

**CANCER INCIDENCE RATES IN  
NORTHEASTERN MINNESOTA**

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## EXECUTIVE SUMMARY

This report provides an update and overview of cancer incidence rates in seven counties in Northeastern Minnesota (Aitkin, Carlton, Cook, Itasca, Koochiching, Lake, and St. Louis). Cancer incidence data from the Minnesota Cancer Surveillance System are presented for the years 1988 through 1996. This represents two additional years of data since a previous report on cancer rates in this region.

There were 15,163 new cancers of all types diagnosed among residents of Northeastern Minnesota during the period 1988-1996. That rate of occurrence was virtually identical to the statewide average. The overall rate among males was 4% lower than the statewide average, while the overall rate among females was 3% higher than the average.

Some differences in rates were noted for specific types of cancer. These differences could reflect random 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 15% deficit of prostate cancer, the most common cancer diagnosed among men. No one type of cancer accounted for the slight excess among females. There was a 13% excess of uterine cancer, a 10% excess of lung cancer among females, and a 12% excess of leukemia among females. Excesses were seen for cancers of the stomach, esophagus and larynx in both males and females.

A 73% excess of mesothelioma was found among males in the Northeast (54 cases). There was a 63% deficit among females (3 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. Other possible links are currently under investigation.

The 1998 Minnesota Legislature provided funding to examine the excess of mesothelioma and to explore the feasibility of developing information systems on other occupational respiratory diseases. Those activities are currently in progress.

## 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 represents an update to a previous 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. Individual county data are routinely included in the biennial reports of the Minnesota Cancer Surveillance System.<sup>1</sup>

## SOURCES OF CANCER DATA

Cancer incidence data for Minnesota residents come 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 1996. This represents two additional years of cancer data since the publication of a previous report for this region.

Cancer incidence data for other areas of the U.S. are available from the National Cancer Institute<sup>2</sup> (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).

## 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 1988-96. For reference, statewide cancer rates are also shown in Table 1.

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<sup>1</sup>The most recent report is *The Occurrence of Cancer in Minnesota 1988-1996: Incidence, Mortality, Trends*. August 1999. Minnesota Department of Health.

<sup>2</sup>Ries LAG, Kosary CL, Hankey BF, Miller BA, Edwards BK (eds). *SEER Cancer Statistics Review, 1973-1995*, National Cancer Institute. Bethesda, MD, 1998. Also available via the internet at: <http://www-seer.ims.nci.nih.gov/Publications>.

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 of these counties during the nine-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 similar to the statewide averages, although some differences may exist for several specific types of cancer. A total of 15,163 new cancers were diagnosed among NE residents during the period 1988-96. For all cancers and both sexes combined, the annual rate in NE (378.6) is virtually identical to the statewide average (383.4). The overall rate for males is slightly (4%) lower than the state average, while the rate for females is slightly higher (3%) 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 (15%) 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. Among males, a notable excess of cancers are seen for cancer of the esophagus (35%), stomach (12%), larynx (14%), lung (4%), thyroid (22%) and non-

Hodgkin's lymphoma (8%). Of these, only the elevation of esophageal cancer reaches statistical significance. Notable deficits in the expected number of cancers are seen for cancer of the prostate (15%), kidney (15%), brain (16%), pancreas (10%), as well as leukemias (7%) and melanomas of the skin (16%). Only deficits of prostate cancer, kidney cancer and melanomas of the skin reach statistical significance.

The slight overall excess of cancers among females in NE Minnesota is not attributable to any one type of cancer. Among females, excesses are seen with cancer of the esophagus (44%), stomach (30%), pancreas (26%), larynx (25%), uterus (13%), lung (10%), and leukemia (12%). The elevations of esophageal, stomach, pancreatic, lung, and uterine cancers reached statistical significance. Notably fewer than expected cases were seen with cancers of the kidney (18%), thyroid (23%), colon (4%) and rectum (8%). Of these deficits, statistical significance was reached with kidney and thyroid cancer.

While every region will have elevations and deficits due to random variation, a few of the elevations may not be due to only chance. The elevations of esophageal cancer, stomach cancer, and laryngeal cancer occurred in both men and women and were elevated in the early 1970's in the Tri-county survey (covering Cook, Lake and St. Louis counties). This suggests something other than random variation as a factor. The overwhelming causes of esophageal cancer in the United States are attributed to tobacco and alcohol. Other possible risk factors include the ingestion of very hot beverages, the ingestion of lye and pickled foods. These last three factors are not well established. Stomach cancer has consistently been associated with the lack of an intake of fresh fruits and vegetables. In addition, numerous studies point to the ingestion of salt and foods containing N-nitroso compounds (smoked or salt-dried fish, bacon, sausages, other cured meats, beer, pickled vegetables, and mushrooms). A role for the bacteria *Helicobacter pylori* has been the focus of recent research and appears to be a factor in stomach cancer. Laryngeal cancer appears to be largely attributable to tobacco and alcohol use. The excess number of cases of uterine cancer both currently and in the Tri-county study suggests some factor other than random variation. Hormonal and reproductive factors are the dominant risk factors for this cancer. In addition, rates may be affected by the percentage of older women with intact uteri which can vary considerably from one geographic region to another.

Although the actual number of mesothelioma cases among NE males was relatively small (54), that number was approximately 73% higher than expected (31). Fewer than expected mesotheliomas occurred among females (3 actual cases while 8 were expected). 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 in the following section.

### 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. Most cases have some history of exposure to asbestos in the workplace, through household contact with an exposed worker, or, in rare instances, through avocational activities can be a cause. In sharp contrast to lung cancer, which can also be caused by 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 when exposed) is relatively small. In other words, although few exposed individuals actually developed mesothelioma, they are many times more likely to develop mesothelioma than someone with no known exposure.

Figure 2 shows mesothelioma rates for each county in comparison to the statewide average (excluding 28 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 1988-96. Most counties had few (if any) cases, reflecting the rareness of this cancer.

Statewide, there were 340 mesotheliomas among men and 92 among women during the nine year period 1988-96. That averages to approximately 38 cases per year among men for an average annual incidence rate of 1.7 per 100,000. Among women, approximately 10 new cases occur each year for a rate of 0.4 per 100,000. These rates are similar to the rates reported by NCI from other cancer registries.

In NE Minnesota, there were 54 new mesotheliomas during the nine-year period 1988-96 among males. This is approximately 73% higher than the expected number of cases (31) 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 3 new cases during 1988-96, while approximately 8 cases would have been expected for a 63% 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. Almost 6,000 workers were employed at this plant during that time period. As shown in Figure 1, Carlton county had the greatest excess of mesothelioma (based on 10 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 54% 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. Because of the large number of people who have been employed in the iron ore mining industry in that region of the state, there have been concerns by some that this industry may be involved. Several studies of iron ore miners in Minnesota have not reported increased risks of respiratory cancers, however asbestos containing materials (insulation, etc.) are likely to have been utilized in mining and other industries. As discussed below, this issue is currently under review.

Despite the excess of mesotheliomas in NE Minnesota males, there was no significant excess of lung cancers among males (1197 actual cases, 1154 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.

#### Occupational Respiratory Disease Information System

Due in part to concerns about mesothelioma and other occupational respiratory diseases in NE Minnesota, the 1998 Minnesota Legislature directed the Commissioner of Health to

establish community-based advisory groups to assist the MDH in addressing these issues. An Advisory Work Group was established in the fall of 1998. One of the first issues addressed by the Work Group is the excess of mesothelioma and the extent to which known asbestos exposures – within and without the mining industry – can account for this finding. Longer term issues involve the feasibility of establishing an ongoing information system for identification and ultimately the prevention of occupational respiratory diseases. Findings from these efforts are not expected before the end of 1999.

## SUMMARY

The overall cancer incidence rate in Northeastern Minnesota is nearly identical to the statewide average for the period 1988-1996. Rates are approximately 4% lower than average for males and 3% 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. Significant 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 73% excess of mesotheliomas occurred among males in the NE. No excess occurred in females. 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. Other occupations and industries may also have contributed to this excess.

Mesothelioma and other occupational respiratory disease issues are currently being addressed by the MDH and an Advisory Work Group, as directed by the 1998 Legislature.



**Table 1. Average Annual Cancer Incidence Rates for Northeastern<sup>1</sup> Minnesota and All Minnesota, 1988-1996.** (Rates represent number of new diagnoses per 100,000 persons per year, age-adjusted to standard US population.)

<i>Cancer</i>	<i>Northeastern</i>			<i>All Minnesota</i>		
	Males	Females	Both Sexes	Males	Females	Both Sexes
Oral Cavity	15.6	6.9	10.8	15.7	6.1	10.4
Esophagus	7.2	2.0	4.3	5.4	1.3	3.1
Stomach	10.0	4.5	6.9	8.8	3.4	5.7
Colon	37.9	28.1	32.1	38.1	29.1	33.0
Rectum	16.8	8.3	12.0	16.5	9.2	12.4
Liver	2.8	1.6	2.1	3.2	1.4	2.2
Pancreas	7.1	6.9	7.0	8.1	5.5	6.7
Larynx	7.2	1.6	4.1	6.4	1.2	3.6
Lung	67.2	38.3	51.0	64.4	34.7	47.5
Mesothelioma	3.0	0.1		1.7	0.4	
Soft Tissues	3.3	1.9	2.5	3.2	2.1	2.6
Melanomas of Skin	10.8	9.2	9.8	12.9	9.6	11.0
Breast	0.8	110.7	61.0	0.8	110.3	60.6
Cervix Uteri	-	7.9	-	-	7.4	-
Corpus Uteri	-	25.2	-	-	22.5	-
Ovary	-	14.9	-	-	15.1	-
Prostate	124.9	-	-	147.8	-	-
Testis	4.6	-	-	5.1	-	-
Urinary Bladder	30.0	8.0	17.4	29.6	7.8	17.2
Kidney	12.0	5.0	8.2	13.8	6.2	9.6
Brain	6.0	4.7	5.3	7.1	4.8	5.9
Thyroid Gland	3.4	4.7	4.0	2.7	6.4	4.6
Hodgkin's Disease	3.0	2.2	2.5	3.3	2.7	3.0
Non-Hodgkin's Lymphomas	20.9	14.1	17.2	19.6	13.4	16.2
Multiple Myelomas	5.0	2.8	3.7	5.3	3.2	4.1
Leukemias	14.2	9.9	11.8	14.8	8.6	11.3
All Cancers	438.0	339.8	378.6	457.9	332.1	383.4

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

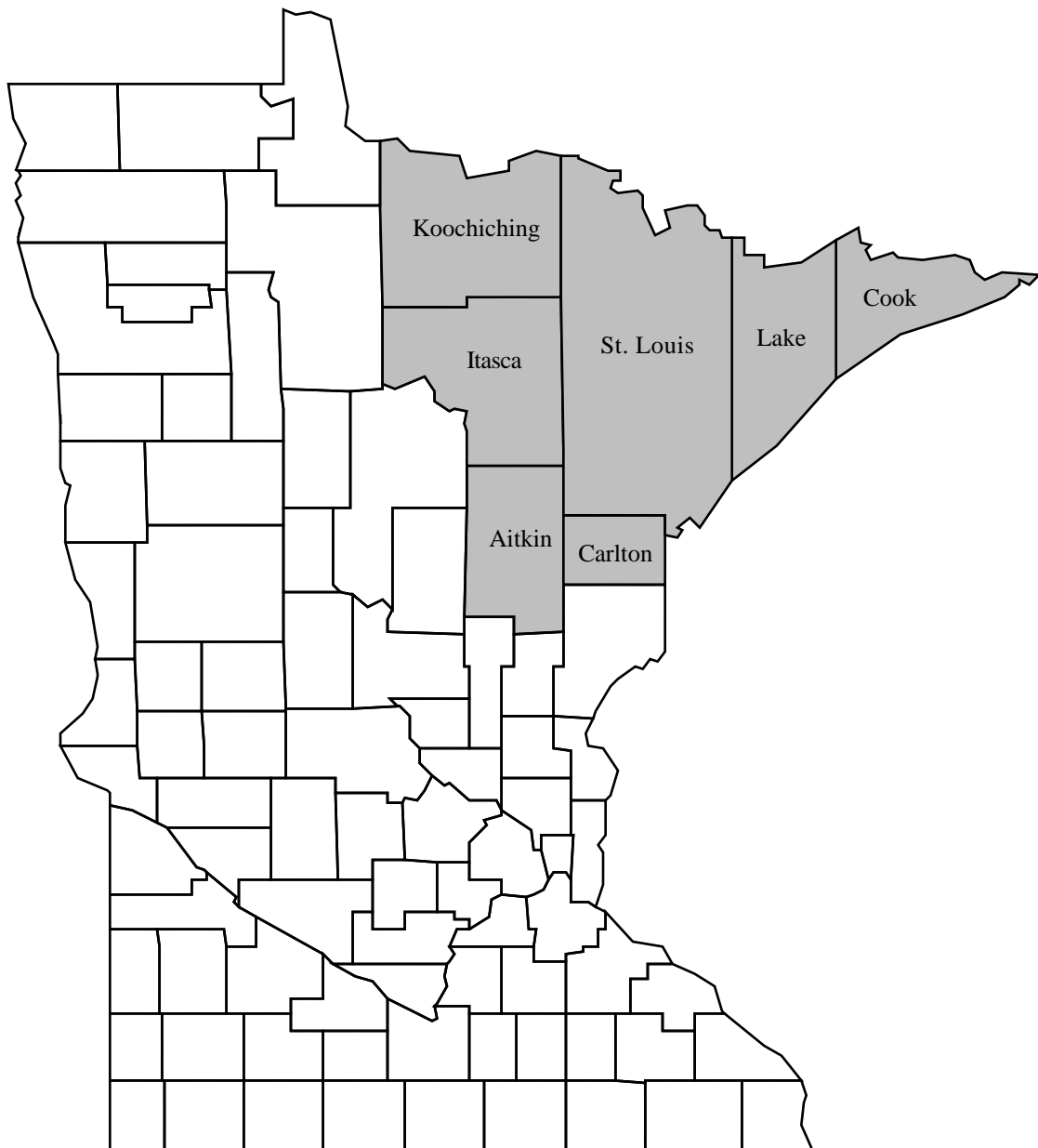
**Table 2. Actual and Expected<sup>1</sup> New Cancers Diagnosed Among Residents in Northeastern<sup>2</sup> Minnesota, 1988-1996.**

<i>Cancer</i>	<i>Males</i>			<i>Females</i>		
	Actual Cases	Expected Cases	Ratio of Actual to Expected	Actual Cases	Expected Cases	Ratio of Actual to Expected
Oral Cavity	266	274	0.97	136	131	1.04
Esophagus	130	96	1.35	46	32	1.44
Stomach	182	162	1.12	113	87	1.30
Colon	715	705	1.01	715	743	0.96
Rectum	297	294	1.01	195	212	0.92
Liver	50	57	0.88	35	30	1.17
Pancreas	130	144	0.90	160	127	1.26
Larynx	127	111	1.14	30	24	1.25
Lung And Bronchus	1197	1154	1.04	792	723	1.10
Mesothelioma	54	31	1.73	3	8	0.37
Soft Tissues	53	54	0.98	39	40	0.98
Melanomas of Skin	185	219	0.84	176	177	0.99
Breast	15	14	1.07	2300	2259	1.02
Cervix Uteri	-	-	-	137	130	1.05
Corpus Uteri	-	-	-	515	454	1.13
Ovary	-	-	-	303	294	1.03
Prostate	2371	2789	0.85	-	-	-
Testis	73	78	0.94	-	-	-
Urinary Bladder	549	544	1.01	195	191	1.02
Kidney And Renal Pelvis	203	240	0.85	108	132	0.82
Brain	93	111	0.84	83	83	1.00
Thyroid Gland	55	45	1.22	82	107	0.77
Hodgkin's Disease	47	50	0.94	33	40	0.82
Non-Hodgkin's Lymphomas	369	343	1.08	311	302	1.03
Multiple Myelomas	92	98	0.94	62	76	0.82
Leukemias	236	254	0.93	203	182	1.12
All Cancers	7928	8281	0.96	7235	7030	1.03

<sup>1</sup>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.

<sup>2</sup>Defined as the following seven counties: Aitkin, Carlton, Cook, Itasca, Koochiching, Lake, and St. Louis

**Figure 1. Counties Included in Northeastern Minnesota.**



**Figure 2. Male Mesothelioma Rates by County Compared to Statewide Average, 1988-96.** (Rates not shown for 28 counties with 0 cases and a total of 37 expected cases.)

