

# Michigan Stroke Initiative

## *Report and Recommendations*

*Michigan Department of Community Health*  
Lansing, Michigan

*September, 2000*



September 2000

Dear Colleagues,

Stroke is the third leading cause of death in Michigan and the largest contributor to long-term adult disability. Increased concern about the impact of stroke on Michigan citizens, new medications available in the treatment of acute ischemic stroke and the increasing science base of stroke risk factors and interventions led to the development of this Michigan Stroke Initiative Report.

This report and its recommendations for reducing the burden of stroke in the state provides a comprehensive review of the problem of stroke with specific strategies focusing on the community, primary care, hospital and rehabilitation settings.

Over 47 experts in stroke treatment and prevention convened in 1998 to form the Michigan Stroke Initiative. This group collaborated on the development of this state-of-the-art report and offered stroke prevention conferences. The messages that resonated throughout the meetings were that we need a strong, coordinated initiative to meet the challenges of appropriate response to stroke symptoms and improved control of risk factors associated with stroke.

Everyone has a role in stroke prevention from being aware of signs and symptoms of stroke to advocating for improved medical treatment. As you read this report and recommendations, consider how you can incorporate some of the advice offered in this document in your work setting or personal life.

To your good health,

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**S**troke is a serious and common illness, both nationwide and in the state of Michigan. According to the American Heart Association, a stroke occurs approximately every 53 seconds and every 33 minutes someone dies of a stroke in the United States, resulting in about 600,000 new or recurring strokes per year<sup>1</sup>. In Michigan, a stroke occurs approximately every 35 minutes for an average of 41 strokes per day<sup>2</sup>.

## How frequent?

Stroke occurs when the blood supply, carrying oxygen and nutrients to the brain, is interrupted. This usually happens when one of the blood vessels bursts (rupture or hemorrhage) or becomes blocked (ischemic stroke)<sup>1</sup>. The most common type of stroke is ischemic, accounting for about 80 percent of all cases. There are two types of ischemic stroke; 1) thrombus, which is a blood clot at a fatty deposit and 2) embolus, a traveling particle too large to pass through a small vessel. The rupture or blockage keeps part of the brain from getting the life-sustaining oxygen it needs. Without the required oxygen, brain cells die and the parts of the body controlled by these brain cells cannot function, causing disability or death.

Stroke has been documented for more than 2,000 years but until recent medical advances, such as development of the new clot-dissolving drug, there has not been the same urgency of immediate evaluation and care of the acute stroke patient. To bring a heightened awareness of the urgency of seeking care for stroke, many health professionals have begun referring to stroke as a “brain attack.” In many aspects, a stroke is similar to a heart attack because it can be caused by a blockage of a blood vessel and it requires emergency action to treat the problem. Since the general public is familiar with the need for immediate care for the heart attack victim, it has been decided that use of a similar term could spread this same emergency message for stroke victims.

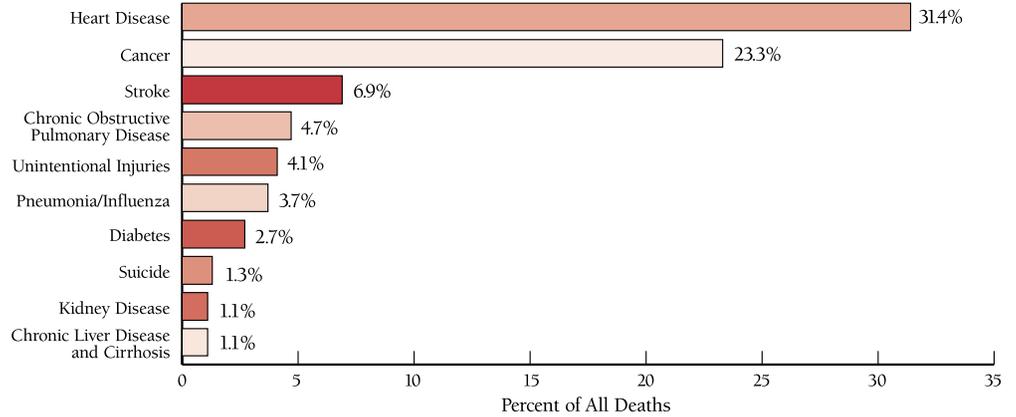
*In Michigan, a stroke occurs approximately every 35 minutes for an average of 41 strokes per day.*

## Why is it important now?

Stroke is the third leading cause of death in the U.S., behind diseases of the heart and all forms of cancer, and the number one cause of adult disability (see Figure 1). Approximately 20 to 30 percent of stroke victims do not survive, and 55 percent of stroke survivors have a disability<sup>3</sup>. There are approximately 44 million stroke survivors alive today in the United States<sup>1</sup>.

*Because of recent medical advances, such as the development of the new clot-dissolving drug, there is an increased need for immediate evaluation and care of the acute stroke patient.*

**Figure 1**  
**Ten Leading Causes of Death in the U.S., 1997**



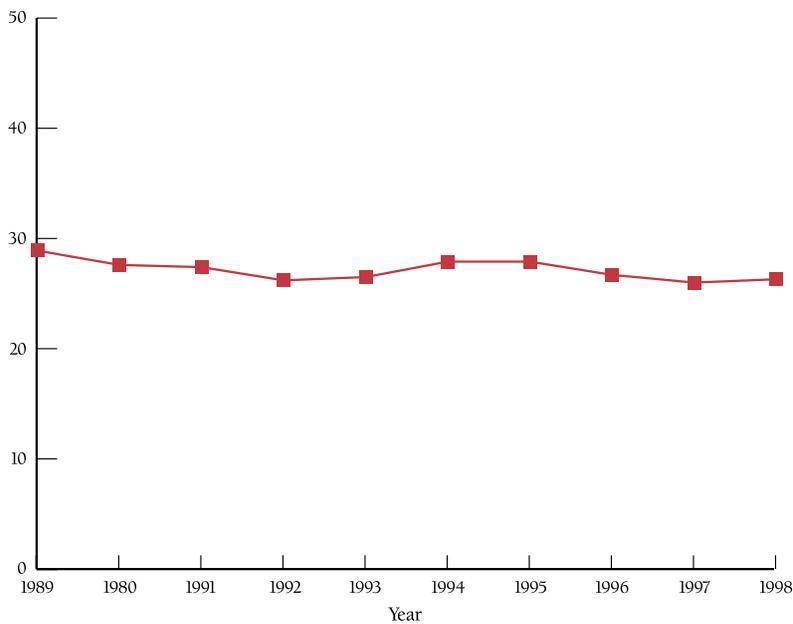
Source: Healthy People 2010, DHHS

While still relatively high, stroke mortality rates nationwide have been declining over the past decades. Much of this decline is due to advancements in treatment of the complications that occur after a stroke and from prevention efforts. However, even more can be done to improve stroke outcomes through the rapid identification and examination of stroke victims, diagnostic testing, and early, appropriate treatment<sup>3</sup>.

# Stroke in Michigan

Stroke constitutes a serious threat to thousands of Michigan residents and their families. After several decades of declining rates, stroke mortality began to flatten in Michigan in 1993 (Figure 2). The most recent data available shows an age-adjusted stroke mortality rate in Michigan of 26.3 per 100,000 (1998 data). Age-adjusted stroke mortality in Michigan (26.0 in 1997) is similar to national (25.9 in 1997) rates<sup>4</sup>. In 1998, there were 5,760 deaths due to stroke in Michigan and it was the sixth leading cause of Years of Potential Life Lost (YPLL) for people below the age of 75<sup>4</sup>. In 1996, stroke was responsible for 3.2 percent of all hospitalizations.

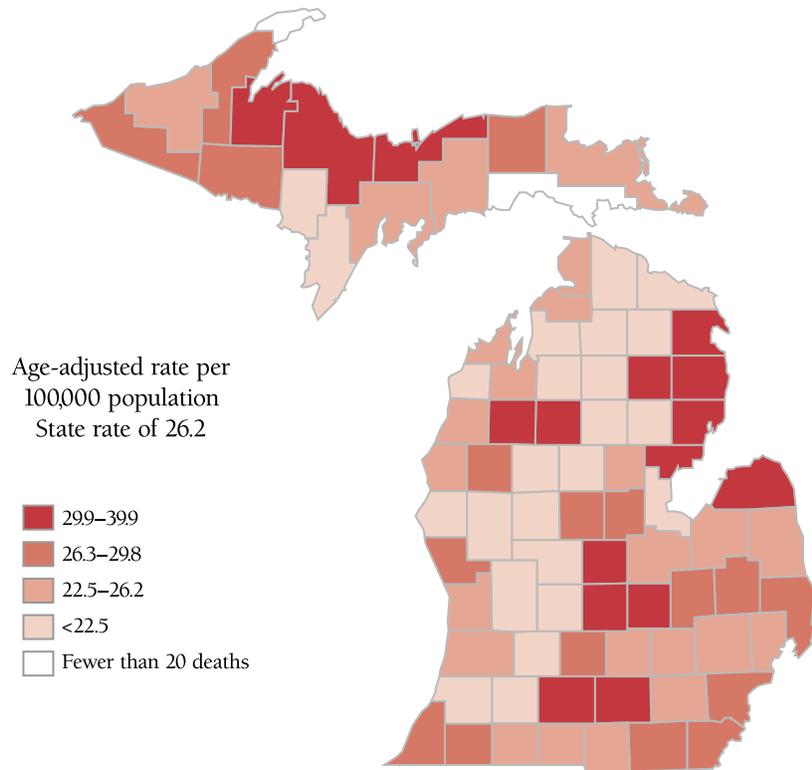
**Figure 2**  
**Age-Adjusted Stroke Mortality Rate per 100,000**  
**Michigan Residents, 1989–1998**



Source: Division for Vital Records and Health Statistics, MDCH

Higher rates of stroke mortality are found in a variety of rural and urban, geographically dispersed counties throughout the state, as shown in Figure 3.

**Figure 3**  
**Stroke Death Rates by County**  
**Michigan Residents, 1996–1998**



Source: Michigan Critical Health Indicators, MDCH

Another measure of the impact of a disease can be evaluated by looking at morbidity data. Morbidity is a measure of illness or disability in a given population. There is little or no state-specific data collected regarding the number of individuals living with some type of disability from stroke. However, we do know from national data that disability from stroke affects over 500,000 individuals annually<sup>7</sup>. Research from the Framingham Heart Study showed that 31 percent of stroke survivors needed help caring for themselves, 20 percent needed help walking, and 71 percent had an impaired vocational capacity when examined an average of seven years later.

### What can be done to limit disability?

*Severe disability could be limited or avoided with early identification and proper treatment of acute stroke.*

The Framingham data illustrates that the impact of stroke goes beyond the number of deaths associated with it to include the quality and productivity of individuals' lives and the lives of those around them. Stroke also has a significant impact on society through increased health care and other costs. Fortunately, stroke is often preventable with lifestyle change. Severe disability could be limited or avoided with early identification and proper treatment of acute stroke.

# Demographic Disparities



While stroke is a concern throughout the state, there are certain populations that have disproportionately higher rates of stroke morbidity and mortality.

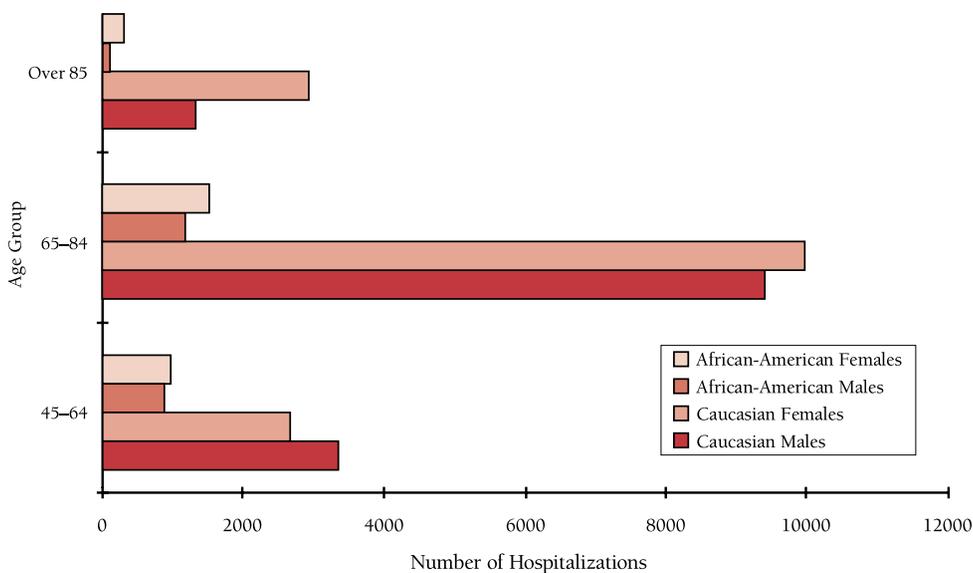
## Age-Specific Mortality

The incidence and severity of stroke increases with age. Of the 36,718 Michigan stroke hospital admissions in 1996, 25 percent were among individuals under the age of 65, while 60 percent were in individuals between the ages of 65 and 84. Among the 5,718 stroke deaths reported that year, 12 percent were among individuals less than 65 years of age, while 50 percent of stroke deaths occurred among those age 65 to 84. Stroke death rates are the highest among individuals age 85 and older. For example, in 1996, stroke mortality rates for Caucasian males age 85 years and older were 74 times greater than for Caucasian males age 45 to 64 years<sup>6</sup>.

## Gender

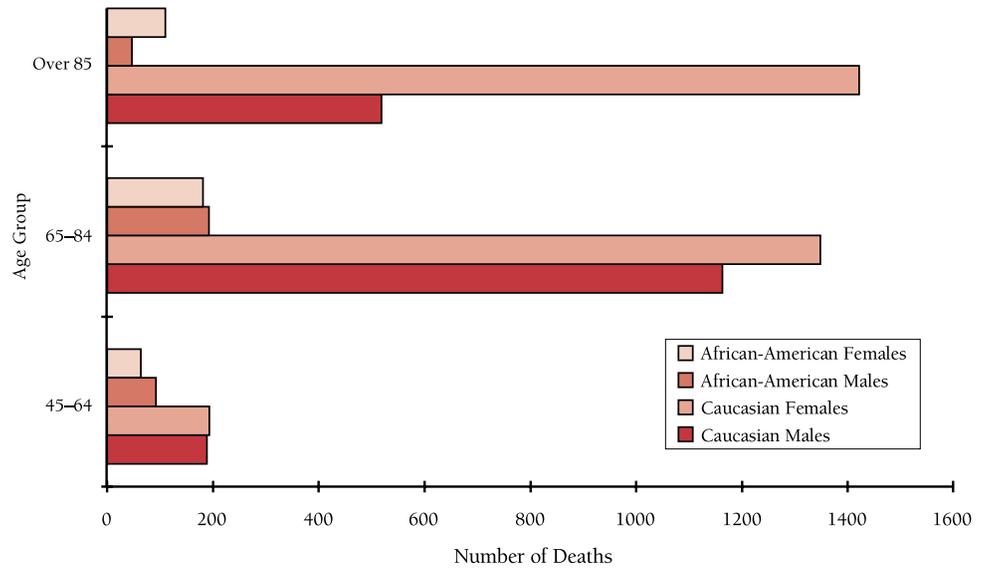
Although males have a higher risk of dying of stroke than females, the number of females actually dying of stroke is larger than for males. This is because women tend to live to older ages when stroke is more common. As seen in figures 4 and 5, women represent a larger proportion of both stroke hospitalizations and deaths with increasing age. In 1996, sixty percent of stroke victims were women<sup>6</sup>.

**Figure 4**  
**Number of Stroke Deaths, Michigan Residents, 1996**



Source: *Epidemiology of Stroke Fact Sheet, MDCH, 1998*

**Figure 5**  
**Number of Stroke Hospitalizations, Michigan Residents, 1996**



Source: *Epidemiology of Stroke Fact Sheet, MDCH, 1998*

## African-Americans

African-Americans carry a disproportionately higher burden of stroke. In 1996, African-Americans accounted for 16 percent of stroke hospitalizations and 15 percent of stroke deaths<sup>6</sup>. Data on hospitalization and death due to stroke show that both African-American males and females suffer strokes at younger ages than Caucasian males and females. As seen in Table 1, the average age of hospitalization for stroke was 64.8 for African-American males compared to 70.6 among Caucasian males. Among women, the average age of hospitalization was 67.6 for African-Americans compared to 73.7 for Caucasians.

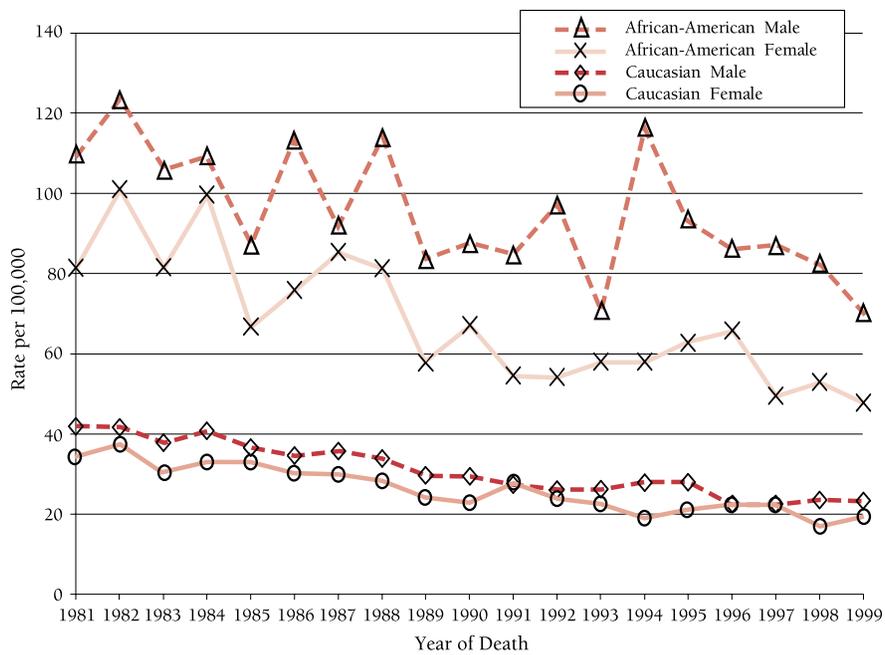
**Table 1**  
**Average Age of Stroke Hospitalization and Death**  
**Michigan Residents, 1997**

	Caucasian		African American	
	Male	Female	Male	Female
Hospitalization	70.6	73.7	64.8	67.6
Death	75.8	80.3	66.5	71.5

Source: *Epidemiology of Stroke Fact Sheet, MDCH, 1998*.

Racial disparities in stroke mortality are the most striking among individuals 45 to 64 years of age for both males and females. As seen in Figure 6, African-American males 45 to 64 are four times more likely to die from a stroke than their Caucasian counterparts, while African-American females have 2.9 times the risk of stroke mortality than Caucasian women in this age group. Racial disparities in stroke mortality, however, decrease with increasing age; such that among those over the age of 85, the risk of stroke death is actually higher among Caucasians than among African-Americans<sup>6</sup>.

**Figure 6**  
**Age-Specific Stroke Death Rates by Race and Gender, Ages 45–64**  
**Michigan Residents, 1980–1998**



Source: Epidemiology of Stroke Fact Sheet, MDCH, 1998

# The Economic and Social Impact

**S**troke morbidity and mortality is a source of significant economic and societal burden. According to national data, the total cost of stroke, both direct and indirect costs, reached an estimated \$51.3 billion<sup>1</sup>. The average hospitalization lasted 10 days and cost \$17,711. Initial hospitalization accounts for most of the cost associated with stroke, followed by rehabilitation and nursing home care<sup>7</sup>.

*In 1996, there were 36,718 stroke hospital admissions, costing individuals who live in the state a total of \$1.1 billion.*

## What is the burden of stroke in Michigan?

In 1996, there were 36,718 stroke hospital admissions in Michigan, costing individuals who live in the state a total of \$1.1 billion. Analysis of state Medicare hospital discharge data revealed that from October 1, 1997 through September 30, 1998, there were 19,675 Medicare-insured stroke events in the state of Michigan, resulting in 43,467 hospital days. Total hospital costs due to these admissions were \$197,556,265 or \$10,041 per patient. Of all the stroke victims in the Medicare population, 18 percent were admitted to a skilled nursing home.

The burden of stroke is felt by families for an extended period of time while a family member is in rehabilitation or supported with care in the home. Among stroke survivors of greater than six months, 48 percent are partially paralyzed, 22 percent cannot walk, 24–53 percent report complete or partial dependence on activity of daily living scales, 12–18 percent can't talk and 32 percent are clinically depressed<sup>8</sup>. The loss of independence and being captive to disabilities is unmeasurable in terms of personal loss.

# Stroke Risk Factors

**W**hile the statistics about stroke are sobering, the good news is that many strokes are potentially preventable. As many as two-thirds of strokes can be prevented through the identification and control of primary risk factors. Strokes are not random; 80 percent of the strokes occur in just 20 percent of the population<sup>2</sup>. The risk factors predisposing this group are high blood pressure, diabetes, cigarette smoking, heart disease and high blood cholesterol. Of these risk factors some have more risk of stroke than others. For example, high blood pressure increases the risk of stroke 4–6 fold in affected persons, diabetes has three times the risk, cigarette smoking has 2–4 times the risk, and heart disease has 2–6 times the risk<sup>9</sup>. The more risk factors that are present, the greater the likelihood of suffering a stroke. If a person has all five of the risks, they have a 50 percent chance of suffering a stroke in the next 10 years<sup>2</sup>.

## Who is at risk to have a stroke?

There are several, well-documented modifiable and non-modifiable risk factors for stroke. Non-modifiable risk factors are those that cannot be changed, such as age, gender, heredity, prior stroke and race. Modifiable risk factors are those attributes or behaviors that can be changed. These can be further classified as major and contributing risk factors. Major risk factors have a direct and significant impact on one's chances of suffering a stroke. See Table 2 for a description of Modifiable and Non-modifiable Risk Factors<sup>10</sup>.

*Eighty percent of the strokes occur in 20 percent of the population, meaning those with high blood pressure, diabetes, cigarette smoking, heart disease and high blood cholesterol.*

**Table 2**  
**Stroke Risk Factors**

Modifiable Risk Factors	
<b>High Blood Pressure</b> Hypertension is one of the most important modifiable risk factors for ischemic and spontaneous hemorrhagic stroke. Risk of hemorrhagic stroke increases markedly with increases in systolic pressure, and control of hypertension substantially decreases the risk of stroke.	with stroke have had a previous TIA. In addition approximately 5 percent of patients with a TIA will develop a completed stroke within one month if untreated. Antiplatelet agents, such as aspirin and ticlopidine, can reduce the risk of subsequent stroke in patients with TIA.
<b>Cigarette Smoking</b> Smoking can cause accelerated atherosclerosis, transient elevations in blood pressure, enzyme release (which has been linked to formation of aneurysm), and alterations in platelet function and survival—all of which have been linked to the risk of stroke. Cessation of cigarette smoking reduces the risk of stroke.	<b>Heart Disease</b> Heart disease significantly increases the risk of stroke. Coronary artery disease and heart failure double the risk of stroke. Atrial fibrillation increases the risk of thromboembolic stroke, although this risk can be reduced significantly through the use of warfarin.
<b>Transient Ischemic Attacks</b> A transient ischemic attack (TIA) is a reversible episode of focal neurological dysfunction that typically lasts a few minutes to a few hours. It is a significant indicator of stroke risk. Approximately one fourth of patients presenting	<b>Diabetes Mellitus</b> Diabetes is associated with accelerated atherosclerosis. Careful monitoring and control of hyperglycemia has been shown to reduce the risk of microvascular complications; it is hoped that such control will also reduce the risk of stroke.

*continued next page*

**Modifiable Risk Factors** (continued)

**Hypercoagulopathy**

Hypercoagulative states, such as protein S and C deficiency, cancer, and pregnancy, increase the risk of stroke.

**High Red Blood Cell Count and Sickle Cell Anemia**

A marked or even moderate increase in red blood cell count is a risk factor for stroke. Sickle cell anemia increases the risk of stroke because “sickled” red blood cells can clump, causing arterial

occlusion. Oxygenation, hydration, and exchange transfusion reduce the risk of sickle cell crisis.

**Carotid Bruit**

A bruit is an abnormal sound heard over an artery (in this case the carotid artery). A bruit often indicates partial obstruction of an artery and is associated with an increased risk of stroke. Surgical endarterectomy in select symptomatic patients (stenosis >70%) reduces the risk of subsequent stroke.

**Non-modifiable Risk Factors**

**Age**

Age is the single most important risk factor for stroke. In persons past the age of 55 years, the incidence of stroke increases for both men and women. However, it is important to note that stroke is not just a disease of the elderly since a quarter of all stroke victims are younger than 55.

**Gender**

Men are at greater risk for stroke than women. However, since more women than men live beyond the age of 65 years, more women than men older than 65 actually die of stroke each year.

**Heredity**

Risk of stroke is greater for people who have a family history of stroke, but this risk is probably complicated by the presence of multiple common

risk factors in families (e.g. smoking, high blood pressure).

**Race**

African-Americans have more than twice the risk of death and disability from stroke than Caucasians. Much of the risk can be explained by the greater number of risk factors present in African-Americans (e.g. smoking, high blood pressure, sickle cell anemia, high cholesterol and diabetes).

**Prior Stroke**

The risk of stroke for someone who has already had a stroke is many times that of someone who has not. Recurrent stroke risk is highest within the first 30 days after a stroke and long-term risk of recurrence averages 4 percent to 14 percent per year.

Contributing factors are those that further predispose an individual to stroke such as diet, obesity, and high cholesterol. Michigan residents have had higher rates for these risk factors when compared to average U.S. rates. See Table 3 for more information.

**Table 3**  
**Percentage of Michigan Adults with CVD Risk Factors**  
**(And Comparison with 1998 National BRFS Data)**  
**1990–98**

Behavioral Risk Factor	1990	1991	1992	1993	1994	1995	1996	1997	1998	U.S. '98 Median
Smoking	29.2	27.9	25.5	25.0	25.4	25.9	25.6	26.2	27.5	22.9
Blood Pressure: Ever Told High	23.3	24.1	23.2	21.8	NS	23.5	23.8	23.3	NS	NS
Cholesterol: Ever Told High	27.0	31.5	26.8	30.3	NS	31.4	30.1	31.2	NS	NS
Overweight	26.5	29.4	29.2	29.1	31.4	31.0	32.0	34.5	34.8	32.4
Sedentary	57.4	55.3	54.8	NS	54.0	NS	51.7	NS	49.6	NS
Fruits & Vegetables: Less than 5 servings per day	NS	NS	NS	78.7	70.2	NS	77.9	NS	73.6	76.2
No Leisure Time Physical Activity	NS	21.7	27.7							
Less Than 30 Min. Physical Activity 5 Times Per Week	NS	75.1	79.6							

NS = Not Sampled that year

Source: Behavioral Risk Factor Survey, (BRFS), MDCH, 2000.

# Advancements in Stroke Treatment and Care

In June of 1996, a new, effective Food and Drug Administration (FDA)-approved treatment for stroke was made available for immediate (<3 hours) care of acute ischemic stroke. The treatment, known as tissue plasminogen activator (t-PA) is the first of its kind and has revolutionized the way the medical community can respond to 80 percent of the strokes. The tissue plasminogen activator works by dissolving blood clots in the arteries to the brain, allowing blood flow to resume and minimizing damage to the tissues of the brain. Intravenous t-PA is the only FDA-approved treatment for acute ischemic stroke at this time. One dose of t-PA is required to treat an acute stroke victim at an average cost of \$2,000 per dose and could reduce disability leading to cost savings in hospital care, nursing home and rehabilitation as well as lost productivity.

## What is new?

In order to be effective, t-PA must be administered within three hours (180 minutes) of the first signs of stroke. This means the stroke victim must be transported to the hospital, undergo various tests including a neurological examination, blood tests, and CT scan to determine the type of stroke, and administered the t-PA treatment before the three-hour time window has expired. Currently, only 3 to 5 percent of those who suffer a stroke reach the hospital in time to receive the t-PA treatment (Am. Stroke Assoc. web site). Published guidelines recommend that the time from arriving in the emergency room to treatment time should be 60 minutes or less<sup>3</sup>. This leaves only two hours for the person to recognize the symptoms and their importance, and then be transported to the appropriate emergency room. Emergency rooms that accept ambulances should have a protocol in place for evaluating and treating stroke patients. The low percentage arriving at the emergency room in time could be significantly improved through professional education and better public awareness of the warning signs and symptoms of stroke and the importance of dialing 911 at the onset of stroke symptoms.

*In 1996, a new effective treatment for acute ischemic stroke called t-PA was approved by the FDA.*

## How many stroke victims reach the hospital in time?

The discovery of t-PA to prevent ischemic stroke damage has created a new option for acute treatment of stroke<sup>3</sup>. Continued improvements in stroke treatment and care through the use of medical advancements such as t-PA require a coordinated, comprehensive approach that spans the entire event including the family or community response, pre-hospital transport, hospital systems and rehabilitation.

The new concept of stroke being an emergency that is dependent on quick evaluation and treatment parallels the concept of heart attack and emphasizes urgency of transport to treatment, and evaluation in the appropriate facility. For successful treatment the public 1) must be able to recognize the symptoms of stroke, 2) stroke victims or bystanders must call 911 and seek emergency care immediately, and 3) the health care system must be clinically prepared and ready to evaluate and treat acute stroke patients according to current standards. For maximum efficiency of acute stroke recognition, triage, and care, linkages that are both strong and rapid will need to be established in communities across the state. This will require intensive, ongoing commitments to educate the public about the risk factors and

*Currently, only 3–5 percent of those with ischemic stroke reach the hospital in time (within three hours) to receive the t-PA treatment.*

warning signs of stroke and how to respond (call 911). Enhanced electronic communication by EMS to hospitals/emergency rooms can activate stroke teams and more quickly notify physicians to prepare for the patient. Pre-notification of CT, labs, and pharmacy can allow faster access to these resources and can better expedite patient assessment and treatment.

*For maximum efficiency of acute stroke recognition, triage, and care, linkages that are both strong and rapid will need to be established in communities across the state.*

## What needs to be done?

Emergency medical systems (EMS) should be prepared to provide immediate assistance and transport stroke patients to a facility capable of treating them. Initial medical assessment should be done as quickly as possible, preferably while the patient is being transported to the emergency department. To make this possible, emergency medical technicians (EMTs) must be trained to conduct appropriate early assessment, notification of the hospital while in route, and stabilization of the patient until arrival at the hospital.

At the hospital, a skilled stroke team must provide rapid, professional assessment, including CT scan and early treatment. The hospital stroke team should expedite a CT scan, inform the pharmacy for potential treatment, and implement patient treatment and monitored care. Intensive education and in-servicing of EMTs and emergency room personnel is necessary, along with other personnel involved in the care of the stroke patient.

# Warning Signs and Symptoms of Stroke

The onset of a stroke happens suddenly, without warning. However, there are recognizable early signs and symptoms that indicate a person may be experiencing a stroke. These warning signs may be temporary, lasting anywhere from a few minutes to almost 24 hours. Even when these symptoms last only a short duration, they may indicate a stroke and warrant immediate emergency medical care<sup>11</sup>. A key feature of these warning signs is that they are *sudden*.

*The warning signs of stroke are:*

*Sudden numbness or weakness of the face, arm, or leg, especially on one side of the body*

*Sudden confusion, trouble speaking or understanding*

*Sudden trouble seeing in one or both eyes*

*Sudden trouble walking, dizziness, loss of balance or coordination*

*Sudden, severe headaches with no known cause.*<sup>12</sup>

A national survey of adults over 50 conducted in 1992 showed that 97 percent of those surveyed could name no warning signs for stroke, 50 percent of stroke victims wait more than 24 hours to seek medical attention and 40 percent do not know the modifiable risk factors for stroke<sup>9</sup>.

## What does the public know about the problem?

To establish how much Michigan residents know about the warning signs of stroke, questions were incorporated into the 1999 Behavioral Risk Factor Survey<sup>13</sup>. Eighty percent of Michigan residents were able to identify at least one risk factor for stroke. The three most frequently mentioned risk factors were high blood pressure (32%), smoking (20%) and lack of physical exercise (26%). Diabetes, a very important risk factor, was only mentioned by two percent of respondents. Seventy percent were able to correctly identify one warning sign of a stroke. The three most frequently mentioned warning signs were weakness or numbness on one side (29%), dizziness (24%) and any weakness or numbness (21%). Eighty percent of the respondents also knew that the first action they should take was to call 911 or take the person to the nearest emergency department, and 90% knew that treatment should be sought immediately.

*Seventy percent of Michigan BRFs respondents could name at least one warning sign for stroke, 80 percent knew the first action to take is to call 911 and 80 percent knew at least one risk factor for stroke.*

# Stroke Rehabilitation

**S**troke is the number one cause of serious adult disability in the United States. Disabilities include paralysis, cognitive deficits, speech deficits, emotional problems, activities of daily living and pain. There are various types of therapies available to the stroke survivor and their family. The cornerstone of rehabilitation is physical therapy which focuses on restoring movement, balance and coordination. Another type of therapy includes occupational therapy. The focus of this rehabilitation is on relearning everyday activities that may have been lost, such as dressing, bathing, reading, writing, eating and other activities of daily living. Speech therapy, another type of stroke rehabilitation, helps stroke patients regain communication and language skills. Lastly, many stroke patients and their families require psychological help after a stroke. Common problems include depression, anxiety, anger and frustration. Stroke survivors with residual deficits are best served by combining these therapies into a coordinated rehabilitation program guided by a physical medicine and rehabilitation physician (physiatrists) or physician with appropriate rehabilitation medicine experience.

*Barriers to an effective post-stroke rehabilitation program are uneven distribution of resources, inadequate insurance coverage or financial ability, and lack of knowledge of resources or the potential of rehabilitation.*

## What are the barriers to effective stroke rehabilitation?

Stroke rehabilitation begins during acute hospitalization and ideally transitions into a multidisciplinary program for those with residual impairments. The goal of therapy is not to provide a cure for the patient, but to facilitate functional recovery and enhance their current abilities. The rehabilitation program should be tailored for the patient and family based on the services needed and resources available. Rehabilitation may take place in a variety of settings based on the patient's medical stability, endurance, and severity of functional deficits. These rehabilitation settings include acute inpatient rehabilitation, sub-acute rehabilitation, long-term care facilities, outpatient facilities and the patient's home. Possible barriers to an appropriate rehabilitation may include availability of rehabilitation programs in a particular area, inadequate insurance coverage or financial ability, and lack of knowledge of resources. The *AHCPR Post-Stroke Rehabilitation Practice Guideline* provides a summary of more than 1,900 clinical research articles and describes the latest scientific findings and recommendations for stroke rehabilitation<sup>4</sup>.

# Michigan's Response to Stroke: The Michigan Stroke Initiative

The Michigan Stroke Initiative (MSI) was convened in 1997 in response to growing concern about the problem of stroke in Michigan and the opportunities to reduce this problem. MSI is a multi-disciplinary group representing a variety of institutions and individuals involved in stroke care throughout the state including: The Michigan Department of Community Health (MDCH), American Heart Association (AHA), Greater Detroit Area Health Council (GDAH), Michigan Association of Health Plans (MAHP), Michigan Hospital Association (MHA), Michigan Osteopathic Association (MOA), Michigan Peer Review Organization (MPRO), Michigan Public Health Institute (MPHI), Michigan State Medical Society (MSMS), universities, hospital administrators, physicians (stroke neurologists, physiatrists, emergency medicine physicians, internists, obstetrics-gynecology), nurses, Emergency Medical Services (EMS) personnel, community educators, public health professionals, pharmaceutical company personnel, and others. Currently, MSI is comprised of 45 members representing 29 agencies across the state. The purpose of MSI is to raise stroke awareness, prevent stroke, and improve stroke care throughout the state.

## What is the purpose of the Michigan Stroke Initiative?

*The purpose is to raise stroke awareness, prevent stroke and improve stroke care throughout the state.*

## Early Initiatives of the MSI

The first initiative of MSI was to implement a professional education program targeting the emergency care of the acute stroke patient. The conference entitled, "Enhancing Access to Acute Stroke Care in Michigan Communities" was held on March 24, 1999 at the Kellogg Hotel and Conference Center in East Lansing. It was decided early in the formation of the MSI that increased professional and public education, and increased awareness of stroke was a major priority and goal of the Initiative. In response, a conference was planned and sponsored by the MSI along with many other partnering organizations. A second initiative of MSI was to obtain current epidemiological trends and state-based stroke data in Michigan. Data on mortality and hospitalizations were compiled and a survey was sent to Michigan's hospitals and physicians registered with state medical societies to assess acute and preventive stroke care, resources, and attitudes of professionals about acute stroke.

Analysis of the data mentioned above revealed some trends: 46 percent of the hospitals responding had a clinical pathway for stroke, 21 percent did not have t-PA use in their clinical pathway and 49 percent expressed interest in assistance with developing a t-PA pathway. Conclusions from the physicians are limited due to the very low response rate, however results revealed that 22 percent said they administer t-PA to their stroke patients, 50 percent were unaware of the cost-savings of t-PA, and some expressed concern over adopting t-PA as a standard of care. Stroke risk factors were not routinely screened by 24 percent of the physicians who responded.

## Current Initiative: Report of Findings and Recommendations

During 1999, MSI conducted a strategic planning process to examine the problem of stroke in Michigan and to develop recommendations to improve stroke prevention, treatment and rehabilitation throughout the state. In order to complete this task, MSI formed three sub-committees: 1) Community, 2) Primary Care, and 3) Hospital-Rehabilitation. The latter sub-committee is divided into three sub-groups: Emergency Department (ED), Hospital, and Rehabilitation.

The following recommendations were developed by each of the MSI subcommittees. Over the course of the planning process, individual subcommittees met to discuss relevant issues, examine current scientific and evidence-based knowledge on related factors, and develop recommendations for improvement of stroke prevention, care, and rehabilitation. The recommendations of each subcommittee were reviewed by the full MSI committee and approved prior to publication. No priority is intended in the order of the recommendations.

## Community Subcommittee

The Community Subcommittee of the MSI was developed to identify issues and strategies that could increase stroke awareness and prevention efforts within Michigan communities. Based on the problems and needs identified, the following recommendations were developed.

### *Recommendations*

Recommendations were chosen based on need and on currently identified issues. The committee also considered recommendations that were either current or could be implemented over the next 1-5 years that would effect change in stroke statistics. The recommendations of the subcommittee are as follows:

1. Implement community-based initiatives to prevent and control major risk factors for stroke.
2. Enhance support for screening and follow-up programs for hypertension and other modifiable stroke risk factors, particularly those targeting high-risk populations.
3. Focus selected efforts on stroke prevention strategies that target the African-American population, including hypertension detection and control.
4. Increase public awareness, through various media channels, about the risk factors for stroke, early warning signs, and the importance of seeking rapid emergency evaluation.
5. Target secondary prevention messages to stroke survivors and care givers through stroke support group networks.
6. Work with EMS systems to ensure stroke management is prioritized as a time-dependent, urgent medical emergency, just as is currently stressed for major trauma and acute myocardial infarction.
7. Develop educational initiatives for health professionals on the emergency treatment of stroke with emphasis on:
  - recognition of stroke;
  - urgent transportation;
  - emergency evaluation; and
  - specialized treatments for stroke.
8. Increase the proportion of health care providers who counsel their high-risk patients and their family members and significant others about the early warning signs of stroke and importance of seeking rapid emergency evaluation.
9. Support efforts to increase the affordability and accessibility of prescription medications that help to control hypertension and other risk factors for stroke.

## Primary Care Subcommittee

The Primary Care Subcommittee was formed to address stroke prevention strategies and initiatives that could be implemented at the primary care level. The following recommendations were identified.

### Recommendations

1. Based on general guidelines of the American Heart Association and the American Academy of Neurology, develop core measures for stroke risk factor evaluation to be used by Michigan health care providers. See list in Table 4.
2. Gain broad statewide agreement and support for adoption of the core measures for stroke risk factor evaluation.
3. Develop assessment tools and mechanisms for encouraging participation among health care providers and assessing impact of stroke risk factor evaluation.
4. Develop educational materials and tools to facilitate health care provider use of the core measures for stroke risk factor evaluation and follow-up among diverse population groups.
5. Develop implementation plan to facilitate incorporation of core measures for stroke risk factor analysis into health care providers' routine assessment of patients.
6. Conduct assessments of usage of core measures for stroke risk factors in health care settings among hospitals and office settings.
7. Ensure that media, community, and patient-education messages, programs and materials are consistent with the core measures for stroke risk factor evaluation.

**Table 4**  
**Core Measures: Stroke Risk Factors**

- |  |
|--|
| <p>I. <b>Hypertension:</b><br/>Blood pressure should be evaluated at each office visit.<sup>15</sup></p> <p>II. <b>Atrial fibrillation</b><br/>Pulse should be evaluated at each office visit.</p> <p>III. <b>Hypercholesterolemia</b><br/>Lipid profile should be evaluated in all adults 20 years of age and older at least once every five years. Clinicians should test at a younger age or more frequently in those considered at higher risk for developing hypercholesterolemia.<sup>16</sup></p> <p>IV. <b>Diabetes</b><br/>Fasting plasma glucose should be evaluated in all adults at age 45 and older, with retesting at three-year intervals if results are normal. Clinicians should test at a younger age or more frequently for those considered at higher risk for developing diabetes.<sup>17</sup></p> <p>V. <b>Smoking</b><br/>Patients who smoke should be offered smoking cessation counseling at each visit.</p> <p>VI. <b>History of coronary artery disease, stroke or transient ischemic attacks</b><br/>History of above disorders and any medications used for them should be obtained.</p> |
|--|

<sup>15</sup>The Sixth Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. *Archives of Internal Medicine* 1997; 157: 2413–2446.

<sup>16</sup>Summary of the Second Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults, *JAMA* 1993; 269: 3015–3023.

<sup>17</sup>Report of the Expert Committee on the Diagnosis and Classification of Diabetes Mellitus, *Diabetes Care* 1997; 20: 1183–1197.

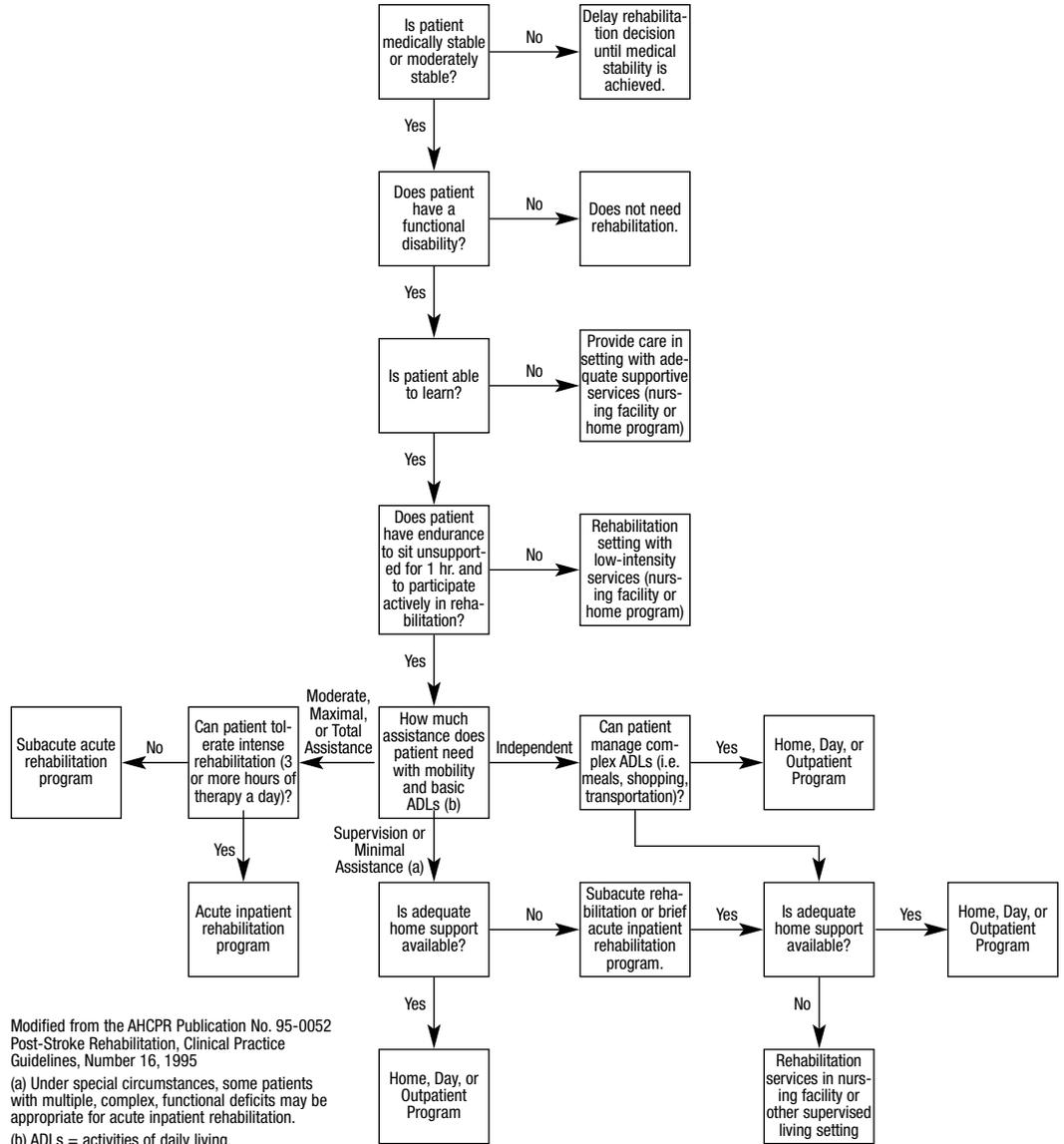
## Hospital-Rehabilitation Subcommittee

The Hospital-Rehabilitation Subcommittee concentrated on care of the acute stroke patient in the emergency department, hospital and rehabilitation facility. The following recommendations were made.

### Recommendations

1. Provide leadership for new state-level projects involving standards for emergency departments and care of acute stroke patients. Specific efforts should include:
  - Defining and disseminating emergency department protocols for triaging, diagnosis and treatment of acute stroke;
  - Providing recommendations for appropriate educational material for patients and families seen in the emergency department with conditions placing them at risk for stroke (those with a prior stroke or TIA, hypertension, smoker, atrial fibrillation);
  - Studying and potentially developing a system of regional acute stroke centers;
  - Encouraging outcomes research to identify effective interventions to reduce the risk of stroke in patients.
2. Provide templates and charge each institution that cares for stroke patients with creating and implementing “Inpatient Stroke Care Maps” and standards that address not only medical care of acute stroke but also the following:
  - prevention of secondary complications (e.g. decubiti<sup>18</sup>, DVT, aspiration pneumonia, depression)
  - coordination of a multidisciplinary approach using appropriate referral to ancillary health professionals (e.g. PT, OT, speech therapy).
3. Develop a process of patient and family teaching that is communicated and addressed by all care providers throughout the entire stroke, from entry into the emergency department through re-integration into the community. This activity should be individualized and planned, based on the needs of the patient and family. This process can include distribution of a core packet of American Heart Association educational materials with establishment and ongoing support of a website with links to multiple sites, potentially modeled on the Minnesota Stroke Association ([http://www.strokmn.org/Layers\\_Home/layers\\_home.html](http://www.strokmn.org/Layers_Home/layers_home.html)) site. Links can include:  
<http://www.vh.org/Providers/ClinGuide/Stroke/Index.html>  
<http://www.amhrt.org/Stroke/index.html>  
<http://www.ncspausa.com/>  
<http://www.mpro.org>  
and all of those listed at: <http://www.stroke.org/>.
4. Throughout the process of developing templates, protocols, educational material and other tools, MDCH should solicit and coordinate ongoing input from state and national stroke professionals, including: the American Heart Association, Michigan Hospital Association, American Medical Association, Michigan Association for Osteopathic Physicians and Surgeons, American Nurses Association, Michigan College of Emergency Physicians, Emergency Nurses Association and American Association of Neurologic Nurses.
5. Offer educational programs to medical professionals about the appropriate rehabilitation dispositions available after the acute hospitalization<sup>19</sup> (See diagram A).
6. Support the Americans with Disabilities Act through patient and provider education.
7. Neurological and functional outcomes should be assessed on a regular interval in the stroke patient until their neurological status reaches a plateau, and then on an annual basis.

Diagram A



**S**troke is a disease that has been present for many years, but the opportunity for limiting the disabling features of a stroke and educating the public about the importance of controlling risk factors associated with stroke brings new challenges to health professionals. The Michigan Stroke Initiative is a collaboration among Michigan health organizations and health professionals concerned about reducing the burden of stroke in Michigan. The recommendations presented by this committee in the report provide a unique opportunity for other health professionals and the public to join the effort to reduce the impact of this disease. It is hoped that this beginning effort to build new programs and expand others will lead to further progress in future years to strengthen the knowledge and commitment to controlling stroke in Michigan.

- <sup>1</sup>American Heart Association. *2000 Heart and Stroke Statistical Update*. Dallas, TX: American Heart Association, 1999.
- <sup>2</sup>Levine, Steven. *Michigan Stroke Initiative Background Paper*. Unpublished paper, 1999.
- <sup>3</sup>Marler JR, Jones PW, Emr M. Eds. *Setting New Directions for Stroke Care: Proceedings of a National Symposium on Rapid Identification and Treatment of Acute Stroke*. Bethesda, MD: The National Institute of Neurological Disorders and Stroke, National Institutes of Health, August 1997.
- <sup>4</sup>Michigan Department of Community Health. *Michigan Critical Health Indicators*. Lansing, MI: Michigan Department of Community Health, 2000.
- <sup>5</sup>Michigan Department of Community Health. *Promoting Cardiovascular Health in Michigan: Update on the Continuing Challenge*. Lansing, MI: Michigan Department of Community Health, January 1997.
- <sup>6</sup>Michigan Department of Community Health. *Epidemiology of Stroke Fact Sheet*. Lansing, MI: Michigan Department of Community Health, November 1998.
- <sup>7</sup>Taylor TN, Davis PH, Torner JC, Holmes J, Meyer JW, Jacobson MF. Lifetime Cost of Stroke in the United States. *Stroke*. 1996;27:1459–1466.
- <sup>8</sup>Helgason C, and Wolf P. AHA Prevention Conference IV. Prevention and Rehabilitation of Stroke: Executive Summary. *Circulation*. July 15, 1997; 96 (2): 701–707.
- <sup>9</sup>National Stroke Association. *Be Stroke Smart Kit*. Englewood, Colorado. 1992.
- <sup>10</sup>American Heart Association. *Acute Stroke: A Continuing Medical Education Product, Emergency Cardiovascular Care Program*, 1998.
- <sup>11</sup>American Heart Association. *Brain Attack—Are You at Risk?* Dallas, TX: American Heart Association, 1997.
- <sup>12</sup>American Heart Association. *Are You At Risk of Heart Attack or Stroke?* Dallas, TX: American Heart Association, 2000.
- <sup>13</sup>Michigan Department of Community Health. *Michigan Behavioral Risk Factor Survey*. Unpublished data. Lansing, MI: Michigan Department of Community Health, 2000.
- <sup>14</sup>U.S. Department of Health and Human Services. *Post-Stroke Rehabilitation Guideline Panel. Post-Stroke Rehabilitation Clinical Practice Guideline*. Rockville, MD: Agency for Health Care Policy and Research. Pub. # 95-0662. 1995.
- <sup>15</sup>The Sixth Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. *Archives of Internal Medicine* 1997; 157: 2413–2446.
- <sup>16</sup>Summary of the Second Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults, *JAMA* 1993; 269: 3015–3023.

- <sup>17</sup> Report of the Expert Committee on the Diagnosis and Classification of Diabetes Mellitus, *Diabetes Care* 1997; 20: 1183–1197.
- <sup>18</sup> U.S. Department of Health and Human Services. Clinical Practice Guidelines. *Pressure Ulcers in Adults: Prediction and Prevention*. Agency for Health Care Policy and Research. Pub. # 92-0047. 1992.
- <sup>19</sup> U.S. Department of Health and Human Services. Clinical Practice Guidelines. *Post-Stroke Rehabilitation*. Agency for Health Care Policy and Research. Pub. # 92-0052. 1995.
- <sup>20</sup> American Heart Association. *Heart and Stroke Facts*. Dallas, TX: American Heart Association, 1999.
- <sup>21</sup> American Heart Association. *Take Charge! A Woman's Guide to Fighting Stroke*. Dallas, TX: American Heart Association, 1997.
- <sup>22</sup> Appel LJ, Moore TJ, Obarzanek E, Vollmer WM, Svetkey LP, Sacks FM, Bray GA, Vogt TM, Cutler JA, Windhauser MM, Lin PH, Karanja N. A clinical trial of the effects of dietary patterns on blood pressure. DASH Collaborative Research Group. *New England Journal of Medicine*, April 17 1997;336(16): 1117–24.
- <sup>23</sup> Centers for Disease Control and Prevention. *Chronic Diseases and Their Risk Factors: The Nation's Leading Causes of Death*. Atlanta, GA: U.S. Department of Health and Human Services, 1999.
- <sup>24</sup> Centers for Disease Control and Prevention. *Physical Activity and Health: A Report of the Surgeon General, Executive Summary* 1996. U.S. Department of Health and Human Services, 1996.
- <sup>25</sup> Centers for Disease Control and Prevention. *A Report of the Surgeon General: Physical Activity and Health, At-A-Glance* 1996. Atlanta, GA: U.S. Department of Health and Human Services, 1996.
- <sup>26</sup> Dobkin B. *The Economic Impact of Stroke*. *Neurology* 1995; 45(suppl 1):S6–S9.
- <sup>27</sup> Ludwig DS, Pereira MA, Kroenke CH, Hilner JE, Horn LV, Slattery ML, Jacobs DR. Dietary Fiber, Weight Gain, and Cardiovascular Disease Risk Factors in Young Adults. *Journal of the American Medical Association*, October 27, 1999;282(16): 1539–1546.
- <sup>28</sup> Michigan Department of Community Health. *Health Risk Behaviors 1997*. Lansing, MI: Michigan Department of Community Health, 1999.
- <sup>29</sup> Mokdad AH, Serdula MK, Dietz WH, Bowman BA, Marks JS, Koplan JP. The Spread of the Obesity Epidemic in the United States, 1991–1998. *Journal of the American Medical Association*, October 27, 1999;282(16):1519–1522.
- <sup>30</sup> National Institutes of Health. *Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults, The Evidence Report*. NIH, National Heart, Lung, and Blood Institute. Preprint June 1998.
- <sup>31</sup> U.S. Department of Health and Human Services. *Healthy People 2010 Conference Edition*. January 2000.
- <sup>32</sup> Michigan Department of Public Health. *Promoting Cardiovascular Health in Michigan. Recommendations for Action*. Lansing, MI. 1991.

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