

**Summary of Investigation into the Occurrence of Cancer  
Bastrop, Bell, Brazos, Burleson, Falls, Lee, Milam,  
Robertson, Travis, and Williamson Counties, Texas  
1993–2002  
August 8, 2005**

**Background:**

A presentation to the Community Advisory Panel to Alcoa Rockdale Operations (CAPARO) regarding cancer incidence and mortality in Texas prompted the Texas Cancer Registry (TCR) Branch of the Texas Department of State Health Services (DSHS) to examine the occurrence of cancer in Bastrop, Bell, Brazos, Burleson, Falls, Lee, Milam, Robertson, Travis, and Williamson Counties. The TCR evaluated 1995–2002 incidence data and 1993–2002 mortality data for cancers of the lung and bronchus, colon and rectum, male bladder, female breast, prostate, corpus and uterus, non-Hodgkin's lymphoma, larynx, stomach, pancreas, and kidney and renal pelvis. The cancers include the leading cancers in Texas, as well as lung, bladder, and stomach cancers have been associated in the scientific literature with miners exposed to lignite. Pancreatic, laryngeal, and kidney cancers have been associated with workers exposed to aluminum smelters. 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 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<sup>1</sup> 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, biologic and epidemiologic evidence are 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 further epidemiologic study. If the epidemiologic study is feasible, the final step is to recommend and/or perform an etiologic investigation to see if the cancer(s) can be related to an 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 1–20 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 Bastrop County, Texas, from January 1, 1995–December 31, 2002, and mortality data from January 1, 1993–December 31, 2002, found cancers of the breast, prostate, lung and bronchus, colon and rectum, corpus and uterus, bladder, non-Hodgkin's lymphoma, kidney and renal pelvis, stomach, and pancreas to be within normal ranges in both males and females. Larynx cancer mortality in males was found to be statistically significantly lower than expected. Analysis summaries are presented in Tables

1-2.

The analysis of incidence data for Bell County, Texas, from January 1, 1995–December 31, 2002, and mortality data from January 1, 1993–December 31, 2002, found cancers of the breast, prostate, colon and rectum, corpus and uterus, bladder, non-Hodgkin's lymphoma, kidney and renal pelvis, stomach, pancreas, and larynx to be within normal ranges in both males and females. Lung and bronchus cancer incidence in males (SIR=1.12) was found to be statistically significantly higher than expected. Analysis summaries are presented in Tables 3–4.

The analysis of incidence data for Brazos County, Texas, from January 1, 1995–December 31, 2002, and mortality data from January 1, 1993–December 31, 2002, found cancers of the breast, prostate, colon and rectum, corpus and uterus, bladder, non-Hodgkin's lymphoma, kidney and renal pelvis, pancreas, and larynx to be within normal ranges in both males and females. Stomach cancer incidence in males (SIR=1.57) was found to be statistically significantly higher than expected while lung cancer mortality in males was statistically significantly lower. Analysis summaries are presented in Tables 5–6.

The analysis of incidence data for Burleson County, Texas, from January 1, 1995–December 31, 2002, and mortality data from January 1, 1993–December 31, 2002, found cancers of the breast, prostate, lung and bronchus, colon and rectum, corpus and uterus, bladder, non-Hodgkin's lymphoma, kidney and renal pelvis, stomach, pancreas, and larynx to be within normal ranges in both males and females. Analysis summaries are presented in Tables 7–8.

The analysis of incidence data for Falls County, Texas, from January 1, 1995–December 31, 2002, and mortality data from January 1, 1993–December 31, 2002, found cancers of the lung and bronchus, colon and rectum, corpus and uterus, bladder, non-Hodgkin's lymphoma, kidney and renal pelvis, stomach, pancreas, and larynx to be within normal ranges in both males and females. Prostate cancer incidence and female breast cancer incidence were found to be statistically significantly lower than expected. Analysis summaries are presented in Tables 9–10.

The analysis of incidence data for Lee County, Texas, from January 1, 1995–December 31, 2002, and mortality data from January 1, 1993–December 31, 2002, found cancers of the breast, prostate, colon and rectum, corpus and uterus, bladder, non-Hodgkin's lymphoma, kidney and renal pelvis, stomach, pancreas, and larynx to be within normal ranges in both males and females. Lung and bronchus cancer incidence and mortality in females was found to be statistically significantly lower than expected. Analysis summaries are presented in Tables 11–12.

The analysis of incidence data for Milam and Robertson County, Texas, from January 1, 1995–December 31, 2002, and mortality data from January 1, 1993–December 31, 2002, found cancers of the breast, prostate, lung and bronchus, colon and rectum, corpus and uterus, bladder, non-Hodgkin's lymphoma, kidney and renal pelvis, stomach, pancreas, and larynx to be within normal ranges in both males and females. Analysis summaries are presented in Tables 13–16.

The analysis of incidence data for Travis County, Texas, from January 1, 1995–December 31, 2002, and mortality data from January 1, 1993–December 31, 2002, found cancers of the corpus and uterus, bladder, non-Hodgkin's lymphoma, kidney and renal pelvis, stomach, and pancreas to be within normal ranges in both males and females. Lung and bronchus, colon and rectum, and larynx cancer incidence in males were found to be statistically significantly lower than expected while female breast cancer incidence was statistically significantly elevated (SIR=1.09). Prostate, male lung, and overall colon and rectum cancer mortality were statistically significantly less than expected. Analysis summaries are presented in Tables 17–18.

The analysis of incidence data for Williamson County, Texas, from January 1, 1995–December 31, 2002, and mortality data from January 1, 1993–December 31, 2002, found cancers of the kidney and renal pelvis, stomach, pancreas, and larynx to be within normal ranges in both males and females. Cancers of the prostate, female breast, lung and bronchus, colon and rectum, male bladder, corpus and uterus, and non-Hodgkin's lymphoma incidence were found to be statistically significantly lower than expected. Prostate, female breast, lung and bronchus, colon and rectum, and corpus and uterus cancer mortality were found to be statistically significantly less than expected. Analysis summaries are presented in Tables 19–20.

**Discussion:**

We do not know why the lung and bronchus cancer elevation is present among males in Bell County, nor may we ever know why. Determining the cause of any excess is beyond the scope of the cancer cluster investigation. However, part of any cancer cluster investigation is to evaluate if further study is recommended at this time. We were not able to separate out the possible effects of smoking in the population under study. According to the American Cancer Society, smoking accounts for 87% of all lung cancer.

We also do not know why the stomach cancer elevation is present among males in Brazos County or the breast cancer elevation in Travis County females. It is important to note that for this investigation, the TCR made 360 comparisons using a 99% confidence interval to obtain our results. Subsequently, we would expect 3.6, or 1% of the results to be statistically significant on the basis of chance alone. In fact, we observed 33 (3 excesses, 29 deficits) of the 360 comparisons (9.2%) as statistically significant.

Like other studies, this cancer cluster investigation had limitations. The number of years of incidence data examined was limited to eight years and did not include data for the most recent years. Ten years of mortality data were examined as a supplemental measure. Also, cancer incidence data are based on residence at the time of diagnosis and mortality data the residence at the time of death. It is possible that some residents who developed cancer no longer lived in the area at the time of diagnosis or death, so were not included in the analyses. However, it is also possible that people may have moved into the area and then developed or died from cancer because of an exposure from a prior residential location or other factors. These cases and deaths are included in the investigation.

**Recommendations:**

Based on the findings and information discussed above, it is recommended that stomach

cancer analyses in Brazos County be updated when more recent data become available. It is not recommended at this time to further examine the cancers in Bastrop, Bell, Burleson, Falls, Lee, Milam, Robertson, Williamson, and Travis Counties. 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.<sup>2</sup> 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, more than 10 years can go by between the exposure to a carcinogen and a diagnosis of cancer.<sup>3</sup>

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.<sup>4</sup> 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.<sup>5</sup> 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.<sup>6</sup> Additionally much of the evidence that pollutants and pesticide residues increase cancer risk is presently considered quite weak and inconsistent. In contrast, the National Cancer Institute estimates that lifestyle factors such as tobacco use and diet cause 50 to 75 percent of cancer deaths.<sup>7</sup> Eating a healthy diet and refraining from tobacco are the best ways to prevent many kinds of cancer. 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 associated with obesity and physical inactivity.<sup>8</sup>

**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.<sup>9,10</sup>

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.

