

### 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 87% 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.<sup>1</sup>
  - 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>2,3</sup> In 2017, stroke caused 5,100 deaths in NC. That equates to one stroke death nearly every two hours and 5.5% of all deaths.<sup>3</sup>
- Nearly 300,000 North Carolinian adults (3.7%) have had a stroke in their lifetime.<sup>4</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 31,693 hospital admissions and \$1.7 billion in hospital charges in North Carolina in 2018.<sup>5</sup> That equates to one stroke hospitalization every 17 minutes and about \$4.6 million in hospital charges for stroke care each day.
- In 2018, the NC Medicaid program spent over \$402 million on 54,526 beneficiaries who had a stroke.<sup>6</sup> That's about \$7,377 per beneficiary who had a stroke.

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

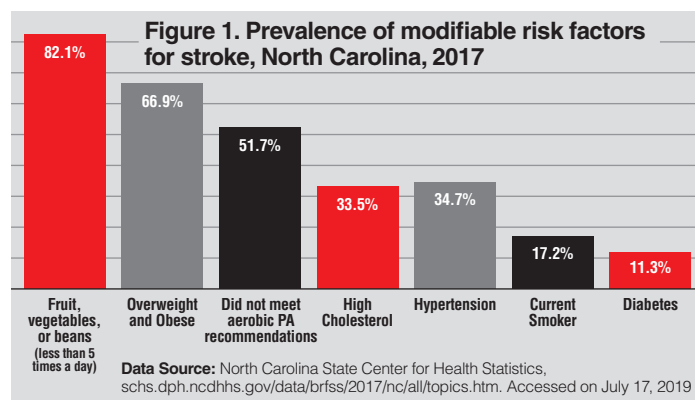
Any combination of the following may occur with stroke or TIA:

- 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>7,8</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?

- Smoking, unhealthy diet and physical inactivity account for about 74% of the stroke burden.<sup>9</sup> County Health Rankings reveal that NC ranks higher than the national average on adult smoking, adult obesity and physical inactivity.<sup>10</sup>
- Other risk factors for stroke include age, gender, race/ethnicity, genetics and family history, high blood pressure, 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.



- TIA 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 during the first few days following a TIA. Thus, 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 first six weeks after delivering 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>10</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 can be started within three hours after onset of symptoms. The National Clinical Guideline for Stroke recommends 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 listing of designated stroke centers in North Carolina visit [info.ncdohhs.gov/dhsr/ahc/listings.html](http://info.ncdohhs.gov/dhsr/ahc/listings.html).

### How can stroke be prevented?

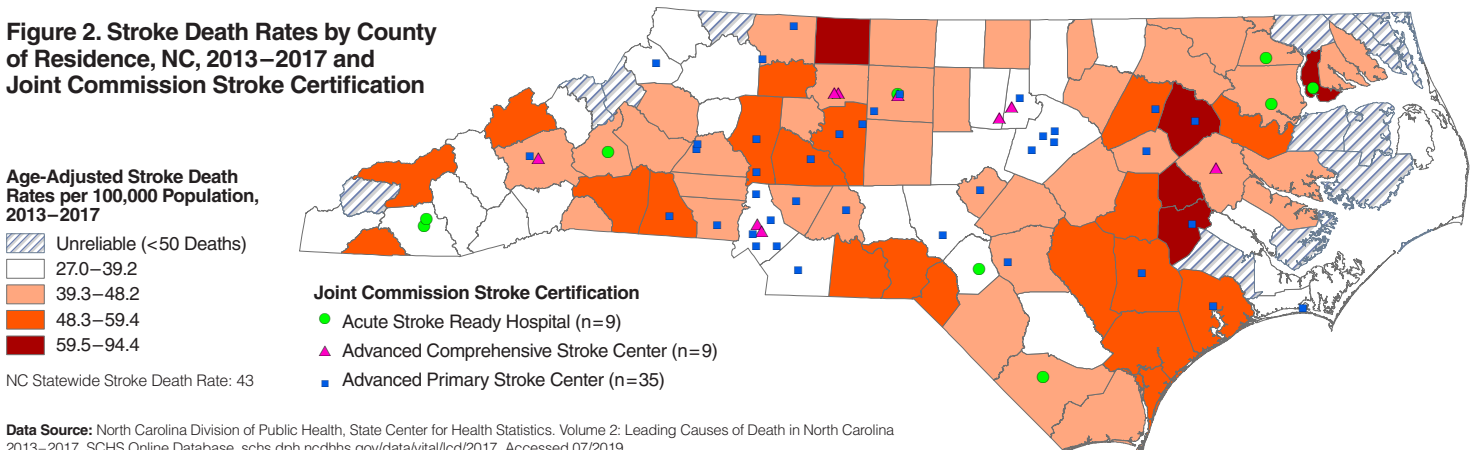
- First-time strokes can be prevented by adopting a healthy lifestyle and managing other medical conditions that increase the risk of stroke.
- Healthy lifestyle practices that help reduce the risk of stroke include:
  - Maintaining a healthy weight or losing weight (for those who are overweight or obese) 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, please visit Centers for Disease Control and Prevention's Alcohol and Public Health website [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.
- Prevention efforts need to be expanded to a younger population. CDC findings demonstrate a significantly increased burden in stroke among persons aged 35 to 64.<sup>10</sup>

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

- In 2017, North Carolina had the 10th highest age-adjusted stroke death rate among the 50 states and the District of Columbia.<sup>11</sup> After decades of decline, stroke deaths have stopped decreasing. Between 2000–2017, stroke death rates reversed and began increasing in adults 35–64 years in NC.<sup>12</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 2017, the proportion of stroke deaths occurring before age 65 by race/ethnicity and gender were as follows:
  - 34% among African-American men.
  - 24% among African-American women.
  - 12% among white men.
  - 11% among white women.<sup>13</sup>

**Figure 2. Stroke Death Rates by County of Residence, NC, 2013–2017 and Joint Commission Stroke Certification**



**Data Source:** North Carolina Division of Public Health, State Center for Health Statistics. Volume 2: Leading Causes of Death in North Carolina 2013–2017, SCHS Online Database. [schs.dph.ncdohhs.gov/data/vital/lcd/2017](http://schs.dph.ncdohhs.gov/data/vital/lcd/2017). Accessed 07/2019.

### REFERENCES

1. Mozaffarian D, Benjamin EJ, Go AS, Arnett DK, Blaha MJ, Cushman M, et al., on behalf of the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. Heart disease and stroke statistics—2016 update: a report from the American Heart Association. *Circulation* 2016;133(4): e38–360.
2. Murphy SL, Xu JQ, Kochanek KD, Arias E. Mortality in the United States, 2017. NCHS Data Brief, no 328. Hyattsville, MD: National Center for Health Statistics. 2018. Accessed at [cdc.gov/nchs/products/databriefs/db328.htm](http://cdc.gov/nchs/products/databriefs/db328.htm) on July 16, 2019.
3. North Carolina Department of Health and Human Services, Division of Public Health, State Center for Health Statistics. North Carolina Vital Statistics 2017 – Volume 2, Leading Causes of Death. Accessed at [schs.dph.ncdohhs.gov/data/vital/lcd/2017](http://schs.dph.ncdohhs.gov/data/vital/lcd/2017) on July 16, 2019.
4. 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 [schs.dph.ncdohhs.gov/data/brfss/2017/nc/all/topics.htm#chd](http://schs.dph.ncdohhs.gov/data/brfss/2017/nc/all/topics.htm#chd) on July 16, 2019. The 2017 estimates of the NC adult population were obtained at [schs.state.nc.us/interactive/query/population/nchspop.cfm](http://schs.state.nc.us/interactive/query/population/nchspop.cfm).
5. North Carolina Department of Health and Human Services, Division of Public Health, State Center for Health Statistics. Data produced upon request on June 12, 2019.
6. North Carolina Department of Health and Human Services, Division of Medical Assistance. Data produced upon request on April 23, 2019.
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 [schs.state.nc.us/data/brfss/2014/nc/all/aid.html](http://schs.state.nc.us/data/brfss/2014/nc/all/aid.html) on March 05, 2018.
8. 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 [schs.state.nc.us/data/brfss/2014/nc/all/stroke2.html](http://schs.state.nc.us/data/brfss/2014/nc/all/stroke2.html) on March 05, 2018.
9. 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
10. University of Wisconsin Population Health Institute. County Health Rankings Key Findings 2019. Accessed at [countyhealthrankings.org/reports/2019-county-health-rankings-key-findings-report](http://countyhealthrankings.org/reports/2019-county-health-rankings-key-findings-report) on July 23, 2019.
11. 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.
12. Centers for Disease Control and Prevention, National Center for Health Statistics. Underlying Cause of Death 1999–2017 on CDC WONDER Online Database, released December 2018. Accessed at [wonder.cdc.gov/ucd-icd10.html](http://wonder.cdc.gov/ucd-icd10.html) on Jul 16, 2019.
13. 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 [schs.dph.ncdohhs.gov/interactive/query/lcd/lcd.cfm](http://schs.dph.ncdohhs.gov/interactive/query/lcd/lcd.cfm) July 16, 2019.