

### What is stroke?

- A stroke occurs when the blood supply to the brain is blocked or when a blood vessel in or around the brain ruptures, causing some brain tissue to die.
- The main types of stroke include:
  - Ischemic stroke which accounts for about 85% of all strokes and occurs when the vessels that carry oxygen-rich blood to the brain become blocked, resulting in damage to the area of the brain supplied by these blood vessels.
  - Hemorrhagic stroke which occurs when the vessels that carry oxygen-rich blood to the brain break open or rupture releasing blood in or around the brain and damaging brain cells.
- Transient Ischemic Attack (TIA) is a warning sign of a future ischemic stroke. A TIA occurs when the blockage of blood supply to the brain lasts only for a very short time and does not cause permanent brain damage. Patients with TIAs have typical stroke symptoms, but the symptoms are temporary, generally lasting only minutes or a few hours.
- When stroke symptoms first occur, there is no way to know whether they are from a TIA or from a stroke.
- All strokes and TIAs are medical emergencies.

### How many people are affected by stroke?

- Stroke is the fifth leading cause of death in the United States (US) and fourth in North Carolina (NC).<sup>1,2</sup> In 2016, stroke caused 4,941 deaths in NC. That equates to one stroke death nearly every two hours and 5.5% of all deaths.<sup>2</sup>
- About 298,000 North Carolinians (3.8% of NC adults) have had a stroke in their lifetime.<sup>3</sup> This estimate excludes people living in long-term care facilities and is therefore probably an underestimate of all those who have suffered a stroke.
- Stroke led to 30,407 hospital admissions and \$1.3 billion in hospital charges in North Carolina in 2016.<sup>4</sup> That's one stroke hospitalization every 19 minutes and over \$3.7 million in hospital charges for stroke care each day.
- The NC Medicaid program spent over \$383 million on 55,046 beneficiaries who had a stroke in 2017.<sup>5</sup> That's about \$6,959 per beneficiary with stroke.

### What are the symptoms of stroke or TIA?

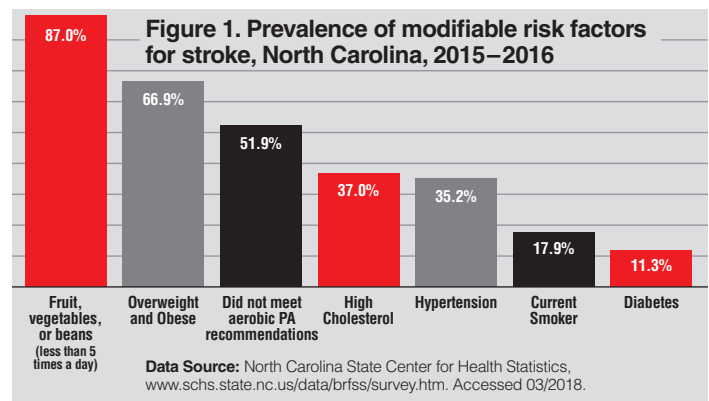
Any combination of the following may occur with stroke or TIA:

- Sudden numbness or weakness in the face, arm or leg.
- Sudden confusion, trouble speaking or difficulty understanding speech.
- Sudden trouble seeing in one or both eyes.
- Sudden trouble walking, dizziness, loss of balance or lack of coordination.
- Sudden severe headache with no known cause.

Although 89% of NC adults say the first thing they would do if they thought someone was having a stroke is to call 9-1-1, only 19% actually know all the signs and symptoms of stroke.<sup>6,7</sup> This means a majority of North Carolinians may not be able to identify a stroke when it occurs. For more information visit [startwithyourheart.com](http://startwithyourheart.com).

### What are the risk factors for stroke?

- Non-modifiable risk factors for stroke include age, gender, race/ethnicity, genetics and family history.
- Modifiable risk factors account for more than 90% of the stroke burden; three factors, including smoking, unhealthy diet and physical inactivity, account for about 74% of stroke burden.<sup>8</sup> This means if these three factors were eliminated, there would be 74% fewer strokes.
- Other modifiable risk factors for stroke include high blood pressure, obesity, diabetes, excessive alcohol consumption, high blood lipids (e.g., cholesterol), abnormal heart rhythm (e.g., atrial fibrillation), other heart conditions, sleep apnea and history of a previous stroke. See Figure 1 for the prevalence of key modifiable risk factors for stroke in NC.



- Transient ischemic attack is a warning sign of a future stroke.
  - About one third of people who have TIAs have a stroke within one year if they do not receive treatment.
  - The highest risk of stroke is over the first few days following a TIA, so it is important to know the symptoms of stroke and to immediately call 9-1-1 if you think you or someone else may be having a stroke or TIA.
- Risk factors specific to women include
  - Menopause
  - Use of combined estrogen and progestin as well as estrogen-only pills
  - The six-week period following delivery of a baby
  - Moderate to severely elevated blood pressure during pregnancy, or pre-eclampsia (formerly called toxemia).

### What are the complications of stroke?

- Stroke is a leading cause of serious long-term disability.<sup>9</sup>
- Examples of the types of disability caused by stroke include:
  - Muscle weakness on one side of the body (hemiparesis)
  - Inability to walk without assistance
  - Decline in cognitive function (e.g., perception, attention, memory, language)
  - Depression
  - Speech difficulties including complete inability to speak (aphasia)
  - Difficulty swallowing.

### How is stroke diagnosed?

- Stroke is diagnosed by a combination of clinical history, findings on physical examination and imaging tests of brain tissue.

### What are the treatment options for stroke?

- Stroke and TIAs are medical emergencies. Treatment for stroke depends on multiple factors including the type of stroke, the patient's overall clinical condition and medical history, and the time that has elapsed since the onset of stroke symptoms.
- It is important to know the symptoms of stroke and to immediately call 9-1-1 if you think you or someone else may be having a stroke. The chance of survival, chance of recovery and degree of lasting disability are affected by the time lapse between the onset of stroke symptoms and the start of treatment.
- Tissue Plasminogen Activator (t-PA, alteplase) is the one drug approved by the Food and Drug Administration (FDA) to be used to treat ischemic stroke. If clinical conditions are met, alteplase is approved for use three hours after onset of symptoms. National guidelines recommend its use in certain circumstances for up to 4.5 hours after symptoms first occur.

- There are also several specialized surgical procedures that are beneficial in the treatment of strokes and may be used up to six hours after the start of stroke symptoms.
- Rehabilitation therapy after stroke is an essential component of treatment that can reduce disability and improve quality of life.
- Primary Stroke Centers and Comprehensive Stroke Centers are hospitals certified for the delivery of high quality care (including alteplase and other procedures) for stroke. Figure 2 shows county-specific death rates and the location of certified stroke treatment centers in North Carolina. For a full listing please visit [qualitycheck.org/StrokeCertificationList.aspx](http://qualitycheck.org/StrokeCertificationList.aspx).

### How can stroke be prevented?

- First-time strokes can be prevented by adopting a healthy lifestyle and managing other medical conditions that increase the risk of a stroke.
- Healthy lifestyle practices that help reduce the risk of stroke include:
  - Maintaining a healthy weight or losing weight (for those who are overweight or obese) through physical activity and healthy eating (including reducing sodium intake). For information on physical activity and healthy eating please visit [esmmweighless.com](http://esmmweighless.com).
  - Avoiding tobacco products and secondhand smoke for non-smokers and quitting for current smokers. For information about smoking and how to get help quitting please visit [quitlinenc.com](http://quitlinenc.com) or call 1-800-QUIT-NOW.
  - Limiting alcohol consumption. Men should have no more than two drinks per day, and women should have no more than one. For more information, visit Centers for Disease Control and Prevention's Alcohol and Public Health web site [cdc.gov/alcohol](http://cdc.gov/alcohol).

- A combination of lifestyle measures and medications may be necessary to control medical conditions that increase the risk of stroke. For fact sheets about diabetes and hypertension in NC visit [communityclinicalconnections.com](http://communityclinicalconnections.com).
- People who have had a previous stroke or TIA should work with their health care provider to develop a treatment plan that will help prevent a future stroke. Such a treatment plan may include medications, surgery and/or lifestyle changes.

### Disparities, inequality and inequity in the burden of stroke

- In 2016, North Carolina had the 8th highest age-adjusted stroke death rate among the 50 states and the District of Columbia.<sup>10</sup> After decades of decline, stroke deaths have stopped decreasing. Between 2000–2015, stroke death rates reversed and began increasing in adults 35 years and older in NC.<sup>11</sup>
- Non-Hispanic African-American North Carolinians have higher stroke death rates compared to all other racial/ethnic subgroups.
- African-American North Carolinians are also more likely to die from stroke and at a younger age compared to white non-Hispanic North Carolinians. In 2016, the proportion of stroke deaths occurring before age 65 by race/ethnicity and gender were as follows:
  - 33% among African-American men.
  - 21% among African-American women.
  - 14% among white men.
  - 8% among white women.<sup>12</sup>

**Figure 2. Stroke Death Rates by County of Residence, NC, 2012–2016 and Joint Commission Stroke Certification**

NC Statewide Stroke Death Rate: 43.1

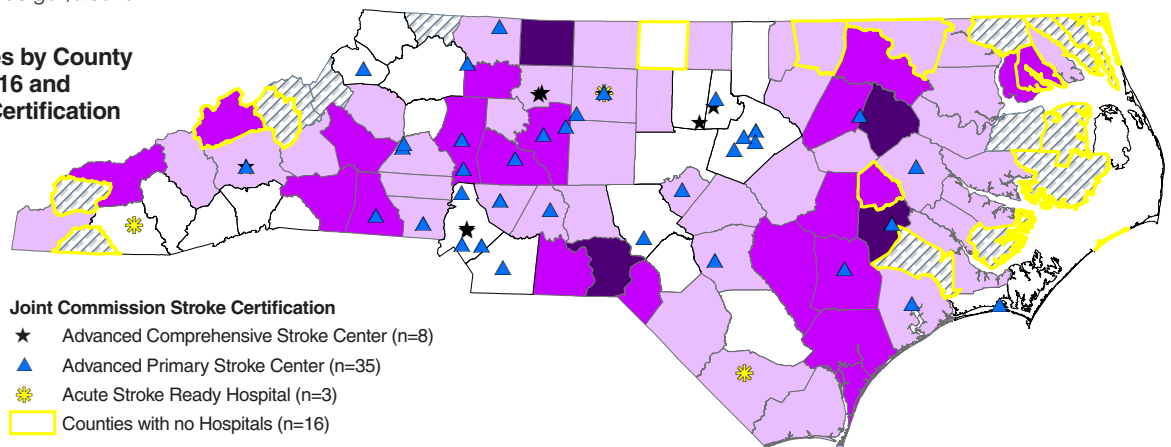
**Stroke:** ICD-10 codes I60-I69.  
Rates per 100,000 population, age-adjusted to the 2000 U.S. standard population.

#### Stroke Death Rate, 2012–2016

- Unreliable (<50 Deaths)
- 27.0–38.8
- 38.9–48.0
- 48.1–59.8
- 59.9–92.4

#### Joint Commission Stroke Certification

- ★ Advanced Comprehensive Stroke Center (n=8)
- ▲ Advanced Primary Stroke Center (n=35)
- ✱ Acute Stroke Ready Hospital (n=3)
- Counties with no Hospitals (n=16)



**Data Sources:** North Carolina Division of Public Health, State Center for Health Statistics. Volume 2: Leading Causes of Death in North Carolina 2016.

Accessed at [www.schs.state.nc.us/data/vital/lcd/2016](http://www.schs.state.nc.us/data/vital/lcd/2016) on March 05, 2018.

The Joint Commission Stroke Certification. Accessed at [www.qualitycheck.org/StrokeCertificationList.aspx](http://www.qualitycheck.org/StrokeCertificationList.aspx) on March 05, 2018.

North Carolina Division of Health Service Regulation, Licensed Facilities, Hospital Listing by County. Accessed at <https://www2.ncdhs.gov/DHSR/data/hlist.pdf> on March 12, 2018.

#### REFERENCES

1. Heron M. Deaths: Leading causes for 2015. National Vital Statistics Reports; vol 66 no 5. Hyattsville, MD: National Center for Health Statistics. 2017. Accessed at [www.cdc.gov/nchs/data/nvsr/nvsr66\\_05.pdf](http://www.cdc.gov/nchs/data/nvsr/nvsr66/nvsr66_05.pdf) on March 05, 2018.
2. North Carolina Department of Health and Human Services, Division of Public Health, State Center for Health Statistics. North Carolina Vital Statistics 2016 – Volume 2, Leading Causes of Death. Accessed at [www.schs.state.nc.us/data/vital/lcd/2016/pdf/TblsA-F.pdf](http://www.schs.state.nc.us/data/vital/lcd/2016/pdf/TblsA-F.pdf) on March 05, 2018.
3. North Carolina Department of Health and Human Services, Division of Public Health, State Center for Health Statistics. Behavioral Risk Factor Surveillance System (BRFSS). Accessed at [www.schs.state.nc.us/data/brfss/2016/nc/all/topics.htm#chd](http://www.schs.state.nc.us/data/brfss/2016/nc/all/topics.htm#chd) on March 05, 2018.
4. North Carolina Department of Health and Human Services, Division of Public Health, State Center for Health Statistics. Data produced upon request on February 21, 2018.
5. North Carolina Department of Health and Human Services, Division of Medical Assistance. Data produced upon request, January 5, 2018.
6. North Carolina Department of Health and Human Services, Division of Public Health, State Center for Health Statistics. Behavioral Risk Factor Surveillance System (BRFSS). Accessed at [www.schs.state.nc.us/data/brfss/2014/nc/all/aid.html](http://www.schs.state.nc.us/data/brfss/2014/nc/all/aid.html) on March 05, 2018.

7. North Carolina Department of Health and Human Services, Division of Public Health, State Center for Health Statistics. Behavioral Risk Factor Surveillance System (BRFSS). Accessed at [www.schs.state.nc.us/data/brfss/2014/nc/all/stroke2.html](http://www.schs.state.nc.us/data/brfss/2014/nc/all/stroke2.html) on March 05, 2018.
8. Feigin, Valery L et al. Global burden of stroke and risk factors in 188 countries, during 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. The Lancet Neurology, Volume 15, Issue 9, 913–924
9. Centers for Disease Control and Prevention (CDC). Prevalence and most common causes of disability among adults: United States, 2005. MMWR Morb Mortal Wkly Rep. 2009;58:421–426.
10. Centers for Disease Control and Prevention, National Center for Health Statistics. Underlying Cause of Death 1999-2016 on CDC WONDER Online Database, released December, 2017. Data are from the Multiple Cause of Death Files, 1999-2016, as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Accessed at [wonder.cdc.gov/ucd-icd10.html](http://wonder.cdc.gov/ucd-icd10.html) on Mar 5, 2018.
11. Centers for Disease Control and Prevention, Vital signs. Preventing Stroke Deaths. September 2017.
12. North Carolina Department of Health and Human Services, Division of Public Health, State Center for Health Statistics. North Carolina Health Data Query System. Accessed at [www.schs.state.nc.us/interactive/query/lcd/lcd.cfm](http://www.schs.state.nc.us/interactive/query/lcd/lcd.cfm) on March 05, 2018.