March 28, 2012

Summary Report of
Texas Department of State Health Services Investigation of
Specific Cancers Occurrences
Within Zip Code 79606, Abilene, Texas
Taylor County, Texas

Covering 2000–2009

Background

Concern about a possible excess of cancer diagnoses prompted the Texas Department of State Health Services (DSHS) to examine the occurrence of cancer in zip code 79606, Abilene, Texas. Local citizens were concerned that unknown toxic chemicals may be causing cancer. To determine if the selected cancers were elevated, DSHS evaluated complete, statewide incidence data (2000–2009) for cancers of the breast (especially under age 40), childhood brain and other nervous system (brain/CNS under age 20), myeloma, Hodgkin's lymphoma, non-Hodgkin's lymphoma, and select leukemia subtypes. Cluster analyses require complete statewide cancer data and currently the Texas Cancer Registry (TCR) is complete through 2009.

For this investigation DSHS used cancer incidence data which shows the number and types of cancer diagnosed each year. Cancer incidence data are the best indicator of cancer occurrence and cancer incidence data for Texas currently meet national standards for timeliness and data quality. This report presents information on methods used to conduct this investigation, the results, recommendations, and general information on cancer risk factors.

Investigation Methodology

According to the National Cancer Institute (NCI), a cancer cluster is a greater than expected number of cancers among people who live or work in the same area and who develop or die from the same cancer within a short time of each other. A cancer cluster investigation is designed with the specific intention of addressing the question, "Is there more cancer in the area or population of concern than we would expect?" While these types of investigations can be used to investigate whether the amount of cancer in a community is more than expected, they cannot determine either the cause of the cancers or possible associations with any risk factors.

DSHS follows guidelines recommended by the federal Centers for Disease Control and Prevention (CDC) for investigating cancer clusters.[1] If DSHS finds more cancer than expected or if rare or unlikely cancers are found in unusual age groups, various factors are considered to determine whether further study could identify a likely cause. Very few cancer cluster investigations in the United States proceed to this stage.

To determine whether a statistically significant excess of cancer existed in the geographic areas of concern, the number of observed cases was compared to what would be "expected" by applying state cancer rates to the average of the 2000 and 2010 Census population data for the area under investigation. Calculating the expected number(s) of cancer cases takes into consideration the race, sex, and ages of those who are diagnosed with cancer. This is important because all of these factors can impact cancer rates. When trying to determine if there is more or less cancer in a community compared to the rest of Texas, an investigation must ensure that differences in cancer rates are not simply due to differences in population demographics. Since a higher than expected number of cancer cases in a community can occur by chance alone, the role of chance also is considered in the statistical analysis.

Attached tables (Table 1–2) present the number of observed cases for males and females; number of "expected" cases; standardized incidence ratio (SIR); and corresponding 99% confidence interval. The SIR is simply the number of observed cases divided by the number of "expected" cases. When the SIR of a selected cancer is equal to 1.0, then the number of observed cases is equal to the expected number of cases, based on incidence rates in the state. When the SIR for a particular cancer is less than 1.0, there are fewer cases of that type of cancer in the area than would be expected. Conversely, an SIR greater than 1.0 indicates that there are more cases of a specific type of cancer in the area than would be expected.

Since an excess of cancer can occur by chance alone, statistics are used in the analysis to calculate the 99% confidence intervals to determine the likelihood that the resultant SIR (whether it is greater or lower than 1.0) is due to chance. A 99% confidence interval provides a range that we would expect the SIR to fall 99% of the time. If the confidence interval for a specific SIR includes 1.0, the result is not statistically significant and the observed number of cases is within the range not considered to be different than the expected number of cases. Confidence intervals are particularly important when trying to interpret small numbers of cases. Wide confidence intervals, which are common when dealing with small populations and small numbers of cases, reflect a greater uncertainty in the results. For instance, if only one or two cases are expected, three or four observed cases will result in a very large SIR. A more extreme example would be when due to the small size of the population the expected number of cases is less than 1.0; in this instance one observed case can result in a very high SIR. As long as the 99% confidence interval contains 1.0, the SIR is still within the expected range and therefore is not statistically significant.

Investigation Results

From January 1, 2000 to December 31, 2009, the number of cancers of the breast (especially those under age 40 in women), childhood brain and other nervous system, myeloma, Hodgkin’s lymphoma, non-Hodgkin’s lymphoma, and select leukemia subtypes were within the expected range in both males and females in zip code 79606, Abilene, Texas. Analysis summaries are presented in Tables 1–2.

Additionally, DSHS reviewed database files and records for known environmental issues and found none in Abilene, Texas.

Discussion

Like other studies, this cancer cluster investigation had limitations. The incidence data used in the cluster analysis did not include data for the most recent years. Also, cancer incidence data are based on residence at the time of diagnosis. It is possible that some residents who developed cancer no longer lived in the area at the time of diagnosis, so were not included in the analyses. However, it is also possible that people may have moved into the area and then developed cancer because of an exposure from a prior residential location or other factors. These cases are included in the investigation.

Recommendations

Based on the findings and the information discussed above, it is not recommended at this time to further examine the cancers in zip code 79606, Abilene, Texas. As new data or additional information become available, consideration will be given to updating or re-evaluating this investigation.

Information on Cancer and Cancer Risk Factors:

Overall, the occurrence of cancer is common, with approximately two out of every five persons alive today predicted to develop some type of cancer in their lifetime.[2] In Texas, as in the United States, cancer is the leading cause of death for people under the age of 85.[3] Also, cancer is not one disease, but many different diseases. Different types of cancer are generally thought to have different causes. If a person develops cancer, it is probably not due to one factor but to a combination of factors such as heredity; diet, tobacco use, and other lifestyle factors; infectious agents; chemical exposures; and radiation exposures. Although cancer may impact individuals of all ages, it primarily is a disease of older persons with over one-half of cancer cases and two-thirds of cancer deaths occurring in persons 65 and older. Finally, it takes time for cancer to develop, between 10–40 years can go by between the exposure to a carcinogen and a diagnosis of cancer.[4]

The chances of a person developing cancer as a result of exposure to an environmental contaminant are slight. Most experts agree that exposure to pollution, occupational, and industrial hazards account for fewer than 10% of cancer cases.[5] The Harvard Center for Cancer Prevention estimates 5% of cancer deaths are due to occupational factors, 2% to environmental pollution and 2% to ionizing/ultraviolet radiation.[6] In contrast, the National Cancer Institute estimates that lifestyle factors such as tobacco use and diet cause 50 to 75 percent of cancer deaths.[7] Eating a healthy diet and refraining from tobacco are the best ways to prevent many kinds of cancer. It is estimated that one-third of all cancer deaths in this country could be prevented by eliminating the use of tobacco products. Additionally, about 25 to 30 percent of the cases of several major cancers are thought to be associated with obesity and physical inactivity.[8]

Known Risk Factors for Cancers Examined in This Investigation:

The following is a brief discussion summarized from the American Cancer Society and the National Cancer Institute about cancer risk factors for the specific cancers studied in this investigation.[9,10]

The occurrence of cancer may vary by race/ethnicity, gender, type of cancer, geographic location, population group, and a variety of other factors. Scientific studies have identified a number of factors for various cancers that may increase an individual's risk of developing a specific type of cancer. These factors are known as risk factors. Some risk factors individuals can do nothing about, but many are a matter of choice.

Childhood Brain/CNS Cancer

The vast majority of brain cancers happen for no apparent reason and are not associated with anything which the child or parent did or didn't do, or anything that the child was exposed to in the environment. The only established risk factors for brain cancer are ionizing radiation and family history.

Acute Lymphocytic Leukemia (ALL)

Possible risk factors for ALL include the following: being male, being white, being older than 70, past treatment with chemotherapy or radiation therapy, radiation exposure, certain viral infections, or having a certain genetic disorder such as Down syndrome.

Chronic Lymphocytic Leukemia (CLL)

Possible risk factors for CLL include the following: being middle-aged or older, male, or white; a family history of CLL or cancer of the lymph system; or having exposure to herbicides or insecticides including Agent Orange, an herbicide used during the Vietnam War.

Acute Myeloid Leukemia (AML)

Possible risk factors for AML include the following: being male; smoking, especially after age 60; treatment with chemotherapy or radiation therapy in the past; treatment for childhood ALL in the past; being exposed to atomic bomb radiation or the chemical benzene; or having a history of a blood disorder such as myelodysplastic syndrome. Scientists estimate that as many as 1 out of 5 cases of AML is caused by smoking

Chronic Myeloid Leukemia (CML)

Being exposed to high-dose radiation (such as being a survivor of an atomic bomb blast or nuclear reactor accident) is the only known environmental risk factor for chronic myeloid leukemia. Aging is also a risk factor for chronic myeloid leukemia.

Hodgkin's Lymphoma

The risk factors for Hodgkin's lymphoma include people who have had infectious mononucleosis, infection with the Epstein-Barr virus, family history, higher socioeconomic background, and HIV infection.

Non-Hodgkin's Lymphoma

Risk factors for non-Hodgkin's lymphoma include infection with Helicobacter pylori, human immunodeficiency virus (HIV), human T-cell leukemia/lymphoma virus (HTVL-1), Epstein-Barr virus, or hepatitis C virus. Other possible risk factors include aging, certain genetic diseases, radiation exposure, immuno-suppressant drugs after organ transplantation, benzene exposure, the drug Dilantin, exposure to certain pesticides, a diet high in meats or fat, obesity, or certain chemotherapy drugs.

Myeloma

The risk factors for myeloma include aging, radiation exposure, family history, exposure from petroleum-related industry, obesity, or other plasma cell diseases. African Americans have higher rates of myeloma. Men are slightly more likely to develop myeloma than women.

Breast Cancer

Simply being a woman is the main risk factor for developing breast cancer. Breast cancer can affect men, but this disease is about 100 times more common among women than men. White women are slightly more likely to develop breast cancer than are African-American women, but African Americans are more likely to die of this cancer because they are often diagnosed at an advanced stage when breast cancer is harder to treat and cure. Other risk factors for breast cancer include aging, presence of genetic markers such as the BRCA1 and BRCA2 genes, personal and family history of breast cancer, previous breast biopsies, previous breast irradiation, diethylstilbestrol therapy, oral contraceptive use, not having children, hormone replacement therapy, drinking alcohol, and obesity. Secondhand smoke may also be a risk factor. Currently, research does not show a link between breast cancer risk and environmental pollutants such as the pesticide DDE (chemically related to DDT) and PCBs (polychlorinated biphenyls).

For additional information about cancer, visit the "Resources" link on the DSHS Web site at http://www.dshs.state.tx.us/tcr/.

Questions or comments regarding this investigation may be directed to Ms. Brenda Mokry, Epidemiology Studies & Initiatives Branch, at 512-776-3606 or Brenda.Mokry@dshs.state.tx.us.

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Table 1
Number of Observed and Expected Cancer Cases and Adjusted Standardized Incidence Ratios, Selected Childhood Cancers, Zip Code 79606, Abilene, TX, 2000–2009

Males (0–19)				
Site	**Observed**	**Expected**	**SIR**	**99% CI**
Ependymomas and Choroid Plexus Tumor	1	0.1	13.5	0.1 – 100.4
Astrocytomas	0	0.5	0.0	0.0 – 10.5
Intracranial & Intraspinal Embryonal Tumors	1	0.2	4.6	0.0 – 34.1
Other Gliomas	0	0.2	0.0	0.0 – 27.2
Other Specified Intracranial & Intraspinal Neoplasms	0	0.0	0.0	0.0 – 391.6
Unspecified Intracranial & Intraspinal Neoplasms	0	0.0	0.0	0.0 – 301.4
Females (0–19)				
Site	**Observed**	**Expected**	**SIR**	**99% CI**
Ependymomas and Choroid Plexus Tumor	0	0.1	0.0	0.0 – 75.4
Astrocytomas	0	0.4	0.0	0.0 – 11.8
Intracranial & Intraspinal Embryonal Tumors	2	0.1	17.2	0.9 – 79.6
Other Gliomas	0	0.2	0.0	0.0 – 31.7
Other Specified Intracranial & Intraspinal Neoplasms	0	0.0	0.0	0.0 – 257.9
Unspecified Intracranial & Intraspinal Neoplasms	0	0.0	0.0	0.0 – 248.2

Note: The SIR (standardized incidence ratio) is defined as the number of observed cases divided by the number of expected cases. The latter is based on race-, sex-, and age-specific cancer incidence rates for Texas during the period 2000–2009. The SIR has been rounded to the first decimal place.

*Significantly higher than expected at the $p < 0.01$ level.
**Significantly lower than expected at the $p < 0.01$ level.

Table 2
Number of Observed and Expected Cancer Cases and Adjusted Standardized Incidence Ratios, Selected Cancers, Zip Code 79606, Abilene, TX, 2000–2009

Males				
Site	**Observed**	**Expected**	**SIR**	**99% CI**
Breast	1	1.0	1.0	0.0 – 7.1
Hodgkin's Lymphoma	5	3.0	1.7	0.4 – 4.8
Non-Hodgkin's Lymphoma	18	21.4	0.8	0.4 – 1.5
Myeloma	7	6.4	1.1	0.3 – 2.7
Acute Lymphocytic Leukemia	1	1.7	0.6	0.0 – 4.5
Chronic Lymphocytic Leukemia	3	6.3	0.5	0.1 – 1.8
Acute Myeloid Leukemia	4	4.2	1.0	0.2 – 3.1
Chronic Myeloid Leukemia	3	2.0	1.5	0.2 – 5.4
Aleukemic, Subleukemic, & NOS	1	0.8	1.3	0.0 – 9.5
Females				
Site	**Observed**	**Expected**	**SIR**	**99% CI**
Breast	124	135.8	0.9	0.7 – 1.2
Breast Under Age 40	10	6.6	1.5	0.6 – 3.2
Hodgkin's Lymphoma	2	2.4	0.8	0.0 – 3.8
Non-Hodgkin's Lymphoma	17	19.1	0.9	0.4 – 1.6
Myeloma	5	5.4	0.9	0.2 – 2.6
Acute Lymphocytic Leukemia	0	1.3	0.0	0.0 – 4.0
Chronic Lymphocytic Leukemia	3	4.5	0.7	0.1 – 2.5
Acute Myeloid Leukemia	4	3.5	1.1	0.2 – 3.6
Chronic Myeloid Leukemia	3	1.6	1.9	0.2 – 6.9
Aleukemic, Subleukemic, & NOS	2	0.7	2.7	0.1 – 12.7

Note: The SIR (standardized incidence ratio) is defined as the number of observed cases divided by the number of expected cases. The latter is based on race-, sex-, and age-specific cancer incidence rates for Texas during the period 2000–2009. The SIR has been rounded to the first decimal place.

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