Heart Failure Awareness Week

Lunch & Learn

Monday, February 14th, 2022

Preventing Heart Failure Among the Expanding Population of Older Adults

American Heart Association.

Preventing HF Among the Expanding Population Of Older Adults

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Director of Translational Research, Geriatric Research, Education, and Clinical Center, VA Pittsburgh Healthcare System

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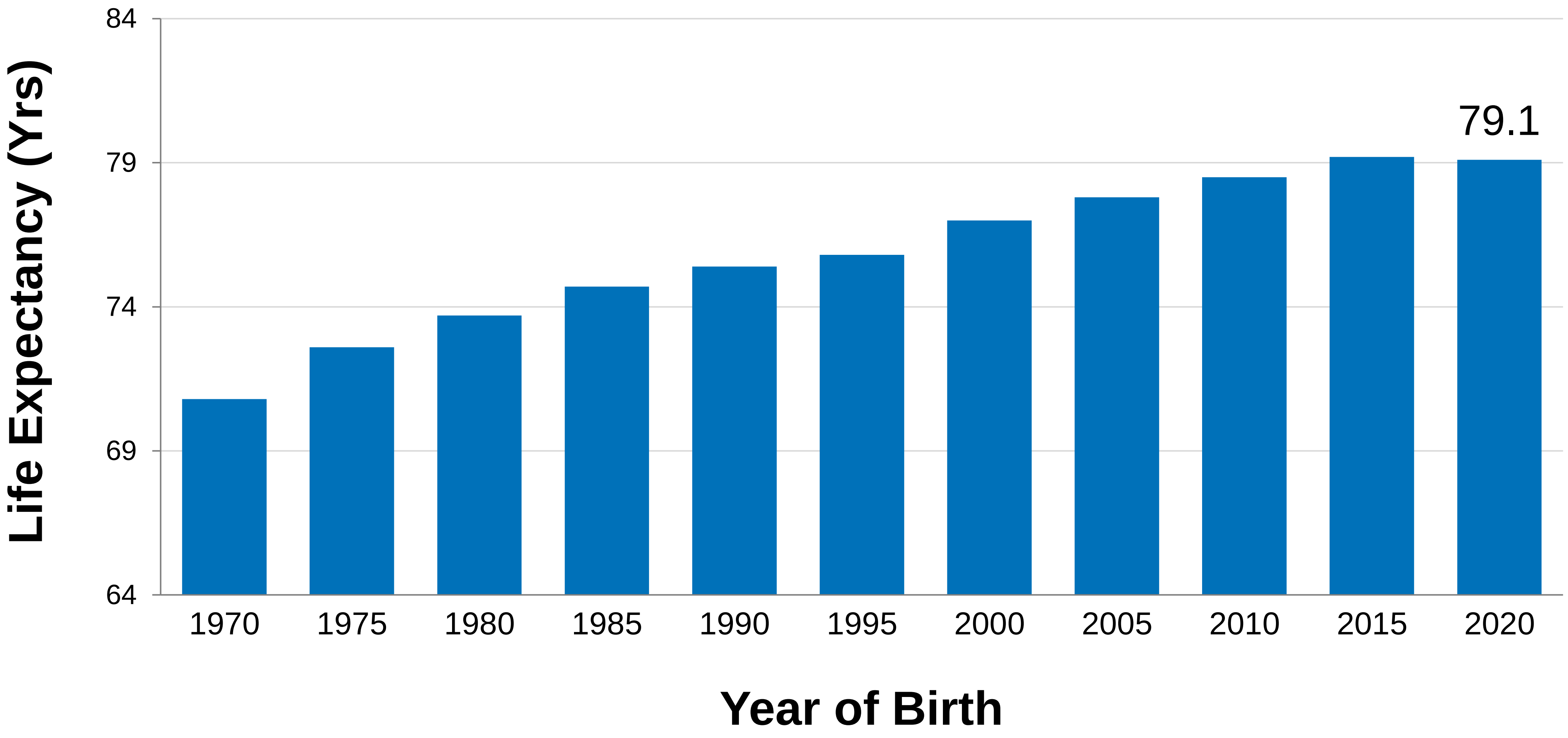
Director, Transitional Care (Cardiac Rehabilitation, GeroFit, C-TraC, COMPASS), VA Pittsburgh Healthcare System

- No disclosures

- As the population is getting older, the concept of risk factors for heart failure is undergoing changes

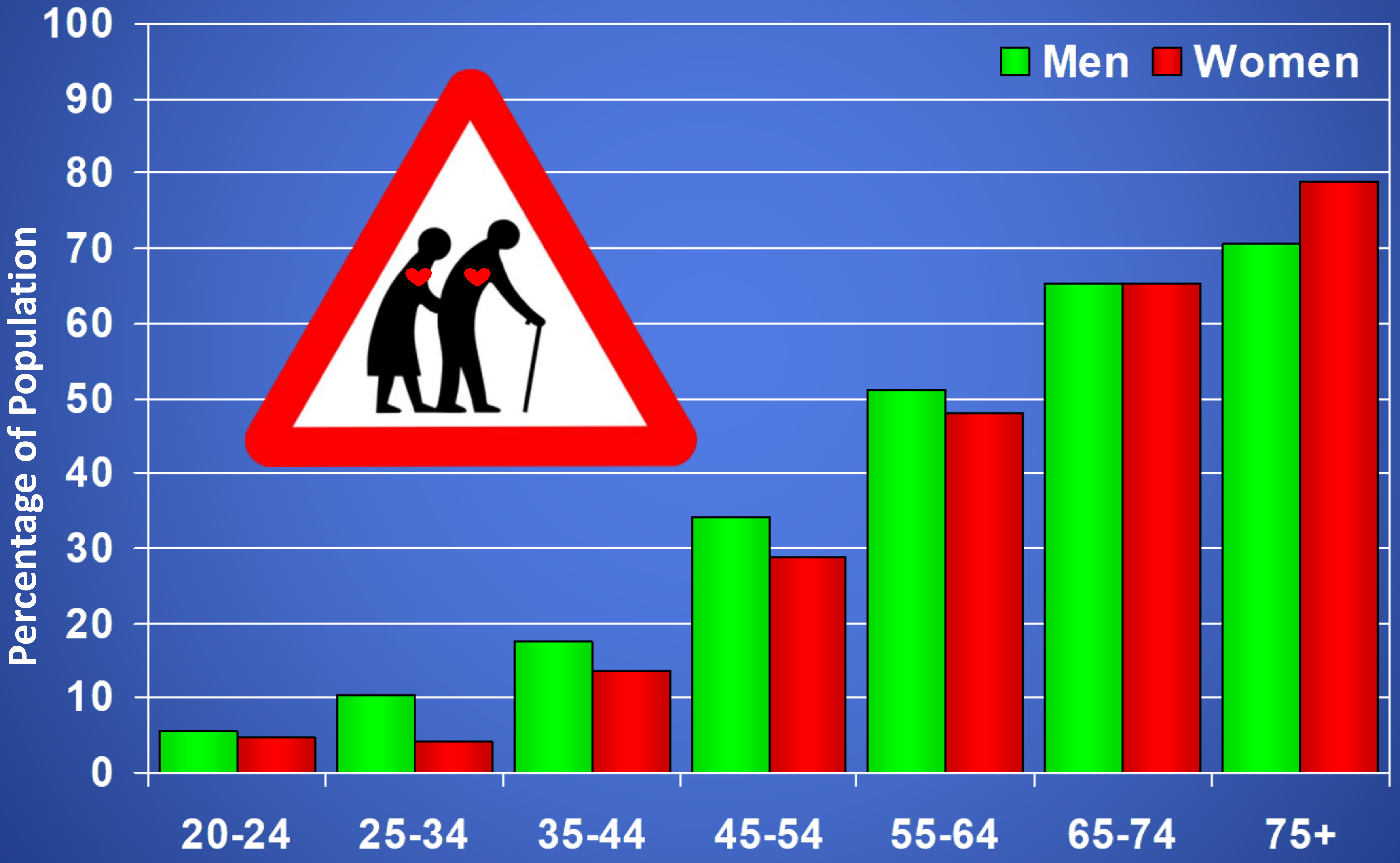
Average US Life Expectancy at Birth

US Trends in Life Expectancy at Birth (1970-2020)



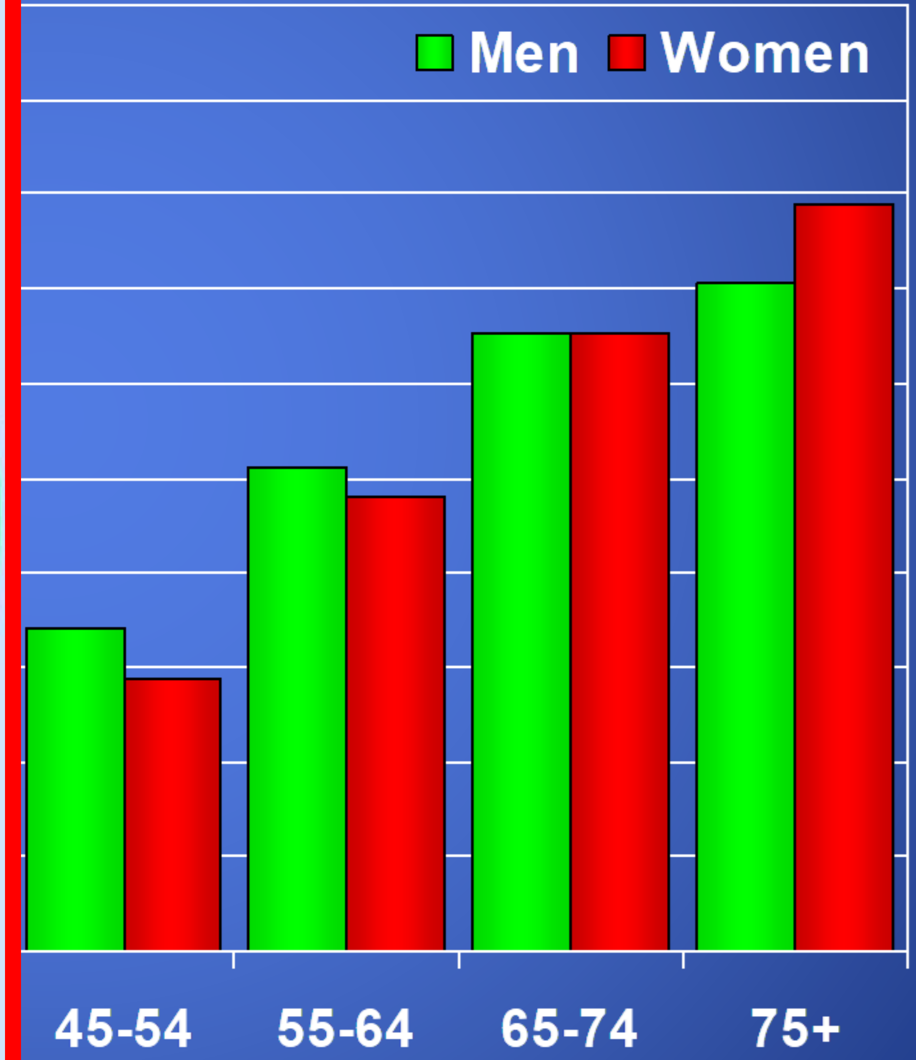
Accessed Sept 2020; http://census.gov

↑ CVD with Aging

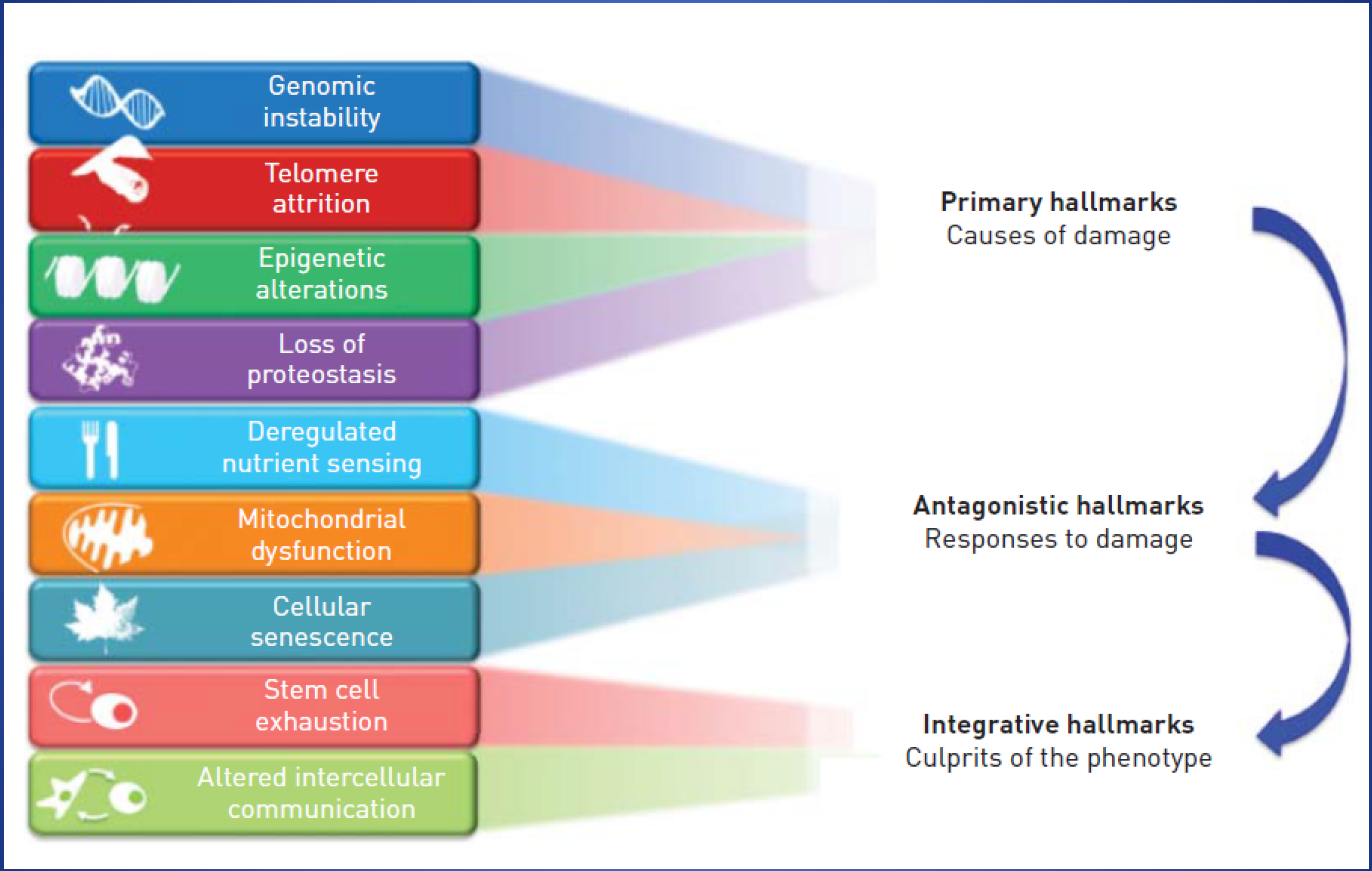


NHANES III

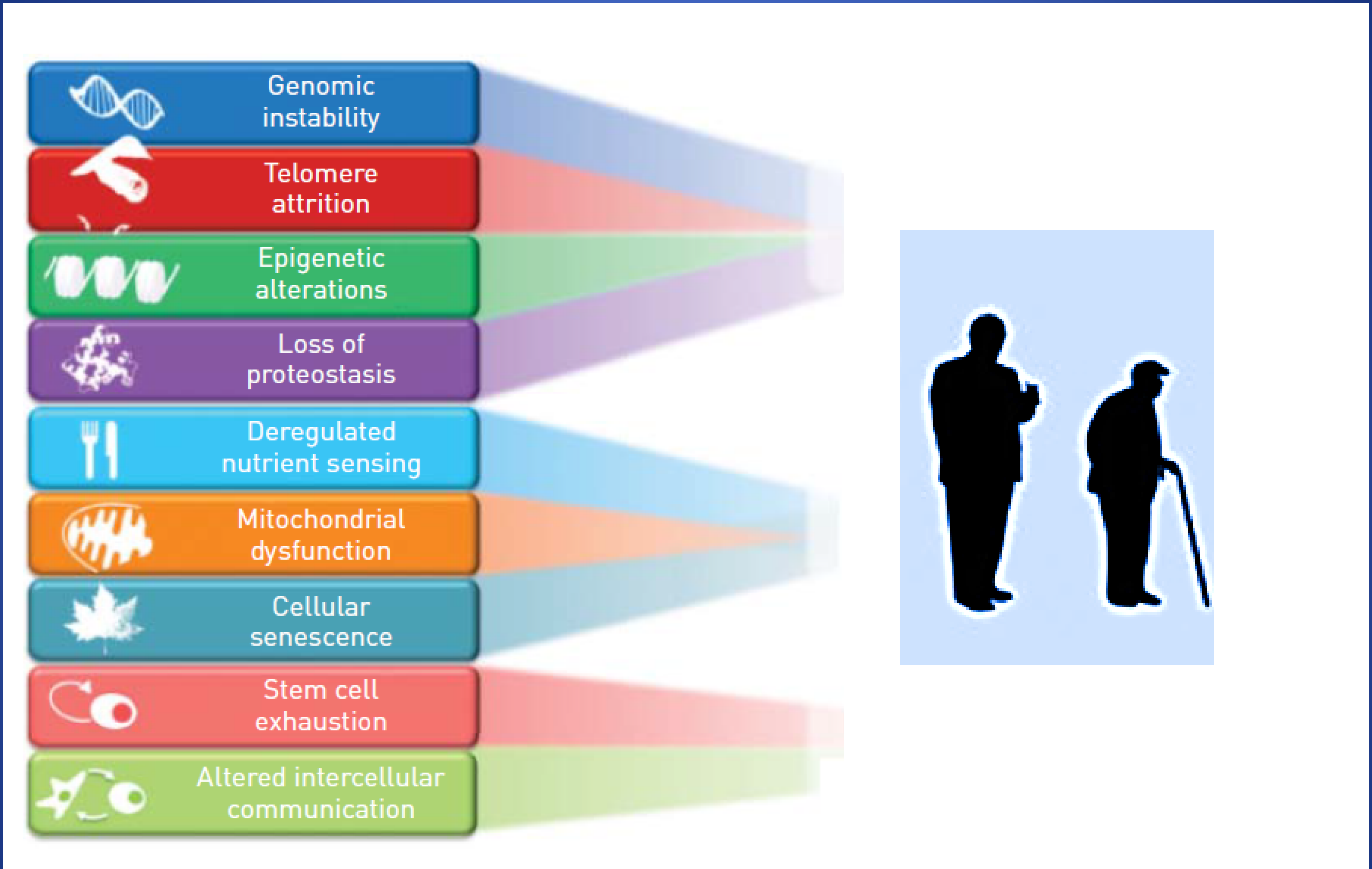
↑ CVD with Age: Driven by Biological Changes



López-Otín C, et al. Cell. 2013;153:1194-217

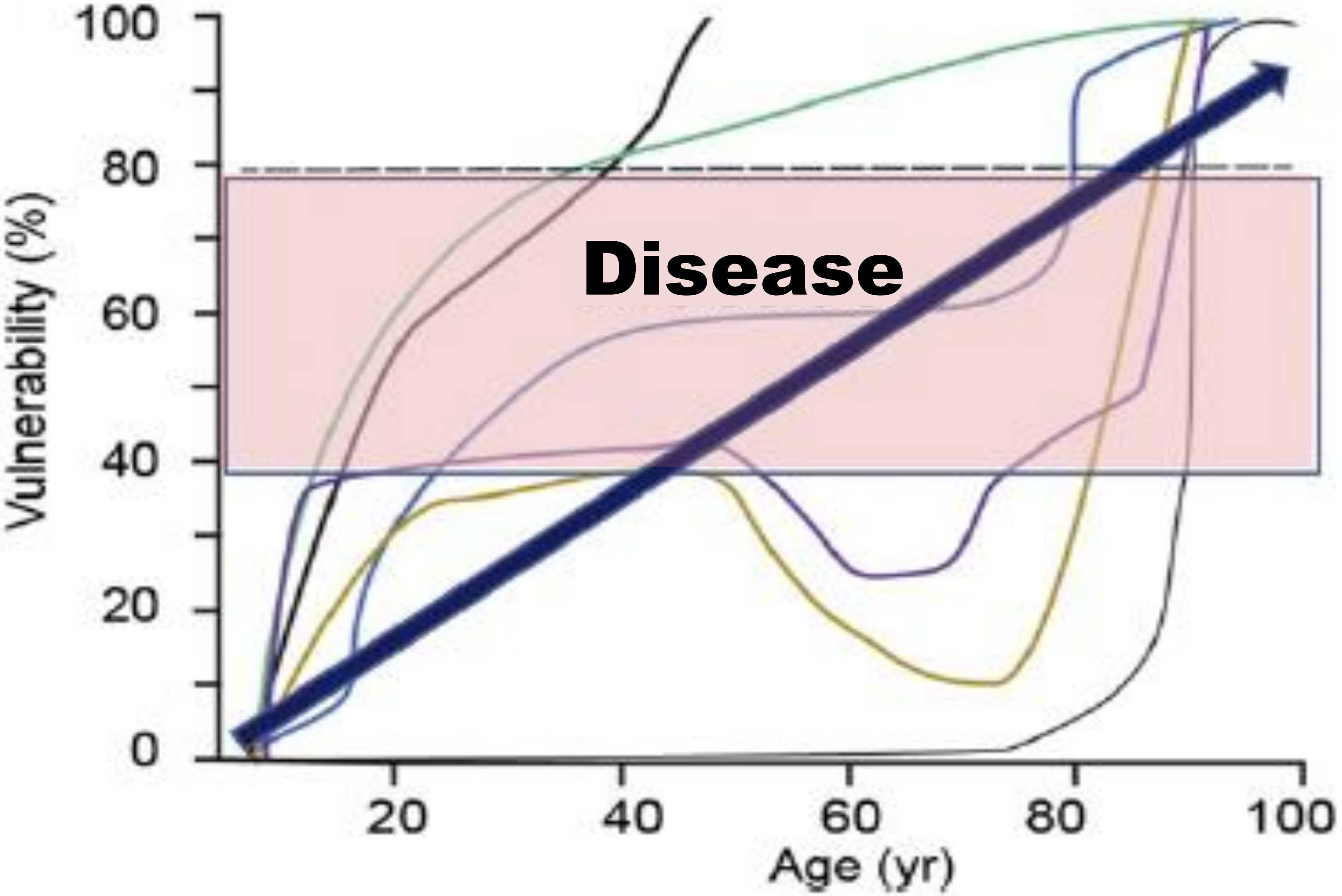


López-Otín C, et al. Cell. 2013;153:1194-217



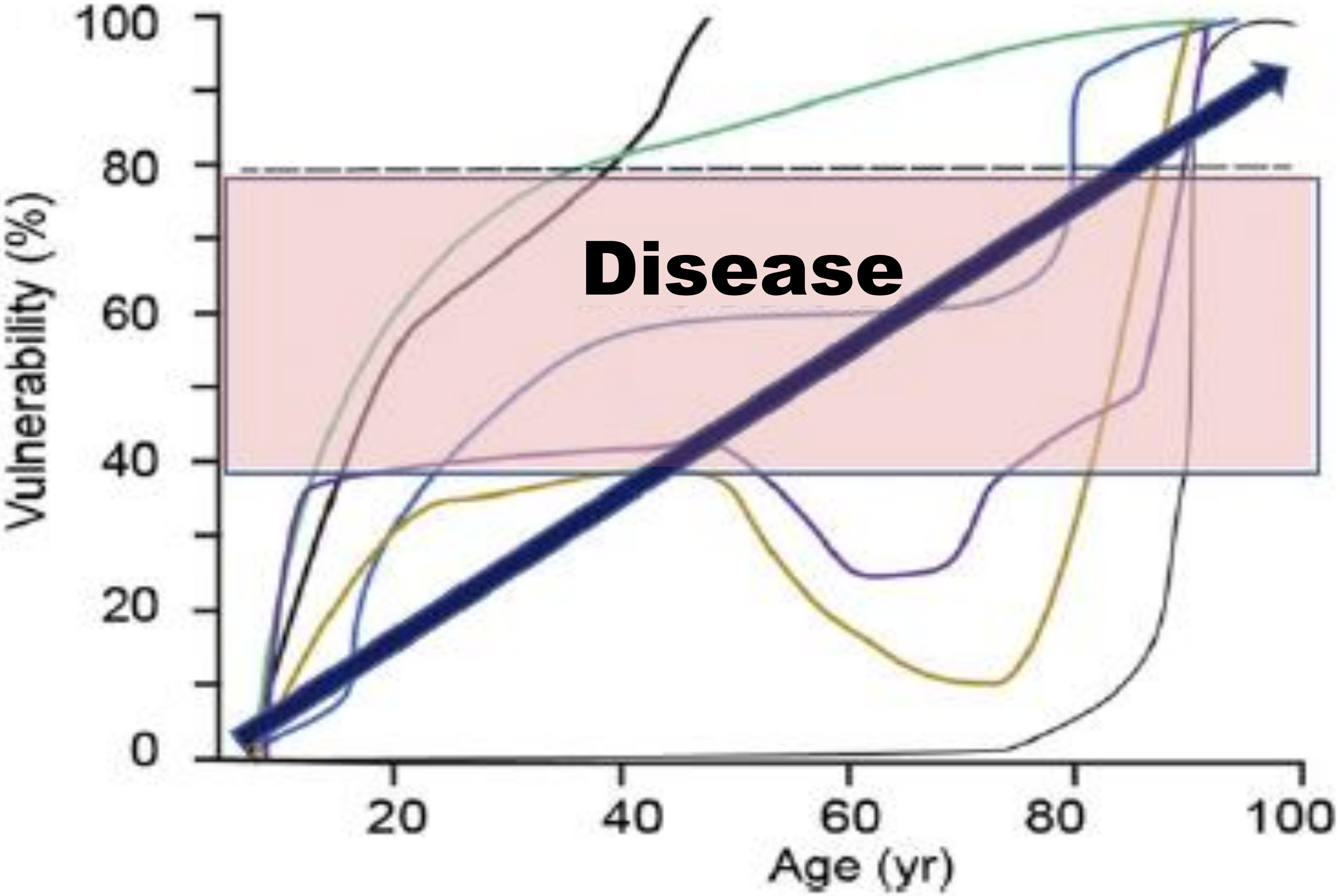
López-Otín C, et al. Cell. 2013;153:1194-217

Age: CVD with Cumulative Disease and Vulnerability



Lakatta EG, J Mol Cell Cardiol. 2015;83:1-13

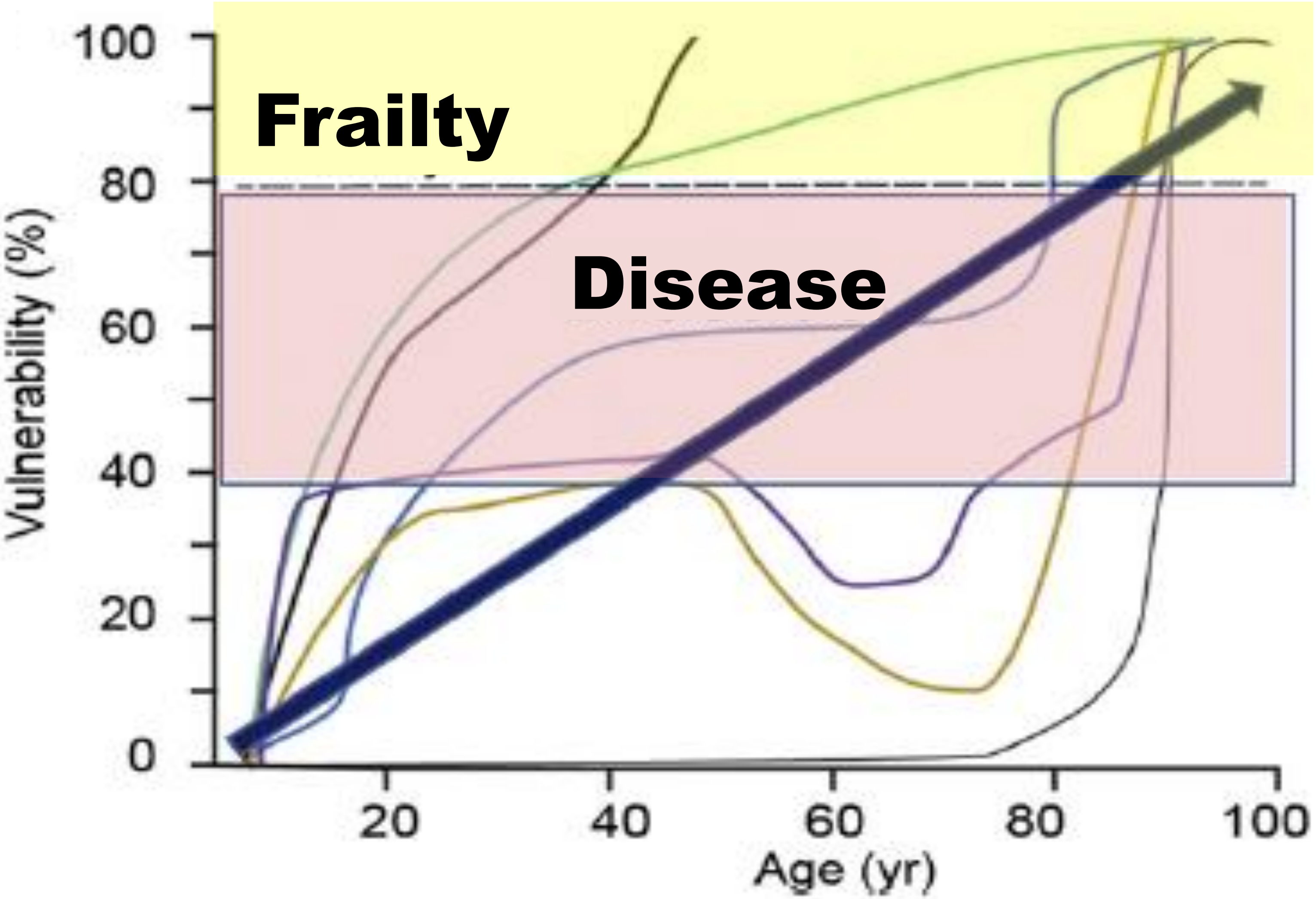
Age: CVD with Cumulative Disease and Vulnerability



CVD in a context of multimorbidity

Lakatta EG, J Mol Cell Cardiol. 2015;83:1-13

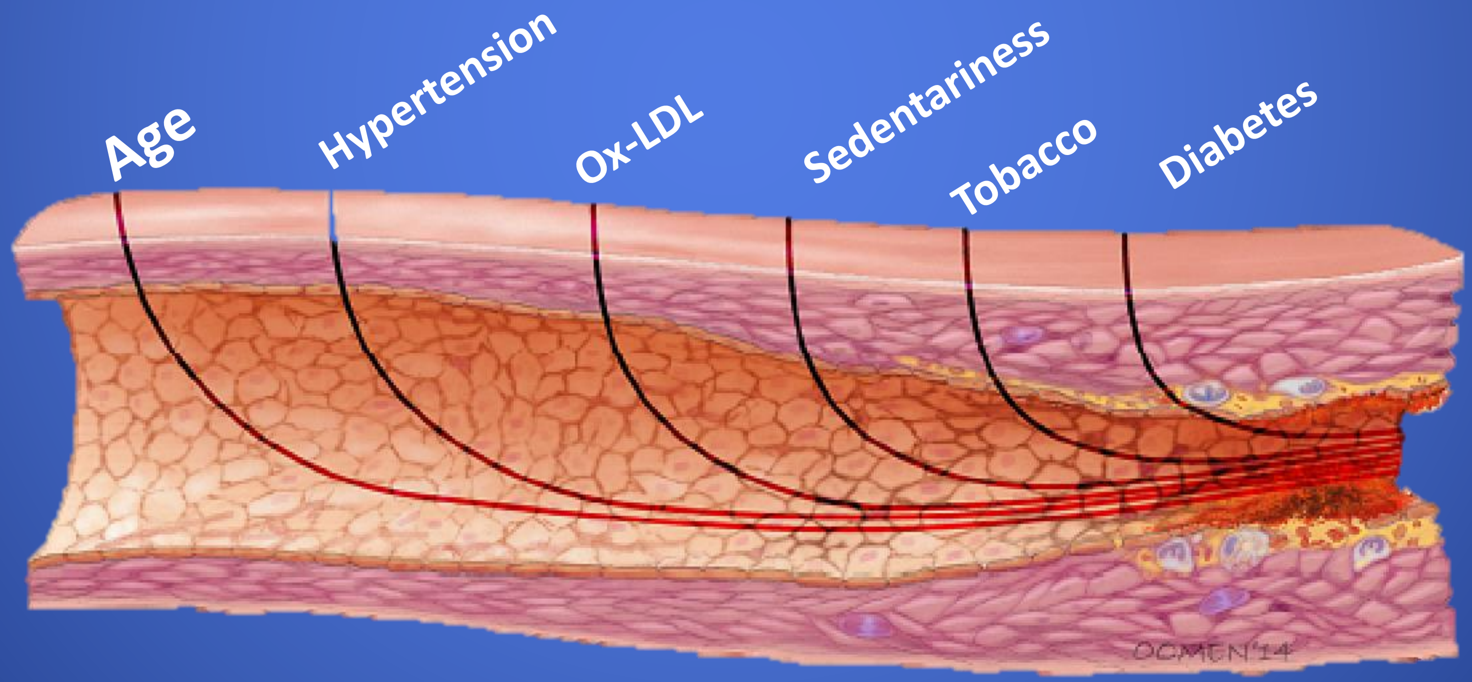
Age: CVD with Cumulative Disease and Vulnerability



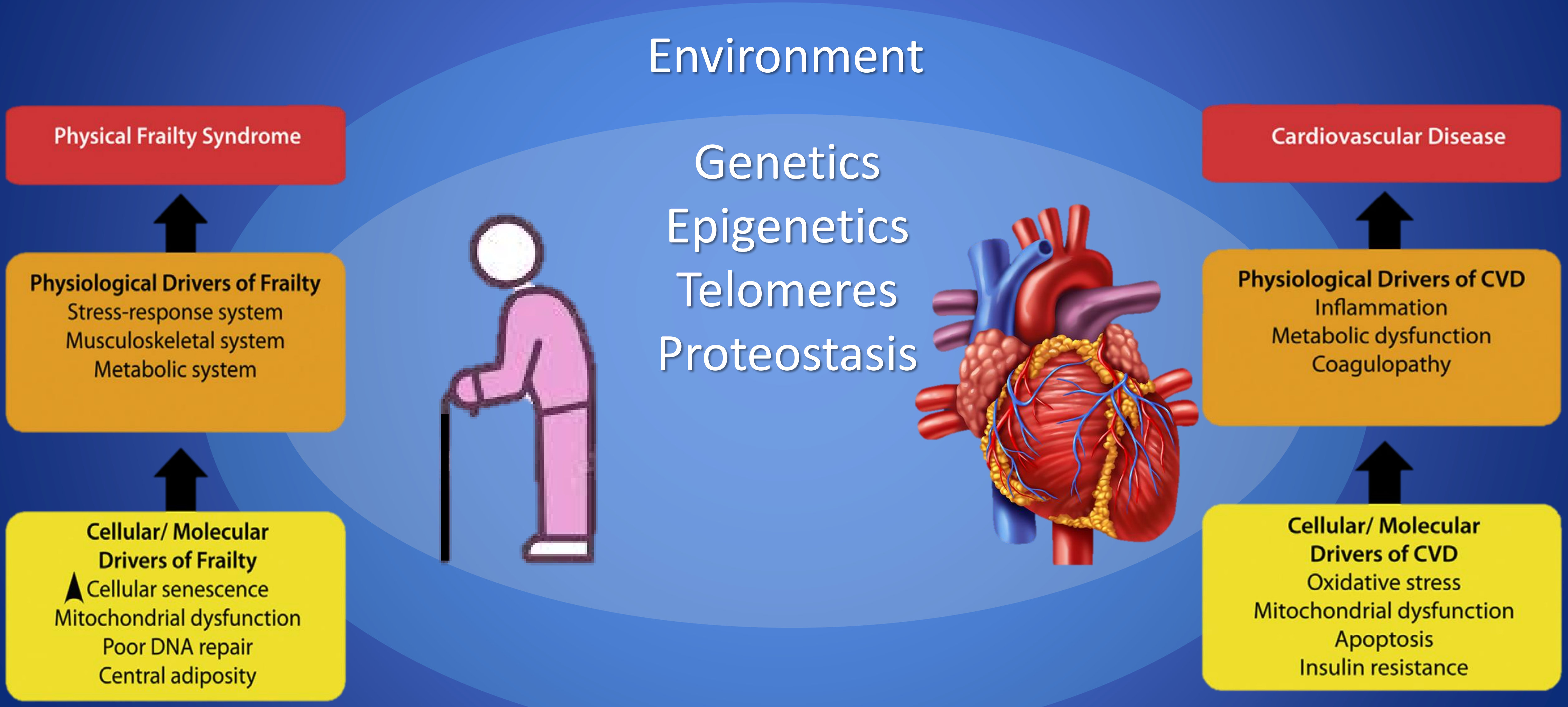
CVD in a context of multimorbidity and frailty

Lakatta EG, J Mol Cell Cardiol. 2015;83:1-13

CVD risks and typical aging…

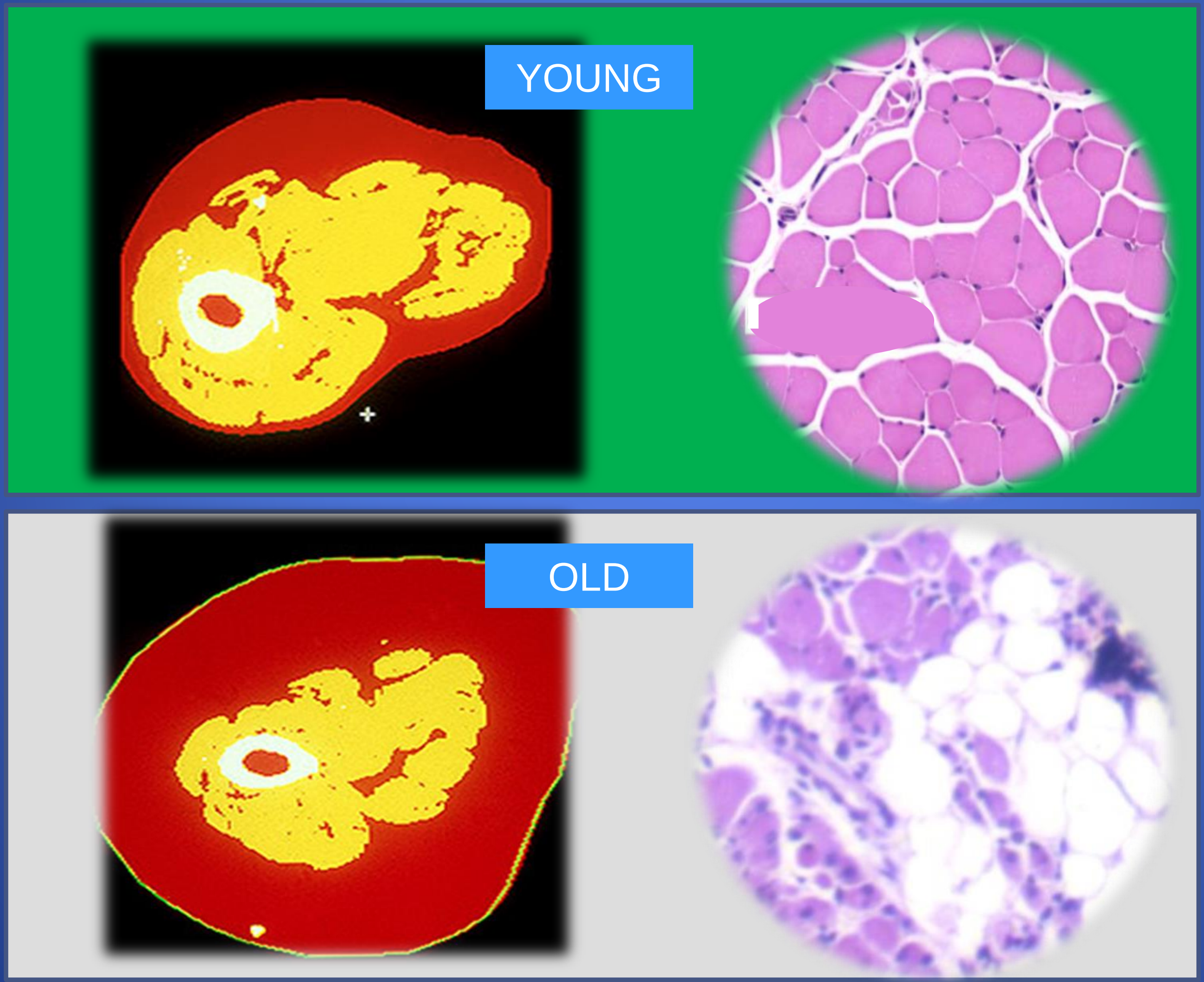


CVD Risk: *Drivers of Frailty and CVD Overlap*



Ijaz N, et al. J Am Coll Cardiol. 2022;79:482-503

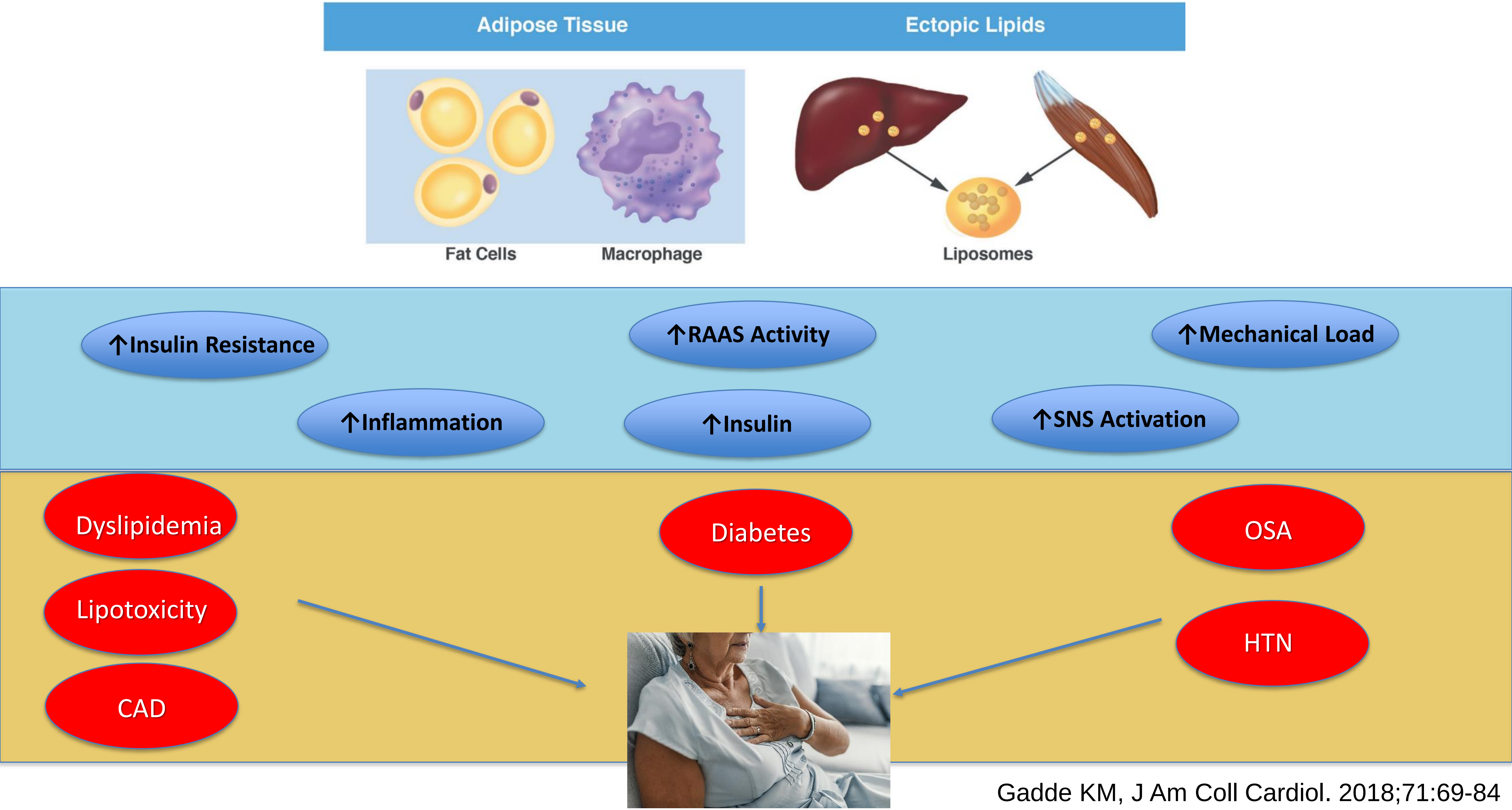
Sarcopenia: Skeletal Muscle Weakening and Atrophy



Inflammation

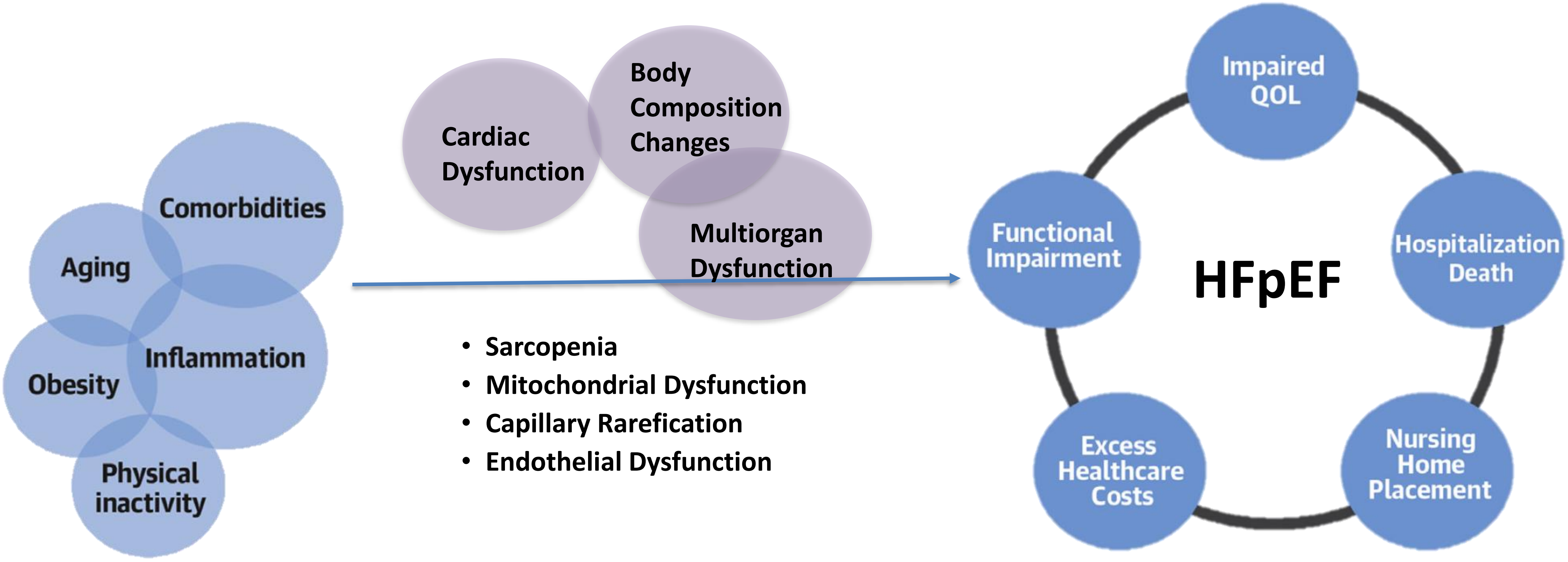
- ↑infiltrating adipose
- ↓type 2 fibers
- ↓Microvascular perfusion
- ↑Mitochondrial dysfunction
- ↑Apoptosis
- ↑Motor neuron loss

Maria Fiatarone Singh



Gadde KM, J Am Coll Cardiol. 2018;71:69-84

Distinctive Age-Related Vulnerabilities to HF Pathophysiology

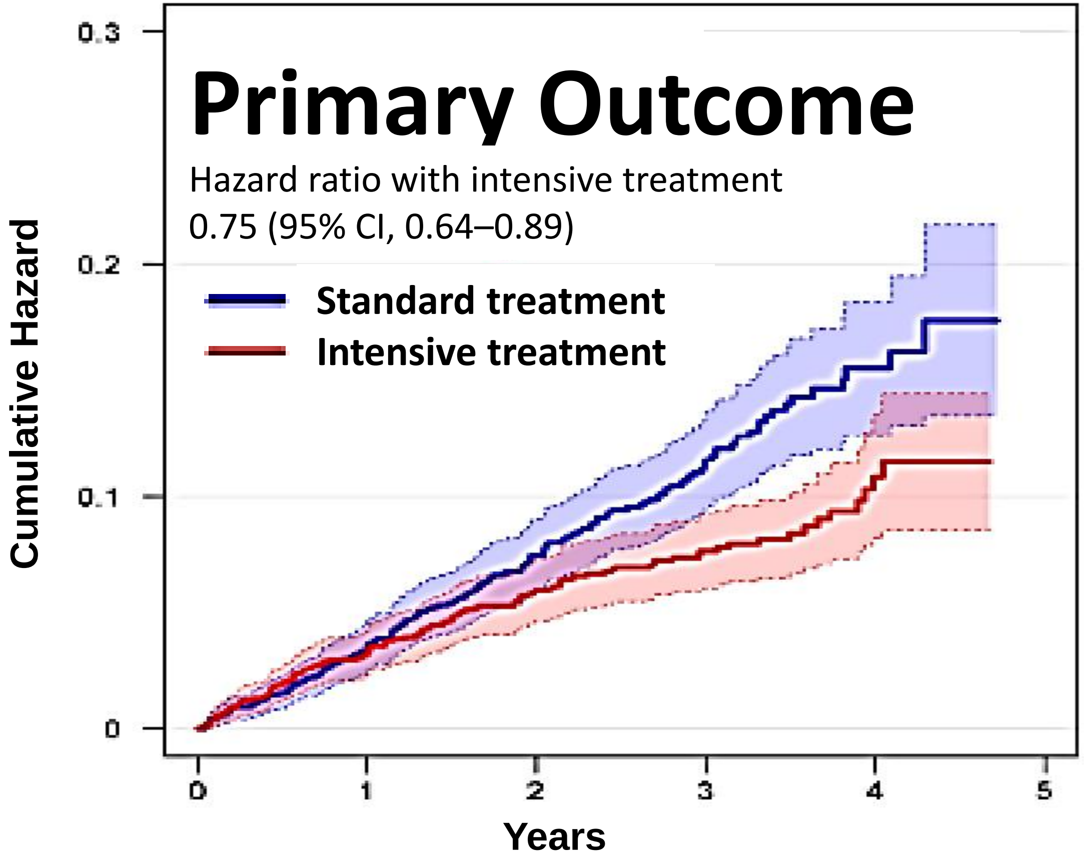


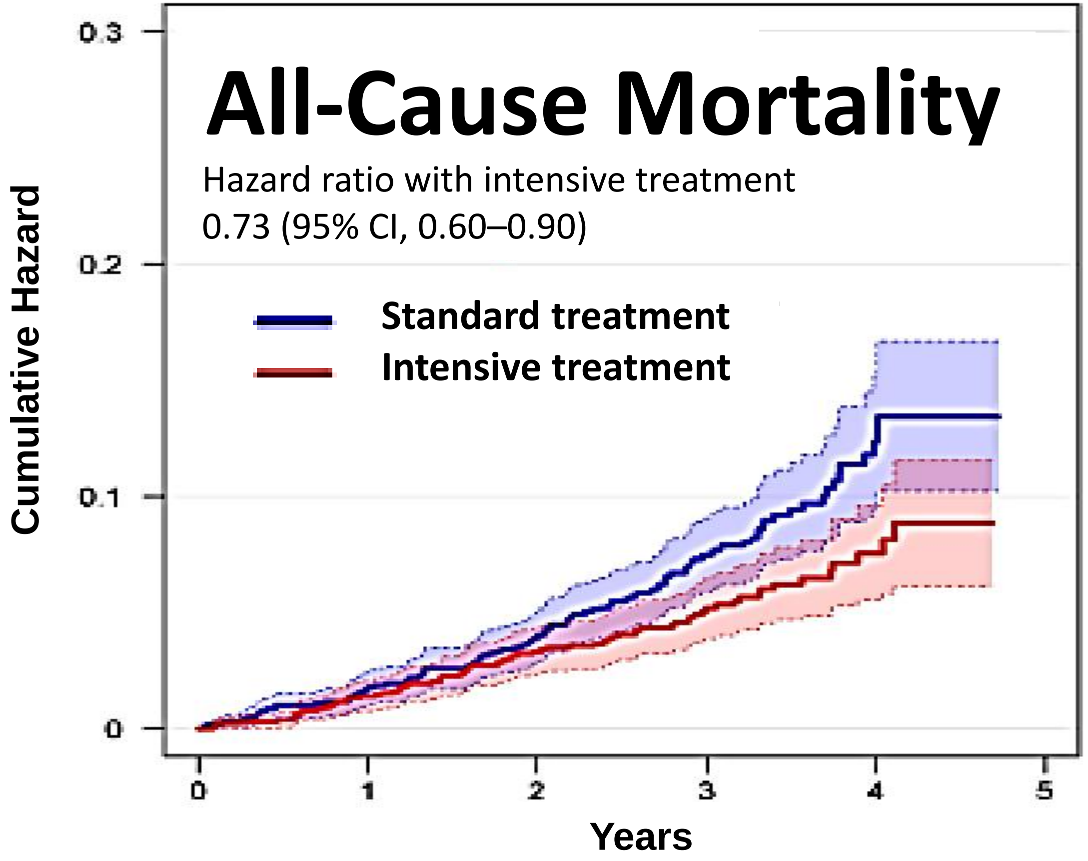
Pandey A…Kitzman DW. J Am Coll Cardiol. 2021;78:1166-87

Modifying Risk Factors to Incident HF

- Traditional CVD risk factors:
  - ↓Hypertension
  - ↓Cholesterol
  - ↓Sedentariness
- New Risk factors
  - Caloric Restriction
  - Caloric Restriction Mimetics

Systolic Blood Pressure Intervention Trial (SPRINT) : Lower is better…

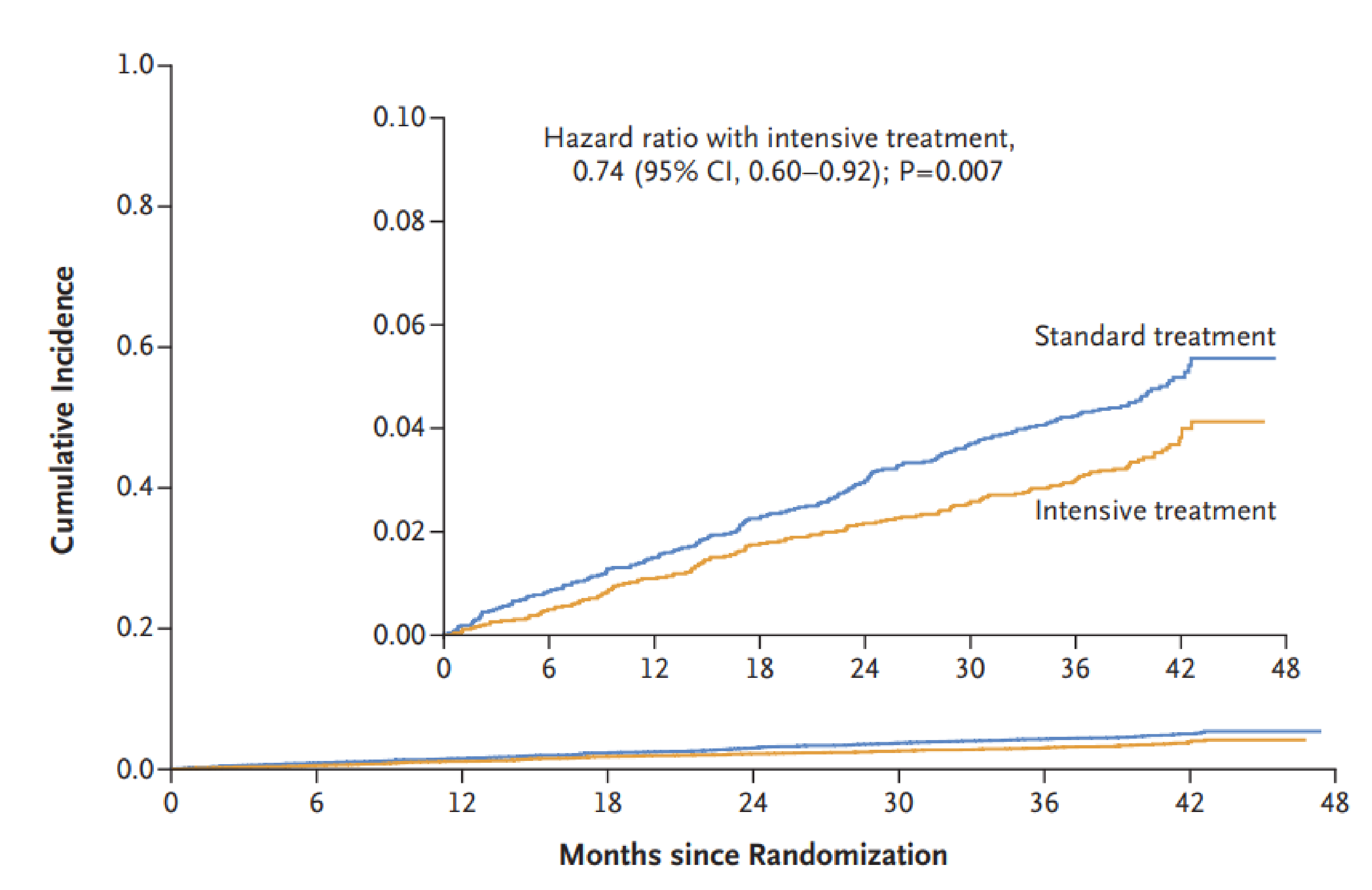




Composite of MI, ACS, stroke, HF, or death from cardiovascular causes

Sprint Research Group. N Engl J Med. 2015;373:2103-16

Strategy of Blood Pressure Intervention in the Elderly Hypertensive Patients (STEP)



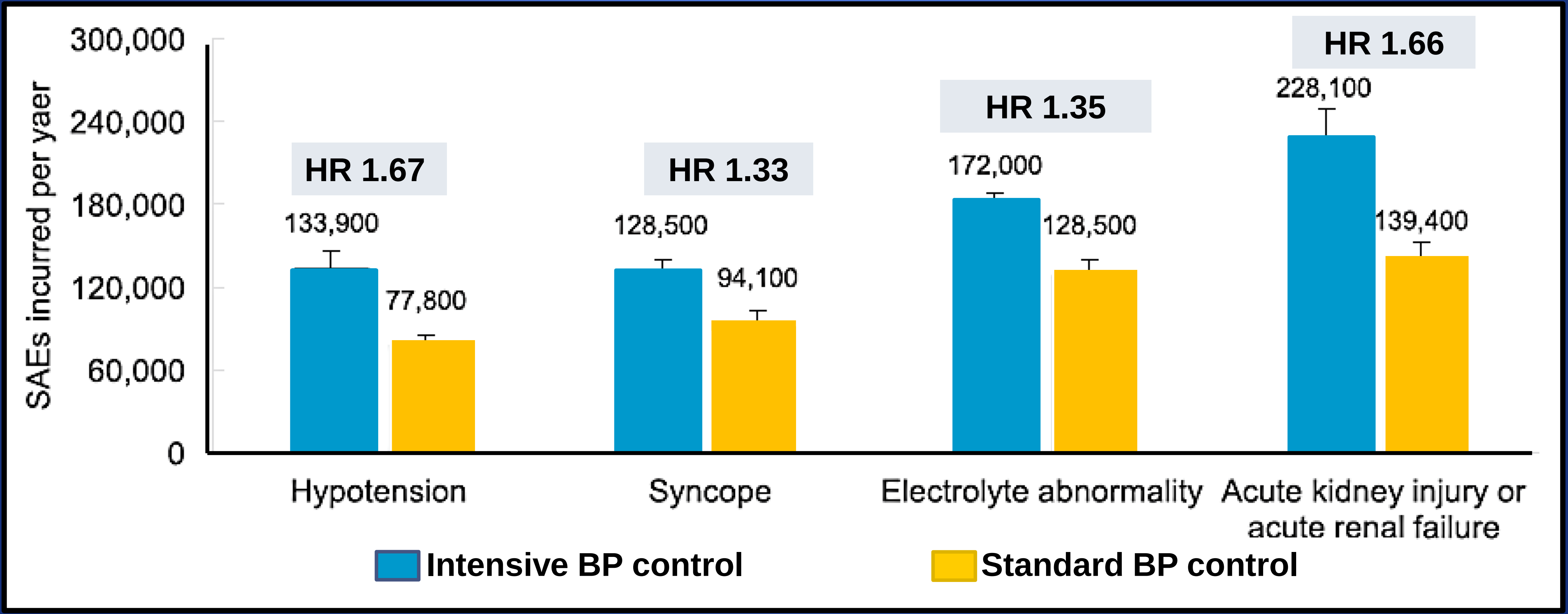
- 60-80 yo
- N=8511
- olmesartan, amlodipine, and HCTZ
- BP systolic target: 110-130 mmHg

1º Outcome:
Composite of stroke, acute coronary syndrome (MI and UA), acute decompensated heart failure, coronary revascularization, atrial fibrillation, or CVD death

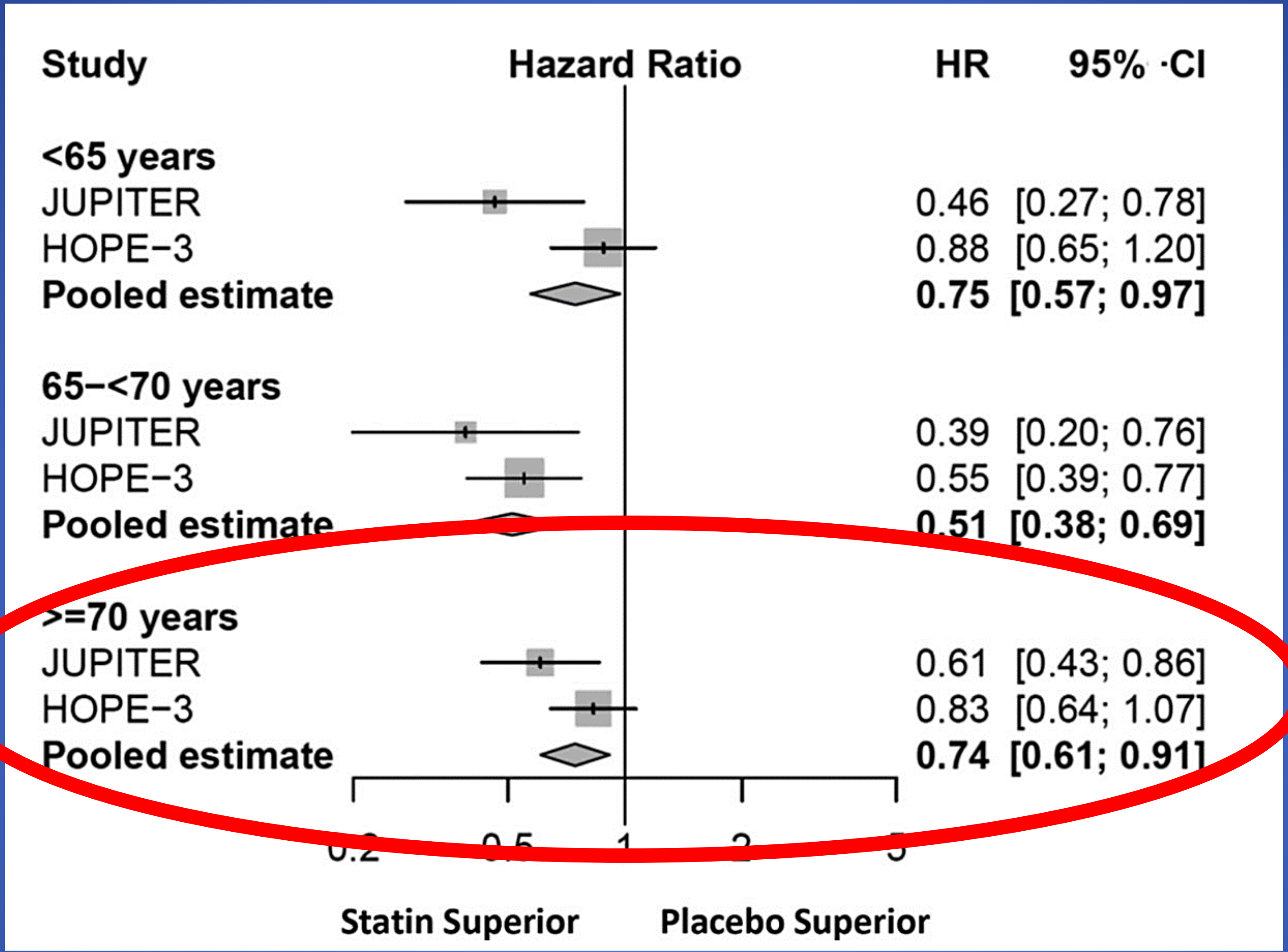
HF declines 28%

Zhang W, et al. N Engl J Med 2021;385:1268-79

Increased adverse events



Bress AP, et al. Circulation. 2017;135:1617-28



Trial	N
JUPITER	7,458
HOPE-3	6,059
JUPITER	4,649
HOPE-3	3,559
JUPITER	5,695
HOPE-3	3,086

Data combined from Jupiter and HOPE-3:

- **Adults ≥70 years: 26% relative risk reduction for the endpoint nonfatal MI, nonfatal stroke, or CV death**

Ridker PM, et al. Circulation 2017; 135:1979-81

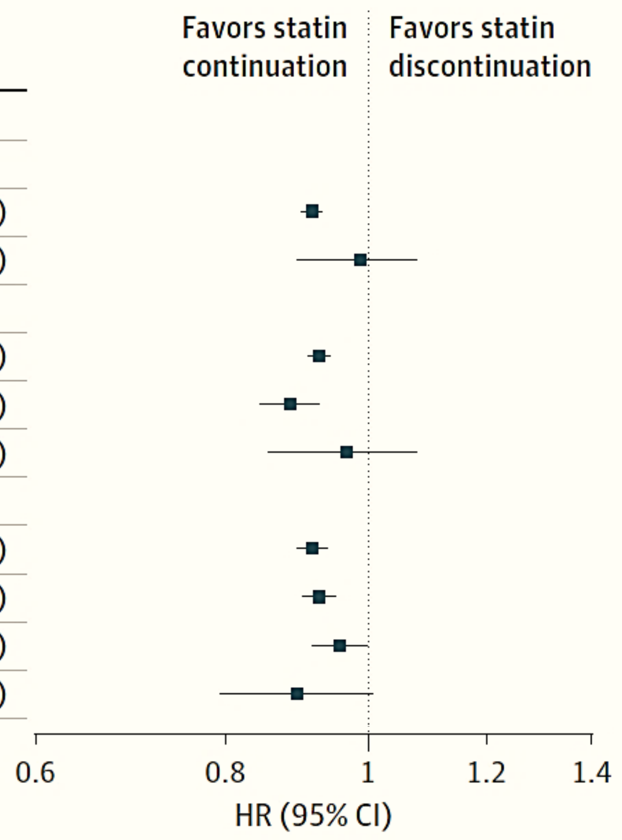
New Statin Use in US Veterans Over Age 75

Outcome	Crude rate/1000 person-years: Statin user (N = 57 178)	Crude rate/1000 person-years: Statin nonuser (N = 269 803)	Weighted incidence rate difference/1000 person-years (95% CI)[a]	HR (95% CI)	*P* value
Primary outcomes					
All-cause mortality (n = 206 902)	78.7	98.2	−19.45 (−20.38 to −18.52)	0.75 (0.74 to 0.76)	<.001
All CV death (n = 53 296)	22.6	25.7	−3.09 (−3.63 to −2.55)	0.80 (0.78 to 0.81)	<.001
Secondary outcomes					
ASCVD composite (n = 123 379)[b]	66.3	70.4	−4.05 (−5.09 to −3.02)	0.92 (0.91 to 0.94)	<.001

N=57,178,
Mean age 81.4 yrs

Orkaby AR, et al. JAMA. 2020;324:68-78

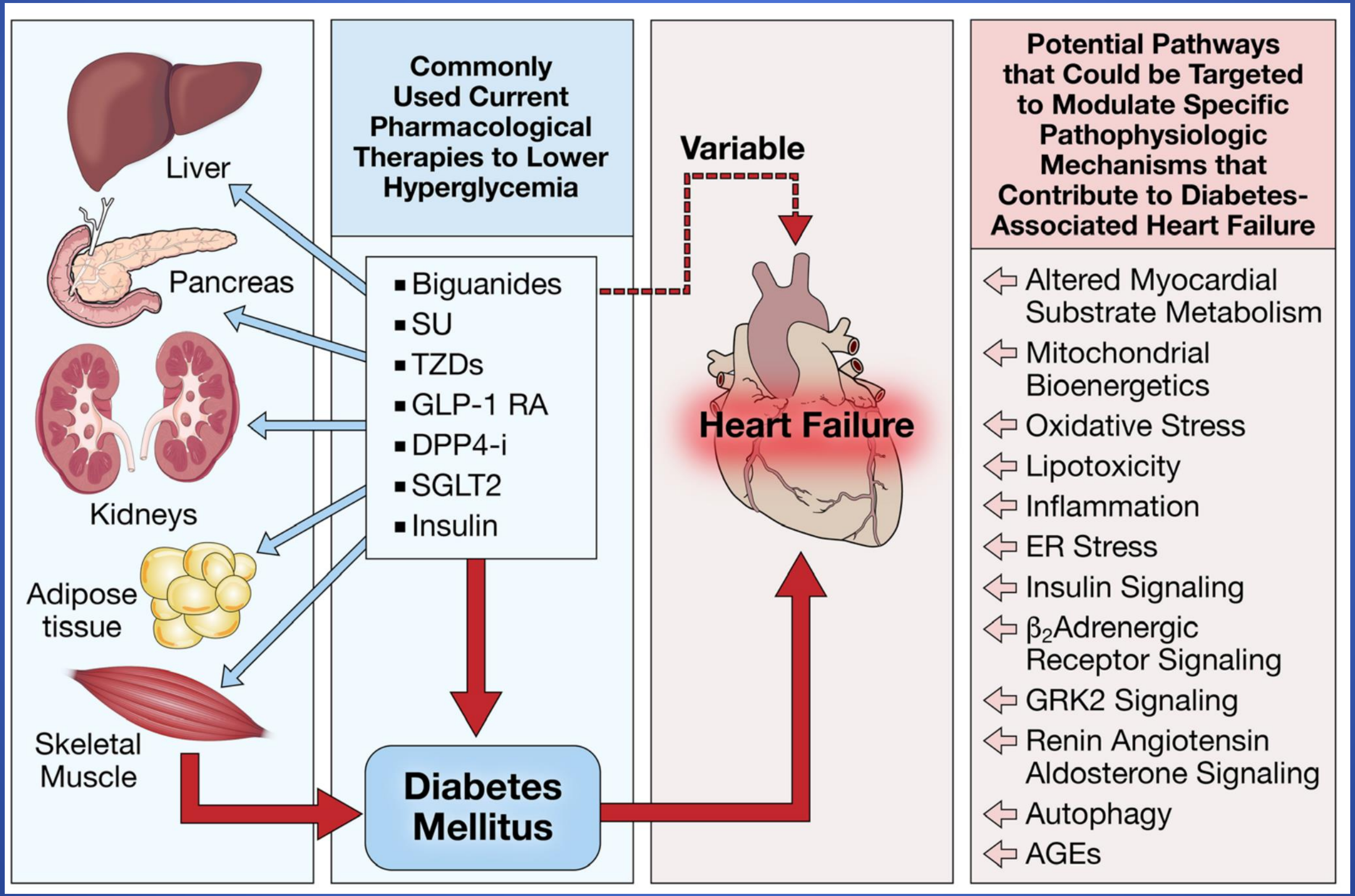
Outcome	No. of events/No. at risk		Weighted incidence rate difference/1000 person-years (95% CI)	HR (95% CI)
	Statin user	Statin nonuser		
Atherosclerotic cardiovascular disease composite				
Sex				
Men	21 111/55 622	99 098/318 244	-4.20 (-5.25 to -3.15)	0.92 (0.91-0.94)
Women	593/1556	2584/8737	1.49 (-4.57 to 7.56)	0.99 (0.90-1.08)
Race				
White	18 961/51 570	88 680/296 617	-3.63 (-4.69 to -2.56)	0.93 (0.91-0.94)
Black	2341 /4530	11 320/24 641	-10.88 (-15.49 to -6.27)	0.89 (0.85-0.93)
Other	402/1078	1567/4645	1.44 (-5.62 to 8.51)	0.97 (0.86-1.08)
Age group, y				
75-79	9161 /24 092	50 538/163 178	-2.95 (-4.31 to -1.59)	0.92 (0.90-0.95)
80-84	9279/24 295	36 084/115 062	-4.94 (-6.68 to -3.20)	0.93 (0.90-0.95)
85-89	2901/7826	12 269/40 186	-3.40 (-7.16 to 0.36)	0.96 (0.92-1.00)
≥90	363/965	2791/8555	-12.99 (-26.36 to 0.39)	0.90 (0.80-1.01)



N=57,178,
Mean age 81.4 yrs

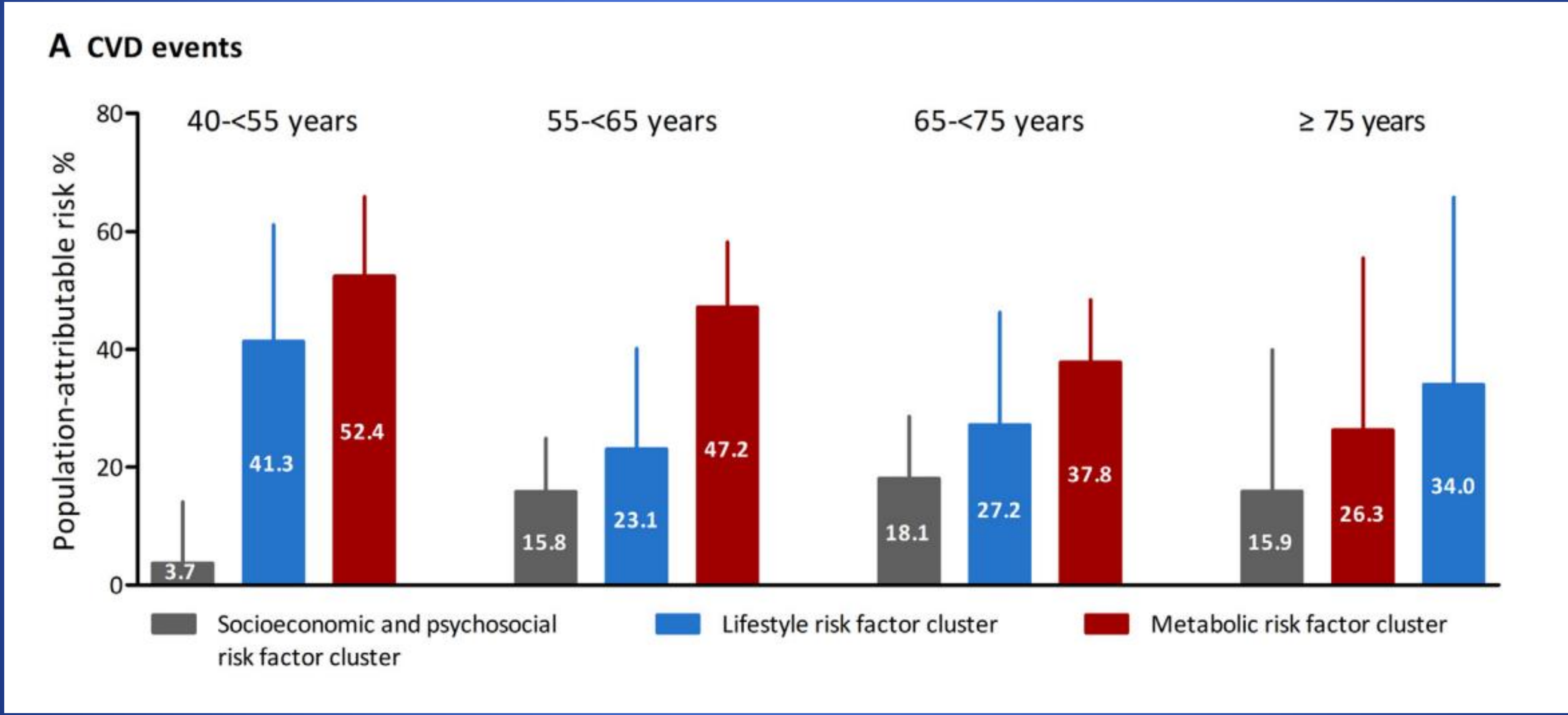
Orkaby AR, et al. JAMA. 2020;324:68-78

DM and HF: *More than glucose control*



Kenny HC, Abel ED. Circ Res. 2019;124:121-141

Age-Specific Shifts in CVD Risk Factors

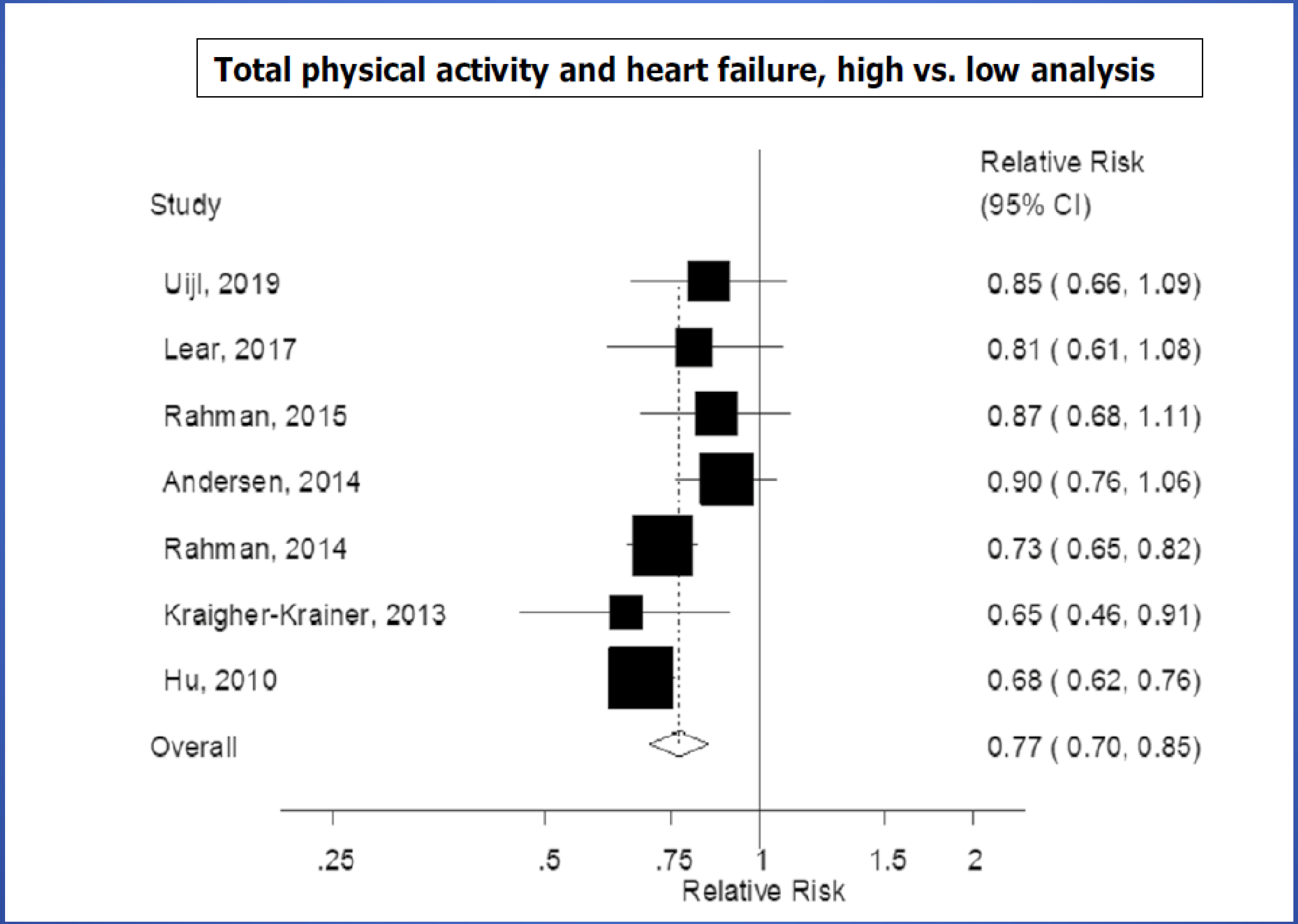


Wang T, et al. Lancet Regional Health September 26, 2021 DOI:https://doi.org/10.1016/j.lanwpc.2021.100277

↑Implications of Lifestyle Risk Factors in Older Adults

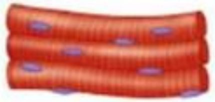
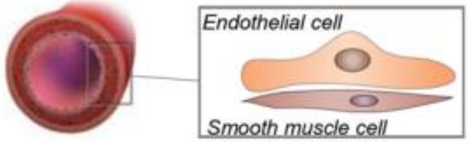
- Physical Activity
- Caloric Restriction
- Caloric Restriction Mimetics
  - Rapamycin
  - Resveratrol
  - Metformin
  - Canakinumab

Physical Activity and Heart Failure

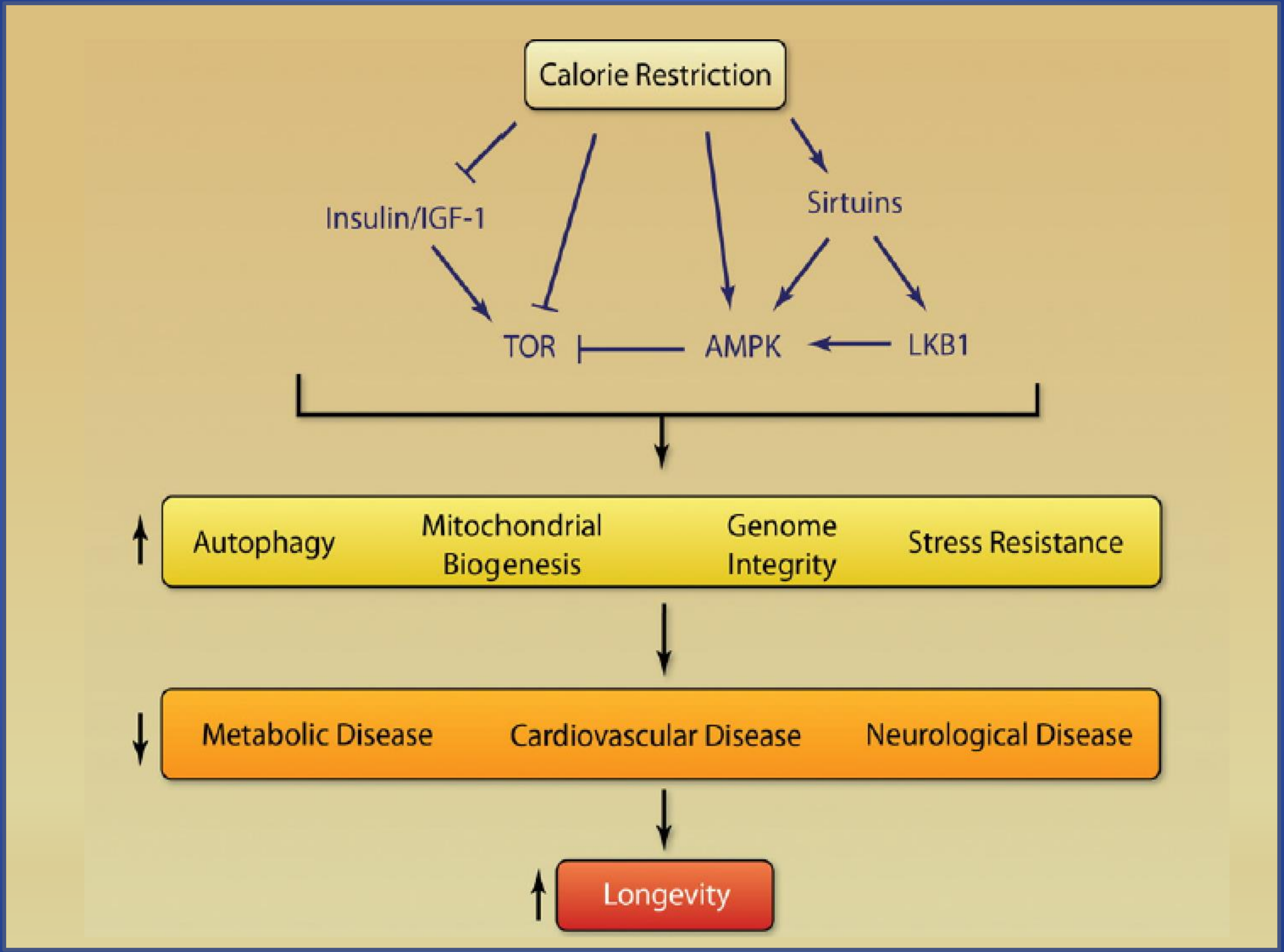


Aune D, e al. European Journal of Epidemiology (2021) 36:367–381

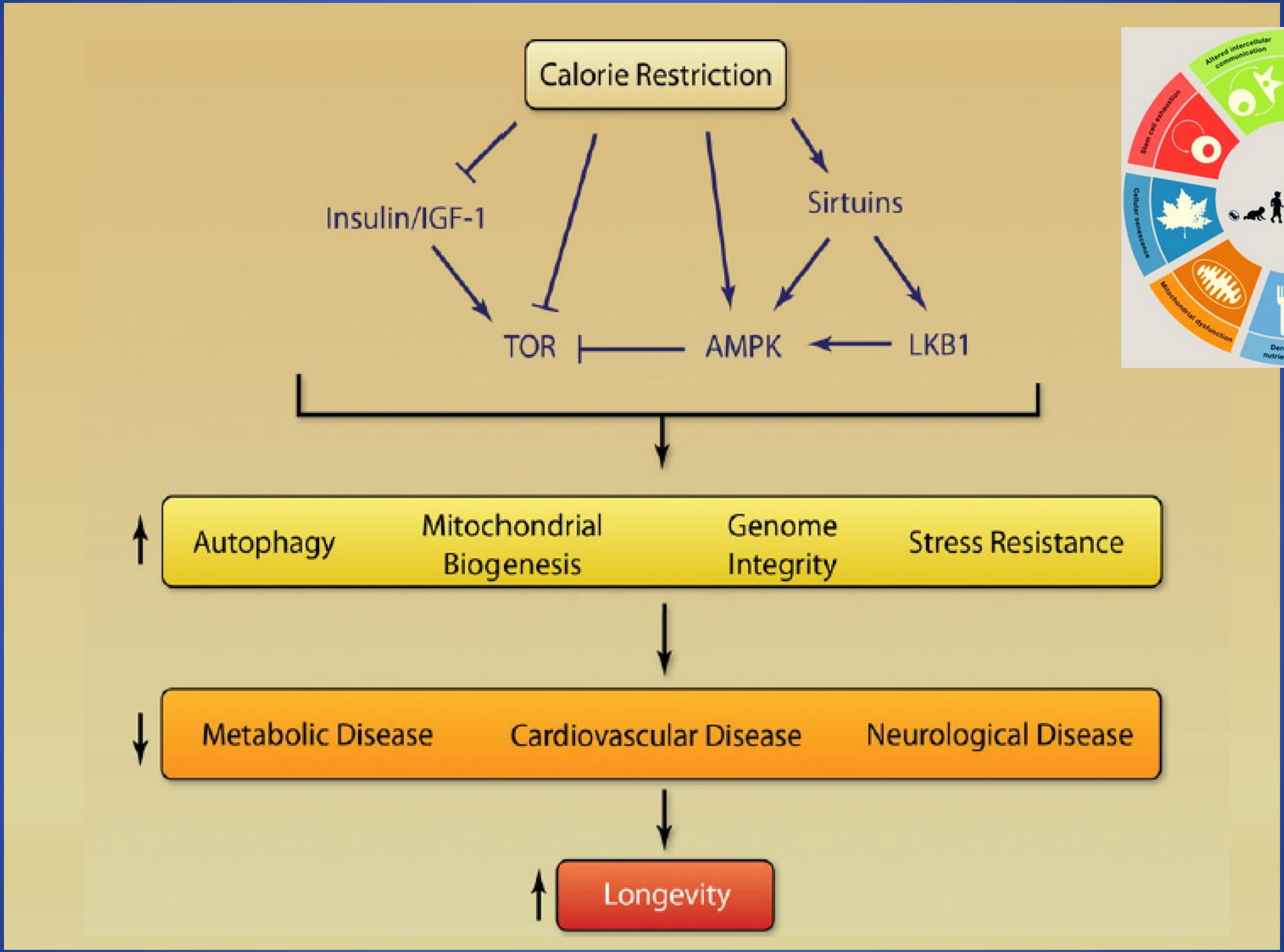
Exercise as Medicine

	Mitochondrial	Skeletal Muscle	Cardiac Muscle	Conduit Arteries
				
Sedentary 	•↑ mitochondrial DNA deletions and mutations[71] •Electron transport chain abnormalities[72] •↑ mitochondrial fission[73] •↓ mitochondrial content[74] •↓ respiration[4]	•↑ IL-6 and CRP[80] •Activation of proteolytic systems[81] •Inactivation of the PI3K/Akt/mTOR pathway[82] •↓ lean muscle mass[83] •Greater proportion of hybrid fibers possibly due to dysregulation in MHC isoform expression[84]	•↑ AGE accumulation indicative of collagen cross-linking[87] •↑ Left ventricular stiffness[88] •β-adrenergic receptor desensitization resulting in impaired inotropic and chronotropic responses to adrenergic stimulation[89, 90] •↓ SERCA2a contributes to prolonged calcium transients[91]	•↓ sympathetic baroreflex sensitivity and ↑ sympathetic activation[94] •↑ NOS uncoupling, ↓ NO bioavailability, thereby ↑ oxidative stress[94] •Extracellular matrix remodeling through elastin degradation by MMPs and formation of AGEs[95] •Endothelial dysfunction[96]
Physical Activity 	•↑ mitochondrial protein turnover through degradation of damaged proteins and de novo synthesis of new functional proteins[75] •↑ expression of PGC-1α[76, 77] •↑ SIRT3 content[78] •↑ mitochondrial volume[79]	•↑ metabolic enzymes profile: citrate synthase, β-HAD, glycogen phosphorylase[85] •↓ catabolic mRNA expression (FOXO3a, MuRF-1, Atrogin-1, myostatin)[86] •↑ capillary-to-fiber ratio[85] •↑ insulin sensitivity[76]	•↑ SERCA2a mRNA & protein expression[92] •↑ phosphorylation of threonine-17 residue of phospholamban allowing for faster reuptake of cytoplasmic calcium[92] •↑ contractility and relaxation due to faster systolic rise and diastolic decay time of calcium[93] •↓ Left ventricular stiffness[88]	•Lower expression of the transcription factor p53 which is associated with senescence compared to sedentary counterparts[97] •Lower markers of senescence (p21 and p16)[97] •↓ expression of nitrotyrosine and NADPH oxidase (prooxidant)[96] •↑ expression of manganese SOD (antioxidant)[96]

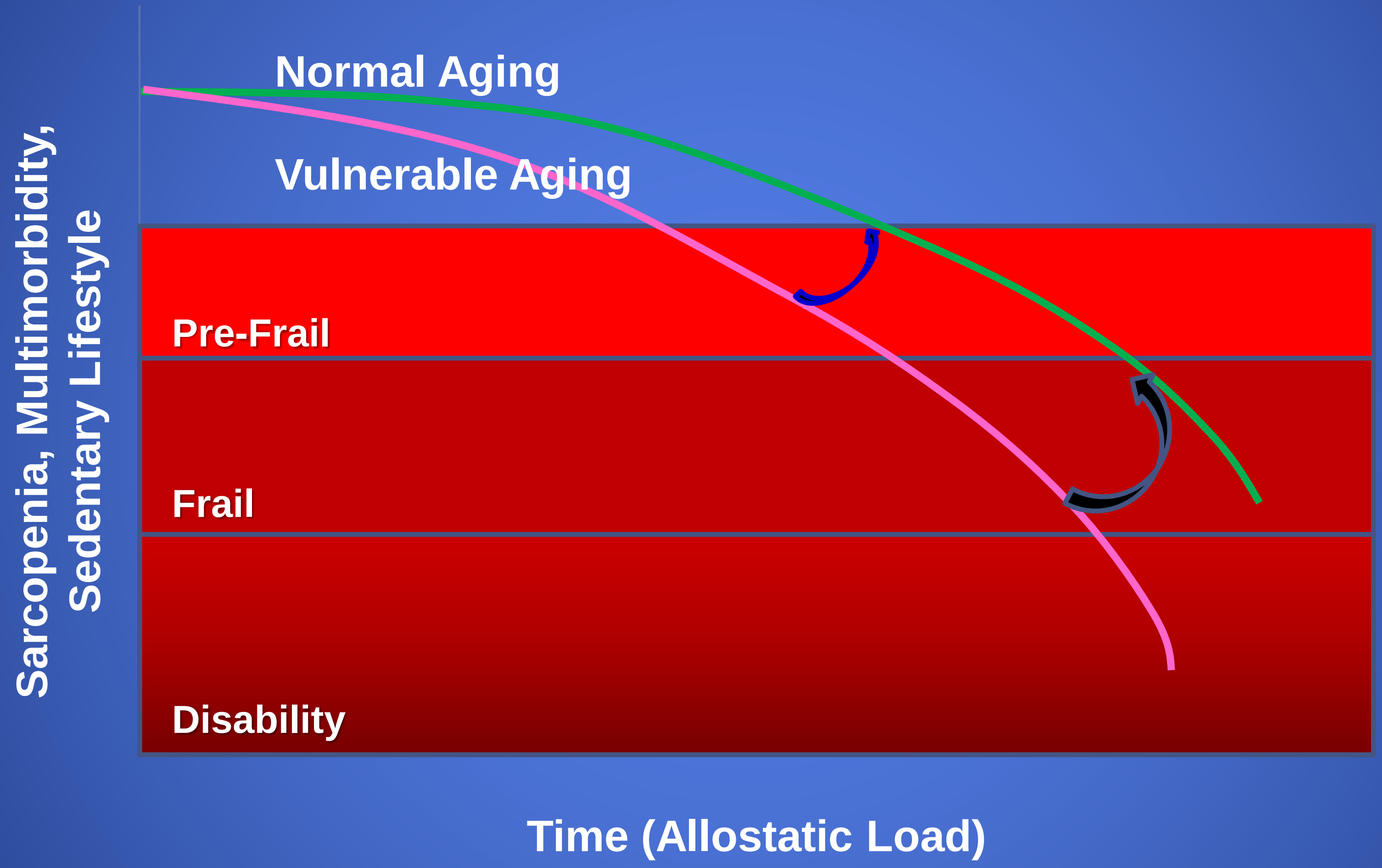
Lavie C, et al. Circ Res. 2019;124:799-815



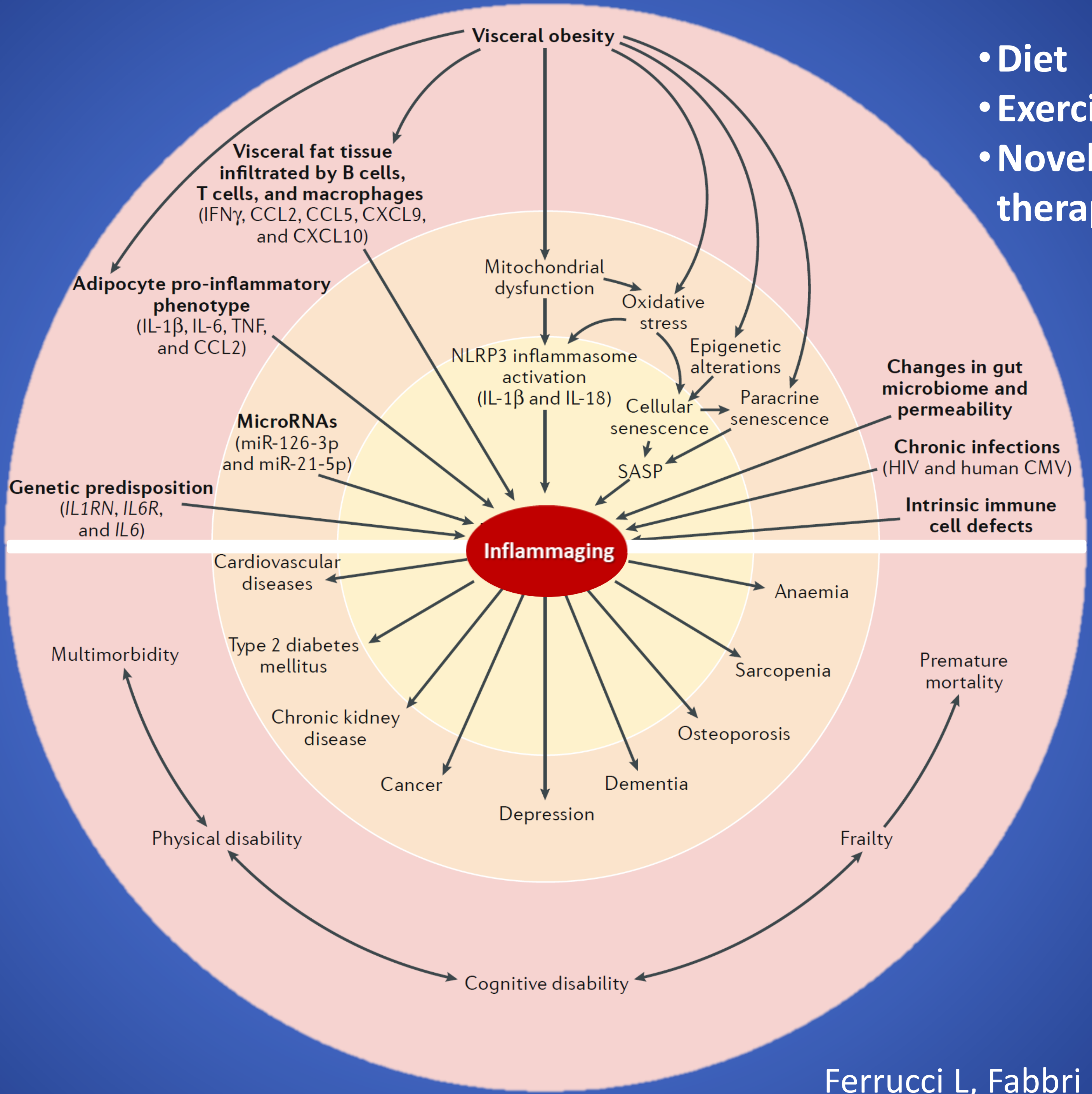
North BJ, Sinclair DA. Circ Res. 2012;110:1097-108



North BJ, Sinclair DA. Circ Res. 2012;110:1097-108



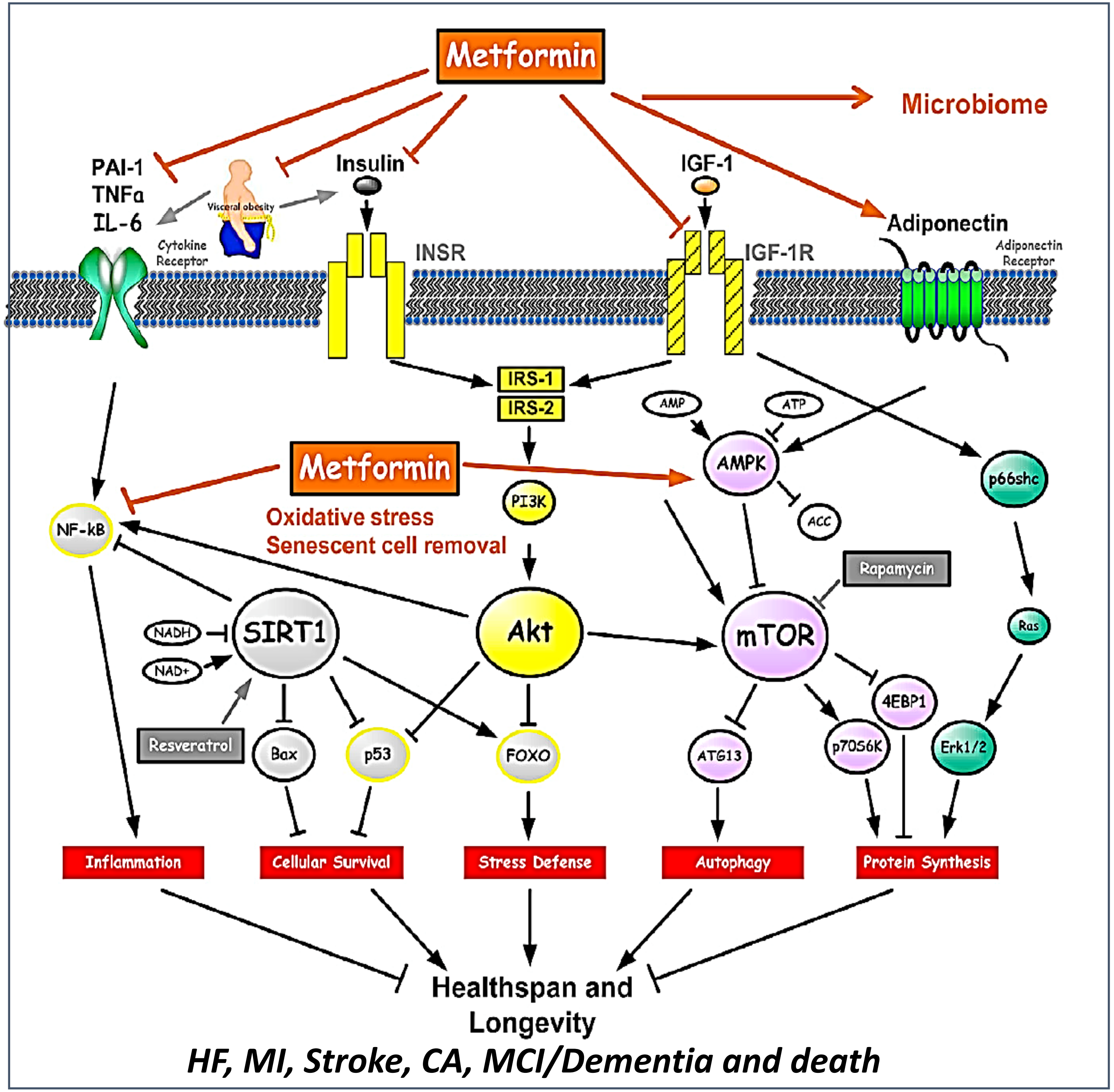
L Rodríguez-Mañas. J Gerontol A Biol Sci Med Sci. 2013;68:62–7



- Diet
- Exercise
- Novel anti-inflammatory therapeutics (Canakinumab)

Ferrucci L, Fabbri E. Nat Rev. 2018; 15:505-22

Targeting Aging with Metformin (TAME)



Metformin

- Most widely prescribed oral medication for type 2 DM worldwide

Barzilai N, Cell Metab. 2016;23:1060-5

Summary

- The rapidly growing population of older adults is intrinsically vulnerable to incident CVD
- Traditional risk factors have sustained and even increased benefit to moderate risks of HF amidst high susceptibility to CVD
- Novel risk factors associated with aging are now being recognized and provide new targets for risk modification

Heart Failure Awareness Week

Lunch & Learn

Monday, February 14th, 2022

Prevention and Early Detection of Heart Failure Patients

American Heart Association.

Heart Failure Awareness Week!

- Welcome!
- Daily Newsletters via email
- Lunch & Learns Monday - Friday 12om CST/ 1pm EST
- Join HFSA and other heart failure-focused organizations on Twitter at 11:00 AM CT on **Wednesday, February 17** for a lively discussion on heart failure. The purpose of the chat is to provide healthcare providers and heart failure patients with an overview on the status of heart failure and to discuss ways to improve quality of care and expand heart failure awareness. **Follow hashtag #HFChat2022**
- Recordings
- Slides & Attachments
- Submit questions through the question panel

Prevention and Early Detection of Heart Failure Patients

Jennifer Maning, DO

American Heart Association | American Stroke Association®

Heart Failure Burden

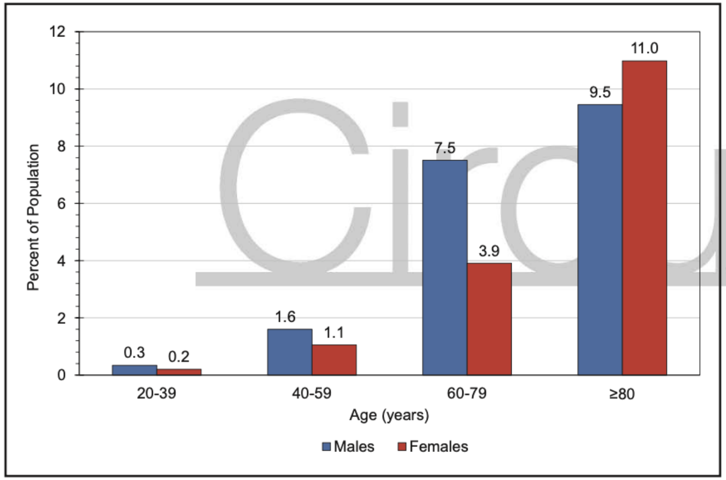


Chart 22-3. Prevalence of heart failure among US adults ≥20 years of age, by sex and age (NHANES, 2015–2018).
NHANES indicates National Health and Nutrition Examination Survey.
Source: Unpublished National Heart, Lung, and Blood Institute tabulation using NHANES.[31]

Prevalence of HF is projected to increase by 46% from 2012 to 2030**, affecting >8 million people** 18 years of age or older

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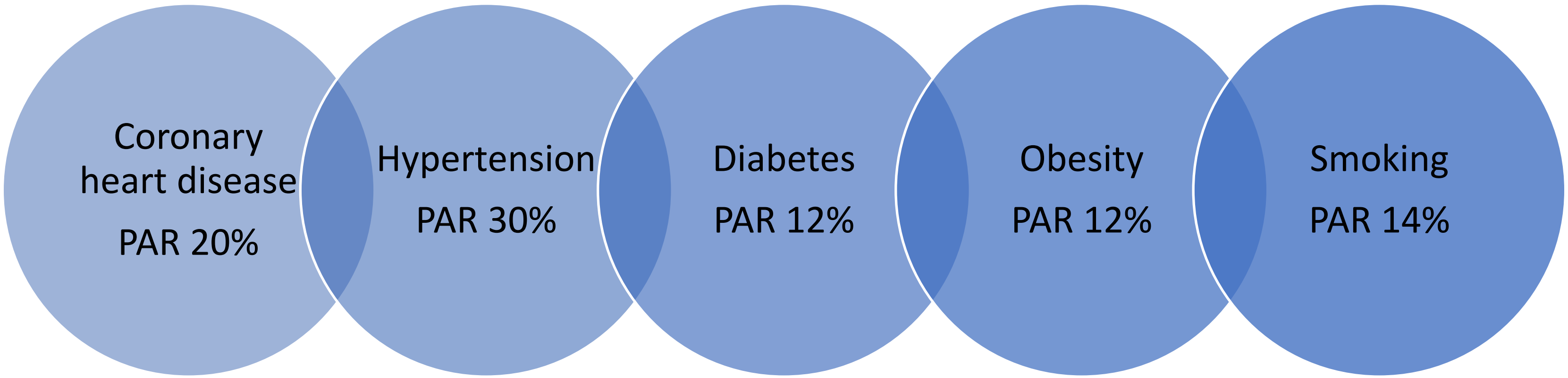
[31]Centers for Disease Control and Prevention, National Center for Health Statistics. National Health and Nutrition Examination Survey (NHANES) public use data files. Accessed April 15, 2021.

Heart Failure Risk Factors



PAR, population attributable risk

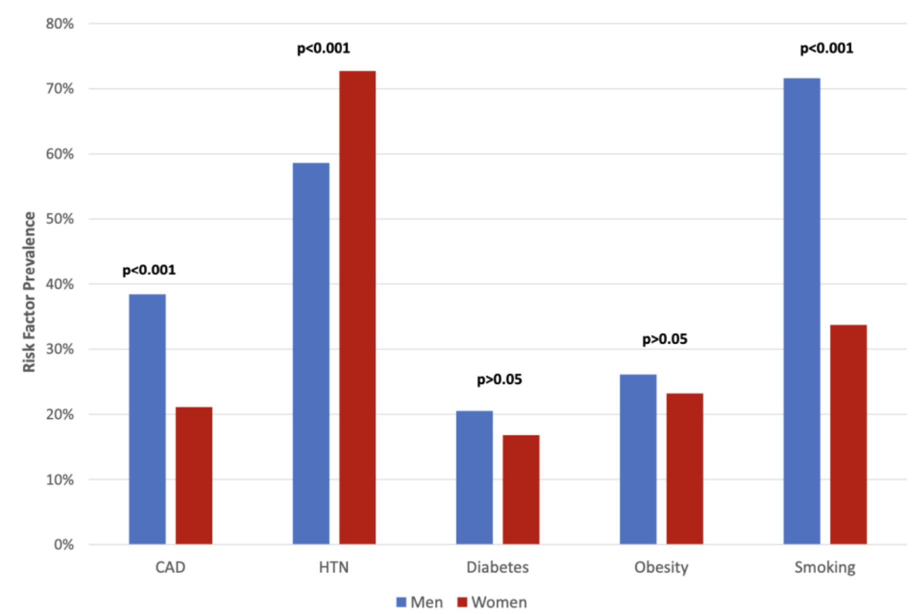
Data from NHANES show that one-third of US adults have at least 1 HF risk factor

Tsao CW et al; American Heart Association Council on Epidemiology and Prevention Statistics Committee and Stroke Statistics Subcommittee. Heart Disease and Stroke Statistics-2022 Update: A Report From the American Heart Association. Circulation. 2022 Jan 26:CIR0000000000001052

Sex Differences in Risk Factors

- *Hypertension* is the most common risk factor in women while *coronary artery disease* is the most common risk factor among men

FIGURE 2 Prevalence of Risk Factors for HF in Men and Women



Daubert MA, Douglas PS. Primary Prevention of Heart Failure in Women. JACC Heart Fail. 2019 Mar;7(3):181-191.

Hypertension

- Long term treatment of hypertension reduces the risk of HF by ~50% and is associated with lower HF mortality

Most effective anti-hypertensive medication classes in reducing the incidence of HF

Diuretics
OR 0.59

ACEI
OR 0.70

ARB
OR 0.76

OR, odds ratio

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Sciarretta S et al. Antihypertensive treatment and development of heart failure in hypertension: a Bayesian network meta-analysis of studies in patients with hypertension and high cardiovascular risk. Arch Intern Med. 2011 Mar 14;171(5):384-94

Diabetes

- For patients with diabetes, **SGLT2 inhibitors** have been shown to reduce incident heart failure (*even without a history of a prior MI or ASCVD)

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Verma S, McMurray JJV. The Serendipitous Story of SGLT2 Inhibitors in Heart Failure. Circulation. 2019 May 28;139(22):2537-2541

Dyslipidemia

Circulation
Volume 120, Issue 23, 8 December 2009; Pages 2345-2351
https://doi.org/10.1161/CIRCULATIONAHA.109.830984

EPIDEMIOLOGY AND PREVENTION

Relations of Lipid Concentrations to Heart Failure Incidence

The Framingham Heart Study

Raghava S. Velagaleti, MD, Joseph Massaro, PhD, Ramachandran S. Vasan, MD, Sander J. Robins, MD, William B. Kannel, MD, and Daniel Levy, MD

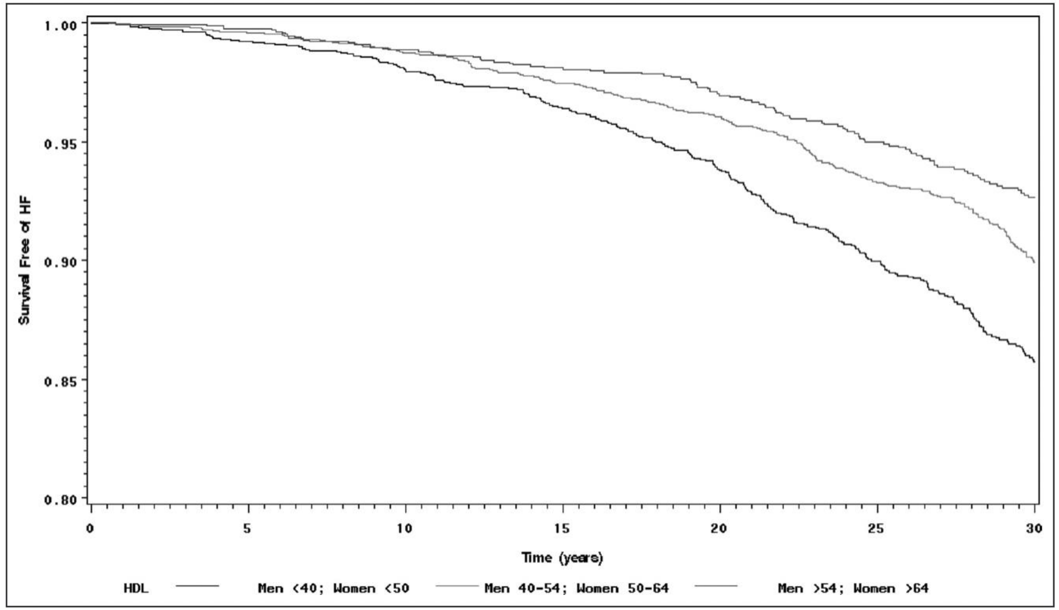

Figure 1. Kaplan-Meier curves of unadjusted survival free of HF in each HDL-C category.

American Heart Association | American Stroke Association®

Velagaleti RS, Massaro J, Vasan RS, Robins SJ, Kannel WB, Levy D. Relations of lipid concentrations to heart failure incidence: the Framingham Heart Study. Circulation. 2009 Dec 8;120(23):2345-51

Smoking

Tobacco use dependence is a

without a history of a prior MI or ASCVD but with multiple risk factors,

For former smokers, the risk of HF is comparable to that of never smokers after >15 years of tobacco cessation


American Heart Association.

ANSWERS by heart

Lifestyle + Risk Reduction
Smoking

How Can I Quit Smoking?

Smoking harms almost every tissue and organ in the body, including your heart and blood vessels. Nicotine, one of the main chemicals in cigarettes, causes your heart to beat faster and your blood pressure to rise. Carbon monoxide from smoking also gets into the blood and robs your body of oxygen. Nonsmokers who are exposed to secondhand smoke are also harmed.

If you smoke or vape, you have good reason to worry about its effect on your health and the health of your loved ones and others.

Deciding to quit is a big step. Following through is just as important. Quitting tobacco and nicotine addiction isn't easy, but others have done it, and you can, too.

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Arnett DK et al. 2019 ACC/AHA Guideline on the Primary Prevention of Cardiovascular Disease: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. Circulation. 2019 Sep 10;140(11):e596-e646

Physical activity

Meta-analysis of 10 cohort studies comprised of **282,889** patients who were followed for up to 30 years,
RR for HF among patients with regular exercise pattern was 28% lower
(RR: 0.72; 95% CI: 0.67 to 0.79)

First author (Year of publication)	Country	Sample size	Relative risk	95% CI	Weight
He et al, 2001 [14]	USA	13643	0.77	(0.62 - 0.96)	7.5%
Kenchaich et al, 2009 [19]	USA	21094	0.73	(0.59 - 0.90)	7.7%
Hu et al, 2010 [24]	Finland -Women	30336	0.68	(0.59 - 0.78)	10.8%
Hu et al, 2010 [24]	Finland-Men	28842	0.69	(0.60 - 0.79)	10.9%
Kraigher-Krainer et al, 2013 [17]	USA	1142	0.65	(0.46 - 0.92)	4.2%
Patel et al, 2013 [15]	USA	5503	0.79	(0.64 - 0.98)	7.8%
Bell et al, 2013 [18]	USA-African-Americans	3707	0.59	(0.47 - 0.74)	7.2%
Bell et al, 2013 [18]	USA-Caucasians	10018	0.64	(0.54 - 0.76)	9.5%
Saevereid et al, 2014 [16]	Denmark	18209	0.91	(0.77 - 1.08)	9.6%
Andersen et al, 2014 [20]	Sweden	39805	0.90	(0.76 - 1.07)	9.5%
Rahman et al, 2014 [21]	USA	27895	0.73	(0.65 - 0.82)	12.1%
Young et al, 2014 [23]	USA	82695	0.48	(0.32 - 0.72)	3.3%
Random effects model			**0.72**	**(0.67 - 0.79)**	**100%**

Heterogeneity: I-squared=56.3%, tau-squared=0.0109, p=0.0087

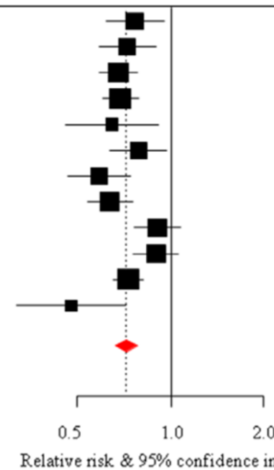

Figure 2. Meta-analysis of effect estimates from studies of the association of physical activity with incident heart failure. Forest plot showing the overall estimate of the association of physical activity and heart failure. CI indicates confidence interval.

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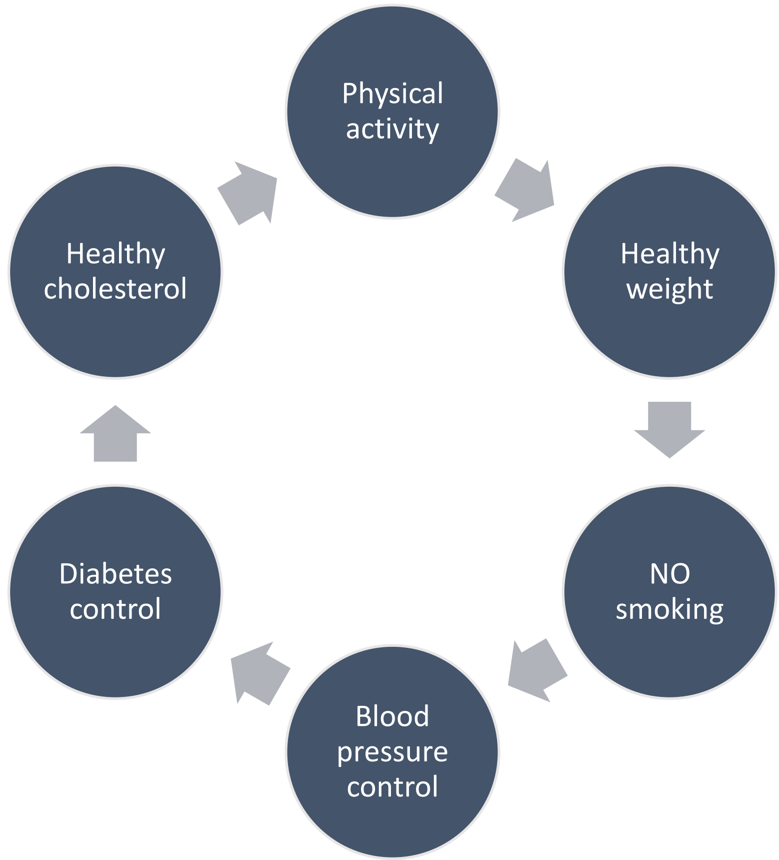
Echouffo-Tcheugui JB, Butler J, Yancy CW, Fonarow GC. Association of Physical Activity or Fitness With Incident Heart Failure: A Systematic Review and Meta-Analysis. Circ Heart Fail. 2015 Sep;8(5):853-61

Key Preventative Strategy

- Promote a healthy lifestyle throughout life



Horwich TB, Fonarow GC. Prevention of Heart Failure. JAMA Cardiol. 2017 Jan 1;2(1):116

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Social Determinants of Health

CLINICAL STATEMENTS AND GUIDELINES

Table 2. Example Considerations for Addressing Social Determinants of Health to Help Prevent ASCVD Events

Topic/Domain	Example Considerations
Cardiovascular risk	Adults should be routinely assessed for psychosocial stressors and provided with appropriate counseling.[S2.1-31]
	Health literacy should be assessed every 4 to 6 y to maximize recommendation effectiveness.[S2.1-36]
Diet	In addition to the prescription of diet modifications, body size perception, as well as social and cultural influences, should be assessed.[S2.1-37,S2.1-38]
	Potential barriers to adhering to a heart-healthy diet should be assessed, including food access and economic factors; these factors may be particularly relevant to persons from vulnerable populations, such as individuals residing in either inner-city or rural environments, those at socioeconomic disadvantage, and those of advanced age*.[S2.1-39]
Exercise and physical activity	In addition to the prescription of exercise, neighborhood environment and access to facilities for physical activity should be assessed.[S2.1- 30,S2.1-40,S2.1-41]
Obesity and weight loss	Lifestyle counseling for weight loss should include assessment of and interventional recommendations for psychosocial stressors, sleep hygiene, and other individualized barriers.[S2.1-42–S2.1-44]
	Weight maintenance should be promoted in patients with overweight/obesity who are unable to achieve recommended weight loss.
Diabetes mellitus	In addition to the prescription of type 2 diabetes mellitus interventions, environmental and psychosocial factors, including depression, stress, self-efficacy, and social support, should be assessed to improve achievement of glycemic control and adherence to treatment.[S2.1-45–S2.1-48]
High blood pressure	Short sleep duration (<6 h) and poor-quality sleep are associated with high blood pressure and should be considered.[S2.1-49] Because other lifestyle habits can impact blood pressure, access to a healthy, low-sodium diet and viable exercise options should also be considered.
Tobacco treatment	Social support is another potential determinant of tobacco use. Therefore, in adults who use tobacco, assistance and arrangement for individualized and group social support counseling are recommended.[S2.1-50,S2.1-51]

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Arnett DK et al. 2019 ACC/AHA Guideline on the Primary Prevention of Cardiovascular Disease: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. Circulation. 2019 Sep 10;140(11):e596-e646

Detecting Heart Failure: symptoms and/or signs

Dyspnea
Orthopnea
Paroxysmal nocturnal dyspnea
Fatigue
Reduced exercise capacity
Ankle swelling

Elevated jugular venous pressure
Positive abdominojugular reflux
S3 gallop
Laterally displaced apical impulse

Cough
Abdominal distension
Wheeze
Abdominal bloating
Early satiety
Bendopnea

Weight gain
Lung rales
Peripheral edema
Ascites
Cool and/or mottled extremities
Narrow pulse pressure
Weight loss and cachexia

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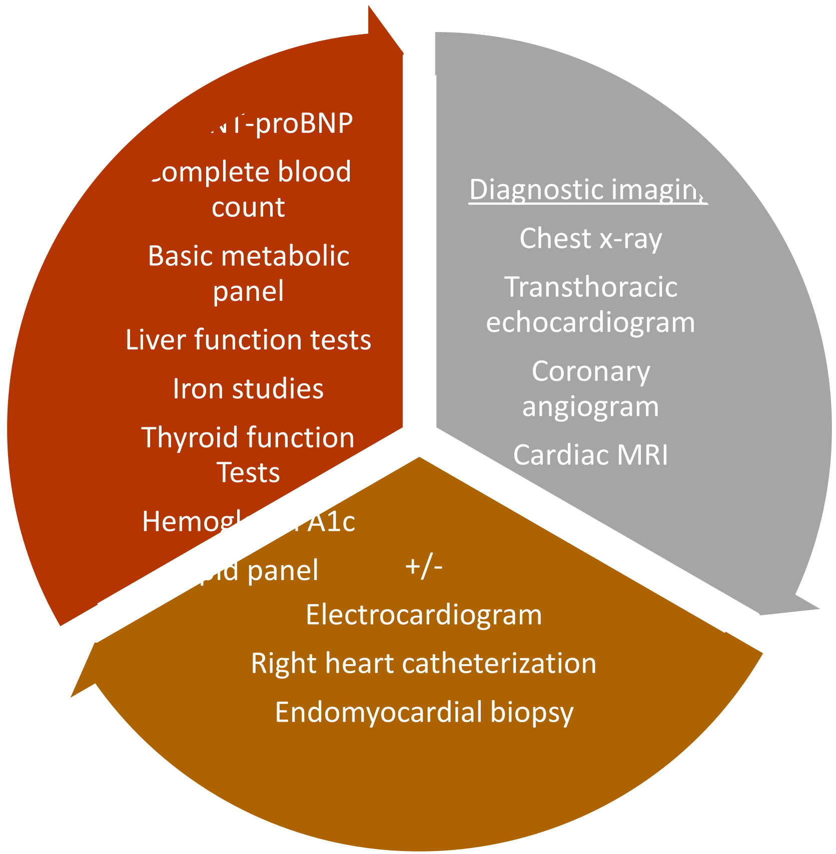
Detecting Heart Failure

- *Diagnostic tools*



Murphy SP, Ibrahim NE, Januzzi JL Jr. Heart Failure With Reduced Ejection Fraction: A Review. JAMA. 2020 Aug 4;324(5):488-504

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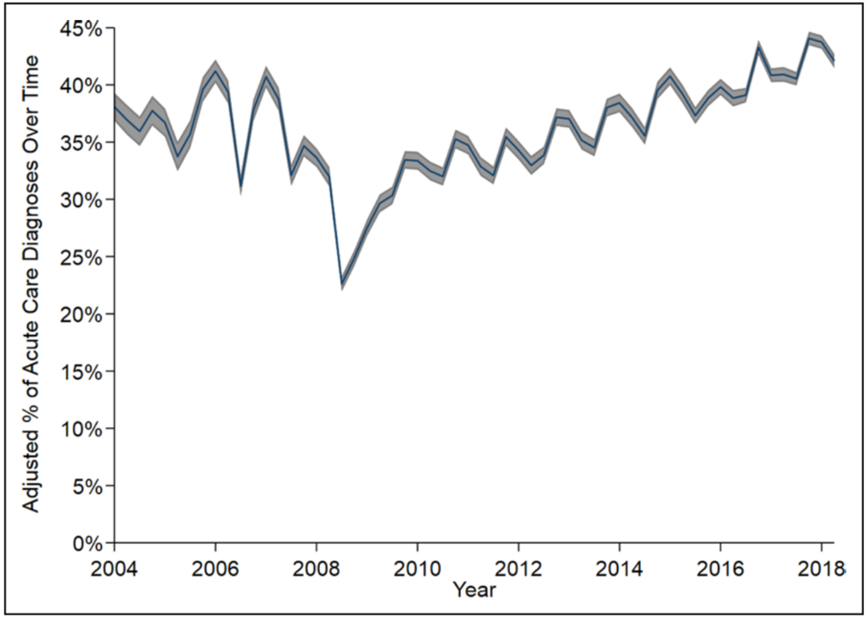
Disparities in Detection of Heart Failure



Critical disparities in diagnosis of HF: female sex, black race, and low net worth were associated with higher rates of diagnosis in the acute care setting

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Sandhu AT, Tisdale RL, Rodriguez F, Stafford RS, Maron DJ, Hernandez-Boussard T, Lewis E, Heidenreich PA. Disparity in the Setting of Incident Heart Failure Diagnosis. Circ Heart Fail. 2021 Aug;14(8):e008538

THANK YOU!

For questions or more information: please contact your local AHA Quality Improvement Manager OR reach out via the below link: https://www.heart.org/en/professional/quality-improvement/contact-your-local-get-with-the-guidelines-representative

Registration for tomorrow's Lunch & Learn on Health Equity in Heart Failure can be completed by clicking here.

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