

## **Chapter 3: Cardiovascular Disease**

Cardiovascular disease (CVD) was one of the first health issues identified in the 1964 Surgeon General's Report as having a causal association with cigarette smoking.<sup>1</sup> This report was the first of its kind and noted that males who smoked had higher CVD mortality rates compared to males who did not smoke. In the 40 years following this report, a substantial body of research has further documented the serious and all-encompassing effects of smoking on the structure and function of the entire cardiovascular system. These effects are directly linked to the occurrence of heart disease and stroke – the two most prevalent types of CVD caused by smoking. Key findings from subsequent reports have concluded smoking is not only one of the main risk factors for coronary heart disease (CHD), which includes non-fatal and fatal myocardial infarctions and sudden death, but also that smoking is a causal factor. Cigarette smokers are two to four times more likely to develop CHD than nonsmokers and have more than double the risk of stroke.<sup>2</sup> The disease burden of smoking also results in a shorter lifespan. On average, male smokers die 13.2 years earlier than male nonsmokers and female smokers die 14.5 years earlier than female nonsmokers.<sup>3</sup> Additional research in the area of smoking cessation has concluded cessation can reduce the risk of developing both ischemic and hemorrhagic stroke, recurrent infarctions and sudden cardiovascular death. For example, the risk of stroke decreases steadily after smoking cessation. Former smokers have the same risk as nonsmokers after five to 15 years.<sup>3</sup> The major conclusions of the latest Surgeon General's report are the following:

1. The evidence is sufficient to infer a causal relationship between smoking and sub-clinical atherosclerosis.
2. The evidence is sufficient to infer a causal relationship between smoking and coronary heart disease.
3. The evidence is sufficient to infer a causal relationship between smoking and stroke.
4. The evidence is sufficient to infer a causal relationship between smoking and abdominal aortic aneurysm.
5. The evidence suggests only a weak relationship between the type of cigarette smoked and coronary heart disease risk.

This chapter presents Ohio and U.S. mortality and Ohio prevalence data (when available) for selected cardiovascular diseases discussed in the 2004 Surgeon General's Report and describes the burden of atherosclerosis, CHD, cerebrovascular disease (stroke) and abdominal aortic aneurysm.

## Atherosclerosis

Atherosclerosis is a progressive hardening of the arteries caused by plaque deposition. Accumulating plaque deposits lead to scarring and thickening of the artery wall, reducing the artery's diameter and decreasing blood flow and oxygen availability. Toxins in the blood from smoking cigarettes worsen the development of atherosclerosis and greatly increase the risk of heart attack and stroke.<sup>3</sup> Cigarette smoking accelerates the atherosclerotic process, affecting smokers as early as their 20s.<sup>4</sup> The development of this condition has been highly associated with cigarette smoking.

**Table 3.1 Atherosclerosis:**

Average Annual Number of Deaths and Age-adjusted Mortality Rates per 100,000, by Gender and Race, Ohio, 1997-2001<sup>[a]</sup>

	Deaths/year	Rate
<b>Male</b>	240	6.0
<b>Female</b>	445	5.8
<b>White</b>	637	6.0
<b>Black</b>	48	5.3
<b>All</b>	685	5.9

On average, 685 Ohioans die from atherosclerosis each year. The average annual mortality rate for the years 1997-2001 was 5.9 per 100,000 persons. The mortality rate for males in Ohio was slightly (3 percent) higher compared to females. The mortality rate for whites (6.0 per 100,000 persons) was 13 percent higher compared to blacks (5.3 per 100,000 persons) (Table 3.1). It should be noted that atherosclerosis is the precursor for the development of other cardiovascular diseases which lead to more serious and fatal cardiovascular events such as heart attack and stroke; therefore, the mortality rates may not be indicative of the true burden of atherosclerosis.

Cigarette smoking damages the heart and blood vessels.

Technical Note: Atherosclerosis Disease Deaths were defined as follows: ICD-9 code 440 for 1997-1998 and ICD-10 code I70 for 1999-2001.

## Coronary Heart Disease

Coronary Heart Disease (CHD), which includes myocardial infarction (MI), i.e. heart attack, ischemic heart disease and angina pectoris (chest pain), has been identified as having a causal relationship with smoking. CHD results from atherosclerosis of the coronary arteries. As many as 30 percent of all CHD deaths in the United States each year are attributable to cigarette smoking.<sup>5</sup> Persons with CHD can reduce their risk of recurrent myocardial infarction, sudden cardiac death and total mortality by up to 50 percent if they quit smoking after their first infarction.<sup>3</sup>

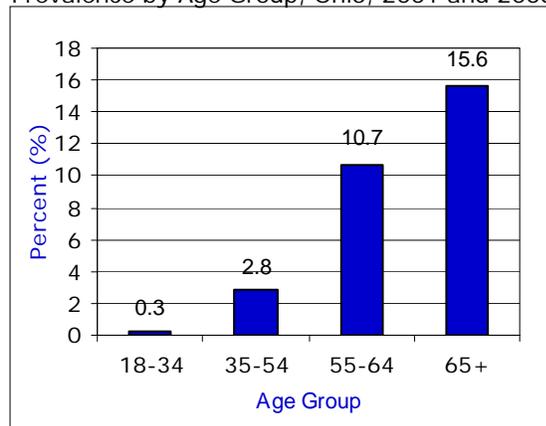
Estimates obtained from the Ohio Behavioral Risk Factor Surveillance System (BRFSS) indicate 5.4 percent of adults 18 years and older report having CHD. Males had a higher prevalence compared to females, with 6.3 percent reporting having CHD compared to 4.5 percent of females (Table 3.2).

**Table 3.2 Coronary Heart Disease:**  
Estimated Prevalence by Gender and by Race, Ohio, 2001 and 2003<sup>[b]</sup>

	(%)	C.I.*
<b>Male</b>	6.3	5.2 - 7.3
<b>Female</b>	4.5	3.8 - 5.3
<b>White</b>	5.7	5.0 - 6.5
<b>Black</b>	2.5	1.2 - 3.9
<b>All</b>	5.4	4.7 - 6.0

\*C.I.=95% Confidence Interval

**Figure 3.1 Coronary Heart Disease:**  
Prevalence by Age Group, Ohio, 2001 and 2003<sup>[b]</sup>



As expected, the prevalence of CHD increased with age, with almost 16 percent of persons age 65 and older having some form of CHD (Figure 3.1).

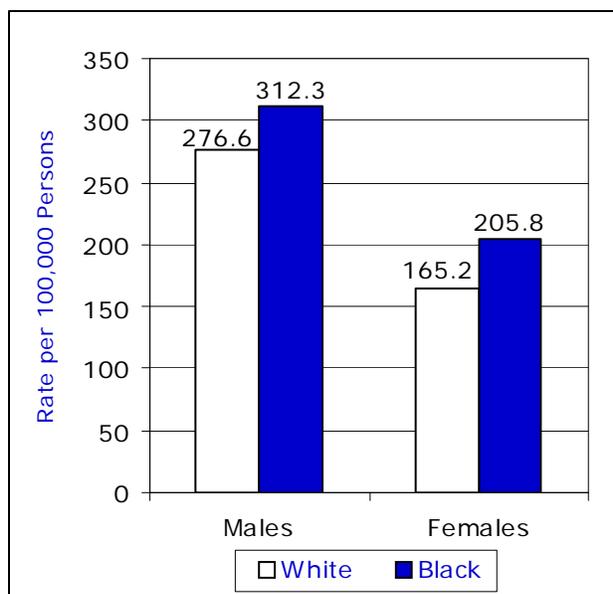
Coronary heart disease is the leading cause of death among Ohioans. On average, 24,040 persons die of coronary heart disease each year. The average annual age-adjusted mortality rate for this time period was 214.9 per 100,000 persons. The mortality rate for males (276.6 per 100,000 persons) was 64 percent higher than females (168.8 per 100,000 persons). The mortality rate for blacks (249.8 per 100,000 persons) was more than 17 percent higher compared to the mortality rate of whites (212.0 per 100,000 persons) (Table 3.3).

**Table 3.3 Coronary Heart Disease:**  
Average Annual Number of Deaths and Age-adjusted Mortality Rates per 100,000, by Gender and Race, Ohio, 1997-2001<sup>[a]</sup>

	Deaths/year	Rate
<b>Male</b>	12,495	276.6
<b>Female</b>	12,509	168.8
<b>White</b>	22,561	212.0
<b>Black</b>	2,392	249.8
<b>All</b>	24,040	214.9

Technical Note: Coronary Heart Disease Deaths were defined as follows: ICD-9 codes 402, 404-414 and 429.2 for 1997-1998 ICD-10 codes I20-I25 for 1999-2001.

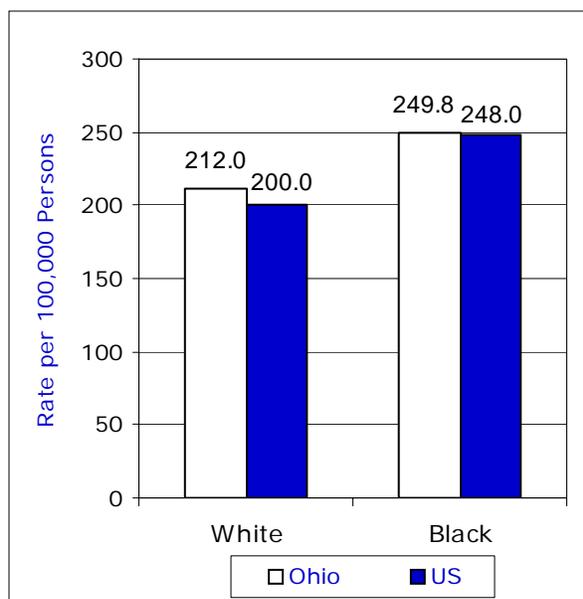
**Figure 3.2 Coronary Heart Disease:**  
Average Annual Age-adjusted Mortality Rates per 100,000, by Gender and Race, Ohio, 1997-2001<sup>[a]</sup>



Disparities between race and gender are evident in CHD mortality rates. The mortality rate for black males (312.3 per 100,000 persons) was 13 percent higher compared to white males (276.6 per 100,000 persons). The same trend exists for females, in which the mortality rate for black females (205.8 per 100,000 persons) was almost 25 percent higher than the rate for white females (165.2 per 100,000 persons).

**Figure 3.3 Coronary Heart Disease:**  
Average Annual Age-adjusted Mortality Rates per 100,000, Ohio (1997-2001)<sup>[a]</sup> with Comparison to the United States (1999)<sup>[c]</sup>

Ohio's mortality rates from coronary heart disease for both the white and black populations were slightly higher compared to the national rates for whites and blacks, respectively. Ohio's white population had a mortality rate of 212.0 per 100,000 persons compared to the national rate of 200.0 per 100,000. Ohio's black population had a mortality rate of 249.8 per 100,000 persons compared to 248.0 per 100,000 persons for the black population nationally.

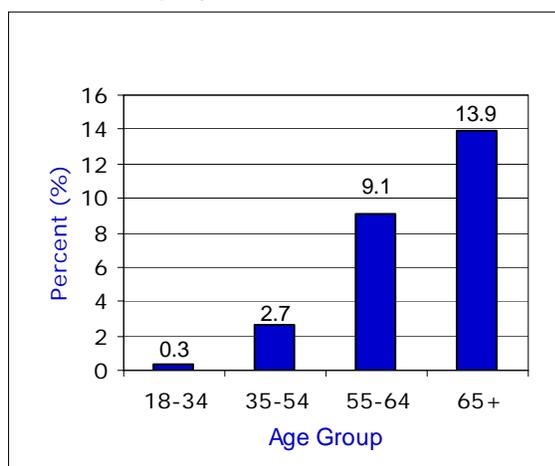


## Myocardial Infarction

Myocardial infarction (MI), commonly referred to as a heart attack, is a form of coronary heart disease. MI results from an interruption of blood flow through the coronary arteries causing damage to the heart and possibly death. Smoking has been identified as a strong risk factor for MI.<sup>3</sup> A smoker's risk of MI is more than twice that of nonsmokers' and smokers who have a MI are more likely to die suddenly (within an hour) than nonsmokers.<sup>2</sup>

Prevalence estimates of MI from the Behavioral Risk Factor Surveillance System indicated more males (6.1 percent) reported having a MI compared to females (3.7 percent).

**Figure 3.4 Myocardial Infarction:**  
Prevalence by Age Group, Ohio, 2001 and 2003<sup>[b]</sup>



Between the time period of 1997-2001, mortality rates for males (105.7 per 100,000 persons) were almost twice that of females (59.6 per 100,000 persons). Whites (79.7 per 100,000 persons) had a slightly higher mortality rate compared to blacks (71.9 per 100,000 persons). During this five-year period, almost 46,000 Ohioans died from MIs, an average of 9,189 deaths each year.

**Table 3.4 Myocardial Infarction:**  
Estimated Prevalence by Gender and Race, Ohio, 2001 and 2003<sup>[b]</sup>

	(%)	C.I.*
<b>Male</b>	6.1	5.0 - 7.1
<b>Female</b>	3.7	3.0 - 4.4
<b>White</b>	5.2	4.5 - 5.9
<b>Black</b>	3.3	1.6 - 5.0
<b>All</b>	4.8	4.2 - 5.4

\*C.I.=95% Confidence Interval

As expected, the prevalence of MI increased with age, with almost 14 percent of persons age 65 and older reporting having suffered an MI.

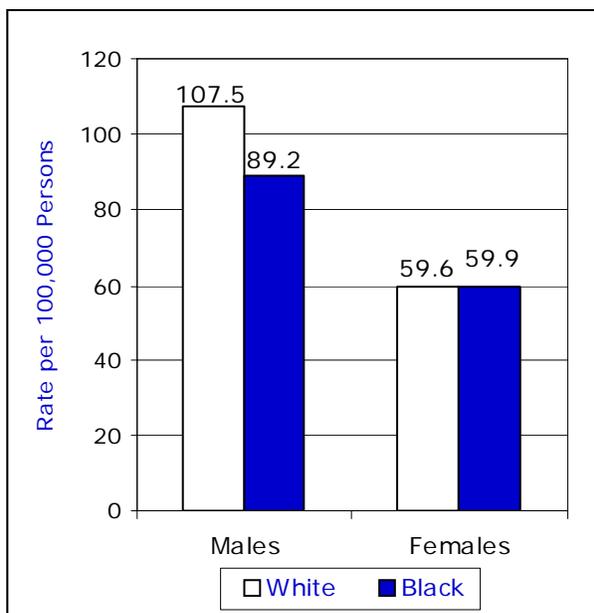
**Table 3.5 Myocardial Infarction:**  
Average Annual Number of Deaths and Age-adjusted Mortality Rates per 100,000, by Gender and Race, Ohio, 1997-2001<sup>[a]</sup>

	Deaths/year	Rate
<b>Male</b>	4,829	105.7
<b>Female</b>	4,360	59.6
<b>White</b>	8,478	79.7
<b>Black</b>	690	71.9
<b>All</b>	9,189	78.8

Technical Note: Myocardial Infarction deaths were defined as follows: ICD-9 code 410 for 1997-1998 and ICD-10 codes I21-I22 for 1999-2001.

**Figure 3.5 Myocardial Infarction:**

Average Annual Age-adjusted Mortality Rates per 100,000, by Gender and Race, Ohio, 1997-2001<sup>[a]</sup>

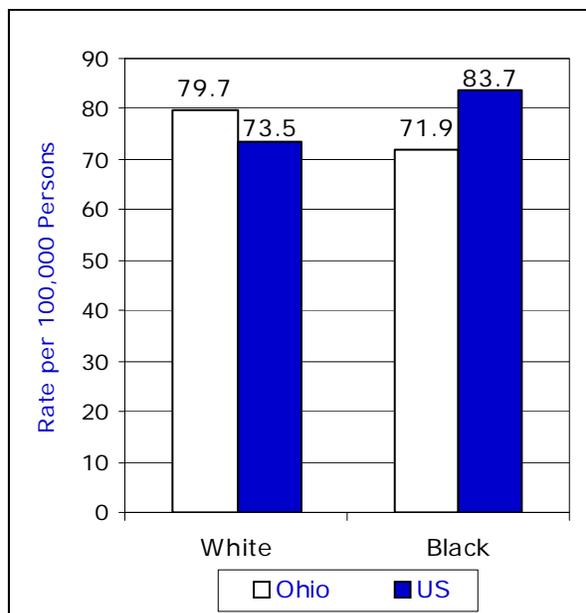


Between 1997-2001 in Ohio, white males had the highest mortality rate (107.5 per 100,000 persons) followed by black males with a mortality rate of 89.2 per 100,000 persons. Among white and black females the rates were nearly equal. Females of both races had a much lower rate compared to males.

The mortality rate from MI for Ohio's white population (79.7 per 100,000 persons) was slightly higher compared to the U.S. white population rate (73.5 per 100,000 persons). The mortality rate for Ohio's black population (71.9 per 100,000 persons) was 16 percent lower compared to the nation's black population rate (83.7 per 100,000 persons).

**Figure 3.6 Myocardial Infarction:**

Average Annual Age-adjusted Mortality Rates per 100,000, Ohio (1997-2001)<sup>[a]</sup> with Comparison to the United States (1999)<sup>[c]</sup>



## Cerebrovascular Disease (Stroke)

Cerebrovascular disease, commonly referred to as stroke, has been identified by the Surgeon General as having a causal relationship to cigarette smoking. Smoking increases the risk of stroke by as much as 50 percent. Many of the mechanisms previously discussed for atherosclerosis and Coronary Heart Disease also relate to cerebrovascular disease, particularly for ischemic stroke.<sup>3</sup> Ischemic strokes are caused by an obstruction or clot in an artery which reduces or stops blood flow. Nicotine and carbon monoxide in cigarette smoke damage blood vessel walls and contribute to clot formation.<sup>5</sup> The Surgeon General's report concludes that cigarette smoking remains a major cause of stroke in the United States.

Estimates obtained from the Behavioral Risk Factor Surveillance System indicate that of adults 18 years and older, 2.5 percent reported having had a stroke. Blacks had a higher prevalence compared to whites, with 3.5 percent reporting having had a stroke compared to 2.4 percent of whites.

Figure 3.7 shows the prevalence of stroke increased with age, with 7.4 percent of persons age 65 and older reporting that they had suffered a stroke.

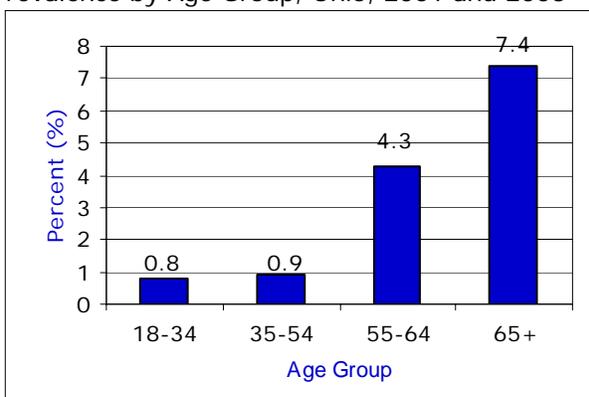
Cerebrovascular disease (stroke) is the third-leading cause of death among Ohioans. On average, 7,564 persons died of stroke from 1997 to 2001. The average annual age-adjusted mortality rate for this time period was 64.2 per 100,000 persons, with males having a slightly higher mortality rate (66.3 per 100,000 persons) compared to females (62.3 per 100,000 persons). The mortality rate for blacks (82.1 per 100,000 persons) was 31 percent higher compared to the mortality rate of whites (62.5 per 100,000 persons).

**Table 3.6 Cerebrovascular Disease (Stroke):**  
Estimated Prevalence by Gender and Race, Ohio, 2001 and 2003<sup>[b]</sup>

	(%)	C.I.*
<b>Male</b>	2.2	1.6 - 2.8
<b>Female</b>	2.8	2.2 - 3.3
<b>White</b>	2.4	2.0 - 2.9
<b>Black</b>	3.5	2.0 - 5.0
<b>All</b>	2.5	2.1 - 2.9

\*C.I. = 95% Confidence Interval

**Figure 3.7 Cerebrovascular Disease (Stroke):**  
Prevalence by Age Group, Ohio, 2001 and 2003<sup>[b]</sup>

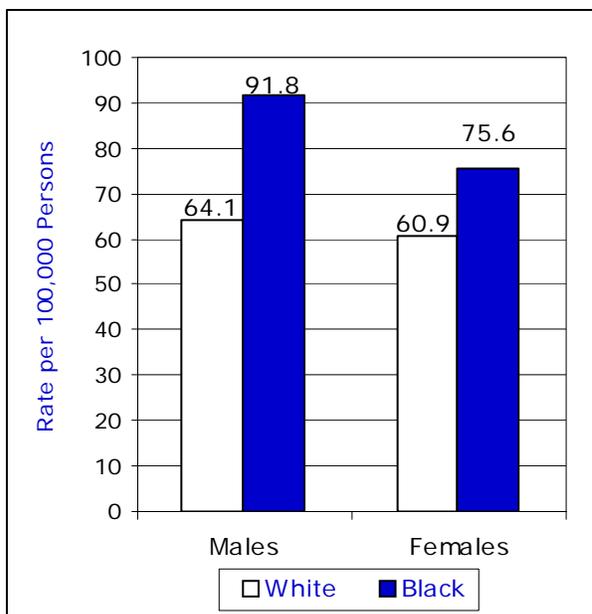


**Table 3.7 Cerebrovascular Disease (Stroke):**  
Average Annual Number of Deaths and Age-adjusted Mortality Rates per 100,000, by Gender and Race, Ohio, 1997-2001<sup>[a]</sup>

	Deaths/year	Rate
<b>Male</b>	2,812	66.3
<b>Female</b>	4,644	62.3
<b>White</b>	6,660	62.5
<b>Black</b>	770	82.1
<b>All</b>	7,564	64.2

Technical Note: Cerebrovascular Disease deaths were defined as follows: ICD-9 codes 430-438 for 1997-1998 and ICD-10 codes I60-I69 for 1999-2001.

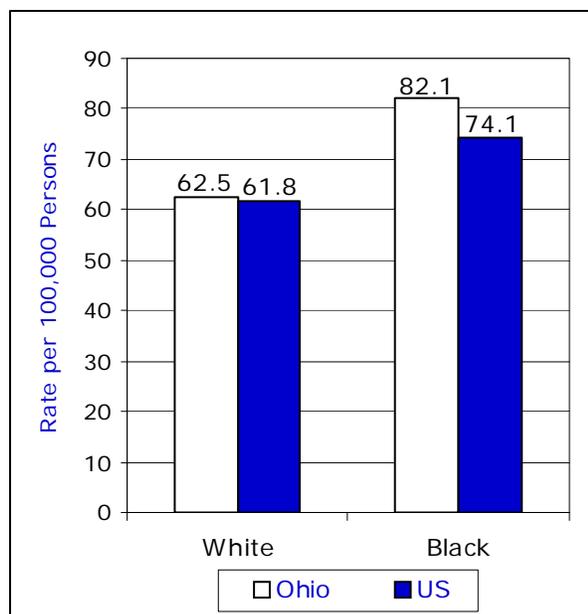
**Figure 3.8 Cerebrovascular Disease (Stroke):**  
Average Annual Age-adjusted Mortality Rates per 100,000,  
by Gender and Race, Ohio, 1997-2001<sup>[a]</sup>



Mortality rates calculated by race and gender illustrate substantial disparities exist. The stroke mortality rate for black males (91.8 per 100,000 persons) was 43 percent higher compared to white males (64.1 per 100,000 persons). The same trend applies for females; the mortality rate for black females (75.6 per 100,000 persons) was more than 24 percent higher than for white females (60.9 per 100,000 persons).

**Figure 3.9 Cerebrovascular Disease (Stroke):**  
Average Annual Age-adjusted Mortality Rates per  
100,000, Ohio (1997-2001)<sup>[a]</sup> with Comparison to  
the United States (1999)<sup>[c]</sup>

Ohio's mortality rates from stroke were slightly higher compared to the national rates for both the white and black populations. Ohio's white population had a mortality rate of 62.5 per 100,000 persons compared to 61.8 per 100,000 persons nationally. Ohio's black population had a mortality rate of 82.1 per 100,000 persons compared to 74.1 per 100,000 persons nationally.



## Abdominal Aortic Aneurysm

Aortic aneurysm (AA) refers to the dilation or expansion of the aorta wall. Abdominal aortic aneurysms (AAA) usually occur in the abdomen below the kidneys. AAA can continue to expand and rupture spontaneously, resulting in hemorrhage and sudden death.<sup>7</sup> Smoking appears to be the risk factor most strongly associated with AAA.<sup>8</sup> Most persons with AAA are asymptomatic until the aneurysm ruptures, at which time sudden death can occur. Surgical repair is less successful once the aneurysm begins to leak.<sup>3</sup> Most AAA result from atherosclerosis. Previous reports have indicated smoking aggravates or accelerates aortic atherosclerosis. Other mechanisms by which smoking may injure the abdominal aorta include inflammation and damage to elastin, a component of blood vessel walls. Dose-response relationships with the amount and duration of smoking have been reported and risks are lower in former smokers than in current smokers.<sup>5</sup> Studies also have shown young adults who smoke have more plaque in their aortas compared to nonsmokers. The 2004 Surgeon General’s report concluded smoking is one of the few currently avoidable causes of AAA.

**Table 3.8 Aortic Aneurysm:**  
Average Annual Number of Deaths and Age-adjusted Mortality Rates per 100,000, by Gender and Race, Ohio, 1997-2001<sup>[a]</sup>

	Deaths/year	Rate
<b>Male</b>	428	9.3
<b>Female</b>	280	3.9
<b>White</b>	648	6.1
<b>Black</b>	58	5.8
<b>All</b>	709	6.0

On average, more than 700 Ohioans die of AA each year (Table 3.8). The average annual mortality rate for the period of 1997-2001 was 6.0 per 100,000 persons. The mortality rate for males (9.3 per 100,000 persons) was more than 2.3 times greater compared to females (3.9 per 100,000 persons). The mortality rate for whites was slightly higher than for blacks during this time period.

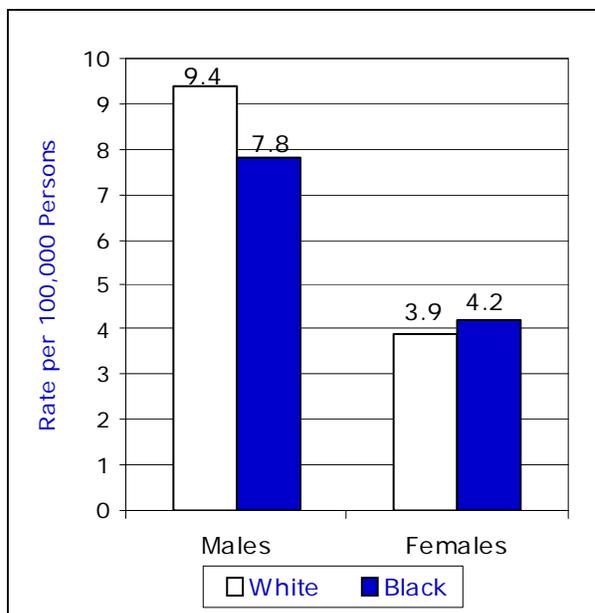
Risk of sudden death from abdominal aortic aneurism is four times higher for smokers compared to nonsmokers.

---

Technical Note: Aortic Aneurysm deaths were defined as follows: ICD-9 code 441 for 1997-1998 and ICD-10 code I71 for 1999-2001.

**Figure 3.10 Aortic Aneurysm:**

Average Annual Age-adjusted Mortality Rates per 100,000, by Gender and Race, Ohio, 1997-2001<sup>[a]</sup>

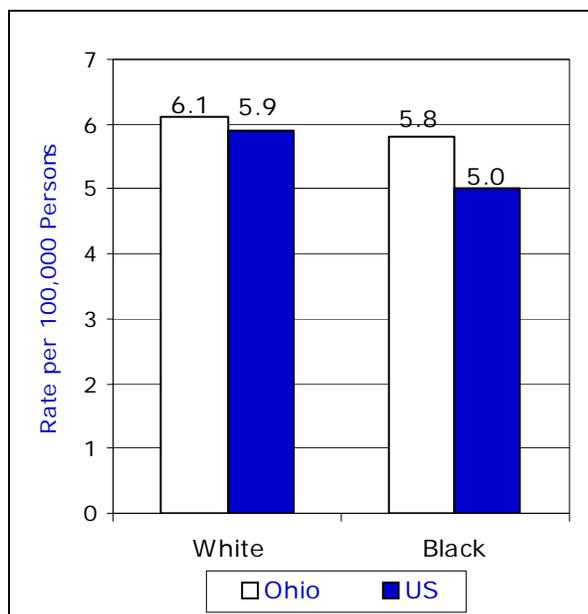


Males are at greatest risk of dying from AA. White males had the highest mortality rate for AA (9.4 per 100,000 persons), followed by black males with a mortality rate of 7.8 per 100,000 persons. Black and white females had the lowest mortality rates of 3.9 per 100,000 persons and 4.2 per 100,000 persons, respectively.

Ohio mortality rates for AA are slightly elevated for both the white and black populations compared to the U.S. white and black populations. The mortality rates for Ohio's white population (6.1 per 100,000 persons) was slightly more than 3 percent higher than the national mortality rate for the white population (5.9 per 100,000 persons). The mortality rate for Ohio's black population (5.8 per 100,000 persons) was 16 percent higher compared to the national mortality rate of 5.0 per 100,000 persons for blacks.

**Figure 3.11 Aortic Aneurysm:**

Average Annual Age-adjusted Mortality Rates per 100,000, Ohio (1997-2001)<sup>[a]</sup> with Comparison to the United States (1999)<sup>[c]</sup>



## Conclusions

Heart disease and stroke, the main types of cardiovascular disease caused by smoking, are the first- and third-leading causes of death in Ohio. In 2001, more than 41,700 Ohioans died of cardiovascular disease, accounting for 39 percent of all deaths. This chapter presented the burden of each form of cardiovascular disease identified in the 2004 Surgeon General's report on the health consequences of smoking as having a causal relationship with cigarette smoking. A summary of the major findings is presented below:

### Atherosclerosis:

- Toxins in the blood from smoking cigarettes worsen the development of atherosclerosis and increase the risk of heart attack and stroke.
- On average, 856 Ohioans died from atherosclerosis each year from 1997-2001.
- For the years 1997 to 2001, Ohio's mortality rate for atherosclerosis was slightly higher in males than females and in whites compared to blacks.

### Coronary Heart Disease (CHD):

- As many as 30 percent of all CHD deaths in the United States each year are attributable to cigarette smoking.
- In Ohio for the years 2001 and 2003, almost 16 percent of the population age 65 and older reported having CHD.
- For the years 1997 to 2001, the mortality rates from CHD were higher among males compared to females and in blacks compared to whites, with black males having the highest mortality rates of all racial/gender groups.
- A smoker has twice the risk compared to a nonsmoker of having a myocardial infarction (heart attack).
- Between 1997 to 2001, males had higher mortality rates from myocardial infarction compared to females and whites had higher rates compared to blacks. White males had the highest mortality rate of all racial/gender groups.

### Cerebrovascular Disease (Stroke):

- Cigarette smoking is a major cause of stroke in the United States.
- In Ohio, between the years 1997-2001, males had a higher mortality rate from stroke compared to females and blacks had a higher mortality rate compared to whites. Black males had the highest mortality rate from stroke among all racial/gender groups.
- The mortality rates for both whites and blacks in Ohio were higher compared to U.S. mortality rates for whites and blacks.

### Abdominal Aortic Aneurysm (AAA):

- Cigarette smoking is one of the few avoidable causes of AAA.
- For the period of 1997 to 2001, males had higher mortality rates from AA compared to females and whites had higher mortality rates compared to blacks, with white males having of highest mortality rates.
- For the years 1997 to 2001, Ohio mortality rates from AA were higher compared to the U.S. mortality rates for both whites and blacks.

## Data Sources

### **[a] Ohio Vital Statistics Mortality Rates:**

All deaths between 1997 through 2001 (numerator) were identified through the population-based, computerized database maintained by the Office of Vital Statistics, Ohio Department of Health. Any person who had the specific cardiovascular disease (i.e., atherosclerosis, coronary heart disease, cerebrovascular disease, myocardial infarction and aortic aneurysm) listed on their death certificate as an underlying cause of death was included in the analysis. The Ohio intercensal population estimates for 1997-1999 (July 1), bridged race census estimates for 2000 (April 1) and the bridged race post-censal estimates for 2001 (July 1) from the U.S. Bureau of Census were used as the denominator. The rates were age-adjusted using the U.S. 2000 standard population. Average annual direct age-adjusted mortality rates were calculated for different race and gender groups (white male, black male, white female, black female and all) for the five-year period between 1997–2001 using 11 age groups.

### **[b] Behavioral Risk Factor Surveillance System (BRFSS):**

The BRFSS is an ongoing state-based, random-digit dialed telephone survey of adults 18 years of age and older for the U.S. non-institutionalized civilian population. The survey is coordinated by the Centers for Disease Control and Prevention and is conducted annually by all states. Ohio BRFSS data collected for the years 2001 and 2003 were analyzed for this chapter. A person was considered to have the specific cardiovascular disease if they answered “yes” to the question “Has a doctor, nurse or other health professional ever told you that you had any of the following:

- 1) Angina or coronary heart disease?
- 2) A stroke?
- 3) A heart attack, also called myocardial infarction?”

The following variables were analyzed in the BRFSS: age, gender and race. The prevalence estimates were adjusted to: 1) probability of selection, i.e. the number of different phone numbers that reach the household, the number of adults in each household and the number of completed interviews in each cluster; and 2) demographic distribution, i.e., age, sex and race. The “Don’t know/Not sure” and “Refused” respondents were excluded from the analysis. All analyses were completed using SAS version 9 (SAS Institute, Cary, NC) and SUDAAN version 9 (Research Triangle Institute, Research Triangle Park, NC).

### **[c] United States Mortality Rates:**

The national mortality rates were taken from the National Vital Statistics Report, Vol 49, No. 8, Sept. 21, 2001. for all diseases except for coronary heart disease. The age-adjusted national mortality rate for coronary heart disease was taken from the Centers for Disease Control and Prevention. Available: <http://wonder.cdc.gov/scripts/broker.exe> [5/17/2005].

## 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. American Heart Association. Heart and Stroke Facts 1992-2003. Available: <http://www.americanheart.org>.
3. 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.
4. Centers for Disease Control and Prevention. Available: <http://www.cdc.gov/tobacco>.
5. American Heart Association. Heart and Stroke Encyclopedia. Available: <http://www.americanheart.org>.
6. Ockene IS, Houston Miller N. Cigarette Smoking, Cardiovascular Disease, and Stroke: A Statement for Healthcare Professionals From the American Heart Association. *Circulation*. 1997; 96:3243-3247.
7. Emedicine. Article by Tan. Available: <http://emedicine.com/radio/topic2.htm>.
8. Emedicine. Article by Pearce. Available: <http://emedicine.com/med/topic3443.htm>.

## **Chapter 4: Chronic Respiratory Disease**

Previous Surgeon General reports on smoking focused on the relationship between cigarette smoking and chronic respiratory disease, particularly chronic obstructive pulmonary disease (COPD).<sup>1</sup> The 2004 Surgeon General's report concludes there is a causal relationship between chronic respiratory disease and cigarette smoking.<sup>2</sup> Cigarette smoking impairs the lungs, causing damage which may lead to the development of these diseases.<sup>2</sup> Chronic respiratory disease was the fourth-leading cause of death in Ohio in 2002. It includes COPD, comprised of chronic bronchitis and emphysema; asthma; bronchiectasis; chronic airway obstruction; and allergic alveolitis. The primary risk factor for chronic respiratory disease is smoking, with 80-90 percent of deaths from COPD attributable to smoking.

In Ohio, the only data available for a direct measure of chronic bronchitis and emphysema are mortality data. Indirect estimates are derived from the National Health Interview Survey. Prevalence data for asthma are available through the Behavioral Risk Factor Surveillance System. Mortality data for all diseases were obtained from the Vital Statistics program at the Ohio Department of Health. Death certificates listing chronic respiratory disease as the underlying cause of death were used in the analysis.

## Chronic Obstructive Pulmonary Disease

Chronic obstructive pulmonary disease (COPD) includes emphysema and chronic bronchitis. COPD is a slowly progressive disease of the airways characterized by gradual loss of lung function. According to the 2004 Surgeon General's report, active smoking causes injury to the airways and alveolar region, ultimately leading to the development of COPD.<sup>2</sup> The only direct measure for COPD in Ohio is mortality data. Indirect prevalence estimates were derived from the National Health Interview Survey by the American Lung Association.

**Table 4.1 Chronic Obstructive Pulmonary Disease**

Average Annual Number of Deaths and Age-adjusted Mortality Rates per 100,000, by Gender and Race, Ohio, <sup>[a]</sup> 1999-2001

	Mortality	
	Deaths/year	Rate
<b>Male</b>	2,783	61.7
<b>Female</b>	2,910	40.3
<b>White</b>	5,345	49.3
<b>Black</b>	341	35.3
<b>All</b>	5,693	48.0

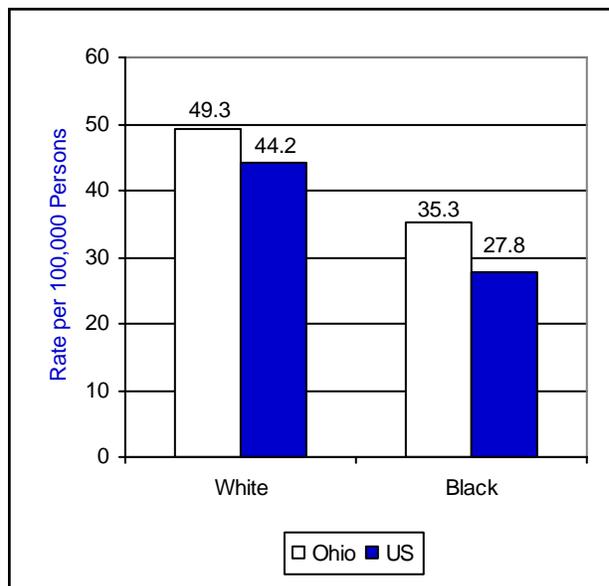
Approximately 5,693 Ohioans die from COPD each year. The average annual mortality rate for the period of 1999-2001 was 48.0 per 100,000 persons. The mortality rate for males in Ohio was 53 percent higher than that of females. Though current smoking prevalence was similar for whites and blacks, mortality rate for whites (49.3 per 100,000 persons) was 40 percent higher than the rate for blacks (35.3 per 100,000 persons) (Table 4.1). Nationally, women have surpassed men in the number of deaths from COPD since 2000.<sup>3</sup> This may be due to their relative rise in smoking prevalence compared to males.

---

Technical Note: COPD deaths were defined as follows: ICD-10 codes J41-J44.

**Figure 4.1 Chronic Obstructive Pulmonary Disease:**

Average Annual Age-adjusted Mortality Rates per 100,000, by Race, Ohio, <sup>[a]</sup> 1999-2001, with Comparison to the United States, <sup>[b]</sup> 2002

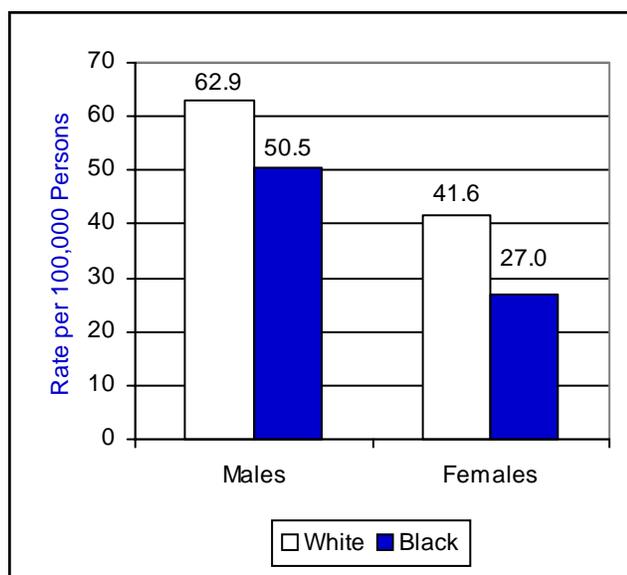


In 1999-2001, Ohio mortality rates from COPD were slightly higher than the national rates for 2002. The rate for Ohio's white population (49.3 per 100,000 persons) was 12 percent higher than the white mortality rate for the nation. The mortality rate for Ohio's black population (35.3 per 100,000 persons) was 27 percent higher than the mortality rate of blacks for the nation.

**Figure 4.2 Chronic Obstructive Pulmonary Disease:**

Average Annual Age-adjusted Mortality Rates per 100,000, by Gender and Race, Ohio, <sup>[a]</sup> 1999-2001

COPD mortality is higher in whites compared to blacks in Ohio. Figure 4.2 indicates white males had the highest mortality rate in 1999-2001 of 62.9 per 100,000 persons, followed by black males with a mortality rate of 50.5 per 100,000 persons. The mortality rate for white males was 25 percent higher than the rate for black males. The mortality rate for white females (41.6 per 100,000 persons) was 54 percent higher compared to black females (27.0 per 100,000 persons).



## Emphysema

Emphysema is defined as “the presence of permanent enlargement of the air-spaces distal to the terminal bronchioles, accompanied by destruction of their walls without obvious fibrosis.”<sup>4</sup> According to the 2004 Surgeon General’s report, emphysema is causally related to cigarette smoking.<sup>2</sup> Prevalence estimates from the National Health Interview Survey applied to the Ohio population indicate about 135,000 adults had emphysema in 2003.<sup>3</sup>

**Table 4.2 Emphysema:**

Average Annual Number of Deaths and Age-adjusted Mortality Rates per 100,000, by Gender and Race, Ohio, <sup>[a]</sup> 1999-2001

	Mortality	
	Deaths/year	Rate
<b>Male</b>	412	8.8
<b>Female</b>	395	5.6
<b>White</b>	757	7.0
<b>Black</b>	49	5.0
<b>All</b>	807	6.8

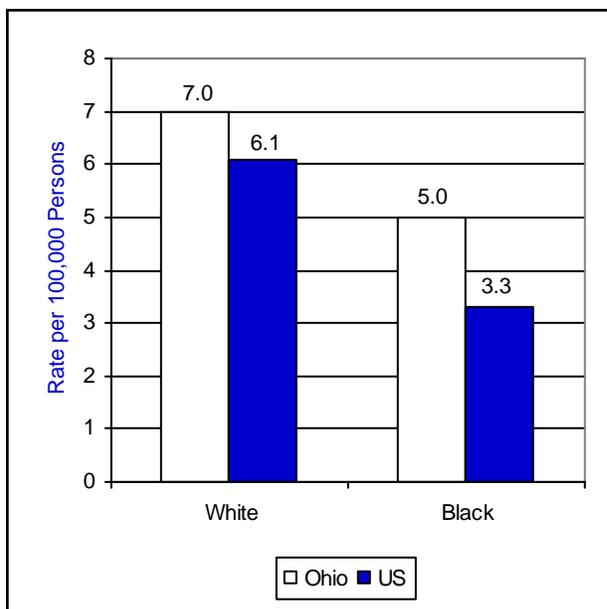
About 807 Ohioans die from emphysema each year. The average annual age-adjusted mortality rate for 1999-2001 was 6.8 per 100,000 persons. The mortality rate for males in Ohio (8.8 per 100,000 persons) was higher than that of females (5.6 per 100,000 persons). The mortality rate for whites (7.0 per 100,000 persons) was 40 percent higher than the rate for blacks (5.0 per 100,000 persons).

---

Technical Note: Emphysema deaths were defined as follows: ICD-10 code J43.

**Figure 4.3 Emphysema:**

Average Annual Age-adjusted Mortality Rates per 100,000, by Race, Ohio, <sup>[a]</sup> 1999-2001, with Comparison to the United States, <sup>[b]</sup> 2001

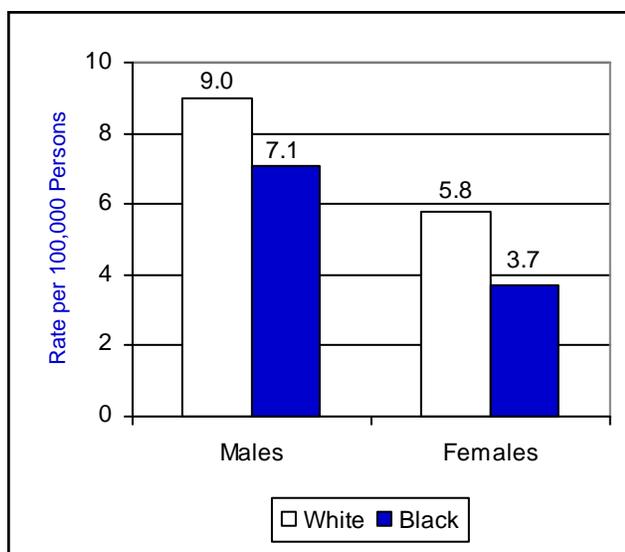


Ohio mortality rates from emphysema were higher than national rates for 1999-2001. The rate for Ohio's white population (7.0 per 100,000 persons) was 15 percent higher than the mortality rate of whites for the nation (6.1 per 100,000 persons). The mortality rate for Ohio's black population was 52 percent higher than the mortality rate of blacks for the nation.

**Figure 4.4 Emphysema:**

Average Annual Age-adjusted Mortality Rates per 100,000, by Gender and Race, Ohio, <sup>[a]</sup> 1999-2001

Emphysema mortality was higher in whites compared to blacks in Ohio during 1999-2001. As shown in Figure 4.4, white males had the highest mortality rate of 9.0 per 100,000 persons followed by black males with a mortality rate of 7.1 per 100,000 persons. The mortality rate for white males was 55 percent higher than white females (5.8 per 100,000 persons). The mortality rate for white females was 57 percent higher compared to black females (3.7 per 100,000 persons).



## Chronic Bronchitis

Chronic bronchitis is defined as “chronic productive cough for three months in each of two successive years in a patient in whom other causes of productive chronic cough have been excluded.”<sup>4</sup> The Surgeon General’s report states there is a causal relationship between chronic bronchitis and smoking.<sup>2</sup>

**Table 4.3 Chronic Bronchitis:**

Average Annual Number of Deaths and Age-adjusted Mortality Rates per 100,000, by Gender and Race, Ohio, <sup>[a]</sup> 1999-2001

	Mortality	
	Deaths/year	Rate
<b>Male</b>	31	0.7
<b>Female</b>	32	0.4
<b>White</b>	58	0.5
<b>Black</b>	4	0.4
<b>All</b>	63	0.5

The mortality rate of chronic bronchitis may not be indicative of the burden of this disease. A 2003 estimate derived from the National Health Interview Survey suggests more than 380,000 Ohioans have been diagnosed with chronic bronchitis.<sup>3</sup> Approximately 63 Ohioans died from chronic bronchitis each year from 1999-2001. The average annual mortality rate was 0.5 per 100,000 persons. The mortality rate for males in Ohio (0.7 per 100,000 persons) was 75 percent higher than that of females (0.4 per 100,000 persons). The mortality rate for whites (0.5 per 100,000 persons) was slightly higher than the rate for blacks (0.4 per 100,000 persons).

---

Technical Note: Chronic bronchitis deaths were defined as follows: ICD-10 codes J40-J42.

**Figure 4.5 Chronic Bronchitis:**

Average Annual Age-adjusted Mortality Rates per 100,000, by Race, Ohio, <sup>[a]</sup> 1999-2001, with Comparison to the United States, <sup>[b]</sup> 2001

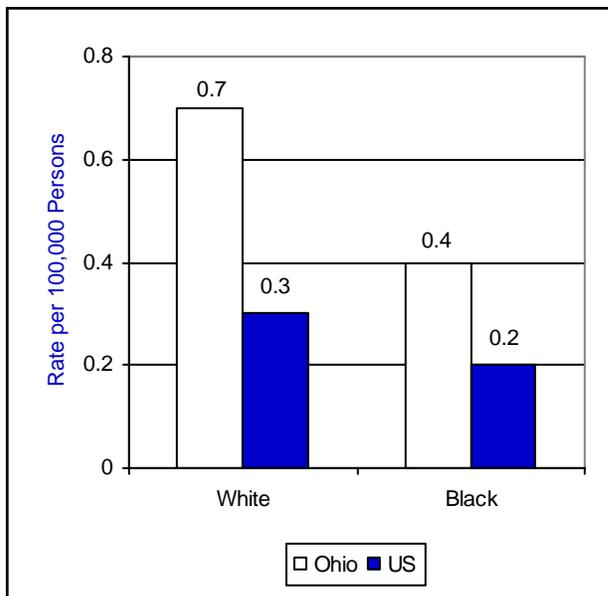
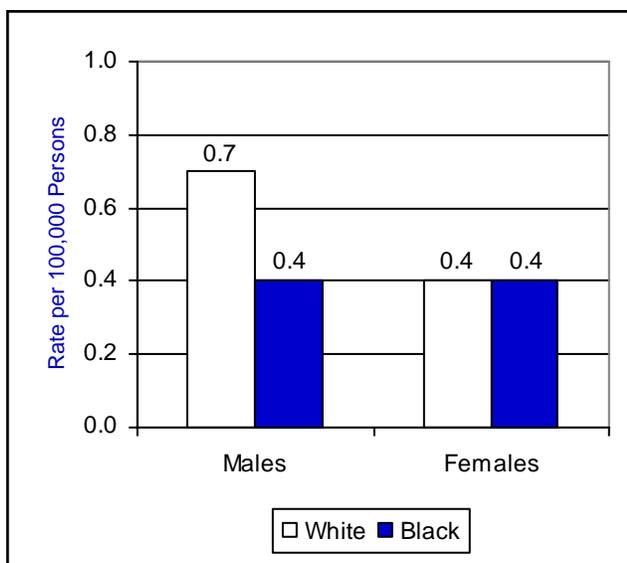


Figure 4.5 shows average annual age-adjusted mortality rates of chronic bronchitis for 1999-2001 by race in Ohio compared to the United States. The mortality rate in Ohio from chronic bronchitis was much higher than the national rate. The rate for Ohio's white population (0.7 per 100,000 persons) was 2.3 times higher than the white mortality rate for the nation (0.3 per 100,000 persons). The mortality rate for Ohio's black population (0.4 per 100,000 persons) was twice the mortality rate of blacks for the nation (0.2 per 100,000 persons).

**Figure 4.6 Chronic Bronchitis:**

Average Annual Age-adjusted Mortality Rates per 100,000, by Gender and Race, Ohio, <sup>[a]</sup> 1999-2001

Among adult Ohioans, white males had the highest mortality rate from chronic bronchitis of 0.7 per 100,000 persons in 1999-2001. This rate was 75 percent higher than that of white females, black males and black females, which all had a mortality rate of 0.4 per 100,000 persons.



## Asthma

Asthma is a chronic disease that involves blocked or narrowed airways or inflamed airways that leads to difficulty in breathing. An estimated 650,000 adult Ohioans (18 years of age and older) are living with asthma.<sup>5</sup> Cigarette smoking has not been proven to have a causal relationship with asthma, but it does exacerbate symptoms and leads to increased attacks. According to the 2004 Ohio Behavioral Risk Factor Surveillance System, 34.6 percent of those who currently have asthma are current smokers. There is no cure for asthma, but it may be controlled with medication.

**Table 4.4 Asthma:**

Adult Prevalence <sup>[c]</sup>, Average Annual Number of Deaths and Age-adjusted Mortality Rates per 100,000, <sup>[a]</sup> by Gender and Race, Ohio, 1999-2001

	Prevalence		Mortality	
	(%)	C.I.*	Deaths/year	Rate
<b>Male</b>	5.7	4.6 - 6.8	43	0.9
<b>Female</b>	9.9	8.7 - 11.1	107	1.6
<b>White</b>	7.3	6.2 - 8.4	115	1.1
<b>Black</b>	7.1	4.2 - 10.0	34	2.9
<b>All</b>	7.9	7.1 - 8.7	150	1.3

\*C.I.=95% Confidence Interval

About 8 percent of adult Ohioans age 18 and older had asthma in 1999-2001. It affected significantly more women (9.9 percent) than men (5.7 percent). The prevalence for whites and blacks was similar at 7.3 percent and 7.1 percent, respectively. Approximately 150 Ohioans died from asthma each year during this time period. The average annual age-adjusted mortality rate was 1.3 per 100,000 persons. The mortality rate for females in Ohio (1.6 per 100,000 persons) was approximately 78 percent higher than that of males (0.9 per 100,000 persons). The mortality rate for blacks (2.9 per 100,000 persons) was 2.6 times higher than the rate for whites (1.1 per 100,000 persons). While prevalence for whites and blacks was similar, the mortality rate was much higher among blacks.

---

Technical Note: Asthma deaths were defined as follows: ICD-10 codes J45-J46.

**Table 4.5 Childhood Asthma:**

Prevalence of Childhood Asthma (age 18 and under), by Gender and Race, Ohio, <sup>[d]</sup> 1999

	Prevalence	
	(%)	C.I.*
<b>Male</b>	15.1	12.2-18.0
<b>Female</b>	11.5	8.6-14.4
<b>All</b>	13.3	12.0-14.0

\*C.I.=95% Confidence Interval

The Surgeon General's report states asthma is one of the most common respiratory diseases among children.<sup>2</sup> It is the most common cause for school absences due to chronic disease. Cigarette smoking worsens the symptoms of asthma in children.<sup>6</sup> The American Lung Association reports smoking cessation by adults in the homes of children with asthma leads to a reduction of asthma symptoms and attacks in those children.<sup>7</sup> In Ohio during 2004, 13.3 percent of children under the age of 18 were diagnosed with asthma, according to the Ohio Family Health Survey. Males under the age of 18 had a higher prevalence than that of females under the age of 18 (15.1 percent and 11.5 percent, respectively).

## Conclusions

The chronic respiratory diseases are a leading preventable cause of death among Ohio adults. Smoking cessation would prevent a number of deaths related to chronic respiratory disease. The data for Ohio regarding chronic respiratory disease for the years 1999-2001 are summarized below:

### Chronic Obstructive Pulmonary Disease (COPD):

- COPD is causally related to cigarette smoking among Ohio adults. A number of COPD cases and deaths could be prevented by smoking cessation.
- In Ohio, the average annual mortality rate for COPD was 48.0 per 100,000 persons, with an average annual mortality of 5,693 persons.
- Males in Ohio are disproportionately affected by COPD due to a higher smoking prevalence. The mortality rate for males in Ohio (61.7 per 100,000 persons) was 53 percent higher than that of females (40.3 per 100,000 persons).
- The COPD mortality rate for whites in Ohio was 40 percent higher than that of blacks, with a rate of 49.3 per 100,000 for whites compared to a rate of 35.3 per 100,000 for blacks.
- The COPD mortality rates in Ohio for whites and blacks were 12 percent and 27 percent higher than those of the nation, respectively.
- White males in Ohio had the highest COPD mortality rate (62.9 per 100,000 persons). This rate was 25 percent higher than the rate for black males. The white female mortality rate (41.6 per 100,000 persons) was 54 percent higher compared to the rate for black females (27.0 per 100,000 persons).

### Emphysema:

- The average annual mortality rate for emphysema in Ohio was 6.8 per 100,000 persons in 1999-2001, with an average annual mortality of 807 persons.
- The emphysema mortality rate in Ohio for whites was 15 percent higher than the mortality rate of the nation for whites and the mortality rate for blacks in Ohio was 52 percent higher than the mortality rate of the nation for blacks.
- White males in Ohio had the highest mortality rate from emphysema (9.0 per 100,000 persons) followed by black males (7.1 per 100,000 persons), white females (5.8 per 100,000 persons) and black females (3.7 per 100,000 persons).

### Chronic Bronchitis:

- The average annual number of deaths from chronic bronchitis was 63 and the mortality rate was 0.5 per 100,000 persons in Ohio from 1999-2001.
- The chronic bronchitis mortality rate for Ohio males was 75 percent higher compared to Ohio females.
- The chronic bronchitis mortality rate for whites was slightly higher compared to blacks in Ohio.

- The mortality rate for chronic bronchitis in Ohio was higher than the national rate. The white rate for Ohio was 2.3 times higher than the national white rate, and the black rate for Ohio was twice the mortality rate of blacks for the nation.
- In Ohio, the chronic bronchitis mortality rate for white males (0.7 per 100,000 persons) was 75 percent higher than that of white females, black males and black females.

### **Asthma:**

- Asthma has not been proven to be causally related to cigarette smoking; however, smoking increases the symptoms of those with the disease.
- In Ohio, an estimated 650,000 adults are living with asthma. According to the 2004 Ohio Behavioral Risk Factor Survey, 34.6 percent of those with asthma currently smoke cigarettes.
- Approximately 8 percent of adult Ohioans had asthma in 1999-2001.
- Asthma affected many more women (9.9 percent) than men (5.7 percent) in 1999-2001.
- The prevalence for whites and blacks with asthma in 1999-2001 was similar at 7.3 percent and 7.1 percent, respectively.
- Approximately 150 Ohioans died from asthma each year during 1999-2001; females had a higher mortality rate than males and the black mortality rate was higher than the white mortality rate.
- In Ohio in 1999, 13.3 percent of children under the age of 18 were diagnosed with asthma. Males under the age of 18 had a higher prevalence than that of females under the age of 18 (15.1 percent and 11.5 percent, respectively).

## Data Sources

### [a] Ohio Mortality Rates:

Mortality rates for chronic obstructive pulmonary disease, emphysema, chronic bronchitis and asthma were derived from death certificates maintained by the Office of Vital Statistics at the Ohio Department of Health. Deaths from 1999-2001 were included in this analysis and were analyzed according to the underlying cause of death. For COPD, this includes ICD-10 codes J41-J44. Emphysema data were analyzed using ICD-10 code J43, and chronic bronchitis was defined as ICD-10 codes J40-J42. Asthma deaths were calculated using ICD-10 codes J45 and J46. The Ohio intercensal population estimates for 1999, bridged race census estimates for 2000 and the bridged race post-censal estimates for 2001 from the U.S. Census Bureau were used as the denominator. The rates were age-adjusted using the U.S. 2000 standard population. Average annual direct age-adjusted mortality rates were calculated for different race and gender groups (white male, black male, white female, black female and all) for the three-year period between 1999-2001 using 11 age groups.

### [b] United States Mortality Rates:

The national death rates were taken from the National Vital Statistics Report, Vol. 49, No. 9, Sept. 21, 2001, except for COPD, which came from the American Lung Association's publication "2003 Lung Disease Data" from the Web site of the American Lung Association at <http://www.lungusa.org>.

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

Adult asthma prevalence was derived from the Ohio Behavioral Risk Factor Surveillance System. These data were from 1999-2001. Current asthma is defined as answering "yes" to the question "Have you ever been told by a doctor, nurse or other health professional that you had asthma?" and also "yes" to the question "Do you still have asthma?"

### [d] Ohio Family Health Survey:

Child current asthma prevalence was derived from the 1999 Ohio Family Health Survey. This is a random-digit dialed telephone survey. Current asthma is defined as answering "yes" to the question "Has a doctor ever told you your child has asthma?"

## 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.
3. American Lung Association. Trends in Chronic Bronchitis and Emphysema: Morbidity and Mortality. Epidemiology and Statistics Unit, Research and Program Services, American Lung Association, May 2005.
4. Definition, Diagnosis, and Staging. American Thoracic Society, 2005. Available: <http://www.thoracic.org/COPD/1/definitions.asp>.
5. American Lung Association. Trends in Asthma Morbidity and Mortality. Epidemiology and Statistics Unit, Research and Program Services, American Lung Association, May 2005.
6. "The Costs of Asthma," Asthma and Allergy Foundation 1992 and 1998 Study, 2000 Update. Available: [http://www.aafa.org/display.cfm?id=8&sub=42#\\_ftn20](http://www.aafa.org/display.cfm?id=8&sub=42#_ftn20).
7. American Lung Association, Asthma and Children Fact Sheet. Available: <http://www.lungusa.org/site/pp.asp?c=dvLUK900E&b=44352>.

## **Chapter 5: Reproductive Effects**

The association between maternal cigarette smoking and adverse reproductive outcomes has been well established in the literature. Despite this fact, approximately 12 percent of pregnant women in the United States smoke during pregnancy.<sup>1</sup> The Surgeon General's report on the health consequences of smoking concluded prenatal smoking is causally associated with reduced fertility, preterm birth, reduced infant birth weight, intrauterine growth retardation and sudden infant death syndrome (SIDS). Low birth weight (LBW), which is defined as weight less than 2,500 grams, is a major predictor of infant mortality and childhood morbidity and mortality.<sup>2</sup> In spite of increased knowledge of the adverse health effects of smoking during pregnancy, only 18 to 25 percent of women quit smoking once they become pregnant.

Data on prenatal smoking and reproductive effects in Ohio were obtained from Ohio birth certificates (Office of Vital Statistics), which provide information on smoking behaviors during the pregnancy as obtained from self-report or from medical records. Data from birth certificates are supplemented by the Pregnancy Risk Assessment Monitoring System (PRAMS) for planning purposes and program evaluation. The PRAMS is a population-based, mail survey developed by the Centers for Disease Control and Prevention (CDC) and administered in Ohio by the Ohio Department of Health. The survey addresses maternal behaviors before, during and after pregnancy and during the early infancy of her child. Ohio has participated in the PRAMS since 1999 and administers the survey to approximately 200 mothers each month. Birth certificate and PRAMS data for the years 1999-2001 are presented in this report.

The objective of the following chapter is to present the prevalence of prenatal smoking among Ohio mothers and the associated adverse reproductive effects. The attributable risk of select reproductive outcomes as the result of smoking is presented to illustrate the impact smoking has on the health of children born to mothers who smoke.

## Reproductive Effects

The first Surgeon General's report in 1964 on the health effects of smoking identified an association between smoking during pregnancy and low birth weight (LBW). Since that time, evidence has been growing on the relationship between smoking and adverse reproductive effects with respect to fertility, pregnancy complications and the health of children born to mothers who smoke. Data for Ohio reveal smoking during pregnancy is associated with the following adverse reproductive outcomes: restricted fetal growth, LBW, pre-term gestation and sudden infant death syndrome (SIDS).

**Figure 5.1 Prenatal Smoking:**  
Percent of Women Who Smoked During Pregnancy,  
Ohio<sup>[a]</sup> with Comparison to the United States,<sup>[b]</sup> 2001

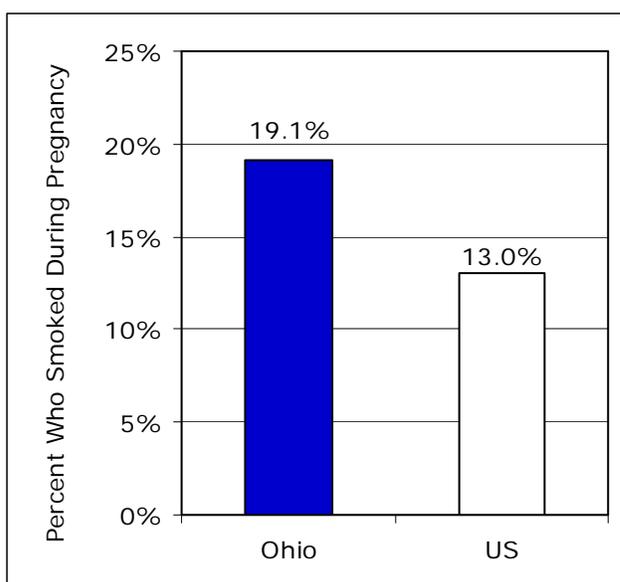


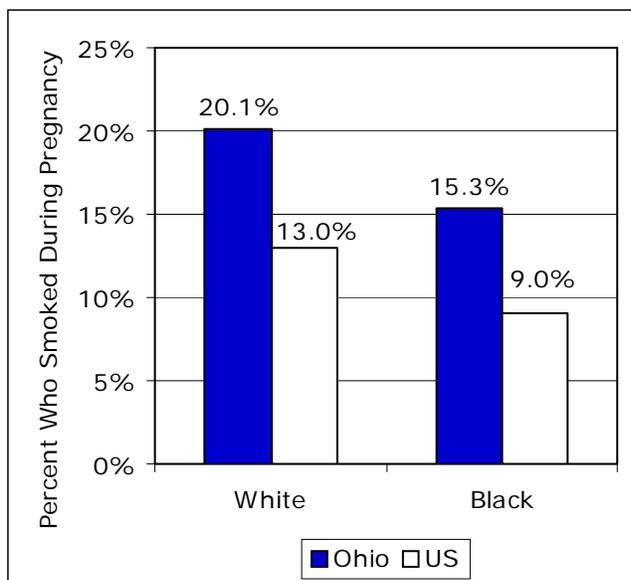
Figure 5.1 presents the prevalence of smoking during pregnancy among women who gave live birth in Ohio and the United States in 2001. Data from Ohio birth certificates reveal that almost one-fifth (19.1 percent) of women reported smoking cigarettes at some time during their pregnancy. The percentage of pregnant women who smoked was nearly 47 percent higher in Ohio as compared to the United States (13.0 percent).

The Pregnancy Risk Assessment Monitoring System survey, which gathers information on smoking during the last trimester of pregnancy, indicates 17.5 percent of Ohio mothers smoked during their pregnancy in 2001. It should be noted that information reported on birth certificates and collected by the PRAMS is often self-reported; thus, the prevalence of prenatal smoking may be underestimated.

Smoking is attributable to reduced fertility, pregnancy complications and adverse health effects in children born to mothers who smoke.

**Figure 5.2 Prenatal Smoking:**

Percent of Women Who Smoked During Pregnancy, by Race, Ohio<sup>[a]</sup> with Comparison to the United States,<sup>[b]</sup> 2001

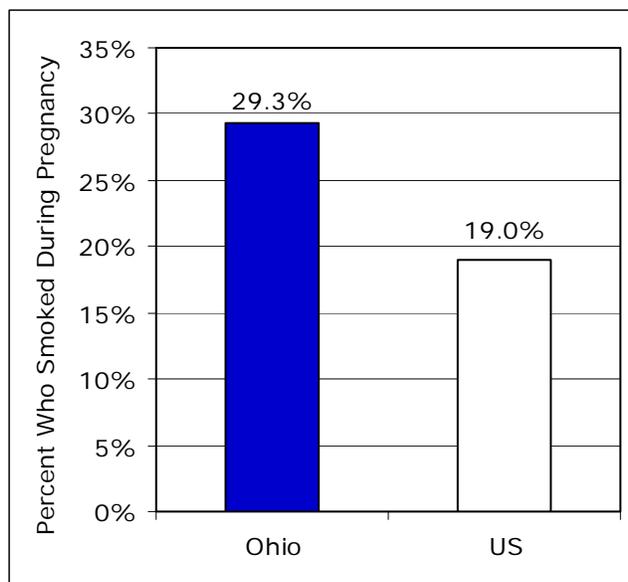


The prevalence of prenatal smoking by race for the year 2001 is shown in Figure 5.2 for Ohio and the United States. Data for Ohio show the prenatal smoking prevalence for whites (20.1 percent) was 31 percent higher than the prevalence for blacks (15.3 percent). This figure also reveals the prevalence of prenatal smoking in 2001 was higher in Ohio compared to the United States for women of both white and black race.

**Figure 5.3 Prenatal Smoking:**

Percent of Teenagers Age 15 to 19 Who Smoked During Pregnancy, Ohio<sup>[a]</sup> with Comparison to the United States,<sup>[b]</sup> 2001

The highest rates of prenatal smoking are found among teenage mothers. As shown in Figure 5.3, teen mothers age 15-19 in Ohio reported a smoking prevalence of 29.3 percent in 2001, which was 54 percent higher than the prevalence for the United States (19.0 percent). Black teen mothers in Ohio reported a smoking prevalence of 12.0 percent in 2001, whereas white teen mothers reported a smoking prevalence of 36.2 percent. While the overall smoking prevalence for new mothers has remained relatively stable over the last three years, the prevalence for white teen mothers increased from 1999 to 2001.



**Table 5.1 Prenatal Smoking and Adverse Reproductive Effects:**

Prevalence of Adverse Reproductive Effects, Attributable Risk and Population Attributable Risk Due to Smoking, Ohio, 1999-2001<sup>[c]</sup>

<b>Reproductive Effect</b>	<b>Prevalence of Reproductive Effect</b>	<b>Attributable Risk Due to Smoking</b>	<b>Population Attributable Risk Due to Smoking</b>
<b>Preterm (&lt; 37 weeks gestation)</b>	52,453 births 11.4%	16.0%	3.5%
<b>Low Birth Weight (LBW) (&lt; 2,500 grams)</b>	36,446 births 7.9%	38.8%	10.7%
<b>Preterm LBW (&lt; 2,500 grams and &lt; 37 weeks gestation)</b>	23,370 births 5.1%	25.4%	6.1%
<b>Small for Gestational Age (&lt; 2,500 grams and &gt;= 37 weeks gestation)</b>	13,076 births 2.9%	55.4%	19.0%
<b>Very LBW (&lt; 1,500 grams)</b>	6,894 births 1.5%	22.4%	5.2%
<b>Sudden Infant Death Syndrome (SIDS)*</b>	214 deaths 0.1%	73.0%	33.8%

\* Data for Sudden Infant Death Syndrome are for the years 1999-2000.

Attributable risk is a measure of the excess risk of a disease or condition in persons exposed to a risk factor such as cigarette smoking. The excess risk of a disease or condition in the total population attributable to a risk factor is known as the population attributable risk (PAR). The excess risk of reproductive effects attributable to smoking can be calculated from Ohio birth certificates, which list the smoking status of the mother during pregnancy, as well as the reproductive outcome of her child. Table 5.1 presents the 1999-2001 prevalence, AR and PAR of select reproductive outcomes in Ohio associated with maternal smoking.

In Ohio children born to mothers who smoke, 1999-2001 data indicate 73.0 percent of deaths from SIDS and 55.4 percent of infants who are small for their gestational age were attributable to smoking by the mother during pregnancy. In addition, smoking was a risk factor for a substantial percentage of babies with LBW (38.8 percent), preterm LBW (25.4 percent) and very LBW (22.4 percent), as well as babies born preterm (16.0 percent). These percentages represent the number of adverse reproductive effects that could be prevented in children born to mothers who smoke if mothers stopped smoking during pregnancy.

The PAR data in Table 5.1 reveal about one-third (33.8 percent) of SIDS deaths and one-fifth (19.0 percent) of infants who are small for their gestational age could be prevented in the State of Ohio if women quit smoking. These percentages translate to about 72 cases of SIDS in 1999-2000 and 2,484 cases of small for gestational age in 1999-2001 that could have been prevented through smoking cessation.

## Conclusions

The prevalence of smoking during pregnancy is higher in Ohio compared to the nation for all age and race groups. In addition, smoking during pregnancy is dramatically higher among pregnant teenagers and continues to rise, especially among white teens. Pregnant teens who smoke are likely to continue smoking into adulthood. Evidence-based smoking cessation programs tailored to pregnant teens and family-oriented support programs will help to reduce the number of adverse reproductive effects associated with smoking during pregnancy. Data for Ohio conclude the following:

- Smoking during pregnancy is causally associated with restricted fetal growth, LBW, preterm gestation and SIDS.
- Data from both Ohio birth certificates and the PRAMS survey indicate that almost one-fifth of Ohio women smoked during their pregnancy.
- The percentage of women who smoked during pregnancy was nearly 47 percent higher in Ohio compared to the United States.
- The prevalence of smoking during pregnancy in Ohio is higher among whites compared to blacks, especially among pregnant teenagers.
- Almost 30 percent of Ohio teen mothers age 15 to 19 smoked during their pregnancy in 2001.
- About one-third of SIDS deaths and one-fifth of infants who are small for their gestational age could be prevented in Ohio if women quit smoking.

## Data Sources

### **[a] Birth Certificate Data:**

The Office of Vital Statistics at the Ohio Department of Health maintains the birth records of persons born to Ohio residents from 1908 to the present. Certificates of birth are received from county vital statistics registrars, hospitals and other states if a birth to an Ohio resident occurred out of state. Ohio birth certificate data were used to determine the prevalence of maternal smoking for this chapter.

### **[b] U.S. Smoking Prevalence:**

Data on smoking prevalence for the United States were obtained from the National Center for Health Statistics (NCHS). Available: [http://www.cdc.gov/nchs/data/nvsr51/nvsr51\\_02.pdf](http://www.cdc.gov/nchs/data/nvsr51/nvsr51_02.pdf).

### **[c] Pregnancy Risk Assessment Monitoring System (PRAMS):**

The PRAMS is a population-based, mail survey that addresses maternal behaviors before, during and after pregnancy and during the early infancy of her child. The survey was developed by the Centers for Disease Control and Prevention and is administered by ODH to approximately 200 mothers each month. ODH began administering the PRAMS survey in 1999, and data for the years 1999 to 2001 were analyzed for this chapter.

### **[d] Population Estimates:**

The 1999-2001 Ohio population estimates used in the prevalence calculations include the following: recalculated intercensal estimates for July 1, 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. Preventing Chronic Diseases: Investing Wisely in Health—Preventing Smoking During Pregnancy. Dept. of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion. Available:  
<http://www.cdc.gov/nccdphp/factsheets/Prevention/pdf/smoking.pdf>.
2. March of Dimes Quick References and Fact Sheets: Low Birthweight. Available:  
[http://www.marchofdimes.com/professionals/14332\\_1153.asp](http://www.marchofdimes.com/professionals/14332_1153.asp).

## Glossary

**Abdominal Aortic Aneurysm (AAA):** The dilation or expansion of the aorta wall, usually occurring in the abdomen below the kidneys. An AAA can continue to expand and rupture spontaneously, resulting in hemorrhage and sudden death.

**Acute Disease:** A disease that has a rapid onset, severe symptoms and short course.

**Acute Myeloid Leukemia:** A cancer of the blood and bone marrow in which stem cells develop into immature white blood cells (myeloblasts) and do not mature into healthy white blood cells.

**Adenocarcinoma:** A malignant tumor arising from a glandular organ.

**Age adjustment:** A statistical process by which age-specific rates are weighted to a standardized population and combined into a summary rate. Rates are typically age-adjusted when the condition or disease of interest is related to age. Age adjustment facilitates more careful comparison of rates for populations that differ in age distribution.

**Alveolar Region:** The air sacs of the lungs.

**Association:** The statistical relationship between a risk factor and a condition or disease of interest, e.g. increasing age and atherosclerosis. While a factor may be associated with the condition or disease, it is not necessarily the cause.

**Atherosclerosis:** A progressive hardening of the arteries caused by plaque deposition. The accumulation of plaque deposits leads to scarring and thickening of the artery wall, which reduces the artery's diameter and decreases blood flow and oxygen availability. Atherosclerosis can lead to stroke, heart attack, eye problems and kidney problems.

**Asthma:** A chronic lung disease that causes increased responsiveness of the tracheobronchial tree to various stimuli, resulting in episodic narrowing and inflammation of the airways and difficulty in breathing.

**Childhood Asthma** – Asthma among persons 17 years and younger.

**Adult Asthma** – Asthma among persons 18 years and older.

**Attributable Risk:** The measure of the excess risk of a disease or condition in persons exposed to a risk factor such as cigarette smoking.

**Cancer:** A group of diseases characterized by the uncontrolled growth and spread of abnormal cells, often with invasion of healthy tissues locally or throughout the body. More than 200 types of cancer have been identified.

**Carcinogen:** Any substance or agent that produces cancer or increases the risk of developing cancer in humans or animals.

**Cardiovascular Disease (CVD):** Diseases of the heart and blood vessels.

**Cause:** A factor (characteristic, behavior, event, etc.) that directly influences the occurrence of disease. Reducing such a factor in a population should reduce the occurrence of the disease.

**Cerebrovascular Disease (Stroke):** There are two main types of stroke – ischemic and hemorrhagic. Ischemic strokes are caused by blockage of the arterial blood supply to the brain. Ischemic strokes account for 70 to 80 percent of all stroke deaths. Hemorrhagic strokes occur when blood vessels rupture and cause bleeding in the brain or in the space between the brain and skull. Hemorrhagic strokes are less prevalent but more lethal.

**Chronic Bronchitis:** Inflammation of the mucous membranes of the bronchial airways caused by irritation or infection from a pathogen. Chronic bronchitis is marked by increased mucous secretion by the tracheobronchial tree. A productive cough must be present for at least three months in two consecutive years for the clinical diagnosis of chronic bronchitis to be made.

**Chronic Disease:** A disease of long duration, typically showing little change or slow progression.

**Chronic Respiratory Disease:** A group of debilitating, progressive and potentially fatal lung diseases that includes chronic obstructive pulmonary disease (COPD), asthma, bronchiectasis, chronic airway obstruction and allergic alveolitis.

**Chronic Obstructive Pulmonary Disease (COPD):** A group of debilitating, progressive and potentially fatal lung diseases that are characterized by increased resistance to air movement, prolonged expiration and loss of the normal elasticity of the lung. The chronic obstructive pulmonary diseases include emphysema, chronic obstructive bronchitis, chronic bronchitis and asthmatic bronchitis.

**Confidence Interval:** In repeated sampling, a range of numbers in which a given percent (typically 95 percent or 99 percent) of similarly constructed intervals would contain the true value.

**Coronary Heart Disease (CHD):** A disease caused by lack of blood flow and oxygen to the heart muscle. Also called ischemic heart disease and coronary artery disease, this condition can ultimately lead to a heart attack.

**Current Adult Smoking Prevalence:** Percentage of adults age 18 and older who have smoked 100 cigarettes or more in their lifetime and now smoke every day

or some days.

**Current Youth Smoking Prevalence:** Youth in grades six through 12 who have smoked on one or more of the past 30 days.

**Disparity:** Inequality or difference in the incidence, prevalence, mortality or burden of a condition or disease among specific populations.

**Dose-response Relationship:** The change in effect on an organism caused by differing levels of exposure to a substance.

**Elastin:** An extracellular connective tissue protein that is the principal component of elastic fibers in the middle layer of arteries.

**Epithelial Cells:** The cells forming the epidermis of the skin and the surface layer of mucous and serous membranes.

**Fertility:** The quality of being productive or fertile.

**Gestation:** The period from conception to birth when a woman carries a developing fetus in her uterus.

**Incidence:** The number of new cases of a disease or condition in a defined population for a defined period of time. Often expressed as a rate per unit of population, e.g. 120 per 100,000 population.

**Infant Birth Weight:** The weight of an infant at birth.

**Intrauterine Growth Retardation:** Weight less than 10 percent of predicted fetal weight for gestational age. This decreased rate of fetal growth is most commonly related to inadequate maternal–fetal circulation resulting from pre-existing or coexisting maternal or placental factors.

**Ischemic Heart Disease:** A disease caused by lack of blood flow and oxygen to the heart muscle. Also called coronary heart disease and coronary artery disease, this condition can ultimately lead to a heart attack.

**Low Birth Weight:** Births of weight less than 2,500 grams.

**Median:** The middle value in a distribution; half of the observations are above the median and half are below.

**Morbidity:** A diseased condition or state; the incidence of a disease or of all diseases in a population.

**Mortality:** The number of new deaths in a defined population for a defined period of time, often expressed as a rate per unit of population, e.g. 120 per 100,000 population.

**Myocardial Infarction (MI):** A form of coronary heart disease commonly referred to as a heart attack. MI results from an interruption of blood flow through the coronary arteries, causing damage to the heart and possibly death.

**Population Attributable Risk:** A measure of the excess risk of a disease or condition in the total population attributable to a risk factor such as cigarette smoking.

**Pregnancy Risk Assessment Monitoring System (PRAMS):** A population-based, mail survey that addresses maternal behaviors before, during and after pregnancy and during the early infancy of her child.

**Prenatal:** Occurring or existing before birth.

**Prenatal Smoking:** Smoking by a mother while pregnant.

**Preterm Birth:** Births that have a gestational age of less than 37 weeks.

**Preterm Low Birth Weight:** Births of weight less than 2,500 grams and gestational age less than 37 weeks.

**Prevalence:** Percentage of persons at a point in time that have a disease, condition or risk factor in a given population.

**Rate:** The number of new cases (incidence) or deaths (mortality) in a time period divided by the population at risk. Typically expressed in terms of "per 100,000 population."

**Risk Factor:** An aspect of personal behavior or lifestyle, an environmental exposure or a hereditary characteristic that is associated with an increase in the occurrence of a particular disease, chronic condition or injury.

**Small for Gestational Age:** Births of weight less than 2,500 grams and a gestational age 37 weeks or greater.

**Squamous Cell Carcinoma:** A new growth or malignant tumor that develops primarily from squamous cells in the skin, mouth, lungs, bronchi or cervix.

**Sudden Infant Death Syndrome (SIDS):** The sudden death of an infant less than 1 year of age that remains unexplained following a thorough case investigation.

**Very Low Birth Weight:** Births of weight less than 1,500 grams.