TEXAS
Health and Human Services

Texas Department of State Health Services

Assessment of the Occurrence of Cancer
Houston, Texas
2000-2016

August 13, 2019

Prepared by the
Texas Department of State Health Services

Investigation# 19002

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Executive Summary

At the request of the Texas Commission on Environmental Quality (TCEQ), the Environmental Surveillance and Toxicology Branch (ESTB) and Texas Cancer Registry (TCR) of the Texas Department of State Health Services (DSHS) have examined the occurrence of cancer in the city of Houston, Texas consisting of ten census tracts.

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 six types of adult (ages 20 years or older) cancers in a geographic area selected by TCEQ staff. 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 17-year period spanning from 2000 through 2016. United States Census data was used to estimate the population in the selected geographic area, which consisted of ten census tracts in Houston, Texas. 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 17-year period (2000-2016). A 95 percent confidence interval (CI) was calculated for each SIR to determine statistical significance.

Based on cancer rates in Texas, lung and bronchus, esophagus, and larynx cancers were statistically significantly greater than expected. The observed numbers of adult acute myeloid leukemia, urinary bladder, and nose and nasal cavity cancers were within the range of what is expected.

Background

At the request of the Texas Commission on Environmental Quality (TCEQ), the Environmental Surveillance and Toxicology Branch (ESTB) and Texas Cancer Registry (TCR) of the Texas Department of State Health Services (DSHS) examined the occurrence of cancer in the city of Houston, Texas consisting of ten census tracts.

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]. 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 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]

Methods

Consistent with the CDC and CSTE guidelines, DSHS collaborated with TCEQ staff to select the geographic area, time frame, and cancers to be included in this analysis. The following adult (ages 20 years or older) cancer types were

[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.

included in the analysis: esophagus, urinary bladder, acute myeloid leukemia, larynx, lung and bronchus, and nose and nasal cavity.

TCEQ staff also requested that DSHS analyze adult lip, pleura, other non-epithelial skin, and trachea, mediastinum, & other respiratory organ cancers. However, because there were less than six cases of each of these types of cancers, they were not included in the analysis per agency protocol.

Complete TCR cancer data are available for 1995 to 2016. DSHS evaluated 17 years of available cancer data to ensure a time period was chosen that reflected long term changes. The geographic area investigated was selected by TCEQ to encompass the entire area of concern. The ten census tracts comprising the area investigated are shown in 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 through 2016 in the area included in the investigation was obtained from the TCR (Incidence – Texas, 1995-2016, 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. Adult (ages 20 years or older) cancers were defined according to Site Recode ICD-O-3/WHO 2008 Definitions[3]. Statewide cancer rates for the same time period were also obtained from the TCR.

Population estimates for 2000 through 2016 were calculated using linear interpolation based on population counts obtained from the United States Decennial Census[4] for the years 2000 and 2010. This method, outlined by the United States Census Bureau[5], 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.

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

[5] US Census Bureau. Methodology for the Intercensal Population and Housing Unit Estimates: 2000 to 2010. 2012; Available from: http://www.census.gov/popest/methodology/2000-2010_Intercensal_Estimates_Methodology.pdf.

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.

Results

Table 1 presents the number of observed cases, the number of expected cases, the SIRs, and the corresponding 95 percent CIs for each adult (ages 20 years and older) cancer type evaluated in the area of investigation. The numbers of esophagus, lung and bronchus, and larynx cancers were statistically significantly greater than is expected based on cancer rates in Texas. The observed numbers of adult acute myeloid leukemia, urinary bladder, and nose and nasal cavity cancers were within the range of what is expected based on cancer rates in Texas.

Table 1. Standardized Incidence Ratios (SIRs) and 95 percent Confidence Intervals (CIs) for Selected Adult (≥20 years) Cancers in Houston, Texas, 2000-2016.

Cancer Type	Observed	Expected	SIR	95% CI
Acute Myeloid Leukemia	24	18.6	1.29	(0.83, 1.92)
Lung & Bronchus*	478	351.9	1.36	(1.24, 1.49)
Esophagus*	40	24.6	1.63	(1.16, 2.22)
Urinary Bladder	68	67.4	1.01	(0.78, 1.28)
Nose & Nasal Cavity	8	3.7	2.18	(0.94, 4.30)
Larynx*	53	27.9	1.90	(1.42, 2.48)

*Indicates observed number of cancer cases is statistically significantly **higher** 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 and Next Steps

Based on cancer rates in Texas, adult (ages 20 years or older) lung and bronchus, esophagus, and larynx cancers were statistically significantly greater than expected in the geographic area between 2000-2016. The observed numbers of adult acute myeloid leukemia, urinary bladder, and nose and nasal cavity cancers were within the range of what is expected. DSHS will provide this report to TCEQ. Additionally, 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 the Environmental Surveillance and Toxicology Branch, at 1-800-588-1248 (email: epitox@dshs.texas.gov).

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