

# THE BURDEN OF TOBACCO IN ALABAMA





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PREPARED FOR  
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## Executive Summary

Tobacco use affects the economic well-being of the State of Alabama and the health of its citizens. Key findings of *The Burden of Tobacco in Alabama* are featured below and, unless noted otherwise, the tobacco use and health impact findings refer to 2009 annual estimates while the tobacco excise tax and economic impact findings refer to 2010 annual estimates.

### Tobacco Use in Alabama

- 22.6% of adults in Alabama are current cigarette smokers.
  - 25.7% of males smoke
  - 19.7% of females smoke
- Alabama has the 7th highest adult smoking rate in the nation.
- 11.1% of mothers reported smoking during pregnancy.
- From 2002 to 2009, adult smoking prevalence fell on average 0.44 percentage points a year.
- 7.0% of middle school students are current smokers (2010).
- 18.6% of high school students are current smokers (2010).
- From 2000 to 2010, youth smoking prevalence declined steadily among high school students (from 30.2% to 18.6%) and middle school students (from 19.1% to 7%).

### Tobacco Excise Tax in Alabama

- Nationwide, Alabama has the 5th lowest excise tax on a pack of cigarettes at \$0.425.

### The Health Impact of Tobacco

- 8,685 deaths in Alabama were attributable to smoking-related diseases.
  - 3,293 deaths due to cancer
  - 2,339 deaths due to cardiovascular disease
  - 2,264 deaths due to respiratory disease
  - 789 deaths due to secondhand smoke (SHS) and smoking-related fires
- 121,909 years of potential life were lost due to smoking-attributable premature death (adults 35+ and infants).
- 15.3 years of life were lost, on average, among Alabama adults who died as a result of a smoking-attributable illness.
- 157,920 Alabama residents are living with a smoking-attributable illness.

### The Economic Impact of Tobacco

- \$1.66 billion in excess personal medical care expenditures were attributable to smoking.
- \$2.84 billion in productivity losses were attributable to smoking-related premature death.
- \$941 million in productivity losses were attributable to smoking-related illnesses.
- \$166 million in personal medical costs and productivity losses were attributable to exposure to SHS.
- \$5.6 billion was the estimated total annual economic impact of smoking in Alabama.

## Introduction

Tobacco use ranks among the most preventable causes of death and disease in the United States (CDC, 2010b). Approximately 443,000 people die in the United States each year due to tobacco-related illnesses (U.S. DHHS, 2010). This is more deaths than those caused by human immunodeficiency virus (HIV), illegal drug use, alcohol use, motor vehicle injuries, suicides, and murders combined (Mokdad, Amrks, Stroup, & Gerberding, 2004). Furthermore, illness reduces the quality of life among smokers; for every person in the United States who dies from smoking, 20 more will live with a serious smoking-related illness (CDC, 2003).

Tobacco use drastically increases the risk of disease and is associated with medical conditions that cause death including cancer, cardiovascular disease, respiratory disease, and perinatal conditions. Fifty percent of all long-term smokers die as the result of a smoking-related illness (U.S. DHHS, 2010).

The consequences of smoking continue to be felt among the non-smoking community as well. Thousands of nonsmokers die in the United States each year due to heart disease and lung cancer caused by SHS. A recent report from the Surgeon General confirms previous findings that there is no safe level of exposure to tobacco smoke (U.S. DHHS, 2010).

Substantial progress has been made in reducing the prevalence of smoking and its consequences over the past 40 years. The national average smoking rate fell from 42% in 1964 to 20.6% in 2009 (U.S. DHEW, 1979; CDC, 2009c). While Alabama has also made progress in reducing smoking prevalence, the state continues to have higher smoking rates than the national average and had the 7th highest smoking rate in the country in 2009 at 22.6%.

This report provides a comprehensive overview of the health and economic burden of tobacco use on the State of Alabama using the most recent data from 2009 and 2010. The health impact is measured through mortality and morbidity statistics, as well as potential years of life lost due to tobacco use. The economic impact is calculated by summing direct medical costs with indirect costs which include productivity losses and economic costs associated with exposure to SHS.

### Adult Smoking Prevalence

Data are collected annually on adult tobacco use in Alabama through the Behavioral Risk Factor Surveillance System (BRFSS). Individuals age 18+ who have smoked over 100 cigarettes in their lifetime and who claim to currently smoke every day or some days are considered current adult smokers (CDC, 2009a).

### Smoking prevalence trends -

Figure 1

Over the past 14 years, smoking prevalence among adults age 18+ in Alabama has remained between 22.2% and 25.3%, with an average rate just under 24%.

The decline in adult smoking prevalence has been slower in Alabama than nationwide. From 2002 to 2009, the median smoking rate among states fell on average 0.70 percentage points a year, while in Alabama the smoking rate fell by 0.44 percentage points a year, on average.

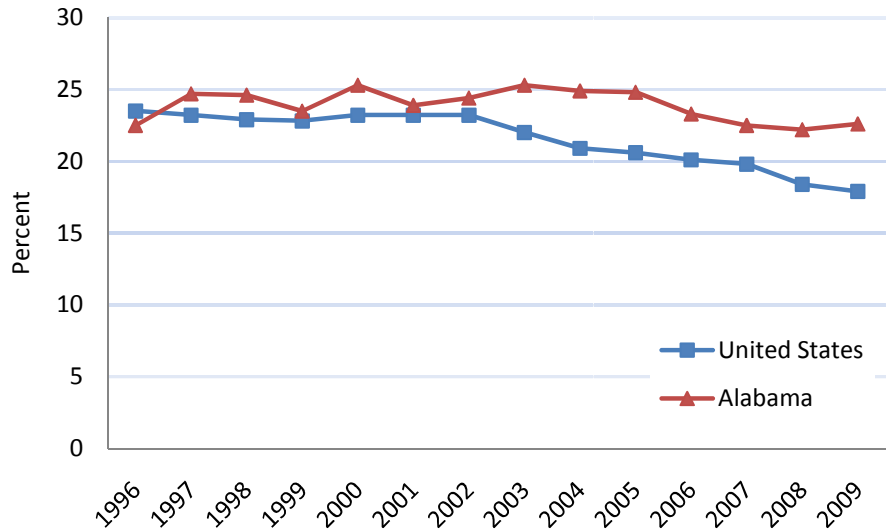
### Smoking prevalence ranking -

Figure 2

In 2009, Alabama had the 7th highest smoking rate among the 50 states and Washington D.C. with a rate of 22.6%. Utah had the lowest smoking rate at 9.8% and Kentucky had the highest smoking rate at 25.7%. The median smoking rate among the 50 states and Washington D.C. was 18%.

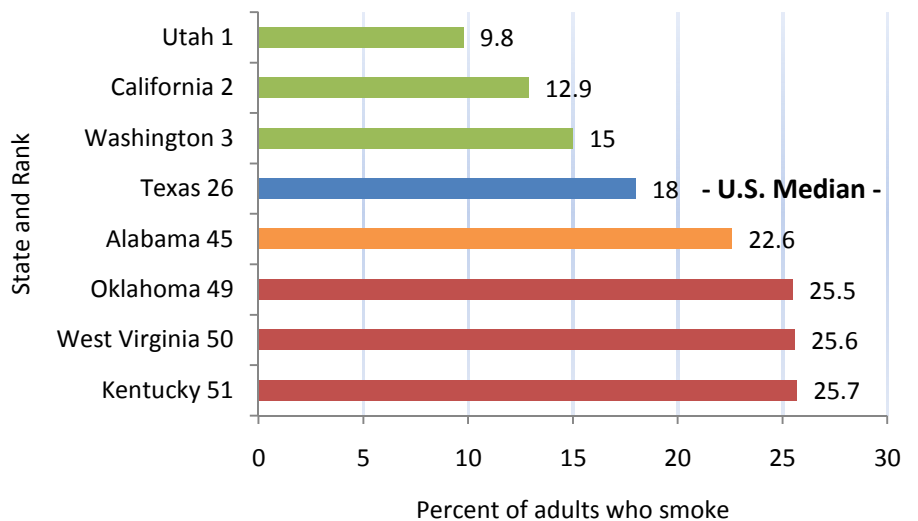
## Tobacco Use in Alabama

Figure 1. Smoking prevalence among Alabama adults age 18+, 1996–2009



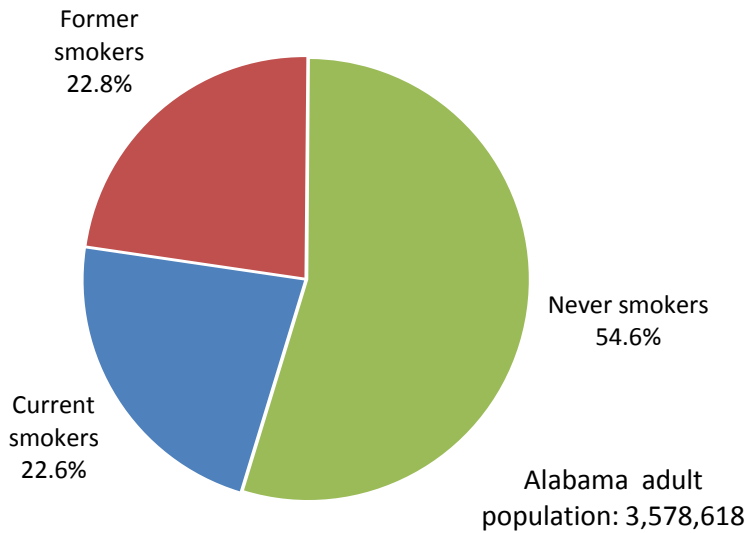
Source: BRFSS 2009

Figure 2. Smoking prevalence among adults in the United States by rank, 2009



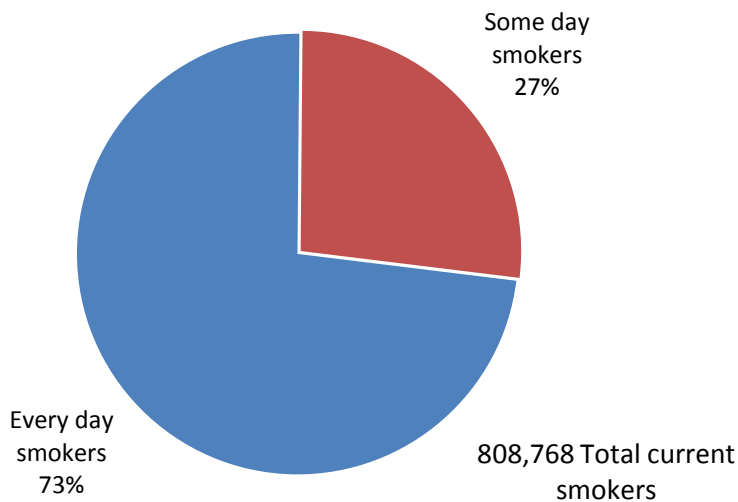
Source: BRFSS 2009

**Figure 3. Smoking status among Alabama adults age 18+, 2009**



Source: BRFSS 2009

**Figure 4. Frequency of cigarette usage among current adult smokers age 18+ in Alabama, 2009**



Source: BRFSS 2009

**Smoking status - Figure 3**

In 2009, 22.6% of adults in Alabama reported being current cigarette smokers, 22.8% reported being former smokers, and 54.6% reported they were never smokers (CDC, 2009b). Based on these figures, it is estimated that approximately 808,768 adults in Alabama were current cigarette smokers in 2009.

**Frequency of cigarette usage - Figure 4**

Among the adults in Alabama who were current smokers, 73% smoked cigarettes every day, while 27% smoked cigarettes only on some days.

## Adult Smoking Prevalence by Demographics - 2009

Figure 5

### Overall adult

Adult smoking prevalence was 22.6%.

### Pregnant mothers

Approximately 11% of pregnant women in Alabama reported smoking during pregnancy (AL CHS, 2009a).

### Gender

Smoking prevalence was significantly higher for males (25.7%) than for females (19.7%).

### Race/Ethnicity

Annual averages from 2005-2009 suggest that smoking prevalence was the highest among Hispanics (27.8%), above that of whites (23.9%), and African Americans (20%).

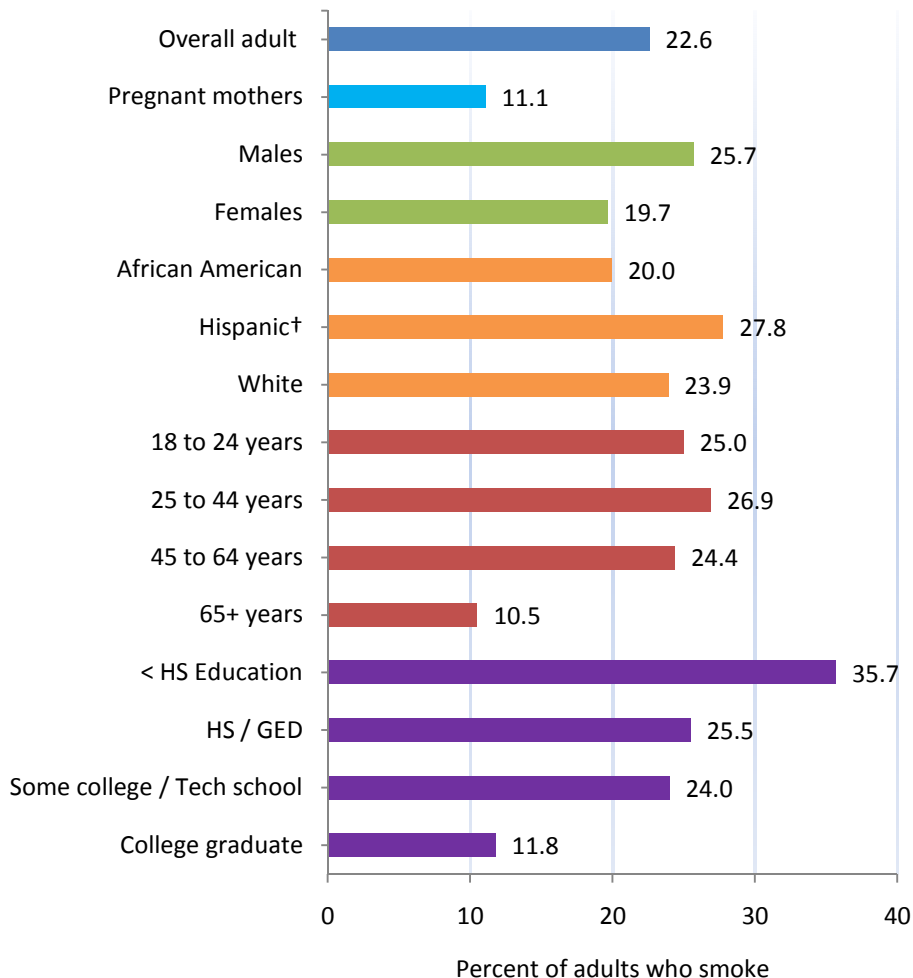
### Age

The prevalence of smoking for young and middle-aged adults was significantly higher than for their elderly counterparts of 65 years and older.

### Education

In Alabama there is a strong negative association between level of education and smoking prevalence. Smoking prevalence was more than twice as great among adults with only a high school education (25.5%) and three times as great among adults with less than a high school education (35.7%) as compared to those with a college degree (11.8%).

**Figure 5. Smoking prevalence among Alabama adults by varied demographics, 2009\***

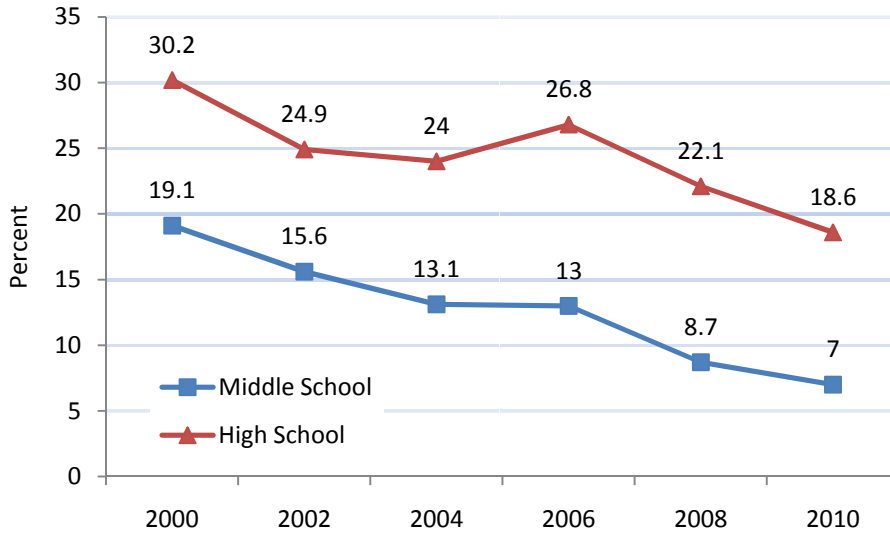


Source: BRFSS 2009; AL Center for Health Statistics (AL CHS)

\* All smoking prevalence figures are from 2009 except those of racial/ethnic groups. Racial/ethnic group estimates are averages from 2005-2009 BRFSS data.

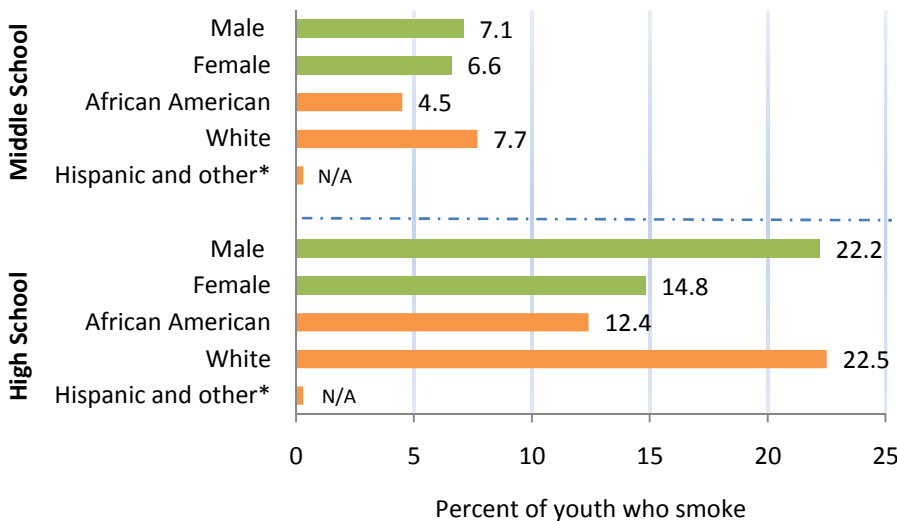
†The sample size for the number of Hispanics surveyed was relatively small and thus the estimate may not be reliable and should be interpreted with caution.

**Figure 6. Smoking prevalence among Alabama youth by school level, 2000–2010**



Source: Youth Tobacco Survey (YTS) 2010

**Figure 7. Smoking prevalence among Alabama youth by school level, gender, and racial/ethnic group, 2010**



Source: YTS 2010

\*Smoking prevalence data for Hispanics and other racial/ethnic groups are not reported due to small sample sizes.

### Youth Smoking Prevalence

The Youth Tobacco Survey is administered to Alabama middle school and high school students every two years. Students who claim to have smoked cigarettes on one or more days in the 30 days preceding the survey are considered current youth smokers (CDC, 2011b).

### Smoking prevalence trends -

Figure 6

Over the past ten years, smoking prevalence among youth in Alabama has declined significantly. From 2000 to 2010, the prevalence of smoking decreased by 38% (from 30.2% to 18.6%) among high school students and by 63% (from 19.1% to 7%) among middle school students.

### School level and gender - Figure 7

In 2010, male and female middle school students had relatively similar smoking rates at 7.1% and 6.6%, respectively. However, the smoking rates in high school significantly differed between gender categories, with males (22.2%) smoking at higher rates than females (14.8%).

### School level and racial/ethnic group - Figure 7

In middle school, African American students (4.5%) had lower smoking rates than white students (7.7%). The smoking disparity between these groups increased significantly in high school where the prevalence of smoking was almost ten percentage points higher for white students (22.5%) than for African American students (12.4%).

### Tobacco Excise Tax

There is substantial evidence-based research indicating that increasing the price of cigarettes is an effective means of reducing smoking prevalence, preventing smoking initiation among adolescents and young adults, and decreasing overall cigarette consumption (U.S. DHHS, 2010; CDC, 2010a).

#### Alabama excise tax by tobacco product - Table 1

Excise taxes on tobacco products have not changed in Alabama since the last increase went into effect in May of 2005. This legislation set the tax on a pack of 20 cigarettes at \$0.425 and the tax on an ounce of chewing tobacco and snuff at \$0.015 and \$0.010, respectively (CDC, 2011b).

#### State cigarette excise tax ranking - Figure 8

At the end of 2010, Alabama had the 5th lowest excise tax on a pack of cigarettes among the 50 states and Washington, D.C. New York had the highest excise tax at \$4.35 per pack and Missouri had the lowest tax at \$0.17 per pack. The median excise tax per pack of cigarettes among the 50 states and Washington, D.C. was \$1.25 (CDC, 2011b).

#### Benefits of increasing the excise tax - Table 2

It is estimated that a \$1 excise tax increase per pack of cigarettes would result in substantial economic and health benefits to the state as noted in Table 2 (Campaign for Tobacco-Free Kids, 2010).

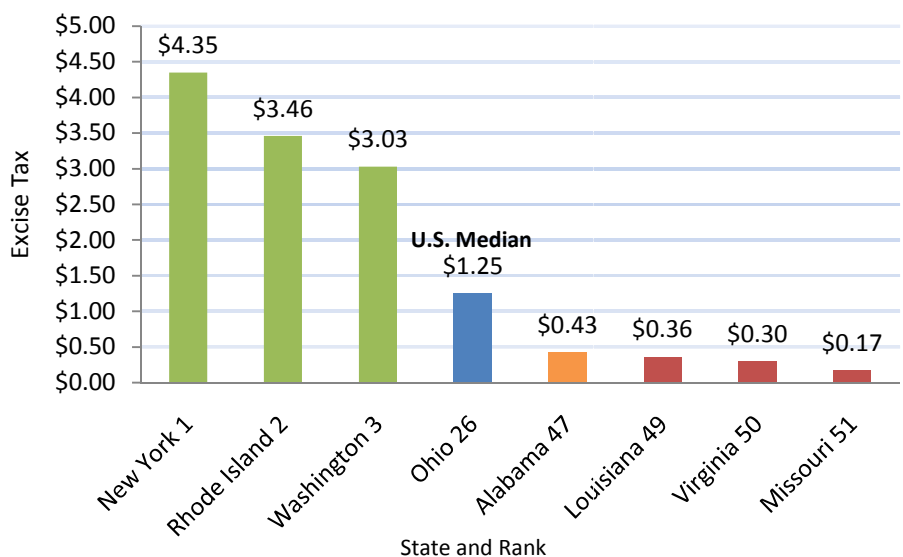
## Tobacco Excise Tax in Alabama

**Table 1. Alabama excise taxes on tobacco products, 2010**

Tobacco Product	Tax
Pack of cigarettes	\$0.425
Chewing tobacco (per ounce)	\$0.015
Snuff (per ounce)	\$0.010

Source: Office on Smoking and Health, CDC

**Figure 8. State excise tax per pack on cigarettes in the United States by rank, 2010**



Source: Office on Smoking and Health, CDC

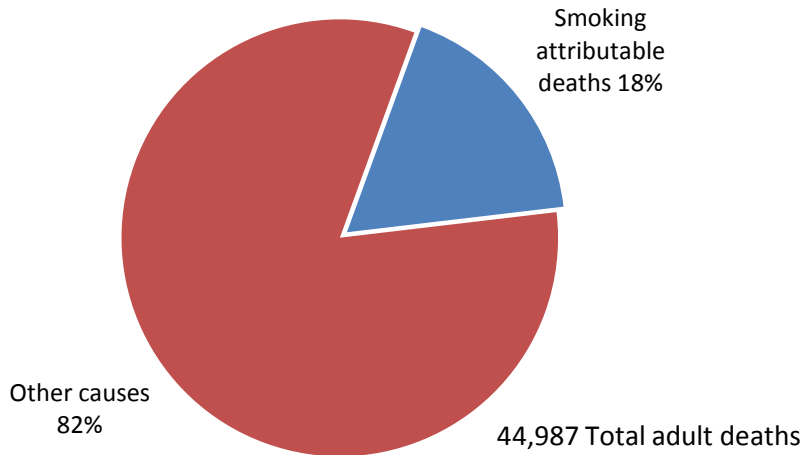
**Table 2. Projected benefits of increasing by \$1 the excise tax on a pack of cigarettes in Alabama, 2010**

Benefit	Amount
New annual state revenue	\$213.3 million
Children kept from becoming addicted smokers	73,200
Lives saved from premature smoking-caused death	30,700

Source: Campaign for Tobacco-Free Kids

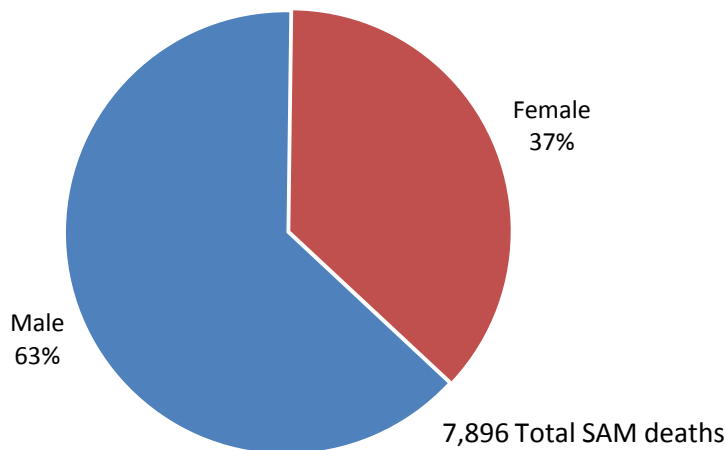
## The Health Impact of Tobacco

Figure 9. Deaths among Alabama adults age 35+, 2009



Sources: CDC SAMMEC; BRFSS 2009; AL CHS

Figure 10. Smoking-attributable deaths among Alabama adults age 35+ by gender, 2009



Sources: CDC SAMMEC; BRFSS 2009; AL CHS

### Smoking-Attributable Mortality (SAM)

According to the CDC, the use of tobacco is the single most preventable cause of illness and death in the United States. Smoking-Attributable Mortality (SAM) is a measure used by the CDC to estimate the number of deaths caused by cigarette smoking. SAM does not account for deaths due to SHS or fires (CDC, 2009d).

#### Adult mortality - Figure 9

Using CDC's Smoking-Attributable Mortality, Morbidity, and Economic Costs (SAMMEC) calculator, it is estimated that 18% (7,896 deaths) of all 44,987 deaths among adults age 35+ that occurred in Alabama in 2009 were attributable to cigarette smoking.

#### Gender - Figure 10

In 2009, there were substantially more smoking-related deaths for males as compared to females. Of the 7,896 SAM deaths among adults age 35+, it is estimated that 63% (4,995 deaths) were male deaths and 37% (2,901 deaths) were female deaths.



### Disease Categories

Smoking-attributable deaths have been causally linked to three main disease categories: cancer, cardiovascular disease, and respiratory disease.

#### Type of disease - Figure 11

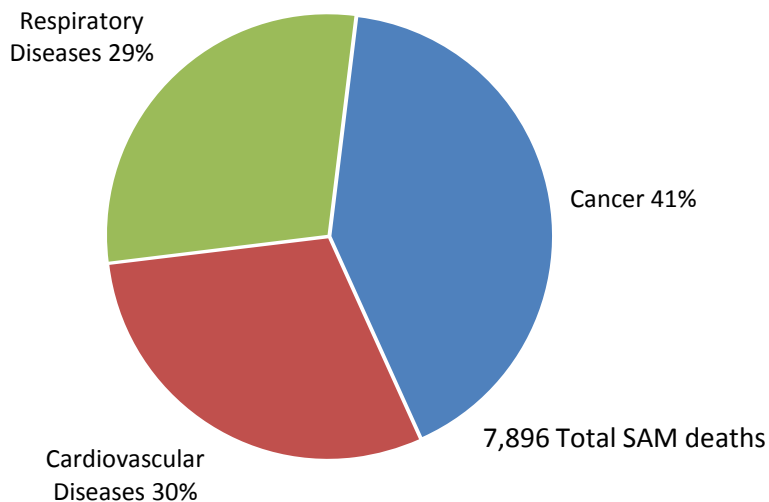
In 2009, cancer was the disease category that caused the most adult SAM deaths (3,293 deaths) at 41%. Cardiovascular disease and respiratory disease were responsible for the remaining deaths, respectively, causing 30% (2,339 deaths) and 29% (2,264 deaths) of the total adult SAM deaths.

#### Disease and gender - Figure 12

SAM affected men more than women in all three disease categories. The disparate effects between gender categories were greater for cancer and cardiovascular disease than they were for respiratory disease. Smoking-attributable cancer was responsible for more than twice as many male deaths as female deaths.

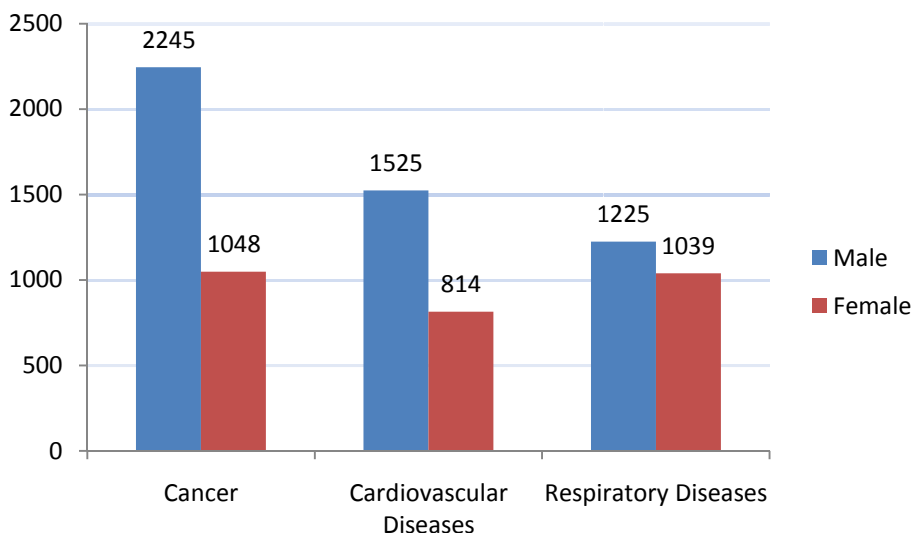
Note: Details on the diseases included in the three above listed disease categories can be found in the appendix.

**Figure 11. Smoking-attributable deaths among Alabama adults age 35+ by disease category, 2009**



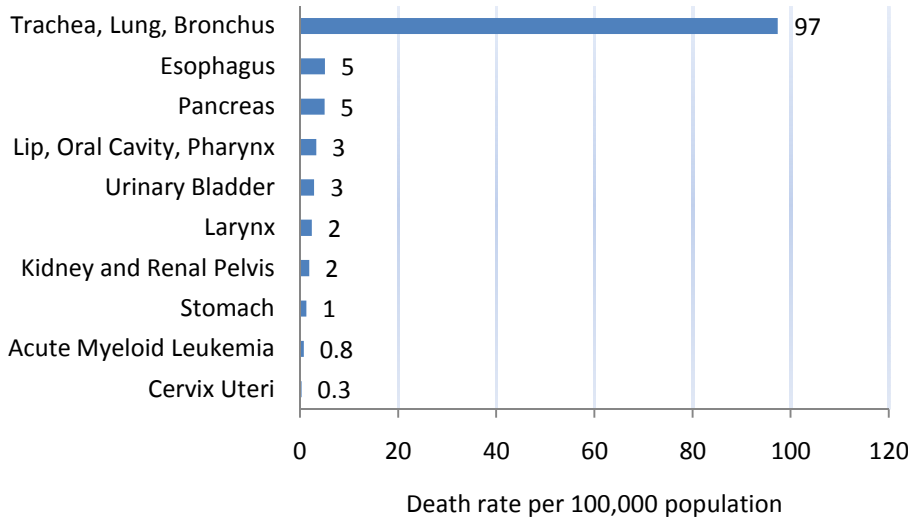
Sources: CDC SAMMEC; BRFSS 2009; AL CHS

**Figure 12. Smoking-attributable deaths among Alabama adults age 35+ by disease category and gender, 2009**



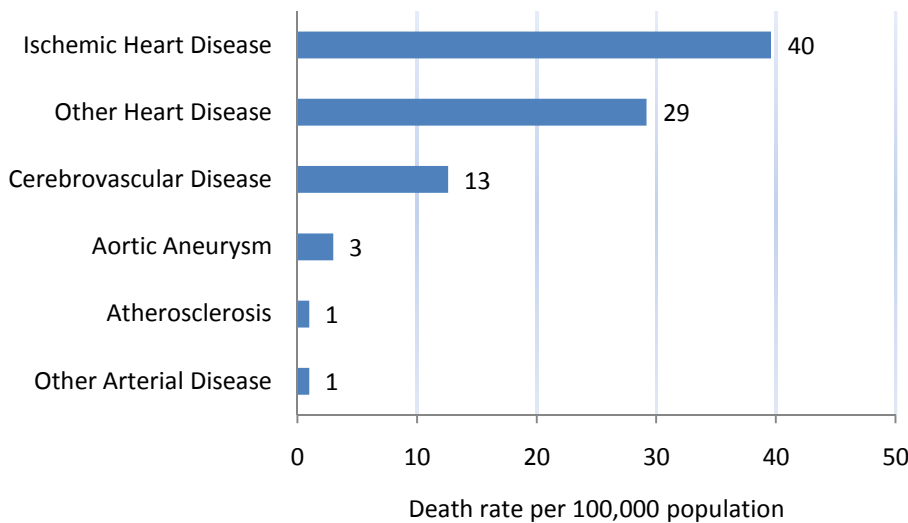
Sources: CDC SAMMEC; BRFSS 2009; AL CHS

**Figure 13. Smoking-attributable mortality rate among Alabama adults age 35+ by type of cancer, 2009\***



Sources: CDC SAMMEC; BRFSS 2009; AL CHS

**Figure 14. Smoking-attributable mortality rate among Alabama adults age 35+ by type of cardiovascular disease, 2009\***



Sources: CDC SAMMEC; BRFSS 2009; AL CHS

\*The SAM rates are age-adjusted to the 2000 US standard population.

**Cancer - Figure 13**

Among ten types of cancer for which smoking is a contributor, the trachea, lung, and bronchus category of cancers had the highest SAM rate at 97 deaths per 100,000 residents among adults age 35+. Trachea, lung, and bronchus cancers were responsible for 2,663 SAM deaths in 2009, while the other cancers accounted for 630 SAM deaths.

**Cardiovascular disease - Figure 14**

Ischemic heart disease had the highest SAM rate among cardiovascular disease categories in 2009 (1,084 deaths) at 40 deaths per 100,000 residents among adults age 35+. Other heart disease and cerebrovascular disease had the second and third highest SAM rates being, respectively, responsible for 731 and 340 deaths.

Note: See the glossary for a definition of terms.

**Respiratory disease - Figure 15**

In 2009, chronic airway obstruction had the highest SAM rate among the respiratory diseases at 73 deaths per 100,000 residents among adults age 35+. Chronic airway obstruction was responsible for 1,945 deaths, while the other respiratory categories accounted for 319 deaths.

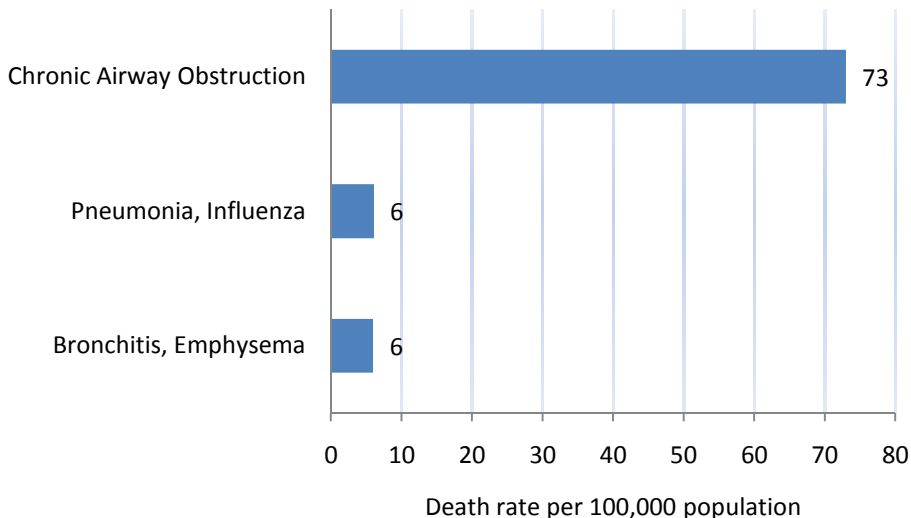
**Disease categories strongly associated with smoking - Table 3**

Eighty-one percent of all trachea, lung, and bronchus cancer deaths in Alabama in 2009 were due to smoking.

Twenty percent of all ischemic heart disease deaths in Alabama in 2009 were due to smoking.

Seventy-eight percent of all chronic airway obstruction deaths in Alabama in 2009 were due to smoking.

**Figure 15. Smoking-attributable mortality rate among Alabama adults age 35+ by type of respiratory disease, 2009\***



Sources: CDC SAMMEC; BRFSS 2009; AL CHS

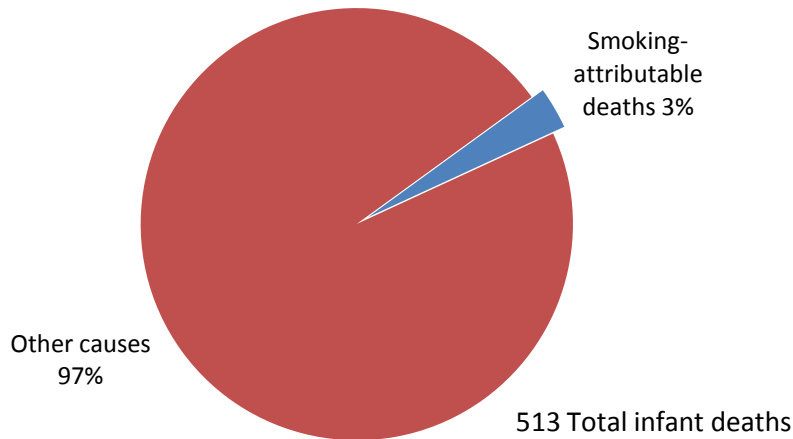
**Table 3. Causes of death for which smoking is a significant contributor, 2009**

Cause of death (Disease category)	Total 2009 AL deaths	Deaths due to smoking	% due to smoking
Lung Cancer†	3,284	2,663	81%
Ischemic Heart Disease	5,538	1,084	20%
Chronic Airway Obstruction	2,498	1,945	78%

Sources: CDC SAMMEC; AL CHS

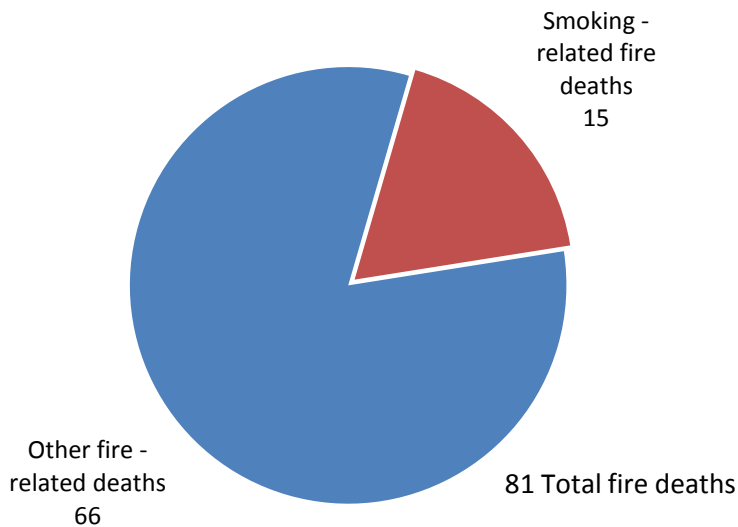
\*The SAM rates are age-adjusted to the 2000 US standard population.  
 †This disease category includes trachea, lung, and bronchus cancers.

**Figure 16. Infant mortality in Alabama, 2009**



Sources: CDC SAMMEC; BRFSS 2009; AL CHS

**Figure 17. Smoking-related fire deaths in Alabama, 2009**



Sources: AL CHS; U.S. Fire Administration

### Indirect Smoking-Related Deaths

#### Infant mortality - Figure 16

Cigarette smoking also contributed to deaths among infants in Alabama. Maternal smoking during pregnancy is estimated to be responsible for 3% (16 deaths) of all 513 infant deaths in Alabama in 2009.

Of the 16 smoking-attributable infant deaths, it is estimated that eight were caused by short gestation/low birth weight, seven were caused by sudden infant death syndrome, and one was caused by respiratory conditions.

#### Smoking-related fire deaths - Figure 17

The Alabama Center for Health Statistics reported that in 2009, 81 residents died from accidental exposure to smoke, fire, and flames. Using national averages for fire deaths caused by smoking materials, it is estimated that 15 of the 81 fire deaths (18%) in Alabama in 2009 were caused by smoking (U.S. Fire Administration, 2007).

**Secondhand smoke deaths -**

Figure 18

Scientific research has shown that involuntary exposure to SHS is causally linked to premature death and disease.

In 2006, the Surgeon General concluded that exposure to SHS increases the risk of coronary heart attack by 25%-30%. It was also concluded that SHS exposure from living with a smoker increases the risk of lung cancer by 20%-30% (U.S. DHHS, 2006).

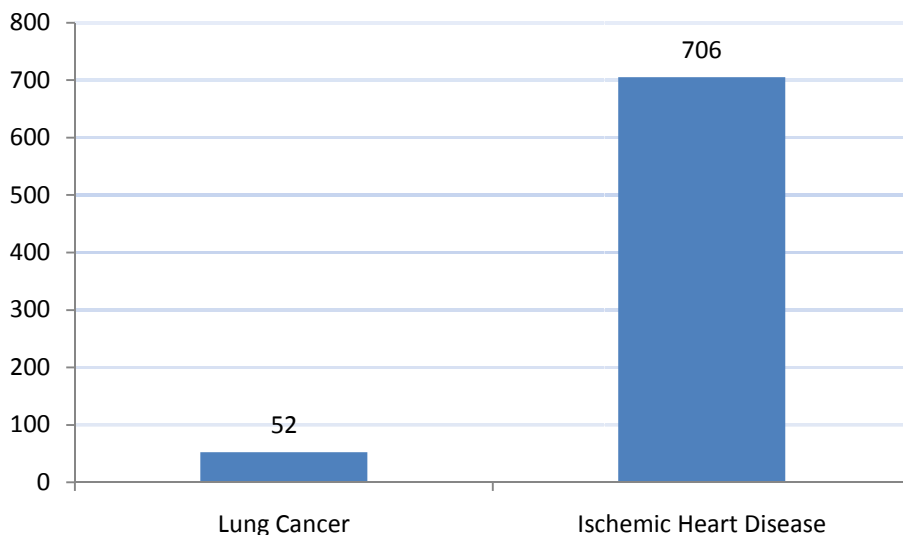
It is estimated that in Alabama, exposure to SHS results in approximately 52 lung cancer deaths and 706 ischemic heart disease deaths each year.

**Total Smoking-Related Deaths**

Table 4

In 2009, a total of 8,685 deaths were attributed to smoking. Of these deaths, 7,896 were directly related to smoking and 789 deaths were indirectly related to smoking, due to SHS, maternal smoking, or fires.

**Figure 18. Annual deaths caused by exposure to secondhand smoke in Alabama by type of disease**



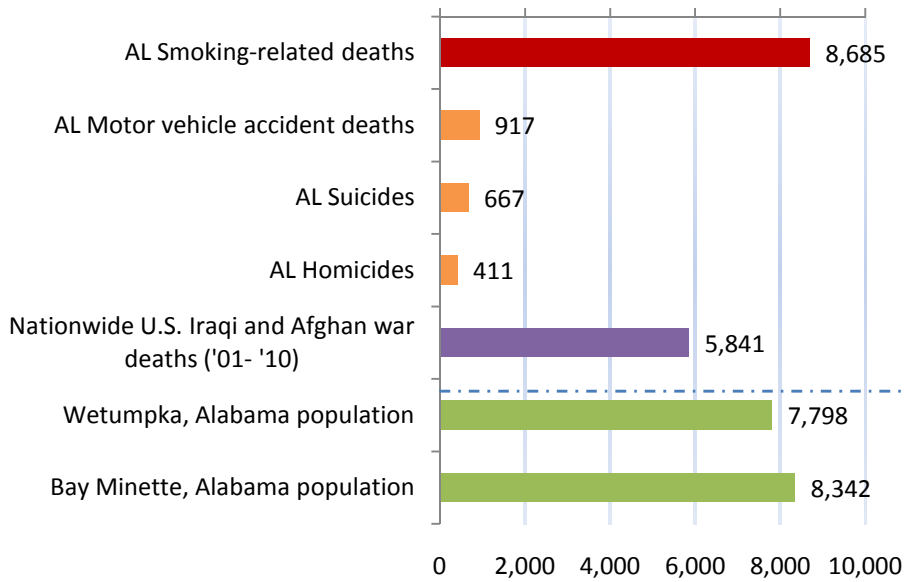
Sources: CA EPA; United States Census Bureau (USCB)

**Table 4. Smoking-related deaths by cause in Alabama, 2009**

Cause of Death	Number of Deaths
Deaths directly related to smoking	
Cancer	3,293
Cardiovascular disease	2,339
Respiratory disease	2,264
<b>Subtotal Direct</b>	<b>7,896</b>
Deaths indirectly related to smoking	
Ischemic heart disease-SHS	706
Lung cancer-SHS	52
Perinatal conditions-maternal smoking	16
Fires	15
<b>Subtotal Indirect</b>	<b>789</b>
<b>Total deaths</b>	<b>8,685</b>

Sources: CDC SAMMEC; BRFSS 2009; AL CHS; CA EPA; U.S. FA

**Figure 19. Causes of death by frequency and comparable-sized populations, 2009**



Sources: BRFSS 2009; AL CHS; Washington Post; USCB

**Figure 20. Smoking-attributable morbidity among Alabama adults, 2009**

(Ratio of smoking-attributable death to illness 1:20)



Source: CDC

\*The smoking-attributable illnesses considered in this morbidity estimate were stroke, heart attack, emphysema, chronic bronchitis, and cancer of the lung, bladder, mouth/pharynx, esophagus, cervix, kidney, larynx, and pancreas.

**Causes of death - Figure 19**

Comparing the number of deaths attributable to smoking in 2009 with other categories, it is estimated that smoking caused:

- Nine times as many deaths as were caused by motor vehicle accidents
- 13 times as many deaths as were caused by suicides
- 21 times as many deaths as were caused by homicides
- More deaths than have occurred among the U.S. military in Iraq and Afghanistan during the wars of the past nine years

**Similar-sized populations**

The number of smoking-attributable deaths is comparable to the population size of numerous towns in Alabama such as Wetumpka or Bay Minette, which have populations of 7,798 and 8,342, respectively.

**Smoking-Attributable Morbidity**

Figure 20

According to the CDC, there are approximately 20 people living with a smoking-attributable illness in the U.S. for every person who dies from a smoking-related disease (CDC, 2006). Assuming this ratio holds true in Alabama, there were an estimated 157,920 adults suffering from a smoking-related illness in the state in 2009.

### Years of Potential Life Lost

Years of Potential Life Lost (YPLL) is a measure used by CDC to calculate the total years of life lost among adults who die prematurely from smoking-attributable illnesses. The YPLL data shown refers to adult smokers in Alabama age 35+ and does not account for deaths due to SHS or fires (CDC, 2009d).

#### Disease category - Figure 21

In 2009, a total of 120,672 years of potential life were lost among Alabama adults age 35+ due to smoking-attributable deaths. Cancer was responsible for 43% (52,589 years) of the years lost, while cardiovascular diseases accounted for 33% (39,375 years), and respiratory diseases accounted for 24% (28,708 years) of the potential years lost.

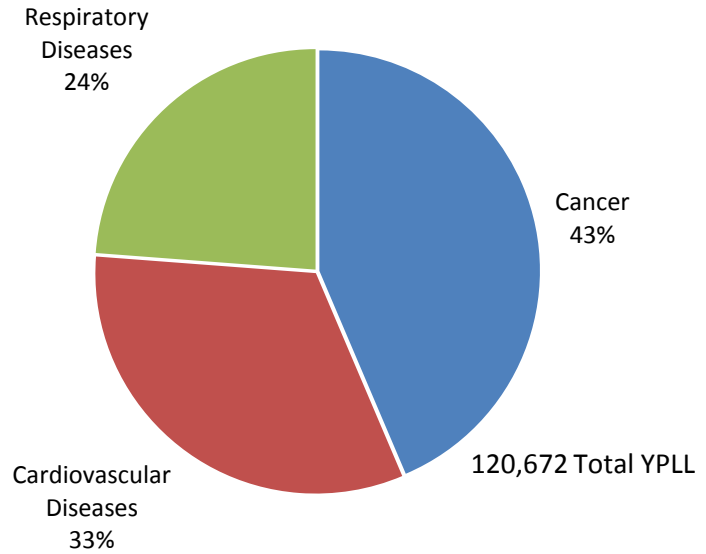
#### Disease and gender - Figure 22

The YPLL were higher for men than for women for those smokers who died of cancer or cardiovascular disease. However, respiratory disease caused nearly equal YPLL for women and men.

#### Infants

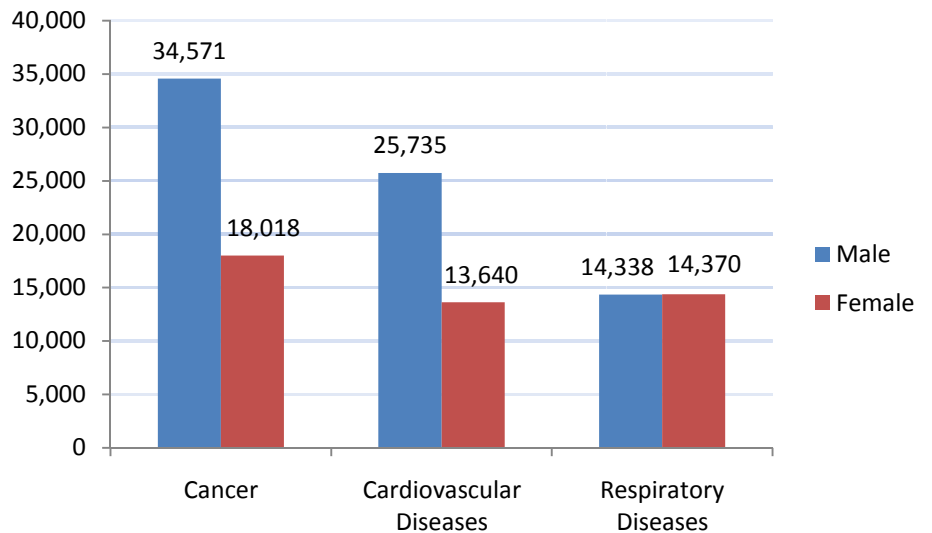
It is estimated that 1,237 years of potential life were lost by infant deaths due to maternal smoking during pregnancy in 2009.

**Figure 21. Years of potential life lost among Alabama adults age 35+ by disease category, 2009**



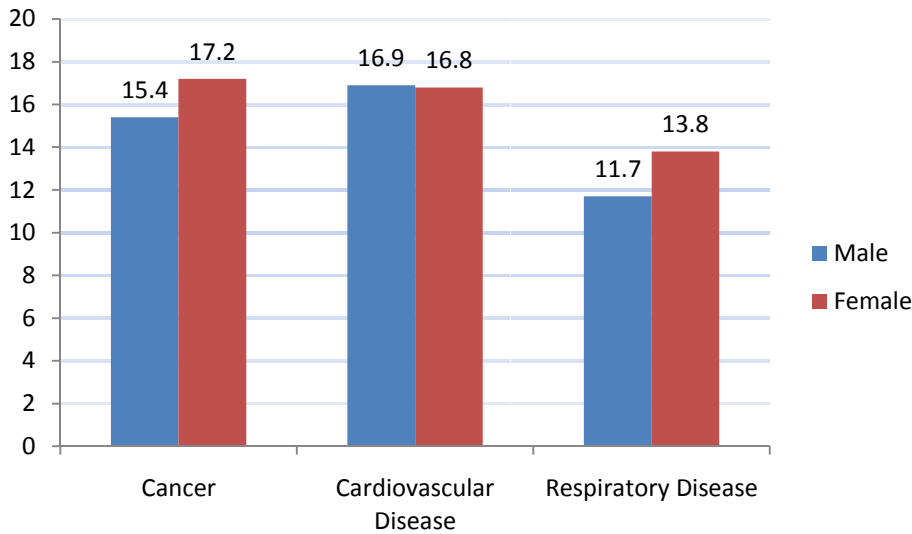
Sources: CDC SAMMEC; BRFSS 2009; AL CHS; National Vital Statistics

**Figure 22. Years of potential life lost among Alabama adults age 35+ by disease category and gender, 2009**



Sources: CDC SAMMEC; BRFSS 2009; AL CHS; National Vital Statistics

**Figure 23. Average years of potential life lost among Alabama adults age 35+ who died of smoking-attributable illnesses by disease, 2009**



Sources: CDC SAMMEC; BRFSS 2009; AL CHS; National Vital Statistics

### Average Years of Life Lost

Among the adults who died in 2009 as a result of smoking-attributable illnesses, the average adult lost 15.3 years of potential life. Male smokers lost an average of 14.9 years of life and female smokers lost an average of 15.9 years of life.

#### Figure 23

On average, adults who died from smoking-attributable cancer lost 16 years of potential life, those who died from smoking-attributable cardiovascular disease lost 16.8 years, and those who died from smoking-attributable respiratory disease lost 12.7 years of potential life.



### Direct Medical Expenditures Attributable to Smoking

Figure 24

In Alabama, smoking was responsible for \$1.66 billion in excess adult medical expenditures in 2010 related to ambulatory care (17%), hospital care (48%), prescription drugs (20%), nursing home care (7%), and other personal health care expenditures (8%).

These excess direct medical expenditures paid by residents and the state government are equivalent to costs of:

- \$352 for every man, woman, and child in Alabama
- \$955 per household
- \$2,051 per smoker in Alabama

### Alternative purchases - Table 5

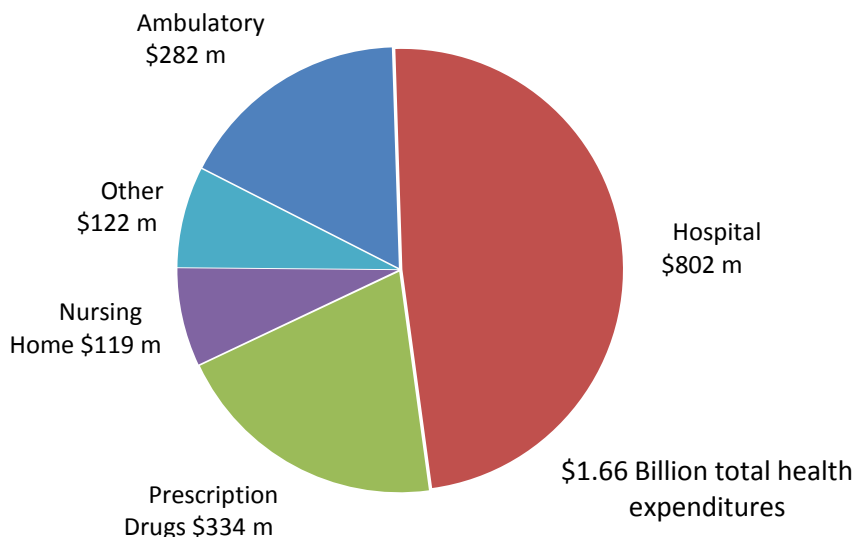
In order to gauge the relative spending power of the \$1.66 billion in excess medical costs due to smoking in Alabama, it is beneficial to compare various alternative purchases that could be made with the same amount of money.

For \$1.66 billion:

- Over 52,000 full-tuition four-year college scholarships† could be provided to residents of Alabama
- Over 41,000 salaried jobs\*\* could be provided at \$40,000 each

## The Economic Impact of Tobacco

**Figure 24. Direct medical expenditures attributable to smoking among Alabama adults age 35+, 2010\***  
(Estimates are in millions of dollars)



Source: CDC SAMMEC

**Table 5. Alternative purchases that could be made with \$1.66 billion spent on direct medical expenditures attributable to smoking, 2010**

Alternative Purchase	Number
Full-tuition four-year scholarships to the University of Alabama†	52,494
Salaried jobs at \$40,000 each**	41,470

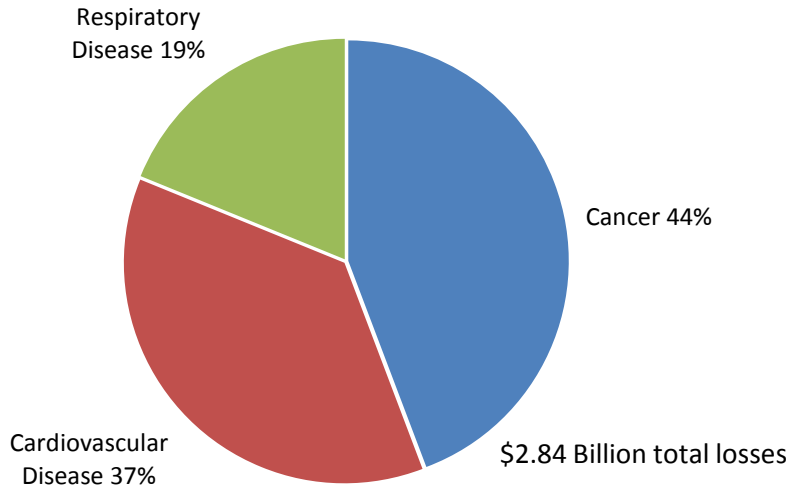
Source: University of Alabama

\*Estimates adjusted for inflation to 2010; values do not add up to total due to rounding.

†Based on 2010-2011 semester tuition rates of \$3,950 for residents and excluding the cost of other enrollment fees and of room and board.

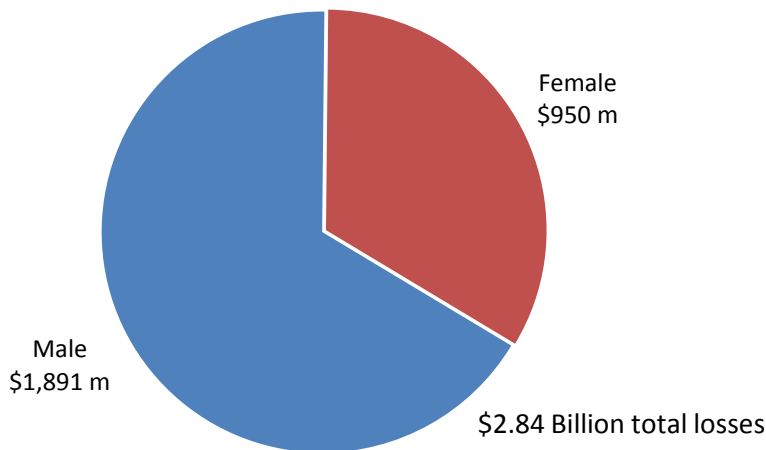
\*\*Assumes salary without benefits.

**Figure 25. Productivity losses due to smoking-attributable death among Alabama adults age 35+ by disease category, 2010**



Sources: CDC SAMMEC; BRFSS 2009; AL CHS

**Figure 26. Productivity losses due to smoking-attributable death among Alabama adults age 35+ by gender, 2010**  
(Estimates are in millions of dollars)



Sources: CDC SAMMEC; BRFSS 2009; AL CHS  
Note: Estimates adjusted for inflation to 2010.

### Productivity Losses Attributable to Smoking

Productivity losses account for a significant portion of the economic burden of tobacco in Alabama. Productivity losses can be calculated by (1) those due to premature death and (2) those due to illness.

**Productivity losses due to premature death** - Figure 25 CDC estimates productivity losses due to premature death using the present value of future earnings (PVFE) and the estimated value of future household production that are lost because of smoking-related deaths. The estimates shown refer to adult smokers in Alabama age 35+ and do not account for deaths due to SHS or fires (CDC, 2009d).

Productivity losses due to premature death in 2010 are estimated at \$2.84 billion. Cancer deaths accounted for 44% of the productivity losses (\$1.27 billion), cardiovascular disease accounted for 37% (\$1.04 billion), and respiratory disease accounted for 19% (\$532 million).

**Gender** - Figure 26 Productivity loss estimates due to premature death were almost twice as much for males (\$1.89 billion) as for females (\$950 million).

**Productivity losses due to illness -**

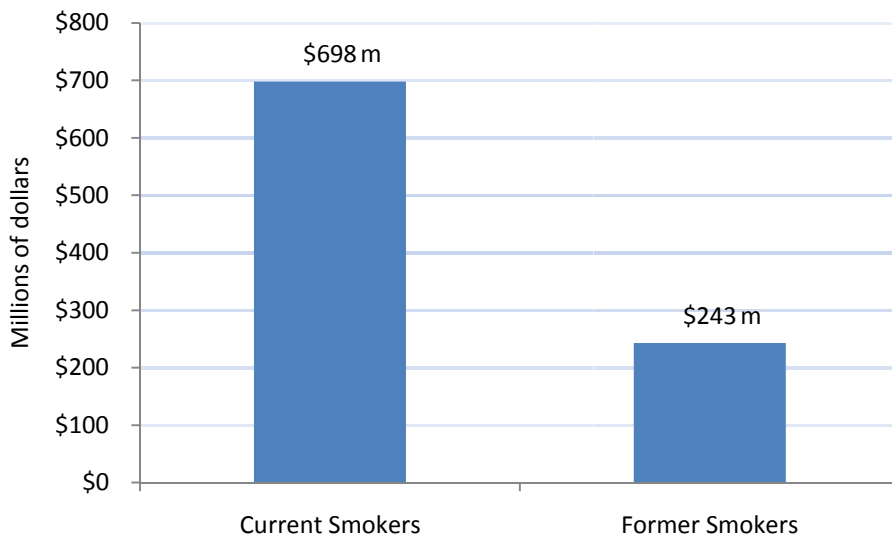
Figure 27

Calculations for productivity losses due to illness are derived by comparing the differences among smokers, former smokers, and non-smokers for time missed from work (absenteeism) and unproductive time at work (presenteeism) (Bunn, Stave, Downs, Alvir, & Dirani, 2006).

The estimated annual net productivity loss was \$1,961 for a current smoker and \$676 for a former smoker over a non-smoking worker.

For 2010, it is estimated that current smokers were responsible for \$698 million and former smokers for \$243 million for a total of \$941 million in productivity losses in Alabama due to smoking-attributable illnesses.

**Figure 27. Productivity losses due to smoking-attributable illness among the Alabama workforce age 16+ by smoking status, 2010**  
(Estimates are in millions of dollars)



Sources: BRFSS 2009; BLS; Bunn et al.  
Note: Estimates adjusted for inflation to 2010.

**Table 6. Indirect medical expenditures and productivity losses attributable to secondhand smoke in Alabama, 2010**

Category	Morbidity	Medical Cost of Excess Morbidity*	Productivity Losses due to Excess Mortality and Disability†
Cancer	Lung cancer	\$3,381,610	\$8,303,535
	Cervical cancer	\$247,867	\$1,947,524
Respiratory system	Asthma	\$13,685,784	\$2,850,467
	Otitis media	\$938,353	N/A
	Chronic pulmonary disease	\$21,511,291	\$15,686,423
Cardiovascular system	Coronary heart disease	\$43,412,087	\$48,723,517
Perinatal manifestations	Low birth weight	N/A**	\$3,080,629
Postnatal manifestations	Sudden infant death syndrome	N/A**	\$2,319,324
<b>Subtotal</b>		<b>\$83,176,993</b>	<b>\$82,911,421</b>
<b>Total Cost</b>			<b>\$166,088,414</b>

Source: Behan et al.

\*Estimated economic value of direct medical costs.

†Estimated economic value of lost wages, fringe benefits, and services excluding infants.

\*\*Estimates for these costs were derived from the MCH SAMMEC application and are included in Table 7 as direct healthcare expenditures.

Note: Estimates adjusted for inflation to 2010.

**Indirect Expenditures and Losses - Secondhand Smoke**

Table 6

It is estimated that SHS is responsible for approximately \$83 million in medical costs due to excess morbidity and \$83 million in productivity losses due to excess mortality and disability.

The economic costs of SHS for Alabama were derived from national estimates produced by Behan et al (Behan, Eriksen, & Lin, 2005).

### Total Economic Costs

Table 7 and Figure 28

The total annual economic impact of tobacco use in Alabama is estimated at over \$5.6 billion.

#### Direct costs

Adult and neonatal personal health care expenditures account for 30% (\$1.66 billion) of the total economic cost of tobacco use in Alabama.

#### Indirect costs

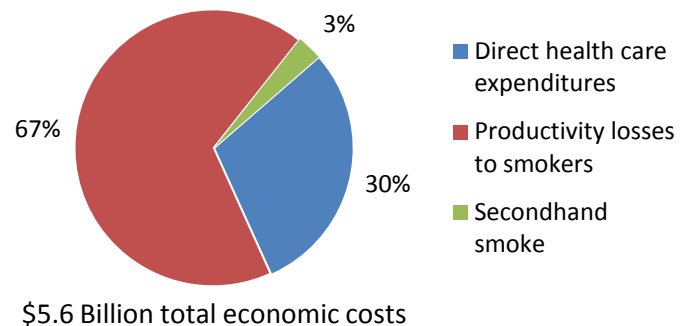
Productivity losses among smokers, due to premature death and to illness attributed to smoking, account for 67% (\$3.78 billion) of the total economic cost of tobacco use in Alabama.

The indirect costs of SHS, including healthcare expenditures and productivity losses among non-smokers caused by SHS exposure, account for 3% (\$166 million) of the total economic costs of smoking in Alabama.

**Table 7. Total smoking-attributable economic costs in Alabama, 2010**

Smoking-attributable Costs	Total
Direct Costs	
<b>Adult healthcare expenditures</b>	
Ambulatory care	\$281,660,476
Hospital care	\$802,270,619
Prescription drugs	\$333,606,056
Nursing care	\$118,897,660
Other care	\$122,360,699
<b>Subtotal adult healthcare</b>	<b>\$1,658,795,511</b>
<b>Neonatal healthcare expenditures</b>	<b>\$2,887,547</b>
<b>Total Direct Costs</b>	<b>\$1,661,683,058</b>
Indirect Costs	
<b>Productivity losses due to smoking</b>	
Losses due to premature mortality	\$2,840,711,000
Losses due to illness	\$941,495,592
<b>Subtotal productivity losses</b>	<b>\$3,782,206,592</b>
<b>Secondhand smoke</b>	
Healthcare expenditures	\$83,176,993
Productivity losses	\$82,911,421
<b>Subtotal secondhand smoke</b>	<b>\$166,088,414</b>
<b>Total Indirect Costs</b>	<b>\$3,948,295,005</b>
<b>Total Economic Costs</b>	<b>\$5,609,978,064</b>

**Figure 28. Total smoking-attributable economic costs by cause, 2010**



Sources: CDC SAMMEC; BRFSS 2009; Bunn et al.; Behan et al.; BLS; AL CHS

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## Methodology

The estimates featured in this report were produced using the most current data available. Adult smoking prevalence and health impact estimates are based on 2009 data, while excise tax and youth smoking prevalence estimates are based on 2010 data. The economic impact estimates are based on the most current research and are all adjusted for inflation to 2010.

### SAMMEC

The principal tool used to produce the estimates found in this report was CDC's SAMMEC application (CDC, 2009d). The online application contains two modules which allow users to estimate the health and economic impact of smoking on adults and infants. The Adult SAMMEC module permits users to produce estimates for SAM, SAM rates, YPLL, YPLL rates, medical expenditures, and productivity losses resulting from premature death. The Maternal Child and Health (MCH) SAMMEC module assists users in producing estimates for smoking-attributable infant deaths, YPLL, and neonatal healthcare expenditures. The SAMMEC software application allows users to edit data elements to produce current estimates. Details on the data elements that were used to produce this report are specified under their respective headings in this section.

### Smoking Prevalence

Adult smoking prevalence data were taken from CDC's BRFSS from the year 2009 (CDC, 2009b). BRFSS categorizes smokers using two questions: (1) "Have you smoked at least 100 cigarettes in your entire life?" and (2) "Do you now smoke cigarettes every day, some days, or not at all?" Current smokers are those who reported ever smoking 100 cigarettes *and* who currently smoke every day or some days. Former smokers are those who reported ever smoking 100 cigarettes but who currently do not smoke. Never smokers are those who reported never having smoked 100 cigarettes in their lifetime. In order to increase accuracy, respondents who refused to answer or answered "don't know" to the former question (1) were excluded from the analysis. BRFSS data are also weighted to account for problems of non-coverage and non-response among segments of the population. See the BRFSS website for details on weighting (CDC, 2009a).

Youth smoking prevalence data were taken from the 2010 Youth Tobacco Survey (YTS) and were obtained from the Alabama Department of Public Health and CDC's STATE system (CDC, 2011a). Current youth smokers are middle or high school students who reported having smoked cigarettes on one or more of the 30 days preceding the survey administration.

Data on maternal smoking come from the Natality Query System at the Alabama Center for Health Statistics which are estimates based on data collected through birth certificates (AL CHS, 2009a). The percentage of women who smoked during pregnancy was calculated by dividing the number of women who claimed to have smoked during their pregnancy by the number of women who had a live birth in 2009.

### Smoking-Attributable Mortality (SAM) Estimates

Adult and MCH SAMMEC derive SAM estimates using the number of deaths for specific disease categories and a smoking-attributable fraction (SAF) formula (CDC, 2009d). The gender and age-specific number of deaths for each disease category is multiplied by the corresponding SAF to produce each estimate:

$$\text{SAM} = \text{number of deaths} \times \text{SAF}$$

Deaths caused by SHS and smoking-related fires are not included in the SAMMEC model of smoking-attributable mortality.

### Smoking-Attributable Fractions (SAF)

The SAF is defined as the proportion of deaths for a particular disease that are attributed to smoking (CDC, 2009d). SAMMEC calculates adult SAF's for 19 disease categories using age (35-64, 65+), sex-specific smoking prevalence, and relative risk (RR) data for current and former smokers. Infant SAF's are calculated using maternal smoking prevalence and RR data for four perinatal health conditions. Disease, age, and sex-specific SAF's are calculated using the following formula:

$$\text{SAF} = [(p_0 + p_1(\text{RR}_1) + p_2(\text{RR}_2)) - 1] / [p_0 + p_1(\text{RR}_1) + p_2(\text{RR}_2)]$$

	Adult SAMMEC	MCH SAMMEC
p0	Percentage of adult never smokers in study group	Percentage of maternal nonsmokers in study group
p1	Percentage of adult current smokers in study group	Percentage of maternal smokers in study group
p2	Percentage of adult former smokers in study group	Not applicable
RR1	Relative risk of death for adult current smokers relative to adult never smokers	Relative risk of death for infants of maternal smokers relative to infants of maternal nonsmokers
RR2	Relative risk of death for adult former smokers relative to adult never smokers	Not applicable

### Number of Deaths

Mortality statistics for the State of Alabama for 2009 were provided by the Alabama Center for Health Statistics. In order to be used in the SAMMEC model to calculate SAM, the mortality data were categorized by gender, five-year age groups, and cause of death, using the 10th revision of the International Classification of Disease (ICD) codes. See Table B in the Appendix for the disease codes.

### Years of Potential Life Lost (YPLL)

Estimates for YPLL attributed to smoking were produced in Adult SAMMEC using SAM and life expectancy statistics. To derive the adult estimates, the SAM numbers for each age category and gender group are multiplied by the midpoint remaining life expectancy (RLE) for each five-year age group. The infant estimates are found in similar fashion but use the RLE at birth for each gender category:

$$\text{smoking-attributable YPLL} = \text{SAM} \times \text{RLE}$$

Age and sex-specific nationwide estimates of life expectancy data were obtained from the National Center for Health Statistics (Arias, 2006).

### Direct Medical Costs

The SAMMEC application was also used to provide estimates for the direct medical costs caused by smoking. These costs are referred to as smoking-attributable expenditures (SAE) and are defined as the excess personal healthcare costs of smokers and former smokers compared with those of individuals who have never smoked (CDC, 2009d). The SAE are calculated separately for adults and infants by using both the Adult and the MCH SAMMEC applications.

SAE were calculated by SAMMEC using two data elements: total personal healthcare expenditures and SAF of expenditures.

The Adult SAMMEC application uses data obtained on total personal healthcare expenditures from the Centers for Medicare and Medicaid Services at <http://www.cms.hhs.gov/NationalHealthExpendData/>. Five major expenditure categories are used for its estimates: ambulatory care, hospital care, prescription drugs, nursing home care, and other care. Other care includes home health, nonprescription drugs, and nondurable medical products. The SAE estimates in this report use 2004 personal medical care expenditure data and are adjusted for inflation to 2010.

Adult SAMMEC uses SAF calculations from Miller et al. (1999) to estimate the SAE. The SAF are equal to the proportion of annual personal health care expenditures that would be avoided if smoking did not occur within the population. (See SAMMEC methodology for more details.)

MCH SAMMEC uses data on neonatal health care expenditures from the Medstat MarketScan database for 2004. In order to produce SAF for neonatal expenditures, data were taken from birth certificates at the National Center for Health Statistics.

### Smoking-Related Fire Deaths

Deaths caused by smoking-related fires were estimated by applying the national percentage of fire deaths caused by smoking materials (U.S. Fire Administration, 2007) to the total number of deaths caused by fires in Alabama in 2009 (AL CHS, 2009b).



### **Secondhand Smoke**

#### *Mortality Estimates*

Estimates for mortality due to SHS exposure in Alabama were calculated using national estimates from a 2005 California EPA report (CA EPA, 2005) on annual deaths within two disease categories: Ischemic heart disease and lung cancer. [This method is suggested by CDC (CDC, 2009d).] The Alabama estimate was produced by multiplying the total number of deaths in the United States attributable to SHS exposure (CA EPA, 2005) by the proportion of the United States population that resides in Alabama. The population estimates used to derive this proportion came from the Population Estimates Program of the U.S. Census Bureau for 2009 (USCB, 2009).

#### *Economic Costs*

The economic costs of SHS were calculated using national estimates from Behan, Eriksen, and Lin (2005). Behan et al. used data on United States population exposure to SHS and disease-specific relative risk estimates to measure excess morbidity in the United States. Average total costs were assigned to each disease category in the model and the average cost per disease was then multiplied by the excess number of cases per disease to estimate the annual direct medical cost of exposure to SHS for each disease.

To calculate estimates for Alabama, the estimated excess medical expenditures and the productivity losses due to SHS were multiplied by the proportion of the United States population that resides in Alabama. The population estimates were taken from the U.S. Census Bureau (USCB, 2009). The direct medical costs of excess morbidity for perinatal and postnatal manifestations were omitted from the estimate since an estimate for this category was already derived through MCH SAMMEC. Finally, the estimates were adjusted for inflation to 2010.

### **Productivity Losses**

#### *Mortality*

Productivity losses resulting from SAM were calculated using Adult and MCH SAMMEC. The smoking-attributable productivity losses related to mortality are the present value of foregone future earnings (PVFE) from both paid labor and from unpaid household work resulting from smoking-attributable premature death (CDC, 2009d). The PVFE estimates were last updated in 2004. The estimates are sex-weighted in order to eliminate the effect of gender bias associated with occupation and compensation.

Productivity losses are calculated for gender and five-year age categories by multiplying the number of smoking-attributable deaths for each of these groups by the associated PVFE value:

$$\text{smoking-attributable productivity losses} = \text{SAM} \times \text{PVFE}$$

The estimates for sex-specific smoking-attributable productivity losses are then calculated by summing across age groups for each disease category. Total smoking-attributable productivity losses are then produced by adding the two sex-specific productivity loss estimates. Estimates were adjusted for inflation to 2010.

### *Illness*

In order to calculate losses in workplace productivity due to morbidity, data were taken from research conducted by Bunn, Stave, Downs, Alvir, and Dirani (2006). Bunn et al. studied the negative economic impact of cigarettes in the workplace and calculated the cost of health-related productivity losses through a large cross-sectional study of employees throughout the United States. Calculations for productivity loss are derived by observing the time missed from work (absenteeism) and unproductive time at work (presenteeism) among smokers, former smokers, and non-smokers. Bunn et al. found that the annual average costs of lost productivity for current smokers and former smokers above that of non-smokers, were \$1,807 and \$623, respectively. These estimates were calculated using a cost per hour of \$34.25 for salary and benefits. Labor force data for full-time employed workers in Alabama, 16 years and older, came from the Bureau of Labor Statistics (BLS, 2009). Smoking prevalence for the year 2009 was taken from the CDC's BRFSS data—the percentages of current and former smokers were 22.6% and 22.8%, respectively. The following equation was used to calculate losses in workplace productivity due to illness:

$$\# \text{ of smokers in the workforce} \times \text{net loss per smoker} = \text{total productivity loss}$$

This equation was used separately for current smokers and for former smokers. Estimates were adjusted for inflation to 2010.

### **Limitations**

#### *SAMMEC*

- For limitations to the estimates based on the Adult and MCH SAMMEC software, see the SAMMEC methodology web page: <http://apps.nccd.cdc.gov/sammec/methodology.asp>.

#### *Smoking-related Fire Deaths*

- Estimates for smoking-related fire deaths were based on national estimates, as state-level data were not available for Alabama.

#### *Productivity Losses Due to Illness*

- In the study by Bunn et al., the figure used in the model for hourly compensation was higher than the national average.
- The labor force data taken from the BLS does not account for part-time workers.

#### *Secondhand Smoke*

- Estimates of mortality and economic impact of secondhand smoke were derived from national estimates because specific population attributable risk (PAR) figures were not available for Alabama. Estimates were produced for only a limited number of disease categories.

## Glossary

**Absenteeism**

Time missed at work due to health conditions.

**Average years of potential life lost**

Average years of potential life lost among individuals who died from smoking-related illness.

**Behavioral Risk Factor Surveillance System (BRFSS)**

A nationwide health survey system which operates in all fifty U.S. states and tracks health conditions and risk behaviors.

**Cerebrovascular disease**

A disease of the arteries and blood vessels that supply oxygen to the brain. Stroke is a type of cerebrovascular disease.

**Current adult smokers**

Individuals who have smoked over 100 cigarettes in their lifetime *and* who currently smoke every day or some days.

**Current youth smokers**

Students who reported that they had smoked cigarettes on one or more of the 30 days preceding the survey.

**Former smokers**

Individuals who have smoked over 100 cigarettes during their lifetime *and* who currently do not smoke.

**Household production**

The value of household services performed by household members who do not receive payment for such services.

**Ischemic heart disease**

More commonly known as coronary artery disease, this term refers to narrowing of the coronary arteries that often leads to chest pain and heart attacks.

**Maternal smoker**

A mother who indicated having smoked during her pregnancy.

**Never smokers**

Individuals who have not smoked 100 cigarettes during their lifetime.

**Presenteeism**

Unproductive time at work due to health conditions.

**Present Value of Future Earnings (PVFE)**

The current value of potential future workplace earnings, often adjusted for inflation and discounted to adjust for the time value of money.

**Productivity losses due to illness**

The present value of losses in future earnings and unpaid household production forgone due to smoking-attributable illness.

**Productivity losses due to premature death**

The present value of losses in future earnings and unpaid household production forgone due to smoking-attributable premature death.

**Smoking-Attributable Mortality, Morbidity, and Economic Costs Calculator (SAMMEC)**

An online application provided by CDC which allows users to calculate the health and economic impact of smoking on adults and infants within selected populations.

**Smoking-Attributable Mortality (SAM)**

The number of deaths attributable to cigarette smoking within 19 disease categories for which smoking has been causally linked.

**Smoking prevalence**

The percentage of people within a selected population who are current smokers.

**Years of Potential Life Lost (YPLL)**

The difference between average life expectancy and actual years lived among people who died prematurely from smoking-attributable illnesses.

**Youth Tobacco Survey (YTS)**

A state-administered survey which gathers data from middle and high school students regarding their use of tobacco, smoking cessation, knowledge and attitudes about tobacco, exposure to SHS, and familiarity with media messages.

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## Appendix

**Table A. Total deaths, SAM deaths, and YPLL among Alabama adults age 35+ and among infants by disease type and gender, 2009**

Disease Category	Female			Male			Total		
	Deaths	SAM	YPLL	Deaths	SAM	YPLL	Deaths	SAM	YPLL
<b>Malignant Neoplasms</b>									
Lip, Oral Cavity, Pharynx	34	17	321	101	75	1,417	135	92	1,738
Esophagus	37	21	352	166	119	2,006	203	140	2,358
Stomach	71	7	106	105	29	441	176	36	547
Pancreas	297	69	1,132	300	68	1,141	597	137	2,273
Larynx	11	10	209	67	56	931	78	66	1,140
Trachea, Lung, Bronchus	1,278	894	15,400	2,006	1,769	26,899	3,284	2,663	42,299
Cervix Uteri	71	8	216	0	0	0	71	8	216
Kidney and Renal Pelvis	76	2	30	129	51	833	205	53	863
Urinary Bladder	55	14	172	138	64	719	193	78	891
Acute Myeloid Leukemia	62	6	80	66	14	184	128	20	264
<b>Subtotal</b>	<b>1,992</b>	<b>1,048</b>	<b>18,018</b>	<b>3,078</b>	<b>2,245</b>	<b>34,571</b>	<b>5,070</b>	<b>3,293</b>	<b>52,589</b>
<b>Cardiovascular Diseases</b>									
Ischemic Heart Disease	2,461	352	6,253	3,077	732	13,376	5,538	1,084	19,629
Other Heart Disease	3,050	254	3,409	2,755	527	7,750	5,805	781	11,159
Cerebrovascular Disease	1,573	161	3,351	1,048	179	3,406	2,621	340	6,757
Atherosclerosis	99	6	46	94	27	383	193	33	429
Aortic Aneurysm	53	27	374	79	51	685	132	78	1,059
Other Arterial Disease	94	14	207	64	9	135	158	23	342
<b>Subtotal</b>	<b>7,330</b>	<b>814</b>	<b>13,640</b>	<b>7,117</b>	<b>1,525</b>	<b>25,735</b>	<b>14,447</b>	<b>2,339</b>	<b>39,375</b>
<b>Respiratory Diseases</b>									
Pneumonia, Influenza	491	67	927	416	94	1,130	907	161	2,057
Bronchitis, Emphysema	90	72	967	94	86	1,187	184	158	2,154
Chronic Airway Obstruction	1,218	900	12,476	1,280	1,045	12,021	2,498	1,945	24,497
<b>Subtotal</b>	<b>1,799</b>	<b>1,039</b>	<b>14,370</b>	<b>1,790</b>	<b>1,225</b>	<b>14,338</b>	<b>3,589</b>	<b>2,264</b>	<b>28,708</b>
<b>Adult Total</b>	<b>11,121</b>	<b>2,901</b>	<b>46,028</b>	<b>11,985</b>	<b>4,995</b>	<b>74,644</b>	<b>23,106</b>	<b>7,896</b>	<b>120,672</b>
<b>Perinatal Conditions</b>									
Short Gestation / Low Birth Weight	37	3	241	56	5	375	93	8	616
Sudden Infant Death Syndrome	26	3	241	30	4	300	56	7	541
Respiratory Distress (Syndrome)	11	0	0	6	0	0	17	0	0
Other Respiratory Conditions	14	1	80	8	0	0	22	1	80
<b>Infant Total</b>	<b>88</b>	<b>7</b>	<b>562</b>	<b>100</b>	<b>9</b>	<b>675</b>	<b>188</b>	<b>16</b>	<b>1,237</b>
<b>Total</b>	<b>11,209</b>	<b>2,908</b>	<b>46,590</b>	<b>12,085</b>	<b>5,004</b>	<b>75,319</b>	<b>23,294</b>	<b>7,912</b>	<b>121,909</b>

Sources: CDC SAMMEC; AL CHS

**Table B. International Classification of Diseases (ICD) 10th revision codes**  
(Disease categories used for SAMMEC calculations)

Disease Category	ICD-10
<b>Malignant Neoplasms</b>	
Lip, Oral Cavity, Pharynx	C00-C14
Esophagus	C15
Stomach	C16
Pancreas	C25
Larynx	C32
Trachea, Lung, Bronchus	C33-C34
Cervix Uteri	C53
Kidney and Renal Pelvis	C64-C65
Urinary Bladder	C67
Acute Myeloid Leukemia	C92.0
<b>Cardiovascular Disease</b>	
Ischemic Heart Disease	I20-I25
Other Heart Disease	I00-I09, I26-I51
Cerebrovascular Disease	I60-I69
Atherosclerosis	I70
Aortic Aneurysm	I71
Other Arterial Disease	I72-I78
<b>Respiratory Disease</b>	
Pneumonia, Influenza	J10-J18
Bronchitis, Emphysema	J40-J42, J43
Chronic Airways Obstruction	J44
<b>Perinatal Conditions</b>	
Short Gestation/Low Birth Weight	P07
Sudden Infant Death Syndrome (SIDS)	R95
Respiratory Distress (Syndrome) – newborn	P22
Other Respiratory Conditions – perinatal	P23-P28









