



# Trends and Predictors of Emergency Department Outcomes in Atrial Fibrillation: A Statewide Analysis from North Carolina—2016 to 2023



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# Introduction to the Authors

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# BACKGROUND

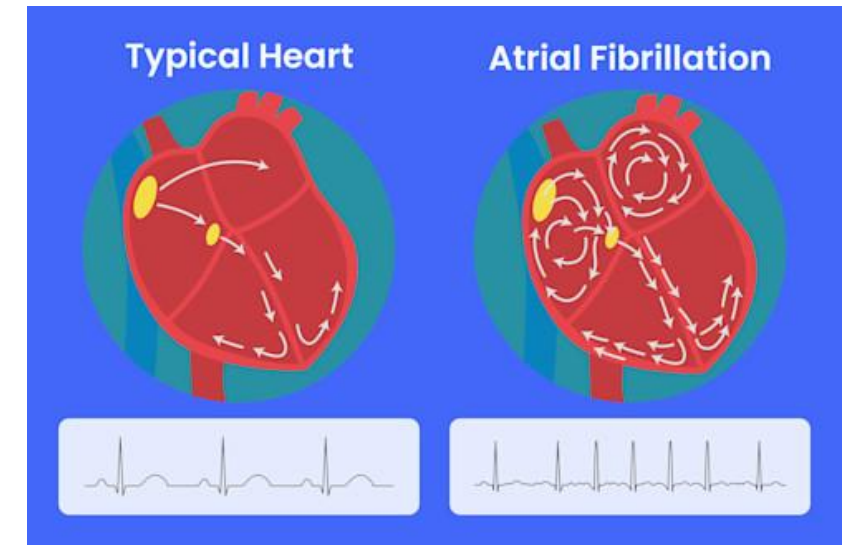
# Atrial Fibrillation (AF) is a common, irregular heart rhythm

Caused by many prevalent risk factors:

- High blood pressure
- Coronary artery disease/heart attack
- Obesity
- Diabetes

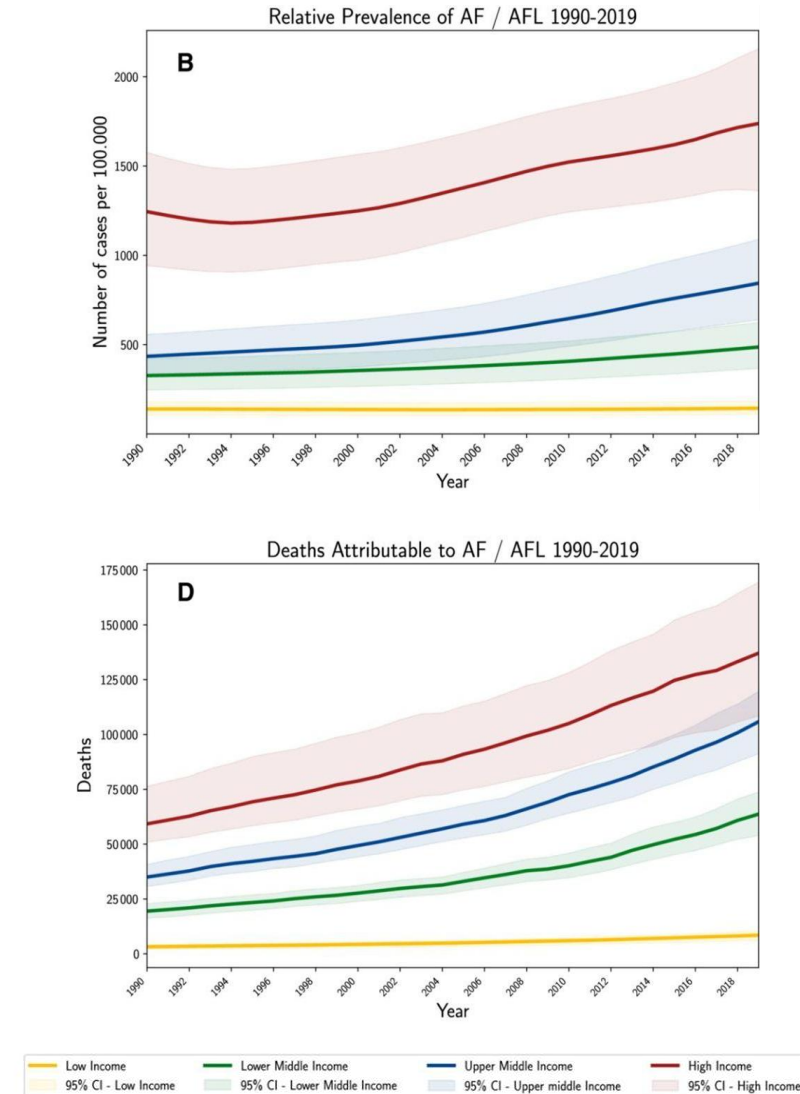
Increases risk of:

- Stroke
- Heart Failure
- Cognitive Impairment/Dementia

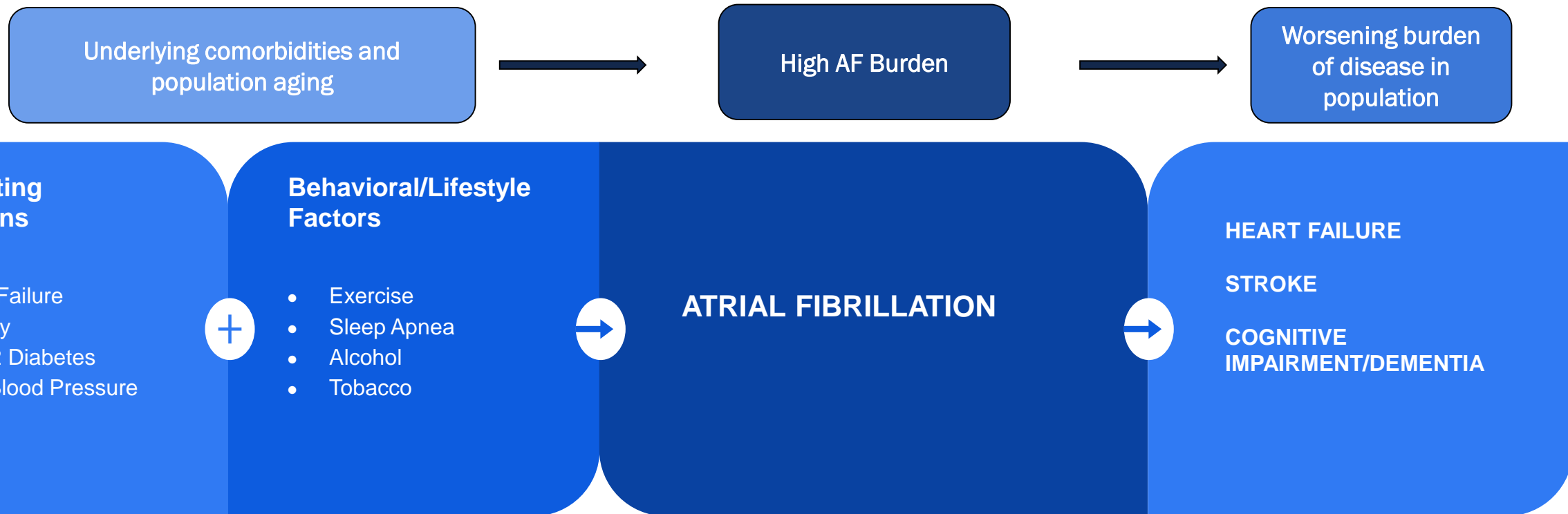


# Atrial Fibrillation Burden is increasing

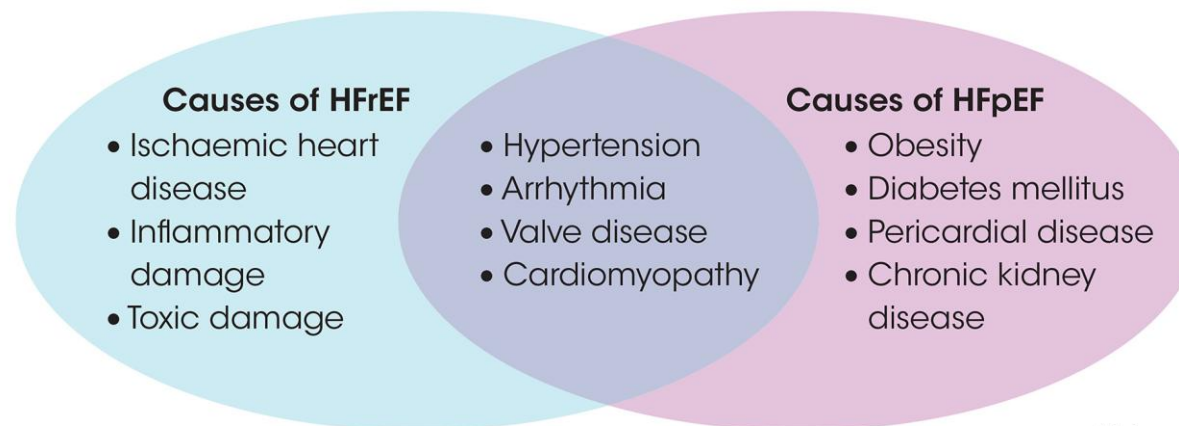
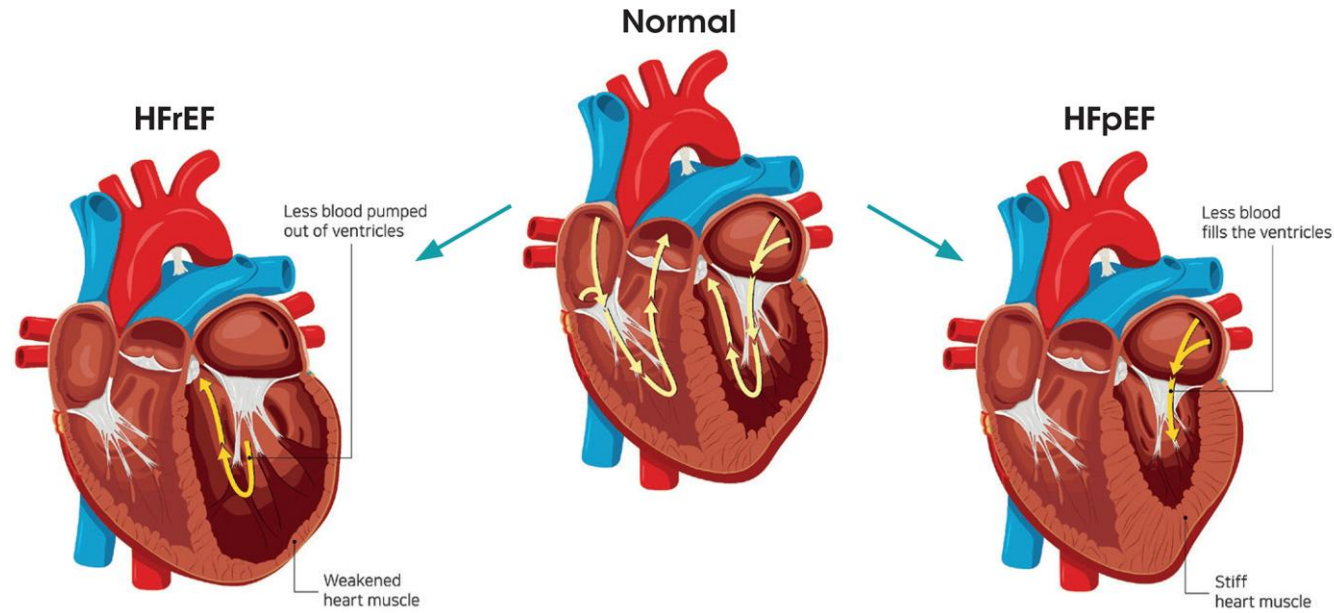
- Previous national estimates projected AFib prevalence to be 3.3 million in 2020
- Current analyses suggest 10.55 million people (5% prevalence) in the US may have AFib, a drastic increase from prior projections
- Incidence: ~160,000 cases/yr
- 1-year mortality is 10% in the ED



# Atrial Fibrillation has significant health burden



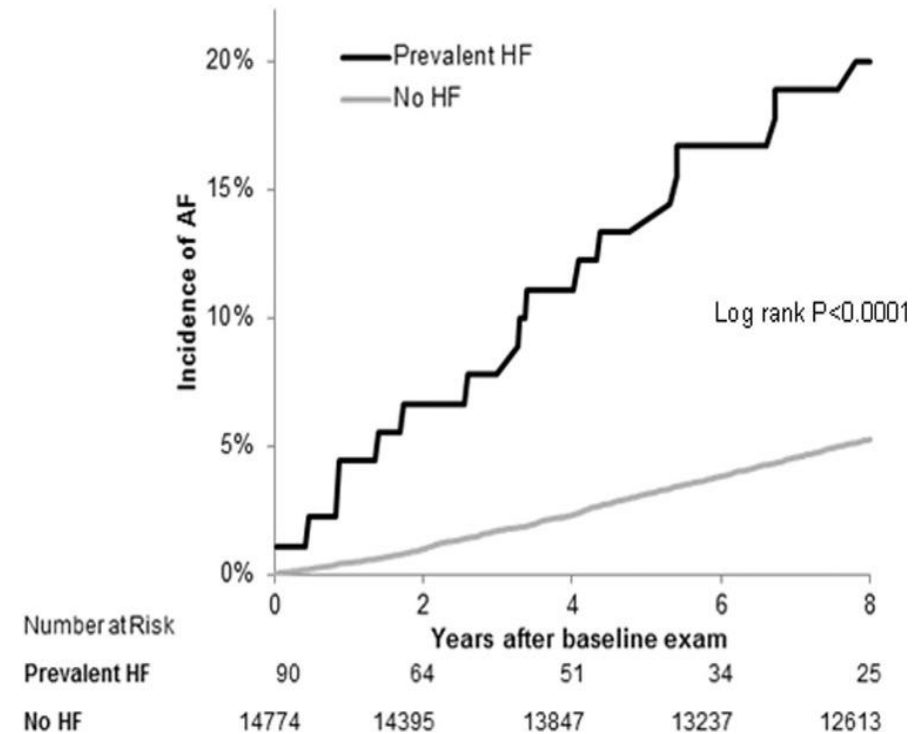
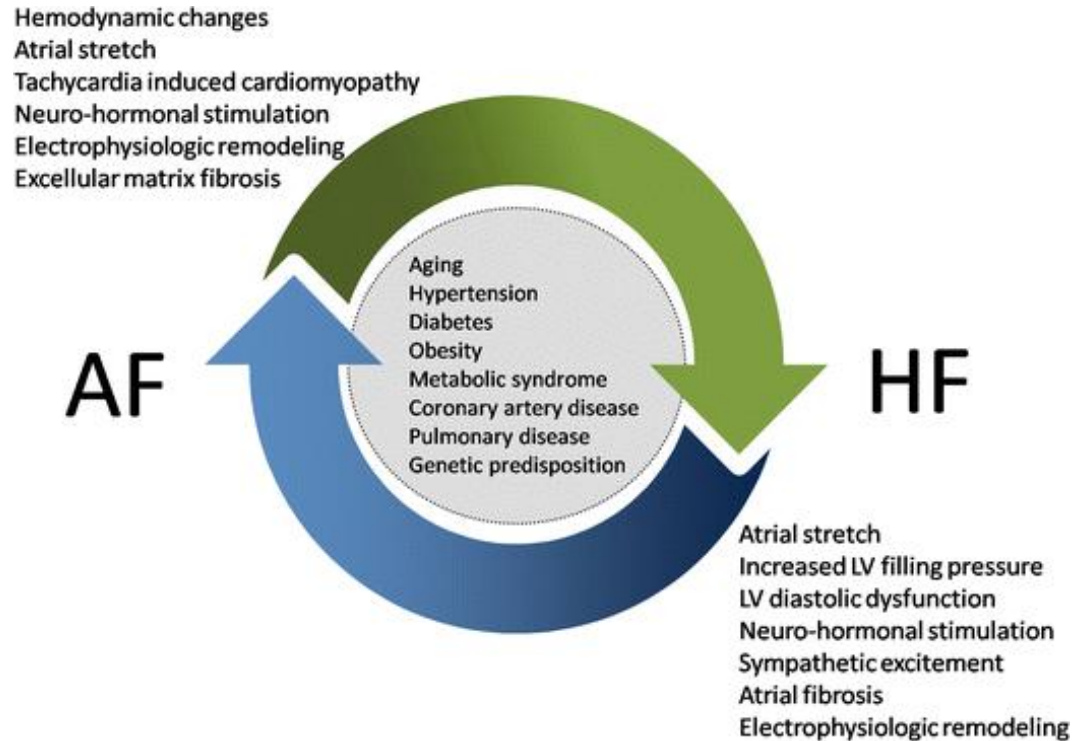
# Atrial Fibrillation and Heart Failure share common risk factors



Abbreviations:

HFrEF: heart failure with reduced ejection fraction;  
HFpEF: heart failure with preserved ejection fraction

# Atrial Fibrillation and Heart Failure can both cause and worsen one another



- Over 1/3 of individuals with AF have HF at some point, with most developing HF after AF



# HF subtypes + AF have different stroke risk



Differences in stroke risk among patients with atrial fibrillation and heart failure subtypes

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- Over 5 years, patients with AF + HFpEF have 19% higher rates of stroke as compared with patients with AF + HFrEF

# Causes of presentation to the ED for AF patients

## Major Causes of presentation:

- Heart Failure and Chest Pain (~ 20%)
- Infectious Disease (~20%)
- Stroke (~15%)
- Trauma (~10%)

## Major Causes of mortality:

- Heart Failure and Stroke (~50%)
- Cancer and Infection (~33%)

# AIMS

# Goals of our Investigation

- 1. Identify NC trends in AF ED visits, admissions, mortality between 2016-2023**
- 2. Characterize relationship between AF and Heart Failure**
- 3. Identify demographic and clinical predictors of ED visits, admissions, mortality**

- NC DETECT, ED encounters within the state of NC from all civilian hospital-affiliated EDs (N = 131)
- Age, sex, race, arrival time/date, insurance, chief complaint, systolic/diastolic blood pressure (BP), initial ED temperature, disposition, and International Classification of Diseases (ICD-9/10) Diagnosis and Procedural codes
- Encounters were restricted to patients presenting to a North Carolina ED between January 1, 2016, and December 31, 2023
- Descriptive statistics, logistic regression models (admission and mortality) adjusted for covariates above
- Admissions and mortality were identified during the ED encounter

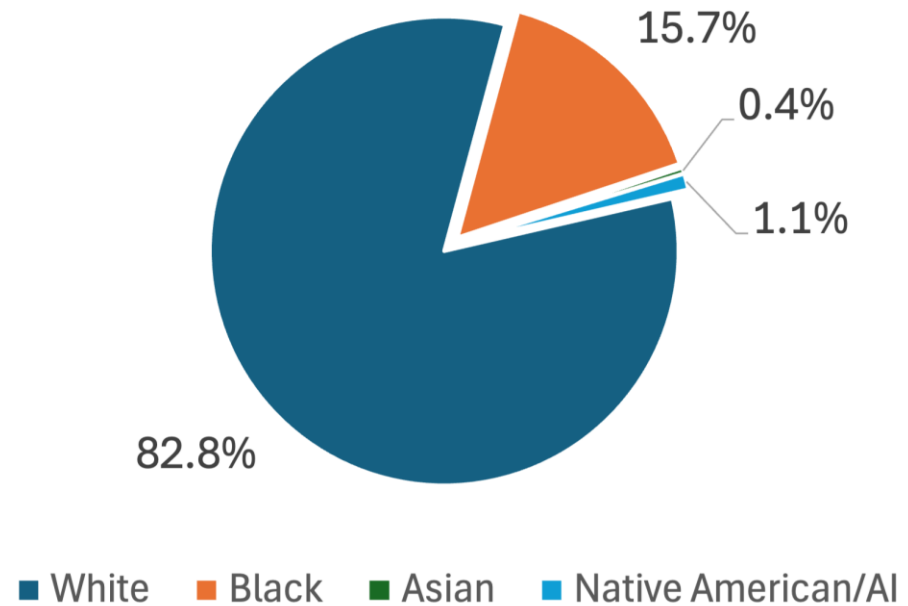
# RESULTS

# Population Characteristics

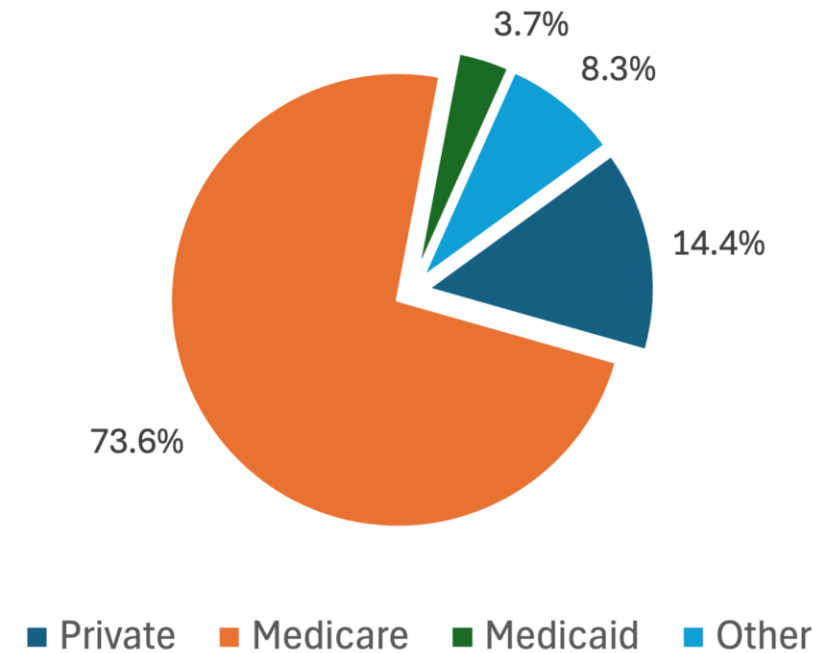
- Between 2016 and 2023, there were a total of 39,445,680 ED visits in North Carolina
- 517,722 had a diagnosis code for AF, representing 1.3% of all ED encounters.
- The mean age of patients presenting with AF was 74.8 years, and approximately 49.8% were male overall.

# Population Characteristics

**Distribution of AF visits by race/ethnicity  
(2016-2023)**

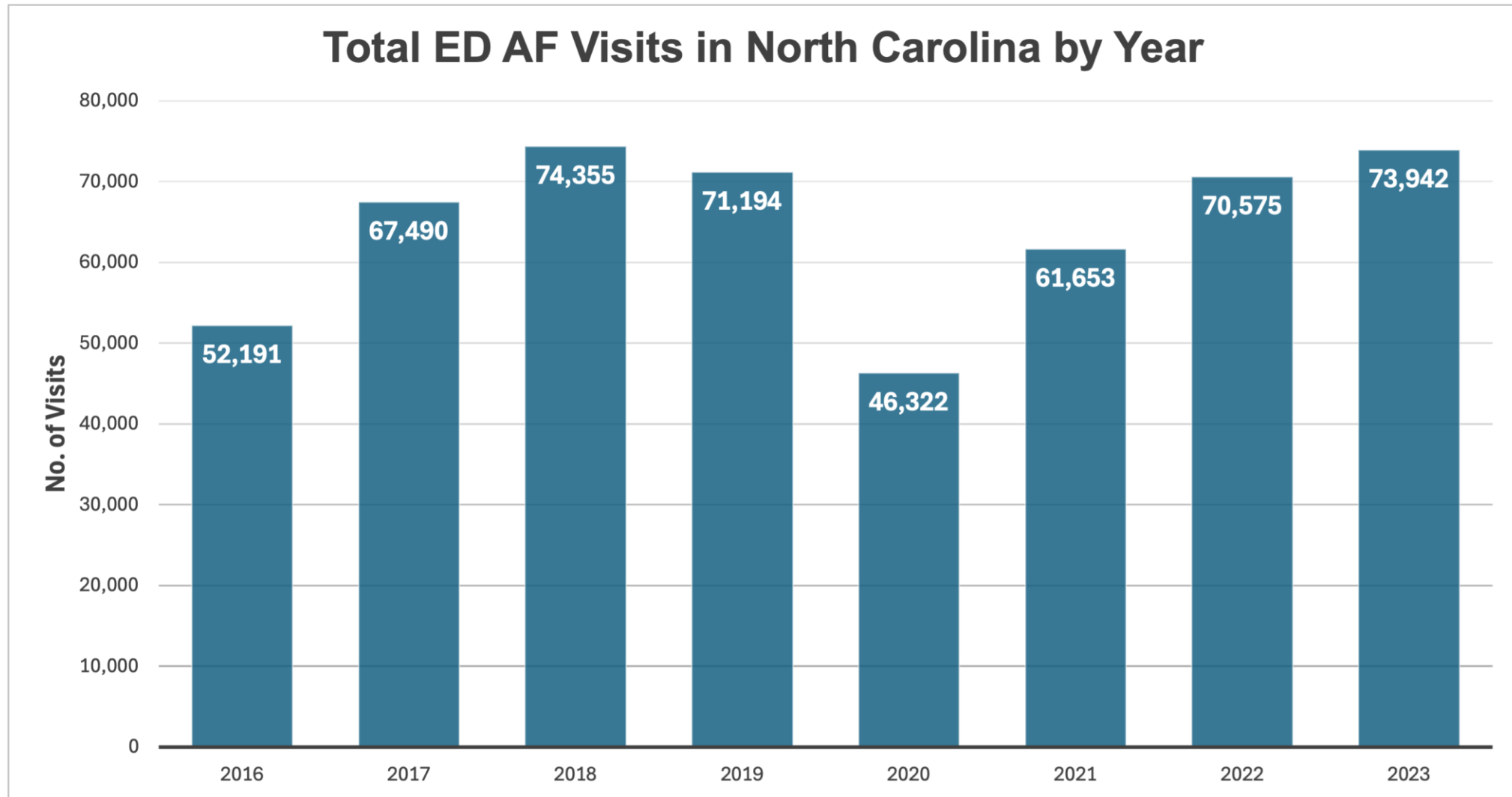


**Distribution of AF visits by Insurance Type  
(2016-2023)**

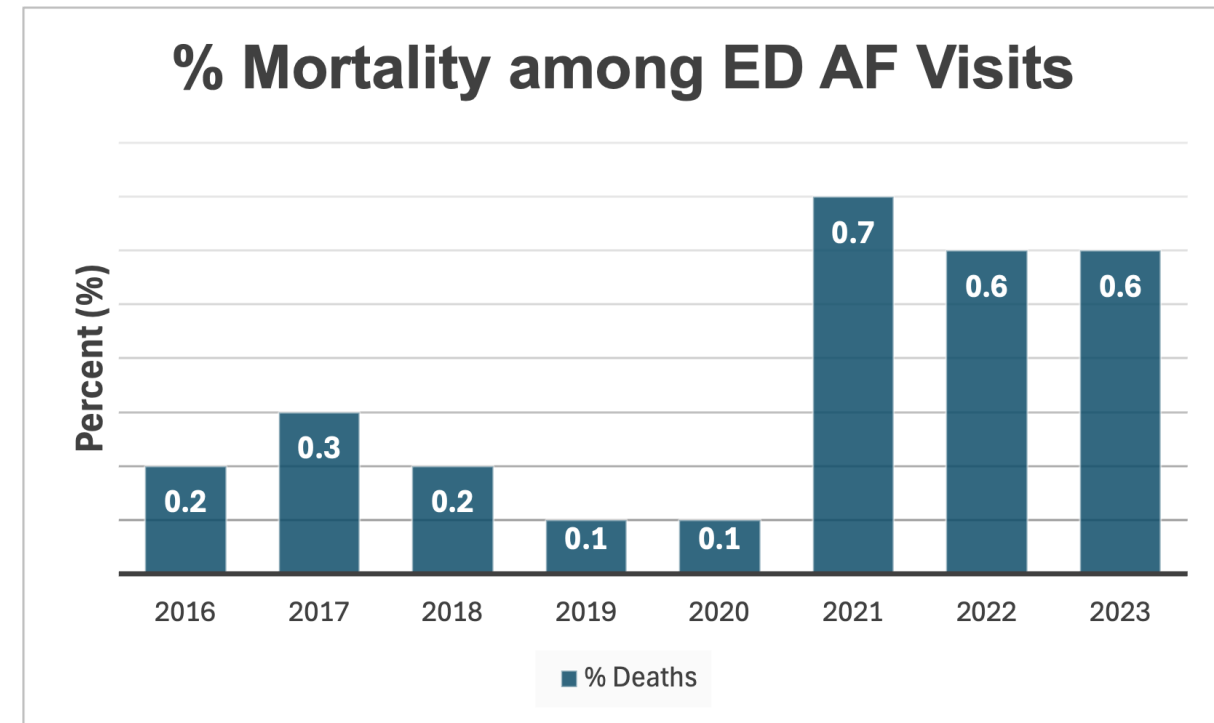
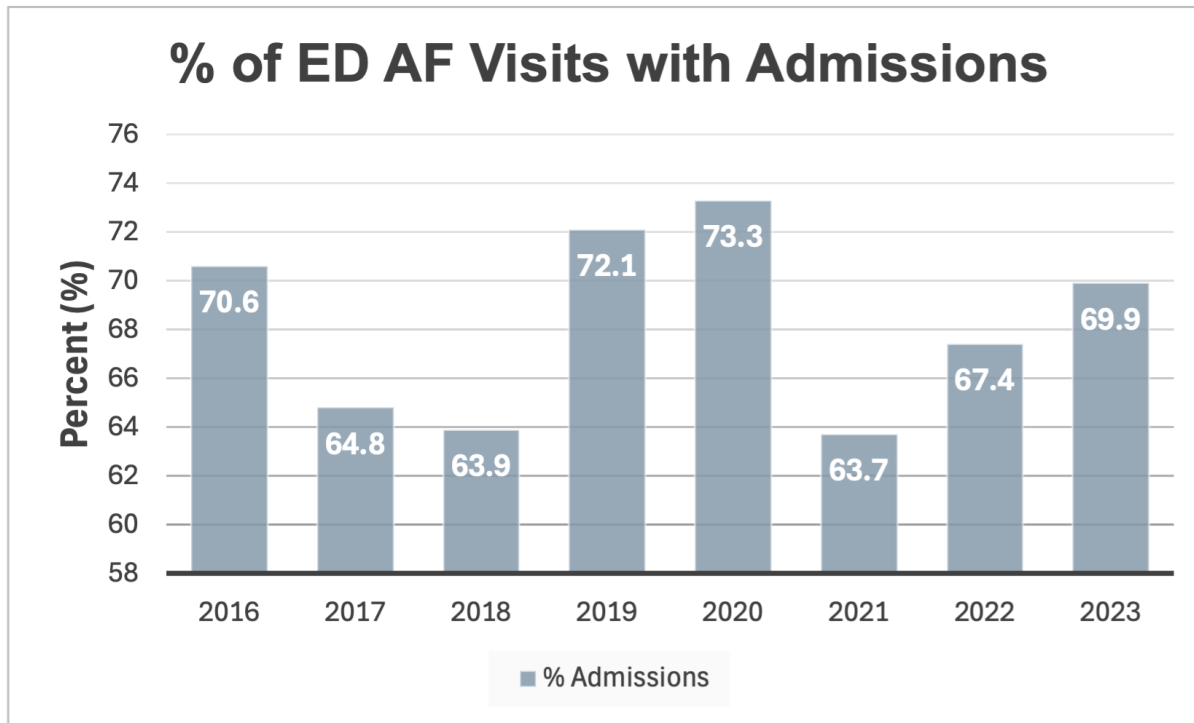




# Trends in ED visits for AF in North Carolina



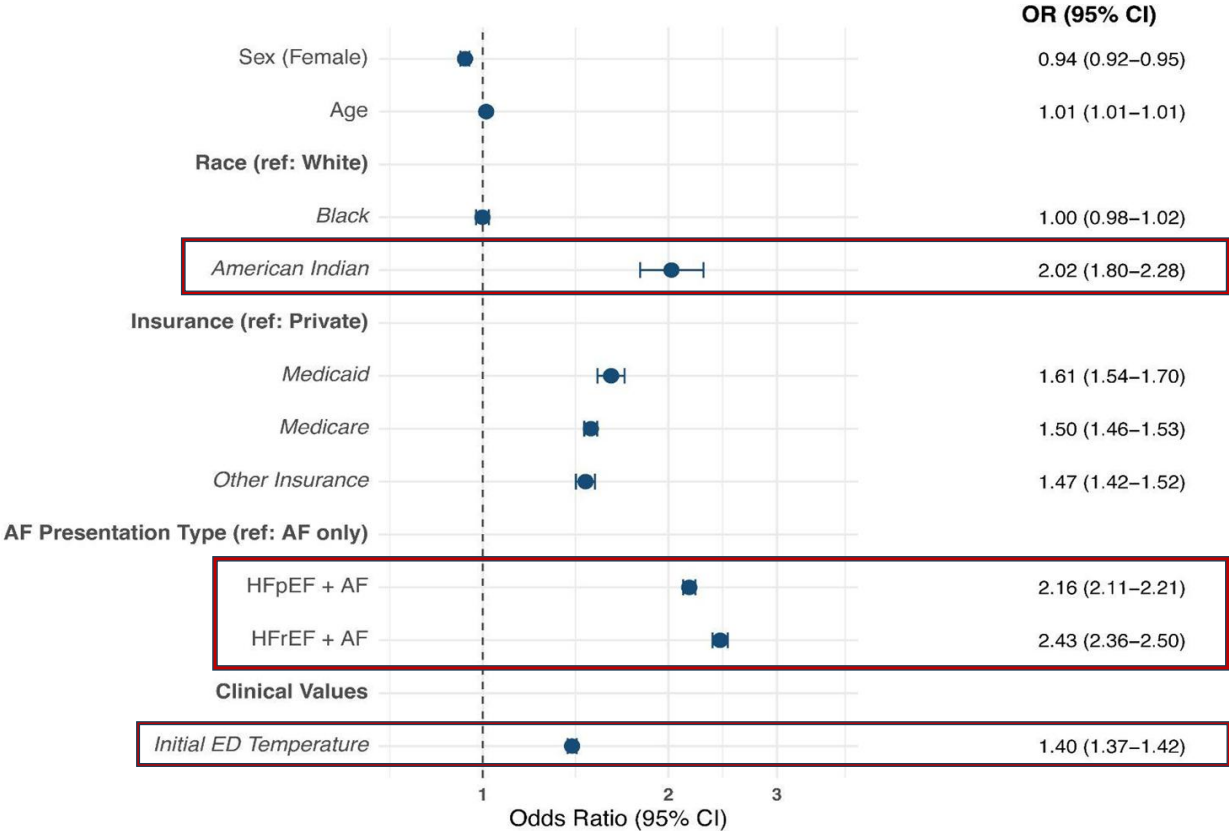
# Trends in AF intra-ED admissions and mortality



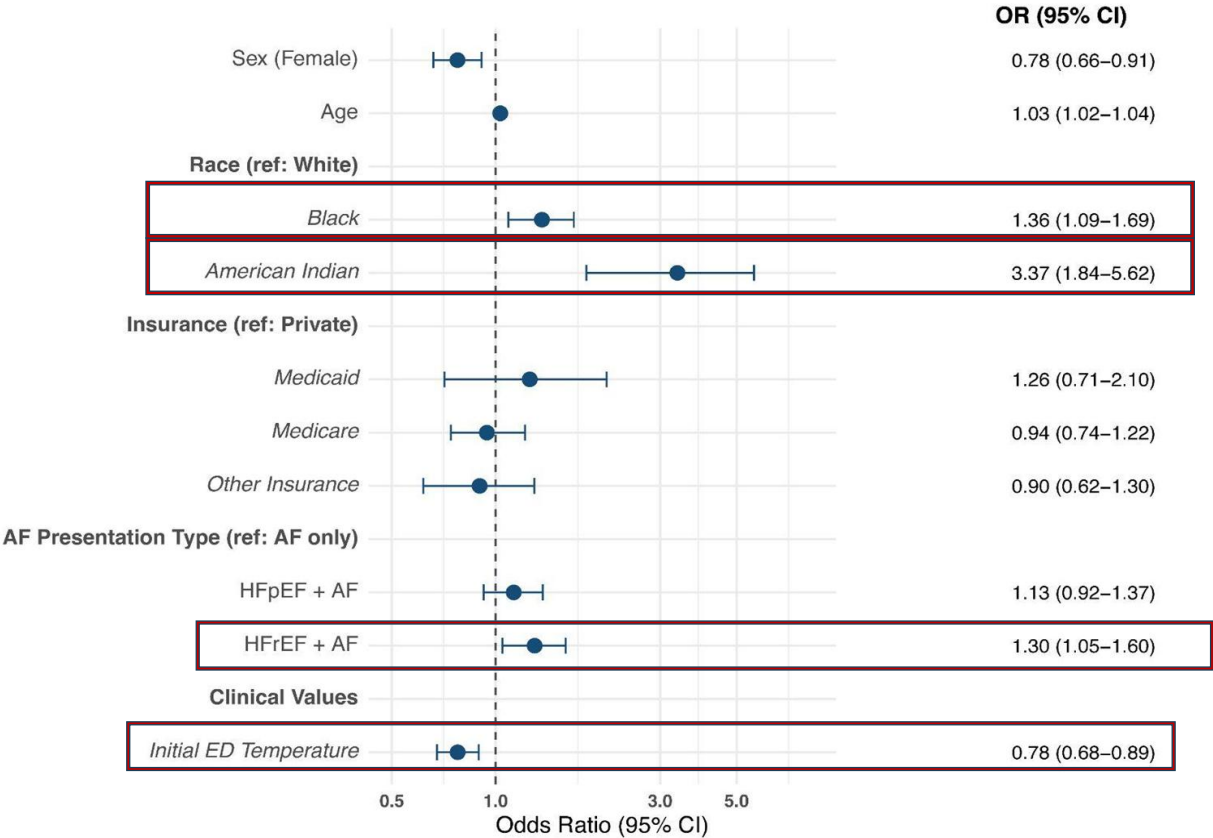
\* admissions and mortality *only* during ED encounter

# Predictors of intra-ED admission and mortality

Odds Ratios for Admission in E.D. AF Presentations (2016–2023)



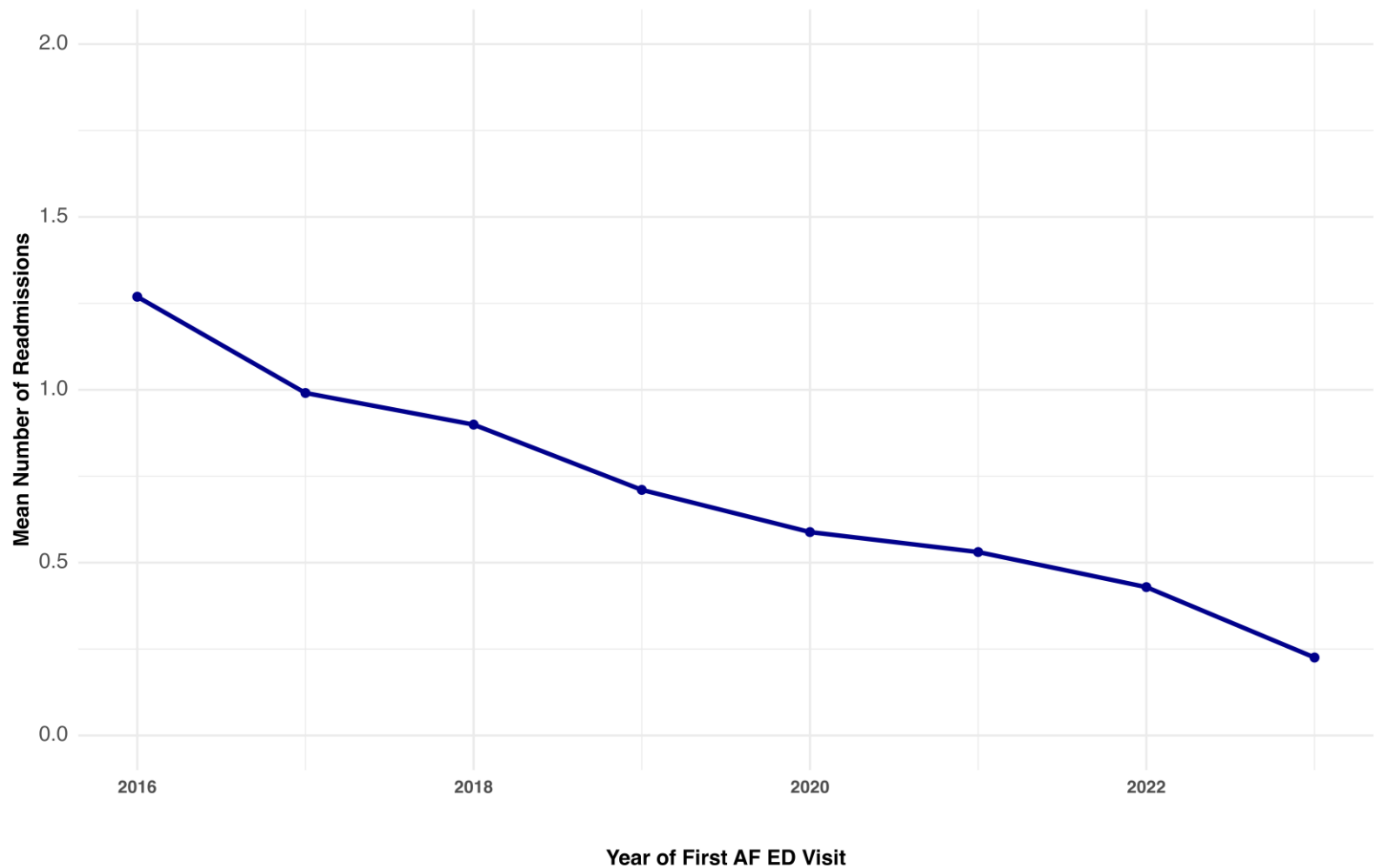
Odds Ratios for Mortality in E.D. AF Presentations (2016–2023)



\*odds for initial ED temperature represents the change in odds for a 1-degree Celsius increase

# ED readmissions for AF have significantly decreased

Mean Number of AF ED Readmissions within a Calendar Year per Patient



# ED readmission is worse for AF + HFrEF

**Table 1.** Average Time to Readmission within 365 days

<u>HF Type</u>	<u>Avg. Time (days)</u>
AF Only	299
AF + HFpEF	216
AF + HFrEF	223

**Table 2.** Average Number of ED Visits per Patient (HF Type)

<u>HF Type</u>	<u>Avg. Number of Visits</u>
AF Only	1.95
AF + HFpEF	3.00
AF + HFrEF	2.50

# How does this compare nationally?

- AF visits accounted for 1.3% of all ED visits; **3.5x more than national levels between 2007-2014** (0.4-0.5%)
- Both in NC and nationally, **70% of AF ED visits end in hospital admission**
- Increased mortality during 2021-2022 potentially due to delayed presentation
- Nationally, women tend to have **higher (~20%) odds of admission** as compared to men, we did not identify any significant disparities by sex
- Both in NC and nationally, disparities for both Native American and Black populations are similar



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# CONCLUSIONS AND FUTURE DIRECTIONS

- Overall, AF visits have consistently high admission rates **~70%**
- Although we have seen **reductions** in *readmissions*, mortality rates have **increased**
- Marked **elevation in admission risk** for patients with AF + HF
- Notably, AF + HFrEF demonstrated **increased mortality risk**, particularly in noninfectious presentations
- Black and Native American race/ethnicity were among the **strongest predictors** of both hospital admission and mortality



- Atrial Fibrillation and concurrent Heart Failure is recognized as a unique condition for which optimal treatment has not been characterized
- With the increased usage of Smart Watch Heart Rate Monitoring, if atrial fibrillation is captured how can patients understand their risk?
- AF + HF have markedly worse outcomes in ED settings → can we design pathways from the ED to divert this population into primary care settings to reduce utilization of ED services?
- Identify causes of elevated mortality risks for racial/ethnic subgroups in North Carolina
- Geographic differences across NC in AF presentation, admission, and mortality (ongoing work)

RESEARCH ARTICLE | Originally Published 19 February 2025 | 

**Atrial Fibrillation Treatment Pathway in the Emergency Department Reduces Median 30-Day Health Service Charges**

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