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Texas Department of State Health Services

Assessment of the Occurrence of Cancer

Corpus Christi, Texas
2000-2014

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Prepared by the
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Executive Summary

In 2011, at the request of the Agency for Toxic Substances and Disease Registry (ATSDR), the Texas Department of State Health Services (DSHS) examined the occurrence of cancer in the Corpus Christi area within an approximate 5-mile buffer surrounding Refinery Row. Due to ongoing community concerns, DSHS conducted a follow-up analysis of cancers in the area, which is described in this report.

For this follow-up assessment, DSHS followed the Centers for Disease Control and Prevention (CDC) and Council of State and Territorial Epidemiologists (CSTE) 2013 guidelines and agency protocol to investigate the occurrence of 2 types of childhood and 15 types of all-age cancers in a geographic area selected for the original assessment. In accordance with these guidelines, the purpose of this assessment was to determine whether the observed number of cancer cases is statistically significantly greater than expected. It was not intended to determine the cause of the observed cancers or identify possible associations with any risk factors.

DSHS staff analyzed TCR data available for a 15-year period spanning from 2000 to 2014. United States Census data was used to estimate the population in the selected geographic area, which consisted of 35 census tracts that encompass the majority of the area included in the 2011 assessment. To evaluate the occurrence of cancer in the area investigated, the number of observed cancer cases was compared to what would be expected for the area based on cancer rates in Texas. Standardized incidence ratios (SIRs) were calculated as the number of observed cases divided by the number of expected cases in the area of concern for the 15-year period (2000-2014). A 95 percent confidence interval (CI) was calculated for each SIR to determine statistical significance.

Based on cancer rates in Texas, the observed number of all-age bladder, colorectal, esophageal, kidney, liver, and lung cancers were statistically significantly greater than expected. The observed number of all-age prostate cancers and childhood leukemias was statistically significantly less than expected. The observed number of the remaining cancer types was within the range of what was expected.

Background

In 2011, at the request of the Agency for Toxic Substances and Disease Registry (ATSDR), the Texas Department of State Health Services (DSHS) examined the occurrence of cancer in the Corpus Christi area within an approximate 5-mile buffer surrounding Refinery Row. Due to ongoing community concerns, DSHS conducted a follow-up analysis of cancers in the area, which is described in this report.

The Centers for Disease Control and Prevention (CDC) and Council of State and Territorial Epidemiologists (CSTE) define a cancer cluster as a greater than expected number of cancer cases that occurs within a group of people in a geographic area over a defined period of time[1]. For the assessment described here, DSHS followed the CDC and CSTE 2013 Guidelines for Investigating Suspected Cancer Clusters and Responding to Community Concerns[1] and agency protocol[2] to investigate the occurrence of cancer in this community.

The CDC and CSTE guidelines include four steps[1]. The first step is to collect information about the community's concerns. The second step, reported here, is to determine whether the observed number of cancer cases is statistically significantly greater than expected. It is important to note that the data and statistical analysis conducted at this step cannot determine if cancers observed in the community are associated with environmental, lifestyle, or other risk factors.

The guidelines also provide additional steps that can be followed when appropriate. The third step is to evaluate the feasibility of performing an epidemiologic study to examine if exposure to a specific risk factor is associated with the suspected cancer cluster, and the fourth step is to conduct an epidemiologic study, if deemed feasible in step three. Many factors are considered in making the determination to progress to steps three or four. The CDC and CSTE guidelines state, "only a small fraction of cancer cluster inquiries might meet the statistical and etiological criteria to support a cluster investigation through all the steps outlined…."[1]

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[1] Centers for Disease Control and Prevention, *Investigating Suspected Cancer Clusters and Responding to Community Concerns.* MMWR, 2013. 62: p. 22.

[2] Texas Department of State Health Services, *Protocol for Responding to Community Cancer Cluster Concerns.* Updated January 15, 2016. Available from: http://www.dshs.texas.gov/epitox/CancerClusters/Protocol-for-Responding-to-Community-Cancer-Cluster-Concerns.pdf.

Methods

DSHS collaborated with ATSDR to select the geographic area, time frame, and cancers to be included in this analysis. The following cancer types were included in the analysis: all-age bladder, brain/central nervous system (CNS), breast, colorectal, esophageal, kidney, liver, lung, prostate, uterine, non-Hodgkin lymphoma, acute lymphocytic leukemia (ALL), acute myeloid leukemia (AML), chronic lymphocytic leukemia (CLL), chronic myeloid leukemia (CML); and childhood leukemia and brain/CNS. DSHS evaluated 15 years of available cancer data. The geographic area investigated was selected to encompass the entire area of concern included in the 2011 assessment, which included 13 zip codes. Instead of zip codes, 35 census tracts encompassing the area investigated were used for the current analysis (Figure 1).

This document outlines the results from step two of the CDC and CSTE guidelines, and only addresses the question, "Is there a statistically significant excess of cancer in the area of investigation?"

Data Sources

For each cancer type, the number of cases observed from 2000 to 2014 in the area included in the investigation was obtained from the TCR (Incidence – Texas, 1995-2014, SEER*Prep 2.5.3). The TCR is responsible for the collection, maintenance, and dissemination of high-quality Texas population-based cancer data, and meets national CDC timeliness and data quality standards, as well as North American Association of Central Cancer Registry certification standards. All-age cancers were defined according to Site Recode ICD-O-3/WHO 2008 Definitions[3], and childhood cancers were defined according to the International Classification of Childhood Cancer[4]. Statewide cancer rates for the same time period were also obtained from the TCR.

Population estimates for 2000 to 2014 were calculated using linear interpolation based on population counts obtained from the United States Decennial Census[5] for the years 2000 and 2010. This method, outlined by

[3] National Cancer Institute, Surveillance, Epidemiology and End Results Program. *Site Recode ICD-O-3/WHO 2008 Definition.* Available online: http://seer.cancer.gov/siterecode/icdo3_dwhoheme/index.html

[4] Steliarova-Foucher E, Stiller C, Lacour B, and Kaatsch P, *International Classification of Childhood Cancer, third edition.* Cancer, 2005. 103(7): p. 1457-1467.

[5] United States Census Bureau. *American FactFinder*. 2012; Available from: http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml.

the United States Census Bureau[6], assumed population growth occurred in a linear manner.

Statistical Analysis
To determine if a statistically significant excess of cancer existed in the area investigated, the number of observed cancer cases was compared to what would be expected for the area based on cancer rates in Texas. Characteristics such as race, sex, and age are closely related to cancer. To ensure that differences between the numbers of observed and expected cancer cases are not simply due to differences in these demographic characteristics, the expected numbers of cancer cases were calculated by multiplying the age-, sex-, and race-specific cancer incidence rates of Texas residents (reference population) by the number of people in the corresponding demographic groups in the area of investigation.

Standardized incidence ratios (SIRs) were calculated to determine if an excess of cancer exists in the area. The SIR is the number of observed cases compared to (divided by) the number of expected cases for each cancer type. A SIR greater than 1.00 indicates that the observed number of cases of a specific cancer type is higher than expected and a SIR less than 1.00 indicates that the observed number of cases of a specific cancer type is lower than expected.

Few, if any, communities will have exactly the same rate as the average state rate for a similar population; most will be higher or lower. Therefore, 95 percent confidence intervals (CI) were calculated for the SIRs to determine if the observed number of cases was statistically significantly different than expected. If a 95 percent CI (range) includes 1.00, no statistically significant excess (or reduction) of cancer is indicated. If a 95 percent CI does not contain 1.00, the SIR is outside the expected range and is statistically significant. When using a 95 percent CI, 5 percent of SIR values calculated is expected to be statistically significantly higher or lower than the state average due to random chance alone.

In all cases, when results are described as significant or not significant, DSHS is referring only to statistical significance, with the understanding that all cases of cancer are significant to the individual, the family, and friends of the individuals who are affected.

[6] US Census Bureau. *Methodology for the Intercensal Population and Housing Unit Estimates: 2000 to 2010*. 2012; Available from: https://www2.census.gov/programs-surveys/popest/technical-documentation/methodology/intercensal/2000-2010-intercensal-estimates-methodology.pdf

Results

Table 1 presents the number of observed cases, the number of expected cases, the SIRs, and the corresponding 95 percent CIs for each cancer type evaluated in the area of investigation. Based on cancer rates in Texas, the observed number of all-age bladder, colorectal, esophageal, kidney, liver, and lung cancers were statistically significantly greater than expected. The observed number of all-age prostate cancers and childhood leukemias was statistically significantly less than expected. The observed number of the remaining cancer types was within the range of what was expected.

Table 1. Standardized Incidence Ratios (SIRs) and 95 percent Confidence Intervals (CIs) for Selected Cancers in 35 Census Tracts, Corpus Christi, Texas, 2000-2014.

Cancer Type	Observed	Expected	SIR	95% CI
Childhood				
Brain/Central Nervous System	24	19.3	1.24	(0.80, 1.85)
Leukemia	24	37.3	0.64	(0.41, 0.96)†
All-age				
Bladder	340	300.2	1.13	(1.02, 1.26)*
Brain/Central Nervous System	112	132.6	0.84	(0.70, 1.02)
Breast	1269	1250.0	1.02	(0.96, 1.07)
Colorectal	1080	935.9	1.15	(1.09, 1.22)*
Esophageal	116	82.0	1.41	(1.17, 1.70)*
Kidney	456	411.3	1.11	(1.01, 1.22)*
Liver	331	252.1	1.31	(1.18, 1.46)*
Lung	1250	1103.1	1.13	(1.07, 1.20)*
Prostate	1077	1165.6	0.92	(0.87, 0.98)†
Uterine	260	240.3	1.08	(0.95, 1.22)
Non-Hodgkin Lymphoma	382	399.3	0.96	(0.86, 1.06)
Acute Lymphocytic Leukemia	45	45.6	0.99	(0.72, 1.32)
Acute Myeloid Leukemia	69	77.8	0.89	(0.69, 1.12)
Chronic Lymphocytic Leukemia	74	84.0	0.88	(0.69, 1.11)
Chronic Myeloid Leukemia	39	38.7	1.01	(0.72, 1.38)

*Indicates observed number of cancer cases is statistically significantly **higher** than expected
†Indicates observed number of cancer cases is statistically significantly **lower** than expected

Discussion

Consistent with the second step of the CDC and CSTE guidelines for investigating suspected cancer clusters, the primary purpose of this step

(assessment) is to determine whether the observed number of cases is statistically significantly greater than expected[1]. It is not intended to determine the cause of the observed cancers or identify possible associations with any risk factors.

The assessment step in a cancer cluster investigation has several inherent limitations, and results should be interpreted with these limitations in mind. Cancer is not a single disease, but rather many different diseases. Different types of cancers vary in etiologies (causes or origins) and may not share the same predisposing factors. Cancers may be associated with a variety of factors such as genetics, lifestyle, and socioeconomic status. Because cancer is common, cases might appear to occur with alarming frequencies within a community even when the number of cases is within the expected rate for the population.

Additionally, cancer incidence data are based on residence at the time of diagnosis. As people move, it becomes more difficult to determine whether living in the area of investigation is associated with an excess of cancers, because residential history is not tracked. Latency (the time period elapsed between exposure and illness onset) adds to the complexity of this step in the investigation. For most adult cancers, a period of 10 to 40 years can elapse between the beginning of an exposure to a cancer-causing agent and the development of a clinically diagnosable case of cancer. It is possible that former residents who developed cancer no longer lived in the area at the time of diagnosis, and these cases would not be included in this assessment. It is also possible that new people have moved into the area and then were diagnosed with cancer; these cases are included in this assessment.

Conclusion

Based on cancer rates in Texas, the observed number of all-age bladder, colorectal, esophageal, kidney, liver, and lung cancers was statistically significantly greater than expected. The observed number of all-age prostate cancers and childhood leukemias was statistically significantly less than expected. The observed number of the remaining cancer types was within the range of what was expected. DSHS will update this analysis upon request when new data become available.

Additional Information

For additional information about cancer clusters, visit the Centers for Disease Control and Prevention, "About Cancer Clusters," web page at http://www.cdc.gov/nceh/clusters/about.htm.

For additional information on cancer risk factors, visit the American Cancer Society, "What Causes Cancer?" web page at http://www.cancer.org/cancer/cancercauses/index.

Questions or comments regarding this investigation may be directed to the DSHS Environmental Epidemiology and Toxicology Unit, 1-800-588-1248, epitox@dshs.texas.gov.

Figure 1. Selected Census Tracts (2010) for Corpus Christi, Texas.