CANCER RATES AND TRENDS IN NORTHEASTERN MINNESOTA

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EXECUTIVE SUMMARY

This report provides a brief overview of cancer incidence rates and trends in seven counties in Northeastern Minnesota (Aitkin, Carlton, Cook, Itasca, Koochiching, Lake, and St. Louis). Data on cancer incidence used in this report come from the Minnesota Cancer Surveillance System, the National Cancer Institute, and two previous surveys of cancer rates in portions of Minnesota.

There were 11,719 new cancers of all types diagnosed among residents of Northeastern Minnesota during the period 1988-94. The annual incidence rate in Northeastern Minnesota was identical to the statewide average during that period. The overall rate among males was 5% lower than the statewide average, while the overall rate among females was 4% higher than the average.

Some differences in rates were noted for specific types of cancer. These differences could reflect random statistically variations, medical screening practices, or the impact of various risk factors such as smoking, diet, occupation, etc.

The lower overall rate in males is due mainly to the 17% deficit of prostate cancers - the most common cancer diagnosed among men. No one type of cancer accounted for the slight excess among females. There was a 17% excess of uterine cancers. Slight excesses were seen for cancers of the stomach and esophagus in both males and females.

A 70% excess of mesothelioma was found among males in the Northeast (39 cases). There was a 70% deficit among females (2 cases). The only known risk factor for mesothelioma is a past exposure to asbestos. The disease typically occurs 30-40 years after the onset of exposure. At least a portion of this excess is attributable to occupational exposures at a manufacturing facility in Carlton County during the period 1958-74.

Changes in cancer incidence rates in Northeastern Minnesota over the past 20 years are comparable to changes that have occurred in the Twin Cities Metro area and elsewhere in the US. The most striking changes were the 3-fold increases in lung cancer rates among women and skin melanoma rates among both sexes. A sharp decrease occurred in cervical cancer. Increases occurred for cancers of the breast and prostate, and for all cancers combined.

INTRODUCTION

This report is one in a series of reports that examine cancer rates and trends for specific cancers and/or specific populations in Minnesota. This report provides a summary of cancer incidence rates and trends in Northeastern Minnesota. The seven adjacent counties included in this report are Aitkin, Carlton, Cook, Itasca, Koochiching, Lake, and St. Louis (Figure 1). The population of this region is approximately 315,000. This is one of the eight geographic regions (along with individual county data) routinely included in the biennial reports of the Minnesota Cancer Surveillance System.[1] Historical cancer incidence rates are also presented for three of the counties in this region (Cook, Lake, St. Louis) and for the Twin Cities Metro region for which such data are available.

SOURCES OF CANCER DATA

Cancer incidence data for Minnesota residents come primarily from the Minnesota Cancer Surveillance System (MCSS), an ongoing program of the Minnesota Department of Health. The MCSS collects data on all new diagnoses of cancer among Minnesota residents. As of this report, cancer rates were available for the years 1988 through 1994. Additional Minnesota data in this report come from two previous studies of cancer rates in specific geographic areas: the *Tri-County Cancer Survey* and the *Third National Cancer Survey*.

The *Tri-County Cancer Survey* was conducted by the Department of Health to address health concerns that arose over the identification of asbestos fibers in the drinking water of several communities in northeastern Minnesota.[2] This survey collected data on newly occurring cancers among residents in Cook, Lake, and St. Louis counties during the period 1969-1976. Data from this survey were included in a previous MCSS report.[3]

The *Third National Cancer Survey* described the incidence of cancers for selected geographic regions throughout the United States during the period 1969-1971. This

[1]The most recent report is *The Occurrence of Cancer in Minnesota 1988-1994: Incidence, Mortality, Trends*. May 1997. Minnesota Department of Health.
[2]Sigurdson, EE. Observations of cancer incidence in Duluth, Minnesota. *Environmental Health Perspectives* 1983; 53:61-67.
[3]Section 5 of *The Occurrence of Cancer in Minnesota 1988-1990; Incidence, Mortality, and Trends.* February 1993. Minnesota Department of Health.

survey was sponsored by the National Cancer Institute. The (then) five-county Minneapolis-St. Paul Metropolitan area was included in that survey.

Cancer incidence data for other areas of the U.S. are available from the National Cancer Institute (NCI) through its supported cancer registries. The NCI funds eleven cancer registries around the country as part of its SEER program (Surveillance, Epidemiology, and End Results). These registries ascertain cancer incidence and survival data in defined populations (an entire state or metropolitan area). NCI SEER data presented in this report include the nine registries that have been reporting between 1973 and 1994 (the states of Connecticut, Iowa, New Mexico, Utah, Hawaii and the metropolitan areas of Detroit, San Francisco, Seattle-Puget Sound, and Atlanta).[4]

The populations included in the SEER registries do not comprise a statistically representative sample of the US population in terms of race and other characteristics. In particular, SEER registries include a much higher proportion of racial and ethnic minorities in order to obtain statistically meaningful rates.[5] Minnesota cancer rates are not available by race and this fact must be taken into consideration when comparing Minnesota and SEER data.

FINDINGS

Cancer Rates in Northeastern Minnesota

Cancer incidence rates (the rate at which new cancers are diagnosed) for the seven Northeastern Minnesota (NE) counties are shown in Table 1. Cancer incidence rates in this table are expressed as the average number of new diagnoses per 100,000 persons per year during the period 1988-94. For reference, statewide cancer rates are also shown in Table 1.

Table 2 presents essentially the same information but from a slightly different perspective. Table 2 shows the actual number of new cancers diagnosed among residents

[4]Ries LAG, Kosary CL, Hankey BF, Miller BA, Harras A, Edwards BK (eds). *SEER Cancer Statistics Review, 1973-1994*, National Cancer Institute. NIH Pub. No. 97-2789. Bethesda, MD, 1997. Also available via the internet at: ftp://ftp.ims.nci.nih.gov/pub/SEER.

[5]Racially, the population of Minnesota differs substantially from both the SEER population and the overall US population. For example, the percentage of blacks in 1990 was 2.2% of the population in Minnesota but 10.6% in the populations covered by the NCI SEER registries.

of these counties during the seven-year period. For reference, a second number is shown which is the number of cancers that would have been "expected" statistically in the region if its cancer rates were identical to the statewide average.

It should be noted that comparing a series of rates between two regions (or between two time periods) requires consideration of many factors. Rarely will two rates be identical and many of these differences will reflect random variation. This is particularly true when examining cancer rates in modest sized populations (such as the NE) in which rates will have a large degree of statistical uncertainty or variability. Furthermore, the larger the number of rates that are compared, the larger the number of statistical differences that can be expected. Rates can also vary (by region or over time) due to differences in medical screening practices. For example, wider use of screening tests or better imaging technologies are associated with changes in reported rates of cancers of the breast, prostate, and brain. Finally, rates can vary due to differences in the occurrence or prevalence of various risk factors such as smoking, dietary habits, occupation, reproductive factors, etc. Thus, the following discussions will be more qualitative than statistical in nature.

These tables indicate that cancer incidence rates in NE are in general very comparable to the statewide averages, although some differences may exist for several specific types of cancer. A total of 11,719 new cancers were diagnosed among NE residents during the period 1988-94. For all cancers and both sexes combined, the annual rate in NE (380.4) is virtually identical to the statewide average (384.0). The overall rate for males is slightly (5%) lower than the state average, while the rate for females is slightly higher (4%) than the state average.

The overall cancer rate is strongly influenced by the rates of the most common types of cancer including lung, prostate, breast, colon, and bladder. The slight overall deficit of cancers among males is due mainly to the substantial deficit (17%) of prostate cancers. Prostate cancer rates in Minnesota and throughout the country have shown dramatic changes during the past ten years, with sharp increases followed by equally sharp declines. These changes are due almost entirely to changes in medical screening, primarily the use of the PSA blood test. Geographic differences in prostate rates are also likely due to screening practices.

Although the actual number of mesothelioma cases among NE males was relatively small (39), that number was approximately 70% higher than expected. Fewer than expected mesotheliomas occurred among females, based on even smaller numbers (2 actual cases). The occurrence of mesotheliomas and other asbestos-related cancers and health outcomes have been of considerable interest and concern by many individuals over many years. Additional data on this topic are presented later in this report.

The slight overall excess of cancers among females in NE Minnesota is not attributable to any one type of cancer. Cancer of the esophagus shows a slight excess (30%) among both males and females. There was a slight excess (17%) of uterine cancers. Stomach cancer rates were 34% higher than average. A smaller excess of stomach cancer occurred among males (14%). This finding is less likely to be due to random variation since elevated stomach cancer mortality rates have been documented in some NE counties extending back almost 50 years.

Long-Term Trends: Tri-County and Metro

The Minnesota Cancer Surveillance System began statewide surveillance in 1988. Thus, long term trends in NE Minnesota cannot be examined by MCSS data alone. As previously noted, however, the Tri-County Cancer Survey ascertained cancer incidence rates during the period 1969-76 in three NE counties: Cook, Lake, and St. Louis. Rates during that previous time period can thus be compared to current rates for those counties, providing a look at changes in cancer rates over approximately a 20-year span. For some perspective on these trends, it is useful to look at changes that have occurred elsewhere in the state during the same time period. The Third National Cancer Survey provides cancer incidence rates for the Twin Cities Metro area for the period 1969-71. The Metro region can thus be used as a comparison region for examining long term trends.

Table 3 shows current and previous cancer incidence rates for each sex for the Tri-County region and for the Twin Cities Metro region. The changes in cancer rates that have occurred in both NE and Metro are summarized in Figure 2. Figure 2 was prepared by dividing the current rate by the historical rate for each region and each sex. If a cancer rate had doubled between the two time periods, this ratio would then be 2.0. If the current rate is half of the previous rate, the ratio would be 0.5. Figure 2 presents these ratios (rate comparisons) for both sexes and regions for 26 types of cancer and for all cancers combined.

Two general conclusions can be drawn from Figure 2: (1) that long term trends in cancer incidence are very similar between the Tri-County region and the Twin Cities Metro; and (2) many cancers have shown significant changes over the 20-year period.

Because there have been only minor differences in the trends between the two geographic areas over this time period, trends for both regions will be discussed together.

Figure 2 (and Table 3) show that many cancer rates have changed - some dramatically - over the approximately 20-year period. Although most of the changes that occurred were increases, some notable decreases were also evident.

Decreasing rates were found in both sexes for cancers of the stomach, rectum, and pancreas. At least part of the decrease in pancreatic cancer may be an artifact of case ascertainment, since MCSS requires tissue confirmation while the previous surveys accepted clinical diagnoses as well. Hodgkin's disease showed a decline in males, while cervical cancer showed a sharp decline in females. These changes are consistent with data from the National Cancer Institute for other regions of the country.

Increased rates in one or both sexes can be seen for many cancers including skin melanomas, non-Hodgkin's lymphomas, and cancers of the liver and urinary bladder (both sexes); breast and lung cancers (females); and cancers of the prostate and "trachea and pleura" (males). Several of these increases are particularly striking. While lung cancer rates showed relatively little change in males over the past 20 years, rates among females increased roughly 3-fold in both regions of Minnesota. This is similar to the pattern seen nationally. The large increase in female lung cancers reflects the rise in smoking rates among females several decades ago. National data indicate that the peak in female smoking rates occurred in the 1960s, much later than the peak in male smoking rates in the 1940s and 50s.[6] Lung cancer incidence rates in Minnesota still remain lower, however, than rates reported by the NCI cancer registries for both sexes.

Increases occurred among males, but not females, for cancers of the "trachea and pleura." This category represents primarily pleural mesotheliomas - the predominant type of

[6]Centers for Disease Control and Prevention. *CDC Surveillance Summaries*, November 18, 1994. MMWR 1994; 43(No. SS-3).

mesothelioma. Mesothelioma rates among males have shown comparable increases in the NCI cancer registries.

Roughly a 3-fold increase also occurred in the rate of melanomas of the skin. However, this increase occurred in both sexes. The epidemic rise in melanomas and other skin cancers has been well-publicized.

For cancer rates overall, both male and female rates showed increases. Among males, the increase was about 34% in the Metro area and 16% in the NE. Among the NCI cancer registries, the increase in males was about 33%. Among females, the overall rate increased 13-14% in both the Metro and NE, the same as for NCI registries.

Mesotheliomas in Northeastern Minnesota

Mesothelioma is a very rare and usually fatal cancer of the lining of the chest cavity or abdomen. The only known cause to date is exposure to asbestos and most victims have some history of exposure to asbestos in the workplace, through household contact with an exposed worker, or, in rare instances, through avocational activities. In sharp contrast to lung cancer, which is also related to occupational exposure to asbestos, smoking does not appear to be a risk factor for mesothelioma. Studies have shown that the increased risk of mesothelioma does not appear until roughly 30 years or more after the onset of exposure. Although the *relative* risk of mesothelioma among exposed workers (i.e., the risk of exposed people compared to non-exposed people) is strikingly high, the *absolute* risk of developing mesothelioma among exposed workers (i.e., the chances of an individual getting the disease) is relatively small.

Figure 3 shows mesothelioma rates for each county in comparison to the statewide average (excluding 32 counties with no cases), ranked from the lowest to the highest rates. Also shown is the actual number of cases that occurred among county residents during 1988-94. Most counties had few (if any) cases, reflecting the rareness of this cancer.

Statewide, there were 245 mesotheliomas among men and 78 among women during the seven year period 1988-94. That averages to approximately 35 cases per year among men for an average annual incidence rate of 1.6 per 100,000. Among women,

approximately 11 new cases occur each year for a rate of 0.4 per 100,000. These rates are the same as the rates reported by NCI from other cancer registries.

In NE Minnesota, there were 39 new mesotheliomas during the seven-year period 1988-94. This is approximately 70% higher than the expected number of cases (23) based on the statewide average and the population of the region. Although these numbers are relatively small, this difference is statistically significant. Among women in NE Minnesota, there were 2 new cases during 1988-94, while approximately 7 cases would have been expected for about a 70% deficit. This difference was not statistically significant.

The occurrence of mesotheliomas among males (whether in excess or not) reflects the impact of occupational exposures to asbestos that occurred 30-40 years ago. An *excess* of mesotheliomas in this region suggests that there was also an excess of exposed individuals, compared to other regions of the state. One known source of occupational exposure in the region during that time period was the Conwed Corporation (Wood Conversion Co.) plant in Carlton County. Asbestos was used in this plant in the manufacture of ceiling tiles between 1958 and 1974. At least 5,000 workers were employed at this plant during that time period. As shown in Figure 3, Carlton County had the greatest excess of mesothelioma (based on 8 cases) in the state, despite the fact that many former Conwed workers had moved out of the county after their employment at the plant.

If Carlton County is excluded from the NE Minnesota analysis, there is still approximately a 50% excess of mesotheliomas in the NE. This observation and partial ascertainment of mesotheliomas among former Conwed workers suggest that this cohort is unlikely to account for the whole excess of mesothelioma in the NE and that other historical occupational exposures - beyond those that occurred in all regions of the state - may be involved (shipbuilding industry, for example).

Despite the excess of mesotheliomas in NE Minnesota males, there was no significant excess of lung cancers among males (928 actual cases, 896 expected cases). This is not unexpected since 80-90% of lung cancers are due to smoking, while only about 5% are attributable to asbestos exposures. Thus, lung cancer rates in the general population will reflect primarily the past smoking experience of the population.

The significance of mesotheliomas goes beyond their modest numbers. They may represent a sentinel for previous exposures to asbestos. Those exposures are related to increased risks of respiratory cancers and other respiratory diseases. Some of those exposures may be ongoing, while others may have ceased (such as Conwed). There are many trades (e.g., shipbuilding, boilermaking, electricians) documented to be at increased risk of mesothelioma through occupational exposures to asbestos. Systematic collection of information on occupational histories of those afflicted with mesothelioma would help define the historical nature of those exposures (i.e., industry and geographic area).

SUMMARY

The overall cancer incidence rate in Northeastern Minnesota is identical to the statewide average for the period 1988-1994. Rates are approximately 5% lower than average for males and 4% higher than average for females. Some differences exist for specific types of cancer, some of which may be due to random variation and some of which may be real. Slight excesses of cancers of the stomach and esophagus were seen for both males and females in the NE. Uterine cancer rates were slightly higher among females, while prostate cancer rates were lower in males.

A 70% excess of mesotheliomas occurred among males in the NE. Mesotheliomas are typically associated with exposures to asbestos that occurred 30-40 years prior to diagnosis. At least one large occupational cohort in the region is known to have incurred such exposures 25-40 years ago that would account for a portion of the excess.

Long-term cancer trends in NE Minnesota closely parallel changes that have occurred in the Twin Cities Metro area. These trends, in turn, are similar to the trends over the same time period in other regions of the country. The sharpest increases were found for melanomas and female lung cancers. Increases also occurred for cancers of the breast and prostate, and for all cancers combined.

Table 1. Average Annual Cancer Incidence Rates for Northeastern[1] Minnesota and All Minnesota, 1988-1994. (Rates represent number of new diagnoses per 100,000 persons per year, age-adjusted to standard US population.)

	Northeastern			*All Minnesota*		
Cancer	Males	Females	Both Sexes	Males	Females	Both Sexes
Oral Cavity	14.9	7.0	10.5	16.2	6.1	10.6
Esophagus	6.6	1.9	4.0	5.1	1.3	3.0
Stomach	10.8	5.0	7.5	9.2	3.5	6.0
Colon	39.1	28.3	32.8	39.4	29.4	33.7
Rectum	15.9	8.4	11.7	17.1	9.4	12.8
Liver	2.9	1.9	2.3	3.2	1.4	2.2
Pancreas	7.3	6.6	7.0	8.0	5.4	6.6
Larynx	7.7	1.4	4.2	6.6	1.2	3.6
Lung	67.3	37.1	50.1	65.0	33.9	47.4
Mesothelioma	2.8	0.1		1.6	0.4	
Soft Tissues	3.6	2.1	2.8	3.4	2.2	2.7
Melanomas of Skin	10.5	9.4	9.8	12.1	9.4	10.5
Breast	0.8	112.1	61.6	0.8	109.5	60.1
Cervix Uteri	-	8.0	-	-	7.5	-
Corpus Uteri	-	25.8	-	-	22.2	-
Ovary	-	15.5	-	-	14.8	-
Prostate	124.1	-	-	149.7	-	-
Testis	4.5	-	-	5.1	-	-
Urinary Bladder	30.1	7.7	17.3	30.1	7.8	17.4
Kidney	13.0	5.2	8.7	13.9	6.1	9.6
Brain	5.8	4.7	5.3	7.3	4.9	6.0
Thyroid Gland	3.8	4.9	4.3	2.7	6.2	4.5
Hodgkin's Disease	3.0	2.3	2.6	3.4	2.7	3.0
Non-Hodgkin's Lymphomas	20.0	13.5	16.6	19.4	13.3	16.0
Multiple Myelomas	5.2	2.7	3.7	5.5	3.2	4.2
Leukemias	14.1	10.4	12.0	14.4	8.5	11.1
All Cancers	438.2	343.5	380.4	462.6	330.1	384.0

[1] Northeastern (NE) Minnesota is defined in this report as the following seven counties: Aitkin, Carlton, Cook, Itasca, Koochiching, Lake, and St. Louis.

Table 2. Actual and Expected[1] New Cancers Diagnosed Among Residents in Northeastern[2] Minnesota, 1988-1994.

	Males			*Females*		
Cancer	Actual Cases	Expected Cases	Ratio of Actual to Expected	Actual Cases	Expected Cases	Ratio of Actual to Expected
Oral Cavity	195	217	0.90	107	102	1.05
Esophagus	91	70	1.29	32	24	1.34
Stomach	148	130	1.14	93	70	1.34
Colon	567	560	1.01	549	581	0.95
Rectum	217	233	0.93	148	167	0.89
Liver	41	43	0.96	32	23	1.38
Pancreas	101	109	0.93	123	97	1.27
Larynx	103	88	1.17	20	18	1.11
Lung And Bronchus	928	896	1.04	591	545	1.09
Mesothelioma	39	23	1.72	2	7	0.29
Soft Tissues	44	44	1.00	33	31	1.07
Melanomas of Skin	137	156	0.88	139	134	1.04
Breast	11	10	1.07	1777	1721	1.03
Cervix Uteri	-	-	-	105	101	1.04
Corpus Uteri	-	-	-	406	347	1.17
Ovary	-	-	-	247	224	1.10
Prostate	1822	2190	0.83	-	-	-
Testis	57	61	0.94	-	-	-
Urinary Bladder	422	423	1.00	143	146	0.98
Kidney And Renal Pelvis	168	184	0.91	87	101	0.86
Brain	68	87	0.78	66	66	1.00
Thyroid Gland	49	35	1.39	66	81	0.82
Hodgkin's Disease	37	39	0.94	28	32	0.87
Non-Hodgkin's Lymphomas	279	260	1.07	232	232	1.00
Multiple Myelomas	72	77	0.94	49	59	0.83
Leukemias	178	190	0.94	161	136	1.18
All Cancers	6108	6447	0.95	5611	5390	1.04

[1]The "expected" number of cancers represents the number of cancers that would have occurred in the region assuming its rates were identical to the statewide average.

[2]Defined as the following seven counties: Aitkin, Carlton, Cook, Itasca, Koochiching, Lake, and St. Louis

Table 3. Tri-County[1] and Twin Cities Metro[2] Area Cancer Incidence Rates: Past and Present.

	Tri-County				*Twin Cities Metro*			
	1969-1976		1988-1994		1969-1971		1988-1994	
Cancer	Males	Females	Males	Females	Males	Females	Males	Females
Oral Cavity	18.6	4.4	15.4	7.1	14.4	5.4	16.2	6.7
Esophagus	6.0	2.0	7.5	1.6	5.5	1.5	5.4	1.5
Stomach	20.7	8.5	10.5	5.0	15.5	7.8	8.8	3.3
Colon	33.3	28.7	38.5	28.7	39.7	35.4	38.6	28.3
Rectum	21.8	10.9	14.2	8.3	20.4	11.8	16.9	9.4
Liver	2.0	1.1	2.9	2.1	2.7	1.2	3.8	1.3
Pancreas	13.7	9.7	7.0	7.2	12.8	8.1	8.4	5.3
Larynx	7.6	1.1	7.8	1.4	7.6	0.8	7.0	1.4
Lung	63.7	13.4	64.8	35.8	63.7	12.8	69.5	39.8
Trachea & Pleura[3]	1.2	0.3	2.8	0.2	0.7	0.3	1.8	0.3
Soft Tissues	2.6	2.4	3.8	2.1	2.4	2.0	3.8	2.3
Melanomas of Skin	3.6	3.3	11.5	8.6	3.9	3.5	13.3	9.8
Breast	0.6	80.4	0.8	110.4	0.6	84.1	0.8	113.7
Cervix Uteri	-	16.1	-	8.2	-	16.7	-	6.8
Corpus Uteri	-	30.5	-	26.1	-	21.3	-	22.0
Ovary	-	16.4	-	15.7	-	16.6	-	15.0
Prostate	75.2	-	122.3	-	69.7	-	161.4	-
Testis	2.4	-	4.2	-	3.3	-	5.0	-
Urinary Bladder	22.0	5.2	29.3	7.7	22.5	7.2	31.9	8.5
Kidney	12.6	6.7	13.1	4.4	11.0	6.2	14.7	6.5
Brain	6.2	4.0	4.8	4.0	6.1	5.0	7.7	4.8
Thyroid Gland	2.5	4.5	3.8	5.1	1.8	4.8	2.7	6.1
Hodgkin's Disease	3.9	2.1	3.2	1.8	4.6	2.8	3.3	2.8
Non-Hodgkin's Lymphomas	11.1	7.7	22.5	13.8	11.5	8.2	20.1	13.7
Multiple Myelomas	3.7	3.2	5.3	3.1	4.4	4.3	5.7	3.5
Leukemias	12.9	9.3	14.0	10.1	14.1	8.2	14.2	7.7
All Cancers	375.0	297.3	434.3	339.3	361.8	302.1	486.6	341.8

[1]Tri-County region includes Cook, Lake, and St. Louis counties.

[2]Twin Cities Metro region includes: 1969-71 Anoka, Dakota, Hennepin, Ramsey, Washington; 1988-94 Anoka, Carver, Dakota, Hennepin, Ramsey, Scott, and Washington counties.

[3]This category represents mainly pleural mesotheliomas and was used for consistency with TNCS data.

Figure 1. Counties Included in Northeastern Minnesota.

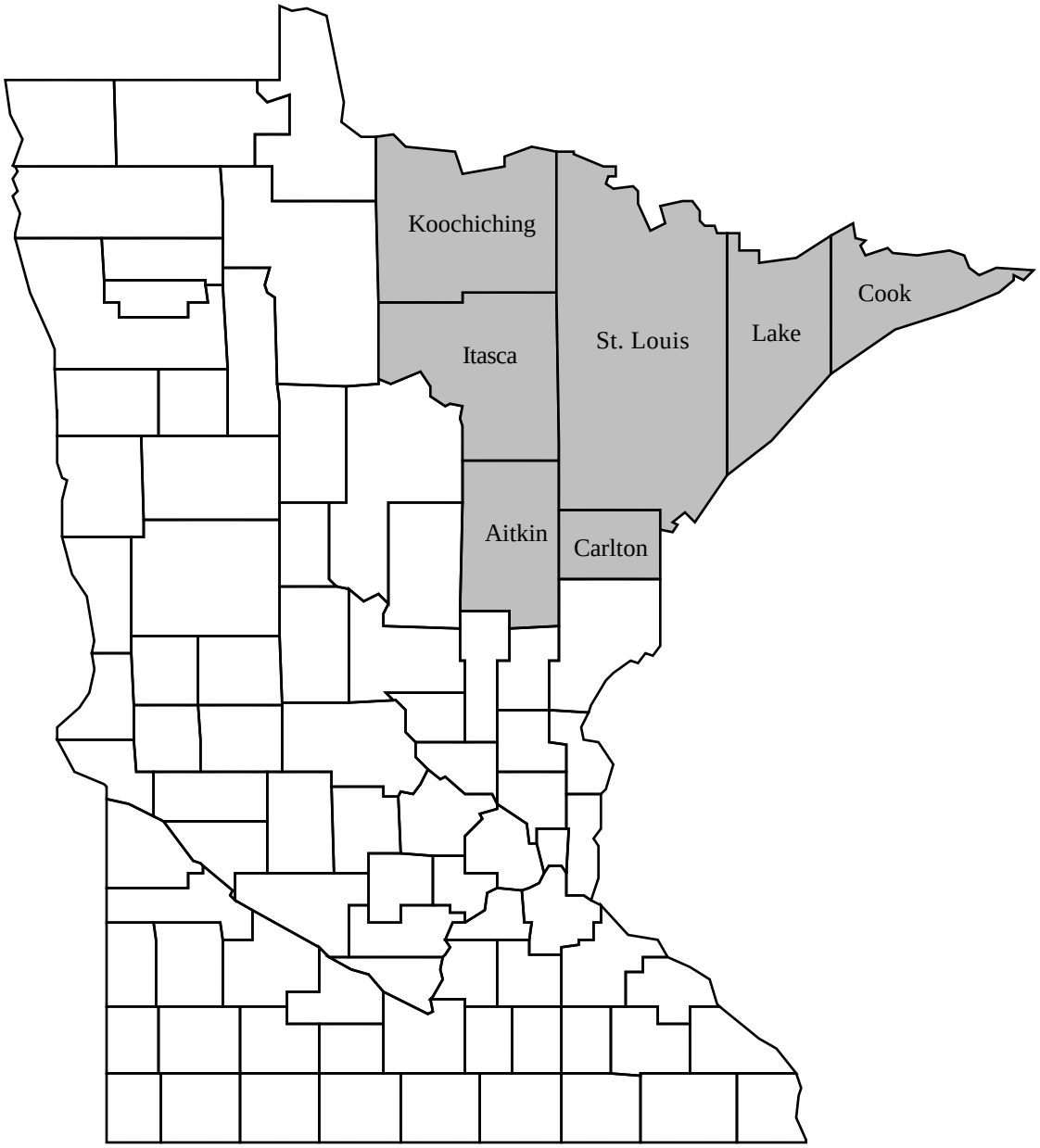
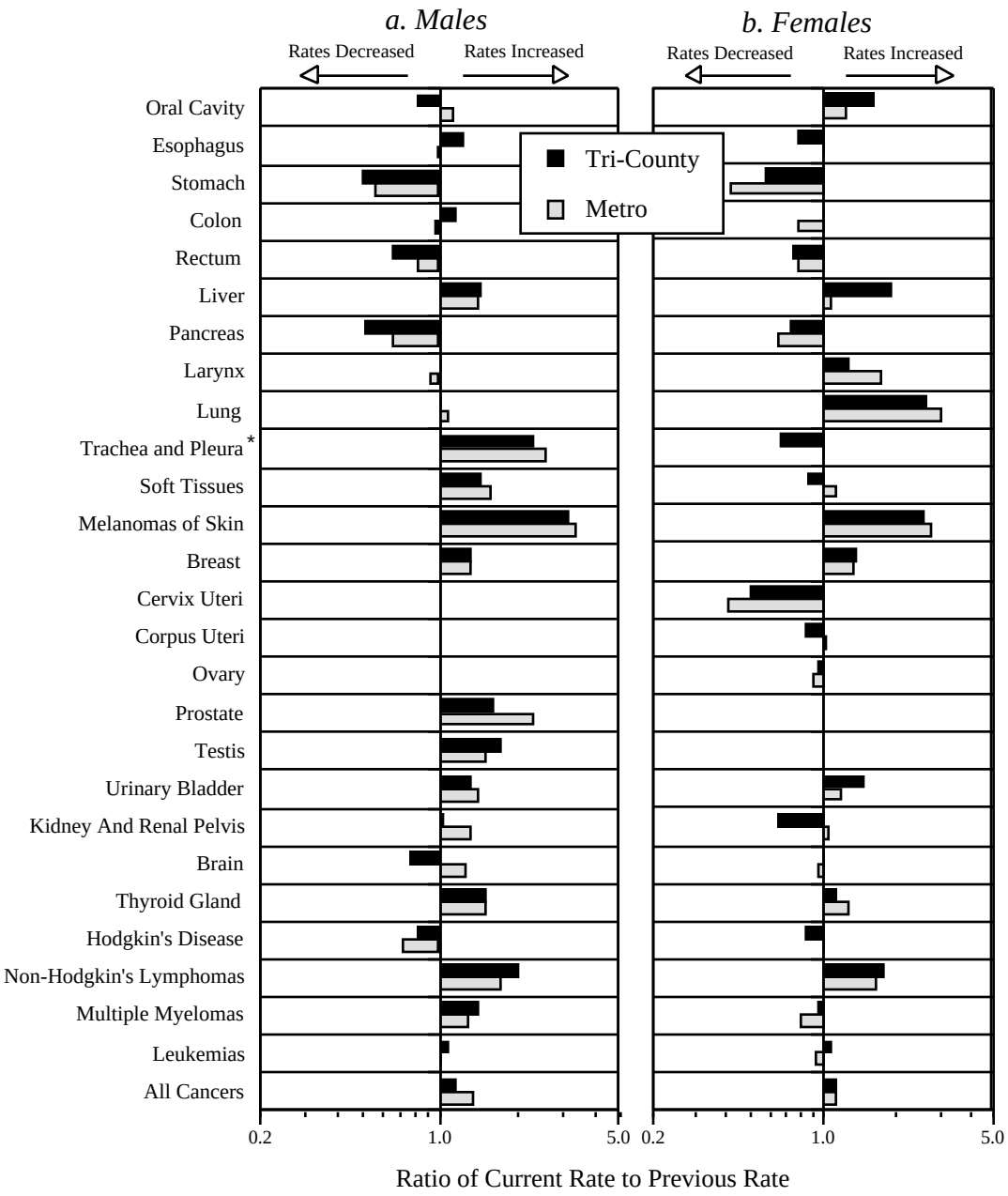


Figure 2. Changes in Cancer Incidence Rates in Tri-County (1969-76-->1988-94) and Twin Cities Metro (1969-71-->1988-94)



*This category includes several types of cancer but is comprised primarily of pleural mesotheliomas.

Figure 3. Male Mesothelioma Rates Compared to Statewide Average, 1988-94. (Rates not shown for 32 counties with 0 cases and a total of 34 expected cases.)