

Close to the Heart of Kentucky, 2009

A report on the status of cardiovascular disease
in the Commonwealth of Kentucky



Heart Disease and Stroke Prevention Program
Chronic Disease Prevention Branch
Division of Prevention and Quality Improvement
Kentucky Department for Public Health

Kentucky
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Commonwealth of Kentucky**

**Heart Disease and Stroke Prevention Program
Chronic Disease Prevention Branch
Division of Prevention and Quality Improvement
Department for Public Health
Cabinet for Health and Family Services**

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Acronyms

ADD	Area Development District
AHA	American Heart Association
BRFSS	Behavioral Risk Factor Surveillance System
CDC	Centers for Disease Control and Prevention
CVD	Cardiovascular Disease
KDPH	Kentucky Department for Public Health
MMWR	Morbidity and Mortality Weekly Report
U.S.	United States of America
YRBSS	Youth Risk Behavior Surveillance System
WHO	World Health Organization

A Word from the Commissioner

Dear Colleague:

The Kentucky Department for Public Health is pleased to release their updated burden document entitled, "*Close to the Heart of Kentucky, 2009.*" This report is intended to help raise Kentuckians' awareness of heart disease and stroke as public health priorities.

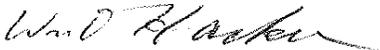
This report documents the significant burden of cardiovascular disease among persons in the Commonwealth. Cardiovascular diseases (CVDs) are the leading cause of death in Kentucky and the nation. Heart disease is the first leading cause of death in Kentucky while stroke is the fifth leading cause of death. Both men and women in the Commonwealth experience higher age-adjusted CVD mortality than the nation overall. While the mortality rates are higher for men than women in Kentucky and the nation, women are at greater risk of dying from this disease.

The mortality, morbidity and disability caused by cardiovascular disease have a large economic impact in terms of both direct and indirect costs. Direct costs are those associated with hospital care, physician and nursing services, and medications. Indirect costs include lost productivity due to morbidity and mortality and are more difficult to estimate. In 2008 there were 81,468 hospitalizations in Kentucky with costs totaling \$2.6 billion dollars.

The Kentucky Department for Public Health's Heart Disease and Stroke Prevention Program, in partnership with the Kentucky Heart Disease and Stroke Prevention Task Force, is leading the cooperative effort to transform our state's cardiovascular health approaches and practices. This is accomplished by utilizing collaborative workgroups to turn knowledge into behavioral change and to increase the use of evidenced based guidelines for health systems change.

With appreciation to all those individuals who assisted in preparing this document, my thanks is also expressed to every reader who will become more informed about the serious efforts needed to reduce the burden of heart disease and stroke in our Commonwealth. Please join us as we partner together to positively impact the lives of our fellow Kentuckians affected by cardiovascular disease.

Sincerely,



William D. Hacker, MD, FAAP, CPE
Commissioner

Executive Summary

- Cardiovascular diseases (CVDs) are the leading cause of death in Kentucky.
- As of 2005, heart disease and stroke were the first and fifth leading causes of death, respectively, in Kentucky (KDPH, 2009a).
- In 2005, 13,601 Kentucky residents died from some form of CVD. Heart disease accounted for 10,337 deaths (76% of CVD deaths) while stroke accounted for 2,117 (15.6%) deaths.
- According to the Behavioral Risk Factor Surveillance System (BRFSS) survey results CVD risk factors prevalent among Kentucky adults (18 years or older) in 2007-2008 include:
 - 25.2% are current cigarette smokers.
 - 30.5% do not participate in any leisure time physical activity.
 - 81.6% consume less than five fruits or vegetables per day.
 - 40.7% have high cholesterol.
 - 31.1% have high blood pressure.
 - 9.9% have Diabetes.
 - 36.5% are overweight and 30.3% are obese
- CVD risk factors prevalent among Kentucky youth (students in grades 9-12):
 - 26% are current cigarette smokers
 - 22.4% did not participate in 60 or more minutes of physical activity on any day
 - 13.2% consumed less than five fruits or vegetables per day
 - 16.4% are overweight
 - 15.6% are obese
- Hospitalizations and costs attributed to CVD, heart disease and stroke in Kentucky:

	Number of hospitalizations	Cost in dollars
CVD	81,468	2.6 billion
Heart disease	63,313	2.0 billion
Stroke	10,542	300 million

Introduction

What are cardiovascular diseases (CVDs)?

CVDs are a group of disorders of the heart and blood vessels. The World Health Organization (WHO, 2009) lists these as:

- Coronary heart disease – disease of the blood vessels supplying the heart muscle.
- Cerebrovascular disease (stroke) - disease of the blood vessels supplying the brain.
- Peripheral arterial disease – disease of the blood vessels supplying the arms and legs.
- Rheumatic heart disease – damage to the heart muscle and heart valves from rheumatic fever, caused by streptococcal bacteria.
- Congenital heart disease - malformations of heart structure existing at birth.
- Deep vein thrombosis and pulmonary embolism – blood clots in the leg veins, which can dislodge and move to the heart and lungs.

The common forms of CVD are coronary heart disease, which causes heart attacks, and stroke, which is commonly referred to as ‘brain attack’. Heart attacks and strokes are usually acute events that are mainly caused by a blockage that prevents blood from flowing to the heart or brain, respectively. The frequent reason for these events is a build-up of fatty deposits on the inner walls of the blood vessels that supply the heart or brain. Strokes can also be caused by bleeding from a blood vessel in the brain, hemorrhagic stroke, or from blood clots, ischemic stroke (WHO, 2009).

Global level

- Globally, CVDs are the number one cause of death: annually more people die from CVDs than from any other cause (WHO, 2009).
- In 2004 an estimated 17.1 million people died from CVDs, of these an estimated 7.2 million were due to coronary heart disease and 5.7 million were due to stroke. (WHO, 2009)
- By 2030, 23.6 million people are projected to die from CVDs, mainly from heart disease and stroke (WHO, 2009).

National level

- In the United States (U.S.) CVDs are the principal causes of death and are major causes of disability (Centers for Disease Control and Prevention (CDC), 2006).
- CDC estimates that 935,000 heart attacks and 795,000 strokes occur each year (CDC, 2009).
- According to estimates by the American Heart Association (AHA, 2009a) 80,000,000 people in the U.S. had one or more forms of CVDs in 2006.
- In 2005, CVDs claimed 864,480 lives (35.3% of all deaths) (AHA, 2009a).
- CVDs account for over 7 million hospitalizations each year. (CDC, 2009)
- The costs associated with CVDs are significant (Figure 1).

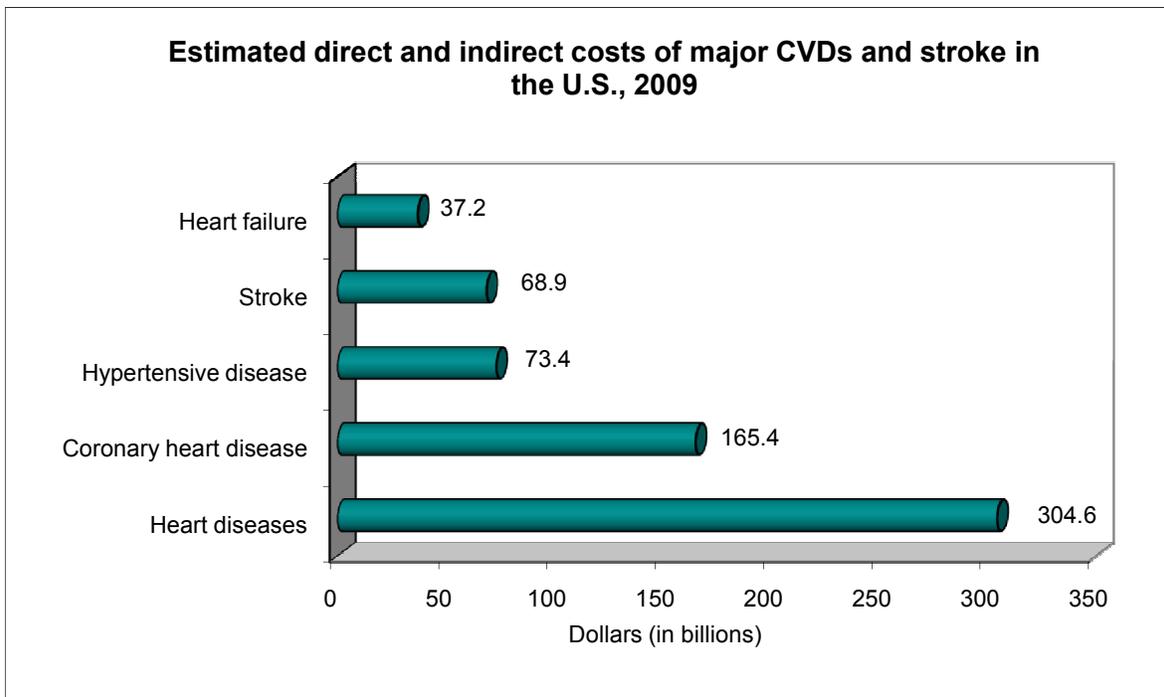


Figure 1: Estimated direct and indirect costs of major CVDs and stroke, U.S. 2009
(Sources: CDC, 2009a; AHA, 2009a)

Kentucky

- CVD is the leading cause of death in Kentucky accounting for nearly a third of all deaths in the state (Figure 2).
- In 2005, 13,601 Kentuckians died from some form of CVD. These included 10,337 deaths from heart disease and 2,117 deaths from stroke. (KDPH, 2009b)
- Heart disease accounted for 76.0% of CVD deaths while stroke accounted for 15.6% of CVD deaths (Figure 2a). (KDPH, 2009b)
- As of 2006, Kentucky ranked sixth in the nation for the number of deaths due to heart disease.

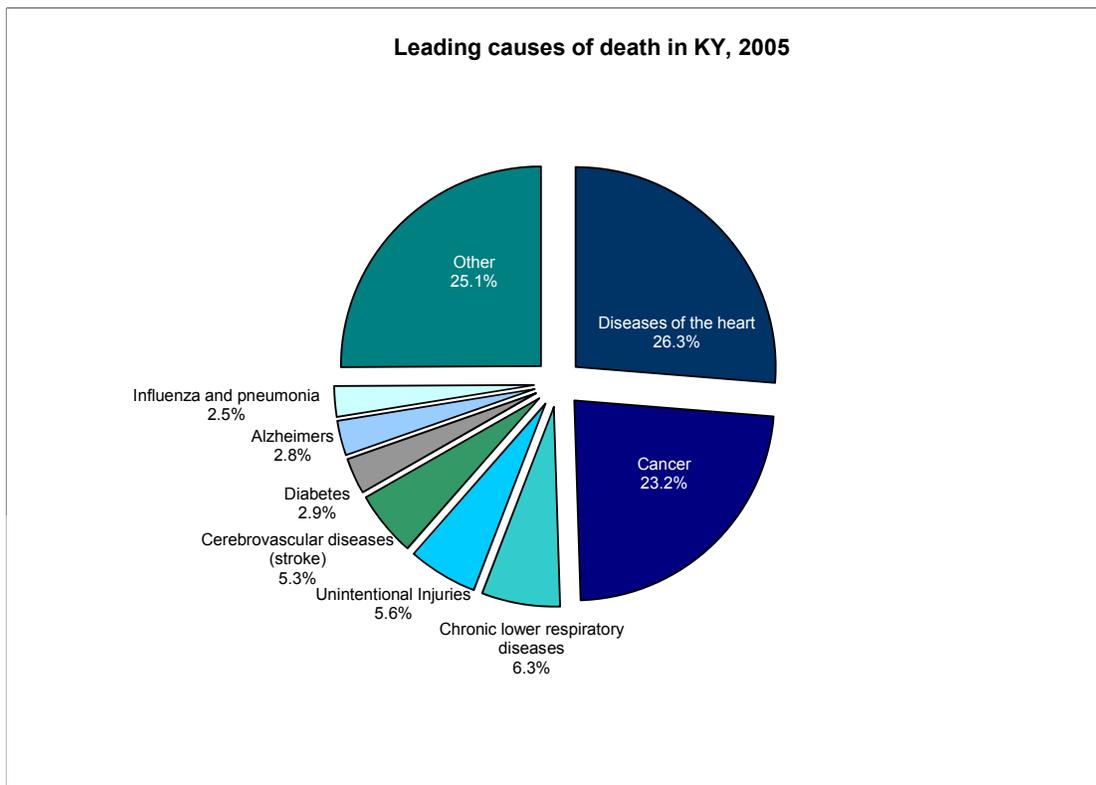


Figure 2: Leading causes of death in Kentucky, 2005
(Sources: KDPH, 2009a, KDPH2009b)

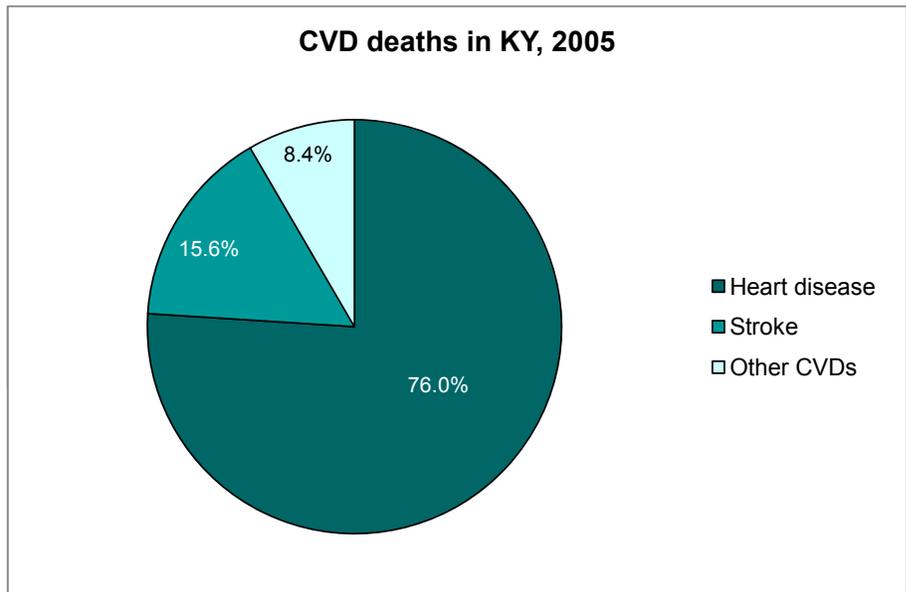


Figure 2a: CVD deaths in Kentucky, 2005 (Source: KDPH, 2009b)

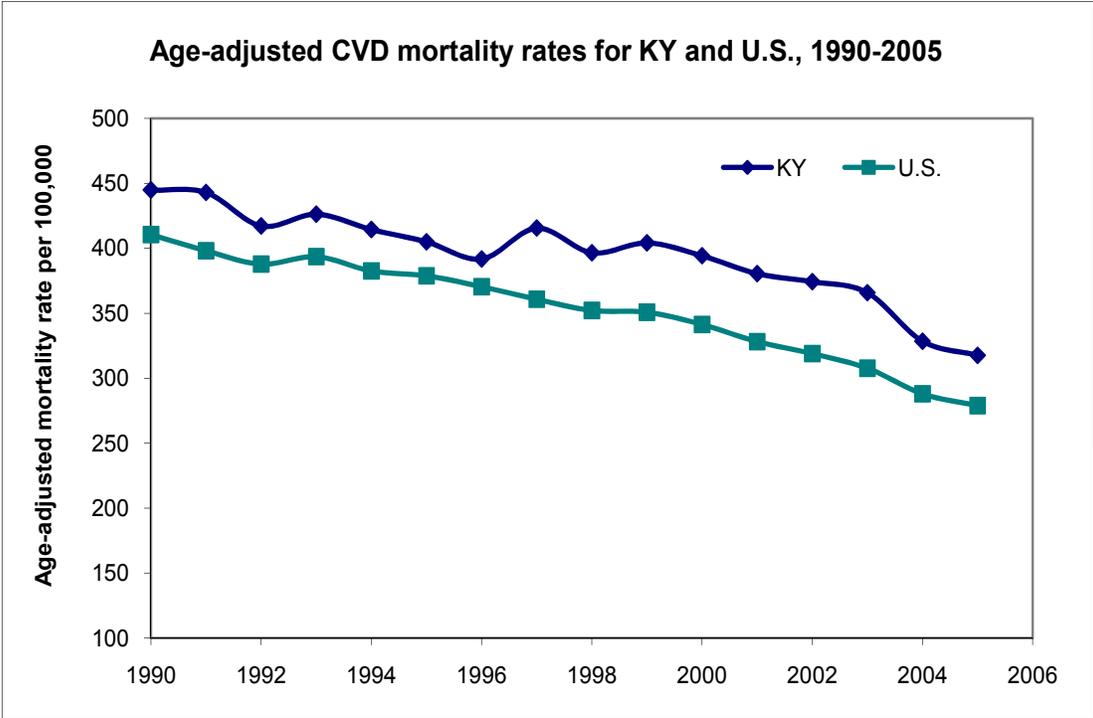


Figure 3: Age-adjusted CVD mortality rates for Kentucky and U.S., 1991-2005 (Source: Wood)

Figure 3 illustrates the states massive burden due to CVD. Even though the age-adjusted CVD mortality rates for Kentucky have been decreasing since 1990, they have always been and continue to be higher than the corresponding U.S. rates.

Cardiovascular Disease

CVD is the leading cause of death in Kentucky and the nation.

The age-adjusted CVD mortality rate in Kentucky was 318 per 100,000 persons in 2005 as compared to 280 per 100,000 persons in the U.S. In the same year over 13,000 deaths in Kentucky, nearly a third of all deaths — were from CVD.

Both men and women in Kentucky experience higher age-adjusted CVD mortality rates than the nation overall (Figure 4). While the mortality rates are higher for men than women in Kentucky (Figure 4a) and the nation (Figure 4) women are at great risk of dying from this disease. *Nearly twice as many women in the U.S. die of heart disease, stroke and other CVDs than from all forms of cancer, including breast cancer* (AHA, 2009b). The difference in CVD death rates between the state and nation isn't seen only among men and women — it is also observed between blacks and whites. The CVD death rate for white Kentuckians is 316 per 100,000 compared with 278 per 100,000 for white Americans. For black Kentuckians, the rate is higher (387 per 100,000) than it is for black Americans (379 per 100,000) (Figure 5). Blacks have higher rates of CVD than whites in both Kentucky and the U.S. (Figure 6).

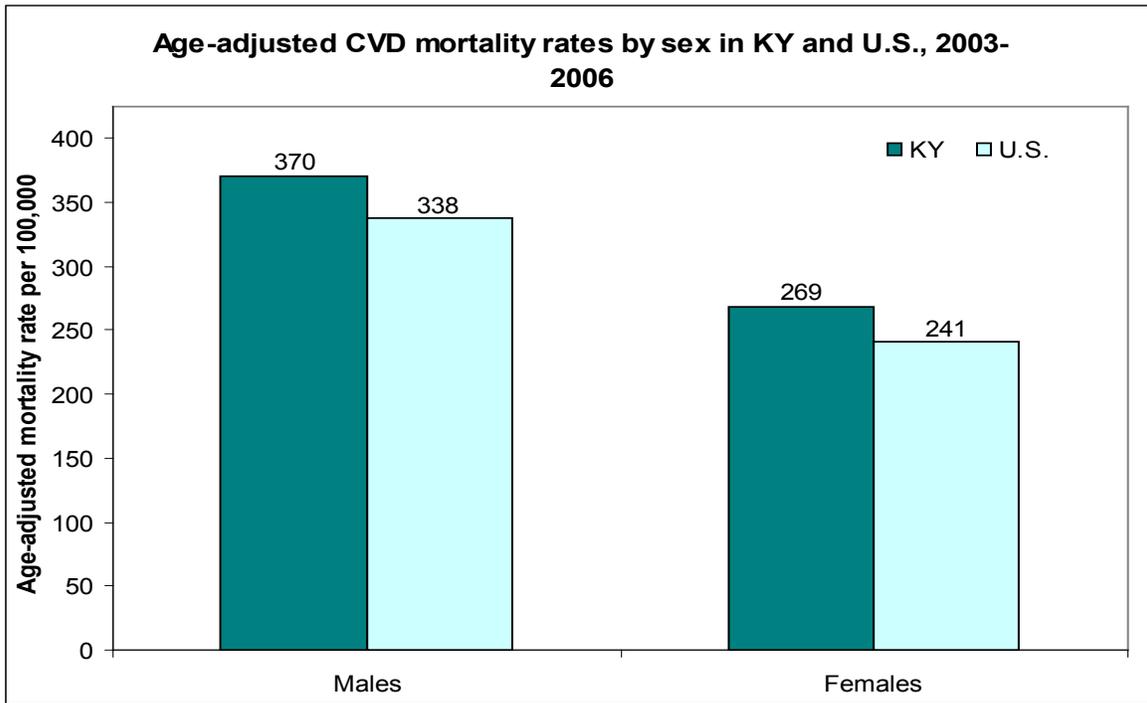


Figure 4: Age-adjusted CVD mortality rates by sex, Kentucky and U.S., 2003-2006 (Data source: KDPH, 2009b)

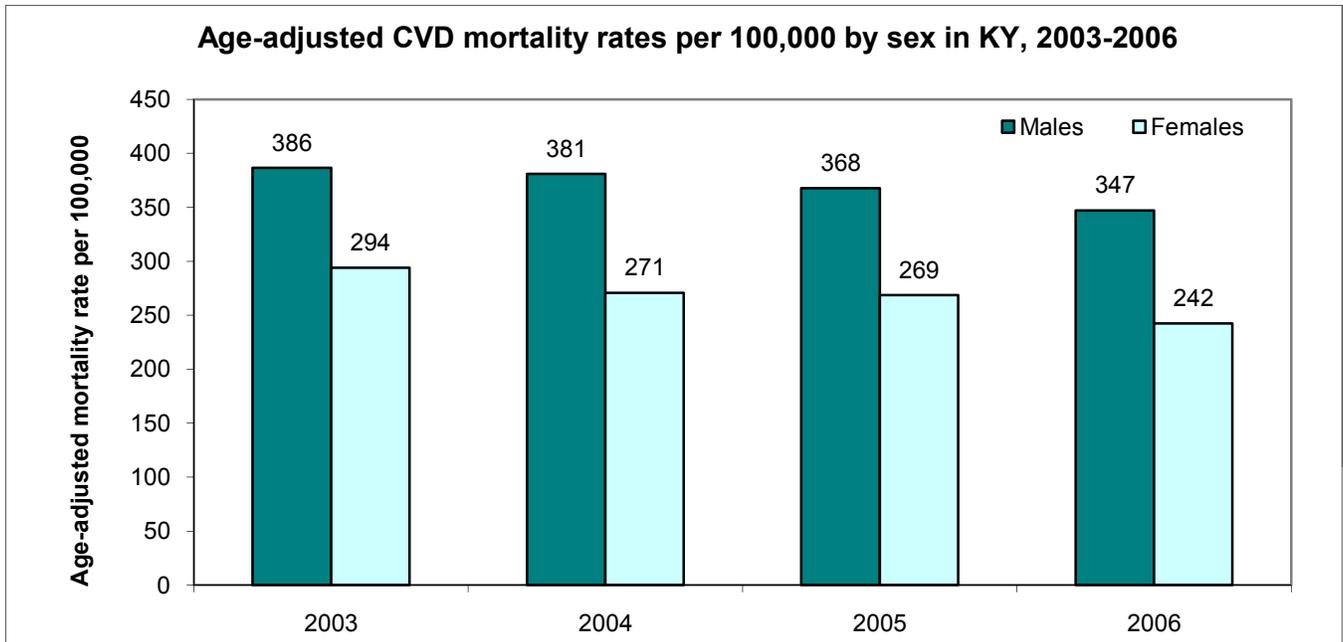


Figure 4a: Age-adjusted CVD mortality rates by sex in Kentucky, 2003-2006 (Data source: KDPH, 2009b)

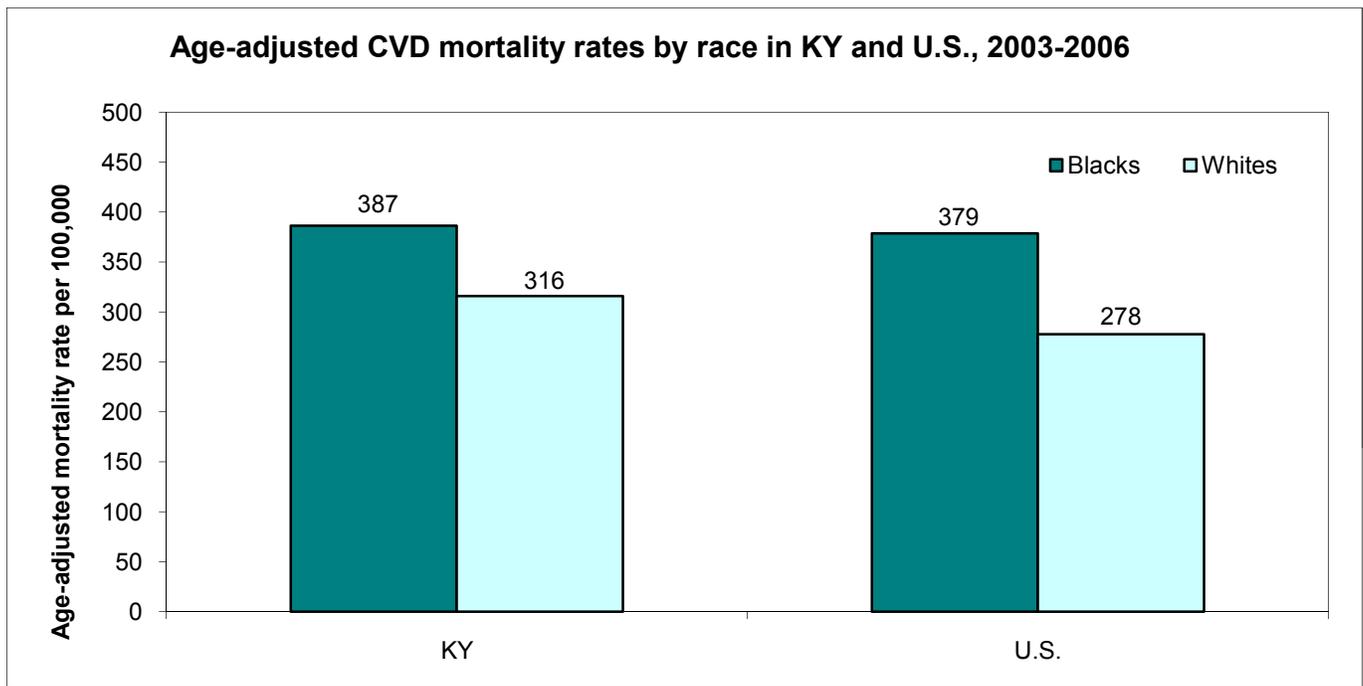


Figure 5: Age-adjusted CVD mortality rates by race, Kentucky and U.S., 2003-2006 (Data source: KDPH, 2009b)

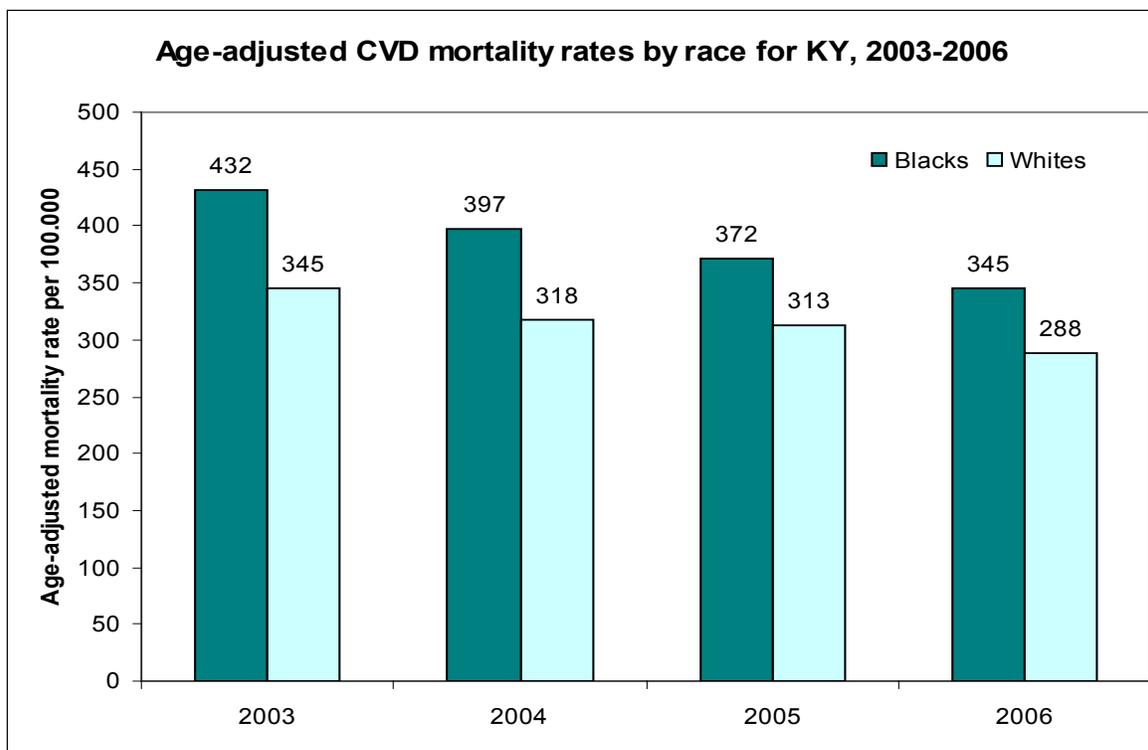


Figure 5a: Age-adjusted CVD mortality rates by race for Kentucky, 2003-2006 (Data source: KDPH, 2009b)

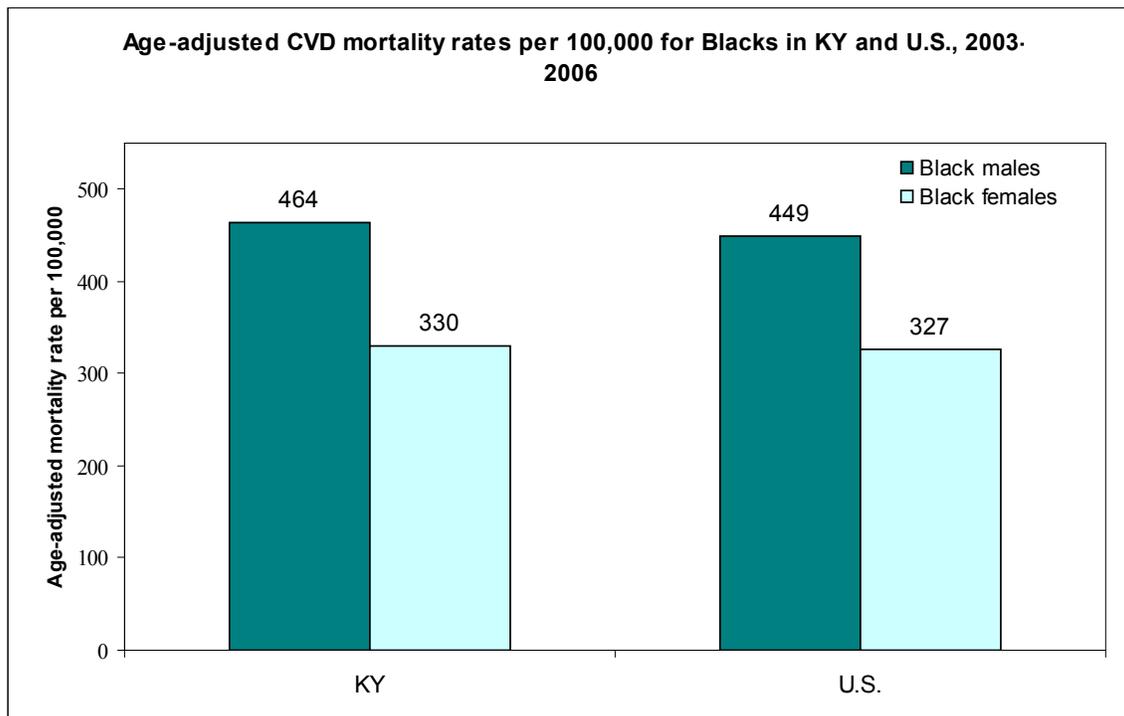


Figure 6: Age-adjusted CVD mortality rates per 100,000 for Blacks in Kentucky and U.S., 2003-2006
(Data source: KDPH, 2009b)

As with most diseases, death from CVD increases with age (Figure 7). However, it is important to note that from 2003-2006, 11,164 deaths (nearly 21%) of all CVD deaths were premature - that is, deaths that occur before age 65 (Table 1). Table 1 shows the percentage of premature CVD deaths in Kentucky by sex and race. Among men, nearly 30% of deaths from CVD occur before age 65 while for women the number is lower (13%). There is not much difference in percentage of premature CVD deaths between blacks and whites.

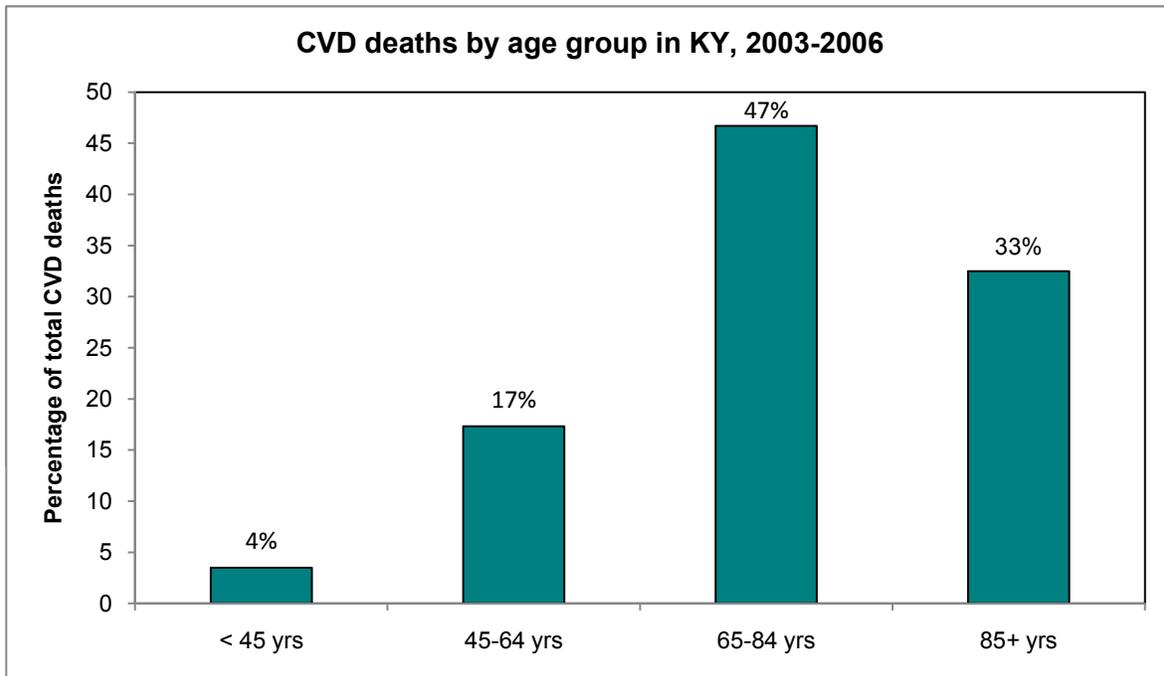


Figure 7: CVD deaths by age group, Kentucky, 2003-2006 (Data source: KDPH, 2009b)

Table 1: CVD deaths before age 65 in Kentucky, 2003-2006 (Data source: KDPH, 2009b)

	Gender/Race	Percentage
Kentucky	Both Sexes, All Races	21
Whites	Males	29
	Females	12
Blacks	Males	40
	Females	24
Both Races	Males	30
	Females	13

CVD death rates vary across Kentucky (Map 1 and 2). The counties with the highest mortality rates of CVD are congregated around the eastern and south-eastern part of the state. Table 2 lists the ten highest CVD death rates by county in Kentucky.

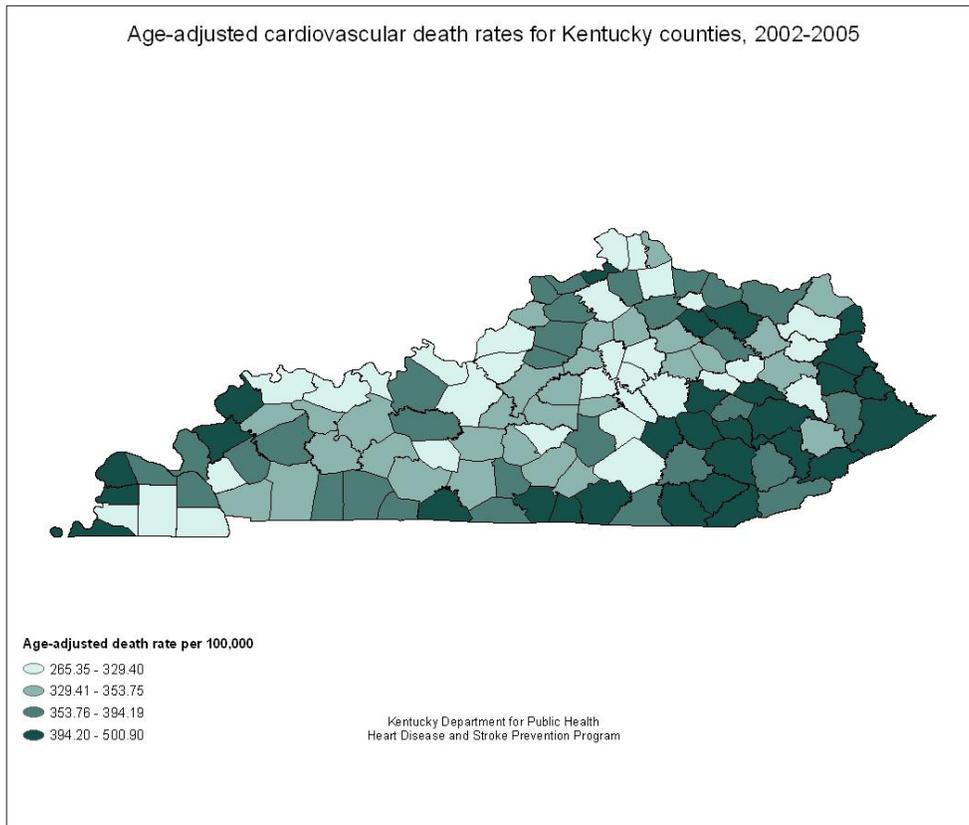
In 2008, over 81,000 hospitalizations in Kentucky were attributable to CVD with an average length of hospital stay at 4.6 days (Table 3). Medical costs for CVD are significant. Nearly \$2.6 billion in hospital charges were billed in 2008 alone, averaging almost \$32,000 per CVD hospitalization. See Appendix A for county-level CVD hospitalizations, average length of stay, and hospital charges billed.

Table 2: Counties with the ten highest age-adjusted CVD mortality rates per 100,000 in the state, 2002-2005 (Data source: KDPH, 2009b)

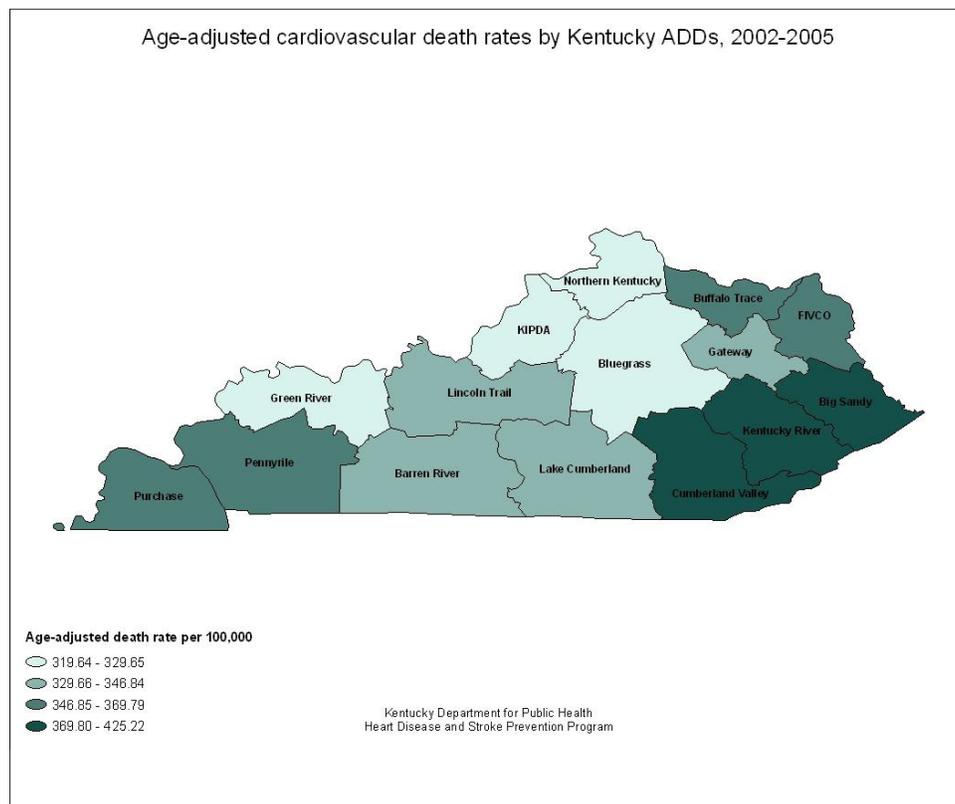
	County	Age-adjusted CVD mortality rate per 100,000
1	Lyon	299.7
2	Daviess	296.8
3	Garrard	295.4
4	Magoffin	294.2
5	Edmonson	293.9
6	Jessamine	292.9
7	Hancock	292.8
8	Calloway	291.9
9	Robertson	270.0
10	Elliott	265.4

Table 3: CVD hospitalizations in Kentucky, 2008 (Source: KDPH, 2009c)

Table 3. CVD hospitalizations in Kentucky, 2008	
Total hospitalizations	81,468
Average length of hospital stay	4.6 days
Total charges	\$2.60 billion
Average charge per hospitalization	\$31,860



Map 1: Age-adjusted CVD death rates by Kentucky county, 2002-2005 (Data source: KDPH, 2009b) *Counties darkly shaded have the highest mortality rates and those lightly shaded have the lowest rates.*



Map 2: Age-adjusted CVD death rates by Kentucky Area Development District (ADD), 2002-2005 (Data source: KDPH, 2009b) *Counties darkly shaded have the highest mortality rates and those lightly shaded have the lowest rates.*

Heart Disease

Heart disease, a group of diseases that can cause heart attacks, is the leading cause of death in Kentucky and the nation. It is the most common form of cardiovascular disease (CVD) and in 2005 accounted for 76% of all CVD deaths in the Commonwealth. This translated to over 10,000 deaths.

As of 2006, Kentucky had the sixth highest rate of heart disease mortality in the nation, while Mississippi, District of Columbia, Alabama, Oklahoma, and West Virginia, had the top five positions, respectively.

Men in Kentucky have higher heart disease death rates than women (Figure 8). The rates for men and women in Kentucky, however, are higher than the rates for men and women nationwide (Figure 8). Similar disparities are also seen among whites and blacks. In both Kentucky and the U.S., heart disease death rates for blacks are higher than they are for whites (Figure 9). The age-adjusted heart disease mortality rate for white Kentuckians (250 per 100,000) is higher than it is for white Americans (212 per 100,000). The rate for black Kentuckians (292 per 100,000) is higher than it is for black Americans (277 per 100,000).

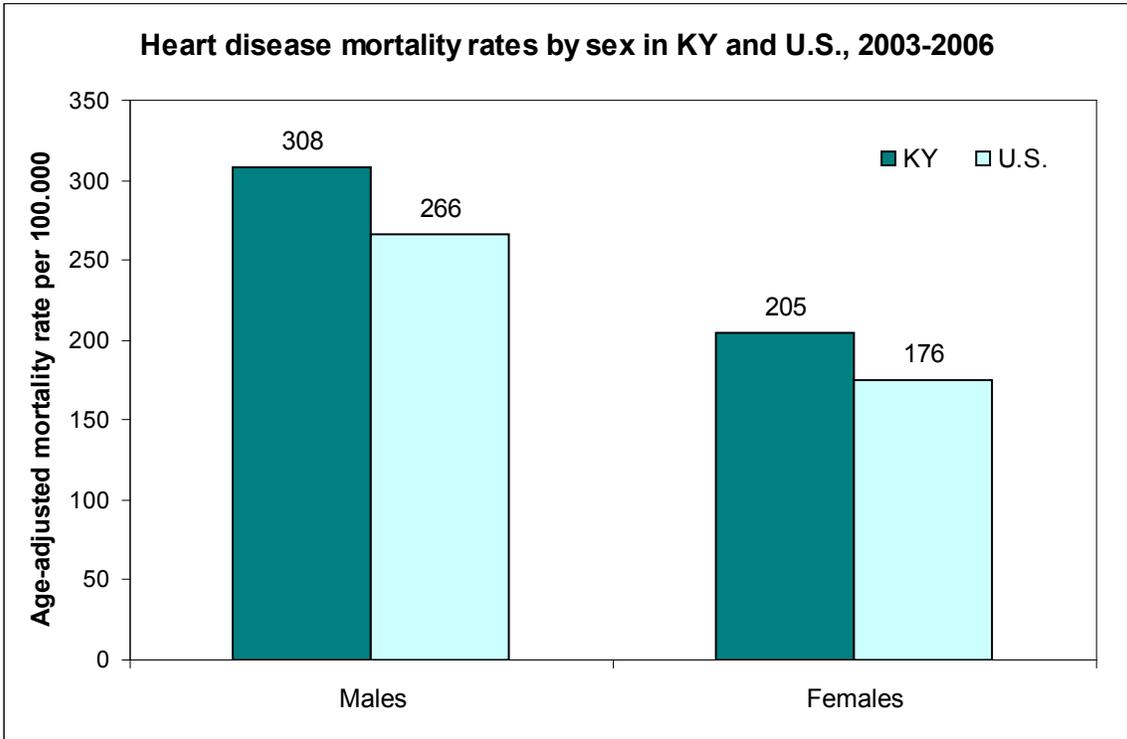


Figure 8: Age-adjusted heart disease death rates by sex, Kentucky and U.S., 2003-2006 (Data source: KDPH, 2009b)

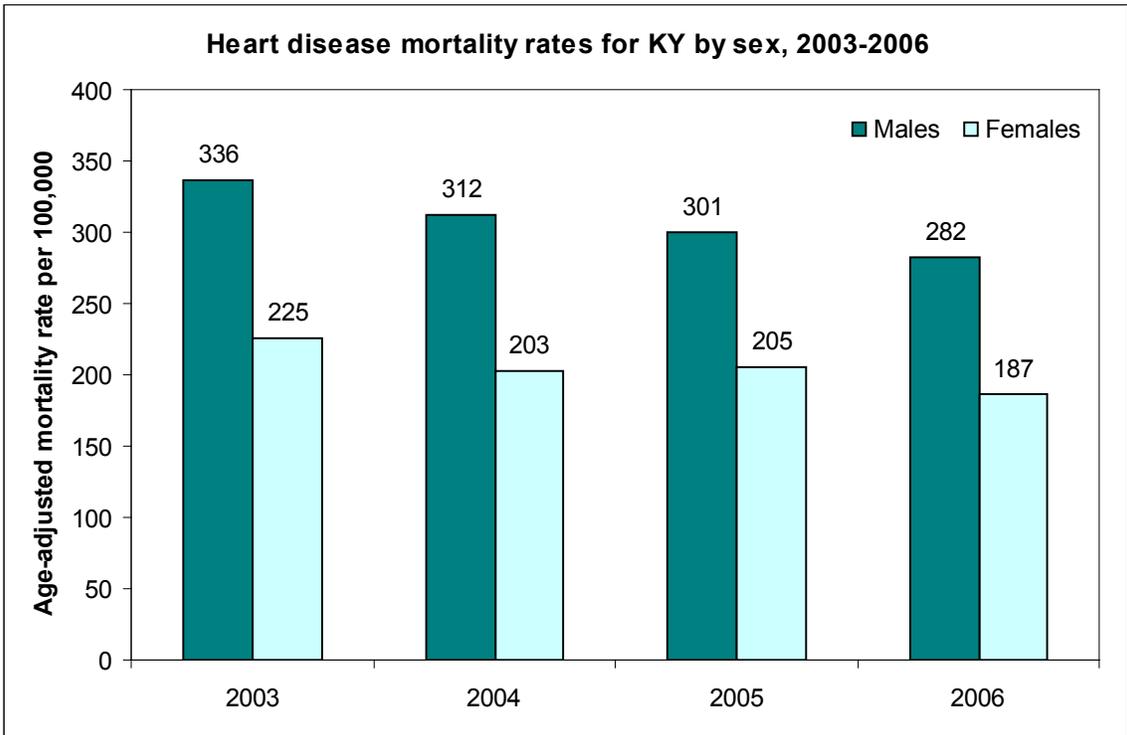


Figure 8a: Age-adjusted heart disease death rates by sex, Kentucky, 2003-2006 (Data source: KDPH, 2009b)

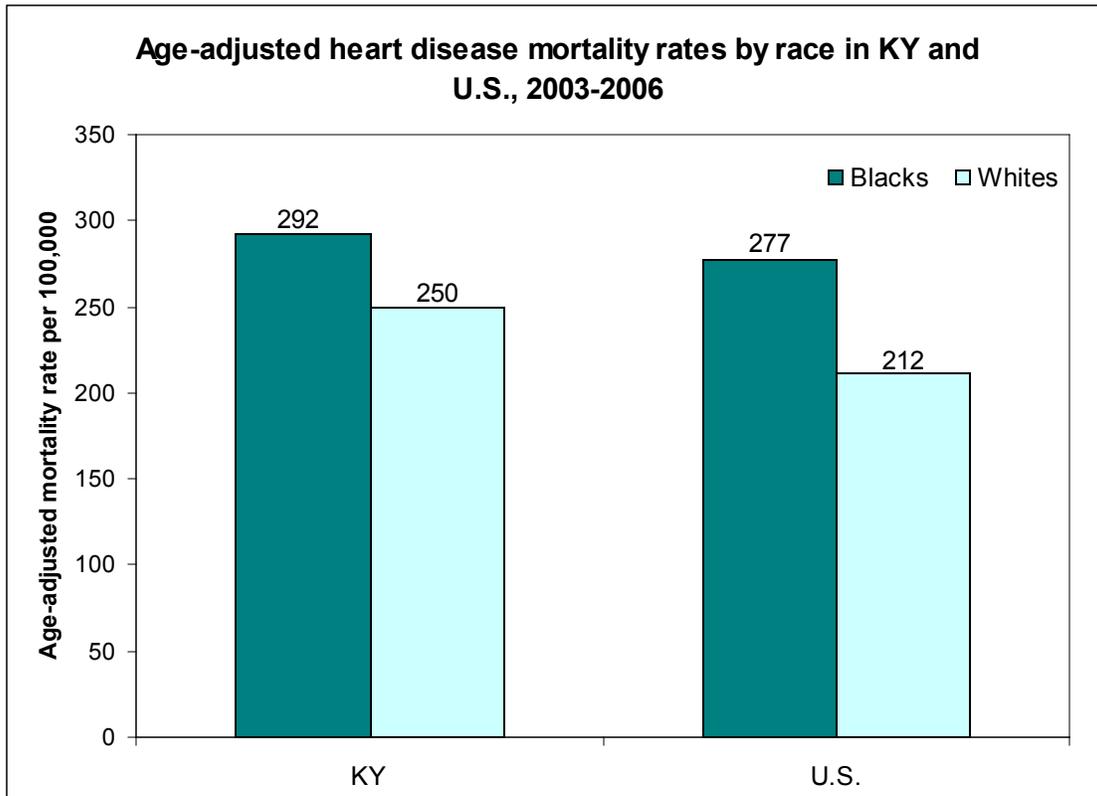


Figure 9: Age-adjusted heart disease rates by race in Kentucky and U.S., 2003-2006
(Data source: KDPH, 2009b)

Figure 10 shows heart disease death rates in Kentucky by age group. Nearly 23% of heart disease deaths occur prematurely — that is, it occurs in those younger than age 65. These premature deaths are not distributed equally among Kentuckians (Table 4). Over 30% of heart disease deaths in men occur prematurely, more than double the percentage of such deaths among women (13%). Black men have the greatest burden of premature death, with more than 40% of all heart disease deaths occurring among those younger than 65. Moreover the percentage of premature deaths of black men is almost 10% higher than that of white men. The percentage of black women (25%) who die prematurely from heart disease is much higher than that of white women (14%).

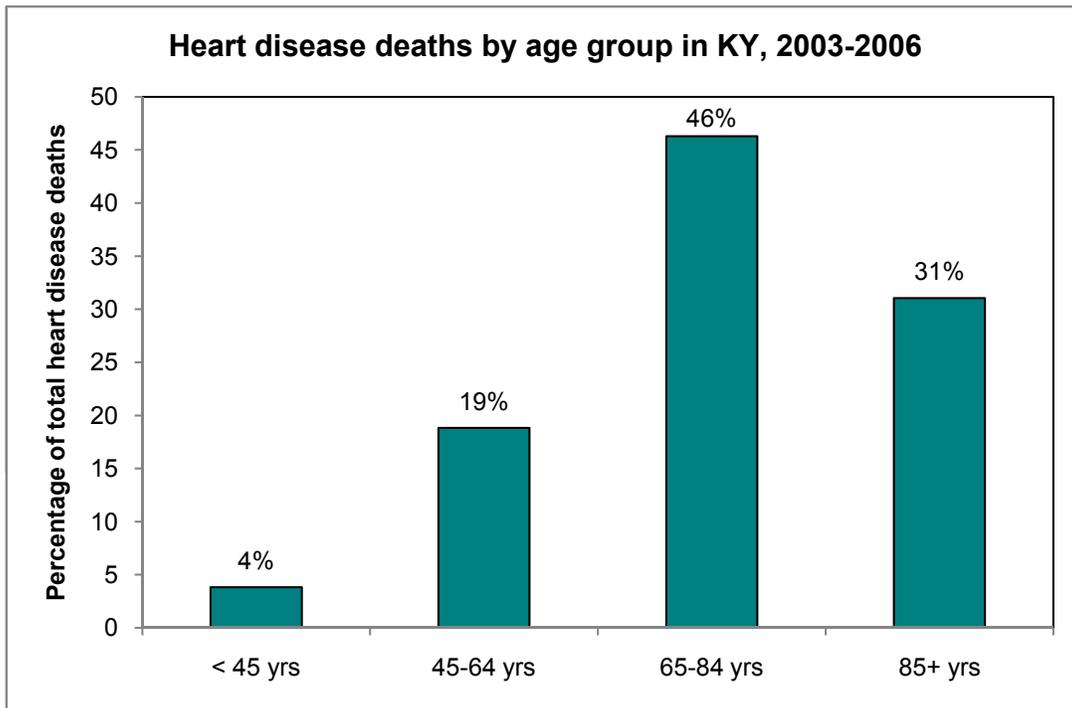


Figure 10: Heart disease deaths by age group in Kentucky, 2003-2006 (Data source: KDPH, 2009b)

Table 4: Heart disease deaths before age 65 in Kentucky, 2003-2006 (Data source: KDPH, 2009b)

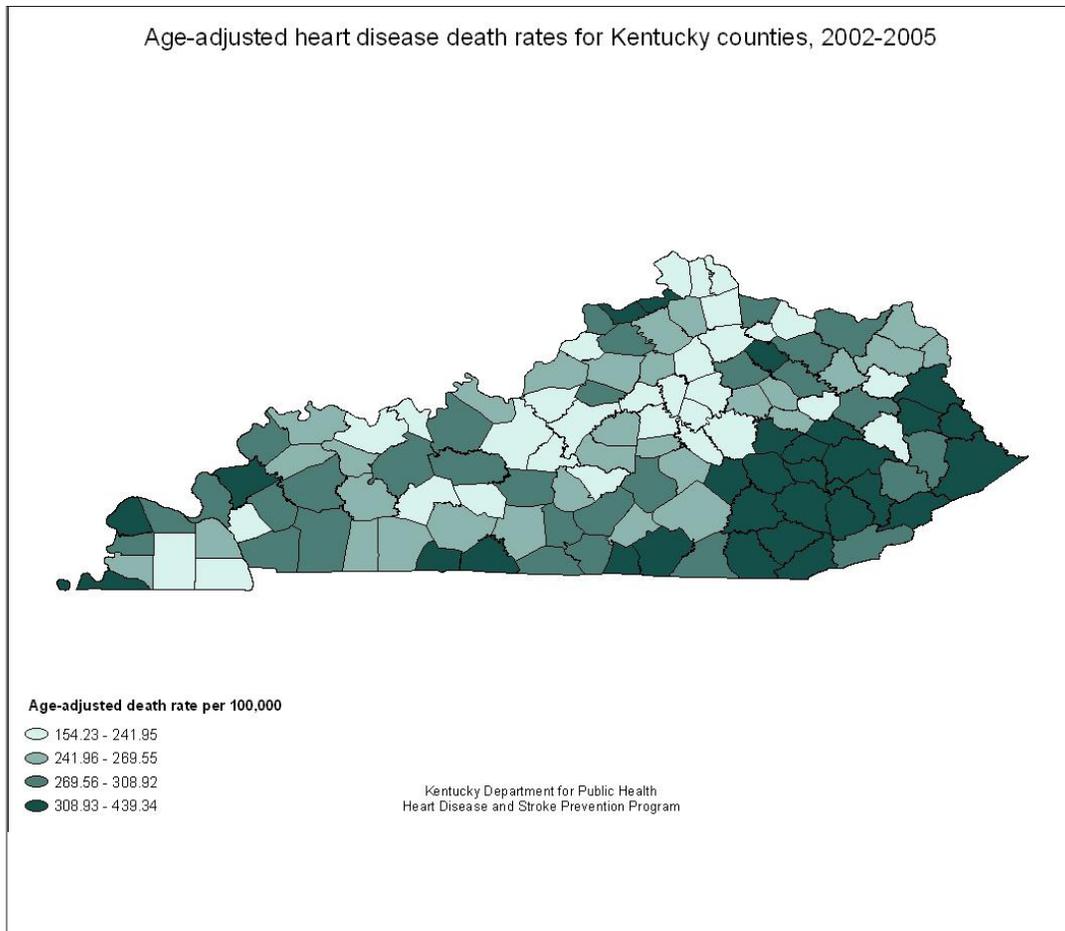
	Gender/Race	Percentage of total heart disease deaths in Kentucky
Kentucky	Both Sexes, All Races	23
Whites	Males	31
	Females	13
Blacks	Males	41
	Females	25
Both Races	Males	32
	Females	14

Table 5: Heart disease hospitalizations in Kentucky, 2003 (Source: KDPH, 2009c)

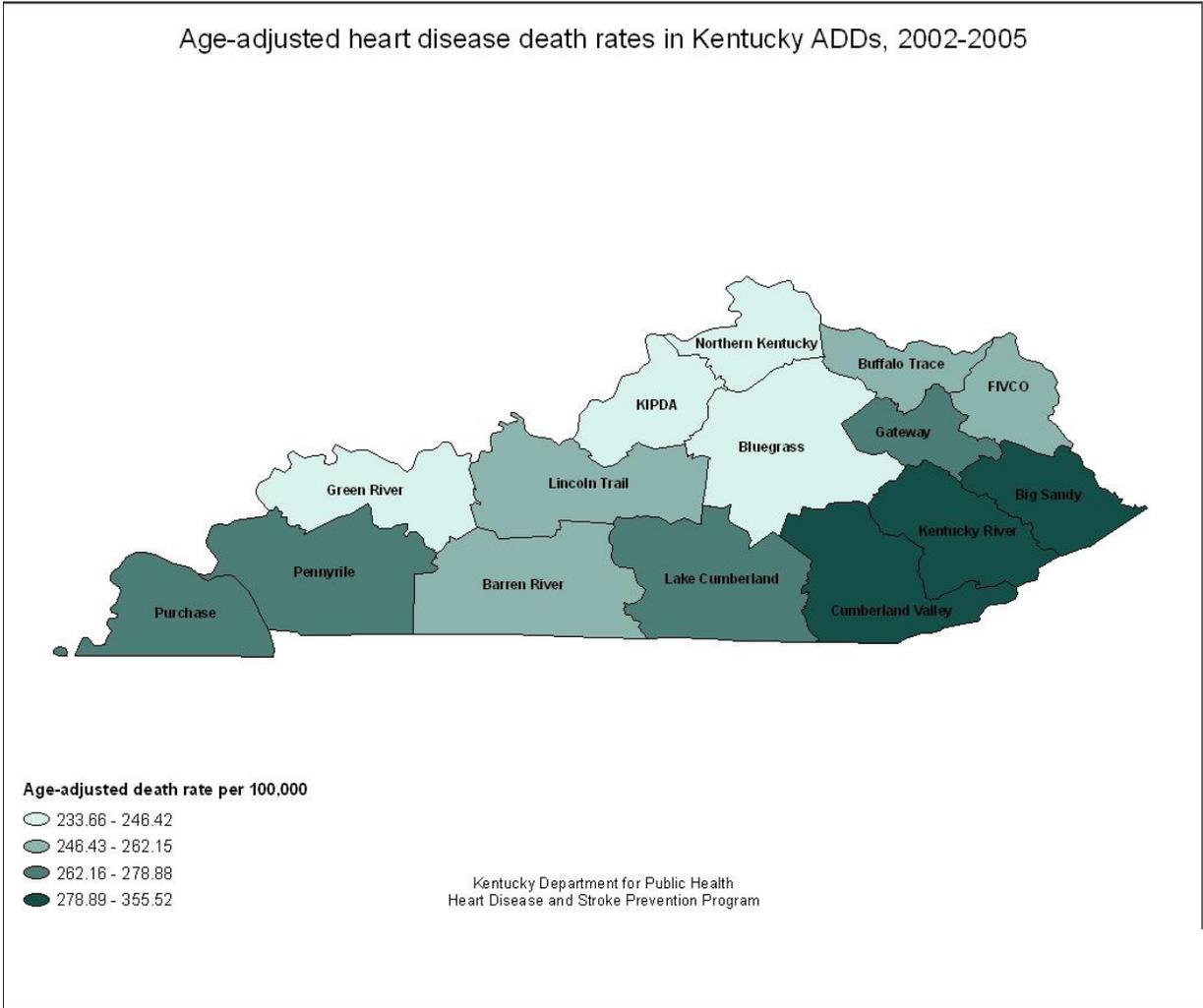
Table 5. Heart disease hospitalizations in Kentucky, 2008	
Total hospitalizations	63,313
Average length of hospital stay	4.5 days
Total charges	\$2.04 billion
Average charge per hospitalization	\$32,185

In 2008, over 63,000 hospitalizations in Kentucky were attributable to heart disease (Table 5). The average length of stay for those hospitalized with heart disease is 4.5 days. About \$ 2 billion in hospital charges were billed in Kentucky for heart disease, averaging nearly \$ 32,000 per hospitalization. Appendix B lists heart disease hospitalization data for each county in Kentucky.

The ADDs and counties in Kentucky with the highest death rates from heart disease tend to be clustered in the eastern and south-eastern part of the state. (Maps 3 and 4).



Map 3: Age-adjusted heart disease mortality rates for Kentucky counties, 2002-2005. (Data source: KDPH, 2009b) *Counties darkly shaded have the highest mortality rates and those lightly shaded have the lowest rates.*



Map 4: Age-adjusted heart disease mortality rates for Kentucky ADDs, 2002-2005. (Data source: KDPH, 2009b) *Counties darkly shaded have the highest mortality rates and those lightly shaded have the lowest rates.*

Stroke

Stroke is the third leading cause of death in the U.S., ranking behind heart disease and cancer. In 2005, stroke was the fifth leading cause of death in Kentucky; CVDs, cancer, chronic lower respiratory infections and unintentional injuries preceded it. In 2005, over 2,000 people in Kentucky died from stroke, accounting for about 15.6% of all CVD deaths in the state.

As with heart disease death rates, stroke death rates among men and women and among blacks and whites in Kentucky are higher than corresponding national values (Figures 11 and 12). In Kentucky and across the nation, little difference among stroke death rates is seen between men and women. But the rates for men and women in Kentucky are higher than corresponding U.S. rates (Figure 11). And stroke death rates among blacks are 16.5% higher than among whites in Kentucky and 2% higher than among blacks in the U.S. (Figure 12).

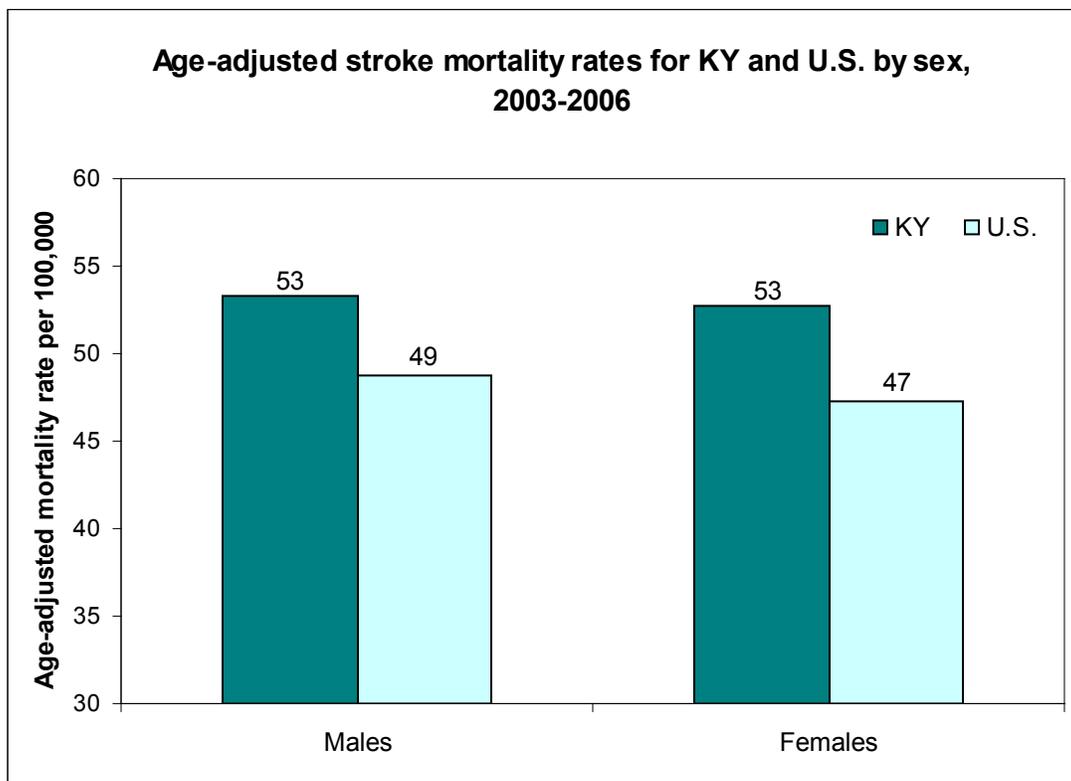


Figure 11: Stroke death rates by sex, Kentucky and U.S., 2003-2006 (Data source: KDPH, 2009b)

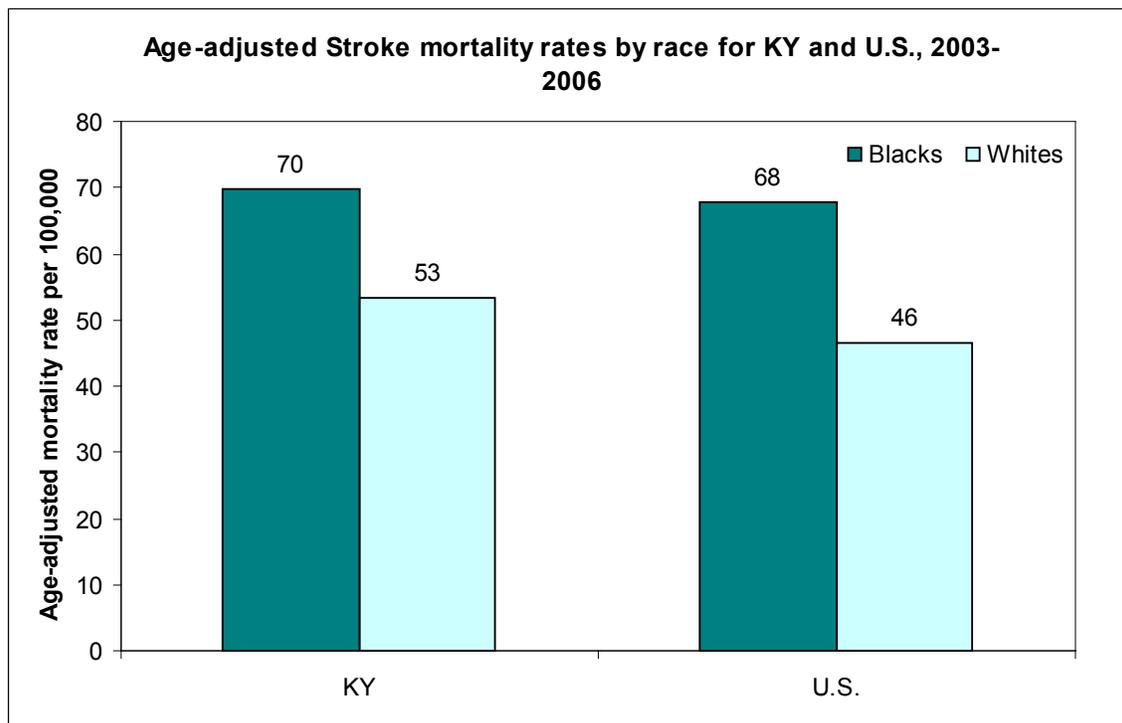


Figure 12: Age-adjusted stroke death rates by race in Kentucky and the U.S., 2003-2006 (Data source: KDPH, 2009b)

Figure 13 shows stroke death rates by age group. In Kentucky, about 13% of all stroke deaths strike someone under age 65. Just as with death from heart disease, premature stroke deaths have a greater impact on male and black residents of the Commonwealth (Table 6). Nearly 18% of stroke deaths among men occur before age 65, more than twice the rate for women (8.7%). Black men have the greatest burden, with nearly 39% of all stroke deaths occurring among those younger than 65. About 22% of black women die prematurely from stroke, more than twice the percent for white women.

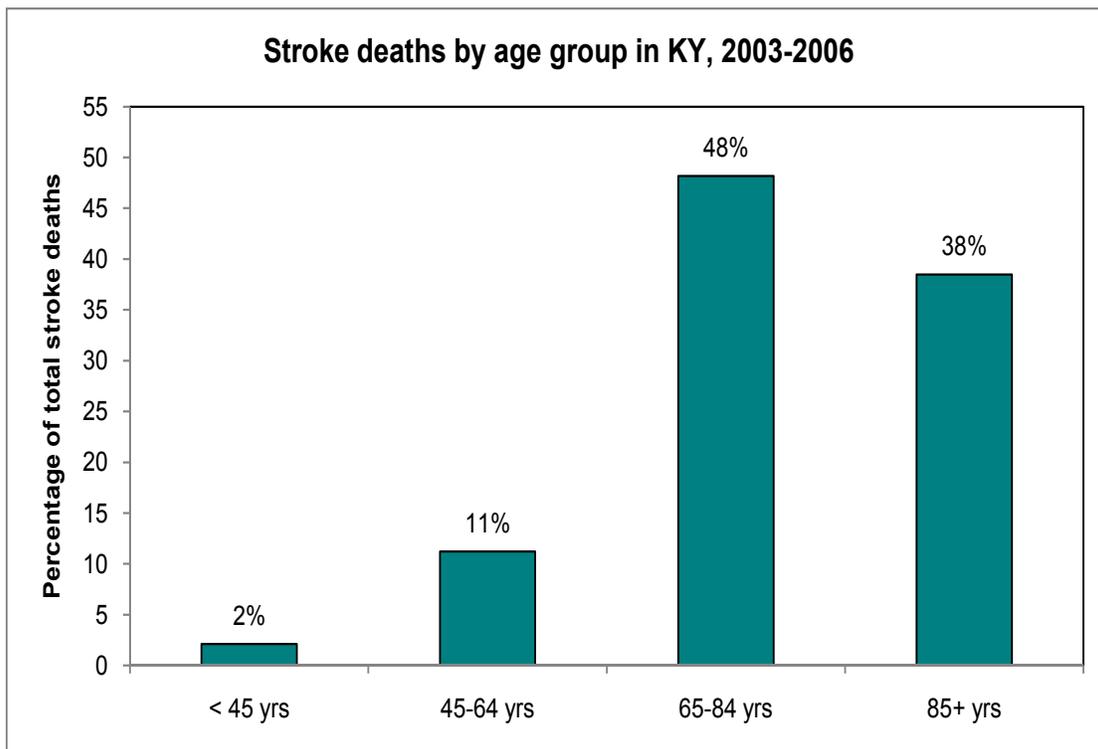


Figure 13: Stroke deaths by age group in Kentucky, 2003-2006 ((Data source: KDPH, 2009b)

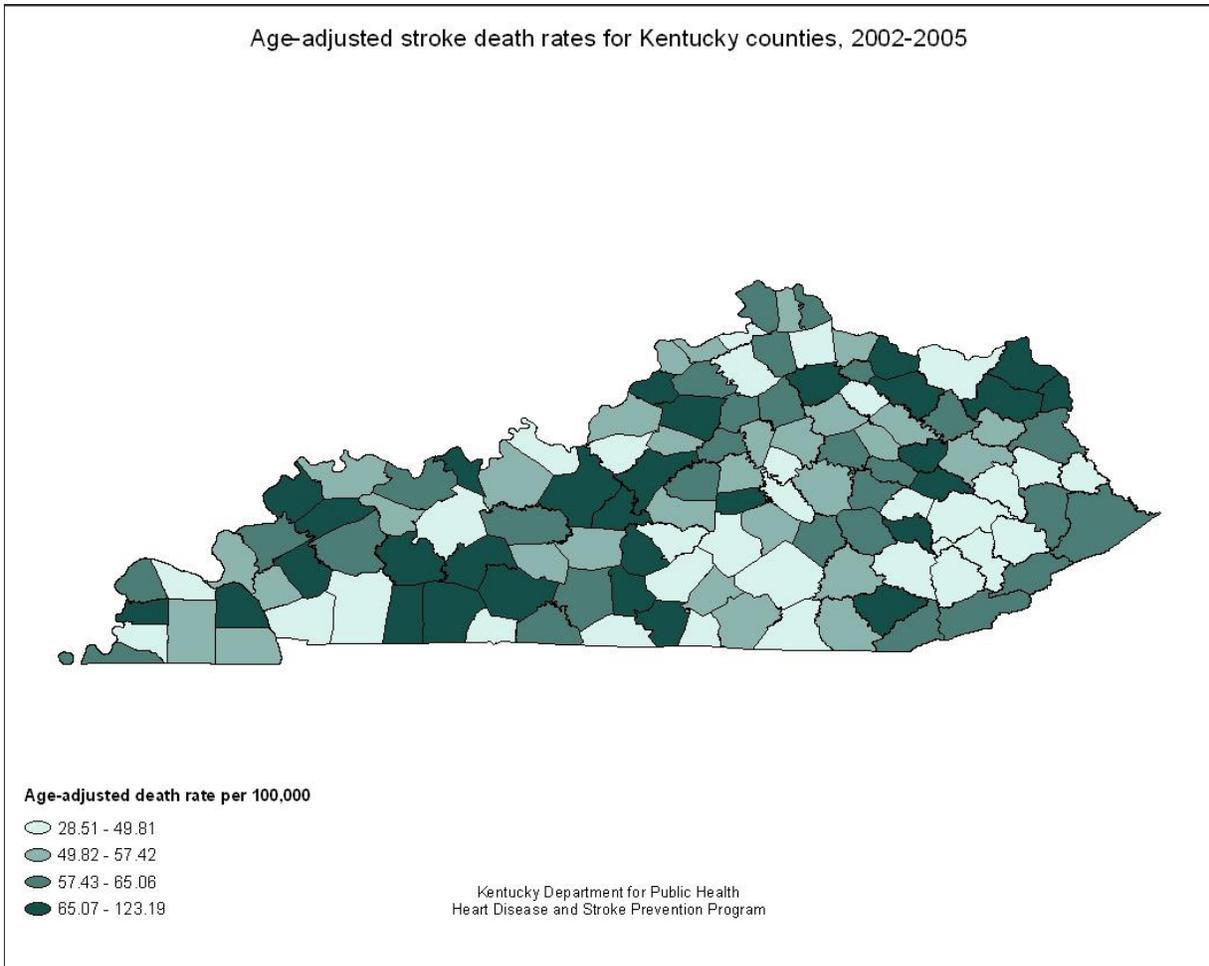
Table 6: Stroke deaths before age 65 in Kentucky, 2003-2006 (Data source: KDPH, 2009b)

	Gender/Race	Percentage of total stroke deaths in Kentucky
Kentucky	Both Sexes, All Races	13
Whites	Males	18
	Females	9
Blacks	Males	39
	Females	22
Both Races	Males	19
	Females	10

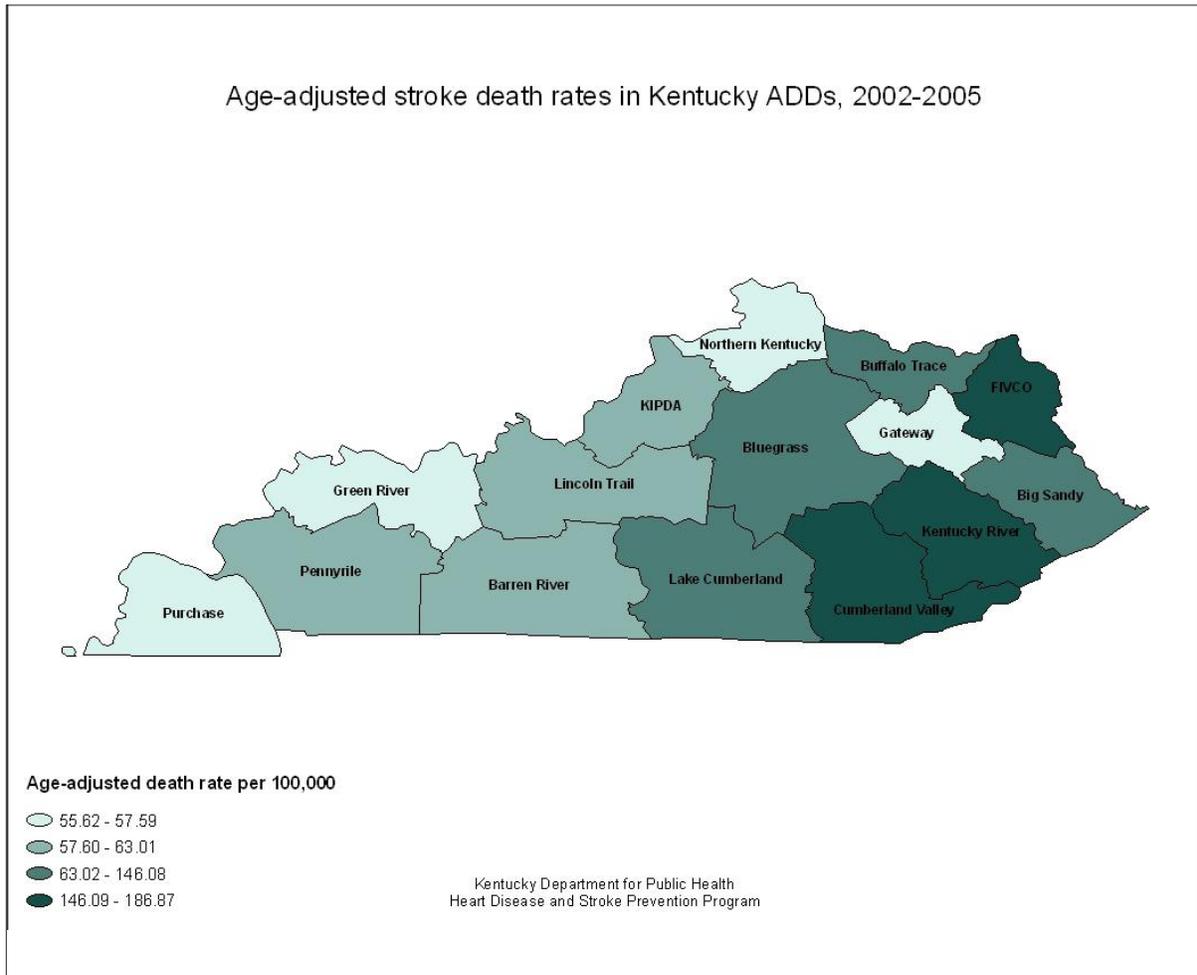
Table 7: Stroke Hospitalizations in Kentucky (Source: KDPH, 2009c)

Table 7. Stroke hospitalizations in Kentucky, 2008	
Total hospitalizations	10,542
Average length of hospital stay	5.06 days
Total charges	\$2.94 million
Average charge per hospitalization	\$27,850

The counties in Kentucky with the highest stroke death rates are scattered across the state and not clustered in the eastern and south-eastern part as they were for CVD and heart disease deaths (Maps 1, 3 and 5). Also Map 6 reveals the different disease burden for Kentucky ADDs are slightly different for stroke (Map 6) compared with that of CVD and heart disease (Maps 2 and 4).



Map 5: Age-adjusted stroke mortality rates for Kentucky counties, 2002-2005 (Data source: KDPH, 2009b)
Counties darkly shaded have the highest mortality rates and those lightly shaded have the lowest rates.



Map 6: Age-adjusted stroke mortality rates for Kentucky ADDs, 2002-2005 (Data source: KDPH, 2009b)
Counties darkly shaded have the highest mortality rates and those lightly shaded have the lowest rates.

Risk Factors among Adults

Risk factors are traits or behaviors that increase the likelihood that a person will develop an illness or condition. Researchers have identified several risk factors for cardiovascular disease. These risk factors are often divided into two categories — *non-modifiable* risk factors or those that cannot be changed, and *modifiable* risk factors or those that can be changed (Table 8).

Table 8: The major risk factors for CVD

Non-modifiable risk factors	Modifiable risk factors
Increasing age	Cigarette smoking
Gender	High blood pressure
Family History	High cholesterol
Race	Overweight or obese
	Physically inactive
	Diet low in fruits and vegetables
Diabetes	

The major non-modifiable risk factors for CVD are increasing age, gender, family history, and race.

- **Increasing age** — About four out of five people who die from coronary heart disease are 65 or older. The chance of having a stroke more than doubles for each decade of life after age 55.
- **Sex** — Men have a greater risk of heart attack than women, and they have heart attacks earlier in life. In most age groups, more men than women will have a stroke in a given year.
- **Family history** — A family history of heart disease or stroke increases your risk for these diseases.
- **Race** — Blacks in America have more severe high blood pressure than whites and a higher risk of heart disease and stroke.

Since you can't do anything about these non-modifiable risk factors it is important to focus on the risk factors that you can change, treat, or control. Below are the main modifiable risk factors for CVD.

- **High blood pressure** — Blood pressure of 140/90 mm Hg or higher is a major risk factor for both heart disease and stroke. In Kentucky, about 33% of adults have been told by a health professional that their blood pressure is high, compared with 29% of adults nationally. Figure 14 shows the percentage of adults in Kentucky who have high blood pressure by sex and race. Slightly more men (32%) than women (31%) report having high blood pressure. Thirty-four percent of black adults in Kentucky have high blood pressure.

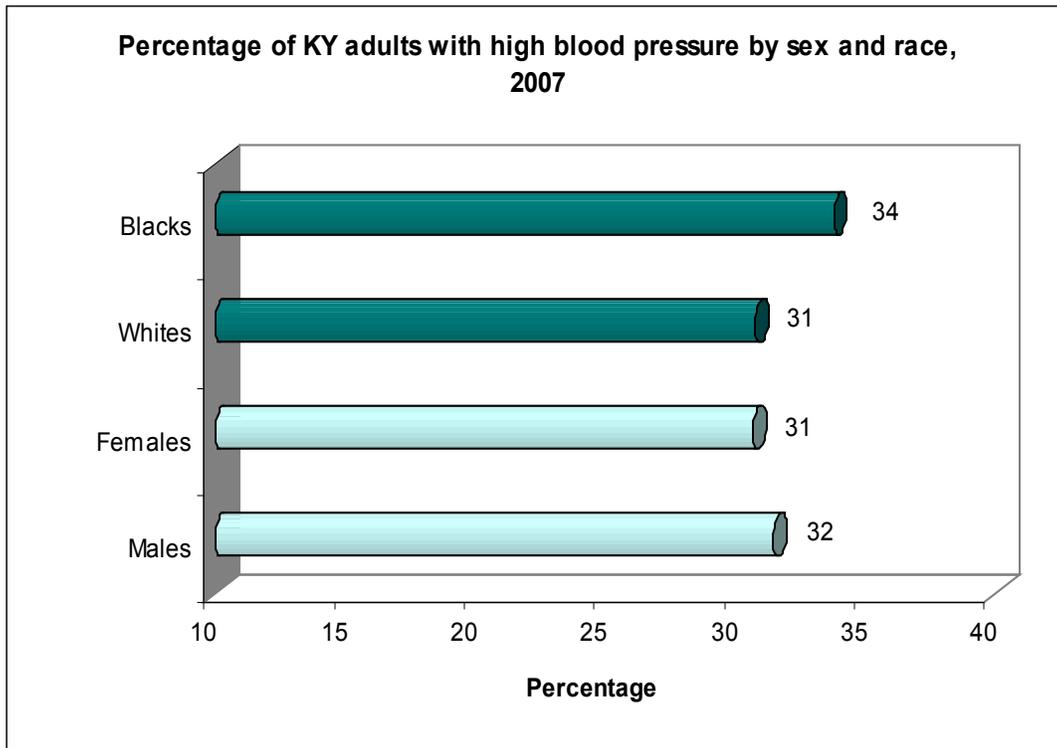


Figure 14: Percentage of adults with high blood pressure by sex and race in Kentucky, 2007 (Source: BRFSS)

- Smoking** — Cigarette smoking, the most preventable cause of death in the U.S., greatly increases the risk of heart disease and stroke. With nearly a third of all adults identifying themselves as current smokers, Kentucky has one of the highest adult smoking rates in the nation (25%) (BRFSS, 2008). Nationally, 21% of adults are currently smokers (National Health Interview Survey [NHIS], 2008). Figure 15 shows the percentage of adult smokers in Kentucky by sex and race. In Kentucky, slightly more males (26%) in Kentucky smoke compared to females (24%) and blacks (28%) smoke more than whites (25%) or hispanics (18%).

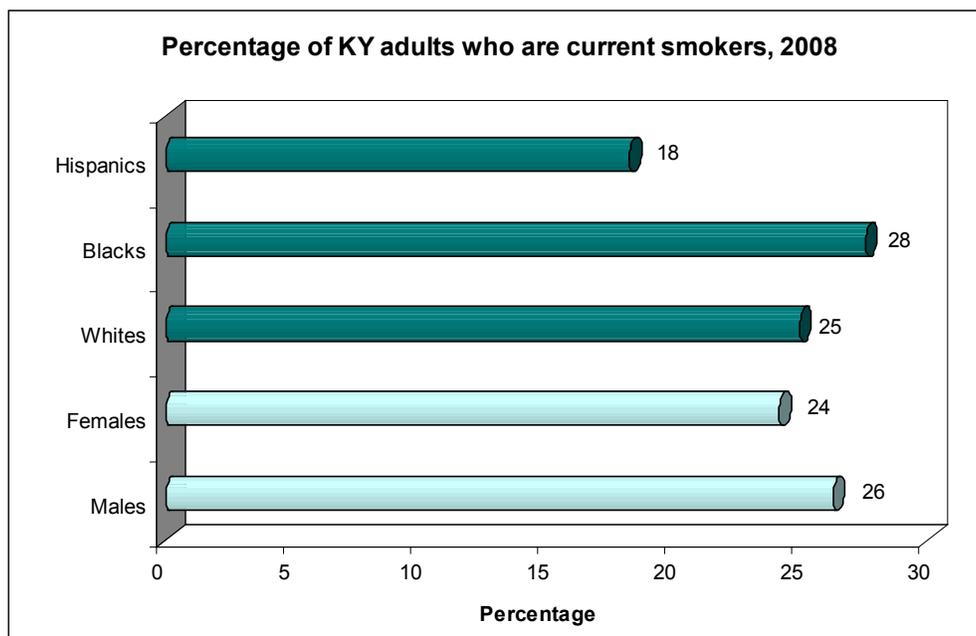


Figure 15: Percentage of Kentucky adults who are current smokers, 2008 (Source: BRFSS)

- **High cholesterol** — Having a blood cholesterol level of 240 mg/dL or higher is another major risk factor for heart disease and stroke. In fact, those with high cholesterol have more than twice the risk of heart disease than those with lower cholesterol levels. In Kentucky, about 40% of adults have been told by their doctors that they have high cholesterol. Figure 16 shows the percentage of adults with high cholesterol in Kentucky. The percentage for men is the same as it is for women (41%), but more white adults (42%) have high cholesterol than do black adults (33%) in the Commonwealth.

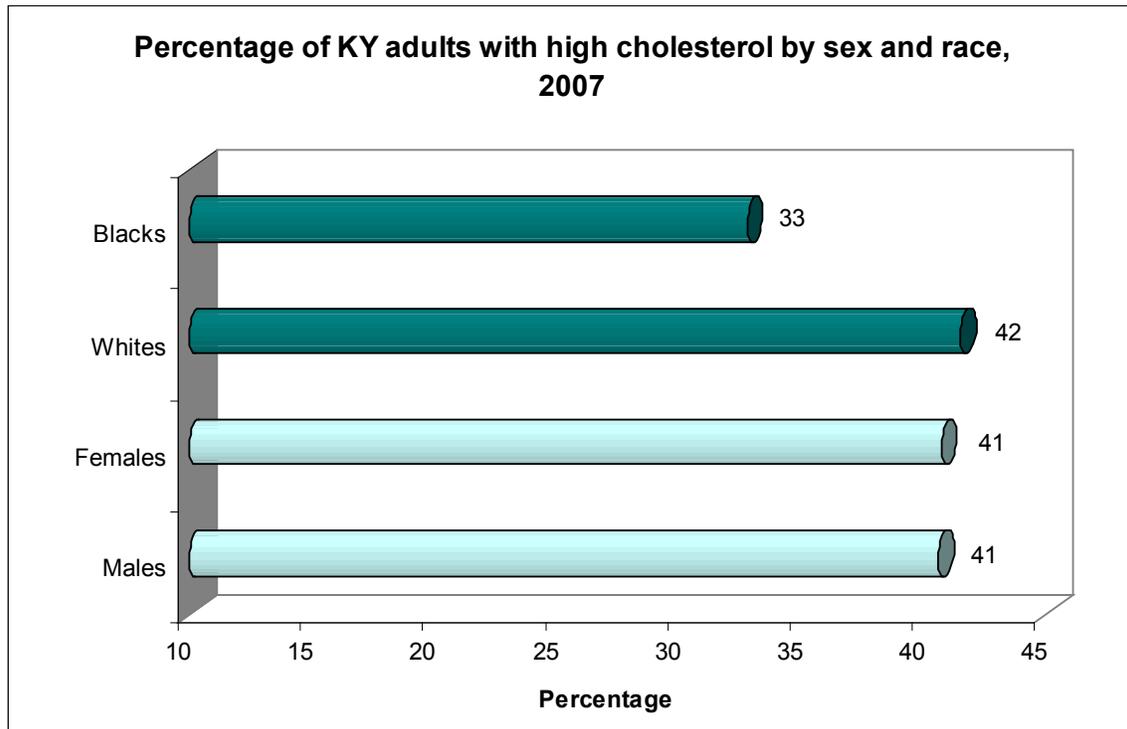


Figure 16: Percentage of Kentucky adults with high cholesterol by sex and race, 2007 (Source: BRFSS)

- **Diabetes** — Diabetes is another major risk factor for CVD, and most people with the disease die of some form of heart or blood vessel disease. Diabetes is considered a partially modifiable risk factor for CVD because it can often be controlled or moderated by changes in behavior and by appropriate use of prescription medications. In Kentucky, nearly 10% (9.9%) of adults are diabetic. The percentage of men (9%) and women (11%) in Kentucky with diabetes does not vary enormously. The percentage of black (11%) and white (10%) diabetic adults in Kentucky is also similar (Figure 17).

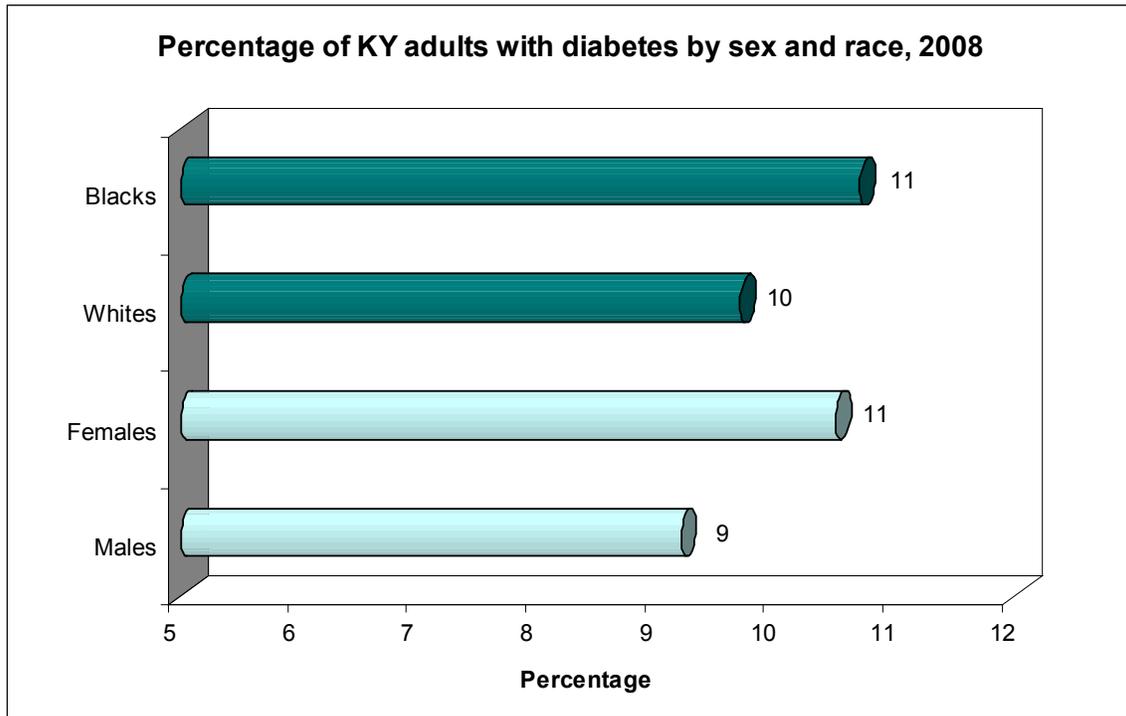


Figure 17: Percentage of Kentucky adults who have diabetes; sex and race, 2008 (Source: BRFSS)

- Excess weight** — People who are overweight or obese, those with a body mass index (BMI) of 25 or more, are at increased risk not only for heart disease and stroke, but also for other risk factors associated with CVD. In Kentucky, nearly 63% of adults are overweight or obese, ranking the state sixth highest in the nation. In the U.S., 58% of adults are overweight or obese. Figure 19 shows the rates of adults overweight (BMI = 25.0–29.9) and obesity (BMI = 30.0+) in Kentucky by sex and race. The percentage of Kentucky men and women who are obese is almost the same, but more men are overweight than women. A different pattern is seen by race, the percentage of white and black adults in Kentucky who are overweight is, but more black adults are obese than white adults (Figure 18).

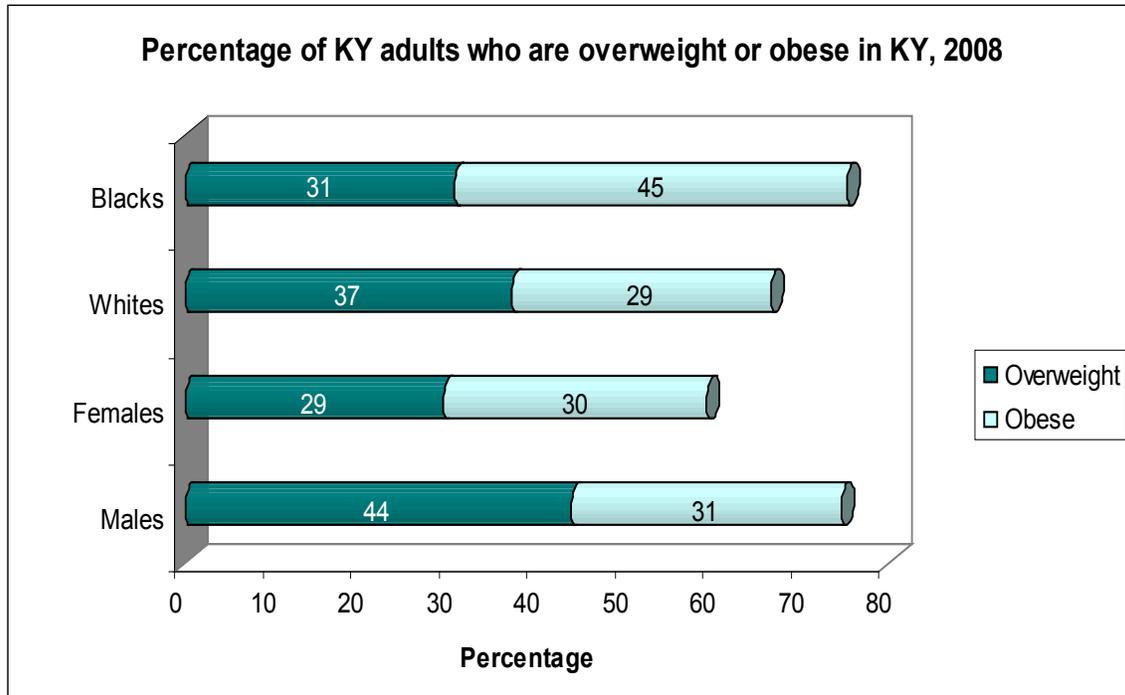


Figure 18: Percentages of adults who are overweight or obese in Kentucky, 2008 (Source: BRFSS)

- **Physical inactivity** — Being physically inactive also increases the risk of heart disease and stroke. Regular physical activity not only reduces the risk of these diseases, but it also helps control diabetes, lower weight, lower blood pressure, as well as control and even lower blood cholesterol levels — all of which are risk factors for CVD. In Kentucky, over 31% of adults report getting no physical activity, a figure that places the Commonwealth fifth highest among all states in the nation. Nationally, about 27% of adults are physically inactive. Figure 19 shows that among Kentucky adults, more women than men and more blacks than whites are physically inactive.

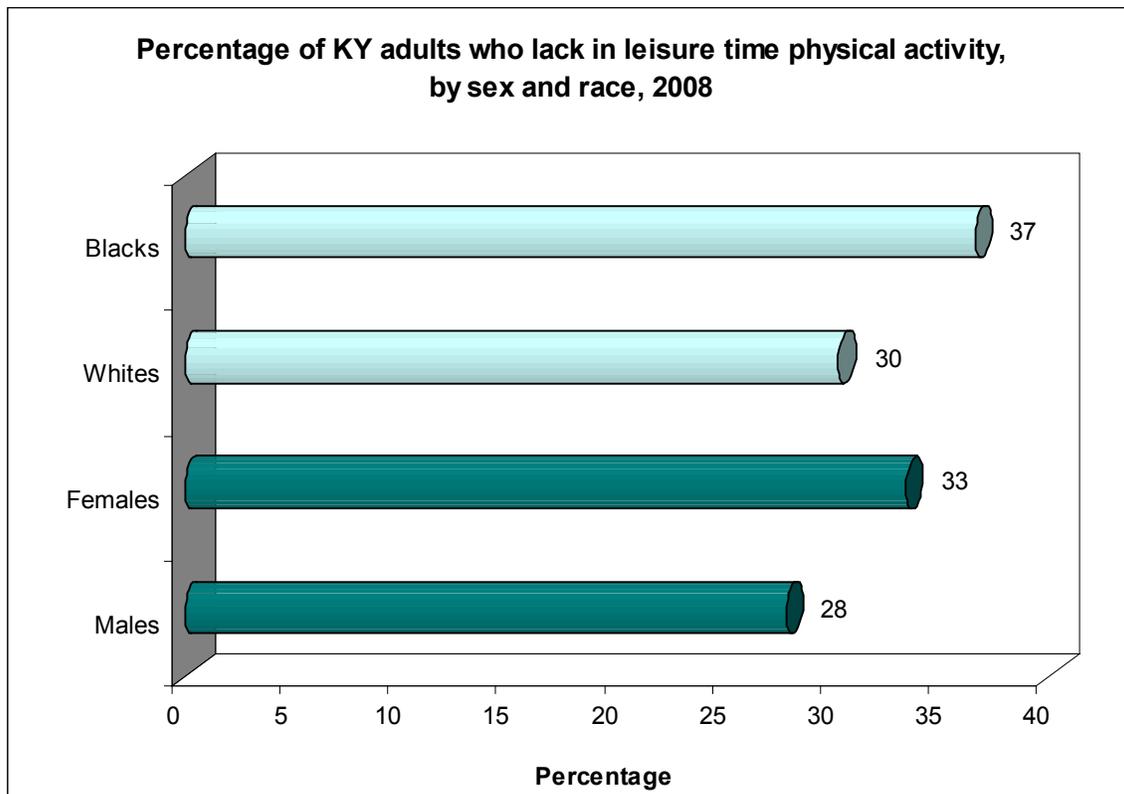


Figure 19: Lack of leisure time physical activity in Kentucky adults, 2008 (Source: BRFSS)

- **Unhealthy diet** — Having an unhealthy diet can also increase the risk for heart disease and stroke. One way of measuring the healthiness of a diet is to count the number of fruit and vegetable servings eaten daily. A minimum of five servings a day of fruits and vegetables has been recommended for better health. In Kentucky, only 18% of adults meet the five-a-day recommendation. Nationally, about 25% of adults do. Figure 20 shows the percentage of adults in Kentucky who eat five or more daily servings of fruits and vegetables. Fewer men than women, and fewer black than white adults meet the five-a-day recommendation.

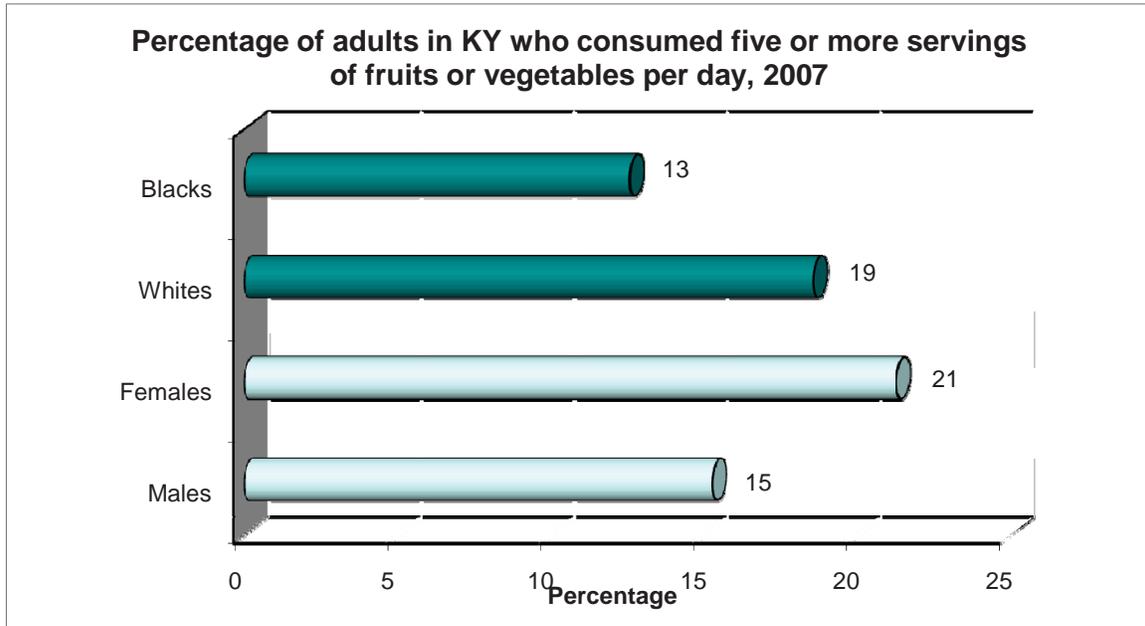


Figure 20: Percentage of adults in Kentucky who consumed five or more servings of fruits or vegetables per day, 2007 (Source: BRFSS)

Risk Factors among Children and Youth

Even though they are below the age when cardiovascular disease is most likely to strike, children and youth in Kentucky and the nation already have many risk factors for CVD. This trend is troubling because unhealthy habits among adults such as poor diet, physical inactivity, and tobacco use often form during childhood and become increasingly difficult to change as people age. Moreover, atherosclerosis, the disease process that causes CVD, begins during childhood. It is vital to instill healthy lifestyle behaviors early on and to help prevent poor behaviors before they become entrenched later in life.

The children and youth of Kentucky have adopted many behaviors that increase their risk of CVDs and tackling this is a struggle for Kentucky. If current trends continue, the Commonwealth may see an adult population in the future that has a greater risk of CVD than previous generations.

The major CVD risk factors for students in grades 9-12 are described below (Eaton et. al., 2007):

Smoking—26% of high school students in Kentucky currently smoke cigarettes. Nationwide, about 20% of high school students currently smoke. While the percentages of boys who smoke in Kentucky is not statistically different from that of the nation's rate (21.3%) the percentage of overall smokers and girl smokers in Kentucky is statistically different from that of the nation.

- 26.2% of Kentucky boys currently smoke
- 25.8% of Kentucky girls currently smoke

At risk of overweight / overweight— About 16.4% of Kentucky high school students are overweight, and 15.6% are obese. Both percentages are higher than the national average for high school youth who are overweight (15.8%) or obese (13.0%) respectively.

- 17.3% of Kentucky boys are overweight
- 15.5% of Kentucky girls are overweight
- 14.7% of Kentucky boys are obese
- 11.0% of Kentucky girls are obese

Physical inactivity— 22.4% of high school students in Kentucky did not participate in 60 or more minutes of physical activity on any day, compared with 24.9% of high school students nationwide. While the percentage of inactive students in the state is lower than that of the nation there is no statistical difference between the two numbers.

- 18.1% of Kentucky boys did not participate in 60 or more minutes of physical activity on any day
- 26.8% of Kentucky girls did not participate in 60 or more minutes of physical activity on any day

Poor diet— 13.2% of Kentucky high school students eat five or more daily servings of fruits and vegetables, this number is lower than the national average 21.4% for U.S. high school students.

- 14.5% of Kentucky boys eat five or more daily servings of fruits and vegetables
- 11.8% of Kentucky girls eat five or more daily servings of fruits and vegetables

Heart Attack and Stroke Warning Signs

Every second counts if someone is having a heart attack or stroke. The sooner warning signs and symptoms are recognized and 911 is called, the greater the chance of survival. But not everyone is aware of all the signs and symptoms, or knows what to do in the event of a heart attack and stroke, potentially delaying life-saving treatment. Tables 9 and 10 list the warning signs of a heart attack and stroke.

Most adults (>95%) in Kentucky recognize that pain in the chest, arm or shoulder and shortness of breath can be signs of a heart attack (Figure 21). Nearly 73% of Kentucky adults correctly identify jaw, neck, or back pain as warning signs. And nearly 83% of adults recognize that feeling weak, lightheaded, and faint can be signs of a heart attack.

For stroke, most adults in the state identified sudden numbness or weakness, sudden trouble speaking or confusion, sudden trouble walking, dizziness, and loss of balance as potential warning signs (Figure 22). Sudden vision problems were less recognized as a sign of stroke and severe headaches from an unknown cause were the least recognized stroke symptom.

Table 9: Heart attack warning signs.

Heart Attack Warning Signs
Chest discomfort
Discomfort in other areas of the upper body (arms, back, neck, jaw, stomach)
Shortness of breath
Lightheadedness, nausea, cold sweat

Table 10: Stroke warning signs

Stroke Warning Signs
Sudden numbness or weakness of the face, arm, or leg, especially on one side of the body
Sudden confusion, trouble speaking, or understanding
Sudden trouble seeing in one or both eyes
Sudden trouble walking, dizziness, loss of balance or coordination
Sudden, severe headache with no known causes

If a person is showing signs of a heart attack or stroke, the most important thing to do is call 911 immediately for help. Doing so usually is the quickest and most reliable way of getting lifesaving medical attention. Adults in Kentucky were asked how they would respond if they suspected someone was having a heart attack or stroke. Their responses are summarized in Figure 23. Most adults nearly 86% indicated they would call 911, this indicates that about 14% of the adults in Kentucky would probably not act appropriately in the event of a stroke or heart attack leading to greater sickness, disability and even death.

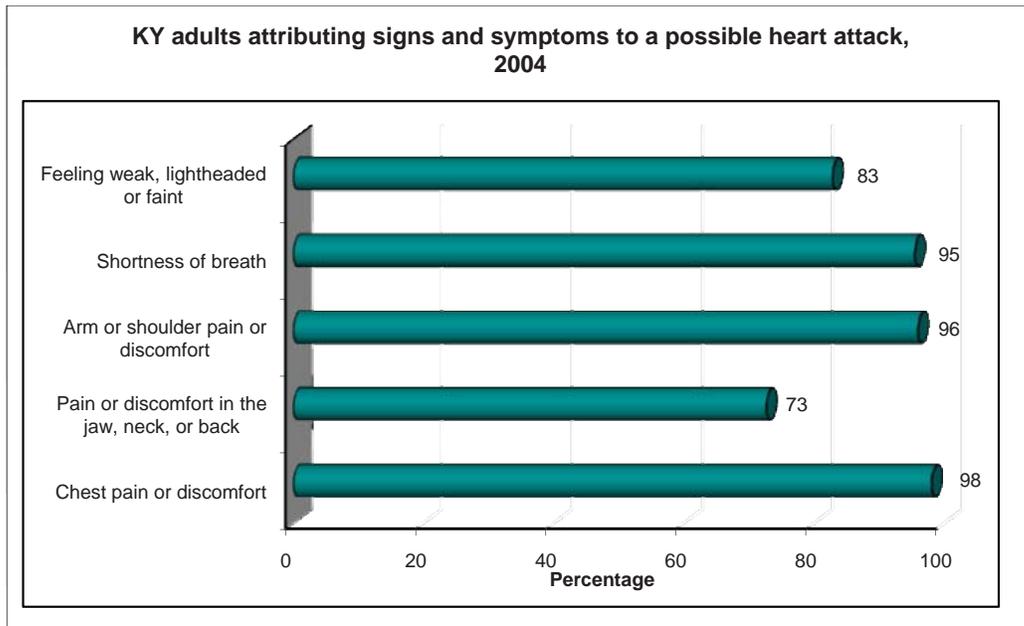


Figure 21: Kentucky adults attributing signs and symptoms to a possible heart attack, 2004 (Source: BRFSS)

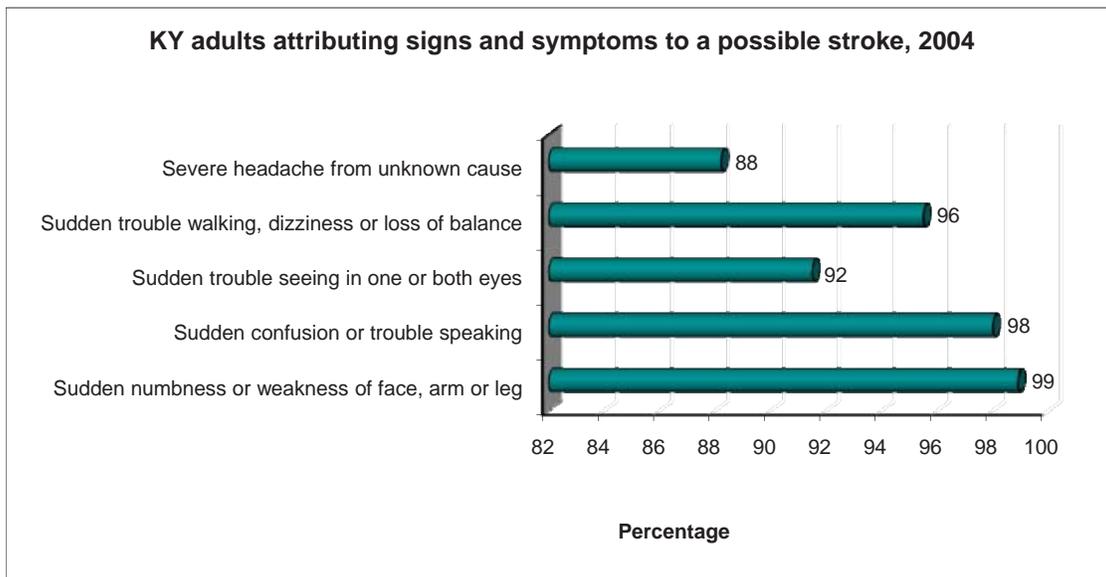


Figure 22: Kentucky adults attributing signs and symptoms to a possible stroke, 2004 (Source: BRFSS)

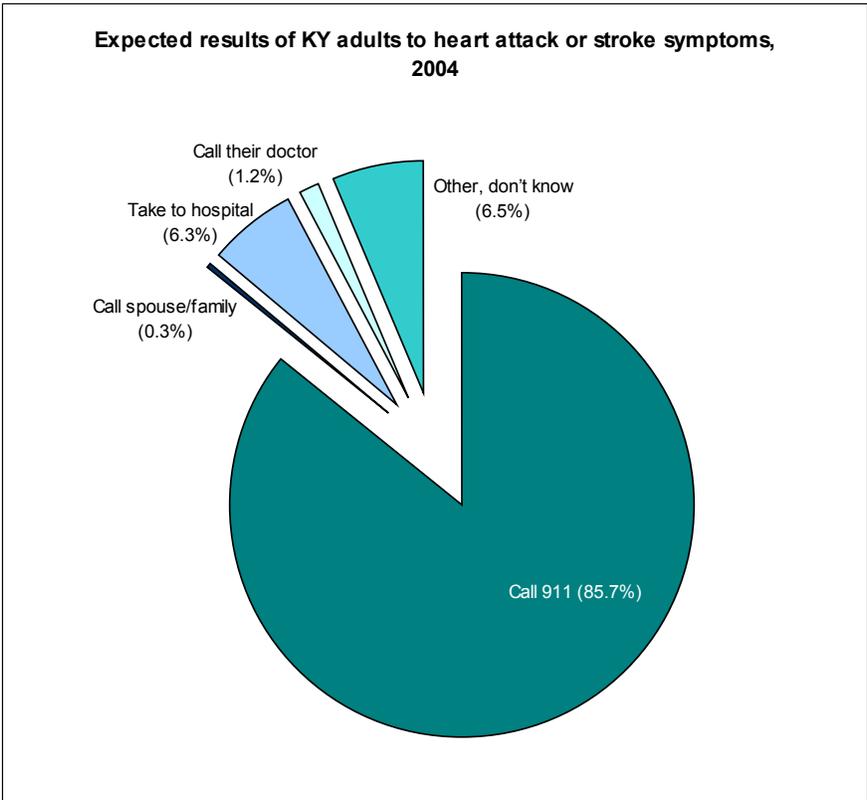


Figure 23: Expected response of Kentucky adults to heart attack or stroke symptoms, 2004 (Source: BRFSS)

Summary

Even though rates have dropped considerably over the last 25 years, CVD continues to be the leading cause of death in Kentucky. In 2005, 13,601 deaths in the Commonwealth were caused by CVD. Of that total, 10,337 deaths were caused by heart disease and 2,117 by stroke, the two most common forms of CVD.

CVD also exacts an enormous financial toll in the Commonwealth. CVD was responsible for more than 80,000 hospitalizations totaling about \$2.6 billion dollars in 2008. The average cost of hospitalization for CVD or heart disease was nearly \$32,000. Stroke hospitalizations averaged nearly \$28,000 per stay.

Although CVD strikes most often among the elderly, it also kills many adults in their prime. About 23% of CVD deaths in Kentucky occur among those younger than 65 years, cutting productive lives short. These premature deaths are not distributed equally among Kentuckians. Among men in the state, 32% of CVD deaths are premature; among women, 14% of CVD deaths are. The percentage of premature CVD deaths among blacks and whites in Kentucky is similar. However, the percentage of premature heart disease and stroke deaths is higher for blacks than whites in Kentucky.

CVD death rates vary across Kentucky. But high death rates from both CVD and heart disease tend to be found in eastern and south-eastern Kentucky while stroke death rates are not the highest in these counties. However the ADDs with the highest burden are congregated in the eastern and south-eastern part of the state making this the geographic area most in need of interventions. Much work needs to be done to reduce CVD disparities across the Commonwealth by sex, race, and region.

Many of the risk factors for heart disease and stroke are within our control. The challenge the Commonwealth faces is that Kentuckians have all too readily adopted three of the strongest risk factors for CVD — Kentucky adults have one of the highest rates in the nation for smoking, excess weight, and physical inactivity. Our children and youth have also adopted many behaviors that place them at higher risk for CVD.

Not all Kentuckians recognize the signs and symptoms of a heart attack or stroke and know to call 911 immediately. Educating Kentuckians in these is of vital importance to reduce the burden of CVD death and disability.

This document illustrates the enormous burden on Kentucky and Kentuckians caused by CVDs and attempts to reiterate the need for action to alleviate this problem plaguing the Commonwealth.

Glossary

Age-adjusted rates - Researchers adjust rates for age to reduce the effect of having older individuals in one group (where the risk of dying is naturally higher) compared to another group which has younger people. For example, Florida has an older average population age than the nation as a whole because Florida tends to attract retirees. Alaska, on the other hand, has a younger population age than average because it tends to attract younger adventurous people eager for adventure. Adjustment for such differences in age compositions allows researchers to make valid comparisons of rates across different regions, populations, and periods.

Coronary artery disease - Coronary arteries are the major blood vessels that supply the heart with blood, oxygen and nutrients. When these arteries become damaged or diseased — usually due to a buildup of fatty deposits called plaques — it's known as coronary artery disease. A complete blockage of the coronary arteries, caused either by accumulated plaques or a ruptured plaque, can cause a heart attack (Mayo Clinic, 2008a).

Heart attack - A heart attack usually occurs when a blood clot blocks the flow of blood through a coronary artery — a blood vessel that feeds blood, to a part of the heart muscle. Interrupted blood flow to the heart can damage or destroy a part of the heart muscle.

Heart disease - Heart disease is a broad term used to describe a range of diseases that affect the heart, and in some cases, the blood vessels. The various diseases that fall under the umbrella of heart disease include diseases of the blood vessels, such as coronary artery disease; heart rhythm problems (arrhythmias); and heart defects one is born with (congenital heart defects) (Mayo Clinic, 2008b).

Mortality rate (also death rate) - The mortality rate is a measure of the proportion of deaths that occur because of a particular cause in a given population during a specified time. Mortality rates are often reported per 100,000 people (KDPH, 2004)

Premature death - Premature death has both a statistical and actuarial meaning. A premature death is one that occurs before statistical expectation, usually because of a specific cause. The term also refers to the death of a person while that person's family relies on his or her earnings for support. In this report, premature death means one that not only has occurred earlier than expected, but also one that has occurred before age 65 (KDPH, 2004)

Stroke - A stroke occurs when blood supply to a part of the brain is interrupted or severely reduced, depriving brain tissue of oxygen and nutrients. Within a few minutes, brain cells begin to die. (Mayo Clinic, 2008c)

Data Sources

Risk factor and warning signs estimates for adults come from the BRFSS, courtesy Kentucky Department for Public Health, Health Promotions Branch, Konnor. The BRFSS is an annual telephone survey that assesses health behaviors and disease prevention practices among adults 18 years of age and older. 2007 and 2008 BRFSS survey data was used in this report as they represent the most up-to-date incidence data. Data presented by race (*i.e.*, white and black) include only non-Hispanic ethnicities. Other race and ethnic groups were not reported because of small sample sizes.

Risk factor data for youth were obtained from the CDC and MMWR Youth Risk Behavior Surveillance – U.S. 2007 Report (Eaton et. al., 2007). The YRBSS, conducted every two years, surveys high and middle school students to monitor priority health risk behaviors among youth. Diabetes information is no longer collected as part of the YRBSS and hence diabetes data for children/youth is not included here.

Mortality data for the U.S. was obtained from CDC WONDER: Wide-ranging Online Data for Epidemiologic Research (<http://wonder.cdc.gov>), a web-based health data repository. Rates are age-adjusted to the 2000 U.S. standard population. Mortality data for Kentucky was obtained from the Kentucky Department for Public Health, Office of Vital Statistics (KDPH, 2009a). The table below lists the ICD codes used to classify deaths in this report.

Disease	ICD-9	ICD-10
Cardiovascular disease	390–434, 436–448	I00–I99
Heart disease	390–398, 402, 404, 410–429	I00–I09, I11, I13, I20–I51
Stroke	430–434, 436–438	I60–I69

Population data for the state and various counties was obtained from online reports at the Kentucky State Data Center (KSDC, 2009a and 2009b).

Kentucky inpatient hospitalization claims data (2008) were provided by the Kentucky Department for Public Health, Office of Health Policy (KDPH, 2009c).

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Appendix A: 2008 CVD hospitalization data by county

County	Number of hospitalizations	Average length of hospital stay (days)	Average charge per hospitalization	Total charges billed
Kentucky	81,468	4.60	\$31,860	\$2,595,598,446
Adair	547	4.69	\$30,998	\$16,955,662
Allen	417	5.49	\$28,834	\$12,023,593
Anderson	344	3.91	\$32,128	\$11,052,103
Ballard	156	4.12	\$24,480	\$3,818,931
Barren	900	4.45	\$25,972	\$23,374,579
Bath	343	4.34	\$29,802	\$10,222,015
Bell	794	4.12	\$19,226	\$15,265,792
Boone	1,512	4.63	\$33,412	\$50,518,308
Bourbon	367	4.19	\$25,904	\$9,506,813
Boyd	1,776	4.08	\$34,939	\$62,051,231
Boyle	494	4.32	\$29,315	\$14,481,397
Bracken	164	4.20	\$26,397	\$4,329,062
Breathitt	543	3.69	\$28,780	\$15,627,710
Breckinridge	358	5.22	\$36,442	\$13,046,266
Bullitt	869	5.41	\$45,507	\$39,545,795
Butler	259	5.46	\$31,532	\$8,166,874
Caldwell	215	4.52	\$22,452	\$4,827,243
Calloway	610	4.67	\$22,142	\$13,506,897
Campbell	1,421	5.02	\$32,755	\$46,544,168
Carlisle	165	4.40	\$25,295	\$4,173,609
Carroll	276	4.51	\$42,960	\$11,857,033
Carter	807	3.98	\$34,778	\$28,065,471
Casey	398	3.84	\$22,496	\$8,953,581
Christian	752	4.89	\$19,447	\$14,624,294
Clark	781	4.35	\$29,594	\$23,112,549
Clay	903	3.81	\$28,205	\$25,469,159
Clinton	306	3.85	\$16,566	\$5,069,230
Crittenden	348	3.99	\$15,892	\$5,530,449
Cumberland	255	4.09	\$17,806	\$4,540,471
Daviess	1,943	4.40	\$26,807	\$52,086,154
Edmonson	230	5.20	\$31,739	\$7,299,996
Elliott	133	3.02	\$33,496	\$4,455,031
Estill	328	4.42	\$31,342	\$10,280,166
Fayette	3,553	4.65	\$32,010	\$113,730,563
Fleming	456	4.20	\$24,417	\$11,134,026
Floyd	1,107	4.38	\$34,248	\$37,912,437
Franklin	1,028	3.77	\$32,281	\$33,184,726
Fulton	194	3.74	\$21,731	\$4,215,745
Gallatin	174	4.63	\$36,661	\$6,379,026
Garrard	264	4.50	\$35,389	\$9,342,620
Grant	465	4.52	\$32,784	\$15,244,343
Graves	866	4.48	\$24,679	\$21,371,753
Grayson	497	4.74	\$33,531	\$16,664,743
Green	202	4.80	\$28,879	\$5,833,639
Greenup	1,181	4.06	\$32,837	\$38,780,228
Hancock	173	4.50	\$30,537	\$5,282,882
Hardin	1,380	5.35	\$27,815	\$38,384,248
Harlan	920	3.53	\$22,624	\$20,813,696
Harrison	363	3.83	\$24,148	\$8,765,813
Hart	385	4.89	\$27,665	\$10,651,060

Henderson	549	4.41	\$20,469	\$11,237,329
Henry	377	4.59	\$32,784	\$12,359,555
Hickman	110	4.01	\$22,424	\$2,466,621
Hopkins	1,078	4.28	\$27,498	\$29,643,295
Jackson	353	4.42	\$32,933	\$11,625,417
Jefferson	12,654	5.47	\$40,736	\$515,478,119
Jessamine	602	4.60	\$31,201	\$18,782,986
Johnson	784	4.02	\$35,251	\$27,636,697
Kenton	2,112	4.63	\$32,361	\$68,346,450
Knott	412	4.91	\$33,698	\$13,883,488
Knox	676	4.12	\$34,356	\$23,224,319
Larue	208	5.18	\$28,998	\$6,031,673
Laurel	1,497	4.40	\$39,196	\$58,676,022
Lawrence	455	3.95	\$37,493	\$17,059,266
Lee	222	3.79	\$31,583	\$7,011,486
Leslie	427	4.48	\$28,402	\$12,127,712
Letcher	878	4.04	\$27,627	\$24,256,199
Lewis	221	4.27	\$34,778	\$7,685,834
Lincoln	535	3.91	\$30,122	\$16,115,420
Livingston	297	3.90	\$20,405	\$6,060,243
Logan	574	4.77	\$24,712	\$14,184,403
Lyon	154	5.34	\$24,585	\$3,786,050
McCracken	1,566	4.78	\$24,238	\$37,956,214
McCreary	255	4.82	\$40,182	\$10,246,361
McLean	231	4.16	\$28,216	\$6,517,843
Madison	1,245	3.79	\$24,593	\$30,617,711
Magoffin	441	3.93	\$30,971	\$13,658,223
Marion	290	4.46	\$41,237	\$11,958,860
Marshall	757	4.75	\$25,480	\$19,288,695
Martin	270	3.82	\$34,182	\$9,229,273
Mason	328	4.33	\$27,042	\$8,869,756
Meade	300	5.24	\$38,820	\$11,646,037
Menifee	161	3.88	\$31,980	\$5,148,821
Mercer	422	4.29	\$29,083	\$12,273,076
Metcalfe	279	4.76	\$29,708	\$8,288,587
Monroe	429	5.41	\$21,567	\$9,252,157
Montgomery	478	4.25	\$28,653	\$13,696,210
Morgan	361	4.25	\$33,899	\$12,237,397
Muhlenberg	576	3.95	\$27,138	\$15,631,714
Nelson	661	4.05	\$32,716	\$21,625,518
Nicholas	144	3.78	\$20,141	\$2,900,281
Ohio	459	4.15	\$26,198	\$12,024,789
Oldham	685	4.66	\$28,995	\$19,861,275
Owen	221	3.96	\$26,069	\$5,761,327
Owsley	174	3.48	\$27,453	\$4,776,900
Pendleton	255	5.21	\$34,829	\$8,881,311
Perry	906	5.08	\$30,779	\$27,886,056
Pike	1,352	4.25	\$36,976	\$49,991,376
Powell	280	4.50	\$32,289	\$9,041,051
Pulaski	1,349	4.90	\$41,573	\$56,082,437
Robertson	38	4.13	\$32,403	\$1,231,315
Rockcastle	419	3.84	\$23,918	\$10,021,565
Rowan	529	3.70	\$30,493	\$16,130,991
Russell	367	4.39	\$33,582	\$12,324,615
Scott	533	4.05	\$29,094	\$15,507,080
Shelby	557	4.66	\$35,234	\$19,625,133

Simpson	326	5.65	\$22,847	\$7,448,197
Spencer	222	4.61	\$37,937	\$8,422,108
Taylor	524	4.79	\$33,264	\$17,430,546
Todd	126	3.83	\$17,562	\$2,212,776
Trigg	178	4.59	\$22,722	\$4,044,591
Trimble	146	4.63	\$32,333	\$4,720,651
Union	197	4.25	\$16,815	\$3,312,460
Warren	1,727	5.13	\$29,793	\$51,451,956
Washington	218	4.56	\$39,306	\$8,568,721
Wayne	397	4.01	\$33,873	\$13,447,745
Webster	252	4.07	\$24,638	\$6,208,683
Whitley	1,197	4.32	\$30,559	\$36,579,534
Wolfe	229	3.43	\$27,692	\$6,341,535
Woodford	314	4.17	\$30,150	\$9,467,225

Source: KDPH, 2009c

Appendix B: 2008 Heart disease hospitalization data by county

County	Number of hospitalizations	Average length of hospital stay (days)	Average charge per hospitalization	Total charges billed
Kentucky	63,313	4.50	\$32,185	\$2,037,748,816
Adair	443	4.55	\$30,127	\$13,346,076
Allen	333	5.35	\$29,443	\$9,804,634
Anderson	267	3.70	\$32,540	\$8,688,310
Ballard	112	4.45	\$25,914	\$2,902,337
Barren	711	4.53	\$25,585	\$18,190,889
Bath	272	4.05	\$28,460	\$7,741,158
Bell	618	4.18	\$20,239	\$12,507,588
Boone	1,217	4.60	\$34,191	\$41,610,192
Bourbon	292	3.72	\$23,600	\$6,891,304
Boyd	1,445	4.07	\$36,933	\$53,367,821
Boyle	405	4.03	\$28,402	\$11,502,688
Bracken	124	4.07	\$27,298	\$3,385,000
Breathitt	436	3.79	\$29,830	\$13,006,036
Breckinridge	262	5.36	\$39,843	\$10,438,784
Bullitt	661	5.57	\$48,074	\$31,776,776
Butler	204	5.58	\$31,351	\$6,395,591
Caldwell	143	4.30	\$22,394	\$3,202,395
Calloway	456	4.69	\$23,845	\$10,873,201
Campbell	1,146	4.88	\$32,694	\$37,466,819
Carlisle	133	4.45	\$26,572	\$3,534,041
Carroll	211	4.55	\$44,927	\$9,479,598
Carter	653	3.90	\$35,621	\$23,260,778
Casey	328	3.46	\$19,454	\$6,380,955
Christian	470	4.54	\$18,232	\$8,569,274
Clark	601	4.18	\$28,891	\$17,363,591
Clay	758	3.65	\$27,949	\$21,185,100
Clinton	225	3.97	\$17,075	\$3,841,972
Crittenden	249	3.93	\$16,375	\$4,077,352
Cumberland	195	4.03	\$17,720	\$3,455,425
Daviess	1,476	4.43	\$27,248	\$40,217,877
Edmonson	181	5.00	\$31,342	\$5,672,859
Elliott	111	2.61	\$32,175	\$3,571,381
Estill	252	4.09	\$31,148	\$7,849,387
Fayette	2,709	4.48	\$31,524	\$85,399,781
Fleming	378	4.14	\$23,879	\$9,026,276
Floyd	888	4.18	\$34,108	\$30,288,133
Franklin	805	3.68	\$32,054	\$25,803,570
Fulton	150	3.93	\$22,899	\$3,434,884
Gallatin	147	4.73	\$37,270	\$5,478,701
Garrard	207	4.22	\$35,242	\$7,295,082
Grant	361	4.64	\$35,398	\$12,778,568
Graves	669	4.40	\$24,739	\$16,550,232
Grayson	368	4.98	\$34,983	\$12,873,904
Green	159	4.42	\$29,679	\$4,718,954
Greenup	957	4.08	\$34,441	\$32,960,383
Hancock	129	3.95	\$31,115	\$4,013,879
Hardin	1,034	5.28	\$27,412	\$28,344,077
Harlan	789	3.48	\$22,259	\$17,562,554
Harrison	276	3.55	\$24,584	\$6,785,240
Hart	306	4.76	\$27,160	\$8,311,007

Henderson	426	4.33	\$20,007	\$8,523,177
Henry	281	4.40	\$33,272	\$9,349,403
Hickman	89	4.11	\$22,062	\$1,963,543
Hopkins	788	4.18	\$28,339	\$22,331,001
Jackson	290	4.02	\$31,896	\$9,249,869
Jefferson	9,486	5.42	\$41,571	\$394,342,217
Jessamine	461	4.56	\$31,498	\$14,520,431
Johnson	664	4.01	\$36,316	\$24,113,496
Kenton	1,713	4.54	\$32,356	\$55,425,197
Knott	344	4.81	\$34,671	\$11,926,708
Knox	544	4.06	\$35,753	\$19,449,739
Larue	152	5.26	\$28,268	\$4,296,737
Laurel	1,228	4.29	\$40,715	\$49,997,670
Lawrence	386	3.72	\$37,859	\$14,613,457
Lee	173	3.60	\$30,201	\$5,224,699
Leslie	351	4.37	\$28,112	\$9,867,243
Letcher	697	3.72	\$26,942	\$18,778,821
Lewis	174	3.97	\$33,995	\$5,915,045
Lincoln	427	3.68	\$29,829	\$12,737,130
Livingston	216	4.00	\$21,778	\$4,704,131
Logan	441	4.87	\$24,328	\$10,728,522
Lyon	111	5.17	\$25,241	\$2,801,781
McCracken	1,123	4.86	\$25,518	\$28,656,692
McCreary	197	5.02	\$43,484	\$8,566,374
McLean	182	4.24	\$30,408	\$5,534,264
Madison	969	3.62	\$24,187	\$23,436,777
Magoffin	379	3.72	\$30,983	\$11,742,624
Marion	229	4.10	\$40,372	\$9,245,222
Marshall	545	4.82	\$27,188	\$14,817,718
Martin	223	3.75	\$35,139	\$7,835,980
Mason	251	4.06	\$27,020	\$6,782,002
Meade	220	4.95	\$39,509	\$8,692,063
Menifee	139	3.84	\$30,720	\$4,270,109
Mercer	327	4.13	\$27,799	\$9,090,142
Metcalfe	235	4.90	\$30,275	\$7,114,573
Monroe	352	5.69	\$23,453	\$8,255,308
Montgomery	379	3.80	\$26,256	\$9,951,022
Morgan	298	4.10	\$33,789	\$10,069,035
Muhlenberg	433	3.86	\$27,732	\$12,008,163
Nelson	534	3.97	\$32,357	\$17,278,567
Nicholas	124	3.53	\$19,862	\$2,462,830
Ohio	367	4.08	\$27,992	\$10,273,192
Oldham	535	4.60	\$27,315	\$14,613,430
Owen	184	4.02	\$25,193	\$4,635,425
Owsley	144	3.19	\$26,775	\$3,855,596
Pendleton	208	5.41	\$35,349	\$7,352,679
Perry	694	5.17	\$31,556	\$21,900,024
Pike	1,084	4.13	\$36,476	\$39,540,110
Powell	213	4.21	\$30,449	\$6,485,713
Pulaski	1,005	4.71	\$43,547	\$43,764,761
Robertson	31	3.68	\$32,782	\$1,016,240
Rockcastle	335	3.39	\$22,400	\$7,503,943
Rowan	437	3.56	\$30,582	\$13,364,355
Russell	274	4.18	\$34,418	\$9,430,529
Scott	418	3.79	\$28,899	\$12,079,857
Shelby	430	4.15	\$31,496	\$13,543,370

Simpson	241	5.25	\$20,986	\$5,057,605
Spencer	164	4.70	\$36,916	\$6,054,165
Taylor	410	4.80	\$31,826	\$13,048,832
Todd	83	3.83	\$16,836	\$1,397,398
Trigg	114	4.67	\$24,284	\$2,768,414
Trimble	118	4.61	\$33,579	\$3,962,299
Union	145	4.05	\$16,312	\$2,365,250
Warren	1,316	5.14	\$30,077	\$39,581,338
Washington	162	4.27	\$39,017	\$6,320,699
Wayne	322	3.73	\$32,653	\$10,514,121
Webster	194	4.05	\$25,912	\$5,026,989
Whitley	946	4.31	\$31,442	\$29,744,484
Wolfe	187	3.44	\$27,177	\$5,082,159
Woodford	249	4.04	\$30,578	\$7,613,942

Source: KDPH, 2009c

Appendix C: 2008 Stroke hospitalization data by county

County	Number of hospitalizations	Average length of hospital stay (days)	Average charge per hospitalization	Total charges billed
Kentucky	10,542	5.06	\$27,850	\$293,596,207
Adair	62	5.32	\$36,034	\$2,234,112
Allen	56	6.68	\$28,059	\$1,571,310
Anderson	51	3.80	\$22,981	\$1,172,020
Ballard	23	3.65	\$19,164	\$440,779
Barren	104	4.79	\$27,749	\$2,885,923
Bath	43	5.21	\$26,582	\$1,143,031
Bell	75	5.16	\$20,101	\$1,507,575
Boone	169	5.26	\$27,035	\$4,568,879
Bourbon	53	6.19	\$30,426	\$1,612,598
Boyd	173	4.14	\$21,140	\$3,657,270
Boyle	57	5.93	\$31,688	\$1,806,191
Bracken	23	4.78	\$18,176	\$418,045
Breathitt	47	4.17	\$25,559	\$1,201,280
Breckinridge	60	4.35	\$23,772	\$1,426,298
Bullitt	133	4.95	\$34,758	\$4,622,834
Butler	37	4.73	\$30,287	\$1,120,621
Caldwell	43	4.77	\$17,180	\$738,740
Calloway	97	4.51	\$12,924	\$1,253,580
Campbell	176	4.65	\$25,032	\$4,405,710
Carlisle	19	4.00	\$14,316	\$272,006
Carroll	41	4.66	\$32,646	\$1,338,475
Carter	86	3.94	\$22,467	\$1,932,133
Casey	37	5.89	\$36,048	\$1,333,785
Christian	155	5.64	\$22,602	\$3,503,299
Clark	81	5.32	\$31,245	\$2,530,855
Clay	58	5.38	\$31,186	\$1,808,775
Clinton	31	4.77	\$16,207	\$502,411
Crittenden	72	4.19	\$12,754	\$918,302
Cumberland	30	4.77	\$20,587	\$617,595
Daviess	238	4.44	\$19,889	\$4,733,631
Edmonson	22	5.55	\$29,753	\$654,569
Elliott	16	5.25	\$41,628	\$666,045
Estill	42	4.71	\$20,824	\$874,591
Fayette	467	5.28	\$30,084	\$14,049,429
Fleming	49	4.73	\$19,738	\$967,145
Floyd	108	5.09	\$27,481	\$2,967,990
Franklin	131	4.24	\$27,424	\$3,592,532
Fulton	22	3.86	\$17,330	\$381,249
Gallatin	14	5.71	\$33,737	\$472,320
Garrard	37	5.35	\$39,571	\$1,464,137
Grant	60	3.98	\$20,080	\$1,204,825
Graves	122	4.73	\$17,861	\$2,179,000
Grayson	80	3.91	\$24,260	\$1,940,775
Green	28	6.21	\$26,836	\$751,403
Greenup	121	4.21	\$23,733	\$2,871,693
Hancock	27	5.48	\$23,970	\$647,190
Hardin	221	5.00	\$23,364	\$5,163,390
Harlan	55	3.89	\$19,160	\$1,053,818
Harrison	63	4.67	\$23,973	\$1,510,302
Hart	43	5.93	\$27,940	\$1,201,406

Henderson	67	5.18	\$24,128	\$1,616,553
Henry	52	4.88	\$24,410	\$1,269,313
Hickman	9	4.22	\$18,848	\$169,636
Hopkins	152	4.15	\$22,072	\$3,354,917
Jackson	33	7.33	\$37,353	\$1,232,651
Jefferson	1,992	5.54	\$35,338	\$70,393,345
Jessamine	89	4.46	\$25,212	\$2,243,891
Johnson	50	4.68	\$27,256	\$1,362,805
Kenton	221	5.46	\$27,049	\$5,977,882
Knott	33	7.39	\$36,641	\$1,209,165
Knox	65	5.14	\$30,094	\$1,956,085
Larue	39	4.56	\$25,554	\$996,599
Laurel	129	5.37	\$29,075	\$3,750,645
Lawrence	31	4.42	\$25,249	\$782,709
Lee	19	3.42	\$20,669	\$392,718
Leslie	48	5.85	\$31,839	\$1,528,265
Letcher	88	6.20	\$39,271	\$3,455,840
Lewis	30	3.67	\$23,352	\$700,569
Lincoln	69	4.55	\$21,407	\$1,477,054
Livingston	44	3.30	\$11,579	\$509,461
Logan	84	4.31	\$22,853	\$1,919,630
Lyon	31	6.48	\$18,284	\$566,792
McCracken	259	5.04	\$19,615	\$5,080,381
McCreary	30	4.23	\$28,453	\$853,601
McLean	34	3.68	\$17,134	\$582,541
Madison	182	4.37	\$23,422	\$4,262,890
Magoffin	29	5.17	\$26,655	\$773,005
Marion	40	5.88	\$44,967	\$1,798,684
Marshall	143	4.63	\$16,274	\$2,327,179
Martin	22	4.95	\$30,872	\$679,189
Mason	46	4.76	\$19,168	\$881,727
Meade	57	5.46	\$32,892	\$1,874,827
Menifee	13	2.85	\$31,497	\$409,457
Mercer	56	4.54	\$26,728	\$1,496,762
Metcalfe	24	5.25	\$32,491	\$779,781
Monroe	53	4.57	\$11,762	\$623,410
Montgomery	62	5.92	\$33,772	\$2,093,880
Morgan	32	4.78	\$23,118	\$739,760
Muhlenberg	79	3.95	\$18,162	\$1,434,806
Nelson	82	4.23	\$32,784	\$2,688,317
Nicholas	10	4.90	\$18,907	\$189,073
Ohio	60	4.87	\$19,330	\$1,159,819
Oldham	106	5.16	\$34,367	\$3,642,926
Owen	20	4.20	\$27,797	\$555,932
Owsley	12	4.33	\$26,978	\$323,738
Pendleton	27	4.41	\$25,566	\$690,278
Perry	108	5.13	\$26,804	\$2,894,871
Pike	144	5.60	\$39,944	\$5,751,936
Powell	42	6.40	\$39,760	\$1,669,902
Pulaski	206	5.21	\$29,129	\$6,000,530
Robertson	3	5.33	\$38,021	\$114,064
Rockcastle	50	5.24	\$22,215	\$1,110,745
Rowan	56	4.07	\$23,308	\$1,305,244
Russell	54	5.13	\$28,458	\$1,536,710
Scott	59	5.80	\$33,429	\$1,972,288
Shelby	89	6.04	\$42,518	\$3,784,093

Simpson	44	8.86	\$33,661	\$1,481,093
Spencer	31	4.58	\$33,777	\$1,047,083
Taylor	84	5.25	\$36,143	\$3,036,050
Todd	27	3.11	\$12,891	\$348,051
Trigg	25	3.28	\$12,431	\$310,781
Trimble	15	4.00	\$22,241	\$333,621
Union	36	5.17	\$17,586	\$633,093
Warren	254	5.43	\$28,244	\$7,174,033
Washington	32	3.63	\$20,833	\$666,665
Wayne	50	5.84	\$41,750	\$2,087,501
Webster	32	3.41	\$16,385	\$524,313
Whitley	130	5.32	\$27,591	\$3,586,783
Wolfe	21	3.90	\$23,610	\$495,805
Woodford	39	5.03	\$26,425	\$1,030,590

Source: KDPH, 2009c

Appendix D

Body mass index (2008)	Not overweight or obese (BMI ≤ 25); overweight (BMI $>25 \leq 30$); or obese (BMI >30)
Physically inactive (2008)	During the past month, other than your regular job, did you participate in any physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise?
Fruit/vegetable servings (2007)	Consumed five or more servings of fruits or vegetables per day
Diabetes (2008)	Have you ever been told by a doctor that you have diabetes?
High blood pressure (2007)	Have you ever been told by a doctor, nurse, or other health professional that you have high blood pressure?
High cholesterol (2007)	Have you ever been told by a doctor, nurse, or other health professional that your blood cholesterol is high?
Current smoker (2008)	Adults who are current smokers
Heart attack signs and symptoms (2004)	<p>Do you think pain or discomfort in the jaw, neck, or back is a symptom of a heart attack?</p> <p>Do you think feeling weak, lightheaded, or faint is a symptom of a heart attack?</p> <p>Do you think chest pain or discomfort is a symptom of a heart attack?</p> <p>Do you think pain or discomfort in the arms or shoulder is a symptom of a heart attack?</p> <p>Do you think shortness of breath is a symptom of a heart attack?</p>
Stroke signs and symptoms (2004)	<p>Do you think sudden confusion or trouble speaking is a symptom of a stroke?</p> <p>Do you think sudden numbness or weakness of face, arm, or leg, especially on one side, is a symptom of a stroke?</p> <p>Do you think sudden trouble seeing in one or both eyes is a symptom of a stroke?</p> <p>Do you think sudden trouble walking, dizziness, or loss of balance is a symptom of a stroke?</p> <p>Do you think severe headache with no known cause is a symptom of a stroke?</p>
Heart attack or stroke symptoms (2004)	If you thought someone was having a heart attack or stroke, what is the first thing you would do?

Data Source: BRFSS

Appendix E

Body mass index (2007)	Percentage of high school students who were obese and who were overweight (Table 82 and 83)
Physically inactive (2007)	Percentage of high school students who met recommended levels of physical activity and who did not participate in 60 or more minutes of physical activity on any day (Table 74 and 75) glasses/day of milk (Table 70 and 71)
Fruit/vegetable servings (2007)	Percentage of high school students who are fruits and vegetables five or more times/day (Table 70 and 71)
At risk for diabetes (2003)	Have you ever been told by a doctor or health care professional that you were at risk for getting diabetes?
Current smoking (2007)	Percentage of high school students who currently smoked cigarettes (Table 27 and 28)

Data source: Eaton et. al., 2007