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In September 1998, a U.S. Senate investigation concluded that “our calculations project a substantial burden of radiation-related cancer in the more heavily-exposed Marshallese population...” (Lund, 2010).

The AEC found that these enormous nucleonucler- ar explosions created hazards 5,000 miles away in the United States. In November 1954, months after the six H-bomb tests known as Castle in the Mar- shall Islands, the director of the AEC’s Biology and Medicine Division, John C. Bugher, reported to the General Advisory Committee that radioactive iodine from the Castle tests:

“...can be detected in thyroid alleles over all the U.S..... It is estimated that everyone in the U.S. [160 mil- lion people] received a dose of 1 rp in the thyroid as a result of Castle” (U.S. Atomic Energy Com- mission, November 1954).

This estimate represents nearly half of the per capita dose estimated decades later for members of the U.S. public by the National Cancer Institute from 100 open-air nuclear tests in Nevada (National Cancer Institute, 2019). Bugher also “cautioned against the use of the expression ‘exposure areas’” and noted that Sr-90 in the New York milk supply has increased” (U.S. Atomic Energy Commission, November 1954).

Despite this, official studies on U.S. health casualties from aboveground bomb testing have been scant. In 1999, the National Cancer Institute released a study based on estimated radioactive iodine [131 in bomb fallout in each U.S. county from atmospheric tests in Nevada from 1951 to 1963. From these data, the institute estimated 11,300 to 212,000 thyroid cancers occurred among Americans who were under 20 years of age at time of exposure (Institute of Medicine, 1999).

In September 1998, a U.S. Senate investigation found that this congressionally mandated study was mismanaged and that the National Cancer Institute withheld key findings from the public for nearly five years (U.S. Senate Committee on Governmental Affairs, 1998).

Subsequently, the U.S. Centers for Disease Con- trol and Prevention estimated 15,000 fatal cancers among Americans alive from 1951 to 2000 caused by worldwide atmospheric bomb test fallout. The report did not test for internal radiation exposure from breathing and ingesting radioactive particles such as Sr-90 (The Guardian, 2014).

In 2017, University of Arizona economics professor Keith Meyers looked at dose estimates of iodine 131 levels in milk from Nevada tests and estimated that 395,000 to 695,000 excess U.S. deaths occurred during the years 1951 to 1973. Meyers went fur- ther, making an estimation that the test ban treaty saved 11.7 to 24.0 million U.S. lives (Meyers, 2017). The wide spread in these results, which rep- resented one of the few attempts to address fallout, suggests that impact on disease and death rates was still not well understood.

Several European nations emulated St. Louis’s tooth study efforts to track fallout. The Radiation and Pub- lic Health Project, a research and education group pri- marily interested in nuclear power reactor, also used the tooth study as a prototype for its own study of the same mix of radioactive chemicals (including Sr-90) in nuclear weapons tests. In 1992, the Radiation and Public Health Project study includes 5,000 baby teeth close to six U.S. nuclear power reactors. That study was the subject of five journal articles showing high and rising Sr-90 levels in teeth near reactors.

In the summer of 2001, Washington University bi- ologist Prof. Daniel Kohl, who had been on the faculty since the 1960s and was well acquainted with the original tooth study, led an inspection of a school-owned storage unit at Tyson Valley just outside of St. Louis. Kohl and his colleagues found long shoe boxes filled with teeth in envelopes attached to small plastic dex cards. He notified biology department administrators, who had no interest in reviewing the teeth. He then called Commoner, who also did not want the teeth, but recommended they be given to the Radia- tion and Public Health Project. The teeth were donated soon after. The project found that a large number of teeth — about 100,000 — had never been tested. Apparently, whoever stored the teeth had forgotten they were there. Because Sr-90 decays slowly, the chemical still could be measured in teeth. Tooth donors and their parents reacted in numerous media acts of donating children’s baby teeth for scientif- ic research questions that are relevant to public health, develop methods that are appropriate to answering those questions, and contribute to efforts to reduce health inequalities” (Wing, 2016).

The St. Louis baby tooth study relied on the simple acts of donating children’s baby teeth for scientif- ic research. This grassroots movement, driven by citizen participation, demonstrated the potential of toxic radiation in human bodies from nuclear weapons tests. Evidence from the study helped speed the passage of the treaty banning these tests. University of North Carolina epidemiologist Steven Wing stated that:

“By joining movements for human rights and social justice, health scientists can identify re- search questions that are relevant to public health, develop methods that are appropriate to answering those questions, and contribute to efforts to reduce health inequalities” (Wing, 2016).

The St. Louis baby tooth study was a groundbreaking example of Wing’s call to join political movements to protect the environment. Decades after the study began, the discovery of a large number of untested teeth provided an entrance to a new era of support for his belief that such movements can document health problems, answer questions about health, and reduce inequalities by providing important and emerging scientific evidence.

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H-bombs and Baby Teeth

Planning a study based on such a large collection of teeth has been extremely difficult. Information remained on the small index cards, and sifting through thousands of teeth was cumbersome and inefficient. In 2019, Harvard School of Public Health Professor Marc Weisskopf, who had led Radiation and Public Health Project Executive Director Joseph Mangano a few years earlier, obtained a few increasing fears from the National Institutes of Health to study health hazards of early-life exposure to heavy metals using a sample of 1,000 teeth.

The first year of the grant was mostly spent enter- ing data on the teeth and donors into an automated spreadsheet. That work was done by the Radiation and Public Health Project’s Robert Miller, who noted that the tally of teeth was greater than previously thought; the collection consists of nearly 100,000 teeth, all from persons born between 1946 and 1965. While the majority of teeth are from the St. Louis area, at least 12 teeth from persons born in each of the 50 states, plus 45 foreign countries, exist.

Teeth can be studied for scientific research pur- poses beyond radiation and heavy metals, including for information on antibiotic resistance, fluoride, genetics, dental research, and anthropolog- y. The Radiation and Public Health Project makes teeth available for any of these efforts. Largely forgotten for several decades, the baby tooth col- lection’s intrinsic scientific value to human health research is unique given its size and its portrait of the large generation of “baby boomers” born after World War II. These data address the still-unre- solved legacy of radioactive fallout and provide rare human evidence of potentially harmful substances found outside of the nuclear industries.

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