# THE HEALTH CONSEQUENCES OF CIGARETTE SMOKING AMONG OHIOANS

Ohio Department of Health
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## Acknowledgements

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# Executive Summary

**Cigarette Smoking in Ohio:**
Smoking is the leading preventable cause of disease and premature death in the United States and in Ohio. Despite this fact, more than one-quarter (26.5 percent) of Ohioans were current smokers in 2001-2003 and Ohio ranked 7th-highest among the 50 states and District of Columbia in smoking prevalence in 2002. Cigarette smoking is not only causally associated with lung cancer, but also with nine additional sites/types of cancer, cardiovascular disease, chronic obstructive pulmonary disease and numerous adverse reproductive outcomes. Smoking prevention and cessation are the most effective strategies for preventing disease and death among residents of the State of Ohio.

Smoking prevalence in Ohio is shown to vary by a number of factors:

- Gender: Males have a higher prevalence compared to females.
- Race: Whites have a slightly higher prevalence compared to blacks.
- Age: Among adults age 18 and older, persons in the age group 18-34 were most likely to smoke and smoking prevalence decreased with increasing age.
- Income: Persons in the lowest income category (<$25,000/year) had the highest prevalence of smoking.
- Insurance status: Smokers were less likely to have health insurance compared to nonsmokers.

Youth tobacco smoking continues to be a problem in Ohio, with one-tenth of middle school students and one-quarter of high school students reporting to be current smokers. Smoking prevention and cessation programs that target these groups with high smoking prevalence may be most effective in reducing the burden of disease and death in Ohio due to smoking.

**Cancer:**
Each year in Ohio, an average of 55,230 persons are diagnosed with cancer and 25,058 persons die from this disease. Smoking is causally associated with about 30 percent of cancer cases and deaths, all of which could be prevented if Ohioans stop smoking or never start. The Surgeon General's report of 2004 provides evidence of a causal association between cigarette smoking and 10 different sites/types of cancer: lung and bronchus; laryngeal; oral cavity and pharyngeal; esophageal; pancreatic; bladder; kidney and renal pelvis; cervical; stomach; and acute myeloid leukemia. Smoking prevention and cessation would therefore reduce the burden of disease from multiple types of cancer and greatly impact the health and longevity of Ohio residents.

1997-2001 incidence and mortality data for the 10 sites/types of cancer attributable to smoking reveal the following:

- Cancer rates in Ohio are higher than national rates for five of the 10 cancer sites/types: lung and bronchus; laryngeal; esophageal; bladder; and kidney and renal pelvis.
- Males have higher rates of both incidence and mortality compared to females for all cancers attributable to smoking except cervical.
- Blacks have higher incidence and mortality rates compared to whites for seven of the 10 cancers (lung and bronchus; laryngeal; oral cavity and pharyngeal; esophageal; pancreatic; cervical; and stomach).

**Cardiovascular Disease:**
The main types of cardiovascular disease caused by smoking-heart disease and stroke-are the first- and third-leading causes of death, respectively, in Ohio. In 2001, more than 41,700 Ohioans died of cardiovascular disease, accounting for 39 percent of all deaths. The Surgeon General's report provides evidence of a causal association between cigarette smoking and atherosclerosis, coronary heart disease, stroke and abdominal aortic aneurysm.

The prevalence and mortality data for the cardiovascular diseases presented in this report conclude:
- The prevalence of cardiovascular disease increases with age.
- Males have higher mortality rates of cardiovascular disease compared to females.
- Ohio mortality rates from cardiovascular disease are higher compared to the national mortality rates.

**Chronic Respiratory Disease:**
Chronic respiratory disease is a leading cause of death in Ohio and is causally related to cigarette smoking. Approximately 5,693 Ohioans die each year from chronic obstructive pulmonary disease (COPD), a type of chronic respiratory disease that includes those who die from emphysema and chronic bronchitis. According to the 2004 Surgeon General's report, active smoking causes injury to the airways and alveolar region, ultimately leading to the development of lung diseases such as COPD and exacerbating diseases such as asthma. If more Ohioans stop smoking, or fewer start, a large number of cases of COPD could be prevented and many cases of asthma could be better controlled.

Chronic respiratory disease mortality and prevalence data for Ohio presented in this report indicate:
- The mortality rate of COPD is higher among males than females and higher among whites than blacks.
- Ohio had higher COPD mortality rates when compared to the United States, which includes higher mortality rates of emphysema and chronic bronchitis.
- The prevalence of asthma was higher among women than men in Ohio during this time period.
- Asthma mortality among women was higher compared to men.

- Blacks had higher mortality from asthma compared to whites, even though they had a similar prevalence.

**Reproductive Effects:**
Prenatal smoking is associated with adverse reproductive outcomes in children born to mothers who smoke. The 2004 Surgeon General's report on the health consequences of smoking concludes prenatal smoking is causally associated with reduced fertility, preterm birth, reduced infant birth weight, intrauterine growth retardation and sudden infant death syndrome (SIDS). Despite this fact, 19 percent of adult women and 29 percent of teenagers age 15 to 19 in Ohio reported they smoked during their pregnancy. Smoking cessation programs targeting women of childbearing age are, therefore, necessary to reduce the infant morbidity and mortality associated with maternal smoking.

Data for Ohio for 2001 (prevalence) and 1999-2001 (attributable risk) reveal the following:

- The prevalence of prenatal smoking in Ohio was 47 percent higher in adult women and 54 percent higher in teenage women compared to the United States.
- Whites are more likely to smoke during pregnancy compared to blacks. This finding holds true for both adult and teenage women, with the prevalence among white teens increasing over time.
- About one-third of SIDS deaths and one-fifth of infants who are small for their gestational age could be prevented in the State of Ohio if women quit smoking during pregnancy.

# Introduction

Smoking causes more premature deaths than any other health-risk behavior in the United States. Cigarette smoking is the most common form of tobacco use. The health consequences of cigarette smoking will be the major focus of this report. It is estimated that one in every five deaths in Ohio (approximately 19,300 deaths annually) is associated with tobacco use.[1] For each person who dies from a smoking-related illness, 20 others currently suffer from the same diseases, many of whom will die in the future due to tobacco use.[2] In Ohio, that means approximately 386,000 individuals are currently suffering from one or more chronic or acute diseases as the result of cigarette smoking.

On Jan. 11, 1964, Surgeon General Luther Terry released the landmark report of the Surgeon General's Advisory Committee on Smoking and Health. In the report, the committee concluded that cigarette smoking causes chronic bronchitis and cancers of the lung and larynx in men.[3] Several reports of the Surgeon General since 1964 have expanded the list of diseases associated with cigarette smoking.

In August 2004, 40 years after the first Surgeon General's report on smoking and health, Surgeon General Richard Carmona released the most recent report on smoking-related health issues titled "The Health Consequences of Smoking."[4] This new report provides a comprehensive review of the current scientific evidence that links cigarette smoking to more diseases than were discussed in the 1964 and subsequent reports of the Surgeon General. As stated in the preface to the 2004 report, "this report provides a tragic picture of the consequential effects of active smoking across a lifetime. Active smoking affects reproduction and the hearts and lungs of adolescents and young adults. Even by early middle age, it causes death from cancer and cardiovascular diseases, shortening the life expectancy of smokers. With increasing age, the frequency of smoking-caused diseases rises." The new report concludes that smoking negatively affects the health of smokers. The report estimates that adults who smoke die an average of 13 to 14 years earlier than nonsmokers.

**Major Conclusions of the 2004 Surgeon General's Report**

1. Smoking harms nearly every organ of the body, causing many diseases and worsening the health of smokers in general.

2. Quitting smoking has immediate as well as long-term benefits, improving health in general and lowering risks for diseases and death caused by smoking .

3. Smoking cigarettes with lower machine-measured yields of tar and nicotine provides no clear benefit to health.

4. The list of diseases caused by smoking has been expanded to include abdominal aortic aneurysm, cataracts, pneumonia, periodontitis, acute myeloid leukemia and cancers of the cervix, kidney, pancreas and stomach.

The 2004 Surgeon General's report finds the evidence is sufficient to infer a causal relationship between smoking and the following diseases and conditions:

**Cancer**

- Lung and bronchus cancer
- Laryngeal cancer
- Oral cavity and pharyngeal cancer
- Esophageal cancer
- Pancreatic cancer
- Bladder cancer
- Kidney and renal pelvis cancer
- Cervical cancer
- Stomach cancer
- Acute myeloid leukemia

**Cardiovascular Diseases**

- Atherosclerosis
- Coronary heart disease
- Myocardial infarction
- Cerebrovascular disease (stroke)
- Abdominal aortic aneurysm

**Respiratory Diseases**

- Chronic obstructive pulmonary disease (emphysema and chronic bronchitis)
- Pneumonia and acute bronchitis
- Respiratory effects in unborn children (caused by maternal smoking)
- Respiratory effects in childhood and adolescence (cough and phlegm production; increased number and severity of respiratory illnesses; decreased physical fitness; an unfavorable lipid profile; potential retardation in the rate of lung growth and function)
- Respiratory effects in adulthood (decline in lung function)
- Poor asthma control

**Reproductive Effects**

- Reduced fertility
- Restricted fetal growth and low birth weight
- Preterm delivery and shortened gestation
- Sudden infant death syndrome (SIDS)

**Other Effects** *(which will not be addressed in this report)*

- Cataracts
- Hip fractures
- Low bone density in postmenopausal women
- Peptic ulcer disease in persons with *Helicobacter pylori*
- Periodontitis
- Diminished health status/morbidity (increased absenteeism from work; increased use of medical care services; adverse surgical outcomes related to wound healing; and respiratory complications)

## Economic Costs

The medical costs associated with tobacco use by Ohioans are approximately $4 billion, of which $1.3 billion is covered by the Ohio Medicaid program. Ohio residents pay about $602 per household in taxes for smoking-related government expenditures annually.[1] In addition, businesses incur additional costs for lost productivity due to smoking.

The U.S. Department of Health and Human Services found between 6 and 14 percent of personal health care expenditures could be attributed to smoking and smokers had greater medical costs over the course of their lifetimes than non-smokers. It is estimated that the economic costs of smoking are about $3,391 per smoker per year.[5] These costs include insurance premiums, losses due to fires and cleaning costs. It is also estimated that each pack of cigarettes sold in the United States costs the nation $7.18 in medical care costs and lost productivity.[1]

## Purpose

The purpose of this monograph is to illustrate the scope of health consequences attributable to cigarette smoking among Ohioans. The prevalence of cigarette smoking among adults in Ohio is presented, followed by chapters on various diseases and conditions associated with cigarette smoking—cancer, cardiovascular disease, chronic respiratory disease and reproductive effects. It should be noted that incidence, prevalence and mortality data are presented for all cases of disease, regardless of causation. Each case of disease may be attributable to multiple risk factors; thus, the effects of smoking on each case cannot be determined.

Please note: This document addresses only the health effects of cigarette smoking and does not address the use of smokeless tobacco, cigars or pipes. It also does not address the diseases caused by secondhand or environmental tobacco smoke. However, these factors are also associated with adverse health outcomes and should be addressed in smoking education and cessation programs.

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3. Smoking and Health: A Report of the Advisory Committee to the Surgeon General of the Public Health Service. U.S Department of Health, Education, and Welfare, Public Health Service, 1964.
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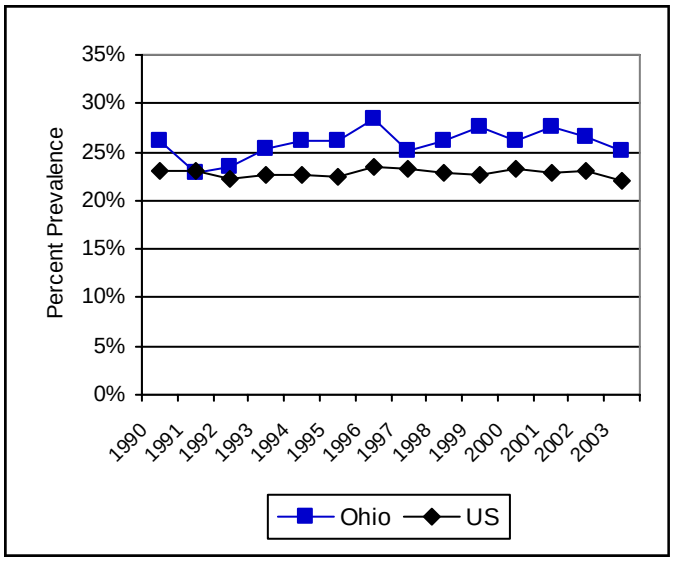
# Chapter 1: Prevalence of Cigarette Smoking in Ohio

**Figure 1.1 Trends in Adult Smoking Prevalence in Ohio:**
Prevalence of Current Adult Smokers, Ohio[a] with Comparison to the United States,[b] 1990-2003




Cigarette smoking rates among Ohio adults remained stable for more than a decade according to the Ohio Behavioral Risk Factor Surveillance System. From 1990 to 2003, the prevalence of current smokers remained between 22.9 and 28.4 percent (Figure 1.1). Note: current smoker is defined as a person who has smoked at least 100 cigarettes in their lifetime and currently smokes every day or some days.

In 2002, Ohio ranked 7th-highest among the 50 states and the District of Columbia in adult smoking prevalence. Data from the national Behavioral Risk Factor Surveillance System show Ohio has ranked above the national median each year since 1992 (Figure 1.1). As shown in Figure 1.2, Ohio was higher in adult smoking prevalence in 2001-2003 (26.5 percent) as compared to the United States for 2002 (23.0 percent). Smoking rates varied by gender, race, age and income levels. Prevalence of smoking in Ohio will be addressed for each of these factors in the following figures.

**Figure 1.2 Adult Smoking Prevalence: Ohio and the United States:**
Prevalence of Current Adult Smokers, Ohio,[a] 2001-2003, with Comparison to the 2002 U.S. Median[b]

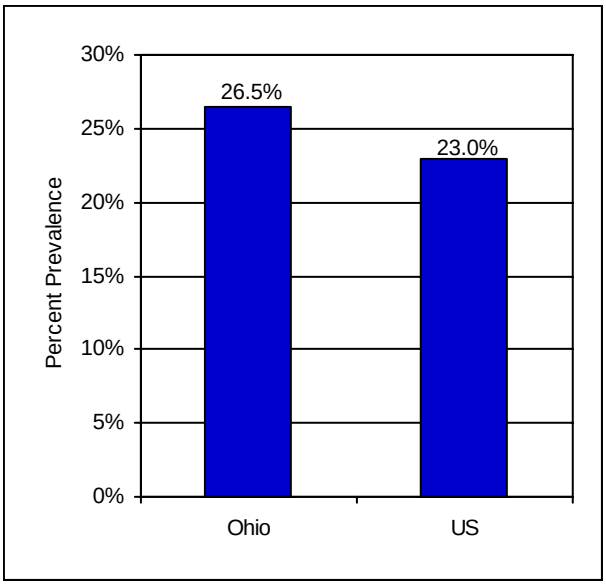
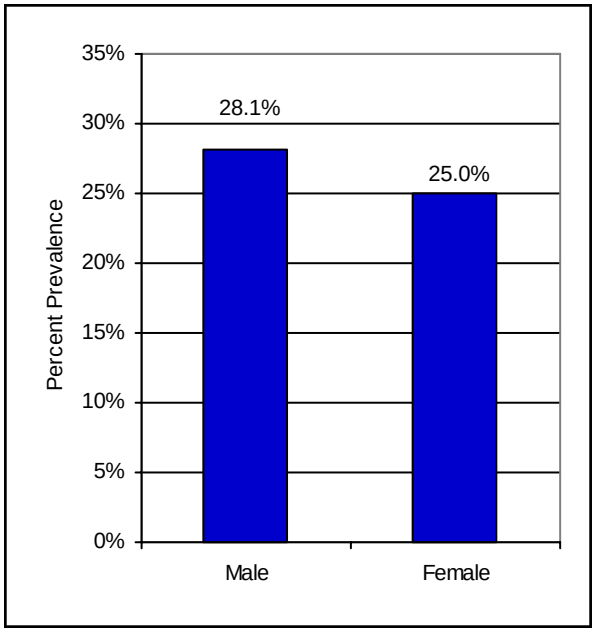


**Figure 1.3 Adult Smoking Prevalence by Gender:**
Prevalence of Current Adult Smokers by Gender, Ohio,[a] 2001-2003




Historically, males have had higher smoking rates than females. As shown in Figure 1.3, the prevalence of current smoking among adults in Ohio was 28.1 percent for males and 25.0 percent for females for the period 2001-2003. While the prevalence of smoking by females has increased since the 1930s, the prevalence among females remained less than that of males.

**Figure 1.4 Adult Smoking Prevalence by Race:**
Prevalence of Current Adult Smokers by Race for White non-Hispanic and Black non-Hispanic, Ohio,[a] 2001-2003

The most recent data available for Ohio (2001-2003) indicate there was very little difference between whites and blacks in smoking prevalence (Figure 1.4). There was little difference based on gender between whites and blacks as well. The similarity in smoking prevalence between whites and blacks was also seen at the national level.

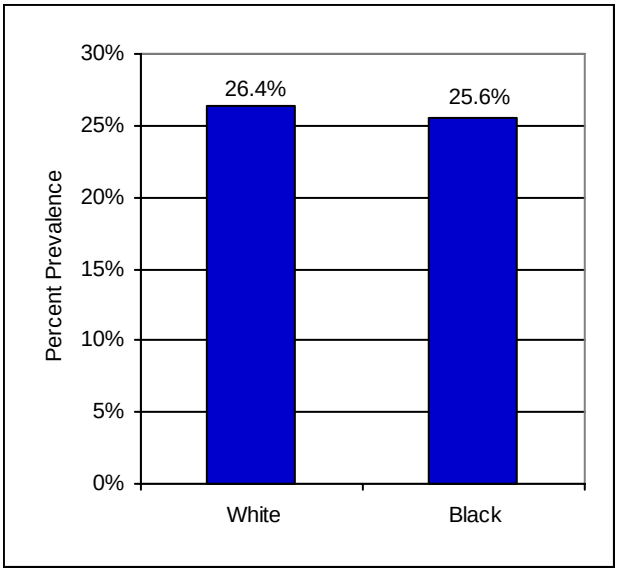
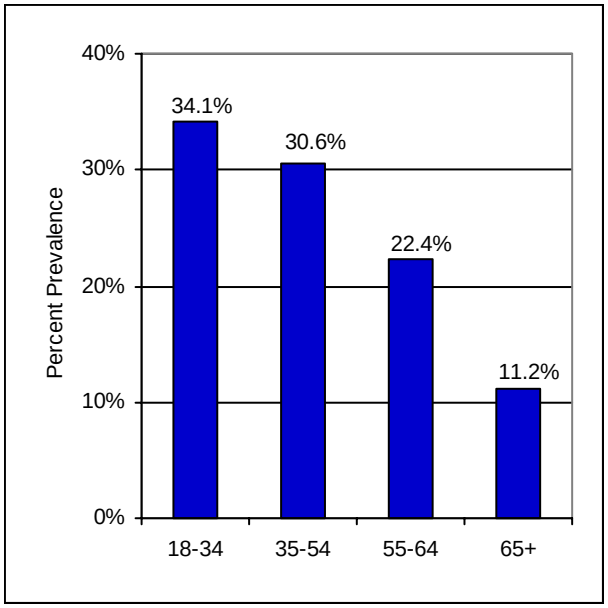


**Figure 1.5 Adult Smoking Prevalence by Age Group:**
Prevalence of Current Adult Smokers by Age Group, Ohio,[a] 2001-2003




The prevalence of smoking among adults decreased as age increased, with 18-34-year-olds having the highest adult smoking prevalence in Ohio for the years 2001-2003 (Figure 1.5). In contrast to smoking prevalence, cessation increases with age. Unfortunately, the illnesses and deaths caused by smoking also increase with age, which may be responsible for the lower prevalence of smoking among the higher age groups.

**Figure 1.6 Adult Smoking Prevalence by Household Income:**
Prevalence of Current Adult Smokers by Household Income, Ohio,[a],2001-2003

One of the primary indicators of smoking prevalence is income, which is closely linked to educational attainment. Ohio Behavioral Risk Factor Surveillance System data for 2001-2003 reveal that people with higher household incomes were less likely to smoke (Figure 1.6). Educational attainment may also play a role in smoking prevalence, as might other complex socio-economic factors. One example is the high level of advertising by tobacco companies in neighborhoods with a lower socio-economic status.

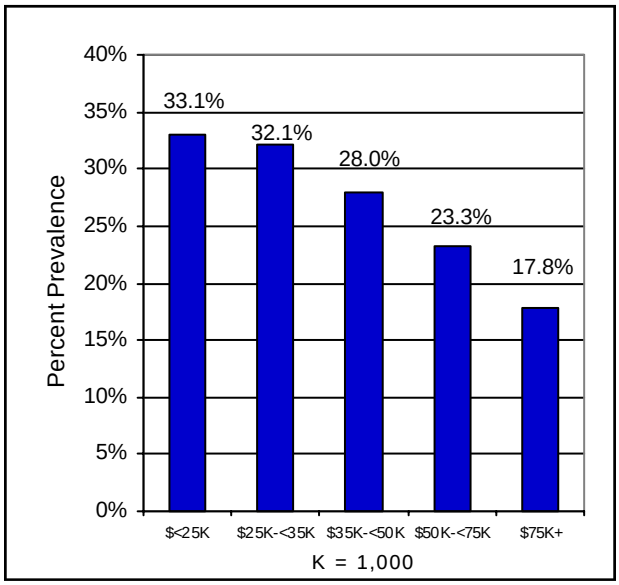
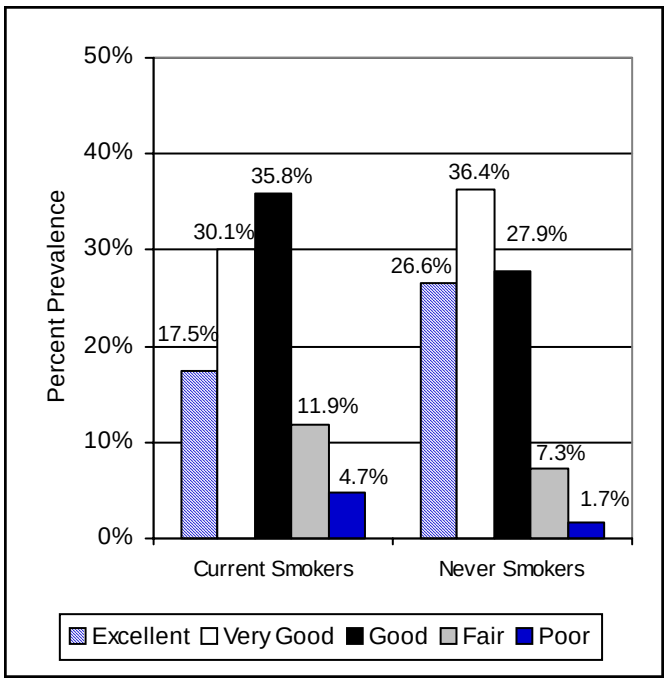


**Figure 1.7 Health Status by Smoking Status:** Health Status of Current Adult Smokers and Never Smokers, Ohio,[a] 2001-2003




The health status of current adult smokers in Ohio was poorer in general than that of adults who never smoked, as seen in Figure 1.7. Current smokers most often rated their health as "good" in a self-reported survey (35.8 percent), while never smokers most often rated their health as "very good" (36.4 percent). There was also a higher percentage of never smokers that rated their health as "excellent" (26.6 percent) as compared to current smokers (17.5 percent). These differences may be due to diseases caused by or exacerbated by smoking cigarettes.

**Figure 1.8 Health Plan Coverage by Smoking Status:** Health Plan Coverage of Current Adult Smokers and Never Smokers, Ohio,[a] 2001-2003

Figure 1.8 indicates the percentage of Ohioans covered by a health care plan was lower among current smokers (78.3 percent) than never smokers (92.2 percent). This means that those at highest risk for smoking-attributable illnesses are less likely to have health care coverage.

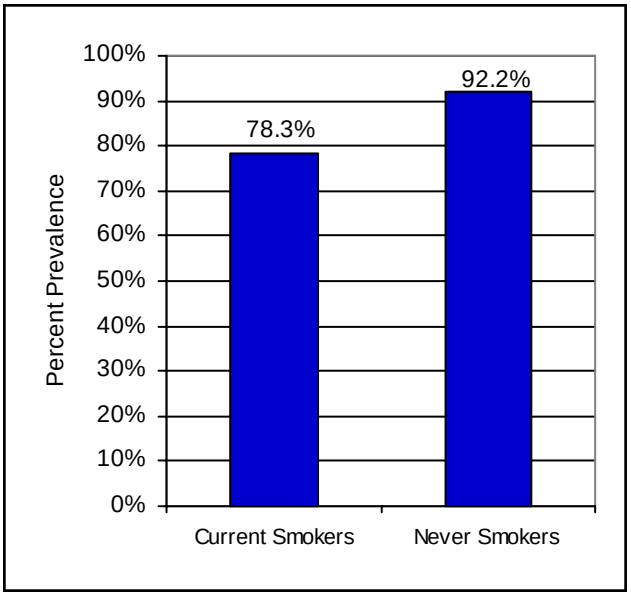
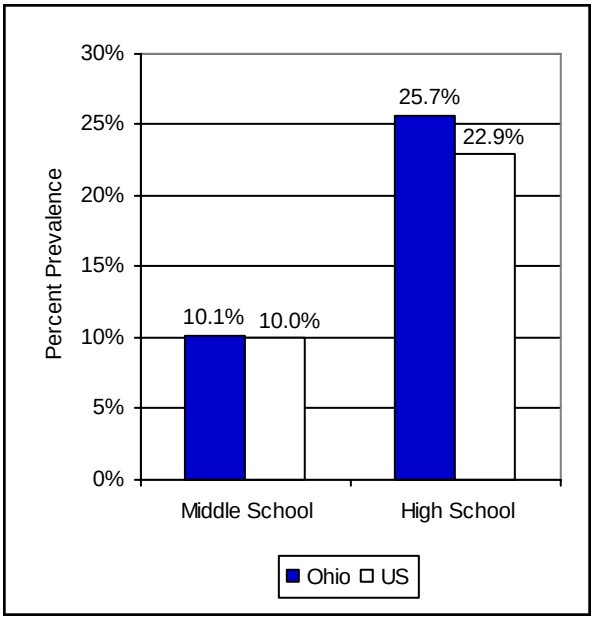


**Figure 1.9 Youth Smoking Prevalence:**
Smoking Prevalence Among Middle and High School Students, Ohio[c] with Comparison to the United States,[d] 2002




The youth currently smoking cigarettes are at risk of poor health in the future due to smoking-related illnesses. According to the 2002 Ohio Youth Tobacco Survey, 10.1 percent of Ohio middle school students and 25.7 percent of Ohio high school students were current smokers (Figure 1.9). These figures for Ohio were higher than the national smoking prevalence of 10.0 percent and 22.9 percent for middle and high school students, respectively, obtained from the National Youth Tobacco Survey.

# Conclusions

Cigarette smoking is the leading preventable cause of disease and death among Ohio adults. Smoking patterns among each age group, race and gender lead to disparities in morbidity and mortality. Smoking cessation will lead to fewer deaths in all gender, race and age groups. It is also important to lower the smoking prevalence among current youth in Ohio to decrease the risk of disease and death from smoking-related illnesses they may face as adults. A summary of the data for Ohio regarding cigarette smoking for the years 2001-2003 is presented below:

- The smoking prevalence in Ohio has been higher than the national median every year since 1992.
- In Ohio, the current smoking prevalence among males was 28.1 percent compared to 25.0 percent for females.
- The smoking prevalence for whites and blacks in Ohio was very similar, with 26.4 percent of whites compared to 25.6 percent of blacks reporting they were current smokers.
- The prevalence of cigarette smoking decreased as age increased in Ohio. The prevalence ranged from a high of 34.1 percent among persons aged 18 to 34 to a low of 11.2 percent among those who were 65 years of age and older.
- People with lower household incomes in Ohio were more likely to smoke. The prevalence of current smokers with household incomes of less than $25,000 annually was 33.1 percent compared to 17.8 percent for persons with household incomes of $75,000 or more.
- The health of current adult smokers in Ohio was poorer than the health of those adults who never smoked. Among those who never smoked, 26.6 percent rated their health as “excellent,” compared to 17.5 percent of current smokers.
- Current smokers were less likely to have health care coverage than those who have never smoked. For Ohio, 92.2 percent of never smokers had health care coverage, compared to 78.3 percent of current smokers with health care coverage.
- In 2002, 10.1 percent of middle school students and 25.7 percent of high school students were current smokers in Ohio. This group is at risk for future smoking-related morbidity and mortality.

# Data Sources

### [a] Ohio Behavioral Risk Factor Surveillance System:

Estimates for current smoking prevalence among adults in Ohio were derived from the Ohio Behavioral Risk Factor Surveillance System (OBRFSS). The OBRFSS is an annual, random-digit dialed telephone survey of adult Ohioans 18 years of age and older in non-institutionalized settings. OBRFSS data for the years 2001-2003 were analyzed for this chapter. Current smoking prevalence was defined as answering "yes" to the question, "Have you smoked at least 100 cigarettes in your entire life? [Note: 5 packs = 100 cigarettes]" and then an answer of "every day" or "some days" to the follow-up question "Do you now smoke cigarettes every day, some days or not at all?". The following variables were analyzed: gender, race, age, household income, general health status and health care plan coverage. The prevalence estimates were weighted to: 1) Probability of selection (how many phone numbers in each home, the number of adults in each home); and 2) Age, sex and race. "Don't Know/Unsure" and persons who refused to answer were excluded from the denominator in this analysis. Analyses were completed using SAS version 8.2 (SAS Institute, Cary, NC) and SUDAAN (Research Triangle Institute, NC).

### [b] U.S. Behavioral Risk Factor Surveillance System:

The estimate of current smoking prevalence among adults nationally is the median of the prevalence of each of the states and territories that were participants in the U.S. BRFSS. The median used in this report is the 2002 median.

### [c] Ohio Youth Tobacco Survey:

Estimates of current smoking prevalence among Ohio youth were calculated from the Ohio Youth Tobacco Survey (OYTS) conducted in 2002. The OYTS is a two-stage sampling frame survey. Schools containing grades 6-12 are selected with a probability proportional to school enrollment size and then whole classrooms within participating schools are sampled with an equal probability of being chosen. The instrument used is the National Youth Tobacco Survey (NYTS) designed by the Centers for Disease Control and Prevention. In the 2002 OYTS, all second-period classes in the selected schools were included in the sample. Current smoking prevalence among youth in Ohio is defined as cigarette use on one or more of the 30 days preceding the survey.

### [d] National Youth Tobacco Survey:

Estimates of current smoking prevalence among youth in the United States were derived from the NYTS, which is a two-stage sampling frame survey. Schools containing grades 6-12 are selected with a probability proportional to school enrollment size and then whole classrooms within participating schools are sampled with an equal probability of being chosen.

# Chapter 2: Cancer

The first Surgeon General's report on smoking and health released in 1964 provided evidence of a causal relationship between cigarette smoking and lung and larynx cancer in men.[1] Since that time, research has been growing to support a causal relationship between cigarette smoking and 10 sites/types of cancer: lung and bronchus; laryngeal; oral cavity and pharyngeal; esophageal; pancreatic; bladder; kidney and renal pelvis; cervical; stomach; and acute myeloid leukemia.[2]

The role cigarette smoking plays in the development of cancer differs by the site/type of cancer and varies with each individual case of cancer. Cancer has multiple risk factors which include tobacco use; obesity; poor diet/nutrition; and genetics, among many others. In most cases, not just one factor, but the interaction of multiple factors increases the risk of developing cancer. However, tobacco use contributes to about 30 percent of all cancer deaths and is the leading preventable cancer risk factor.[3] The elimination of cigarette smoking would, therefore, greatly reduce cancer incidence and mortality in the United States and in the State of Ohio.

The 1997-2001 Ohio cancer incidence and mortality data presented in this chapter were obtained from the Ohio Cancer Incidence Surveillance System and the Office of Vital Statistics at the Ohio Department of Health. The following chapter provides a summary of cases, deaths and populations at risk for each of the 10 sites/types of cancer with an established causal relationship to cigarette smoking. It is important to note the data represent the total number of cancer cases and deaths in Ohio, regardless of the risk factors and causes of each cancer. The objective of this chapter is to illustrate the burden of cancer in Ohio and the types of cancer that may be prevented through the elimination of cigarette smoking among Ohio residents.

# Lung and Bronchus Cancer

Cancer of the lung and bronchus has been identified by the Surgeon General as having a causal relationship to cigarette smoking.[2] Research has shown the chemicals in cigarette smoke cause genetic changes in the cells of the lung, contributing to the development of lung cancer. It is estimated that 87 percent of lung cancer deaths are attributable to smoking.[3] Incidence and mortality rates of lung and bronchus cancer are declining in males but rising in females, reflecting patterns of cigarette use over time. In addition, the prevention of smoking among youth has been shown to decrease the risk of this cancer type by decreasing the duration of smoking.

**Table 2.1 Lung and Bronchus Cancer:**
Average Annual Number of Cases and Age-adjusted Incidence Rates per 100,000,[a] and Average Annual Number of Deaths and Age-adjusted Mortality Rates per 100,000,[b] by Gender and Race, Ohio, 1997-2001

| | Incidence | | Mortality | |
|---|---|---|---|---|
| | Cases/yr | Rate | Deaths/yr | Rate |
| **Male** | 5,178 | 103.7 | 4,340 | 88.2 |
| **Female** | 3,869 | 58.1 | 3,009 | 44.5 |
| **White** | 8,017 | 75.1 | 6,551 | 61.2 |
| **Black** | 891 | 87.4 | 777 | 77.2 |
| **All** | 9,047 | 76.8 | 7,349 | 62.3 |

The greatest percentage of newly diagnosed cancers among Ohio residents is cancers of the lung and bronchus. An average of 9,047 cases of lung and bronchus cancer were diagnosed among Ohioans in 1997-2001. The average annual age-adjusted incidence rate for males (103.7 per 100,000) was 78 percent higher than the rate for females (58.1 per 100,000) and the rate among blacks was 16 percent higher than the rate for whites (87.4 and 75.1 per 100,000, respectively). The 1997-2001 average annual age-adjusted mortality rate of 62.3 per 100,000 was only slightly less than the incidence rate for this time period (76.8 per 100,000), illustrating the low probability of survival from this disease. Similar to incidence, mortality rates were found to be higher among males compared to females (88.2 versus 44.5 per 100,000, respectively) and higher among blacks (77.2 per 100,000) compared to whites (61.2 per 100,000) (Table 2.1).

Beginning to smoke at a younger age may slow lung growth, reduce lung function and increase the duration of smoking, which increases the risk for lung and bronchus cancer.

Technical Note: Lung and bronchus cancer cases were defined as follows: ICD-O-3 codes C340-C349, excluding histology types 9590-9989. Lung and bronchus cancer deaths were defined as follows: for 1997-1998, ICD-9 codes 1622-1629; and for 1999-2001, ICD-10 codes C340-C349.

**Figure 2.1 Lung and Bronchus Cancer:**
Average Annual Age-adjusted Incidence[a] and Mortality[b] Rates per 100,000, Ohio with Comparison to the United States (SEER[c]), 1997-2001

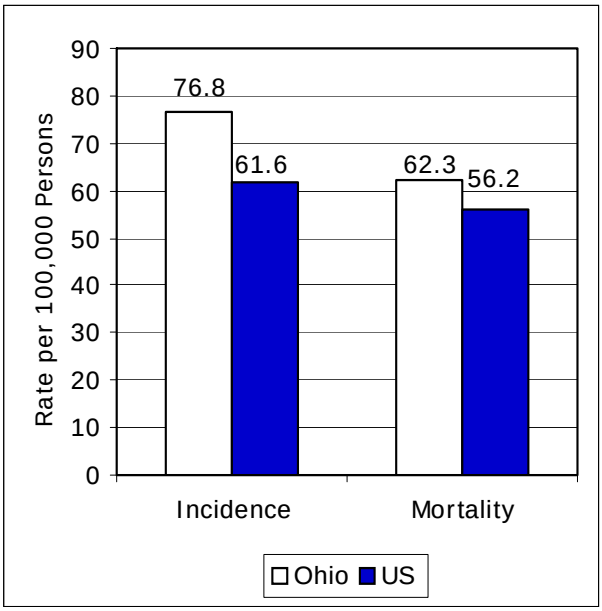
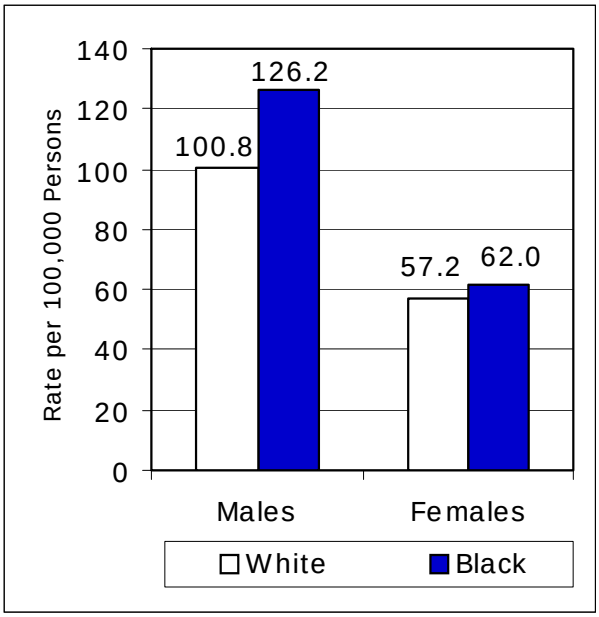



Figure 2.1 presents 1997-2001 average annual age-adjusted incidence and mortality rates of lung and bronchus cancer in Ohio compared to the United States (SEER[c]). It is revealed that the incidence rate in Ohio of 76.8 per 100,000 was 25 percent higher than the rate for the United States of 61.6 per 100,000. Similarly, the mortality rate in Ohio was 11 percent greater than the rate for the nation (62.3 versus 56.2 per 100,000, respectively). The high prevalence of cigarette smoking in Ohio compared to the United States is likely contributing to the higher rates of lung and bronchus cancer in the state.

**Figure 2.2 Lung and Bronchus Cancer:**
Average Annual Age-adjusted Incidence Rates per 100,000,[a] by Gender and Race, Ohio, 1997-2001

Figure 2.2 presents a comparison of 1997-2001 average annual age-adjusted incidence rates of lung and bronchus cancer in Ohio by gender and race. This figure illustrates higher incidence rates in males compared to females and in blacks compared to whites. Black males had the highest incidence rate of all the gender/race categories in 1997-2001 (126.2 per 100,000), whereas, white females had the lowest (57.2 per 100,000).



# Laryngeal Cancer

The 2004 Surgeon General's report on smoking concludes that a causal relationship exists between cigarette smoking and cancer of the larynx.[2] The larynx is directly exposed to the carcinogens in cigarette smoke as inhaled smoke passes between the vocal chords, increasing cancer risk. This risk rises with the duration of smoking and the number of cigarettes smoked. In addition, persons who smoke cigarettes and drink large amounts of alcohol are at an even greater risk of developing laryngeal cancer.

**Table 2.2 Laryngeal Cancer:**
Average Annual Number of Cases and Age-adjusted Incidence Rates per 100,000,[a] and Average Annual Number of Deaths and Age-adjusted Mortality Rates per 100,000,[b] by Gender and Race, Ohio, 1997-2001

| | Incidence | | Mortality | |
|---|---|---|---|---|
| | Cases/yr | Rate | Deaths/yr | Rate |
| Male | 428 | 8.3 | 131 | 2.7 |
| Female | 117 | 1.8 | 40 | 0.6 |
| White | 463 | 4.4 | 142 | 1.3 |
| Black | 70 | 6.7 | 29 | 2.8 |
| All | 545 | 4.7 | 171 | 1.5 |

In 1997-2001, about 1 percent of new cancer cases diagnosed among Ohio residents were cancers of the larynx. Table 2.2 shows that, during this time period, an average of 545 cases of laryngeal cancer were diagnosed each year among Ohioans. The average annual number of cases of laryngeal cancer was nearly four times higher in males compared to females and the age-adjusted incidence rate was more than 360 percent higher (8.3 versus 1.8 per 100,000 for males and females, respectively). It also shows the average annual age-adjusted incidence rate for blacks (6.7 per 100,000) was 52 percent higher than the incidence rate for whites (4.4 per 100,000). An average of 171 deaths from laryngeal cancer occurred among Ohioans each year from 1997-2001, as shown in Table 2.2. Similar to incidence, the average annual age-adjusted mortality rate of laryngeal cancer was nearly five times higher for males (2.7 per 100,000) compared to females (0.6 per 100,000) and was two times higher for blacks (2.8 per 100,000) compared to whites (1.3 per 100,000).

Cigarette smoking and alcohol consumption are responsible for the majority of cases of laryngeal cancer in the United States.

Technical Note: Laryngeal cancer cases were defined as follows: ICD-O-3 codes C320-C329, excluding histology types 9590-9989. Laryngeal cancer deaths were defined as follows: for 1997-1998, ICD-9 codes 161-1619; and for 1999-2001, ICD-10 codes C320-C329.

**Figure 2.3 Laryngeal Cancer:**
Average Annual Age-adjusted Incidence[a] and Mortality[b] Rates per 100,000, Ohio with Comparison to the United States (SEER[c]), 1997-2001

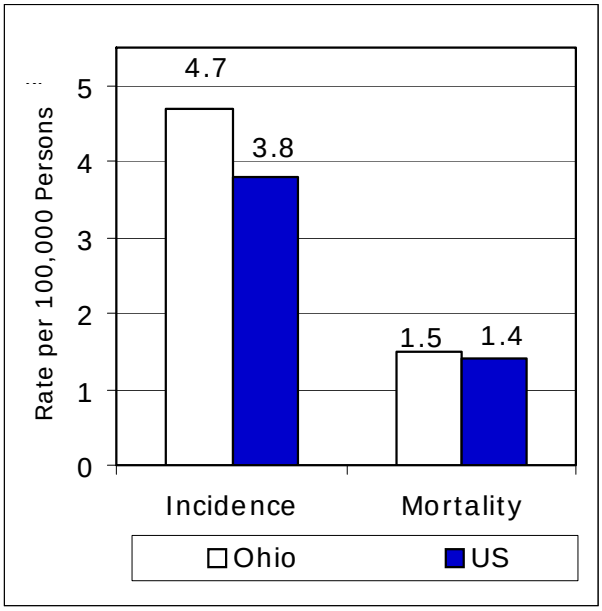
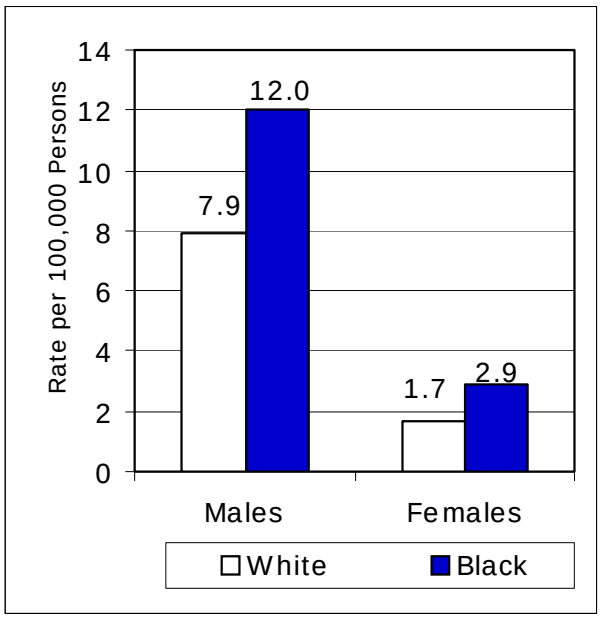



Figure 2.3 illustrates the 1997-2001 average annual age-adjusted incidence and mortality rates of laryngeal cancer for Ohio in comparison to the United States (SEER[c]). This figure indicates the rates for both incidence and mortality were higher in Ohio compared to the United States during this time period. The average annual age-adjusted incidence rate in Ohio (4.7 per 100,000) was 24 percent higher than the incidence rate in the United States (3.8 per 100,000), and the average annual age-adjusted mortality rate in Ohio of 1.5 per 100,000 was slightly higher than the U.S. mortality rate of 1.4 per 100,000.

**Figure 2.4 Laryngeal Cancer:**
Average Annual Age-adjusted Incidence Rates per 100,000,[a] by Gender and Race, Ohio, 1997-2001

Figure 2.4 presents a comparison of 1997-2001 Ohio average annual age-adjusted incidence rates of laryngeal cancer by gender and race. This figure illustrates the gender and racial disparities in the rates for this type of cancer, with males and blacks having substantially higher rates compared to females and whites. Black males had the highest rate of all gender/race categories (12.0 per 100,000), and white females had the lowest (1.7 per 100,000).



# Oral Cavity and Pharyngeal Cancer

The 2004 Surgeon General's report on the health consequences of smoking, consistent with previous publications, supports a causal relationship between oral cavity and pharyngeal cancer and cigarette smoking.[2] The findings reveal the average risk of this cancer type among current smokers is 10 times higher in males and five times higher in females compared to nonsmokers. Rates of both incidence and mortality are shown to increase with the number of cigarettes smoked per day. In addition, all forms of tobacco use (cigarettes, pipes, cigars, snuff, chewing tobacco, etc.) are shown to increase the occurrence of precancerous and cancerous lesions in the tissues of the oral cavity and pharynx.

**Table 2.3 Oral Cavity and Pharyngeal Cancer:**
Average Annual Number of Cases and Age-adjusted Incidence Rates per 100,000,[a] and Average Annual Number of Deaths and Age-adjusted Mortality Rates per 100,000,[b] by Gender and Race, Ohio, 1997-2001

| | Incidence | | Mortality | |
|---|---|---|---|---|
| | Cases/yr | Rate | Deaths/yr | Rate |
| Male | 714 | 13.8 | 206 | 4.1 |
| Female | 379 | 5.8 | 102 | 1.5 |
| White | 940 | 9.0 | 265 | 2.5 |
| Black | 117 | 10.9 | 42 | 4.0 |
| All | 1,092 | 9.4 | 308 | 2.6 |

Oral cavity and pharyngeal cancer made up 2 percent of the total cancer cases diagnosed among Ohio residents in 1997-2001. On average, 1,092 cases of oral cavity and pharyngeal cancer were diagnosed each year among Ohioans during this time period, as shown in Table 2.3. The average annual age-adjusted incidence rate for this cancer type was 2.4 times higher in males (13.8 per 100,000) compared to females (5.8 per 100,000), and was 21 percent higher among blacks (10.9 per 100,000) compared to whites (9.0 per 100,000). Table 2.3 shows an average of 308 deaths from oral cavity and pharyngeal cancer occurred each year from 1997-2001 in Ohio. Similar to incidence, the average annual age-adjusted mortality rate was 2.7 times higher in males compared to females (4.1 versus 1.5 per 100,000, respectively). The racial disparity in the incidence of oral cavity and pharyngeal cancer is also seen for mortality; the mortality rate among blacks (4.0 per 100,000) was 60 percent higher than the rate for whites (2.5 per 100,000).

> The combination of cigarette smoking and alcohol use produces a greater risk for oral cavity and pharyngeal cancer than either factor alone.

Technical Note: Oral cavity and pharynx cancer cases were defined as follows: ICD-O-3 codes C000-C009; C019-C029; C079-C089; C040-C049; C030-C039; C050-C059; C060-C069; C110-C119; C090-C099; C100-C109; C129; C130-C139; C140-C142; C148, excluding histology types 9590-9989. Lung and bronchus cancer deaths were defined as follows: for 1997-1998, ICD-9 codes 140-1499; and for 1999-2001, ICD-10 codes C000-C149.

**Figure 2.5 Oral Cavity and Pharyngeal Cancer:**
Average Annual Age-adjusted Incidence[a] and Mortality[b] Rates per 100,000, Ohio with Comparison to the United States (SEER[c]), 1997-2001

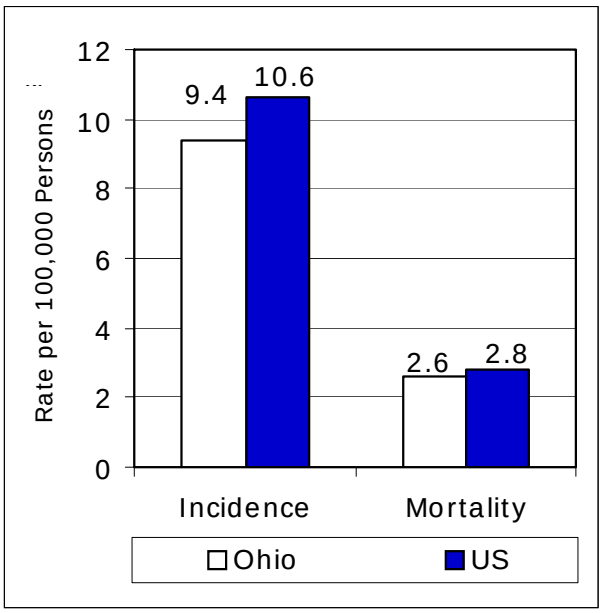
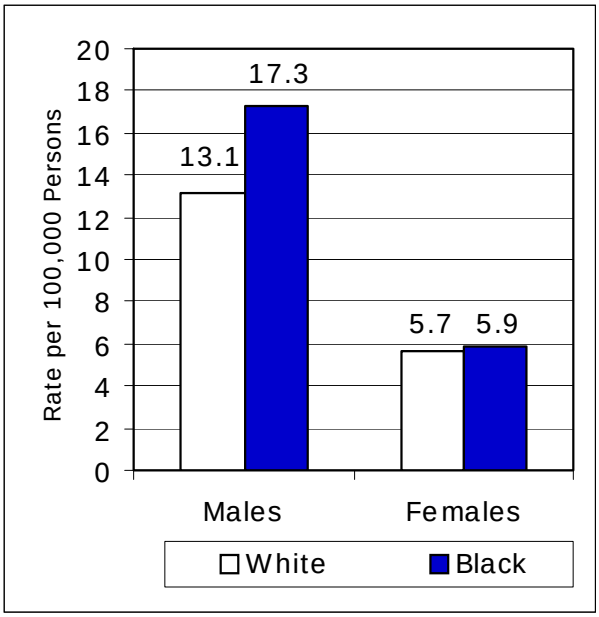



Figure 2.5 presents 1997-2001 average annual age-adjusted incidence and mortality rates of oral cavity and pharyngeal cancer for Ohio and the United States (SEER[c]). The rates in Ohio are lower than the rates for the United States for both incidence and mortality. The average annual age-adjusted incidence rate in Ohio of 9.4 per 100,000 was 11 percent lower than the incidence rate for the United States (10.6 per 100,000). Similarly, the average annual age-adjusted mortality rate in Ohio (2.6 per 100,000) was 7 percent lower than the U.S. mortality rate (2.8 per 100,000).

**Figure 2.6 Oral Cavity and Pharyngeal Cancer:**
Average Annual Age-adjusted Incidence Rates per 100,000,[a] by Gender and Race, Ohio, 1997-2001

Figure 2.6 presents the Ohio 1997-2001 average annual age-adjusted incidence rates of oral cavity and pharyngeal cancer by gender and race. This figure demonstrates the gender disparity in the incidence of this cancer type, with males of both races having higher rates than females. The highest incidence rate in 1997-2001 was found among black males (17.3 per 100,000), whereas the lowest incidence rate was among white females (5.7 per 100,000).



# Esophageal Cancer

The Surgeon General reports cigarette smoking is a major cause of both squamous cell carcinoma and adenocarcinoma of the esophagus.[2] Evidence suggests the risk of esophageal cancer among current smokers is seven times higher than the risk for nonsmokers and this risk increases with the number of cigarettes smoked. Persons who smoke are at a particularly high risk for esophageal cancer if they are also heavy drinkers of alcohol.

**Table 2.4 Esophageal Cancer:**
Average Annual Number of Cases and Age-adjusted Incidence Rates per 100,000,[a] and Average Annual Number of Deaths and Age-adjusted Mortality Rates per 100,000,[b] by Gender and Race, Ohio, 1997-2001

| | Incidence | | Mortality | |
|---|---|---|---|---|
| | Cases/yr | Rate | Deaths/yr | Rate |
| Male | 482 | 9.5 | 435 | 8.7 |
| Female | 156 | 2.3 | 133 | 1.9 |
| White | 546 | 5.1 | 501 | 4.7 |
| Black | 75 | 7.2 | 66 | 6.4 |
| All | 638 | 5.4 | 568 | 4.8 |

For the years 1997-2001, esophageal cancer accounted for about 1 percent of new cancer cases among Ohio residents. Table 2.4 shows a yearly average of 638 cases of esophageal cancer were diagnosed among Ohio residents during this time period. More than three times as many cases of esophageal cancer were diagnosed among males (482 cases/yr; 9.5 per 100,000) compared to females (156 cases/yr; 2.3 per 100,000). Although the majority of esophageal cancer cases were diagnosed among whites compared to blacks during this time period, the incidence rate for blacks was 41 percent higher than the rate for whites (7.2 versus 5.1 per 100,000, respectively). Table 2.4 shows an average of 568 deaths from esophageal cancer occurred each year from 1997 to 2001. Comparisons of average annual age-adjusted mortality rates of esophageal cancer by gender and race reveal patterns similar to incidence; the mortality rate for males was 4.6 times higher than the rate for females (8.7 versus 1.9 per 100,000, respectively), and the rate for blacks (6.4 per 100,000) was 36 percent higher than the rate for whites (4.7 per 100,000).

Cigarette smoking combined with alcohol consumption is more strongly associated with esophageal cancer than either factor alone.

Technical Note: Esophageal cancer cases were defined as follows: ICD-O-3 codes C150-C159, excluding histology types 9590-9989. Esophageal cancer deaths were defined as follows: for 1997-1998, ICD-9 codes 150-1509; and for 1999-2001, ICD-10 codes C150-C159.

**Figure 2.7 Esophageal Cancer:**
Average Annual Age-adjusted Incidence[a] and Mortality[b] Rates per 100,000, Ohio with Comparison to the United States (SEER[c]), 1997-2001

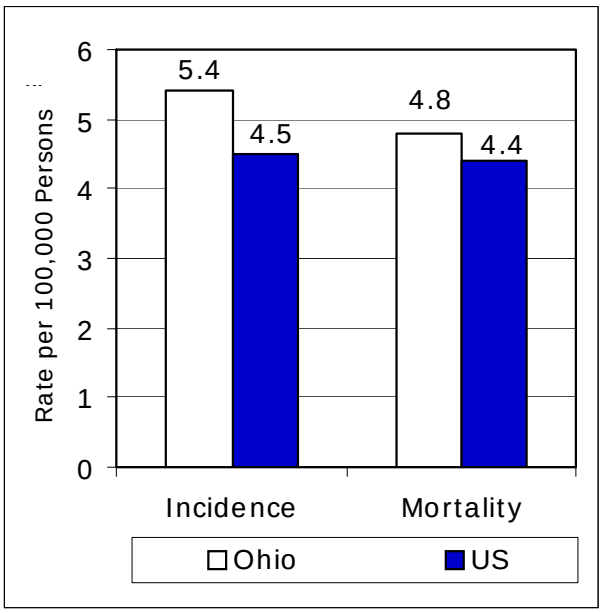
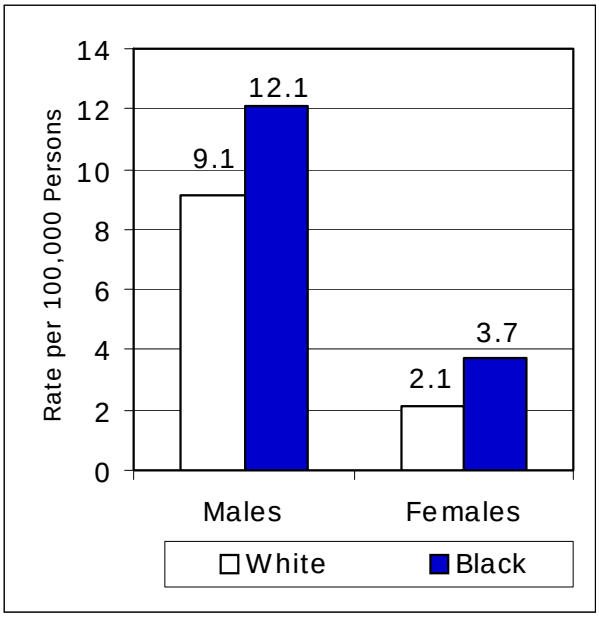



Figure 2.7 presents a comparison of 1997-2001 average annual age-adjusted incidence and mortality rates of esophageal cancer for Ohio and the United States (SEER[c]). This figure shows the incidence and mortality rates of esophageal cancer are similar, demonstrating the low probability of survival from this disease. The average annual age-adjusted incidence rate in Ohio of 5.4 per 100,000 was 20 percent higher than the incidence rate in the United States (4.5 per 100,000). Similarly, Ohio had a higher rate of mortality compared to the United States (4.8 versus 4.4 per 100,000, respectively).

**Figure 2.8 Esophageal Cancer:**
Average Annual Age-adjusted Incidence Rates per 100,000,[a] by Gender and Race, Ohio, 1997-2001

Figure 2.8 presents the average annual age-adjusted incidence rates of esophageal cancer in Ohio for the years 1997-2001, by gender and race. This figure clearly demonstrates the excess burden of esophageal cancer among males as compared to females. Black males had the highest esophageal cancer incidence rate of all gender/race categories (12.1 per 100,000), whereas, white females had the lowest rate (2.1 per 100,000).



# Pancreatic Cancer

The Surgeon General's report of 2004 states a causal relationship is present between cancer of the pancreas and cigarette smoking.[2] The risk of pancreatic cancer has been shown to increase with the duration of smoking and the number of cigarettes smoked. This risk; however, may be reduced though smoking prevention and cessation among persons who currently smoke.

**Table 2.5 Pancreatic Cancer:**
Average Annual Number of Cases and Age-adjusted Incidence Rates per 100,000,[a] and Average Annual Number of Deaths and Age-adjusted Mortality Rates per 100,000,[b] by Gender and Race, Ohio, 1997-2001

| | Incidence | | Mortality | |
|---|---|---|---|---|
| | Cases/yr | Rate | Deaths/yr | Rate |
| **Male** | 601 | 12.2 | 584 | 12.0 |
| **Female** | 634 | 9.2 | 629 | 9.0 |
| **White** | 1,075 | 10.1 | 1,062 | 9.9 |
| **Black** | 145 | 14.7 | 147 | 15.0 |
| **All** | 1,235 | 10.5 | 1,213 | 10.3 |

Table 2.5 illustrates that from 1997-2001, an average of 1,235 cases and 1,213 deaths from pancreatic cancer occurred each year. The average annual age-adjusted incidence and mortality rates of pancreatic cancer are similar, illustrating the low probability of survival from this disease. The incidence rate among males was 33 percent higher than the rate for females (12.2 versus 9.2 per 100,000, respectively), and the incidence rate for blacks (14.7 per 100,000) was 46 percent higher than the incidence rate for whites (10.1 per 100,000). Similar to incidence, males and blacks had higher rates of mortality from cancer of the pancreas compared to females and whites (Table 2.5). The 1997-2001 average annual age-adjusted mortality rate for males was 12.0 per 100,000, which was 33 percent higher than the rate for females (9.0 per 100,000). For the same time period, the mortality rate for blacks (15.0 per 100,000) was 52 percent higher than the rate for whites (9.9 per 100,000).

Smoking prevention and cessation are the best known strategies for reducing the number of cases of pancreatic cancer.

Technical Note: Pancreatic cancer cases were defined as follows: ICD-O-3 codes C250-C259, excluding histology types 9590-9989. Pancreatic cancer deaths were defined as follows: for 1997-1998, ICD-9 codes 157-1579; and for 1999-2001, ICD-10 codes C250-C259.

**Figure 2.9 Pancreatic Cancer:**
Average Annual Age-adjusted Incidence[a] and Mortality[b] Rates per 100,000, Ohio with Comparison to the United States (SEER[c]), 1997-2001

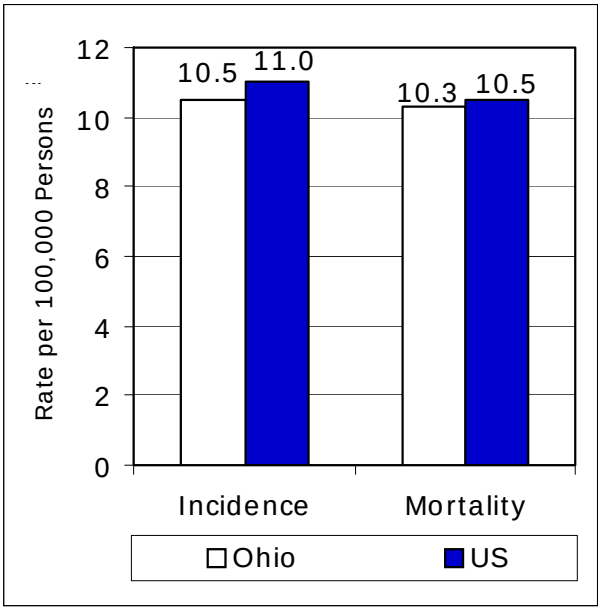
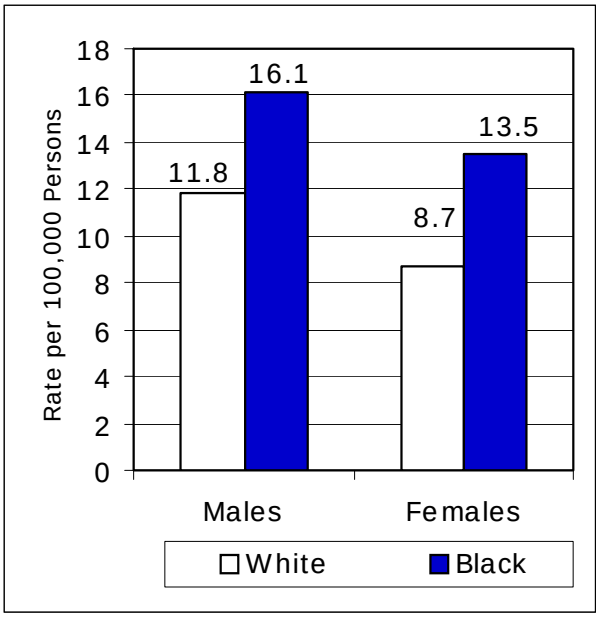



Figure 2.9 presents average annual age-adjusted incidence and mortality rates of pancreatic cancer in Ohio compared to the United States (SEER[c]) for the years 1997-2001. The average annual age-adjusted incidence rate in Ohio (10.5 per 100,000) was just slightly less than the incidence rate for the United States (11.0 per 100,000) for this time period. Similarly, the average annual age-adjusted mortality rate of pancreatic cancer in Ohio was slightly less than the U.S. rate; for 1997-2001, the mortality rate in Ohio was 10.3 per 100,000 compared to a U.S. mortality rate of 10.5 per 100,000.

**Figure 2.10 Pancreatic Cancer:**
Average Annual Age-adjusted Incidence Rates per 100,000,[a] by Gender and Race, Ohio, 1997-2001

Figure 2.10 shows Ohio average annual age-adjusted incidence rates of pancreatic cancer by gender and race for the years 1997-2001. This figure illustrates the racial disparity in the incidence of pancreatic cancer, with both black males and black females having higher rates than whites of both genders. The highest incidence rate (16.1 per 100,000) was found among black males, whereas the lowest incidence rate (8.7 per 100,000) was among white females.



# Bladder Cancer

The conclusions of the 2004 Surgeon General's report support a causal relationship between cigarette smoking and bladder cancer.[2] The cancer-causing agents in cigarette smoke are cleared from the body through urine, exposing the bladder to these chemicals. Research has shown the risk of bladder cancer increases with the number of cigarettes smoked and the duration of smoking.

**Table 2.6 Bladder Cancer:**
Average Annual Number of Cases and Age-adjusted Incidence Rates per 100,000,[a] and Average Annual Number of Deaths and Age-adjusted Mortality Rates per 100,000,[b] by Gender and Race, Ohio, 1997-2001

| | Incidence | | Mortality | |
|---|---|---|---|---|
| | Cases/yr | Rate | Deaths/yr | Rate |
| Male | 1,939 | 40.3 | 389 | 8.8 |
| Female | 700 | 10.2 | 188 | 2.6 |
| White | 2,438 | 22.8 | 537 | 5.0 |
| Black | 124 | 12.6 | 39 | 4.2 |
| All | 2,639 | 22.5 | 577 | 4.9 |

Bladder cancers accounted for about 5 percent of newly diagnosed cancers in 1997-2001 among Ohio residents. Table 2.6 shows a yearly average of 2,639 cases of bladder cancer were diagnosed among Ohioans during this time period. A substantial majority of bladder cancers were diagnosed among males compared to females; the average annual age-adjusted incidence rate for males of 40.3 per 100,000 was almost 300 percent higher than the rate for females of 10.2 per 100,000. Similarly, the incidence rate for whites (22.8 per 100,000) was considerably (81 percent) higher than the incidence rate for blacks (12.6 per 100,000). Table 2.6 illustrates an average of 577 deaths from bladder cancer occurred each year from 1997 to 2001. Similar to incidence, the mortality rate for males (8.8 per 100,000) was 3.4 times higher than the mortality rate for females (2.6 per 100,000), and the rate for whites (5.0 per 100,000) was 19 percent higher than the rate for blacks (4.2 per 100,000).

A substantial number of bladder cancers could be eliminated through smoking prevention and cessation.

Technical Note: Bladder cancer cases were defined as follows: ICD-O-3 codes C670-C679, excluding histology types 9590-9989. Bladder cancer deaths were defined as follows: for 1997-1998, ICD-9 codes 188-1889; and for 1999-2001, ICD-10 codes C670-C679.

**Figure 2.11 Bladder Cancer:**
Average Annual Age-adjusted Incidence[a] and Mortality[b] Rates per 100,000, Ohio with Comparison to the United States (SEER[c]), 1997-2001

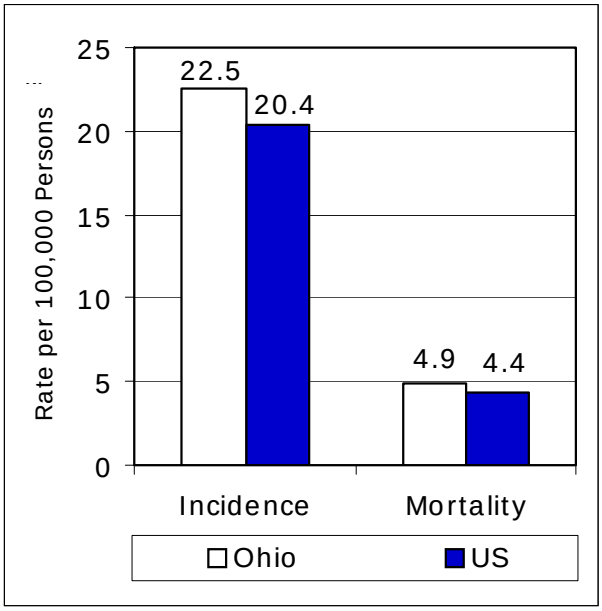
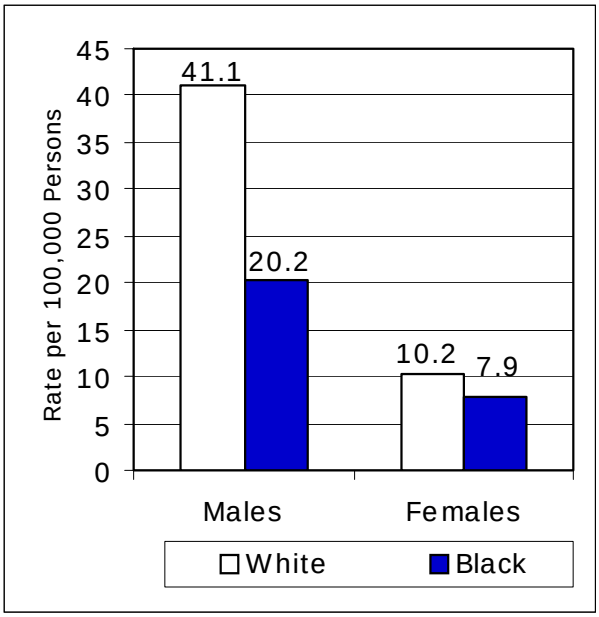



Figure 2.11 presents the 1997-2001 average annual age-adjusted incidence and mortality rates of bladder cancer in Ohio compared to the United States (SEER[c]). It is revealed that the incidence rate of bladder cancer in Ohio (22.5 per 100,000) was 10 percent higher than the incidence rate for the United States (20.4 per 100,000). A comparison of mortality rates reveals a similar finding; the mortality rate of bladder cancer in Ohio was 11 percent higher than the U.S. mortality rate for this time period (4.9 versus 4.4 per 100,000, respectively).

**Figure 2.12 Bladder Cancer:**
Average Annual Age-adjusted Incidence Rates per 100,000,[a] by Gender and Race, Ohio, 1997-2001

Figure 2.12 presents a comparison of 1997-2001 average annual age-adjusted incidence rates of bladder cancer in Ohio by gender and race. This figure illustrates the excess burden of bladder cancer among males compared to females. It is shown white males clearly had the highest incidence rate of all gender/race categories (41.1 per 100,000), whereas black females had the lowest rate of this type of cancer (7.9 per 100,000).



# Kidney and Renal Pelvis Cancer

A review of research on smoking and cancer, as reported in the 2004 Surgeon General's report, supports a causal relationship between cigarette smoking and cancer of the renal cells (kidney) and renal pelvis.[2] Cigarette smoke contains cancer-causing chemicals and the kidney and renal pelvis are exposed to these chemicals as they are cleared through the body. Risk increases with the number of cigarettes smoked and decreases with the number of years after quitting smoking. A substantial number of kidney and renal pelvis cancers could be prevented through smoking prevention and cessation.

**Table 2.7 Kidney and Renal Pelvis Cancer:**
Average Annual Number of Cases and Age-adjusted Incidence Rates per 100,000,[a] and Average Annual Number of Deaths and Age-adjusted Mortality Rates per 100,000,[b] by Gender and Race, Ohio, 1997-2001

| | Incidence | | Mortality | |
|---|---|---|---|---|
| | Cases/yr | Rate | Deaths/yr | Rate |
| Male | 797 | 15.6 | 330 | 6.7 |
| Female | 580 | 8.9 | 221 | 3.2 |
| White | 1,217 | 11.6 | 506 | 4.8 |
| Black | 135 | 12.7 | 45 | 4.4 |
| All | 1,377 | 11.8 | 551 | 4.7 |

Kidney and renal pelvis cancer accounted for 2.5 percent of new cancer cases among residents of Ohio in 1997-2001. As shown in Table 2.7, an average of 1,377 cases of kidney and renal pelvis cancer were diagnosed each year among Ohioans during this time period. The average annual age-adjusted incidence rate of kidney and renal pelvis cancer was 75 percent higher in males compared to females (15.6 versus 8.9 per 100,000, respectively) and 9 percent higher in blacks (12.7 per 100,000) compared to whites (11.6 per 100,000). About 2 percent of cancer deaths in 1997-2001 were from cancers of the kidney and renal pelvis. A total of 551 deaths occurred each year on average during this time period, as shown in Table 2.7. Similar to incidence, the average annual age-adjusted mortality rate of kidney and renal pelvis cancer was higher for males (6.7 per 100,000) compared to females (3.2 per 100,000). In contrast to the incidence rates by race, mortality rates of kidney and renal pelvis cancer were higher for whites compared to blacks (4.8 versus 4.4 per 100,000, respectively).

> The risk of kidney and renal pelvis cancer increases with the number of cigarettes smoked and significantly decreases with years of cessation.

Technical Note: Kidney and renal pelvis cancer cases were defined as follows: ICD-O-3 codes C649; C659, excluding histology types 9590-9989. Kidney and renal pelvis cancer deaths were defined as follows: for 1997-1998, ICD-9 codes 1890-1891; and for 1999-2001, ICD-10 codes C640-C659.

**Figure 2.13 Kidney and Renal Pelvis Cancer:**
Average Annual Age-adjusted Incidence[a] and Mortality[b] Rates per 100,000, Ohio with Comparison to the United States (SEER[c]), 1997-2001

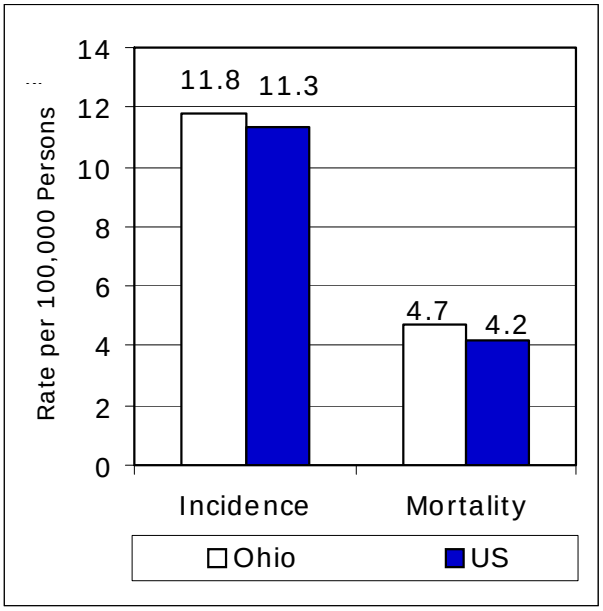
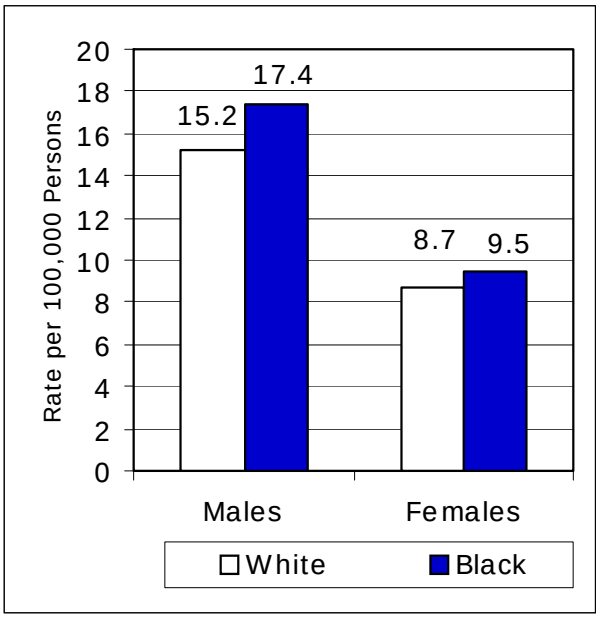



Figure 2.13 presents 1997-2001 average annual age-adjusted incidence and mortality rates of kidney and renal pelvis cancer for Ohio in comparison to the United States (SEER[c]). This figure reveals the rates in Ohio for both incidence and mortality were greater than the rates for the United States during this time period. The average annual age-adjusted incidence rate in Ohio (11.8 per 100,000) was 4 percent higher than the incidence rate in the United States (11.3 per 100,000), and the Ohio average annual age-adjusted mortality rate of 4.7 per 100,000 was 12 percent higher than the U.S. mortality rate of 4.2 per 100,000.

**Figure 2.14 Kidney and Renal Pelvis Cancer:**
Average Annual Age-adjusted Incidence Rates per 100,000,[a] by Gender and Race, Ohio, 1997-2001

Race and gender comparisons of 1997-2001 Ohio average annual age-adjusted incidence rates of kidney and renal pelvis cancer are presented in Figure 2.14. It is shown males had higher rates of this type of cancer compared to females, with black males having the highest rate of all gender/race categories (17.4 per 100,000). It is also shown whites had lower incidence rates of kidney and renal pelvis cancer compared to blacks for both males and females, with white females having the lowest rate of all categories (8.7 per 100,000).



# Cervical Cancer

Cigarette smoking has been causally associated with an increased risk of cervical cancer. The 2004 report of the Surgeon General supports this finding and concludes a causal relationship exists between cigarette smoking and cancer of the cervix.[2] Cigarette smoke acts directly on the epithelial cells of the cervix, increasing the risk of developing cervical cancer. This risk is shown to increase with the number of cigarettes smoked and the duration of smoking.

**Table 2.8 Cervical Cancer:**
Average Annual Number of Cases and Age-adjusted Incidence Rates per 100,000 Females,[a] and Average Annual Number of Deaths and Age-adjusted Mortality Rates per 100,000 Females,[b] by Race, Ohio, 1997-2001

| | Incidence | | Mortality | |
|---|---|---|---|---|
| | Cases/yr | Rate | Deaths/yr | Rate |
| White | 460 | 8.8 | 146 | 2.6 |
| Black | 60 | 9.6 | 31 | 5.1 |
| All | 533 | 8.9 | 177 | 2.8 |

In 1997-2001, cervical cancers accounted for about 2 percent of newly diagnosed cancers among female Ohioans. Table 2.8 shows a yearly average of 533 cases of cervical cancer were diagnosed among Ohio females during this time period. The majority of cervical cancers were diagnosed among whites; however, the average annual age-adjusted incidence rate of cervical cancer was higher among blacks (9.6 per 100,000) compared to whites (8.8 per 100,000). Average annual deaths and age-adjusted mortality rates of cervical cancer in Ohio are also shown in Table 2.8. For the years 1997-2001, 177 deaths from cervical cancer occurred each year on average. The racial disparity in the incidence of cervical cancer is also observed for mortality; the average annual cervical cancer mortality rate for blacks of 5.1 per 100,000 was 96 percent higher than the mortality rate for whites (2.6 per 100,000) during this time period.

The cervical mucous of current smokers is found to contain a number of carcinogens present in cigarette smoke.

Technical Note: Cervical cancer cases were defined as follows: ICD-O-3 codes C530-C539, excluding histology types 9590-9989. Cervical cancer deaths were defined as follows: for 1997-1998, ICD-9 codes 180-1809; and for 1999-2001, ICD-10 codes C530-C539.

**Figure 2.15 Cervical Cancer:**
Average Annual Age-adjusted Incidence[a] and Mortality[b] Rates per 100,000 Females, Ohio with Comparison to the United States (SEER[c]), 1997-2001

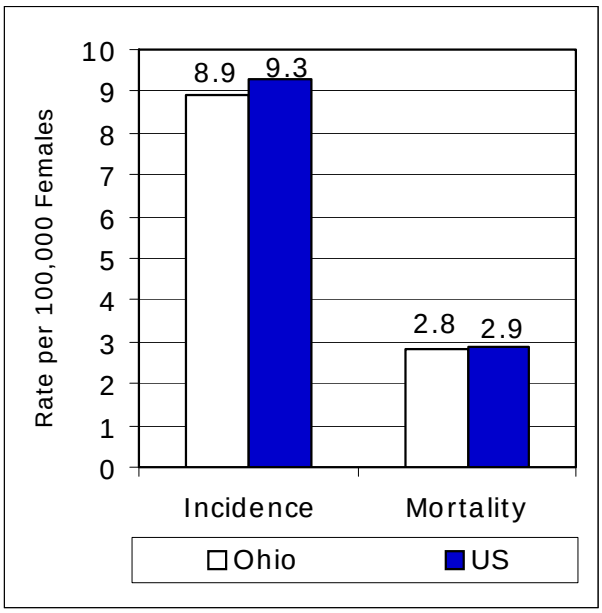
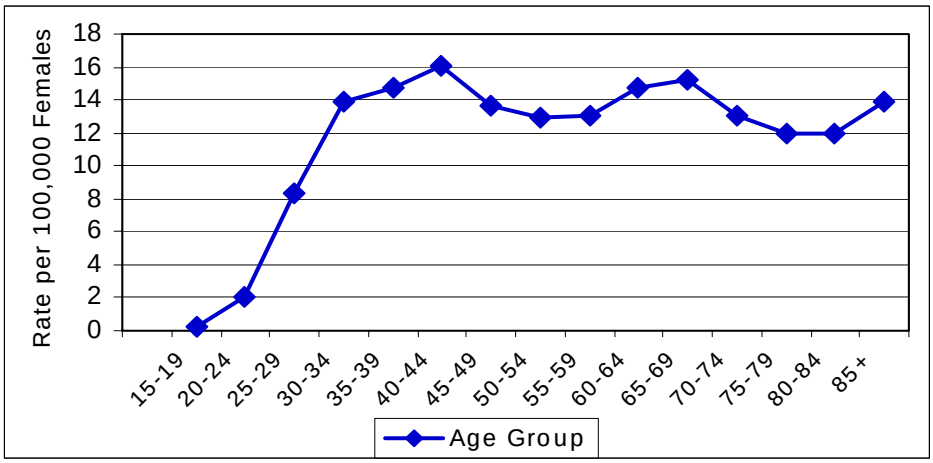



Figure 2.15 presents the 1997-2001 average annual age-adjusted incidence and mortality rates of cervical cancer in Ohio compared to the United States (SEER[c]). This figure shows the average annual age-adjusted incidence rate of cervical cancer in Ohio (8.9 per 100,000) was slightly less than the incidence rate for the United States (9.3 per 100,000). A similar pattern is observed for mortality; the average annual age-adjusted mortality rate of cervical cancer in Ohio of 2.8 per 100,000 was just slightly less than the U.S. mortality rate of 2.9 per 100,000 for this time period.

Age-specific incidence rates of cervical cancer among female Ohioans age 15 and older are presented in Figure 2.16. In 1997-2001, the rate of new cervical cancer cases increased sharply with advancing age until the 40-44 age group (16.1 per 100,000), followed by a slight decline with peaks at age 65-69 (15.2 per 100,000) and age 85 and older (13.9 per 100,000)

**Figure 2.16 Cervical Cancer:**
Average Annual Age-specific Incidence Rates per 100,000,[a] Among Females Age 15 and Older, Ohio, 1997-2001



# Stomach Cancer

The findings of the 2004 Surgeon General's report on the health consequences of smoking support a causal relationship between cigarette smoking and stomach cancer.[2] In addition, evidence suggests cigarette smoking may also play a role in other gastric cancers. Cigarette smoking by itself is not a major independent risk factor for stomach cancer; however, both the incidence and mortality of this cancer type are higher among current smokers compared to nonsmokers.

**Table 2.9 Stomach Cancer:**
Average Annual Number of Cases and Age-adjusted Incidence Rates per 100,000,[a] and Average Annual Number of Deaths and Age-adjusted Mortality Rates per 100,000,[b] by Gender and Race, Ohio, 1997-2001

| | Incidence | | Mortality | |
|---|---|---|---|---|
| | Cases/yr | Rate | Deaths/yr | Rate |
| Male | 465 | 9.6 | 299 | 6.3 |
| Female | 298 | 4.3 | 197 | 2.8 |
| White | 622 | 5.8 | 409 | 3.8 |
| Black | 116 | 11.8 | 82 | 8.5 |
| All | 763 | 6.5 | 496 | 4.2 |

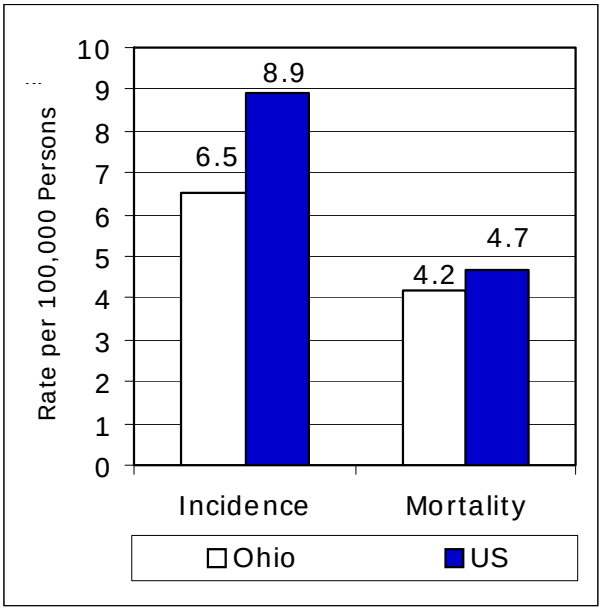
An average of 763 cases of stomach cancer occurred each year in Ohio from 1997-2001, as shown in Table 2.9. Stomach cancer accounted for 1.4 percent of new cancer cases among Ohioans during this time period. The average annual age-adjusted incidence rate for males (9.6 per 100,000) was 2.2 times higher than the incidence rate for females (4.3 per 100,000). Similarly, the incidence rate for blacks was about two times higher than the incidence rate for whites (11.8 versus 5.8 per 100,000, respectively).

About 2 percent of cancer deaths among Ohioans in 1997-2001 were cancers of the stomach. During this time period, an average of 496 deaths from stomach cancer occurred each year among Ohio residents (Table 2.9). The disparities by gender and race in the incidence of stomach cancer are also seen for mortality; the average annual age adjusted mortality rates for males (6.3 per 100,000) and blacks (8.5 per 100,000) were higher than the rates for females (2.8 per 100,000) and whites (3.8 per 100,000).

> The risk of stomach cancer among smokers approaches that of nonsmokers upon cessation of smoking.

Technical Note: Stomach cancer cases were defined as follows: ICD-O-3 codes C160-C169, excluding histology types 9590-9989. Stomach cancer deaths were defined as follows: for 1997-1998, ICD-9 codes 151-1519; and for 1999-2001, ICD-10 codes C160-C169.

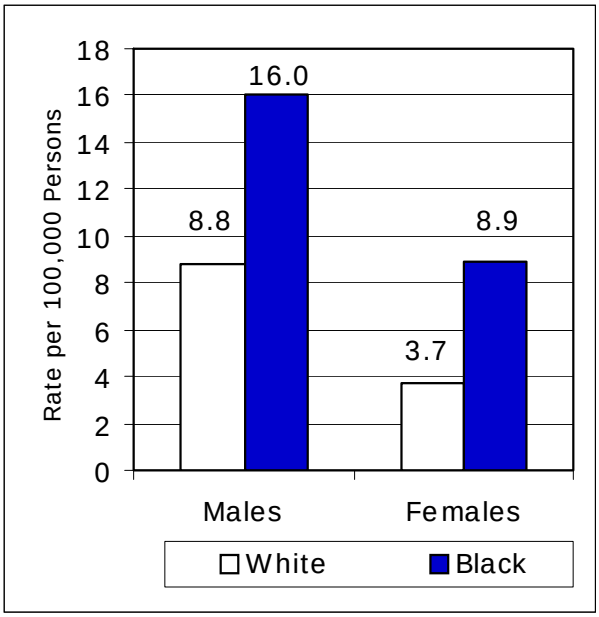
**Figure 2.17 Stomach Cancer:**
Average Annual Age-adjusted Incidence[a] and Mortality[b] Rates per 100,000, Ohio with Comparison to the United States (SEER[c]), 1997-2001




The 1997-2001 average annual age-adjusted incidence and mortality rates of stomach cancer in Ohio compared to the United States (SEER[c]) are presented in Figure 2.17. Ohio is shown to have lower rates of both incidence (6.5 per 100,000) and mortality (4.2 per 100,000) compared to the United States (8.9 and 4.7 per 100,000 for incidence and mortality, respectively). However, the lower incidence rate in Ohio compared to the United States may be due to underreporting of stomach cancer in Ohio; estimates indicated only 82 percent of stomach cancers were reported in Ohio for the years 1997-2001.

**Figure 2.18 Stomach Cancer:**
Average Annual Age-adjusted Incidence Rates per 100,000,[a] by Gender and Race, Ohio, 1997-2001

Gender and race comparisons of the incidence of stomach cancer in Ohio are presented in Figure 2.18. For the years 1997-2001, black males had the highest average annual age-adjusted incidence rate of stomach cancer of all gender/race categories (16.0 per 100,000). This rate was 82 percent higher than the rate for white males (8.8 per 100,000) during this time period. The lowest incidence rate of stomach cancer among Ohio residents was found for white females (3.7 per 100,000).



# Acute Myeloid Leukemia

Studies of cancer risk factors in recent years have implicated leukemia as a potential smoking-related cancer. Based on this research, the 2004 Surgeon General's report concludes there is a causal relationship between cigarette smoking and acute myeloid leukemia (AML).[2] Benzene has been identified as the strongest chemical cause of leukemia and benzene is found in cigarette smoke. The risk for AML increases with the number of cigarettes smoked and the duration of smoking.

**Table 2.10 Acute Myeloid Leukemia:**
Average Annual Number of Cases and Age-adjusted Incidence Rates per 100,000,[a] and Average Annual Number of Deaths and Age-adjusted Mortality Rates per 100,000,[b] by Gender and Race, Ohio, 1997-2001

| | Incidence | | Mortality | |
|---|---|---|---|---|
| | Cases/yr | Rate | Deaths/yr | Rate |
| Male | 230 | 4.6 | 154 | 3.2 |
| Female | 203 | 3.1 | 137 | 2.0 |
| White | 391 | 3.7 | 265 | 2.5 |
| Black | 34 | 3.1 | 25 | 2.4 |
| All | 433 | 3.7 | 291 | 2.5 |

AML accounted for about 1 percent of newly diagnosed cancers among Ohio residents in 1997-2001. An average of 433 cases of AML were diagnosed among Ohioans each year during this time period, as shown in Table 2.10. The average annual age-adjusted incidence rate for males (4.6 per 100,000) was 48 percent higher than the rate for females (3.1 per 100,000), and the rate for whites was 19 percent higher than the rate for blacks (3.7 and 3.1 per 100,000, respectively). Table 2.10 reveals an average of 291 deaths from AML occurred each year from 1997 to 2001. Similar to incidence, the mortality rate for males (3.2 per 100,000) was substantially higher (60 percent) than the mortality rate for females (2.0 per 100,000). In contrast, the mortality rates by race are very similar; whites had an average annual age-adjusted mortality rate of 2.5 deaths per 100,000 persons compared to a rate of 2.4 deaths per 100,000 for blacks.

> The risk for AML increases with the number of cigarettes smoked and the duration of smoking.

Technical Note: AML cases were defined as follows: ICD-O-3 histology types 9840; 9861; 9866-9867; 9871-9874; 9895-9897; 9910; 9920. AML deaths were defined as follows: for 1997-1998, ICD-9 codes 2050; 2070; 2072; and for 1999-2001, ICD-10 codes C920; C924-C925; C940; C942.

**Figure 2.19 Acute Myeloid Leukemia:**
Average Annual Age-adjusted Incidence[a] and Mortality[b] Rates per 100,000, Ohio with Comparison to the United States (SEER[c]), 1997-2001

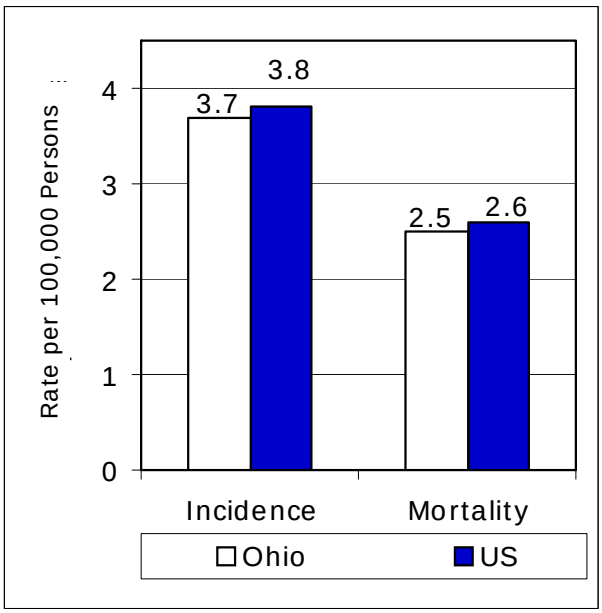
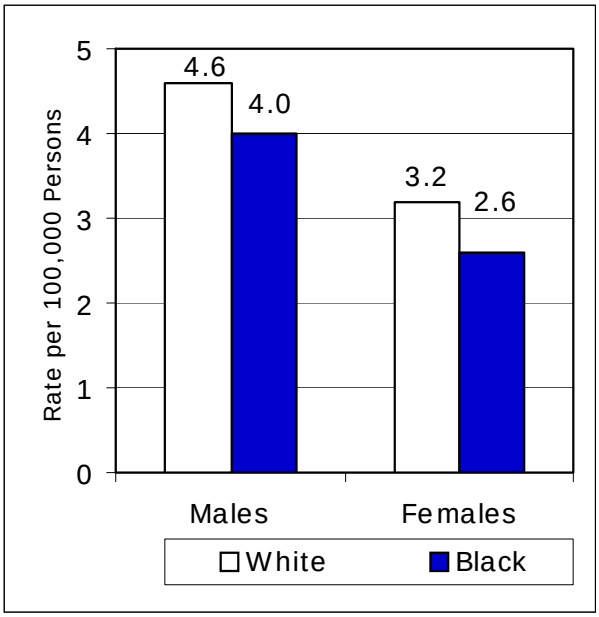



Figure 2.19 presents 1997-2001 average annual age-adjusted incidence and mortality rates of AML in Ohio compared to the United States (SEER[c]). During this time period, the incidence rate in Ohio of 3.7 per 100,000 was similar to the rate for the United States (3.8 per 100,000). Likewise, the mortality rate of AML in Ohio was comparable to the rate in the United States for this time period (2.5 per 100,000 versus 2.6 per 100,000, respectively). Prevention and control of cigarette smoking in Ohio may help reduce the number of cases and deaths from AML in the future.

**Figure 2.20 Acute Myeloid Leukemia:**
Average Annual Age-adjusted Incidence Rates per 100,000[a], by Gender and Race, Ohio, 1997-2001

A comparison of 1997-2001 average annual age-adjusted incidence rates of AML in Ohio by gender and race is presented in Figure 2.20. This figure illustrates higher incidence rates in males compared to females and in whites compared to blacks. White males had the highest incidence rate of all the gender/race categories during this time period (4.6 per 100,000), whereas black females had the lowest (2.6 per 100,000).



# Conclusions

Cancer is the leading cause of death in Ohio among persons less than 85 years of age. For the years 1997-2001, a yearly average of 55,230 Ohioans were diagnosed with cancer and 25,058 died from the disease. Tobacco use contributes to about 30 percent of all cancer deaths and is the leading preventable cancer risk factor. The purpose of this chapter was to assess the burden of cancer among Ohioans in 1997-2001, focusing on the 10 sites/types of cancer identified in the 2004 Surgeon General's report as having a causal relationship to cigarette smoking. A summary of the major findings is presented below:

### Lung and Bronchus Cancer:

- Chemicals in cigarette smoke cause genetic changes in the cells of the lung, contributing to the development of lung and bronchus cancer.
- Eighty-seven percent of lung and bronchus cancer deaths are estimated to be attributable to smoking.
- Lung and bronchus cancer is the leading site of new cancer cases and cancer deaths in Ohio and in the United States.
- In Ohio for the years 1997 to 2001, the rates of lung and bronchus cancer incidence and mortality were higher in males compared to females and in blacks compared to whites, with black males having the highest incidence rate of all gender/race categories.
- Lung and bronchus cancer incidence and mortality rates are higher in Ohio compared to the United States, likely from the high prevalence of cigarette smoking among Ohio residents.

### Laryngeal Cancer:

- Cigarette smoking and alcohol consumption are responsible for the majority of cancers of the larynx in the United States.
- Ohio males, compared to females, are four times more likely to develop laryngeal cancer and five times more likely to die from the disease.
- For the years 1997 to 2001, rates of laryngeal cancer incidence and mortality were higher in Ohio compared to the United States.

### Oral Cavity and Pharyngeal Cancer:

- The risk of oral cavity and pharynx cancer is 10 times higher in men and five times higher in women who smoke compared to nonsmokers.
- Incidence and mortality rates of oral cavity and pharynx cancer in 1997-2001 were lower in Ohio compared to the United States; however, the rates would decrease even further if Ohioans quit smoking.
- The incidence rates of oral cavity and pharynx cancer were higher in males compared to females, with black males having the highest rate of all gender/race categories.

### Esophageal Cancer:

- The risk of esophageal cancer is seven times higher in smokers compared to nonsmokers and increases with the number of cigarettes smoked.
- Incidence and mortality rates of esophageal cancer were higher in males compared to females and in blacks compared to whites in 1997-2001.
- For the years 1997-2001, Ohio had higher rates of esophageal cancer incidence and mortality compared to the nation.

### Pancreatic Cancer:

- The risk of pancreatic cancer increases with the number of cigarettes smoked and the duration of smoking.
- Ohio incidence and mortality rates of pancreatic cancer are similar, illustrating the low probability of survival from this disease.
- Rates of pancreatic in Ohio in 1997-2001 were similar to the rates for the nation.
- Black males and females in Ohio are at a greater risk of developing pancreatic cancer compared to whites of both genders.

### Bladder Cancer:

- Persons who smoke a greater number of cigarettes and/or have smoked for a longer time period are at highest risk of developing bladder cancer.
- Males are four times more likely to develop bladder cancer compared to females and more than three times more likely to die from the disease.
- Whites had higher incidence and mortality rates of bladder cancer in 1997-2001, with white males having the greatest risk.
- Incidence and mortality rates of bladder cancer were higher in Ohio compared to the United States for the years 1997-2001.

### Kidney and Renal Pelvis Cancer:

- The risk of kidney and renal pelvis cancer increases with the number of cigarettes smoked and significantly decreases with years of cessation.
- Black males in Ohio are at greatest risk for developing kidney and renal pelvis cancer, followed by white males, black females and white females.
- Ohio rates of kidney and renal pelvis cancer were higher than the rates for the nation from 1997 to 2001.

### Cervical Cancer:

- Cigarette smoke acts directly on the cells of the cervix, increasing the risk of developing cervical cancer.
- In 1997-2001, blacks in Ohio had higher incidence and mortality rates of cervical cancer compared to whites.
- Ohio incidence and mortality rates of cervical cancer were similar to the rates for the U.S. population in 1997-2001.
- Risk of cervical cancer increases with age until the 40 to 44 age group and then remains relatively stable thereafter.

### Stomach Cancer:

- The risk of stomach cancer among smokers approaches the risk for nonsmokers upon cessation of smoking.
- Males and blacks in Ohio are at greatest risk of developing and dying from bladder cancer.
- Incidence and mortality rates of bladder cancer were lower in Ohio compared to the United States from 1997 to 2001; however, this may be due to underreporting of bladder cancer in the state.

### Acute Myeloid Leukemia (AML):

- Benzene found in cigarette smoke increases the risk of developing AML.
- Rates of AML incidence and mortality were lower in Ohio compared to the nation in 1997-2001 but can be reduced even further through smoking prevention and cessation.
- White males are at greatest risk of developing AML, whereas black females are at lowest risk.

# Data Sources

### [a] Ohio Cancer Incidence:

New case data for cancers diagnosed among Ohio residents are collected and coded by the Ohio Cancer Incidence Surveillance System at the Ohio Department of Health. Ohio law (Ohio Revised Code 3701.26) requires all medical providers who diagnose and/or treat cancer patients to report to the OCISS all primary cancers diagnosed on or after Jan. 1, 1992, with the exception of basal and squamous cell skin cancer and carcinoma *in situ* of the cervix.

Cancer cases for the years 1997-2001 were coded according to the International Classification of Diseases for Oncology, Third Edition (ICD-O-3), codes C00.0-C80.9. Cases were grouped by ICD-O-3 code into site/type categories as defined by the Surveillance, Epidemiology and End Results (SEER) Program at the National Cancer Institute. Cancers are categorized at diagnosis by whether they are *in situ* or invasive. *In situ* cancers are malignant tumors that have not penetrated the basement membrane (supportive tissue underlying the epithelium) of the organ of origin or extended beyond the epithelial tissue, whereas invasive cancers have infiltrated the tissue of the organ in which the tumor originated. Incidence counts and rates include invasive cancers only, with the addition of *in situ* bladder cancers. The inclusion of *in situ* bladder cancers in the calculation of incidence rates is consistent with the methodology of the SEER Program.

### [b] Ohio Cancer Mortality:

Cancer deaths among Ohio residents are collected and coded by the Office of Vital Statistics at ODH. Deaths are categorized by the primary underlying cause of death listed on the death certificate.

Cancer deaths for 1997-1998 were coded according to the International Classification of Diseases, Ninth Revision (ICD-9), codes 140 to 2089; and cancer deaths for 1999-2001 were coded based on the International Classification of Diseases and Related Health Problems, Tenth Revision (ICD-10), codes C000 to C979.

### [c] U.S. Cancer Incidence and Mortality:

The SEER Program at the National Cancer Institute serves as the source of the 1997-2001 national cancer incidence and mortality data presented in this report. SEER collects and publishes cancer incidence data from 14 population-based and three supplemental registries covering 26 percent of the U.S. population. The U.S. incidence rates presented in this report are from the SEER public-use database comprising 11 SEER registries plus Alaska, which was considered to most closely represent the national cancer burden at the time of publication. The SEER Program also publishes U.S. mortality rates calculated from the National Center for Health Statistics public-use mortality file. National cancer rates are of benefit to determine if rates in Ohio for specific sites/types of cancer, demographic populations and geographic areas are higher than expected compared to the U.S. cancer burden.

### [d] Population Estimates:

The 1997-2001 Ohio population estimates used in the rate calculations include the following: recalculated intercensal estimates for July 1, 1997-1999; Census 2000 bridged estimates for April 1, 2000; and post-censal estimates for July 1, 2001. The 31 race categories collected in the 2000 Census were bridged to obtain white and black race.

# References

1. 1964 Surgeon General Report: Reducing the Health Consequences of Smoking. [Atlanta, Ga.]: Dept. of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; Washington, D.C., 1964.
2. The Health Consequences of Smoking: a Report of the Surgeon General. [Atlanta, Ga.]: Dept. of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; Washington, D.C., 2004.
3. National Cancer Institute. Available: http://cis.nci.nih.gov/fact/10_14.htm.