



**Cancer Cluster Investigation
French Limited Superfund Site, Harris County, Texas**

Time Period: 1995-2011

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Prepared by the Texas Department of State Health Services

Summary

Some residents living in the vicinity of the French Limited Superfund site in Harris County, Texas, expressed concern that possible exposure to contaminants related to the site was causing cancer in the area. In November 2014, the Texas Department of State Health Services (DSHS) investigated incidence of liver, lung, breast, and ovarian cancers in the area surrounding the French Limited Superfund site. Census tracts comprising the geographic area of concern were selected in collaboration with community members.

The Centers for Disease Control and Prevention (CDC) and the Council for 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 In accordance with their guidelines, the primary purpose of this cancer cluster investigation is to determine whether the suspected cancer clusters are a statistically significant excess. It is not intended to be an epidemiologic study to assess the association between cancers and environmental causes or to determine whether an epidemiologic study is feasible. 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.

In this investigation, 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 a sixteen year period (1995-2011). A 95% confidence interval (CI) was calculated for each SIR to determine statistical significance.

The observed number of lung cancer cases within the combined area of concern was statistically significantly higher than expected. The observed number of lung cancer cases within census tracts 2519 and 2526 for both sexes combined and in census tract 2521 for females was also statistically significantly higher than expected. Given the limited magnitude of the SIRs and the fact that lung cancer is the second most common cancer among men and women, no additional investigation is recommended at this time.

Background

The French Limited Superfund Site is a 55-acre hazardous waste site located in northeast Harris County, Texas, approximately 2 miles southwest of the town of Crosby.² The site is located one mile east of the San Jacinto River, and lies within the river's flood plain.

During the 1950s and 1960s, this tract of land was used for sand mining operations. After mining ceased, a sand pit on site was used to receive industrial waste. From 1966 to 1972, at least 3.4 million cubic feet of hazardous waste was dumped into the unlined pit; additional waste was burned in open pits.² During that time, the French Limited site operated under a permit issued by the State of Texas. The permit was revoked in 1973 after continuing violations and legal proceedings. French Limited was ordered to cease operations and to remove all structures and equipment from the site. Eventually, the property was given to the state.

Improper waste management practices at the site resulted in the contamination of four classes of environmental media: sludge, soil, groundwater, and surface water. Contaminants included volatile organic compounds, phenols, heavy metals, and polychlorinated biphenyls.³ The site was added to the National Priorities List* in 1983. In its 1988 Record of Decision (ROD), EPA specified several remedies to be implemented, with *in situ* bioremediation selected as the primary remedy for treating contaminated media. The ROD also specified that ground water monitoring was to be conducted for 30 years post-closure.³ In 1989, a steel sheet pile wall was put in place due to concerns about flooding and contaminant migration.²

In 2014, an ROD Amendment was approved by EPA, as it was determined that ground water clean-up levels for certain contaminants could not be achieved through previously-selected remedies.² New remedies include implementation of Institutional Controls and installation of additional monitoring wells. Importantly, it was determined that existing remedies at the site currently protect area residents from exposures to chemicals found at the site.² These additional remedies were selected to prevent future exposures from occurring.

*The National Priorities List (NPL) is the list of hazardous waste sites in the U.S. eligible for remedial action financed under the federal Superfund program.

In response to residential concerns about a possible excess of cancer cases occurring in the vicinity of the site, DSHS performed an analysis of the incidence of various cancers occurring in the area surrounding the site.

Cancer Clusters and their Limitations

The CDC and 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

The primary purpose of a cancer cluster investigation is to determine whether the observed number of cancer cases is statistically significantly greater than expected for the people living in the area of concern. It is important to note that it is not intended to determine the feasibility of conducting an epidemiologic study, or to carry out an epidemiologic study to assess the association between cancers and environmental exposures.

Cancer is not a single disease, but rather many different diseases. Different types of cancers vary in etiologies, predisposing factors, and rates of occurrence. Cancers are often caused by a combination of factors interacting in ways that are not fully understood. Some common cancers, such as breast and lung, are associated with many genetic or lifestyle-related factors.

Investigations of such common cancers may identify case counts that are higher than expected in a community; however, CDC guidelines state that if it is unlikely that the cancers have a common environmental etiology, they would not necessarily be considered a cluster, and additional evaluation may not be indicated.¹

Latency adds to the complexity of these investigations, as a period of 10-40 years can elapse between the beginning of an exposure to a carcinogen and the development of a clinically diagnosable case of cancer. During this time period, people may move in and out of an area of interest, making it more difficult to tell whether living in the area is associated with an excess of cancer, or if cancer is associated with exposures that occurred elsewhere.

There are also statistical issues associated with cancer cluster investigations. In cancer cluster investigations, the population under study is generally a community or part of a community, typically resulting in a small denominator. Such small denominators frequently yield wide confidence intervals, meaning that the standardized incidence ratio (SIR) will not be precise

enough to evaluate statistical significance.¹ Consequently, such values should be interpreted with caution. Additionally, the SIR compares the observed number of cancer cases in the area of concern to the average in Texas; it is expected that some cancer sites will be higher and others will be lower than the state average.

Lastly, a statistically significant excess of cancer cases can occur within a given population due to chance. When using a 95% CI, there is a 5% chance of getting a statistically significant SIR value due to random chance alone. The more SIRs calculated in a single investigation, the more statistically significant associations are expected simply due to chance.

Methods

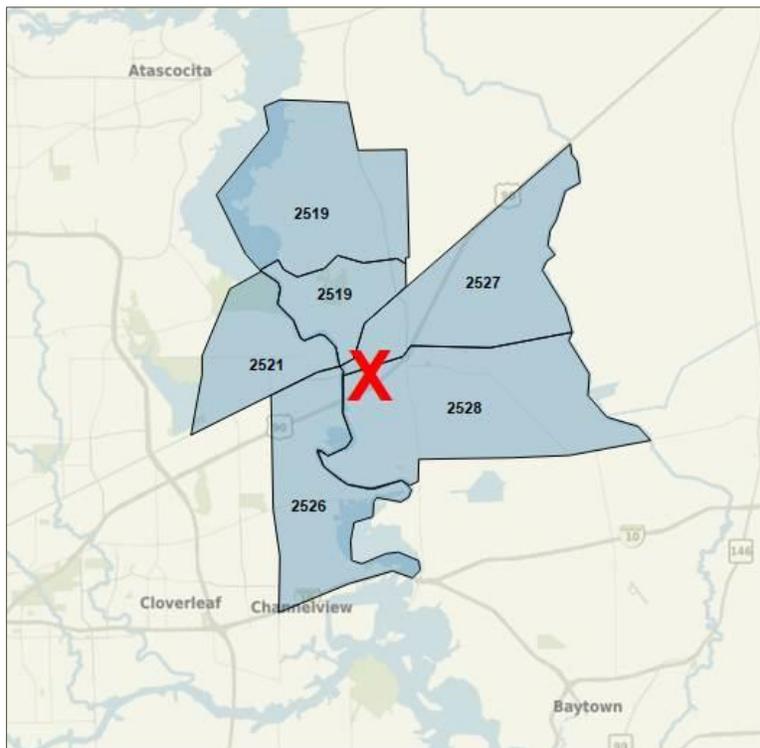
This investigation evaluates incidence data from 1995-2011 for all ages liver, lung, breast, and ovarian cancers. These specific cancers were evaluated because of citizens' concerns. The approach to this investigation is consistent with the guidelines from CDC and the Council of State and Territorial Epidemiologists.¹

Data Source

Census tracts determining the geographic area of concern were selected in collaboration with EPA. The 5 census tracts delineating the area of concern are shown in Figure 1. Population estimates for the 5 census tracts (2519, 2521, 2526, 2527, 2528; see Figure 1) from 1995-2011 were calculated using linear interpolation based on population counts obtained from the United States Decennial Census for the years 1990, 2000, and 2010.⁴ This method assumed that the population growth occurred in a linear manner.⁵

The number of observed cases for each cancer site in each census tract from 1995 to 2011 was obtained from the Texas Cancer Registry (TCR). Cancer incidence rates for Texas residents were also obtained from the TCR. The TCR is responsible for the collection, maintenance, and dissemination of high quality population-based cancer data. The TCR collects information such as the types of cancers that occur and their locations within the body, the malignancy of cancer at the time of diagnosis (disease stage), the length of survival, and patient characteristics. The TCR meets national CDC timelines and high quality data standards, as well as North American Association of Central Cancer Registry certification standards.

Figure 1. Census tracts (2000) selected for the French Limited Superfund site Cancer Incidence Investigation for the 1995-2011.



Statistical Analysis

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 census tracts of concern. Population estimates for each demographic group for the years 1995 to 2011 were calculated using linear interpolation.

The SIR is the number of observed cases divided by the number of expected cases for each cancer site. SIRs equal to or less than 1.00 indicate that the number of observed cancer cases is not greater than expected. An SIR greater than 1.00 indicates that the observed number of cases of a specific cancer site is higher than expected.

To determine whether an SIR is statistically significant, 95% confidence intervals (CIs) were calculated. When the lower end of the CI is greater than 1.00, the observed number of cases is

considered statistically significantly higher than expected. With 95% CIs we expect that 5% of the cancer sites investigated will be statistically significantly higher or lower than the state average by chance alone. Wide confidence intervals reflect a greater uncertainty in the results. Consequently, such values should be interpreted with caution.

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 displays the SIR values and corresponding 95% CIs for each cancer site evaluated in the area of concern (all census tracts combined). For this area of concern, the number of observed lung cancers was statistically significantly higher than expected. The number of breast, liver, and ovary cancers was not higher than expected.

SIRs and 95% CIs were also calculated for each census tract separately. Census tracts 2519 and 2526 had significantly higher than expected numbers of lung cancer. There were no statistically significantly higher than expected numbers of any of the other cancer types within these census tracts. Since two of the census tracts had elevated lung cancer results, Table 2 shows lung cancer SIRs for each of the census tracts within the area of concern.

Table 1. Standardized incidence ratios (SIRs) and 95% confidence intervals (95% CI) for breast, liver, lung and ovarian cancer from 1995 to 2011 in all census tracts combined selected around the French Limited Superfund site.

Cancer Site	Observed	Expected	SIR	95% CI
Breast	289	282	1.03	(0.91, 1.15)
Liver	28	28	1.00	(0.66, 1.44)
Lung	390	285	1.37	(1.24, 1.51)*
Ovary	33	28	1.18	(0.81, 1.65)

Notes: SIR=standardized incidence ratio; CI=confidence interval

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

Table 2. Standardized incidence ratios (SIRs) and 95% confidence intervals (95% CI) for lung cancer cases from 1995 to 2011 per census tract surrounding the French Limited Superfund site.

Census Tract	Observed	Expected	SIR	95% CI
2519	180	114	1.58	(1.35, 1.82)*
2521	22	14	1.57	(0.99, 2.38)
2526	78	50	1.58	(1.23, 1.95)*
2527	35	42	0.83	(0.58, 1.15)
2528	75	64	1.16	(0.92, 1.46)

Notes: SIR=standardized incidence ratio; CI=confidence interval

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

Discussion

In the combined area of concern during the 1995-2011 time period, the observed number of lung cancer cases was statistically significantly higher than expected. Numbers of lung cancer cases within census tracts 2519 and 2526 for both sexes combined and in census tract 2521 for females (data not shown) were also statistically significantly higher than expected.

To understand the relevance of the results presented, a number of issues must be considered. CCIs have many inherent design limitations. For example, the cancer incidence data used here does not take into account migration into or out of the area. Former residents may have developed cancer after moving to another area, and they would not be included in this analysis. Conversely, a resident who has recently moved into the area may develop cancer as a result of an exposure that occurred elsewhere.

One strength of this cancer cluster investigation is the relatively long time period (16 years) included in the data. SIRs compare cancer incidence in a community to the average in the reference population. Confidence intervals measure how precise the SIR is; a larger number of people and years in the sample results in a smaller confidence interval.

Due to their inherent design limitations, CCIs are unable to address issues of causality or determine specific risk factors for any observed cancer excesses. There are many possible factors contributing to the increased rates of lung cancer identified by this CCI. The greatest single risk factor for lung

cancer is smoking. The American Cancer Society estimates that 87% of lung cancer is due to smoking.⁶ 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, preexisting silicosis or berylliosis, personal and family history of lung cancer, and diet.⁷

Recommendations

Based on the findings and the information discussed above, a more in-depth epidemiologic study of cancers in this area is not recommended at this time. As new data or additional information become available, consideration will be given to updating or re-evaluating this CCI.

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 Emily Hall, Environmental Epidemiology & Disease Registries Section, at emily.hall@dshs.texas.gov or (512) 776-2652.

References

1. Centers for Disease Control and Prevention. Investigating Suspected Cancer Clusters and Responding to Community Concerns. MMWR 2013:62.
2. Environmental Protection Agency. (2014). French Limited Superfund Site, Crosby, Harris County Texas, Updated October, 2014. Retrieved from <http://www.epa.gov/region6/6sf/pdffiles/french-limited-tx.pdf>
3. Environmental Protection Agency. (1988). Superfund Record of Decision: French Limited, TX. Retrieved from <http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=20013WAO.TXT>
4. US Census Bureau. (2012). American FactFinder. Retrieved from <http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml>
5. US Census Bureau. (2012). Methodology for the Intercensal Population and Housing Unit Estimates: 2000 to 2010. Retrieved from http://www.census.gov/popest/methodology/2000-2010_Intercensal_Estimates_Methodology.pdf
6. American Cancer Society. (2014). Tobacco-Related Cancers Fact Sheet. Retrieved from <http://www.cancer.org/cancer/cancercauses/tobaccocancer/tobacco-related-cancer-fact-sheet>
7. Centers for Disease Control and Prevention. (2014). Basic Information about Lung Cancer. Retrieved from http://www.cdc.gov/cancer/lung/basic_info/risk_factors.htm