

The Hanford Birth Cohort: Autoimmune and Cardiovascular Disease in Residents Near the Hanford Nuclear Reservation

People who lived near the Hanford Nuclear Reservation in Washington State were exposed to various types of radiation, especially during the years 1944–1957. Scientists from the Agency for Toxic Substances and Disease Registry (ATSDR) have been evaluating the potential health effects that may have resulted from those exposures. Their data show a small increased risk for certain men to develop a thyroid disease.

This report summarizes the findings of the Hanford Birth Cohort study. The study used interviews to collect health information from people who were born in Washington State between January 1, 1945, and December 31, 1951, and lived in Adams, Benton, or Franklin counties for at least 1 year. For comparison, ATSDR also collected health information for people who were born and lived in Mason, San Juan, or Whatcom counties during the same period.

People who lived in Adams, Benton, or Franklin counties during the years 1944–1957 lived closer to Hanford facility than people who lived in Mason, San Juan, or Whatcom counties and were exposed to more iodine-131 (^{131}I) radiation from the plant.

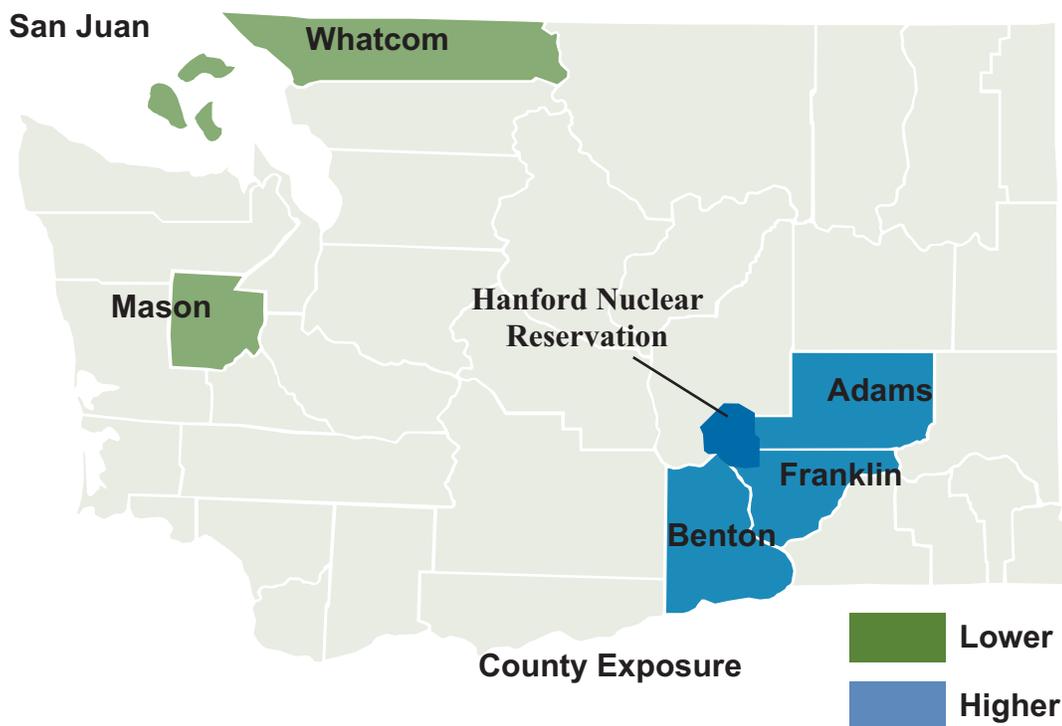
This study found a small increased risk of Hashimoto's thyroiditis (thyroiditis/hypothyroidism) for men who lived in the counties near the facility, compared with men in the distant counties. Hashimoto's is an autoimmune disease that occurs when the thyroid gland makes too little thyroid hormone.

The percentage of women reporting Hashimoto's thyroiditis was the same in the higher and lower exposure counties. ATSDR found no link between exposure to iodine-131 and cardiovascular disease and other autoimmune diseases in men or women.

What happened at Hanford?

The Hanford nuclear facility released large amounts of iodine-131 and other radioactive materials into the air from 1944 to 1957. Iodine-131 was carried by winds and deposited on vegetation. Cows and goats ate the vegetation contaminated by iodine-131. Iodine-131 passed into the cow's and goat's milk that people drank. Most people received most of their iodine-131 exposure from contaminated milk. People were also exposed by eating contaminated fruits and vegetables and by breathing contaminated air. Once inhaled or ingested, iodine-131 is deposited in the thyroid gland. Children who lived in Adams, Benton, or Franklin counties at the time of the releases received the highest doses of iodine-131 (Figure 1).

Figure 1. Location of counties in study area



What is the Hanford Birth Cohort study (HBCS)?

The Hanford Birth Cohort study was conducted with the guidance of the Hanford Health Effects Subcommittee, an advisory group of more than 20 community members, local scientists, and ATSDR scientists. ATSDR conducted this study because the community had concerns that iodine-131 exposure caused autoimmune and cardiovascular disease.

Who participated in the study?

A random sample of 4,190 people was selected for this study from the 24,742 births that occurred in the six counties during the specified years (Figure 2). People in the higher exposure group were born and lived at least 1 year in Adams, Benton, or Franklin counties from 1945 to 1951, the years when the highest exposures reportedly occurred. People in the lower exposure group were born and lived at least 1 year in Mason, San Juan, or Whatcom counties. They did not live in Adams, Benton, or Franklin counties at any time during 1945 to 1951. Only 37% of the 4,190 people in the random sample were able to be interviewed. The 1,283 interviews were completed by telephone during January to March 2003. Among those, 123 participants were found to be ineligible, so their interviews were excluded from the analysis. The final study population includes 1,160 people.

Of the participants included in the study, 42% were born and lived in Adams, Benton, or Franklin counties and 58% were born and lived in Mason, San Juan, or Whatcom counties. In both groups, more than half of the participants were male (Table 1).

Figure 2. Study population

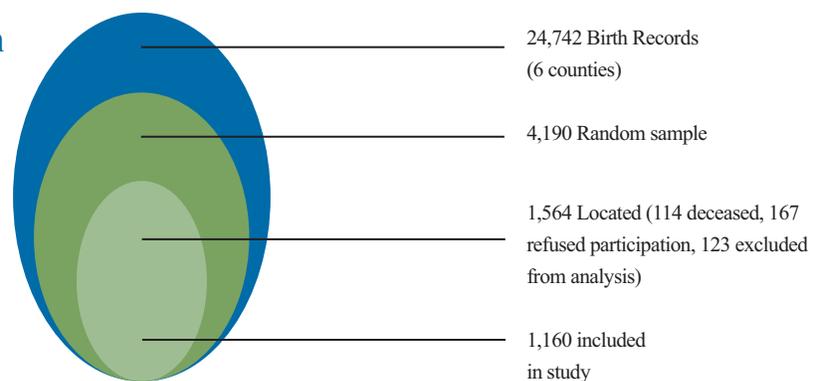


Table 1. Distribution of HBCS participants by gender and exposure group

	Adams, Benton, and Franklin counties*		Mason, San Juan, and Whatcom counties†	
Sex	Number‡	%§	Number‡	%§
Male	294	60.0	383	57.0
Female	193	40.0	290	43.0
Total	487	100.0	673	100.0

*Higher exposure counties, †lower exposure counties, ‡number participating, §percentage participating

What did ATSDR find?

Participants were asked questions about their place of birth, lifestyle, diet, job, and whether they had been diagnosed by a physician as having any one of 28 autoimmune or cardiovascular diseases. Hypertension was the most reported health condition in both the higher exposure and lower exposure counties (Table 2). Rheumatoid arthritis, Hashimoto’s thyroiditis (thyroiditis/hypothyroidism), psoriasis, and Crohn’s disease were the next four most commonly reported conditions in both areas.

Health conditions were self-reported by participants. A participant could have reported more than one condition. Nearly half of all participants reported at least one autoimmune or cardiovascular disease.

Participants were asked permission to have ATSDR contact their physician to verify the self-reported conditions. Physicians confirmed 48% of the self-reported conditions.

Table 2. Self-reported health conditions in Hanford Birth Cohort study

Health Condition	Adams, Benton, and Franklin counties*	Mason, San Juan, and Whatcom counties†	TOTAL
	(n=487‡)	(n=673‡)	
	Number of people	Number of people	
Angina	15	18	33
Chronic fatigue syndrome	25	21	46
Crohn's disease	28	28	56
Fibromyalgia	14	27	41
Graves' disease (hyperthyroidism)	17	17	34
Hashimoto's thyroiditis (thyroiditis/hypothyroidism)	42	49	91
Heart attack	16	23	39
Hypertension	149	200	349
Multiple sclerosis	6	7	13
Pernicious anemia	15	12	27
Psoriasis	31	44	75
Raynaud's phenomenon	9	7	16
Rheumatic fever	13	21	34
Rheumatoid arthritis	52	54	106
Stroke	9	14	23

*Higher exposure counties, †lower exposure counties, ‡number of participants who completed the interview

Fewer than five people in either the higher or lower exposure counties reported having the following conditions:

Addison's disease	lupus	scarcooidosis
alopecia	myasthenia gravis	scleroderma
arteriosclerosis	Parkinson's disease	Sjorgren's syndrome
celiac disease	phlebitis	urticaria
diabetes (type 1)	primary biliary cirrhosis	uveitis
goiter	Reiter's syndrome	vitiligo

ATSDR scientists found that three times as much Hashimoto’s thyroiditis (thyroiditis/hypothyroidism) was reported by men in the study group from Adams, Benton, or Franklin counties, compared with those from Mason, San Juan, or Whatcom counties (Table 3).

This was not found to be true in women. None of the other reported health conditions were found to be statistically elevated in men or women in the higher exposure counties relative to the lower exposure counties.

Table 3. Occurrence of Hashimoto’s thyroiditis* (physician verified) among Hanford Birth Cohort study participants, by subgroup

Sex	Adams, Benton, and Franklin counties†	Mason, San Juan, and Whatcom counties‡	Relative Risk§	95% Confidence Interval**
Male	10/291	4/385	3.31	(1.05, 10.44) ¶
Female	10/185	23/275	0.65	(0.32, 1.33)

*No other reported conditions were significantly elevated (excludes missing)

† Higher exposure counties, ‡ Lower exposure counties

§ Relative Risk is the ratio of the rate of disease in the higher exposed counties compared to the lower exposed counties

** 95% confidence interval means that the true relative risk lies between the confidence limits shown

¶ Statistically significant

The ATSDR scientists considered the following factors when interpreting the data:

- Of the eligible participants, only 1,160 (72.5%) of the targeted 1,600 interviews were completed
- Less than half (48%) of the self-reported Hashimoto’s thyroiditis was verified by a physician
- It was not possible to know the iodine-131 exposure levels of individual study participants

Even though participants reported some health problems more often than the general population, ATSDR scientists cannot say that iodine-131 causes these health problems. Other factors, such as diet, lifestyle, and work history, can increase the risk of developing many of the reported health conditions. ATSDR analyzed the reported health problems and risks, but found no significant connections. In addition, it was impossible to account for all possible risk factors in the analysis.

What should you do?

People who are concerned about their possible exposure to iodine-131 from Hanford should visit their health care provider.

For questions about this report, please call Caroline Cusack, toll-free, at (888) 422-8737 or e-mail at cyc9@cdc.gov

For educational materials about Hanford, radioactive iodine, and related topics, please visit <http://www.hanfordhealth.info>

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NOTES

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