

# The Burden of Cardiovascular Disease in North Carolina



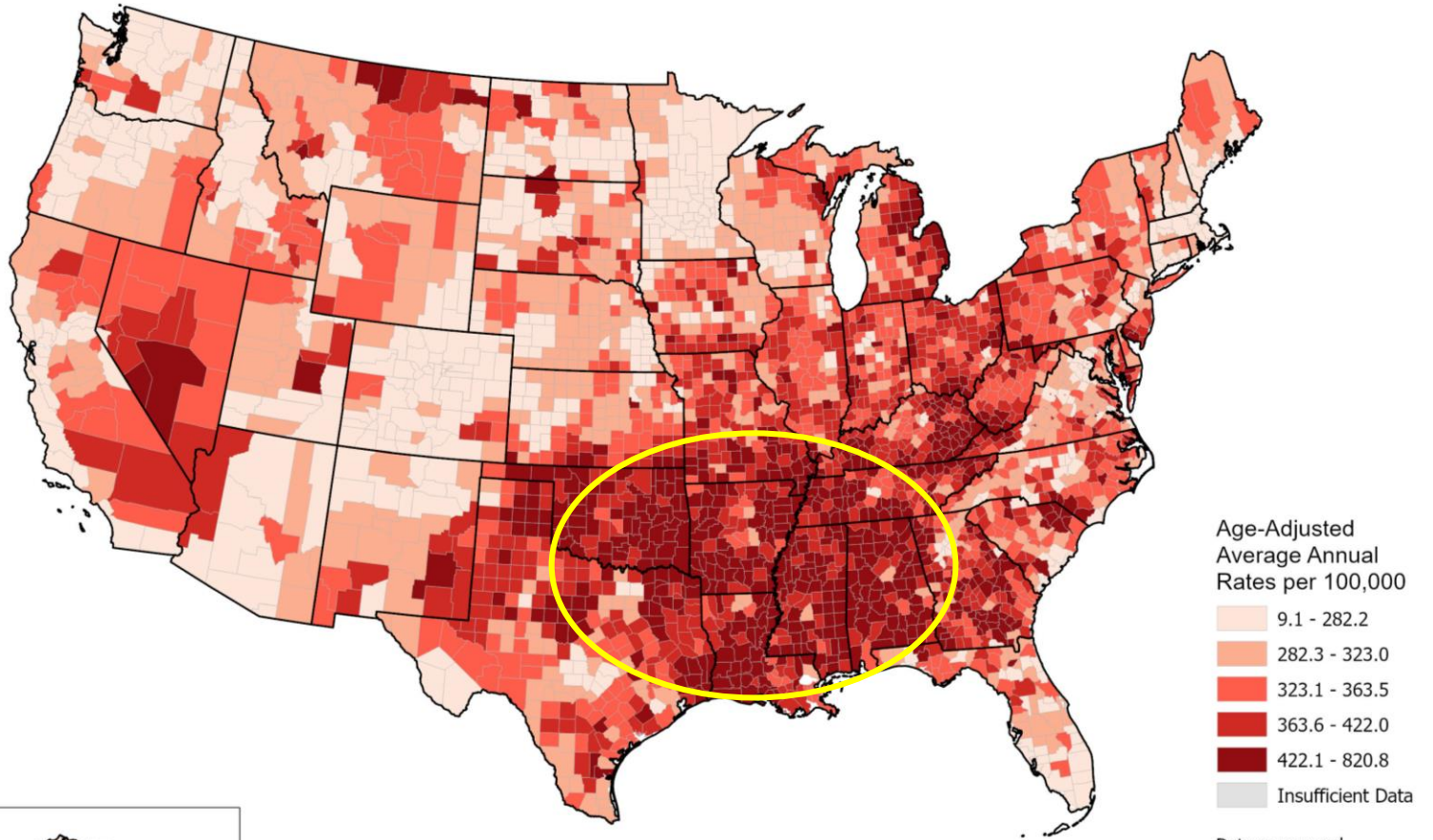
*Justus-Warren Heart Disease  
& Stroke Prevention Task Force*

Justus-Warren Heart Disease and Stroke Prevention  
Task Force  
2024

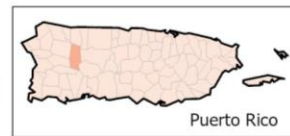
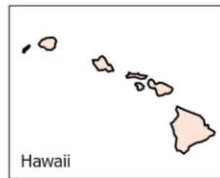
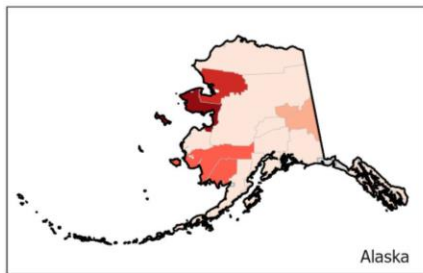
## Purpose

1. To detail the burden of heart disease and stroke in North Carolina
2. To examine the risk factors for heart disease and stroke including identification of subpopulations at highest risk
3. To publicize the profile of the heart disease and stroke burden and its preventability
4. To identify priority strategies which are effective in preventing and controlling risks for heart disease and stroke
5. To recommend to the Governor and General Assembly funding and strategies needed to modify or enact laws to enhance heart disease and stroke prevention

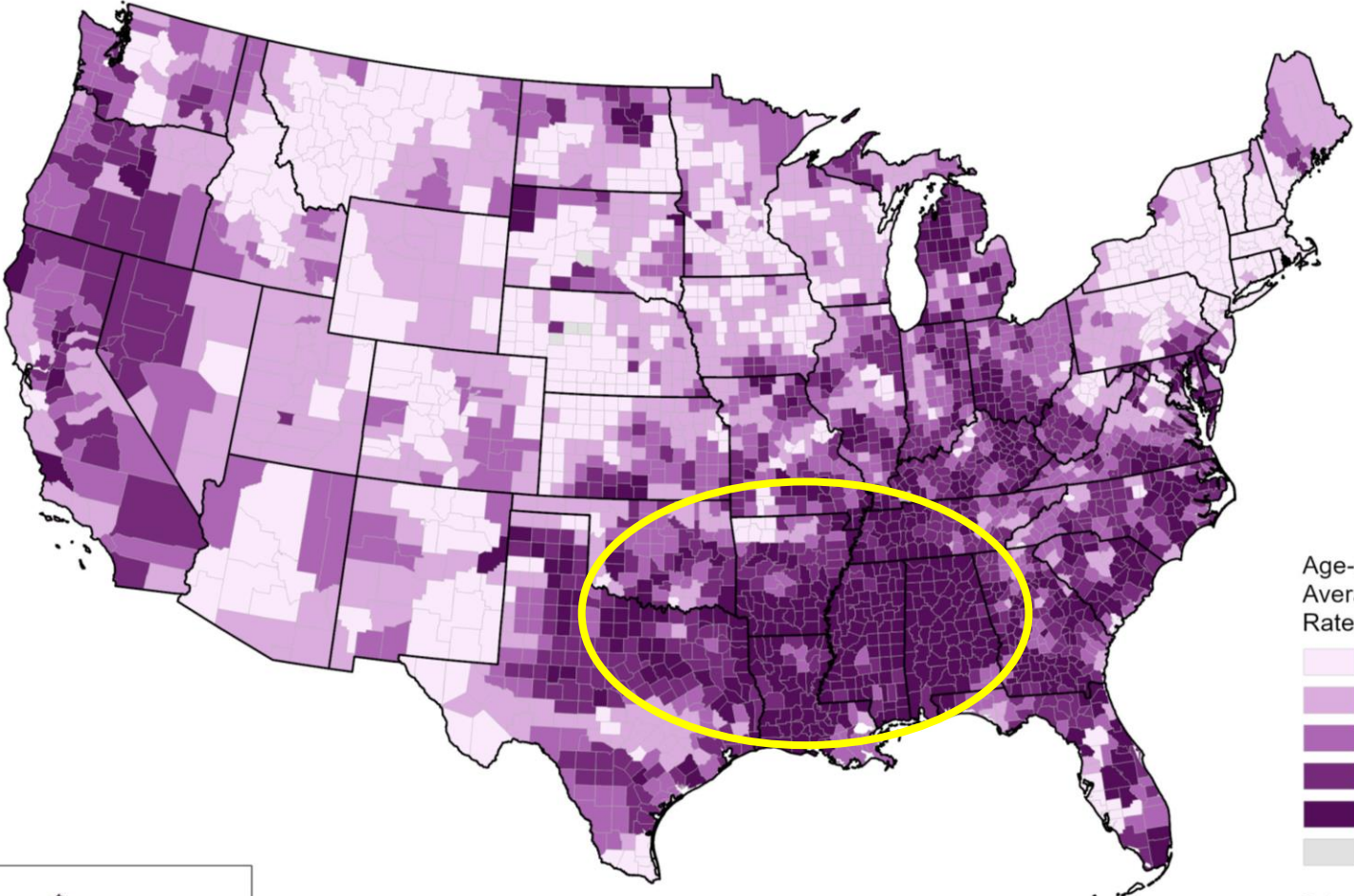
# US Heart Disease Death Rates by County, Ages 35+, 2018 - 2020



Data source and methodology found at: [www.cdc.gov/dhdsp/maps/atlas/statistical-methods](http://www.cdc.gov/dhdsp/maps/atlas/statistical-methods)



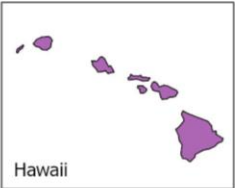
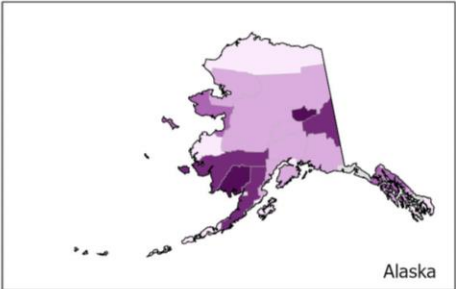
# US Stroke Death Rates by County, Adults Ages 35+, 2018-2020



Age-Adjusted  
Average Annual  
Rates per 100,000

- 3.6 - 61.4
- 61.5 - 70.6
- 70.7 - 78.4
- 78.5 - 89.3
- 89.4 - 177.5
- Insufficient Data

Data source and methodology found at:  
[www.cdc.gov/dhdsp/maps/atlas/statistical-methods](http://www.cdc.gov/dhdsp/maps/atlas/statistical-methods)



# US Heart Disease Death Rates and Ranking by State, 2017-2021

State	2017		2018		2019		2020		2021	
	Age Adjusted Death Rate	US Rank	Age Adjusted Death Rate	US Rank	Age Adjusted Death Rate	US Rank	Age Adjusted Death Rate	US Rank	Age Adjusted Death Rate	US Rank
Delaware	158.4	27	159.1	27	154.3	21	159.6	23	162.7	22
Maryland	164.5	31	161.9	28	159.3	28	168.3	30	165.2	23
Idaho	162.4	29	157.9	24	150.7	19	151.9	17	166.4	24
Virginia	154.5	21	147.9	16	149.1	17	152	18	167.2	25
Maine	143.5	12	147.0	15	142.4	11	146.2	13	169.8	26
Illinois	163.3	30	163.9	31	162.0	30	171.4	32	169.8	27
North Carolina	156.5	24	155.5	21	154.7	22	156.5	22	170.9	28
Wisconsin	157.6	25	157.8	23	158.8	27	162.2	25	171.7	29
Montana	155.0	22	163.2	30	157.1	23	162.7	26	175.2	30
Vermont	152.5	20	150.5	18	151.6	20	167.1	29	175.7	31
Kansas	157.9	26	158.9	25	166.0	33	167.0	28	176.1	32
Pennsylvania	176.0	37	176.1	37	172.9	37	175.7	35	180.6	33
Texas	169.2	33	170.0	34	163.4	31	173.9	34	180.7	34

Rates per 100,000 population, age-adjusted to the 2000 U.S. standard population.

Data Source: Centers for Disease Control and Prevention, National Center for Health Statistics. Heart Disease Mortality by State. Accessed at [https://www.cdc.gov/nchs/pressroom/sosmap/heart\\_disease\\_mortality/heart\\_disease.htm](https://www.cdc.gov/nchs/pressroom/sosmap/heart_disease_mortality/heart_disease.htm) on December 4, 2023.

# US Stroke Death Rates and Ranking by State, 2017 - 2021

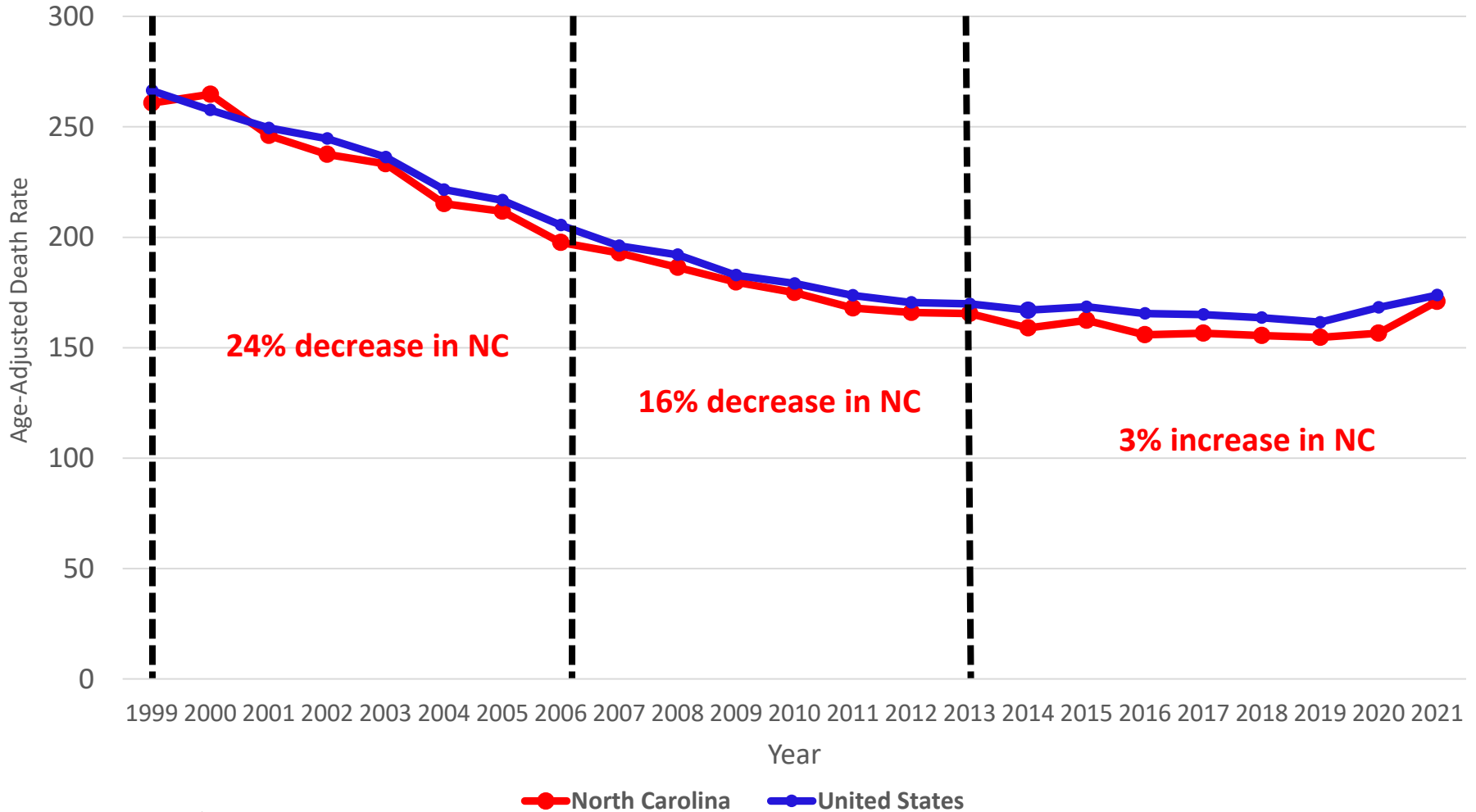
State	2017		2018		2019		2020		2021	
	Age Adjusted Death Rate	US Rank	Age Adjusted Death Rate	US Rank	Age Adjusted Death Rate	US Rank	Age Adjusted Death Rate	US Rank	Age Adjusted Death Rate	US Rank
Illinois	38.9	31	37.3	27	38.8	32	42.3	36	44.1	35
Oregon	39.9	34	38.0	29	39.5	35	40.5	33	45.1	36
Kentucky	39.4	33	41.5	42	42.5	46	42.4	37	45.8	37
Michigan	39.3	32	40.0	36	39.3	34	44.5	45	46.2	38
Tennessee	45.0	46	43.6	45	41.8	42	43.6	43	46.2	39
Florida	38.9	30	39.6	34	40.4	37	43.5	41	46.5	40
<b>North Carolina</b>	<b>43.0</b>	<b>41</b>	<b>41.3</b>	<b>40</b>	<b>41.5</b>	<b>40</b>	<b>44.4</b>	<b>44</b>	<b>46.5</b>	<b>41</b>
Maryland	40.2	36	40.3	38	41.8	41	42.5	38	47.3	42
Georgia	43.5	43	43.4	44	41.9	43	43.0	39	47.9	43
South Carolina	44.9	45	45.5	46	42.2	45	43.5	42	48.3	44
Ohio	42.8	40	42.6	43	42.2	44	45.3	46	49.0	45
Arkansas	43.8	44	41.5	41	40.7	38	43.5	40	49.9	46
Louisiana	47.4	48	46.7	48	44.1	47	46.6	47	52	47

Rates per 100,000 population, age-adjusted to the 2000 U.S. standard population.

Data Source: Centers for Disease Control and Prevention, National Center for Health Statistics. Stroke Mortality by State. Accessed at [https://www.cdc.gov/nchs/pressroom/sosmap/stroke\\_mortality/stroke.htm](https://www.cdc.gov/nchs/pressroom/sosmap/stroke_mortality/stroke.htm) on December 4, 2023.



# Heart Disease Death Rates, NC vs. US, 1999 - 2021



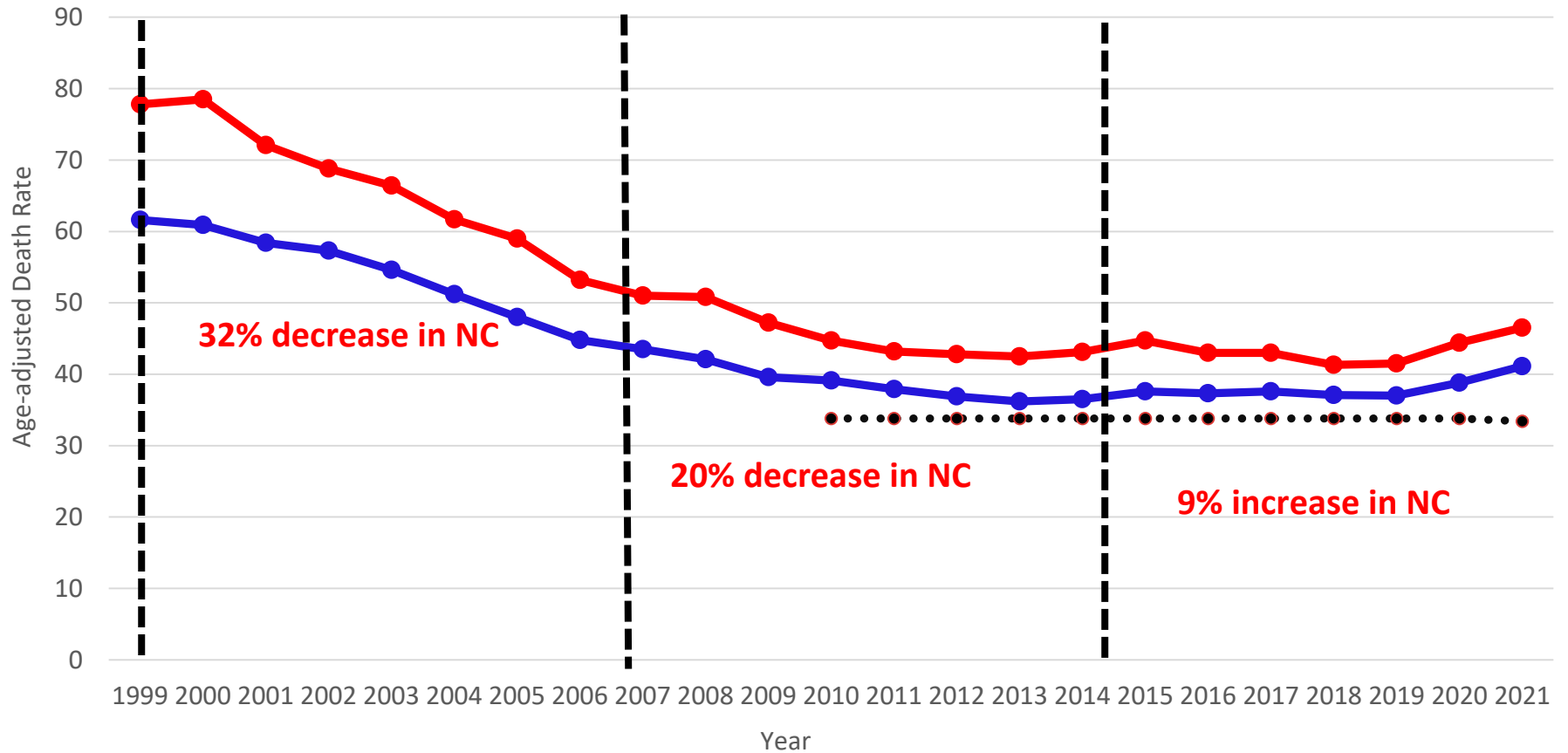
Heart Disease: ICD-10 codes I00-I09, I11, I13, I20-I51

Rates per 100,000 population, age-adjusted to the 2000 U.S. standard population.

**Data Sources:** Centers for Disease Control and Prevention, National Center for Health Statistics. Underlying Cause of Death 1999-2019 on CDC WONDER Online Database, released in 2020. Accessed at <https://wonder.cdc.gov/ucd-icd10.html> on January 4, 2021.

Centers for Disease Control and Prevention, National Center for Health Statistics. Heart Disease Mortality by State. Accessed at [https://www.cdc.gov/nchs/pressroom/sosmap/heart\\_disease\\_mortality/heart\\_disease.htm](https://www.cdc.gov/nchs/pressroom/sosmap/heart_disease_mortality/heart_disease.htm) on December 4, 2023.

# Stroke Death Rates NC vs. US, 1999 – 2021



••• Healthy People 2020 Target (33.8)      —●— North Carolina      —●— United States

Stroke: ICD-10 codes I60-I69

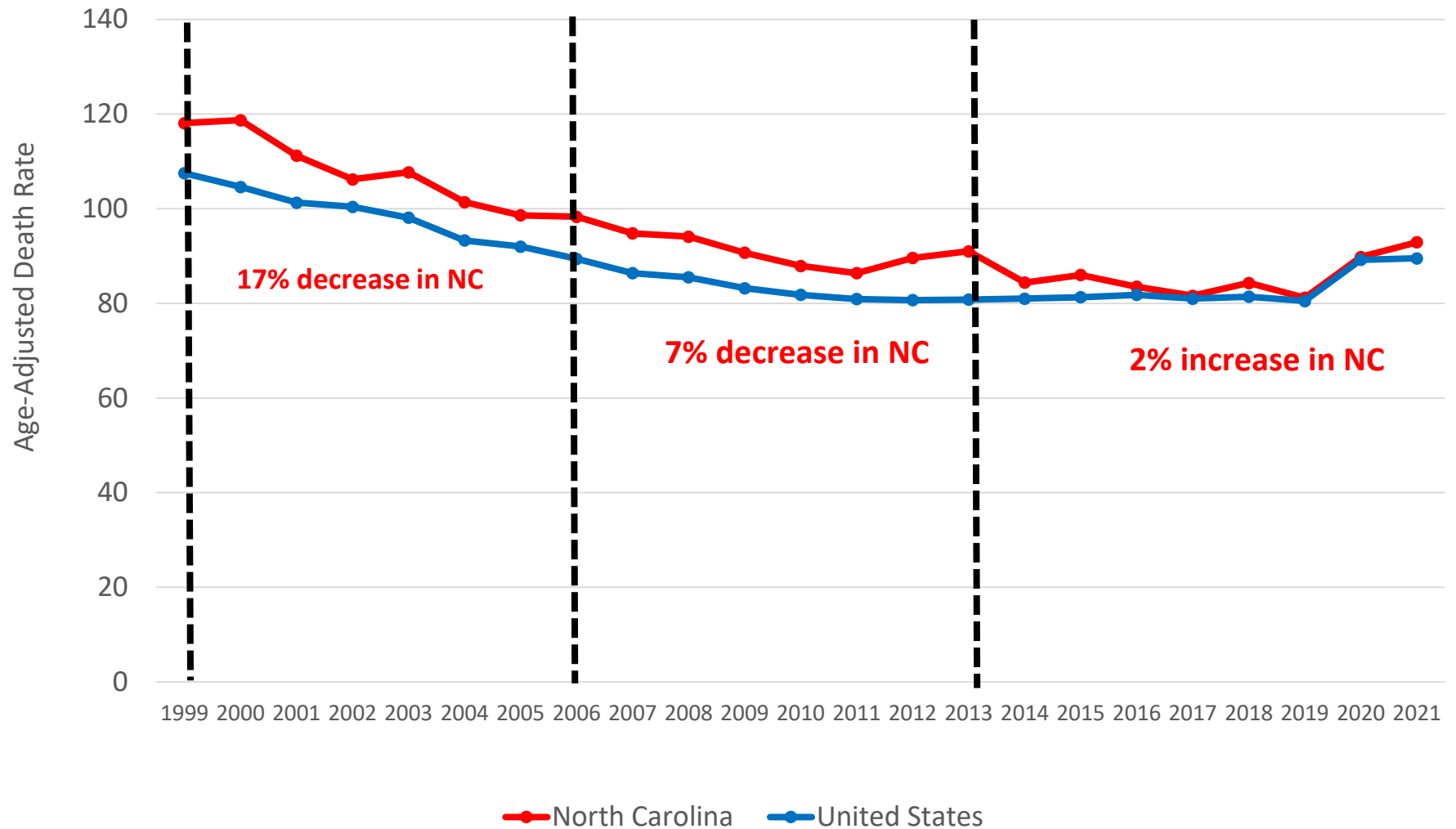
Rates per 100,000 population, age-adjusted to the 2000 U.S. standard population.

Data Source: Centers for Disease Control and Prevention, National Center for Health Statistics. Underlying Cause of Death 1999-2019 on CDC WONDER Online Database, released in 2020. Accessed at <https://wonder.cdc.gov/ucd-icd10.html> on January 4, 2021.

Centers for Disease Control and Prevention, National Center for Health Statistics. Stroke Mortality by State. Accessed at [https://www.cdc.gov/nchs/pressroom/sosmap/stroke\\_mortality/stroke.htm](https://www.cdc.gov/nchs/pressroom/sosmap/stroke_mortality/stroke.htm) on December 4, 2023.



# Heart Disease Death Rates, Ages 35-64 Years, NC vs. US, 1999 - 2021



— North Carolina — United States

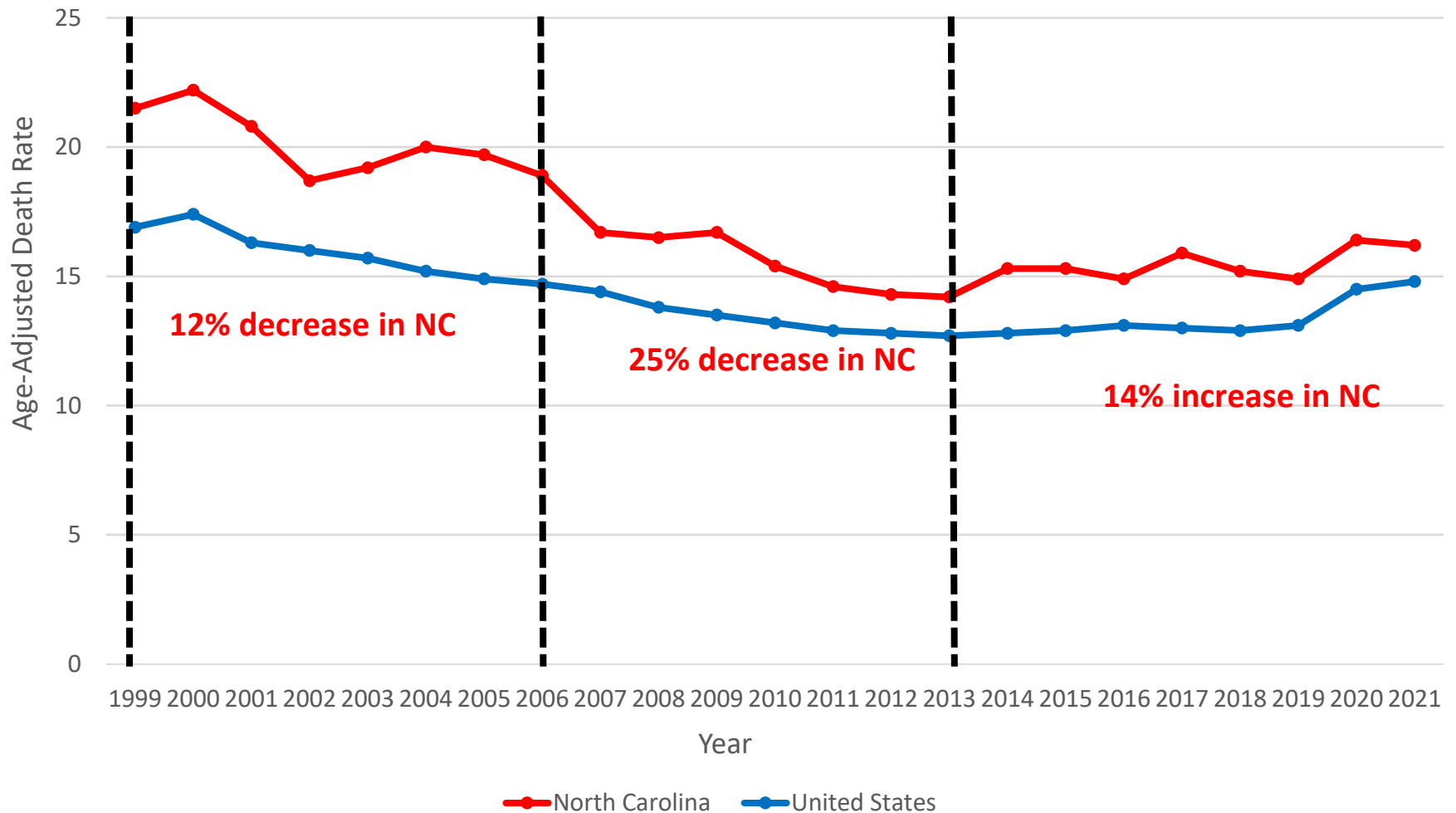
Heart Disease: ICD-10 codes I00-I09, I11, I13, I20-I51'

Rates per 100,000 population, age-adjusted to the 2000 U.S. standard population.

Data Source: Centers for Disease Control and Prevention, National Center for Health Statistics. Underlying Cause of Death 1999-2019 on CDC WONDER Online Database, released in 2020. Accessed at <https://wonder.cdc.gov/ucd-icd10.html> on January 4, 2021.

Data Source: Centers for Disease Control and Prevention, National Center for Health Statistics. Heart Disease Mortality by State. Accessed at [https://www.cdc.gov/nchs/pressroom/sosmap/heart\\_disease\\_mortality/heart\\_disease.htm](https://www.cdc.gov/nchs/pressroom/sosmap/heart_disease_mortality/heart_disease.htm) on December 5, 2023.

# Stroke Death Rates, Ages 35-64 Years, NC vs. US, 1999 - 2021



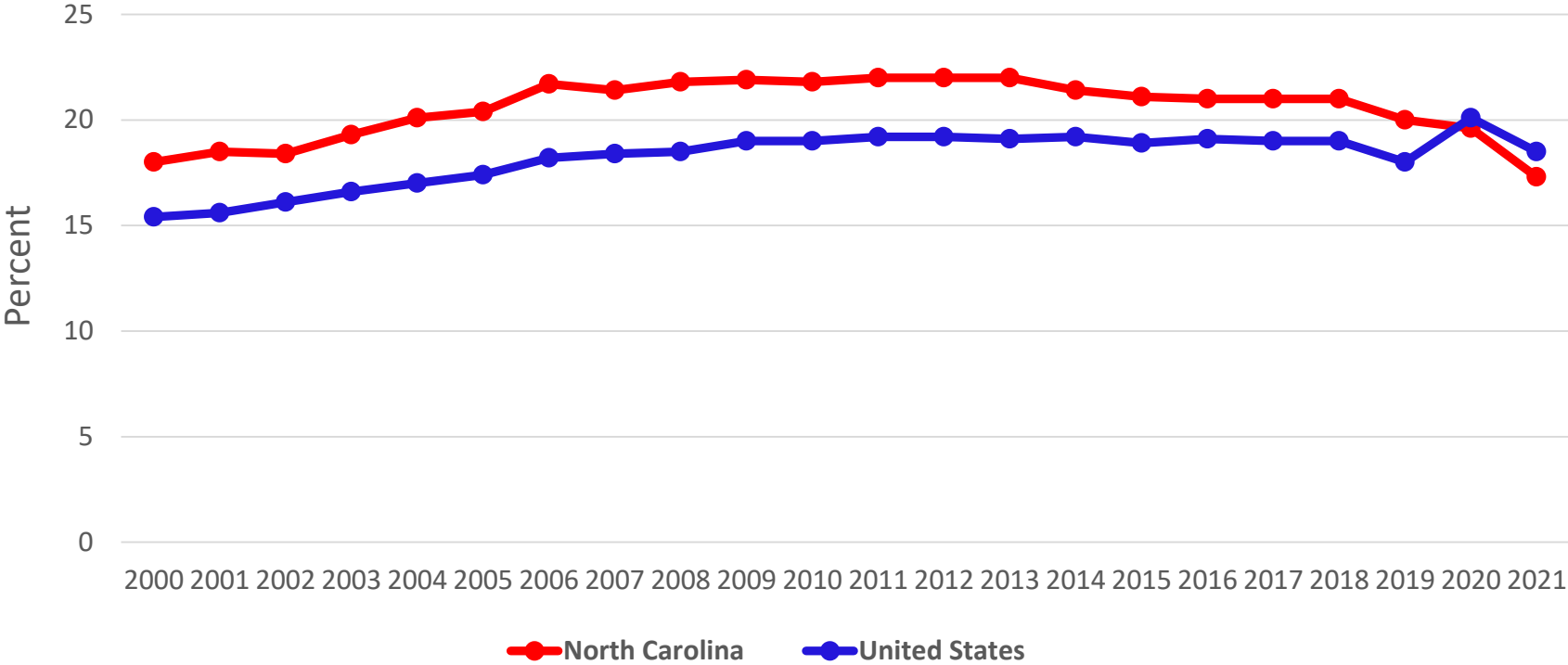
Stroke: ICD-10 codes I60-I69

Rates per 100,000 population, age-adjusted to the 2000 U.S. standard population.

Data Source: Centers for Disease Control and Prevention, National Center for Health Statistics. Underlying Cause of Death 1999-2019 on CDC WONDER Online Database, released in 2020. Accessed at <https://wonder.cdc.gov/ucd-icd10.html> on January 4, 2021.

Centers for Disease Control and Prevention, National Center for Health Statistics. National Vital Statistics System, Mortality 2018-2021 on CDC WONDER Online Database, released in 2021. Data are from the Multiple Cause of Death Files, 2018-2021, as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Accessed at <http://wonder.cdc.gov/ucd-icd10-expanded.html> on Dec 5, 2023

# Cardiovascular Disease Deaths Under 65 Years, NC vs. US, 2000 – 2021



Cardiovascular Disease: ICD-10 codes I00-I78

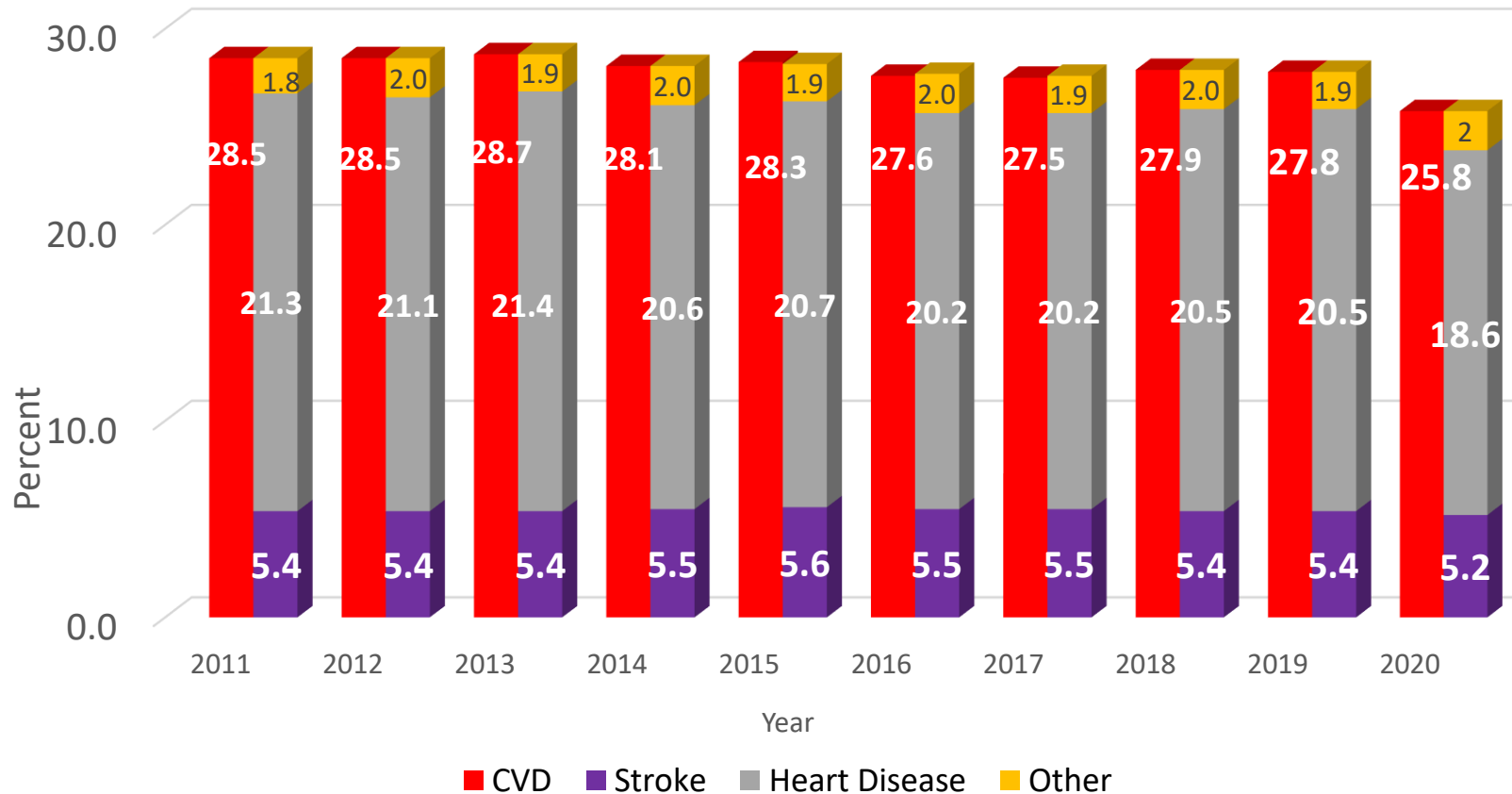
Data Source: Centers for Disease Control and Prevention, National Center for Health Statistics. Compressed Mortality File, 1999-2019. CDC WONDER Online Database. Accessed at <https://wonder.cdc.gov/ucd-icd10.html> on January 31, 2024.

## Leading Causes of Death, NC, 2021

Rank	Cause	Number	%
1	Diseases of the heart	21,299	18.0
2	Cancer	20,225	17.1
3	COVID-19	13,594	11.5
4	Cerebrovascular Disease	5,670	4.8
5	Chronic Lower Respiratory Diseases	4,742	4.0
6	Alzheimer's Disease	4,262	3.6
7	Unintentional Poisoning	3,968	3.4
8	Diabetes Mellitus	3,932	3.3
9	Unintentional Injuries	2,707	2.3
10	Nephritis, Nephrosis and Necrotic Syndrome	2,240	1.9
	All other causes (Residual)	11,031	9.3
	<b>Total Deaths -- All Causes</b>	<b>118,040</b>	<b>100</b>

Data Source: North Carolina Division of Public Health, State Center for Health Statistics. Leading causes of death in NC. Accessed at <https://schs.dph.ncdhhs.gov/data/provisional/Death/2021/CY2021PD19ResidentDeathsbyCODbyGender.html> on December 5, 2023

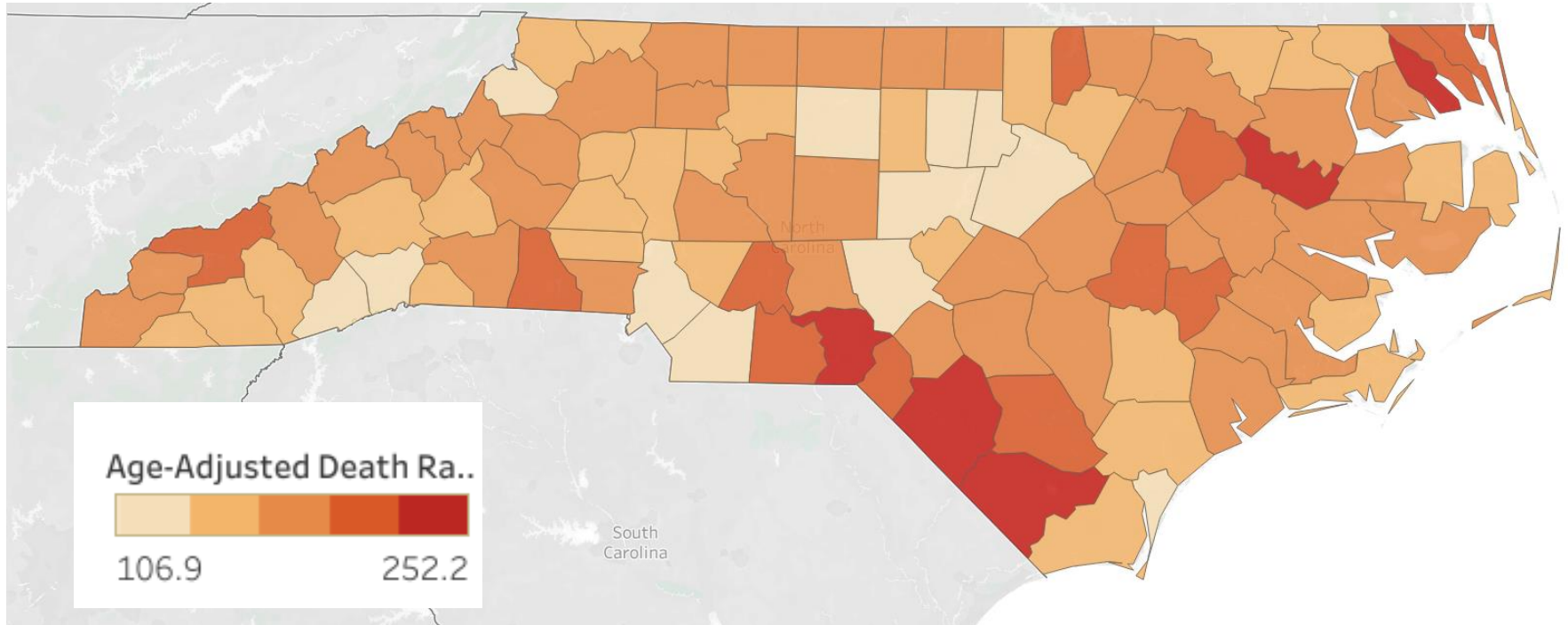
# Percentage of Deaths Caused by CVD, NC, 2011 - 2020



CVD Deaths includes deaths from ICD-10 codes I00-I78; Heart Disease ICD -10 codes I00-I09, I11, I13, I20-I51.; Stroke ICD -10 codes I60-I69.

Data Source: North Carolina Division of Public Health, State Center for Health Statistics. Detailed Mortality Statistics for North Carolina. SCHS Online Database, accessed at <https://schs.dph.ncdhhs.gov/data/vital/dms/2020/> on December 5, 2023.

# Heart Disease Death Rates by County of Residence, NC, 2016 - 2020



NC Heart Disease Mortality Rate = 156.1

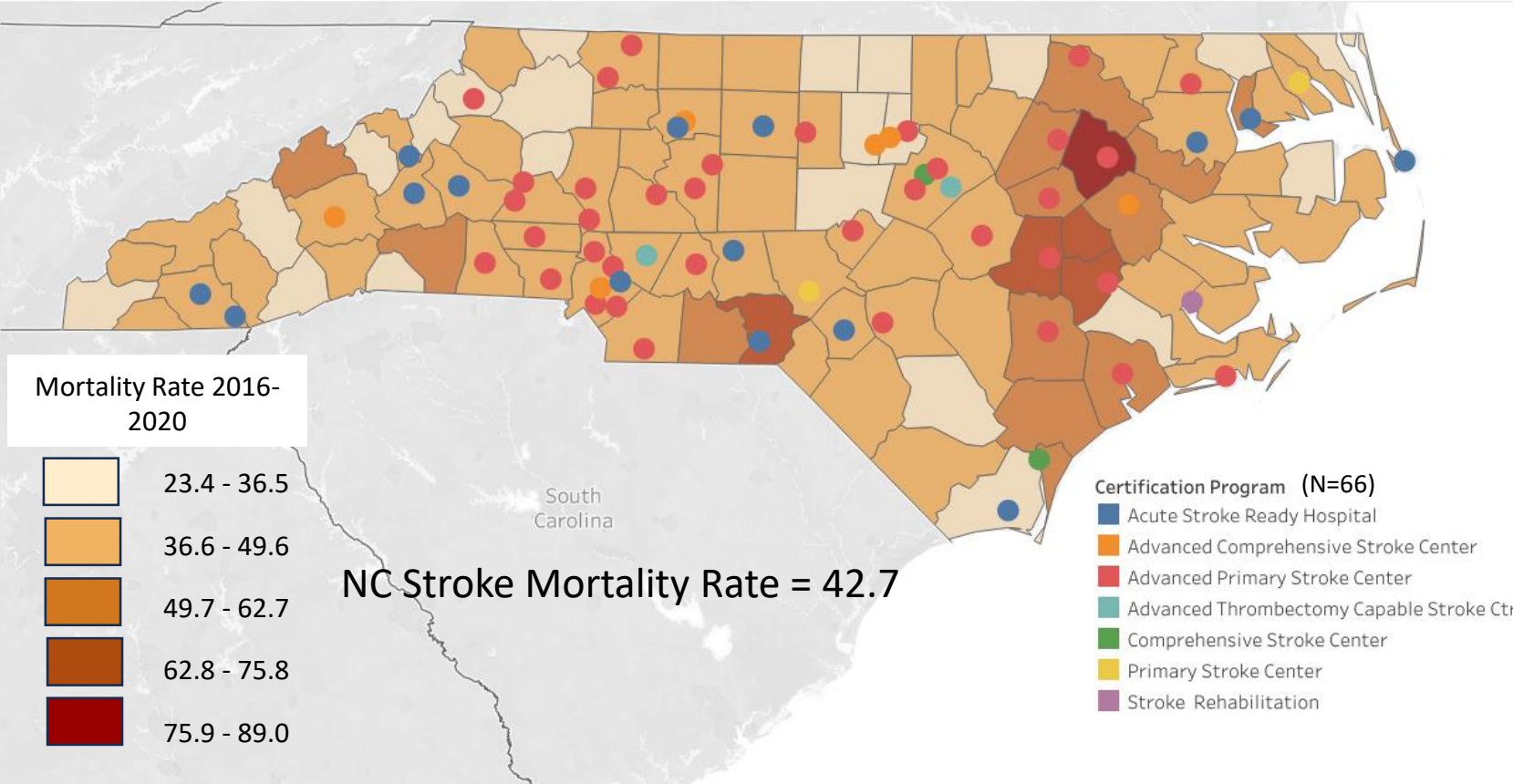
Heart Disease: ICD-10 codes I00-I09, I11, I13, I20-I51.

Rates per 100,000 population, age-adjusted to the 2000 U.S. standard population.

N.C. Data Source: North Carolina Division of Public Health, State Center for Health Statistics. *Volume 2: Leading Causes of Death in North Carolina 2020, SCHS Online Database*. Accessed at <https://schs.dph.ncdhs.gov/data/vital/lcd/2020/> on January 31, 2024.

# Stroke Death Rates by County of Residence, NC, 2016 - 2020

North Carolina Stroke Deaths 2016-2020



Stroke: ICD-10 codes I60-I69.

Rates per 100,000 population, age-adjusted to the 2000 U.S. standard population.

The Joint Commission Stroke Certification. Accessed at [www.qualitycheck.org/StrokeCertificationList.aspx](http://www.qualitycheck.org/StrokeCertificationList.aspx) on January 31, 2024.

N.C. Data Source: North Carolina Division of Public Health, State Center for Health Statistics. *Volume 2: Leading Causes of Death in North Carolina 2020, SCHS Online Database*. Accessed at <https://schs.dph.ncdhs.gov/data/vital/lcd/2020/> on January 31, 2024.



## Morbidity, NC, 2023

- Nearly 1 in 10 North Carolinians (9.8% of the adult population) has a history of either heart attack, coronary heart disease or stroke.<sup>1</sup>
- Cardiovascular disease (CVD) is one of the leading cause of hospitalization in North Carolina.<sup>2</sup>
  - 145,373 CVD hospital discharges in 2022
    - 30,662 stroke
    - 102,427 heart disease

Stroke ICD-10 codes I60-I69; Heart Disease ICD 10 codes I00-I09, I11, I13, I20 - I51; and Major Cardiovascular Disease ICD 10 codes I00-I78.

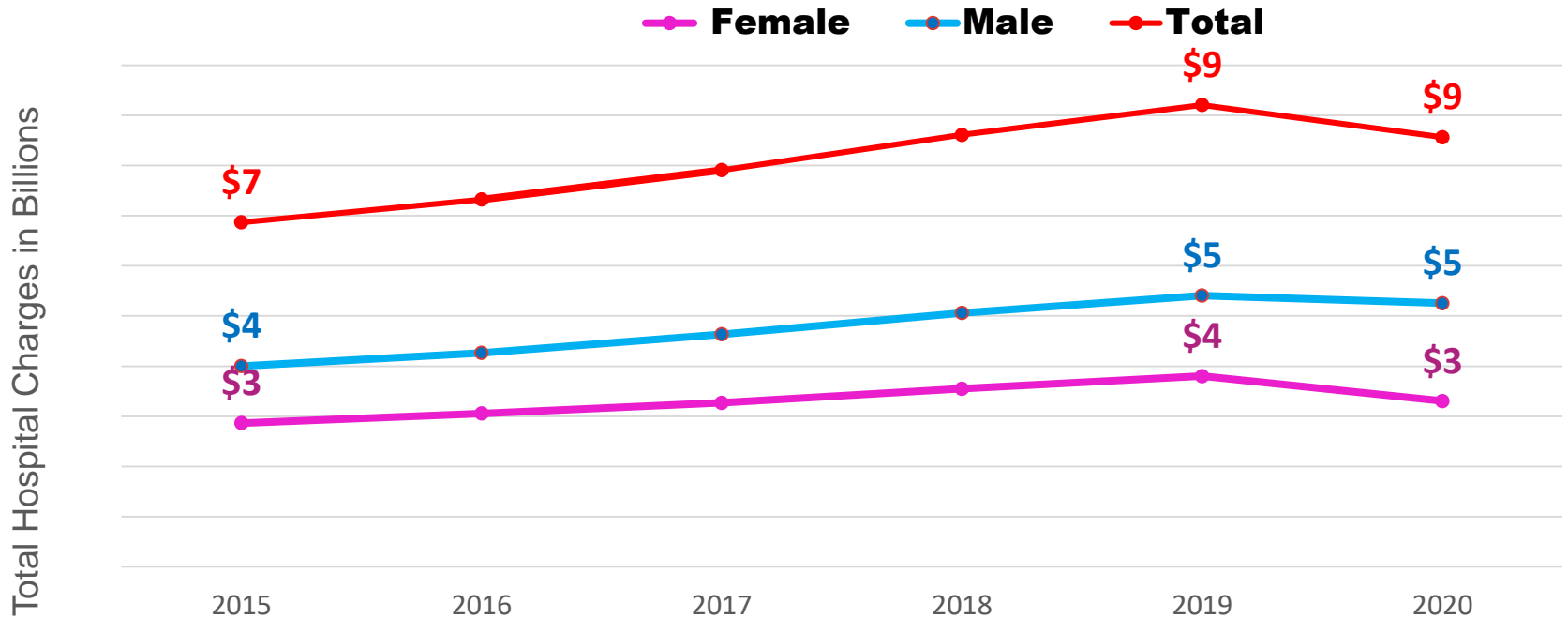
### Data Sources:

1. North Carolina Division of Public Health, State Center for Health Statistics. Behavioral Risk Factor Surveillance System (BRFSS) accessed at

<https://schs.dph.ncdhhs.gov/data/brfss/2022/nc/all/topics.htm> on December 19, 2023.

2. North Carolina Division of Public Health, State Center for Health Statistics. Inpatient Hospital Utilization and Charges by Principal Diagnosis. Data produced on request on January 31, 2024.

# Cardiovascular Disease Hospital Charges, NC, 2015-2020



Cardiovascular Disease: ICD 10 Codes I00-I78. Principal diagnosis only.

Data Source: North Carolina Division of Public Health, State Center for Health Statistics. Produced by: State Center for Health Statistics on request on February 02, 2021.

Accessed at <https://datatools.ahrq.gov/hcupnet/> on December 19, 2023.

# Hospitalization Charges for Selected Cardiovascular Disease Conditions and Risk Factors, NC, 2022

DIAGNOSTIC CATEGORY	TOTAL CHARGES	TOTAL DISCHARGES	AVG CHARGE PER BENEFICIARY
HEART DISEASE	\$7.3 Billion	112,956	\$71,462
STROKE	\$2.1 Billion	30,662	\$69,574
CORONARY HEART DISEASE	\$2.6 Billion	26,160	\$100,740
HEART FAILURE	\$253 Million	3,772	\$67,066
DIABETES MELLITUS	\$1.1 Billion	24,304	\$43,367
HYPERTENSION	\$1.8 Billion	37,526	\$48,028

ICD-10 codes: Heart Disease (I00-I09, I11, I13, I20-I51), Stroke (I60 – I69), Coronary Heart Disease (I20 – I25), Heart Failure (I50), Diabetes Mellitus (E10-E11), Hypertension (I10-I15). Data includes only NC residents served in NC hospitals.

Data Source: North Carolina Division of Public Health, State Center for Health Statistics. Inpatient Hospital Utilization and Charges by Principal Diagnosis.

Data produced on request on January 31, 2024.

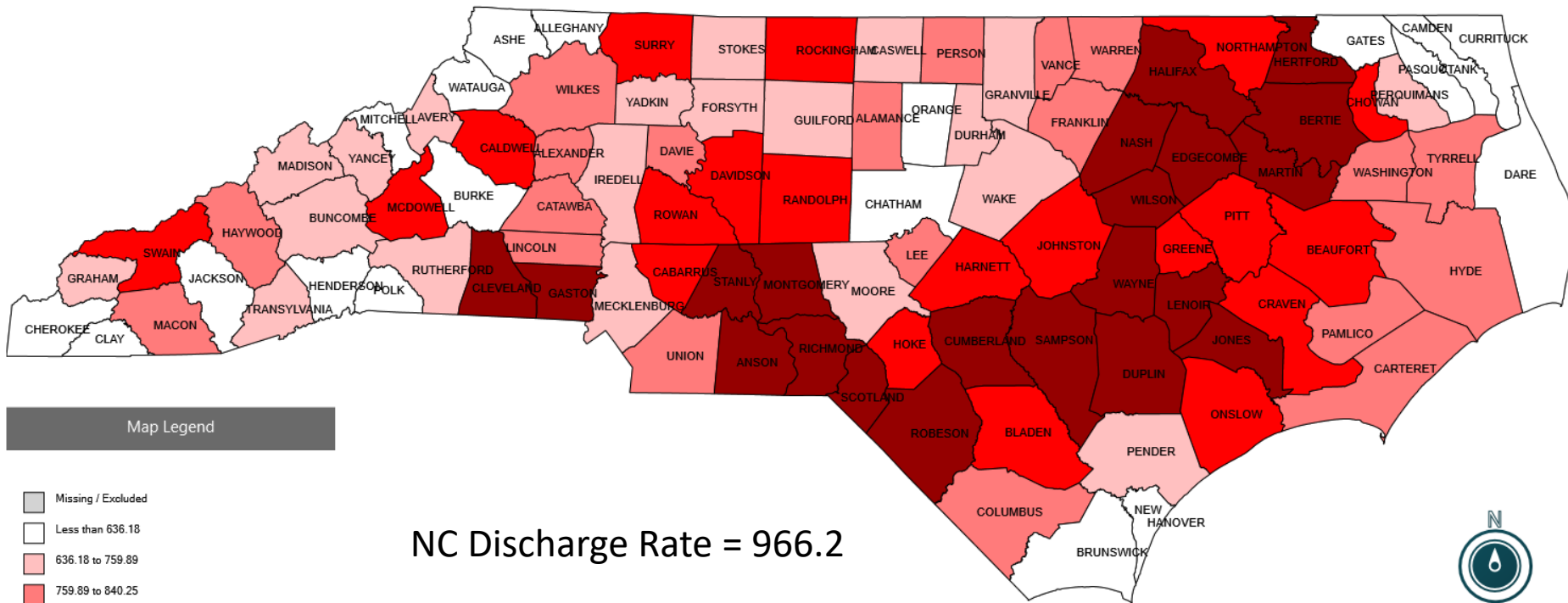
## Medicaid Expenditures on Beneficiaries with Selected Cardiovascular Disease Conditions and Risk Factors, NC, 2023

DIAGNOSTIC CATEGORY	TOTAL CHARGES	BENEFICIARIES	CHARGE PER BENEFICIARY
HEART DISEASE	\$570 Million	121,252	\$4,695
STROKE	\$528 Million	33,983	\$15,537
CORONARY HEART DISEASE	\$118 Million	33,944	\$3,480
HEART FAILURE	\$131 Million	29,118	\$4,495
DIABETES MELLITUS	\$346 Million	128,375	\$2,693
HYPERTENSION	\$455 Million	186,505	\$2,437

ICD-10 codes: Heart Disease (I00-I09, I11, I13, I20-I51), Stroke (I60 – I69), Coronary Heart Disease (I20 – I25), Heart Failure (I50), Diabetes Mellitus (E10-E11), Hypertension (I10-I15). Medicaid costs only by principal diagnosis.

Data Source: North Carolina Division of Health Benefits. Data produced on request on March 20, 2024.

# Heart Disease Hospital Discharge Rates by County of Residence, NC, 2022

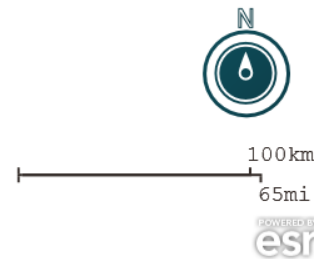


NC Discharge Rate = 966.2

Map Legend

- Missing / Excluded
- Less than 636.18
- 636.18 to 759.89
- 759.89 to 840.25
- 840.25 to 1004.33
- 1004.33 and above

Min: 240.180801734667 (CURRITUCK)  
 Max: 1288.48195344003 (ANSON)

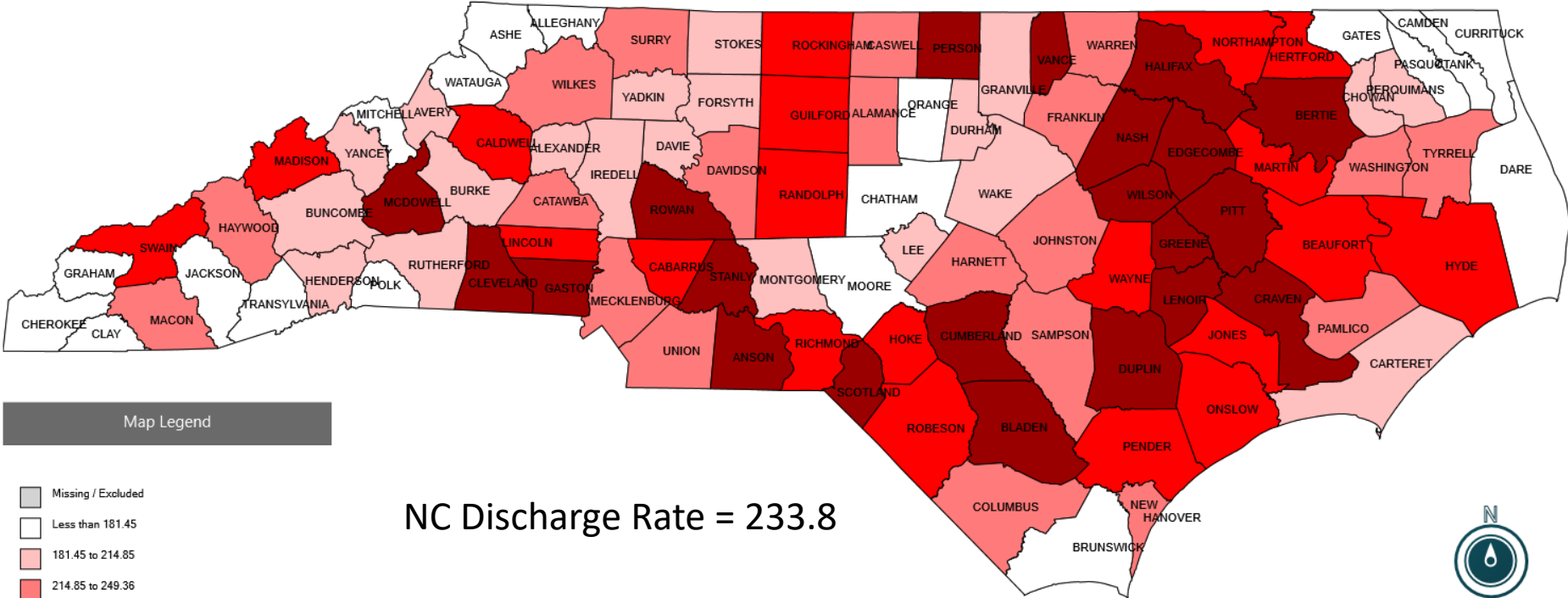


Heart Disease: ICD-10 codes I00-I09, I11, I13, I20-I51. Principal diagnosis only; N.C. residents only.

Rates per 100,000 population, age-adjusted to the 2000 U.S. standard population.

Data Source: North Carolina Division of Public Health, State Center for Health Statistics. Data produced on request by NC State Center for Health Statistics on January 31, 2024.

# Stroke Hospital Discharge Rates by County of Residence, NC, 2022

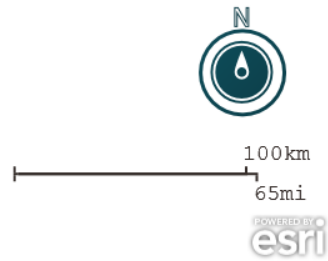


Map Legend

- Missing / Excluded
- Less than 181.45
- 181.45 to 214.85
- 214.85 to 249.36
- 249.36 to 291.4
- 291.4 and above

Min: 42.1433550582375 (CLAY)  
 Max: 404.920246863575 (GREENE)

NC Discharge Rate = 233.8



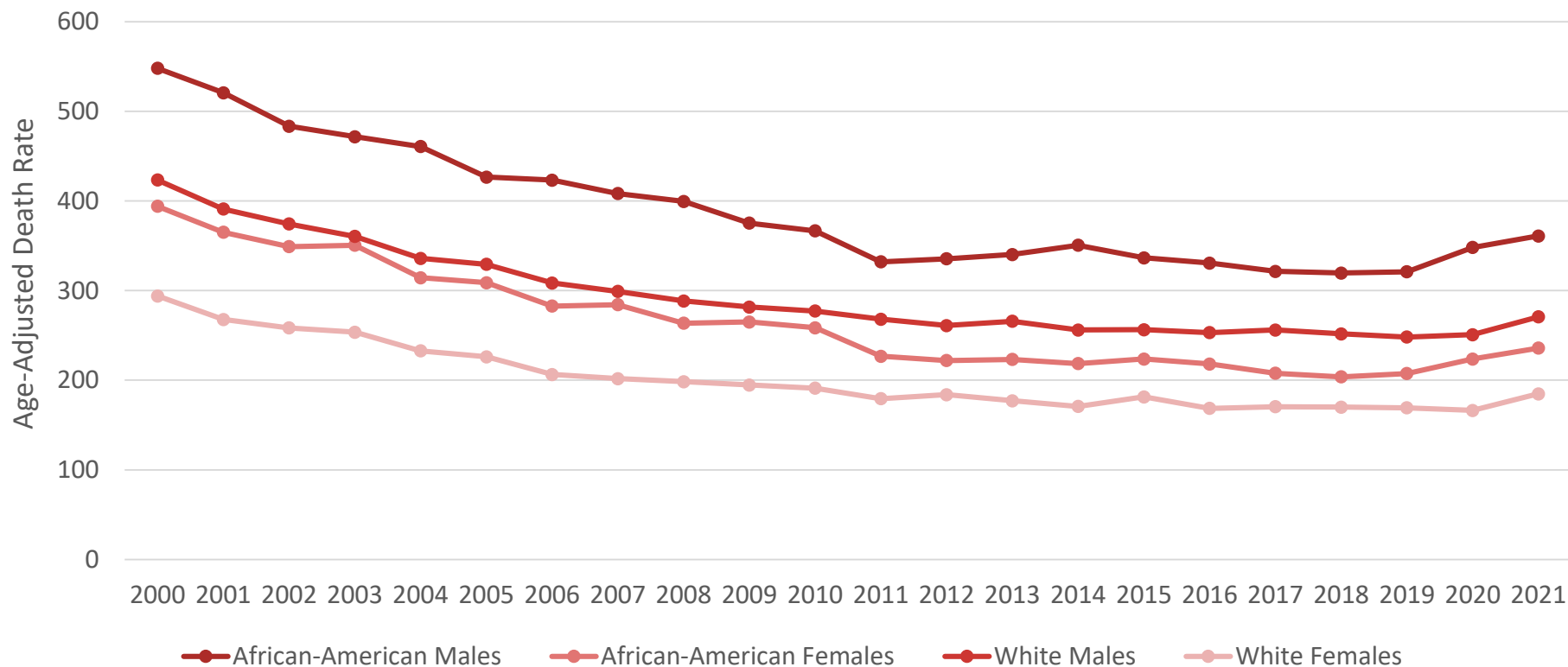
Stroke: ICD-10 codes I60-I69. Principal diagnosis only; N.C. residents only.  
 Rates per 100,000 population, age-adjusted to the 2000 U.S. standard population.  
[Data Source:](#) North Carolina Division of Public Health, State Center for Health Statistics. Data produced on request by NC State Center for Health Statistics on January 31, 2024.

## Non-Modifiable Risk Factors

- **Race/Ethnicity:** African Americans are more likely to suffer overall and premature mortality and morbidity from CVD compared to Whites.
- **Gender:** Men are more likely to have or die from CVD and at an earlier age (<55 years) than women.
- **Age:** Risk of CVD increases with age irrespective of the presence of potentially modifiable risk factors.
- **Geographical location:** NC has a greater burden of CVD -especially stroke.



# Major Cardiovascular Disease Death Rates by Race and Gender, NC, 1999 - 2021

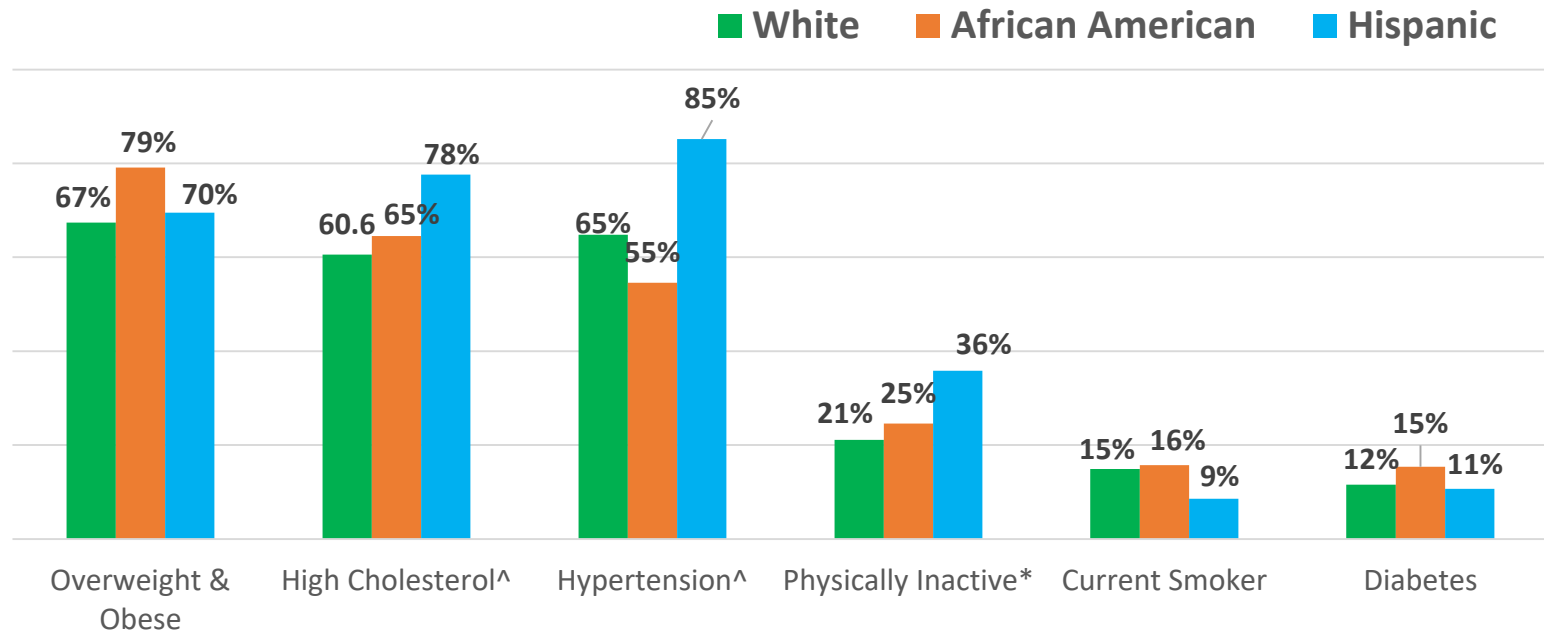


Major Cardiovascular Disease: ICD-10 codes I00-I78

Rates per 100,000 population, age-adjusted to the 2000 U.S. standard population.

Data Source: Centers for Disease Control and Prevention, National Center for Health Statistics. Underlying Cause of Death 1999-2021 on CDC WONDER Online Database, released in 2023. Accessed at <https://wonder.cdc.gov/> on December 19, 2023.

# Prevalence of CVD Risk Factors by Race and Ethnicity, NC, 2022



Adults=18+

<sup>\*</sup>Physically Inactivity=Respondent answered “No” to During the past month, other than your regular job, did you participate in any physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise?

<sup>^</sup>High Cholesterol and Hypertension data are 2021 data

Data Source: North Carolina Division of Public Health, State Center for Health Statistics. *North Carolina Behavioral Risk Factor Surveillance System, 2022*. Accessed at <https://schs.dph.ncdhhs.gov/data/brfss/2022/> on December 19,2023.

North Carolina Division of Public Health, State Center for Health Statistics. *North Carolina Behavioral Risk Factor Surveillance System, 2021*. Accessed at <https://schs.dph.ncdhhs.gov/data/brfss/2021/> on December 19,2023.

# Risk Factors for Heart Disease

- High blood pressure
- High LDL cholesterol
- Smoking
- Overweight and obesity
- Unhealthy eating
- Physical inactivity
- Diabetes

In the United States, cardiovascular diseases cause:



**1 IN 3 DEATHS**  
or more than 859,000  
people each year.



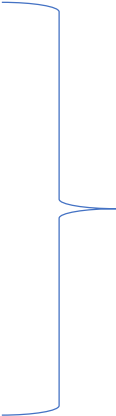
**\$216 BILLION**  
in health care system costs.



**\$147 BILLION**  
in lost productivity  
on the job from  
premature death.

# Risk Factors for Stroke

- High blood pressure
- High cholesterol
- Diabetes
- Overweight/obesity
- Smoking
- Unhealthy eating
- Physical inactivity
- Heart disease

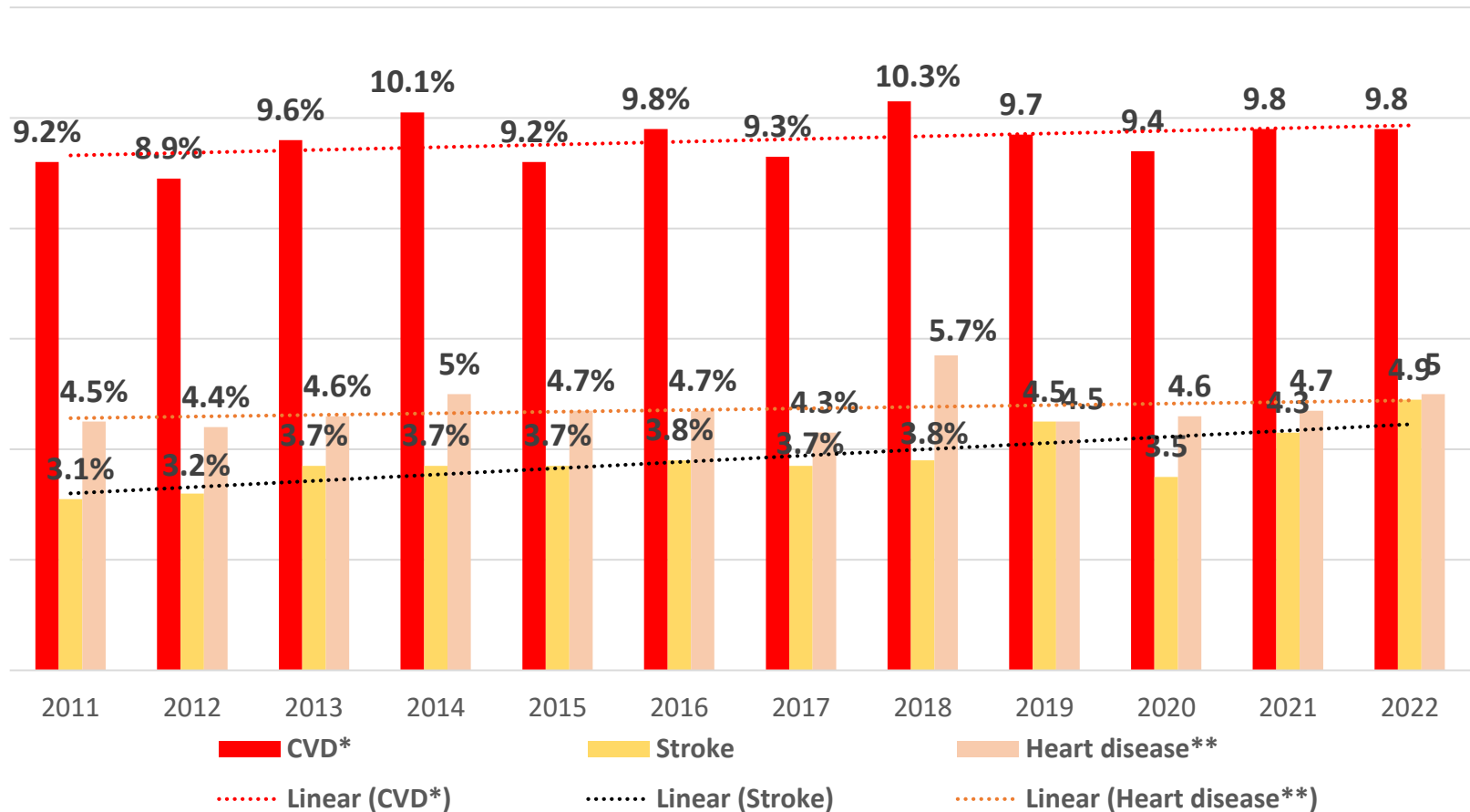


1 in 3 U.S. adults has at least one of these conditions or habits

# High Blood Pressure

- Primary or contributing cause for 45% of all CVD deaths
- If completely eliminated from the population, there will be 34.6% fewer cases of stroke and 17.9% fewer cases of myocardial infarction
- Responsible for about 45% of all strokes occurring in hypertensive individuals

# Prevalence of Cardiovascular Disease in Adults, NC, 2011 - 2022

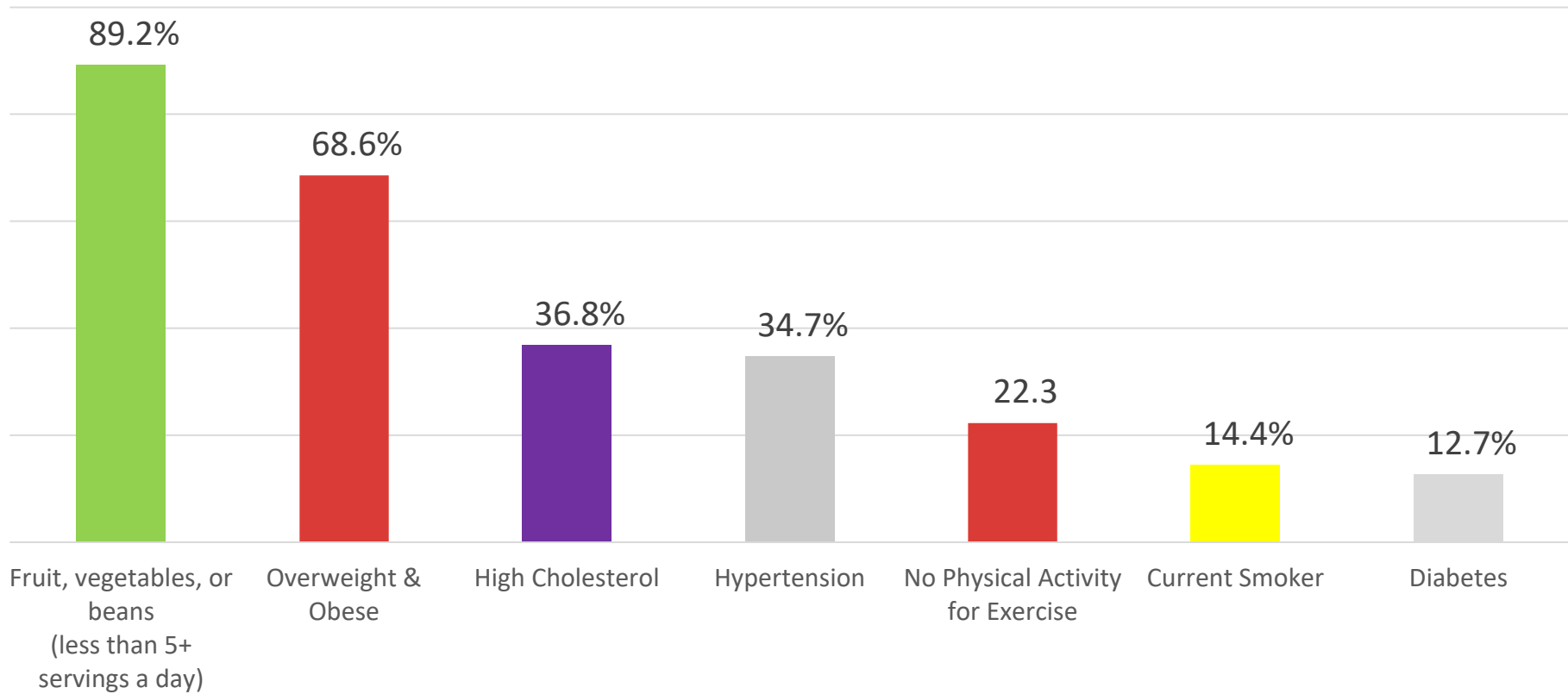


\*History of Any Cardiovascular Diseases (heart attack or coronary heart disease or stroke)

\*\* Had angina or coronary heart disease

Data Source: NC State Center for Health Statistics. Behavioral Risk Factor Surveillance System (BRFSS) accessed at <http://www.schs.state.nc.us/data/brfss/survey.htm> on December 19, 2023.

# Prevalence of CVD Risk Factors, NC, 2021



Adults=18+; \*PA = Physical activity

Data Source: North Carolina Division of Public Health, State Center for Health Statistics. North Carolina Behavioral Risk Factor Surveillance System (BRFSS). Accessed at <https://schs.dph.ncdhhs.gov/data/brfss/survey.htm> on January 4, 2021.



# Racial Disparities in Cardiovascular Health

## *Cardiovascular Health in African Americans<sup>1</sup>*

- Higher prevalence of traditional risk factors (e.g., hypertension, diabetes mellitus, obesity)
- Adverse health behaviors (e.g., unhealthy eating, physical inactivity, smoking)
- Comorbidities (renal disease, sickle cell disease, HIV/AIDS)
- Contribution of genetics

**1. Cardiovascular Health in African Americans: A Scientific Statement From the American Heart Association.**

Carnethon, M. R., Pu, J., Howard, G., Albert, M. A., Anderson, C. A. M., Bertoni, A. G., Mujahid, M. S., Palaniappan, L., Taylor, H. A., Willis, M., & Yancy, C. W. (2017). Cardiovascular health in African Americans: A scientific statement from the American Heart Association. *Circulation*, *136*(21). <https://doi.org/10.1161/cir.0000000000000534>

# Racial and Geographic Disparities in Stroke Mortality

## *The Reasons for Geographic and Racial Differences in Stroke (REGARDS) Study<sup>1</sup>*

- An ongoing national cohort study designed with the primary aim of documenting and finding possible explanations for geographic (Stroke belt and buckle vs. rest of the US) and racial/ethnic (African-American vs. White) differences in stroke
- For more information visit [REGARDS Study](#)

1. Howard VJ, Cushman M, Pulley L, Gomez C, Go R, Prineas RJ, Graham A, Moy CS, Howard G. The Reasons for Geographic And Racial Differences in Stroke (REGARDS) Study: Objectives and design. *Neuroepidemiology* 2005;25:135-143.

## Resources for Preventing Cardiovascular Disease

- Maintaining a healthy weight or losing weight.  
For information on achieving a healthy weight, visit [esmmweighless.com](http://esmmweighless.com)
- Engaging in regular physical activity and healthy eating (including reducing sodium intake)  
For information on physical activity and healthy eating, visit [eatsmartmovemorenc.com](http://eatsmartmovemorenc.com)
- Avoiding tobacco products and secondhand smoke for non-smokers and quitting for current smokers  
For information visit [quitlinenc.com](http://quitlinenc.com) or call 1-800-QUIT-NOW (1-800-784-8669)
- Working with your health care team to manage diabetes  
For information visit [diabetesnc.com](http://diabetesnc.com)

## Resources for Preventing Cardiovascular Disease

- Managing high blood pressure

For resources and information visit [startwithyourheart.com](http://startwithyourheart.com)

- Limiting alcohol consumption.

For more information visit [cdc.gov/alcohol](http://cdc.gov/alcohol)

- Healthy for Good

For resources to Eat Smart. Add Color. Move More. Be Well, visit [healthyforgood.heart.org](http://healthyforgood.heart.org)

- My Life Check - Life's Simple 7

For resources and to conduct a heart self-assessment, visit [heart.org](http://heart.org)

Visit [startwithyourheart.com](http://startwithyourheart.com) for more data, fact sheets, and resources.



*Justus-Warren Heart Disease  
& Stroke Prevention Task Force*