LUNG CANCER IN WISCONSIN

A REPORT BY THE WISCONSIN CANCER COLLABORATIVE

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Wisconsin Cancer Collaborative

ACKNOWLEDGEMENTS

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For more information, or to view the Wisconsin Cancer Plan 2020-2030 for strategies and action steps to improve cancer survival in Wisconsin, visit **www.wicancer.org.**

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KEY POINTS

- Lung cancer incidence and mortality in Wisconsin declined significantly in the last decade.
- Lung cancer incidence is declining at a slower pace in Wisconsin compared to the U.S. overall in recent years.
- Men have higher rates of lung cancer than women in general, but particularly at ages 60+ when lung cancer is more often diagnosed.
- Non-Hispanic (NH) American Indian/Alaska Native (AI/AN) populations in Wisconsin had the highest rates of lung cancer from 2017-2021. NH Black populations had the second highest incidence rate. The racial and ethnic disparity between NH AI/AN and NH Black populations compared to NH White populations in Wisconsin is notably larger than the U.S. overall.
- Lung cancer screening can find cancer at an earlier stage, when there are more treatment options. Screening rates remain low but those at high risk may benefit from interventions to raise awareness of screening options.

INTRODUCTION

Lung cancer (both small cell and non-small cell) is the second most common cancer for both men and women in the U.S. (not including skin cancer).[1] In Wisconsin, approximately 4,400 new cases are diagnosed annually, and more than 2,590 people die from the disease each year.[3,4] Roughly 1 in 16 men and 1 in 17 women in the U.S. will develop lung cancer in their lifetime.[1]

Lung cancer is by far the leading cause of cancer deaths, accounting for 1 in 5 of all cancer deaths in the U.S.[1] In Wisconsin, lung cancer deaths outnumbered all colon, breast, and prostate cancer deaths combined.[3,4]

This report provides an overview of Wisconsin's lung cancer landscape, focusing on incidence and mortality, as well as survival outcomes for small cell lung cancer and non-small cell lung cancer combined (Table 1). It also offers insights into how lung cancer affects different populations in Wisconsin, highlights important risk factors, and underscores the importance of timely diagnosis and treatment. Understanding these data are critical to implementing effective public health strategies and improving outcomes for those affected by lung cancer.

TABLE 1.
Two main types of lung cancer.[2]

Small Cell Lung Cancer	Non-Small Cell Lung Cancer
Two types of small cell lung cancer: **1)** Small cell carcinoma **2)** Mixed small cell/large cell cancer or combined small cell lung cancer • The types of small cell lung cancer are named for the kinds of cells found in the cancer and how the cells look when viewed under a microscope. • Small cell lung cancer is almost always associated with cigarette smoking. • Small cell lung cancer is usually treated with chemotherapy.	There are three different types of non-small cell lung cancer: **1)** Adenocarcinoma **2)** Squamous cell carcinoma **3)** Large cell carcinoma • Non-small cell lung cancer is more common. It makes up 80% of lung cancer cases. • This type of cancer usually grows and spreads to other parts of the body more slowly than small cell lung cancer does.

DEFINITIONS

Definitions are from the National Cancer Institute Dictionary of Cancer Terms.[5]

- **Age-adjusted rate:** Age adjusting the cancer rates ensures that differences in incidence or deaths from one year to another, or between one geographic area and another, are not due to differences in the age distribution of the populations being compared.

- **Annual percentage change (APC):** One way to characterize trends in cancer rates over time using linear regression analyses transformed to a logarithmic scale. This approach assumes cancer rates change at a constant percentage of the rate of the previous year. The change in rates over time is described as the slope of a trend line.

- **Commercial tobacco ("tobacco"):** A corruption of traditional tobacco into dangerous recreational commodities like cigarettes, vapes, and chewing tobacco.

- **Confidence intervals (CI):** Confidence intervals demonstrate the variation in the estimation of cancer rates. The width of confidence interval differs based on the amount of variability in the data.

- **Incidence rate:** The number of new cases in a population over a specified period.

- **Low-dose computed tomography:** A procedure that uses a computer linked to an x-ray machine that gives off a very low dose of radiation to make a series of detailed pictures of areas inside the body.

- **Lung cancer:** Cancer that forms in tissues of the lung, usually in the cells lining air passages. The two main types are small cell lung cancer and non-small cell lung cancer. These types are diagnosed based on how the cells look under a microscope.

- **Mortality rate:** A measure of the frequency of occurrence of death in a defined population during a specified interval.

- **Non-small cell lung cancer:** A group of lung cancers named for the kinds of cells found in the cancer and how the cells look under a microscope. The three main types of non-small cell lung cancer are adenocarcinoma (most common), squamous cell carcinoma, and large cell carcinoma.

- **Radon:** A radioactive gas that is released by uranium, a substance found in soil and rock. Breathing in too much radon can damage lung cells and may lead to lung cancer.

- **Small cell lung cancer:** An aggressive (fast-growing) cancer that forms in tissues of the lung and can spread to other parts of the body. The cancer cells look small and oval shaped when viewed under a microscope.

- **Stage:** The extent of a cancer in the body. Staging is usually based on the size of the tumor, whether lymph nodes contain cancer, and whether the cancer has spread from the original site to other parts of the body.

- **Survival rate:** The percentage of people in a study or treatment group who are still alive for a certain period of time after they were diagnosed with or started treatment for a disease, such as cancer. The survival rate is often stated as a five-year survival rate, which is the percentage of people in a study or treatment group who are alive five years after their diagnosis or the start of treatment. Also called the overall survival rate.

- **Traditional tobacco:** A sacred medicine for healing, offerings to the Creator, and spiritual gifts to express gratitude, show respect, and ask for prayers or advice used by Native communities.

DATA SOURCES, METHODS, AND CONSIDERATIONS

Table 2 describes data sources used in this report. Most incidence data are from the Wisconsin Cancer Reporting System (WCRS) at the Wisconsin Department of Health Services. All health care facilities in Wisconsin are required to report cancers to WCRS as mandated by Wis. Stat. § 255.04, Cancer Reporting. All tumors with malignant cell types are reportable except basal cell and squamous cell carcinomas of the skin and in situ cervical cancer. Lung and bronchus cancers were defined by SEER Site Recode ICD-O-3/WHO 2008 "22030" and are referred to as "lung cancer" throughout the narrative of this report.

All analyses on lung cancer incidence and mortality were performed in SEER*Stat version 8.4.3 and Joinpoint version 5.2.0. To determine whether Joinpoint annual percentage changes (APCs) were significantly different from zero, a t-test was used.

All lung cancer rates are age-adjusted and expressed per 100,000 using the 2000 U.S. standard population in 19 age groups. Ninety-five percent CIs around age-adjusted cancer incidence rates use the Tiwari *et al.*, 2006 modification.[6]

To protect confidentiality, counts, rates, and percentages in all figures and tables are suppressed when there are fewer than six cases or 10 deaths.

Finally, this report includes data on new cancer cases diagnosed in 2020, when the COVID-19 pandemic disrupted health services, leading to delays and reductions in cancer screening and diagnoses. This may have contributed to the decline in new lung cancer diagnoses during these years. For this reason, we excluded 2020 in our trend data to account for COVID-19 pandemic impacts.

TABLE 2.
Data sources for lung cancer incidence and mortality data.

Type	SEER*Stat Database or Source
Wisconsin Incidence	Wisconsin Cancer Reporting System, Office of Health Informatics, Wisconsin Department of Health Services. Internal SEER*Stat Incidence Database, accessed July 23, 2024. NAACCR Incidence Data - CiNA Research Data, 2010-2021, Public Use (20 Age Groups), Dec 2023 Submission. Stage at diagnosis data: U.S. Cancer Statistics Working Group. U.S. Cancer Statistics Data Visualizations Tool. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, and National Cancer Institute; https://www.cdc.gov/cancer/dataviz, released in June 2024.
Wisconsin and U.S. Mortality	Surveillance, Epidemiology, and End Results (SEER) Program SEER*Stat Database: Mortality - All COD, Aggregated With County, Total U.S. (1990-2021) Katrina/Rita Population Adjustment - Linked To County Attributes - Total U.S., 1969-2022 Counties, National Cancer Institute, DCCPS, Surveillance Research Program, released May 2024. Underlying mortality data provided by the National Center for Health Statistics.
U.S. Incidence	North American Association of Central Cancer Registries (NAACCR) SEER*Stat database: NAACCR Incidence Data - CiNA Research Data, 2010-2021, Public Use (20 Age Groups), Nov 2023 Submission.

WCRS supports online public portals with cancer surveillance data for free. Data for common cancer sites is available at the county-level.

www.dhs.wisconsin.gov/wcrs/data-pubs.htm

TRENDS

Lung cancer age-adjusted incidence and mortality rates in both the United States and Wisconsin declined significantly in the last decade. Modeled trends analyzed in Joinpoint are displayed as dotted lines in Figures 1 and 2.
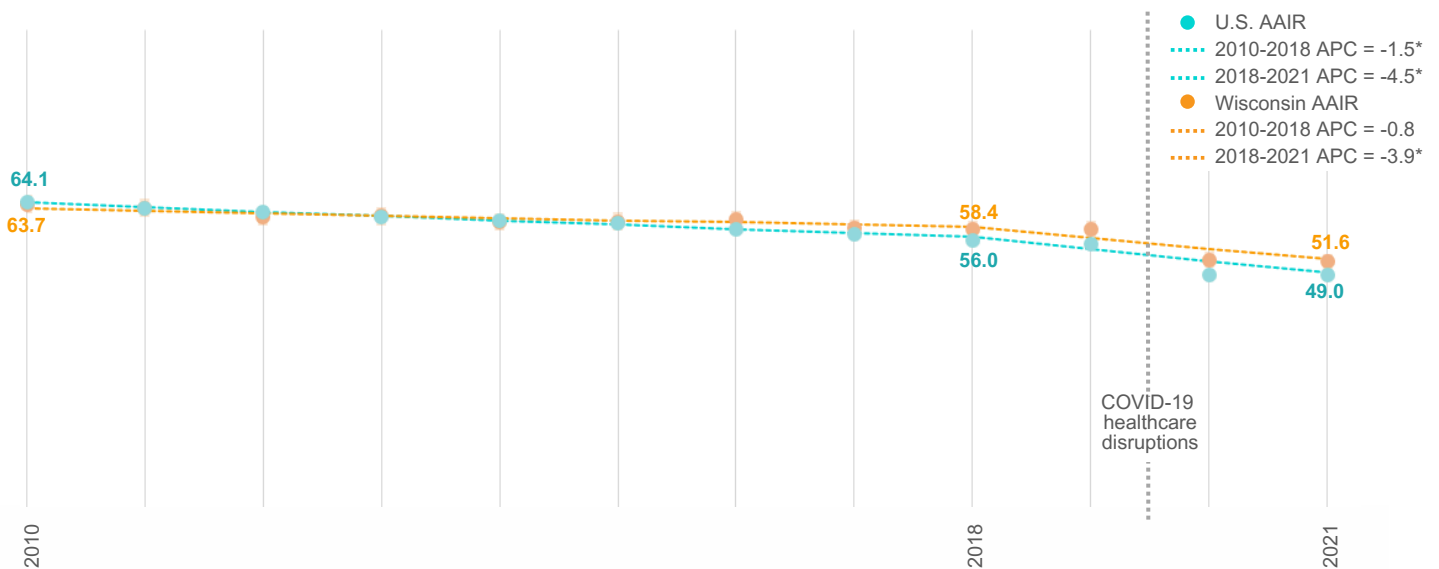
These modeled trends suggest Wisconsin lung cancer incidence rates are declining at a slightly slower rate than the U.S. overall in the last decade, while mortality rates are declining at about the same rate.

Declining smoking rates, effective tobacco control policies and regulations, earlier diagnosis, and improved treatments are largely responsible for improvements in lung cancer incidence and mortality.

FIGURE 1.
Trends in lung cancer age-adjusted incidence rates (AAIR) per 100,000, U.S. and Wisconsin (2010-2021).

U.S. AAIR
2010-2018 APC = -1.5*
2018-2021 APC = -4.5*
Wisconsin AAIR
2010-2018 APC = -0.8
2018-2021 APC = -3.9*

64.1
63.7
58.4
56.0
51.6
49.0

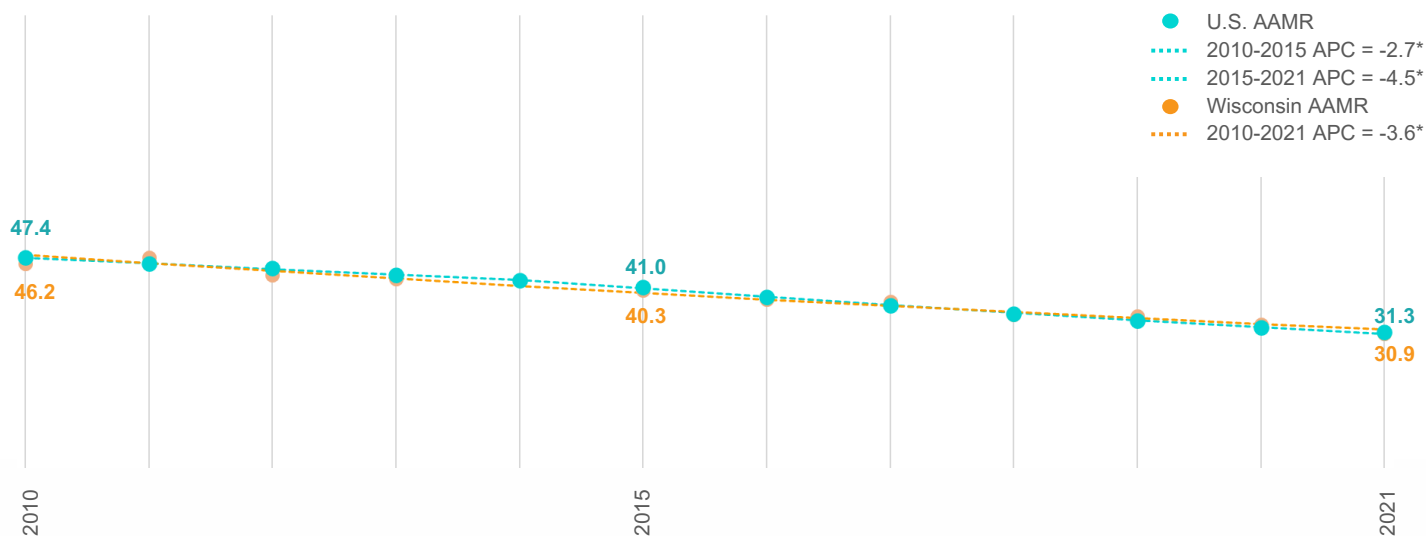COVID-19 healthcare disruptions

2010
2018
2021

The COVID-19 pandemic disrupted access to medical care. This resulted in a drop in cancer diagnoses for the year 2020, particularly for cancers diagnosed before symptoms develop. This drop reflects changes in medical care for 2020 and should not be interpreted as a reduction in the underlying lung and bronchus cancer burden.

*Indicates significant change in APC.

FIGURE 2.
Trends in lung cancer age-adjusted mortality rates (AAMR) per 100,000, U.S. and Wisconsin (2010-2021).

Legend:
- ● U.S. AAMR
- ···· 2010-2015 APC = -2.7*
- ···· 2015-2021 APC = -4.5*
- ● Wisconsin AAMR
- ···· 2010-2021 APC = -3.6*

47.4
46.2
41.0
40.3
31.3
30.9

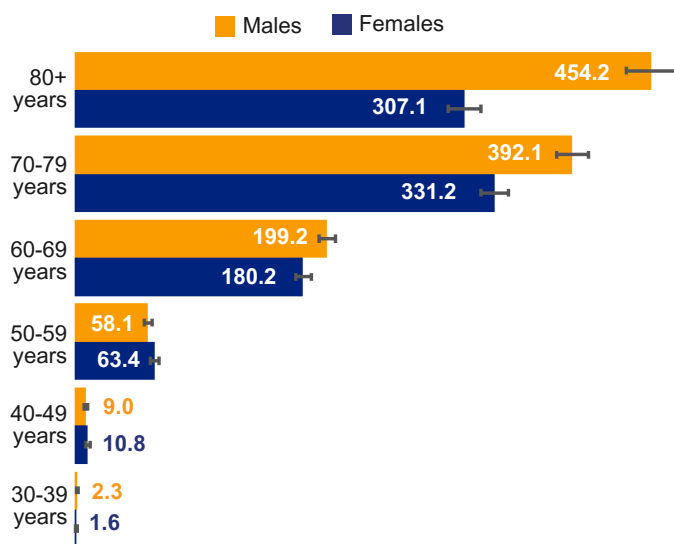2010 — 2015 — 2021

*Indicates significant change in APC.

SEX

Men have a higher risk of being diagnosed with lung cancer at some point in their lives. Lung cancer incidence in Wisconsin is higher for men than women. This disparity becomes more notable at ages 60+, when lung cancer is more frequently diagnosed (Figure 3).

After age 30, men have higher lung cancer mortality among all 10-year age groups (Figure 4). Men are also more likely to be diagnosed with lung cancer at distant stages, when it is harder to treat (Figure 8). The reasons for observed sex differences in lung cancer incidence and outcomes are complex, and likely involve a combination of multiple environmental, biological, and behavioral factors.
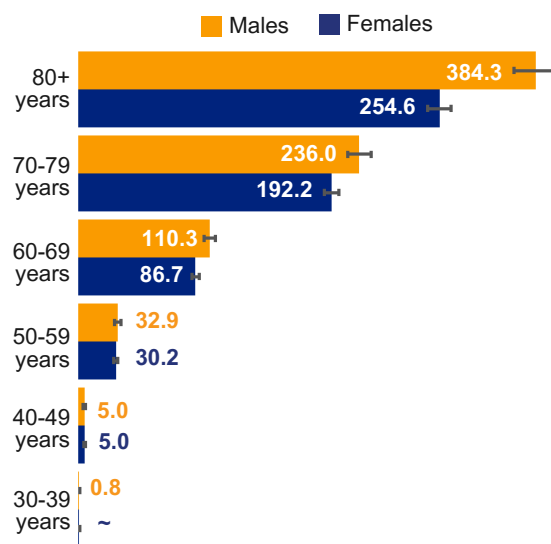
FIGURE 3.
Age-adjusted lung cancer incidence rates per 100,000 by sex and age at diagnosis, Wisconsin (2017-2021).

■ Males   ■ Females

Age	Males	Females
80+ years	454.2	307.1
70-79 years	392.1	331.2
60-69 years	199.2	180.2
50-59 years	58.1	63.4
40-49 years	9.0	10.8
30-39 years	2.3	1.6

FIGURE 4.
Age-adjusted lung cancer mortality rates per 100,000 by sex and age at death, Wisconsin (2017-2021).

■ Males   ■ Females

Age	Males	Females
80+ years	384.3	254.6
70-79 years	236.0	192.2
60-69 years	110.3	86.7
50-59 years	32.9	30.2
40-49 years	5.0	5.0
30-39 years	0.8	~

RACE AND ETHNICITY

Non-Hispanic (NH) American Indian/Alaska Native (AI/AN) populations in Wisconsin had the highest incidence of lung cancer from 2017-2021 (Figure 5). That rate is 1.8 times that of the Wisconsin overall rate. NH Black populations had the second highest rate at 84.9 per 100,000.

NH Black and NH AI/AN populations had the highest rates of lung cancer mortality from 2017-2021 (Figure 6). Both are 1.5 times that of the Wisconsin overall mortality rate.

The racial and ethnic disparities between NH AI/AN and NH Black populations compared to the NH White population in Wisconsin are possibly due to a number of factors. Individuals are less likely to be diagnosed early and less likely to receive treatment.[7] Additionally, racial and ethnic disparities in commercial tobacco use persist. Unjust and unfair systems, practices, policies, and conditions have negatively affected these populations and may explain root causes.[8,9] Some examples include targeted tobacco industry marketing, uneven protections to secondhand smoke exposure, barriers to health care and treatment, and the pressures of discrimination, poverty, and other social conditions that can exacerbate smoking and its related health problems.[10]

FIGURE 5.
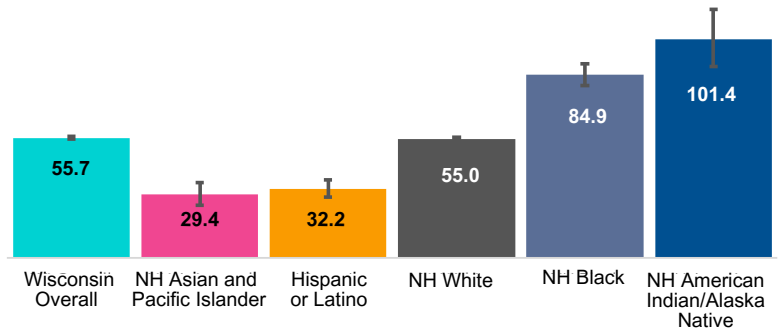Age-adjusted lung cancer incidence rates per 100,000, Wisconsin (2017-2021).

FIGURE 6.
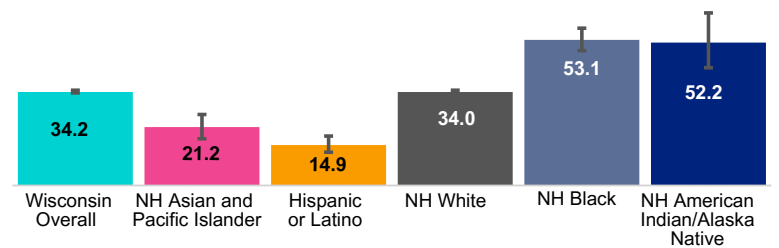Age-adjusted lung cancer mortality rates per 100,000, Wisconsin (2017-2021).

TABLE 3.
Lung cancer incidence and mortality, counts and age-adjusted rates per 100,000 by race and ethnicity, Wisconsin (2017-2021).

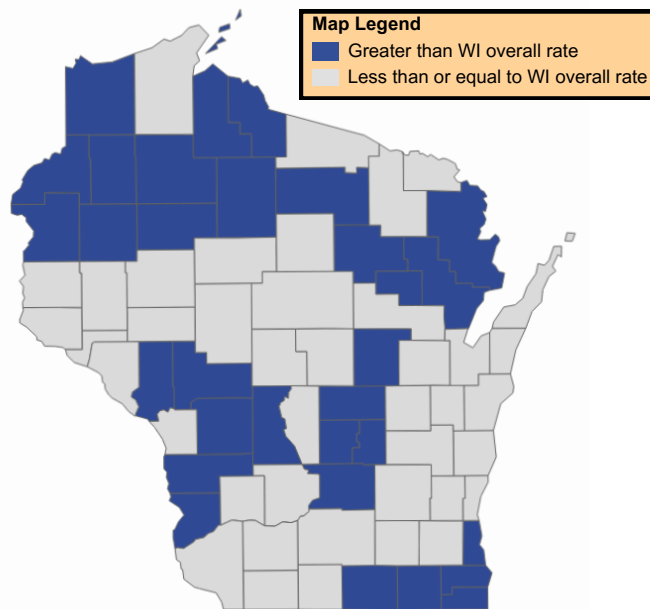| Race	Incidence		Mortality	
	Cases	Rate (95% CI)	Deaths	Rate (95% CI)
Wisconsin Overall	21,987	55.7 (55.0, 56.5)	13,327	34.2 (33.6, 34.8)
NH American Indian/Alaska Native	266	101.4* (88.8, 115.3)	129	52.2 (43.0, 62.8)
NH Black	1,237	84.9 (79.9, 90)	716	53.1 (49.1, 57.4)
NH White	19,995	55.0 (54.3, 55.8)	12,262	34.0 (33.4, 34.6)
Hispanic or Latino	287	32.2 (28.2, 36.4)	125	14.9 (12.2,18)
NH Asian and Pacific Islander	143	29.4 (24.6, 34.8)	95	21.2 (17, 26)
Unknown	68	~	NA	NA

GEOGRAPHY

Lung cancer incidence and mortality also vary by geography. For the most part, counties with higher lung cancer incidence rates tend to have higher lung cancer mortality rates (Figures 7A-C). Data supporting Figures 7A-C can be found in Appendix 6.

Some geographic differences in lung cancer rates may be explained by variances in known risk factors, like commercial tobacco use. For example, rates of lung cancer and other tobacco-associated cancers are higher in regions with a higher prevalence of smoking. Although environmental carcinogens can be responsible for some cancer cases, most cases appear to be related to lifestyle and behavioral factors such as smoking.
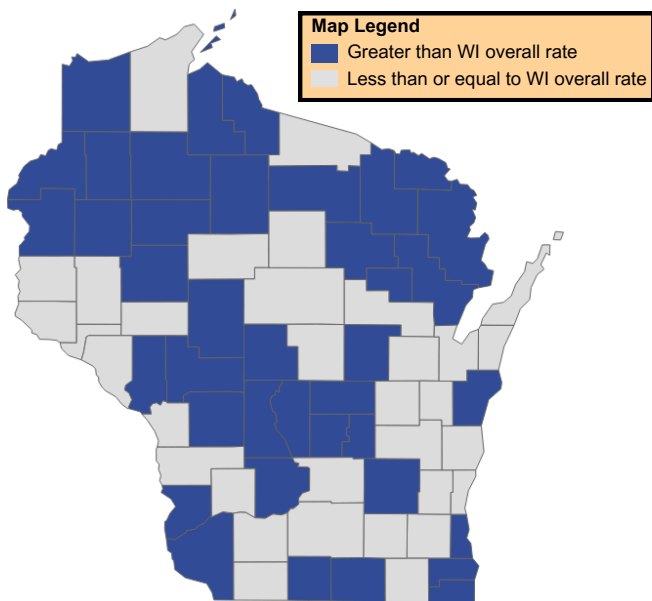
We do know that lung cancer rates tend to be higher in rural areas than in urban areas across the U.S. It is suspected that elevated lung cancer incidence in rural areas is due to higher commercial tobacco use.[11] Residents in rural areas may also have a harder time accessing cancer screening, diagnosis and treatment, and tobacco cessation counseling.

It should also be noted that northern counties in Wisconsin have higher (older) median ages than southern/southeastern Wisconsin counties.[12]
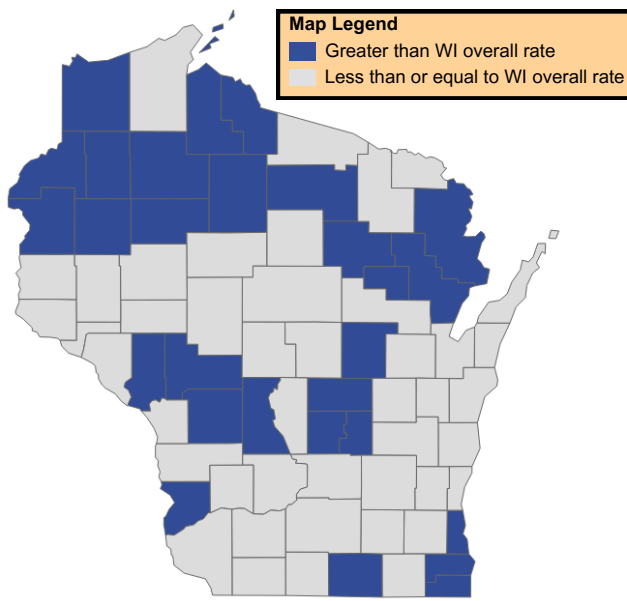
FIGURE 7A.
Lung cancer age-adjusted incidence rates by county (2017-2021).

Map Legend
- Greater than WI overall rate
- Less than or equal to WI overall rate

FIGURE 7B.
Lung cancer age-adjusted mortality rates by county (2017-2021).

Map Legend
- Greater than WI overall rate
- Less than or equal to WI overall rate

FIGURE 7C.
Lung cancer age-adjusted incidence and mortality rates by county (2017-2021).

Map Legend
- Greater than WI overall rate
- Less than or equal to WI overall rate

SCREENING

Lung cancer screening is a painless procedure that uses a low-dose computed tomography (LDCT) scan. LDCT scans can be used for those who are at an increased risk of developing lung cancer. Data suggests LDCT can reduce the lung cancer death rate 20% by detecting cases at earlier stages.[13]

The U.S. Preventive Services Task Force recommends annual screening for lung cancer with LDCT in adults aged 50 to 80 years old who have a 20 pack-year smoking history, and currently smoke or have quit within the past 15 years (Table 4).[14]

In 2022, only 19.2% of adults at high risk for lung cancer in Wisconsin were screened compared to the national average of 16%.[13] Screening is most effective in reducing lung cancer mortality when high risk individuals are evaluated sooner, and cancer is detected earlier.

Low screening rates among those at high risk may be due to lack of access or knowledge among patients and providers. Also, the revised recommendations defining eligibility exclusively based on pack-year thresholds exclude racial and ethnic differences in lung cancer risk which could make them less likely to be eligible for screening.[15]

The American Lung Association curates resources for health care professionals, patients, and friends and family. Learn more about what you can do to help at Lung Cancer Screening Resources (www.lung.org/lung-health-diseases/lung-disease-lookup/lung-cancer/screening-resources).

TABLE 4.
U.S. Preventive Services Task Force Lung Cancer Screening Recommendation (2021).

High Risk is defined as:	
Age	50-80 years
Smoking History	20 or more pack-year history (this means 1 pack a day for 20 years, 2 packs a day for 10 years, etc.)
Smoking Status	Current smoker or quit within the last 15 years

A computer tomography (CT) scan with a patient in gown.

STAGE AND SURVIVAL

Five-year relative survival statistics measure the proportion of people who will be alive five years after diagnosis, given that they did not die from something else during that time. Lung cancer has one of the lowest five-year survival rates compared to other cancers because cases are often diagnosed at a distant stage, when treatments are less likely to be effective. The five-year relative survival rate for lung cancer in Wisconsin is 29.4% which is not significantly different from the national rate of 28.4%.[13]

From 2017-2021, nearly half (47%) of all staged lung cancers in the U.S. were diagnosed at a distant stage, meaning the cancer had spread from the lungs to distant parts of the body.[17,18] When diagnosed at a distant stage, the five-year relative survival rate for lung cancer patients is only 9%.[18] About one in three (29%) of U.S. lung cancer cases from 2017-2021 were found at a localized stage (the cancer had not spread outside the lungs). When diagnosed at a localized stage, the five-year relative survival rate is estimated at 60%.

In Wisconsin from 2017-2021, 45% of staged lung cancers were diagnosed at a distant stage (Figure 8), and 31% of cases were diagnosed at a localized stage. Both are slightly better than national estimates. The American Lung Association ranks Wisconsin 9th among 47 U.S. states with available data on diagnosis at an early stage, placing the state above the national average.[13]
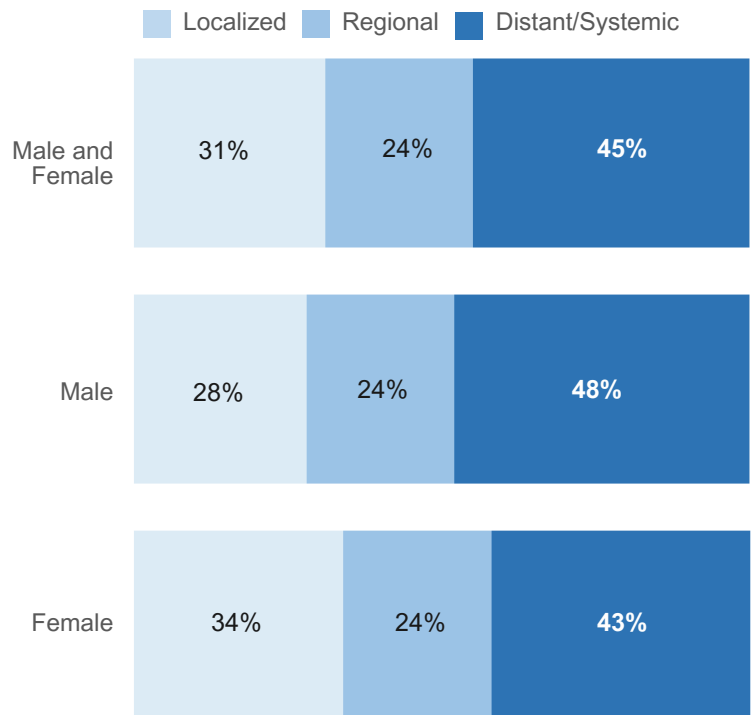
Men with lung cancer in Wisconsin are more likely to be diagnosed at distant stages when it is harder to treat (Figure 8). In Wisconsin, the five-year relative survival rate for men (24%) is lower than women (32%).[16] Sex disparities in stage of diagnosis are also seen across the U.S.

The reasons for sex disparities in lung cancer survival are complex, but some potential contributions include differences in stage at diagnosis and treatment response, differences in tumor characteristics, other biological differences such as sex hormones and immune system functioning, as well as behavioral differences.

NH American Indian/Alaska Native (AI/AN) populations in Wisconsin have the lowest five-year lung cancer survival rates at 22% (Figure 9). NH AI/AN populations also have higher proportions of cases diagnosed at distant stages (48%) compared to Wisconsin overall (45%) (Figure 10).
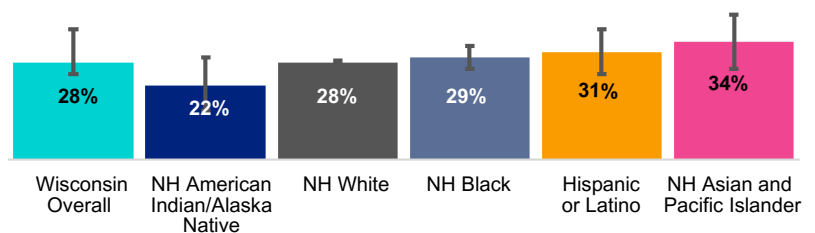
NH Asian and Pacific Islander populations in Wisconsin have the highest five-year survival rate (34%) despite having a higher proportion of cases diagnosed at distant stages (54%).

FIGURE 8.
Stage distribution* (%) of new lung cancer cases by sex, Wisconsin (2017-2021).

| Localized | Regional | Distant/Systemic |

Male and Female	31%	24%	45%
Male	28%	24%	48%
Female	34%	24%	43%

*Unknown stages excluded from percentages represented in this figure.

FIGURE 9.
Five-year relative survival* (%), lung cancer by race/ethnicity, Wisconsin.

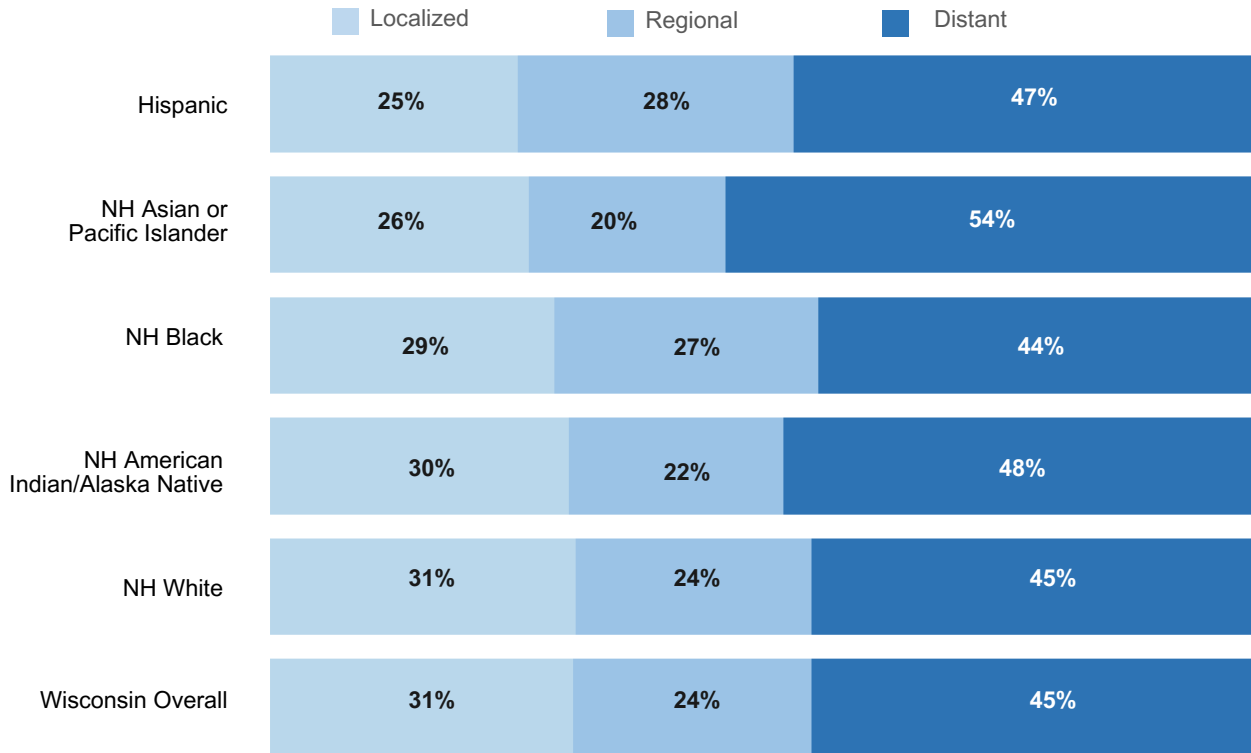| Wisconsin Overall | NH American Indian/Alaska Native | NH White | NH Black | Hispanic or Latino | NH Asian and Pacific Islander |
| 28% | 22% | 28% | 29% | 31% | 34% |

*Estimates are based on cases reported from 2014-2020 and follow-up of patients through December 31, 2020.

FIGURE 10.
Stage distribution* (%) of new lung cancer cases by race/ethnicity, Wisconsin (2017-2021).

	Localized	Regional	Distant
Hispanic	25%	28%	47%
NH Asian or Pacific Islander	26%	20%	54%
NH Black	29%	27%	44%
NH American Indian/Alaska Native	30%	22%	48%
NH White	31%	24%	45%
Wisconsin Overall	31%	24%	45%

*Unknown stages excluded from percentages represented in this figure.

TREATMENT

Lung cancer cases are often diagnosed at a distant stage, when treatments are less likely to be effective because the cancer has spread from the lungs to distant parts of the body. Lung cancer screening can find cancer at an earlier stage, when there are more treatment options. Screening rates remain low but those at high risk may benefit from interventions to raise awareness of screening options.

Although there are multiple treatment options for individuals diagnosed with lung cancer, those who undergo surgery as part of their initial treatment experience higher survival rates than those who do not. In Wisconsin, 21.8% of cases undergo surgery as part of the first course of treatment.[13] Other treatments may be recommended instead of, or in addition to surgery, such as chemotherapy, radiation, targeted therapy, or immunotherapy.

After diagnosis, some individuals may not receive treatment due to poor health or refuse treatment for their cancer. In Wisconsin, 17.5% of cases do not receive treatment for lung cancer.[13] There could also be barriers to receiving cancer treatment such as stigma, fatalism after diagnosis, the cost of treatment, access to a treatment facility, or lack of knowledge among the patient or provider. However, these barriers should not prevent someone from receiving cancer treatment. It is important to address these barriers to reduce the percentage of individuals who forego treatment.

RISK REDUCTION

Like many other chronic diseases, there are ways to reduce the risk of developing lung cancer. The two leading risk factors contributing to lung cancer risk are cigarette smoking and exposure to radon gas.

COMMERCIAL TOBACCO

Cigarette smoking is the number one risk factor for lung cancer, contributing to 80-90% of all lung cancer deaths nationally.[19] In Wisconsin, the smoking rate is 14.3% compared to the national rate of 12.9%.[13] Having smoked a greater number of years, and a greater number of cigarettes each day, contributes to an an increased risk of lung cancer. Additionally, exposure to secondhand smoke increases the risk of lung cancer, particularly among children.[20] If you smoke, quitting is the single most important step you can take to reduce your risk of lung cancer and improve your lung health.[21] Free assistance to quit commercial tobacco and nicotine is available by calling 800-QUIT-NOW or texting READY to 34191 for anyone 13 and older. Culturally tailored coaching is available via the American Indian Quit Line to Indigenous adults, 18 and older by calling 888-7AI-QUIT.

TABLE 5.
Types of Tobacco.

Commercial Tobacco	Traditional Tobacco
• Corrupts the sacred meaning of the traditional tobacco plant with commercial tactics • Sold for recreational use • Causes death and disease • Contains harmful chemical additives	• Offered as a spiritual gift to express gratitude as a sign of respect; and to ask for prayers, advice, or blessings • Offered in prayer to the Creator • Heals mind, body, and spirit • Cleanses, purifies, and blesses

RADON

Exposure to radon is the second leading cause of lung cancer in the Unites States. Radon is a naturally occurring radioactive gas that is formed in rocks, soil, and water that is odorless, tasteless, and unseen. It can enter homes and buildings through cracks and gaps. Exposure to elevated levels of radon can increase the risk of lung cancer over time.[22]
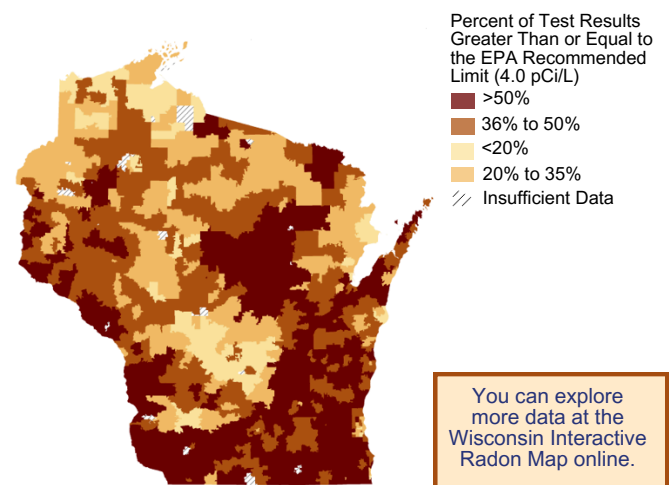
The map in Figure 11 shows areas of Wisconsin that have higher than EPA recommended acceptable radon test results. The Wisconsin Department of Health Services recommends everyone test for radon in their home, regardless of where you live. Of the homes tested in Wisconsin, 46.4% of the results were at or above the action level recommended by EPA.[13] The only way to determine risk for radon exposure is to test homes and buildings.

Tests are readily available through local hardware stores or a Radon Information Center for around $20. Mitigation is recommended for homes with high levels of radon (above 4pCi/L) to reduce your risk of exposure.[22] Experts are available to answer questions about radon and provide test kits by calling 888-LOW-RADON (888-569-7236).

FIGURE 11.
Wisconsin Indoor Radon Test Results.

Percent of Test Results Greater Than or Equal to the EPA Recommended Limit (4.0 pCi/L)

- >50%
- 36% to 50%
- <20%
- 20% to 35%
- Insufficient Data

You can explore more data at the Wisconsin Interactive Radon Map online.

https://www.dhs.wisconsin.gov/radon/index.htm

CONCLUSION

The [Wisconsin Cancer Plan 2020-2030](#)[23] is a blueprint for action and underscores several priorities, relevant to improving lung cancer outcomes for everyone living in Wisconsin. Steps can be taken to improve risk reduction strategies that support lung cancer prevention, enhance our approaches to lung cancer screening for those at highest risk to detect cancer early, and pursuit of better treatment outcomes and improved survivorship opportunities.

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Appendix 1: Lung cancer cases and age-adjusted incidence rates per 100,000, U.S. and Wisconsin (2010-2021).

Diagnosis year	Wisconsin		U.S.	
	Cases	Rate (95% CI)	Cases	Rate (95% CI)
2010	4,082	63.7 (61.8, 65.7)	214,592	64.1 (63.8, 64.3)
2011	4,129	62.8 (60.9, 64.8)	215,229	62.9 (62.7, 63.2)
2012	4,092	61.0 (59.1, 62.9)	218,008	62.1 (61.9, 62.4)
2013	4,186	61.2 (59.3, 63.1)	219,605	61.1 (60.9, 61.4)
2014	4,198	60 (58.1, 61.9)	221,660	60.2 (59.9, 60.4)
2015	4,285	60.1 (58.3, 62)	225,043	59.6 (59.4, 59.9)
2016	4,420	60.5 (58.7, 62.4)	225,679	58.4 (58.2, 58.7)
2017	4,412	58.7 (56.9, 60.5)	227,987	57.5 (57.3, 57.7)
2018	4,515	58.4 (56.7, 60.2)	227,749	56 (55.7, 56.2)
2019	4,615	58.5 (56.8, 60.2)	230,988	55.4 (55.2, 55.6)
2020	4,185	52 (50.4, 53.7)	204,270	48.8 (48.6, 49.1)
2021	4,260	51.6 (50, 53.2)	206,741	49.0 (48.8, 49.2)

Appendix 2: Lung cancer deaths and age-adjusted mortality rates per 100,000, U.S. and Wisconsin (2010-2021).

Year of Death	Wisconsin		U.S.	
	Deaths	Rate (95% CI)	Death	Rate (95% CI)
2010	2,971	46.2 (44.5, 47.9)	158,248	47.4 (47.2, 47.7)
2011	3,118	47.4 (45.7, 49.1)	156,953	46.1 (45.9, 46.3)
2012	2,930	43.6 (42, 45.2)	157,423	45.1 (44.9, 45.3)
2013	2,932	42.8 (41.2, 44.4)	156,176	43.7 (43.4, 43.9)
2014	2,959	42.5 (41, 44.1)	155,526	42.5 (42.3, 42.7)
2015	2,869	40.3 (38.8, 41.9)	153,718	41 (40.8, 41.2)
2016	2,788	38.3 (36.9, 39.8)	148,869	38.8 (38.6, 39)
2017	2,802	37.8 (36.4, 39.3)	145,849	37.1 (36.9, 37.3)
2018	2,681	35.1 (33.8, 36.5)	142,080	35.2 (35, 35.4)
2019	2,712	34.8 (33.5, 36.2)	139,601	33.8 (33.6, 34)
2020	2,635	32.9 (31.6, 34.2)	136,084	32.2 (32, 32.4)
2021	2,497	30.9 (29.7, 32.1)	134,502	31.3 (31.1, 31.4)

Appendix 3: Lung cancer counts and age-adjusted incidence rates per 100,000 by sex and age at diagnosis, Wisconsin (2017-2021).

Age at Diagnosis	Males		Females		Total	
	Cases	Rate (95% CI)	Cases	Rate (95% CI)	Cases	Rate (95% CI)
30-39 years	43	2.3 (1.7, 3.1)	28	1.6 (1, 2.3)	71	2.0 (1.5, 2.5)
40-49 years	166	9.0 (7.7, 10.5)	188	10.8 (9.3, 12.4)	354	9.9 (8.9, 11)
50-59 years	1,275	58.1 (54.9, 61.4)	1,370	63.4 (60, 66.9)	2,645	60.7 (58.4, 63.1)
60-69 years	3,666	199.2 (192.8, 205.8)	3,359	180.2 (174.2, 186.4)	7,025	189.6 (185.2, 194.1)
70-79 years	3,896	392.1 (379.8, 404.8)	3,670	331.2 (320.5, 342.2)	7,566	359.9 (351.8, 368.2)
80+ years	2,098	454.2 (435, 474.1)	2,206	307.1 (294.3, 320.4)	4,304	362.6 (351.8, 373.7)
Total	**11,144**	**104.7 (102.7, 106.7)**	**10,821**	**89 (87.3, 90.8)**	**21,965**	**95.6 (94.3, 96.9)**

Appendix 4: Lung cancer deaths and age-adjusted mortality rates per 100,000 by sex and age at diagnosis, Wisconsin (2017-2021).

Age at Death	Males		Females		Total	
	Deaths	Rate (95% CI)	Deaths	Rate (95% CI)	Deaths	Rate (95% CI)
30-39 years	15	0.8 (0.4, 1.3)	~	~	24	0.7 (0.4, 1)
40-49 years	92	5 (4, 6.1)	87	5 (4, 6.1)	179	5 (4.3, 5.8)
50-59 years	723	32.9 (30.5, 35.5)	646	30.2 (27.8, 32.6)	1369	31.5 (29.9, 33.3)
60-69 years	2,028	110.3 (105.5, 115.2)	1,615	86.7 (82.6, 91.1)	3643	98.4 (95.3, 101.7)
70-79 years	2,337	236 (226.4, 245.9)	2,124	192.2 (184.1, 200.6)	4461	212.9 (206.6, 219.2)
80+ years	1,774	384.3 (366.6, 402.6)	1,874	254.6 (243.1, 266.6)	3648	303.6 (293.8, 313.7)
Total	**6,969**	**67.5 (65.9, 69.1)**	**6,355**	**52.1 (50.8, 53.4)**	**13,324**	**58.7 (57.7, 59.8)**

Appendix 5: Lung cancer five-year relative survival* (%), lung cancer by race/ethnicity, Wisconsin.

Race/Ethnicity	Rate (95%)
Wisconsin Overall	27.9 (24.5, 37.5)
NH White	27.8 (27.0, 28.5)
NH Black	29.4 (26.1, 32.7)
NH American Indian/Alaska Native	21.1 (14.0, 29.4)
NH Asian or Pacific Islander	33.8 (26.1, 41.6)
Hispanic	30.9 (24.5, 37.5)

Appendix 6: Lung cancer cases, deaths, and age-adjusted incidence and mortality rates by Wisconsin county (2017-2021).

County	Incidence		Mortality	
	Cases	Rate (95% CI)	Deaths	Rate (95% CI)
Adams	99	45.4 (36.5, 56.9)	87	40.6 (32.2, 51.4)
Ashland	81	65.0 (51.3, 81.9)	48	39.0 (28.6, 52.7)
Barron	218	56.6 (49.2, 65.1)	162	41.5 (35.2, 48.8)
Bayfield	72	44.9 (34.3, 58.7)	45	26.9 (19.5, 37.6)
Brown	826	51.0 (47.5, 54.7)	461	29.3 (26.6, 32.2)
Buffalo	58	51.7 (38.9, 68.3)	33	29.5 (20.0, 43.0)
Burnett	121	68.7 (56.5, 83.9)	76	44.3 (34.4, 57.2)
Calumet	141	44.6 (37.3, 52.9)	78	24.5 (19.3, 30.9)
Chippewa	246	52.3 (45.8, 59.5)	159	35.1 (29.8, 41.3)
Clark	115	51.8 (42.5, 62.6)	84	38.5 (30.6, 48.1)
Columbia	236	56.4 (49.2, 64.4)	136	32 (26.7, 38.1)
Crawford	86	62.3 (49.4, 78.2)	63	46 (35.0, 60.0)
Dane	1367	45.6 (43.1, 48.1)	780	26.3 (24.5, 28.3)
Dodge	325	50.9 (45.4, 56.9)	221	35.2 (30.6, 40.3)
Door	163	51.0 (43.2, 60.4)	83	25.4 (20.1, 32.4)
Douglas	221	67.6 (58.7, 77.5)	136	43.3 (36.1, 51.6)
Dunn	129	46.2 (38.4, 55.3)	92	32.9 (26.4, 40.6)
Eau Claire	292	45.7 (40.5, 51.4)	208	32.6 (28.3, 37.5)
Florence	22	46.4 (28.8, 77.1)	19	39.8 (23.7, 69.3)
Fond du Lac	395	53 (47.8, 58.7)	235	31.3 (27.4, 35.8)
Forest	43	51.4 (36.9, 71.2)	32	40.1 (26.8, 59.2)
Grant	182	53.2 (45.6, 61.9)	128	36.4 (30.2, 43.5)
Green	136	50.4 (42.1, 60.2)	98	36.1 (29.2, 44.4)
Green Lake	110	70.3 (57.4, 85.7)	63	39.8 (30.5, 51.7)
Iowa	78	44.8 (35.1, 56.8)	52	32.4 (24.0, 43.0)
Iron	51	74.8 (54.6, 103.9)	35	50.8 (34.3, 76.8)

County	Incidence		Mortality	
	Cases	Rate (95% CI)	Deaths	Rate (95% CI)
Jackson	97	59.5 (48.1, 73.2)	66	41.1 (31.7, 52.9)
Jefferson	286	49.7 (44.0, 56.0)	175	30.1 (25.7, 35.1)
Juneau	157	72.1 (61.1, 84.8)	92	44.4 (35.6, 55.1)
Kenosha	680	66.7 (61.7, 72.1)	415	43.2 (39.0, 47.7)
Kewaunee	61	40.9 (30.9, 53.5)	42	27.6 (19.7, 38.1)
La Crosse	425	55.1 (49.8, 60.7)	255	33.2 (29.2, 37.7)
Lafayette	56	45.3 (33.9, 59.8)	38	31.3 (21.9, 43.9)
Langlade	140	79.2 (65.9, 94.9)	81	45.6 (36.1, 57.5)
Lincoln	135	53.8 (45.0, 64.3)	79	31.0 (24.5, 39.2)
Manitowoc	362	55.1 (49.5, 61.4)	250	38.9 (34.1, 44.3)
Marathon	471	49.5 (45.0, 54.3)	303	31.7 (28.2, 35.5)
Marinette	227	62.1 (53.9, 71.3)	136	37.0 (30.8, 44.2)
Marquette	104	70.0 (56.8, 86.3)	64	43.1 (32.9, 56.6)
Menominee	27	124.3 (80.4, 183.6)	15	69.7 (38.1, 117.3)
Milwaukee	3399	66.0 (63.7, 68.3)	1,975	38.9 (37.2, 40.7)
Monroe	232	73.7 (64.3, 84.1)	126	41.3 (34.3, 49.5)
Oconto	175	56.4 (48.1, 66.1)	121	38.3 (31.6, 46.3)
Oneida	259	71.2 (62.4, 81.3)	139	39.0 (32.6, 46.8)
Outagamie	616	53.5 (49.3, 58.0)	354	31.2 (28.0, 34.7)
Ozaukee	323	46.8 (41.7, 52.4)	178	26.2 (22.4, 30.5)
Pepin	21	33.3 (20.4, 53.4)	18	27.3 (16.1, 45.7)
Pierce	125	50.1 (41.5, 60.2)	66	27.4 (21.0, 35.1)
Polk	231	63.4 (55.3, 72.5)	146	39.5 (33.3, 46.9)
Portage	206	43.4 (37.5, 50)	118	25.7 (21.2, 31.0)
Price	88	64.7 (51.7, 81.3)	53	41.2 (30.2, 56.2)
Racine	909	70 (65.5, 74.9)	505	39.5 (36.0, 43.2)

County	Incidence		Mortality	
	Cases	Rate (95% CI)	Deaths	Rate (95% CI)
Richland	79	51.0 (40.1, 64.6)	47	29.8 (21.7, 40.6)
Rock	756	70.2 (65.2, 75.5)	458	43.0 (39.1, 47.3)
Rusk	76	57.1 (44.6, 73.0)	58	45.4 (34.0, 60.3)
St. Croix	238	44.8 (39.2, 51.1)	157	30.2 (25.6, 35.5)
Sauk	261	55.7 (49.0, 63.2)	190	40.9 (35.2, 47.4)
Sawyer	127	71.3 (59.0, 86.4)	74	43.2 (33.5, 55.7)
Shawano	152	45.0 (38.0, 53.1)	109	32.2 (26.4, 39.2)
Sheboygan	440	52.7 (47.8, 58.0)	253	30.5 (26.8, 34.7)
Taylor	74	47.5 (37.1, 60.5)	44	28.7 (20.7, 39.4)
Trempealeau	146	69.7 (58.7, 82.4)	80	38.8 (30.7, 48.6)
Vernon	137	60.3 (50.2, 72.0)	63	26.1 (20.0, 33.9)
Vilas	136	51.3 (42.8, 62.0)	82	31.3 (24.9, 40.0)
Walworth	418	57.0 (51.6, 63.0)	233	32.4 (28.3, 37.1)
Washburn	97	58.7 (46.9, 73.4)	68	40.9 (31.2, 53.6)
Washington	489	49.8 (45.4, 54.5)	248	25.3 (22.2, 28.7)
Waukesha	1443	48.8 (46.3, 51.5)	905	30.9 (28.9, 33.1)
Waupaca	245	58.8 (51.5, 67.0)	156	37.3 (31.5, 43.9)
Waushara	145	62.7 (52.8, 74.6)	97	43.0 (34.6, 53.3)
Winnebago	576	52.7 (48.4, 57.4)	364	33.4 (30.0, 37.1)
Wood	308	51.6 (45.9, 57.9)	217	36.5 (31.7, 41.9)
Unknown	19	NA	NA	NA
Wisconsin	21,987	55.7 (55, 56.5)	13,327	34.2 (33.6, 34.8)