New York State Department of Health
Bureau of Chronic Disease Epidemiology and Surveillance

SUMMARY OF METHODS AND FINDINGS

CANCER INCIDENCE IN ZIP CODE 12059 (TOWN OF BERNE)
ALBANY COUNTY, NEW YORK, 1982-1991

Newly diagnosed cancer cases were the subject of an investigation initiated in response to concern over the potential health effects of emissions from existing radio and television towers in the area of the National Weather Service NEXRAD weather radar.

METHODS

- The expected numbers of newly diagnosed cancer cases, by sex and location in the body, were calculated based on the age and sex distribution of persons in the study area.
- The actual observed numbers of newly diagnosed cancer cases, by sex and location in the body, were counted from New York State Cancer Registry records.

FINDINGS

The geographic location of the residences of the persons diagnosed with cancer did not appear to be related to the location of the radio and television towers in the area.

Cancer Cases in Men

- Overall, the actual number of newly diagnosed cancer cases was not significantly different from the number expected (21 cases observed; 25 cases expected).
- Among specific cancer sites, there was a significantly higher than expected number of cases of malignant melanoma (fewer than 6 cases observed; 1 case expected). The expected numbers of cases for all of the other individual cancer sites were no different from those observed.
- Malignant melanoma is one form of skin cancer. Malignant melanoma of the skin is related to sun exposure, certain kinds of moles, and family history. Malignant melanoma has not been linked with radiofrequency electromagnetic fields or with 60 Hz magnetic fields.

Cancer Cases in Women

- Overall, the actual number of newly diagnosed cancer cases was not significantly different from the number expected (28 cases observed; 29 cases expected).
- Among specific cancer sites, the expected numbers of cases for all of the other individual cancer sites were no different from those observed.

DISCUSSION

Radio, television and communication transmitters emit radiofrequency radiation. With exposure to radiofrequency radiation, the body can absorb energy in the form of heat. In the study area, the strengths of the radiofrequency fields are too low to induce thermal effects in areas of potential exposure. There is no clear evidence that radiofrequency fields induce non-thermal harmful effects, including cancer.

In addition to the radiofrequency electromagnetic fields associated with the transmitters, magnetic fields are generated by the power lines providing electricity to these systems. While exposure to magnetic fields has been controversial, these fields are expected to be a small fraction of the fields produced by a home's own electrical wiring and household appliances because of the distance of the power lines to the homes in this area.

For further information on the occurrence of cancer or for additional questions regarding this investigation, please contact Ms. Aura L. Weinstein, New York State Department of Health, Cancer Surveillance Program, at (518) 474-2354.
CANCER INCIDENCE IN ZIP CODE 12059 (TOWN OF BERNE)  
ALBANY COUNTY, NEW YORK, 1982-1991

STUDY PURPOSE

In January 1994, a number of residents of East Berne, Albany County contacted the Environmental Health Unit of the Bureau of Environmental and Occupational Epidemiology, New York State Department of Health. These residents voiced concern over the potential health effects of emissions from existing radio and television towers and over the possibility that the National Weather Service NEXRAD weather radar installed in 1994 would add to these effects. The Environmental Health Unit then requested the Cancer Surveillance Program of the Bureau of Chronic Disease Epidemiology and Surveillance to do an investigation. This report presents the results of the investigation conducted by the Cancer Surveillance Program because of these concerns.

BACKGROUND

Because of its elevation, East Berne is the location of many radio, television and communication transmitters which serve the Capital Region, in addition to being the site of the NEXRAD weather radar transmitter. These transmitters emit electromagnetic radiation with different frequencies within the radiofrequency range of the spectrum from 30 kHz (30,000 cycles per second) to 300 Ghz (300 billion cycles per second).

For this radiofrequency radiation, the significant quantity relating to biological effects is the amount of energy that is absorbed by the tissue. If enough energy is absorbed in a short enough time, an increase in body temperature can occur. If sufficient heating occurs, biological effects associated with heating would be expected to result. The strength of a radiofrequency field decreases with distance from the source. Also, for directional beams, such as those from the radar or communication links, intensity drops off rapidly with distance from the direct beam. The field strengths in areas of potential exposure to such fields are normally too low to induce thermal effects in exposed individuals.

There is no clear evidence that radiofrequency fields induce non-thermal harmful effects, including cancer. A 1996 report by the European Commission (1) concluded that there is no persuasive evidence that electromagnetic fields can promote the development of cancer. A report issued by a British Independent Expert Group in April, 2000 concluded that current epidemiological evidence does not suggest that exposure to radiofrequency fields causes cancer and that the balance of biological evidence suggests that such fields below guidelines do not cause mutation, or initiate or promote tumor formation (2).

In addition to the radiofrequency electromagnetic fields associated with the transmitters, a 60 Hz magnetic field is generated by the power lines providing electricity to these systems. The interaction of this low frequency field with biological systems is different from that of radiofrequency fields.

The 60 Hz magnetic fields induce internal electrical currents within the body. These induced currents, however, are much smaller than the electrical currents that occur naturally in the body. Many studies have been carried out to examine if these fields can increase cancer risk. A number of epidemiological studies have found a correlation between childhood leukemia and the electric wire-code classification of the electric distribution lines near the homes (used as an estimate of magnetic field exposure). These
studies, together with other scientific research studies on the effects of these fields on cells, tissues and organisms were examined by a National Academy of Sciences Committee (3). The Committee's report, issued in 1996, concluded that "no conclusive and consistent evidence shows that exposures to residential electric and magnetic fields produce cancer, adverse neurobehavioral effects, or reproductive and developmental effects". While the Committee found that the causative factor responsible for the statistical association between electric wire-codes and childhood leukemia has not been identified, it concluded that the evidence of an association between exposure to electric and magnetic fields and cancer is not convincing. In a 1999 report to Congress, the National Institute of Environmental Health Sciences (4) also found that the scientific evidence suggesting that exposure to 60 Hz magnetic fields poses any health risk is weak, but that such exposure cannot be recognized as entirely safe. The report found that the epidemiological studies show a pattern of a small increased risk with increasing exposure for childhood leukemia and chronic lymphocytic leukemia in occupationally exposed adults. In contrast, animal and laboratory studies fail to support a causal relationship between exposure to magnetic fields at environmental levels and such health effects.

Furthermore, the 60 Hz magnetic fields associated with the electricity supply to the various transmitters in the area decrease rapidly with distance. Their contribution to the magnetic fields in any of the area homes is expected to be a small fraction of the fields produced by a home's own electrical wiring and household appliances.

METHODS

Study Area. The study area was defined as zip code 12059 which includes East Berne in the Town of Berne as well as portions of the adjacent towns of Knox and New Scotland (see attached map). East Berne is located in a rural area of Albany County. When this study began, cancer reporting to the New York State Cancer Registry was considered complete for the years 1982 through 1991. The study is limited to these years.

Approach. To determine whether the amount of cancer in this community is unusual, we compared the number of new cancer cases that were actually diagnosed among residents of the study area with the number we expected to find. The following sections describe how this comparison was made.

Identification of Observed New Cases of Cancers. By law, all cases of cancer are reported to the New York State Department of Health and compiled in the New York State Cancer Registry. Using the Cancer Registry, we identified all cases of cancer newly diagnosed between 1982 and 1991 among residents of the study area and then grouped them by sex and age. These cases are referred to as "observed" cases.

Variation in cancer among different geographic areas reflects not only true differences in cancer occurrence, but also differences in how cancer is diagnosed, treated, and recorded in various areas of the state. The completeness and accuracy of the Cancer Registry depend upon reporting from hospitals. Estimates show that the Registry receives reports on over 95% of all cancer cases (5).

The computerized Cancer Registry files are updated continually to assure the accuracy of case information. Since a person may be treated in more than one hospital for the same cancer, each cancer report received must be compared with existing Registry records to see if the report is about a new case of cancer. Reports about metastatic cancers (cancers that have spread from another site in the body) are also collected to
make sure that the original (primary) cancer site was reported. Regular updating also corrects dates of diagnosis and information on the type of cancer when necessary. This report presents data on people diagnosed with cancer from 1982 through 1991, with information updated as of January 1995.

**Calculation of Expected New Cases of Cancer.** In order to draw conclusions regarding the number of cancer cases in East Berne, we first must calculate the number of cases expected in an area with the same population, and with the same age and sex composition as the study area. Since cancer patterns are different in urban and rural areas, we also took the number of residents per square mile (population density) of the study area into consideration. We did this by using standard cancer rates based on population density categories to generate expected numbers of cancer cases. All of the cities and towns of New York State (except New York City) have been assigned to one of five population density categories. These categories are based on the number of residents per square mile in 1980 and 1985. The Town of Berne is rural, the least densely populated category.

According to the 1980 United States Census, the total population of the study area was 1378 people (694 men, 684 women). Using the 1980 and 1990 United States Censuses, we estimated that the total population of the study area in 1987 was 2038 (1026 men and 1012 women). Cancer incidence rates by age and sex for rural areas of New York State were used to calculate the expected numbers of cases. The 1980 population of the study area was used in calculations of expected numbers of cases in 1982. The estimated 1987 population was used for the years 1983-1991. Expected numbers in the two time periods were then summed to obtain total numbers of cases expected for the period 1982-1991. This procedure adjusts the calculation of expected numbers for a number of factors, including differences in sex, age, and population density among study area residents and changes in the standard cancer rates that have occurred over time.

**Cancer Sites Studied.** For this study, we examined total numbers of cancers among men and women, as well as sixteen of the most common types of cancer for men and eighteen of the most common sites among women. These included and cancers of the lung, colon, rectum, and bladder, and lymphoma and leukemia. We also included cancers of the breast and female reproductive organs for women, and prostate cancer for men.

**Statistical Testing.** We used statistical testing based on the Poisson model to determine if chance alone could explain whether the observed number of cases was either more or less than expected (6). If the probability of observing a difference was 0.025 or less, the result was considered to be statistically significant, or not likely due to chance. Differences that were not statistically significant were considered to be random changes in patterns of disease.

**RESULTS**

In all, we identified 49 cancers among persons residing in the study area between 1982 and 1991. For all anatomic sites combined, there were 21 cases observed among men when 25 cases were expected, and 28 cases among women when 29 cases were expected. These observed numbers are not statistically different from the numbers expected. The geographic location of the residences of the persons diagnosed with cancer did not appear to be related to the location of the radio and television towers in the area. (To protect the confidentiality of patients, we do not provide information pertaining to
individuals, such as maps of case residences, or exact numbers of cases when there are fewer than six cases of cancer in a given category. Although numbers of cancer cases for sites with fewer than six cases are not shown, they are included in the total number observed.)

When individual sites of cancer were examined separately, there was a significantly higher than expected number of cases of malignant melanoma among men. One case of malignant melanoma was expected; the number observed was less than six (but greater than one). The expected number of cases for all of the other individual cancer sites was no different from that observed. Table 1 summarizes these results. Related cancer sites are combined for men and women in Table 1, but statistical testing was done separately.

**DISCUSSION**

**Significant findings.** We found no statistically significant differences in the total numbers of cases for either men or women. We found a statistically significantly higher than expected number of cases of malignant melanoma in men, although the number of actual cases was small. No cases of malignant melanoma were diagnosed in women. No other statistically significant differences were found for any individual cancer sites.

Malignant melanoma is one form of skin cancer. Malignant melanomas occur more frequently on the head and neck and trunk among males, and on the leg in females (7). We found this to be true of the men with malignant melanoma in the study area. The occurrence of malignant melanoma of the skin in both men and women has been rising steadily in recent years. This is true in the nation as a whole (8) and in New York State (9). Malignant melanoma of the skin is related to sun exposure. This cancer occurs more often in people of higher socioeconomic status, and may be more common among those who have experienced sunburns that have blistered. Some melanomas can develop from abnormal changes in moles on the skin. In some families, this may be hereditary. As with other skin cancers, malignant melanoma of the skin is more common among light-skinned people, and is greatest in regions closest to the equator (7, 10). Malignant melanoma has not been linked with radiofrequency electromagnetic fields or with 60 Hz magnetic fields. When detected early, malignant melanomas of the skin can be cured. The American Cancer Society's ABCD rule summarizes warning signs to watch for in moles:

"A is for asymmetry. One half of the mole does not match the other half. B is for border irregularity. The edges are ragged, notched, or blurred. C is for color. The pigmentation is not uniform, with varied degrees of tan, brown, or black, or is intensely black. D is for diameter great than 6 millimeters. Any sudden or progressive increase in size should be of particular concern." (10).

**Study limitations.** Several points about the methods need to be made. In this study, we made 36 different comparisons between numbers of observed and expected cases (16 among men, 18 among women and 1 each for men and women for all cancer sites combined). In making this number of comparisons, it is possible for one or two to appear statistically significant due to chance fluctuations in the data alone. This may have been the case with the greater than expected number of malignant melanomas diagnosed in men.

The ability of a statistical test to identify a true difference, if one exists, is called statistical power. The level of statistical power depends on the number of expected cases. At least 16 cases are required for the statistical test used in this study to have a 90%
probability of detecting a cancer rate twice that expected. In this study, only the total numbers of expected cases in men and women exceeded 16. Therefore, the statistical power of the test to detect a doubling, if one existed, was lower than 90% for comparisons of the individual cancer sites.

This study was not able to take into account people who may have moved in to or out of the study area shortly before being diagnosed with cancer. We studied cancers among people who lived in the study area and were diagnosed between 1982 and 1991. According to US Census information, about 64% of study area residents over the age of 5 reported living in the same house for at least five years. This compares with 55% among Albany County residents. Although the population of the study area was less mobile than the population of the county as a whole, many (36%) were still relatively recent arrivals. The issue of migration may introduce a degree of uncertainty into the conclusions that may be drawn from this analysis.

This study was limited to a statistical comparison between the observed and expected numbers of cancers before the NEXRAD weather radar was installed, so this source could not have been related to any of the cancer cases studied. In other studies, radio frequency measurements were taken in the vicinity of the national Weather Service NEXRAD weather radar to measure exposure to emissions from the existing radio and television towers and the NEXRAD transmitter (11). All measurements were below the Institute of Electrical and Electronic Engineers (IEEE) protection guidelines. The beam from the NEXRAD Doppler radar tower is designed to pass over the surrounding area and therefore does not add significantly to existing exposures from other sources.

**General cancer information.** Cancer may result from either genetic or environmental influences or an interaction of both genetics and environment. Examples of possible environmental influences include diet and other lifestyle factors, and occupation as well as natural and man-made cancer-causing substances in the air, food or water. The development of cancer is usually a long process. For many kinds of cancer, cancer does not occur until 10 to 30 years after exposure to cancer-causing agents. An agent that promotes the uncontrolled growth of cancer cells may cause cancer symptoms to be recognized in less time.

Cancer, unfortunately, is a common disease. One in two men and one in three women will develop cancer during their lifetime (10). The number of people with cancer is increasing in most communities because more people are living to older ages, at which cancer is more common.

More research is necessary before the causes of cancer are well understood. We do know that cigarette smoking is a major contributor to cancer deaths. Researchers believe that dietary factors, including excessive alcohol consumption and eating high fat foods, also increase the risk of cancer. In fact, it has been estimated that up to two-thirds of all cancer deaths may be due to tobacco use and diet (12, 13). People can also reduce their risk of cancer by avoiding ionizing radiation such as unnecessary X-rays, occupational exposures to cancer-causing agents and too much exposure to sunlight. Early diagnosis can lead to effective treatment and cure for many cancers. Screening for cancers of the breast, cervix, rectum, colon, and prostate can find problems before symptoms occur, when the chances for cure are best. Many people could reduce their chances of developing or dying from cancer by adopting a healthier lifestyle and by visiting their physician for a checkup that includes cancer screening.
REFERENCES


# Table 1

**Bureau of chronic disease epidemiology and surveillance**  
**New York state department of health**

**Observed and expected numbers of new cases of cancer**  
**All anatomic sites (ICD-9 codes 140-208), zip code 12059**  
**Town of Berne, Albany County, New York, 1982-1991**

<table>
<thead>
<tr>
<th>ANATOMIC SITES (ICD-9)</th>
<th>Observed</th>
<th>Expected</th>
</tr>
</thead>
<tbody>
<tr>
<td>All anatomic sites (140-208)</td>
<td>49</td>
<td>54</td>
</tr>
<tr>
<td>Digestive system</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Includes stomach (151), colon (153), rectum (154), liver (155) and pancreas (157))</td>
<td>7</td>
<td>11</td>
</tr>
<tr>
<td>Lung (162)</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>Malignant melanoma (172)</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Female breast (174)</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>Other*</td>
<td>26</td>
<td>25</td>
</tr>
</tbody>
</table>

* Classification of site based on International Classification of Diseases, ninth revision.  
* Data were obtained from the New York state cancer registry (database as of January 1995).  
* Expected numbers are based on rates of new cases of cancer by age and sex for New York state, except New York city. Rates for 1978-1982 for rural areas were applied to the 1980 population to obtain expected numbers of cases for 1982, and 1983-1987 rates for rural areas were applied to the estimated 1987 population to obtain expected numbers of cases for 1983-1991 for zip code 12059. Individual sites may not sum to total due to rounding.  
* Fewer than six cases observed.  
* Includes cases at other cancer sites as well as cases not listed separately in order to protect patient confidentiality.  
* Denotes statistically significant result at the p < 0.025 level
Zip Code 12059 (East Berne)
Albany County, New York

Legend
- Zip Code Boundary
- Town/Village Boundaries

Town of Knox
Town of Berne
Town of New Scotland
Town of Guilderland
Village of Altamont
Warner's Lake
East Berne

Miles
0 1.5 3

- 14
APPENDIX


The Cancer Surveillance Program of the New York State Department of Health, Bureau of Chronic Disease Epidemiology and Surveillance, conducted a cancer incidence study to see whether people living in the East Berne area had experienced higher than expected rates of any type of cancer during the years 1982 through 1991. The study evaluated cancers among residents of zip code 12059 which includes the Town of Berne and as well as portions of the Towns of Knox and New Scotland. Prior to the release this study, Cancer Registry data became available through 1996. This Appendix presents more recent cancer incidence for the same study area for the years 1992 through 1996.

The updated cancer incidence evaluation for 1992 through 1996 shows that for all types of cancers combined among men and for all type of cancers combined among women, the number of cancers seen were not different from expected (see Appendix table). From 1992 through 1996, 12 cases of cancer were observed in men while 19 were expected. For women, 18 cases were observed, while 21 were expected. Of the sixteen specific cancer sites evaluated for men, none were statistically significantly elevated. Of the eighteen specific cancer sites evaluated for women, none were statistically significantly elevated.
## Appendix Table

### BUREAU OF CHRONIC DISEASE EPIDEMIOLOGY AND SURVEILLANCE
**NEW YORK STATE DEPARTMENT OF HEALTH**

**Observed and Expected Numbers of New Cases of Cancer**
All Anatomic Sites (ICD-9 Codes 140-208), Zip Code 12059
Town of Berne, Albany County, New York, 1992-1996

<table>
<thead>
<tr>
<th>ANATOMIC SITES (ICD-9)*</th>
<th>Observedb</th>
<th>Expectedc</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Anatomic Sites (140-208)</td>
<td>30</td>
<td>40</td>
</tr>
<tr>
<td>Digestive System</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Includes Stomach (151), Colon (153), Rectum (154), Liver (155) and Pancreas (157))</td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>Lung (162)</td>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>Malignant Melanoma (172)</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Female Breast (174)</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>Other*</td>
<td>13</td>
<td>20</td>
</tr>
</tbody>
</table>

* Classification of site based on International Classification of Diseases, ninth revision.

b Data were obtained from the New York State Cancer Registry (database as of May 1999).

* Expected numbers are based on rates of new cases of cancer by age and sex for New York State, except New York City, for the period 1992-1996. Individual sites may not sum to total due to rounding.

d Fewer than six cases observed.

* Includes cases at other cancer sites as well as cases not listed separately in order to protect patient confidentiality.

* Denotes statistically significant result at the $p < 0.025$ level