Cardiovascular Disease in Diabetes and the Link to PAD

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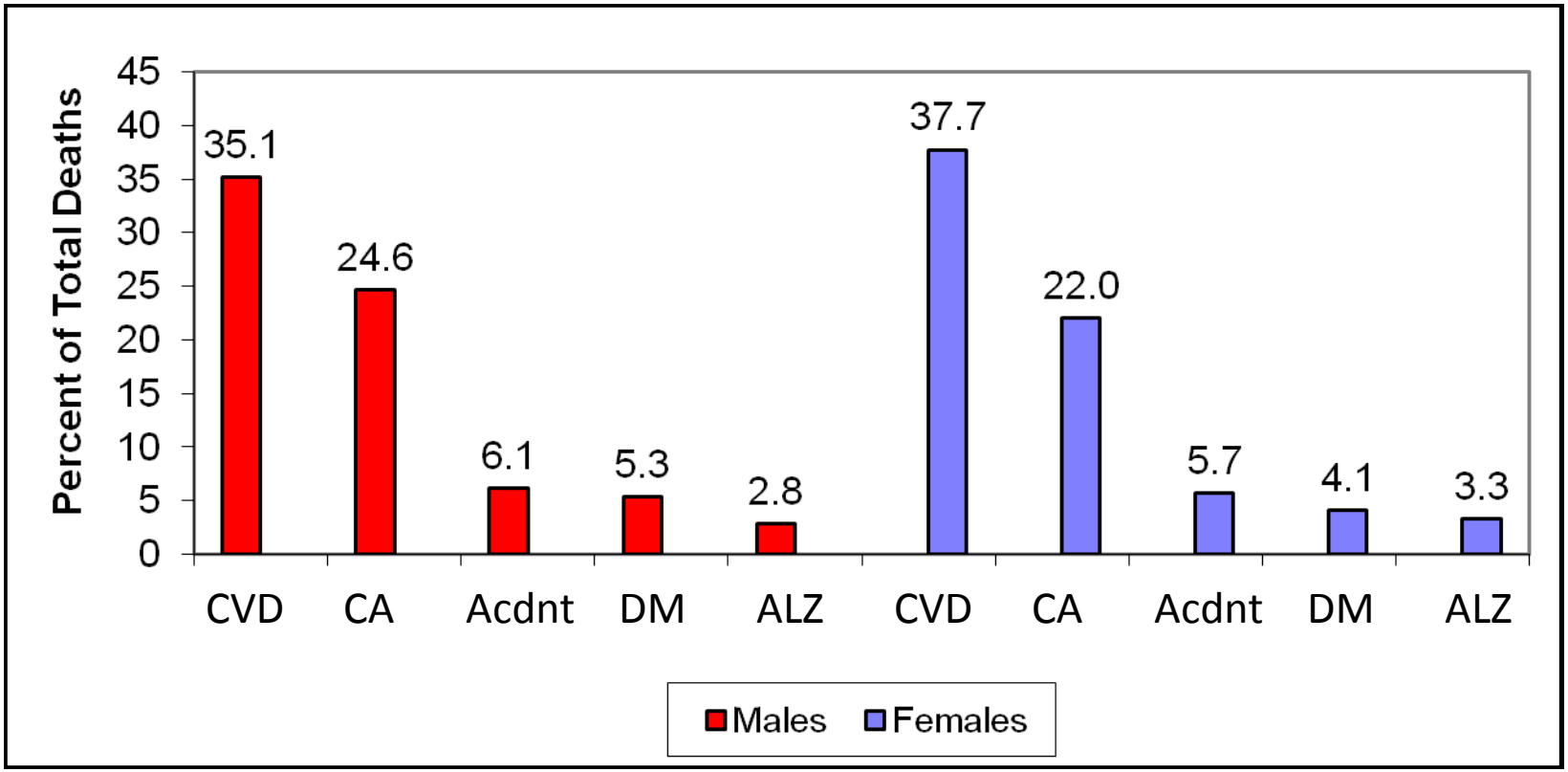
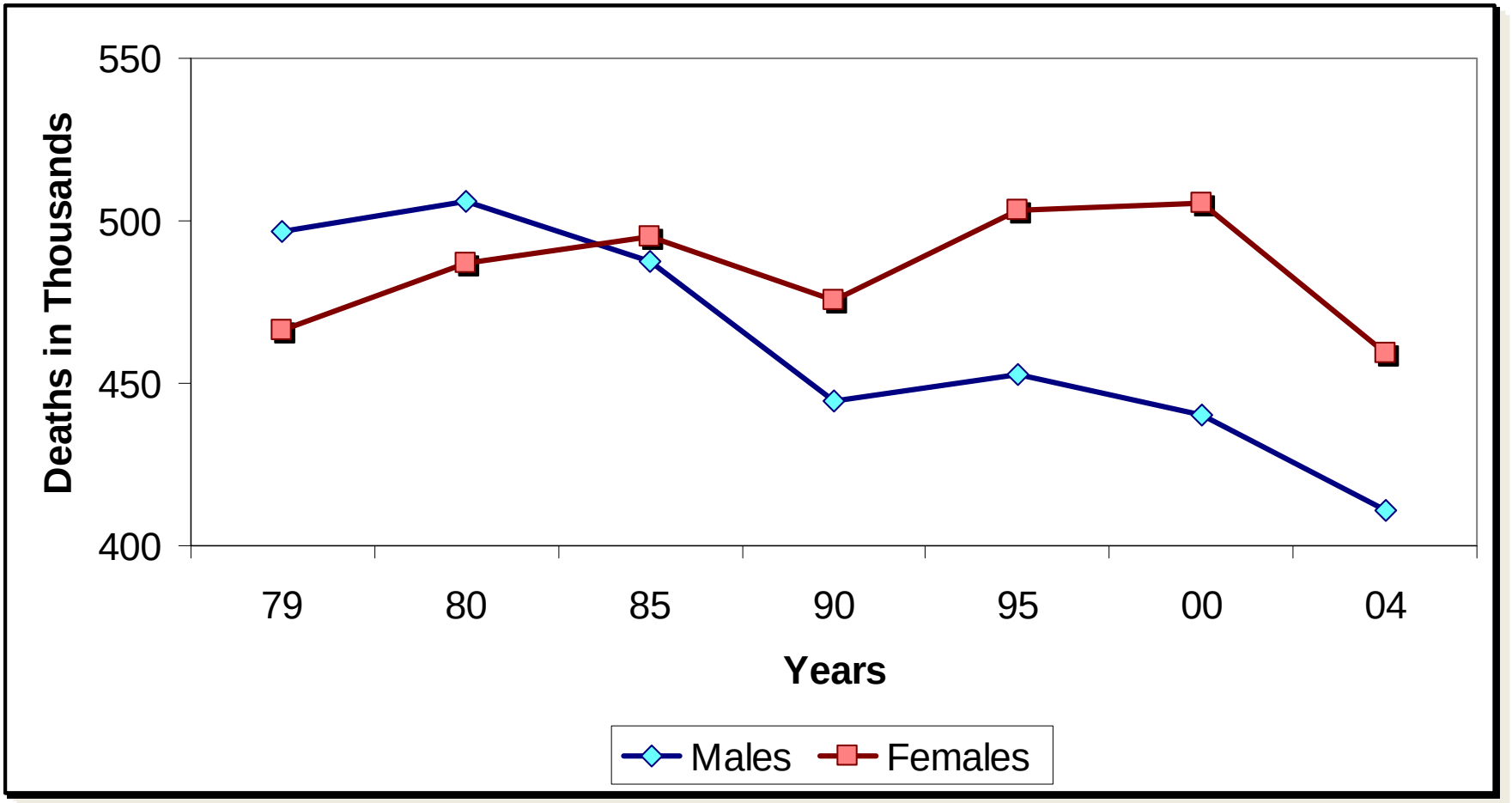
CVD and Other Major Causes of Death



AHA Statistical Update Source: NCHS and NHLBI (United States: 2004).

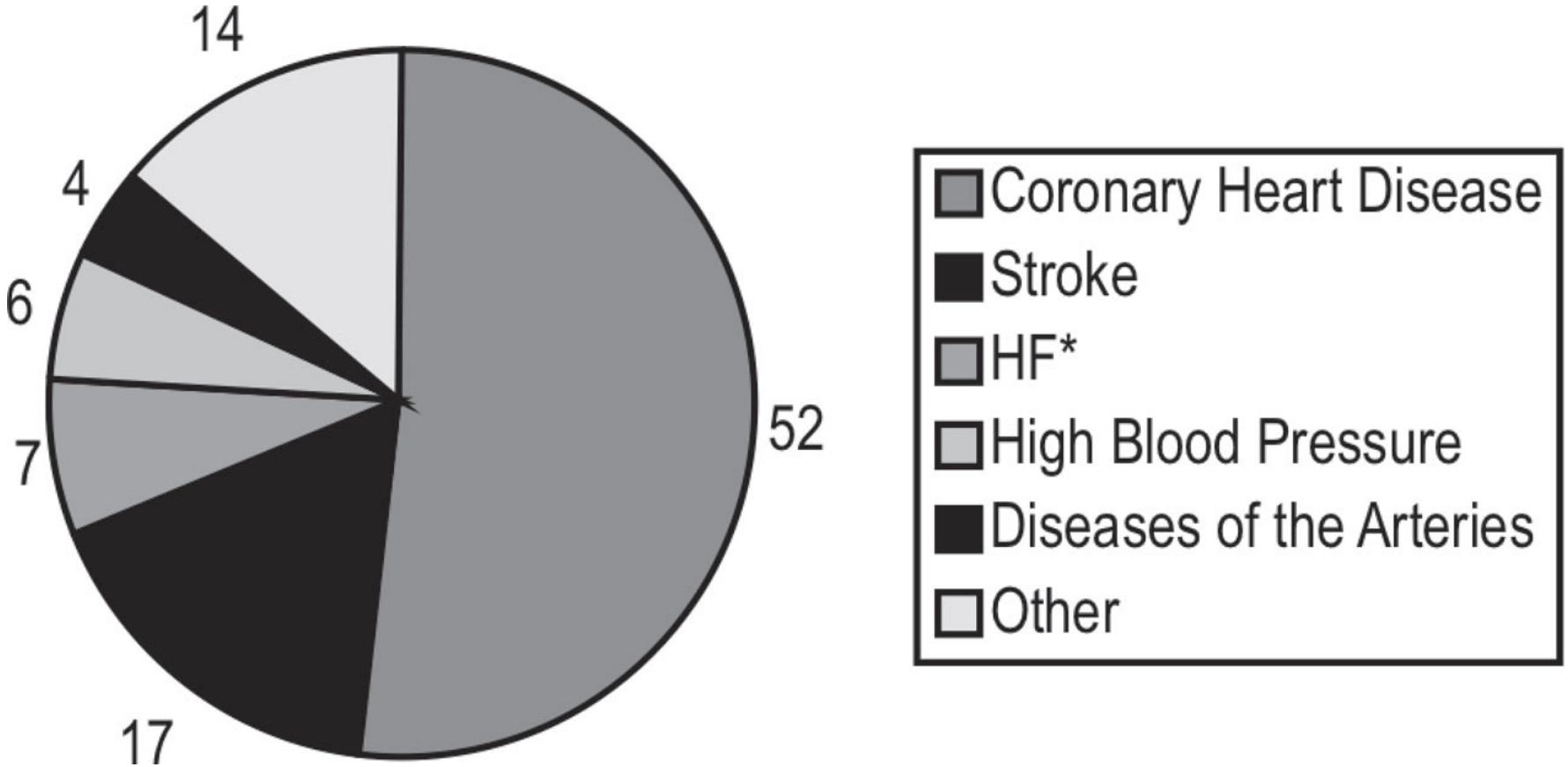
CVD Mortality Trends

United States: 1979-2004



AHA Statistical Update 2007 - Source: NCHS and NHLBI.

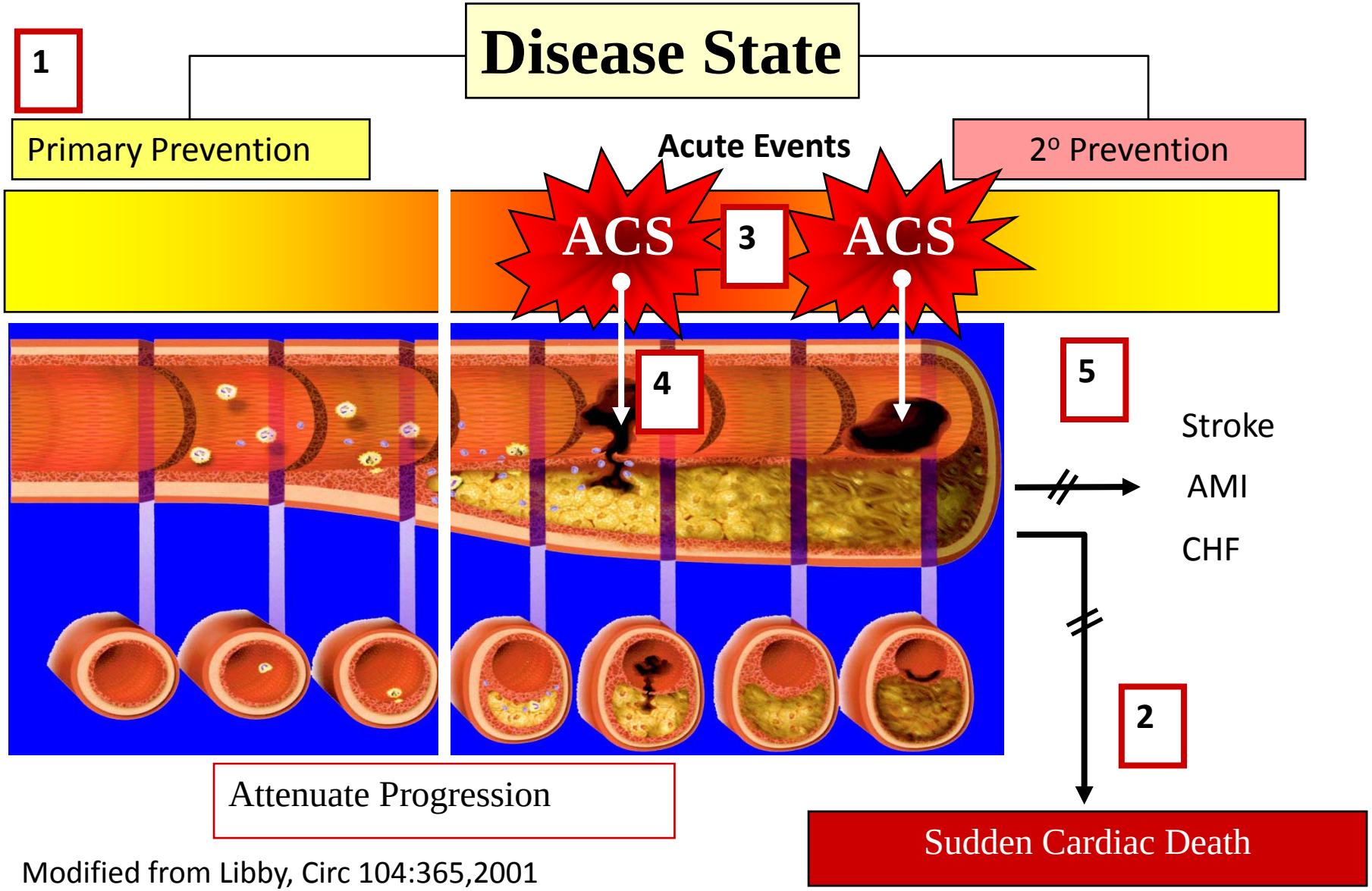
Death Due to CVD



AHA Statistical Update 2008

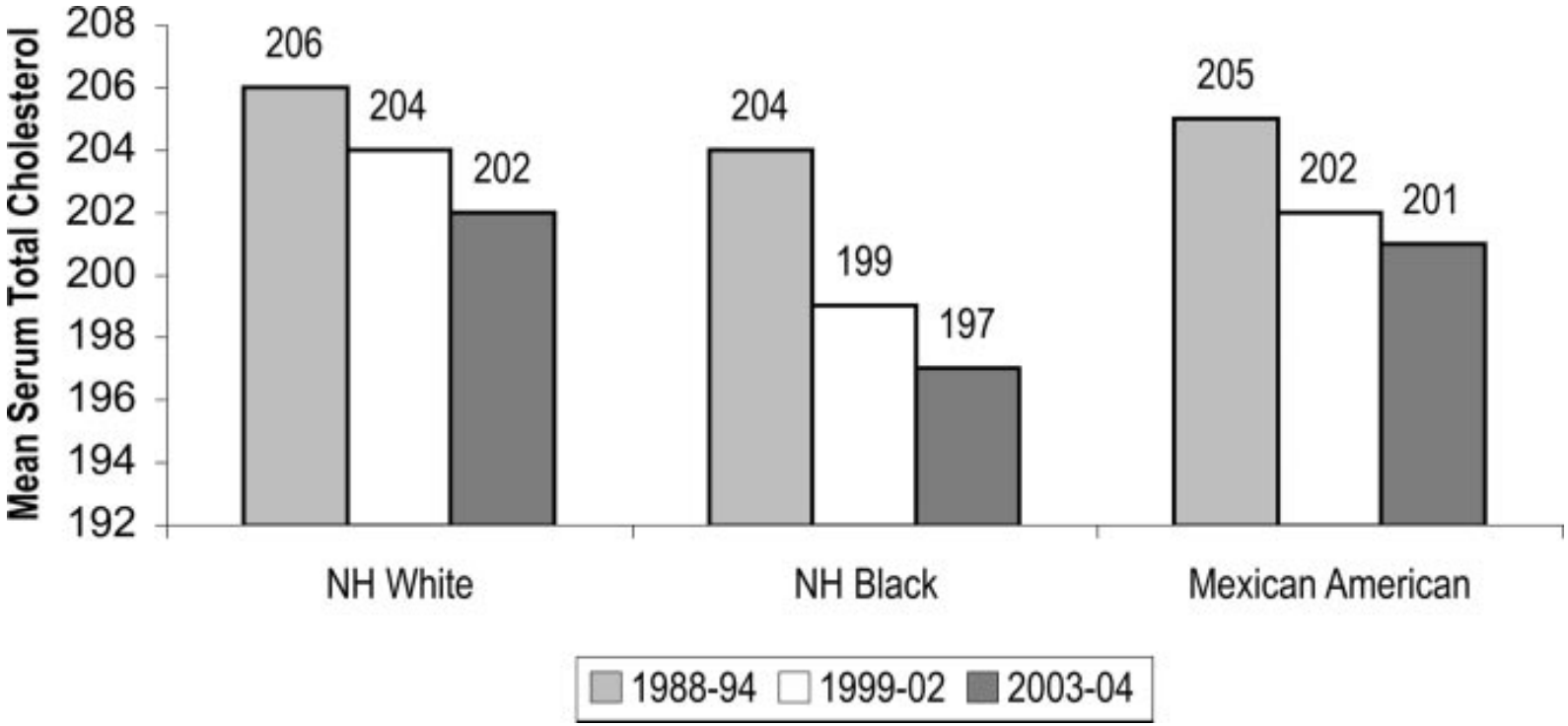
Inflammatory

Atherothrombotic Coronary Artery Disease

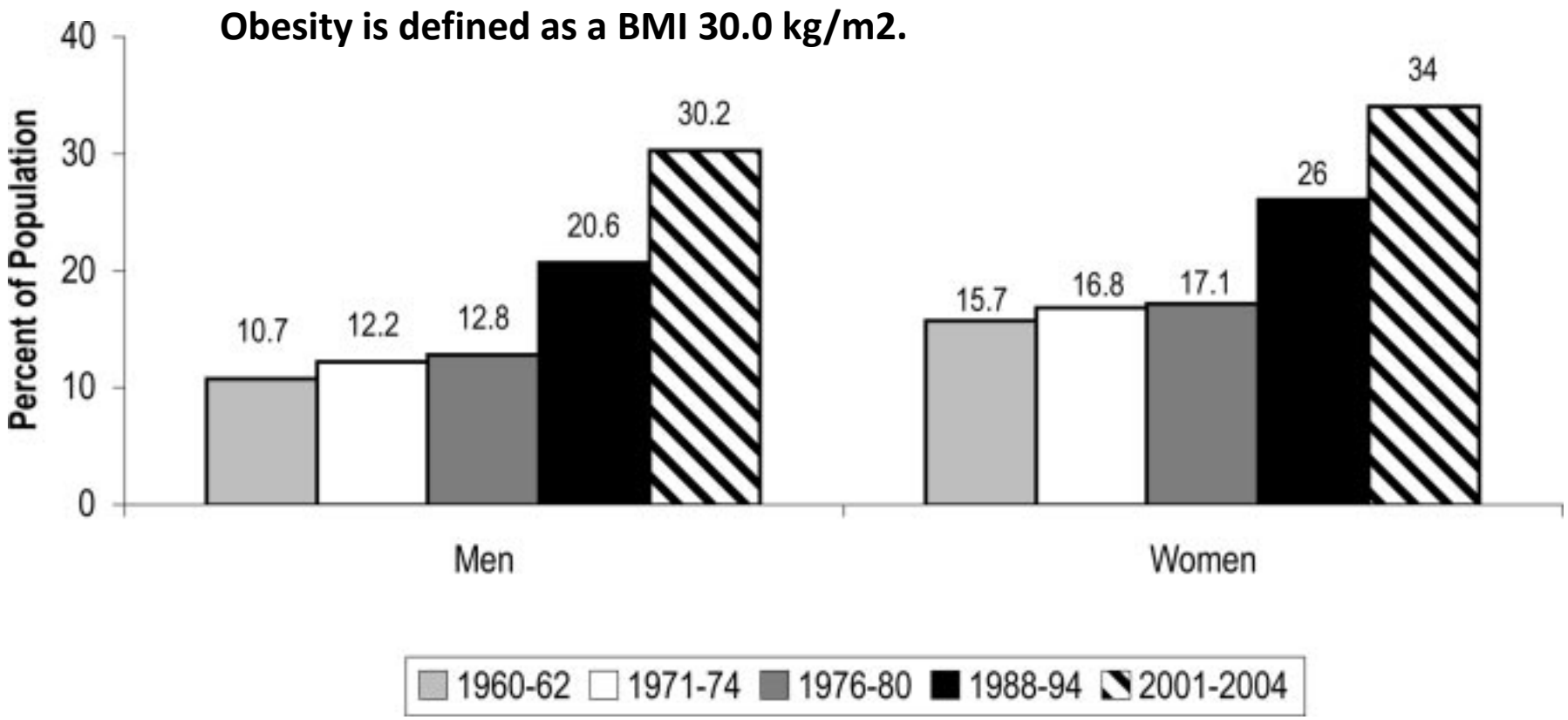


Modified from Libby, Circ 104:365,2001

Total Cholesterol in US Adults



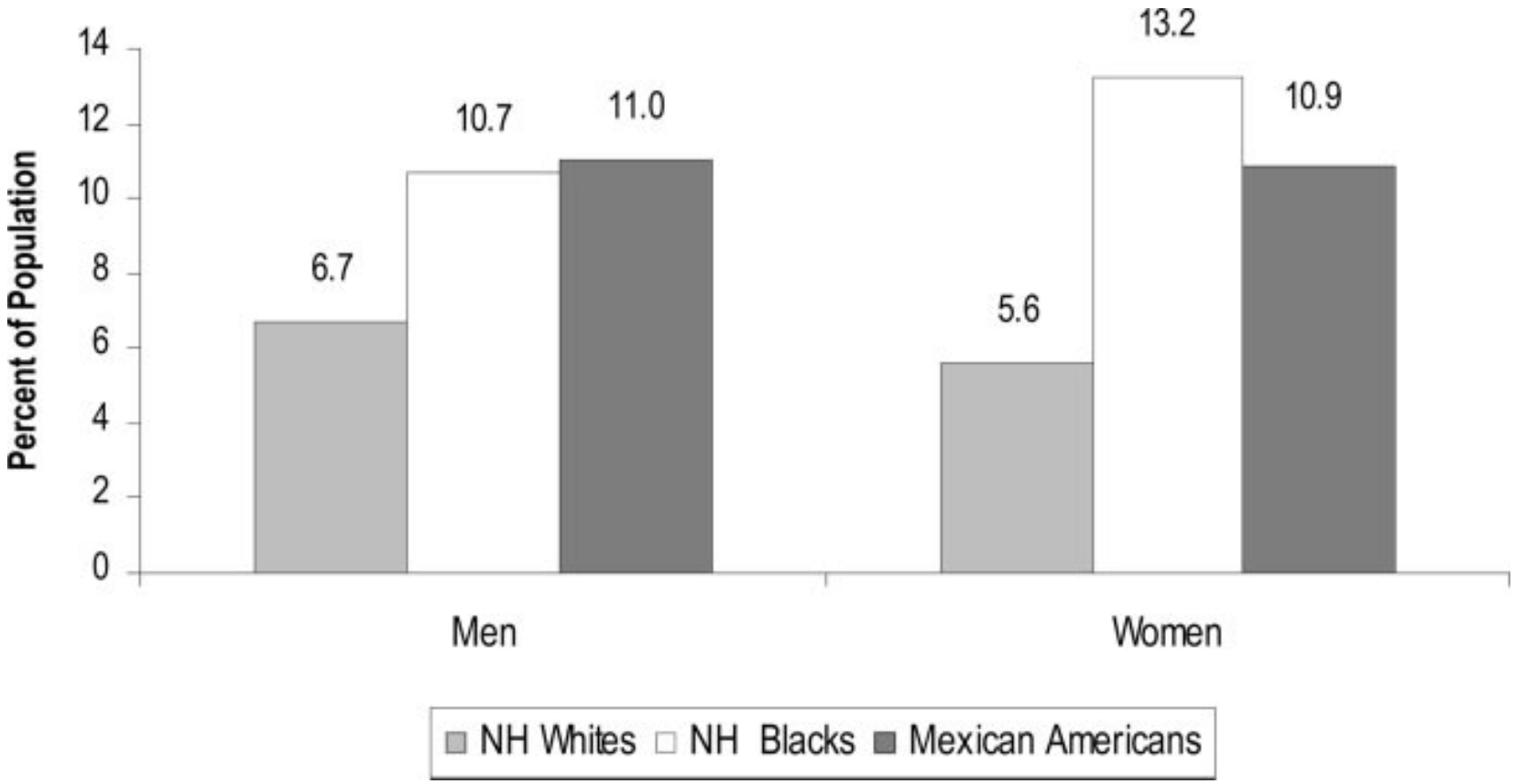
Prevalence of Obesity in Adults



(NHES: 1960–1962; NHANES: 1971–1974, 1976–1980, 1988–1994, and 2001–2004).
Note: Source: *Health, United States, 2006.2*

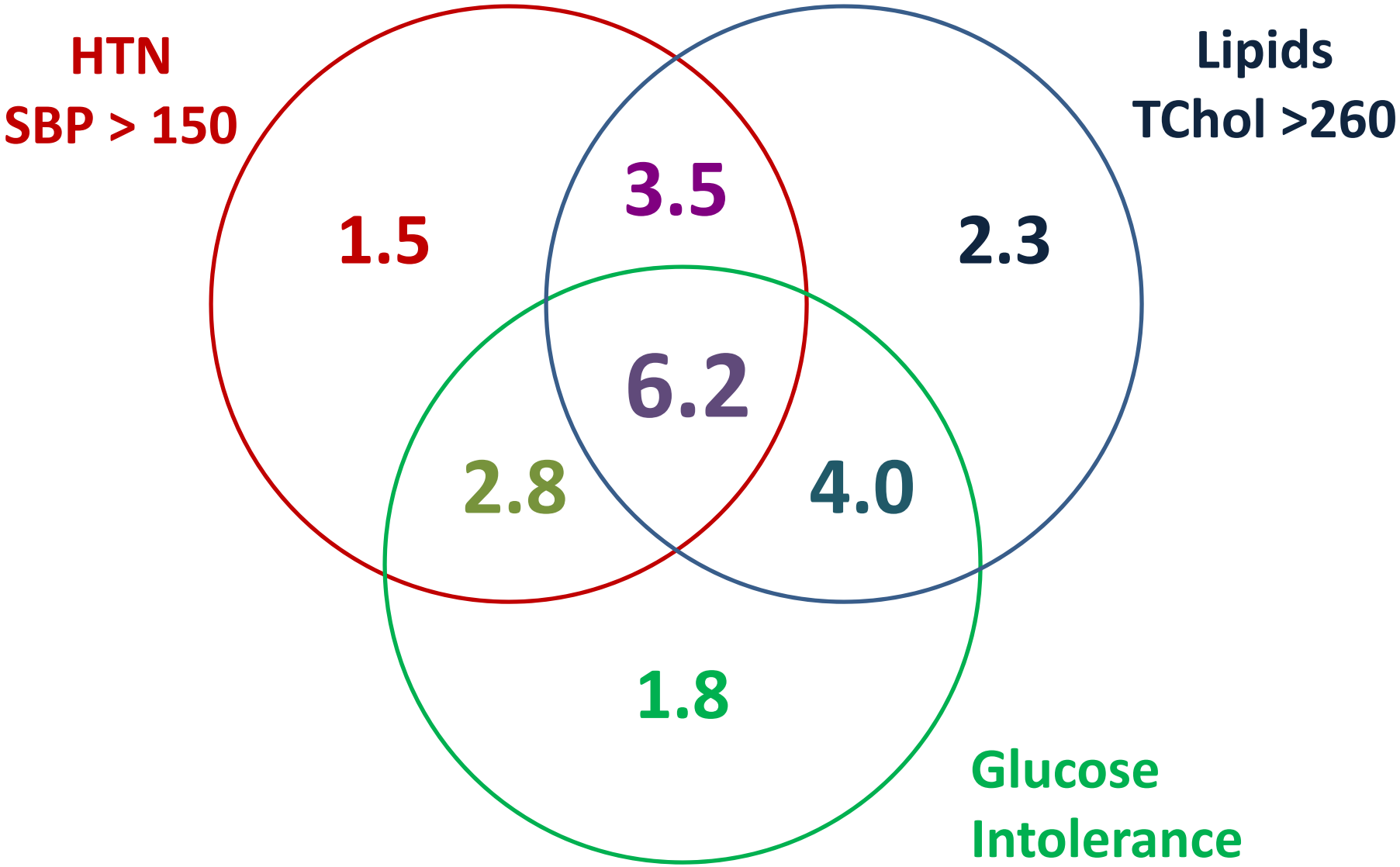
Prevalence of DM in Adults

as diagnosed by an MD in patients age > 18



NHANES: 1999–2004: Source: NCHS and NHLBI

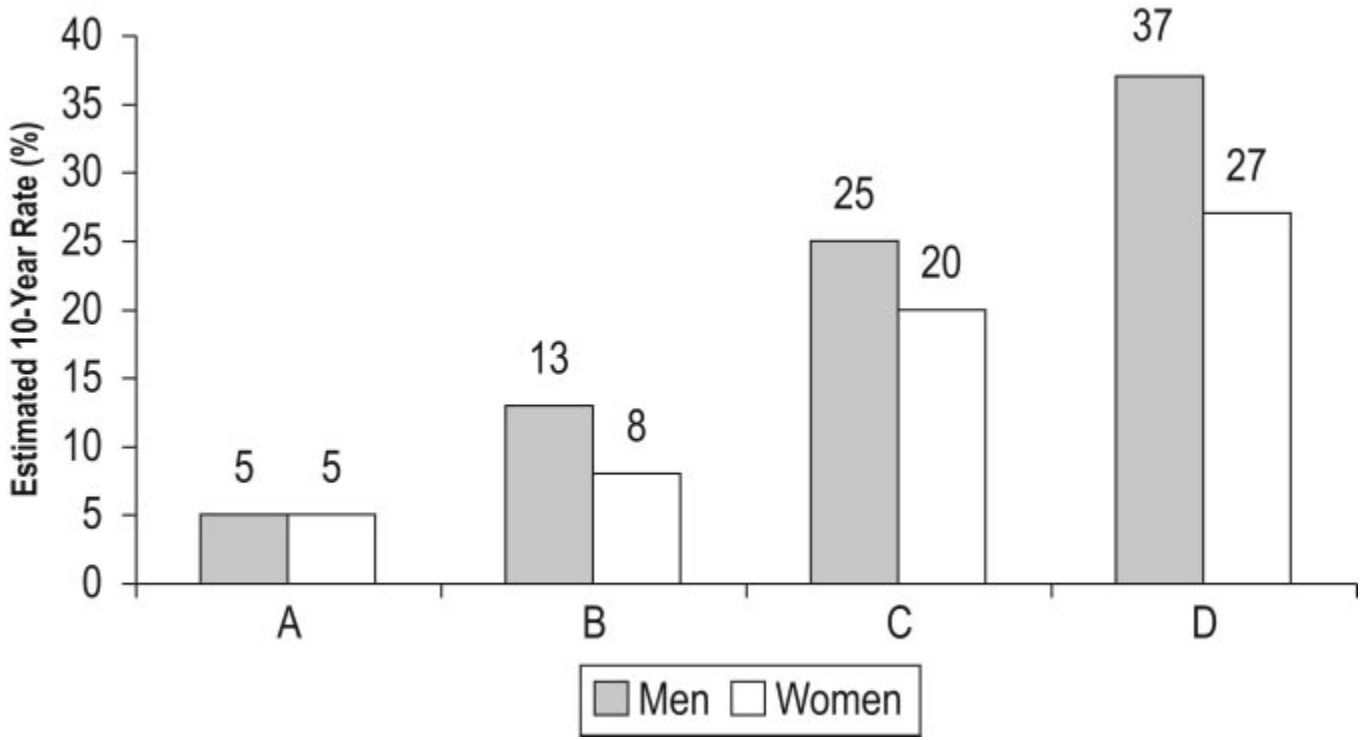
Multiple Risk Factors and CVD



CV Risk is Compounded

- 62% with HTN also have dyslipidemia
- 44% with dyslipidemia also have HTN
- 54% with DM have HTN and dyslipidemia

10 Year CHD Risk In 55 Year Olds



	A	B	C	D
BP, mm Hg	120/80	140/90	140/90	140/90
Total cholesterol, mg/dL	200	240	240	240
HDL cholesterol, mg/dL	50	50	40	40
Diabetes	No	No	Yes	Yes
Cigarettes	No	No	No	Yes

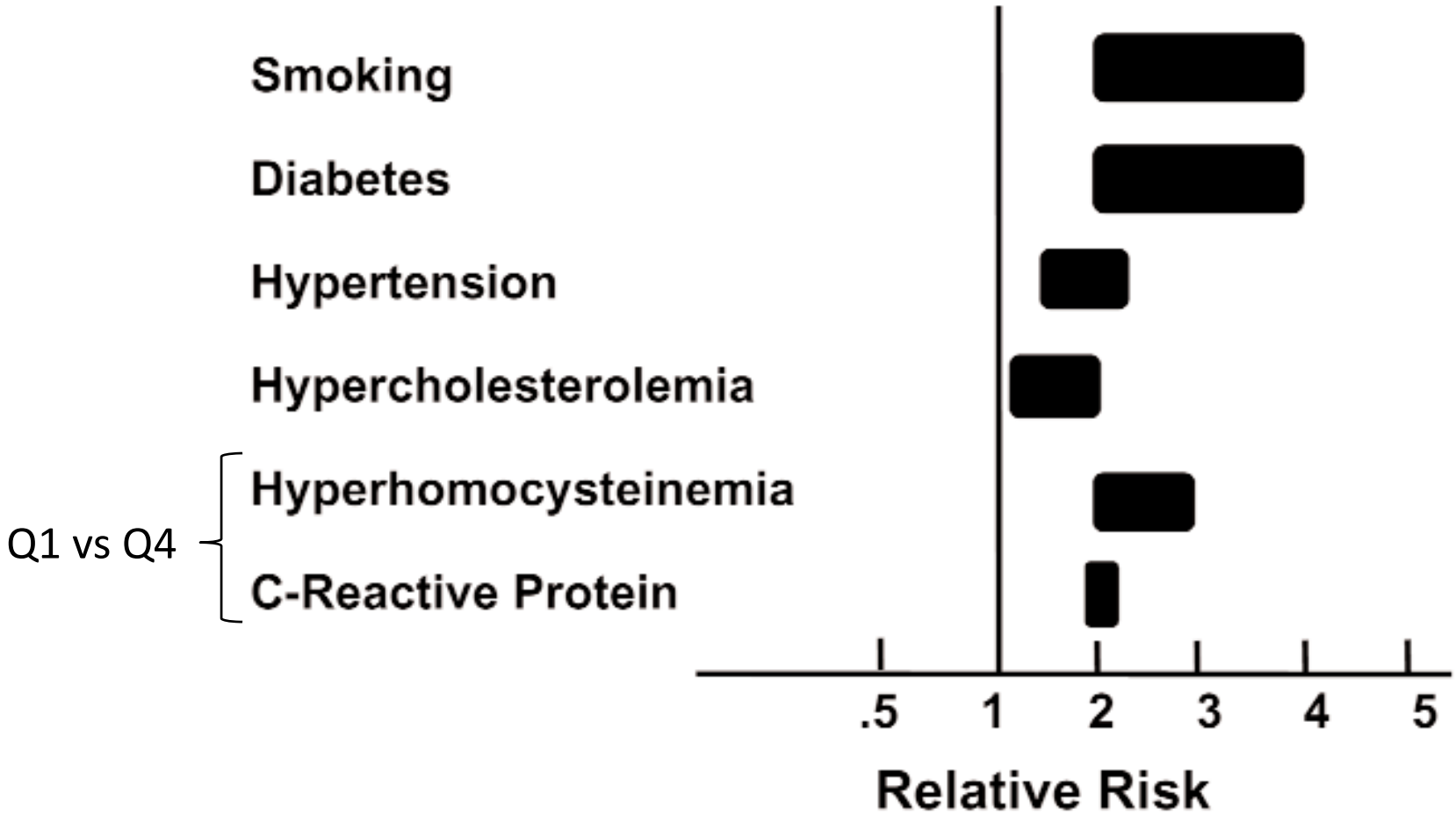
Patients at Risk for LE-PVD

- Age less than 50 years, with diabetes and one atherosclerosis risk factor (smoking, dyslipidemia, hypertension, or hyper-homocysteinemia)
- Age 50 to 69 years and history of smoking or diabetes
- Age 70 years and older

- Leg symptoms with exertion (suggestive of claudication)
- Ischemic rest pain
- Abnormal lower extremity pulse examination

- Known atherosclerotic coronary, carotid, or renal artery disease

Risk for Developing Lower Extremity PAD



Normandy JA. J Vasc Surg. 2000; 31(1 pt 2):S1-S296

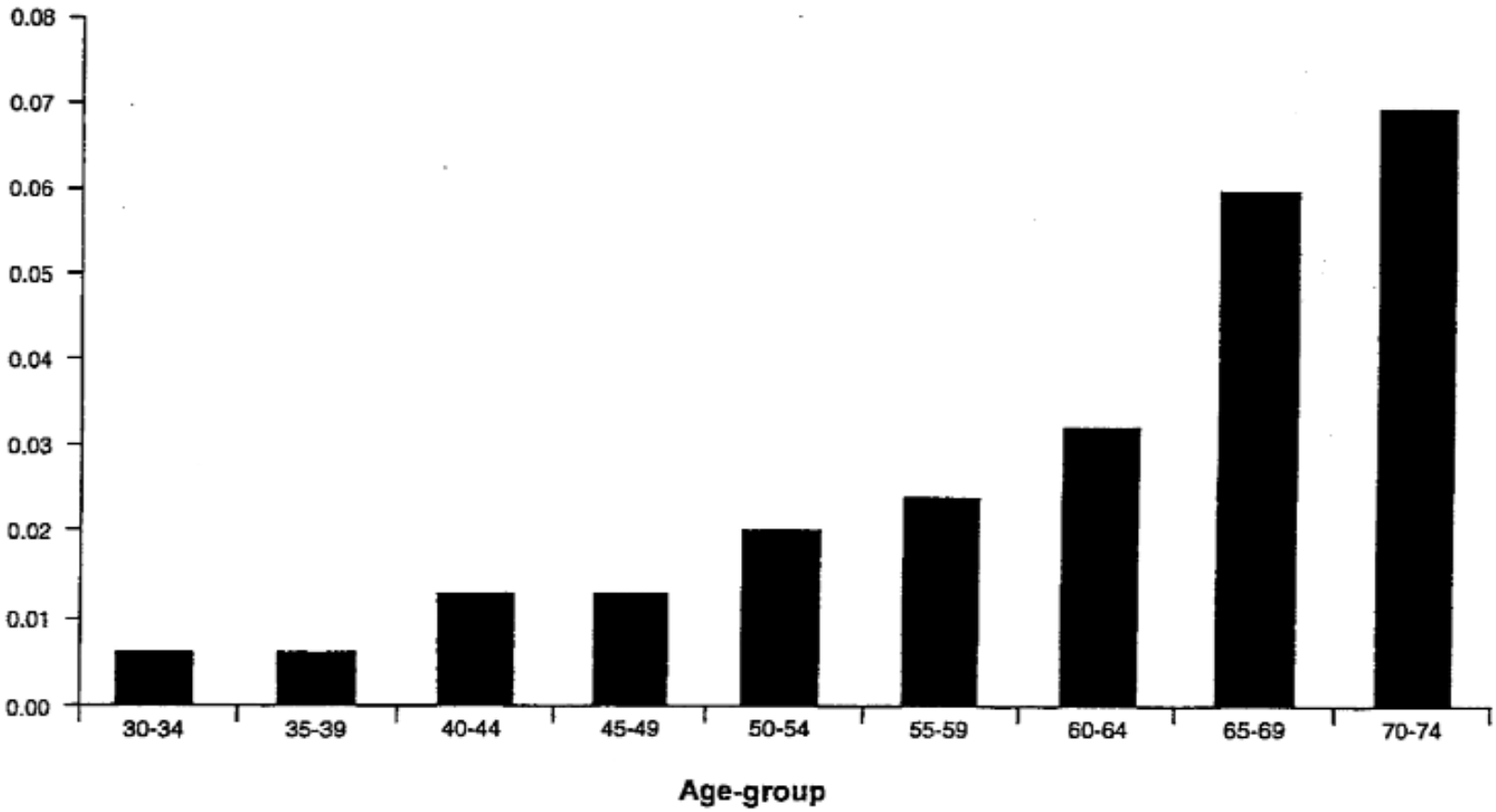
Presentation of Lower Extremity PAD

Individuals at Risk for LE PAD

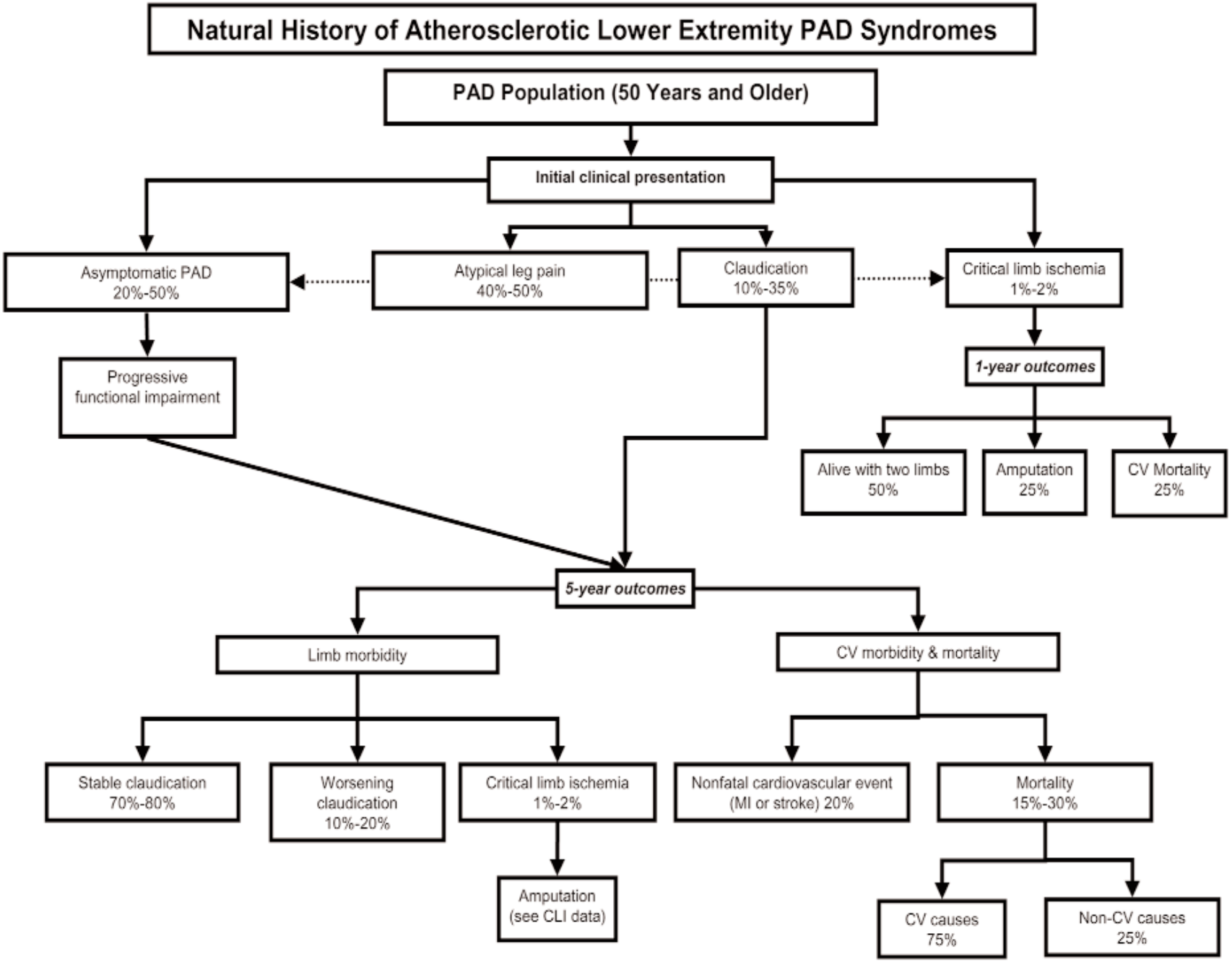
Age < 50 with DM or One Atherosclerotic Risk Factor
(Smoking, Dyslipidemia, Hypertension, Homocysteine)
Age > 70
Leg Symptoms with Exertion or Rest Pain
Abnormal LE Pulse Exam
Known Coronary, Carotid or Renal Artery Disease

- No Leg Pain
- Atypical Leg Pain
- Classic Claudication
- Ischemic Rest Pain Non-Healing Ulcers
- Acute Ischemic Pain

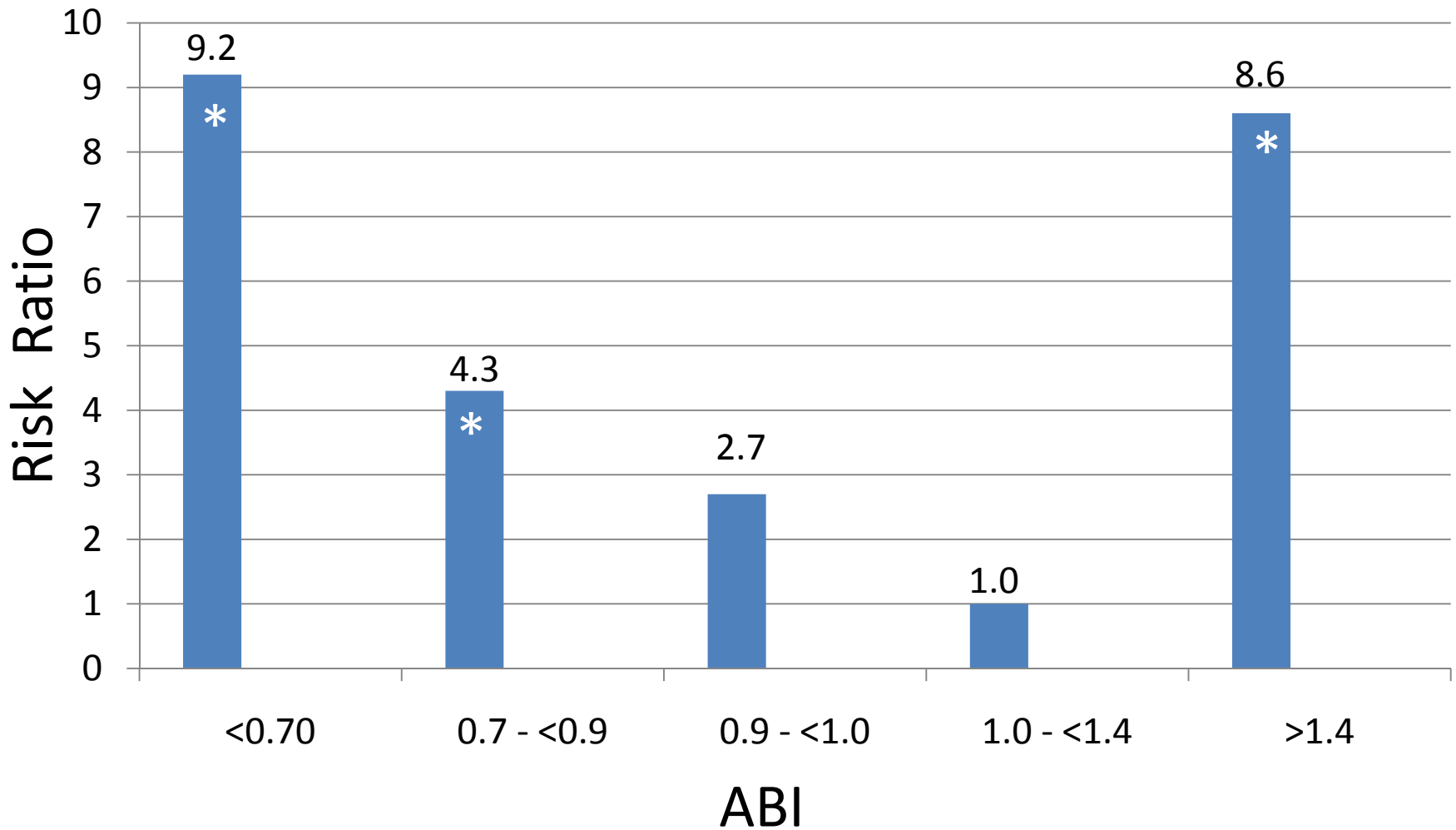
Prevalence of Intermittent Claudication



Dormandy JA. J Vasc Surg, 2000, 31: RBS1-S296,


Natural History of Atherosclerotic Lower Extremity PAD Syndromes
PAD Population (50 Years and Older)
Initial clinical presentation
Asymptomatic PAD 20%-50%
Atypical leg pain 40%-50%
Claudication 10%-35%
Critical limb ischemia 1%-2%
Progressive functional impairment
1-year outcomes
Alive with two limbs 50%
Amputation 25%
CV Mortality 25%
5-year outcomes
Limb morbidity
CV morbidity & mortality
Stable claudication 70%-80%
Worsening claudication 10%-20%
Critical limb ischemia 1%-2%
Nonfatal cardiovascular event (MI or stroke) 20%
Mortality 15%-30%
Amputation (see CLI data)
CV causes 75%
Non-CV causes 25%

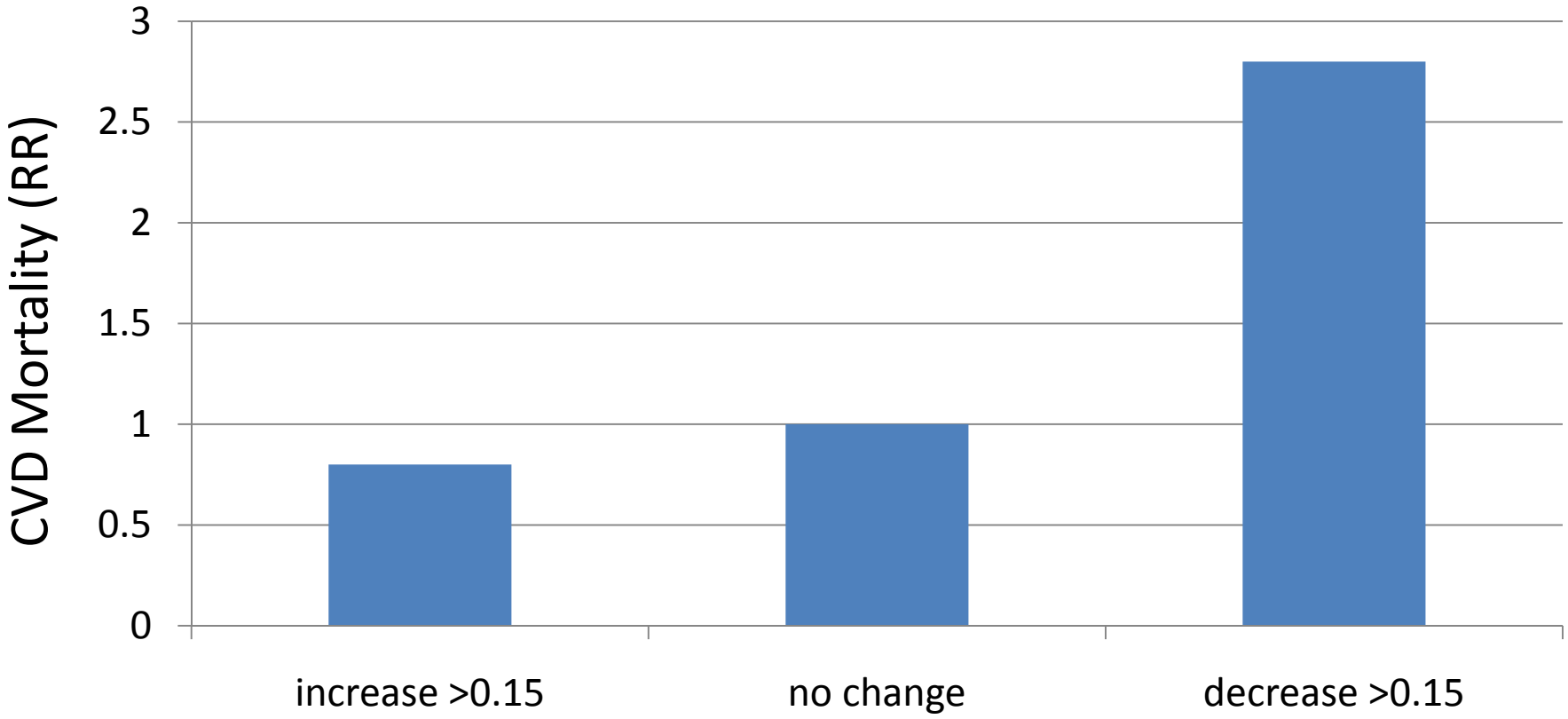
CVD Mortality by ABI at 3 years



Criqui MH, JACC 2008, 52(21):1736

CVD Mortality and PVD

Change in ABI over time



Criqui MH, JACC 2008, 52(21):1736

Microvascular Blood Flow

- Factors that reduce blood flow to the micro-vascular bed
  - Diabetes
  - Severe renal failure
  - Severely decreased cardiac output (heart failure/shock)
  - Vasospastic diseases or conditions (e.g., Raynaud's phenomenon, prolonged cold exposure)
  - Smoking and tobacco use

Microvascular Blood Flow

- Factors that increase demand for blood flow to the microvascular bed:
  - Infection (e.g., cellulitis, osteomyelitis)
  - Skin breakdown or traumatic injury

Asymptomatic LE PAD

- < 2% of patients have claudication
- ~ 20% have abnormal femoral or PT pulses
- Only 11.7 % have large vessel disease by non-invasive testing

- Symptoms under estimate and the PE over estimates the prevalence of PAD

- Discordance between large and small vessel dz?

Asymptomatic LE PAD

- Of new diagnoses of LE PVD
  - 48 % are asymptomatic
  - 46 % have atypical pain
  - 6 % have typical claudication

- Most patients with significant LE PVD do not have typical symptoms claudication
- Most patients with LE PVD also have significant risk factors for CAD.

Conclusions

- CV Risk factors are pack animals

- DM is no longer considered a “risk factor”
- DM is a CAD equivalent
- DM is a vascular disease predominantly involving small vessels

- PVD defines a state of advanced vascular disease and carries significant prognostic implications

Who is Responsible ?

The initial responsibility for the detection of lower extremity peripheral arterial disease should be with the primary care provider, because such providers are best positioned to determine an at-risk population and to initiate educational, life style, and cardiovascular risk reduction therapies.

The Future

- Improving tissue blood flow
  - Angiogenesis - growth factors
  - Tissue engineering (small conduit grafts)
  - Genomic solutions?
- Detecting ischemic tissue
  - Raman spectroscopy – Near IR
- Rethinking biomarkers and risk

END

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