Summary of Investigation into the Occurrence of Cancer
Zip Code 77536, Deer Park
Harris County, Texas
1996–2005
August 25, 2008

Background: Concern about a possible excess of cancer prompted the Texas Cancer Registry (TCR) of the Texas Department of State Health Services (DSHS) to examine the occurrence of cancer in zip codes 77536, Deer Park, Texas. Local citizens were concerned that unknown environmental toxins may be causing cancer. The TCR evaluated 1996–2005 incidence data for cancers of the prostate, breast, lung, oral cavity and pharynx, liver and intrahepatic bile duct, pancreas, bladder, kidney and renal pelvis, total childhood cancers, Hodgkin's lymphoma, non-Hodgkin's lymphoma, multiple myeloma, and select leukemia subtypes. Incidence data are the best indicator of the occurrence of cancer in an area because they more accurately show the number and types of cancer diagnosed each year than mortality data. Compared with previous investigations that included mortality data as a supplemental measure, the TCR now solely uses incidence data for assessment of possible cancer clusters. This is due to the improved timeliness, quality, and availability of incidence data which meet national standards for high data quality. 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. The cancer cluster investigation is the primary tool used by the TCR to investigate the possibility of excess cancer in a community. The cancer cluster investigation cannot determine that cancer was associated with or caused by environmental or other risk factors. Instead, the cancer cluster investigation is specifically intended to address the question "Is there an excess of cancer in the area or population of concern?"

The TCR follows guidelines recommended by the Centers for Disease Control and Prevention for investigating cancer clusters[1] and often works with the DSHS Environmental and Injury Epidemiology and Toxicology Branch, as well as other state and federal agencies. In order to determine if an excess of cancer is occurring and if further study is recommended, epidemiologic evidence is considered. Such evidence may include documented exposures; the toxicity of the exposures; plausible routes by which exposures can reach people (ingesting, touching, breathing); the actual amount of exposure to the people which can lead to absorption in the body; the time from exposure to development of cancer; the statistical significance of the findings; the magnitude of the effect observed; risk factors; and the consistency of the findings over time. The occurrence of rare cancers or unlikely cancers in certain age groups may also indicate a cluster needing further study. Because excesses of cancer may occur by chance alone, the role of chance is considered in the statistical analysis.

If further study is indicated, the TCR will determine the feasibility of conducting an epidemiologic study. If the epidemiologic study is feasible, the final step is to recommend an

etiologic investigation 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 was compared to what would be "expected" based on the state cancer rates. 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 a person's race, sex, and age all impact cancer rates. 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 1–3 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 standardized incidence ratio (SIR) is simply the number of observed cases compared to 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 is less than 1.0, fewer people developed cancer than we would have expected. Conversely, an SIR greater than 1.0 indicates that more people developed cancer than we would have expected. To determine if 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 statistical significance and takes into account the likelihood that the result occurred by chance. It also indicates the range in which we would expect the SIR to fall 99% of the time. If the confidence interval contains a range that includes 1.0, no statistically significant excess of cancer is indicated. The confidence intervals are particularly important when trying to interpret small numbers of cases. 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. As long as the 99% confidence interval contains 1.0, this indicates that the SIR is still within the range one might expect and, therefore, not statistically significant.

Results: The analysis of incidence data for zip codes 77536, Deer Park, Texas, from January 1, 1996–December 31, 2005, found cancers of the prostate, breast, lung, oral cavity and pharynx, bladder, liver and intrahepatic bile duct, kidney and renal pelvis, pancreas, total childhood cancers, Hodgkin's lymphoma, non-Hodgkin's lymphoma, multiple myeloma, and select leukemia subtypes to be within expected ranges in both males and females. Analysis summaries are presented in Tables 1–3.

Discussion: Like other studies, this cancer cluster investigation had limitations. The incidence data 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 codes 77536, Deer Park, 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 we can do nothing about, but many are a matter of choice.

Prostate Cancer: Prostate cancer is the most common type of malignant cancer (other than skin) diagnosed in men, affecting an estimated one in five American men. Risk factors for prostate cancer include aging, a high fat diet, physical inactivity, and a family history of prostate cancer. African American men are at higher risk of acquiring prostate cancer and dying from it. Prostate cancer is most common in North America and northwestern Europe. It is less common in Asia, Africa, Central America, and South America.

Lung and Bronchus Cancer: The greatest single risk factor for lung cancer is smoking. The American Cancer Society estimates that 87% of lung cancer is due to smoking. Several studies have shown that the lung cells of women have a genetic predisposition to develop cancer when they are exposed to tobacco smoke. Other risk factors include secondhand smoke, asbestos exposure, radon exposure, other carcinogenic agents in the workplace such as arsenic or vinyl chloride, marijuana smoking, recurring inflammation of the lungs, exposure to industrial grade talc, people with silicosis and berylliosis, personal and family history of lung cancer, and diet. In some cities, air pollution may slightly increase the risk of lung cancer. This risk is far less than that caused by smoking.

Colon and Rectum Cancer: Researchers have identified several risk factors that increase a person's chance of developing colon cancer: family and personal history of colon cancer, hereditary conditions such as familial adenomatous polyposis, personal history of intestinal polyps and chronic inflammatory bowel disease, aging, a diet mostly from animal sources, physical inactivity, obesity, smoking, and heavy use of alcohol. People with diabetes have a 30%-40% increased chance of developing colon cancer. Recent research has found a genetic mutation leading to colorectal cancer in Jews of Eastern European descent (Ashkenazi Jews).

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. 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).

Oral Cavity and Pharynx Cancer: Risk factors for cancers of the oral cavity and pharynx include tobacco use, alcohol consumption, ultraviolet light, long-term denture irritation, poor nutrition, Plummer-Vinson syndrome, using high-alcohol content mouthwash, human papillomavirus infection, immune suppression, aging, and being male.

Hodgkin's Lymphoma: Some people who have reduced immune systems, for example, those with AIDS, and organ transplant patients, are at a higher risk of Hodgkin's lymphoma. Possible risk factors include being in young or late adulthood, being male, being infected with the Epstein-Barr virus, or having a first-degree relative with Hodgkin's lymphoma.

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), or the Epstein-Barr virus and malaria. 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.

Bladder Cancer: The greatest risk factor for bladder cancer is smoking. Men get bladder cancer at a rate four times that of women. Smokers are more than twice as likely to get bladder cancer as nonsmokers. Whites are two times more likely to develop bladder cancer than are African Americans. Other risk factors for bladder cancer include occupational exposure to aromatic amines such as benzidine and beta-napthylamine, aging, chronic bladder inflammation, personal history of urothelial carcinomas, birth defects involving the bladder and umbilicus, infection with a certain parasite, high doses of certain chemotherapy drugs, and arsenic in your drinking water.

Multiple 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 50% more likely to have myeloma than women.

Pancreatic Cancer: Risk factors for cancer of the pancreas include smoking, long-standing diabetes, chronic pancreatitis, aging, obesity, family history, occupational exposure, and stomach problems. A diet high in meats and fat may increase pancreatic cancer risk.

Kidney and Renal Pelvis Cancer: Kidney cancer risk factors include smoking, obesity, a sedentary lifestyle, occupational exposure to heavy metals or organic solvents, advanced kidney disease, family history, high blood pressure, certain medications, and aging. Men have higher rates of kidney cancer.

Liver and Intrahepatic Bile Duct Cancer: In contrast to many other types of cancer, the number of people who develop liver cancer and die from it is increasing. This cancer is about 10 times more common in developing countries. The risk factors for liver cancer include viral hepatitis, cirrhosis, long-term exposure to aflatoxin, exposure to vinyl chloride and thorium dioxide, older forms of birth control pills, anabolic steroids, arsenic in drinking water, obesity, diabetes, tobacco use, bile duct disease, ulcerative colitis, liver fluke infection, and aging. Chemicals that are associated with bile duct cancer include dioxin, nitrosamines, and polychlorinated biphenyls (PCBs).

Acute Lymphocytic Leukemia (ALL): Possible risk factors for ALL include the following: being male, being white, being older than 70 years of age, past treatment with chemotherapy or radiation therapy, exposure to atomic bomb radiation, 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; having relatives who are Russian Jews or Eastern European Jews; 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; having had treatment with chemotherapy or radiation therapy in the past; past treatment for childhood ALL; being exposed to atomic bomb radiation or the chemical benzene; or having a history of a blood disorder such as myelodysplastic syndrome.

Chronic Myeloid Leukemia (CML): Most people with CML have a gene mutation (change) called the Philadelphia chromosome. The Philadelphia chromosome is not passed from parent to child. CML is slightly more common in males than females and the only known risk factor is high-dose radiation exposure such as being a survivor of an atomic bomb blast or nuclear reactor accident.

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, Texas Cancer Registry, at 1-800-252-8059 or brenda.mokry@dshs.state.tx.us.

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Table 1
Number of Male Observed and Expected Cancer Cases and Race Adjusted Standardized Incidence Ratios, Selected Cancers, Zip Code 77536, Deer Park, TX, 1996–2005

Males				
Site	**Observed**	**Expected**	**SIR**	**99% CI**
Oral Cavity and Pharynx	17	19.6	0.9	0.4 – 1.6
Colon and Rectum	47	54.2	0.9	0.6 – 1.3
Liver and Intrahepatic Bile Duct	7	9.1	0.8	0.2 – 1.9
Pancreas	21	10.9	1.9	1.0 – 3.3
Lung and Bronchus	84	86.4	1.0	0.7 – 1.3
Prostate	121	135.3	0.9	0.7 – 1.1
Bladder	29	28.2	1.0	0.6 – 1.6
Kidney and Renal Pelvis	25	20.9	1.2	0.7 – 2.0
Multiple Myeloma	5	6.1	0.8	0.2 – 2.3
Hodgkin's Lymphoma	2	4.0	0.5	0.0 – 2.3
Non-Hodgkin's Lymphoma	17	22.9	0.7	0.4 – 1.4
Acute Lymphocytic Leukemia	3	2.5	1.2	0.1 – 4.4
Chronic Lymphocytic Leukemia	7	5.3	1.3	0.4 – 3.2
Acute Myeloid Leukemia	6	4.4	1.4	0.4 – 3.6
Chronic Myeloid Leukemia	0	2.2	0.0	0.0 – 2.4
Aleukemic, Subleukemic, & NOS	0	0.7	0.0	0.0 – 7.8

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 1996–2005. 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 Female Observed and Expected Cancer Cases and Race Adjusted Standardized Incidence Ratios, Selected Cancers, Zip Code 77536, Deer Park, TX, 1996–2005

Females				
Site	**Observed**	**Expected**	**SIR**	**99% CI**
Oral Cavity and Pharynx	3	7.5	0.4	0.1 – 1.5
Colon and Rectum	47	44.8	1.1	0.7 – 1.5
Liver and Intrahepatic Bile Duct	2	3.6	0.6	0.0 – 2.6
Pancreas	15	9.4	1.6	0.7 – 3.0
Lung and Bronchus	73	61.2	1.2	0.9 – 1.6
Breast	158	157.6	1.0	0.8 – 1.2
Bladder	5	8.4	0.6	0.1 – 1.7
Kidney and Renal Pelvis	18	11.9	1.5	0.8 – 2.7
Multiple Myeloma	4	4.8	0.8	0.1 – 2.6
Hodgkin's Lymphoma	4	3.1	1.3	0.2 – 4.0
Non-Hodgkin's Lymphoma	21	18.5	1.1	0.6 – 1.9
Acute Lymphocytic Leukemia	3	1.8	1.6	0.2 – 5.9
Chronic Lymphocytic Leukemia	3	3.3	0.9	0.1 – 3.3
Acute Myeloid Leukemia	5	3.5	1.4	0.3 – 4.0
Chronic Myeloid Leukemia	3	1.5	2.0	0.2 – 7.3
Aleukemic, Subleukemic, & NOS	2	0.6	3.4	0.2 – 15.6

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 1996–2005. The SIR has been rounded to the first decimal place.

*Significantly higher than expected at the $p < 0.01$ level.
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Table 3

Number of Childhood Observed and Expected Cancer Cases and Race Adjusted Standardized Incidence Ratios, Zip Code 77536, Deer Park, TX, 1996–2005

Males (0-19)				
Site	**Observed**	**Expected**	**SIR**	**99% CI**
Total Childhood Cancers	11	8.8	1.2	0.5 – 2.6
Females (0-19)				
Site	**Observed**	**Expected**	**SIR**	**99% CI**
Total Childhood Cancers	8	7.4	1.1	0.4 – 2.5

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 1996–2005. The SIR has been rounded to the first decimal place.

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