CANCER INCIDENCE AMONG ADULTS IN
THE HAMLET OF HILLCREST,
BROOME COUNTY, NEW YORK, 1990-1997

Prepared by the:

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Background

In February 1998, the Broome County Health Department brought to the attention of the New York State Department of Health (NYS DOH) community concerns over what they perceived to be an unusual number of cancers among children living or attending school in the Hamlet of Hillcrest in the Town of Fenton, Broome County. NYS DOH confirmed the diagnoses of the six reported cases of childhood cancer, and in September 1998 released a case verification report that concluded that the cancer cases represented an unusual pattern that required further investigation. The cases included multiple types of cancer, including leukemia and lymphoma. An unusual pattern was suggested by the location of the cases in a small geographic area and their occurrence over a short period of time.

To follow up on these findings, NYS DOH began further investigations of cancer incidence among children and adults residing in Hillcrest, as well as further investigation regarding environmental factors. One part of this follow-up investigation was an investigation of cancer incidence from 1980 through 1998 among children residing in the Hamlet of Hillcrest, which included an interview study with the parents of the children with cancer. Findings of this investigation were released in a report dated November, 1999. The investigation confirmed the findings of the earlier case review, indicating a higher than expected incidence of all types of cancer combined, and of leukemia in particular, among children ages 14 and younger. However, the data showed no evidence of a long-term pattern of childhood cancer in the study area, with most of the childhood cancers being diagnosed in 1997 and 1998. Interviews with the parents of the children did not point to an obvious explanation for the unusual pattern of cancer in the study area.

Another part of the follow-up investigation was an investigation of cancer incidence from 1990 through 1997 among adults residing in Hillcrest. This report presents the findings of that investigation, which used data from the New York State Cancer Registry to identify cases of cancer. Residents of the area also supplied NYS DOH with information about cancer diagnoses among people formerly residing or working in the area; these reports are summarized in the Appendix to this report. Further investigation of environmental factors in Hillcrest is in progress and results will be presented in a separate report.

Methods

Study Plan: This investigation was designed to determine whether the number of cancer cases arising among adults residing in the Hamlet of Hillcrest was unusual. In order to do this, the number of cases actually diagnosed among residents of the study area ages 15 and up was compared with
the number of cases one would expect to find, if cancer rates in Hillcrest were the same as in similar areas of the state.

Study Area and Time Period: The study area was the same as in the study of cancer incidence among children residing in the Hamlet of Hillcrest. This area consists of Census Tract 122.01 and Block 105 only of Census Tract 126.00 in Broome County (see attached map). The time period for the investigation of cancer incidence was 1990 through 1997, the most recent year for which cancer reporting was considered complete for analysis within small geographic areas at the time work on this study was initiated.

Identification of Observed Incident Cancers: In order to proceed with this investigation, it was necessary to identify all cases of cancer diagnosed among adults residing in the study area between 1990 and 1997. The source for these data was the New York State Cancer Registry. The Cancer Registry contains information on all cases of cancer reported to the New York State Department of Health, as mandated by law.

Variation in cancer incidence among different geographic areas reflects not only true differences in cancer incidence, but also differences in how cancer is diagnosed, treated, and recorded in different areas of the state. The completeness and accuracy of the Cancer Registry depend upon reporting from hospitals. The Cancer Registry has been certified as over 95% complete by the North American Association of Central Cancer Registries (1).

The computerized Cancer Registry files are continuously updated to reflect information gained from multiple reports on the same cancer. Cancer incidence data presented in this report represent cancer cases diagnosed from 1990 through 1997, with information updated as of September 2000.

In order to identify all cancer cases within the study area, a listing of all cancer cases with ZIP Codes serving the study area was obtained from the Cancer Registry. Each street address was then examined individually to determine whether that individual lived within either Census Tract 122.01 or Census Tract 126.00 at the time of diagnosis. Street addresses for all individuals found to live in Census Tract 126.00 were then examined further to determine whether they lived in Block 105 of that census tract. All cases with a street address located within the study area were then grouped by sex and type of cancer. These are referred to as "observed" cases.

Calculation of Expected Incident Cancers: In order to determine whether the number of observed cases was unusual, it was necessary to calculate the number of cancer cases that would be expected if cancer rates in the study area were the same as in a reference area, taking into account the population size and the age and sex distribution of the study area. The reference area selected for this investigation was all of New York State, exclusive of New York City.

Based on data from the 1990 United States Census, the total population of the study area in 1990 was estimated at 2302 persons, with 1087 males and 1215 females. Cancer incidence rates by
age and sex for New York State, exclusive of New York City, were applied to the population of the study area in each age group in males and females to calculate the expected numbers of cases for each sex.

Seventeen of the most common cancer types of cancer were examined among males, including lung, colorectal, prostate, and bladder cancers, and lymphomas and leukemias. Nineteen of the most common types were examined among females. In addition to the sites examined for males (except prostate), cancers of the breast and female reproductive organs were also examined for females.

Statistical Testing: The Poisson model was used to determine the probability that chance alone could explain an increase or decrease in the observed number of cancer cases compared to the expected number (2). If the probability of observing an excess or deficit was 0.025 or less for any cancer site, the result was considered to be statistically significant. Non-significant excesses or deficits were considered to represent random variations in observed patterns of disease.

Results

A total of 136 cancers were observed among male and female adults residing in the study area during 1990-1997. In males, 80 cancer cases were observed and 72 cases were expected, while among females 56 cancer cases were observed and 64 cases were expected for all anatomic sites combined. The differences between the observed and expected numbers of total cancer cases were not statistically significant in either males or females. These results are summarized in Table 1.

The most common types of cancer observed among males included prostate, with 31 cases observed (20 cases expected); colorectal, with 8 cases observed (9 cases expected); and lung, with 8 cases observed (13 cases expected)(see Table 1.). Fewer than six cases were observed for several types of cancer, including cancers of the mouth and throat, pancreas, kidney, and brain, and leukemias and lymphomas. (To protect patient confidentiality, for cancer sites with fewer than six observed cases, the specific numbers of observed cases have not been indicated. Some related cancer sites with fewer than six cases are grouped in the table, although statistical testing was done for each site separately.) The 31 observed cases of cancer of the prostate was significantly greater than the 20 cases expected. No other individual site of cancer among males showed a statistically significant excess or deficit in the numbers of cases observed compared to the numbers expected.

The most common types of cancer among females included breast, with 20 cases observed (19 cases expected); lung, with 8 cases observed (9 cases expected); and colorectal, with 6 cases observed (8 cases expected). Fewer than six cases were observed for several other types of cancer, including cancers of the mouth and throat, uterus, ovary, and brain, and leukemias and lymphomas. No individual site of cancer among females showed a statistically significant excess or deficit in the numbers of cases observed compared to the numbers expected.
Discussion

Significant Findings: This present study found that total numbers of cancer cases diagnosed among both males and females residing in the Hillcrest study area were similar to the numbers expected. When individual types of cancer were examined separately, a significant excess in the number of cancer cases diagnosed was found for prostate cancer in males. No other single cancer site, including leukemia or lymphoma, which were observed among the children, showed a significant difference in the number of cases actually diagnosed compared to the number expected among either males or females.

Prostate Cancer A significant excess was found in numbers of cases of cancer of the prostate among males in the Hillcrest study area, with 31 cases observed and 20 cases expected. The prostate is a male sex gland, about the size of a walnut, located at the base of the penis. Cancer of the prostate is the most frequently diagnosed type of cancer among men, and the second leading cause of cancer deaths. The incidence of prostate cancer increases with advancing age, with the majority of cases observed in men over the age of 65. The highest incidence of prostate cancer is observed among blacks; prostate cancer is less frequent among white and, especially, Asian populations. While the causes of prostate cancer are unclear, it is believed to be associated with dietary fat intake (3-5). Hormonal and reproductive factors may also play a role, and certain occupational exposures, including exposures to cadmium and rubber production, have been suggested as possible risk factors, although these findings have not been confirmed (4, 5). Several reports have noted an increased incidence or mortality from prostate cancer among farmers (4-6), but associations with specific components of farming activity have not been consistent.

Among the men identified as having prostate cancer, over three-quarters were age 65 or older at the time of diagnosis. Numbers of cases were similar to the numbers expected in all age groups except for the 65-74 year age group, where the 19 cases observed was significantly greater than the 9 expected. All of the prostate cancer cases were reported as white. Numbers of prostate cancer cases diagnosed were fairly constant from year to year.

Locations of the residences of the men diagnosed with prostate cancer were plotted on a map of the area. There was no obvious clustering of these residences around any of the three environmental sites of concern, or around any other point. The majority of the men with prostate cancer, as with the majority of the population of the study area, lived in the Hamlet of Hillcrest itself, while only a few lived in the sparsely settled eastern portion of the census tract. When men age 65-74 were examined separately, there was also no obvious clustering of their residences.

The incidence of prostate cancer increased sharply in the late 1980's to early 1990's, both in New York State and nationally, reaching a peak in 1992. Incidence began to decline after this point, but remains substantially higher than in years prior to 1990. This increase is believed to be due in part to the utilization of new techniques of early detection, specifically, the prostate-specific antigen (PSA) screening test, which was introduced in 1986. The subsequent leveling off in rates may be
due to changes in the use of screening tests, or to the fact that many of the cases that were
detectable by screening had already been detected (7). Screening is an important issue in the
discussion of prostate cancer incidence since many cases detected by screening would never have
gone on to produce symptoms in a man’s lifetime and would never have been detected otherwise.
In fact, autopsy studies have found previously undetected prostate cancer in about 20% of males
over 44 years of age (5). Screening is an important procedure nevertheless since stage of disease
at diagnosis has important implications for long term survival. The decline in prostate cancer
mortality that has been observed since the mid-1990's is believed to be, at least in part, a result of
the wide-scale adoption of prostate screening methods.

Since screening is intended to detect disease at an earlier stage, when it is more treatable,
the introduction of screening into a community would be expected to cause an increase in the
number, and percentage, of cancer cases detected at an earlier stage. Staging information was
available for 27 of the 31 prostate cancer cases identified in the present study. Of these, about 90%
were diagnosed at a localized stage, and about 10% were diagnosed at a regional stage, and none
were diagnosed at a distant or metastatic stage. (Localized disease is restricted to the prostate and
regional disease has spread beyond the prostate to nearby organs, while distant disease has spread
throughout the body.) In comparison, the stage distribution for prostate cancer cases diagnosed
1990-1997 in New York State, exclusive of New York City, was 77% localized, 13% regional, and
10% distant or metastatic. The staging distribution in the present study is thus somewhat more
favorable than statewide, with a larger percentage of cases diagnosed in the earliest stage and no
cases diagnosed at the latest stage.

The above considerations suggest that the excess number of prostate cancer cases
observed in the study area might be explained by prostate cancer screening patterns. The staging
distribution of the prostate cancer cases diagnosed in the study area is more favorable than in the
remainer of the state, suggesting a higher level of prostate cancer screening activity. It is also
possible that men in this area have been seeking prompt treatment of cancer symptoms more
frequently and/or that alert physicians have been identifying prostate cancer at an earlier point in its
development. The excess in numbers of prostate cancer cases in Hillcrest may thus be related to
medical care utilization factors, and not to any difference in the actual occurrence of the disease.

Comparison with Childhood Cancer Incidence Findings: Because this investigation was
conducted in response to the unusual pattern of childhood cancer in Hillcrest, an additional review
was conducted of the adult cases of cancer of the blood-forming system. Among the types of cancer
in this category are leukemias, lymphomas and multiple myelomas. The category lymphomas
includes both Hodgkin’s disease and non-Hodgkin’s lymphomas. For males, nine cases of cancers
of the blood-forming system were diagnosed from 1990 to 1997. The estimated number of expected
cases of these types of cancer as a group in the study area was six. For females, the observed
number was fewer than six (not shown to protect individual privacy) and the expected number was
also fewer than six. Separate analyses of observed versus expected numbers of cases were
conducted for the specific cancer types, leukemias, lymphomas, and multiple myelomas, and none
of the individual comparisons showed statistically significant elevations. (Numbers are too small to provide.)

These results show that the numbers of cases of these types of cancer diagnosed in the study area are not statistically significantly higher than expected. However, because of the concern about leukemia and lymphoma in this area, related to the children diagnosed with these types of cancer in the 1990’s, these adult cases were examined more closely to check for unusual patterns, such as an unusual pattern of rare types of cancer, unusual age pattern, or unusual clustering in time or geographical area.

The nine cancers diagnosed among males included all three types, lymphoma, leukemia and multiple myeloma. The cancers diagnosed among women also included all three types. For males, most of the nine cases were over age 65 at the time of diagnosis. The small number of males diagnosed at ages younger than 65 included both leukemia and lymphoma diagnoses. For females, all the cases were over age 70 at the time of diagnosis.

The number of cases diagnosed in any one year among men and women varied from zero to three, and there was no increasing or decreasing trend over time. Approximately half of these cancers of blood-forming organs were diagnosed in the first four years of the study period, 1990 through 1993, and approximately half were diagnosed in the second four-year period, 1994-1997. Among the small number of men younger than age 65 at the time of their diagnoses, there was no unusual pattern in time.

All the male and female cases’ addresses at the time of diagnosis were mapped in order to evaluate whether the cases’ locations showed an unusual geographic pattern, or were clustered in a particular area. The cases’ locations did not cluster together in any unusual patterns within the study area.

In conclusion, additional review of adult cases of the blood-forming organs did not show any unusual patterns in the types of cancer, ages of the people diagnosed, timing of diagnoses or geographical location of cases’ residences at the time of diagnosis.

**Study Limitations:** In drawing conclusions from these data, several aspects of the methodology need to be addressed. First, since there were 38 individual tests of significance, (17 among males, 19 among females and one each among males and females overall), it was anticipated that one or two results might appear statistically significant even though the differences between observed and expected events were due entirely to random fluctuations in the data.

The second aspect is the power of the statistical test, that is, the probability that a true departure from the expected number can be detected by significance testing. The power of a significance test varies with the number of expected cases. For example, using the statistical test described above, the probability of detecting a true doubling in cancer incidence over the expected value will be 90 percent or higher when the expected number is at least 16. For this investigation,
the power of detecting a doubling, if one were present, was high for the total number of cancer cases for each sex and for breast cancer among females and prostate cancer among males. The power for detecting a doubling was not high for any of the less common cancer sites.

An additional limitation is the fact that cancer cases were identified among persons who both resided in the study area and were diagnosed with cancer during the period 1990-1997. Migration into and out of the study area could not be taken into account. As a secondary data source, U.S. Census information for 1990 was used to review patterns of migration in Census Tract 122.01, based on residents' place of residence five years earlier. (Information on migration patterns is not available for individual census blocks.) In Census Tract 122.01, about 67% of residents (over the age of 5) had reported residing in the same house for at least five years. This leaves a sizeable proportion of study area residents who were recent arrivals, indicating that migration may be an issue for this area.

**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 lengthy process. For many types of cancer, symptoms do 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 of every two men and one of every three women will develop cancer during his/her lifetime (3). The number of people with cancer is increasing in most communities because more people are living to the older ages, where cancer is more common.

Much more research is necessary before the causes of cancer are well understood. Current knowledge, however, suggests that the leading preventable cause of cancer is cigarette smoking. Dietary practices such as excessive alcohol consumption and the eating of high fat foods are also believed to be important. In fact, tobacco and diet may account for as many as two-thirds of all cancer deaths (8). Other avoidable risk factors include excessive exposure to sunlight, ionizing radiation, and various occupational exposures to cancer-causing agents.

It is important to realize that many cancers can be effectively treated if they are diagnosed at an early stage. Screening for cancers of the breast, cervix, rectum, colon, and prostate, for example, helps to identify these diseases before the onset of symptoms and at a time when they are usually the most curable. Many persons could reduce their chances of developing or dying from cancer by adopting a healthier lifestyle and by visiting their physician for a cancer-related checkup.
References


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Notes to table:
\(^a\) Classification of site based on International Classification of Diseases, ninth revision.
\(^b\) Data obtained from the New York State Cancer Registry (database as of September 2000).
\(^c\) Expected numbers based on cancer incidence rates by age and sex for New York State, exclusive of New York City for 1990-1997 applied to the 1990 U.S. Census population of Census Tract 122.01 and Census block 105 of Census Tract 126.00. Individual sites may not sum to total due to rounding.
\(^d\) Number of cases not shown to protect patient confidentiality. The numbers of observed and expected cases have been added to the numbers for "All other sites".
\(^e\) Includes cases at other cancer sites as well as cases not listed separately in order to protect patient confidentiality.

\(^\star\) Denotes statistically significant difference from expected at the p<0.025 level.