

THE MARYLAND BURDEN OF
Heart DISEASE
AND STROKE



Maryland Department of Health & Mental Hygiene
Family Health Administration
Office of Chronic Disease Prevention

2009 Data Review

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EXECUTIVE SUMMARY

Heart disease and stroke are the numbers one and three causes of death for Maryland residents. The public health impact of heart disease and stroke is substantial, both in terms of disease burden and cost. In 2008, an estimated \$1.2 billion of adult medical expenditures in Maryland were attributable to heart disease and stroke (Maryland Health Services Cost Review Commission). Coronary heart disease (angina or/and heart attack) and stroke are linked to higher prevalence rates, high hospitalization rates, and high mortality. Controlling risk factors such as high blood pressure, high blood cholesterol and diabetes play an important role in heart disease and stroke prevention. In 2008, over half (63.4%) of Maryland residents were overweight and obese and high blood pressure was a common co-occurring condition among residents who have experienced heart attack or stroke (Maryland BRFSS).

SPECIAL POPULATIONS

It was estimated from 2005 to 2008 that heart disease and stroke affected certain segments of the population disproportionately based on race and ethnicity, gender, age, and education and income levels.

- Angina and heart attack were most prevalent among white males.
- The prevalence of coronary heart disease has increased the most among white males and black females.
- Coronary heart disease and stroke were most prevalent among Maryland adults aged 55 and over, with a lower household income (\$15k-25k), and with less education.
- Black Marylanders had almost twice the age-adjusted hospital discharge rate for heart failure, non-specific chest pain, and stroke than white Marylanders.
- Black Marylanders had nearly 5-6 times the hypertension rate of white Marylanders.
- Black males experienced the highest levels of age-adjusted death associated with coronary heart disease, hypertensive heart disease and stroke.

Data sources, disease definitions and disease diagnosis can be found in Appendix A-C (pp29-32).

RECOMMENDATIONS

This Burden Report is released in conjunction with the Maryland Heart Disease and Stroke Prevention and Control Plan (The 5 Year Plan), a joint publication of the Maryland Department of Health and Mental Hygiene and the Governor's Heart Disease and Stroke Prevention Council. The five year Plan identifies specific recommendations, activities and partners to improve the morbidity and mortality associated with cardiovascular disease and stroke in Maryland.

Sources utilized in this report include data from the Behavioral Risk Factor Surveillance System (BRFSS), the Maryland Health Services Cost Review Commission and the Maryland Vital Statistics Administration.

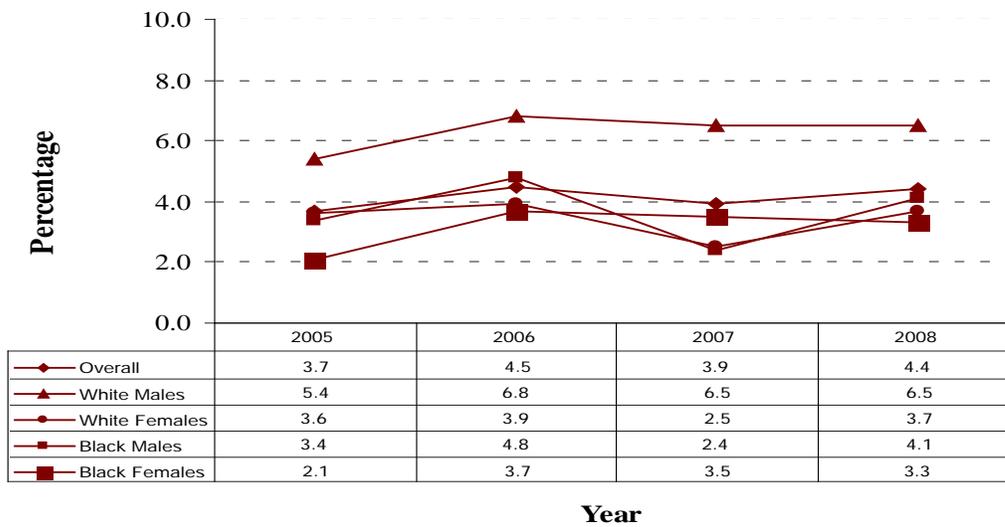
BURDEN OF Heart DISEASE IN MARYLAND

Coronary Heart Disease Prevalence

This report discusses prevalence as it refers to coronary heart disease (angina or/and heart attack) as defined by the Maryland Behavior Risk Factor Surveillance System (Maryland BRFSS, 2005-2008, since 2009 is not available). This section highlights differences in coronary heart disease prevalence based on race and ethnicity, gender, age, education and income levels from 2005 to 2008.

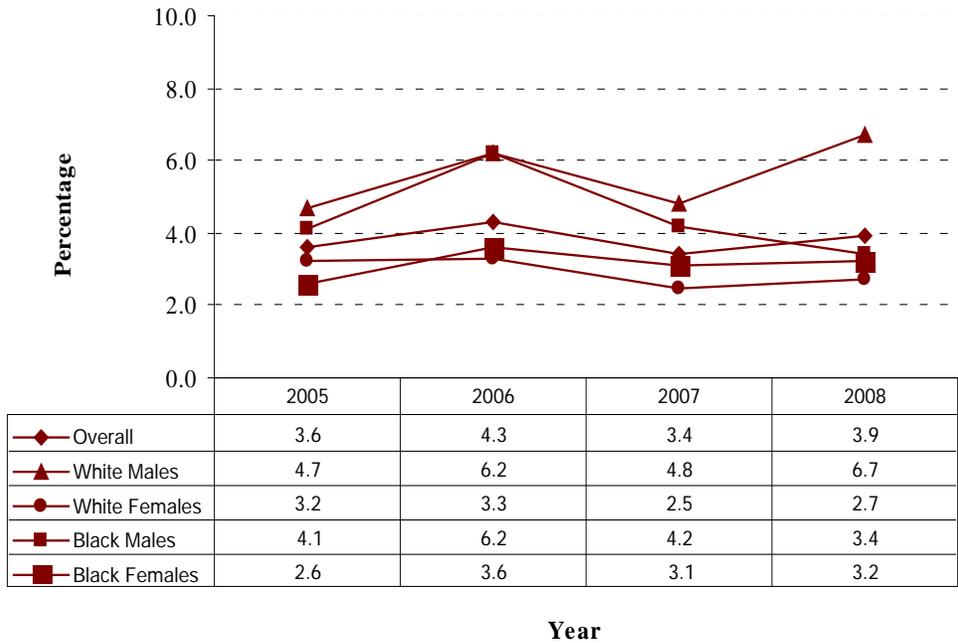
The overall prevalence of angina in Maryland has increased from 3.7 percent in 2005 to 4.4 percent in 2008 (Figure 1). Prevalence remains highest in white males (6.5 percent) and lowest in black females (3.3 percent, Figure 1).

Figure 1. Prevalence of Angina in Maryland, Overall and by Gender/Race, 2005-2008
Source: Maryland BRFSS



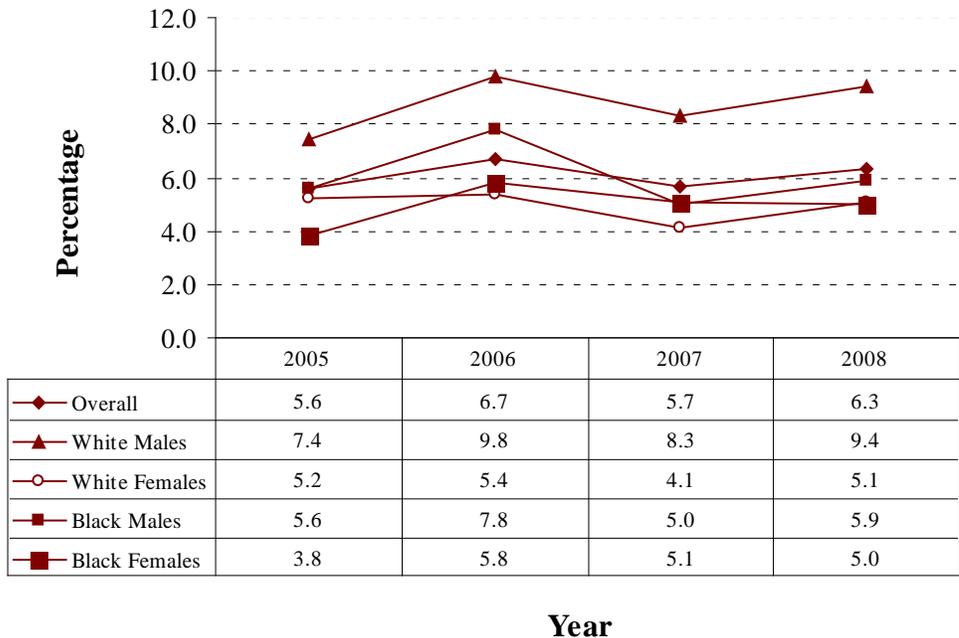
Prevalence of heart attack in Maryland has increased overall and across all races/genders from 2005 to 2008 (Figure 2) with the exception of white females and black males. The prevalence of heart attack for white males increased from 4.7 percent in 2005 to 6.7 percent in 2008 (Figure 2).

Figure 2. Prevalence of Heart Attack in Maryland, Overall and by Gender/Race, 2005-2008
Source: Maryland BRFS



Coronary heart disease prevalence in Maryland was the highest among white males, and increased from 7.4 percent in 2005 to 9.4 percent in 2008 (Figure 3). Prevalence of coronary heart disease has also increased among black females, moving from 3.8 percent in 2005 to 5 percent in 2008 (Figure 3).

Figure 3. Prevalence of Coronary Heart disease in Maryland, Overall and by Gender/Race, 2005-2008
Source: Maryland BRFS

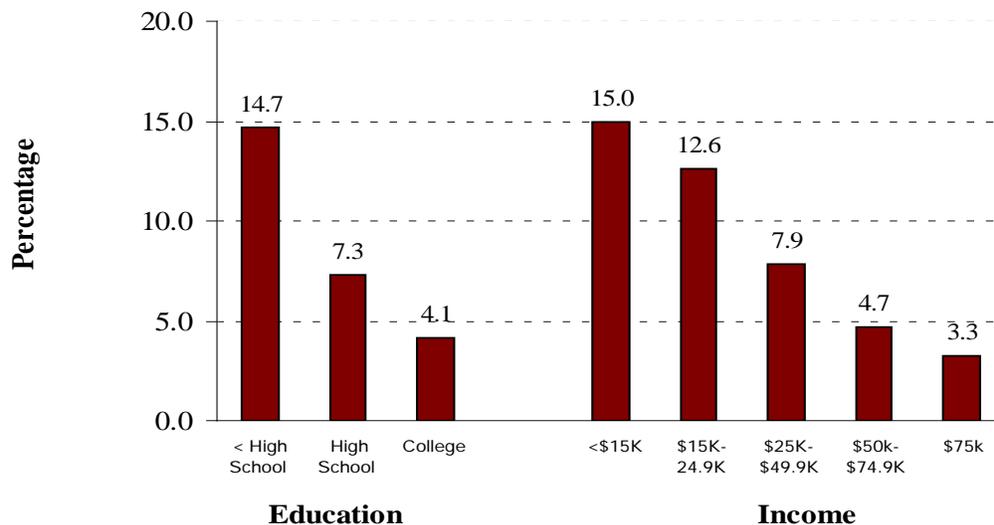


Maryland residents ages 55 and over comprised the highest prevalence of coronary heart disease from 2005 to 2008 (Figure 4). Residents with less than a high school education experiences more than three times the prevalence of heart disease (14.7 percent) compared to those that attained a college level education (4.1 percent). The prevalence of coronary heart disease decrease as income level increases. Maryland residents earning less than \$25,000 per year experience almost four times the prevalence of coronary heart disease than those making more than \$75,000 per year (Figure 5). In 2005-2008, the Somerset county had the highest prevalence of heart attack, three times the state average prevalence at 3.8% (Map 1) and Allegany county had the highest prevalence of angina (9%) and twice the state average prevalence at 4.1% (Map 2).

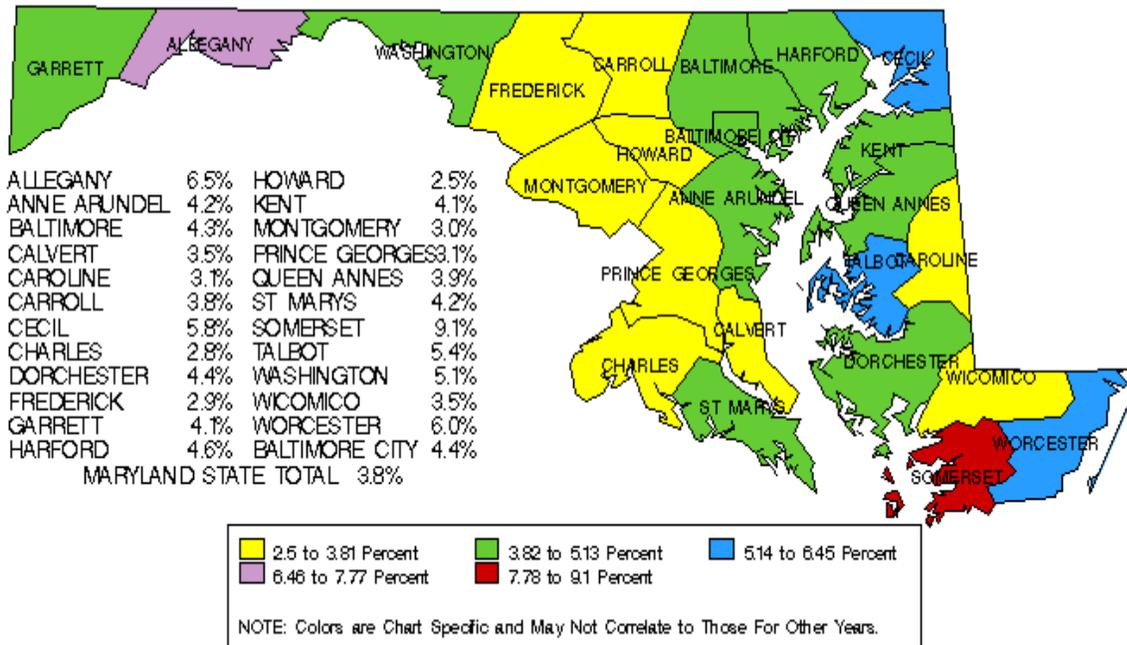
Figure 4. Prevalence of Coronary Heart Disease in Maryland by Age, 2005-2008 (4 Year Average)
Source: Maryland BRFSS



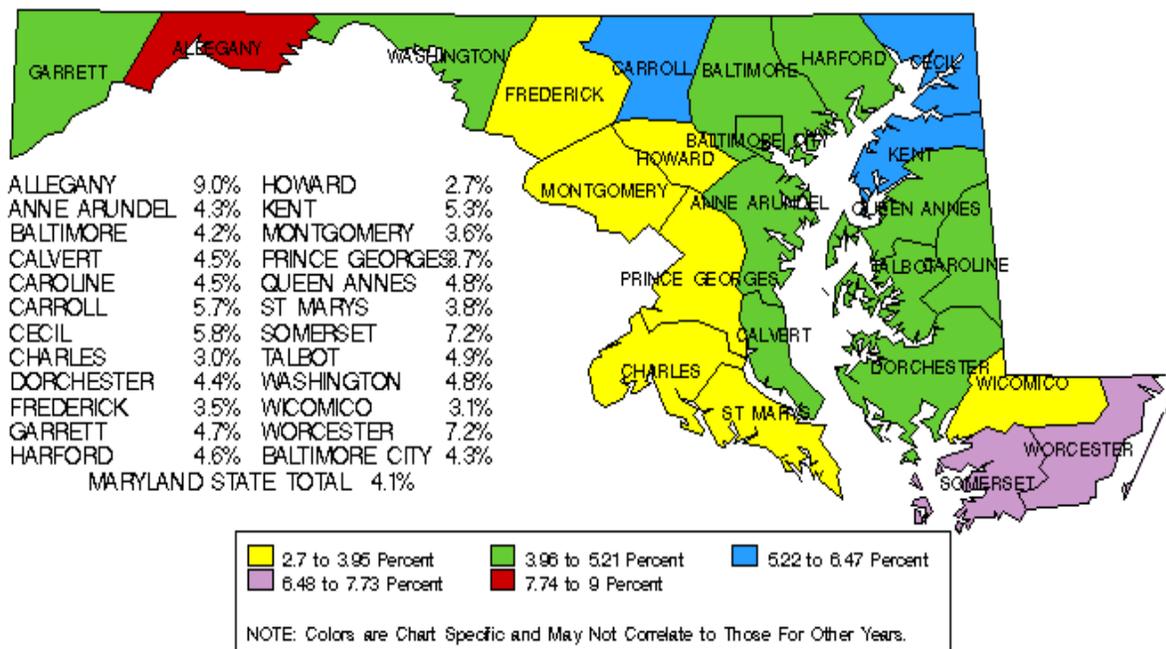
Figure 5. Prevalence of Coronary Heart Disease in Maryland, by Education and Income, 2005-2008 (4 Year Average)
Source: Maryland BRFSS



Map 1. Percent of Residents Ever Told by a Doctor They Had a Heart Attack (Myocardial Infarction), 2005-2008 (4 Year Average)
Source: Maryland BRFS



Map 2. Percent of Residents Ever Told by a Doctor They Had Angina, 2005-2008 (4 Year Average)
Source: Maryland BRFS



Heart Disease Mortality

Of all types of heart disease, coronary heart disease had the highest mortality in Maryland (Figure 6a). The overall age-adjusted death rate attributable to coronary heart disease has declined between 2005 and 2008 from 166.5 to 147.1 deaths per 100,000 population. The largest reduction took place among white females and black females (Figure 6b). The age-adjusted death from coronary heart disease is disproportionately highest among black males at 239.3 (Figure 6b). In 2008, Seven of Maryland’s twenty-four jurisdictions had mortality of coronary heart disease that were above the Healthy People 2010 goal of reducing age-adjusted death rate associated with coronary heart disease to 166 per 100,000 populations (Table 1).

Black males had the highest mortality of hypertensive heart disease (Figure 6c). Age-adjusted death rate of heart failure in both white and black have declined between 2005 and 2008 (Figure 6d)

Figure 6a. Age-adjusted Death Rates for Heart Disease in Maryland, 2005 – 2008
Source: Maryland Vital Statistics Administration/MATCH

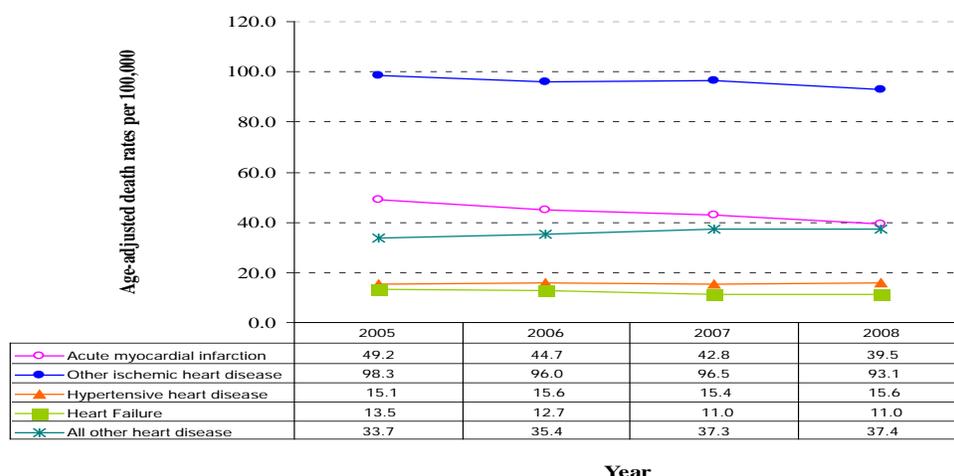


Figure 6b. Age-adjusted Death Rates for Coronary Heart Disease in Maryland, Overall and by Race and Gender, 2005 – 2008; Source: Maryland Vital Statistics Administration

Table 1. Crude and Age-adjusted Death Rates for Coronary Heart Disease in Maryland by County, 2008, Source: Maryland Vital Statistics Administration/MATCH

Region	Crude rate per 100, 000 population	Age-adjusted death rate per 100,000 population
Maryland	151.8	147.1
Allegany	307.6	206.3
Anne Arundel	131.4	145.5
Baltimore County	186.4	146.3
Calvert	143.8	174.3
Caroline	196.9	177.6
Carroll	141.5	136.7
Cecil	167.7	173.1
Charles	96.6	136.0
Dorchester	249.7	153.0
Frederick	129.3	143.8
Garrett	191.9	138.0
Harford	144.2	155.1
Howard	99.3	130.7
Kent	249.1	142.8
Montgomery	105.8	93.7
Prince George's	134.1	174.7
Queen Anne's	139.5	138.0
St. Mary's	115.3	142.6
Somerset	248.3	224.0
Talbot	252.8	129.1
Washington	188.1	155.5
Wicomico	235.5	200.9
Worcester	293.8	164.9
Baltimore City	213.5	200.2

Figure 6c. Age-adjusted death rates for Hypertensive Heart Disease in Maryland by Race and Gender, 2005-2008

Source: Maryland Vital Statistics Administration/MATCH

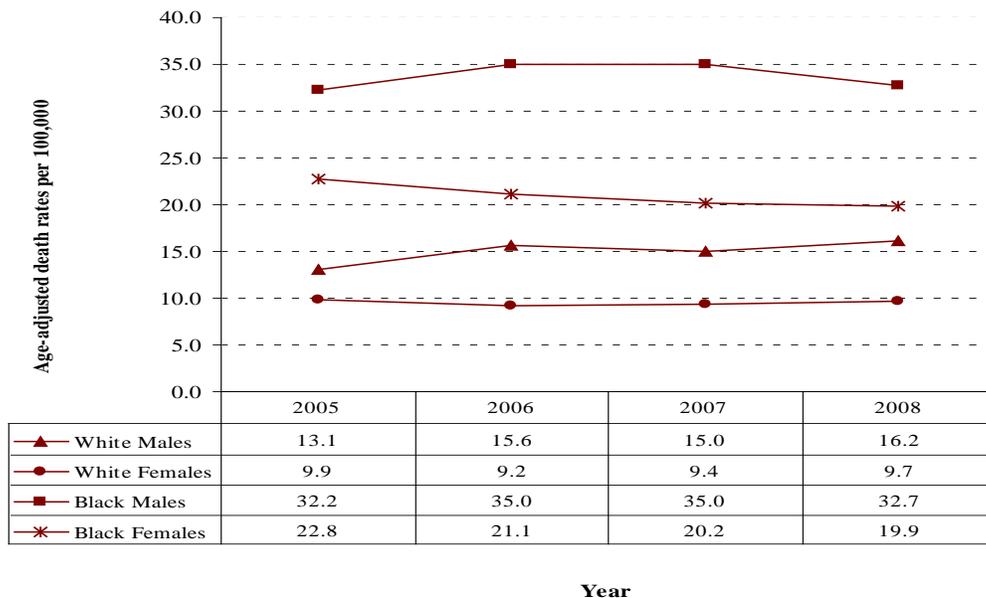
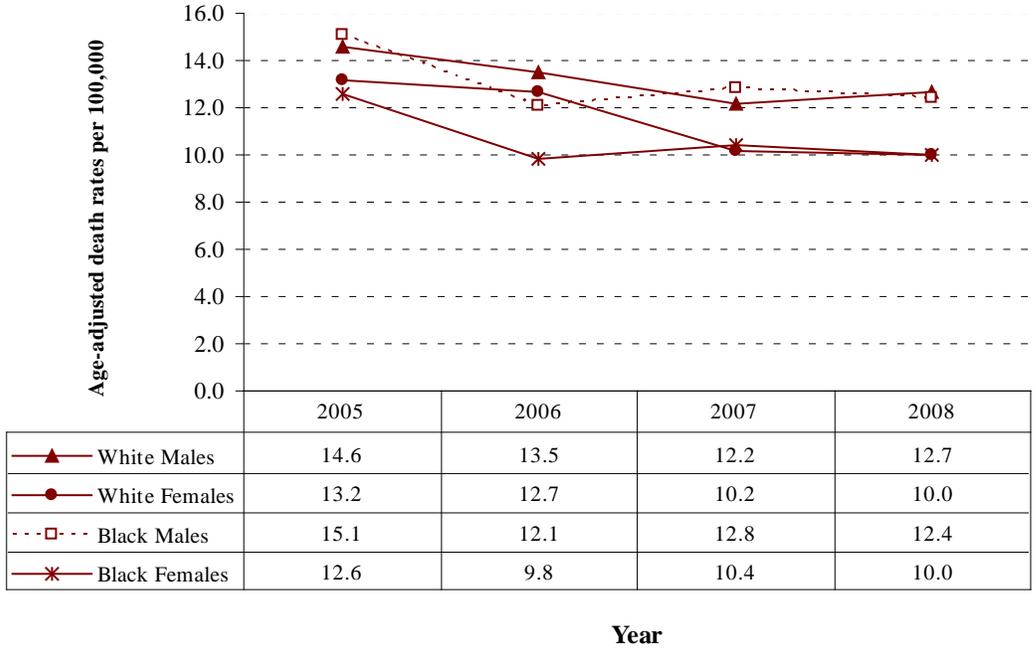


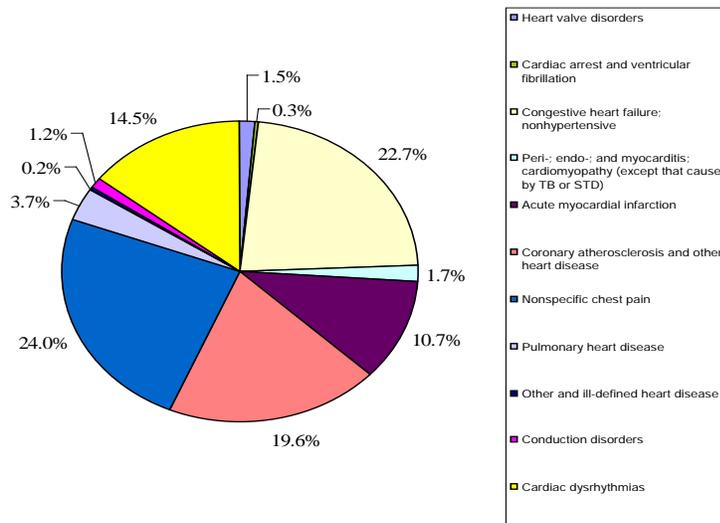
Figure 6d. Age-adjusted Death Rates for Heart Failure in Maryland by Race and Gender, 2005-2008
 Source: Maryland Vital Statistics Administration/MATCH



Heart Disease Hospital Data

In 2008, coronary atherosclerosis and other heart disease contributed to 19.6 percent of hospital discharges for heart disease while acute myocardial infarctions accounted for 10.7 percent (Figure 7). Non-specific chest pain constituted 24 percent and non-hypertensive congestive heart failure did 22.7 percent of hospital discharges for heart disease (Figure 7).

Figure 7. Percentage of Hospital Discharges for Heart Disease 2008
Source: Maryland Health Services Cost Review Commission/MATCH



Age-adjusted hospital discharge rate from total coronary heart disease (including heart attack) and heart failure have declined 30-60 per 100,000 population except nonspecific chest pain (Figure 8). Nonspecific chest pain made up a largest proportion of heart disease related hospital discharges at 354 per 100,000 population in 2008, and have increased from 314 (2005) to 354 (2008) per 100,000 population (Figure 8). White adults with coronary heart disease had the highest age-adjusted hospital discharge rate from 2005 to 2008 (Figure 9a). Black adults had almost twice the age-adjusted hospitalization rate for heart failure (Figure 9b) and nonspecific chest pain (Figure 9d), and nearly 5-6 times the rate of hypertension than white adults (Figure 9c). In 2005-2008, the lower Eastern Shore area exhibited the highest hospital discharge rates from coronary heart disease.

Figure 8. Age-adjusted Hospital Discharge Rate from Heart Disease, Overall, 2005-2008
Source: Maryland Health Services Cost Review Commission/MATCH

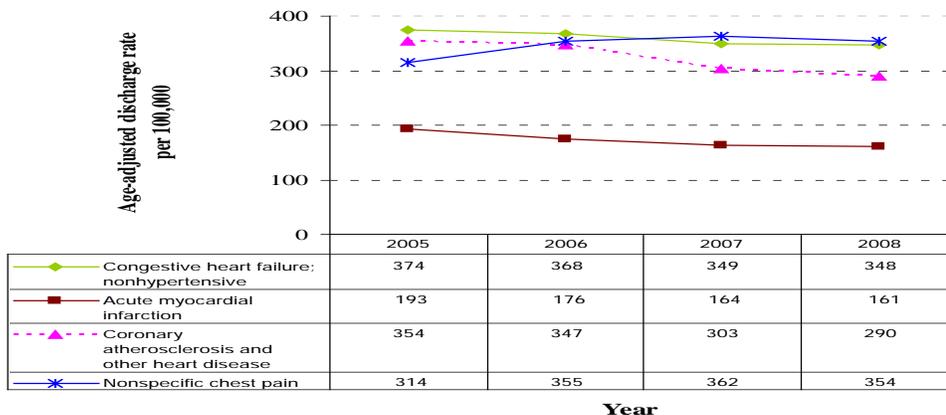


Figure 9a. Age-adjusted Hospital Discharge Rate from Angina (Coronary Heart Disease) in Maryland by Race and Gender, 2005-2008
 Source: Maryland Health Services Cost Review Commission/MATCH

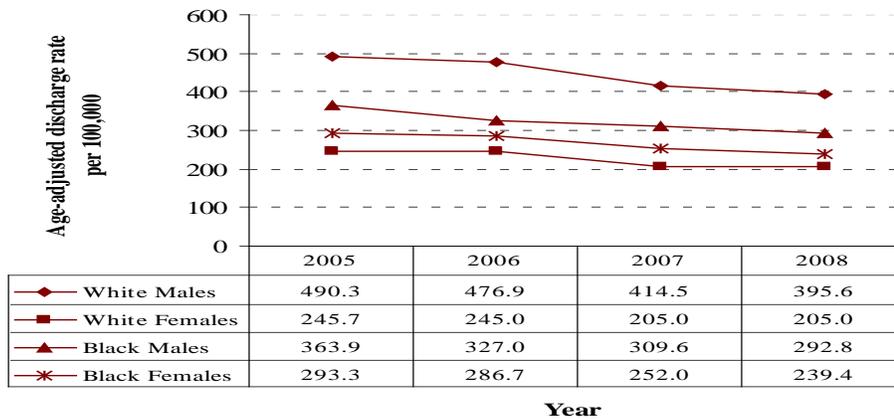


Figure 9b. Age-adjusted Hospital Discharge Rate from Heart Failure in Maryland by Race and Gender, 2005-2008
 Source: Maryland Health Services Cost Review Commission/MATCH

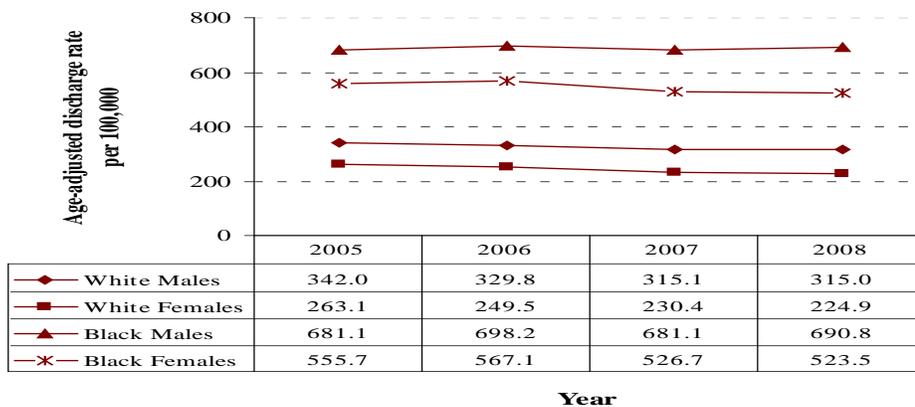


Figure 9c. Age-adjusted Hospital Discharge Rate from hypertension in Maryland by Race and Gender, 2005-2008
 Source: Maryland Health Services Cost Review Commission/MATCH

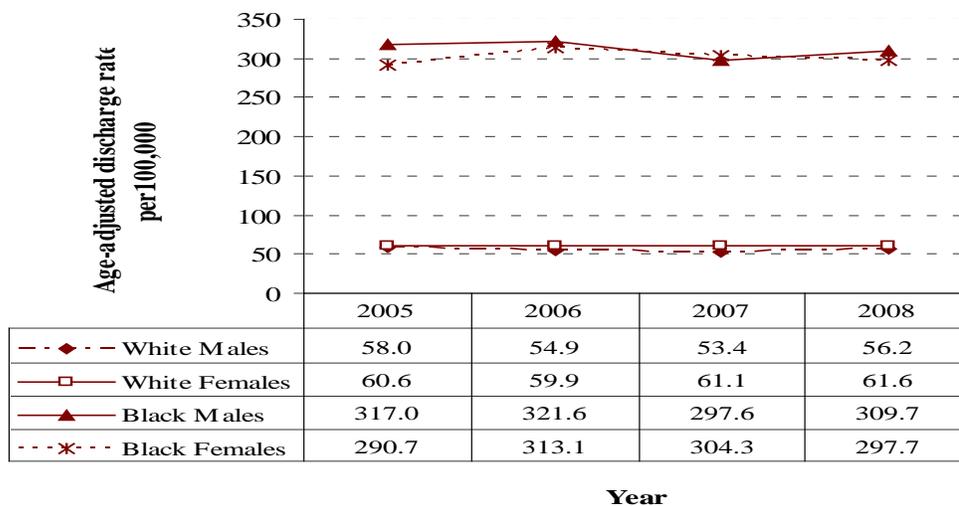
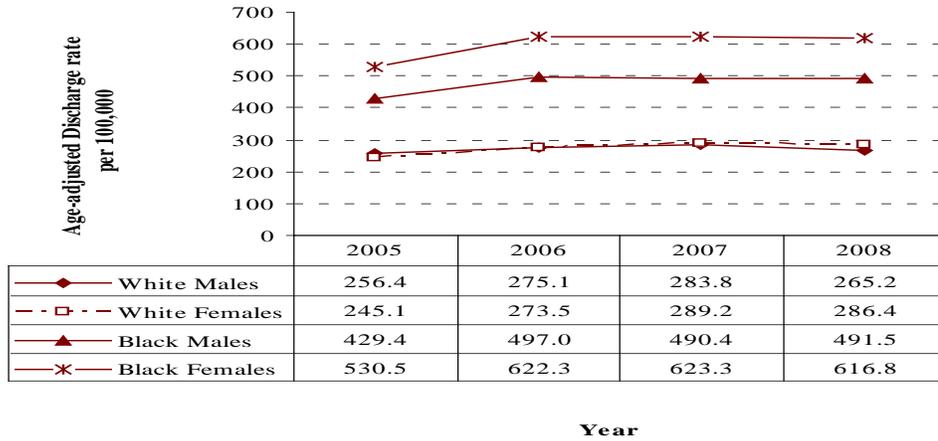


Figure 9d. Age-adjusted Hospital Discharge Rate from Non-Specific Chest Pain in Maryland by Race and Gender, 2005-2008
 Source: Maryland Health Services Cost Review Commission/MATCH



Heart disease accounted for \$1 billion of hospital expenses in 2008, almost half of which (\$428 million) were due to coronary heart disease. The leading heart disease related hospital discharge costs from 2005 through 2008 were coronary atherosclerosis, non-hypertensive congestive heart failure and acute myocardial infarction (Figure 10a). Heart valve disorders remain the highest average hospital discharge cost of heart diseases (Figure 10b).

Figure 10a. Annual Total Cost of Hospital Charges for Heart Disease in Maryland, 2005 - 2008
 Source: Maryland Health Services Cost Review Commission/MATCH

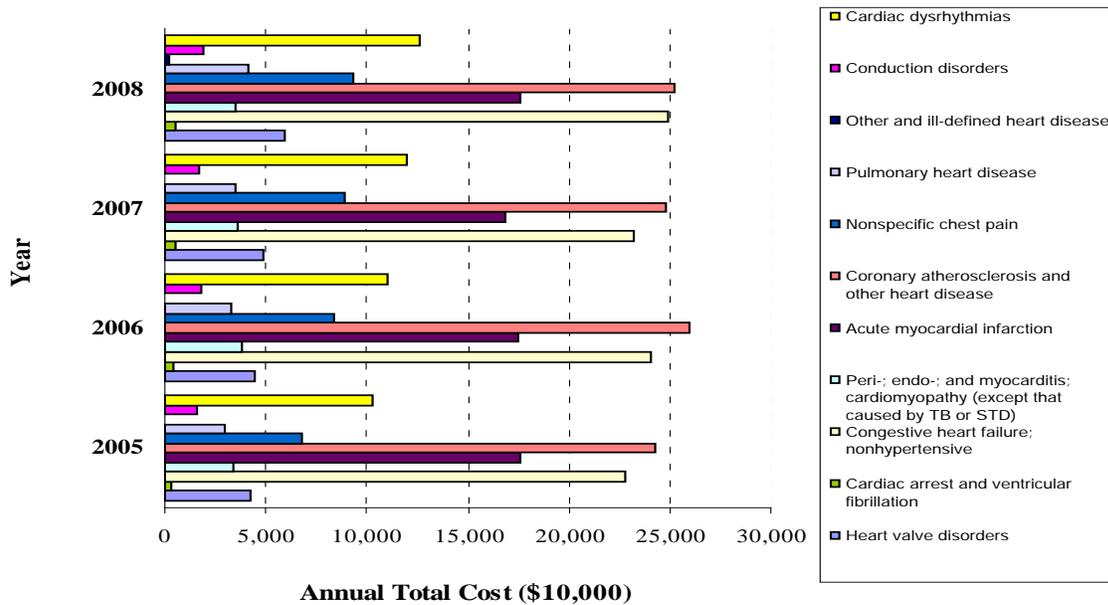
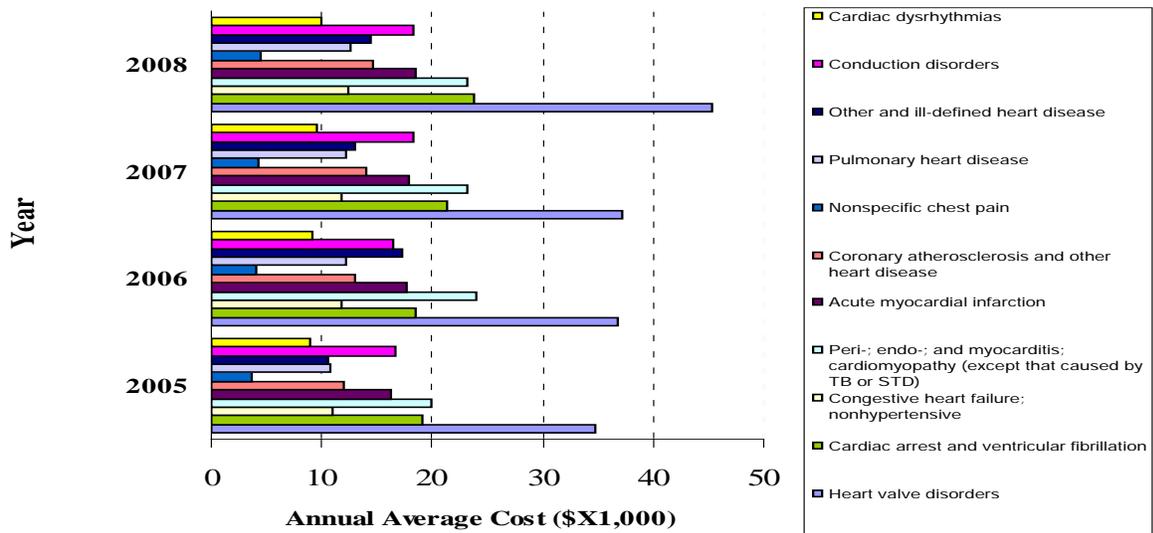


Figure 10b. Annual Average Cost of Hospital Charges for Coronary Heart Disease in Maryland, 2005 - 2008

Source: Maryland Health Services Cost Review Commission/MATCH

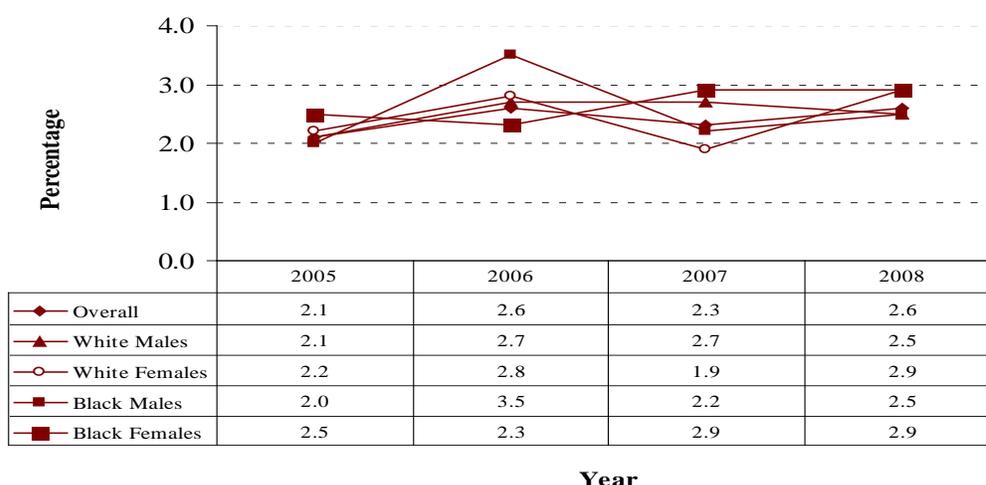


BURDEN OF STROKE IN MARYLAND

Stroke Prevalence

This section highlights differences in stroke (cerebrovascular disease) prevalence based on race and ethnicity, gender, age, education and income levels. The prevalence of stroke in Maryland has varied slightly from 2005 to 2008 with the overall prevalence moving from 2.1 percent in 2005 to 2.6 percent in 2008 (Figure 11). 2008 prevalence indicates that women have a slightly higher prevalence of stroke than men at 2.9 percent (Figure 11).

Figure 11. Prevalence of Stroke in Maryland, Overall and by Race and Gender 2005-2008
Source: Maryland BRFSS



Maryland residents ages 65 and over have the highest prevalence of stroke at 6.2 percent, almost two times higher than residents ages 55 to 64 (Figure 12). Stroke prevalence increases among Maryland residents as the level of education decreases. Maryland residents with less than a high school education have twice the prevalence of stroke than residents with a high school education, and more than four times the prevalence of those with a college education (Figure 13). The same is true for income. Stroke prevalence is the highest among those residents earning the least. Maryland residents earning between \$15,000 and \$24,900 per year experience prevalence of stroke three times higher than residents earning \$50,000 or more per year (Figure 13).

Figure 12. Prevalence of Stroke in Maryland, by Age 2005-2008
Source: Maryland BRFSS

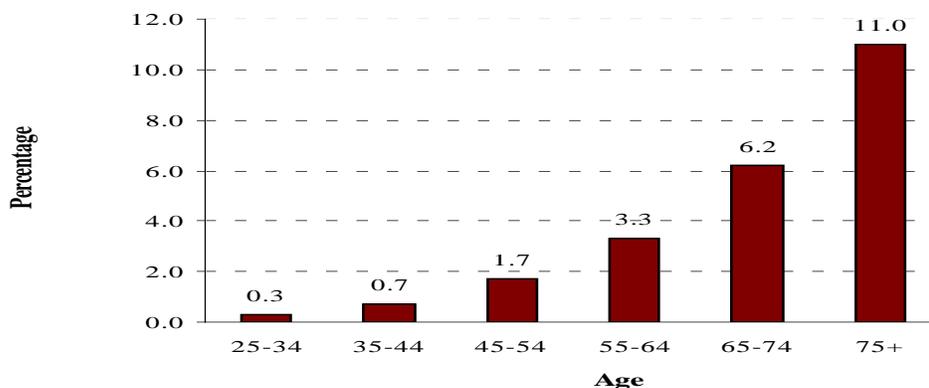
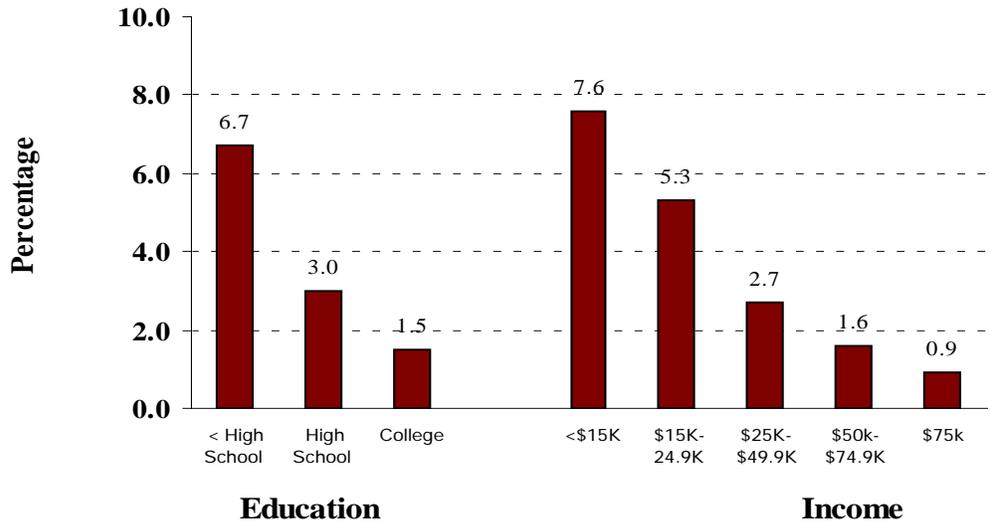
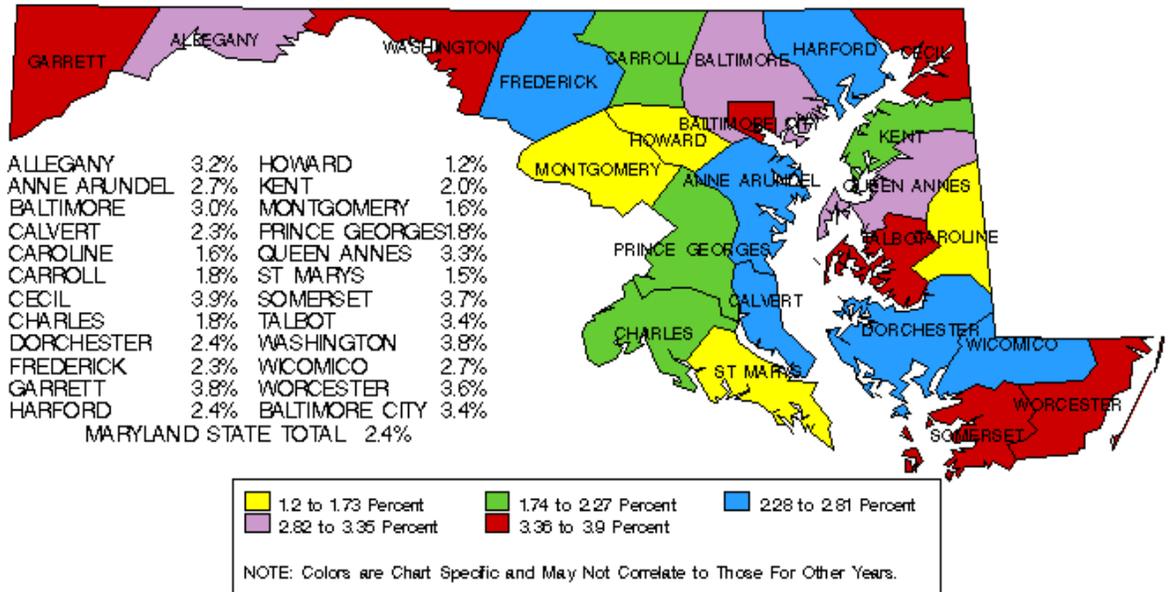


Figure 13. Prevalence of Stroke in Maryland, by Education and Income 2005-2008
Source: Maryland BRFS



The following map graphically represents, by county, the distribution of Maryland residents who have been told by a doctor they have had a stroke. Cecil had the highest prevalence of stroke (3.9%) in Maryland jurisdiction (Map 3).

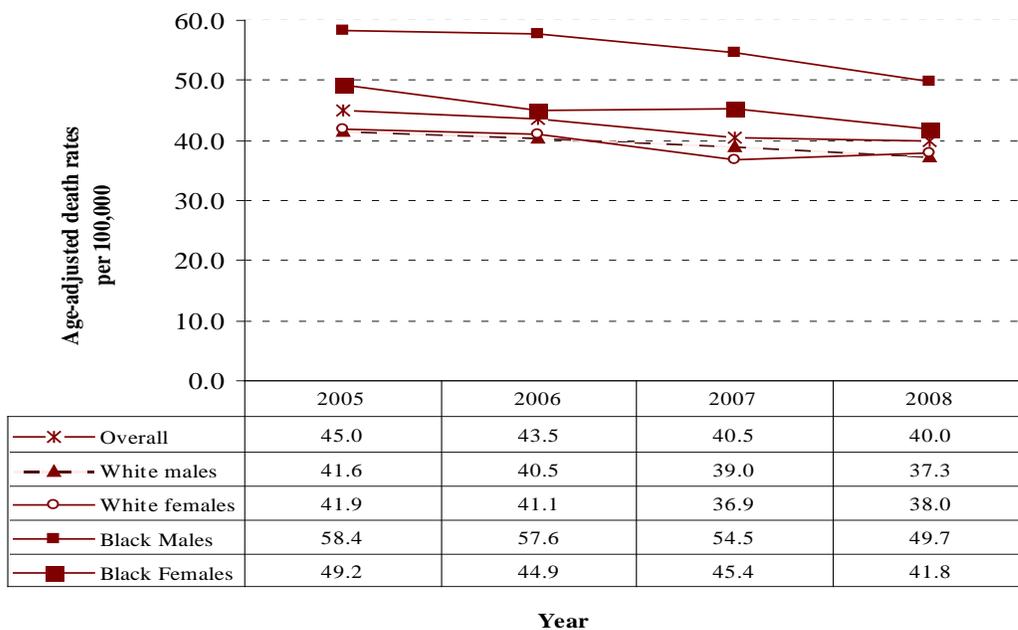
Map 3. Maryland Residents Ever Told by a Doctor They Had a Stroke 2005-2008 (4 Year Average)
Source: Maryland BRFS



Stroke Mortality

Stroke is the third leading cause of death in Maryland. The overall death rate attributable to stroke has declined from 2005 to 2008 from 45 to 40 deaths per 100,000 residents. Black males experienced the largest decline in stroke mortality across the four years from 58.4 to 49.7 deaths (Figure 14). Black females also experienced a higher decline in stroke deaths than white males and females moving from 49.2 in 2005 to 41.8 in 2008. In 2008, four of twenty-four Maryland's jurisdictions had death rates from stroke that were higher than Healthy people 2010 goal of resucing death rate associated with stroke to 48 per 100,000 populations (Table 2).

Figure 14. Maryland Age Adjusted Death Rates for Cerebrovascular Disease 2005-2008
Source: Maryland Vital Statistics Administration/MATCH



Map 4. Comparison of County Age Adjusted Death Rates for Stroke to the Maryland Average, 2006-2008
Source: Maryland Vital Statistics Administration

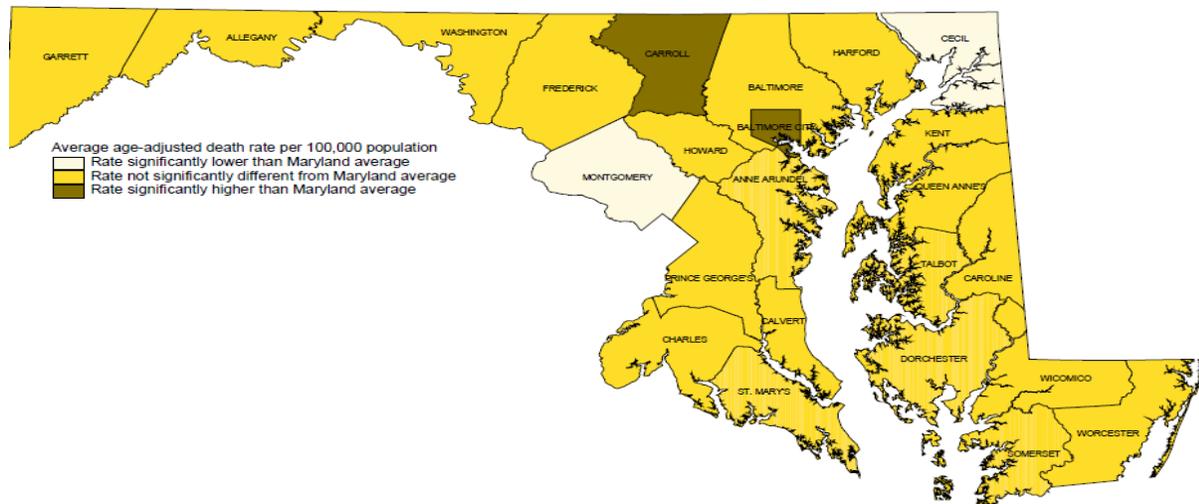


Table 2. Crude and Age Adjusted Death Rate for Stroke by County, 2008
Source: Maryland Vital Statistics Administration/MATCH

Region	Crude rate per 100,000 population	Age-adjusted death rate per 100,000 population
Maryland	39.9	40
Allegany	65.1	41.8
Anne Arundel	35.9	41.4
Baltimore County	57.5	44.6
Calvert	23.7	29.8
Caroline	33.2	*
Carroll	54.9	56.7
Cecil	26.0	28.7
Charles	30.5	49.7
Dorchester	78.1	50.3
Frederick	37.7	44.6
Garrett	70.7	50.2
Harford	33.3	38.7
Howard	30.2	43.1
Kent	49.6	*
Montgomery	33.8	31.4
Prince George's	25.7	33.8
Queen Anne's	53.1	51.8
St. Mary's	34.5	44.3
Somerset	19.1	*
Talbot	96.6	47.6
Washington	42.0	34.2
Wicomico	37.2	32.7
Worcester	54.8	31.4
Baltimore City	49.3	48

* Rates based on fewer than 20 deaths are not included.

Stroke Hospital Data

Acute stroke disease is the most common cerebrovascular disease related to Maryland hospital discharges in 2008 (55%), followed by transient cerebral ischemia (28%, Figure 15). The percent of hospital discharges of cerebral vascular disease for transient cerebral ischemia has increased 15% (Figure 16); acute stroke has decreased over the past three years; and occlusion or stenosis of the precerebral arteries has remained steady (Figure 16).

Figure 15. Maryland Percentage Hospital Discharges for Various Types of Cerebrovascular Disease, 2008

Source: Maryland Health Services Cost Review Commission/MATCH

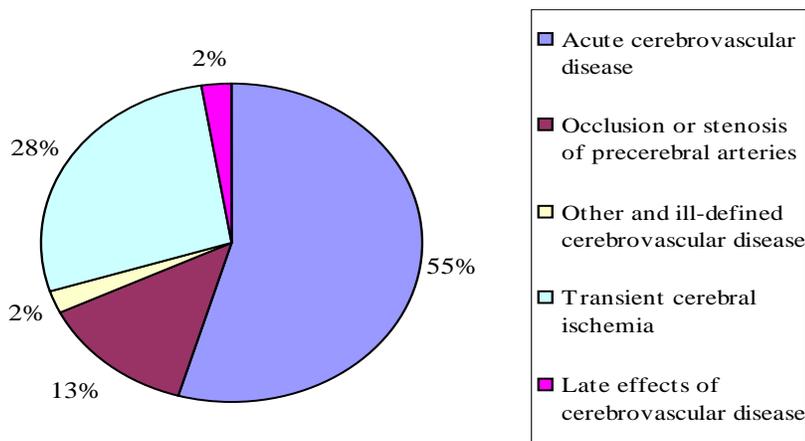
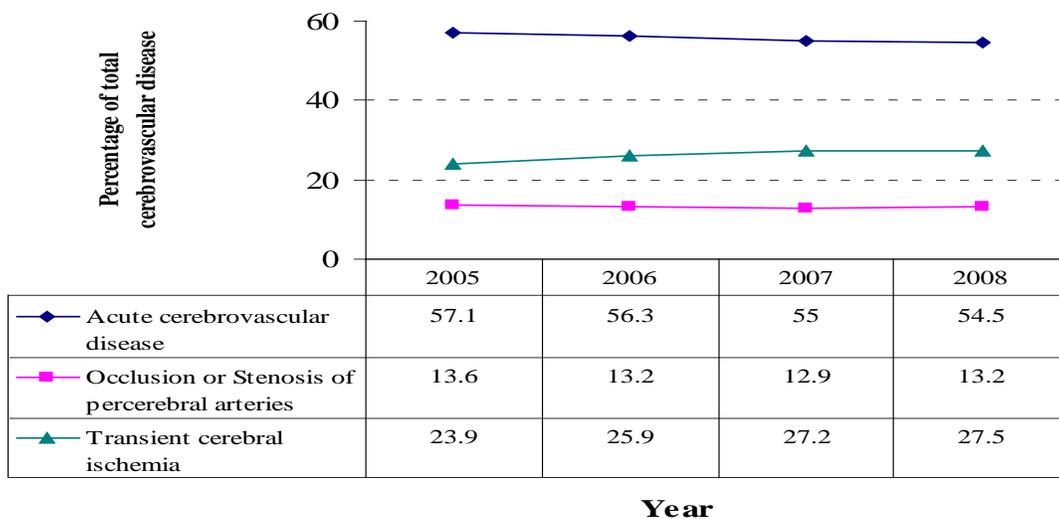


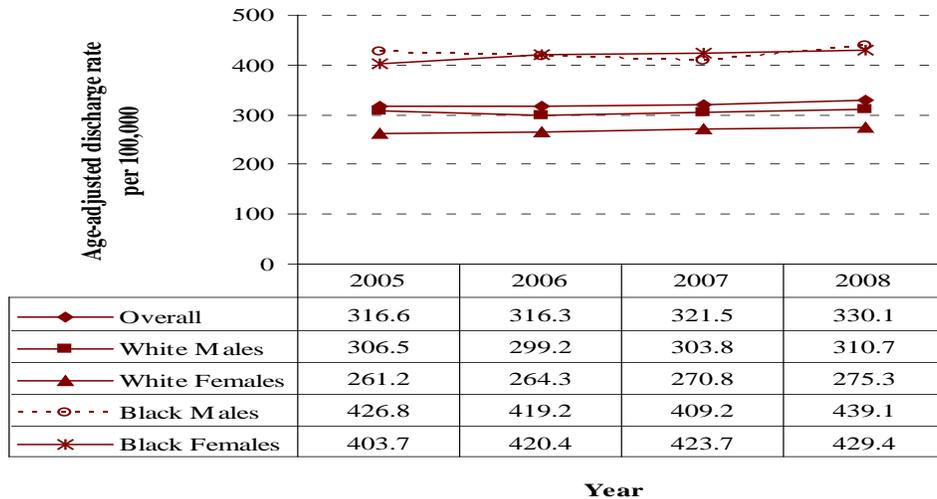
Figure 16. Maryland Percentage of Total Cerebrovascular Disease Hospital Discharges, 2005-2008

Source: Maryland Health Services Cost Review Commission/MATCH



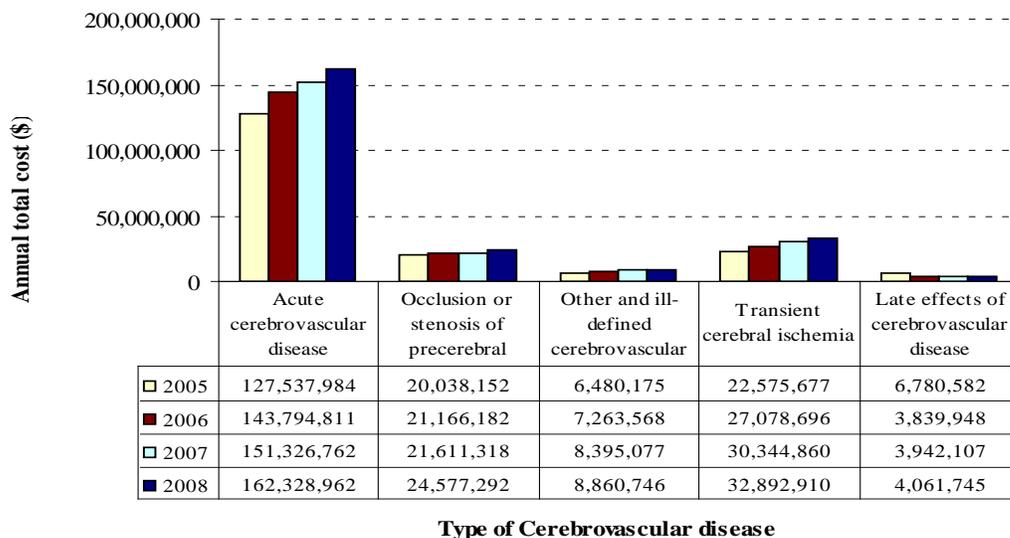
Although both genders experienced an increase of stroke hospitalization from 2005 to 2008, males have consistently higher rates than women (Figure 17). The age adjusted hospital discharge rate for strokes among black Marylanders is nearly twice as high as that of their white counterparts (Figure 17). In 2005-2008, the Lower Eastern Shore area exhibited the highest hospital discharge rates from strokes when compared to other areas in Maryland

Figure 17. Maryland Age Adjusted Hospital Discharge Rates for Cerebrovascular Disease Overall and by Gender, 2005-2008
Source: Maryland Health Services Cost Review Commission



Cerebrovascular disease accounted for \$230 million of Maryland hospital expenses in 2008. \$162 million were due to acute stroke and \$32 million to transient cerebral ischemia (Figure 18).

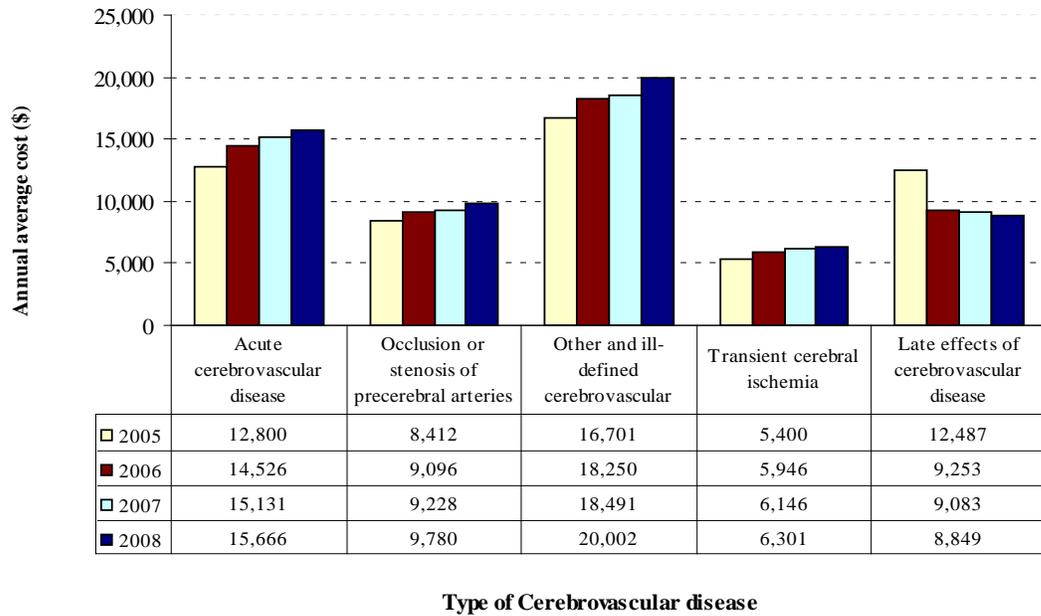
Figure 18. Annual Total Cost of Hospital Charges for Cerebrovascular Disease in Maryland, 2005 – 2008
Source: Maryland Health Services Cost Review Commission/MATCH



From 2005 - 2008 average hospital charges associated with cerebrovascular disease have increased except for the late effects of cerebrovascular disease, which have decreased (Figure 19).

Figure 19. Annual Average Cost of Hospital Charges for Cerebrovascular Disease in Maryland, 2005 - 2008

Source: Maryland Health Services Cost Review Commission



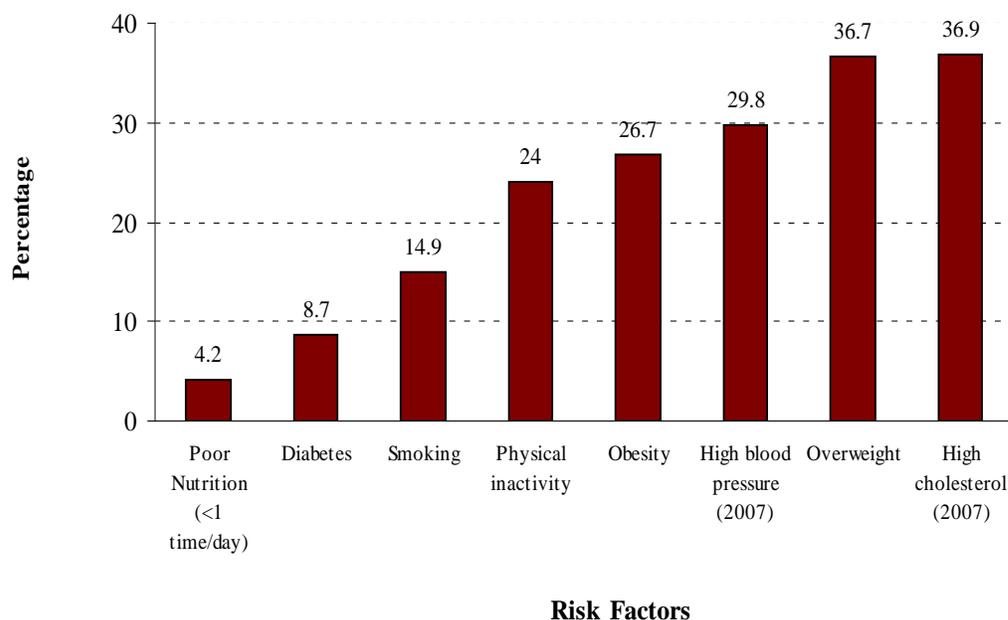
BURDEN OF HEART DISEASE AND STROKE IN MARYLAND

Heart Disease, Stroke and Related Risk Factors

Common risk factors for both heart disease and stroke include high blood cholesterol, high blood pressure, overweight/obesity, inadequate physical activity (no leisure time physical activity), smoking status (current and former smokers) and poor nutrition (less than one serving of fruits and vegetables per day). This section examines these risk factors, and others, in the Maryland population and their co-occurrence with residents reporting heart disease and stroke.

The most prevalent risk factor for heart disease and stroke among Maryland residents is high cholesterol (36.9%), followed by overweight at 36.7% and high blood pressure at 29.8%. Viewed together, overweight and obesity are prevalent among 63.4% of the population (Figure 20). Inadequate physical activity, smoking (current smoker only, Figure 20), and diabetes follow.

Figure 20. Prevalence of Chronic Disease Risk Factors in Maryland, 2007/2008
Source: Maryland BRFSS 2008 and MATCH-BRFSS 2007*
*High blood pressure and high blood cholesterol data from MATCH-BRFSS 2007



Although the prevalence of diabetes among Maryland residents is not as common as other risk factors, it is estimated that Maryland adults who have been diagnosed with diabetes (compared to those who have not diagnosed with diabetes) are about 4.8 times more likely also to have suffered from heart attack and angina (Figures 21 and 22). The same is true for stroke and diabetes (Figure 23). High blood pressure is the most common co-occurrence for heart attack, angina and stroke.

Figure 21. Prevalence of Heart Attack with Risk Factors, 2007/2008
Source: Maryland BRFSS 2008 and MATCH-BRFSS 2007*
***High blood pressure and high blood cholesterol data from MATCH-BRFSS 2007**

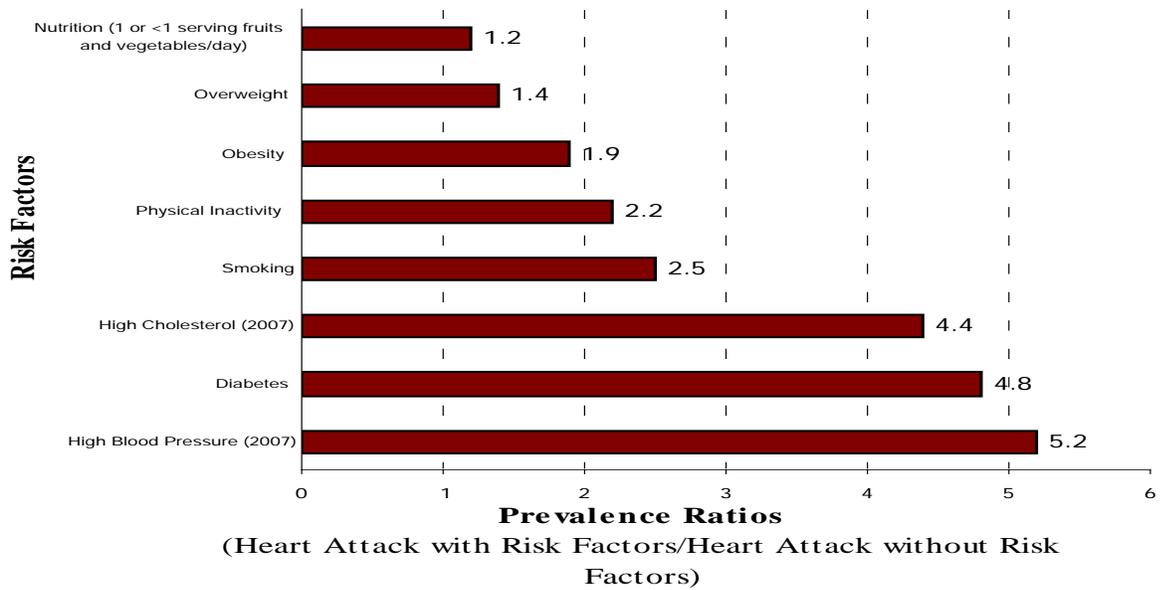


Figure 22. Prevalence of Angina with Risk Factors, 2007/ 2008
Source: Maryland BRFSS 2008 and MATCH-BRFSS 2007*
***High blood pressure and high blood cholesterol data from MATCH-BRFSS 2007**

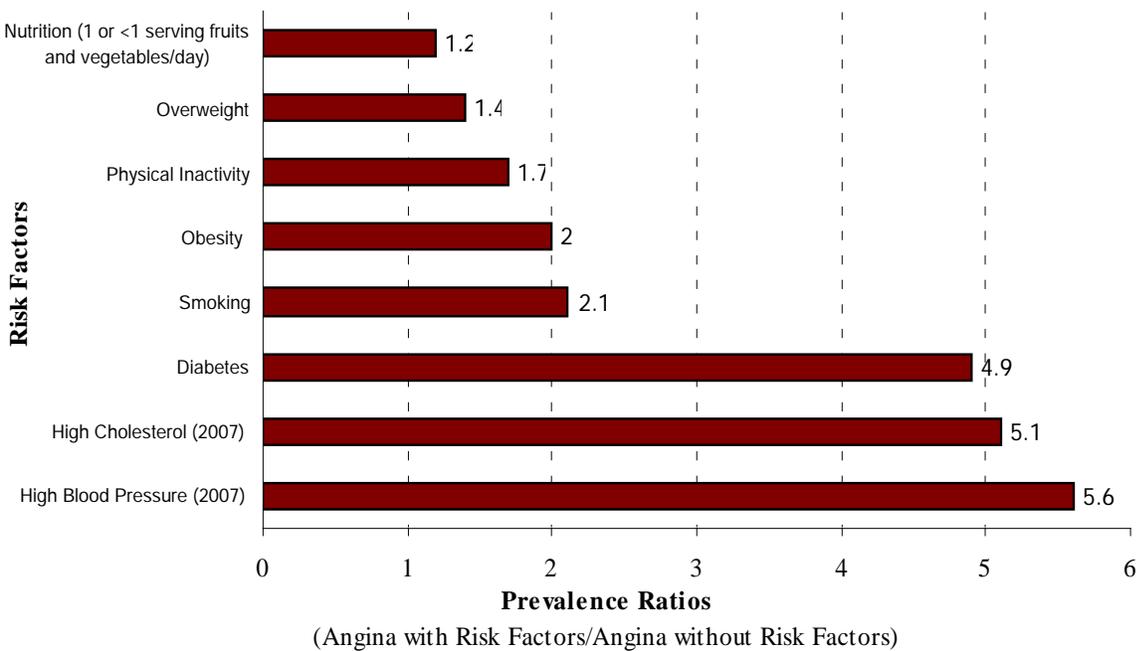
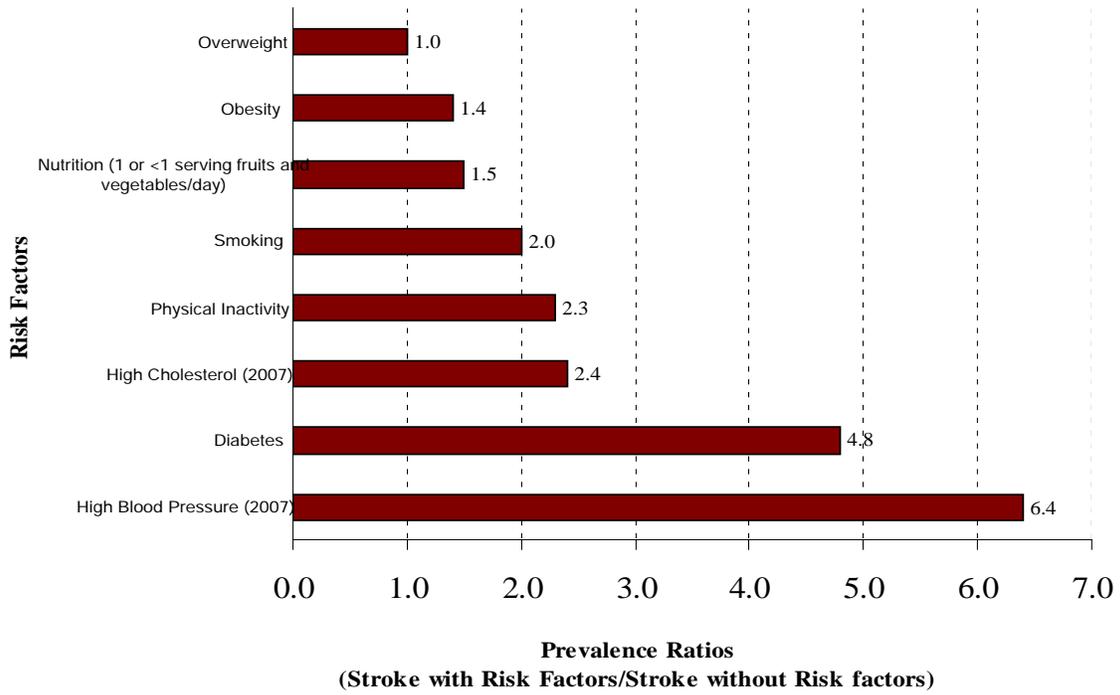


Figure 23. Prevalence of Stroke with Risk Factors, 2007/ 2008
Source: Maryland BRFSS 2008 and MATCH-BRFSS 2007*
***High blood nressure and high blood cholesterol data from MATCH-BRFSS 2007**



MARYLAND HEART DISEASE AND STROKE PREVENTION PROGRAM

The Maryland Heart Disease and Stroke Prevention Program, along with other state and local partners, will use the report findings to guide the implementation of statewide strategies found in the Maryland Heart Disease and Stroke Prevention and Control Plan. This Report, in conjunction with the Plan, are requirements of the cooperative CDC funding agreement of the Maryland Heart Disease and Stroke Prevention Program. Based on the Social-ecological Model, the essential strategies of the program are to use education, policy and systems changes to increase heart disease and stroke prevention with emphasis on six program priority areas:

1. Addressing control of high blood pressure and high blood cholesterol in adults and older adults
2. Increasing knowledge of signs and symptoms for heart disease and stroke and the importance of calling 9-1-1
3. Improving emergency response
4. Improving quality of heart disease and stroke care
5. Eliminating health disparities
6. Focusing on the health care and worksite settings

Additional required activities of the cooperative agreement are to develop the foundation for a comprehensive cardiovascular disease prevention program through:

1. Partnership development
2. Definition of the burden of heart disease and stroke
3. Development of a State Plan
4. Pilot testing interventions

The Governor's Council on Heart Disease and Stroke serves as the advisory group for the grant providing strategic planning leadership and partnering in the production and evaluation of the Plan. Additional information is available through the Office of Chronic Disease Prevention web site: <http://fha.maryland.gov/cdp/> .

APPENDIX A: DATA SOURCES

DATA SOURCE	DESCRIPTION
<p>MD Behavioral Risk Factor Surveillance System (BRFSS)</p>	<p>The Maryland BRFSS is an ongoing telephone surveillance program designed to collect data on the behaviors and conditions that place Marylanders at risk for chronic diseases, injuries, and preventable infectious diseases.</p> <p>The typical sample size each year is 8,900 households with an adult respondent 18 years of age or older. The data in this report are based on the weighted data. The weighting method involved adjustments of the sample proportions of selected demographic characteristics so that they equal the sample proportions in the population and also adjustments of the sample surveyed so that it represents the State population.</p> <p>Refer to www.marylandbrfss.org for more information on Maryland BRFSS. National BRFSS data can be downloaded from www.cdc.gov/brfss</p>
<p><u>Maryland Assessment Tool for Community health (MATCH)</u></p>	<p>Maryland Assessment Tool for Community Health (MATCH) features statistics for Maryland resident health events. Health officials, health practitioners, public health researchers and others can find Maryland population estimates along with statistics on births to Maryland resident mothers, resident deaths and hospitalizations. The information is aggregated by year of event, by county of residence and by other population characteristics. MATCH is sponsored by the Family Health Administration and is developed in partnership with the Maryland Vital Statistics Administration and the Maryland Health Care Commission.</p> <p>Refer to www.matchstats.org for more information on Maryland Assessment Tool for Community Health.</p>
<p>MD Health Services Cost Review Commission</p>	<p>The Maryland Health Services Cost Review Commission created a significant data infrastructure that includes a uniform accounting and reporting system and extensive data collection on, and analysis of, every aspect of hospital operations. To fulfill its broad disclosure responsibilities, it distributes annual reports on hospital operations and makes all such Commission files accessible to the public.</p> <p>Refer to http://www.hsrc.state.md.us/index.cfm for more information on Maryland Health Services Cost Review Commission</p>

DATA SOURCE	DESCRIPTION
<p>MD Vital Statistics Administration</p>	<p>The Maryland Vital Statistics Administration is charged with registering all births, deaths, and fetal deaths occurring in the State of Maryland; issuing certified copies of birth, death, and marriage certificates and providing divorce verifications; compiling and analyzing vital statistics data; preparing annual estimates of the population of Maryland by political subdivision, age, race, and sex; preparing mandated vital statistics and population reports; and supplying vital statistics and population data to users in the public and private sectors.</p> <p>Refer to http://www.vsa.state.md.us/ for more information on Maryland Vital Statistics Administration.</p>

APPENDIX B: DEFINITIONS

Heart disease and stroke encompass multiple health conditions and risk factors.

The following terms are commonly referred to in this Burden Report. Definitions are from the American Heart Association and the American Stroke Association and can be found at www.americanheart.org and www.strokeassociation.org. For a complete list of ICD codes used to define specific data sets see Appendix C.

Angina (Angina Pectoris): Medical term for chest pain or discomfort due to coronary heart disease. Angina is a symptom of a condition called myocardial ischemia. It occurs when the heart muscle (myocardium) doesn't get as much blood (hence as much oxygen) as it needs for a given level of work. Insufficient blood supply is called ischemia. Stable angina (or chronic stable angina) refers to "predictable" chest discomfort such as that associated with physical exertion or mental or emotional stress. Rest and/or nitroglycerin usually relieve stable angina. Unstable angina refers to unexpected chest pain and usually occurs at rest. It is typically more severe and prolonged and is due to a reduced blood flow to the heart caused by the narrowing of the coronary arteries in atherosclerosis. **Unstable angina is an acute coronary syndrome and should be treated as an emergency.**

Blood Pressure: The force or pressure exerted by the heart against the walls of the arteries. When the arterioles (smaller arteries) constrict (narrow), the blood must flow through a smaller "pipe" and the pressure rises. High blood pressure can result, adding to the workload of the heart and arteries. Optimal blood pressure is less than 120/80 mm Hg. High blood pressure, or **hypertension**, is a condition in which blood pressure levels are above the normal range. Blood pressures of 120-139 / 80-89 mm Hg are considered prehypertension. Blood pressure is considered high if it is 140/90 mm Hg or higher. Long-standing, uncontrolled high blood pressure increases the risk for heart attack, angina, stroke, chronic kidney failure and peripheral artery disease (PAD). High blood pressure may also increase the risk of developing fatty deposit in arteries (atherosclerosis). The risk of heart failure also increases due to the increased workload that high blood pressure places on the heart.

Cerebrovascular Disease (Stroke): Stroke is a disease that affects the arteries leading to and within the brain. A stroke occurs when a blood vessel that carries oxygen and nutrients to the brain is either blocked by a clot or bursts. When that happens, part of the brain cannot get the blood (oxygen) it needs, so brain cells start to die. Stroke can be caused by either a clot obstructing the flow of blood to the brain (called an ischemic stroke) or by a blood vessel rupturing and preventing blood flow to the brain (called a hemorrhagic stroke).

Cholesterol: A soft, waxy substance found among the lipids (fats) in the bloodstream and in all the body's cells. It's an important part of a healthy body because it's used to form cell membranes, some hormones and is needed for other functions. Cholesterol and other fats can't dissolve in the blood. They have to be transported to and from the cells by special carriers called lipoproteins. There are several kinds but the most important are low-density lipoprotein (LDL or "bad") and high-density lipoprotein (HDL or "good").

Cholesterol Classifications: Total blood cholesterol is the most common measurement of blood cholesterol. Cholesterol is measured in milligrams per deciliter (mg/dL) of blood. Total

cholesterol is composed of high-density lipoprotein (HDL or “good”) cholesterol, low-density lipoprotein (LDL or “bad”) cholesterol and very-low density lipoprotein (VLDL), which carries triglycerides. Triglycerides, a common type of blood fat, can also affect cardiac arrest. Blood cholesterol and triglycerides are classified by levels that relate to the risk of heart disease. The numbers are interpreted based on all risk factors including age, family history, smoking status, blood pressure, physical activity level, weight and diabetes status.

Congestive Heart Failure (Heart Failure): Because not all patients with heart failure have problems with excess fluids, such as in the lungs or extremities, the term “heart failure” is preferred over “congestive heart failure.” Heart failure is the inability of the heart to pump out all the blood that returns to it. This results in blood backing up in the veins that lead to the heart and sometimes in fluid accumulating in various parts of the body.

Coronary Heart Disease (CHD): Disease of the heart caused by atherosclerotic narrowing of the coronary arteries likely to produce chest pain (angina pectoris) or heart attack.

Heart Attack (Myocardial Infarction): Death or damage to part of the heart muscle due to an insufficient blood supply. Heart attacks occur when one of the coronary arteries that supply blood to the heart muscle is blocked. Blockage is usually caused from a buildup of plaque (deposit of fat-like substances) due to atherosclerosis. If a plaque deposit tears or ruptures, a blood clot may form and block the artery, causing a heart attack. Heart attack is also called a coronary thrombosis or coronary occlusion.

APPENDIX C: DISEASE DIAGNOSIS

The following International Statistical Classification of Diseases and Related Health Problems (ICD) Codes were used to define the data sets analyzed within the report.

Cardiovascular Disease	Age	Data source	Definition
Mortality from coronary heart disease	All	Vital statistics	Underlying cause ICD-10-CM codes I11, I20-I25
Mortality from congestive heart failure	All	Vital statistics	Underlying cause ICD-10-CM code I50.0
Mortality from hypertensive heart disease	All	Vital statistics	Underlying cause ICD-10-CM codes I11.0-I11.9, I50, I51.4-I51.9
Mortality from cerebrovascular disease (stroke)	All	Vital statistics	Underlying cause ICD-10-CM codes I60-I69
Hospitalization for acute myocardial infarction	All	MATCH	Primary diagnosis ICD-9-CM code 410
Hospitalization for angina pectoris and other forms of chronic ischemic heart disease	All	MATCH	Primary diagnosis ICD-9-CM code 413-414
Hospitalization for congestive heart failure	All	MATCH	Primary diagnosis ICD-9-CM code 428.0
Hospitalization for hypertension	All	MATCH	Primary diagnosis ICD-9-CM code 401
Hospitalization for Non-specific chest pain	All	MATCH	Primary diagnosis ICD-9-CM code 786.5
Hospitalization for cerebrovascular disease (stroke)	All	MATCH	Primary diagnosis ICD-9-CM codes 430-438, (include transient cerebral ischemia because it accounts for 28% of total hospital discharges of cerebrovascular disease in 2008)
Prevalence of high blood cholesterol awareness among adults aged ≥ 18 years	≥ 18 years	BRFSS	Respondents who report having been told by a doctor of having high blood cholesterol within the previous 5 years
Prevalence of high blood pressure awareness among adults aged ≥ 18 years	≥ 18 years	BRFSS	Respondents who report having been told by a doctor, nurse or other health professional of having high blood pressure
Prevalence of heart attack, angina or stroke among adults aged ≥ 18 years	≥ 18 years	BRFSS	Respondents who report having been told by a doctor of having heart attack, angina or stroke
Chronic disease linked to heart disease and stroke, Physical Activity, Nutrition and Tobacco Use			
Prevalence of diabetes among adults aged ≥ 18 years	≥ 18 years	BRFSS	Respondents who report having been told by a doctor of having diabetes
Prevalence of overweight or Obesity among adults aged ≥ 18 years	≥ 18 years	BRFSS	Respondents who have a body mass index (BMI) ≥ 25.0 -29.99kg/m ² (overweight) and ≥ 30.0 kg/m ² (obesity) calculated from self-reported weight and height
Recommended physical activity among adults aged ≥ 18 years	≥ 18 years	BRFSS	Respondents who report not having any leisure time physical activity for ≥ 30 minutes or running or walking for exercise during the last 30 days.
Fruit and vegetable consumption among adults aged ≥ 18 years	≥ 18 years	BRFSS	Respondents who report eating fruits and vegetables ≥ 5 times/day or ≥ 1 and 0 time/day
Cigarette smoking among adults aged ≥ 18 years	≥ 18 years	BRFSS	Respondents who report having smoked 100 cigarettes in their lifetime and are current smokers on every day or some days or former smoker (stopped smoking now)