March 30, 2011

Updated Summary Report of Texas Department of State Health Services Investigation of Specific Cancers Occurrences Within Zip Codes 75022 and 75028, Flower Mound Denton County, Texas

Covering 1999–2008, 2008–2010

Executive Summary

In 2010, concern about a possible excess of cancer diagnoses in Flower Mound, Texas, prompted the Texas Department of State Health Services (DSHS) to examine the occurrence of cancer in the Flower Mound Zip Codes 75022 and 75028. The original community concerns were prompted by fears that benzene was coming from area gas drilling and could be causing cancer. The initial cancers of concern were leukemia and non-Hodgkin's lymphoma; subsequent concerns included breast cancer and childhood brain/central nervous system (CNS) cancer.

This report updates a previous analysis by including more recent cancer data. To determine if selected cancers were elevated, DSHS evaluated complete, statewide incidence data (1999–2008) for childhood leukemia subtypes (0-19 years); all-age leukemia subtypes; all-age non-Hodgkin's lymphoma; female breast cancer; and childhood brain/central nervous system (CNS) cancers. DSHS also evaluated preliminary data for years 2008–2010 (As of March 2011).

Investigation Results

From January 1, 1999 to December 31, 2008, the number of childhood leukemia subtypes, childhood brain/CNS cancer subtypes, all-age leukemia subtypes, and all-age non-Hodgkin's lymphoma for Flower Mound Zip Codes 75022 and 75028 were within the expected ranges both for males and females. The number of female breast cancer cases found reported for each of these Zip Codes was statistically greater than what was expected. From 2008-2010, the average annual numbers of all cancers were similar to that found from 1999-2008.

Discussion

All leukemias (all ages and subtypes) and lymphomas fell within the expected ranges; however, the number of cases of breast cancer in females was statistically higher than what was expected. Due to inherent limitations associated with these types of investigations, DSHS cannot determine with any degree of certainty why the number of breast cancer cases is higher than expected in these areas but the increase is likely explained by the rapid increase in the Flower Mound population. For Flower Mound, population estimates indicate

that from 1999 to 2008 there was a 41% increase in the population (from 49,164 to 69,388). A larger population increases the expected number of cases. Since the expected number of cases in Flower Mound was calculated on the basis of population data from the 2000 Census, the result likely underestimated the number of expected cases. Although the 2010 Census data are now available, this population estimate would be too high for the period examined.

Recommendations

Due to the high level of citizen concern and more recently diagnosed cancer cases, DSHS will continue to confirm cases occurring in Flower Mound and update these analyses upon request as new data become available.

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Background

In 2010, concern about a possible excess of cancer diagnoses in Flower Mound, Texas, prompted the Texas Department of State Health Services (DSHS) to examine the occurrence of cancer in the Flower Mound Zip Codes 75022 and 75028. The original community concerns were prompted by fears that benzene was coming from area gas drilling and could be causing cancer. The initial cancers of concern were leukemia and non-Hodgkin's lymphoma; subsequent concerns included breast cancer and childhood brain/central nervous system (CNS) cancer.

This report updates a previous analysis by including more recent cancer data. To determine if selected cancers were elevated, DSHS evaluated complete, statewide incidence data (1999–2008) for childhood leukemia subtypes (0-19 years); all-age leukemia subtypes; all-age non-Hodgkin's lymphoma; female breast cancer; and childhood brain/central nervous system (CNS) cancers. Cluster analyses require complete statewide cancer data and currently the Texas Cancer Registry (TCR) is complete through 2008; however, DSHS also evaluated preliminary data for years 2008–2010 (As of March 2011). To protect patient confidentiality due to the small area under analysis and the rare cancer types investigated, data from 2008 were included with preliminary 2009 and 2010 data.

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 the results that would be "expected" from a calculation that applied state cancer rates to the 2000 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.

The U.S. Census is the only data source that provides population data below the county level broken down by all combinations of age, sex and race/ethnicity, which is used to calculate the expected number of cancers. However, due to extensive population growth in Flower Mound in the past decade, population numbers from the 2000 Census are low for the period examined (1999-2008). Using a population estimate that is too low results in an underestimated number of expected cancer cases and, therefore, the observed number of cases will commonly appear to be more than expected. Although the 2010 Census data are now available, this population estimate would be too high for the period examined.

Attached tables (Tables 1–6) 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 within 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.

Table 7 presents both the numbers of observed cases and the average annual numbers of cases for the same cancer sites from 2008–2010 (As of March 4, 2011) compared to cases occurring from 1999–2008. A statistical evaluation of these data was not conducted since the 2009-2010 data are not complete statewide and sufficient population (denominator) data are not yet available.

Investigation Results

Flower Mound Zip Codes 75022 and 75028 (1999-2008):
From January 1, 1999 to December 31, 2008, the number of childhood leukemia subtypes, childhood brain/CNS cancer subtypes, all-age leukemia subtypes, and all-age non-Hodgkin's lymphoma for the above Zip Code areas were within the expected ranges both for males and females. The number of female breast cancer cases found reported for each of these Zip Codes was statistically greater than what was expected. Analysis summaries are presented in Tables 1–6.

Flower Mound Zip Codes 75022 and 75028 (Preliminary data for 2008-2010):
From 2008–2010, there were three cases of childhood leukemia (all subtypes) and 1 case of childhood brain/CNS cancer. Two additional childhood cancer cases reported to DSHS by concerned citizens were found to reside in other zip code areas at the time of diagnosis and could not be included in the preliminary data. From 2008-2010, the average annual numbers of all cancers were similar to that found from 1999-2008. It should be noted that because of large year-to-year variation in the number of cases that may occur, it is impossible to draw any definitive conclusions from only three years of data.

Discussion

1999-2008 Data:
All leukemias (all ages and subtypes) and lymphomas fell within the expected ranges; however, the number of cases of breast cancer in females was statistically higher than what was expected. Due to inherent limitations associated with these types of investigations, DSHS cannot determine with any degree of certainty why the number of breast cancer cases is higher than expected in these areas but is likely explained by the rapid increase in the Flower Mound population. These types of analyses require detailed population data broken down by age, race/ethnicity, and sex; the most recent population data that DSHS is currently able to use at the Zip Code level are from the 2000 Census. For Flower Mound, population estimates (http://www.census.gov/popest/cities/cities.html) indicate that from 1999 to 2008 there was a 41% increase in the population (from 49,164 to 69,388). For a larger population, the expected number of cases would also be higher (Figure 1). As a result, it is likely that the number of expected cases was underestimated. While this would be true for all cancer sites, the fact that breast cancer is the most commonly diagnosed cancer in women, both in Texas

and the United State, might in part explain the statistically significant result. Screening rates also can influence the observed incidence of breast cancer. For cities like Flower Mound where the average education and income levels may be higher compared to the rest of the state, mammography screening rates tend to be higher which identifies more breast cancer cases than communities with lower education and income levels.

As for community's concerns that benzene from gas drilling could be causing cancer, long-term exposure to high levels of benzene in the air has been associated with leukemia, particularly acute myelogenous leukemia, often referred to as AML. Studies addressing the risk of leukemia associated with exposures to low levels of benzene (less than approximately 1 ppm) have been inconclusive. Several reports relate benzene exposure to a variety of lymphatic tumors including non-Hodgkin lymphoma and multiple myeloma. The association between exposure to benzene and development of non-hematologic tumors remains inconclusive.

Preliminary 2008–2010 Data:
The average numbers of cancers from 2008-2010 for the cancer sites examined were similar to the average numbers from 1999-2008. It is important to note that data from 2009 and 2010 are not complete and DSHS does not usually review preliminary data, especially when those data only cover a few years. Cancer data can vary substantially from year-to-year; therefore, extreme caution must be used when interpreting preliminary data. For instance, eight cases may be found one year and two the next; thus, to obtain an idea of what is occurring in a community it is important to capture cases captured over many years (Ten or more years is preferable). Additionally, when using preliminary, comparative statewide data, the most appropriate data for statistical comparison, are not available.

Recommendations

Due to the high level of citizen concern and more recently diagnosed cancer cases, DSHS will continue to confirm cases occurring in Flower Mound and update these analyses upon request as new data become available.

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 Lymphoid Leukemia:
Possible risk factors for childhood lymphoid leukemia include: having a sibling with leukemia; being white or Hispanic; being exposed to x-rays before birth; being exposed to radiation; past treatment with chemotherapy or radiation therapy; or having certain genetic disorders, such as Down syndrome.

Childhood Acute Myeloid Leukemia:
Possible risk factors for childhood acute myeloid leukemia include: having a sibling, especially a twin, with leukemia; Hispanic ethnicity; being exposed to cigarette smoke or alcohol before birth; having a history of myelodysplastic syndrome; past treatment with chemotherapy or radiation therapy; being exposed to ionizing radiation or chemicals such as benzene; or having certain genetic disorders, such as Down syndrome, Fanconi's anemia, or Noonan's syndrome.

Acute Lymphocytic Leukemia (ALL):
Possible ALL risk factors include: 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 CLL risk factors include: 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 AML risk factors 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 one out of five cases of AML is caused by smoking.

Chronic Myeloid Leukemia (CML):
Being exposed to high-dose radiation (such as surviving an atomic bomb blast or nuclear reactor accident) is the only known environmental risk factor for chronic myeloid leukemia.

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.

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.

Breast Cancer: The main risk factor for developing breast cancer is gender. 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 (SIR), Selected Childhood Cancers (Aged 0-19 Years), Zip Code 75022, Flower Mound, TX 1999–2008

Males 0-19				
Site	**Observed**	**Expected**	**SIR**	**99% CI**
Lymphoid Leukemias	3	0.9	3.2	0.4 – 11.8
Acute Myeloid Leukemia	0	0.2	0.0	0.0 – 26.4
Chronic Myeloproliferative Diseases	0	0.1	0.0	0.0 – 71.7
Myelodysplastic Syndrome & Other Myeloproliferative Diseases	0	0.0	0.0	N/A
Unspecified and Other Specified Leukemias	0	0.1	0.0	0.0 – 97.5
Ependymomas and Choroid Plexus Tumor	0	0.1	0.0	0.0 – 78.0
Astrocytomas	2	0.5	4.0	0.2 – 18.5
Intracranial & Intraspinal Embryonal Tumors	0	0.2	0.0	0.0 – 23.4
Other Gliomas	0	0.2	0.0	0.0 – 31.6
Other Specified Intracranial & Intraspinal Neoplasms	0	0.0	0.0	N/A
Unspecified Intracranial & Intraspinal Neoplasms	0	0.0	0.0	N/A
Females 0-19				
Site	**Observed**	**Expected**	**SIR**	**99% CI**
Lymphoid Leukemias	2	0.8	2.5	0.1 – 11.6
Acute Myeloid Leukemia	1	0.2	6.2	0.0 – 46.1
Chronic Myeloproliferative Diseases	0	0.1	0.0	0.0 – 64.4
Myelodysplastic Syndrome & Other Myeloproliferative Diseases	0	0.0	0.0	N/A
Unspecified and Other Specified Leukemias	0	0.0	0.0	N/A
Ependymomas and Choroid Plexus Tumor	0	0.1	0.0	0.0 – 78.0
Astrocytomas	0	0.4	0.0	0.0 – 12.1
Intracranial & Intraspinal Embryonal Tumors	0	0.1	0.0	0.0 – 46.8
Other Gliomas	0	0.1	0.0	0.0 – 37.6
Other Specified Intracranial & Intraspinal Neoplasms	0	0.0	0.0	N/A
Unspecified Intracranial & Intraspinal Neoplasms	0	0.0	0.0	N/A

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 1999–2008. 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.

Prepared by: Brenda J. Mokry, Epidemiologist, Epidemiology Studies & Initiatives Branch, Texas Department of State Health Services on 03/14/2011.

Table 2
Number of Observed and Expected Cancer Cases and Adjusted Standardized Incidence Ratios (SIR), Selected Childhood Cancers (Aged 0-19 Years), Zip Code 75028, Flower Mound, TX 1999–2008

Males 0-19				
Site	**Observed**	**Expected**	**SIR**	**99% CI**
Lymphoid Leukemias	2	2.6	0.8	0.0 – 3.6
Acute Myeloid Leukemia	1	0.6	1.8	0.0 – 13.4
Chronic Myeloproliferative Diseases	0	0.2	0.0	0.0 – 26.3
Myelodysplastic Syndrome & Other Myeloproliferative Diseases	0	0.1	0.0	0.0 – 43.8
Unspecified and Other Specified Leukemias	1	0.1	6.9	0.0 – 50.9
Ependymomas and Choroid Plexus Tumor	0	0.2	0.0	0.0 – 28.6
Astrocytomas	3	1.4	2.2	0.3 – 8.1
Intracranial & Intraspinal Embryonal Tumors	1	0.6	1.6	0.0 – 12.2
Other Gliomas	0	0.5	0.0	0.0 – 11.4
Other Specified Intracranial & Intraspinal Neoplasms	0	0.0	0.0	N/A
Unspecified Intracranial & Intraspinal Neoplasms	0	0.0	0.0	N/A
Females 0-19				
Site	**Observed**	**Expected**	**SIR**	**99% CI**
Lymphoid Leukemias	4	2.0	2.0	0.3 – 6.3
Acute Myeloid Leukemia	0	0.4	0.0	0.0 – 12.9
Chronic Myeloproliferative Diseases	0	0.2	0.0	0.0 – 25.3
Myelodysplastic Syndrome & Other Myeloproliferative Diseases	0	0.1	0.0	0.0 – 67.7
Unspecified and Other Specified Leukemias	0	0.1	0.0	0.0 – 59.2
Ependymomas and Choroid Plexus Tumor	0	0.2	0.0	0.0 – 30.6
Astrocytomas	0	1.1	0.0	0.0 – 4.8
Intracranial & Intraspinal Embryonal Tumors	0	0.3	0.0	0.0 – 18.3
Other Gliomas	1	0.4	2.8	0.0 – 20.5
Other Specified Intracranial & Intraspinal Neoplasms	0	0.0	0.0	N/A
Unspecified Intracranial & Intraspinal Neoplasms	0	0.1	0.0	0.0 – 94.2

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 1999–2008. 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.

Prepared by: Brenda J. Mokry, Epidemiologist, Epidemiology Studies & Initiatives Branch, Texas Department of State Health Services on 03/14/2011.

Table 3
Number of Observed and Expected Cancer Cases and Adjusted Standardized Incidence Ratios (SIR), Selected Childhood Cancers (Aged 0-19 Years), Zip Codes 75022 & 75028 Flower Mound, TX, 1999–2008

Males 0-19				
Site	**Observed**	**Expected**	**SIR**	**99% CI**
Lymphoid Leukemias	5	3.5	1.4	0.3 – 4.0
Acute Myeloid Leukemia	1	0.8	1.3	0.0 – 9.8
Chronic Myeloproliferative Diseases	0	0.3	0.0	0.0 – 19.2
Myelodysplastic Syndrome & Other Myeloproliferative Diseases	0	0.2	0.0	0.0 – 32.1
Unspecified and Other Specified Leukemias	1	0.2	5.0	0.0 – 37.1
Ependymomas and Choroid Plexus Tumor	0	0.3	0.0	0.0 – 20.9
Astrocytomas	5	1.9	2.7	0.6 – 7.6
Intracranial & Intraspinal Embryonal Tumors	1	0.8	1.2	0.0 – 8.9
Other Gliomas	0	0.6	0.0	0.0 – 8.4
Other Specified Intracranial & Intraspinal Neoplasms	0	0.0	0.0	N/A
Unspecified Intracranial & Intraspinal Neoplasms	0	0.0	0.0	N/A
Females 0-19				
Site	**Observed**	**Expected**	**SIR**	**99% CI**
Lymphoid Leukemias	6	2.8	2.1	0.6 – 5.6
Acute Myeloid Leukemia	1	0.6	1.8	0.0 – 13.0
Chronic Myeloproliferative Diseases	0	0.3	0.0	0.0 – 18.2
Myelodysplastic Syndrome & Other Myeloproliferative Diseases	0	0.1	0.0	0.0 – 48.7
Unspecified and Other Specified Leukemias	0	0.1	0.0	0.0 – 42.6
Ependymomas and Choroid Plexus Tumor	0	0.2	0.0	0.0 – 22.0
Astrocytomas	0	1.5	0.0	0.0 – 3.4
Intracranial & Intraspinal Embryonal Tumors	0	0.4	0.0	0.0 – 13.1
Other Gliomas	1	0.5	2.0	0.0 – 14.8
Other Specified Intracranial & Intraspinal Neoplasms	0	0.1	0.0	0.0 – 77.9
Unspecified Intracranial & Intraspinal Neoplasms	0	0.1	0.0	0.0 – 67.4

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 1999–2008. 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.

Prepared by: Brenda J. Mokry, Epidemiologist, Epidemiology Studies & Initiatives Branch, Texas Department of State Health Services on 03/14/2011.

Table 4
Number of Observed and Expected Cancer Cases and Adjusted Standardized Incidence Ratios (SIR), Selected Cancers (All Ages), Zip Code 75022, Flower Mound, TX 1999–2008

Males				
Site	**Observed**	**Expected**	**SIR**	**99% CI**
Acute Lymphocytic Leukemia	4	1.3	3.2	0.5 – 10.1
Chronic Lymphocytic Leukemia	1	1.8	0.5	0.0 – 4.0
Acute Myeloid Leukemia	0	1.6	0.0	0.0 – 3.4
Chronic Myeloid Leukemia	0	0.8	0.0	0.0 – 6.4
Aleukemic, Subleukemic, & NOS	0	0.2	0.0	0.0 – 24.5
Non-Hodgkin's Lymphoma	9	9.0	1.0	0.4 – 2.2
Breast	1	0.4	2.7	0.0 – 19.9
Females				
Site	**Observed**	**Expected**	**SIR**	**99% CI**
Acute Lymphocytic Leukemia	2	1.0	2.0	0.1 – 9.2
Chronic Lymphocytic Leukemia	1	1.1	0.9	0.0 – 6.5
Acute Myeloid Leukemia	3	1.4	2.2	0.3 – 8.0
Chronic Myeloid Leukemia	1	0.6	1.7	0.0 – 12.4
Aleukemic, Subleukemic, & NOS	0	0.2	0.0	0.0 – 28.2
Non-Hodgkin's Lymphoma	10	6.4	1.6	0.6 – 3.3
Breast	106	59.3	1.8*	1.4 – 2.3

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 1999–2008. 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.

Prepared by:
Brenda J. Mokry, Epidemiologist, Epidemiology Studies & Initiatives Branch, Texas Department of State Health Services on 03/14/2011.

Table 5
Number of Observed and Expected Cancer Cases and Adjusted Standardized Incidence Ratios (SIR), Selected Cancers (All Ages), Zip Code 75028, Flower Mound, TX 1999–2008

Males				
Site	**Observed**	**Expected**	**SIR**	**99% CI**
Acute Lymphocytic Leukemia	2	3.3	0.6	0.0 – 2.8
Chronic Lymphocytic Leukemia	4	3.5	1.1	0.2 – 3.6
Acute Myeloid Leukemia	4	3.4	1.2	0.2 – 3.7
Chronic Myeloid Leukemia	1	1.8	0.5	0.0 – 4.0
Aleukemic, Subleukemic, & NOS	2	0.5	4.3	0.2 – 19.9
Non-Hodgkin's Lymphoma	27	19.4	1.4	0.8 – 2.2
Breast	1	0.8	1.3	0.0 – 9.8
Females				
Site	**Observed**	**Expected**	**SIR**	**99% CI**
Acute Lymphocytic Leukemia	4	2.5	1.6	0.3 – 5.1
Chronic Lymphocytic Leukemia	1	2.2	0.5	0.0 – 3.5
Acute Myeloid Leukemia	6	3.1	1.9	0.5 – 5.0
Chronic Myeloid Leukemia	2	1.3	1.5	0.1 – 6.9
Aleukemic, Subleukemic, & NOS	0	0.4	0.0	0.0 – 14.3
Non-Hodgkin's Lymphoma	14	14.0	1.0	0.5 – 1.9
Breast	185	134.1	1.4*	1.1 – 1.7

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 1999–2008. 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.

Prepared by:
Brenda J. Mokry, Epidemiologist, Epidemiology Studies & Initiatives Branch, Texas Department of State Health Services on 03/14/2011.

Table 6
Number of Observed and Expected Cancer Cases and Adjusted Standardized Incidence Ratios (SIR), Selected Cancers (All Ages), Zip Codes 75022 & 75028
Flower Mound, TX
1999–2008

Males				
Site	**Observed**	**Expected**	**SIR**	**99% CI**
Acute Lymphocytic Leukemia	6	4.6	1.3	0.3 – 3.4
Chronic Lymphocytic Leukemia	5	5.4	0.9	0.2 – 2.6
Acute Myeloid Leukemia	4	5.0	0.8	0.1 – 2.5
Chronic Myeloid Leukemia	1	2.7	0.4	0.0 – 2.8
Aleukemic, Subleukemic, & NOS	2	0.7	2.9	0.2 – 13.6
Non-Hodgkin's Lymphoma	36	28.4	1.3	0.8 – 1.9
Breast	2	1.1	1.8	0.1 – 8.2
Females				
Site	**Observed**	**Expected**	**SIR**	**99% CI**
Acute Lymphocytic Leukemia	6	3.5	1.7	0.4 – 4.5
Chronic Lymphocytic Leukemia	2	3.3	0.6	0.0 – 2.8
Acute Myeloid Leukemia	9	4.5	2.0	0.7 – 4.5
Chronic Myeloid Leukemia	3	1.9	1.6	0.2 – 5.7
Aleukemic, Subleukemic, & NOS	0	0.6	0.0	0.0 – 9.5
Non-Hodgkin's Lymphoma	24	20.4	1.2	0.7 – 2.0
Breast	291	193.4	1.5*	1.3 – 1.8

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 1999–2008. 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.

Prepared by:
Brenda J. Mokry, Epidemiologist, Epidemiology Studies & Initiatives Branch, Texas Department of State Health Services on 03/14/2011.

Table 7
Number of Observed and Average Annual Number of Cancer Cases
Zip Codes 75022 and 75028 Combined, Flower Mound, TX,
2008-2010 Compared to 1999–2008

Site	Total Cases 2008-2010	Total Cases 1999-2008	Average Annual Cases 2008-2010	Average Annual Cases 1999-2008
Childhood Lymphoid Leukemias (0-19 Years)	2#	11	0.7	1.1
Childhood Acute Myeloid Leukemia (0-19 Years)	1	2	0.3	0.2
Childhood Brain/Central Nervous System (0-19 Years)	1	7	0.3	0.7
Acute Lymphocytic Leukemia (All Ages)	3	12	1.0	1.2
Chronic Lymphocytic Leukemia (All Ages)	1	7	0.3	0.7
Acute Myeloid Leukemia (All Ages)	7	13	2.3	1.3
Chronic Myeloid Leukemia (All Ages)	1	4	0.3	0.4
Other Leukemia Subtypes (All Ages)	3	7	1.0	0.7
Non-Hodgkin's Lymphoma (All Ages)	17	60	5.7	6.0
Female Breast (All Ages)	84	291	28.0	29.1

#TCR has heard from parents of two children diagnosed prior to moving to Flower Mound or diagnosed after moving elsewhere.

Cancer analysis file as of 03/04/2011.

Figure 1. Newly Diagnosed Female Breast Cancer Cases and Population Increases in Flower Mound, Texas, 1999-2008.