

# Addressing Health Equity as a Strategy to Impact Peripheral Arterial Disease and Obesity Health Outcomes

March 31, 2023



AMGA Foundation



John Kennedy, MD  
President, AMGA Foundation  
Chief Medical Officer, AMGA

# Thank You Chronic Care Roundtable Partners



**Abbott**

**AMGEN**



Boehringer  
Ingelheim

**Dexcom**<sup>®</sup>  
CONTINUOUS GLUCOSE MONITORING

Janssen



PHARMACEUTICAL COMPANIES OF  
*Johnson & Johnson*

*Lilly*



MAGMUTUAL<sup>®</sup>



Novo Nordisk<sup>®</sup>



NOVARTIS



*Pfizer*

**sanofi**

# Chronic Care Roundtable Theme

Strategize on health equity with a focus on peripheral arterial disease and obesity.

# Agenda

<b>8:30am – 8:35am</b>	<b>Welcome &amp; Introductions</b> <b>John W. Kennedy, MD, Chief Medical Officer, AMGA; President AMGA Foundation</b>
<b>8:35 am – 9:05 am</b>	Keynote presentation Osama A. Ibrahim, MD, FACC, FSCAI, Interventional, Cardiovascular Medicine and Endovascular Medicine Specialist, Vanderbilt Tullahoma Harton Hospital; Physician Lead - Vascular Service Line; Director of Vascular Medicine; Director of The Vein Clinic, Cardiology and Vascular Associates, PLLC
<b>9:05 am- 9:20 am</b>	Audience Q&A for Dr. Osama Ibrahim
<b>9:20 am- 9:50 am</b>	Moderated panel discussion <ul style="list-style-type: none"><li>• Kara Mayes, MD, FAAFP, Medical Director, Mercy Clinic Weight and Wellness</li><li>• W. Timothy Garvey, MD, MACE; University Professor; University of Alabama at Birmingham; Director, UAB Diabetes Research Center</li></ul>
<b>9:55 am – 10:00 am</b>	Closing remarks



AMGA Foundation



Osama A. Ibrahim, MD, FACC, FSCAI  
Interventional Cardiovascular Medicine  
and Endovascular Medicine Specialist  
Vanderbilt Tullahoma Harton Hospital

# Peripheral Arterial Disease (PAD) The New Cardiovascular Pandemic

**Osama A. Ibrahim, MD, FACC, FSCAI**

Founder and President, Pinnacle Vascular Solutions (PVS)

Physician Lead - Vascular Service Line

Director of Vascular Medicine and Director of The Vein Clinic

Cardiology and Vascular Associates, LLC (CVA)

Vascular Disease Leadership Council, Healthcare Affairs Committee, and Heart  
PAC Executive Committee - American College of Cardiology (ACC)

Governmental Affairs Committee – Society of Cardiovascular Angiography and  
Interventions (SCAI)





# Talk objectives



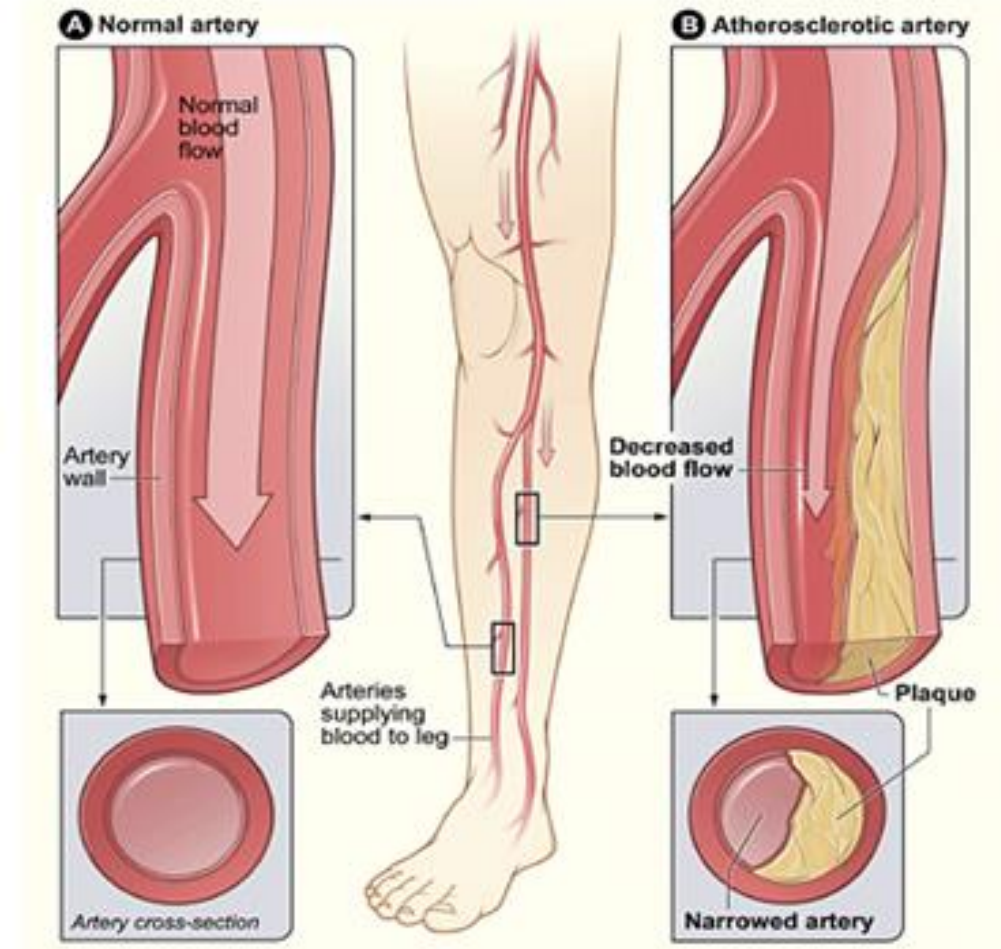
1- Define Peripheral Arterial Disease (PAD) and understand Non traumatic Amputation trends.

2- Understand the economic burden and challenges of diagnosis/management of PAD.

3- Health Disparities and Inequities within PAD Management and Amputation trends.

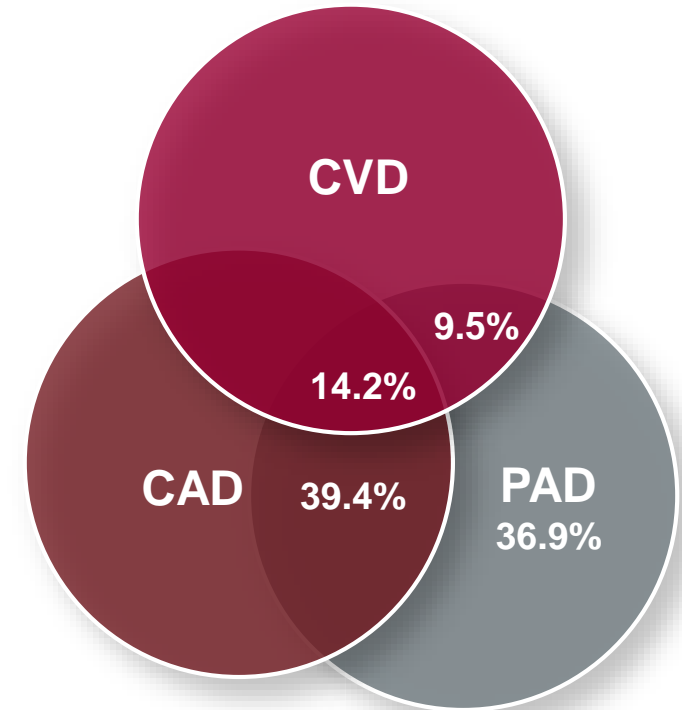
# Peripheral Artery Disease (PAD)

- Disease of arteries outside the heart and brain that can lead to loss of a limb and can be life threatening
- Manifestation of systemic atherosclerosis, characterized by narrowing and hardening of the arteries that supply blood to the legs and feet
- Narrowing of the vessels reduces flow of oxygen-rich blood to lower limbs and results in nerve and tissue injury
- Can lead to development of foot ulcers and gangrene
- Iliac, femoropopliteal, and infrapopliteal arteries are commonly affected



# Definition of PAD

- The presence of a stenosis or occlusion in the aorta or arteries of the limbs
- One of the three cardinal manifestations of atherosclerosis in addition to CAD and CVD
- Associated with an increased risk of cardiovascular and cerebrovascular events, including death, MI and stroke

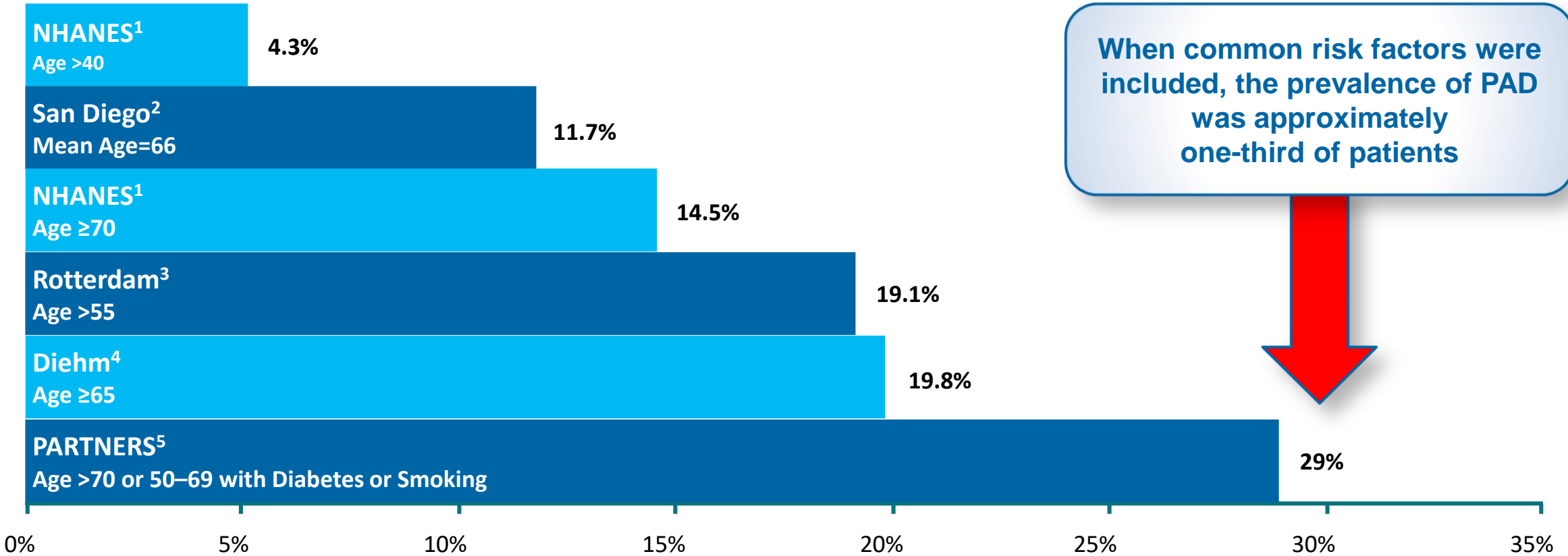


Patients with one manifestation often have coexistent disease in other vascular beds<sup>1</sup>

CAD=coronary artery disease; CVD=cardiovascular disease; MI=myocardial infarction.

1. Bhatt DL et al, on behalf of the REACH Registry Investigators. JAMA 2006; 295(2): 180-189
2. Rooke T et al. 2011 ACCF/AHA focused update of the guideline for the management of patients with peripheral arterial disease (updating the 2005 guideline): a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. *Circulation*. 2011;124:2020–2045.

# Prevalence of PAD



NHANES=National Health and Nutrition Examination Survey.

1. Selvin E, Erlinger T. Prevalence of and risk factors for peripheral arterial disease in the United States: results from the National Health and Nutrition Examination Survey, 1999–2000. *Circulation*. 2004;110:738–743.

2. Criqui M et al. The prevalence of peripheral arterial disease in a defined population. *Circulation*. 1985;71:510–515.

3. Meijer W et al. Peripheral arterial disease in the elderly: the Rotterdam Study. *Arterioscler Thromb Vasc Biol*. 1998;18:185–192.

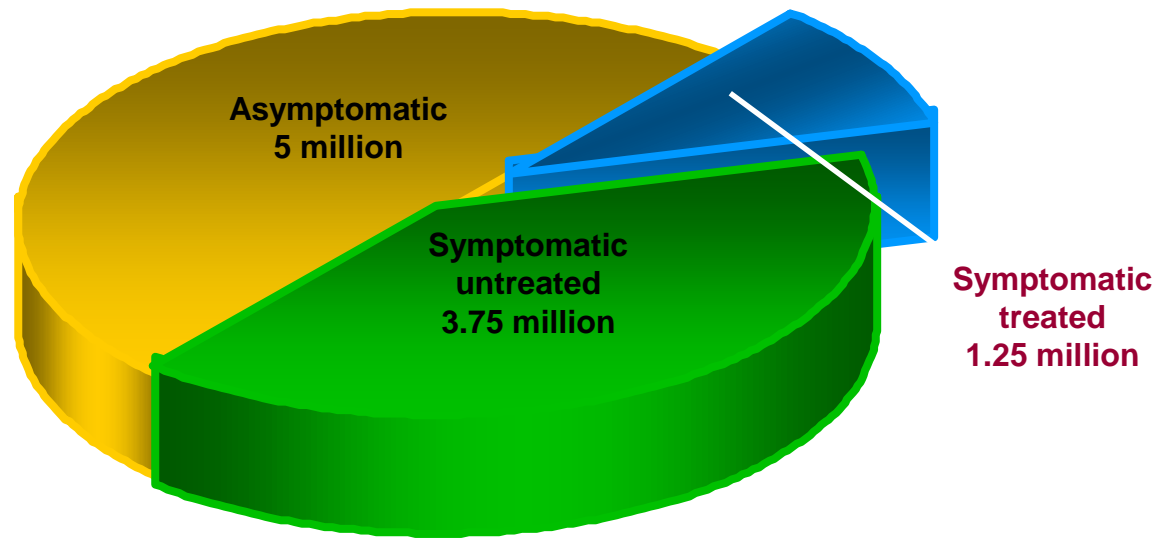
4. Diehm C et al. High prevalence of peripheral arterial disease and co-morbidity in 6880 primary care patients: cross-sectional study. *Atherosclerosis*. 2004;172:95–105.

5. Hirsch A et al. Peripheral arterial disease detection, awareness, and treatment in primary care. *JAMA*. 2001;286:1317–1324.

# Prevalence

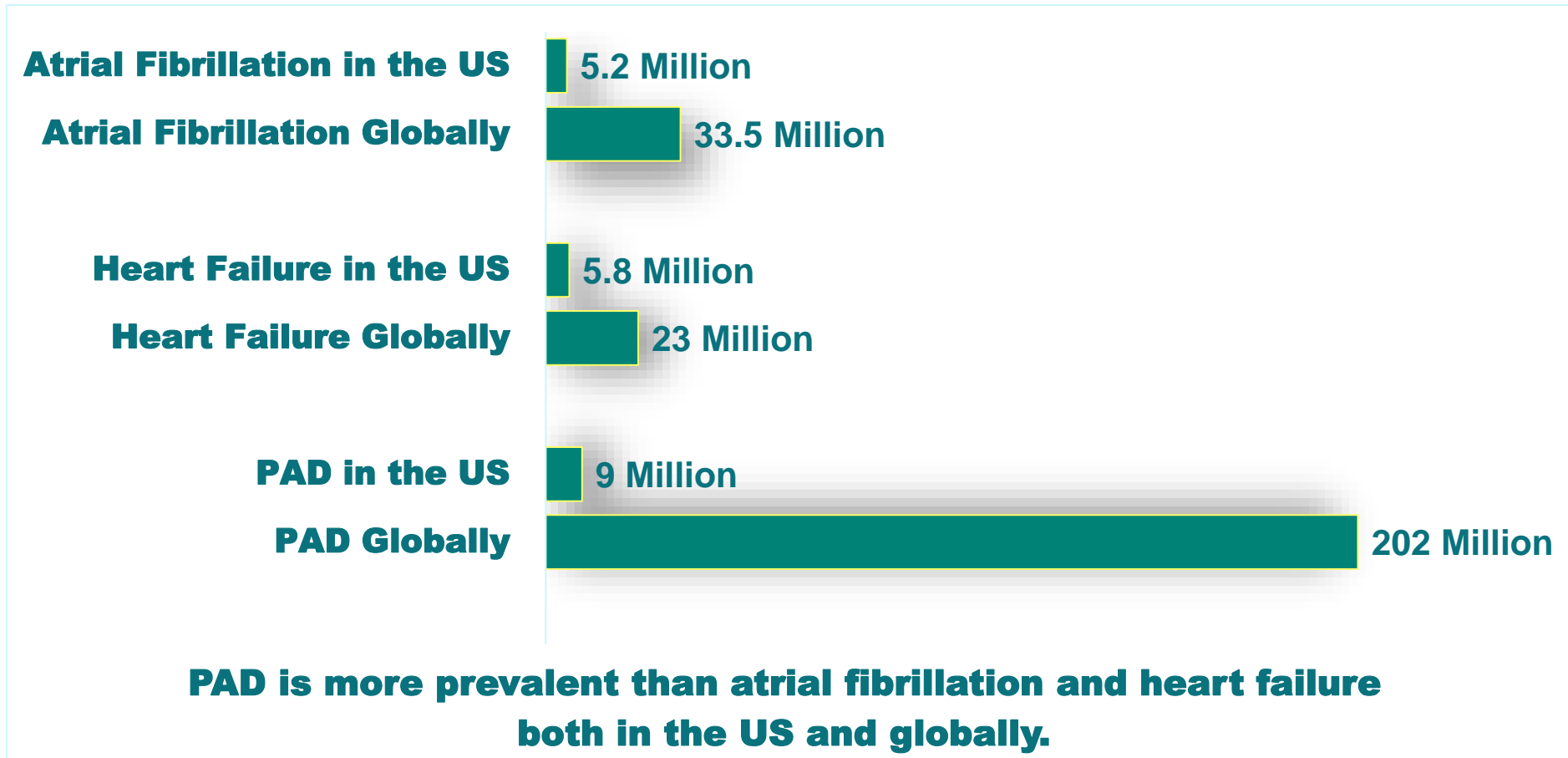


**Total ~ 10 million U.S. patients**



In 2017 ~ 20 million US patients with **15-17.5 million patients not treated**

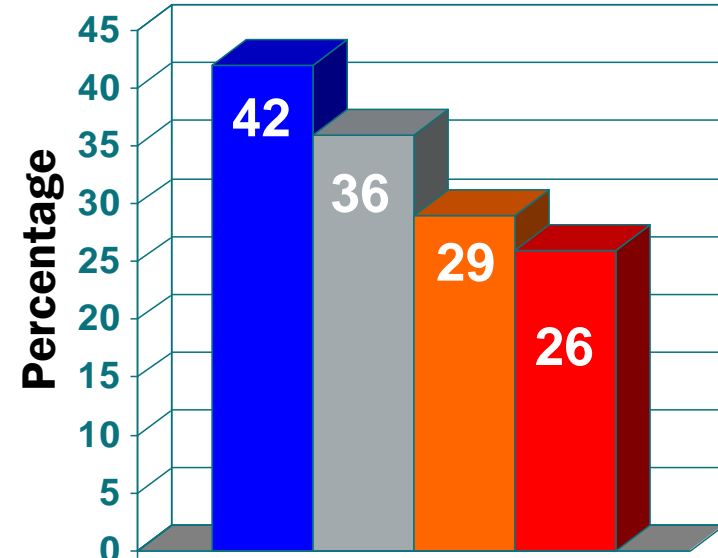
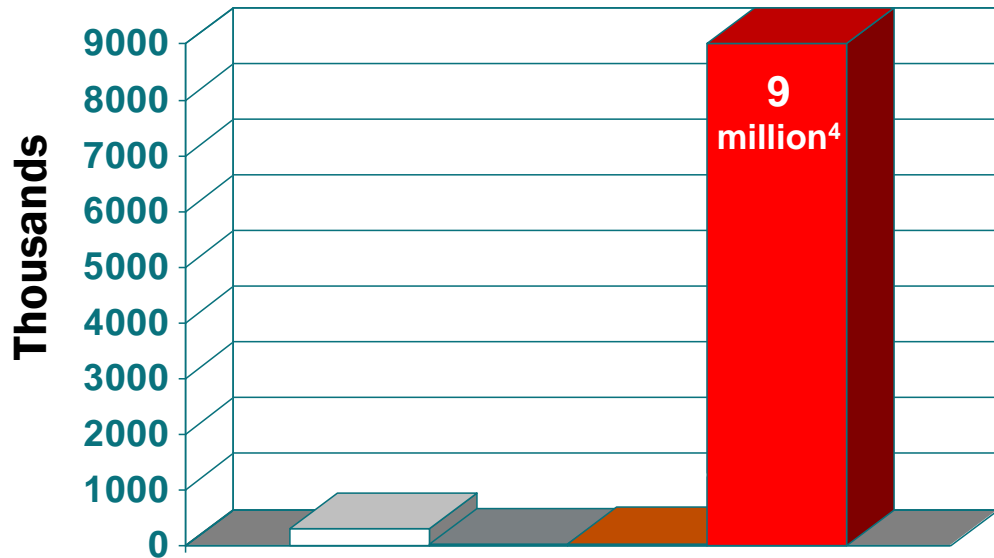
# Comparison of the Global and US Prevalence of PAD with Heart Failure and Atrial Fibrillation



Fowkes FGR, Rudan D, et al. Lancet 2013  
Bui AL. et al. Nat Rev Cardiol. 2011  
Chugh SS. et al. Circulation. 2014

# Public PAD Awareness is Low:

Diseases With A Much Lower Prevalence Are Much Better Known Than PAD



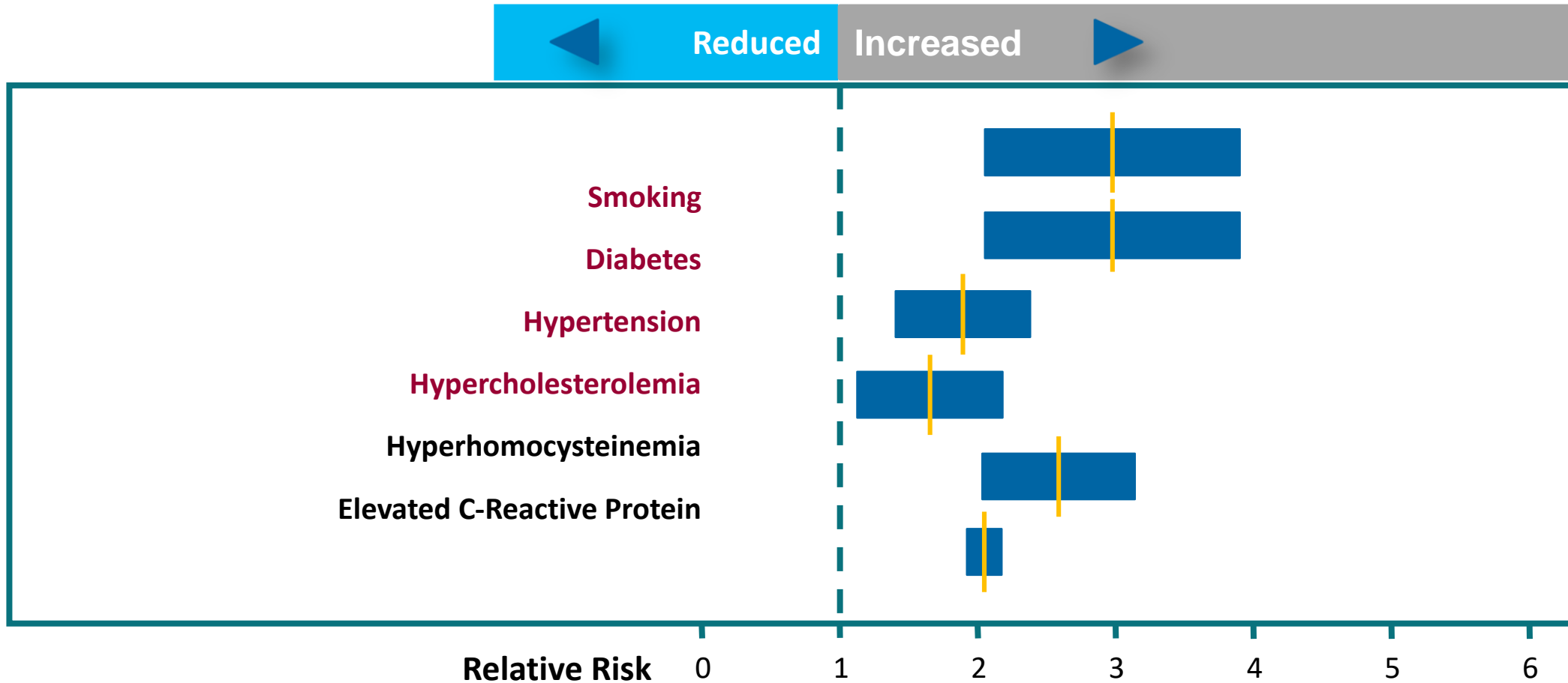
Multiple Sclerosis

Lou Gehrig's Disease

Cystic Fibrosis

PAD

# Risk Factors for PAD



Dormandy J, Rutherford R; TASC Working Group, TransAtlantic Inter-Society Consensus (TASC). Management of peripheral arterial disease (PAD). *J Vasc Surg.* 2000;31(1 pt 2):S1–S288.



# Clinical Presentation



- Asymptomatic 20-50 %
- Atypical leg pain 40-50 %
- Classic claudication 10-35 %
- Critical limb ischemia 1-2 %

Hirsch, AT et al. ACC/AHA 2005 Practice guidelines for management of patients with PAD, Circ 2006

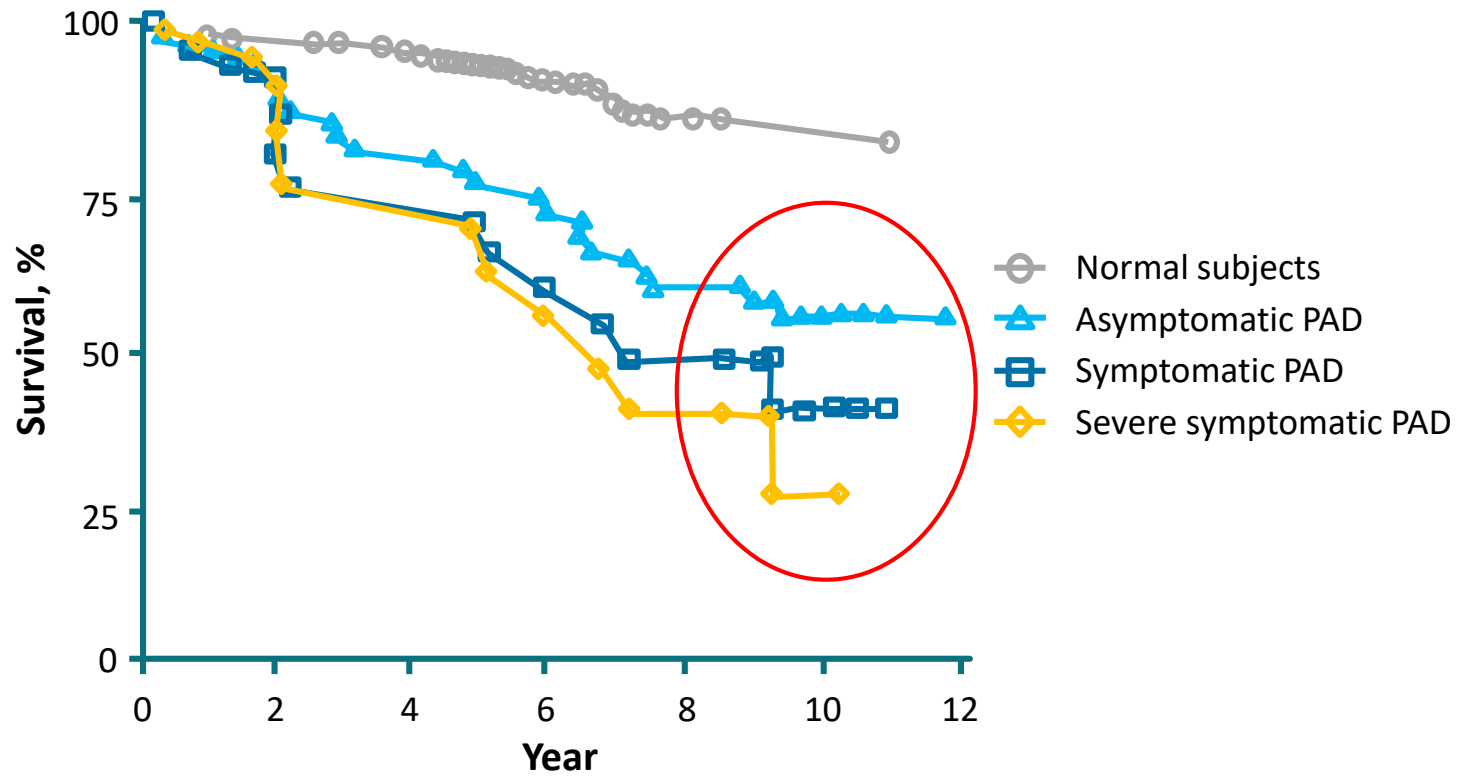
# Classification of PAD



Fontaine Stages		Rutherford Categories		
Stage	Clinical	Grade	Category	Clinical
I	Asymptomatic	0	0	Asymptomatic
IIA	Mild claudication	I	1	Mild claudication
IIB	Moderate-severe claudication	I	2	Moderate claudication
		I	3	Severe claudication
III	Ischemic rest pain	II	4	Ischemic rest pain
IV	Ulceration or gangrene	III	5	Minor tissue loss
		IV	6	Ulceration or gangrene

Dormandy J, Rutherford R; TASC Working Group, TransAtlantic Inter-Society Consensus (TASC). Management of peripheral arterial disease (PAVasc Surg. 2000;31(1 pt 2):S1-S2D). J 88.

# 10-Year Survival Rates for Patients with PAD



Criqui M et al. Mortality over a period of 10 years in patients with peripheral arterial disease. *N Engl J Med.* 1992;326:381-386.

# PAD ANNUAL ECONOMIC BURDEN\*



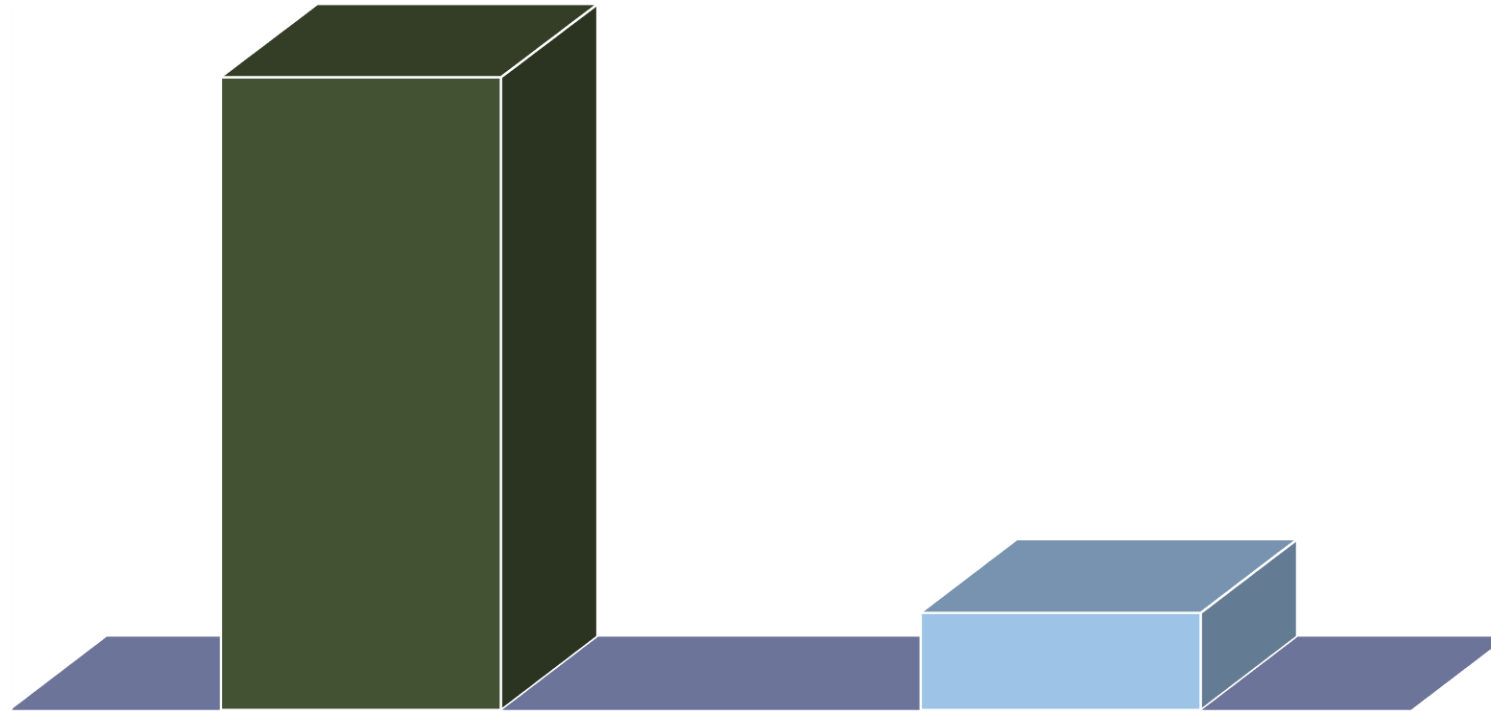
\$223<sup>†</sup>-\$414<sup>‡</sup> BILLION

<sup>†</sup>U.S. REACH population inpatient costs + outpatient medication = \$11,280 X 19.8 Mil PAD in 2015

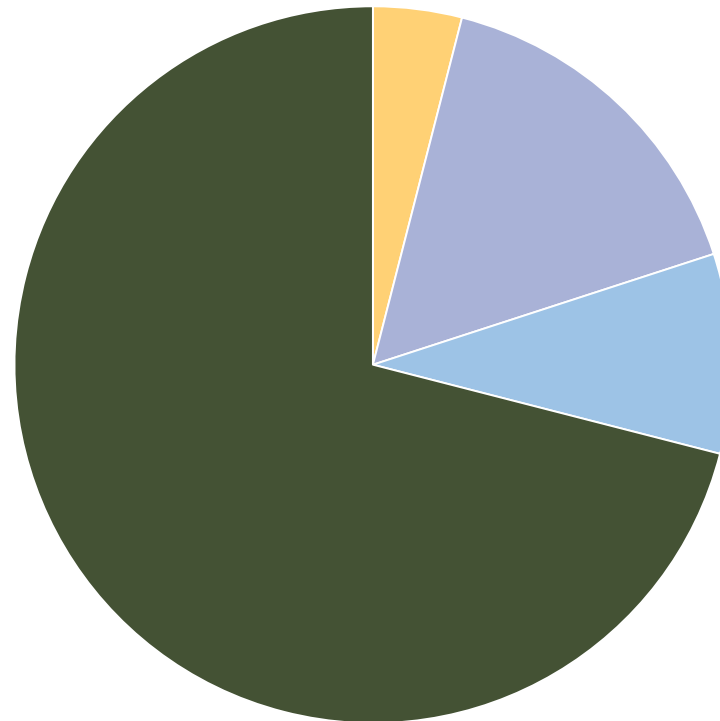
<sup>‡</sup>Margolis managed care population all-cause hospitalizations + medications + other =  
\$20,895 x 19.8 Mil PAD. Per pt. costs in 2015 \$.

Source: Mahoney EM. Circ Cardiovasc Qual Outcomes 2008;1:38-45, Margolis J. J Manag Care Pharm 2005; 11(9): 727-24 and Yost ML. Real cost of PAD 2011 THE SAGE GROUP.

# 2015 ANNUAL MEDICARE EXPENDITURES

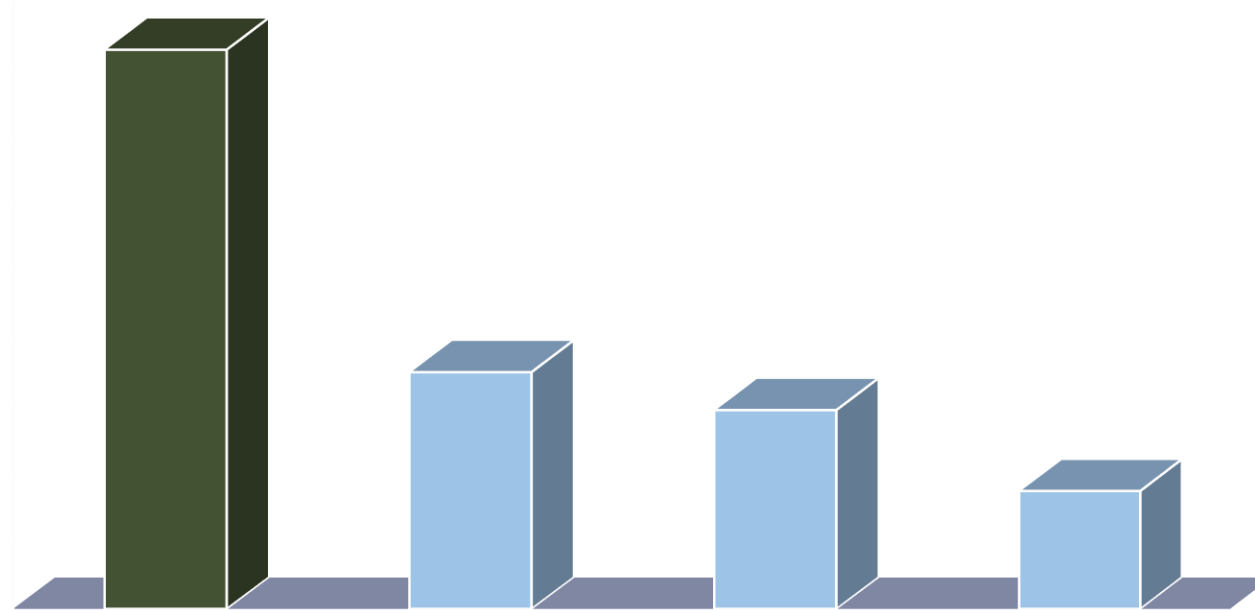


# WHO PAYS THE PAD BILL?

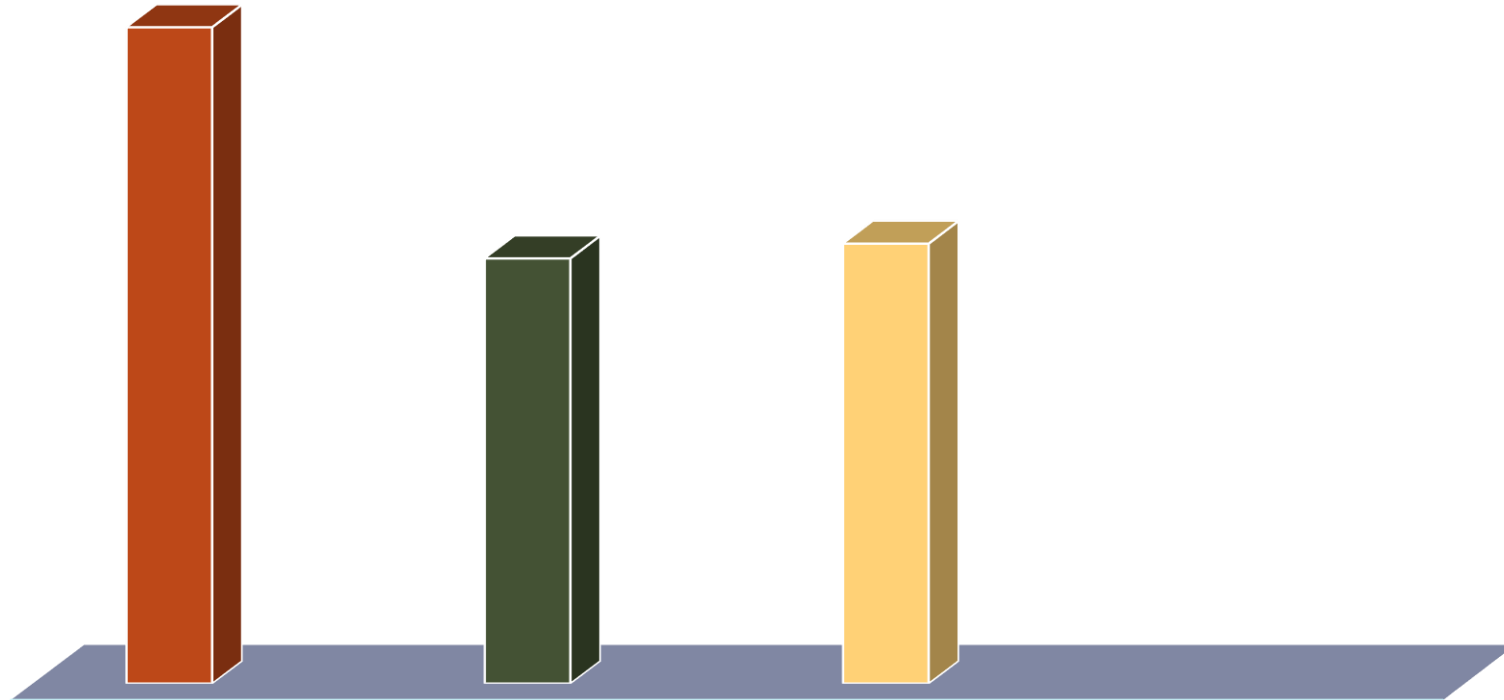


# 2015 ANNUAL ECONOMIC BURDEN\*

(Billions \$)



# AMPUTATION COSTS MORE THAN REVASCULARIZATION





# Why fear PAD ?



- Similar characteristics of any **CANCER**
  - Progressive.
  - Asymptomatic.
  - When identified – usually too late.
  - Significant morbidity/mortality.
  - Extremely prevalent and numbers are only on the rise:
    - Aging population.
    - Increasing diabetic population ( > 30-50% of population by 2050)

*IF YOU HAVE A CANCER YOU NEED TO SCREEN PATIENTS AND IDENTIFY THOSE AT RISK – Pap smear, CXR, and mammography.*



Horizons  
International  
Peripheral  
Group



# Why fear PAD ?



- We know PAD patients exist – ALL the prevalence data supports such a claim.

PAD is our new number one cardiovascular challenge  
SO why are we behind ?

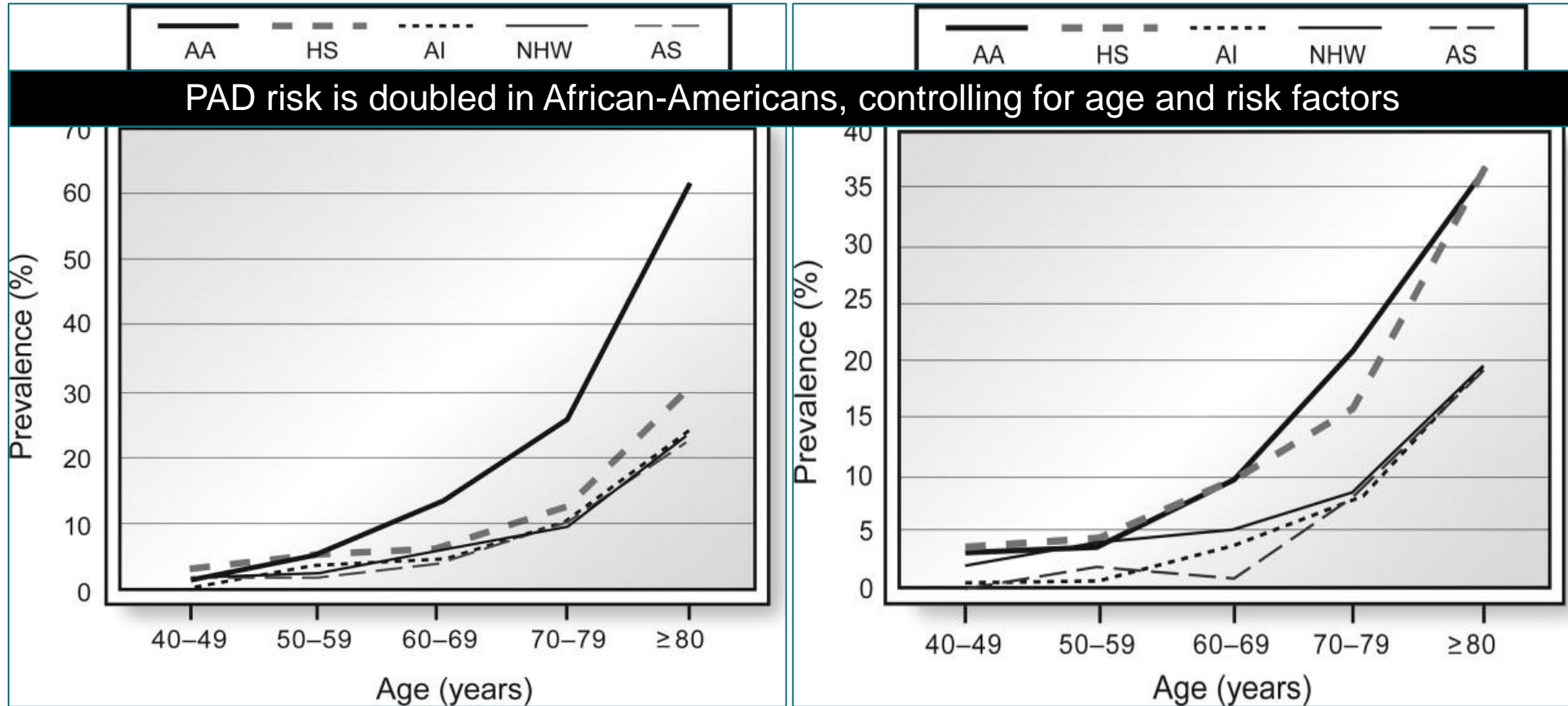
*“THE PATIENT NEEDS TO BE EXTRAPOLATED – THIS CAN BE ACHIEVED BY PATIENT SPECIFIC POPULATION SCREENING AND PROMOTING AWARENESS TO PHYSICIANS, HEALTHCARE ADMINISTRATORS, AND COMMUNITY”*



Horizons  
International  
Peripheral  
Group

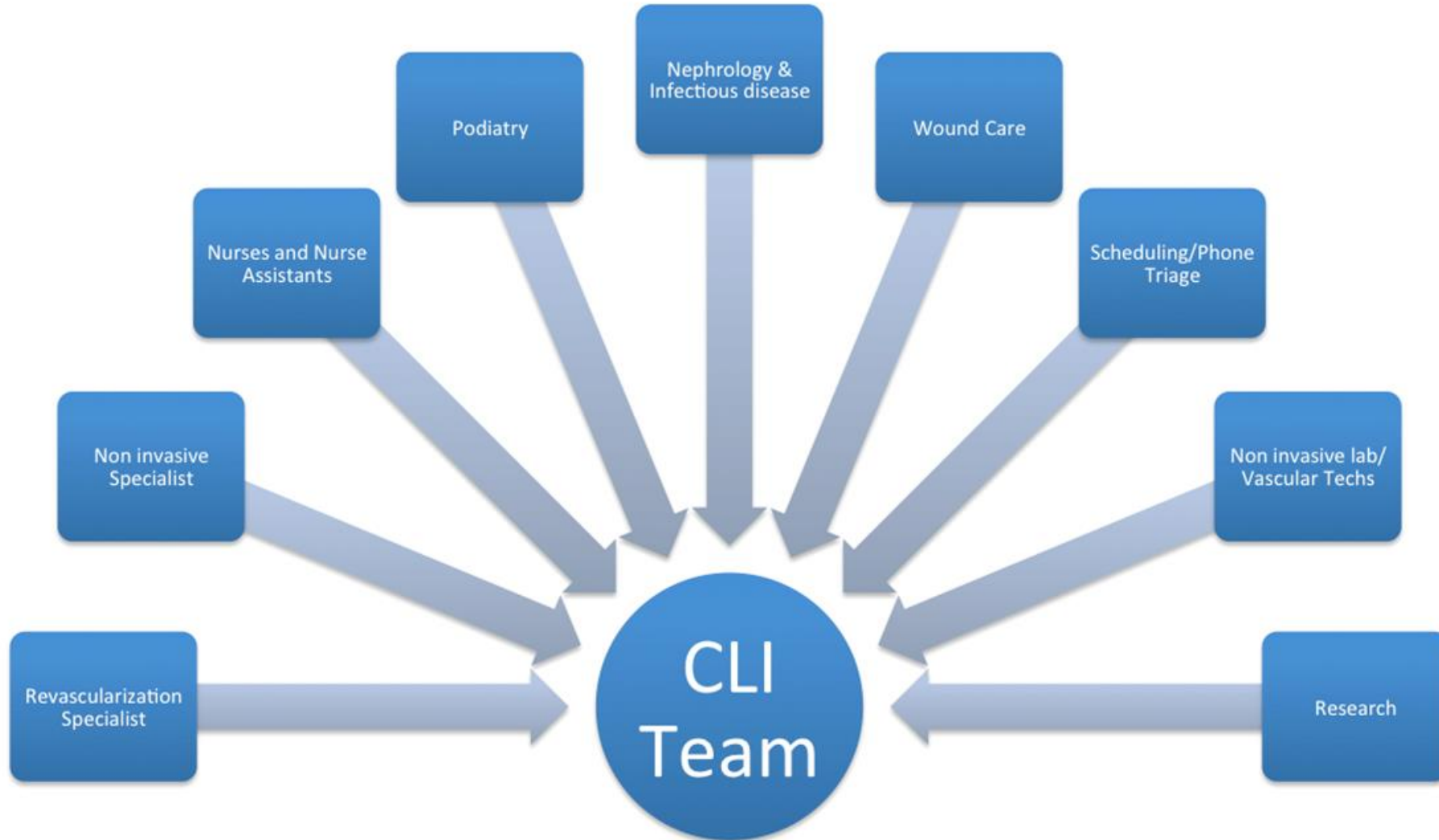


# Ethnic-Specific Prevalence of Peripheral Arterial Disease in Men and Women



Allison MA, et al. Ethnic-specific prevalence of peripheral arterial disease in the United States. Am J Prev Med. 2007;32:328-333

# Critical Limb Ischemia – Multidisciplinary approach

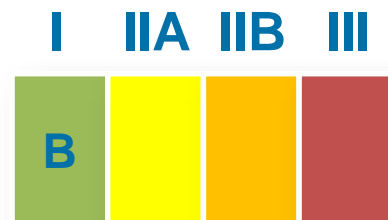


# Diagnosis of PAD



# ACCF/AHA 2011 PAD Guidelines Diagnostic Methods: ABI

- The resting ABI should be used to establish the lower extremity PAD diagnosis in patients with suspected lower extremity PAD, defined as individuals
  - With exertional leg symptoms
  - With nonhealing wounds
  - Who are age  $\geq 65$
  - Or who are age  $\geq 50$  with a history of smoking or diabetes



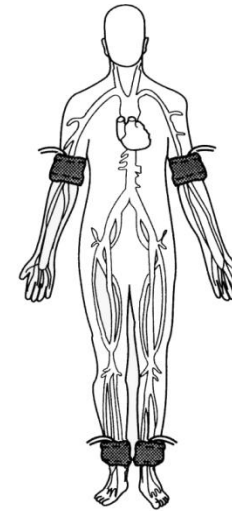
ACCF=American College of Cardiology Foundation; AHA=American Heart Association.

Adapted from Rooke T et al. 2011 ACCF/AHA focused update of the guideline for the management of patients with peripheral arterial disease (updating the 2005 guideline): a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. *Circulation*. 2011;124:2020–2045.

# Ankle Brachial Index

$$\text{ABI} = \frac{\text{Ankle systolic pressure}}{\text{Brachial systolic pressure}}$$

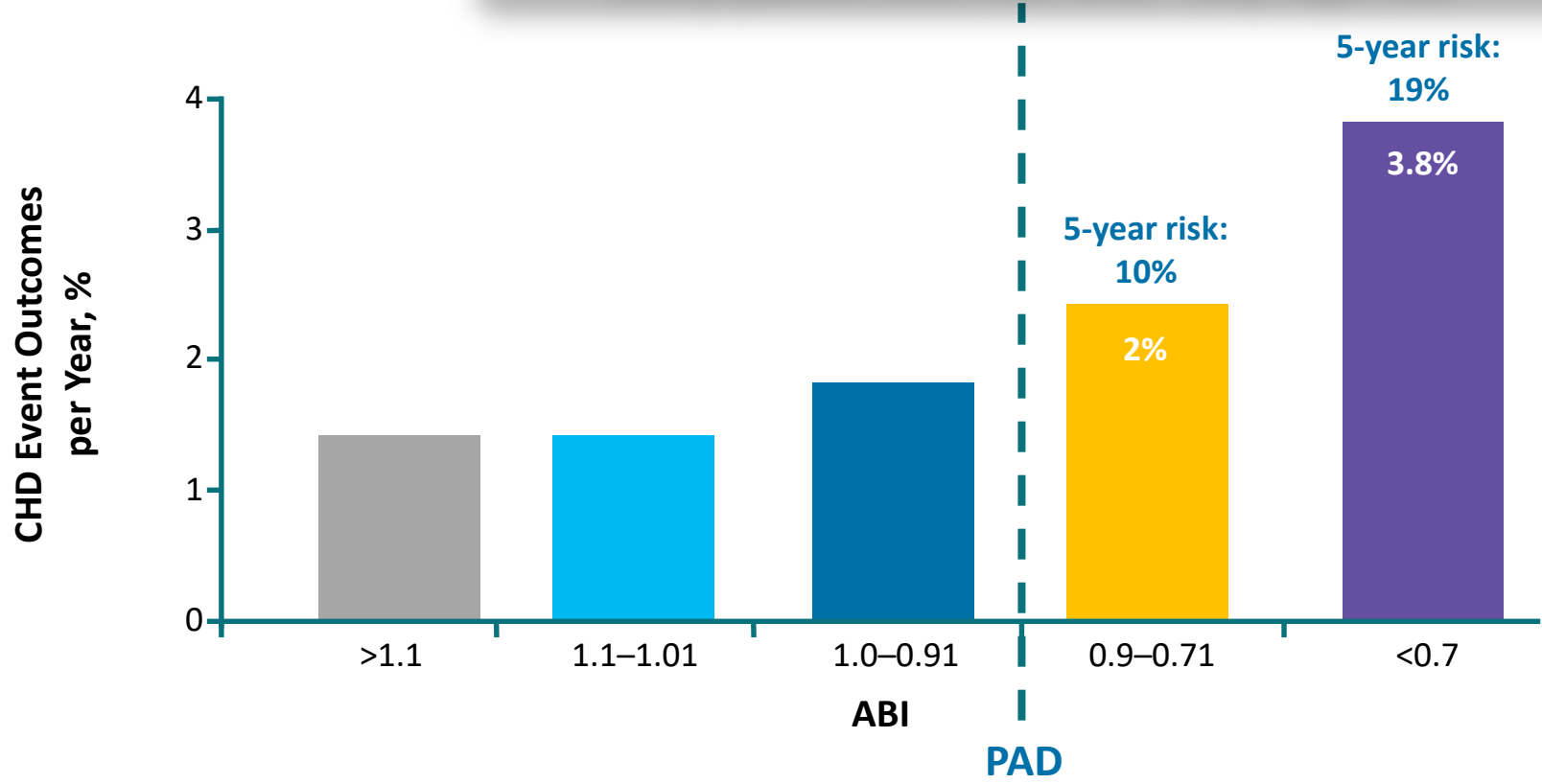
- Ankle and brachial systolic pressures taken using a hand-held Doppler instrument
- The ABI is 95-percent sensitive, 99-percent specific for PAD



<b>Normal</b>	1.00–1.40
<b>Borderline</b>	0.91–0.99
<b>PAD</b>	≤0.90
<b>Pain/Ulceration</b>	≤0.40
<b>Noncompressible</b>	≥1.40

# Cardiovascular Risk Increases with Decreases in ABI

Framingham “high risk” = 20 percent at 10 years  
 Every patient with PAD is at “very high risk”



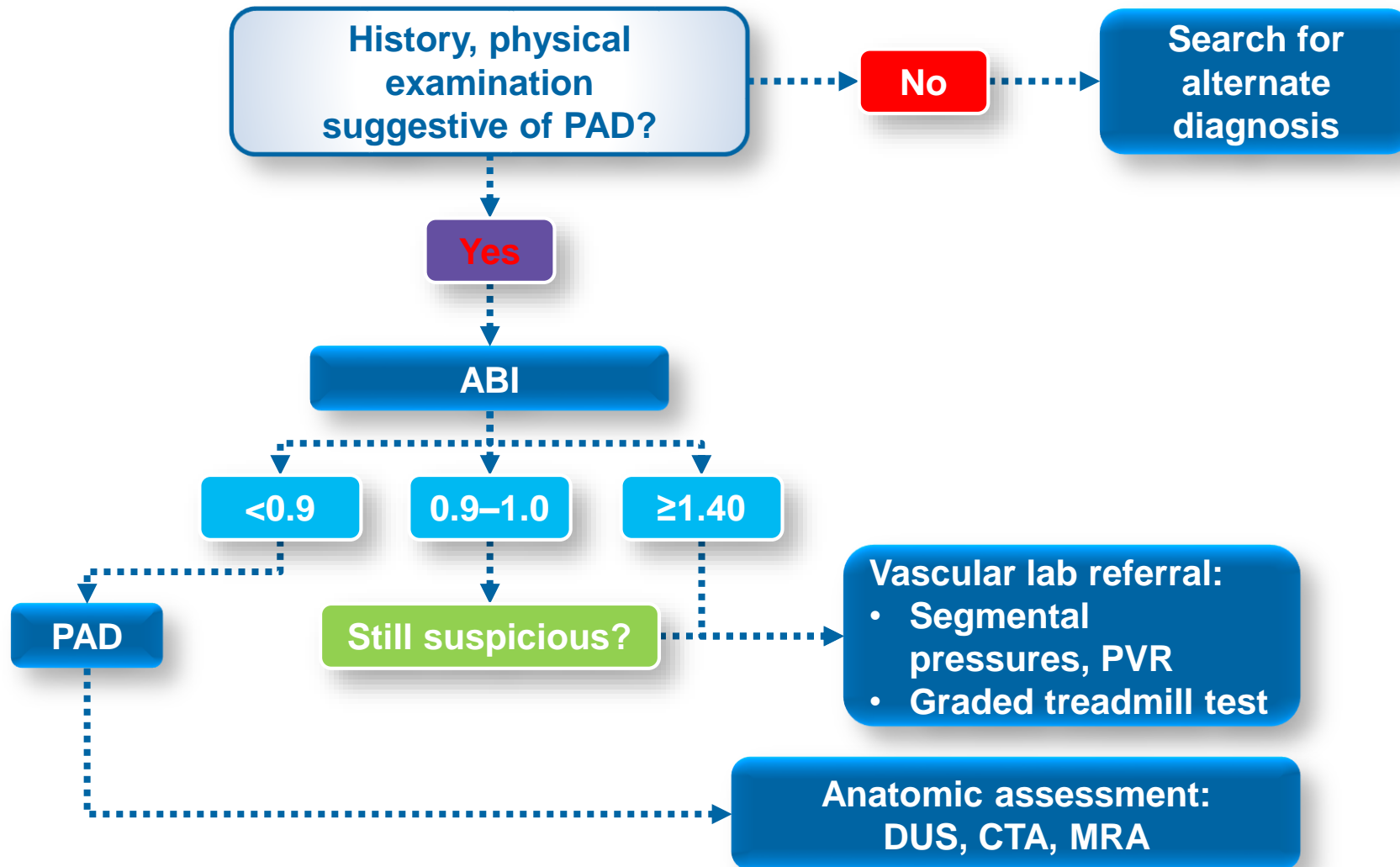
Fatal or nonfatal MI.

CHD=coronary heart disease (chronic heart failure).

Leng G et al. Use of ankle brachial pressure index to predict cardiovascular events and death: a cohort study. *Brit Med J.* 1996;313:1440-1444.



# Suggested Diagnostic Algorithm for PAD



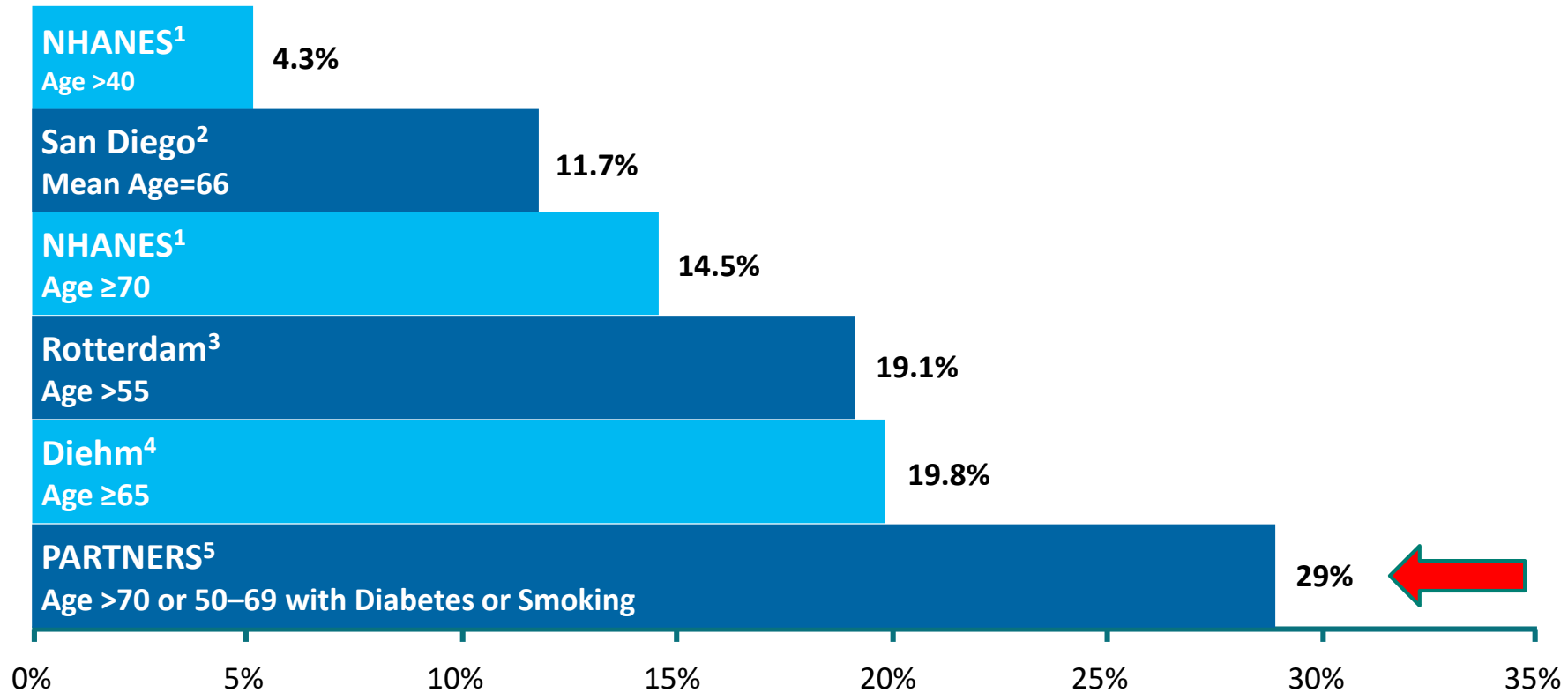
CTA=computed tomography angiography; DUS=duplex ultrasound; MRA=magnetic resonance angiography; PVR=pulmonary vascular resistance. Source: Sunil Parikh, MD, UHHS

# North Memorial Heart and Vascular Institute PAD Screening

*Population specific screening.  
Guideline derived adjudicated science.*



# Prevalence of PAD



NHANES=National Health and Nutrition Examination Survey.

1. Selvin E, Erlinger T. Prevalence of and risk factors for peripheral arterial disease in the United States: results from the National Health and Nutrition Examination Survey, 1999–2000. *Circulation*. 2004;110:738–743.

2. Criqui M et al. The prevalence of peripheral arterial disease in a defined population. *Circulation*. 1985;71:510–515.

3. Meijer W et al. Peripheral arterial disease in the elderly: the Rotterdam Study. *Arterioscler Thromb Vasc Biol*. 1998;18:185–192.

4. Diehm C et al. High prevalence of peripheral arterial disease and co-morbidity in 6880 primary care patients: cross-sectional study. *Atherosclerosis*. 2004;172:95–105.

5. Hirsch A et al. Peripheral arterial disease detection, awareness, and treatment in primary care. *JAMA*. 2001;286:1317–1324.

## ACC/AHA 2016 PAD Guideline -- Patients at Increased Risk of PAD (Table 3)



- Age  $\geq 65$  y
- Age 50–64 y, with risk factors for atherosclerosis (e.g., diabetes mellitus, history of smoking, hyperlipidemia, hypertension) or family history of PAD
- Age  $< 50$  y, with diabetes mellitus and 1 additional risk factor for atherosclerosis
- Individuals with known atherosclerotic disease in another vascular bed (e.g., coronary, carotid, subclavian, renal, mesenteric artery stenosis, or AAA)

# Resting ABI for Diagnosing PAD



COR	LOE	Recommendations
I	B-NR	In patients with history or physical examination findings suggestive of PAD (Table 4), the resting ABI, with or without segmental pressures and waveforms, is recommended to establish the diagnosis.
I	C-LD	Resting ABI results should be reported as abnormal (ABI $\leq 0.90$ ), borderline (ABI 0.91–0.99), normal (1.00–1.40), or noncompressible (ABI $> 1.40$ ).
IIa	B-NR	In patients at increased risk of PAD (Table 3) but without history or physical examination findings suggestive of PAD (Table 4), measurement of the resting ABI is reasonable.
III: No Benefit	B-NR	In patients not at increased risk of PAD (Table 3) and without history or physical examination findings suggestive of PAD (Table 4), the ABI is not recommended.

# Free screening

for Peripheral Arterial Disease (PAD)



Peripheral Arterial Disease (PAD) currently affects 8-12 million Americans. People with PAD are at greater risk for cardiovascular disease, heart attack and stroke.

North Memorial Health Heart & Vascular is offering **free PAD screening** for individuals:



This screening uses a Doppler to obtain pulses and blood pressures through the surface of the skin.

You will be told if your screening test is positive or negative for peripheral arterial disease after the screening is performed.

**Call to schedule your free PAD screening:  
(763) 581-6736**

Nancy Wulf, RVT – Peripheral Vascular Disease Program Coordinator

**North Memorial Health**  
3300 Oakdale Ave. N  
Robbinsdale, MN 55422  
(763) 581-5402



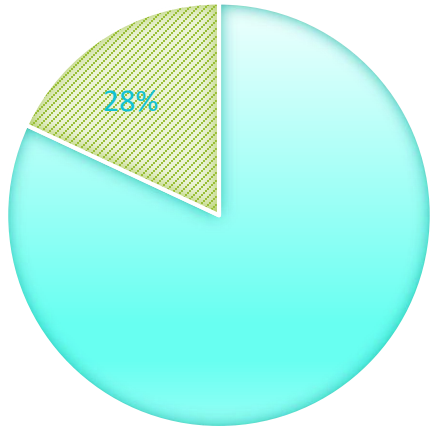
## Free PAD Screening for:

- Age > 50 years
- DM
- Smokers or former smokers

# North Memorial HVI Screening Results 2016-2019



■ Total PAD Screenings   ■ Positive Screenings



**PAD Screenings – Criteria  
North Memorial Heart & Vascular**

Important to keep in mind ALL that these people ASYMPTOMATIC.

# State of the Program

- Approximately 3000 patients screened over past 3 years.
- ~ 28% patients identified with PAD.
- > 900 patients had PAD and were *UNAWARE*.
- All patients seen for risk factor modification.
- Majority of patients enrolled in Supervised Exercise Programs (SEPs).
- All patients placed in US surveillance programs.
- Unfortunately on detailed history taking a large portion of these patients had unrecognized symptoms for years and were misdiagnosed.



# Management

- AGGRESSIVE RISK FACTOR MODIFICATION.
- REGULAR WALKING EXERCISES.
- MAXIMIZED GUIDELINE DIRECTED MEDICAL THERAPY.
  - ASA and Clopidogrel.
  - Vascular Dose Rivaroxiban (2.5 mg PO BID).
  - Statins/PCSK9 inhibitors.
  - SGLT2 inhibitors
- Revascularization (small but necessary part of the puzzle).
- Surveillance arterial Ultrasounds.
- Regular follow up (lifelong disease).

# Risk Factor Modification

- HTN - < 130/80 mmHg.
- Tobacco Cessation – 10 fold increase in amputation risk
- Aggressive glycemic control;
  - Hgb A1C Levels.
  - SGLT2 inhibitors.
- LDL Reduction;
  - Statins.
  - PCSK9 inhibitors.

# Surveillance Program - Noninvasive Lab

## Medically Managed Patients

- 0-29% (Normal)  
No need to follow-up, unless clinically indicated or new symptoms develop.
- 30-49%  
Annual follow-up
- 50-75%  
Every 6 months follow-up
- >75%  
Every 3-6 months or as clinically indicated for more frequent follow-up/Intervention

## Post-Intervention

- 6 weeks post intervention
- 6 months post intervention
- 1 year post intervention
- Annually
- Modification per patient condition
  - Increase in symptoms
  - Recurrence of wounds

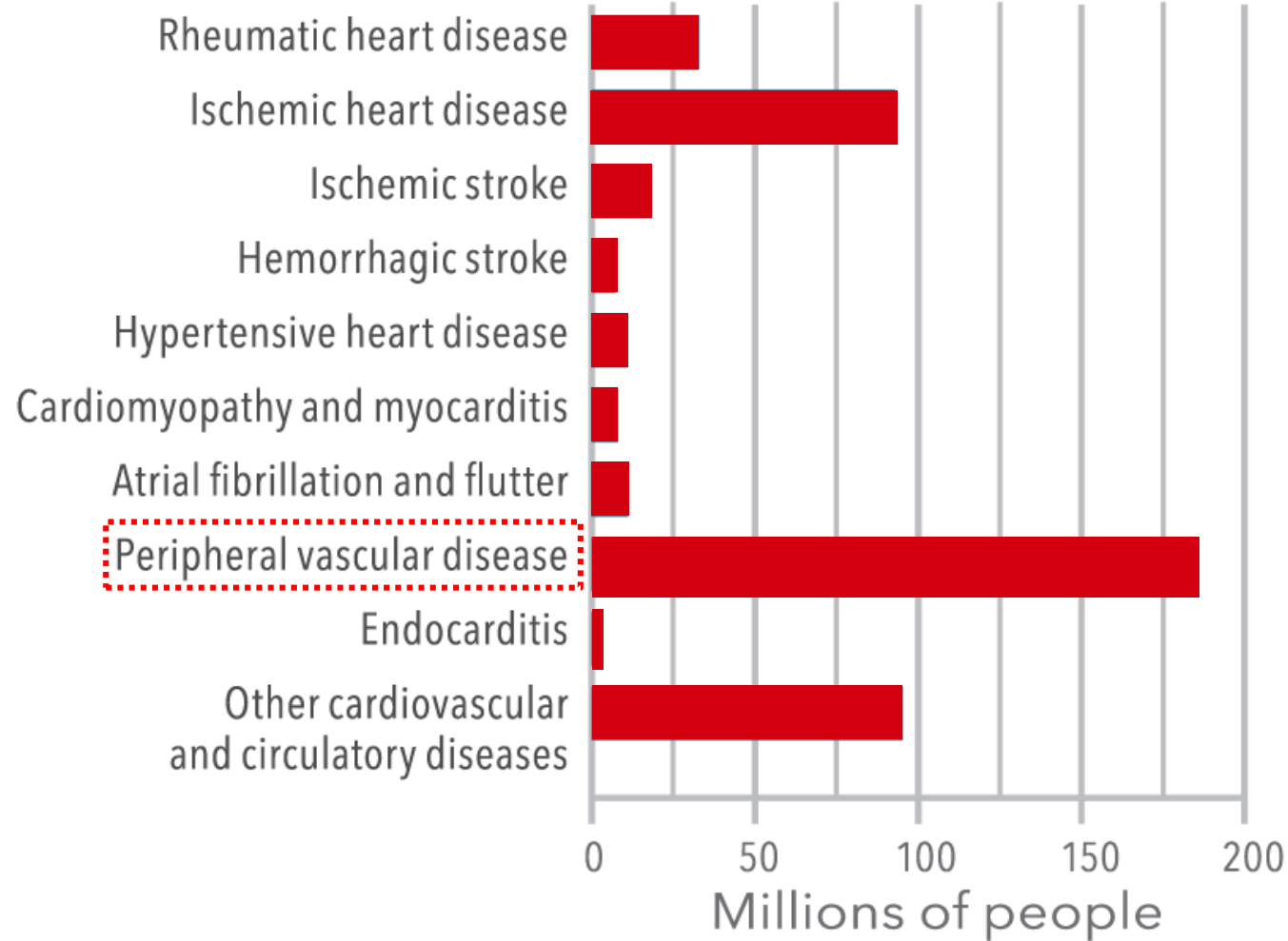
# Executive Summary



- Peripheral artery disease or PAD commonly refers to the presence of a stenosis or occlusion in the aorta or arteries of the limbs
- Individuals with PAD have an exceptionally elevated risk for cardiovascular events, and the majority will eventually die of cardiac or cerebrovascular etiology
- Prognosis is correlated with the severity of PAD as measured by the ankle brachial index (ABI)
- General practitioners (e.g., PCP, podiatrists, etc) must be engaged in the diagnosis and management of PAD—it can be life saving
- Early referral to a (cardio)vascular specialist can facilitate optimal risk factor modification and management—this saves lives
  - **WHEN** revascularization is necessary, endovascular therapy for PAD should be considered **FIRST-LINE** therapy in most cases

# Health Disparities and PAD: *We need a National Action Plan*

# Cardiovascular Disease Prevalence, 2013



# PAD Awareness – 59% among total sample

Black Americans, who are at greatest risk, are least aware of PAD



Black Americans are significantly less aware of PAD:

45% Black  
53% Hispanic  
66% White

} Aware of PAD

*Which of the following conditions have you heard of? (select all that apply)*

n=1,543 Total, 468 Black, 793 White, 62 Hispanic, 86 Other

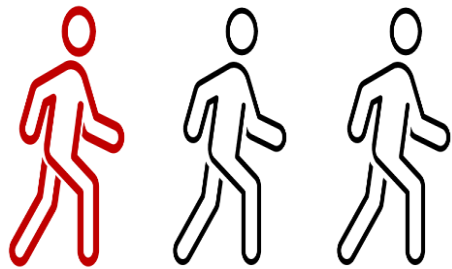
# Lifetime Risk of Developing PAD Based on Race and Ethnicity



**Male and female Black Americans have the highest prevalence of PAD (ABI < 0.90)**

**30%**

**Black Americans**



**20%**

**Non-Hispanic White Americans**



Allison MA et al. *Am J Prev Med*. 2007;32(4):328-333.

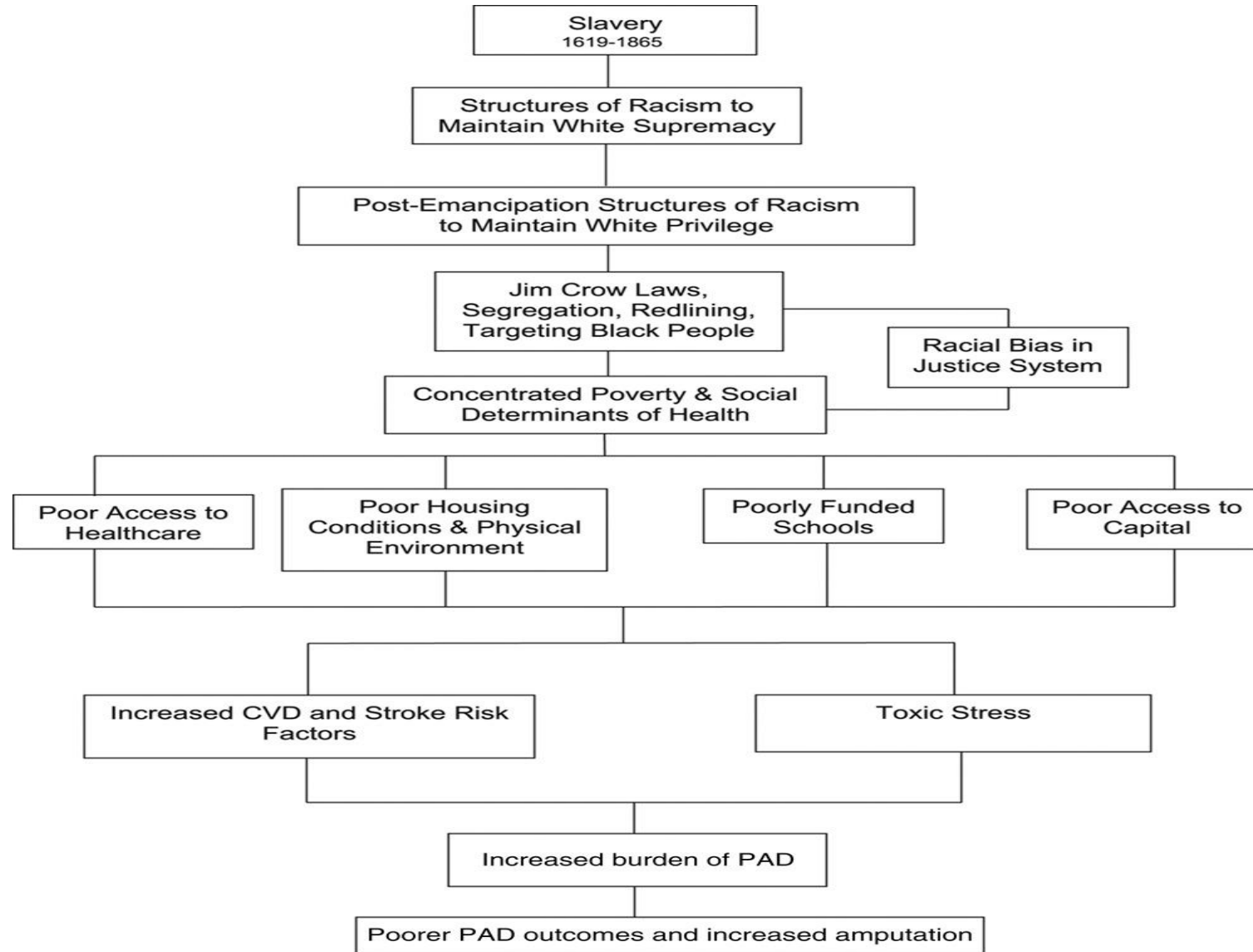
Matsushita K et al. *J Am Heart Assoc*. 2019;8:e012177.



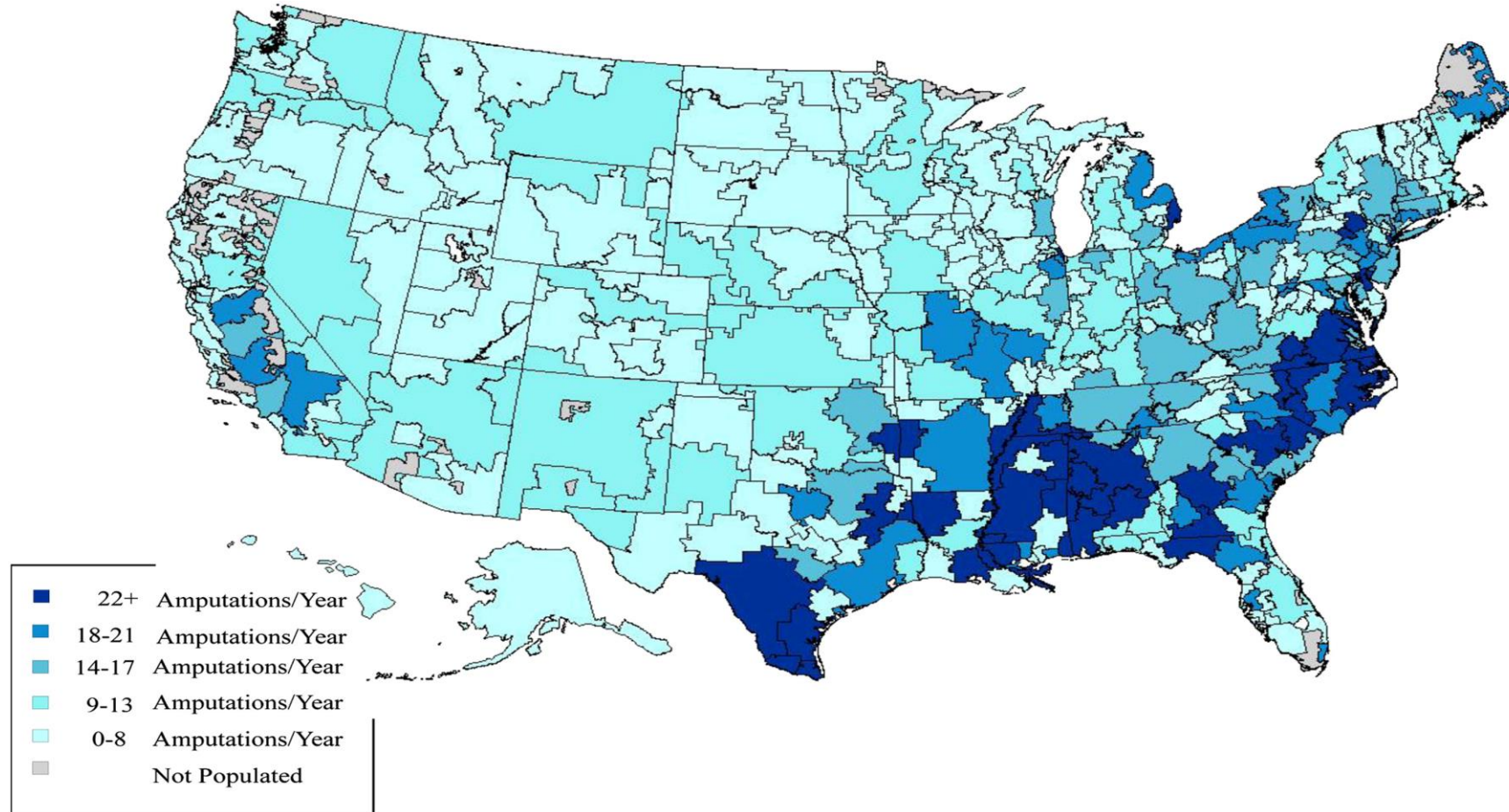
# Black Americans with PAD



- Longer time to diagnosis with more severe disease
- Less likely to have optimal medical therapy
- Less likely to have limb salvage procedures
- More likely to have non-traumatic amputation
- Higher risk for death due to CV events



# Geographic Variation in Non-traumatic Lower Extremity Amputation

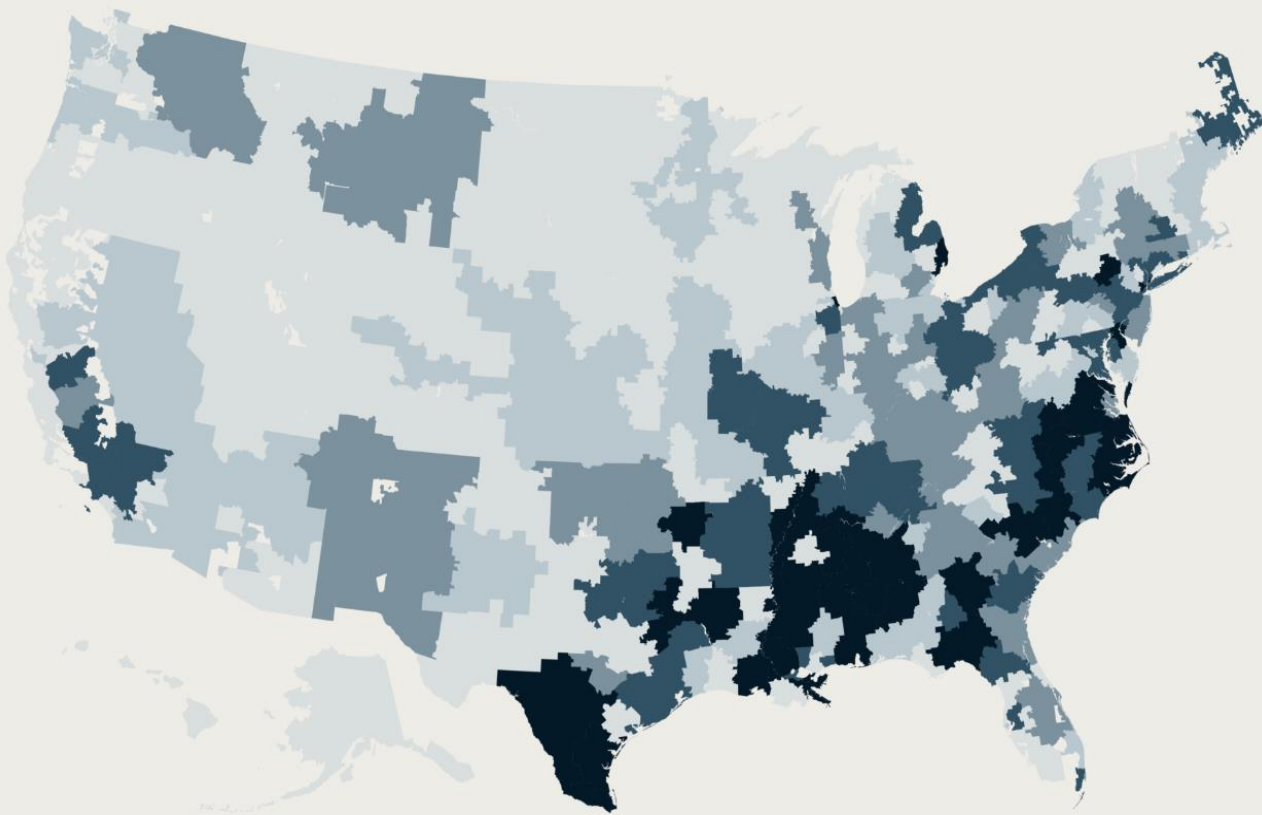


Goodney PP et al. *J Vasc Surg.* 2013;57(6):1471-1480.

# The Black American Amputation Epidemic

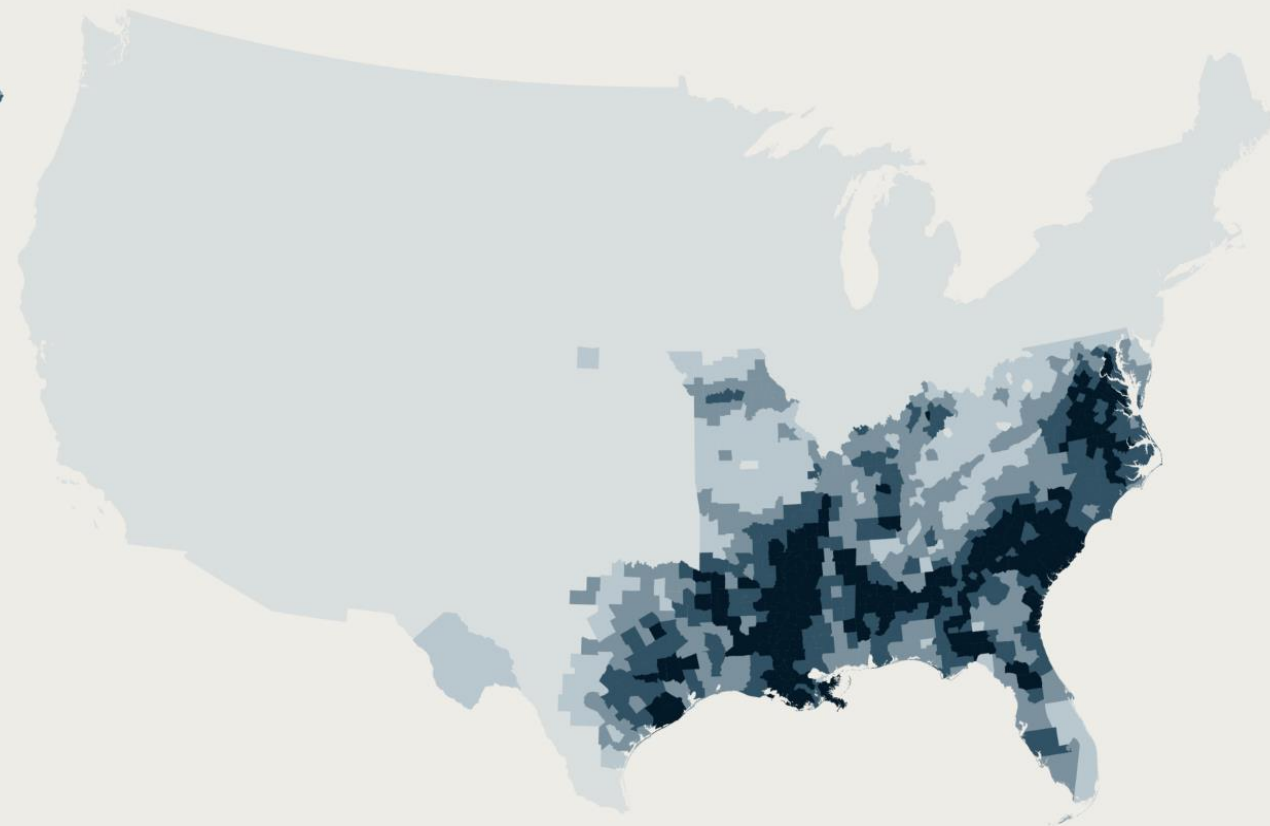
by Lizzie Presser  
May 19, 2020

## AVERAGE ANNUAL AMPUTATIONS, 2007-9



The average number of amputations for peripheral artery disease per 10,000 patients per year. Source: [Dartmouth Atlas of Healthcare](#)







## ENSLAVED POPULATION IN 1860



The percentage of the population enslaved in 1860. Source: [IPUMS NHGIS, University of Minnesota](#)



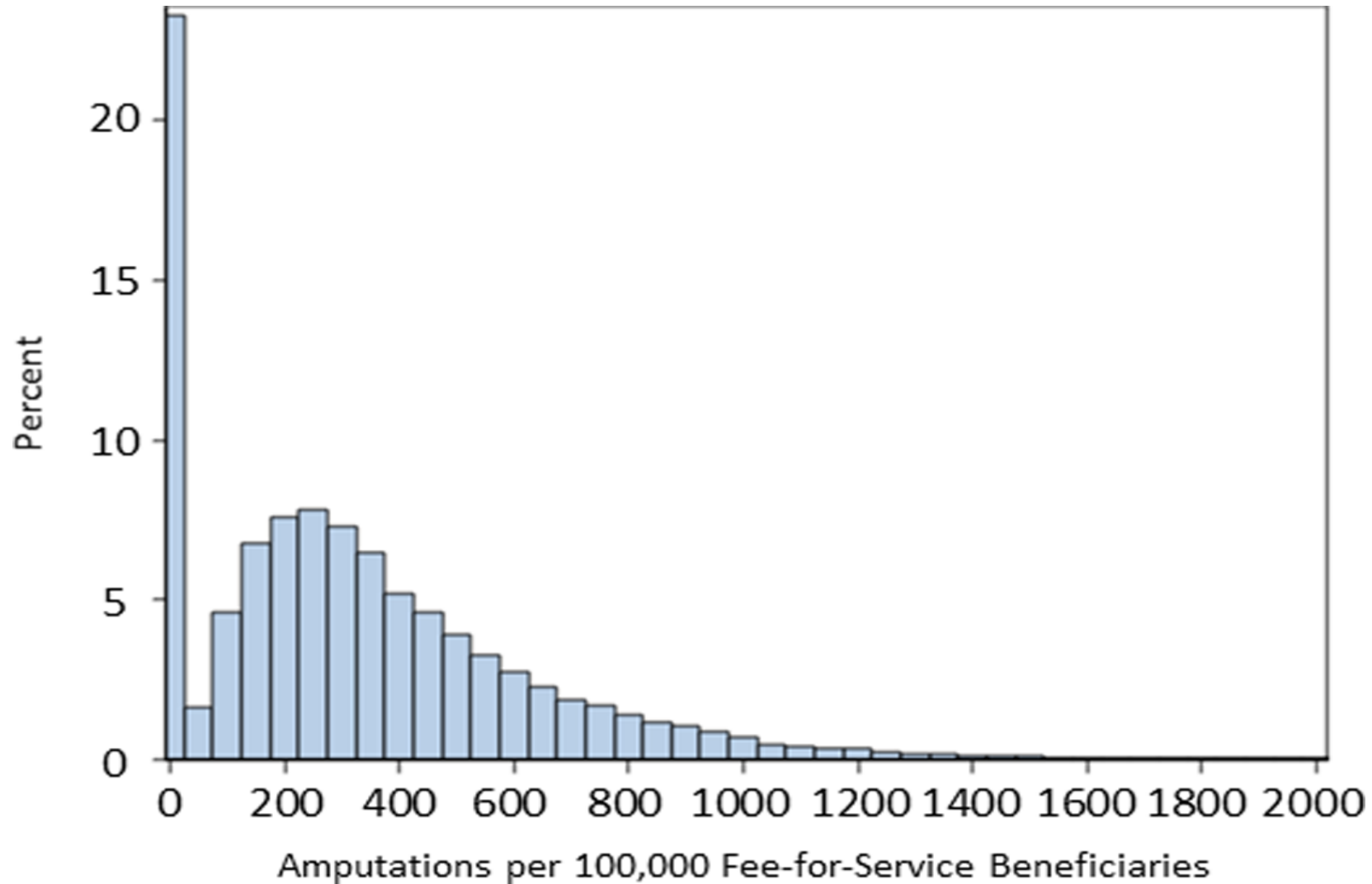
## Geographic and Socioeconomic Disparities in Major Lower Extremity Amputation Rates in Metropolitan Areas

Alexander C. Fanaroff, MD, MHS ; Lin Yang, MS; Ashwin S. Nathan, MD, MS ; Sameed Ahmed M. Khatana, MD, MPH ; Howard Julien, MD, MPH; Tracy Y. Wang, MD, MSc, MHS; Ehrin J. Armstrong, MD; Diane Treat-Jacobson, PhD, RN; Julia D. Glaser, MD; Grace Wang, MD, MSCE; Scott M. Damrauer, MD ; Jay Giri, MD, MPH ; Peter W. Groeneveld, MD, MS 

**Conclusions—** In metropolitan areas, where most individuals undergoing lower extremity amputation live, markers of lower socioeconomic status and Black race were associated with higher rates of major lower extremity amputation. Development of community-based tools for peripheral artery disease diagnosis and management targeted to communities with high amputation rates in urban areas may help reduce inequities in peripheral artery disease outcomes.

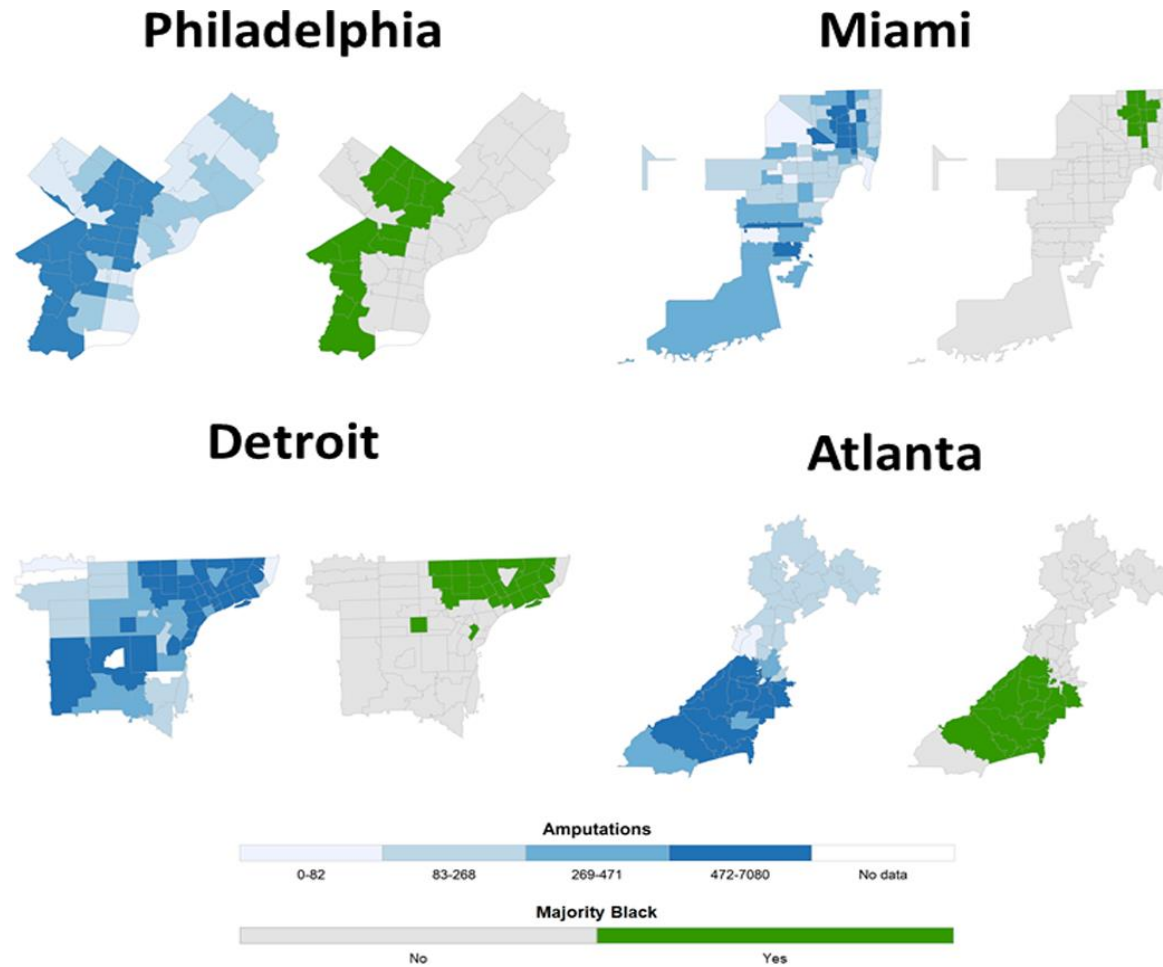
**Key Words:** amputation • healthcare disparities • peripheral artery disease





Peter W. Groeneveld. Journal of the American Heart Association.  
Geographic and Socioeconomic Disparities in Major Lower Extremity  
Amputation Rates in Metropolitan Areas, Volume: 10, Issue: 17, DOI:  
(10.1161/JAHA.121.021456)

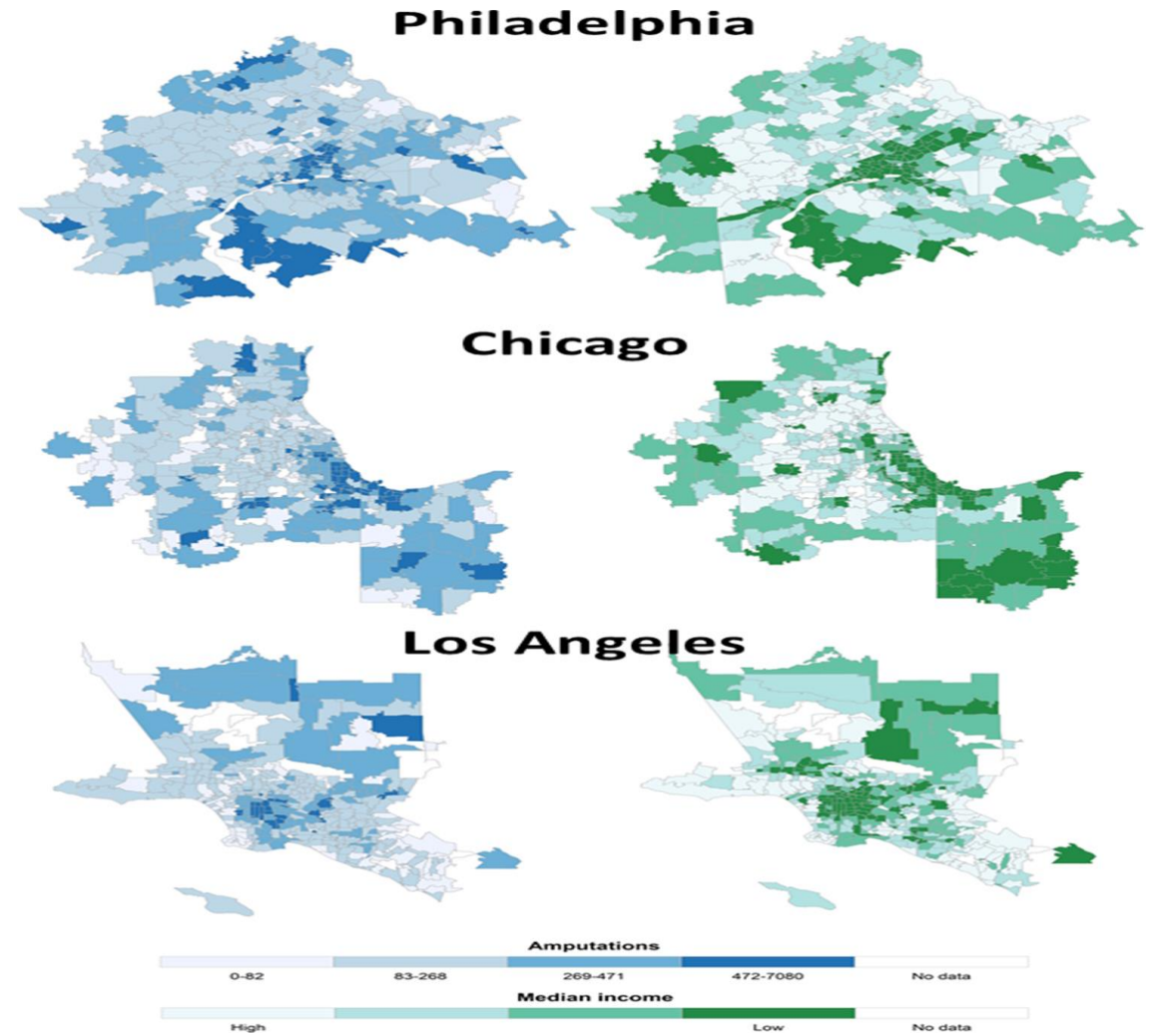

Copyright © 2021 The Authors. Published on behalf of the  
American Heart Association, Inc., by Wiley Blackwell



Peter W. Groeneveld. Journal of the American Heart Association. Geographic and Socioeconomic Disparities in Major Lower Extremity Amputation Rates in Metropolitan Areas, Volume: 10, Issue: 17, DOI: (10.1161/JAHA.121.021456)

Copyright © 2021 The Authors. Published on behalf of the American Heart Association, Inc., by Wiley Blackwell



Peter W. Groeneveld. Journal of the American Heart Association.  
 Geographic and Socioeconomic Disparities in Major Lower Extremity  
 Amputation Rates in Metropolitan Areas, Volume: 10, Issue: 17, DOI:  
 (10.1161/JAHA.121.021456)

Copyright © 2021 The Authors. Published on behalf of the  
 American Heart Association, Inc., by Wiley Blackwell

# FACT SHEET



## Race and Ethnicity Disparities in Limb Loss

Updated 09/2021

## Racial Disparities in Limb Loss



Black Americans are much less likely than white Americans to undergo procedures that can prevent amputation, known as limb salvage.<sup>3</sup> They are FOUR TIMES more likely to experience amputation for any reason than white Americans, and nearly TWO TIMES more likely to experience diabetes-related amputations.<sup>2,4</sup>

Latino Americans are ONE-and-a-HALF times more likely to experience amputation for any reason than white Americans, and 30% more likely to experience a major amputation related to a diabetic foot infection than white Americans.<sup>5</sup>



Indigenous Americans are up to 70% more likely to experience amputation for any reason than insured, non-Indigenous adult Americans.<sup>9</sup> Indigenous Americans are TWO TO THREE times more likely to experience a major amputation related to a Diabetic Foot Infection than white Americans.<sup>7,10</sup>

## Racial Disparities in Predisposing Conditions

Diabetes often leads to Peripheral Artery Disease (PAD), which restricts blood flow to the limbs. Black Americans experience PAD at three times the rate of white Americans.<sup>[11,12](#)</sup>

PAD is a type of vascular disease, and **nearly half of people who lose a limb because of vascular disease will die within five years.** This is a higher five-year mortality rate than breast, colon, or prostate cancer.<sup>[13,14](#)</sup>



## Income Disparity in Limb Loss

Lower household income correlates with higher rates of amputation, particularly due to diabetes.<sup>[15](#)</sup>

People living with limb loss who have a household income at or near the poverty line were up to three-and-a-half times more likely to experience barriers to participation in work and community life.<sup>[15,16](#)</sup>





## Race and Socioeconomic Status Independently Affect Risk of Major Amputation in Peripheral Artery Disease

Shipra Arya, MD, SM; Zachary Binney, MPH; Anjali Khakharia, MD, MS; Luke P. Brewster, MD, PhD; Phil Goodney, MD, MS; Rachel Patzer, MPH, PhD; Jason Hockenberry, PhD; Peter W. F. Wilson, MD

**Conclusions—** Black race significantly increases the risk of amputation within the same SES stratum compared with white race and has an independent effect on limb loss after controlling for comorbidities, severity of PAD at presentation, and use of medications.

**Key Words:** amputations • disparities • race • socioeconomic position



**Original Investigation** | Diversity, Equity, and Inclusion


## Association of Race, Ethnicity, and Rurality With Major Leg Amputation or Death Among Medicare Beneficiaries Hospitalized With Diabetic Foot Ulcers

Meghan B. Brennan, MD; W. Ryan Powell, PhD; Farah Kaiksow, MD; Joseph Kramer, MA; Yao Liu, MD; Amy J. H. Kind, MD, PhD; Christie M. Bartels, MD

**CONCLUSIONS AND RELEVANCE** Rural patients identifying as Black had a more than 10% absolute increased risk of major leg amputation or death compared with the overall cohort. This study suggests that racial and rural disparities interacted, amplifying risk. Findings support using an intersectionality lens to investigate and address disparities in major leg amputation and mortality for patients with diabetic foot ulcers.

*JAMA Network Open.* 2022;5(4):e228399. doi:10.1001/jamanetworkopen.2022.8399

# Association between race/ethnicity and the risk of amputation of lower extremities among medicare beneficiaries with diabetic foot ulcers and diabetic foot infections

Tze-Woei Tan <sup>1</sup>, David G Armstrong,<sup>2</sup> Kirsten C Concha-Moore,<sup>3</sup> David G Marrero,<sup>1</sup> Wei Zhou,<sup>1</sup> Elizabeth Calhoun,<sup>1</sup> Ching-Yuan Chang,<sup>4</sup> Wei-Hsuan Lo-Ciganic<sup>4</sup>

BMJ Open Diab Res Care: first published as 10.1136/bmj



**Conclusions** Racial and ethnic disparities in the risk of lower extremity amputations appear to exist among fee-for-service Medicare beneficiaries with diabetic foot problems. AAs and NAs with DFUs and/or DFIs were associated with an increased risk of major amputations compared with white Medicare beneficiaries.





## Disparities in Peripheral Artery Disease Hospitalizations Identified Among Understudied Race-Ethnicity Groups

LaiTe Chen<sup>1</sup>, Donglan Zhang<sup>2</sup>, Lu Shi<sup>3</sup> and Corey A. Kalbaugh<sup>3\*</sup>

<sup>1</sup> Department of Cardiology, Sir Run Run Shaw Hospital, School of Medicine, Zhejiang University, Hangzhou, China, <sup>2</sup> Department of Health Policy and Management, University of Georgia, Athens, GA, United States, <sup>3</sup> Department of Public Health Sciences, Clemson University, Clemson, SC, United States

### OPEN ACCESS

#### Edited by:

Xiang Xie,  
First Affiliated Hospital of Xinjiang  
Medical University, China

#### Reviewed by:

Shadeh Ghaffari-Rafi,  
The University of Iowa, United States  
Carol Parise,  
Sutter Institute for Medical Research,  
United States

#### \*Correspondence:

Corey A. Kalbaugh  
coreyk@clemson.edu

#### Specialty section:

This article was submitted to  
General Cardiovascular Medicine,  
a section of the journal  
Frontiers in Cardiovascular Medicine

Received: 07 April 2021

Accepted: 04 May 2021

Published: 24 May 2021

#### Citation:

Chen L, Zhang D, Shi L and  
Kalbaugh CA (2021) Disparities in  
Peripheral Artery Disease  
Hospitalizations Identified Among  
Understudied Race-Ethnicity Groups.  
Front. Cardiovasc. Med. 8:692236.  
doi: 10.3389/fcvm.2021.692236

**Background:** To assess racial/ethnic differences in disease severity, hospital outcomes, length of stay and healthcare costs among hospitalized patients with peripheral artery disease (PAD).

**Methods:** This study used data from the National Inpatient Sample (NIS) to explore the racial/ethnic disparities in PAD-related hospitalizations including presence of PAD with chronic limb threatened ischemia (CLI), amputation, in-hospital mortality, length of hospital stays and estimated medical costs. Race-ethnicity groups included non-Hispanic White, Black, Hispanic, Asian or Pacific Islander, Native American, and others (multiple races). Regression analyses adjusted for age, gender, Charlson Comorbidity Index, primary payer, patient location, bed size of the admission hospital, geographic region of the hospital, and rural/urban location of the hospital.

**Results:** A total of 341,480 PAD hospitalizations were identified. Compared with non-Hispanic Whites, Native Americans had the highest odds of PAD with CLI (OR = 1.77, 95% CI: 1.61, 1.95); Black (OR = 1.71, 95% CI: 1.66, 1.76) and Hispanic (OR = 1.36, 95% CI: 1.31, 1.41) patients had higher odds of amputation; Asian or Pacific Islanders had a higher mortality (OR = 1.20, 95% CI: 1.01, 1.43), whereas Black (OR = 0.81, 95% CI: 0.76, 0.87) patients has a lower mortality; Asian or Pacific Islanders incurred higher overall inpatient costs (Margin = 30093.01, 95% CI: 28827.55, 31358.48) and most prolonged length of stay (IRR = 0.14, 95% CI: 0.09, 0.18).

**Conclusions:** Our study identified elevated odds of amputation among Hispanic patients hospitalized with PAD as well as higher hospital mortality and medical expenses among Asian or Pacific Islander PAD inpatients. These two demographic groups were previously thought to have a lower risk for PAD and represent important populations for further investigation.

**Keywords:** peripheral artery disease, chronic limb threatened ischemia, disparities, medical expenditure, mortality

**Conclusions:** Our study identified elevated odds of amputation among Hispanic patients hospitalized with PAD as well as higher hospital mortality and medical expenses among Asian or Pacific Islander PAD inpatients. These two demographic groups were previously thought to have a lower risk for PAD and represent important populations for further investigation.



# Gender and Racial Disparities: The Impact on Diagnosis and Treatment of Peripheral Arterial Disease

---

Mohammad M. Ansari, MD<sup>1</sup>; Anthony Pham, BS<sup>1</sup>; Cole Pollina, BS<sup>1</sup>; Geoff Thomas, BS<sup>1</sup>; Ardalan Naghian, BS<sup>1</sup>; Mikal Ramon, MD<sup>1</sup>; Steven Daley, BS<sup>1</sup>; Nitish Mittal, MD<sup>1</sup>; Victoria Acosta, BS<sup>1</sup>; Marina Iskandir, MD<sup>1</sup>; George Pliagas, MD<sup>2</sup>; Dixon Santana, MD<sup>1</sup>; Scott Shurmur, MD<sup>1</sup>; Aliakbar Arvandi, MD<sup>1</sup>; Sahil A. Parikh, MD<sup>3</sup>; Fadi A. Saab, MD<sup>2</sup>

greater degree than non-Hispanic females. **Conclusion.** The “Hispanic paradox” seems to incorrectly suggest that Hispanics have a lower rate of CAD and PAD despite a high burden of cardiovascular risk factors compared with non-Hispanics. The reasons for such a paradox are somewhat unclear. One possibility is that Hispanics may have a higher rate of undiagnosed PAD due to reported barriers to healthcare access including transportation and language. Public health and policy strategies are needed to mitigate these barriers that affect Hispanics from receiving treatment and diagnosis for PAD.

**J CRIT LIMB ISCHEM 2022;2(4):E101-E107. Epub 2022 November 14.**

# Racial Disparities in Risk for Major Amputation or Death After Endovascular Interventions for Peripheral Artery Disease: A LIBERTY 360 Study

Stefanos Giannopoulos, MD(1); Foluso A. Fakorede, MD(2); Ian Cawich, MD(3); Dwight Dishmon, MD(4); Aaron Horne, Jr., MD(5); M. Laiq Raja, MD(6); Jihad A. Mustapha, MD(7,8); George L. Adams, MD, MHS, MBA(9); Ehrin J. Armstrong, MD, MS(c1)



event (MAE), and combination of major amputation/death up to 3 years of follow-up. **Results.** We included 1150 patients with PAD (178 Black patients vs 972 White patients) treated with any United States Food and Drug Administration (FDA)-approved or cleared device. Isolated below-the-knee disease was more prevalent among Black patients ( $P=.01$ ). Procedural success was similar between the 2 groups with no statistically significant difference in periprocedural complication rates. Among the subjects with baseline wounds, 58.8% of Black patients and 52.6% of White patients had wound healing at 6 month follow-up exam ( $P=.44$ ). Despite similar rates of wound care and wound healing, Black patients were at higher risk for the combined endpoint of major amputation/death compared with White patients at 12-month follow-up (HR, 1.61; 95% CI, 1.03-2.50;  $P=.04$ ) and 36-month follow-up (HR, 1.45; 95% CI, 1.04-2.04;  $P=.03$ ). Data regarding racial disparity in outcomes after endovascular therapy of patients with PAD are sparse. In our study, Black race was associated with combined major amputation/death risk during follow-up. However, this is likely attributed to population-related characteristics rather than biological characteristics. **Conclusions.** Further studies are needed to evaluate the role of race in revascularization outcomes among patients with PAD.

## Regional variation in racial disparities among patients with peripheral artery disease



Thomas F. X. O'Donnell, MD,<sup>a,b</sup> Chloe Powell, BS,<sup>a,c</sup> Sarah E. Deery, MD, MPH,<sup>a,b</sup> Jeremy D. Darling, MS,<sup>a</sup> Kakra Hughes, MD,<sup>d</sup> Kristina A. Giles, MD,<sup>e</sup> Grace J. Wang, MD,<sup>f</sup> and Marc L. Schermerhorn, MD,<sup>a</sup> *Boston, Mass; Washington, D.C.; Gainesville, Fla; and Philadelphia, Pa*

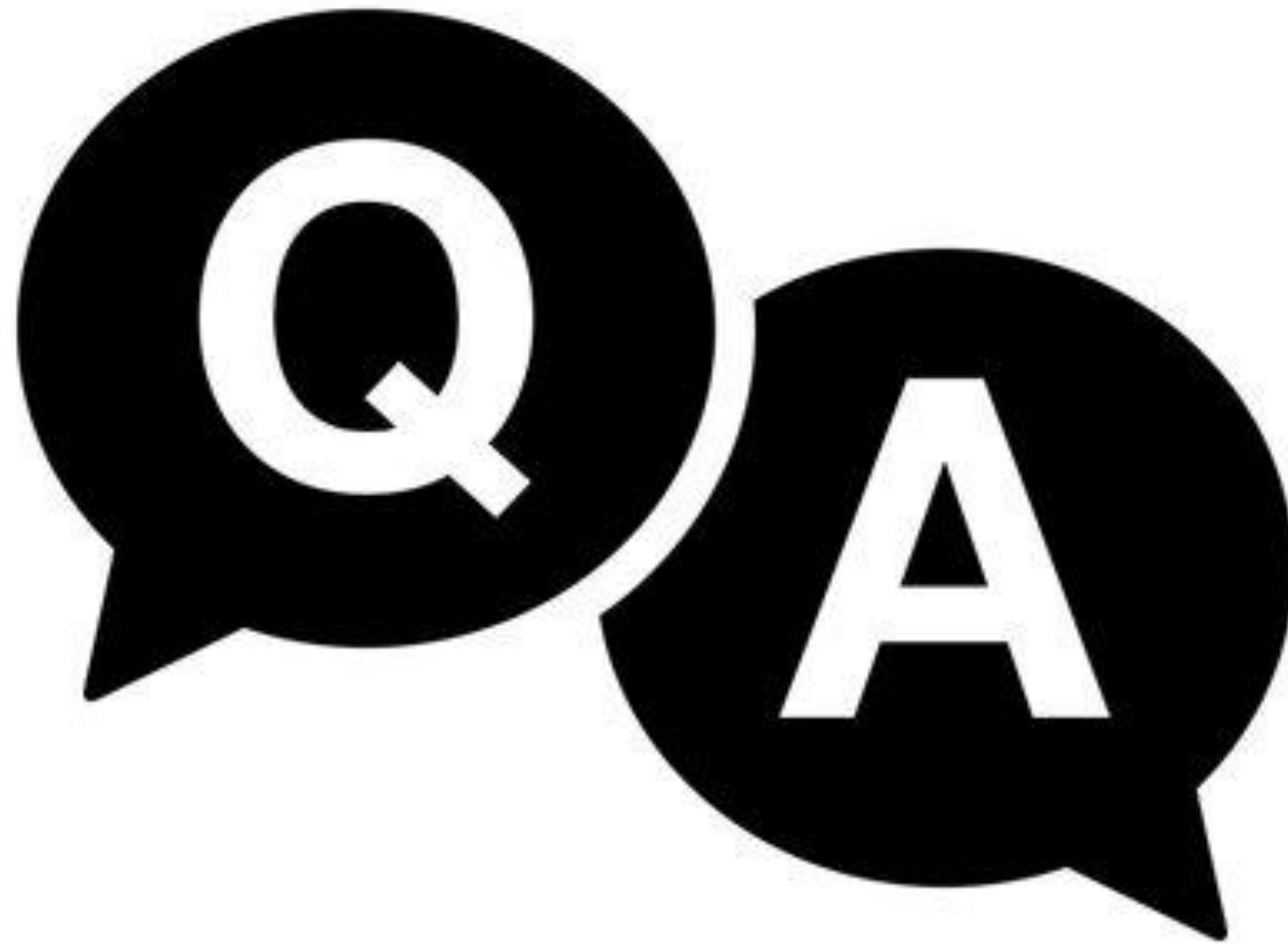
**Results:** We identified 90,418 patients, 15,527 (17%) of whom were black. Patients underwent 31,263 bypasses, 52,462 endovascular interventions, and 6693 amputations. Black patients were younger and less likely to smoke, to have coronary artery disease, or to have chronic obstructive pulmonary disease, but they were more likely to have diabetes, limb-threatening ischemia, dialysis dependence, and hypertension and to be self-insured or on Medicaid (all  $P < .05$ ). Adjusted 30-day mortality ranged from 1.2% to 2.1% across regions for white patients and 0% to 3.0% for black patients; adjusted 30-day MALE varied from 4.0% to 8.3% for white patients and 2.4% to 8.1% for black patients; and adjusted 30-day amputation rates varied from 0.3% to 1.2% for white patients and 0% to 2.1% for black patients. Black patients experienced significantly different (both higher and lower) adjusted rates of 30-day mortality and amputation than white patients did in several regions ( $P < .05$ ) but not MALEs. In addition, *within* each racial group, we found significant variation in the adjusted rates of all outcomes between regions (all  $P < .01$ ). In adjusted analyses, compared with white patients, black patients experienced consistently lower long-term mortality (hazard ratio [HR], 0.80; 95% confidence interval [CI], 0.73-0.88;  $P < .001$ ) and higher rates of MALEs (HR, 1.15; 95% CI, 1.06-1.25;  $P < .001$ ) and amputation (HR, 1.33; 95% CI, 1.18-1.51;  $P < .001$ ), with no statistically significant variation across the regions. However, rates of all long-term outcomes varied *within* both racial groups across regions.

**Conclusions:** Significant racial disparities exist in outcomes after lower extremity procedures in patients with PAD, with regional variation contributing to perioperative but not long-term outcome disparities. Underperforming regions should use these data to generate quality improvement projects, as understanding the etiology of these disparities is critical to improving the care of all patients with PAD. (J Vasc Surg 2018;68:519-26.)



# THANK YOU AND QUESTIONS

**email: [oaibrahim@gmail.com](mailto:oaibrahim@gmail.com)**



# Health Equity and Obesity Moderated Panel Discussion



**Panelist:**

Kara Mayes, MD, FAAFP  
Medical Director  
Mercy Clinic Weight and Wellness



**Panelist:**

W. Timothy Garvey, MD  
Associate Director, Professor  
Department of Nutrition Sciences,  
School of Health Professions

# Thank You Chronic Care Roundtable Partners



**Abbott**

**AMGEN**



Boehringer  
Ingelheim

**Dexcom**<sup>®</sup>  
CONTINUOUS GLUCOSE MONITORING

Janssen



PHARMACEUTICAL COMPANIES OF  
*Johnson & Johnson*

*Lilly*



MAGMUTUAL<sup>®</sup>



Novo Nordisk<sup>®</sup>



NOVARTIS



*Pfizer*

**sanofi**



THANK  
YOU!

