DEPARTMENT OF HEALTH
MINNESOTA CANCER REPORTING SYSTEM

Cancer Occurrence in New Brighton and Saint Anthony

2007-2016

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Cancer Occurrence in New Brighton, St. Anthony

Minnesota Department of Health
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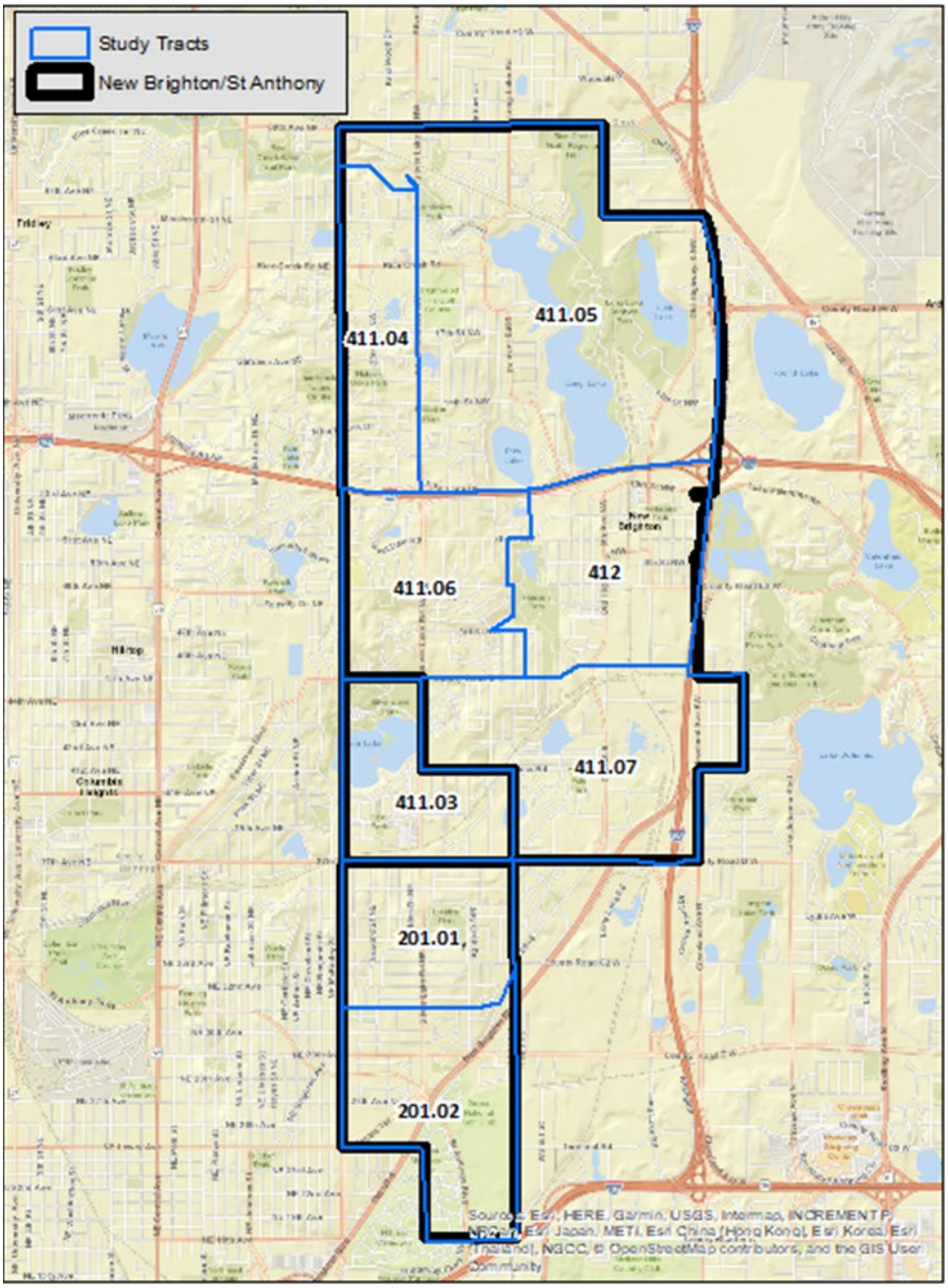
Contents

Main finding

A detailed study including 10 years of cancer data establishes that the majority of cancer incidence rates in eight census tracts in the New Brighton and Saint Anthony are virtually identical to cancer rates in the Twin Cities metropolitan area. There were deficits in the number of all cancers combined and lung cancers observed in males.

Area of analysis



Summary

There have been cancer concerns among many New Brighton and St. Anthony residents related to a history of possible exposure to industrial pollutants from the Twin Cities Army Ammunition Plant (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 eight census tracts defining the two cities. 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).

During the 10-years, there were 914 new cancers diagnosed in males and 1000 new cancers diagnosed in females. A majority of the cancer rates in the area of analysis were virtually identical to metro area rates. The number of total cancers observed in males was 9% lower than expected. Among the common cancer types, the number of lung cancer diagnoses in males was 27% lower than expected. The number of observed cancers among females did not differ from expected.

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

Residents of New Brighton and St. Anthony have expressed concerns about groundwater contamination from the Twin Cities Army Ammunition Plant that has impacted the drinking water systems of the two communities. Historically, in both communities, the water supplies are served by groundwater wells and have been impacted by trichloroethylene (TCE) released at low levels from the plant. In 1990, New Brighton, with funding from the U.S. Army, constructed a water treatment plan to remove the TCE from the water supply. Levels in St. Anthony were not high enough to require treatment. In 2015, another chemical related to the Twin Cities Army Ammunition Plant, 1,4-dioxane, was found in the water supplies serving both cities. Both TCE and 1,4-dioxane are considered carcinogenic (cancer-causing) to humans. TCE has been associated with kidney and liver cancers in humans, as well as non-Hodgkin's lymphoma. 1,4-dioxane has been associated with liver and other cancers. Both cities took action to reduce the levels of 1,4-dioxane in their water supplies after it was discovered and have since installed treatment to remove it from the groundwater.

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 eight census tracts in New Brighton and St. Anthony were identified from the MCRS for the most recent 10-year period for which complete data were available: 2007-2016. Eight census tracts (041104, 041105, 041106, 041107, 041200, 041103, 020101, 020102) 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 which 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 cancers 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 eight 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.

Over the 10-year period, the number of all new cancers combined diagnosed in males living in New Brighton and St. Anthony was 9% lower than expected compared to the seven-county metropolitan area. There were 914 new cancer diagnoses in males compared with 1008 expected (ratio 0.91). There was also a deficit of new lung cancer diagnosed in males. The number of new lung cancers diagnosed was 87 compared with 120 expected (ratio 0.73). For female residents of the area, there were no significant differences between the observed and expected numbers of cancers based on metro area rates. There were 1000 new cancers diagnosed in females living in the area compared with 1051 expected based on metro area rates (ratio 0.95).

Except for the lower than expected rates for all cancers and lung cancers newly diagnosed among males, this analysis shows that the cancer rates overall and for individual cancers for both males and females in the eight census tracts in the area of analysis were virtually identical to the metro area rates.

Strengths and Limitations

The major strength of this analysis is the use of data from the 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[1]). 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	914	1007.7	0.91	(0.85, 0.97)
Bladder	60	73.5	0.82	(0.62, 1.05)
Brain	31	25.2	1.23	(0.84, 1.75)
Colorectal	71	79.3	0.90	(0.70, 1.13)
Esophagus	15	14.7	1.02	(0.57, 1.68)
Hodgkin's Lymphoma	2	5.3	0.38	(0.05, 1.37)
Kidney	35	40.2	0.87	(0.61, 1.21)
Larynx	11	10.1	1.09	(0.54, 1.94)
Leukemia	35	41.6	0.84	(0.59, 1.17)
Liver	15	19.7	0.76	(0.43, 1.26)
Lung	87	119.8	0.73	(0.58, 0.90)
Melanoma	53	63.9	0.83	(0.62, 1.09)
Myeloma	11	16.3	0.68	(0.34, 1.21)
Non-Hodgkin's Lymphoma	54	51.9	1.04	(0.78, 1.36)
Oral	29	31.9	0.91	(0.61, 1.31)
Pancreas	31	26.9	1.15	(0.78, 1.64)
Prostate	257	263.1	0.98	(0.86, 1.10)
Soft Tissue	11	7.2	1.52	(0.76, 2.73)
Stomach	9	15.7	0.57	(0.26, 1.09)
Testes	5	9.9	0.50	(0.16, 1.18)
Thyroid	11	10.4	1.06	(0.53, 1.89)

Figure 1. Cancer Rates Among Males

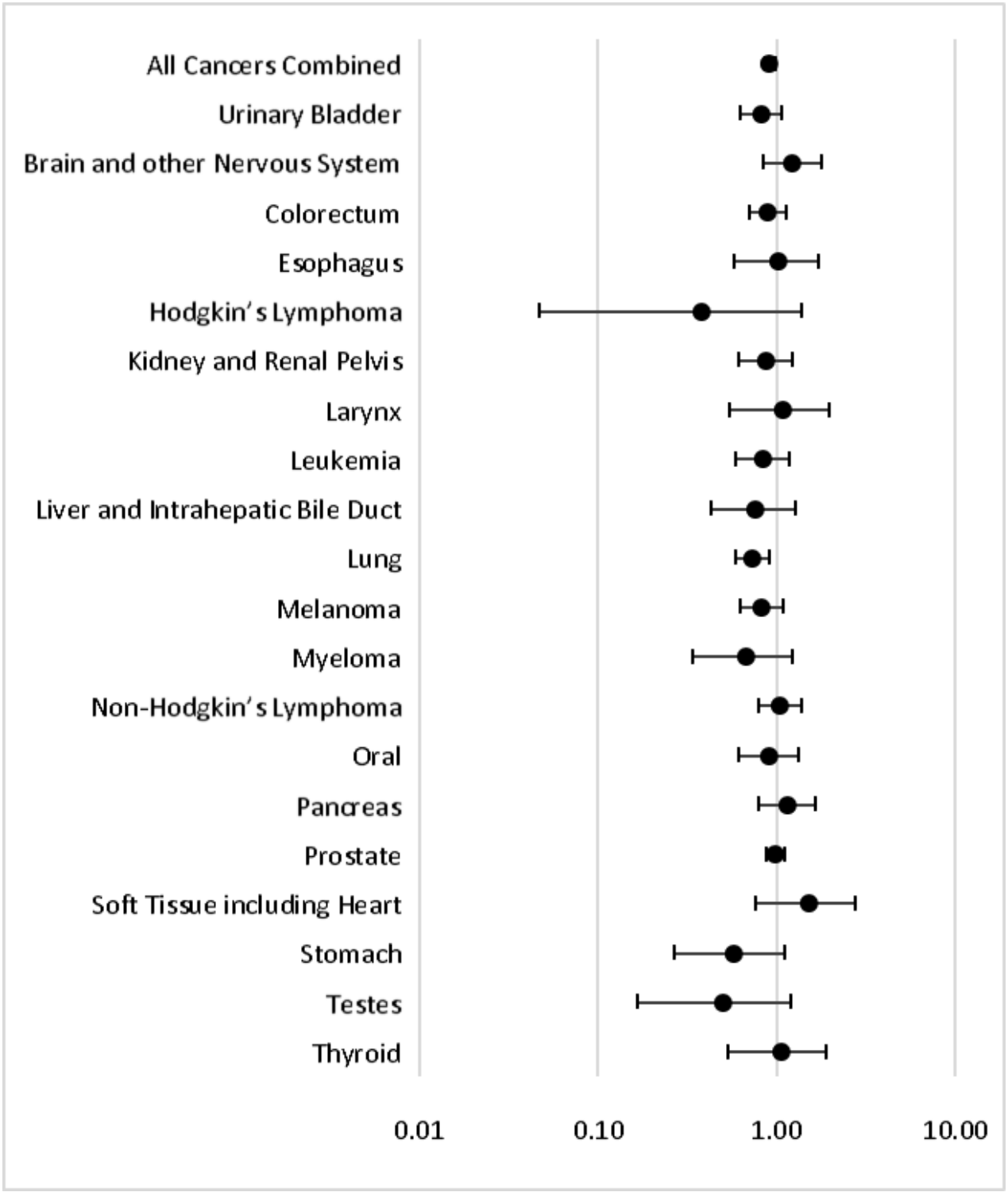


Table 2. Observed and Expected Cancer Incidence Among Females

Cancer	Observed Cases	Expected Cases	Observed to Expected Ratio	95% Confidence Interval of Ratio
All Cancers Combined	1000	1050.5	0.95	(0.89, 1.01)
Bladder	32	25.6	1.25	(0.86, 1.77)
Brain	36	33.5	1.08	(0.75, 1.49)
Breast	273	298.0	0.92	(0.81, 1.03)
Cervix	4	9.9	0.40	(0.11, 1.03)
Colorectal	84	88.5	0.95	(0.76, 1.17)
Esophagus	8	5.5	1.44	(0.62, 2.84)
Hodgkin's Lymphoma	2	4.4	0.46	(0.06, 1.66)
Kidney	27	23.6	1.14	(0.75, 1.66)
Larynx	2	2.6	0.78	(0.09, 2.83)
Leukemia	36	30.0	1.20	(0.84, 1.66)
Liver	8	10.1	0.79	(0.34, 1.56)
Lung	120	136.9	0.88	(0.73, 1.05)
Melanoma	46	48.8	0.94	(0.69, 1.26)
Myeloma	18	13.4	1.35	(0.80, 2.13)
Non-Hodgkin's Lymphoma	50	45.4	1.10	(0.82, 1.45)
Oral	17	17.0	1.00	(0.58, 1.60)
Ovary	27	25.4	1.06	(0.70, 1.55)
Pancreas	18	27.8	0.65	(0.38, 1.02)
Soft Tissue	2	5.9	0.34	(0.04, 1.22)
Stomach	6	9.8	0.61	(0.22, 1.33)
Thyroid	20	30.3	0.66	(0.40, 1.02)
Uterus	80	68.4	1.17	(0.93, 1.46)

Figure 2. Cancer Rates Among Females

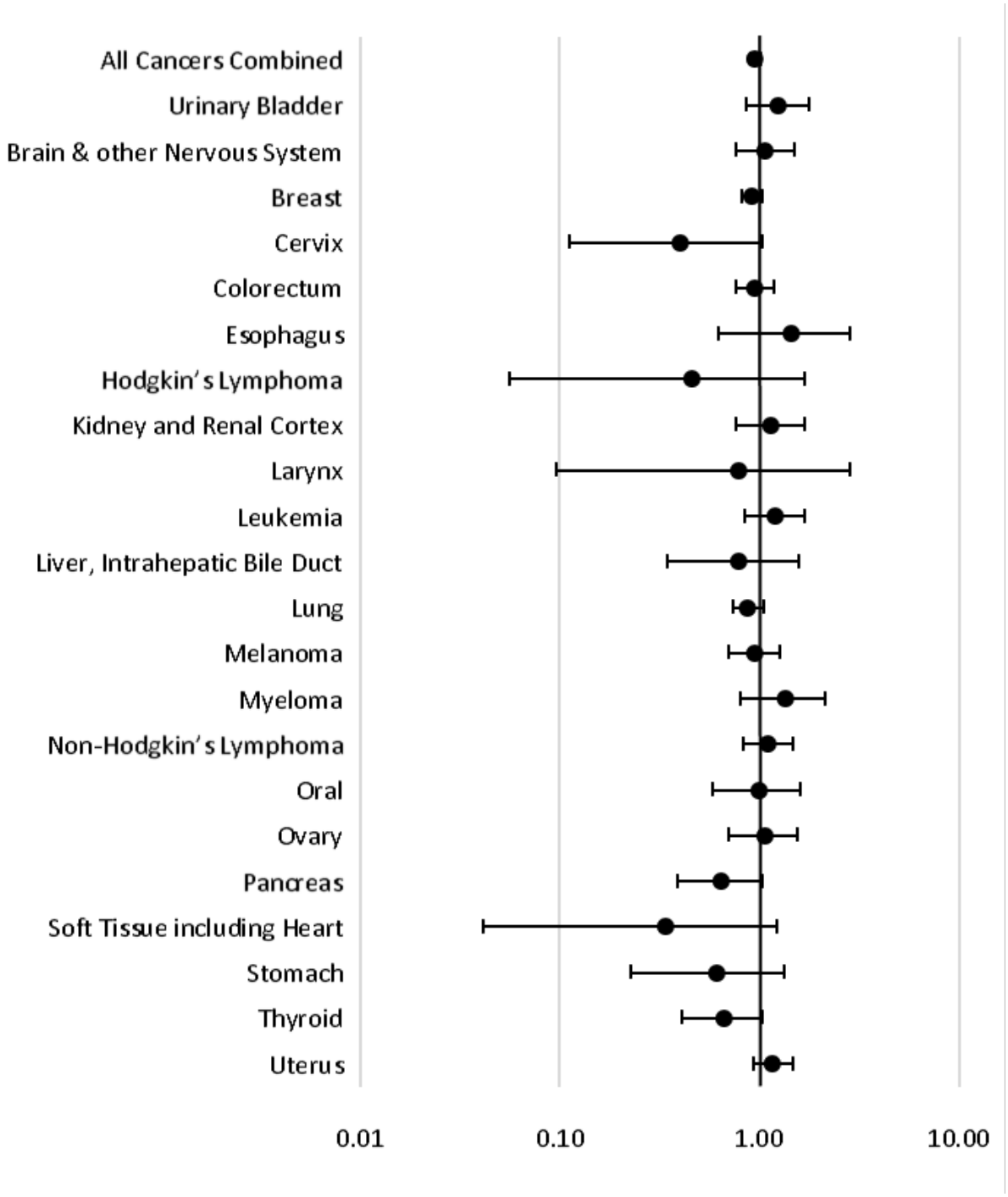
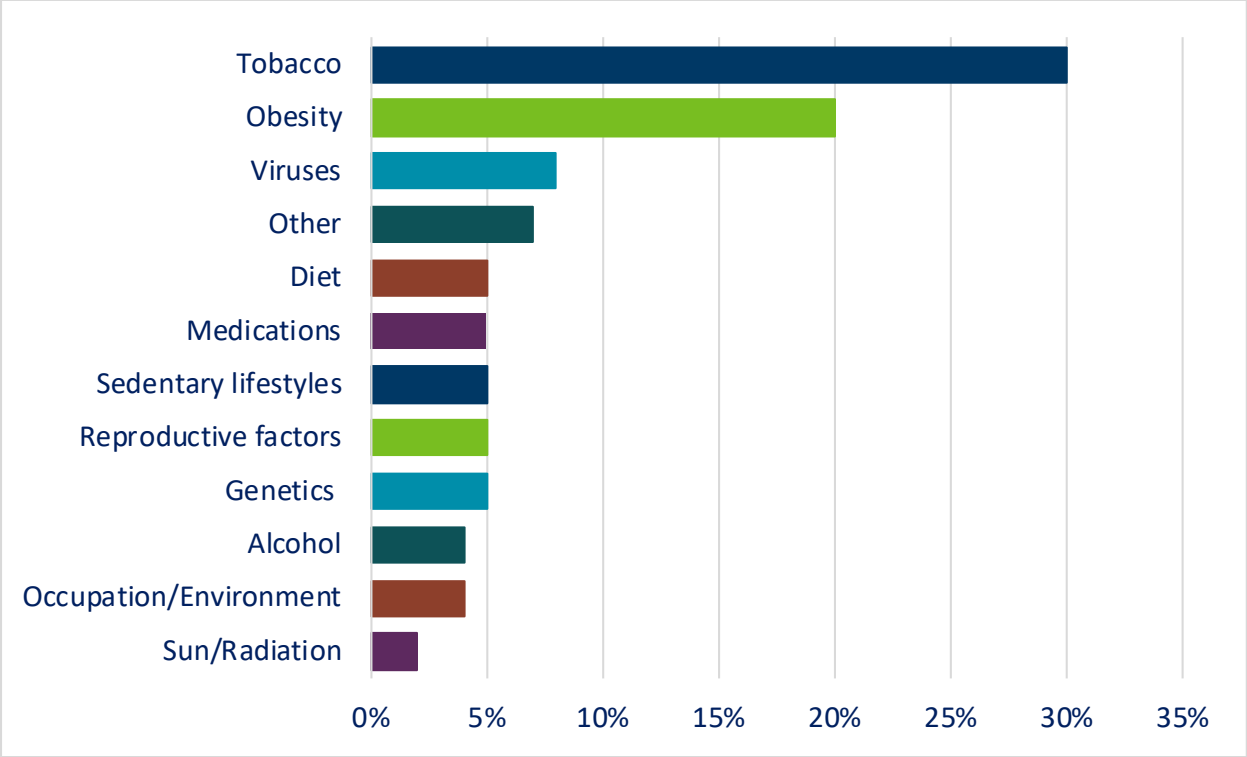


Figure 3. Estimate of U.S. cancer mortality attributable to various known risk factors



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References

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