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Nuclear denial: From Hiroshima to Fukushima

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Abstract

Governments and the nuclear power industry have a strong interest in playing down the harmful effects of radiation from atomic weapons and nuclear power plants. Over the years, some scientists have supported the view that low levels of radiation are not harmful, while other scientists have held that all radiation is harmful. The author examines the radiation effects of nuclear bombs dropped on Japan in 1945; nuclear weapons testing; plutonium plant accidents at Windscale in England and Chelyabinsk in the Soviet Union; nuclear power plant emissions during normal operations; and the power plant accidents at Three Mile Island in the United States, Chernobyl in the Soviet Union, and Fukushima Daiichi in Japan. In each case, he finds a pattern of minimizing the damage to humans and attributing evidence of shortened life spans mostly to stress and social dislocation rather than to radiation. While low-level radiation is now generally accepted as harmful, its effects are deemed to be so small that they cannot be distinguished from the much greater effects of stress and social dislocation. Thus, some scientists declare that there is no point in even studying the populations exposed to the radioactive elements released into the atmosphere during the 2011 accident at Fukushima.

Keywords

Chernobyl, Fukushima, Hiroshima, human health, Nagasaki, nuclear power plants, radiation, Three Mile Island

The Fukushima Daiichi nuclear disaster, which began in March 2011, is unique in many respects: the massive tsunami, the multiple reactor meltdowns, the rats gnawing through switchboards, the struggle to contain huge amounts of radioactive water. But when it comes to the human health impacts of the ongoing emergency in Japan, it's déjà vu all over again, as Yogi Berra would say. Fukushima is an eerie replay of the denial and controversy that began with the atomic bombings of Hiroshima and Nagasaki. The 2011 headlines differ little from those that appeared in 1945: "Survey Rules Out Nagasaki Dangers" then, and "Experts Foresee No Detectable Health Impact from Fukushima Radiation" now (Greene, 2012; Revkin, 2013). This is the same nuclear denial that also greeted nuclear bomb tests, plutonium plant disasters at Windscale in northern England and Chelyabinsk in the Ural Mountains, and the nuclear power plant accidents at Three Mile Island in the United States and Chernobyl in what is now Ukraine.

Today, the scientific community remains divided over the effects of low-level radiation, with a significant minority of experts holding that low levels are essentially harmless, while the majority says that all levels are harmful to some degree (Beyea, 2012). Estimates of how many people will die as a result of radiation released from Fukushima range from none (UNSCEAR, 2013) to 1,400 people developing cancer as a result of just the first year of exposure to fallout in the contaminated regions outside the evacuation zone (Rosen, 2012).

The Fukushima disagreement is only the latest chapter in a 68-year-old story. Although it may seem that the two scientific camps are not far apart, the question of whether there is any threshold for radiation impacts is a critical one. Unlike the climate debate, nuclear "deniers" are not a tiny minority but rather are respected members of the scientific community who specialize in radiation effects. Most of these experts no longer contend that there is zero harm in low-level radiation, but rather that the range of uncertainty includes zero: In other words, low-level health effects may exist, but they are too small to measure. This view preserves the status quo, since there is no point in comprehensively measuring low-level radiation effects or taking aggressive steps to prevent harm. Nuclear denial creates scientific ambiguity that provides cover for governmental and commercial interests and allows nuclear power to continue expanding worldwide.

Fukushima's health effects

Soon after the Fukushima Daiichi disaster began, industry organizations, governments, and international agencies declared that there were not likely to be any long-term radiation dangers. One of the first was a spokesperson for the Nuclear Energy Institute, a nuclear energy trade group, who declared three months after the accident that "no health effects are expected among the Japanese people as a result of the events at Fukushima" (Nuclear Energy Institute, 2011).

The World Health Organization was also reassuring, stating that while people worldwide receive about 3 millisieverts of radiation per year from sources including background radiation and medical procedures, only two Japanese communities had effective dose rates of 10 to 50 millisieverts, a bit higher than normal.[1] The rest of the Fukushima prefecture and neighboring prefectures were below 10 millisieverts (Brumfiel, 2012; World Health Organization, 2012b).

Experts convened in Vienna by the United Nations Scientific Committee on the Effects of Atomic Radiation concluded: "Radiation exposure following the nuclear accident at Fukushima-Daiichi did not cause any immediate health effects. It is unlikely to be able to attribute any health effects in the future among the general public and the vast majority of workers" (UNSCEAR, 2013).

A public health study at Fukushima Medical University reported that only 0.7 percent of people exposed received doses above 10 millisieverts in the first four months after the accident, and that the highest recorded dose was 23 millisieverts, well below the 100-millisievert exposure level at which the World Health Organization estimates a slight increase in cancer risk (Brumfiel and Fuyuno, 2012).

An article in *Scientific American* (republished in *Nature*) saw no health

effects from radiation and was positively jolly. While one expert quoted in the article said that victims could no longer get the usual treatments for their conditions because of disruptions in the health system, he also said they "are probably getting better care than they were before" the accident (Harmon, 2012).

Other studies, however, have raised considerable alarm. German pediatrician Alex Rosen examined reports from Japanese agencies that came to quite different conclusions than US and international agencies such as the World Health Organization. One example, from the Japanese Ministry of Education, Culture, Sports, Science and Technology (MEXT), indicated that a child living in Iitate (a village in Fukushima prefecture) and spending about eight hours a day outside would be exposed to about 148 millisieverts during the course of a year—100 times the natural background radiation in Japan of 1.48 millisieverts per year (Rosen, 2012).

Medical checks by the Minami-Soma municipal hospital using whole-body counters reportedly found that more than half of the 527 children examined during and after September 2011 had internal exposure to cesium-137, one of the isotopes that pose the greatest risk to human health following nuclear accidents (*Sentaku*, 2012).

The French Institute for Radiological Protection and Nuclear Safety (IRSN) also tells an alarming story. The institute found areas with ambient dose rates 20 to 40 times higher than natural background radiation, and in the most contaminated areas the rates were 10 times those elevated dose rates (IRSN, 2012:). While the World Health Organization report found just two communities with doses of 10 to 50 millisieverts, IRSN found places in four municipalities where doses could have been higher than 25 millisieverts, and noted this was without counting plume exposure or consumption of contaminated foodstuffs (IRSN, 2012). Contamination at levels above 50 millisieverts could have occurred as far as 60 kilometers south of the power plant (IRSN, 2012). Close to 70,000 people living outside the evacuation zone were likely to receive a dose greater than 10 millisieverts in the first year, the report said (IRSN, 2012).

Nuclear physicist Frank N. von Hippel initially estimated 1,000 extra cancer deaths from radiation by extrapolating from an estimate of 16,000 cancer deaths caused by Chernobyl (von Hippel, 2011). More recently, von Hippel and others have estimated from 1,000 to 3,000 cancer deaths (Beyea et al., 2013; Fairlie, 2013).

Nuclear bomb fallout

Contradictory messages about radiation effects are nothing new. In 1945, the bombing of Hiroshima and Nagasaki created radioactive fallout that contaminated food sources and the landscape. The US government minimized the damages immediately. Based on government reports, a headline in the *New York Times* claimed, "No Radioactivity in Hiroshima Ruin." Three weeks later, under the headline "Survey Rules Out Nagasaki Dangers," the subhead in the *New York Times* said, "Radioactivity after Atomic Bomb Is Only 1,000th of that from Luminous Dial Watch" (Greene, 2012).

The denial continued long after the initial blasts. In 1953, the Atomic Energy Commission insisted that low-level exposure to radiation "can be continued

indefinitely without any detectable bodily change" (Johnston, 2007). In 1954, the United States exploded a powerful hydrogen bomb in the Marshall Islands, releasing a huge amount of cesium-137. The fallout area was wider than expected. Marshall Island citizens were exposed to life-threatening doses of radioactive fallout, as were Japanese fishermen outside the official danger zone. There was a public outcry, but the Atomic Energy Commission saw it as an opportunity. One scientist said, with ghoulish racism: "It would be very interesting to go back and get good environmental data [on what happens]... when people live in a contaminated environment.... While it is true that these people do not live, I would say, the way Westerners do, civilized people, it is nevertheless also true that they are more like us than the mice" (Alvarez, 2010).

The aftermath of the 1954 test created a fissure in the scientific community. Atomic scientists said that while high levels of radiation could kill, low levels were not harmful. But geneticists said that all levels of radiation exposure were harmful. The two factions reached a fragile consensus in a 1956 report by the National Academy of Sciences. Biologists on the committee successfully established that all radiation was harmful, but representatives of the Atomic Energy Commission succeeded in promoting a statistical or population approach, which diluted the danger. One member of the Academy's research team pointed to the problem: The number of children handicapped by genetic mutations per 1,000 live births might only increase from 20 to 22, but in the United States alone this would mean something like an additional 300,000 handicapped children per generation—a different framing than a small increase of two per 1,000 (Hamblin, 2007).

The passage of time allowed more cancers to appear, and by 2005 it was clear that any dose of radiation was harmful, and scientists had found a linear increase in risk with increasing radiation doses. They had also identified other damaging health effects besides cancers: in particular, genetic changes passed on to succeeding generations. There was no threshold below which radiation exposure was harmless (National Research Council, 2006). Still, some scientists, even radiation experts, continue to speak of radiation in relative language—comparing exposure with x-rays, for example—rather than acknowledging that any additional radiation is harmful and still insist that there is a threshold below which there is no harm.

What, in fact, were the long-term effects of the Hiroshima and Nagasaki bombs? Reports estimate a total of about 1,900 excess leukemia deaths and cases of other cancers can be attributed to radiation (Radiation Effects Research Foundation, 2007). This is not a gigantic number compared with roughly 200,000 deaths from the bombs' immediate effects, but it is not as negligible as the US government's estimate of 430 cancer deaths (US Department of Homeland Security, n.d.).

Nuclear weapons processing

As the United States, the Soviet Union, the United Kingdom, and other countries expanded their nuclear arsenals, another problem emerged. In 1957, a fire in a nuclear reactor at the British plutonium-manufacturing plant at Windscale burned for five days, sending radioactive material over a large area

of Cumbria. The event was not made public and no evacuation was ordered. The accident resulted in an estimated 240 cancers among those living near the site (Corey, 1979; Morelle, 2007). But, as with the link between smoking and cancer, some scientists disputed the cancer connection. One imaginative research account attributes the documented rise in childhood leukemia to "population mixing," wherein rural children who have not acquired the usual immunity to childhood leukemia move to an urban place where they can be exposed (Kinlen, 2011).

A much more serious accident, also in 1957, was a huge explosion at the Chelyabinsk nuclear weapons processing plant in the eastern Ural Mountains of the Soviet Union. One estimate is that 272,000 people were irradiated; lakes and streams were contaminated, and radioactivity levels are still extremely high in some areas (Hertsgaard, 2006). The world did not know of this event for decades; the Soviet Union thought it was essential to keep it secret. The CIA knew of it immediately but also kept it secret. If a processing plant could do that much damage, it would be a powerful argument against building nuclear weapons.

Nuclear power

By exploiting the peaceful uses of the atom—in medicine, earth removal, and later in nuclear power plants—nuclear deniers embarked on an ambitious program to dissipate fears about things nuclear and gain acceptance for nuclear weapons. One element in the "friendly atom" program was Project Plowshare, in which atomic explosions would enlarge harbors and the Panama Canal. The chairman of the Atomic Energy Commission announced that the project was intended to "highlight the peaceful applications of nuclear explosive devices and thereby create a climate of world opinion that is *more favorable to weapons development and tests*" (Strauss, quoted in Kuznick, 2011, emphasis added). As a Pentagon official put it in 1953: "The atomic bomb will be accepted far more readily if at the same time atomic energy is being used for constructive ends" (Osgood, 2008: 156).

Nuclear power became the major vehicle for this constructive change. The relationship between weapons and power is intimate; nuclear power plants produce low-grade plutonium that can be reprocessed into weapon-grade plutonium. As State Department Attorney William H. Taft IV warned in 1981, the civilian nuclear power industry could be seriously damaged because of the "mistaken impression" that low-level radiation is hazardous (Greene, 2012). It was not a mistaken impression. In 1953, an American anthropologist working for the Atomic Bomb Casualty Commission showed that Japanese children who were exposed to fallout were not only smaller than their counterparts but also had less resistance to disease in general and were more susceptible to cancer, especially leukemia. The report was censored (Johnston, 2011). But there would be more.

Power plant accidents

After bomb testing ended, a new demon emerged: the possibility of a serious power plant accident. Following the Three Mile Island accident in 1979, a Columbia University study found increases in some cancers—but there were factors

that ruled out a cancer link, one of which was that the level of radiation was said to be too low to have caused them. What, then, could have caused the increase? The researchers suggested it was stress (Hatch et al., 1991). A group of citizens that was suing the utility asked for a second study (Wing, 2003). Lawyers for the litigants supported a nonprofit group that financed a new analysis of the data by researchers from the University of North Carolina. They found: "Accident doses were positively associated with cancer incidence. Associations were largest for leukemia, intermediate for lung cancer, and smallest for all cancers combined; larger for longer than for shorter latency; and larger with adjustment for socioeconomic variables" (Wing et al., 1997: 52). In a lengthy trial, the federal judge disagreed, finding that "the paucity of proof" by the plaintiffs was "manifest."

A later study at the University of Pittsburgh once again reviewed the data, but this time it followed residents not just to 1985, as had the previous studies, but to 1998. The researchers found only slight increases of both overall mortality and overall cancer mortality. Thus they concluded that there was "no consistent evidence" of "a significant impact" (Talbott et al., 2003: 341).

Large uncertainties remain. People who left the area were not included in the sample; the track of the radioactive plume could only be grossly estimated; individual exposures could not be measured; and, as Wing (2003) noted in a lengthy critique, the studies that found no impact were set to avoid overestimation of radiation effects, and thus risked underestimation. About 13 percent of all deaths are due to various forms of cancer, and aside from direct penetrating radiations, almost every instance of cancer that *could* have come from radiation could instead have come from other sources. These cancers existed before the nuclear age, just as lung cancers existed before smoking was widespread. There could always be an alternative explanation. The issue is ripe for what British sociologist Linsey McGoey (2012) calls "the mobilization of ambiguity."

The Soviet Union successfully mobilized this ambiguity after the 1986 Chernobyl disaster, when Soviet prestige was at stake. The government suppressed medical studies by Soviet scientists, and doctors were told not to use the designation of leukemia in health reports. But as the years went by and radioactive particles in the air, earth, plants, and animals did their work, life expectancy in the polluted areas of Belarus, Ukraine, and southern Russia fell sharply. Twenty-seven years later, Germany still requires testing of wild boar meat; some reindeer in Scandinavian countries are still contaminated; areas of Ukraine and Belarus closest to the plant are still off-limits.

Today, estimates of the damage from radiation vary to an astounding degree. United Nations agencies generally cite 4,000 premature deaths in the contaminated areas of Ukraine, Belarus, and Russia, while Greenpeace puts the figure at 200,000 (Greenpeace, 2006). Then there is the very controversial estimate of 985,000 premature cancer deaths worldwide between 1986 and 2004 made by Russian scientists with access to thousands of Russian, Belarusian, and Ukrainian publications (Yablokov and Nesterenko, 2010; Yablokov et al., 2009).

The easiest way to play down the damage in the face of evidence of sharp

declines in life expectancy is to say that these declines are only partly related to radiation, and mostly to other causes. Stress is an obvious one, but the Soviet Union piled on with more general "lifestyle" causes. The International Atomic Energy Agency agreed, saying that designating the affected population as "victims" rather than "survivors" "has led them to perceive themselves as helpless, weak and lacking control over their future. This, in turn, has led either to over cautious behavior and exaggerated health concerns, or to reckless conduct, such as consumption of mushrooms, berries and game from areas still designated as highly contaminated, overuse of alcohol and tobacco, and unprotected promiscuous sexual activity" (International Atomic Energy Agency, n.d.).

"Normal" operation

Even the normal operation of a nuclear power plant is expected to release some radiation. While most studies have concluded there is no risk to human health, some see radiation damages. A study published in 2002 looked at the health effects on children in the two years following the closing of eight US nuclear plants in 1987. Strontium-90 levels in local milk declined sharply, as did death rates of infants who lived downwind and within 40 miles of the plants, suggesting a link between low-dose radiation from gases emitted by the plants and early deaths (Mangano et al., 2002).

The research task is daunting. Children are the most vulnerable population, and the biggest risk is childhood leukemia, so most studies focus on this. But since the disease is rare among children, a doubling of the tiny number of expected deaths is still so small it is hard to detect. In 2007, a German study found increased rates of childhood leukemia in the vicinity of all 16 nuclear power plants in Germany. Children who lived less than 5 kilometers (about 3 miles) from a plant were more than twice as likely to develop leukemia as children who lived more than 5 kilometers away. It should not surprise us that, despite their findings of leukemia, the study's authors said they could not determine the cause (Federal Office for Radiation Protection, 2009). It could not be radiation because the levels were too low!

A French study, for the years 2002 to 2007, found a clear correlation between the frequency of acute childhood leukemia and proximity to 19 nuclear power stations. The study reported a doubling of childhood leukemia incidence under the age of five, but the researchers concluded that there was only a "possible" excess risk for this cancer, and are explicit that it cannot be attributed to gaseous discharges because the radiation is so low. They called for more studies (Sermage-Faure et al., 2012). A meta-study of 136 reactor sites in seven countries, extended to include children up to age nine, found childhood leukemia increases of 14 percent to 21 percent (Baker and Hoel, 2007).

Assessing Fukushima

Epidemiological studies of children and adults living near the Fukushima Daiichi Nuclear Power Plant will face the same obstacles as earlier studies. It will take decades for all radiation damages to appear, and many experts deny that there will be any significant long-term effects. "In terms of the health impact, the radiation is negligible," said Richard

Garfield, a professor at Columbia University's Mailman School of Public Health. "The radiation will cause very few, close to no deaths." Thomas McKone of the University of California, Berkeley, School of Public Health agreed: "Much of the damage was really psychological—the stress of not knowing, of being relocated" (Harmon, 2012).

While the Japanese government plans an extensive and expensive health follow-up on citizens from the Fukushima area, American radiological experts say it is not worth it. David Brenner, a radiologist at Columbia University, doubts a direct link will ever be definitively made. He said that, under normal circumstances, in a developed country such as Japan, "40 percent of everybody will get cancer. It doesn't seem to me that it's possible to do an epidemiological study that will see an increased risk." He did add that it might be valuable to conduct studies to reassure the population that they are not being misled (Brumfiel, 2012: 3).

In a panel discussion of Fukushima at the National Press Club in March 2012, John Boice Jr., a medical epidemiologist who now heads the National Council on Radiation Protection and Measurements, said: "There's no opportunity for conducting epidemiological studies that have any chance of success. . .. The doses are just too low" (Wald, 2012). He emphasized the stumbling block that haunts the radiation field: the lower the dose, the greater the difficulty in detecting any increase in the number of cancers possibly attributable to radiation.

In late February, the World Health Organization (2013) announced its latest assessment of Fukushima, nearly two years after the event. CNN summarized it under the headline "Fukushima's Radiation Damaged More Souls Than Bodies" (Brumfield, 2013). Any increase in human disease, the WHO report said, is "likely to remain below detectable levels." The report modeled estimated doses from sub-optimal data, rather than from direct measures of exposure or the consequences of exposure. (It is worth noting that the WHO still only releases reports on radiation impacts in consultation with the International Atomic Energy Agency.)

One direct examination has been conducted: In its 10th report, dated March 2013, the Fukushima Prefecture Health Management Survey reported examining 133,000 children using new, highly sensitive ultrasound equipment. The survey found that 41 percent of the children examined had cysts of up to 2 centimeters in size and lumps measuring up to 5 millimeters on their thyroid glands, presumably from inhaled and ingested radioactive iodine. However, the survey found no cause for alarm because the cysts and lumps were too small to warrant further examination. The defense ministry also conducted an ultrasound examination of children from three other prefectures distant from Fukushima and found somewhat elevated percentages of small cysts and lumps, arguing that radiation was not the cause (Oiwa, 2013).

A June 9, 2013 article in the *Japan Times* reported on the latest findings of the Fukushima Medical University survey, which found that 12 of 175,499 children had tested positive for possible thyroid cancer, and 15 more were deemed at high risk of developing the disease (Osaki, 2013). This might be considered a small number for a population of this size, giving authorities even more grounds for finding no radiation

damages. However, children on other continents have not had this type of ultrasound examination, so no normal rate has been established. Experts concerned about radiation effects point out that the small cysts and lumps found in many of the children surveyed, which are signs of possible thyroid cancer, have appeared alarmingly soon after the accident; that the radiation would not be expected to be limited to the Fukushima prefecture; that there is evidence of unusual numbers of cysts and growths in children living on the West Coast of the United States (Mangano and Sherman, 2013); that it is not clear that the Fukushima survey subjects were randomly selected (some refused examination); and finally, that it will take some years to see whether the abnormalities increase in size, so follow-ups are essential (Caldicott, 2012; Osaki, 2013; RT, 2013).

Echoes of the past

The denial that Fukushima has any significant health impacts echoes the denials of the atomic bomb effects in 1945; the secrecy surrounding Windscale and Chelyabinsk; the studies suggesting that the fallout from Three Mile Island was, in fact, serious; and the multiple denials regarding Chernobyl (that it happened, that it was serious, and that it is still serious).

Will Fukushima make nations reject nuclear power? It appears not. In June 2012, the US Department of Energy granted $800,000 to the Massachusetts Institute of Technology to address the "difficulties in gaining the broad social acceptance" of nuclear power. The Energy Department, as we have seen, has been attempting this for half a century. Giant companies such as Areva in France and South Korean firms are building more plants. In the United States, while three plants are being retired for mechanical reasons and one because its electricity is more expensive than power from gas-fired plants, construction is still going ahead for four US reactors. Europe is not on board. Germany is planning to shut down all its existing plants, and other European countries are phasing them out. But China leads the way in construction, and India is not far behind. While the picture is mixed, and cheap natural gas may greatly weaken the US nuclear industry, the number of plants worldwide will continue to grow.

Ambiguities about radiation's effects have at times appeared to be purposeful. Vast investments are at stake in both the weapons and the nuclear power industries, and there is enough ambiguity about low-level radiation and its social acceptance to keep government-sponsored grants flowing to scientists.

While international agencies now agree that there is no threshold below which radiation can be deemed harmless, that does not translate into policy recommendations for evacuations or power plant closures (Thompson, 2012). Only one United Nations agency, the UN Human Rights Council, has shown alarm about the post-disaster radiological effects, referring to them as "immense and long-term" and calling for greater transparency and accountability (Grover, 2013). Even if the only health impacts of nuclear power plants—during normal operations or following a serious accident—were stress and "nuclear phobia," the risks of these human costs (which are said to include premature deaths) must be weighed against the

advantages of producing nuclear power and weapon-grade plutonium. Denials of radiation effects only exacerbate stress, by undermining public trust.

While "no harm in low-level radiation" is an increasingly minority view, it has been replaced by "too low to measure any harm," which is a handy excuse for continuing business as usual. For some scientists, it means there is no point in measuring the effects. The Japanese government assures the world that Fukushima victims will be closely monitored.[2] The same government, however, assured the world that an accident like this could never happen.

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Notes

1. The World Health Organization says that there is a significant increase of cancer risk at doses above 100 millisieverts (World Health Organization, 2012a).
2. After a November 2012 mission to Japan, the Special Rapporteur for the UN Human Rights Council prepared a report that commended the government on steps taken to monitor the health of the population affected by Fukushima, but pointed out significant gaps in monitoring (see Grover, 2013).

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