Women's Interagency HIV Study

WIHS Dossier

June 2017

This slide set summarizes key study characteristics and scientific contributions of the WIHS.

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Women's Interagency HIV Study (WIHS) Sites

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*WIHS Data Center

WIHS Sites and Principal Investigators

- **Consortia:**
  - Atlanta, Georgia *(I. Ofotokun, G. Wingood)*
  - Birmingham, Alabama/Jackson, Mississippi *(M. Saag, M. Kempf, D. Konkle-Parker)*
  - Bronx, New York *(K. Anastos)*
  - Brooklyn, New York *(H. Minkoff, D. Gustafson)*
  - Chapel Hill, North Carolina *(A. Adimora)*
  - Chicago, Illinois *(M. Cohen, A. French)*
  - Los Angeles, California *(J. Milam)*
  - Miami, Florida *(M. Fischl, L. Metsch)*
  - Northern California *(R. Greenblatt, P. Tien, B. Aouizerat)*
  - Washington, D.C. *(S. Kassaye)*
- **Data Coordinating Center (WDMAC):**
  - Johns Hopkins University, Baltimore, Maryland *(S. Gange, E. Golub)*

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WIHS Sponsoring Institutions (Program Officers)

- **National Institute of Allergy and Infectious Diseases** *(J. Roe)*
  - **National Cancer Institute** *(G. Dominguez)*
  - ***Eunice Kennedy Shriver*** **National Institute of Child Health and Human Development** *(D. Russo)*
  - **National Institute on Drug Abuse** *(K. Davenny, R. Jenkins)*
  - **National Institute of Mental Health** *(D. Colosi)*

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WIHS Operational Groups

- Executive Committee
- Data Management
- Laboratory / Specimen
- National Community Advisory Board
- Project Directors
- WIHS Specimen Allocation Committee

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Areas of Focused Scientific Research in WIHS-V

- Aging
- Behavior & Substance Use
- Cancer/Pathology
- Cardiovascular
- Epidemiology
- Female Genital Tract & Pathogenesis
- Genomics
- Gynecology
- Hepatitis & Liver Disease
- Human Papillomavirus
- Metabolics
- Neurocognition
- Pharmacokinetics & Antiretroviral Exposure
- Pregnancy
- Renal

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WIHS Major Substudies

- ***DATRII 009***: HIV-1 in vaginocervical secretions
- ***NIDA Health Care Utilization***: Influence of drug use on utilization of health care
- ***NIDA Immunology/Virology***: Influence of drug use on HIV-1 natural history
- ***Oral***: Oral lesions, periodontal disease, salivary assessment
- ***HHV8***: HHV-8 shedding in saliva and cervico-vaginal fluid
- ***Viral Resistance***: Retrospective and prospective studies of viral resistance and rebound
- ***Anal HPV***: Anal HPV infection and development and progression of ASIL in the era of HAART

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WIHS Major Substudies

- ***Metabolic Toxicities***: Cross-sectional assessment of metabolic abnormalities, fat redistribution, osteoporosis, osteopenia, and protease inhibitor exposure
- ***Intensive Pharmacokinetics (PK)***: Bioavailability and clearance rates for selected target antiretroviral medications (*WIHS-III*: Viracept, Kaletra, Reyataz, Sustiva, Viramune; *WIHS-IV*: Isentress)
- ***Prospective Metabolic***: Prospective assessment of metabolic complications in pre- versus post-menopausal women as determined via DXA scan, oral glucose tolerance testing (GTT), NMR LipoProtein, and MRI

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WIHS Major Substudies

- ***Sex Steroid***: Effect of HIV infection on age of onset of diminished ovarian reserve
- ***Cardiovascular Disease***: Assessment of aspects of cardiovascular disease among HIV+ and HIV- women, including cardiovascular risk factors, carotid artery intima-media thickness (CIMT), and clinical cardiovascular events
- ***Neurocognition WIHS-III***: Interaction between aging and HIV/AIDS on neurocognitive functioning among HIV+ and HIV at-risk women
- ***Physical Functioning***: Cross-sectional assessment to identify and characterize physical impairment and frailty among HIV+ and HIV at-risk women

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WIHS Major Substudies

- ***Genetics and Disease Progression***: Interaction between genetic factors, substance abuse, mood, cognitive impairment, and progression of HIV disease
- ***Neurocognition WIHS-IV & V***: Administration of a Neurocognitive Battery to assess stress, activities of daily living, cognition and functional ability
- ***MALT / GALT***: Effects of HIV infection in gut-associated lymphoid tissue (GALT) and endometrial mucosal-associated lymphoid tissue (MALT) in HIV+ and HIV-women at selected stages of HIV disease progression
- ***Musculoskeletal Substudy***: Assessment of women undergoing the menopausal transition with detailed musculoskeletal studies performed using DXA scanning, Quantitative CT and functional performance tests

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WIHS Major Substudies

- ***Geocoding***: Evaluate the relationship between virologic suppression and serious AIDS-defining events, blood pressure control, and mortality and the proportion of the population below the federal poverty line in each participant's census block group, income inequality in each participant's county, and each participant's health insurance status
- ***Cervical Cancer Screening Substudy (CCSS)***: Compare the accuracy of different molecular assays for cervical cancer screening
- ***Arterial Brachial Index Measurement:*** Measure peripheral arterial disease (PAD) using the ankle brachial index (ABI) to determine the factors associated with PAD and its progression

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WIHS Major Substudies

- ***Liver Disease and Reproductive Aging (LIVRA) Study***: Study to examine the association of HIV, HCV, the menopausal transition and associated metabolic and inflammatory mediators with liver steatosis and liver fibrosis progression
- ***Immunologic and Clinical Consequences of Hepatitis C Cure***: Characterization of the effect of HCV cure on neurocognitive consequences, and on markers of monocyte/macrophage activation
- ***Frailty Study:*** Assessment to characterize and track potential changes in physical impairment and frailty among HIV+ and HIV at-risk women

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Semi-Annual Visit

- Interviewer-administered Questionnaires:
  - Behavior
  - Health Services
  - Medical and OB/GYN History
  - Demographics/Psychosocial
- Physical and Gynecological Examination
- Annual Lipodystrophy Exam (body measures, BIA)
- Medication use (ART, OI prophylaxis, hepatitis, etc.)
- Participant Samples:
  - Blood (virologic, immunologic, fasting metabolic markers, liver/renal function, etc.)
  - Other (CVL, saliva, urine)
  - Local and National Repositories

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Continuous Outcome Ascertainment

- Seroconversion
- Clinical Outcomes:
  - AIDS Diagnoses
  - Malignancies
  - Mortality
  - Tuberculosis
  - Hospitalizations
  - CVD Events
- Sources:
  - Self-report
  - Medical Record Abstraction (for selected outcomes only)
  - Registry Match
    - Cancer
    - Tuberculosis
  - National Death Index - Plus

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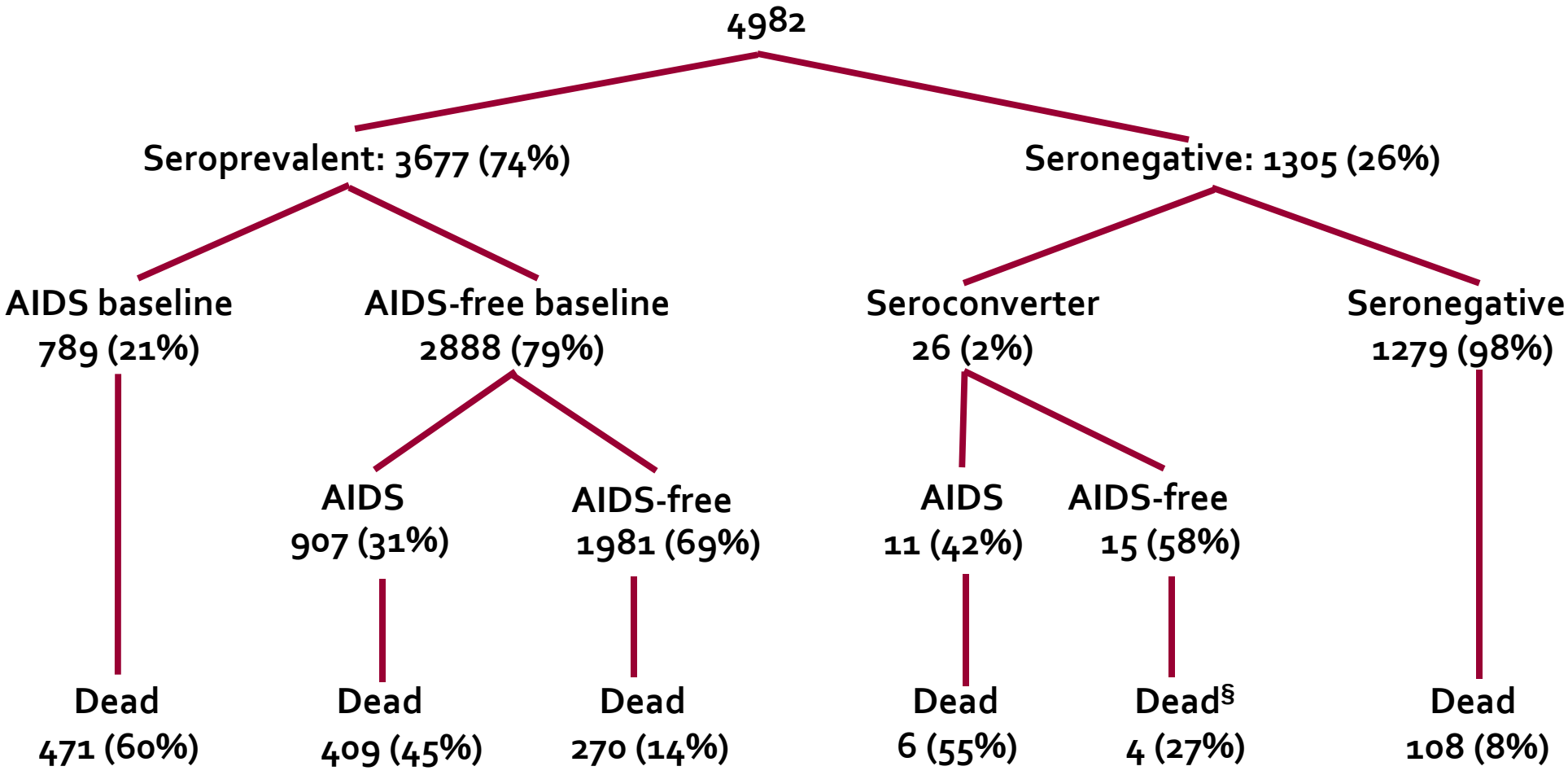
*WIHS Cohort: Enrollment Through 9/30/16**



* HIV & AIDS status as of the end of visit 44 (9/30/16). Deaths via NDI (through 12/31/14 for sites 1-6) and through 9/30/16 via other reports

§ Two seroconverters found at death

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WIHS Cohort by Enrollment Wave

	WIHS I 1994-95 N=2623 (53%)	WIHS II 2001-02 N=1143 (23%)	WIHS IV 2011-12 N=371 (7%)	WIHS V 2013-15 N=845 (17%)
HIV Serostatus at Baseline				
Seronegative	569 (22)	406 (36)	95 (26)	234 (28)
Seropositive				
Therapy-naïve	2054 (78)	255 (22)	78 (21)	92 (11)
Therapy-exp'd	--	482 (42)	198 (53)	519 (61)
Current Cohort [a] (N=2416)	721 (30%)	575 (24%)	290 (12%)	796 (33%)

[a] Current cohort = All participants seen at Visit 43 or 44

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Baseline Characteristics

(Barkan, Melnick, . . . , Feldman, *Epidemiology* 1998; 9:117-125)[a]

	94/95 Cohort		01/02 Cohort	
	HIV+	HIV-	HIV+	HIV-
Median age	36	34	33	29
Race/ethnicity				
African-American	56%	54%	60%	61%
Latina	23%	28%	32%	28%
Exposure Category				
Intravenous drug use	34%	28%	10%	13%
Heterosexual sex	42%	26%	41%	24%
Transfusion risk	4%	3%	--[b]	--[b]
No identified risk	20%	43%	48%	63%

[a] 01/02 cohort data added [b] Transfusion risk not assessed in 01/02 cohort

Baseline Characteristics

(Barkan, Melnick, . . . , Feldman, *Epidemiology* 1998; 9:117-125)[a]

	94/95 Cohort		01/02 Cohort	
	HIV+	HIV-	HIV+	HIV-
Employed	21%	29%	34%	40%
Median per capita household income	$4,500	$5,000	$4,500	$4,500
No health insurance	18%	41%	15%	39%
History of physical/sexual abuse	66%	67%	9%[b]	16%[b]
Median CD4+ count (cells/mm3)	330	1,028	493	984
Median viral load (copies/ml, NASBA assay)	22,000	---	610	---

[a] 01/02 cohort data added [b] Assessed only in 6 months prior to enrollment

Baseline Characteristics

(Bacon, Von Wyl, . . . , Young, *CDLI* 2005; 12:1013-1019)

	94/95 Cohort		01/02 Cohort	
	HIV+	HIV-	HIV+	HIV-
Completed high school	63%	63%	60%	65%
Single mother	28%	21%	37%	32%
Below poverty line	46%	54%	52%	51%
Unstable housing situation	13%	21%	7%	16%
HAART use	0	---	66%	---
Clinical AIDS	34%	---	3%	---

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Baseline Characteristics

(Bacon, Von Wyl, . . . , Young, *CDLI* 2005; 12:1013-1019)

Parameter or Condition	Percent with Comorbidity	
	94/95 Cohort	01/02 Cohort
HBV core antibodies	43%	19%
HBV surface antigen	2.6%	1.4%
HCV antibodies	39%	13%
SIL on Pap test*	13%	8%
Diabetes	4.4%	4.6%
Hypertension	17%	12%
Obesity	53%	65%
Smoking	58%	42%

* Low-grade SIL, high-grade SIL, or carcinomas were detected in situ on initial Pap smear

HBV, hepatitis B virus; HCV, hepatitis C virus; SIL, squamous intraepithelial lesion

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WIHS Database (as of 9/30/16)

Total number of PARTICIPANTS enrolled	3,701	HIV+
	1,281	HIV-
Total number of PERSON-YEARS	34,384	HIV+
	12,753	HIV-
Median (Mean) FOLLOW-UP TIME in years	13.32 (12.14)	WIHS I
	13.54 (10.80)	WIHS II
	4.46 (3.98)	WIHS IV
	1.87 (1.75)	WIHS V
Total number of PERSON-VISITS	64,931	HIV+
	23,871	HIV-
Total number of CD_4 MEASUREMENTS	60,717	HIV+
	10,554	HIV-
Total number of VIRAL LOAD MEASUREMENTS	60,531	
Total number of REPOSITORY ALIQUOTS*	2,775,412	

* Available as of 05/23/2017

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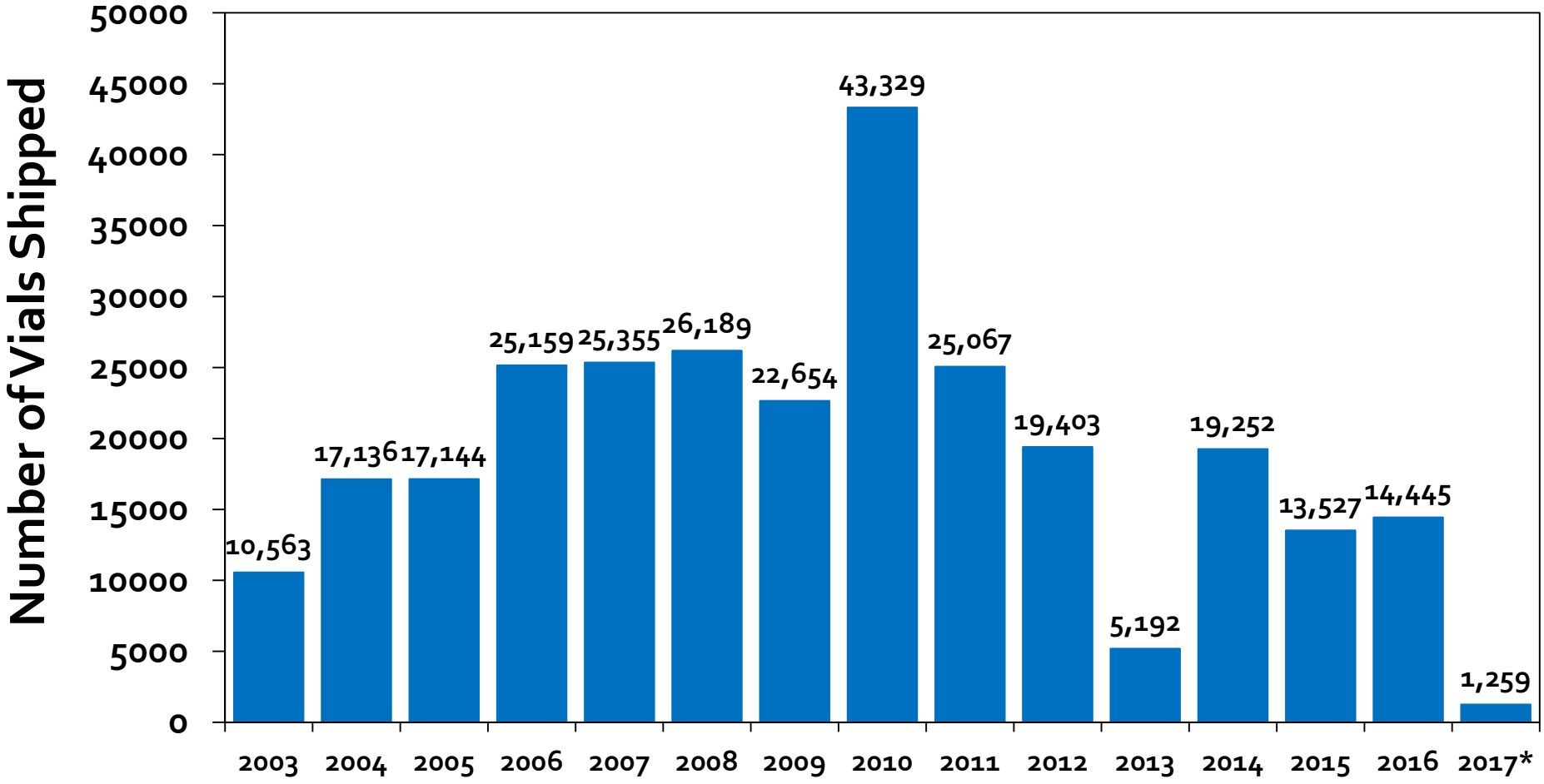
Vials Shipped from Precision Bioservices, 2003-2017



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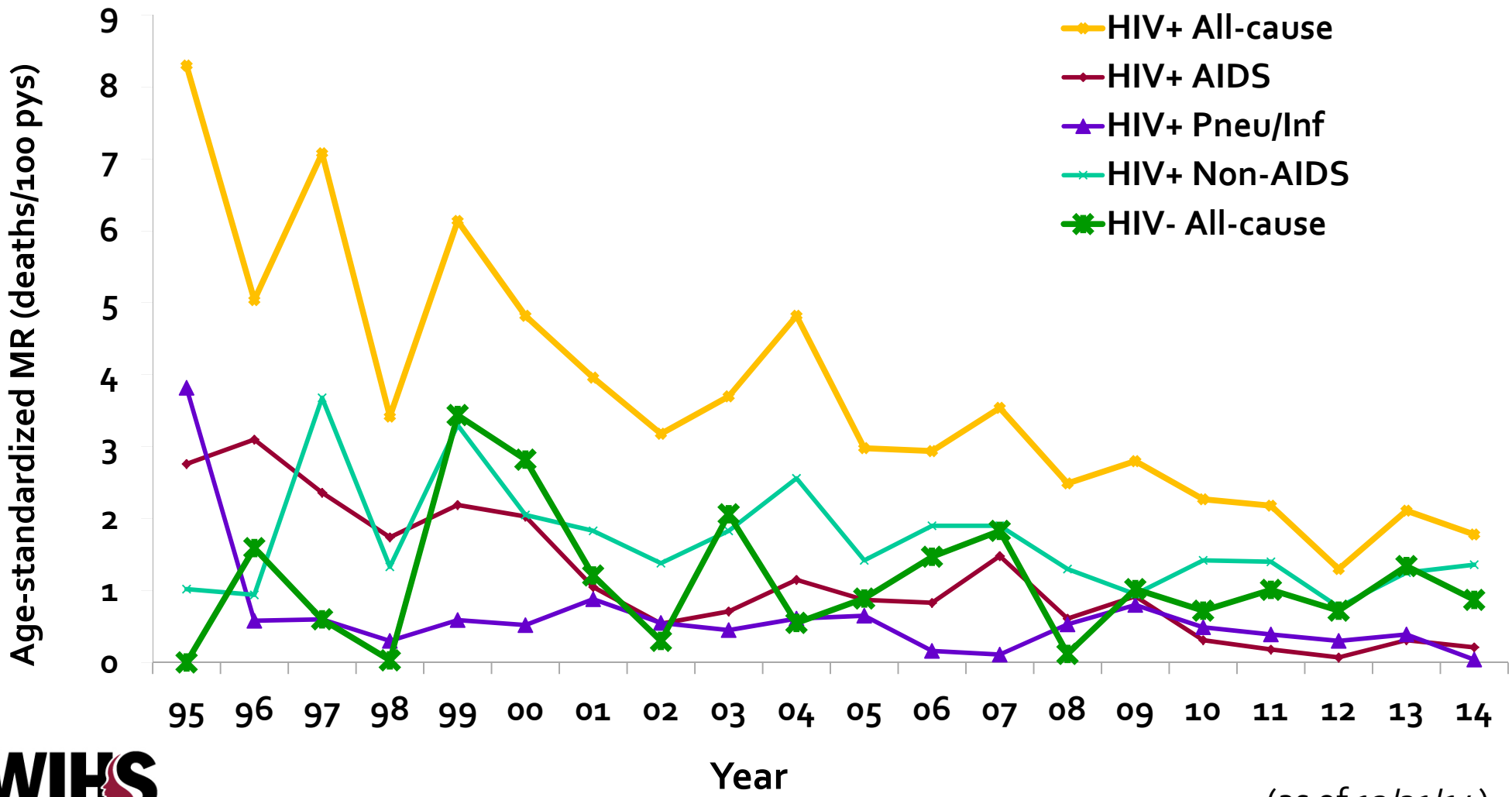
* 2017 includes shipments through 5/23/2017

Mean number of vials shipped per year for 2003-2016 is 20,315

Change in Age-Adjusted 6-Month Mortality Rates



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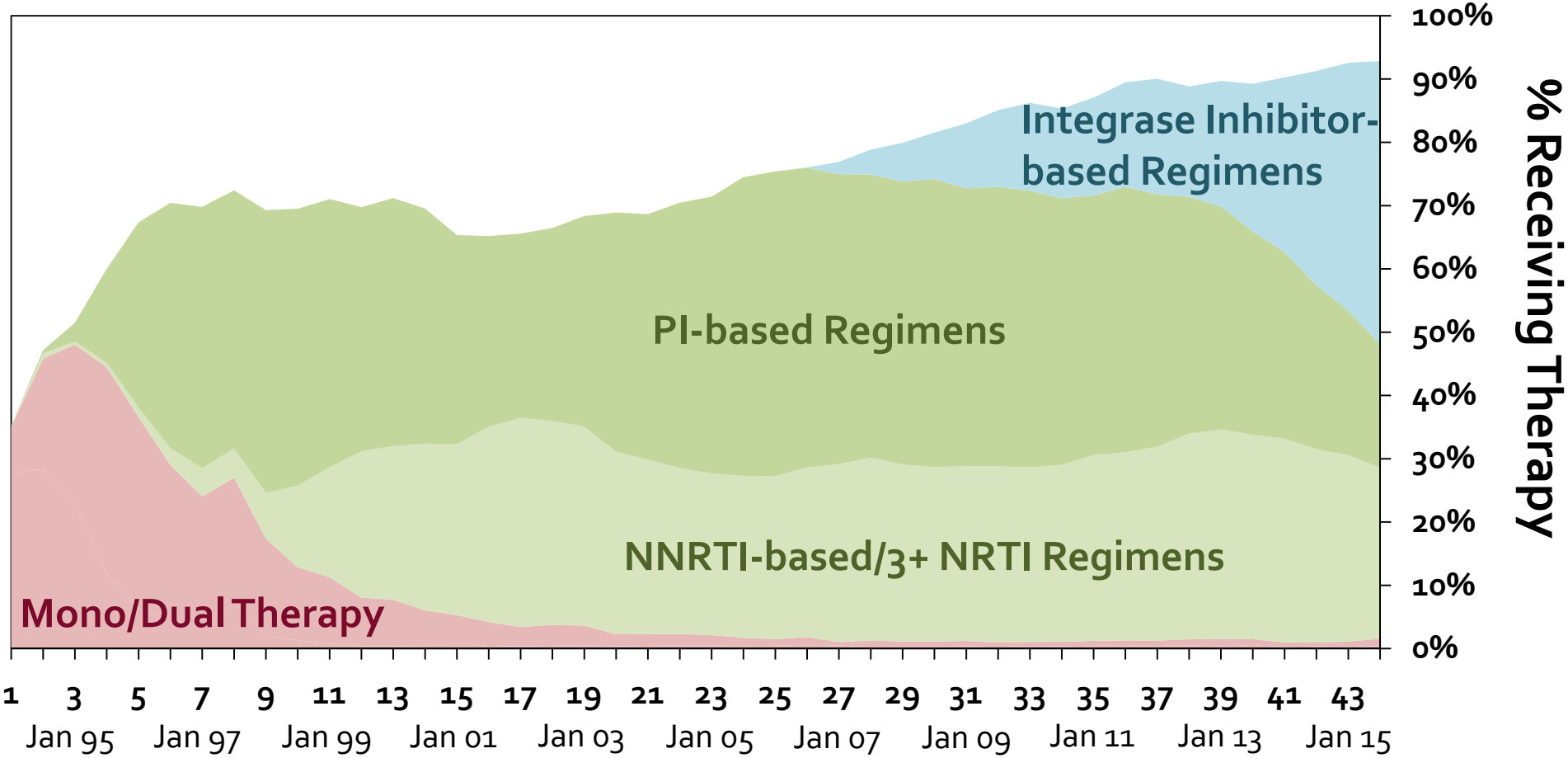
(as of 12/31/14)

Antiretroviral Therapy Use Among WIHS HIV-infected Participants



Calendar Time

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Summary of Selected WIHS Publications

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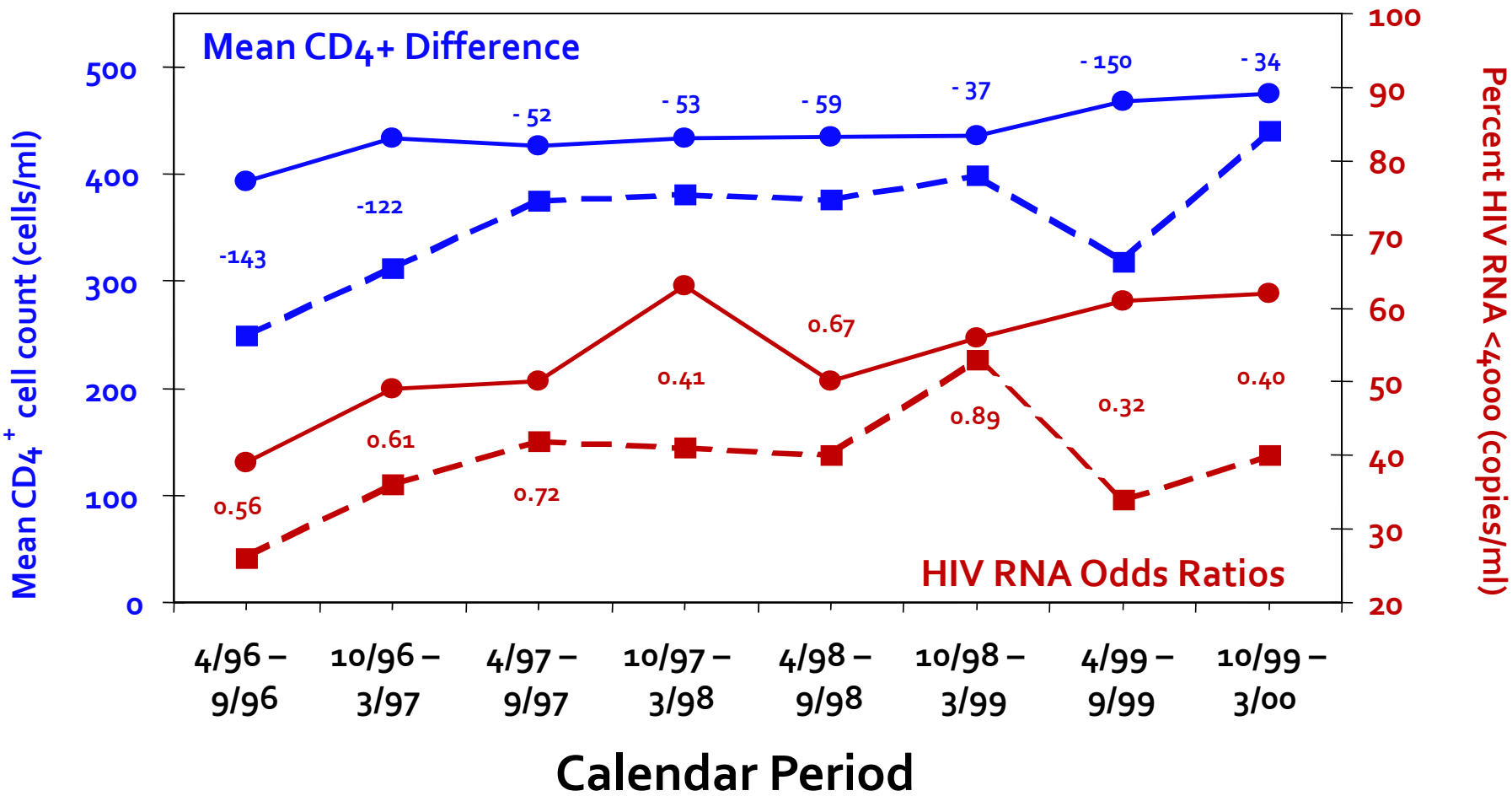
Selection by Indication for Potent ART Initiation

(Ahdieh, Gange, . . . , Muñoz, *Am J Epidemiol* 2000; 152:923-933)



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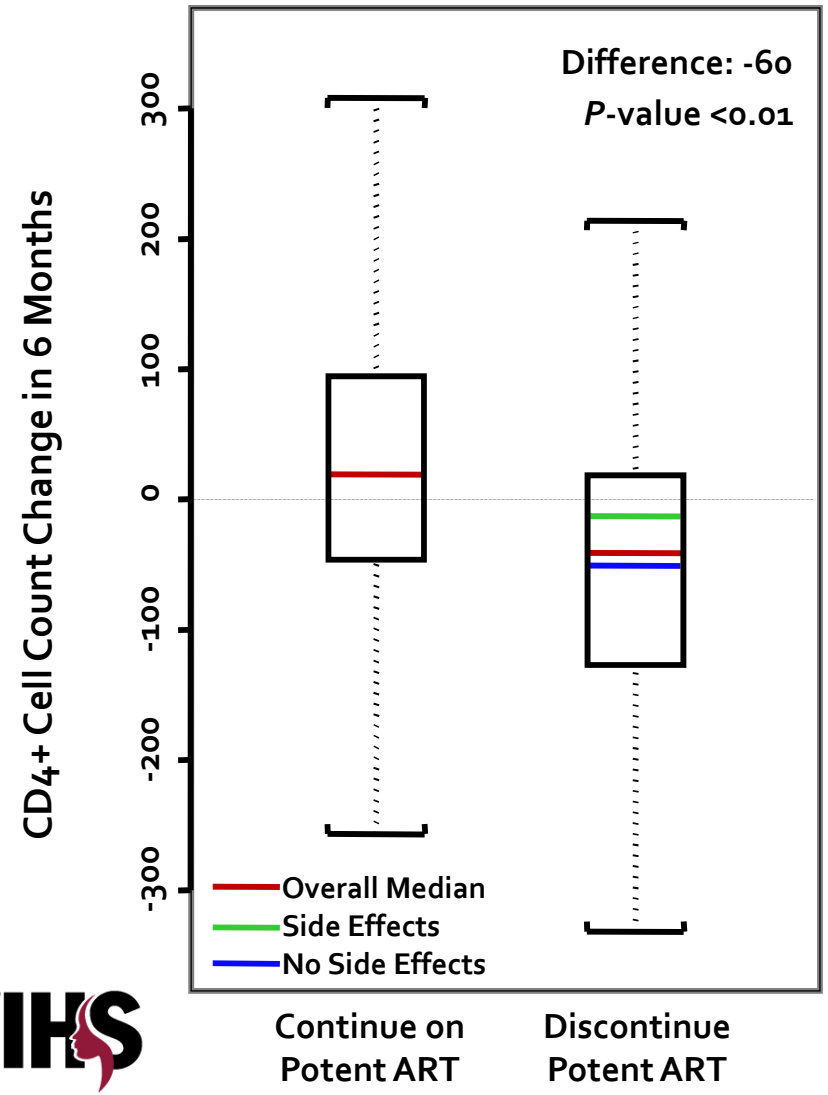
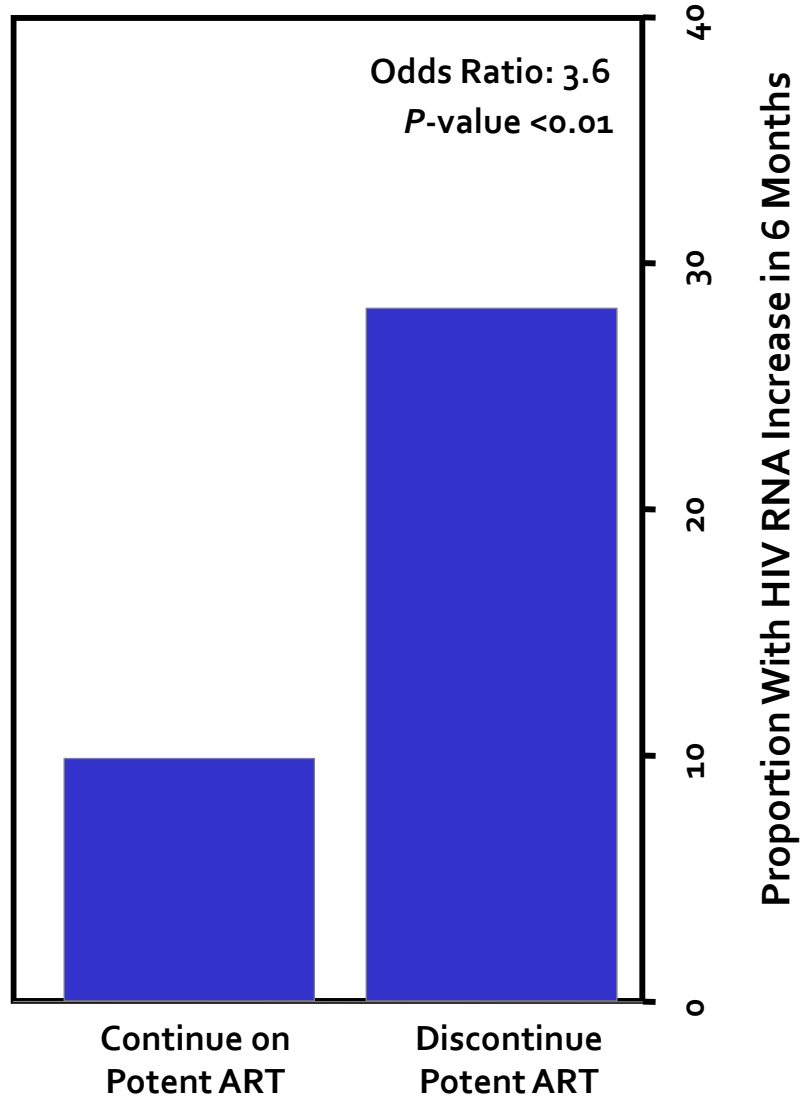
– – – – Start potent ART ——— Do not start potent ART

(as of 5/00)

Short-term Consequences of Potent ART Discontinuation

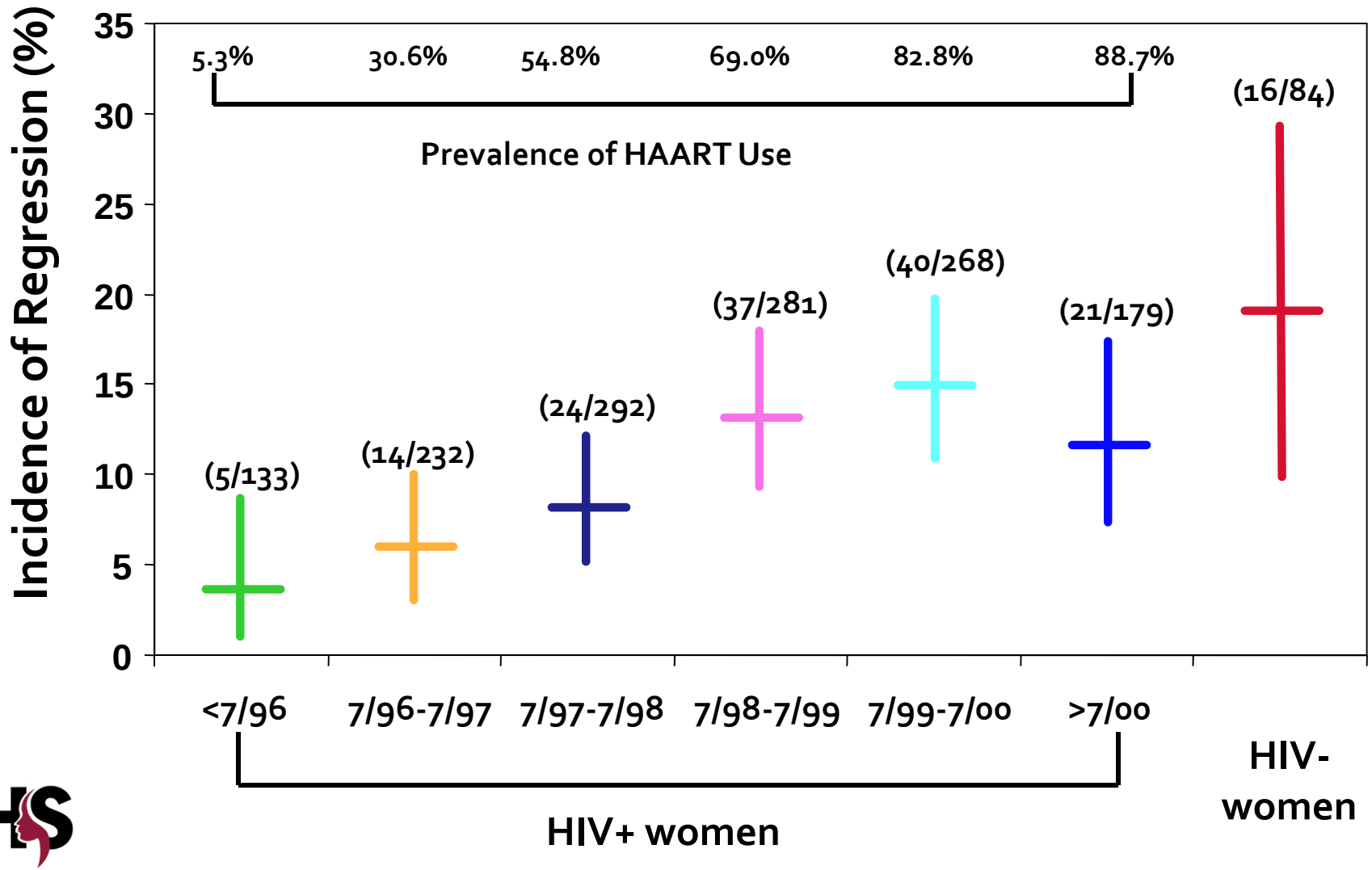
(Ahdieh, Silverberg, . . . , Muñoz, *AIDS* 2001; 15:2101-2108)





HAART and Cervical Squamous Intraepithelial Lesions in HIV+ Women

(Ahdieh-Grant, Li, . . . , Gange, *J Natl Cancer Inst* 2004; 96:1070-1076)



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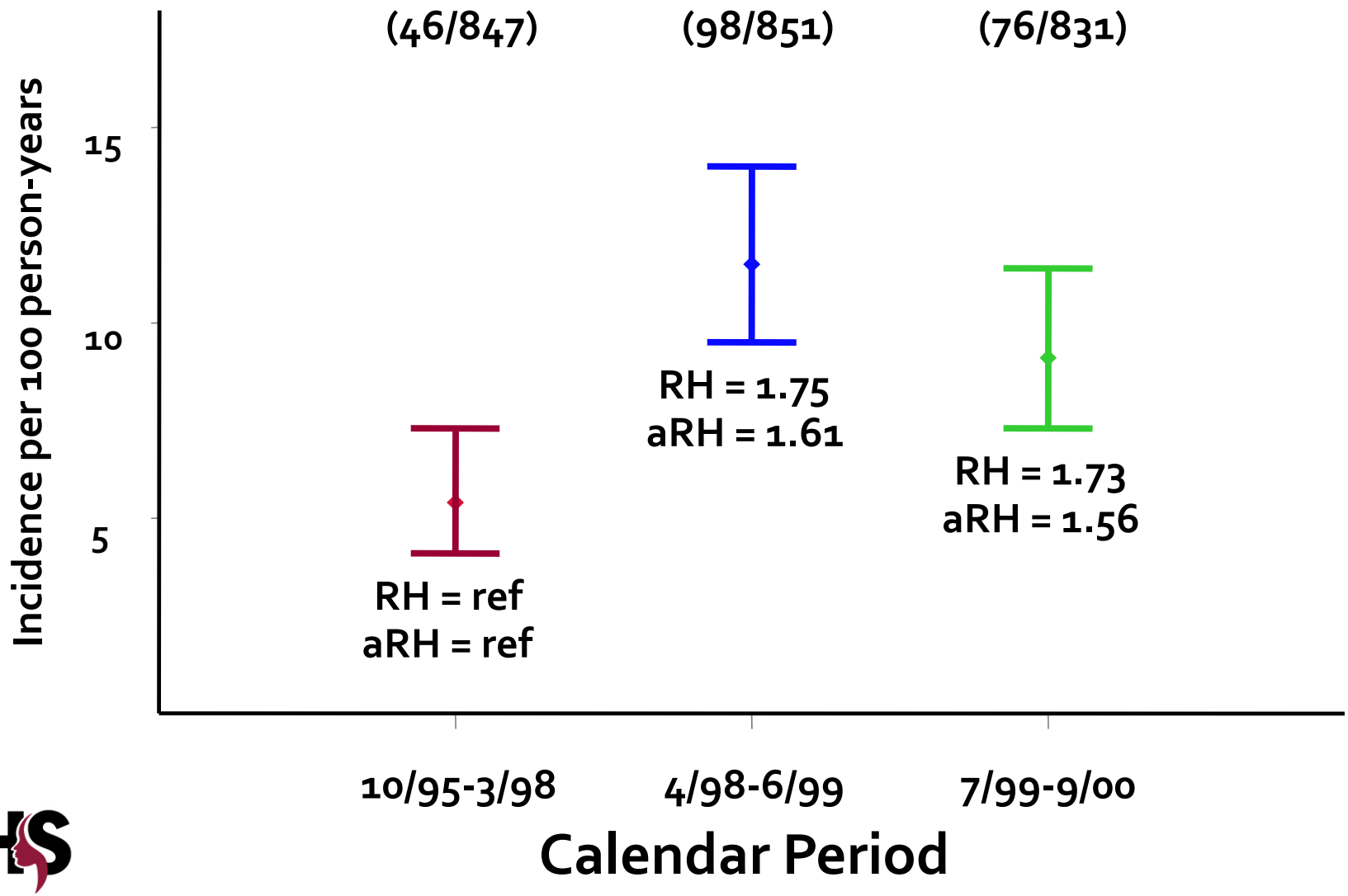
Incidence of HAART Discontinuation by Calendar Period

(Ahdieh-Grant, Tarwater, . . . , Greenblatt, *J Acquir Immune Defic Syndr* 2005; 38:500-503)



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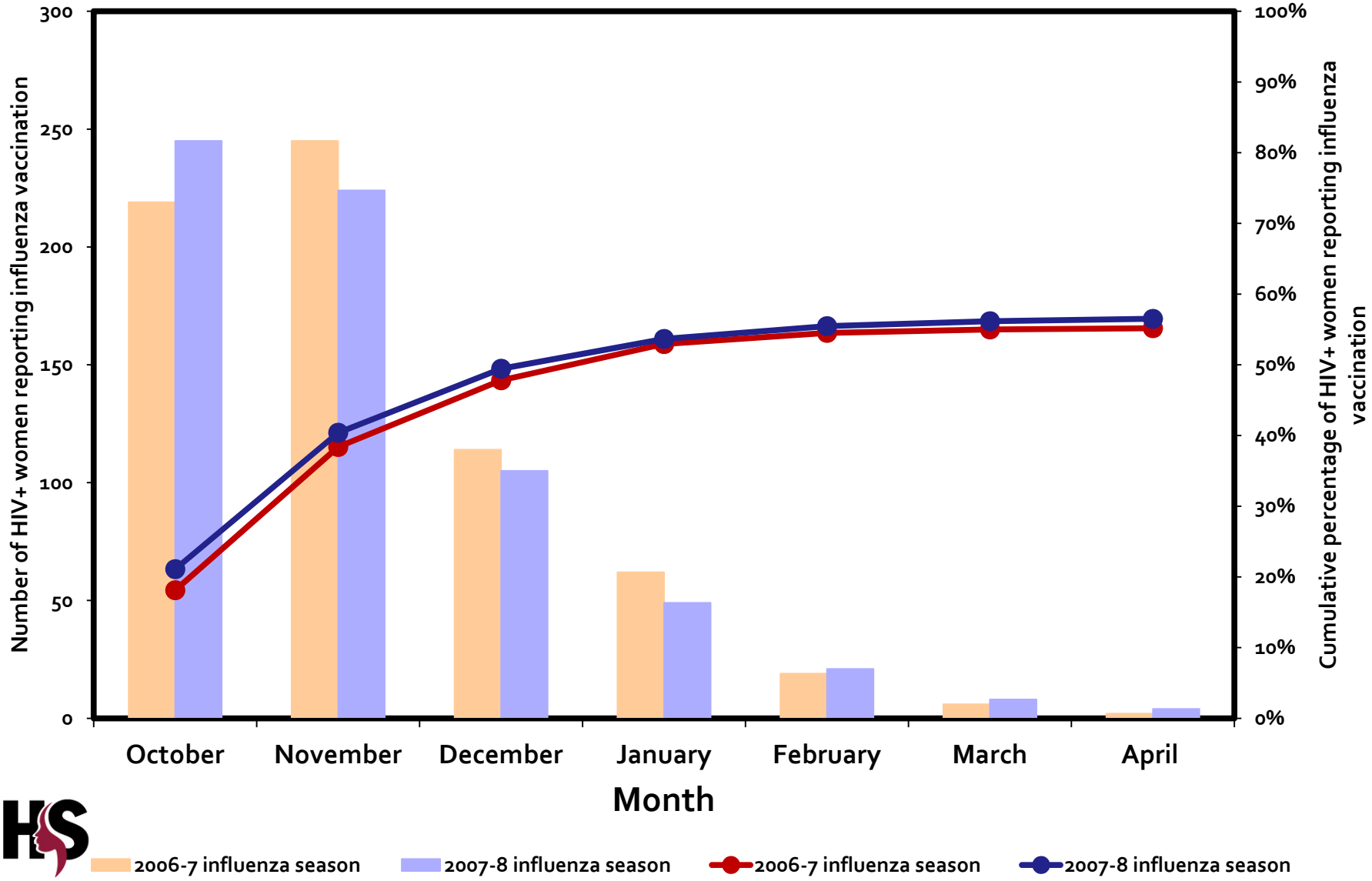
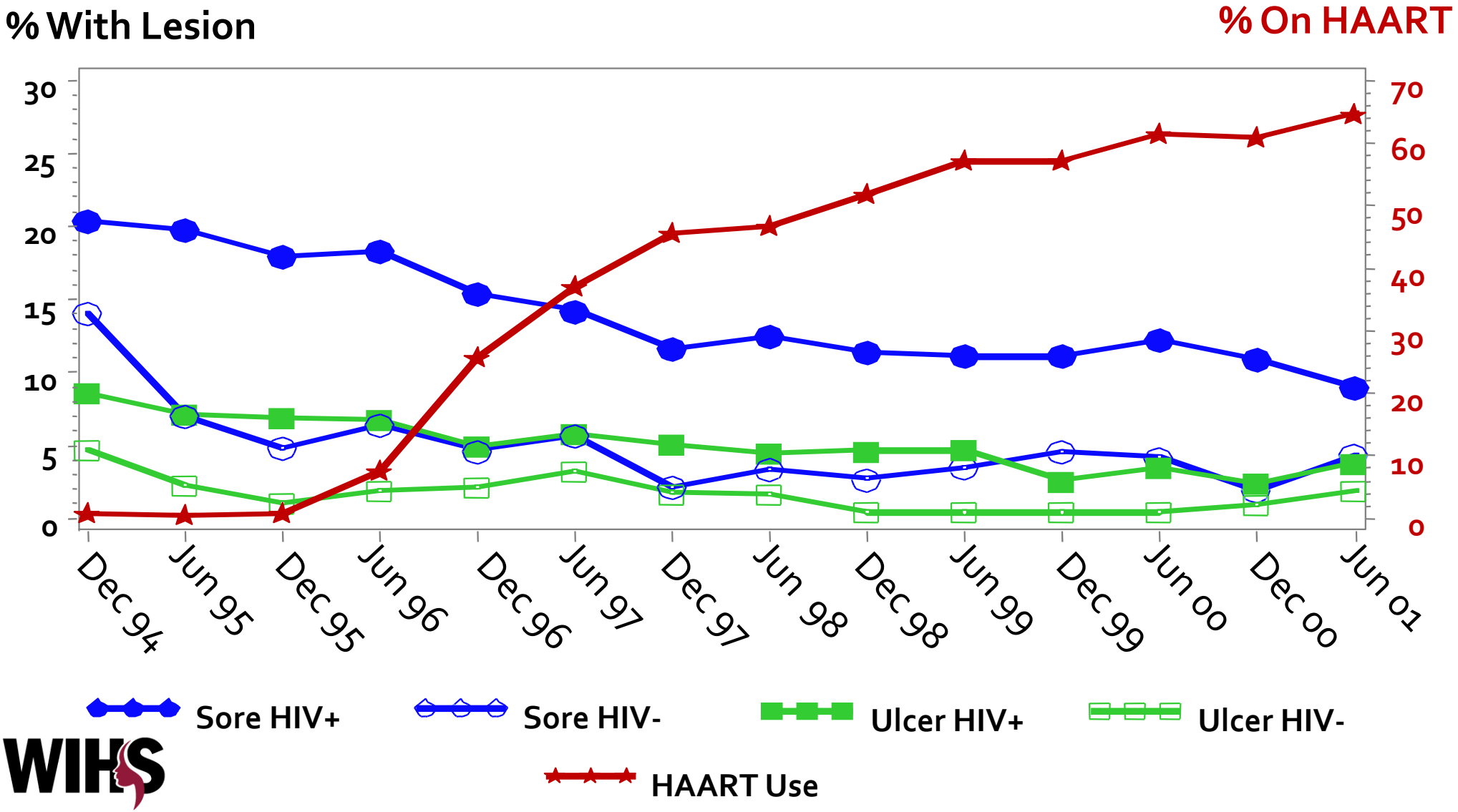
Influenza Vaccination of HIV-infected Women in WIHS

(Althoff, Anastos, . . ., Gange, *Preventive Medicine* 2010; 50:223-229)



Incidence of Genital Lesions and HAART Use among HSV-2+ Women

(Ameli, Bacchetti, . . . , Greenblatt, *AIDS* 2006; 20:1051-1058)



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Relative Hazard of Death (all cause) after HAART

(Anastos, Barrón, . . . , Gange, *Ann Intern Med* 2004; 140:256-264)

	Relative Hazard for Death (95% CI)	
	Univariate	**Multivariate[a]**
Pre-HAART age, 10 yr increments	1.56 (1.29 – 1.90)[b]	1.61 (1.27 – 2.05)[b]
Pre-HAART CD4 cell count		
< 200 cells/mL	4.04 (2.47 – 6.59)[b]	1.09 (0.56 – 2.11)
200 – 350 cells/mL	1.75 (0.98 – 3.11)	1.04 (0.55 – 2.00)
> 350 cells/mL	Reference	Reference
Pre-HAART HIV-1 RNA level		
< 80 copies/mL	Reference	Reference
80 – 10,000 copies/mL	1.67 (0.51 – 5.51)	1.42 (0.43 – 4.77)
> 10,000 copies/mL	4.26 (1.35 – 13.44)[b]	1.95 (0.60 – 6.34)

[a] Adjusted for pre-HAART and post-HAART variables.
[b] Statistically Significant.

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Relative Hazard of Death (all cause) after HAART

(Anastos, Barrón, . . . , Gange, *Ann Intern Med* 2004; 140:256-264)

	Relative Hazard for Death (95% CI)	
	Univariate	**Multivariate[a]**
Post-HAART CD4 cell count		
< 200 cells/mL	5.95 (3.83 – 9.24)[b]	2.66 (1.42 – 4.99)[b]
200 – 350 cells/mL	1.34 (0.73 – 2.44)	0.90 (0.45 – 1.81)
> 350 cells/mL	Reference	Reference
Post-HAART HIV-1 RNA level		
< 80 copies/mL	Reference	Reference
80 – 10,000 copies/mL	2.34 (1.18 – 4.62)[b]	1.81 (0.87 – 3.75)
> 10,000 copies/mL	7.53 (4.01 – 14.12)[b]	3.44 (1.67 – 7.09)[b]
AIDS before HAART initiation	3.12 (2.14 – 4.56)[b]	2.15 (1.41 – 3.28)[b]

[a] Adjusted for pre-HAART and post-HAART variables.
[b] Statistically Significant.

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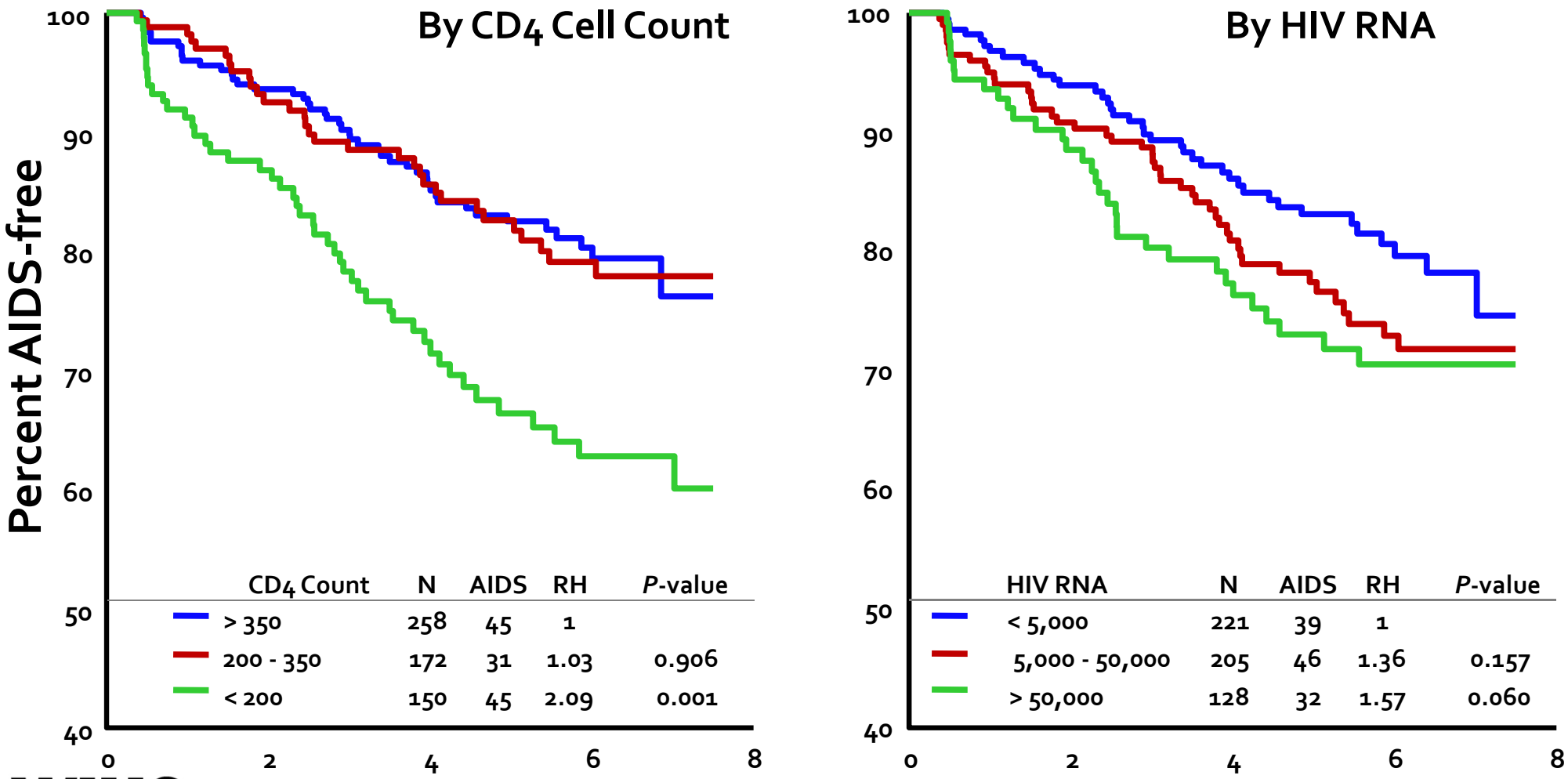
AIDS after HAART Initiation (94/95 cohort)

(Anastos, Barrón, . . . , Muñoz, *Arch Int Med* 2002; 162:1973-1980)



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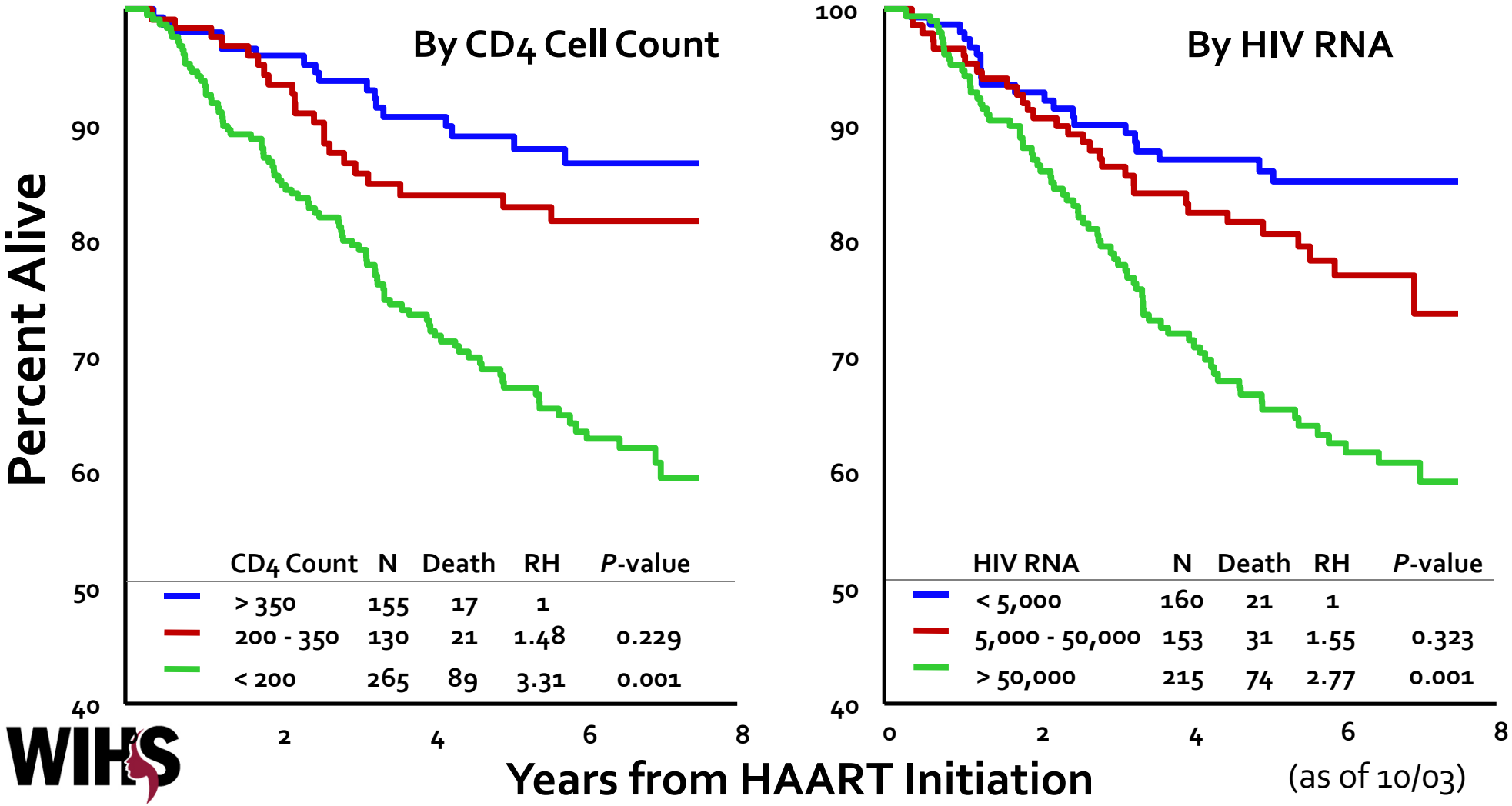
Years from HAART Initiation

(as of 10/03)

Death among Women with AIDS at HAART Initiation (94/95 cohort)

(Anastos, Barrón, . . . , Muñoz, *Arch Int Med* 2002; 162:1973-1980)



(as of 10/03)

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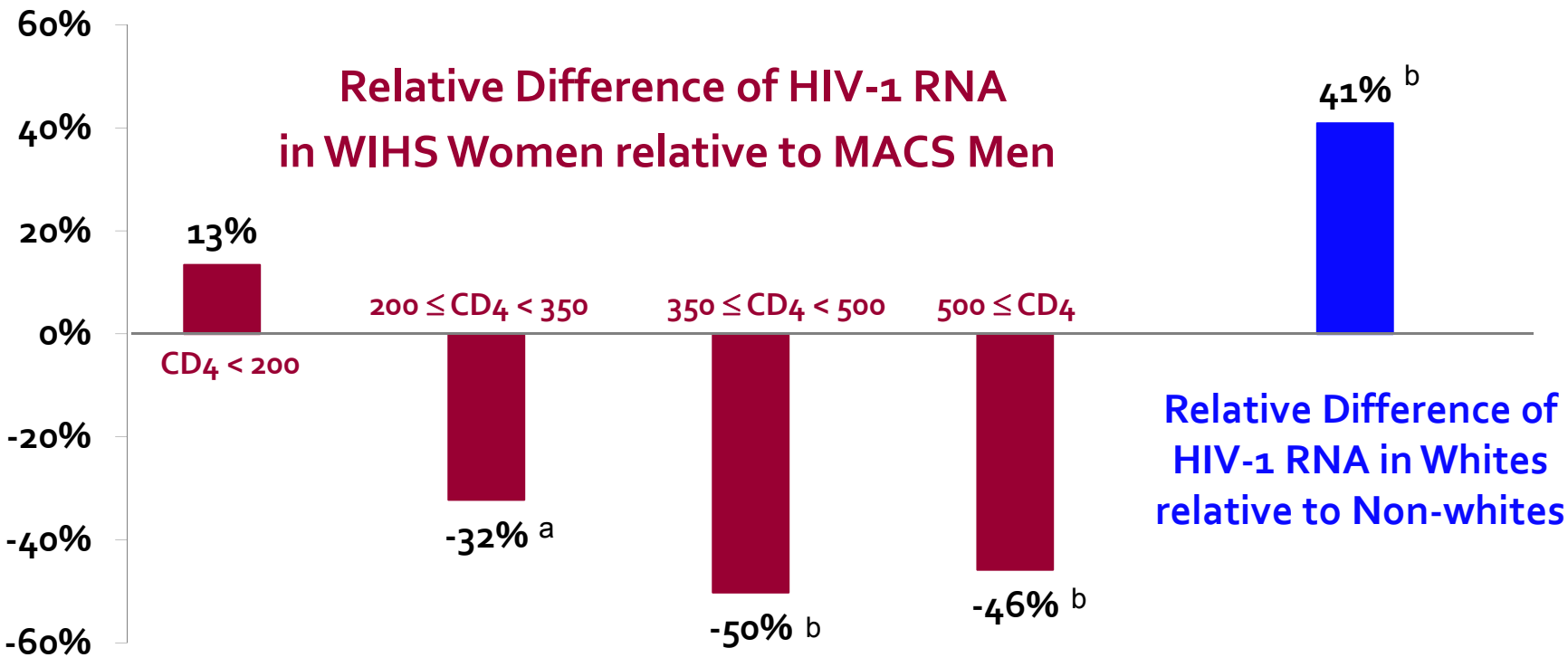
Association of Race and Gender with HIV-1 RNA

(Anastos, Gange, . . . , Greenblatt, *J Acquir Immune Defic Syndr* 2000; 24:218-226)



[a] $P < 0.05$ [b] $P < 0.005$

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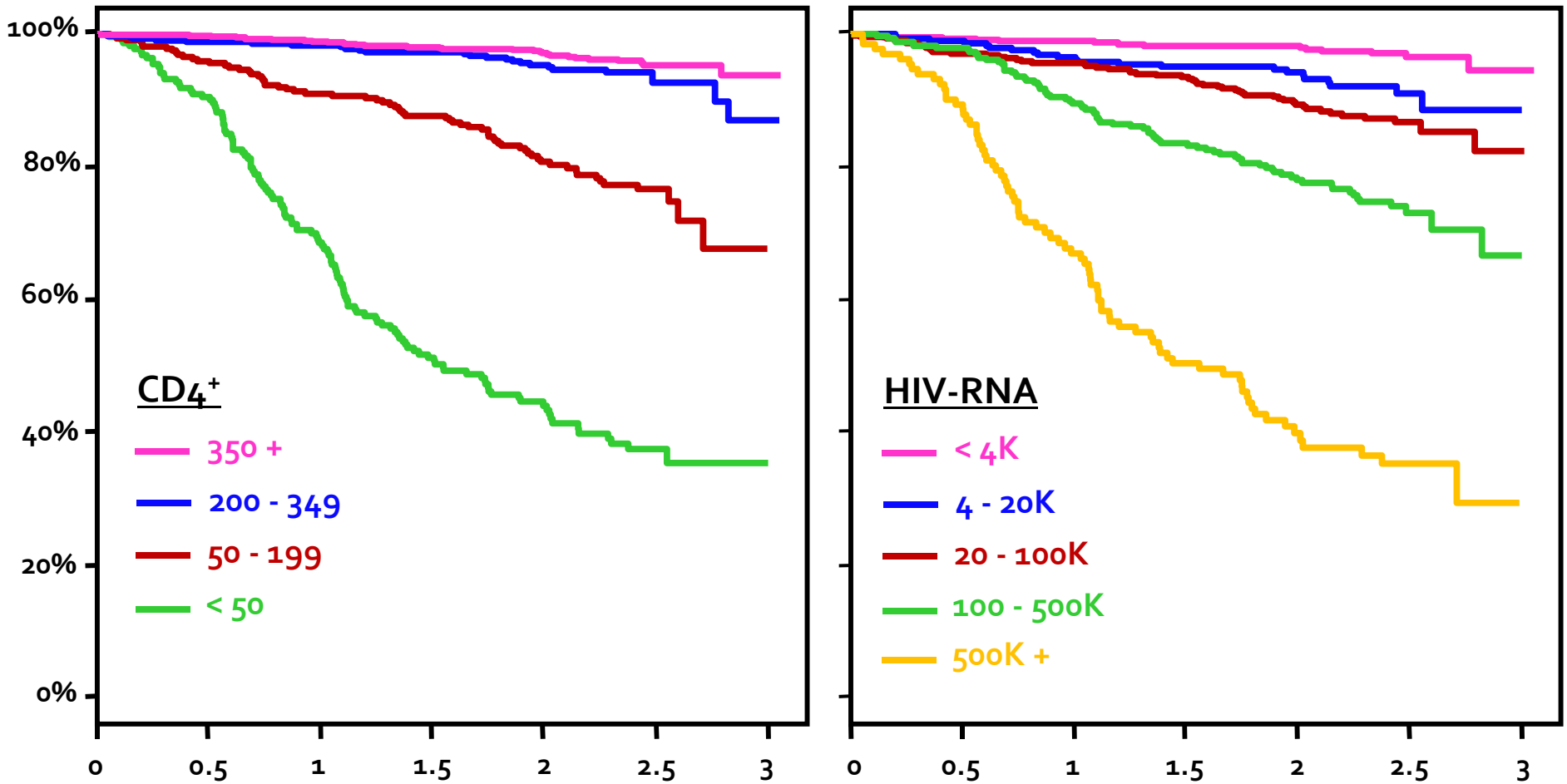
Survival Time According to CD4⁺ and HIV RNA

(Anastos, Kalish, . . . , Kovacs, *AIDS* 1999; 13:1717-1726)



Calendar Time in Years

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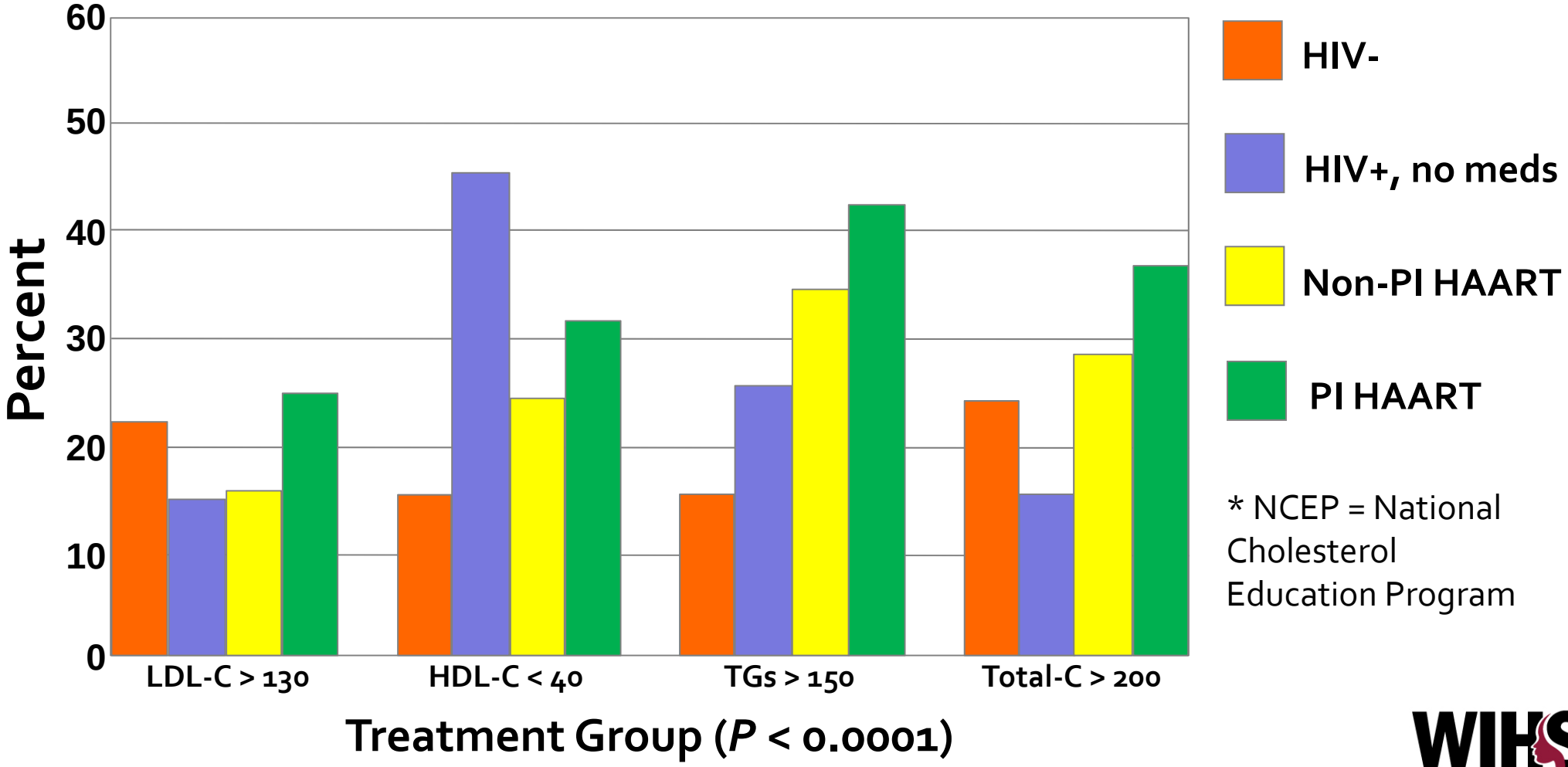
Proportion of Women Meeting NCEP Treatment Thresholds by HIV Status and ART Use*

(Anastos, Lu, . . . , Justman, *J Acquir Immune Defic Syndr* 2007; 45:34-42)



* NCEP = National Cholesterol Education Program

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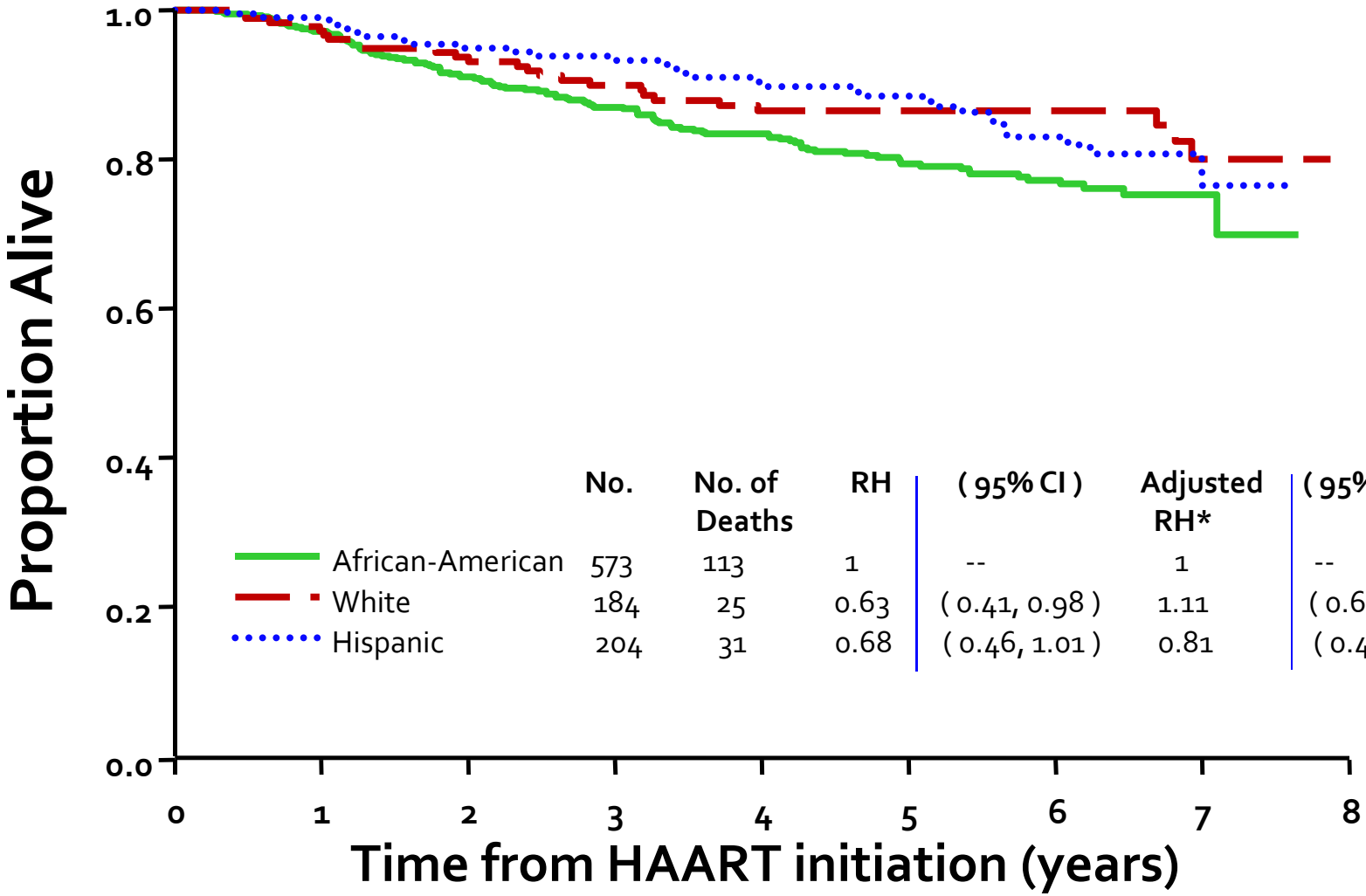
Factors Associated with Response to HAART

(Anastos, Schneider, . . . , Cohen, *J Acquir Immune Defic Syndr* 2005; 39,5:537-544)



	No.	No. of Deaths	RH	(95% CI)	Adjusted RH*	(95% CI)
African-American	573	113	1	--	1	--
White	184	25	0.63	(0.41, 0.98)	1.11	(0.64, 1.93)
Hispanic	204	31	0.68	(0.46, 1.01)	0.81	(0.47, 1.39)

* Adjusted for ART use prior to HAART initiation, age at last pre-HAART visit, pre-HAART AIDS status, pre-HAART nadir $CD4^+$ cell count, pre-HAART peak HIV-1 RNA, self-reported baseline HIV-1 exposure category, depression, current drug use, cigarette smoking, income, ART use following HAART initiation.

Factors Associated with Response to HAART

(Anastos, Schneider, . . . , Cohen, *J Acquir Immune Defic Syndr* 2005; 39,5:537-544)

Exposure	*Virologic Response*	*Virologic Rebound*	*Immunologic Response*	*Immunologic Failure*	*Incident ADI*	*Death*	*AIDS Death*
ART naïve prior to HAART	1.77	0.82	0.96	0.72	1.29	0.94	1.41
Age at last pre-HAART visit (per 10 years)	1.19	0.91	1.12	1.00	0.98	1.36	1.18
Pre-HAART AIDS	0.98	1.04	0.93	0.92	2.19	1.35	1.62
Pre-HAART nadir $CD4^+$ count (per 100 cells)	1.08	1.02	1.09	1.27	0.86	0.61	0.30
Pre-HAART peak HIV-1 RNA (per $\log_{10}$)	0.62	1.48	1.02	0.89	1.38	1.61	1.63
Therapy used after HAART							
No therapy	1	1	1	1	1	1	1
Mono/combo	8.55	0.30	4.07	0.59	0.72	0.53	0.71
HAART	16.14	0.26	7.04	0.31	0.74	0.46	0.33
Depression (CES-D > 16)	0.81	1.22	0.96	1.98	1.62	1.65	1.06
Current drug use	0.89	1.23	0.85	1.11	1.49	1.04	2.35
Currently smoke cigarettes	0.72	1.30	1.04	0.93	1.18	1.38	1.05
Income <$12,000	0.91	1.25	0.98	1.45	1.19	1.64	1.39
Adherence	2.19	0.37	1.47	0.66	0.65	0.67	0.53

Note: Adjusted for HIV-1 exposure and race. Significant values are in red.

Risk Factors for HIV-associated Sensory Neuropathy

(Anziska, Helzner, . . . , Burian, *J Neuro Sci* 2012;315(1-2):129-132)

Multivariable analysis		
	Odds ratio (95% CI)	P-value
Age[a]	**1.30 (1.20-1.40)**	**<0.001**
Diabetes	**1.45 (1.02-2.08)**	**0.04**
Alcohol use	0.82 (0.49-1.4)	0.48
Hepatitis C	**1.45 (1.03-2.05)**	**0.03**
CD4 count[b]	1.0 (1.0-1.0)	0.96
Viral load[c]	0.97 (0.83-1.1)	0.62
D-NRTI	1.19 (0.65-2.17)	0.57
African Americans	**1.67 (1.22-2.27)**	**0.001**

[a]per 5 years.

[b]cells/mm^3

[c]$\log_{10}$ copies/mL

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Hepatitis C Virus Infection and Biological False-positive Syphilis Tests

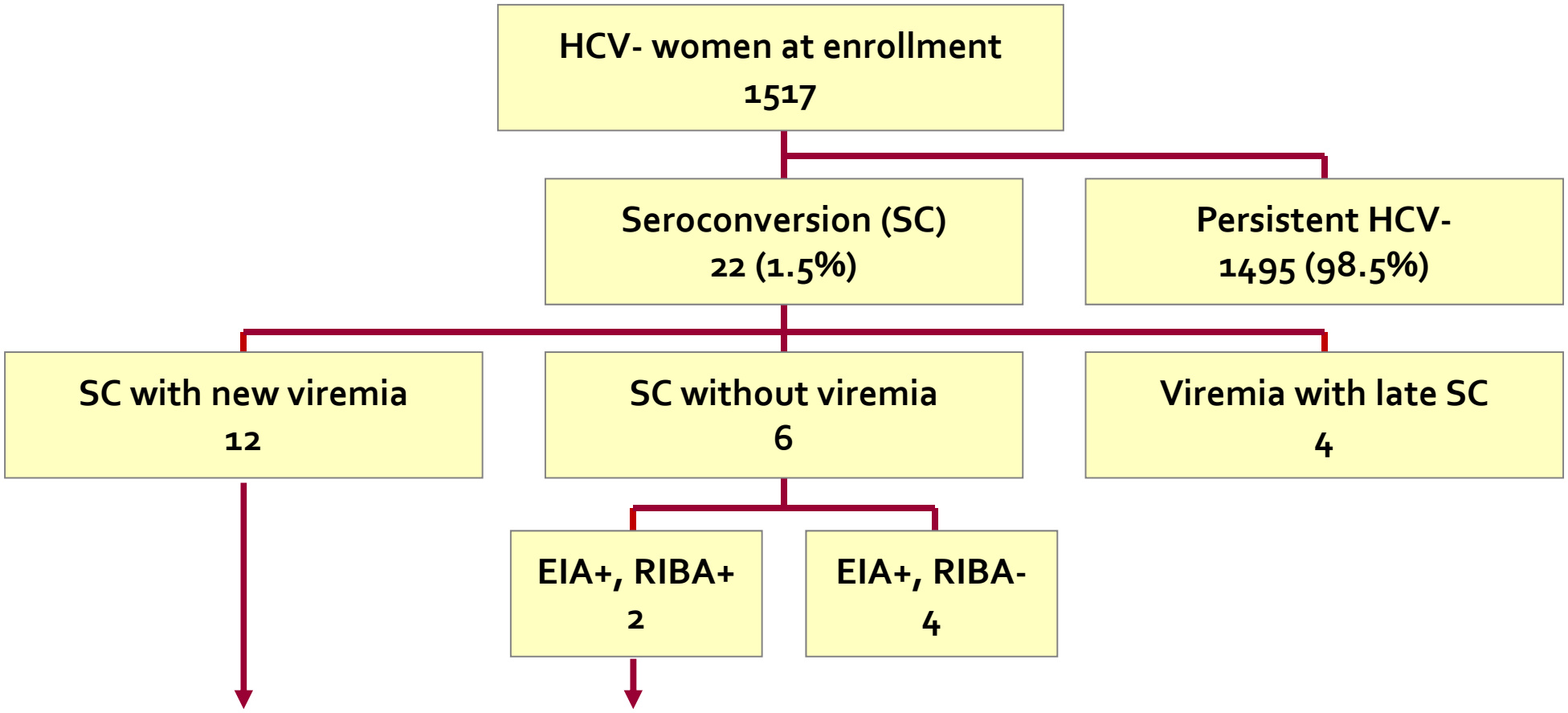
(Augenbraun, French, . . . , Sharma, *Sex Transm Infect* 2010; 86:97-98)

- Non-treponemal serological tests (e.g., RPR) are frequently reactive in individuals with HCV infection
- In patients with evidence of HCV infection, reactive non-treponemal serological tests are often not confirmed by reactive treponemal-specific tests and therefore should be considered less specific for detecting true disease
- Discordant treponemal serological tests in HCV-infected individuals appear to occur independently of a history of IDU or HIV infection

WIHS

Hepatitis C Virus (HCV) Antibody Acquisition in the WIHS

(Augenbraun, Goedert, . . . , Terrault, *Clin Infect Dis* 2003; 37:1357-1364)



Number with true HCV acquisition = 14

WIHS

Comparison of Baseline HIV Disease by Herpes Simplex Virus-2 Infection Status

(Aumakhan, Gaydos, . . ., Gange, *PLoS ONE* 2010; 5:e9973)

Characteristic	Asymptomatic (n=262)	Symptomatic (n=388)				*P* [a]
		SR GH (n=101)	*1 L-V (n=125)*	*2 L-V (n=92)*	*3 L-V (n=70)*	
# (%) w/ HIV VL ≤4000 cp/ml	107 (41%)	36 (36%)	34 (27%)	22 (25%)	9 (13%)	<0.001
Median HIV VL[b]	25,000	42,000	46,000	76,500	92,000	<0.001
Median CD4+	418	391	347	282	138	<0.001

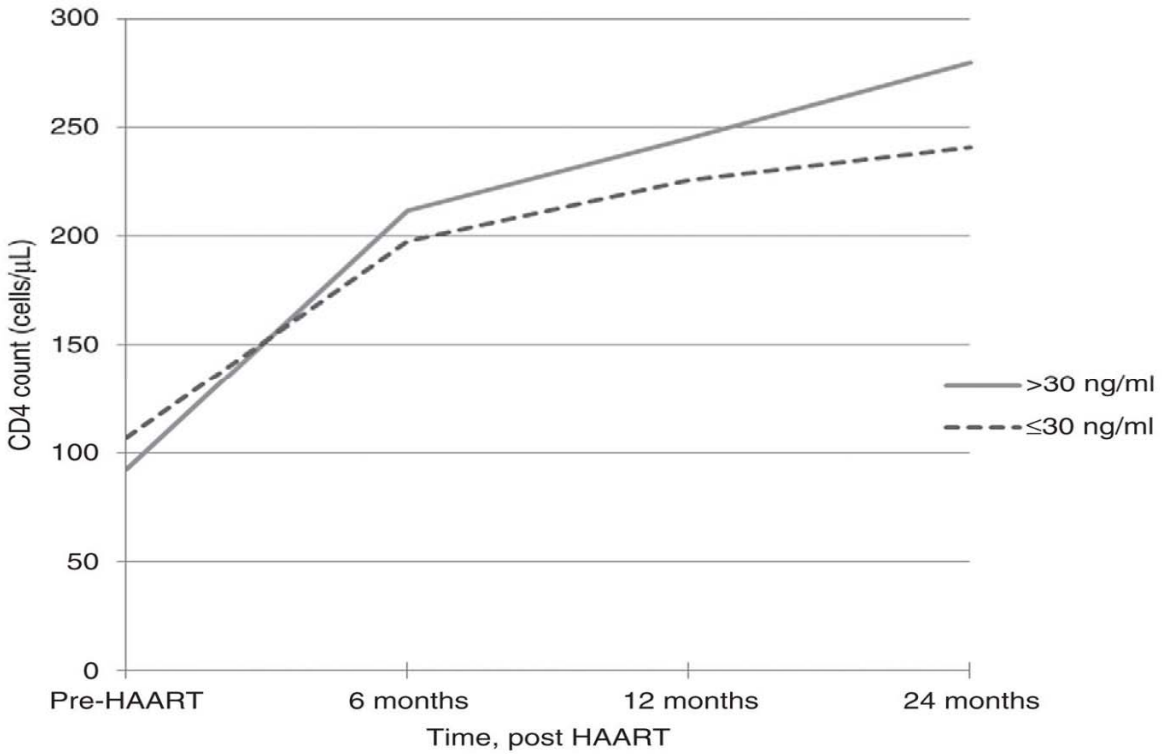
[a] *P*-value for overall comparison of symptomatic group vs. asymptomatic group.
[b] Among women with HIV VL >4,000 copies/ml.

SR GH: self-reported genital herpes; L-V: lesion-visit.

WIHS

Vitamin D Insufficiency May Impair CD4 Recovery among Women with Advanced Disease on HAART

(Aziz, Livak, . . . , Adeyemi, *AIDS* 2013;27(4):573-578)



Mean CD4 count (cells/µl) among women with normal (>30 ng/ml) and insufficient or deficient vitamin D (≤ 30 ng/ml), before HAART initiation and 6, 12, and 24 months post-HAART initiation.

In univariate analysis of variance (ANOVA), difference in mean CD4 by vitamin D status is non significant (F = 0.639, P = 0.424); difference in mean CD4 by time point is significant (ANOVA F = 14.92, P <0.001); and vitamin D by time interaction is nonsignificant (F =0.358, P = 0.783).

WIHS

Multivariate Models of HCV Infection Risk

(Bacchetti, Tien, . . . , Edlin, *BMC Infect Dis*, 2007; 7:145)

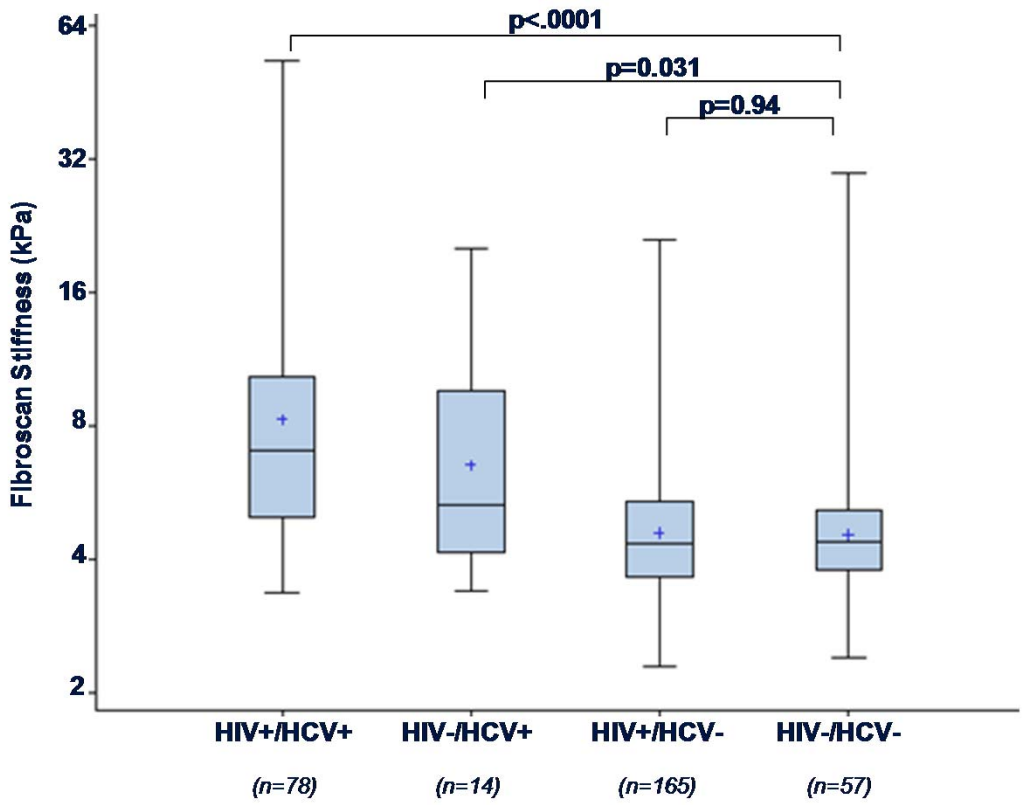
	WIHS			SFUHS*		
	OR	(95% CI)	*P*	OR	(95% CI)	*P*
IDU (vs. non-IDU)						
1st year of use	310	(163-588)	<0.0001	61	(21-177)	<0.0001
2nd & 3rd year	163	(65-404)	<0.0001	9.8	(1.94-50)	0.0058
4th or later year	7.2	(2.1-24.4)	0.0015	5.2	(3.2-8.4)	<0.0001
Daily IDU (vs. less frequent)	1.14	(0.73-1.77)	0.57	1.59	(1.4-1.81)	<0.0001
Race/ethnicity (vs. white)						
African American	1.5	(1.05-2.1)	0.027	0.86	(0.76-0.97)	0.014
Hispanic	1.64	(1.09-2.5)	0.018	1.44	(1.15-1.81)	0.0018
Other	1.38	(0.66-2.9)	0.4	0.94	(0.76-1.16)	0.57
HIV-infected	1.56	(1.16-2.1)	0.003	1.27	(1.09-1.47)	0.0017

* San Francisco Urban Health Study

WIHS

Association of HIV, Hepatitis C Virus, and Metabolic Factors with Liver Stiffness Measured by Transient Elastography

(Bailony, Scherzer, . . . ,Tien, *Infect Dis* 2013;208(11):1776-1783)

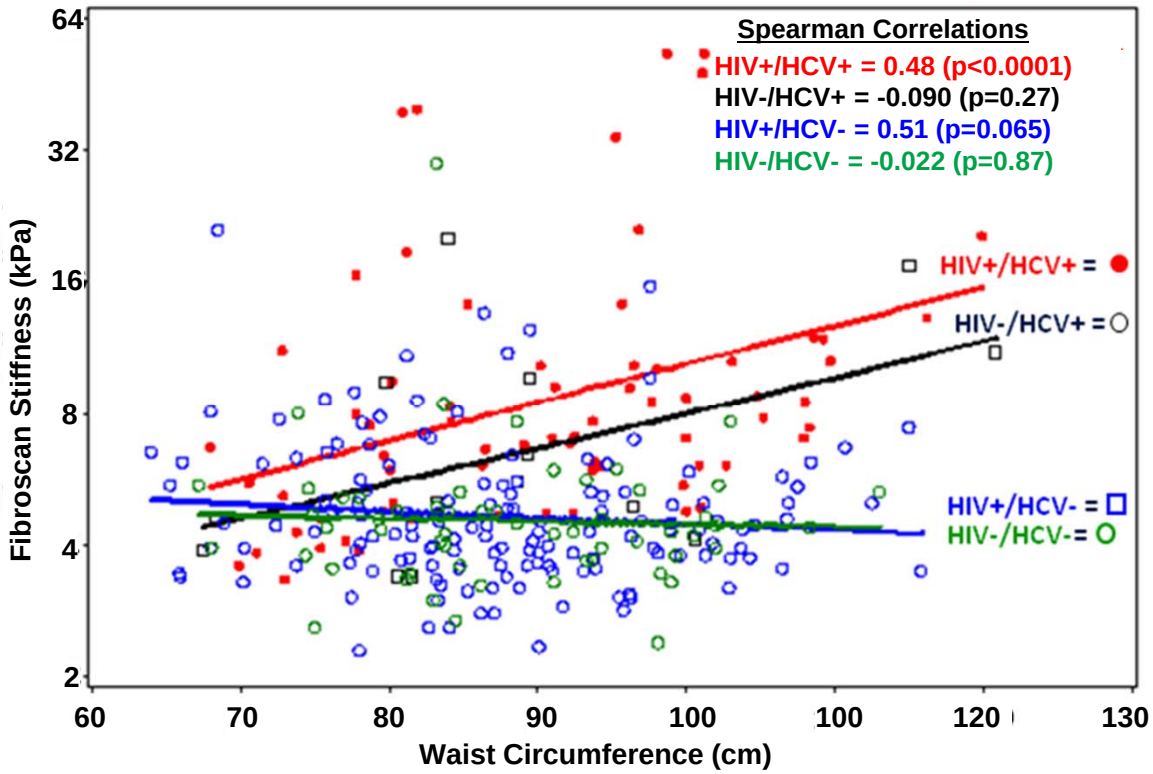


Median transient elastography-measured liver stiffness values by HIV and HCV status

WIHS

Association of HIV, Hepatitis C Virus, and Metabolic Factors with Liver Stiffness Measured by Transient Elastography

(Bailony, Scherzer, . . . ,Tien, *Infect Dis* 2013;208(11):1776-1783)



Association of Waist Circumference with Fibroscan Stiffness in HIV/HCV-infected and uninfected participants

WIHS

Estimates of the Effect of ART Discontinuation on Time to Death for 951 HAART Initiators

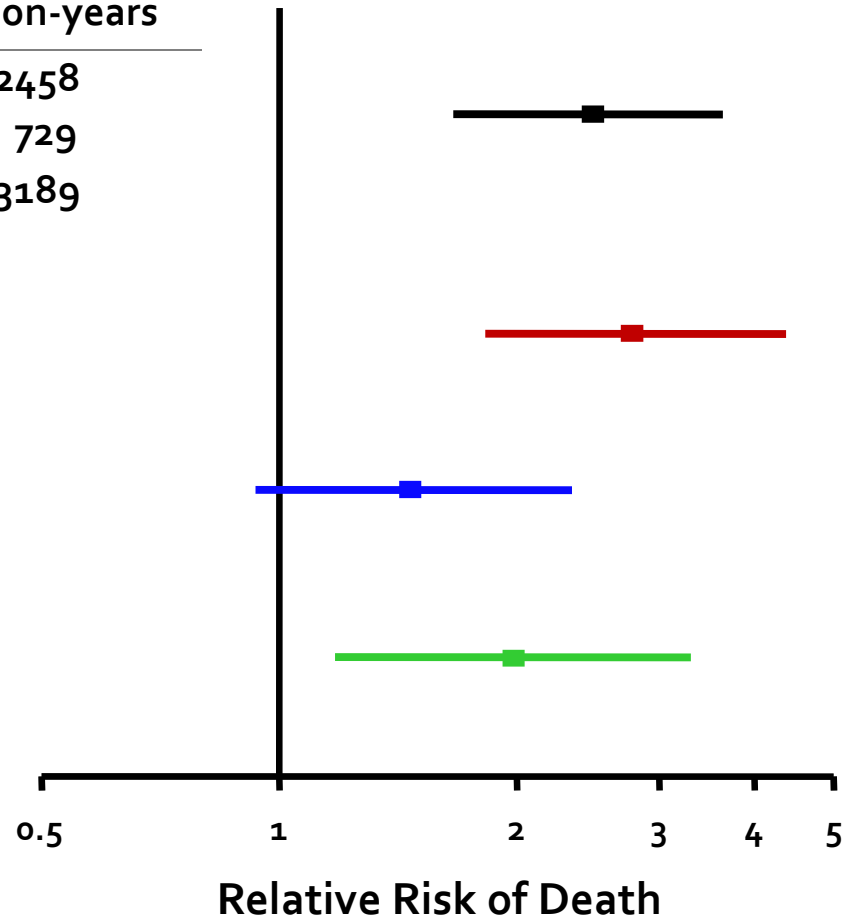
(Barrón, Cole, . . . , Gange, *AIDS* 2004; 18:1579-1584)

	Discontinued all therapy	Number of Events	Person-years
Unadjusted	No	71	2458
	Yes	45	729
	Total	116	3189

Baseline adjusted

Fully adjusted

Marginal Structural



WIHS

Nevirapine Concentration in Hair Samples Is a Strong Predictor of Virologic Suppression

(Baxi, Greenblatt, . . . ,Gandhi, *PLoS One* 2015;10(6))

Factor	# suppressed/N (% suppressed)	OR of HIV RNA < 80 copies/mL (± 95% CI)	P
Self-reported adherence			
≤ 74%	14/38 (36.8)	Reference	
75-94%	57/107 (53.3)	3.19 (0.69-14.8)	0.14
≥95%	417/569 (73.3)	4.63 (1.21-17.8)	0.026
African-American versus other			
Other	284/358 (79.3)	Reference	-
African-American	204/356 (57.3)	0.09 (0.03-0.33)	0.0003
Per decade of age	-	1.28 (0.67-2.4)	0.45
Pre-NVP regimen viral load, per 10-fold increase	-	0.42 (0.24-0.75)	0.0035
Pre-NVP regiment CD4, per 2-fold increase	-	1.88 (1.1-3.2)	0.022
NVP concentraition in hair			
Quartile 1 (0.25-16.28 ng/mg)	86/178 (48.3)	Reference	-
Quartile 2 (16.29-32.13 ng/mg)	123/170 (72.4)	2.47 (1.09-5.6)	0.031
Quartile 3 (32.14-57.33 ng/mg)	121/162 (74.7)	3.33 (1.33-8.3)	0.010
Quartile 4 (>57.33 ng/mg)	158/204 (77.5)	9.17 (3.2-26	<0.0001

OR = odds ratio

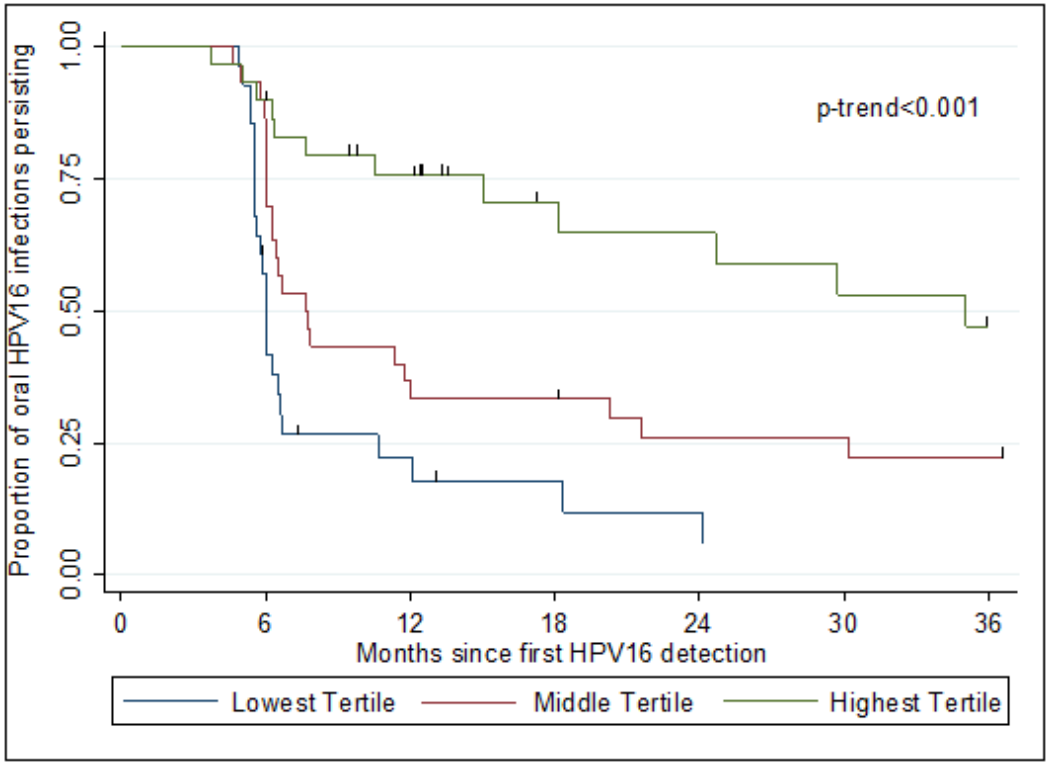
Multivariate random intercept logistic regression model of NVP concentration in hair as a predictor of virologic success (n = 714 observations from n = 181 women)

WIHS

High Oral HPV16 Viral Load Predicts Long-term Persistence

(Beachler, Guo, . . . ,D'Souza, *J Infect Dis* 2015;212(10):1588-1591)

Time to clearance of oral HPV16 infections among 88 oral HPV16 infected individuals, by HPV16 viral load tertile at first visit infection detected*^

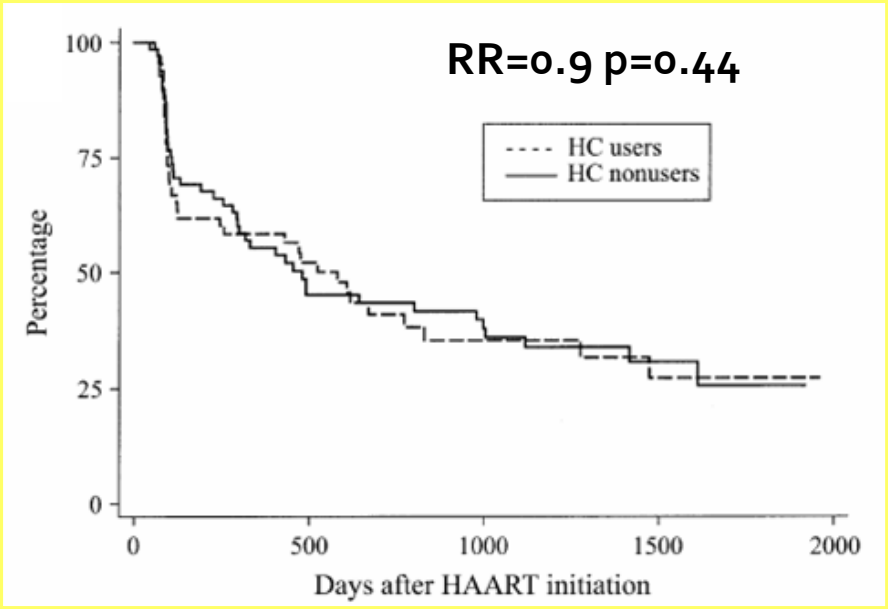


*Oral HPV clearance defined at first visit when oral HPV16 DNA was not detected.
^Tertile ranges: Lowest Tertile 0.0-5.9 copies per 100,000 cells; Middle Tertile: 6.0-155.3 copies per 100,000 cells; Highest Tertile: >155.3 copies per 100,000 cells. The p-trend was calculated using the log-rank test.

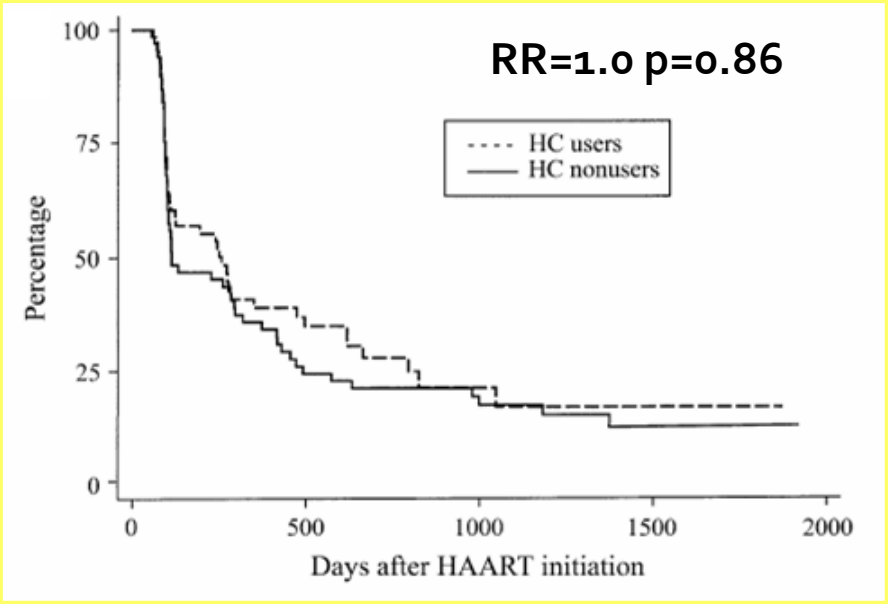
WIHS

Use of Hormonal Contraceptives (HC) Does Not Impact the Effectiveness of HAART

(Chu, Gange, . . . , Greenblatt, *Am J Epidemiol* 2005;161:881-890)



Percentage of Subjects Achieving CD4+ Cell Count Increase of 50 cells/mm^3

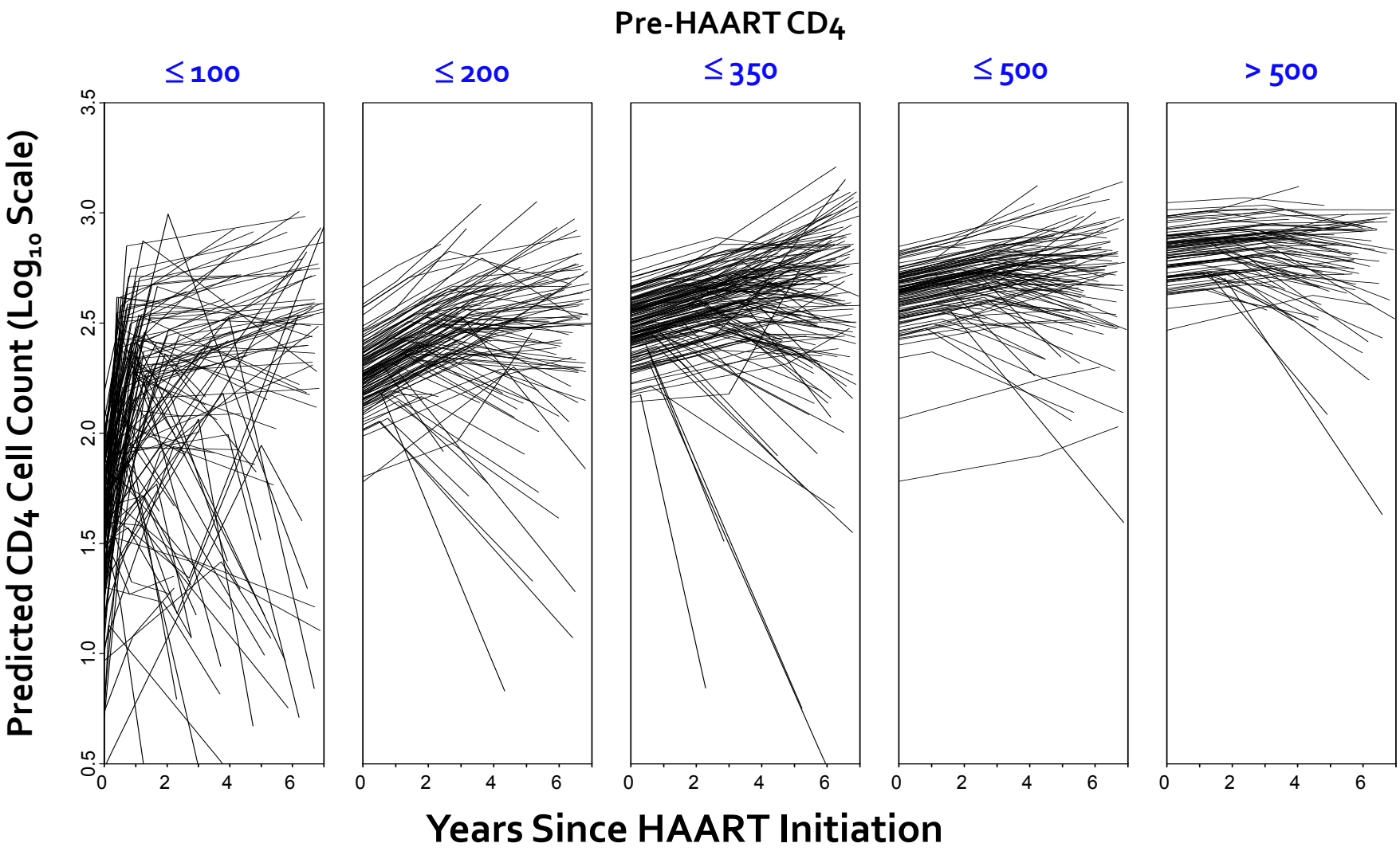


Percentage of Subjects Achieving HIV RNA < 80 copies/ml

WIHS

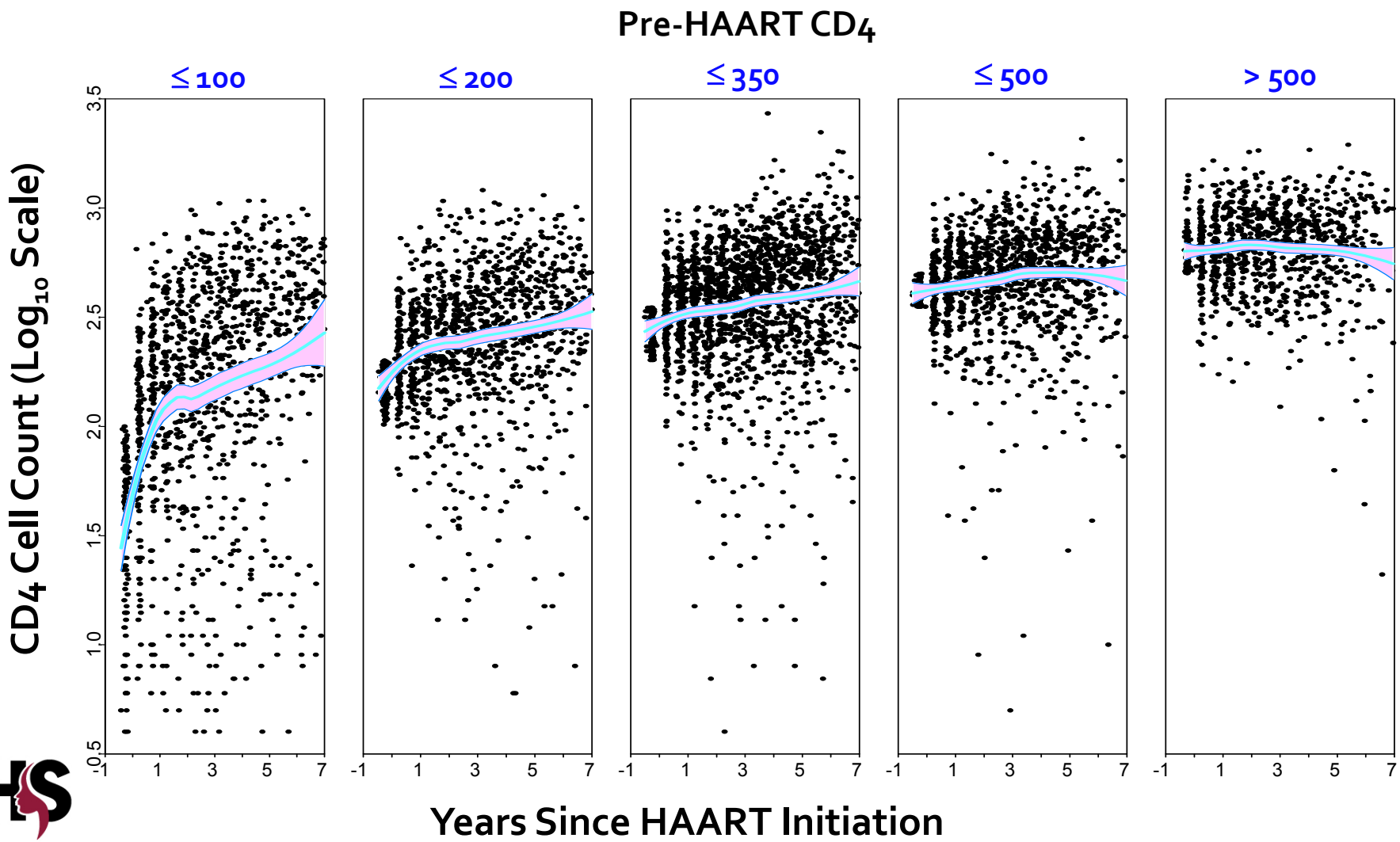
Individual Variation of CD4 T-Cell Trajectory among HIV+ on Long-term HAART (1)

(Chu, Gange, . . . , Jacobson, *Am J Epidemiol* 2005; 162,8:787-797)



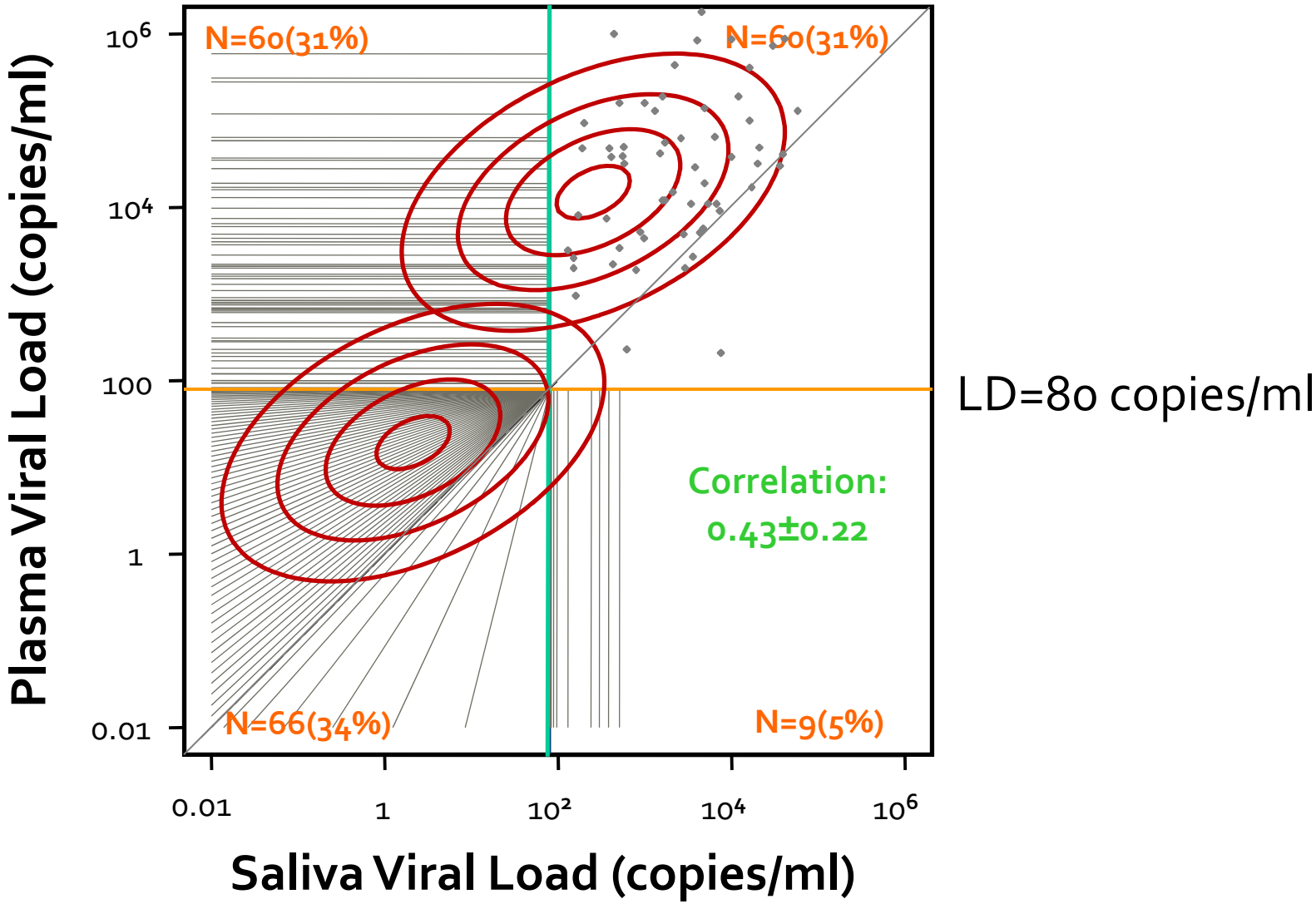
Individual Variation of CD4 T-Cell Trajectory among HIV+ on Long-term HAART (2)

(Chu, Gange, . . . , Jacobson, *Am J Epidemiol* 2005; 162,8:787-797)



Correlation of Plasma and Saliva Viral Loads

(Chu, Moulton, . . . , Muñoz, *Applied Statistics* 2005; 54,5:831-845)



WIHS

Characteristics Associated with Receipt of a Contraindicated Initial ARV Regimen

(Cocohoba, Wang, . . . Greenblatt, *J Acquir Immune Defic Syndr* 2008; 47:377-383)

Effect	**OR**	**(95% CI)**
Age per 10 years	1.10	(0.66 – 1.84)
CD4 cell count nadir per 100 cells	1.07	(0.86 – 1.34)
Pre-initiation HIV VL (per $\log_{10}$ copies)	0.43	(0.26 – 0.71)
Race		
Non-Hispanic black vs. other	1.06	(0.32 – 3.48)
Hispanic vs. other	0.88	(0.20 – 3.90)
Initial ARV regimen before 2001	4.17	(1.61 – 11.1)

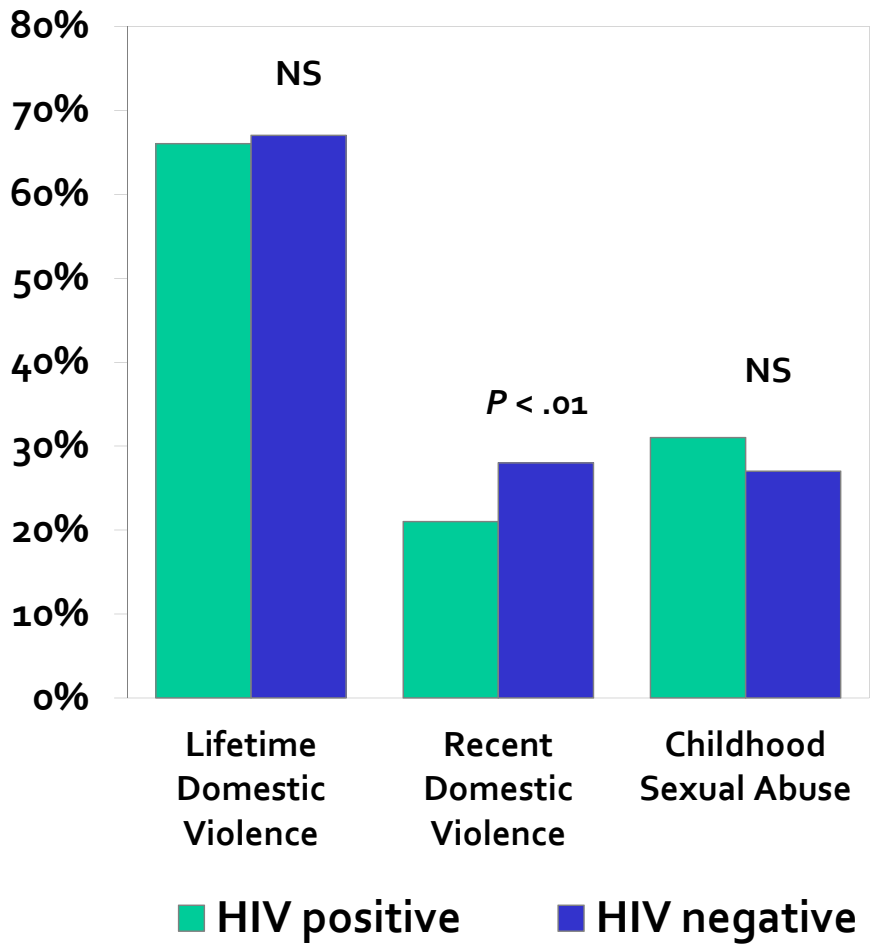
NOTE: Adjusted for WIHS study site.

WIHS

Domestic Violence and Childhood Sexual Abuse in WIHS Women

(Cohen, Deamant, . . . , Melnick, *Am J Public Health* 2000; 90:560-565)

Baseline Prevalence



Multivariate Behavioral Correlates of Childhood Sexual Abuse

- Drug use, ever
  (OR* = 4.25, $P < .001$)
- Male partner w/HIV risk
  (OR* = 2.07, $P < .001$)
- Lifetime male sex partners (>10)
  (OR* = 2.29, $P < .001$)
- Sex for drugs, money or shelter
  (OR* = 2.62, $P < .001$)

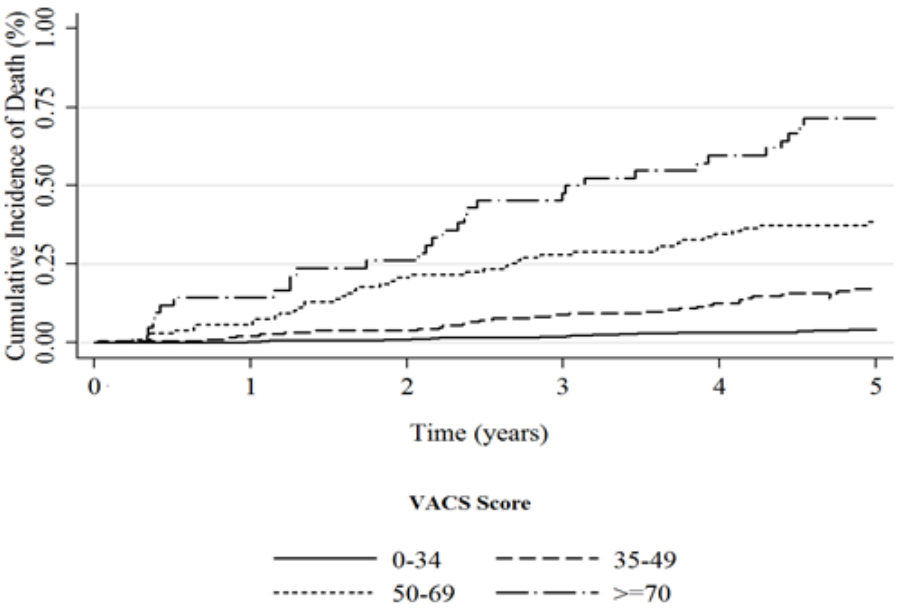
*OR adjusted for HIV serostatus, age, race/ethnicity and annual household income.

WIHS

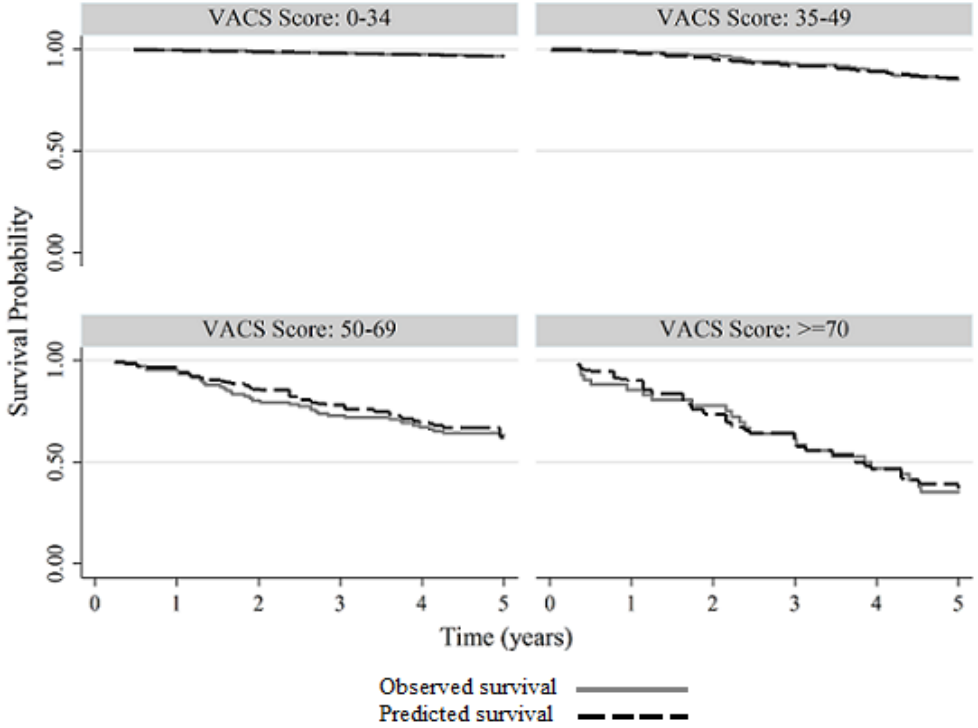
Gender-related Risk Factors Improve Mortality Predictive Ability of VACS Index among HIV-infected Women

(Cohen, Hotton, . . . , Weber, *J Acquir Immune Defic Syndr* 2015; 70(5):538-544)

5-Year Cumulative Mortality after 1 year on HAART by Category of VACS Score: 1997–2007



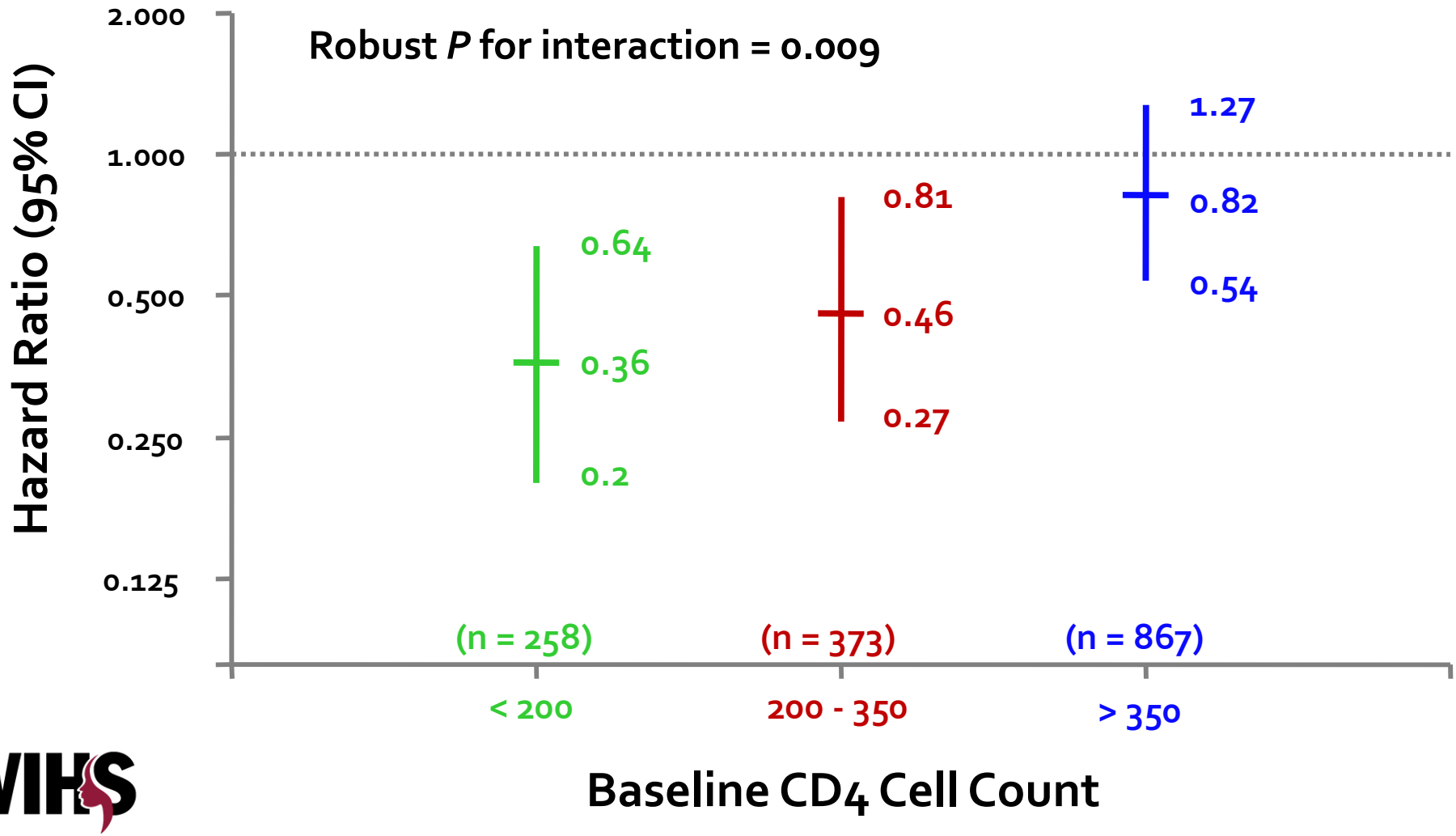
Observed vs. Expected 5-Year Survival Probability by VACS Index Score



WIHS

Individual Effect of HAART on AIDS or Death

(Cole, Hernán, . . . , Muñoz, *Am J Epidemiol* 2003; 158:687-694)



WIHS

Effect of HAART on Incident AIDS or Death among 950 HIV+ Men and Women

(Cole, Jacobson, . . . , Anastos, *Am J Epidemiol* 2010; 171:113-122)

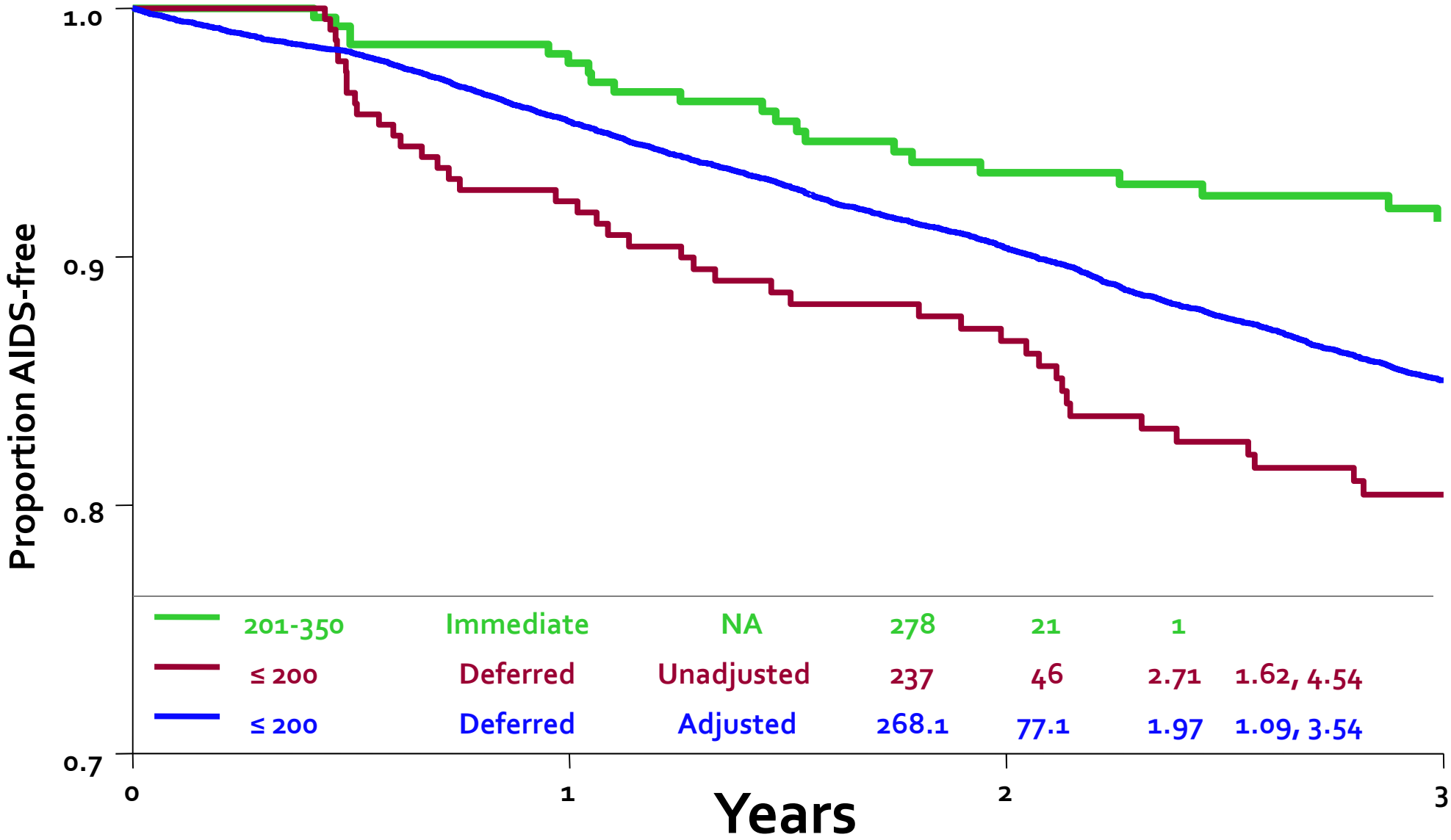
Model	Exposure	Hazard Ratio	95% CL[a]
Unadjusted	No ART	1	
	HAART[b]	0.75	0.49, 1.17
Adjusted[c]		0.95	0.58, 1.56
Weighted[c]		0.36	0.21, 0.61
Weighted & calibrated		0.17	0.06, 0.43[d]

[a] Robust for weighted models.
[b] Use during the prior 2 years.
[c] Controlled for time-varying prior CD_4 cell count and HIV RNA level by using restricted cubic splines.
[d] Confidence limits obtained by the delta method using robust variance.

WIHS

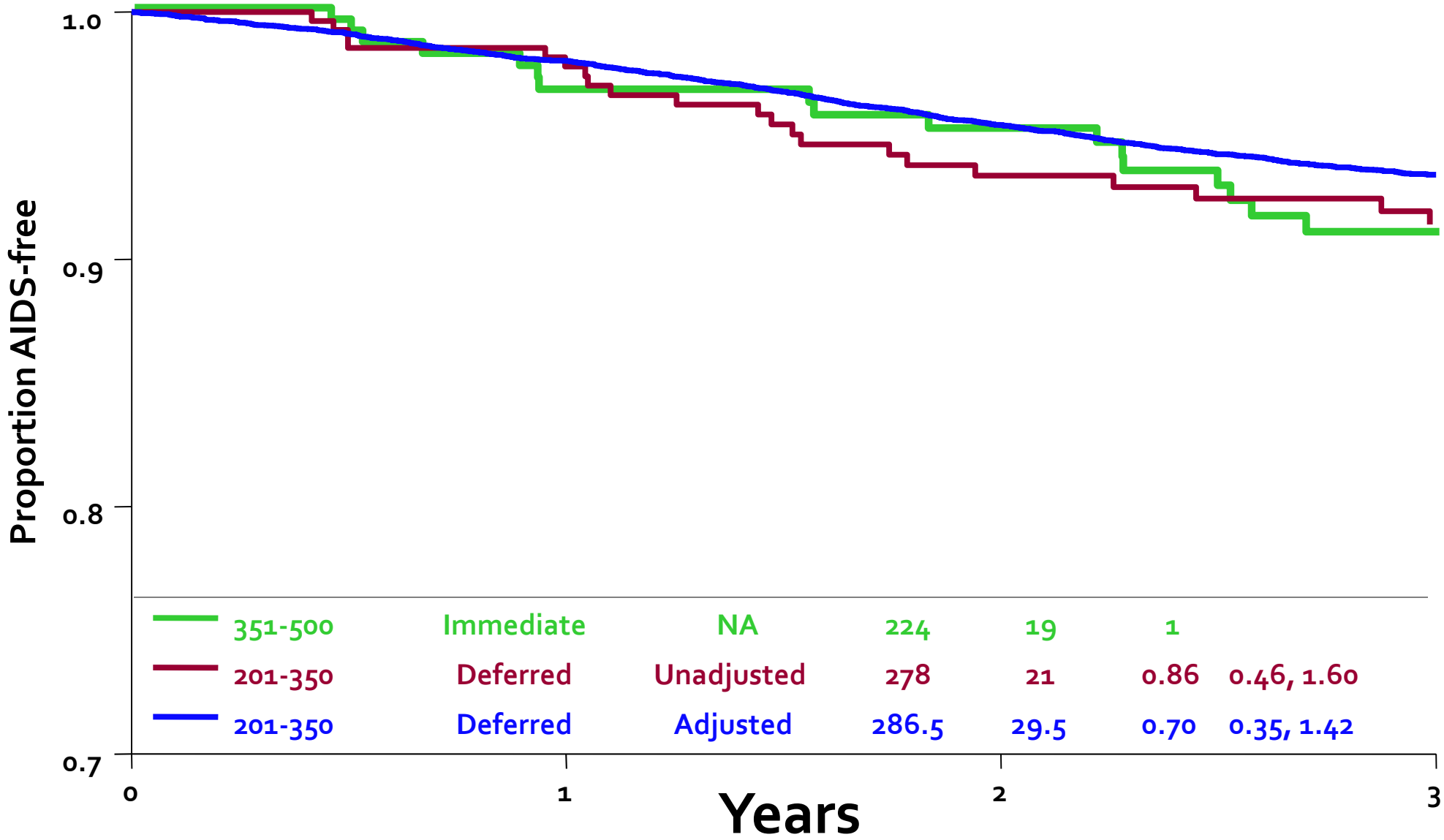
Percent AIDS-free after HAART Initiation (MACS & WIHS) (1)

(Cole, Li, . . . , Muñoz, *Stat Med* 2004; 23:3351-3363)



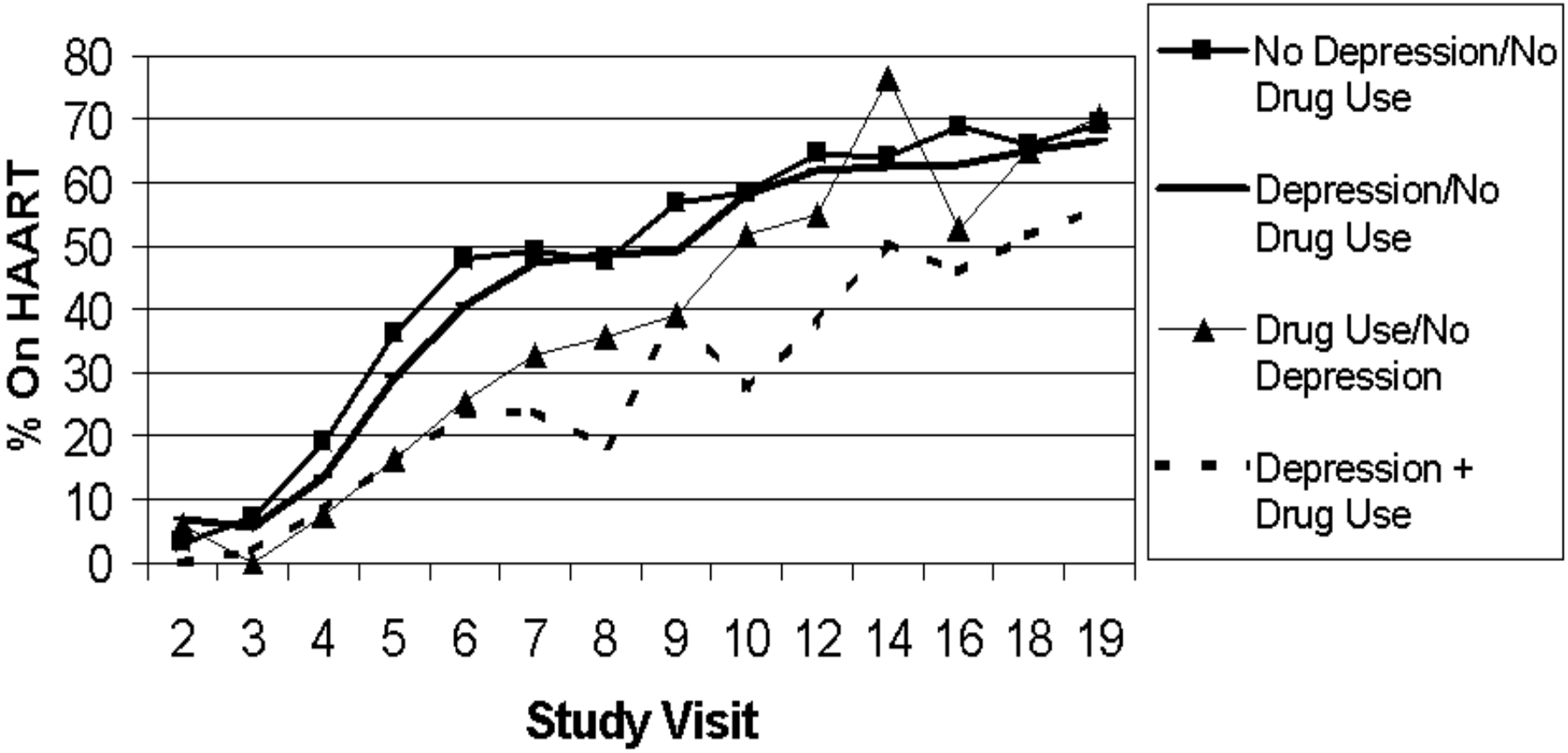
Percent AIDS-free after HAART Initiation (MACS & WIHS) (2)

(Cole, Li, . . . , Muñoz, *Stat Med* 2004; 23:3351-3363)



Proportion on HAART by Illicit Drug Use and Probable Depression

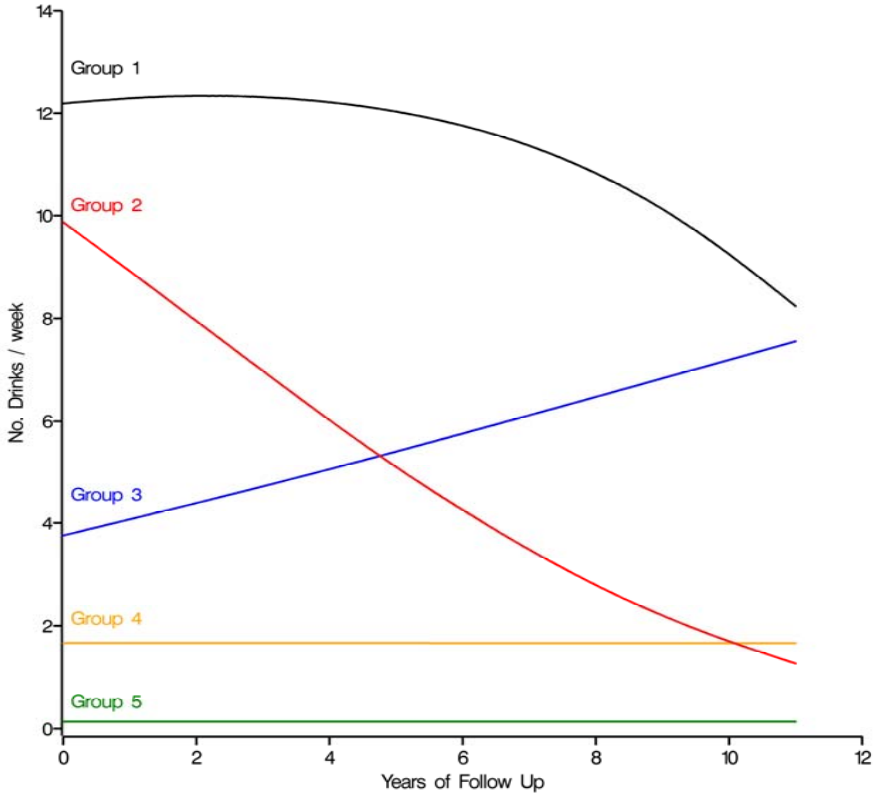
(Cook, Grey, . . . , Levine, *Drug Alcohol Dependence* 2007; 89:74-81)



Probable depression = CES-D score ≥16; Drug use = crack, cocaine, heroin use in past 6 months.

Alcohol Consumption Trajectories in Adult Women with HIV Infection: 1994-2006

(Cook, Zhu, . . . , Cohen, *AIDS Behav* 2013;17(5):1705-1712)



Drinking trajectory patterns for 3768 women. The five groups include:

(1) Women who were persistent heavy drinkers (3%)

(2) Women who cut back from heavy drinking to non-heavy drinking (4%)

(3) Women who increased to heavy drinking over time (8%)

(4) Women who remained non-heavy drinkers during the entire follow-up (36%)

(5) Women who were non-drinkers (49%)

WIHS

Alcohol Consumption Trajectories in Adult Women with HIV Infection

(Cook, Zhu, . . . , Cohen, *AIDS Behav* 2013;17(5):1705-1712)

In women with heavy drinking at baseline, factors associated with a persistent heavy drinking trajectory, compared to women who reduced drinking over time: multivariable analysis

Baseline Variable	HIV-positive (N = 329)				HIV-uninfected (N = 148)			
	Odds ratio	95 % CI	Wald χ2	*p*	Odds ratio	95 % CI	Wald χ2	*p*
Depression								
Yes (vs. no)	1.6	1.0-2.8	3.5	0.06				
Crack/cocaine use								
Yes (vs. no)	3.6	2.1-6.8	23.7	<0.001	5.8	2.6-12.9	18.3	<0.001
HCV seropositive								
Yes (vs. no)	1.8	1.1-3.0	4.7	0.03	2.4	1.0-5.8	4.8	0.03

WIHS

Alcohol Consumption Trajectories in Adult Women with HIV Infection

(Cook, Zhu, . . . , Cohen, *AIDS Behav* 2013;17(5):1705-1712)

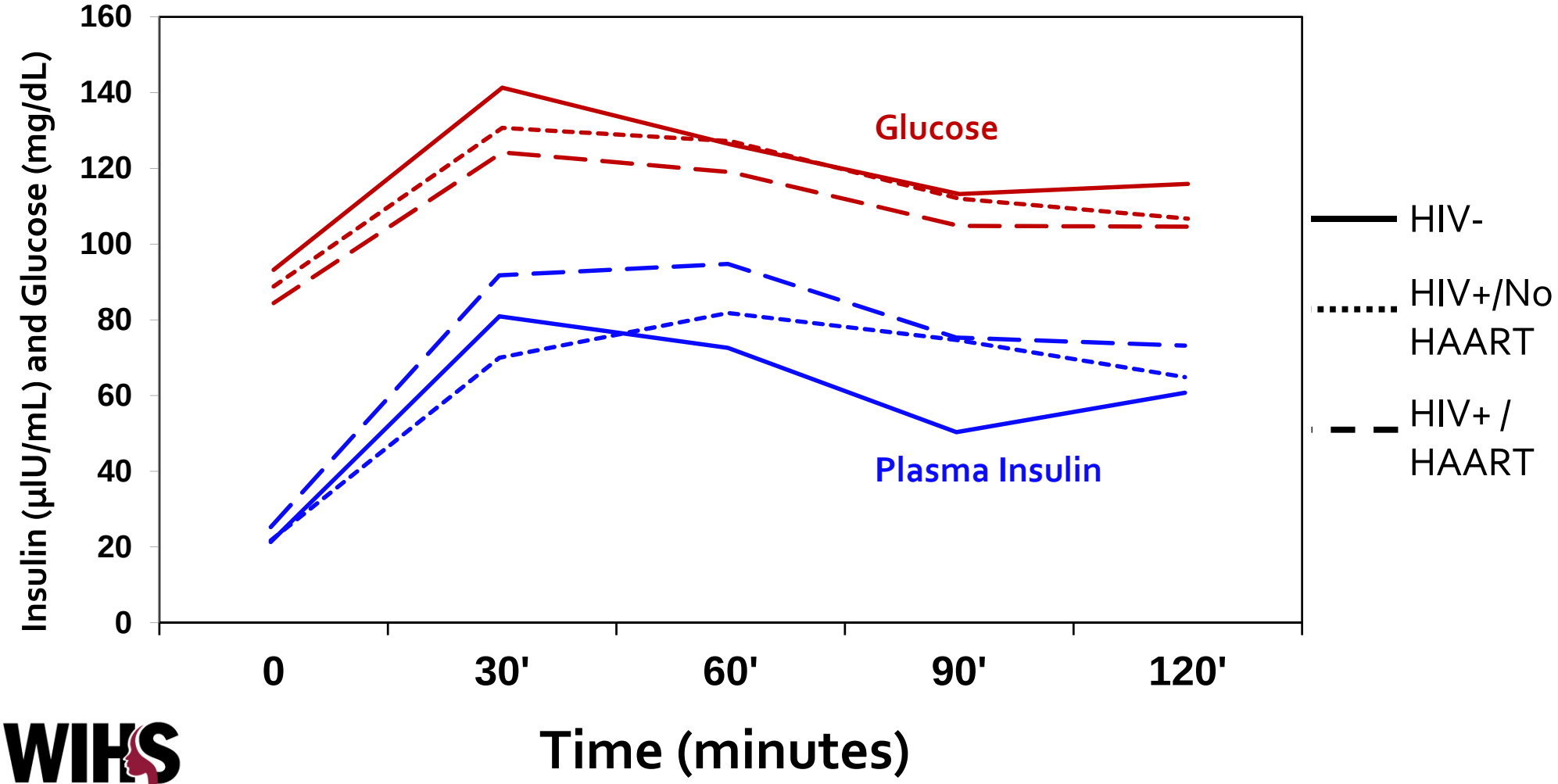
Among women without heavy drinking at baseline, factors associated with trajectory increasing to heavy drinking over time (compared trajectories that remained non-heavy drinking or non-drinking): multivariable analysis

Baseline Variable	HIV-positive (N = 2,303)				HIV-uninfected (N = 779)			
	Odds ratio	95 % CI	Wald χ2	*p*	Odds ratio	95 % CI	Wald χ2	*p*
Education								
> High school (vs. ≤ high school)	0.65	0.41-1.04	3.3	0.07	-	-		
Crack/cocaine use								
Yes (vs. no)	3.48	2.33-5.19	37.3	<0.001	3.17	1.88-5.37	21.0	<0.001
Marijuana use								
Yes (vs. no)	2.79	1.89-4.10	27.0	<0.001	3.06	1.86-5.05	24.8	<0.001
Tobacco use								
Yes (vs. no)	2.91	1.74-4.87	16.5	<0.001	2.27	1.25-4.12	6.6	
Peak drinking history (prior to baseline)								
Non-drinker (reference	1				1			
Moderate drinker	0.36	0.13-1.03	5.4	0.02	0.44	0.15-1.33	5.4	0.02
Heavy drinker	1.51	1.00-2.28	22.0	<0.001	2.40	1.45-3.97	14.4	<0.001
Ever had alcohol treatment (prior to baseline)								
Yes (vs. no)	2.66	1.77-3.99	22.0	<0.001	-	-		
HCV seropositive								
Yes (vs. no)	0.97	0.65-1.43	0.0	0.86	0.97	0.56-1.65	0.0	0.90

WIHS

Effect of HIV Infection & HAART Use on Oral Glucose Tolerance and Insulin Sensitivity

(Danoff, Shi, . . . , Anastos, *J Acquir Immune Defic Syndr* 2005; 39:55-62)



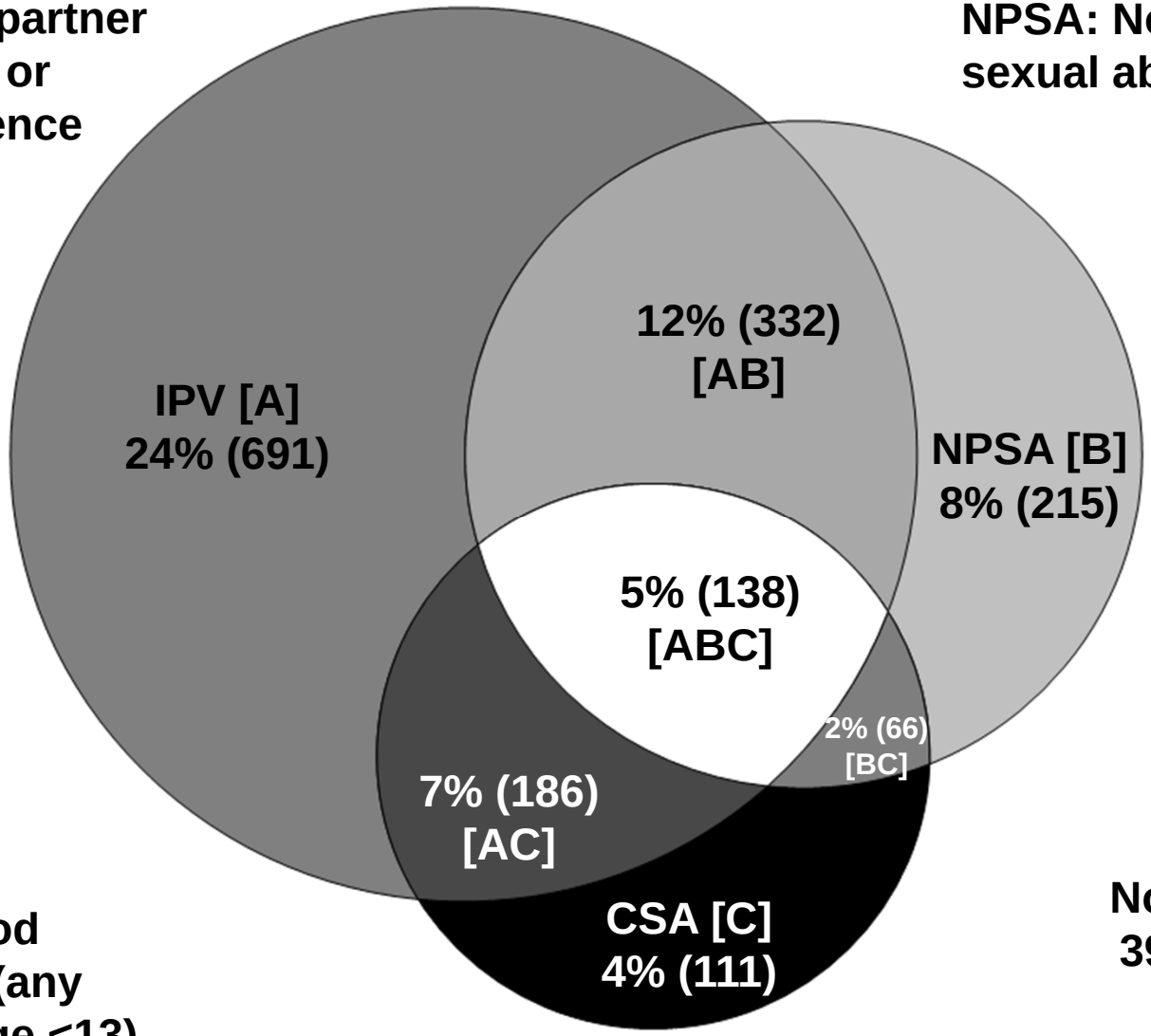
WIHS

Polyvictimization Exposures in WIHS

(Decker, Benning, …, Golub, Am J Prev Med 2016; 51:731-742)

IPV: Intimate partner sexual abuse or physical violence

NPSA: Non-partner sexual abuse (age >12)



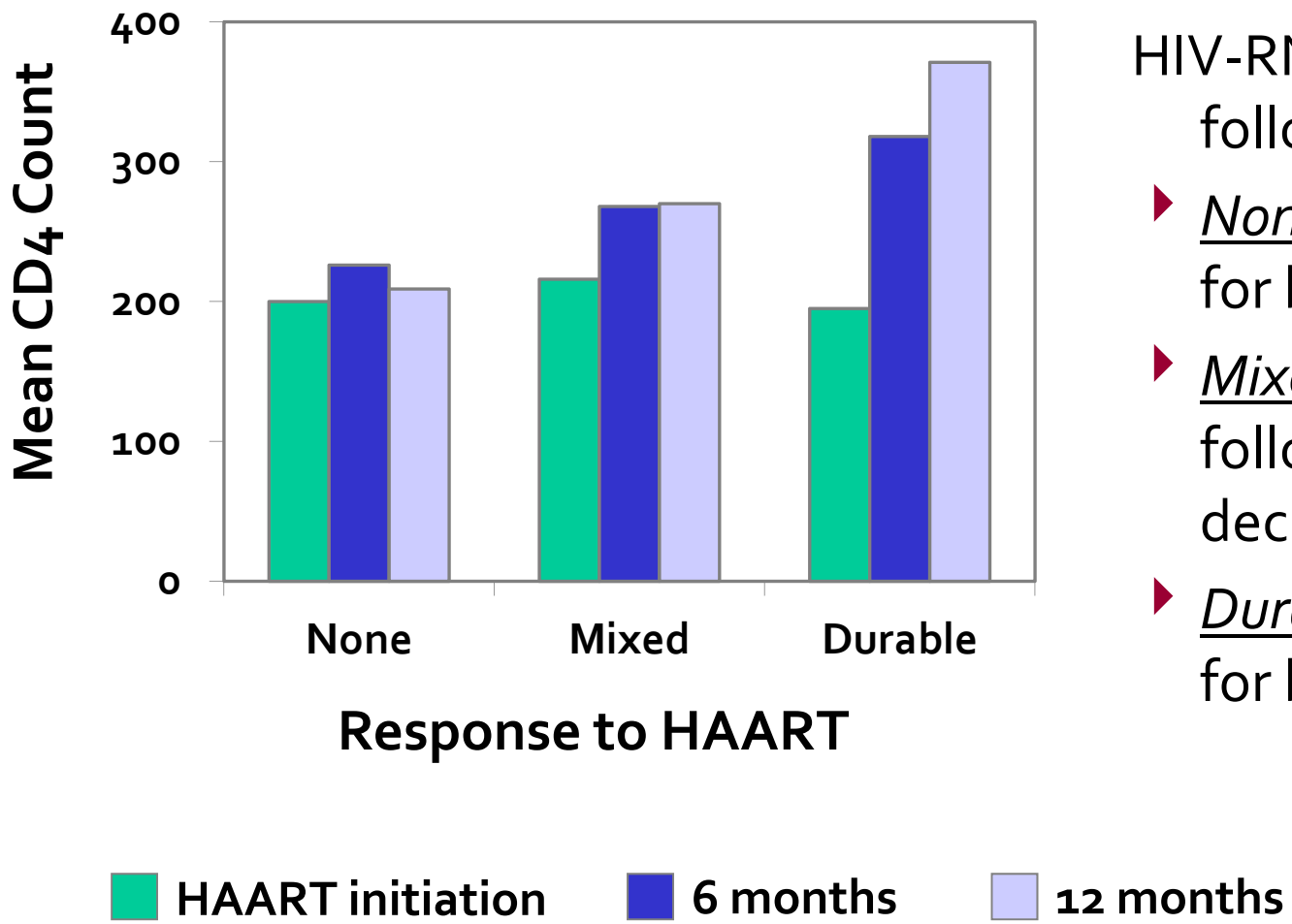
CSA: Childhood sexual abuse (any perpetrator, age <13)

No violence
39% (1099)

WIHS

Observed CD4 Counts by Response to HAART

(DeHovitz, Kovacs, . . . , Greenblatt, *JID* 2000; 182:1527-1530)



HIV-RNA response at the two follow-up visits:

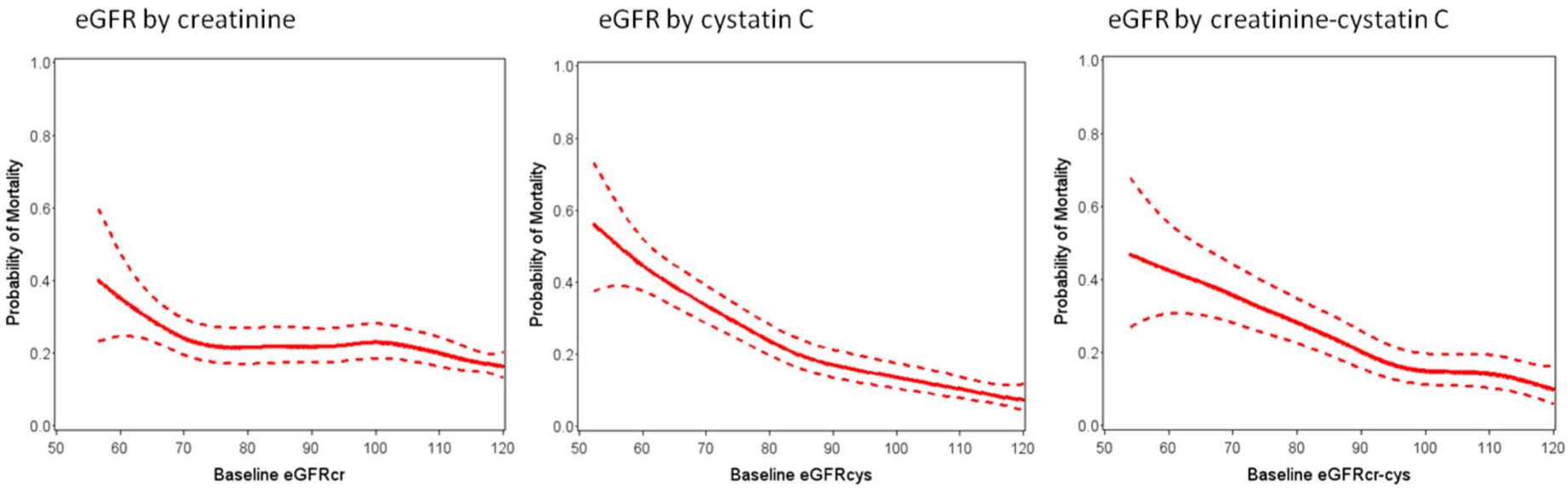
- *None*: < 0.5 log decrease for both visits
- *Mixed*: > 1 log decrease, followed by < 0.5 log decrease
- *Durable*: > 1 log decrease for both visits

WIHS

Comparisons of Creatinine and Cystatin C for Detection of Kidney Disease and Prediction of All-cause Mortality in HIV-infected Women

(Driver, Scherzer, . . . , Shlipak, *AIDS* 2013;27(14):2291-2299)

Association of Baseline eGFR with Mortality among HIV-infected WIHS Participants



Solid lines denote the predicted probability of mortality (with dotted 95% CI bounds) calculated from unadjusted generalized additive models. The lowest 5% of eGFR values and all values above 120 are truncated.

Comparisons of Creatinine and Cystatin C for Detection of Kidney Disease and Prediction of All-cause Mortality in HIV-infected women

(Driver, Scherzer, . . . , Shlipak, *AIDS* 2013;27(14):2291-2299)

Association of baseline eGFR with all-cause mortality in HIV-infected WIHS participants

	Total Number	Death rate (per 1000 person-years) (95% CI)	Unadjusted HR (95% CI)	Adjusted HR[a] (95% CI)
Creatinine				
>90 ml/min per 1.73 m^2	694	18.9 (15.7-22.7)	Reference	Reference
60-90 ml/min per 1.73 m^2	154	23.5 (18.3-30.1)	1.25 (0.92-1.71), *P*=0.15	1.20 (0.85-1.67), *P*=0.30
<60 ml/min per 1.73 m^2	60	43.6 (29.2-65.0)	2.53 (1.62-3.95), *P*<0.0001	2.34 (1.44-3.79), *P*=0.0006
Cystatin C				
>90 ml/min per 1.73 m^2	479	11.3 (8.8-14.6)	Reference	Reference
60-90 ml/min per 1.73 m^2	337	28.5 (23.3-34.8)	2.59 (1.87-3.58), *P*<0.0001	1.80 (1.28-2.53), *P*=0.0007
<60 ml/min per 1.73 m^2	92	59.4 (44.7-79.1)	5.78 (3.93-8.49), *P*<0.0001	2.56 (1.63-4.02), *P*<0.0001
Creatinine-cystatin C				
>90 ml/min per 1.73 m^2	524	13.4 (10.7-16.8)	Reference	Reference
60-90 ml/min per 1.73 m^2	316	30.1 (24.6-36.8)	2.29 (1.69-3.11), *P*<0.0001	1.91 (1.38-2.66), *P*=0.0001
<60 ml/min per 1.73 m^2	68	53.8 (38.1-76.1)	4.44 (2.93-6.74), *P*<0.0001	3.11 (1.94-5.00), *P*<0.0001

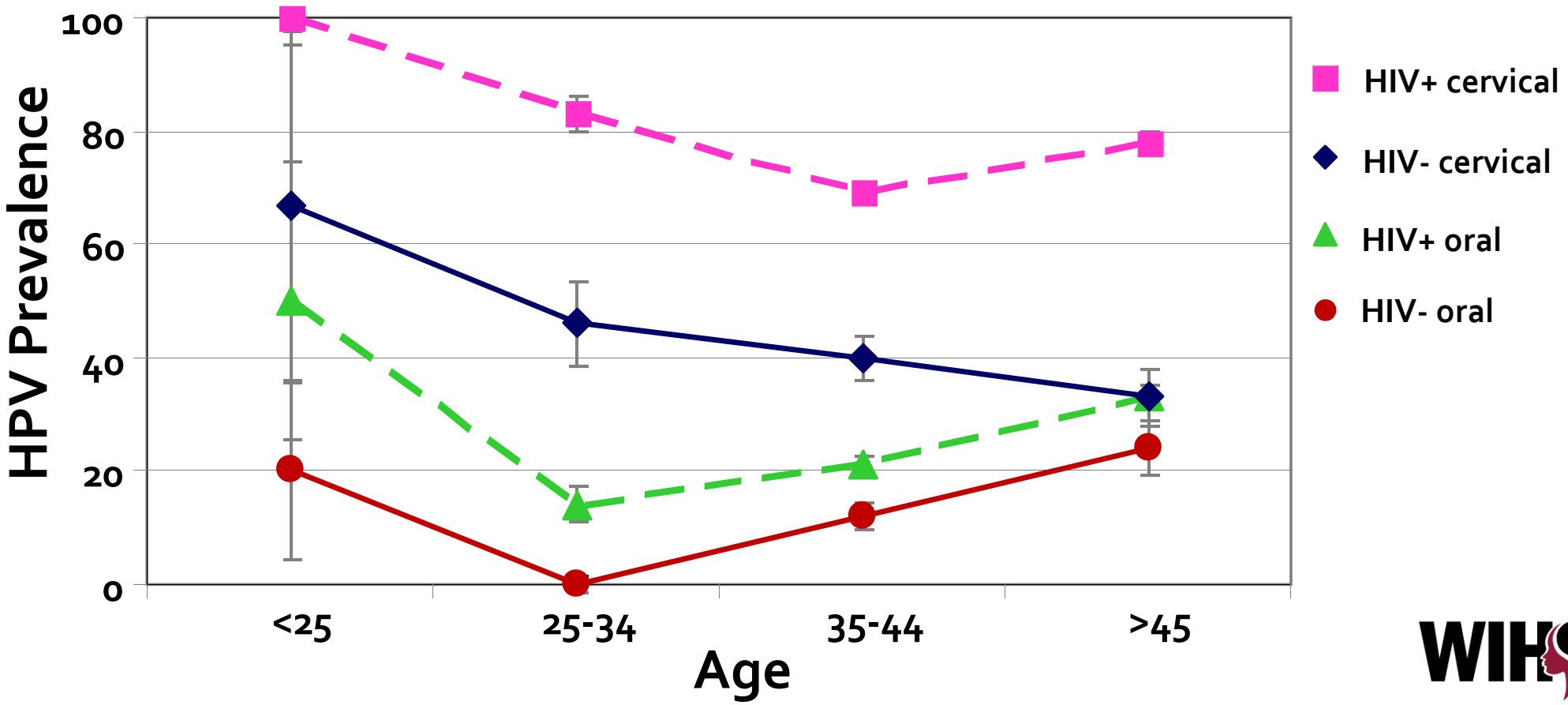
CI, confidence interval; HR, hazard ratio.

[a]Fully adjusted Cox models control for age, ethnicity, traditional kidney risk factors (smoking, hypertension, diabetes, and ACR), and HIV-related risk factors($CD4^+$ count, HIV RNA, and HCV) (all measured at baseline, except for $CD4^+$ count and HIV RNA, which are time-updated).

WIHS

Relationship of Age and Prevalent HPV Infection by Site and HIV Status

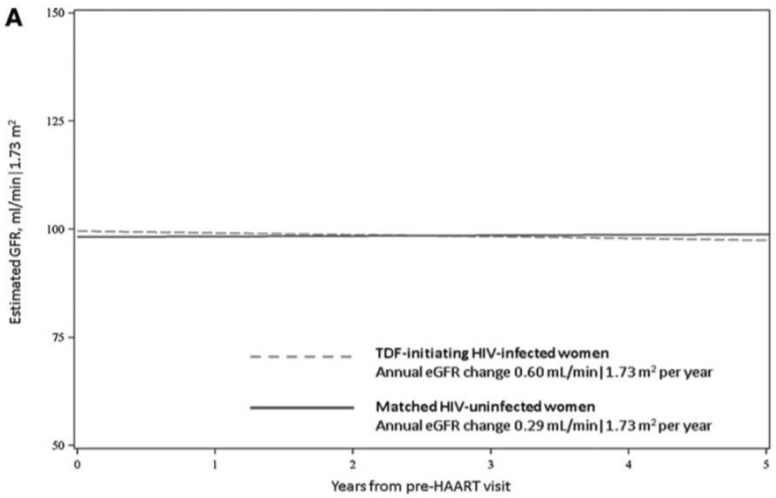
(D'Souza, Fakhry, . . . , Gillison, *Int J Cancer* 2007; 121:2897-2904)



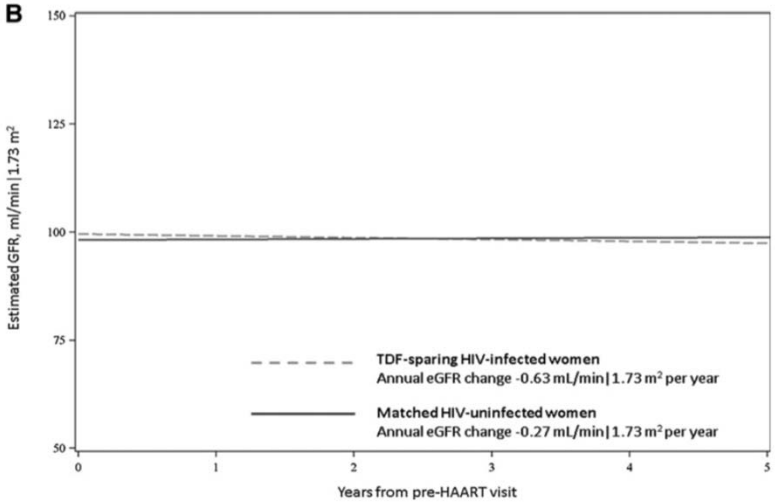
WIHS

Antiretroviral-Treated HIV-Infected Women Have Similar Long-Term Kidney Function Trajectories as HIV-Uninfected Women

(Estrella, Abraham, . . . , Gange, *AIDS Res Hum Retroviruses* 2013;29(5):755-760)



Longitudinal kidney function among HIV- infected women initiated on TDF-containing HAART vs. matched HIV-uninfected women



Longitudinal kidney function among HIV- infected women initiated on TDF-sparing HAART vs. matched HIV-uninfected women

WIHS

Antiretroviral-Treated HIV-Infected Women Have Similar Long-Term Kidney Function Trajectories as HIV-Uninfected Women

(Estrella, Abraham, . . . , Gange, *AIDS Res Hum Retroviruses* 2013;29(5):755-760)

Mean Estimated Glomerular Filtration Rate and Annual Change in Estimated Glomerular Filtration Rate in HIV-Infected and Matching HIV-Uninfected Women

	TDF-initiating HIV-infected women	*Matched HIV-uninfected women*	*p-value*	*TDF-sparing HIV-infected women*	*Matched HIV-uninfected women*	*p-value*
Mean estimated GFR[a] after HAART initiation (years)						
1 year	94.92 (92.54, 97.29)	99.90 (98.80, 101.00)	<0.001	98.68 (97.08, 100.29)	99.42 (98.27, 100.56)	0.47
3 years	96.12 (93.55, 98.69)	100.48 (99.29, 101.68)	0.003	97.41 (95.93, 98.89)	98.87 (97.81, 99.93)	0.12
5 years	97.33 (93.69, 100.96)	101.07 (99.36, 102.78)	0.07	96.14 (94.51, 97.98)	98.33 (97.13, 99.54)	0.03
Mean change in estimated GFR per year[b]						
	0.60 (-0.24, 1.44)	0.29 (0.11, 0.69)	0.51	-0.63 (-0.96, -0.31)	-0.27 (-0.52, -0.02)	0.08

[a] In ml/min/1.73m² (95% confidence interval).
[b] In ml/min/1.73m² per year (95% confidence interval).
Model adjusted for baseline estimated GFR and race.

WIHS

Characteristics at HAART Initiation by CKD Status

(Estrella, Parekh, …, Gange, *JAIDS* 2010; 55:217-220)

Characteristic	No CKD (n=1381)	Prevalent CKD (n=44)
Age, mean years (SD)*	38.9 (8.1)	44.0 (9.1)
Black, no. (%)	774 (56)	28 (64)
IDU, no. (%)	489 (36)	20 (46)
BMI, median kg/m^2 (IQR)	26.1 (22.8-30.6)	23.8 (20.5-32.1)
CD4, median cells/mm^3 (IQR)*[a]	271 (149-419)	171 (65-322)
HIV RNA, median copies/mL (IQR)[a]	17,000 (2300-80,000)	19,000 (935-115,000)
Serum albumin, median mg/dL (IQR)*[a]	4.2 (3.9-4.4)	3.6 (3.2-4.0)
Serum creatinine, median mg/dL (IQR)*	0.8 (0.7-0.9)	1.5 (1.3-3.2)
eGFR, median ml/min/1.73m^2 (IQR)*	92.6 (77.9-113.2)	40.8 (19.5-52.9)
HCV Ab+, no. (%)	505 (38)	21 (48)
History of illness, no. (%)		
AIDS*	812 (59)	33 (75)
Diabetes Mellitis*	99 (9)	9 (30)
Hypertension*	622 (46)	33 (75)

[a] Values from visit just before HAART initiation.

* *P* value < 0.05

Characteristics Associated with Toxoplasma Seropositivity

(Falusi, French, . . . , Cohen, *Clin Infect Dis* 2002; 35:1414-1417)

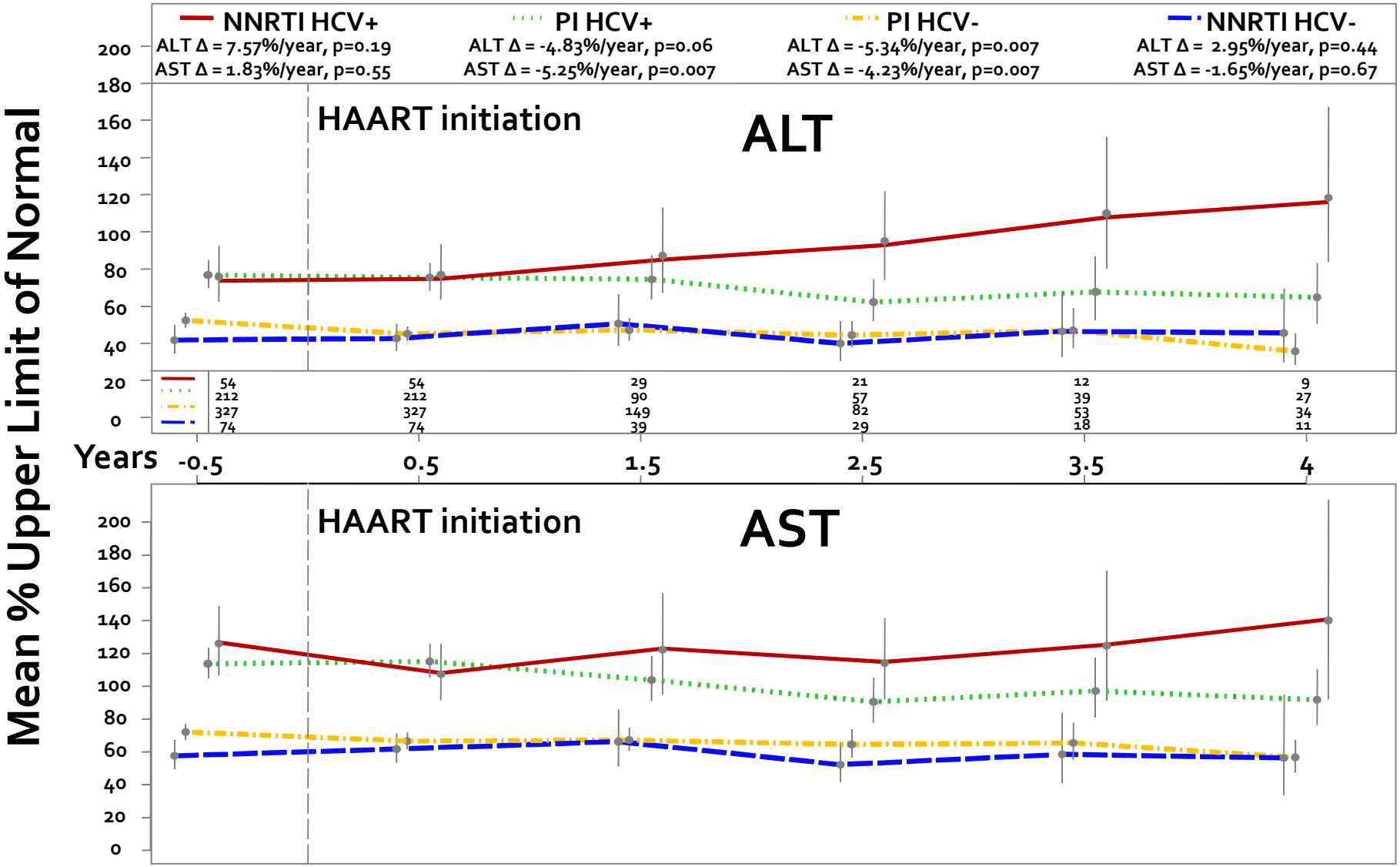
Characteristic	Proportion w/ + Results (%)[b]	Unadjusted *P* Value[a]	Unadjusted OR (95% CI) (n=1973)	Adjusted OR (95% CI) (n=1898)
Age, years		*<.0001*		
< 30	65/392 (16.6)		1	1
30 – 39	134/949 (14.1)		0.8 (0.6–1.1)	1.0 (0.7–1.4)
40 – 49	69/528 (13.1)		0.8 (0.5–1.1)	1.1 (0.7–1.8)
≥ 50	33/103 (32.0)		2.4 (1.4–3.9)*	3.1 (1.8–5.5)*
Race		*<.0001*		
White, non-Hispanic	36/363 (9.9)		1	1
Black, non-Hispanic	130/1080 (12.0)		1.2 (0.8–1.8)	1.2 (0.8–1.8)
Latina/Hispanic	123/473 (26.0)		3.2 (2.1–4.8)*	1.5 (1.0–2.5)
Other	11/55 (20.0)		2.3 (1.1–4.8)*	1.3 (0.6–3.1)

[a] Global *P* values are based on likelihood ratio statistics. *Significant

[b] Of 1973 total participants, 15.3% were found to be seropositive for *Toxoplasma* infection.

Mean Aminotransferase Levels Relative to HAART Initiation, Stratified by Categorized Pre-HAART Level

(French, Benning, . . . , Terrault, *Clin Infect Dis* 2004; 39:402-410)



Incidence and Predictors of TB Skin Test Conversion

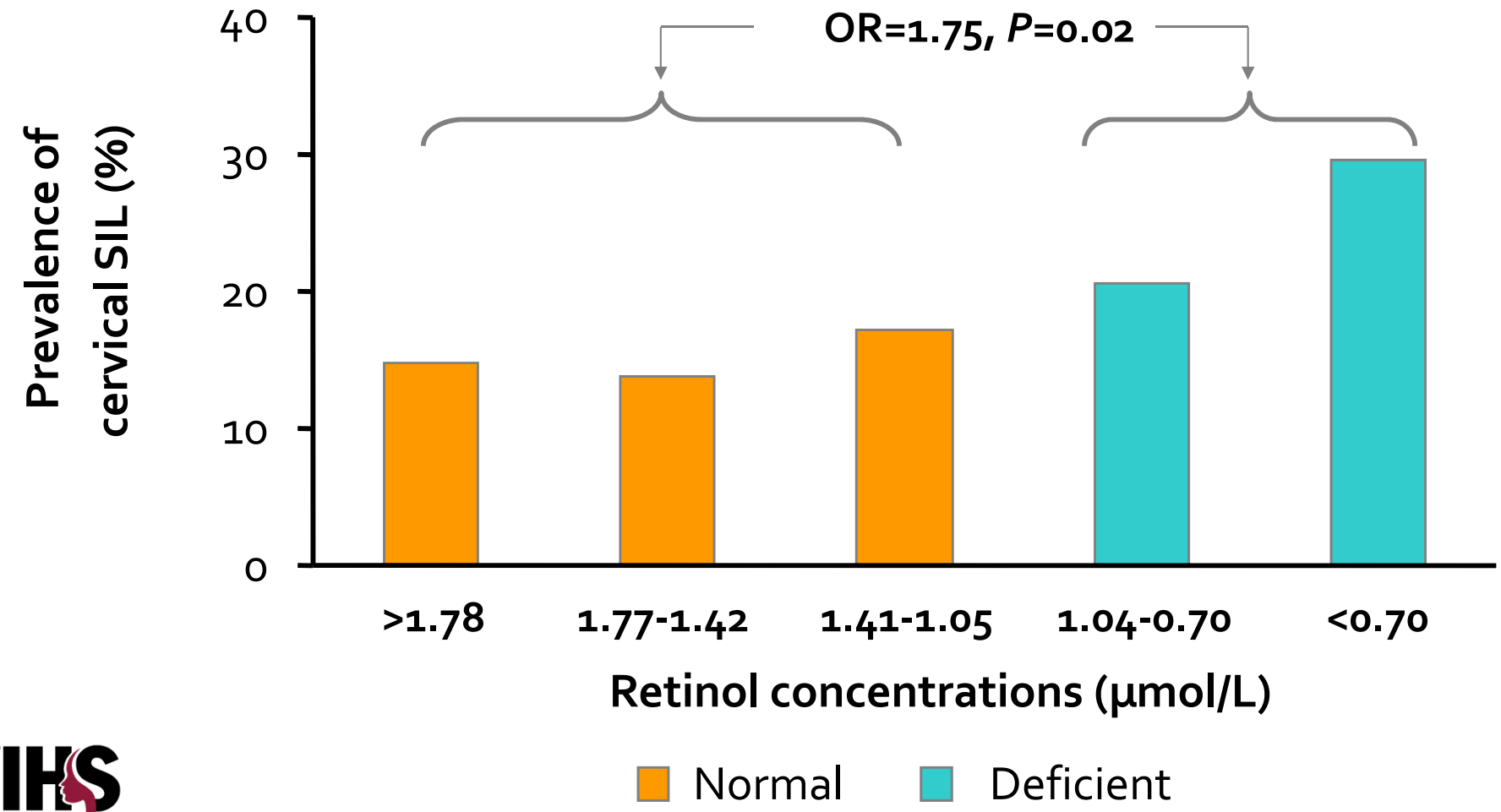
(French, Evans, . . . , Passaro, *J Acquir Immune Defic Syndr* 2006; 42:592-596)

	No. Women	TST Conversions/ Person-Years (%)		aOR (95% CI)		Multivariate *P*
All women (N=1255)						
HIV Serostatus						
Positive	995	36/4416	(0.8)	0.74	(0.35-1.52)	0.41
Negative	260	11/1114	(1.0)	---	---	---
Race						
Non-Hispanic Black	762	38/3465	(1.1)	3.00	(1.36-6.62)	0.006*
Other	493	9/2066	(0.4)	---	---	---
Age						
<40	601	30/2503	(1.1)	2.91	(1.46-5.82)	0.003*
≥ 40	654	17/3027	(0.6)	---	---	---
HIV-infected women (N=995)						
No. Years on HAART						
Never used HAART	115	4/400	(1.0)	6.25	(1.64-23.87)	0.007*
<2	360	21/1253	(1.7)	7.69	(2.67-22.10)	0.0002*
2 - <4	281	7/1171	(0.6)	2.48	(0.73-8.48)	0.15
≥4	265	4/1585	(0.3)	---	---	---

*Statistically significant values.

Prevalence of Cervical Squamous Intraepithelial Lesions by Retinol Level in HIV+ Women

(French, Kirstein, . . . , Cohen, *JID* 2000; 182:1084-1089)



WIHS

Multivariate Analysis of Factors Associated with Isolated Hepatitis B Core Antibody

(French, Operskalski, . . . , Kovacs, *JID* 2007; 195:1437-1442)

Characteristic, parameter	aOR (95% CI)	*P*
HCV status		
Ab-	1.0	
Ab+, RNA-	1.1 (0.6-1.8)	0.77
Ab+, RNA+	1.7 (1.1-2.8)	0.02
HIV status		
HIV-	1.0	
HIV+	1.8 (1.1-2.8)	0.01
History of IDU		
Never	1.0	
Ever	1.7 (1.1-2.6)	0.02
Lifetime no. sex partners		
< 5	1.0	
> 10	1.7 (1.1-2.5)	0.01
Plasma HIV RNA level		
≤ 4000	1.0	
> 100,000	1.7 (1.0-2.7)	0.03

*Multivariate Model: Predictors of Nevirapine Exposure**

(Gandhi, Benet, . . . , Greenblatt, *J Acquir Immune Defic Syndr* 2009; 50:482-491)

Predictor	Estimated Effect on AUC	95% Lower CI	95% Higher CI	*P*-value
Per 2-fold increase in ALT	↑ 1.25-fold	1.14	1.38	<0.001
Per 2-fold decrease in CrCl	↑ 1.22-fold	1.01	1.47	0.036
% Fat in diet, last 30 days	↓ 0.69-fold	0.54	0.87	0.002
Crack cocaine use	↓ 0.70-fold	0.51	0.96	0.028
Amenorrhea > 12 months	↓ 0.77-fold	0.61	0.97	0.026

* Controlled for age, race and ideal body weight.

WIHS

*Multivariate Model: Predictors of Efavirenz Exposure**

(Gandhi, Benet, . . . , Greenblatt, *J Acquir Immune Defic Syndr* 2009; 50:482-491)

Predictor	Estimated Effect on AUC	95% Lower CI	95% Higher CI	*P*-value
Per 2-fold increase in ALT	↑ 1.22-fold	1.05	1.41	0.009
Per 2-fold increase in albumin	↑ 2.47-fold	1.19	5.10	0.015
Oranges/OJ in past 5 days	↑ 1.39-fold	1.09	1.78	0.009
Amenorrhea > 12 months	↓ 0.73-fold	0.55	0.97	0.030
Tenofovir use	↓ 0.75-fold	0.57	0.99	0.045
Per 2-fold increase in IBW	↓ 0.38-fold	0.18	0.83	0.015
African-American vs. other	↓ 0.75-fold	0.56	1.00	0.050

WIHS

* Controlled for age.

IBW, ideal body weight.

CD4 Change and HIV RNA Concentration from Baseline to Failure Visit

(Gange, Schneider, . . . , Greenblatt, *J Acquir Immune Defic Syndr* 2006; 41:68-74)

	Estimated Impact on Mean Change (95% CI)		*P* Value*
Change in $CD4^+$ cell count (cells/mm^3)			
NRTI resistance at baseline visit	-31.0	(-82.1, 20.1)	0.233
NRTI resistance at failure visit	-14.7	(-71.6, 42.3)	0.611
PI resistance at failure visit	64.4	(14.7, 114.2)	0.012
NNRTI resistance at failure visit			
No baseline NRTI resistance	1.5	(-95.3, 98.2)	0.976
Baseline NRTI resistance	118.3	(38.3, 198.4)	0.004
Log_{10} HIV-1 RNA (at failure at visit)	-72.7	(-105.0, -40.4)	<0.001
Change in Log_{10} HIV RNA (copies/mL)			
NRTI resistance at baseline visit	0.196	(-0.039, 0.432)	0.102
NRTI resistance at failure visit	-0.297	(-0.586, -0.008)	0.044
PI resistance at failure visit	-0.038	(-0.297, 0.222)	0.774
NNRTI resistance at failure visit	-0.013	(-0.346, 0.320)	0.938

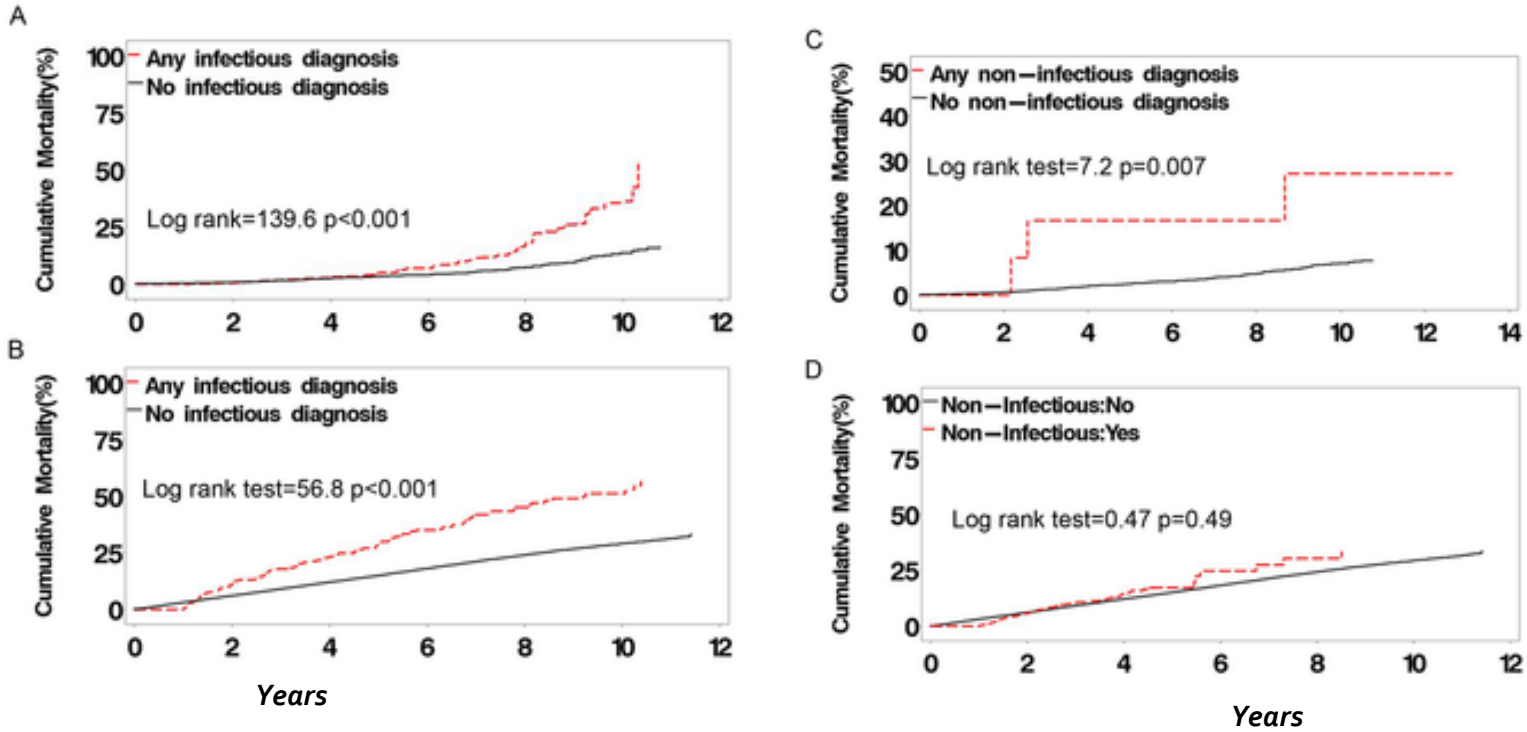
*Multivariable model simultaneously adjusting for all listed variables, CD4 cell count and HIV RNA level prior to PI/NNRTI initiation, and type of PI and NNRTI therapies. Changes were standardized by duration between baseline and failure visit.

The Impact of HAART on Respiratory Complications of HIV Infection: Longitudinal Trends in the MACS and WIHS Cohorts

(Gingo, Balasubramani, . . . , Morris, *PLoS One; 2013;8(3):e58812)*

MACS

WIHS



Unadjusted cumulative HAART era mortality.
Unadjusted Kaplan-Meier mortality curves starting during the HAART era for HIV-infected participants who had any infectious respiratory disease vs. those who never had any infectious disease in the MACS (A) and WIHS (B) cohorts and for HIV-infected participants who had any non-infectious respiratory disease vs. those who never had any non-infectious disease in the MACS (C) and WIHS (D) cohorts. Time zero represents the start of the HAART era or seroconversion for participants who seroconverted during the HAART era.

WIHS

Pulmonary Symptoms and Diagnoses are Associated with HIV in the MACS and WIHS Cohorts

(Gingo, Balasubramani, . . . , Morris, *BMC Pulm Med* 2014;14:75)

Estimates for the Effect of HIV Infection on Incidence of Pulmonary Diagnoses

	MACS				WIHS			
	Incident rates per 100 person-years		RR (95% CI)	p-value	Incident rates per 100 person-years		RR (95% CI)	p-value
Diagnosis	HIV-infected	HIV-uninfected	HIV-infected vs. HIV uninfected		HIV-infected	HIV-uninfected	HIV-infected vs. HIV-uninfected	
Asthma	0.69	0.62	0.86 (0.35-2.13)	0.75	2.59	3.35	0.87 (0.54-1.41)	0.58
COPD	1.70	0.69	2.21 (1.09-4.50)	0.03	2.13	1.39	1.58 (0.85-2.94)	0.15
Sleep apnea	1.41	1.45	0.92 (0.49-1.73)	0.81	1.12	0.49	2.33 (0.89-6.11)	0.09

Adjusted for age, race smoking status and intravenous drug use.
MACS - Multicenter Aids Cohort Study; WIHS - Women's Interagency HIV Study; RR = Rate ratio; CI - confidence interval; COPD - chronic obstructive pulmonary disease.

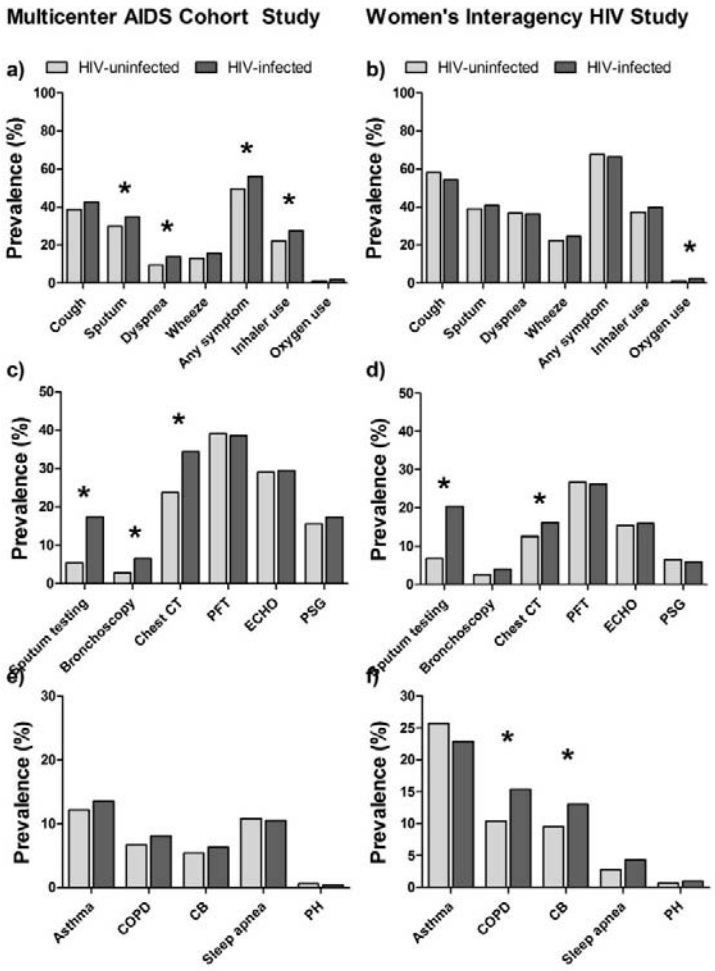
WIHS

Pulmonary Symptoms and Diagnoses are Associated with HIV in the MACS and WIHS Cohorts

(Gingo, Balasubramani, . . . , Morris, *BMC Pulm Med* 2014;14:75)

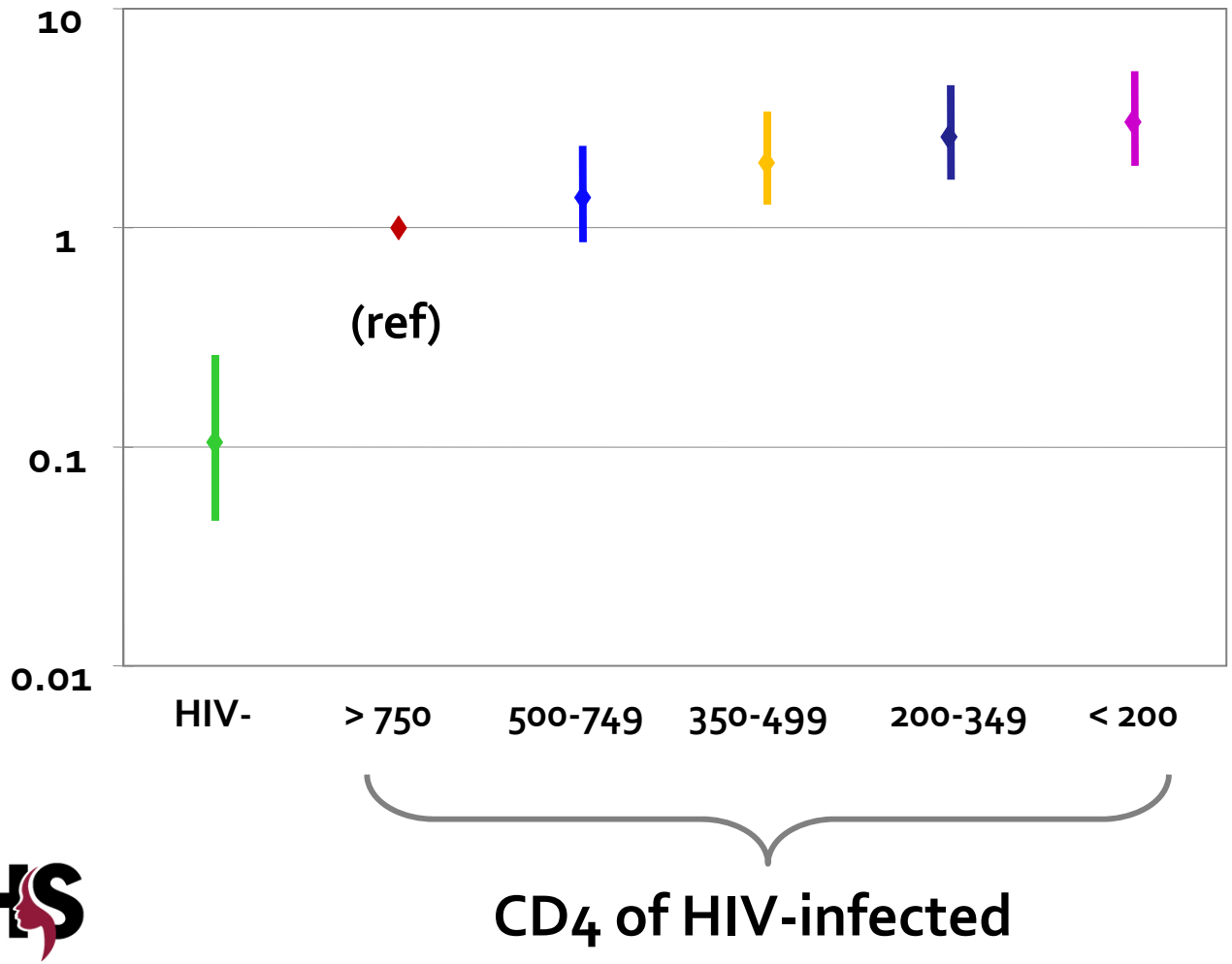
Prevalence of respiratory symptoms in the Multicenter AIDS Cohort (MACS) (a) and Women's Interagency HIV Study (WIHS) (b), diagnostic testing in MACS (c) and WIHS (d), and respiratory diagnoses in MACS (e) and WIHS (f) by HIV status.

ECHO - echocardiogram, CT - computed tomography, PFT - pulmonary function testing, PSG - polysomnography, COPD - chronic obstructive pulmonary disease, CB - chronic bronchitis, PH - pulmonary hypertension. (*) represents a p-value < 0.05 by chi-square test.



Risk of Herpes Zoster by CD4 Cell Count in HIV+ versus HIV- Women

(Glesby, Hoover, . . . , Anastos, *J Acquir Immune Defic Syndr* 2004; 37:1604-1609)



Diamonds denote point estimates of the odds ratios. *Vertical bars* denote 95% CIs. Odds ratios are adjusted for time on study.

WIHS

Baseline Characteristics Associated with Tobacco Cessation (1)

(Goldberg, Weber, . . . , Cohen, *J Gen Intern Med* 2010; 25:39-44)

BL Characteristics	Adjusted OR	95% CI	*P* for trend
Ethnicity and race			
Non-Hispanic black	1.00		
Non-Hispanic white	1.53	0.85-2.75	
Hispanic	2.07	1.28-3.35	
Education			
Less than HS	1.00		
HS graduate	1.37	1.06-1.76	0.02
Beyond HS	1.87	1.13-3.12	

Variables included in the multivariate model include study center; ethnicity; education; CES-D score; crack, cocaine, or heroin use; average number of cigarettes/day; and number of years since beginning smoking.

WIHS

Baseline Characteristics Associated with Tobacco Cessation (2)

(Goldberg, Weber, . . . , Cohen, *J Gen Intern Med* 2010; 25:39-44)

BL Characteristics	Adjusted OR	95% CI	*P* for trend
Crack/cocaine/heroin use			
Never	1.00		
Former	0.65	0.49-0.86	0.003
Current	0.43	0.24-0.74	
Cigarettes smoked/day			
≤10	1.00		
11-20	0.50	0.34-0.74	<0.001
>20	0.25	0.12-0.55	

Variables included in the multivariate model include study center; ethnicity; education; CES-D score; crack, cocaine, or heroin use; average number of cigarettes/day; and number of years since beginning smoking.

WIHS

Factors Associated with CD4 after HAART

(Golub, Benning, . . . , Gange, *Clin Infect Dis* 2008; 46:305-312)

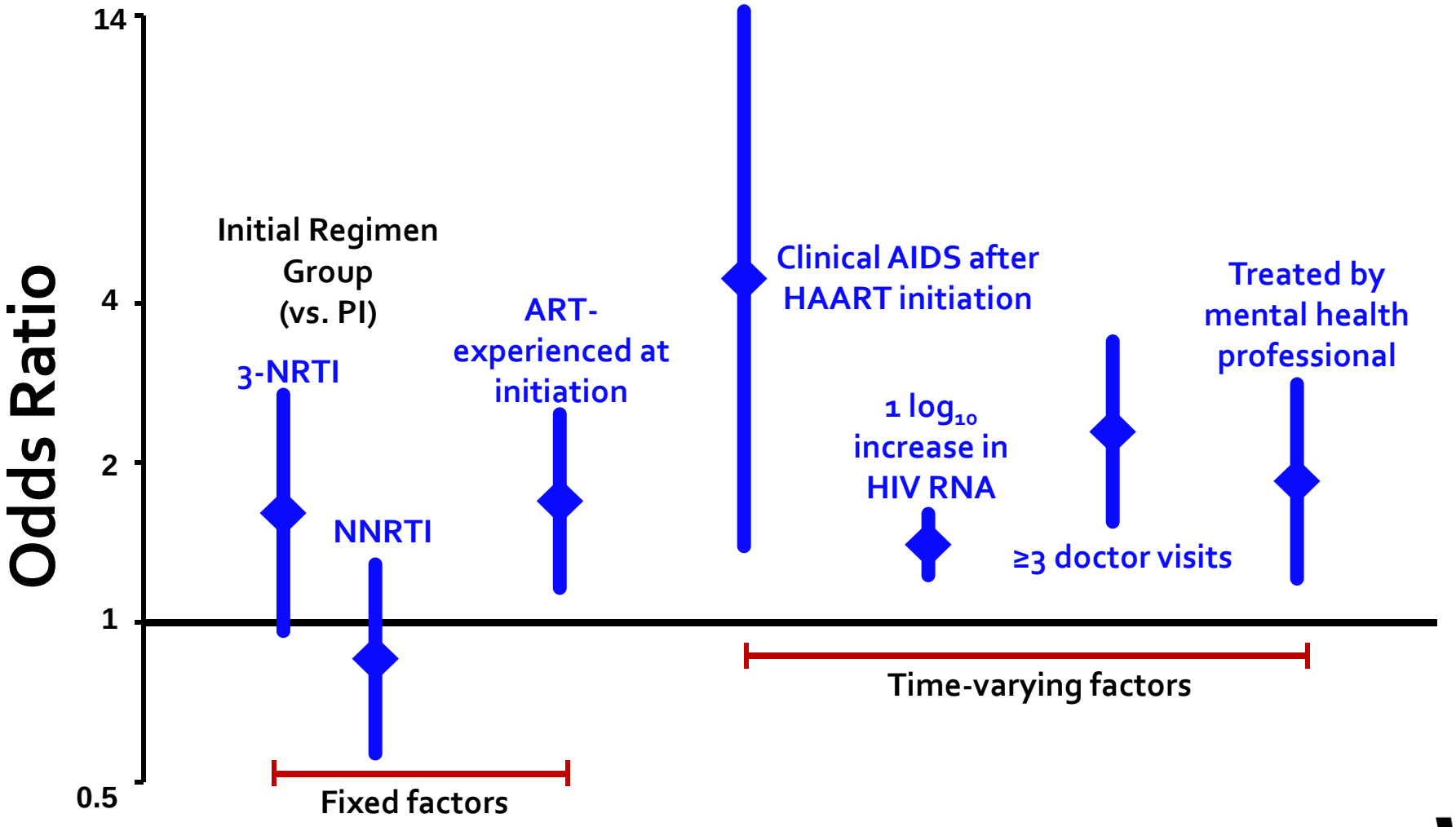
Time after HAART initiation & factor		Mean CD4 cells/mL	Mean CD4 diff. (95% CI)	*P*
YEAR 1	Initial regimen group			
	PI	438	Reference	…
	NNRTI	460	23 (-26 to 72)	0.35
	3-NRTI	369	-90 (-155 to -26)	0.006
	Initiated 4/1/02-3/31/05[a]	…	27 (-255 to 309)	0.85
	Last pre-HAART CD4	…	39 (21 to 56)	<0.001
	Nadir CD4	…	79 (52 to 106)	<0.001
	Peak HIV RNA (per $\log_{10}$)	…	0 (-34 to 34)	1.00
	Concurrent VL < LOQ[b]	…	113 (54-173)	<0.001
YEAR 2	Initial regimen group			
	PI	483	Reference	…
	NNRTI	454	-54 (-107 to 0)	0.05
	3-NRTI	398	-104 (-174 to -34)	0.004
	Initiated 4/1/02-3/31/05[a]	…	-198 (-519 to 122)	0.22
	Last pre-HAART CD4	…	17 (-3 to 38)	0.10
	Nadir CD4	…	69 (40 to 98)	<0.001
	Peak HIV RNA (per $\log_{10}$)	…	-30 (-65 to 6)	0.10
	Concurrent VL < LOQ[b]	…	169 (107 to 231)	<0.001

WIHS

[a] Versus period 4/1/00-3/31/02. [b] LOQ – limit of quantitation.

Predictors of First Switch after HAART Initiation*

(Golub, Benning, . . . , Gange, *Clin Infect Dis* 2008; 46:305-312)

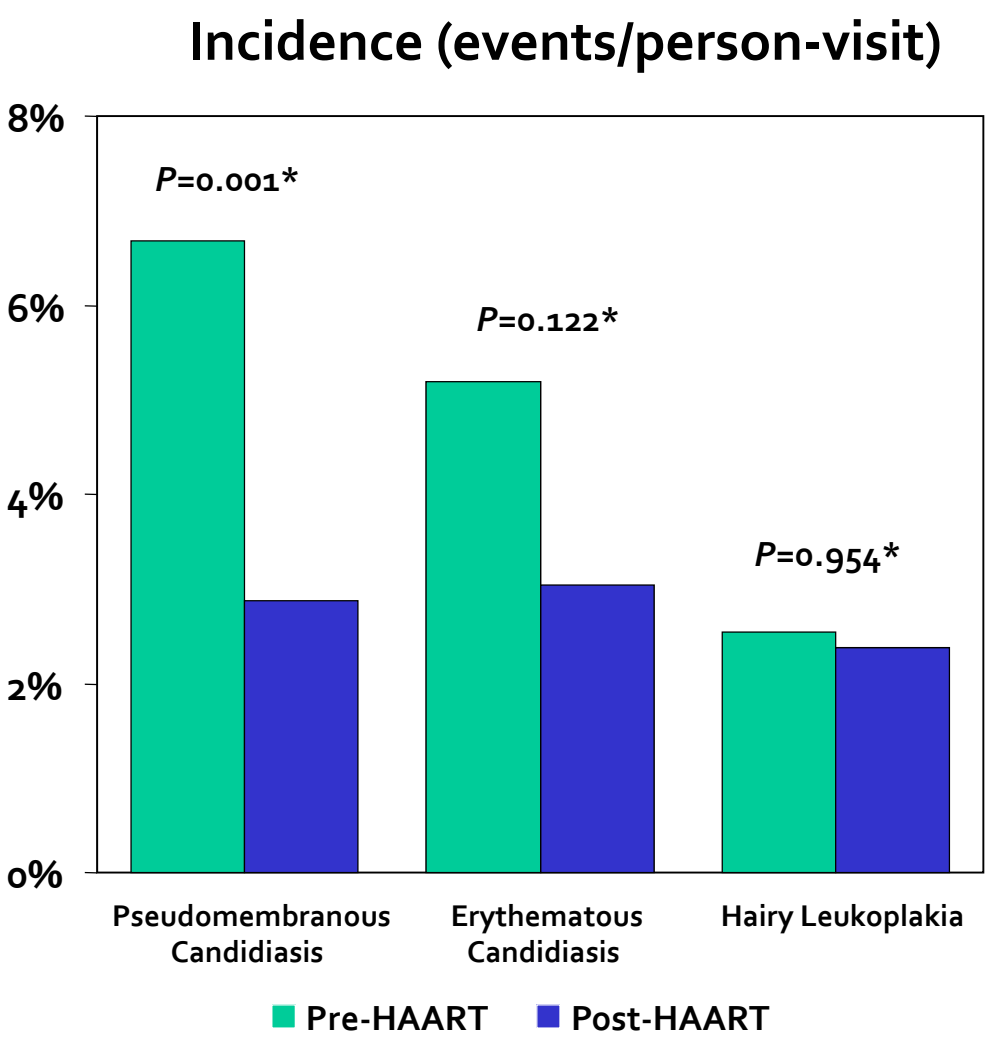


* Switch to a different regimen type, to a non-HAART regimen, or discontinue all ART.

WIHS

Incidence of Oral Mucosal Lesions in WIHS

(Greenspan, Gange, . . . , Greenspan, *JDR* 2004; 83:145-150)



Multivariate* Correlates of Incident Candidiasis:

- HIV RNA > 40,000
- Smoking
- Heroin/methadone

Multivariate* Correlates of Incident Hairy Leukoplakia:

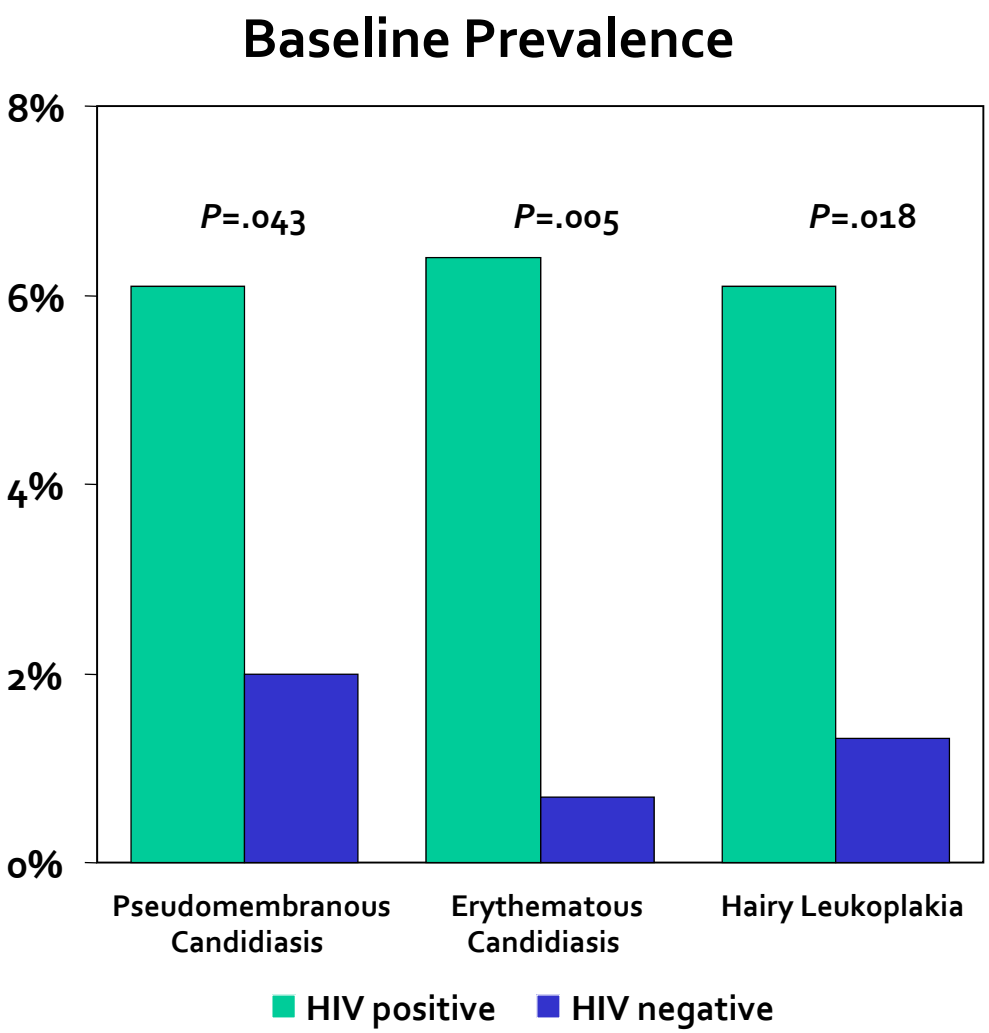
- HIV RNA > 4,000
- CD_4 < 350

*Adjusted for CD_4, HIV RNA, antifungal use, smoking, marijuana, heroin/methadone.

WIHS

Prevalence of Oral Mucosal Lesions in WIHS

(Greenspan, Komaroff, . . . , Greenspan, *J Acquir Immune Defic Syndr* 2000; 25:44-50)



Multivariate* Correlates of Candidiasis:

- CD4 < 200
- HIV RNA > 50,000
- Smoking
- Heroin/methadone

Multivariate* Correlates of Hairy Leukoplakia:

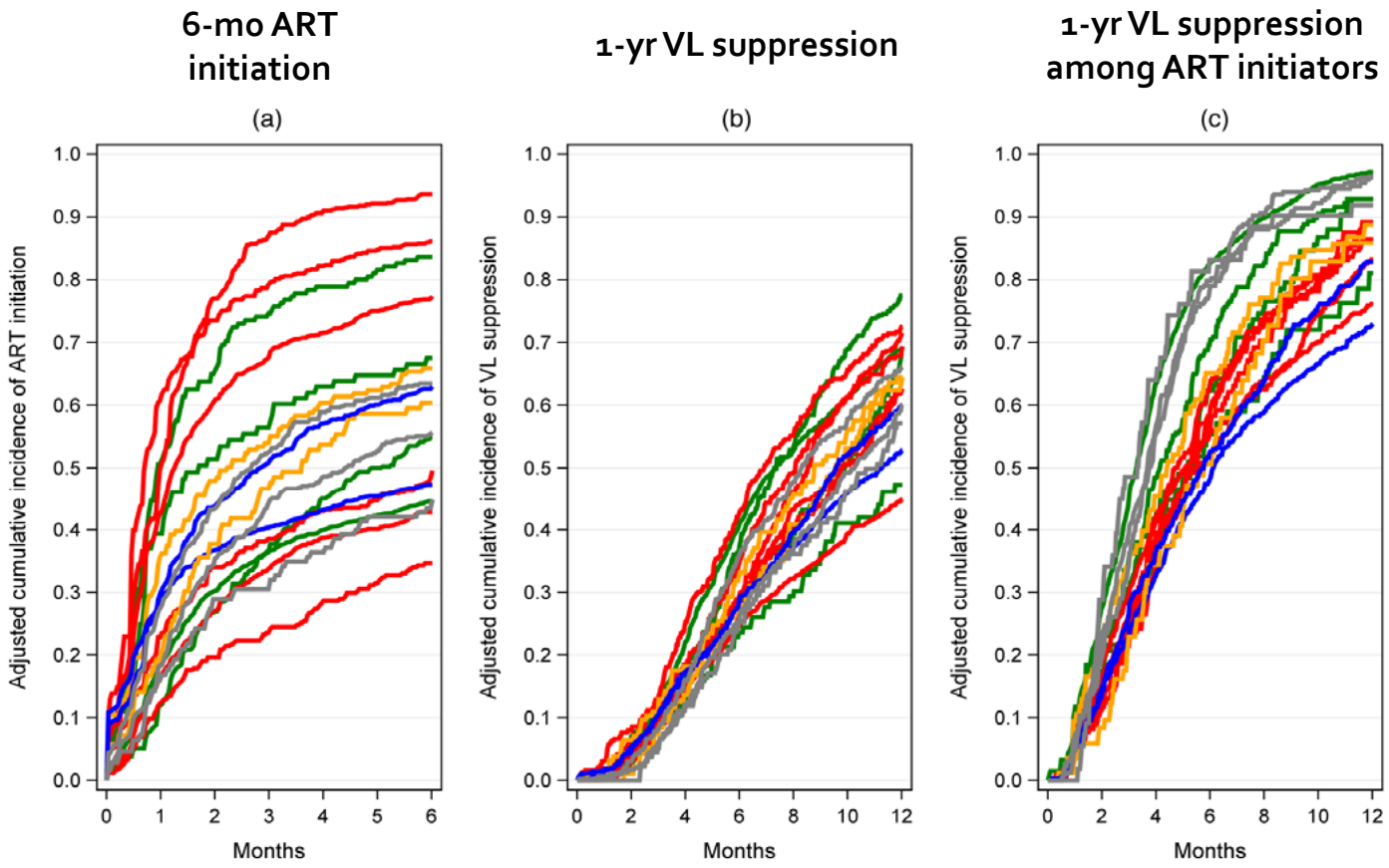
- HIV RNA > 50,000

*Adjusted for CD4, HIV RNA, antifungal use, ART, smoking, marijuana, heroin/methadone, genital herpes, vaginal candidiasis.

WIHS

Trends and Disparities in Antiretroviral Therapy Initiation and Virologic Suppression among Newly Treatment-eligible HIV-infected Individuals in North America, 2001-2009

(Hanna, Buchacz, . . . , Gange, *Clin Infect Dis* 2013;56(8):1174-1182)



Southern US
Northeast US
Western US
Canada

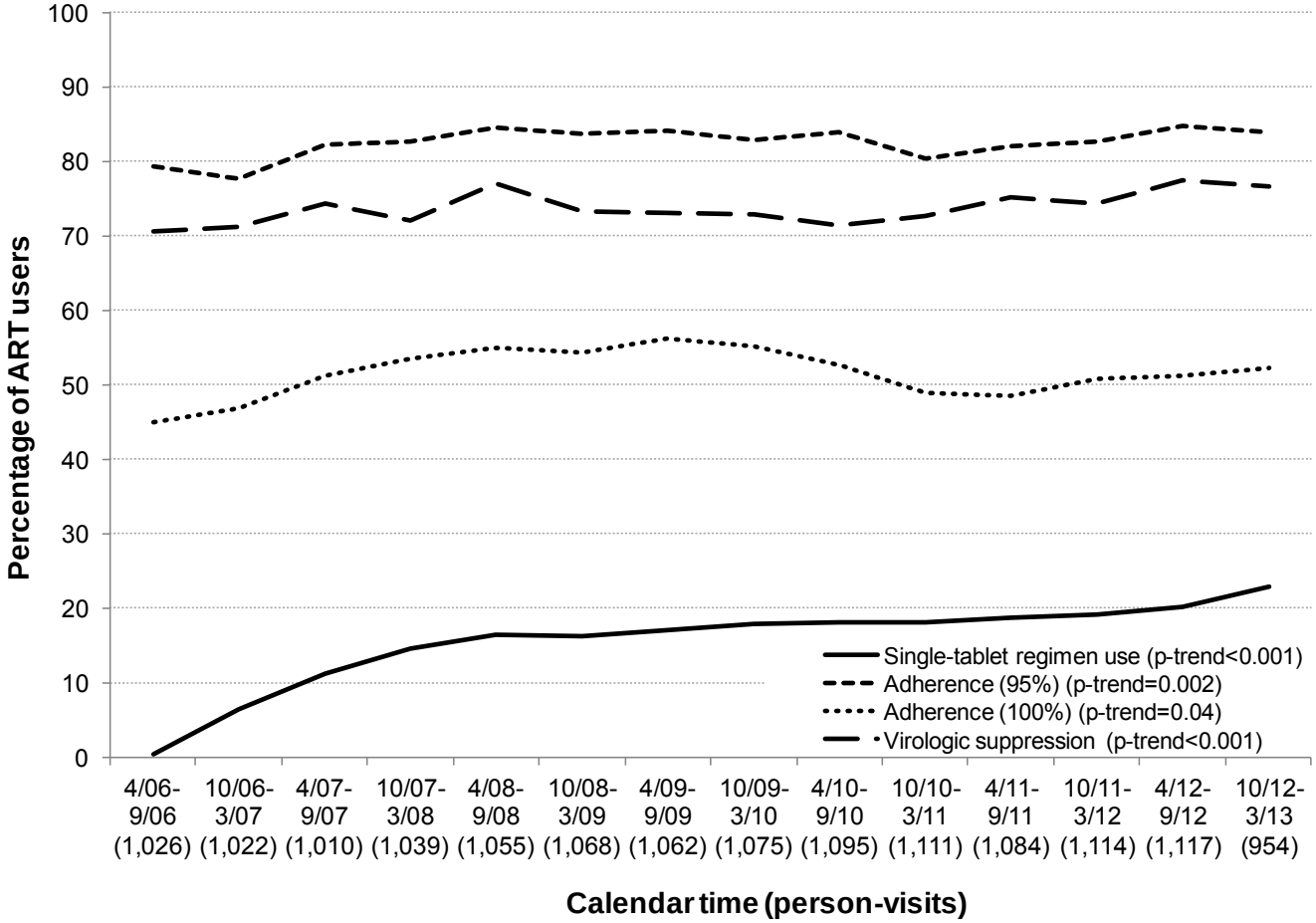
Estimates were adjusted for age; race/ethnicity; sex; transmission risk; documented history of non–injection drug abuse, alcohol abuse, and mental illness; CD4+ count and viral load at eligibility; calendar year; type of cohort; and clinic-specific mechanisms undertaken to assist with access to ART. $P_{heterogeneity}<0.001$ for all three.

WIHS

Increase in Single-tablet Regimen Use and Associated Improvements in Adherence-related Outcomes

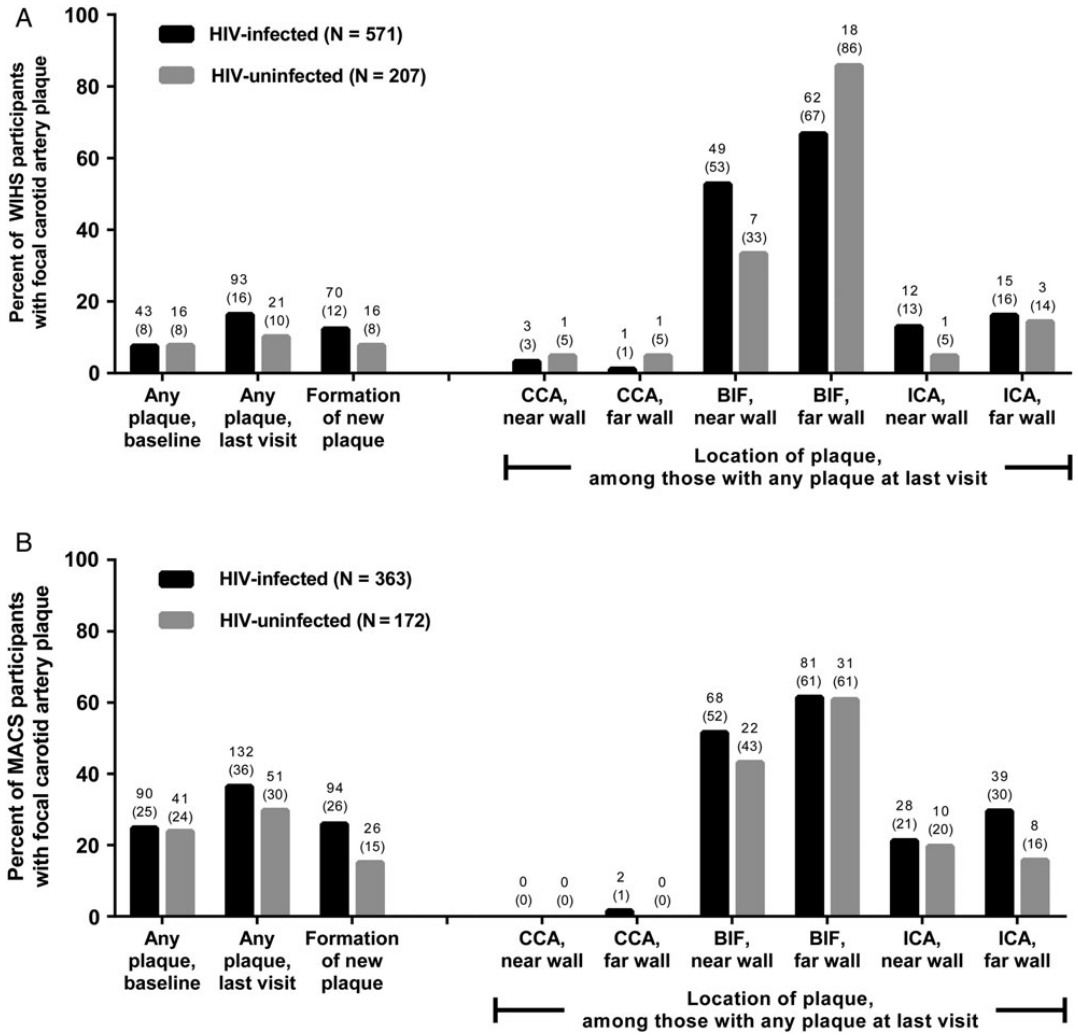
(Hanna, Hessol, . . . , Kaplan, *JAIDS* 2014;65(5):587-596)

Trends in single-tablet regimen use, adherence, and virologic suppression among ART users, Women's Interagency HIV Study, 2006-2013



HIV Infection is Associated with Progression of Subclinical Carotid Atherosclerosis

(Hanna, Post, . . . , Kingsley, *Clin Infect Dis* 2015; 61(4):640-650)

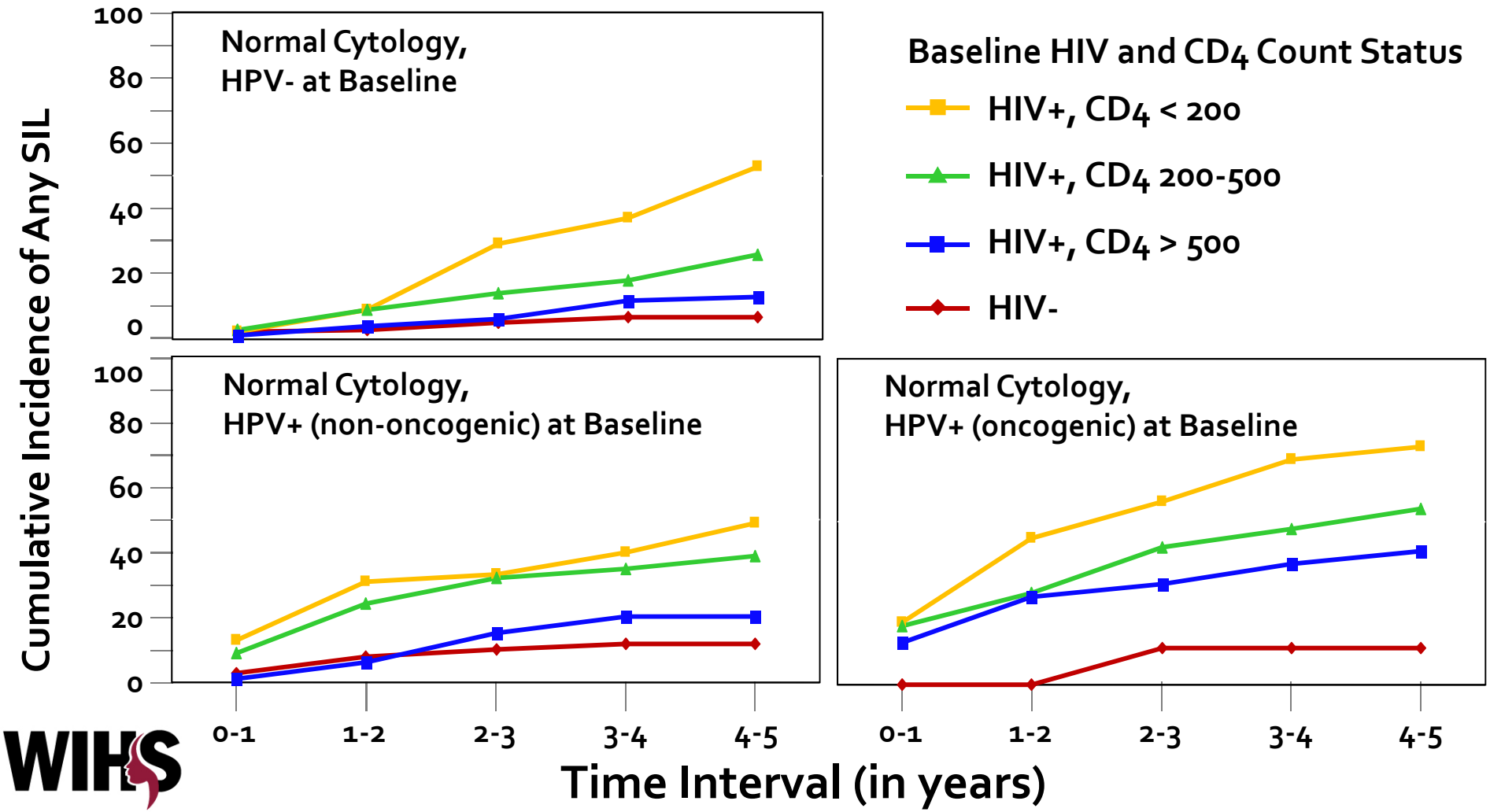


Distribution of focal carotid artery plaque by human immunodeficiency virus (HIV) serostatus, among (A) WIHS, and (B) MACS participants

WIHS

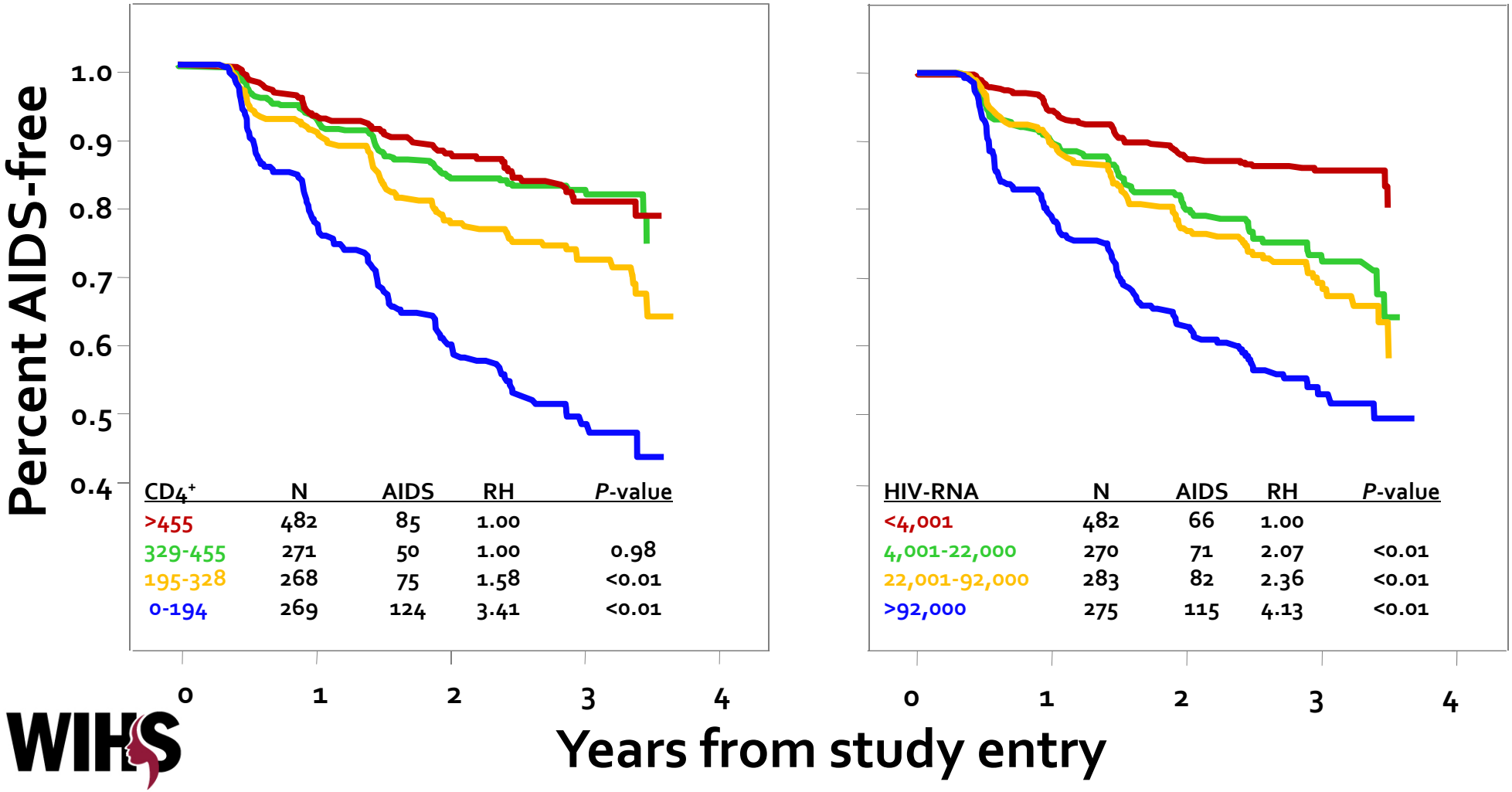
Cumulative Incidence of Squamous Intraepithelial Lesion by HIV Serostatus and CD4 Count

(Harris, Burk, . . . , Strickler, *JAMA* 2005; 293:1471-1476)



Time to Self-reported Clinical AIDS by $CD4^+$ and HIV RNA

(Hessol, Anastos, . . . , Gange, *AIDS Res Hum Retrovir* 2000; 16:1105-1112)



$CD4^+$	N	AIDS	RH	*P*-value
>455	482	85	1.00	
329-455	271	50	1.00	0.98
195-328	268	75	1.58	<0.01
0-194	269	124	3.41	<0.01

HIV-RNA	N	AIDS	RH	*P*-value
<4,001	482	66	1.00	
4,001-22,000	270	71	2.07	<0.01
22,001-92,000	283	82	2.36	<0.01
>92,000	275	115	4.13	<0.01

WIHS

Accident- and Injury-related Causes of Death in MACS and WIHS

(Hessol, Kalinowski, . . . , Cohen, *Clin Infect Dis* 2007; 44:287-294)

	MACS			WIHS		
Cause of Death	**HIV+**	**HIV-**	**ALL**	**HIV+**	**HIV-**	**ALL**
Suicide	5 (21)	5 (19)	10 (20)	1 (3)	2 (20)	3 (7)
Poisoning / Drug OD	7 (29)	6 (22)	13 (25)	26 (72)	5 (50)	31 (67)
Drowning	1 (4)	2 (7)	3 (6)	2 (6)	1 (10)	3 (7)
Assault / homicide	3 (13)	6 (22)	9 (18)	5 (14)	1 (10)	6 (13)
Suffocation	1 (4)	1 (4)	2 (4)	0	0	0
Other injury accidents	7 (29)	7 (26)	14 (27)	2 (6)	1 (10)	3 (7)
Total accident / injury	**24**	**27**	**51**	**36**	**10**	**46**
All other causes	1721	58	1779	554	19	573

NOTE: Data are number of participants (% of total accident/injury deaths).

Lung Cancer Incidence and Survival among HIV-infected and Uninfected Women and Men

(Hessol, Martínez-Maza, . . . , Seaberg, *AIDS* 2015;29(10):1183-1193)

	Baseline		Lung cancer incidence			
	N	%	N	P-yrs	IR per 100 000	P value
Cohort						
WIHS	2549[a]	37	37[b]	24376	151.8	<0.0001
MACS	4274	63	23[c]	45362	50.7	
HIV status						
Infected	3735	55	46	38645	119.0	0.001
Uninfected	3088	45	14	31093	45.0	
Total	6823	100	60	69738	86.0	

Cl, confidence interval; IR, incidence rate; MACS, Multicenter AIDS Cohort Study; P-yrs, person-years; WIHS, Women's Interagency HIV Study.

[a] Excludes 3 WIHS participates with lung cancer diagnosed prior to enrollment

[b] Includes 31 HIV-infected and 6 HIV-uninfected women

[c] Includes 15 HIV-infected and 8 HIV-unifected men

WIHS

Standardized Incidence Ratios for Cancer in the HAART and Pre-HAART Eras among 1559 HIV+ Women

(Hessol, Seaberg, . . . , Levine, *J Acquir Immune Defic Syndr* 2004; 36:978-985)

Person-years:	Years 1994 – 1996 2,492			Years 1997 – 2001 5,417		
Cancer site/type	*Observed*	*SIR*	*95% CI**	*Observed*	*SIR*	*95% CI**
AIDS Cancers	13	23.4	12.5 – 37.7	6	4.4	1.6 – 8.6
NHL	9	53.4	24.4 – 93.6	3	6.4	1.3 – 15.5
KS	4	316.1	86.1 – 692.7	2	189.3	22.9 – 527.3
Non-AIDS Cancers	7	1.4	0.6 – 2.6	15	1.0	0.6 – 1.5
Lung/larynx	2	6.8	0.8 – 18.9	6	6.2	2.3 – 12.1
Breast	1	0.4	0.01 – 1.6	4	0.5	0.1 – 1.2

* The 95% confidence intervals (CI) are based on exact statistical methods.

WIHS

Poisson Regression Comparison of the Incidence Rates for Cancer among 1559 HIV+ Women

(Hessol, Seaberg, . . . , Levine, *J Acquir Immune Defic Syndr* 2004; 36:978-985)

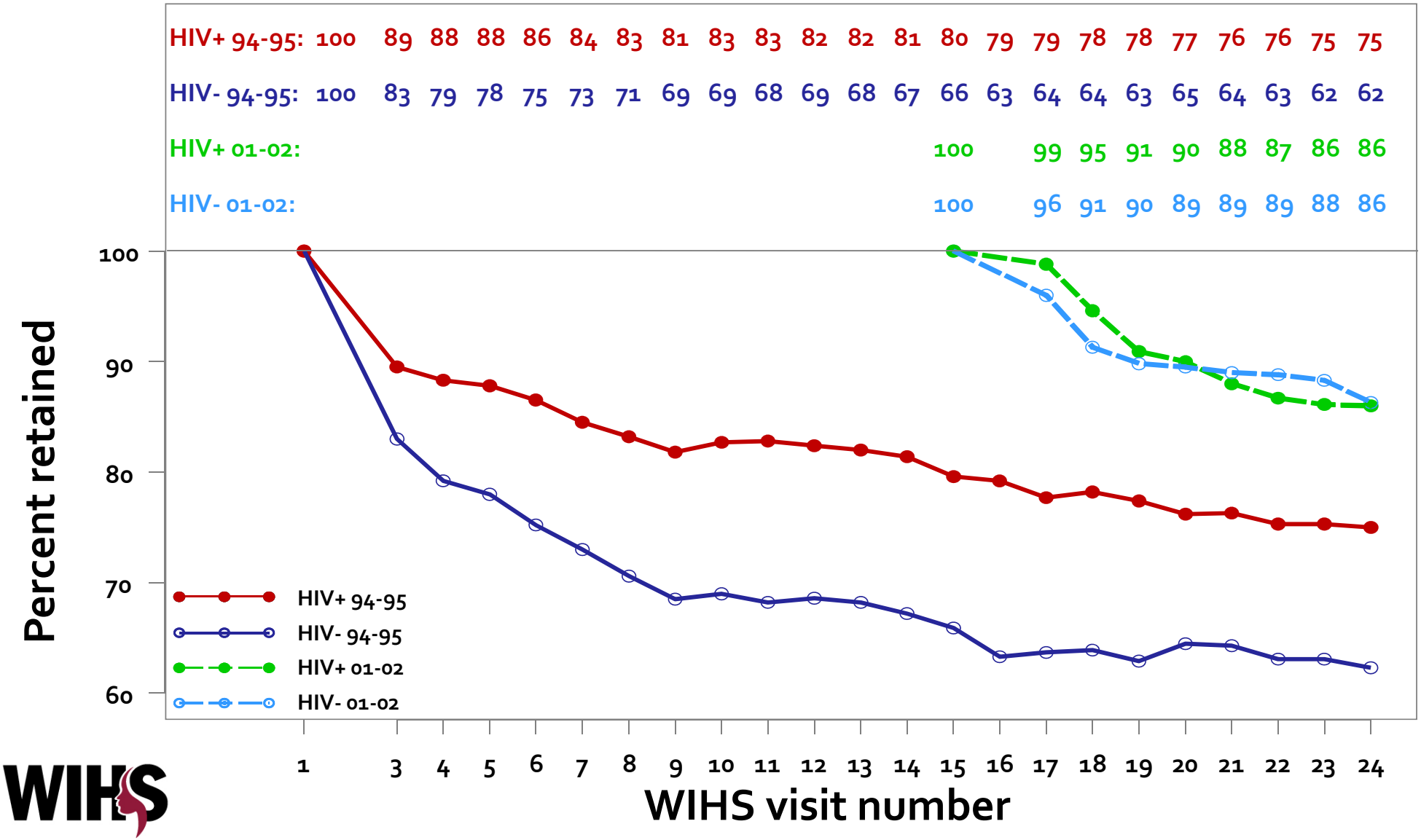
Cancer site/type	*Rate Ratio*	*95% CI*	*P-value**
AIDS Cancers	**0.21**	**0.07 – 0.60**	**0.002**
NHL	**0.15**	**0.03 – 0.61**	**0.005**
KS	**0.23**	**0.02 – 1.60**	**0.17**
Non-AIDS Cancers	**0.99**	**0.38 – 2.86**	**1.0**
Lung/larynx	**1.38**	**0.25 – 13.98**	**1.0**
Breast	**1.84**	**0.18 – 90.62**	**0.99**

* The 95% CI and p-value are based on exact statistical methods for Poisson regression.

WIHS

Retention Rates (v1-24) Stratified by HIV Status

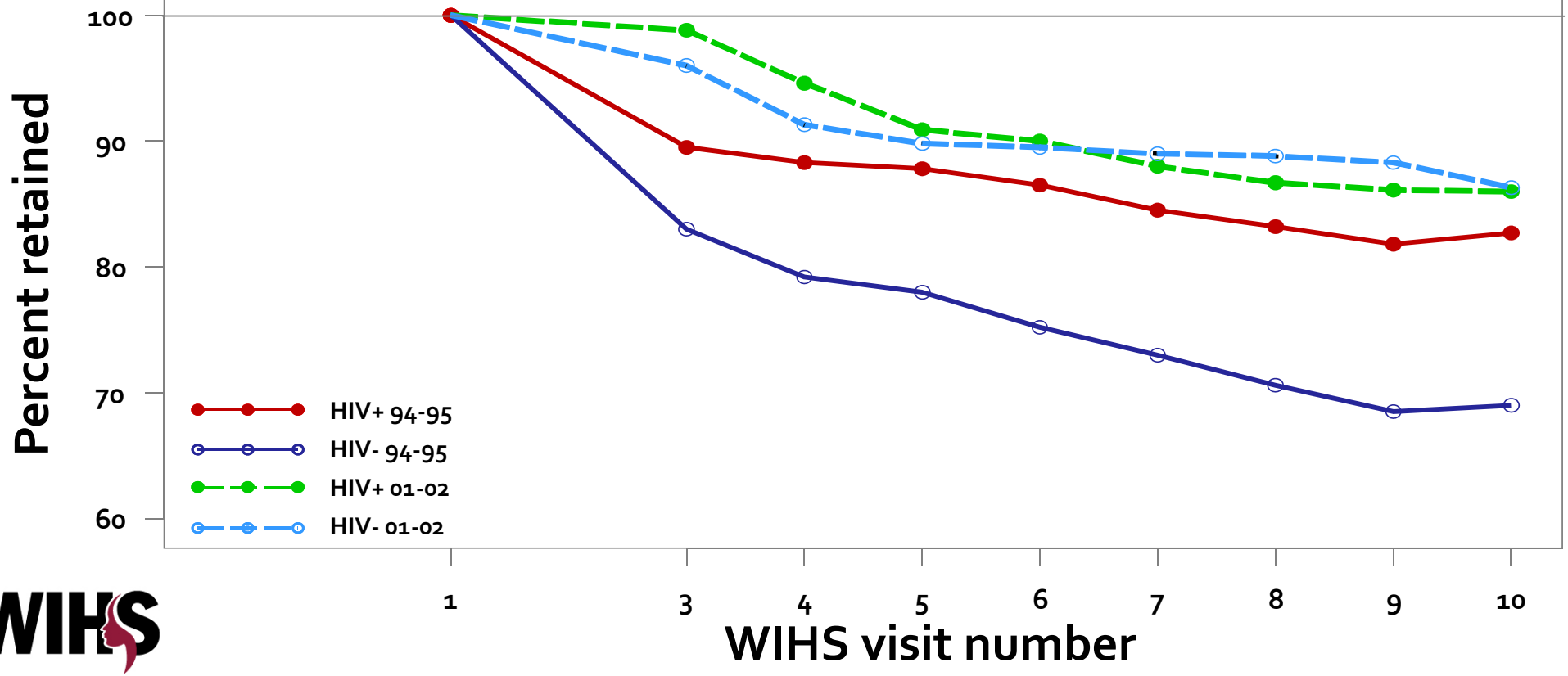
(Hessol, Weber, . . . , Ameli, *J Women's Health* 2009; 18:1627-1637)



Retention Rates (v1-10) Stratified by HIV Status

(Hessol, Weber, . . . , Ameli, *J Women's Health* 2009; 18:1627-1637)

HIV+ 94-95:	100	89	88	88	86	84	83	81	83
HIV- 94-95:	100	83	79	78	75	73	71	69	69
HIV+ 01-02:	100	99	95	91	90	88	87	86	86
HIV- 01-02:	100	96	91	90	89	89	89	88	86



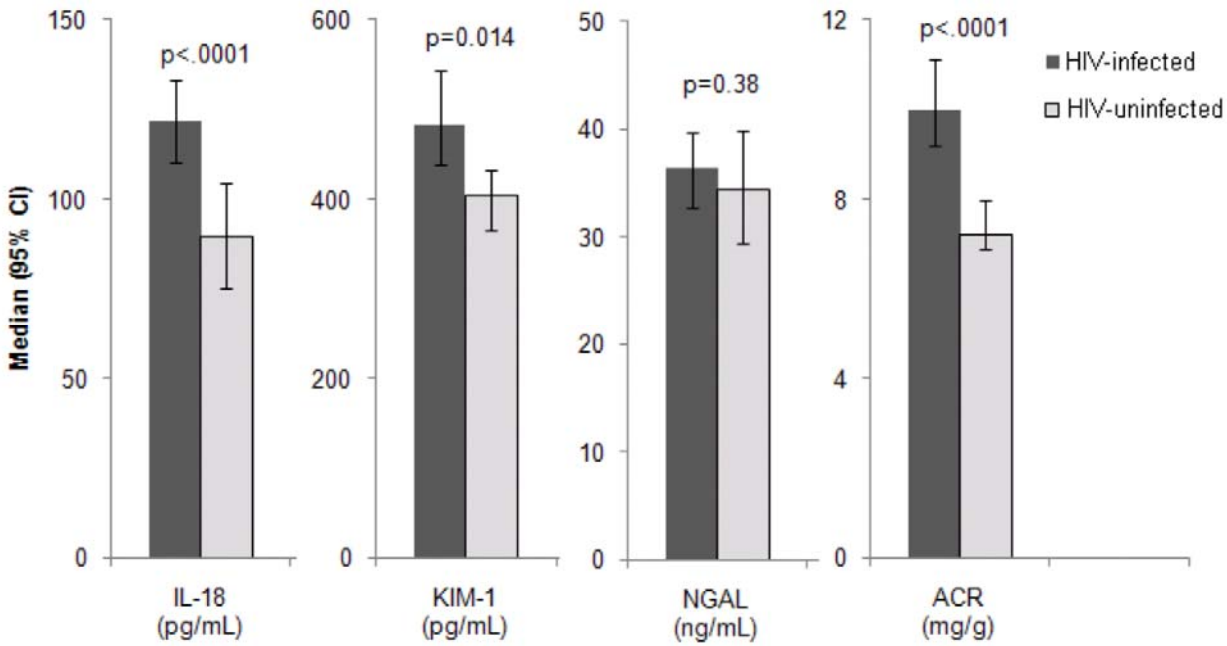
WIHS

Does HIV Infection Promote Early Kidney Injury in Women?

(Jotwani, Scherzer, . . . , Shlipak, *Antivir Ther* 2014;19(1):79-87)

Association of HIV infection with urine biomarkers among HIV-infected (N=908) and uninfected (N=289) WIHS participants

Note: Bars represent median urine biomarker concentrations with 95% confidence intervals.
P-values from Mann-Whitney U test.
Abbreviations: ACR, albumin-to-creatinine ratio; IL-18, interleukin-18; KIM-1, kidney injury molecule-1; NGAL, neutrophil gelatinase-associated lipocalin.



WIHS

Echolucency of the Carotid Artery Intima-Media Complex and Intima-Media Thickness Have Different Cardiovascular Risk Factor Relationships

(Jung, Parrinello, . . . , Kaplan, *J Am Heart Assoc* 2015;4(2))

	N	Mean GSM* (95% CI)	P Value*
Nadir CD4+ T cell count, cells/mm^3			
HIV+, ≥500	128	61.7 (58.5, 64.8)	Ref
HIV+, 350 to 500	194	62.2 (59.6, 64.7)	0.81
HIV+, 200 to 350	409	61.9 (60.2, 63.7)	0.89
HIV+, <200	551	62.3 (60.8, 63.8)	0.72
Current CD4+ T cell count, cells/mm^3			
HIV+, ≥500	507	61.2 (59.7, 62.8)	Ref
HIV+, 350 to 500	278	61.2 (59.1, 63.4)	0.99
HIV+, 200 to 350	287	63.5 (61.5, 65.6)	0.08
HIV+, <200	194	63.1 (60.5, 65.6)	0.23

Age-adjusted correlation coefficient between nadir CD4+ T cells count with GSM=-0.03, P=0.28; age adjusted correlation coefficient between curent CD4+ T cells count with GSM=-0.08, P=0.005. GSM indicates grey scale median; WIHS, Women's Interagency HIV Study.

*Age-adjusted

WIHS

Echolucency of the Carotid Artery Intima-Media Complex and Intima-Media Thickness Have Different Cardiovascular Risk Factor Relationships

(Jung, Parrinello, . . . , Kaplan, *J Am Heart Assoc* 2015;4(2))

	N	Mean cIMT* (95% CI)	P Value*
Nadir CD_4+ T cell count, cells/mm^3			
HIV+, ≥500	128	737.5 (720.1, 754.9)	Ref
HIV+, 350 to 500	194	722.4 (708.3, 736.5)	0.18
HIV+, 200 to 350	409	735.1 (725.4, 744.7)	0.81
HIV+, <200	551	717.1 (708.7, 725.5)	0.04
Current CD_4+ T cell count, cells/mm^3			
HIV+, ≥500	507	732.6 (723.9, 741.3)	Ref
HIV+, 350 to 500	278	723.5 (711.7, 735.3)	0.22
HIV+, 200 to 350	287	719.3 (707.6, 730.9)	0.07
HIV+, <200	194	721.1 (707.0, 735.3)	0.18

Age-adjusted correlation coefficient between nadir CD_4+ T cells count with cIMT=-0.06, P=0.04; age adjusted correlation coefficient between curent CD_4+ T cells count with cIMT=-0.07, P=0.01. cIMT indicates cartoid artery intima-media thickness; WIHS, Women's Interagency HIV Study.
*Age-adjusted

WIHS

Incidence of Diabetes

(Justman, Benning, . . . , Anastos, *J Acquir Immune Defic Syndr* 2003; 32:298-302)

			Incidence (stratified by initial BMI)[a]			
Therapy Group	N	Incidence (cases/100PY)	Morbidly Obese	Obese	Overweight	Normal
PI	609	2.8[b]	3.1	4.8	3.2	1.6
RTI	932	1.2	1.5	2.4	2.0	0.3
No ART	816	1.2	6.9	1.0	1.1	0.8
HIV-	350	1.4	4.8	2.2	0.5	1.1

[a] Adjusted for BMI, the relative risk of reporting DM for PI users vs. HIV- women is 2.0 [$P = 0.06$]; vs. RTI users, 2.2 [$P = 0.02$].

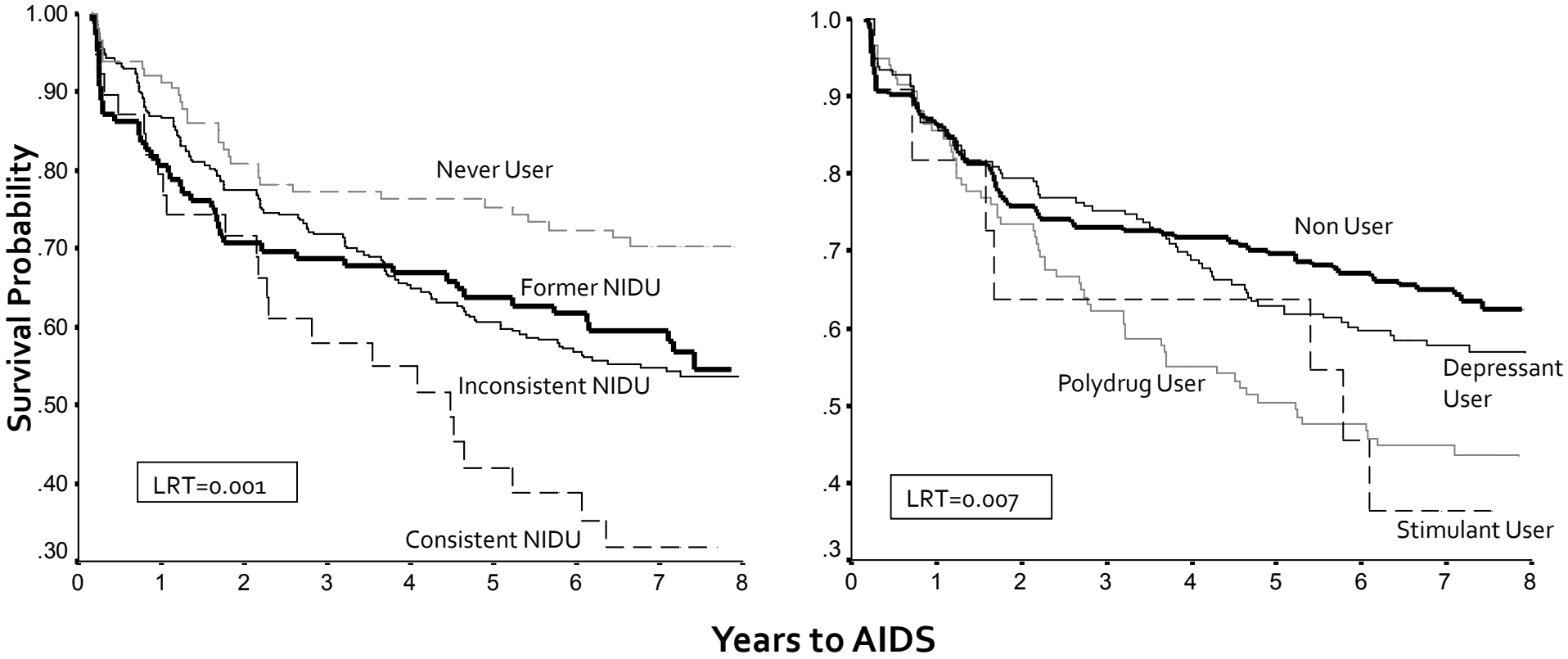
Adjusted for therapy group, the relative risk of reporting DM for morbidly obese, obese and overweight vs. normal/underweight women is 5.2 [$P = < 0.0001$], 2.8 [$P = 0.0002$], 2.0 [$P = 0.04$], respectively.

[b] $P = 0.06$ [RR = 1.97] for comparison with HIV- women; $P = 0.01$ [RR = 2.34] for comparison with RTI group.

WIHS

Time to AIDS Among Non-injecting Drug Users (NIDU) in the HAART Era

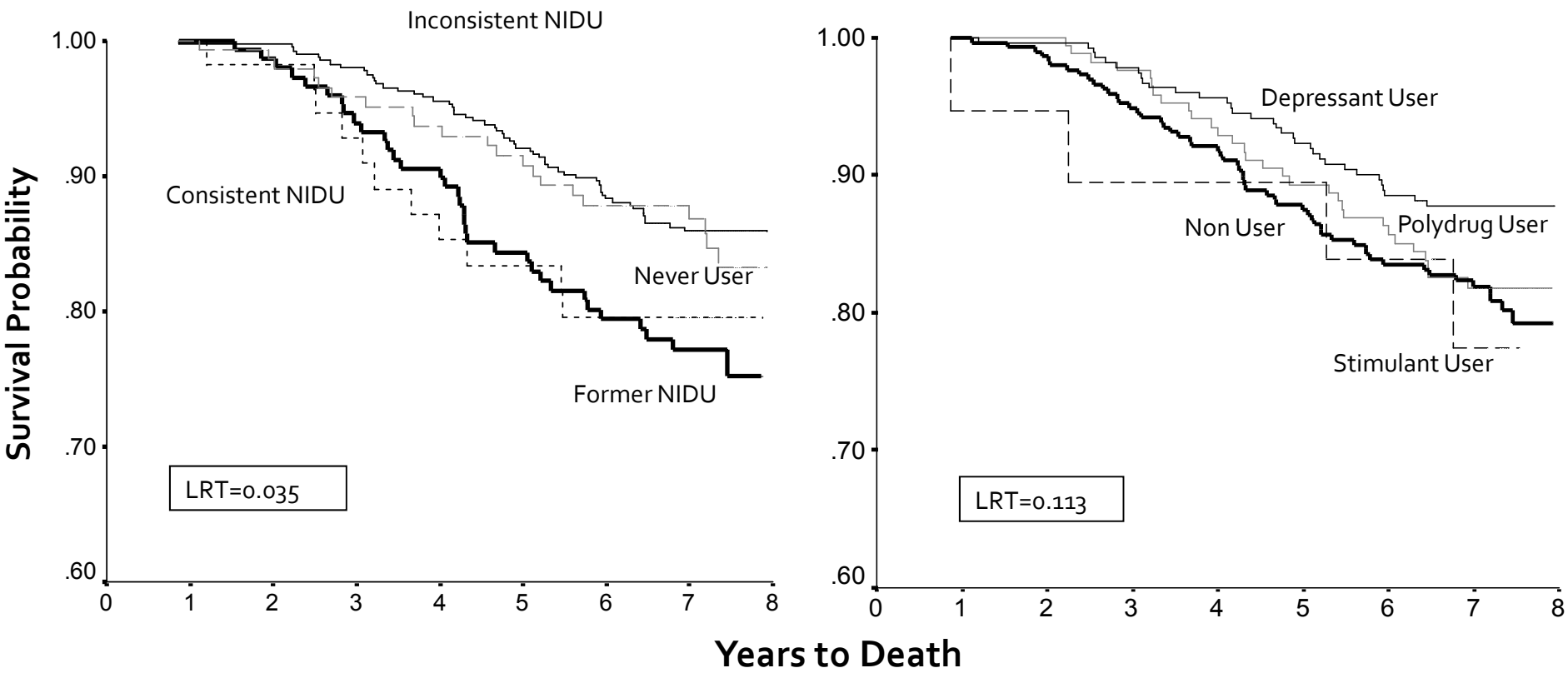
(Kapadia, Cook, . . . , Vlahov, *Addiction* 2005; 100:990-1002)



Kaplan-Meier curves of cumulative probabilities of survival for AIDS by pattern and type of NIDU among HAART users, WIHS (n=1046).

Time to Death Among Non-injecting Drug Users (NIDU) in the HAART Era

(Kapadia, Cook, . . . , Vlahov, *Addiction* 2005; 100:990-1002)



Kaplan-Meier curves of cumulative probabilities of survival for death by pattern and type of NIDU among HAART users, WIHS (n=1046).

Association between Sociodemographics and ART/HAART Adherence

(Kapadia, Vlahov, . . . , Wilson, *Am J Drug Alcohol Abuse* 2008; 34:161-170)

	Adherence			
	Total % (n) N=573	<95% % (n) N=152	≥95% % (n) N=421	*P*-value
Education				
< High School	34% (195)	36% (54)	33% (141)	.650
≥ High School	66% (378)	64% (98)	67% (280)	
Employed				
No	74% (421)	72% (110)	74% (311)	.687
Yes	26% (151)	28% (42)	26% (109)	
Doctor visit in last 6 months				
No	3% (19)	3% (4)	4% (15)	.591
Yes	97% (553)	97% (147)	96% (406)	
Health Insurance				
None	11% (61)	14% (21)	10% (40)	.159
Private	13% (71)	9% (14)	14% (57)	
Public	77% (432)	76% (113)	77% (319)	

Association between Health Status and ART/HAART Adherence

(Kapadia, Vlahov, . . . , Wilson, *Am J Drug Alcohol Abuse* 2008; 34:161-170)

	Adherence			
	Total % (n) N=573	<95% % (n) N=152	≥95% % (n) N=421	*P*-value
CES-D				
<16	53% (301)	39% (58)	58% (243)	<.001
≥16	47% (264)	61% (90)	42% (174)	
CD_4 Level				
<200 cells/ul	24% (127)	29% (42)	22% (85)	.071
≥200 cells/ul	76% (405)	71% (101)	78% (304)	
Viral Load				
<4000 cells/ml	68% (380)	53% (80)	73% (300)	<.001
≥4000 cells/ml	32% (182)	47% (70)	27% (112)	
AIDS-defining Illness				
No	45% (255)	42% (64)	45% (191)	.488
Yes	55% (318)	58% (88)	55% (230)	

Association between Drug Use and ART/HAART Adherence

(Kapadia, Vlahov, . . . , Wilson, *Am J Drug Alcohol Abuse* 2008; 34:161-170)

	Adherence			
	Total % (n) N=573	<95% % (n) N=152	≥95% % (n) N=421	*P*-value
Illicit Drug Use SLV				
No	82% (468)	70% (107)	86% (361)	<.001
Yes	18% (105)	30% (45)	15% (60)	
In Treatment Program				
No	75% (431)	81% (123)	73% (308)	.042
Yes	25% (141)	19% (28)	27% (113)	
Drug Use Hx / Treatment Type				
No drug use / no Tx	65% (369)	62% (93)	66% (276)	<.001
Drug use Hx / no Tx	11% (62)	20% (30)	8% (32)	
Medication-based Tx	13% (84)	11% (16)	14% (58)	
Medication-free Tx	12% (67)	8% (12)	13% (55)	

WIHS

Moderate-to-high Risk of CHD among Men & Women >40 Years of Age

(Kaplan, Kingsley, . . . , Gange, *Clin Infect Dis* 2007; 45:1074-1081)

Variable	Adjusted OR	(95% CI)
HAART		
Current PI-based	1	(reference)
Current non-PI-based	0.74	(0.53 – 1.01)
Former	0.68	(0.46 – 1.03)
Naïve	0.57	(0.36 – 0.89)
Annual Income		
< $10,000	2.32	(1.51 – 3.56)
$10,000 - $39,999	1.42	(0.97 – 2.10)
≥ $40,000	1	(reference)
Body Mass Index		
< 18.5 (underweight)	0.80	(0.37 – 1.74)
18.5 – 24.9 (normal weight)	1	(reference)
25 – 30 (overweight)	1.41	(1.03 – 1.93)
> 30 (obese)	1.79	(1.25 – 2.56)

The outcome was defined as moderate-to-high predicted risk of coronary heart disease, defined as 10-year risk of ≥15% or diabetes. ORs are adjusted for values in table, plus age, center, cohort entry period, AIDS, education, IDU, alcohol use, race/ethnicity and sex.

WIHS

Relationship between Standard Cardiovascular Risk Factors and CIMT

(Kaplan, Kingsley, . . . , Hodis, *AIDS* 2008; 22:1615-1624)

	WIHS		MACS	
	Δ CIMT	*P*-value	Δ CIMT	*P*-value
Age (years)				
<35	-73	<0.01	NA	NA
35-39	-40	<0.01	NA	NA
40-44	Reference		Reference	
45-49	29	<0.01	24	0.06
50-54	45	<0.01	60	<0.01
>55	105	<0.01	91	<0.01
Race/Ethnicity (vs. AA)				
Hispanic	-29	<0.01	-28	0.15
Caucasian	-17	0.02	-54	<0.01
Current Smoker	23	<0.01	-21	0.06
Alcohol Use (vs. None)				
1-2 drinks/week	-5	0.35	23	0.08
>2 drinks/week	-6	0.40	24	0.10

Relationship between Standard Cardiovascular Risk Factors and CIMT

(Kaplan, Kingsley, . . . , Hodis, *AIDS* 2008; 22:1615-1624)

	WIHS		MACS	
	Δ CIMT	*P*-value	Δ CIMT	*P*-value
Diabetes	22	<0.01	1	0.90
Lipid-lowering Med Use	4	0.71	22	0.10
BMI (per 5 kg/m^2)	4	0.01	27	<0.01
SBP (per 10 mmHg)	11	<0.01	10	0.01
LDL-C (per 20 mg/dl)	3	0.02	6	0.03
HLD-C (per 5 mg/dl)	0	0.55	-5	0.01

WIHS

Relationship between Standard Cardiovascular Risk Factors and Carotid Lesions

(Kaplan, Kingsley, . . . , Hodis, *AIDS* 2008; 22:1615-1624)

	WIHS		MACS	
	Prevalence Ratio	*P*-value	Prevalence Ratio	*P*-value
Age (years)				
<35	0.23	<0.01	NA	NA
35-39	0.63	0.16	NA	NA
40-44	Reference		Reference	
45-49	1.85	0.01	1.38	0.18
50-54	1.97	0.01	2.13	<0.01
>55	3.22	<0.01	3.54	<0.01
Race/Ethnicity (vs. AA)				
Hispanic	0.87	0.52	0.73	0.40
Caucasian	1.51	0.07	1.19	0.35
Current Smoker	1.51	0.03	1.59	<0.01
Alcohol Use (vs. None)				
1-2 drinks/week	0.99	0.97	1.12	0.55
>2 drinks/week	0.94	0.81	1.12	0.61

Relationship between Standard Cardiovascular Risk Factors and Carotid Lesions

(Kaplan, Kingsley, . . . , Hodis, *AIDS* 2008; 22:1615-1624)

	WIHS		MACS	
	Prevalence Ratio	*P*-value	Prevalence Ratio	*P*-value
Diabetes	1.40	0.11	0.90	0.54
Lipid-lowering Med Use	0.60	0.15	1.37	0.04
BMI (per 5 kg/m^2)	0.81	<0.01	0.98	0.83
SBP (per 10 mmHg)	1.10	0.02	1.06	0.20
LDL-C (per 20 mg/dl)	1.09	0.05	1.07	0.04
HLD-C (per 5 mg/dl)	0.97	0.17	0.98	0.40

Association of HIV Clinical Disease Progression with Profiles of Early Immune Activation: Results from a Cluster Analysis Approach

(Karim, Mack, . . . , Kovacs, *AIDS* 2013;27(9):1473-1481)

Correlation between Activation Markers on CD8 and CDF T cells

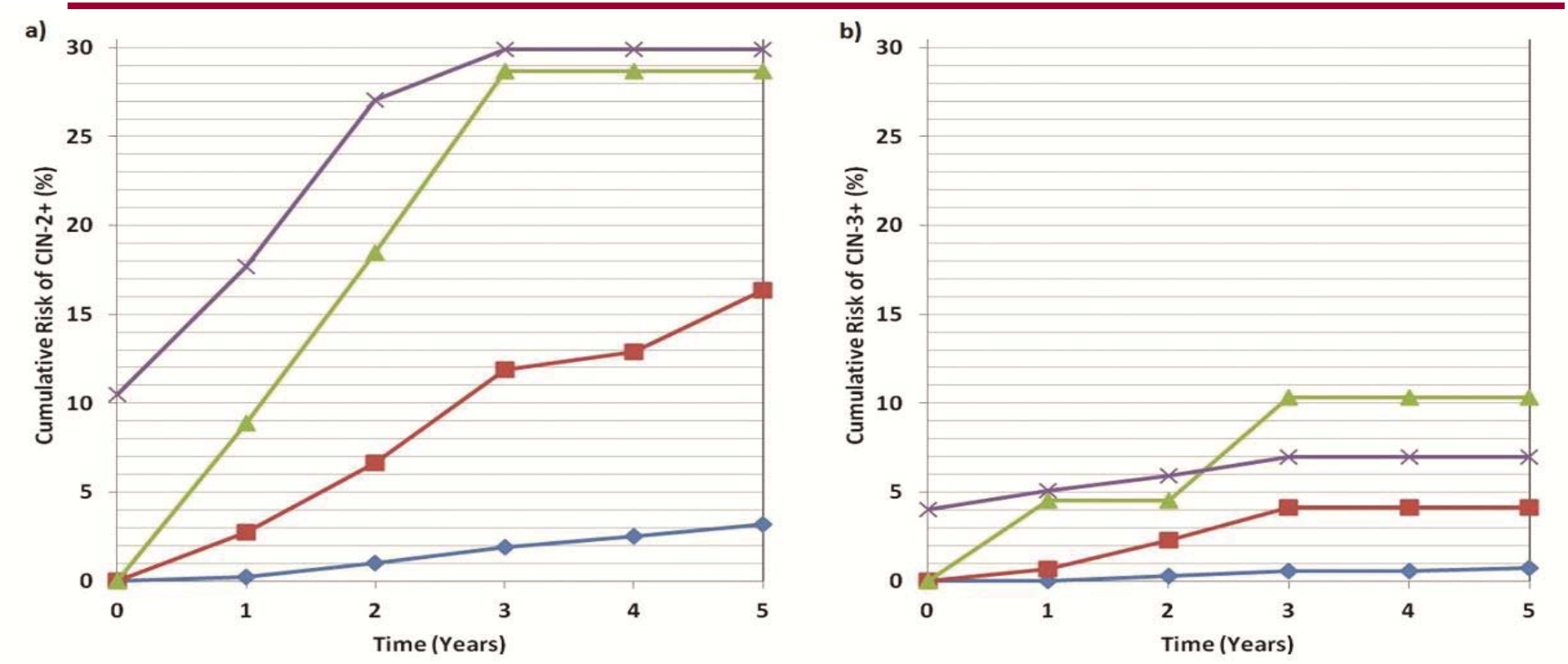
Activation markers subtypes	$CD4^+CD38^-DR^-$	$CD4^+CD38^+DR^-$	$CD4^+CD38^-DR^+$	$CD4^+CD38^+DR^+$
$CD4^+CD38^-DR^-$	0.62 (<0.0001)[a]	-0.27 (<0.0001)	-0.08 (0.05)	-0.39 (<0.0001)
$CD4^+CD38^+DR^-$	-0.43 (<0.0001)	0.55 (<0.0001)	-0.44 (<0.0001)	-0.005 (0.90)
$CD4^+CD38^-DR^+$	0.41 (<0.0001)	-0.41 (<0.0001)	0.41 (<0.0001)	-0.16 (0.0001)
$CD4^+CD38^+DR^+$	-0.50 (<0.0001)	0.07 (0.10)	0.15 (0.004)	0.49 (<0.0001)

[a]**correlation coefficient r (*P*-value)**

WIHS

Cervical Precancer Risk in HIV-Infected Women Who Test Positive for Oncogenic HPV Despite a Normal Pap Test

(Keller, Burk, . . . , Strickler, *Clin Infect Dis* 2015;61(10):1573-1581)

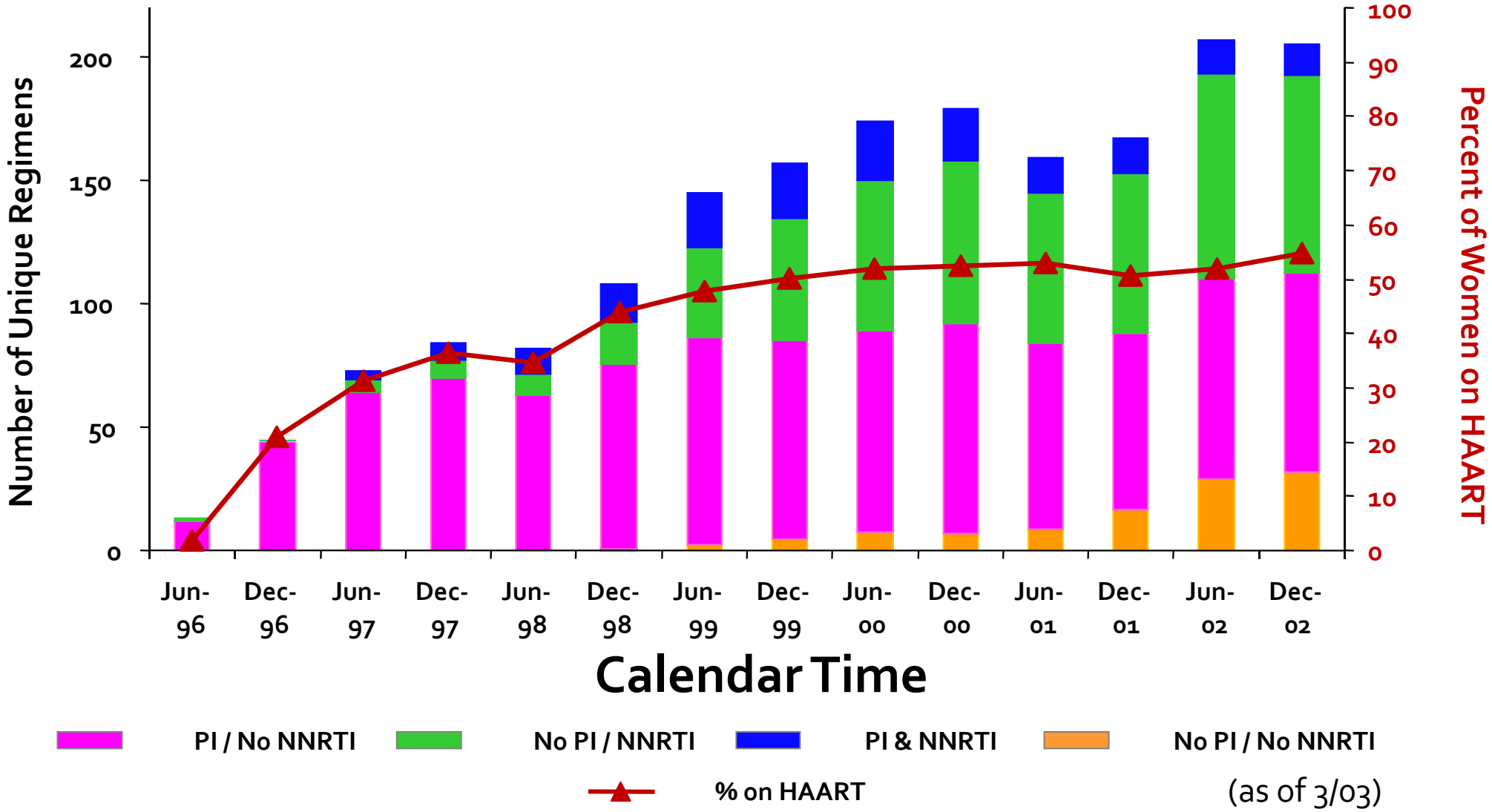


Cumulative risk of CIN-2+ (a) and CIN-3+ (b) among HIV-infected women who at baseline had a normal Pap result with no oncogneic HPV (blue diamonds), any oncogenic HPV (red squares), HPV type 16 (green triangles), or had a baseline Pap diagnosed as LSIL (purple crosses). The cumulative risk for women with LSIL includes both prevalent and incident cases, as LSIL is an indication for immediate colposcopy, whereas for all other groups the data reflect cumulative incidence.

WIHS

Unique HAART Regimens by Calendar Time

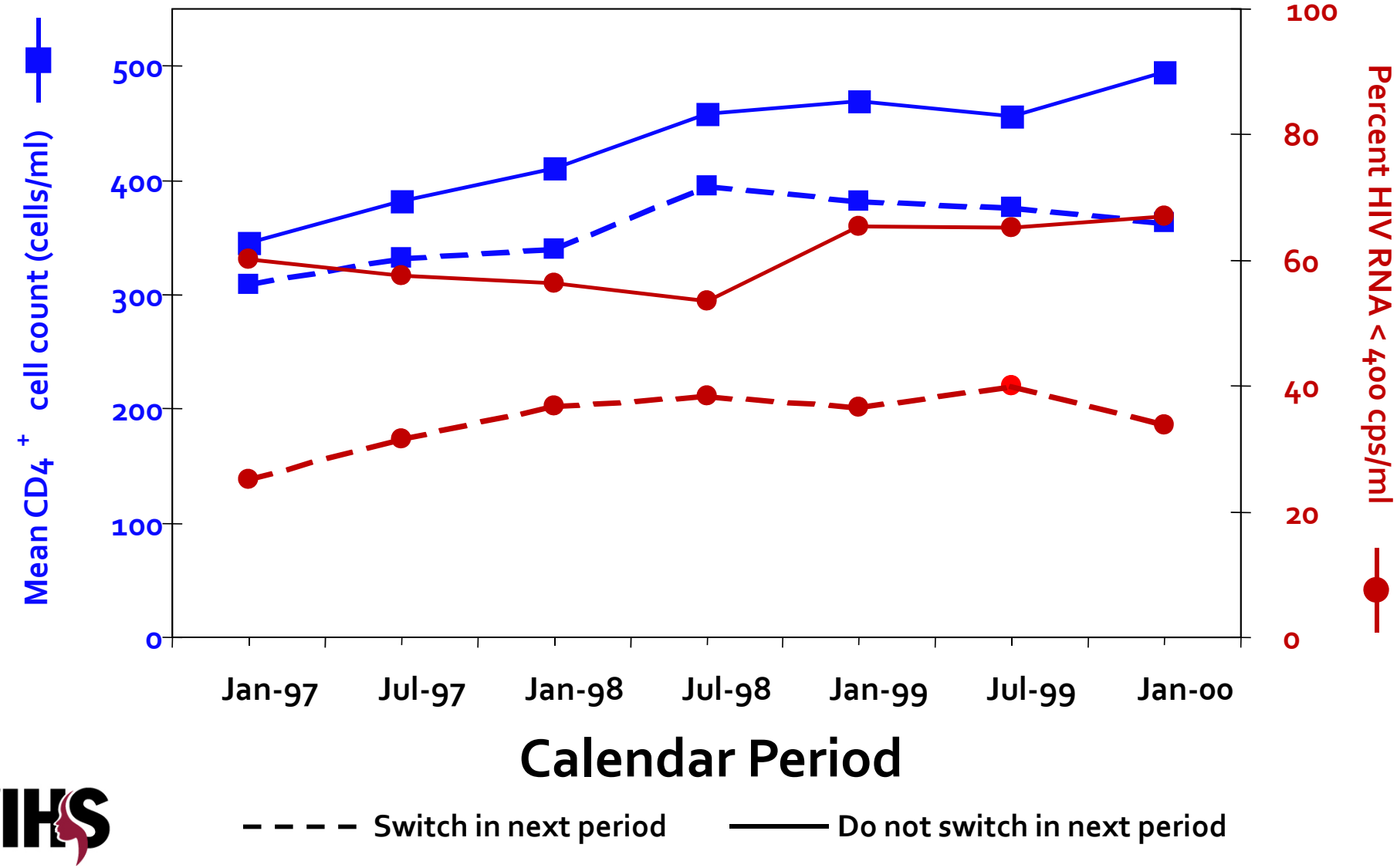
(Kirstein, Greenblatt, . . . , Gange, *J Acquir Immune Defic Syndr* 2002; 29:495-503)



(as of 3/03)

Selection by Indication for HAART Switching

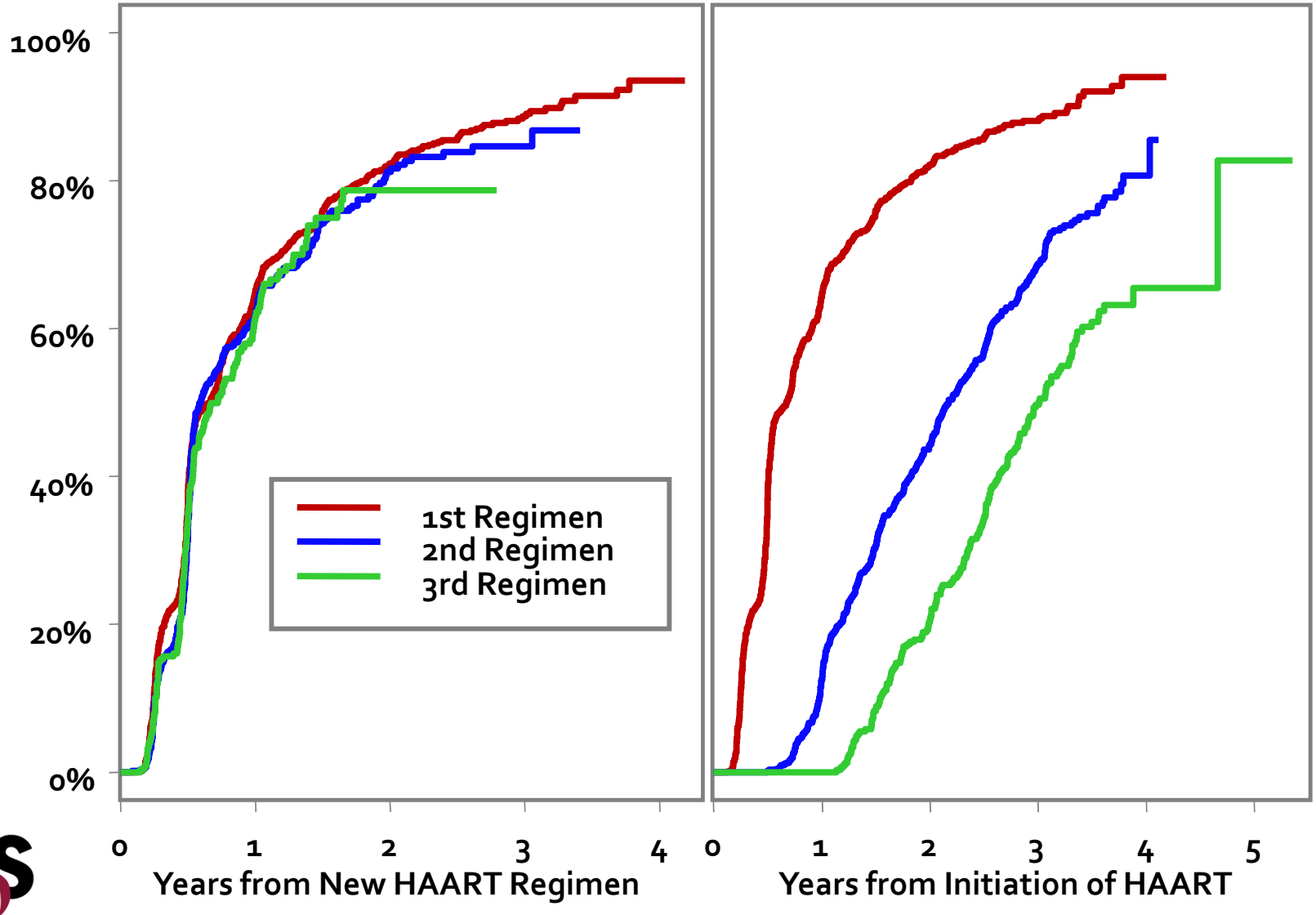
(Kirstein, Greenblatt, . . . , Gange, *J Acquir Immune Defic Syndr* 2002; 29:495-503)



WIHS

Time to Switching HAART

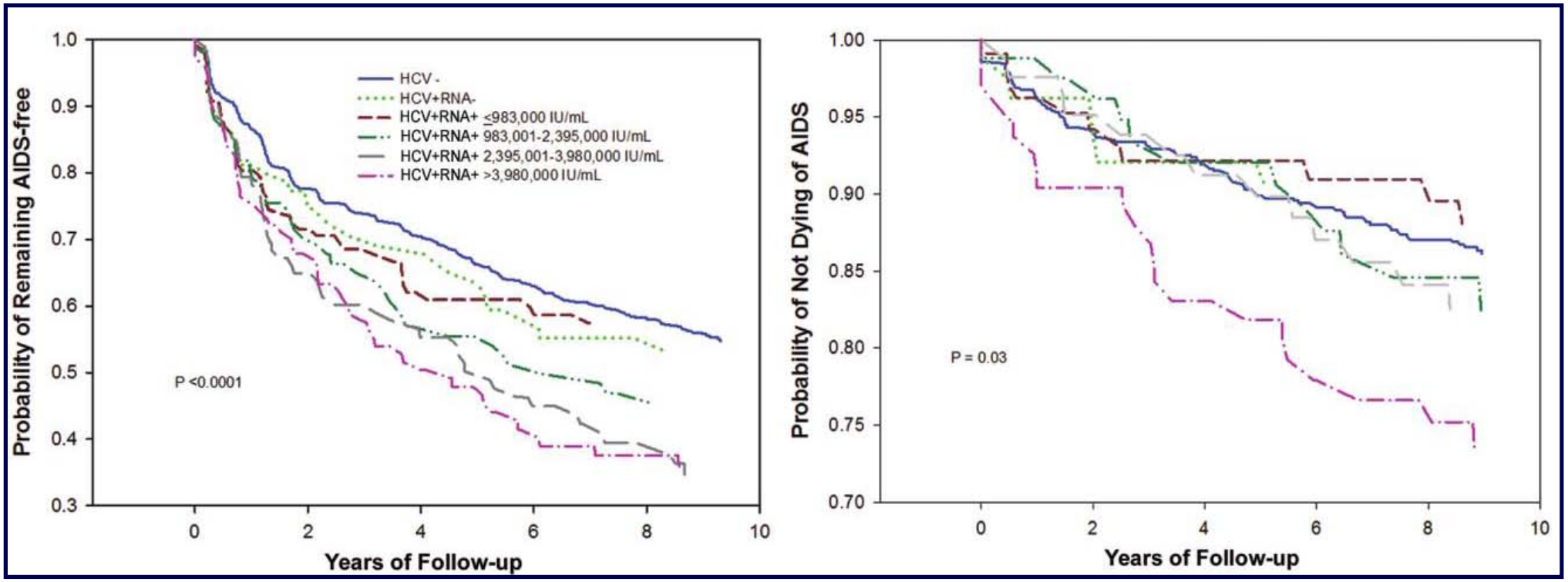
(Kirstein, Greenblatt, . . . , Gange, *J Acquir Immune Defic Syndr* 2002; 29:495-503)



WIHS

Probability of Remaining AIDS-free and of not Dying of AIDS by HCV Status at Baseline

(Kovacs, Karim, . . . , Al-Harthi, *JID* 2010; 201:823-834)



Probability of remaining AIDS-free by HCV status for 1307 HIV+ women

Probability of not dying of AIDS by HCV status for 1307 HIV+ women

WIHS

Relation of HLA Class I and II Supertypes with Spontaneous Clearance of Hepatitis C Virus

(Kuniholm, Anastos, . . . , Strickler, *Genes Immun* 2013;14(5):330- 335)

Independent Associations of HLA Supertypes and HLA Alleles with HCV Viremia among HCV-seropositive Women [a,b]

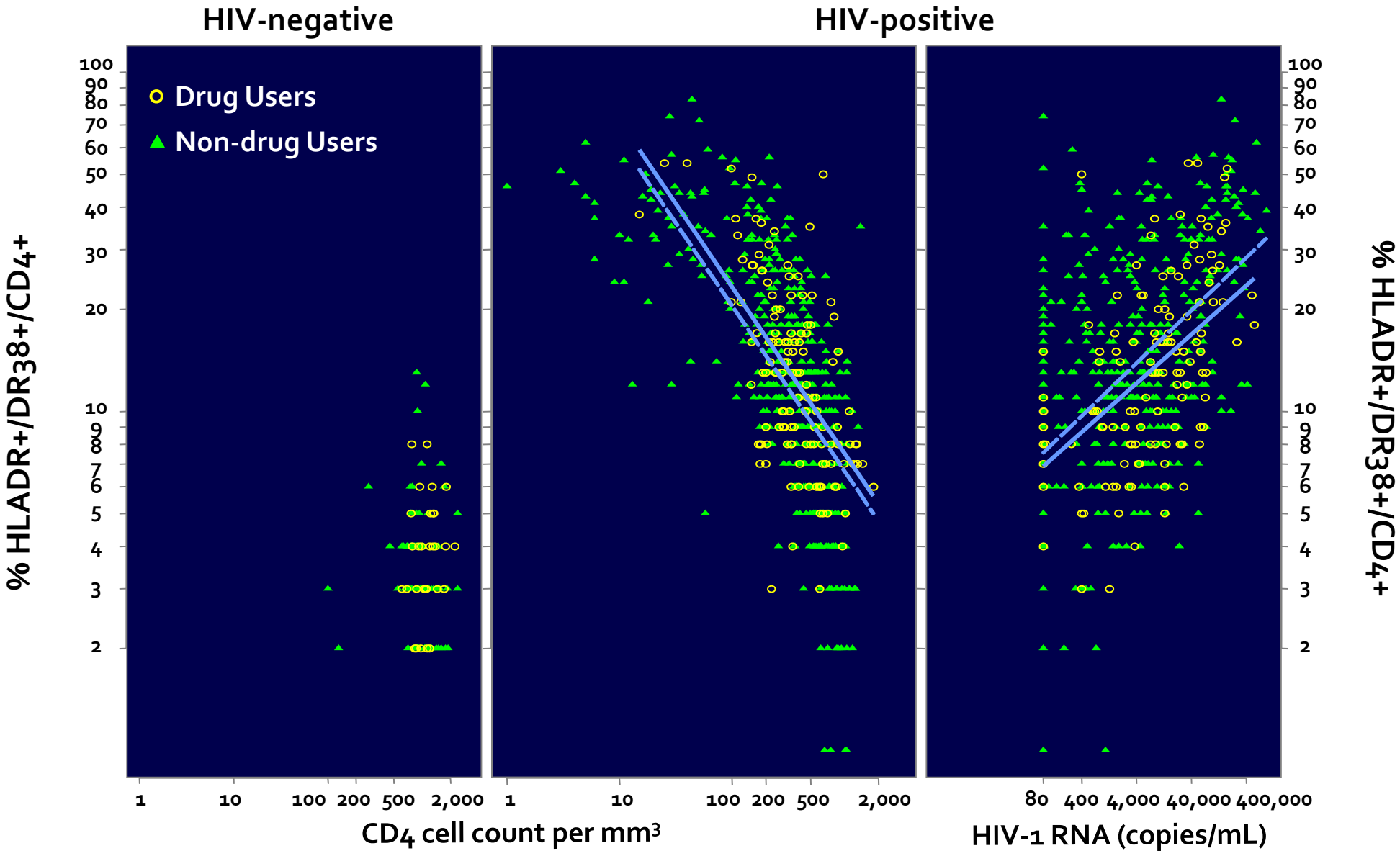
	PR (95% CI)	*P-value*
HLA supertype		
DRB3	0.44 (0.25, 0.76)	0.004
DR8	1.76 (1.14, 2.72)	0.01
DR1*01	1.50 (0.90, 2.50)	0.12
A	1.49 (0.97, 2.28)	0.07
Individual alleles		
DRB1*07:01	1.73 (1.18, 2.53)	0.005
B*57:01	1.44 (0.70, 3.00)	0.32
B*57:03	1.89 (1.18, 3.02)	0.008
C*01:02	1.32 (0.72, 2.43)	0.37

Abbreviations: CI, confidence interval; HVA, hepatitis C virus; HLA, human leukocyte antigen; PR, prevalence ratio. [a]Those HLA supertypes that retained significant or marginally significant ($\alpha<0.10$) falso discovery rate (FDR)-adjusted *q* values after adjustment for multiple comparisons, and those alleles not part of these supertypes that were significantly associated with HCV viremia in our prior study in this population are shown. [b]Results from a single multivariable log-binomial model with adjustment for race/ethnicity (non-Hispanic black, non-Hispanic white and Hispanic).

WIHS

Impact of Drug Use on CD4 Cell Activation

(Landay, Benning, . . . , Kovacs, *JID* 2003; 188:209-218)



Effect of IDU History on HAART Initiation and Incident AIDS or Death

(Lau, Cole, Gange, *Am J Epidemiol* 2009; 170:244-256)

	Time to HAART Initiation Prior to AIDS/Death		Time to AIDS or Death Prior to HAART Initiation	
	Semi-Parametric Proportional Hazards Model[a]	Parametric Mixture Model[b]	Semi-Parametric Proportional Hazards Model[a]	Parametric Mixture Model[b]
History of IDU Cause-specific Relative Hazard (95% CI)	0.67 (0.57-0.80)	0.71 (0.59-0.85)	1.71 (1.37-2.13)	1.77 (1.40-2.27)
History of IDU Subdistribution Relative Hazard (95% CI)	0.60 (0.50-0.71)	0.60 (0.50-0.71)	2.01 (1.62-2.51)	2.02 (1.62-2.59)

Models adjusted for age, race and CD4 nadir at study entry.

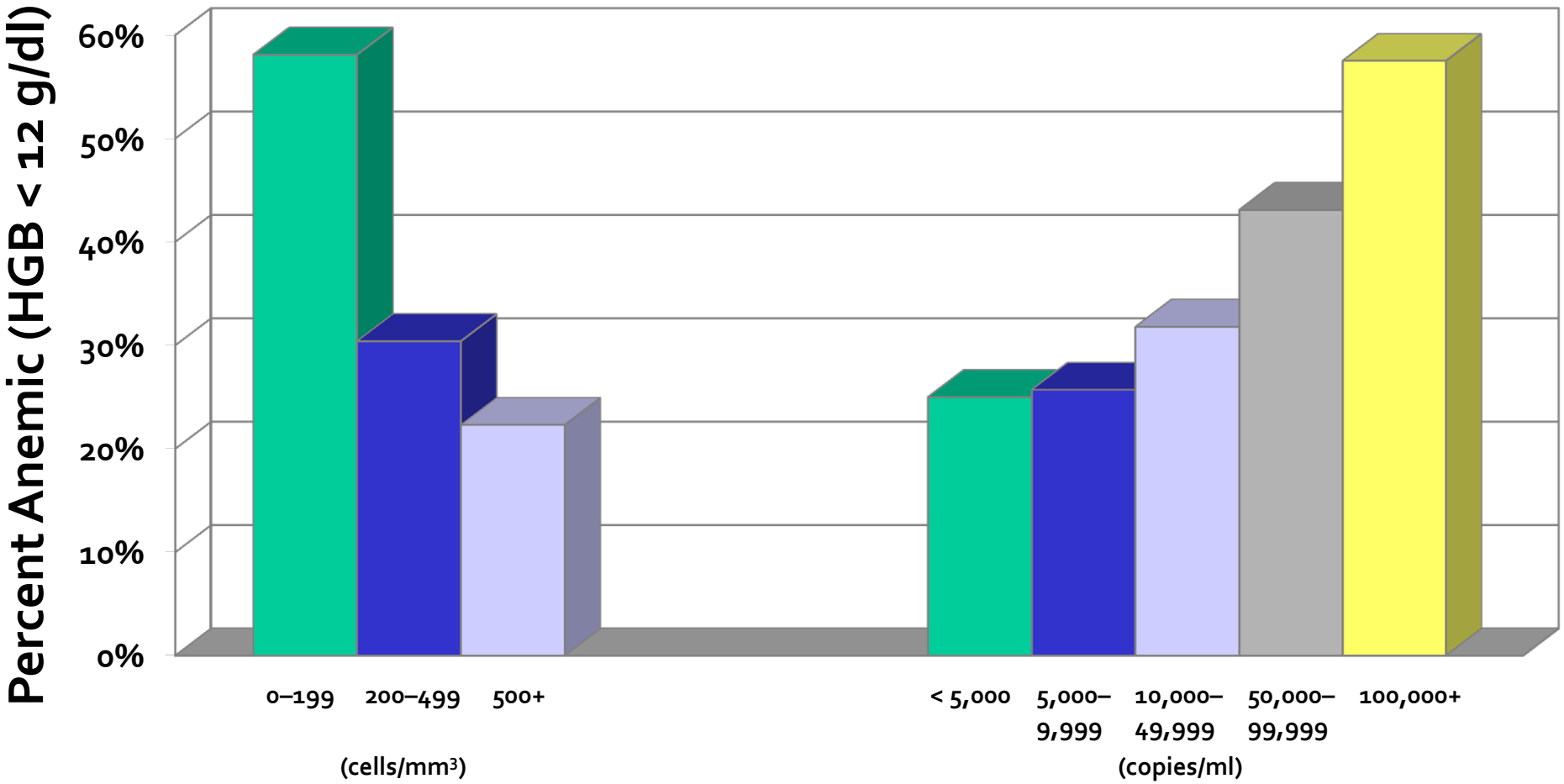
[a] Some indication that proportional hazards assumption may not hold – these differences were quantitative than qualitative.

[b] A lognormal (for HAART) and generalized gamma (for AIDS/Death) distributions were used for the parametric mixture model.

WIHS

Prevalence of Anemia in HIV+ WIHS Women

(Levine, Berhane, . . . , Watts, *J Acquir Immune Defic Syndr* 2001; 26:28-35)



WIHS

CD4⁺ Count

HIV-RNA Level

Factors Associated with Development & Resolution of Neutropenia

(Levine, Karim, . . . , Watts, *Arch Intern Med* 2006; 166:405-410)

	Development		Resolution	
	OR (95% CI)	*P*-value	OR (95% CI)	*P*-value
CD4 cell count, /µL				
≥500	1.00		1.00	
350-499	1.19 (0.98-1.44)	.09	0.80 (0.63-1.01)	.07
200-349	1.42 (1.14-1.75)	.001	0.62 (0.49-0.78)	<.001
<200	1.82 (1.32-2.53)	<.001	0.68 (0.52-0.89)	.004
HIV RNA, copies/mL				
<5000	1.00		1.00	
5000-9999	1.19 (0.89-1.59)	.24	0.81 (0.60-1.10)	.18
10,000-49,999	1.34 (1.09-1.64)	.005	0.85 (0.68-1.06)	.14
50,000-99,999	1.83 (1.32-2.53)	<.001	0.66 (0.48-0.92)	.01
≥100,000	1.47 (1.10-1.97)	.009	0.96 (0.72-1.29)	.79

Factors Associated with Development & Resolution of Neutropenia

(Levine, Karim, . . . , Watts, *Arch Intern Med* 2006; 166:405-410)

	Development		Resolution	
	OR (95% CI)	*P*-value	OR (95% CI)	*P*-value
ART Use				
None	1.00		1.00	
Mono w/ATZ	1.24 (0.58-2.63)	.58	1.30 (0.56-3.06)	.54
Mono, no ATZ	1.02 (0.61-1.70)	.94	1.15 (0.64-2.07)	.64
Combo w/ATZ	1.07 (0.80-1.44)	.62	1.24 (0.89-1.74)	.20
Combo, no ATZ	0.68 (0.51-0.92)	.01	1.50 (1.12-2.02)	.007
HAART w/ATZ	1.18 (0.96-1.46)	.12	1.35 (1.07-1.70)	.01
HAART, no ATZ	0.83 (0.67-1.01)	.06	1.47 (1.18-1.83)	<.001
Pregnant at visit	0.32 (0.14-0.72)	.006	4.77 (2.18-10.0)	<.001
Anemia	1.45 (1.24-1.70)	<.001	0.81 (0.69-0.96)	.01
Thrombocytopenia	1.60 (1.27-2.02)	<.001	0.49 (0.38-0.62)	<.001

Standardized Incidence Ratios for Lung Cancer Incidence Compared with the SEER Program

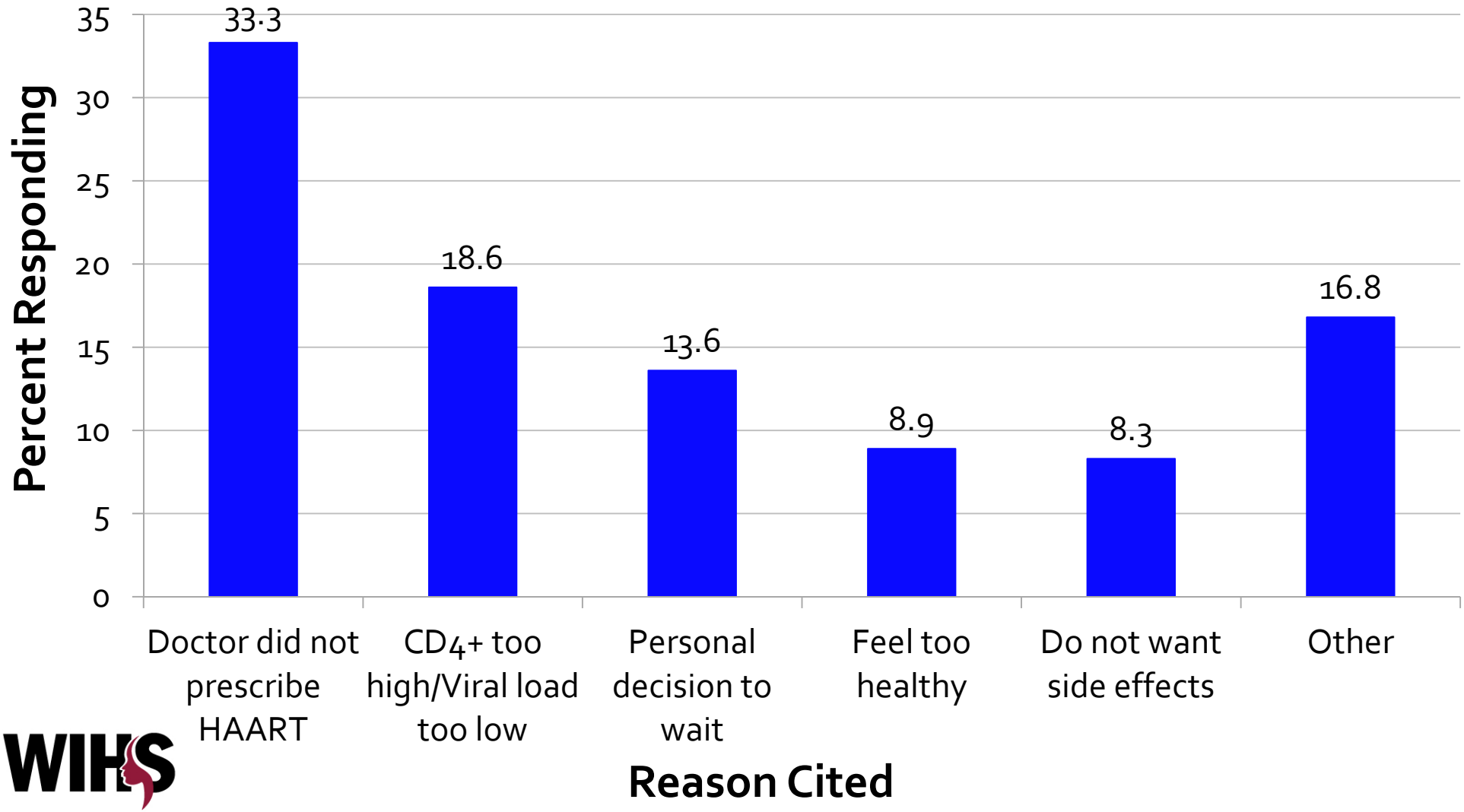
(Levine, Seaberg, . . . , Watts, *J Clin Oncol* 2010; 28:1514-1519)

Parameter	Observed Person-Years	No. of Lung Cancers		SIR	95% CI
		Observed	*Expected*		
Overall	25,000	14	4.60	3.04	1.66-5.10
HIV+	18,825	12	3.65	3.28	1.70-5.74
HIV-	6,175	2	0.95	2.11	0.25-7.61
Pre-HAART Era (1994-1996)	4,059	3	0.48	6.22	1.28-18.19
HIV+	3,221	2	0.40	4.97	0.60-17.95
HIV-	838	1	0.08	12.57	0.32-70.05
HAART Era (1997-2006)	20,941	11	4.12	2.67	1.33-4.78
HIV+	15,604	10	3.25	3.08	1.47-5.66
HIV-	5,337	1	0.87	1.15	0.03-6.40

SEER: Surveillance, Epidemiology and End Results Program; SIR Standardized Incidence Ratio.

Reasons for not Taking HAART

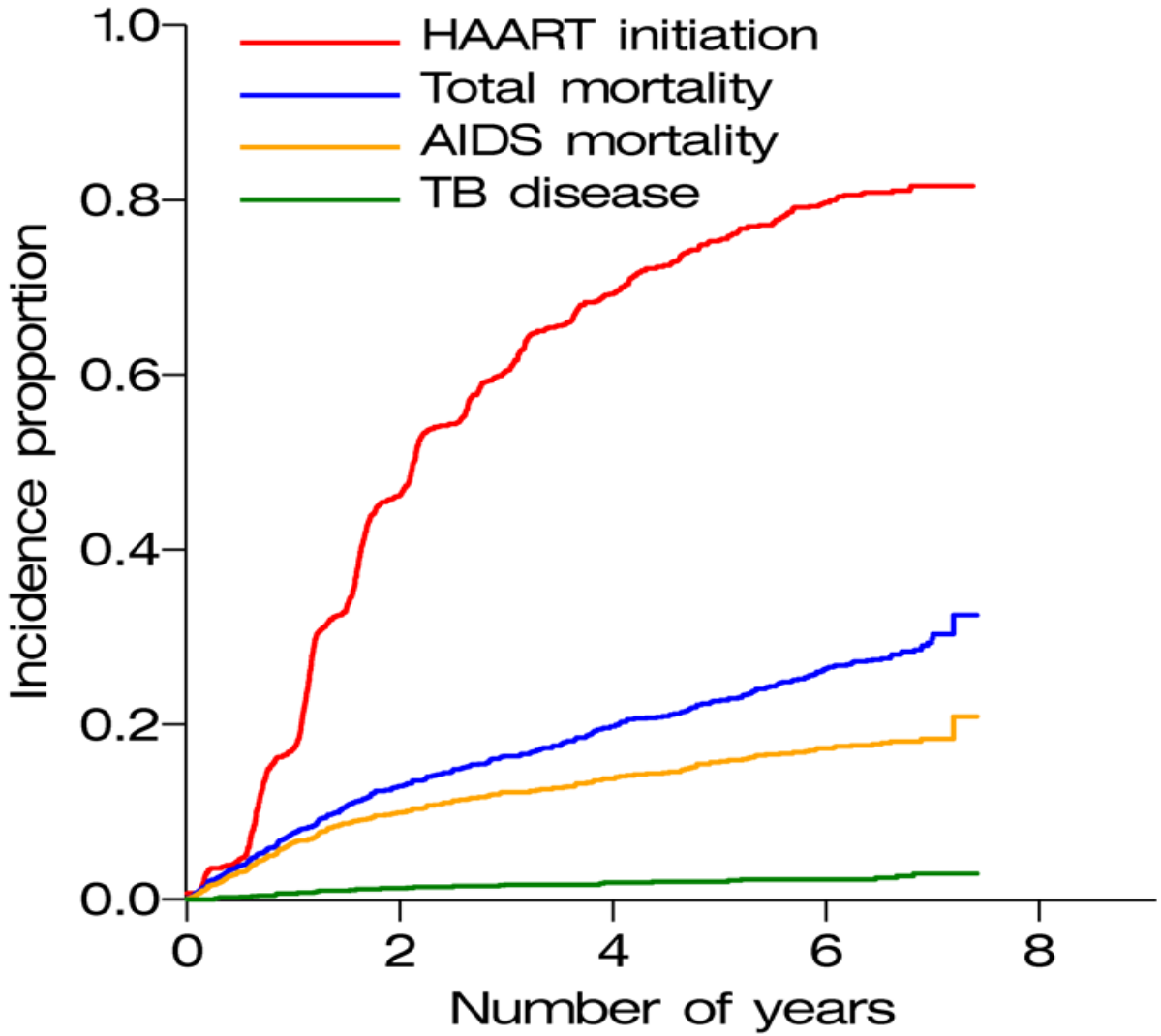
(Lillie-Blanton, Stone, . . . , Wilson, *Am J Public Health* 2010; 100:1493-1499)



WIHS

Proportion of HAART Initiation, Total Mortality, AIDS-related Mortality and Incidence of TB Among HIV+ Women

(López-Gatell, Cole, . . . , Anastos, *Am J Epidemiol* 2007;165:1134-1142)



WIHS

Cognitive Function in Women with HIV

(Maki, Rubin, . . . , Anastos, *Neurology* 2015;84(3):231-240)

HIV status and cognition: Results from regression based analyses[a] on demographically adjusted t scores

	Regression-based results			
Measure	No.	B (SE)	p Value	Cohen δ (95% CI)
HVLT				
Trial 1	1509	-1.71 (0.55)	0.002	-0.18 (-0.28 to -0.07)
Total trials 1-3	1509	-1.44 (0.55)	0.008	-0.15 (-0.04 to -0.26)
Learning slope	1509	-0.14 (0.55)	0.8	-0.01 (-0.12 to 0.09)
Delayed recall	1509	-1.92 (0.55)	<0.001	-0.20 (-0.09 to -0.31)
Recognition	1508	-1.39 (0.65)	0.03	-0.12 (-0.01 to -0.23)
Percent retention	1509	-1.58 (0.57)	0.005	-0.16 (-0.27 to -0.05)
Stroop[b]				
Trial 1	1504	-1.58 (0.63)	0.01	-0.14 (-0.04 to -0.25)
Trial 2	1504	-1.55 (0.62)	0.01	-0.14 (-0.04 to -0.25)
Trial 3	1449	-0.48 (0.73)	0.51	-0.04 (-0.15 to 0.07)
Trail Making Test[b]				
A	1507	-0.44 (0.57)	0.44	-0.04 (-0.15 to 0.06)
β	1469	-0.35 (0.58)	0.55	-0.03 (-0.14 to 0.07)

Abbreviations: CI = confidence interval, HVLT = Hopkins Verbal Learning Test; WIHS = Women's Interagency HIV Study

[a]Analyses conducted on demographically corrected t scores, where t scores were calculated based on age, years of education, Wide Range Achievement Test standard score, and race/ethnicity. The regression then adjusted for all of the following factors: site, cohort, income, smoking status, self-reported rates of depressive symptoms and antidepressant medication, hepatitis C virus antibody status, and alcohol, marijuana, crack, cocaine, and/or heroin use. For the HVLT, Trail Making Test, Symbol Digit, and Stroop we also controlled for the number of times a woman was exposed to the test during WIHS participation. B = parameter estimate reflecting the difference between HIV-infected and HIV-uninfected women.

[b]Log-transformed scores were used.

WIHS

Cognitive Function in Women with HIV

(Maki, Rubin, . . . , Anastos, *Neurology* 2015;84(3):231-240)

HIV status and cognition: Results from regression based analyses[a] on demographically adjusted t scores

	Regression-based results			
Measure	No.	B (SE)	p Value	Cohen δ (95% CI)
Symbol digit				
Correct	1501	-0.73 (0.54)	0.17	-0.08 (-0.18 to 0.03)
Incidental recall	1497	-1.12 (0.56)	0.048	-0.11 (-0.22 to -0.01)
Fluency				
Phonemic	1502	0.18 (0.58)	0.76	0.01 (-0.09 to 0.12)
Semantic	1504	-0.46 (0.55)	0.40	-0.05 (-0.15 to 0.06)
Grooved pegboard[b]				
Dominant hand	1485	0.27 (0.58)	0.64	0.03 (-0.08 to 0.13)
Nondominant hand	1458	-0.06 (0.61)	0.92	-0.00 (-0.11 to 0.11)
Average	1456	0.18 (0.58)	0.76	0.02 (-0.09 to 0.13)
Letter Number Sequence				
Attention	1347	-1.67 (0.61)	0.006	-0.17 (-0.28 to -0.05)
Working memory	1311	-0.63 (0.65)	0.33	-0.06 (-0.17 to 0.05)

Abbreviations: CI = confidence interval, HVLT = Hopkins Verbal Learning Test; WIHS = Women's Interagency HIV Study

[a]Analyses conducted on demographically corrected t scores, where t scores were calculated based on age, years of education, Wide Range Achievement Test standard score, and race/ethnicity. The regression then adjusted for all of the following factors: site, cohort, income, smoking status, self-reported rates of depressive symptoms and antidepressant medication, hepatitis C virus antibody status, and alcohol, marijuana, crack, cocaine, and/or heroin use. For the HVLT, Trail Making Test, Symbol Digit, and Stroop we also controlled for the number of times a woman was exposed to the test during WIHS participation. B = parameter estimate reflecting the difference between HIV-infected and HIV-uninfected women.

[b]Log-transformed scores were used.

WIHS

Independent Correlates of Left Ventricular Mass/Height$^{2.7}$

(Mansoor, Golub, . . . , Lazar, *AIDS Res Hum Retroviruses* 2009; 25:476-481)

	LV mass/height$^{2.7}$ (Model R^2 = 0.19, *P* <0.001) Coefficient (CI)
History of ADI	1.6 (-0.78 – 3.95)
Nadir CD4 < 200 cells/ul	0.78 (-1.64 – 3.20)
Duration of HAART, per year	0.38 (-0.06 – 0.82)
Current CD4, 100 cells/ul	0.001 (-0.004 – 0.004)
HIV RNA, 1000 cps/ml	-0.000004 (-0.000009 – 0.0000006)
Age, per year	-0.017 (-0.16 – 0.14)
Weight, per kg*	0.14 (0.06 – 0.23)
Smoking duration, per year	0.04 (-0.06 – 0.13)
Triceps skinfold thickness	0.09 (-0.04 – 0.22)
W/H ratio	8.31 (-5.27 – 21.89)
Systolic BP, per mm Hg	0.03 (-0.07 – 0.13)
Diastolic BP, per mm Hg	0.09 (-6.06 – 0.25)
Diabetes	-1.12 (-6.03 – 3.79)
Hypertension	0.57 (-2.29 – 3.43)
Dyslipidemia	1.32 (-3.44 – 0.80)

* Indicates significant independent relationship.

Independent Correlates of LV Relative Wall Thickness

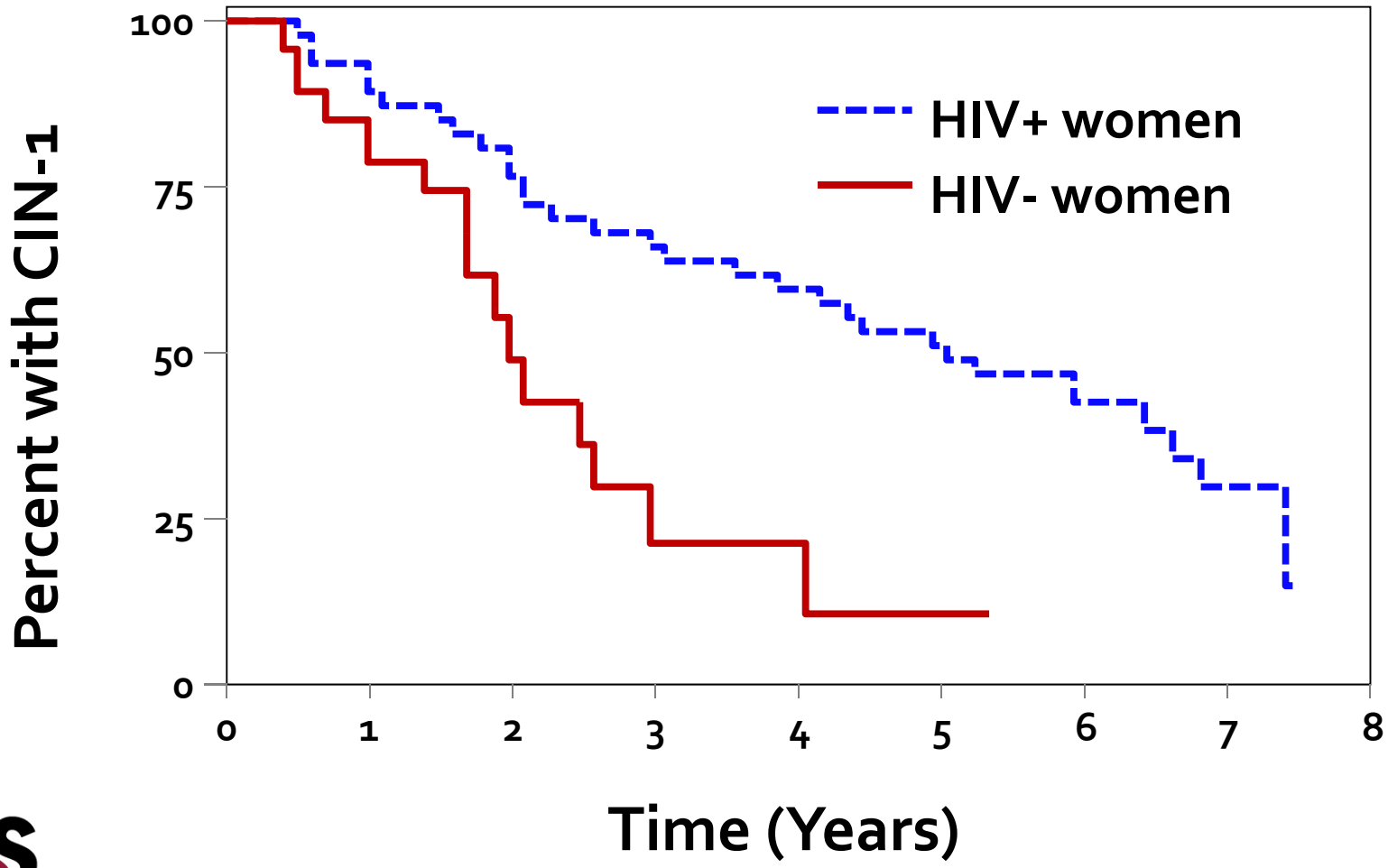
(Mansoor, Golub, . . . , Lazar, *AIDS Res Hum Retroviruses* 2009; 25:476-481)

	Relative Wall Thickness (Model R^2 = 0.13, *P* <0.001) Coefficient (CI)
History of ADI	-0.002 (-0.014 – 0.01)
Nadir CD4 < 200 cells/ul	0.012 (-0.001 – 0.024)
Duration of HAART, per year	-0.001 (-0.004 – 0.001)
Current CD4, 100 cells/ul*	0.00002 (0.000003 – 0.00004)
HIV RNA, 1000 cps/ml	0.00000002 (0.000000002 – 0.00000004)
Age, per year*	0.001 (0.003 – 0.002)
Weight, per kg	-0.00006 (-0.0005 – 0.0004)
Smoking duration, per year	-0.0002 (-0.001 – 0.0002)
Triceps skinfold thickness*	0.001 (0.0001 – 0.002)
W/H ratio*	0.092 (0.021 – 0.16)
Systolic BP, per mm Hg	-0.0004 (-0.001 – 0.00008)
Diastolic BP, per mm Hg*	0.001 (0.00008 – 0.002)
Diabetes	-0.015 (-0.04 – 0.01)
Hypertension	-0.0033 (-0.0182 – 0.0116)
Dyslipidemia	-0.001 (-0.012 – 0.01)

* Indicates significant independent relationship.

Regression of Cervical Intraepithelial Neoplasia-1 to Normal among HIV+ and HIV- Women

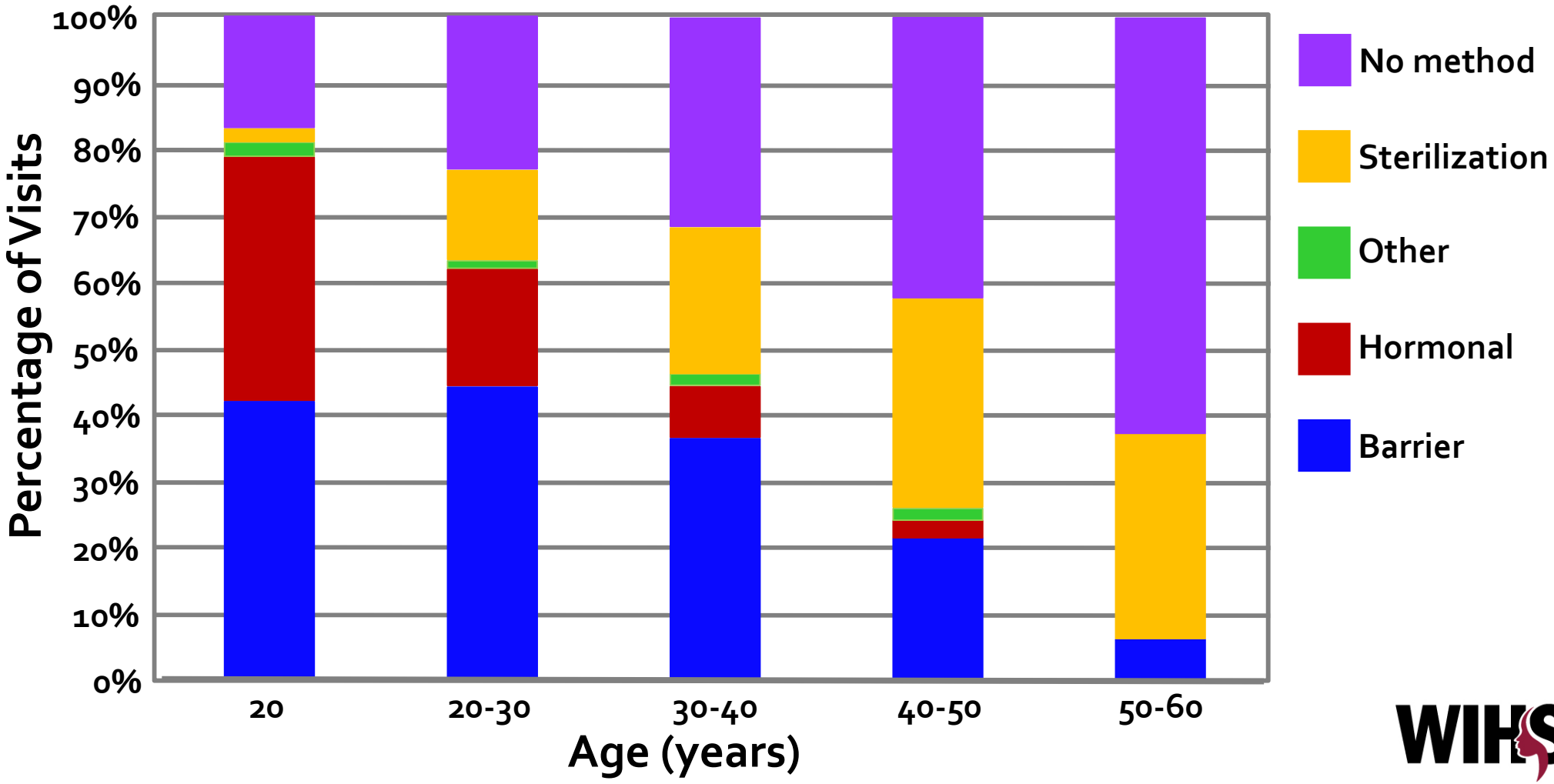
(Massad, Evans, . . . , Passaro, *Obstet Gynecol* 2004; 104:1077-1085)



WIHS

Changes in Contraception Use with Age Among HIV+ Women at Risk for Pregnancy

(Massad, Evans, . . . , Watts, *J Womens Health* 2007; 16:657-666)



WIHS

Indications for Incident Hysterectomy by Serostatus

(Massad, Evans, . . . , Watts, *J Acquir Immune Defic Syndr* 2007; 44:566-568)

	HIV+ [N (%)] (n = 64)	HIV- [N (%)] (n=13)	*P* [a]
Cervical neoplasia[b]	27 (42.2)	3 (23.1)	0.23
Fibroids	20 (31.3)	6 (46.2)	0.34
Abnormal vaginal bleeding	18 (28.1)	2 (15.4)	0.49
Pelvic pain	9 (14.1)	3 (23.1)	0.42
Pelvic organ prolapse	8 (12.5)	1 (7.7)	1.00
Pelvic mass	5 (7.8)	1 (7.7)	1.00
Endometriosis	2 (3.1)	1 (7.7)	0.43
Pelvic infection	1 (1.6)	0	1.00
Endometrial cancer	1 (1.6)	0	1.00
Placenta previa	0	1 (7.7)	0.17

Each indication was compared with all others, and multiple indications were possible (n=77).

[a] By the Fisher exact test. [b] Includes 1 case of invasive cancer.

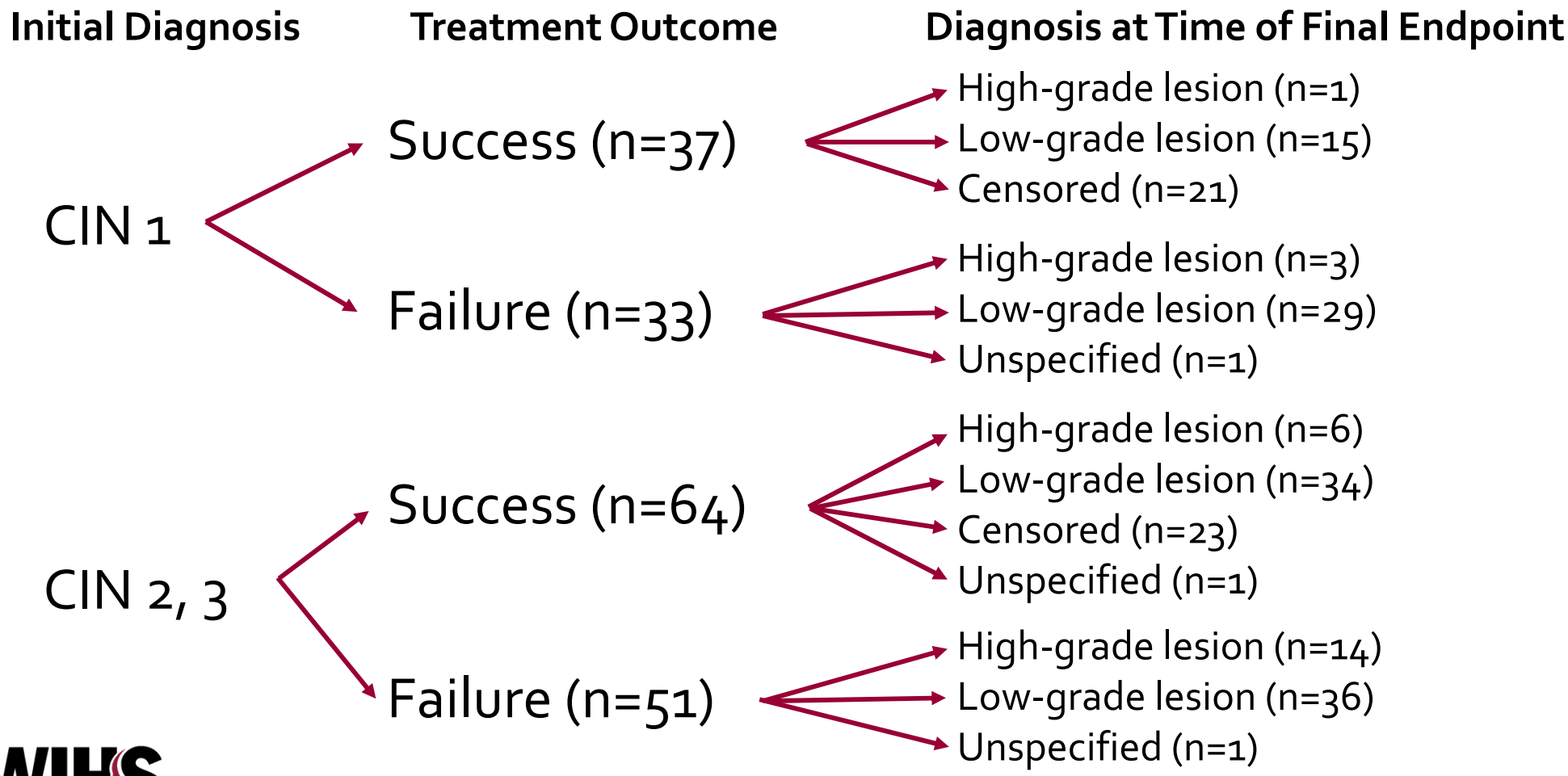
Pap Test Results and Cervical Cancer Prevention Procedures

(Massad, Evans, . . . , Weber, *Gynecologic Oncology* 2010; 117:70-76)

	HIV+ (N=1123)	HIV- (N=465)	*P*-value
Median # abnormal Pap results per patient	3.0	1.0	<0.0001
Ever abnormal Pap result	878 (78.2)	268 (57.6)	<0.0001
Grade of last Pap result			
Negative	858 (76.4)	419 (90.1)	<0.0001
ASCUS	183 (16.3)	36 (7.8)	
LGSIL	66 (5.9)	7 (1.5)	
HGSIL	16 (1.4)	2 (0.4)	
Squamous cancer	0 (0)	1 (0.2)	
Grade of worst Pap result			
Normal	246 (21.9)	198 (42.6)	<0.0001
ASCUS	376 (33.5)	195 (41.9)	
LGSIL	423 (37.7)	62 (13.3)	
HGSIL	78 (6.9)	9 (2.0)	
Squamous cancer	0 (0)	1 (0.2)	

Recurrence Among HIV+ and HIV- Women Free of Disease 6-Months after CIN Therapy

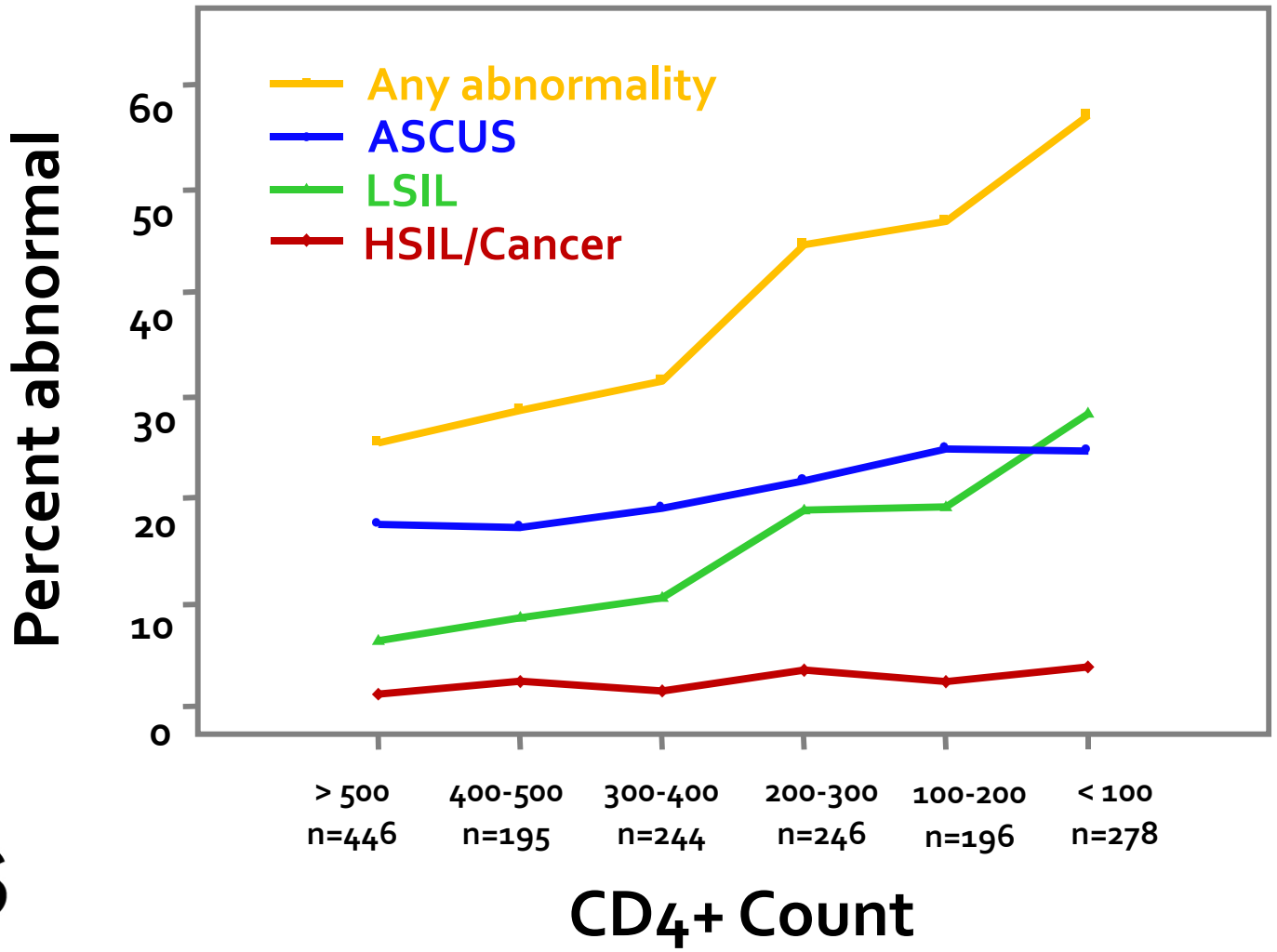
(Massad, Fazzari, . . . , Strickler, *J Low Genit Tract Dis* 2007; 11:90-97)



WIHS

Prevalence of Squamous Cell Abnormalities in HIV+ Women

(Massad, Riester, . . . , Miotti, *J Acquir Immune Defic Syndr* 1999; 21:33-41)



WIHS

Baseline Characteristics of Women at Risk for Invasive Cervical Cancer (ICC)

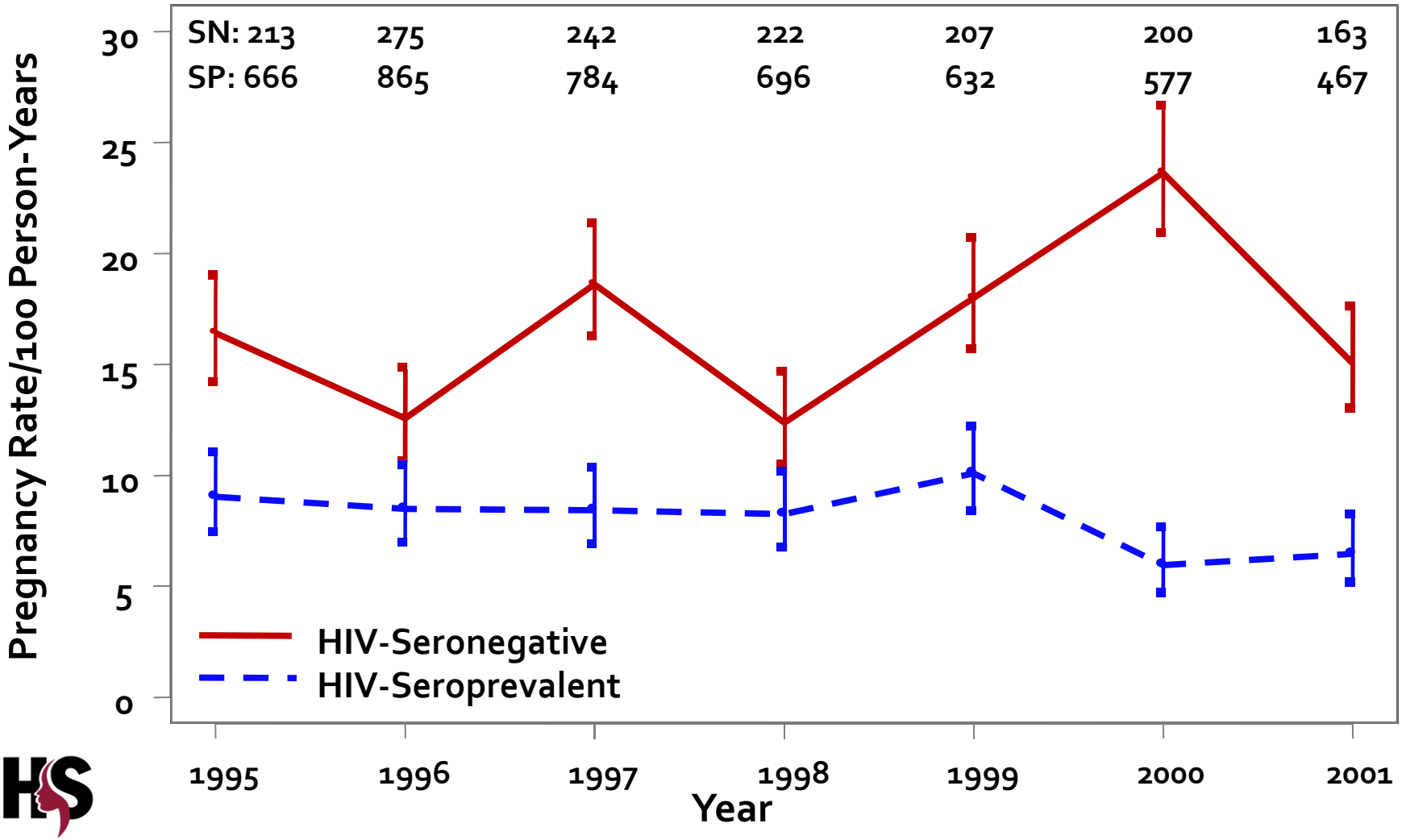
(Massad, Seaberg, . . . , Minkoff, *AIDS* 2004; 18:109-113)

	HIV+, n (%)	HIV-, n (%)
HPV status/oncogenicity		
Not tested/missing	230 (54)	---
Negative	533 (37.3)	284 (68.3)
Low risk	462 (32.3)	97 (23.3)
Intermediate risk	242 (16.9)	20 (4.8)
High risk	194 (13.6)	15 (3.6)
Cytology		
Not done/missing	105 (26)	---
Normal/benign	969 (62.3)	367 (82.7)
ASCUS	304 (19.5)	48 (10.8)
AGCUS	30 (1.9)	12 (2.7)
Low grade SIL	220 (14.1)	11 (2.5)
High grade SIL	32 (2.1)	6 (1.4)
Carcinoma	1 (0.1)	0 (0)
TOTAL	**1661 (100)**	**470 (100)**

SIL, squamous intraepithelial lesion; ASCUS, atypical squamous cells of undetermined significance; AGCUS, atypical glandular cells of undetermined significance.

Age-adjusted Conception Rates Among HIV Seronegative and Seropositive Women

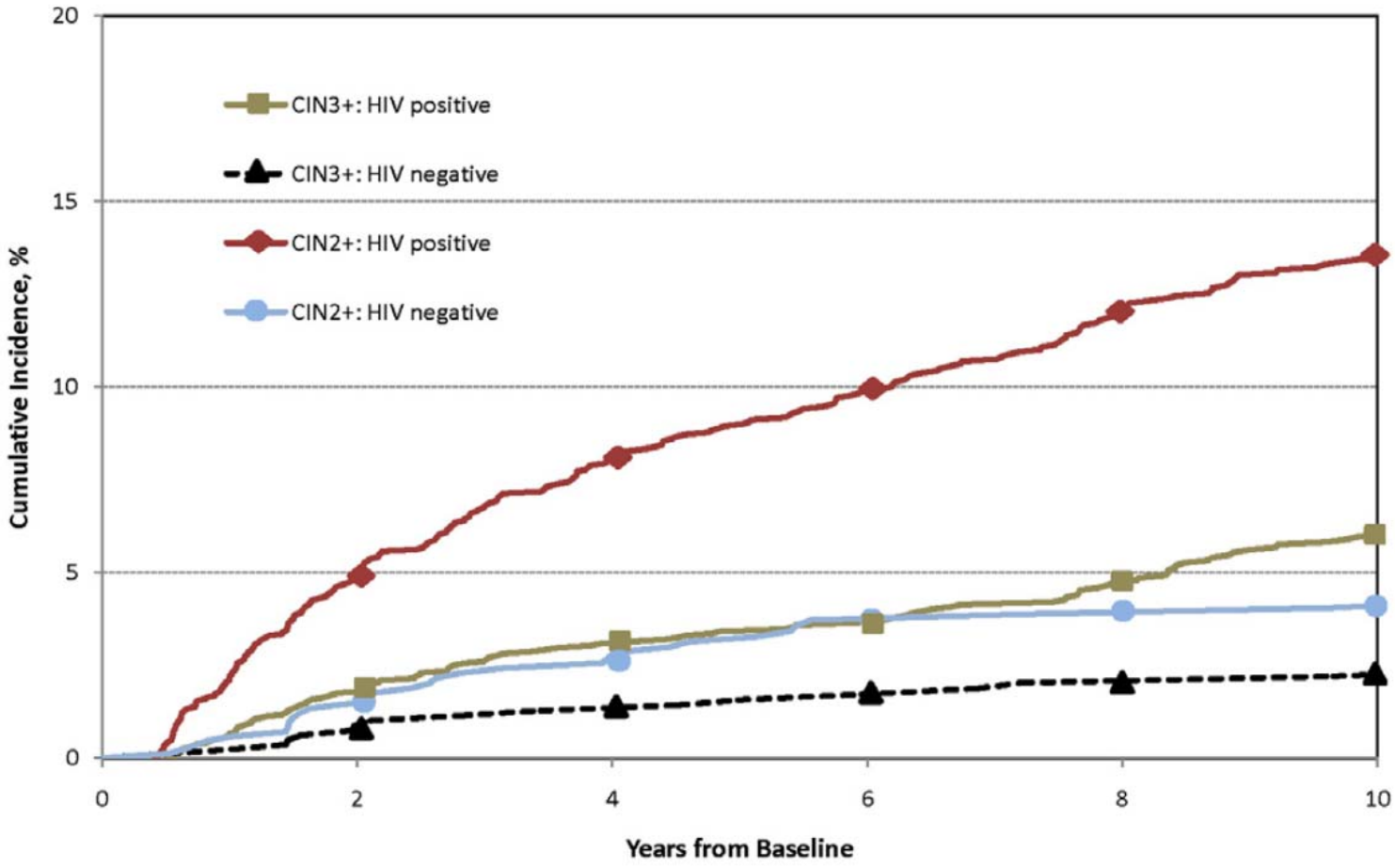
(Massad, Springer, . . . , Minkoff, *AIDS* 2004; 18:281-286)



WIHS

Incidence of Cervical Precancers among HIV-seropositive Women

(Massad, Xie,…Strickler, *Am J Obstet Gynecol 2015; 212(5):606)*

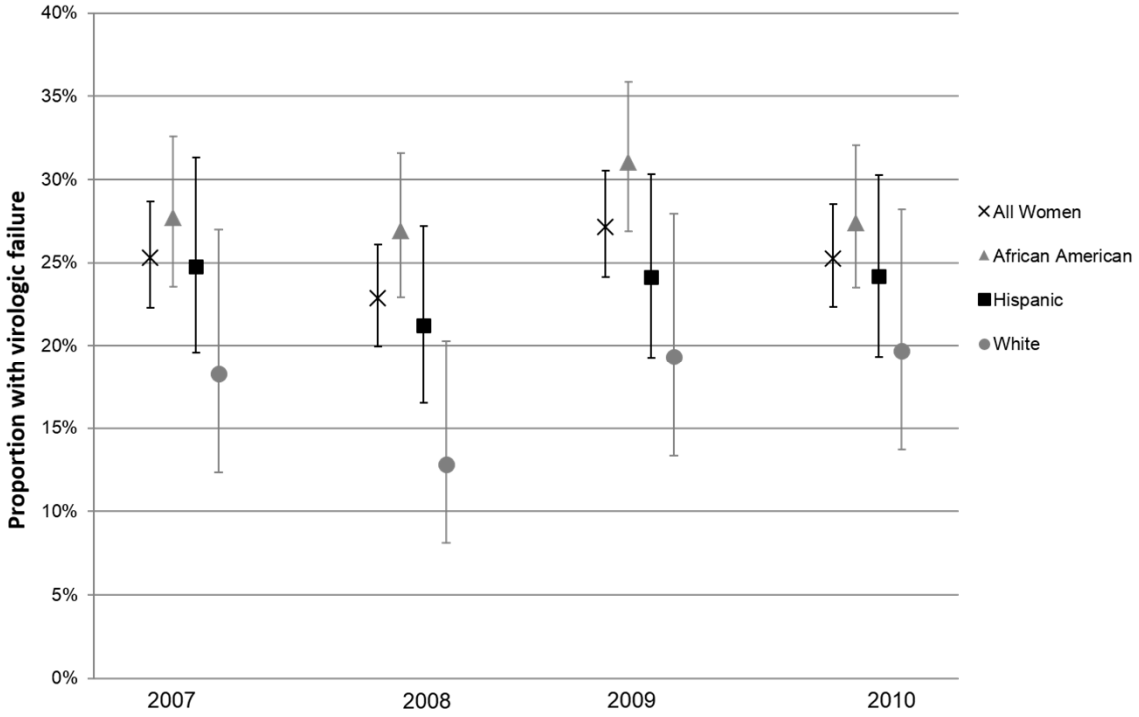


WIHS

Understanding the Disparity: Predictors of Virologic Failure in Women Using HAART Vary by Race and/or Ethnicity

(McFall, Dowdy, . . . , Althoff, *J Aquir Immune Defic Syndr* 2013;64(3):289-298)

Annual proportion (and 95% confidence intervals) of women with virologic failure, by race/ethnicity, the Women's Interagency HIV Study (WIHS), 2007-2010



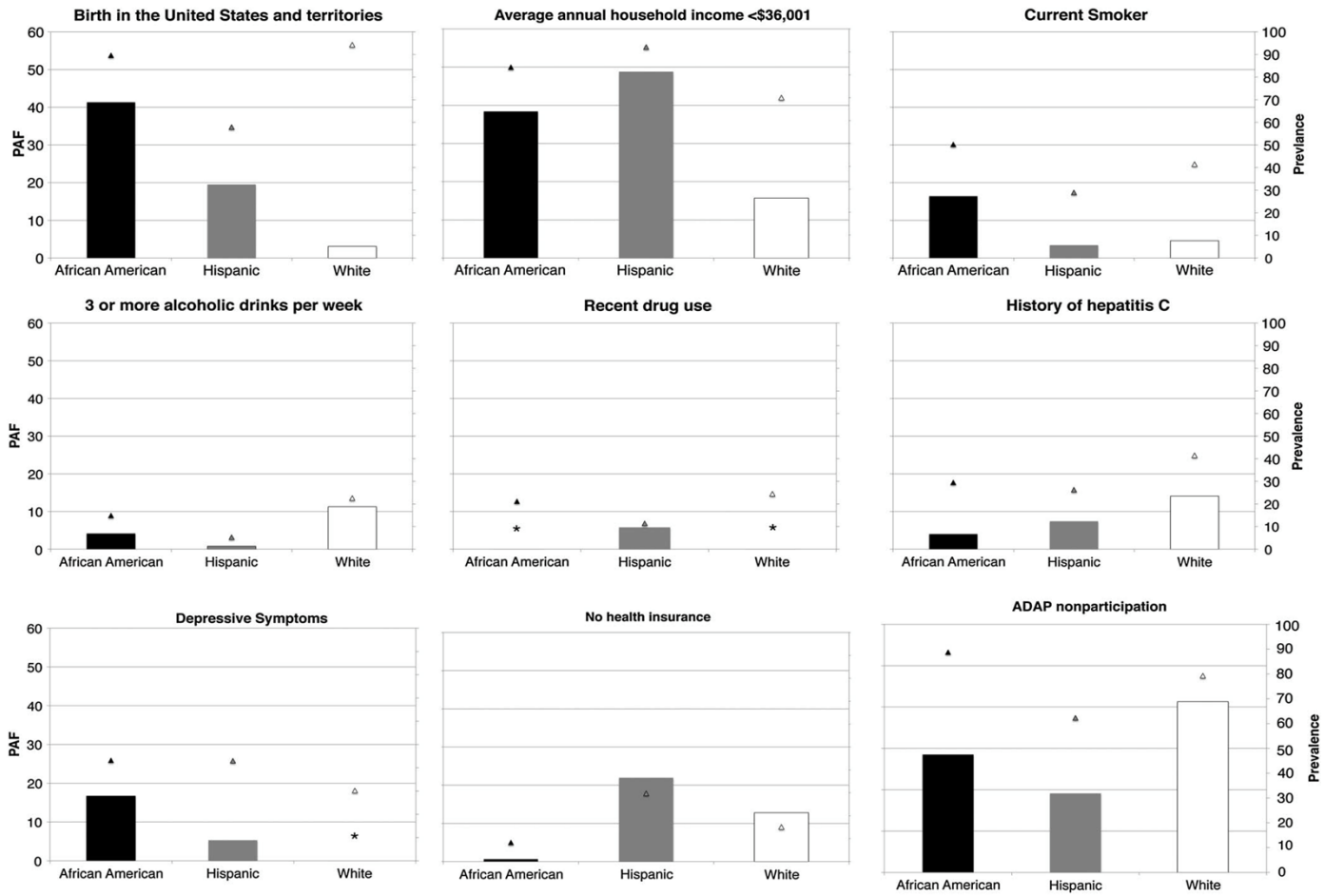
Number at risk (N)				
All women	708	761	767	785
African-American	379	405	412	423
Hispanic	214	231	236	240
White/other	115	125	119	122

P-value for trends: All women, p=0.483; African-American women, p1; Hispanic women, p=0.889; White p=0.363.

WIHS

Understanding the Disparity: Predictors of Virologic Failure in Women Using HAART Vary by Race and/or Ethnicity

(McFall, Dowdy, . . . , Althoff, *J Aquir Immune Defic Syndr* 2013;64(3):289-298)



PAFs (Population-attributable fractions) and prevalence of predictors stratified by race/ethnicity, WIHS, April 2006 to March 2011 (n = 792). Bars represent PAF; Triangles represent prevalence; *Negative population attributable fraction.

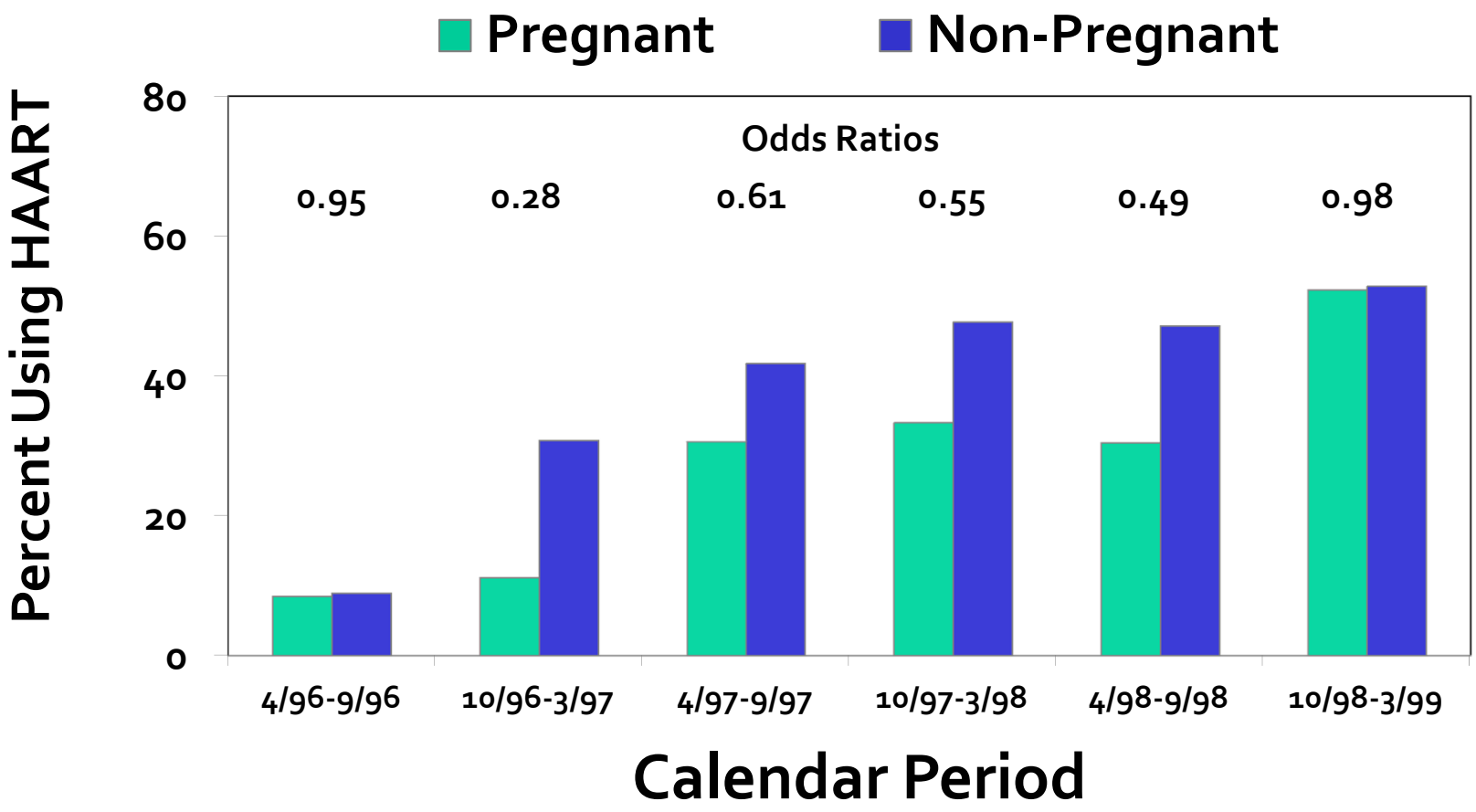
Characteristics Associated with ≥95% Adherence

(Merenstein, Schneider, . . . , Plankey, *Pediatrics* 2008; 121:e787-e793)

Characteristic	Number Person-Visits	No. (%) with ≥95% adherence	Adjusted OR	95% CI
No. children ≤18 yo living in household				
0	2817	2193 (78)	1.00	Reference
1	1402	1073 (77)	0.89	0.73 – 1.07
2	934	685 (73)	0.85	0.68 – 1.06
3	402	284 (71)	0.84	0.62 – 1.12
≥4	277	195 (70)	0.77	0.56 – 1.08
Study site				
Bronx	1188	995 (84)	1.00	Reference
Brooklyn	1093	753 (69)	0.39	0.29 – 0.53
Washington, D.C.	770	555 (72)	0.47	0.34 – 0.64
Los Angeles	1190	975 (82)	0.75	0.55 – 1.02
San Francisco	714	515 (72)	0.50	0.35 – 0.72
Chicago	877	637 (73)	0.51	0.37 – 0.70

HAART Use Among Pregnant and Non-Pregnant Women

(Minkoff, Ahdieh, . . . , Stek, *Am J Obstet Gynecol* 2001; 184:1221-1227)



Among those with CD4 ≤ 500 µl or HIV RNA ≥ 10,000 copies/ml.

Relative Hazard for New HPV Infection in HIV+ Women

(Minkoff, Feldman, . . . , Anastos, *JID* 2004; 189:1821-1828)

	RH (95% CI)	*P*
Monotherapy vs. none	0.81 (0.49 – 1.32)	0.40
Combination therapy vs. none	1.06 (0.64 – 1.75)	0.83
HAART vs. none	1.08 (0.66 – 1.77)	0.76
Oral contraceptive use (yes vs. no)	1.09 (0.69 – 1.72)	0.72
Log CD4+ cell count	0.90 (0.83 – 0.97)	0.008
Log viral load	1.06 (1.01 – 1.11)	0.01
Smoking status (yes vs. no)	1.33 (1.10 – 1.60)	0.003
Parity	1.02 (0.98 – 1.06)	0.34
No. Sex partners, recent or lifetime	0.99 (0.97 – 1.03)	0.80
Age at baseline	0.99 (0.97 – 1.00)	0.04
Age at first intercourse	1.00 (0.97 – 1.03)	0.79

Parity and age at first intercourse are fixed variables; smoking, number of sex partners, oral contraceptive use, CD4+ cell count, and viral load are time-dependent variables. 1797 women; 501 events.

Association of Crack and Cocaine Use with HPV and Cervical SIL

(Minkoff, Zhong, . . . , Burk, *Infect Dis Obstet Gynecol* 2008; 2008:587082)

Crack or Cocaine Use in Past 6 Mos. vs. No Use	Any HPV	Oncogenic HPV	Non-oncogenic HPV	SIL with Oncogenic HPV
Prevalent HPV & SIL: OR (95% CI)	1.22 (1.09-1.37)	1.30 (1.09-1.55)	1.18 (1.04-1.34)	1.70 (1.27-2.27)
Incident HPV & SIL: HR (95% CI)	1.20 (1.02-1.42)	1.21 (0.97-1.52)	1.20 (1.00-1.44)	1.51 (0.99-2.3)
Clearance of HPV & SIL: HR (95% CI)	1.02 (0.88-1.17)	0.96 (0.80-1.16)	1.05 (0.88-1.25)	0.57 (0.34-0.97)

Adjusted for CD4 count, number of sexual partners, smoking, age, and race.

WIHS

Effective HAART Use and HPV Infection

(Minkoff, Zhong, . . . , Strickler, *JID* 2010; 201:681-690)

Outcome, Effectiveness	Any HPV		Oncogenic HPV	
	OR (95% CI)	*P*	*OR (95% CI)*	*P*
Prevalence				
Effective vs. pre-HAART	0.72 (0.60-0.87)	<.001	0.71 (0.50-1.02)	.06
Ineffective vs. pre-HAART	0.89 (0.77-1.03)	.13	0.79 (0.62-1.01)	.06
Effective vs. ineffective	0.81 (0.65-1.01)	.06	0.90 (0.60-1.35)	.61
Incidence				
Effective vs. pre-HAART	0.64 (0.46-0.88)	.006	0.62 (0.38-1.02)	.06
Ineffective vs. pre-HAART	1.00 (0.78-1.29)	.98	0.92 (0.64-1.34)	.68
Effective vs. ineffective	0.63 (0.44-0.92)	.02	0.67 (0.38-1.19)	.17
Clearance				
Effective vs. pre-HAART	1.16 (0.88-1.52)	.30	--[a]	--[a]
Ineffective vs. pre-HAART	1.12 (0.89-1.41)	.34	--[a]	--[a]
Effective vs. ineffective	1.03 (0.75-1.42)	.84	--[a]	--[a]

[a] No results were obtained because of nonconvergence of the statistical model.

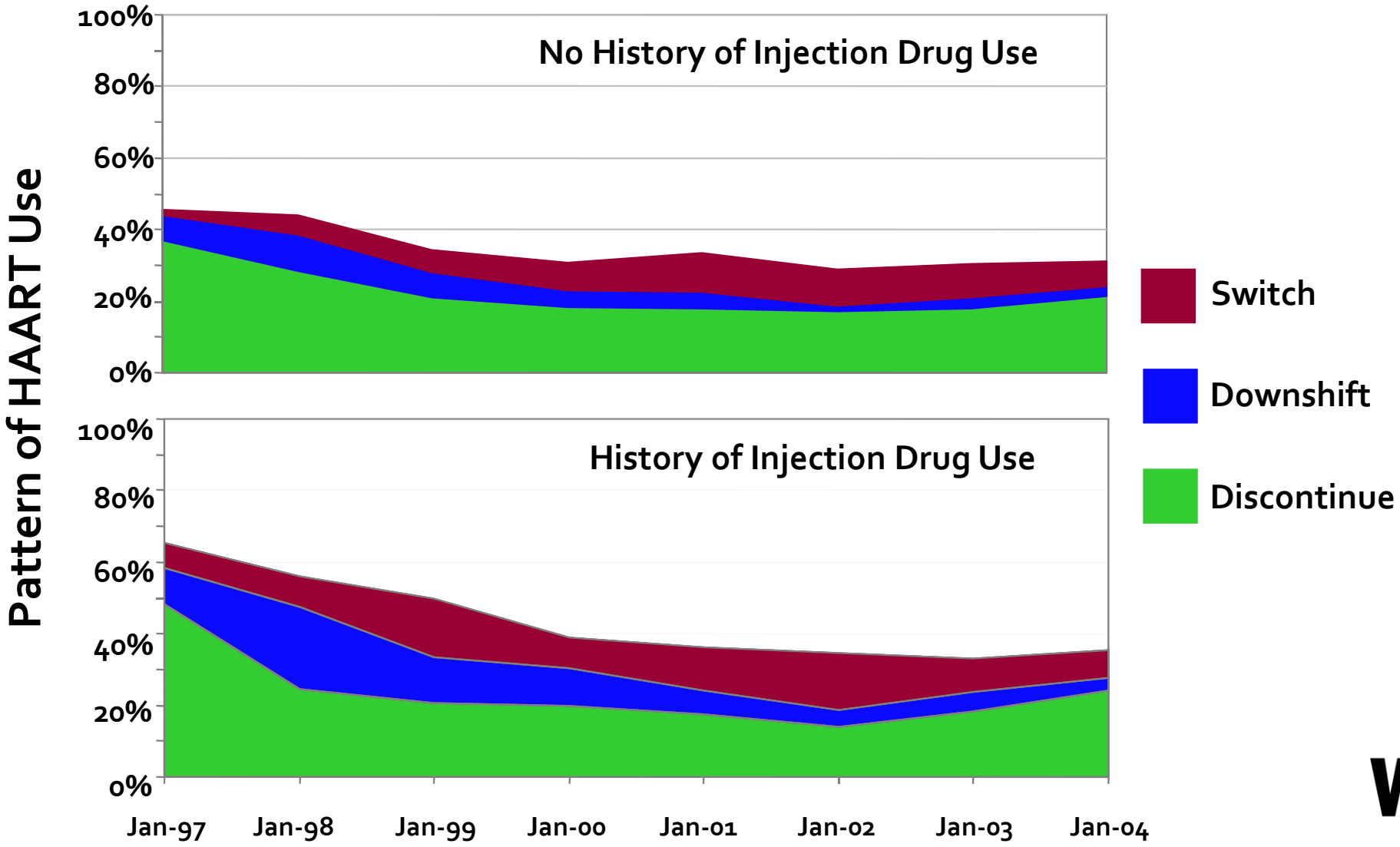
Effective HAART Use and SIL

(Minkoff, Zhong, . . . , Strickler, *JID* 2010; 201:681-690)

Outcome, Effectiveness	Any HPV		Oncogenic HPV	
	OR (95% CI)	*P*	*OR (95% CI)*	*P*
Prevalence				
Effective vs. pre-HAART	0.45 (0.25-0.80)	.007	0.47 (0.19-1.16)	.10
Ineffective vs. pre-HAART	0.93 (0.55-1.58)	.79	0.80 (0.42-1.51)	.48
Effective vs. ineffective	0.48 (0.23-1.01)	.05	0.59 (0.21-1.71)	.33
Incidence				
Effective vs. pre-HAART	0.71 (0.37-1.36)	.30	0.75 (0.30-1.85)	.53
Ineffective vs. pre-HAART	0.44 (0.21-0.94)	.03	0.48 (0.18-1.25)	.13
Effective vs. ineffective	1.61 (0.65-3.95)	.30	1.56 (0.47-5.21)	.47
Clearance				
Effective vs. pre-HAART	2.48 (1.10-5.61)	.03	1.21 (0.42-3.49)	.72
Ineffective vs. pre-HAART	1.26 (0.53-2.99)	.60	0.55 (0.24-1.27)	.16
Effective vs. ineffective	1.97 (0.70-5.53)	.20	2.20 (0.62-7.73)	.22

Injection Drug Use and Patterns of HAART Use: An Analysis of ALIVE, WIHS and MACS Cohorts

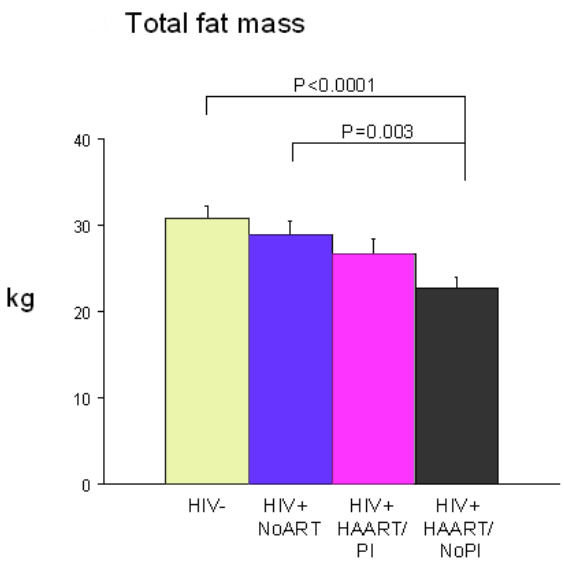
(Morris, Golub, . . . , Gange, *AIDS Res Ther* 2007Jun 6; 4:12)

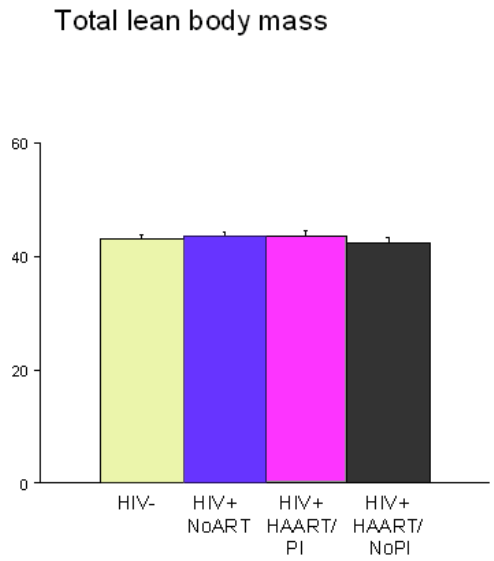


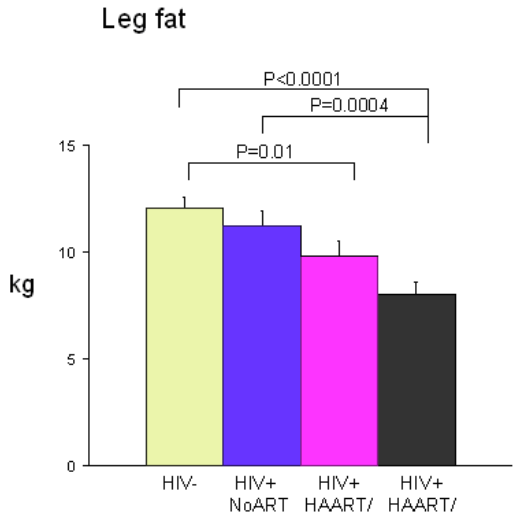
WIHS

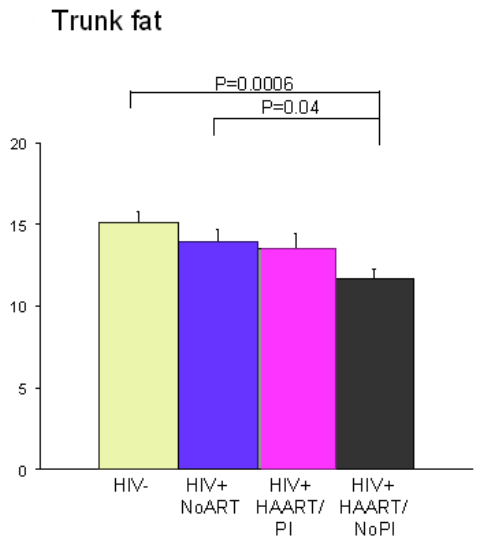
Fat Distribution in HIV+ Women

(Mulligan, Anastos, . . . , Hessol, *J Acquir Immune Defic Syndr* 2005; 38:18-22)









Association of Self-reported Race with AIDS Death in Continuous HAART Users

(Murphy, Hoover, . . . , Anastos, *AIDS* 2013;27(15):2413-2423)

	White (N = 334)	Black (N = 823)	Other (N = 314)	*P*-value (N = 1471)
Demographics				
Age at last pre-HAART visit (years)	40.0 (8.4)	41.3 (8.5)	39.3 (8.0)	<0.001
Baseline risk category				
IDU	28.8%	28.9%	24.4%	0.60
Heterosexual risk	68.5%	67.9%	72.1%	
Transfusion risk	2.7%	3.2%	3.6%	
Pre-HAART annual income ≤ $12,000	40.8%	58.9%	59.9%	<0.001
Education level (% graduating from high school)	72.2%	65.5%	49.2%	<0.001
WIHS year of enrollment (199401995 vs. 2001-2002)				
1994-1995	77.8%	80.9%	91.7%	<0.001
2001-2002	22.2%	19.1%	8.3%	
Calendar year HAART initiated	2001.4 (4.6)	2001.4 (4.2)	2000.5 (4.1)	0.002
Behaviors at pre-HAART visit				
Pre-HAART illicit drug use	9.9%	13.7%	8.0%	0.01
Pre-HAART smoking	39.2%	54.8%	34.7%	<0.001
Pre-HAART depressive symptoms CES-D ≥ 16 (%)	41.6%	46.1%	47.5%	0.27
Pre-HAART CES-D subscale depression				
Negative subscale ≤4 vs >4	42.5%	47.2%	51.0%	0.1
Somatic subscale ≤6 vs. >6	39.8%	44.6%	44.2%	0.31
Positive subscale ≤3 vs. >3	42.5%	40.5%	49.4%	0.03
Interpersonal subscale 0 vs. >0	32.0%	38.8%	41.4%	0.03

CES-D, Center for Epidemiology Studies Depression score; HCV, hepatitis C virus; IDU, injection drug use; WIHS, Women's Interagency HIV Study.

[a]All person-visits from October 2002 onwards for which adherence was self-reported in 1255 women. *P*-values are from generalized estimation models.

[b]See Table 2 for statistical comparison of times to AIDS and non-AIDS deaths.

WIHS

Association of Self-reported Race with AIDS Death in Continuous HAART Users

(Murphy, Hoover, . . . , Anastos, *AIDS* 2013;27(15):2413-2423)

	White (N = 334)	Black (N = 823)	Other (N = 314)	*P*-value (N = 1471)
Clinical characteristics pre-HAART				
Pre-HAART nadir $CD4^+$	221 (154)	210 (158)	206 (143)	0.38
Pre-HAART peak HIV-1 RNA (log base 10)	4.7 (0.9)	4.8 (0.8)	4.8 (0.8)	0.37
Pre-HAART AIDS-defining illness	46.1%	49.0%	47.1%	0.64
Pre-HAART HCV infection	27.0%	31.8%	22.6%	0.006
Post-HAART events/outcomes				
Adherence ≥95% vs. <95%	80.9%	73.1%	80.1%	<0.001
Vital status at end of study				
Alive	84.4%	75.6%	80.6%	NA[b]
AIDS death	6.0%	13.4%	11.8%	NA[b]
Non-AIDS death	9.3%	10.1%	7.0%	NA[b]
Unknown/indeterminate	0.3%	1.0%	0.6%	NA[b]

CES-D, Center for Epidemiology Studies Depression score; HCV, hepatitis C virus; IDU, injection drug use; WIHS, Women's Interagency HIV Study.

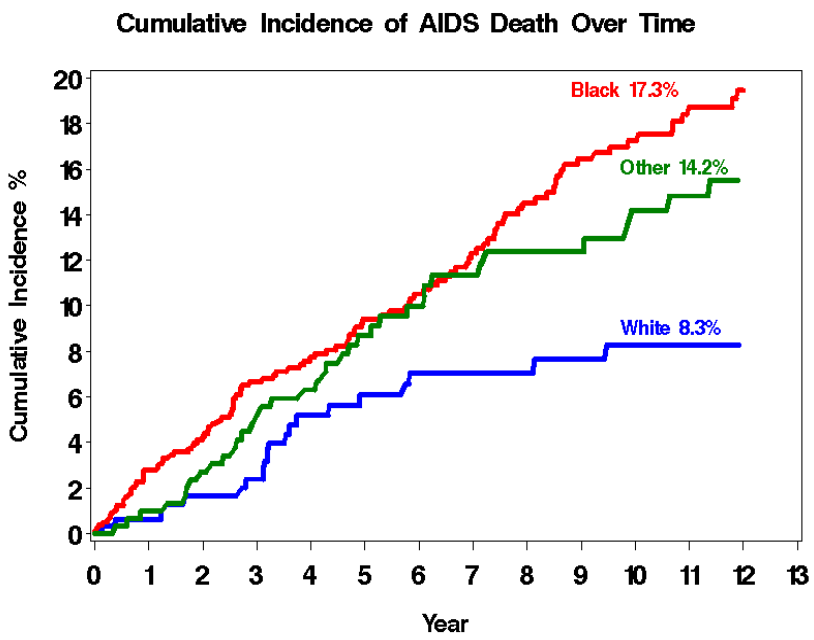
[a]All person-visits from October 2002 onwards for which adherence was self-reported in 1255 women. *P*-values are from generalized estimation models.

[b]See Table 2 for statistical comparison of times to AIDS and non-AIDS deaths.

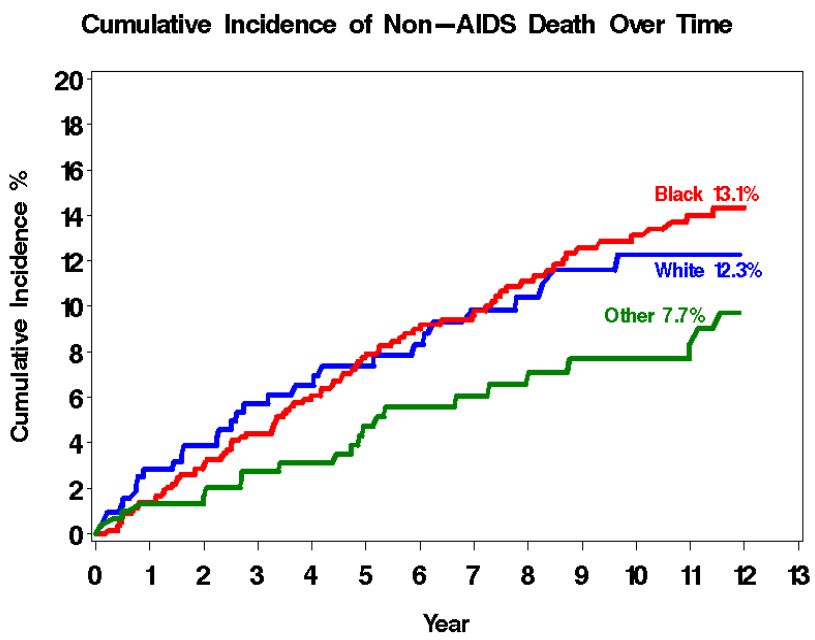
WIHS

Association of Self-reported Race with AIDS Death in Continuous HAART Users

(Murphy, Hoover, . . . , Anastos, *AIDS* 2013;27(15):2413-2423)



Cumulative incidence of AIDS death over time. Lines correspond to the cumulative incidence of AIDS death stratified by race. The red line represents black women, the blue line represents white women and the green line represents women who reported their race as other.



Cumulative incidence of non-AIDS death over time. Lines correspond to the cumulative incidence of non-AIDS death stratified by race. The red line represents black women, the blue line represents white women and the green line represents women who reported their race as other.

WIHS

Impact of HAART on Salivary Gland Function

(Navazesh, Mulligan, . . . , Alves, *Oral Dis* 2009; 15:52-60)

	All HAART		Non-PI HAART		PI HAART	
	Estimate (SE)	*P*-value	Estimate (SE)	*P*-value	Estimate (SE)	*P*-value
Changes in stimluated flow rate (ml/min)						
No HAART	Reference		Reference		Reference	
Ended HAART	-0.04 (0.05)	0.40	-0.10 (0.07)	0.14	-0.02 (0.04)	0.67
Initiated HAART	-0.02 (0.04)	0.60	-0.08 (0.06)	0.16	0.02 (0.04)	0.67
Maintained	-0.14 (0.03)	<.0001	-0.05 (0.05)	0.23	-0.11 (0.03)	0.0004
Changes in unstimulated flow rate (ml/min)						
No HAART	Reference		Reference		Reference	
Ended HAART	0.02 (0.03)	0.40	0.02 (0.03)	0.52	-.0005 (0.03)	0.01
Initiated HAART	0.004 (0.01)	0.81	0.34 (0.03)	0.29	-.0005 (0.02)	0.80
Maintained	-0.02 (0.01)	0.17	0.01 (0.03)	0.60	-0.04 (0.02)	0.01

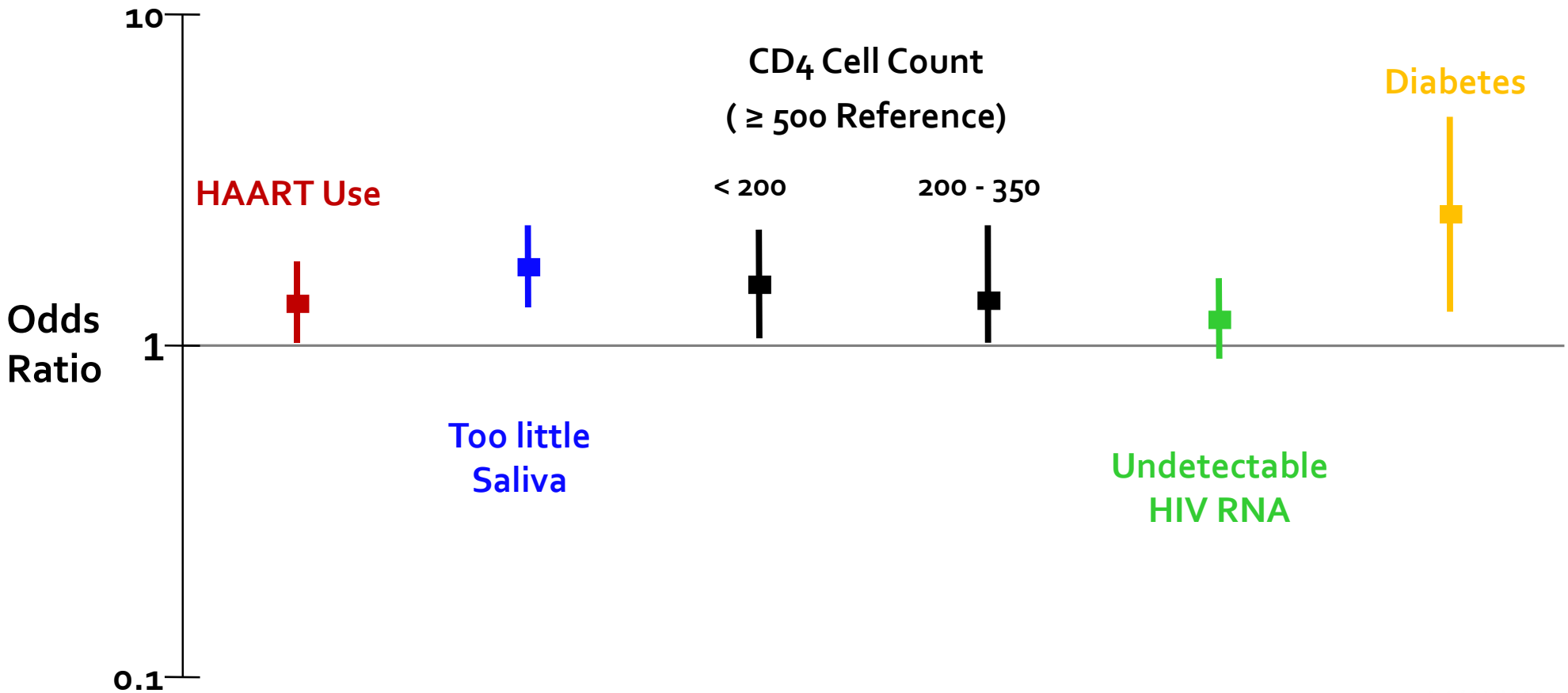
Impact of HAART on Salivary Gland Function

(Navazesh, Mulligan, . . . , Alves, *Oral Dis* 2009; 15:52-60)

	All HAART		Non-PI HAART		PI HAART	
	OR (95% CI)	*P*	OR (95% CI)	*P*	OR (95% CI)	*P*
Complaint of too little saliva						
No HAART	Reference		Reference		Reference	
Ended HAART	0.82 (0.50-1.34)	0.42	0.55 (0.23-1.29)	0.17	1.05 (0.65-1.69)	0.84
Initiated HAART	0.80 (0.56-1.12)	0.19	1.18 (0.72-1.92)	0.55	0.80 (0.54-1.18)	0.26
Maintained	0.73 (0.55-0.97)	0.03	0.67 (0.41-1.10)	0.64	0.79 (0.59-1.08)	0.14
Enlargement of the salivary gland						
No HAART	Reference		Reference		Reference	
Ended HAART	2.14 (1.04-4.44)	0.04	2.43 (0.94-6.27)	0.07	1.22 (0.57-2.58)	0.61
Initiated HAART	1.19 (0.64-2.19)	0.58	0.78 (0.30-2.05)	0.62	1.05 (0.56-1.93)	0.89
Maintained	2.20 (1.44-3.38)	0.003	1.56 (0.81-2.99)	0.18	1.82 (1.18-2.80)	0.006

Correlates of Low (≤ 0.7 mL/min) Chewing Stimulated Whole Saliva Flow Rate in HIV+ Women

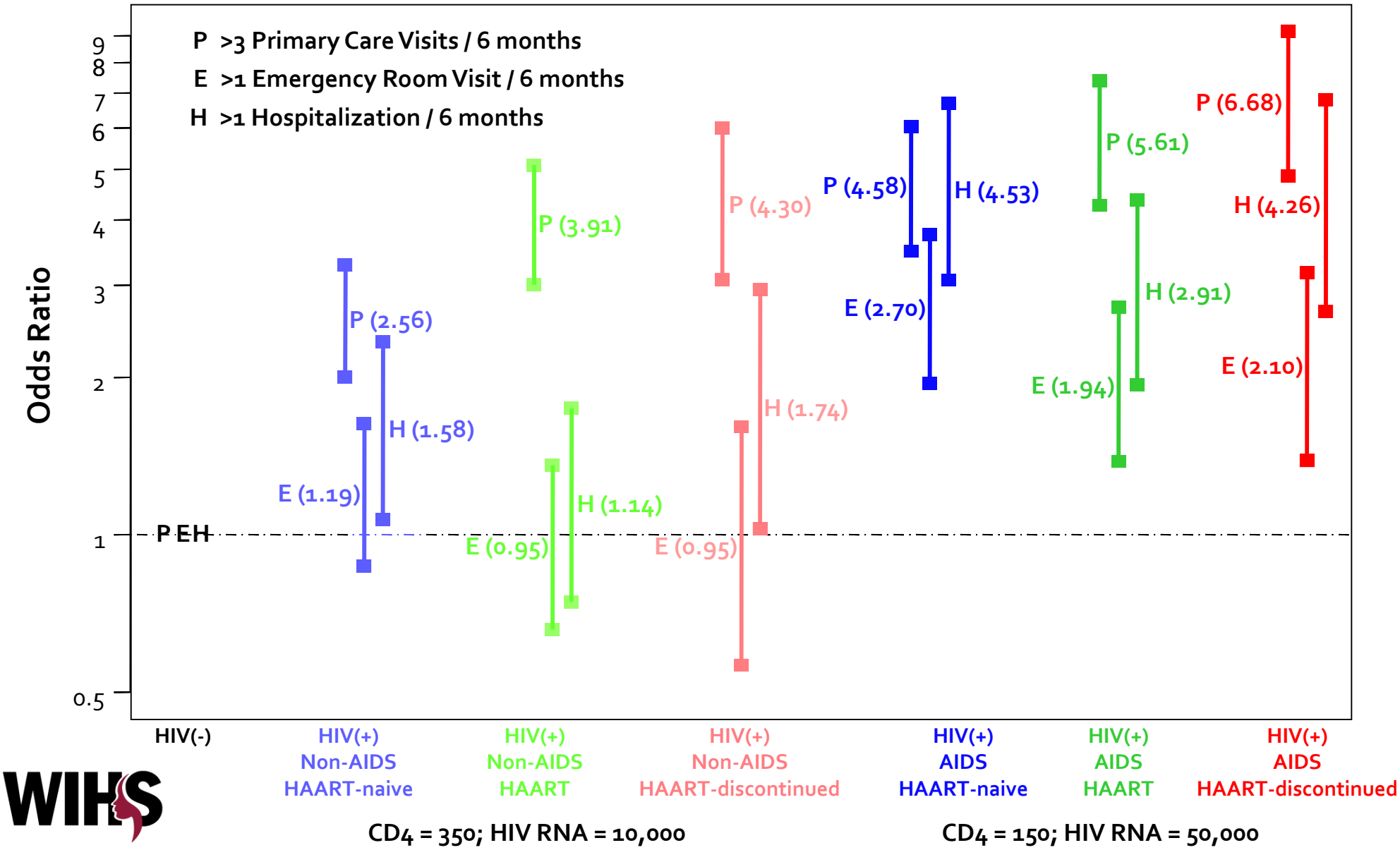
(Navazesh, Mulligan, . . . , Phelan, *OOOOE* 2003; 95:693-698)



WIHS

Healthcare Utilization by HIV+ Relative to HIV-

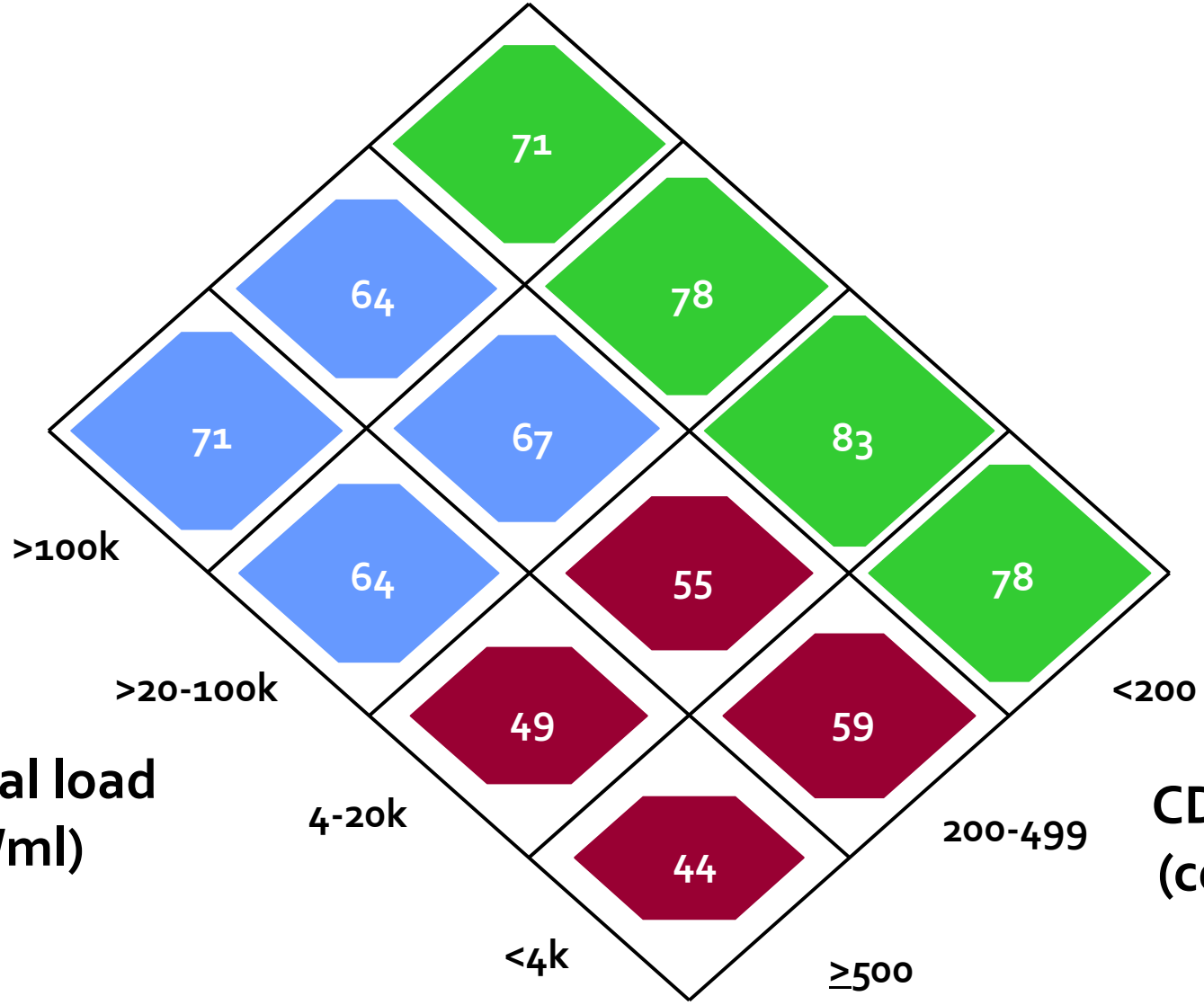
(Palacio, Li, . . . , Muñoz, *AIDS* 2004; 18:621-630)



WIHS

HPV Prevalence in 1483 HIV-positive Women

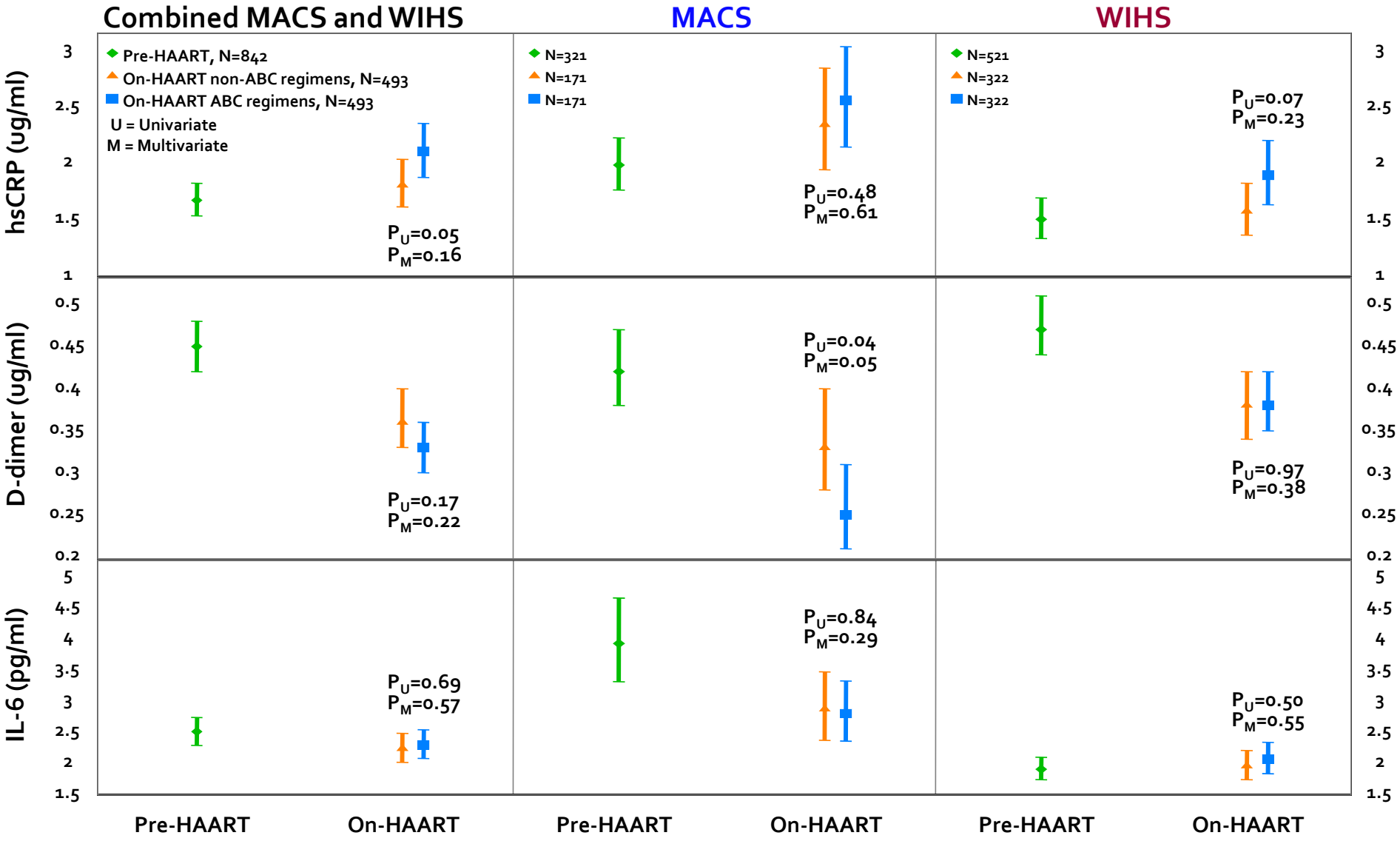
(Palefsky, Minkoff, . . . , Burk, *J Natl Cancer Inst* 1999; 91:226-36)
(Li, Buechner, . . . , Muñoz, *Am Statist* 2003; 57:193-236)



WIHS

Pre- and On-HAART Biomarker Geometric Means and 95% Confidence Intervals Overall and Stratified by Cohort

(Palella, Gange, . . . , Elion, *AIDS* 2010; 24:1657-1665)



Frequency of CCR5 Δ32 Heterozygous Genotype

(Philpott, Weiser, . . . , Burger, *JID* 2003; 187:569-575)

HIV Status	Subjects (n)	Δ32 heterozygous n (%)	OR	Exact 95% CI	Exact *P*
Uninfected	542	45 (8.3)	1	NA	NA
Infected, CD4 cell count, cells/µl					
< 200	593	29 (4.9)	0.57	0.34 – 0.94	.027
200 – 349	458	18 (3.9)	0.45	0.24 – 0.81	.007
350 – 499	403	30 (7.4)	0.89	0.53 – 1.47	.718
≥ 500	518	28 (5.4)	0.63	0.37 – 1.05	.082

* Test for trend. $P = 0.12$ (χ^2 test); $P = .307$ (χ^2 test) among HIV-1-infected categories only.

WIHS

Racial/Ethnic Differences in Spontaneous HCV Clearance

(Sarkar, Bacchetti, . . . , Peters, *Dig Dis Sci* 2013;58(5):1341-1348)

Factors associated with spontaneous HCV clearance in HIV infected women

Variable	Univariate OR (95% CI)	*p* value	Multivariate[a] OR (95% CI)	*p* value
Log10 HIV RNA	**0.73 (0.62-0.85)**	**<0.0001**	**0.75 (0.61-0.92)**	**0.006**
HBsAg positivity	**3.0 (1.40-6.1)**	**0.004**	**3.5 (1.57-7.9)**	**0.002**
CD4 count (per doubling)	**1.19 (1.05-1.34)**	**0.006**	1.07 (0.93-1.24)	0.324
History of alcohol use	0.66 (0.39-1.14)	0.14	0.60 (0.33-1.08)	0.088
Age	0.99 (0.97-1.02)	0.53	1.01 (0.98-1.04)	0.49
History of IVDU	0.84 (0.53-1.33)	0.46	0.75 (0.44-1.28)	0.29
History of blood transfusion	1.33 (0.87-2.1)	0.19	1.49 (0.94-2.4)	0.087
History of >10 lifetime sexual partners	1.28 (0.91-1.81)	0.16	1.34 (0.92-1.98)	0.13

The bold results reflect those that reach statistical significance with *p* values <0.05

[a]Adjusted for race/ethnicity, age, HIV RNA, CD4 count, HBsAg positivity, and alcohol use

WIHS

Racial/Ethnic Differences in Spontaneous HCV Clearance

(Sarkar, Bacchetti, . . . , Peters, *Dig Dis Sci* 2013;58(5):1341-1348)

Factors associated with spontaneous HCV clearance in HIV uninfected women

Variable	Univariate OR (95% CI)	*p* value	Multivariate[a] OR (95% CI)	*p* value
Race/ethnicity				
Caucasian	Ref		Ref	
African American	**0.24 (0.09-0.67)**	**0.006**	**0.26 (0.09-0.79)**	**0.017**
Hispanic	1.47 (0.57-3.8)	0.42	1.45 (0.56-3.8)	0.45
African American versus Hispanic	**0.16 (0.07-0.40)**	**<0.0001**	**0.18 (0.07-0.48)**	**0.001**
Age	**0.94 (0.89-0.99)**	**0.015**	0.97 (0.91-1.03)	0.29
History of alcohol use	0.67 (0.24-1.91)	0.46	0.85 (0.28-2.6)	0.78
History of IVDU	0.73 (0.28-1.91)	0.52	0.46 (0.14-1.49)	0.20
History of blood transfusion	0.85 (0.29-2.5)	0.76	1.05 (0.29-3.8)	0.95
History of >10 lifetime sexual partners	1.39 (0.67-2.9)	0.38	1.01 (0.45-2.3)	0.98

The bold results reflect those that reach statistical significance with *p* values <0.05

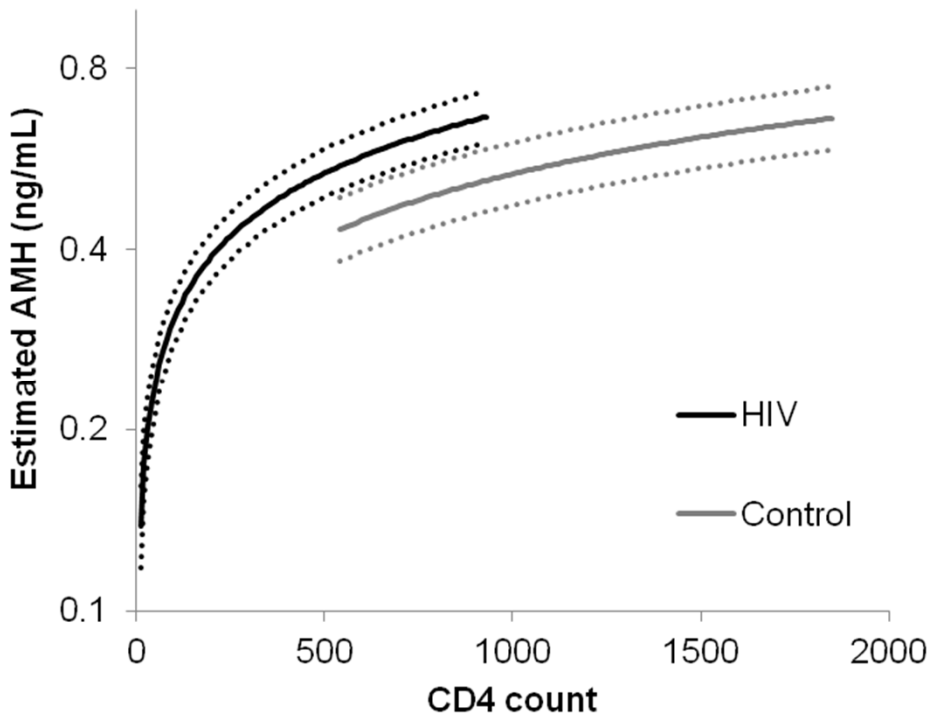
[a]Adjusted for age, alcohol use and race/ethnicity

WIHS

Impact of CD4+ Lymphocytes and HIV Infection on AMH

(Scherzer, Bacchetti, . . . , Greenblatt, *Am J Reprod Immunol* 2015;73(3):273-284)

Estimated Anti-Mullerian Hormone levels at age 40 by HIV status and CD4 count

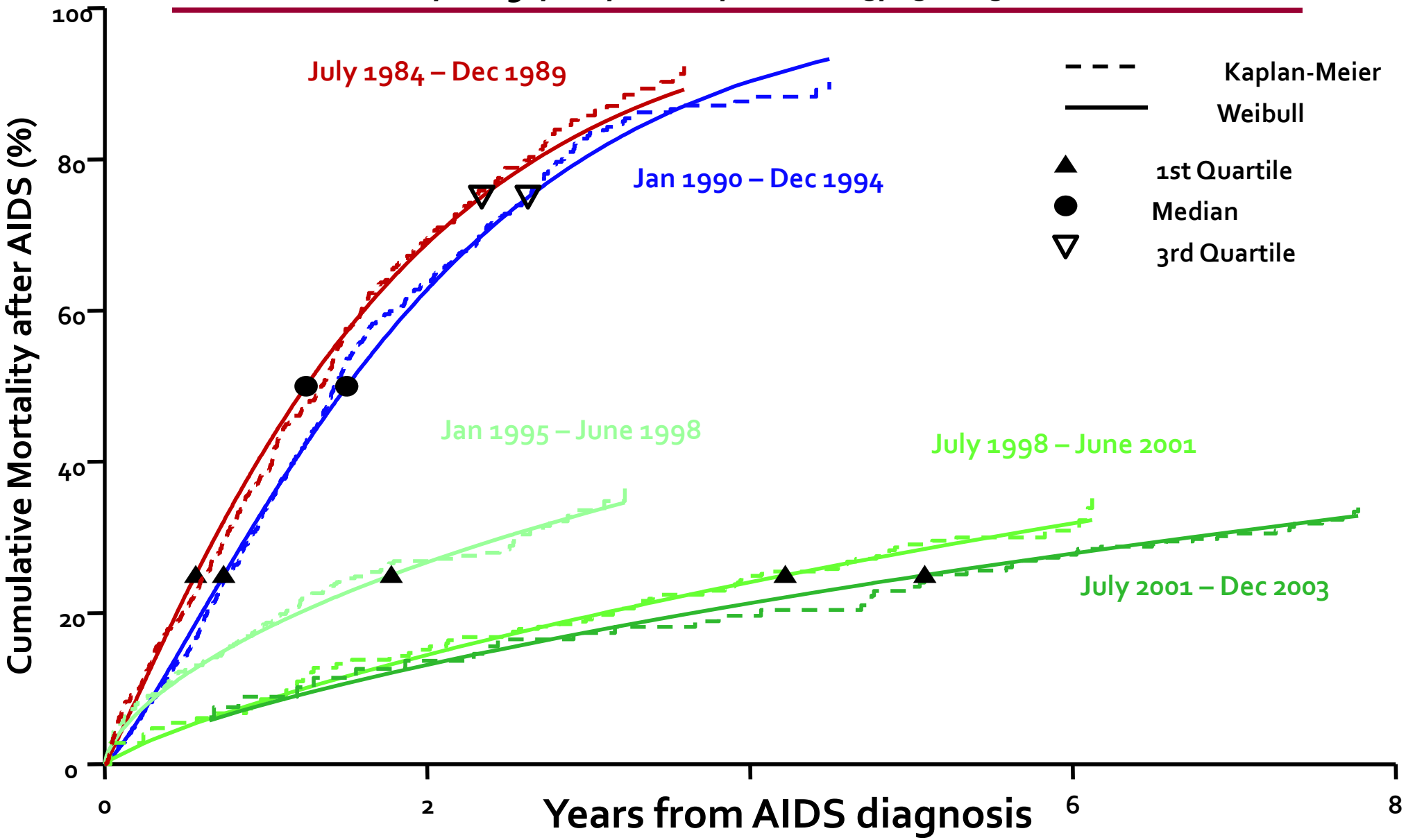


- Solid lines denote estimated level of AMH from linear piecewise model including left-censoring, with random intercept and slope to handle repeated AMH measures within a subject.
- CD4 ranges shown extend from 5th to 95th percentile for HIV-infected and uninfected participants separately.
- Dotted lines indicate 95% confidence bands. Model controls for age, HIV status, and CD4 count.

WIHS

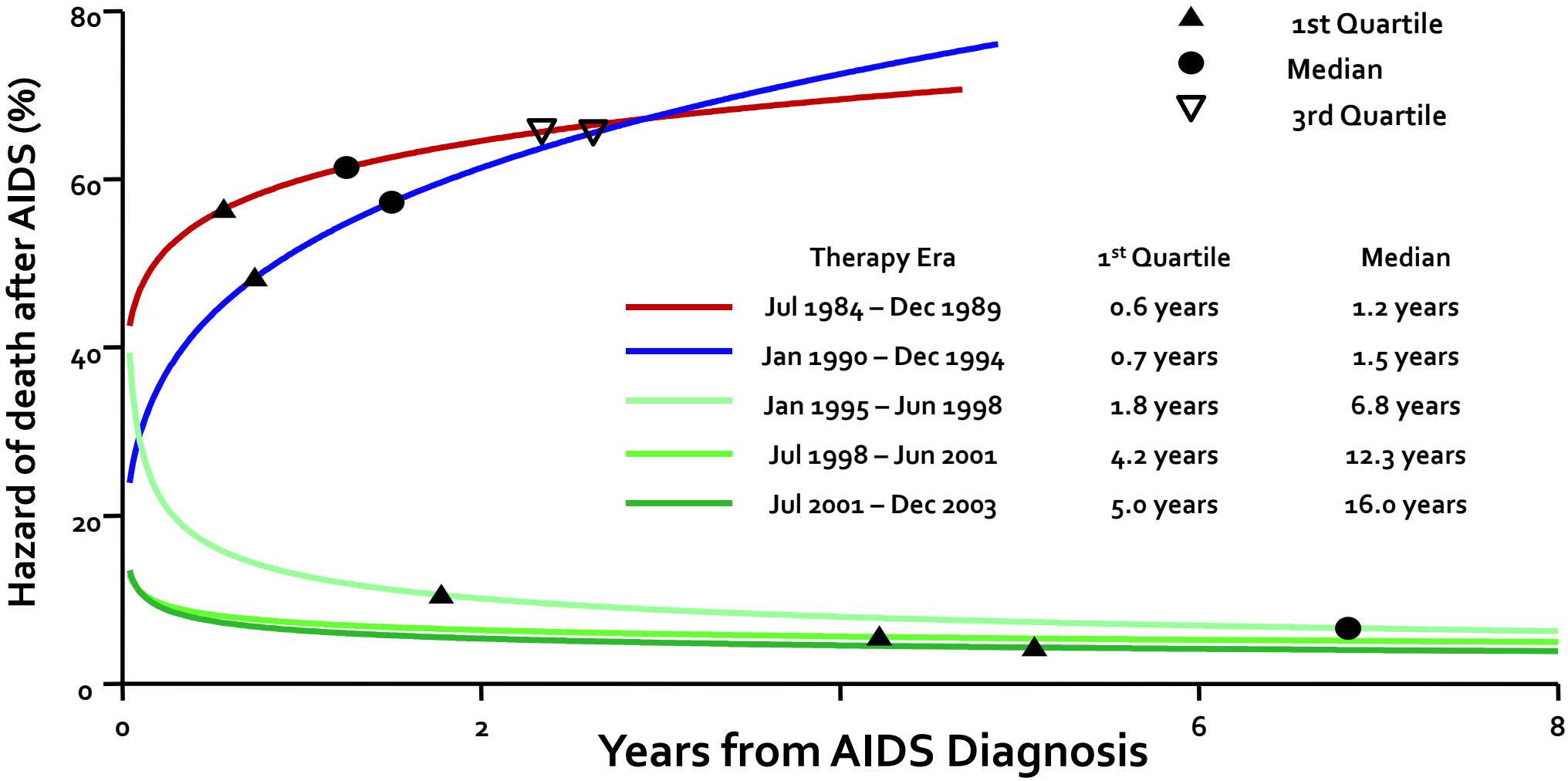
Cumulative Mortality after AIDS

(Schneider, Gange, . . . , Muñoz, *AIDS* 2005; 19:2009-2018)



Hazard of Death after AIDS

(Schneider, Gange, . . . , Muñoz, *AIDS* 2005; 19:2009-2018)



Psychosocial and Demographic Correlates of Gender-based Violence History

(Schwartz, Weber, . . . , Cohen, *AIDS Patient Care and STDs* 2014;28(5):260-267)

	No GBV history (n=308)	GBV history (n=427)	p value
Probable depression*	23%	35%	0.001
Low consideration of future consequences	22%	18%	0.275
High hopelessness	20%	22%	0.456
Low self esteem	3%	6%	0.104
Problem drinking	10%	14%	0.136
Non-injection drug use*	8%	23%	0.000
History of injection drug use*	7%	18%	0.000
Married/living with partner	31%	31%	0.969
Age 45 and older*	43%	53%	0.008
Did not graduate high school	35%	31%	0.226
Unemployed*	51%	62%	0.006
Low income*	47%	57%	0.012
Born outside U.S.*	30%	14%	0.000
Race			
White	8%	11%	0.382
African American	76%	73%	
Hispanic	12%	13%	
Other	4%	3%	
HIV-infected	71%	73%	0.515

* $p<0.05$

Psychosocial and Demographic Correlates of Childhood Sexual Abuse History

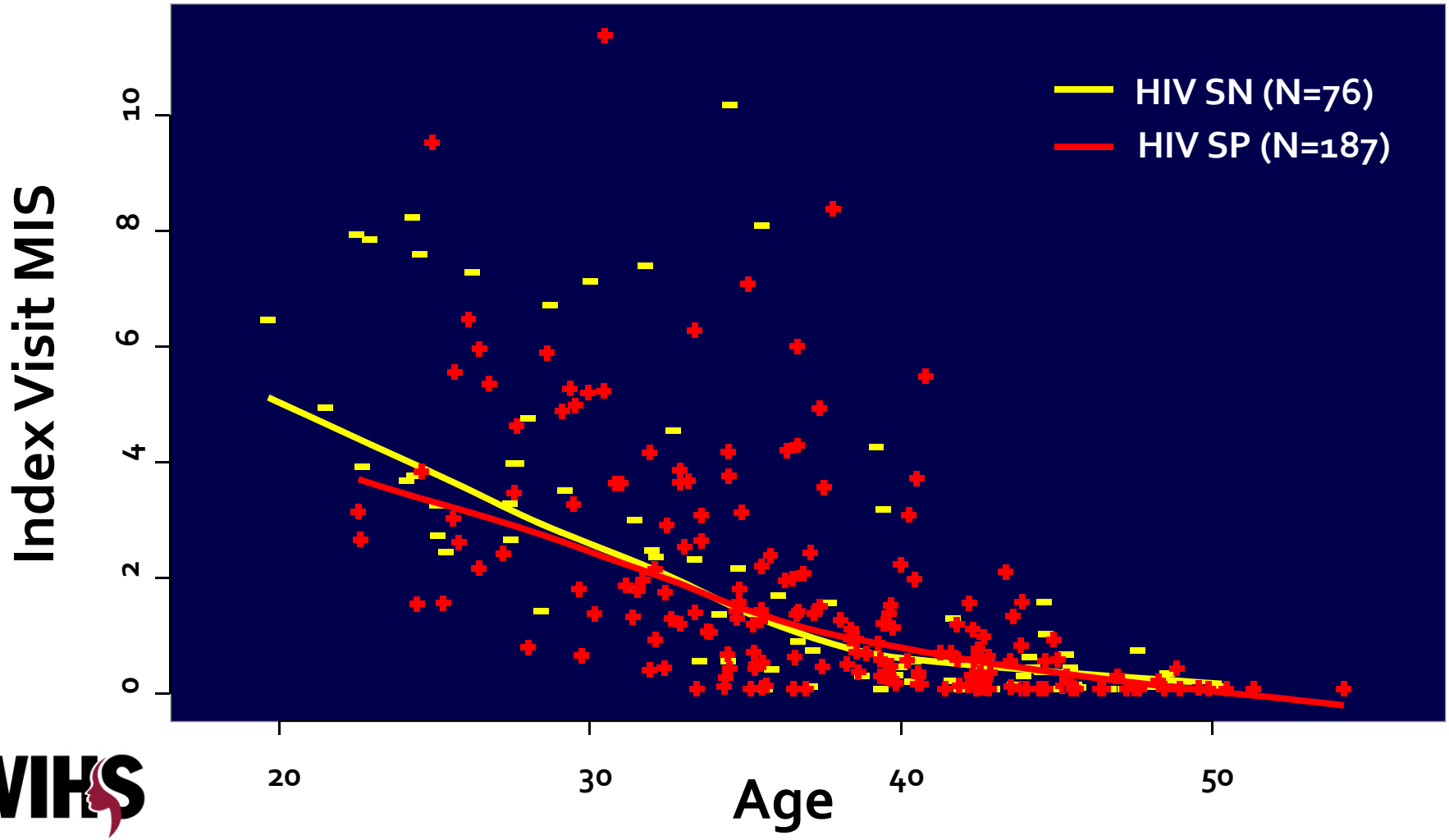
(Schwartz, Weber, . . . , Cohen, *AIDS Patient Care and STDs* 2014;28(5):260-267)

	No CSA history (n=544)	CSA history (n=154)	p value
Probable depression*	27%	37%	0.016
Low consideration of future consequences	18%	24%	0.110
High hopelessness	19%	28%	0.019
Low self esteem	4%	7%	0.198
Problem drinking	11%	16%	0.163
Non-injection drug use*	14%	27%	0.000
History of injection drug use*	9%	27%	0.000
Married/living with partner	32%	38%	0.500
Age 45 and older*	45%	64%	0.000
Did not graduate high school	33%	29%	0.325
Unemployed*	57%	56%	0.832
Low income*	52%	53%	0.843
Born outside U.S.*	25%	7%	0.000
Race			
White	7%	21%	0.000
African American	77%	68%	
Hispanic	12%	8%	
Other	3%	3%	
HIV-infected	71%	76%	0.207

* $p<0.05$

Mullerian Inhibiting Substance (MIS) by Age and HIV Status in WIHS

(Seifer, Golub, . . . , Greenblatt, *Fertil Steril* 2007; 88(6):1645-1652)



WIHS

Independent Predictors of MIS/AMH in WIHS

(Seifer, Golub, . . . , Greenblatt, *Fertil Steril* 2009; 92:1674-1678)

	Percent Difference*	95% CI	*P*-value
Race (vs. White)			
Black	-25.2	-43.0, -1.9	.037
Hispanic	-24.6	-43.9, 1.5	.063
Age (years)	-22.3	-23.3, -21.2	<.001
BMI (per unit increase)	0.5	-0.6, 1.7	.347
Smoking (vs. never)			
Former	-6.1	-25.2, 17.7	.583
Current	-4.7	-22.7, 17.6	.655
HIV Infected	-17.3	-33.9, 3.4	.097

* From a repeated-measures model with a random intercept for log-transformed MIS incorporating left censoring for undetectable values and adjusted for all factors listed.

WIHS

Live Birth Rates for HIV+ in pre-HAART and HAART Era Cohorts

(Sharma, Feldman, . . . , Minkoff, *Am J Obstet Gyn* 2007; 196:541-541)

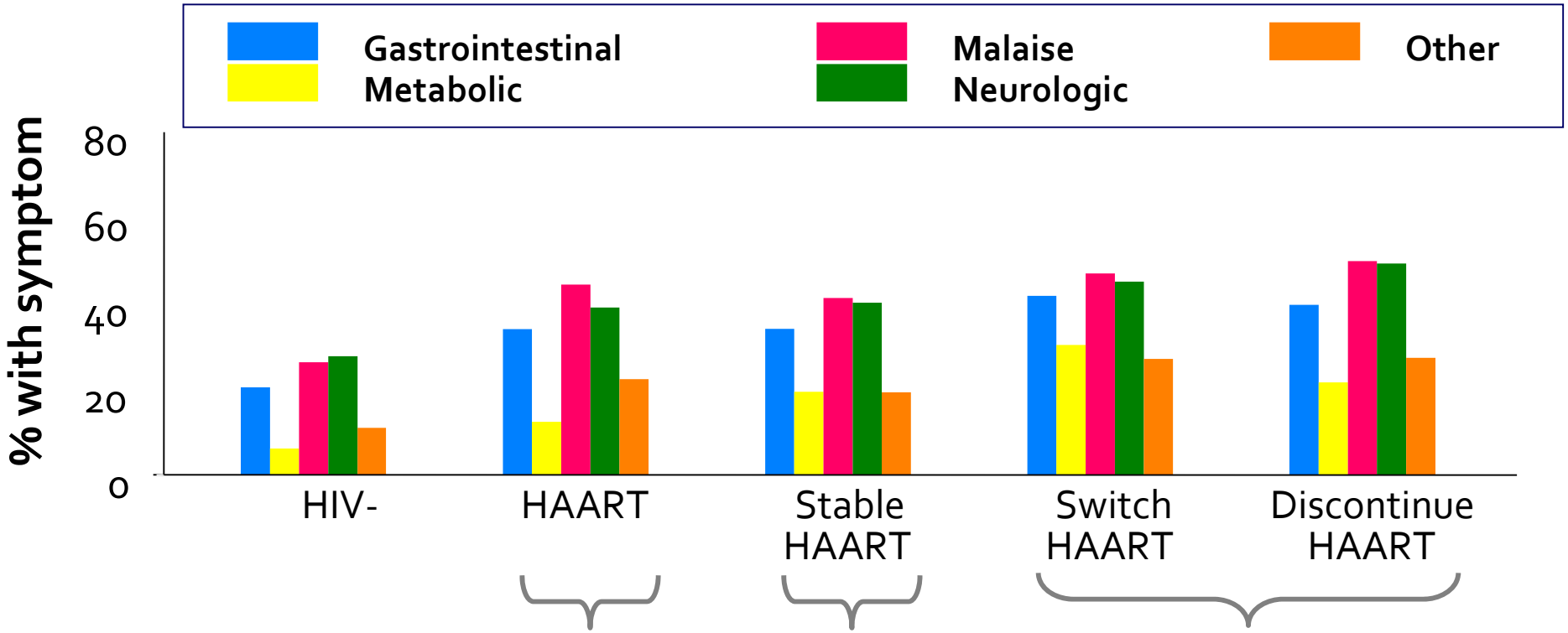
CD4 count at study enrollment	Pre-HAART cohort Live births/1000 person-years	HAART-era cohort Live births/1000 person-years	*P*-value*
Less than 200	42.4	198.5	0.03
200 – 350	53.6	123.9	0.62
More than 350	70.2	142.6	ref

* Adjusted for age at diagnosis in a Poisson regression model.

WIHS

Prevalence of Clinical Symptoms Associated with HAART

(Silverberg, Gore, . . . , Gange, *Clin Infect Dis* 2004; 39:717-724)



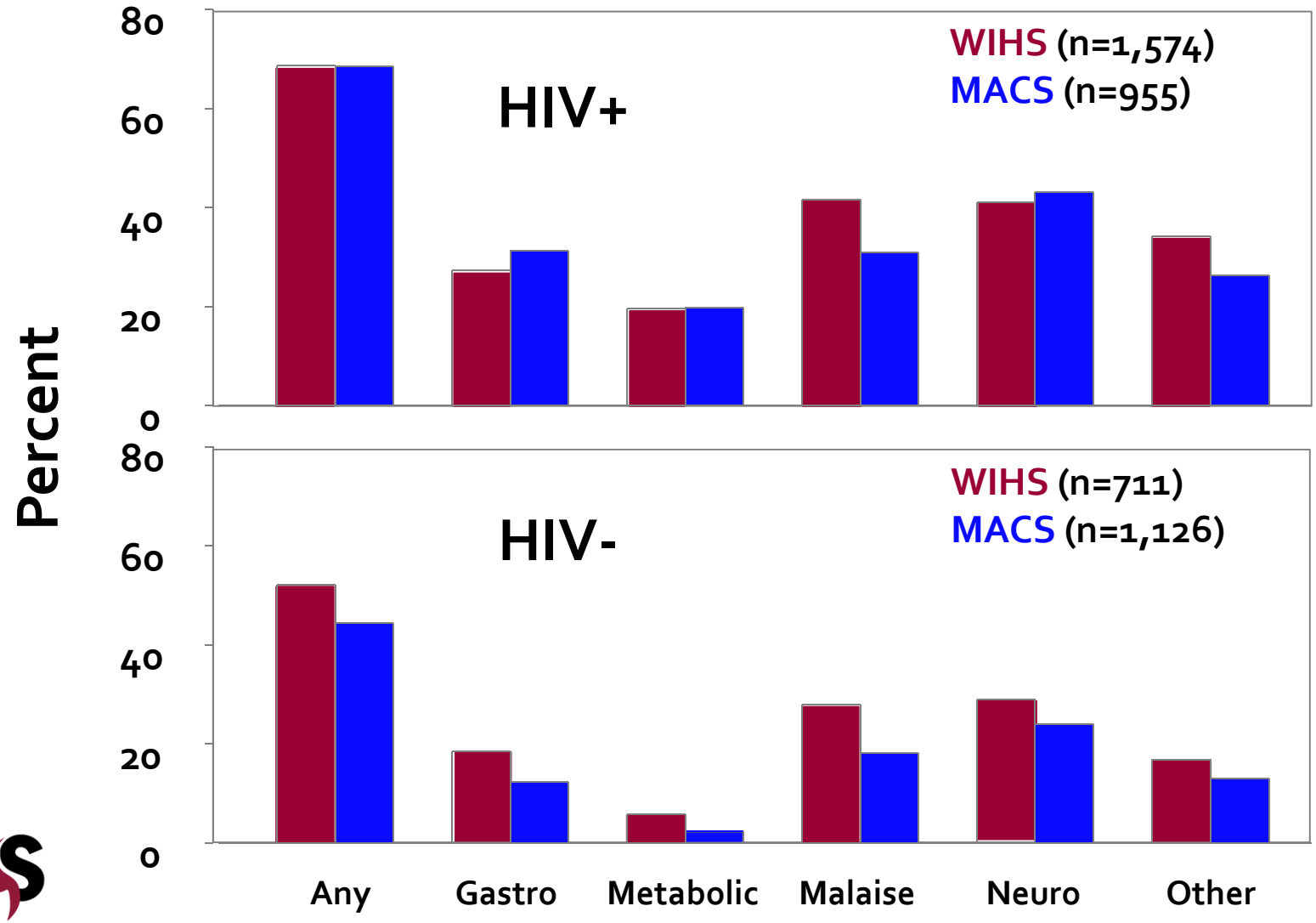
	HAART	Stable HAART	Switch HAART / Discontinue HAART
OR* for any symptom:	1	0.9	1.4
95% CI:	(reference)	0.7, 1.1	1.1, 1.8

* Adjusted for age, race, BMI, baseline HIV risk, alcohol, CD4+, HIV RNA, AIDS.

WIHS

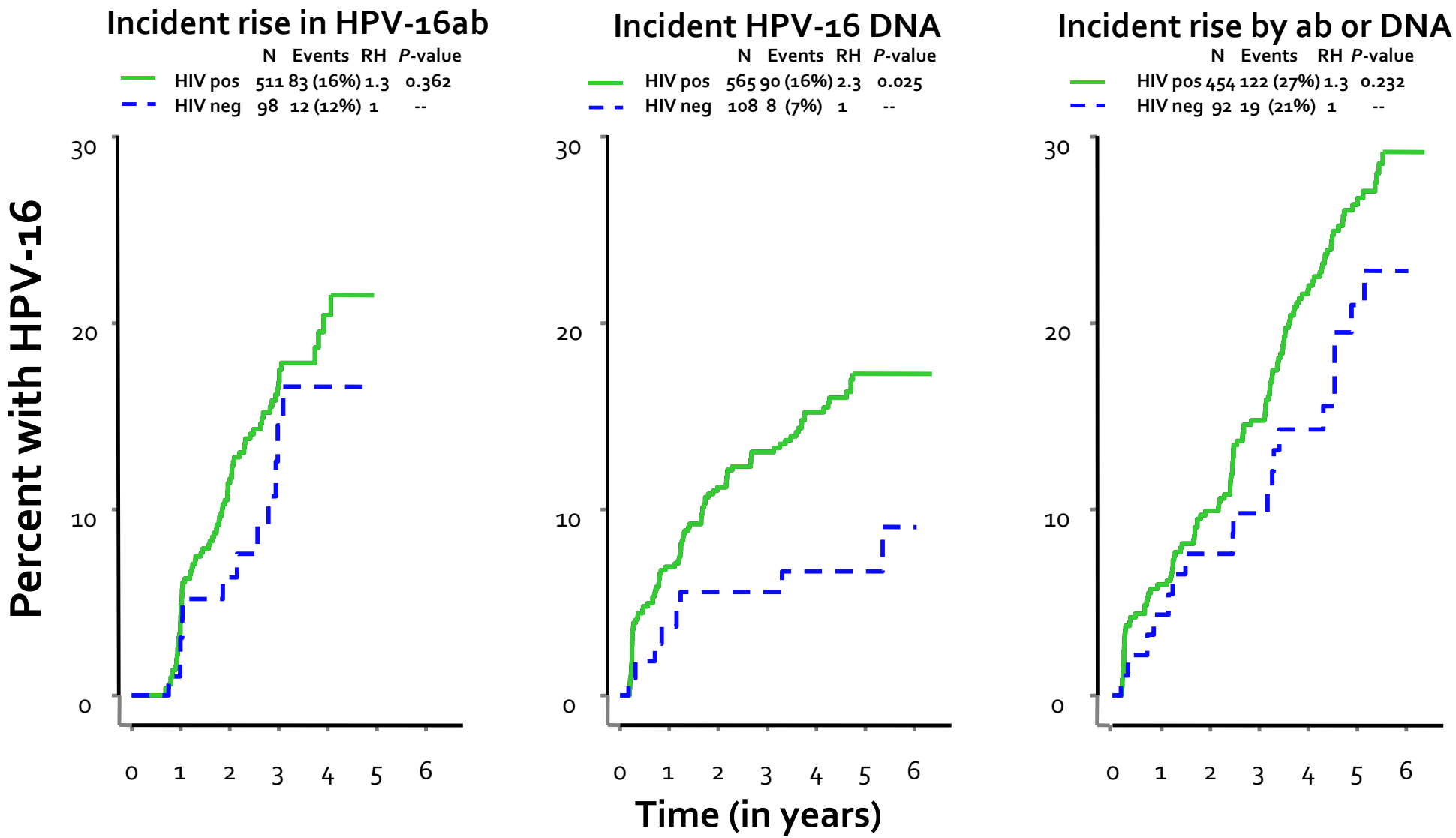
Symptoms Reported by HIV+ and HIV- WIHS and MACS Participants

(Silverberg, Jacobson, . . . , Gange, *J Pain Symptom Manage* 2009; 38:197-207)



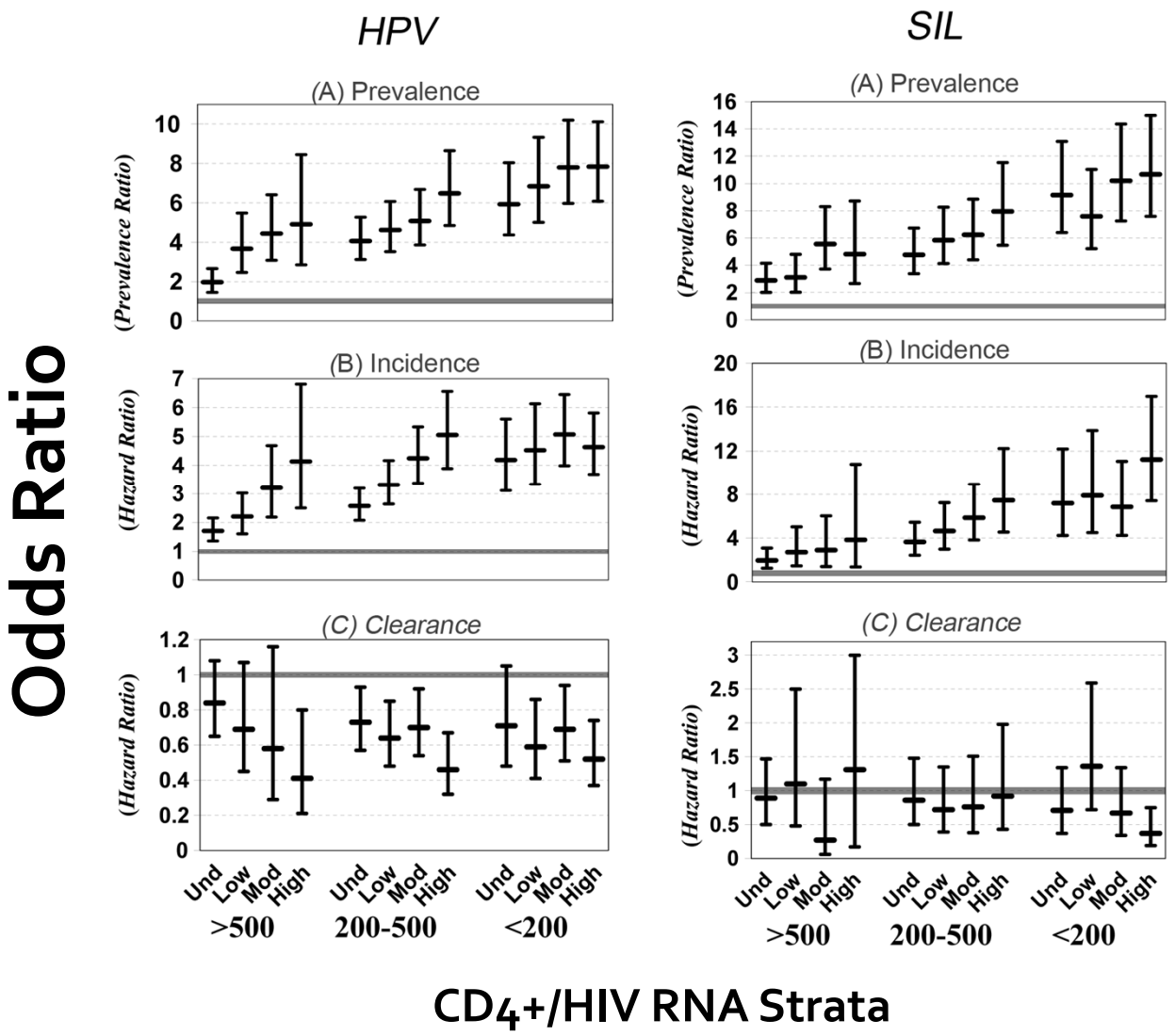
Serological Detection of HPV-16 in HIV+ and HIV- Women

(Silverberg, Schneider, . . . , Viscidi, *Clin Vac Immun* 2006; 13:511-519)



Prevalence, Incidence and Persistence of HPV and Squamous Intraepithelial Lesions by CD4 and HIV RNA

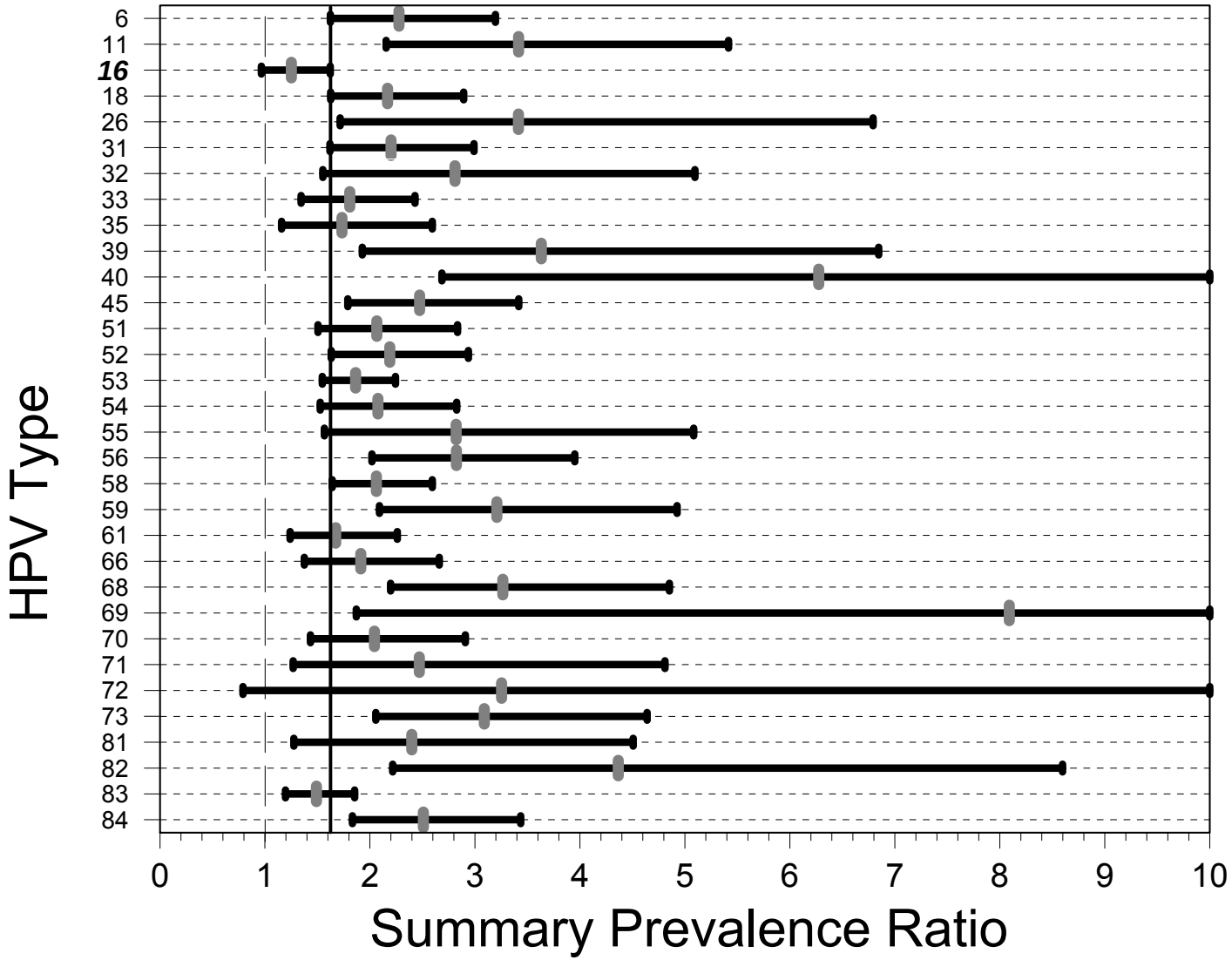
(Strickler, Burk, . . . , Palefsky, *J Natl Cancer Inst* 2005; 97:577-586)



WIHS

HPV-16 and Immune Status in HIV+ Women

(Strickler, Palefsky, . . . , Burk, *J Natl Cancer Inst* 2003; 95:1062-1071)



Incidence Rate Ratios of Death at CD4>350 While ART Naive

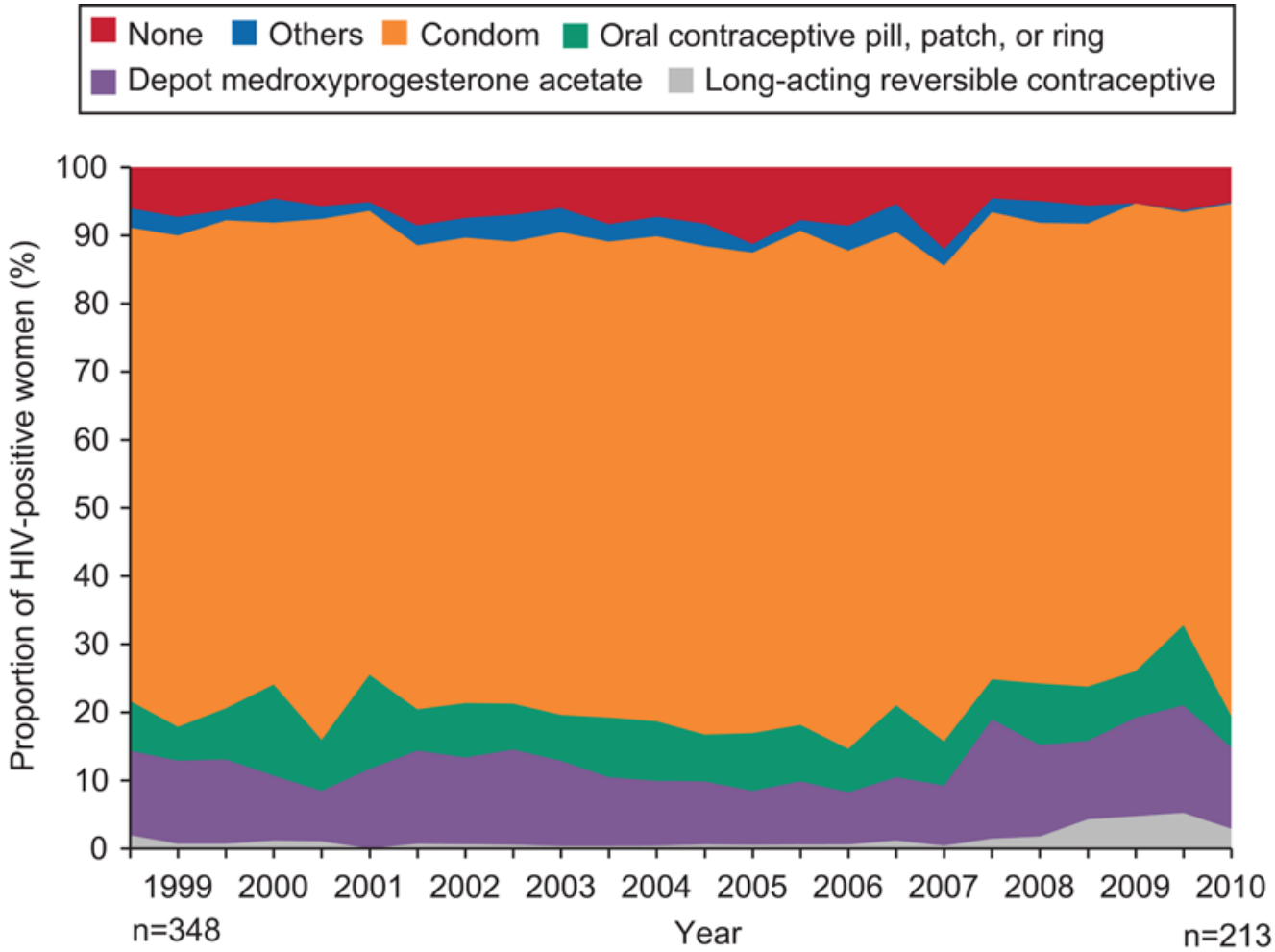
(Study Group on Death Rates at High CD4 Count in Antiretroviral Naïve Patients, *Lancet* 2010; 376:340-345)

	Rate Ratio (95% CI)	*P*-value
CD4 count		
350 – 499	1.00	0.0023
500 – 699	0.77 (0.61 – 0.95)	
≥ 700	0.66 (0.52 – 0.85)	
Sex		
Men	1.00	0.015
Women	0.74 (0.57 – 0.94)	
Risk Group		
MSM	1.00	<0.0001
Heterosexual	1.83 (1.29 – 2.59)	
IDU	5.85 (4.54 – 7.53)	
Other / Unknown	2.97 (1.96 – 4.50)	
Age		
20 – 29	1.00	<0.0001
30 – 39	1.41 (1.08 – 1.83)	
40 – 49	2.09 (1.55 – 2.82)	
50 – 59	3.24 (2.17 – 4.83)	

WIHS

Trends in Contraceptive Use among HIV+ Women

(Sun, Peipert, . . . , Massad, *Obstet Gynecol* 2012;120(4):783-790)



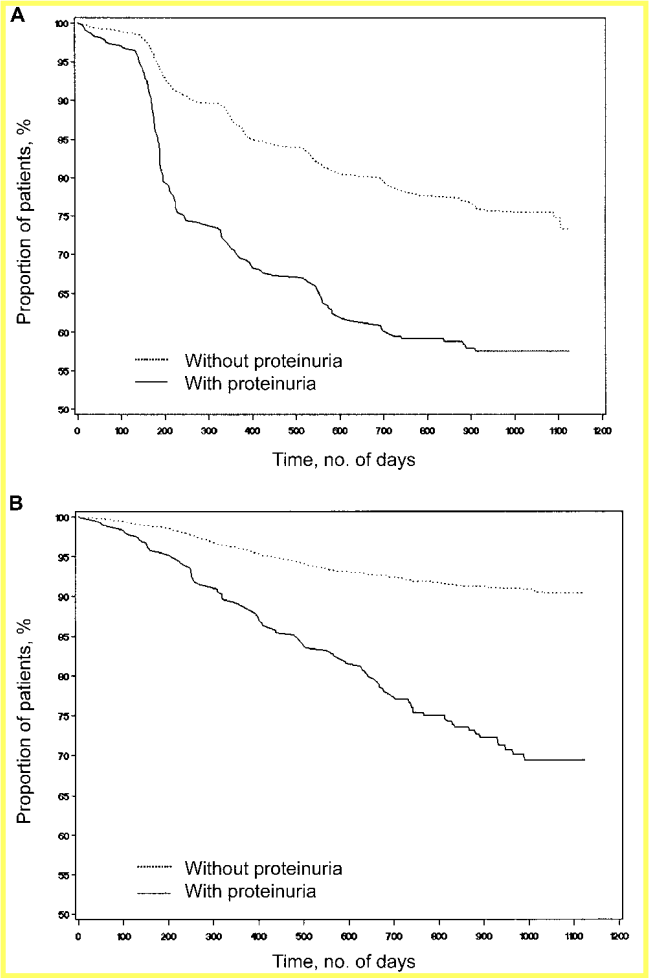
WIHS

Association between Renal Disease and Outcomes among HIV+ Receiving or Not Receiving HAART

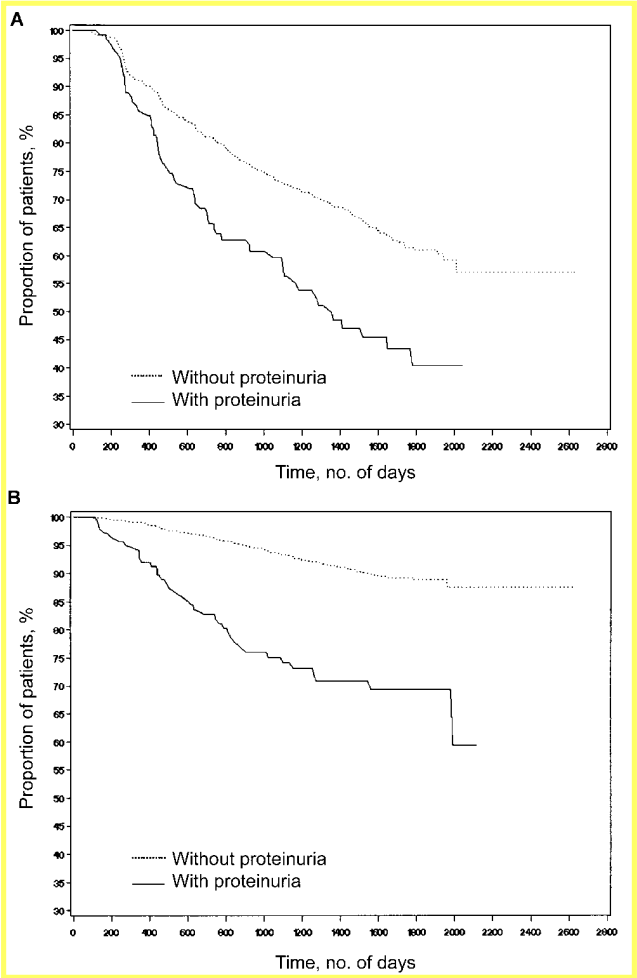
(Szczech, Hoover, . . . , Anastos, *Clin Infect Dis* 2004; 39:1199–1206)

Time to Death

Time to ADI



Before HAART Era



After HAART Era

Multivariate Predictors of AIDS-Defining Illness and Death, after HAART Initiation

(Szczech, Hoover, . . . , Anastos, *Clin Infect Dis* 2004; 39:1199–1206)

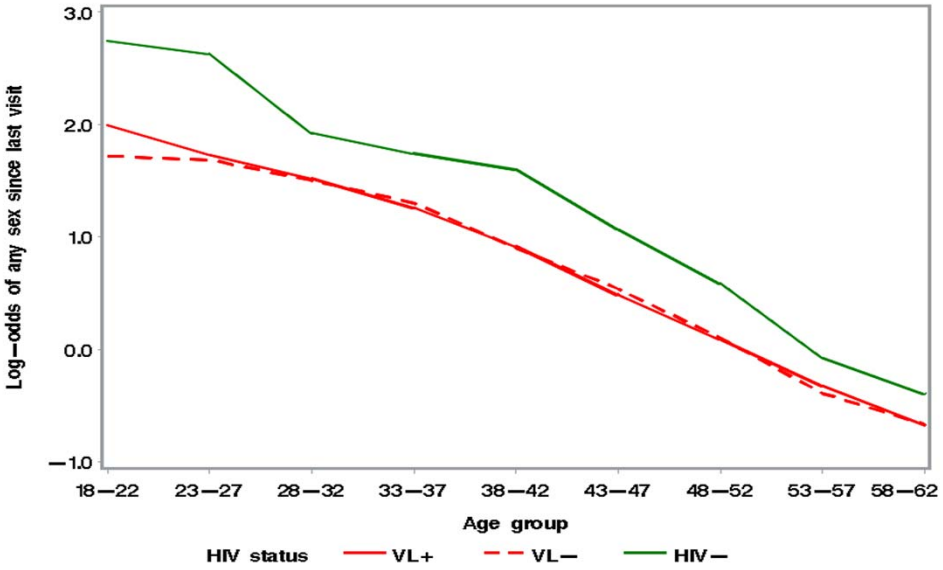
Class of predictor, variable	Hazard Ratio (95% CI)	*P*
Predictor of ADI		
Inverse creatinine level, per 1-dL/mg decrease	1.42 (0.97-2.08)	.07
Prior history of ADI	2.29 (1.75-2.99)	<.0001
Hepatitis C virus infection	1.58 (1.23-2.04)	.0004
CD4 count, per 100-cells/mL decrease	1.09 (1.02-1.17)	.02
Log viral load[a], per 1-log increase	1.17 (1.03-1.33)	.02
Albumin level, per 1-mg/dL decrease	1.32 (0.98-1.77)	.07
Predictor of Death		
Proteinuria, presence vs. absence	2.21 (1.33-3.67)	.002
CD4 count, per 100-cells/mL decrease	1.36 (1.15-1.60)	.0003
History of hypertension	2.25 (1.37-3.68)	.001
Hepatitis C virus infection	2.13 (1.34-3.39)	.001
Albumin level, per 1-mg/dL decrease	2.04 (1.26-3.29)	.004
Prior history of ADI	1.81 (1.09-3.01)	.02

[a] Log10 HIV RNA copies/mL

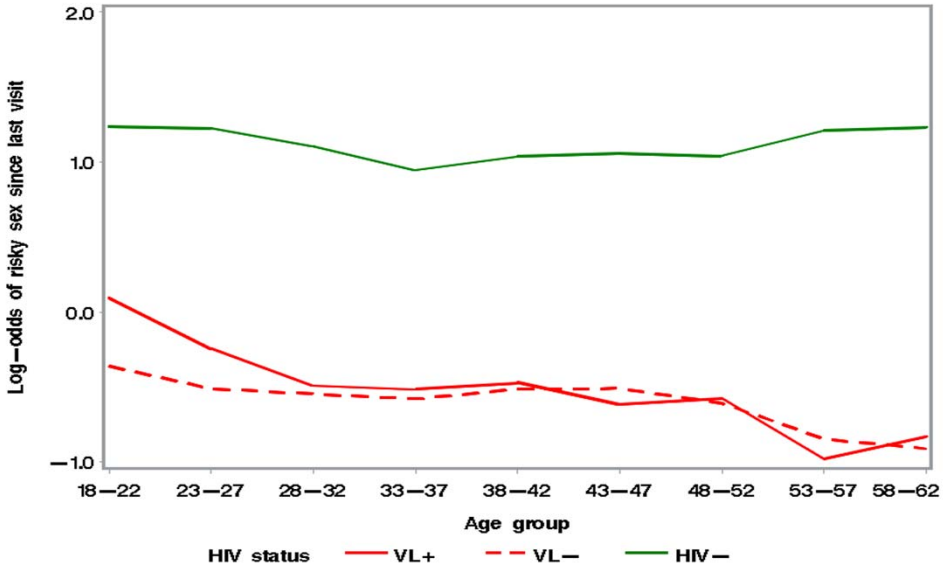
Longitudinal Trends in Sexual Behaviors with Advancing Age and Menopause

(Taylor, Weedon, . . . , Wilson, *AIDS Behav* 2015;19(5):931-940)

Linearity of relationship of age to log-odds of sexual activity (SA)

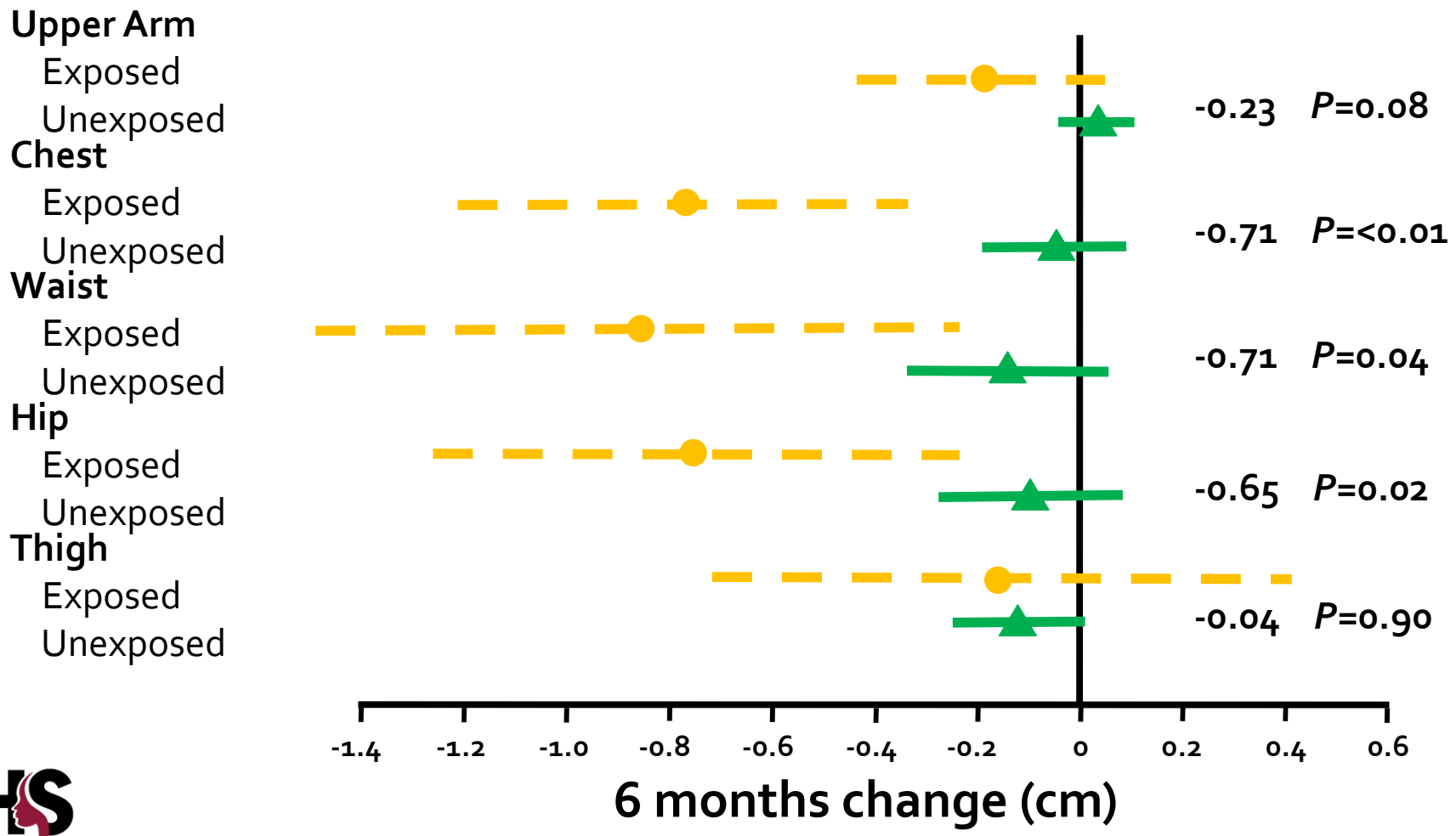


Linearity of relationship of age to log-odds of sexual risk behaviors (UAVI)



6-month Change in Regional Body Circumference for HIV+ Exposed and Unexposed to DDI

(Tien, Barrón, . . . , Cole, *AIDS Patient Care STDs*, 2007; 21:397-305)



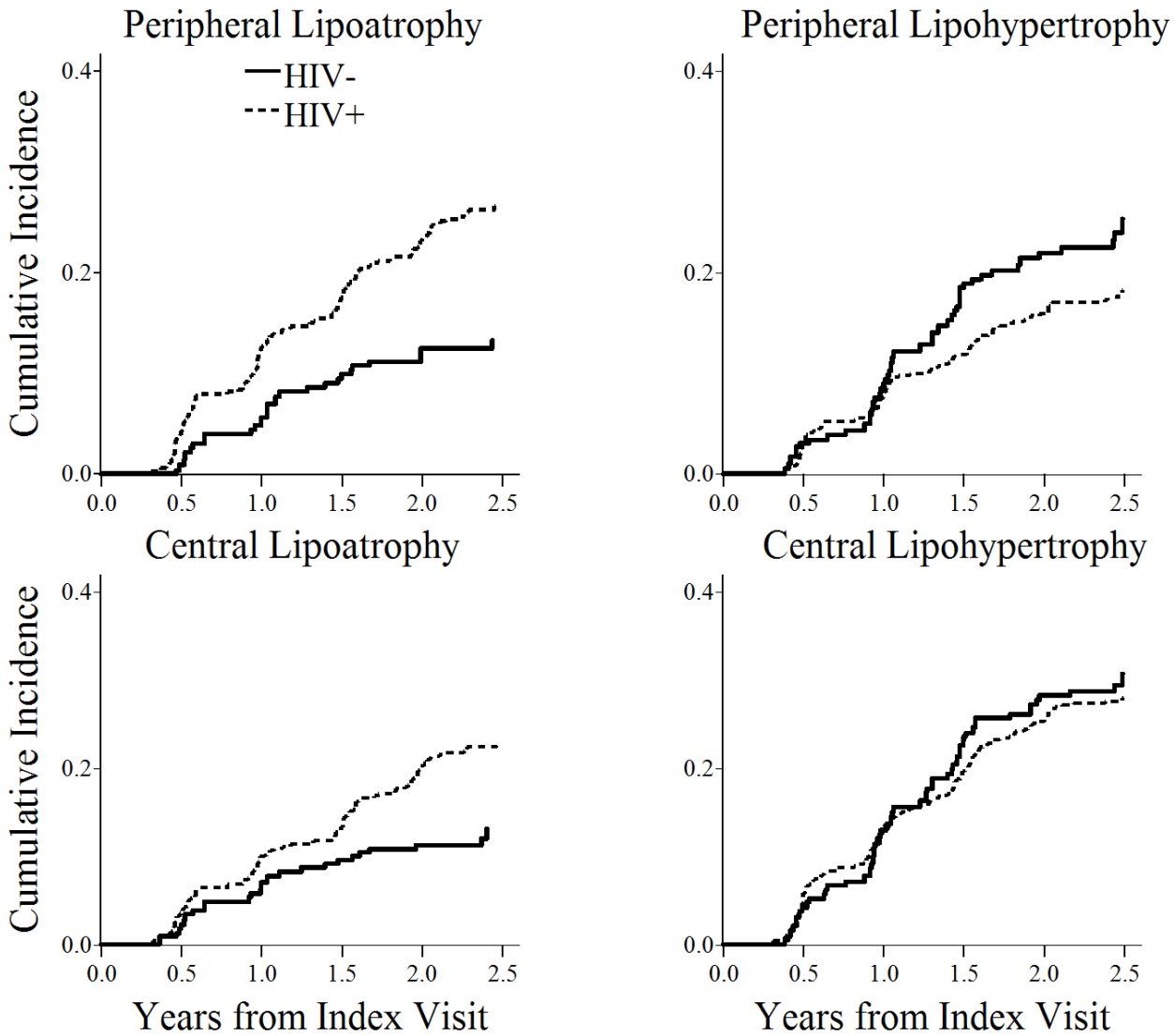
WIHS

Incident Lipoatrophy and Lipohypertrophy

(Tien, Cole, . . . , Grunfeld, *J Acquir Immune Defic Syndr* 2003; 34:461- 466)

RH = 2.9
95% CI, 1.4 – 3.2

RH = 0.8
95% CI, 0.6 – 1.1



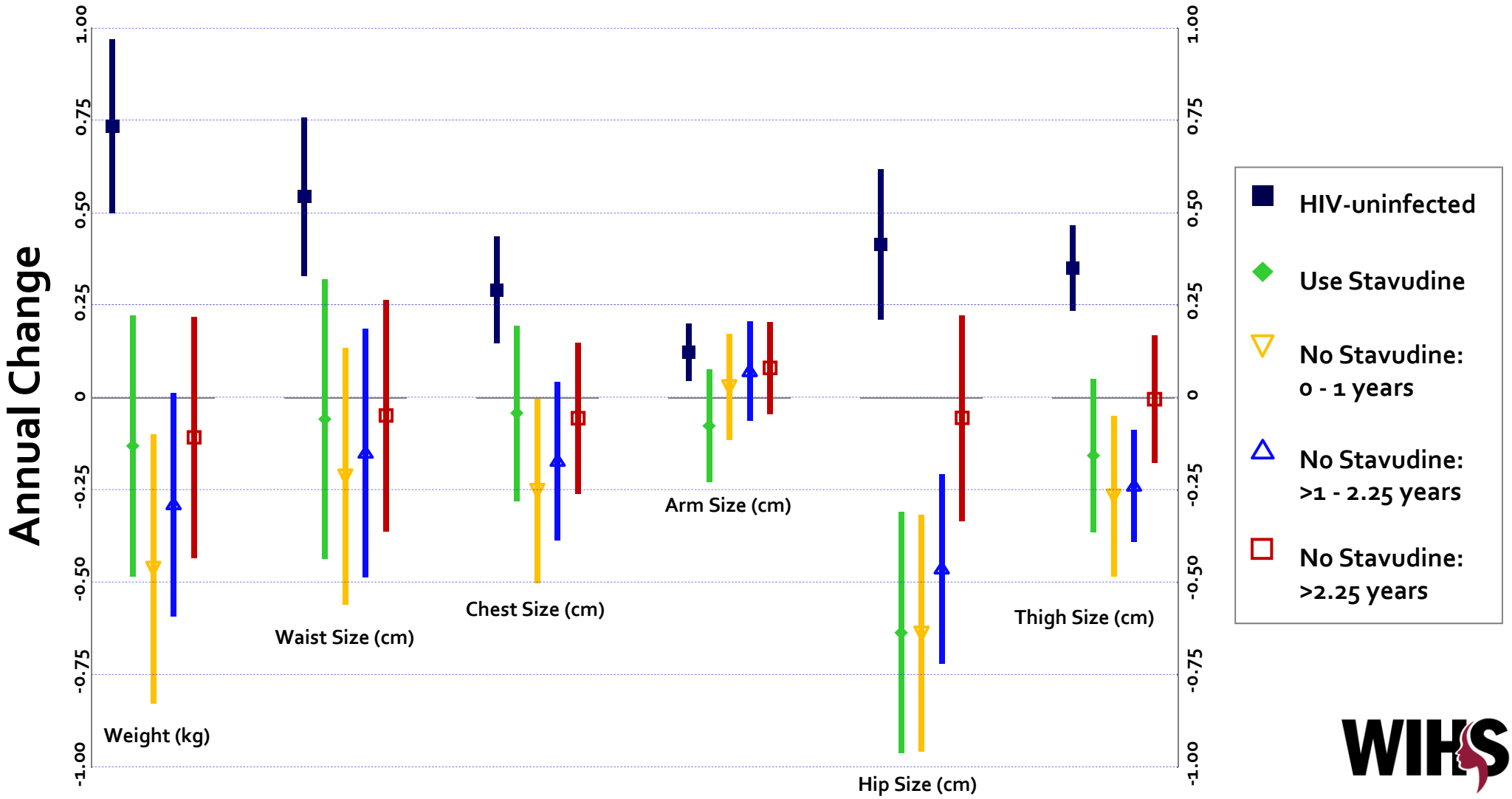
RH = 1.8
95% CI, 1.2 – 2.8

RH = 1.0
95% CI, 0.7 – 1.3

WIHS

Annual Changes in Body Weight and Regional Anthropometry at Five Body Sites

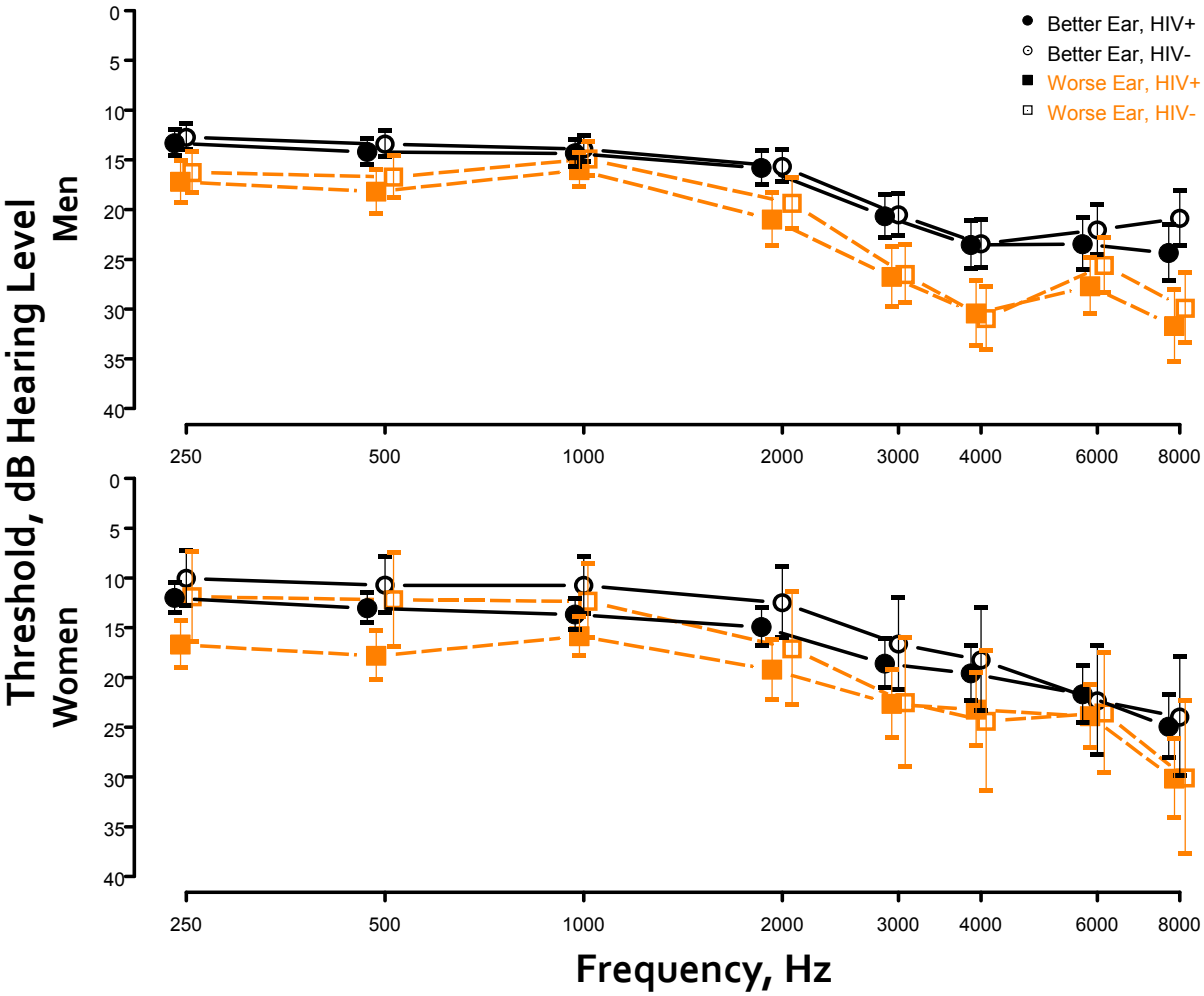
(Tien, Schneider, . . . , Brown, *J Acquir Immune Defic Syndr* 2007; 44:43-48)



Hearing Loss Among HIV+ and HIV-Men and Women

(Torre III, Hoffman,…,Plankey, *JAMA Otolaryngol Head Neck Surg* 2015 Mar; 141(3):202-10)

Age-Adjusted Means and Standard Errors of Pure-Tune Threshold Data for Men and Women



Estimated Ratios of Pure-Tone Averages (PTAs) for HIV+ People to Those for HIV– People, for High and Low Frequencies and Better and Worse Ear

Condition	Ratio of PTA for HIV+ vs HIV- (95% CI)*	P-Value**
High frequency x worse ear	1.12 (0.97-1.29)	0.12
High frequency x better ear	1.18 (1.02-1.36)	0.02
Low frequency x worse ear	1.11 (0.98-1.25)	0.09
Low frequency x better ear	1.12 (1.00-1.26)	0.05

* Adjusted for age, sex, race and occupational and nonoccupational noise exposure

** P-values for comparing the estimated ratios to the null value of 1

Baseline Characteristics by eGFR and HCV Status

(Tsui, Vittinghoff, . . . , Szczech, *Am J Kidney Dis* 2009; 54:43-50)

	eGFR ≥ 60 mL/min/1.73 m²			eGFR < 60 mL/min/1.73 m²		
	HCV+ (N=1,652)	HCV- (N=852)	*P*	HCV+ (N=87)	HCV- (N=93)	*P*
Age (y)	33 ± 8	39 ± 6	<0.001	39 ± 9	42 ± 7	0.008
African American	908 (55)	513 (60)	0.01	31 (36)	44 (47)	0.1
Non-HS graduate	580 (35)	374 (44)	<0.001	27 (31)	37 (40)	0.2
Income ≤$12,000/y	868 (54)	595 (72)	<0.001	45 (52)	65 (71)	0.009
IDU	79 (5)	707 (83)	<0.001	7 (8)	80 (86)	<0.001
Any drug use	424 (26)	437 (51)	<0.001	21 (24)	49 (53)	<0.01
Diabetes	64 (4)	42 (5)	0.2	8 (9)	9 (10)	0.9
Hypertension	166 (10)	180 (21)	<0.001	29 (33)	36 (39)	0.5
Systolic BP (mm Hg)	114 ± 14	117 ± 17	<0.001	122 ± 21	122 ± 22	0.9
Diastolic BP (mm Hg)	73 ± 10	76 ± 12	<0.001	78 ± 13	80 ± 13	0.2
HBV sAg+	42 (3)	30 (4)	0.2	2 (2)	2 (2)	0.9
AST (IU/L)	31 ± 32	58 ± 69	<0.001	34 ± 24	58 ± 56	<0.001
ALT (IU/L)	29 ± 35	47 ± 51	<0.001	30 ± 30	41 ± 42	0.03

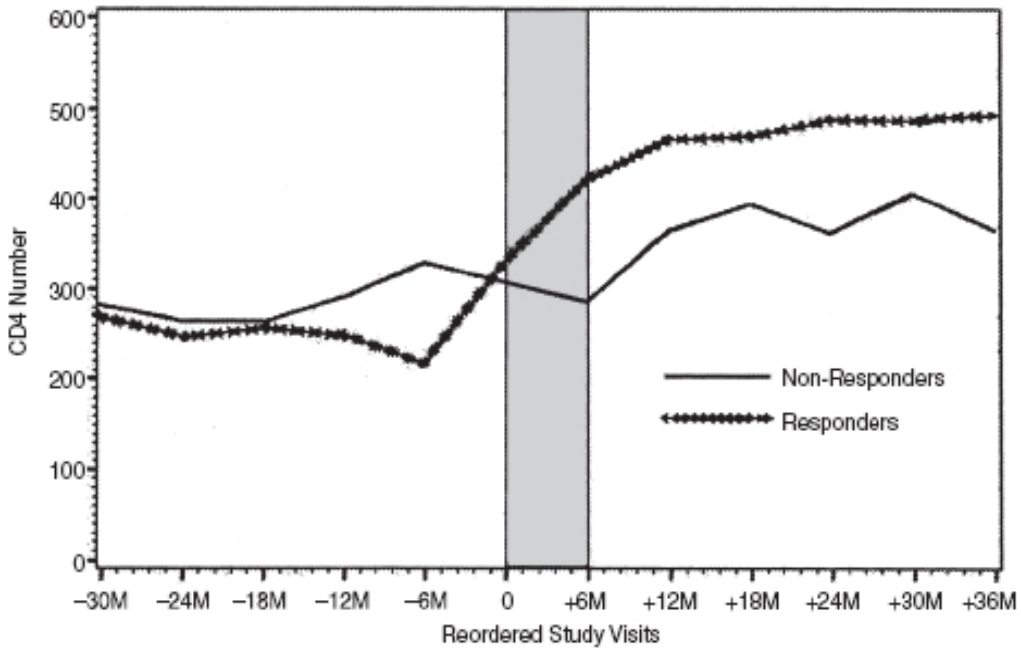
Baseline Characteristics by eGFR and HCV Status

(Tsui, Vittinghoff, . . . , Szczech, *Am J Kidney Dis* 2009; 54:43-50)

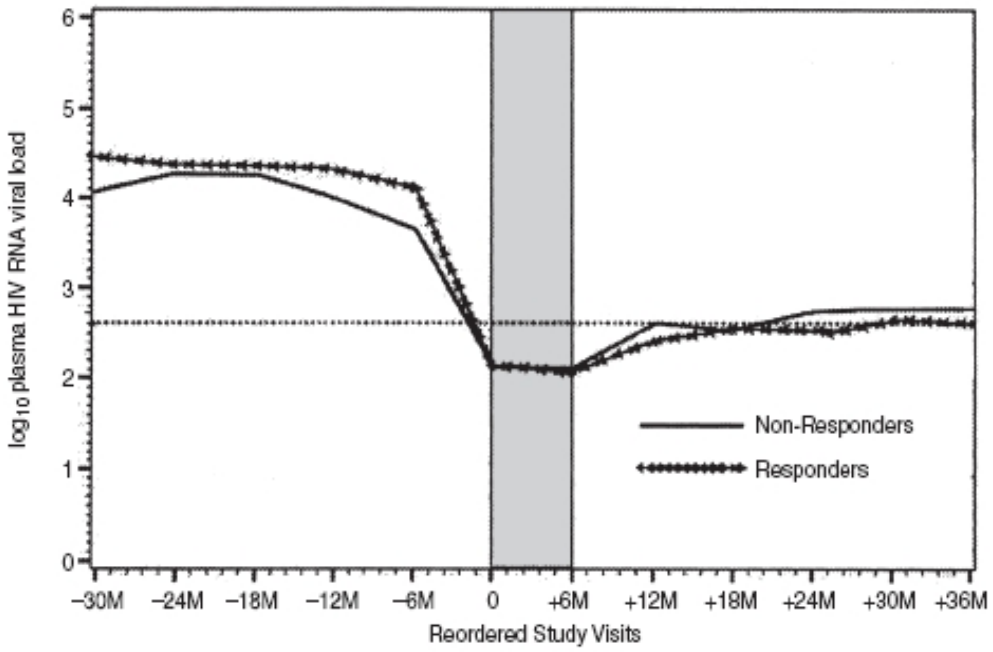
	eGFR ≥ 60 mL/min/1.73 m²			eGFR < 60 mL/min/1.73 m²		
	HCV+ (N=1,652)	HCV- (N=852)	*P*	HCV+ (N=87)	HCV- (N=93)	*P*
CD4 (cells/uL)	421 ± 292	417 ± 332	0.8	344 ± 312	362 ± 276	0.7
Log HIV RNA (cp/mL)	3.9 ± 1.2	4.2 ± 1.1	<0.001	4.5 ± 1.0	4.2 ± 1.1	0.09
AIDS	325 (20)	295 (35)	<0.001	28 (32)	38 (41)	0.2
HAART	330 (20)	51 (6)	<0.001	6 (7)	2 (2)	<0.01
Tenofovir use	21 (1)	3 (0.4)	0.03	0 (0)	0 (0)	--
Foscarnet use	2 (0.1)	0 (0)	0.3	0 (0)	0 (0)	--
Indinavir use	17 (1)	6 (0.7)	0.4	1 (1)	2 (2)	0.6
Acyclovir use	137 (8)	76 (9)	0.6	12 (14)	5 (5)	0.06
Gancyclovir use	3 (0.2)	1 (0.1)	0.7	0 (0)	0 (0)	--
TMP/SMZ use	528 (32)	375 (44)	<0.001	41 (48)	54 (59)	0.1
IV Pentamidine use	12 (0.7)	8 (0.9)	0.6	2 (2)	0 (0)	0.1
ACE inhibitor use	14 (0.7)	3 (0.4)	0.3	1 (1)	2 (3)	0.5

Factors Associated with Poor Immunologic Response to Virologic Suppression

(Vaamonde, Hoover, . . . , Glesby, *AIDS Res Hum Retroviruses* 2006; 22:222-231)



	−30M	−24M	−18M	−12M	−6M	0	+6M	+12M	+18M	+24M	+30M	+36M
No. NR	26	31	37	38	38	38	38	38	36	37	35	35
No. R	71	96	109	114	115	115	115	109	102	95	90	82



	−30M	−24M	−18M	−12M	−6M	0	+6M	+12M	+18M	+24M	+30M	+36M
No. NR	26	31	37	38	38	38	38	38	36	37	35	35
No. R	71	96	109	114	115	115	115	109	102	95	90	82

WIHS

HPV-16 Seropositivity and Pap Smear Results in HERS and WIHS

(Viscidi, Ahdieh-Grant, . . . , Miotti, *JID* 2003; 187:194-205)

HPV group, Pap smear finding	WIHS[a] No. of subjects	WIHS[a] % subjects w/ HPV-16 antibodies	HERS[b] No. of subjects	HERS[b] % subjects w/ HPV-16 antibodies
HPV-16 DNA+				
Normal/ASCUS	63	56%	29	52%
LSIL/HSIL	35	60%	25	68%
P	*.67*		*.22*	
HPV-16 DNA-				
Normal/ASCUS	1831	49%	895	53%
LSIL/HSIL	270	60%	126	66%
P	*.001*		*.006*	

[a] Of the 2257 women in WIHS with decisive PCR results, 58 did not have Pap smear results.
[b] Of the 1206 women in HERS with decisive PCR results, 131 did not have Pap smear results.

WIHS

Cause-Specific Life Expectancies After 35 Years of Age for HIV+ and HIV- Individuals Followed Simultaneously in Long-term Cohort Studies, 1984-2008

(Wada, Jacobson, . . . , Muñoz, *Am J Epidemiol* 2013;177(2):116-125)

Estimated Proportions of Mortality, Location Parameters, Scale Parameters, and Median Ages at Death From Weibull Mixture Models Comparing the Pre- and Post-Highly Active Antiretroviral Therapy Eras[a] Among Multicenter AIDS Cohort Study Participants[b], 1984-2008

Mortality Category	Proportion of Mortality, %	95% CI	Location Parameter	95% CI	Scale Parameter	95% CI	Median Age, years[b]
HIV-negative, 1984-2008	N/A	N/A	3.73	3.71, 3.75	0.25	0.24, 0.26	73.1.
Pre-HAART era (reference)							
Non-AIDS mortality	6	5, 8	2.84	2.63, 3.04	0.53	0.41, 0.66	49.0
AIDS-mortaltiy	94	92, 95	2.34	2.29, 2.40	0.83	0.79, 0.87	42.7
HAART era							
Non-AIDS mortality	53*	48, 59	3.57*	3.52, 3.62	0.37*	0.34, 0.40	66.0*
AIDS-mortaltiy	47*	41, 52	2.86*	2.70, 3.01	0.75	0.68, 0.83	48.2*

Abbreviations: AIDS, acquired immune deficiency syndrome; CI, confidence interval; HAART, highly active antiretroviral therapy; HIV, human immunodeficiency virus; MACS, Mulitcenter AIDS Cohort Study; N/A, not applicable.

* $P < 0.05$ for difference relative to pre-HAART era

[a]Pre-HAART era: 1984-1995; HAART era: 1996-2008

[b]Time origin is age 35 years. For HIV-negative individuals, survival times were modeled as Weibull (β, σ). For HIV-positive individuals, survival times were modeled as a mixture with the proportion who died of non-AIDS causes (π) as Weibull (location $(\beta)_1$, scale $(\sigma)_1$) and the complement ($1 - \pi$) who died of AIDS as Weibull (β_2, σ_2)

WIHS

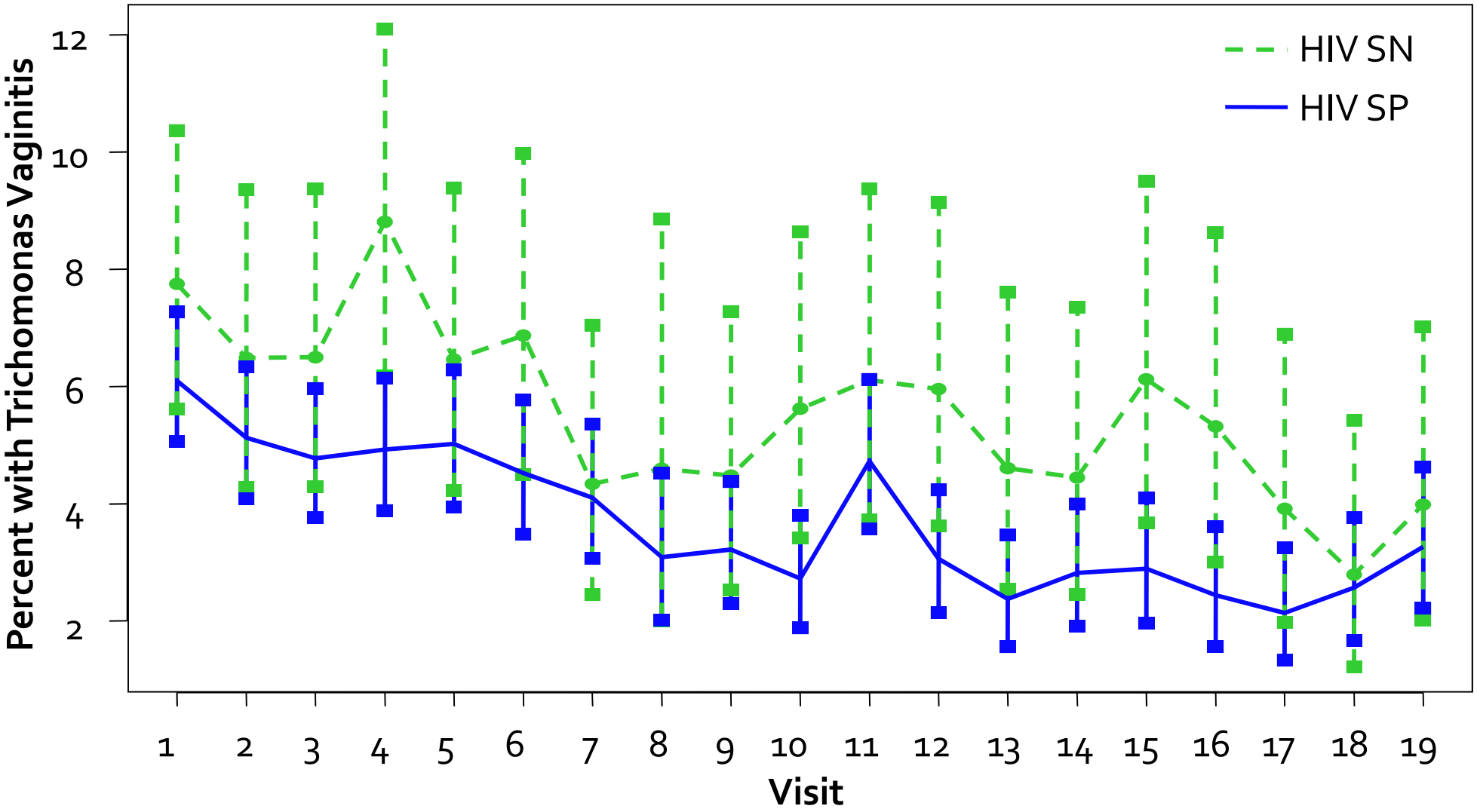
Factors Associated with Incident HPV

(Watts, Fazari, . . . , Strickler, *JID* 2005; 191:1129-1139)

Factor	Adjusted Odds Ratio
# of current male partners (Reference = No partners)	
One	1.31 (1.14-1.50)
More than one	1.59 (1.35-1.88)
Current smoking (Reference = No smoking)	1.96 (1.75-2.20)
HIV / CD4+ cell count (Reference = HIV-negative)	
HIV+ and $CD4^+ > 500$ cells/mm^3	2.12 (1.73-2.60)
HIV+ and $500 \geq CD4^+ > 200$ cells/mm^3	3.61 (3.01-4.32)
HIV+ and $CD4^+ \leq 200$ cells/mm^3	5.19 (4.30-6.26)
Vaginal Gram stain (Reference = Normal)	
Intermediate	1.23 (1.07-1.41)
Bacterial vaginosis	1.41 (1.25-1.59)
Trichomonas vaginalis	1.36 (1.14-1.62)

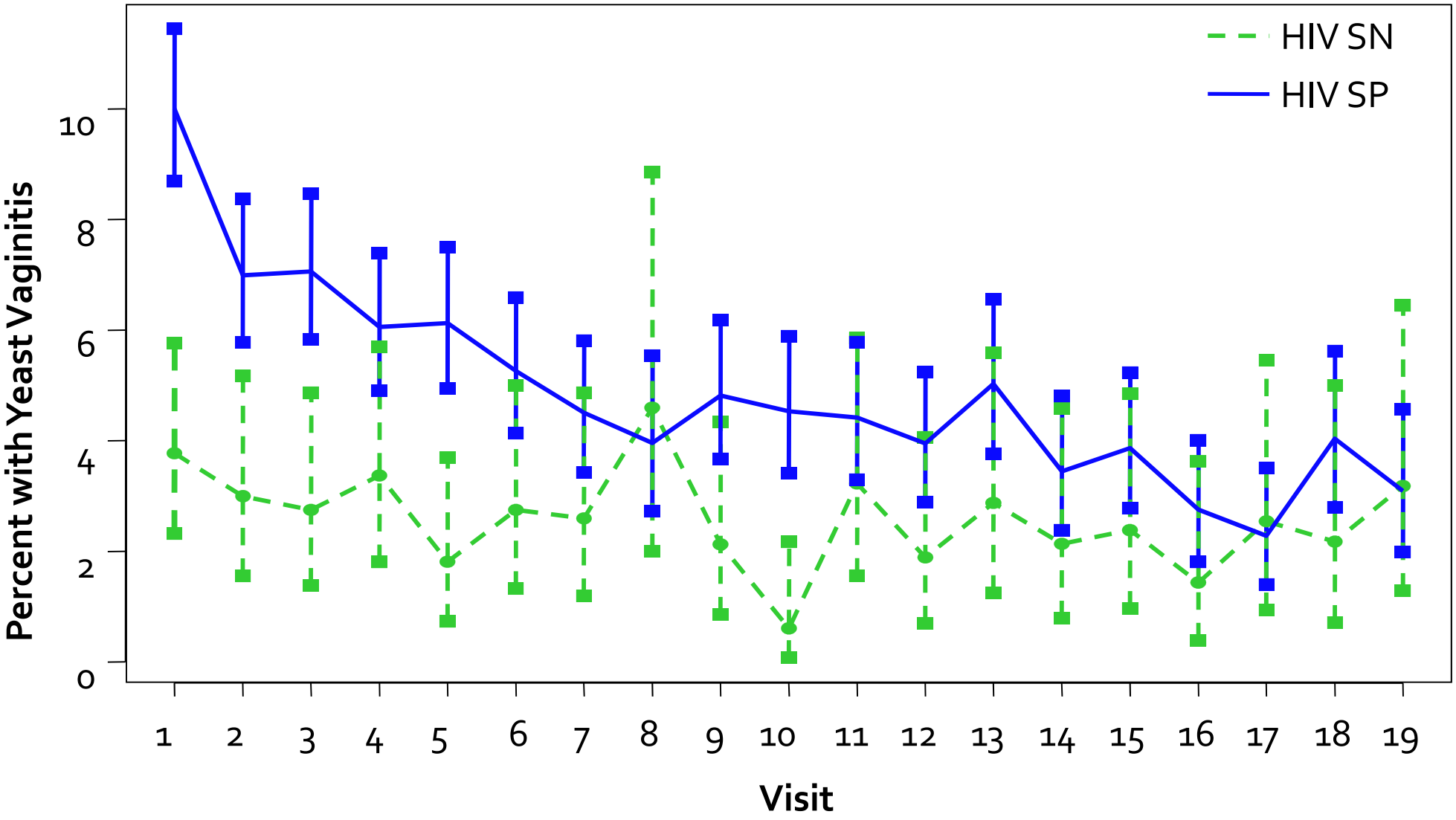
Prevalence of Clinical Trichomonas Vaginitis by Wet Mount

(Watts, Springer, . . . , Greenblatt, *J Acquir Immune Defic Syndr* 2006; 43:161-168)



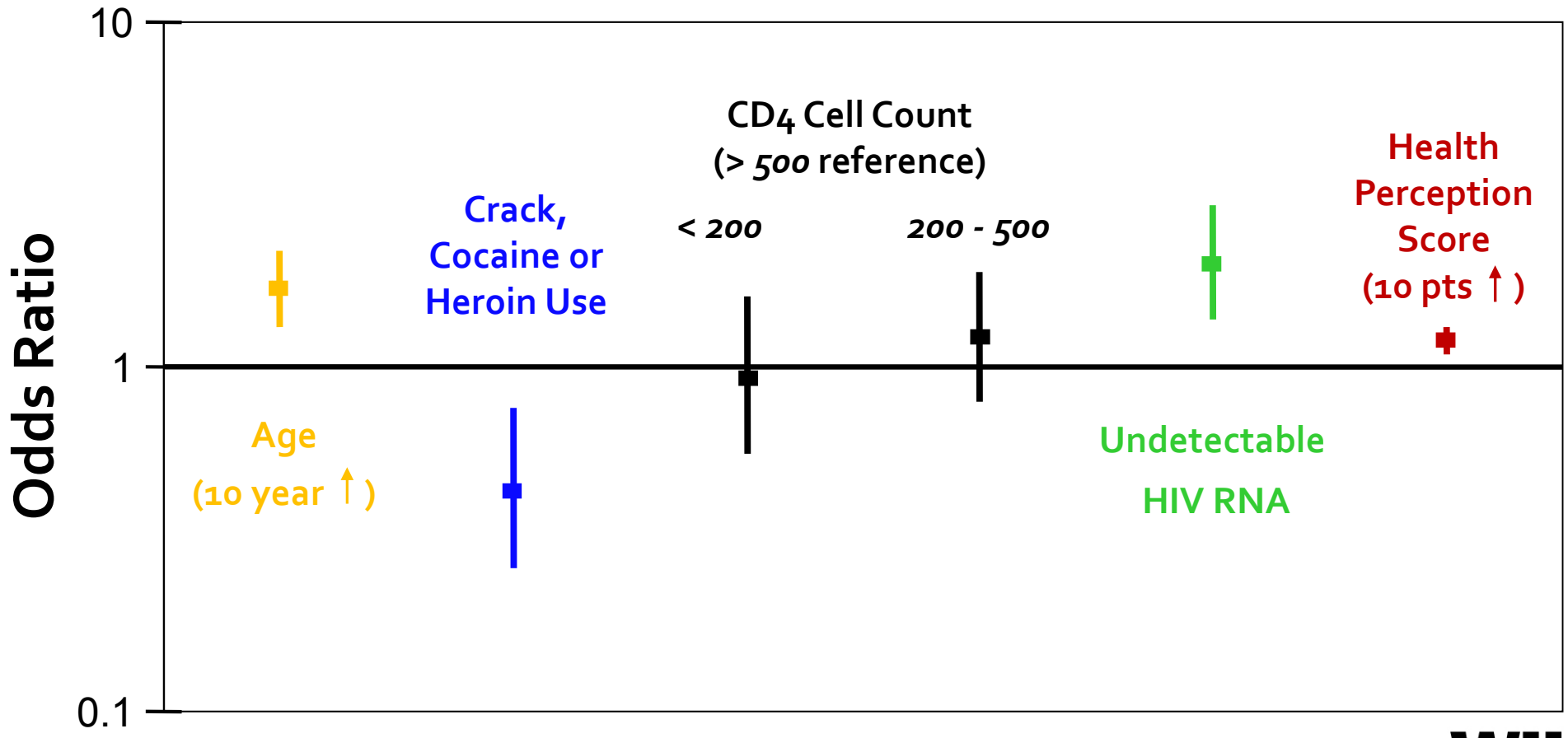
Prevalence of Symptomatic Candida (Yeast Vaginitis)

(Watts, Springer, . . . , Greenblatt, *J Acquir Immune Defic Syndr* 2006; 43:161-168)



Correlates of ART Adherence in the Women's Interagency HIV Study

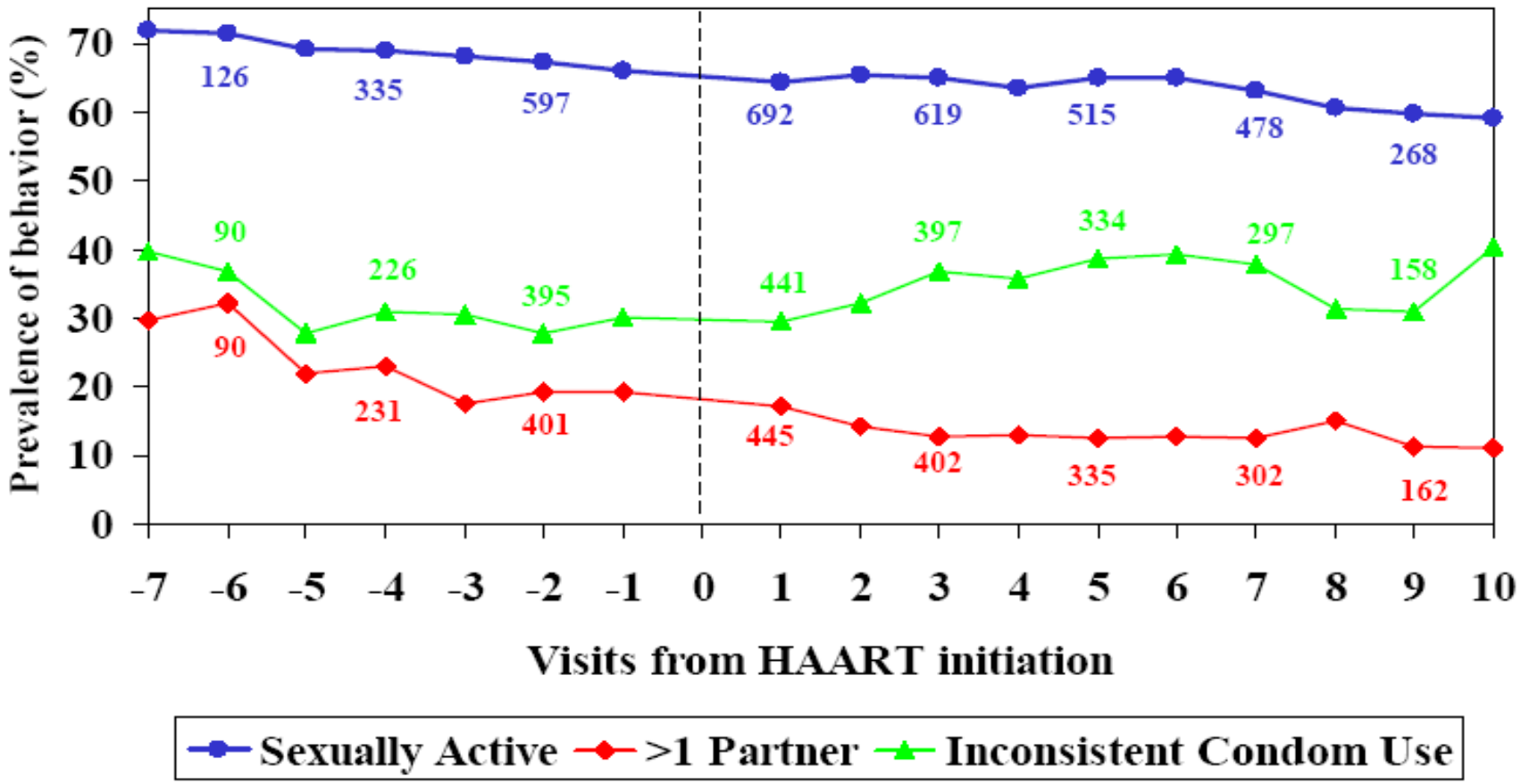
(Wilson, Barrón, . . . , Young, *Clin Infect Dis* 2002; 34:529-534)



WIHS

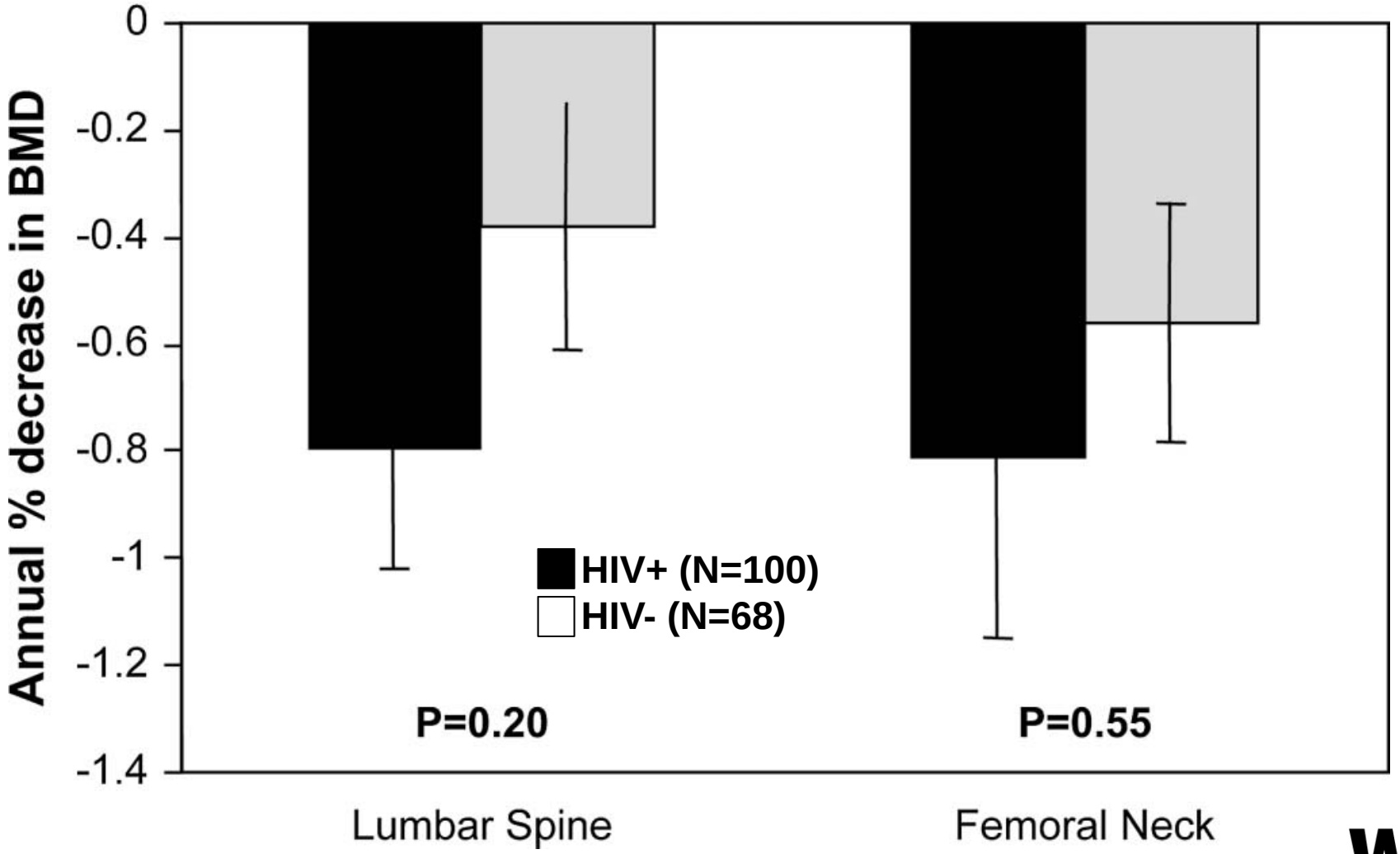
Changes in Sexual Behavior Among HIV+ Women After Initiation of HAART

(Wilson, Gore, . . . , Gange, *Am J Public Health* 2004; 94:1141-1146)



Annual Percent Decrease in Bone Mineral Density

(Yin, Lu, . . . , Anastos, *J Acquir Immune Defic Syndr* 2010; 53:202-208)



P-values are for comparison between HIV+ and HIV- groups

WIHS