March 2024 ~CONSEQUENCES - Report. 2024. Lochbaum. ContamiNATION (link+sum) (Mar 2024). (Feb 11 2025 summary update.)

CIECP SYNOPSIS

REPORT: ContamiNATION

(David Lochbaum, March 2024)

WIP - WORKING DRAFT.

KEY to this Document

Box bracketed synopsis is not intended to be a comprehensive overview or summary. Words within curly brackets provide commentary or contextual information not within the underlying source. Some quoted passages omit spacing of original to save room. We aim to be reliable but make no representations and urge others to double-check what is presented here. Internal footnote, cite, graph, and table references are, for the most part, excluded. Emphasis added unless otherwise indicated.

{ rad}{**KEY REPORT**}

{NOTE: The author of this report, David Lochbaum is a nuclear engineer and expert consultant who formerly served as Director of the Nuclear Safety Project at the Union of Concerned Scientists (UCS) and also served as a reactor technology instructor at the Nuclear Regulatory Commission (NRC). Previously he worked in the nuclear power industry for 17 years as a reactor engineer, shift technical advisor, system engineer, and licensing engineer and expert consultant, who subsequently monitored safety issues at the Union of Concerned Scientists. Lochbaum is also coauthor of the book "Fukushima: The Story of a Nuclear Disaster" about Japan's 2011 nuclear accident and the lessons that should have been learn from it.}

{KEY QUOTE: "**U.S. nuclear power plants routinely release as much if not more radioactivity to the environment than was released from atomic bomb tests at the Nevada Test Site. Workers at NTS and downwinders received compensation. Workers and downwinders from nuclear power plants received nothing, except perhaps harm, or death, from radiation exposure.**" (p 20)}

{Cover page of report quotes from an August 1980 U.S. House of Representatives, Committee on Interstate and Foreign Commerce, Subcommittee on Oversight and Investigations report: "The greatest irony of our atmospheric nuclear testing program is that the only victims of U.S. nuclear arms since World War II have been our own people." Citing U.S. Congress: "The Forgotten Guinea Pigs" – A Report on Health Effects of Low-Level Radiation Sustained as a Result of the Nuclear Weapons Testing Program Conducted by the United States Government, Subcommittee on Oversight and Investigations, Committee on Interstate and Foreign Commerce, U.S. House of Representatives report, Aug 1980 https://babel.hathitrust.org/cgi/pt?id=mdp.39015081186986&seq=7. (hereafter "Forgotten Guinea Pigs Report".} {COMMENT: This, of course, ignores all of the fallout from testing overseas, e.g., the Pacific. However the statement reflects some recognition in Washington of the harm inflicted on Americans.}

{1980s-era District Court decision In Irene v. US discussed found that the lack of measured radiation exposures left dose reconstruction as the only avenue of ascertaining harm and damages to exposed individuals.} {COMMENT: This is true but scientific understanding

since, has moved beyond the simplistic dose:effect model. For cancers, age and gender are crucial variables. For non-cancer non-targeted effects, the DNA-centric model has limited applicability and dose does not necessarily correspond to effect.}

{NOTE: The Radiation Exposure Compensation Act (RECA), enacted in 1990, provides financial compensation to individuals who worked at certain nuclear weapons testing sites or uranium mines during the cold War, as well as some 'downwinders' who lived near test sites. The Energy Employees Occupational Illness Compensation Program Act (EEOICPA), enacted in October 2000, provides compensation for workers and contractors or their survivors who worked at defense facilities, weapons facilities, and uranium miners, millers, and ore transporters.}

{Full summary (indiv) ~CONSEQUENCES - Report. 2024. Lochbaum. ContamiNATION (Mar 2024). (conseq.)

{Full report ~CONSEQUENCES - REPORT. 2024. David Lochbaum. ContamiNATION (Mar 2024).}

Lochbaum, David, ContamiNATION: How the US Nuclear Weapons Program Harmed Thousands of Americans and Why Those Americans Had to Fight for Decades to Receive Compensation for that Undue Harm, report, Mar 2024. https://beyondnuclear.org/wp-content/uploads/2024/03/20240300-ContamiNATION.pdf. ContamiNATION. (Headings and emphasis added.)

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ATOM BOMB TESTS IN CONTINENTAL USA

The US conducted **1,054 atomic weapons tests**, of which **928** were at the 1,375 square-mile **Nevada Test Site (NTS)** (828 under-ground, 100 above). (p 2)

Between March 17 and June 4, 1953, 11 atmospheric nuclear tests were conducted at NTS including the 'Nancy' and 'Harry' detonations atop 300-foot tall towers. Of the 11,710 **sheep** grazing in an area 40-mi north to 160-mi east of the NTS, 1,420 ewes and 2,970 new lambs (37.5% of the herd) died during the spring and summer of 1953. (p 2) **The Atomic Energy Commission (AEC), in a press release, attributed the deaths to "*unprecedented cold weather*".** (p 3, citing Ball, Howard, Downwind from the Bomb, New York Times Magazine, Feb 9, 1986). AEC then doubled down on its disclaimer: "'*On the basis of information now available, it is evident that radioactivity from atomic tests was not responsible for deaths and illness*

among sheep in areas adjacent to the Nevada Proving Grounds last Spring, the U.S. Atomic Energy Commission reported today.'" (p 3, citing U.S. Congress: The Forgotten Guinea Pigs: A Report on Health Effects of Low-Level Radiation Sustained as a Result of the Nuclear Weapons Testing Program Conducted by the United States Government, Subcommittee on Oversight and Investigations, Committee on Interstate and Foreign Commerce, U.S. House of Representatives report, at p 4, Aug 1980 (hereafter "Forgotten Guinea Pigs Report") Thereafter, the federal government classified all evidence to the contrary. (p 3)

On October 30, 1958, during the Blanca 22-kiloton underground test, radioactivity escaped through the overburden at the edge of Rainier Mesa, releasing a radioactive dust cloud. Two months later, **all the pinyon and juniper trees** within 1,000 feet of the vent were dead. (p 3) Between September 15, 1961 and December 12, 1988, 583 nuclear weapons were detonated at the NTS and other US continental sites. Of these, 15 events were surface or near-surface tests, not designed to be contained. The other 568 tests were intended to be completely contained underground, but 104 events (18.3%) involved containment failures and radioactive releases. Another 191 events (33.6%) also involved release of radioactive materials. (p 4) Between June 30, 1962 and July 31, 1962, 8 nuclear weapons tests were conducted of which 3 involved underground detonations, 2 involved crater detonations, 2 had surface detonations, and 1 featured a tower detonation. The total radioactive released from these tests was 15,023,760 curies. On March 5, 1962, the DANNY BOY test released 14,000,000,000 curies. (pp 16 & 17, citing U.S. DOE: Radiological Effluents Released from Announced U.S. Continental Tests 1961 Through 1988, Nevada Operations Office, U.S. Department of Energy report, DOE/NV-317, UC-702, May 1990)

Radioactive fallout from the nuclear weapons testing, however, did not confine itself to Western states. (p 18) "Lots of nuclear weapons testing at the Nevada Test Site released lots of radioactive materials that have harmed lots of people in lots of places – ContamiNATION." (p 19, with chart showing data on specific Nevada Test Site test shots and radioactivity released from each, totally 15,052,121 curies)

COMPLEXITIES OF RADIATION EXPOSURES AND EFFECTS

Regulations allow permissible radiation releases. Permissible is not the same thing as safe and harmless exposures. "The more that is known about the health effects of radiation exposure, the lower the radiation dose that is permissible." (p 4)

"The harm from fallout can be direct exposure to the radioactive emissions. In addition, radioactivity can be inhaled or ingested in air or contaminated food and fluids. The hazard does not end when the radioactive cloud floats by. Particles settling onto the ground or falling in raindrops can contaminate water sources and foodstuffs. Different radioactive materials behave differently within the body. Iodine131 can be absorbed by the thyroid. Strontium-90 can be absorbed into the teeth and bone. Some radioactive materials remain in the body until they are exhaled or excreted; however, some radioactive materials are absorbed into the body and never leave. Jane Smith and John Doe can live next door to one another for three decades and yet have different radiation doses due to differences in age, gender, diet, metabolism, house types (i.e., brick vs. wooden frame), hobbies (i.e., backyard gardening vs. basement video gaming), and many other factors." (p 5)

Data presented by Lochbaum in Table 16 illustrates the challenge in estimating the radiation exposure received by a member of the public when measured levels are unavailable. Without

measurements, the amount of radioactivity released "must then be evaluated to estimate the doses to members of the public from direct, external radiation, from inhalation of radioactive gases and particles, and from ingestion of radioactive material in food and drink. **Making appropriate assumptions about parameters like diets, lifestyles, metabolisms, etc., in order to accurately estimate radiation doses is a daunting task fraught with uncertainties."** (p 9)

EARLY GOVERNMENT AWARENESS OF PUBLIC HEALTH DANGER

Rand Corporation Study

By 1953, the federal government knew from a research study it commissioned from the Rand Corporation, "that each nuclear weapon detonation released 1 gram of Strontium-90 per kiloton of bomb yield, that Strontium-90 had a long half-life, that the ingestion rate of Strontium-90 by the body is high, that Strontium-90 is a bone-seeker, and that Strontium-90 '*is the principal long-range, possibly worldwide, contaminant*' of nuclear weapons." (p 16, noting, for context that the bomb dropped on Hiroshima was ~15 kilotons, and subsequent weapons exploded in testing had significantly larger yields, and citing Rand Corporation, Worldwide Effects of Atomic Weapons – Project Sunshine, Rand Corporation study, R-251-AEC, Aug 6, 1953) The government also knew that the researchers had found that: "***Young and growing tissue is most susceptible to radiation damage; bone formation in an individual is complete by the time he is 20 years of age****... In our model, therefore, we have taken as the individual most at risk the one who accumulates Sr90 from the age of 0 to 20 years*." (p 16, with emphasis added, citing Rand Corporation, Worldwide Effects of Atomic Weapons – Project Sunshine, Rand Corporation study, R-251-AEC, at p 4, Aug 6, 1953)

Forgotten Guinea Pigs Report

"*As early as 1953, the government was aware of the potential health hazards posed to humans by the internalization of radionuclides absorbed through the food chain system. Yet, the government failed to take measurements of milk contamination by radioisotopes, upon which to establish internal safety standards, until 1957. Moreover, the government refused to alter the levels subsequently set for internal radiation exposure even after a 1963 scientific report concluded that the government's original assessment of the hazard was substantially underestimated*." (p 5, citing Forgotten Guinea Pigs Report, at p 17)

NEJM Study

In 1979, a study by Dr. Joseph L. Lyon, published in the New England Journal of Medicine, provided further substantiation of previous research finding excess leukemia deaths in Utah from 1959 through 1967 and statistics from the Cancer Center in Reno, Nevada similarly revealed elevated incidence of leukemia deaths compared to the national average for the years 1959 through 1963. (p 5, citing Forgotten Guinea Pigs Report, at p 14) An increase of ~40% in both leukemia and other cancers following prenatal diagnostic examination was statistically consistent with values identified by other investigators. (p 6, citing Fabrikant, Jacob I {Professor and Head, Department of Radiology, University of Connecticut School of Medicine}, Biological Effects of Small Doses of Radiation, paper presented in Symposium on Reduction of Radiation Dose in Diagnostic X-Ray Procedures, 13th Annual Meeting, American Association of Physicist in Medicine, Houston, Texas, Jul 6-9,1971: 23-24. https://www.osti.gov/servlets/purl/4603349.)

MONITORING FAILURES

Researchers trying to ascertain mortality rates among military participants in nuclear weapons testing sought to use the Nuclear Test Personnel Review (NTPR) database on radiation doses for participants. But doses in most cases were estimated through reconstruction based on duty assignments and the researchers concluded that the NTPR dosimetry data was not "*appropriate for the individual specific assignments necessary for the type of epidemiologic comparisons*.". (p 9, citing Institute of Medicine, The Five Series Study: Mortality of Military Participants in U.S. Nuclear Weapons Tests, National Academies Press, at p 37 (2000). https://Doi.org/10.17226/9697.)…

"Making matters worse, the recorded film badge doses might not be the actual dose measured by the film badges. For example, workers' film badges at the **Oak Ridge National Laboratory** were read weekly from mid-1944 to mid-1956. If the film badge showed a dose below the permissible weekly exposure limit, the recorded value was typically set to zero. **Thus, a worker receiving 90 percent of the permissible exposure each and every week for an entire year might have a recorded dose of 0 rem for that year when his or her actual dose was significantly higher.** Furthermore, the policy at Oak Ridge's Y-12 nuclear facility from 1948 to 1961 was to provide film badges to only those workers considered to be at risk for radiation exposure. (p 9, citing Watkins JP, Reagan JL, Cragle DL, Frome EL, West CM, Crawford-Brown DJ, and Tankerley WG, data Collection, Validation, and Description for the Oak Ride Nuclear Facilities Mortality Study, Oak Ridge Institute for Science and Education, at p 3, (1985)) Further, a US General Accounting Office (GAO) investigation of radiation exposures to personnel during the Crossroads nuclear testing at the Bikini Atoll in 1946 found that, in the mid-1950s, the U.S. National Bureau of Standards determined that film badge readings were up to 100% inaccurate. "Hence, a 'measured' radiation dose of 5 rem could represent an actual dose of 10 rem, or an actual dose of 2.5 rem. GAO also found that personnel were assigned doses lower than measured by the film badges on the unsubstantiated belief the badges overestimated external beta radiation." (pp 9-10, citing U.S. GAO: Operation Crossroads: Personnel Radiation Exposure Estimates Should Be Improved, U.S. General Accounting Office report, GAO/RCED-86-15, at p 3 Nov 1985)

Irene Allen v United States: Revelation of Poor Monitoring

In the late 1970s, over 1,100 plaintiffs filed a lawsuit claiming damage from US weapons tests. In *Irene Allen et al v. United States of America*, Judge Bruce Jenkins heard the case and ruled in favor of nearly half of the individuals in a select group of 24 test cases. In his opinion, Judge Jenkins determined that it was necessary to estimate the radiation exposures to which the plaintiffs were subjected because Federal testing protocols did very little to measure and document external and internal doses to the public from radioactive fallout. Judge Jenkins explained:

"*Review of the radiation safety plans and reports as well as more recent analyses of NTS monitoring data and the testimony of witnesses at trial, however, discloses an astounding fact: at no time during the period 1951 through 1962 did the off-site radiation safety program make any concerted effort to directly monitor and record internal contamination or dosage in off-site residents on a comprehensive person-specific basis*.'"

"*No thyroid or whole-body counters were constructed for use in screening members of the community especially children who may have been exposed to more than was permissible even*

for radiation workers. In fact, in the aftermath of HARRY, the monitors decided not to take a number of milk samples in order to avoid arousing public concern."

"*Even the efforts actually made to indirectly estimate internal dose risks through monitoring of milk or food stuffs were haphazard at best*."

"*Calculation of internal radiation exposure from these various sources is a complicated process that is fraught with tremendous uncertainty. Overlooking a single pathway can easily render analysis of internal exposure largely ineffective*."

(pp 7 & 21, citing of U.S. District Court for the District of Utah, *Irene Allen et al v. United States of America*, 588 F. Supp. 247, May 10, 1984.)

The Federal Tort Claims Act (FTCA) governs civil lawsuits against the federal government. But under its terms, the federal government enjoys sovereign immunity and may be sued without its consent. (p 6) The Federal government appealed Judge Jenkin's decision and won on the technical grounds of the FTCA, stating: "*Our decision here adheres to the principle enunciated by the Supreme Court of broad sovereign immunity. An inevitable consequence of that sovereign immunity is that the United States may escape legal responsibility for injuries that would be compensable if caused by a private party*." (p 9, citing U.S. Court of Appeals for the Tenth Circuit *Allen v. United States*, 816 F.2d 1417 (1987))

National Cancer Institute Study

Hearings before Congress and elsewhere prompted the release of a fallout study. As reported in a 1989, article:

"*The scientist who oversaw a 14-year health study of radiation fallout from Cold War bomb tests apologized Wednesday for years of delay in making the findings public. "**The sense was that nobody was really terribly interested in this**," Bruce Wachholz, chief of the radiation effects branch of the National Cancer Institute who coordinated the fallout study, told a Senate hearing. … The study, which tracked fallout nationwide from 100 aboveground nuclear explosions in the Nevada desert during the early years of the Cold War, was released last October, nearly 15 years after Congress ordered it. Three months earlier, key findings were made public. **The study concluded that exposure to iodine-131 from the bomb test fallout may have caused 11,300 to 212,000 additional cases of cancer***."
(p 10, with emphasis in Lochbaum report, citing Press-Republican, Scientist apologizes for delay in fallout study, at p 2 Sep 17, 1989)

RADIATION EXPOSURES

Radiation from Defense Activities – Federal Compensation Scheme: RECA & EEOICPA

In reaction to studies showing that nuclear workers had elevated health problems, efforts by Congress by Senator Orrin Hatch (R-UT) and Senator Ted Kennedy (D-MA), among many others on both sides of the aisle led to the passage of the Radiation Exposure Compensation Act (RECA) {enacted in 1990}. RECA provides financial compensation to individuals who worked at certain nuclear weapons testing sites or uranium mines during the cold War, as well as some 'downwinders' who lived near test sites. The Energy Employees Occupational Illness Compensation Program Act (EEOICPA) {enacted in October 2000}, provides compensation for

workers and contractors or their survivors who worked at defense facilities, weapons facilities, and uranium miners, millers, and ore transporters. (pp 10-13)

However, the federal compensation programs "did nothing to mandate improved radiation exposure records for ongoing employees, or to lower the permissible levels in light of the record-keeping deficiencies." (p 14)

Through January 15, 2024 {RECA & EEOICPA paid out approximately **$27.6 billion**}:
• RECA paid out over **$2.6 billion** in compensation for more than 41,000 claims with nearly half of the compensation awarded to downwinders. (p 14)
• EEOICPA paid out nearly **$25 billion** in compensation and medical bills for claims by 141,006 individuals. (p 15)

A 1980 Congressional report titled "The Forgotten Guinea Pigs: A Report on Health Effects of Low-Level Radiation Sustained as a Result of the Nuclear Weapons Testing Program Conducted by the United States Government", reflects: "The greatest irony of our atmospheric nuclear testing program is that the only victims of U.S. nuclear arms since World War II have been our own people." (p 20, citing U.S. Congress: The Forgotten Guinea Pigs: A Report on Health Effects of Low-Level Radiation Sustained as a Result of the Nuclear Weapons Testing Program Conducted by the United States Government, Subcommittee on Oversight and Investigations, Committee on Interstate and Foreign Commerce, U.S. House of Representatives report, Aug 1980)

Radiation from Civilian Nuclear Power Plants – No Compensation

"**U.S. nuclear power plants routinely release as much if not more radioactivity to the environment than was released from atomic bomb tests at the Nevada Test Site. Workers at NTS and downwinders received compensation. Workers and downwinders from nuclear power plants received nothing, except perhaps harm, or death, from radiation exposure.**" (p 20)

Radiation Exposures – the Need to Know the Public Health Consequences

There is a need to invest in a forensic investigations which would: "• determine the actual, not guesstimated or conjectured, radiation doses of individuals, • establish how radiation doses, even at low levels, affect the human body, and • distinguish between harm caused by radiation and harm caused by other factors." (p 20)

"Knowing so little, almost nothing, with certainty about these areas that have harmed tens of thousands of Americans more than seven decades after Hiroshima and Nagasaki is CURIEous…." (p 20)

As noted by Jacob I Frabrikant of the Department of Biophysics and Medical Physics at the University of California in 1987: "*What is currently lacking is a systematic approach to quantifying the nature and extent of these uncertainties, such as sites of cancer and cell types, source tables of cancer incidence, latent period, radiation dose and dose-rate effects, dose-response models, sampling errors in epidemiologic data, radiation risk coefficients, influence of age and sex, time-response models, other cancer risk factors and interaction effects, transfer of risk coefficients from one population to another, etc. and their influence on the reliability of the computation of PC estimates*." (p 21, citing Fabrikant JI, Probability of Causation: Implications for Radiological Protection and Dose Limitation, at pp 8-9, May 1987(p 21, citing Fabrikant)

"*Dose calculations for both licensing and compliance are based on computer models that have been and continue to be the subject of study. The most obvious shortcoming is the continued reliance on the internal dose models of 1959, but a change to more recent models (ICRP, 1969) would not materially change the results. The meteorology model may entail the greatest uncertainty. Unfortunately, means for improving confidence have not been readily available. The liquid pathway dose calculations also are uncertain but again opportunities for improvement are limited*." (p 21, citing, NCRP: Public Radiation Exposure from Nuclear Power Generation in the United States, National Council on Radiation Protection and Measurements Report No. 92, at p 109, Dec 30, 1987)

"The right thing would also permit informed decisions about whether routine releases of radioactivity to the air and water from dozens of nuclear power reactors across the country are, or are not, harming individuals." (p 22) And with civilian nuclear power reactors adding to the radioactivity delivered by military activities' fallout, investigation should would determine whether the synergistic effects have adverse health implications. (p 22)

"If ignorance is bliss, a bliss reduction program for the health effects of radioactive materials released to the environment from all sources, not just a handful of them, is long overdue." (p 22)]