Lung Cancer

Definition: The National Cancer Institute defines lung cancer as uncontrolled growth of cancer cells in the lung or large air passages of the lungs (bronchi). Mortality from this disease is expressed using ICD-9 codes 162.2-162.9 (for deaths in years prior to 1999) and ICD-10 code C34 (for deaths in 1999 or later) on the death certificate. Incidence is coded with the ICD-O-3 codes C34.0-C34.9, excluding histology codes 9140 and 9590-9989. Hospitalizations for lung cancer are expressed using ICD-9-CM codes 162.2-162.9.

Summary

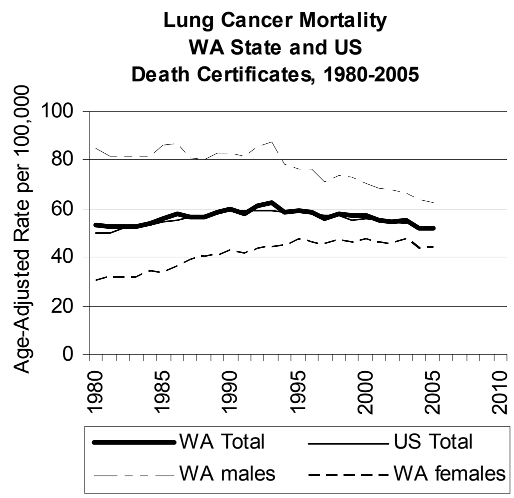
Lung cancer is the leading cause of cancer death in Washington State, in the United States, and in many countries throughout the world. In 2005 in Washington, the age-adjusted mortality rate of lung cancer was 52 per 100,000 people. More men than women died of lung cancer in 2005 (1,641 men compared to 1,476 women). The age-adjusted mortality rate for women was 44 per 100,000 compared to 62 per 100,000 for men.

Lung cancer patients have very poor survival, partly because diagnosis typically occurs after the cancer has spread beyond the lungs, at which point there are few treatment options. Unfortunately, a screening test with proven ability to reduce mortality is not yet available.

The major cause of lung cancer is tobacco use. For this reason, smoking prevention and cessation remain the most effective methods to reduce lung cancer.

Time Trends

Trends in lung cancer incidence and mortality closely match trends in smoking 30 years earlier. This is generally the time required to develop lung cancer after exposure to the harmful chemicals in cigarettes.[1] In Washington, lung cancer mortality rates increased from 1980 until about 1993, when the trend reversed. Lung cancer mortality rates continued to decline through 2005. Washington patterns appear similar to national trends from 1980 through 2003, the most recent year for which national data are available.[2] Among Washington men, lung cancer mortality rates were steady from 1980 until about 1992, when they began to decline. Among women, rates increased from 1980 until about 2000. The rate of increase slowed from 1990 to 2000, when mortality in this group hit a plateau. There is some suggestion that mortality rates among women began to decline in 2000, but more years of data are necessary to determine if this is the case. Washington patterns for men and women are similar to national trends from 1980 to 2003.



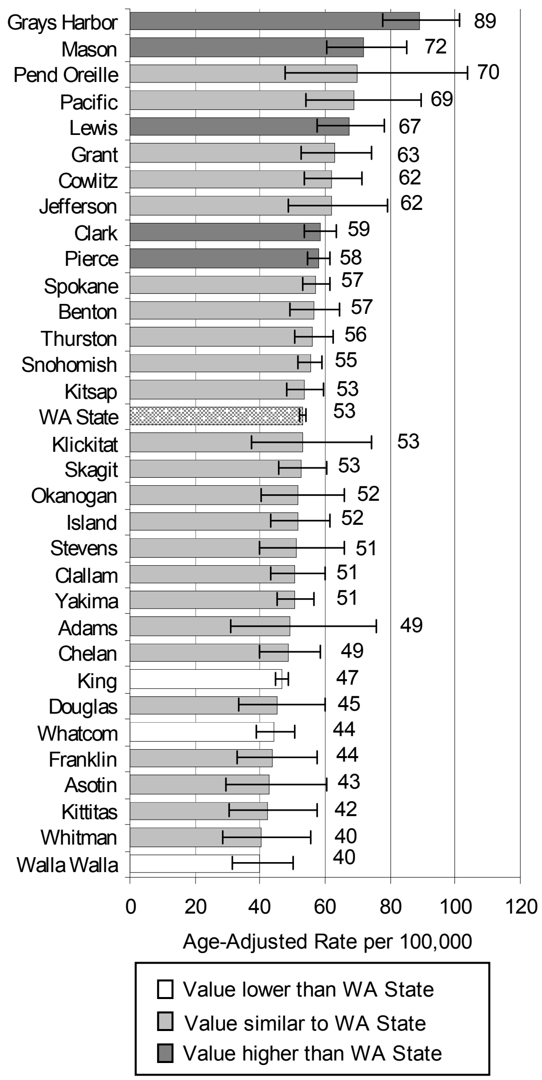
Year 2010 Goals

The national goal in *Healthy People 2010 (Midcourse Review)* is to reduce the age-adjusted mortality rate for cancers of the lung, bronchus, and trachea to about 43 deaths per 100,000 people. In 2005, the death rate for these cancers in Washington was 52 deaths per 100,000 people. To meet the 2010 goal, Washington would need to experience a steeper reduction in lung cancer mortality than has occurred since the decline began in about 1993.

Geographic Variation

The higher a population's smoking rates, the higher are its lung cancer rates. This is true nationally and on a global scale. Increasing cancer incidence rates have followed the rise in smoking prevalence in developing countries.[3] Within Washington, there is some geographic variation in lung cancer mortality rates. In 2003–2005 combined, Gray's Harbor, Pierce, Lewis, Clark, and Mason counties had higher mortality rates than the state as a whole. King, Walla Walla, and Whatcom counties had lower mortality rates. Given that geographic patterns in lung cancer mortality tend to follow patterns of smoking,[3] these differences may be due in part to historical variations in smoking rates.

Lung Cancer Mortality
County Data
WA State Death Certificates, 2003-2005

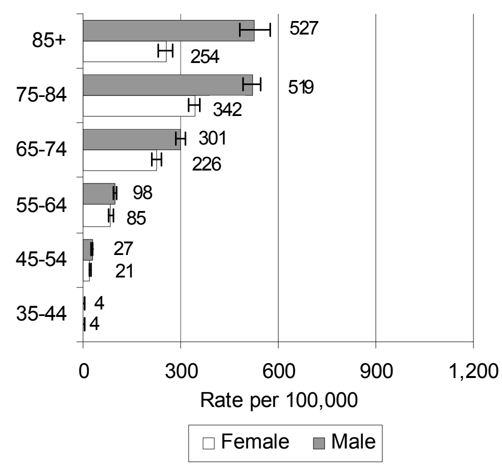


Age and Gender

Lung cancer mortality rates increase with age and vary by gender. Nationally, men have had higher mortality rates and higher rates of smoking. The gap between male and female lung cancer mortality rates is narrowing because the difference between male and female smoking rates over the past few decades has narrowed. From 2003 to 2005, Washington males and females in nearly all age groups had similar smoking prevalence rates. This finding indicates that in Washington, lung cancer rates in women will likely continue to approach rates in men in coming years.

Although smoking plays an important role in lung cancers in both genders, a greater percent of women than men with lung cancer are non-smokers.[4] The reason for this gender difference is unknown, but one potential contributor could be differences in exposure to environmental tobacco smoke (ETS). In one study, although a greater percent of men than women were exposed to ETS in the workplace (71% vs. 47%), a much higher percent of women than men were exposed to this carcinogen at home because their spouses smoked (63% vs. 13%).[5] If women have more exposure than men to ETS, then this could help explain why a greater percent of non-smoking women than non-smoking men develop lung cancer. Other research suggests that women might be more susceptible to developing lung cancer than men, potentially due to hormone-related or genetic factors.[6,7,8,9,10,11] Not all studies support these findings, however.[12,13]

Lung Cancer Mortality
Age and Gender
WA State Death Certificates, 2003-2005



In 2003–2005, lung cancer mortality rates rose among Washington women with increasing age, except among women ages 85 and older, who had lower mortality than women ages 75–84. During the same period, mortality increased with age among Washington men until age 84. Unlike the pattern in women, Washington men ages 85 and older had the same lung cancer mortality rate as those ages 75–

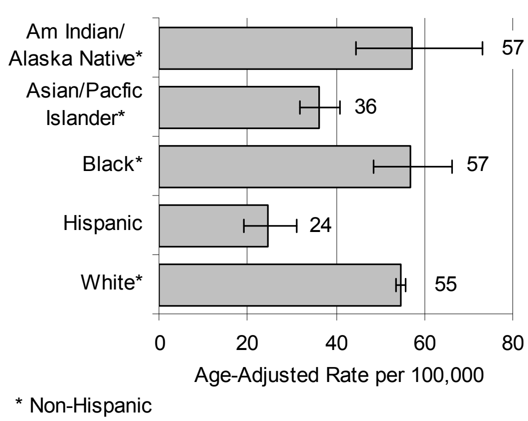
84. Competing causes of death in the oldest age group could contribute to a lower lung cancer mortality rate in the oldest age group.[3] Lung cancer mortality rates for people younger than age 35 (not presented) are very low for both genders.

Race and Hispanic Origin

In 2003–2005 combined, people of Hispanic origin in Washington had the lowest age-adjusted lung cancer mortality rate, followed by Asians and Pacific Islanders. American Indians and Alaskan Natives, blacks, and whites had the highest mortality rates. These patterns reflect differences in smoking across these groups.

Nationally, blacks have the highest lung cancer death rates. Once diagnosed, they also have poorer survival than whites. One factor that might contribute to their poorer survival is more frequent diagnosis at a later stage when the cancer has spread further.[3] But even when comparing people diagnosed at the same stage, blacks have poorer survival than whites.[1] This gap could be due to differences in access to care, quality of care, or other illnesses that also influence survival.[14,15] One study found that although physicians offered surgery, which presents the best chance of cure,[16] to blacks as often as to whites, blacks were more likely to refuse it.[17] The authors speculated that varying beliefs about the potential effectiveness of surgery might explain the difference in surgery acceptance between the two groups.

Lung Cancer Mortality
Race and Hispanic Origin
WA State Death Certificates, 2003-2005

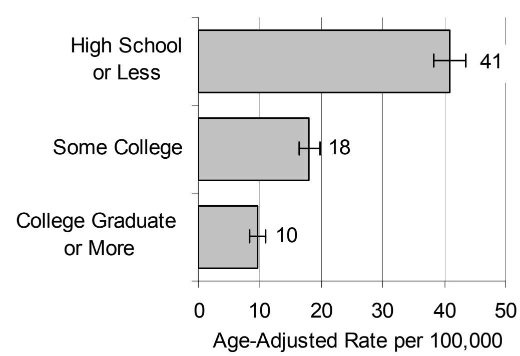


Income and Education

In the United States, socioeconomic position, often measured by income or education, has been associated with lung cancer mortality. One study found that among men ages 25 and older, higher lung cancer mortality was linked with higher socioeconomic position from 1950 to 1980, but this relationship began to reverse in the early 1970s.[18] The same study showed that lung cancer deaths among women in higher socioeconomic groups increased over time.[18] Studies of cancer in industrialized nations in the late 1990s and later have reported consistent inverse relationships between socioeconomic position and lung cancer incidence and mortality rates among men. Results for women have been less consistent.[3]

In 2004–2005 in Washington, lung cancer mortality decreased with increasing education among adults ages 25 and older. People who had four or more years of college education experienced lower lung cancer mortality than those who attended some college or professional school. That group, in turn, had lower lung cancer death rates than those who received a high school education or less. The same pattern held when lung cancer mortality and education were assessed separately by gender (results not shown). This pattern mirrors the Washington pattern in smoking by education, such that greater education is generally associated with lower likelihood of smoking.

Lung Cancer Mortality
Education
WA State Death Certificates, 2004-2005



Measures of the relationship between income and lung cancer mortality in Washington were not available for recent years. But as reported in *The Health of Washington State, 2004 Supplement*[19] for 2000–2002 combined, mortality from lung cancer increased as the percent of the population in poverty increased. This is not surprising because cigarette smoking also tends to increase with increasing poverty.

Other Measures of Impact and Burden

Incidence. In Washington in 2004, 1,985 new cases of lung cancer were diagnosed in men and 1,863 in women. For men, the age-adjusted incidence rate was 76 per 100,000; for women, it was 58 per 100,000. Washington incidence trends are similar to national patterns of declining incidence in men and stable rates in women since the late 1990s.[2] Because of poor survival from lung cancer, trends in incidence among Washington's men and women have closely resembled statewide lung cancer mortality trends.

Hospitalizations. In 2004, Washington residents experienced 2,378 hospitalizations that had a primary diagnosis of lung cancer. Another 4,135 hospitalizations were for people with lung cancer, but lung cancer was not the primary diagnosis. Nonetheless, most of these hospitalizations were likely directly or indirectly related to lung cancer. Since 2000, there has been no change in rates of hospitalizations associated with lung cancer in Washington.

Survival. Lung cancer patients have very poor survival. In the United States, about 15% of people with lung cancer are still alive five years after diagnosis.[3] One of the main reasons is that diagnosis typically occurs when the cancer has spread beyond the lungs, at which point there are few treatment options. Surgery, which offers the best chance of cure for lung cancer, is possible for only about 15% of lung cancer patients.[3,16,20] Other factors that worsen the already poor survival from lung cancer include older age at diagnosis and diagnosis with certain subtypes.[3]

Risk and Protective Factors

The most important risk factor for lung cancer is tobacco use. Smokers are about 22 times more likely than non-smokers to die from lung cancer.[21] Increased risk associated with smoking decreases with time since quitting but continues for many years. Cigarette smoking is responsible for about 90% of lung cancer deaths in men and 75%–85% in women.[3] Exposure to ETS is also associated with increased risk for lung cancer. A review of about 50 studies of people who had never smoked found a 25% increase in risk for lung cancer among those who were exposed to ETS at home from a spouse who smoked compared to people without ETS exposure.[22] One large study among people who never smoked and former smokers found a 65% increase in risk of lung cancer for those who were exposed to ETS in the workplace.[23] Another study illustrated carcinogenic effects of exposure to ETS at home, in the workplace, and in social settings among people who never smoked.[24] Different tobacco products have different effects on health. Although filtered cigarettes and those with lower tar and nicotine yields are advertised as safer, available scientific evidence does not support this claim.[3]

Chronic respiratory diseases have also been linked with increased risk for lung cancer.[3] Other studies have examined the influence of dietary factors, such as fats, fruits and vegetables, and alcohol on lung cancer risk. This type of work is challenging as it involves disentangling the effects of these factors from the effects of smoking, which is highly related to diet.[3] Based on the body of evidence so far, it appears that increased intake of fats might increase risk for lung cancer and that increased intake of fruits and vegetables, particularly fruits, might reduce risk.[3,25]

Additional research, often in occupational settings, has helped establish a link between lung cancer and a variety of exposures inside and outside the home and workplace including asbestos, radon, arsenic, chloromethyl ethers, chromium, nickel, and polycyclic aromatic hydrocarbons. Some of these chemicals exert a stronger negative health effect among people who smoke than people who do not.[3]

Air pollution has also been implicated in the development of some lung cancers.[3] A review of studies on this topic indicated that people with high exposure to air pollution experience about a 30%–50% increase in the risk of developing lung cancer compared to those with low exposure.[26] We still do not know all of the specific air pollutants that increase the risk of developing lung cancer.[3] The *Washington State Comprehensive Cancer Control Plan* identified diesel engine exhaust as one of the three known or probable environmental carcinogens (the others are radon and arsenic) with the greatest potential impact on public health in Washington.[27] According to the International Agency for Research on Cancer, diesel exhaust is probably carcinogenic to humans.[28]

Intervention Strategies

Because tobacco use is the most important cause of lung cancer, reducing tobacco use is an essential intervention. A number of campaigns, ranging from cessation programs to public education and community and school-based programs have effectively reduced tobacco use. (See the Tobacco Use chapter for additional information.)

Medical researchers have assessed several screening approaches for reducing mortality from lung cancer by diagnosing early stage disease. Early diagnosis might lead to lower mortality because in current practice, surgery—which appears to be associated with better outcomes—is performed only if the cancer has not spread beyond the lungs.[16,20,29] The results of studies to examine the effectiveness of chest X-rays, sputum cytology, and low-dose computed tomography (also known as spiral CT) in reducing mortality have been inconclusive.[29,30,31,32] Several ongoing studies might help answer this question.[3]

Additional studies are trying to identify biomarkers from tissues that are relatively easy to collect (for instance, certain proteins or genetic mutations testable in blood samples or easily accessible tissues) to identify early stage lung cancer as alternative screening tools to radiology.[33] Other research attempts to define factors that influence susceptibility to cancer after exposure to carcinogens.[3] This work will help determine the most appropriate populations to target in chemoprevention and other possible interventions to reduce mortality from lung cancer.

See Related Chapters: Tobacco Use, Nutrition, Indoor Air Quality, and Outdoor (Ambient) Air Quality.

Data Sources (For additional detail, see Appendix B).

Washington State Death Certificate Data: Washington State Department of Health, Vital Registration System Annual Statistical Files, Deaths 1980–2005, released December 2006

Washington State Cancer Incidence: Washington State Department of Health, Washington State Cancer Registry, October 2006.

Washington Hospitalization Data: Dataset compiled by the Washington State Department of Health, Center for Health Statistics from the Washington Comprehensive Hospitalization Abstract Reporting System, Oregon Hospital Discharge data, and Veterans Hospital Administration datasets, December 2006.

Washington State Population Counts: U.S. Census provided through Washington State Office of Financial Management (OFM); OFM intercensal and postcensal estimates, Krupski Consulting.

National Death Data: SEER*Stat Database: Mortality-All Causes of Death (COD), Public-Use With State, Total U.S. (1969–2003), National Cancer Institute, DCCPS, Surveillance Research Program, Cancer Statistics Branch, released April 2006. Underlying COD mortality data provided by NCHS.

For More Information

Washington State Cancer Registry, http://www3.doh.wa.gov/WSCR/

SEER Program, http://www.seer.cancer.gov/

National Cancer Institute, http://www.cancer.gov/cancertopics/types/lung

American Cancer Society, http://www.cancer.org/docroot/home/index.asp

Technical Notes

Mortality rates based on counts of less than 20 were not presented.

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