

**THE DRESDEN NUCLEAR PLANT, AND THE POTENTIAL LINK
WITH CANCER PATTERNS AND TRENDS IN GRUNDY COUNTY, ILLINOIS
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The Dresden nuclear plant is located in Grundy County Illinois, 43 miles southwest of Chicago. Units 2 and 3 have been in operation since 1969 and 1971, making them among the oldest reactors in the U.S. Dresden has generated a large amount of highly radioactive waste. A portion is released into the environment, where it enters human bodies through breathing and the food chain.

Demographic measures suggest Grundy's 51,000 residents are not at high risk for cancer. Grundy has a low proportion of non-whites, a low rate with no health insurance, and has access to specialty medical services in Chicago. It has low rates of poverty, foreign born, and those not speaking English at home, and high rates of owner-occupied housing units and high school graduates.

According to official CDC data, about 300 newly diagnosed cases of cancer, and about 100 cancer deaths, occur among county residents each year. The following trends and patterns exist:

1. Rising Cancer Death Rates. In the 1970s, the county cancer rate was 12.5% below the U.S. rate. Since then, the county rate has exceeded the state, with a growing gap between the two rates (all rates are adjusted for the standard 2000 U.S. population). Each excess is statistically significant.

| | |
|-----------|---------|
| 1969-1978 | - 12.5% |
| 1979-1988 | + 3.3% |
| 1989-1998 | + 4.9% |
| 1999-2008 | +14.6% |
| 2009-2019 | +14.5% |

If the county rate had remained at 12.5% below the U.S. after 1978, **696** fewer Grundy County residents would have died of cancer in the following 41 years (2,618 vs. 3,314).

2. High Cancer Incidence Rates. In the latest five-year period available (2014-2018), **Grundy County had the 9th highest cancer incidence rate of the 102 Illinois Counties.** The county rate exceeded the U.S. by 21.9%, based on 1,500 cancer cases. The annual county rate of 546.8 cases per 100,000 persons is one of the highest rates among U.S. counties with 50,000 or more residents. The county's 2014-2018 cancer incidence rate was especially high, compared to the U.S. rate, for those cancers most sensitive to radiation exposure (all of the excesses are statistically significant):

| | |
|---------------------|---|
| Child Cancer (< 20) | +18.3%(5 th highest in IL) |
| Breast Cancer | +24.4%(4 th highest in IL) |
| Thyroid Cancer | +43.2%(10 th highest in IL) |
| Leukemia | +31.3% (12 th highest in IL) |

These findings raise questions of potential adverse health effects of exposure to radioactive emissions from Dresden. Further review of county disease and death rates are warranted.

Introduction.

The Dresden nuclear plant is located in Morris, Illinois. It consists of three reactors. Unit 1 operated from 1959 to 1978. Units 2 and 3, with capacities of 902 and 895 megawatts electrical, have operated since 1969 and 1971, respectively. Only eight of 93 currently operating U.S. reactors have operated as long (U.S. Energy Information Administration, 2020):

| <u>Reactor</u> | <u>State</u> | <u>Startup</u> |
|-------------------|--------------|----------------|
| Dresden 2 | IL | 1969 |
| Nine Mile Point 1 | NY | 1969 |
| Monticello | MN | 1970 |
| Point Beach 1 | WI | 1970 |
| Robinson 2 | SC | 1970 |
| Dresden 3 | IL | 1971 |
| Palisades | MI | 1971 |
| Point Beach 2 | WI | 1971 |

Dresden is in the north-central portion of Grundy County, in the town of Morris. It is 43 miles to the southwest of downtown Chicago. In 2010, 7.3 million persons lived within 50 miles of Dresden, the second highest total of any U.S. nuclear plant still in operation, trailing only Limerick in Pennsylvania, with 8.0 million (Dedman, 2011).

The current (2019) county population is 51,054 residents, rising from 22,350 in 1960. Below are selected demographic indicators for Grundy County and the United States; each represents a 2019 estimate unless otherwise noted (U.S. Census Bureau, 2019).

| <u>Indicator</u> | <u>Grundy</u> | <u>U.S.</u> |
|---|---------------|-------------|
| % Caucasian | 85.8% | 60.1% |
| % Hispanic | 10.5% | 15.5% |
| % Black | 1.8% | 10.5% |
| % High School Graduate, Age >25* | 93.2% | 88.0% |
| % Living Below Poverty | 5.6% | 10.5% |
| % Foreign Born, Age > 5* | 3.9% | 13.6% |
| % Language other than English spoken at home, Age > 5 | 7.7% | 21.6% |
| % Without Health Insurance | 5.5% | 9.5% |

* 2015-2019

Grundy County’s land mass is 418 square miles, meaning virtually all of its 51,000 residents live within 20 miles of Dresden.

Nuclear Power from Dresden and Health Risks.

Electric power from Dresden, and from all nuclear reactors, involves splitting uranium atoms to generate high heat used to create steam, which drives generators to produce electricity. The process of splitting uranium, known as fission, is the same used in detonating nuclear weapons. It creates over 100 chemicals not found in nature, each of which is carcinogenic, in the form of gases and tiny metal particles.

Most of these radioactive chemicals are stored at reactors, but some are released into the air and water. They enter human bodies through breathing, food, and water. Each chemical affects human biology differently. For example, radioactive iodine seeks out the thyroid gland, and radioactive strontium seeks out bone and teeth.

All radioactive isotopes have the potential to damage DNA in cells or kill them outright, leading to an elevated risk of disease and death. Several major findings are clear after decades of study:

1. All humans are affected negatively by radiation exposure, even at the lowest doses (Committee on the Biological Effects of Ionizing Radiation: BEIR V, 1990)
2. The most severe effects of a dose are borne by the fetus and infant, whose immune systems are immature; by the frail elderly, whose immune systems are failing; and by those who are immunocompromised
3. The lag time between exposure and onset of disease or death may take several years, or even decades
4. While some cancers are known to be especially sensitive to radioactivity, such as thyroid cancer or bone cancer, the risk of all cancers are increased after radiation exposure

Numerous articles have appeared in the medical literature, documenting the excess in cancers after relatively low-dose exposures. A recent article in the Journal of the National Cancer Institute found 21 of the 26 studies determined an excess of cancer from low-level radiation (Gonzalez, 2020).

The federal government has conducted just one study of cancer near nuclear plants, mandated by Senator Edward Kennedy. The study looked at cancer mortality from 1950 to 1984 and found no consistent link between cancer and proximity to nuclear plants. However, no federal update has been forthcoming (National Cancer Institute, 1990); a 2009 proposed cancer study near nuclear plants by the Nuclear Regulatory Commission was abandoned several years later before any analysis of cancer data began.

The Radiation and Public Health Project (RPHP), a non-profit research and educational organization, has published 38 medical journal articles, mostly on health patterns and trends near nuclear plants. Unexpectedly high rates of cancer closest to nuclear plants have often been documented (Radiation and Public Health Project, 2021).

The operation of units 2 and 3 at the Dresden nuclear plant for over 50 years, and existence of cancer mortality data beginning before startup, provides an opportunity to study trends in local cancer rates, which are presented in this report.

Study Methods

Grundy County will be the focus of this report. The 1990 National Cancer Institute study selected the home county of each nuclear plant, sometimes adding an adjoining county. Since virtually all

51,000 Monroe residents reside within 20 miles of Dresden, and the majority reside within 10 miles, this report will analyze patterns in Grundy County.

Cancer mortality and incidence trends and current patterns will each be addressed in the report:

Cancer Mortality. The 1990 National Cancer Institute study selected the U.S. cancer rate as the control for each county and calculated a county vs. national ratio for cancer mortality, before and after startup of each plant. This report will follow the same formula. Mortality trends for all cancers combined will be the principal measure used in this report.

The source for the study will be the Centers for Disease Control and Prevention's "CDC Wonder" data base. Available online, CDC Wonder includes information on every U.S. death, each year from 1968 to 2019, as of mid-2021 (U.S. Centers for Disease Control and Prevention, 2021).

The measure used in the study will be the rate of cancer deaths per 100,000 persons. These rates are adjusted to the 2000 U.S. census, a standard method in epidemiology to account for any unusual age distributions in the population, allowing for "apples to apples" comparisons. Age adjusted rates were used in the 1990 National Cancer Institute study.

The availability of over 50 years of data allows five 10-year periods to be studied. These will start with 1969-1978, and end with 2009-2019 (the last period is actually 11 years). The percent that Grundy County's cancer rate is greater than or less than the U.S. will be the key measure, as it was in the 1990 federal study.

The 1969-1978 county/national ratio will be the baseline or "expected" ratio for all future periods. Significance testing for later 10-year periods will be made to assess if the ratio differs from the expected. A p-value of .05 or less is the standard for significance, meaning that there is a 95% or greater chance that changes in county/national ratios after 1978 are not due to random chance.

Cancer Incidence. The National Cancer Institute maintains cancer incidence rates for all U.S. counties, with the exception of those in Kansas and Minnesota, for the period 2014-2018. The Grundy County rate for all cancers combined will be compared to the national rate, and ranked among the 3,100 U.S. counties.

In addition, the Illinois Department of Public Health has published county-specific incidence rates for each five-year period from 1993-1997 to 2013-2017. The Dresden rate for all cancers combined will be compared to that of Illinois for each five-year period, along with its rank among the 102 Illinois counties.

Results – Radioactive Emissions from Dresden

Studies assessing the relationship between radiation exposure and cancer typically consist of a "dose" and a "response." In this report, the "dose" is the unquantified exposure of Grundy County residents to routine releases from Dresden, and the "response" is cancer deaths.

It is not possible to precisely measure total in-body exposures to a population for various reasons:

1. Measurement is an involved process, sometimes involving autopsies.
2. There are many radioactive chemicals, making it impossible to measure each one.
3. Some chemicals decay quickly and are impossible to measure once they enter the body.
4. Each person in a population would have to be measured.
5. No regulatory body requires in-body measurements of persons living near nuclear plants.

RPHP has conducted the only study of in-body radioactivity near U.S. nuclear power plants. The “Tooth Fairy Project” measured Strontium-90 levels in 5,000 baby teeth, as did 1960s studies of fallout from above-ground atomic bomb tests.

Results of the RPHP tooth study, which were published in five medical journal articles, showed a 30-50% greater average concentration of Strontium-90 in areas closest to nuclear plants; increases through the 1980s and 1990s, and a matching of trends of Strontium-90 and cancer incidence in children under age five (Mangano et al., 2003; Mangano, et al., 2006).

In 2019, Dresden units 2 and 3 emitted a total of 434.30 curies of fission and activation gases into the environment. This amount is the 3rd highest of the 57 U.S. nuclear plants reporting, trailing only Peach Bottom, Pennsylvania (625.00), and Brunswick, North Carolina (442.30). The median annual release of the 57 plants is just 2.13 curies; see Appendix 1.

In the most recent five-year period (2015-2019), total gaseous releases of fission and activation products from Dresden totaled 797.5 curies, higher than the 2010-2014 total (284.1) but similar to the 2005-2009 total (839.9) (U.S. Nuclear Regulatory Commission, 2021).

While releases of fission and activation gases do not represent all radioactivity, these findings suggest that emissions from Dresden may be larger than from most U.S. nuclear plants.

Results – Cancer Death Trends in Grundy County

In the 10-year period 1969-1978, before and soon after Dresden units 2 and 3 began operations, the Grundy County death rate from malignant cancers was 12.5% below the U.S. In the following four decades, the county rate exceeded the U.S. by 3.3%, 4.9%, 14.6%, and 14.5% (the last period was 11 years). Over 100 Grundy County residents now die of cancer each year.

Rates are significantly different compared to the county/national ratio of -12.5% in 1969-1978. Had this ratio not changed after 1978, a total of 696 fewer Grundy residents would have died of cancer. See table below and Appendix 2.

| | |
|-----------|--------------------------------|
| 1969-1978 | county 12.5% below U.S. |
| 1979-1988 | county 3.3% above U.S. |
| 1989-1998 | county 4.9% above U.S. |
| 1999-2008 | county 14.6% above U.S. |
| 2009-2019 | county 14.5% above U.S. |

(1999-2019) county **14.2% above** U.S.

Each disparity between the county and nation after 1978 is statistically significant.

Results – Current Cancer Death Patterns in Grundy County

In the 21-year period 1999-2019, cancer mortality in Grundy County reached an all-time high of 14.2% above the U.S., based on 1,962 deaths to Grundy residents. A comparison of county and national rates by the most common four types of cancer – which comprise over half of all cancer cases and deaths - are in the table below and Appendix 3. (Note: all cancer incidence and mortality data represent persons who lived in Grundy County at diagnosis/death).

| | |
|-------------------|---------------------------------|
| Total | county 14.2% above U.S. |
| Lung and bronchus | county 20.8% above U.S. |
| Female breast | county 104.2% above U.S. |
| Male prostate | county 1.0.% above U.S. |
| Colorectal | county 26.9% above U.S. |
| All other | county 9.5% above U.S. |

The county rate exceeded the U.S. rate for each of the four most common types of cancer, along with all other cancers combined. The county-national difference is statistically significant for each type of cancer, with the exception of prostate cancer.

An unusually large gap of 104.2% existed between county and national rates. Put another way, the breast cancer death rate in Grundy County was more than double the U.S. rate in the 21-year period 1999-2019.

Results – Cancer Incidence Trends in Grundy County

In 1993-1997, the Grundy County cancer incidence rate for males was 581.8 annual cases per 100,000 population, or 2.0% below the state of Illinois. By 2013-2017, the county rate had risen to 635.9, or 26.1% above the state – the 3rd highest of the 102 Illinois counties.

Grundy’s incidence rate for females was 430.8 annual cases per 100,000 population in 1993-1997, or 2.5% above the state rate. By 2013-2017, the county rate had risen to 508.0, or 14.9% above the state – the 5th highest of the 102 Illinois counties; see Appendix 4.

Results – Current Cancer Incidence Patterns in Grundy County

In the period 2014-2018, the adjusted rate of all cancers combined in Grundy County was 546.8 annual cases per 100,000 population. The county rate is 21.9% above the U.S. rate of 448.6, based on all states and the District of Columbia, except for Kansas and Minnesota (see Appendix 5).

Dresden’s rate is the 9th highest of any of the 102 Illinois counties. A total of 1,500 county residents were diagnosed with cancer in the five-year period 2014 to 2018.

In addition, the Grundy County 2014-2018 incidence rate for persons diagnosed under age 50 was 18.0% above the U.S., based on 200 cases. The county exceeded the nation by 22.7% for persons diagnosed over age 50, based on 1,300 cases.

Results – Current Cancer Incidence for Radiosensitive Cancers

While exposure to radiation raises risk of all cancers, certain types of cancer are considered to be especially radiosensitive. Based on research on survivors of the atomic bombs used on the Japanese cities of Hiroshima and Nagasaki in 1945, these cancers include thyroid cancer, female breast cancer, and leukemia.

The 2014-2018 Grundy County cancer incidence rates for radiosensitive cancers are all higher than the U.S. Rates are significantly higher for all categories except childhood cancer (diagnosed age < 20); exposures to the fetus, infant, and child are more dangerous than similar doses to adults. See table below and Appendix 6.

| | |
|-----------------------|--|
| All Cancers, all ages | county 21.9% above U.S. (1,500 cases) |
| All Cancers, age < 20 | county 18.1% above U.S. (15 cases) |
| Female Breast Cancer | county 24.4% above U.S. (220 cases) |
| Thyroid Cancer | county 43.2% above U.S. (55 cases) |
| Leukemia | county 31.3% above U.S. (50 cases) |

Discussion

Units 2 and 3 at the Dresden nuclear plant have released radioactive materials into the environment since their startup in 1969 and 1971. While no comprehensive analysis of each chemical is possible, recent emissions show Dresden may be one of the highest-emitting U.S. reactors.

The existence of over 50 years of cancer mortality data for each county in the U.S. provides a basis for a review of health trends and current patterns after the startup of Dresden 2 and 3, using methods from the only federal study (1990) of cancer near U.S. nuclear plants. In addition, the existence of 25 years of cancer incidence data allows further review of cancer trends and patterns.

Mortality and incidence for all cancers combined in Grundy County, which once were at or below national or state rates, are now significantly greater. Elevated rates are especially pronounced for those cancers most sensitive to radiation. Grundy has one of the highest cancer rates of any county in the U.S., and the highest in Illinois.

Multiple factors affect cancer risk, but none are apparent for Grundy County. Socioeconomic status is not as low as elsewhere in Illinois and the U.S. In addition, local residents do not have limited access to medical care; the percent of county residents without health insurance is low, and residents have access to specialty medical (including cancer) care in nearby Chicago.

In addition to socioeconomic factors, the impact of toxic exposures from industries other than the Dresden nuclear plant is an important issue in assessing factors behind elevated cancer rates. There are multiple industries located in and near the county that contribute contaminants into the environment. These industries, and the potential impact on local cancer risk, should be individually studied, similar to this first report on exposure from Dresden's radioactive releases.

The issue of whether routine emissions of radioactivity from Dresden into the environment merits further review. Prior to this report, the only epidemiological study that addressed proximity to Dresden and cancer was the 1990 study by the National Cancer Institute. Unfortunately, no data after 1984 was included; only cancer mortality (not incidence) data were used; and data for Grundy and Will counties were combined, thus not permitting a review of Grundy-only trends.

Results call for continued efforts to understand the potential link between radiation and adverse health effects. Review of cancer data should continue, but other available data that may be correlated with radiation exposure can be analyzed, including mortality from other causes, infant deaths, low weight births, and premature births.

Direct measurement of in-body radiation is also needed. Measurement of Strontium-90 in baby teeth has been the most frequently employed means of such measurement, as the natural loss of baby teeth makes collection of in-body samples easier than other methods. The Radiation and Public Health Project's study of 5,000 baby teeth, mostly near six U.S. nuclear plants, can be a prototype for such a study near Dresden.

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Appendix 1

U.S. Nuclear Plants with Largest Emissions, 2019
Gaseous Releases, Fission and Activation Gases, in Curies
(Total = 57 plants)

| <u>Plant</u> | <u>State</u> | <u>Curies</u> |
|-----------------------|--------------|---------------|
| 1. Peach Bottom | PA | 625.00 |
| 2. Brunswick | NC | 442.30 |
| 3. Dresden | IL | 434.30 |
| 4. La Salle | IL | 294.50 |
| 5. Grand Gulf | MS | 267.85 |
| 6. River Bend | LA | 259.70 |
| 7. Clinton | IL | 187.39 |
| 8. Monticello | MN | 181.50 |
| 9. Nine Mile Point | NY | 168.01 |
| 10. Watts Bar 1 | TN | 160.03 |
| 11. Browns Ferry | AL | 125.83 |
| 12. Columbia | WA | 121.30 |
| 13. Quad Cities | IL | 64.20 |
| 14. James Fitzpatrick | NY | 40.56 |
| 15. St. Lucie | FL | 16.18 |
| U.S Median | | 2.13 |

Dresden, Five-Year Totals:

| | |
|-----------|-------|
| 2005-2009 | 839.9 |
| 2010-2014 | 284.1 |
| 2015-2019 | 797.5 |

Source: U.S. Nuclear Regulatory Commission. Radioactive Effluent and Environmental Reports. www.nrc.gov/reactors/operating/ops-experience/tritium/plant-info.html.

Appendix 2

Mortality Trend, Malignant Cancers

Grundy County vs. United States

By 10-Year Period, 1969-2019

| <u>Yr. of Death</u> | <u>U.S. Rate</u> | <u>Grundy County Rate (Deaths)</u> | <u>% Grundy is +/- U.S.</u> | <u>Excess Deaths</u> |
|---------------------|------------------|--|---------------------------------|--------------------------|
| 1969-1978 | 203.81 | 178.39 (413) | - 12.5% | --- |
| 1979-1988 | 212.60 | 219.61(606) | + 3.3%* | 93 |
| 1989-1998 | 213.23 | 223.66(746) | + 4.9%* | 140 |
| 1999-2008 | 193.38 | 221.61(889) | + 14.6%* | 210 |
| 2009-2019 | 164.40 | 188.27 (1073) | + 14.5%* | 253 |
| TOTAL | | | | 696 |

Rates are deaths per 100,000, adjusted to 2000 U.S. population. Cancer codes include 140.0-239.9 (ICD-8, 1969-1978); 140.0-239.9 (ICD-9, 1979-1998); C00-D48.9 (ICD-10, 1999-2018). * County actual/expected rate significantly different (P <.05). Excess death calculation = 1969-1978 county/national ratio (-12.5%), minus actual ratio, times number of deaths in 10-year period. Example: 1979-1988 excess = ((.033-(-.125)) x 606 = 93. Source: U.S. Centers for Disease Control and Prevention, <https://wonder.cdc.gov>.

Appendix 3

Mortality, Malignant Cancers

Grundy County vs. United States

By Most Common Types of Cancer, 1999-2019

| <u>Category</u> | <u>U.S. Rate</u> | <u>Grundy County Rate (Deaths)</u> | <u>% Grundy is +/- U.S.</u> |
|-----------------|------------------|--|---------------------------------|
| Total | 176.65 | 201.80 (1962) | + 14.2%* |
| Bronchus/lung | 46.14 | 55.75 (549) | + 20.8%* |
| Female breast | 12.55 | 25.63 (140) | + 104.2%* |
| Male prostate | 22.50 | 22.72 (83) | + 1.0% |
| Colorectal | 15.96 | 20.25 (195) | + 26.9%* |
| All other | 93.08 | 102.69 (994) | + 9.5%* |

Rates are deaths per 100,000, adjusted to 2000 U.S. population. * County rate significantly different (P <.05). ICD-10 codes include total (C00-D48.9); bronchus/lung (C34); female breast (C50); male prostate (C61); colorectal (C18-C20); Source: U.S. Centers for Disease Control and Prevention, <https://wonder.cdc.gov>.

Appendix 4

Trends in Incidence of All Cancers Combined
 Grundy County vs. Illinois, Males and Females
 1993-1997 to 2013-2017

| <u>Period</u> | <u>IL Rate</u> | <u>Grundy County</u> <u>Rate (Cases)</u> | <u>% Grundy</u> <u>is +/- U.S.</u> | <u>Rank of 102</u> <u>IL Counties</u> |
|----------------|----------------|---|---------------------------------------|--|
| Males | | | | |
| 1993-1997 | 570.3 | 581.8 (424) | - 2.0% | --- |
| 1998-2002 | 596.1 | 623.8 (510) | + 4.6%* | 29 |
| 2003-2007 | 585.6 | 653.4 (604) | + 11.6%* | 15 |
| 2008-2012 | 554.2 | 637.4 (706) | + 15.0%* | 15 |
| 2013-2017 | 504.2 | 635.9 (794) | + 26.1%* | 3 |
| Females | | | | |
| 1993-1997 | 420.1 | 430.8 (405) | + 2.5% | --- |
| 1998-2002 | 436.7 | 490.6 (499) | + 12.3%* | 1 |
| 2003-2007 | 436.6 | 461.4 (531) | + 5.7%* | 28 |
| 2008-2012 | 443.3 | 483.1 (624) | + 9.0%* | 12 |
| 2013-2017 | 442.0 | 508.0 (714) | + 14.9%* | 5 |

Rates are cases per 100,000, adjusted to 2000 U.S. population. * Significant at P < .05. Source: Illinois Department of Public Health. Cancer in Illinois: Illinois-Specific Statistics. <http://www.idph.state.il.us/cancer/statistics.htm>.

Appendix 5

U.S. Counties with Highest Cancer Incidence
 Of 1,600 Counties with > 27,000 Population, 2013-2017

| <u>County</u> | <u>State</u> | <u>Cases</u> | <u>Rate</u> |
|------------------|--------------|--------------|--|
| 1. Floyd | KY | 1440 | 609.8 |
| 2. Pickens | GA | 1295 | 584.3 |
| 3. Polk | TX | 1880 | 580.0 |
| 4. Knox | KY | 1115 | 574.5 |
| 5. Cape May | NJ | 4405 | 564.6 |
| 6. Cerro Gordo | IA | 1760 | 562.9 |
| 7. Pike | KY | 2220 | 562.7 |
| 8. Grundy | IL | 1508 | 559.8 (39th of all 3,100 counties) |
| 9. Warren | NY | 2640 | 558.7 |
| 10. Nassau | FL | 3160 | 557.5 |

Rates are cases per 100,000 population, adjusted to 2000 U.S. standard population. Omits counties in Kansas and Minnesota. Source: National Cancer Institute, State Cancer Profiles, www.statecancerprofiles.cancer.gov.

Appendix 6

Incidence of Cancers Most Sensitive to Radiation
 And by Age at Diagnosis
 Grundy County vs. United States, 2014-2018

| <u>Type of Cancer</u> | <u>U.S. Rate</u> | <u>Grundy County Rate (Cases)</u> | <u>% Grundy is +/- U.S.</u> | <u>Rank of 102 IL Counties</u> |
|-----------------------|------------------|---------------------------------------|---------------------------------|------------------------------------|
| All Combined | 448.6 | 546.8 (1510) | + 21.9% | 9 |
| Child Cancer (< 20) | 19.1 | 22.6 (20) | + 18.3% | 5 |
| Female Breast | 126.8 | 157.7(220) | + 24.4%* | 4 |
| Thyroid | 14.1 | 20.2 (55) | + 43.2%* | 10 |
| Leukemia | 14.2 | 18.7 (50) | + 31.3%* | 12 |
| Age < 50 | 106.1 | 125.2 (200) | + 18.0%* | 25 |
| Age > 50 | 1349.4 | 1655.6 (1300) | + 22.7* | 30 |

Rates are cases per 100,000, adjusted to 2000 U.S. population. * Significant at P < .05. Source: National Cancer Institute, State Cancer Profiles, www.statecancerprofiles.cancer.gov.

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