

MORTALITY TRENDS NEAR THE PALISADES NUCLEAR REACTOR

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Background.

The Palisades nuclear plant in South Haven Michigan (Van Buren County), is in the southwestern part of the state. The plant's reactor went critical (began generating radioactivity) on May 24, 1971; and went commercial (began selling power) on December 31, 1971.

Entergy Nuclear operated the reactor until it closed permanently, on May 31, 2022. Entergy sold the plant to Holtec International, which initially intended to decommission the plant. However, Holtec has since applied (unsuccessfully) for funds from the Civil Nuclear Credit to re-start the reactor; and it intends to re-apply.

Of the dozens of U.S. reactors that have closed permanently, none have re-started. Potentially operating a 51-year-old reactor that requires considerable maintenance for its aging and embrittled parts raise the question of health risks to the local populations.

Methodology.

This report will present historical data on mortality for the area closest to Palisades compared with the U.S., a method similar to that used by the National Cancer Institute (NCI) in the 1980s in the only federal study of cancer near U.S. nuclear plants. Because Van Buren County is the site of the reactor, it will be the focus of this study.

The Centers for Disease Control (CDC) web site makes mortality rates for each of the 3100 U.S. counties for each year from 1968 to 2020. Like the NCI study, this report will analyze cancer mortality for each five-year period starting in 1968. The percent that Van Buren is greater than or less than the U.S. will be given.

Rates will be adjusted for age (standard 2000 U.S. population), a standard method used in epidemiology (and used by the NCI). In addition to all cancers combined, rates for all causes combined will be analyzed, as exposure to radiation can raise risk of diseases other than cancer. The source for all data presented is the CDC (<https://wonder.cdc.gov>).

Results – Cancer Mortality.

Table 1 shows mortality rates for all cancers combined for Van Buren County and the U.S., for each five-year period starting in 1968.

Table 1
 Age-Adjusted Deaths per 100,000 Population
 All Cancers Combined
 Van Buren County MI and the U.S.
 By Period, 1968 to 2020

<u>Period</u>	<u>Deaths</u> <u>Van Buren</u>	<u>Rate</u> <u>Van Buren</u>	<u>Rate</u> <u>U.S.</u>	<u>% County</u> <u>vs. U.S.</u>	<u>Excess Deaths</u>
1968-1973	571	188.81	202.10	- 6.6	
1974-1978	527	186.80	205.18	- 9.0	
1979-1983	622	199.44	201.31	- 5.2	
1984-1988	724	221.82	214.64	3.3	
1989-1993	805	235.37	217.44	8.2	
1994-1998	773	211.85	209.37	1.2	
1999-2003	752	197.26	201.12	- 1.9	
2004-2008	871	215.70	186.35	15.7	
2009-2013	863	193.27	173.30	11.5	
2014-2018	903	186.80	159.50	17.1	
2019-2020	349	165.81	149.02	11.3	
1968-1978	1098	188.06	203.77	- 7.7	
1979-1998	2924	217.53	213.09	2.1	287
1999-2020	3738	194.24	175.05	11.0	699
				Total	986 14.8%
Estimated Rate					
2021-2023	524	163.85	147.98	10.7	

In the earliest five-year periods, the Van Buren County rate fell below the U.S. (-6.6%, -9.0%, and -5.2%). But in all but one of the periods thereafter, the county rate exceeded the U.S. The largest excesses are in the periods since 2004 (+15.7%, +11.5%, +17.1%, and +11.3%).

If the county rate had remained 7.7% below the U.S., as it was in 1968-1978, the number of cancer deaths since 1978 would have been 986 fewer than that recorded - an “excess” is 14.8% of all cancer deaths during that time.

Table 2 presents age-specific cancer mortality rates for Van Buren County and the U.S., for the most recent 18 years (2003-2020).

Table 2
 Age-Specific Deaths per 100,000 Population
 All Cancers Combined
 Van Buren County MI and the U.S.
 For Years 2003 to 2020

<u>Age at Death</u>	Deaths <u>Van Buren</u>	Rate <u>Van Buren</u>	Rate <u>U.S.</u>	% County <u>vs. U.S.</u>
0-24	17	3.77	3.00	25.7
25-34	23	15.23	8.92	70.7
35-44	57	32.94	29.87	10.3
45-54	249	123.23	107.54	14.6
55-64	599	321.10	297.15	8.1
65-74	897	750.16	640.33	17.2
75-84	851	1366.52	1187.53	15.1
85+	435	1839.95	1747.19	5.3
Total	3128	192.72	170.17	13.3

Van Buren County cancer rates exceed the U.S. for each age group. However, the largest increases occurred among children and young adults (age 0-34). Table 3 presents the historical rates for this age group.

Table 3
 Trends in Deaths per 100,000 Population
 All Cancers Combined, Age 0-34
 Van Buren County MI and the U.S.

<u>Period</u>	Deaths <u>Van Buren</u>	Rate <u>Van Buren</u>	Rate <u>U.S.</u>	% County <u>vs. U.S.</u>
1968-1978	20	5.63	9.20	- 38.3
1979-1998	63	8.50	6.74	26.1
2003-2020	40	6.94	4.63	49.9

In the period 1968-1978, the Van Buren death rate was well below (-38.3%) the U.S. But in the next two decades, the rate was 26.1% higher, rising to 49.9% higher in 2003-2020.

Results – All-Cause Mortality.

Table 4 shows mortality rates for all causes combined for Van Buren County and the U.S., for each five-year period starting in 1968.

Table 4
 Age-Adjusted Deaths per 100,000 Population
 All Causes Combined
 Van Buren County MI and the U.S.
 By Period, 1968 to 2020

<u>Period</u>	<u>Deaths</u> <u>Van Buren</u>	<u>Rate</u> <u>Van Buren</u>	<u>Rate</u> <u>U.S.</u>	<u>% County</u> <u>vs. U.S.</u>	<u>Excess Deaths</u>
1968-1973	3641	1220.57	1235.61	- 1.2	
1974-1978	2910	1043.60	1083.56	- 3.7	
1979-1983	2967	966.35	1005.94	- 3.9	
1984-1988	3272	1027.98	978.54	5.1	
1989-1993	3174	933.77	927.92	0.6	
1994-1998	3289	910.76	829.50	9.8	
1999-2003	3376	897.00	860.33	4.3	
2004-2008	3539	902.78	793.69	13.7	
2009-2013	3520	829.28	740.33	12.0	
2014-2018	3825	822.83	728.31	13.0	
2019-2020	1676	856.76	775.79	10.4	
1968-1978	6551	1134.52	1163.27	- 2.5	----
1979-1998	12702	957.56	947.75	1.0	445
1999-2020	15936	858.80	775.31	10.8	2119
				Total	2564 9.0%
Estimated Rate					
2021-2023	2672	906.73	809.37	12.0	

Source: Centers for Disease Control and Prevention (<https://wonder.cdc.gov>)

In the earliest five-year periods, the Van Buren County rate fell below the U.S. (-1.2%, -3.7%, and -3.9%). But in all but one of the periods thereafter, the county rate exceeded the U.S. The largest excesses are in the periods since 2004 (+13.7%, +12.0%, +13.0%, and +10.4%).

If the county rate had remained 2.5% below the U.S., as it was in 1968-1978, the number of all-cause deaths since 1978 would have been 2564 fewer than that recorded - an “excess” of 9.0% during that time.

Discussion.

The data presented in this report include mortality rates for all cancers combined, comparing Van Buren County and the U.S. Results show that the cancer death rate among Van Buren County residents was 7.7% below national rates in the years 1968 to 1978.

In subsequent periods, the county rate has consistently exceeded the U.S. rate, and the most recent period (2004 to 2020) shows the greatest excess. If the county rate had remained 7.7% below the U.S. after 1978, 986 fewer cancer deaths would have occurred in the next 42 years. This “excess” represents 14.8% of all Van Buren cancer deaths during this time.

In the most recent period (2003-2020), Van Buren County cancer mortality exceeded the U.S. for each age group. Excesses were highest (+49.9%) among children and young adults age 0-34, based on 40 deaths during this time.

In addition, the report illustrates trends in county vs. national mortality for all causes combined. Van Buren County’s all-cause mortality rate was 2.5% below the U.S. from 1968-1978. Soon after, county rates exceeded the nation, peaking in the years after 2003. If the county rate had remained 7.7% below the U.S. after 1978, 2564 fewer deaths would have occurred in the next 42 years, or 9.0% of all Van Buren deaths.

The consistent pattern of low death rates, for cancers and other causes, occurred during the period just before and just after the startup of Palisades. The shift from a low-mortality to a high-mortality county, with steadily widening gap between the county and nation over time, is observed for both all cancers and all causes.

Radioactive emissions from Palisades have occurred since its startup in 1971. This array of over 100 chemicals not existent in nature, are produced only by atomic bomb explosions and nuclear reactor operations. These radionuclides enter the environment and human bodies through breathing and the food chain. They can kill or damage cells, increasing risk of cancer and other diseases, and are most harmful to the very young.

The shift in Van Buren County from a low-mortality to a high-mortality area raises the issue of which factors contributed to this change. While multiple causes of mortality can be assessed, one of these is the introduction of toxic, cancer-causing radioactivity from Palisades. The fact that excess deaths occurred for all causes, especially for cancer, and especially for cancers in young persons, suggest that radioactivity contributed to these trends.

More study of health trends in the Palisades area are in order, and results shared with the public and public officials. Based on the report, no action to re-start the reactor should be taken until the impact Palisades has had on local health is understood.

Death Rate, All Cancers Van Buren County, MI vs. U.S.

