

Fallout

You Can Take It To The Bank



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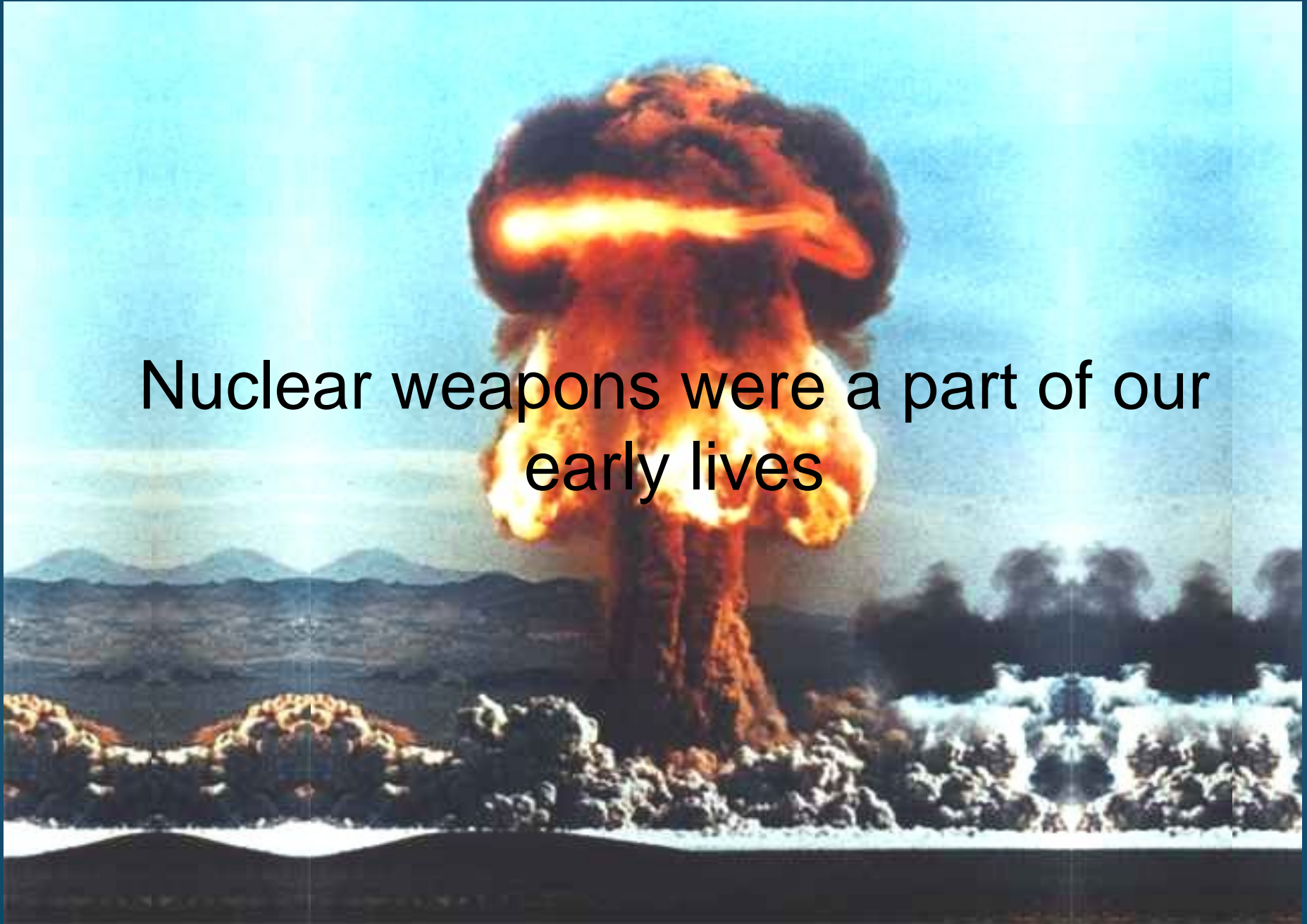
Bruce W. Church

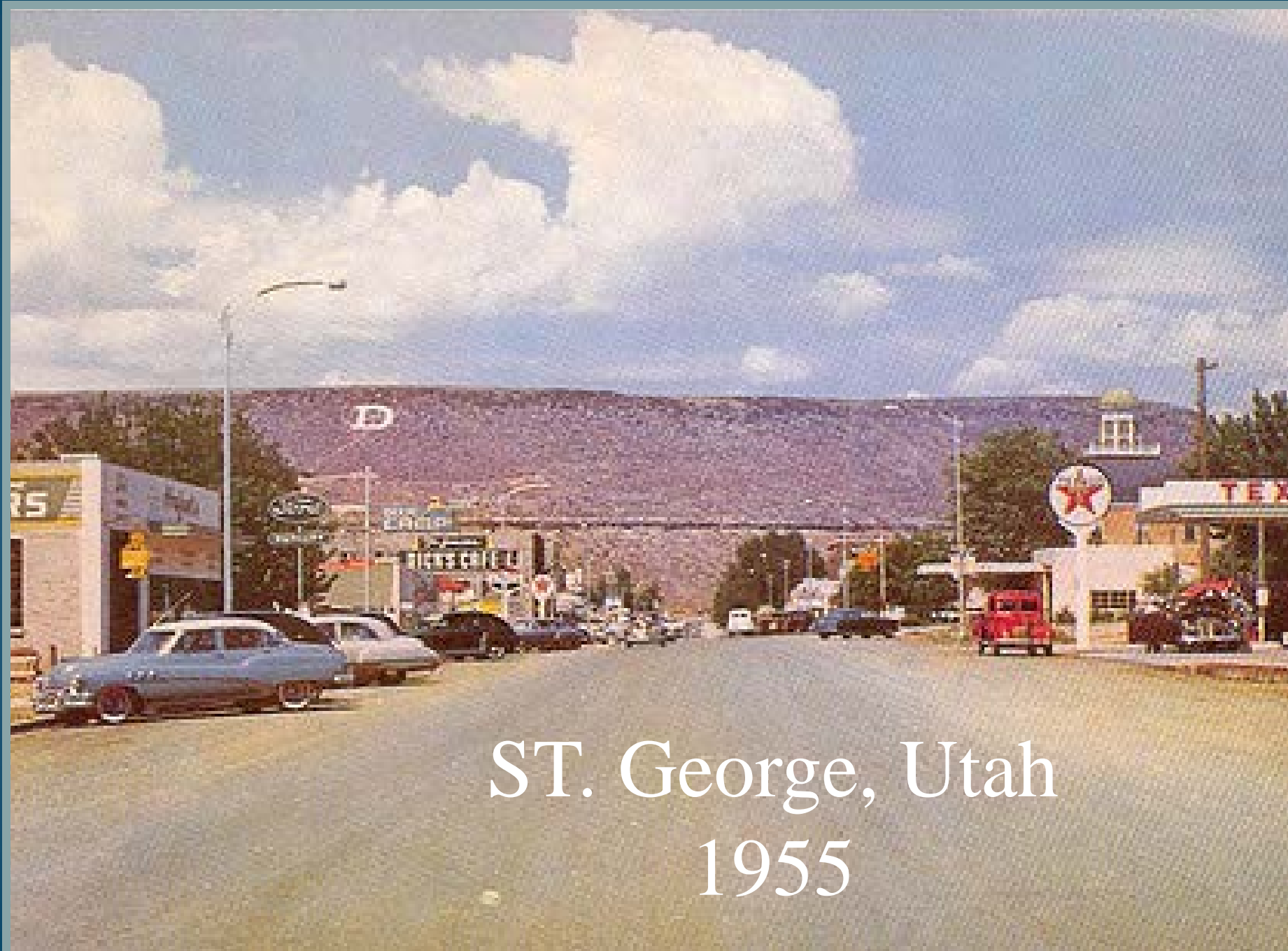
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Outline of Presentation

- Fallout Patterns and Dose Distribution
- Fallout Myths in Southern Utah
- Who was exposed and Who can take it to the Bank?
- Scientific data on effects of low dose and dose-rate

Nuclear weapons were a part of our
early lives





ST. George, Utah
1955

**Fallout was on everything
and in everything!**

**Our ecological research demonstrated lots of radioactive
material in our bodies. We need to be sure we have not
underestimated risk!!**

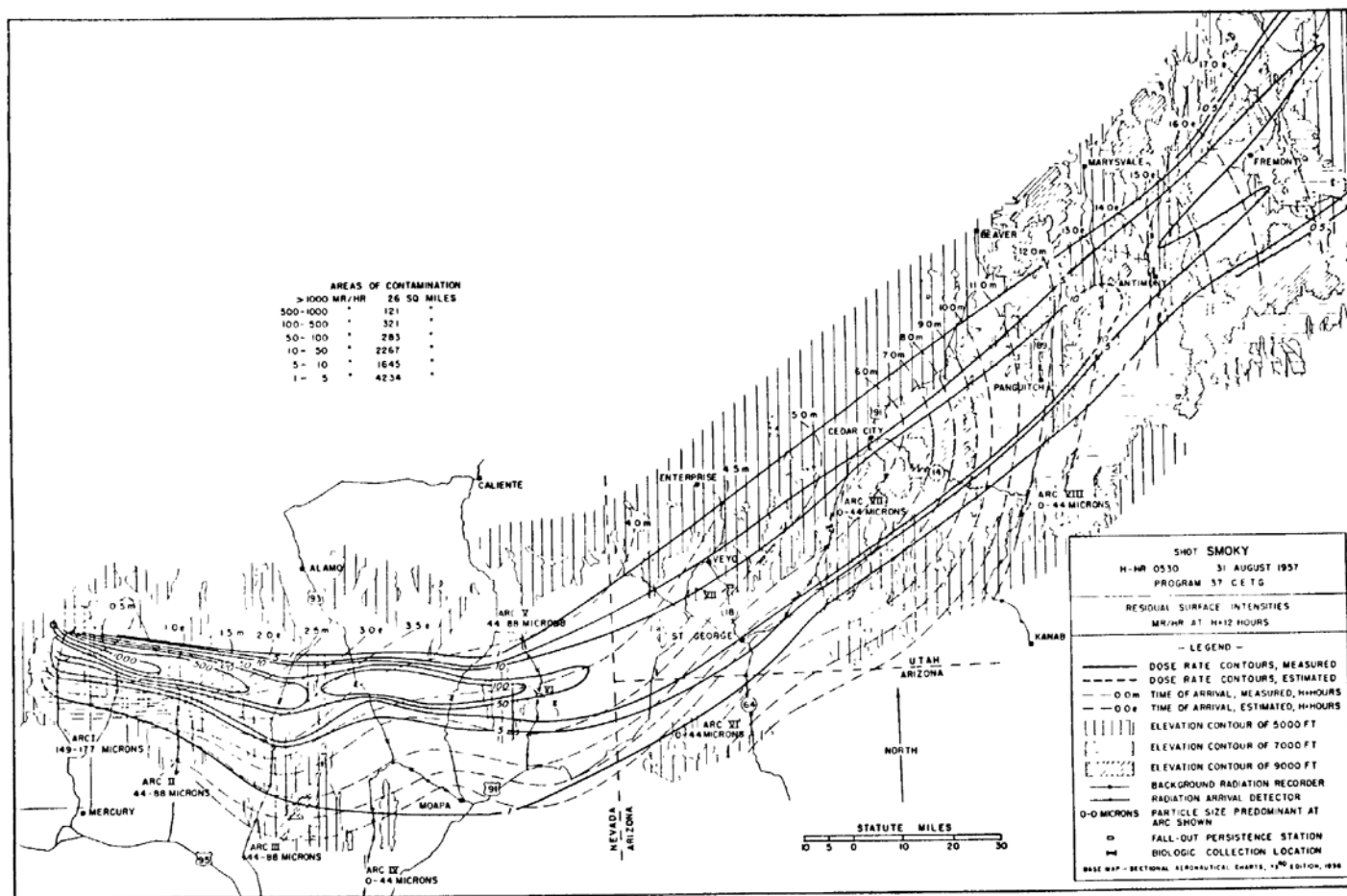


FIGURE 2.7a. Smoky Fallout Pattern

Figure 22. Program 37 1958 fallout pattern and fallout arrival time lines.

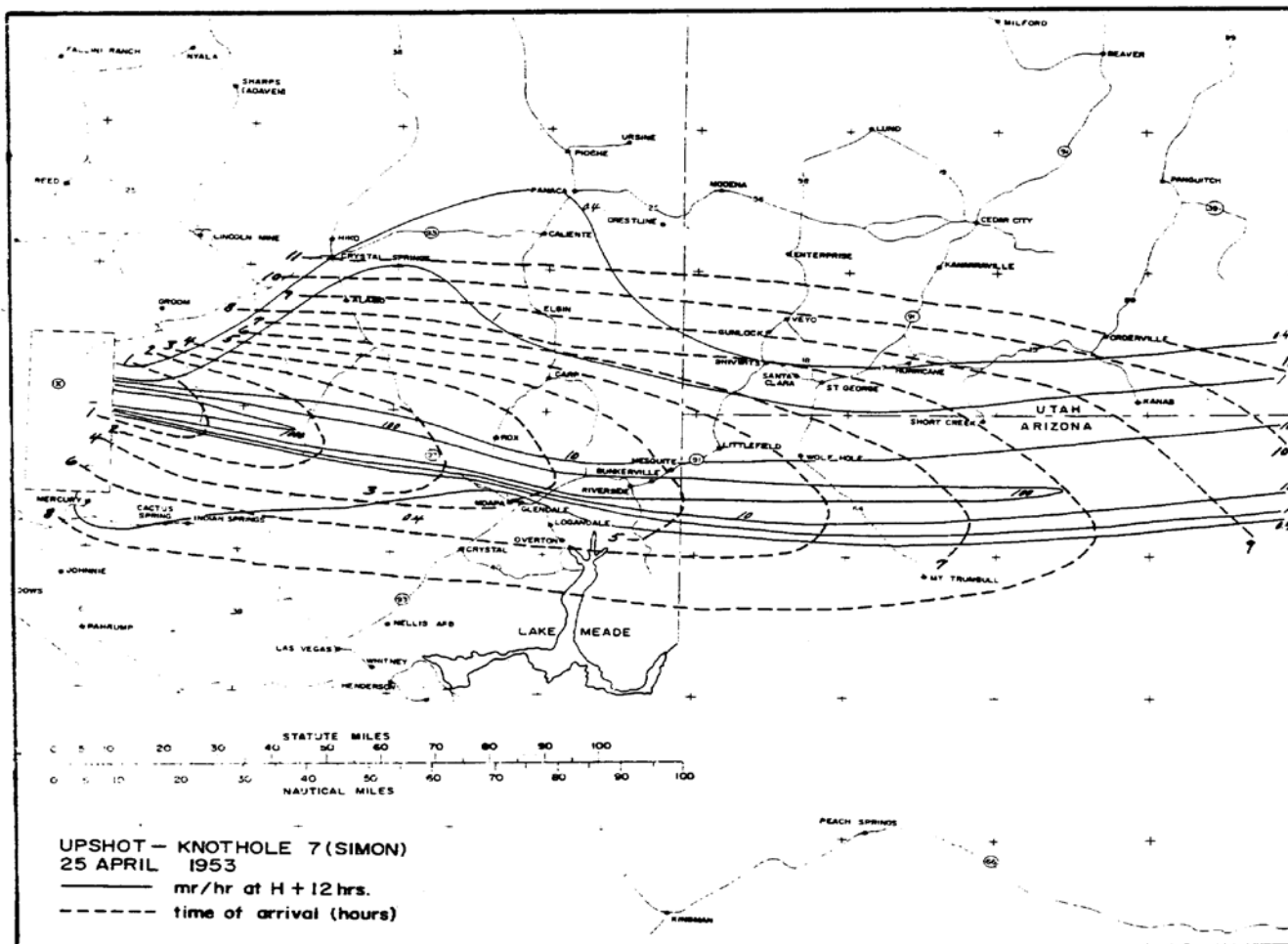
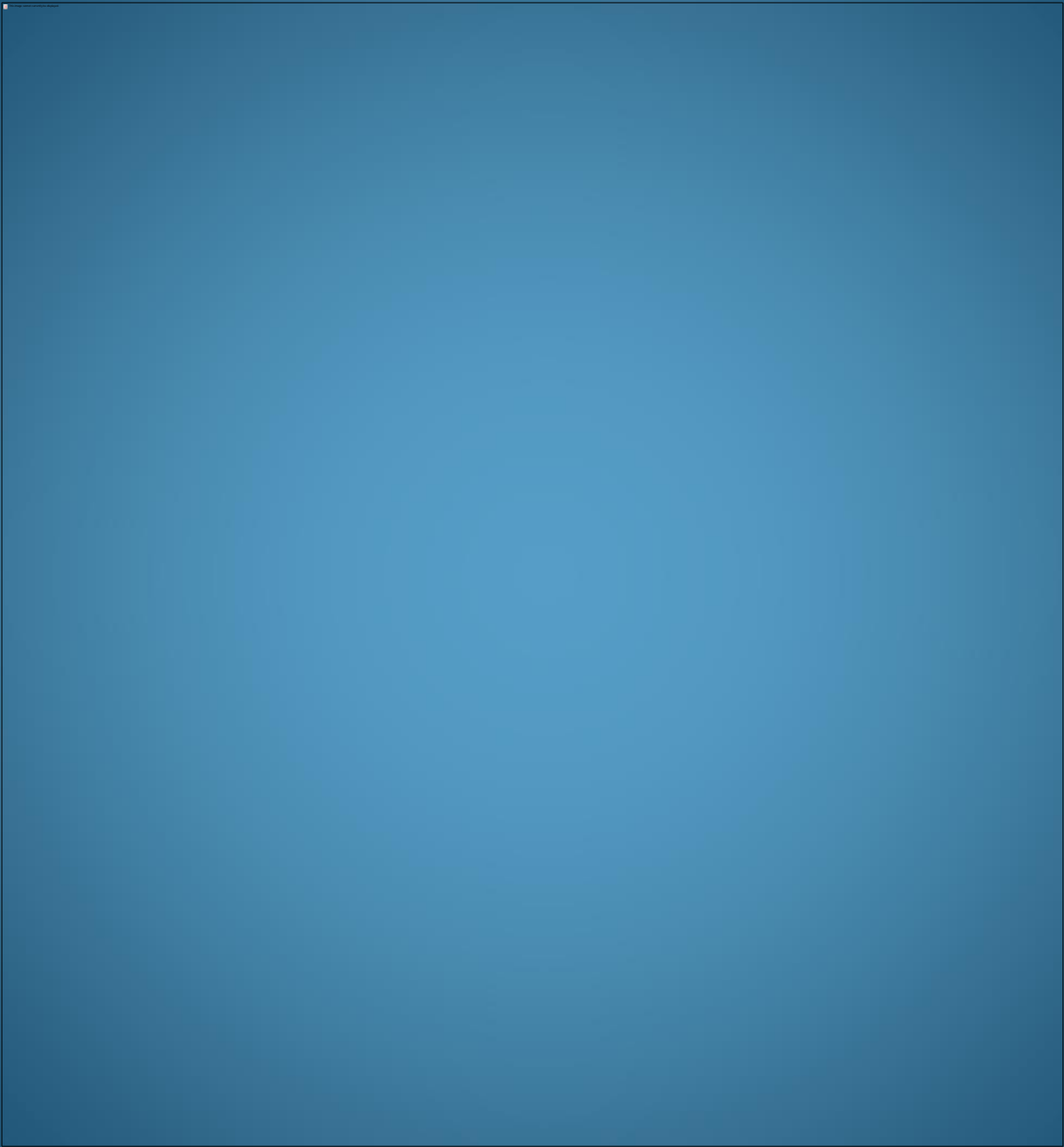


Figure 1.2. The U.S. Weather Bureau 1956 SIMON Fallout Pattern.



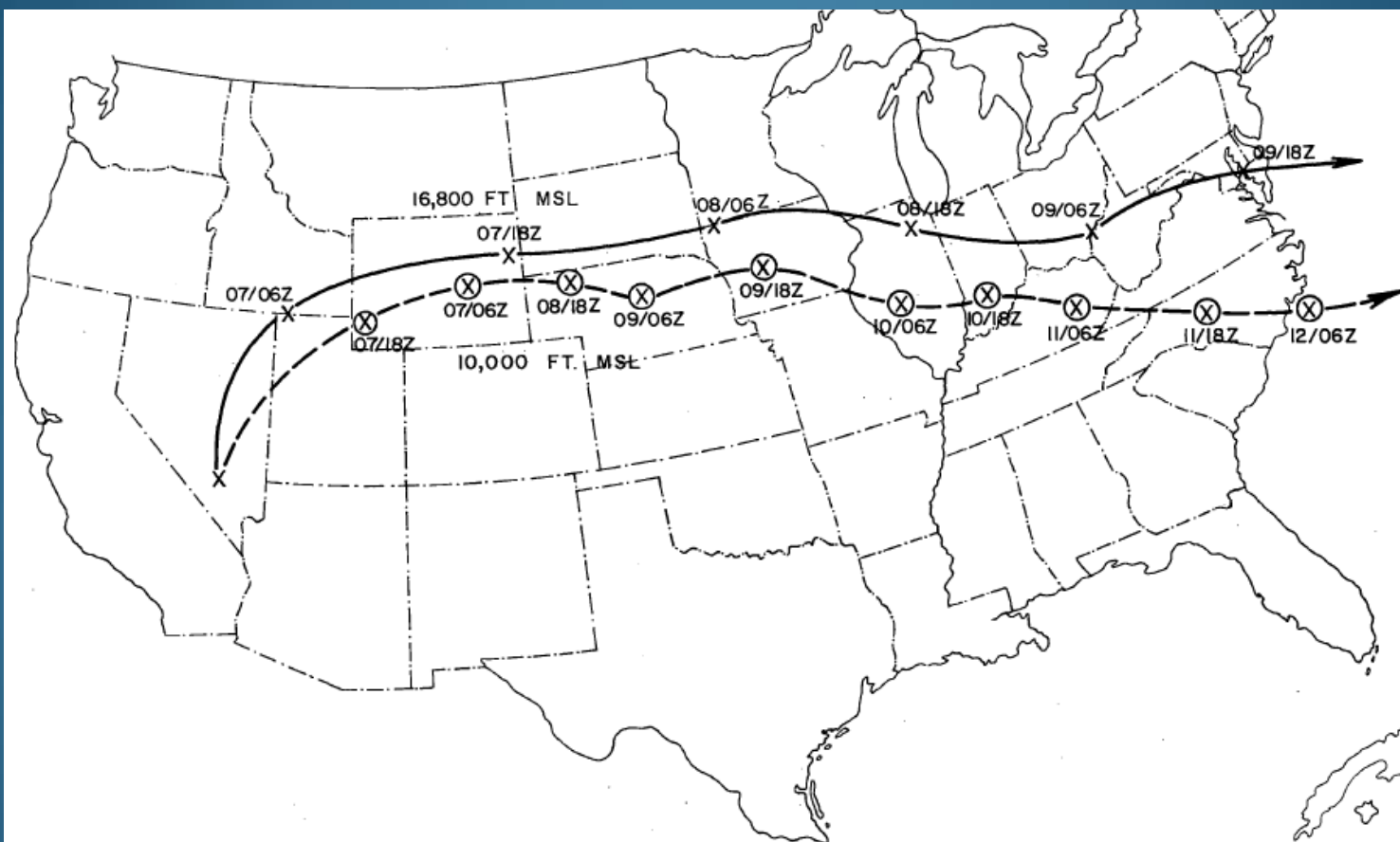


FIGURE 2.6 METEOROLOGICAL TRAJECTORIES — *SEDAN* — DETONATED
JULY 6, 1962 AT 1700Z, DAY / TIME (GCT)



HARRY (Operation Upshot-Knothole) – 32 kt - May 19, 1953--- Height of Burst - 300 feet - tower

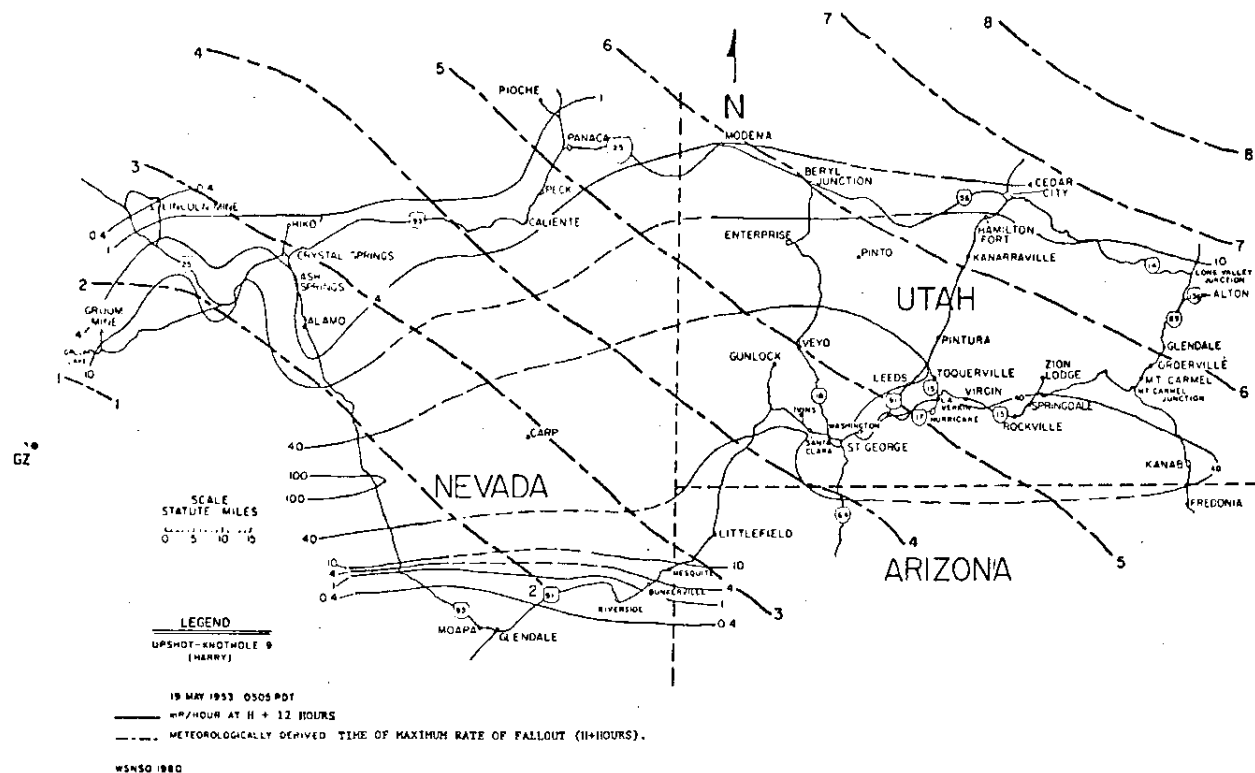


Figure 9. Extended range fallout pattern contours (mR/hr at H + 12 hours) and meteorologically derived time of maximum rate of fallout (H + HOURS).

OPERATION UPSHOT-KNOTHOLE, HARRY Event, May 19, 1953.
Fallout pattern reanalyzed by Weather Service Nuclear Support
Office in 1980.

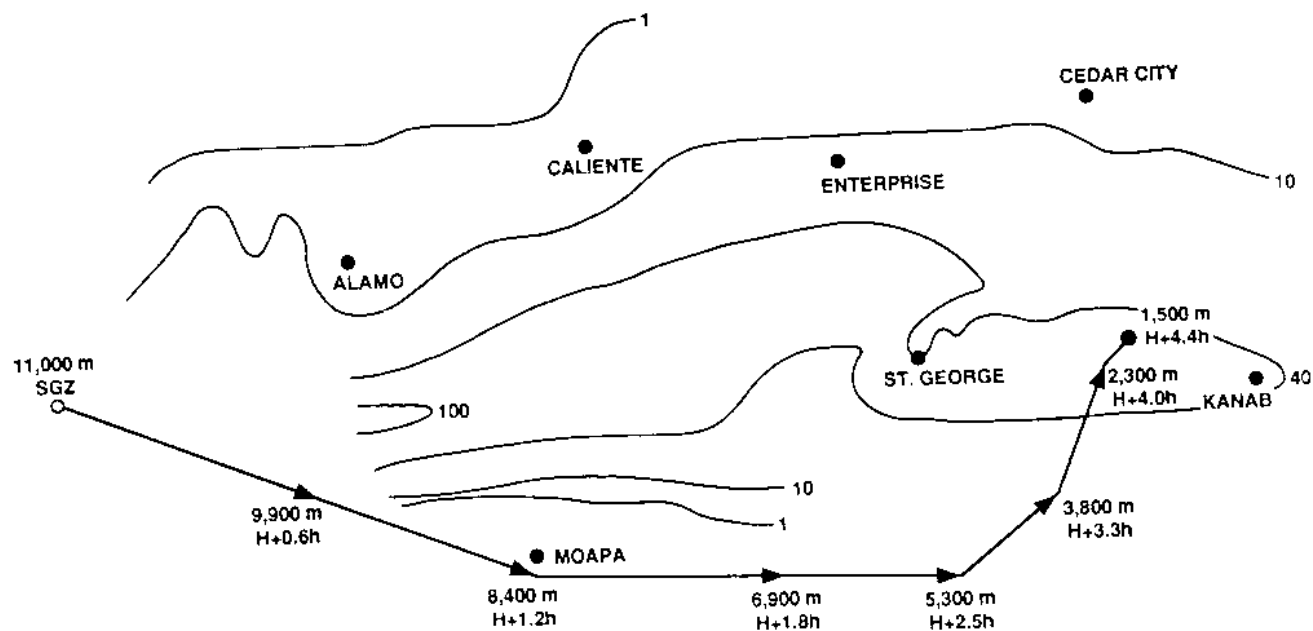


Fig. 3. Fallout particle trajectory (path), shown by the heavy line with arrowheads, as it falls from 11,000 m ASL to 1,500 m ASL in 4.4 h. The numbers by the arrowheads are the altitude of the particle and the time (H + h) it reached that altitude. Thin lines are fallout contours (mR h⁻¹ at H + 12 h) from the WNSO HARRY analysis.

OPERATION UPSHOT-KNOTHOLE, HARRY Event, May 19, 1953.
Fallout particle path shown by heavy line with arrowheads.

Fallout in Southern Utah

City	Event	Dose (rem)	% of Total Dose
St. George, Wa	Harry	2.5	68
	Smokey	0.66	18
	Annie	0.33	9
Total		3.7	
Cedar City, Iron	Harry	0.25	39
	Smokey	0.21	33
Total		0.64	
Kanab, Kane	Harry	1.6	97
Total		1.6	
Orderville	Harry	1.4	88
	Tesla	0.08	5
	Pirscilla	0.04	3
		0.04	3
	Total	1.6	

Books on Fallout

- The day we bombed Utah (John Fuller)
- Fallout an American Tragedy (Philip L. Fradkin)
- America Ground Zero: The Secret Nuclear War
- Phantom Utah fallout cancer epidemic:
Disillusioned and waiting to die (Daniel Miles)
- Underexposed: What if Radiation is actually
good for you? (Ed Hiserodt)
- America the Powerless (Alan Walter)

Fallout Myths in Southern Utah

- Fallout came down like snow, kids played in it.
- Children died four years after the fallout.
- Enterprise High School death from cancer.
- Epidemic of Cancer deaths in Southern Utah.
- John Wayne Killed by fallout.

Radiation Myths in Southern Utah

Reality

No Photographs, No mention in journals, letters, neighborhood newspaper articles to document “fallout snow”. No Mention by radiation monitoring personnel present at the time. This should have been BIG news at the time.

Radiation Myths in Southern Utah

Reality



There is only one headstone for a child in the St. George Cemetery for 1955- a 9-year-old killed in a tragic vehicle accident.

Radiation Myths in Southern Utah

Reality

- No reunion was ever held at the cemetery
- In the classes of 1968, 1969, 1970, 1971, and 1972, as of 2004, only one member of the class died.
- Her death was



“Preston Jay Truman’s resolve was

ended his
a few years
at the local
ds he had
community of
to reach his
ad died of

Radiation Myths in Southern Utah

Reality

- No Leukemia deaths reported in Kane County from 1951-1972.

“Every time I go out I see someone else my age that’s dying”

- NCI showed all cancer 30% below the national average

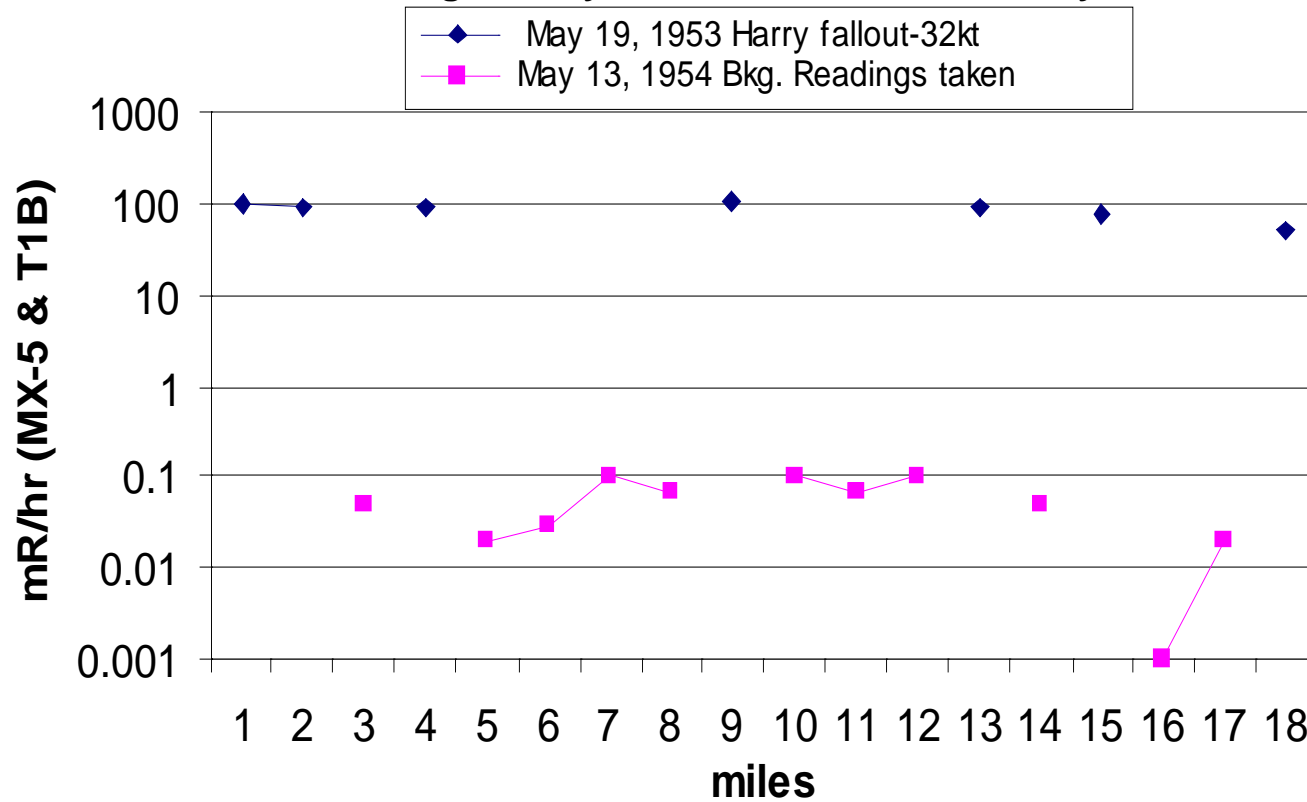
“And when the young boys and girls developed leukemia, dropping off like flies a regular epidemic around here, nobody seemed to know. They were holding three or four funerals a week.”

“Almost every family had had at least one member die from cancer, leukemia or some other debilitating disease”

Radiation Myths in Southern Utah

- Myth #5: John Wayne got cancer from the radiation in Southern Utah while filming the Conqueror.

Radiation Readings Hiway 18 East Side of Snow Canyon



The John Wayne myth – facts!

- Conqueror filmed in Snow Canyon May-Aug. 1954!
- There was NO nuclear weapons testing in Nevada in 1954!
- When the film was made the activity had returned to background.
- Smokers, Dick Powell, Pedro Armendariz, Agnes Moorehead, Susan Hayward all dead by 1975. JOHN WAYNE diagnosed w/ lung cancer Sept., 1964, died from stomach cancer 1979!
- *People Magazine* Nov. 10, 1980. “Of The Conqueror's 220 cast & crew members from Hollywood, an astonishing 91 have contracted cancer.”
- NCI “the overall incidence of being diagnosed with cancer in a person's lifetime is about 40%.” Thus, a cohort of 220 people 88 would be diagnosed with cancer.
- Expected 88 and observed 91 are the same.

Radiation Myths in Southern Utah

Southern Utah Fallout Myths

Busted

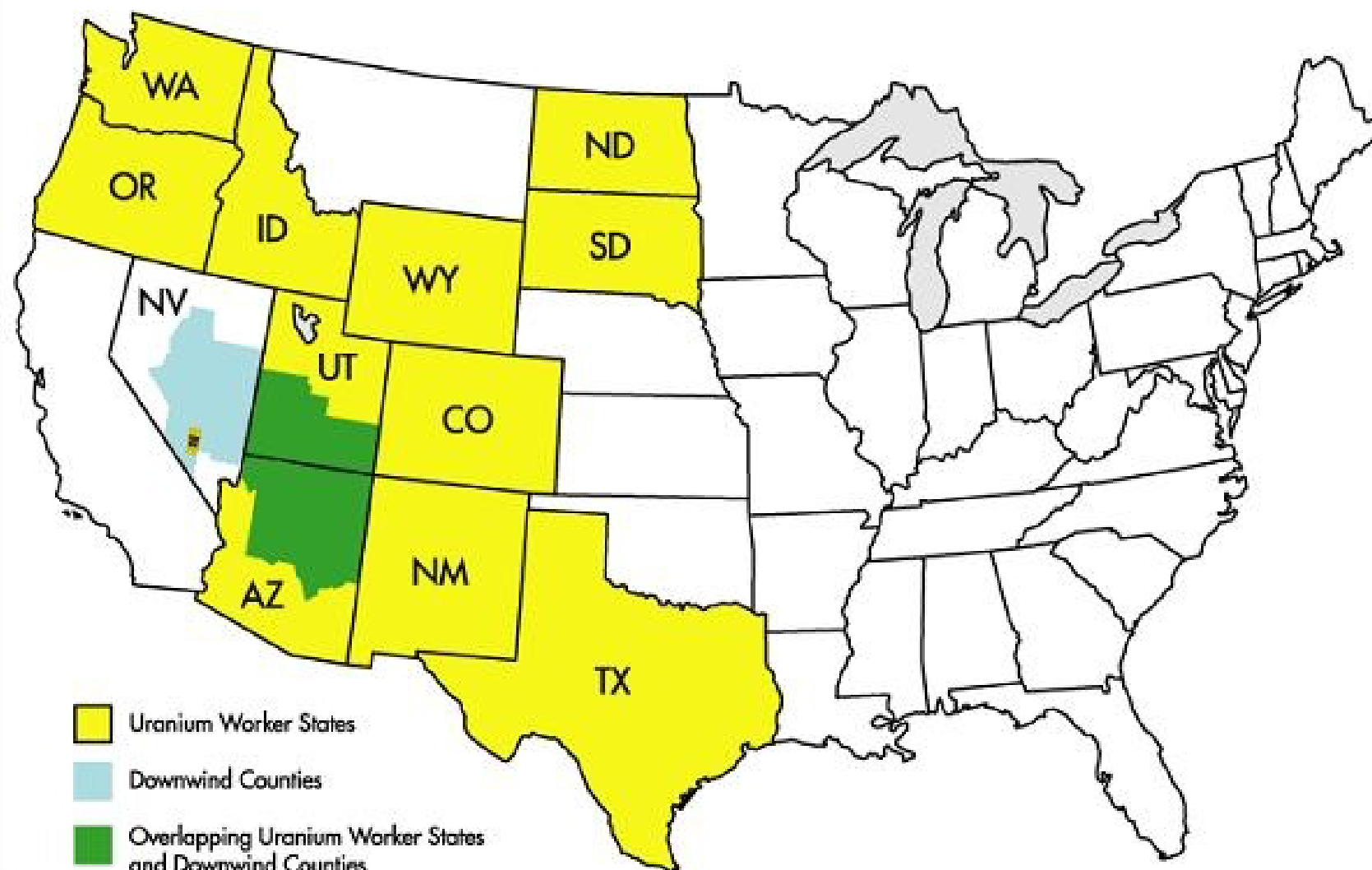
Myths, Fear and Politics Resulted in Compensation

- RECA – Radiation Exposure Compensation Act
- EEOICPA - The Energy Employees Occupational Illness Compensation Program Act

(RECA) Radiation Exposure Compensation Act

- RECA passed 1990, Scope of coverage broadened in 2000.
- The Act presents an apology and monetary compensation to individuals who lived in defined locations during the atmospheric nuclear weapons tests and developed “any one of 27 radiation related” cancer or other disease.
- Act provides compensation to those employed in the Uranium industry during the Cold War arsenal buildup.

RECA COVERED AREAS



AWARDS TO DATE 06/24/2015

Claim Type Desc	Pending	Approved	% Approved/of Disposed	\$ Approved	Denied	Total
Downwinder	383	18,893	81.5	\$944,620,000	4,286	23,562
Onsite Participant	227	3,768	54.5	\$274,234,940	3,145	7,140
Uranium Miner	105	6,136	63.2	\$612,874,560	3,571	9,812
Uranium Miller	38	1,643	76.8	\$164,300,000	497	2,178
Ore Transporter	18	318	69.3	\$31,800,000	141	477
Total:	771	30,758	72.5	\$2,027,829,500	11,640	43,169

Who got the fallout?

Who gets to take Money to the Bank?

- Southern Utah gets the money, Northern Utah got the largest collective dose.
- Utah and Nevada got the most fallout
Arizona gets most of the money.
 - Arizona 67.5%
 - Utah 25.4%
 - Nevada 7.2%

Why?

- RECA based on politics and not science
- Reimbursement based on location not dose or risk.
- The total cancers in an area are dependent on the number of people not dose.
- Radiation poor carcinogen (for protracted exposure 5%/Sv or 5%/100 rem). Highest dose from fallout (0.05 Sv or 5 rem) to a small population.
- Background cancer frequency high without radiation exposure.
 - 40% get cancer
 - 25% die from cancer

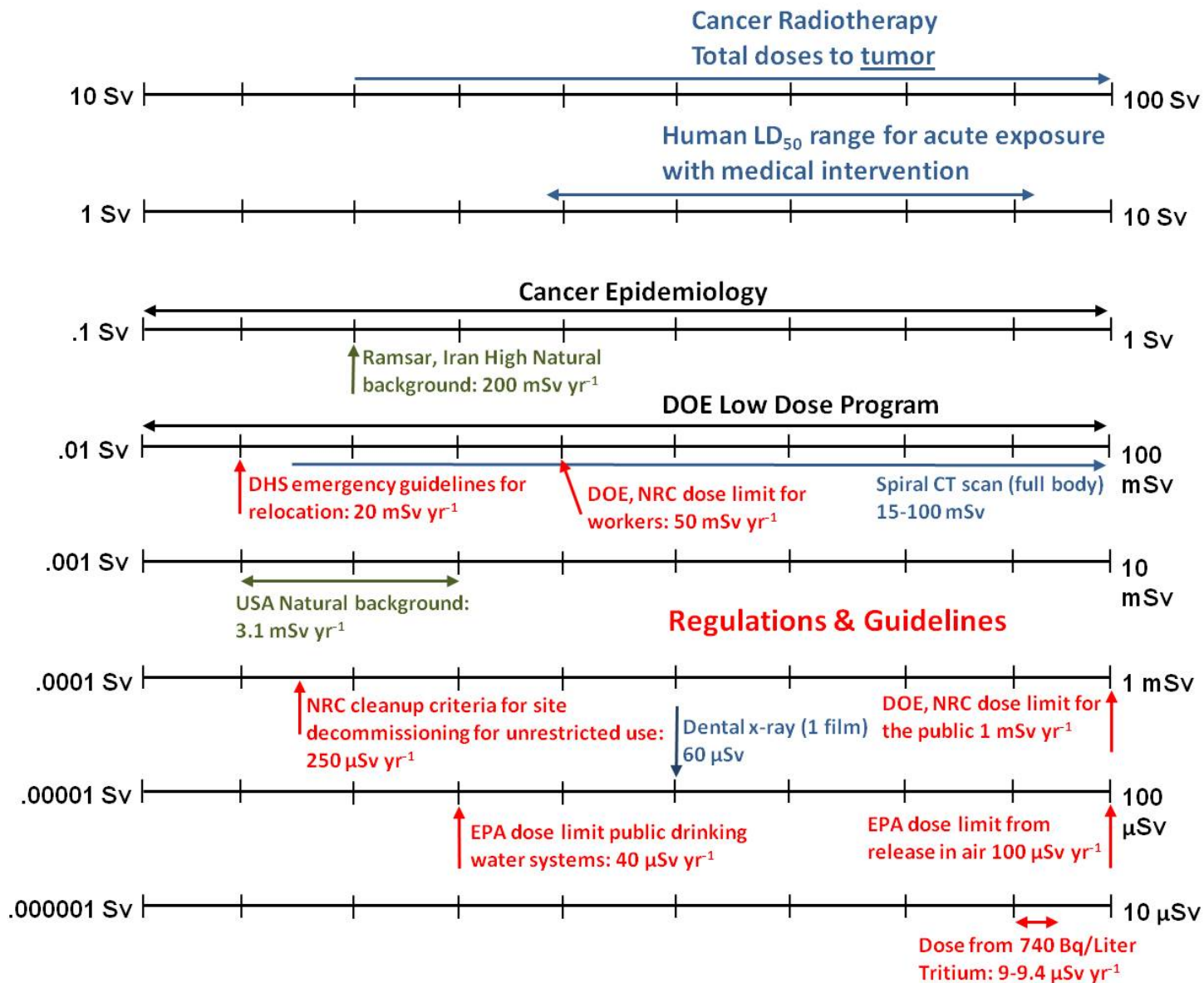
What If...

internally deposited radioactive materials are more hazardous than external radiation?

(Fallout) Beta-Gamma emitting Radionuclides of Concern

- Iodine-131
- Strontium-90
- Cesium-137

Ionizing Radiation Dose Ranges Chart (Sievert)



Health Effects of Iodine-131

- Iodine-131 concentrates in the Thyroid
- Short half-life results in high doses
- Utah had high thyroid doses but no detectable increase in Thyroid cancer.
- Chernobyl had very large doses of Iodine-131 to a large population.
- No increase in adult thyroid cancer
significant increase thyroid cancers in children (7,000 excess cancers)
- Less than ten thyroid cancer deaths

What If...

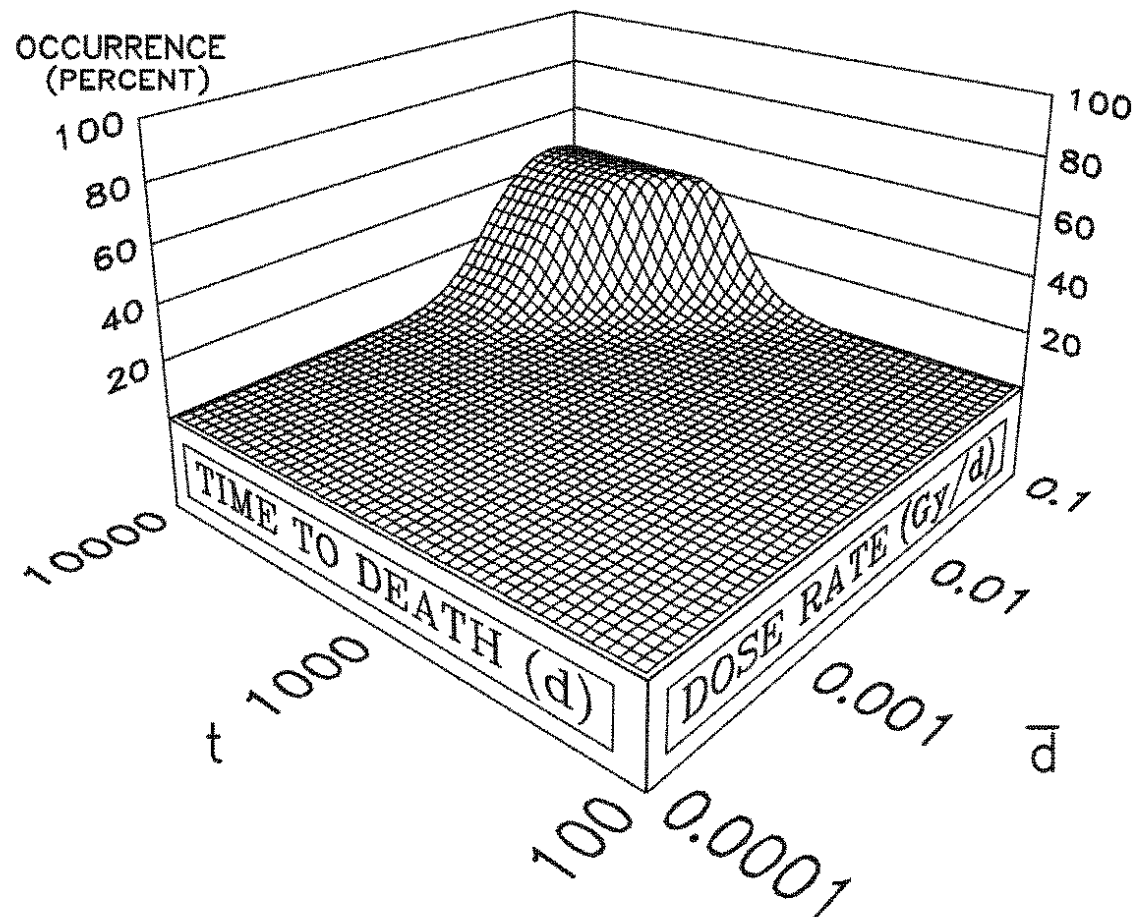


injected or inhaled ^{90}Sr - ^{90}Y was
much more hazardous than acute
radiation?



- Samples from the environment were measured in pCi/liter or pCi/Kg range
- Chinese Hamsters were injected with mCi $^{90}\text{Sr/g}$ body weight (100,000-1,000,000,000 times higher than the environment) to study chromosome aberrations and cancer.

OCCURRENCE OF DEATHS FROM BONE CANCER FOR BEAGLES FED ^{90}Sr AT DAVIS



O. RAABE

TIME AFTER BIRTH & AVERAGE BETA DOSE RATE TO SKELETON (LOG SCALES)

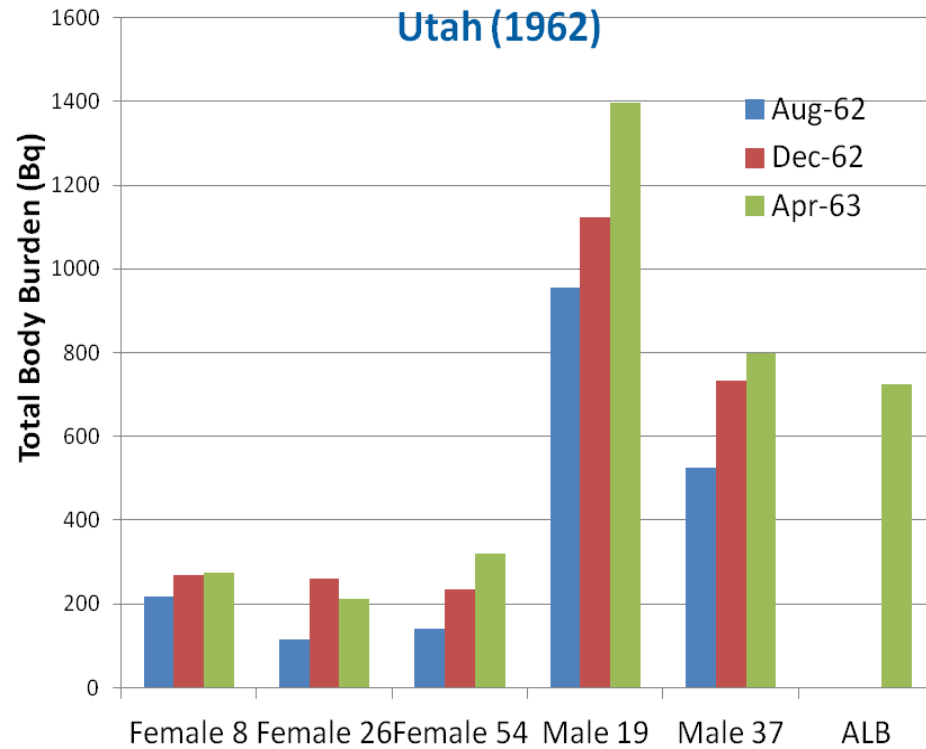
What if Strontium-90 was More hazardous than acute exposure?

- Huge doses were required to produce lung cancer from inhaled ^{90}Sr . Doses less than 20 Gy had **no increase in lung cancer**.
- Huge doses and dose rates were required to produce bone cancer from ^{90}Sr . **low dose rates did not increase bone cancer**.

Dose and health effects of Cesium-137

- Cesium-137 has long physical half-life and short effective half-life
- Cesium-137 is uniformly distributed in the body and results in a whole body dose
- Cesium-137 is a major component of fallout from nuclear weapons
- Cesium-137 can concentrate up the food chain
- Cesium binds to clay particles making it less biologically available

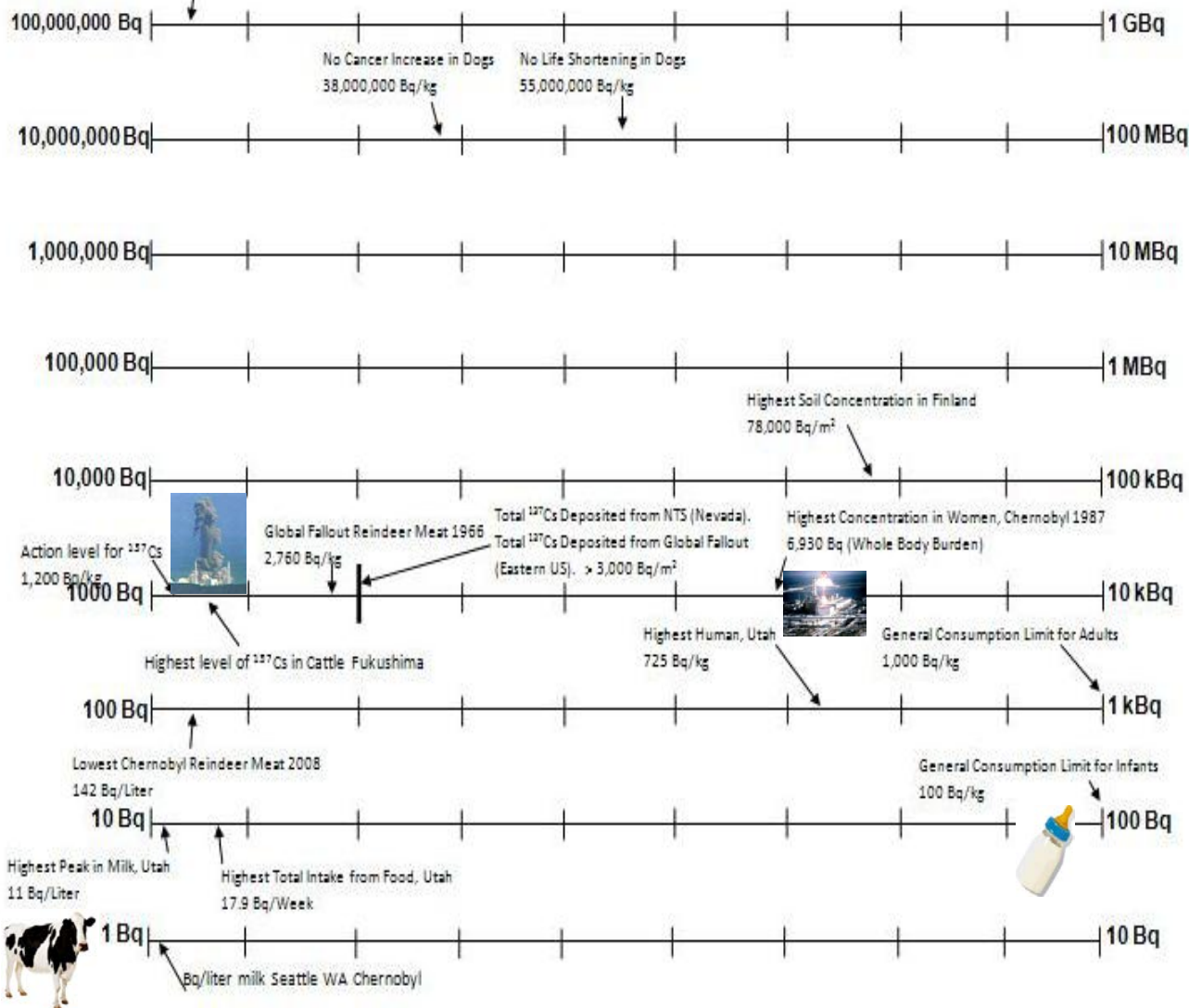
Human Body Burdens ^{137}Cs Following Fallout Utah (1962)





Marked Life Shortening in Dogs
138,000,000 Bq/kg

^{137}Cs Environmental and Effects Levels

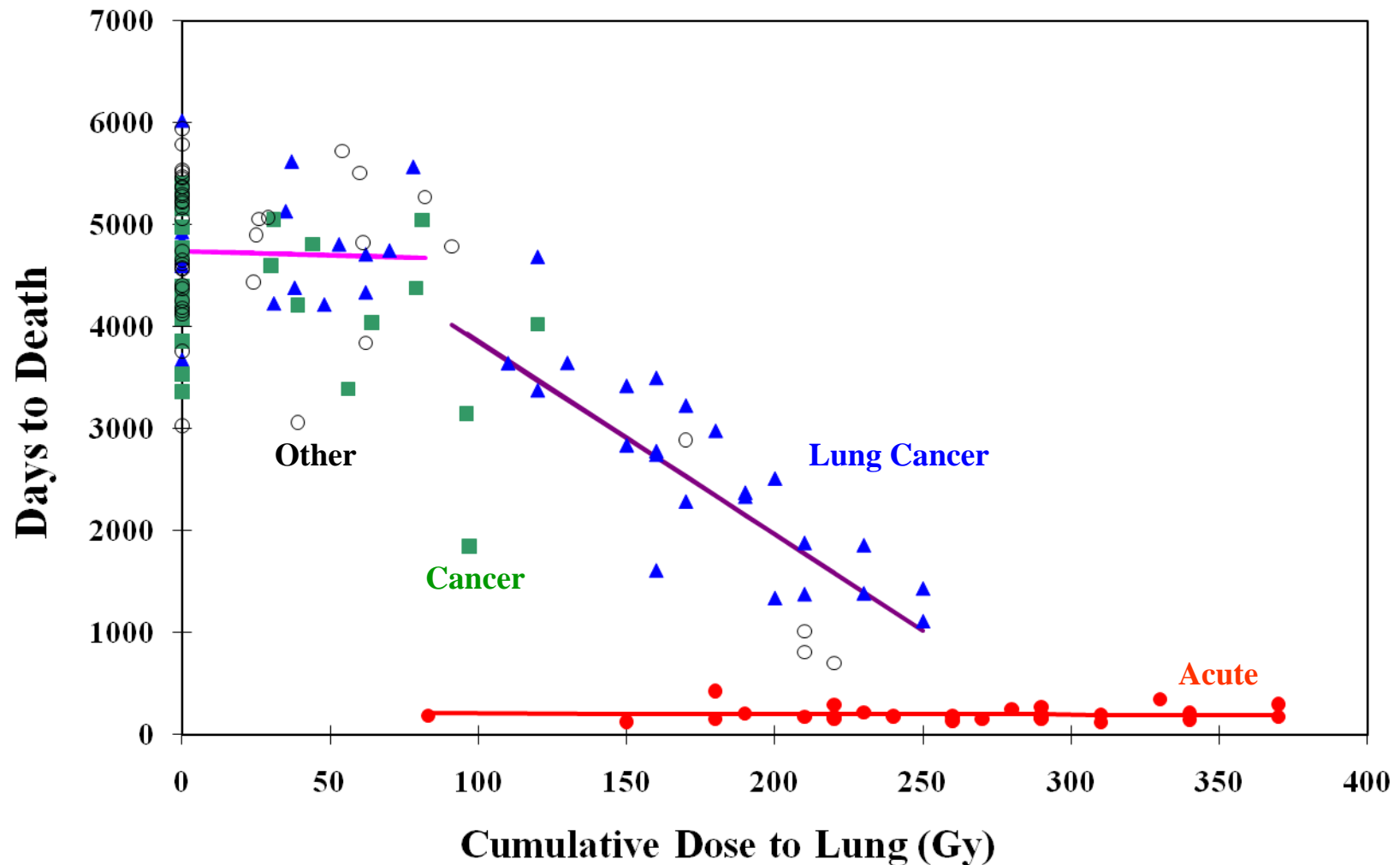




Low-LET Studies

	Utah	Davis	Argonne	ITRI
Injection	1954 ^{90}Sr	1963 ^{90}Sr	1956 ^{90}Sr (Transplacental) 1957 ^{90}Sr (Subcutaneous) 1960 ^{144}Ce 1961 ^{137}Cs	
Ingestion		1961 ^{90}Sr		
Inhalation				1970 ^{90}Sr (insol) 1967 ^{144}Ce (insol) 1970 ^{91}Y (insol) 1969 ^{90}Y (insol) 1965 ^{90}Sr (soluble) 1966 ^{144}Ce (soluble) 1972 ^{144}Ce (juvenile) 1972 ^{144}Ce (aged) 1972 ^{144}Ce (multiple exposures) 1968 ^{137}Cs (soluble) 1966 ^{91}Y (soluble)

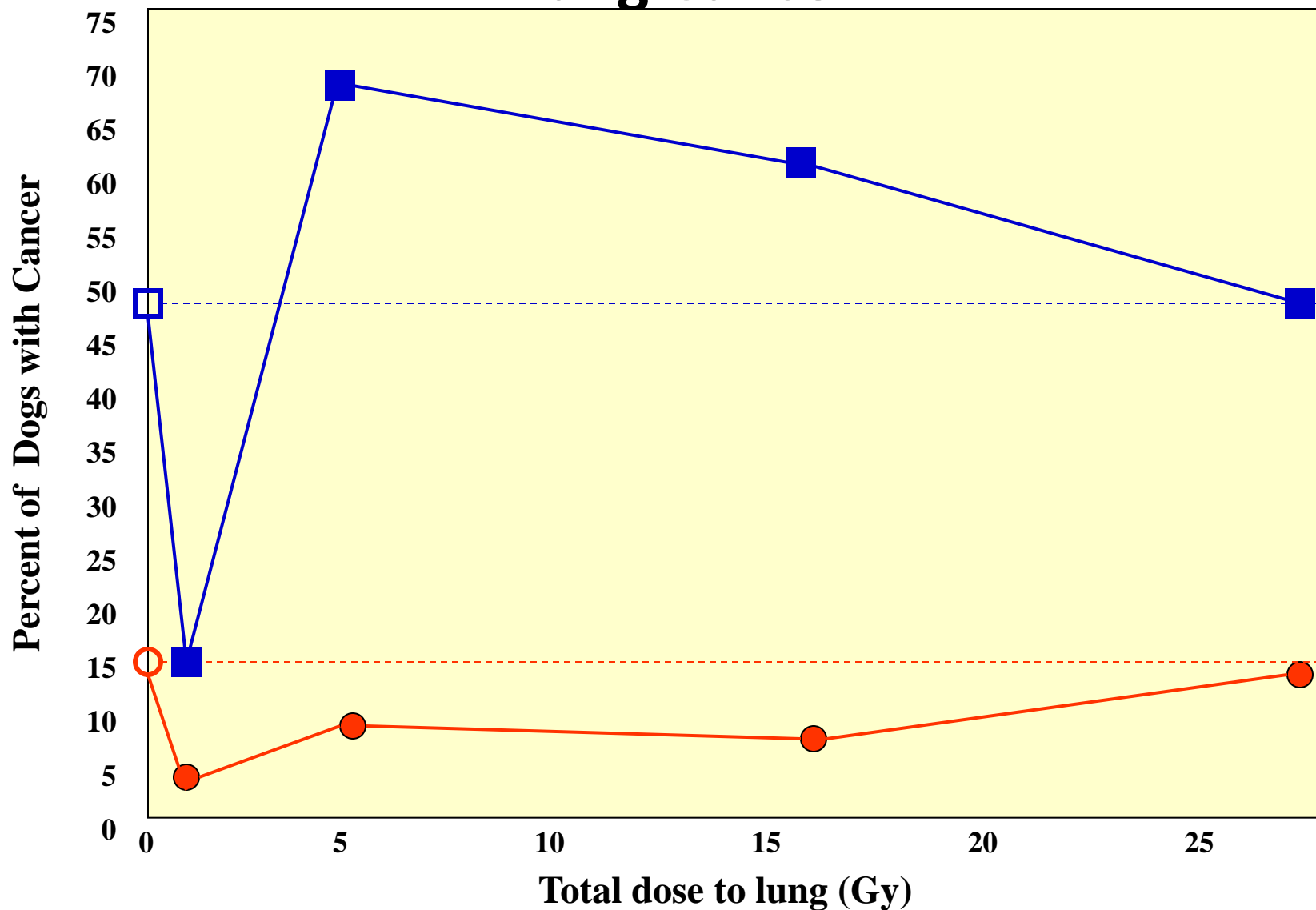
Life Shortening Response to Cumulative Dose to Lung Following Inhalation of ^{91}Y -FAP



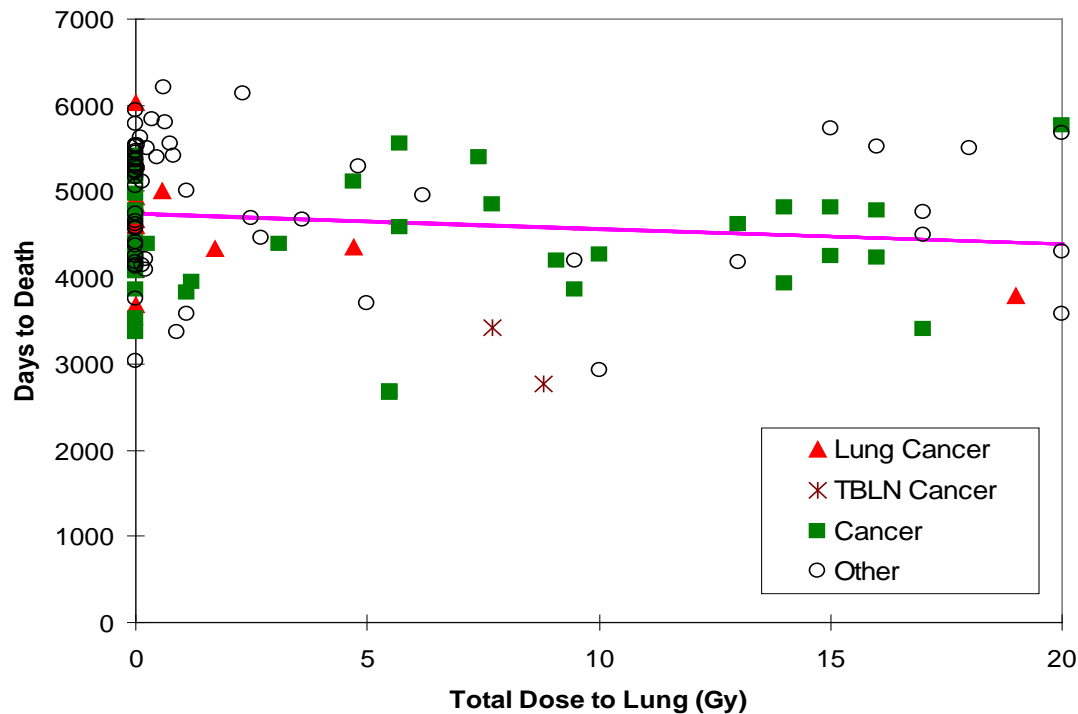
□ Control dogs
■ All cancers

○ Control dogs
● Lung cancer

Total Cancer and Lung Cancer



Dogs <20 Gy Dose to Lung after Inhalation of FAP



	Lung Cancer	Total Cancer
Control	8/54= 15%	26/54= 48%
Exposed	4/64= 6%	29/64= 45%

Differences between High- and Low-Dose Radiation Responses (Mechanisms?)

Dose > 0.2 Sv (20 rem)

Cell killing high

DNA damage high

Gene Expression (Damage?)

Epigenetic Effects?

Free Radical Increased

Direct Action

↑ Apoptosis (Increased)

↑ Mutation Frequency

↑ Cell Transformation

Immune response (-)

Cancer increased (5%/Sv)

Dose < 0.2 Sv (20 rem)

Cell killing low

DNA damage low/not detected

Gene Expression (Protective?)

Epigenetic Effects (Protective)

Free Radicals decreased

Indirect Action

MnSOD

Glutathione

↑ Selective Apoptosis

↓ Mutation Frequency

↓ Cell Transformation

Immune response? (+)

Cancer (mSv)?

Nevada Fallout

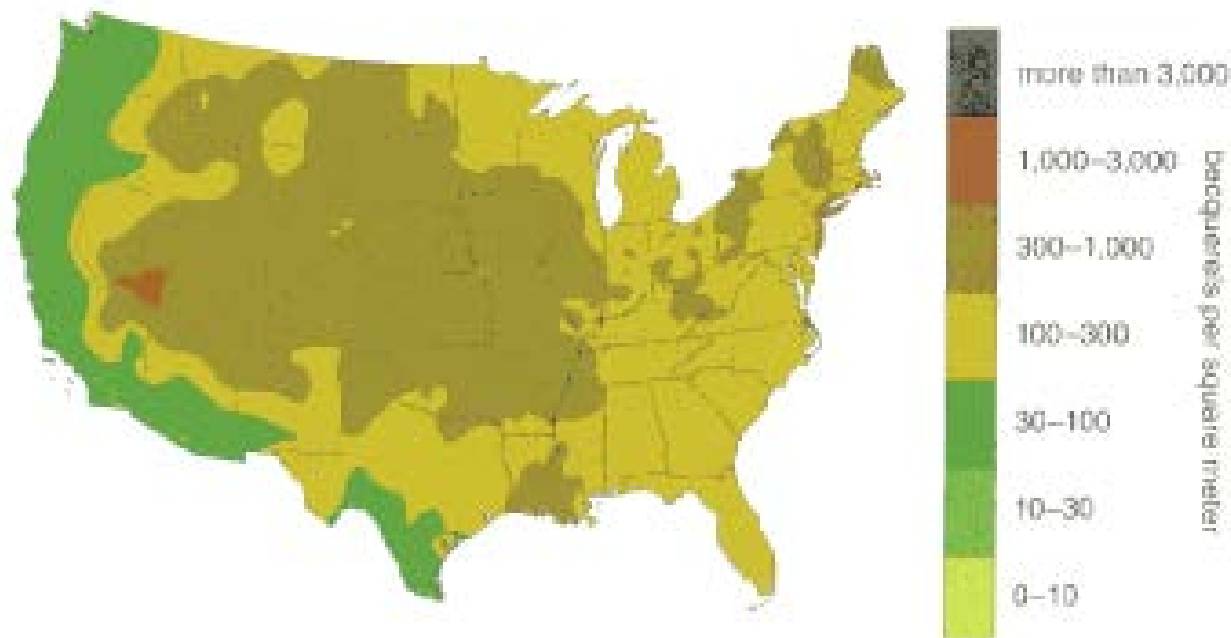
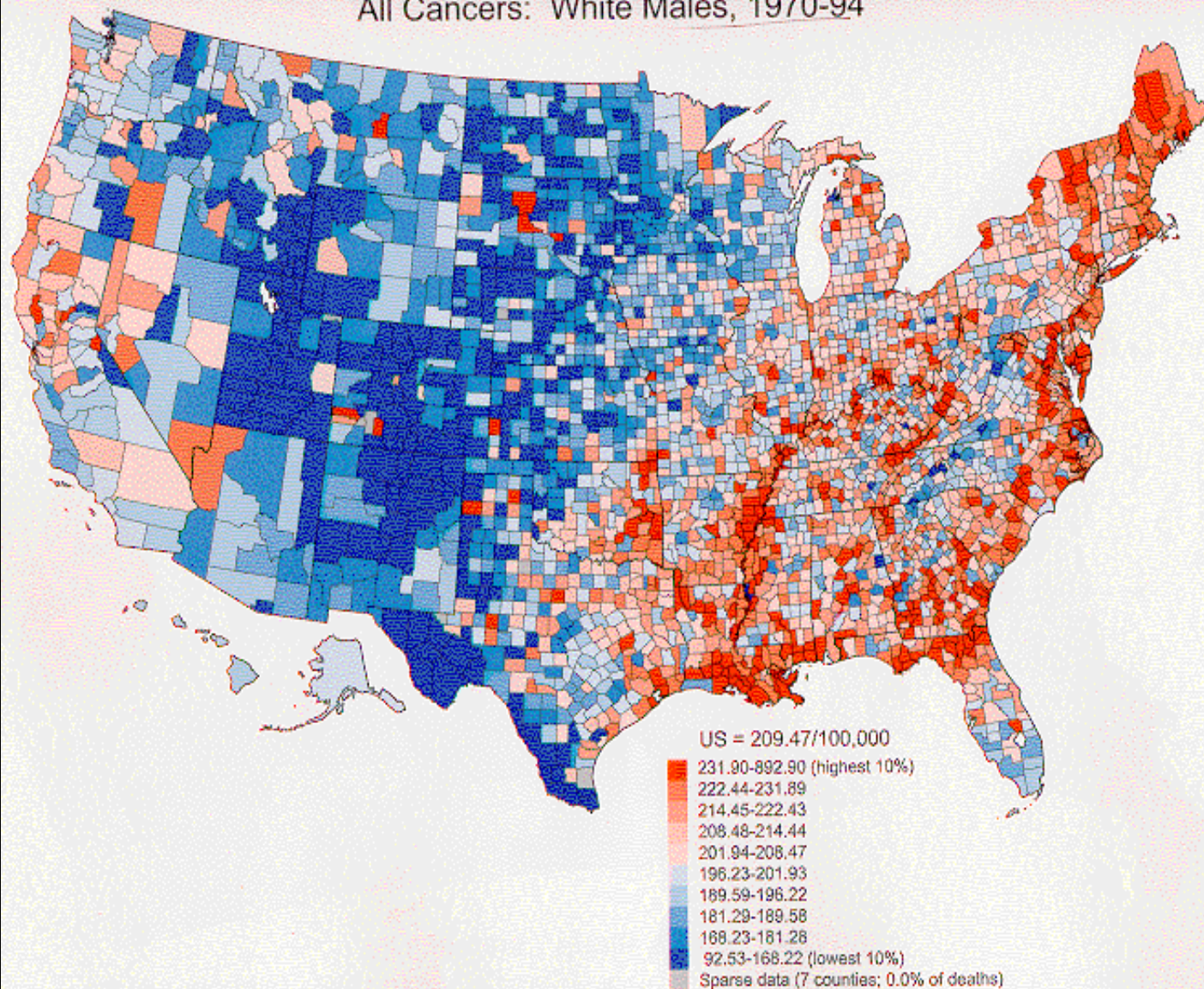
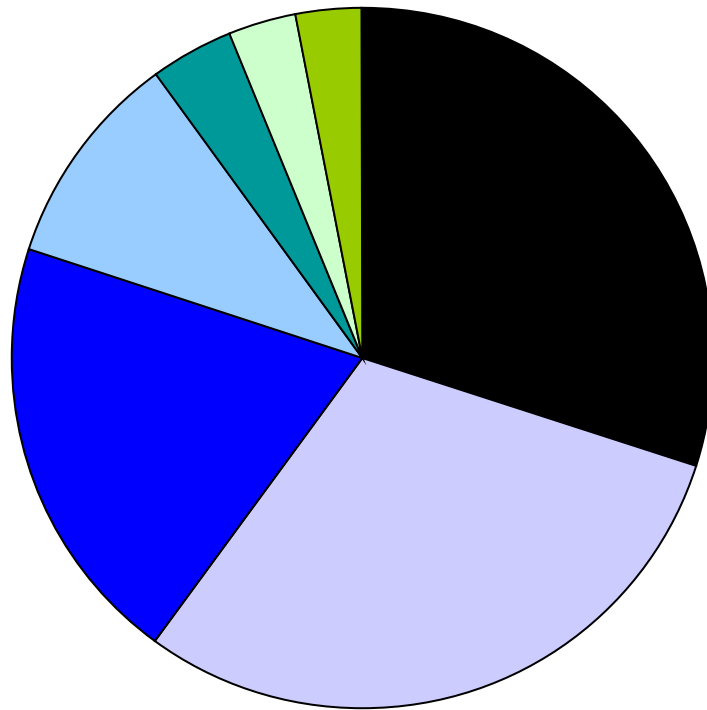


Figure 7. Cesium-137 deposition density resulting from the cumulative effect of the Nevada tests generally decreases with distance from the test site in the direction of the prevailing wind across North America, although isolated locations received significant deposition as a result of rainfall.

Cancer Mortality Rates by County (Age-adjusted 1970 US Population)
All Cancers: White Males, 1970-94



What Causes Cancer?



WHO

- Cigarette smoke
- Diet & nutrition
- Chronic infection
- Occupational exposure
- Genetic
- Alcohol drinking
- Environmental factors including radiation

Summary

- Fallout world wide with local fallout measured and monitored.
- The fallout doses were low, cause no detectable increase in cancer.
- The reimbursement methods made without a scientific basis.
- Internally deposited radioactive material less hazardous than acute exposures.
- Cell and molecular data support a high dose-rate effectiveness factor.
- Many of those who got the money did not get the dose.