MAY 0 2002

Texas Radiation Advisory Board

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May 6, 2002

Robert J. Huston
Chairman
Texas Natural Resource Conservation Commission
P.O. Box 13087
Austin, TX 78711-3087

Re: Waste

Dear Chairman Huston:

I am writing you today to explain why the Texas Radiation Advisory Board (TRAB) in its 6 April 2002 meeting recommended that 30 TAC Sec. 290.108 not be proposed for rulemaking.

In short, we believe that: (1) the revised EPA rules are unwarranted and unsupported by public health information (specifically epidemiological data); (2) the results of unvalidated mathematical models are used to support the diversion of public and private monies toward compliance with the rules; and (3) the rules unnecessarily create a category of radioactive waste for which there is currently no approved method of disposal.

As we discussed with your staff in our meeting on 5 April 2002, the most significant change to the existing rule is the addition of uranium as a regulated substance in drinking water. The fact that the existing regulations have been unchanged in Texas since 1971 is now well understood by the TRAB; however, the Environmental Protection Agency's (EPA) proposed rule in 1991 raised the question of appropriate limits supported by epidemiological data.

EPA's apparent reversal in April of 2000 with the issuance of the Notice of Data Availability (NODA) document was supported only by the recently-developed models described in Federal Guidance Report (FGR) 13. This Report was roundly criticized in the Health Physics community because the levels to which the FGR 13 models seek to analyze are not supported by any published epidemiological data. A documented TRAB review also commented on the inadequacy of the FGR 13 document.

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This position is further supported by EPA's own statements in the NODA document:

> *" EPA recognizes the inherent uncertainties that exist in estimating health impacts at the low levels of exposure and exposure rates expected to be present in the environment. EPA also recognizes that, at these levels, the actual health impact from ingested radionuclides will be difficult, if not impossible, to distinguish from natural disease incidences, even using very large epidemiological studies employing sophisticated statistical analyses."* [FR21600, Vol. 65, No. 78, 21 APR 2000]

The federal agency concedes that it is practically impossible to distinguish natural disease rates from disease rates enhanced by the minuscule levels of radioactive materials represented by the MCLs for drinking water. However, the EPA essentially ignores its own admonitions in the NODA and concludes that it plans to proceed with the revised levels in the NODA, maintaining the unsupported and unvalidated assumption that the linear, non-threshold model holds at the levels represented by the MCLs. When confronted with such unyielding adherence to the results of mathematical models, the TRAB has little choice. We cannot and will not support the diversion of public and private monies to fund EPA's mathematical exercises that have no basis in fact.

Similarly, the TRAB cannot support the TNRCC's position that "[T]he proposed rulemaking would *materially protect* public health and safety by preventing the exposure to unacceptable levels of radium-226, radium-228, and gross alpha particle radioactivity naturally occurring in groundwater which may be used as a public drinking water source in various geographical areas in Texas." [*Emphasis added.* Ref. 22 FEB 02 draft of 30 TAC Sec. 290.108, pg 10]. There are no data to support the assertions made in that statement.

The view held by the TRAB of this rulemaking activity is essentially identical to that expressed in a 19 September 2000 letter to Governor Bush on the subject of the EPA's proposed radon in drinking water rule:

> *"... The TRAB's concerns are that the burdens placed on Texans by the changes in the EPA rules are unwarranted and unsupported by public health information. The public health hazard this rule presumes to address has never been scientifically demonstrated.*
>
> *The TRAB understands that community water system (CWS) funds are very limited; the TRAB believes that issues of water supply, infrastructure, and basic hygiene should take precedence over radon mitigation. These critical CWS funds should not be exhausted on the mitigation of a hypothetical risk of radon in water, but instead on the mitigation of water-borne pathogens that are causing real death and disease throughout the nation today. In the end, it is not a question of what is the most cost-effective alternative for Texans, but ultimately it is a question of 'who pays' for the mitigation of a minuscule or non-existent risk. ..."*

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To further complicate matters, the radioactive waste unnecessarily generated by this rule creates additional hazards for Texans for which there is currently no approved method of disposal. The small rural CWSs most affected by these proposed rules could be financially devastated by the liability and cost of safely handling and disposing of the radioactive materials created by these rules. In fact, as stated in the attached comments to the proposed rule, the proposed rulemaking has the potential to materially endanger the public health and safety by creating radioactive wastes without providing for their safe handling and disposal and by limiting access of some Texans to safe, pathogen-free water. In many cases, these small rural CWSs are the sole source of suitable pathogen-free water for rural Texans.

Mr. Chairman, the TRAB understands the difficult position this puts the TNRCC in especially in regard to primacy status. However, the Board must take this position when the mitigation of an unsubstantiated hazard is involved in removing monies from limited public health coffers.

We will continue to work closely with the TNRCC staff in resolving this matter for the benefit of all Texans. Additional comments on the proposed rule are attached.

If you have any questions regarding the position of the TRAB on this matter, please feel free to contact me at your earliest convenience.

Sincerely,

Michael Ford, C.H.P.
Vice Chair

cc: Governor Rick Perry
Representative Warren Chisum, Chair, Committee on Environmental Regulation
Senator J.E. "Buster" Brown, Chair, Senate Natural Resources Committee
Environmental Protection Agency

City Drug

From: "Brenda Mokry" <Brenda.Mokry@tdh.state.tx.us>
To: <tac@centex.net>
Cc: <citydrug@centex.net>; <john.villanacci@tdh.state.tx.us>; <miguel.escobedo@tdh.state.tx.us>; <kimberly.kinney-lara@tdh.state.tx.us>; <tbennett@tceq.state.tx.us>
Sent: Monday, March 22, 2004 3:13 PM
Attach: csum04028.doc
Subject: cancer cluster report for Brady and McCulloch County

Dear Treva,

Enclosed is the completed report for zip code 76825, Brady, Texas and McCulloch County. Concern about a possible excess of cancer prompted the Cancer Registry Division (CRD) of the Texas Department of Health to re-examine the occurrence of cancer in zip code 76825, Brady, and McCulloch County, Texas. A previous cluster investigation (#01005) had found no excess of cancer for the sites of the bone and joint, nose and nasal cavity, and acute myeloid leukemia. Local residents were concerned that radium in the drinking water and silicone from the sanding industry may be causing cancer among residents. The Cancer Registry evaluated 1995-2001 incidence data (the most recent and best available data) and 1992-2001 mortality data for cancers of the bone and joint, nose and nasal cavity, lung and bronchus, total leukemia, and selected leukemia subtypes. Radium in drinking water has been associated with osteosarcoma in the scientific literature. Silicone, such as that from the sanding industry has been associated with an increased risk of lung and bronchus cancer.

The analysis of incidence data for zip code 76825, Brady and McCulloch County, Texas, from January 1, 1995-December 31, 2001, and mortality data from January 1, 1992-December 31, 2001, showed incidence and mortality data for cancers of the bone and joint, nose and nasal cavity, lung and bronchus, total leukemia, and the selected leukemia subtypes were within the ranges expected for both males and females. Additionally, the TCR contacted Tony Bennett with the Texas Commission on Environmental Quality. He confirmed that the naturally occurring radium in the drinking water is above the standards set by the Environmental Protection Agency. The City of Brady municipal water system is addressing these violations by treating surface water from Brady Lake.

Based on the findings and the information discussed above, further study is not recommended at this time to determine whether the various cancers in zip code 76825, Brady and McCulloch County, Texas may be associated with radium in the drinking water or silicone from the sanding industry. As new data or additional information become available, consideration will be given to updating or re-evaluating this investigation.

Sincerely,

Brenda J. Mokry
Epidemiologist
Texas Cancer Registry
Texas Department of Health
512-458-7111 ext. 3606
1-800-252-8059

17 pages

3/23/2004

Summary of Investigation Into the Occurrence of Cancer
Concho, McCullouch, San Saba, and Tom Green Counties, Texas
1990-1998
December 15, 2000

Background: In response to concerns regarding a possible excess of cancer, the Cancer Registry Division (CRD) of the Texas Department of Health conducted an investigation into the occurrence of cancer in Concho, McCullouch, San Saba, and Tom Green Counties, Texas. Specifically, we evaluated 1995-1997 incidence data and 1990-1998 mortality data for cancers of the nose, nasal sinus, and middle ear, bone and joints, and acute myelogenous leukemia (AML). Incidence data are the best indicator of the occurrence of cancer in an area. Currently, however, complete statewide cancer incidence data are only available for 1992, 1995, 1996, and 1997. Until additional years of statewide cancer incidence data become available, cancer mortality data is used as a supplemental measure and are complete for the entire state through 1998. The remaining portion of this report provides general information on cancer, the methodologies we use to investigate possible cancer clusters, the results of our investigation and general cancer risk factors.

General: Cancer is a very common disease, much more common than most people realize. Approximately two out of every five persons alive today will develop some type of cancer in their lifetime. Furthermore, cancer is not one disease, but many different diseases. Different types of cancer are generally thought to have different causes. In Texas, as in the United States, cancer is the second leading cause of death, exceeded only by heart disease. In 1998, 32,275 Texans died of cancer. Sixty-eight percent of these deaths were in persons 65 years of age or 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 actually slight. According to The Causes of Cancer by Doll and Peto, two renowned epidemiologists at the University of Oxford, pollution and occupational exposures are estimated to collectively cause 4-6% of all cancer deaths. The 1996 "Harvard Report on Cancer Prevention," published in the international journal, Cancer Causes and Control, states that cigarette smoking accounts for 30% of all cancer deaths. The report also notes that nearly two-thirds of cancer deaths in the U.S. can be linked to tobacco use, diet, and lack of exercise. Eating a healthy diet, refraining from tobacco use, and exercising regularly constitute the soundest approach a person can take to eliminate their chances of developing many kinds of cancer.

Methodology: The cancer cluster investigation is the primary tool used by the Texas Cancer Registry to investigate concerns of excess cancer. A cluster is a greater than expected number of cancers occurring among people who may live or work in the same area, and who may develop the disease within a short time of each other. The existence of a cluster is not necessarily a reason for concern. The fact that cancer is so common means that many clusters will be explainable solely on the basis of chance.

We assess the role of chance by comparing what is observed in a specific geographic area to what would be expected to occur if only chance were operating. For example, if we wanted to study the occurrence of fatal accidents on a particular highway, we would begin by collecting data over a period of several years. We would then have a certain expectation as to how many deaths might occur on that highway on a particular weekend, say Labor Day weekend. This expected number could be compared to what we actually observe on Labor Day weekend this year. Of course, we do not think that what we observe will be exactly the same as what we expected, but we do anticipate that the observed will be fairly close to the expected. It might be a little higher on Labor Day weekend this year but a little lower next year, but always about the same. This is simple variation due to the working of chance. If, however, the number of highway fatalities is much higher than what we expected, this might suggest that some new factor might be involved such as bad weather or a higher volume of traffic. In any event, we would accept that the observed number of deaths was outside the variation likely to be due to chance.

To determine whether an excess of cancer exists in Concho, McCullouch, San Saba, and Tom Green Counties, the numbers of observed cases and deaths were compared to what would be "expected" based on the race-, sex-, and age-specific cancer incidence and mortality of the entire state of Texas for the same periods of time. The attached Tables 1-10 list 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 95% 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 experience of 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 were also calculated.

The 95% confidence interval indicates the range in which we would expect the SIR or SMR to fall 95% of the time. The confidence interval is a statistical measure of the precision of the risk estimate. If the confidence interval contains 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 (or even less than one) 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 95% confidence interval contains 1.00, that indicates that the SIR or SMR is still within the range one might expect based on the incidence or mortality experience of the rest of the state.

Another way of defining the 95% confidence interval is to say that it represents the range within which the true magnitude of effect lies with a certain degree of assurance. For example, in evaluating the relationship of smoking with bladder cancer in men, instead of simply reporting that those who smoked had a statistically significant increased risk (RR = 1.9) of bladder cancer compared with those who did not, the 95% confidence interval (1.3 - 2.8) would also be presented. This indicates that the best estimate of the increased risk of bladder cancer associated with smoking is 1.9; however, we are 95% confident that the true relative risk is no less than 1.3 and no greater than 2.8.

Results: The analysis of incidence data for Concho, McCullouch, and San Saba Counties, during the period January 1, 1995-December 31, 1997, and mortality data from January 1, 1990-December 31, 1998, showed no statistically significant excesses of nose/nasal cavity/middle ear, bone and joint, or acute myelogenous leukemia cancers in either males or females. Analysis summaries are presented in Tables 1-6.

The analysis of incidence data for Tom Green County, as well as for all four counties combined during the same time period, showed that acute myelogenous leukemia incidence in males was statistically significantly elevated at the $p<0.05$ level (SIR = 2.3, CI = 1.1-4.2; SIR = 2.2, CI = 1.1-3.8), respectively. Tom Green mortality rates did not differ significantly from the rest of the state for nose/nasal cavity/middle ear, bone and joint, or acute myelogenous leukemia cancers. Analysis summaries are presented in Tables 7-10.

Discussion: We do not know why male acute myelogenous leukemia incidence in Tom Green County and all counties combined is elevated. 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 the possibility that any observed excess is being caused by some environmental exposure.

When evaluating the possibility that an observed excess is being caused by some environmental exposure, one of the markers we look for is whether the excess is observed in both males and females. None of the observed cancer elevations occurred in both males and females. This finding is not consistent with exposure to some environmental agent.

Epidemiologic studies have helped to identify a number of factors that may increase an individual's risk of developing cancer. These factors are known as risk factors. Some risk factors we can do nothing about, but most are a matter of choice.

The following is a brief discussion on leukemia and general cancer risk factors from "Texas Cancer Facts & Figures 2000: A Source Book for Planning and Implementing Programs for Cancer Prevention and Control," by the American Cancer Society and the American Cancer Society web site at www.cancer.org/.

Leukemia Risk Factors:
About 30,800 new cases of leukemia will be diagnosed in the United States during the year 2000. Approximately 28,090 of these newly diagnosed patients will be adults and 2,710 will be children. The most common adult leukemia is acute myelogenous leukemia

(parents, siblings, or children) who have had CLL.

Most people who develop leukemia, however, do not have any of the above risk factors. The cause of their leukemia remains unknown at this time. Because the cause is not known, there is no way to prevent most cases of leukemia. There are two important exceptions: avoiding smoking, and avoiding known cancer-causing chemicals such as benzene.

General Cancer Risk Factors:

The occurrence of cancer may vary by race/ethnicity, gender, the type of cancer, geographic distribution, population under study, and a variety of other factors. Scientific studies have identified a number of factors for various cancers which may increase an individual's risk of developing a specific type of cancer.

Heredity: When there is a family predisposition to cancer, heredity may be the first event that promotes the growth of cancer. Although a tendency or susceptibility to developing cancer can be inherited under certain conditions, only about 2 percent of malignancies are caused directly by heredity. Most family histories of cancer result from a complex interaction of genes, environment, and lifestyle.

Geographic Area: People living in areas where there are vitamin or mineral deficiencies such as selenium deficiency may run a higher risk of cancer. The biggest influence of geographic area, however, is on diet, which may also be influenced by cultural habits.

Diet: High levels of fats, both saturated (hard, mostly animal) and unsaturated (liquid, mostly vegetable), appear to play a role in causing cancers of the colon, rectum, prostate, testes, breast, uterus, and gallbladder. Low fiber consumption plays a role in the development of colon and rectal cancers. Even lean people with high-fat and low-fiber diets run increased risks of developing these cancers.

Eating preserved foods, especially smoked or nitrate-cured meats, increases the risk for cancers of the esophagus and stomach. Low levels of vitamins A and C increase the risk for cancers of the larynx, esophagus, stomach, colon, rectum, prostate, bladder, and lung.

Environmental Cancer Risks: The environmental causes of cancer include exposures in the community or workplace settings, as well as exposures determined by individual lifestyle choices (smoking, diet, medications, etc). The degree of cancer hazard posed by such risks depends on the concentration or intensity of the carcinogen in the environment and the exposure dose a person receives. These factors in combination create a range of risk. For example, in situations where high levels of carcinogens are present and where exposures are extensive, significant hazards may exist, but where concentrations are low and exposures limited, hazards are often negligible.

Chemicals and Radiation: Not all chemicals or all forms of radiation cause cancer. Only a limited number of chemicals (for example, benzene, asbestos, vinyl chloride, arsenic, aflatoxins) show definite evidence of human carcinogenicity or are probable human carcinogens based on animal experiments (for example, chloroform, dichlorodiphenyltrichloroethane (DDT), formaldehyde, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons). The only forms of radiation proven to cause human cancer are ionizing radiation (for example, x-rays, radon, cosmic rays) and ultraviolet radiation (principally UV-B radiation).

Ionizing Radiation: Excessive exposure to ionizing radiation can increase cancer risk. Most medical and dental x-rays are adjusted to deliver the lowest dose possible without sacrificing image quality. Excessive radon exposure in homes may increase risk of lung cancer, especially in cigarette smokers. If levels are found to be too high, remedial actions should be taken.

Sunlight: Almost all of the approximately 1,000,000 cases of basal and squamous cell skin cancer diagnosed each year in the U.S. are sun-related (ultraviolet radiation). Epidemiologic evidence shows that sun exposure is a major factor in the development of melanoma and that incidence increases for those living near the equator.

Estrogen: Estrogen treatment to control menopausal symptoms can increase risk of endometrial cancer. However, including progesterone in estrogen replacement therapy helps to minimize risk. Consultation with a physician will help each woman to assess personal risks and benefits. Continued research is needed in the area of estrogen use and breast cancer.

Sexual Practices: Sexual history and habits influence the chance of developing cancer. They can either protect you or promote the growth of tumors. Childbearing reduces risk of cancers of the ovary, uterus, and breast. And women who give birth before age 30 are less likely to develop breast cancer in later life.

The more sex partners one has, the more likely they are to be exposed to sexually transmitted viruses. Some of these can cause cancers of the head and neck, cervix, penis and anus, as well as AIDS and AIDS related cancers.

Alcohol: In about 7 percent of males and 3 percent of females, about 4 percent of people overall, alcohol can lead to cancers in the head and neck, the larynx, and possibly the liver and pancreas. Alcohol consumption also has a strong relationship with smoking, a combination that greatly increases the risk for cancers of the mouth, throat, and esophagus.

Tobacco Smoke: There is no longer any question about the causal relationship between smoking and cancer. The link has been established statistically since 1950, though it was apparent long before that. In 1950, when the first report relating smoking and lung cancer was published in the *Journal of the American Medical Association*, there were 18,000 lung cancer deaths. By 1982, there were 111,000. In 2000, it is estimated that there will be approximately 157,000 lung cancer deaths in the U.S. This death rate has started to decrease in men but is still increasing in women. Lung cancer has replaced breast cancer as the number one cause of cancer deaths in women.

Unproven Risks: Public concern about environmental cancer risks often focuses on risks for which no carcinogenity has been proven or on situations where known carcinogen exposures are at such levels that risks are negligible. For example:

Non-ionizing Radiation: Electromagnetic radiation at frequencies below ionizing and ultraviolet levels has not been shown to cause cancer. While some epidemiologic studies suggest associations with cancer, other do not, and experimental studies have not yielded reproducible evidence of carcinogenic mechanisms. Low frequency radiation includes radio waves, microwaves, and radar, as well as power frequency radiation arising from the electric and magnetic fields associated with electric currents (often called ELF or extremely low frequency radiation).

Pesticides: Many kinds of pesticides (insecticides, herbicides, etc.) are widely used in producing and marketing our food supply. While some of these chemicals cause cancer at high doses in experimental animals, the very low concentrations found in some foods are generally within established safety levels. Environmental pollution by slowly degraded pesticides such as DDT, a result of past agricultural practices, can lead to food chain bioaccumulation and to persistent residues in body fat. Such residues have been suggested as a possible risk factor for breast cancer; concentrations in tissue are low, however, and the evidence is not conclusive.

Toxic Wastes: Toxic wastes in dump sites can threaten human health through air, water, and soil pollution. Although many toxic chemicals contained in such wastes can be carcinogenic at high doses, most community exposures appear to involve very low or negligible dose levels. Clean-up of existing dump sites and close control of toxic materials in the future is essential to ensure healthy living conditions in our industrialized society.

Nuclear Power Plants: Ionizing radiation emissions from nuclear facilities are closely controlled and involve negligible levels of exposure for communities near such plants. Although reports about cancer case clusters in such communities have raised public concern, studies show that clusters do not occur more often near nuclear plants than they do by chance elsewhere in the population.

Summary: In summary, the analysis of incidence data for Concho, McCullouch, and San Saba Counties, during the period January 1, 1995-December 31, 1997, and mortality data from January 1, 1990-December 31, 1998, showed no statistically significant excesses of nose/nasal cavity/middle ear, bone and joint, or acute myelogenous leukemia cancers in either males or females.

The analysis of incidence data for Tom Green County, as well as for all four counties combined during the same time period, showed that acute myelogenous leukemia incidence in males was statistically significantly elevated. Tom Green mortality rates did not differ significantly from the rest of the state for nose/nasal cavity/middle ear, bone and joint, or acute myelogenous leukemia cancers.

Any questions regarding this investigation should be directed to Melanie A. Williams, Ph.D., Cancer Registry Division, at 1-800-252-8059 or melanie.williams@tdh.state.tx.us.

Table 1

Number of Observed and Expected Cancer Cases and Race Adjusted Standardized Incidence Ratios, Selected Sites, Concho County, TX, 1995-1997

		Males		
Site	**Observed**	**Expected**	**SIR**	**95% CI**
Nose, Nasal Cavity, and Middle Ear			0	0.0
	--	--		
Bone and Joint	0	0.1	0.0	0.0-61.5
Acute Myelogenous Leukemia		1	0.2	5.0
	0.1-27.9			

		Females		
Site	**Observed**	**Expected**	**SIR**	**95% CI**
Nose, Nasal Cavity, and Middle Ear			0	0.0
	--	--		
Bone and Joint	0	0.0	0.0	0.0-92.2
Acute Myelogenous Leukemia		0	0.1	0.0
	0.0-26.3			

Note: The SIR (standardized incidence ratio) is defined as the number of observed cases divided by the number of expected cases. The latter is based on race-, sex-, and age-specific cancer incidence rates for Texas during the period 1995-1997. The SIR has been rounded to the first decimal place.

*Significant at the p< 0.05 level.

Prepared by:
Melanie A. Williams, Ph.D.
Texas Cancer Registry Division
Texas Department of Health
12/14/2000

Table 2

Number of Observed and Expected Cancer Deaths and Race Adjusted Standardized Mortality Ratios, Selected Sites, Concho County, 1990-1998

		Males		
Site	**Observed**	**Expected**	**SMR**	**95% CI**
Nose, Nasal Cavity, and Middle Ear			0	0.0
	--	--		
Bone and Joint	0	0.2	0.0	0.0-24.6
Acute Myelogenous Leukemia		0	0.5	0.0

0.0-7.5

		Females		
Site	Observed	Expected	SMR	95% CI
Nose, Nasal Cavity, and Middle Ear			0	0.0
	--	--		
Bone and Joint	0	0.1	0.0	0.0-33.5
Acute Myelogenous Leukemia		1	0.3	2.9
	0.1-16.4			

Note: The SMR (standardized mortality ratio) is defined as the number of observed deaths divided by the number of expected deaths. The latter is based on race-, sex-, and age-specific cancer mortality rates for Texas during the period 1990-1998. The SMR has been rounded to the first decimal place.

*Significant at the p< 0.05 level.

Prepared by:
Melanie A. Williams, Ph.D.
Texas Cancer Registry Division
Texas Department of Health
12/14/2000

Table 3

Number of Observed and Expected Cancer Cases and Race Adjusted Standardized Incidence Ratios, Selected Sites, McCullouch County, TX, 1995-1997

		Males		
Site	Observed	Expected	SIR	95% CI
Nose, Nasal Cavity, and Middle Ear			0	0.1
	0.0	0.0-36.9		
Bone and Joint	0	0.2	0.0	0.0-24.6
Acute Myelogenous Leukemia		0	0.6	0.0
	0.0-6.1			

		Females		
Site	Observed	Expected	SIR	95% CI
Nose, Nasal Cavity, and Middle Ear			0	0.1
	0.0	0.0-36.9		
Bone and Joint	0	0.1	0.0	0.0-26.3
Acute Myelogenous Leukemia		0	0.5	0.0
	0.0-7.8			

Note: The SIR (standardized incidence ratio) is defined as the number of observed cases divided by the number of expected cases. The latter is based on race-, sex-, and age-specific cancer incidence rates for Texas during the period 1995-1997. The SIR has been rounded to the first decimal place.

*Significant at the p< 0.05 level.

Prepared by:
Melanie A. Williams, Ph.D.
Texas Cancer Registry Division
Texas Department of Health
12/14/2000

Table 4

Number of Observed and Expected Cancer Deaths and Race Adjusted Standardized Mortality Ratios, Selected Sites, McCullouch County, TX, 1990-1998

		Males		
Site	**Observed**	**Expected**	**SMR**	**95% CI**
Nose, Nasal Cavity, and Middle Ear			0	0.1
	0.0	0.0-36.9		
Bone and Joint	0	0.5	0.0	0.0-8.2
Acute Myelogenous Leukemia		3	1.5	2.0
	0.4-5.9			

		Females		
Site	**Observed**	**Expected**	**SMR**	**95% CI**
Nose, Nasal Cavity, and Middle Ear			0	0.1
	0.0	0.0-36.9		
Bone and Joint	1	0.4	2.7	0.1-15.1
Acute Myelogenous Leukemia		0	1.1	0.0
	0.0-3.2			

Note: The SMR (standardized mortality ratio) is defined as the number of observed deaths divided by the number of expected deaths. The latter is based on race-, sex-, and age-specific cancer mortality rates for Texas during the period 1990-1998. The SMR has been rounded to the first decimal place.

*Significant at the p< 0.05 level.

Prepared by:
Melanie A. Williams, Ph.D.
Texas Cancer Registry Division
Texas Department of Health
12/14/2000

Table 5

Number of Observed and Expected Cancer Cases and Race Adjusted Standardized Incidence Ratios, Selected Sites, San Saba County, TX, 1995-1997

		Males		
Site	**Observed**	**Expected**	**SIR**	**95% CI**
Nose, Nasal Cavity, and Middle Ear			0	0.1

0.0 0.0-36.9

Bone and Joint	0	0.1	0.0	0.0-36.9
Acute Myelogenous Leukemia		1	0.4	2.5

0.1-13.9

		Females		
Site	Observed	Expected	SIR	95% CI
Nose, Nasal Cavity, and Middle Ear			0	0.1

0.0 0.0-36.9

Bone and Joint	0	0.1	0.0	0.0-46.1
Acute Myelogenous Leukemia		0	0.3	0.0

0.0-11.9

Note: The SIR (standardized incidence ratio) is defined as the number of observed cases divided by the number of expected cases. The latter is based on race-, sex-, and age-specific cancer incidence rates for Texas during the period 1995-1997. The SIR has been rounded to the first decimal place.

*Significant at the p< 0.05 level.

Prepared by:
Melanie A. Williams, Ph.D.
Texas Cancer Registry Division
Texas Department of Health
12/14/2000

Table 6

Number of Observed and Expected Cancer Deaths and Race Adjusted Standardized Mortality Ratios, Selected Sites, San Saba County, TX, 1990-1998

		Males		
Site	Observed	Expected	SMR	95% CI
Nose, Nasal Cavity, and Middle Ear			0	0.1

0.0 0.0-36.9

Bone and Joint	2	0.3	6.7	0.8-24.1
Acute Myelogenous Leukemia		1	1.0	1.0

0.0-5.5

		Females		
Site	Observed	Expected	SMR	95% CI
Nose, Nasal Cavity, and Middle Ear			0	0.1

0.0 0.0-36.9

Bone and Joint	0	0.2	0.0	0.0-15.4
Acute Myelogenous Leukemia		2	0.8	2.7

0.3-9.6

Note: The SMR (standardized mortality ratio) is defined as the number of observed deaths divided by the number of expected deaths. The latter is based on race-, sex-, and age-specific cancer mortality rates for Texas during the period 1990-1998. The SMR has been rounded to the first decimal place.

*Significant at the p< 0.05 level.

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12/14/2000

Table 7

Number of Observed and Expected Cancer Cases and Race Adjusted Standardized Incidence Ratios, Selected Sites, Tom Green County, TX, 1995-1997

		Males		
Site	**Observed**	**Expected**	**SIR**	**95% CI**
Nose, Nasal Cavity, and Middle Ear	1	1.0	1.0	0.0-5.6
Bone and Joint	1	1.4	0.7	0.0-4.0
Acute Myelogenous Leukemia	10	4.4	2.3*	1.1-4.2

		Females		
Site	**Observed**	**Expected**	**SIR**	**95% CI**
Nose, Nasal Cavity, and Middle Ear	1	1.0	1.0	0.0-5.6
Bone and Joint	0	1.2	0.0	0.0-3.0
Acute Myelogenous Leukemia	2	3.8	0.5	0.1-1.9

Note: The SIR (standardized incidence ratio) is defined as the number of observed cases divided by the number of expected cases. The latter is based on race-, sex-, and age-specific cancer incidence rates for Texas during the period 1995-1997. The SIR has been rounded to the first decimal place.

*Significant at the p< 0.05 level.

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Table 8

Number of Observed and Expected Cancer Deaths and Race Adjusted Standardized

Mortality Ratios, Selected Sites, Tom Green County, TX, 1990-1998

		Males		
Site	**Observed**	**Expected**	**SMR**	**95% CI**
Nose, Nasal Cavity, and Middle Ear	0	1.0	0.0	0.0-3.7
Bone and Joint	2	3.4	0.6	0.1-2.1
Acute Myelogenous Leukemia	7	10.5	0.7	0.3-1.4

		Females		
Site	**Observed**	**Expected**	**SMR**	**95% CI**
Nose, Nasal Cavity, and Middle Ear	1	0.7	1.4	0.0-8.0
Bone and Joint	2	2.8	0.7	0.1-2.6
Acute Myelogenous Leukemia	15	8.6	1.7	1.0-2.9

Note: The SMR (standardized mortality ratio) is defined as the number of observed deaths divided by the number of expected deaths. The latter is based on race-, sex-, and age-specific cancer mortality rates for Texas during the period 1990-1998. The SMR has been rounded to the first decimal place.

*Significant at the $p < 0.05$ level.

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Table 9

Number of Observed and Expected Cancer Cases and Race Adjusted Standardized Incidence Ratios, Selected Sites, Concho, McCullouch, San Saba, and Tom Green Counties Combined, TX, 1995-1997

		Males		
Site	**Observed**	**Expected**	**SIR**	**95% CI**
Nose, Nasal Cavity, and Middle Ear	1	1.3	0.8	0.0-4.3
Bone and Joint	1	1.7	0.6	0.0-3.3
Acute Myelogenous Leukemia	12	5.6	2.2*	1.1-3.8

		Females		
Site	**Observed**	**Expected**	**SIR**	**95% CI**

Nose, Nasal Cavity, and Middle Ear			1	1.2
	0.8	0.0-4.6		
Bone and Joint	0	1.5	0.0	0.0-2.5
Acute Myelogenous Leukemia		2	4.7	0.4
	0.1-1.5			

Note: The SIR (standardized incidence ratio) is defined as the number of observed cases divided by the number of expected cases. The latter is based on race-, sex-, and age-specific cancer incidence rates for Texas during the period 1995-1997. The SIR has been rounded to the first decimal place.

*Significant at the p< 0.05 level.

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Table 10

Number of Observed and Expected Cancer Deaths and Race Adjusted Standardized Mortality Ratios, Selected Sites, Concho, McCullouch, San Saba, and Tom Green Counties Combined, TX, 1990-1998

		Males		
Site	**Observed**	**Expected**	**SMR**	**95% CI**
Nose, Nasal Cavity, and Middle Ear			0	1.2
	0.0	0.0-3.1		
Bone and Joint	4	4.3	0.9	0.3-2.4
Acute Myelogenous Leukemia		11	13.4	0.8
	0.4-1.5			

		Females		
Site	**Observed**	**Expected**	**SMR**	**95% CI**
Nose, Nasal Cavity, and Middle Ear			1	0.9
	1.1	0.0-6.2		
Bone and Joint	3	3.5	0.9	0.2-2.5
Acute Myelogenous Leukemia		18	10.9	1.7
	1.0-2.6			

Note: The SMR (standardized mortality ratio) is defined as the number of observed deaths divided by the number of expected deaths. The latter is based on race-, sex-, and age-specific cancer mortality rates for Texas during the period 1990-1998. The SMR has been rounded to the first decimal place.

*Significant at the p< 0.05 level.

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(AML) with, about 9,700 new cases expected. About 3,200 adults are expected to develop acute lymphocytic leukemia.

About 21,700 adults and children in the United States will die of leukemia during 2000.

While the exact cause of leukemia is not known, several risk factors for this cancer in children and adults have been identified.

Childhood Leukemia: Leukemia is the most common cancer in children; it accounts for about one-third of all cancers in children. For the most part, lifestyle risk factors such as diet and exercise, while important in adult cancers, are not linked to childhood cancers.

Certain genetic diseases that cause children to be born with an abnormal immune system increase their risk of developing leukemia. Other conditions such as Li-Fraumeni syndrome, Down's syndrome, Klinefelter's syndrome and others also carry an increased risk of leukemia.

Exposure to high doses of radiation, such as that among Japanese survivors of the atomic bomb, contributes to an increase in leukemia. Patients treated earlier with radiation therapy and chemotherapy for other cancers have a slight risk of developing a second cancer, usually AML, later in life.

Acute Leukemia: Smoking is a proven risk factor for acute myelogenous leukemia (AML). Although many people know that smoking causes lung cancer, few realize that it can affect cells that do not come into direct contact with smoke. Cancer-causing substances in tobacco smoke get into the bloodstream and spread to many parts of the body. About one-fifth of cases of AML are caused by smoking. People who smoke should attempt to quit.
There are some factors in the environment that are linked to acute leukemia. For example, long-term exposure to benzene is a risk factor for AML, and high-dose radiation exposure (such as from an atomic blast or nuclear reactor accident) increases the risk of AML and acute lymphocytic leukemia (ALL).

People who have had other cancers and were treated with certain chemotherapy drugs are more likely to develop AML. Most of these cases of AML happen within 9 years after treatment of Hodgkin's disease, non-Hodgkin's lymphoma, childhood ALL, or other cancers such as breast and ovarian cancer.

There is some concern about very high-voltage power lines as a risk factor for leukemia. The National Cancer Institute (NCI) has several large studies going on now to look into this question. So far, the studies show either no increased risk or a very slightly increased risk. Clearly, most cases of leukemia are not related to power lines.

A small number of people are at greater risk of acute leukemia because they have certain very rare diseases or because the have a certain virus (HTLV-1).

Chronic Leukemia: There are some factors in the environment that are linked to chronic leukemia. For example, high-dose radiation exposure (such as from an atomic blast or nuclear reactor accident) increases the risk of chronic myelogenous leukemia (CML) but not chronic lymphocytic leukemia (CLL). Long-term contact with herbicides or pesticides among farmers can increase their risk of CLL.

The only known inherited risk factor for chronic leukemia is having first-degree relatives

Estimated New Cancer Cases for Selected Cancer Sites by State, US, 2004*

State	All Cases	Female Breast	Uterine Cervix	Colon & Rectum	Uterine Corpus	Leukemia	Lung & Bronchus	Melanoma of the Skin	Non-Hodgkin Lymphoma	Prostate	Urinary Bladder
Alabama	24,270	3,980	190	2,330	680	530	3,350	840	840	4,850	810
Alaska	1,890	270	†	210	60	†	240	70	80	230	90
Arizona	23,560	3,980	190	2,490	510	590	2,760	1,180	950	3,920	1,140
Arkansas	14,800	2,050	160	1,630	340	370	2,230	560	640	2,150	570
California	134,300	21,860	1,210	13,880	3,920	3,240	15,650	5,020	5,550	23,160	5,730
Colorado	15,510	2,580	110	1,610	400	440	1,740	910	810	2,540	620
Connecticut	17,010	2,850	80	1,710	450	400	2,000	700	760	3,310	660
Delaware	4,390	700	†	410	110	110	550	210	200	690	†
Dist. of Columbia	2,860	590	†	340	170	†	300	70	60	620	90
Florida	97,290	13,350	730	9,950	2,450	2,500	13,390	4,250	2,690	17,090	4,550
Georgia	35,430	6,080	350	3,420	970	790	5,050	1,460	1,320	5,700	1,520
Hawaii	5,070	750	†	520	170	110	570	140	250	1,000	190
Idaho	5,460	920	†	540	170	140	660	280	250	1,080	330
Illinois	60,280	9,640	490	6,680	2,050	1,550	7,320	2,020	2,270	9,930	2,610
Indiana	32,160	4,790	130	3,520	910	790	4,490	1,320	1,430	5,390	1,230
Iowa	15,940	2,320	110	1,840	510	460	1,820	560	640	3,160	620
Kansas	12,940	1,880	80	1,480	400	340	1,690	630	640	2,690	660
Kentucky	22,720	3,340	190	2,310	510	470	3,660	1,040	980	2,620	850
Louisiana	23,540	3,930	190	2,560	510	550	3,160	700	980	3,690	760
Maine	7,520	920	†	800	230	140	950	280	250	1,150	470
Maryland	25,310	4,090	220	2,820	740	650	3,180	980	1,040	4,080	1,140
Massachusetts	33,050	5,170	130	3,520	970	760	4,050	1,460	1,150	5,700	1,800
Michigan	48,220	7,270	350	4,920	1,420	1,210	6,160	1,670	2,040	8,540	2,370
Minnesota	22,720	3,610	110	2,200	680	630	2,580	980	1,290	4,230	1,040
Mississippi	15,120	2,480	110	1,610	280	300	2,230	420	390	3,390	470
Missouri	30,290	4,680	240	3,240	850	780	4,090	1,320	1,400	3,460	1,140
Montana	5,000	590	†	470	110	140	650	210	200	1,080	330
Nebraska	8,280	1,290	†	1,010	280	230	1,040	350	360	1,460	330
Nevada	10,990	1,620	80	1,240	170	260	1,570	490	420	2,000	520
New Hampshire	6,290	920	30	670	170	140	800	280	140	1,000	380
New Jersey	43,830	7,970	380	4,770	1,760	1,030	5,110	1,810	1,820	7,930	2,040
New Mexico	7,550	1,020	†	830	230	170	750	280	310	1,690	330
New York	88,190	15,190	840	9,890	3,180	2,110	10,020	3,060	2,770	14,470	4,410
North Carolina	40,240	5,870	320	4,120	1,190	930	5,710	1,740	1,480	7,160	1,470
North Dakota	3,250	540	†	360	60	100	360	70	140	540	190
Ohio	59,410	10,070	320	6,760	1,880	1,450	7,720	2,300	2,410	8,620	2,940
Oklahoma	18,540	2,910	130	2,070	400	440	2,570	910	760	2,620	760
Oregon	17,280	2,750	110	1,790	450	400	2,140	910	920	2,920	900
Pennsylvania	72,590	11,200	400	8,570	2,500	1,620	8,560	2,720	3,030	12,010	3,510
Rhode Island	5,950	860	†	650	110	130	760	280	280	1,000	330
South Carolina	21,500	3,280	160	2,280	510	490	2,950	700	870	4,770	810
South Dakota	4,000	540	†	490	110	110	450	210	220	920	140
Tennessee	30,850	4,310	300	3,470	740	730	4,680	1,250	1,400	4,540	1,090
Texas	84,530	12,980	1,030	9,220	2,390	2,140	10,470	3,550	2,970	13,540	3,270
Utah	6,360	1,080	†	670	230	220	480	420	390	1,080	280
Vermont	3,150	590	†	340	110	70	400	140	170	460	140
Virginia	31,190	6,350	220	3,550	1,080	760	4,050	1,390	1,230	5,080	1,330
Washington	27,380	4,040	130	2,720	910	720	3,520	1,320	1,290	4,850	1,330
West Virginia	11,430	1,620	110	1,270	340	270	1,780	420	500	1,540	570
Wisconsin	26,160	4,040	110	2,900	850	750	3,050	1,110	1,290	3,850	1,280
Wyoming	2,430	270	†	280	60	60	280	140	80	620	90
United States	1,368,030	215,990	10,520	146,940	40,320	33,440	173,770	55,100	54,370	230,110	60,240

*Rounded to nearest 10. Excludes basal and squamous cell skin cancers and in situ carcinomas except urinary bladder. †Estimate is 50 or fewer cases.

Note: These estimates are offered as a rough guide and should be interpreted with caution. They are calculated according to the distribution of estimated cancer deaths in 2004 by state. State estimates may not add up to US total due to rounding.

Estimated Cancer Deaths for Selected Cancer Sites by State, US, 2004*

State	All Sites	Brain/ Nervous System	Female Breast	Colon & Rectum	Leukemia	Liver	Lung & Bronchus	Non-Hodgkin Lymphoma	Ovary	Pancreas	Prostate
Alabama	10,000	200	740	900	370	260	3,090	300	320	530	630
Alaska	780	†	†	80	†	†	220	†	†	†	†
Arizona	9,710	240	740	960	410	260	2,550	340	290	560	510
Arkansas	6,100	160	380	630	260	200	2,060	230	150	280	280
California	55,340	1,440	4,060	5,360	2,260	1,880	14,450	1,980	1,730	3,020	3,010
Colorado	6,390	180	480	620	310	160	1,610	290	210	380	330
Connecticut	7,010	150	530	660	280	170	1,850	270	200	380	430
Delaware	1,810	†	130	160	80	†	510	70	†	110	90
Dist. of Columbia	1,180	†	110	130	†	†	280	†	†	60	80
Florida	40,090	980	2,480	3,840	1,740	1,030	12,360	960	1,120	2,270	2,220
Georgia	14,600	260	1,130	1,320	550	300	4,660	470	430	750	740
Hawaii	2,090	†	140	200	80	100	530	90	†	150	130
Idaho	2,250	70	170	210	100	†	610	90	80	120	140
Illinois	24,840	490	1,790	2,580	1,080	650	6,760	810	660	1,400	1,290
Indiana	13,250	280	890	1,360	550	280	4,150	510	380	670	700
Iowa	6,570	160	430	710	320	110	1,680	230	210	380	410
Kansas	5,330	120	350	570	240	100	1,560	230	160	300	350
Kentucky	9,360	160	620	890	330	180	3,380	350	230	410	340
Louisiana	9,700	190	730	990	380	280	2,920	350	230	520	480
Maine	3,100	80	170	310	100	60	880	90	100	170	150
Maryland	10,430	210	760	1,090	450	240	2,940	370	300	590	530
Massachusetts	13,620	280	960	1,360	530	340	3,740	410	360	830	740
Michigan	19,870	450	1,350	1,900	840	500	5,690	730	580	1,120	1,110
Minnesota	9,360	250	670	850	440	190	2,380	460	270	540	550
Mississippi	6,230	160	460	620	210	190	2,060	140	160	320	440
Missouri	12,480	270	870	1,250	540	270	3,780	500	350	660	450
Montana	2,060	†	110	180	100	†	600	70	†	100	140
Nebraska	3,410	90	240	390	160	†	960	130	90	180	190
Nevada	4,530	80	300	480	180	110	1,450	150	110	220	260
New Hampshire	2,590	70	170	260	100	60	740	†	60	140	130
New Jersey	18,060	320	1,480	1,840	720	480	4,720	650	540	1,040	1,030
New Mexico	3,110	70	190	320	120	110	690	110	90	170	220
New York	36,340	690	2,820	3,820	1,470	890	9,250	990	1,080	2,270	1,880
North Carolina	16,580	320	1,090	1,590	650	350	5,270	530	450	900	930
North Dakota	1,340	40	100	140	70	†	330	†	†	90	70
Ohio	24,480	520	1,870	2,610	1,010	520	7,130	860	660	1,290	1,120
Oklahoma	7,640	160	540	800	310	160	2,370	270	170	360	340
Oregon	7,120	160	510	690	280	150	1,980	330	230	400	380
Pennsylvania	29,910	570	2,080	3,310	1,130	690	7,900	1,080	910	1,650	1,560
Rhode Island	2,450	†	160	250	90	60	700	100	60	160	130
South Carolina	8,860	200	610	880	340	190	2,720	310	170	500	620
South Dakota	1,650	†	100	190	80	†	420	80	60	100	120
Tennessee	12,710	300	800	1,340	510	270	4,320	500	340	660	590
Texas	34,830	940	2,410	3,560	1,490	1,120	9,670	1,060	960	1,930	1,760
Utah	2,620	80	200	260	150	60	440	140	90	150	140
Vermont	1,300	†	110	130	50	†	370	60	†	70	60
Virginia	12,850	290	1,180	1,370	530	320	3,740	440	400	750	660
Washington	11,280	340	750	1,050	500	300	3,250	460	390	700	630
West Virginia	4,710	90	300	490	190	100	1,640	180	140	190	200
Wisconsin	10,780	260	750	1,120	520	250	2,820	460	260	630	500
Wyoming	1,000	†	†	110	†	†	260	†	†	†	80
United States	563,700	12,690	40,110	56,730	23,300	14,270	160,440	19,410	16,090	31,270	29,900

*Rounded to nearest 10. †Estimate is 50 or fewer deaths. **Note:** State estimates may not add up to US total due to rounding.

Source: US Mortality Public Use Data Tapes, 1969-2001, National Center for Health Statistics, Centers for Disease Control and Prevention, 2003.