

Nuclear: War of Human Consequences

Mary Olson, Nuclear Information and Resource Service

www.nirs.org

maryo@nirs.org

Thank you for this opportunity to speak; and Thank You World Family for being here. I am particularly glad to address those who did not experience the Cold War first-hand; you inspire this presentation.

My name is Mary Olson, I serve as nuclear waste specialist with a civil society organization, Nuclear Information and Resource Service [nirs.org] based in the United States.

Nuclear, is war of human consequences.

The Cold War promised “mutual destruction” of civilian populations; most cities of 100,000 or more people in both the USA and Russia became targets. Vaporizing large numbers of people is the strategy.

Even a “limited use” with today’s weapons, would result in unavoidable, enduring, catastrophic damage to our ecologic, economic and public health.

It is my job to give a summary of the medical consequences of using these weapons. Others will give far greater detail.

Resources:

International Physicians for the Prevention of Nuclear War:

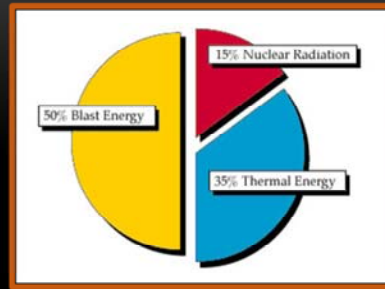
<http://www.ippnw.org/pdf/1998ForrowJAMA.pdf>

“From Hiroshima to **Mutual Assured Destruction** to Abolition 2000.” Lachlan Forrow, MD; Victor W. Sidel, MD; reprinted from the Journal of the American Medical Association, August 5, 1998; Vol 280, No 5, pages 456—461.

European Leadership Network: 2014. Ambassador A. Kmentt.

http://www.europeanleadershipnetwork.org/avoiding-the-worst-re-framing-the-debate-on-nuclear-disarmament_1558.html

The energy profile of a nuclear explosion:



A nuclear explosion is composed of three types of energy: Blast, Heat, and Radiation.

85% of the total energy is the blast and the heat.
Instantaneous radiation is about 5%,
and long term persistent radioactivity is about 10%.

Broad Resources:

The Bulletin of Atomic Scientists; <http://thebulletin.org/search/topics/nuclear-weapons>

Union of Concerned Scientists:

<http://www.ucsusa.org/our-work/nuclear-weapons#.VHpzhDHF8xl>

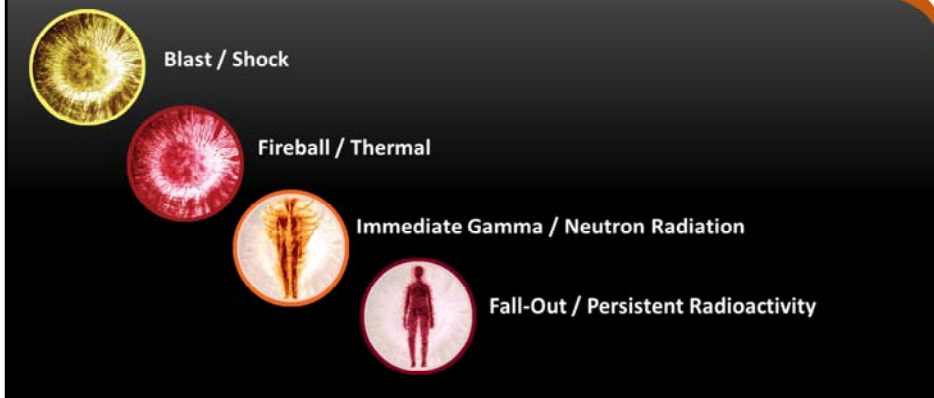
International Atomic Energy Agency – Tools for Nuclear Inspection (factsheet):

<http://www.iaea.org/sites/default/files/inspectors.pdf>

Reaching Critical Will: <http://www.reachingcriticalwill.org>

The disarmament arm of Women's International League for Peace and Freedom.

Icons used in this paper:



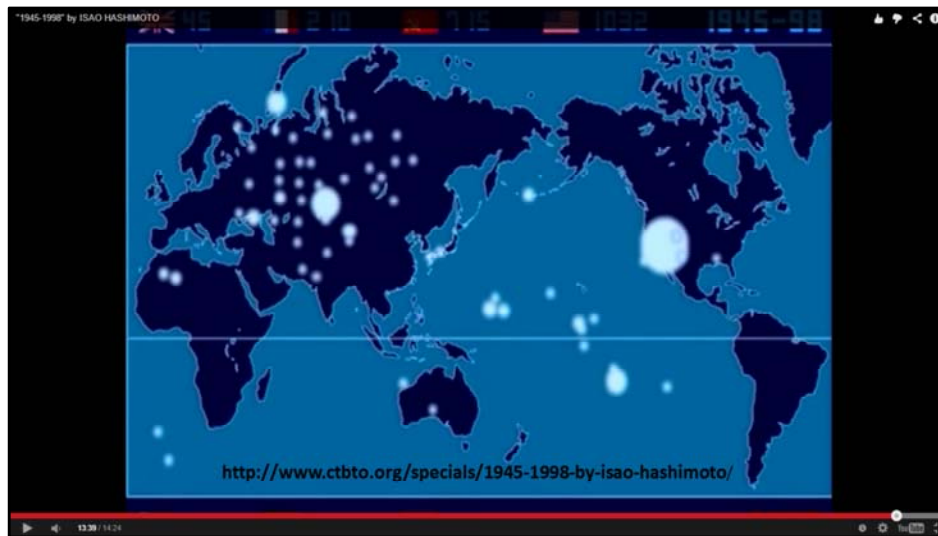
I am using four ICONS to track how each type of energy from these weapons impact human health:

- Yellow is Blast.
- Red is Thermal.
- Orange is Immediate Gamma / Neutron Radiation.
- Purple is Persistent radioactivity from the atomic fission products.

Today Nuclear Weapons are very much larger than in 1945, but the forces are the same, just bigger.

Art Credit:

Figures and Emblem by Loren Olson. Icon formatting, Saro Lynch-Thomason, Fullsteam Labs.



This work of art by Isao Hashimoto, shows places where in the last 7 decades more than 2000 nuclear explosions have already occurred.

Every nuclear explosion results in harm to human health and our environment. We have already contaminated our planet, with local and global consequences, even without waging a full-scale nuclear war.

Of these , two nuclear bombs exploded were directly on cities: In August 1945 the United States bombed Hiroshima and Nagasaki, Japan. More than 150,000 people died.

I need to acknowledge the personal side of this:

My government chose to use the first nuclear weapons on cities full of people. Five years later, the US initiated a long-term study of the atomic bomb survivors.

Those researchers assumed that humanitarian and medical aid might “skew the results” of their study and so medical treatment was not offered to the victims.

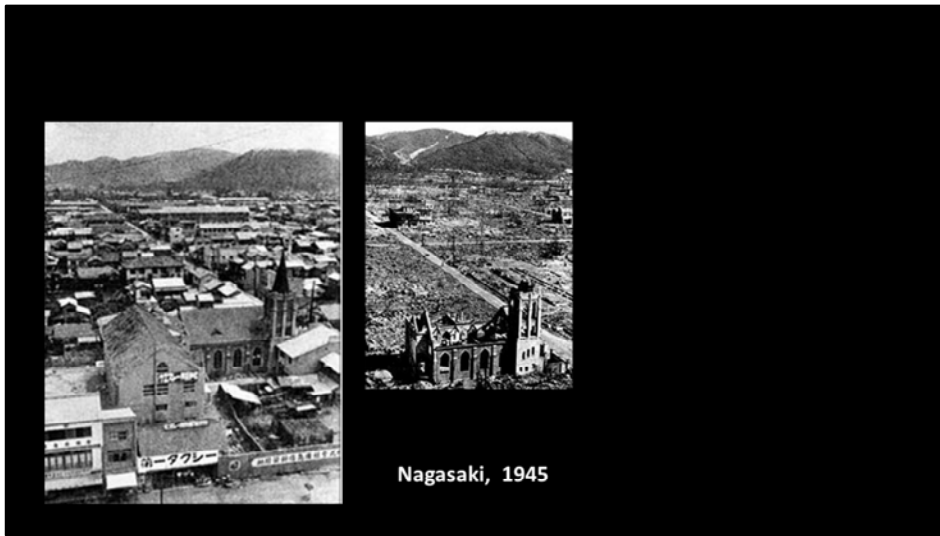
The data on radiation that I, and many others, use came from these historical actions. Most published studies do not acknowledge this. Speaking only as one woman, I am deeply sorry that any of this ever happened.

Art Credit:

This image, used with permission from Mr Hashimoto is a screen capture from a short film by Isao Hashimoto, entitled “1945-1998.” posted here:

<http://www.ctbto.org/specials/1945-1998-by-isao-hashimoto/>

The DVD is also available from the artist.



Nagasaki. 1945.

The church is in both frames...

Today this size of bomb would be considered a "tactical" or small weapon.

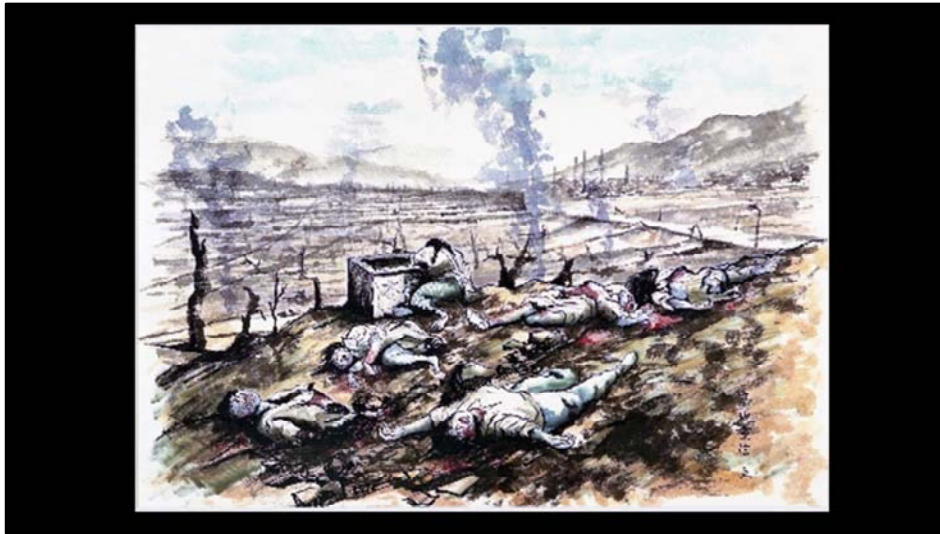


A nuclear shockwave is somewhat slower than conventional explosives.
Pressure waves form in living tissue;
The body's lungs and other membranes rupture.

Internal bleeding and embolisms cause immediate death.

Reference:

Dr. Helen Caldicott, 2004, "The New Nuclear Danger," The New Press, NY, NY.



A survivor, a Hibakusha from Nagasaki who witnessed this destruction, made this painting from memory.

Art Credit:

Painting by a Hibakusha from Nagasaki, recording events witnessed. Made available by Hibakusha Stories Project; <http://www.hibakushastories.org/>



Thermal: Immediate medical consequences

At Ground Zero temperatures are as hot as the surface of the sun
(7000° F / 3800° C)

Resulting winds of 160 -- 500 mph / 250 -- 800 kph leveling
people, homes and vegetation;

Immediate updraft of mushroom cloud carries particulate to
atmosphere.

At Ground Zero the temperatures are as hot as the surface of the sun (3,800 degrees C)

Resulting in:

- Immolation
- Asphyxiation
- Burns

The updraft from the heat creates winds up to 88 kilometer per hour, leveling everything in the way.

The immediate updraft of the mushroom cloud carries particulate high in the atmosphere.

Sources:

The Atomic Bombings of Hiroshima and Nagasaki : Chapter 18 - Characteristics of the Injuries to Persons

("This report has been compiled by the Manhattan Engineer District of the United States Army under the direction of Major General Leslie R. Groves.") circa 1945 – no date given

http://avalon.law.yale.edu/20th_century/mp18.asp

Hiroshima by John Hersey

<https://archive.org/details/hiroshima035082mbp>

An account of a visit to the remains of Hiroshima, published in The New Yorker in August, 1946.



*
...



*
...



Immediate Air Radiation levels:
Lethal if not shielded

Hiroshima:

Gamma rays: 10,300 rads / 103 Gy;

Estimated neutrons: 14,100 rads / 141 Gy

Nagasaki:

Gamma rays: 25,100 rads / 251 Gy

Estimated neutrons: 3,900 rads / 39 Gy

Lethal level ~ 4.5 Gy

A dose of ionizing radiation of 4.5 Grays is considered lethal.

These are levels far exceed that.

Source of information:

http://atomicbombmuseum.org/3_health.shtml

Resources on Ionizing Radiation:

Nuclear Information and Resource Service:

<http://www.nirs.org/radiation/radiationhome.htm>

Institute for Energy and Environmental Research:

<http://ieer.org/resource/classroom/measuring-radiation-terminology/>

Dr. Ian Fairlie is an independent researcher in radiological impacts; his collection of articles of interest is here:

<http://www.ianfairlie.org/scientific-references/>



Acute High-Dose Ionizing Radiation: Immediate Medical Consequences

In the human body systemic failure is in three forms:

1. (> 30 Gy whole body) **Cerebrovascular syndrome**
2. (6 to 30 Gy whole body) **Gastro-Intestinal syndrome**
3. (1 to 6 Gy whole body) **Hematopoietic syndrome**

Number 1: **Cerebrovascular syndrome:**

Tremors, seizures, ataxia, and cerebral edema;
is immediate and always fatal within hours to 1 or 2 days;

Number 2: **Gastro-Intestinal syndrome:**

Intestinal lining cells die; marked by
Nausea, vomiting, and diarrhea, leading to severe dehydration;
Plasma volume falls, veins collapse;
Necrosis of intestine; contributing to intestinal perforation, bacteremia, sepsis;
Death is common.

Number 3: **Hematopoietic syndrome:**

Bone marrow stem cells are depleted;
Circulating blood is not fully replaced;
Antibody production down;
Increased risk of various infections;
Hemorrhaging results from low blood platelets and Anemia develops slowly.
Survivors have an increased incidence of radiation-induced cancer, including leukemia.

Citations:

J. Radiol, 1984. May; 57(677):355-69.

The LD50 for uniform low LET irradiation of man.

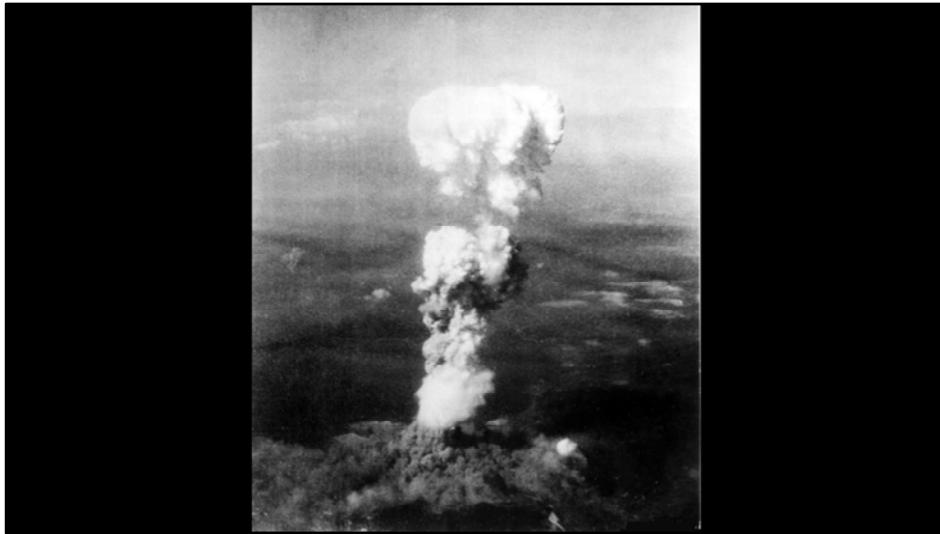
<http://www.ncbi.nlm.nih.gov/pubmed/6372928>

Characterization of systemic failures;

http://www.merckmanuals.com/professional/injuries_poisoning/radiation_exposure_and_contamination/radiation_exposure_and_contamination.html

More details:

http://atomicbombmuseum.org/3_health.shtml



This photo was taken from the plane that dropped the bomb on Hiroshima.

It is a mistake to say that this photo is of the bomb.

This cloud is what was, moments before:

buildings,

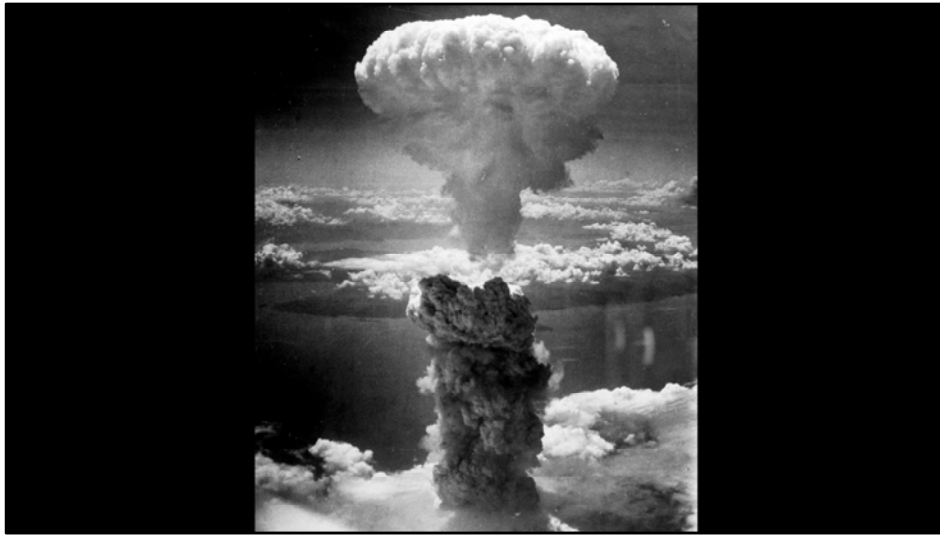
trees,

homes,

girls,

boys,

women and men.



And this was the City of Nagasaki.

Nuclear weapons are inherently indiscriminate.



Immediate Fatalities

City	Estimated Population at the time of the bombing	Estimated number of acute deaths (with 2 – 4 months)
Hiroshima	340,000 – 350,000	90,000 – 166,000
Nagasaki	250,000 – 270,000	60,000 – 80,000

Source: Radiation Effects Research Foundation

At least 150,000 men, women and children died in 1945 from these two nuclear weapons; and over time, many more.

Source for data reported in the table:
Radiation Effects Research Foundation.
http://www.rerf.jp/general/ga_e/ga1.html



Now we turn our attention to those who survived.

Photo Credit: Nagasaki Atomic Bomb Museum, via Hibakusha Stories Project.



Community Infrastructure Gone

At Hiroshima, 270 of 300 Doctors perished
and also 1654 of 1780 nurses

Source: ICRC Resource Center

Families and homes were destroyed.
Social infrastructure was gone.
There was little help for those suffering injury or burns.
Most of the medical community perished in the initial blast.

Today's weapons very much larger.

Source for loss of medical personnel:

International Red Cross Resource Center

The Hiroshima disaster – a doctor's account

12-09-2005

Extracts from the journal written by the ICRC's Dr. Marcel Junod, the first foreign doctor to reach Hiroshima after the atom bomb attack on 6 August 1945, and to treat some of the victims.

<https://www.icrc.org/eng/resources/documents/misc/hiroshima-junod-120905.htm>

The Cities of Hiroshima and Nagasaki have created educational museums. These links are to the websites created by these organizations:

http://www.pcf.city.hiroshima.jp/index_e2.html

<http://www.city.nagasaki.lg.jp/peace/english/abm/>



Climate and Public Health Impacts

- Firestorms from 100 Hiroshima-size bombs used against modern cities would inject 5 teragrams of smoke and soot into the atmosphere, blocking sunlight from reaching the Earth.

International Physicians for the Prevention of Nuclear War Action Kit on Humanitarian Impacts of Nuclear Weapons: <http://hinwcampaignkit.org/>

READ SLIDE

Resources:

International Physicians for the Prevention of Nuclear War, Campaign Kit, Banning Nuclear Weapons: the Humanitarian Facts, posted Nov 2014

<http://hinwcampaignkit.org/table-of-contents/>

Ira Helfand, IPPNW, "Nuclear Famine: 2 Billion People at Risk" second edition; 2013.

<http://www.ippnw.org/pdf/nuclear-famine-two-billion-at-risk-2013.pdf>



Without direct sunlight, green plants cannot grow well.

Agricultural crops in addition to natural ecosystems would be impacted.

In the event of a full-scale nuclear war, these climate impacts have been dubbed “Nuclear Winter.”

Resources:

In 1983 Carl Sagan published a pamphlet entitled “Nuclear Winter.” Now out of print, the document outlined a remarkable finding: even if only Super Power side fired its nuclear arsenal, it would still result in global destruction of the climate due to a shroud of particulate material in the atmosphere. Without direct sunlight for years, green plants and all those who eat them would die.

2007, Robock, Oman and Stenchikov published: “Nuclear Winter Revisited with a Modern Current Climate Model and Current Nuclear Arsenals: Still catastrophic Consequences.” Printed in the Journal of Geophysical Research, Vol. 112, D13107 (14 pages) and posed: <http://climate.envsci.rutgers.edu/pdf/RobockNW2006JD008235.pdf>



International Physicians for the Prevention of Nuclear War have published a number of papers on the climate impacts of even an limited nuclear war. The most recent of which projects a staggering 2 billion deaths likely from what is now called Nuclear Famine.

Resources:

Ira Helfand, IPPNW, "Nuclear Famine: 2 Billion People at Risk: Global Impacts of Limited Nuclear War on agriculture, food supplies and Human Nutrition," second edition, 2013. Posted here: <http://www.ippnw.org/pdf/nuclear-famine-two-billion-at-risk-2013.pdf>

Steven Starr, Senior Research Scientist for Physicians for Social Responsibility has compiled many references on "Nuclear Darkness" posted here:

<http://www.wagingpeace.org/references-on-high-alert-and-nuclear-famine-dangers/>



Ionizing Radiation: No Safe Dose

- All regulatory agencies acknowledge that every exposure to ionizing radiation carries risk of harm:

**There is no “safe” dose of ionizing radiation:
It is not safe for adult males.
Recent findings:
Ionizing radiation is even less safe for children and for females.**

Read slide

Citation and Resources:

Nuclear Information and Resource Service: Factsheet, “The Myth of the Millirem” posted:
<http://www.nirs.org/factsheets/mythmiliremftsht.htm>

Dr. Rosalie Bertell, 2000; “No Immediate Danger? Prognosis for a Radioactive Earth.”
Summertown Books.

Dr. Helen Caldicott, 1994. “Nuclear Madness.” WW Norton Co.

Dr. John Gofman, 1990. “Radiation Induced Cancer from Low-Dose Exposure: an
Independent Analysis.”

Much of the book is posted here (no fee):

<http://www.ratical.org/radiation/CNR/RIC/contents.html>

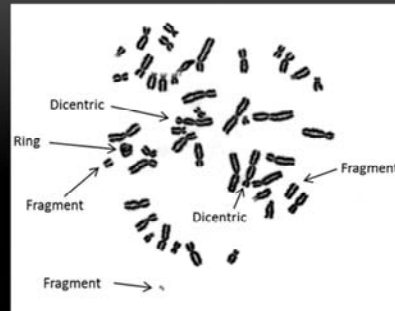
Møller AP and Mousseau TA(2012) The effects of natural variation in background
radioactivity on humans, animals and other organisms. Biological Reviews
DOI: 10.1111/j.1469-185X.2012.00249.x

Ian Fairlie, 2013. “Recent Evidence on the risks of very low doses of radiation” posted:

<http://www.ianfairlie.org/news/recent-evidence-on-the-risks-of-very-low-level-radiation/>



Radiation Induced Chromosomal Aberrations, as seen with microscope

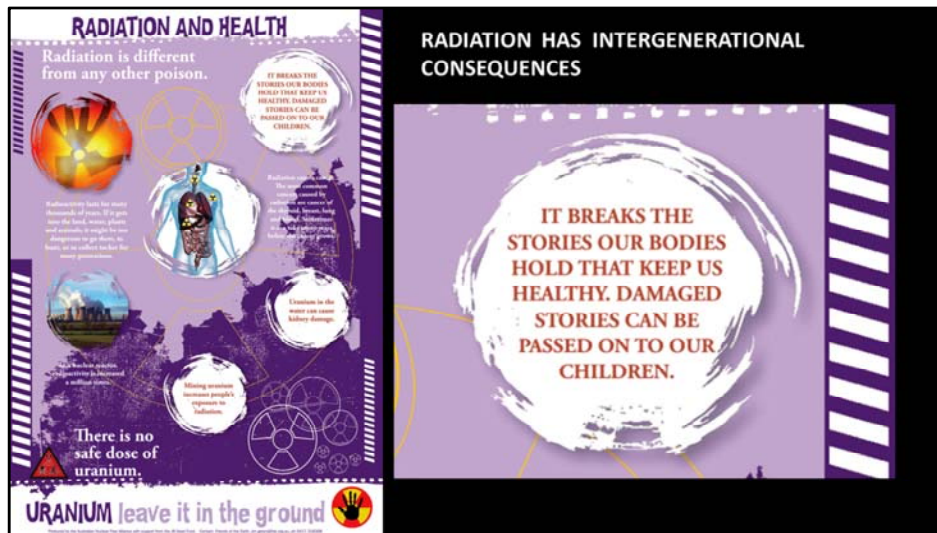


Radiation is invisible. However we can see the impact that radiation has on our cells and the damage it can do. These chromosomes were broken by ionizing radiation. Some have rejoined in a way that is not normal. These dicentric chromosomal aberrations can be used to assess radiation exposure, but they also cause cells to malfunction.

Resources:

Dicentric and other chromosomal aberrations are common in people who have suffered acute radiation exposure. The damaged chromosomes are found in white blood cells and can be assessed as a biological dosimeter. More information here:

http://www.rerf.jp/radefx/late_e/chromoab.html



I offer this view from traditional communities in Australia.

“Radiation: Breaks the stories our bodies hold that keep us healthy. Damaged Stories can be passed on to our children.”



Ionizing Radiation: Non-Cancer Medical Impacts



Radiation impacts our cells.
When reproductive cells are harmed, deformations are one outcome.

We also suffer:
Loss of fertility due to abnormal egg or sperm, spontaneous abortion and miscarriage;
Possible heritable mutations;
Avoidance of reproduction due to uncertainty.

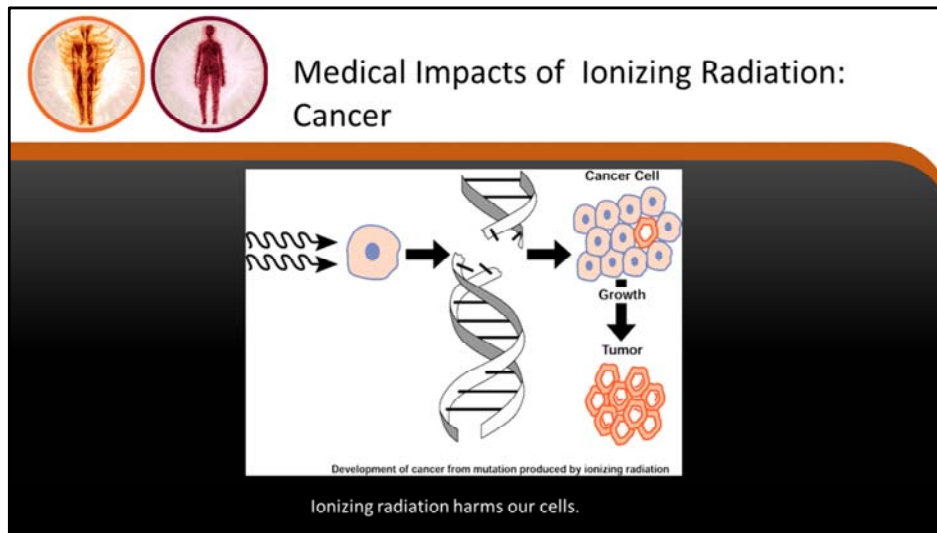
Resources:

Impact on radiation exposure on reproduction has been very difficult to study in human beings. The work of Moller and Mousseau on species with a shorter life span (birds, bugs, plants) shows that ionizing radiation does reduce population size, results in mutations that are heritable and that some of the mutations are expanding in populations outside the initial study areas near Chernobyl and Fukushima. See:

http://www.academia.edu/1376987/Abundance_of_birds_in_Fukushima_as_judged_from_Chernobyl and:

<http://cricket.biol.sc.edu/chernobyl/papers/moller-et-al-Ecol-Ind-2013.pdf>

Radiation exposure can also lower our overall immune function, leading to many symptoms like increases in other illness, chemical intolerance and in the extreme and AIDS-like syndrome.



When energy in the form of a gamma or X-ray, or a moving particle hits the genetic material inside a living cell, the damage may lead to an abnormal cell. Typically there is a period of time (latency period) of years or even decades before the damaged cell divides. A cancer results from out-of-control division of abnormal cells.

One of the challenges of the longer term impacts of exposure to ionizing radiation is uncertainty. There is no way to predict which exposure will result in an abnormal cell. Our bodies have repair mechanisms that fix a lot of damage, but these are not perfect. In general, the more radiation the higher the risk of a malignancy, but there is no way to know for sure. Even an exposure too small to measure could, sometimes result in death.

This makes radiation exposure a source of uncertainty in people's lives as well.

Resources

Previous pages have listed some of the classic authors on radiation of the 20th century. The National Institute of Environmental Health in the United States published this broader piece "Cancer and the Environment: What You Need to Know." posted: http://www.niehs.nih.gov/health/materials/cancer_and_the_environment_508.pdf



Radiation is more harmful to children



Children Between Birth and 5 Years

It has been long understood that radiation is more harmful to children and most harmful to the developing embryo and fetus.

Children's bodies are small; so the same amount of radiation delivers a larger dose. Since children are growing, the cells in their bodies are dividing more rapidly. The DNA in cells is most likely to be damaged when in cell division.

Art Credit:

Saro Lynch-Thomason, Fullsteam Labs



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

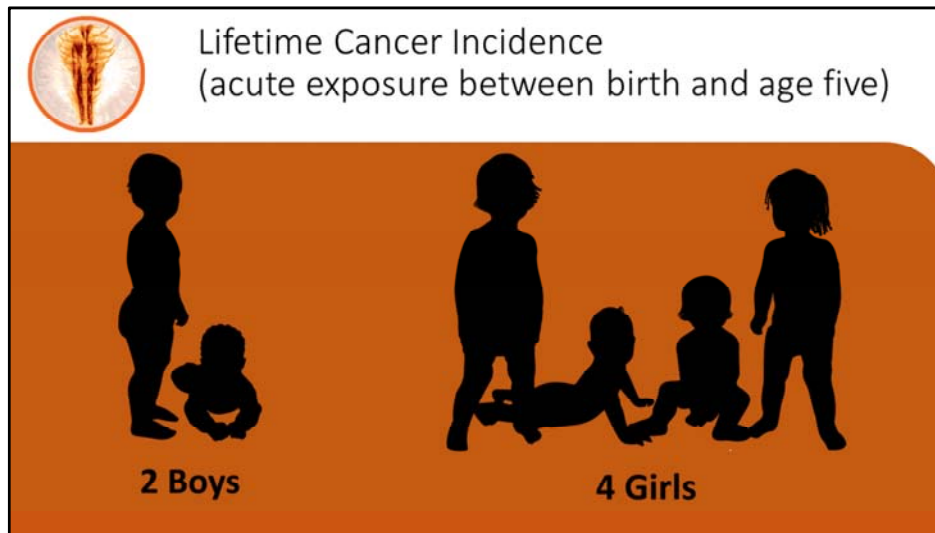
There are many studies of radiation. This US National Academy of Sciences Biological Effects of Ionizing Radiation bases its findings of “Lifetime Attributable Risk” of cancer, primarily on data from the survivors of Hiroshima and Nagasaki bombings.

It is assumed that the radiation exposure was an acute external exposure.

The numbers in the tables of BEIR VII contain the following information about gender and radiation. It is a mystery why the text of the report does not discuss gender as a factor.

Citation:

The Biological Effects of Ionizing Radiation, VII; Phase 2 is available at no charge for a PDF file here: <http://www.nap.edu/openbook.php?isbn=030909156X>



The children who between the ages of birth and 5 years old in August 1945 and survived in Hiroshima or in Nagasaki, were put together as a group called a “cohort.”

This, and other age cohorts were tracked in the long-term survivor study.

The 0-5 year cohort had the highest risk of getting 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 two males in this group who suffered cancer at some point in their lives, four females got cancer.

This disproportionate impact is derived from the data BEIR VII report. Dr. Arjun Makhijani independently published a paper and began a campaign in 2006 to change radiation standards to protect the most vulnerable called “Healthy from the Start.” The BEIR VII report is silent on gender as a factor in cancer risk. People have a right to know about this.

Source:

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

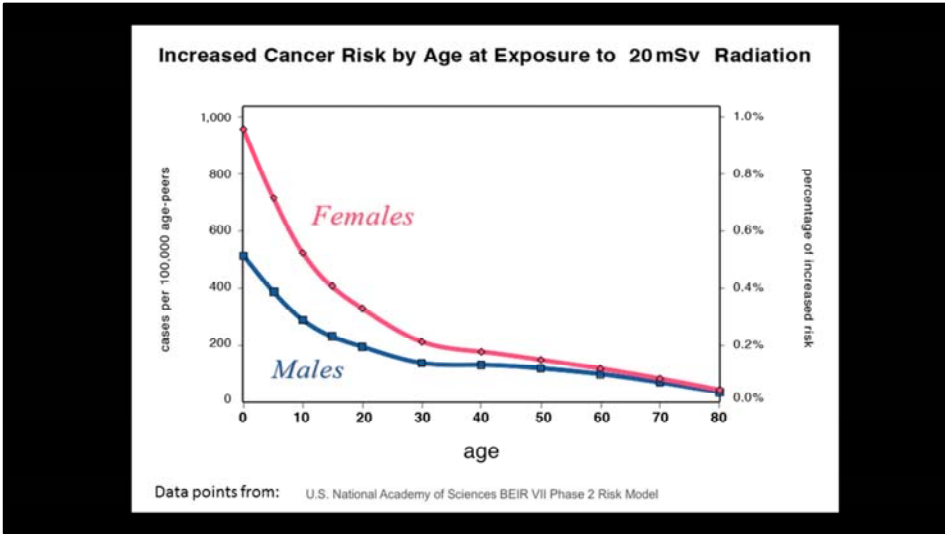
Makhijani, 2005 started the Healthy from the Start Campaign to address disproportionate impact of ionizing radiation on young females.

<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/>

Art Credit:

Saro Lynch-Thomason, Fullsteam Labs



Here is the same information in graphic form.

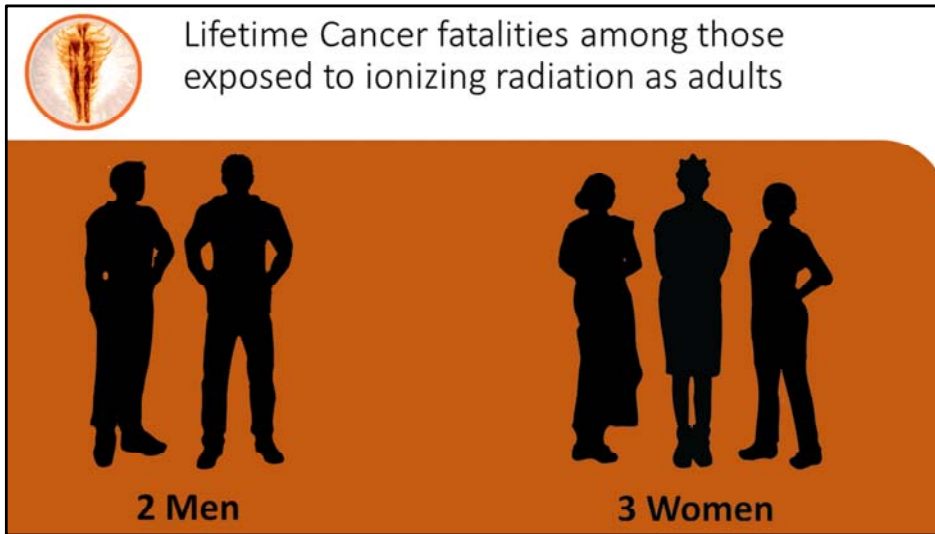
On the left side the radiation exposure happened between birth to 5 years of age, and this is where the difference between boys (the blue line) and girls (the pink line) is greatest.

The entire graph is a picture of the human lifecycle’s response to exposure to acute radiation exposure.

Graph provided to NIRS by Ian Goddard.



It is extremely important to understand that little girls are not a “sub-population.” She is not a subpopulation, she is part of the human lifecycle.



Among survivors who were adults at the time of the atomic bombing there is still a gender difference. When exposed to acute radiation as adults, over their remaining lifetime women suffer 50% more fatal cancer than will men in the same group.

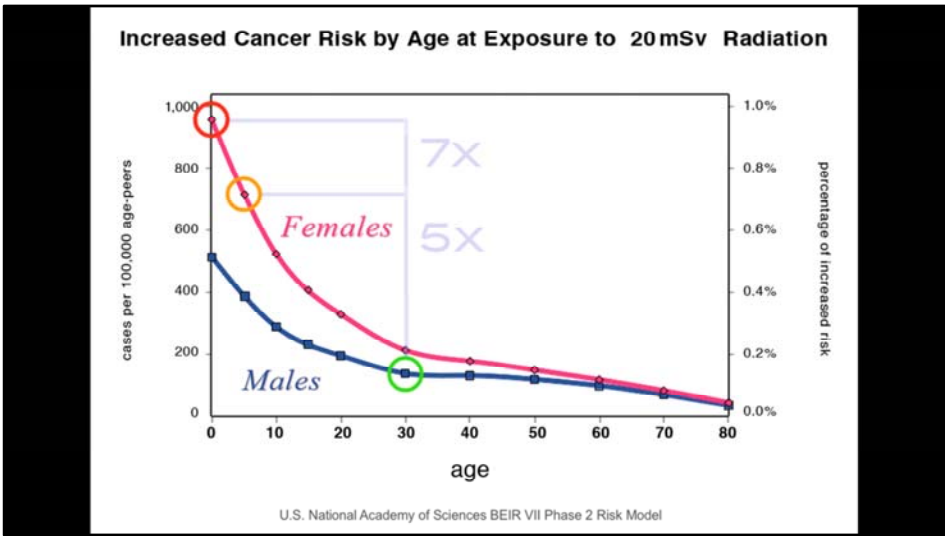
For every 2 men in these cohorts who die of cancer, three women will die of cancer.

Source:

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

Art Credit:

Saro Lynch-Thomason, Fullsteam Labs



I am offering the same graph again, this time with a green circle marking the part of the human life cycle that has for generations been used to set radiation protection standards. Now that most of the lifetime data is in from the A-Bomb survivors from Hiroshima and Nagasaki, it is easy to see that if we want to protect our species from harm, we need to base our protection standards on those most vulnerable: little girls.

This is the core of the Precautionary Principle. Protect first.



Possible Factors in Gender Difference

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



Body mass (0–5 years, not so much)
Proportion of sensitive reproductive tissue
Proportion of fatty tissue
Metabolic differences
Selection (long term environmental)
Life-style (short term environmental)

Animal studies also show gender differences
Olga Kovalchuk, et al (add cites)

Art Credit:

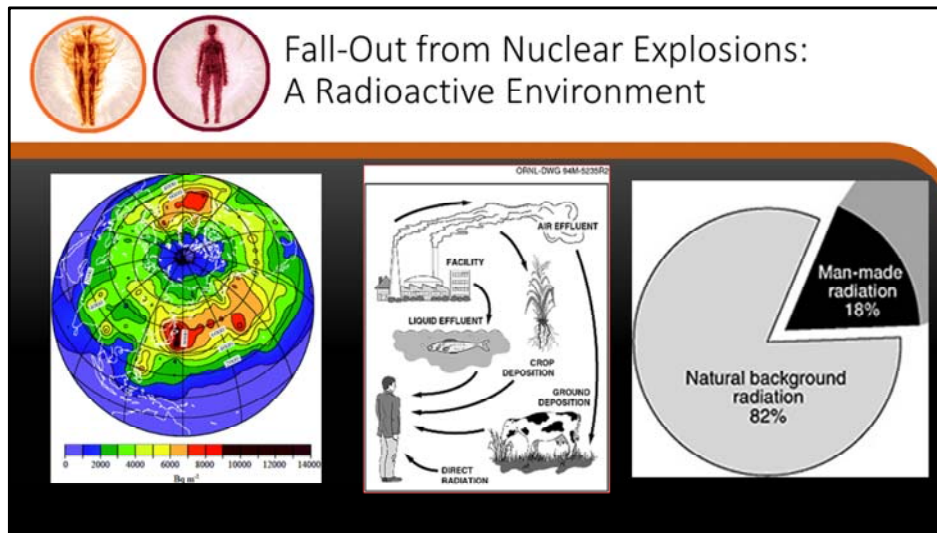
Dave Shannon



Radiation is More Harmful to Females

- This has many implications, all worthy of engagement:
 - Medical
 - Ethical
 - Occupational
 - Political
 - Legal
 - Historical
 - Evolutionary
 - Policy + Regulation

Read slide



On the left is a recent reconstruction of the fall-out from nuclear weapons worldwide.

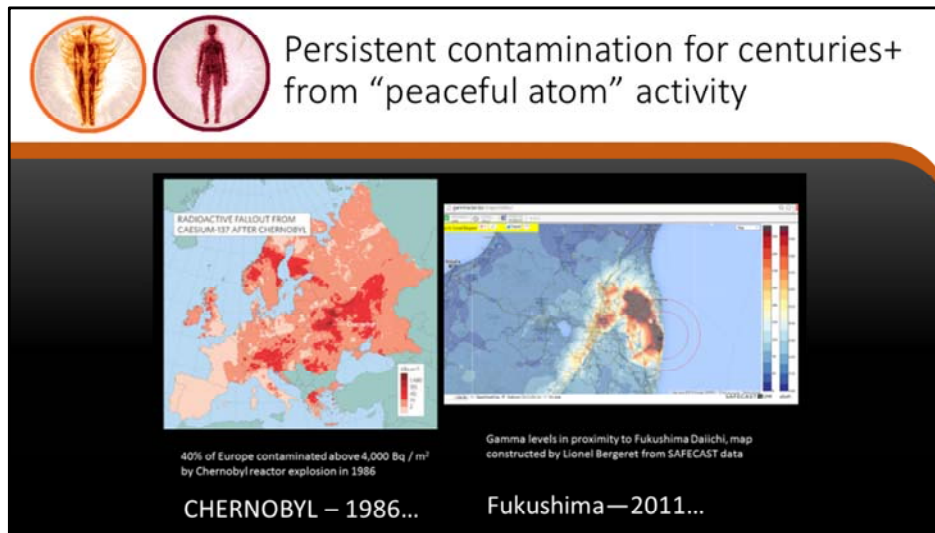
In the middle is a sketch showing how radioactivity in our air, rain, water and food travels to us, the top of our food chain.

Other sources of radioactivity in our environment include:

- uranium mining and processing,
- Depleted Uranium (DU) in conventional arms,
- Reprocessing to separate plutonium,
- Nuclear reactor releases,
- Major nuclear reactor accidents.

Taken all together, the right chart shows that human beings have increased the average dose of ionizing radiation that people get in a year by about 25% -- primarily in the last 70 years.

For our planet – this is contamination will persist into Deep Time. Some of these unnatural elements will be part of the ecosystems of Earth for millions of years.



Nuclear reactor explosions have also contaminated large areas of our planet.

Note: the Fukushima map by Lionel Bergeret is based on crowd-sourced data collected by people working together under the SAFecast project. The detection does not include aquatic or marine data.

Map Credits:

Chernobyl map has been an image on my hard drive too long. Attribution is hard to recover at this juncture. Apologies.

Fukushima Daiichi contamination map is constructed by Lionel Bergeret from crowd-sourced data generated by people working together in Japan, and now in a growing number of other locations under the flag of Safecast.org

Available here:

<http://gamma.tar.bz/maps/static/>



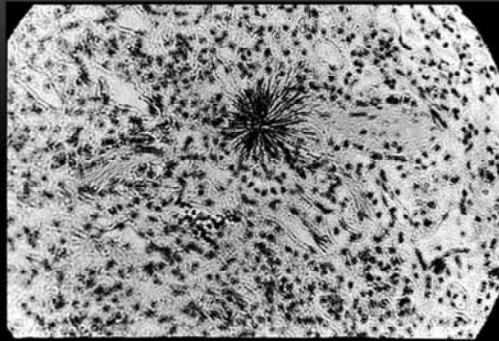
“Collateral Damage” Nuclear Power Stations Could Multiply Radiological Impacts



Each red dot is a nuclear power reactor. Nuclear weapon detonation in some areas of the world would result in the destruction, or at the least the disruption of a reactor. This would greatly increase the radiological exposures and the duration of contamination.



Visible damage from Plutonium emitting alpha radiation in lung tissue



When we breathe, eat and drink radioactive contamination, the radioactivity is released as particles and energy inside our body:

The Local Dose to the immediate surrounding cells may be very high

Alpha particle emissions inside the body may damage cells and cell structures 1000 times more than an external gamma or X-ray

Damage from internal exposures may be qualitatively different than a purely external exposure

An internal dose of radioactivity may be so local in impact that there is “no” dose to the whole body; nonetheless, cancer may result.

Photo Credit:

Robert Del Tredici (used by permission).

Resources with discussions of internal v external radiation exposure.

<http://www.euradcom.org/>

<http://www.euradcom.org/2011/2009confproc.htm>



These wise words from Physicians for Social Responsibility.



Standing up for prevention and precaution can be joyful when we win. These women have succeeded in stopping a nuclear waste dump on their traditional lands, with the help of their lawyer (middle).

See: <http://www.foe.org.au/muckaty-winnerz>



**Earth will be more safe,
people will be more healthy
when we have
ended the Atomic Age, peacefully,
by investing in strong and
just agreements.**

-- view of a traditional healer



For our Earth, time moves slow. For Earth, the time since the first nuclear weapon is very very short – not even a blink.

The future is in our hands.

I want to thank this community for moving this discussion forward. Thank you.