Cancer Occurrence in the North/Northeast Communities of Minneapolis, 2003-2012

MDH Minnesota Department *of* Health

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Executive Summary

A request in February 2016 for cancer rates in several neighborhoods in North and Northeast Minneapolis led to the Minnesota Department of Health analysis of cancer incidence rates and other relevant data from 2003 to 2012 for these communities. 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.

This MDH analysis found that the North Minneapolis neighborhoods included in ZIP codes 55411 and 55412 had a greater overall cancer incidence when compared to the metro area but did not have a significantly different cancer burden compared to the broader African American community in the metro area. African Americans comprised 8.6 percent of the Twin Cities Metro in 2010 but made up nearly 46 percent of the population in North Minneapolis.

In contrast, the Northeast Neighborhood ZIP codes (55413, 55418) with a racial makeup more similar to the metro area had only had one significantly elevated cancer, liver cancer, among males, when compared to the metro area.

Differences in cancer incidence rates by race, ethnicity, and gender have been well-documented throughout the U.S. as well as in Minnesota. The pattern of rates in the North Minneapolis communities was generally consistent with these known differences. The elevated cancer rates in North Minneapolis are similar to the cancer rates for African Americans in other parts of the Twin Cities metro area, where African Americans have much higher incidence rates of some cancers, such as cervical cancer, liver cancer, and colorectal cancer.

In the North Minneapolis zip codes, seven categories of cancer among males, and four among females were significantly elevated. Two types of cancer including skin cancer and thyroid cancer were significantly lower than the Metro rates. In the North Minneapolis neighborhoods, among males, cancer rates were elevated for total cancers (27%), and for cancers of the colon (37%), esophagus (61%), larynx (179%), liver (219%), lung (99%), oral cavity (75%), and pancreas (87%). Among females, there was no overall excess of total cancers, but elevations were found for cancers of the cervix (96%), esophagus (201%), larynx (208%), lung (38%), and multiple myeloma (117%). There were significant deficits of melanoma skin cancer for both males (61% deficit) and females (72% deficit) and a marginally significant deficit of thyroid cancer among females (34% deficit). This pattern of cancer incidence in North Minneapolis communities is likely attributable to the known racial disparities in cancer incidence rates as well as to the major cancer risk factors.

This finding highlights an opportunity to improve public health prevention efforts because these cancers are associated with well-known, preventable risk factors such as smoking, living in a household with a smoker, alcohol use, obesity, dietary habits, and hepatitis and HPV infection rates.

While there is now sufficient evidence that air pollution (particularly the very tiny particles that can arise from natural sources or from autos, trucks, and industrial emissions) is a risk factor for lung cancer, the overwhelming contributors to lung cancer are smoking, secondhand smoke, radon, and occupational exposures to asbestos, silica, diesel exhaust, arsenic, chromium, cadmium, and nickel compounds.

Many opportunities exist for intervention and health promotion to reduce cancer disparities affecting North Minneapolis and Minnesota's African American community. These elevated cancer rates in one of Minnesota's largest African American communities fit with the general pattern of Minnesota's health inequities between whites and people of color. While the common belief is that good health is due to personal choices and good medical care, it is now known that health is created by much more than just good medical care. Personal behaviors and medical care do influence health and are important related to cancer but achieving optimal health for everyone requires excellent schools, economic opportunities, environmental quality, secure housing, good transportation, safe neighborhoods, and much more. For example, limiting the marketing of menthol cigarettes (the type of cigarette most popular in the Black community) and decreasing the concentration of liquor stores and bars in African American communities could positively affect lung and liver cancer rates.

This analysis highlights the need for a cancer reduction approach in the African American community and North Minneapolis that pairs targeted action steps and broader efforts to address social and economic factors. African American and North Minneapolis cancer reduction efforts should focus on increasing access to healthy foods, campaigns to combat hepatitis infection and increase HPV vaccination, smoking prevention, particularly related to menthol cigarettes, and reduced use of alcohol and increased access to chemical dependency treatment. To succeed, these more targeted efforts must occur in a broader context of addressing the complex and longstanding barriers to improving income and education that prevent populations of color and American Indian communities from gaining equal access to opportunities to attain optimal health.

Background

The Minnesota Cancer Surveillance System (MCSS) staff received a data request on February 11, 2016, to provide leukemia rates of residents living in the 55411, 55412, 55413, and 55418 ZIP codes of Minneapolis (Figure 1). These data were provided on February 18, 2016. A subsequent request was made on February 23, 2016, for rates of other cancers in this geographic area. Preliminary analyses of cancer rates and demographic data suggested that this area differed significantly from the Twin Cities Metro and that further analyses were warranted beyond the original data request. Demographic data for these communities indicated that the North communities differed significantly in terms of race and ethnicity from the Northeast

communities and the Metro region. To further examine underlying population characteristics that could have a significant impact on cancer rates, data from the SHAPE surveys of adults conducted by Hennepin County every four years between 1998 and 2014 were examined. These surveys indicated a persistently higher prevalence of cancer risk factors in the North communities compared to Hennepin County overall. These factors included current smoking, living in a household with a smoker, obesity, diabetes, dietary habits, and alcohol use. In addition, it was determined that past or current hepatitis infection rates—a risk factor for liver cancer—were greatly elevated in both the North and Northeast communities compared to the Metro region.

Data Sources and Methods

The MCSS 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 MCSS at over 99%. The county of residence at the time of diagnosis is the geographic unit used for describing the incidence of cancer in Minnesota. Analysis of cancer incidence at the ZIP code level of residence is not routine or automated, can require substantial additional staff effort, and may be subject to errors due to uncertainties in the size and characteristics of populations who reside in a ZIP code (see Strengths and Limitations). These analyses are conducted when the numbers of cancers are sufficiently large to provide statistical reliability and protect privacy, when population data are available, and when the analysis would be useful in addressing the issue or concern. Geographic analyses of cancer rates will be greatly facilitated as a new cancer reporting system is implemented in 2017.

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MCSS staff retrieved information on the number of individuals with newly-diagnosed cancer (defined here as "observed cancer cases") among residents of the requested ZIP code geographic area, for the years 2003 through 2012 (the most recent ten years of complete data at the time of the request). The ZIP code associated with a new case of cancer is the ZIP code of residence at the time of diagnosis. The 55411 and 55412 ZIP code areas include most, but not all of the neighborhoods in the Camden and North communities of Minneapolis and will be referred to in this report as the Minneapolis "North" community. The 55413 and 55418 ZIP codes include most but not all the neighborhoods in the Northeast and University communities and will be referred to in this report as the Minneapolis "Northeast" community.

MCSS staff also estimated the number of cancers that would be "expected" if rates of cancer occurrence were similar to those of the entire seven-county Twin Cities metropolitan area

(Metro). The expected case counts are statistically-modeled estimates of cancer occurrence that take into account differences in age and gender distribution and population size between the geographic areas. Only the age and gender distributions of the population are taken into account when determining "expected" cancers since the data for these important factors are readily available. However, data on other important factors that will greatly impact cancer rates are frequently not readily available and are not usually included in estimating expected cancers in a community. These factors include demographic characteristics of the community such as race/ethnicity or poverty or country of origin as well as 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). When survey data are available on smoking rates or other significant cancer risk factors in a community, these data can be useful in interpreting cancer rates in that community.

For ease of comparison, the observed number of cancers divided by the expected number gives an observed-to-expected 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 encompass 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, the confidence intervals do not take into account further uncertainty that arises from random differences that are 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.

The purpose of this report is to provide an accurate and complete profile on cancer occurrence among Minneapolis residents in ZIP codes 55411, 55412, 55413, 55418 using the highest quality data available for such a purpose -- primarily from the Minnesota Cancer Surveillance System (MCSS). County-based survey data as well as national cancer data were also utilized.

Findings

North Minneapolis vs Northeast Minneapolis Cancer Rates

This analysis found that consistent with the area's demographics and risk factors, the North Minneapolis neighborhoods (ZIP codes 55411, 55412) had a greater pattern of cancer incidence when compared to the Metro area. Within the Northeast Neighborhood ZIP codes (55413, 55418) only one cancer in males, liver cancer, was significantly elevated.

It has been well-documented that cancer rates vary by race and ethnicity (Ryerson et al, 2016). Cancer incidence rates by race for selected cancers (those which were elevated) for both the Metro and all Minnesota shown in Tables 1 and 2 for males and for females, respectively. Similar differences are seen in national cancer data (Table 3 for all racial groups and Figures 2 and 3 for black vs white comparisons). Because of these known racial differences and because it was recognized that there were considerable racial and ethnic differences in the populations among these ZIP codes and between these ZIP codes and the overall Metro region (see Fig. 4), additional analyses were performed to examine cancer incidence in the two North Minneapolis ZIP codes (55411, 55412) separately from the two Northeast (NE) Minneapolis ZIP codes (55413, 55418) for each sex. These data are presented in Tables 4 – 7 and Figures 5 and 6. These data show that the demographic characteristics of the NE neighborhoods are much more similar to the overall Metro region and the corresponding cancer rates are also very similar. In NE, the only elevated cancer among males was liver cancer (94% excess) and there were no excesses for any cancer among females. Among NE males there were deficits of multiple myeloma (57% deficit) and prostate cancer (21% deficit). Among NE females there were deficits of melanoma (38% deficit) and thyroid cancer (41% deficit).

In sharp contrast to Northeast, the demographic characteristics of the two North Minneapolis ZIP codes differed greatly from both the NE and the overall Metro (Fig.4), with a much higher proportion of non-white residents in the North neighborhoods. For example, in ZIP code 55411, almost 55% of the population in 2010 was black versus 8.6% of the Metro population overall. As expected, these demographic differences were clearly reflected in the cancer rates in the North Minneapolis neighborhoods where even greater excesses were found when compared to the Metro area. Among males, cancer rates were elevated for total cancers (27%), and for cancers of the colon (37%), esophagus (61%), larynx (179%), liver (219%), lung (99%), oral cavity (75%), and pancreas (87%). Among females, there was no overall excess of cancers, but elevations were found for cancers of the cervix (96%), esophagus (201%), larynx (208%), lung (38%), and multiple myeloma (117%). There were significant deficits of melanoma skin cancer for both males (61% deficit) and females (72% deficit) and a marginally significant deficit of thyroid cancer among females (34% deficit).

The patterns of elevations and deficits in the North neighborhoods are generally consistent with the well-documented racial/ethnic variations in rates of specific cancers, both in Minnesota and in the US (Ryerson et al, 2016; ACS, 2016). Figures 2 and 3, for example, show cancer rates among blacks compared to rates among whites in the US over the period 2008-2012. The excess of oral cancers in males and lung cancer in females are the only cancers that don't appear to follow the pattern in national data; however, as with almost all the elevated cancers, tobacco use is a significant risk factor for these cancers.

Cancer Incidence in the Combined Four ZIP Codes

Table 8 shows the observed and expected numbers of cases for all cancers combined and for the most frequent types of cancer among males in the combined four Minneapolis ZIP codes. The observed-to-expected ratios and statistical 95% confidence intervals are also shown. Table 9 provides the same information for females. The same ratios and confidence intervals are also shown graphically in Figures 7 and 8 for males and females, respectively.

For many specific types of cancers, there is a greater degree of variability and uncertainty because the small numbers of cases are less stable even when they are aggregated over 10-years.

Among males in these four ZIP codes, there were statistically significant elevations in the number of cases for all cancers types combined (10% excess) as well as for cancers of colon/rectum (17% excess), larynx (90% excess), liver (150% excess), lung (48% excess), oral cavity (54% excess) and pancreas (45% excess) (see Table 8, Figure 7). There was a significant deficit of melanoma skin cancer (33% deficit).

Among females, there was no overall excess of cancers, but there were statistically significant elevations for cancers of cervix (62%), esophagus (81%), larynx (134%), lung (21%), and multiple myeloma (55%) (Table 9, Figure 8). There were significant deficits of melanomas (54% deficit) and thyroid cancer (38% deficit).

While it is typical to find some increases or decreases in specific types of cancer at the community level due primarily to random variability, the number and the magnitude of the differences in cancer incidence in this population as well as the specific types of cancer associated with these differences compared to the overall Metro suggested that substantial differences in the prevalence of major cancer risk factors (compared to the overall Metro population) must be involved. While it was apparent that smoking is a significant risk factor for most of the types of cancer that were elevated (see Appendix) and that the study population differed from the overall Metro population in terms of race and ethnicity, further analyses of the cancer incidence data were conducted and additional sources of information were obtained to more fully interpret these findings.

Cancer Health Disparities

Many types of health disparities, including cancer health disparities, have been characterized in terms of race/ethnicity and socioeconomic status (Andersen et al, 2016; CDC, 2013; MDH, 2014; Ward et al, 2004). State cancer surveillance systems almost always provide cancer rates by race/ethnicity since that information is typically readily available for cancer patients and for the population of interest. While often correlated at a community level, socioeconomic factors, rather than racial and ethnic factors, may be more important determinants of health disparities. While some racial differences in cancer rates are likely related to biologic or genetic factors—such as the low incidence of melanoma skin cancer and the high incidence of multiple myeloma in blacks (Waxman et al, 2010)—many cancer health disparities are believed to be related to differences in socioeconomic status (SES) and associated risk factors (Boscoe et al, 2014; Ward et al, 2004). SES is associated with many risk factors for cancer including access to health care and screening as well as many behavioral risk factors such as smoking, excessive alcohol consumption, unhealthy diet, obesity, and lack of exercise (NCI).

To examine whether poverty and/or other associated cancer risk factors differ in the North and Northeast neighborhoods, data was obtained from the *Survey of the Health of All the Population and Environment* (SHAPE), conducted by the Hennepin County Human Services and Public Health Department in 1998, 2002, 2006, 2010, and 2014 (SHAPE Surveys). These surveys of adults age 18 and above included a wide variety of health-related indicators among the residents of Hennepin County, including eleven specific neighborhoods in Minneapolis.

The Minneapolis communities included in the SHAPE surveys largely overlap with, but are not identical to, the geographic regions analyzed in this study based only on ZIP codes. Data from the SHAPE surveys for the Camden and Near-North communities were assumed to be representative of the two ZIP codes (55411, 55412) defined as North in this study. Data from the SHAPE surveys for the Northeast, University, and (beginning in 2006) Longfellow communities were assumed to be representative of the two ZIP codes (55413, 55418) defined as Northeast in this study. While SHAPE survey data are not available for the entire Metro, data are available for Hennepin County which provide a basis for comparison for the Minneapolis communities.

Table 10 summarizes the prevalence of several selected risk factors for cancer for the Minneapolis communities as well as for Hennepin County overall. Due to some variations in the SHAPE surveys in the questions asked and/or in the data presented in different surveys, the same set of risk factors was not available for all survey periods.

Tobacco use is the single largest risk factor (other than age) for cancer, accounting for almost one-third of cancer deaths in the US (Fig. 9). While smoking is most closely associated with lung cancer, accounting for over 80% of cases, smoking is also a significant risk factor for cancers of the oral cavity, larynx, esophagus, stomach, liver, pancreas, bladder, kidney, colon, cervix, and for acute myeloid leukemia (NCI; Parkin, 2011; Schottenfeld et al, 2013). Environmental tobacco

smoke has also been shown to be a cancer risk factor (NCI; Schottenfeld et al, 2013). The SHAPE surveys indicate a persistent pattern of higher rates of current smoking and households with a regular smoker in the two North communities compared to the NE communities and to Hennepin County. For the two most recent surveys, for example, the prevalence of smokers in the North communities was approximately twice the prevalence in Hennepin County overall. Smoking is an established risk factor for all of the elevated cancers in the North communities among males and females.

Overweight or obesity and lack of physical activity account for most cases of adult onset (type 2) diabetes (age, race and family history are additional risk factors) (NIH). Obesity and lack of physical activity are also associated with an increased risk of specific cancers, including cancers of the breast (post-menopause), colon, uterus, esophagus, kidney, pancreas, and gallbladder (NCI). Obesity and diabetes have also been associated with an increased risk of liver cancer (Chuang et al, 2009; Loomba et al, 2013; Dyal et al, 2016). SHAPE survey data suggest a generally consistent increased prevalence of obesity, diabetes, and lack of physical activity in the North communities compared to the NE communities and Hennepin County overall.

Other important cancer risk factors such as diet (e.g., consumption of fruits and vegetables) and alcohol use that are also documented in the SHAPE surveys show similar disparities in the North communities. Chronic alcohol consumption has been associated with cancers of the oral cavity, larynx, esophagus, liver, colon, and breast (NCI; Schottenfeld et al, 2013).

In both the North and NE communities, the largest cancer excesses (in terms of percent increase) were for liver cancers among males; liver cancer was not elevated among females. The excess in the North communities among males was approximately three-fold (compared to the Metro), while in NE the excess was approximately two-fold. Liver cancer rates vary significantly by race/ethnicity (see Fig. 10) as well as by country (Kim and Han, 2012). Rates are 3-fold higher in males than females and have been significantly increasing for many years (Ryerson et al, 2016). As noted above, smoking, obesity, diabetes and alcohol consumption are all risk factors for liver cancer and when some of these factors occur together can greatly magnify the risk. An additional significant risk factor for liver cancer is infection with the hepatitis B virus (HBV) or the hepatitis C virus (HCV). Chronic infection with these viruses can cause liver damage and an increased risk of liver cancer. The MDH viral hepatitis registry contains hepatitis B reports to MDH since 1987 and hepatitis C reports since 1998. An analysis of hepatitis infection rates for the four ZIP codes and overall Metro region was provided by the Infectious Disease Epidemiology, Prevention and Control Division. These rates are shown in Figure 11. As shown in the Figure, rates of past or present HBV infections were higher in all four ZIP codes than in the overall Metro. Rates were highest in the two North communities (2.9-fold in 55411 and 2.4-fold in 55412). Rates of past or present HCV infection were only elevated in the 55411 ZIP code (2.0-fold higher than Metro). As with the other risk factors, these findings are consistent with the observed excesses of liver cancer in the North and NE communities.

Strengths and Limitations

The major strength of these analyses is the use of data from the MCSS to examine and compare cancer incidence rates. All newly-diagnosed cancers among Minnesota residents are reported to the MCSS. MCSS data has 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 zip codes was required to determine the expected number of new cancers. Numerous changes in population counts—both upward and downward—by age, sex, and racial/ethnic categories were noted between the 2000 and the 2010 census. Data from the 2000 and 2010 census were averaged to provide an approximate population distribution. A limitation of ZIP code population data is that ZIP codes are postal delivery areas and do not necessarily correspond to city and neighborhood boundaries and census divisions. The US Census estimates ZIP code populations based on several criteria; for example, the single most frequent ZIP code in a census block will be assigned to the whole block (US Census Zip Code Tabulation Areas). Over- or under-estimates of the population will affect the estimated number of expected cancers.

Despite a considerable effort to do so, this report was not able to determine cancer rates by racial or ethnic categories *within* each of the ZIP codes studied since the required detailed population counts for 19 age categories for each race/gender category over the time frame of this study was not available. Had this information been available it would have allowed for more direct racial comparisons of cancer rates between these ZIP codes and the overall Metro region and State. As the state cancer reporting system migrates to a different set of technologies beginning in 2017, geographic-based studies of cancer incidence in Minnesota may have improved capacities for such analyses in the future.

Studies have indicated that data on race and ethnicity obtained by cancer registries from medical records (electronic or otherwise) may be of variable accuracy and completeness compared to self-reported responses of cancer patients (Clarke et al, 2016; Gomer and Glaser, 2006; Webster et al, 2013). Furthermore, these data are usually not ascertained in a manner completely comparable to US Census Bureau population surveys which provide the population data used in determining cancer rates (Institute of Medicine, 2009). Consequently, there will be some degree of error in characterizing cancer rates by racial and ethnic categories due to limitations in both the medical records data and the census data.

While this study provides a relatively clear picture of overall cancer incidence among these Minneapolis area residents, the picture is much less clear for many specific types of cancer due to the relatively small numbers of cases at a community level. This problem was only partially overcome by aggregating cancer data over a ten 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 2003-2012. Similarly, the Hennepin County SHAPE survey data reflect the prevalence of risk factors and other characteristics of the community at the time the various surveys were conducted between 1998 and 2014. However, the cancer risks from smoking, alcohol, obesity, hepatitis infection and other risk factors typically occur decades after the start of the exposure. 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. However, given that the SHAPE findings were generally consistent across all the surveys, that the demographic characteristics of the communities were generally similar during previous census periods, and that racial disparities in cancer incidence have been documented for many decades, it is most likely that the cancer rates in this community reflect the racial and risk factor characteristics of the population.

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

The MCSS is a vital tool for examining cancer rates and trends in Minnesota and MCSS 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). 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 many 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 (Fig. 9). Those factors account about 60% of cancer deaths in the U.S. Other lifestyle factors that increase risk include reproductive patterns, sexual behavior, and medications, (Colditz and Wei, 2012; Harvard Report, 1996; Shottenfeld et al, 2013). 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.

Cancer reduction and prevention strategies for selected cancers

To reduce tobacco use and exposure to secondhand smoke (lung cancer, larynx cancer, oral cancer, esophageal cancer)

- Support communities to build their own capacity to address tobacco use and exposure, especially among youth, using a Policy System Environmental approach.
- Invest in the development and deployment of culturally-tailored, community-based smoking cessation interventions.
- Limit the marketing of menthol cigarettes and the targeting of the Black community.

To reduce exposure to radon (lung cancer)

- Test residences for radon and mitigate if level is elevated

To reduce alcohol abuse (liver cancer, colorectal cancer, oral cancer, esophageal cancer)

- Work with providers to screen for and treat alcohol abuse.
- Increase availability of culturally specific alcohol treatment, follow-up and supportive services.
- Limit the concentration of liquor stores and bars.
- Promote the dietary guidelines for alcohol consumption.

To promote healthy eating and active living to prevent/reduce obesity (colorectal cancer, esophageal cancer)

- Improve access to fresh fruits and vegetables.
- Promote healthy choices in workplaces, schools and communities.
- Improve access to nutritious foods such as fruits and vegetables by increasing availability and affordability in grocery and corner stores, concession facilities and other food vendors
- Require calorie or nutrition labeling on menus
- Facilitate the development of new farmers markets and promote their use
- Facilitate the development of new community-based agriculture and other small scale food production strategies.
- Promote active transportation integrating physical activity into daily routines such as walking or biking to destinations such as work, grocery stores or parks.
- Solicit community input into policies and practices in community design, land use and facility access to increase opportunities for physical activity.
- Keep parks staffed both inside and outside in order to give children safe environments to play.
- Strategically engage in youth development approaches.

To increase Hepatitis B vaccination rates (liver cancer)

- Ensure that children receive Hepatitis B vaccine.

To increase HPV vaccination rates (cervical cancer, oral cancer)

- Work with Federally Qualified Community Health Centers and other community health care providers to ensure that adolescents receive all recommended doses of HPV vaccine
- Inform parents about the value and importance of HPV vaccine.

To reduce Hepatitis C transmission and improve treatment (liver cancer)

- Work with Federally Qualified Community Health Centers and other community health care providers to screen for and treat asymptomatic Hepatitis C, especially among those at elevated risk

- Offer a comprehensive set of services built around syringe services. Syringe services provide access to clean needles, syringes, and other injection drug use equipment, counseling, which studies have shown may reduce the risk of hepatitis C transmission in persons who inject drugs.
- Provide supportive services to those in need of hepatitis C treatment to improve use of and adherence to treatment.

To increase cancer screening (colorectal cancer, cervical cancer)

- Work with Federally Qualified Community Health Centers and other community health care providers to improve colorectal cancer screening by offering recommended test options with advice about each
- Utilize front line health care workers such as CHWs to assist navigating patients through use of stool tests and prep, screening colonoscopies for colorectal cancer.
- Offer stool test kits (FOBT/FIT) in places other than clinic settings, such as flu shot clinics.
- Ensure patients receive appropriate follow-up and treatment if needed.
- Continue to work with Federally Qualified Health Centers and other community providers to improve rates of Pap smears for women 21 and older.

To improve delivery of quality health care services

- Increase the number of people that have their health care needs met in which primary care providers, families and patients work in partnership to improve health outcomes and quality of life for individuals with chronic health conditions and disabilities.
- Increase the integration of emerging professions, such as community health Care workers, community paramedics and dental therapists into the health workforce.
- Increase the exposure of youth to health sciences along with science and math.

Conclusion

While only one cancer remained elevated in the Northeast Minneapolis community (liver cancer among males), many cancer types were elevated in the North Minneapolis community. Among males, total cancers, and cancers of colon, larynx, liver, lung, oral cavity, and pancreas were elevated. Among females, cancers of the cervix, esophagus, kidney, lung and multiple myeloma were elevated. Deficits were found for melanoma (both sexes) and for thyroid cancer among females.

Rates of individual cancer types tend to vary substantially over time within small geographic areas. It is not unusual to find that several types of cancer occurred more or less often than expected within a zip code area over a period of several years. What is noteworthy about these findings is that cancers of several types occurred more often than expected in North Minneapolis, and that numbers of cases were roughly doubled for four of these cancers; liver and larynx in males, and larynx and esophagus in females.

These findings are generally consistent with known racial and ethnic differences in cancer rates as well as available risk factor data from the Hennepin County SHAPE surveys between 1998 and 2014 and available hepatitis infection rates.

While environmental contaminants are the frequent focus of community cancer concerns, the primary determinants of cancer risk include tobacco use, obesity, diet, lack of exercise, UV radiation, alcohol use, viruses, genetics, reproductive history, medications, and occupation. There would appear to be many opportunities for additional intervention and health promotion initiatives to reduce the many health disparities in this community.

Tables

TABLE 1. AGE-ADJUSTED CANCER RATES/100,000 BY RACE AMONG MALES, METRO AND STATE-WIDE, 2003-2012; INCLUDES THOSE CANCERS THAT WERE ELEVATED IN MINNEAPOLIS STUDY ZIP CODES

Cancer	Race	Minnesota Rate	95% CI	Metro Rate	95% CI
All Cancers Combined	Non-Hispanic White	530.9	(528.0 - 533.9)	531.3	(526.8 - 535.8)
	Black	547.2	(525.1 - 569.9)	565.5	(541.5 - 590.2)
	American Indian	657.3	(613.0 - 703.6)	483.2	(421.1 - 551.3)
	Asian/Pacific Islander	283.7	(266.2 - 302.0)	273.7	(255.0 - 293.2)
	Hispanic White	424.3	(395.9 - 454.0)	444.3	(407.9 - 482.7)
Oral Cavity and Pharynx	Non-Hispanic White	16.1	(15.6 - 16.6)	16.1	(15.3 - 16.9)
	Black	16.3	(12.9 - 20.3)	17.8	(14.0 - 22.3)
	American Indian	20.2	(13.6 - 28.9)	17.6	(8.6 - 32.5)
	Asian/Pacific Islander	13.7	(10.7 - 17.4)	12.8	(9.7 - 16.6)
	Hispanic White	7.8	(4.8 - 11.7)	5.3	(2.7 - 9.6)
Colon and Rectum	Non-Hispanic White	49.8	(48.8 - 50.7)	46.7	(45.4 - 48.1)
	Black	44.0	(37.7 - 50.9)	47.8	(40.8 - 55.6)
	American Indian	68.7	(55.4 - 84.0)	29.7	(17.9 - 46.9)
	Asian/Pacific Islander	33.1	(27.4 - 39.5)	33.2	(27.0 - 40.1)
	Hispanic White	40.8	(32.0 - 50.9)	45.3	(33.6 - 59.1)
Liver and IBD	Non-Hispanic White	5.6	(5.3 - 5.9)	6.3	(5.8 - 6.8)
	Black	27.8	(23.1 - 33.0)	27.2	(22.3 - 32.8)
	American Indian	21.8	(13.8 - 32.3)	24.3	(10.1 - 47.0)
	Asian/Pacific Islander	25.0	(20.2 - 30.6)	24.1	(19.0 - 30.1)
	Hispanic White	15.6	(11.4 - 20.7)	16.0	(10.5 - 23.1)
Pancreas	Non-Hispanic White	12.2	(11.7 - 12.6)	12.5	(11.8 - 13.2)
	Black	19.6	(15.2 - 24.6)	20.3	(15.6 - 25.8)
	American Indian	12.9	(7.8 - 20.1)	18.2	(6.8 - 37.5)
	Asian/Pacific Islander	12.6	(8.9 - 17.2)	12.4	(8.3 - 17.4)
	Hispanic White	11.3	(7.0 - 16.8)	13.3	(7.5 - 21.2)
Larynx	Non-Hispanic White	5.4	(5.1 - 5.7)	5.6	(5.1 - 6.1)
	Black	8.9	(6.4 - 12.0)	9.4	(6.7 - 12.7)
	American Indian	12.9	(7.6 - 20.1)	5.4	(2.0 - 14.9)
	Asian/Pacific Islander	2.5	(1.1 - 4.7)	2.5	(1.0 - 5.0)
	Hispanic White	4.5	(2.0 - 8.4)	3.6	(1.2 - 7.9)
Lung and Bronchus	Non-Hispanic White	65	(64.0 - 66.1)	64.7	(63.1 - 66.3)
	Black	80.3	(71.5 - 89.7)	82.9	(73.3 - 93.3)
	American Indian	142.9	(121.7 - 166.3)	89.8	(61.4 - 125.5)
	Asian/Pacific Islander	35.4	(29.3 - 42.2)	34.0	(27.6 - 41.3)
	Hispanic White	47.3	(37.8 - 58.2)	49.5	(37.3 - 63.8)

TABLE 2. AGE-ADJUSTED CANCER RATES/100,000 BY RACE AMONG FEMALES, METRO AND STATE-WIDE, 2003-2012; INCLUDES THOSE CANCERS THAT WERE ELEVATED IN MINNEAPOLIS STUDY ZIP CODES

Cancer	Race	MN Rate	95% CI	Metro Rate	95% CI
Esophagus	Non-Hispanic White	2.0	(1.8 -2.2)	1.9	(1.7 -2.2)
	Black	4.8	(3.2 -6.9)	4.5	(2.9 -6.8)
	American Indian	4.3	(1.6 -8.9)	2.9	(0.5 -9.6)
	Asian/Pacific Islander	1.2	(0.4 -2.7)	1.0	(0.2 -2.5)
	Hispanic White	2.5	(0.9 -5.3)	1.3	(0.2 -4.4)
Larynx	Non-Hispanic White	1.1	(1.0 -1.3)	1.2	(1.0 -1.4)
	Black	2.5	(1.5 -4.1)	2.8	(1.6 -4.4)
	American Indian	2.2	(0.8 -4.9)	0.8	(0.0 -6.3)
	Asian/Pacific Islander	0	(0.0 -0.6)	0.0	(0.0 -0.7)
	Hispanic White	3.0	(1.2 -5.9)	2.6	(0.7 -6.2)
Lung and Bronchus	Non-Hispanic White	49.7	(48.8 -50.5)	53.5	(52.2 -54.8)
	Black	49.1	(43.3 -55.5)	49.5	(43.3 -56.2)
	American Indian	109.4	(94.0 -126.4)	81.7	(58.0 -110.8)
	Asian/Pacific Islander	24.5	(20.3 -29.3)	22.0	(17.7 -27.1)
	Hispanic White	36.5	(29.1 -44.9)	41.0	(31.3 -52.5)
Cervix	Non-Hispanic White	5.5	(5.2 -5.8)	5.2	(4.8 -5.6)
	Black	8.3	(6.5 -10.5)	8.5	(6.6 -10.9)
	American Indian	15.4	(11.1 -20.9)	11.2	(6.0 -19.9)
	Asian/Pacific Islander	11.9	(9.1 -15.1)	12.3	(9.3 -15.8)
	Hispanic White	11.9	(8.7 -15.8)	10.7	(7.1 -15.5)
Myeloma	Non-Hispanic White	4.3	(4.1 -4.6)	4.5	(4.1 -4.9)
	Black	11.1	(8.4 -14.4)	11.4	(8.5 -14.9)
	American Indian	7.2	(4.0 -11.9)	8.4	(3.2 -18.0)
	Asian/Pacific Islander	2.6	(1.3 -4.4)	2.8	(1.4 -4.9)
	Hispanic White	4.4	(2.2 -7.5)	3.8	(1.6 -7.4)

TABLE 3. AVERAGE ANNUAL AGE-ADJUSTED CANCER INCIDENCE RATES PER 100,000 BY RACE AND ETHNICITY, U.S., 2008-2012.

	White	Black	Asian/PI	Amer. Indian/ Native Alaskan	Hispanic	Non-Hispanic
Males						
Total	506.5	573.6	309.7	416.2	400.8	524.1
Prostate	121.4	205.1	67.8	90.5	112.1	133.5
Lung	76.2	91.2	47.4	66.2	43.3	79.6
Colon	47.1	59.1	39.0	50.4	44.6	48.8
Bladder	38.6	19.5	15.4	18.3	20.1	37.8
Melanoma	28.4	1.1	1.5	6.8	4.7	27.6
Non-Hodgkin Lym.	23.7	17.0	15.7	17.0	19.9	23.4
Kidney	21.6	23.6	10.8	29.7	20.6	21.7
Oral	17.3	15.0	10.9	14.7	10.9	17.6
Leukemia	17.3	12.9	9.6	11.2	12.7	17.0
Pancreas	13.8	16.8	9.8	11.3	12.0	14.2
Liver	10.3	16.2	20.6	18.7	19.3	10.8
Stomach	8.4	14.8	14.5	12.0	13.5	8.9
Esophagus	8.5	7.8	3.8	7.2	5.3	8.6
Brain	8.3	4.8	4.4	5.3	5.9	8.1
Myeloma	7.1	14.6	4.5	6.3	7.5	7.8
Thyroid	7.3	3.6	6.3	4.0	5.1	7.1
Larynx	6.2	9.1	2.3	5.8	5.2	6.4
Females						
Total	418.4	394.9	283.1	367.2	324.7	422.3
Breast	124.4	121.8	88.3	91.9	91.9	126.6
Lung	55.7	50.3	28.3	52.7	26	56.7
Colon	35.7	43.3	29.2	40.1	30.6	37.2
Uterus	25.8	24.3	17.7	22.9	21.1	25.7
Thyroid	21.3	12.7	20.4	12.9	19.3	20.6
Non-Hodgkin Lym.	16.5	11.8	10.8	13.5	15.2	16.1
Melanoma	18.3	1.0	1.2	5.2	4.0	17.5
Ovary	12.3	9.4	9.0	11.8	10.6	12.0
Kidney	11.4	12.7	4.9	18.3	11.8	11.3
Pancreas	10.6	14.2	8.7	9.6	10.3	11.0
Leukemia	10.6	8.3	6.2	8.9	8.9	10.3
Bladder	9.5	6.6	3.8	4.9	5.1	9.4
Cervix	7.5	9.8	6.3	9.4	10.2	7.4
Oral	6.4	5.1	4.9	5.2	4.2	6.6
Brain	6.1	3.5	3.1	3.8	4.5	5.8
Myeloma	4.4	10.9	2.9	5.3	5.1	5.1
Stomach	4.0	7.9	8.5	6.6	7.8	4.3
Liver	3.5	4.8	7.9	8.9	7.2	3.6

Notes: Race categories include Hispanic and non-Hispanic; race and ethnicity data are not mutually exclusive. Source: Ryerson, 2016.

TABLE 4. OBSERVED AND EXPECTED CANCER INCIDENCE AMONG MALES, MINNEAPOLIS NORTH (55411, 55412), 2003-2012

Cancer	Observed Cases	Expected Cases	Observed to Expected Ratio	95% Confidence Interval of Ratio
All Cancers Combined	980	771	1.27	1.19 - 1.35
Brain	12	15	0.82	0.42 - 1.43
Colorectal	89	65	1.37	1.10 - 1.68
Esophagus	18	11	1.61	0.95 - 2.55
Hodgkin Lymphoma	5	8	0.63	0.21 - 1.47
Kidney	35	33	1.07	0.74 - 1.48
Larynx	22	8	2.79	1.75 - 4.22
Leukemia	32	34	0.94	0.64 - 1.33
Liver	40	13	3.19	2.28 - 4.35
Lung	163	82	1.99	1.70 - 2.32
Melanoma	17	43	0.39	0.23 - 0.63
Multiple Myeloma	15	10	1.47	0.82 - 2.42
Non-Hodgkin Lymphoma	38	40	0.95	0.67 - 1.31
Oral	45	26	1.75	1.28 - 2.34
Pancreas	32	17	1.87	1.28 - 2.64
Prostate	254	228	1.11	0.98 - 1.26
Soft tissue	9	7	1.24	0.57 - 2.35
Stomach	15	11	1.37	0.77 - 2.26
Testes	10	17	0.57	0.28 - 1.06
Thyroid	12	11	1.13	0.58 - 1.97
Urinary Bladder	44	47	0.93	0.68 - 1.25

Table Notes:
1. “Observed” cases are the newly-diagnosed cancers among residents living in ZIP codes of 55411 and 55412 at the time of cancer diagnosis.
2. “Expected” cases are the estimated number of new cancer cases based on the number, age, and gender of residents in those ZIP codes and applying Twin Cities Metro cancer rates.
3. The “Observed to Expected Ratio” is the number of Observed cancers divided by the Expected number of cancers. A ratio of 2.00 would indicate twice as many cancers as expected, while a ratio of 0.50 would indicate half as many cancers as expected.
4. The “95% Confidence Interval” shows the statistical variability or uncertainty of the ratio

TABLE 5. OBSERVED AND EXPECTED CANCER INCIDENCE AMONG FEMALES, MINNEAPOLIS NORTH (55411, 55412), 2003-2012

Cancer	Observed Cases	Expected Cases	Observed to Expected Ratio	95% Confidence Interval of Ratio
All Cancers Combined	857	839	1.02	0.95 - 1.09
Brain	5	11	0.45	0.14 - 1.04
Breast	245	265	0.93	0.81 - 1.05
Cervix	27	14	1.96	1.29 - 2.86
Colorectal	83	69	1.20	0.95 - 1.49
Esophagus	11	4	3.01	1.50 - 5.39
Hodgkin Lymphoma	7	7	1.04	0.42 - 2.14
Kidney	17	19	0.91	0.53 - 1.45
Larynx	7	2	3.08	1.24 - 6.35
Leukemia	27	26	1.03	0.68 - 1.50
Liver	8	6	1.35	0.58 - 2.67
Lung	128	92	1.38	1.16 - 1.65
Melanoma	13	46	0.28	0.15 - 0.49
Multiple Myeloma	19	9	2.17	1.31 - 3.39
Non-Hodgkin Lymphoma	28	35	0.81	0.54 - 1.16
Oral	19	15	1.29	0.78 - 2.01
Ovary	26	26	1.02	0.67 - 1.49
Pancreas	21	16	1.28	0.79 - 1.95
Soft tissue	9	7	1.28	0.59 - 2.44
Stomach	10	7	1.45	0.70 - 2.67
Thyroid	25	38	0.66	0.42 - 0.97
Urinary Bladder	11	18	0.61	0.31 - 1.09
Uterus	44	55	0.80	0.58 - 1.08

Table Notes:

1. “Observed” cases are the newly-diagnosed cancers among residents living in ZIP codes of 55411 and 55412 at the time of cancer diagnosis.
2. “Expected” cases are the estimated number of new cancer cases based on the number, age, and gender of residents in those ZIP codes and applying Twin Cities Metro cancer rates.
3. The “Observed to Expected Ratio” is the number of Observed cancers divided by the Expected number of cancers. A ratio of 2.00 would indicate twice as many cancers as expected, while a ratio of 0.50 would indicate half as many cancers as expected.
4. The “95% Confidence Interval” shows the statistical variability or uncertainty of the ratio

TABLE 6. OBSERVED AND EXPECTED CANCER INCIDENCE AMONG MALES, NORTHEAST MINNEAPOLIS (55413, 55418), 2003-2012

Cancer	Observed Cases	Expected Cases	Observed to Expected Ratio	95% Confidence Interval of Ratio
All Cancers Combined	987	1013	0.97	0.91 - 1.04
Brain	19	15	1.25	0.75 - 1.95
Colorectal	91	89	1.03	0.83 - 1.26
Esophagus	17	15	1.14	0.66 - 1.82
Hodgkin Lymphoma	6	8	0.76	0.28 - 1.65
Kidney	33	40	0.83	0.57 - 1.16
Larynx	13	11	1.23	0.66 - 2.10
Leukemia	36	42	0.85	0.59 - 1.18
Liver	30	15	1.94	1.31 - 2.77
Lung	132	117	1.13	0.94 - 1.34
Melanoma	49	55	0.89	0.66 - 1.18
Multiple Myeloma	6	14	0.43	0.16 - 0.93
Non-Hodgkin Lymphoma	56	52	1.07	0.81 - 1.39
Oral	43	32	1.36	0.99 - 1.84
Pancreas	27	24	1.15	0.76 - 1.67
Prostate	236	300	0.79	0.69 - 0.89
Soft tissue	5	8	0.63	0.20 - 1.47
Stomach	14	15	0.92	0.51 - 1.55
Testes	18	18	1.01	0.60 - 1.60
Thyroid	7	12	0.60	0.24 - 1.23
Urinary Bladder	64	72	0.89	0.69 - 1.14

Table Notes:
1. “Observed” cases are the newly-diagnosed cancers among residents living in ZIP codes 55413 and 55418 at the time of cancer diagnosis.
2. “Expected” cases are the estimated number of new cancer cases based on the number, age, and gender of residents in those ZIP codes and applying Twin Cities Metro cancer rates.
3. The “Observed to Expected Ratio” is the number of Observed cancers divided by the Expected number of cancers. A ratio of 2.00 would indicate twice as many cancers as expected, while a ratio of 0.50 would indicate half as many cancers as expected.
4. The “95% Confidence Interval” shows the statistical variability or uncertainty of the ratio

TABLE 7. OBSERVED AND EXPECTED CANCER INCIDENCE AMONG FEMALES, NORTHEAST MINNEAPOLIS (55413, 55418), 2003-2012

Cancer	Observed Cases	Expected Cases	Observed to Expected Ratio	95% Confidence Interval of Ratio
All Cancers Combined	977	1037	0.94	0.88 - 1.00
Brain	6	11	0.54	0.20 - 1.17
Breast	249	310	0.80	0.71 - 0.91
Cervix	17	13	1.26	0.74 - 2.02
Colorectal	87	100	0.87	0.70 - 1.07
Esophagus	5	5	0.96	0.31 - 2.24
Hodgkin Lymphoma	5	6	0.82	0.27 - 1.92
Kidney	27	23	1.16	0.76 - 1.68
Larynx	5	3	1.75	0.57 - 4.08
Leukemia	25	32	0.78	0.51 - 1.15
Liver	8	8	1.01	0.44 - 2.00
Lung	141	130	1.08	0.91 - 1.28
Melanoma	30	49	0.62	0.42 - 0.88
Multiple Myeloma	14	12	1.12	0.61 - 1.88
Non-Hodgkin Lymphoma	49	47	1.05	0.77 - 1.38
Oral	18	19	0.97	0.58 - 1.54
Ovary	25	30	0.84	0.54 - 1.23
Pancreas	23	24	0.95	0.60 - 1.43
Soft tissue	8	7	1.14	0.49 - 2.26
Stomach	11	10	1.14	0.57 - 2.04
Thyroid	21	36	0.59	0.36 - 0.90
Urinary Bladder	29	27	1.07	0.72 - 1.53
Uterus	68	65	1.05	0.82 - 1.33

Table Notes:
1. “Observed” cases are the newly-diagnosed cancers among residents living in ZIP codes of 55413 and 55418 at the time of cancer diagnosis.
2. “Expected” cases are the estimated number of new cancer cases based on the number, age, and gender of residents in those ZIP codes and applying Twin Cities Metro cancer rates.
3. The “Observed to Expected Ratio” is the number of Observed cancers divided by the Expected number of cancers. A ratio of 2.00 would indicate twice as many cancers as expected, while a ratio of 0.50 would indicate half as many cancers as expected.
4. The “95% Confidence Interval” shows the statistical variability or uncertainty of the ratio

TABLE 8. OBSERVED AND EXPECTED CANCER INCIDENCE AMONG MALES, MINNEAPOLIS NORTH/NORTHEAST (55411, 55412, 55413, 55418), 2003-2012

Cancer	Observed Cases	Expected Cases	Observed to Expected Ratio	95% Confidence Interval of Ratio
All Cancers Combined	1967	1783	1.10	1.05 - 1.15
Brain	31	30	1.04	0.71 - 1.47
Colorectal	180	154	1.17	1.01 - 1.36
Esophagus	35	26	1.34	0.93 - 1.86
Hodgkin Lymphoma	11	16	0.69	0.35 - 1.24
Kidney	68	73	0.93	0.73 - 1.18
Larynx	35	18	1.90	1.32 - 2.64
Leukemia	68	76	0.89	0.69 - 1.13
Liver	70	28	2.50	1.95 - 3.16
Lung	295	199	1.48	1.32 - 1.66
Melanoma	66	98	0.67	0.52 - 0.86
Multiple Myeloma	21	24	0.87	0.54 - 1.32
Non-Hodgkin Lymphoma	94	92	1.02	0.82 - 1.25
Oral	88	57	1.54	1.23 - 1.89
Pancreas	59	41	1.45	1.10 - 1.87
Prostate	490	528	0.93	0.85 - 1.01
Soft tissue	14	15	0.92	0.50 - 1.55
Stomach	29	26	1.11	0.74 - 1.60
Testes	28	35	0.80	0.53 - 1.15
Thyroid	19	22	0.85	0.51 - 1.33
Urinary Bladder	108	119	0.91	0.75 - 1.10

Table Notes:
1. “Observed” cases are the newly-diagnosed cancers among residents living in ZIP codes of 55411, 55412, 55413, and 55418 at the time of cancer diagnosis.
2. “Expected” cases are the estimated number of new cancer cases based on the number, age, and gender of residents in those ZIP codes and applying Twin Cities Metro cancer rates.
3. The “Observed to Expected Ratio” is the number of Observed cancers divided by the Expected number of cancers. A ratio of 2.00 would indicate twice as many cancers as expected, while a ratio of 0.50 would indicate half as many cancers as expected.
4. The “95% Confidence Interval” shows the statistical variability or uncertainty of the ratio.

TABLE 9. OBSERVED AND EXPECTED CANCER INCIDENCE AMONG FEMALES, MINNEAPOLIS NORTH/NORTHEAST (55411, 55412, 55413, 55418), 2003-2012

Cancer	Observed Cases	Expected Cases	Observed to Expected Ratio	95% Confidence Interval of Ratio
All Cancers Combined	1834	1876	0.98	0.93 - 1.02
Brain	11	22	0.49	0.25 - 0.88
Breast	494	574	0.86	0.79 - 0.94
Cervix	44	27	1.62	1.17 - 2.17
Colorectal	170	169	1.00	0.86 - 1.17
Esophagus	16	9	1.81	1.03 - 2.93
Hodgkin Lymphoma	12	13	0.94	0.48 - 1.63
Kidney	44	42	1.05	0.76 - 1.40
Larynx	12	5	2.34	1.21 - 4.08
Leukemia	52	58	0.89	0.67 - 1.17
Liver	16	14	1.16	0.66 - 1.88
Lung	269	223	1.21	1.07 - 1.36
Melanoma	43	94	0.46	0.33 - 0.61
Multiple Myeloma	33	21	1.55	1.07 - 2.18
Non-Hodgkin Lymphoma	77	82	0.94	0.74 - 1.18
Oral	37	33	1.11	0.78 - 1.53
Ovary	51	55	0.92	0.68 - 1.21
Pancreas	44	41	1.08	0.79 - 1.45
Soft tissue	17	14	1.21	0.71 - 1.94
Stomach	21	17	1.27	0.79 - 1.94
Thyroid	46	74	0.62	0.46 - 0.83
Urinary Bladder	40	45	0.89	0.63 - 1.21
Uterus	112	119	0.94	0.77 - 1.13

Table Notes:
1. “Observed” cases are the newly-diagnosed cancers among residents living in ZIP codes of 55411, 55412, 55413, and 55418 at the time of cancer diagnosis.
2. “Expected” cases are the estimated number of new cancer cases based on the number, age, and gender of residents in those ZIP codes and applying Twin Cities Metro cancer rates.
3. The “Observed to Expected Ratio” is the number of Observed cancers divided by the Expected number of cancers. A ratio of 2.00 would indicate twice as many cancers as expected, while a ratio of 0.50 would indicate half as many cancers as expected.
4. The “95% Confidence Interval” shows the statistical variability or uncertainty of the ratio.

TABLE 10. PREVALENCE (%) OF SELECTED HEALTH AND HEALTH BEHAVIOR CHARACTERISTICS FROM THE HENNEPIN COUNTY SHAPE SURVEYS FOR MINNEAPOLIS COMMUNITIES AND HENNEPIN COUNTY OVERALL. SEE NOTES BELOW.

	Camden	Near North	Northeast	University	Hennepin Co.
1998					
Current Smoker	34.0	26.3	27.6	22.4	21.2
Diabetes	4.5	7.2	5.2	2.5	4.3
Overweight	34.2	35.6	29.4	16.2	25.1
Heavy alcohol use	4.4	3.9	7.0	7.4	3.7
Below 200% Poverty	33.8	43.1	28.6	48.8	20.7
2002					
Current Smoker	24.0	29.4	19.3	18.9	18.5
Former Smoker	25.2	19.0	30.9	15.8	27.1
Households w/regular smoker	22.6	27.5	18.9	12.3	14.5
Diabetes	7.4	7.2	7.4	2.8	4.9
Obese	20.3	26.4	21.8	10.2	16.8
Below 200% of Poverty	27.6	42.8	18.9	54.6	15.8
	Camden/Near North		**NE/University/Longfellow**		**Hennepin Co.**
2006					
Current Smoker	26.9		18		17.1
Former Smoker	22.4		25.3		27
Households w/regular smoker	25.5		13.1		12.5
Diabetes	13		6		6
Obese	26.8		20.8		19.1
No physical activity	31.5		14.8		15.5
2010					
Current Smoker	23.8		13.8		12.1
Former Smoker	24		22.4		26.6
Diabetes	7.9		4.2		5.3
Obese	30.3		15.7		20.4
No physical activity	25.4		10.9		11.9
2014					
Current Smoker	15.8		10.8		7.7
Former Smoker	25.6		26.8		27.3
Households w/regular smoker	12.2		5.2		4.5
Diabetes	10.7		5		6.1
Obese	22.5		32.9		21.9
No physical activity	34.2		14		14.2

1. Data are from the Hennepin County SHAPE surveys of adult residents aged 18 and over. SHAPE surveys include many more health-related data items than are included here. Additional data items and full descriptions, interpretations, and limitations of the SHAPE data can be found at: http://www.hennepin.us/your-government/research-data/shape-surveys
2. Beginning with the 2006 survey, Camden and Near North neighborhood data were combined; Northeast, University, and Longfellow neighborhood data were also combined.

Figures

FIGURE 1. STUDY AREA FOR ANALYSIS OF CANCER RATES IN MINNEAPOLIS NORTH (ZIP CODES 55411, 55412) AND NORTHEAST (55413, 55418) NEIGHBORHOODS.

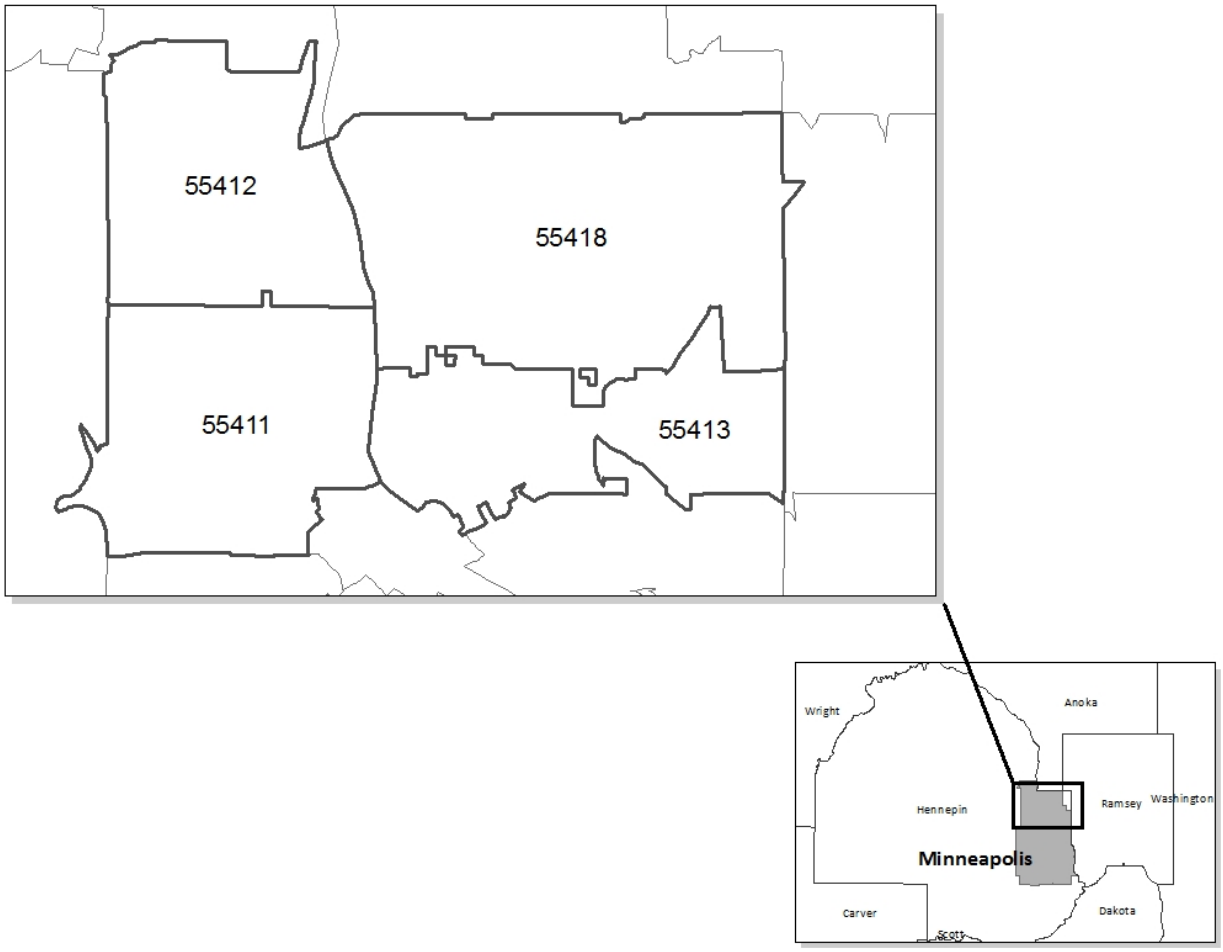


FIGURE 2. RATIO OF CANCER RATES FOR BLACKS COMPARED TO WHITES, MALES, US, 2008-2012

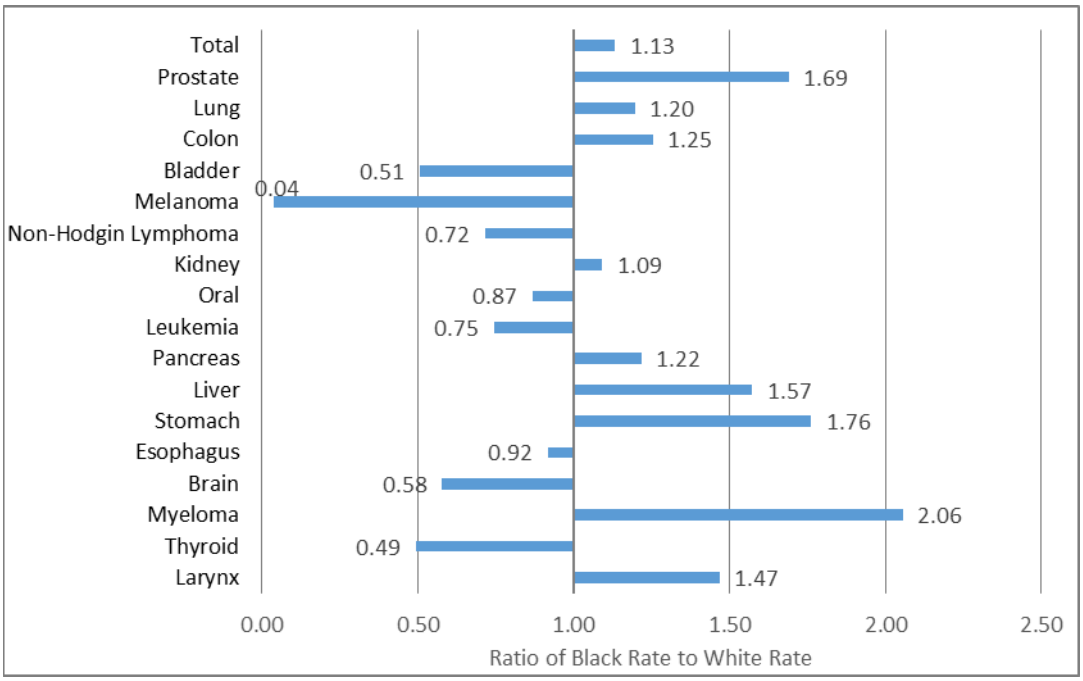
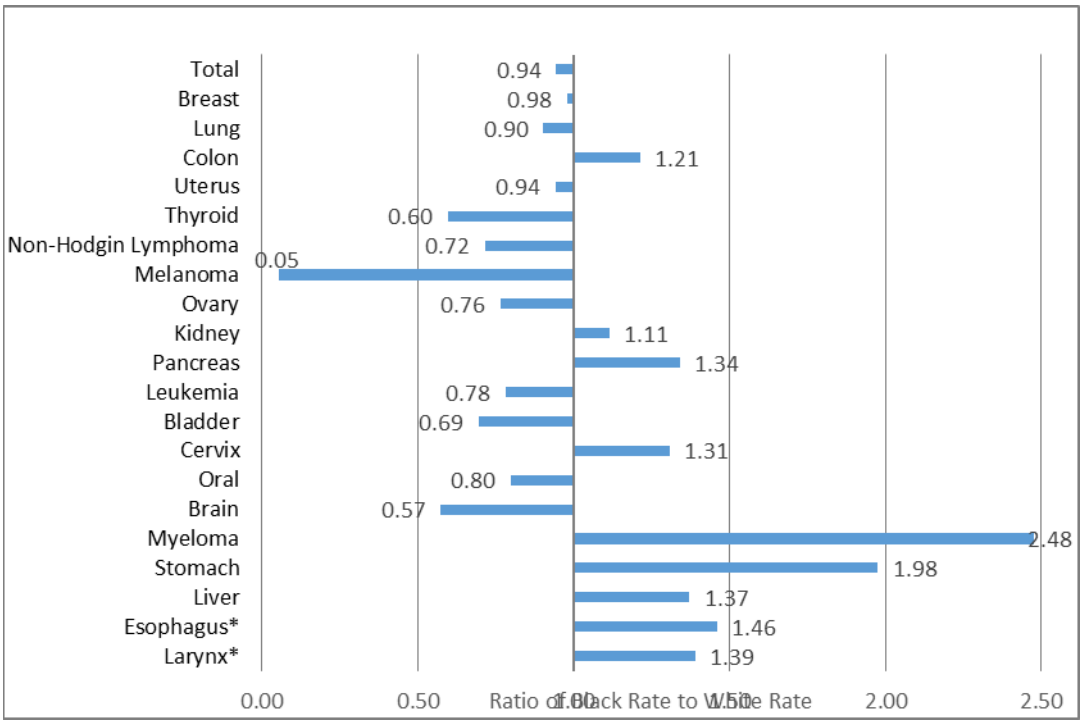
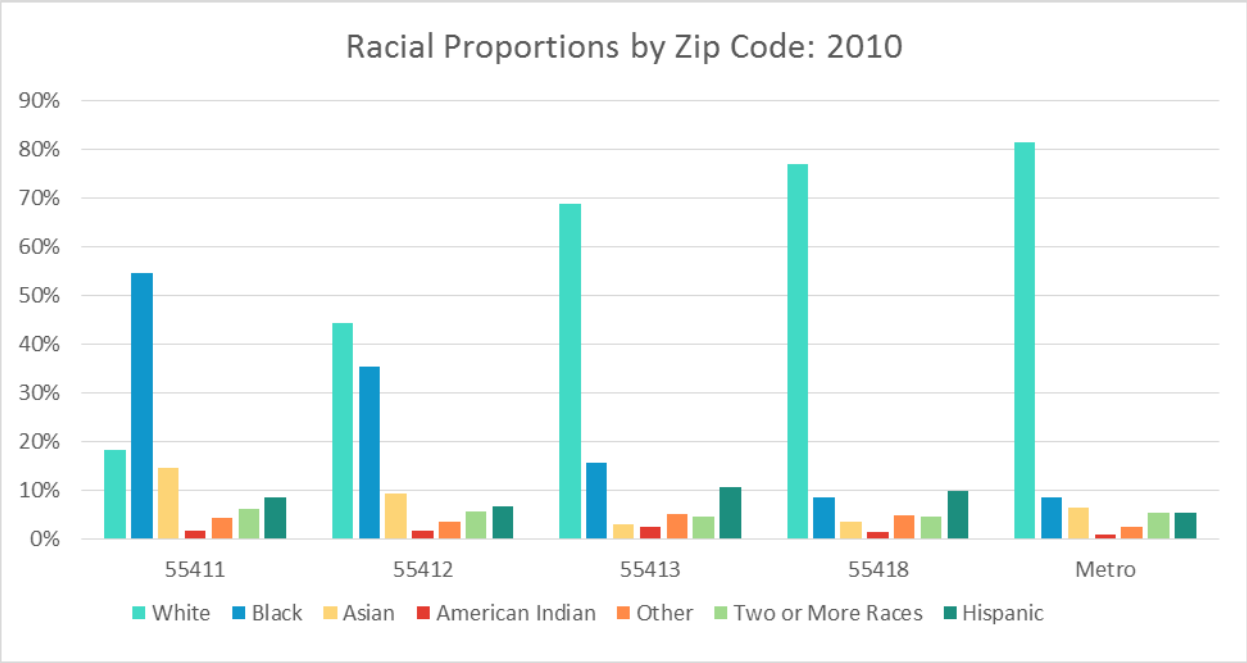


FIGURE 3. RATIO OF CANCER RATES FOR BLACKS COMPARED TO WHITES, FEMALES, US, 2008-2012



Source: Ryerson et al, 2016; *Rate ratios estimated from NCI SEER17 data; Race categories include Hispanic and non-Hispanic.

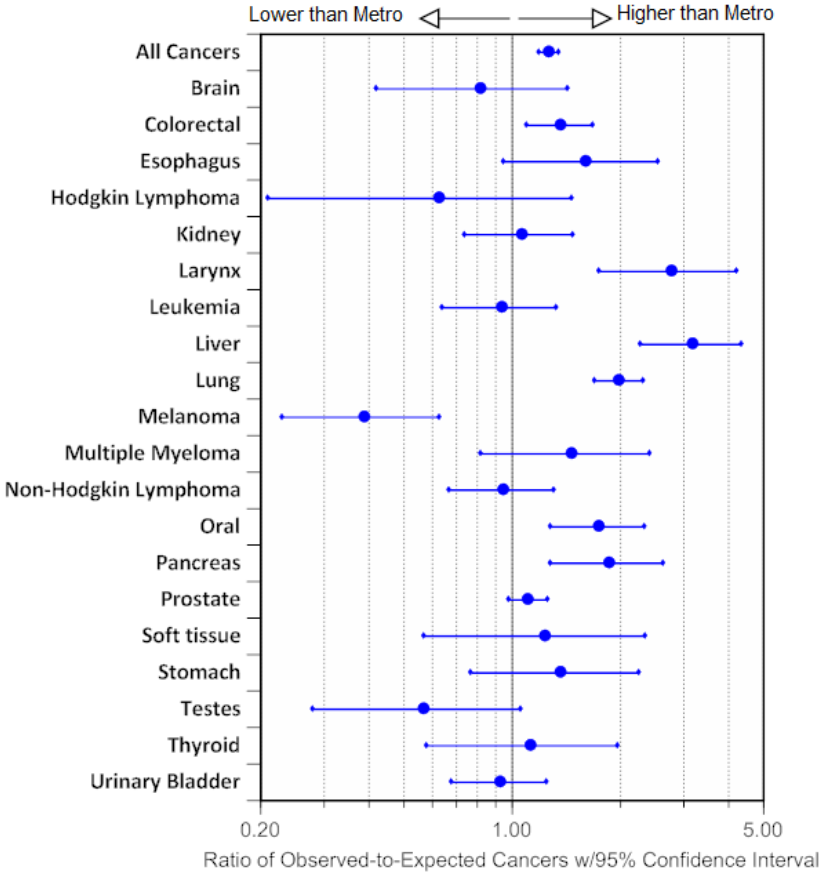
FIGURE 4. RACIAL PROPORTIONS BY MINNEAPOLIS ZIP CODE VS TWIN CITIES METRO: 2010 CENSUS



Race is for people identifying as single race; Hispanic is for any race

FIGURE 5. CANCER RATES AMONG MALES IN TWO MINNEAPOLIS NEIGHBORHOODS COMPARED TO METRO AREA RATES, 2003-2012

Minneapolis North ZIP Codes (55411, 55412)



Minneapolis Northeast ZIP Codes (55413, 55418)

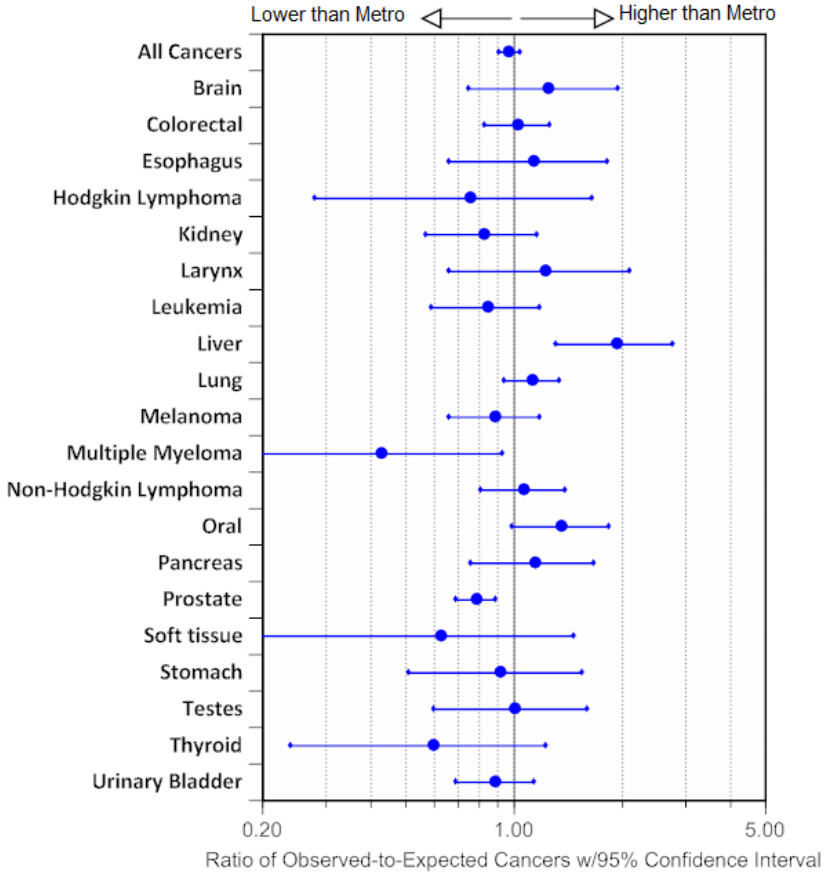
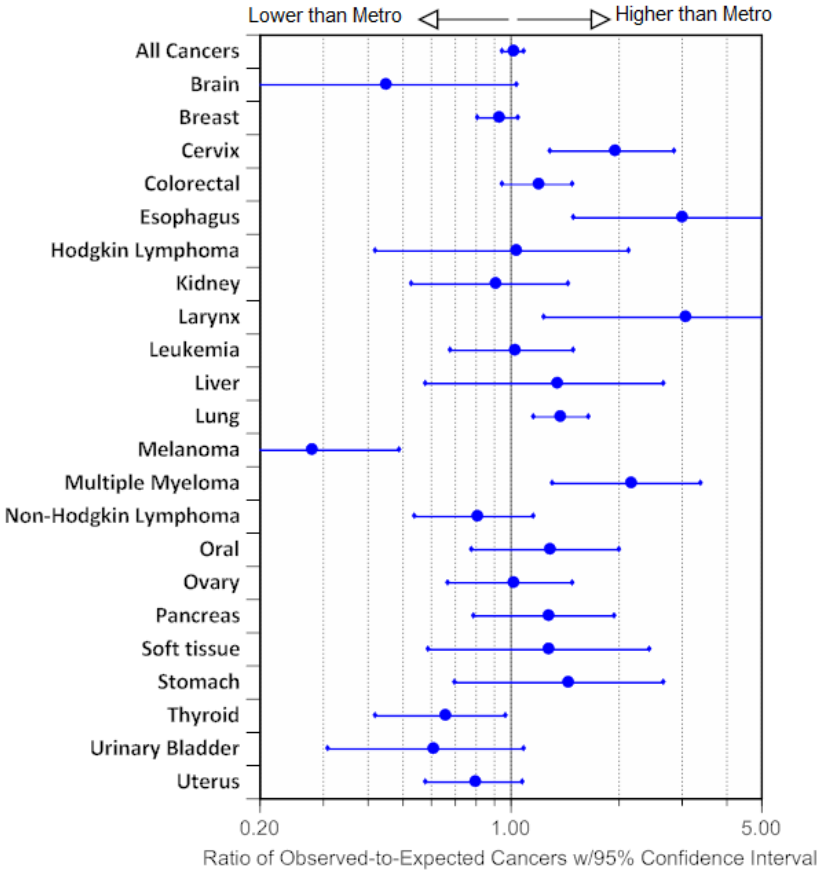


FIGURE 6. CANCER RATES AMONG FEMALES IN TWO MINNEAPOLIS NEIGHBORHOODS COMPARED TO METRO AREA RATES, 2003-2012

Minneapolis North ZIP Codes (55411, 55412)



Minneapolis Northeast ZIP Codes (55413, 55418)

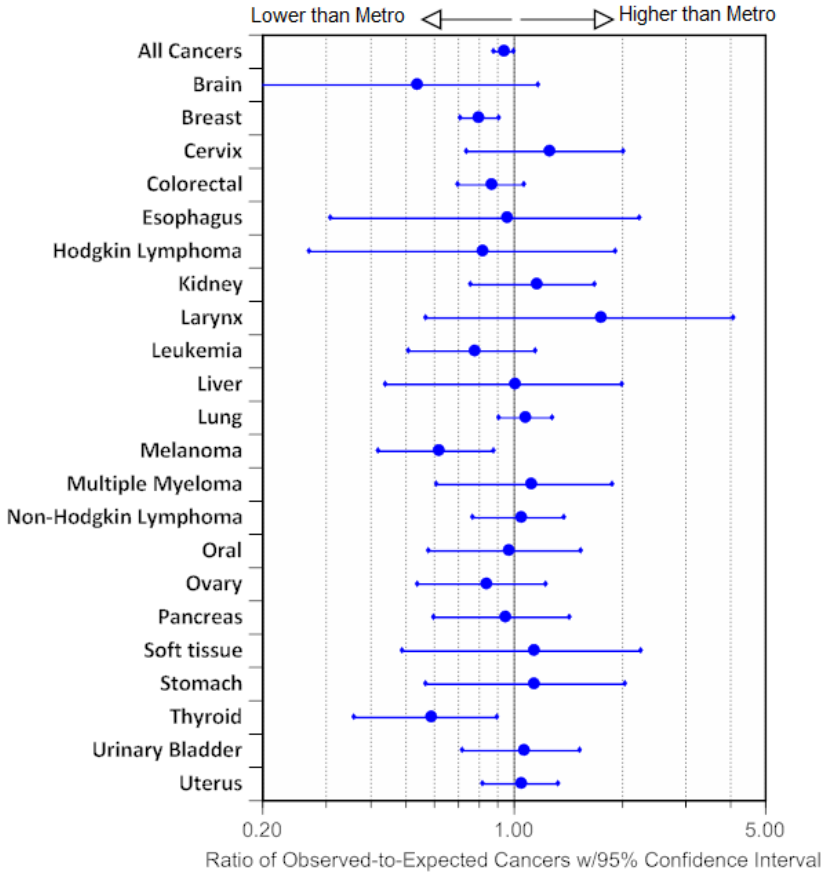


FIGURE 7. CANCER RATES AMONG MALES, MINNEAPOLIS NORTH/NORTHEAST COMPARED TO TWIN CITIES METRO, 2003-2012.

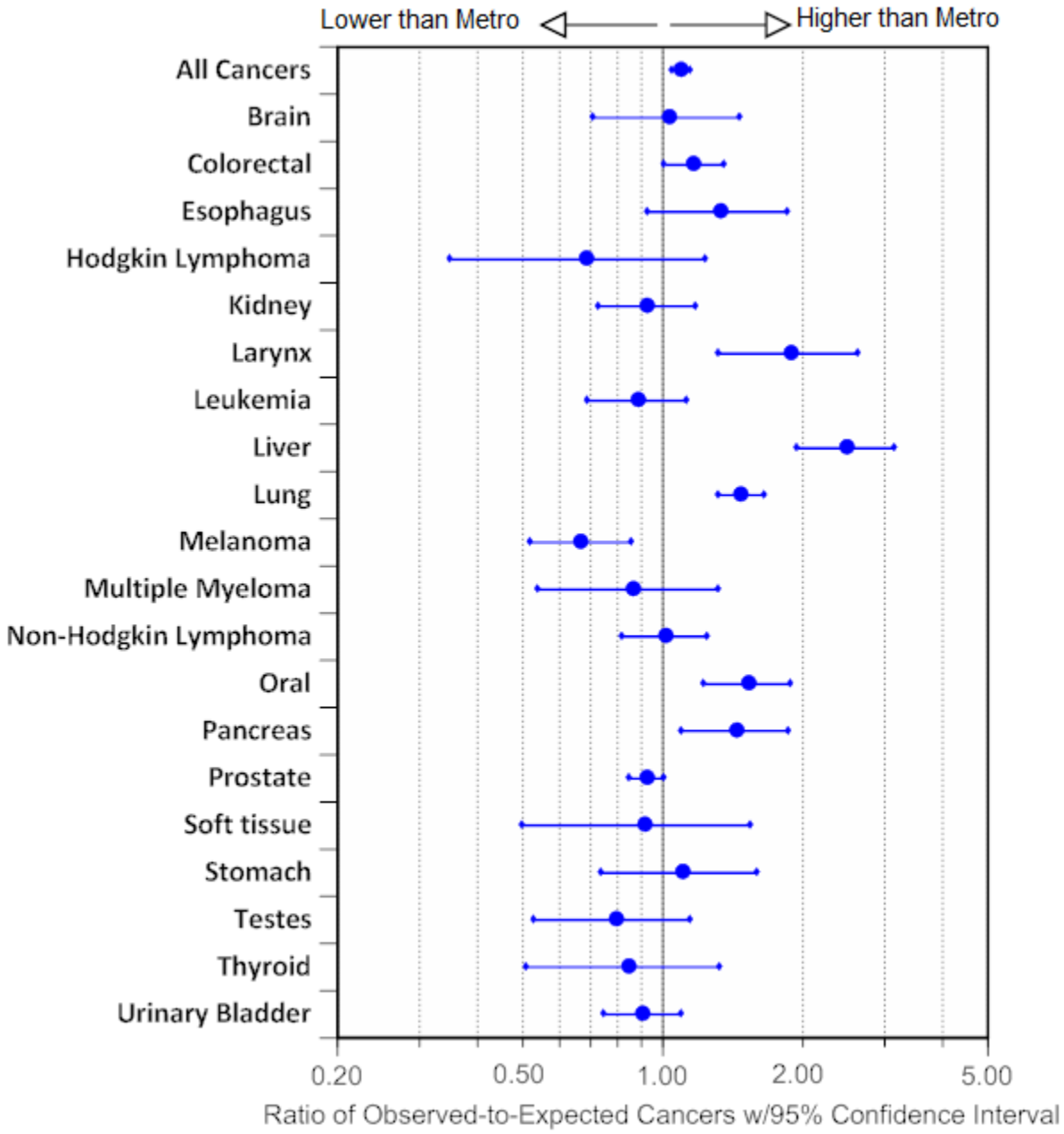


FIGURE 8. CANCER RATES AMONG FEMALES, MINNEAPOLIS NORTH/NORTHEAST COMPARED TO TWIN CITIES METRO, 2003-2012.

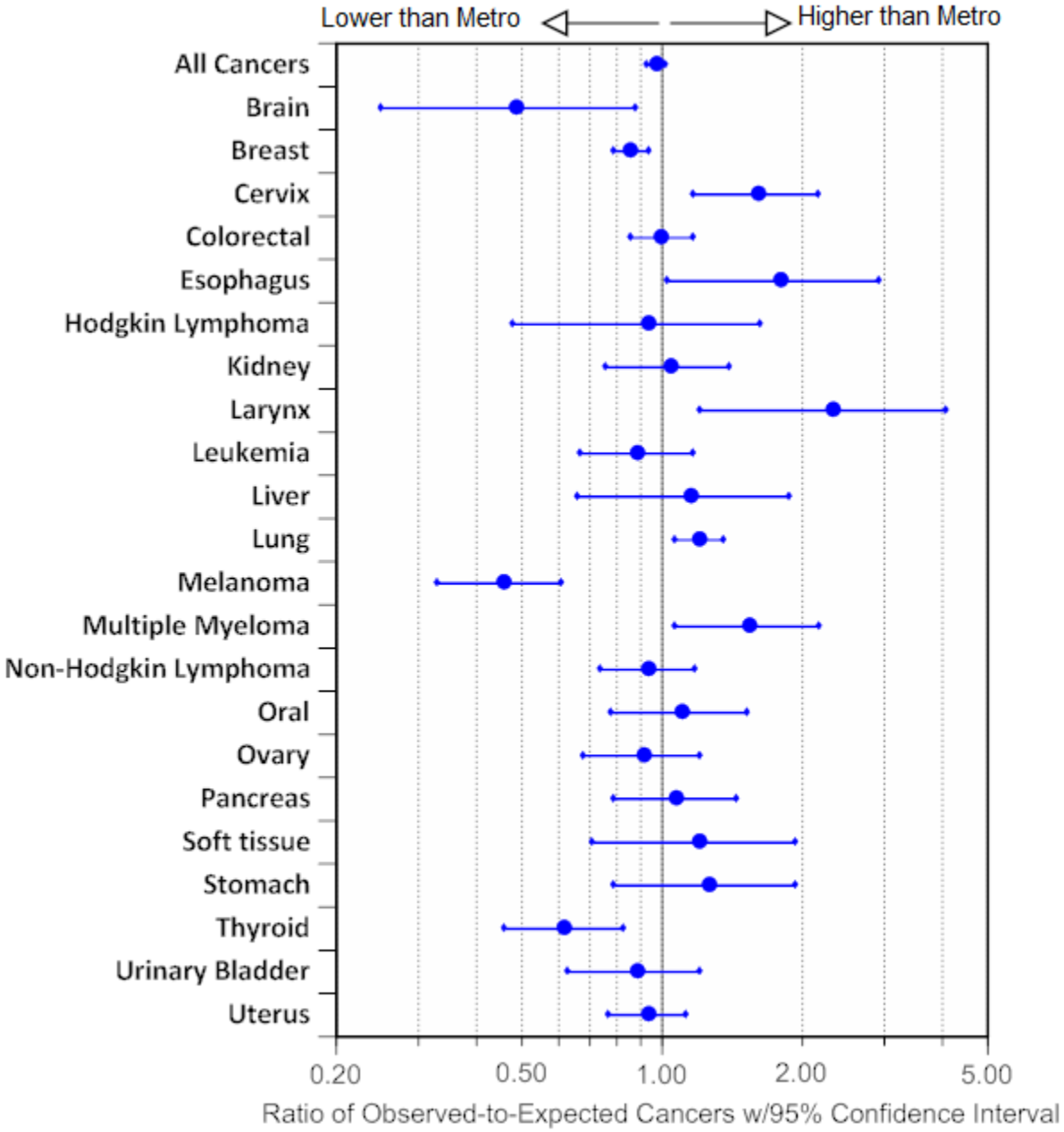
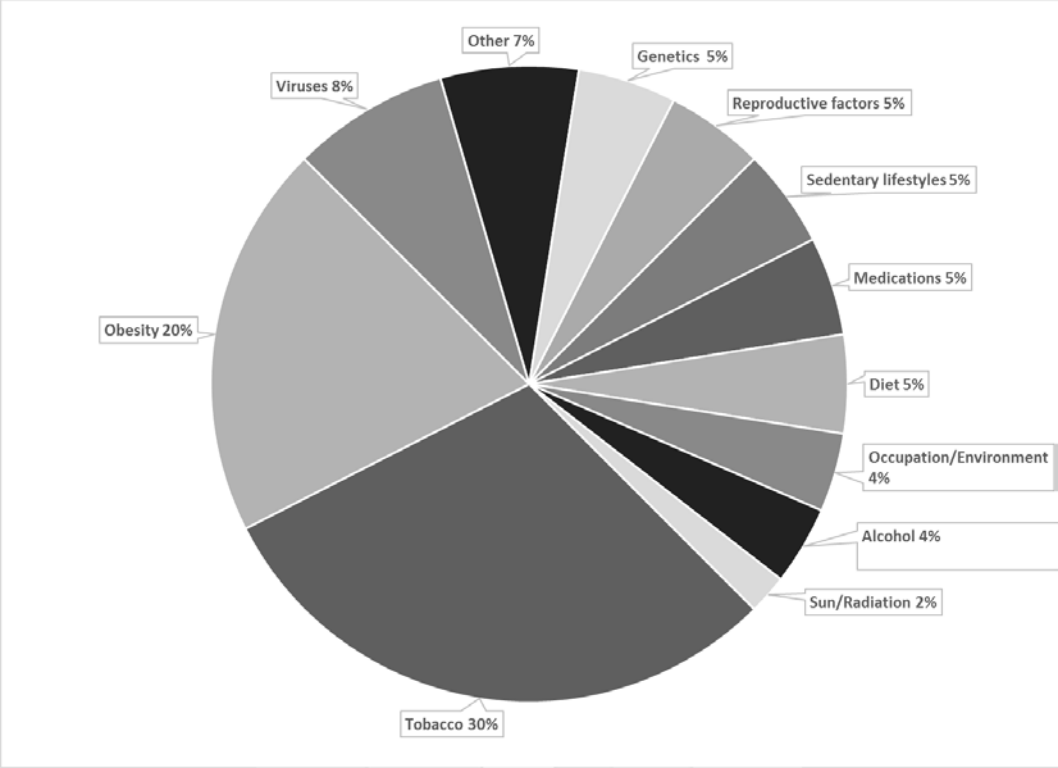
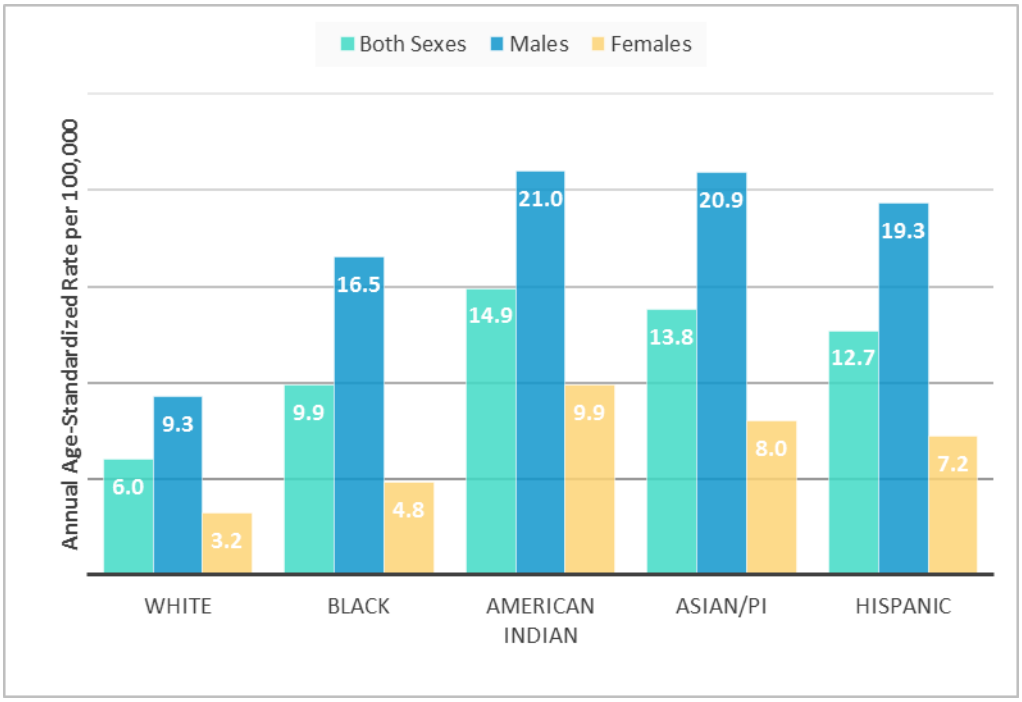


FIGURE 9. ESTIMATE OF CANCER MORTALITY ATTRIBUTABLE TO VARIOUS KNOWN RISK FACTORS IN THE U.S.



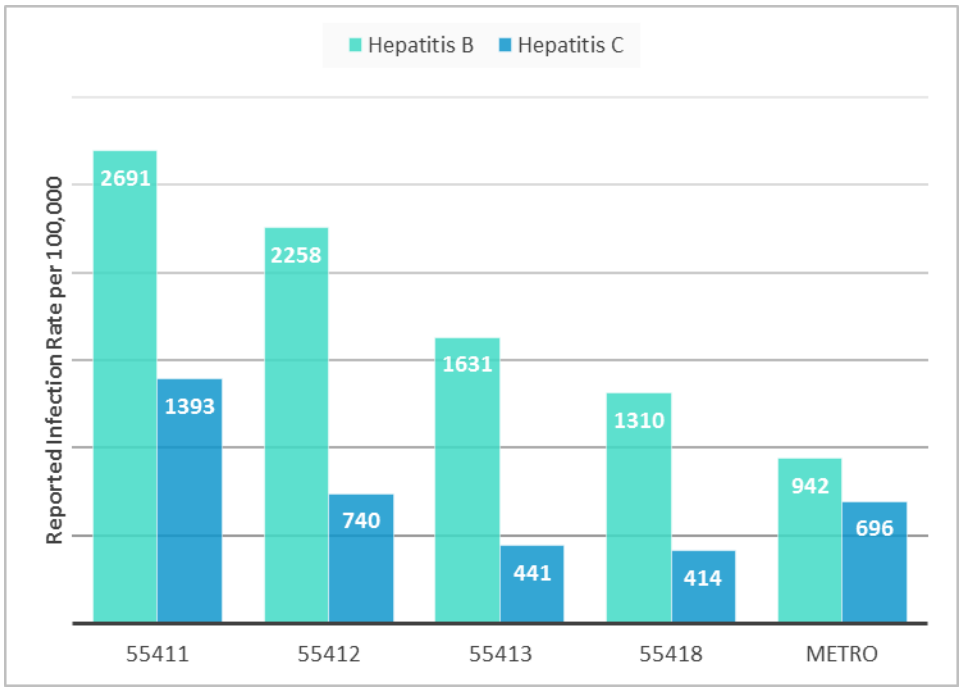
Source: Colditz and Wei, 2012

FIGURE 10. INCIDENCE RATES OF LIVER CANCER BY RACE/ETHNICITY, US, 2008-2012



Source: Ryerson et al, 2016

FIGURE 11. INFECTION RATES FOR HEPATITIS B AND C REPORTED TO MDH BY ZIP CODE



Source: Hepatitis Unit, Infectious Disease Epidemiology, Prevention and Control Division, MDH

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Appendix

Cancer Risk Factors

(Summarized from MCSS biennial reports, American Cancer Society, National Cancer Institute)

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.

Larynx

- **Smoking**: Smokers have a ten-fold greater risk of developing laryngeal cancer compared to nonsmokers.
- **Heavy alcohol consumption**: Heavy drinkers have a two to five times greater risk of laryngeal cancer than nondrinkers.
- **Long-term exposure to environmental tobacco smoke (ETS)**, also known as secondhand smoke, may increase the risk for laryngeal cancer and other cancers of the head and neck.
- **Occupational exposures**: Long term and intense occupational exposure to asbestos, nickel, wood dust, paint fumes and possibly other chemicals appears to increase risk.
- **Race**: Blacks, and in Minnesota, American Indians, have a higher rate of laryngeal cancer than non-Hispanic whites.

Liver

- **Chronic infection with hepatitis B or C viruses** are the largest risk factors and the main cause of liver cancer worldwide. In the U.S., hepatitis C is the more common cause of liver cancer. Chronic hepatitis C infection can lead to cirrhosis and liver cancer.
- **Heavy alcohol consumption.**

- **Diabetes and obesity.**
- **Long term exposure to aflatoxins** (a fungus that contaminates certain foods) is a major risk factor in some parts of the world -- though not the United States because of federal regulations that keep contaminated products from reaching consumers.
- **Long term exposure to high levels of arsenic** through drinking water with high levels of naturally-occurring arsenic (e.g. contaminated private wells).
- **Occupational exposures:** Workplace exposure to vinyl chloride (a chemical used in plastic manufacturing) causes a particular type of liver cancer (hepatocellular carcinoma).
- **Race**: Liver cancer is two to three times more common among Blacks, Asian/Pacific Islanders, and American Indians than among non-Hispanic whites.
- **Gender**: Rates in males are almost 3-fold higher than in females
- **Cirrhosis**: Cirrhosis, mostly due to excessive alcohol use, is often a precursor to liver cancer
- **Smoking**: Smokers have higher rates than non-smokers

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.

Oral

- **Tobacco use** (smoking or chewing) and **heavy alcohol use** are the strongest known risk factors for oral and pharyngeal cancers. Smoking and drinking together dramatically increase risk.
- **Human papilloma virus (HPV) infection** is associated with squamous cell cancers of specific parts of the oral cavity and pharynx, mostly the throat and tonsils. More than 60% of cancers in these specific locations are thought to be related to HPV infection. HPV infections of the oral cavity and pharynx have no symptoms and only a small percentage of people with the infection will go on to develop cancer. HPV infection is

also linked to squamous cell cancers of other anatomic sites (i.e., cervix, vulva, vagina, penis, and anus).
- **Occupational exposures:** Long-term, intense workplace exposures to wood dust, textile dust, or nickel and chromium dust increases the risk of pharyngeal cancers.
- **Gender:** Males are two times more likely than females to be diagnosed with oral cavity and pharyngeal cancer.
- **Ultraviolet (UV) light**: Sunlight and other UV light exposure increase the risk of cancer of the lip (a type of oral cancer).

Pancreas

- **Smoking** is the most important risk factor (doubling or tripling the risk) for pancreatic cancer, as is smokeless tobacco use. An estimated 20-30% of pancreatic cancers are caused by cigarette smoking.
- **Obesity** and **type 2 diabetes** increase risk of pancreatic cancer.
- **Diets** high in meat, fat, and processed meat increase risk. The exact role of diet in pancreatic cancer is still being studied.
- **Chronic pancreatitis** (long-term inflammation of the pancreas) is a risk factor for developing pancreatic cancer but many people with pancreatitis never develop pancreatic cancer.
- **Occupational exposures**: Heavy occupational exposures to certain pesticides, dyes, and metal refinery chemicals may increase the risk of pancreatic cancer.
- **Race:** Blacks are about two times more likely to have this cancer than whites.

Cervix

- **Human papilloma virus (HPV) infection** is the most important risk factor for cervical cancer. HPV is a group of more than 150 related viruses, some of which cause a type of growth called *papillomas*, which are more commonly known as *warts.* Infection with HPV is common, and in most people the body can clear the infection by itself. Sometimes, however, the infection does not go away and becomes chronic. Chronic infection, especially when it is caused by certain high-risk HPV types, can eventually cause certain cancers, such as cervical cancer.
- **Obesity** increases risk of cervical cancer.
- **Smoking** Women who smoke are about twice as likely as non-smokers to get cervical cancer. Tobacco by-products have been found in the cervical mucus of women who smoke. Researchers believe that these substances damage the DNA of cervix cells and may contribute to the development of cervical cancer. Smoking also makes the immune system less effective in fighting HPV infections.
- **Poverty:** Poverty is also a risk factor for cervical cancer. Many low-income women do not have ready access to adequate health care services, including Pap tests. This means they may not get screened or treated for cervical pre-cancers.
- **Other sexually transmitted infections (STIs):** Having other STIs — such as chlamydia, gonorrhea, syphilis and HIV/AIDS — increases your risk of HPV.

- **Long term use of birth control pills:** There is evidence that taking oral contraceptives (OCs) for a long time increases the risk of cancer of the cervix. Research suggests that the risk of cervical cancer goes up the longer a woman takes OCs, but the risk goes back down again after the OCs are stopped. In one study, the risk of cervical cancer was doubled in women who took birth control pills longer than 5 years, but the risk returned to normal 10 years after they were stopped.

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.

Multiple Myeloma

- **Age:** The risk of multiple myeloma goes up as people age. Less than 1% of cases are diagnosed in people younger than 35. Most people diagnosed with this cancer are at least 65 years old
- **Radiation:** People who were exposed to radiation from an atomic bomb blast had a higher risk of multiple myeloma. Exposure to lower levels of radiation may also increase the risk of multiple myeloma. At most, this accounts for a very small number of cases.
- **Gender:** Men are more likely to develop the disease than are women.
- **Family history**: Multiple myeloma seems to run in some families. Someone who has a sibling or parent with myeloma is 4 times more likely to get it than would be expected. Still, most patients have no affected relatives, so this accounts for only a small number of cases.
- **Race:** Blacks are about two times more likely to have this cancer than whites.