DEPARTMENT OF HEALTH
MINNESOTA CANCER REPORTING SYSTEM

Cancer Occurrence Fridley, Spring Lake Park

2007-2016

July 2019

Cancer Occurrence in Fridley, Spring Lake Park

Minnesota Department of Health
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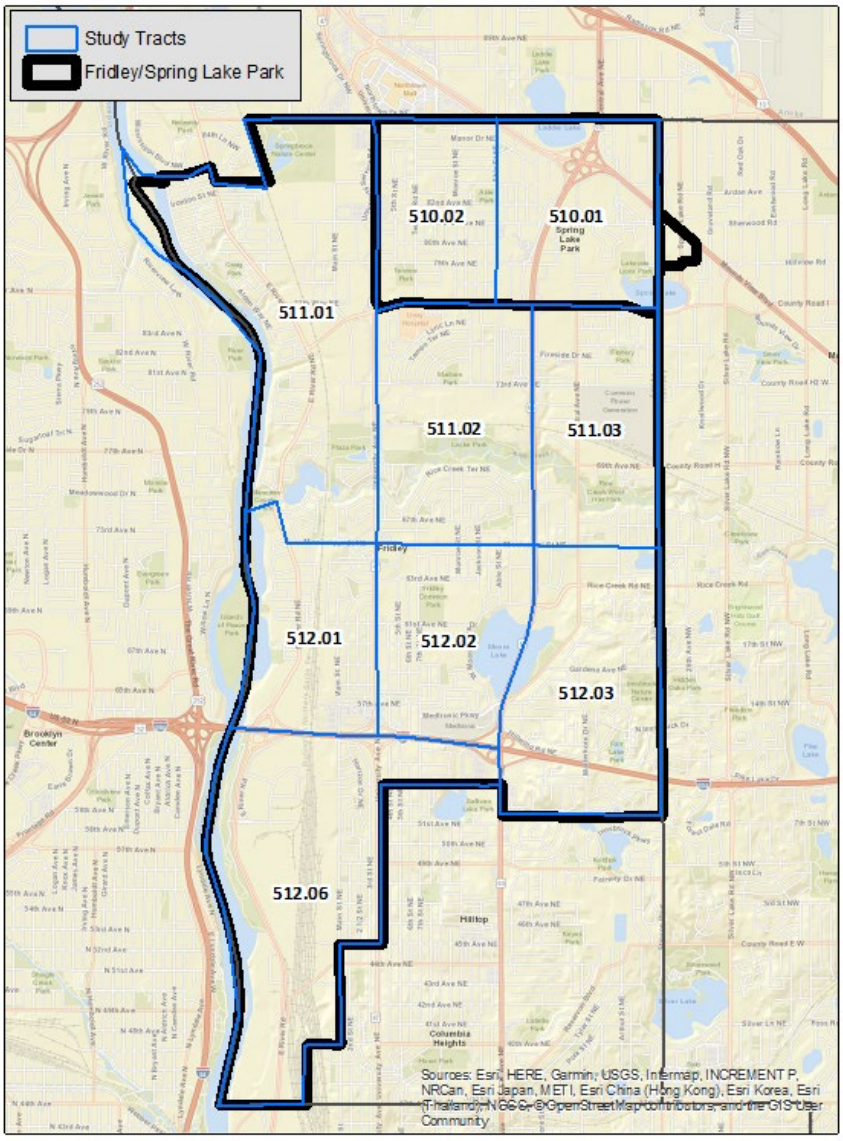
Main Finding

A detailed study encompassing 10 years of cancer data establishes that the majority of cancer incidence rates in nine census tracts in Fridley and Spring Lake Park are virtually identical to cancer rates in the Twin Cities metropolitan area. There were some excess numbers of cancers observed for some cancers. Specific sites with higher counts include colorectal, esophagus and Hodgkin's lymphoma for males and high counts for colorectal, bladder, and lung for females.

Area of Analysis



Summary

There have been cancer concerns among many Fridley and Spring Lake Park residents related to a history of possible exposure to trichloroethylene (TCE) in drinking water (see map location above). The purpose of this report is to provide a complete and accurate profile of cancer occurrence among residents living in the nine census tracts surrounding the Amory-Superfund site. Data from the Minnesota Cancer Reporting System (MCRS) were used to compare cancer rates among individuals living in the census tracts of interest at the time of their diagnosis with cancer rates in the seven county Twin Cities metropolitan area during the most recent 10-year period for which complete data were available (2007-2016).

A majority of the cancer rates in the area of analysis were virtually identical to metro area rates. There were, however, some elevations observed. In males, the elevation counts were for colorectal, esophageal, and Hodgkin's lymphoma cancer sites. In females, the elevated counts were for all cancer sites combined as well as bladder, colorectal, and lung cancer sites. The risk factors associated with these cancers can be found in the Appendix.

Due to their smaller numbers and greater variability (over time or from one location to another), the rates of specific types of cancer at a community (or even county) level are generally much less stable or informative and permit few conclusions. The number of residents in the study area currently living with any history of cancer likely exceeds 2000 individuals.

While environmental contaminants are the frequent focus of community cancer concerns, the primary determinants of cancer risk include smoking, obesity, diet, lack of exercise, UV radiation, alcohol, viruses, genetics, reproductive history, medications, and occupation.

Background

City of Fridley residents have been concerned that they were exposed to elevated levels of trichloroethylene (TCE) in the municipal drinking water supply coming from the Fridley Commons Well Field Superfund site. The Fridley Commons Well Field Superfund site (U.S. Environmental Protection Agency Facility ID, MND985701309) is the location of eight drinking water wells serving the City of Fridley. The Environmental Health Division of the Minnesota Department of Health has information related to TCE and health at these websites:

Minnesota Department of Health:

Trichloroethylene (TCE) and Your Health[1]

Technical and Application Information for Trichloroethylene (TCE)[2]

Data Sources and Methods

The MCRS is Minnesota's statewide cancer registry (database) and has operated since 1988. It collects diagnostic and related data on all cancer diagnoses among Minnesota residents. The data come from hospitals, clinics, and pathology laboratories and are carefully reviewed for completeness and accuracy. Independent audits estimate completeness of the MCRS at over 99%.

Cancer cases for the five census tracts in Fridley and Spring Lake Park were identified from the MCRS for the most recent 10-year period for which complete data were available: 2007-2016. Nine census tracts (051001, 051002, 051101, 051102, 051103, 051201, 051202, 051203, 051206) were used to identify residents who received a new diagnosis of cancer in that period and resided in the area of analysis.

When examining cancer rates in a community or county with a relatively small population, the preferred approach is to compare the actual "observed" number of newly-occurring cancers to the estimated "expected" number (calculated with the assumption that the community had the same cancer rates as some larger comparison population). For this analysis, cancer rates for the seven-county Twin Cities metropolitan area during 2007-2016 were used for comparison to the census tracts. The "expected" number of cancers was estimated by applying metro area cancer rates (by age and gender) to the population of the five census tracts from the 2010 census. Eighteen age categories were used to estimate expected cancer cases separately for males and females. Only the age and gender distributions of the population are taken into account when determining "expected" cancers since these important risk factors alone are known. However, other significant determinants of cancer risk such as smoking history, medical history, family history, obesity, diet, occupation, reproductive history, infectious agents (e.g. human papilloma virus, hepatitis viruses), or other established risk factors are unknown and cannot be taken into account.

For ease of comparison, the observed number of cancers divided by the expected number gives an observed-to-expected ratio (also called the Standardized Incidence Ratio). If the two numbers were identical (which only rarely happens), this ratio would be 1.00. If there were twice as many cancers as expected, the ratio would be 2.00; if there were half as many cancers as expected, the ratio would be 0.50. For each such ratio, a 95% confidence interval was calculated and is also shown in this report. The confidence intervals represent a range in which the ratio is expected to be 95% of the time; this means there is a 5% chance that the ratio could be outside the range. The confidence intervals give an additional measure of the variability and uncertainty that is encountered when examining cancer rates in a community and comparing them to expected rates.

If a confidence interval does not include a value of 1.00, the ratio is considered "statistically significant" – meaning that the difference is less likely to be due to random chance. However, there is still some further uncertainty that is not reflected in the confidence intervals, which do not take into account random differences that can be expected whenever multiple comparisons are made (e.g., comparing a large number of different types of cancer) or the effects of errors in estimating the population of the community.

This report provides information about total cancers for males and for females, as well as 20 specific types of cancers among males and 22 types of cancer among females (representing about 93% of the total cancer incidence for each gender).

Findings

Cancer incidence describes the rates and number of newly-diagnosed cancers over a specified time period. Table 1 shows the observed and expected numbers of cases for all cancers combined and for the most frequent types of cancer among males in the nine census tracts in the area of analysis. The observed-to-expected ratios and statistical 95% confidence intervals are also shown. Table 2 provides the same information for females. The same ratios and confidence intervals are also shown graphically in Figure 1 and Figure 2 for males and females, respectively.

For all cancers combined over the 10-year period 2007-2016, there were higher than expected numbers of cancers (based on metro area rates) for males and for females. For males, there were 976 newly-diagnosed cancers versus 919 expected cancers (ratio of 1.06). For females, there were 972 observed cancers compared to 880 expected cancers (ratio of 1.04). There were cancer sites that had a higher than expected number of cancers in males and females. For males, the higher counts were for colorectal, esophagus, and Hodgkin's lymphoma sites. For females, the high counts were seen with colorectal, bladder, and lung. The risk factors associated with the individual cancer sites are listed in the Appendix. Smoking is the most important risk factor associated with lung, esophageal, and bladder cancer. TCE has been associated with kidney and liver cancers in humans, as well as non-Hodgkin's lymphoma.

Strengths and Limitations

The major strength of this analysis is the use of data from MCRS to examine and compare cancer incidence rates. All newly diagnosed cancers among Minnesota residents are reported to the MCRS. MCRS data have been shown to meet the highest standards of data completeness and accuracy. Examining rates of newly diagnosed cancers provides the most detailed and complete profile of cancer occurrence among Minnesota residents statewide.

Detailed population data (18 age categories for each gender) for the requested census tracts were required to determine the expected number of new cancers. Data from 2010 United States Census were used to provide an approximate population distribution for the 10-year time period. There are fluctuations in populations over time but the US census is the most accurate account of the population. MCRS data are available at the census tract level which correspond exactly with the population data.

While this study provides a relatively clear picture of overall cancer incidence among these residents living in the area of analysis, the picture is much less stable and informative for many specific types of cancer due to the small numbers of cases at a community level. This problem was partially overcome by aggregating cancer data over a 10-year period.

Finally, these cancer data represent the occurrence of cancer among people who lived in the community at the time of diagnosis (cancer incidence) during the period 2007-2016. However, the time period for the development of cancer (latency period) is typically several decades. Many cancers diagnosed today are possibly due to exposures and lifestyle experiences that began or occurred many years ago. As in any community, there will be migration from one neighborhood to another as well as migration into and out of these communities over time.

Usefulness and Limitations of Community Cancer Rates in Addressing Environmental Cancer Concerns

The MCRS is a vital tool for examining cancer rates and trends in Minnesota and MCRS data are extremely useful in facilitating epidemiologic studies of specific cancers, quality of care studies, evaluating screening and prevention programs, and many other purposes. While community cancer rates have a high degree of statistical uncertainty and must be interpreted cautiously, such data are also very useful in addressing public concerns over cancer rates in a county or a community by providing a more complete and accurate profile of cancer occurrence. However, for many reasons, analyses of community cancer rates are rarely useful in documenting potential cancer risks from low levels of environmental pollutants.

- Cancer is not a single disease but a group of more than 100 different diseases. Cancers differ in their rates of occurrence, risk factors, treatment, and survivorship. Unfortunately, cancer is not a rare disease, especially when considered in terms of lifetime risk. Not including the most common forms of skin cancer, the average lifetime risk of developing some type of cancer (in situ or malignant) is approximately 44% among males and 41% among females (National Cancer Institute: The Cancer Query System[3]). On average then, almost one in two people will have a diagnosis of cancer during their lifetimes. For any individual, of course, the lifetime risk will be dependent on many personal factors such as smoking history, obesity, alcohol use, family history, and other risk factors.

- The time period for the development of cancer (latency period) is typically several decades, such that many cancers diagnosed today are due to exposures and lifestyle experiences that began or occurred many years ago. Unfortunately, it is often not possible to know when and to what extent newly identified contaminants would have created the potential for exposure in a community. Furthermore, due to the high mobility of our population, many residents in a community may not reside there for more than five years prior to their diagnosis of cancer. Thus, community cancer rates are frequently comprised of individuals who differ in their residential histories in the community, their personal risk factors for cancer, as well as in their potential exposures to environmental contaminants.

- While we have no control over risk factors such as age, race, family history, and genetics, much of our cancer risk is strongly influenced by lifestyle factors that we can control. Such lifestyle risk factors include cigarette smoking, obesity, alcohol consumption, ionizing and solar radiation, certain infectious agents (e.g., hepatitis viruses), occupation, and physical inactivity (Figure 3). Those factors account for about 60% of cancer deaths in the U.S. Other lifestyle factors that increase risk include reproductive patterns, sexual behavior, and medications. However, even when no modifiable risk factors are known that can reduce the risk of developing a cancer, screening and early diagnosis may prevent or reduce the risk of death.

- While little is known about the causes of some types of cancer (e.g., brain tumors), for many types of cancer, specific risk factors have been identified. For some cancers, these

known risk factors account for a significant proportion of cancer occurrence (e.g., 85-90% of lung cancer is attributable to smoking; 95% of cervical cancer is due to the Human Papilloma Virus). Communities and counties can vary widely in terms of known risk factors for cancer, contributing to the variability of cancer rates. While age and gender distributions in a community can routinely be accounted for, lack of information about other known determinants of cancer incidence (such as smoking histories) in a given population makes it difficult to attribute any observed excess or deficit in cancer rates to a given cause.

- Well-designed epidemiological studies, in addition to toxicological research, are necessary to answer questions about the extent to which an environmental exposure may be contributing to the occurrence of cancers in human populations. Indeed, most known human carcinogens have been identified through epidemiologic studies of occupational groups. Cancer risks are much more likely to be detected in the workplace rather than in a community setting since (1) occupational exposures are generally much greater than community exposures; (2) it is frequently possible to estimate past exposures in a workplace using industrial hygiene data, job histories, and other data; and (3) it is usually possible to identify all the people who worked at a workplace for a particular time period using personnel records.

- State and federal regulatory standards and guidelines are intended to limit exposures to potential carcinogens to very low risks, for example, one additional cancer in 100,000 people with lifetime exposure. This level of cancer risk is purposefully many thousands of times lower than cancer risks that can be detected by epidemiologic studies or examination of community cancer rates.

Table 1. Observed and Expected Cancer Incidence Among Males

Cancer	Observed Cases	Expected Cases	Observed to Expected Ratio	95% Confidence Interval of Ratio
All Cancers Combined	976	919	1.06	(1.00, 1.13)
Bladder	70	65	1.08	(0.84, 1.36)
Brain	19	14	1.36	(0.82, 2.12)
Colorectal	98	77	1.28	(1.04, 1.55)
Esophagus	22	14	1.60	(1.01, 2.42)
Hodgkin's Lymphoma	12	6	2.03	(1.05, 3.54)
Kidney	48	40	1.20	(0.89, 1.60)
Larynx	15	10	1.58	(0.88, 2.60)
Leukemia	49	39	1.27	(0.94, 1.68)
Liver	23	19	1.22	(0.77, 1.83)
Lung	116	110	1.06	(0.87, 1.27)
Melanoma	50	61	0.82	(0.61, 1.08)
Multiple Myeloma	12	15	0.79	(0.41, 1.38)
Non-Hodgkin's Lymphoma	40	49	0.82	(0.58, 1.11)
Oral	34	31	1.09	(0.76, 1.52)
Pancreas	29	25	1.16	(0.78, 1.67)
Prostate	236	250	0.94	(0.83, 1.07)
Soft tissue	9	7	1.25	(0.57, 2.38)
Stomach	14	15	0.96	(0.53, 1.61)
Testes	11	12	0.94	(0.47, 1.68)
Thyroid	13	11	1.17	(0.62, 2.01)

Figure 1. Cancer Rates Among Males

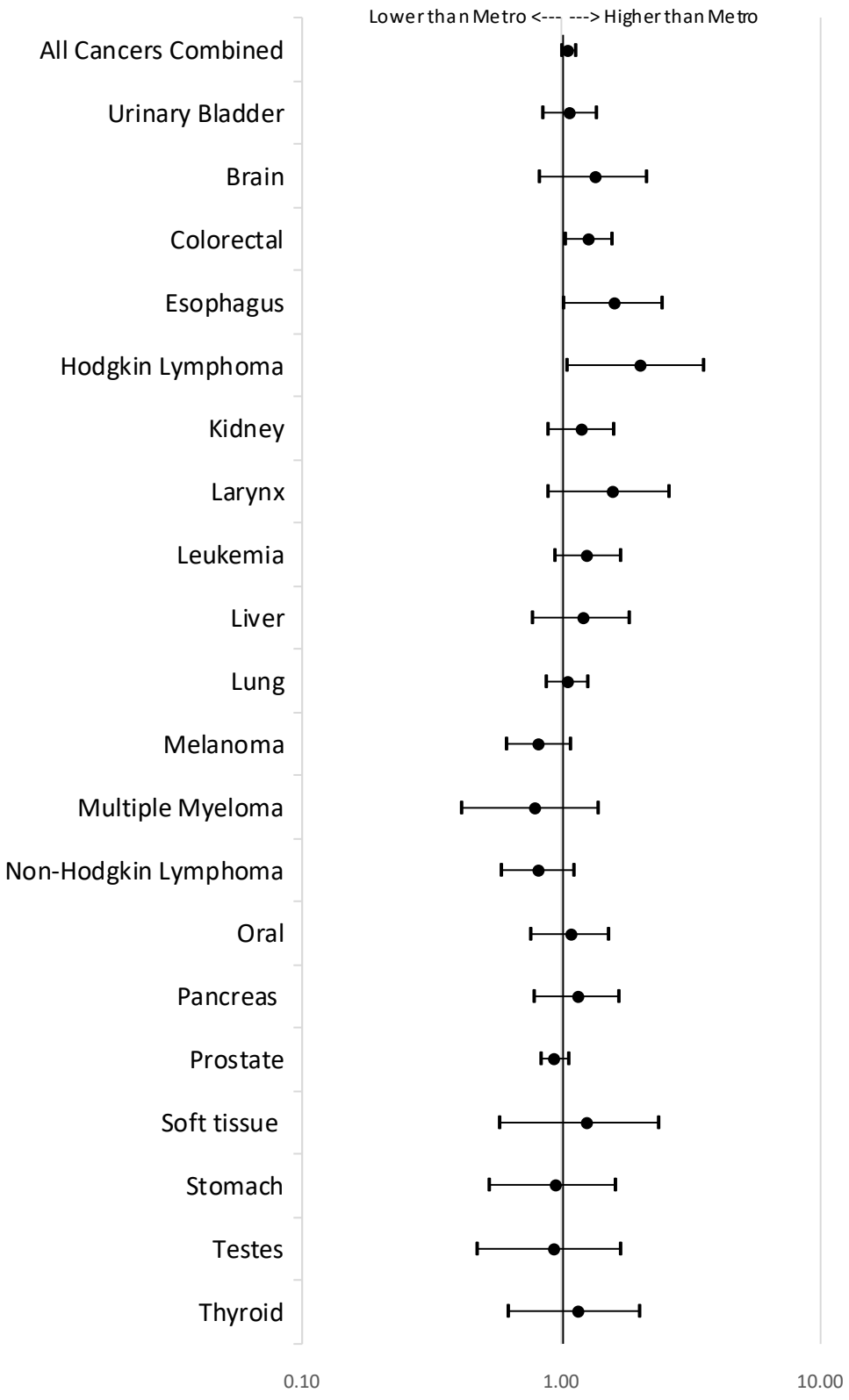


Table 2. Observed and Expected Cancer Incidence Among Females

Cancer	Observed Cases	Expected Cases	Observed to Expected Ratio	95% Confidence Interval of Ratio
All Cancers Combined	975	880	1.11	(1.04, 1.18)
Bladder	30	20	1.51	(1.02, 2.16)
Brain	13	11	1.17	(0.63, 2.01)
Breast	248	273	0.91	(0.80, 1.03)
Cervix	9	10	0.88	(0.40, 1.68)
Colorectal	93	74	1.26	(1.02, 1.54)
Esophagus	5	4	1.12	(0.36, 2.61)
Hodgkin's Lymphoma	6	4	1.34	(0.49, 2.91)
Kidney	28	21	1.34	(0.89, 1.93)
Larynx	1	2	0.44	(0.01, 2.43)
Leukemia	19	25	0.77	(0.46, 1.20)
Liver	10	9	1.17	(0.56, 2.15)
Lung	176	113	1.55	(1.33, 1.80)
Melanoma	59	46	1.27	(0.97, 1.64)
Multiple Myeloma	6	11	0.55	(0.20, 1.20)
Non-Hodgkin's Lymphoma	47	37	1.26	(0.93, 1.68)
Oral	16	15	1.10	(0.63, 1.79)
Ovary	21	23	0.91	(0.56, 1.39)
Pancreas	27	22	1.23	(0.81, 1.79)
Soft tissue	5	6	0.89	(0.29, 2.08)
Stomach	7	8	0.87	(0.35, 1.79)
Thyroid	32	32	1.00	(0.68, 1.41)
Uterus	68	62	1.09	(0.85, 1.38)

Figure 2. Cancer Rates Among Females

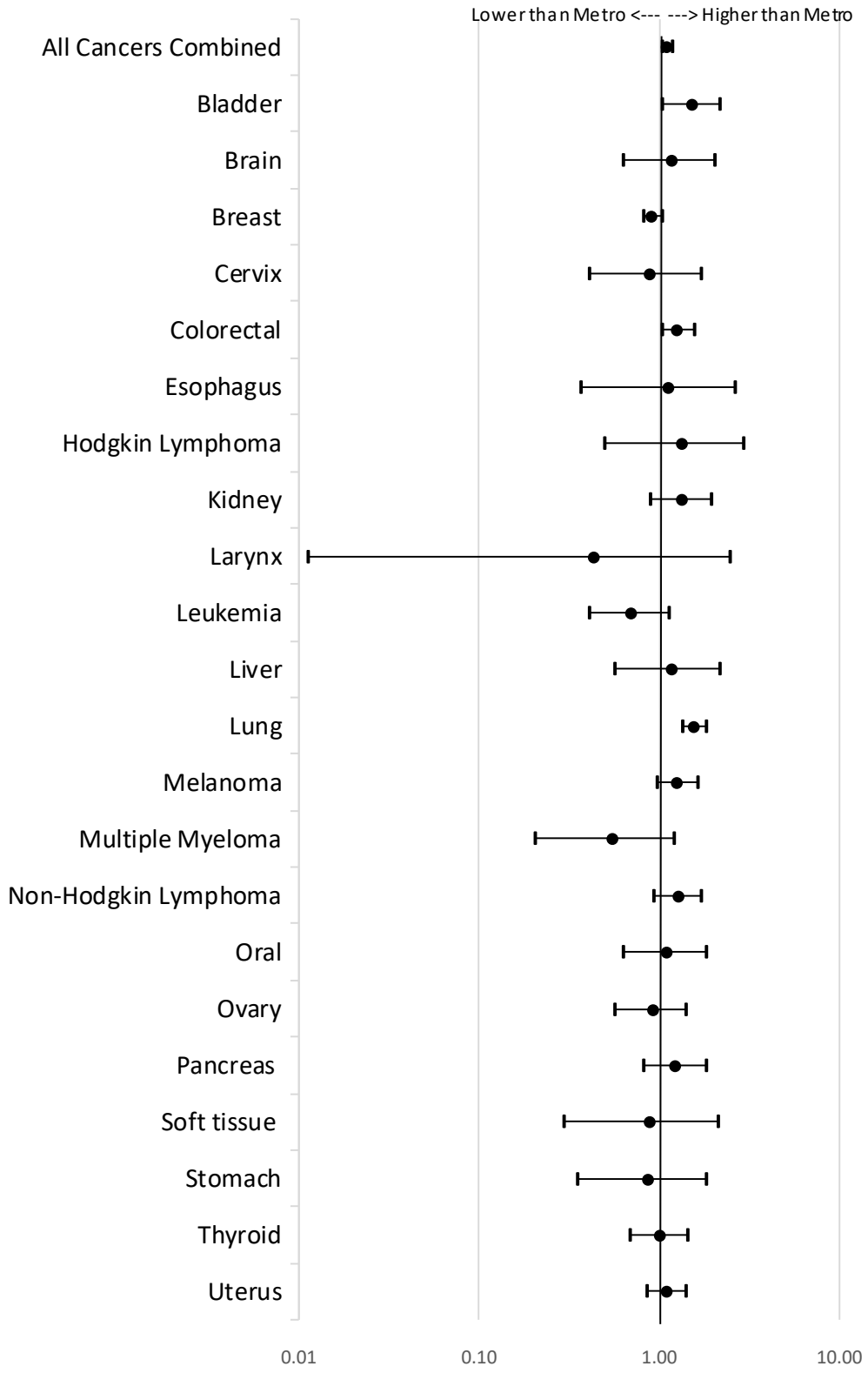
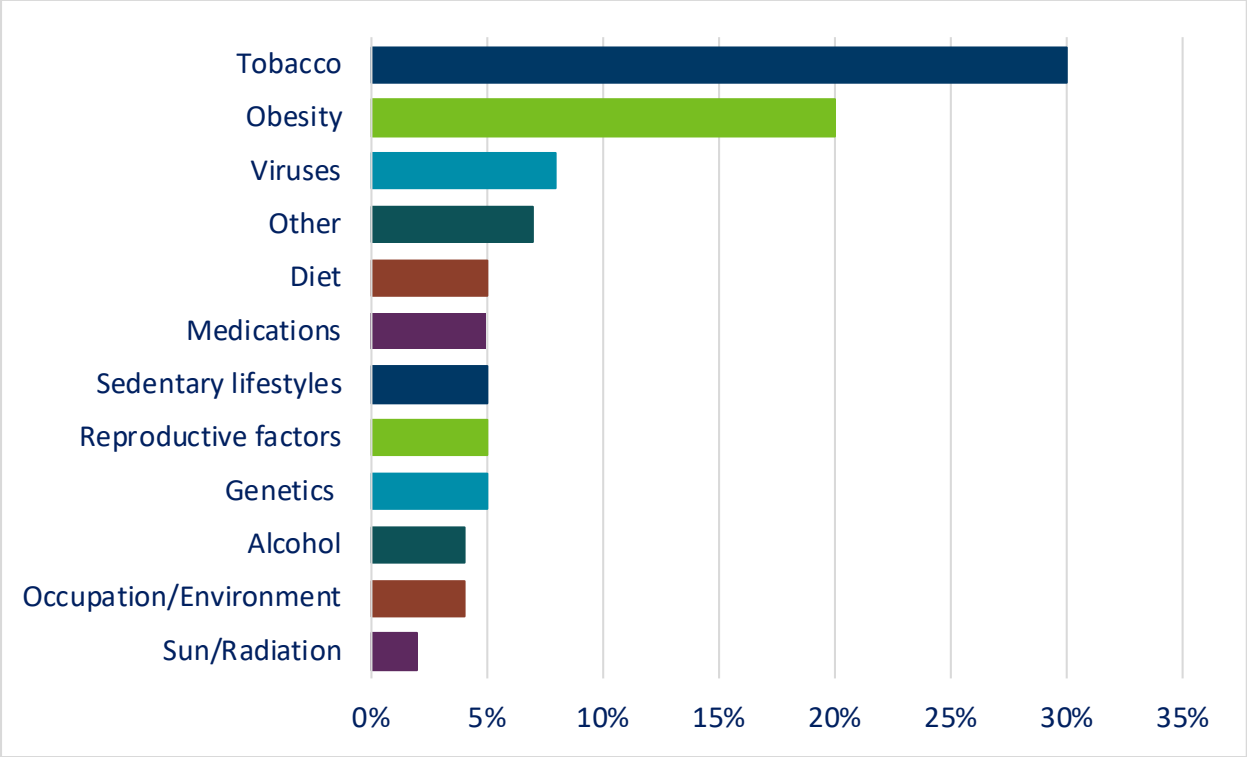


Figure 3. Estimate of U.S. cancer mortality attributable to various known risk factors



Colditz G.A., Wei E.K. Relative Contributions of Biologic and Social and Physical Environmental Determinants of Cancer Mortality. Annual Review of Public Health, 2012;33:137-156.

Appendix

Cancer Risk Factors

(Summarized from MCRS biennial reports[4], American Cancer Society[5], National Cancer Institute[6])

Colorectal

- **Age**: about 9 out of 10 people diagnosed with colorectal cancer are at least 50 years old.
- **Personal history of colorectal polyps or cancer**.
- **Family history of colorectal cancer**: Most colorectal cancers occur in people without a family history but people with a history of colorectal cancer or polyps in close relatives (parents, siblings, or children) are at increased risk. There are some inherited gene defects (mutations) that are linked with colorectal cancers.
- **Inflammatory bowel disease (IBD)**, a condition in which the colon is inflamed over a long period of time. IBD is different from irritable bowel syndrome (IBS), which is a common disorder that can cause cramping, abdominal pain, and diarrhea, but does not increase the risk for colorectal cancer.
- **Race**: Blacks have the highest colorectal cancer incidence and mortality rates of all racial groups in the U.S. In Minnesota, American Indians have the highest incidence and mortality rates.
- **Other risk factors**: physical inactivity, obesity, smoking, heavy alcohol use, and a diet high in red meats and processed meats.

Lung

- **Smoking** is the leading cause of lung cancer. Approximately 90% of lung cancers in males and 80% in females are caused by smoking, and it increases risk for many other cancers as well.
- **Radon**, a common indoor pollutant and second leading cause of lung cancer, enters the home from the surrounding soil. About one in three Minnesota homes have enough radon to pose a risk to the occupants' health over many years of exposure.
- **Environmental tobacco smoke (ETS)**, also known as secondhand smoke, is a known human carcinogen. According to the CDC and EPA, it is the third leading cause of lung cancer, after cigarette smoking and exposure to radon.
- **Occupational exposures** to known and probable carcinogens (e.g., occupations with exposure to arsenic, asbestos, beryllium, cadmium, or radon) account for a small but significant number of lung cancers.
- **Other risk factors:** Exposure to arsenic, asbestos, and diesel exhaust are other risk factors. Air pollution may cause a small increase in lung cancer.

Hodgkin's Lymphoma

- **Epstein-Barr virus infections/mononucleosis** are associated with an increased risk of Hodgkin lymphoma's. But even though the risk is higher than for people who haven't had mono, it is still very small (about 1 in 1,000).
- **Age** is associated with Hodgkin's lymphoma. People can be diagnosed with Hodgkin's lymphoma at any age, but it's most common in early adulthood (especially in a person's 20s) and in late adulthood (after age 55).
- **Gender:** Hodgkin's lymphoma occurs slightly more often in males than females.
- **Family history of Hodgkin's lymphoma**: Brothers and sisters of young people with this disease have a higher risk for Hodgkin's lymphoma. The risk is very high for an identical twin of a person with Hodgkin's lymphoma. But a family link is still uncommon – most people with Hodgkin's lymphoma do not have a family history of it.
- **Weakened immune system:** The risk of Hodgkin's lymphoma is increased in people infected with HIV, the virus that causes AIDS. People who take medicines to suppress the immune system after an organ transplant and people with auto-immune diseases are also at higher than normal risk for Hodgkin's lymphoma.

Esophagus

- **Tobacco use** and **alcohol abuse** irritate the squamous cells of the esophagus and increase the risk for esophageal cancer. The use of any tobacco product, including cigarettes, cigars, pipes, and chewing tobacco, increases the risk for esophageal cancer, especially with heavy or prolonged use.
- **Diet**: Consumption of foods preserved in lye (such as lutefisk) can increase a person's risk for esophageal cancer, especially if consumed in large quantities. Eating few fruits and vegetables is associated with an increased risk of esophageal cancer. However, more research is needed to know whether there is a protective effect of fruits and vegetables or whether it is simply a marker for another risk factor.
- **Gastroesophageal reflux disease (GERD)**, also known as reflux, acid indigestion, and heartburn, occurs when acid escapes from the stomach back into the esophagus. This chronic reflux has been shown to increase the risk of adenocarcinoma of the esophagus. The long-term damage caused to the cells of the esophagus from strong stomach acids can cause a condition known as Barrett's esophagus, which greatly increases risk of esophageal cancer.
- **Obesity** is associated with esophageal cancer, probably because obese individuals are more likely to have GERD.
- **Long-term exposure to chemical fumes** in certain work settings such as dry cleaning appears to increase the risk of esophageal cancer.

Bladder

- **Smoking:** The most common risk factor is cigarette smoking, although smoking cigars and pipes can also raise the risk of developing bladder cancer. Smokers are 4 to 7 times more likely to develop bladder cancer than nonsmokers.

- **Age:** The chances of being diagnosed with bladder cancer increases with age. More than 70% of people with bladder cancer are older than 65 years old.
- **Gender:** Males are 3 to 4 times more likely to develop bladder cancer than females, but females are more likely to die from bladder cancer than males.
- **Race.** White people are more than twice as likely to be diagnosed with bladder cancer as black people, but black people are twice as likely to die from the disease.
- **Workplace exposures:** Chemicals used in the textile, rubber, leather, dye, paint, and print industries; some naturally occurring chemicals; and chemicals called aromatic amines can increase the risk of bladder cancer.
- **Chronic bladder problems.** Bladder stones and infections may increase the risk of bladder cancer. Bladder cancer may be more common for people who are paralyzed from the waist down who are required to use urinary catheters and have had many urinary infections.
- **Chemotherapy:** People who have had chemotherapy with cyclophosphamide have a higher risk of developing bladder cancer.
- **Genetics and a family history:** People who have family members with bladder cancer have a higher risk of getting it themselves. A small number of people inherit a gene syndrome that increases their risk for bladder cancer (retinoblastoma, Cowden disease, Lynch syndrome).
- **Arsenic:** Drinking water that contains arsenic has been linked to bladder cancer. Exposure depends on where a person lives and the water source. In the United States, safety measures have been put in place to limit the level of arsenic in public drinking water.

References

[1] Trichloroethylene (TCE) and Your Health (https://www.health.state.mn.us/communities/environment/hazardous/topics/tce.html#water)

[2] Technical and Application Information for Trichloroethylene (TCE) (https://www.health.state.mn.us/communities/environment/risk/guidance/gw/tceaddedguidance.html)

[3] National Cancer Institute: The Cancer Query System (https://surveillance.cancer.gov/devcan/canques.html)

[4] Data - MCRS Cancer Statistics and Reports (https://www.health.state.mn.us/data/mcrs/data/index.html)

[5] American Cancer Society: Cancer A-Z (https://www.cancer.org/cancer.html)

[6] National Cancer Institute: Causes and Prevention (https://www.cancer.gov/about-cancer/causes-prevention)