

**Summary of Investigation into the Occurrence of Cancer
Zip Code 77879, Somerville
Burleson County Texas
1993-2002
November 2, 2004**

Background:

Concern about a possible excess of cancer prompted the Cancer Epidemiology and Surveillance (CES) Branch of the Texas Department of State Health Services to examine the occurrence of cancer in zip code 77879, Somerville, Texas. Local residents were concerned that a local creosote plant may be causing cancer among residents. The CES evaluated 1995-2001 incidence data and 1993-2002 mortality data for cancers of the female breast, prostate, lung and bronchus, colon and rectum, bladder, corpus and uterus, kidney and renal pelvis, non-Hodgkin's lymphoma, oral cavity and pharynx, esophagus, stomach, larynx, melanoma, total leukemia, and selected leukemia subtypes. According to the scientific literature, creosote has shown a possible association with cancers of the oral cavity, larynx, esophagus, stomach, bladder, skin, kidney and renal pelvis, and leukemia. The remaining cancer sites were requested by the customer. Only melanomas of the skin are reportable and only mortality is shown for melanoma due to incidence under-reporting. Incidence data are the best indicator of the occurrence of cancer in an area because they show how many cancers were diagnosed each year. Cancer mortality data are used as a supplemental measure and are complete for the entire state through 2002. The rest of this report examines the investigative methods the CES 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 CES to investigate the possibility of excess cancer in a community. The cancer cluster investigation is not used to prove that cancer was caused by environmental or other risk factors because it is extremely difficult to determine exactly what causes a particular cancer in a particular individual. Individuals are often exposed to many cancer-causing agents over their lifetime and not everyone who is exposed will get cancer. Instead, the cancer cluster investigation is specifically intended to answer the question "Is there an excess of cancer in the area or population of concern?" Two other questions that must be answered before an environmental hazard can be possibly associated with the cancer are: 1) Is there evidence of exposure to hazardous substances, and 2) Can the exposure and the cancer type be linked by a statistical association? To answer these questions, the CES often works with the Environmental & Injury Epidemiology and Toxicology Branch, the Spatial Approaches to Health Outcomes program within the Texas Department of State Health Services, and other state and federal agencies.

The CES follows guidelines recommended by the Centers for Disease Control and Prevention for investigating cancer clusters.¹ To determine if a true excess of cancer is occurring and if further study is warranted at the time of the initial investigation, biologic and 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 indicate a cluster needing further study. Because excesses of cancer may occur by chance alone, the role of chance is also considered in the statistical analysis.

If further study is indicated, the CES will determine the feasibility of conducting an epidemiologic study examining the cancer and the exposure. If the epidemiologic study is feasible, the final step is to perform an etiologic investigation to see if the cancer can be related to the exposure. 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 and deaths 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 or die from cancer. This is important because peoples' 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 1–4 present the number of observed cases and deaths for males and females, the number of "expected" cases and deaths, the standardized incidence ratio (SIR) or standardized mortality ratio (SMR), and the corresponding 99% confidence interval. The standardized incidence or mortality ratio (SIR, SMR) is simply the number of observed cases or deaths compared to the number of "expected" cases or deaths. When the SIR or SMR of a selected cancer is equal to 1.00, then the number of observed cases or deaths is equal to the expected number of cases or deaths, based on the incidence or mortality in the rest of the state. When the SIR or SMR is less than 1.00, fewer people developed or died of cancer than we would have expected. Conversely, an SIR or SMR greater than 1.00 indicates that more people developed or died of cancer than we would have expected. To determine if an SIR or SMR greater than 1.00 or less than 1.00 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 the likelihood that the result occurred by chance into account. It also indicates the range in which we would expect the SIR or SMR to fall 99% of the time. If the confidence interval contains a range that includes 1.00, 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 or SMR. As long as the 99% confidence interval contains 1.00, this indicates that the SIR or SMR is still within the range one might expect and, therefore, not statistically significant.

Results:

The analysis of incidence data for zip code 77879, Somerville, Texas, from January 1, 1995–December 31, 2001, and mortality data from January 1, 1993–December 31, 2002, found cancers of the female

breast, prostate, colon and rectum, bladder, corpus and uterus, kidney and renal pelvis, non-Hodgkin's lymphoma, oral cavity and pharynx, esophagus, stomach, larynx, melanoma, total leukemia, and selected leukemia subtypes were found to be within normal ranges in both males and females. Lung and bronchus cancer mortality in 77879 females was found to be statistically significantly less than expected. Analysis summaries are presented in Tables 1-4.

Discussion:

Like other studies, this cancer cluster investigation had limitations. The number of years of incidence data examined was limited to seven years and did not include data for the most recent years. Ten years of mortality data were examined as a supplemental measure and were available for one more recent year. Also, cancer incidence data are based on residence at the time of diagnosis. It is possible that some residents who may have been exposed and developed cancer no longer lived in the area at the time of diagnosis so were not included in the data. However, it is also possible that people with no exposure may have moved into the area and then developed cancer because of other factors. These cases are included in the investigation.

This study was also limited in its power to detect a small effect from some environmental or other type of exposure. However, a large increased risk of cancer in an area could have been observed using this methodology.

Recommendations:

Based on the findings and the information discussed above, it is not recommended at this time to determine whether the cancers in zip code 77879, Somerville, Texas may be associated with exposure to creosote. 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. In Texas, as in the United States, cancer is the second leading cause of death, exceeded only by heart disease. 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, usually 20 to 40 years. Conditions that have prevailed for only the last 5 or 10 years are unlikely to be related to the current incidence of cancer in a community.

The chances of a person developing cancer as a result of exposure to an environmental contaminant are slight. According to Richard Doll and Richard Peto, renowned epidemiologists at the University of Oxford, pollution and occupational exposures are estimated to collectively cause 4-6% of all cancer deaths.² 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.³ In

contrast, the National Cancer Institute estimates that lifestyle factors such as tobacco use and diet cause 50 to 75 percent of cancer deaths.⁴ Eating a healthy diet and refraining from tobacco are the best ways to prevent many kinds of cancer.

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.

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.^{5,6}

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, 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).

Stomach Cancer

Stomach cancer is about twice as common in men as it is in women. Other risk factors for stomach cancer include *Helicobacter pylori* infection, diets high in smoked and salted foods, tobacco and alcohol abuse, previous stomach surgery, pernicious anemia, type A blood, familial cancer syndromes, and stomach polyps. Japanese have a very high rate of stomach cancer when they live in Japan. If they move to the United States, the rate goes down after a number of years, but still remains higher than that of people born in the U.S.

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 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

Colorectal cancer is the second leading cause of cancer death in both men and women. Researchers have identified several risk factors that increase a person's chance of developing colorectal cancer: family and personal history of colorectal 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).

Bladder Cancer

The greatest risk factor for bladder cancer is smoking. 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-naphthylamine, 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 use of the herb *Aristolochia Fangchi*.

Corpus and Uterus Cancer

Corpus and uterus cancer include cancer of the endometrium (lining of the uterus). Risk factors for endometrial cancer include menstrual periods before age 12, menopause after age 52, infertility, obesity, treatment with the drug Tamoxifen, estrogen replacement therapy, certain ovarian diseases, a diet high in animal fat, diabetes, aging, family history of endometrial cancer, and early pelvic radiation therapy. Women who have had breast or ovarian cancer may have increased risk of getting endometrial cancer.

Esophageal Cancer

Compared with women, men have a three-fold higher rate of esophageal cancer. African Americans are two times more likely to have esophageal cancer than whites. Other risk factors for esophageal cancer include aging, use of tobacco products, alcohol, obesity, gastric reflux, diets low in fruits and vegetables, lye ingestion, achalasia, tylosis, and esophageal webs.

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, vitamin A deficiency, Plummer-Vinson syndrome, use of high-alcohol content mouthwash, human papillomavirus infection, immune suppression, aging, and being male.

