DEPARTMENT OF HEALTH

# Kidney and Pancreas Cancer Incidence

## DAKOTA AND WASHINGTON COUNTIES

**Kidney and Pancreas Cancer Incidence in Dakota & Washington Counties**

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# Contents

# Summary

In response to concerns about the number of kidney and pancreas cancers diagnosed in residents of the eastern metropolitan area (East Metro) of Minnesota, the Minnesota Department of Health (MDH) developed this report on kidney and pancreas cancers. The report provides information on factors that can increase the chance of developing kidney and pancreas cancers. Factors that increase the risk of a disease are called "risk factors." The report also describes the incidence of these cancers for two East Metro counties: Dakota and Washington. Incidence is the number of new cancers diagnosed in a defined population and time period.

Our analytic approach was descriptive. Our aim was to provide a picture of the patterns and trends in kidney and pancreas cancer incidence in Dakota and Washington Counties. We also described the incidence of these cancers for larger comparison populations: Hennepin/Ramsey Counties combined, Minnesota, and the U.S. including the District of Columbia. Including cancer incidence rates for larger populations in Minnesota and the U.S. broadens the picture and provides more stable rates for comparison purposes.

Highlights from the report include the following:

- Kidney and pancreas cancers are among the 10 most common cancers diagnosed in both males and females in Minnesota and the U.S. Historical trends show that the incidence of these cancers has been increasing since 2002 and both cancers share three important risk factors: cigarette smoking, obesity, and older age.
- In both Dakota and Washington Counties, kidney and pancreas cancer incidence fluctuated from year to year over the past 25 years. Nevertheless, the incidence trends of both cancers for the two East Metro counties increased slightly, following trends observed in Minnesota. Additionally, the average annual incidence rates for kidney and pancreas cancers in Dakota and Washington Counties were similar to those in Hennepin/Ramsey Counties combined, Minnesota, and the U.S from 2015-2019.
- County-level incidence rates for both kidney and pancreas cancers vary widely from one county to another in Minnesota. The differences between counties reflect all of the differences in genetics, health behaviors (such as smoking or physical activity), health care access and utilization, and other characteristics and circumstances that differ between people, as well as effects due to random chance. Counties with small populations or small numbers of cancers in specific age groups are highly variable (unstable) from one year to the next.

MCRS cancer statistics that describe the burden of cancer in Minnesota are essential to cancer prevention and control efforts in public health, health care system planning, resource allocation and decision making, and research into the causes of cancer. However, for many reasons, cancer rates are rarely useful in trying to identify potential cancer risks from exposure to low levels of chemical contaminants in the environment. Some of those reasons relate to the complex nature of cancer, the difficulty in measuring people's actual exposure levels to contaminants in the environment, and the difficulty in identifying small increases above and beyond the normal variation in cancer incidence rates across populations.

Despite the challenges of using MCRS data to understand cancer risk from low levels of environmental contaminants, MDH actively works to assure and maintain a healthy

environment for communities. Additionally, MDH and our community partners also provide information and resources (see Appendix) to communities and individuals to reduce their risk of cancer and improve cancer outcomes.

# Background

In February 2022, community residents contacted the Minnesota Department of Health (MDH) expressing concern about the number of kidney and pancreatic cancers diagnosed in residents of Dakota and Washington Counties. To address these concerns, MDH developed this report to provide information about the risk factors for kidney and pancreas cancers, and to summarize the incidence patterns and trends of kidney and pancreas cancers in Dakota and Washington Counties against the backdrop of the incidence of these cancers in larger comparison populations.

There have been concerns about cancer among many residents of the eastern metropolitan area (East Metro) related to the presence of perfluorochemicals (PFCs) in drinking water sources. Public health officials at the local and state levels have taken steps to improve water quality and implemented ongoing water quality monitoring. In response these concerns, the Minnesota Cancer Reporting System, MCRS (formerly the Minnesota Cancer Surveillance System, MCSS) developed detailed profiles of cancers occurring in Dakota County, Washington County, and in selected communities in the East Metro. The results were summarized in three reports published in 2007, 2015 and 2018.[1,2,3]

The results from these analyses did not find unusual elevations of cancer in the East Metro. Rather, the patterns, trends, and variations of these cancers in the East Metro were similar to those seen at the state and county-levels. Despite these findings, community residents remain concerned about cancer occurrence in the East Metro.

# Data Analysis and Interpretation

In this report, we summarize the pattern and trends in the incidence of kidney and pancreas cancers for Dakota and Washington Counties, and for three comparison populations defined by geographic area: Minnesota, Hennepin/Ramsey Counties combined, and the U.S. including the District of Columbia. Incidence is the number of new cancers diagnosed in a defined population and time period. Our analytic approach in developing this report was descriptive. The primary measure of cancer occurrence in this report is the age-standardized incidence rate. We analyzed MCRS data or gathered previously published statistics from different sources described in the Data Sources and Methods Section of the Appendix.

Including cancer incidence rates for larger populations in Minnesota and the U.S. broadens the picture and provides more stable rates for comparison purposes. In a few instances, we applied statistical testing based on the overlap of 95% confidence intervals to clarify patterns as appropriate. However, our approach does not concentrate on testing for the statistical significance of differences between incidence rates and trends.

The most recent year of MCRS data available for this analysis is from cancers diagnosed in 2019. Measures of cancer occurrence—even for common cancers—are highly variable over short periods of time, especially for county and community level cancer statistics. As such, at least 10

years of new data would be needed to extend the results of the previous MDH reports based on detailed analyses of observed to expected ratios.

This report also does not examine whether chemical contaminants in drinking water are related to the patterns and trends in the incidence of kidney and pancreas cancers in Dakota and Washington Counties. As we indicate later in this report, there are limitations to using cancer registry statistics to identify cancer risks that could be related to chemical contaminant exposures from the environment. Instead, we answer the questions: "What does the incidence of kidney and pancreas cancers in Dakota and Washington Counties look like?" and "How does this compare to the incidence of kidney and pancreas cancers in larger comparison populations?" The results of our analyses include a description of the:

- Historical trends in kidney cancer and pancreas cancer incidence rates for Minnesota and the U.S.
- Pattern of kidney and pancreas cancer incidence rates for Dakota and Washington Counties versus Minnesota over the past 25 years
- Five-year average annual incidence rates of kidney and pancreatic cancers for Dakota and Washington Counties compared to the rates for Minnesota, Hennepin and Ramsey Counties combined, and the U.S. including the District of Columbia
- Distribution of the five-year average annual kidney and pancreas cancer incidence rates for all 87 Minnesota counties.

# Findings

## Kidney cancer

The kidneys are organs located on each side of the spinal cord just above the waist. They filter and clean blood and create urine from the waste. There are several different subtypes of invasive kidney cancer. Cancer within the kidneys is called renal cell cancer and is the most common subtype (90%). Cancer in the part of the kidney that connects to the urinary bladder (called the renal pelvis) is called transitional cell cancer and represents about 7% of all kidney cancers.[4]

### Risk factors[5,6]

Risk factors for kidney cancer include cigarette smoking, obesity, high blood pressure, and older age. Males and Black people are also at higher risk of kidney cancer. Rare inherited conditions account for 3-5% of all kidney cancers. Occupational studies have linked high levels of a chemical called trichloroethylene to cancer in some industrial work environments. For more information about kidney cancer, visit Kidney (Renal Cell) Cancer—Patient Version - National Cancer Institute (www.cancer.gov/types/kidney)

### Cancer burden and historical trends in Minnesota and the U.S.

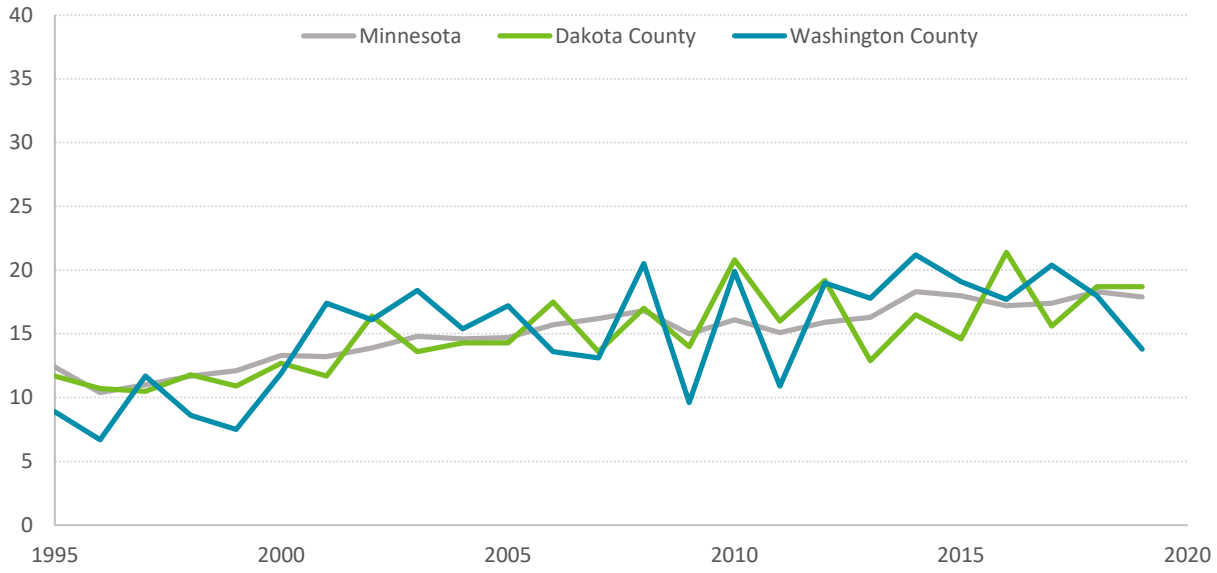
Kidney cancer is among the ten most common cancers diagnosed in Minnesota[7] and the U.S.[8] Each year between 2015 and 2019, an estimated 1,170 Minnesotans were diagnosed with kidney cancer and 260 died of the disease. The incidence rate for kidney cancer for males is double the rate for females.[9] Kidney cancer occurs more often in older individuals, with about half of all cases diagnosed at age 64 years and older.

Historical trends show that overall kidney cancer incidence for males and females combined in Minnesota increased 1.2% per year from 2002 and 2018. During this time, overall kidney cancer incidence in the U.S. increased over most years but may have recently stabilized.

### 25-year trends in Dakota and Washington Counties versus Minnesota

The chart below displays kidney cancer incidence rates for Dakota, Washington, and Minnesota over the last 25 years for males and females combined. The county-level rates show marked variation from year-to-year, with the incidence rates for both counties bouncing above and below the statewide average rate. Additionally, the rates over time for Dakota and Washington Counties generally follow the pattern of slightly increasing incidence seen for Minnesota. Even with the variation, the trend in the county-level rates does not appear to substantially differ from the 25-year trend seen in Minnesota.

## 25-year trends in kidney cancer incidence rates for Dakota and Washington Counties versus Minnesota




*Age-standardized incidence rates per 100,000 population; Minnesota Cancer Reporting System, November 2021 submission, 1995-2019*

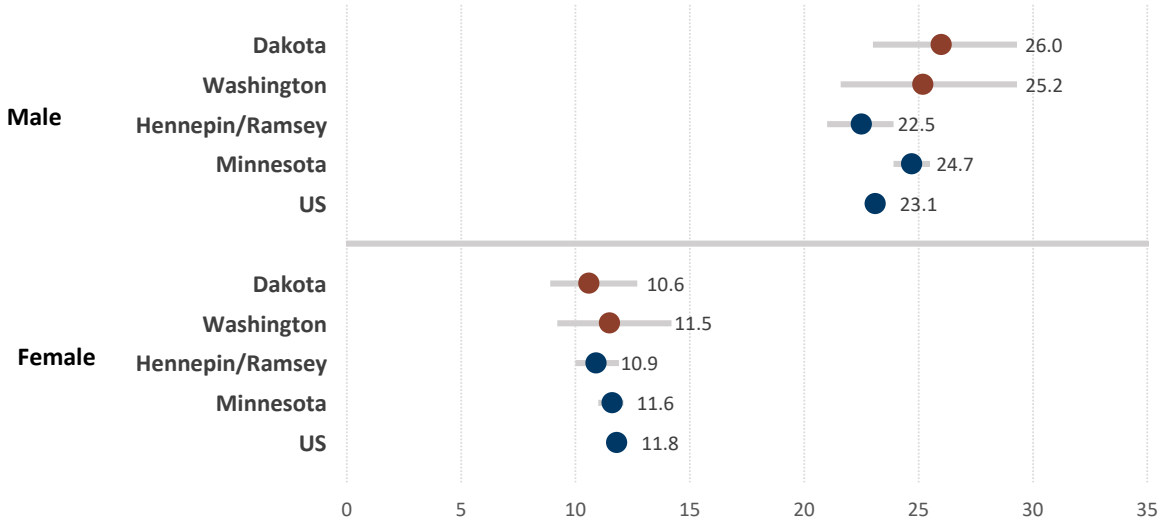
## Dot-in-bar charts for kidney cancer incidence

The "dot-in-bar" chart below displays the five-year average annual kidney cancer incidence rates for Dakota and Washington Counties, and the three comparison populations (geographic areas).

- Incidence among females in Dakota and Washington Counties is similar to females in Hennepin/Ramsey Counties combined, Minnesota and the U.S.
- The rates for males in Dakota and Washington Counties are slightly higher than the rates for the three comparison populations. However, Dakota and Washington County kidney cancer incidence rates are not statistically different from the rates for the three populations.
- The county, state and U.S. incidence rates for males are consistently higher than the rates for females.
- The 95% confidence intervals (gray bars) are much wider for Dakota and Washington Counties compared to the confidence intervals for the state and U.S. This means that kidney cancer incidence rates for Dakota and Washington County are less precise than the incidence rates for the state and U.S.

## Kidney cancer incidence rates in the East Metro are similar to local, state, and national incidence rates

Age-standarized kidney cancer incidence/100,000 by sex and area: Dakota, Washington, Hennepin/Ramsey, Minnesota, US. Data in table below.




*Age-standardized incidence rates per 100,000 population; MCRS incidence from 2015-2019; U.S. incidence from 2014-2018. Dots represent the estimated age-standardized average annual incidence rate. Gray bars represent the 95% confidence intervals for the incidence rate.*

## Pancreas cancer

The pancreas is an abdominal organ connected to the small intestine. It makes and transports enzymes needed for digesting proteins, carbohydrates, and fats. The pancreas also produces the hormones insulin and glucagon that regulate blood sugar levels. About 90% of pancreatic cancers are ductal adenocarcinomas and occur in the parts of the pancreas involved in digestion.[10,11] Pancreas cancers often do not cause symptoms until after the cancer has spread to the liver and other sites in the body, making this cancer difficult to treat.

### Risk factors[11]

Risk factors for pancreas cancer include tobacco use, obesity, type 2 diabetes, chronic pancreatitis, and older age. Males, as well as Black and American Indian individuals, are also at higher risk of developing pancreas cancer. Inherited mutations within families account for 5-10% of all pancreas cancers. Studies of workers in specific occupations or industries have linked certain workplace exposures to increased risk of pancreatic cancer.[12] For more information about pancreas cancer, visit Pancreatic Cancer—Patient Version - National Cancer Institute (www.cancer.gov/types/pancreatic).

### Cancer burden and historical trends in Minnesota and the U.S.

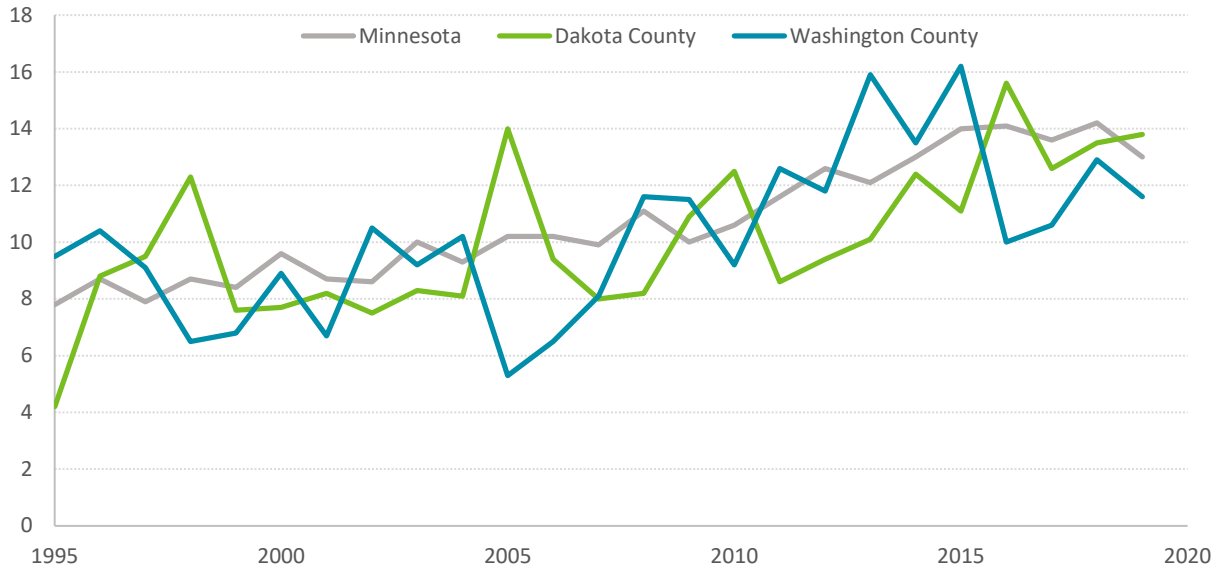
Pancreas cancer is among the 10 most common cancers diagnosed in males and females in Minnesota[7] and the U.S.[8] Each year between 2015 and 2019, an estimated 930 Minnesotans were diagnosed with pancreas cancer and 760 died of the disease. The incidence rate for pancreas cancer for males is about 30% higher than the rate for females.[13] Pancreas cancer occurs more often in older individuals, with about half of all cases diagnosed at age 70 years and older.

The incidence rate of pancreas cancer for males and females combined in Minnesota has increased 1.7% since 1988.[14] This trend analysis accounts for changes in Minnesota cancer reporting rules in 2012.[15] Prior to 2012, all new cancers reported to MCRS had to have tissue confirmation. Beginning in 2012, the reporting rules in Minnesota expanded to include new cancers diagnosed without tissue confirmation. Because cancers without microscopic confirmation were not reported to MCRS, pancreas cancer incidence was likely underestimated in Minnesota prior to 2012. In the U.S., pancreas cancer incidence in the U.S. has been rising since at least 2002. The incidence increased by 1.7% per year from 2002 to 2006, then slowed slightly to 0.9% per year from 2006 to 2018.

### 25-year trends in Dakota and Washington Counties versus Minnesota

The chart below displays pancreas cancer incidence rates for Dakota, Washington, and Minnesota over the last 25 years for males and females combined. The rates for both counties fall below and above the state average rate for periods of time. Additionally, the incidence rates for Dakota and Washington Counties generally follow the pattern of slightly increasing rates seen for Minnesota. Despite the wide fluctuation in rates over the 25-year period, trends in pancreas cancer incidence in Dakota and Washington Counties do not appear to substantially differ from the 25-year trend seen in Minnesota.

## 25-year trends in pancreas cancer incidence rates for Dakota and Washington Counties versus Minnesota



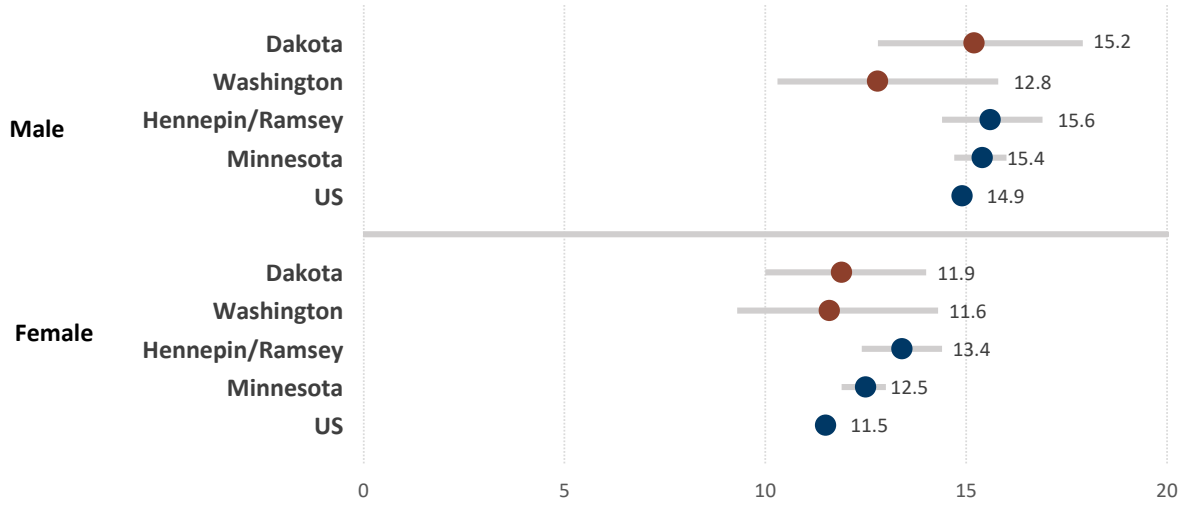

*Age-standardized incidence rates per 100,000 population; MCRS 1995-2019*

## Dot-in-bar charts for pancreas cancer incidence

The "dot in bar" chart below displays the five-year average, annual pancreas cancer incidence rates for Dakota and Washington Counties, and the three comparison populations (geographic areas).

- The rates for males and females in Dakota and Washington Counties are similar to the rates for the three comparison populations (geographic areas).
- The incidence rates for males of these two counties are not statistically different from those for the comparison populations. Similarly, the incidence rates for females in Dakota and Washington Counties are not different from the rates for females in the comparison populations.
- The county, state, and U.S. pancreas cancer incidence rates for males are higher than for females, with one exception: the rate for females in Hennepin/Ramsey Counties is slightly higher than the rate for males in Washington County.
- The 95% confidence intervals (gray bars) are much wider for Dakota and Washington Counties compared to the confidence intervals for the state and U.S. This means that pancreas cancer incidence rates for Dakota and Washington County are less precise than the rates for the state and U.S.

## Pancreas cancer incidence rates in the East Metro are similar to local, state, and national incidence rates




*Age-standardized incidence rates per 100,000 population; MCRS incidence from 2015-2019; U.S. incidence from 2014-2018. Dots represent the estimated age-standardized average annual incidence rate. Gray bars represent the 95% confidence intervals for the incidence rate.*

# Variability in Kidney & Pancreas Cancer Rates Across Counties

Cancer incidence rates vary substantially from one county to another in Minnesota. The charts below display the wide variation in county-level rates for kidney and pancreas cancers in Minnesota based on MCRS data from 2015-2019.

The differences in incidence rates between counties reflect all of the differences in genetics, health behaviors, health care access and utilization, and other characteristics and circumstances that differ between people, as well as effects due to random chance. It is very common for the cancer rate of a county to be relatively high one year and low the next. This is especially true for counties with small populations or small numbers of cancers in specific age groups.[16] Rates that are highly variable from one year to the next are called "unstable," and these rates are flagged in the data tables included in the Appendix.

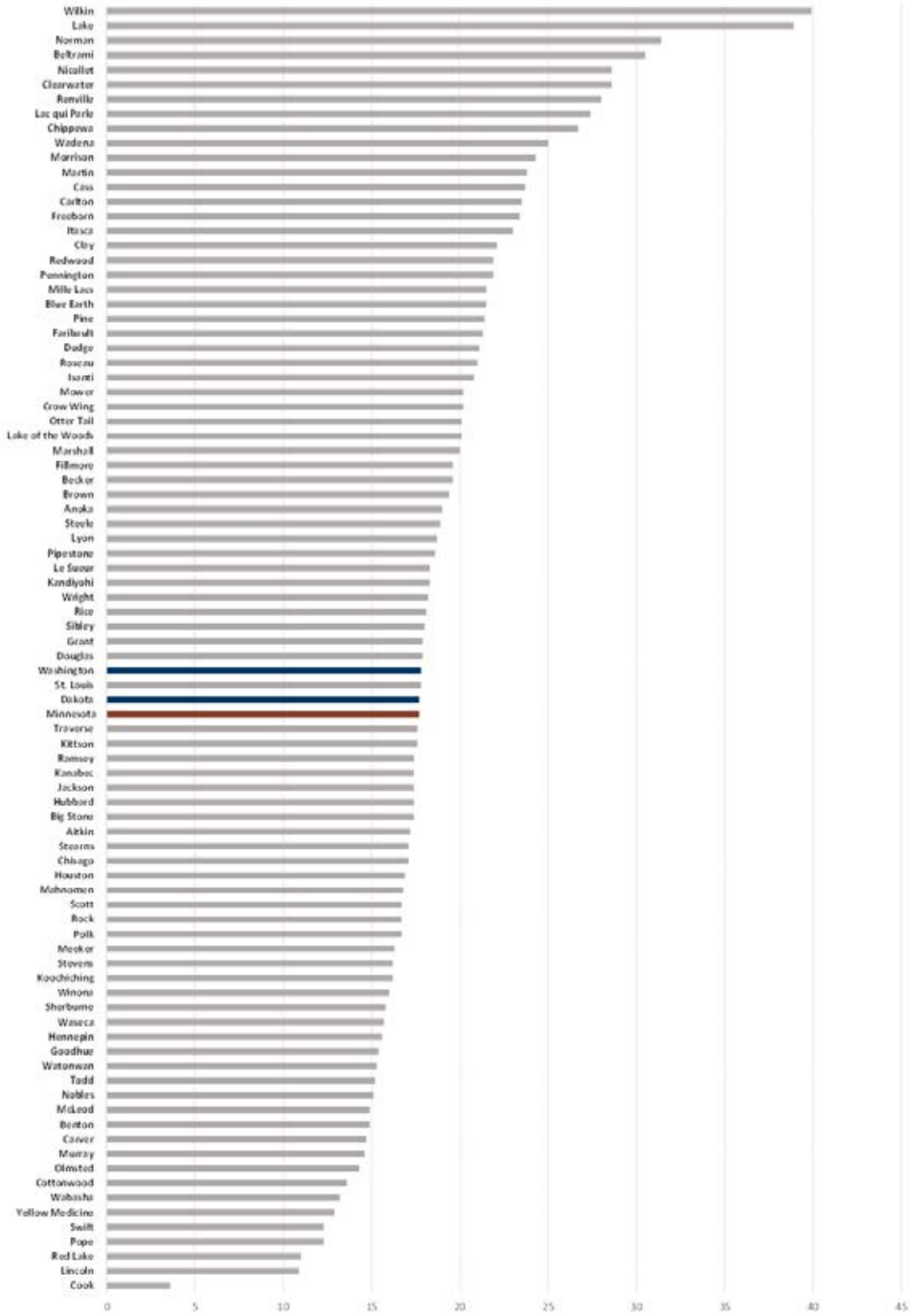
## Kidney cancer

- The kidney cancer incidence rates for Dakota and Washington Counties fall in the middle of the range among all the counties. Although the incidence rates for Dakota and Washington Counties were slightly higher than the rate for the entire state, the county-level rates were not statistically different from the state's rate, as we noted above.
- Kidney cancer incidence rates range from a low of 3.6 per 100,000 in Cook County to a high of 39.9 per 100,000 in Wilkin.

## Pancreas cancer

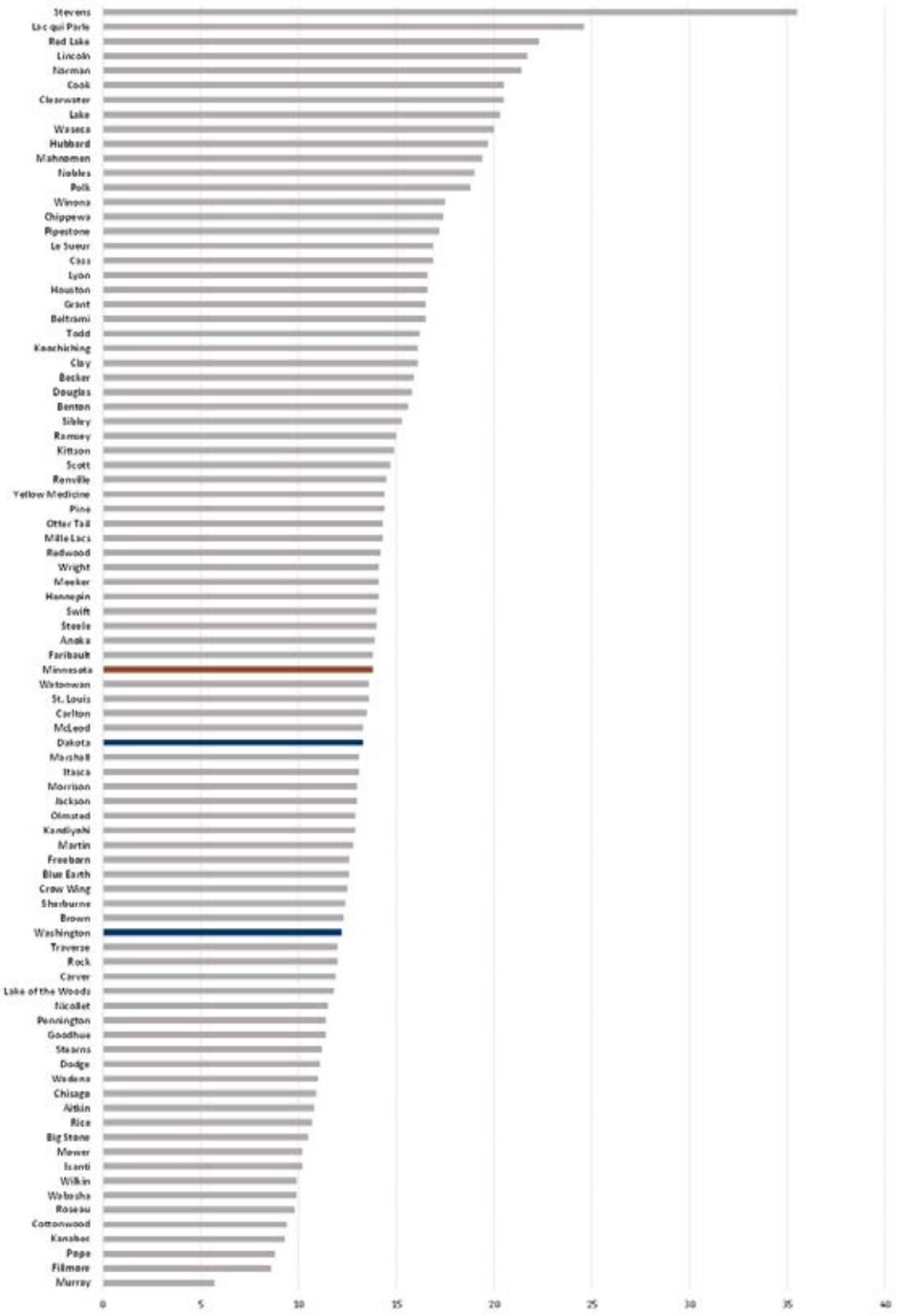
- Pancreas cancer incidence rates for Dakota and Washington Counties are somewhat lower than, but not statistically different from the incidence rate for the entire state, as mentioned above.
- County-level incidence rates for pancreas cancer also vary widely across the state, from a low of 5.7 per 100,00 in Murray County to a high of 35.5 per 100,000 in Stevens County.

## Kidney cancer incidence rates for Minnesota counties, 2015-2019




*Age-standardized incidence rates per 100,000 population; MCRS 2015-2019*

## Pancreas cancer incidence rates for Minnesota counties, 2015-2019




*Age-standardized incidence rates per 100,000 population; MCRS 2015-2019*

# Usefulness & Limitations MCRS Cancer Statistics

MCRS data are essential to cancer prevention and control efforts. Local, state, and national experts use cancer statistics to develop, fund, carry out and evaluate public health programs aimed at reducing the risk of developing various cancers through education and intervention programs (tobacco cessation), campaigns to increase vaccinations (HPV and hepatitis B), and early detection and treatment programs (screening for breast, colorectal, and lung cancers). MCRS data also support public health efforts to identify and reduce persistent cancer-related disparities in Minnesota. The data are critically important to help guide health system planning, resource allocation, and decision-making in response to the increased cancer burden as the population ages and the growing population of cancer survivors. Finally, MCRS has supported numerous investigations into the causes of various cancers conducted by approved researchers.[17]

However, for many reasons, cancer rates are rarely useful in identifying potential cancer risks from exposure to low levels of chemical contaminants in the environment. Cancer is a group of complex, biological diseases that have different risk factors. Measuring people's actual exposure levels to environmental contaminants is challenging at best, especially over time, and often is inaccurate. Clear determinations are difficult to make because cancer registry statistics cannot establish cause and effect and cannot identify small increases in cancers over and above the normal variation across populations. We highlight these and other challenges below.

## Steps to protect the environment and improve cancer outcomes

Before we consider challenges and limitations, however, it is important to acknowledge the programs and activities that MDH, local public health, and community health boards take to assure and maintain a healthy environment for communities. Additionally, there are a number of resources available to communities and individuals that can reduce cancer risk and improve cancer outcomes. We have included additional information and resources in the Resource Section of the Appendix.

## Challenges of using MCRS data to understand cancer risk in communities

### What is cancer?

- **Cancer is not a single disease.** Cancer includes more than 100 different diseases that occur when cells grow uncontrolled and spread throughout the body. Cancers differ in their causes, risk factors, how often they occur, treatment, and how likely a person with that cancer is to survive. Even cancer types in the same organ may be different diseases. For example, breast cancer has 21 distinct cell types and four different molecular subtypes with differing risks, treatments, and outcomes.
- **Unfortunately, cancer is not a rare disease,** especially when considered in terms of lifetime risk. Lifetime risk is the chance a person has, over the course of their lifetime (from birth to death) of being diagnosed with or dying from cancer. Lifetime risk is one way to measure how common cancer is. Not including the most common forms of skin cancer, the average lifetime risk of developing some type of serious cancer is approximately 41% among males

and 39% among females.[18] On average, almost four in 10 people will have a diagnosis of cancer during their lifetimes.

- **Cancer is much more common among older versus younger people**. Cancer rates increase with age. Nearly 90% of all cancers are diagnosed in adults over the age of 50. With the aging of the baby boom generation and increases in life expectancy, we would expect to see more Minnesotans diagnosed with cancer.

## What causes cancer?

- **The exact causes of many cancers are unknown.** While we have no control over risk factors such as age, genetics, race/ethnicity, and family history. However, much of our cancer risk is strongly influenced by lifestyle and risk factors we can control, such as using tobacco, gaining weight, drinking alcohol, being out in the sun, and not getting enough physical activity. It is estimated that modifiable risk factors account for three in five cancer deaths in the U.S.[19]
- **Risk factors for cancer.** According to the National Cancer Institute (NCI) the most studied risk factors for cancer[20] are listed below (not in any particular order).
  - Age
  - Diet
  - Obesity
  - Alcohol
  - Tobacco
  - Radiation
  - Hormones
  - Immunosuppression
  - Chronic inflammation
  - Excessive exposure to the sun
  - Certain chemicals and other substances
  - Certain viruses and bacteria (e.g., hepatitis viruses and Human Papillomavirus (HPV))
- **While many cancers do not have one specific cause, some cancers do have known risk factors.** The known risk factors listed above account for a significant proportion of cancer occurrence. For example, 85-90% of lung cancer is attributable to smoking and 95% of cervical cancer is due to the Human Papillomavirus.
- **Cancer diagnosed today is usually related to events that happened many years ago**. It can take several decades for cancer to grow to the point where it can be detected in your body. The time between possible exposure to a carcinogen (something that causes cancer) and development of cancer often makes it difficult to identify the original cause.

## Chemical contaminants

- **Environmental factors, including chemical contaminants, account for a small amount (4%) of all cancer deaths.[19]** Some chemical contaminants have been linked to cancers, but the risk of developing cancer depends on how long a person was exposed to that contaminant, and how much contaminant was present.

- **Even if contaminants were present in a community long ago, it is very difficult to link that contaminant to current cancer diagnoses in a community.** Historical data is usually inadequate to accurately determine who was exposed and to how much of the contaminant. Furthermore, many people diagnosed with cancer have lived in several places before their diagnosis. Thus, the cancer rate in a community is frequently made up of many different experiences among people who differ in where they have lived, their personal risk factors for cancer, and their potential exposures to multiple environmental contaminants.

## Cancer concerns in communities

- **Communities and counties can vary widely in terms of known risk factors for cancer.** While age and gender distributions in a community can be measured and accounted for, missing or inaccurate information about other known risk factors (such as smoking histories) makes it almost impossible to make a direct connection to cancer rates in a community from a particular chemical contaminant. The same is true for variability in exposures, especially over time, between members of a neighborhood, group, or even a family.
- **It is normal to see many cases of cancer in a geographic area.** For example, if cancer is expected in four in 10 people on average in a neighborhood and a particular neighborhood has six in 10 people with cancer, neighbors may think there is something present in the air or water that is causing more cancers than are expected. What they don't see is that the neighborhood next to them has two in 10 people with cancer. Even when we look at cancer rates at the county level, we see great variability. At the community or neighborhood level, the variability in cancer rates is usually even greater.
- **Well-designed epidemiological studies (studies that look at the causes of disease in populations) and toxicological research** are both necessary to learn more about how a chemical contaminant may cause or contribute to cancers in human populations. Most known carcinogens (something that causes cells to become cancerous) 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 because: (1) exposures in the workplace are generally much greater than community exposures; (2) it is frequently possible to estimate past exposures in a workplace using health and safety records, job histories, and other data; and (3) it is usually possible to identify all workers for a particular time using personnel records.
- **State and federal regulatory standards and guidelines** limit potential carcinogens to ensure the risk of harm remains very low; for example, setting a standard for a contaminant below a threshold of one additional cancer in 100,000 people who are exposed to that contaminate over their lifetime. This level of cancer risk is purposefully protective and many thousands of times lower than cancer risks that can be detected by epidemiologic studies or examination of community cancer rates.

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# Appendix

## Resources

### Protecting drinking water in Minnesota

The Division of Environmental Health (EH) (https://www.health.state.mn.us/eh ) at MDH works behind the scenes with families, neighborhoods, schools, and workplaces to create conditions that support the health of all Minnesotans, no matter where they live. EH establishes health protective guidance values for contaminants, including six PFAS compounds, in drinking water that are used to ensure drinking water from private wells is safe for consumption and other household uses. When PFAS have been found above MDH guidelines in private wells in the east metro region, the Minnesota Pollution Control Agency (MPCA) has provided water treatment systems or connection to city water. EH also provides technical and engineering support to community water systems and assure compliance with federal Safe Drinking Water Act requirements through routine monitoring. Where PFAS have been detected in community water systems, EH has worked with the municipality and the MPCA to install treatment to remove PFAS to safe levels. Other activities to protect drinking water resources from contamination include: investigation of environmental contaminant releases, targeted water testing and education, and oversight to assure proper construction of drinking water wells and promote sealing of unused or abandoned wells.

### Reducing cancer risk and improving outcomes

Programs and resources are available to individuals and communities to reduce cancer risk. Examples include promoting HPV vaccination and smoking cessation, and community-driven solutions to expand health lifestyles. Cancer screening programs and services are also available. Screening and early diagnosis of cancer improve outcomes by providing care at the earliest possible stage leading to increased chance of survival, decreased problems associated with treatment, and lower costs of care. Cancer screening is effective for breast, cervical, colorectal, and lung cancers.

Resources and programs that Minnesotans can access to help reduce cancer risk and improve cancer outcomes include:

- MDH Comprehensive Cancer Program (health.state.mn.us/diseases/cancer/compcancer/index.html) The Comprehensive Cancer Control Program works with organizations and individuals across Minnesota to plan and implement a coordinated approach to address cancer. Cancer Plan Minnesota focuses on prevention and detection, treatment, survivorship and health equity.
- **Human Papillomavirus (HPV)** (health.state.mn.us/diseases/hpv/index.html). HPV is a common virus that is spread though intimate skin-to-skin contact. People who do not clear HPV infection are at increased risk for developing certain pre-cancers and cancers of the throat and mouth, cervix, vulva, vagina, penis or anus. On-time vaccination of 11- and 12-year-old boys and girls prior to HPV exposure is the best way to prevent these cancers and genital warts.

- **Helping People Quit Commercial Tobacco** (health.state.mn.us/communities/tobacco/initiatives/cessation/index.html). Tobacco products of all types contain dozens of harmful chemicals that can cause cancer. Many people who use commercial tobacco want quit and free help is available to Minnesotans.
- Statewide Health Improvement Partnership (www.health.state.mn.us/communities/ship/index.html). The Statewide Health Improvement Partnership (SHIP) supports community-driven solutions to expand opportunities for active living, healthy eating, and commercial tobacco-free living.
- **MDH Sage Programs** (www.health.state.mn.us/diseases/cancer/sage/index.html). Sage Programs partner with participating clinic sites across Minnesota to provide free screening and diagnostic services for breast and cervical cancers and free diagnostic services for colorectal cancer. In addition, Sage Programs support the implementation of population-based approaches to improve Minnesota's health systems that increase high-quality cancer care.
- **The American Cancer Society (ACS)** (www.cancer.org/about-us/local/minnesota.html).The ACS provides Minnesotans with information and resources on cancer prevention, cancer screening guidelines, access to cancer care, patient and caregiver services, and survivorship support.
- **The American Indian Cancer Foundation (AICAF)** (americanindiancancer.org/). AICAF is a national non-profit organization established to address health inequities faced by Native communities. Their mission is to eliminate the cancer burdens of Indigenous people through early detection, treatment, and survivor support, providing programs on breast, cervical, colorectal, and lung cancers, and information on prevention and policy.

# Data sources and methods

## Data sources

**Minnesota Cancer Reporting System (MCRS)**

Cancer incidence data for Minnesota and county-level statistics for were drawn from the MCRS database on January 2022. The database contains information on malignant and selected *in situ* cancers diagnosed in Minnesota residents between 1988 and 2019. After a state cancer reporting rule change, both clinical and microscopically confirmed cancers were reported to the state's cancer registry, starting in 2012. For detailed information about cancer reporting in Minnesota, cancer statistics and reports, legislative authority, and archived reports and publications, please visit Minnesota Cancer Reporting System (www.health.state.mn.us/data/mcrs/index.html).

- We used MCRS data to estimate 5-year age-standardized average annual incidence rates ("Dot-in-Bar Charts" 2015-2019) for Dakota and Washington Counties, Hennepin/Ramsey Counties combined, and Minnesota. We also analyzed MCRS data to estimate age-standardized average annual incidence for Dakota and Washington Counties and the entire state (Charts of 25-year trends (1995-2019) in kidney and pancreas cancer incidence).

**United States Cancer Statistics - Incidence: 1999 - 2018, WONDER Online Database available at http://wonder.cdc.gov/cancer-v2018.html**

The United States Cancer Statistics (USCS) are the official federal statistics on cancer incidence from registries having high-quality data and cancer mortality statistics for 50 states and the District of Columbia. Data are provided by the Centers for Disease Control and Prevention National Program of Cancer Registries (NPCR) and the National Cancer Institute Surveillance, Epidemiology and End Results (SEER) program. Data for years 1999-2018 are provided as reported to NPCR and SEER in the 2020 data submission.

- We ran queries of CDC Wonder to estimate 2014-2018 age-standardized average annual kidney and pancreas cancer incidence rates for the U.S. ("Dot in Bar Charts").

**National Cancer Institute's State Cancer Profiles online data analysis and query tool available at https://statecancerprofiles.cancer.gov**

The State Cancer Profiles are based on data from two sources: (1) National Program of Cancer Registries and Surveillance, Epidemiology, and End Results SEER*Stat Database (2001-2018) - United States Department of Health and Human Services, Centers for Disease Control and Prevention and National Cancer Institute. Based on the 2020 submission; (2) National Program of Cancer Registries SEER*Stat Database (2001-2018) - United States Department of Health and Human Services, Centers for Disease Control and Prevention (based on the 2020 submission).

AAPCs are calculated by the Joinpoint Regression Program and are based on APCs. Data are age-standardized to the 2000 US standard population (19 age groups: <1, 1-4, 5-9, ... , 80-84,85+). Rates are for invasive cancer only (except for bladder cancer which is invasive and in situ) or unless otherwise specified. Population counts for denominators are based on Census populations as modified by NCI. The 1969-2018 US Population Data File is used with SEER November 2020 data.

- We ran queries of the State Cancer Profiles online data analysis and query tool to estimate age-standardized kidney and pancreas cancer incidence rates and historical trends for Minnesota and the U.S. for the diagnosis years 2002-2018.

**Population data**

The NCI's website contains population data used in generating statistics for this report. The U.S. Census Bureau develops annual population estimates. Census population estimation methods and the population estimates used in the calculations. See the National Cancer Institute (NCI) – U.S. Population Data – 1969-2019 (seer.cancer.gov/popdata/) page for more information.

## Methods

**Analytic software**

Age-standardized incidence rates for this report were generated using NCI's SEER*Stat software. Previously published trend statistics and average annual percent change estimates for pancreas cancer in Minnesota were generated using NCI's Joinpoint software (Jump model). The Jump model accounts for sudden changes in coding rules like those that occurred in Minnesota in 2012. For more information, go to: Jump Model and Comparability Ratio Model (cancer.gov) https://surveillance.cancer.gov/joinpoint/jump.html.

**Age-standardized rate**

Incidence rates over a 5-year period represent average annual rates. As in standard registry practice, to adjust for differences in age distributions between populations, incidence rates were age-standardized to the 2000 U.S. Census Standard Population and presented per 100,000 population. To learn what an age-standardized rate is and how it is calculated, please see the NCI Tutorial to Calculate Age-Adjusted Rates (seer.cancer.gov/seerstat/tutorials/aarates/definition.html).

Incidence rates are displayed in "dot-in-bar" charts to show both the estimated incidence rate (dot) and 95% confidence intervals (gray bars). A 95% confidence interval (95% CI) represents a range in which an incidence rate is expected to be 95% of the time. This means that 5% of the time, a rate could be outside of this range.

To clarify patterns as appropriate, statistical significance was assessed based on overlapping 95% confidence intervals for two rates. If the bars of the 95% confidence intervals overlapped, the two rates were not considered statistically significantly different.

**Unstable rate**

Counties with unstable rates had a count of pancreas or kidney cancer less than 20 or a relative standard error (100 x SE/Rate) $\geq$ 30%. Unstable rates in the tables are denoted with "Yes".

**Standard population**

To learn more about the 2000 U.S. standard population used in calculating age-standardized rates, go to NCI-2000 US Standard Population (https://seer.cancer.gov/stdpopulations/single_age.html).

## Table 1. Kidney and Pancreas Cancer Incidence Rates by Diagnosis Year for Dakota County, Washington County, Minnesota

| Year | MN Kidney Rate | Dakota Kidney Rate | Dakota Kidney Rate Unstable | Washington Kidney Rate | Washington Kidney Rate Unstable | MN Pancreas Rate | Dakota Pancreas Rate | Dakota Pancreas Rate Unstable | Washington Pancreas Rate | Washington Pancreas Rate Unstable |
|---|---|---|---|---|---|---|---|---|---|---|
| 1995 | 12.4 | 11.7 | | 8.9 | Yes | 7.8 | 4.2 | Yes | 9.5 | Yes |
| 1996 | 10.4 | 10.7 | | 6.7 | Yes | 8.7 | 8.8 | Yes | 10.4 | Yes |
| 1997 | 11.0 | 10.5 | | 11.7 | | 7.9 | 9.5 | Yes | 9.1 | Yes |
| 1998 | 11.7 | 11.8 | | 8.6 | Yes | 8.7 | 12.3 | | 6.5 | Yes |
| 1999 | 12.1 | 10.9 | | 7.5 | Yes | 8.4 | 7.6 | | 6.8 | Yes |
| 2000 | 13.3 | 12.7 | | 11.9 | | 9.6 | 7.7 | | 8.9 | Yes |
| 2001 | 13.2 | 11.7 | | 17.4 | | 8.7 | 8.2 | | 6.7 | Yes |
| 2002 | 13.9 | 16.4 | | 16.1 | | 8.6 | 7.5 | | 10.5 | Yes |
| 2003 | 14.8 | 13.6 | | 18.4 | | 10.0 | 8.3 | | 9.2 | Yes |
| 2004 | 14.6 | 14.3 | | 15.4 | | 9.3 | 8.1 | | 10.2 | Yes |
| 2005 | 14.7 | 14.3 | | 17.2 | | 10.2 | 14.0 | | 5.3 | Yes |
| 2006 | 15.7 | 17.5 | | 13.6 | | 10.2 | 9.4 | | 6.5 | Yes |
| 2007 | 16.2 | 13.6 | | 13.1 | | 9.9 | 8.0 | | 8.1 | Yes |
| 2008 | 16.8 | 17.0 | | 20.5 | | 11.1 | 8.2 | | 11.6 | |
| 2009 | 15.0 | 14.0 | | 9.6 | | 10.0 | 10.9 | | 11.5 | |
| 2010 | 16.1 | 20.8 | | 19.9 | | 10.6 | 12.5 | | 9.2 | |
| 2011 | 15.1 | 16.0 | | 10.9 | | 11.6 | 8.6 | | 12.6 | |
| 2012 | 15.9 | 19.2 | | 19.0 | | 12.6 | 9.4 | | 11.8 | |
| 2013 | 16.3 | 12.9 | | 17.8 | | 12.1 | 10.1 | | 15.9 | |
| 2014 | 18.3 | 16.5 | | 21.2 | | 13.0 | 12.4 | | 13.5 | |
| 2015 | 18.0 | 14.6 | | 19.1 | | 14.0 | 11.1 | | 16.2 | |
| 2016 | 17.2 | 21.4 | | 17.7 | | 14.1 | 15.6 | | 10.0 | |
| 2017 | 17.4 | 15.6 | | 20.4 | | 13.6 | 12.6 | | 10.6 | |
| 2018 | 18.3 | 18.7 | | 18.0 | | 14.2 | 13.5 | | 12.9 | |
| 2019 | 17.9 | 18.7 | | 13.8 | | 13.0 | 13.8 | | 11.6 | |

*Age-standardized incidence rates per 100,000 population*

## Table 2. Kidney and Pancreas Cancer Incidence Rates for Minnesota Counties, 2015-2019

| County | Kidney Rate | Kidney Count | Kidney Rate Unstable | Pancreas Rate | Pancreas Count | Pancreas Rate Unstable |
|---|---|---|---|---|---|---|
| Aitkin | 17.2 | 23 | | 10.8 | 20 | |
| Anoka | 19.0 | 381 | | 13.9 | 263 | |
| Becker | 19.6 | 48 | | 15.9 | 41 | |
| Beltrami | 30.5 | 71 | | 16.5 | 43 | |
| Benton | 14.9 | 35 | | 15.6 | 35 | |
| Big Stone | 17.4 | < 20 | Yes | 10.5 | < 20 | Yes |
| Blue Earth | 21.5 | 72 | | 12.6 | 45 | |
| Brown | 19.4 | 34 | | 12.3 | 25 | |
| Carlton | 23.5 | 55 | | 13.5 | 33 | |
| Carver | 14.7 | 78 | | 11.9 | 58 | |
| Cass | 23.7 | 53 | | 16.9 | 44 | |
| Chippewa | 26.7 | 20 | | 17.4 | < 20 | Yes |
| Chisago | 17.1 | 56 | | 10.9 | 40 | |
| Clay | 22.1 | 72 | | 16.1 | 56 | |
| Clearwater | 28.6 | < 20 | Yes | 20.5 | < 20 | Yes |
| Cook | 3.6 | < 20 | Yes | 20.5 | < 20 | Yes |
| Cottonwood | 13.6 | < 20 | Yes | 9.4 | < 20 | Yes |
| Crow Wing | 20.2 | 90 | | 12.5 | 66 | |
| Dakota | 17.7 | 421 | | 13.3 | 309 | |
| Dodge | 21.1 | 26 | | 11.1 | < 20 | Yes |
| Douglas | 17.9 | 47 | | 15.8 | 51 | |
| Faribault | 21.3 | < 20 | Yes | 13.8 | < 20 | Yes |
| Fillmore | 19.6 | 30 | | 8.6 | < 20 | Yes |
| Freeborn | 23.4 | 47 | | 12.6 | 29 | |
| Goodhue | 15.4 | 50 | | 11.4 | 40 | |
| Grant | 17.9 | < 20 | Yes | 16.5 | < 20 | Yes |
| Hennepin | 15.6 | 1,066 | | 14.1 | 956 | |
| Houston | 16.9 | 25 | | 16.6 | 23 | |
| Hubbard | 17.4 | 28 | | 19.7 | 35 | |

| County | Kidney Rate | Kidney Count | Kidney Rate Unstable | Pancreas Rate | Pancreas Count | Pancreas Rate Unstable |
|---|---|---|---|---|---|---|
| Isanti | 20.8 | 49 | | 10.2 | 26 | |
| Itasca | 23.0 | 75 | | 13.1 | 48 | |
| Jackson | 17.4 | < 20 | Yes | 13.0 | < 20 | Yes |
| Kanabec | 17.4 | 22 | | 9.3 | < 20 | Yes |
| Kandiyohi | 18.3 | 53 | | 12.9 | 39 | |
| Kittson | 17.6 | < 20 | Yes | 14.9 | < 20 | Yes |
| Koochiching | 16.2 | < 20 | Yes | 16.1 | < 20 | Yes |
| Lac qui Parle | 27.4 | < 20 | Yes | 24.6 | < 20 | Yes |
| Lake | 38.9 | 28 | | 20.3 | < 20 | Yes |
| Lake of the Woods | 20.1 | < 20 | Yes | 11.8 | < 20 | Yes |
| Le Sueur | 18.3 | 32 | | 16.9 | 32 | |
| Lincoln | 10.9 | < 20 | Yes | 21.7 | < 20 | Yes |
| Lyon | 18.7 | 28 | | 16.6 | 26 | |
| Mahnomen | 16.8 | < 20 | Yes | 19.4 | < 20 | Yes |
| Marshall | 20.0 | < 20 | Yes | 13.1 | < 20 | Yes |
| Martin | 23.8 | 34 | | 12.8 | 22 | |
| McLeod | 14.9 | 35 | | 13.3 | 33 | |
| Meeker | 16.3 | 28 | | 14.1 | 26 | |
| Mille Lacs | 21.5 | 37 | | 14.3 | 27 | |
| Morrison | 24.3 | 54 | | 13.0 | 31 | |
| Mower | 20.2 | 50 | | 10.2 | 27 | |
| Murray | 14.6 | < 20 | Yes | 5.7 | < 20 | Yes |
| Nicollet | 28.6 | 55 | | 11.5 | 23 | |
| Nobles | 15.1 | < 20 | Yes | 19.0 | 27 | |
| Norman | 31.4 | < 20 | Yes | 21.4 | < 20 | Yes |
| Olmsted | 14.3 | 127 | | 12.9 | 117 | |
| Otter Tail | 20.1 | 92 | | 14.3 | 72 | |
| Pennington | 21.9 | 20 | | 11.4 | < 20 | Yes |
| Pine | 21.4 | 44 | | 14.4 | 34 | |
| Pipestone | 18.6 | < 20 | Yes | 17.2 | < 20 | Yes |
| Polk | 16.7 | 34 | | 18.8 | 39 | |

| County | Kidney Rate | Kidney Count | Kidney Rate Unstable | Pancreas Rate | Pancreas Count | Pancreas Rate Unstable |
|---|---|---|---|---|---|---|
| Pope | 12.3 | < 20 | Yes | 8.8 | < 20 | Yes |
| Ramsey | 17.4 | 522 | | 15.0 | 447 | |
| Red Lake | 11.0 | < 20 | Yes | 22.3 | < 20 | Yes |
| Redwood | 21.9 | 23 | | 14.2 | < 20 | Yes |
| Renville | 28.0 | 26 | | 14.5 | < 20 | Yes |
| Rice | 18.1 | 69 | | 10.7 | 41 | |
| Rock | 16.7 | < 20 | Yes | 12.0 | < 20 | Yes |
| Roseau | 21.0 | 21 | | 9.8 | < 20 | Yes |
| Scott | 16.7 | 117 | | 14.7 | 96 | |
| Sherburne | 15.8 | 76 | | 12.4 | 55 | |
| Sibley | 18.0 | < 20 | Yes | 15.3 | < 20 | Yes |
| St. Louis | 17.8 | 248 | | 13.6 | 200 | |
| Stearns | 17.1 | 151 | | 11.2 | 100 | |
| Steele | 18.9 | 42 | | 14.0 | 33 | |
| Stevens | 16.2 | < 20 | Yes | 35.5 | 22 | |
| Swift | 12.3 | < 20 | Yes | 14.0 | < 20 | Yes |
| Todd | 15.2 | 29 | | 16.2 | 30 | |
| Traverse | 17.6 | < 20 | Yes | 12.0 | < 20 | Yes |
| Wabasha | 13.2 | < 20 | Yes | 9.9 | < 20 | Yes |
| Wadena | 25.0 | 21 | | 11.0 | < 20 | Yes |
| Waseca | 15.7 | 21 | | 20.0 | 23 | |
| Washington | 17.8 | 276 | | 12.2 | 185 | |
| Watonwan | 15.3 | < 20 | Yes | 13.6 | < 20 | Yes |
| Wilkin | 39.9 | < 20 | Yes | 9.9 | < 20 | Yes |
| Winona | 16.0 | 44 | | 17.5 | 55 | |
| Wright | 18.2 | 127 | | 14.1 | 94 | |
| Yellow Medicine | 12.9 | < 20 | Yes | 14.4 | <20 | Yes |

*Age-standardized incidence rates per 100,000 population; MCRS 2015-2019*