Letter to the Editors of
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NTS Fallout-induced Cancer in Southwestern Utah

Dear Editors:

Late last year, an article (Scharnberg 1995) was featured in the periodical, *The American Legion Magazine*. It discussed the idea of an excess cancer rate among the population of Washington County, Utah, in particular the principal town, St. George, as a result of fallout from nuclear detonations at the Nevada Test Site (NTS). I first read this article in May of 1996, and I took exception to nearly every claim it made. I have been on record for more than 30 years as being unalterably opposed to the unnecessary exposure of off-site populations to fallout radiation (Lloyd 1992). Rather than preparing a rebuttal to each inaccuracy in the Scharnberg article, I would like to offer just a few observations.

Many of the fallout tracks from detonations at the NTS initially went north along the Nevada-Utah border and then veered northeast across Salt Lake City. Only three of them (*Harry,* 19 May 1953, accounting for about 80% of the total exposure; *Smoky,* 31 August 1957, 9%; and *Annie,* 17 March 1953, 7%) contributed radiation dose to St. George in any substantial way. Fifteen other events accounted for a combined total of about 4% (Lloyd et al. 1990). Without Harry, the total exposure at St. George would not have been much different from that recorded elsewhere in Utah and in other nearby states.

I have worked closely on fallout-related projects with both Dr. Robert C. Pendleton (1961 until his death in 1982) and Dr. Joseph L. (Lynn) Lyon (1985-1996). I first met Duncan A. Holaday when he visited my laboratory in the early 1960's, and I kept track of his professional activities for about another decade. The article by Scharnberg characterized all three of these investigators as, "...some of AEC's own top scientists..." To my knowledge, none of them ever worked for AEC. Duncan Holaday served with the U. S. FDA and then the U. S. PHS. As a matter of fact, I would say that their scientific points of view would classify both RCP and JLL as anti-establishment iconoclasts with respect to AEC/DOE. Duncan Holaday investigated the relationship between lung cancer and uranium mining, a subject that caused the AEC some discomfort and distress.

During the period from January 1985 through May 1988, I worked (with JLL) on the Utah Fallout Project as dosimetry coordinator. That study considered the occurrence of (a) thyroid cancer (Kerber et al. 1993) in a carefully defined cohort of persons and (b) leukemia (Stevens et al. 1990) among persons who died during 1952-1981 as Utah residents and who were members of the Church of Jesus Christ of Latter-day Saints (LDS or "Mormons"). I considered my most important tasks on that project to be the refutation of the official AEC/DOE fallout exposure estimates and the establishment of correct and more defensible radiation doses to each individual subject. After almost 3 years of intensive study, we concluded (Lloyd et al. 1990)
-- to our astonishment-- that the official AEC/DOE exposure estimates were not seriously in error and that the total external exposure at St. George was only of the order of about 4 R.

In late 1987, I prepared the first draft of a report about leukemia occurrence in Washington County (and St. George) during the years 1952-1981 that included everyone in the county, Mormons and non-Mormons alike. This work was done with the indispensable assistance of Steven L. Simon, Donald C. Gren, Terry M. Lotz, Lynn Lyon, Mary Bishop, the late Nancy Nelson and others. Since that time, our article (authored by SLS, DCG, TML and myself), yet to be published, has undergone extensive but discontinuous revision. However, the basic conclusions have remained unchanged. We approached the problem using several different methods, but the one that most nearly addresses the central claim in Scharnberg's article has to do with estimation of expected number of leukemias in the absence of NTS fallout and comparison with the total number that actually occurred. In Table 1, excerpted from our report, chronic lymphocytic leukemia (CLL) is excluded because it is well known that CLL is not associated with radiation exposure: only the forms of leukemia that are known to be induced by radiation were considered in the analysis.

Comparison of the observed number of deaths with non-CLL leukemia and the expected numbers without NTS fallout exposure (Table 1) suggests that the effect of NTS fallout was small if not entirely absent; that is, the possibility of zero induced cases is not excluded. When I initiated this analysis, I expected that I would be able to

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identify an unmistakable excess of leukemia in the population. My anticipation was that I could use this value with the collective dose for the county to estimate a leukemia risk coefficient for low-dose radiation exposures, but I was surprised that a clear excess did not emerge from the data.

BEIR III and BEIR V (National Research Council, 1980 and 1990) have proposed a ratio of induced solid cancers to induced leukemias in an irradiated population of something like 5. If this is indeed true, then multiplication of the induced number of leukemias by this factor (whatever it is) should yield the total number of non-leukemia malignancies induced in the irradiated population. As a consequence, the number of these non-leukemia malignancies induced among the NTS fallout-irradiated population of Washington County can be estimated by multiplying the number of induced leukemias by this factor (e. g., 5). But the product of the factor (5?) and a very small number of induced leukemias (such as zero) is, in turn, a very small number. If essentially no leukemias were induced among the Washington County population by NTS fallout (see Table 1), then virtually no other cancers were induced.

In addition to the data displayed above, we found that among the 39 deaths of persons with CLL or non-CLL leukemia in Washington County, 12 of these persons did not move there until well after the 1953 fallout and probably were not exposed to an increased radiation dose therefrom. There were 7 of these 39 persons who were not members of the LDS Church. The leukemia in one of the 1953 residents was diagnosed the year before the first fallout occurrence so could not have been related to NTS fallout. During the interval 1952-1981, there was one year (1979) in which there were 5 deaths among these persons (3 among long-term residents--2 of those with CLL--and 2 among those not living there in March-June 1953--1 with CLL); 2 years (1959 and 1978) with 4 deaths each (4 each among 1953 residents and nonresidents); 2 years with 3 (1980 and 1981); 4 years with 2; 12 with 1; and 9 with zero.

Details about these data (methods of ascertainment, etc.) cannot be included in such a brief communication, but I will be pleased to furnish them to interested investigators. I am not insensitive to the intense and powerful feelings of families who are convinced that their loved ones died as a result of NTS fallout exposure. Similarly, I cannot deny their sincerity. However, I feel in this instance that it is an unnecessary and almost unbearable burden upon Americans to believe in the doctrine of Government-As-Enemy as I discussed previously (Lloyd 1996). I would be interested to receive information about Washington County leukemia cases (1952-1981) that may not have been included in our analysis (if any), especially persons exposed to the 1953 fallout who died outside of Utah.

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Table 1. Person-years at risk for death with leukemia, age-specific rates for the occurrence of non-CLL leukemia in the entire U. S. and in Utah, the expected number in the absence of NTS fallout and the observed number of non-CLL leukemia deaths in Washington County during the period 1952-1981, inclusive.

AGE RANGE	PERSON -YEARS 1952-1981	LEUKEMIA DEATHS[a] PER 100,000 PY UTAH	LEUKEMIA DEATHS[a] PER 100,000 PY U. S.	EXPECTED[b] LEUKEMIA DEATHS UTAH	EXPECTED[b] LEUKEMIA DEATHS U. S.	OBSERVED
0-4 yr	53,633	2.1	2.0	1.1	1.1	1
5-14	96,468	2.4	2.5	2.3	2.4	4
15-19	48,761	2.5	2.0	1.2	1.0	1
20-24	28,728	1.1	1.8	0.3	0.5	1
25-44	85,251	2.4	2.1	2.0	1.8	2
45-64	72,056	6.8	6.9	4.9	5.0	9
65+	51,442	22.1	30.7	11.4	15.8	11
TOTAL				23.2	27.6	29

95% Confidence Interval[c] = 19 - 42

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[a]Non-CLL leukemia death rates for Utah and the U.S. were taken from Young, et al., (1981). Mortality rates were calculated from population weighted averages of the various age groups comprising the intervals in this table.

[b]Product of column 2 and either column 3 or column 4.

[c]From Table A-5 of Lilienfield et al. (1967). Note that all 3 totals (23.2, 27.6 and 29) fall within this range and that the observed number is almost exactly midway between the extremes for the 95% confidence interval.
