

**Radiation:
More Harmful to
Girls and Women
than to
Boys and Men**

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Project

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Atomic Radiation is more harmful to girls and women compared to boys and men.

A number of independent analysts have found this pattern; I am one of them.

More information and citations at [www,genderandradiation.org](http://www.genderandradiation.org)

Radioactivity impacts all life on Earth



This talk will focus on harm to people, however all forms of life are impacted by radiation.

Radiation regulation has been based on
“Reference Man”



Historically and still in the USA today, regulations of radiation are based on only males. It is assumed that the body being exposed to radiation is a young adult male: a “Reference Man.” The definition also includes race and lifestyle factors.

In general, female bodies as well as anyone with a land-based, local foods lifestyle have been invisible, and so less protected by national safety regulations.

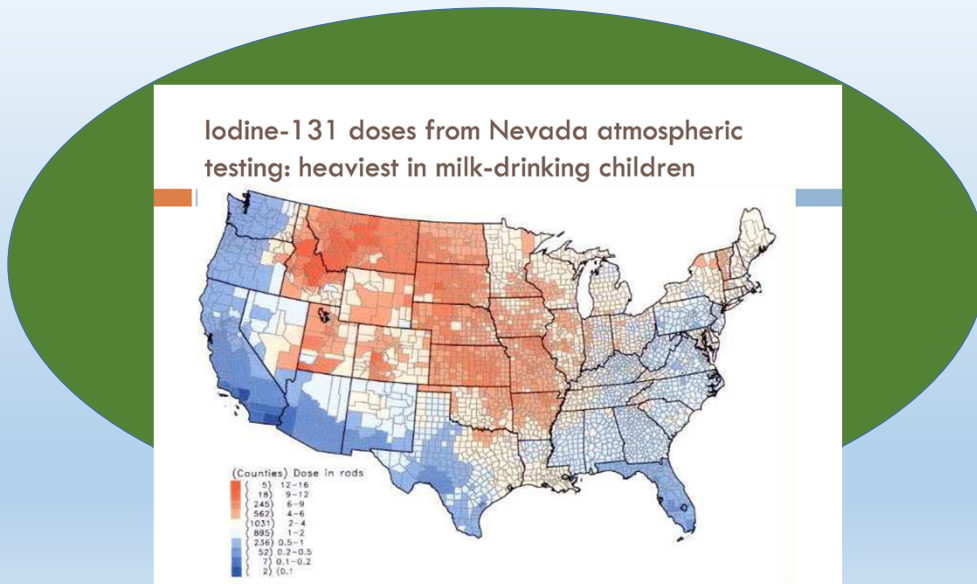
Nuclear Weapons Testing



1945—1998 is a film by Isaio Hashimoto and contains this image of the places on Earth where nuclear weapons have been detonated up to 1998. This is not a fallout map—it shows relative numbers of tests.

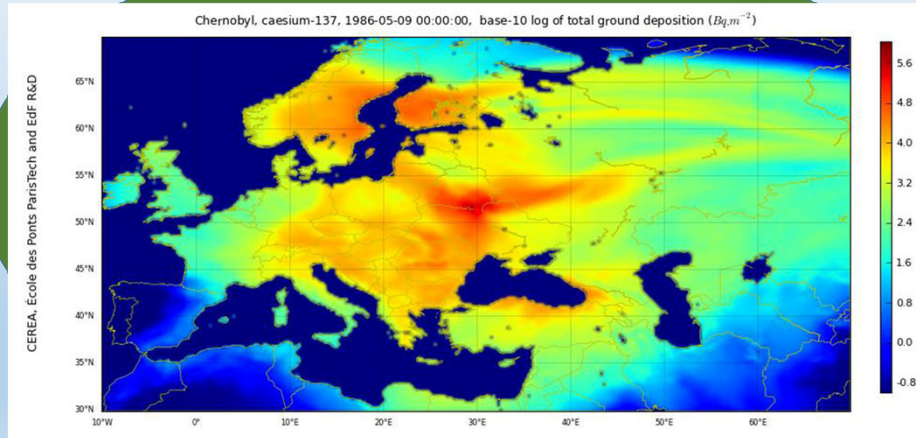
1945—1998 is a film by Isaio Hashimoto. It contains this image of the places on Earth where nuclear weapons have been detonated up to 1998. This is not a fallout map—it shows relative numbers of nuclear explosions. There have been more than 2000, and 528 of these were in our atmosphere.

This is a **nuclear fallout** map for USA, 1951—1962 showing where radioactive iodine exposed US population to radiation from nuclear weapons tests at Nevada Test Site.



This nuclear fallout map shows where radioactive iodine exposed US population to radiation from atmospheric nuclear weapons tests at Nevada Test Site, 1951--1962. The iodine was concentrated by the food chain.

Nuclear Reactor Explosion: Deposition of radioactive Cesium-137 from the 1986 Chernobyl explosion and graphite fire.



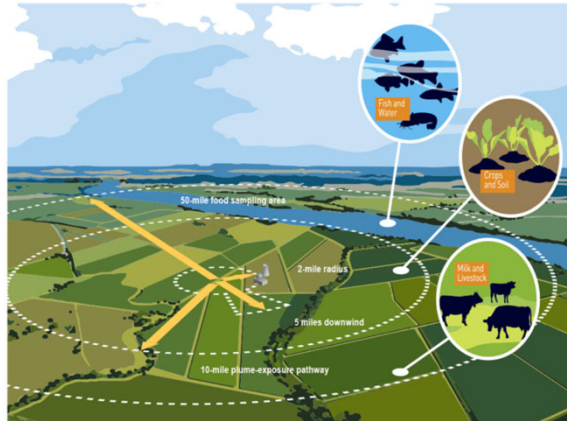
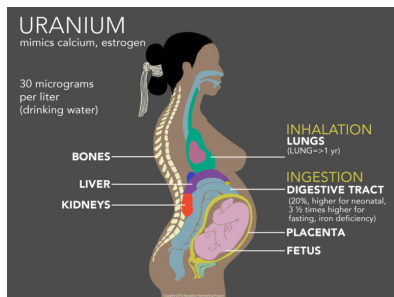
This is a reconstruction of deposition of radioactive Cesium-137 from the 1986 Chernobyl explosion and graphite fire.

The decay of Cesium-137 results in stable barium-137—and now that 37 years have passed, a bit more than half of the radioactivity is gone. Good news!

Image: Cesium 137 distribution from Chernobyl, original by CEREA

Fallout and Reactor Accidents are stories of

Contaminated air
Contaminated water
Contaminated food
LEADING TO
CONTAMINATED BODIES



Note: A 2-mile (3.2-kilometer) ring around the plant is identified for evacuation, along with a 5-mile (8-kilometer) zone downwind of the projected release path.

Images via Beyond Nuclear / www.beyondnuclear.org

Fallout from nuclear weapons detonations and from reactor accidents result in contaminated air, water, and food leading to contaminated bodies.

Thank you to Beyond Nuclear for use of the images.

Today, we don't know if biological sex is a factor in outcomes from the internal exposure to radiation. **We need to know.**

- The findings I will now share are:
 - Based on external exposure to gamma and neutron radiation
 - Are first generation only
 - Biological sex was assigned by researchers / binary male / female only
 - A large population with a control population with a research question:
 - “What are the long-term consequences of using nuclear weapons on civilian populations?” measured as cancer incidence and cancer deaths.

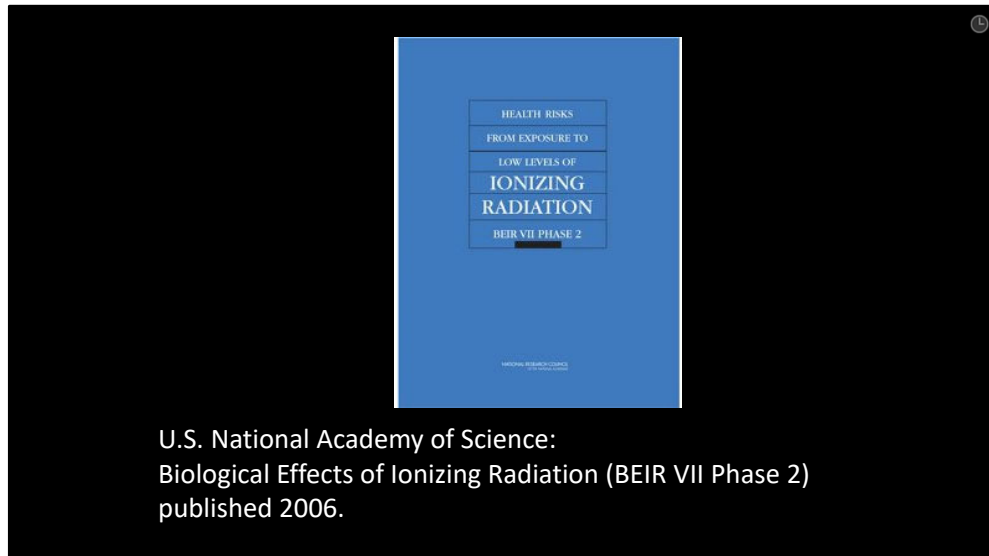
Slide will be read. Additional commentary:

My government chose to create nuclear weapons, and then, to use the first weapons on unconscionable targets—cities full of people. As only one woman, I am so sorry any of this happened. It was wrong. Worse, it was a war crime.

The decision to study the Japanese A-bomb survivors in Hiroshima and Nagasaki was by design. The researchers made no effort to treat the injured and sick survivors—it was thought that care could change the outcome of the experiment. Clearly the study was also a war crime.

The data from the A-bomb survivors is used widely, including by me, here. I use this data because it is the only large data set that contains people of all ages and sexes. We do not want another one!

The information in these numbers is important to the survival of life on earth—but that does not absolve my sin. I am so sorry we are here.



U.S. National Academy of Science:
Biological Effects of Ionizing Radiation (BEIR VII Phase 2)
published 2006.

This 2006 report by the US National Academy of Sciences, the Biological Effects of Ionizing Radiation, #VII, or BEIR VII, is the source of the data for my independent findings.

I did not collect any data myself.

The report provides the numbers, but no discussion of biological sex as a factor in degree of radiation harm.

Dr Arjun Makhijani and his team published the same findings in 2006. My work was completely independent and provides a second-look.

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On-line download of PDF of full report available here:

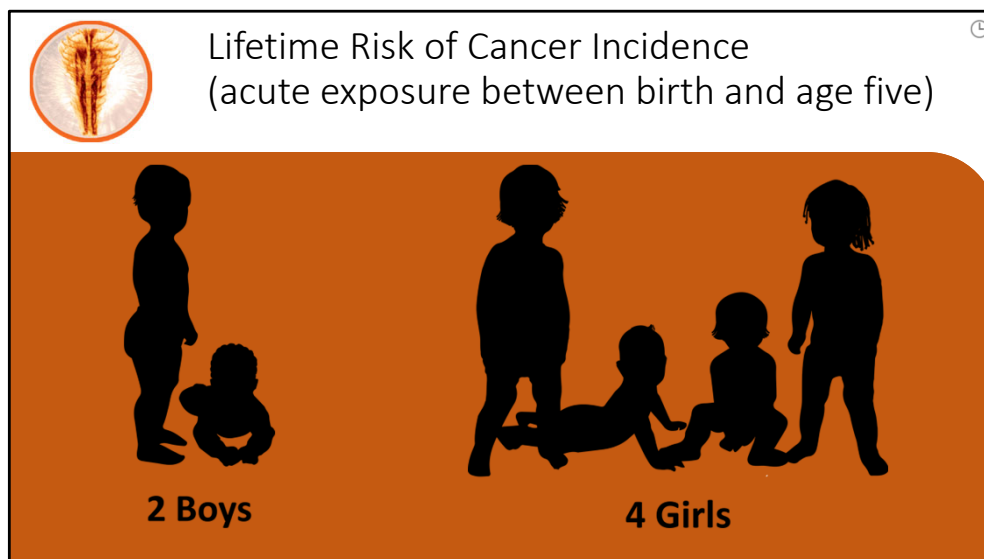
https://www.nap.edu/login.php?record_id=11340&page=https%3A%2F%2Fwww.nap.edu%2Fdownload%2F11340

Screen capture of report cover



Since children are growing, the cells in their bodies are dividing more rapidly than adults. The DNA in cells is more likely to be damaged when in cell division.

We cannot know which exposure to radiation will result in cancer. AND we can rarely prove that a particular cancer was caused by radiation. Therefore we have to study large groups called data-sets and look for patterns.



The news, from the atomic ashes of Hiroshima and Nagasaki is that biological sex makes a big difference in the degree of radiation harm to individuals of all ages.

The Survivors were grouped by the age they were at the time of the bombing. These groups were tracked over their lifetimes. Cancers and cancer deaths were counted.

Both males and females who were five years or younger when exposed to the A-Bomb radiation in August, 1945 had the most cancer at some point in their lives.

Girls in this group were twice as likely to get cancer at some point than were boys. For every male in the birth-5 cohort that suffered cancer at some point in their lives, **two** females got cancer. This is news.

Source:

Olson, 2011. NIRS Briefing Paper: "Atomic Radiation is more harmful to women." posted: <http://www.nirs.org/radiation/radhealth/radhealthhome.htm>

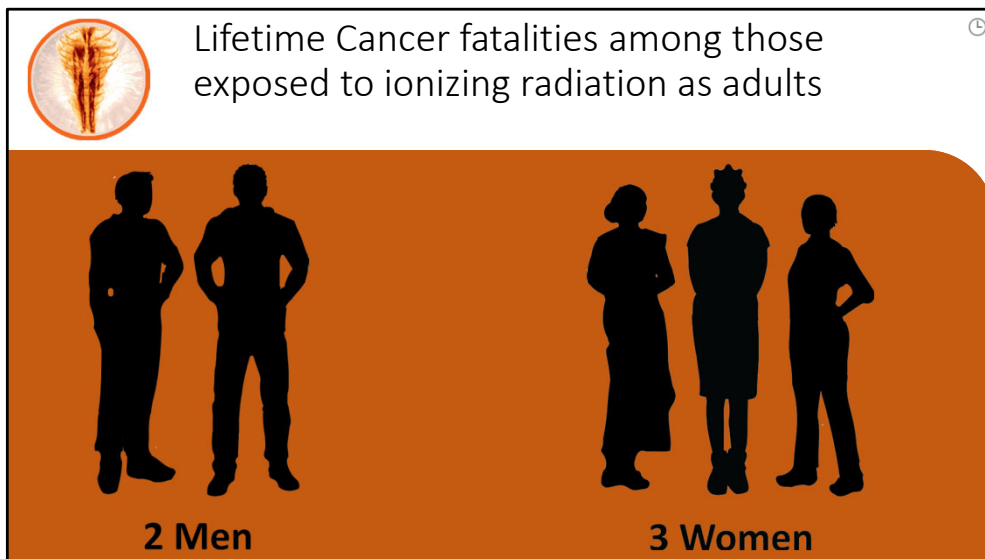
Makhijani, 2005 started the Healthy from the Start Campaign to address disproportionate impact of ionizing radiation on young females.

<http://ieer.org/projects/healthy-from-the-start/>

And <http://ieer.org/resource/health-and-safety/open-letter-to-president-bush-on-protecting-the-most-vulnerable/>



Little girls are not a “subpopulation” as some regulators think.
We are an inextricable link in the human lifecycle.

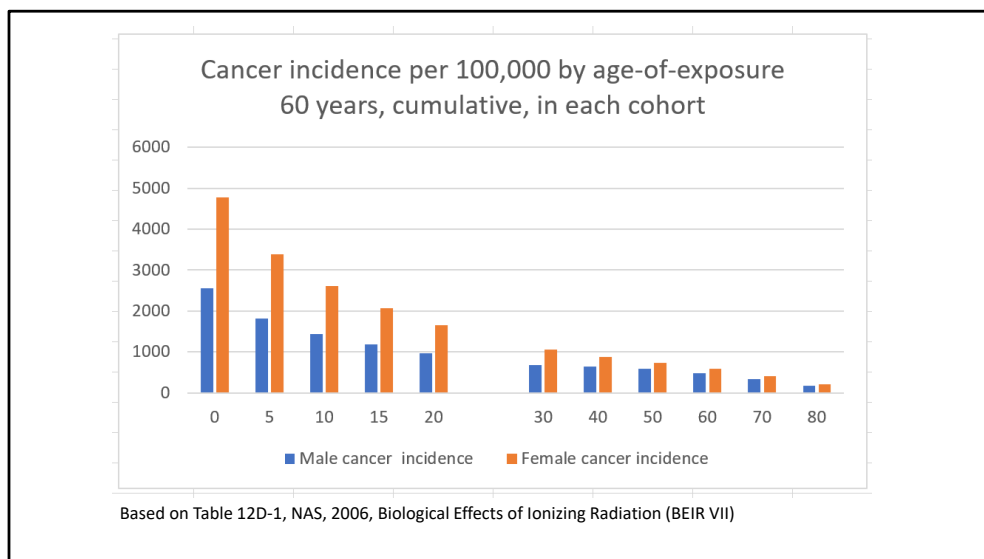


Gender was also a factor for those who were adults at the time of the bombings.

Over their lifetime women exposed as adults suffered more cancer death than did men in the same age group.

For every 2 men in these cohorts who died of cancer, three women died of cancer.

Source:
(see above) Olson, Makhijani, numbers in tables of BEIR VII.



This is the same information on a chart, with a scenario based on the primary data.

This scenario is “What if everyone got the same level of radiation?” This case is a constant exposure of 1 GY—so we can look specifically at age and biological sex.

The bottom shows the ages the survivors were in August 1945. Those who were infants are grouped at the left and on the right the elders.



Each bar is 60 years of data and shows the rate of cancer per 100,000

It is easy to see that females suffered more cancers than males in every age group, and the difference is greatest when the exposure was in childhood.

The chart does not show age of cancer onset—but it is not all childhood cancers.


Source: Table 12D-1, NAS 2006. Biological Effects of Ionizing Radiation (BEIR VII, phase 2).

Is Gender a factor in radiation harm (cancer)?



Dr. Rosalie Bertell

Females have 50% more high-risk tissue compared to males



This work raises more questions than answers.

No one with a research team and funding has yet asked (and answered) the question WHY? Why is biological sex a factor in harm from radiation?

Is the fact it has not been addressed due to gendered dynamics in research funding?

I am partially retired.

The rising generation of brilliant minds should get PhD's and Medical Degrees asking this and other basic science questions

Including questions key to understanding the consequences of Chernobyl:

Is biological sex a factor in outcome when radioactivity is inside the body due to environmental contamination including air, food, and water?

So many questions!

Radiation regulation has been based on “Reference Man”



- Historical perspective: Early radiation workers were medical or military / para-military males
- No one stopped to evaluate whether Reference Man represents the GENERAL POPULATION

Read slide
(header only)

Radiation regulation based on Reference Man results in systematic under-reporting of radiation harm for the global population.



Read slide

Thank you for listening. I welcome anyone being in touch.

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