

THE BURDEN OF HEART DISEASE AND STROKE: RHODE ISLAND

2009





THE BURDEN OF HEART DISEASE AND STROKE: RHODE ISLAND

2009

Rhode Island Department of Health
Division of Community, Family Health and Equity
Heart Disease and Stroke Prevention Program
3 Capitol Hill
Cannon Building, Room 408
Providence, Rhode Island 02908

This work was funded by the U.S. Centers for Disease Control and Prevention Cooperative Agreement Award Number: 5U50DP000745-03.

Citation: Pearlman, Deborah N; Affleck, Patricia; Everage, Nicholas; and Goldman, Dona. The Burden of Heart Disease and Stroke: Rhode Island, 2009. Rhode Island Department of Health, Division of Community, Family Health and Equity, Heart Disease and Stroke Prevention Program, 2009.

Available at: <http://www.health.ri.gov/programs/heartdiseaseandstrokeprevention/index.php>.

Acknowledgements

The Rhode Island Department of Health Heart Disease and Stroke Prevention Program would like to thank the following people for their valuable comments and for making available the data for this report: Samara Viner-Brown, Chief, Center for Health Data and Analysis; Donald Perry, Health Surveys Manager; Jana Hesser, BRFSS Project Director; and Kathy Taylor, Data Manager. Appreciation also is extended to Carol Hall-Walker, Chief, Program Administration; for her ongoing support of this work. This document would not have been possible without John Egan's contributions to and guidance on graphic design and layout. This document benefited from the excellent copy editing by Caitlin Morgan.



Department of Health

3 Capitol Hill
Providence, RI 02908-5097
(401) 222-5960

RI Relay: 711
www.health.ri.gov

December 19, 2009

Dear Rhode Islanders,

It is a great pleasure to present *The Burden of Heart Disease and Stroke: Rhode Island, 2009*, the first in a series of data reports on heart disease and stroke in the state. Population-based data are provided on heart disease and stroke prevalence, risk factors, hospitalizations, and morbidity. Whenever possible, this report combines several years of data to ensure sufficient sample sizes for meaningful analyses of small populations groups in order to identify disparities based on race and ethnicity, income, and geography.

Comprehensive data are critical to the Rhode Island Department of Health (HEALTH) and our partners in implementing the Rhode Island Heart Disease and Stroke Prevention State Plan. This data report will assist us in our commitment to reducing the burden of heart disease and stroke. The information is important for the evaluation of our objectives and activities in reaching state plan goals. We hope that you find this information useful and thought provoking as we work together to improve the lives of people affected by heart disease and stroke.

Sincerely,

David R. Gifford, MD, MPH
Director of Health

TABLE OF CONTENTS

Executive Summary	1
Introduction	5
Guide to Reading This Report	9
Who Has Heart Disease or a Stroke in Rhode Island?	13
What Are Risk Factors for Heart Disease and Stroke?	17
Who is Hospitalized for Heart Disease or a Stroke in Rhode Island?	29
Who Dies From Heart Disease or a Stroke in Rhode Island?	45
Addressing High Blood Pressure in Vulnerable Populations	51
Conclusion	55
References	59
Appendix A: Rhode Island Department of Health Databases and Indicators	65

List of Tables

Table 1.	Five leading causes of death (All ages), U.S., 2005 and Rhode Island, 2005-2007	7
Table 2.	Rhode Island Heart Disease and Stroke Surveillance System	9
Table 3.	Measuring disparities in cardiovascular disease prevalence and cardiovascular-related outcomes	10
Table 4.	<i>Healthy People 2010</i> objectives for heart disease and stroke measured in Rhode Island's Heart Disease and Stroke Surveillance System	11
Table 5.	Determining statistical significance for heart attack prevalence among women and men	12
Table 6.	Cardiovascular disease questions, Behavioral Risk Factor Surveillance System	14
Table 7.	Disparities in cardiovascular disease prevalence, 2007-2008	15
Table 8.	Major risk factors for cardiovascular diseases	17
Table 9.	American Heart Association high blood pressure categories	19
Table 10.	Cardiovascular disease risk factor questions, Behavioral Risk Factor Surveillance System	20
Table 11.	Centers for Disease Control and Prevention Body Mass Index (BMI) categories	20
Table 12.	Percentage of Rhode Island adults aged 20-64 years with one or more cardiovascular disease risk factor, 2005, 2007	24
Table 13.	Disparities in prevalence of having three or more cardiovascular disease risk factors among Rhode Island adults aged 20-64 years, 2005, 2007	25
Table 14.	Cardiovascular disease risk factor questions, Youth Risk Behavioral Surveillance Survey	26
Table 15.	International classification of disease codes for cardiovascular disease hospital discharges	30
Table 16.	Two-year average age-specific heart disease and stroke hospitalization rates by sex, race/ethnicity, and age group, among adults ages 18 and older, 2006-2007	36
Table 17.	Three-year average age-specific and age-adjusted heart disease and stroke hospitalization rates by geographic area, among adults ages 20 and older, 2005-2007	38
Table 18.	Hospitalizations for cardiovascular diseases listed as the primary diagnosis and associated mean length of stay and charges, by demographic groups, for adults 18 years of age and older, 2007	39
Table 19.	Hospitalizations for heart diseases listed as the primary diagnosis and associated mean length of stay and charges, by demographic groups, for adults 18 years of age and older, 2007	40
Table 20.	Hospitalizations for strokes listed as the primary diagnosis and associated mean length of stay and charges, by demographic groups, for adults 18 years of age and older, 2007	42
Table 21.	International classification of diseases codes for cardiovascular disease deaths	45
Table 22.	Two-year average age-specific heart disease and stroke mortality rates by sex, age group, and race/ethnicity, among adults ages 18 and older, 2006-2007	48
Table 23.	Three-year average age-specific heart disease and stroke mortality rates and overall age-adjusted heart disease and stroke mortality rates, by geographic residence, among adults ages 20 and older, 2005-2007	49

List of Figures

Figure 1. Map of Rhode Island	5
Figure 2. Population distribution by race/ethnicity, Rhode Island, 2008	6
Figure 3. Poverty rate by race/ethnicity, Rhode Island, 2006-2007, U.S., 2007	6
Figure 4. Global causes of death, 2005	6
Figure 5. Estimated direct and indirect costs of major cardiovascular diseases, U.S., 2009	7
Figure 6. Trends in self-reported cardiovascular disease prevalence by year, 2005-2008	14
Figure 7. Prevalence of self-reported doctor-diagnosed high blood pressure by year, Rhode Island and U.S. adults, 2001-2007, odd years only	21
Figure 8. Prevalence of self-reported doctor-diagnosed high cholesterol by year, Rhode Island and U.S. adults, 2001-2007, odd years only	21
Figure 9. Prevalence of self-reported doctor-diagnosed diabetes by year, Rhode Island and U.S. adults, 2001-2007	22
Figure 10. Prevalence of self-reported tobacco use (current smoking) by year, Rhode Island and U.S. adults, 2001-2007	22
Figure 11. Prevalence of self-reported physical inactivity by year, Rhode Island and U.S. adults, 2001-2007	22
Figure 12. Prevalence of obesity (BMI ≥ 30) by year, Rhode Island and U.S. adults, 2001-2007	22
Figure 13. Percentage of Rhode Island adults aged 20-64 years with 0 to 6 cardiovascular disease risk factors, 2005, 2007	23
Figure 14. Percentage of Rhode Island middle and high school public school students that smoke cigarettes, 2007	27
Figure 15. Age-adjusted annual hospitalization rates for all cardiovascular diseases, heart disease, and stroke, 2000-2007	32
Figure 16. Age-adjusted annual hospitalization rates for all cardiovascular diseases, by sex, among adults ages 18 and older, 2000-2007	34
Figure 17. Age-adjusted annual hospitalization rates for all cardiovascular diseases, by race/ethnicity, among adults ages 18 and older, 2000-2007	34
Figure 18. Primary payer for heart disease hospitalizations for adults 18 years of age and older, 2007	39
Figure 19. Point of entry into Rhode Island's hospital system for cardiovascular disease events, 2007	44
Figure 20. Age-adjusted annual mortality rates for all cardiovascular diseases, heart disease, and stroke, 2000-2007	46
Figure 21. Sample referral process for the Heart Disease and Stroke Neighborhood Pilot Project, South Providence, Rhode Island	54
Figure 22. The Rhode Island Chronic Care Collaborative	56



EXECUTIVE SUMMARY

The Rhode Island Heart Disease and Stroke Prevention (RI HDSP) Program

By the year 2012, the Rhode Island Department of Health (HEALTH), with funding from the Centers for Disease Control and Prevention (CDC), will have implemented a five-year Heart Disease and Stroke Prevention capacity-building program. The goal is to launch and sustain a statewide coordinated effort to prevent and control heart disease and stroke. The program is committed to furthering policies and systems that:

- Sustain individual behavior change,
- Enhance access to effective medical care, and
- Improve health status with a special focus on the elimination of racial and ethnic disparities in heart disease and stroke.

RI HDSP Program has six priority areas, which seek to:

1. Increase control of high blood pressure,
2. Increase control of high blood cholesterol,
3. Increase knowledge of the signs and symptoms of heart attacks and strokes,
4. Improve emergency response for heart disease and stroke,
5. Improve quality of heart disease and stroke care, and
6. Eliminate health disparities.

What is cardiovascular disease?

Cardiovascular diseases include diseases of the heart and hypertension (high blood pressure), as well as cerebrovascular diseases, such as stroke. Modifiable risk factors that increase the risk of developing and dying from heart disease or a stroke include tobacco use, physical inactivity, an unhealthy diet, high blood pressure, high cholesterol, overweight or obesity, and type 2 diabetes.

How big is the problem in the U.S.?

Heart disease and stroke are major causes of disability and lead to more deaths in the United States than any other disease. Coronary heart disease is the most common type of heart disease. It is a condition caused by plaque building up inside the coronary arteries. These are the arteries that supply the heart with oxygen enriched blood.¹

The burden of heart disease and stroke also can be measured in terms of both direct and indirect costs. In 2009, the direct and indirect costs of cardiovascular diseases and stroke in the United States were estimated at \$475.3 billion.² Direct costs include the cost of physicians and other professionals, hospital and nursing home services, the cost of medications, home health care and other medical durables.² Indirect costs include lost productivity that results from illness and death attributable to heart disease or stroke.²

Who is most affected?

Coronary heart disease mortality has been declining in the United States since the 1990s, although at a slower rate than in the 1980s.³ Stroke mortality rates have declined little, if at all, since the 1990s.³ National data have documented steep gradients in cardiovascular disease mortality based on socioeconomic status, as measured by education, income, or occupation.³ What is particularly disturbing is that the available data suggest that the gap in cardiovascular disease mortality between the poor and less formally educated versus the wealthy and well-educated has not lessened and may be widening.³ Highlighted below are findings specific to Rhode Island (See Key Findings).

Purpose of this report

This report provides the current picture of the burden of cardiovascular disease in Rhode Island. Data for Rhode Island come from the HEALTH's Heart Disease and Stroke Surveillance System. This system is used to track heart disease and stroke prevalence, morbidity, and mortality, as well as disparities in health outcomes. Public health tracking of the health status and health care outcomes of Rhode Islanders is essential for identifying high-risk groups, formulating health care policies, and evaluating our state's progress in implementing population-based strategies for primary and secondary prevention of heart disease and stroke.

Key Findings

Who Has Cardiovascular Diseases in Rhode Island?

In 2008:

- 4.0% of Rhode Island adults have had a heart attack, which is similar to the national average (4.2%).
- 4.6% of Rhode Island adults have coronary heart disease, which is slightly higher than the national data for the U.S.(4.2%).
- 2.3% of Rhode Island adults have had a stroke, which is slightly lower than the national data for the U.S. (2.6%).
- 8% of Rhode Island adults or 64,228 Rhode Islanders ages who were 18 years of age and older had one or more cardiovascular diseases in 2008. Cardiovascular disease is defined as ever being told by a doctor that you have coronary heart disease, or have had a heart attack, or have had a stroke.

Cardiovascular disease risk factors

A substantial number of deaths from cardiovascular diseases can be attributed to tobacco use, which increases the risk of dying from coronary heart disease and cerebrovascular disease two to three-fold. Other cardiovascular disease risk factors include physical inactivity, diets low in fruits and vegetables, high blood pressure, high cholesterol, type 2 diabetes, and overweight and obesity. These seven leading risks are called modifiable risk factors because they are physical conditions or behaviors that a person can change, unlike one's age. The 2005 and 2007 Rhode Island Behavioral Risk Factor Surveillance System was used to measure the cardiovascular disease risk profile of adults from 20 to 64 years of age. Risk factors included: cigarette smoking, physical inactivity, diet low in fruits and vegetables, high blood pressure, high cholesterol, and overweight and obesity. The findings are of concern.

Among Rhode Island adults from 20 to 64 years of age:

- Only 5% had no modifiable cardiovascular disease risk factors.
- An estimated 16% had one risk factor, representing 76,302 Rhode Island adults at risk for heart disease and stroke.
- About 27% reported having two modifiable cardiovascular disease risk factors. This represents 124,633 Rhode Island adults at high risk for heart disease and stroke.
- Close to one-third adults reported having three modifiable risk factors (28%). This represents 128,164 Rhode Island adults at high risk for heart disease and stroke.

Among Rhode Island adults from 20 to 64 years who have with at least one modifiable cardiovascular disease risk factor:

- More than two-thirds (77%) reported that they did not eat 5 or more fruits and vegetables a day.
- An estimated 66% were overweight or obese.
- Close to one-half (49%) did not meet national guidelines for minimum physical activity.
- About 35% had been diagnosed with high cholesterol.
- About one-fourth (25%) had been diagnosed with high blood pressure.
- Twenty percent currently smoked.

There are important disparities in the burden of cardiovascular disease. Adults who are more likely to have three or more modifiable cardiovascular disease risk factors and have been diagnosed with cardiovascular disease are:

- Men
- People with less than 12 years of education, and
- People with household incomes below \$25,000.

Who Is Hospitalized for Heart Disease and Stroke in Rhode Island?

- *All Rhode Islanders.* Among all Rhode Island residents, the age-adjusted hospitalization rate for heart disease ranged from a high of 141.3 per 10,000 in 2001 to a low of 120.5 per 10,000 in 2007. This represents a 15% decline between 2001 and 2007.
- *All Rhode Islanders.* Among all Rhode Island residents, the age-adjusted hospitalization rate for stroke ranged from 30.7 per 10,000 in 2000 to 26.7 in 2004, before increasing again to a rate of 28.1 per 10,000 in 2007. This represents a 5% increase between 2004 and 2007.
- *Adult women.* Among Rhode Island women age 50 and older, non-Hispanic black women have a 2.1 times higher risk of being hospitalized for heart disease as Hispanic women (451.5 per 10,000

vs. 217.9 per 10,000), and 1.3 times higher risk of being hospitalized for heart diseases as non-Hispanic white women (451.5 per 10,000 vs. 354.3 per 10,000).

- *Adult men.* Among Rhode Island men 50 years of age and older, non-Hispanic white men have slightly higher age-specific hospitalization rates for heart disease than non-Hispanic black men, and both groups have higher age-adjusted hospitalization rates for heart disease than Hispanic men (453.1 per 10,000, 410.0 per 10,000, and 281.8 per 10,000, respectively).

Who Dies from Heart Disease or Stroke in Rhode Island?

- *Among Rhode Islanders.* Among all Rhode Island residents, age-adjusted mortality rates for heart disease ranged from a high of 30.2 per 10,000 population in 2000 to a low of 26.2 per 10,000 in 2006; a 13% decrease over 7 years.
- *Among Rhode Islanders.* Among all Rhode Island residents, the age-adjusted mortality rate for stroke was 5.6 per 10,000 population in 2000, which dropped to a low of 4.1 per 10,000 in 2006, before increasing slightly to 4.3 per 10,000 residents in 2007.
- *Adult women and men.* Age-specific mortality rates for heart disease show that men aged 18 to 64 die from heart disease at a rate that is nearly three times higher than that of women aged 18 to 64 (Male: 6.9 per 10,000 population vs. Female: 2.5 per 10,000 population, respectively).
- *Over 65 years of age.* In the over-65 age group, non-Hispanic whites (both sexes) are more likely to die of heart disease or a stroke than racial/ethnic minorities. In the 65-and-older age group, whites have 1.3 times the risk of dying from heart disease as racial/ethnic minorities.
- *Geographic residence.* Age-adjusted mortality rates for 2003 to 2005 years (combined data) show that the city of Providence had higher mortality rates for stroke than the state overall (Providence: 7.9 per 10,000 population vs. Rhode Island: 5.4 per 10,000 population, respectively). Age-adjusted mortality rates for heart disease were also higher for the city of Providence relative to the state as a whole (38.4 per 10,000 population vs. 32.8 per 10,000 population), but the difference was more modest than for stroke.



INTRODUCTION

About Rhode Island

Rhode Island is the smallest state in the U.S. geographically. It is only 37 miles wide and 48 miles long. It is one of the most densely populated and heavily industrialized states for its size.

In 2008, Rhode Island's estimated resident population was 1,050,788; 78.8% of the state's population is white non-Hispanic, 6.4% is black/African-American, 11.6% is of Hispanic/Latino origin and 3.3% are other racial/ethnic groups (See Figure 2).

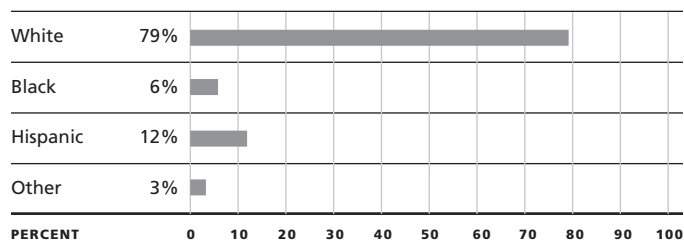
In Rhode Island, the percentage of people living in poverty varies substantially by race/ethnicity (Figure 3). Persons in poverty are defined here as those individuals with incomes less than 100% of the federal poverty level (FPL) as measured by the U.S. Census Bureau's poverty thresholds. Blacks are twice as likely to be poor as whites, and Hispanics are more than three times as likely to be poor as whites. Most of Rhode Island's poor and minority residents live in one of Rhode Island's core cities (See Figure 1). Rhode Island defines a core city as any city where, according to the 2000 Census, the child poverty level is greater than 15%. These cities are: Central Falls, Newport, Pawtucket, Providence, West Warwick, and Woonsocket.

FIGURE 1. MAP OF RHODE ISLAND



Source: Rhode Island Department of Labor and Training Available online at: <http://www.dlt.ri.gov/lmi/maps/county.htm>

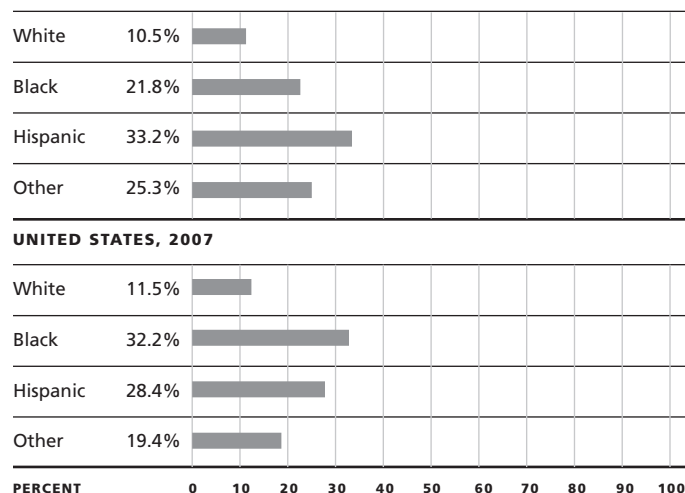
FIGURE 2. POPULATION DISTRIBUTION BY RACE/ETHNICITY,¹ RHODE ISLAND, 2008



¹Race/ethnicity: Persons of Hispanic origin may be of any race; all other racial/ethnic groups are non-Hispanic. "Other" includes Asian Americans, Pacific Islanders, American Indians, Aleutians, Eskimos and persons of "Two or More Races." These groups are combined due to their small populations, which prevent meaningful statistical analyses of the groups individually.

Data source: U.S. Census Bureau State and County QuickFacts, Rhode Island 2008. Available on-line: <http://quickfacts.census.gov/qfd/states/44000.html>

FIGURE 3. POVERTY RATE BY RACE/ETHNICITY,¹ RHODE ISLAND, 2006-2007, U.S., 2007



¹Race/ethnicity. See Figure 2.

Data source: Urban Institute and Kaiser Commission on Medicaid and the Uninsured estimates based on the Census Bureau's March 2007 and 2008 Current Population Survey (CPS: Annual Social and Economic Supplements). Available online at: <http://www.statehealthfacts.org/comparebar.jsp?ind=14&cat=1>

What is cardiovascular disease?

Cardiovascular disease is a broad term used to describe a range of diseases that affect a person's heart or blood vessels. The major cardiovascular diseases include:

- Coronary heart disease (also called ischemic heart disease or coronary artery disease)
- Cerebrovascular diseases (stroke)
- Hypertension (also called high blood pressure)
- Heart failure
- Rheumatic heart disease

How big is the problem?

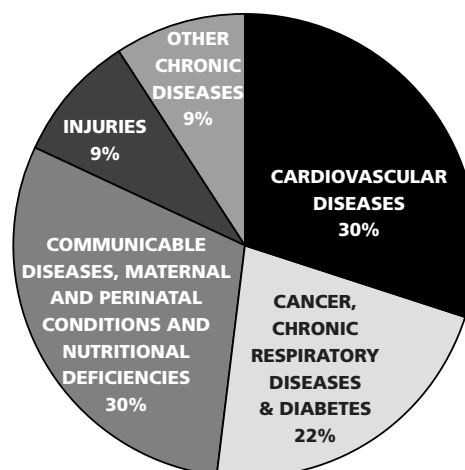
Cardiovascular diseases are no longer only diseases of the developed world.⁴ Globally, cardiovascular diseases are among the top causes of death and are projected to remain so.

Cardiovascular diseases, including heart disease and stroke, are the first and third leading causes of death for both men and women in the United States and in Rhode Island (See Table 1).⁵ Heart disease and stroke are also costly health problems.

Figure 5 shows the estimated direct health care costs (e.g. payment to physicians and other professionals, hospital and nursing home services, medications costs, home health care, and other medical durables) and indirect costs (e.g. loss of productivity resulting from morbidity and mortality) for cardiovascular diseases in 2009.⁵

In Rhode Island, health care costs for cardiovascular diseases and stroke are estimated using the Rhode Island Hospital Discharge Data. In 2007, Rhode Island's average hospital charges for all cardiovascular diseases were estimated at \$36,000 per hospital stay. These health care costs are based on charges for an inpatient hospitalization and do not include many other direct and indirect costs associated with caring for

FIGURE 4. GLOBAL CAUSES OF DEATH, 2005



Data source: World Health Organization. Fact sheet about cardiovascular diseases. Available online at: http://www.who.int/cardiovascular_diseases/en/

persons with cardiovascular diseases. As Rhode Island's population ages, the economic impact of cardiovascular diseases on the state's health care system will become even greater. Rhode Island is one of 14 states that will continue to have a rapidly aging population; people 65 years old and older currently account for 14.1% of Rhode Island's population.⁶ This percentage will increase when all baby boomers are older than 65 years of age.

What factors increase the risk of developing cardiovascular diseases?

According to the World Health Organization, tobacco use, physical inactivity, unhealthy diets, high blood pressure, high cholesterol, type 2 diabetes, and overweight and obesity are the main factors that increase an individual's risk of developing and dying from cardiovascular diseases.⁴ Modifiable risk factors that increase the chances of developing heart disease or having a stroke begin early in life. Encouraging young children and teenagers to be physically active and maintain a healthy weight is important, as is preventing children and youth from starting to smoke cigarettes. If all major types of cardiovascular disease were eliminated, U.S. life expectancy would increase by nearly 7 years.⁵

Who is most affected by cardiovascular disease?

Reducing health disparities remains a major public health challenge, nationally and in Rhode Island. Having timely access to current data on health outcomes and health care access is important for policy and program development to reduce health disparities. Substantial research has documented that the poor have worse health than other population groups, including: shorter life expectancy; higher cancer rates, and higher incidence of asthma, diabetes, and cardiovascular diseases.^{7,8,9,10,11} The following factors may contribute to these disparities.

The poor are more likely than the non-poor to:

- Have less access to health care resources in a community,
- Have increased exposure to stress and violence, which negatively affects mental and physical health, and
- Live in neighborhoods with greater exposure to environmental hazards that can increase the risk of developing chronic disease.

In Rhode Island, striking disparities exist in the prevalence of heart disease and stroke among the poor (household income less than \$25,000 per year) as compared with the non-poor (household income greater than or equal to \$25,000 per year). Combined Rhode Island population-based survey

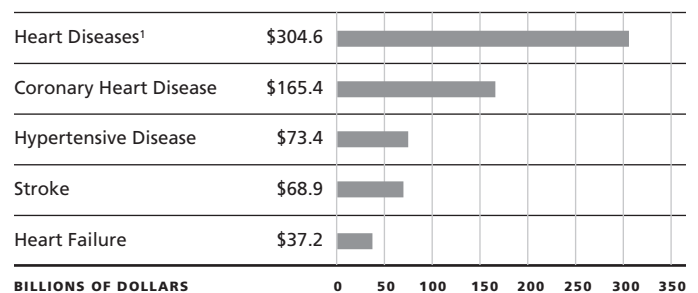
TABLE 1. FIVE LEADING CAUSES OF DEATH (ALL AGES), U.S., 2005 AND RHODE ISLAND, 2005-2007¹

CAUSE OF DEATH	NUMBER OF US DEATHS	NUMBER OF RHODE ISLAND DEATHS
Heart Disease	652,091	7,374
Cancer	559,312	1,871
Stroke (cerebrovascular diseases)	143,579	1,041
Chronic lower respiratory diseases	130,933	437
Accidents (unintentional injuries):	117,809	185

¹Mortality Codes: Heart Disease ICD-10: I00-I09, I11, I13, I20-I51; Malignant neoplasms: C00-C97; Stroke I60-I69; Chronic lower respiratory disease J40 to J47; Accidents (unintentional injuries) V01-X59, Y85-Y86. Centers for Disease Control and Prevention, National Vital Statistics Report Volume 52 (21); June 2, 2004. Available online at: http://www.cdc.gov/nchs/data/nvsr/nvsr52_21acc.pdf

Data Source: 2005 National Center for Health Statistics, 2005 and 2005-2007 Rhode Island Vital Records, Rhode Island Department of Health, Center for Health Data and Analysis.

FIGURE 5. ESTIMATED DIRECT AND INDIRECT COSTS OF MAJOR CARDIOVASCULAR DISEASES, U.S., 2009



¹Includes coronary heart disease, congestive heart failure, part of hypertensive disease, cardiac dysrhythmias, rheumatic heart disease, cardiomyopathy, pulmonary heart disease, and other or ill-defined "heart" diseases.

Data source: Centers for Disease Control and Prevention. Chronic Disease Prevention and Health Promotion. Heart disease and stroke prevention: Addressing the nation's leading killers. At A Glance 2009. Available online at: <http://www.cdc.gov/NCCDPHP/publications/AAG/dhdp.htm>

data for 2007-2008 show that adults 18 years of age and older living in families defined as poor were more likely to have ever been told they had heart disease than were adults in families that were not poor (7% vs. 4%). The poor also were more likely than the non-poor to have had a stroke (5% vs. 2%).

The National Conference of State Legislatures works in partnership with the Centers for Disease Control and Prevention (CDC) Heart Disease and Stroke Prevention Program to provide up-to-date information on heart disease and stroke. Readers are encouraged to go to the website to download interactive maps that show national, state, and county rates for heart disease and stroke mortality and hospitalizations.¹² The World Health Organization (WHO) in collaboration with CDC has produced *The Atlas of Heart Disease and Stroke*. The atlas addresses the global epidemic of heart disease and stroke in a clear and accessible format and can be downloaded from the WHO website.¹³

Purpose of Report

1. To provide a comprehensive overview of the prevalence of heart disease, stroke, and related chronic disease risk factors in Rhode Island, and to show trends in hospital and mortality rates for heart disease and stroke, and
2. To provide timely, comprehensive, and accurate Rhode Island-specific data for the lay public, program planners, health care providers, legislators, and policy makers.

Rhode Island is making tremendous strides in improving the quality of life for people with heart disease and stroke. Findings in this report were also used to develop the *Rhode Island Heart Disease and Stroke 2009 State Plan* accessed on the HEALTH website at <http://www.health.ri.gov/programs/heartdiseaseandstrokeprevention/index.php>. This surveillance report will be updated on an ongoing basis and will be used to measure our progress improving the health of individuals with heart disease and stroke in Rhode Island.



GUIDE TO READING THIS REPORT

Rhode Island's Heart Disease and Stroke Surveillance System

Rhode Island's Heart Disease and Stroke Prevention Surveillance System is a comprehensive set of databases that include population-based and clinical data (See Table 2).

TABLE 2. RHODE ISLAND HEART DISEASE AND STROKE SURVEILLANCE SYSTEM

DATA SETS	POPULATION
Behavioral Risk Factor Surveillance System	State-wide random sample of adults 18 years of age and older
Youth Risk Behavior Survey	Random sample of Rhode Island public high school and middle school students (Grades 6–12).
Rhode Island Chronic Care Collaborative	Low-income patients in community health centers and private physician practices.
Hospital Discharge Data	Rhode Island residents hospitalized in the state.
Emergency Department Data	Rhode Island residents with an emergency room visit in the state.
Vital Records (Death data)	Rhode Island residents who die in- or out-of-state.

Data Sources: Rhode Island Department of Health, Center for Health Data and Analysis and Rhode Island Chronic Care Collaborative.

Tracking Disparities

Whenever possible, this report combines several years of data to ensure sufficient sample sizes for meaningful analyses of small populations groups. However, many of HEALTH's data sets have small samples of racial and ethnic minority groups. As many racial and ethnic differences between minority groups and non-Hispanic whites mirror differences in socioeconomic status, this burden of disease report often focuses on socioeconomic differences in health status and health outcomes rather than racial and ethnic differences. As shown in Figure 3, in Rhode Island, blacks are twice as likely to be poor as whites, and Hispanics are more than three times as likely to be poor as whites. Therefore, racial and ethnic differences in health outcomes and health care access are likely to be intrinsically related to socioeconomic factors.

Groups used to measure potential disparities in health status and health outcomes are shown in Table 3. An annual household income of less than \$25,000 was used as a marker of low income in this report. Many social services in Rhode Island use a cutoff of \$25,000 in annual household income as a measure of need, a category often referred to as "low income" or "near-poor."

TABLE 3. MEASURING DISPARITIES IN CARDIOVASCULAR DISEASE PREVALENCE AND CARDIOVASCULAR-RELATED OUTCOMES

DISPARITY	DEFINITIONS
ADULTS 18+	
Sex	Female vs. Male
Age groups	18 to 64 years of age vs. older than 65 years of age 18 to 49 years of age vs. older than 50 years of age
Educational level	Less than 12 years vs. High school diploma or more years of schooling
Household income	Less than \$25,000 per year vs. more than \$25,000 per year
Race/ethnicity ¹	Hispanic, black non-Hispanic, white non-Hispanic, other non-Hispanic racial/ethnic groups
MIDDLE AND HIGH SCHOOL STUDENTS	
Sex	Female vs. Male
Age group	Middle school: 11 or younger vs. 12 and older High school: 15 or younger vs. 16 and older

¹Persons of Hispanic origin may be of any race; all other racial/ethnic groups are non-Hispanic. "Other" includes Asian Americans and American Indians.

Making a Difference

One way Rhode Island monitors how well the state is reducing the prevalence of chronic diseases and eliminating disparities is by comparing state data against national benchmarks. One national benchmark is *Healthy People*, which provides science-based, 10-year national objectives for promoting health and preventing disease. Since 1979, *Healthy People* has set and monitored national health objectives to meet a broad range of health needs. *Healthy People 2010* is the most recent benchmark for monitoring the nation's health. Every 10 years, the U.S. Department of Health and Human Services (HHS) issues a new *Healthy People* report. *Healthy People 2020* will reflect new assessments of major risks to health and wellness and emerging issues related to our nation's health preparedness and prevention.¹⁴

Shown in Table 4 are the *Healthy People 2010* objectives for heart disease and stroke¹⁵ that can be measured using data from Rhode Island's Heart Disease and Stroke Prevention Surveillance System. As a result of the *Healthy People 2010* Midcourse Review, some changes were made to the objectives for heart disease and stroke, such as changes in the data source used to support an objective.¹⁶ The overall goal for heart disease and stroke remains the same: Improve cardiovascular health and quality of life through the prevention, detection, and treatment of risk factors; early identification and treatment of heart attacks and strokes; and prevention of recurrent cardiovascular events.

TABLE 4. HEALTHY PEOPLE 2010 OBJECTIVES FOR HEART DISEASE AND STROKE MEASURED IN RHODE ISLAND'S HEART DISEASE & STROKE SURVEILLANCE SYSTEM

CONDITION	HEALTHY PEOPLE 2010 TARGET ¹	RHODE ISLAND DATA ²
HEART DISEASE		
12-1. Reduce coronary heart disease deaths.	Target: 162 deaths per 100,000 population	Vital Records Death Certificates
12-2. Increase the proportion of adults aged 20 years and older who are aware of the early warning symptoms and signs of a heart attack and the importance of accessing rapid emergency care by calling 911.	Target: 50 percent	Behavioral Risk Factor Surveillance System (BRFSS)
12-6. Reduce hospitalizations of older adults with congestive heart failure as the principal diagnosis.	Targets: 12-6a. Adults aged 65 to 74 years, Target: 6.5 per 1,000 population 12-6b. Adults aged 75 to 84 years, Target 13.5 per 1,000 population 12-6c. Adults aged 85 years and older, Target: 26.5 per 1,000 population	Hospital Discharge Data
STROKE		
12-7. Reduce stroke deaths.	Target 50 deaths per 100,000 population	Vital Records Death Certificates
12-8. Increase the proportion of adults who are aware of the early warning symptoms and signs of a stroke and the importance of accessing rapid emergency care by calling 911.	Target 83 percent	BRFSS
Blood Pressure		
12-9. Reduce the proportion of adults with high blood pressure.	Target 14 percent	BRFSS
12-10. Increase the proportion of adults with high blood pressure whose blood pressure is under control.	Target 68 percent	Rhode Island Chronic Care Collaborative
12-11. Increase the proportion of adults with high blood pressure who are taking action (e.g. losing weight, increasing physical activity, or reducing sodium intake) to help control their blood pressure.	Target 98 percent	BRFSS
CHOLESTEROL		
12-13. Reduce the mean total blood cholesterol levels among adults.	Target 199 mg/dL (mean)	Rhode Island Chronic Care Collaborative
12-14. Reduce the proportion of adults with high total blood cholesterol levels.	Target 17 percent	BRFSS and RI Chronic Care Collaborative
12-15. Increase the proportion of adults who have had their blood cholesterol checked within the preceding 5 years.	Target 80 percent	BRFSS

¹Centers for Disease Control and Prevention and National Institutes of Health. Midcourse Review Healthy People 2010. Heart Disease and Stroke. Available online at: <http://healthypeople.gov/Data/midcourse/pdf/fa12.pdf>

²Data sources cited are population based except for the Rhode Island Chronic Care Collaborative.

Prevalence. How do we measure the burden of disease or health-related events? To answer this question we estimate how many people have a specific disease or health-related event at a given point in time out of the entire population. Incidence is the number of newly diagnosed cases of a disease. An incidence rate is the number of new cases of a disease divided by the number of persons at risk for the disease. Rhode Island's population-based data allow us to determine a person's likelihood of having a disease, or prevalence. But the data cannot be used to measure incidence.

Statistical significance and 95% confidence intervals (95% CI). How do we know if one group is significantly different from another group with respect to the burden of disease or health-related event? One way of determining significant differences across groups is to compute a 95% confidence interval (95% CI). Since all values in a survey are estimates, the 95% confidence interval is the range of values within which the “true” value probably lies 95% of the time. When two groups have 95% confidence intervals that overlap, indicating that the “true” value could potentially be the same in both groups, the groups are conservatively assumed to have statistically similar rates. If the 95% confidence intervals do not overlap, we assume that the groups being compared are significantly different from one another. A narrow confidence interval implies high precision, while a wide interval implies low precision. Determination of statistical significance for data in this report is based on non-overlapping 95% confidence intervals. Although this is not strictly speaking a statistical test, it is a commonly accepted way to compare estimates.¹⁷

Displaying disparities. This report displays findings on disparities in table format to show when the 95% confidence intervals do and do not overlap. In the example above, men are **significantly more likely** than women to have had a heart attack, also called a myocardial infarction (Table 5).

TABLE 5. DETERMINING STATISTICAL SIGNIFICANCE FOR HEART ATTACK PREVALENCE AMONG WOMEN AND MEN

POPULATION GROUPS	BRFSS SAMPLE	HEART ATTACK SAMPLE, N ¹	% (95% CI) ²
Men	1,690	140	5.4
Women	3,096	126	(4.4-6.4)
Overall	4,786	266	2.7 (2.2-3.3)

¹Unweighted number of respondents who responded to the question on having a heart attack diagnosed by a doctor or other health professional.

²Weighted data.

Data Source: 2008 Rhode Island Behavioral Risk Factor Surveillance System, Rhode Island Department of Health, Center for Health Data and Analysis.



WHO HAS HEART DISEASE OR A STROKE IN RHODE ISLAND?

This section describes the prevalence of cardiovascular diseases among Rhode Island adults. Cardiovascular disease is a term that includes many different types of heart conditions as well as different types of strokes. This section also illustrates which segments of the Rhode Island population are more likely to have cardiovascular diseases than others. Throughout this section there are shaded boxes that summarize information in a table or figure. These boxes are labeled Highlights. There also are shaded boxes labeled Public Health Message. These boxes highlight key information about cardiovascular health. The data source analyzed in this section is the Rhode Island Behavioral Risk Factor Surveillance System (BRFSS).

Rhode Island's Adult Population (18 years of age and older)

Measuring Heart Disease and Stroke Prevalence

As described in the previous section, cardiovascular disease is a broad term used to describe diseases that involve the heart or blood vessels (arteries and veins). Cardiovascular diseases are complex chronic health problems with varying degrees of severity. These characteristics make it difficult to determine the number of people living in the community with cardiovascular disease at any one time (known as prevalence).

One method for determining the prevalence of cardiovascular diseases is through the Behavioral Risk Factor Surveillance System (BRFSS). This is the world's largest on-going population-based telephone health survey, tracking health conditions and risk behaviors in the United States annually for over 25 years. It is conducted by each state in collaboration with the Centers for Disease Control and Prevention (CDC). Once a household is selected, one adult (18 years of age or older) from that household is randomly selected to be interviewed. BRFSS data are weighted to provide national- and state-level estimates of health outcomes that are representative of the adult population.

Who is represented in the Rhode Island Behavioral Risk Factor Surveillance System?

The adult sample (18 years of age and older) in the Rhode Island BRFSS has increased over the past eight years from 3,544 respondents in 2000 to 4,786 respondents in 2008. In 2008, more than half of the respondents were women (52%), a majority were white (86%), and 18% of respondents were 65 years of age or older. While the sample overrepresents women and the elderly, the data are "weighted" to accurately reflect the age and sex makeup of the Rhode Island adult population before any analyses are conducted.



How does the Rhode Island Behavioral Risk Factor Surveillance System identify persons with cardiovascular diseases?

The Rhode Island BRFSS gathers information on the prevalence of heart disease and stroke using three core questions. Survey respondents answered questions indicating whether a doctor or other health professional had ever told them that they had experienced (1) a heart attack, also called a myocardial infarctions, (2) angina also called coronary heart disease, or (3) a stroke. These three questions have been on the BRFSS since 2005.

Figure 6 shows trends for respondents reporting a history of coronary heart disease, heart attack, or a stroke. There has been very little change in the prevalence of respondents with a history of any of these three conditions over the past four years (2005 to 2008).

This report also describes the first Rhode Island-based prevalence estimates of cardiovascular diseases. Survey respondents who indicated that a doctor or other health professional had ever told them that they had experienced one or more of the following conditions—a heart attack, coronary heart disease, a stroke—were counted as having cardiovascular disease. In 2008, 5.0% of respondents reported having one cardiovascular disease, 2.4% reported having two cardiovascular diseases and 0.4% reported having all three cardiovascular diseases. Overall, a total of 7.8% (95% confidence interval [CI] = 6.9 to 8.5) of respondents reported a history of one or more cardiovascular diseases. This represents 64,228 Rhode Island adults living with cardiovascular disease.

TABLE 6. CARDIOVASCULAR DISEASE QUESTIONS, BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (BRFSS)

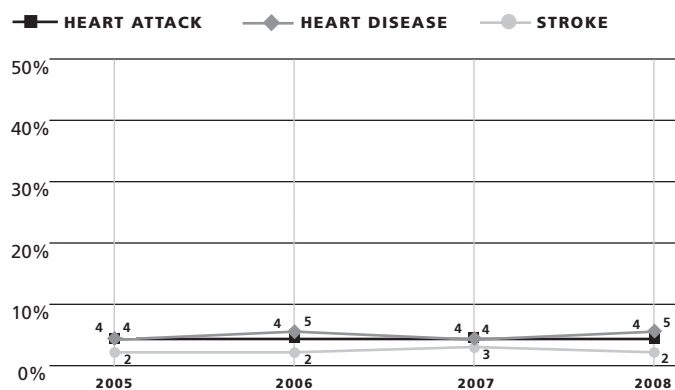
HAS A DOCTOR, NURSE, OR OTHER HEALTH PROFESSIONAL EVER TOLD YOU THAT YOU HAD ANY OF THE FOLLOWING?

A heart attack, also called a myocardial infarction?

Angina or coronary heart disease?

A stroke?

FIGURE 6. TRENDS IN SELF-REPORTED CARDIOVASCULAR DISEASE PREVALENCE BY YEAR, 2005–2008



Data Source: 2005–2008 Rhode Island Behavioral Risk Factor Surveillance System, Rhode Island Department of Health, Center for Health Data and Analysis.

Highlights — Figure 6

Cardiovascular disease prevalence for adults (18 years of age and older), Rhode Island and U.S.

In 2008 the prevalence of cardiovascular diseases was similar in Rhode Island and the U.S.

- Heart attack
 - 4.0% of Rhode Island adults
 - 4.2% of U.S. adults
- Coronary heart disease
 - 4.6% of Rhode Island adults
 - 4.2% of U.S. adults
- Stroke
 - 2.3% of Rhode Island adults
 - 2.6% of U.S. adults

TABLE 7. DISPARITIES IN CARDIOVASCULAR DISEASE PREVALENCE, 2007–2008

CHARACTERISTICS OF ADULTS (18+ YRS)	CARDIOVASCULAR DISEASE SAMPLE	
	SAMPLE NUMBER, N ¹	%(95% CI) ²
SEX		
Male	3,266	9.1 (8.1 – 10.1)
Female	6,016	6.7 (6.0 – 7.4)
AGE GROUP		
18 – 64	6,374	4.2 (3.7 – 4.8)
65 and older	2,816	24.2 (22.4 – 26.0)
EDUCATIONAL LEVEL		
Less than 12 years	911	14.4 (11.8 – 16.9)
HS Diploma or higher	8,344	7.2 (6.7 – 7.8)
HOUSEHOLD INCOME		
Less than \$25,000 per year	2,011	13.5 (11.6 – 15.3)
Greater than or equal to \$25,000 per year	5,933	6.3 (5.6 – 6.9)
RACE/ETHNICITY		
Minority ³	1,155	5.8 (4.0 – 7.5)
White non-Hispanic	8,017	8.1 (7.5 – 8.7)
Overall	9,282	7.8 (7.3 – 8.4)

¹Unweighted number of respondents who responded to the questions on having one or more of the following conditions diagnosed by a doctor or other health professional—a heart attack, coronary heart disease, a stroke.

²Weighted data

³Minority group includes Hispanics and non-Hispanic minority groups, including Blacks, Asians, and American Indians.

Data Source: 2007-2008 Rhode Island Behavioral Risk Factor Surveillance System combined file, Rhode Island Department of Health, Center for Health Data and Analysis.

Highlights — Table 7

Disparities in cardiovascular disease prevalence for adults ages 18+

Individual Factors

- **Sex.** The prevalence of cardiovascular disease is **significantly higher** in men than women (9% vs. 7%).
- **Age.** Adults 65 years of age and older had the highest cardiovascular disease prevalence; **six times higher** for adults age 65 than adults from 18 to 64 years of age (24% vs. 4%).
- **Education.** Cardiovascular disease prevalence is **significantly higher** among those with less than 12 years of education than adults with more years of formal schooling (14% vs. 7%).
- **Income.** The prevalence of cardiovascular disease is **significantly higher** among adults with household incomes below \$25,000 than adults with higher household incomes (14% vs. 6%).
- **Race.** When Hispanics and non-Hispanic blacks were considered together, minority group members had a lower prevalence of cardiovascular disease than non-Hispanic whites. Non-Hispanic white respondents in the BRFSS are older, on average, than minority respondents (56 years vs. 46 years). In the 2008 BRFSS, 20% of non-Hispanic white respondents were 65 years of age and older as compared with only 7% of minority respondents (data not shown). As described above, cardiovascular diseases are more common among those 65 years of age and older than in younger individuals.

Helping people with cardiovascular disease take care of their own health is important. Chronic disease self management can have a significant impact on the health status and health care use of people with cardiovascular diseases by focusing on:

- Nutritional changes,
- Exercise programs,
- Medication compliance,
- Community resources, and
- Solving health-related problems.

Strategies to reduce disparities in the onset of cardiovascular diseases should be culturally sensitive and targeted to specific populations.

Agency for Healthcare Research and Quality (AHRQ.gov).



WHAT ARE RISK FACTORS FOR HEART DISEASE AND STROKE?

This section describes the prevalence of selected modifiable risk factors for heart disease and stroke in Rhode Island, first for adults and then for middle and high school youth. It also illustrates which segments of the Rhode Island population have higher risks of developing heart disease or having a stroke than others. Throughout this section there are shaded boxes that summarize information in a table or figure (Highlights), and key messages about cardiovascular disease risk factors (Public Health Message). The data sources analyzed in this section are the Rhode Island Behavioral Risk Factor Surveillance System (BRFSS) and the Rhode Island Youth Risk Behavior Survey (YRBS).

Risk factors for heart disease and stroke can be categorized into two broad groups: those factors that can not be modified, such as age and family history, and factors that are modifiable. As described previously, modifiable risk factors are physical conditions or behaviors that a person can change.

Modifiable risk factors are responsible for about 80% of coronary heart disease and cerebrovascular disease.¹⁸ Heart disease and stroke share several modifiable risk factors, including high blood pressure, high cholesterol, overweight and obesity, and tobacco use. Physical inactivity and type 2 diabetes are additional risk factors for heart disease.

Behavioral or lifestyle risk factors for heart disease and stroke are often distinguished from physical conditions or “intermediate risk factors.” The latter include high blood pressure, high cholesterol levels, high blood glucose, and overweight and obesity. There are also a number of social and economic factors that are associated with heart disease and stroke. These include poverty, stress, and above average exposure to air pollution (Table 8).

TABLE 8. MAJOR RISK FACTORS FOR CARDIOVASCULAR DISEASES

NON-MODIFIABLE	MODIFIABLE		
	BEHAVIORAL (LIFESTYLE)	INTERMEDIATE	SOCIAL & ECONOMIC
Family history, including race	Tobacco use	High blood pressure	Poverty
Male sex (gender)	Physical inactivity	High cholesterol	Stress
Aging	Unhealthy diet	High glucose	Air pollution, such as particulate matter and sulfur dioxide ¹
	Overweight/obesity		

¹A person's relative risk of developing heart disease or having a stroke due to air pollution is small compared with the impact of established cardiovascular risk factors such as smoking or high blood pressure. However, air pollution is a serious health problem because most people are exposed to toxins in the air over an entire lifetime.

Non-Modifiable Risk Factors

Family history. Adults at higher risk of heart disease because of family history include: (1) those with a mother or sister who have been diagnosed with heart disease before age 65, (2) those with a father or brother diagnosed with heart disease before age 55, (3) those with a family history of stroke, and (4) African-Americans.

Sex. Before menopause, women have a lower risk of having a heart attack than men. After menopause, women experience an increased risk of having a heart attack.

Generally, heart attacks are more severe in women than men, in part, because heart attack symptoms in women may be different than in men and may not be as easily diagnosed. Also, women develop heart problems later in life than men — typically 7 or 8 years later.

Increasing age. Adults at higher risk of heart disease vary by age and gender. Men are at greater risk of heart disease and stroke at age 55 years and older, while women have greater risks for these diseases at 65 years or older. In the 65 and older age group, women are twice as likely as men to die within a few weeks of a heart attack.



Modifiable Risk Factors (Behavioral)

Tobacco use. Cigarette smoking is the most important preventable cause of premature death, both nationally and in Rhode Island. Cigarette smokers have a higher risk of developing heart disease and stroke. Cigarette smoke puts a strain on the heart and increases fatty deposits in the blood, increasing the risk of coronary heart disease and atherosclerosis. Studies also show that cigarette smoking is an important risk factor for stroke. Inhaling cigarette smoke damages the cerebrovascular system, which can cause a stroke.¹⁹

Physical inactivity. Regular aerobic physical activity plays a role in both primary and secondary prevention of cardiovascular disease. Regular aerobic activities can lower blood pressure, which reduces the risk of developing coronary heart disease.²⁰

Unhealthy diet. Diets low in saturated and trans fat reduce the risk of high blood cholesterol. A high blood cholesterol level can lead to a buildup of plaque in the arteries (i.e., atherosclerosis), which can increase your risk of heart attack and stroke. Diets high in fresh fruits and vegetables also are important to reduce the risk of heart disease.

Modifiable Risk Factors (Intermediate)

High blood pressure. Hypertension is the term used to describe high blood pressure. Blood pressure readings are measured in millimeters of mercury (mmHg) and are usually given as two numbers, the systolic blood pressure number and the diastolic blood pressure number. For example, 120 systolic over 80 diastolic is written as 120/80 mmHg. High blood pressure in adults is defined as a blood pressure greater than or equal to 140 mmHg systolic pressure or greater than or equal to 90 mmHg diastolic pressure.²¹ High blood pressure directly increases the risk of coronary heart disease and stroke, especially when it is present with other risk factors. Table 9 shows blood pressure categories defined by the American Heart Association.

High cholesterol. Cholesterol is a soft, waxy substance found among the lipids (fats) in the bloodstream and in all your body's cells. A high level of cholesterol in the blood

TABLE 9. AMERICAN HEART ASSOCIATION HIGH BLOOD PRESSURE CATEGORIES

BLOOD PRESSURE CATEGORY	SYSTOLIC MM HG (UPPER #)		DIASTOLIC MM HG (LOWER #)
Normal	less than 120	and	less than 80
Prehypertension	120 – 139	or	80 – 89
High Blood Pressure (Hypertension) Stage 1	140 – 159	or	90 – 99
High Blood Pressure (Hypertension) Stage 2	160 or higher	or	100 or higher
Hypertensive Disease (Emergency care needed)	Higher than 180	or	Higher than 110

American Heart Association. Understanding Blood Pressure Readings. Available on-line at:
<http://www.americanheart.org/presenter.jhtml?identifier=2112>

(hypercholesterolemia) leads to a build-up of cholesterol in the arteries. Like high blood pressure, high cholesterol increases the risk of coronary heart disease and stroke.

Type 2 Diabetes. Diabetes is a disease that affects the body's ability to produce or respond to insulin, a hormone that allows blood glucose (blood sugar) to enter the cells of the body and be used for energy. The most common form of the disease is type 2 diabetes, which usually is diagnosed after age 45, but is increasingly being found in children and adolescents. Diabetes is a major chronic disease itself, and a significant risk factor for cardiovascular diseases. The risk of

cardiovascular disease among people with diabetes is dramatic. An adult with diabetes has the same risk of developing cardiovascular disease as an adult who has had one heart attack. More than 65 percent of deaths among diabetes patients are attributed to heart and vascular disease.²²

Overweight and obesity. Excess body weight has many long-term health consequences.²³ Some of the health risks associated with overweight and obesity include:

- High blood pressure (Hypertension)
- Coronary heart disease
- Stroke
- Type 2 diabetes
- Cancers (endometrial, breast, and colon)
- Dyslipidemia (for example, high total cholesterol or high levels of triglycerides)
- Liver and gallbladder disease
- Sleep apnea and respiratory problems
- Osteoarthritis (a degeneration of cartilage and its underlying bone within a joint)

Cardiovascular Risk Factors in Adults (18 years of age and older)

Table 10 shows the wording of the BRFSS cardiovascular disease risk factor questions. Because the BRFSS is a cross-sectional survey, it only provides information at one point in time. Thus, we cannot look at cause and effect. For example, we cannot conclude from BRFSS data that people began smoking or became obese *before* they developed a health condition or if people started smoking or became obese *after* they developed a health condition.



TABLE 10. CARDIOVASCULAR DISEASE RISK FACTOR QUESTIONS, BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (BRFSS)

RISK FACTOR	BRFSS QUESTIONS
Tobacco use	Smoking status is determined by a person's response to two questions: (1) Have you smoked at least 100 cigarettes in your entire life? (2) Do you now smoke cigarettes every day, some days, or not at all? Respondents are grouped into three categories: (1) current smoker, (2) former smoker, and (3) never smoked. This question is included on the BRFSS every year.
Physical inactivity	During the past month, did you participate in any physical activity? This question is included on the BRFSS every year.
Unhealthy diet	An unhealthy diet is determined by a person's response to two questions: (1) How often do you eat fruit? (2) How often do you eat vegetables? Respondents who consume less than five or more servings of fruits or vegetables per day are coded as having an unhealthy diet. This question is included on the BRFSS every other year (odd years only).
High blood pressure	Have you ever been told by a doctor, nurse, or other health professional that you have high blood pressure? This question is included on the BRFSS every other year (odd years only).
High cholesterol	Have you ever been told by a doctor, nurse, or other health professional that you have high blood cholesterol? This question is included on the BRFSS every other year (odd years only).
Diabetes	Have you ever been told by a doctor that you have diabetes? Persons with gestational diabetes or diabetes during pregnancy are not included in the "yes" group. This question is included on the BRFSS every year.
Overweight / obesity	Weight status is calculated based on self-reported height and weight. These questions are included on the BRFSS every year. The categories used to calculate weight status are shown in Table 11.

The standard weight status categories associated with BMI ranges for adults are shown in Table 11. As described previously, overweight and obesity are associated with an increased risk of many health conditions

The next section looks at modifiable risk factors in relation to heart disease or stroke in two ways. First, we display trends in the prevalence of modifiable risk factors for cardiovascular disease. Second, we assess whether certain population groups are more likely than others to have multiple risk factors for heart disease and stroke. In order to compare Rhode Island findings with Healthy People 2010 guidelines for U.S. adults, data for high blood pressure, high cholesterol, and obesity weight status start at age 20. Data for doctor-diagnosed diabetes, tobacco use, and physical inactivity start at age 18, as do Healthy People 2010 guidelines for these risk factors.

TABLE 11. CENTERS FOR DISEASE CONTROL AND PREVENTION BODY MASS INDEX (BMI) CATEGORIES

BMI	WEIGHT STATUS
Below 18.5	Underweight
18.5 – 24.9	Normal
25.0 – 29.9	Overweight
30.0 and Above	Obese

Centers for Disease Control and Prevention. About BMI for Adults. Available on-line at: http://www.cdc.gov/healthyweight/assessing/bmi/adult_BMI/index.html#Other%20Ways

What are the trends in modifiable risk factors for heart disease and stroke in the U.S. and Rhode Island?

High blood pressure. In 2001, an estimated 26% of Rhode Islanders 20 years of age and older reported that they had been diagnosed with high blood pressure. This percentage increased to 29% by 2007 (Figure 7). The *Healthy People 2010* objective for improving cardiovascular health is to reduce the proportion of U.S. adults 20 years of age and older with high blood pressure to 16%.

High cholesterol. In 2001, an estimated 33% of Rhode Islanders 20 years of age and older reported that they had been diagnosed with high cholesterol. This percentage increased to 38% by 2007 (Figure 8). The *Healthy People 2010* objective for primary prevention of heart disease and stroke is to reduce the proportion of U.S. adults 20 years of age and older with high cholesterol to 17%.

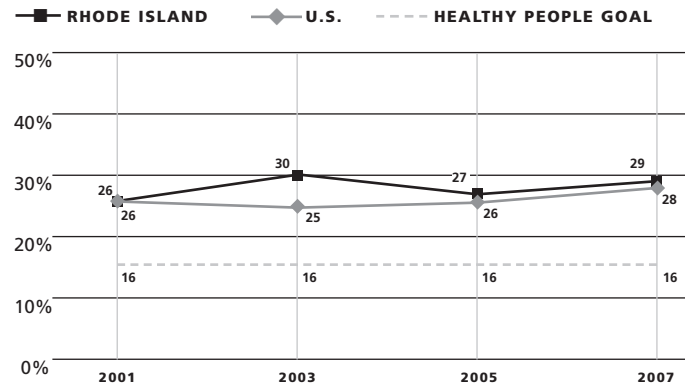
Diabetes. The percentages of adults aged 18 years and older with doctor-diagnosed diabetes have remained fairly constant, around 7% in Rhode Island and 8% nationally (Figure 9). The *Healthy People 2010* objective for the U.S. is to prevent diabetes (Objective 5-3). The target is 2.5 new cases per 1,000 people per year.

Current smoking. Current cigarette use among adults aged 18 years and older has shown a modest decline over a 7-year period (Figure 10). However, by 2005, smoking prevalence among Rhode Island adults began to drop slightly below the national level for U.S. adults. By 2007, smoking prevalence among Rhode Island adults was 3% lower than the national level for U.S. adults (17% vs. 20%, respectively). The percentage of current adult smokers in Rhode Island declined from 24% in 2001 to 17% in 2007, a decline of 7%. The *Healthy People 2010* objective for tobacco use is to reduce cigarette smoking among U.S. adults aged 18 years and older to 12%.

Physical inactivity. The percentages of adults aged 18 years and older that have not engaged in any physical activity in the past month have remained fairly constant in Rhode Island and nationally (Figure 11; around 25% in Rhode Island and 24% in the U.S.).

The *Healthy People 2010* objective for physical activity and fitness is to reduce the proportion of U.S.

FIGURE 7. PREVALENCE OF SELF-REPORTED DOCTOR-DIAGNOSED HIGH BLOOD PRESSURE BY YEAR, RHODE ISLAND AND U.S. ADULTS,^{1,2} 2001–2007, ODD YEARS ONLY

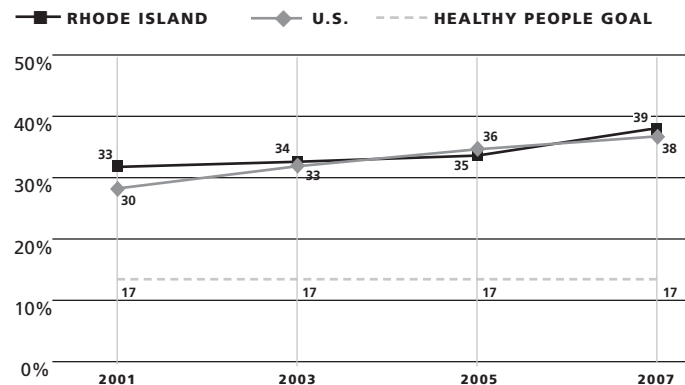


¹Adults aged 20+ who have had their blood pressure checked and have ever been told by a doctor or nurse it was high. Data Source: 2001, 2003, 2005, 2007 Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Behavioral Risk Factor Surveillance System, Prevalence Data. Weighted percentages. Available at <http://apps.nccd.cdc.gov/brfss/index.asp>

²Healthy People 2010. Objective 12-9. Reduce the proportion of adults aged 20 years and older who have high blood pressure. Target: 16%. Available online at <http://www.healthypeople.gov/Document/HTML/volume1/12Heart.htm>

Data Source: 2001–2007 (odd years only), 2003, 2005, 2007 Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Behavioral Risk Factor Surveillance System, Prevalence Data. Weighted percentages. Available online at: <http://apps.nccd.cdc.gov/brfss/index.asp>.

FIGURE 8. PREVALENCE OF SELF-REPORTED DOCTOR-DIAGNOSED HIGH CHOLESTEROL BY YEAR, RHODE ISLAND AND U.S. ADULTS,^{1,2} 2001–2007, ODD YEARS ONLY

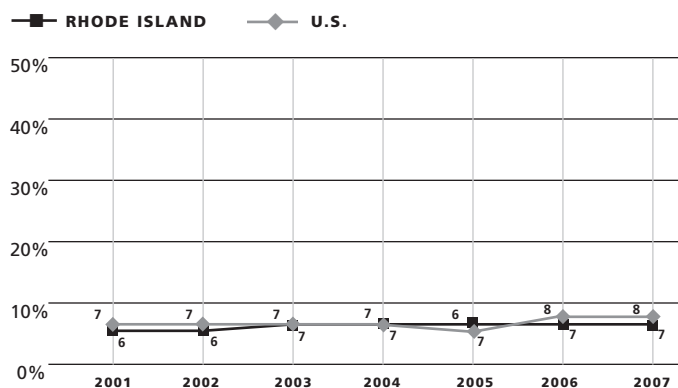


¹Adults aged 20+ who have had their cholesterol checked and have ever been told by a doctor or nurse it was high. Data Source: 2001, 2003, 2005, 2007 Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Behavioral Risk Factor Surveillance System, Prevalence Data. Weighted percentages. Available online at <http://apps.nccd.cdc.gov/brfss/index.asp>

²Healthy People 2010. Objective 12-9. Reduce the proportion of adults aged 20 years and older who have high cholesterol. Target: 17%. Available online at: <http://www.healthypeople.gov/Document/HTML/volume1/12Heart.htm>

Data Source: 2001–2007 (odd years only), 2003, 2005, 2007 Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Behavioral Risk Factor Surveillance System, Prevalence Data. Weighted percentages. Available online at: <http://apps.nccd.cdc.gov/brfss/index.asp>.

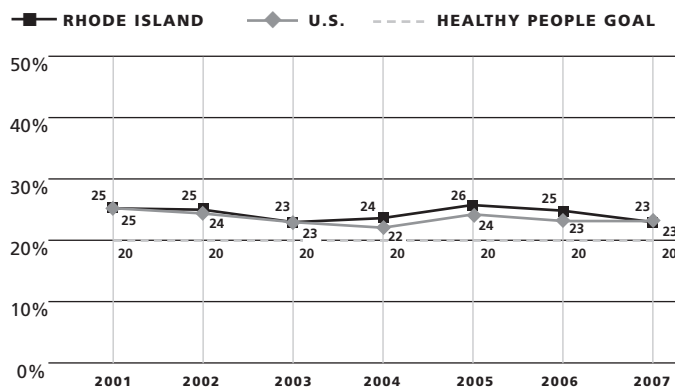
FIGURE 9. PREVALENCE OF SELF-REPORTED DOCTOR-DIAGNOSED DIABETES BY YEAR, RHODE ISLAND AND U.S. ADULTS,¹ 2001–2007



¹Adults aged 18+ who have ever been told by a doctor that they have diabetes. Excludes women diagnosed with gestational diabetes.

Data Source: 2001–2007 Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Behavioral Risk Factor Surveillance System, Prevalence Data. Weighted percentages. Available online at <http://apps.nccd.cdc.gov/brfss/index.asp>

FIGURE 11. PREVALENCE OF SELF-REPORTED PHYSICAL INACTIVITY BY YEAR, RHODE ISLAND AND U.S. ADULTS,^{1,2} 2001–2007

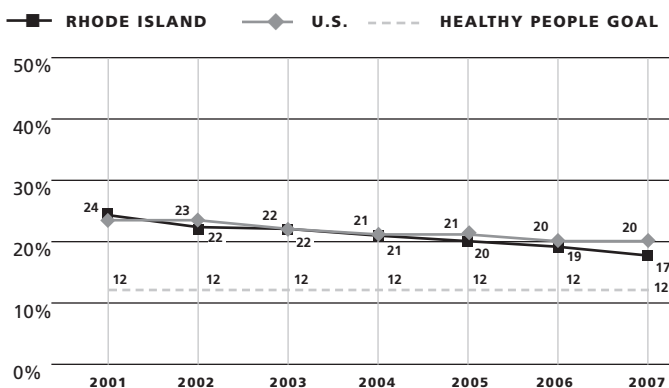


¹Adults aged 18+ who did not participate in any physical activities in the past month.

²Healthy People 2010. Objective 22-1 Reduce the proportion of adults aged 18 years and older who engage in no leisure-time physical activity. Target: 20%. Available online at http://www.healthypeople.gov/document/html/Volume2/22Physical.htm#_Toc490380801

Data Source: 2001–2007 Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Behavioral Risk Factor Surveillance System, Prevalence Data. Weighted percentages. Available at <http://apps.nccd.cdc.gov/brfss/index.asp>

FIGURE 10. PREVALENCE OF SELF-REPORTED TOBACCO USE (CURRENT SMOKING) BY YEAR, RHODE ISLAND AND U.S. ADULTS,^{1,2} 2001–2007

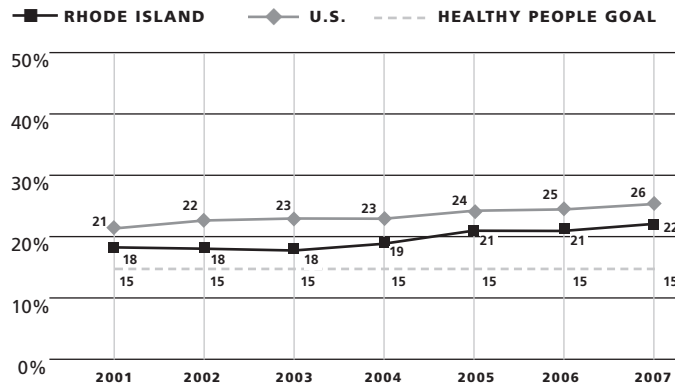


¹Adults aged 18+ who say they currently smoke cigarettes.

²Healthy People 2010. Objective 27-1 Reduce cigarette smoking by adults aged 18 years and older. Target: 12%. Available at http://www.healthypeople.gov/document/html/Volume2/27tobacco.htm#_Toc489766220

Data Source: 2001–2007 Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Behavioral Risk Factor Surveillance System, Prevalence Data. Weighted percentages. Available online at <http://apps.nccd.cdc.gov/brfss/index.asp>

FIGURE 12. PREVALENCE OF OBESITY (BMI≥30) BY YEAR, RHODE ISLAND AND U.S. ADULTS,^{1,2} 2001–2007



¹Adults aged 20+ with a body mass index (BMI) of 30.0 or higher, based on self-reported height and weight.

²Healthy People 2010. Objective 19-2 Reduce the proportion of adults aged 20 years and older who are obese. Target: 15%. Available online at http://www.healthypeople.gov/document/html/Volume2/19Nutrition.htm#_Toc490383121

Data Source: 2001–2007 Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Behavioral Risk Factor Surveillance System, Prevalence Data. Weighted percentages. Available at <http://apps.nccd.cdc.gov/brfss/index.asp>

adults aged 18 years and older who engage in no leisure-time physical activity to 20%.

Obesity. Rhode Island, like the rest of the U.S., is experiencing an increase in levels of obesity (Figure 12). As shown in Table 11, obesity is defined as a body mass index (BMI) of 30.0 or higher. The prevalence of obesity among Rhode Islanders aged 20 years and older increased from 18% in 2001 to 22% in 2007. A similar pattern was observed nationally, where the percentage of U.S. adults that are obese has risen over the past seven years. The *Healthy People 2010* objective for weight status is to reduce the proportion of adults aged 20 years and older who are obese to 15%.

Public Health Message

Much of the burden of heart disease and stroke could be eliminated by reducing common major risk factors: high blood pressure, high blood cholesterol, tobacco use, and obesity. The more risk factors a person has the greater the likelihood of developing heart disease or having a stroke. When the effects of cigarette smoking are combined with those of other risk factors, such as high blood pressure, the likelihood of developing heart disease or having a stroke greatly increases.

What is the cardiovascular disease risk profile of Rhode Islanders from 20 to 64 years of age?

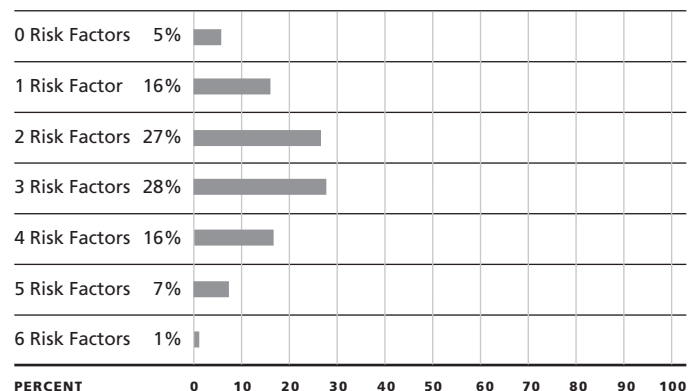
Several studies suggest that cardiovascular disease risk factors tend to cluster in individuals. Each modifiable risk factor for cardiovascular disease can independently increase the risk of developing cardiovascular diseases. The risk of developing cardiovascular disease increases with the total number of risk factors.^{24,25,26,27} It has not yet been precisely determined which combination of factors or “clustering” of risk factors contributes most to the risk of developing cardiovascular disease.²⁸

The Rhode Island Behavioral Risk Factor Surveillance System (BRFSS) can be used to create a cardiovascular disease risk profile for adults. The profile includes lifestyle (smoking, physical inactivity, diet low in fruits and vegetables), and intermediate (high blood pressure, high cholesterol, and overweight and obesity) risk factors.

The BRFSS does not include a question about doctor-diagnosed high blood glucose levels, which greatly increase the risk for diabetes, heart disease and stroke. Because the BRFSS does not distinguish between type 1 and type 2 diabetes, diabetes was not included in the cardiovascular disease risk profile. Some of the serious complications of type 1 and type 2 diabetes are heart disease and stroke. Type 2 diabetes, however, is the more common risk factor for heart disease and stroke because people with type 2 diabetes have a higher-than-average risk of having a heart attack or stroke.

The cardiovascular disease risk profile of Rhode Islanders from 20 to 64 years of age is shown in Figure 13. As discussed previously, this age limit was used to match *Healthy People 2010* guidelines for high blood pressure and high cholesterol in U.S. adults. This age limit also was set because the BRFSS can be used to estimate the percentage of adults aged 20 to 64 years that meet national guidelines for physical activity. These national guidelines state that adults aged 18 to 64 years should do 90 minutes a week of moderate-intensity, or 75 minutes a week of vigorous-intensity aerobic physical activity, or an equivalent combination of moderate- and vigorous-intensity aerobic physical activity. Older adults (aged 65 and older) should be physically active as their abilities allow, but avoid inactivity.²⁹ The findings shown in Figure 13 are of concern.

FIGURE 13. PERCENTAGE OF RHODE ISLAND ADULTS AGED 20-64 YEARS WITH 0 TO 6 CARDIOVASCULAR DISEASE RISK FACTORS,¹ 2005, 2007



¹Risk factors include diet low in fruits and vegetables (less than 5-a-day), did not meet national guidelines for moderate physical activity, current smoker, diagnosed high blood pressure, diagnosed high cholesterol, and being overweight or obese.

Data Source: 2005 and 2007 Rhode Island Behavioral Risk Factor Surveillance System combined file, Rhode Island Department of Health, Center for Health Data and Analysis.

Highlights — Figure 13

The cardiovascular disease risk profile of Rhode Island adults

Among Rhode Islanders from 20 to 64 years of age...

- About 5% had no modifiable cardiovascular disease risk factors.
- An estimated 16% had one risk factor, representing 76,302 Rhode Island adults at risk for heart disease and stroke.
- About 27% reported having two modifiable cardiovascular disease risk factors. This represents 124,633 Rhode Island adults at risk for heart disease and stroke.
- Close to one-third reported having three modifiable cardiovascular disease risk factors (28%). This represents 128,164 Rhode Island adults at high risk for heart disease and stroke.

TABLE 12. PERCENTAGE OF RHODE ISLAND ADULTS AGED 20-64 YEARS WITH ONE OR MORE CARDIOVASCULAR DISEASE RISK FACTOR, 2005, 2007

INDIVIDUAL RISK FACTORS	SAMPLE ¹	
	ESTIMATED NUMBER OF ADULTS WITH RISK FACTOR	PERCENT WITH RISK FACTOR ² (95% CI) ³
Diet low in fruits and vegetables.	340,311	77.4 (75.8–78.9)
Overweight or obese.	288,264	65.5 (63.8–67.3)
Did not meet national guidelines for moderate physical activity.	214,794	48.8 (47.0–50.7)
High cholesterol.	154,507	35.1 (33.4–36.9)
High blood pressure.	111,238	25.3 (23.7–26.9)
Current smoker.	88,803	20.2 (18.6–21.7)

¹Weighted number of adults aged 20 to 64 years with the cardiovascular disease risk factor.

²May include adults with more than one risk factor.

³95%CI=95% confidence intervals

Data Source: 2005 and 2007 Rhode Island Behavioral Risk Factor Surveillance System combined file, Rhode Island Department of Health, Center for Health Data and Analysis

Highlights — Table 12

Prevalence of individual cardiovascular disease risk factors

Among Rhode Islanders from 20 to 64 years of age who have at least one risk factor for cardiovascular disease...

- More than two-thirds (77%) reported that they did not eat 5 or more fruits and vegetables a day
- An estimated 66% were overweight or obese
- Close to one-half (49%) did not meet national guidelines for minimum physical activity
- About 35% have high cholesterol
- About one-fourth (25%) have high blood pressure
- Twenty percent currently smoke.

TABLE 13. DISPARITIES IN PREVALENCE OF HAVING THREE OR MORE CARDIOVASCULAR DISEASE RISK FACTORS AMONG RHODE ISLANDERS FROM 20 TO 64 YEARS OF AGE, 2005, 2007

CHARACTERISTIC	SAMPLE ¹	
	ESTIMATED NUMBER OF ADULTS WITH 3+ RISK FACTORS ²	PERCENT WITH 3+ RISK FACTORS (95% CI) ³
SEX		
Male	135,594	60.6 (57.7 – 63.4)
Female	103,293	43.2 (41.0 – 45.5)
EDUCATIONAL LEVEL		
< 12 years	16,937	69.7 (62.8 – 76.6)
HS Diploma or higher	221,675	50.6 (48.7 – 52.5)
HOUSEHOLD INCOME		
< \$25,000 per year	35,503	66.8 (62.1 – 71.6)
≥ \$25,000 per year	179,860	49.4 (47.4 – 51.5)
RACE/ETHNICITY		
Minority ⁴	29,928	53.3 (47.7 – 58.9)
White non-Hispanic	206,223	51.4 (49.4 – 53.3)
CORE CITY⁵		
Yes	60,804	52.5 (49.0 – 56.0)
No	170,720	51.4 (46.4 – 50.8)
Overall	238,887	51.6 (49.8 – 53.4)

1 Weighted number of adults aged 20 to 64 years with 3+ cardiovascular disease risk factors.

2 Numbers may not equal to overall total because don't know and missing responses are not shown.

3 95% CI = confidence intervals.

4 Minority group includes Hispanics and non-Hispanic minority groups, including Blacks, Asians, and American Indians.

5 Rhode Island defines a core city as any city where, according to the 2000 Census, the child poverty level is greater than 15%. These cities include: Central Falls, Newport, Pawtucket, Providence, West Warwick, and Woonsocket.

Data Source: 2005, 2007 Rhode Island Behavioral Risk Factor Surveillance System combined file, Rhode Island Department of Health, Center for Health Data and Analysis.

Highlights — Table 13

Disparities

Among Rhode Islanders from 20 to 64 years of age ...

- **Sex.** Men are **significantly more likely** than women to have three or more cardiovascular disease risk factors (61% vs. 43%).
- **Education.** Those with less than 12 years of education are **significantly more likely** than adults with more years of formal schooling to have three or more cardiovascular disease risk factors (70% vs. 41%).
- **Income.** Those with household incomes below \$25,000 a year are **significantly more likely** than adults with higher incomes to have three or more cardiovascular disease risk factors (67% vs. 50%).
- **No significant differences** were found by race/ethnicity or area of residence. The latter was defined as living in a core city or not in a core city. As previously noted, Rhode Island defines a core city as any city or town where the child poverty level is greater than 15%.

Public Health Message

This report found that approximately 55% of Rhode Islanders aged 20 to 64 years have three or more risk factors for cardiovascular disease. Based on these findings, an estimated 238,887 Rhode Islanders are at risk for developing heart disease or a stroke.

BUT...

Many modifiable risk factors for heart disease and stroke can be addressed through policy and environmental changes. Workplace smoking cessation programs and laws prohibiting smoking in public places are population-based environmental strategies that support cardiovascular health for all Rhode Islanders.

What is the cardiovascular disease risk profile of Rhode Island youth?

Youth Risk Behavior Survey (YRBS)

This section presents findings from the Rhode Island Youth Risk Behavior Survey (YRBS). The YRBS is administered every other year to public high school students in Rhode Island to assess health risk behaviors. The survey is administered by HEALTH in collaboration with the Rhode Island Department of Education (RIDE), with guidance from the CDC.

In 2007, the state conducted the YRBS among 2,210 high school students with a response rate of 66%.³⁰ The state also conducted the first middle school YRBS among 2,382 students with a response rate of 81%. The weighted, self-reported data can be used to make important inferences about tobacco use among pre-teens and teens enrolled in public schools.³¹ However, the YRBS survey results are only representative of the public middle and high school student populations in Rhode Island, not of all Rhode Island youth (i.e. those in private or parochial school populations). Table 14 displays the YRBS survey questions assessing weight status and tobacco use.

TABLE 14. CARDIOVASCULAR DISEASE RISK FACTOR QUESTIONS, YOUTH RISK BEHAVIORAL SURVEILLANCE SURVEY

RISK FACTOR	SURVEY QUESTIONS
Weight status (High school survey)	<p>Weight status is computed from an adolescent's self-reported height and weight. Height and weight are used to calculate body mass index (BMI). For children and teens, BMI is age- and sex-specific and is often referred to as BMI-for-age. BMI is calculated for children and teens, and is often referred to as BMI-for-age. The BMI-for-age is based on the Centers for Disease Control and Prevention BMI-for-age growth charts (for either girls or boys) to obtain a percentile ranking.*</p> <p>UnderweightLess than the 5th percentile</p> <p>Healthy weight.....5th percentile to less than the 85th percentile</p> <p>Overweight.....85th to less than the 95th percentile</p> <p>ObeseEqual to or greater than the 95th percentile</p>
Cigarette use	<p>Smoking status is determined by an adolescent's response to two questions:</p> <p>(1) Ever tried cigarette smoking? [Lifetime cigarette use] and</p> <p>(2) Have you smoked cigarettes on at least 1 day during the 30 days before the survey? [Current cigarette use]</p>

* Information on the Centers for Disease Control and Prevention BMI-for-age growth charts is available on-line at: http://www.cdc.gov/healthyweight/assessing/bmi/childrens_BMI/about_childrens_BMI.html

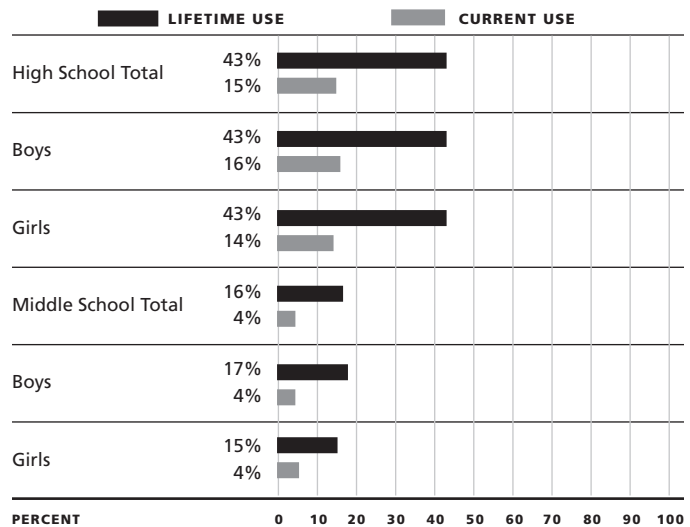
Obesity

In 2007, 16% of Rhode Island high school students were overweight (95% CI: 14.6–18.1) and 11% were obese (95% CI = 8.7–13.1). In the 2007 survey for middle school students, children were asked to describe their weight. About one-fourth of middle school students described themselves as slightly or very overweight. Overweight and obesity predispose children and youth to develop medical complications associated with type 2 diabetes and cardiovascular disease, including hypertension, dyslipidemia, impaired glucose metabolism, and hyperinsulinemia.³²

Cigarette Use

In 2007, 43% of public high school students had tried cigarette smoking at least once and 15% were current smokers (Figure 14). A smaller percentage of middle school students had ever tried smoking (16%) or were current smokers (4%). Cigarette smoking among Rhode Island's public middle and high school students is of concern. Most adolescents believe they can quit smoking anytime they want. But young people become just as addicted to nicotine as adults do. In fact, smoking habits in youth influence cigarette consumption throughout adulthood.³³ There is also evidence that young people who begin smoking before age 20 have the highest incidence and earliest onset of coronary heart disease and high blood pressure.³³

FIGURE 14. PERCENTAGE OF RHODE ISLAND MIDDLE AND HIGH SCHOOL PUBLIC SCHOOL STUDENTS THAT SMOKE CIGARETTES, 2007



Data source: 2007 Rhode Island Youth Risk Behavior Survey, Rhode Island Department of Health, Center for Health Data and Analysis.

Public Health Message

HEALTH's Tobacco Control Program is helping children, adolescents, and adults recognize the full extent of the dangers of tobacco use in relation to heart disease and stroke through awareness campaigns and interventions. The program's four goals are: (1) prevent youth tobacco use, (2) help smokers quit, (3) reduce secondhand smoke exposure, and (4) eliminate disparities related to tobacco use in different population groups. Information about the Tobacco Control Program is available online at: <http://www.health.ri.gov/tobacco/index.php>



WHO IS HOSPITALIZED FOR HEART DISEASE OR A STROKE IN RHODE ISLAND?

This section presents information on hospitalization rates, average length of stay, and average charges for cardiovascular diseases. It also illustrates disparities in hospitalizations for cardiovascular diseases by sex, race, and geographic residence. Information is provided on the point of entry into a hospital system for patients experiencing a cardiovascular disease event. Throughout this section there are shaded boxes that summarize information in a table or figure (Highlights), and key messages about hospitalizations for cardiovascular diseases (Public Health Message). The data sources analyzed in this section are the Rhode Island Hospital Discharge Data (HDD) and the Rhode Island Emergency Department Data (EDD).

Inpatient Hospitalizations

Monitoring trends in cardiovascular disease hospitalizations remains a critical and urgent public health problem. Hospitalizations for cardiovascular disease are frequently accompanied by diminishments in quality of life and decreased mobility. The large and increasing burden of obesity and associated diabetes is expected to further increase the prevalence of cardiovascular diseases in the 21st century, placing greater demands on the health care system.³⁴

Data on hospital discharges for heart disease and stroke (2000 – 2007) were obtained from the Rhode Island Hospital Discharge Data. All of Rhode Island's acute care, non-federal hospitals are required to report hospital discharges to HEALTH according to licensure regulations effective January 1, 1989. Although the data are collected for billing purposes, the files include valuable surveillance information, such as patient demographics, procedures, charges, and primary and additional diagnoses.

Defining a hospitalization for cardiovascular disease

Two types of diagnosis codes are given in hospital discharge records: principal diagnosis and underlying diagnosis. A principal diagnosis refers to the primary reason for which the patient was hospitalized. An underlying diagnosis refers to related conditions, which may have contributed to the patient's hospitalization. The Rhode Island Hospital Discharge Data includes one field for a primary diagnosis and up to 24 additional or underlying diagnoses.

The *International Statistical Classification of Diseases and Related Health Problems* is the official disease classification system for inpatient and outpatient records and physician offices.³⁵ ICD-9-CM codes specific to cardiovascular diseases are shown in Table 15.

Calculations of hospitalization counts and rates are based on the number of hospitalizations, not on the number of individuals hospitalized. An individual may have more than one hospitalization within a reporting period. Therefore, the information presented in this report is based on “events” or hospital discharges and not individuals.

Calculating a hospitalization rate for cardiovascular disease

Hospitalization rates for cardiovascular disease are calculated in three ways.

1. *Crude Rate.* To calculate a crude rate the number of hospitalizations in a given year or time period is divided by the size of the population in the same year or time period times a multiplier of 10 (e.g. 100, 1,000, 10,000, 100,000). In this report crude rates are calculated for specific age groups and are shown as age-specific hospitalization rates.

Example: Crude hospitalization rate for heart disease

$$\frac{\text{Number of hospitalizations for heart disease in the population in a specific time period}}{\text{Number of persons in the population in a specific time period}} \times 10,000$$

2. *Age-specific hospitalization rate.* An age-specific hospitalization rate is a measure of how common something is in a certain age group. It is calculated as the number of people hospitalized for heart disease at a certain age in a certain year, divided by the population of that age group in that year times a multiplier of 10 (e.g. 100, 1,000, 10,000, 100,000). Age-specific rates also can be calculated for population subgroups defined by race, sex, or other demographic characteristics. If these rates are separately tabulated for males and females, we display “age-sex-specific rates.” If the number of cases or events is large enough to generate stable rates, these rates can be further subdivided to display “age-sex-race-specific rates.”

Example: Age-specific hospitalization rate for heart disease

$$\frac{\text{Number of hospitalizations for heart disease in a specific age group (e.g. 0 to 17) in a specific time period}}{\text{Number of persons in a specific age group (e.g. 0 to 17) in the population in a specific time period}} \times 10,000$$

TABLE 15. INTERNATIONAL CLASSIFICATION OF DISEASE CODES FOR CARDIOVASCULAR DISEASE HOSPITAL DISCHARGES

DISEASE CATEGORY	ICD-9-CM CODE
Cardiovascular diseases ¹	391 - 448
Any heart disease	391 - 429
Hypertensive disease ²	401-402
Myocardial infarction ³	410
Coronary heart disease ⁴	410 - 414
Coronary atherosclerosis	414
Congestive heart failure	428
Cerebrovascular disease (Stroke)	430 to 438

¹Diseases of veins, lymphatics, and other diseases of circulatory system (ICD-9-CM codes 451-459) are not included.

²Also called high blood pressure.

³Also called a heart attack.

⁴Also called coronary artery disease or ischemic heart disease.

3. *Age-adjusted hospitalization rate.* Almost all diseases or health outcomes occur at different rates in different age groups. Most chronic diseases occur more often in older people. Other outcomes, such as sports injuries, happen more often in younger people. A community with older individuals will have higher crude rates of chronic diseases than one with younger individuals. Conversely, a community with a large number of teenagers will have higher crude rates of motor vehicle injuries than a community with more elderly residents. Thus, the age distribution of a community can affect rates of diseases, injuries, hospitalizations, and mortality. An age-adjusted rate remedies the problem of comparing populations with one another, or populations at different time periods, by removing the confounding caused by age differences. Age-adjusted rates can be calculated for population subgroups defined by race, sex, or other demographic characteristics. The steps for calculating an age-adjusted hospitalization rate are shown below using heart disease as an example.

Step 1. Calculate the age-specific rate for hospital discharges for heart disease per 10,000 (or 100,000) population for each age group, for example, 17 years of age and younger, 18 to 44, 45 to 64, and 65 years of age and older.

Step 2. Multiply each age-specific heart disease hospitalization rate by a standard weight. The standard weight represents the proportion of the standard population that is in that age group. Age-adjustment weights based on the year 2000 projected U.S. population are commonly found on the internet and in statistical briefs published by the CDC.³⁶

Step 3. Add each age-adjusted hospitalization rate to get the overall age-adjusted rate.

What are the trends in hospitalizations for cardiovascular diseases in Rhode Island?

This section presents trends in hospitalizations for cardiovascular diseases using age-adjusted and age-specific hospitalization rates. Reducing the number of in-patient hospitalizations for cardiovascular diseases depends, in part, on identifying adults at risk and providing those at highest risk with community resources and optimal primary care.

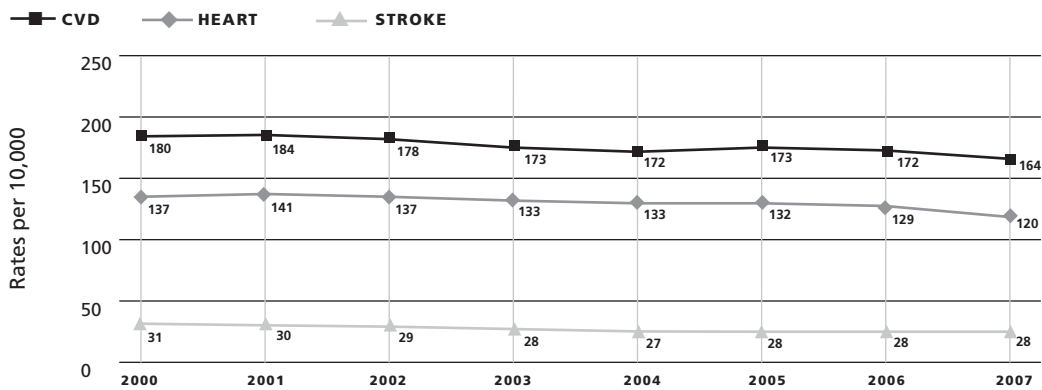
High-risk groups for heart disease or stroke-related hospitalizations include:

- Adults with type 2 diabetes,
- Adults who smoke, and
- Adults with multiple modifiable risk factors, especially high blood pressure and/or high LDL cholesterol.

This report follows the guidelines of the National Center for Health Statistics in reporting hospitalization rates. Because of low reliability, a sample of fewer than 30 hospital discharges for a specific condition is not reported, and a sample based on 30 to 50 hospital discharges for a specific condition is noted as having low reliability.³⁷



FIGURE 15. AGE-ADJUSTED¹ ANNUAL HOSPITALIZATION RATES² FOR ALL CARDIOVASCULAR DISEASES,³ HEART DISEASE,⁴ AND STROKE,⁵ 2000-2007



¹Data are age-adjusted to the 2000 U.S. Standard Population. Inclusive of all ages.

²All rates are per 10,000 population.

³Cardiovascular diseases listed as the principal diagnosis (ICD-9-CM 391-448).

⁴Heart disease listed as the principal diagnosis (ICD-9-CM 391-429).

⁵Stroke listed as the primary diagnosis (ICD-9-CM 430-438).

Data Source: 2000-2007 Rhode Island Hospital Discharge Data, Rhode Island Department of Health, Center for Health Data and Analysis.

Highlights — Figure 15

Hospitalization rates for cardiovascular disease, heart disease and stroke

2000-2007 (All ages) Rhode Island

- Between 2000 and 2007, Rhode Island saw a decrease in age-adjusted hospitalization rates for cardiovascular diseases, which included diseases of the heart and stroke. In 2000, the age-adjusted hospitalization rate for cardiovascular diseases was 180 per 10,000 people. By 2007, this rate was 164 per 10,000. Much of this decline was due to decreases in the age-adjusted hospitalization rate for heart disease, although hospitalizations for stroke also saw a decline over this eight year period.
 - In 2000 the age-adjusted hospitalization rate for heart disease was 137 per 10,000 people and by 2007 this rate was 120 per 10,000 people.
 - In 2000 the age-adjusted hospitalization rate for stroke was 31 per 10,000 people and by 2007 this rate was 28 per 10,000 people.

Public Health Message

Rhode Island, like the nation, has seen a decline in hospitalization rates for heart disease.

According to the latest release from the Agency for Healthcare Research and Quality (AHRQ), the number of Americans admitted to hospitals for treatment of coronary artery disease declined by 31 percent between 1997 and 2007. As a result of this decrease, coronary heart disease no longer ranks as the leading disease treated in hospitals. It is now the third.

Advances in cardiac care, and broader use of preventive treatments, such as statin drugs and aspirin, have contributed to this decline. Rhode Island also has seen a 7% decline in adult smokers between 2001 and 2007, from 24% in 2001 to 17% in 2007. The risk of developing and dying from coronary heart disease or an ischemic stroke is reduced relatively soon after a person stops smoking.

Public Health Message

It is important to know the signs that can mean a heart attack or stroke is happening: *

HEART ATTACK SIGNS

- Chest discomfort.
- Discomfort in other areas of the upper body.
- Shortness of breath with or without chest discomfort.
- Other signs may include breaking out in a cold sweat, nausea or lightheadedness.
- Doctors treating women for potential heart disease should be diligent in looking for symptoms that are often more common in women than men. These include reports of unexplained fatigue and pressure lower down on the body, rather than in the chest.

* American Heart Association. Heart Attack, Stroke and Cardiac Arrest Warning Signs. Available online at: <http://www.americanheart.org/presenter.jhtml?identifier=3053>

STROKE SIGNS

ACT F.A.S.T.

- | | |
|--------|--|
| FACE | ASK THE PERSON TO SMILE.
DOES ONE SIDE OF THE FACE DROOP? |
| ARMS | ASK THE PERSON TO RAISE BOTH ARMS.
DOES ONE ARM DRIFT DOWNWARD? |
| SPEECH | ASK THE PERSON TO REPEAT A SIMPLE SENTENCE.
ARE THE WORDS SLURRED? CAN HE/SHE REPEAT THE SENTENCE CORRECTLY? |
| TIME | IF THE PERSON SHOWS ANY OF THESE SYMPTOMS, TIME IS IMPORTANT.
CALL 911 OR GET TO THE HOSPITAL FAST.
BRAIN CELLS ARE DYING. |

* National Stroke Association. Stroke Symptoms. Available on-line at: <http://www.stroke.org/site/PageServer?pagename=symp>

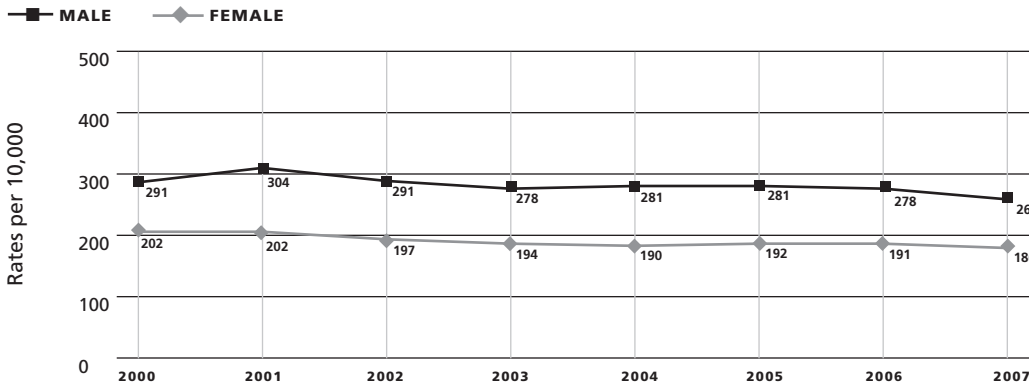


Disparities in age-adjusted rates

Disparities in health care are pervasive in the United States. These disparities adversely impact the cardiovascular health of Americans, especially African Americans, Hispanics, the poor, and those without a high school diploma.³⁸ Cardiovascular disease is still typically portrayed as a male disease. However, given that the average life expectancy for women is higher than for men (80 years vs. 74 years, respectively), an increasingly larger proportion of patients with heart disease are women.³⁹

In this section we describe disparities in cardiovascular disease burden by comparing age-adjusted hospital discharge rates for cardiovascular diseases as the principal diagnosis per 10,000 population by sex and then by race/ethnicity. We focus on adults aged 18 and older because the number of hospital discharges for heart disease or stroke in children is too small to report.

FIGURE 16. AGE-ADJUSTED¹ ANNUAL HOSPITALIZATION RATES² FOR ALL CARDIOVASCULAR DISEASES,³ BY SEX, AMONG ADULTS AGES 18 AND OLDER, 2000-2007



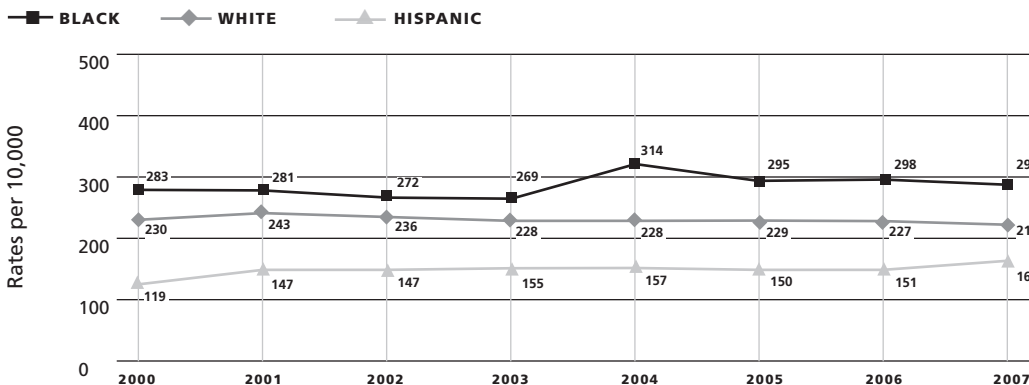
¹Data are age-adjusted to the 2000 U.S. Standard Population. Ages 18 and older

²All rates are per 10,000 population.

³Cardiovascular diseases listed as the principal diagnosis (ICD-9-CM 391-448).

Data Source: 2000-2007 Rhode Island Hospital Discharge Data, Rhode Island Department of Health, Center for Health Data and Analysis.

FIGURE 17. AGE-ADJUSTED¹ ANNUAL HOSPITALIZATION RATES² FOR ALL CARDIOVASCULAR DISEASES,³ BY RACE/ETHNICITY, AMONG ADULTS AGES 18 AND OLDER, 2000-2007



¹Data are age-adjusted to the 2000 U.S. Standard Population. Ages 18 and older

²All rates are per 10,000 population.

³Cardiovascular diseases listed as the principal diagnosis (ICD-9-CM 391-448).

Data Source: 2000-2007 Rhode Island Hospital Discharge Data, Rhode Island Department of Health, Center for Health Data and Analysis.

Highlights — Figures 16 & 17

Age-adjusted hospitalization rates for cardiovascular diseases

2000-2007 (18 years of age and older), Rhode Island

- Sex
 - Age-adjusted cardiovascular disease hospitalization rates for women and men declined slightly between 2000 and 2007.
 - In every year between 2000 and 2007, the age-adjusted cardiovascular disease hospitalization rate was higher among men than women.
- Race/Ethnicity
 - In every year between 2000 and 2007, the age-adjusted cardiovascular disease hospitalization rate was higher among non-Hispanic black adults than non-Hispanic white or Hispanic adults.
 - Among non-Hispanic white adults, the age-adjusted cardiovascular disease hospitalization rate declined slightly between 2000 and 2007, but among Hispanic adults the rate increased over seven years.

Public Health Message

Higher age-adjusted hospitalization rates for cardiovascular diseases among non-Hispanic blacks, as compared with Hispanics and non-Hispanic whites, may reflect, in part, racial and ethnic differences in receipt of routine preventive care and access to outpatient specialized services.

HEALTH's Heart Disease and Stroke Prevention Program is working with partners around the state to eliminate disparities in access to clinical care and subsequent inequalities in the detection and treatment of cardiovascular diseases.

Disparities in age-specific rates

Identifying population groups that have increased rates of hospitalizations for heart disease or stroke helps direct resources to assist those most likely to bear the burden of cardiovascular diseases. Here we ask the question: *How common are hospitalizations for heart disease and stroke by age, sex, and race/ethnicity?* To answer this question we need to look at age-, sex-, and race-specific rates for heart disease and stroke. As noted above, these rates are very useful for displaying hospitalization rates within population subgroups.

The findings shown in Table 16 compare two age groups: adults from 18 to 49 years of age and individuals 50 years of age and older, first for women and then for men. Women and men are looked at separately because there is both an awareness gap and a treatment gap between women and men when it comes to heart disease and stroke.⁴⁰ The reasons for this gender gap are complex. In general, women are less likely than men to know the warning signs and symptoms of a heart attack. Heart attack symptoms may present differently in women and men, which can affect both the diagnosis and treatment of a heart attack in women. Once diagnosed with a heart attack, women are less likely than men to receive the most sophisticated treatment for coronary heart disease, which may be related to different presentation of heart attack symptoms in women than in men. When women are

looked at as a group, women of color continue to fare worse than white women on a variety of measures of health and health care access, including those specific to heart disease and stroke.⁴¹

The highlights for Table 16 present differences in the age-specific hospitalization rates of one group compared with a second group as ratios. The group with the highest hospitalization rate is the numerator and the group with a lower hospitalization rate is the denominator. In Rhode Island, for example, the two-year average heart disease hospitalization rate (2006-2007) for non-Hispanic black women 50 years of age and older was 451.5 per 10,000 population, but only 217.9 per 10,000 population for Hispanic women aged 50 and older. The ratio is expressed as $451.5/217.9 = 2.07$. Put another way, among women 50 years of age and older, non-Hispanic black women had about two times higher risk of being hospitalized for heart disease as Hispanic women over age 50.

TABLE 16. TWO-YEAR AVERAGE AGE-SPECIFIC HEART DISEASE¹ AND STROKE² HOSPITALIZATION RATES³ BY SEX, RACE/ETHNICITY, AND AGE GROUP, AMONG ADULTS AGES 18 AND OLDER, 2006-2007

CHARACTERISTICS	HEART DISEASE RATES (95% CI) ⁴	STROKE RATES (95% CI) ⁴
FEMALES		
Black non-Hispanic		
18 – 49	45.5 (33.8-57.1)	—
50+	451.5 (394.9-508.2)	122.1 (92.7-151.6)
White non-Hispanic		
18 – 49	16.9 (15.0-18.7)	4.3 (2.4-5.3)
50+	354.3 (345.4-363.3)	88.2 (83.7-92.6)
Hispanic		
18 – 49	13.9* (9.6-18.1)	—
50+	217.9 (187.1-248.7)	47.7* (32.2-62.1)
MALES		
Black non-Hispanic		
18 – 49	51.4 (39.4-63.3)	—
50+	410.0 (351.7-468.3)	107.9* (78.0-137.8)
White non-Hispanic		
18 – 49	37.5 (34.7-40.3)	5.3 (4.3-6.4)
50+	453.1 (441.8-464.4)	92.8 (87.7-97.9)
Hispanic		
18 – 49	20.2 (15.2-25.3)	—
50+	281.8 (242.5-331.2)	68.7* (49.2-88.1)

— Unreliable. Number of hospital discharges ≤ 30

*Low reliability. Number of hospital discharges >30 and <50.

¹Heart disease listed as the principal diagnosis (ICD-9-CM codes 391-429)

²Stroke listed as the principal diagnosis (ICD-9-CM codes 430-438)

³All rates per 10,000 population. Ages 18 and older

⁴CI=Confidence Interval

Data Source: 2006 and 2007 Rhode Island Hospital Discharge Data, Rhode Island Department of Health, Center for Health Data and Analysis.

Highlights — Table 16

Disparities in age-specific rates for heart disease

2006 – 2007 (18 years of age and older), Rhode Island

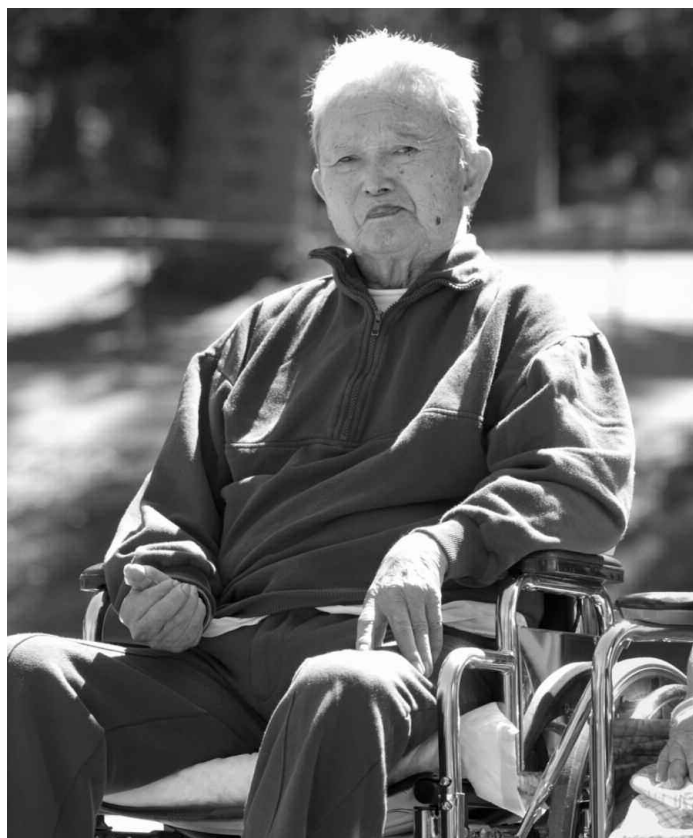
- Among Rhode Island women 50 years of age and older, non-Hispanic black women have the highest age-specific hospitalization rates for heart disease.
 - 2.1 times higher risk of being hospitalized for heart disease as Hispanic women. (451.5 per 10,000 vs. 217.9 per 10,000)
 - 1.3 times higher risk of being hospitalized for heart disease as non-Hispanic white women (451.5 per 10,000 vs. 354.3 per 10,000)
- Among Rhode Island men 50 years of age and older, non-Hispanic white men have the highest age-specific hospitalization rates for heart disease.
 - 1.6 times higher risk of being hospitalized for heart disease as Hispanic men (453.1 per 10,000 vs. 281.8 per 10,000).
 - 1.1 times higher risk of being hospitalized for heart disease as black men (453.1 per 10,000 vs. 410.0 per 10,000).

Geographic disparities in hospitalizations for heart disease and stroke

Rhode Island data show large disparities in hospital discharges for heart disease by geographic residence. These analyses are based on adults 20 years of age and older in order to calculate age-adjusted rates using the 2005-2007 American Community Survey for U.S. cities and towns.

Adults living in one of Rhode Island's core cities have higher age-adjusted hospitalization rates for heart disease and stroke than adults living in non-core cities. As previously described, Rhode Island defines a core city as any city where the child poverty level is greater than 15%, according to the 2000 Census. These cities are: Central Falls, Newport, Pawtucket, Providence, West Warwick, and Woonsocket.

National data for the United States show that lifelong disadvantage, whether measured as low income, being uninsured, or living in a community where poverty is prevalent, often translates into an "accumulation of risk" for heart disease and stroke.^{42,43} U.S. Census data show that whites make up more than half of the population living in poorer areas. However, whites make up a high proportion of those living in non-poorer areas. This is not the case for blacks and Hispanics. Four times as many blacks and three times as many Hispanics live in poorer areas than live outside them.⁴⁴ Thus, the higher risk of developing and dying from heart



disease among blacks and Hispanics in Rhode Island likely reflects that a disproportionate percent of blacks and Hispanics are poorer than whites.

Striking geographic disparities in hospital discharges for heart disease and stroke also may reflect large differences in the proportion of the population with health insurance coverage in core cities versus non-core cities. Residents of Rhode Island's core cities are more likely to be uninsured than non-core city residents. In 2001, 12.3% of core city residents were uninsured as compared with 5.7% of residents living in non-core cities.⁴⁵ Gaps in health insurance coverage make a real difference in a person's financial security, access to health care, and even how healthy a person is throughout her/his life.^{46,47} However, by age 65, most Americans become eligible for Medicare (approximately 15 percent of beneficiaries become eligible by reason of a disability or specific disease, rather than age). Not surprisingly, individuals who were uninsured prior to Medicare eligibility utilize more health care resources once they become eligible for Medicare than do their counterparts who had been insured.⁴⁸

TABLE 17. THREE-YEAR AVERAGE AGE-SPECIFIC AND AGE-ADJUSTED FOR HEART DISEASE¹ AND STROKE² HOSPITALIZATION RATES³ BY GEOGRAPHIC AREA, AMONG ADULTS AGES 20 AND OLDER, 2005-2007

GEOGRAPHIC RESIDENCE	HEART DISEASE RATE (95% CI) ⁴	STROKE RATE (95% CI) ⁴
STATE		
Age Group		
20-34	17.3	3.0
35-64	125.1	24.6
65+	656.5	150.9
Overall — Age-Adjusted	164.2 (164.1 - 166.9)	35.9 (34.6-37.2)
CORE CITIES⁵		
Providence		
Age Group		
20-34	18.8	3.3
35-64	146.2	33.3
65+	713.4	158.5
Overall — Age-Adjusted	181.6 (172.8-190.4)	40.1 (35.9-44.2)
All other Core Cities		
Age Group		
20-34	22.5	3.5
35-64	171.4	33.3
65+	658.7	160.4
Overall — Age-Adjusted	181.6 (174.6-188.6)	40.6 (37.3-43.9)

¹Heart disease listed as the principal diagnosis (ICD-9-CM codes 391-429).

²Stroke listed as the principal diagnosis (ICD-9-CM codes 430-438).

³All rates are per 10,000 population. Ages 20 and older. Age-adjusted rates are standardized to the U.S. Census Bureau 2005-2007 American Community Survey 3-Year population estimates for Rhode Island cities and towns

⁴CI=Confidence Interval

⁵Rhode Island core cities: Central Falls, Newport, Pawtucket, Providence, West Warwick, and Woonsocket. These cities have child poverty levels greater than 15%, according to the 2000 Census.

Data Source: Rhode Island Hospital Discharge Data 2005-2007 combined file 3-Year estimates and 2005-2007 American Community Survey.

Highlights — Table 17

Geographic variation in age-adjusted hospital rates for heart disease and stroke are notable.

2005 – 2007 (20 years of age and older), Rhode Island

- Heart disease
 - Providence and the other core cities had the highest age-adjusted hospitalization rate for heart disease (181.6 per 10,000), followed by the state as a whole (164.2 per 10,000).
- Stroke
 - Providence and other core cities had the highest age-adjusted hospitalization rate for stroke (40.1 per 10,000 and 40.6 per 10,000, respectively), compared with the state as a whole (35.9 per 10,000).

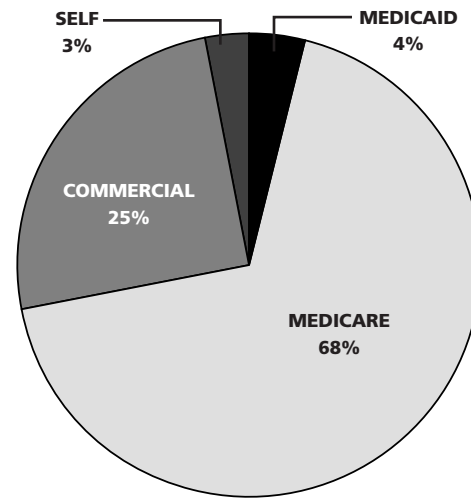
What are the economic costs of hospitalizations for cardiovascular diseases in Rhode Island?

In most cases, adults who have a heart attack, a stroke, or other cardiovascular disease event need inpatient care. In 2009, the estimated cost of heart disease and stroke in the United States, including health care expenditures and lost productivity from deaths and disability, was projected to be more than \$475 billion.² With the aging of the U.S. population, the economic impact of cardiovascular diseases on our nation's health care system will become even greater.

Shown in Table 18 are the average lengths of stay (in days) and average charges for cardiovascular disease events in Rhode Island. Because hospital discharges are based on events, not distinct individuals, some events may represent individuals with repeat hospitalizations for cardiovascular disease in 2007.

In 2007, 69% of Rhode Islanders hospitalized for heart disease were over 65 years of age. Medicare is the primary payer for hospitalizations for heart disease (Figure 18). Not surprisingly, Medicare beneficiaries ages 65 and older make up the largest percentage of patients hospitalized for stroke (72%).

FIGURE 18. PRIMARY PAYER FOR HEART DISEASE¹ HOSPITALIZATIONS FOR ADULTS 18 YEARS OF AGE AND OLDER, 2007



¹Primary diagnosis of heart disease (ICD-9-CM 391-429).

Data source: 2007 Rhode Island Hospital Discharge Data, Rhode Island Department of Health, Center for Health Data and Analysis

TABLE 18. HOSPITALIZATIONS FOR CARDIOVASCULAR DISEASES LISTED AS THE PRIMARY DIAGNOSIS AND ASSOCIATED MEAN LENGTH OF STAY AND CHARGES, BY DEMOGRAPHIC GROUPS, FOR ADULTS 18 YEARS OF AGE AND OLDER, 2007

PRINCIPAL DIAGNOSIS (ADULTS 18+)	ICD-9-CM CODES	TOTAL DISCHARGES	AVERAGE LENGTH OF STAY IN DAYS PER STAY (95% CI)	AVERAGE CHARGES PER STAY (95% CI)
All cardiovascular diseases	391-448	19,204	5.0 (4.9 to 5.1)	\$35,770 (35,132 to 36,408)
Heart diseases	391-329	14,136	4.7 (4.6 to 4.8)	\$36,208 (35,498 to 36,918)
Coronary heart disease ¹	410-414	5,297	4.0 (3.8 to 4.2)	\$50,681 (49,410 to 51,952)
Congestive heart failure	428	4,065	5.5 (5.3 to 5.6)	\$24,808 (23,863 to 25,754)
Hypertensive disease ²	401-402	371	3.3 (3.0 to 3.6)	\$14,374 (13,066 to 15,682)
Stroke	430-438	3,282	5.7 (5.4 to 6.0)	\$28,716 (27,239 to 30,193)

¹Also called coronary artery disease or ischemic heart disease.

²Also called high blood pressure.

Data Source: 2007 Rhode Island Hospital Discharge Data, Rhode Island Department of Health, Center for Health Data and Analysis.

Highlights — Table 18

Economic burden of a hospitalization for heart disease in Rhode Island

2007 (18 years of age and older), Rhode Island

- The most costly illness in 2007 was coronary heart disease, with average in-patient charges ranging from \$49,410 to \$51,952 and a hospital stay, on average, of 4 days.
- Although the average in-patient charges for treating hypertension (high blood pressure) were not as high as the average charges for other heart conditions or a stroke, these charges still placed a burden on Rhode Island's health care system. Hypertension is an ambulatory care sensitive condition. These are conditions that can be treated outside of a hospital with proper medication and management of care.

TABLE 19. HOSPITALIZATIONS FOR HEART DISEASES¹ LISTED AS THE PRIMARY DIAGNOSIS AND ASSOCIATED MEAN LENGTH OF STAY AND CHARGES, BY DEMOGRAPHIC GROUPS, FOR ADULTS 18 YEARS OF AGE AND OLDER, 2007

CHARACTERISTICS (AGE 18+)	PERCENT DISCHARGES ² (N = 14,136)	MEAN LENGTH OF STAY (DAYS)	95% CI	MEAN CHARGES	95% CI
Sex					
Men					
18 – 49	6%	3.5	3.2 to 3.9	\$37,276	34,723 to 39,829
50+	46%	4.7	4.5 to 4.9	\$41,222	40,045 to 42,399
Women					
18 – 49	3%	4.2	3.7 to 4.7	\$31,494	28,185 to 34,802
50+	45%	5.0	4.9 to 5.1	\$31,155	30,243 to 32,066
Race					
White	89%	4.8	4.7 to 4.9	\$36,067	35,313 to 36,820
Black	4%	4.5	4.1 to 4.9	\$32,010	28,205 to 35,815
Hispanic	3%	4.2	3.8 to 4.6	\$32,408	29,485 to 35,331
Payer type					
Medicare	68%	5.1	5.0 to 5.3	\$34,965	34,081 to 35,850
Medicaid	4%	5.0	4.5 to 5.5	\$35,735	32,550 to 38,920
Commercial	26%	3.7	3.6 to 3.9	\$39,598	38,271 to 40,925

¹Primary diagnosis of heart disease (ICD-9-CM 391-429).

²Percentages may not add up to 100% because some groups with low numbers are not shown, for example, persons who self-pay for health care.

Data Source: 2007 Rhode Island Hospital Discharge Data, Rhode Island Department of Health, Center for Health Data and Analysis.

Highlights — *Table 19*

Hospital discharges for heart disease by demographic groups

2007 (18 years of age and older), Rhode Island

- Men and women 50 years of age and older comprise a higher percentage of hospital discharges for heart disease than younger aged adults (18 – 49 years of age).

BUT ...

- Average charges for heart disease among those 50 years of age and older are ***significantly higher*** for men than for women.
- Women have heart attacks at older ages than men do and are more likely to die from them within a few weeks. Thus, gender differences in average charges for heart disease may reflect differences in treatment protocols based on a patient's age (e.g., eligibility for heart transplants).

Medicare

- Medicare beneficiaries have longer hospital stays but slightly lower charges for heart disease than patients with commercial insurance.

BUT ...

- Hospital reimbursement for inpatient services varies greatly by type of insurance plan and this must be taken into consideration when comparing charges for heart disease and stroke by payer source. On July 31, 2008, the Centers for Medicare & Medicaid Services (CMS) issued the final rules for acute inpatient hospital services for fiscal year 2009. These rules place different caps on payment rates than those used by commercial fee-for-service and health maintenance plans.⁴⁹

TABLE 20. HOSPITALIZATIONS FOR STROKES¹ LISTED AS THE PRIMARY DIAGNOSIS AND ASSOCIATED MEAN LENGTH OF STAY AND CHARGES, BY DEMOGRAPHIC GROUPS, FOR ADULTS 18 YEARS OF AGE AND OLDER, 2007

CHARACTERISTICS (AGE 18+)	PERCENT DISCHARGES ² (N = 3,282)	MEAN LENGTH OF STAY (DAYS)	95% CI	MEAN CHARGES	95% CI
Sex					
Men					
18 – 49	4%	8.0	6.0 to 9.5	\$48,085	36,412 to 59,759
50+	41%	6.0	5.3 to 6.2	\$28,526	26,123 to 30,929
Women					
18 – 49	4%	7.6	5.7 to 9.5	\$58,482	44,670 to 72,295
50+	51%	5.4	5.1 to 5.7	\$25,206	23,595 to 26,817
Race					
White	87%	5.5	5.2 to 5.8	\$27,549	26,080 to 29,017
Black	4%	6.7	5.5 to 7.8	\$29,734	24,405 to 35,061
Hispanic	4%	7.0	5.3 to 8.5	\$39,593	30,409 to 48,777
Payer type					
Medicare	70%	5.5	5.2 to 5.8	\$25,406	23,901 to 26,909
Medicaid	4%	8.4	6.3 to 10.6	\$42,750	32,601 to 52,900
Commercial	23%	5.6	5.2 to 6.2	\$34,976	31,245 to 38,708

¹ Primary diagnosis of stroke (ICD-9-CM 430-438).

² Percentages may not add up to 100% because some groups with low numbers are not shown, for example, persons who self-pay for health care.

Data Source: 2007 Rhode Island Hospital Discharge Data, Rhode Island Department of Health, Center for Health Data and Analysis.

Highlights — *Table 20*

Hospital discharges for stroke by demographic groups

2007 (18 years of age and older), Rhode Island

- Men and women 50 years of age and older comprise a higher percentage of hospital discharges for stroke than younger adults (18 – 49 years of age).

BUT ...

- Average charges for stroke in the 18-to-49 year age group are **significantly higher** than for older adults (50 years of age and older).
- Although hospitalizations for strokes in young adults represented only 4% of all stroke discharges in Rhode Island in 2007, it is possible that these strokes are more severe, and have more complications, than strokes in older age groups. However, the Rhode Island Hospital Discharge file does not include information on severity of disease.
- An area worth researching further is the short- and long-term prognoses of stroke in younger versus older adults at the time of the first event.

Medicaid and Medicare

- Medicaid insured patients have significantly longer hospital stays for stroke, on average, than Medicare beneficiaries or patients with commercial health insurance hospitalized for stroke. In 2007, average hospital charges for stroke among Medicaid patients were almost 2 times greater than for Medicare enrollees.
- In Rhode Island, Medicaid patients hospitalized for stroke tend to be younger, on average, than Medicare patients hospitalized for stroke (50 years of age as opposed to 75 years of age). Although the Rhode Island Hospital Discharge Data cannot be used to determine severity of disease, it is possible that Medicaid patients hospitalized for stroke have a higher level of neurological impairment than Medicare patients hospitalized for stroke, and thus require longer, more costly lengths of stay.

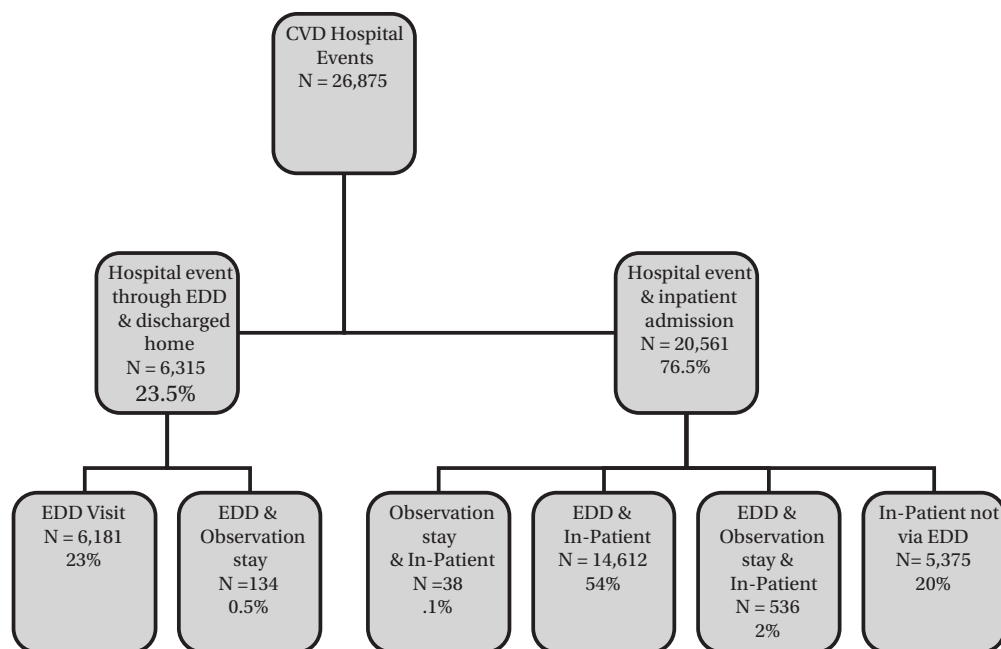
Emergency Department Visits

Data on emergency department visits for cardiovascular diseases (2005 – 2007) were obtained from the 2007 Rhode Island Emergency Department and Observation Data. The data are collected through a system of hospital-based reporting tools established by regulations promulgated by HEALTH under its licensure authority, which requires hospitals to report patient-level data on all emergency department visits and observation stays.

Figure 19 shows the point of entry into the hospital system for cardiovascular disease events, where cardiovascular disease was the principal diagnosis. In 2007, there were 26,876 hospital events where a cardiovascular disease was the principal diagnosis. About one-fourth of these events (23%) were emergency department visits where the patient was sent home. Most cardiovascular disease events resulted in an inpatient admission (77%). Among patients seen in the emergency department and discharged home, less than 1% of patients were held for observation.

Among patients with a cardiovascular event who were admitted to the hospital, 54% were first seen in the emergency room. In contrast, 20% of patients admitted to the hospital for a cardiovascular disease event were a direct referral from a physician or a transfer from another medical facility, such as a hospital or nursing home. Monitoring the point of entry into the hospital system for cardiovascular disease events is part of Rhode Island's overall efforts to work with providers to improve quality of life, reduce medical costs, and reduce the number of cardiovascular disease-related emergency department visits.

FIGURE 19. POINT OF ENTRY INTO RHODE ISLAND'S HOSPITAL SYSTEM FOR CARDIOVASCULAR DISEASE (CVD) EVENTS, 2007¹



¹Principal diagnosis of cardiovascular disease (ICD-9-CM 391-448).

WHO DIES FROM HEART DISEASE OR A STROKE IN RHODE ISLAND?

This section analyzes deaths attributable to cardiovascular diseases, heart disease, and stroke. It also illustrates disparities in mortality from cardiovascular diseases by sex, age, race, and geographic residence. Throughout this section there are shaded boxes that summarize information in a table or figure (Highlights), and key messages about cardiovascular disease mortality (Public Health Message). The data source analyzed in this section is Rhode Island Death Certificates from Vital Records.

Cardiovascular Disease Deaths

As shown in Table 1 (page 7), heart disease and stroke are the first and third leading causes of death in Rhode Island and the U.S.⁵⁰ The good news is that deaths from heart disease and strokes in the U.S. have been declining over the past eight years. Between 1999 and 2006 there was a 30.7% decline in coronary heart disease deaths and a 29.2% drop in stroke deaths nationally.⁵¹

Many factors have contributed to the decline in cardiovascular disease related deaths. These include: (1) improvements in health screening and prevention, (2) advances in therapies, and (3) increased public awareness of the dangers of smoking and high cholesterol. However, the increasing numbers of Americans who are obese or have diabetes, along with widespread racial/ethnic and socioeconomic disparities in access to care, are likely to result in a rise in cardiovascular disease deaths in the years ahead.

Defining a death from heart disease and stroke

By law, deaths in Rhode Island are reported to HEALTH's Office of Vital Records. Two types of diagnosis codes are given on death certificates: underlying cause and contributing cause. The World Health Organization (WHO) defines the "underlying cause of death" as: (1) the disease or injury which directly led to the death or (2) the circumstances of the accident or violence which produced the fatal injury.⁵² The contributing cause of death refers to significant conditions contributing to death but not resulting in the underlying cause.

Tables that show mortality rates for cardiovascular diseases and/or trends in deaths from cardiovascular diseases use the International Statistical Classification of Diseases and Related Health Problems ICD-10-CM codes. Beginning in 2008, ICD-10-CM codes replaced ICD-9-CM codes as the official system for classifying mortality data from death certificates.⁵³

Calculations of age-adjusted and age-specific mortality rates are the same as those shown in the

TABLE 21. INTERNATIONAL CLASSIFICATION OF DISEASE CODES FOR CARDIOVASCULAR DISEASE DEATHS

Disease category	ICD-10-CM Code
Cardiovascular diseases	I00-I99
Any heart disease	I00-I09, I11, I13, I20-I51
Cerebrovascular disease (Stroke)	I60-I69

section on hospitalization rates. This report does not show mortality rates when there are fewer than 30 death records. A sample of 30 deaths has low reliability when calculating an age-adjusted or age-specific mortality rate.

What are the trends in cardiovascular disease mortality in Rhode Island?

This section presents trends in cardiovascular disease mortality using age-adjusted and age-specific mortality rates. Reducing the number of deaths attributable to cardiovascular events depends in part on identifying adults at risk.⁵⁴ High risk groups that should be targeted to reduce deaths from cardiovascular diseases are the same groups that should be targeted to reduce cardiovascular disease related hospitalizations.

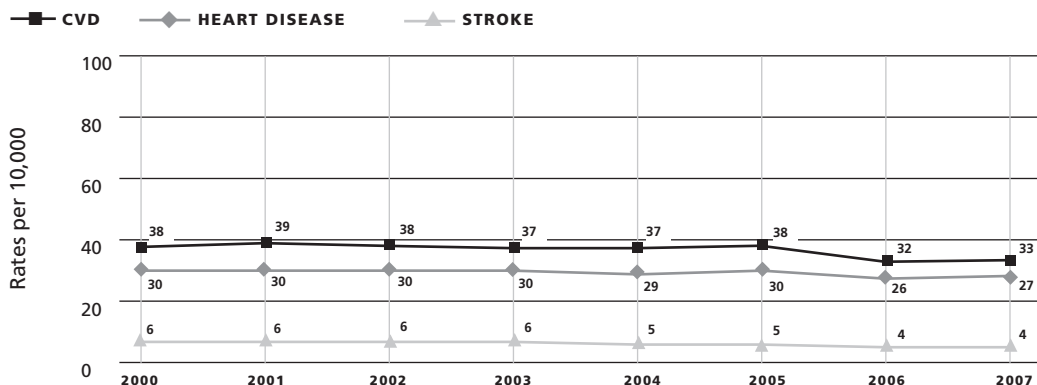
High-risk groups for heart disease or stroke-related deaths include:

- Adults with type 2 diabetes,
- Adults who smoke, and
- Adults with multiple modifiable risk factors.

Public Health Message

The World Health Organization estimates that 29% of all global deaths result from the various forms of cardiovascular disease. It's been projected that by 2020, chronic diseases will account for almost three-fourths of all deaths unless national efforts and individual actions are taken to reduce major risk factors, such as unhealthy diets, physical inactivity, and high rates of tobacco use.

FIGURE 20. AGE-ADJUSTED¹ ANNUAL MORTALITY RATES² FOR ALL CARDIOVASCULAR DISEASES,³ HEART DISEASE,⁴ AND STROKE,⁵ 2000-2007



¹Data are age-adjusted to the 2000 U.S. Standard Population. Inclusive of all ages

²All rates are per 10,000 population.

³Cardiovascular diseases listed as the principal diagnosis (ICD-10-CM 100-199).

⁴Heart disease listed as the principal diagnosis (ICD-10-CM 100-109, 111, 113, 120-151).

⁵Stroke listed as the principal diagnosis (ICD-10-CM 160-169).

Data Source: 2000-2007 Rhode Island Hospital Discharge Data, Rhode Island Department of Health, Center for Health Data and Analysis.

Highlights — *Figure 20*

Primary (underlying) cause of deaths from heart disease or stroke

2000-2007 (All ages) Rhode Island

- Between 2000 and 2007, Rhode Island saw modest decreases in mortality rates for cardiovascular diseases, heart disease, and stroke.

Mortality Rates (All ages)

- In 2000, the age-adjusted mortality rate for heart disease was 30.0 per 10,000 Rhode Islanders and the age-adjusted mortality rate for stroke was 6.0 per 10,000 Rhode Islanders.
- In 2007, the age-adjusted mortality rate for heart disease was 27.0 per 10,000 U.S. population and the age-adjusted mortality rate for stroke was 4.0 per 10,000 U.S. population.

Public Health Message

Heart disease and stroke are among the most widespread and costly health problems facing our state today, yet both diseases are among the most preventable. Rhode Island's Heart Disease and Stroke Prevention Program is collaborating with other chronic disease and health promotion programs to reverse upward trends in the state's diabetes and obesity rates, and to support efforts to continue the downward trend in smoking rates. Without these efforts, Rhode Island can anticipate a new wave of cardiovascular disease deaths.

Disparities in cardiovascular disease mortality rates

National data for cardiovascular disease mortality rates show that men and black adults have more premature mortality from heart disease or a stroke as compared with women and white adults. Premature mortality is measured by years of potential life lost before 75 years of age.^{38,55} In fact, black men older than age 35 are 26 percent more likely to die of heart disease than white men aged 35 years and older.⁵⁶

In 2006-2007, 6,452 Rhode Islanders died from a cardiovascular disease. Less than 2% of these deaths occurred in persons aged 44 and younger. Ten percent of these deaths occurred in adults aged 45 to 64, and 88% of these deaths occurred in adults aged 65 and older (data not shown). Most of these deaths were due to heart disease (81%), followed by stroke (13%) and other cardiovascular conditions (6%; data not shown). There are important differences in mortality rates for cardiovascular diseases among Rhode Islanders 65 years of age and older.

Rhode Island data show that among those who are 65 years of age and older, non-Hispanic whites (both sexes) are more likely to die of heart disease than racial/ethnic minorities (See Table 22). Among people who are 65 years of age and older, whites have 1.3 times higher risk of dying from heart disease than racial/ethnic minorities. As noted earlier, however, Rhode Island's minority population is younger than the state's non-Hispanic white population. In 2008, the average age of the state's minority population was 45 years and the average age of the non-Hispanic white population was 56 years.

TABLE 22. TWO-YEAR AVERAGE AGE-SPECIFIC HEART DISEASE¹ AND STROKE² MORTALITY RATES³ BY SEX, AGE GROUP, AND RACE/ETHNICITY, AMONG ADULTS AGES 18 AND OLDER, 2006-2007

CHARACTERISTICS	HEART DISEASE RATE	STROKE RATE
SEX/AGE		
Male		
18 – 64	6.9	—
65+	159.3	21.9
Female		
18 – 64	2.5	—
65+	154.3	27.3
SEX/AGE/RACE		
Male		
Minority ⁴		
65+	123.8	—
White non-Hispanic		
65+	162.0	21.7
Female		
Minority ⁴		
65+	118.9	—
White non-Hispanic		
65+	157.3	27.4

— Number of events too small to be reliable (<30)

¹ Heart disease listed as the primary cause of death (ICD-10-CM codes I00 - I09, I11, I13, I20, I51).

² Stroke listed as the primary cause of death (ICD-10-CM codes I60-I69).

³ All rates are per 10,000 population.

⁴ Minority defined as non-Hispanic black and Hispanic ethnicity any race.

Data Source: 2006 and 2007 Rhode Island Vital Records Death Certificates combined file, Rhode Island Department of Health, Center for Health Data and Analysis.

Geographic disparities in deaths from heart disease and stroke

Age-adjusted mortality rates for heart disease and stroke show important disparities by geographic residence (Table 23). The city of Providence has higher death rates for these two diseases than the state overall (See Table 23). These analyses are based on deaths from heart disease or stroke among adults aged 20 years and older in order to calculate age-adjusted rates using population estimates for cities and towns from the 2005-2007 American Community Survey. As previously described, population estimates from the 2005-2007 American Community Survey begin with 20 year olds.

TABLE 23. THREE-YEAR AVERAGE AGE-SPECIFIC HEART DISEASE¹ AND STROKE² MORTALITY RATES³ AND OVERALL AGE-ADJUSTED HEART DISEASE AND STROKE MORTALITY RATES,⁴ BY GEOGRAPHIC RESIDENCE, AMONG ADULTS AGES 20 AND OLDER, 2005-2007

GEOGRAPHIC RESIDENCE	HEART DISEASE RATE (95% CI)	STROKE RATE (95% CI)
STATE		
Age Group		
20-34	1.2	—
35-64	11.1	1.5
65+	28.7	27.4
Overall — Age-Adjusted	23.1 (21.1 – 24.0)	5.4 (4.9 – 5.9)
CORE CITIES⁵		
Providence		
Age Group		
20-34	—	—
35-64	16.2	—
65+	184.5	39.1
Overall — Age-Adjusted	38.4 (34.3 – 42.6)	7.9 (6.0 – 9.8)
All other Core Cities		
Age Group		
20-34	—	—
35-64	14.9	—
65+	158.5	4.2
Overall — Age-Adjusted	33.5 (30.6 – 36.5)	5.0 (3.9 – 6.1)

— Data are unreliable because the number of events is based on fewer than 30 observations

¹Heart disease listed as the primary cause of death (ICD-10-CM codes I00 - I09, I11, I13, I20, I51).

²Stroke listed as the primary cause of death (ICD-10-CM codes I60-I69).

³All rates are per 10,000 population.

⁴Data are age-adjusted to the 2000 standard population. Ages 20 and older.

⁵Rhode Island core cities: Central Falls, Newport, Pawtucket, Providence, West Warwick, and Woonsocket. These cities have child poverty levels greater than 15%, according to the 2000 Census.

Data Source: Rhode Island Vital Record Death Certificates combined and U.S. Census Bureau, 2005-2007 American Community Survey 3-Year estimates.

Highlights — Table 23

Geographic variations in heart disease and stroke mortality rates

Rhode Island data show considerable geographic variations in age-adjusted mortality rates for heart disease when the city of Providence is compared with other core cities¹ and the state as a whole.

- Heart disease mortality
 - 38.4 per 10,000 population in Providence
 - 33.5 per 10,000 population in core cities
 - 23.1 per 10,000 population in Rhode Island
- Stroke
 - 7.9 per 10,000 population in Providence
 - 5.0 per 10,000 population in core cities
 - 5.4 per 10,000 population in Rhode Island



ADDRESSING HIGH BLOOD PRESSURE IN VULNERABLE POPULATIONS

This section describes a pilot project being implemented in South Providence, Rhode Island. It details the objectives of the project, the organizations collaborating on the pilot project, and its accomplishments in its first year. The section also displays the cross-agency referral system that is at the heart of the pilot project.

Many modifiable risk factors for heart disease and stroke can be addressed through prevention, early recognition, and treatment. Rhode Island's Heart Disease and Stroke Prevention Program is committed to helping Rhode Islanders live heart-healthy and stroke-free lives through interventions where individual-level change occurs in tandem with policy and environmental changes. These changes include legislation, building walkable communities, and integration of health care with community-based resources.

In April 2008, the Rhode Island Heart Disease and Stroke Prevention Program implemented a four-year Neighborhood Pilot Project (Pilot Project) in South Providence, Rhode Island. The Pilot Project is a partnership of four agencies with a long-standing commitment to the people living and working in South Providence: Center for Hispanic Policy and Advocacy (CHisPA), John Hope Settlement House, St. Joseph Center for Health and Human Services of Rhode Island (St. Joseph), and Women and Infants Hospital mobile Family Van. An end-of-study evaluation will assess the project's sustainability.

South Providence, Rhode Island was chosen as the Pilot Project site because it is a community where nearly 40% of residents live in poverty. A majority of the residents are Hispanic (52%). About one-fourth of the residents are African-American. Thirty-nine percent of the residents are foreign-born. It is a neighborhood with few parks or green spaces and no national chain supermarkets.

The goal of the Pilot Project is to create systems-level changes that support a heart-healthy and stroke-free neighborhood in South Providence through:

- Establishing inter-agency partnerships to integrate health care with community-based resources,
- Building a referral system across partnering agencies to encourage and support the monitoring of clients who have high blood pressure, and
- Building cross-organizational links beyond the partnering agencies to include other health promotion and worksite wellness programs in the neighborhood.



The first year of the Pilot Project culminated in nine important innovative systems changes. Each systems-level change is briefly described.

1. Pilot Project partners offered clients of CHisPA and John Hope Settlement House an opportunity to get free screenings for blood pressure, cholesterol, and glucose through Rhode Island's Women and Infants Hospital mobile Family Van. The hospital's "traveling" Family Van brings accessible and culturally appropriate education, prevention, screenings and health outreach services to those living in disadvantaged urban communities.⁵⁷
2. John Hope Settlement House expanded opportunities for free blood pressure screenings by offering screenings once a month by a registered nurse. Blood pressure screenings take place before a very popular line dancing class offered in the evening.
3. Pilot Project partners established a cross-agency referral system (Figure 21):
 - a. Clients of CHisPA are offered free, monthly on-site health screenings in partnership with Women and Infants Hospital Family Van and Lifespan Community Health Services. The Family Van and Lifespan Community Health Services are on-site every other month (alternate months).
 - b. Clients of John Hope Settlement House are offered free, monthly on-site health screenings in partnership with Women and Infants Hospital Family Van.
 - c. Clients of CHisPA and John Hope Settlement House identified as having high blood pressure are encouraged to see their primary care providers. Adults who do not have a primary care provider and/or health care insurance are referred to St. Joseph Center for Health and Human Services for medical care.
 - d. Clients of CHisPA and John Hope Settlement House who are referred to St. Joseph Center for Health and Human Services through the Pilot Project see a nurse in St. Joseph's Diabetes Resource Center as part of their medical appointment. The nurse counsels patients about nutrition and physical exercise resources at CHisPA and John Hope Settlement House.
4. Pilot Project partners established a written protocol for the referral system. At the time of the free health screenings, an Intake/Referral Form is completed by project staff with participants. The Intake/Referral Form includes signed consent. Information is collected on demographics, medical history, on-site screening results, and follow-up services requested by the participant, such as medical follow-up, nutritional counseling, and smoking cessation.
5. Pilot Project partners compiled and published a Community Resource Guide. The guide lists services and classes offered by the partnering organizations, as well as other nearby community sites with resources for nutritional counseling and activities to support physical exercise.

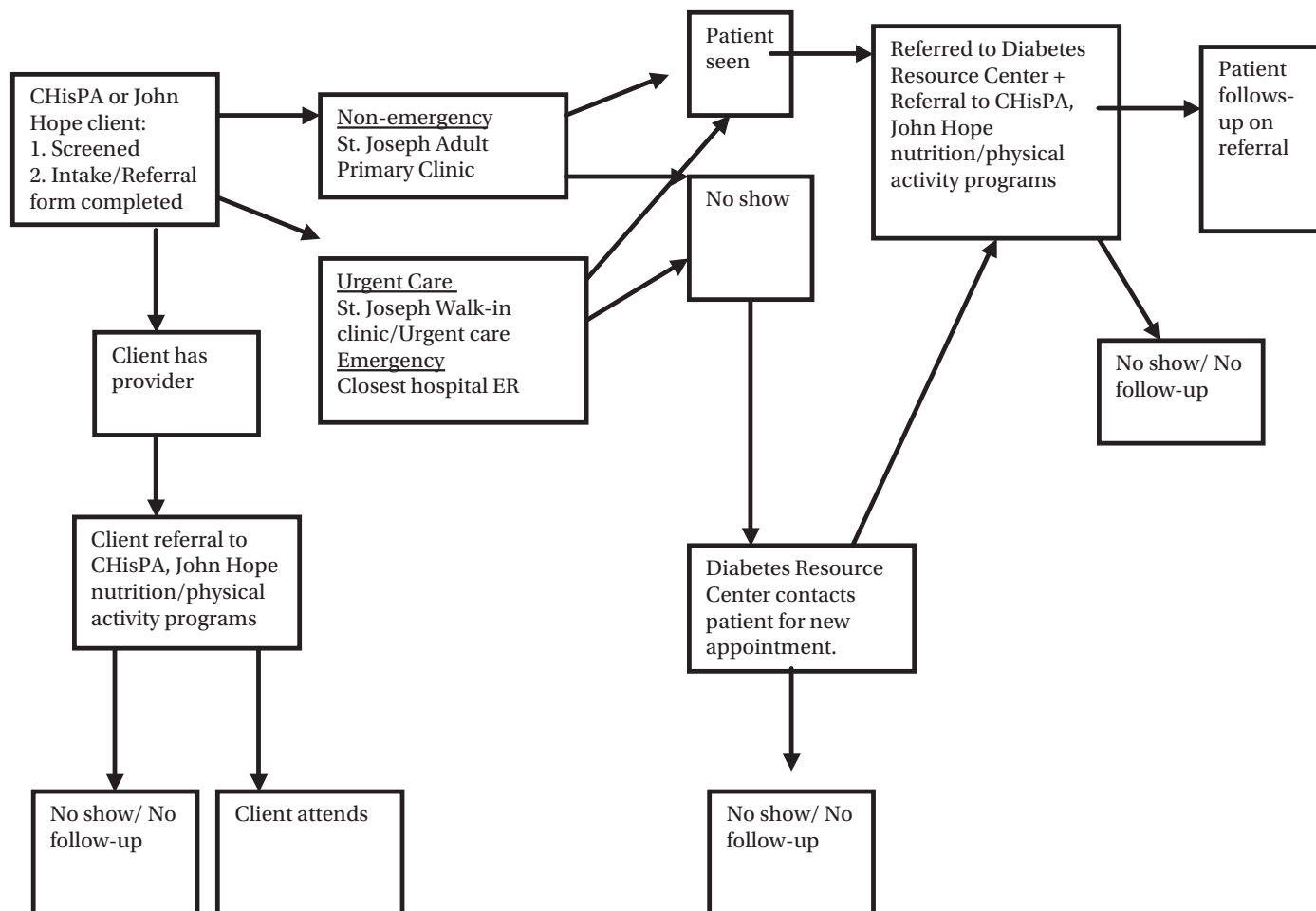


6. St. Joseph Center for Health and Human Services established an electronic cardiovascular disease database (registry) for all patients with a doctor-diagnosed cardiovascular condition, including patients at risk for developing cardiovascular disease. The registry has a field to count the number of patients with a cardiovascular condition who are referred from CHisPA and John Hope Settlement House to St. Joseph for medical follow-up. Other fields in the registry include the number of patient visits, demographics, vital signs (blood pressure, height and weight), health conditions, medications, laboratory results for fasting cholesterol and glucose tests, and smoking status. Monthly registry reports provide health care providers with information that can be used to improve patient health outcomes and sustain organizational changes in health care delivery.
7. Pilot Project partners set up a database for the Intake Referral Forms for program evaluation. The Intake Referral Form is linked to St. Joseph's Cardiovascular Disease Registry to see if participants followed through on a referral for medical care. Follow-up of participants with high blood pressure and/or high cholesterol who are referred to their primary care provider is not possible at this time due to staffing and budgetary constraints.
8. Pilot project partners established cross-agency collaboration on grants to fund tobacco control activities. The three partnering organizations have successfully collaborated on a grant to train two health educators as Tobacco Control Specialists. Health educators will develop free quit-smoking programs that will be implemented at ChisPA, John Hope Settlement House, St. Joseph, and other community organizations in South Providence.
9. Pilot Project partners brought worksite wellness programs and educational materials to their fellow employees by teaming with the Worksite Wellness Council of Rhode Island. The Council worked with the Pilot Project partners to develop a calendar of wellness programs based on national wellness events and provided posters, brochures, and educational materials. The materials included American Heart Association "CPR Anytime Kits," American Heart Association "Health Trackers," and pedometers. "CPR Anytime Kits" are self-directed, personal tools to make learning the core skills of cardiopulmonary resuscitation easy, convenient, and affordable. Heart

Health Trackers are useful tools for managing and tracking one's own health. There are trackers for blood pressure, cholesterol, blood glucose, weight status, fruit and vegetable consumption, and specific disease outcomes such as angina.



FIGURE 21. SAMPLE REFERRAL PROCESS FOR THE HEART DISEASE AND STROKE NEIGHBORHOOD PILOT PROJECT, SOUTH PROVIDENCE, RHODE ISLAND



Data Source: Neighborhood Pilot Project, South Providence, Rhode Island

CONCLUSION

This report summarizes the most recent information available on the burden of cardiovascular diseases in Rhode Island. Like the nation, cardiovascular diseases are the leading cause of death in Rhode Island. Between 2006 and 2007, an estimated 6,452 Rhode Islanders died of cardiovascular diseases, particularly heart disease and stroke. Nearly all of these deaths occurred in people 65 years of age and older (88%).

Cardiovascular diseases also have a significant impact on Rhode Island's health care system. In 2007, 19,204 Rhode Islanders 18 years of age and older were hospitalized for cardiovascular diseases. The average length of stay was five days. The average charges for a hospitalization when cardiovascular disease was the principal reason for admission was \$35,770. Annual hospital discharges for cardiovascular diseases and associated charges are likely to increase in the future with rising health care costs, the aging of Rhode Island's population, and the escalating prevalence of cardiovascular disease risk factors.

Much of the morbidity and mortality due to cardiovascular diseases is preventable. With funding from the CDC, the Rhode Island Heart Disease and Stroke Prevention Program has developed a comprehensive state plan for heart disease and stroke prevention. *The Rhode Island Heart Disease and Stroke 2009 State Plan* emphasizes policy and system changes for primary and secondary prevention of heart disease and stroke, and the elimination of disparities based on socioeconomic status, gender, race or ethnicity, and geographic residence.

The Rhode Island Heart Disease and Stroke Prevention Neighborhood Pilot Project is one strategy to decrease hospitalizations and deaths attributable to cardiovascular disease in the state. A second strategy to improve the cardiovascular health of Rhode Islanders is through the Rhode Island Chronic Care Collaborative (RICCC).

The RICCC is a multi-year and multi-site program currently made up of 26 primary care sites. Started in 2002 to reengineer primary care delivery for persons with diabetes, RICCC sites have expanded to improve patient outcomes for asthma, colorectal screening, and cardiovascular diseases. Health care teams are funded to improve the quality of care provided to and the health care outcomes for patients with chronic diseases. Teams are adopting the Chronic Care Model and the Model of Influence to improve the delivery of primary care for patients with chronic illness. A key

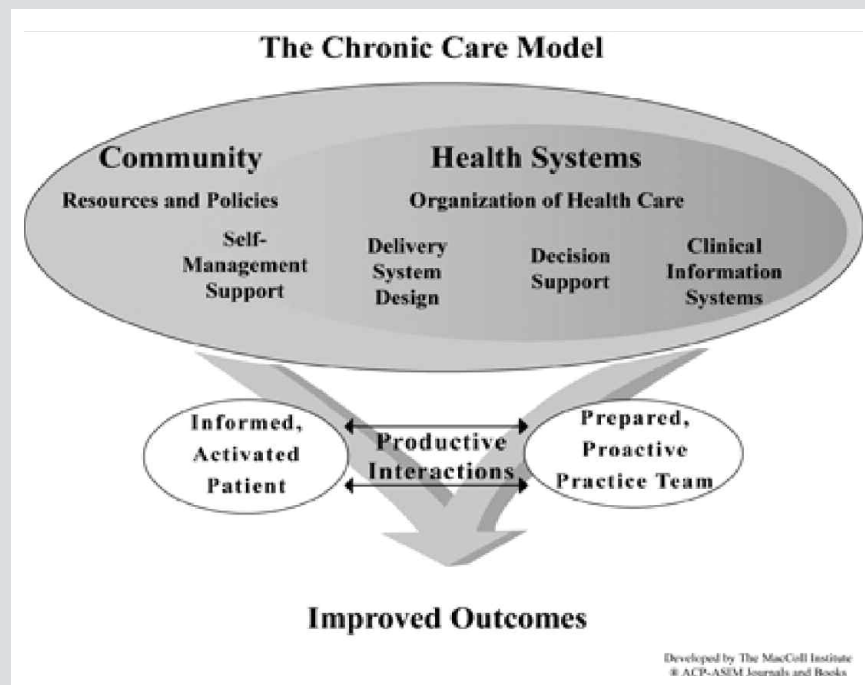
component of the Chronic Care Model is self-management. Self-management allows patients to have a central role in determining their care, one that fosters a sense of responsibility for their own health care. Another key component of the Chronic Care Model is linking the health care system with community resources that provide education and coaching for the management of chronic diseases.

In 2007, the Rhode Island Heart Disease and Stroke Prevention Program was awarded a three year Optional Funding Grant from CDC. The grant is funding eight RICCC community health centers to improve health outcomes in patients with high blood pressure and/or high cholesterol. These eight RICCC sites join St Joseph Center for Health and Human Services, another RICCC site, in adapting the Chronic Care Model to (1) improve the management of high blood pressure and high cholesterol in low income patients and (2) reduce health care costs.

FIGURE 22.

The Rhode Island Chronic Care Collaborative

The Rhode Island Chronic Care Collaborative is an innovative initiative to reengineer care for patients with cardiovascular disease and to decrease disparities in health outcomes.



A third strategy to improve the cardiovascular health of Rhode Islanders is the collaboration between the Rhode Island Heart Disease and Stroke Prevention Program and the American Heart Association on the HeartSafe Community Program. This initiative is based on the principle that lives can be saved by preventive resources, early access to care, early cardiopulmonary resuscitation (CPR) intervention, and early defibrillation. The goals of the Rhode Island HeartSafe Community initiative are to: (1) increase the number of community members trained in CPR, (2) increase First Responders equipped with automated external defibrillators (AEDs), (3) ensure appropriate pre-arrival instructions, and (4) optimize pre-hospital care. A pilot of this initiative has involved the participation of two Rhode Island communities. The citizens of Warwick and Westerly are now designated as HeartSafe Communities. Statewide implementation is planned for the near future.

In summary, this burden of disease report is designed to present information on heart disease and stroke in a clear and accessible format. The tables and figures have been designed for use by policy makers, health care and community organizations, and the general public. As we move forward, the Rhode Island Heart Disease and Stroke Prevention Program and its many public and private sector partners are committed to using the data in this report to help Rhode Islanders live healthier lives and to reduce the burdens of heart disease and stroke.

Public Health Message

Take steps to avoid heart disease or a stroke.

1. Don't smoke or use tobacco products.
2. Get active.
3. Eat a heart-healthy diet.

Eating a special diet called the Dietary Approaches to Stop Hypertension (DASH) eating plan also can help protect your heart. Following the DASH diet means eating foods that are low in fat, cholesterol and salt.

4. Lower salt intake.
5. Maintain a healthy weight.
6. Get regular health screenings.



REFERENCES

- ¹What is Coronary Artery Disease? National Heart Lung and Blood Institute Diseases and Conditions Index Website.
http://www.nhlbi.nih.gov/health/dci/Diseases/Cad/CAD_WhatIs.html. February 2009. Accessed January 8, 2010.
- ²Cardiovascular Disease Cost. American Heart Association Website.
<http://www.americanheart.org/presenter.jhtml?identifier=4475>. Accessed February 12, 2010.
- ³Cooper R et al. Trends and Disparities in Coronary Heart Disease, Stroke, and Other Cardiovascular Diseases in the United States. Findings of the National Conference on Cardiovascular Disease Prevention. *Circulation*. 2000 Dec 19;102(25):3137-47.
- ⁴Global Strategy on Diet, Physical Activity and Health. World Health Organization Website.
<http://www.who.int/dietphysicalactivity/publications/facts/cvd/en>. Accessed January 8, 2010.
- ⁵Heart Disease and Stroke Prevention: Addressing the Nation's Leading Killers: At A Glance 2010. Centers for Disease Control and Prevention Website.
<http://www.cdc.gov/NCCDPHP/publications/AAG/dhdsp.htm>. Accessed January 8, 2010.
- ⁶State & County QuickFacts: Rhode Island. U.S. Census Bureau Website.
<http://quickfacts.census.gov/qfd/states/44000.html>. Accessed January 8, 2010.
- ⁷Closing the Gap in a Generation: Health Equity Through Action on the Social Determinants of Health; Final Report of the Commission on Social Determinants of Health. World Health Organization. Geneva 2008.
- ⁸Kondro W. Poverty is main predictor of heart disease. *Lancet*. 2002 May 11;359(9318):1679.
- ⁹Lethbridge-Çejku M, Rose D, Vickerie J. Summary health statistics for U.S. Adults: National Health Interview Survey, 2004. National Center for Health Statistics. *Vital Health Stat*. 10(228). 2006. http://www.cdc.gov/nchs/data/series/sr_10/sr10_228.pdf. Accessed January 8, 2010.

- ¹⁰Muenning P, Fiscella K, Tancredi D, Franks P. The relative health burden of selected social and behavioral risk factors in the United States: Implications for policy. *Am J Public Health* 2010 Jan 14.
- ¹¹Muenning P, Franks P, Jia H, Lubetkin E, Gold MR. The income-associated burden of disease in the United States. *Soc Sci Med*. 2005 Nov; 61(9):2018-26.
- ¹²Division for Heart Disease and Stroke Prevention. Centers for Disease Control and Prevention Website. <http://ccom.ncsl.org/programs/health/HDSOverview.htm>. Accessed January 8, 2010.
- ¹³The Atlas of Heart Disease and Stroke. World Health Organization Website. http://www.who.int/cardiovascular_diseases/resources/atlas/en/. Accessed January 8, 2010.
- ¹⁴Healthy People 2020: The Road Ahead. U.S. Department of Health & Human Services Website. <http://www.healthypeople.gov/HP2020/>. Updated November 3, 2009, Accessed January 8, 2010.
- ¹⁵U.S. Department of Health and Human Services. Healthy People 2010: Understanding and Improving Health. 2nd ed. Washington (DC). Office of Disease Prevention and Health Promotion. (Accessed January 8, 2010 at <http://www.health.gov/healthypeople>).
- ¹⁶Healthy People 2010: Heart Disease and Stroke. Objectives and Subobjectives. U.S. Department of Health & Human Services Website. <http://healthypeople.gov/data/midcourse/html/focusareas/FA12Objectives.htm>. Accessed January 8, 2010.
- ¹⁷Schenker N and Gentleman J. On judging the significance of differences by examining the overlap between confidence intervals. *The American Statistician*. 2001; 55:182-186.
- ¹⁸Cardiovascular diseases (CVDs). World Health Organization Website. <http://www.who.int/mediacentre/factsheets/fs317/en/index.html>. Accessed January 8, 2010.
- ¹⁹Cigarette Smoking and Cardiovascular Diseases. American Heart Association Website. <http://www.americanheart.org/presenter.jhtml?identifier=4545>. Accessed January 8, 2010.
- ²⁰Physical Activity. American Heart Association Website. <http://www.americanheart.org/presenter.jhtml?identifier=4563>. Accessed January 8, 2010.
- ²¹Understanding Blood Pressure Readings. American Heart Association Website. <http://www.americanheart.org/presenter.jhtml?identifier=2112>. Accessed January 8, 2010.
- ²²Diabetes and Cardiovascular (Heart) Disease. American Diabetes Association. (Accessed January 8, 2010 at <http://www.diabetes.org/diabetes-statistics/heart-disease.jsp>).
- ²³Krauss R, Winston M, Fletcher B, Grundy S. Obesity: Impact on Cardiovascular Disease. *Circulation*. 1998; 98: 1472-1476.
- ²⁴Centers for Disease Control and Prevention. Declining Prevalence of No Known Major Risk Factors for Heart Disease and Stroke Among Adults—United States, 1991-2001. *Morbidity and Mortality Weekly Report*. 2004; 53: 4-7.

- ²⁵Centers for Disease Control and Prevention. Racial/Ethnic and Socioeconomic Disparities in Multiple Risk Factors for Heart Disease and Stroke -- United States, 2003. *Morbidity and Mortality Weekly Report*. 2005; 54:113-117.
- ²⁶Greenlund K, Zheng Z, Keenan N, et al. Trends in self-reported multiple cardiovascular disease risk factors among adults in the United States, 1991-1999. *Archives of Internal Medicine*. 2004;164: 181-188.
- ²⁷Wilson P, Kannel W, Silbershatz H, D'Agostino R. Clustering of metabolic factors and coronary heart disease. *Archives of Internal Medicine*. 1999; 159: 1104-1109
- ²⁸Risk Factors and Coronary Heart Disease and Stroke. American Heart Association Website. <http://www.americanheart.org/presenter.jhtml?identifier=539>. Updated January 30, 2008. Accessed January 8, 2010.
- ²⁹Physical activity guidelines for Americans. U. S. Department of Health and Human Services. (Accessed January 8, 2010 at <http://www.health.gov/paguidelines/factsheetprof.aspx>).
- ³⁰Perry D, Jiang Y. Health Risks Among Rhode Island High School Students, 1997 2007. *Medicine & Health/Rhode Island*. 2008 Nov;91(11):349-50. <http://www.health.ri.gov/publications/periodicals/healthbynumbers/0811.pdf>. Accessed January 8, 2010.
- ³¹Perry D. Health Risks Among Rhode Island Public Middle School Students 2007 Youth Risk Behavior Survey. Rhode Island Department of Health 2008 May. <http://www.health.ri.gov/publications/healthriskreports/youth/2007MiddleSchoopdf>. Accessed January 8, 2010.
- ³²Velásquez-Mieyer PA., Perez-Faustillini S, Cowan PA. Identifying children at risk for obesity, type 2 diabetes, and cardiovascular disease. *Diabetes Spectrum*. 2005; 18: 213-220.
- ³³Cigarette Smoking and Children. American Heart Association Website. <http://www.americanheart.org/presenter.jhtml?identifier=4549>. Accessed January 8, 2010.
- ³⁴McDermott MM. The international pandemic of chronic cardiovascular disease. *JAMA*. 2007; 297: 1253-1255.
- ³⁵Classification of Diseases, Functioning, and Disability. Centers for Disease Control and Prevention Website. <http://www.cdc.gov/nchs/icd.htm>. Updated January 4, 2010. Accessed January 8, 2010.
- ³⁶Klein RJ, Schoenborn CA. Age adjustment using the 2000 projected U.S. population. *National Center for Health Statistics*. 2001 Jan; 20.
- ³⁷DeFrances CJ, Lucas CA, Buie VC, Golosinskiy A. 2006 National Hospital Discharge Survey. *National Health Statistics Reports*; no 5. Hyattsville, MD: National Center for Health Statistics. 2008. <http://www.cdc.gov/nchs/data/nhsr/nhsr005.pdf>. Accessed January 8, 2010.
- ³⁸Mensah G, Mokdad A, Ford E, Greenlund K, Croft J. State of disparities in cardiovascular health in the United States. *Circulation*. 2005; 111: 1233-1241.
- ³⁹Witt BJ, Roger VL. Sex differences in heart disease incidence and prevalence: implications for intervention. *Expert Opin Pharmacother*. 2003; 4: 675-83.

- ⁴⁰Women and Cardiovascular Disease Facts. American Heart Association Website.
<http://www.americanheart.org/presenter.jhtml?identifier=3039318>. Accessed January 8, 2010.
- ⁴¹James CV, Salganicoff A, Thomas M, Ranji U, Lillie-Blanton M, Wyn R. Putting women's health care disparities on the map: Examining racial and ethnic disparities at the state level. 2009 June. Henry J. Kaiser Family Foundation.
<http://www.kff.org/minorityhealth/upload/7886.pdf>.
- ⁴²Pickle LW, Gillum RF. Geographic variation in cardiovascular disease mortality in US blacks and whites. *J Natl Med Assoc*. 1999;91(10): 545-556. See also: Cooper R, Cutler J, Desvigne-Nickens P et al. Trends and disparities in coronary heart disease, stroke, and other cardiovascular diseases in the United States. Findings of the National Conference on Cardiovascular Disease Prevention. *Circulation*. 2000;102:3137.
- ⁴³Loucks E, Lynch J, Pilote L, Furher R, Almeida N, et al. Life-course socioeconomic position and incidence of coronary heart disease. *Am. J. Epidemiol*. 2009; 169:829-836.
- ⁴⁴Poverty Areas. Statistical Brief: U.S. Census Bureau Website.
<http://www.census.gov/population/socdemo/statbriefs/povarea.html>. Accessed January 8, 2010.
- ⁴⁵Bogen K. Who Are the Uninsured in Rhode Island? Demographic Trends 1990-2004, Access to Care, and Health Status for the Under 65 Population. Rhode Island Department of Health & Human Services. 2006 Nov.
http://www.ritecare.ri.gov/documents/reports_publications/Who%20are%20the%20Uninsured%20-%202004%20Update.pdf. Accessed January 8, 2010.
- ⁴⁶The Uninsured and the Difference Health Insurance Makes. Kaiser Commission on Medicaid and the Uninsured. 2008 Sept. <http://www.kff.org/uninsured/upload/1420-10.pdf>. Accessed January 8, 2010.
- ⁴⁷Low-Income Adults Under Age 65 – Many are Poor, Sick, and Uninsured. Kaiser Commission on Medicaid and the Uninsured. 2009 June.
<http://www.kff.org/healthreform/upload/7914.pdf>. Accessed January 8, 2010.
- ⁴⁸McWilliams JM, Meara E, Zaslavsky AM, Ayanian JZ. Health of Previously Uninsured Adults After Acquiring Medicare Coverage, *JAMA*. 2007 Dec 26; 298(24):2886-94.
<http://www.commonwealthfund.org/Content/Publications/In-the-Literature/2007/Dec/Health-of-Previously-Uninsured-Adults-After-Acquiring-Medicare-Coverage.aspx>. Accessed January 8, 2010.
- ⁴⁹Medicare Policy Changes for the Fiscal Year (FY) 2009 Hospital Inpatient Prospective Payment System. Centers for Medicare & Medicaid Services (CMS). Fact Sheet 2008 Aug 4.
<http://www.cms.gov/apps/media/press/factsheet.asp?Counter=3223&intNumPerPage=10&checkDate=&checkKey=&srchType=1&numDays=3500&srchOpt=0&SearchData=&keywordType=All&chkNewsType=6&intPage=&showAll=&pYear&year=&desc=false&cboOrder=date>. Updated May 14, 2007. Accessed January 8, 2010.
- ⁵⁰Leading Causes of Death. Centers for Disease Control and Prevention Website.
<http://www.cdc.gov/nchs/FASTATS/lcod.htm>. Updated December 31, 2009. Accessed January 8, 2010.

- ⁵¹American Heart Association. Heart Disease and Stroke Statistics – 2009 Update. Dallas, Texas: American Heart Association; 2009.
<http://www.americanheart.org/downloadable/heart/123783441267009Heart%20and%20Stroke%20Update.pdf>.
- ⁵²Anderson RN, Miniño AM, Hoyert DL, Rosenberg HM. Comparability of Cause of Death Between ICD-9 and ICD-10: Preliminary Estimates. National vital statistics reports; vol 49 no. 2. Hyattsville, MD.
- ⁵³National Center for Health Statistics. About the International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM). (Available online
<http://www.cdc.gov/nchs/about/otheract/icd9/abtcd10.htm>).
- ⁵⁴National Institute for Health and Clinical Excellence (NICE). Reducing the rate of premature deaths from cardiovascular disease and other smoking-related diseases: finding and supporting those most at risk and improving access to services. London (UK): National Institute for Health and Clinical Excellence (NICE); 2008 (Public health guidance; no. 15).
- ⁵⁵Casper ML, Barnett E, Williams GI Jr, Halverson JA, Braham VE, Greenlund KJ. Atlas of Stroke Mortality: Racial, Ethnic, and Geographic Disparities in the United States. Atlanta, GA: Department of Health & Human Services, Centers for Disease Control and Prevention; January 2003. ftp://ftp.cdc.gov/pub/Publications/stroke_atlas/00-atlas-all.pdf.
- ⁵⁶Barnett E, Casper ML, Halverson JA, Elmes GA, Brahan VE, Majeed ZA, Bloom AS, Stanley S. Men and Heart Disease: An Atlas of Racial and Ethnic Disparities in Mortality, First Edition. Morgantown, WV: Office for Social Environment and Health Research, West Virginia University, 2001. Copies of Men and Heart Disease are available free of charge from the Centers for Disease Control and Prevention National Center of Chronic Disease and Health Promotion. Division of Adult and Community Health. 4770 Buford Highway NE, MS K-47, Atlanta, GA 30341. Tel: 888-232-2306. A companion resource is Women and Heart Disease: An Atlas of Racial and Ethnic Disparities in Mortality, which is also available for free from the Centers for Disease Control and Prevention.
- ⁵⁷Specific Programs and Services Needing Your Support. Women & Infants Website.
<http://www.womenandinfants.org/body.cfm?id=313>. Accessed January 8, 2010.
- ⁵⁸Coleman K, Austin BT, Brach C, Wagner EH. Evidence on the chronic care model in the new millennium. Health Affairs. 2009; 28, (1): 75-85.

APPENDIX A: RHODE ISLAND DEPARTMENT OF HEALTH DATA SOURCES AND DEFINITIONS

Indicator	Data Source	Definition
Cardiovascular Disease Mortality rate, crude and adjusted	Center for Data & Analysis: Vital Records	The number of deaths due to cardiovascular disease per 10,000 population. The ICD-10 codes used for cardiovascular disease are: I00-I99.
Disease of the Heart Mortality rate, crude and adjusted	Center for Data & Analysis: Vital Records	The number of deaths due to heart disease per 10,000 population. The ICD-10 codes used for Heart Disease are: I00-I09, I11, I13, and I20-I51.
Coronary Heart Disease mortality rate, crude and adjusted	Center for Data & Analysis: Vital Records	The number of deaths due to coronary heart disease per 10,000 population. The ICD-10 codes used for Coronary Heart Disease are: I11, I20-I25.
Congestive Heart Failure mortality, crude and adjusted	Center for Data & Analysis: Vital Records	The number of deaths due to congestive heart failure per 10,000 population. The ICD-10 code used for Congestive Heart Failure is: I50
Cerebrovascular Disease (Stroke) Mortality rate, crude and adjusted	Center for Data & Analysis: Vital Records	The number of deaths due to cerebrovascular disease per 10,000 population. The ICD-10 codes used for Cerebrovascular Disease are: I60-I69.
Cardiovascular Disease Hospitalization Rate rate, crude and adjusted	Center for Data & Analysis: Hospital Discharge Data	The number of hospitalizations for cardiovascular disease per 10,000 population. The ICD-9 codes used for Cardiovascular Disease are: 390-459.
Disease of the Heart Hospitalization rate, crude and adjusted	Center for Data & Analysis: Hospital Discharge Data	The number of hospitalizations for heart disease per 10,000 population. The ICD-9 codes for Disease of the Heart are: 390-398, 402, 404-429

Indicator	Data Source	Definition
Coronary Heart Disease Hospitalization rate, crude and adjusted	Center for Data & Analysis: Hospital Discharge Data	The number of hospitalizations for coronary heart disease per 10,000 population. The ICD-9 codes used for Coronary Heart Disease are: 402, 410-414, and 429.
Congestive Heart Failure Hospitalization rate, crude and adjusted	Center for Data & Analysis: Hospital Discharge Data	The number of hospitalizations for congestive heart failure per 10,000 population. The ICD-9 code for Congestive Heart Failure is: 428.
Cerebrovascular Disease (Stroke) Hospitalization rate, crude and adjusted	Center for Data & Analysis: Hospital Discharge Data	The number of hospitalizations for cerebrovascular disease per 10,000 population. The ICD-9 codes used for Cerebrovascular Disease are: 430-438.
Percent of adults with diagnosis of heart attack, stroke, or angina	Center for Data & Analysis: Behavioral Risk Factor Surveillance System	The percent of respondents who reported they had been told by a health professional they had ever had a heart attack, stroke or angina in their lifetime.
Percent of adults with cholesterol checked in the last 5 years	Center for Data & Analysis: Behavioral Risk Factor Surveillance System	The percent of respondents who reported they had their cholesterol checked in the last 5 years.
Percent of adults with high blood pressure	Center for Data & Analysis: Behavioral Risk Factor Surveillance System	The percent of respondents who reported they had been told by a health professional they had high blood pressure.



Rhode Island Department of Health
Division of Community, Family Health and Equity
Heart Disease and Stroke Prevention Program
3 Capitol Hill
Cannon Building, Room 408
Providence, Rhode Island 02908