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Supplementary Documentation for an Environmental Impact Statement Regarding the Pantex Plant

A Comparison of County and State Cancer Mortality Rates

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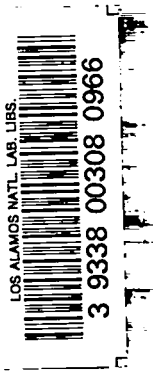

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SUPPLEMENTARY DOCUMENTATION FOR AN ENVIRONMENTAL IMPACT STATEMENT REGARDING THE PANTEX PLANT:

A COMPARISON OF COUNTY AND STATE CANCER MORTALITY RATES

by

L. D. Wiggs, G. S. Wilkinson, G. L. Tietjen, and J. F. Acquavella

ABSTRACT

This report documents work performed in support of preparation of an Environmental Impact Statement (EIS) regarding the Department of Energy's Pantex Plant near Amarillo, Texas.

This report considers cancer mortality rates in the region surrounding the Pantex nuclear weapons facility. The working hypothesis was that increased cancer mortality rates would exist in counties proximal to the Pantex Plant. To evaluate this hypothesis, we compared age-adjusted cancer mortality rates for the six surrounding counties with Texas state rates for three time periods: 1950 to 1959, 1960 to 1969, and 1970 to 1978. These comparisons showed that cancer mortality rates for Carson County (where the plant is located) and the five adjacent and downwind counties were not significantly different from rates for the State of Texas.

I. INTRODUCTION

This report documents work performed in support of preparation of an Environmental Impact Statement (EIS) regarding the Department of Energy's Pantex Plant near Amarillo, Texas. That EIS addresses continuing nuclear weapons operations at Pantex and the construction of additional facilities to house those operations. The EIS was prepared in accordance with current regulations under the National Environmental Policy Act. Regulations of the Council on Environmental Quality (40 CFR 1500) require agencies to prepare concise EISs with less than 300 pages for complex projects. This report was prepared by Los Alamos National Laboratory to document details of work performed and supplementary information considered during preparation of the Draft EIS.

Recently, there has been increasing nationwide interest in the health of residents living near nuclear and chemical industrial sites. In Amarillo, Texas, this interest has been directed toward individuals living near the Pantex Plant, a nuclear weapons production facility.

To address this concern, we compared age-adjusted cancer mortality in this region with mortality for the State of Texas. The working hypotheses were that (1) cancer mortality rates in this region were significantly higher than rates for Texas, and that (2) these elevated rates would follow a geographic pattern consistent with the pattern of ambient emissions from the plant.

We selected cancer as the health endpoint of interest because of the large body of literature supporting the association between cancer and exposures to radiation and chemicals. Investigations of radiation-induced cancers have demonstrated (1) increased mortality from leukemia, cancers of the thyroid, breast, lung, urinary organs, stomach, and lymphomas among the Japanese atomic bomb survivors (Beebe 1978); (2) increased incidence of tumors of the brain, thyroid, and parotid among tinea capitis patients treated with x-ray therapy during childhood (Shore 1976); (3) excess mortality from leukemia, cancers of the pharynx, bronchi, skin, liver, pancreas, and lymphatic and hemopoietic cancers in ankylosing spondylitics treated with therapeutic x rays (Court Brown 1965); (4) excess breast cancer in women treated with x rays for postpartum mastitis (Shore 1977); and (5) increased mortality from leukemias and cancers of the bone, liver, and lung in Portuguese thorotrast patients (Horta 1978).

Investigations of chemically related cancers have shown (1) excesses of angiosarcoma, brain cancer, and respiratory cancers among vinyl chloride workers (Tabershaw 1974, Waxweiler 1976); (2) lymphatic leukemias among workers exposed to solvents (McMichael 1975); and (3) excess mortality from respiratory cancers among chromium workers (Satoh 1981). Several recent articles (Cole 1980, Tomatis 1976, Tomatis 1978) have summarized and attempted to quantify the associations between cancer and chemical exposures.

Other studies in the past have examined cancer mortality in the regions surrounding nuclear or chemical industries. Lambert (1980) and Grahn (1975) examined cancer mortality in the vicinity of the Big Rock Point nuclear reactor in Charlevoix County, Michigan. Both studies reported that cancer mortality rates were not significantly different from rates for the State of Michigan.

Two recent investigations in counties with a heavy concentration of either chemical (Hoover 1975) or petroleum (Blot 1977) industries reported excess rates for "all cancers," cancers of the lung, skin, and other sites. These studies compared county cancer mortality rates with rates for the

United States (chemical industry study) or with rates for selected control counties (petroleum industry study).

II. CHARACTERISTICS OF PLANT OPERATIONS

Since 1951, the mission of the Pantex Plant has been to assemble and disassemble nuclear weapons. In addition, the facility maintains weapons for the national nuclear stockpile, develops and synthesizes small amounts of chemical high explosives (HE), and performs quality assurance and testing of weapons (USERDA 1976).

III. EXPOSURES FROM PLANT OPERATIONS

The Pantex Plant handles a variety of chemical and radioactive elements including (1) solvents and adhesives; (2) chemical HE; and (3) uranium, tritium, and plutonium. As with most studies of this nature, current emissions records are superior compared to earlier records. Therefore, it is difficult to estimate the potential radioactive and chemical exposures received by individuals living near the plant during early Pantex operations. For this reason, we must rely on current data to estimate exposures.

IV. CURRENT RADIOACTIVE EXPOSURES

In 1981, extensive environmental monitoring was conducted at the Pantex Plant. Levels of gross alpha, gross beta, and total uranium in water samples reflected naturally occurring levels of these components. Levels of ^{137}Cs, ^{238}Pu, ^{239}Pu, and tritium were at or below the limits of detection (Purtymun 1982A).

Monitoring of air and soil detected no measurable levels of radioactive contamination offsite. Consequently, computer modeling was used to estimate potential environmental doses below the detection limit of current analytic techniques (Buhl 1982). The estimated annual whole body dose was determined to be (at a maximum) less than 1 mrem for individuals in the surrounding population. This estimate is less than 1% of the exposure received from naturally occurring background radiation (Buhl 1982).

V. CURRENT NONRADIOACTIVE EXPOSURES

Air and water contamination represent the two potential sources of nonradioactive exposures for the surrounding population. Water samples from the Pantex supply wells and Ogallala Aquifer test wells met all primary and secondary federal drinking water standards (Purtymun 1982B).

A review of purchasing records for toxic materials used in the plant indicated that burning of waste HE and the disposal of waste organic solvent through evaporation represented the major sources of nonradioactive airborne

emissions (Macdonell 1982). Macdonell (1982) modeled the dispersion concentrations of potential airborne emissions for commonly used waste solvents and waste HE. These estimated concentrations meet all Environmental Protection Agency (EPA) air quality standards and all Texas Air Quality Regulations. In addition, these concentrations are within the DOE's occupational exposure standards (Macdonell 1982).

VI. METHODS

The purpose of this investigation was to evaluate the working hypothesis that cancer mortality rates in the region surrounding the Pantex Plant exceeded cancer mortality rates in the State of Texas.

Meteorological data (Bowen 1981) were used to determine the counties most likely to be exposed to emissions from plant operations. These data indicated that air concentrations resulting from plant emissions would decrease rapidly with increasing distance from the plant. People living within a 10-km radius of the plant were expected to have had the highest potential for exposure from these emissions. The prevailing winds would direct plant emissions toward the north and east of the plant. On this basis, the study region (Fig. 1) was defined as (1) the two counties (Carson and Potter) adjacent to the plant, and (2) the three downwind counties

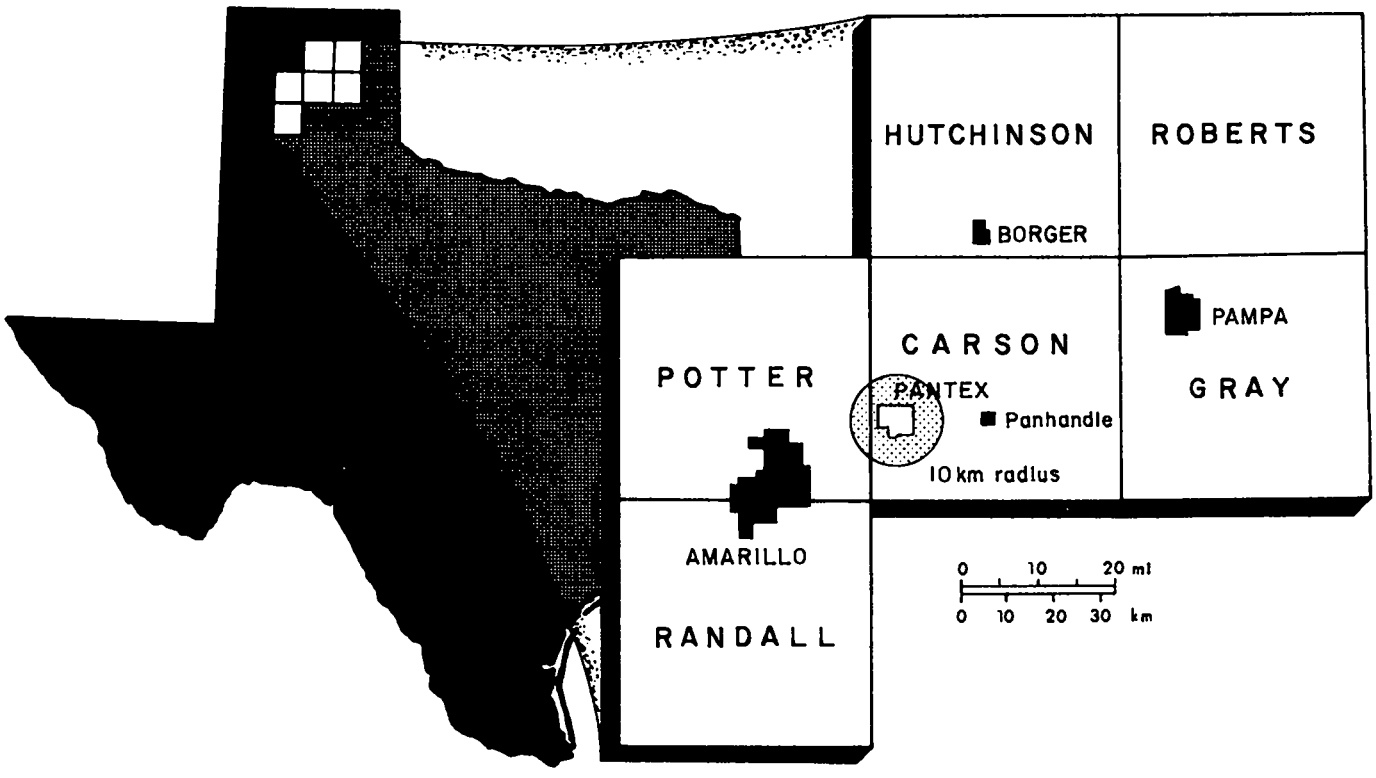

Fig. 1. Texas counties included in the study region.

(Hutchinson, Roberts, and Gray) to the north and east of the plant. Because a portion of the major population center in the area, the City of Amarillo, is located in Randall County, cancer mortality rates for Randall County were also evaluated.

The region studied contained a population of 203,000 persons according to the 1970 census (US Bureau of the Census 1973). Only a small part of this population resides within the 10-km radius of the plant. In 1980, there were 155 residents within an 8-km radius and 934 within a 16-km radius. Of those living within the 16-km radius, only 155 live to the north and east (downwind) of the plant (LATA 1982).

County data were used for this investigation because mortality data were not available for smaller geographic units. Texas was chosen as the appropriate comparison group because (1) Texas state rates are more representative of the region than US rates, and (2) state rates are more stable than county rates. We examined the percentage of the state population residing in urban areas and found that it was similar to that of the study region (Table I). Age, sex, and race characteristics were controlled by the use of sex- and race-specific, age-adjusted rates. The percentage of persons of Hispanic heritage represents a possible confounding factor not controlled in these analyses. In 1970, the percentage of persons of Hispanic heritage for Texas was 18.4% compared with a range of <1.0 to 8.0% for the counties in

TABLE I

PERCENTAGE OF POPULATION LIVING IN URBAN AREAS* - 1970

	Total Population	Per Cent of Urban**
State of Texas	11 195 431	79.8
Six-County Study Region	203 096	85.5
Carson County	6 358	00.0
Gray County	26 949	80.3
Hutchinson County	24 443	68.4
Potter County	90 511	95.6
Randall County	53 885	90.4
Roberts County	950	00.0

*Source: US Bureau of the Census 1973.
**Urban refers to incorporated and unincorporated places with ≥2500 inhabitants (US Bureau of the Census 1973).

TABLE II

PERCENTAGE OF THE POPULATION OF SPANISH HERITAGE*

Region	Per Cent Spanish**
State of Texas	18.4
Carson County, Texas	---***
Gray County, Texas	2.5
Hutchinson County, Texas	2.9
Potter County, Texas	8.0
Randall County, Texas	3.2
Roberts County, Texas	---***

*Source: US Bureau of the Census 1973.
**Spanish is defined as persons reporting Spanish as their "mother tongue" (US Bureau of the Census 1973).
***Percentage not calculated when less than 400 members of the population possess a given characteristic (US Bureau of the Census 1973).

the study region (Table II) (US Bureau of the Census 1973). Because Mexican-Americans, in general, tend to have low cancer mortality rates (Menck 1975), this bias would elevate our mortality rate ratios and result in a conservative estimate of cancer mortality in the study region.

Mortality ratios were calculated by comparing age-adjusted cancer mortality rates (Riggan in press)* for counties in the study region with rates for the State of Texas. These mortality rate ratios and their associated exact 95% confidence intervals (Pearson 1966) served as the basis for statistical evaluation. A rate ratio of 1.00 indicated no difference between county and state rates. A chi-squared goodness-of-fit test (Bowker 1972) and sign tests (Bowker 1972) were used to determine whether significant mortality rate ratios displayed patterns. Although mortality rate ratios were computed for white males and white females for three time periods (1950 to 1959, 1960 to 1969, and 1970 to 1978), our interest centered on the 1960s and 1970s because of the long latent periods required for most cancers.

*These analyses were based on an advance copy (dated April 1982) of the cancer mortality atlas (Riggan in press). These age-adjusted rates were based on extrapolated age-specific populations for the 1970s.

TABLE III

CANCER SITES INCLUDED IN THE INVESTIGATION OF CANCER MORTALITY IN THE REGION SURROUNDING THE PANTEX PLANT

Cancer Sites	ICDA-8*
All cancers combined	140-207
Bladder and other urinary organs	188, 189.9
Bone, including jaw	170
Brain and nervous system	191, 192
Breast	174
Kidney and ureter	189.0-189.2
Large intestine	153
Larynx	161
Leukemias	204-207
Liver, gallbladder and bile ducts	155, 156, 197.8
Lung	162, 163.0, 163.9
Lymphosarcoma, reticulum cell sarcoma	200, 202
Multiple myeloma	203
Pancreas	157
Prostate	185
Stomach	151
Testis	186
Thyroid gland	193

*Eighth Revision, International Classification of Diseases (USDHEW 1968).

To limit the number of chance associations, we restricted our analyses to cancers (Table III) previously associated with radiation or chemical exposures. Cancer of the testis was added because of public interest (Tiede 1980).

VII. RESULTS

Tables IV and V list mortality rate ratios that differ significantly from the null value (i.e. 1.00). A complete listing of all cancer sites is contained in the Appendix. In general the number of ratios that were significantly different is consistent with the number expected.

Cancer mortality in the region around Pantex did not follow a pattern that would suggest a relationship between cancer mortality and exposures to ambient emissions. Carson County, which contains the plant and was,

TABLE IV

SIGNIFICANTLY ELEVATED MORTALITY RATE RATIOS FOR SELECTED TEXAS COUNTIES (1950-1978)

County	Site	Sex	No. of Deaths	Ratio*	Confidence Interval**
		1950 to 1959			
Hutchinson	Stomach	M	18	1.77	1.05-2.80
Potter	Bone	M	12	2.47	1.27-4.31
	Kidney	M	19	1.74	1.05-2.72
		1960 to 1969			
Gray	Liver	F	11	2.43	1.21-4.35
Hutchinson	Large intestine	M	17	1.90	1.11-3.05
Potter	Kidney	M	24	1.65	1.06-2.45
	Multiple myeloma	M	14	2.17	1.18-3.64
Randall	Leukemia	M	19	1.84	1.11-2.88
		1970 to 1978			
Gray	All cancers	M	272	1.14	1.00-1.28
	Lymphosarcoma	M	14	2.09	1.14-3.51
Potter	Prostate	M	80	1.28	1.01-1.59
Randall	Brain	F	15	1.95	1.09-3.21
Roberts	Leukemia	F	3	12.39	2.56-36.22

*County rate divided by the state rate.
**Exact 95% confidence interval (Pearson 1966).

therefore, most likely to receive the heaviest ambient exposures, displayed no significantly elevated mortality rate ratios (1950 to 1978). Mortality rate ratios (for $n \geq 5$) for Carson County (1970 to 1978) are presented in Table VI.

The mortality rate ratios for the study region as a whole were distributed as expected based on statistical chance alone. A chi-squared goodness-of-fit test demonstrated that the number of significantly different mortality rate ratios observed in each of the three time periods was not significantly different from the number expected ($\alpha = 0.05$) (Table VII).

TABLE V

SIGNIFICANTLY LOW MORTALITY RATE RATIOS FOR SELECTED TEXAS COUNTIES (1950-1978)

County	Site	Sex	No. of Deaths	Ratio*	Confidence Interval**
		1950 to 1959			
Gray	Leukemia	F	1	0.10	0.00-0.57
	Stomach	M	7	0.47	0.19-0.97
Hutchinson	Leukemia	M	4	0.27	0.07-0.69
Potter	Liver	M	2	0.17	0.02-0.60
	Lymphosarcoma	M	5	0.33	0.11-0.78
Randall	All cancers	M	59	0.60	0.45-0.77
	Lung	M	11	0.54	0.27-0.97
Roberts	All cancers	F	1	0.14	0.00-0.78
		1960 to 1969			
Gray	Prostate	M	11	0.55	0.27-0.98
Hutchinson	Liver	M	1	0.17	0.00-0.95
Potter	Liver	M	7	0.42	0.17-0.85
Randall	All cancers	M	177	0.84	0.72-0.97
	Liver	F	1	0.09	0.00-0.51
	Lung	M	45	0.68	0.50-0.91
	Lung	F	4	0.38	0.10-0.96
		1970 to 1978			
Carson	Lung	M	10	0.47	0.22-0.86
Hutchinson	Leukemia	M	2	0.20	0.02-0.70
Potter	Liver	F	9	0.49	0.22-0.93
Randall	Lung	M	86	0.79	0.63-0.97

*County rate divided by the state rate.
**Exact 95% confidence interval (Pearson 1966).

An analysis using the sign test (Bowker 1972) showed that 29 of 36 sex-county-decade specific groups demonstrated no difference in the number of cancer mortality rate ratios above and below unity. The remaining seven sex-county-decade specific groups had significantly more cancer rate ratios less than one. A second sign test (Bowker 1972) demonstrated that there was not a

TABLE VI

MORTALITY RATE RATIOS FOR SELECTED CANCER SITES:
CARSON COUNTY, TEXAS, COMPARED WITH THE STATE OF TEXAS, 1970 TO 1978*

		Males			Females		
Cancer Site	ICDA-8**	No. of Deaths (N)	Ratio	Confidence Interval	No. of Deaths (N)	Ratio	Confidence Interval
All cancers combined	140-207	48	0.77	0.57-1.03	41	0.96	0.69-1.31
Breast	174	0	--	--	7	0.88	0.35-1.80
Large intestine	153	6	1.31	0.48-2.85	9	1.72	0.78-3.26
Leukemia	204-207	6	1.98	0.73-4.30	0	--	--
Lung	162,163.0,163.9	10	0.47	0.22-0.86***	5	0.94	0.30-2.18

*Limited to cancers where N $\geq$ 5.
**Eighth Revision, International Classification of Diseases (USDHEW 1968).
***Significantly lower than expected: 95% CI.

TABLE VII

CHI-SQUARED GOODNESS-OF-FIT TEST FOR NUMBER OF SIGNIFICANTLY DIFFERENT CANCER MORTALITY RATE RATIOS

Time Period	Observed Number of Significant Results	Expected Number of Significant Results*	X^2 (1 degree of freedom)	Probability**
1950-1959	11.0	10.2	0.063	0.802
1960-1969	12.0	10.2	0.318	0.573
1970-1978	9.0	10.2	0.141	0.707

*Expected number based on $\alpha = 0.05$.
**Probability of obtaining a value larger than the one given (Rothman 1979).

significant difference between the number of significantly high and significantly low results for each decade (1950 to 1959, 1960 to 1969, or 1970 to 1978) or for the entire period (1950 to 1978) (Table VIII).

VIII. DISCUSSION

These results demonstrate that county cancer mortality rates in the region surrounding the Pantex Plant were not unusual when compared to rates

TABLE VIII

SIGN TEST FOR HIGH AND LOW CANCER MORTALITY RATIOS

Time Period	Number Significantly High	Number Significantly Low	Number of Trials	Critical Value* for Sign Test ($\alpha = 0.05$)	Result
1950-1959	3	8	11	1	NS**
1960-1969	5	7	12	2	NS
1970-1978	5	4	9	1	NS
1950-1978	13	19	32	9	NS

*If below or equal to this value, the null hypothesis is rejected (Bowker 1972).
**NS = Not Significant at $\alpha = 0.05$.

for the State of Texas. This indicates that the past operations of the Pantex Plant are unlikely to have affected cancer mortality in this region.

Some of the rate ratios differed significantly ($\alpha = 0.05$) from the null value of 1.00. These significant rate ratios probably represent a chance occurrence because (1) a chi-squared goodness-of-fit test confirmed that the number of significant rate ratios (in each time period) was not greater than the number expected by chance alone ($\alpha = 0.05$); (2) a sign test indicated that when there was a difference in the number of rates above and below unity, there were significantly more ratios <1.000; and (3) a sign test demonstrated that the number of significantly high results was not different from the number of significantly low results.

Because a long latent period would be necessary for cancers related to the operations of the Pantex Plant to develop, we concentrated our emphasis on comparisons of rates for the 1960s and 1970s. Comparisons for both the 1960s and 1970s did not indicate any pattern of significant excesses in cancer mortality for the study area.

The significantly elevated mortality rate ratios were not distributed in a fashion consistent with estimated air concentrations of plant emissions that decrease rapidly as the distance from the plant increases. Because most of Carson County lies to the north and east of the plant (in the path of the prevailing winds), it should receive the heaviest exposures to air emissions and, therefore, should be the best indicator of effects resulting from the

operations of the plant. Carson County did not display any significantly high mortality rate ratios. This observation further supports the conclusion that significant ratios observed in the other counties were random statistical events. There is no reason to suspect that more distant counties would display effects related to plant operations when the most proximal county displayed no effects.

The results of this study should be interpreted in light of its limitations. First, the region consists of counties with 1970 populations ranging from 950 to 90,511 (US Bureau of the Census 1973). Many of the age-adjusted cancer mortality rates for these relatively small population counties were based on few deaths. This results in unstable rates with large variances that limit our ability to detect significant differences with the corresponding state rates.

A second limitation was that the cancer mortality data (Riggan in press) were not specifically generated to study the Pantex Plant. Only county-, state-, and national-level data were available, and therefore, our comparisons were limited. We were unable to compare those individuals living within the 10-km radius of Pantex with suitable nonexposed controls. However, the estimated potential exposure level for the heaviest exposed individuals was less than 1% of radiation exposure from natural sources, making related cancers unlikely.

Other cancer-related factors not controlled included (1) migration in and out of the region, (2) the presence of other industries in the region, (3) the personal habits of the decedents (patterns of smoking, diet, alcohol consumption, etc.), (4) familial history of disease, (5) medical exposure to drugs and x rays, and (6) occupational chemical and radiation exposures.

Because occupational exposures at Pantex are higher than ambient exposures, we have initiated a study of the work force as a more sensitive indicator of health effects due to the plant's activities. Employee radiation and chemical exposure histories will be used to determine whether there is a relationship between occupational exposure and mortality. If excesses are discovered, case-control studies that allow for careful consideration of confounders such as smoking history and occupational exposure to radiation and chemicals can be designed.

IX. CONCLUSIONS

This investigation did not find any evidence that Pantex Plant operations have resulted in abnormally high cancer mortality rates in the region. Cancer mortality rates for counties in this area were similar to those for Texas.

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APPENDIX

TABLES OF CANCER MORTALITY RATE RATIOS: SELECTED TEXAS COUNTIES COMPARED WITH THE STATE OF TEXAS, 1950 TO 1978

MORTALITY RATE RATIOS FOR SELECTED CANCER SITES:
CARSON COUNTY, TEXAS, COMPARED WITH THE STATE OF TEXAS, 1950-1959

Cancer Site	ICDA-8***	White Males				White Females			
		No. of Deaths	Ratio	Confidence Interval		No. of Deaths	Ratio	Confidence Interval	
All cancers combined	140-207	37	0.924	0.65	1.27	26	0.774	0.51	1.13
Bladder and other urinary organs	188,189.9	0	--	--	--	0	--	--	--
Bone, including jaw	170	1	2.800	0.07	15.60	0	--	--	--
Brain and nervous system	191,192	4	2.757	0.75	7.06	0	--	--	--
Breast	174	1	20.500	0.52	114.18	5	0.865	0.28	2.02
Kidney and ureter	189.0-189.2	1	1.548	0.04	8.63	0	--	--	--
Large intestine	153	1	0.337	0.01	1.89	2	0.592	0.07	2.14
Larynx	161	2	4.571	0.55	16.51	0	--	--	--
Leukemia	204-207	4	1.366	0.37	3.50	1	0.627	0.02	3.49
Liver, gallbladder and bile ducts	155,156,197.8	0	--	--	--	0	--	--	--
Lung	162,163.0,163.9	5	0.709	0.23	1.66	2	1.655	0.20	5.98
Lymphosarcoma, reticulum cell	200,202	1	1.000	0.03	5.57	2	3.536	0.43	12.77
Multiple myeloma	203	0	--	--	--	0	--	--	--
Pancreas	157	3	1.094	0.23	3.20	0	--	--	--
Prostate	185	5	1.170	0.38	2.73	--	--	--	--
Stomach	151	3	0.762	0.16	2.23	3	1.402	0.29	4.10
Testis	186	0	--	--	--	--	--	--	--
Thyroid gland	193	0	--	--	--	1	5.857	0.15	32.63

*Significantly lower than expected: 95% CI.
**Significantly higher than expected: 95% CI.
***Eighth Revision, International Classification of Disease (USDHEW 1968).

MORTALITY RATE RATIOS FOR SELECTED CANCER SITES:
CARSON COUNTY, TEXAS, COMPARED WITH THE STATE OF TEXAS, 1960-1969

Cancer Site	ICDA-8***	White Males				White Females			
		No. of Deaths	Ratio	Confidence Interval		No. of Deaths	Ratio	Confidence Interval	
All cancers combined	140-207	46	0.822	0.60	1.10	36	0.898	0.63	1.24
Bladder and other urinary organs	188,189.9	1	0.532	0.01	2.96	1	1.435	0.04	7.99
Bone, including jaw	170	0	--	--	--	0	--	--	--
Brain and nervous system	191,192	2	1.192	0.14	4.30	0	--	--	--
Breast	174	0	--	--	--	10	1.308	0.63	2.41
Kidney and ureter	189.0-189.2	1	0.784	0.02	4.37	0	--	--	--
Large intestine	153	4	0.984	0.27	2.52	5	1.103	0.36	2.57
Larynx	161	0	--	--	--	0	--	--	--
Leukemia	204-207	7	2.105	0.85	4.34	3	1.594	0.33	4.66
Liver, gallbladder and bile ducts	155,156,197.8	0	--	--	--	3	2.091	0.43	6.11
Lung	162,163.0,163.9	10	0.647	0.31	1.19	3	1.182	0.24	3.45
Lymphosarcoma, reticulum cell	200,202	2	1.125	0.14	4.06	0	--	--	--
Multiple myeloma	203	2	3.111	0.38	11.24	0	--	--	--
Pancreas	157	3	0.859	0.18	2.51	1	0.365	0.01	2.03
Prostate	185	3	0.552	0.11	1.61	--	--	--	--
Stomach	151	4	1.170	0.32	3.00	2	0.928	0.11	3.35
Testis	186	0	--	--	--	--	--	--	--
Thyroid gland	193	0	--	--	--	0	--	--	--

*Significantly lower than expected: 95% CI.
**Significantly higher than expected: 95% CI.
***Eighth Revision, International Classification of Diseases (USDHEW 1968).

MORTALITY RATE RATIOS FOR SELECTED CANCER SITES:
CARSON COUNTY, TEXAS, COMPARED WITH THE STATE OF TEXAS, 1970-1978

Cancer Site	ICDA-8***	White Males				White Females			
		No. of Deaths	Ratio	Confidence Interval		No. of Deaths	Ratio	Confidence Interval	
All cancers combined	140-207	48	0.774	0.57	1.03	41	0.963	0.69	1.31
Bladder and other urinary organs	188,189.9	2	1.120	0.14	4.05	0	--	--	--
Bone, including jaw	170	1	3.778	0.10	21.05	0	--	--	--
Brain and nervous system	191,192	0	--	--	--	3	2.974	0.61	8.69
Breast	174	0	--	--	--	7	0.875	0.35	1.80
Kidney and ureter	189.0-189.2	1	0.628	0.02	3.50	0	--	--	--
Large intestine	153	6	1.308	0.48	2.85	9	1.715	0.78	3.26
Larynx	161	1	1.231	0.00	6.86	1	7.250	0.18	40.39
Leukemia	204-207	6	1.977	0.73	4.30	0	--	--	--
Liver, gallbladder and bile ducts	155,156,197.8	2	1.167	0.14	4.22	0	--	--	--
Lung	162,163.0,163.9	10	0.466	0.22	0.86*	5	0.935	0.30	2.18
Lymphosarcoma, reticulum cell	200,202	1	0.537	0.01	2.99	1	0.891	0.02	4.96
Multiple myeloma	203	2	2.417	0.29	8.73	1	1.700	0.04	9.47
Pancreas	157	3	0.776	0.16	2.27	0	--	--	--
Prostate	185	4	0.657	0.18	1.68	--	--	--	--
Stomach	151	0	--	--	--	3	1.813	0.37	5.30
Testis	186	0	--	--	--	--	--	--	--
Thyroid gland	193	0	--	--	--	0	--	--	--

*Significantly lower than expected: 95% CI.
**Significantly higher than expected: 95% CI.
***Eighth Revision, International Classification of Disease (USDHEW 1968).

MORTALITY RATE RATIOS FOR SELECTED CANCER SITES:
GRAY COUNTY, TEXAS, COMPARED WITH THE STATE OF TEXAS, 1950-1959

Cancer Site	ICDA-8***	White Males				White Females			
		No. of Deaths	Ratio	Confidence Interval		No. of Deaths	Ratio	Confidence Interval	
All cancers combined	140-207	134	0.963	0.81	1.14	101	0.882	0.72	1.07
Bladder and other urinary organs	188,189.9	3	0.804	0.17	2.35	1	0.667	0.02	3.71
Bone, including jaw	170	1	1.067	0.03	5.94	0	--	--	--
Brain and nervous system	191,192	0	--	--	--	4	0.958	0.26	2.45
Breast	174	0	--	--	--	16	0.986	0.56	1.60
Kidney and ureter	189.0-189.2	4	1.355	0.37	3.47	2	0.739	0.09	2.67
Large intestine	153	9	1.019	0.47	1.93	16	1.265	0.72	2.05
Larynx	161	3	1.381	0.28	4.04	0	--	--	--
Leukemia	204-207	10	0.890	0.43	1.64	1	0.102	0.00	0.57*
Liver, gallbladder and bile ducts	155,156,197.8	6	2.133	0.78	4.64	4	1.410	0.38	3.61
Lung	162,163.0,163.9	28	0.943	0.63	1.36	3	0.759	0.16	2.22
Lymphosarcoma, reticulum cell	200,202	7	2.194	0.88	4.52	2	0.536	0.06	1.94
Multiple myeloma	203	3	1.692	0.35	4.95	0	--	--	--
Pancreas	157	5	0.588	0.19	1.37	3	1.150	0.24	3.36
Prostate	185	14	1.042	0.57	1.75	--	--	--	--
Stomach	151	7	0.469	0.19	0.97*	8	1.083	0.47	2.13
Testis	186	1	0.857	0.02	4.78	--	--	--	--
Thyroid gland	193	0	--	--	--	1	0.857	0.02	4.78

*Significantly lower than expected: 95% CI.
**Significantly higher than expected: 95% CI.
***Eighth Revision, International Classification of Diseases (USDHEW 1968).

MORTALITY RATE RATIOS FOR SELECTED CANCER SITES:
GRAY COUNTY, TEXAS, COMPARED WITH THE STATE OF TEXAS, 1960-1969

Cancer Site	ICDA-8***	White Males				White Females			
		No. of Deaths	Ratio	Confidence Interval		No. of Deaths	Ratio	Confidence Interval	
All cancers combined	140-207	215	1.012	0.88	1.16	181	1.125	0.97	1.30
Bladder and other urinary organs	188,189.9	3	0.575	0.12	1.68	3	1.130	0.23	3.30
Bone, including jaw	170	2	1.182	0.14	4.27	0	--	--	--
Brain and nervous system	191,192	10	1.404	0.67	2.58	9	1.714	0.78	3.25
Breast	174	0	--	--	--	28	0.886	0.59	1.28
Kidney and ureter	189.0-189.2	3	0.514	0.11	1.50	6	2.136	0.78	4.65
Large intestine	153	14	0.976	0.53	1.64	26	1.381	0.90	2.02
Larynx	161	2	0.750	0.09	2.71	1	2.333	0.06	13.00
Leukemia	204-207	20	1.621	0.99	2.50	15	1.725	0.97	2.84
Liver, gallbladder and bile ducts	155,156,197.8	5	0.927	0.30	2.16	11	2.432	1.21	4.35**
Lung	162,163.0,163.9	77	1.251	0.98	1.56	15	1.466	0.82	2.42
Lymphosarcoma, reticulum cell	200,202	8	1.000	0.43	1.97	2	0.462	0.06	1.67
Multiple myeloma	203	5	2.333	0.76	5.45	1	0.375	0.01	2.09
Pancreas	157	11	0.802	0.40	1.43	6	0.622	0.23	1.35
Prostate	185	11	0.546	0.27	0.98*	--	--	--	--
Stomach	151	9	0.760	0.35	1.44	1	0.275	0.01	1.53
Testis	186	0	--	--	--	--	--	--	--
Thyroid gland	193	0	--	--	--	2	2.500	0.30	9.03

*Significantly lower than expected: 95% CI.
**Significantly higher than expected: 95% CI.
***Eighth Revision, International Classification of Diseases (USDHEW 1968).

MORTALITY RATE RATIOS FOR SELECTED CANCER SITES:
GRAY COUNTY, TEXAS, COMPARED WITH THE STATE OF TEXAS, 1970-1978

Cancer Site	ICDA-8***	White Males				White Females			
		No. of Deaths	Ratio	Confidence Interval		No. of Deaths	Ratio	Confidence Interval	
All cancers combined	140-207	272	1.135	1.00	1.28**	180	0.990	0.85	1.14
Bladder and other urinary organs	188,189.9	10	1.620	0.78	2.98	2	0.750	0.09	2.71
Bone, including jaw	170	3	2.778	0.57	8.12	0	--	--	--
Brain and nervous system	191,192	10	1.569	0.75	2.89	7	1.308	0.53	2.69
Breast	174	1	3.000	0.75	16.71	35	1.056	0.74	1.47
Kidney and ureter	189.0-189.2	10	1.721	0.83	3.16	3	0.864	0.18	2.52
Large intestine	153	16	0.856	0.49	1.39	27	1.259	0.83	1.83
Larynx	161	1	0.231	0.83	1.29	0	--	--	--
Leukemia	204-207	13	1.115	0.59	1.91	7	0.918	0.37	1.89
Liver, gallbladder and bile ducts	155,156,197.8	3	0.438	0.09	1.28	4	0.744	0.20	1.90
Lung	162,163.0,163.9	100	1.205	0.98	1.46	15	0.706	0.40	1.16
Lymphosarcoma, reticulum cell	200,202	14	2.093	1.14	3.51**	7	1.109	0.45	2.28
Multiple myeloma	203	5	1.500	0.49	3.50	1	0.300	0.01	1.67
Pancreas	157	14	0.991	0.54	1.66	10	1.013	0.49	1.86
Prostate	185	23	1.000	0.63	1.50	--	--	--	--
Stomach	151	11	1.296	0.65	2.32	8	1.250	0.54	2.46
Testis	186	0	--	--	--	--	--	--	--
Thyroid gland	193	1	2.000	0.65	11.14	1	1.333	0.54	7.43

*Significantly lower than expected: 95% CI.
**Significantly higher than expected: 95% CI.
***Eighth Revision, International Classification of Diseases (USDHEW 1968).

MORTALITY RATE RATIOS FOR SELECTED CANCER SITES:
HUTCHINSON COUNTY, TEXAS, COMPARED WITH THE STATE OF TEXAS, 1950-1959

Cancer Site	ICDA-8***	White Males				White Females			
		No. of Deaths	Ratio	Confidence Interval		No. of Deaths	Ratio	Confidence Interval	
All cancers combined	140-207	109	0.915	0.75	1.10	104	0.935	0.76	1.13
Bladder and other urinary organs	188,189.9	5	2.109	0.68	4.92	2	1.037	0.13	3.75
Bone, including jaw	170	1	0.467	0.01	2.60	3	2.583	0.53	7.55
Brain and nervous system	191,192	7	1.324	0.53	2.73	5	1.167	0.38	2.72
Breast	174	0	--	--	--	19	0.888	0.53	1.39
Kidney and ureter	189.0-189.2	3	0.677	0.14	1.98	2	1.435	0.17	5.18
Large intestine	153	6	0.981	0.36	2.14	5	0.469	0.15	1.10
Larynx	161	0	--	--	--	1	8.333	0.21	46.43
Leukemia	204-207	4	0.268	0.07	0.69*	4	0.441	0.12	1.13
Liver, gallbladder and bile ducts	155,156,197.8	2	0.600	0.07	2.17	3	1.026	0.21	3.00
Lung	162,163.0,163.9	21	0.830	0.51	1.27	4	0.897	0.24	2.30
Lymphosarcoma, reticulum cell	200,202	2	0.750	0.09	2.71	0	--	--	--
Multiple myeloma	203	1	0.385	0.01	2.14	1	1.667	0.04	9.29
Pancreas	157	8	1.059	0.46	2.09	4	1.000	0.27	2.56
Prostate	185	6	0.733	0.27	1.60	--	--	--	--
Stomach	151	18	1.769	1.05	2.80**	6	0.979	0.36	2.13
Testis	186	0	--	--	--	--	--	--	--
Thyroid gland	193	0	--	--	--	1	4.143	0.10	23.08

*Significantly lower than expected: 95% CI.
**Significantly higher than expected: 95% CI.
***Eighth Revision, International Classification of Diseases (USDHEW 1968).

MORTALITY RATE RATIOS FOR SELECTED CANCER SITES:
HUTCHINSON COUNTY, TEXAS, COMPARED WITH THE STATE OF TEXAS, 1960-1969

Cancer Site	ICDA-8***	White Males				White Females			
		No. of Deaths	Ratio	Confidence Interval		No. of Deaths	Ratio	Confidence Interval	
All cancers combined	140-207	156	0.907	0.77	1.06	126	1.043	0.87	1.24
Bladder and other urinary organs	188,189.9	4	1.021	0.28	2.61	2	0.913	0.11	3.30
Bone, including jaw	170	0	--	--	--	0	--	--	--
Brain and nervous system	191,192	8	1.170	0.51	2.31	3	0.714	0.15	2.09
Breast	174	0	--	--	--	19	0.890	0.54	1.39
Kidney and ureter	189.0-189.2	4	0.730	0.20	1.87	4	2.591	0.71	6.63
Large intestine	153	17	1.902	1.11	3.05**	18	1.206	0.71	1.91
Larynx	161	0	--	--	--	0	--	--	--
Leukemia	204-207	11	1.042	0.52	1.86	7	0.913	0.37	1.88
Liver, gallbladder and bile ducts	155,156,197.8	1	0.171	0.00	0.95*	4	1.000	0.27	2.56
Lung	162,163.0,163.9	45	0.751	0.55	1.01	10	1.352	0.65	2.49
Lymphosarcoma, reticulum cell	200,202	6	1.083	0.40	2.36	6	1.615	0.59	3.52
Multiple myeloma	203	4	2.056	0.56	5.26	1	0.438	0.01	2.44
Pancreas	157	9	0.679	0.31	1.29	4	0.527	0.14	1.35
Prostate	185	5	0.491	0.16	1.15	--	--	--	--
Stomach	151	6	0.640	0.23	1.39	8	1.406	0.61	2.77
Testis	186	0	--	--	--	--	--	--	--
Thyroid gland	193	0	--	--	--	0	--	--	--

*Significantly lower than expected: 95% CI.
**Significantly higher than expected: 95% CI.
***Eighth Revision, International Classification of Diseases (USDHEW 1968).

MORTALITY RATE RATIOS FOR SELECTED CANCER SITES:
HUTCHINSON COUNTY, TEXAS, COMPARED WITH THE STATE OF TEXAS, 1970-1978

Cancer Site	ICDA-8***	White Males				White Females			
		No. of Deaths	Ratio	Confidence Interval		No. of Deaths	Ratio	Confidence Interval	
All cancers combined	140-207	192	0.907	0.78	1.04	163	1.032	0.88	1.20
Bladder and other urinary organs	188,189.9	2	0.500	0.06	1.81	4	1.850	0.50	4.74
Bone, including jaw	170	1	0.778	0.06	4.33	3	3.250	0.67	9.50
Brain and nervous system	191,192	8	1.314	0.57	2.59	4	0.718	0.20	1.84
Breast	174	0	--	--	--	26	0.815	0.53	1.19
Kidney and ureter	189.0-189.2	9	1.791	0.82	3.40	2	0.818	0.10	2.95
Large intestine	153	16	0.863	0.49	1.40	23	1.285	0.81	1.93
Larynx	161	0	--	--	--	0	--	--	--
Leukemia	204-207	2	0.195	0.02	0.70*	6	0.836	0.31	1.82
Liver, gallbladder and bile ducts	155,156,197.8	4	0.938	0.26	2.40	6	1.116	0.41	2.43
Lung	162,163.0,163.9	68	0.905	0.70	1.15	28	1.424	0.95	2.06
Lymphosarcoma, reticulum cell	200,202	9	1.667	0.76	3.16	5	1.109	0.36	2.59
Multiple myeloma	203	3	1.042	0.21	3.05	6	2.650	0.97	5.77
Pancreas	157	12	1.206	0.62	2.11	11	1.397	0.70	2.50
Prostate	185	20	0.953	0.58	1.47	--	--	--	--
Stomach	151	6	1.000	0.37	2.18	2	0.313	0.04	1.13
Testis	186	1	1.429	0.37	7.96	--	--	--	--
Thyroid gland	193	1	2.000	0.37	11.14	0	--	--	--

*Significantly lower than expected: 95% CI.
**Significantly higher than expected: 95% CI.
***Eighth Revision, International Classification of Diseases (USDHEW 1968).

MORTALITY RATE RATIOS FOR SELECTED CANCER SITES:
POTTER COUNTY, TEXAS, COMPARED WITH THE STATE OF TEXAS, 1950-1959

Cancer Site	ICDA-8***	White Males				White Females			
		No. of Deaths	Ratio	Confidence Interval		No. of Deaths	Ratio	Confidence Interval	
All cancers combined	140-207	452	1.057	0.96	1.16	421	1.035	0.94	1.14
Bladder and other urinary organs	188,189.9	19	1.522	0.92	2.38	10	1.333	0.64	2.45
Bone, including jaw	170	12	2.467	1.27	4.31**	1	0.333	0.01	1.86
Brain and nervous system	191,192	12	0.622	0.32	1.09	17	1.500	0.87	2.40
Breast	174	0	--	--	--	75	1.107	0.87	1.38
Kidney and ureter	189.0-189.2	19	1.742	1.05	2.72**	7	1.217	0.49	2.51
Large intestine	153	35	1.221	0.85	1.70	40	0.980	0.70	1.33
Larynx	161	3	0.381	0.08	1.11	3	4.000	0.82	11.69
Leukemia	204-207	23	0.781	0.49	1.17	20	1.051	0.64	1.62
Liver, gallbladder and bile ducts	155,156,197.8	2	0.167	0.02	0.60*	11	1.180	0.59	2.11
Lung	162,163.0,163.9	102	1.174	0.95	1.42	18	1.035	0.61	1.63
Lymphosarcoma, reticulum cell	200,202	5	0.333	0.11	0.78*	11	1.107	0.55	1.98
Multiple myeloma	203	7	1.692	0.68	3.49	4	1.111	0.30	2.84
Pancreas	157	30	1.306	0.88	1.86	20	1.233	0.75	1.90
Prostate	185	44	1.097	0.80	1.47	--	--	--	--
Stomach	151	43	1.119	0.81	1.51	23	0.897	0.57	1.35
Testis	186	0	--	--	--	--	--	--	--
Thyroid gland	193	1	1.500	0.04	8.36	1	0.857	0.02	4.78

*Significantly lower than expected: 95% CI.
**Significantly higher than expected: 95% CI.
***Eighth Revision, International Classification of Diseases (USDHEW 1968).

MORTALITY RATE RATIOS FOR SELECTED CANCER SITES:
POTTER COUNTY, TEXAS, COMPARED WITH THE STATE OF TEXAS, 1960-1969

Cancer Site	ICDA-8***	White Males				White Females			
		No. of Deaths	Ratio	Confidence Interval		No. of Deaths	Ratio	Confidence Interval	
All cancers combined	140-207	652	1.030	0.95	1.11	524	0.988	0.90	1.08
Bladder and other urinary organs	188,189.9	20	1.213	0.74	1.87	8	0.870	0.38	1.71
Bone, including jaw	170	7	1.455	0.58	3.00	1	0.250	0.01	1.39
Brain and nervous system	191,192	22	1.064	0.67	1.61	17	1.057	0.62	1.69
Breast	174	0	--	--	--	96	1.004	0.81	1.22
Kidney and ureter	189.0-189.2	24	1.649	1.06	2.45**	11	1.227	0.61	2.20
Large intestine	153	38	0.813	0.58	1.12	53	0.923	0.69	1.21
Larynx	161	9	0.958	0.44	1.82	0	--	--	--
Leukemia	204-207	39	0.968	0.69	1.32	23	0.797	0.51	1.20
Liver, gallbladder and bile ducts	155,156,197.8	7	0.415	0.17	0.85*	12	0.682	0.35	1.19
Lung	162,163.0,163.9	197	1.102	0.95	1.27	37	0.989	0.70	1.36
Lymphosarcoma, reticulum cell	200,202	25	1.333	0.86	1.97	24	1.513	0.97	2.25
Multiple myeloma	203	14	2.167	1.18	3.64**	8	1.188	0.51	2.34
Pancreas	157	41	1.019	0.73	1.38	28	1.054	0.70	1.52
Prostate	185	47	0.830	0.61	1.10	--	--	--	--
Stomach	151	39	1.070	0.76	1.46	18	0.681	0.40	1.08
Testis	186	3	1.000	0.21	2.92	--	--	--	--
Thyroid gland	193	1	0.750	0.02	4.18	3	1.333	0.27	3.90

*Significantly lower than expected: 95% CI.
**Significantly higher than expected: 95% CI.
***Eighth Revision, International Classification of Diseases (USDHEW 1968).

MORTALITY RATE RATIOS FOR SELECTED CANCER SITES:
POTTER COUNTY, TEXAS, COMPARED WITH THE STATE OF TEXAS, 1970-1978

Cancer Site	ICDA-8***	White Males				White Females			
		No. of Deaths	Ratio	Confidence Interval		No. of Deaths	Ratio	Confidence Interval	
All cancers combined	140-207	707	1.038	0.96	1.12	547	0.966	0.89	1.05
Bladder and other urinary organs	188,189.9	21	1.160	0.72	1.77	10	1.200	0.58	2.21
Bone, including jaw	170	4	1.111	0.30	2.84	4	1.250	0.34	3.20
Brain and nervous system	191,192	19	1.000	0.60	1.56	12	0.744	0.38	1.30
Breast	174	2	2.500	0.30	9.03	92	0.899	0.72	1.10
Kidney and ureter	189.0-189.2	18	1.116	0.66	1.76	9	1.046	0.48	1.98
Large intestine	153	59	1.082	0.82	1.40	75	1.114	0.88	1.40
Larynx	161	12	1.192	0.62	2.08	1	0.750	0.02	4.18
Leukemia	204-207	41	1.276	0.92	1.73	18	0.738	0.44	1.17
Liver, gallbladder and bile ducts	155,156,197.8	17	0.958	0.56	1.53	9	0.488	0.22	0.93*
Lung	162,163.0,163.9	226	0.947	0.83	1.08	61	0.871	0.67	1.12
Lymphosarcoma, reticulum cell	200,202	19	1.093	0.66	1.71	11	0.630	0.31	1.13
Multiple myeloma	203	8	0.875	0.38	1.72	5	0.600	0.19	1.40
Pancreas	157	38	0.963	0.68	1.32	37	1.103	0.78	1.52
Prostate	185	80	1.279	1.01	1.59**	--	--	--	--
Stomach	151	23	0.887	0.56	1.33	22	1.042	0.65	1.58
Testis	186	3	1.143	0.24	3.34	--	--	--	--
Thyroid gland	193	0	--	--	--	5	1.833	0.60	4.28

*Significantly lower than expected: 95% CI.
**Significantly higher than expected: 95% CI.
***Eighth Revision, International Classification of Diseases (USDHEW 1968).

MORTALITY RATE RATIOS FOR SELECTED CANCER SITES:
RANDALL COUNTY, TEXAS, COMPARED WITH THE STATE OF TEXAS, 1950-1959

Cancer Site	ICDA-8***	White Males				White Females			
		No. of Deaths	Ratio	Confidence Interval		No. of Deaths	Ratio	Confidence Interval	
All cancers combined	140-207	59	0.598	0.45	0.77*	66	0.795	0.61	1.01
Bladder and other urinary organs	188,189.9	0	--	--	--	1	1.037	0.03	5.78
Bone, including jaw	170	1	0.733	0.02	4.09	0	--	--	--
Brain and nervous system	191,192	2	0.487	0.06	1.76	2	0.875	0.11	3.16
Breast	174	0	--	--	--	10	0.661	0.32	1.21
Kidney and ureter	189.0-189.2	2	0.484	0.06	1.75	1	0.609	0.02	3.39
Large intestine	153	3	0.356	0.07	1.04	12	1.381	0.71	2.41
Larynx	161	0	--	--	--	0	--	--	--
Leukemia	204-207	2	0.415	0.05	1.50	4	0.848	0.23	2.17
Liver, gallbladder and bile ducts	155,156,197.8	3	1.767	0.36	5.16	1	0.513	0.01	2.86
Lung	162,163.0,163.9	11	0.543	0.27	0.97*	3	1.207	0.25	3.53
Lymphosarcoma, reticulum cell	200,202	5	1.611	0.52	3.76	0	--	--	--
Multiple myeloma	203	1	0.462	0.01	2.57	2	3.111	0.38	11.24
Pancreas	157	2	0.518	0.06	1.87	3	0.767	0.16	2.24
Prostate	185	5	0.624	0.20	1.46	--	--	--	--
Stomach	151	5	0.643	0.21	1.50	3	0.567	0.12	1.66
Testis	186	0	--	--	--	--	--	--	--
Thyroid gland	193	0	--	--	--	1	1.000	0.03	5.57

*Significantly lower than expected: 95% CI.
**Significantly higher than expected: 95% CI.
***Eighth Revision, International Classification of Diseases (USDHEW 1968).

MORTALITY RATE RATIOS FOR SELECTED CANCER SITES:
RANDALL COUNTY, TEXAS, COMPARED WITH THE STATE OF TEXAS, 1960-1969

Cancer Site	ICDA-8***	White Males				White Females			
		No. of Deaths	Ratio	Confidence Interval		No. of Deaths	Ratio	Confidence Interval	
All cancers combined	140-207	177	0.842	0.72	0.97*	144	0.879	0.74	1.03
Bladder and other urinary organs	188,189.9	6	1.064	0.39	2.32	3	1.609	0.33	4.70
Bone, including jaw	170	1	0.364	0.01	2.03	1	0.875	0.02	4.88
Brain and nervous system	191,192	10	1.277	0.61	2.35	7	1.200	0.48	2.47
Breast	174	0	--	--	--	30	1.044	0.70	1.49
Kidney and ureter	189.0-189.2	6	1.054	0.39	2.29	2	0.364	0.04	1.31
Large intestine	153	9	0.724	0.33	1.37	15	0.877	0.49	1.45
Larynx	161	2	0.625	0.08	2.26	0	--	--	--
Leukemia	204-207	19	1.842	1.11	2.88**	12	1.217	0.63	2.13
Liver, gallbladder and bile ducts	155,156,197.8	4	0.659	0.18	1.69	1	0.091	0.00	0.51*
Lung	162,163.0,163.9	45	0.680	0.50	0.91*	4	0.375	0.10	0.96*
Lymphosarcoma, reticulum cell	200,202	4	0.625	0.17	1.60	7	1.282	0.52	2.64
Multiple myeloma	203	1	0.444	0.01	2.48	3	1.375	0.28	4.02
Pancreas	157	11	0.717	0.36	1.28	6	0.716	0.26	1.56
Prostate	185	12	0.709	0.37	1.24	--	--	--	--
Stomach	151	9	0.920	0.42	1.75	7	1.087	0.44	2.24
Testis	186	1	0.625	0.02	3.48	--	--	--	--
Thyroid gland	193	0	--	--	--	0	--	--	--

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**Significantly higher than expected: 95% CI.
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MORTALITY RATE RATIOS FOR SELECTED CANCER SITES:
RANDALL COUNTY, TEXAS, COMPARED WITH THE STATE OF TEXAS, 1970-1978

Cancer Site	ICDA-8***	White Males				White Females			
		No. of Deaths	Ratio	Confidence Interval		No. of Deaths	Ratio	Confidence Interval	
All cancers combined	140-207	282	0.921	0.82	1.03	226	0.928	0.81	1.06
Bladder and other urinary organs	188,189.9	9	1.280	0.59	2.43	2	0.650	0.08	2.35
Bone, including jaw	170	4	2.556	0.70	6.54	1	0.500	0.08	2.79
Brain and nervous system	191,192	12	1.157	0.60	2.02	15	1.949	1.09	3.21**
Breast	174	0	--	--	--	49	1.000	0.74	1.32
Kidney and ureter	189.0-189.2	3	0.535	0.11	1.56	5	1.318	0.43	3.08
Large intestine	153	29	1.178	0.79	1.69	26	0.975	0.64	1.43
Larynx	161	2	0.615	0.07	2.22	0	--	--	--
Leukemia	204-207	22	1.356	0.85	2.05	8	0.902	0.39	1.78
Liver, gallbladder and bile ducts	155,156,197.8	7	0.833	0.33	1.72	3	0.442	0.09	1.29
Lung	162,163.0,163.9	86	0.789	0.63	0.97*	29	0.953	0.64	1.37
Lymphosarcoma, reticulum cell	200,202	13	1.500	0.80	2.57	9	1.087	0.50	2.06
Multiple myeloma	203	3	0.708	0.15	2.07	4	1.350	0.37	3.46
Pancreas	157	19	1.047	0.63	1.64	13	1.013	0.54	1.73
Prostate	185	19	0.773	0.47	1.21	--	--	--	--
Stomach	151	13	1.282	0.68	2.19	3	0.396	0.08	1.16
Testis	186	0	--	--	--	--	--	--	--
Thyroid gland	193	0	--	--	--	0	--	--	--

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**Significantly higher than expected: 95% CI.
***Eighth Revision, International Classification of Diseases (USDHEW 1968).

MORTALITY RATE RATIOS FOR SELECTED CANCER SITES:
ROBERTS COUNTY, TEXAS, COMPARED WITH THE STATE OF TEXAS, 1950-1959

Cancer Site	ICDA-8***	White Males				White Females			
		No. of Deaths	Ratio	Confidence Interval		No. of Deaths	Ratio	Confidence Interval	
All cancers combined	140-207	3	0.348	0.07	1.02	1	0.140	0.00	0.78*
Bladder and other urinary organs	188,189.9	0	--	--	--	0	--	--	--
Bone, including jaw	170	0	--	--	--	0	--	--	--
Brain and nervous system	191,192	0	--	--	--	0	--	--	--
Breast	174	0	--	--	--	0	--	--	--
Kidney and ureter	189.0-189.2	0	--	--	--	0	--	--	--
Large intestine	153	0	--	--	--	0	--	--	--
Larynx	161	0	--	--	--	0	--	--	--
Leukemia	204-207	0	--	--	--	0	--	--	--
Liver, gallbladder and bile ducts	155,156,197.8	0	--	--	--	0	--	--	--
Lung	162,163.0,163.9	0	--	--	--	0	--	--	--
Lymphosarcoma, reticulum cell	200,202	0	--	--	--	1	6.786	0.17	37.81
Multiple myeloma	203	0	--	--	--	0	--	--	--
Pancreas	157	0	--	--	--	0	--	--	--
Prostate	185	1	0.946	0.02	5.27	--	--	--	--
Stomach	151	0	--	--	--	0	--	--	--
Testis	186	0	--	--	--	--	--	--	--
Thyroid gland	193	0	--	--	--	0	--	--	--

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MORTALITY RATE RATIOS FOR SELECTED CANCER SITES:
ROBERTS COUNTY, TEXAS, COMPARED WITH THE STATE OF TEXAS, 1960-1969

Cancer Site	ICDA-8***	White Males				White Females			
		No. of Deaths	Ratio	Confidence Interval		No. of Deaths	Ratio	Confidence Interval	
All cancers combined	140-207	4	0.618	0.17	1.58	5	0.633	0.21	1.48
Bladder and other urinary organs	188,189.9	0	--	--	--	0	--	--	--
Bone, including jaw	170	0	--	--	--	0	--	--	--
Brain and nervous system	191,192	0	--	--	--	0	--	--	--
Breast	174	0	--	--	--	2	1.476	0.18	5.33
Kidney and ureter	189.0-189.2	0	--	--	--	0	--	--	--
Large intestine	153	0	--	--	--	1	1.123	0.03	6.26
Larynx	161	0	--	--	--	0	--	--	--
Leukemia	204-207	0	--	--	--	0	--	--	--
Liver, gallbladder and bile ducts	155,156,197.8	0	--	--	--	0	--	--	--
Lung	162,163.0,163.9	4	2.197	0.60	5.63	0	--	--	--
Lymphosarcoma, reticulum cell	200,202	0	--	--	--	0	--	--	--
Multiple myeloma	203	0	--	--	--	0	--	--	--
Pancreas	157	0	--	--	--	0	--	--	--
Prostate	185	0	--	--	--	--	--	--	--
Stomach	151	0	--	--	--	0	--	--	--
Testis	186	0	--	--	--	--	--	--	--
Thyroid gland	193	0	--	--	--	0	--	--	--

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MORTALITY RATE RATIOS FOR SELECTED CANCER SITES:
ROBERTS COUNTY, TEXAS, COMPARED WITH THE STATE OF TEXAS, 1970-1978

Cancer Site	ICDA-8***	White Males				White Females			
		No. of Deaths	Ratio	Confidence Interval		No. of Deaths	Ratio	Confidence Interval	
All cancers combined	140-207	9	1.270	0.58	2.41	10	1.649	0.79	3.03
Bladder and other urinary organs	188,189.9	0	--	--	--	0	--	--	--
Bone, including jaw	170	0	--	--	--	0	--	--	--
Brain and nervous system	191,192	1	2.784	0.07	15.51	0	--	--	--
Breast	174	0	--	--	--	1	0.786	0.02	4.38
Kidney and ureter	189.0-189.2	0	--	--	--	0	--	--	--
Large intestine	153	1	0.938	0.02	5.23	3	3.532	0.73	10.32
Larynx	161	0	--	--	--	0	--	--	--
Leukemia	204-207	1	6.506	0.16	36.25	3	12.393	2.56	36.22**
Liver, gallbladder and bile ducts	155,156,197.8	0	--	--	--	0	--	--	--
Lung	162,163.0,163.9	3	0.858	0.18	2.51	1	1.071	0.20	5.97
Lymphosarcoma, reticulum cell	200,202	0	--	--	--	0	--	--	--
Multiple myeloma	203	0	--	--	--	0	--	--	--
Pancreas	157	0	--	--	--	0	--	--	--
Prostate	185	1	3.291	0.08	18.34	--	--	--	--
Stomach	151	1	2.056	0.05	11.46	0	--	--	--
Testis	186	0	--	--	--	--	--	--	--
Thyroid gland	193	0	--	--	--	0	--	--	--

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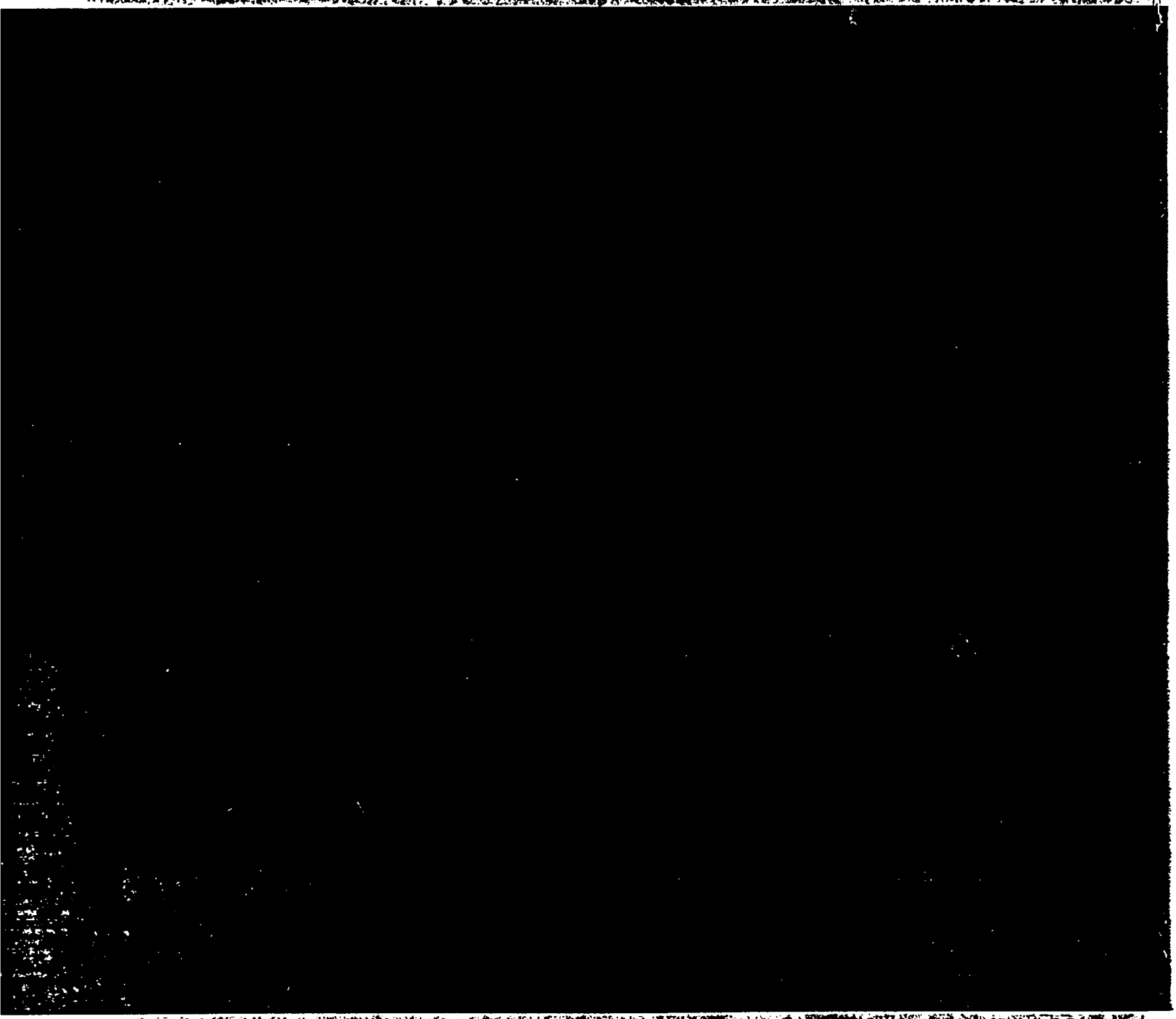

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