

THE BURDEN OF STROKE IN CONNECTICUT

2008 Surveillance Report

DECEMBER 2008



**410 Capitol Avenue
Hartford, Connecticut**

Prepared by

Margaret M. Hynes, PhD, MPH and Betty C. Jung, RN, MPH, CHES
Surveillance and Reporting Unit
Health Information Systems and Reporting Section
Planning Branch
Connecticut Department of Public Health

Acknowledgments

We gratefully acknowledge the following Connecticut Department of Public Health epidemiologists who provided data for this report, including Diane Aye, MPH, PhD and Anil Shah, BVSc, AH (BRFSS data); Lloyd M. Mueller, PhD and Karyn Backus, MPH (mortality data); and Jon Olson, DPM, DrPH (hospital discharge data).

For additional information:

Connecticut Department of Public Health
Planning Branch
Health Information Systems and Reporting Section
410 Capitol Avenue
Hartford, CT 06134-0308
Phone: (860) 509-7658
Fax: (860) 509-8403



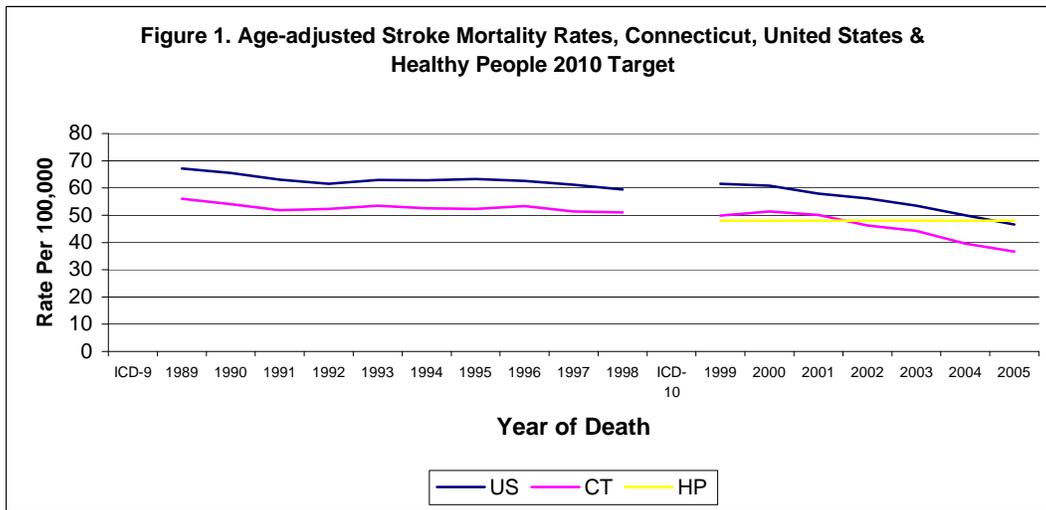
Webpage: <http://www.ct.gov/dph>

This report was developed to support the Connecticut stroke prevention and care planning process and partially funded by a grant from the U.S. Centers for Disease Control and Prevention (grant number CDC-RFA-DP07-704).

THE BURDEN OF STROKE IN CONNECTICUT

Stroke is the most severe clinical manifestation of cerebrovascular disease, a disease of one or more blood vessels in the brain. Stroke accounts for about 1,800 deaths per year in Connecticut, and includes two major types – ischemic stroke and hemorrhagic stroke.^{1, 2}

During the 1990s, age-adjusted stroke mortality rates remained about the same for the Connecticut population;³ however, between 1999 and 2004, stroke death rates for Connecticut residents declined significantly. Since the 1990s, Connecticut stroke death rates have been consistently lower than those of the United States; and between 2002 and 2004, Connecticut death rates were lower than the national *Healthy People 2010* target of 48 per 100,000 population (Figure 1).⁴



Sources: Centers for Disease Control and Prevention, 2008. *CDC WONDER*; Connecticut Department of Public Health, 2008. *Vital Records Mortality Files*; U.S. Department of Health and Human Services, 2000. *Healthy People 2010*.
Note: Rates are adjusted to the 2000 US standard million population. Classification includes deaths with ICD-9 codes: 430-438 (1989 to 1998); ICD-10 codes: I60-69 (1999 to 2005).

Mortality by Gender

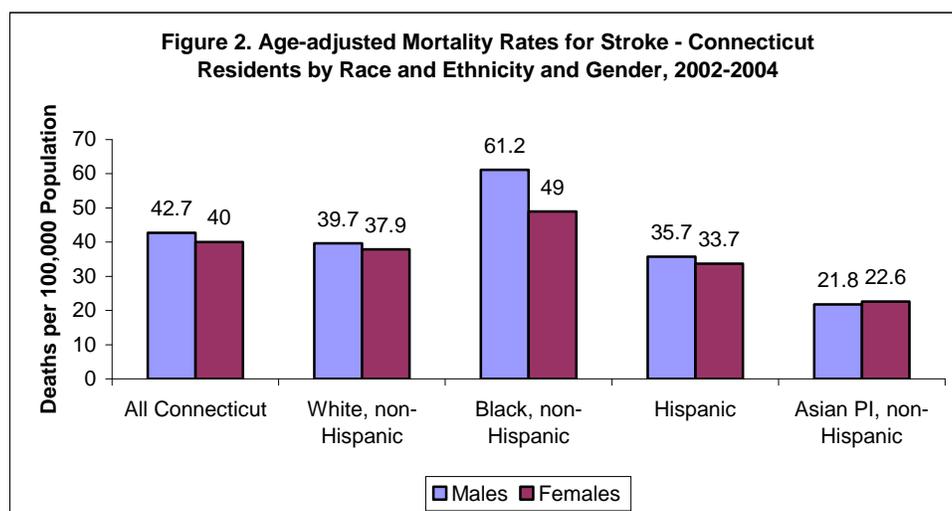
Approximately 62% of all Connecticut resident stroke deaths between 2002-2004 were female. While more females than males die from stroke in Connecticut, male and female age-adjusted death rates are not significantly different (Table 1).⁵

Table 1. Stroke Deaths and Age-adjusted Mortality Rates (AAMR) per 100,000 population - Connecticut Residents by Gender, 2002 – 2004		
Connecticut Residents	Stroke Deaths (ICD-10 codes I60- 69)	AAMR
All	5,311	41.5
Male	1,997	42.7
Female	3,314	40.0

Source: Connecticut Department of Public Health, 2008. *Vital Records Mortality Files, 2002 - 2004*.

Mortality by Race/Ethnicity and Gender

Age-adjusted stroke death rates differ by race, ethnicity and gender. Black male and female Connecticut residents have significantly higher death rates from stroke compared with White male and female residents, respectively ($p < .01$). Age-adjusted stroke death rates of Hispanic males and females are not significantly different than those of White males and females, respectively. Asian and Pacific Islander male and female Connecticut resident stroke death rates are significantly lower than those of White male and female Connecticut residents, respectively ($p < .05$) [Figure 2].⁶

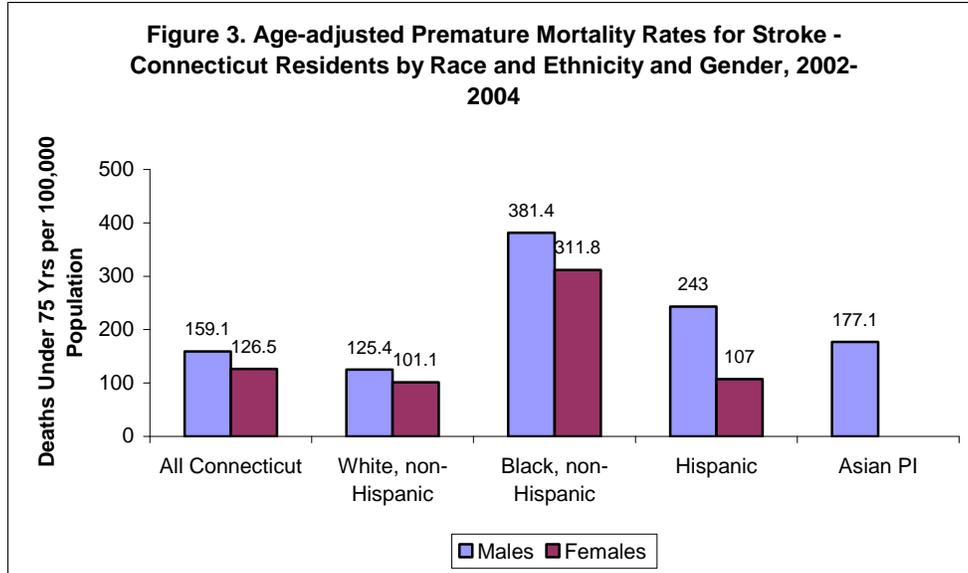


Source: Connecticut Department of Public Health, 2008. *Vital Records Mortality Files, 2002-2004*.

Premature Mortality by Race/Ethnicity and Gender

Premature mortality, defined as the “years of potential life lost before age 75,” emphasizes deaths that occur at younger ages. For example, a person who dies at age 45 is considered to have lost 30 years of life, and a person who dies at 70 is considered to have lost 5 years of life.⁷

Age-adjusted premature stroke death rates differ somewhat by race, ethnicity and gender. Black Connecticut male and female residents have significantly higher premature death rates due to stroke compared with White male and female residents, respectively ($p < .01$ for both comparisons). Hispanic males have significantly lower premature death rates due to stroke compared with White males ($p < .05$), while premature stroke death rates for Hispanic and White females are not significantly different. Premature stroke death rates of Asian and Pacific Islander and White males in Connecticut are not significantly different. There were insufficient numbers of premature deaths (under 75 years) among Asian and Pacific Islander females to calculate reliable rates (Figure 3).⁸



Source: Connecticut Department of Public Health, 2008. *Vital Records Mortality Files, 2002-2004.*

Morbidity

During 2005, there were 60,188 discharges from Connecticut hospitals for all circulatory diseases, including stroke. This represents 14.8% of all hospital discharges (excluding pregnancy and childbirth related discharges). For the same period, there were 7,354 stroke hospitalizations, which comprised 12.2% of circulatory disease-related hospitalizations. The median length of stay for stroke was four days versus a median stay of three days for circulatory disease-related hospital discharges.⁹

Hospitalization Rates by Gender

Connecticut males have significantly higher rates of hospitalizations for all circulatory diseases and for stroke compared with Connecticut females ($p < .05$ for both comparisons). More females than males, however, are hospitalized for stroke (Table 2).¹⁰

Table 2. Stroke Hospitalizations and Age-adjusted Hospitalizations Rates (AAHR) per 100,000 population – Connecticut Residents by Gender, 2005						
Diagnostic Group (ICD-9-CM)	All Residents		Male		Female	
	Number	AAHR	Number	AAHR	Number	AAHR
All Circulatory Diseases (390-459)	60,188	1,508.0	31,982	1,901.2	28,206	1,194.2
Stroke (430-4, 436-8)	7,354	183.3	3,572	216.2	3,782	158.1

Source: Connecticut Department of Public Health, 2008. *Connecticut Hospital Discharge Abstract and Billing Data Base, 2005.*

Hospitalization Rates by Race and Ethnicity

Black Connecticut residents have significantly higher rates of hospitalizations than both White and Hispanic residents for all circulatory diseases and for stroke ($p < .05$ for all comparisons). Black residents have about 40% higher rates of hospitalizations due to stroke than do White and Hispanic residents (Table 3).¹¹

Table 3. Stroke Hospitalizations and Age-adjusted Hospitalizations Rates (AAHR) per 100,000 population – Connecticut Residents by Race and Ethnicity, 2005								
Diagnostic Group (ICD-9-CM)	All Residents		White, Non-Hispanic		Black, Non-Hispanic		Hispanic	
	Number	AAHR	Number	AAHR	Number	AAHR	Number	AAHR
All Circulatory Diseases (390-459)	60,188	1,508.0	50,293	1,427.9	4,972	1,970.7	2,759	1,434.3
Stroke (430-4, 436-8)	7,354	83.3	6,127	171.8	662	268.1	294	151.9

Source: Connecticut Department of Public Health, 2008. Connecticut Hospital Discharge Abstract and Billing Data Base, 2005.

Economic Costs

The estimated national annual cost for the medical management of stroke is \$65.5 billion in 2008. This estimate includes direct medical costs and indirect costs associated with lost productivity from illness and death.¹² Stroke can accrue enormous indirect costs. It is a major cause of disability and the ability to live independently, and it can severely impact the quality of life for individuals and families. In 2005, stroke hospitalization charges for Connecticut residents amounted to \$192 million. The median Connecticut hospital charge for stroke was \$15,759.¹³

Risk Factors for Stroke

Risk factors for stroke include non-modifiable (age, family history, prior stroke, TIA or heart attack) and modifiable (high blood pressure, high cholesterol, smoking, diabetes, obesity, physical inactivity, poor diet, heart disease) factors (Table 4).

Table 4. Risk Factors for Stroke	
Modifiable Factors	Non-Modifiable Factors
<ul style="list-style-type: none"> • high blood pressure • high cholesterol • smoking • diabetes • obesity • physical inactivity • poor diet • heart disease 	<ul style="list-style-type: none"> • increasing age • family history • prior stroke, TIA, or heart attack

Increasing age is a key risk factor for stroke. About 90% of all stroke deaths in Connecticut occur among persons aged 65 and older (2002-2004 data).¹⁴ A family history of stroke increases one's risk for stroke. A combination of inherited characteristics and behavioral patterns (similar dietary, smoking, and activity habits, for example) are thought to explain increased risk within families.^{15, 16}

Lower Socioeconomic Position as a Risk Marker

Lower socioeconomic position (SEP) is an important risk marker for stroke. SEP is commonly measured by personal income, household income, or educational attainment level. Persons of lower SEP have higher stroke-related morbidity and mortality than do middle- or upper-income persons. Behavioral risk factors such as smoking, hypertension, and obesity are more prevalent in lower SEP persons and may explain some of the observed disparity;^{17, 18} however, other factors, like neighborhood socioeconomic environment, appear to have effects on individuals' risk for stroke.^{19, 20} Low-income neighborhood environments may contribute to increased stroke-related risk and poorer health outcomes because of such factors like poorer air quality, fewer food choices, and lower quality and/or lack of public services.²¹ Lower-income persons tend to have less access to, and/or less effectively use, preventive health services that are important to the early detection and treatment of hypertension.²² While low-socioeconomic position may be considered "modifiable" in the sense that people can move in and out of poverty during a lifetime or over generations, it is not usually within a given individual's control to change his or her social position or neighborhood environment.

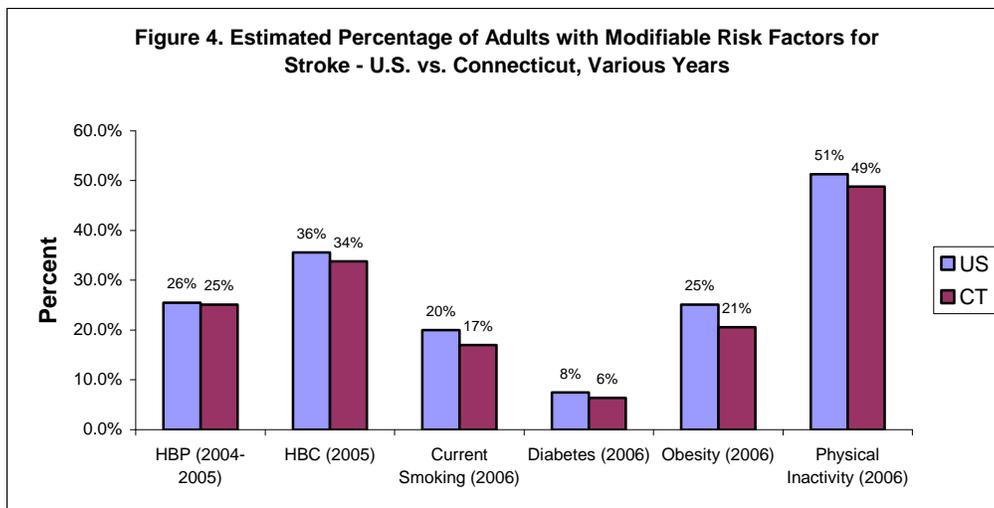
Modifiable Risk Factors

Current Connecticut Behavioral Risk Factor Surveillance (BRFSS) data show that about one out of three Connecticut adults report having one or more modifiable risk factors for stroke. Following are summaries of the five main risk factors (high blood pressure, high blood cholesterol, tobacco use, diabetes, and obesity) for stroke.

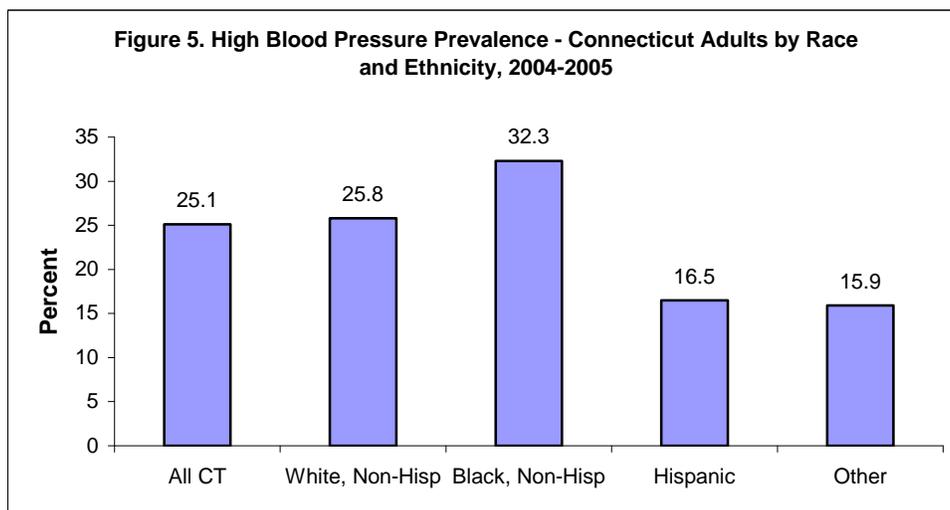
High Blood Pressure

High blood pressure (HBP) is the most important modifiable risk factor for stroke.²³ About 26% of all stroke mortality is attributable to high blood pressure.²⁴ New federal guidelines classify normal blood pressure as below 120/80 mm Hg and readings from 120/80 Hg up to 140/90 mmHg as prehypertensive.²⁵

Approximately 25% of Connecticut adults report that they have high blood pressure compared with about 26% of adults nationwide (Figure 4).²⁶ The risks for hypertension-related cardiovascular disease increase markedly with age, as does the prevalence of hypertension, and drug treatment for high blood pressure.²⁷ Black Connecticut adults experience high blood pressure more than White and Hispanic adults. About 32.3% of Black Connecticut adults report that they were told they had hypertension compared with 25.8% of White, 16.5% of Hispanic, and 15.9% of other adults in Connecticut ($p < .05$ for all comparisons) [Figure 5].²⁸



Source: Centers for Disease Control and Prevention, 2008. Behavioral Risk Factor Surveillance System; Connecticut Department of Public Health, 2007. Behavioral Risk Factor Surveillance System.



Source: Connecticut Department of Public Health, 2007. Behavioral Risk Factor Surveillance System.

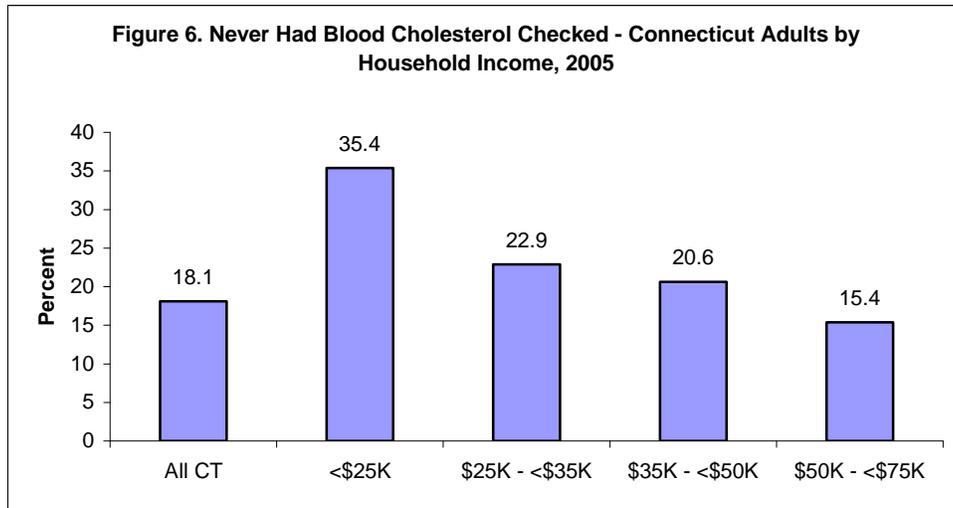
High Blood Cholesterol

High blood cholesterol (HBC) is considered a moderate risk factor for stroke. The Centers for Disease Control and Prevention estimates that more than 80% of people with high blood cholesterol do not have it under control. A 10% decrease in total blood cholesterol levels may reduce the incidence of coronary heart disease by as much as 30%.²⁹ Studies have found that stroke risk can be reduced with cholesterol-lowering medication among persons with higher cholesterol levels and persons with coronary artery disease.³⁰

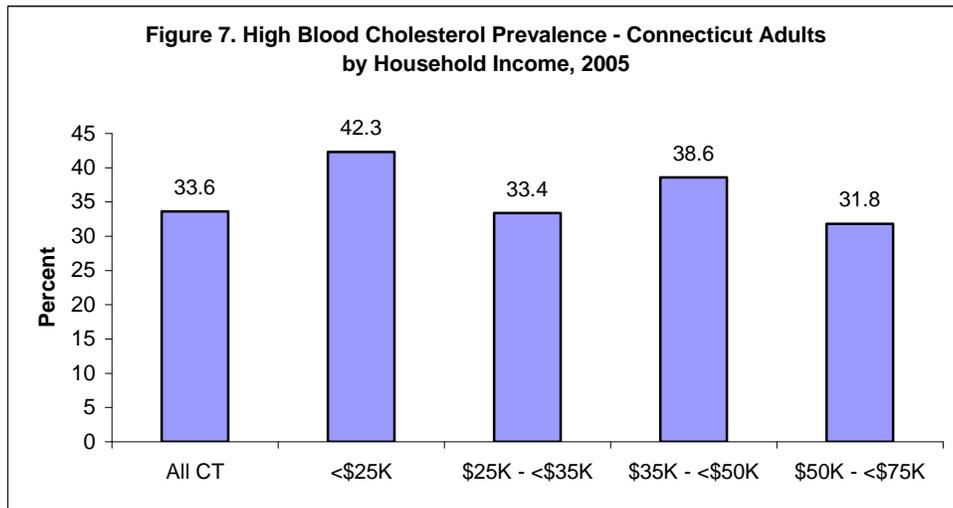
Connecticut adults compare favorably to adults nationwide in terms of cholesterol screening and blood cholesterol levels. In 2005, 80% of Connecticut adults reported having had their blood cholesterol

screened within the last five years compared with 73% of adults in the U.S.³¹ About 34% of Connecticut adults were told they had high blood cholesterol (HBC) compared with about 36% of adults nationwide (Figure 4).³²

Lower-income Connecticut adults are more likely to report that they have never had their blood cholesterol checked compared with higher-income adults (Figure 6). Among Connecticut adults who have had their cholesterol checked, lower-income residents are also more likely to report high blood cholesterol compared with higher income adults in Connecticut (Figure 7).



Source: Connecticut Department of Public Health, 2007. Behavioral Risk Factor Surveillance System.

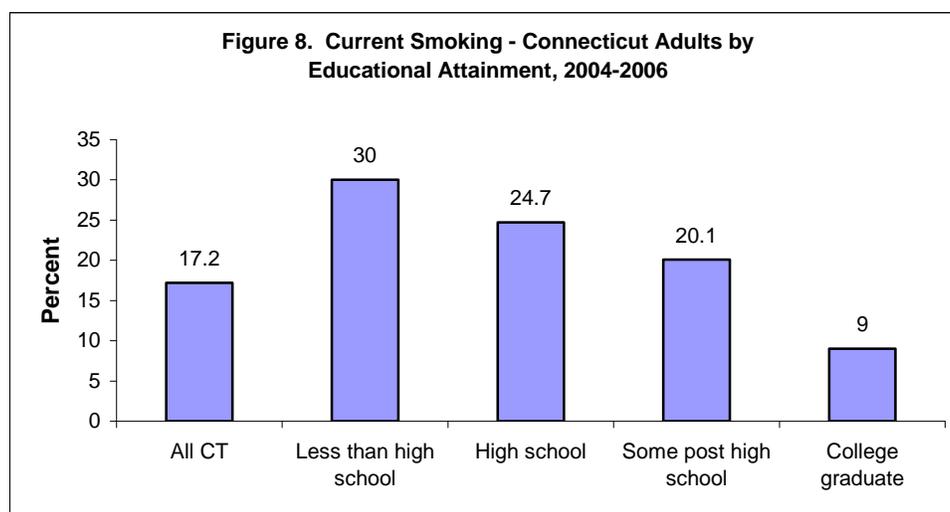


Source: Connecticut Department of Public Health, 2007. Behavioral Risk Factor Surveillance System.

Smoking

Cigarette smoking is a major modifiable risk factor for cardiovascular diseases. Smoking causes reduced blood vessel elasticity by increasing arterial wall stiffness. Smoking increases the risk of heart attack two-fold. Smokers have higher coronary heart disease (CHD) mortality rates than non-smokers and their risk of death increases with greater number of cigarettes smoked. Current smokers have more than twice the risk of stroke compared with those who have never smoked.³³ Approximately 18% of strokes are attributable to current cigarette smoking.³⁴ People who stop smoking decrease their stroke risk and their risk of CHD mortality.³⁵

In 2006, about 17% of Connecticut adults reported being current smokers compared with about 20% of adults nationwide (Figure 4). Connecticut adult smokers are more likely to be younger, with lower incomes, and less educated. For example, 24.7% of Connecticut adults 18 to 24 years old smoke compared with only 19.4% of those aged 45 to 54, and 6.9% of those aged 65 and older. About 23.5% of adults with household incomes under \$25,000 smoke, compared with 11.2% of adults with household incomes of \$75,000 or more (data not shown). About 30% of adults with less than a high school education smoke compared with only about 9% of adults who graduated from college (Figure 8).³⁶



Source: Connecticut Department of Public Health, 2007. Behavioral Risk Factor Surveillance System.

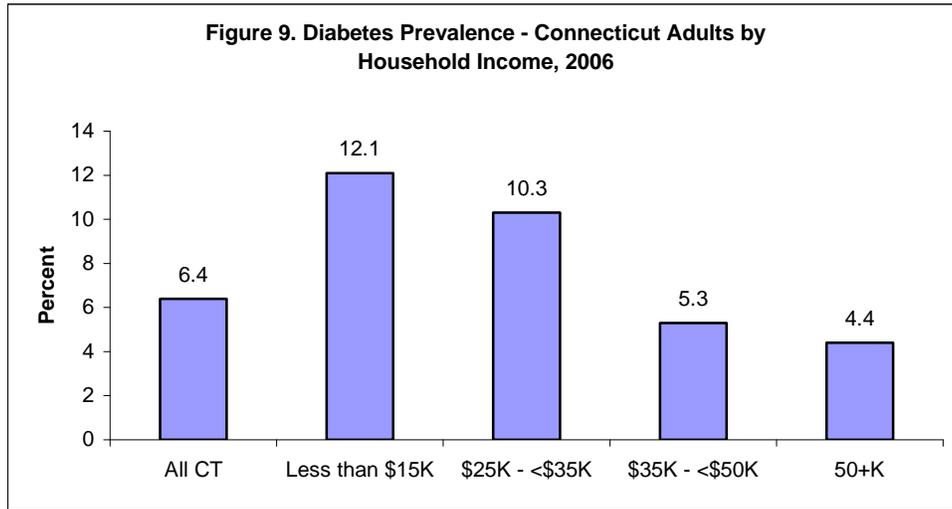
Diabetes

Cardiovascular disease (CVD) is the primary cause of death for persons with diabetes, accounting for about 65% of mortality. Increased cardiovascular risk precedes the formal diagnosis of type 2 diabetes by many years.³⁷ Diabetic persons are 2 to 4 times more likely to develop coronary heart disease than the rest of the population and are at much greater risk of having a stroke.^{38, 39} People with diabetes often have high blood pressure and high cholesterol and are overweight, increasing their risk for CVD even more.⁴⁰

About 6% of Connecticut adults have been diagnosed with diabetes compared with almost 8% of adults nationwide (Figure 4).⁴¹ Lower-income people are at higher risk of diabetes than are higher-income people. For example, approximately 12.1% of Connecticut adults with household incomes under \$15,000

report having diabetes, compared with 4.4% of Connecticut adults with household incomes over \$50,000 (Figure 9).⁴²

Diabetes self-management education is essential because improperly controlled diabetes can result in cardiovascular disease, kidney disease, blindness and loss of limb. It is, therefore, a particular concern that only 52% of Connecticut adults with diabetes reported that they had never taken a course to manage the disease.⁴³



Source: Centers for Disease Control and Prevention, 2007. Behavioral Risk Factor Surveillance System.

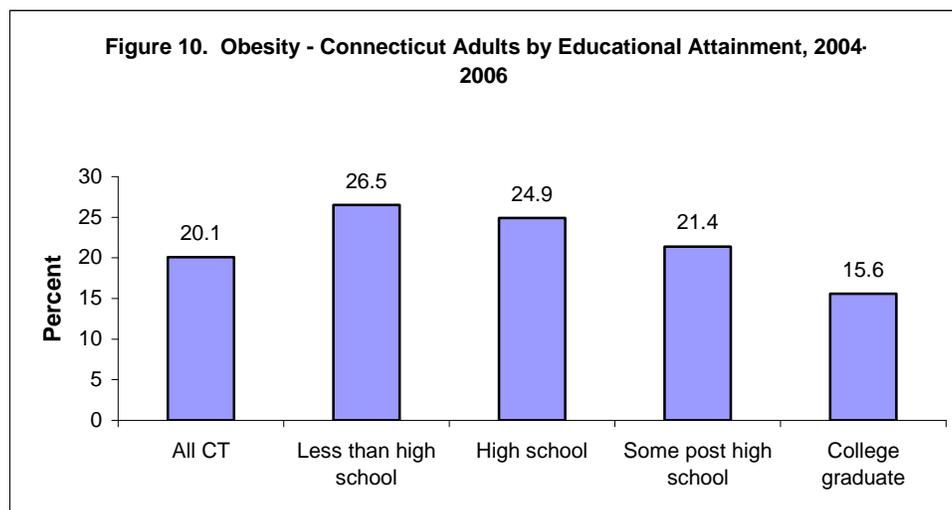
Obesity

Body mass index (BMI), or weight adjusted for height, is a widely used screening method for obesity. Medical guidelines identify normal/desirable weight as a BMI under 25, overweight as a BMI of 25 to 29.9, and obese as a BMI of 30 or more.⁴⁴ The prevalence of overweight and obesity has been increasing in the United States since the mid 1980s.⁴⁵ High calorie diets, along with less physical activity, in our society have contributed to the obesity epidemic.⁴⁶

Obesity is considered a metabolic disorder, which can be explained by a combination of hereditary and environmental factors. Obesity has been found to independently predict coronary atherosclerosis. Left ventricular hypertrophy, right heart changes and systemic hypertension are more common in those who are obese. While co-morbidities relating obesity to coronary heart disease increase as BMI increases, body fat distribution is also an important factor.⁴⁷ For example, abdominal obesity places individuals at higher risk for health problems, including high blood pressure, high blood cholesterol, high triglycerides, diabetes, heart disease and stroke.⁴⁸ Obesity increases the risk of fatal and non-fatal stroke. Among females, increasing BMI is associated with increased risk of stroke. Among males, abdominal obesity, rather than BMI, is closely related to stroke risk.⁴⁹

An estimated 21% of Connecticut adults are obese compared with about 25% of adults nationwide (Figure 4).⁵⁰ Approximately 38% of Connecticut adults are overweight, and 42% are normal or desired weight.⁵¹ Adults with less education are more likely to be obese than adults with more education in Connecticut. For example, an estimated 26.5% of adults with less than a high school education are obese, compared with only 15.6% of college-educated Connecticut adults (Figure 10).⁵² African American

adults are significantly more likely to be obese compared with White and Hispanic adults. An estimated 31.7% of African American adults in Connecticut are obese, compared with 22.2% of Hispanic adults ($p < .05$), and 19.4% of White adults ($p < .05$) [data not shown].⁵³ Connecticut adults who are obese are significantly more likely to report that they are in poorer health compared with non-obese adults. Twenty percent of obese adults report that they are in fair or poor health compared with about 10% of those who are overweight or of healthy weight (data not shown).⁵⁴



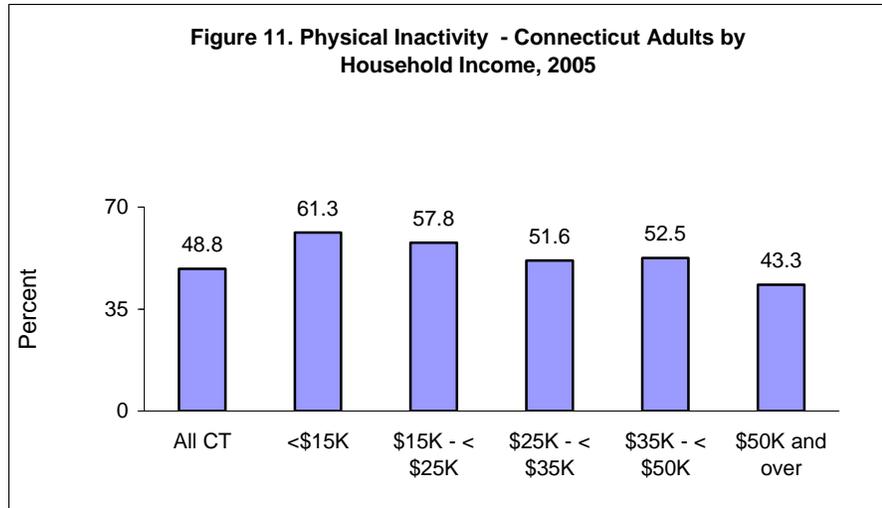
Source: Connecticut Department of Public Health, 2007. Behavioral Risk Factor Surveillance System.

Physical Inactivity

Physical inactivity and poor diet are associated with an increased risk of a number of chronic health conditions including cardiovascular disease, diabetes, some cancers, high blood pressure, overweight and obesity, back problems, and osteoporosis.^{55, 56} Physical inactivity indirectly increases the risk of stroke because it is associated with high blood pressure.

The Centers for Disease Control and Prevention (CDC) and the American College of Sports Medicine (ACSM) recommend that all adults should engage in “at least 30 minutes of moderate intensity physical activity on five or more days of the week.”⁵⁷ Approximately 49% of Connecticut adults report having less than thirty minutes of moderate physical activity five or more days per week, defined here as “physical inactivity” (Figure 11).

Physical inactivity increases with age. About 59% of Connecticut adults 65 and older do not meet the recommended CDC/ACSM activity levels compared with 34% of Connecticut adults aged 18 to 24 (data not shown). Lower-income adults are also more likely to be physically inactive compared with higher-income adults. About 61.3% of Connecticut adults with incomes of less than \$15,000 per year are inactive compared with 43.3% of Connecticut adults earning \$50,000 or more per year (Figure 11).⁵⁸



Source: Centers for Disease Control and Prevention, 2007. Behavioral Risk Factor Surveillance System.

Co-Prevalence of Stroke Risk Factors

A common set of risk factors are usually found among those who develop stroke. For example, research has shown that 84% of those having both diabetes and hypertension were also found to have dyslipidemia (abnormal lipid levels),⁵⁹ and that the relative risk of stroke, and all-cause mortality increases linearly with the number of metabolic risk factors (overweight, high blood pressure, high fasting glucose, and high total cholesterol).⁶⁰ Approximately 52% of Connecticut adults report having 2 or more and 25% report having 3 or more modifiable risk factors for stroke.⁶¹ The co-prevalence of risk factors contributes to the complexity of disease management.

Recognizing the Signs and Symptoms of Stroke

The *Healthy People 2010* national objectives for stroke include increasing the proportion of persons who are aware of the early warning symptoms and signs of stroke and the necessity of calling 911 when persons are suffering from stroke.⁶² Early recognition and calling 911 increase the likelihood of immediate emergency transport to the hospital and timely medical care that can reduce disability and death.

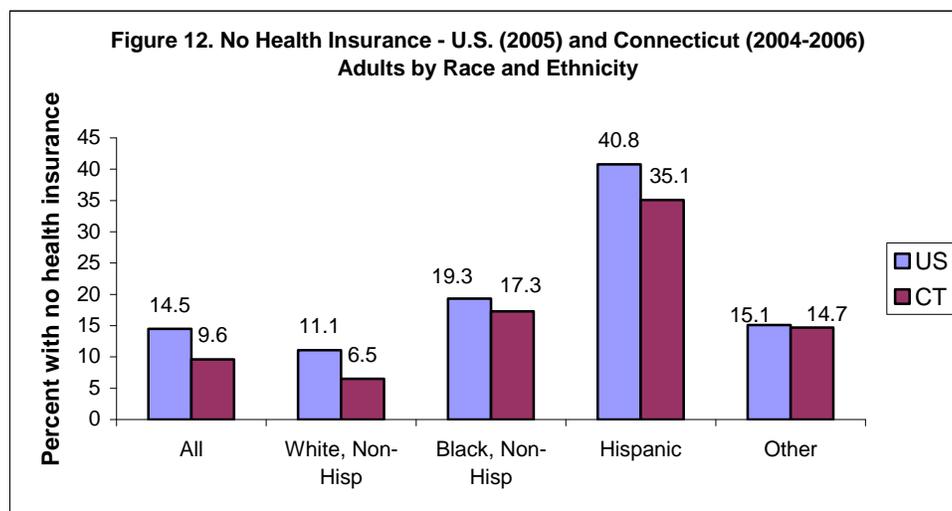
Table 5. Warning Signs for Stroke	
•	Severe headache with no known cause
•	Trouble seeing in one or both eyes
•	Trouble walking, dizziness, or loss of balance
•	Confusion, trouble speaking
•	Sudden numbness/weakness of face, arm, or leg

Source: Centers for Disease Control and Prevention, 2007. Behavioral Risk Factor Surveillance System.

The percentage of Connecticut adults who know all the warning signs and symptoms for stroke tends to be very low. About 19% of Connecticut adults know all the proper stroke signs. Women tend to be more knowledgeable than men about signs and symptoms of stroke. About 21% of Connecticut females know all stroke signs compared with about 17% of males ($p < .001$).

Access to Health Care

Access to health care is key to the prevention, treatment, and management of stroke. People without health insurance are less likely than others to have a usual source of care, to receive preventive health care services, and appropriate medical management of chronic conditions. About 9.6% of Connecticut adults aged 18 and over do not have health insurance compared with almost 14.5% of adults nationwide. Hispanic adults in Connecticut are least likely to report having health insurance (about 35.1%), followed by Black adults (17.3%), and White adults (6.5%). Comparable national figures show that about 40.8% of Hispanic adults, 19.3% of Black adults, and 11.1% of White adults nationwide reported having no health insurance (Figure 12).⁶³ The health status of the entire Connecticut population is compromised when large numbers of residents are uninsured, and it imposes a significant additional financial burden on our state.



Sources: Centers for Disease Control and Prevention, 2007. *Behavioral Risk Factor Surveillance System*; Connecticut Department of Public Health, 2007. *Behavioral Risk Factor Surveillance System*.

Prevention Efforts and High-Risk Populations

The high co-prevalence of risk factors for stroke indicates the need to address all these risk factors rather than each factor individually in public health prevention efforts. A special emphasis needs to be placed on adults with diabetes, whose high percentages of high blood pressure, overweight and obesity increase their risk for developing cardiovascular disease. Second, screening for high blood pressure, high cholesterol, and overweight is necessary to address the high co-prevalence of these three factors. Third, smoking cessation and cholesterol and blood pressure control would greatly benefit those with multiple risk factors, especially those with diabetes (Table 6).

Table 6. Targeting High Risk Populations

- Address multiple risk factors together
- Emphasize risk factor interventions among adults with diabetes
- Screen for high blood pressure, high cholesterol, and overweight
- Emphasize smoking cessation, blood cholesterol management, and blood pressure control
- Focus policy efforts on low-income environments

Black males and females have higher death and premature mortality rates due to stroke compared with the respective White and Hispanic populations. Black Connecticut residents have significantly higher rates of some important modifiable risk factors for stroke, such as high blood pressure, diabetes, and obesity compared with White and Hispanic Connecticut residents. Lower-income residents are also more likely to have higher rates of high blood pressure, high cholesterol, diabetes, smoking, obesity, and physical inactivity compared with higher-income residents. Therefore, targeted public health interventions are warranted for all Connecticut residents with multiple risk factors with a special emphasis on risk factor reduction among Black and lower-income Connecticut residents. Also, public health policy should specifically address those factors in low-income environments that put residents at higher risk for stroke. These factors include fewer food choices, lower quality of and/or lack of public services, less access to preventive health care, poorer air quality, and unsafe neighborhoods.

Footnotes

¹ Connecticut Department of Public Health. 2008. *Vital Records Mortality Files, 2002-2004*. Hartford, CT: Connecticut Department of Public Health.

² Insel, P.M., and W.T. Roth 2006. *Core Concepts in Health*. Tenth Edition. NY: McGraw-Hill. p. 290.

³ Hynes, M.M., L.M. Mueller, H. Li, and F. Amadeo. 2005. *Mortality and its Risk Factors in Connecticut, 1989-1998*, Hartford, CT: Connecticut Department of Public Health.

⁴ Connecticut Department of Public Health. 2008. *Op. cit.*

⁵ *Ibid.*

⁶ *Ibid.*

⁷ National Center for Health Statistics. 2004. *Health, United States with Chartbook on Trends in the Health of Americans*. Hyattsville, MD: NCHS. Retrieved on January 5, 2006: <http://www.cdc.gov/nchs/data/hus/hus04acc.pdf>.

⁸ Connecticut Department of Public Health. 2008. *Op. cit.*

⁹ Connecticut Department of Public Health. 2007. *Connecticut Resident Hospitalizations, 2005*. Hartford, CT: Connecticut Department of Public Health. www.ct.gov/dph/HospitalDischargeData

¹⁰ *Ibid.*

¹¹ *Ibid.*

¹² American Heart Association American Stroke Association. 2008. *Heart Disease and Stroke Statistics—2008 Update*. Retrieved on April 8, 2008: <http://www.americanheart.org/presenter.jhtml?identifier=3000090>

¹³ *Ibid.*

¹⁴ Connecticut Department of Public Health. 2008. *Unpublished mortality data*. Hartford, CT: Connecticut Department of Public Health

¹⁵ Newschaffer, C.J., C.A. Brownson, and L.J. Dusenbury. 1998. Chapter 11— Cardiovascular Disease. In Brownson, R.C., P.L. Remington, and J.R. Davis *Chronic Disease Epidemiology and Control* Washington, D.C.: American Public Health Association.

¹⁶ Goldstein, L.B., R. Adams, K. Becker, et al. 2001. Primary prevention of ischemic stroke—A statement for healthcare professionals from the Stroke Council of the American Heart Association. *Stroke* 32: 280-299.

- ¹⁷National Heart, Lung, and Blood Institute. 1995. *Report of the Conference on Socioeconomic Status and Cardiovascular Health and Disease* Washington, D.C.: Public Health Service. U.S. Department of Health and Human Services. Retrieved on April 24, 2008: <http://www.nhlbi.nih.gov/resources/docs>
- ¹⁸Hart, C.L., D.J. Hole, and G. Davey Smith. 2000. The contribution of risk factors to stroke differentials, by socioeconomic position in adulthood: the Renfrew/Paisley Study. *American Journal of Public Health* 90(11): 1788-1791.
- ¹⁹Diez Roux, A.V., F.J. Nieto, and C. Muntaner, et al. 1997. Neighborhood environments and coronary heart disease: A multilevel analysis. *American Journal of Epidemiology* 146(1): 48-63.
- ²⁰Newschaffer, Brownson, and Dusenbury. *Op. cit.*
- ²¹Boden-Abala, B. and R.L. Sacco. 2002. Socioeconomic status and stroke mortality: Refining the relationship (editorial comment). *Stroke* 33: 274-275.
- ²²Kunst, A.E., M. del Rios, F. Groenhouf, et al. 1998. Socioeconomic inequalities in stroke mortality among middleaged men—An international overview. *Stroke* 29: 2285-2291.
- ²³Newschaffer, Brownson, and Dusenbury, 1998. *Op. cit.*
- ²⁴Goldstein, Adams, and Becker, 2001. *Op. cit.*
- ²⁵Chobanian, A.V., G.L. Bakris, H.R. Black, et al. 2003. The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. *Journal of the American Medical Association* 289: 2560-2571.
- ²⁶Centers for Disease Control and Prevention. 2008. *2006 Connecticut and US BRFSS data*. Retrieved on March 19, 2008: <http://apps.nccd.cdc.gov/brfss/>
- ²⁷Blood Pressure Control Poor Among Elderly Women. 2007. Reuters Health Information (*JAMA* 2005; 294:466-472.). Retrieved on May 1, 2007: http://www.medscape.com/viewarticle/510238_2
- ²⁸Centers for Disease Control and Prevention. 2006. 2005 Connecticut BRFSS data. Retrieved on June 13, 2006: <http://apps.nccd.cdc.gov/brfss/race.asp?cat=HA&yr=2005&qkey=4420&state=CT>
- ²⁹Preventing Heart Disease and Stroke Addressing the Nation's Leading Killers At A Glance 2005. Retrieved on September 7, 2005: <http://www.cdc.gov/nccdphp>
- ³⁰Goldstein, Adams, and Becker, *Op. cit.*
- ³¹Centers for Disease Control and Prevention. 2005 Connecticut BRFSS data. Retrieved on June 13, 2006: <http://apps.nccd.cdc.gov/brfss/display.asp?cat=CA&yr=2005&qkey=1487&state=CT>
- ³²Centers for Disease Control and Prevention. 2005 Connecticut BRFSS data. Retrieved on June 13, 2006: <http://apps.nccd.cdc.gov/brfss/display.asp?cat=CA&yr=2005&qkey=4392&state=CT>
- ³³Newschaffer, Brownson, and Dusenbury, *Op. cit.*
- ³⁴Goldstein, Adams, and Becker, *Op. cit.*
- ³⁵Newschaffer, Brownson, and Dusenbury, *Op. cit.*
- ³⁶Connecticut Department of Public Health. 2007. *Behavioral Risk Factors Surveillance System*. Unpublished data. Hartford, CT: Connecticut Department of Public Health.
- ³⁷Vinik, A.I, *Natural History of the Metabolic Syndrome and Type 2 Diabetes: The Ticking Clock*. Presentation at the 65th Scientific Session of the American Diabetes Association. Retrieved on August 10, 2005: http://www.medscape.com/viewprogram/4324_pnt
- ³⁸Newschaffer, Brownson, and Dusenbury, *Op. cit.*
- ³⁹Goldstein, Adams, and Becker, *Op. cit.*
- ⁴⁰American Heart Association. 2005. Women, Heart Disease and Stroke. Retrieved on September 8, 2005: <http://www.americanheart.org/presenter.jhtml?identifier=4786>
- ⁴¹Centers for Disease Control and Prevention. 2005 Connecticut and US BRFSS data. Retrieved on March 19, 2008: <http://apps.nccd.cdc.gov/brfss/>
- ⁴²Centers for Disease Control and Prevention. 2005 Connecticut and US BRFSS data. Retrieved on March 19, 2008: <http://apps.nccd.cdc.gov/brfss/>
- ⁴³Connecticut Department of Public Health, Behavioral Risk Factor Surveillance System (BRFSS) Program. 2005. *Connecticut, 2004 BRFSS Module Variables Reports*. Unpublished data. Hartford, CT: Connecticut Department of Public Health.
- ⁴⁴U.S. Preventive Services Task Force. 2005. *The Guide to Clinical Preventive Services, Recommendations of the U.S. Preventive Services Task Force*. Washington, DC: US Department of Health and Human Services, Agency for Healthcare, Research and Quality.
- ⁴⁵Flegal, K.M. 2005. Epidemiologic aspects of overweight and obesity in the United States. *Physiology and Behavior* 86(5): 599-602.

-
- ⁴⁶ Eckel, R.H. 1997. Obesity and heart disease. *Circulation* 96:3248-3250. Retrieved on September 8, 2005: <http://circ.ahajournals.org/cgi/content/full/96/9/3248>
- ⁴⁷ *Ibid.*
- ⁴⁸ American Heart Association. 2005 *Op. cit.* <http://www.americanheart.org/presenter.jhtml?identifier=4786>
- ⁴⁹ Goldstein, Adams, and Becker, *Op. cit.*
- ⁵⁰ Centers for Disease Control and Prevention. 2006. *Op. cit.*
- ⁵¹ *Ibid.*
- ⁵² Connecticut Department of Public Health. 2007. *Behavioral Risk Factors Surveillance System*. Unpublished data. Hartford, CT: Connecticut Department of Public Health.
- ⁵³ *Ibid.*
- ⁵⁴ *Ibid.*
- ⁵⁵ Effects of physical inactivity and unhealthy diets. Retrieved on May 1, 2007: <http://www.sciencedaily.com/releases/2006/06/060603091830.htm>
- ⁵⁶ Warburton, D. E., C.W. Nicol, and S.S. Bredin. 2006. Health benefits of physical activity: the evidence. *Canadian Medical Association Journal*. 174(60):801-809.
- ⁵⁷ Physical activity for everyone: Recommendations. Retrieved on June 13, 2006: http://www.cdc.gov/nccdphp/dnpa/physical/recommendations/older_adults.htm
- ⁵⁸ Connecticut Department of Public Health. 2007. *Behavioral Risk Factors Surveillance System*. Unpublished data. Hartford, CT: Connecticut Department of Public Health.
- ⁵⁹ Managing the overall risk of cardiovascular disease. Retrieved on July 24, 2005: http://www.qualityprofiles.org/leadership_series/cardiovascular_disease/cardiovascular_managingrisk.asp#
- ⁶⁰ Park, H.S., S.I. Choi, Y.M. Song, and J. Sung. 2005. Multiple metabolic risk factors and total and cardiovascular mortality in men with low prevalence of obesity. *Atherosclerosis* September 26, 2005. Retrieved on November 18, 2005: http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=16197950&query_hl=3
- ⁶¹ Connecticut Department of Public Health. 2006. *2005 Behavioral Risk Factor Surveillance System Survey*. Unpublished data. Hartford, CT: Connecticut Department of Public Health.
- ⁶² United States Department of Health and Human Services. 2000. *Healthy People 2010* (2nd ed.) *With Understanding and Improving Health and Objectives for Improving Health*. Volume II. Chapter 12 – Heart Disease and Stroke. Washington, DC: U.S. Government Printing Office.
- ⁶³ Centers for Disease Control and Prevention. 2005 US BRFSS data. Retrieved on March 19, 2008: <http://apps.nccd.cdc.gov/brfss/> and Connecticut Department of Public Health. 2007. *Behavioral Risk Factor Surveillance System, 2004-2006*. Unpublished data. Hartford, CT: Connecticut Department of Public Health.

Appendix 1. Data Sources Referenced

Behavioral Risk Factor Surveillance System

Connecticut Webpage: www.ct.gov/dph/brfss

CDC Webpage: <http://www.cdc.gov/brfss>

Referenced:

Connecticut Department of Public Health, 2007. *Behavioral Risk Factor Surveillance System*, 2004-2005, 2004-2006, and 2005 single-year unpublished data. Hartford, CT: Connecticut Department of Public Health.

Centers for Disease Control and Prevention, 2007; 2008. *Behavioral Risk Factor Surveillance System*, 2005, 2006 data. Atlanta, GA: Centers for Disease Control and Prevention.

Description:

The Behavioral Risk Factor Surveillance System (BRFSS) survey is a state-based system of health surveys that generate information about health risk behaviors, clinical preventive practices, and health care access and use. The BRFSS, sponsored by the Centers for Disease Control and Prevention, is the world's largest telephone survey, and is conducted in all 50 states. It is an on-going random sample telephone survey of non-institutionalized adults, 18 years and older. Information from the survey is used to improve the health of people nationwide and in Connecticut. Racial and ethnic classifications are based on self-report and include White, non-Hispanic, Black, non-Hispanic, and Hispanic (including persons of any race). Other national and state-specific risk factor data and information regarding BRFSS methodology can be accessed on the CDC's BRFSS Web site at: <http://www.cdc.gov/brfss/>

Centers for Disease Control and Prevention (CDC) - WONDER

Webpage: <http://wonder.cdc.gov/>

Referenced:

Centers for Disease Control and Prevention, 2008. *WONDER*, 1989-2005 single-year U.S. mortality data. Atlanta, GA: Centers for Disease Control and Prevention.

Description:

CDC WONDER (Wide-ranging Online Data for Epidemiologic Research) is an interactive data query system that makes national mortality data and other health data available to the public.

Connecticut Vital Records Mortality Files

Webpage: www.ct.gov/dph/DeathData

Referenced:

Connecticut Department of Public Health, 2008. *Connecticut Vital Records Mortality Files*, 1989-2004 single-year and 2002-2004 mortality data. Hartford, CT: Connecticut Department of Public Health.

Description:

The Connecticut Vital Records Mortality Files are part of the state's vital statistics data base that contains records pertaining to deaths that occur within the state as well as deaths of Connecticut residents occurring in other states and Canada. Mortality statistics are compiled in accordance with the World

Health Organization (WHO) regulations, which specify that deaths be classified by the current Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death. Deaths for the 1989-1998 period included in this report are classified by the Ninth Revision of the International Classification of Diseases [ICD-9] (World Health Organization 1977). Deaths for the 1999-2002 period are classified by the Tenth Revision of the International Classification of Diseases [ICD-10] (World Health Organization 1992).

The race-ethnicity designation is typically based on report by next of kin, a funeral director, coroner, or other official. As such, the race-ethnicity designation based on observation may be reported incorrectly. Another potential source of error is the fact that death rates are calculated using two different sources of data – the death certificate for the numerator and the Census Bureau population estimates for the denominator. Errors in under- or overcounting populations by race and ethnicity will affect the death rates reported for these groups. Mortality data are reported using racial categories that exclude persons of Hispanic origin (White, non-Hispanic and Black, non-Hispanic) and by Hispanic ethnicity (Hispanics of any race). Death Registry data follow the National Center for Health Statistics guidelines for coding race and Hispanic ethnicity.

Connecticut Hospital Discharge Abstract and Billing Data Base

Webpage: www.ct.gov/dph/HospitalDischargeData

Referenced:

Connecticut Department of Public Health, 2008. *Connecticut Hospital Discharge Abstract and Billing Data Base, 2005*. Hartford, CT: Connecticut Department of Public Health.

Description:

The Connecticut Hospital Discharge Abstract and Billing Data Base is the source of inpatient hospitalization data. It is maintained by the Connecticut Office of Health Care Access, and it contains patient-level demographic, clinical, and billing data for all non-federal acute care hospitals in the state. In addition to age, gender, and town of residence, the demographic data elements include race and ethnicity. Based upon observation of the patient rather than self-reporting by the patient, race is designated as White, non-Hispanic and Black, non-Hispanic. Hispanic ethnicity includes persons of any race. It should be noted that counts reflect hospitalizations not persons. For example, a patient admitted to a hospital on two separate occasions in 2002 would be counted twice in these data.

United States Department of Health and Human Services (US DHHS)

Webpage: <http://www.healthypeople.gov/>

Referenced:

US DHHS, 2000. *Healthy People 2010: Understanding and Improving Health*. Washington, DC: U.S. Department of Health and Human Services, Government Printing Office.

Description:

The U.S. Department of Health and Human Services' initiative *Healthy People* was first launched in 1979, and since then it has provided a framework for measuring state and national progress in leading health indicators. *Healthy People 2010* was released in 2000, and provides a comprehensive set of disease prevention and health promotion objectives for the nation covering 467 objectives in 28 focus areas. The *Healthy People 2010* target objective for stroke deaths is 48 per 100,000 population.

Appendix 2. Glossary of Statistical Terms

Age-adjusted Mortality Rates (AAMR) and Age-adjusted Hospitalization Rates (AAHR) are used to compare relative mortality and hospitalization risk, respectively, across groups and over time. They are not actual measures of risk but rather an index of risk. They are weighted statistical averages of the age-specific rates, in which the weights represent the fixed population proportions by age (Murphy 2000). The age-adjusted rates in these tables were computed by the direct method. The 1940 and 2000 U.S. standard million population distributions are shown below:

Age group	1940	2000
0-4	80,057	69,136
5-9	81,151	72,533
10-14	89,209	73,032
15-19	93,665	72,169
20-24	88,002	66,477
25-29	84,280	64,529
30-34	77,787	71,044
35-39	72,501	80,762
40-44	66,744	81,851
45-49	62,696	72,118
50-54	55,116	62,716
55-59	44,559	48,454
60-64	36,129	38,793
65-69	28,519	34,264
70-74	19,519	31,773
75-79	11,423	26,999
80-84	5,878	17,842
85+	2,765	15,508
Total	1,000,000	1,000,000

Age standardization is a technique that allows for the comparison of death rates in two or more populations. The National Center for Health Statistics (NCHS) used the 1940 standard million population in reporting national mortality statistics for over 50 years. Implementation of the new year 2000 population standard began with deaths occurring in 1999. Age-adjustment based on the year 2000 standard often results in age-adjusted death rates that are larger than those based on the 1940 standard. The new standard affects trends in age-adjusted death rates for certain causes of death and decreases race and ethnicity differentials in age-adjusted death rates (Anderson and Rosenberg 1998).

Cause-of-death classification Mortality statistics for this report were compiled in accordance with the World Health Organization (WHO) regulations, which specify that member nations classify causes of death by the current Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death. Deaths for the 1989-1998 period were classified by the Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death, Ninth Revision of the International Classification of Diseases [ICD-9] (World Health Organization 1977). Deaths for the 1999-2002 period

were classified according to the Tenth Revision of the International Classification of Diseases [ICD-10] (World Health Organization 1992).

Healthy People 2000 and **Healthy People 2010** are part of a national strategy addressing the prevention of major chronic illnesses, injuries, and infectious diseases. They are the product of an effort, involving expert working groups, a consortium of national organizations, all state health departments, and the Institute of Medicine of the National Academy of Sciences to set health objectives for the nation. After extensive national and regional hearings were conducted with a period of public review and comment, the health objectives were published in 1990 as *Healthy People 2000—National Health Promotion and Disease Prevention Objectives*. It established national objectives and served as the basis for the development of state and community plans. *Healthy People 2010* provides a comprehensive view of the nation's health in 2000, and establishes national goals and targets to be achieved by 2010, and monitors progress over time.

Hispanic origin refers to people whose origins are from Spain, the Spanish-speaking countries of Central America, South America, and the Caribbean, or persons of Hispanic origin identifying themselves as Spanish, Spanish-American, Hispanic, Hispano, or Latino. Since 1988, the Connecticut death certificate has had a separate line item for Hispanic ethnicity. Individuals identified as “Hispanic” can be of any race, and are also counted in the race breakdown as either “white,” “black,” “Asian or Pacific Islander,” “American Indian,” or other.

International Classification of Diseases (ICD-9, ICD-10) has been the internationally accepted coding system for determining cause of death since the early 1900s. It is periodically revised. The ninth revision (ICD-9) was in use from 1975 through 1998. Beginning with 1999 deaths, the tenth revision (ICD-10) is being used.

Preliminary estimates of the comparability of ICD-9 to ICD-10 have been published and indicate that the discontinuity in trends from 1998 to 1999 for some leading causes of death (septicemia, influenza and pneumonia, Alzheimer's disease, nephritis, nephrotic syndrome, and nephrosis) is substantial (Anderson, Minino, Hoyert, et al. 2001).

International Classification of Diseases, Clinical Modification (ICD-9-CM) is a coding system recommended for use in all clinical settings to describe procedures and diagnoses. It is required for reporting diagnoses and diseases to all U.S. Public Health Service and Department of Health and Human Services programs, including Medicare and Medicaid. The foundation of the ICD-9-CM is the *International Classification of Diseases, 9th Revision* published by the World Health Organization.

Population bases for computing rates are taken from the U.S. Census Bureau *Estimates of the population of states by age, sex, race, and Hispanic origin*. These data are estimates of the population of Connecticut by 5-year age groups (age 0 to 4, 5 to 9, ... 85 and over), sex (male, female), modified race (white; black; Native American including Alaska Natives; Asian and Pacific Islander) and Hispanic origin (Hispanic, non-Hispanic) for each year, July 1, 1999 through July 1, 2002.

Premature mortality See Years of Potential Life Lost (YPLL).

Race refers to a population of individuals identified from a common history, nationality, or geographical place. Race is widely considered a valid scientific category, but not a valid biological or genetic category (Lewontin, 1995; Gould 1981). Available scientific evidence indicates that racial and ethnic classifications do not capture biological distinctiveness, and that there is more genetic variation within racial groups than there is between racial groups (Williams, Lavizzo-Mourey, and Warren 1994; American Anthropological Association 1998). Contemporary race divisions result from historical events and circumstances and reflect current social realities. Thus, racial categories may be viewed more accurately as proxies for social and economic conditions that put individuals at higher risk for certain disease conditions.

Data are reported for two racial groups in Connecticut: white, non-Hispanic and black, non-Hispanic. Individuals identified as “Hispanic” can be of any race.

Socioeconomic position refers to a person’s social and economic place in a society, and is operationalized or measured by characteristics such as per capita or household income, educational attainment, or occupation. Historically, lower socioeconomic position has been strongly correlated with less favorable health outcomes such as higher death and premature mortality rates from all causes; conversely, persons of higher socioeconomic position do better on most measures of health status.

Years of Potential Life Lost (YPLL) represents the number of years of potential life lost by each death before a predetermined end point (e.g., 65 or 75 years of age). Whereas the crude and adjusted death rates are heavily influenced by the large number of deaths among the elderly, the YPLL measure provides a picture of premature mortality by weighting deaths that occur at younger ages more heavily than those occurring at older ages. It thereby emphasizes different causes of death. Age-adjusted YPLLs are calculated using the methodology of Romeder and McWhinnie (1977).

References

- American Anthropological Association. 1998. *American Anthropological Association Statement on “Race.”* Via website <http://www.aaanet.org/stmts/racepp.htm>.
- Anderson, R.N., A.M.Minino, D.L. Hoyert, H.M. Rosenberg. 2001. “Comparability of cause of death between ICD-9 and ICD-10: Preliminary estimates.” *National Vital Statistics Reports* 49(2): 1-32.
- Anderson, R.N. and H.M. Rosenberg 1998. “Age standardization of death rates: implementation of the year 2000 standard.” *National Vital Statistics Report* 47(3):1-16, 20.
- Gould, S.J. 1981. *The Mismeasure of Man*. New York: W.W. Norton and Company.
- Lewontin, R. 1995. *Human Diversity*. New York: Scientific American Books.
- Murphy, S.L. 2000. Deaths: Final data for 1998. *National Vital Statistics Reports* 48(11). Hyattsville, MD: National Center for Health Statistics. DHHS Publication No. (PHS) 2000-1120.
- Romeder, J.M. and McWhinnie, J.R. 1977. Potential Years of Life Lost between ages 1 and 70: An indicator of premature mortality for health planning. *International Journal of Epidemiology* 6:143-151.

Williams, D.R., R. Lavizzo-Mourey, and R.C. Warren. 1994. The concept of race and health status in America. *Public Health Reports* 109: 26-41.

World Health Organization. 1977. *Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death, based on the recommendations of the Ninth Revision Conference, 1975*. Geneva: World Health Organization.

World Health Organization. 1992. *Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death, based on the recommendations of the Tenth Revision Conference, 1992*. Geneva: World Health Organization.

Appendix 3. Glossary of Medical Terms (excerpted from the sources listed below)

Atherosclerosis: A disease that affects the arteries, particularly those supplying the heart, the brain, the aorta, and the lower extremities. Atherosclerosis underlies the occurrence of heart attacks, many strokes, peripheral arterial disease, and ruptures of the aorta. **Source:** Centers for Disease Control and Prevention. 2006. *A Public Health Action Plan to Prevent Heart Disease and Stroke, Appendix A*. Retrieved 1/2/2007: http://www.cdc.gov/dhdsp/library/action_plan/full_appendix_a.htm

Cardiovascular Diseases (CVD): Diseases of the circulatory system, which include acute myocardial infarction, ischemic heart disease, valvular heart disease, peripheral vascular disease, arrhythmias, high blood pressure and stroke. **Source:** World Health Organization Collaborating Centre on Surveillance of Cardiovascular Diseases. *The Growing Burden of Heart Disease and Stroke*. (n.d.). Retrieved 1/2/2006: <http://www.cvdinfobase.ca/cvdbook/En/Glossary.htm>

Cholesterol: See Serum (Blood) Lipids.

Coronary Heart Disease (CHD): A form of heart disease resulting from impaired circulation in one or more coronary arteries. Common clinical manifestations of CHD include chest pain (angina pectoris) or heart attack.” **Source:** Centers for Disease Control and Prevention. 2006. Retrieved 1/2/2007: http://www.cdc.gov/dhdsp/library/action_plan/full_appendix_a.htm

Cerebrovascular Disease: A disease of one or more blood vessels in the brain, which often results in the sudden development of a focal neurologic deficit, or stroke. Stroke, or a “brain attack” is the most severe clinical manifestation of cerebrovascular disease. **Source:** World Health Organization Collaborating Centre on Surveillance of Cardiovascular Diseases. *The Growing Burden of Heart Disease and Stroke*. Retrieved 1/2/2006: <http://www.cvdinfobase.ca/cvdbook/En/Glossary.htm>

Diabetes (or diabetes mellitus): A metabolic disorder that results from the body’s insufficient production or utilization of insulin. The most common types of diabetes includes “Type 1 diabetes,” formerly known as “juvenile diabetes,” and “Type 2 diabetes,” formerly known as “adult-onset diabetes.” Long-term effects of diabetes include cardiovascular complications. **Source:** Centers for Disease Control and Prevention. 2006. *A Public Health Action Plan to Prevent Heart Disease and Stroke, Appendix A*. Retrieved 1/2/2007: http://www.cdc.gov/dhdsp/library/action_plan/full_appendix_a.htm

Dyslipidemia: A disorder of lipoprotein metabolism, such as an overproduction or deficiency of lipoprotein. Dyslipidemia is often manifested by elevated levels of total cholesterol, the “bad” or low-density lipoprotein (LDL) cholesterol, and the triglyceride concentrations, as well as decreased levels of the “good” or high-density lipoprotein (HDL) cholesterol concentration in the blood. **Source:** MedicineNet.com. *Definition of Dyslipidemia*. Retrieved 1/3/2007: <http://www.medterms.com/script/main/art.asp?articlekey=33979>

Essential Hypertension: “high blood pressure that does not have an apparent cause — The vast majority (95 percent) of high blood pressure is essential hypertension.” **Source:** The Cleveland Clinic Information Center. 2004. Hypertension Glossary. Retrieved 1/3/2007: <http://www.clevelandclinic.org/health/health-info/docs/3800/3846.asp?index=12273>

Hemorrhagic Stroke: Hemorrhagic stroke involves bleeding within the brain that damages nearby brain tissue. A common cause of hemorrhagic stroke is the bursting of an aneurysm (a weak spot in an artery wall). Hemorrhagic stroke is often associated with high blood pressure. About 20% of all strokes are hemorrhagic. **Source:** MedlinePlus. 2006. *Hemorrhagic Stroke*. Retrieved 1/2/2007: <http://www.nlm.nih.gov/medlineplus/>

High Blood Cholesterol: Cholesterol is a substance found in all cells of the body; it is carried in lipoproteins, made of fat (lipid) on the inside and proteins on the outside. Low-density lipoprotein (LDL) cholesterol is sometimes called “bad cholesterol” because it leads to a buildup of cholesterol in arteries. The higher the LDL level in the blood, the greater one’s chance of getting heart disease. The buildup of cholesterol in the arteries is called plaque, which over time causes the narrowing of the arteries, or “atherosclerosis.” Some plaques can burst, releasing fat and cholesterol into the bloodstream, which may cause the blood to clot and block the flow of blood. This blockage can cause angina or a heart attack. Lowering one’s cholesterol level decreases the chance of having a plaque burst and a subsequent heart attack. Lowering cholesterol may also slow down, reduce, or even stop plaque from building up. **Source:** National Heart, Lung and Blood Institute. 2006. *What is Cholesterol? What is High Blood Cholesterol?* Retrieved 1/3/2007: http://www.nhlbi.nih.gov/health/dci/Diseases/Hbc/HBC_WhatIs.html

High Blood Pressure: A condition in which the pressure in the arterial circulation system is greater than clinically recommended, that is, a systolic pressure greater than or equal to 140 mm Hg or a diastolic pressure greater than or equal to 90 mm Hg. High blood pressure is associated with increased risk for heart disease, stroke, and chronic kidney disease. **Source:** Centers for Disease Control and Prevention. 2006. *A Public Health Action Plan to Prevent Heart Disease and Stroke, Appendix A.* Retrieved 1/2/2007: http://www.cdc.gov/dhdsp/library/action_plan/full_appendix_a.htm

Hypertensive Heart Disease: An abnormality in the structure and function of the heart caused by long-standing high blood pressure. A common, clinical manifestation of hypertensive heart disease is heart failure. **Source:** Centers for Disease Control and Prevention. 2006. *A Public Health Action Plan to Prevent Heart Disease and Stroke, Appendix A.* Retrieved 1/2/2007: http://www.cdc.gov/dhdsp/library/action_plan/full_appendix_a.htm

Ischemic Stroke: The most common type of stroke that occurs when too little blood reaches an area of the brain usually due to a clot that has blocked a blood vessel. An ischemic stroke can sometimes lead to a brain hemorrhage. About 80% of strokes are ischemic strokes, **Source:** MedlinePlus. 2006. *Hemorrhagic Stroke.* Retrieved 1/2/2007: <http://www.nlm.nih.gov/medlineplus>

Obesity: Defined in terms of body mass index (BMI), and calculated as body weight in kilograms (1 kg = 2.2 lbs) divided by height in meters (1 m = 39.37 in) squared. Adults with a BMI of greater than or equal to 30.0 kg/m² are considered “obese,” and those with a BMI of 25–29.9 kg/m² are considered “overweight.” **Source:** Centers for Disease Control and Prevention. 2006. *A Public Health Action Plan to Prevent Heart Disease and Stroke, Appendix A.* Retrieved 1/2/2007: http://www.cdc.gov/dhdsp/library/action_plan/full_appendix_a.htm

Classification of Overweight and Obesity in Adults According to BMI		
Classification	BMI (kg/m ²)	Risk of Health Problems
Underweight	< 18.5	Low (but risk of other clinical problems increased)
Normal range	18.5-24.9	Average
Overweight	25.0-29.9	Mildly increased
Obese	≥ 30.0	
Class I	30.0-34.9	Moderate
Class II	35.0-39.9	Severe
Class III	≥ 40.0	Very severe
Note that these values are age-independent and correspond to the same degree of fatness across different populations.		

Source: World Health Organization Collaborating Centre on Surveillance of Cardiovascular Diseases. *The Growing Burden of Heart Disease and Stroke*. Retrieved 1/2/2006: <http://www.cvdinfobase.ca/cvdbook/En/Glossary.htm>

Serum (Blood) Lipids: Cholesterol and triglycerides are two forms of lipid, or fat in the body. Patients with elevated triglyceride levels typically have other major risk factors for heart disease (obesity, diabetes, and/or high blood pressure), but no study has yet proven that high triglyceride levels are an independent risk factor for heart disease. Recent evidence strongly suggests that an elevated triglyceride level is a significant risk factor for cardiac disease - especially when it is elevated as part of the "metabolic syndrome X." **Source:** About: Heart Disease. *Cholesterol and Triglycerides*. Retrieved 1/3/2007: <http://heartdisease.about.com/cs/cholesterol/a/choltri.htm>

Stroke: The most common clinical manifestation of cerebrovascular disease. Stroke describes an interruption of the blood supply in the brain that results in damaged brain tissue. It can be caused by clots or by bleeding in the brain from a ruptured blood vessel or a significant injury. **Source:** The Cleveland Clinic Information Center. 2004. *Hypertension Glossary*. Retrieved 1/3/2007: <http://www.clevelandclinic.org/health/health-info/docs/3800/3846.asp?index=12273>

Triglycerides: See Serum (Blood) Lipids.