

Radiation and Public Health Project

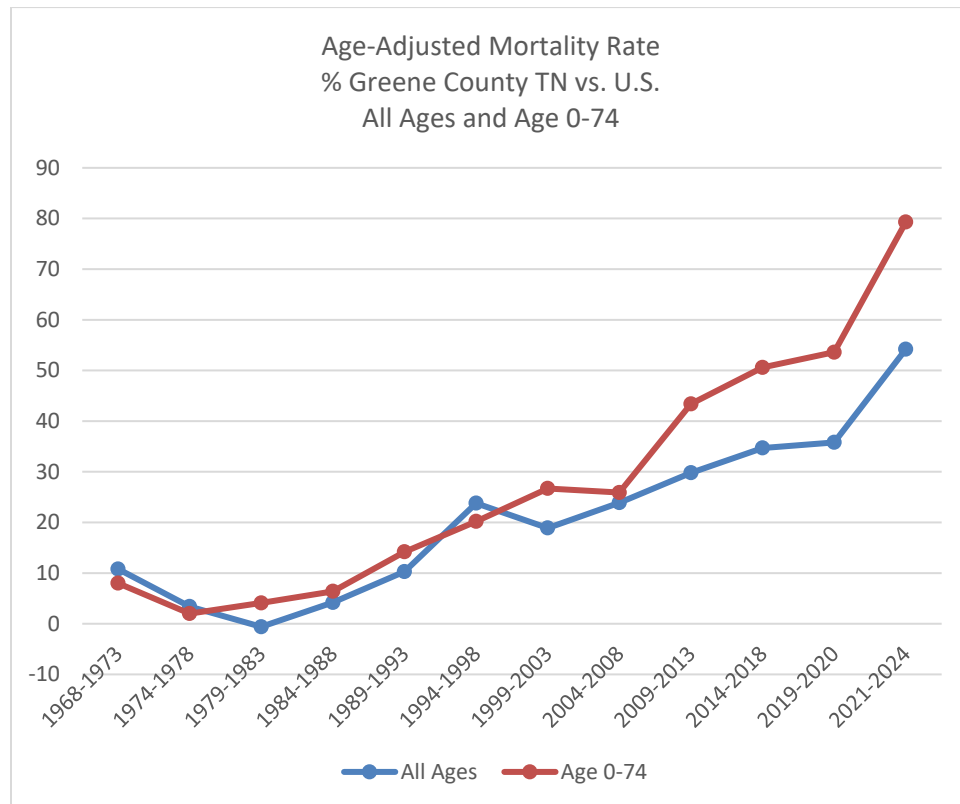
Joseph J. Mangano, MPH, MBA, Executive Director
716 Simpson Avenue, Ocean City NJ 08226
odiejoe@aol.com
www.radiation.org
484-948-7965

Directors Robert Alvarez
Christie Brinkley
Karl Grossman
Lisa Martino-Taylor
Mark Meinberg
Susan Shapiro

HIGH AND RISING MORTALITY RATES IN GREENE COUNTY TENNESSEE, 1968 TO 2024

Joseph J. Mangano MPH MBA
Radiation and Public Health Project
June 18, 2025

Trends in Greene County Death Rates Compared to U.S. Rates



Results

For all age groups, the Greene County all-cause mortality rate in the baseline period 1968-1978 was 7.1% above the U.S. rate. Soon after 1978, the excess steadily increased, reaching a peak of 54.2% above the U.S. in 2021-2024. **The number of “excess” deaths after 1978 was 6509, or 18.9% of all deaths.**

The county’s all-cause mortality rate age 0-74 in 1968-1978 was 5.3% above the U.S. rate. The steady increase in the gap reached a high of 79.3% in 2021-2024. **Excess premature deaths (age 0-74) after 1978 are 5192, or 29.7% of all deaths.**

Introduction

The Nuclear Fuel Services (NFS) plant, occupying 70 acres in eastern Tennessee, is situated in Erwin, in Unicoi County, and 0.2 miles from the Nolichucky River. NFS has conducted nuclear fuel fabrication and uranium recovery since 1959, producing high-enriched and low-enriched uranium (U.S. Nuclear Regulatory Commission, 2021).

Operations at NFS have generated enormous amounts of radioactive chemicals, to provide fuel for U.S. Navy submarines and aircraft carriers. The site also converts enriched uranium into fuel used to power commercial nuclear reactors. A portion of these radioactive products are released into the environment.

Until recently, no study of health patterns among residents living near the site has been conducted. In June 2023, the Radiation and Public Health Project (RPHP), an independent research and education group, published a study of Unicoi County mortality. Results, using U.S. Centers for Disease Control and Prevention (CDC) data, included two major findings:

All-Cause Mortality: Until the early 1980s, the Unicoi County age-adjusted mortality rate (all ages) was roughly equal to the U.S. rate. Thereafter, Unicoi's rate steadily rose, peaking in the latest period studied, 2019-2020, when the county rate exceeded the U.S. by 44.5%.

All-Cause Premature (Age 0-74) Mortality: Until the mid-1980s, the Unicoi County age-adjusted premature mortality rate, defined by the CDC as deaths age 0-74 (National Cancer Institute, 2025) was about equal to the U.S. rate. Unicoi's rate then steadily rose, peaking in 2019-2020 at 61.5% above the U.S. (Radiation and Public Health Project, 2023;).

The 2023 report identified cumulative environmental exposures to radioactivity from the Nuclear Fuel Services site as one potential cause of these trends, with no other apparent factor that could contribute to such dramatic excesses.

For Greene County TN, which adjoins Unicoi County on its western border, this report uses the same methodology as the 2023 mortality analysis. The Nolichucky River flows from Unicoi into Greene County, allowing NFS contamination in the river to enter the Greene County ecosystem.

Greene County TN has an estimated 2024 population of 73,398. A large proportion is Caucasian (91.5%, versus 58.4% in the U.S.), just as in Unicoi County. In addition, the county has greater socioeconomic needs compared to the nation as a whole, namely higher rates of poverty, and of residents under 65 years old with disabilities or who lack health insurance. See Table below (U.S. Census Bureau, 2025).

<u>Indicator (all 2019-2023)</u>	<u>Greene</u>	<u>U.S.</u>
With a disability, age <65	17.1%	9.1%
No health insurance, age <65	12.0%	9.5%
Living below poverty	14.8%	11.1%

Methods

A 1990 National Cancer Institute (NCI) study – the only national study of health near nuclear plants by the federal government - selected the home county of each nuclear plant, and (sometimes) an adjoining county (National Cancer Institute, 1990). Greene County borders Unicoi County on its west, and all residents live within 30 miles of NFS.

The 1990 study calculated trends in county vs. national ratios for cancer mortality for five-year periods. This report will analyze trends in all-cause mortality, as exposure to radioactivity has been linked with many diseases and conditions other than cancer (Yablokov, 2009). Thus, the principal measures will be mortality from all causes combined, for all ages and age 0-74, the age group that represents premature deaths.

The source will be the CDC Wonder data base, which includes aggregate data on annual U.S. deaths from 1968 to 2024 (U.S. Centers for Disease Control and Prevention, 2025). The study uses the rate of cancer deaths per 100,000 persons, adjusted to the 2000 U.S. census, a standard method in epidemiology, also used in the 1990 NCI study.

Five-year periods are studied, along with 2019-2020 and 2021-2024. The percentage by which the Greene County rate is greater than or less than the U.S. mortality rate will be the key measure, as it was in the 1990 NCI study. The 1968-1978 county/national ratio will be the baseline; any deviation from baseline in future periods will be used to calculate “excess” deaths.

Significance tests for periods after 1978 will be made to assess if the ratio differs from the expected. A p-value of .05 or less, i.e., there is a 95% or greater chance the difference between county and national ratios are not due to random chance, will be used.

Results

For all ages, the Greene County all-cause mortality rate in the baseline period 1968-1978 was 7.1% above the U.S. rate. Soon after 1978, the excess steadily increased, reaching a peak of 54.2% above the U.S. in 2021-2024. **The number of “excess” deaths after 1978 was 6509, or 18.9% of all deaths.**

The county’s all-cause mortality rate age 0-74 in 1968-1978 was 5.3% above the U.S. rate. The steady increase in the gap reached a high of 79.3% in 2021-2024. **Excess premature deaths (age 0-74) after 1978 are 5192, or 29.7% of all deaths.**

The causes of death in which excesses are highest, especially for persons age 0-74, merit further analysis. In Greene County, deaths from diseases of the respiratory system had been 12.0% BELOW the national rate during the 1968-1978 baseline period. But by the 2014-2020 period, the rate of respiratory system deaths in Greene County EXCEEDED the national rate by 115.6%, based on 396 deaths. Common causes of respiratory diseases include Chronic Obstructive Pulmonary Disease, Emphysema, Influenza, and Pneumonia.

See appendices 1 and 2 at the end of this report for all statistical information, along with the graph on page 1.

Discussion

The growing gap in mortality rates between Unicoi County and the U.S. raises the issue of whether trends are similar in nearby counties. A similar analysis in Greene County, which adjoins Unicoi and where the Nolichucky River continues flowing, is merited.

The county-versus-national ratio of mortality rates has steadily risen in Greene County since the 1970s. The gap peaked in the most recent period (2021-2024), and has grown more rapidly for premature deaths (age 0-74). Total excess deaths after 1978 number 6,509 (18.9% of all deaths), of which 5,192 (29.7%) are persons under age 75.

These findings are very similar to the Unicoi County trends. It is crucial that the data be shared with policymakers and health professionals to better understand the cause(s) of these trends. Exposure to radioactive emissions from the Nuclear Fuel Services site must be considered as one of these factors.

References

National Cancer Institute, National Institutes of Health. Cancer in Populations Living Near Nuclear Facilities. Volumes I-III. NIH Publication No. 90-874. Washington DC: U.S. Government Printing Office, July, 1990.

National Cancer Institute. Premature Death (definition).
<https://www.cancer.gov/publications/dictionaries/cancer-terms/def/premature-death>.
Accessed June 13, 2025.

Radiation and Public Health Project. Health Trends Near Nuclear Fuel Services Site.
<https://radiation.org/wp-content/uploads/2023/06/Nuclear-Fuel-Services-w-ltrhead.pdf>.
Published June 27, 2023.

U.S. Census Bureau. Quick Facts. Population estimates of July 1, 2024.
<https://www.census.gov/quickfacts/fact/table/greenecountytennessee,unicoicountytennessee,US/PST045224>. Accessed June 13, 2025.

U.S. Centers for Disease Control and Prevention. CDC Wonder: Mortality.
<https://wonder.cdc.gov>. Accessed June 13, 2025.

U.S. Nuclear Regulatory Commission. Nuclear Fuel Services.
<https://www.nrc.gov/info-finder/decommissioning/fuel-cycle/nuclear-fuel-services.html>.
Last updated March 25, 2021.

Yablokov AV, Nesterenko VB, Nesterenko AV. Chernobyl: Consequences of the Catastrophe for People and the Environment. Annals of the New York Academy of Sciences, Volume 1181. Boston MA: Blackwell Publishing, 2009.

Appendix 1

Age-Adjusted Mortality, All Causes Combined

Greene County TN vs. U.S., by Five-Year Periods, 1969-2020

* County rate significantly different than U.S. at P <.05

<u>All Ages</u>	<u>Greene County</u>	<u>U.S.</u>	<u>% Greene</u>	<u>Excess</u>
<u>Yr of Death</u>	<u>Rate (Deaths)</u>	<u>Rate</u>	<u>vs. U.S.</u>	
1968-1978	1244.8 (5044)	1163.3	+ 7.1%*	----
1979-1983	999.8 (2372)	1005.9	- 0.6%	- 184
1984-1988	1019.2 (2708)	978.5	+ 4.2%	- 81
1989-1993	1023.4 (2982)	927.9	+10.3%*	+ 94
1994-1998	1027.2 (3319)	892.5	+23.8%*	+ 554
1999-2003	1023.3 (3614)	860.3	+18.9%*	+ 430
2004-2008	983.2 (3831)	793.7	+23.9%*	+ 641
2009-2013	961.1 (4159)	740.3	+29.8%*	+ 943
2014-2018	981.1 (4661)	728.3	+34.7%*	+1285
2019-2020	1053.9 (2165)	775.8	+35.8%*	+ 621
2021-2024	1116.4 (4686)	745.7	+54.2%*	+2206

Total **+6509 (18.9%)**

<u>Age 0-74</u>	<u>Greene County</u>	<u>U.S.</u>	<u>% Greene</u>	<u>Excess</u>
<u>Yr of Death</u>	<u>Rate (Deaths)</u>	<u>Rate</u>	<u>vs. U.S.</u>	
1968-1978	634.9 (3200)	602.8	+ 5.3%*	----
1979-1983	528.5 (1430)	507.5	+ 4.1%	- 17
1984-1988	513.0 (1475)	482.1	+ 6.4%	+ 16
1989-1993	518.9 (1561)	454.4	+14.2%*	+ 138
1994-1998	510.6 (1667)	424.8	+20.2%*	+ 248
1999-2003	497.9 (1770)	393.1	+26.7%*	+ 378
2004-2008	454.1 (1797)	360.6	+25.9%*	+ 370
2009-2013	480.5 (2074)	335.1	+43.4%*	+ 790
2014-2018	509.0 (2310)	337.9	+50.6%*	+1047
2019-2020	566.2 (1080)	368.6	+53.6%*	+ 522
2021-2024	609.1 (2302)	343.2	+79.3%*	+1702

Total **+5192 (29.7%)**

Source: U.S. Centers for Disease Control and Prevention, <https://wonder.cdc.gov> (1968-2024).

Appendix 2

Age-Adjusted Mortality, By Major Cause of Death, Age 0-74

Greene County TN vs. U.S., 2014-2020

* County rate significantly different than U.S. at $P < .05$

<u>Cause of Death</u>	<u>Greene County</u> <u>Rate (Deaths)</u>	<u>U.S.</u> <u>Rate</u>	<u>% Greene</u> <u>vs. U.S.</u>
Infectious/Parasitic	14.87 (93)	10.07	+ 47.7%*
Cancer (neoplasms)	118.67 (857)	86.90	+ 36.6%*
Endocrine Disease	23.89 (154)	17.74	+ 34.7%*
Nervous System	19.23 (125)	11.62	+ 65.5%*
Circulatory System	127.55 (881)	80.64	+ 58.2%*
Respiratory System	55.10 (396)	25.56	+115.6%*
Digestive System	32.14 (198)	18.14	+ 77.2%*
Accid/Suic/Homicide	89.89 (419)	61.89	+ 45.2%*
All Other	44.68 (267)	34.37	+ 30.0%*
TOTAL	525.96 (3390)	346.94	+ 51.6%*