

Aging, Comorbidities, & HIV: CROI Update 2023

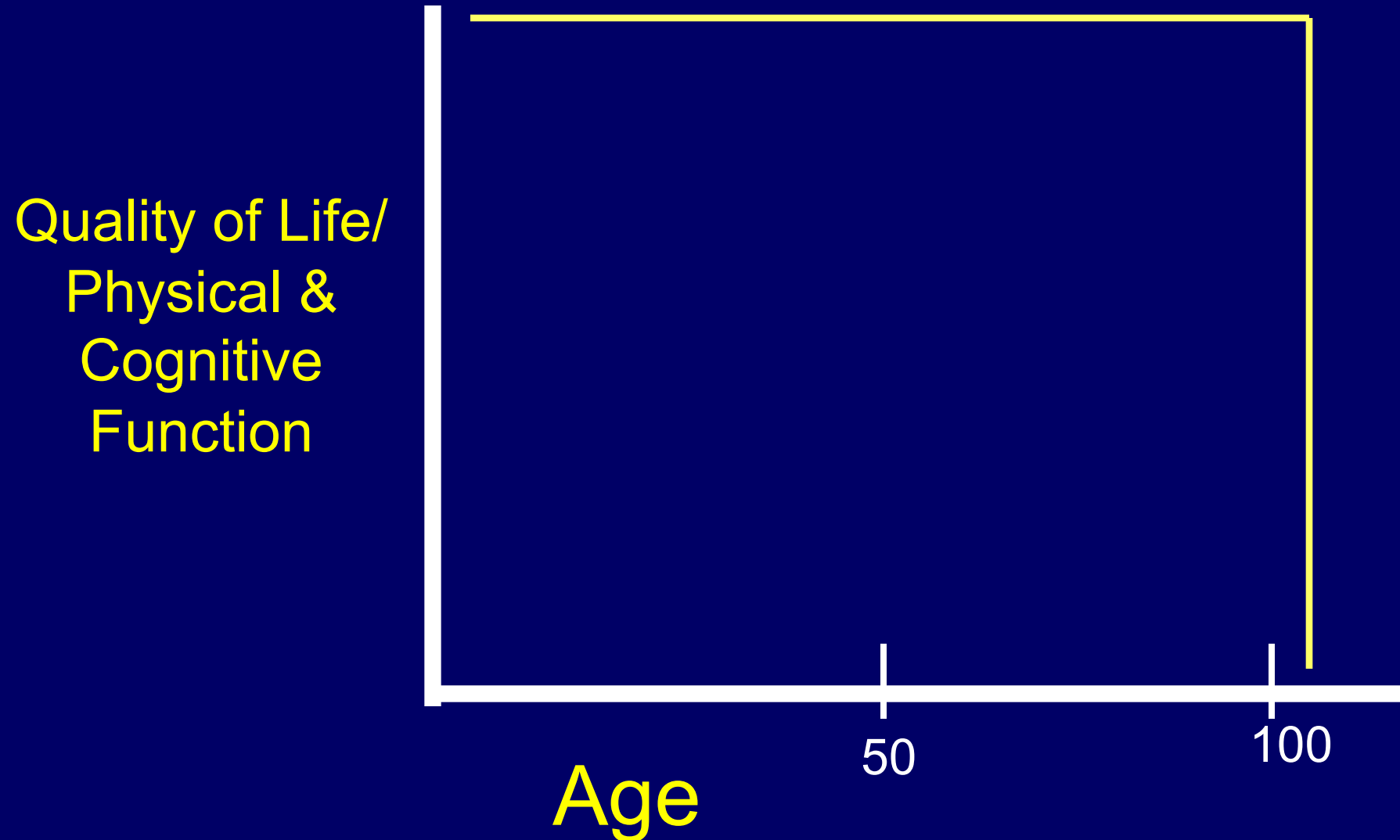


Todd T. Brown, MD, PhD
Professor of Medicine and Epidemiology
Division of Endocrinology, Diabetes, and Metabolism
Johns Hopkins University

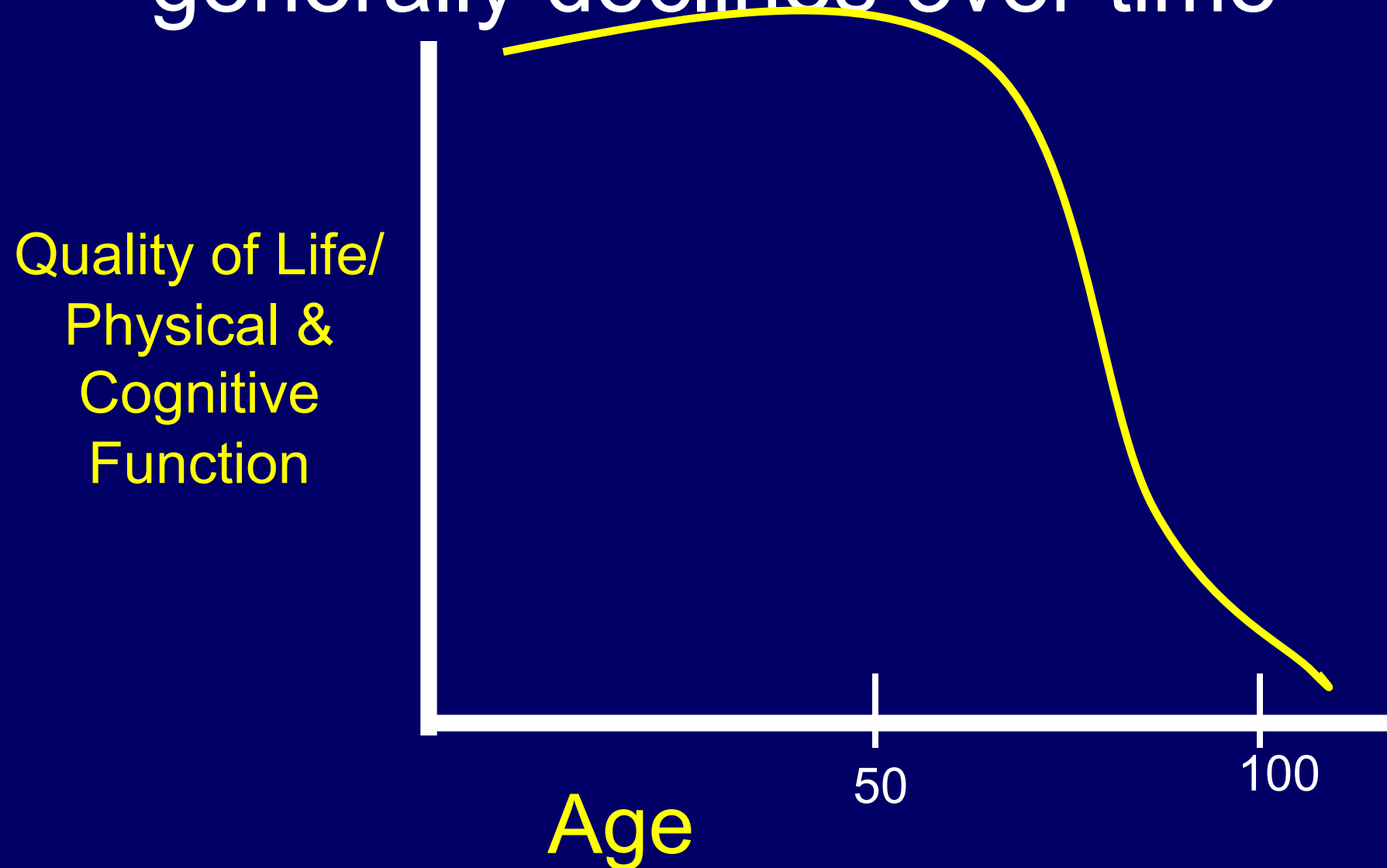
Disclosures

- Dr Brown has served as a consultant to Gilead, ViiV Healthcare, Merck, and Janssen.

The Ideal Life: Quality x Time

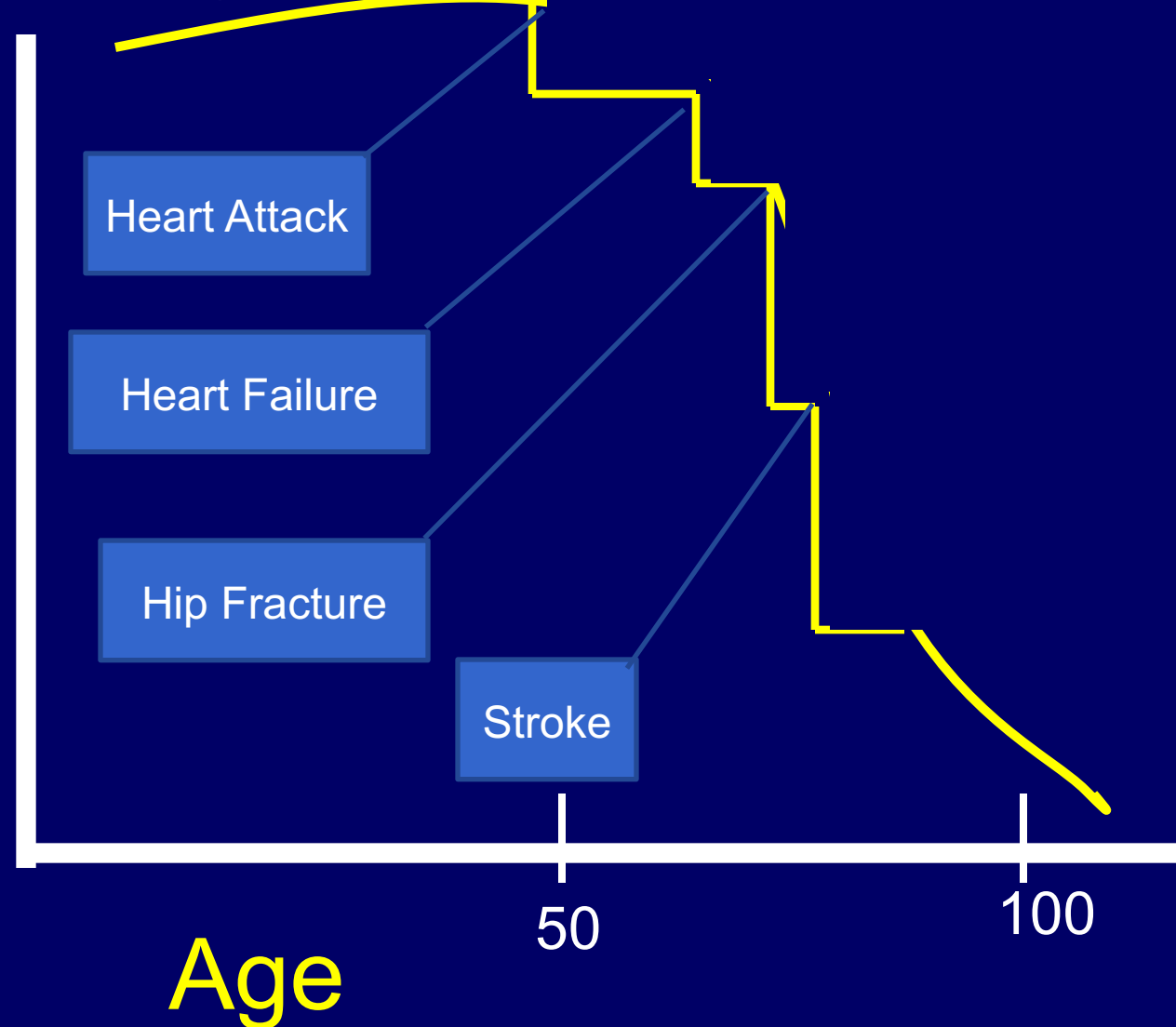


Physical & cognitive function generally declines over time



Decline in Function May Not Be Gradual

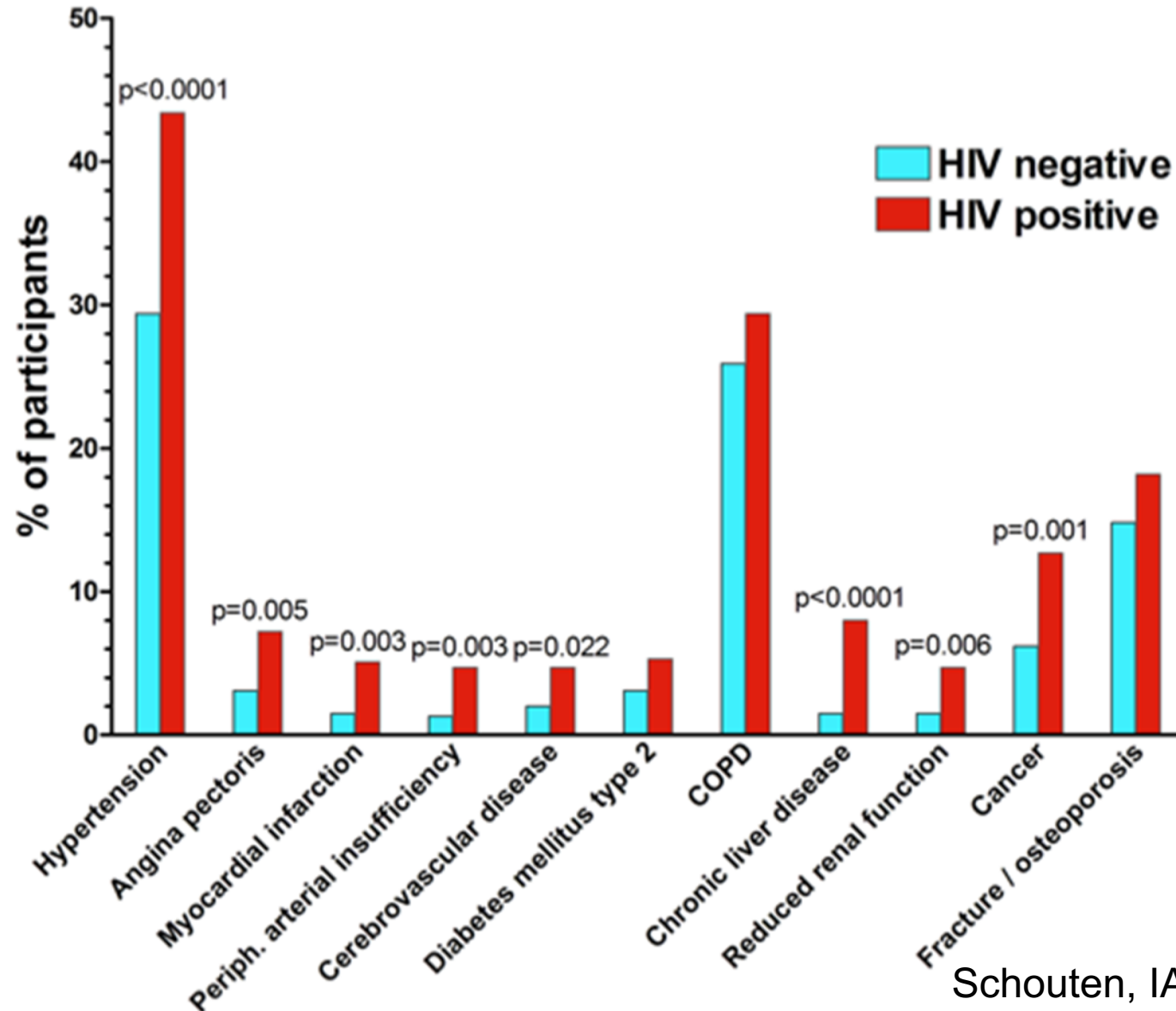
Quality of Life/
Physical &
Cognitive
Function



Prevention of Comorbid Events is Essential and Achievable

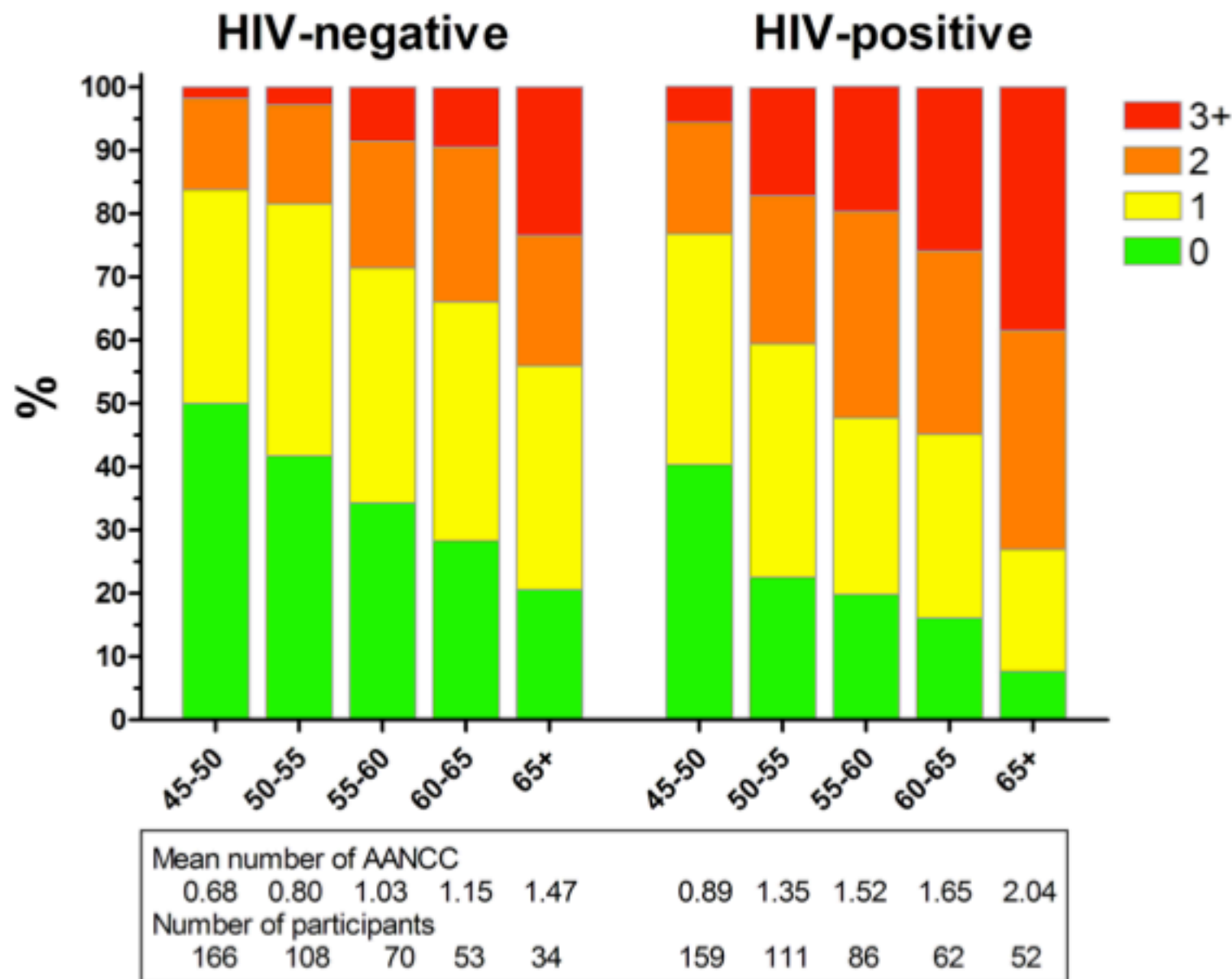
- Good screening tests are available for comorbid conditions
- Many behavioral factors contribute to comorbid conditions and can be modified
- Early treatment is important
- Good treatments exist that can decrease the risk of events (cardiovascular disease, fracture)
- Preventing complications can alter the aging process

Comorbidity distribution



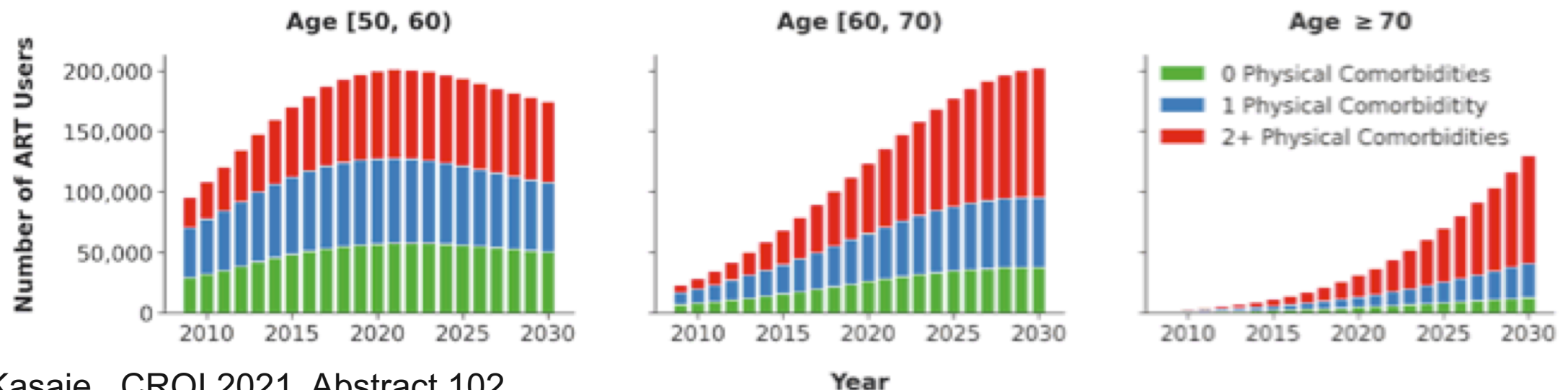
Schouten, IAS, 2012

Comorbidity in relation to age

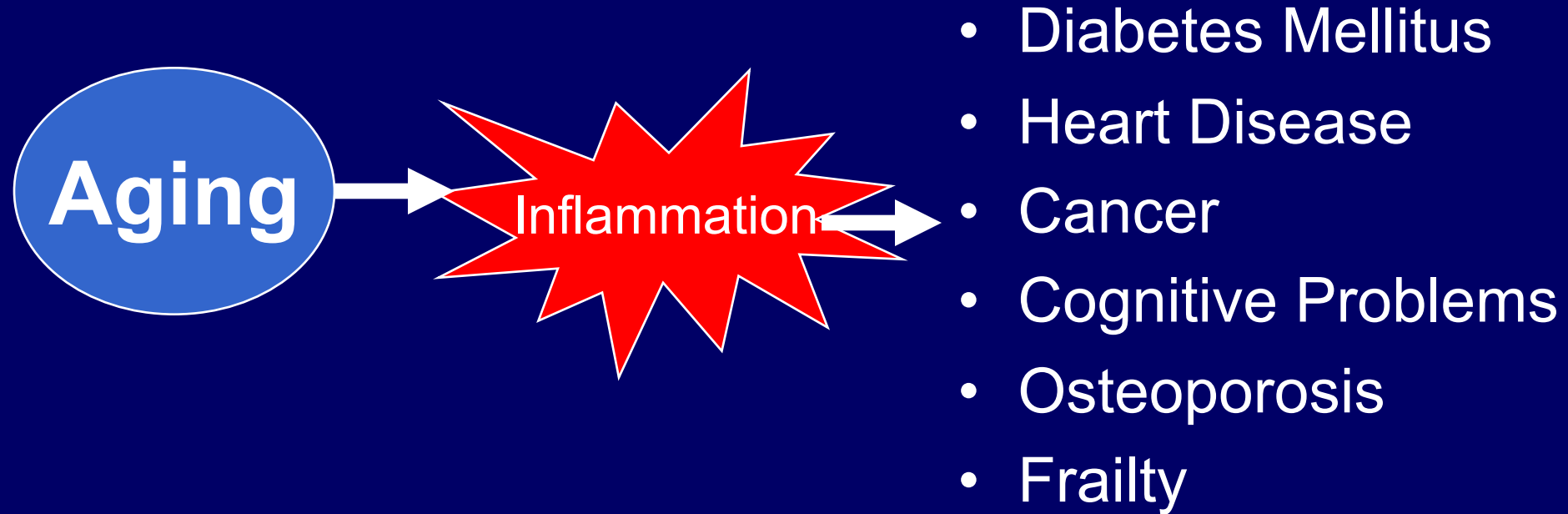


Multimorbidity will increase markedly in PLWH over the next 10 years Slide 9

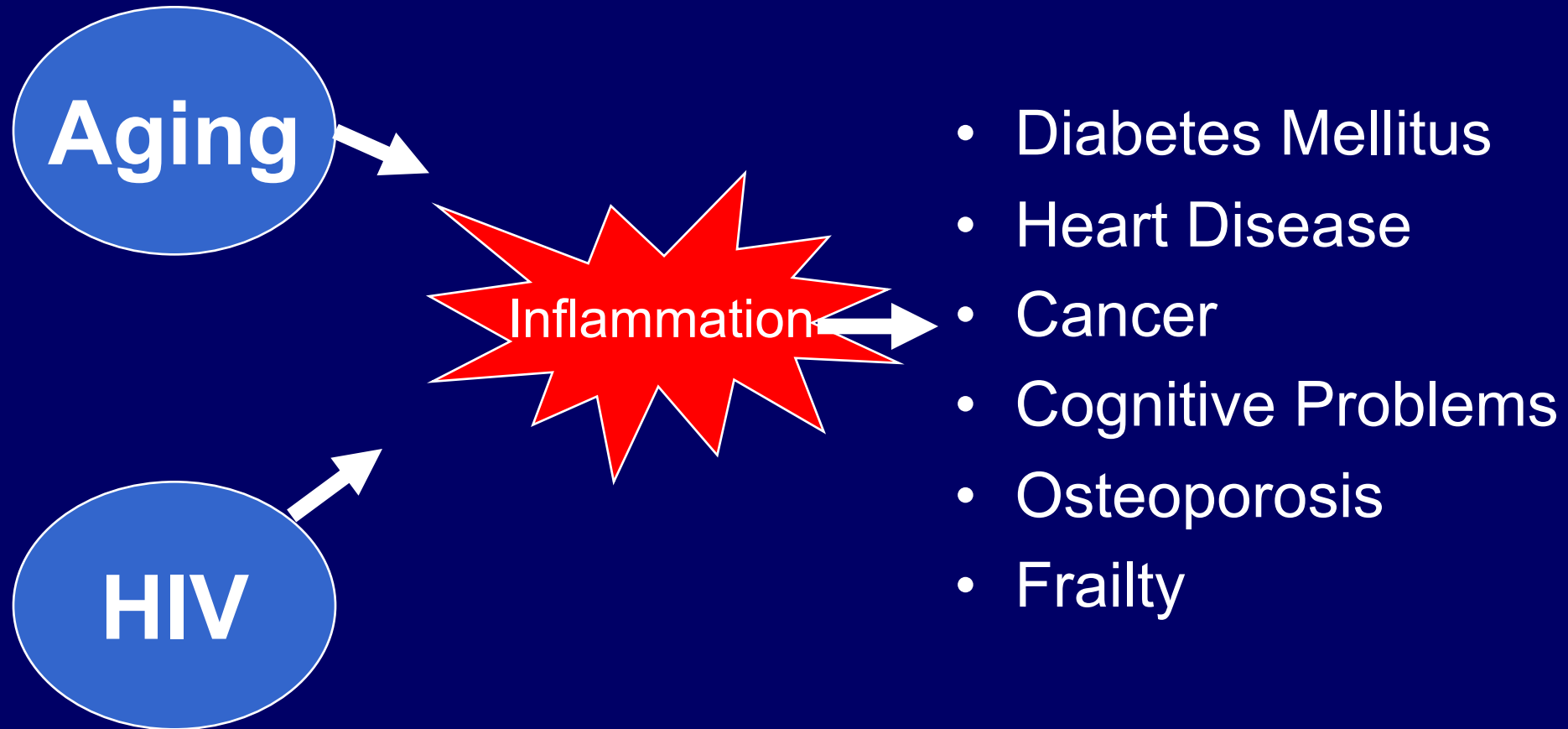
- Older age-groups experience an **increase in population size and prevalence of multimorbidity**
- Among those ≥ 70 yrs, the projected prevalence of multimorbidity increases from 58% (in 2020) to 69% (in 2030), corresponding to an additional 71,000 individuals living with 2+ physical comorbidities beside HIV by 2030



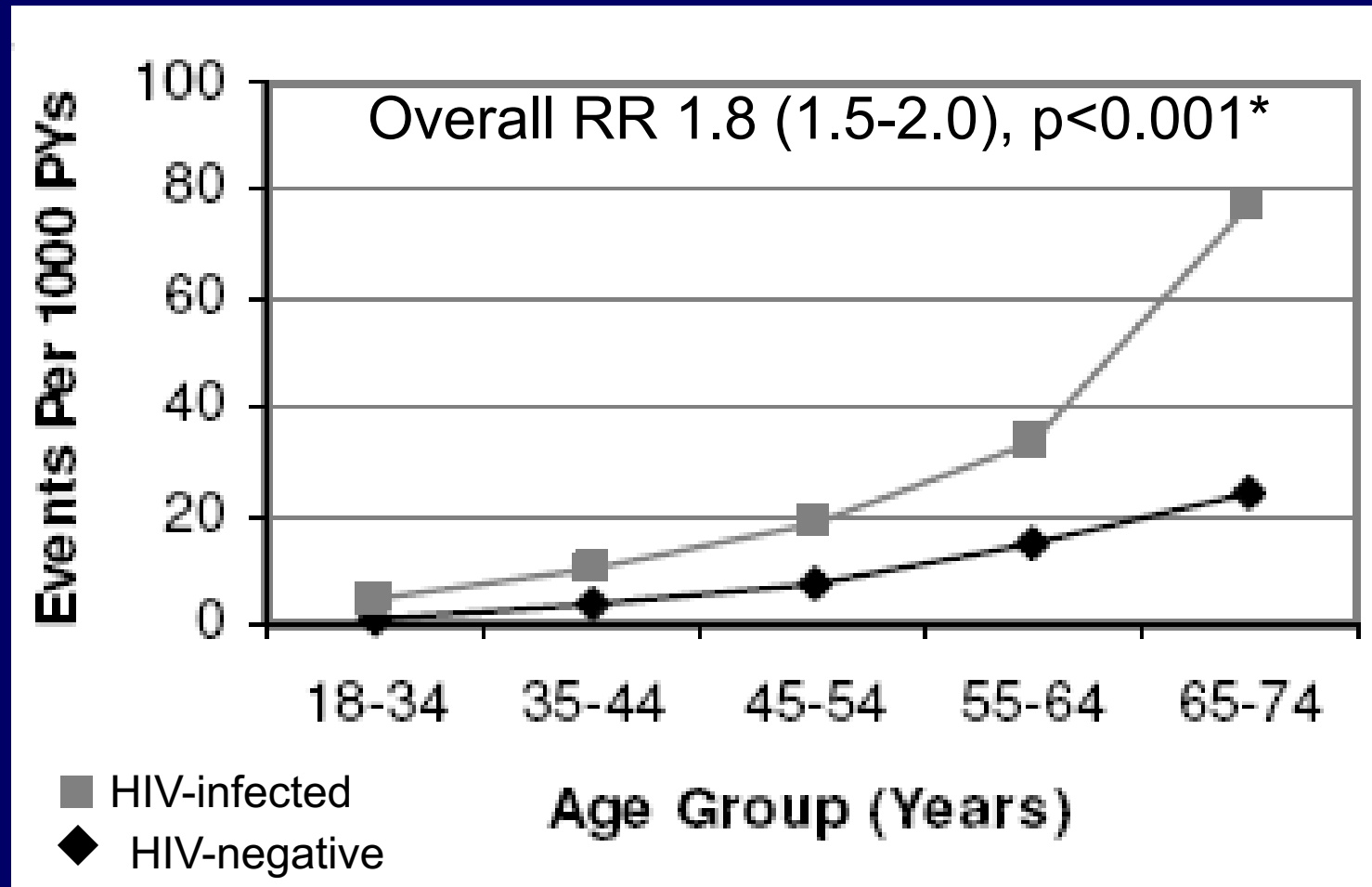
Inflammation and Immune Dysfunction: A Central Mechanism for Aging



Aging & HIV: The Inflammation Double Whammy



Myocardial Infarction in People with and Without HIV: MGH Study

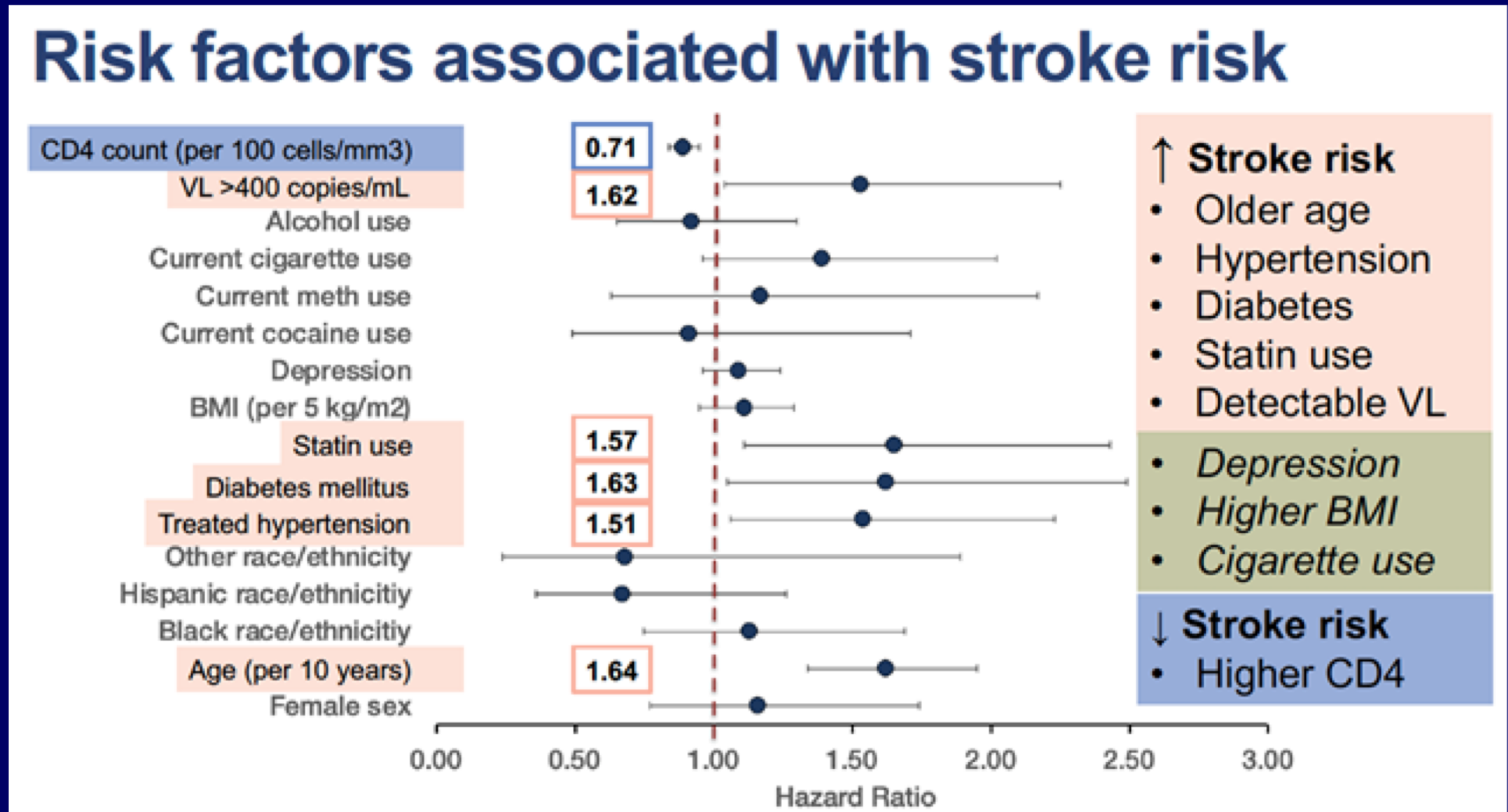


*adjusted for age, gender, race, HTN, DM, dyslipidemia

Triant, JCEM, 2007

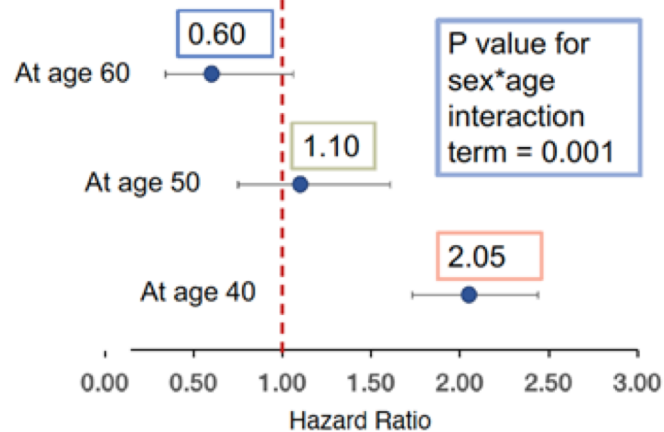
Cardiovascular Disease at CROI 2023

Risk Factors for Stroke in the CNICS Population



Stroke More Common in Women than Men at Younger Ages

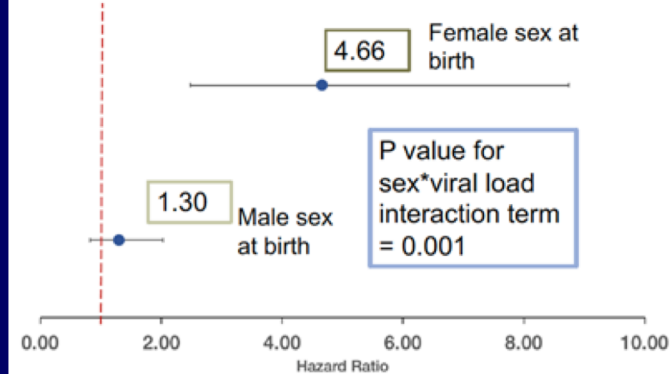
Risk of stroke associated with female sex at birth varies by age



- Female sex at birth associated with higher risk of stroke at younger ages, independent of stroke disease risk score
- Sex*age interaction remained significant after additional adjustment for:
 - Viral load
 - Methamphetamine use
 - Depression

*Stroke disease risk score based on race/ethnicity, cohort entry year, CNICS site, HIV risk factor, blood pressure, renal function, lipids, cigarette, cocaine + alcohol use, physical activity

Risk of stroke associated with detectable viral load varies by sex at birth



- Detectable VL was associated with higher risk of stroke in those assigned female sex at birth, independent of age and stroke disease risk score
- Sex*viral load interaction remained significant after additional adjustment for:
 - Methamphetamine use





*Stroke disease risk score based on race/ethnicity, cohort entry year, CNICS site, HIV risk factor, blood pressure, renal function, lipids, cigarette, cocaine + alcohol use, physical activity

Detectable HIV viral load is a risk factor for stroke in women but not men

Two types of heart attack:

- 1) Type 1: Plaque in wall of artery ruptures
- 2) Type 2: Demand for oxygen not met

CENTRAL ILLUSTRATION: Differences in Clinical Characteristics Between Patients With Type 1 and Type 2 Myocardial Infarction

Type 1 Myocardial Infarction	Type 2 Myocardial Infarction
 <p>Plaque rupture or erosion with thrombus</p>	 <p>Mild or no plaque OR Fixed atherosclerosis</p>
 <p>Patient Phenotype</p> <ul style="list-style-type: none"> • More likely to be: <ul style="list-style-type: none"> -Male -Younger • Higher prevalence of: <ul style="list-style-type: none"> -Smoking -Dyslipidemia -Prior myocardial infarction -Prior PCI -Prior CABG • Coronary artery evaluation and treatment: <ul style="list-style-type: none"> -57% Coronary angiography -38.5% PCI -7.8% CABG 	 <p>Patient Phenotype</p> <ul style="list-style-type: none"> • More likely to be: <ul style="list-style-type: none"> -Older -Female • Higher prevalence of: <ul style="list-style-type: none"> -Heart failure -Atrial fibrillation -Valvular heart disease -Hypertension -Renal failure -Cancer -Liver disease -Depression -Alcohol use disorder -Substance use disorder • Coronary artery evaluation and treatment: <ul style="list-style-type: none"> -10.9% Coronary angiography -1.7% PCI -0.4% CABG
Higher risk of in-hospital death and 30-day readmission for MI	Lower risk of in-hospital death and 30-day readmission for MI

McCarthy, C.P. et al. J Am Coll Cardiol. 2021;77(7):848-57.

Depression is related to Type 1 MI in PWH

Risk of incident Type 1 MI among PWH with versus without a diagnosis of depression or anxiety

	aHR	95% CI
Demographics		
Male at birth	1.55	1.13, 2.14
Age (scaled by 10 years)	1.50	1.35, 1.66
Substance use		
Tobacco (ever/never)	1.88	1.45, 2.43
Cocaine (ever/never)	0.97	0.71, 1.31
Traditional CVD risk factors		
Hypertension	2.81	2.26, 3.49
Diabetes Mellitus	1.33	1.05, 1.68
Elevated total cholesterol or statin use	2.39	1.94, 2.96
Chronic Kidney Disease (eGFR<60 mL/min)	1.36	1.07, 1.74
HIV-related risk factors		
History of protease inhibitor use (ever/never)	1.49	1.23, 1.81
History of detectable viral load (ever/never)	1.13	0.85, 1.49
Mental health comorbidities		
Anxiety	0.92	0.74, 1.16
Depression	1.23	1.02, 1.49

Model is additionally adjusted for:

- Race/ethnicity
- HIV acquisition group
- At-risk alcohol use
- Cannabis use
- Body mass index
- History of AIDS
- History of HCV
- CD4 at ART initiation
- VL at ART initiation
- Time-varying CD4

Anxiety is related to Type 2 MI in PWH

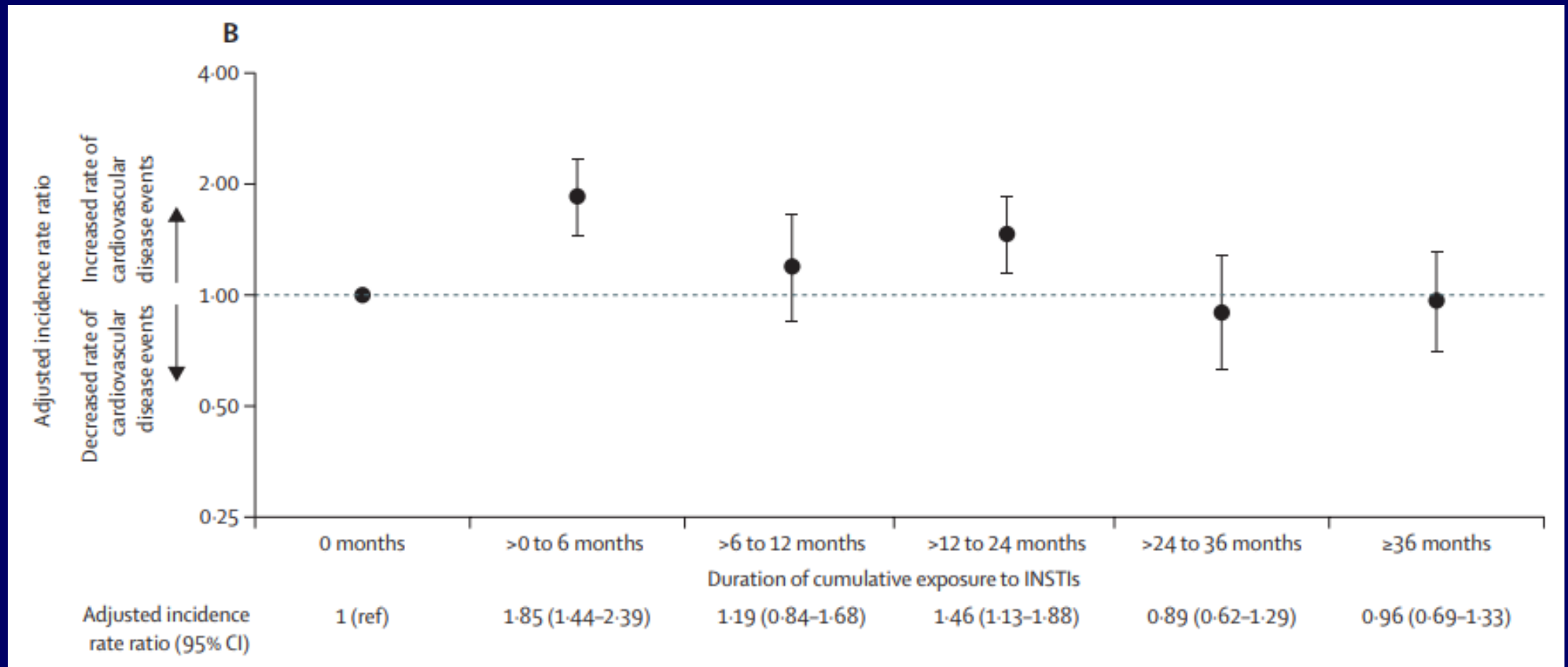
Risk of incident Type 2 MI among PWH with versus without a diagnosis of depression or anxiety

	aHR	95% CI
Demographics		
Male at birth	0.98	0.72, 1.32
Age (scaled by 10 years)	1.18	1.05, 1.33
Substance use		
Tobacco (ever/never)	1.36	1.01, 1.84
Cocaine (ever/never)	1.49	1.11, 1.99
Traditional CVD risk factors		
Hypertension	2.50	1.93, 3.25
Diabetes Mellitus	2.39	1.84, 3.11
Elevated total cholesterol or statin use	1.02	0.80, 1.30
Chronic Kidney Disease (eGFR<60 mL/min)	3.05	2.37, 3.93
HIV-related risk factors		
History of protease inhibitor use (ever/never)	1.07	0.85, 1.34
History of detectable viral load (ever/never)	1.35	1.02, 1.79
Mental health comorbidities		
Anxiety	1.42	1.10, 1.83
Depression	1.20	0.96, 1.51

Model is additionally adjusted for:

- Race/ethnicity
- HIV risk acquisition group
- At-risk alcohol use
- Cannabis use
- Body mass index
- History of AIDS
- History of HCV
- CD4 at ART initiation
- VL at ART initiation
- Time-varying CD4

Are integrase inhibitors associated with heart attack?: RESPOND Study

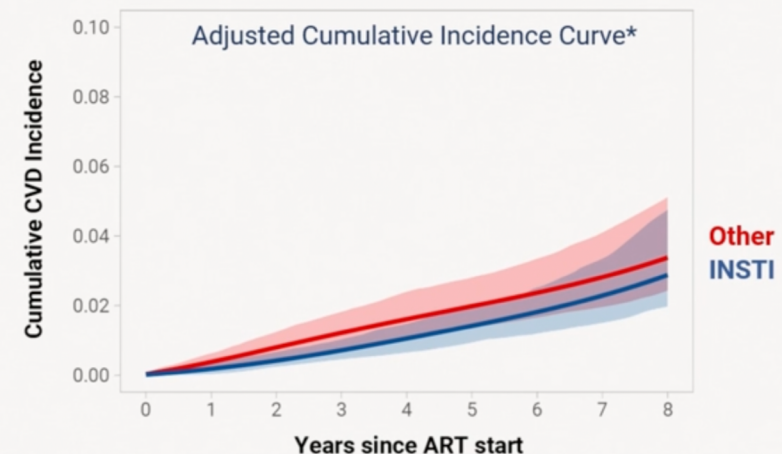
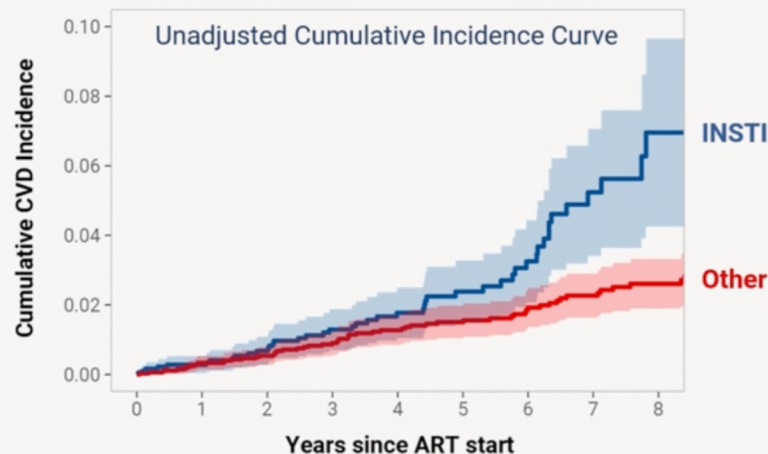


ART-initiation with integrase inhibitors not associated with CVD events in Swiss Cohort

Cardiovascular disease events

30th
CROI
2023

116 CVD events within 4.9 years (IQR 2.4–7.4)



Number at risk

INSTI	1813	1615	1398	1165	945	722	504	275	130
Other	3549	3161	2855	2522	2227	1933	1582	1261	976

*Adjusted for calendar year, age, sex, ethnicity, HIV transmission group, highest education, CD4 cell count, HIV viral load, personal and family history of cardiovascular disease, body mass index, arterial hypertension, diabetes, renal function, current use of antiplatelet or lipid-lowering drugs, and current use of abacavir or tenofovir alafenamide.

Surial B

Cancer at CROI 2023

New Cancers in Medicare Recipients by HIV Serostatus: 2001-2015

AIDS-defining cancers:

Kaposi's sarcoma, cervical, and non-Hodgkin's lymphoma

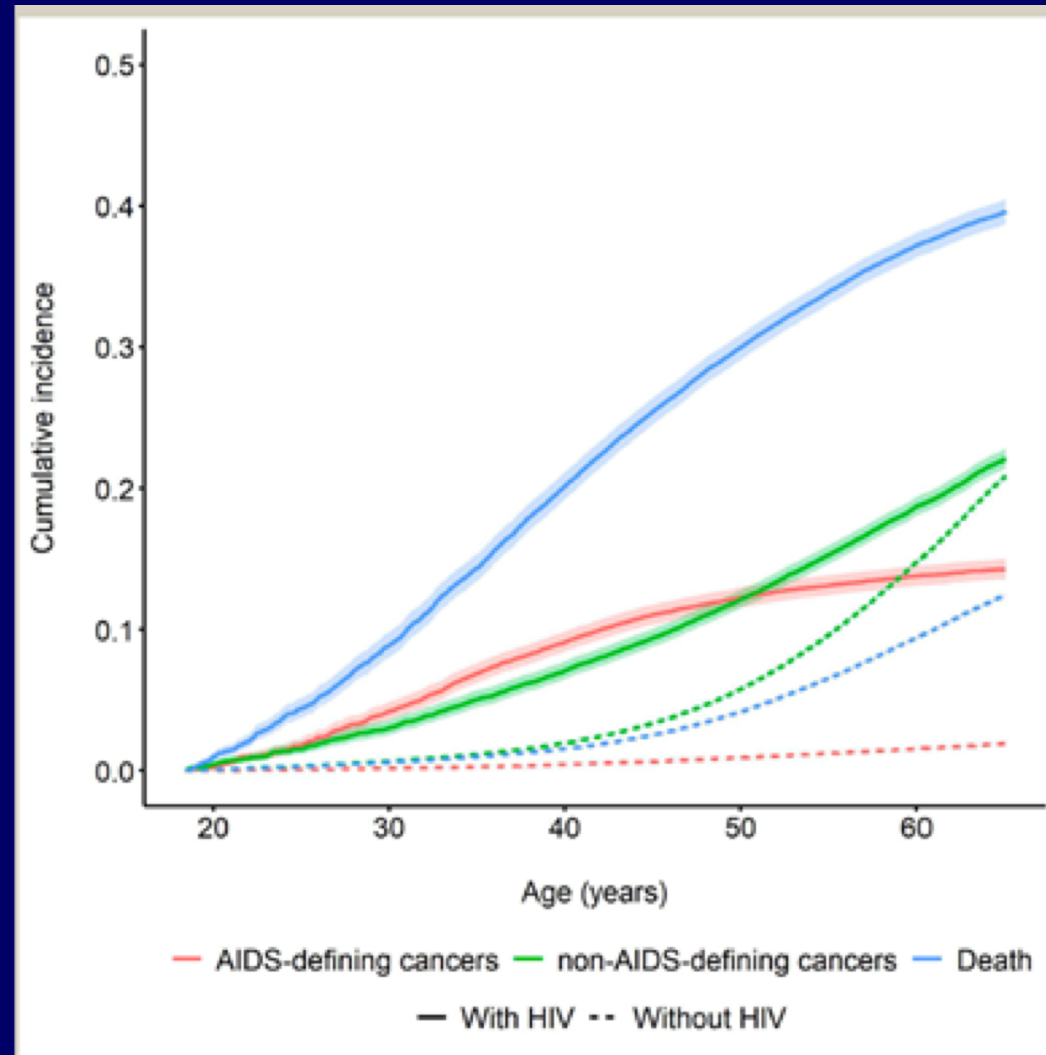
Non-AIDS-defining cancers:

breast, colon, head/neck, kidney, larynx, leukemia, liver, lung, oropharynx, pancreatic, prostate, anal, Hodgkin's lymphoma

HIV+: 181, 030

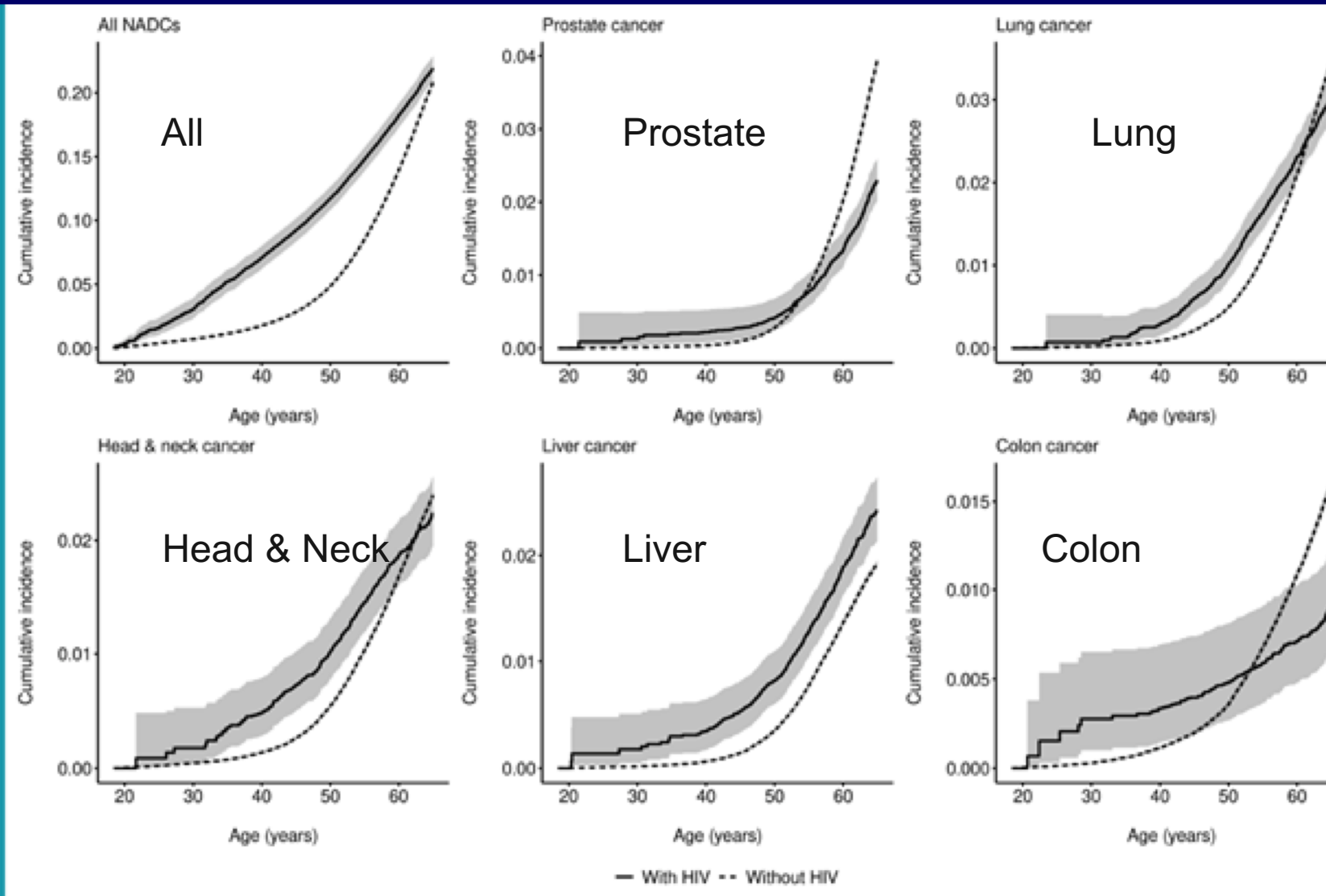
HIV-: 43.9 M

Rudolph, 155



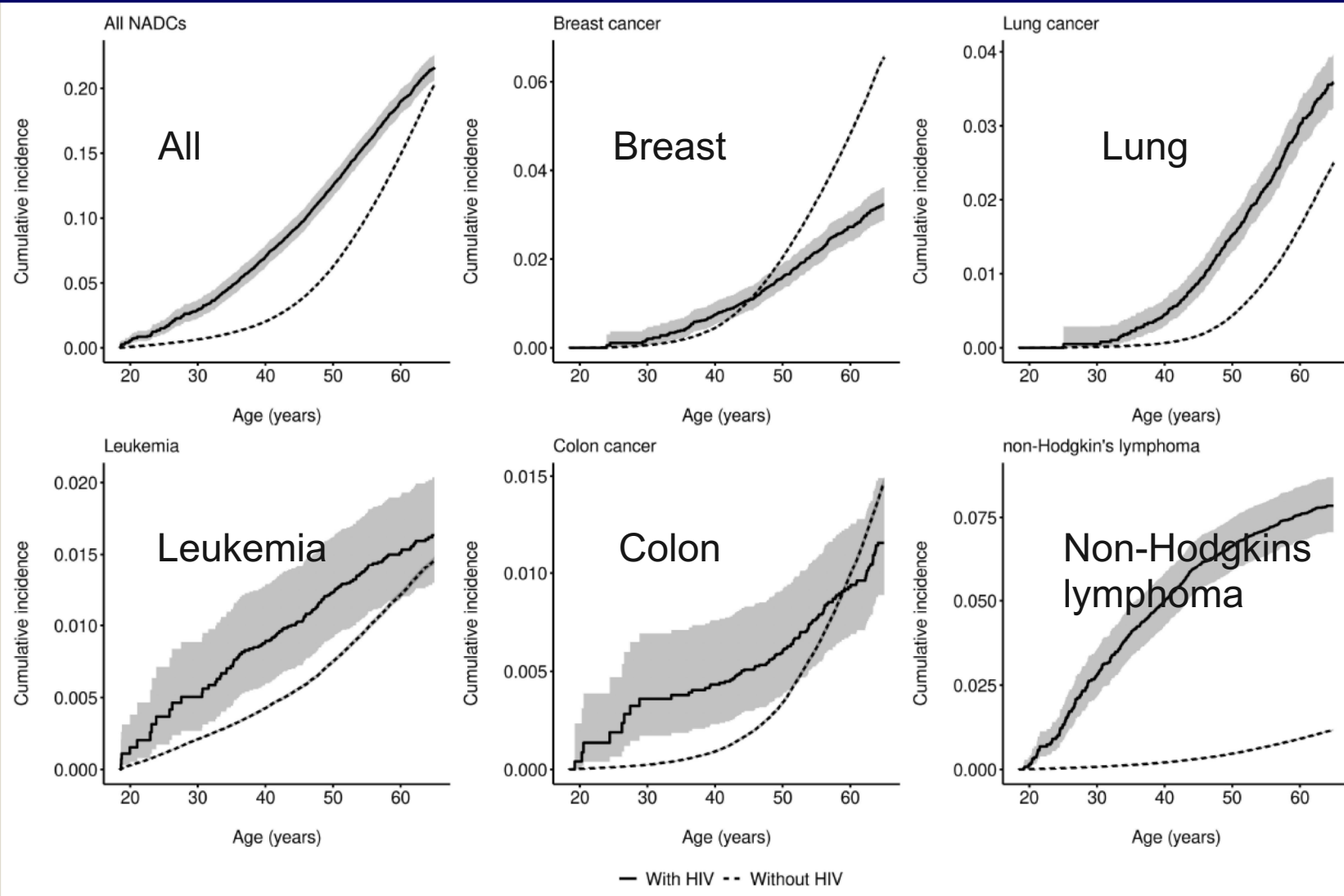
Cancer Incidence by Age: Men

Male Beneficiaries













Cancer Incidence by Age: Women

Female Beneficiaries



Cancer Mortality Higher in PWH Compared to General Spanish Population

Table 1. Participants characteristics at enrollment 2004-2020 (N=17,329)

	85% (N=14,801) males
	35 years old median age [IQR 29-43]
	62% (N=10,755) HIV transm through homo/bisexual contact
	69.4% (N=12,022) from Europe
	41% (N= 5,168) current smokers
	391 cell/μL median CD4 count [IQR 213-583]
	34% (N= 5,877) viral load >100,000 copies/mL
	13% (N= 2,168) AIDS diagnosis
	10% (N= 1,674) hepatitis C virus antibodies
	3% (N= 582) hepatitis B surface antigens

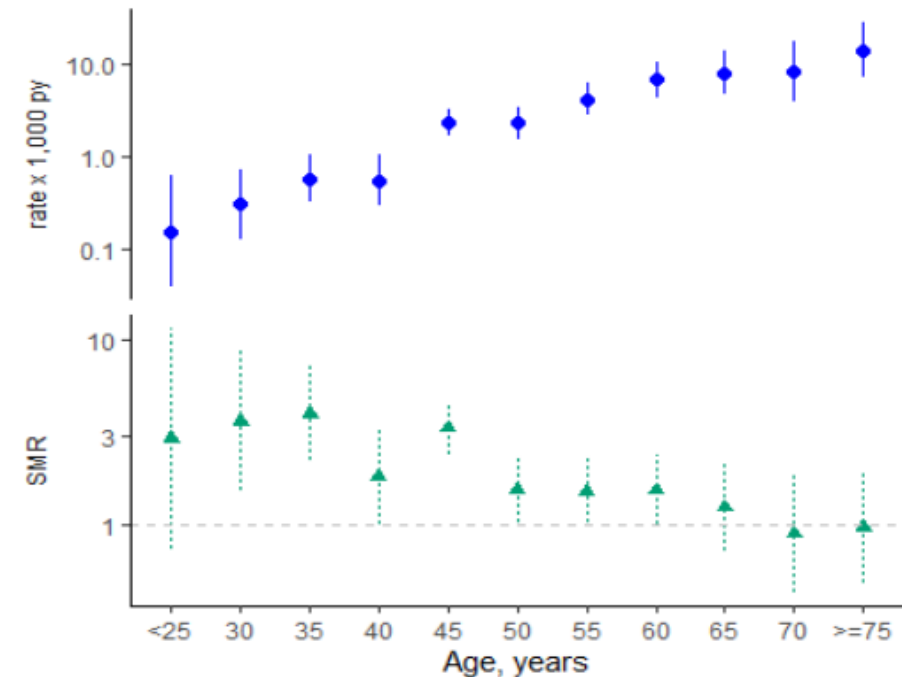
Factors associated with cancer mortality in PWH:

Smoking

Viral Hepatitis

Lower CD4 cell count

Figure 2. Mortality rates and SMRs according to age

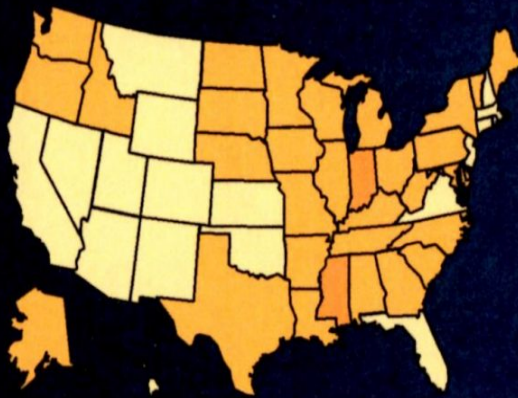


	<25	30	35	40	45	50	55	60	65	70	≥75
Rate	0.15	0.3	0.57	0.54	2.3	2.26	4.11	6.69	7.88	8.11	13.99
SMR	2.94	3.66	4	1.83	3.35	1.54	1.53	1.53	1.24	0.89	0.96

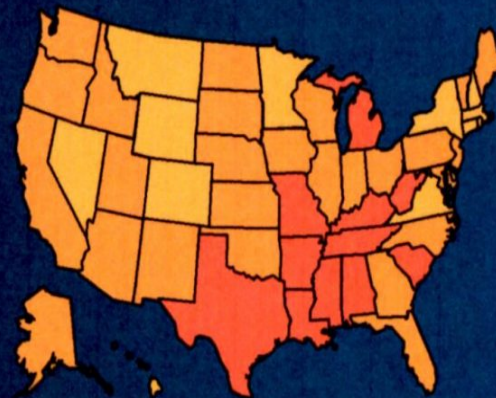
Increasing Prevalence of Obesity in US

Obesity (BMI ≥ 30 kg/m²)

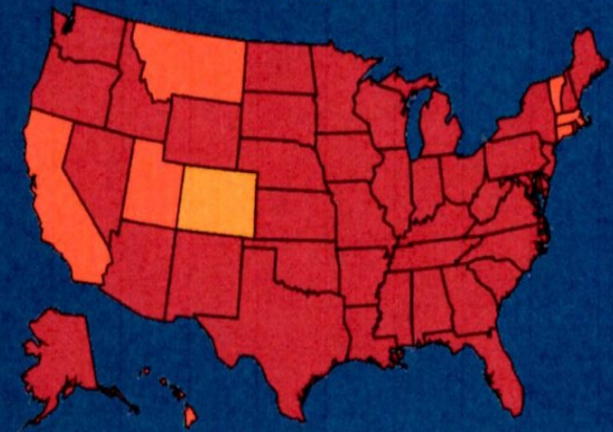
1994



2000



2014



□ No Data □ $<14.0\%$ □ $14.0\% - 17.9\%$ □ $18.0\% - 21.9\%$ □ $22.0\% - 25.9\%$ □ $\geq 26.0\%$



NOTE: Survey method changes in 2011 may impact trends <http://www.cdc.gov/surveillancepractice/reports/brfss/brfss.html>

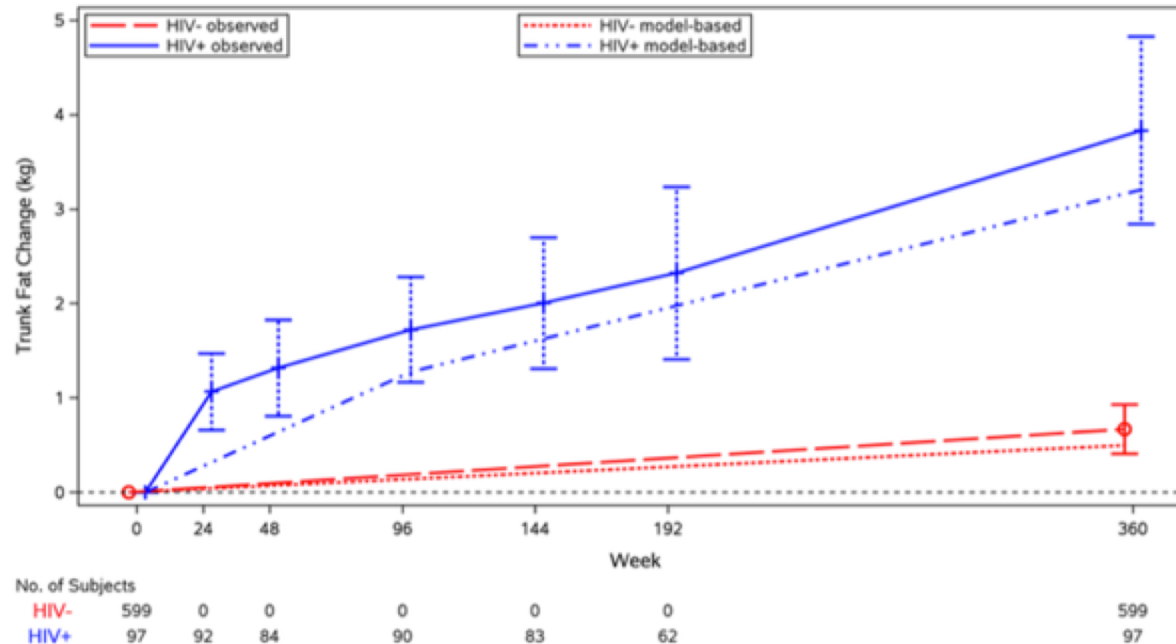
CDC's Division of Diabetes Translation. United States Diabetes Surveillance System available at

<http://www.cdc.gov/diabetes/data>

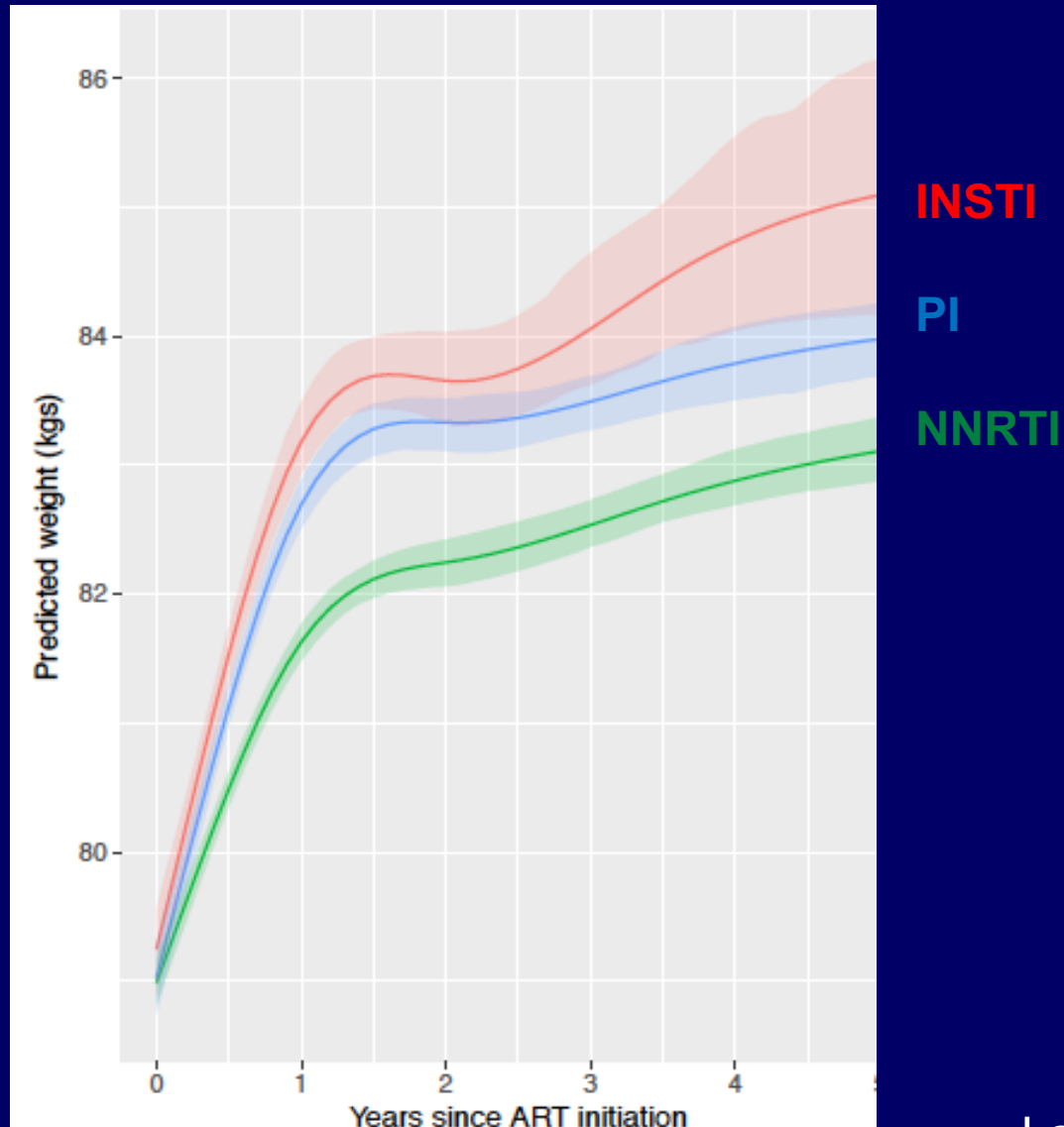


Central fat increases with ART initiation are greater than expected

Long Term Changes in Trunk Fat in HIV+ vs. HIV-

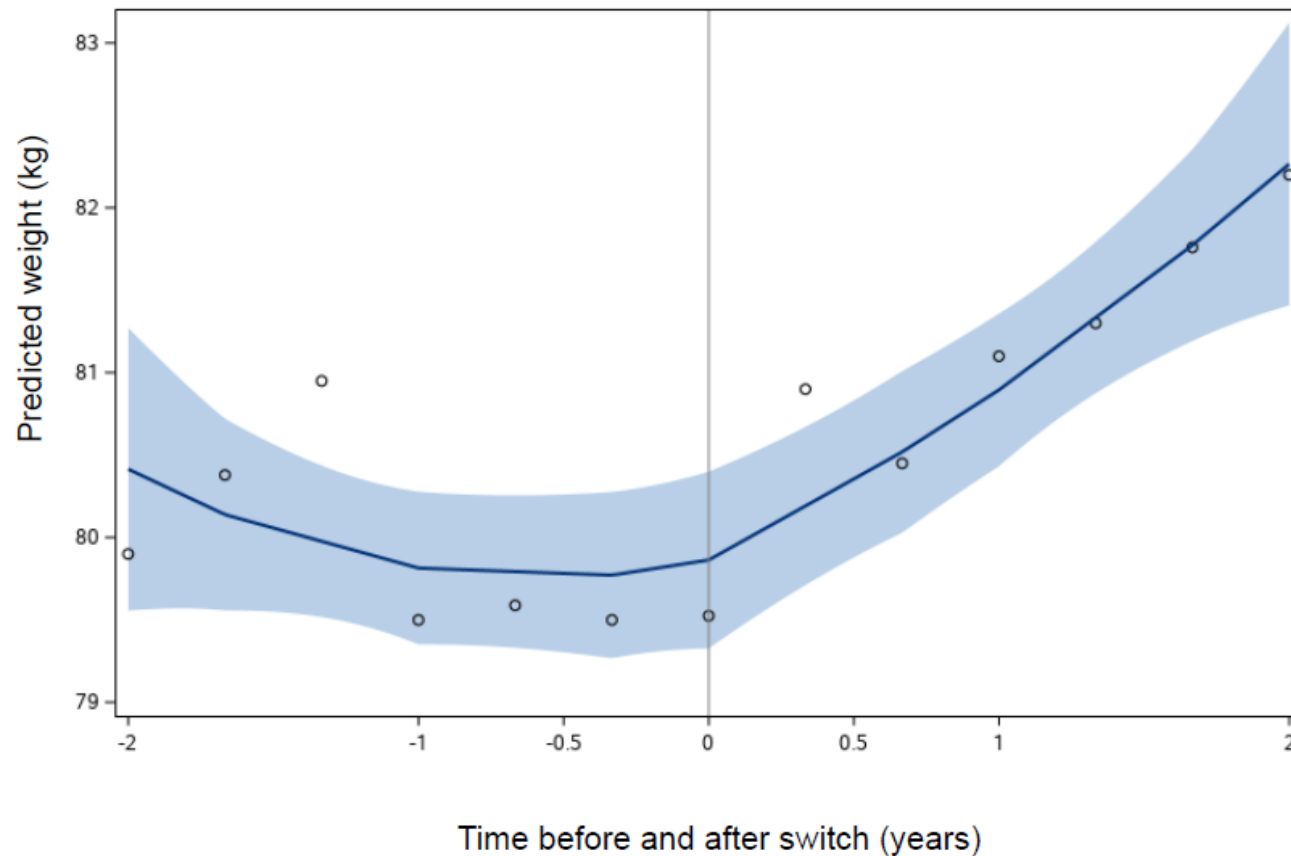


Weight Gain is Greater with INSTI in NA-ACCORD



Switching to INSTI: HAILO Study

B. Two years before and after switch

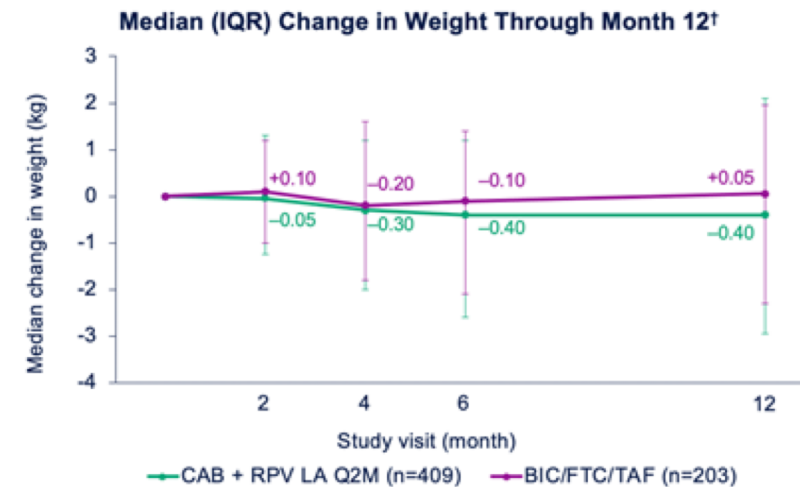


Does switching off of integrase inhibitors decrease weight?

SOLAR:

- PWH on F/TAF/BIC randomized 2:1 to CAB LA or stay on F/TAF/BIC over 12M.
- Median age 37, 88% men, 60% overweight or obese.

Change in Weight Through Month 12 by Treatment Regimen*



- At Month 12, median (IQR) change in weight in the CAB + RPV LA group was -0.40 (-2.95, +2.10) kg and +0.05 (-2.30, +1.95) kg in the BIC/FTC/TAF group

*Any participant that started lipid-modifying agents during the study was non-evaluable in anthropometric assessments. †Median (IQR) weight (kg) at baseline: CAB + RPV LA, 81.3 (70.70, 91.80); BIC/FTC/TAF, 79.0 (69.40, 91.70).

Switching off TAF to TDF decreases weight in women: CHARACTERISE

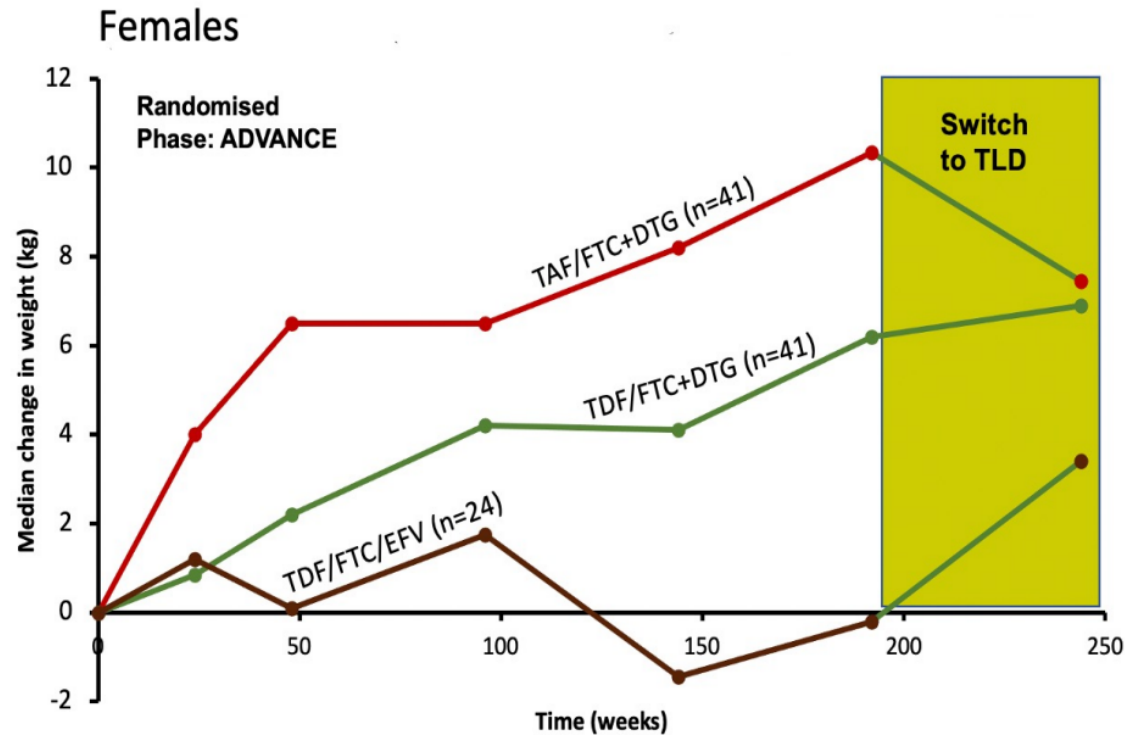


Figure 1: Median weight change for females

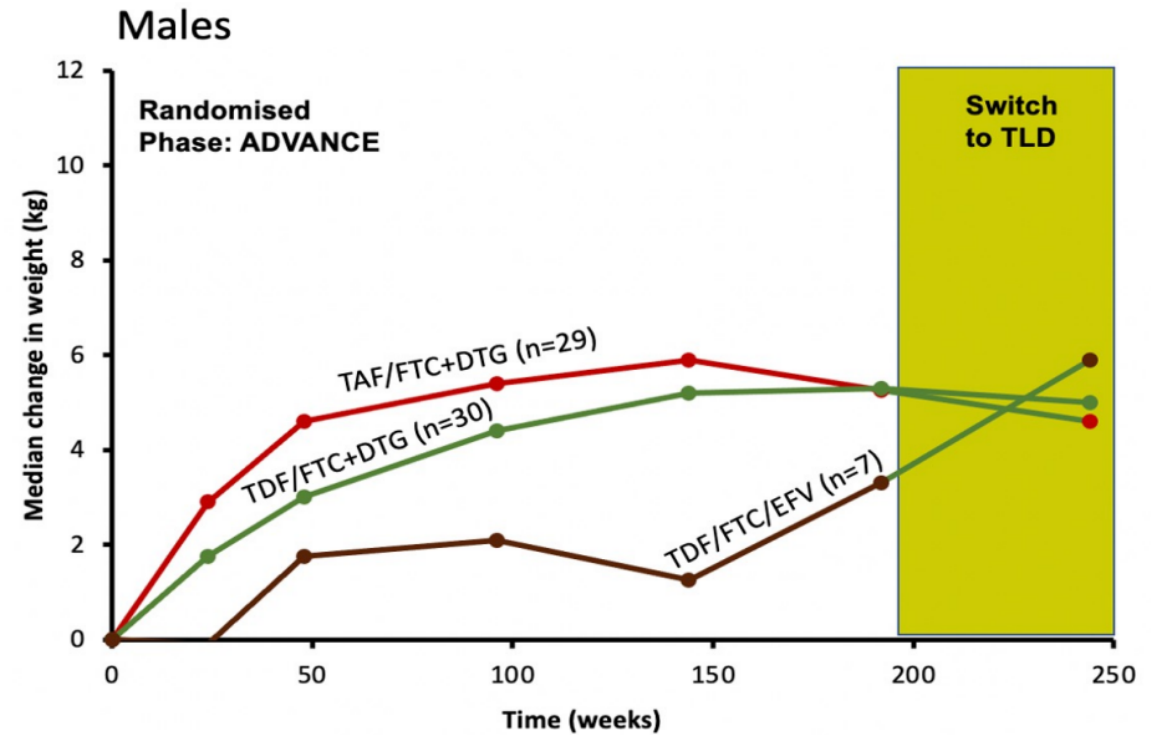
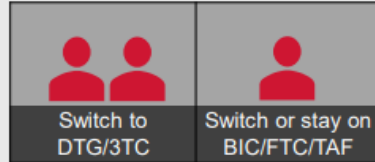


Figure 2: Median weight change for males

Switching from F/TAF/BIC to DTG/3TC

METHODS

- Randomized, open-label controlled trial (2:1)
- Longitudinal follow-up: baseline, week 24, week 48
- Outcomes (2ary): weight, BMI, waist, lipids, insulin resistance, DXA scan, fibroscan
- Linear mixed models with covariance patterns
- Intention to treat – exposed analysis



145 screened

• 11 screen fails

134 randomized

• 4 did not take study medication

ITT-E analysis

130 at baseline

• 5 drop-outs

125 at week 24

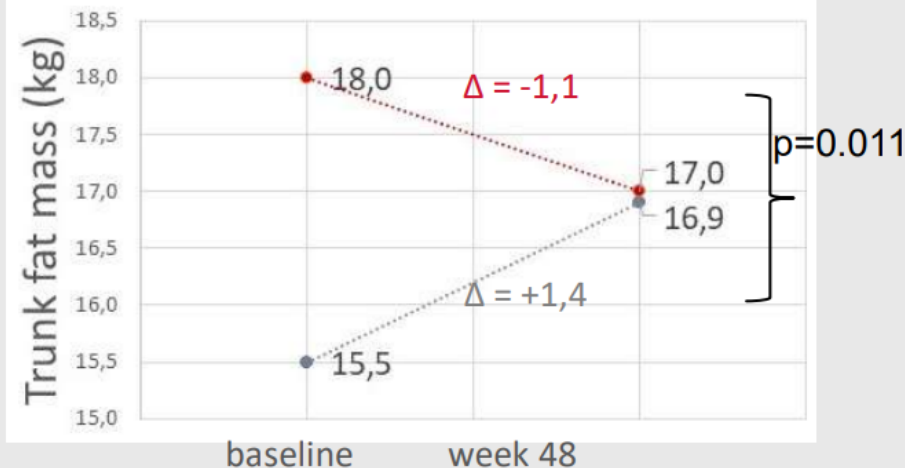
• 4 drop-outs

121 at week 48

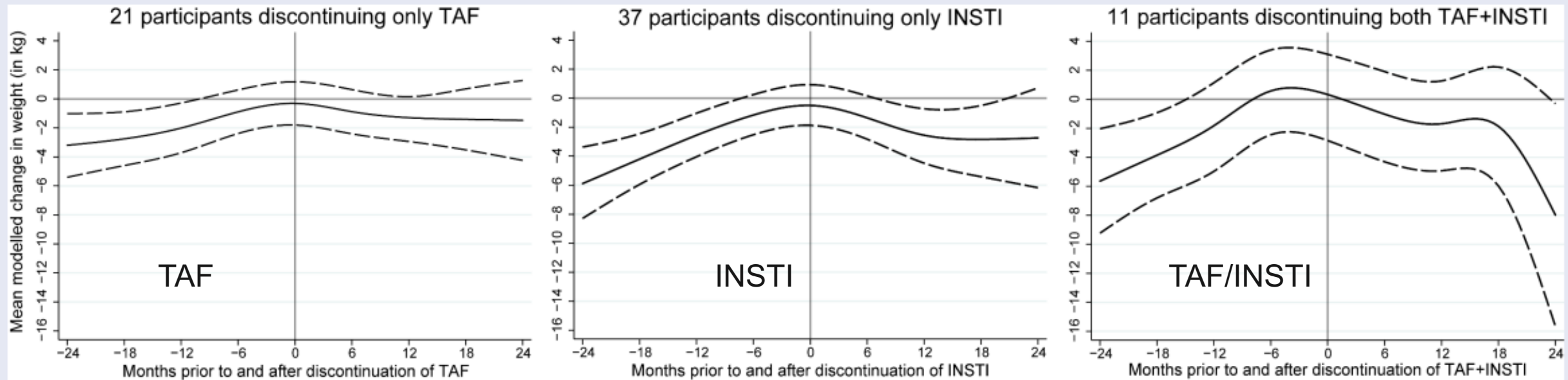
	DTG/3TC	BIC/FTC/TAF	p-value
ALT (U/L)	- 0.73	+ 4.55	0.040
HDL (mg/L)	- 0.043	- 2.84	0.043
Lean trunk mass (gram)	+ 112	- 474	0.032
Trunk fat mass (gram)	+ 41	+ 719	0.043
Fat percentage	- 0.04	+ 1.32	0.003

DTG/3TC: N = 13
BIC/FTC/TAF: N = 4

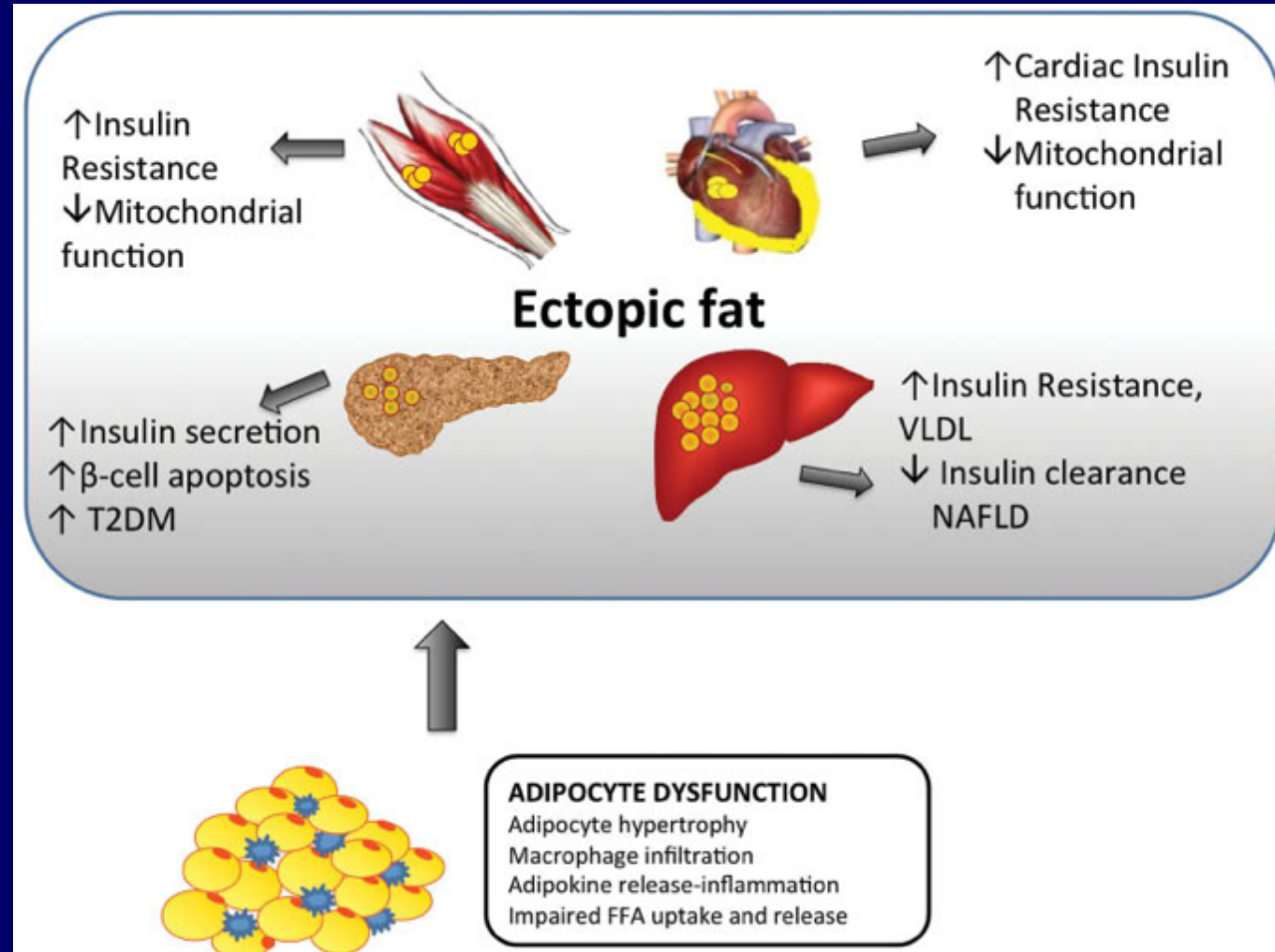
BMI > 30



Switching off of TAF, INSTIs, or Both in PWH with >7% weight gain: ATHENA Cohort



What is Ectopic Fat?



Increase in Liver Fat after switch to INSTIs

Figure 1. Cross Sectional Study Schema. One FibroScan conducted at varying time-point post-INSTI switch or comparable time-point in non-INSTI group

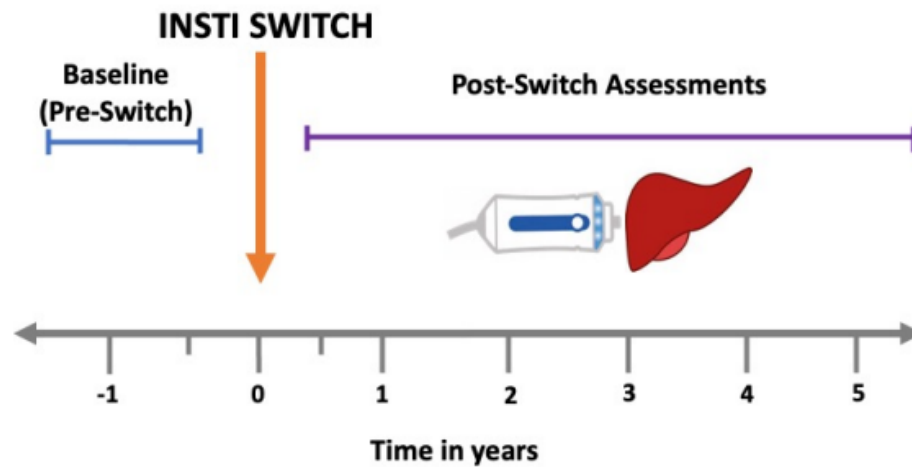
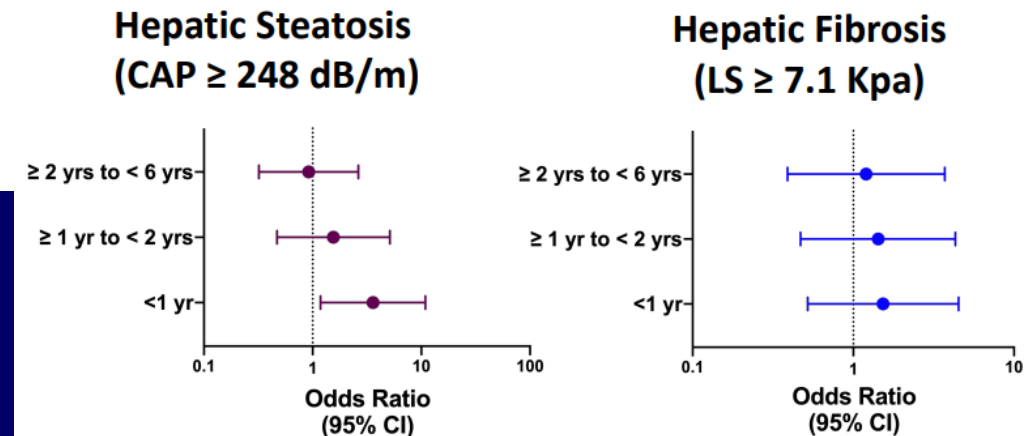


Table 1. Cohort characteristics, n=257

Mean (SD) or n(%)	INSTI N=123	Non-INSTI N=134
Age, years	50 (8)	49 (8)
Black race	82 (67)	107 (80)
BMI, kg/m ²	32 (8)	32 (8)

Figure 3. Model-adjusted odds of hepatic steatosis and moderate fibrosis in INSTI vs non-INSTI groups. Women on INSTIs had a 3.6 greater odds of having hepatic steatosis within 1 year of switch compared to non-INSTI Controls.



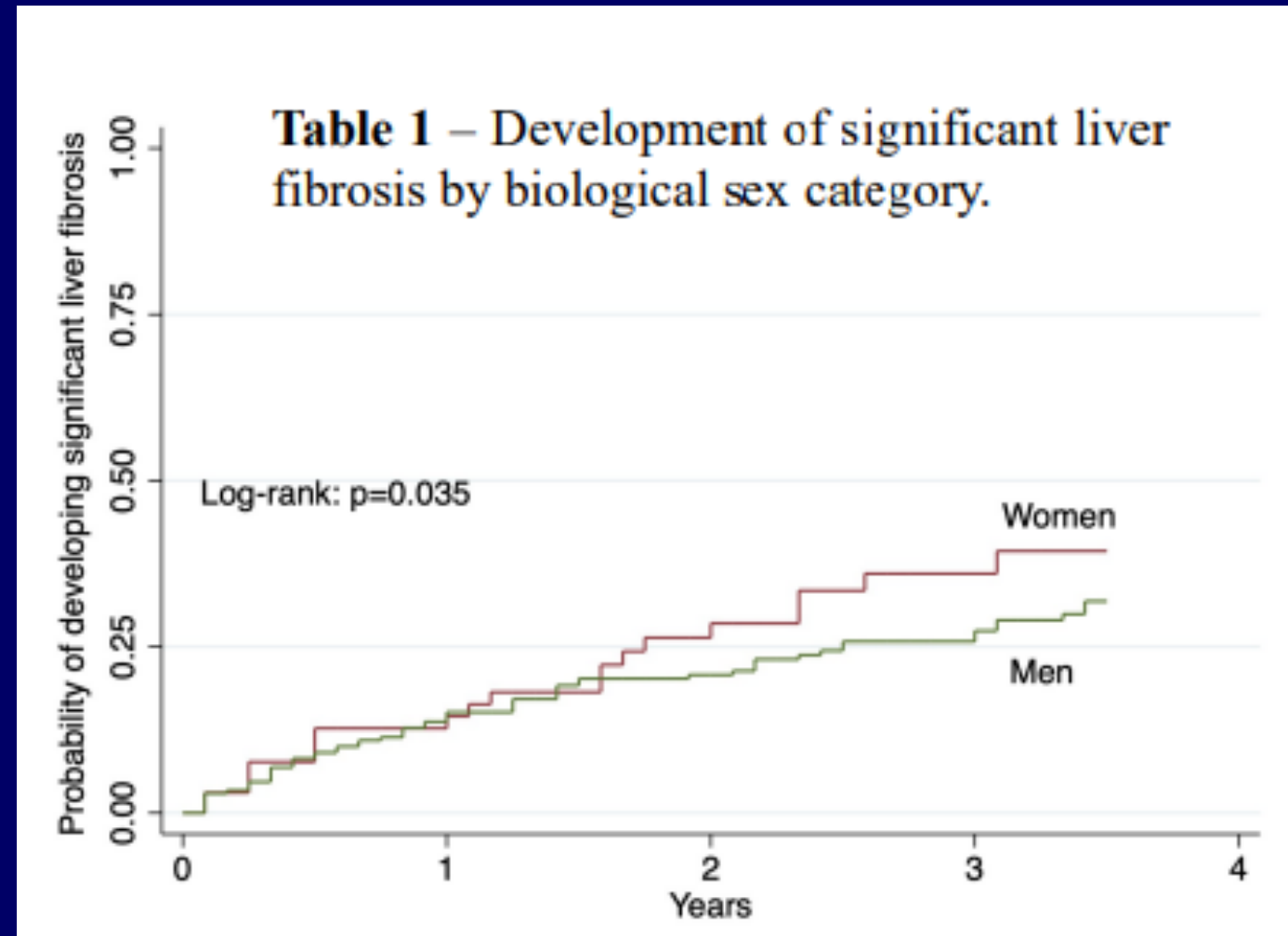
Women had lower prevalence of fatty liver, but a greater progression to fibrosis

Population characteristics

Population characteristics (N= 1359)	
Age	51.8 (9.9)
Female	25%
BMI	25.1 (4.4)
Ethnicity	25% black, 64% white
HIV duration	17.2 (9.5) years

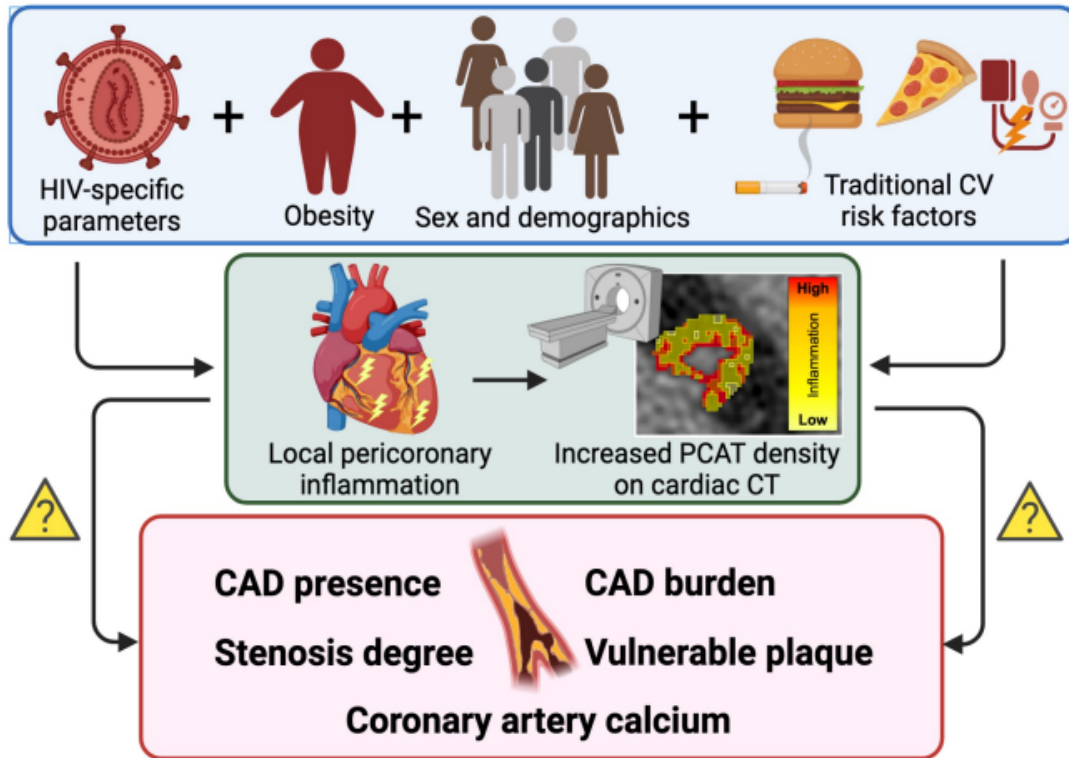
Baseline characteristics

	Female	Male
Prevalence of MAFLD	17.7%	24.3%
Prevalence of liver fibrosis	10.7%	13.4%
Black ethnicity	48%	17%
ALT	26.4	33.4
HDL cholesterol	1.46	1.11
Triglycerides	1.69	2.47



Inflammation in fat surrounding coronary arteries associated with coronary plaque

Figure 1. Central illustration



Multivariable regression relating PCAT to plaque phenotypes

- PCAT density was associated with CT-derived CAD measures independent of ASCVD risk score, smoking & substance use, BMI, ART parameters and systemic inflammatory biomarkers (Table 2).

Table 2: Association of PCAT density with CAD in REPRIEVE

Presence of	Univariable			Model 1			Model 2		
	OR	95%CI	p	OR	95%CI	p	OR	95%CI	p
Coronary Plaque	1.3	1.13–1.50	<0.001	1.3	1.10–1.50	0.002	1.4	1.21–1.70	<0.001
Coronary Calcium	1.5	1.28–1.74	<0.001	1.5	1.26–1.75	<0.001	1.6	1.35–1.94	<0.001
Vulnerable plaque	1.3	1.10–1.54	0.002	1.3	1.06–1.51	0.01	1.3	1.07–1.57	0.008
Leaman >5	1.5	1.27–1.87	<0.001	1.6	1.27–1.93	<0.001	1.9	1.47–2.37	<0.001

Model 1: ASCVD risk, substance use, BMI, HIV parameters; **Model 2:** Model 1 + systemic biomarkers (MCP-1, IL-6, LpPLA2, oxLDL, hsCRP). ORs are per 10 HU of PCAT density.

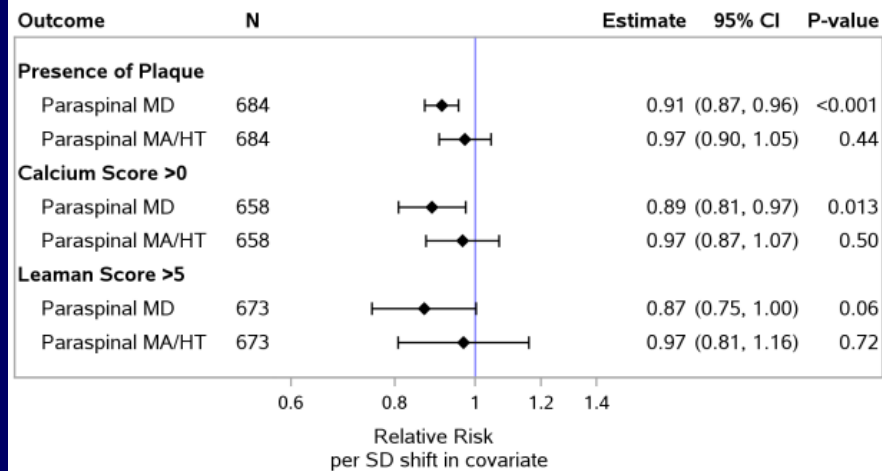
Fat within the muscle associated with coronary artery disease: REPRIEVE



Figure 1. Paraspinal Muscle on Non-Contrast CT Scan, in green

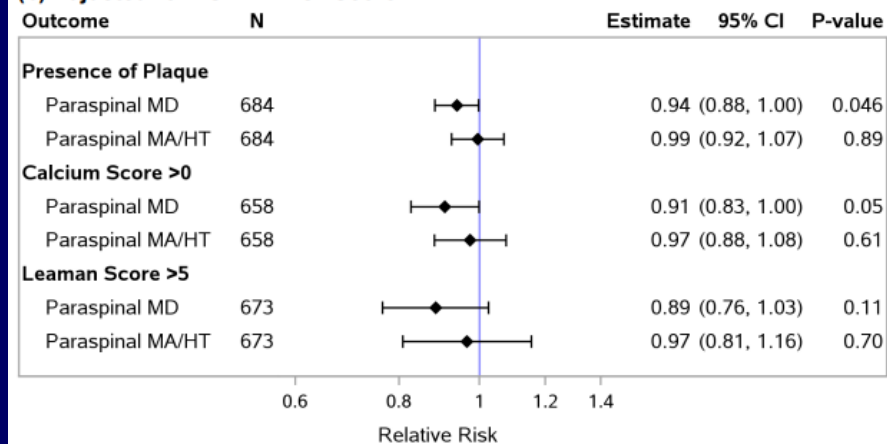
Figure 3. Associations between paraspinal MD and MA/HT with CT-based plaque measures.

(a) Adjusted for Age and Natal Sex



Muscle **density** but not muscle area was associated with the presence of coronary plaque and calcium score >0 in analyses adjusted for age and natal sex (Figure 3a).

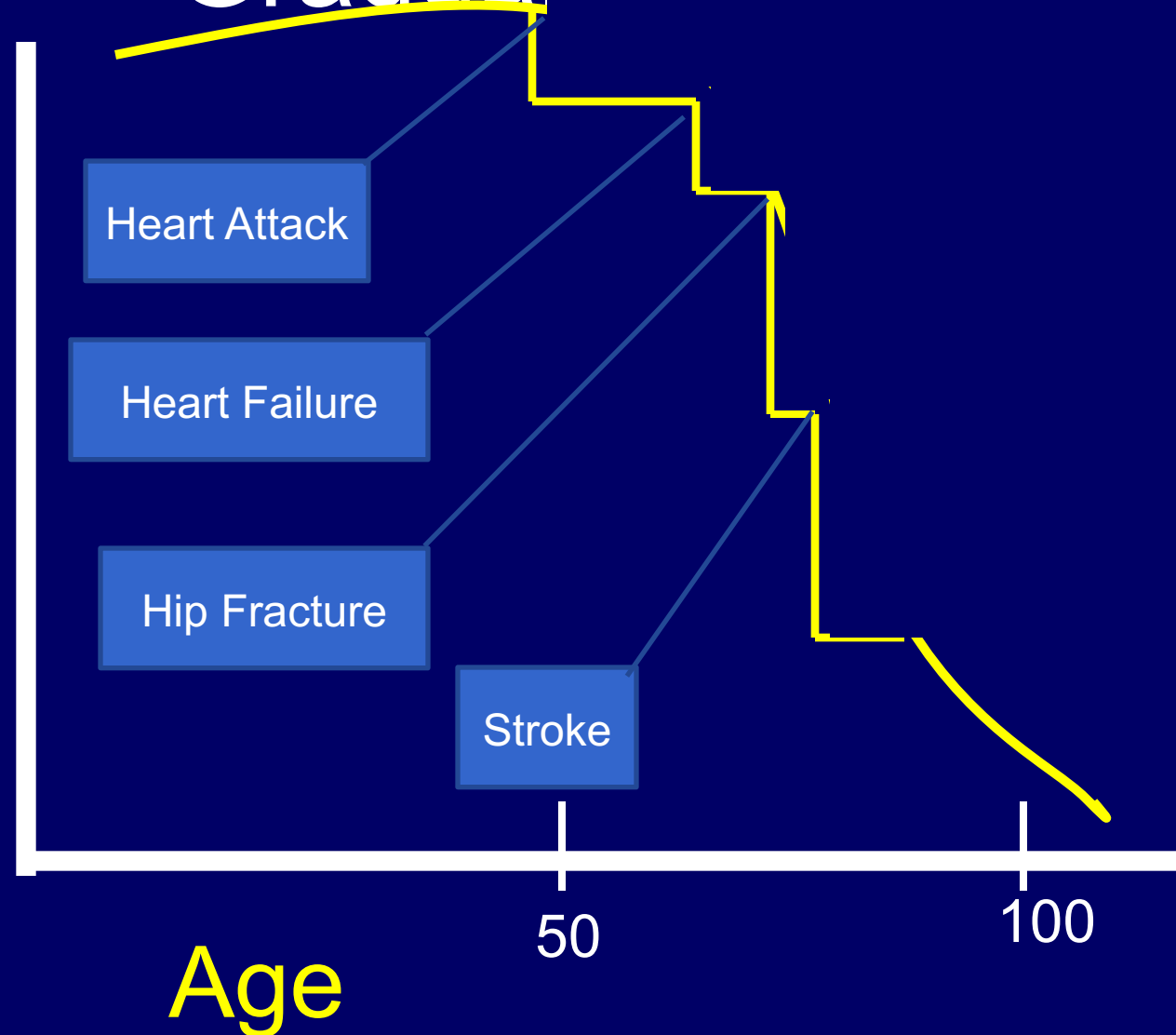
(b) Adjusted for ASCVD Risk Score



These associations were attenuated in models adjusted for ASCVD risk (Figure 3b).

Decline in Function May Not Be Gradual

Quality of Life/
Physical &
Cognitive
Function

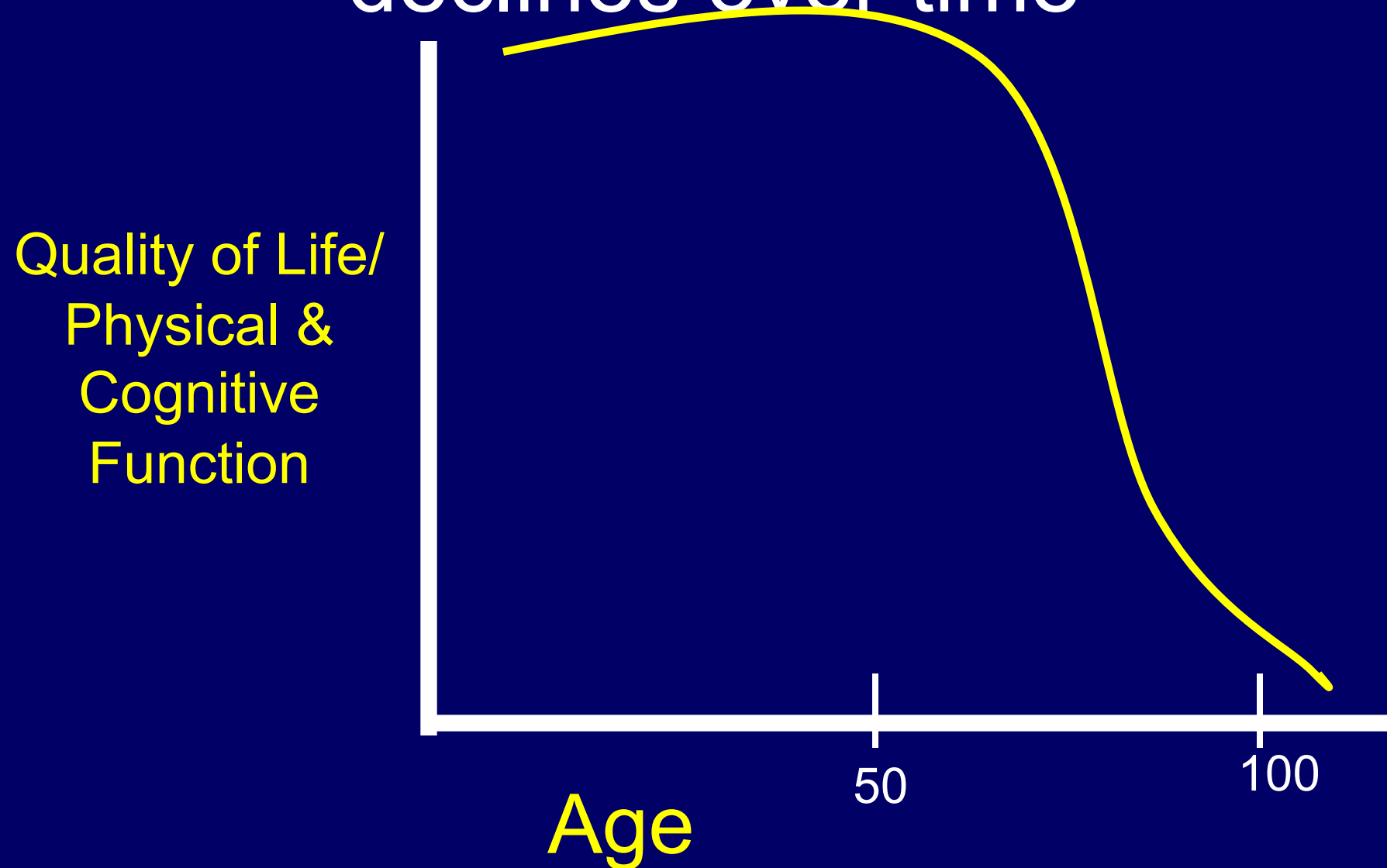


Let's Get Screened!

Slide 40

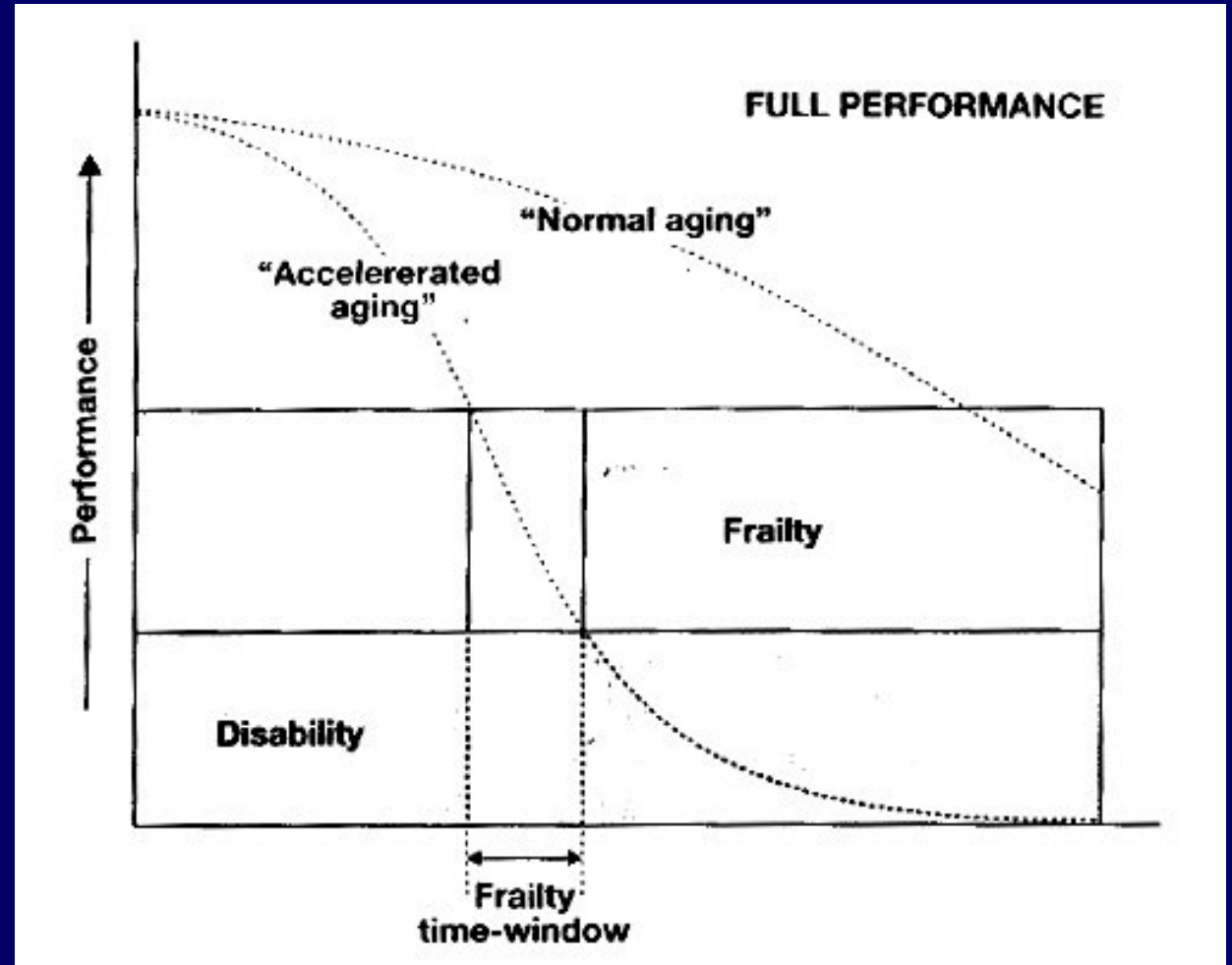
Condition	Tests	Frequency
Diabetes	Fasting Glucose Hgb A1C	Yearly
High Cholesterol	Lipid Panel	Yearly
High Blood Pressure	BP Measurement	At least Yearly
Kidney Disease	Serum Creatinine Urine protein test	Every 6-12 months
Osteoporosis	DXA Scan	Age 50+
Anal/Cervical Cancer	Pap test	Yearly
Lung Cancer	CT (if smoker)	debated
Liver Cancer	Ultrasound (if HBV or HCV+)	Yearly
Breast Cancer	Mammogram	Yearly
Colon Cancer	Colonoscopy	Every 5 years
Prostate Cancer	PSA	debated

Physical function generally declines over time



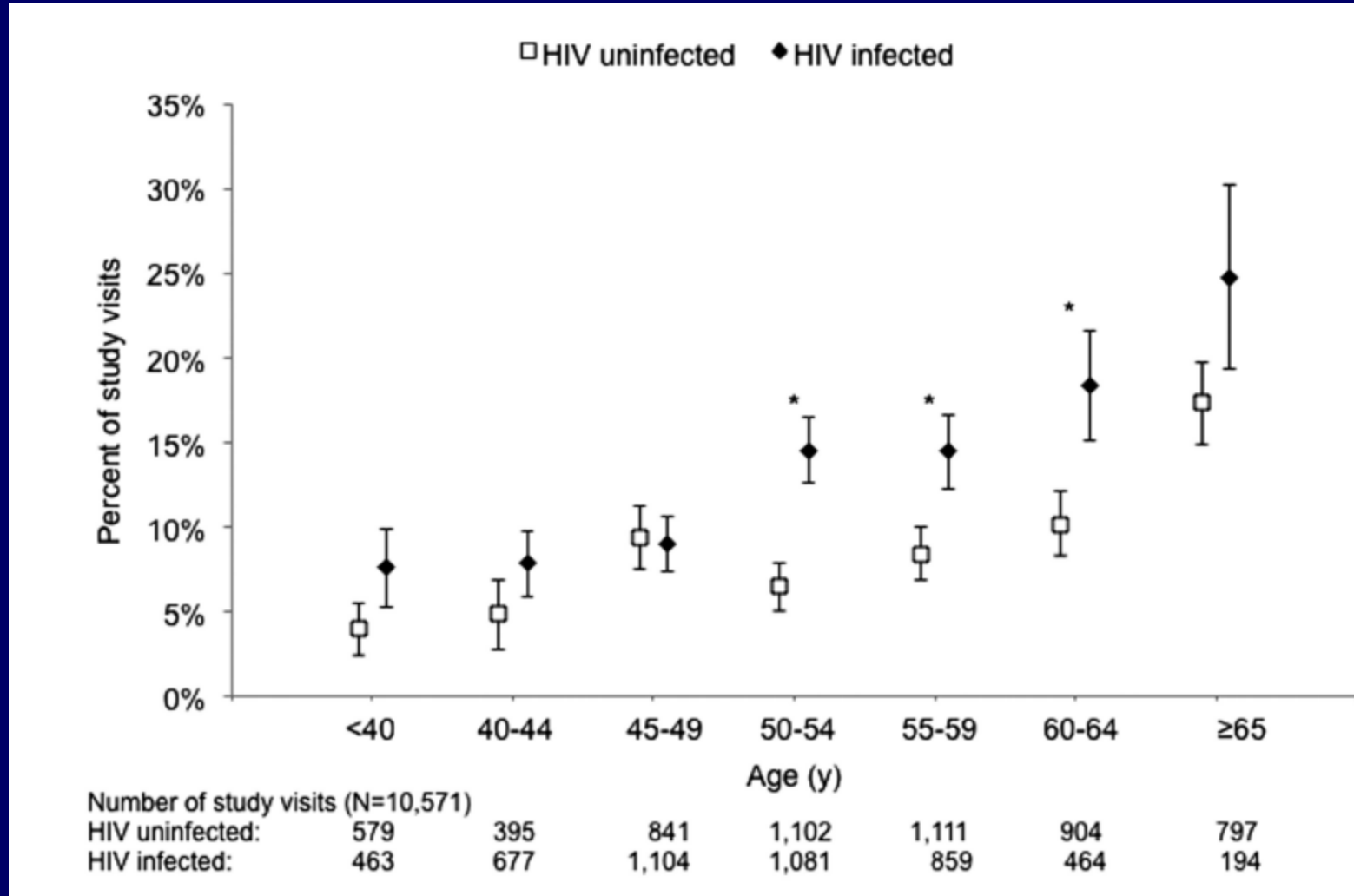
Frailty: A Brief Overview

- **Weight loss**
- **Weakness**
- **Exhaustion**
- **Slowness**
- **↓ Physical Activity**



HIV+ Men Are More Frail At a Younger Age vs HIV- Men: MACS

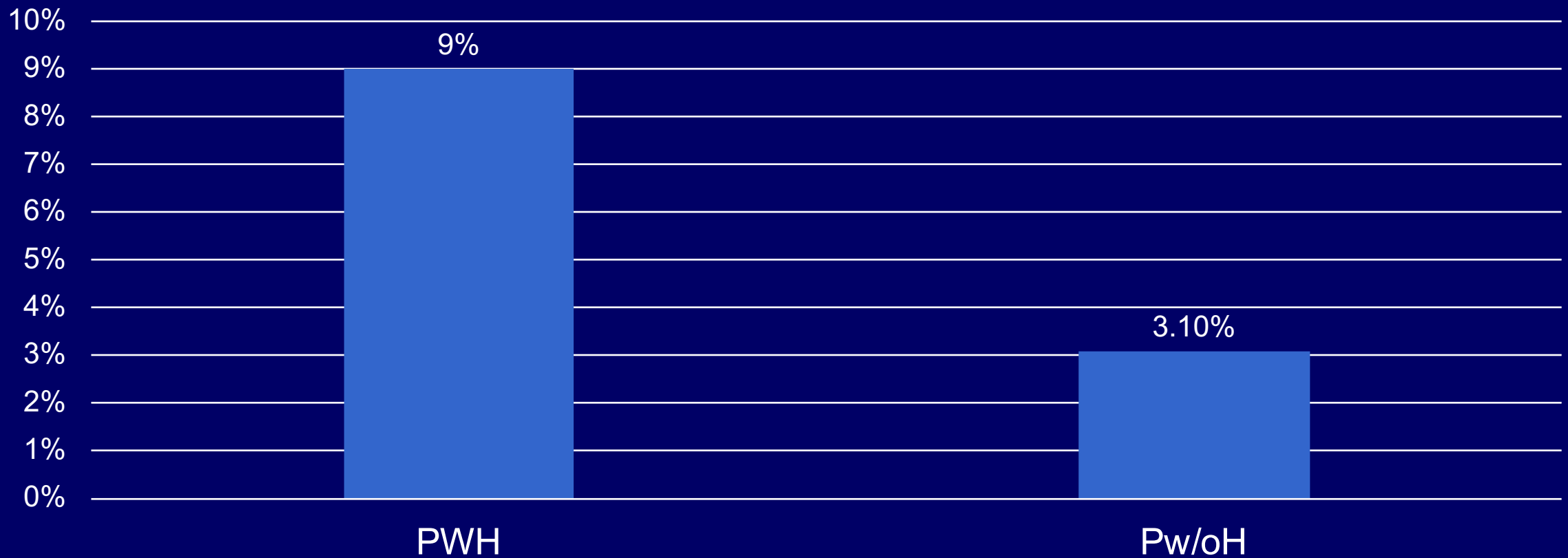
Slide 43



Althoff, J of Gerontology, 2013

Frailty more common PWH compared to Pw/oH: Thai HIV-NAT

Frailty by HIV Serostatus



Lower trunk muscle area associated with lower grip strength

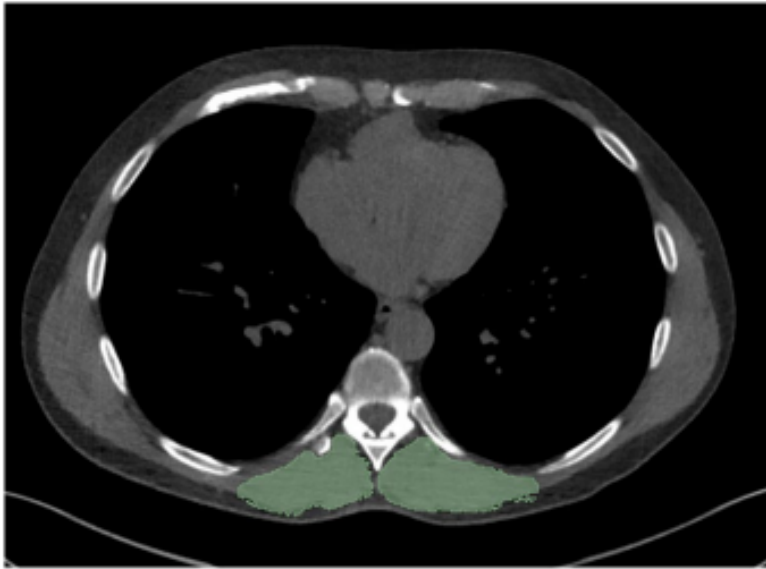


Figure 1. Paraspinal Muscle on Non-Contrast CT Scan, in green

RESULTS (continued)

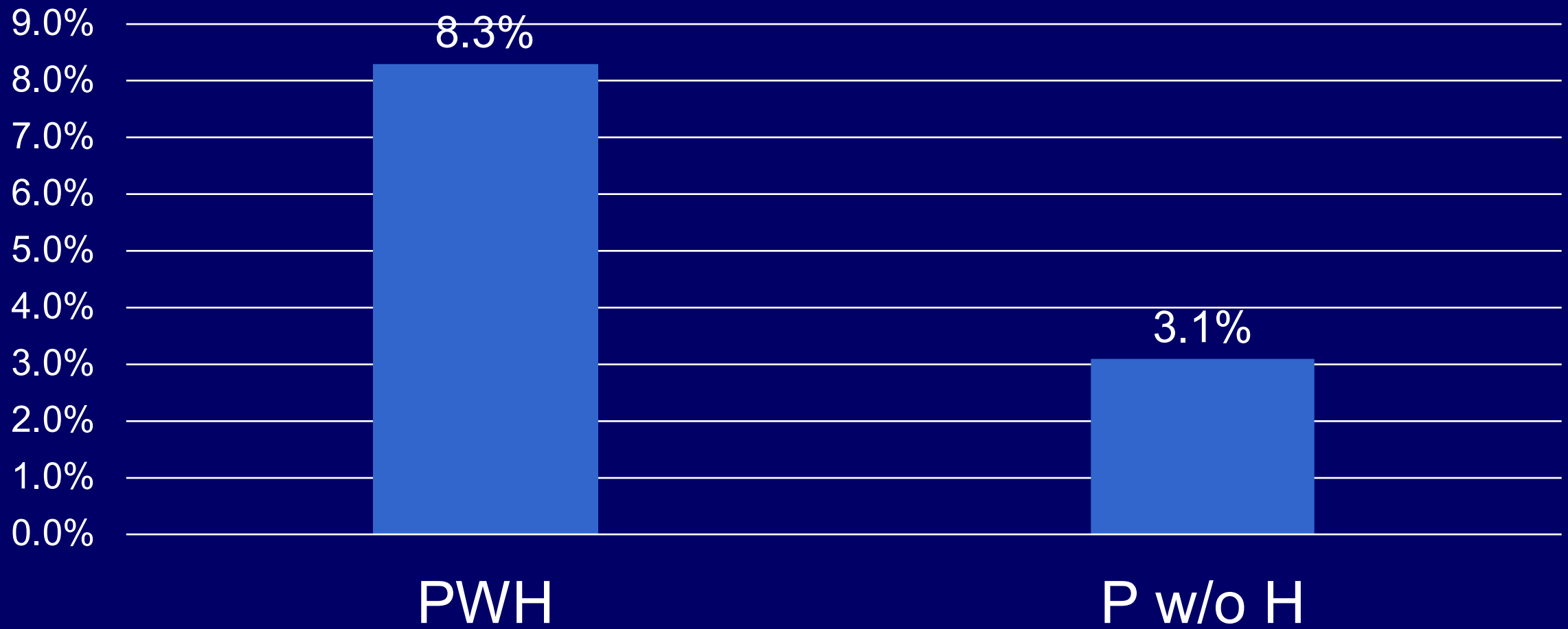
- Lower MD (as outcome) was associated with older age, female sex, thymidine analogue exposure, greater BMI and waist circumference, and hsCRP, MCP-1, sTNFR-1, and the inflammatory index score (data not shown).
- Smaller MA/HT (as outcome) was associated with older age, female sex, non-Black race, greater ASCVD risk, and MCP-1 (data not shown).

(c) Models for Continuous Physical Function Measures: Chair Rise and Grip Strength

Outcome	N		Estimate	95% CI	P-value
Chair Rise Rate (rises/min)					
Paraspinal MD	139		0.665	(-0.659, 1.988)	0.32
Paraspinal MA/HT	139		1.075	(-0.351, 2.501)	0.14
Grip Strength (kg)					
Paraspinal MD	138		-0.28	(-2.11, 1.56)	0.77
Paraspinal MA/HT	138		2.45	(0.52, 4.38)	0.013

Difference in Outcome per SD shift in covariate

Sarcopenia more common in PWH vs Pw/oH: Thai HIV-NAT



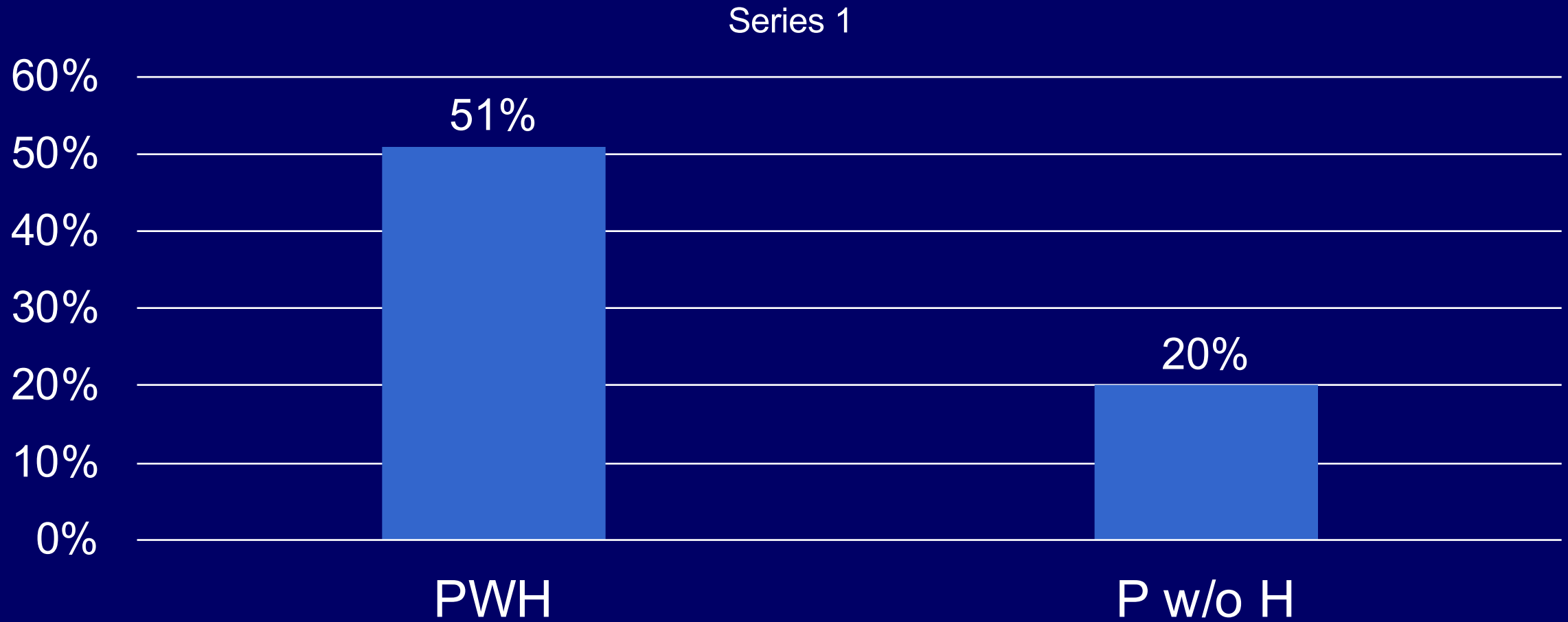
Sarcopenia: low grip strength, low walk speed, and low muscle mass

Factors associated with falls in CNICS

		Any Falls (N=435)	1 vs 0 Falls (N=218)	2 vs 0 Falls (N=120)	3 vs 0 Falls (N=97)
		RR (95% CI)	RR (95% CI)	RR (95% CI)	RR (95% CI)
Neuropathy symptoms: (None = REF)	Not/ a little bothersome	1.74 (1.41, 2.15)	1.50 (1.12, 2.01)	1.69 (1.06, 2.69)	2.35 (1.47, 3.77)
	Bothersome/ highly bothersome	2.85 (2.34, 3.46)	1.76 (1.30, 2.40)	2.41 (1.62, 3.59)	6.77 (4.39, 10.4)
Difficulty remembering: (None = REF)	Not/ a little bothersome	2.18 (1.79, 2.65)	1.62 (1.24, 2.13)	3.35 (2.29, 4.90)	1.65 (1.06, 2.60)
	Bothersome/ highly bothersome	3.18 (2.67, 3.95)	1.71 (1.21, 2.42)	3.98 (2.63, 6.01)	4.37 (2.81, 6.80)
Fatigue or Loss of Energy: (None = REF)	Not/ a little bothersome	2.39 (1.89, 3.02)	1.59 (1.18, 2.15)	3.24 (2.08, 5.03)	2.09 (1.25, 3.51)
	Bothersome/ highly bothersome	3.57 (2.83, 4.51)	2.04 (1.49, 2.79)	4.09 (2.62, 6.40)	4.81 (2.93, 7.92)
Feeling dizzy: (None = REF)	Not/ a little bothersome	2.49 (2.07, 3.00)	1.70 (1.28, 2.24)	2.78 (1.93, 3.99)	3.29 (2.22, 4.89)
	Bothersome/ highly bothersome	3.91 (3.20, 4.77)	1.49 (0.98, 2.30)	4.95 (3.34, 7.34)	6.90 (4.60, 10.3)
Frailty Phenotype: (None = REF)	Prefrail	2.42 (1.94, 3.01)	1.71 (1.30, 2.25)	1.64 (1.10, 2.44)	4.45 (2.82, 7.02)
	Frail	4.67 (3.69, 5.92)	1.69 (1.14, 2.52)	4.22 (2.70, 6.60)	10.13 (6.42, 16.0)
Depression Symptoms: (None = REF)	Mild/ moderate	2.33 (1.95, 2.78)	1.97 (1.52, 2.56)	2.15 (1.50, 3.08)	3.07 (2.06, 4.59)
	Moderately severe/ Severe	3.50 (2.72, 4.50)	1.72 (1.08, 2.75)	2.61 (1.49, 4.56)	6.39 (4.07, 10.04)
Diabetes		1.43 (1.20, 1.72)	1.44 (1.09, 1.90)	1.34 (0.91, 1.97)	1.58 (1.04, 2.42)
Quality of Life index	per 1 standard deviation	0.41 (0.35, 0.47)	0.54 (0.46, 0.62)	0.45 (0.38, 0.53)	0.30 (0.25, 0.36)
# Emergency visits (in the past 2 years)	per visit	1.07 (1.05, 1.09)	1.09 (1.03, 1.15)	1.10 (1.03, 1.17)	1.18 (1.12, 1.25)

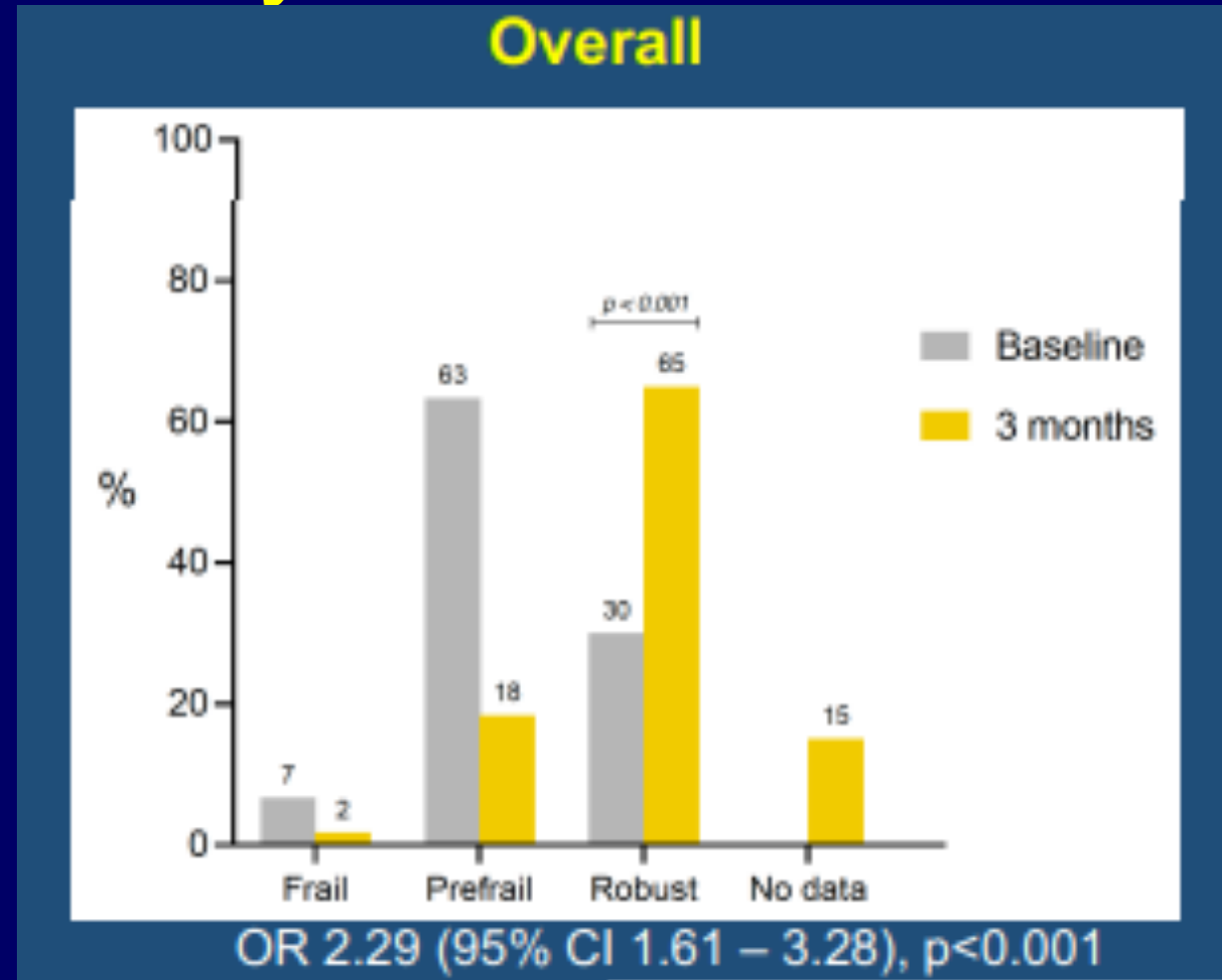
- Neuropathy
- Cognitive Problems
- Dizziness
- Depression
- Frailty
- Diabetes
- Low QOL
- ED visits

Among people over 65, falls more common in PWH: GEPPPO Cohort



12 week exercise program can reverse frailty

- 51 participants (31 HIV+, 20 HIV)
- Median age 57 (53-63) years
- 25% women.
- Personalized multicomponent exercise program (resistance, endurance, balance, and flexibility training)
- Also, improvements in quality of life
- Intervention worked regardless of HIV status

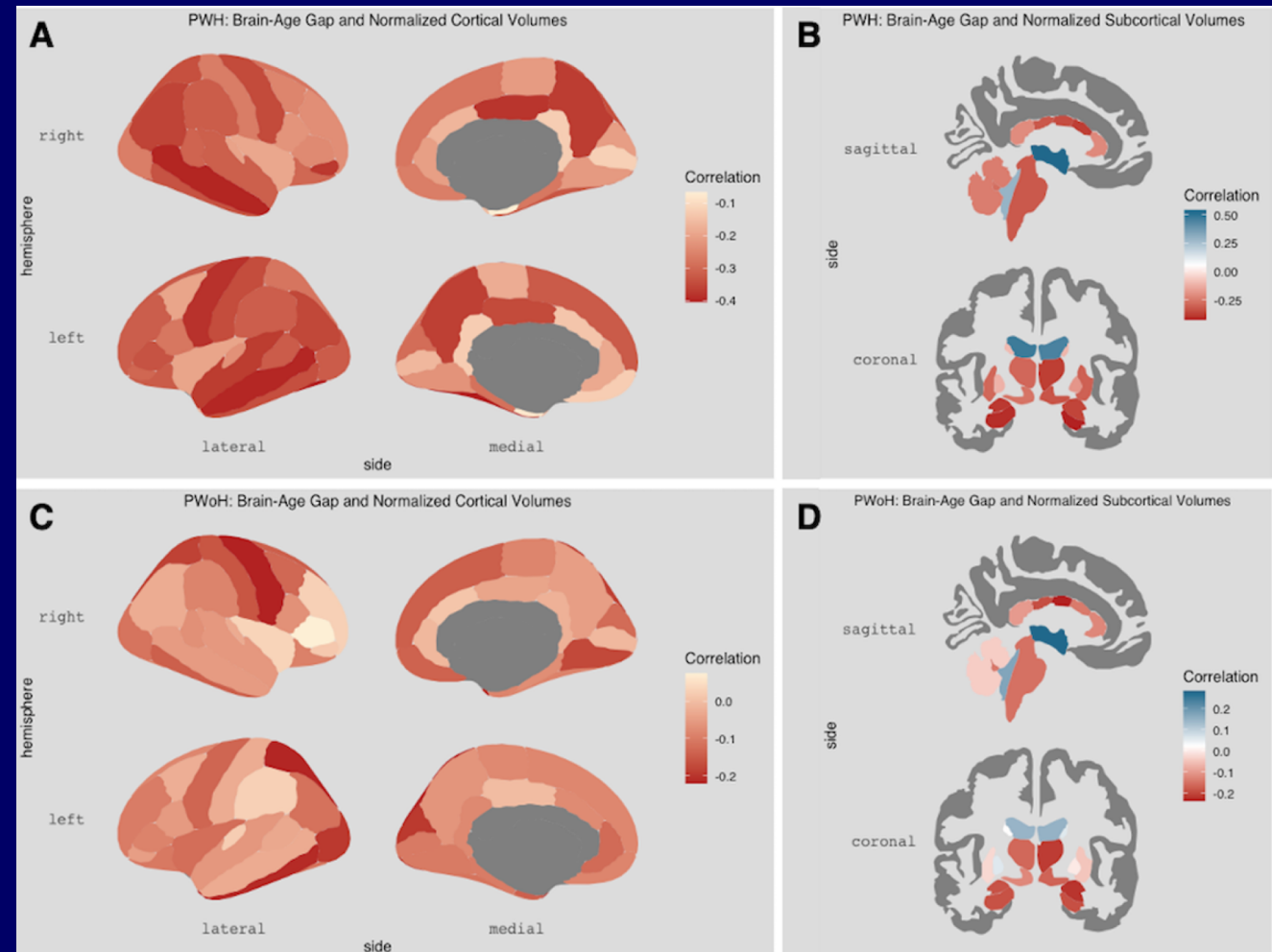


Cognitive function generally declines over time

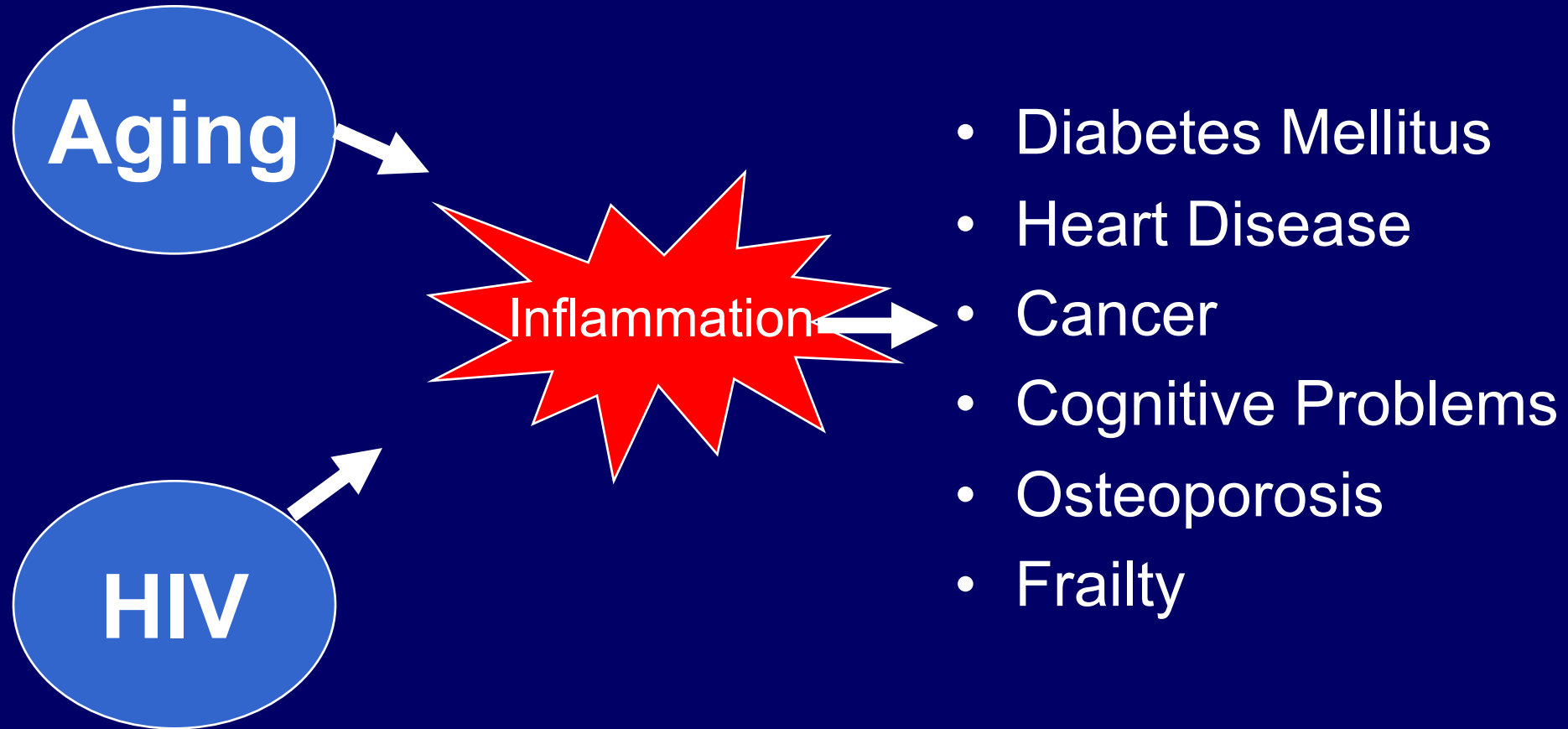


Brain-age gap greater in PWH vs Pw/oH

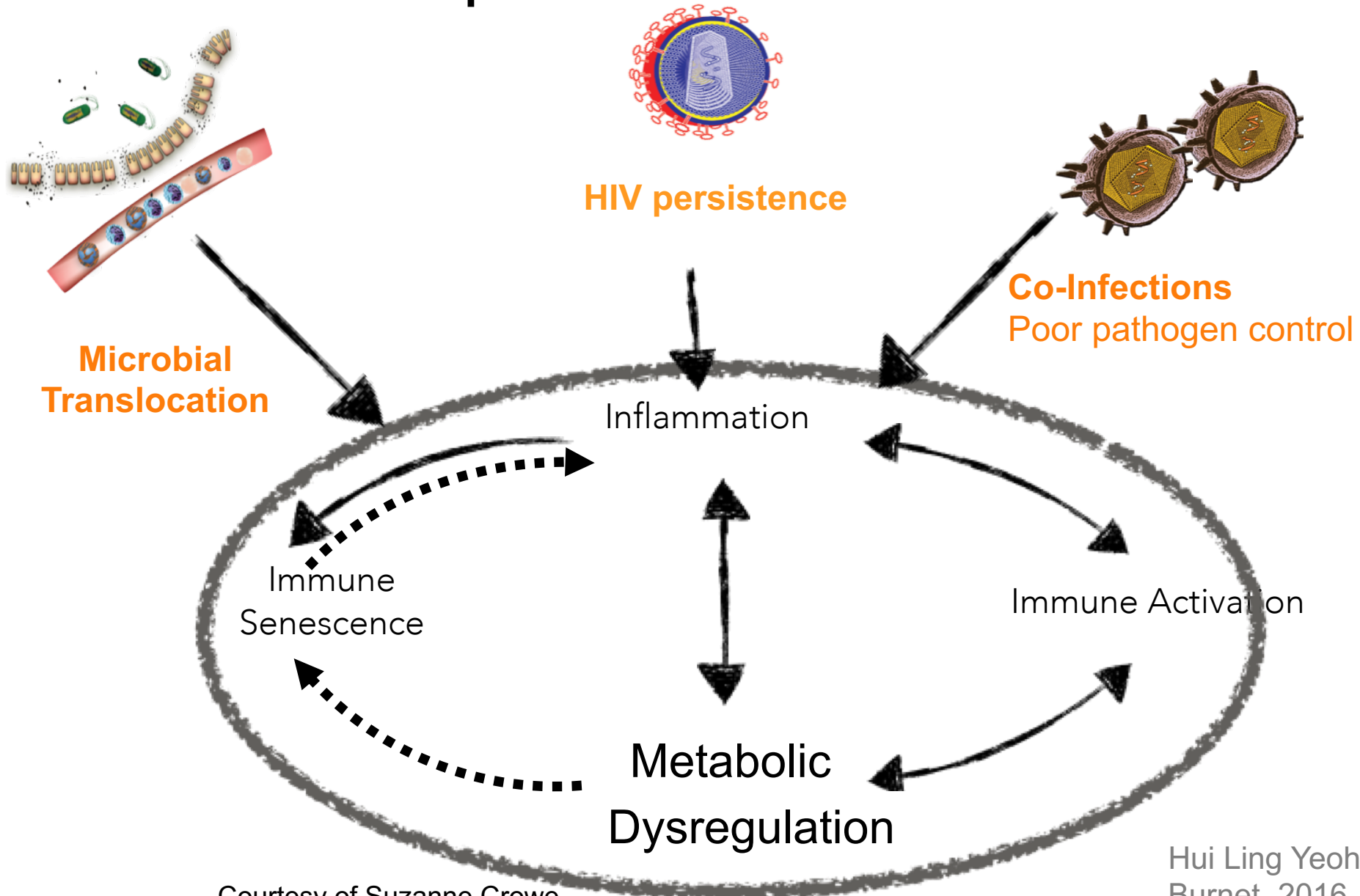
- Brain-age gap related to:
 - CVD risk
 - HCV
 - Detectable VL
 - Early life stress
 - Socioeconomic challenges
- Brain regions were affected differently in those with and without HIV



Aging & HIV: The Inflammation Double Whammy



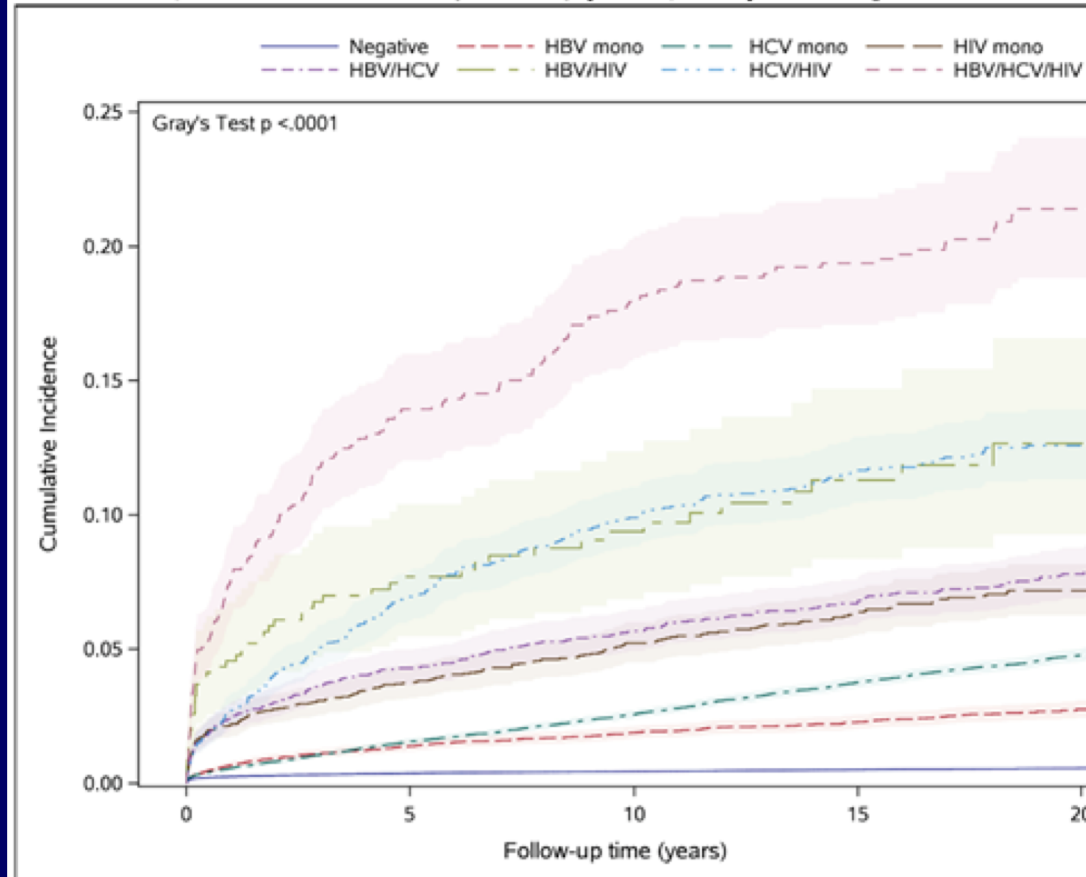
Microbial translocation, HIV persistence and coinfections cause persistent innate immune activation



Viral hepatitis increases risk of kidney failure

- n=690,873
- 5552 ESRD, 49753 deaths over 6.3 years
- Results even stronger in those with diabetes or hypertension

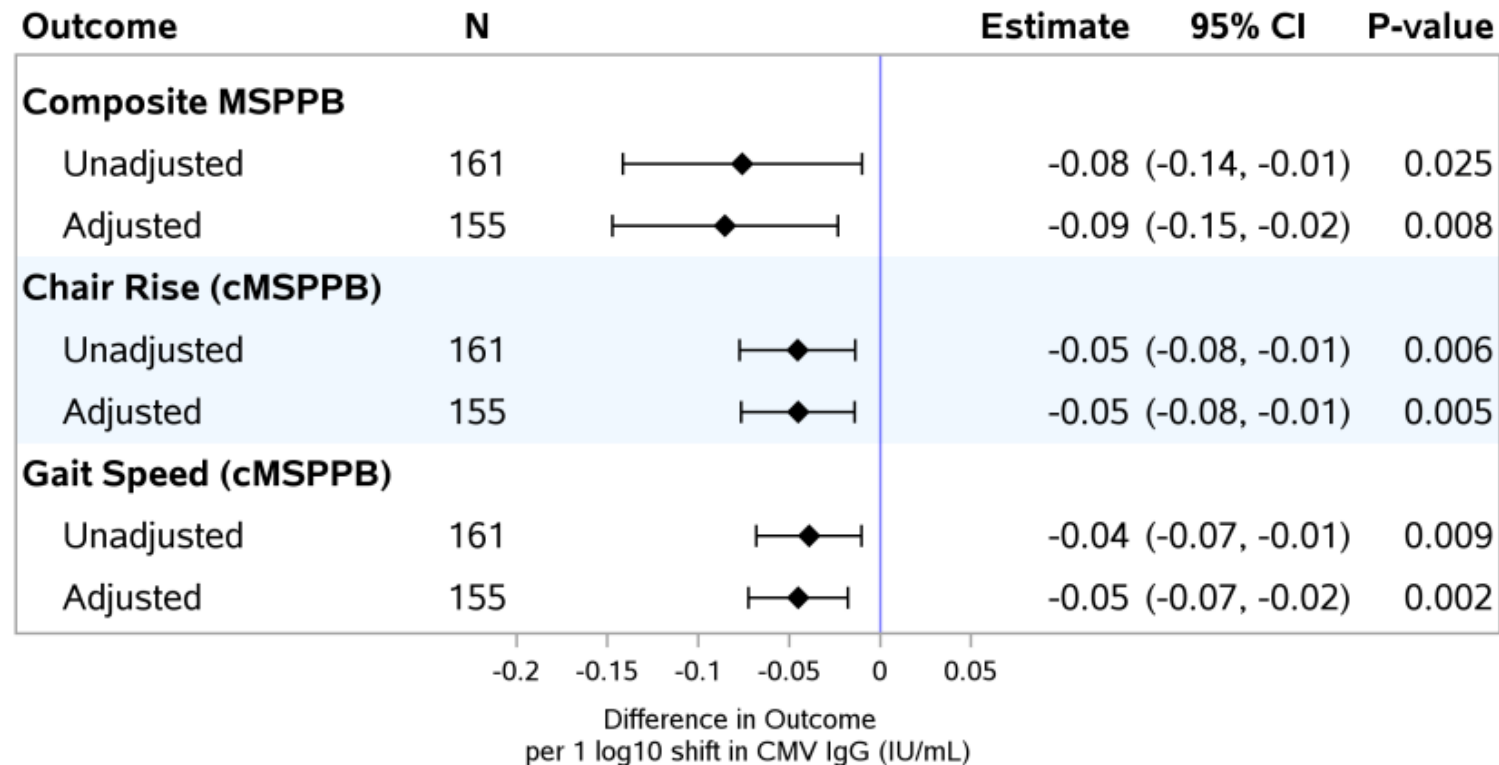
Figure 1. Cumulative incidence curves for incident ESRD among individuals with chronic viral infections, incidence rates (95% CI) per 1,000 person-years of follow-up (Table)



Negative	0.55 (0.53-0.57)
HBV mono	1.58 (1.42-1.76)
HCV mono	2.83 (2.7-2.97)
HIV mono	4.75 (4.18-5.41)
HBV/HCV	5.8 (5.14-6.54)
HBV/HIV	11.39 (8.59-15.12)
HCV/HIV	10.32 (9.28-11.47)
HBV/ HCV/HIV	23.23 (20.4-26.46)

Antibody titer for CMV associated with poorer physical function in REPRIEVE

Figure 3: Associations between CMV IgG and physical function.



Estimates are from linear regression models with CMV IgG as risk factor and physical function measures as outcomes, unadjusted and adjusted for age, sex, BMI, nadir CD4 and hsCRP.

Serious Non-AIDS Events associated with low level viremia

Definitions for the primary exposure of interest

Non-suppressed viremia

- A single VL ≥ 1000 copies/mL, OR
- VL ≥ 200 copies/mL on two or more consecutive determinations at least 3 months apart

- High-level viremia:** VL of 200-999 copies/mL, that does not meet the criteria for a blip or non suppressed viremia

- Low-level viremia:** VL of 51-199 copies/mL which do not met criteria for a blip

Virological suppression

- VL ≤ 50 copies/mL OR
- Blips: Isolated VL of 51-999 copies/mL which is preceded and followed by a VL ≤ 50 copies/mL

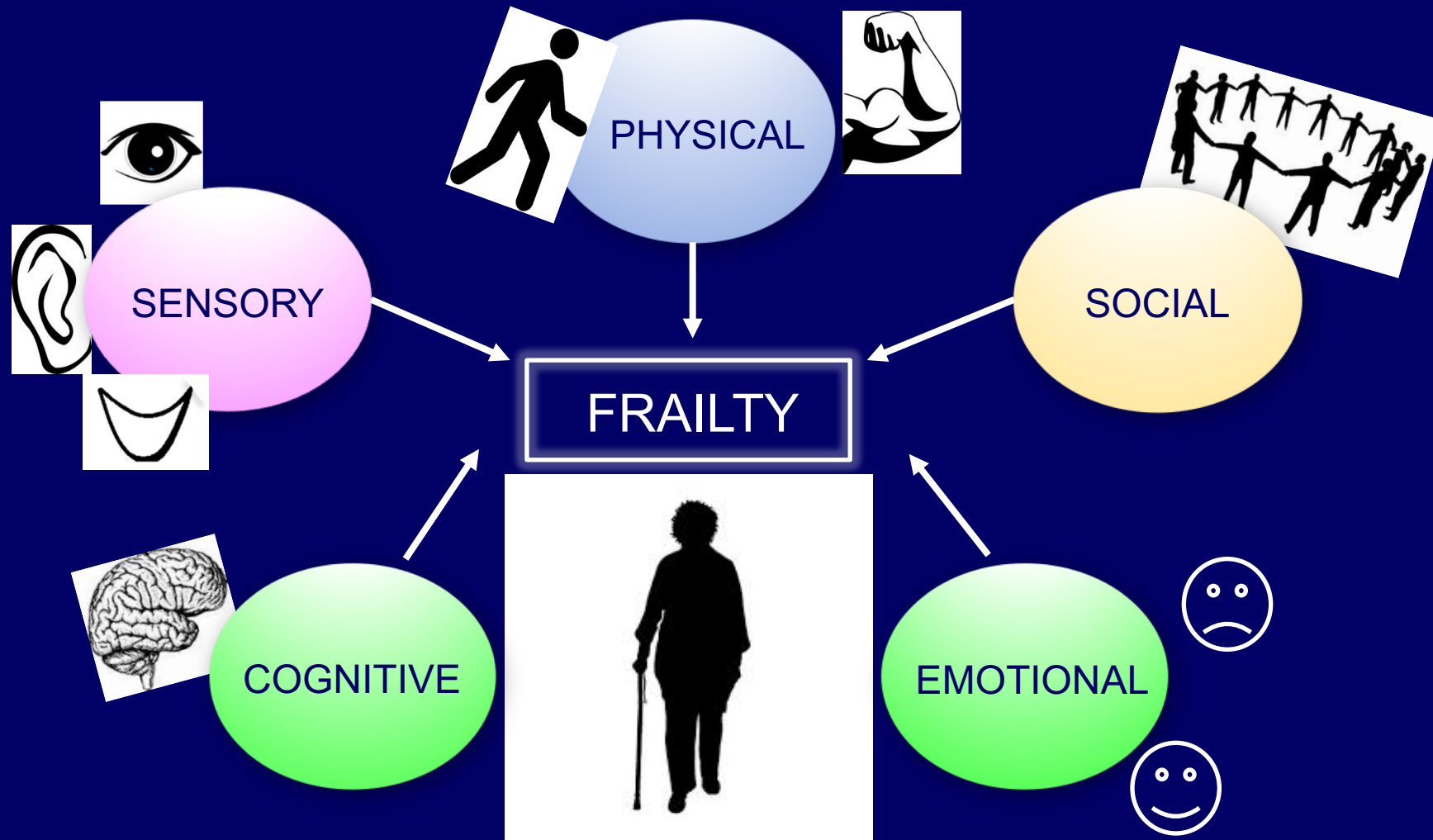
Highest Viremia Status	Overall (n=2815)	No SNAEs (n=2326)	SNAEs (n=489)
VS	1220 (43.3)	1094 (47)	126 (25.8)
Blips	325 (11.5)	266 (11.4)	59 (12.1)
LLV	221 (7.9)	194 (8.3)	27 (5.5)
hLV	122 (4.3)	102 (4.4)	20 (4.1)
NS	927 (32.9)	670 (28.8)	257 (52.6)

	HR	Adjusted 95% CI		P
Time updated viral load categories (Reference: VS)				
LLV	1.249	1.161	1.343	<.0001
hLV	1.566	1.453	1.689	<.0001
NS	1.713	1.641	1.788	<.0001
Gender				
Female vs. Male	1.355	1.28	1.436	<.0001

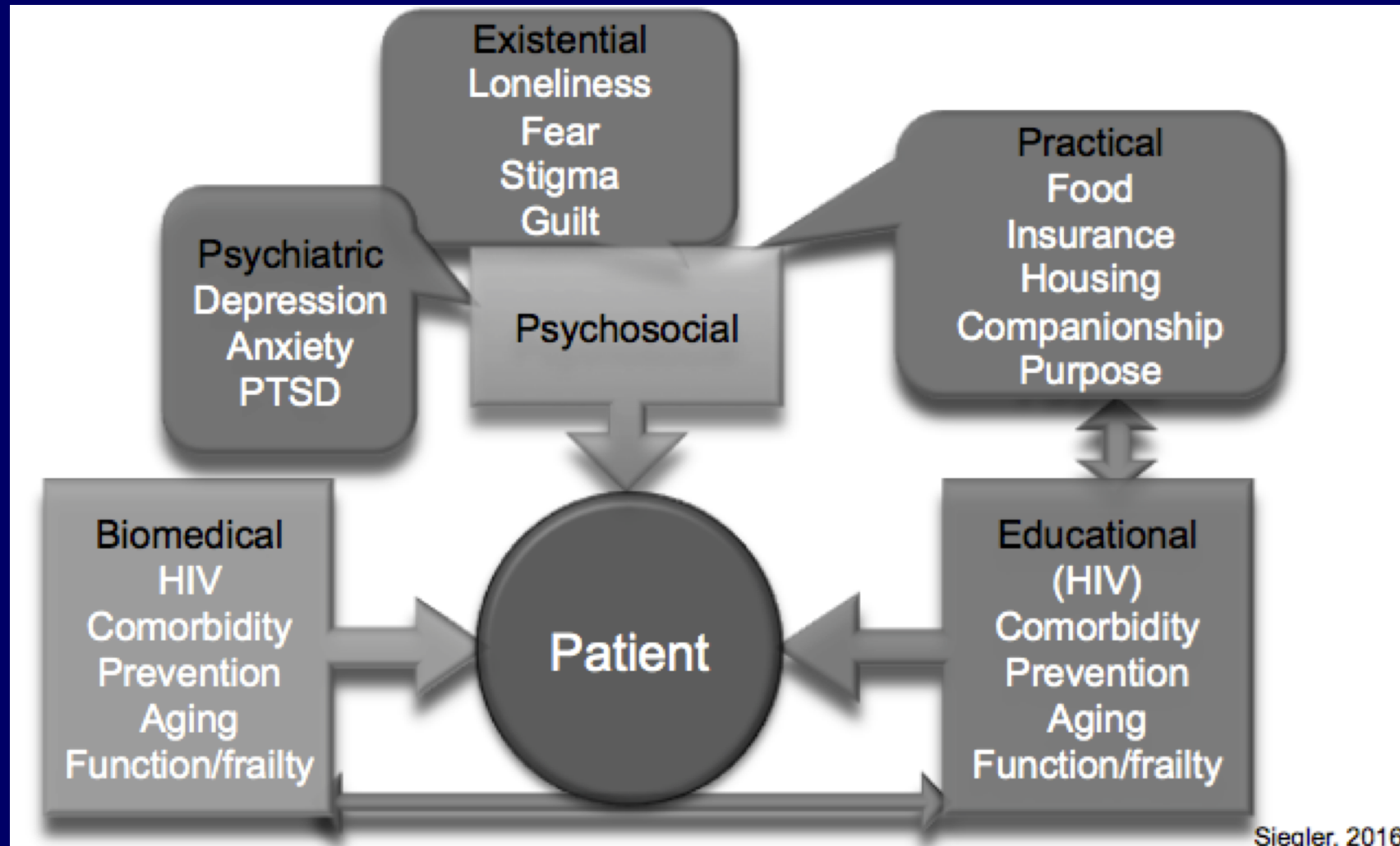
How to Beat Inflammation: A Patient's Guide

- Continue your HIV medications. Stay undetectable
- Stop smoking
- Maintain normal weight
- If overweight, lose at least 5-10% of body weight
- Exercise
- Have a healthy diet
- Cut down on alcohol, avoid drugs
- Get your hepatitis C cured
- Maintain dental health
- Practice good sleep hygiene

The Faces of Frailty



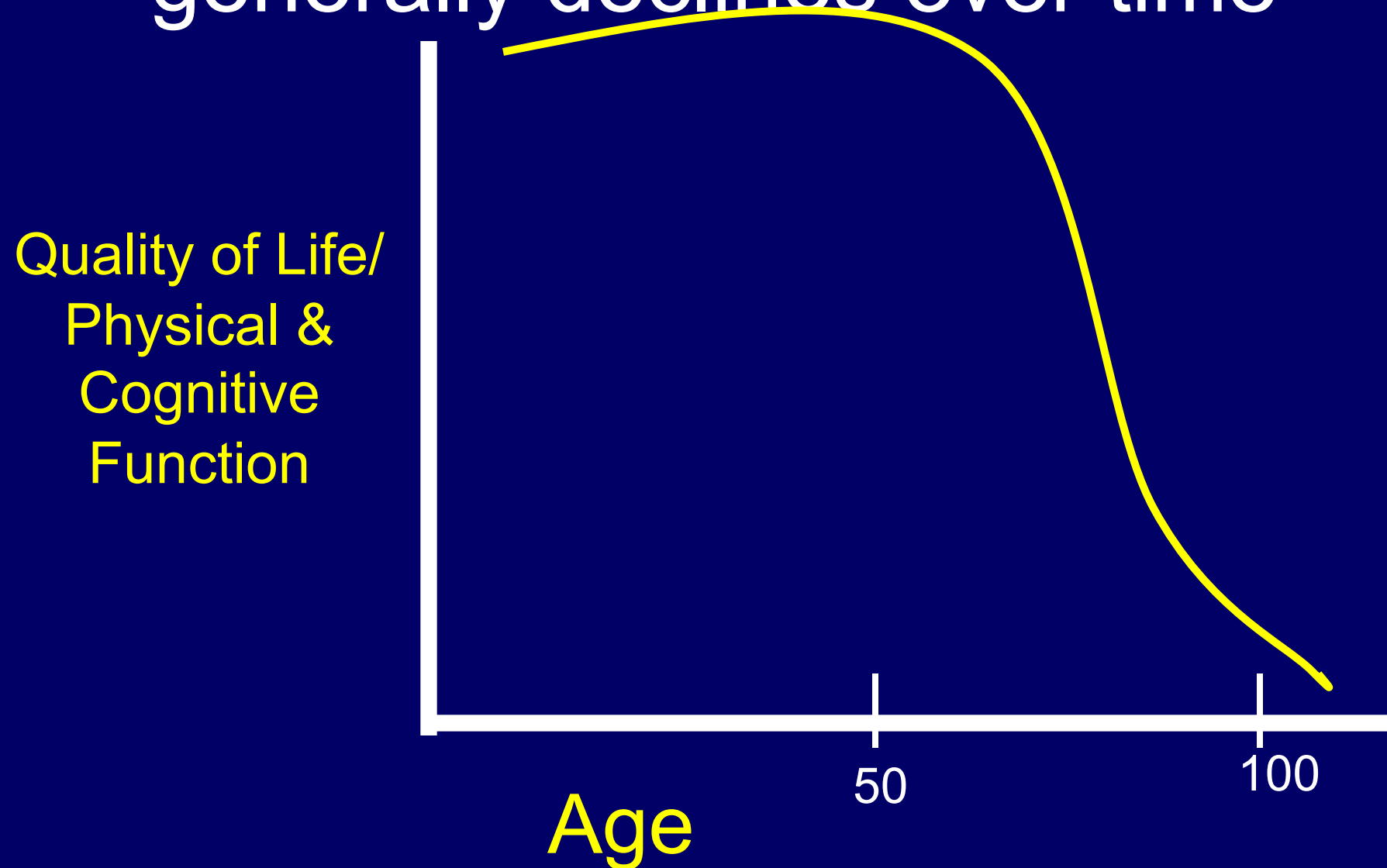
Treating the Whole Patient



Major Challenges for Aging PLWH

- Multimorbidity: What is the best model for care?
- Access to Geriatric Care
- Health care navigation
- Access to mental health services
- Access to social services
- Prevention of disability
- Bias in long term care
- Health disparities by race/sexual minority
- Relative lack of data in women

Physical & cognitive function generally declines over time



Bending the Curve Upwards is the Essential Goal of Healthy Aging

Quality of Life/
Physical &
Cognitive
Function

Age

50

100

