1

Lifecourse Approaches to Atrial Fibrillation: Focus on Prevention & Social Drivers

Emelia J. Benjamin, MD, ScM, DrHC
Ad Interim Dean for Faculty Development, Boston University (BU) CAMed
Coffman Professor of Vascular Medicine,
BU Chobanian & Avedisian School of Medicine
Professor Epidemiology, BU School of Public Health
Honorary Doctorate Medical Science, Aalborg University, Denmark
NHLBI & Boston University's Framingham Heart Study

BOSTON MEDICAL CENTER

BOSTON UNIVERSITY

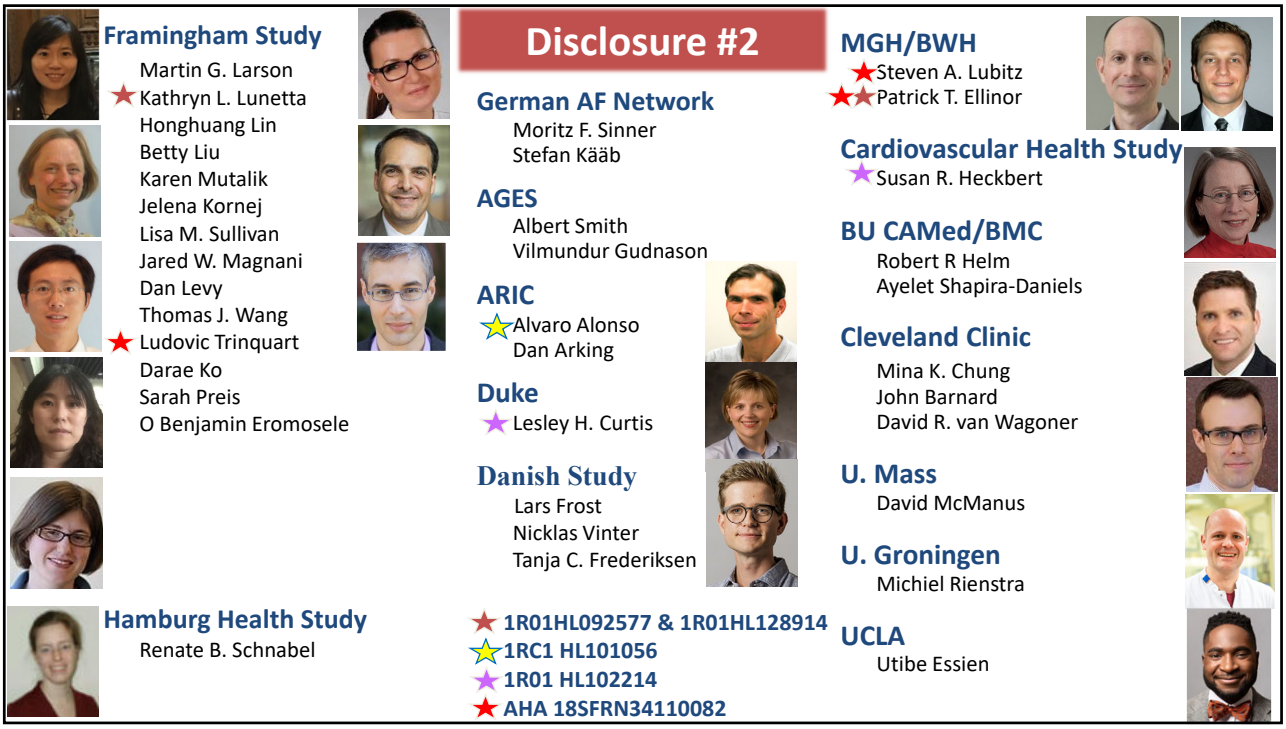
Minneapolis Heart Institute Foundation | GRAND ROUNDS

2

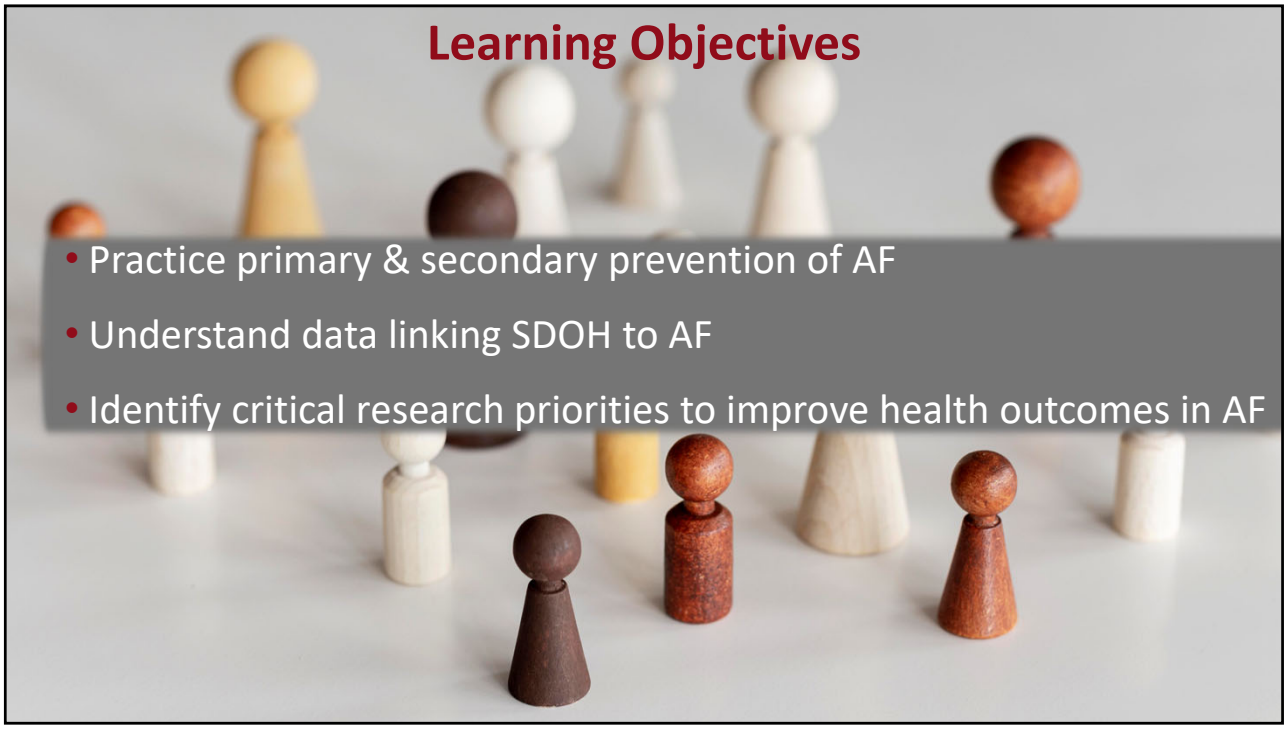
Disclosures

- **AF** R01HL092577
- **Pain** R01AG066010; 1R01AG066914; 1R01NS121419
- **NHLBI** **Co-Chair, AF Research Working Group**
  - Screening. *Circulation.* 2021;143:372
  - 2º Prevention. *JAHA.* 2021;10:e021566
  - AF Social Determinants. *JAMA Cardiol.* 2023;8:182

3



4

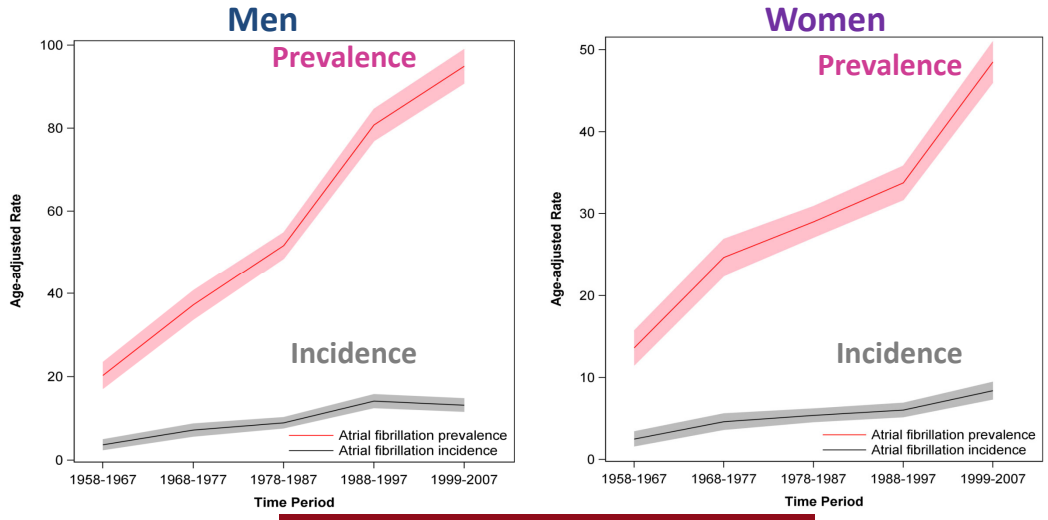

Learning Objectives
• Practice primary & secondary prevention of AF
• Understand data linking SDOH to AF
• Identify critical research priorities to improve health outcomes in AF

5


Background – Atrial Fibrillation
Prevalence
Incidence
Outcomes

6

Increasing Age-Adjusted AF Prevalence & Incidence Over Time
Framingham Heart Study



Increase in AF Prevalence due to:
- ↑Age of population
- ↑Survival heart disease & AF

Background

- Schnabel *Lancet.* 2015;386:154

7

Five Year Risk of AF – *CHARGE-AF Model*

5 Year AF Risk Predictione	↓	Enter Values Here
Risk Factor	Units	
Age	years	**68**
Race (White)	yes or no	**Yes**
Height	inches	**72.0**
Weight	pounds	**220.0**
Smoking	yes or no	**no**
Systolic Blood Pressure	mm Hg	**145**
Diastolic Blood Pressure	mm Hg	**75**
Hypertension Treatment	yes or no	**yes**
Diabetes	yes or no	**no**
History of Heart Failure	yes or no	**Yes**
History of Myocardial Infarction	yes or no	**no**
YOUR RISK (Simple Model)	**>26%**	←
NORMAL	**7.6%**	←
OPTIMAL	**6.8%**	

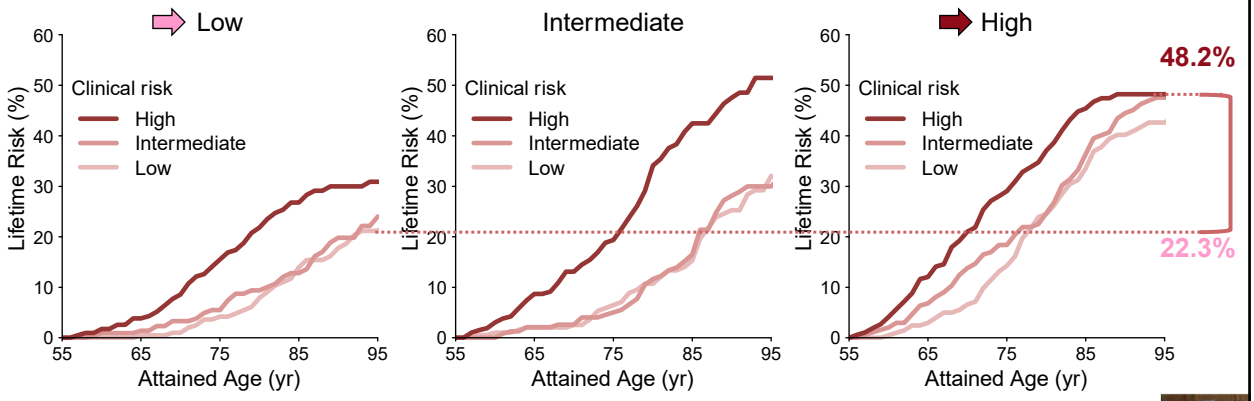
Background

- Alonso *J Am Heart Assoc.* 2013;2:e000102

8

Genetic & Clinical Factors Account for Substantial Variability in Lifetime Risk of AF

Polygenic Risk



Background

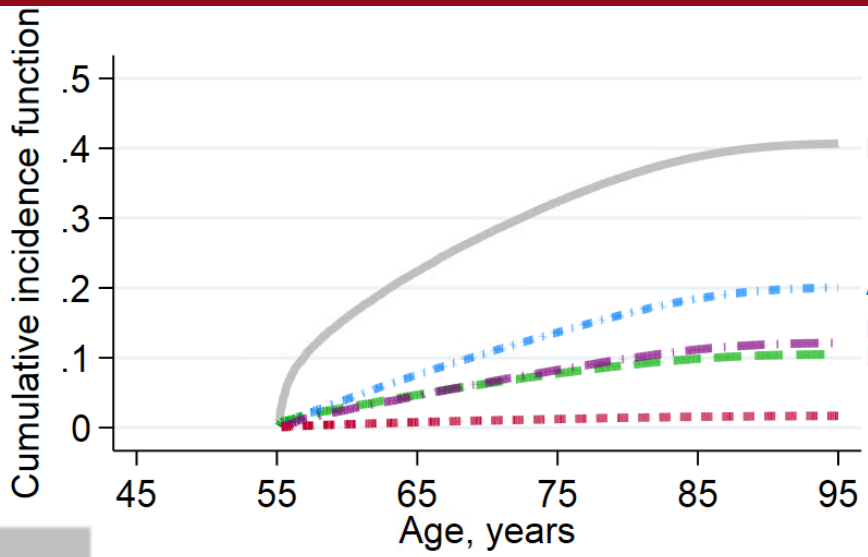
•Weng *Circulation*. 2018;137:1027

9

Lifetime Risk of Complications After AF Diagnosis

Denmark Population-Wide Estimates 2011-2022

Between 2000-2010 & 2011-2022 the Lifetime Risk of AF increased from 24% to 31%



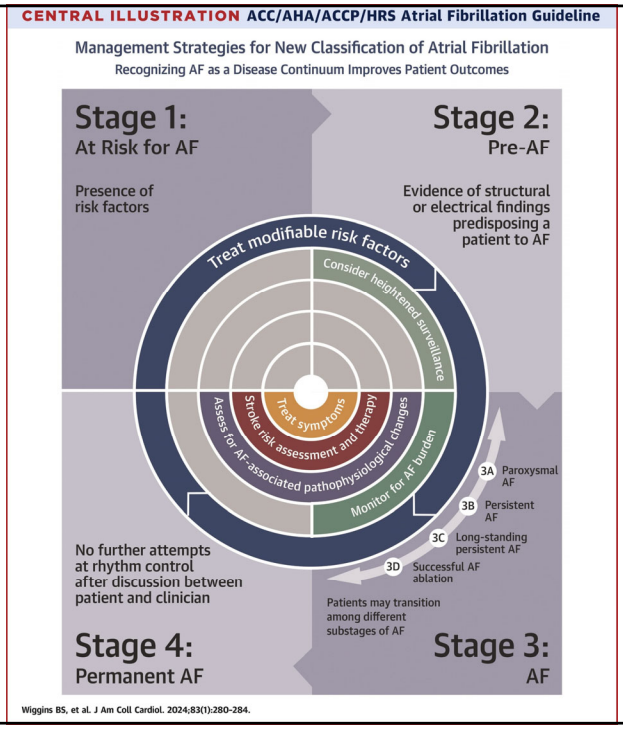
Background

•Vinter *BMJ* 2024;385:e077209

Nicklas Vinter, MD, PhD

10

2° Prevention: AF



11

AF & HF: Disease Progression & Treatment

Heart Failure Stage	At Risk	Pre-HF	Symptomatic Heart Failure				Advanced HF
			New Onset/ De Novo	Resolution of Symptoms	Persistent	Worsening	
	1	2	3A	3B	3C	3D	4
Screen for and Address Risk	Nonmodifiable: male, aging, genetics						
	Modifiable: obesity, sedentariness, hypertension, sleep apnea, alcohol consumption, diabetes						
Disease Surveillance		Periodic ECGs, ambulatory monitoring, commercial wearable devices as indicated					
		Monitor biomarkers, cardiac imaging (eg, echocardiography)					
Treatment for Coexistent AF + HF			Rate control (including pace and ablate in some cases of permanent AF)				
			Rhythm control				
			Guideline-directed medical and device-based therapy as indicated				
Risk of Stroke			Assessment and modification with OAC or LAAO where indicated				
Atrial Fibrillation Stage	1	2	3A	3B	3C	3D	4
	At Risk	Pre-AF	Paroxysmal	Persistent	Long-Standing Persistent	Successful Ablation	Permanent AF
			Clinical Atrial Fibrillation				

AF + HF AF HF

2° Prevention: AF

- Zeitler *JACC Heart Fail* 2024;12:1528

12

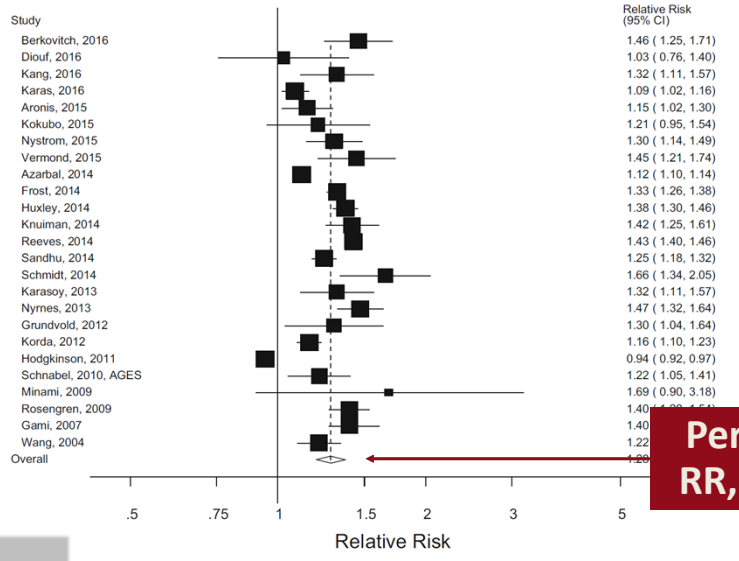

Prevention of AF & its complications
Primary
Secondary

13


Primary Prevention

14

AF Incidence ↑ with higher BMI
Meta-analyses of 25 Observational Studies



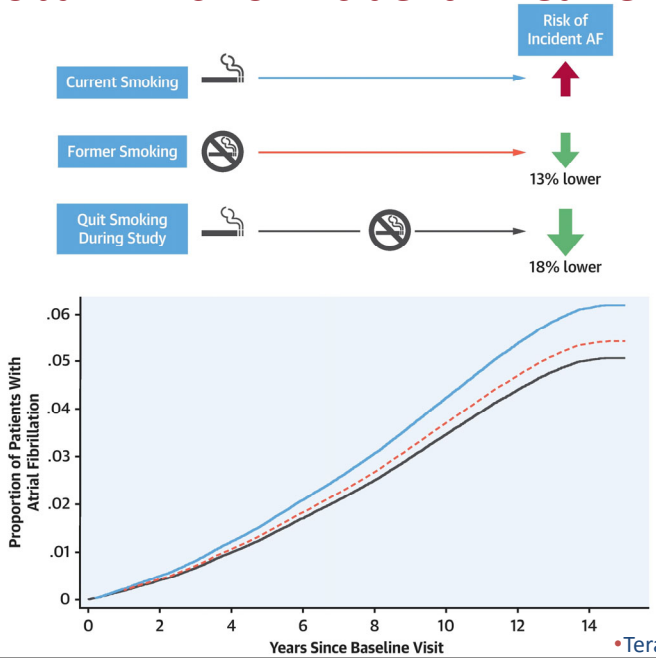
Per 5-unit increment BMI, RR, 1.28; 95% CI, 1.20-1.38

1° Prevention

- Aune *Eur J Epidemiol*. 2017;32:181

15

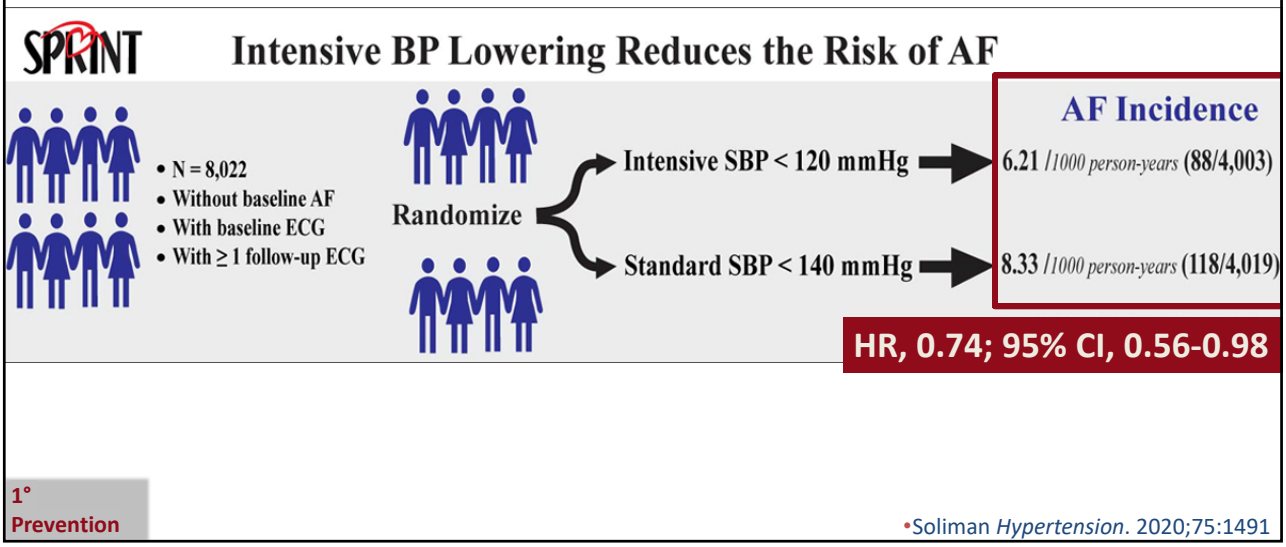
UK Biobank: Risk of incident AF Current > Former > Quit



- Teraoka *JACC Clin Electrophysiol*. 2024;10:2198

16

AF Incidence ↓ after Intensive BP Lowering
RCT SPRINT

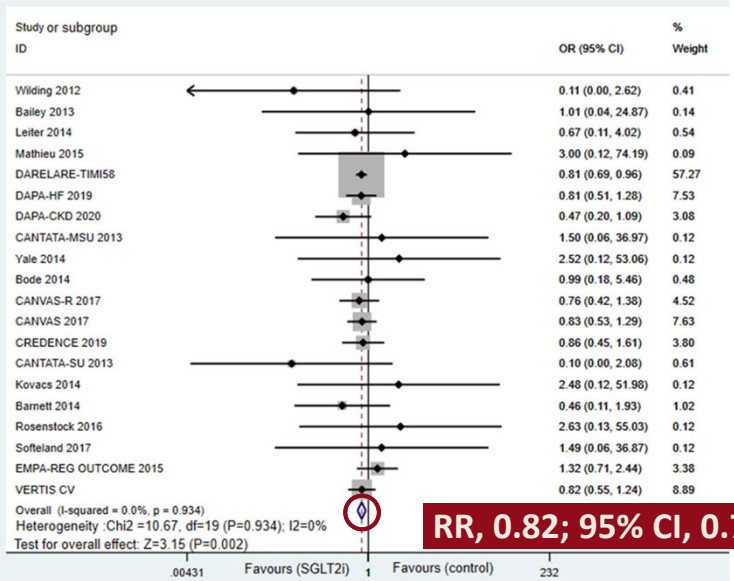


1° Prevention

•Soliman *Hypertension*. 2020;75:1491

17

SGLT2i ↓ Risk of AF
Meta-analysis of RCTs in patients with DM, heart failure or CKD



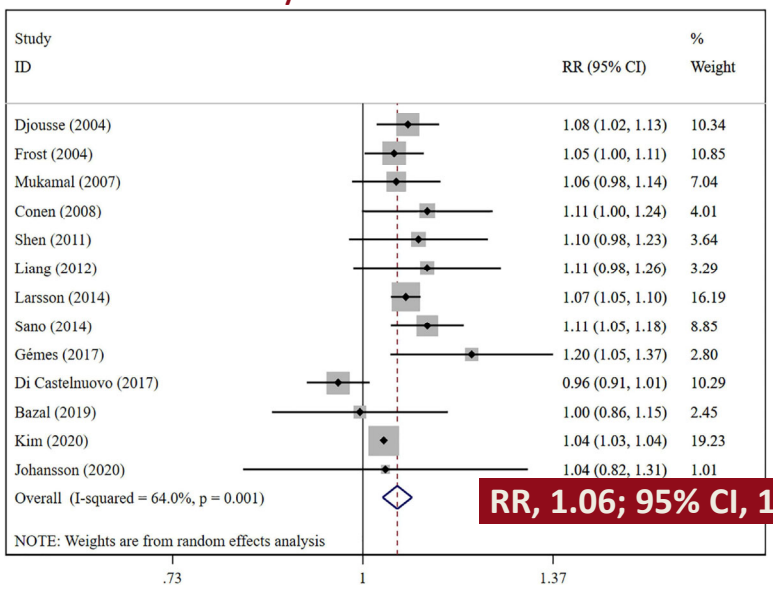
1° Prevention

•Zheng *Cardiovasc Pharmacol*. 2022;79:e145

18

Risk of AF per 1 drink/day Increment Alcohol Consumption

Meta-analysis Observational Data



RR, 1.06; 95% CI, 1.03-1.08

1° Prevention

• Jiang *Front Cardiovasc Med* 2022;9:979982

19

CLINICAL PRACTICE GUIDELINES

2023 ACC/AHA/ACCP/HRS Guideline for the Diagnosis and Management of Atrial Fibrillation: A Report of the American College of Cardiology/ American Heart Association Joint Committee on Clinical Practice Guidelines

Recommendation for Primary Prevention		
COR	**LOE**	**Recommendation**
1	**B-NR**	**1. Patients at increased risk of AF should receive comprehensive guideline-directed LRFM for AF, targeting obesity, physical inactivity, unhealthy alcohol consumption, smoking, diabetes, & hypertension.**

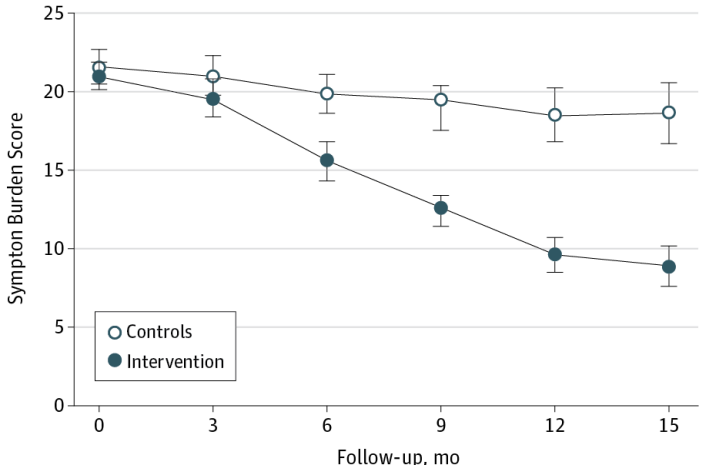
1° Prevention

• Joglar et al. *Circulation*. 2024;149:e1

20

21

Weight Management vs. Lifestyle ↓ AF Symptom Burden
Australian RCT single-center partially blinded



- **Lower AF symptom burden score**
- Fewer episodes AF: 2.5 vs. no change *P*=0.01

Cumulative duration AF minutes: ↓692 vs. ↑ 419; p = .002 • Abed *JAMA*. 2013; 310:2050

2° Prevention: AF

22

CLINICAL PRACTICE GUIDELINES

2023 ACC/AHA/ACCP/HRS Guideline for the Diagnosis and Management of Atrial Fibrillation: A Report of the American College of Cardiology/ American Heart Association Joint Committee on Clinical Practice Guidelines

Recommendation for Weight Loss in Individuals Who Are Overweight or Obese		
COR	**LOE**	**Recommendation**
1	**B-R**	**1. In patients with AF who are overweight or obese (BMI>27 kg/m^2), weight loss is recommended, with an ideal target of at least 10% weight loss to reduce AF symptoms, burden, recurrence, & progression to persistent AF.**

2° Prevention: AF

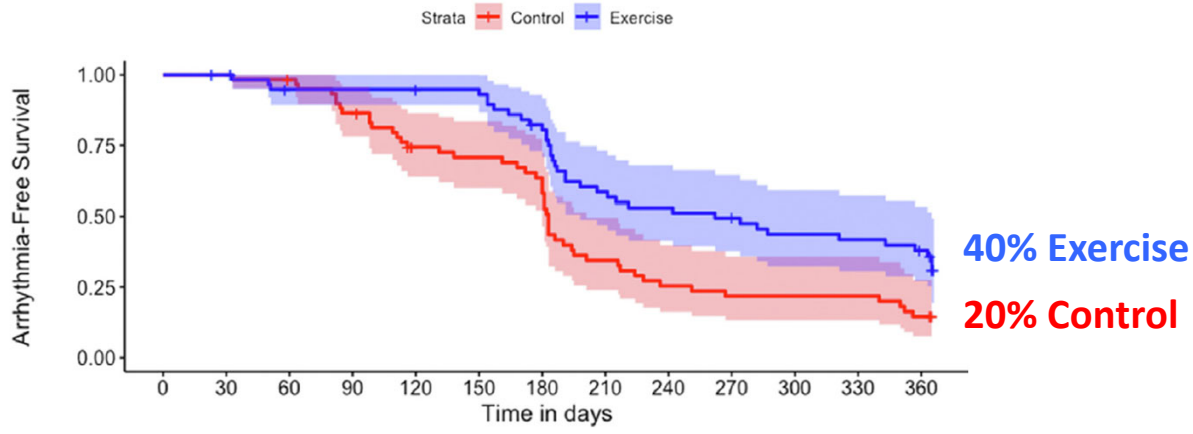
• Joglar et al. *Circulation*. 2024;149:e1

23

ACTIVE-AF Study RCT Exercise vs. Control

Exercise led to ↓ Recurrent AF & Improved Symptom Burden

AF Free @12 months HR, 0.50; 95% CI 0.22-0.78



2° Prevention: AF

• Elliot *J Am Coll Cardiol EP.* 2023;9:455

24

CLINICAL PRACTICE GUIDELINES

2023 ACC/AHA/ACCP/HRS Guideline for the Diagnosis and Management of Atrial Fibrillation: A Report of the American College of Cardiology/ American Heart Association Joint Committee on Clinical Practice Guidelines

Recommendation for Physical Fitness		
COR	**LOE**	**Recommendation**
1	**B-R**	**1. In individuals with AF,* moderate to vigorous exercise training to a target of 210 minutes per week is recommended to reduce AF symptoms and burden, increase maintenance of sinus rhythm, increase functional capacity, and improve QOL.**

*Without AF related to excessive exercise training

2° Prevention: AF

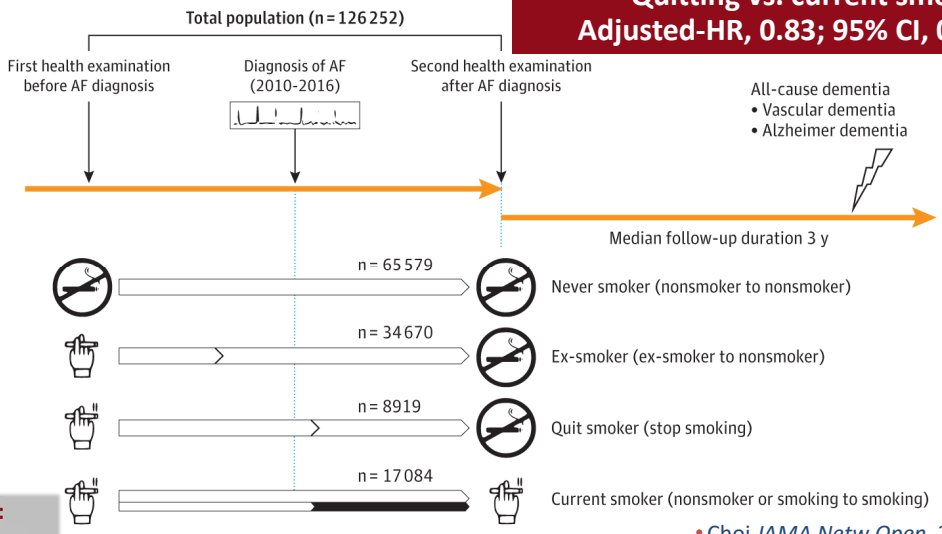
• Joglar et al. *Circulation*. 2024;149:e1

25

Quitting Smoking after AF Dx Associated Significant ↓ in Dementia

Observational Korean National Health Insurance Data

Quitting vs. current smoking
Adjusted-HR, 0.83; 95% CI, 0.72-0.96



2° Prevention: Other Outcomes

• Choi *JAMA Netw Open.* 2022; 5:e2217132

26

CLINICAL PRACTICE GUIDELINES

2023 ACC/AHA/ACCP/HRS Guideline for the Diagnosis and Management of Atrial Fibrillation: A Report of the American College of Cardiology/ American Heart Association Joint Committee on Clinical Practice Guidelines

Recommendation for Smoking Cessation		
COR	**LOE**	**Recommendation**
1	**B-NR**	**1. Patients with a history of AF who smoke cigarettes should be strongly advised to quit smoking and should receive GDMT for tobacco cessation to mitigate increased risks of AF-related cardiovascular complications and other adverse outcomes.**

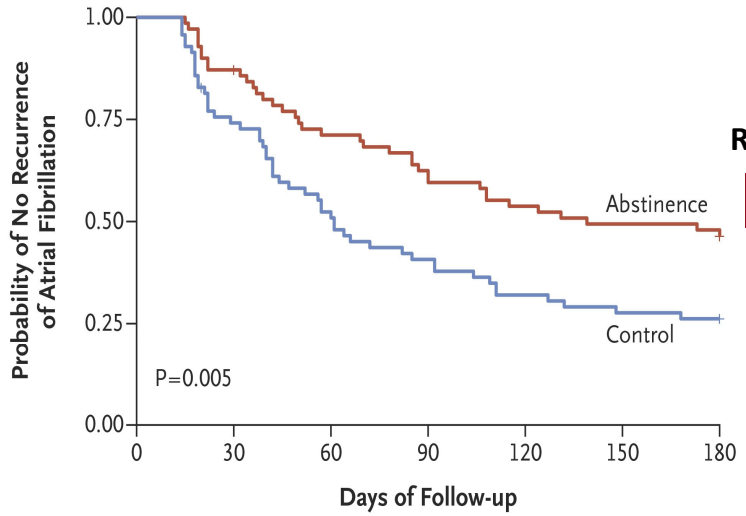
2° Prevention: AF

• Joglar et al. *Circulation*. 2024;149:e1

27

Alcohol Abstinence Improved Time to Recurrence AF

RCT Multi-center, open-labelled



Recurrence free @ 6 months

47% Abstinent group

27% Control group

HR, 0.55; 95% CI, 0.36-0.84; p=0.005

2° Prevention: AF

· Voskoboinik *NEJM*. 2020;382:20

28

CLINICAL PRACTICE GUIDELINES

2023 ACC/AHA/ACCP/HRS Guideline for the Diagnosis and Management of Atrial Fibrillation: A Report of the American College of Cardiology/ American Heart Association Joint Committee on Clinical Practice Guidelines

Recommendation for Alcohol Consumption		
COR	**LOE**	**Recommendation**
1	**B-R**	**1. Patients with AF seeking a rhythm-control strategy should minimize or eliminate alcohol consumption to reduce AF recurrence and burden.**

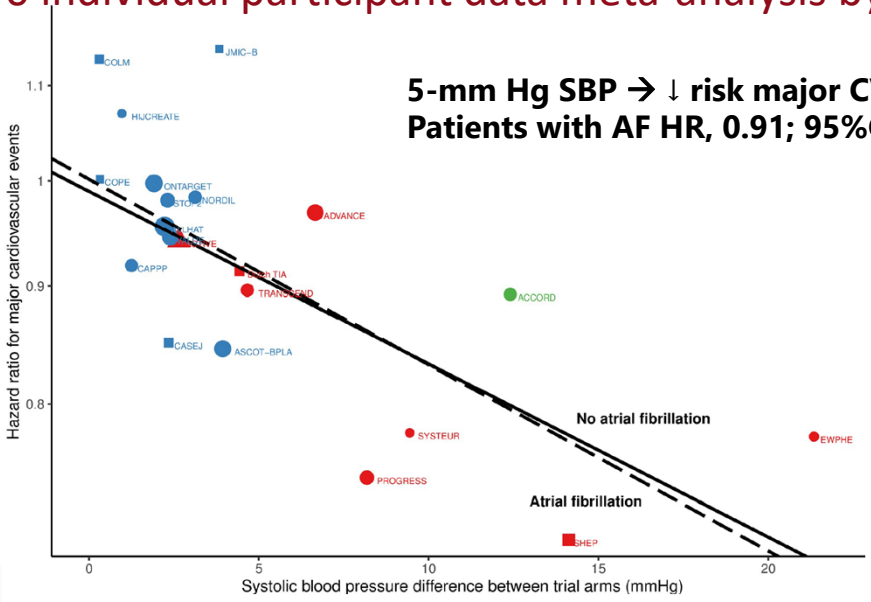
2° Prevention: AF

• Joglar et al. *Circulation*. 2024;149:e1

29

BP Lowering Treatment Trialists' Collaboration – 22 Trials

188,570 individual participant data meta-analysis by AF status



5-mm Hg SBP → ↓ risk major CVE
Patients with AF HR, 0.91; 95%CI, 0.83-1.00

2° Prevention: AF

• Pinho-Gomes *PLoS Med*. 2021;18:e1003599

30

CLINICAL PRACTICE GUIDELINES

2023 ACC/AHA/ACCP/HRS Guideline for the Diagnosis and Management of Atrial Fibrillation: A Report of the American College of Cardiology/ American Heart Association Joint Committee on Clinical Practice Guidelines

Recommendation for the Treatment of Hypertension		
COR	**LOE**	**Recommendation**
1	**B-NR**	**1. For patients with AF and hypertension, optimal BP control is recommended to reduce AF recurrence and AF-related cardiovascular events.**

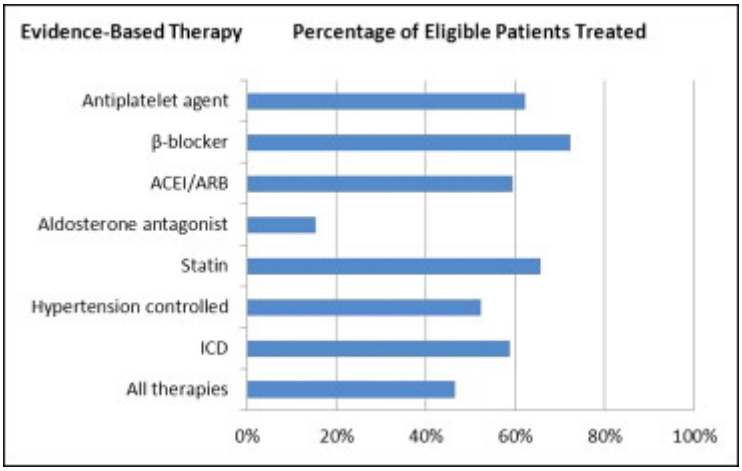
2° Prevention: AF

• Joglar et al. *Circulation*. 2024;149:e1

31

Use of Evidenced-Based Cardiac Prevention Therapies in AF

ORBIT-AF, US national registry AF patients



- 93.5% eligible ≥1 evidence-based therapy

Among eligible, 46.6% received all indicated Rx

2° Prevention: Other Outcomes

• Hess *Am J Med.* 2013; 126:625

32

CLINICAL PRACTICE GUIDELINES

2023 ACC/AHA/ACCP/HRS Guideline for the Diagnosis and Management of Atrial Fibrillation: A Report of the American College of Cardiology/ American Heart Association Joint Committee on Clinical Practice Guidelines

Recommendations for Comprehensive Care		
COR	**LOE**	**Recommendation**
1	A	1. Patients with AF should receive comprehensive care addressing guideline-directed LRFM, AF symptoms, risk of stroke, & other associated medical conditions to reduce AF burden, progression, or consequences.
2a	B-R	2. In patients with AF, use of clinical care pathways, such as nurse-led AF clinics, is reasonable to promote comprehensive, team-based care and to enhance adherence to evidence-based therapies for AF and associated conditions.

2° Prevention: AF

• Joglar et al. *Circulation*. 2024;149:e1

33

Social Determinants of Health

Systemic Barriers:
Education & Socioeconomic Status
Geography and Rurality
Race and Ethnicity

34

Impact of Social Determinants of Health

Tremendous impact on individuals' health

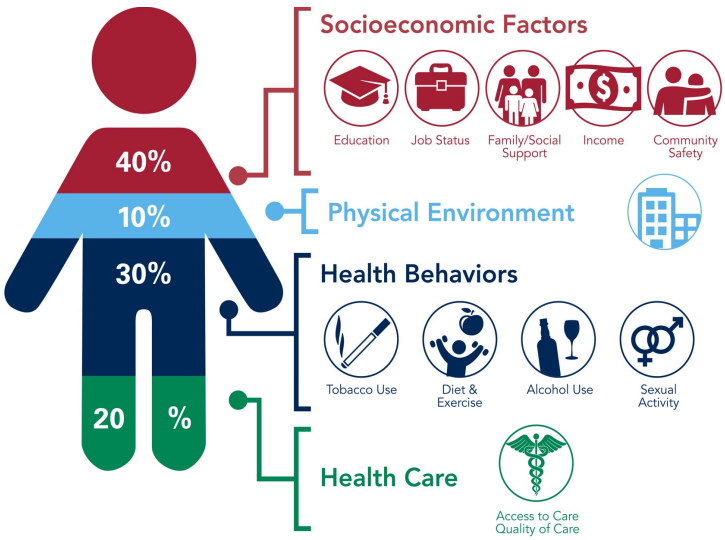
Barriers: Systemic & Socioeconomic

Source: Institute for Clinical Systems Improvement; Going Beyond Clinical Walls: Solving Complex Problems, 2014 Graphic designed by P

35

Impact of Social Determinants of Health

Tremendous impact on individual's health regardless of age, race, ethnicity

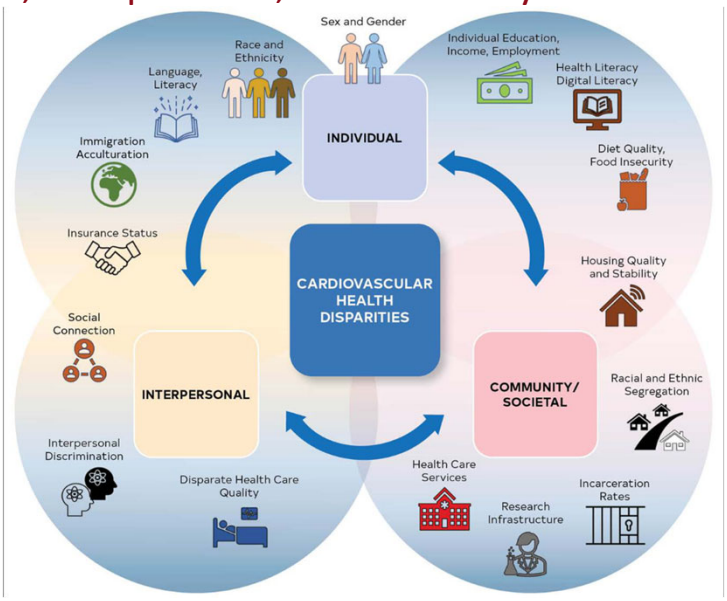


Barriers: Systemic & Socioeconomic

Source: Institute for Clinical Systems Improvement; Going Beyond Clinical Walls: Solving Complex Problems, 2014 Graphic designed by P

36

Social Determinants of Health
Individual, Interpersonal, & Community and Societal Levels

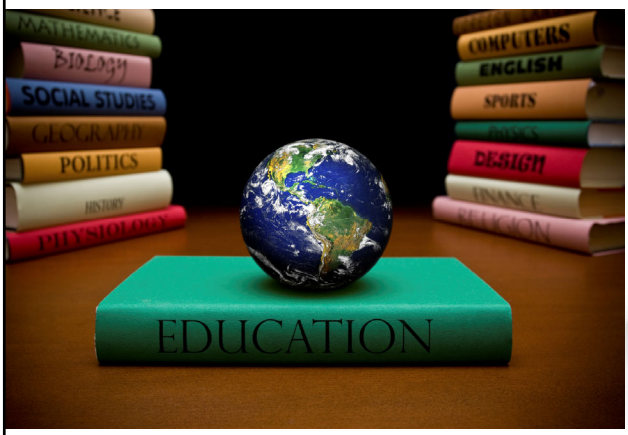


Barriers: Systemic & Socioeconomic

Morris *Circ Cardiovasc Qual Outcomes.* 2024:e000133

37

Education & Income

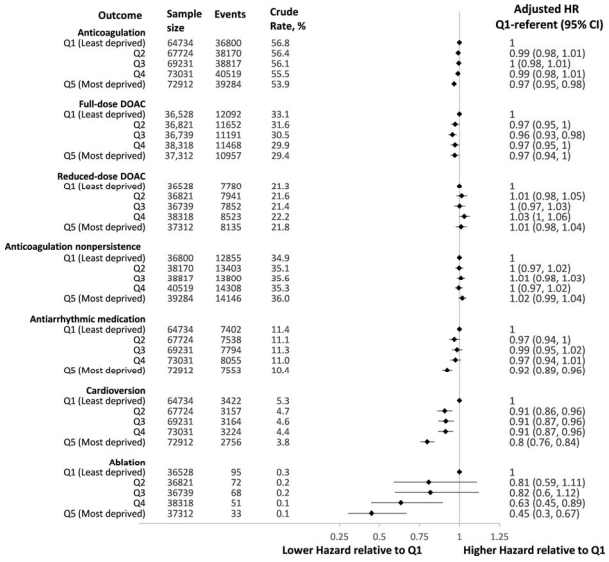


Barriers: Systemic & Socioeconomic

38

Adverse outcomes by material deprivation of individuals' neighborhood

~350K Ontario Canada individuals with AF



5th vs. 1st quintile Less therapy

Anticoagulation HR, 0.97; 95% CI 0.95-0.98

Cardioversion HR, 0.80 95% CI, 0.76–0.84

Ablation HR, 0.45; 95% CI, 0.30-0.67

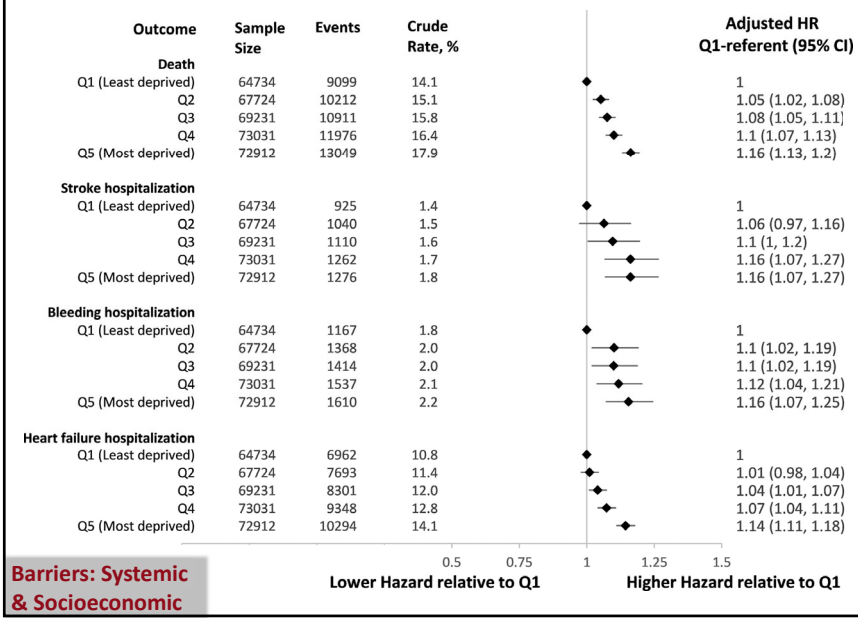
Barriers: Systemic & Socioeconomic

• Abdel-Qadir *Circulation* 2022;146:159

39

Adverse outcomes by material deprivation of individuals' neighborhood

~350K Ontario Canada individuals with AF



5th most vs. 1st least deprived quintile associated with:

Mortality HR, 1.16

Stroke HR, 1.16

Bleeding HR, 1.16

Heart Failure HR, 1.14

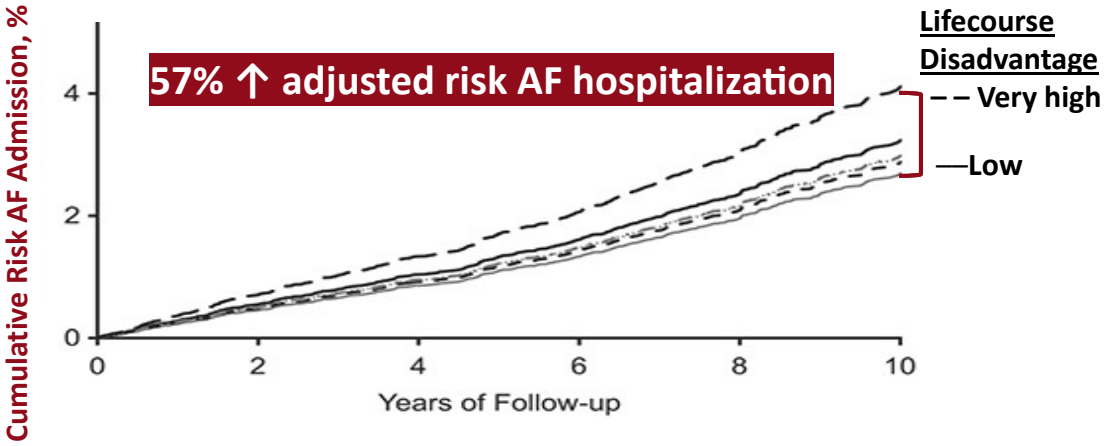
Barriers: Systemic & Socioeconomic

• Abdel-Qadir *Circulation* 2022;146:159

40

Socioeconomic SES Disadvantage & Risk AF Hospitalization

20K Adults in Moli-Sani Italian Study



AF risk halved with educational advancement

HR, 0.50; 95% CI, 0.28-0.89

Barriers: Systemic & Socioeconomic

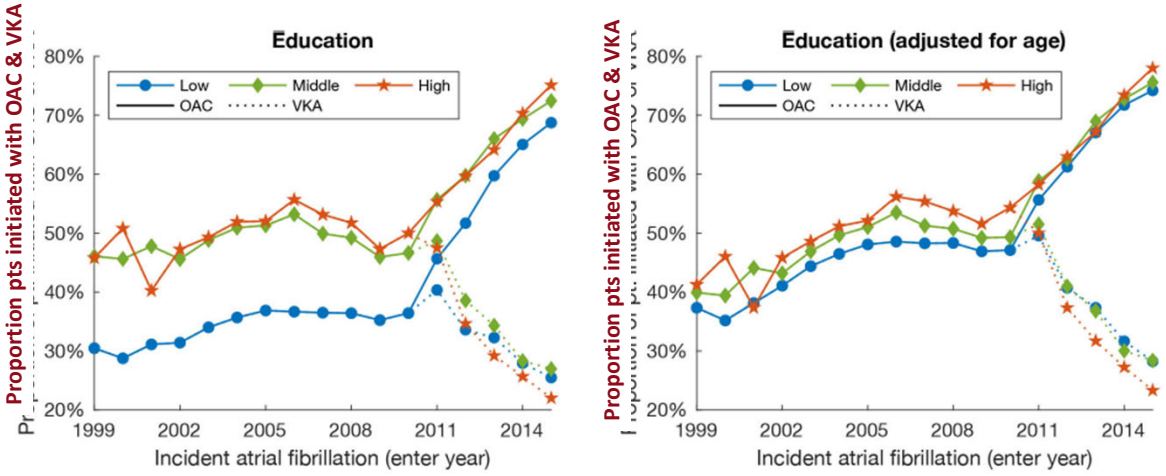
• Bonaccio *Am J Epidemiol.* 2021;190:1561

41

Socioeconomic Inequality in OAC initiation

In AF patients with high stroke risk Denmark

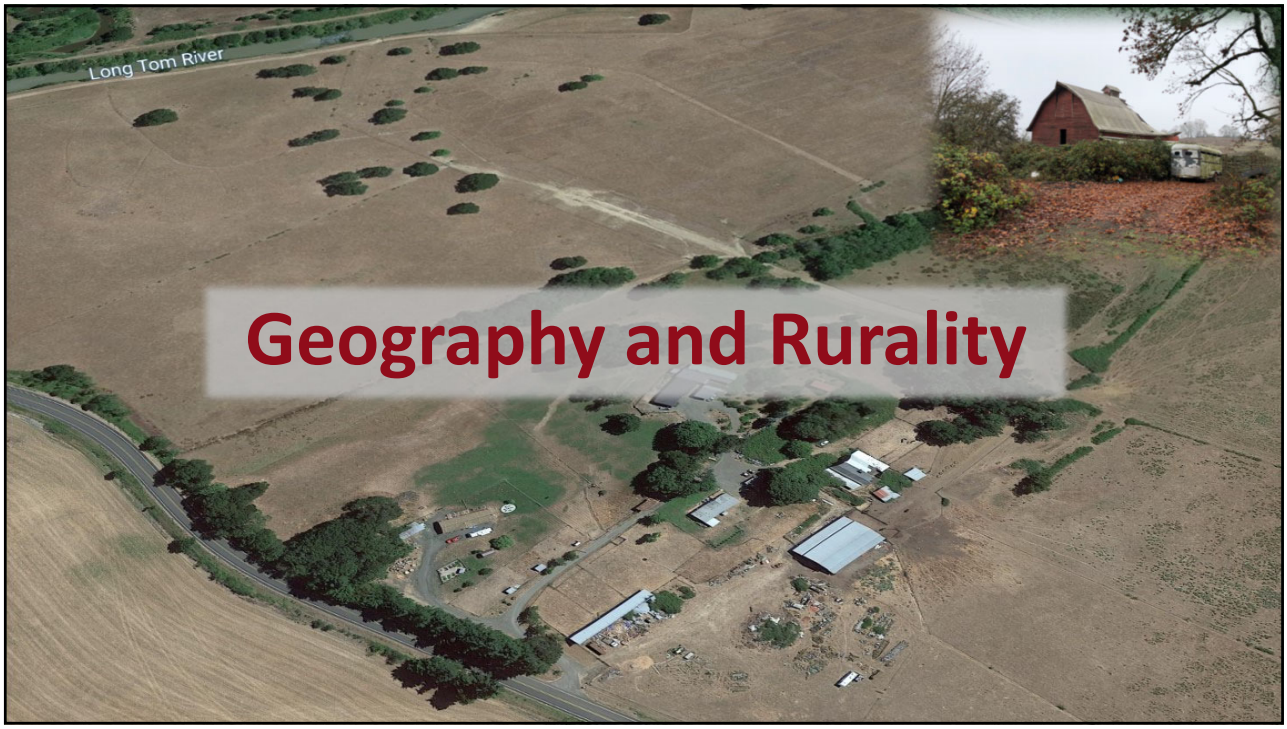
Guidelines introduced 2011 – ↓ OAC Gap



Barriers: Systemic & Socioeconomic

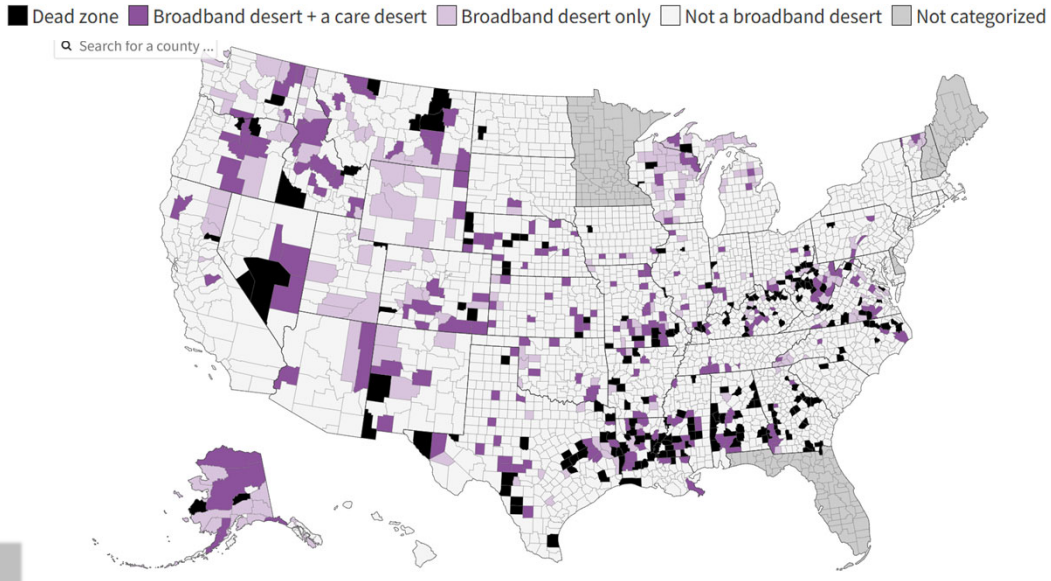
• Lunde *BMJ Open* 2021;11:e048839

42



43

~3 million Americans live in mostly rural counties lacking
Both health care & reliable high-speed internet



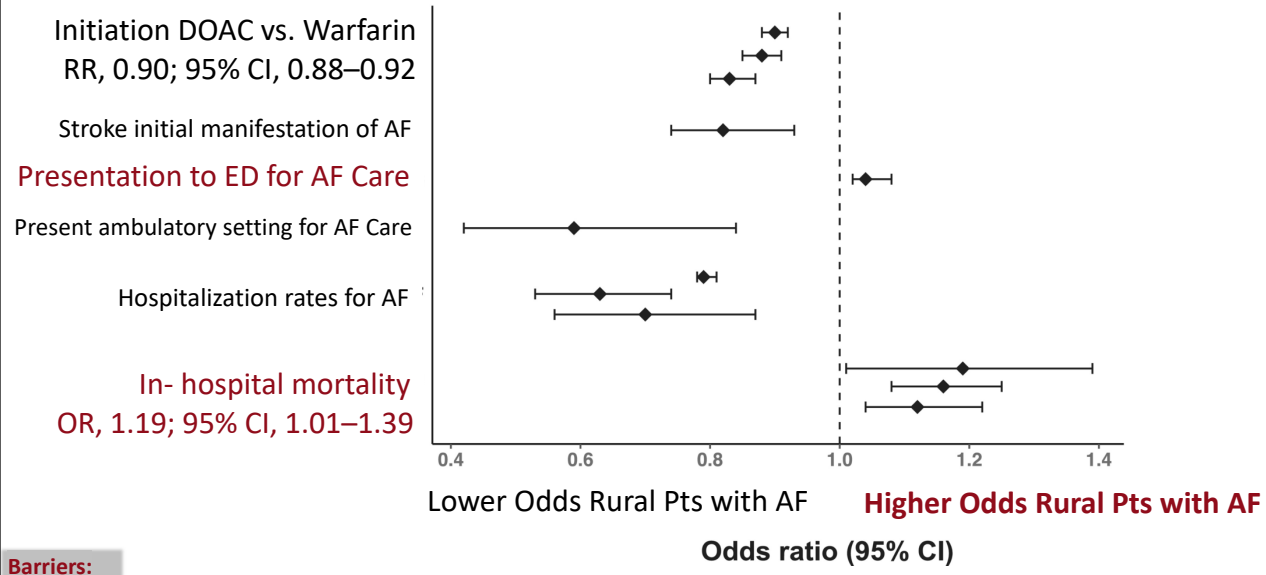
Barriers: Rurality

- https://kffhealthnews.org/news/article/dead-zone-sickest-counties-slow-internet-broadband-desert-health-care-provider-shortage/

44

Key Variation AF Care: Rural vs. Urban Communities

Systematic Review: 14 articles



Barriers: Rurality

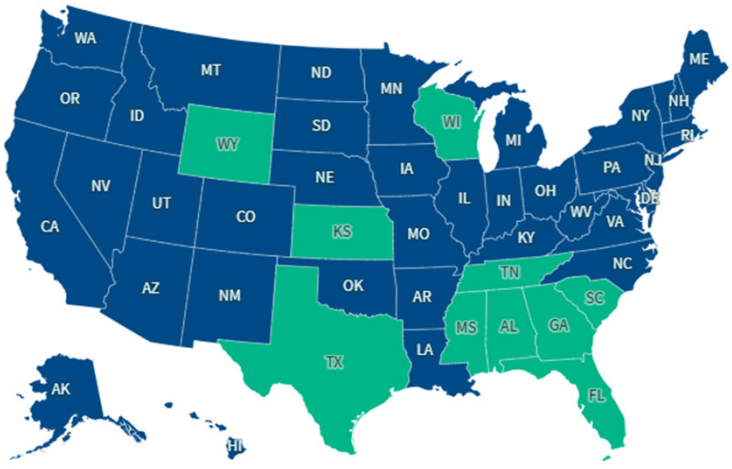
- Lin *J Am Heart Assoc.* 2025;14:e036899

45

Medicaid Expansion Associated with Lower Financial Strain

Many States with Large Rural Populations Did Not Adopt Medicaid

Adopted & Implemented Medicaid – 41 states + DC **Not Adopted Medicaid**

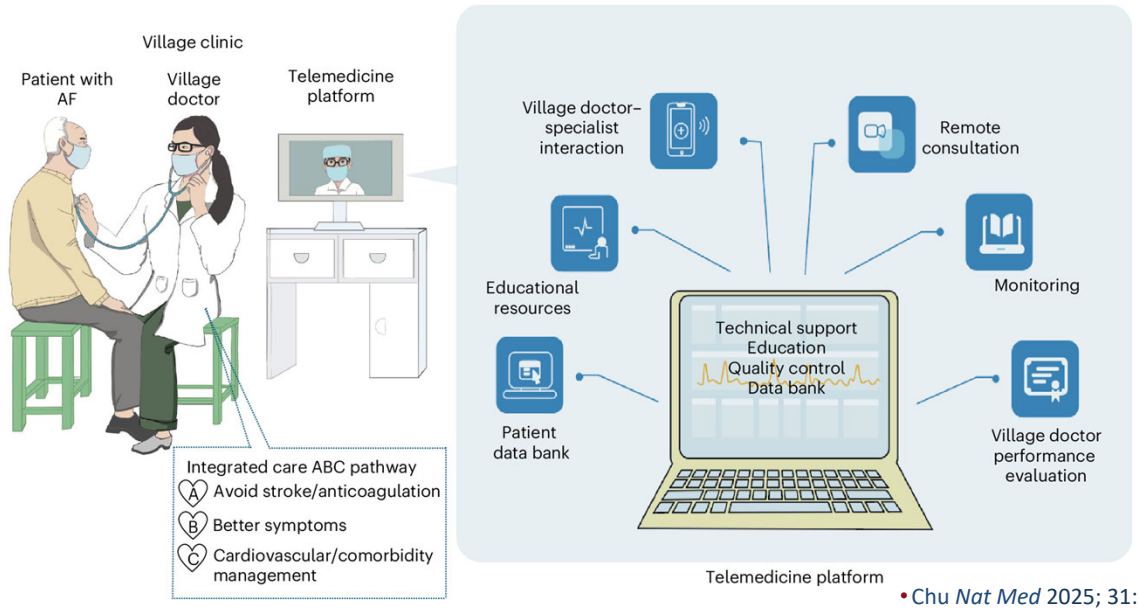


Barriers: Systemic & Socioeconomic

- https://www.kff.org/status-of-state-medicaid-expansion-decisions/
- Harrington *Circulation.* 2020;141:e615

46

Cluster RCT Telemedicine-based integrated Rx AF in Chinese Village Clinics



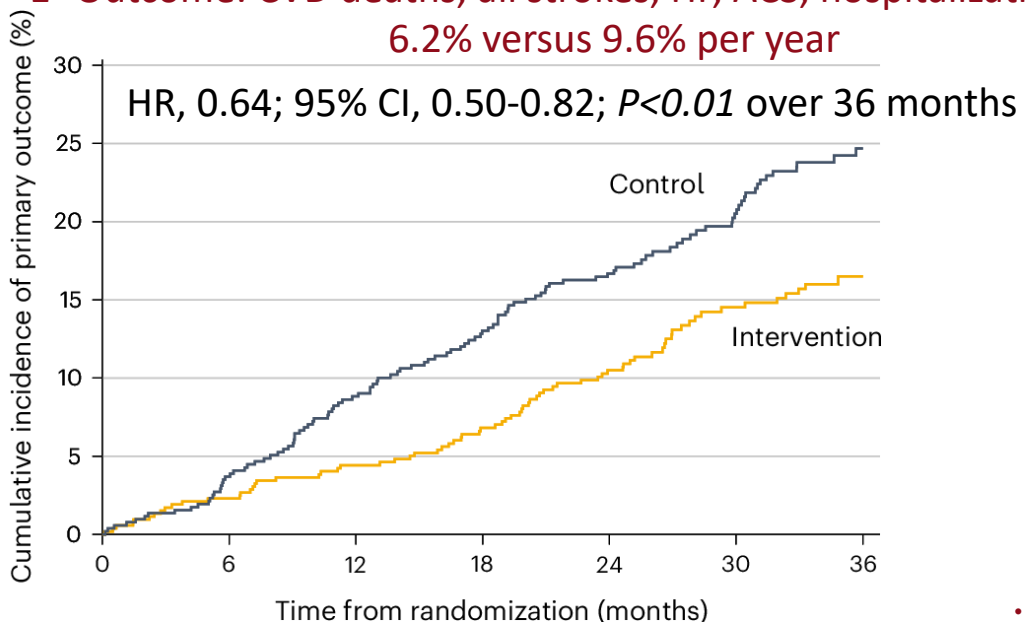
• Chu *Nat Med* 2025; 31:1276

47

Cluster RCT Telemedicine-based integrated Rx AF in Chinese Villages

1º Outcome: CVD deaths, all strokes, HF, ACS, hospitalization for AF

6.2% versus 9.6% per year



• Chu *Nat Med* 2025

48

49

AF-Related Mortality & Stroke & Treatments
Pittsburgh Medical Center Black vs. White Differences

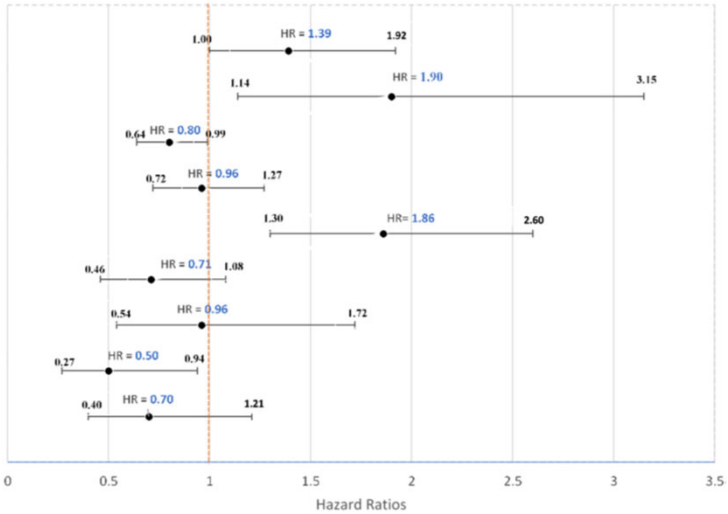
Black vs. White

↑ Mortality HR, 1.39

↑ Stroke HR, 1.90

↑ HF Hospitalization HR, 1.86

↓ AF Ablation HR, 0.50



Race & Ethnicity

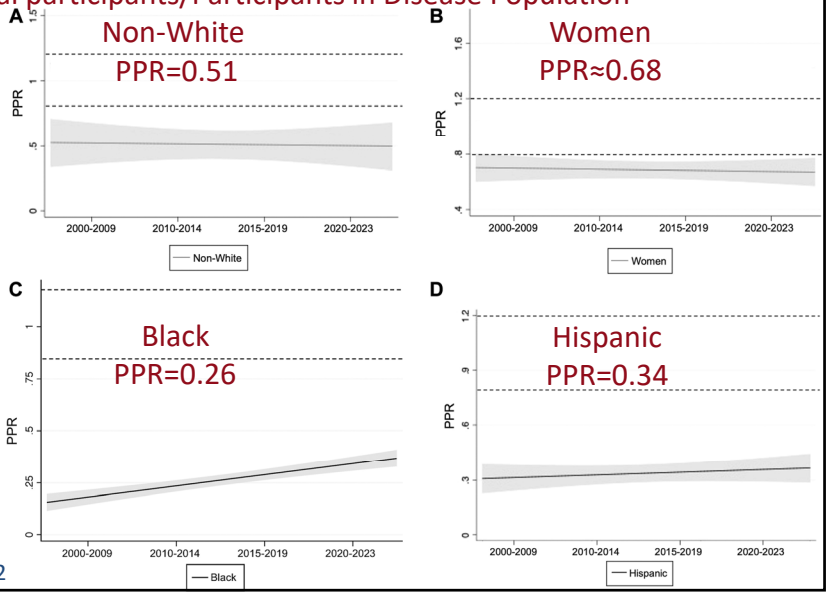
- Ugowe *Heart Rhythm* 2018;15:1337 & Durrani *J Immigr Minor Health*. 2018;20:1

50

277 AF Clinical Trials with 1.9 million Adults
Only 1/3 Trials Reported Comprehensive Race Information

PPR=Proportion trial participants/Participants in Disease Population

- Men overrepresented PPR=1.20–1.29
- White participants well-represented PPR=1.08–1.17
- Underrepresentation of non-Whites & Women has not changed over time



Sex, Race, Ethnicity

• Lan *Heart Rhythm* 2025;22:602

51

CLINICAL PRACTICE GUIDELINES

2023 ACC/AHA/ACCP/HRS Guideline for the Diagnosis and Management of Atrial Fibrillation: A Report of the American College of Cardiology/ American Heart Association Joint Committee on Clinical Practice Guidelines

Recommendations to Address Health Inequities & Barriers to AF Management

COR	LOE	Recommendation
1	B-NR	1. Patients with AF, regardless of sex and gender diversity, race and ethnicity, or adverse social determinants of health (SDOH), should be equitably offered guideline-directed stroke risk reduction therapies as well as rate or rhythm control strategies and LRFM as indicated to improve quality of life (QOL) and prevent adverse outcomes.

Barriers: Systemic & Socioeconomic

• Joglar et al. *Circulation*. 2024;149:e1

52

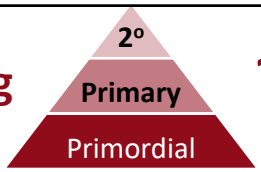
What can we do as Clinicians?

- **Diversify our training programs, practices, & research teams**
- **Utilize multidisciplinary teams & community health workers**
- **Advocate for policy changes**
- **Support research to establish evidence-based implementation**

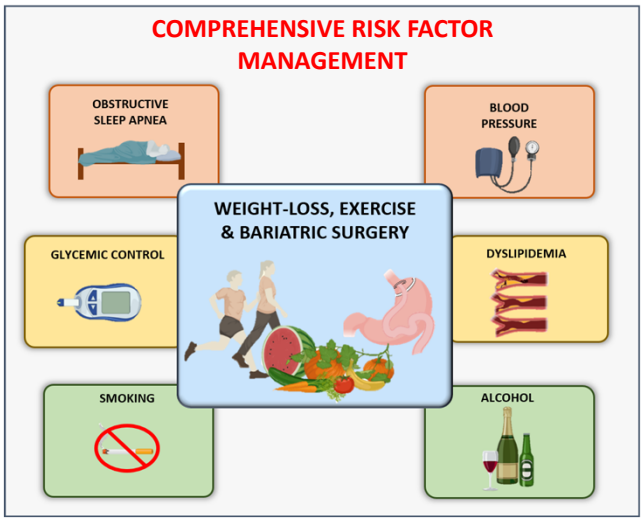
https://aida.org.au/app/uploads/2022/03/AIDA-Growing-medical-specialists-report-2021_v2.pdf
Burgess *Intern Med J* 2020;50:412

53

Are You Practicing



?



Benjamin *J Am Heart Assoc*. 2021;10:e021566
https://tobiasglaser.ch/2018/02/23/the-confidence-meter/

54

CMS Inpatient Prospective Payment System

3 equity-measures Hospital Inpatient Quality Program

	Voluntary	Mandatory	Payment Determination
Hospital Commitment to Health Equity			2025
Screening for Social Drivers of Health	2023	2024	2026
Screen Positive Rates Social Drivers of Health	2023	2024	2026

FY 2026 Hospital Inpatient Prospective Payment System Proposed Rule — CMS-1833-P Fact Sheet 4/11/2025

CMS is proposing to remove measures:

- Remove Hospital Commitment to Health Equity, beginning CY 2024 reporting period/FY 2026 program year
- Remove Screening for Social Drivers of Health & Screen Positive Rate for Social Drivers of Health measures, beginning with CY 2024 reporting period/FY 2026 payment determination.

Slide courtesy of Jennifer Mieres, MD Northwell Health;
https://www.cms.gov/newsroom/fact-sheets/fy-2026-hospital-inpatient-prospective-payment-system-ipps-and-long-term-care-hospital-prospective

55

The Joint Commission: Reducing Disparities in Quality & Safety

1. Designate Equity Champion
2. Assess social needs & SDoH
3. Stratify key quality & safety data
4. Develop written action plan
5. Monitor effectiveness
6. Annual report

Slide courtesy of Jennifer Mieres, MD Center for Equity of Care & Office of Strategic Planning Northwell Health
https://www.jointcommission.org/-/media/tjc/documents/standards/r3-reports/r3_disparities_july2022-6-20-2022.pdf
R3 Report Issue 36: New Requirements to Reduce Health Care Disparities

56

57

Globally US is 46th in Life Expectancy*

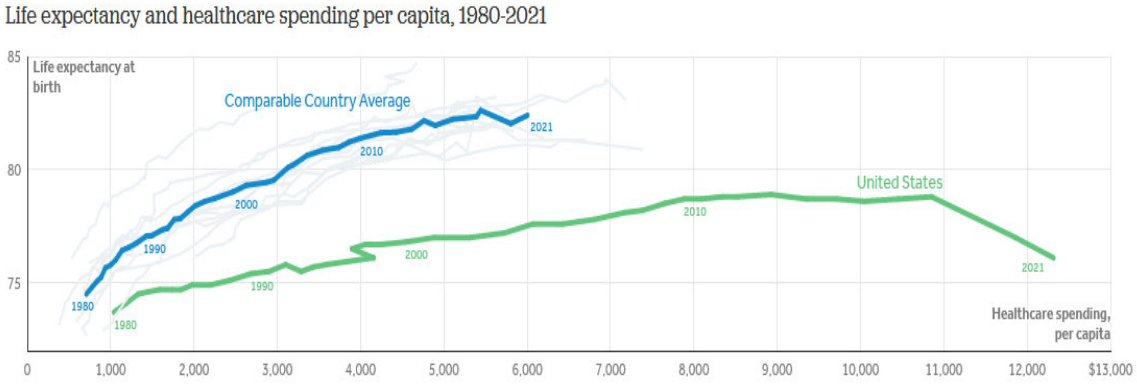
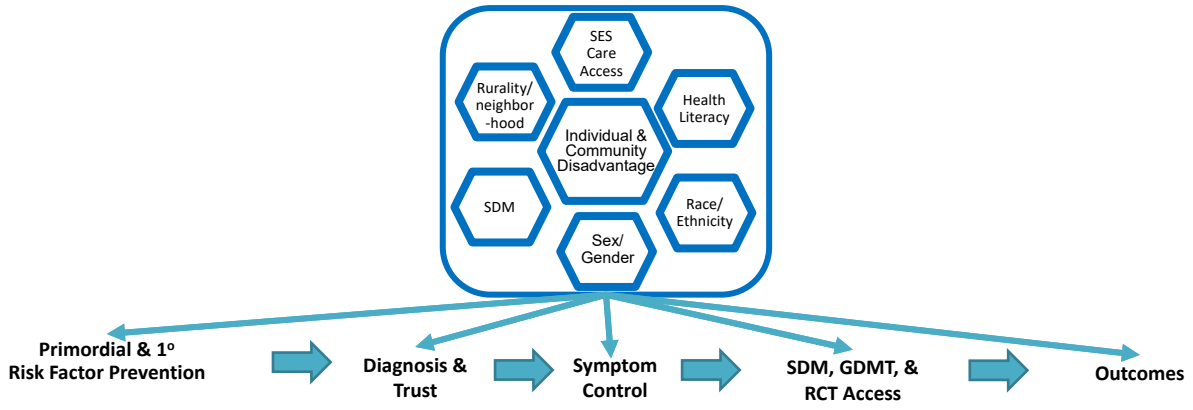


Image courtesy of Kevin Volpp, MD, PhD
*Shanahn *Am J Public Health.* 2023;113:961

58

NHLBI Workshop AF SDOH Cross-Cutting Research Opportunities



Marked inequities amplified by SDOH across the lifecourse of AF

Summary

Benjamin *JAMA Cardiol*. 2023;8:182

59

Social Drivers of AF

Levels of influence on AF incidence and outcomes	Suggested research focus areas
Patient-level research	How do social determinants of health such as race/ethnicity, financial resources and adverse working conditions interact to affect AF outcomes?
Research on clinical interactions	How can clinicians engage in shared decision-making in AF management while addressing the social determinants of health?
Community-based research	How do factors such as neighbourhood deprivation, segregation, homelessness and structural racism affect AF outcomes?
Research infrastructure	How do we best integrate social determinants of health into clinical trials and observational studies of AF?
Policy implementation research	How can local and national policies influence social determinants of health and in turn AF incidence and outcomes?

Research Priorities

• Essien *Nat Rev Cardiol*. 2021;18:763.

60

61

Primary & Secondary Prevention → Equitable Care

- **Primary Prevention, patients @ ↑ risk AF** :
  - Class 1, LOE B-NR should receive Lifestyle & RF management
- **Secondary prevention**
  - Class 1, LOE B-R, obesity, exercise, alcohol limitations or abstinence
  - Class 1, LOE B-NR, smoking cessation, hypertension treatment
  - Class 1, LOE A, comprehensive care for lifestyle & RF management




Summary

62

Social Determinants of AF

AF Guidelines & JAHCO all focus on health equity

Future Research Priorities

- ↑ **Diversity**
  - Recruitment & retention diverse patients in observational & pragmatic studies by gender, race/ethnicity, income, education
  - Settings, including communities & rural
- Develop innovative methods to analyze multiple intersectional identities & cumulative disadvantage across the life course
- Pragmatic studies to test multilevel strategies mitigate SDOH in AF diagnosis, management, & outcomes

Summary

Benjamin *JAMA Cardiol*. 2023;8:182

63