TEXAS Department of State Health Services

**News Release**
**March 24, 2010**

# Analysis of Cancer in Flower Mound Finds No Evidence of Cluster

**A Texas Department of State Health Services analysis has found that the occurrence of leukemia, non-Hodgkin's lymphoma and childhood brain cancers in two ZIP codes in Flower Mound, Texas, is within the expected ranges for males and females.**

**In response to community concerns about a possible cluster of cancer cases, DSHS analyzed the occurrence of childhood and overall leukemia, non-Hodgkin's lymphoma, childhood brain cancer and female breast cancer in the 75022 and 75028 ZIP codes, using Texas Cancer Registry data from 1998 to 2007. The number of cancer cases occurring in these two ZIP codes was compared with the number of cases expected based on statewide rates.**

**"The incidence of all but breast cancer was within a statistically normal range in these two Flower Mound areas," said Eric Miller, the DSHS epidemiologist who conducted the analysis. "We found nothing in the data to indicate the community is at higher risk for these types of cancers. However, we understand residents' concerns and will continue to analyze new cancer data from these two areas."**

**In ZIP code 75028 and both ZIP codes combined, the analysis did find a statistically higher than expected number of breast cancer cases, although there isn't any established scientific link between breast cancer and benzene, the contaminant of chief concern to the Flower Mound community. The breast cancer result could be due to overall population increases in Flower Mound and the likelihood that women in this area are more frequently screened for breast cancer.**

**In response to requests for an assessment of more current data, DSHS also compared the average annual number of cases for the same four cancers in the same two ZIP codes from 2007 to 2009 with the average annual number of cases from 1998 to 2007.**

**The average annual number of childhood leukemia and brain cancer cases remained essentially unchanged from 2007 to 2009 compared with the previous 10 years. The average**

**annual number of cases of overall leukemia, non-Hodgkin's lymphoma and breast cancer was somewhat higher from 2007 to 2009.**

**However, DSHS cautions against drawing any conclusions regarding the 2007 to 2009 results, as the data for this time period are still being received and evaluated by the department. The number of individual cancer cases can fluctuate significantly from year to year, particularly with rarer cancers and in such small geographic areas. An annual increase or decrease doesn't necessarily indicate a longer-term trend.**

**"Flower Mound's significant population increase alone could account for a higher average number of cancer cases between 2007 and 2009," Miller said. "We consider these figures a snapshot, not a complete picture, and that's why we'll continue to collect and analyze the data from this area."**

***(News Media Contact: Allison Lowery, DSHS Assistant Press Officer, 512-458-7753.)***

**The full DSHS report on Flower Mound begins on the next page and can be found at the link: www.dshs.state.tx.us/epitox/consults/flower_mound32010.pdf.**

**Summary of Investigation into the Occurrence of Cancer**
**Zip Codes 75022 and 75028, Flower Mound**
**Denton County, Texas**
**1998–2007, 2007–2009**
**March 8, 2010**

## Executive Summary

In response to citizen concerns about a possible elevation of cancer in Flower Mound, Texas, the Department of State Health Services (DSHS) Texas Cancer Registry (TCR) examined the occurrence of cancer in Flower Mound zip codes 75022 and 75028. Local citizens were concerned that benzene from gas drilling could be causing cancer.

Since benzene has been shown to have an association with leukemia and non-Hodgkin's lymphoma in the scientific literature, and to a lesser degree with childhood leukemias, the TCR evaluated complete, statewide incidence data (1998–2007) for childhood leukemia subtypes (0-19 years), all age leukemia subtypes, and all age non-Hodgkin's lymphoma. Breast and childhood brain/central nervous system (CNS) cancers were included in the analyses because of separate requests from concerned citizens.

The TCR also evaluated the preliminary numbers of cancer cases occurring from 2007–2009 received as of March 2010, compared to 1998-2007 for the same cancer sites. In order to protect patient confidentiality with such a small area of analysis (zip codes) and some rare cancer sites, data from 2007 were included with preliminary 2008 and 2009 data. No statistical evaluation could be conducted since 2008-2009 data are not yet complete statewide, and sufficient population (denominator) data are not yet available. It should also be noted that because of the 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.

*Investigation of 1998–2007 Flower Mound Zip Codes 75022 and 75028:*

There was no evidence of a cancer cluster in zip codes 75022 and 75028. However, there was a slight elevation of female breast cancer, which is consistent with the population growth in the area and likely higher mammography use compared to Texas overall.

The analysis of incidence data for zip codes 75022 and 75028, Flower Mound, Texas, from January 1, 1998–December 31, 2007, found childhood leukemia subtypes, childhood brain/CNS cancer subtypes, all age leukemia subtypes, and all age non-Hodgkin's lymphoma to be within expected ranges in both males and females. A statistically significant elevation was found among females for breast cancer in zip code 75028 and both zip codes combined (but not 75022 alone).

Because of the inherent limitations associated with these types of investigations, we cannot determine with any degree of certainty why the number of breast cancer cases is higher than expected among females in zip code 75028. Breast cancer is the most

commonly diagnosed cancer in Texas and the U.S., and these results may in part be explained by the rapid increase in the Flower Mound population.

*Investigation of Preliminary 2007–2009 Flower Mound Zip Codes 75022 and 75028:*

From 2007–2009, there were 5 cases of childhood leukemia (all subtypes) and 2 brain/CNS cancers. Two additional childhood cancer cases reported to the TCR by concerned citizens were found to reside in zip codes other than 75022 and 75028 at the time of diagnosis, so they could not be included in the preliminary data. Comparison of the average annual number of cases between 2007-2009 and 1998-2007 does not take into account the population growth that occurred in this area between the time periods; more people usually results in more cases. Compared to 1998-2007, the average annual number of cases between 2007-2009 remained essentially unchanged for all childhood cancers. The average annual number of cases of all age acute leukemias, non-Hodgkin's lymphoma and breast cancer were somewhat higher from 2007 to 2009.

The TCR does not usually review preliminary data, such as that from 2008 and 2009, particularly when those data only cover a few years. Cancer data can vary substantially from year-to-year. Caution must be used when interpreting preliminary data such as these because the number of cases represented in the preliminary data could change. The receipt of additional information or a subsequent review of the cancer reports for coding validity/quality assurance purposes might change the status of the preliminary cases reported, impacting the actual number of cases.

**Recommendations:**
Due to the high level of citizen concern about the environment and more recently diagnosed cancer cases, as well as having only preliminary TCR 2008–2009 data available at this time, the TCR will continue to confirm cases reported from the public, work with the DSHS Environmental & Injury Epidemiology & Toxicology Unit, and update these analyses as new data become available.

**Summary of Investigation into the Occurrence of Cancer**
**Zip Codes 75022 and 75028, Flower Mound**
**Denton County, Texas**
**1998–2007, 2007–2009**
**March 8, 2010**

## Background:

In response to citizen concerns about a possible elevation of cancer in Flower Mound, Texas, the Department of State Health Services (DSHS) Texas Cancer Registry (TCR) examined the occurrence of cancer in Flower Mound zip codes 75022 and 75028. Local citizens were concerned that benzene from gas drilling could be causing cancer. Since benzene has been shown to have an association with leukemia and non-Hodgkin's lymphoma in the scientific literature, and to a lesser degree with childhood leukemias, the TCR evaluated complete, statewide incidence data (1998–2007) for childhood leukemia subtypes (0-19 years), all age leukemia subtypes, and all age non-Hodgkin's lymphoma. Breast and childhood brain/central nervous system (CNS) cancers were included in the analyses because of separate requests from concerned citizens. The TCR also evaluated the preliminary numbers of cancer cases occurring from 2007–2009, (received as of March 2010) compared to 1998-2007 for the same cancer sites. In order to protect patient confidentiality with such a small area of analysis (zip codes) and some rare cancer sites, data from 2007 were included with preliminary 2008 and 2009 data.

Incidence data, as opposed to mortality data, are the best indicator of the occurrence of cancer in an area because they accurately show the number and types of cancer diagnosed each year. In Texas, incidence data meet national standards for high quality data. The rest of this report examines the investigative methods the TCR used, the results of the investigation, recommendations, and general information on cancer risk factors.

## Methodology:

According to the National Cancer Institute, 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 whether the cancers are associated with any environmental or other risk factors.

The TCR follows guidelines recommended by the Centers for Disease Control and Prevention for investigating these types of concerns[1] and often works with the DSHS Environmental and Injury Epidemiology and Toxicology Unit and other state and federal agencies. In order to determine whether an elevation of cancer is occurring and whether further study is needed, epidemiologic and toxicologic evidence are considered. Such evidence may include the statistical significance of the findings; the magnitude of the observed effect; risk factors; documented exposures; the toxicity of the exposures; plausible routes by which exposures can reach people (ingesting, touching, breathing); the actual

amount of exposure; absorption into the body; the time from exposure to development of cancer; and the consistency of the findings over time. The occurrence of rare cancers or unlikely cancers in certain age groups also may justify the need for additional study.

If further study is indicated, the TCR and the Environmental and Injury Epidemiology and Toxicology Unit will determine the feasibility of conducting an epidemiologic study and whether a study could be designed to see if the cancer(s) can be related to the exposure of concern. 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 were compared to what would be "expected" by applying state cancer rates to the 2000 Census population data for the area being investigated. Calculating the expected number(s) of cancer cases takes into consideration the race, sex, and ages of people who are diagnosed with cancer. This is important because cancer rates can be substantially different by race, sex, and age. If we are trying to determine if there is more or less cancer in a community compared to the rest of the state, we must make sure that the difference in cancer rates is not simply due to one of these factors.

The attached Tables 1–6 present the number of observed cases for males and females, the number of "expected" cases, the standardized incidence ratio (SIR), and the 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 the incidence in the rest of 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 we would have expected. Conversely, an SIR greater than 1.0 indicates that there are more cases of a specific type of cancer in the area than we would have expected. Because an excess of cancer may occur by chance alone, the role of chance is considered in the statistical analysis. To determine whether an SIR greater than 1.0 or less than 1.0 is statistically significant, or outside the variation likely to be due to chance, confidence intervals are also calculated.

A 99% confidence interval is used for determining statistical significance and takes into account the likelihood that the result occurred by chance. Because there is variability in the number of cancer cases that occur each year and some uncertainty in calculating the expected number of cases, the confidence interval provides a range in which we would expect the SIR to fall 99% of the time. If the confidence interval for the SIR contains a range that includes 1.0, the result is not statistically significant and the observed number of cases is within a range that is considered no different than the expected number of cases. The confidence intervals are particularly important when trying to interpret small numbers of cases. When dealing with a small number of cases and a small population (for example, a zip code), the confidence interval will be wide. Wide confidence intervals reflect greater uncertainty in the results. Additionally, if only one or two cases are expected for a particular cancer, then the report of three or four observed cases will result in a very large SIR. A more extreme example would be the situation where the expected number of cases was less than 1.0; in such an instance 1 case can result in a very high SIR. As long as the 99% confidence interval contains 1.0, the SIR is still within the range one might expect and is, therefore, 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 2007–2009 (received as of March 5, 2010) compared to cases occurring from 1998–2007. In order to protect patient confidentiality with such a small area of analysis (zip codes) and some rare cancer sites, data from 2007 were included with preliminary 2008 and 2009 data. No statistical evaluation could be conducted since 2008-2009 data are not yet complete statewide, and sufficient population (denominator) data are not yet available. It should also be noted that because of the 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.

**Results:**

*Investigation of 1998–2007 Flower Mound Zip Codes 75022 and 75028:*

The analysis of incidence data for zip codes 75022 and 75028, Flower Mound, Texas, from January 1, 1998–December 31, 2007, found childhood leukemia subtypes, childhood brain/CNS cancer subtypes, all age leukemia subtypes, and all age non-Hodgkin's lymphoma to be within expected ranges in both males and females. A statistically significant elevation was found among females for breast cancer in zip code 75028 and both zip codes combined. Analysis summaries are presented in Tables 1–6.

*Investigation of Preliminary 2007–2009 Flower Mound Zip Codes 75022 and 75028:*

From 2007–2009, there were 5 cases of childhood leukemia (all subtypes) and 2 childhood brain/CNS cancers. Two additional childhood cancer cases reported to the TCR by concerned citizens were found to reside in zip codes other than 75022 and 75028 at the time of diagnosis, so they could not be included in the preliminary data. Comparison of the average annual number of cases between 2007-2009 and 1998-2007 does not take into account the population growth that occurred in this area between the time periods; more people usually results in more cases. Compared to 1998-2007, the average annual number of cases between 2007-2009 remained essentially unchanged for all childhood cancers. The average annual number of cases of all age acute leukemias, non-Hodgkin's lymphoma and breast cancer were somewhat higher from 2007 to 2009.

**Discussion:**

*1998-2007 Data*

All leukemias (all ages and subtypes) and lymphomas fell within the expected ranges. Elevated SIRs could in part be explained by the small number of cases relative to the low number of expected cases. This is reflected in the wide ranges in the 99% confident intervals, as wide confidence intervals indicate high variability. Only the number of cases of breast cancer in females was found to be statistically higher than what would be expected.

Because of the inherent limitations associated with these types of investigations, we cannot determine with any degree of certainty why the number of breast cancer cases is higher than expected among females in zip code 75028. Breast cancer is the most commonly diagnosed

cancer in Texas and the United States, and these results may in part be explained by the rapid increase in the Flower Mound population. With a larger population we would expect to find more cases of cancer (Figure 1). Since a cluster analysis requires detailed population data broken down by age, race/ethnicity and sex, the most recent population data the TCR can use at the zip code level for this analysis are from 2000. However, population estimates for Flower Mound indicate that the population has increased from 44,173 in 1998 to 68,337 in 2007 (http://www.census.gov/popest/cities/cities.html). As a result, the expected number of cases is likely underestimated. Although this would be true for all cancer sites, because breast cancer is much more common, it might have contributed to the statistically significant result.

Other possible explanations for the result include chance and population demographics. Although the SIR was statistically significantly greater than 1.0, elevations can still occur by chance. In addition, the population in Flower Mound has higher average education and income levels compared to the state overall. As a result, mammography screening rates tend to be higher and identify more cases of breast cancer than communities with less screening.

*Preliminary 2007–2009 Data*

Although the average numbers of cancer cases for most cancers were higher from 2007–2009 compared to 1998–2007, it cannot be assumed that the number of cases over 10 years will be statistically significantly greater than expected. In addition, the rapid growth in the Flower Mound population will also influence the average annual number of cases and needs to be considered when comparing the two different time periods.

The TCR does not usually review preliminary data, particularly when those data only cover a few years. Cancer data can vary substantially from year-to-year, for instance you may find 8 cases one year and 2 the next; thus, to obtain an idea of what is happening in a community it is important to consider the number of cases captured over many years (generally, 10 years is preferable). Additionally, when using preliminary data such as these, comparative statewide data, the most appropriate data for statistical comparison, are not available. Extreme caution must be used when interpreting preliminary data such as these because the number of cases represented in the preliminary data could change. The receipt of additional information or a subsequent review of the cancer reports for coding validity/quality assurance purposes might change the status of the preliminary cases reported, impacting the actual number of cases.

**Recommendations:**

Due to the high level of citizen concern about the environment and more recently diagnosed cancer cases, as well as having only preliminary TCR 2008–2009 data available at this time, the TCR will continue to confirm cases reported from the public, work with the DSHS Environmental & Injury Epidemiology & Toxicology Unit, and update these analyses 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 we 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 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.

**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:** 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 our web site at http://www.dshs.state.tx.us/tcr/.

Questions or comments regarding this investigation may be directed to Ms. Brenda Mokry, Environmental & Injury Epidemiology & Toxicology Unit, 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 Race Adjusted Standardized Incidence Ratios, Selected Childhood Cancers (Aged 0-19 Years), Zip Code 75022, Flower Mound, TX, 1998–2007**

| Males 0-19 | | | | |
|---|---|---|---|---|
| **Site** | **Observed** | **Expected** | **SIR** | **99% CI** |
| **Lymphoid Leukemias** | 4 | 0.9 | 4.3 | 0.7 – 13.4 |
| **Acute Myeloid Leukemia** | 0 | 0.2 | 0.0 | 0.0 – 27.0 |
| **Chronic Myeloproliferative Diseases** | 0 | 0.1 | 0.0 | 0.0 – 86.1 |
| **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 – 81.2 |
| **Astrocytomas** | 2 | 0.5 | 4.2 | 0.2 – 19.6 |
| **Intracranial & Intraspinal Embryonal Tumors** | 0 | 0.2 | 0.0 | 0.0 – 24.1 |
| **Other Gliomas** | 0 | 0.2 | 0.0 | 0.0 – 30.9 |
| **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 | 6.6 | 0.0 – 48.8 |
| **Chronic Myeloproliferative Diseases** | 0 | 0.1 | 0.0 | 0.0 – 77.6 |
| **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 – 68.0 |
| **Astrocytomas** | 0 | 0.4 | 0.0 | 0.0 – 11.9 |
| **Intracranial & Intraspinal Embryonal Tumors** | 0 | 0.1 | 0.0 | 0.0 – 46.6 |
| **Other Gliomas** | 0 | 0.1 | 0.0 | 0.0 – 37.7 |
| **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 1998–2007. 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.

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**Table 2**
**Number of Observed and Expected Cancer Cases and Race Adjusted Standardized Incidence Ratios, Selected Childhood Cancers (Aged 0-19 Years), Zip Code 75028, Flower Mound, TX, 1998–2007**

| Males 0-19 | | | | |
|---|---|---|---|---|
| **Site** | **Observed** | **Expected** | **SIR** | **99% CI** |
| **Lymphoid Leukemias** | 3 | 2.6 | 1.2 | 0.1 – 4.3 |
| **Acute Myeloid Leukemia** | 0 | 0.5 | 0.0 | 0.0 – 9.9 |
| **Chronic Myeloproliferative Diseases** | 0 | 0.2 | 0.0 | 0.0 – 31.5 |
| **Myelodysplastic Syndrome & Other Myeloproliferative Diseases** | 0 | 0.1 | 0.0 | 0.0 – 49.1 |
| **Unspecified and Other Specified Leukemias** | 1 | 0.1 | 7.6 | 0.0 – 56.1 |
| **Ependymomas and Choroid Plexus Tumor** | 0 | 0.2 | 0.0 | 0.0 – 29.7 |
| **Astrocytomas** | 3 | 1.3 | 2.3 | 0.3 – 8.6 |
| **Intracranial & Intraspinal Embryonal Tumors** | 1 | 0.6 | 1.7 | 0.0 – 12.5 |
| **Other Gliomas** | 1 | 0.5 | 2.1 | 0.0 – 15.8 |
| **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 | 2.0 | 1.0 | 0.1 – 4.6 |
| **Acute Myeloid Leukemia** | 0 | 0.4 | 0.0 | 0.0 – 13.7 |
| **Chronic Myeloproliferative Diseases** | 0 | 0.2 | 0.0 | 0.0 – 30.3 |
| **Myelodysplastic Syndrome & Other Myeloproliferative Diseases** | 0 | 0.1 | 0.0 | 0.0 – 76.5 |
| **Unspecified and Other Specified Leukemias** | 0 | 0.1 | 0.0 | 0.0 – 56.6 |
| **Ependymomas and Choroid Plexus Tumor** | 0 | 0.2 | 0.0 | 0.0 – 26.9 |
| **Astrocytomas** | 1 | 1.1 | 0.9 | 0.0 – 6.6 |
| **Intracranial & Intraspinal Embryonal Tumors** | 0 | 0.3 | 0.0 | 0.0 – 18.2 |
| **Other Gliomas** | 1 | 0.4 | 2.8 | 0.0 – 20.6 |
| **Other Specified Intracranial & Intraspinal Neoplasms** | 0 | 0.1 | 0.0 | 0.0 – 96.9 |
| **Unspecified Intracranial & Intraspinal Neoplasms** | 0 | 0.1 | 0.0 | 0.0 – 84.0 |

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 1998–2007. 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:
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02/24/2010

**Table 3**
**Number of Observed and Expected Cancer Cases and Race Adjusted Standardized Incidence Ratios, Selected Childhood Cancers (Aged 0-19 Years), Zip Codes 75022 & 75028, Flower Mound, TX, 1998–2007**

| Males 0-19 | | | | |
|---|---|---|---|---|
| **Site** | **Observed** | **Expected** | **SIR** | **99% CI** |
| **Lymphoid Leukemias** | 7 | 3.5 | 2.0 | 0.6 – 4.9 |
| **Acute Myeloid Leukemia** | 0 | 0.7 | 0.0 | 0.0 – 7.2 |
| **Chronic Myeloproliferative Diseases** | 0 | 0.2 | 0.0 | 0.0 – 23.1 |
| **Myelodysplastic Syndrome & Other Myeloproliferative Diseases** | 0 | 0.1 | 0.0 | 0.0 – 36.0 |
| **Unspecified and Other Specified Leukemias** | 1 | 0.2 | 5.5 | 0.0 – 41.0 |
| **Ependymomas and Choroid Plexus Tumor** | 0 | 0.2 | 0.0 | 0.0 – 21.7 |
| **Astrocytomas** | 5 | 1.8 | 2.9 | 0.6 – 8.1 |
| **Intracranial & Intraspinal Embryonal Tumors** | 1 | 0.8 | 1.2 | 0.0 – 9.1 |
| **Other Gliomas** | 1 | 0.6 | 1.6 | 0.0 – 11.6 |
| **Other Specified Intracranial & Intraspinal Neoplasms** | 0 | 0.1 | 0.0 | 0.0 – 87.1 |
| **Unspecified Intracranial & Intraspinal Neoplasms** | 0 | 0.1 | 0.0 | 0.0 – 84.4 |
| **Females 0-19** | | | | |
| **Site** | **Observed** | **Expected** | **SIR** | **99% CI** |
| **Lymphoid Leukemias** | 4 | 2.8 | 1.4 | 0.2 – 4.5 |
| **Acute Myeloid Leukemia** | 1 | 0.5 | 1.9 | 0.0 – 13.8 |
| **Chronic Myeloproliferative Diseases** | 0 | 0.2 | 0.0 | 0.0 – 21.8 |
| **Myelodysplastic Syndrome & Other Myeloproliferative Diseases** | 0 | 0.1 | 0.0 | 0.0 – 54.9 |
| **Unspecified and Other Specified Leukemias** | 0 | 0.1 | 0.0 | 0.0 – 40.7 |
| **Ependymomas and Choroid Plexus Tumor** | 0 | 0.3 | 0.0 | 0.0 – 19.3 |
| **Astrocytomas** | 1 | 1.6 | 0.6 | 0.0 – 4.7 |
| **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 – 69.7 |
| **Unspecified Intracranial & Intraspinal Neoplasms** | 0 | 0.1 | 0.0 | 0.0 – 60.0 |

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 1998–2007. 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.

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02/24/2010

**Table 4**
**Number of Observed and Expected Cancer Cases and Race Adjusted Standardized Incidence Ratios, Selected Cancers (All Ages), Zip Code 75022, Flower Mound, TX, 1998–2007**

| Males | | | | |
|---|---|---|---|---|
| **Site** | **Observed** | **Expected** | **SIR** | **99% CI** |
| **Acute Lymphocytic Leukemia** | 4 | 1.2 | 3.2 | 0.5 – 10.1 |
| **Chronic Lymphocytic Leukemia** | 1 | 1.8 | 0.6 | 0.0 – 4.1 |
| **Acute Myeloid Leukemia** | 0 | 1.6 | 0.0 | 0.0 – 3.4 |
| **Chronic Myeloid Leukemia** | 1 | 0.8 | 1.2 | 0.0 – 9.0 |
| **Aleukemic, Subleukemic, & NOS** | 0 | 0.2 | 0.0 | 0.0 – 25.3 |
| **Non-Hodgkin's Lymphoma** | 7 | 8.9 | 0.8 | 0.2 – 1.9 |
| **Breast** | 2 | 0.6 | 3.3 | 0.2 – 15.4 |
| **Females** | | | | |
| **Site** | **Observed** | **Expected** | **SIR** | **99% CI** |
| **Acute Lymphocytic Leukemia** | 2 | 1.0 | 2.0 | 0.1 – 9.1 |
| **Chronic Lymphocytic Leukemia** | 1 | 1.1 | 0.9 | 0.0 – 6.7 |
| **Acute Myeloid Leukemia** | 3 | 1.3 | 2.2 | 0.3 – 8.2 |
| **Chronic Myeloid Leukemia** | 1 | 0.6 | 1.7 | 0.0 – 12.6 |
| **Aleukemic, Subleukemic, & NOS** | 0 | 0.2 | 0.0 | 0.0 – 27.5 |
| **Non-Hodgkin's Lymphoma** | 7 | 6.4 | 1.1 | 0.3 – 2.7 |
| **Breast** | 68 | 59.3 | 1.2 | 0.8 – 1.6 |

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 1998–2007. 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:
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02/24/2010

**Table 5**
**Number of Observed and Expected Cancer Cases and Race Adjusted Standardized Incidence Ratios, Selected Cancers (All Ages), Zip Code 75028, Flower Mound, TX, 1998–2007**

| Males | | | | |
|---|---|---|---|---|
| **Site** | **Observed** | **Expected** | **SIR** | **99% CI** |
| **Acute Lymphocytic Leukemia** | 3 | 3.3 | 0.9 | 0.1 – 3.3 |
| **Chronic Lymphocytic Leukemia** | 3 | 3.5 | 0.9 | 0.1 – 3.1 |
| **Acute Myeloid Leukemia** | 3 | 3.5 | 0.9 | 0.1 – 3.1 |
| **Chronic Myeloid Leukemia** | 1 | 1.8 | 0.6 | 0.0 – 4.1 |
| **Aleukemic, Subleukemic, & NOS** | 2 | 0.5 | 4.4 | 0.2 – 20.6 |
| **Non-Hodgkin's Lymphoma** | 29 | 19.2 | 1.5 | 0.9 – 2.4 |
| **Breast** | 3 | 1.2 | 2.4 | 0.3 – 8.9 |
| **Females** | | | | |
| **Site** | **Observed** | **Expected** | **SIR** | **99% CI** |
| **Acute Lymphocytic Leukemia** | 2 | 2.5 | 0.8 | 0.0 – 3.7 |
| **Chronic Lymphocytic Leukemia** | 2 | 2.1 | 1.0 | 0.1 – 4.4 |
| **Acute Myeloid Leukemia** | 2 | 3.1 | 0.7 | 0.0 – 3.0 |
| **Chronic Myeloid Leukemia** | 2 | 1.3 | 1.5 | 0.1 – 7.0 |
| **Aleukemic, Subleukemic, & NOS** | 0 | 0.4 | 0.0 | 0.0 – 14.4 |
| **Non-Hodgkin's Lymphoma** | 12 | 13.8 | 0.9 | 0.4 – 1.8 |
| **Breast** | 183 | 134.0 | 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 1998–2007. The SIR has been rounded to the first decimal place.

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

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02/24/2010

**Table 6**
**Number of Observed and Expected Cancer Cases and Race Adjusted Standardized Incidence Ratios, Selected Cancers (All Ages), Zip Codes 75022 & 75028, Flower Mound, TX, 1998–2007**

| Males | | | | |
|---|---|---|---|---|
| **Site** | **Observed** | **Expected** | **SIR** | **99% CI** |
| **Acute Lymphocytic Leukemia** | 7 | 4.6 | 1.5 | 0.5 – 3.8 |
| **Chronic Lymphocytic Leukemia** | 4 | 5.4 | 0.8 | 0.1 – 2.4 |
| **Acute Myeloid Leukemia** | 3 | 5.1 | 0.6 | 0.1 – 2.2 |
| **Chronic Myeloid Leukemia** | 2 | 2.7 | 0.8 | 0.0 – 3.5 |
| **Aleukemic, Subleukemic, & NOS** | 2 | 0.7 | 3.0 | 0.2 – 14.0 |
| **Non-Hodgkin's Lymphoma** | 36 | 28.1 | 1.3 | 0.8 – 1.9 |
| **Breast** | 5 | 1.8 | 2.7 | 0.6 – 7.7 |
| **Females** | | | | |
| **Site** | **Observed** | **Expected** | **SIR** | **99% CI** |
| **Acute Lymphocytic Leukemia** | 4 | 3.5 | 1.1 | 0.2 – 3.6 |
| **Chronic Lymphocytic Leukemia** | 3 | 3.2 | 0.9 | 0.1 – 3.4 |
| **Acute Myeloid Leukemia** | 5 | 4.4 | 1.1 | 0.2 – 3.2 |
| **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** | 19 | 20.2 | 0.9 | 0.5 – 1.7 |
| **Breast** | 251 | 193.3 | 1.3* | 1.1 – 1.5 |

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 1998–2007. The SIR has been rounded to the first decimal place.

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

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02/24/2010

**Table 7**
**Number of Observed and Average Annual Number of Cancer Cases**
**Zip Codes 75022 and 75028 Combined, Flower Mound, TX, 2008-2009**
**Compared to 1998–2007**

| Site | Total Cases 2007-2009 | Total Cases 1998-2007 | Average Annual Cases 2007-2009 | Average Annual Cases 1998-2007 |
|---|---|---|---|---|
| **Childhood Lymphoid Leukemias (0-19 Years)** | 4[#] | 11 | 1.3 | 1.1 |
| **Childhood Acute Myeloid Leukemia (0-19 Years)** | 1 | 1 | 0.3 | 0.1 |
| **Childhood Brain/Central Nervous System (0-19 Years)** | 2 | 9 | 0.7 | 0.9 |
| **Acute Lymphocytic Leukemia (All Ages)** | 5 | 11 | 1.7 | 1.1 |
| **Chronic Lymphocytic Leukemia (All Ages)** | 2 | 7 | 0.7 | 0.7 |
| **Acute Myeloid Leukemia (All Ages)** | 7 | 6 | 2.3 | 0.6 |
| **Chronic Myeloid Leukemia (All Ages)** | 4 | 5 | 1.3 | 0.5 |
| **Other Leukemia Subtypes (All Ages)** | 2 | 2 | 0.7 | 0.2 |
| **Non-Hodgkin's Lymphoma (All Ages)** | 25 | 55 | 8.3 | 5.5 |
| **Female Breast (All Ages)** | 118 | 251 | 39.3 | 25.1 |

#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 03/07/2010.

**Figure 1. Newly Diagnosed Female Breast Cancer Cases and Population Increases in Flower Mound, Texas, 1998-2007**