# Epidemiology of Cardiac Amyloidosis in Veterans

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UTILIZING VETERANS DATA WORKSHOP

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# Introduction

- Cardiac amyloidosis (CA) is a disease of heart muscle (cardiomyopathy) caused by the extracellular infiltration and deposition of amyloid proteins in the myocardium
- Symptoms are nonspecific causing misdiagnosis or missed diagnosis
- Delays in diagnosis are associated with significant morbidity and mortality.
  - The median delay in diagnosis was 39 months, and 42% of patients waited more than 4 years for a diagnosis.[1]
- The diagnosis of CA presents a substantial challenge for patients, clinicians, and healthcare organizations.
- Prevalence and impact in the veteran population is unknown

1. Lane T et al. (Circulation 140(1), 16-26, 2019)

# Research Goals

- Quantify the incidence, prevalence, risk factors and the health outcomes of veterans with cardiac amyloidosis

- Guide the development of screening programs, enable early detection and improve individual and population level health

- Expected outcomes and potential impact on veteran healthcare:
  - Identify regions that would benefit from enhanced screening
  - Long Term Goals
    - Identify risk factors and predictors of cardiac amyloidosis in veterans
    - Identify CA comorbidities and clinical features (phenotyping)
    - Measure health outcomes, including mortality

# Methods and Data Utilization

- **Design:** Retrospective cohort study of VA health records utilizing MDClone ADAMS platform to access the VA Corporate Data Warehouse.

- **Population:** All patients with an inpatient or outpatient VA encounter in 2012 and 2021 by state.

- MDClone was used to define and identify cases of cardiac amyloidosis
  - Inclusion criteria: 2 instances of HF and Amyloidosis ICD coded diagnoses
  - Exclusion criteria: Light chain or other forms of amyloid, numerous others

- The platform allowed us to build an intricate case definition which we validated in an iterative fashion
  - Identify an initial cohort for targeted chart review
  - Refine our definition, regenerate cohort

  **Mapping:** We constructed choropleth maps using R to visualize CA rates geographically.
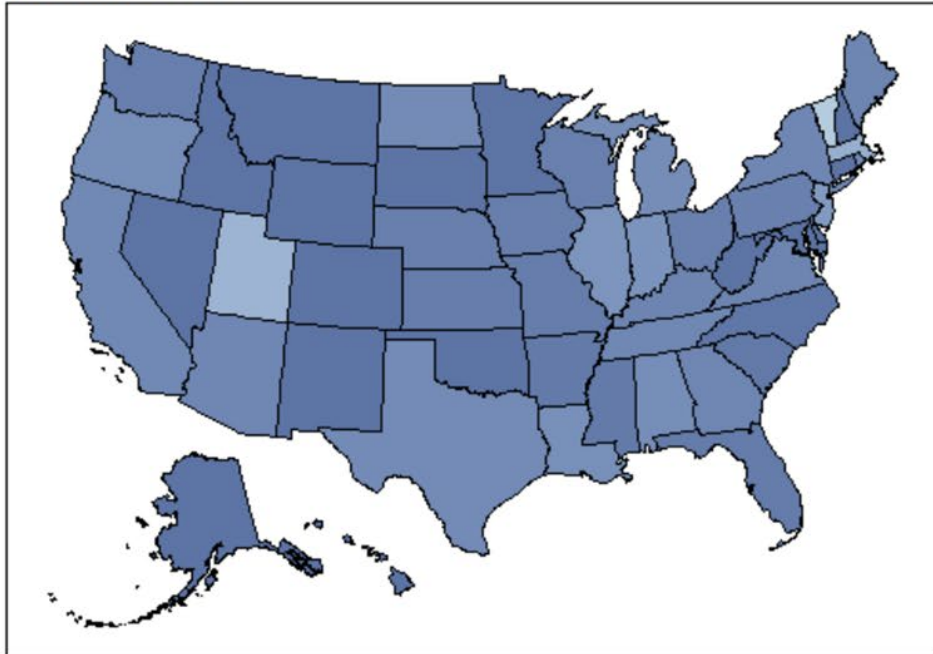
# Assembling a Cardiac Amyloidosis Cohort

| | 2012 | 2021 | 2012 | 2021 |
|---|---|---|---|---|
| | **Incident Cases** | | **Prevalent Cases** | |
| **VA cases - all regions (n)** | 179 | 807 | 1,521 | **5,417** |
| **Total VA population - all regions (n)** | 5,694,401 | 7,267,263 | 5,694,401 | 7,267,263 |
| **VA cases - Black race, all regions (n)** | 55 | 299 | 182 | 1,009 |
| **Total VA population - Black race, all regions (n)** | 859,962 | 1,170,534 | 859,962 | 1,170,534 |
| **Distribution by U.S. Census Region – All VA cases** | **Incidence Rates (cases per 100,000 patients)** | | **Prevalence Rates (cases per 100,000 patients)** | |
| **Northeast** | 4.3 | 19.0 | 43.4 | 124.1 |
| **Midwest** | 3.3 | 12.8 | 26.7 | 81.1 |
| **South** | 2.8 | 8.1 | 22.7 | 60.3 |
| **West** | 2.9 | 11.3 | 23.8 | 69.6 |

# Incidence



Incidence in 2012
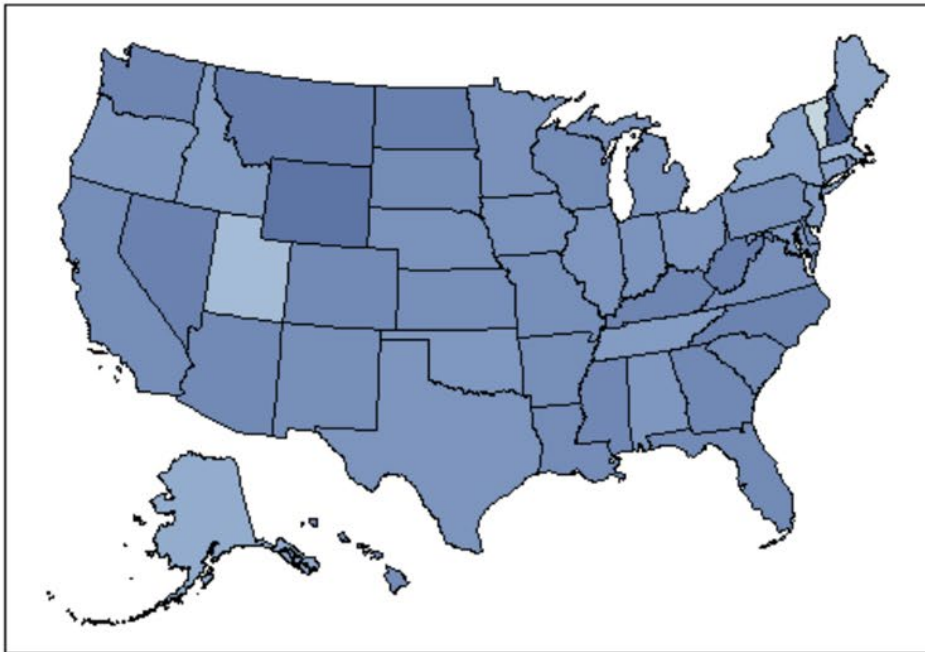
Incidence in 2021
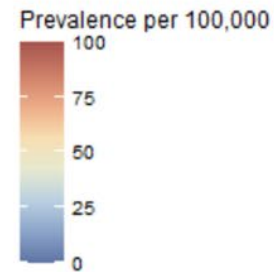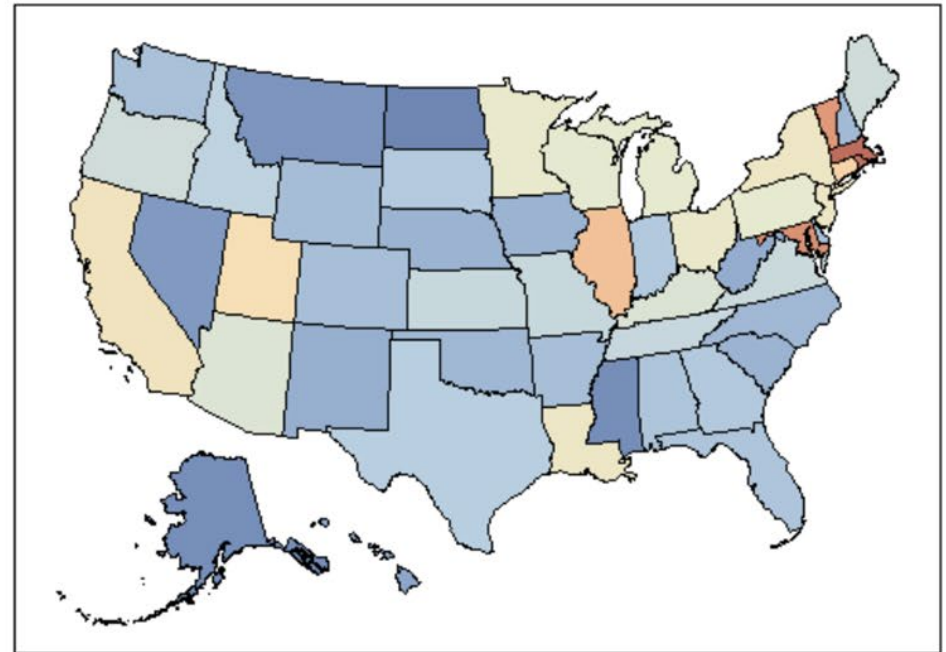
Incidence per 100,000
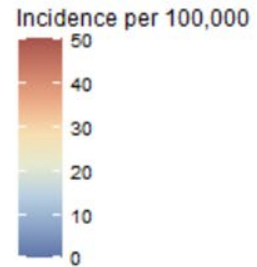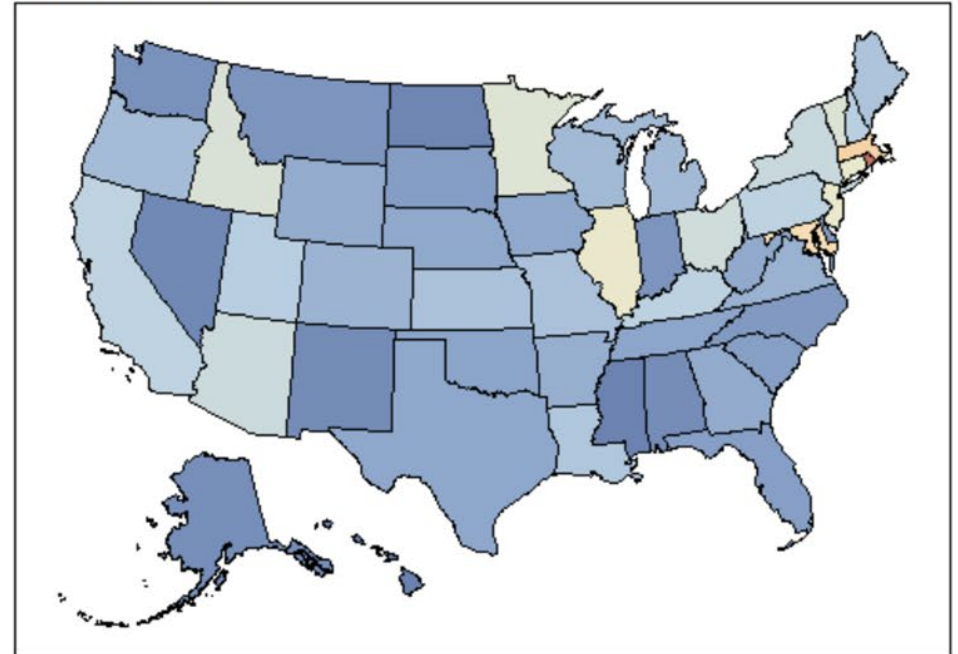
# Prevalence



Prevalence in 2012

Prevalence in 2021

Prevalence per 100,000

# Results

- There was a substantial increase in ATTR CA incidence and prevalence in all regions in 2012 and 2021.

- In both years, **incidence and prevalence were highest in the Northeast region** and lowest in the South. In 2021, there was a 2.3-fold difference in incidence between these two regions.

- Census division level variation was greater than regional variation. The highest incidence rate in 2021 was in New England which had a 3.8-fold higher incidence than East South Central.

- Incidence in Black patients in 2021 was highest in Midwest and 3.2-fold higher than the South region.

# Conclusion

- Despite increasing recognition of ATTR CA in the VA Health System, there is **regional variation** in incidence and prevalence when comparing 2012 and 2021.

- VA facilities in the Midwest, West and especially the South may have **differences in ATTR CA detection** relative to those in the Northeast region. This geographic variation appears largest in Black patients.

- Further research into health system, provider, and patient factors leading to this variation is needed to ensure health equity and quality of care for patients with CA.

# User Experience

MY JOURNEY INTO DATA SCIENCE

# A New Frontier

- Transition from Basic Science to Clinical Research
  - Background in systems biology with a focus on tissue regeneration
    - Epigenomics, Genomics, Proteomics and Metabolomics…Data Analysis
  - Found little time for meaningful benchwork during residency
- Spent a lot of time interacting with CPRS during clinical duties
  - Immediately understood the richness of health data
  - Started exploring potential research questions

# Challenges

- Navigating Data Access
  - Began identifying ways to access VA data…SQL?
  - Time-consuming and laborious data access process. Email based.
  - Reliance on others for running searches, limiting independence in hypothesis testing.
- Connected with a data science PI
  - Joined an existing project with prior regulatory/IRB approval
  - Received a VA Laptop, access to secure computing environment
  - Introduced to MDClone

# Breakthrough

- Instantaneous hypothesis generation with MD Clone
  - MD Clone provided immediate access to data
  - Empowered to run queries independently, saving significant time
  - Allowed for iterative, collaborative data analysis
  - Best practices built into the system
- Accurate Phenotyping and Cohort Building
  - Achieved accurate phenotyping for Cardiac Amyloidosis
  - Created the largest study cohort for the condition to date
- High-Volume, High-Value Research
  - Conduct clinical research without prior knowledge of data structures
  - Minimal burden for all participants, easy to learn, use and teach

# Outcomes

- Significant Research Output over a 6 month period
  - Generated several abstracts and presentations
  - Two manuscripts in preparation with more in the pipeline
- Collaborative and Multidisciplinary Approach
  - PI, Clinician, Data Scientists, Statistician, MD Clone Expert, Research Coordinator, Epidemiologist – tackling CA from multiple angles
- Generated data aiding in the development of screening tools and improving care for our veterans

# Advice for Future Researchers

- Great opportunity for medical students, residents and fellows
- Get connected with a PI
- Build or join a data science team – think of your colleagues
- Get started with credentialling early
  - MDClone, Arches and VA Research onboarding takes time!
- Get hands on with the data, start building queries with synthetic data
- Try to get a VA laptop

# Acknowledgements

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