The Ohio Department of Health

American Heart Association | American Stroke Association

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The Burden of Stroke in Ohio

2006

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Ohio Valley Affiliate
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The American Heart Association is a national voluntary health agency whose mission is to reduce disability and death from cardiovascular diseases and stroke.
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To protect and improve the health of all Ohioans.

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Message from the Ohio Department of Health and the American Stroke Association

Dear Partner in Stroke Prevention and Treatment:

The American Heart Association/American Stroke Association and the Ohio Department of Health are pleased to present the inaugural edition of *The Burden of Stroke in Ohio*.

In February 2005, the American Heart Association/American Stroke Association issued *Recommendations for the Establishment of Stroke Systems of Care*. This statement identifies opportunities to improve stroke care and develop a system that ultimately addresses the full range of activities and services associated with stroke prevention, treatment and rehabilitation.

These recommendations provide the framework to assess Ohio's stroke care system and identify existing capabilities and limitations. *The Burden of Stroke in Ohio* is the first comprehensive review of currently available data that describe various aspects of stroke from prevention through mortality.

Stroke impacts all Ohioans – children, men and women – and disproportionately affects racial and ethnic minorities. It can be debilitating not only to the survivor, but also to the family, the health care system and our workforce.

In Ohio, as in the nation, stroke is the third-leading cause of death. Stroke accounted for almost 40,000 hospitalizations in 2003 and more than 7,000 Ohioans die from stroke each year. Stroke is the leading cause of serious, long-term disability, according to the American Heart Association.

It is our hope that this report will be the catalyst that initiates important discussions about stroke and supports efforts to develop strategies that strengthen coordination and integration across all aspects of Ohio's stroke system of care.

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Introduction

Stroke, the brain equivalent of a heart attack, is the third-leading cause of death in the United States and the leading cause of serious long-term disability in adults.[1] It is estimated that more than 700,000 Americans have a stroke each year and approximately 500,000 of these are first attacks.[1] On average, every 45 seconds someone in the United States has a stroke and every three minutes someone dies of a stroke.[1] Direct and indirect costs for stroke in 2005 are estimated at $56.8 billion, including lost productivity resulting from morbidity and mortality.[2] Nationally, stroke death rates in 2002 were substantially higher for African Americans than whites, with rates of 82 per 100,000 for black men and 72 per 100,000 for black women, compared to 54 per 100,000 for white men and 53 per 100,000 for white women.[3]

In Ohio, as in the nation, stroke is the third-leading cause of death, accounting for more than 7,000 deaths in 2002. Among the 50 states and the District of Columbia, Ohio ranks 36th-highest for overall stroke mortality. While the mean age for stroke death among Ohioans is 79.9 years, 10.7 percent of these deaths occurred before age 65. Based on an average life expectancy of 75 years, in 2002 Ohioans lost more than 23,000 years of potential life due to stroke.[3]

While many advances have been made in stroke prevention, treatment and rehabilitation, much remains to be accomplished to create a coordinated and integrated system that will reduce the prevalence, morbidity and mortality of stroke for all Ohioans. The organization and operation required for a systems approach to stroke are described in the American Stroke Association's (ASA) *Recommendations for the Establishment of Stroke Systems of Care*.[4] These recommendations, which address primordial and primary prevention; community education; notification and response of emergency medical services; acute stroke treatment, including the hyper-acute and emergency department phases; sub-acute stroke treatment and secondary prevention; rehabilitation; and continuous quality improvement, provide the framework for this report.

The purpose of this report is to present currently available data that describe the burden of stroke in Ohio and help identify the existing capabilities and limitations for stroke treatment and prevention. This report will:

- Provide a focal point for stroke data related to health disparities, risk factors, morbidity, mortality and associated costs;
- Provide information to assess services and address relevant issues related to stroke prevention and treatment; and
- Identify issues and needs in Ohio's stroke system of care that have an impact on quality of life and premature death and disability from stroke.

This report used seven existing data sources, each characterizing a different Ohio stroke sub-population or system of care. Results from each data source are presented in a separate section in the report. The first section presents data from

the Behavioral Risk Factor Surveillance System (BRFSS). The BRFSS collects population-based statewide health data on Ohioans 18 years of age and older. The second section presents information on transports of patients exhibiting signs and symptoms of stroke collected by Ohio's Emergency Medical Services (EMS). The third section, hospital discharge data, provides information on persons who were admitted and discharged from the hospital. The fourth section, Ohio Prototype Paul Coverdell registry, provides information on care delivered to acute stroke patients. The fifth section, Medicaid data, has information on low-income adult Ohioans. The sixth section, the Minimum Data Set (MDS), provides information on residents in Ohio's nursing homes. The seventh and last section provides information on mortality data associated with stroke (Vital Statistics).

Clinical and public health professionals can utilize this information in several ways: 1) to document the magnitude of stroke as a public health problem; 2) to monitor disease trends over time; 3) to detect changes in health care practices; 4) to educate the public, the community and policymakers about disease prevention; and 5) to initiate the collaborative process and develop a system of care that will achieve the long-term goal of optimal management of stroke for every Ohio resident.

Key Findings

Ohio Behavioral Risk Factor Surveillance System

- More than 75 percent of Ohio adults have at least one of the following modifiable risk factors for stroke: diabetes, obesity, physical inactivity, smoking, high blood pressure, high cholesterol or low fruit and vegetable consumption.
- The prevalence of stroke was higher among black females (5.2 percent) and black males (3.8 percent), compared to white females (2.8 percent) and white males (2.2 percent).
- Black males (23.5 percent) and black females (28.8 percent) were least likely and white females (43.9 percent) were most likely to recognize all five symptoms of stroke and call 911 as the first response to someone having a stroke or heart attack.

Ohio Emergency Medical Services

- In 2004, there were 15,846 suspected stroke transports by Ohio's EMS system with an average transport time of 34.2 minutes.
- Persons aged 75-84 years represented the largest percentage of suspected stroke transports.

- Counties in rural Appalachia had the longest average transport times (41.2 minutes), while Ohio metropolitan counties had the shortest average transport times (32.0 minutes) for patients with suspected stroke.
- Counties with one hospital and multiple EMS providers had transport times that were 46 percent shorter for patients with suspected stroke than counties with no hospital and one EMS.

Ohio Hospital Discharges

- For each of the years during 1999-2003, males had higher age-adjusted hospital discharge rates for stroke compared to females.
- In 2003, the total charges for discharges with any mention of stroke as a listed diagnosis were $1.7 billion. Medicare was the primary payor for the majority of the discharges.
- Between 1999-2003, the average charge for hospital discharges with stroke listed as the principal diagnosis increased by 55 percent from $11,739 to $18,164. The average charge for discharges with stroke listed as any diagnosis increased by 54 percent from $13,053 to $20,090.
- Ischemic and hemorrhagic stroke are the two types of stroke. Of hospital discharges with ischemic or hemorrhagic stroke listed as the principal diagnosis, ischemic stroke was listed as the principal diagnosis for 85 percent of the discharges in this category.
- In 2003, the average length of stay for hemorrhagic stroke (8.1 days) was longer compared to ischemic stroke (5.4 days).
- The average age for ischemic stroke was 72 years; for hemorrhagic stroke it was 67 years. In general, males diagnosed with either ischemic or hemorrhagic stroke were three to four years younger than females with either diagnosis.
- Thirty-four percent of hospital discharges with a principal diagnosis of ischemic stroke and 20 percent with a principal diagnosis of hemorrhagic stroke were discharged to home.

Ohio Medicaid Program

- In Fiscal Year (FY) 2003, Medicaid provided coverage for nearly 1 million adults. Of these, 4.8 percent (44,926) adults had a medical claim with a diagnosis of stroke. Males had a slightly higher prevalence of stroke (4.9 percent) compared to females (4.7 percent).

- Adults aged 75-84 years had the highest prevalence of stroke (16.8 percent). Adult eligibles 45 years and older accounted for 88 percent of the Medicaid population with stroke.
- In FY 2003, Ohio Medicaid Program (fee for service) total expenditures for adults were more than $8.1 billion. Seventeen percent ($1,357,074,748) was spent on health care for eligibles (fee for service) diagnosed with stroke.
- The category of service with the greatest expenditure for eligibles with stroke was for skilled nursing facilities (SNF), followed by inpatient care and then prescriptions. These three categories accounted for 72 percent of expenditures, with SNF costs nearly half of the total expenditures.
- The majority of the expenditures were for individuals who were dual eligible (eligible for both Medicaid and Medicare).

Ohio Nursing Home Residents

- In 1999, there were 165,365 adult residents in Ohio's long-term care nursing homes. Of this group, 23 percent (38,019 residents) had a diagnosis of stroke.
- Black males aged 65-74 years had the highest prevalence of stroke (38.2 percent) of all racial-gender-age groups.

Mortality

- In 2002, stroke was the third-leading cause of death in both the United States and Ohio.
- Between 1990-2002, Ohio's mortality rates from stroke were slightly higher than the U.S. mortality rates.
- Between 1990-2002, the age-adjusted mortality rates for all racial-gender groups decreased, except for black males.
- Black males had the highest age-adjusted mortality rate from stroke of all racial-gender groups. In 2002, the stroke mortality rate for black males (89.9 per 100,000 persons) was 53 percent higher compared to white males (58.6 per 100,000 persons).

Risk Factors, Prevalence and Symptom Awareness–The Behavioral Risk Factor Surveillance System

CHAPTER 1

Ohio Stroke Survivor Story

While at work one day in June of 2000, Joyce Beatty, then 50 and a freshman state representative, suddenly felt that she had no control over her throat. She felt like she was choking; she couldn't swallow, and talking wasn't possible. Her first response to her dilemma was to put a hand to her throat and that she needed to get some water. However, before she could react further, her left side went numb and she collapsed.

"All of a sudden, this sensation riddled through the right side of my body," Joyce remembers. "My staff at first thought I was choking… then someone thought I was having a heart attack. Fortunately, someone called 911."

When Joyce got to the hospital, her doctor recognized she was having a stroke. Looking back Joyce knows she should have realized her stroke risk: both her maternal and paternal grandparents had died of heart attack and stroke complications, and she was already diagnosed with high blood pressure. (She later discovered she also had a high cholesterol level.)

However, it never occurred to her that she was having a stroke. "When we think about cardiovascular disease, we think it only affects people who are more into their senior years," she says. "Like many working women, I wasn't in touch with my personal health. I should have been more aware."

Now Joyce understands how hard it is to face the reality of a stroke. She spent a month in the hospital and then several more months in rehabilitation. It took almost six months before she began to feel normal and almost a year before she was fully recuperated. "Learning to walk all over again was the most difficult task for me," Joyce says, "…but I had a great recovery. I thank God everyday for it and that's why I tell my story. It helped me to know that I want to help others. People still think stroke as a stigma—in the workplace and in society. It's important to dispel that."

So she decided to do everything she can to raise awareness. As a legislator, Joyce has used her leadership role to champion stroke and other healthcare issues. She became a sought-after spokesperson for the American Heart Association, and its division, the American Stroke Association, telling her story to regional and national audiences. She also serves on the board of the local American Heart Association. This year, she agreed to serve as the honorary chairwoman of Go Red For Women campaign for Columbus, giving the keynote address at the Go Red For Women Luncheon and Educational Forum in February.

Risk Factors for Stroke

Risk factors are traits and lifestyle habits that increase the risk of disease. Nonmodifiable risk factors for stroke include increasing age, sex, family history, race and previous stroke or heart attack. These risk factors cannot be changed but are important characteristics that should be considered when evaluating a person's total risk for stroke. Modifiable risk factors for stroke include hypertension, diabetes, carotid or other artery disease, atrial fibrillation, heart disease, transient ischemic attacks (TIAs), sickle cell anemia, high blood cholesterol, physical inactivity, obesity, cigarette smoking and excessive alcohol use. These risk factors can be improved with lifestyle changes, medical monitoring and treatment or both.

The American Stroke Association (ASA) has identified primordial and primary prevention of modifiable risk factors as an essential component in a stroke system of care. Primordial prevention refers to strategies designed to decrease the development of disease risk factors for the entire population, not just people at risk for stroke, e.g., efforts to decrease obesity, increase physical activity and encourage a well-balanced diet.[4] Primary prevention refers to the treatment of established disease risk factors e.g., management of hypertention.[4] Individuals and providers need to know the risk factors for stroke and have the skills, tools and resources to promote behavioral and systems improvements directed toward primordial and primary prevention of stroke risk factors, and secondary prevention strategies to reduce the risk of recurrent stroke or other cardiovascular events.

Prevalence of Risk Factors for Stroke

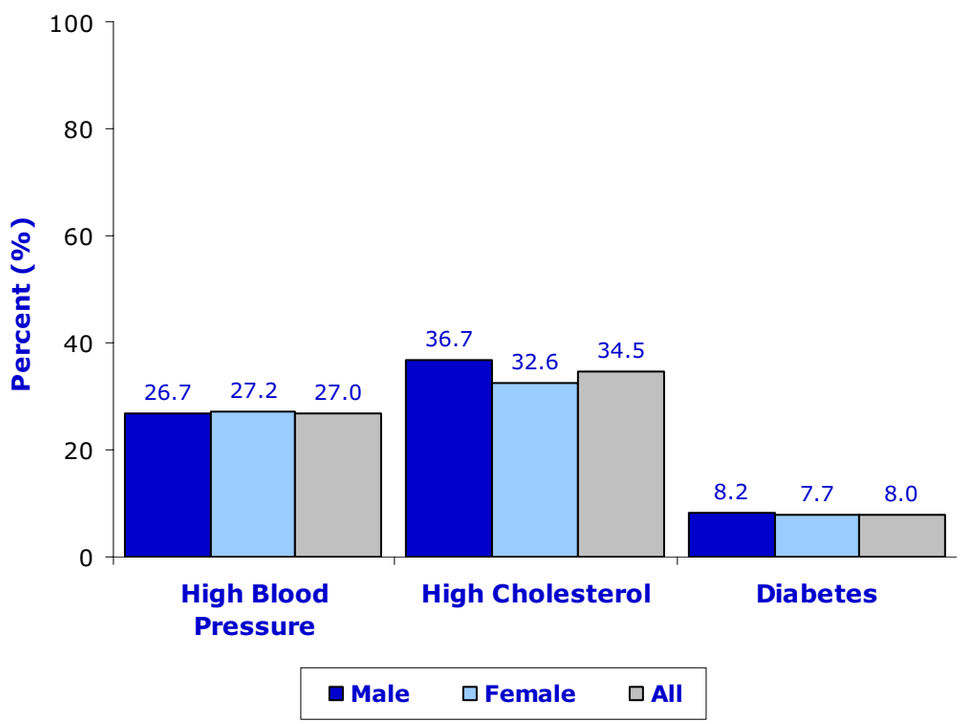
The Behavioral Risk Factor Surveillance System (BRFSS) collects population-based, statewide health data on Ohioans 18 years of age and older. The BRFSS data presented in this section describe the prevalence of selected modifiable stroke risk factors and some of the actions Ohioans are taking to reduce their risk of stroke.

Risk factors for stroke that can be prevented, treated or controlled include high blood pressure, elevated blood cholesterol and diabetes. High blood pressure, defined as systolic pressure of 140 mm Hg or greater, or diastolic pressure of 90 mm Hg or greater, is the most important risk factor for stroke. It usually has no specific symptoms and no early warning signs.[2] Among Ohio BRFSS respondents, the self-reported prevalence of high blood pressure was 27 percent. Females had a slightly higher prevalence of high blood pressure (27.2 percent) compared to males (26.7 percent) (Figure 1-1, Appendix B-1).

High blood cholesterol, defined as 240 mg/dl or higher, contributes to atherosclerosis, the buildup of plaque in arteries that may lead to stroke. More than one-third of BRFSS respondents reported being told by a doctor or health professional that their blood cholesterol level is high. Males had a slightly higher prevalence of elevated cholesterol (36.7 percent) compared to females (32.6 percent) (Figure 1-1, Appendix B-1).

Diabetes is defined as a fasting plasma glucose level of 126 mg/dl or higher. Diabetes is controllable, but having it increases the risk for stroke by two to four times.[1] Many people with diabetes also have high blood pressure, high blood cholesterol and are overweight which increases stroke risk even more. Among Ohio adults, 8.2 percent of males and 7.7 percent of females have been diagnosed with diabetes (Figure 1-1, Appendix B-1).

Figure 1-1. Prevalence of Established Disease Risk Factors for Stroke, Ohio 2001 and 2003-2004.[1,2,3,4]



Source: Ohio Behavioral Risk Factor Surveillance System, Chronic Disease and Behavioral Epidemiology Section BHSIOS-Prevention, Ohio Department of Health.
[1]The weighted percentage was adjusted to: 1) probability of selection, i.e. the number of different phone numbers that reached the household, the number of adults in each household and the number of completed interviews in each cluster; 2) demographic distribution, i.e. age, sex and race.
[2] "Don't know/Not sure" and "Refused" were excluded from the denominator.
[3]High Blood Pressure prevalence does not include women who were told they had high blood pressure only while pregnant for 2003-2004 data.
[4]For adults 18 years and older.

*The Burden of **Stroke** in Ohio*

Behavioral risk factors that increase the risk for stroke include smoking, obesity, physical inactivity and low fruit and vegetable consumption. These risk factors can be managed with lifestyle modifications.

Smoking is one of the most preventable risk factors for stroke and greatly elevates the risk of stroke. People who smoke have almost double the risk of stroke compared to nonsmokers.[1] Despite public awareness of the dangers of smoking, more than 26 percent of Ohio adults currently smoke. Smoking prevalence is higher for males (27.7 percent) than females (24.9 percent) (Figure 1-2, Appendix B-2).

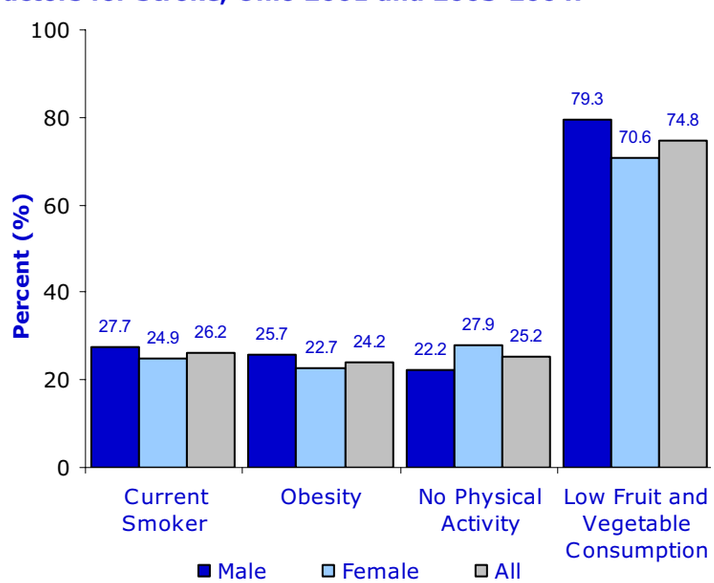
Obesity, defined as a Body Mass Index ≥30, increases the risk for diabetes, high blood pressure and high cholesterol, all of which greatly increase stroke risk. Almost one-quarter of Ohio adults are considered obese. More males (25.7 percent) than females (22.7 percent) were classified as obese (Figure 1-2, Appendix B-2).

More than 25 percent of adults reported not participating in any physical activity outside of work. More females (27.9 percent) than males (22.2 percent) reported that they engaged in no leisure-time physical activity during the past month (Figure 1-2, Appendix B-2). Moderate-intensity physical activity such as brisk walking for 30 minutes a day can reduce the risk of stroke.[1]

Almost 80 percent of males and slightly more than 70 percent of females reported eating fewer than the minimum recommended five servings of fruits and vegetables daily. A diet high in fruits and vegetables is an important lifestyle intervention that can prevent or reduce high blood pressure (Figure 1-2, Appendix B-2).

General prevention efforts that target smoking cessation, obesity, physical inactivity and increasing fruit and vegetable consumption can benefit the entire population and will reduce risk not only for stroke, but also for heart disease and other chronic diseases.[4]

Figure 1-2. Prevalence of Modifiable Behavioral Risk Factors for Stroke, Ohio 2001 and 2003-2004.[1,2,3,4,5,6,7,8]

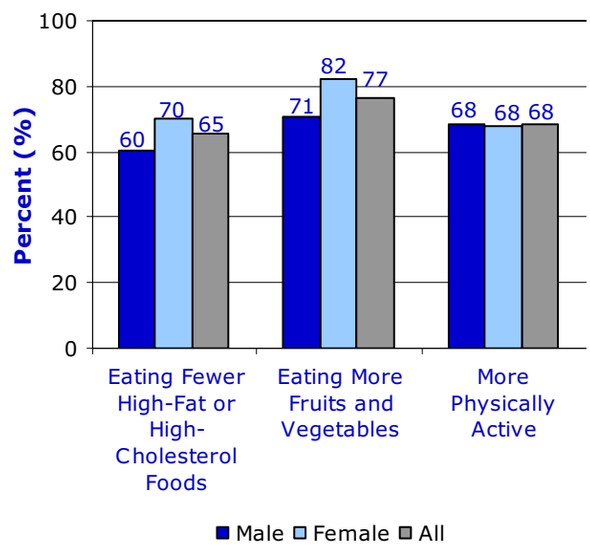


Source: Ohio Behavioral Risk Factor Surveillance System, Chronic Disease and Behavioral Epidemiology Section BHSIOS-Prevention, Ohio Department of Health.
[1]The weighted percentage was adjusted to: 1) probability of selection, i.e. the number of different phone numbers that reached the household, the number of adults in each household and the number of completed interviews in each cluster; 2) demographic distribution, i.e. age, sex and race.
[2] "Don't know/Not sure" and "Refused" were excluded from the denominator.
[3]Current Smoker was defined as someone who smoked at least 100 cigarettes in their lifetime and now smokes every day or some days.
[4]Obesity was defined as BMI≥30.
[5]Physical Inactivity is defined as no leisure time physical activity or exercise in the last 30 days.
[6]Low Fruit and Vegetable Consumption is defined as consuming less than five servings of fruits or vegetables a day.
[7]Low Fruit and Vegetable Consumption prevalence only includes data from 2001 and 2003.
[8]For adults 18 years and older.

Primary Prevention of Stroke

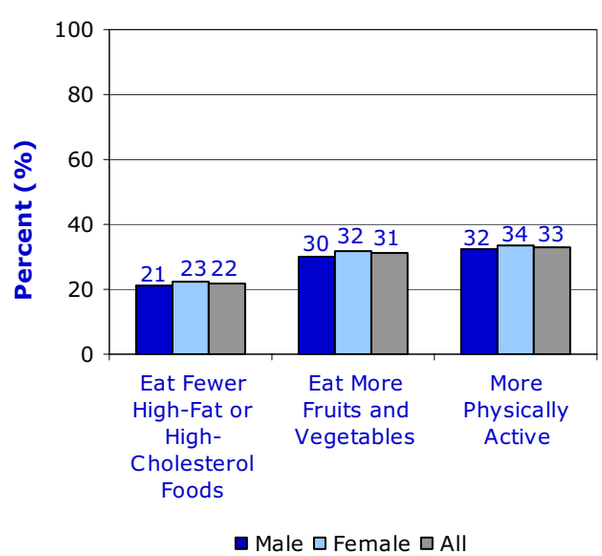
According to the BRFSS, many adults are attempting to lower their risk for stroke and heart disease by improving their health behaviors. More than 65 percent of adults report that they are choosing to eat fewer high-fat and high-cholesterol foods. More women (70 percent) than men (60 percent) report this behavior. Nearly 77 percent of adults are eating more fruits and vegetables. More women (82 percent) compared to men (71 percent) report this behavior. Sixty-eight percent of both males and females participated in more physical activity as an effort to lower their risk of developing heart disease and stroke (Figure 1-3, Appendix B-3).

Figure 1-3. Percentage of Adults Attempting to Lower Their Risk of Heart Disease and Stroke with Diet and Physical Activity, Ohio 2001 and 2003-2004.[1,2,3]



Twenty-one percent of adults have been advised by their doctor to eat fewer high-fat and high-cholesterol foods, while only 31 percent have been advised by their doctor to eat more fruits and vegetables. Thirty–three percent have been advised to become more physically active as a method to lower their risk of both heart disease and stroke (Figure 1-4, Appendix B-4). The percentage of males and females advised by a doctor to modify these behaviors differed only slightly.

Figure 1-4. Percentage of Adults Advised by a Doctor to Attempt to Lower Their Risk of Heart Disease and Stroke with Diet and Physical Activity, Ohio 2001 and 2003-2004.[1,2,3]



Source: Ohio Behavioral Risk Factor Surveillance System, Chronic Disease and Behavioral Epidemiology Section BHSIOS-Prevention; Ohio Department of Health.

[1]The weighted percentage was adjusted to: 1) probability of selection, i.e. the number of different phone numbers that reached the household, the number of adults in each household and the number of completed interviews in each cluster; 2) demographic distribution, i.e. age, sex and race.

[2]"Don't know/Not sure" and "Refused" were excluded from the denominator.

[3]For adults 18 years and older.

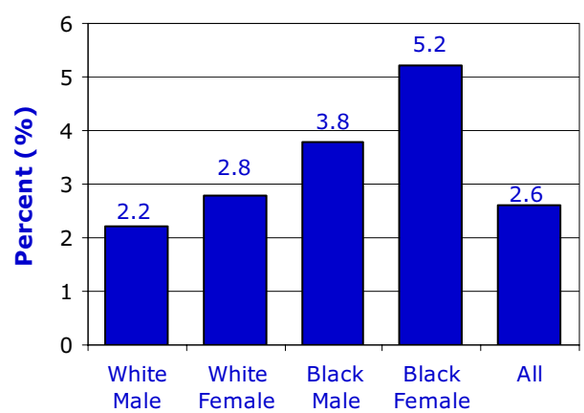
Prevalence of Stroke

The BRFSS provides an estimate of the prevalence of stroke among Ohio adults. However, because BRFSS data are collected through a cross-sectional telephone survey, institutionalized persons and persons not able to answer questions because of stroke-related disability are not included. This may underestimate the true prevalence of stroke in Ohio.[5]

Prevalence of Stroke by Race and Gender

In Ohio, 2.6 percent, an estimated 224,000 adults, report that they have been told by a doctor, nurse or other health care provider that they had a stroke. Black females have the highest prevalence of stroke, followed by black males (Figure 1-5, Appendix B-5).

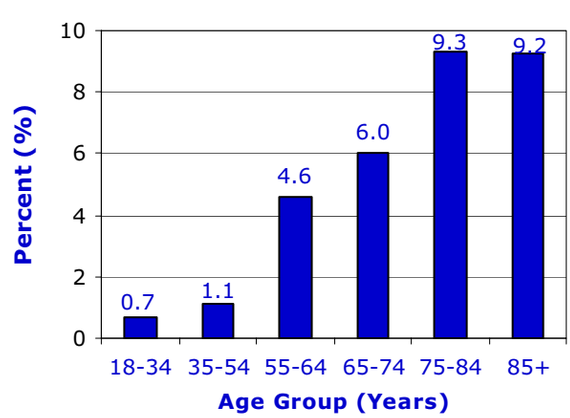
Figure 1-5. Prevalence of Stroke by Race and Gender, Ohio 2001 and 2003-2004.[1,2,3]



Prevalence of Stroke by Age

The prevalence of stroke increased with increasing age. Persons aged 75-84 years report the highest prevalence of stroke, with 9.3 percent reporting they were told by a health professional that they had a stroke (Figure 1-6, Appendix B-6).

Figure 1-6. Prevalence of Stroke by Age Group, Ohio 2001 and 2003-2004.[1,2,3]



Source: Ohio Behavioral Risk Factor Surveillance System, Chronic Disease and Behavioral Epidemiology Section BHSIOS-Prevention, Ohio Department of Health.

[1]The weighted percentage was adjusted to: 1) probability of selection, i.e. the number of different phone numbers that reached the household, the number of adults in each household and the number of completed interviews in each cluster; 2) demographic distribution, i.e. age, sex and race.

[2]"Don't know/Not sure" and "Refused" were excluded from the denominator.

[3]For adults 18 years and older.

Rehabilitation for Stroke

After a stroke, 15 to 30 percent of survivors are permanently disabled and 20 percent require institutional care three months after onset.[1] Approximately two-thirds of stroke survivors require rehabilitation and the intensity of this therapy often is a critical determinant in recovery. The goals of rehabilitation are to help survivors become as independent as possible, attain the best possible quality of life and prevent recurrent stroke or other vascular events. Stroke rehabilitation programs are intended to maximize neurological recovery, teach compensatory strategies for residual deficits, teach activities of daily living and skills for community living and provide psychosocial and medical intervention to manage depression.[6]

The types and degree of disability after stroke depend on the area of the brain that is damaged. Stroke can generally cause five types of disability: paralysis or problems controlling movement; sensory disturbances including pain; problems using or understanding language; problems with thinking and memory; and emotional disturbances related to the psychological trauma of stroke or the physical effects of brain damage.[7] Post-stroke rehabilitation should involve physicians; rehabilitation nurses; physical, occupational, recreational, speech-language and vocational therapists; and mental health professionals. The six focus areas for post-stroke rehabilitation include:

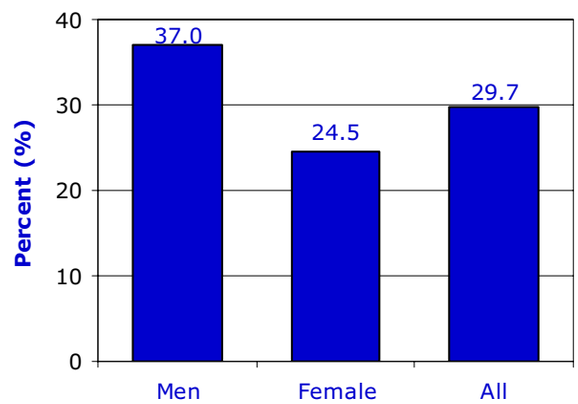
- Training for maximum recovery.
- Preventing and treating co-morbid conditions.
- Enhancing psychosocial coping.
- Promoting integration into the community.
- Preventing recurring strokes and other vascular events.
- Enhancing quality of life.[8]

All stroke patients should receive a standardized screening evaluation while hospitalized to identify those individuals in need of rehabilitation.[4] Current recommendations emphasize rehabilitation should begin as soon as possible after a stroke once the patient is medically stable. Early rehabilitation therapy improves functional outcomes, particularly for patients with lesser degrees of impairment.[6] Stroke patients should be referred to a facility that most closely addresses their medical and functional needs. Patients discharged from the hospital or other facilities to home need appropriate follow-up, including education and training for the recovering individual and family members as well as referral to primary care providers.

Data on adult stroke survivors who responded to the BRFSS indicate participation in outpatient rehabilitation is relatively low. Stroke survivors also reported mental, physical or emotional problems that limited routine activities.

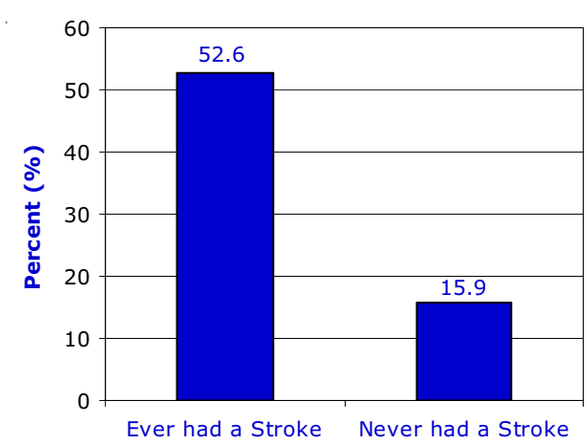
Of the adults surveyed who reported they had a stroke, 29.7 percent said they received outpatient rehabilitation. More men (37 percent) than women (24.5 percent) reported receiving rehabilitation therapy after being discharged from the hospital (Figure 1-7, Appendix B-7).

Figure 1-7. Percentage of Adults Who Received Post-stroke Outpatient Rehabilitation, by Gender, Ohio 2001 and 2003-2004.[1,2,3,4]



Source: Ohio Behavioral Risk Factor Surveillance System, Chronic Disease and Behavioral Epidemiology Section BHSIOS--Prevention, Ohio Department of Health.
[1]The weighted percentage was adjusted to: 1) probability of selection, i.e. the number of different phone numbers that reached the household, the number of adults in each household and the number of completed interviews in each cluster; 2) demographic distribution, i.e. age, sex and race.
[2]"Don't know/Not sure" and "Refused" were excluded from the denominator.
[3]For adults 18 years and older.
[4]Respondents reported being told by a doctor, nurse or other health care professional that they had a stroke.

Figure 1-8. Percentage of Adults Reporting Any Limitation in Activities Caused by Physical, Mental, or Emotional Problems, by



Source: Ohio Behavioral Risk Factor Surveillance System, Chronic Disease and Behavioral Epidemiology Section BHSIOS-Prevention, Ohio Department of Health.
[1]The weighted percentage was adjusted to: 1) probability of selection, i.e. the number of different phone numbers that reached the household, the number of adults in each household and the number of completed interviews in each cluster; 2) demographic distribution, i.e. age, sex and race.
[2]"Don't know/Not sure" and "Refused" were excluded from the denominator.
[3]For adults 18 years and older.
[4]Ever had a stroke was defined as: Respondents reported being told by a doctor, nurse or other health care professional that they had a stroke.

The long-term effects of stroke can be profound. Stroke survivors are often left with permanent impairments that limit performing activities of daily living such as dressing and preparing meals. Physical conditions such as partial paralysis, vision loss, memory loss and emotional problems such as depression or mood disturbances can reduce quality of life and increase the need for support care.

Nearly 53 percent of Ohio adults who had a stroke reported limitations in their activities because of physical, mental or emotional problems; compared to 15.9 percent of adults who never suffered a stroke (Figure 1-8, Appendix B-8).

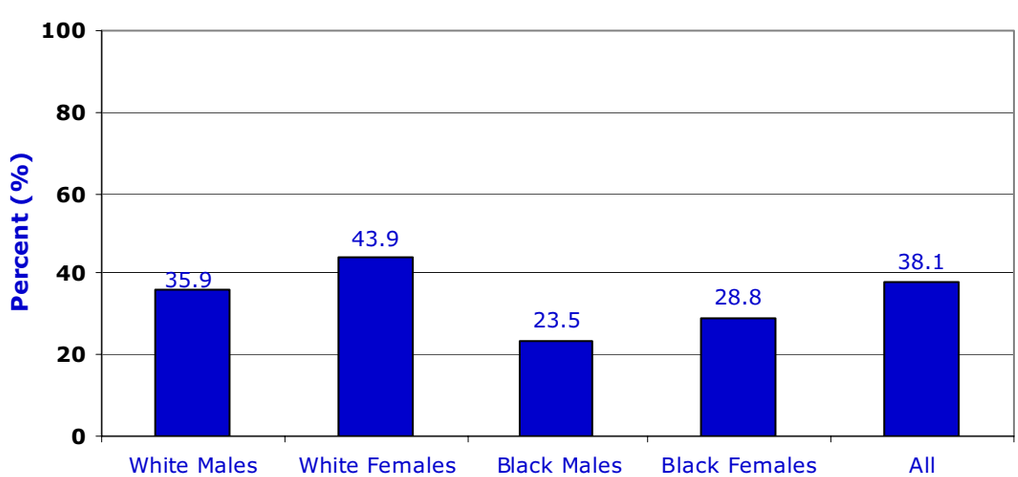
Stroke Symptom Awareness

Improving recognition of the warning signs of stroke and the need to call 911 quickly are vital components of a stroke system of care. Early and rapid medical intervention improves the outcome of stroke.[4] Widespread community education campaigns to increase knowledge about the warning signs of stroke for high-risk patients, their families and bystanders are necessary to improve the quality of stroke care. The warning signs of stroke include:

- Sudden numbness or weakness of the face, arms or legs.
- Sudden confusion or trouble speaking or understanding others.
- Sudden trouble seeing in one or both eyes.
- Sudden trouble walking, dizziness or loss of balance or coordination.
- Sudden severe headache with no known cause.

Stroke signs vary among individuals and are dependent on the part of the brain that is affected. Improving the public's awareness of warning signs of stroke may increase the appropriate reaction of calling the 911 emergency response number. Early presentation at a hospital increases the proportion of patients eligible for stroke treatments administered soon after onset of symptoms.[4] However, many adults do not know all five symptoms of stroke and the importance of calling 911 when someone is having a stroke or heart attack. Black males (23.5 percent) and black females (28.8 percent) were least likely to recognize all five symptoms of stroke and to call 911 as the first response. White females (43.9 percent) were most likely to recognize all five symptoms and call 911 (Figure 1-9, Appendix B-9). Overall, only 38.1 percent of all adults could recognize all five symptoms of stroke and the need to call 911 as the first response to someone having a stroke or heart attack.

Figure 1-9. Percentage of Adults Who Recognized All Five Symptoms of Stroke and to Call 911 as the First Response to Someone Having a Stroke or Heart Attack by Race and Gender, Ohio 2001 and 2003-2004.[1,2,3]



Source: Ohio Behavioral Risk Factor Surveillance System, Chronic Disease and Behavioral Epidemiology Section BHSIOS-Prevention, Ohio Department of Health.
[1]The weighted percentage was adjusted to: 1) probability of selection, i.e. the number of different phone numbers that reached the household, the number of adults in each household and the number of completed interviews in each cluster; 2) demographic distribution, i.e. age, sex and race.
[2]"Refused" were excluded from the denominator.
[3] For adults 18 years and older.

Figure 1-10. Percentage of Adults Who Recognized Sudden Numbness or Weakness of Face, Arm or Leg (Especially One Side) as a Symptom of Stroke by Race and Gender, Ohio 2001 and 2003-2004.[1,2,3]

Nearly 94 percent of adults recognized that sudden numbness or weakness of the face, arm or leg (especially on one side) was a symptom of stroke. However, differences between race and gender existed, with black males (85.8 percent) least likely to recognize this symptom (Figure 1-10, Appendix B-10).

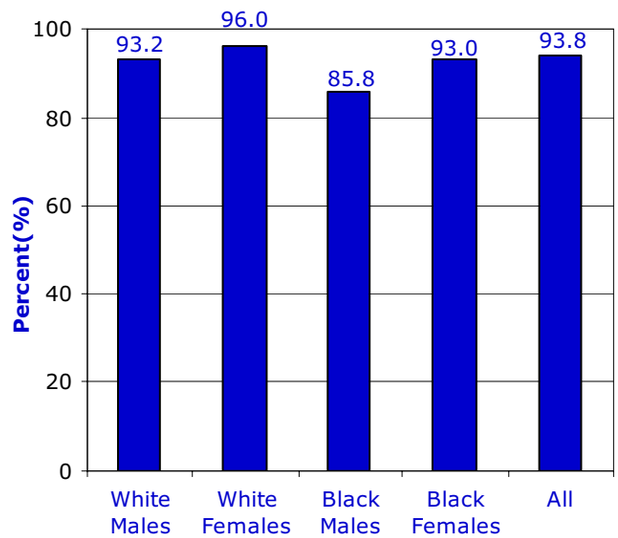
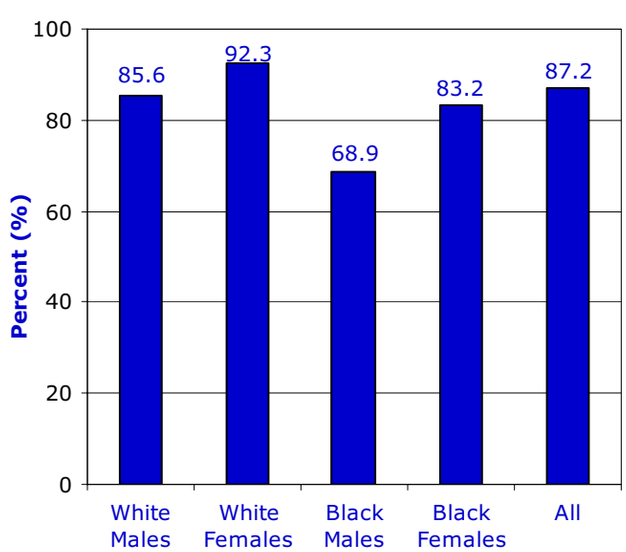


Figure 1-11. Percentage of Adults Who Recognized Sudden Confusion or Trouble Speaking as a Symptom of Stroke by Race and Gender, Ohio 2001 and 2003-2004.[1,2,3]

More than 87 percent of adults recognized that sudden confusion or trouble speaking was a symptom of stroke. However, differences again existed between race and gender, with black males (68.9 percent) least likely and white females (92.3) most likely to recognize this symptom (Figure 1-11, Appendix B-11).



Source: Ohio Behavioral Risk Factor Surveillance System, Chronic Disease and Behavioral Epidemiology Section BHSIOS-Prevention, Ohio Department of Health.

[1]The weighted percentage was adjusted to: 1) probability of selection, i.e. the number of different phone numbers that reached the household, the number of adults in each household and the number of completed interviews in each cluster; 2) demographic distribution, i.e. age, sex and race.

[2]"Refused" were excluded from the denominator.

[3] For adults 18 years and older.

Figure 1-12. Percentage of Adults Who Recognized Sudden Trouble Walking, Dizziness or Loss of Balance as a Symptom of Stroke by Race and Gender, Ohio 2001 and 2003-2004.[1,2,3]

Eighty-four percent of adults recognized that sudden trouble walking, dizziness or loss of balance was a symptom of stroke. White females were most likely and black males were least likely to recognize this symptom. (Figure 1-12, Appendix B-12).

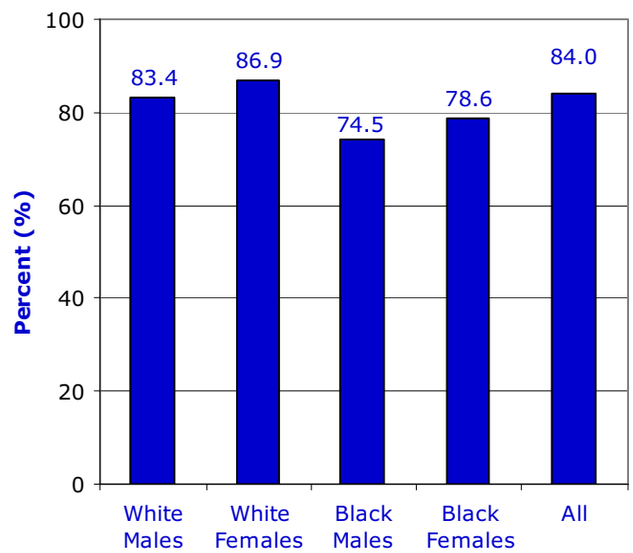
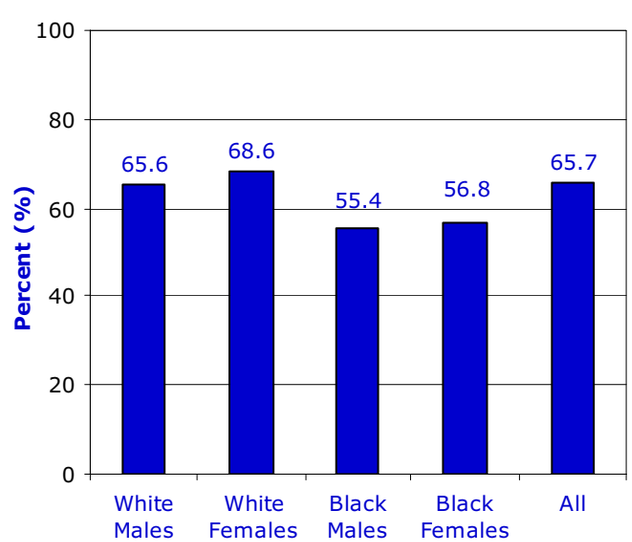


Figure 1-13. Percentage of Adults Who Recognized Sudden Trouble Seeing in One or Both Eyes as a Symptom of Stroke by Race and Gender, Ohio 2001 and 2003-2004.[1,2,3]

Nearly 66 percent of adults recognized that sudden trouble seeing in one or both eyes was a symptom of stroke. Black males and black females were least likely to recognize this symptom; white females and white males were more likely (Figure 1-13, Appendix B-13).



Source: Ohio Behavioral Risk Factor Surveillance System, Chronic Disease and Behavioral Epidemiology Section BHSIOS-Prevention, Ohio Department of Health.

[1]The weighted percentage was adjusted to: 1) probability of selection, i.e. the number of different phone numbers that reached the household, the number of adults in each household and the number of completed interviews in each cluster; 2) demographic distribution, i.e. age, sex and race.

[2]"Refused" were excluded from the denominator.

[3] For adults 18 years and older.

Figure 1-14. Percentage of Adults Who Recognized Severe Headache with Unknown Cause as a Symptom of Stroke by Race and Gender, Ohio 2001 and 2003-2004.[1,2,3]

A severe headache with unknown cause was the least recognized symptom of stroke. Only 57.3 percent of adults recognized this as a symptom of stroke. Black males did not recognize this symptom as often as white males, white females or black females (Figure 1-14, Appendix B-14).

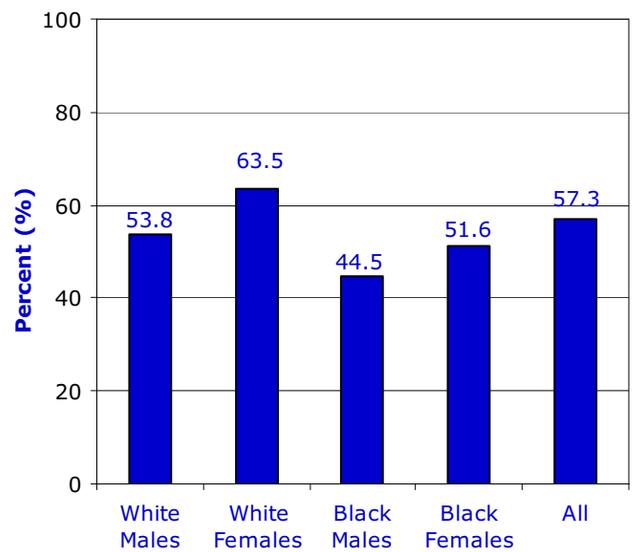
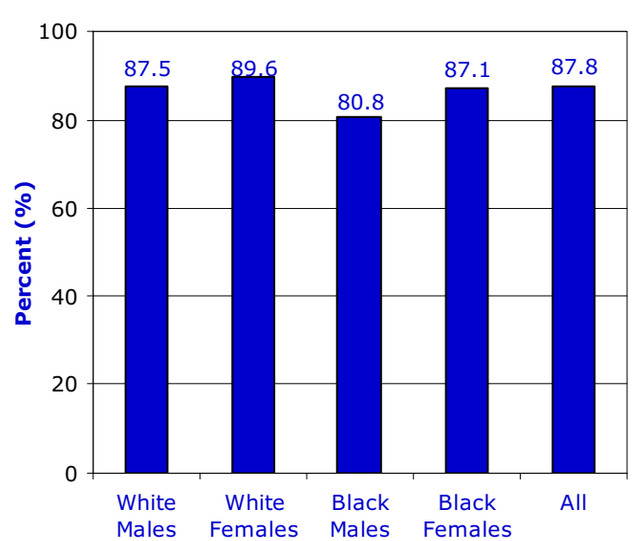


Figure 1-15. Percentage of Adults Who Recognized Calling 911 as the First Response to Someone Having a Stroke or Heart Attack by Race and Gender, Ohio 2001 and 2003-2004.[1,2,3]

Calling 911 is an important part of the response to someone having a stroke or heart attack. Advancements in the treatment of acute stroke can improve outcomes. However, many of these treatments are dependent on time. The sooner a person is transported to a hospital, the greater the opportunity for rapid assessment and treatment. Nearly 88 percent of adults identified calling 911 as the first response to stroke or heart attack. Black males were least likely to identify this response compared to all others (Figure 1-15, Appendix B-15).



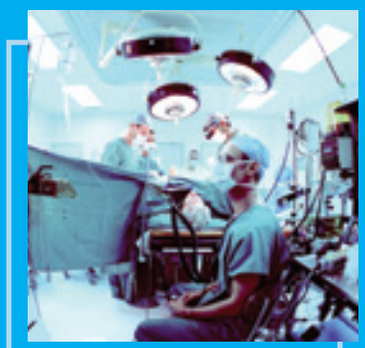
Source: Ohio Behavioral Risk Factor Surveillance System, Chronic Disease and Behavioral Epidemiology Section BHSIOS-Prevention, Ohio Department of Health.
[1]The weighted percentage was adjusted to: 1) probability of selection, i.e. the number of different phone numbers that reached the household, the number of adults in each household and the number of completed interviews in each cluster; 2) demographic distribution, i.e. age, sex and race.
[2]"Refused" were excluded from the denominator.
[3] For adults 18 years and older.

These data indicate that public awareness of most of the major symptoms of stroke is relatively high. Recognition is lower for certain stroke symptoms compared to others. There is also variation among racial-gender groups. However, less than half the population recognized all five symptoms of stroke and the response of calling 911 to someone having a stroke or heart attack. The findings in this report are subject to at least three limitations. First, BRFSS data are based on self reports and are subject to social desirability and recall biases. Second, using closed-ended questions with fixed responses resulted in higher estimates of stroke-sign recognition than using open-ended questions in which a respondent provides an answer but no choices are available to prompt the respondent; therefore, these estimates for individual signs probably overestimate the true prevalence of awareness. Finally, BRFSS excludes households without telephones.[9]

Emergency Medical Services

CHAPTER 2

Ohio Stroke Survivor Story



On January 9, 1999, I suffered a stroke. I had fallen asleep on the sofa while watching television. My wife, who had gone to bed, came downstairs about 3 a.m. I noticed I could not read, and told her so. She questioned what I meant. She thought perhaps I meant I needed my glasses, or I needed more light, or the lettering was too small. But, I knew I could not read or comprehend the words. Later that morning, my words became very confused and the logical thought processes were not there. The sequence of the letters of the words and the sequence of words in a sentence became jumbled.

We went to the hospital, where I received what I consider to be the best of care. They ran countless tests and my doctors all tended to my care. I had experienced a blockage in a small artery of the left parietal lobe of my cerebrum. My blood pressure had been around 200/95 and cholesterol was about 250.

The speech therapist called to schedule ongoing treatment. Since I had not experienced any paralysis, numbness, or problems with the actual production of sounds, I doubted that we needed her services. However, my wife and I later learned that speech therapy includes language therapy, which deals with language disorders and difficulty understanding or putting words together to communicate ideas. I had speech therapy for about 6 months. It is hard to believe how excited we were when I was actually able to add small numbers or complete short sentences. Progress continued at a rapid pace.

Now, with medication, diet and exercise, I have lost weight; my blood pressure is about 120/80 and cholesterol is just under 200.

Since my stroke, I have earned my Master of Arts Degree in Education and am currently working on my Master of Science Degree in Microbiology. I am currently a Lecturer III at Washington State Community College teaching a full load of courses including lectures and labs in Introduction to Chemistry, Principles of Chemistry I and II, Introduction to Biology, Microbiology, Human Anatomy and Physiology, Pre-Algebra, Elementary Algebra, and Nutrition.

George Michael (Mike) Dodrill
Marietta, Ohio

The response of Ohio's Emergency Medical Services (EMS) is a crucial part of the treatment of stroke. EMS dispatchers play a critical role in recognizing stroke and determining the timing and the type of EMS response to a stroke. Recognition of stroke by EMS personnel is needed to guide both the transport of patients to the appropriate facilities and initiation of stroke-specific basic or advanced life support before the patient's arrival at the hospital.[4] Use of stroke education materials and validated stroke scales, such as the NIH Stroke Scale aid in the rapid identification and transport of stroke patients.[4]

Suspected Stroke Transports

Overall, there were 15,846 suspected stroke transports by Ohio's EMS in 2004. This accounted for 1.8 percent of all EMS emergency transports. The average time from the dispatch to the scene was 6.7 minutes. The average time from scene to the hospital was 12.4 minutes. The total average time from dispatch to hospital (including time at scene) was 34.2 minutes. Persons aged 75-84 had the greatest number of transports (4,497) (Table 2-1).

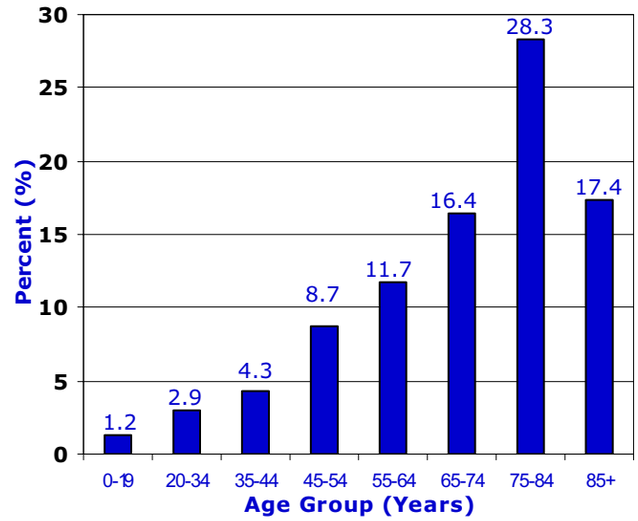
Table 2-1. Number of Suspected Stroke Transports, Total Number of Runs, Percent of Total Runs, Average Time to Scene, Average Time Scene to Hospital and Average Total Time by Age Group, Ohio 2004.

Age Group	Number of Suspected Stroke Transports	Total Number of runs	Percentage of Total Runs	Average Time Dispatch to Scene (minutes)	Average Time Scene to Hospital (minutes)	Average Total Time from Dispatch to Hospital
0-19	197	97,407	0.2%	7.3	13.9	34.8
20-34	466	118,336	0.4%	6.4	12.4	31.7
35-44	676	87,111	0.8%	6.5	12.1	33.0
45-54	1,377	95,118	1.5%	6.5	12.4	33.5
55-64	1,852	80,482	2.3%	6.9	13.1	35.2
65-74	2,608	86,003	3.0%	6.9	12.7	34.9
75-84	4,497	118,919	3.8%	6.7	12.4	34.5
85+	2,761	71,351	3.9%	6.7	12.1	34.3
All*	15,864	870,562	1.8%	6.7	12.4	34.2

Source: Ohio EMS.
*All category includes transports in which age was not reported, therefore the totals may not add up.

Persons aged 75-84 accounted for the largest proportion of stroke transports (28.3 percent), followed by persons 85 years and older (17.4 percent). Persons aged 65-74 years old (16.4 percent) had the third-largest proportion of transports (Figure 2-1).

Figure 2-1. Percentage of Suspected Stroke Transports by Age Group, Ohio 2004.

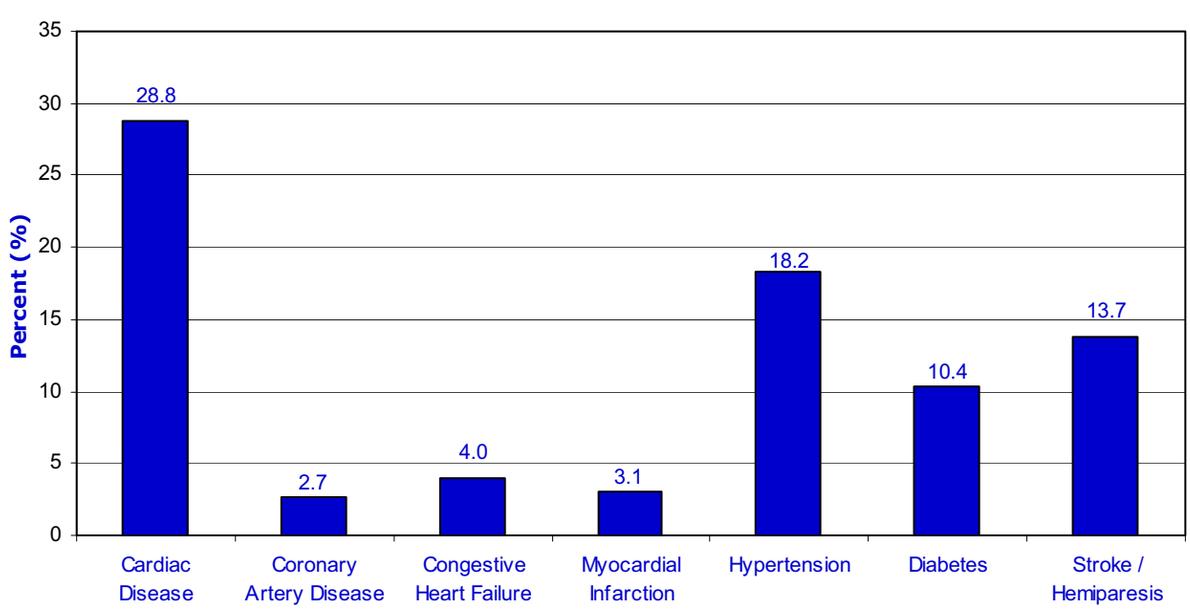


Source: Ohio EMS.

Pre-existing Conditions

Many persons transported for a suspected stroke had a history of pre-existing conditions. Nearly 29 percent of transports had cardiac disease documented as a pre-existing condition. More than 18 percent had hypertension, 13.7 percent had a prior stroke or hemiparesis and 10.4 percent had diabetes (Figure 2-2).

Figure 2-2. Percentage of Suspected Stroke Transports with Pre-existing Conditions, Ohio 2004.[1]



Source: Ohio EMS.
[1]Full medical history may not have been available on every patient.

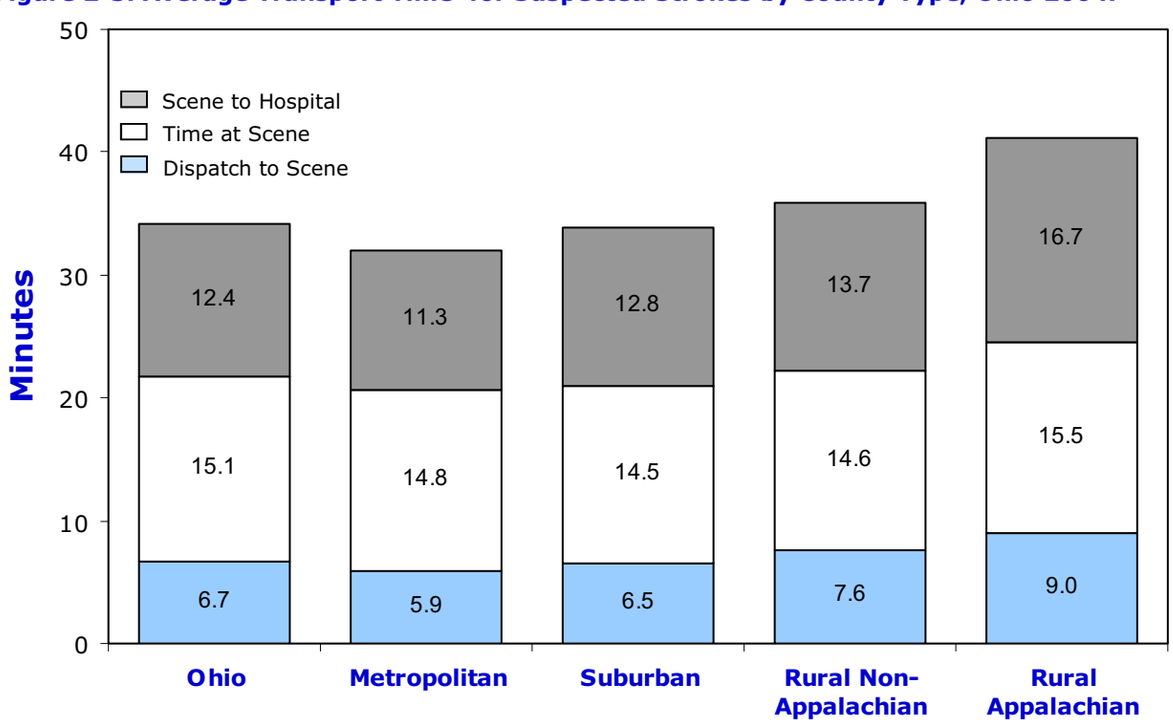
Average Transport Time for Suspected Strokes by County Type

The average EMS transport time for patients exhibiting stroke symptoms varied by the type of county throughout the state. Aggregation of Ohio's counties into Metropolitan, Suburban, Rural Non-Appalachian and Rural Appalachian indicated that the Metropolitan counties had the lowest average transport time of 32 minutes. This compared to Rural-Appalachian counties with the longest average transport time of 41.2 minutes. The average time from dispatch to scene and average time from scene to hospital also followed the same trend, with Metropolitan counties having the lowest times, followed by Suburban and Rural Non-Appalachian counties, respectively. Rural Appalachian counties had the greatest average transport time (Table 2-2, Figure 2-3).

Table 2-2. Average Transport Time[1] for Suspected Strokes by County Type, Ohio 2004.

County Type	Ohio	Metropolitan	Suburban	Rural Non-Appalachian	Rural Appalachian
Number of Transports[2]	15,864	7,905	2,761	1,883	1,845
Dispatch to Scene[1]	6.7	5.9	6.5	7.6	9.0
Time at Scene[1,3]	15.1	14.8	14.5	14.6	15.5
Scene to Hospital[1]	12.4	11.3	12.8	13.7	16.7
Dispatch to Hospital[1,3]	34.2	32.0	33.8	35.9	41.2

Figure 2-3. Average Transport Time[1] for Suspected Strokes by County Type, Ohio 2004.

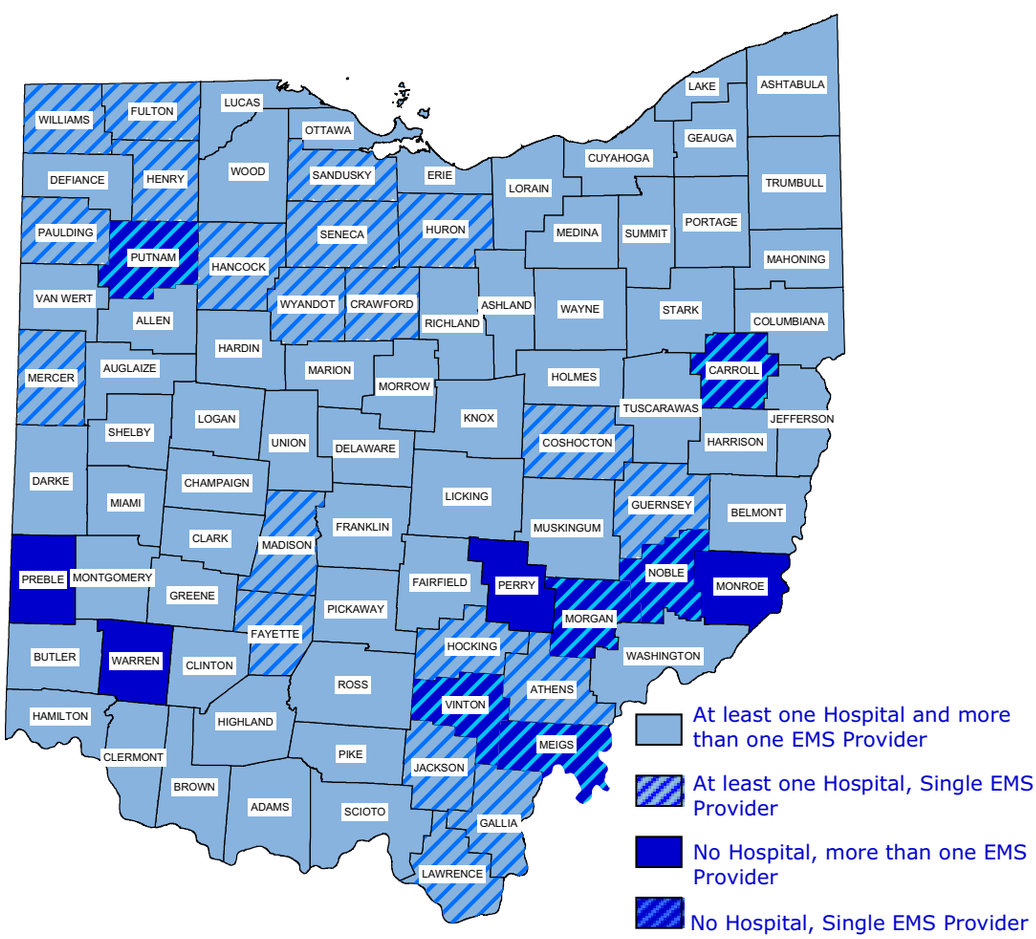


Source: Ohio EMS.
[1]Average Time in Minutes.

Average Transport Time for Suspected Strokes by Availability of Hospital and EMS Service

Differences in resources related to EMS and hospital availability have a notable impact on how quickly stroke patients arrive at a hospital and receive appropriate diagnostic tests and treatments. Of Ohio's 88 counties, six have no hospitals and only one EMS provider (Figure 2-4). These counties had the longest average stroke transport times — 61.4 minutes (Figure 2-5). As the number of EMS providers and/or hospitals increased, stroke transport times decreased. The four counties with no hospitals and multiple EMS providers had average run times of 51.8 minutes; those with one hospital and one EMS provider had average transport times of 38.7 minutes (Figure 2-4). Counties with one hospital and multiple EMS providers had transport times of 33.1 minutes, 46 percent shorter than the four no-hospital/single-EMS provider counties (Figure 2-5).

Figure 2-4. Ohio Counties by Availability of EMS Providers and Hospitals, 2004.



Source:Ohio EMS, map created by Chronic Disease and Behavioral Epidemiology, Ohio Department of Health.

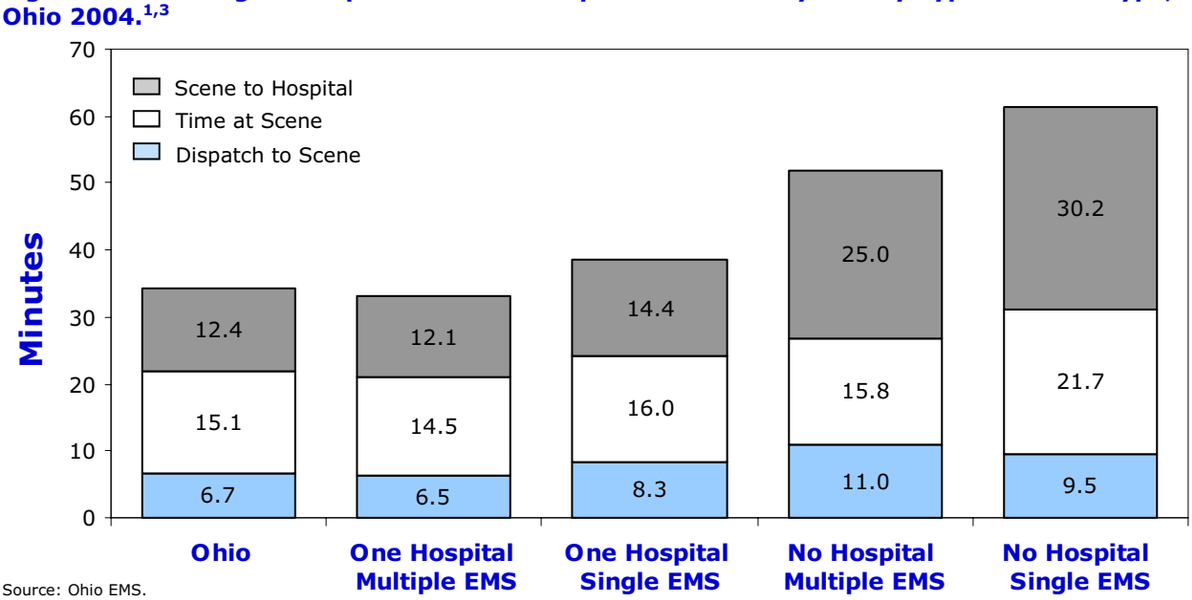
The longest average transport time from scene to hospital occurred in counties with no hospital and a single EMS provider. These counties had an average transport time from scene to hospital of 30.2 minutes compared to the 12.1 minutes for the counties with at least one hospital and multiple EMS providers (Table 2-3, Figure 2-5).

Transport time in counties with at least one hospital and more than one EMS provider were predictably shorter than in all other types of counties. At the other end of the continuum, counties with no hospital and a single EMS provider had the longest transport times. Recommendations for a stroke system of care suggest that each local or regional EMS determine goal response times for suspected stroke patients tailored to local resources and infrastructure. According to the American Stroke Association, "Stroke transport protocols should be based on providing the highest possible quality of clinical care and reducing transport times."[4]

Table 2-3. Average Transport Time[1] for Suspected Strokes by County Type and EMS Type, Ohio 2004.[1,2,3]

County Type	Ohio	One Hospital Multiple EMS Providers	One Hospital Single EMS Provider	No Hospital Multiple EMS Providers	No Hospital Single EMS Provider
Number of Transports[2]	15,864	12,934	1,096	283	81
Dispatch to Scene[1]	6.7	6.5	8.3	11.0	9.5
Time at Scene[1,3]	15.1	14.5	16.0	15.8	21.7
Scene to Hospital[1]	12.4	12.1	14.4	25.0	30.2
Dispatch to Hospital[1,3]	34.2	33.1	38.7	51.8	61.4

Figure 2-5. Average Transport Time[1] for Suspected Strokes by County Type and EMS Type, Ohio 2004.[1,3]

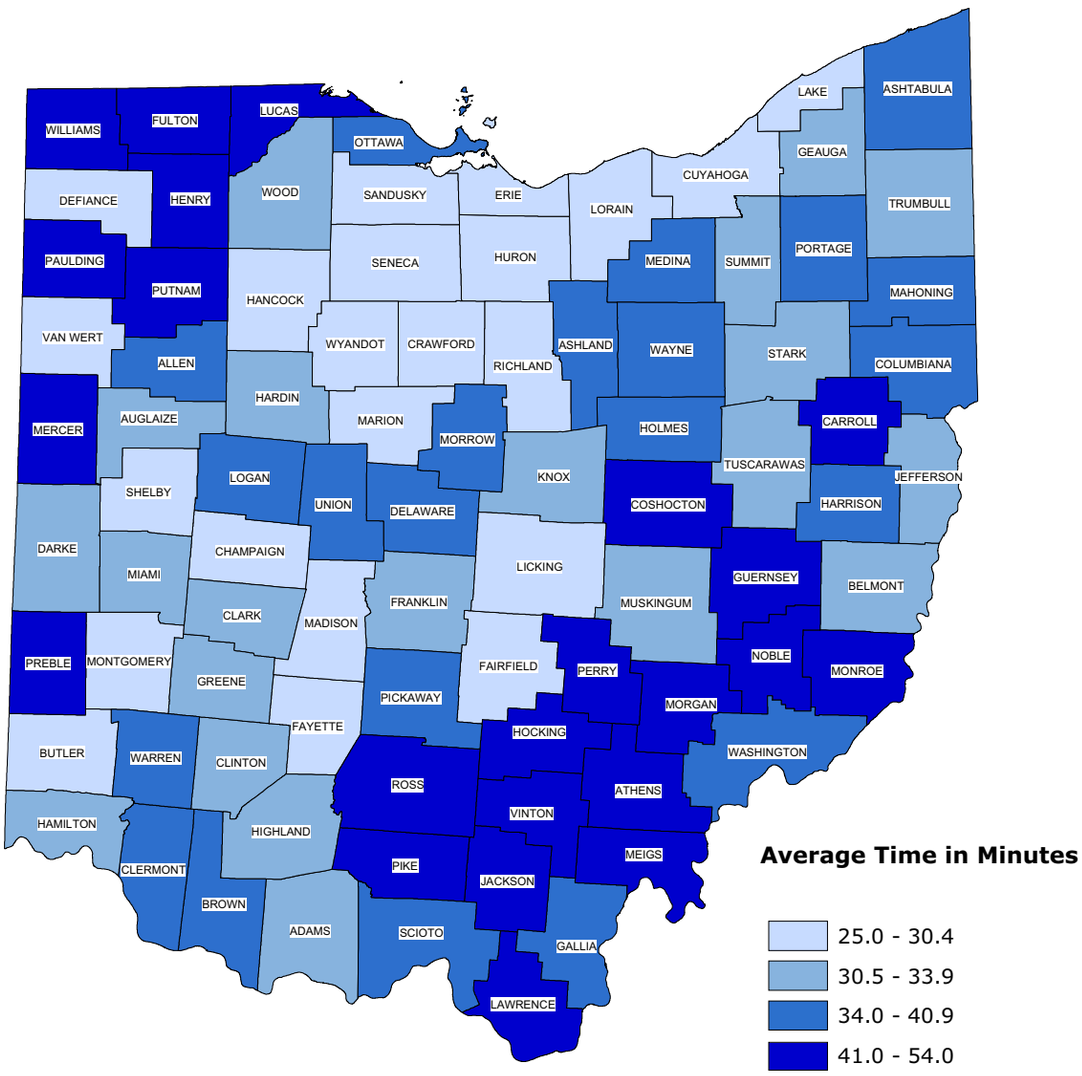


Source: Ohio EMS.
[1]Average Time in Minutes.
[2]Numbers may not add up due to unreported counties.
[3]Time at Scene was calculated by subtracting the sum of the Average Time of Dispatch to Scene and Average Time of Scene to Hospital from the Total Average Time (Dispatch to Hospital).

Transport Time for Suspected Strokes by County

The average transport time for patients with suspected stroke varied by individual county. The highest times clustered in Ohio's Appalachian counties and the counties in the northwest region of the state (Figure 2-6, Appendix C-1).

Figure 2-6. Average EMS Transport Time in Minutes for Patients with Suspected Stroke by County, Ohio 2004.[1,2,3,4,5]



Source:Ohio EMS.
[1]The following counties were grouped together for analysis: Athens, Hocking, Jackson, Lawrence, Meigs and Vinton.
[2]The following counties were grouped together for analysis: Carroll, Coshocton, Guernsey, Monroe, Morgan, Noble and Perry.
[3]The following counties were grouped together for analysis: Crawford, Hancock, Huron, Sandusky, Seneca and Wyandot.
[4]The following counties were grouped together for analysis: Fayette and Madison.
[5]The following counties were grouped together for analysis: Fulton, Henry, Mercer, Paulding, Putnam and Williams.
Note: The above counties were grouped together because there was only a single EMS provider in the respective county.

911 Availability in Ohio

The three-digit 9-1-1 telephone number has been designated as the Universal Emergency Number to request emergency assistance anywhere in the country. This number was chosen because it is brief, easily remembered and can be dialed quickly. Easy access to 911 allows prompt notification of EMS and increases the likelihood that a person suffering a stroke will be transported to a hospital as quickly as possible. In Ohio, 87 of the 88 counties have 911 service available. The type of service varies from county to county, from enhanced 911, which displays the caller's phone number and address to the dispatcher, to wireless 911, which displays the phone number and location of the cell phone used to place the call.[10]

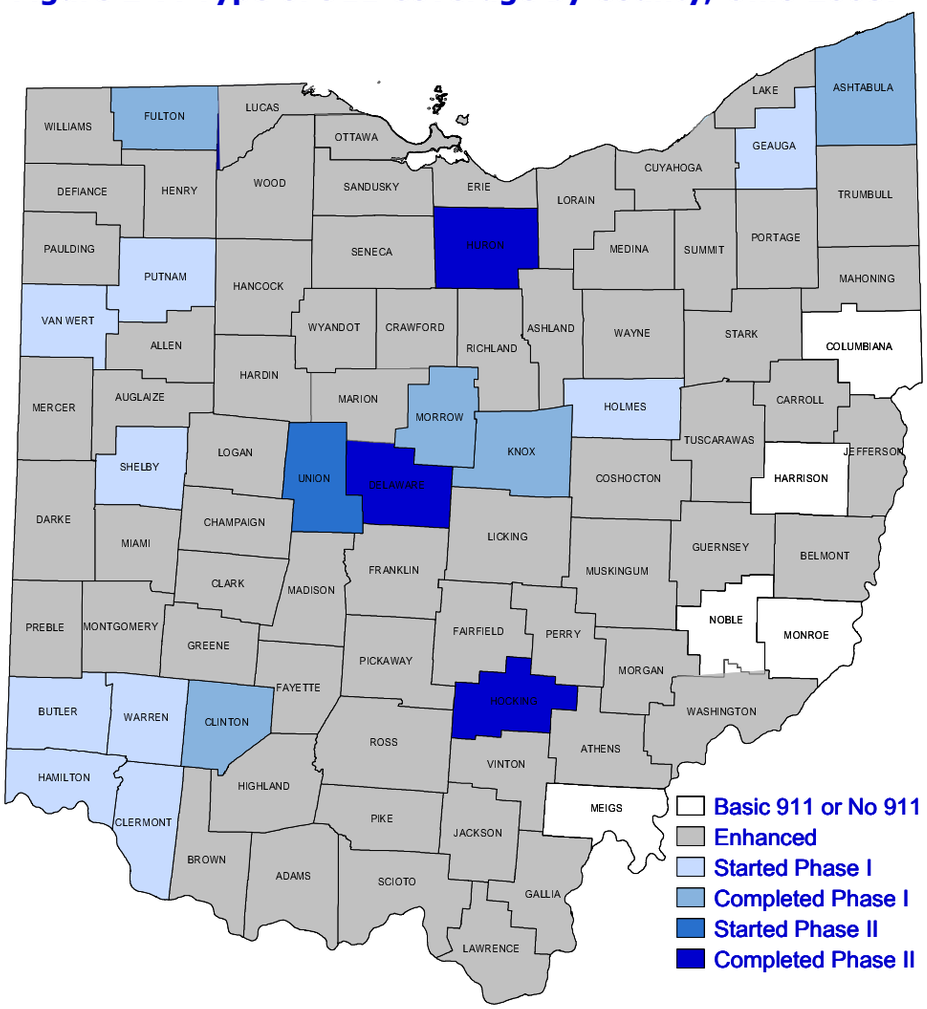
Table 2-4. Definitions of 911 Coverage Type	
Basic	Basic 9-1-1 means that when the three-digit number is dialed, a dispatcher in the local public safety answering point (PSAP) or 9-1-1 call center, answers the call. The emergency and its location are communicated by voice (or TTY) between the caller and the dispatcher.
Enhanced	In areas serviced by enhanced 9-1-1, the call is selectively routed to the proper PSAP for the caller's location and the PSAP has equipment and database information that display the caller's phone number and address to the call taker.
Wireless Phase I	Phase I allows the dispatcher to automatically receive the wireless phone number. This is important in the event the wireless phone call is dropped and it may allow PSAP employees to work with the wireless company to identify the wireless subscriber. Phase I also delivers the location of the cell tower handling the call. The call is routed to a PSAP based on cell site/sector information.
Wireless Phase II	Phase II allows call takers to receive both the caller's wireless phone number and their location information. The call is routed to a PSAP either based on cell site/sector information or on caller location information.

Source: National Emergency Number Association (NENA).

911 Availability by County

The majority of Ohio's Counties have enhanced 911 coverage. Only three counties, Huron, Delaware and Hocking, have implemented the wireless Phase II service. However, many counties are working to implement wireless Phase I and Phase II service.[11]

Figure 2-7. Type of 911 Coverage by County, Ohio 2005.



Source: National Emergency Number Association (NENA), map re-created by Chronic Disease and Behavioral Epidemiology, Ohio Department of Health.

Ohio Hospital Discharges

CHAPTER 3

Ohio Stroke Survivor Story

It was a Saturday morning in July 1997. Lillian V. Jones-Tubbs, a nurse at MetroHealth's Clement Center, thought about what to wear to work. Standing at her closet, one arm against the door frame, she surveyed her options. Suddenly, her left side went dead. Jones-Tubbs fell against the door frame. Recovering, she realized she couldn't move her left side.

Jones-Tubbs stayed on the floor about 10 minutes until the incident had passed. Slowly she regained the ability to wiggle her fingers and toes. Progressively the majority of the feeling came back. Within a half hour she was moving. She got dressed and went to work – something she also did the week that followed.

Some may say that as a nursing manager and staff nurse she should have known better. There had been warning signs, the most obvious a blood pressure reading of 200/110 six months earlier. Instead, like most of us, she went into denial.

"I stayed in my office that week," she says. "I knew but I didn't want to know. The weakness on my left side was unnoticeable so no one assumed anything was wrong."

Following a normal EKG, her doctor ordered an echocardiogram. While the first part showed no signs of irregularity, the answer appeared at the end. Air had been injected into an IV tube. And, as her doctor watched the air bubble's progress through her heart, he discovered a hole. Jones-Tubbs had no prior history of heart problems.

Now 58 years old and 20 pounds lighter, she remains on a low-cholesterol diet. She works as many as seven days a week as a family practice nurse at two jobs. "I should have known there was a problem when my blood pressure went up, and [I should have] watched my diet and weight," she says. "But the hole in my heart is a big mystery."

As a professional and stroke survivor, she offers a bit of advice. "We pay attention to our kids and don't pay much attention to ourselves. We need to be more cognizant of ourselves, health-wise," she says. "If there's a family history of hypertension, get checked out frequently. Watch your weight, diet and cholesterol. If you experience stroke symptoms, seek medical attention immediately by calling 911. Time lost is brain lost. Be proactive and learn as much as you can about the warning signs and risk factors of stroke."

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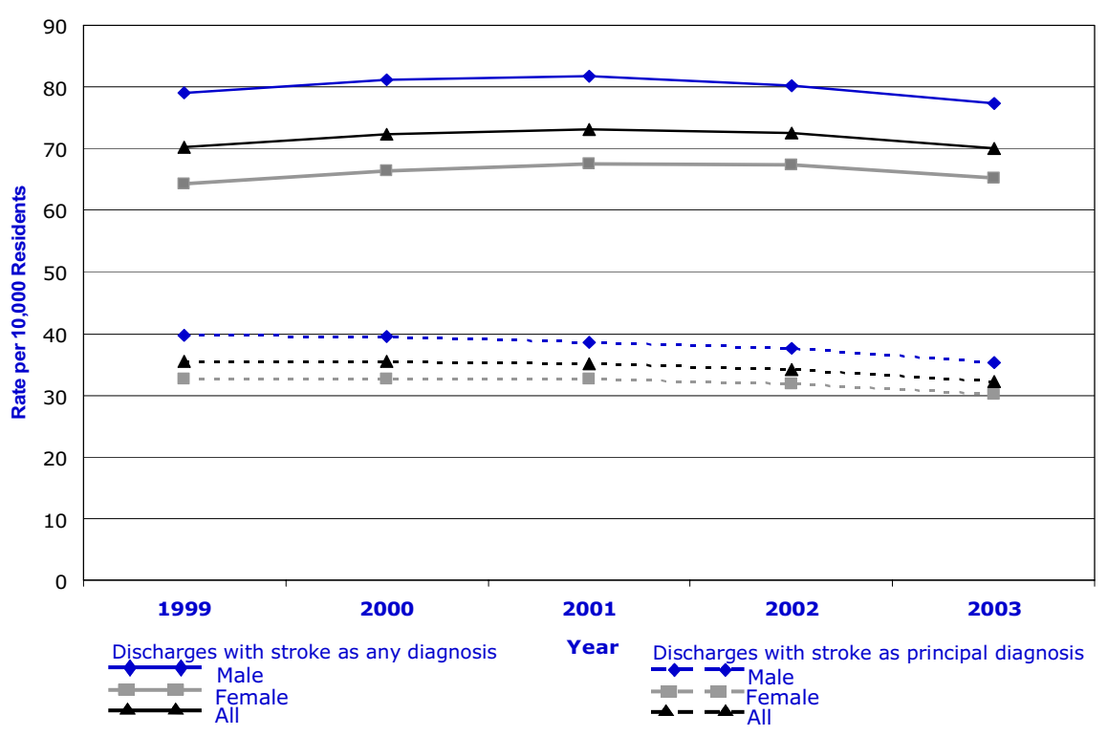
The hospital system is a key component of a stroke system of care. Hospitals are vital not only for immediate treatment of stroke, but also in the delivery of subacute care as well as secondary prevention activities. An effective stroke system of care provides focused and organized approaches during hospitalization by integrating acute, subacute and rehabilitative care coordinated and delivered by a multidisciplinary team specializing in the care of stroke patients. Disease management and medication adherence interventions such as carotid endarterectomy or anticoagulation therapy may be appropriate for selected patients. Early implementation of secondary prevention regimens for stroke is critical for maximizing patient outcomes and limiting disability.[4]

This chapter illustrates the burden that stroke has on the hospital system in Ohio. During 1999–2003, the number of hospital discharges with stroke listed as any diagnosis has increased from 82,163 to 85,815. The age-adjusted discharge rate has remained relatively constant (Figure 3-1, Table 3-1).

However, for hospital discharges with stroke listed as the principal diagnosis both the number of discharges and the age-adjusted rate decreased. Overall, the age-adjusted rate for discharges with stroke listed as the principal diagnosis decreased by 10 percent from 35.6 to 32.3 per 10,000 residents. The age-adjusted rate for hospital discharges for males with a principal diagnosis of stroke decreased by 11

Figure 3-1. Age-adjusted Rates for Hospital Discharges with Stroke[1] Listed as Any Diagnosis and for Hospital Discharges with Stroke[1] Listed as Principal Diagnosis by Gender, Ohio 1999-2003.



Source: Ohio Hospital Association. Analysis completed by the Chronic Disease and Behavioral Epidemiology Section, BHSIOS-Prevention; Ohio Department of Health.
[1]Stroke defined as Cerebrovascular Disease (Stroke) ICD-9 codes 430-438.

percent from 39.8 to 35.3 per 10,000 residents. The age-adjusted rate for females also decreased slightly (8 percent) from 32.7 to 30.1 per 10,000 residents (Figure 3-1, Table 3-2). Males had higher age-adjusted discharge rates compared to females.

Table 3-1. Hospital Discharges with Stroke[1] Listed as Any Diagnosis by Gender, Number of Discharges, Average Length of Stay,[2] Total Number of Days, Average Charge,[3,4] Total Charges,[3] Crude and Age-adjusted Discharge Rate per 10,000 Residents, Ohio 1999-2003.

Year	Gender	Number of Discharges	Average Length of Stay (Days)	Total Number of Days	Average Charge (Dollars)	Total Charges (Dollars)	Crude Discharge Rate per 10,000 Residents	Age-adjusted Discharge Rate per 10,000 Residents
1999	Male	37,206	6.3	232,814	13,700	508,959,823	67.6	79.1
	Female	44,957	6.3	280,982	12,517	561,890,529	77.1	64.2
	Total	**82,163**	**6.3**	**513,796**	**13,053**	**107,0850,352**	**72.5**	**70.1**
2000	Male	38,809	6.3	246,137	15,504	600,777,925	70.3	81.2
	Female	46,765	6.3	294,367	13,798	643,759,345	80.1	66.4
	Total	**85,574**	**6.3**	**540,504**	**14,572**	**1,244,537,270**	**75.3**	**72.3**
2001	Male	39,686	6.3	248,713	16,856	668,291,119	71.7	81.7
	Female	47,901	6.2	299,129	15,242	729,178,328	81.9	67.6
	Total	**87,587**	**6.3**	**547,842**	**15,973**	**1,397,469,447**	**76.9**	**73.2**
2002	Male	39,897	6.2	248,593	19,194	764,940,133	71.9	80.3
	Female	47,959	6.3	300,235	17,199	823,844,252	81.8	67.4
	Total	**87,856**	**6.2**	**548,828**	**18,105**	**1,588,784,385**	**77.1**	**72.6**
2003	Male	39,071	6.1	239,520	21,122	824,043,451	70.2	77.4
	Female	46,744	6.1	283,563	19,228	898,027,625	79.6	65.2
	Total	**85,815**	**6.1**	**523,083**	**20,090**	**1,722,071,076**	**75.0**	**70.1**

Table 3-2. Hospital Discharges with Stroke[1] Listed as Principal Diagnosis by Gender, Number of Discharges, Average Length of Stay,[2] Total Number of Days, Average Charge,[3,4] Total Charges,[3] Crude and Age-adjusted Rate per 10,000 Residents, Ohio 1999-2003.

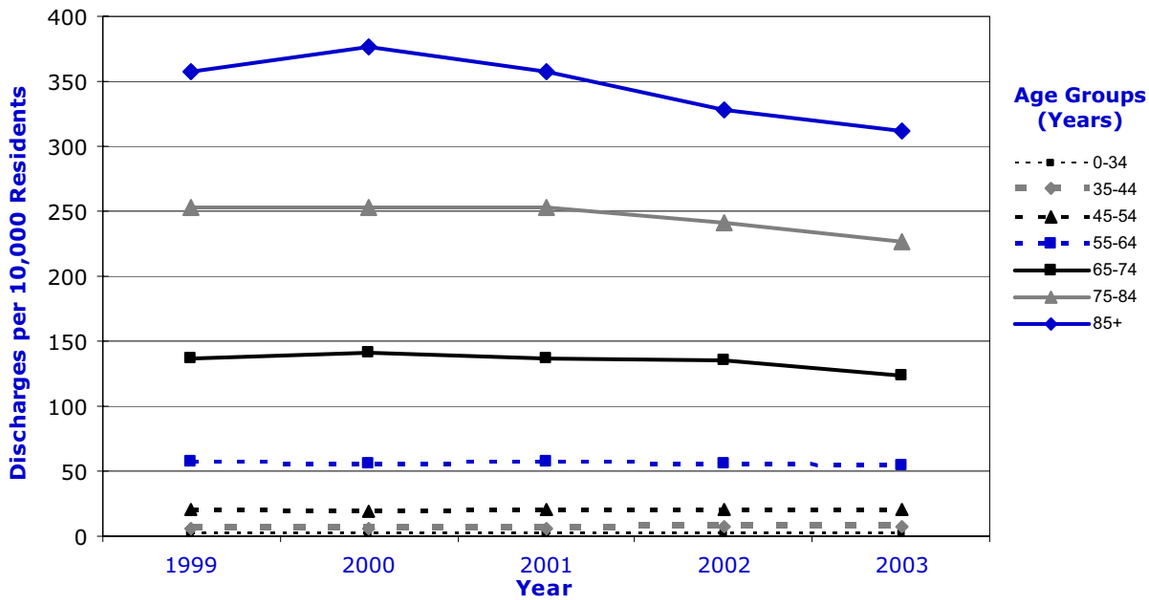
Year	Gender	Number of Discharges	Average Length of Stay (Days)	Total Number of Days	Average Charge (Dollars)	Total Charges (Dollars)	Crude Discharge Rate per 10,000 Residents	Age-adjusted Discharge Rate per 10,000 Residents
1999	Male	18,902	4.8	91,569	11,963	225,901,808	34.4	39.8
	Female	22,773	5.1	115,584	11,554	262,847,931	39.0	32.7
	Total	**41,675**	**5.0**	**207,153**	**11,739**	**488,749,739**	**36.8**	**35.6**
2000	Male	19,014	4.7	90,060	13,294	252,297,828	34.5	39.4
	Female	22,896	4.9	111,102	12,315	280,990,923	39.2	32.6
	Total	**41,910**	**4.8**	**201,162**	**12,760**	**533,288,751**	**36.9**	**35.4**
2001	Male	18,979	4.7	88,402	14,416	273,408,011	34.3	38.6
	Female	23,064	4.9	113,694	13,876	319,753,842	39.4	32.7
	Total	**42,043**	**4.8**	**202,096**	**14,120**	**593,161,853**	**36.9**	**35.2**
2002	Male	18,804	4.7	88,706	16,472	309,421,227	33.9	37.5
	Female	22,539	4.9	110,858	15,627	352,020,928	38.5	31.8
	Total	**41,343**	**4.8**	**199,564**	**16,011**	**661,442,156**	**36.2**	**34.2**
2003	Male	18,009	4.7	83,903	18,636	335,273,012	32.4	35.3
	Female	21,535	4.9	104,867	17,769	382,421,653	36.7	30.1
	Total	**39,544**	**4.8**	**188,770**	**18,164**	**717,694,665**	**34.6**	**32.3**

Source: Ohio Hospital Association. Analysis completed by the Chronic Disease and Behavioral Epidemiology Section, BHSIOS-Prevention; Ohio Department of Health.
[1]Stroke defined as Cerebrovascular Disease (Stroke) ICD-9 codes 430-438.
[2]Total number of days divided by number of hospital discharges.
[3]Total amount of charges divided by number of hospital discharges.
[4]Charges represent total amount billed, not actual amount collected.

*The Burden of **Stroke** in Ohio*

The number of hospital discharges with stroke as principal diagnosis increased as the age group increased (Figure 3-2, Table 3-3). Between 1999-2003 the age-specific hospital discharge rate decreased for all age groups over 55 years. However, the discharge rate for both the age groups of 35-44 years and 45-54 years increased. The discharge rate for patients aged 35-44 years increased from six to seven discharges per 10,000 residents, while the discharge rate for patients 45-54 increased by 16 percent from 18 to 20 discharges per 10,000 residents (Figure 3-2, Table 3-3).

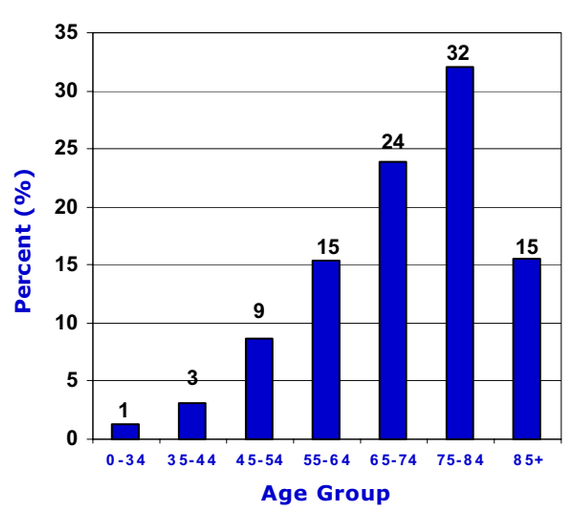
Figure 3-2. Hospital Discharges with Stroke[1] Listed as Principal Diagnosis per 10,000 by Age Group, Ohio 1999-2003.



In 2003, discharges for persons 75-84 years old accounted for the greatest proportion (32 percent) of discharges with stroke as the principal diagnosis, followed by persons 65-74 years old (24 percent) (Figure 3-3, Table 3-3).

While stroke is commonly perceived as an elderly person's disease, anyone can have a stroke. Persons under the age of 65 years accounted for 28 percent (11,288) of hospital discharges with stroke as the principal diagnosis (Table 3-3, Figure 3-3). Among this group, 84 percent (9,544) of the discharges occurred in patients between the age of 45 and 64 (Table 3-3, Figure 3-3).

Figure 3-3. Percentage of Hospital Discharges with Stroke[1] Listed as Principal Diagnosis by Age Group, Ohio 2003.



Source: Ohio Hospital Association. Analysis completed by the Chronic Disease and Behavioral Epidemiology Section, BHSIOS-Prevention; Ohio Department of Health.

[1]Stroke defined as Cerebrovascular Disease (Stroke) ICD-9 codes 430-438.

Table 3-3. Number of Hospital Discharges with Stroke[1] Listed as Principal Diagnosis and Discharges per 10,000 Residents by Age Group and Gender, Ohio 1999-2003.

Year	Age Group (Years)	Male		Female		All	
		Number of Discharges	Discharges per 10,000 Residents	Number of Discharges	Discharges per 10,000 Residents	Number of Discharges	Discharges per 10,000 Residents
1999	0-34	231	1	220	1	451	1
	35-44	520	6	557	6	1,077	6
	45-54	1,404	19	1,361	18	2,765	18
	55-64	3,029	63	2,682	51	5,711	57
	65-74	5,665	160	5,447	123	11,112	140
	75-84	6,096	298	7,968	241	14,064	263
	85+	1,957	417	4,538	358	6,495	374
	Total	**18,902**	**34**	**22,773**	**39**	**41,675**	**37**
2000	0-34	238	1	228	1	466	1
	35-44	503	6	609	7	1,112	6
	45-54	1,604	21	1,489	18	3,093	20
	55-64	3,088	64	2,508	47	5,596	55
	65-74	5,598	159	5,574	128	11,172	142
	75-84	5,984	287	7,748	232	13,732	253
	85+	1,999	407	4,740	365	6,739	376
	Total	**19,014**	**34**	**22,896**	**39**	**41,910**	**37**
2001	0-34	236	1	253	1	489	1
	35-44	501	6	593	7	1,094	6
	45-54	1,769	22	1,642	20	3,411	21
	55-64	3,312	67	2,688	50	6,000	58
	65-74	5,235	151	5,349	124	10,584	136
	75-84	5,970	281	7,899	235	13,869	253
	85+	1,956	380	4,640	349	6,596	358
	Total	**18,979**	**34**	**23,064**	**39**	**42,043**	**37**
2002	0-34	252	1	276	1	528	1
	35-44	539	6	675	8	1,214	7
	45-54	1,745	22	1,675	20	3,420	21
	55-64	3,241	62	2,858	50	6,099	56
	65-74	5,245	153	5,188	122	10,433	136
	75-84	5,877	272	7,528	222	13,405	242
	85+	1,905	351	4,339	319	6,244	328
	Total	**18,804**	**34**	**22,539**	**38**	**41,343**	**36**
2003	0-34	255	1	243	1	498	1
	35-44	561	7	695	8	1,256	7
	45-54	1,738	21	1,686	20	3,424	20
	55-64	3,276	60	2,834	48	6,110	54
	65-74	4,734	139	4,693	112	9,427	124
	75-84	5,566	254	7,142	210	12,708	227
	85+	1,879	329	4,242	305	6,121	312
	Total	**18,009**	**32**	**21,535**	**37**	**39,544**	**35**

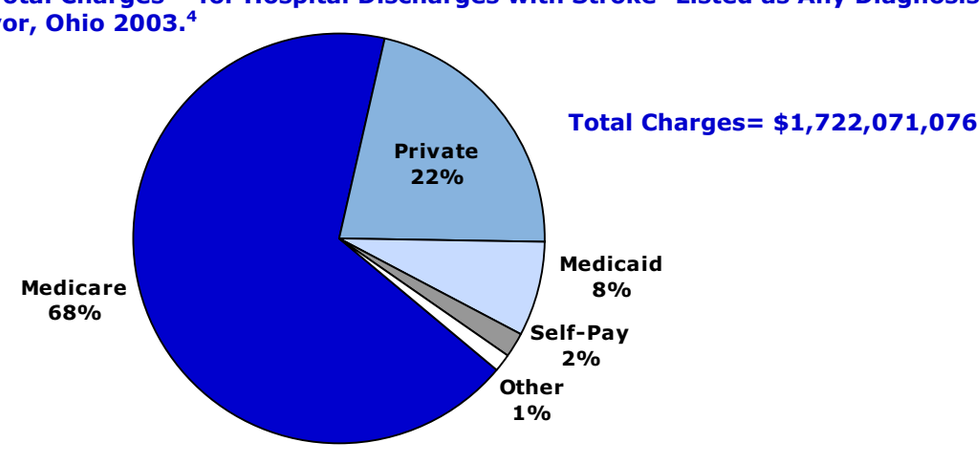
Source: Ohio Hospital Association. Analysis completed by the Chronic Disease and Behavioral Epidemiology Section, BHSIOS-Prevention; Ohio Department of Health.

[1]Stroke defined as Cerebrovascular Disease (Stroke) ICD-9 codes 430-438.

Charges

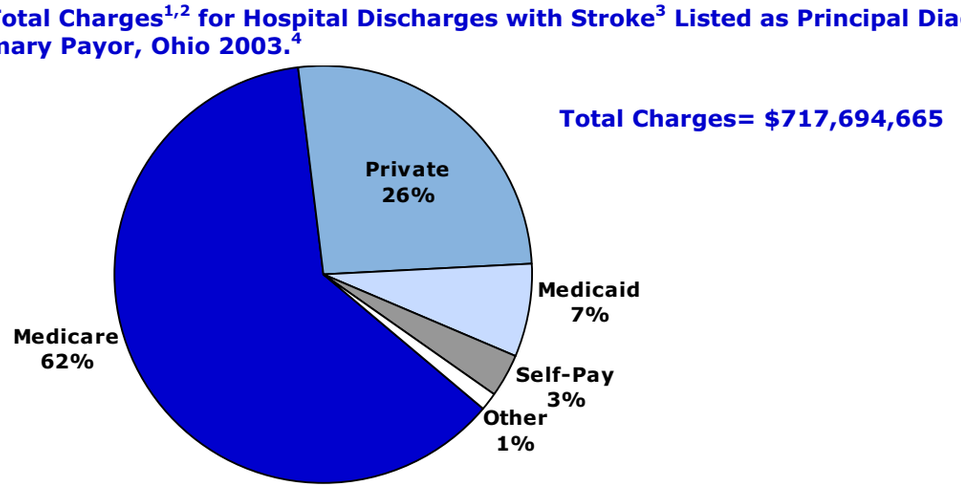
The economic burden of stroke is striking. In 2003, total charges for discharges with stroke listed as any diagnosis were more than $1.7 billion (Figure 3-4). This figure represents the total amount billed and not the actual amount collected. Medicare was the primary payor for 68 percent of the charges, followed by private insurance companies (22 percent) and then Medicaid with 8 percent of the charges. These figures do not include costs associated with emergency transport, physician fees, medications, rehabilitation, lost work, lost wages and long-term care.

Figure 3-4.Total Charges[1,2] for Hospital Discharges with Stroke[3] Listed as Any Diagnosis by Primary Payor, Ohio 2003.[4]



A similar proportion of cost distribution among the top three payors was observed for hospital discharges with stroke listed as principal diagnosis, in which the total charges amounted to more than $717 million. Medicare was the primary payor for 62 percent of the charges, followed by private insurance with 26 percent and then Medicaid at 7 percent (Figure 3-5).

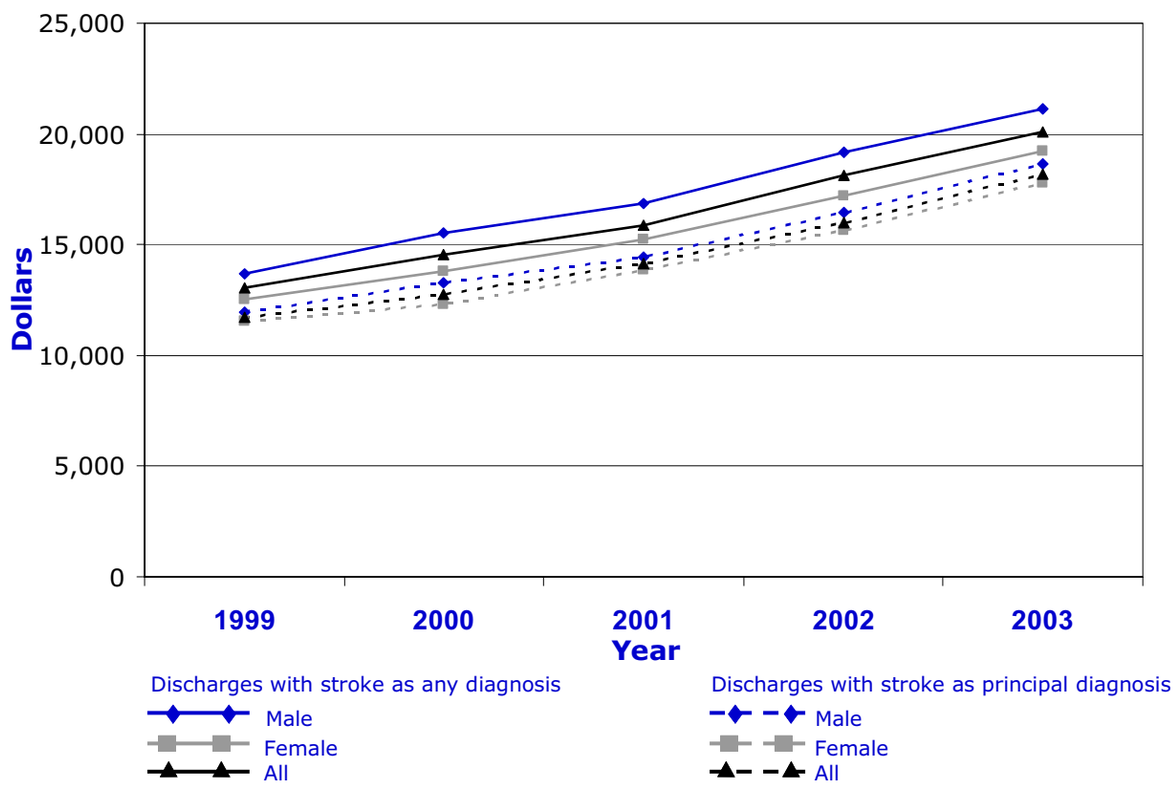
Figure 3-5. Total Charges[1,2] for Hospital Discharges with Stroke[3] Listed as Principal Diagnosis by Primary Payor, Ohio 2003.[4]



Source: Ohio Hospital Association. Analysis completed by the Chronic Disease and Behavioral Epidemiology Section, BHSIOS-Prevention; Ohio Department of Health.
[1]Charges represent total amount billed and not actual amount collected.
[2]Charges in Dollars.
[3]Stroke defined as Cerebrovascular Disease (Stroke) ICD-9 codes 430-438.
[4]Total may not equal 100 percent, due to rounding.

The average charge per discharge for stroke as any listed diagnosis and stroke as the principal diagnosis have increased between 1999 and 2003. In that five-year period, the average charge for stroke as a principal diagnosis increased by 55 percent from $11,739 in 1999 to $18,164 in 2003. Similarly, the average charge for stroke as any diagnosis increased by 54 percent from $13,053 to $20,090 (Table 3-1, Table 3-2, Figure 3-6).

Figure 3-6. Average Charge[1,2] per Discharge for Hospital Discharges with Stroke Listed as any Diagnosis and for Hospital Discharges With Stroke[2] Listed as the Principal Diagnosis by Gender and Year, Ohio 1999-2003.



Source: Ohio Hospital Association. Analysis completed by the Chronic Disease and Behavioral Epidemiology Section, BHSIOS-Prevention; Ohio Department of Health.
[1]Charges represent total amount billed and not actual amount collected.
[2]Charges in Dollars.
[3]Stroke defined as Cerebrovascular Disease (Stroke) ICD-9 codes 430-438.

Type of Stroke

There are two types of stroke: ischemic and hemorrhagic. Ischemic strokes are caused by the blockage of arterial blood supply to the brain. Nationally, ischemic strokes account for 70 to 80 percent of all strokes. Hemorrhagic strokes are less prevalent but more lethal. Hemorrhagic strokes occur when one or more blood vessels rupture and cause bleeding in the brain or in the space between the brain and skull. In Ohio, analysis of hospital discharges with a principal diagnosis of either ischemic or hemorrhagic stroke indicated that 85 percent of the discharges had a principal diagnosis of ischemic stroke. In 2003, the length of stay for hemorrhagic stroke was longer (8.1 days) compared to ischemic stroke (5.4 days). Average length of stay remained relatively unchanged during 1999-2003. Also, the average age for ischemic stroke was higher (72 years) compared to hemorrhagic stroke (67 years) (Table 3-4).

Table 3-4. Hospital Discharges with the Principal Diagnosis of Stroke (Hemorrhagic[1] and Ischemic[2]) by Year, Gender, Number of Discharges, Average Age, Average Length of Stay,[3] Number of Days, Average Charge,[4] Total Charges[4] and Percentage of Discharges[5] for Persons 18 Years and Older, Ohio 1999-2003.

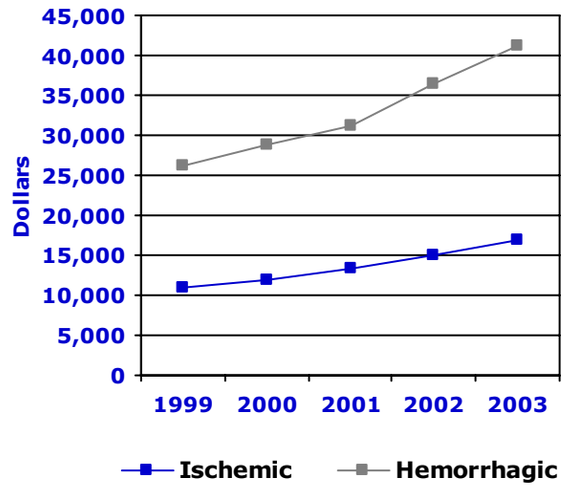
Hemorrhagic Stroke[1]								
Year	**Gender**	**Number of Discharges**	**Average Age**	**Average Length of Stay[3] (Days)**	**Total Number of Days**	**Average Charge[4] (Dollars)**	**Total Charges (Dollars)**	**Percentage of Discharges[5]**
1999	Male	1,454	66	8.4	12,278	26,330	38,257,499	**15%**
	Female	1,980	70	8.4	16,534	25,982	51,419,233	**16%**
	Total	**3,434**	**68**	**8.4**	**28,812**	**26,130**	**8,976,732**	**15%**
2000	Male	1,493	65	8.6	12,768	29,173	43,468,897	**15%**
	Female	1,863	69	8.1	15,175	28,668	53,294,268	**15%**
	Total	**3,356**	**67**	**8.3**	**27,943**	**28,893**	**96,763,165**	**15%**
2001	Male	1,484	66	8.1	11,993	29,897	44,367,086	**15%**
	Female	1,937	69	8.3	16,062	32,200	62,275,390	**15%**
	Total	**3,421**	**68**	**8.2**	**28,055**	**31,200**	**106,642,477**	**15%**
2002	Male	1,451	65	8.0	11,571	35,513	51,529,700	**15%**
	Female	1,853	68	8.5	15,715	37,024	68,569,191	**15%**
	Total	**3,304**	**67**	**8.3**	**27,286**	**36,361**	**120,098,892**	**15%**
2003	Male	1,434	65	8.1	11,650	40,852	58,499,740	**15%**
	Female	1,859	68	8.0	14,932	41,452	77,017,633	**15%**
	Total	**3,293**	**67**	**8.1**	**26,582**	**41,191**	**135,517,372**	**15%**

Ischemic Stroke[2]								
Year	**Gender**	**Number of Discharges**	**Average Age**	**Average Length of Stay[3] (Days)**	**Total Number of Days**	**Average Charge[4] (Dollars)**	**Total Charges (Dollars)**	**Percentage of Discharges[5]**
1999	Male	8,392	72	5.7	48,169	11,339	95,054,525	**85%**
	Female	10,792	76	5.7	61,995	10,559	113,799,612	**84%**
	Total	**19,184**	**74**	**5.7**	**110,164**	**10,900**	**208,854,137**	**85%**
2000	Male	8,367	71	5.5	46,123	12,648	105,600,119	**85%**
	Female	10,747	75	5.4	58,380	11,447	123,127,874	**85%**
	Total	**19,114**	**74**	**5.5**	**104,503**	**12,002**	**228,727,993**	**85%**
2001	Male	8,431	70	5.6	46,826	14,044	118,282,459	**85%**
	Female	10,806	75	5.6	60,644	12,890	139,150,006	**85%**
	Total	**19,237**	**73**	**5.6**	**106,715**	**13,396**	**257,432,465**	**85%**
2002	Male	8,245	70	5.5	45,704	15,818	130,260,802	**85%**
	Female	10,705	74	5.5	59,089	14,299	153,002,258	**85%**
	Total	**18,950**	**72**	**5.5**	**104,793**	**14,960**	**283,263,060**	**85%**
2003	Male	7,955	70	5.3	42,237	17,468	138,749,657	**85%**
	Female	10,050	74	5.5	55,047	16,348	164,196,157	**85%**
	Total	**18,005**	**72**	**5.4**	**97,284**	**16,842**	**302,945,814**	**85%**

Source: Ohio Hospital Association. Analysis completed by the Chronic Disease and Behavioral Epidemiology Section, BHSIOS-Prevention; Ohio Department of Health.
[1]ICD Codes for Hemorrhagic Stroke 430, 431, 432, 432.0, 432.1, 432.9.
[2]ICD Codes for Ischemic Stroke 433.01, 433.11, 433.21, 433.31, 433.81, 433.9, 434.00, 434.01, 434.11 , 434.91, 436.
[3]Number of days divided by number of hospital discharges.
[4]Charges represent total amount billed, not actual amount collected.
[5]Percent of discharges with Hemorrhagic or Ischemic Stroke listed as the diagnosis.

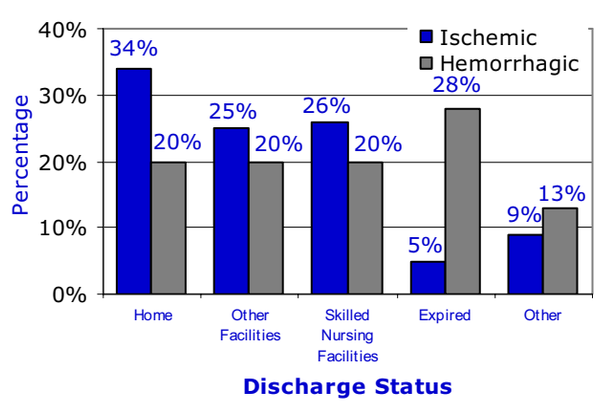
From 1999 through 2003, the average charge for hospital discharges with ischemic stroke and hemorrhagic stroke as principal diagnosis increased. The average charge for hospital discharges with ischemic stroke listed as the principal diagnosis increased by 58 percent. Similarly, the average charge for hospital discharges with hemorrhagic stroke listed as the principal diagnosis increased by 55 percent during the same period. In 2003, the average charge for hospital discharges with hemorrhagic stroke listed as the principal diagnosis was $41,191, almost 2.5 times higher than the average charge for hospital discharges with ischemic stroke listed as the principal diagnosis ($16,842) (Figure 3-7, Table 3-4). The average length of stay for both types of stroke remained relatively unchanged during this period (Table 3-4).

Figure 3-7. Average Charge of Hospital Discharges with the Principal Diagnosis of Stroke (Hemorrhagic[1] and Ischemic[2]) for Persons 18 Years and Older, Ohio 1999-2003.[3]



Source: Ohio Hospital Association. Analysis completed by the Chronic Disease and Behavioral Epidemiology Section, BHSIOS-Prevention; Ohio Department of Health.
[1]ICD Codes for Hemorrhagic Stroke 430, 431, 432, 432.0, 432.1,432.9
[2]ICD Codes for Ischemic Stroke 433.01, 433.11, 433.21, 433.31, 433.81, 433.9, 434.00, 434.01, 434.11 , 434.91, 436
[3]Charges represent total amount billed and not actual amount collected.

Figure 3-8. Percentage of Hospital Discharges with the Principal Diagnosis of Stroke (Hemorrhagic[1] and Ischemic[2]) by Discharge Status for Persons 18 Years and Older, Ohio



Hemorrhagic strokes have a higher mortality rate than ischemic strokes. In 2003, 28 percent of the hospital discharges with hemorrhagic stroke listed as a principal diagnosis had a discharge status of expired, compared to 5 percent of the discharges with ischemic stroke listed the principal diagnosis. Only 34 percent of the discharges with ischemic stroke as the principal diagnosis and only 20 percent of the discharges with hemorrhagic stroke were discharged to home (Figure 3-8, Table 3-5). Discharges to other facilities (including short-term care, intermediate care, home health care, rehabilitation or out-patient services) or skilled nursing facilities accounted for the largest proportion of hospital discharges for persons with either type of stroke as the principal diagnosis. For ischemic stroke, a total of 51 percent of persons were discharged to one of these facilities; hemorrhagic stroke accounted for a total of 40 percent of discharges to one of these facilities (Figure 3-8, Table 3-5).

Source: Ohio Hospital Association. Analysis completed by the Chronic Disease and Behavioral Epidemiology Section, BHSIOS-Prevention; Ohio Department of Health.
[1]ICD Codes for Hemorrhagic Stroke 430, 431, 432, 432.0, 432.1, 432.9.
[2]ICD Codes for Ischemic Stroke 433.01, 433.11, 433.21, 433.31, 433.81, 433.9, 434.00, 434.01, 434.11 , 434.91, 436.
[3]Other Facility includes: Short-term Care, Intermediate Care, Home Health, Rehabilitation Facility and Out-patient Services.

Table 3-5. Hospital Discharges with the Principal Diagnosis of Stroke (Hemorrhagic[1] and Ischemic[2]) by Discharge Status for Persons 18 Years and Older, Ohio 1999-2003.

Hemorrhagic Stroke											
Discharge Status		Home		Other Facility[3]		Skilled Nursing Facility		Expired		Other	
	Gender	Number of Hospital Discharges	%	Number of Hospital Discharges	%	Number of Hospital Discharges	%	Number of Hospital Discharges	%	Number of Hospital Discharges	%
1999	Male	373	26%	149	10%	249	17%	394	27%	289	20%
	Female	345	17%	237	12%	421	21%	573	29%	404	20%
	Total	**718**	**21%**	**386**	**11%**	**670**	**20%**	**967**	**28%**	**693**	**20%**
2000	Male	345	23%	155	10%	261	17%	426	29%	306	20%
	Female	364	20%	197	11%	408	22%	540	29%	354	19%
	Total	**709**	**21%**	**352**	**10%**	**669**	**20%**	**966**	**29%**	**660**	**20%**
2001	Male	368	25%	166	11%	227	15%	431	29%	292	20%
	Female	413	21%	230	12%	378	20%	559	29%	357	18%
	Total	**781**	**23%**	**396**	**12%**	**605**	**18%**	**990**	**29%**	**649**	**19%**
2002	Male	359	25%	240	17%	253	17%	393	27%	206	14%
	Female	371	20%	292	16%	404	22%	544	29%	242	13%
	Total	**730**	**22%**	**532**	**16%**	**657**	**20%**	**937**	**28%**	**448**	**14%**
2003	Male	326	23%	284	20%	266	19%	374	26%	184	13%
	Female	339	18%	384	20%	384	20%	540	29%	235	12%
	Total	**665**	**20%**	**645**	**20%**	**650**	**20%**	**914**	**28%**	**419**	**13%**

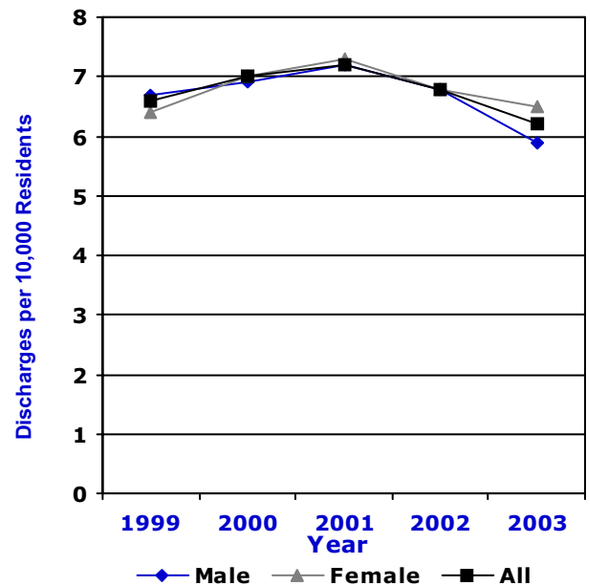
Ischemic Stroke											
Discharge Status		Home		Other Facility[3]		Skilled Nursing Facility		Expired		Other	
	Gender	Number of Hospital Discharges	%	Number of Hospital Discharges	%	Number of Hospital Discharges	%	Number of Hospital Discharges	%	Number of Hospital Discharges	%
1999	Male	3,086	37%	1,244	15%	1,851	22%	565	7%	1,646	20%
	Female	3,098	29%	1,784	17%	3,190	30%	735	7%	1,985	18%
	Total	**6,184**	**32%**	**3,028**	**16%**	**5,041**	**26%**	**1,300**	**7%**	**3,631**	**19%**
2000	Male	3,322	40%	1,127	13%	1,806	22%	478	6%	1,634	20%
	Female	3,229	30%	1,773	16%	3,113	29%	626	6%	2,006	19%
	Total	**6,551**	**34%**	**2,900**	**15%**	**4,919**	**26%**	**1,104**	**6%**	**3,640**	**19%**
2001	Male	3,384	40%	1,320	16%	1,671	20%	475	6%	1,581	19%
	Female	3,313	31%	1,995	18%	3,045	28%	679	6%	1,774	16%
	Total	**6,697**	**35%**	**3,315**	**17%**	**4,716**	**25%**	**1,154**	**6%**	**3,355**	**17%**
2002	Male	3,260	40%	1,796	22%	1,808	22%	459	6%	922	11%
	Female	3,319	31%	2,489	23%	3,187	30%	599	6%	1,111	10%
	Total	**6,579**	**35%**	**4,285**	**23%**	**4,995**	**26%**	**1,058**	**6%**	**2,033**	**11%**
2003	Male	3,163	40%	1,933	24%	1,712	22%	389	5%	758	10%
	Female	2,963	29%	2,609	26%	3,033	30%	534	5%	911	9%
	Total	**6,126**	**34%**	**4,542**	**25%**	**4,745**	**26%**	**923**	**5%**	**1,669**	**9%**

Source: Ohio Hospital Association. Analysis completed by the Chronic Disease and Behavioral Epidemiology Section, BHSIOS-Prevention; Ohio Department of Health.
[1]ICD Codes for Hemorrhagic Stroke 430, 431, 432, 432.0, 432.1,432.9.
[2]ICD Codes for Ischemic Stroke 433.01, 433.11, 433.21, 433.31, 433.81, 433.9, 434.00, 434.01, 434.11 , 434.91, 436.
[3]Other Facility includes: Short-term Care, Intermediate Care, Home Health, Rehabilitation Facility and Out-patient Services.

Transient Ischemic Attacks

A transient ischemic attack (TIA) is a "warning stroke" or "mini-stroke" that produces stroke-like symptoms that completely resolve within 24 hours.[12] Most strokes aren't preceded by TIAs. However, of the people who've had one or more TIAs, more than a third will later have a stroke.[12] In 2003, there were 7,598 discharges with TIA listed as the principal diagnosis (Table 3-6). During the years 1999 to 2003, the age-adjusted rate for hospital discharges has remained relatively constant, while the average charge has increased by 55 percent from $6,449 to $9,990 (Figure 3-9,Table 3-6).

Figure 3-9. Age-adjusted Rates for Hospital Discharges with Transient Ischemic Attack (TIA) Listed as Principal Diagnosis by Gender, Ohio 1999-2003.[1]



Source: Ohio Hospital Association. Analysis completed by the Chronic Disease and Behavioral Epidemiology Section, BHSIOS-Prevention; Ohio Department of Health.
[1]TIA defined as ICD-9 code 435.

Table 3-6.Hospital Discharges with TIA[1] Listed as Principal Diagnosis by Gender, Number of Discharges, Average Length of Stay,[2] Total Number of Days, Average Charge,[3,4] Total Charges,[3] Crude and Age-adjusted Rate per 10,000 Residents, Ohio 1999-2003.

Year	Gender	Number of Discharges	Average Length of Stay (Days)	Total Number of Days	Average Charge (Dollars)	Total Charges (Dollars)	Crude Discharge rate per 10,000 Residents	Age-adjusted Discharge Rate per 10,000 Residents
1999	Male	3,158	3.1	9,824	6,532	20,609,270	5.7	6.7
	Female	4,512	3.2	14,483	6,390	28,814,476	7.7	6.4
	Total	**7,670**	**3.2**	**24,307**	**6,449**	**49,423,746**	**6.8**	**6.6**
2000	Male	3,284	3.1	10,077	7,158	23,472,057	6.0	6.9
	Female	4,968	3.3	16,347	7,189	35,593,494	8.5	7.0
	Total	**8,252**	**3.2**	**26,424**	**7,177**	**59,065,551**	**7.3**	**7.0**
2001	Male	3,487	3.0	10,438	7,989	27,856,204	6.3	7.2
	Female	5,178	3.2	16,532	7,761	40,155,626	8.9	7.3
	Total	**8,665**	**3.1**	**26,970**	**7,853**	**68,011,830**	**7.6**	**7.2**
2002	Male	3,358	3.0	10,066	8,800	29,531,476	6.1	6.8
	Female	4,815	3.1	15,147	8,890	42,789,207	8.2	6.8
	Total	**8,173**	**3.1**	**25,213**	**8,853**	**72,320,683**	**7.2**	**6.8**
2003	Male	2,967	2.9	8,537	9,936	29,468,931	5.3	5.9
	Female	4,631	3.1	14,247	10,025	46,397,523	7.9	6.5
	Total	**7,598**	**3.0**	**22,784**	**9,990**	**75,866,454**	**6.6**	**6.2**

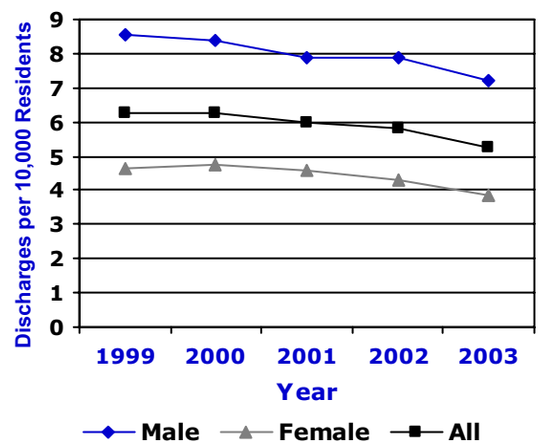
Source: Ohio Hospital Association. Analysis completed by the Chronic Disease and Behavioral Epidemiology Section, BHSIOS-Prevention; Ohio Department of Health.
[1]TIA defined as ICD-9 code 435.
[2]Total number of days divided by number of hospital discharges.
[3]Charges represent total amount billed, not actual amount collected.
[4]Total amount of charges divided by number of hospital discharges.

Carotid Endarterectomy

Carotid endarterectomy is a surgical procedure in which plaque is removed from the carotid arteries as a means to prevent stroke.[13] In 2003, 6,443 endarterectomies were performed.* Between 1999 and 2003 the number of procedures conducted and the age-adjusted rates decreased. However, males were almost twice as likely to have the procedure compared to females (Figure 3-10, Table 3-7). The average charge for this procedure increased 57 percent during this five-year period (Table 3-7).

** Among discharges with Diseases of the Circulatory System listed as any diagnosis.*

Figure 3-10. Age-adjusted Rates for Hospital Discharges With Endarterectomy Listed as a Surgical Procedure by Gender, Ohio 1999-2003.[1,2]



Source: Ohio Hospital Association. Analysis completed by the Chronic Disease and Behavioral Epidemiology Section, BHSIOS-Prevention; Ohio Department of Health.
[1]Endarterectomy defined as ICD-9 Surgical Procedure Codes 38.12.
[2]Among Hospital Discharges with Disease of the Circulatory System (ICD-9 codes 390-459) listed as any diagnosis.

Table 3-7. Hospital Discharges with Endarterectomy[1] Listed as a Surgical Procedure by Gender, Number of Mentions, Average Length of Stay,[2] Total Number of Days, Average Charge,[3,4] Total Charges,[3] Crude and Age-adjusted Discharge Rate per 10,000 Residents, Ohio 1999-2003.[5]

Year	Gender	Number of Discharges	Average Length of Stay (Days)	Total Number of Days	Average Charge (Dollars)	Total Charges (Dollars)	Crude Discharge rate per 10,000 Residents	Age-adjusted Discharge Rate per 10,000 Residents
1999	Male	4,247	3.2	13,591	14,102	59,833,513	7.7	8.6
	Female	3,167	3.2	10,108	13,469	42,628,840	5.4	4.7
	Total	**7,414**	**3.2**	**23,699**	**13,831**	**102,462,353**	**6.5**	**6.3**
2000	Male	4,198	3.0	12,714	15,189	63,657,951	7.6	8.4
	Female	3,244	3.2	10,358	14,868	48,038,262	5.6	4.7
	Total	**7,442**	**3.1**	**23,072**	**15,049**	**111,696,213**	**6.6**	**6.3**
2001	Male	3,998	3.0	12,070	17,368	69,436,064	7.2	7.9
	Female	3,173	3.3	10,415	16,843	53,444,024	5.4	4.6
	Total	**7,171**	**3.1**	**22,485**	**17,136**	**122,880,087**	**6.3**	**6.0**
2002	Male	4,014	3.1	12,594	20,099	80,618,911	7.2	7.9
	Female	2,954	3.4	10,104	19,962	58,946,820	5.0	4.3
	Total	**6,968**	**3.3**	**22,698**	**20,041**	**139,565,731**	**6.1**	**5.8**
2003	Male	3,744	3.1	11,505	22,333	83,614,422	6.7	7.2
	Female	2,699	3.2	8,675	20,912	56,378,165	4.6	3.9
	Total	**6,443**	**3.1**	**20,180**	**21,738**	**139,992,587**	**5.6**	**5.3**

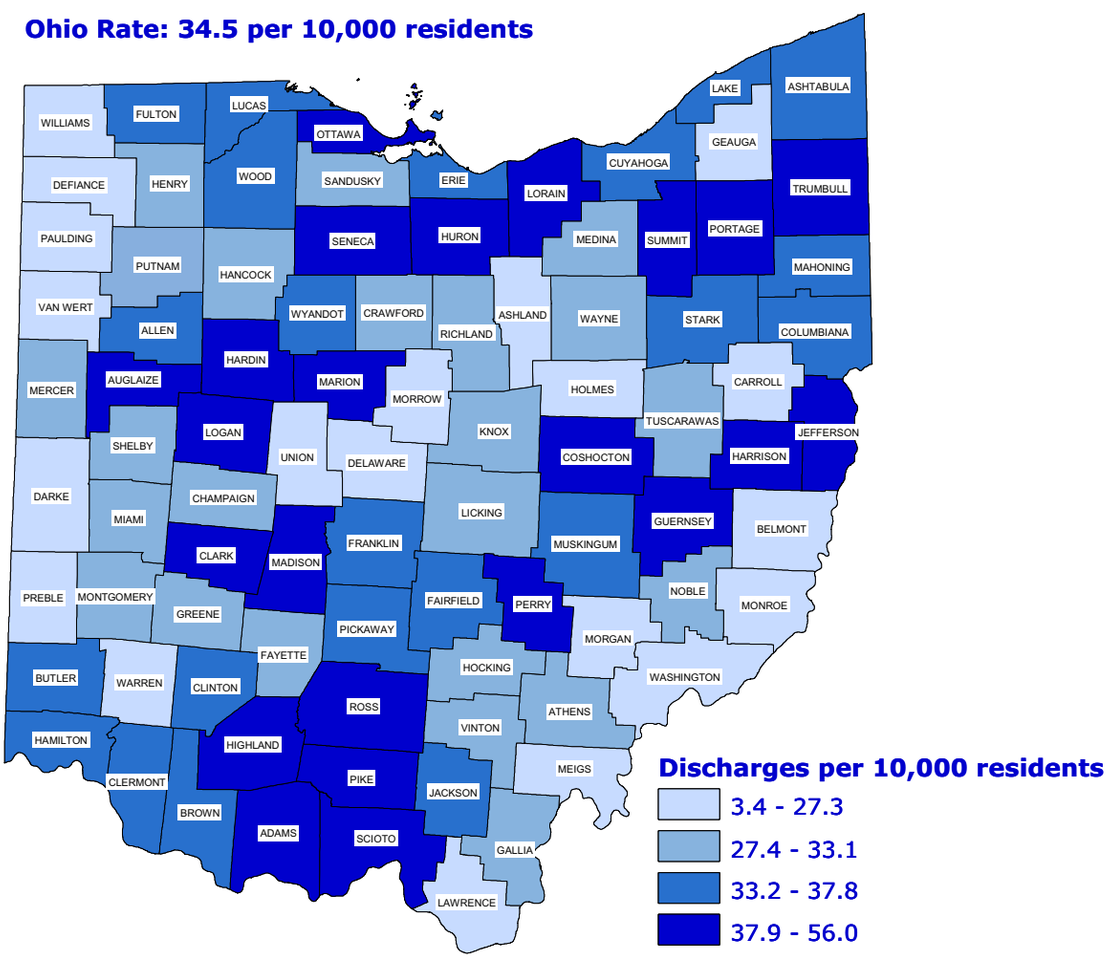
Source: Ohio Hospital Association. Analysis completed by the Chronic Disease and Behavioral Epidemiology Section, BHSIOS-Prevention; Ohio Department of Health.
[1]Endarterectomy defined as ICD-9 Surgical Procedure Codes ICD-9 38.12.
[2]Total number of days divided by number of hospital discharges.
[3]Charges represent total amount billed, not actual amount collected.
[4]Total amount of charges divided by number of hospital discharges.
[5]Among Hospital Discharges with Diseases of the Circulatory System (ICD-9 codes 390-459) listed as any diagnosis.

Hospital Discharges by County

Ohio's average annual age-adjusted hospital discharge rate for discharges with stroke listed as the principal diagnosis was 34.5 per 10,000 residents for the five year period of 1999-2003. The discharge rates among Ohio's 88 counties ranged from a high 56 of per 10,000 residents for Adams County to a low of for 3.4 per 10,000 residents for Lawrence County* (Figure 3-11, Appendix C-2).

**Hospital discharge data from Ohio residents who received care at West Virginia hospitals were not collected in 2003. Therefore caution must used when interpreting data from border counties where residents may have received care in West Virginia.*

Figure 3-11. Average Annual Age-adjusted Hospital Discharge Rates with Stroke Listed as Principal Diagnosis per 10,000 by County, Ohio 1999-2003.[1]



Source: Ohio Hospital Association. Analysis completed by the Chronic Disease and Behavioral Epidemiology Section, BHSIOS-Prevention; Ohio Department of Health.
[1]Stroke defined as Cerebrovascular Disease (Stroke) ICD-9 codes 430-438.

Stroke Centers

Mortality and the degree of disability related to stroke can be reduced in hospitals that are able to provide specialized and timely multidisciplinary care and appropriate stroke therapies through established stroke protocols. The importance of a hospital-based acute stroke team and the urgency of the limited time frames within which to treat stroke were addressed in 2000 by the Brain Attack Coalition (BAC) recommendations for the establishment of hospital stroke centers to reduce stroke-related disability and death. The two major goals of the stroke center recommendations are: (1) improvement in the level of care received by stroke victims; and (2) standardization of the acute care provided to patients.[14] The BAC recommended two types of stroke centers be established: primary stroke centers to stabilize and provide emergency care to stroke patients and comprehensive stroke centers to provide extensive care for the most complicated cases.

Based on the guidelines established for emergency treatment provided in trauma centers, BAC recommendations for primary stroke centers include:

- An acute stroke team, to include a physician with experience in diagnosing and treating stroke and a minimum of one other health care provider, available 24 hours a day, seven days a week.
- Written protocols to reduce time and complications of treatment.
- Improved coordination of EMS and hospitals.
- An emergency department staff trained in the diagnosis and treatment of stroke.
- Access to an established stroke unit for specialized care.
- Provision of neurological services within two hours.
- Brain imaging capabilities and laboratory services.
- A stroke registry or database to track and measure patient outcomes.
- At least eight hours a year of continuing medical education for professional staff and at least two annual public education programs about stroke prevention and treatment.

Every hospital in the stroke care system can utilize the BAC recommendations to assess their capability to deliver acute stroke care. Based on this assessment, hospitals that have the resources and are "acute stroke capable" can collaborate with limited-resource hospitals in the area to develop strategies that improve patient access to rapid and appropriate care.

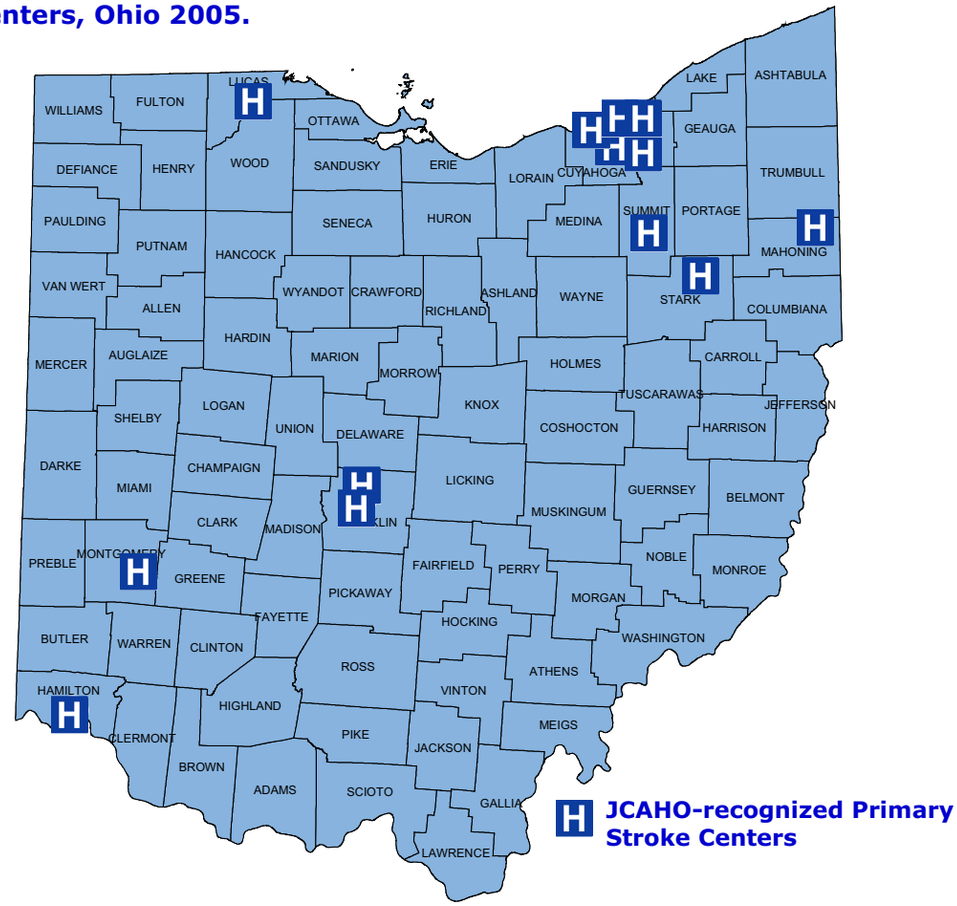
In 2005, BAC released recommendations for comprehensive stroke centers designed to treat patients who require a high intensity of medical and surgical care, specialized tests or interventional therapies. A comprehensive stroke center has additional expertise and infrastructure in three key areas: diagnostic radiology, endovascular therapy and surgery; and the capability to manage patients with large ischemic or hemorrhagic strokes.[4]

Primary Stroke Centers

Hospital certification, designation or licensure based on BAC primary stroke center recommendations is available through a variety of organizations. For example, the Joint Commission for Accreditation of Health Care Organizations (JCAHO) has established a formal process for recognition of primary stroke centers that make exceptional efforts to foster better outcomes for stroke care. This process, based on the BAC recommendations, is used to evaluate hospitals functioning as primary stroke centers. A Certificate of Distinction for Primary Stroke Center (PSC) is awarded to hospitals providing services that have the critical elements to achieve long-term success in improving outcomes. Certification is a signal to the community that the quality of care provided is effectively managed to meet the unique and specialized needs of stroke patients.[15]

Since the publication of the BAC recommendations in 2000, Primary Stroke Centers have been established in 35 states. As of December 2005, Ohio had 13 hospitals designated as PSCs by JCAHO.[16] Five PSCs are located in Cuyahoga County and two are located in Franklin County. The remaining six PSCs are widely dispersed across the state and located in urban counties (Figure 3-12).

Figure 3-12. Distribution of JCAHO-recognized Primary Stroke Centers, Ohio 2005.



Source: Joint Commission for Accreditation of Health Care Organizations (JCAHO), 2005.

Continuous Quality Improvement Initiatives

CHAPTER 4

Ohio Stroke Survivor Story

"I didn't know that kids could have strokes," reported Cindi Hamblin. She learned firsthand when her five day-old daughter, Zoe, had a stroke.

Zoe was at home when she started acting very agitated, unusual for this normally happy baby. She was taken to the hospital and after many tests, was diagnosed as having a blood clot over one-third of her brain and a brain hemorrhage. She had a 5 percent survival rate if she made it out of the coma and then was expected to be in a vegetative state because so much of her brain had been damaged.

Zoe proved them all wrong. After three-and-a-half weeks in the hospital, Zoe returned home. She is now 14 months old and full of smiles. She still attends physical and occupational therapy and recently started speech therapy. Zoe has overcome tremendous obstacles including blindness (she now can see with the assistance of glasses) and right- side paralysis.

Doctors still do not know what caused Zoe's stroke. It may have been from a hereditary blood clotting disorder which her mother and big sister, Brooke, have called Anti-thrombin 3 Deficiency. However, Zoe's brain is recovering from her stroke and she is doing very well.

Story provided by Angela Hedworth of the Great Lakes Regional Stroke Network

Paul Coverdell Acute Stroke Registry

In addition to primary prevention of stroke, improvement in the quality of care that patients with acute stroke receive at medical facilities is needed to reduce death and disability from stroke.

However, while evidence-based medical guidelines for stroke care have been developed, along with new and improved diagnostic and treatment tools, many hospitals still do not have the organization, staff or equipment to effectively diagnose and treat acute stroke patients.[16]

In 2001, the U.S. Congress provided funding to the Centers for Disease Control and Prevention (CDC) to implement state-based registries that measure, track and improve the delivery and quality of stroke care. Congress further directed that this project be named the Paul Coverdell National Acute Stroke Registry, after the late U.S. Senator Paul Coverdell of Georgia who suffered a fatal stroke in 2000 while serving in Congress.[16]

CDC began by consulting with stroke experts and organizations to identify specific data items to be collected and then piloted eight prototype registry projects, led by academic and medical institutions across the country, to test models for measuring delivery of care. "Wave I" projects were funded in 2001 and located in Georgia, Massachusetts, Michigan and Ohio. "Wave II" projects were funded in 2002 and located in California, Illinois, North Carolina and Oregon. Under these prototypes, data were gathered along each step of the entire process of stroke care, from emergency response to eventual discharge from a hospital. At the end of the three-year demonstration period, the results showed large gaps existed between the recommended treatment guidelines and actual hospital practices. Intensive quality improvement efforts were needed to close those gaps.[16]

The long–term goal of this program is to ensure all Americans receive the highest quality of acute stroke care that is available to reduce untimely deaths, prevent disability and avoid recurrent strokes.[16]

The Ohio Prototype for the Paul Coverdell Acute Stroke Registry

This section presents data collected by the Ohio Prototype for the Paul Coverdell Acute Stroke Registry from a statewide sample of 36 hospitals during November and December 2001. The statewide registry is housed and coordinated by the University of Cincinnati. The care delivered to acute stroke patients across the continuum from hospitalization through discharge was evaluated against recommended treatment guidelines. Critical data elements evaluated were:

- Patient demographics: age, race, gender.
- Documentation of the date and time of onset of stroke symptoms. This is the crucial first step in determining an acute stroke patient's eligibility for thrombolytic therapy.
- Use of the National Institutes of Health Stroke Scale (NIHSS), the gold standard for evaluation of acute stroke symptoms and prognosis.
- Lipid profile on all ischemic stroke or Transient Ischemic Attack (TIA) patients to document Low Density Lipids (LDL) and total cholesterol levels.
- Swallowing evaluation to screen for dysphagia prior to oral intake.
- Deep vein thrombosis (DVT) prophylaxis to prevent clot formation caused by patient immobility.
- Antithrombolytic medications prescribed on discharge for all ischemic stroke patients.

The demographic characteristics for the 1,610 patients enrolled in the Ohio Coverdell registry are shown in Table 4-1. Fifty-six percent of the patients were female. The mean age of the patient was 71 years. Seventy-five percent of the patients were white and 20 percent were black.

Table 4-1. Demographic Characteristics, Ohio Prototype for the Paul Coverdell Acute Stroke Registry, November/December 2001.

Number of Case-patients	1,610
Age (Years)	71.0±14.0
Female	56%
Race	
White	75%
Black	20%
Hispanic	1.2%
Other/Not Entered	3.8%

The breakdown of stroke subtypes is shown in Table 4-2. Ischemic strokes accounted for 65 percent of the strokes in the registry. In addition to data for ischemic and hemorrhagic stroke, this registry also collected data for transient ischemic attacks (TIA). TIAs accounted for 19 percent of the strokes in the registry.

Table 4-2. Breakdown of Stroke Subtypes, Ohio Prototype for the Paul Coverdell Acute Stroke Registry, November/December 2001.

Type of Stoke	Percent
Ischemic	65%
Transient Ischemic Attack (TIA)	19%
Intracranial Hemorrhage (ICH)	9.6%
Subarachnoid Hemorrhage (SAH)	3.2%
ICH/SAH	0.5%
Undetermined	2.6%

The mean length of stay for ischemic strokes was slightly over five days compared to intracranial hemorrhage (ICH) at 6.36 days and subarachnoid hemorrhage (SAH) at 11.16 days (Table 4-3).

Table 4-3. Mean Length of Stay (Days) by Stroke Subtypes, Ohio Prototype for the Paul Coverdell Acute Stroke Registry, November/ December 2001.

Type of Stroke	Length of Stay (mean ±SD)
Ischemic	5.05 ± 3.92
Intracranial Hemorrhage	6.36 ± 6.37
Subarachnoid Hemorrhage	11.16 ± 9.55

Similar to the Ohio Hospital Discharge Data, the Coverdell data indicated the majority of patients were not discharged to home. Twenty-three percent of patients were discharged to a skilled nursing facility or an intermediate care facility (Table 4-4).

Table 4-4. Discharge Status for All Strokes (not including TIA) Ohio Prototype for the Paul Coverdell Acute Stroke Registry, November/December 2001.

Discharge Status	
Home	31%
Short-term facility	2%
Skilled nursing facility or intermediate care facility	23%
Inpatient rehabilitation	20%
Transfer to another hospital	3%
Home health care	8%
Hospice	2%
Died	10%

Tables 4-5 through 4-7 present a summary of data collected from the medical records that compares the actual care registry patients received against selected recommended standardized stroke measures of care. These data helped to identify logical targets for quality improvement strategies. Subsequent to the pilot registry project, the Ohio Coverdell investigators worked with participating hospitals on a detailed quality improvement program.

Selected Measures of Stroke Care from the Ohio Prototype for the Paul Coverdell Acute Stroke Registry, November/December 2001.

Table 4-5. Selected Measures of Stroke Care — Stroke Team Consulted and tPA Administered for Ischemic Strokes.

Stroke Team Consulted	40%
Administered tPA	3.6%

According the data collected in the Ohio prototype, the stroke team was consulted on only 40 percent of stroke patients. Tissue Plasminogen Activator (tPA) was administered to 3.6 percent of ischemic stroke patients (Table 4-5).

Table 4-6. Selected Measures of Stroke Care — Stroke Management, Complications and Smoking Cessation Counseling for All Strokes (not including TIA).

Stroke Management	
DVT prophylaxis	37%
Swallowing evaluation	44%
Complications	
DVT	1.6%
Pneumonia	6.2%
Urinary tract infection	10.3%
Smoking Cessation Counseling	24%

Stroke patients who are immobilized or not encouraged to be ambulatory are at greater risk of developing blood clots from deep vein thrombosis (DVT), pneumonia and/or a urinary tract infection (UTI) related to long-term catheter use. In the Ohio Coverdell pilot data, DVT prophylaxis was documented in 37 percent of the cases. For patients not receiving DVT prophylaxis, 1.6 percent developed DVT. UTIs related to long-term catheter use developed in 10.3 percent of registry patients (Table 4-6).

Stroke patients with dysphagia (impaired swallowing function) are at increased risk of developing pneumonia, one of the most frequent serious medical complications of stroke. The treatment of stroke patients with dysphagia includes the avoidance of any oral intake, so it is important to identify this problem immediately. This is most easily accomplished through a bedside water swallow test. In the Ohio Coverdell pilot data, swallowing evaluation was documented prior to oral intake in only 44 percent of the cases. Of those patients not receiving a swallow test, 6.2 percent developed pneumonia (Table 4-6).

Tobacco smoking is the most alterable risk factor for stroke and is a significant contributor to premature morbidity and mortality. Smoking nearly doubles the risk for an ischemic stroke and the risk of developing a stroke for smokers who quit begins to decline immediately. However, health care providers consistently fail to discuss tobacco cessation with their patients. In the Ohio Coverdell pilot data, cessation counseling was documented in the medical records of 24 percent of the stroke patients who were current smokers (Table 4-6).

Table 4-7 .Selected Measures of Stroke Care — Medications Prescribed at Discharge For Ischemic Strokes.

Antithrombolytic Medications	
Aspirin	49%
Plavix	31%
Aggrenox	3%
Warfarin	23%
Other	11%
None	15%
Lipid-lowering medications	29%

Secondary prevention measures are designed to reduce the risk of subsequent cardiovascular events in stroke patients. Medications to reduce the risk of blood clots and normalize LDL and total cholesterol are important long-term interventions for ischemic stroke patients. In the Ohio Coverdell pilot data, antithrombolytics were prescribed for less than half of these patients and only 29 percent were discharged on a lipid-lowering medication (Table 4-7).

Continuous Quality Improvement

Continuous quality improvement (CQI) is an ongoing process that identifies process and outcome performance measures and includes a mechanism to evaluate all components of the stroke system of care. The goal of CQI is to assess the effectiveness of the entire system and its individual components to determine whether and to what extent various efforts are succeeding in improving patient care. A well-developed CQI program promotes the use of measures identified through evidenced-based methods or national expert consensus guidelines.[4] CQI processes can be applied to all components in the system to determine the effectiveness of primordial and primary prevention activities and to expedite the exchange of relevant clinical data across the continuum of care beginning in the prehospital setting through rehabilitation.

Get with the Guidelines℠

The American Heart Association's (AHA) Get With The Guidelines-Stroke℠ (GWTG-Stroke), is a continuous quality improvement program designed to reduce risk factors and save lives by quickly and positively impacting in-hospital patient care through the consistent application of the most up-to-date scientific guidelines on stroke. Hospitals participating in GWTG-Stroke utilize the GWTG-Stroke Patient Management Tool™ (PMT), an online, interactive reporting and assessment system to implement the CQI process.

The GWTG-Stroke program was launched in Ohio in spring 2003. Hospitals participating in year two of the Paul Coverdell Acute Stroke Registry utilized the GWTG-Stroke PMT for data collection. As of January 2006, 35 Ohio hospitals are participating in the GWTG-Stroke quality improvement program and 16,826 patient records have been entered into the PMT. This tool allows hospitals to track their performance on various process measures over time. Although the data

reporting system is a useful feature, the central focus of GWTG-Stroke is on changing systems in the hospital to improve patient outcomes.

The GWTG-Stroke QI system tracks and evaluates the patient from admission through discharge. Appropriate care and management is achieved by using the PMT to determine if all physician orders, medications, discharge plans and patient and family education are in compliance with the latest guidelines. GWTG hospitals utilize a team approach to individualize processes, procedures and protocols. The ability to customize a QI process that is compatible with the needs and resources of each institution promotes ownership of the QI process, creates a cohesive team, and promotes a high level of compliance.

In Ohio, the majority of the hospitals certified by JCAHO as Primary Stroke Centers (PSC) are also GWTG-Stroke hospitals. The GWTG-Stroke PMT and GWTG-Stroke QI program provides the PSC with the infrastructure and QI data needed to qualify and maintain certification status.

GWTG-Stroke in Ohio is supported by the AHA's Quality Improvement initiative staff. This support includes educational workshops offering continuing education units, teleconferences with keynote speakers, printed materials and a GWTG client group open to all Ohio hospitals. These activities have enabled the development of a statewide collaborative that focuses on sharing of best practices. The collaborative is driven by the desire to develop appropriate systems of care, a culture of quality and conduct continuous evaluation to maintain high performance. This sharing of materials and strategies maximizes the efficiency of QI efforts throughout the state.

CHAPTER 5

Ohio Stroke Survivor Story

April 18, 2001 was a day David Kasprzak will always remember. He was on a business trip in Lansing, Michigan when he began to experience numbness in his right hand and a headache across the back of his head. His speech became slurred and he was unable to walk. An MRI scan at a local hospital revealed that David had a stroke on the left side of his brain or cerebrovascular accident. Two days later, David was admitted to the Flower Rehabilitation Center (FRC) to undergo an intensive rehabilitation program.

Prior to this event, 58-year-old David was very active. His past medical history included high blood pressure and minor surgery on his left knee and left arm. His older brother had died of a heart attack when he was 58, yet there was nothing to indicate that David was at risk of a serious life-changing event at such a young age.

Upon his admission to the FRC, he experienced double vision as well as difficulty swallowing and speaking. His entire right side was not able to function normally. He could only walk 15 feet with assistance.

Two months later, on June 16, 2001, David's twin brother Dan also experienced a serious health event. While working in his yard, he had a sudden onset of slurred speech, weakness on his left side and vision problems. An MRI at Toledo Hospital revealed a stroke affecting his right side. Like his brother, David, Dan was not prepared for this. Although he had a mild stroke 20 years earlier, he was in relatively good health except for minor arthritis and diet-controlled diabetes. He, like his brother, was very active and engaged in athletic activities on a regular basis.

When Dan was admitted to FRC, he was experiencing memory and vision problems, and impairments of his left arm and leg. He was not able to walk, express himself, get into a chair, or move about in bed without assistance.

Since their strokes, the brothers have made remarkable progress and still have goals they want to reach. David was very motivated to get back on the golf course, and determined to dance with his wife at the wedding of a good friend shortly after discharge. Dan wanted to golf again too, but more importantly, he wanted to regain his ability to drive. David did dance at the wedding unassisted by a walker. Although both brothers are not golfing yet and Dan is still not able to drive, in time, they are expected to accomplish these goals.

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The Ohio Medicaid Program provides health care for three main groups of low-income Ohioans: parents (pregnant women) and children; the elderly; and the blind and disabled. In Fiscal Year (FY) 2003, Ohio Medicaid provided health insurance for nearly 1 million adults (18 years and older). Of the nearly 1 million adults receiving Medicaid, 44,926 adults (4.8 percent) had a claim with a diagnosis of stroke (Table 5-1).

Prevalence of Eligibles with Stroke

The prevalence of stroke among adult eligibles (individuals enrolled in Medicaid) was 4.8 percent. The prevalence was slightly higher among males (4.9 percent) compared to females (4.7 percent) (Table 5-1).

Table 5-1. Prevalence of Stroke[1] among Adult Medicaid Eligibles[2,3] by Gender, Ohio FY 2003.

Gender	Eligibles[2] with Stroke	Total Eligibles[2]	Stroke[1] Prevalence for Eligibles
Female	29,919	638,632	4.7%
Male	15,007	306,071	4.9%
Total	44,926	944,703	4.8%

Source: Ohio Medicaid Program.
[1]Stroke is defined as having a claim with primary or secondary diagnosis codes (ICD-9) 430-438.
[2]Eligibles had coverage for any part of the year (one month or more).
[3]Adults 18 years and older.

The prevalence of stroke between white and black adult eligibles differed only slightly. Adults classified as other races had the highest prevalence of stroke at 5.1 percent (Table 5-2).

Table 5-2. Prevalence of Stroke[1] among Adult Medicaid Eligibles[2,3] Race/Ethnicity, Ohio FY 2003.

Race/ Ethnicity	Eligibles[2] with Stroke[1]	Total Eligibles[2]	Stroke[1] Prevalence for Eligibles[2]
White Non-Hispanic	32,284	665,619	4.9%
Black Non-Hispanic	11,532	245,849	4.7%
Other[4]	514	10,059	5.1%
Hispanic	608	23,176	2.6%

Source: Ohio Medicaid Program.
[1] Stroke is defined as having a claim with primary or secondary diagnosis code between 430 and 438.99.
[2]Eligibles had coverage for any part of the year (one month or more).
[3]Adults 18 years and older.
[4]Other includes:Asian, American Indian, Alaskan Native, Hawaiian/Pacific Islander, Multiple Races and Other.

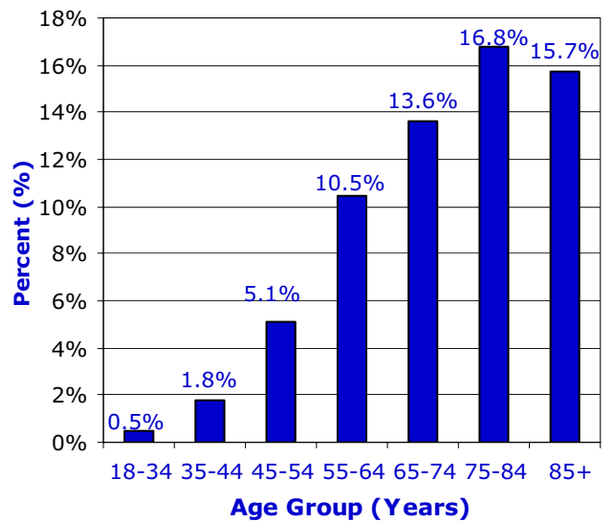
The prevalence of stroke increased with age. Stroke was most common in persons aged 75-84 years. Eighty-eight percent of adult eligibles with stroke were 45 years and older (Table 5-3, Figure 5-1).

Table 5-3. Prevalence of Stroke[1] among Adult Medicaid Eligibles[2,3] by Age Group, Ohio FY 2003.

Age Group (Years)	Eligibles[2] with Stroke[1]	Total Eligibles[2]	Stroke[1] Prevalence for Eligibles
18-34	2,189	434,433	0.5%
35-44	3,401	184,050	1.8%
45-54	6,205	121,175	5.1%
55-64	8,366	79,808	10.5%
65-74	9,064	66,522	13.6%
75-84	10,173	60,525	16.8%
85+	6,570	41,757	15.7%

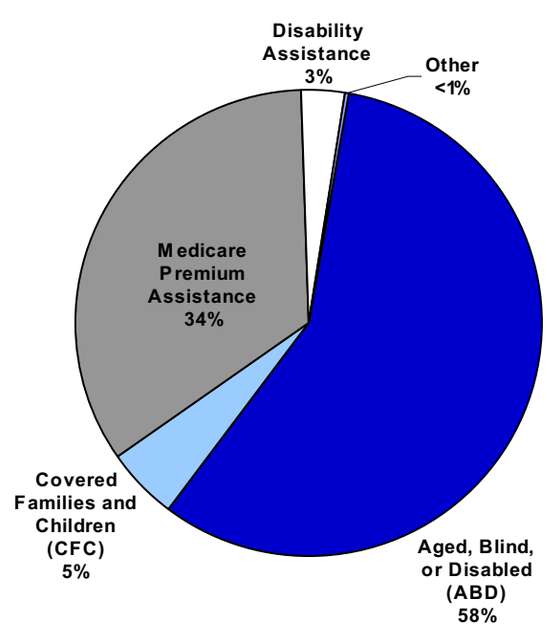
Source: Ohio Medicaid Program.
[1]Stroke is defined as having a claim with primary or secondary diagnosis codes (ICD-9) 430-438.
[2]Eligibles had coverage for any part of the year (one month or more). Eligibles in more than one category during the year are counted multiple times.
[3]Adults 18 years and older.

Figure 5-1. Prevalence of Stroke[1] among Adult Medicaid Eligibles[2,3] by Age Group, Ohio FY 2003.



The Medicaid program classifies the covered individuals into general categories based on a determination of eligibility. The Aged, Blind and Disabled (ABD) category consists of persons whose income and assets meet established program requirements. ABD Medicaid assists with some or all medical expenses for those who are 65 years of age or older, blind or who have a disability.[18] Some people in this category are residents of nursing facilities or receive community long-term care services.[19] This category accounted for the largest proportion of Medicaid eligibles with stroke. The next largest consisted of individuals eligible for Medicaid Premium Assistance with 34 percent of eligibles (Figure 5-2). This category consists of individuals who are eligible for Medicare and have limited income and assets. They receive Medicaid assistance to help with their Medicare premium, deductible, and Medicare co-insurance.[18]

Figure 5-2. Distribution of Adult Medicaid Eligibles[1,2] with Stroke[3] by Aid Category, Ohio FY 2003.



Source: Ohio Medicaid Program.
[1]Eligibles had coverage for any part of the year (one month or more). Eligibles in more than one category during the year are counted multiple times.
[2]Adults 18 years and older.
[3]Stroke is defined as having a claim with primary or secondary diagnosis codes (ICD-9) 430-438.

Expenditures by Health Service Category

In 2003, the total Medicaid expenditures for eligibles with stroke was $1.3 billion. This represents 17 percent of the total expenditures for all Medicaid eligibles. Overall, the highest expenditure for stroke eligibles was for skilled nursing facilities (SNF) (44 percent), followed by inpatient care (14 percent), then by prescription expenditures (13 percent) (Figure 5-3).

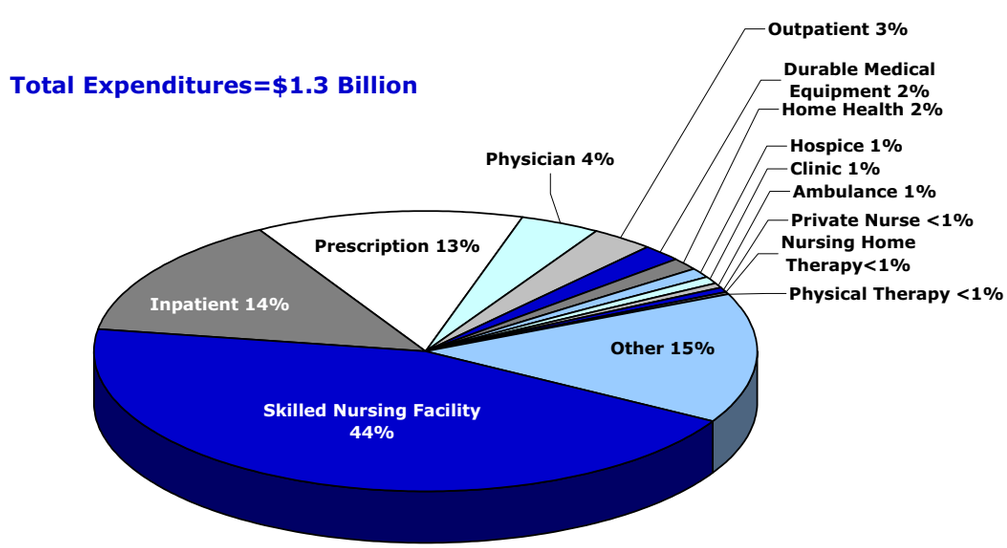
A majority of the expenditures were for persons who were eligible for both Medicare and Medicaid, referred to as dual eligibles. For these individuals, Medicaid pays the remaining balance of a claim, after Medicare has paid its portion (Table 5-4).

Table 5-4. Total Medicaid Expenditures by Health Service Category for Eligibles with Stroke, Ohio FY 2003.[1,2,3,4,5]

Service Category	Medicaid Eligible Only	Medicaid and Medicare Eligible	All
Skilled Nursing Facility	118,897,360	478,775,528	597,672,888
Inpatient	174,926,494	20,464,402	195,390,896
Prescription	66,739,889	110,508,280	177,248,169
Physician	35,839,882	16,455,751	52,295,633
Outpatient	29,920,921	11,397,351	41,318,273
Durable Medical Equipment	8,974,518	15,296,136	24,270,653
Home Health	11,777,102	9,388,682	21,165,784
Hospice	3,343,609	11,056,547	14,400,156
Clinic	6,218,839	4,457,664	10,676,503
Ambulance	3,948,573	4,837,706	8,786,279
Private Nurse	3,132,143	2,128,723	5,260,866
Nursing Home Therapy	3,427,957	84,659	3,512,616
Physical Therapy	66,560	24,355	90,915
Other	60,259,718	144,725,402	204,985,120
Total	527,473,563	829,601,185	1,357,074,748

Source: Ohio Medicaid Program.
[1]Eligibles had coverage for any part of the year (one month or more).
[2]Adults 18 years and older.
[3]Stroke is defined as having a claim with primary or secondary diagnosis codes (ICD-9) 430 -438.
[4]Fee for Service Only.
[5]Other includes mental health, PACE, physiological laboratory, vision, family planning, waiver services, dental, optometry, podiatrist, federally qualified health centers, rural health, independent labs and speech therapy.

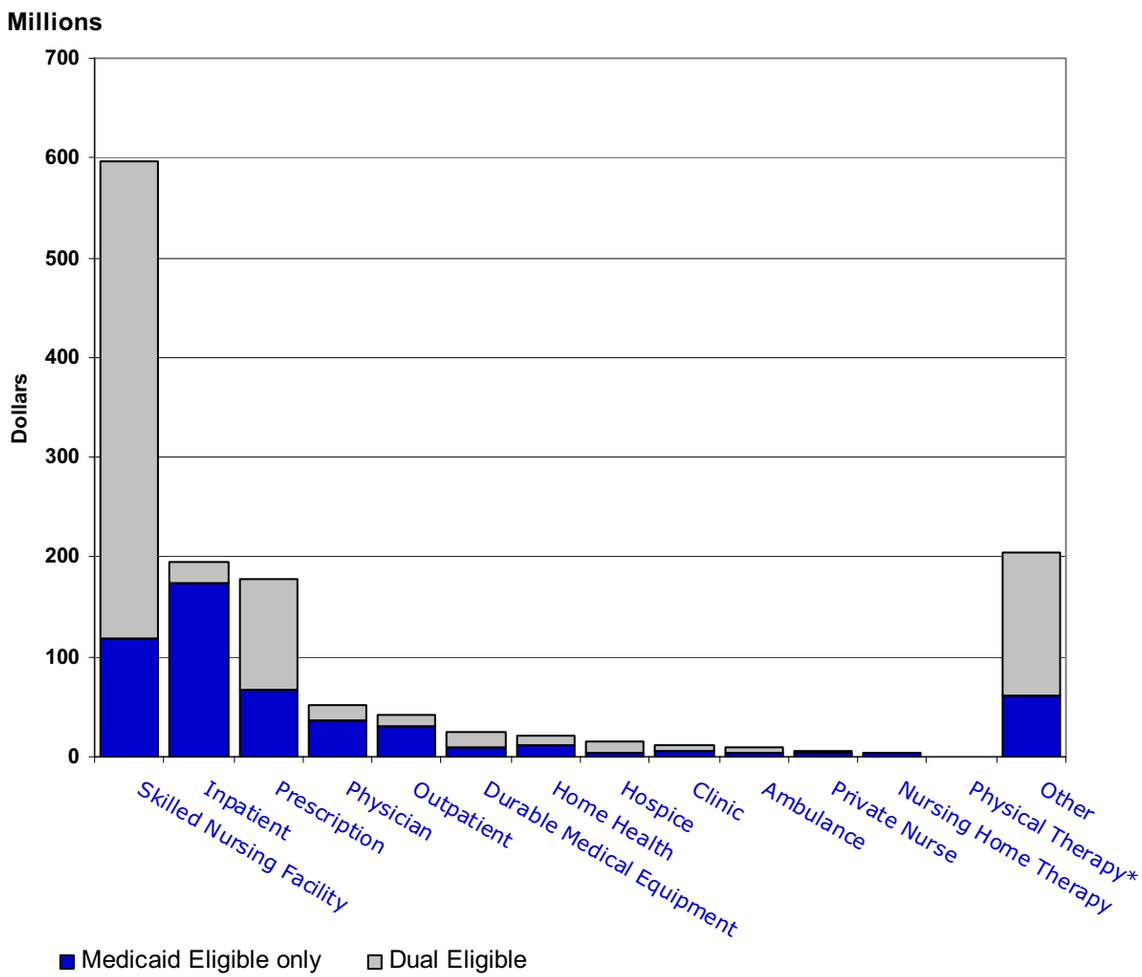
Figure 5-3. Health Service Category Percentages for Expenditures for All Medicaid Eligibles[1] with Stroke,[2] Ohio FY 2003.[3,4,5]



Source: Ohio Medicaid Program.
[1] Stroke is defined as having a claim with primary or secondary diagnosis codes (ICD-9) 430-438.
[2]Eligibles had coverage for any part of the year (one month or more).
[3]Adults 18 years and older.
[4]Fee for Service Only.
[5]Other includes expenditures for mental health, PACE, physiological laboratory, vision, family planning, waiver services, dental, optometry, podiatrist, federally qualified health centers, rural health, independent labs and speech therapy.

As mentioned previously, the most expensive health service category for stroke eligibles was for skilled nursing facilities (SNF). Of the approximately $600 million spent on SNF care, 80 percent (nearly $480 million) was for individuals who were dual eligible for Medicaid and Medicare. (Figure 5.4). The second-most costly health service category was for inpatient care. Ninety percent of the nearly $196 million spent on inpatient care was for persons who were covered solely by the Medicaid program. The third-most costly service category was for prescription drugs with 62 percent of the $178 million expended for individuals who were dual eligible (Figure 5-4).

Figure 5-4. Expenditures by Health Service Category for Stroke Dual Eligibles and Medicaid Only Eligibles, Ohio FY 2003.[1,2,3,4,5,6]

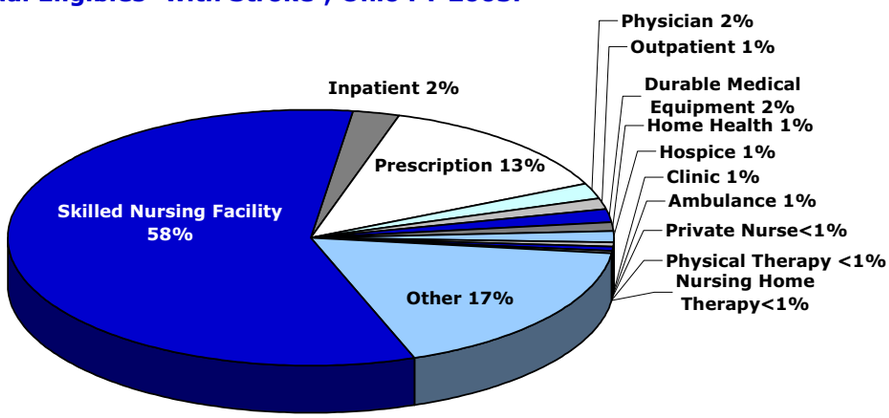


Source: Ohio Medicaid Program.
[1]Eligibles had coverage for any part of the year (one month or more).
[2]Adults 18 years and older.
[3]Stroke is defined as having a claim with primary or secondary diagnosis codes (ICD-9) 430 -438.
[4]Expenditures in dollars.
[5]Fee for Service Only.
[6]Other includes expenditures for mental health, PACE, physiological laboratory, vision, family planning, waiver services, dental, optometry, podiatrist, federally qualified health centers, rural health, independent labs and speech therapy.
*Expenditures for Physical Therapy ($90,915) are not represented on graph due to the scale of the graph.

Expenditures by Health Service Category for Dual Eligibles

Of the nearly $830 million expended solely for dual-eligible stroke patients, skilled nursing facilities received the most dollars with 59 percent ($479 million) of the total used to pay for this service category. Seventeen percent ($145 million) was spent for Other and 13 percent ($111 million) for prescriptions (Table 5-4, Figure 5-5).

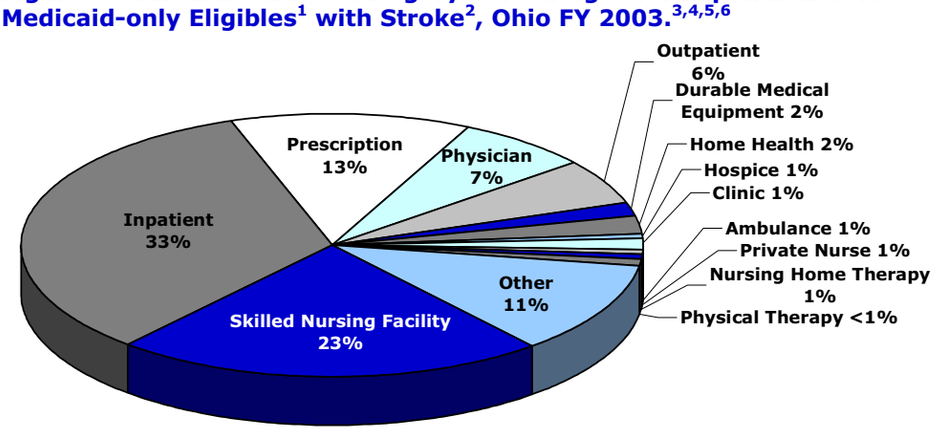
Figure 5-5. Health Service Category Percentages for Expenditures for Dual Eligibles[1] with Stroke[2], Ohio FY 2003.[3,4,5,6]



Expenditures by Health Service Category for Medicaid Only Eligibles

Nearly $527 million was expended on those who were Medicaid eligible only. Among this group, inpatient care was the highest expenditure with 33 percent of the dollars ($175 million) allocated for this category, followed by skilled nursing facilities at 23 percent ($119 million) and prescriptions at 13 percent ($67 million) of the total (Table 5-4, Figure 5-6).

Figure 5-6. Health Service Category Percentages for Expenditures for Medicaid-only Eligibles[1] with Stroke[2], Ohio FY 2003.[3,4,5,6]

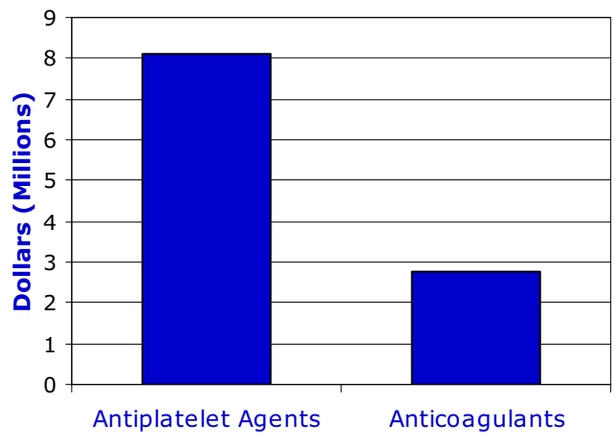


Source: Ohio Medicaid Program.
[1]Eligibles had coverage for any part of the year (one month or more).
[2]Adults 18 years and older.
[3]Stroke is defined as having a claim with primary or secondary diagnosis codes (ICD-9) 430-438.
[4]Fee for Service Only.
[5]Other includes expenditures for mental health, PACE, physiological laboratory, vision, family planning, waiver services, dental, optometry, podiatrist, federally qualified health centers, rural health, independent labs and speech therapy.
[6]Total may not equal 100 percent, due to rounding.

Expenditures by Drug Class

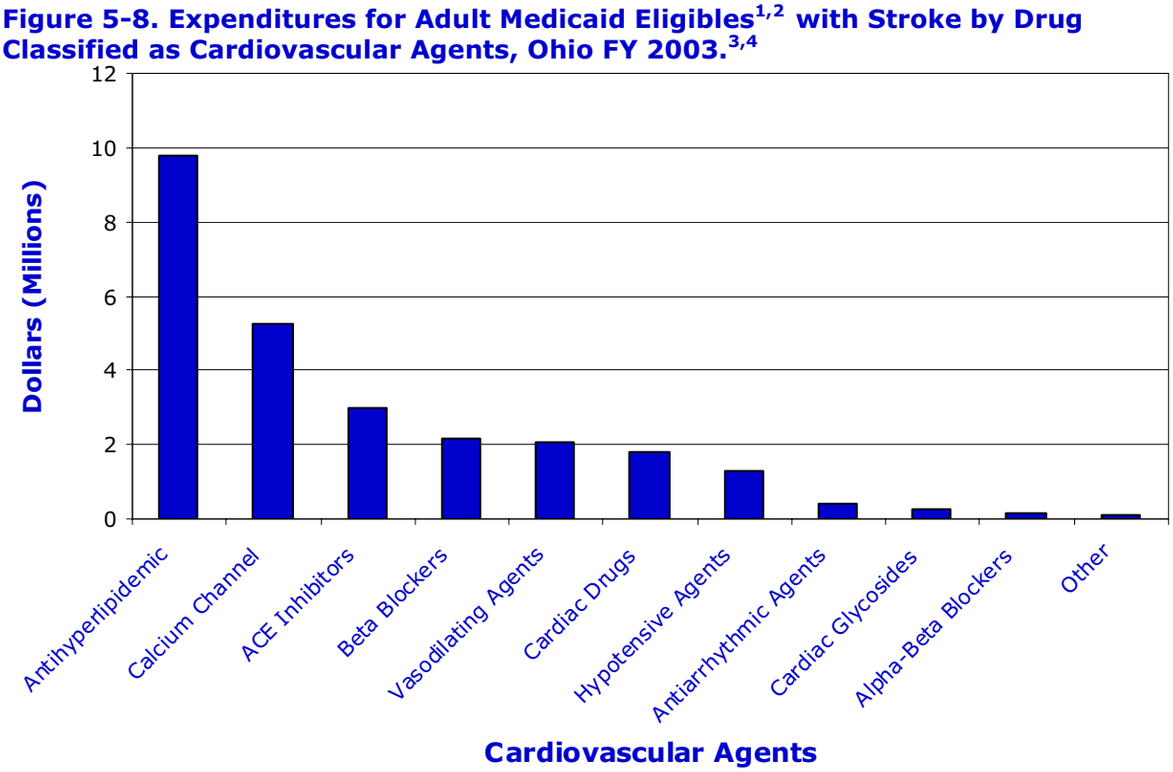
As noted previously, the third-most costly Medicaid service category was for prescription drugs. Of the $178 million spent in this category, 15 percent ($26 million) were for drugs classified as cardiovascular agents (Figure 5.8), and more than 6 percent ($10.8 million) were for drugs classified as antithrombotic agents (Figure 5.7). Within this drug class, antiplatelet agents were the highest expenditure ($8 million) (Figure 5-7). Within the cardiovascular agents class, expenditures for antihyperlipidemics were the highest at nearly $10 million; followed by calcium channel blockers at more than $5 million (Figure 5-8).

Figure 5-7. Expenditures[1] for Adult Medicaid Eligibles[2,3] with Stroke[4] by Drugs Classified as Antithrombotic Agents, Ohio FY 2003.[3,4,5]



Source: Ohio Medicaid Program
[1]Expenditures in dollars.
[2]Eligibles had coverage for any part of the year (one month or more).
[3]Adults 18 years and older.
[4]Stroke is defined as having a claim with primary or secondary diagnosis codes (ICD-9) 430 -438.
[5]Fee for Service Only.

Figure 5-8. Expenditures for Adult Medicaid Eligibles[1,2] with Stroke by Drug Classified as Cardiovascular Agents, Ohio FY 2003.[3,4]



Source: Ohio Medicaid Program.
[1]Eligibles had coverage for any part of the year (one month or more).
[2]Adults 18 years and older.
[3]Stroke is defined as having a claim with primary or secondary diagnosis codes (ICD-9) 430-438.
[3]Expenditures in dollars
[4]Fee for Service Only.

Nursing Home Residents

CHAPTER 6

Ohio Stroke Survivor Story

When you see Wendy Shoger run the Human Heart Mini-Marathon this spring, you won't believe that three years ago she couldn't walk, talk or write her name.

"People are constantly incredibly surprised to learn that I am a stroke survivor," says Wendy, a Wyoming resident. "Like many people I used to think that strokes were something only old people had. As I have struggled through my recovery from my massive stroke just three years ago, I have come to realize that anybody can have a stroke. That's why when people ask me to tell my story, I tell it. I am hopeful that I can continue to raise awareness of the signs and symptoms of strokes."

Wendy's stroke hit while she was eating breakfast with her husband and two young children. As unthinkable as it was for a fit, healthy 40-year-old runner to have a stroke, her husband miraculously recognized it and rushed her to the hospital. She was treated immediately with the clot-busting drug tPA by the Greater Cincinnati/Northern Kentucky Stroke Team, a state-of-the-art group that serves all the hospitals in the area. Still, the stroke left her speechless and paralyzed completely on the right side of her body. Doctors never determined what caused it.

Wendy says her recovery has been a journey of extreme determination and will. She endlessly practiced walking, talking, writing and many other things until her brain re-learned the tasks.

"From the beginning I would just look at my kids and think, 'They need their mom back,'" Wendy recalls. "I'm really proud of the fact that I've gotten to a point where my doctors never thought I'd be."

Wendy still has deficits from the stroke, but now she has progressed to the point where her remaining deficits don't show. While her constant daily reminder is the fact that her handwriting has changed dramatically, she maintains her marketing career and people would never imagine she is a stroke-survivor.

"My husband always says, 'Look how far you've come. How can you complain about that?' And while they are not noticable, there are still things I am determined to continue to improve."

On the positive side, Wendy says her stroke has made her a completely different person. "I'm probably enjoying life's journey a whole lot more because I know there's no guarantee there's going to be a tomorrow."

*The Burden of **Stroke** in Ohio*

Most U.S. nursing homes use the Resident Assessment Instrument (RAI) to document the health status of residents. The RAI is contained in the Minimum Data Set (MDS), a comprehensive tool used to ascertain the resident's initial health status and function, changes in that status and function and to develop individualized care plans.[20] The MDS requires full assessments within 14 days of admission, annually and whenever a resident's health status (such as their activities of daily living) change significantly. Ohio nursing home residents undergo a full assessment every three months. Nursing homes transmit this information electronically to the state, which compiles it into a database.

In 1999, more than 165,000 persons were admitted to Ohio nursing homes. Of these, 38,019 (23 percent) had a stroke documented on the RAI. Black residents had the highest percentage of stroke at 31.5 percent. Black males aged 65-74 years had the highest documented percentage of all racial-gender groups at 38.2 percent (Table 6-1).

Table 6-1. Number and the Percentage of Nursing Home Residents with Stroke,[1] Ohio 1999.

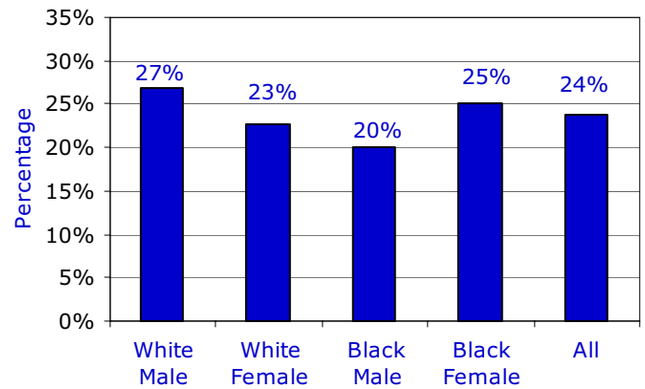
Race	Age Group (Years)	Male			Female			All		
		Number of Residents with Stroke[1]	Number of Residents	Percentage of Residents with Stroke[1]	Number of Residents with Stroke[1]	Number of Residents	Percentage of Residents with Stroke[1]	Number of Residents with Stroke[1]	Number of Residents	Percentage of Residents with Stroke[1]
White	0-34	30	517	5.8%	49	454	10.8%	79	971	8.1%
	35-44	67	934	7.2%	73	720	10.1%	140	1,654	8.5%
	45-54	256	1,811	14.1%	225	1,802	12.5%	481	3,613	13.3%
	55-64	723	3,218	22.5%	711	3,829	18.6%	1,434	7,047	20.3%
	65-74	2,341	9,109	25.7%	2,808	13,723	20.5%	5,149	22,832	22.6%
	75-84	4,774	17,396	27.4%	8,098	36,177	22.4%	12,872	53,573	24.0%
	85+	2,841	12,185	23.3%	9,316	45,187	20.6%	12,157	57,372	21.2%
	Total	**11,032**	**45,170**	**24.4%**	**21,280**	**101,892**	**20.9%**	**32,312**	**147,062**	**22.0%**
Black	0-34	17	168	10.1%	9	112	8.0%	26	280	9.3%
	35-44	34	318	10.7%	36	257	14.0%	70	575	12.2%
	45-54	136	604	22.5%	117	479	24.4%	253	1,083	23.4%
	55-64	300	821	36.5%	274	821	33.4%	574	1,642	35.0%
	65-74	620	1,621	38.2%	757	2,128	35.6%	1,377	3,749	36.7%
	75-84	679	1,885	36.0%	1,180	3,436	34.3%	1,859	5,321	34.9%
	85+	294	1,025	28.7%	949	3,458	27.4%	1,243	4,483	27.7%
	Total	**2,080**	**6,442**	**32.3%**	**3,322**	**10,691**	**31.1%**	**5,402**	**17,133**	**31.5%**
All[2]	0-34	47	699	6.7%	59	573	10.3%	106	1,272	8.3%
	35-44	102	1,282	8.0%	111	987	11.2%	213	2,269	9.4%
	45-54	395	2,437	16.2%	345	2,305	15.0%	740	4,742	15.6%
	55-64	1,037	4,095	25.3%	998	4,696	21.3%	2,035	8,791	23.1%
	65-74	2,996	10,840	27.6%	3,606	15,993	22.5%	6,602	26,833	24.6%
	75-84	5,506	19,427	28.3%	9,335	39,845	23.4%	14,841	59,272	25.0%
	85+	3,159	13,300	23.8%	10,323	48,886	21.1%	13,482	62,186	21.7%
	Total	**13,242**	**52,080**	**25.4%**	**24,777**	**113,285**	**21.9%**	**38,019**	**165,365**	**23.0%**

Source: Ohio Minimum Data Set
[1]Stroke was defined as cerebrovascular accident (stroke) checked in the disease diagnosis section of the Long-term Care Resident Assessment Tool, as a disease that has a relationship to current ADL status, mood and behavior status, medical treatments, nursing monitoring or risk of death.
[2]All categories includes all races.

Nursing Home Residents – Rehabilitation Therapy

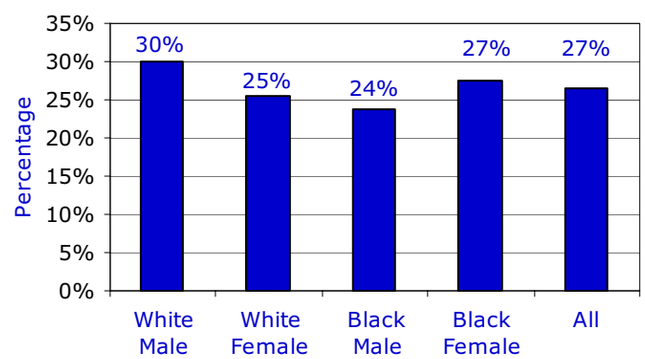
Overall, 24 percent of nursing home residents who had a stroke received occupational therapy. Twenty-seven percent of white males received occupational therapy compared to 20 percent of black males (Figure 6-1).

Figure 6-1. Percentage of Nursing Home Residents with Stroke[1] Who Received Occupational Therapy, Ohio 1999.[2]



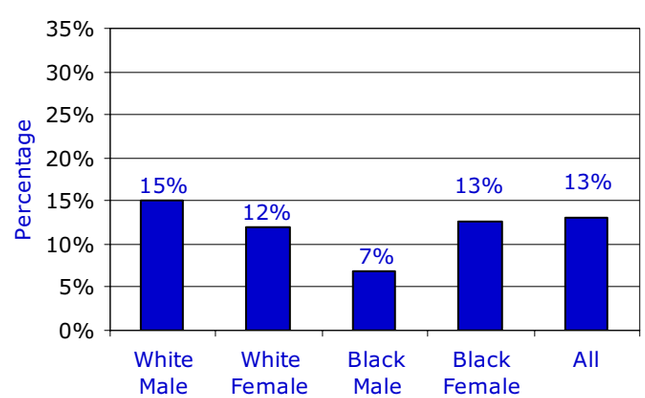
Twenty-seven percent of nursing home residents affected by a stroke received physical therapy. Thirty percent of white males received physical therapy compared to 24 percent of black males (Figure 6-2).

Figure 6-2 . Percentage of Nursing Home Residents with Stroke[1] Who Received Physical Therapy, Ohio 1999.[2]



Among nursing home residents who suffered a stroke, 13 percent received speech therapy. Fifteen percent of white males received speech therapy compared to 7 percent of black males (Figure 6-3).

Figure 6-3. Percentage of Nursing Home Residents with Stroke[1] Who Received Speech Therapy, Ohio 1999.[2]



Source: Ohio Minimum Data Set.
[1]Stroke was defined as cerebrovascular accident (stroke) checked in the disease diagnosis section of the Long-term Care Resident Assessment Tool, as a disease that has a relationship to current ADL status, mood and behavior status, medical treatments, nursing monitoring or risk of death.
[2]All categories includes all races.

Nursing Home Residents – Discharge Status

Of the more than 38,000 nursing home residents with stroke, 34 percent (13,027) had at least one assessment completed in 1999 with a discharge status identified. The majority of residents were discharged to an acute care hospital. During 1999, 2,981 residents (7.8 percent) with stroke died while residing in a nursing home. Less than 3 percent of residents (370 residents) with stroke were discharged to a private home with no home health services (Figure 6-4,Table 6-2).

Figure 6-4. Percentage of Nursing Home Residents with Stroke[1] by Discharge Status,[2] Ohio 1999.

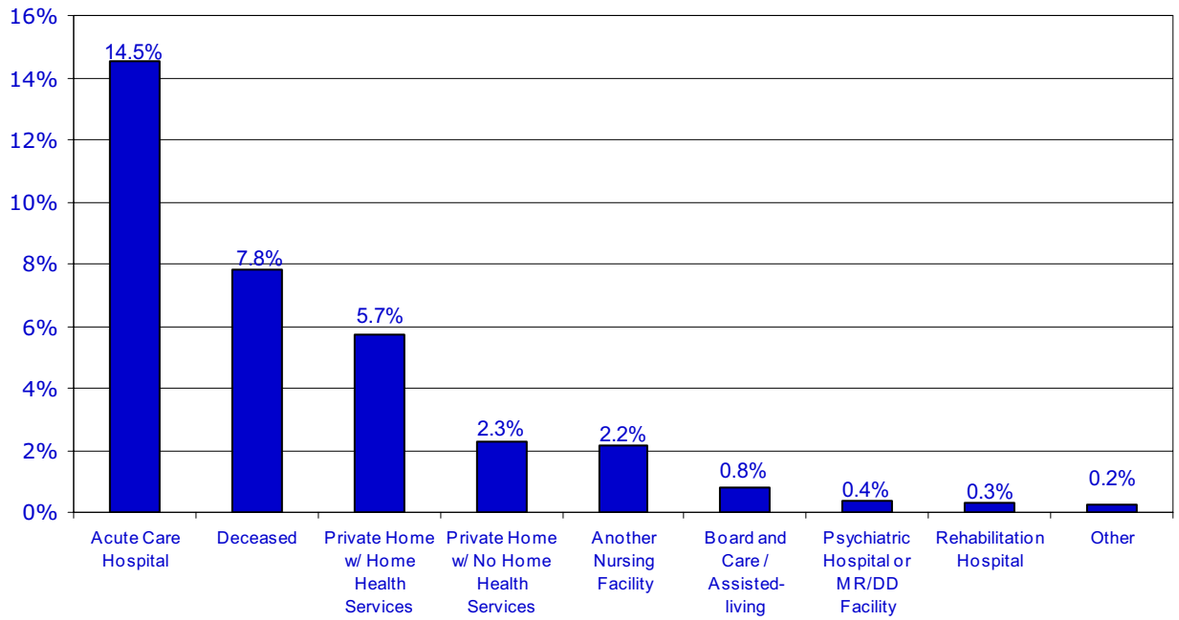


Table 6-2. Number and Percentage of Nursing Home Residents with Stroke[1] by Discharge Status,[2] Ohio 1999.

Discharge Status	Male		Female		All	
	Number of Residents with Stroke[1]	Percentage	Number of Residents with Stroke[1]	Percentage	Number of Residents with Stroke[1]	Percentage
Acute Care Hospital	2,067	15.6%	3,452	13.9%	5,519	14.5%
Deceased	1,072	8.1%	1,909	7.7%	2,981	7.8%
Private Home w/ Home Health Services	888	6.7%	1,282	5.2%	2,170	5.7%
Private Home w/ No Home Health Services	370	2.8%	497	2.0%	867	2.3%
Another Nursing Facility	276	2.1%	553	2.2%	829	2.2%
Board and Care/Assisted-Living	89	0.7%	224	0.9%	313	0.8%
Psychiatric Hospital, MR/DD Facility	73	0.6%	63	0.3%	136	0.4%
Rehabilitation Hospital	62	0.5%	62	0.3%	124	0.3%
Other	36	0.3%	52	0.2%	88	0.2%

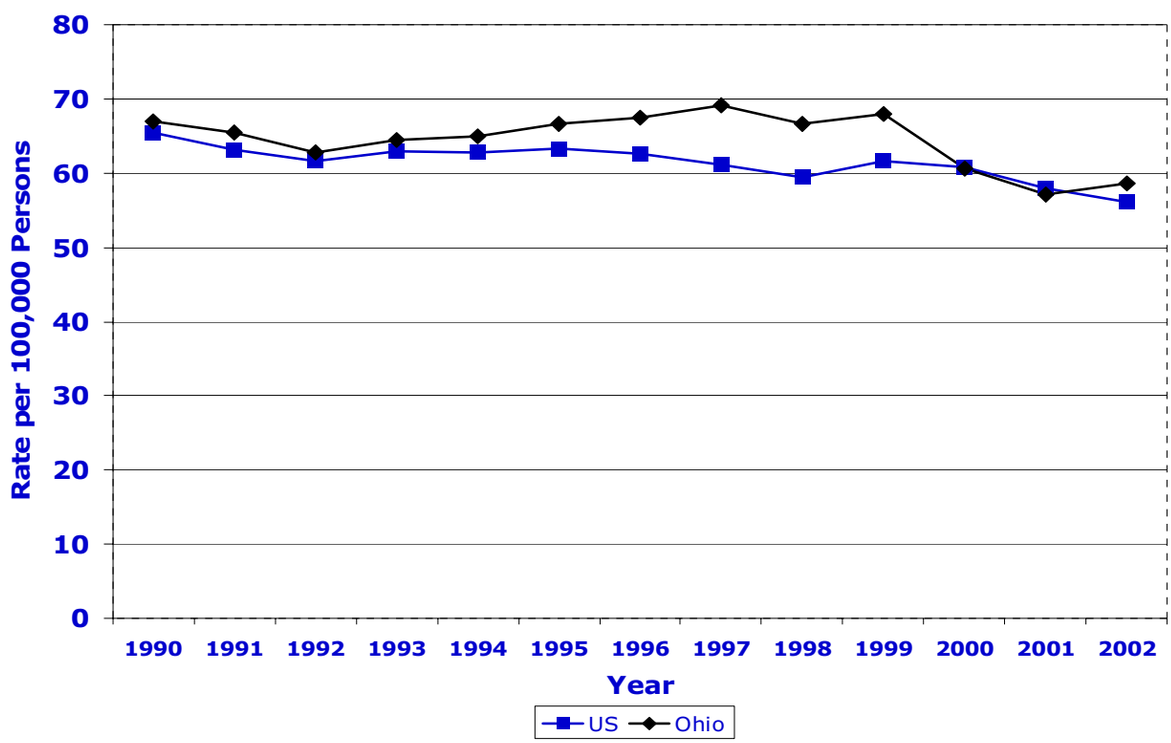
Source: Ohio Minimum Data Set.
[1]Stroke was defined as cerebrovascular accident (stroke) checked in the disease diagnosis section of the Long-term Care Resident Assessment Tool, as a disease that has a relationship to current Activity Daily Limit status, mood and behavior status, medical treatments, nursing monitoring or risk of death.

Stroke Mortality

CHAPTER 7

In 2002, stroke remained the third-leading cause of death in both the United States and Ohio. Ohio's mortality rates over time have been slightly higher than U.S. mortality rates. Between 1990-2002, the overall stroke mortality rate for Ohio has decreased by 12 percent from 67 to 58.7 per 100,000 persons compared to the U.S. mortality rate, which decreased by 15 percent during that same time period. (Figure 7-1, Appendix B-16).

Figure 7-1. Age-adjusted Mortality Rates for Stroke[1] per 100,000 Persons, Ohio[2] with Comparison to United States[3] 1990-2002.

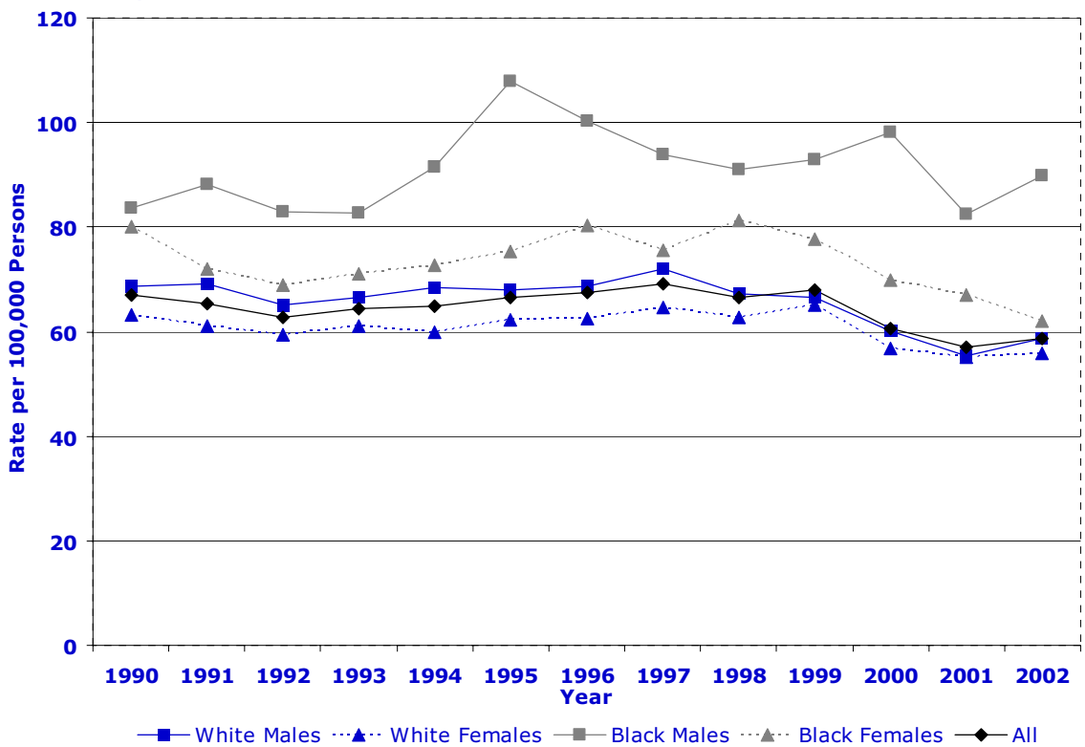


Source: Chronic Disease and Behavioral Epidemiology, Ohio Department of Health.
[1]Stroke was define as Stroke:ICD-09 codes 430-438 for 1990-1998 deaths and ICD-10 codes I60-I69 for 1999-2002 deaths.
[2]The direct age-adjusted rates were calculated using the inter-censal estimates for 1990-1999 (July 1), bridged race census estimates for 2000 (April 1) and the bridged race post-censal estimates for 2001-2002 (July 1) as a denominator and to U.S. 2000 standard population for age adjustment.
[3]CDC Wonder.

Stroke Mortality by Race and Gender

The age-adjusted stroke mortality rates for all racial-gender groups decreased between 1990-2002, except for black males. The mortality rate for black males rose by 8 percent from 83.6 to 89.9 per 100,000 persons. The mortality rate for black females had the largest decrease (23 percent). Disparities between race and gender are apparent by the comparison of mortality rates. The mortality rate for black males was 53 percent higher compared to white males (Figure 7-2). Although black females had the largest decline in mortality rates during this period; their rate in 2002 was 11 percent higher than the mortality rate for white females (Figure 7-2, Appendix B-16).

Figure 7-2. Age-adjusted Mortality Rates for Stroke per 100,000 Persons, by Race and Gender, Ohio 1990-2002.[1,2]

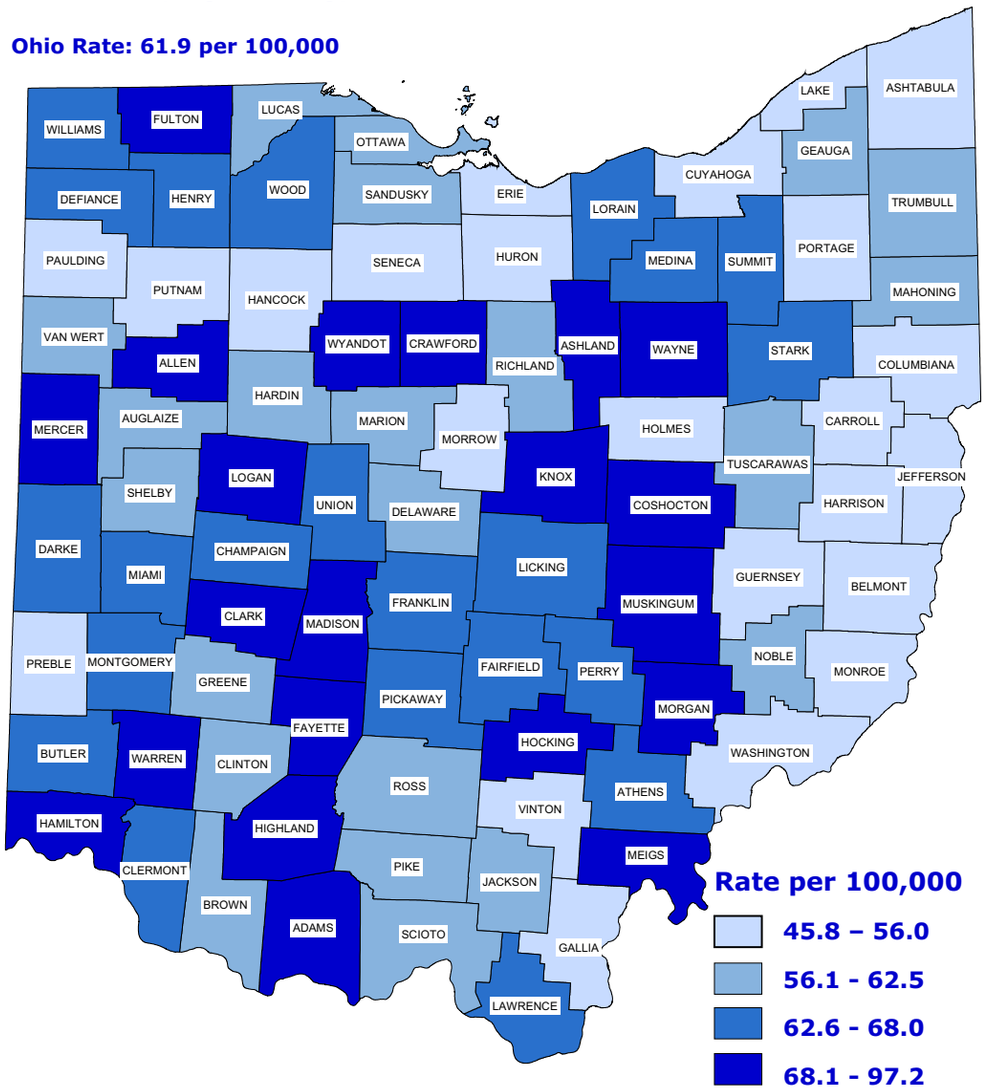


Source: Chronic Disease and Behavioral Epidemiology, Ohio Department of Health.
[1]Stroke was define as Stroke: ICD-09 codes 430-438 for 1990-1998 deaths and ICD-10 codes I60-I69 for 1999-2002 deaths.
[2]The direct age-adjusted rates were calculated using the inter-censal estimates for 1990-1999 (July 1), bridged race census estimates for 2000 (April 1) and the bridged race post-censal estimates for 2001-2002 (July 1) as a denominator and to the U.S. 2000 standard population for age adjustment.

Stroke Mortality by County

The average annual age-adjusted stroke mortality rate for Ohio was 62.1 per 100,000 persons for the five-year period of 1998-2002. The mortality rates among Ohio's 88 counties ranged from a high of 97.2 per 100,000 persons for Fayette County to a low of 45.8 for Seneca County. Mortality rates tended to be higher for counties in central and southwest Ohio (Figure 7-3, Appendix C-3).

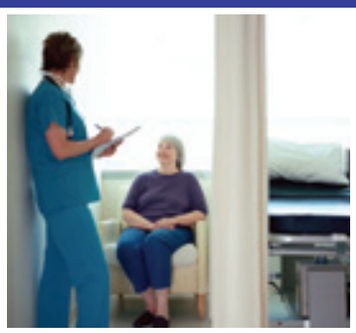
Figure 7-3. Average Annual Age-adjusted Stroke Mortality Rate per 100,000 Persons, by County, Ohio 1998-2002.[1,2]



Source: Chronic Disease and Behavioral Epidemiology, Ohio Department of Health.
[1]Stroke was define as Stroke: ICD-09 codes 430-438 for 1998 deaths andICD-10 codes I60-I69 for 1999-2002 deaths.
[2]The direct age-adjusted rates were calculated using the inter-censal estimates for 1998-1999 (July 1), bridged race census estimates for 2000 (April 1) and the bridged race post-censal estimates for 2001-2002 (July 1) as a denominator and to the U.S. 2000 standard population for age adjustment.

Description of Databases

APPENDIX A



Description of Databases

The following seven databases were analyzed by the Chronic Disease and Behavioral Epidemiology Section, Bureau of Health Surveillance, Division of Prevention, Ohio Department of Health.

Behavioral Risk Factor Surveillance System (BRFSS):

The BRFSS is an ongoing, population-based, statewide, random-digit-dialed telephone survey of adults 18 years of age and older for the U.S. non-institutionalized civilian population. The survey is coordinated by the Centers for Disease Control and Prevention (CDC) and is conducted annually by all states. Ohio BRFSS data collected for the years 2001 and 2003-2004 were analyzed for this report. A person was considered to have had a stroke if they answered yes to the question: "Has a doctor, nurse or other health professional ever told you that you had a stroke?"

The following variables were analyzed in the BRFSS: age, gender, race, fruit and vegetable consumption, high cholesterol, high blood pressure, physical activity, cigarette smoking, Body Mass Index (BMI) and diabetes. The results of the two modules for cardiovascular health and heart attack and stroke symptom awareness were also presented. These variables included prevention of stroke and heart attack through reduction of risk factors (increased fruit and vegetable consumption, reduction in high-fat and high-cholesterol foods and increased physical activity). Also, the frequency of a doctor advising the person to take action to reduce risk factors was also analyzed. Stroke symptom awareness was measured by the respondent answering "yes" to the following questions: 1)"Which of the following do you think is a symptom of a stroke. For each, tell me Yes, No or Not Sure."

a. "Do you think sudden confusion or trouble speaking are symptoms of a stroke?"
b. "Do you think sudden numbness or weakness of face, arm or leg; especially on one side, are symptoms of a stroke?"
c. "Do you think sudden trouble seeing in one or both eyes is a symptom of a stroke?"
d. "Do you think sudden trouble walking, dizziness or loss of balance are symptoms of a stroke?"
e. "Do you think severe headache with no known cause is a symptom of a stroke?"

The response of calling 911 to someone having a heart attack or stroke was measured by answering "call 911" to the following question: "If you thought someone was having a heart attack or a stroke, what is the first thing you would do?"

a. "Take them to the hospital."
b. "Tell them to call their doctor."
c. "Call 911."
d. "Call their spouse or a family member."
e. "Do something else."

f. "Don't know/Not sure."
g. "Refused."

The prevalence estimates were adjusted to: 1) probability of selection, i.e. the number of different phone numbers that reach the household, the number of adults in each household and the number of completed interviews in each cluster; and 2) demographic distribution, i.e. age, sex and race. The "Don't know/Not sure" respondents were excluded from the analysis except for questions measuring knowledge of stroke symptoms and response to someone having a stroke. The respondents who "Refused" to answer were excluded from all analyses. All analyses were completed using SAS version 9 (SAS Institute, Cary, N.C.) and SUDAAN version 9 (Research Triangle Institute, Research Triangle Park, N.C.).

Emergency Medical Services (EMS)

The suspected stroke EMS transport data were obtained from the Emergency Medical Services Incident Reporting System (EMSIRS) at the Ohio Department of Public Safety (ODPS). Suspected stroke transports for 2004 were defined by the following provider assessment codes: 1) 0401 CVA/Stroke; 2) 0402 TIA ;3) 0403 Numbness/Tingling (paresthesia); 4) 0404 Paralysis (loss of motion, unknown origin). This definition of a suspected stroke was used under advisement of the Ohio EMS because confirmation of a diagnosis of stroke is possible only at an equipped medical facility and EMS personnel are trained to respond the same way to each of the assessment codes as if the patient were having a possible stroke. The variables analyzed were gender, age, county of transport (where the event happened not the individual's county of residence), transport times of dispatch to the scene, from scene to the hospital and total transport time (including time spent at the scene) in minutes. All analysis was completed by the EMS Data Center, ODPS.

Ohio Hospital Discharge Data

The hospital discharge data were collected and provided to the ODH Chronic Disease and Behavioral Epidemiology Section by the Ohio Hospital Association. The data collected between 1999–2003 were analyzed for this report. Stroke was defined by the following range of ICD-9-CM Codes: Cerebrovascular Disease (Stroke) 430–438.

The variables analyzed included length of stay (days), age, gender, county of residence, charges (dollars) and primary payor. Hospital discharges with stroke listed in any diagnosis field and hospital discharges with stroke listed in the principal diagnosis field were analyzed. Hospital discharges with invalid birthdates, ages, unknown gender and lengths of stay more than 365 days were excluded from analysis. All analyses were performed using SAS version 9 (SAS Institute, Cary, N.C.).

Specific analysis by type of stroke was also completed using the ICD-9-CM codes: Ischemic Stroke was defined by the following ICD-9-CM codes:

1) 433.01 Occlusion and stenosis of basilar artery with cerebral infarction

2) 433.11 Occlusion and stenosis of carotid artery with cerebral infarction
3) 433.31 Occlusion and stenosis of vertebral artery with cerebral infarction
4) 433.81 Occlusion and stenosis of other specified precerebral artery with cerebral infarction
5) 433.91 Occlusion and stenosis of unspecified precerebral artery with cerebral infarction
6) 434.00 Cerebral thrombosis without mention of cerebral infarction
7) 434.01 Cerebral thrombosis with cerebral infarction
8) 434.11 Cerebral embolism with cerebral infarction
9) 434.91 Cerebral artery occlusion unspecified with cerebral infarction
10) 436 Acute, but ill-defined, cerebrovascular disease

Hemorrhagic Stroke was defined by the following ICD-9-CM codes:

1) 430 Subarachnoid hemorrhage
2) 431 Intracerebral hemorrhage
3) 432 Other and Unspecified intracranial hemorrhage
4) 432.0 Nontraumatic extradural hemorrhage
5) 432.1 Subdural hemorrhage
6) 432.9 Unspecified intracranial hemorrhage

Transient Ischemic Attack (TIA) was defined by ICD-9-CM code: 435 Transient cerebral ischemia.

To calculate the number of discharges with a Cardiac Endarterectomy listed as a surgical procedure, hospital discharges with any listed diagnosis of Disease of the Circulatory System ICD-9-CM codes 390-459 and Cardiac Endarterectomy surgical procedure code 38.12 listed in any of the six procedure code fields were analyzed.

Two different methods were used to calculate hospital discharge rates. In the first method, rates were calculated by using the estimate for Ohio's resident population as the denominator (crude rate). In the second method, rates were calculated and age-adjusted using the direct method to the U.S. 2000 standard population. Both rates were calculated as the number of hospital discharges per 10,000 persons. The Ohio resident population was obtained from the U.S. Census Bureau, using the intercensal 1999, censal 2000 population estimates and the 2001-2003 intercensal estimates.

Ohio Prototype Paul Coverdell Stroke Registry

Ohio Prototype for the Paul Coverdell Acute Stroke Registry collected inpatient chart data from a statewide sample of 36 hospitals during November and December 2001. The statewide registry is housed and coordinated by the University of Cincinnati (UC). The following data elements were collected and analyzed by the UC Stroke Center: age, race, gender, type of stroke, length of stay, tPA administration, selected stroke management measures, complications, medications at discharge and discharge status.

Ohio Medicaid Program

The stroke Medicaid data were obtained from the Ohio Department of Job and

Family Services (ODJFS), Office of Ohio Health Plans' Bureau of Health Plan Policy. Data for Ohio's Fiscal Year (FY) 2003, which included the period from July 2002 through June 2003 were analyzed.

Stroke was defined by the following range of ICD-9-CM Codes: cerebrovascular disease stroke (430–438) listed as primary or secondary diagnosis in the claim record. The variables analyzed included age; gender; race; county of residence; Medicare eligibility and expenditures related to: ambulance, prescriptions, durable medical equipment, inpatient care, intermediate care facilities for the mentally retarded, skilled nursing home, outpatient care, physicians, clinic, hospice, home health, private nursing, nursing home therapy, physical therapy and others (mental health, PACE, physiological laboratory, vision, family planning, waiver services, dental, optometry , podiatrist, federally qualified health centers, rural health, independent labs and speech therapy). Only the expenditures of individuals part of the "Fee for Service" system were included in the analysis. The Fee for Service program is the traditional Medicaid payment program in which the Medicaid Program pays for the individual claims for the eligible versus the Managed Care system. In the Managed Care system ODJFS contracts with private managed care plans to provide services for eligibles.[19]

Ohio Nursing Home Data-Ohio Minimum Data Set

Nursing facilities (NFs), skilled nursing facilities (SNFs) and hospital skilled nursing units (SNUs) certified to participate in the Medicare or Medicaid programs are required by federal regulation to conduct comprehensive, accurate, standardized and reproducible assessments of each resident's functional capacity using a Resident Assessment Instrument (RAI). The RAI consists of the minimum data set (MDS), resident assessment protocols (RAPS) and Triggers.

The Ohio Minimum Data Set is located in the Division of Quality Assurance, Ohio Department of Health. The data collected in 1999 are reported by all long-term care nursing homes using the Long-Term Care Resident Assessment Instrument. Stroke was defined as cerebrovascular accident (stroke) indicated in Section I. on any of the assessment forms at least once for that resident. The resident was determined to have received speech therapy, occupational or physical therapy if the specific therapy was indicated in Section P of any assessment form. The variables of age, race and gender were analyzed.

Mortality

All deaths between 1990 through 2002 (numerator) were identified through the population-based, computerized database maintained by the Office of Vital Statistics, Ohio Department of Health. Any person who had cerebrovascular disease (stroke), listed on their death certificate as an underlying cause of death was included in the analysis. Stroke was defined by the following ICD-9 codes for deaths certificates for years 1990-1998: cerebrovascular disease (stroke) ICD-9 (430-438); for deaths in 1999-2002: ICD-10 codes I60-I69 were used. The Ohio intercensal estimates for 1997-1999 (July 1), bridged race census estimates for 2000 (April 1) and the bridged race post-censal estimates for 2001-2002 (July 1)

from the U.S. Bureau of Census were used as the denominator.

Two methods of calculating mortality rates were used. Direct age-adjusted mortality rates were calculated for different race and gender groups (white male, black male, white female, black female and all) for all 13 years between 1990–2002. Average annual direct age-adjusted rates were calculated for Ohio's 88 counties for the five-year period, 1998–2002. Because some Ohio counties had a relatively small number of residents, and thus a small number of stroke deaths, five years of data were combined to obtain a sufficiently large sample for analysis. Both rates were age-adjusted using the U.S. 2000 standard population and calculated per 100,000 persons.

The U.S. stroke mortality rates were obtained from CDC Wonder.
For years 1990-1998: Centers for Disease Control and Prevention. Available from http://wonder.cdc.gov/wonder/cgi-bin/asp/MortRates.asp?ARCHIVE=&FPS1=00000&SFPS1=00000&CDB1=430&CDE1=438&CDB2=&CDE2=&CDB3=&CDE3=&CDB4=&CDE4=&CDB5=&CDE5=&CDB6=&CDE6=&CDB7=&CDE7=&CDB8=&CDE8=&CDB9=&CDE9=&CDBA=&CDEA=&RCE1=All&GND1=All&AGB1=01Under+1+day&AGE2=17Unknown&YRB1=1990&YRE2=1998&AART=ON&SYER=2000&NSYER=&SRCE=All&SGEN=All&BYV1=Year&BYV2=&SRT1=NON&ReturnAs=HTML&RETURNZERO=1&Comment=Compressed+Mortality&comprate=100000&BUTTON=Send (accessed 2006 February 21)

For years 1999-2002: Centers for Disease Control and Prevention. Available from http://wonder.cdc.gov/wonder/cgi-bin/asp/MortRates.asp?ARCHIVE=&FPS1=00000&SFPS1=00000&CDB1=i60&CDE1=i69&CDB2=&CDE2=&CDB3=&CDE3=&CDB4=&CDE4=&CDB5=&CDE5=&CDB6=&CDE6=&CDB7=&CDE7=&CDB8=&CDE8=&CDB9=&CDE9=&CDBA=&CDEA=&RCE1=All&GND1=All&AGB1=01Under+1+day&AGE2=17Unknown&YRB1=1999&YRE2=2002&AART=ON&SYER=2000&NSYER=&SRCE=All&SGEN=All&BYV1=Year&BYV2=&SRT1=NON&ReturnAs=HTML&RETURNZERO=1&comprate=100000&Comment=Compressed+Mortality&BUTTON=Send (accessed 2006 February 21)

Additional State Level Analyses

APPENDIX B

Table B-1. Prevalence of Adults with Established Disease Stroke Risk Factors by Gender, Ohio 2001 and 2003-2004.[1,2,3,4]					
Risk Factor	**Gender**	**Prevalence (%)**	**95 % C.I.**		
High Blood Pressure	Male	26.7	24.9	-	28.4
	Female	27.2	25.9	-	28.6
	Total	27.0	25.9	-	28.0
High Cholesterol	Male	36.7	34.6	-	38.8
	Female	32.6	31.0	-	34.3
	Total	34.5	33.2	-	35.8
Diabetes	Male	8.2	7.2	-	9.2
	Female	7.7	6.9	-	8.5
	Total	8.0	7.3	-	8.6

Source: Ohio Behavioral Risk Factor Surveillance System, Chronic Disease and Behavioral Epidemiology Section BHSIOS-Prevention, Ohio Department of Health.
[1]The weighted percentage was adjusted to: 1) probability of selection, i.e. the number of different phone numbers that reached the household, the number of adults in each household and the number of completed interviews in each cluster; 2) demographic distribution, i.e. age, sex and race.
[2] "Don't know/Not sure" and "Refused" were excluded from the denominator.
[3]High Blood Pressure prevalence does not include women who were told they had high blood pressure only while pregnant for 2003-2004 data.
[4]For adults 18 years and older.

Table B-2. Prevalence of Adults with Behavioral Stroke Risk Factors by Gender, Ohio 2001 and 2003-2004.[1,2,3,4,5,6,7,8]					
Risk Factor	**Gender**	**Prevalence (%)**	**95 % C.I.**		
Current Smokers	Male	27.7	25.9	-	29.5
	Female	24.9	23.5	-	26.3
	Total	26.2	25.1	-	27.3
Obesity	Male	25.7	24.0	-	27.4
	Female	22.7	21.4	-	24.0
	Total	24.2	23.1	-	25.3
No Physical Activity	Male	22.2	20.6	-	23.8
	Female	27.9	26.5	-	29.3
	Total	25.2	24.1	-	26.2
Low Fruit and Vegetable Consumption	Male	79.3	77.4	-	81.2
	Female	70.6	69.0	-	72.3
	Total	74.8	73.5	-	76.0

Source: Ohio Behavioral Risk Factor Surveillance System, Chronic Disease and Behavioral Epidemiology Section BHSIOS-Prevention, Ohio Department of Health.
[1]The weighted percentage was adjusted to: 1) probability of selection, i.e. the number of different phone numbers that reached the household, the number of adults in each household and the number of completed interviews in each cluster; 2) demographic distribution, i.e. age, sex and race.
[2] "Don't know/Not sure" and "Refused" were excluded from the denominator.
[3]Current Smoker was defined as someone who smoked at least 100 cigarettes in their lifetime and now smokes every day or some days.
[4]Obesity was defined as BMI≥30.
[5]Physical Inactivity is defined as no leisure time physical activity or exercise in the last 30 days.
[6]Low Fruit and Vegetable Consumption is defined as consuming less than 5 servings of fruits or vegetables a day.
[7]Low Fruit and Vegetable Consumption prevalence only includes data from 2001 and 2003.
[8]For adults 18 years and older.

Table B-3. Percentage of Adults Attempting to Lower Their Risk for Stroke and Heart Disease with Diet and Physical Activity by Gender, Ohio 2001 and 2003-2004.[1,2,3]					
Risk Factor	**Gender**	**Percent (%)**	**95 % C.I.**		
Eating More Fruits and Vegetables	Male	70.8	68.9	-	72.6
	Female	82.0	80.8	-	83.2
	Total	76.7	75.6	-	77.7
Eating Fewer High-Fat and High-Cholesterol Foods	Male	60.3	58.3	-	62.3
	Female	70.0	68.5	-	71.5
	Total	65.4	64.2	-	66.7
Participating in More Physical Activity	Male	68.4	66.5	-	70.3
	Female	67.9	66.5	-	69.4
	Total	68.2	67.0	-	69.3

Table B-4. Percentage of Adults Advised by Their Doctor to Attempt to Lower Their Risk of Heart Disease and Stroke with Diet and Physical Activity by Gender, Ohio 2001 and 2003-2004.[1,2,3]					
Risk Factor	**Gender**	**Percent (%)**	**95 % C.I.**		
Eat More Fruits and Vegetables	Male	30.0	28.1	-	31.8
	Female	32.0	30.5	-	33.5
	Total	31.0	29.9	-	32.2
Eat Fewer High-Fat and High-Cholesterol Foods	Male	21.1	19.4	-	22.7
	Female	22.5	21.2	-	23.8
	Total	21.8	0.5	-	22.9
Participate in more physical Activity	Male	32.2	30.3	-	34.1
	Female	33.8	32.3	-	35.3
	Total	33.0	31.9	-	34.2

Table B-5. Prevalence of Stroke by Race and Gender, Ohio 2001 and 2003-2004.[1,2,3]					
Race	**Gender**	**Prevalence(%)**	**95 % C.I.**		
White	Male	2.2	1.7	-	2.7
	Female	2.8	2.3	-	3.3
	Total	2.5	2.1	-	2.9
Black	Male	3.8	1.3	-	6.2
	Female	5.2	2.8	-	7.7
	Total	4.6	2.9	-	6.4
All	Male	2.3	1.8	-	2.9
	Female	2.9	2.4	-	3.4
	Total	2.6	2.3	-	3.0

Source: Ohio Behavioral Risk Factor Surveillance System, Chronic Disease and Behavioral Epidemiology Section BHSIOS-Prevention, Ohio Department of Health.
[1]The weighted percentage was adjusted to: 1) probability of selection, i.e. the number of different phone numbers that reached the household, the number of adults in each household and the number of completed interviews in each cluster; 2) demographic distribution, i.e. age, sex and race.
[2] "Don't know/Not sure" and "Refused" were excluded from the denominator.
[3] For adults 18 years and older.

Table B-6. Prevalence of Stroke by Age Group, Ohio 2001 and 2003-2004.[1,2,3]				
Age Group	**Prevalence (%)**	**95 % C.I.**		
18-34	0.7	0.3	-	1.1
35-54	1.1	0.8	-	1.5
55-64	4.6	3.2	-	6.0
65-74	6.0	4.2	-	7.8
75-84	9.3	6.9	-	11.6
85+	9.2	4.3	-	14.2
All	2.6	2.3	-	3.0

Source: Ohio Behavioral Risk Factor Surveillance System, Chronic Disease and Behavioral Epidemiology Section BHSIOS-Prevention, Ohio Department of Health.
[1]The weighted percentage was adjusted to: 1) probability of selection, i.e. the number of different phone numbers that reached the household, the number of adults in each household and the number of completed interviews in each cluster; 2) demographic distribution, i.e. age, sex and race.
[2] "Don't know/Not sure" and "Refused" were excluded from the denominator.
[3] For adults 18 years and older.

Table B-7. Percentage of Adults Who Received Post-Stroke Outpatient Rehabilitation by Gender, Ohio 2001, 2003 and 2004.[1,2,3,4]				
Gender	**Percent (%)**	**95 % C.I.**		
Male	37.0	26.0	-	48.0
Female	24.5	17.3	-	31.7
Total	29.7	23.4	-	36.0

Source: Ohio Behavioral Risk Factor Surveillance System, Chronic Disease and Behavioral Epidemiology Section BHSIOS-Prevention, Ohio Department of Health.
[1]The weighted percentage was adjusted to: 1) probability of selection, i.e. the number of different phone numbers that reached the household, the number of adults in each household and the number of completed interviews in each cluster; 2) demographic distribution, i.e. age, sex and race.
[2]"Don't know/Not sure" and "Refused" were excluded from the denominator.
[3]For adults 18 years and older.
[4]Respondents reported being told by a doctor, nurse or other health care professional that they had a stroke.

Table B-8. Percentage of Adults Reporting Any Limitation in Activities Caused by Physical, Mental, or Emotional Problems, by Stroke Status, Ohio 2001 and 2003-2004.[1,2,3,4]				
Stroke Status	**Percent (%)**	**95 % C.I.**		
Ever Had a Stroke	52.6	45.6	-	59.5
Never Had a Stroke	15.9	15.0	-	16.8

Source: Ohio Behavioral Risk Factor Surveillance System, Chronic Disease and Behavioral Epidemiology Section BHSIOS-Prevention, Ohio Department of Health.
[1]The weighted percentage was adjusted to: 1) probability of selection, i.e. the number of different phone numbers that reached the household, the number of adults in each household and the number of completed interviews in each cluster; 2) demographic distribution, i.e. age, sex and race.
[2]"Don't know/Not sure" and "Refused" were excluded from the denominator.
[3]For adults 18 years and older.
[4]Ever had a stroke was defined as: Respondents reported being told by a doctor, nurse or other health care professional that they had a stroke.

Table B-9. Percentage of Adults Who Recognized All Five Symptoms of Stroke and To Call 911 as the First Response to Someone Having a Heart Attack or Stroke by Race and Gender, Ohio 2001 and 2003-2004.[1,2,3]					
Race	**Gender**	**Percent (%)**	**95 % C.I.**		
White	Male	35.9	33.9	-	38.0
	Female	43.9	42.1	-	45.6
	Total	40.1	38.7	-	41.4
Black	Male	23.5	18.0	-	29.1
	Female	28.8	24.6	-	33.1
	Total	26.6	23.2	-	30.0
All	Male	34.1	32.2	-	36.0
	Female	41.7	40.1	-	43.3
	Total	38.1	36.9	-	39.3

Table B-10. Percentage of Adults Who Recognized Sudden Numbness or Weakness of Face, Arm or Leg (Especially on One Side) as a Symptom of Stroke by Race and Gender, Ohio 2001 and 2003-2004.[1,2,3]					
Race	**Gender**	**Percent (%)**	**95 % C.I.**		
White	Male	93.2	92.0	-	94.4
	Female	96.0	95.2	-	96.7
	Total	94.7	94.0	-	95.4
Black	Male	85.8	80.2	-	91.4
	Female	93.0	91.0	-	95.1
	Total	90.1	87.4	-	92.7
All	Male	92.1	91.0	-	93.3
	Female	95.3	94.7	-	96.0
	Total	93.8	93.1	-	94.5

Table B-11. Percentage of Adults Who Recognized Sudden Confusion or Trouble Speaking as a Symptom of Stroke by Race and Gender, Ohio 2001 and 2003-2004.[1,2,3]					
Race	**Gender**	**Percent (%)**	**95 % C.I.**		
White	Male	85.6	84.0	-	87.1
	Female	92.3	91.3	-	93.3
	Total	89.1	88.2	-	90.0
Black	Male	68.9	61.8	-	76.0
	Female	83.2	79.7	-	86.6
	Total	77.3	73.5	-	81.0
All	Male	83.0	81.4	-	84.6
	Female	91.1	90.1	-	92.0
	Total	87.2	86.3	-	88.1

Source: Ohio Behavioral Risk Factor Surveillance System, Chronic Disease and Behavioral Epidemiology Section BHSIOS-Prevention, Ohio Department of Health.
[1]The weighted percentage was adjusted to: 1) probability of selection, i.e. the number of different phone numbers that reached the household, the number of adults in each household and the number of completed interviews in each cluster; 2) demographic distribution, i.e. age, sex and race.
[2]"Refused" were excluded from the denominator.
[3] For adults 18 years and older.

Table B-12. Percentage of Adults Who Recognized Sudden Trouble Walking, Dizziness or Loss of Balance as a Symptom of Stroke by Race and Gender, Ohio 2001 and 2003-2004.[1,2,3]					
Race	**Gender**	**Percent (%)**	**95 % C.I.**		
White	Male	83.4	81.8	-	85.1
	Female	86.9	86.3	-	87.6
	Total	85.2	84.2	-	86.3
Black	Male	74.5	67.9	-	81.1
	Female	78.6	74.8	-	82.5
	Total	76.9	73.4	-	80.5
All	Male	81.9	80.3	-	83.5
	Female	85.8	84.7	-	86.9
	Total	84.0	83.0	-	84.9

Table B-13. Percentage of Adults Who Recognized Sudden Trouble Seeing in One or Both Eyes as a Symptom of Stroke by Race and Gender, Ohio 2001 and 2003-2004.[1,2,3]					
Race	**Gender**	**Percent (%)**	**95 % C.I.**		
White	Male	65.6	63.5	-	67.6
	Female	68.6	67.7	-	69.4
	Total	67.1	65.8	-	68.4
Black	Male	55.4	48.3	-	62.6
	Female	56.8	52.2	-	61.4
	Total	56.2	52.2	-	60.2
All	Male	64.2	62.3	-	66.2
	Female	67.0	65.5	-	68.5
	Total	65.7	64.5	-	66.9

Table B-14. Percentage of Adults Who Recognized Severe Headache with Unknown Cause as a Symptom of Stroke by Race and Gender, Ohio 2001 and 2003-2004.[1,2,3]					
Race	**Gender**	**Percent (%)**	**95 % C.I.**		
White	Male	53.8	51.6	-	55.9
	Female	63.5	61.8	-	65.2
	Total	58.9	57.5	-	60.2
Black	Male	44.5	37.6	-	51.5
	Female	51.6	46.9	-	56.3
	Total	48.7	44.7	-	52.7
All	Male	52.5	50.5	-	54.5
	Female	61.7	60.2	-	63.3
	Total	57.3	56.0	-	58.6

Source: Ohio Behavioral Risk Factor Surveillance System, Chronic Disease and Behavioral Epidemiology Section BHSIOS-Prevention, Ohio Department of Health.
[1]The weighted percentage was adjusted to: 1) probability of selection, i.e. the number of different phone numbers that reached the household, the number of adults in each household and the number of completed interviews in each cluster; 2) demographic distribution, i.e. age, sex and race.
[2]"Refused" were excluded from the denominator.
[3] For adults 18 years and older.

Table B-15. Percentage of Adults Who Recognized Calling 911 as the First Response to Someone Having a Stroke or Heart Attack by Race and Gender, Ohio 2001 and 2003-2004.[1,2,3]					
Race	**Gender**	**Percent (%)**	**95 % C.I.**		
White	Male	87.5	86.0	-	89.0
	Female	89.6	88.6	-	90.6
	Total	88.6	87.7	-	89.5
Black	Male	80.8	75.2	-	86.3
	Female	87.1	83.6	-	90.7
	Total	84.5	81.4	-	87.6
All	Male	86.4	84.9	-	87.8
	Female	89.0	88.0	-	90.0
	Total	87.8	86.9	-	88.6

Source: Ohio Behavioral Risk Factor Surveillance System, Chronic Disease and Behavioral Epidemiology Section BHSIOS-Prevention, Ohio Department of Health.
[1]The weighted percentage was adjusted to: 1) probability of selection, i.e. the number of different phone numbers that reached the household, the number of adults in each household and the number of completed interviews in each cluster; 2) demographic distribution, i.e. age, sex and race.
[2]"Refused" were excluded from the denominator.
[3] For adults 18 years and older.

Stroke Mortality

Table B-16. Number of Deaths and Age-adjusted Mortality Rates of Stroke per 100,000 Persons, by Race and Gender, Ohio 1990-2002.[1,2]										
	White				**Black**				**All**	
	Males		**Females**		**Males**		**Females**			
	Number of Deaths	**Rate**	**Number of Deaths**	**Rate**	**Number of Deaths**	**Rate**	**Number of Deaths**	**Rate**	**Number of Deaths**	**Rate**
1990	2,254	68.6	3,760	63.3	247	83.6	387	80.1	6,650	67.0
1991	2,295	69.1	3,706	61.0	279	88.1	352	72.1	6,646	65.4
1992	2,201	65.1	3,673	59.3	276	82.9	349	68.9	6,513	62.8
1993	2,292	66.5	3,870	61.0	259	82.6	369	71.0	6,802	64.4
1994	2,419	68.4	3,849	59.9	310	91.5	388	72.8	6,981	64.9
1995	2,438	67.9	4,049	62.2	358	107.9	409	75.4	7,272	66.6
1996	2,544	68.6	4,126	62.4	349	100.3	443	80.3	7,484	67.4
1997	2,670	71.9	4,330	64.7	328	93.8	427	75.6	7,780	69.1
1998	2,527	67.2	4,270	62.7	340	91.1	465	81.2	7,623	66.6
1999	2,566	66.5	4,493	65.2	329	93.0	457	77.8	7,880	67.9
2000	2,369	60.1	3,966	56.9	342	98.1	451	69.8	7,151	60.6
2001	2,224	55.3	3,886	55.1	305	82.5	406	67.1	6,846	57.1
2002	2,404	58.6	4,005	55.9	346	89.9	382	62.0	7,161	58.7

Source: Chronic Disease and Behavioral Epidemiology, Ohio Department of Health.
[1]Stroke was define as Stroke: ICD-09 codes 430-438 for 1990-1998 deaths and ICD-10 codes I60-I69 for 1999-2002 deaths.
[2]The direct age adjusted rates were calculated using the inter-censal estimates for 1990-1999 (July 1), bridged race census estimates for 2000 (April 1) and the bridged race post-censal estimates for 2001-2002 (July 1) as a denominator and to U.S. 2000 standard population for age-adjustment.

County Tables

APPENDIX C

Table C-1. Number of Suspected Stroke Transports Average Time (Minutes) to Scene, Average Time (Minutes) Scene to Hospital and Average Total Time (Minutes) by County/Region, Ohio 2004.

County	Number of Suspected Stroke Transports	Average Time[1] Dispatch to Scene	Average Time[1] Scene to Hospital	Average Total Time[1] from Dispatch to Hospital	County	Number of Suspected Stroke Transports	Average Time[1] Dispatch to Scene	Average Time[1] Scene to Hospital	Average Total Time[1] from Dispatch to Hospital
Adams	28	11.1	13.7	33.1	Licking	268	6.1	13.5	29.9
Allen	153	7.3	11.5	37.9	Logan	96	5.7	11.9	33.9
Ashland	83	6.4	13.4	34.0	Lorain	268	6.6	11.1	29.2
Ashtabula	92	7.3	17.6	36.6	Lucas	401	14.5	17.0	44.4
Athens[2]	40	8.5	16.2	45.8	Madison[5]	157	6.6	9.8	30.3
Auglaize	64	7.0	12.0	31.7	Mahoning	147	8.2	15.8	34.2
Belmont	148	7.7	13.1	33.2	Marion	37	5.1	11.3	25.2
Brown	39	11.2	12.8	38.9	Medina	188	6.8	11.8	34.9
Butler	352	6.3	8.9	27.7	Meigs[2]	40	8.5	16.2	45.8
Carroll[3]	224	10.4	26.2	48.4	Mercer[6]	192	8.8	17.4	43.5
Champaign	60	6.6	10.7	29.3	Miami	115	5.9	13.7	33.1
Clark	310	8.4	9.7	31.2	Monroe[3]	224	10.4	26.2	48.4
Clermont	258	7.1	16.5	39.6	Montgomery	1,022	6.7	11.1	30.3
Clinton	39	8.3	15.1	33.5	Morgan[3]	224	10.4	26.2	48.4
Columbiana	122	10.0	16.0	38.6	Morrow	4	10.0	17.8	40.4
Coshocton[3]	224	10.4	26.2	48.4	Muskingum	120	8.3	12.3	33.0
Crawford[4]	297	5.9	9.2	30.1	Noble[3]	224	10.4	26.2	48.4
Cuyahoga	1,623	4.5	7.7	27.7	Ottawa	42	7.6	12.5	34.1
Darke	79	7.1	10.4	33.2	Paulding[6]	192	8.8	17.4	43.5
Defiance	50	5.7	7.1	25.9	Perry[3]	224	10.4	26.2	48.4
Delaware	46	5.7	16.4	34.4	Pickaway	90	8.3	13.8	37.3
Erie	137	3.3	7.0	28.2	Pike	7	15.0	9.3	43.0
Fairfield	175	5.7	12.3	29.3	Portage	252	5.5	14.6	35.2
Fayette[5]	157	6.6	9.8	30.3	Preble	60	10.6	27.2	47.1
Franklin	714	5.6	11.5	30.9	Putnam[6]	192	8.8	17.4	43.5
Fulton[6]	192	8.8	17.4	43.5	Richland	163	5.8	9.9	25.0
Gallia	354	9.0	17.2	40.7	Ross	52	15.5	16.4	42.0
Geauga	88	6.2	12.8	33.6	Sandusky[4]	297	5.9	9.2	30.1
Greene	262	5.6	16.3	32.8	Scioto	114	9.8	19.1	35.8
Guernsey[3]	224	10.4	26.2	48.4	Seneca[4]	297	5.9	9.2	30.1
Hamilton	1,079	6.3	12.7	31.5	Shelby	81	6.0	7.4	28.0
Hancock[4]	297	5.9	9.2	30.1	Stark	626	6.4	13.5	33.4
Hardin	75	7.6	11.5	33.0	Summit	1,357	5.1	14.1	33.3
Harrison	31	8.8	20.6	40.7	Trumbull	228	7.1	14.8	31.7
Henry[6]	192	8.8	17.4	43.5	Tuscarawas	62	6.7	13.2	31.8
Highland	50	9.5	9.8	33.6	Union	110	9.2	16.4	35.9
Hocking[2]	40	8.5	16.2	45.8	Van Wert	34	4.8	9.6	26.9
Holmes	26	8.3	8.8	35.7	Vinton[2]	40	8.5	16.2	45.8
Huron[4]	297	5.9	9.2	30.1	Warren	136	7.4	19.5	35.2
Jackson[2]	40	8.5	16.2	45.8	Washington	76	6.9	11.8	35.6
Jefferson	94	9.0	16.2	33.1	Wayne	152	9.2	15.2	38.3
Knox	71	7.2	13.8	32.6	Williams[6]	192	8.8	17.4	43.5
Lake	351	5.9	8.5	27.5	Wood	123	6.1	11.3	31.0
Lawrence[2]	40	8.5	16.2	45.8	Wyandot[4]	192	8.8	17.4	43.5

Source: Ohio EMS.
[1] Time in Minutes.
[2-6] The following counties were grouped together for analysis: [2]Athens, Hocking, Jackson, Lawrence, Meigs and Vinton. [3]Carroll, Coshocton, Guernsey, Monroe, Morgan, Noble and Perry. [4]Crawford, Hancock, Huron, Sandusky, Seneca and Wyandot. [5]Fayette and Madison. [6]Fulton, Henry, Mercer, Paulding, Putnam and Williams.

Table C-2. Average Number of Hospital Discharges with Stroke[1] Listed as Principal Diagnosis per Year, Average Length of Stay (LOS),[2] Average Total Number of Days per Year, Average Charge,[3,4] Average Total Charges[3] per Year, Crude and Age-adjusted Hospital Discharge Rate per 10,000 Residents by County and Gender, Ohio 1999-2003.

County	Gender	Average Number of Discharges per Year	Average LOS[2]	Average Total Number of Days per Year	Average Charge[3,4]	Average Total Charges per Year[3]	Crude Rate per 10,000 Residents	Age-adjusted Rate per 10,000 Residents
Adams	Male	68	4.0	269	11,496	779,439	50.1	53.5
	Female	93	4.5	416	10,702	988,848	65.9	57.4
	All	160	4.3	684	11,038	1,768,287	58.1	56.0
Allen	Male	192	4.8	923	13,134	2,524,414	35.5	39.2
	Female	223	4.6	1,021	11,699	2,594,740	41.1	31.9
	All	415	4.7	1,944	12,365	5,119,154	38.3	34.8
Ashland	Male	68	4.6	314	14,856	1,007,257	26.0	27.9
	Female	81	3.8	310	10,402	844,639	30.2	23.9
	All	149	4.2	624	12,429	1,851,896	28.1	25.4
Ashtabula	Male	181	4.5	808	15,677	2,840,666	36.1	36.9
	Female	208	4.6	959	14,176	2,948,540	39.6	30.6
	All	390	4.5	1,766	14,875	5,789,206	37.9	33.2
Athens	Male	59	4.6	270	15,815	929,898	19.0	28.3
	Female	73	4.7	345	14,622	1,064,451	22.6	26.6
	All	132	4.7	615	15,155	1,994,349	20.9	27.7
Auglaize	Male	99	4.3	424	11,374	1,126,004	43.2	45.3
	Female	113	4.5	515	11,077	1,256,144	47.8	36.2
	All	212	4.4	939	11,215	2,382,148	45.5	40.0
Belmont	Male	76	4.2	320	10,810	821,527	22.2	20.7
	Female	110	4.7	523	10,461	1,150,710	31.0	18.4
	All	186	4.5	843	10,603	1,972,237	26.7	19.1
Brown	Male	70	4.2	294	13,325	935,403	33.4	38.6
	Female	73	3.9	286	11,337	823,091	33.4	31.7
	All	143	4.1	580	12,314	1,758,494	33.4	35.2
Butler	Male	475	4.4	2,106	13,646	6,470,924	28.9	38.3
	Female	546	5.0	2,726	14,093	7,688,912	31.7	32.4
	All	1,021	4.7	4,832	13,885	14,159,837	30.3	35.0
Carroll	Male	38	5.5	206	10,179	384,752	26.3	25.8
	Female	41	5.2	214	9,157	373,608	27.7	22.5
	All	79	5.3	420	9,648	758,360	27.0	24.0
Champaign	Male	60	4.3	257	14,021	838,482	31.2	34.2
	Female	69	4.6	321	13,536	939,409	34.8	29.2
	All	129	4.5	578	13,761	1,777,891	33.1	31.6
Clark	Male	276	4.9	1,339	14,555	4,011,453	39.7	39.7
	Female	370	5.0	1,855	13,615	5,035,009	49.5	38.2
	All	646	4.9	3,194	14,017	9,046,462	44.8	38.9
Clermont	Male	249	4.2	1,041	14,142	3,515,618	28.0	40.3
	Female	285	4.1	1,181	12,865	3,661,260	31.0	33.9
	All	534	4.2	2,223	13,460	7,176,878	29.5	36.5

Source: Ohio Hospital Association. Analysis completed by the Chronic Disease and Behavioral Epidemiology Section, BHSIOS-Prevention; Ohio Department of Health.
[1]Stroke defined as Cerebrovascular Disease (Stroke) ICD-9 codes 430-438.
[2]Total number of days divided by number of hospital discharges.
[3]Total amount of charges divided by number of hospital discharges.
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Table C-2 continued. Average Number of Hospital Discharges with Stroke[1] Listed as the Principal Diagnosis per Year, Average Length of Stay (LOS),[2] Average Total Number of Days per Year, Average Charge,[3,4] Average Total Charges[3] per Year, Crude and Age-adjusted Hospital Discharge Rate per 10,000 Residents by County and Gender, Ohio 1999-2003.

County	Gender	Average Number of Discharges per Year	Average LOS[2]	Average Total Number of Days per Year	Average Charge[3,4]	Average Total Charges per Year[3]	Crude Rate per 10,000 Residents	Age-adjusted Rate per 10,000 Residents
Clinton	Male	63	4.6	289	16,436	1,038,776	31.5	38.8
	Female	77	4.6	357	14,632	1,132,526	37.1	32.9
	All	141	4.6	646	15,443	2,171,302	34.3	35.1
Columbiana	Male	217	4.8	1,034	11,473	2,487,308	39.1	39.9
	Female	265	4.9	1,294	9,993	2,640,089	47.1	34.9
	All	482	4.8	2,328	10,660	5,127,397	43.1	37.0
Coshocton	Male	76	4.4	332	11,301	858,881	42.3	43.5
	Female	98	4.8	468	10,517	1,028,572	51.9	39.3
	All	174	4.6	800	10,860	1,887,454	47.2	41.4
Crawford	Male	77	4.2	324	12,306	952,459	34.4	34.2
	Female	81	4.6	370	11,467	928,822	33.6	24.3
	All	158	4.4	694	11,877	1,881,281	34.0	28.2
Cuyahoga	Male	2,737	5.0	13,677	16,212	44,323,257	41.9	41.7
	Female	3,489	5.2	18,019	15,448	53,868,814	47.9	34.9
	All	6,226	5.1	31,696	15,784	98,192,071	45.0	37.7
Darke	Male	61	4.2	255	12,342	750,400	23.3	23.1
	Female	82	4.9	401	13,483	1,105,588	30.4	21.4
	All	143	4.6	657	12,997	1,855,988	26.9	22.0
Defiance	Male	46	3.9	180	8,179	379,526	23.9	27.4
	Female	59	4.5	263	9,700	572,306	29.6	24.0
	All	105	4.2	442	9,031	951,832	26.8	25.4
Delaware	Male	97	4.5	437	16,470	1,604,225	16.6	27.7
	Female	117	4.5	526	15,259	1,785,348	19.5	25.1
	All	215	4.5	962	15,810	3,389,573	18.1	26.0
Erie	Male	176	4.0	701	13,833	2,431,914	45.6	41.0
	Female	182	4.4	792	14,394	2,613,961	44.8	33.6
	All	358	4.2	1,493	14,118	5,045,875	45.2	36.9
Fairfield	Male	211	4.1	864	13,302	2,801,295	33.5	42.3
	Female	229	4.9	1,121	13,776	3,149,174	36.0	34.1
	All	440	4.5	1,985	13,548	5,950,469	34.8	37.6
Fayette	Male	50	4.2	212	13,730	689,228	36.0	36.6
	Female	50	4.2	211	11,656	582,810	34.9	27.3
	All	100	4.2	423	12,695	1,272,037	35.5	31.3
Franklin	Male	1,289	4.9	6,311	17,110	22,051,851	24.6	36.5
	Female	1,601	5.1	8,113	16,379	26,192,574	28.9	30.8
	All	2,890	5.0	14,424	16,705	48,244,425	26.8	33.1
Fulton	Male	79	4.5	353	15,603	1,223,279	38.3	44.1
	Female	78	4.5	348	14,919	1,151,769	36.1	31.1
	All	157	4.5	700	15,264	2,375,048	37.2	36.4
Gallia	Male	43	4.7	203	9,269	398,577	28.2	31.6
	Female	51	6.6	333	11,294	571,485	31.7	25.3
	All	94	5.7	536	10,364	970,062	30.0	27.7

Source: Ohio Hospital Association. Analysis completed by the Chronic Disease and Behavioral Epidemiology Section, BHSIOS-Prevention; Ohio Department of Health.
[1]Stroke defined as Cerebrovascular Disease (Stroke) ICD-9 codes 430-438.
[2]Total number of days divided by number of hospital discharges.
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Table C-2 continued. Average Number of Hospital Discharges with Stroke[1] Listed as Principal Diagnosis per Year, Average Length of Stay (LOS),[2] Average Total Number of Days per Year, Average Charge,[3,4] Average Total Charges[3] per Year, Crude and Age-adjusted Hospital Discharge Rate per 10,000 Residents by County and Gender, Ohio 1999-2003.

County	Gender	Average Number of Discharges per Year	Average LOS[2]	Average Total Number of Days per Year	Average Charge[3,4]	Average Total Charges per Year[3]	Crude Rate per 10,000 Residents	Age-adjusted Rate per 10,000 Residents
Geauga	Male	124	4.1	508	14,310	1,780,210	27.5	31.4
	Female	125	4.6	571	14,396	1,799,542	26.8	23.5
	All	250	4.3	1,080	14,353	3,579,751	27.2	27.0
Greene	Male	177	4.5	795	15,252	2,699,628	24.4	30.6
	Female	216	4.9	1,066	16,180	3,485,083	28.2	26.5
	All	393	4.7	1,860	15,761	6,184,711	26.4	27.9
Guernsey	Male	100	4.9	493	11,272	1,120,464	50.1	52.2
	Female	113	4.9	554	10,163	1,148,424	53.6	41.4
	All	213	4.9	1,047	10,682	2,268,888	51.9	45.9
Hamilton	Male	1,303	4.7	6,079	13,716	17,858,781	32.6	37.2
	Female	1,706	4.6	7,920	12,785	21,788,676	39.0	31.8
	All	3,009	4.7	13,999	13,189	39,647,457	35.9	34.0
Hancock	Male	98	4.1	396	12,025	1,173,645	28.0	31.3
	Female	114	4.6	524	12,288	1,398,418	30.7	24.8
	All	212	4.4	921	12,167	2,572,063	29.4	27.6
Hardin	Male	64	4.8	309	11,691	750,575	41.1	48.6
	Female	78	5.3	412	12,609	983,489	48.2	39.7
	All	142	5.1	722	12,195	1,734,063	44.7	43.5
Harrison	Male	38	5.2	199	9,576	367,710	49.8	42.8
	Female	48	6.9	331	8,407	398,473	58.3	36.4
	All	86	6.2	529	8,930	766,183	54.2	39.5
Henry	Male	44	3.7	165	12,561	555,198	30.7	34.5
	Female	46	3.6	165	11,424	520,938	30.8	24.1
	All	90	3.7	330	11,984	1,076,136	30.7	27.6
Highland	Male	77	3.9	305	13,357	1,033,831	38.4	41.1
	Female	93	4.8	445	12,876	1,194,863	43.9	36.7
	All	170	4.4	751	13,095	2,228,694	41.2	38.5
Hocking	Male	45	3.6	164	11,309	513,426	32.1	33.7
	Female	52	3.9	200	10,662	550,176	36.2	31.9
	All	97	3.8	364	10,965	1,063,602	34.2	32.8
Holmes	Male	32	4.3	137	10,562	335,858	16.0	22.4
	Female	30	4.8	145	11,080	332,399	15.1	15.7
	All	62	4.6	282	10,813	668,257	15.6	18.7
Huron	Male	110	4.2	460	14,869	1,629,646	37.5	44.5
	Female	123	4.6	563	13,950	1,718,613	40.5	35.8
	All	233	4.4	1,023	14,383	3,348,259	39.0	39.5
Jackson	Male	53	4.4	233	10,689	570,776	33.7	37.2
	Female	67	5.4	365	12,965	871,258	39.6	32.7
	All	121	5.0	598	11,957	1,442,034	36.8	34.3
Jefferson	Male	199	6.7	1,339	11,935	2,370,323	57.2	48.0
	Female	239	6.9	1,646	10,700	2,548,645	62.4	39.1
	All	438	6.8	2,984	11,261	4,918,968	59.9	42.8

Source: Ohio Hospital Association. Analysis completed by the Chronic Disease and Behavioral Epidemiology Section, BHSIOS-Prevention; Ohio Department of Health.
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Table C-2 continued. Average Number of Hospital Discharges with Stroke[1] Listed as the Principal Diagnosis per Year, Average Length of Stay (LOS)[2], Average Total Number of Days per Year, Average Charge[3,4], Average Total Charges[3] per Year, Crude and Age-adjusted Hospital Discharge Rate per 10,000 Residents by County and Gender, Ohio 1999-2003.

County	Gender	Average Number of Discharges per Year	Average LOS[2]	Average Total Number of Days per Year	Average Charge[3,4]	Average Total Charges per Year[3]	Crude Rate per 10,000 Residents	Age-adjusted Rate per 10,000 Residents
Knox	Male	92	4.7	426	14,104	1,291,971	33.9	37.4
	Female	101	4.6	467	11,551	1,168,962	35.6	28.6
	All	193	4.6	893	12,764	2,460,932	34.8	32.3
Lake	Male	396	4.2	1,677	14,252	5,638,061	35.7	37.7
	Female	468	4.5	2,083	12,954	6,059,886	39.9	30.7
	All	864	4.4	3,760	13,549	11,697,946	37.9	33.8
Lawrence	Male	10	3.5	36	7,874	80,311	3.4	3.4
	Female	13	4.6	59	9,796	127,349	4.0	3.3
	All	23	4.1	95	8,951	207,661	3.7	3.4
Licking	Male	196	4.2	821	13,107	2,569,052	27.4	32.9
	Female	214	4.1	887	12,552	2,688,582	28.4	26.0
	All	411	4.2	1,708	12,817	5,257,634	27.9	28.8
Logan	Male	94	4.2	391	12,937	1,210,923	41.4	44.6
	Female	96	4.4	420	11,537	1,107,562	40.9	33.0
	All	190	4.3	812	12,228	2,318,485	41.2	38.0
Lorain	Male	558	4.6	2,554	13,043	7,262,328	39.7	45.6
	Female	603	4.5	2,724	13,250	7,955,187	41.3	36.2
	All	1,161	4.5	5,278	13,150	15,217,515	40.5	40.1
Lucas	Male	782	5.0	3,944	20,284	15,854,071	35.7	41.5
	Female	964	5.2	4,992	18,750	18,067,230	40.9	34.8
	All	1,746	5.1	8,936	19,437	33,921,301	38.4	37.5
Madison	Male	63	5.6	354	17,415	1,104,102	29.1	41.1
	Female	89	5.4	481	13,725	1,216,013	47.7	43.0
	All	152	5.5	834	15,264	2,320,115	37.7	41.6
Mahoning	Male	554	5.2	2,857	17,755	9,829,122	45.5	40.2
	Female	675	5.3	3,548	15,936	10,730,992	50.7	33.1
	All	1,230	5.2	6,405	16,756	20,560,114	48.2	36.1
Marion	Male	128	3.9	500	11,145	1,419,832	37.2	43.9
	Female	143	4.4	623	10,928	1,560,523	44.8	35.3
	All	271	4.1	1,123	11,030	2,980,355	40.9	38.5
Medina	Male	198	4.1	817	13,718	2,718,976	25.9	33.9
	Female	219	4.7	1,030	13,803	3,025,691	27.9	27.8
	All	418	4.4	1,846	13,763	5,744,667	26.9	30.5
Meigs	Male	26	5.4	141	11,015	284,199	22.9	23.8
	Female	28	4.2	118	9,630	269,647	23.6	17.5
	All	54	4.8	259	10,295	553,846	23.3	20.0
Mercer	Male	62	4.1	257	10,248	637,439	30.4	32.0
	Female	71	4.7	330	9,665	682,325	34.5	25.6
	All	133	4.4	587	9,938	1,319,764	32.5	28.5
Miami	Male	157	4.5	704	14,191	2,230,869	32.3	35.3
	Female	172	5.2	894	15,166	2,611,529	34.0	27.8
	All	330	4.8	1,598	14,701	4,842,398	33.2	31.0

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Table C-2 continued. Average Number of Hospital Discharges with Stroke[1] Listed as the Principal Diagnosis per Year, Average Length of Stay (LOS),[2] Average Total Number of Days per Year, Average Charge,[3,4] Average Total Charges[3] per Year, Crude and Age-adjusted Hospital Discharge Rate per 10,000 Residents by County and Gender, Ohio 1999-2003.

County	Gender	Average Number of Discharges per Year	Average LOS[2]	Average Total Number of Days per Year	Average Charge[3,4]	Average Total Charges per Year[3]	Crude Rate per 10,000 Residents	Age-adjusted Rate per 10,000 Residents
Monroe	Male	17	4.1	69	9,595	161,196	22.5	20.0
	Female	23	4.7	109	11,168	256,859	30.2	21.2
	All	40	4.5	178	10,504	418,055	26.4	20.6
Montgomery	Male	843	5.2	4,389	18,284	15,413,114	31.6	34.1
	Female	1,107	5.2	5,740	16,789	18,578,837	38.3	31.2
	All	1,950	5.2	10,130	17,435	33,991,951	35.1	32.5
Morgan	Male	22	4.9	110	12,284	275,170	30.7	28.8
	Female	25	5.8	145	16,983	424,579	33.1	25.5
	All	47	5.4	255	14,763	699,749	31.9	26.6
Morrow	Male	34	4.1	139	14,015	479,301	21.2	24.8
	Female	36	4.1	147	11,792	424,509	22.2	21.7
	All	70	4.1	286	12,875	903,810	21.7	23.0
Muskingum	Male	162	4.7	757	13,075	2,112,933	39.8	41.4
	Female	195	5.3	1,030	12,586	2,446,683	44.2	34.6
	All	358	5.0	1,787	12,808	4,559,616	42.1	37.7
Noble	Male	20	3.8	76	10,369	205,304	25.0	31.2
	Female	24	4.0	95	8,457	199,591	38.8	28.7
	All	43	4.0	172	9,329	404,895	31.0	30.2
Ottawa	Male	104	4.0	414	14,843	1,540,653	51.4	46.2
	Female	97	4.6	443	16,123	1,563,931	46.7	32.9
	All	201	4.3	857	15,461	3,104,583	49.0	38.6
Paulding	Male	14	3.4	46	9,944	135,232	13.8	15.6
	Female	20	3.9	76	6,468	126,769	19.2	15.7
	All	33	3.7	123	7,892	262,001	16.6	16.0
Perry	Male	66	4.9	322	15,033	989,154	38.5	44.9
	Female	71	5.0	355	12,177	869,435	41.4	37.8
	All	137	4.9	676	13,547	1,858,589	39.9	40.8
Pickaway	Male	82	4.4	362	14,608	1,200,758	29.0	39.5
	Female	92	4.6	427	15,102	1,386,371	38.6	34.8
	All	174	4.5	790	14,869	2,587,129	33.4	36.4
Pike	Male	56	3.7	211	12,401	699,424	41.5	45.0
	Female	71	4.2	299	11,603	821,498	49.7	41.4
	All	127	4.0	510	11,957	1,520,922	45.7	42.8
Portage	Male	250	4.2	1,042	14,617	3,657,068	33.5	42.6
	Female	276	4.6	1,279	15,698	4,326,485	35.2	35.6
	All	526	4.4	2,321	15,184	7,983,554	34.4	38.5
Preble	Male	51	4.8	249	18,905	971,740	24.3	25.9
	Female	54	4.2	225	14,113	756,433	25.3	21.5
	All	105	4.5	474	16,459	1,728,173	24.8	23.4
Putnam	Male	47	4.8	225	13,704	638,598	27.0	31.2
	Female	55	4.3	235	11,062	606,220	31.4	24.9
	All	101	4.5	460	12,276	1,244,818	29.2	27.6

Source: Ohio Hospital Association. Analysis completed by the Chronic Disease and Behavioral Epidemiology Section, BHSIOS-Prevention; Ohio Department of Health.
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County	Gender	Average Number of Discharges per Year	Average LOS[2]	Average Total Number of Days per Year	Average Charge[3,4]	Average Total Charges per Year[3]	Crude Rate per 10,000 Residents	Age-adjusted Rate per 10,000 Residents
Richland	Male	201	5.4	1,086	13,976	2,806,332	31.1	33.6
	Female	224	5.4	1,202	12,347	2,753,269	35.0	26.9
	All	424	5.4	2,287	13,118	5,559,601	33.0	29.5
Ross	Male	129	4.0	514	13,073	1,683,741	33.6	41.8
	Female	173	4.4	763	12,708	2,198,463	48.8	41.5
	All	302	4.2	1,276	12,864	3,882,205	40.9	41.2
Sandusky	Male	108	4.0	430	14,765	1,597,541	35.7	37.6
	Female	111	4.2	470	14,069	1,553,219	35.1	27.1
	All	219	4.1	900	14,413	3,150,761	35.4	31.3
Scioto	Male	156	5.2	810	15,498	2,423,935	40.7	43.0
	Female	218	5.0	1,099	13,773	3,005,347	54.3	40.7
	All	375	5.1	1,909	14,494	5,429,282	47.7	41.7
Seneca	Male	121	4.0	478	14,524	1,751,595	41.8	46.0
	Female	130	4.2	545	12,825	1,669,868	44.3	35.1
	All	251	4.1	1,023	13,642	3,421,463	43.0	39.7
Shelby	Male	67	3.8	257	12,024	803,194	27.9	33.6
	Female	80	4.7	373	13,307	1,061,879	32.9	29.2
	All	147	4.3	629	12,722	1,865,073	30.4	31.3
Stark	Male	695	5.1	3,568	10,816	7,508,301	38.3	38.2
	Female	821	5.4	4,410	9,991	8,196,962	41.8	31.1
	All	1,515	5.3	7,978	10,369	15,705,263	40.1	34.0
Summit	Male	1,054	4.4	4,648	16,459	17,354,057	40.2	42.7
	Female	1,301	4.7	6,094	15,542	20,208,253	46.1	36.6
	All	2,355	4.6	10,742	15,953	37,562,309	43.2	39.2
Trumbull	Male	557	6.2	3,458	17,323	9,565,551	51.3	48.6
	Female	665	6.3	4,205	16,884	11,079,049	57.6	41.9
	All	1,222	6.3	7,663	17,084	20,644,601	54.6	44.6
Tuscarawas	Male	162	4.5	722	9,083	1,467,876	36.3	36.8
	Female	169	4.6	785	8,473	1,433,709	36.2	26.9
	All	331	4.6	1,508	8,771	2,901,585	36.3	31.0
Union	Male	42	4.7	197	16,148	671,741	20.6	29.7
	Female	46	4.2	195	15,352	700,041	21.0	23.7
	All	88	4.5	392	15,731	1,371,782	20.8	26.0
Van Wert	Male	27	4.1	111	9,131	246,527	18.7	18.6
	Female	39	3.5	138	7,413	289,107	25.9	18.4
	All	66	3.8	248	8,116	535,634	22.4	18.6
Vinton	Male	20	3.8	76	12,159	243,179	30.9	34.2
	Female	18	4.4	77	12,844	226,055	27.0	25.5
	All	38	4.1	153	12,480	469,234	29.0	29.7
Warren	Male	162	4.3	687	14,792	2,387,496	19.1	28.7
	Female	192	4.2	808	13,369	2,561,557	23.2	25.9
	All	353	4.2	1,494	14,020	4,949,053	21.1	27.2

Source: Ohio Hospital Association. Analysis completed by the Chronic Disease and Behavioral Epidemiology Section, BHSIOS-Prevention; Ohio Department of Health.
[1]Stroke defined as Cerebrovascular Disease (Stroke) ICD-9 codes 430-438.
[2]Total number of days divided by number of hospital discharges.
[3]Total amount of charges divided by number of hospital discharges.
[4]Charges represent total amount billed, not actual amount collected.

Table C-2 continued. Average Number of Hospital Discharges with Stroke[1] Listed as the Principal Diagnosis per Year, Average Length of Stay (LOS),[2] Average Total Number of Days per Year, Average Charge,[3,4] Average Total Charges[3] per Year, Crude and Age-adjusted Hospital Discharge Rate per 10,000 Residents by County and Gender, Ohio 1999-2003.

County	Gender	Average Number of Discharges per Year	Average LOS[2]	Average Total Number of Days per Year	Average Charge[3,4]	Average Total Charges per Year[3]	Crude Rate per 10,000 Residents	Age-adjusted Rate per 10,000 Residents
Washington	Male	90	4.0	363	11,472	1,032,483	29.4	29.3
	Female	89	4.0	355	10,632	948,415	27.6	20.5
	All	179	4.0	718	11,054	1,980,898	28.5	24.1
Wayne	Male	172	4.0	689	12,304	2,116,308	31.0	36.2
	Female	172	4.3	742	11,251	1,935,216	30.3	26.7
	All	344	4.2	1,431	11,778	4,051,524	30.7	30.9
Williams	Male	50	4.8	238	9,853	490,680	25.7	27.2
	Female	58	5.0	287	11,539	664,647	29.3	22.0
	All	107	4.9	525	10,757	1,155,326	27.5	24.2
Wood	Male	180	4.0	728	14,438	2,604,704	30.5	39.7
	Female	193	4.7	915	14,369	2,773,153	30.7	29.7
	All	373	4.4	1,642	14,402	5,377,857	30.6	34.0
Wyandot	Male	44	4.1	182	15,737	692,406	39.5	39.5
	Female	52	4.1	215	10,099	523,134	44.3	30.7
	All	96	4.1	397	12,688	1,215,540	42.0	34.6
Unknown	Male	92	4.0	73	14,399	264,946	NA	NA
	Female	96	4.7	89	17,571	333,841	NA	NA
	All	188	4.3	163	16,010	598,787	NA	NA
Ohio	Male	18,742	4.7	88,528	14,917	279,260,378	33.9	38.1
	Female	22,561	4.9	111,221	14,185	319,607,055	38.6	32.0
	All	41,303	4.8	199,749	14,517	598,867,433	36.3	34.5

Source: Ohio Hospital Association. Analysis completed by the Chronic Disease and Behavioral Epidemiology Section, BHSIOS-Prevention; Ohio Department of Health.
[1]Stroke defined as Cerebrovascular Disease (Stroke) ICD-9 codes 430-438.
[2]Total number of days divided by number of hospital discharges.
[3]Total amount of charges divided by number of hospital discharges.
[4]Charges represent total amount billed, not actual amount collected.

Table C-3. Average Annual Number of Deaths and Average Annual Age-adjusted Rate Per 100,000 persons for Stroke[1] by County, Ohio 1998-2002.[2]

County	Average Number of Deaths Per Year	Average Annual Rate per 100,000
Adams	20	72.0
Allen	97	78.7
Ashland	46	74.9
Ashtabula	66	55.7
Athens	29	62.8
Auglaize	34	59.7
Belmont	53	52.8
Brown	23	61.0
Butler	171	63.8
Carroll	16	53.5
Champaign	27	65.9
Clark	139	82.6
Clermont	83	65.3
Clinton	24	61.2
Columbiana	66	52.3
Coshocton	35	84.8
Crawford	39	69.9
Cuyahoga	938	54.6
Darke	45	66.5
Defiance	27	67.8
Delaware	40	60.0
Erie	51	53.9
Fairfield	73	67.2
Fayette	31	97.2
Franklin	554	67.7
Fulton	32	73.5
Gallia	18	55.2
Geauga	49	57.2
Greene	80	62.3
Guernsey	25	54.7
Hamilton	632	68.6
Hancock	43	54.6
Hardin	20	59.0
Harrison	11	51.5
Henry	21	63.0
Highland	36	81.7
Hocking	23	81.5
Holmes	17	51.0
Huron	31	54.0
Jackson	20	57.8
Jefferson	48	46.5
Knox	45	75.7
Lake	122	49.8
Lawrence	44	67.7
Licking	84	63.6
Logan	40	83.1
Lorain	174	63.7
Lucas	294	62.3
Madison	29	85.1
Mahoning	203	57.9
Marion	42	62.2
Medina	77	62.6
Meigs	22	83.6
Mercer	32	68.4
Miami	67	65.3
Monroe	11	55.9
Montgomery	383	65.4
Morgan	12	69.2
Morrow	15	51.8
Muskingum	69	71.8
Noble	9	60.4
Ottawa	31	61.3
Paulding	11	55.9
Perry	20	64.3
Pickaway	28	64.5
Pike	17	58.8
Portage	69	55.9
Preble	19	45.9
Putnam	19	48.5
Richland	84	60.7
Ross	43	60.8
Sandusky	41	56.6
Scioto	54	59.8
Seneca	28	45.8
Shelby	28	59.8
Stark	283	63.3
Summit	377	63.3
Trumbull	151	56.2
Tuscarawas	67	61.7
Union	20	63.6
Van Wert	22	58.4
Vinton	6	52.7
Warren	77	68.4
Washington	40	55.3
Wayne	73	68.1
Williams	29	62.6
Wood	67	62.8
Wyandot	22	76.0
Ohio	7,332	62.1

Source: Chronic Disease and Behavioral Epidemiology, Ohio Department of Health.
[1] Stroke was define as Cerebrovascular Disease (Stroke): ICD-09 codes 430-438 for 1998 deaths and ICD-10 codes I60-I69 for 1999-2002 deaths.
[2] The direct age-adjusted rates were calculated using the inter-censal estimates for 1998-1999 (July 1), bridged race census estimates for 2000 (April 1) and the bridged race post-censal estimates for 2001-2002 (July 1) as a denominator and to the U.S. 2000 standard population for age adjustment.

Appendix D. Glossary of Terms

Age-adjusted rates: Age-adjustment is a statistical process applied to rates of disease, death, injuries or other health outcomes which allows communities with different age structures to be compared.

Atrial fibrillation: A common heart rhythm disorder in which the two small upper chambers of the heart (the atria) quiver instead of beating effectively. This quivering makes the heart less efficient, allows blood to pool and form clots and predisposes to stroke.

Any listed diagnosis of stroke: Refers to a diagnosis of stroke listed in any one of the available diagnosis fields of the hospital record.

Anticoagulant: Medication that delays the clotting (coagulation) of blood.

Aphasia: The inability to speak, write or understand spoken or written language because of stroke, brain injury or disease.

Blood cholesterol: The blood concentration of a family of lipid or " fatty" molecular compounds obtained directly form the diet or produced in the body from fatty dietary components. Subtypes of cholesterol differ in their relation to cardiovascular disease risk; high-density lipoprotein (HDL) cholesterol is considered "good" and low-density cholesterol (LDL) is considered "bad."

Blood pressure: The force or pressure exerted by the heart in pumping blood; the pressure of blood in the arteries.

Body mass index (BMI): A measurement of weight in relation to height. It is calculated as weight (in kilograms) divided by the square of height (in meters). It correlates highly with body fat in most people. A BMI of less than 25 is considered normal, 25-29 is overweight and 30 or greater is obese.

Cardiovascular disease (CVD): May refer to any of the disorders that can affect the circulatory system, but often means coronary heart disease (CHD), heart failure and stroke, taken together.

Cardiovascular health (CVH): A combination of favorable health habits and conditions that protects against the development of cardiovascular diseases.

Carotid arteries: The four main arteries in the head and neck that supply blood to the brain and elsewhere in the head.

Carotid stenosis: Narrowing of the carotid arteries, the main arteries in the neck.

Cerebrovascular disease: Also called a stroke or the brain equivalent of a heart attack. A condition in which a blood vessel in the brain bursts or is clogged by a blood clot, leading to inadequate blood supply to the brain and death of brain cells.

Cholesterol: A waxy, fat-like substance found in the bloodstream and produced in the liver.

Confidence interval (C.I.): A range of numbers in which the true value of the estimate would be found (95 percent of the time). Confidence intervals are related to sample size; a larger sample size produces a more reliable estimate and a narrower confidence interval.

Diabetes (or diabetes mellitus): A metabolic disorder resulting from insufficient production or utilization of insulin. Cardiovascular disease is a common complication.

Direct costs: Costs associated with an illness that can be attributed to a medical service, procedure, medication, etc. such as X-ray examination, pharmaceutical drugs, surgery or a clinic visit.

Dysphagia: Difficulty chewing and swallowing food that occurs when one side of the mouth is weak due to stroke or other brain injury. One or both sides of the mouth can lack feeling, increasing the risk of choking.

Emergency care: Treatment for people who have experienced a first or recurrent acute cardiovascular disease event (e.g., heart attack, heart failure, stroke) designed to increase their probability of survival and to minimize associated damage or disability.

Emergency medical services (EMS): The pre-hospital medical stabilization, triage and transportation of persons who are sick, injured, wounded or otherwise incapacitated or helpless by any person who is in that service or regularly provides that service.

Endarterectomy: A surgical procedure in which plaque is removed from the carotid arteries as a means to prevent stroke.

Health disparities: Differences in the burden and impact of disease among different populations defined, for example, by sex, race or ethnicity, education, income, disability, place of residence or sexual orientation.

Heart attack: An acute event in which the heart muscle is damaged because of a lack of blood flow from the coronary arteries, typically accompanied by chest pain and other warning signs, but sometimes occurring without recognized symptoms (i.e., "silent heart attack").

Heart disease: Any affliction that impairs the structure or function of the heart (e.g. atherosclerotic and hypertensive diseases, congenital heart disease,

rheumatic heart disease, cardiomyopathies).

Hemiparesis: Weakness or paralysis on one side of the body.

Hemorrhagic stroke: Occurs when blood vessels rupture and cause bleeding in the brain or in the space between the brain and skull.

High blood pressure: A chronic condition in which the pressure in the arterial circulation is greater than desired and associated with increased risk for heart disease, stroke, chronic kidney disease and other conditions. Blood pressure is considered "high" if systolic pressure (measured at the peak of contraction of the heart) is ≥140 mm Hg or if diastolic pressure (measured at the fullest relaxation of the heart) is ≥90 mm Hg.

Incidence: The number of new cases of disease occurring in a population of given size within a specified time interval (e.g., the average annual incidence of stroke for women in during 1985-1989 was approximately 120/100,000 population).

Indirect costs: Costs associated with an illness that occur because an individual or family members cannot work at their usual job because of premature death, sickness or disability.

Ischemic stroke: Caused by the blockage of arterial blood supply to the brain. Ischemic strokes account for 70 to 80 percent of all stroke deaths.

Medicaid: A program that provides health care services for eligible individuals and families with low incomes and resources. Although the federal government establishes general guidelines for the program, the Medicaid program requirements are established by each state. Whether a person can be eligible for Medicaid will depend on the state where they live. Each state administers its own Medicaid program.

Medicare: A social program enacted in 1965 that is financed by a combination of payroll taxes from workers and their employers, beneficiary premium payments and general federal revenues. The program provides health insurance to people age 65 and older, those who have permanent kidney failure requiring dialysis or transplant and certain individuals under 65 with disabilities.

Morbidity: Disease; any departure, subjective or objective, from a state of physiological or psychological health and well-being.

Mortality rate: Rate of death expressed as the number of deaths occurring in a population of a given size within a specified time interval.

Obesity: A condition characterized by excessive body fat. Usually defined as a Body Mass Index of 30 or higher.

Occupational therapy: Services given to help a individual to return to usual

activities (such as bathing, preparing meals, housekeeping) after illness.

Physical therapy: Treatment of injury and disease by mechanical means, such as heat, light, exercise and massage.

Plaque: A deposit of fatty (and other) substances in the inner lining of an artery wall characteristic of atherosclerosis.

Premature death: Death that occurs at an age earlier than the average life expectancy for the population.

Prevalence: The frequency of a particular condition within a defined population at a designated time (e.g., 12.6 million Americans living with heart disease in 1999 or 36.4 percent black men aged 20-74 years found to have hypertension in a survey conducted in 1988-1994).

Primary CVD prevention: A set of interventions, including the detection and control of risk factors, designed to prevent the first occurrence of heart attack, heart failure or stroke among people with identifiable risk factors.

Primordial CVD prevention: A set of interventions targeting people without risk factors or CVD (including the maintenance or restoration of favorable social and environmental conditions and the promotion of healthy behavioral patterns) to prevent development of risk factors. Although this approach was originally intended to apply to whole societies to prevent the first appearance of epidemic levels of risk factors, the term is commonly used in the sense of "early intervention" to prevent risk factors in individuals even in populations where risk factors are already epidemic.

Principal diagnosis of stroke: The principal diagnosis is submitted as the first of several possible diagnoses coded on the discharge record. The condition established after study to be chiefly responsible for admitting the patient to the hospital for care.

Rehabilitation: An intervention approach designed to limit disability among survivors of CVD events and reduce their risk for subsequent events.

Risk factor: An individual characteristic associated with increased frequency of specified health problems; for example, high LDL cholesterol, high blood pressure and diabetes are all associated with CVD.

Speech therapy: Also known as speech-language therapy. Treatment to regain and strengthen speech skills.

Secondary CVD prevention: A set of interventions aimed at survivors of acute CVD events (e.g., heart attack, heart failure, stroke) or others with known CVD in which long–term case management is used to reduce disability and risk for subsequent CVD events.

Stroke: Sudden interruption of blood supply to the brain caused by an obstruction or rupture of a blood vessel. There are two types of stroke: ischemic and hemorrhagic.

Thrombolysis: The breaking up of a blood clot.

Tissue plasminogen activator (tPA): One of several clot-dissolving drugs used during a stroke to restore blood flow in a blocked artery.

Transient ischemic attack (TIA): A temporary stroke-like event that lasts for a short time and is caused by a temporarily blocked vessel leading to or within the brain. Also called a "mini-stroke" or "little stroke," it is an extremely important stroke indicator and is often a warning sign of an impending stroke.

Years of potential life lost (YPLL): A measure of the impact of premature death on a population. YPLL is calculated using a predetermined expected life span and is the sum of the differences between this age and the age at death for everyone who died early.

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The Story Continues

Ohio Stroke Survivor Story

It took Michele Standifer a few days to realize she had had a stroke. The thought never even occurred to her – healthy 34-year-olds don't have strokes. No, it must be a virus.

The headache she woke up with one Sunday morning was so severe she thought if she shot her head off with a gun it probably would have felt better. But it was a virus.

She had trouble gripping the soap in the shower, so she figured it was time to try a new brand of soap. She had a virus.

"When I look back on it, I was dragging my left leg," she recalls, "but I've got a virus."

Doctors at the first hospital she visited on Monday sent her home diagnosed with a migraine headache, and they told her to call a neurologist if she wasn't better by Tuesday. But by Tuesday she couldn't move the left side of her body.

This time her family rushed her to Cincinnati's University Hospital, where doctors discovered through an angiogram that an aneurism in her carotid artery had resulted in a stroke. Nearly a year of therapy helped Michele to regain the use of her left arm and leg. She had to re-learn to write, pick up a fork, even how to put her hand on the table.

That was 16 years ago. Today, the 50-year-old from Colerain Township is a marathon walker and completed the marathon in Kona, Hawaii with the American Stroke Association's Train to End Stroke program. She educates other women, especially African Americans, on the importance of taking control of their health. Doctors don't know what caused the aneurism, but Michele believes that her stroke was God's way of getting her to teach others about the importance of exercise, good nutrition and adequate sleep.

"Pay attention to your health," she advises women, "because it's not only for you, it's for your family. You were given this body as a gift, and if you don't take care of it, it will be taken away from you."

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