



HIV 101: Overview of HIV Epidemiology, Treatment and Outcome

Kris Ann Oursler, MD, ScM

Deputy Director, Infectious Disease Clinic

Baltimore VA Medical Center

Division of Gerontology and Geriatric Medicine

University of Maryland School of Medicine

Krisann.oursler@va.gov

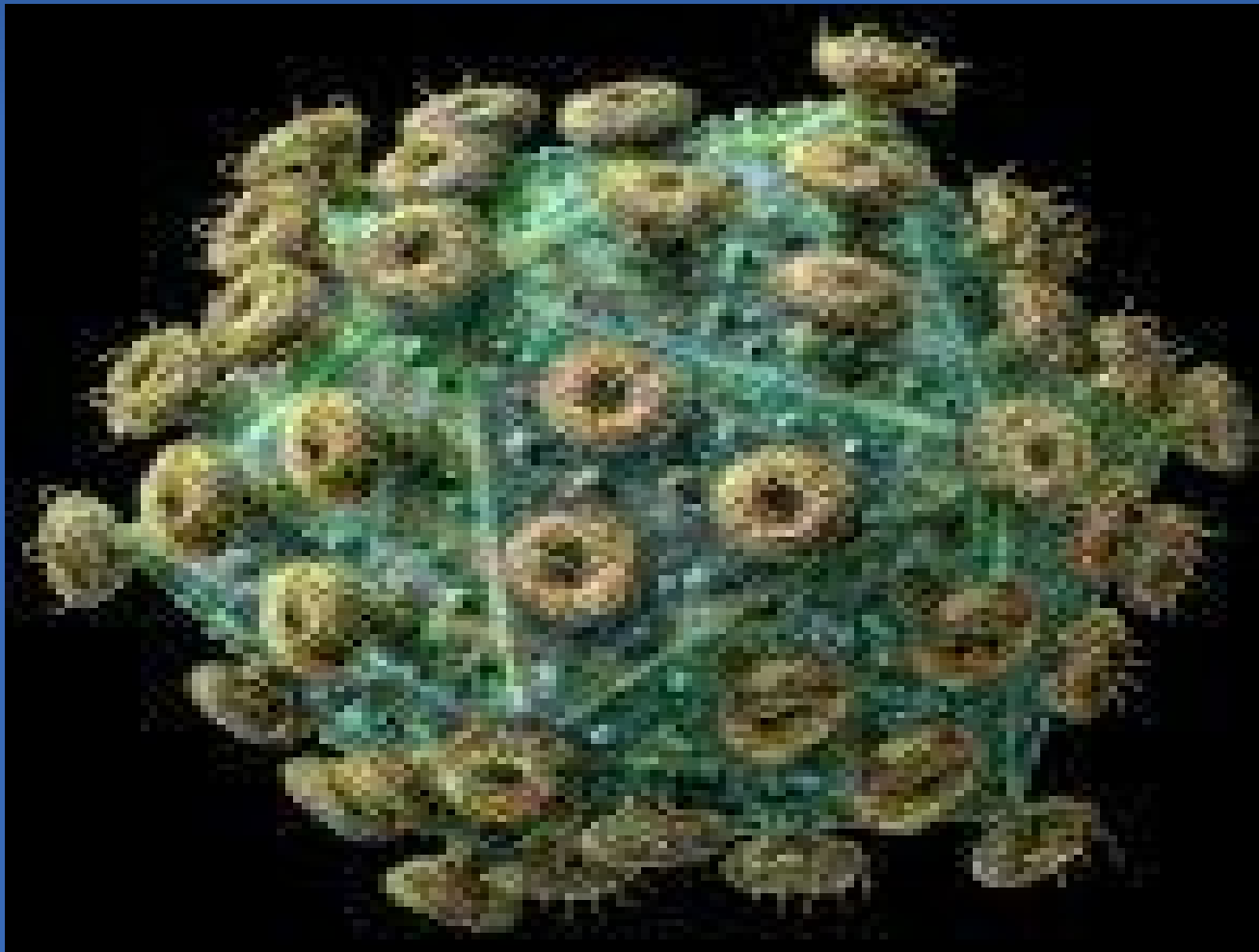
Learning Objectives:

1. Identify the virus that causes HIV
2. Explain the natural course of HIV infection
3. Understand the treatments associated with HIV
4. Discuss trends in epidemiology associated with HIV

No disclosures

HIV: what is it?

Human immunodeficiency virus



HIV: what is it?

Human immunodeficiency virus

- **Infects only humans**
 - **Research Studies Limited**
 - **Exposure Risks**

HIV Transmission

- **The body fluids that transmit HIV**
 - Blood
 - Semen
 - Vaginal Fluids
 - Breast Milk
- **High Risk Behaviors**
 - Unprotected sex
 - Injection Drug use
- **Mother to child during pregnancy, delivery, and breast feeding**

HIV: what it is

- Human **immunodeficiency** virus
- Disease is caused by weakened immune system
- Immune system protects from infections
→ Increased risk of infections

HIV: what it is

- **Human immunodeficiency **virus****
- **Like all viruses, it needs living cells to make copies of itself and spread**
 - **Not hardy outside the body**
- **The type of virus called a retrovirus**
 - **Viral RNA works with cells DNA to make more Viral RNA, and packages it as new HIV viruses**
 - **Long latent phase**
 - **Potential for increased risk cancers**

Life Cycle of HIV-1

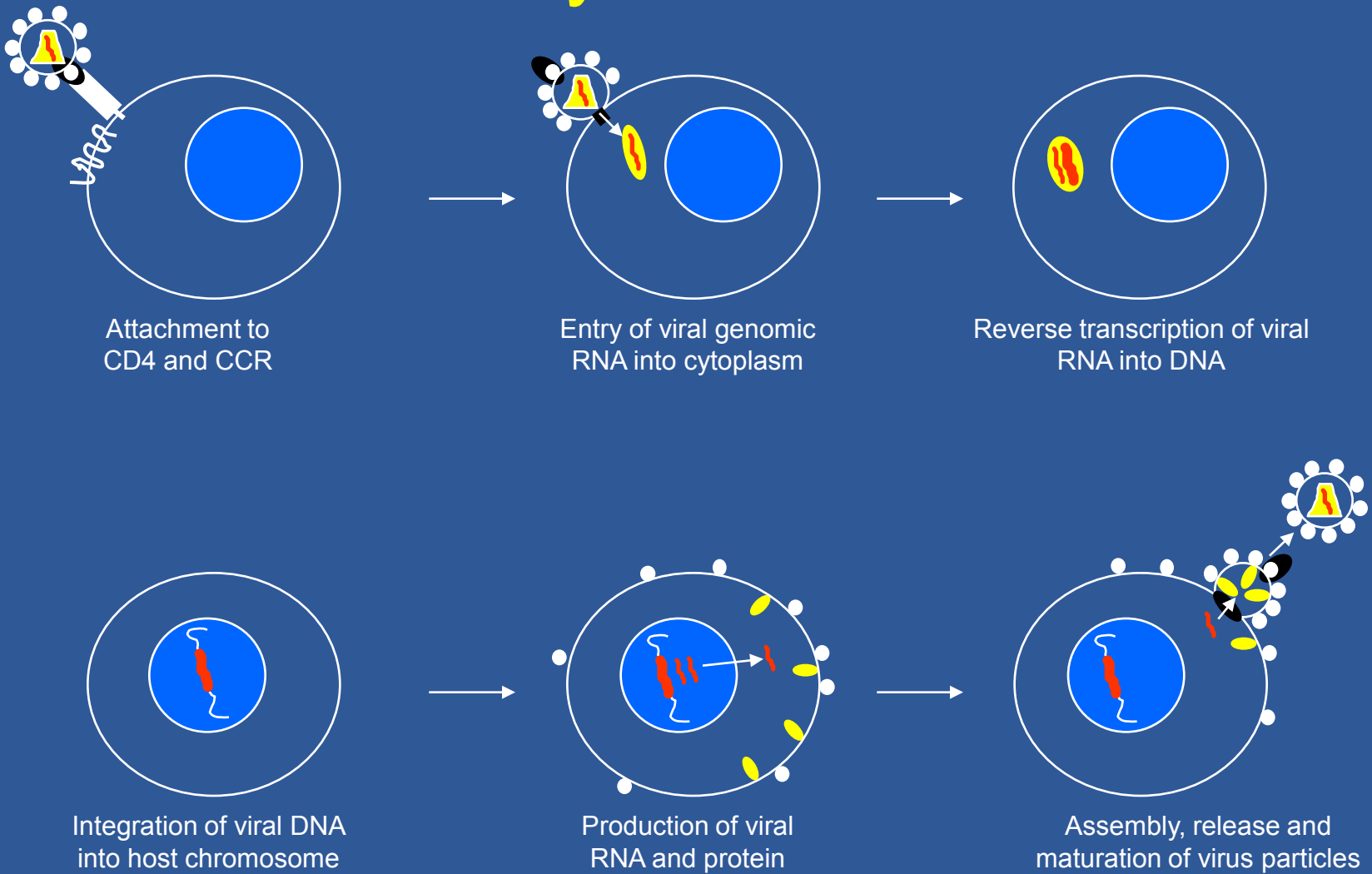
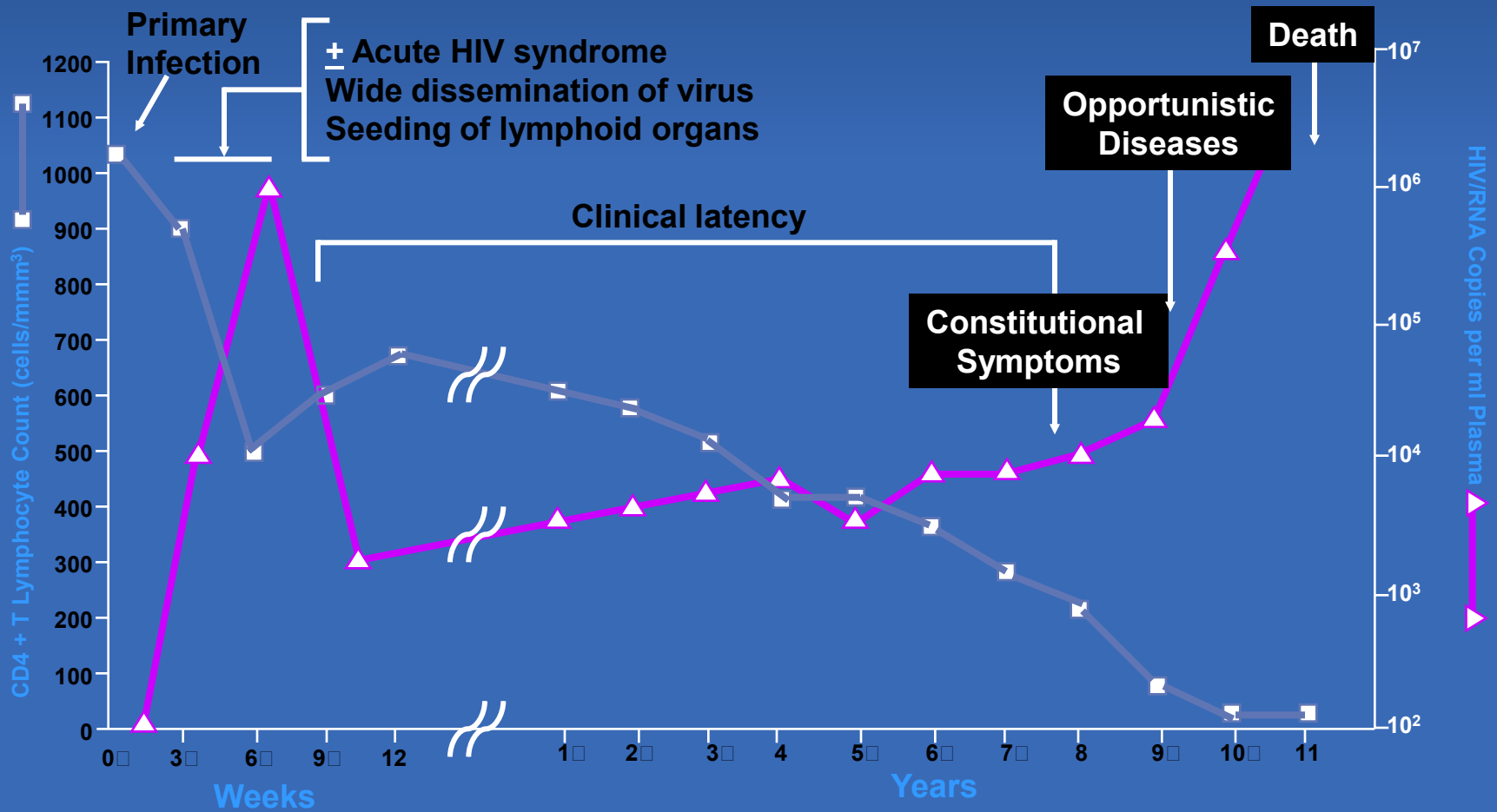


Figure courtesy of R. Silicano

Natural History of HIV Infection



What is the difference between HIV and AIDS ?

- **Human Immunodeficiency Virus**
- **AIDS: Acquired Immunodeficiency Disease Syndrome, the disease caused by the virus**
 - *Acquired* = from an other human
 - *Immunodeficiency* = weakened immune system
CD4 Cell count is 200 or less
 - *Syndrome*: meeting the CDC Criteria for an “AIDS-defining illness”



- Candidiasis of bronchi, trachea, or lungs
- **Candidiasis, esophageal**
- Coccidioidomycosis, disseminated or extrapulmonary
- Cryptococcosis, extrapulmonary
- Cryptosporidiosis, chronic intestinal
- Cytomegalovirus disease
- Encephalopathy, HIV related
- Herpes simplex: chronic ulcers, pneumonitis, or esophagitis
- Histoplasmosis, disseminated or extrapulmonary
- Isosporiasis, chronic intestinal
- **Kaposi sarcoma**
- Lymphoid interstitial pneumonia
- Lymphoma, Burkitt or immunoblastic
- Lymphoma, primary, of brain
- Mycobacterium avium complex or M. kansasii, disseminated or extrapulmonary
- Mycobacterium tuberculosis, of any site
- Pneumocystis jirovecii pneumonia (PCP)
- Pneumonia, recurrent
- Progressive multifocal leukoencephalopathy
- Salmonella septicemia, recurrent
- Toxoplasmosis of brain
- Wasting syndrome due to HIV

Historic Milestones in Treatment of HIV

- 1983** Isolation of the virus
- 1985** AZT and nucleoside RT inhibitors
- 1990** Non-nucleoside RT inhibitors
- 1990's** Combination NRTI therapy
- 1993** Protease inhibitors
- 1995** Combination of 2+ drug classes, aka:
 - HAART-** Highly Active Antiretroviral therapy
 - cART-** Combination Antiretroviral therapy**“the cocktail”**

Goals of Therapy



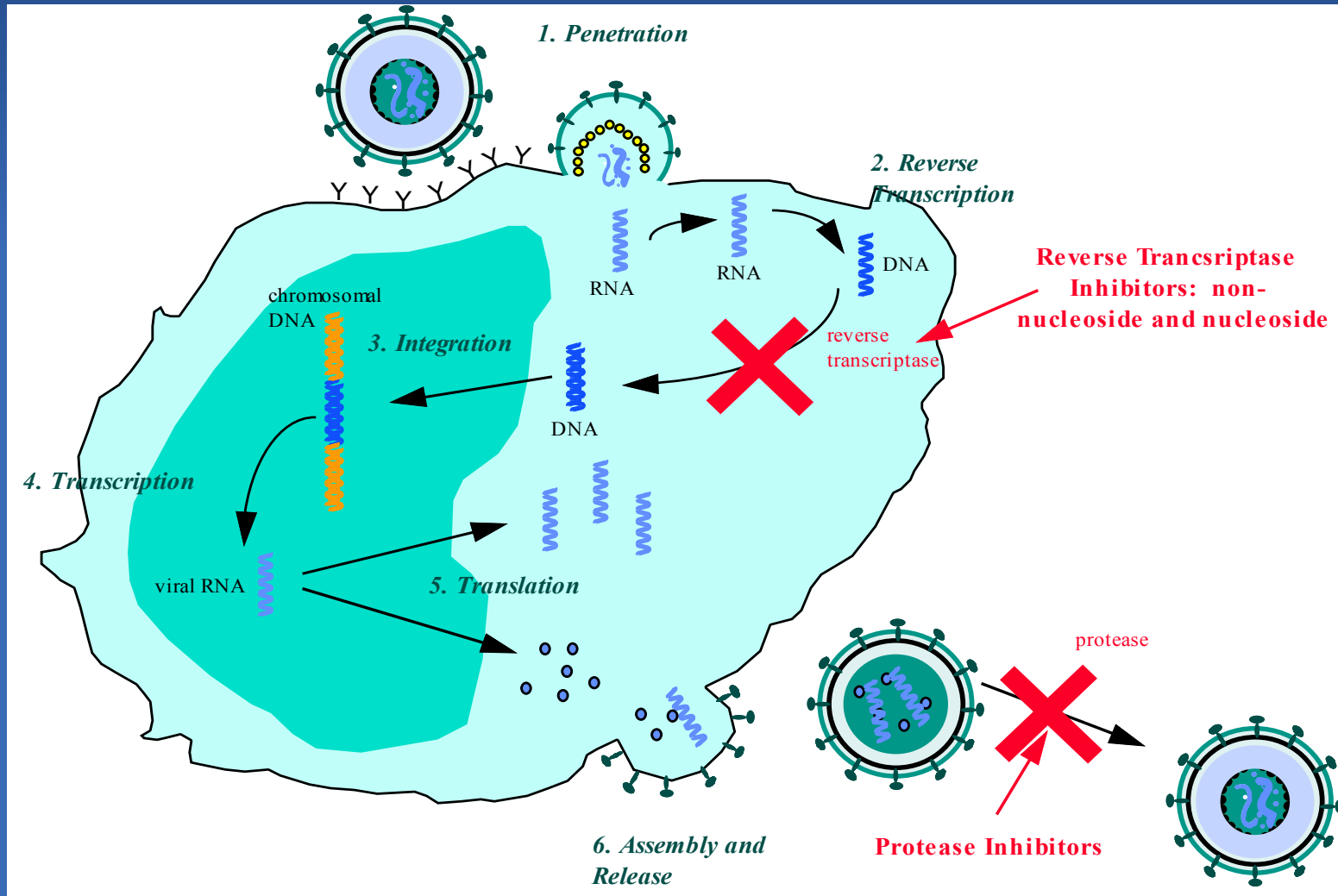
Increase or Maintain:

- Viral suppression
- CD4 cell count
- Good Health
- Quality of life

Decrease:

- Toxicity
- Drug resistance
- Overall cost of care

Life Cycle of HIV-1 and Mechanisms of Action of Antiretroviral Drugs



Reverse Transcriptase Inhibitors

NRTI

Year approved*	Generic Name	Trade Name
1987	Zidovudine	Retrovir
1991	Didanosine	Videx
1992	Zalcitabine, Hivid (ddC, dideoxycytidine) by Roche: Man	
1994	Stavudine	Zerit
1995	Lamivudine	Epivir
1997	Zidovudine/Lamivudine	Combivir
1998	Abacavir	Ziagen
2000	Zidovudine/Lamivudine/Abacavir	Trizivir
2001	Tenofovir	Viread
2003	Emtricitabine	Emtriva
2004	Abacavir/Lamivudine	Epzicom
2004	Emtricitabine/Tenofovir	Truvada

NNRTI

1996	Nevirapine	Viramune
1997	Delavirdine	Rescriptor
1998	Efavirenz	Sustiva
2008	Etravirine	Intelence
2011	Rilpivirine	Edurant

Protease Inhibitors

1995	Saquinavir	Invirase	SQV
1996	Ritonavir	Norvir	RTV
1996	Indinavir	Crixivan	IDV
1997	Nelfinavir	Viracept	NFV
1997	Saquinavir	Fortovase Manufacture discontinued in 2006; Roche	
1999	Amprenavir	Agenerase Manufacture discontinued in 2007	
2000	Lopinavir/ritonavir	Kaletra, Aluvia	LPV
2003	Atazanavir	Reyataz	ATV
2003	Fosamprenavir	Lexiva	FPV
2005	Tipranavir	Aptivus	TPV
2006	Darunavir	Prezista	DRV

Integrase Inhibitors

2007	Raltegravir	Isentress	RGV
------	-------------	-----------	-----

Fusion Inhibitors & Chemokine Coreceptor Antagonists

2003	Enfuvirtide	Fuzeon	T-20
2007	Maraviroc	Selzentry, Celsentri	MVC

Metabolic and Morphologic Complications of HIV and HAART

Morphologic

- Fat accumulation
- Fat loss

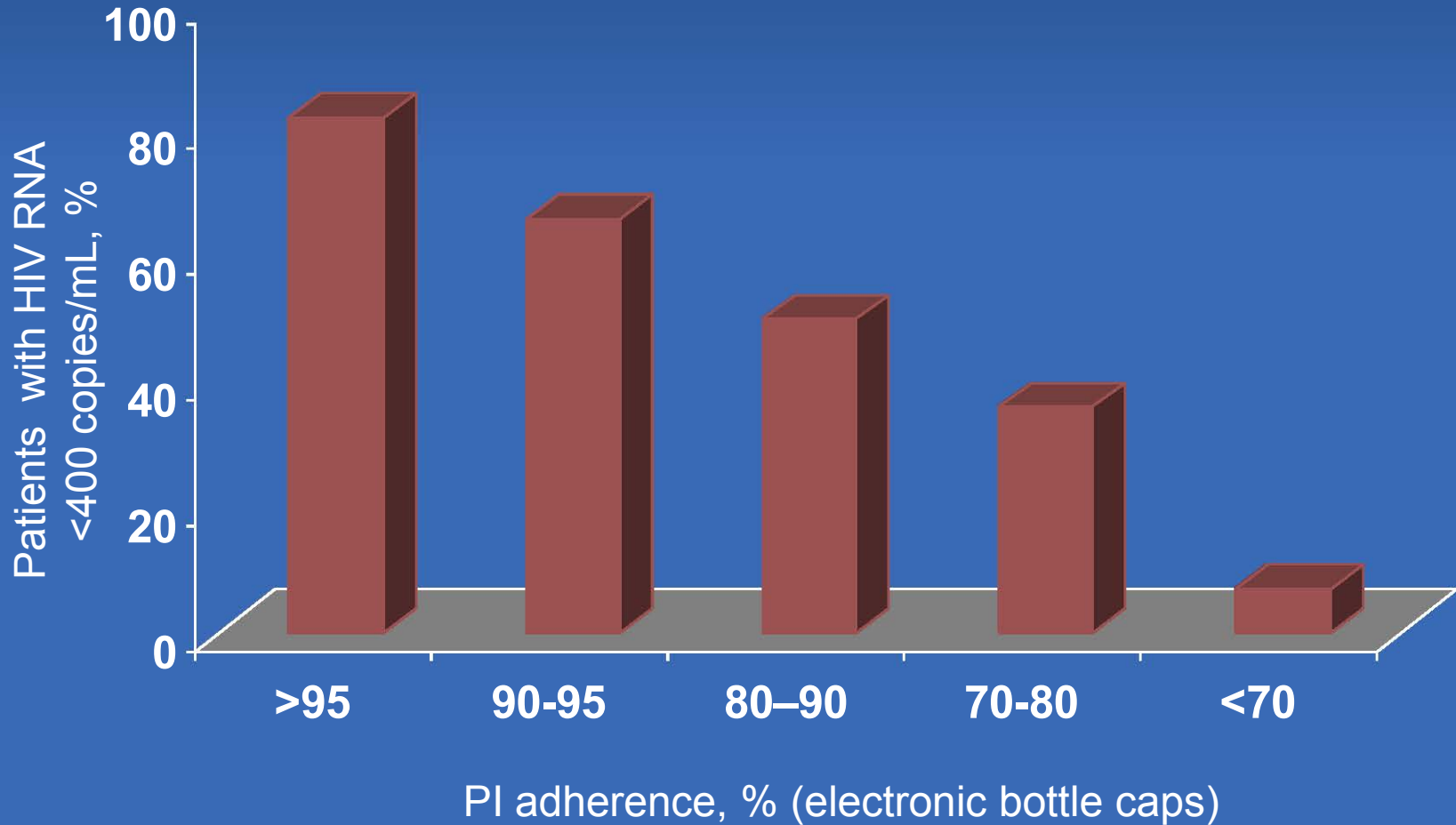
Others

- Osteoporosis
- Osteopenia
- Osteonecrosis

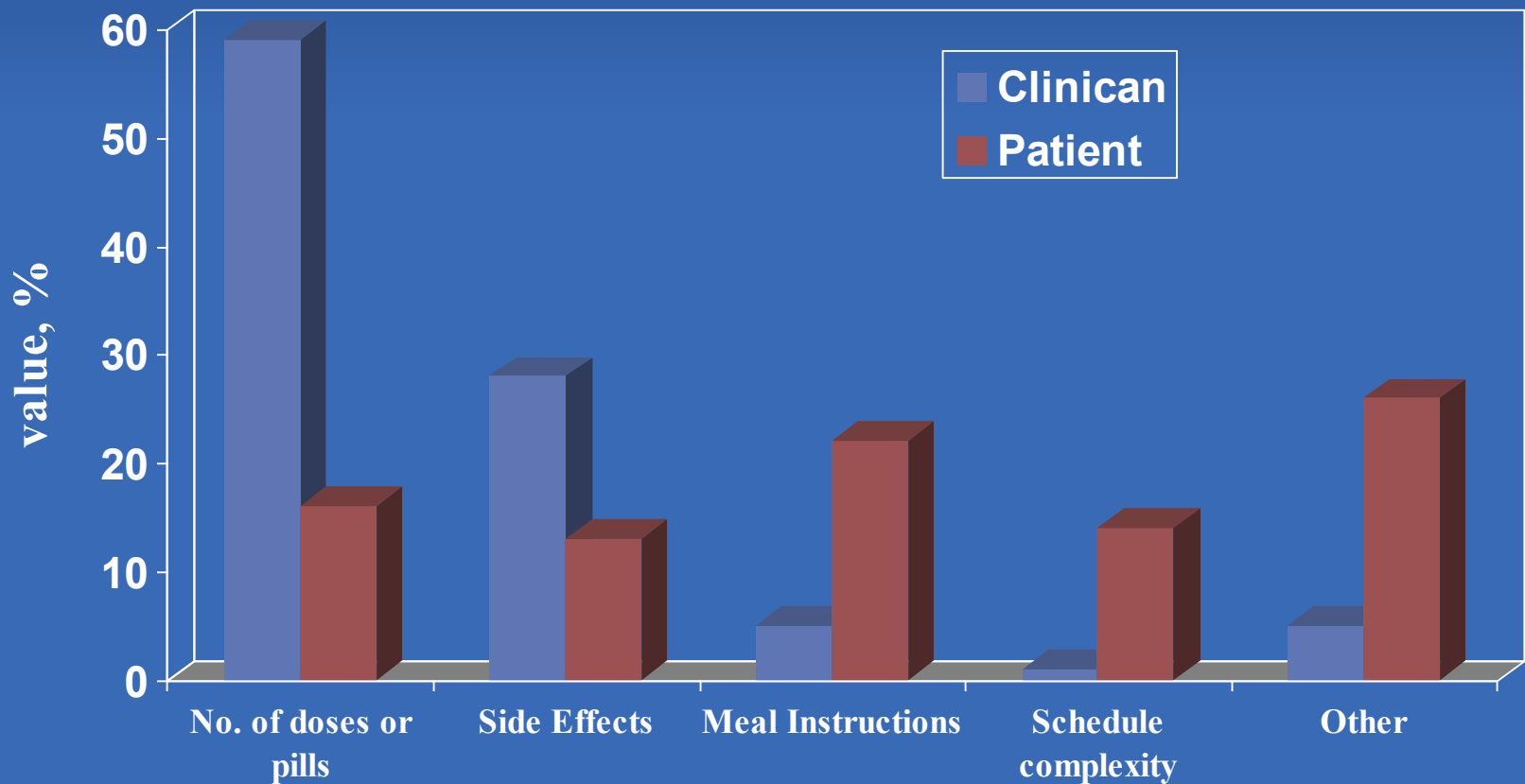
Metabolic

- Dyslipidemias
 - hypercholesteremia
 - hypertriglyceridemia
- Impaired glucose tolerance/ Diabetes
- Lactic acidosis

Viral Suppression and Adherence



Reasons for Non-Adherence: Clinician vs Patient Views



Probability of ADI without ART by Baseline CD4 and Viral Load

CD4	HIV RNA	3 years	9 years
<350	<20,000	8%	66%
<350	>55,000	73%	96%
350-500	<20,000	6%	61%
350-500	>55,000	48%	94%
>500	<20,000	7%	50%
>500	>55,000	33%	76%

The Balance of Antiretroviral Therapy

Reduce Viral Load
Increase CD4 cells
Prevent AIDS
Prolong life
Reduce transmission

Not cure HIV infection
Drug resistance
Toxicities / side-effects
Access to medication & care
Monitoring
Cost

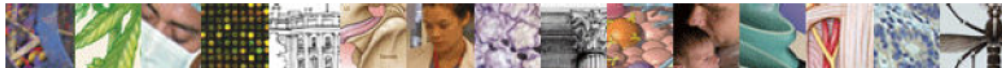
Life Expectancy on HAART

At HAART Initiation	CD4 Cell Count (mm ³)		
	<100	100-199	<u>≥</u> 200
A 20 yr old will live to (years)	52	62	70
A 35 yr old will live to (years)	62	65	72
% Remaining Life Lost (all ages)	46%	27%	14%

Epidemiology of HIV: the Changing Face of the Epidemic



The NEW ENGLAND
JOURNAL of MEDICINE



Perspective

HIV and Aging — Preparing for the Challenges Ahead

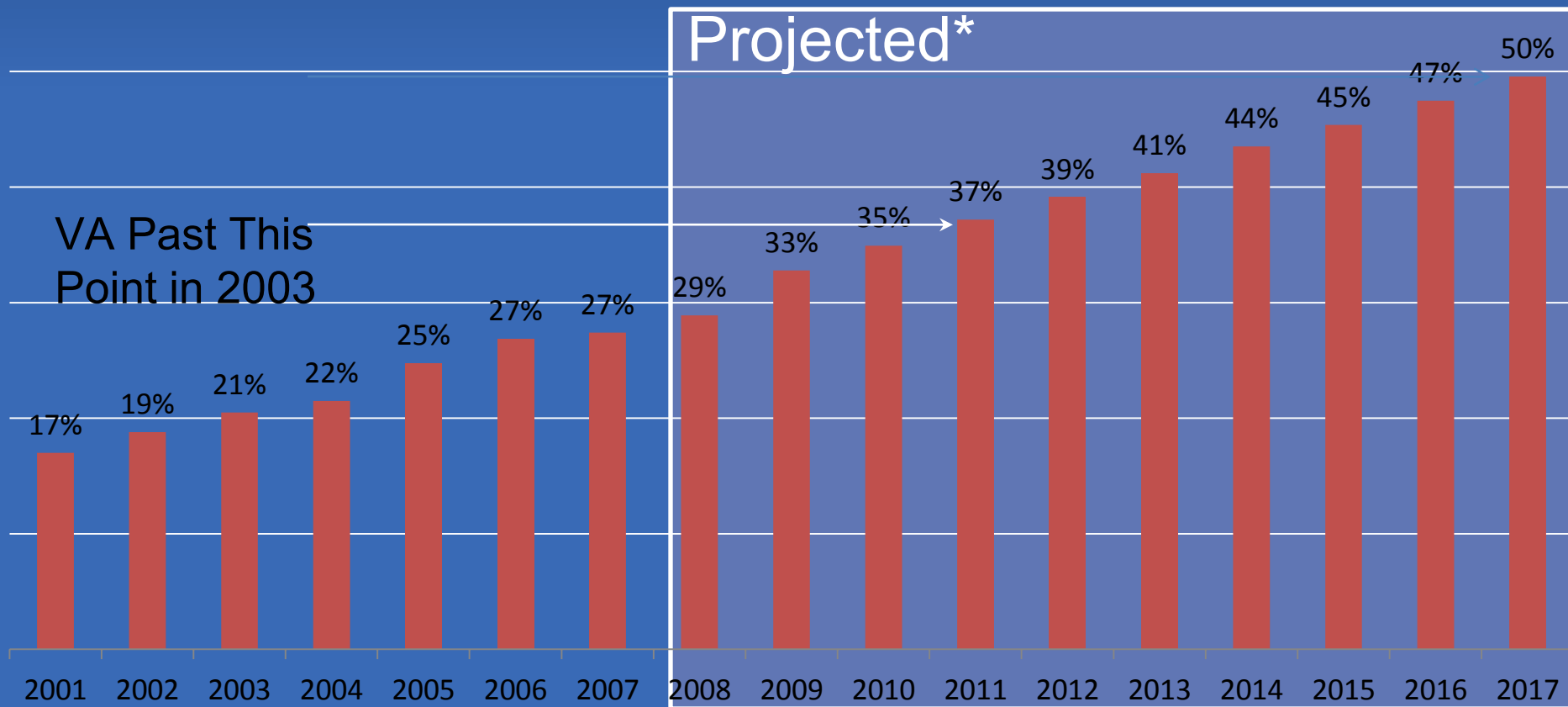
Edward J. Mills, Ph.D., Till Bärnighausen, M.D., Sc.D., and Joel Negin, M.I.A.

N Engl J Med 2012; 366:1270-1273 | [April 5, 2012](#)

Article

By 2015, half the U.S. population living with human immunodeficiency virus (HIV) infection will be older than 50 years of age. As antiretroviral therapy (ART) coverage continues to expand worldwide, this aging of the HIV epidemic will be mirrored in developing countries. In sub-Saharan Africa, ART has already reduced mortality rates, with 320,000 (or 20%) fewer people dying of HIV-related causes in 2009 than in 2004.¹ Currently, HIV-infected Ugandans in their 40s who are receiving ART can expect to live well into their 60s.² The increased life expectancy of HIV-infected persons will lead to increases in HIV prevalence among older adults. Approximately 1 in 8 HIV-infected adults and 1 in 10 patients receiving ART in sub-Saharan Africa are older than 50 years of age,³ and these ratios are likely to increase manyfold in the coming decades

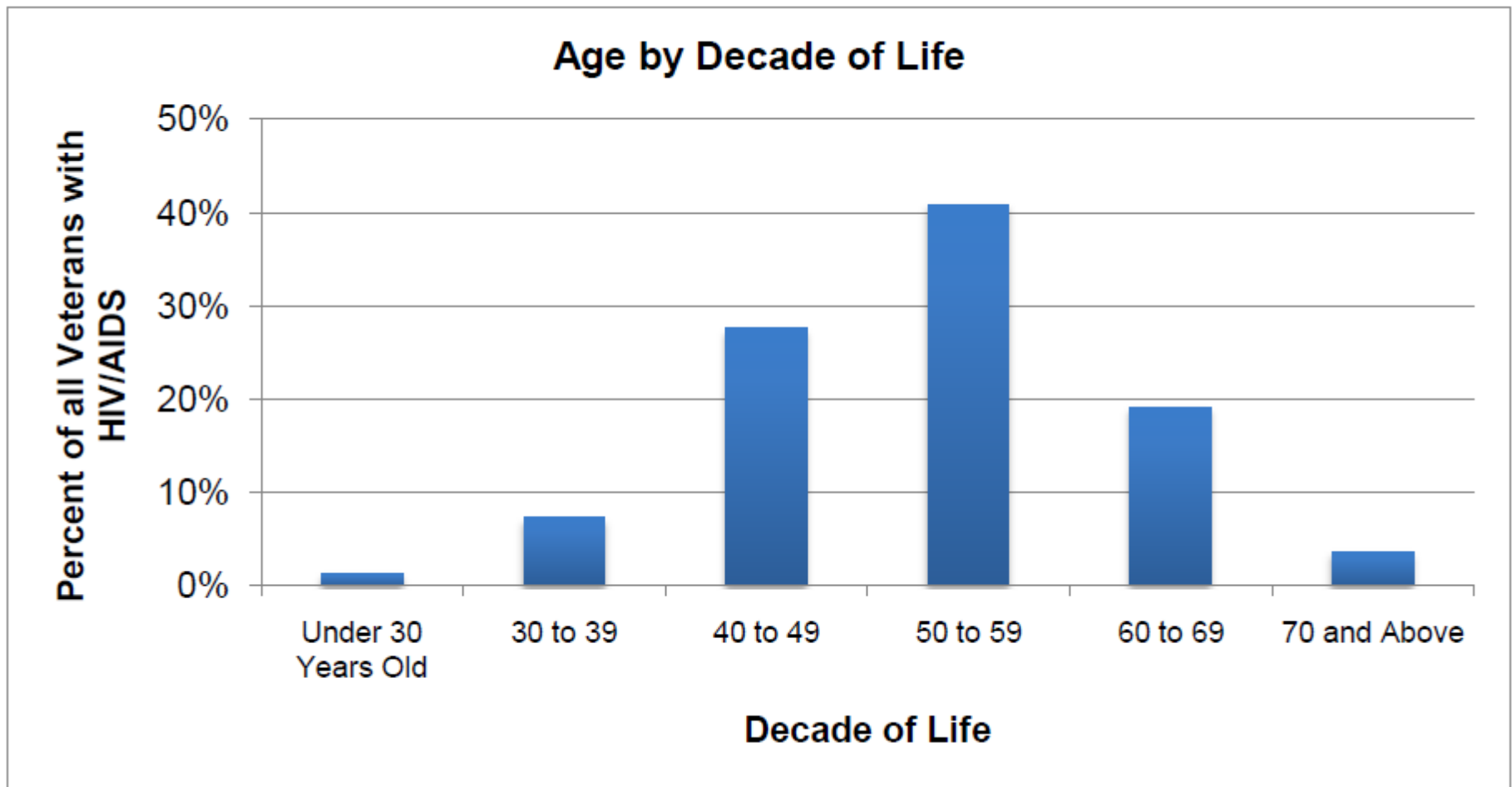
Proportion Patients With HIV 50+ Years of Age in United States 2001-2017



*Data from 2008, onward projected based on 2001 2007 trends (calculated by author), 2001 2007 data from CDC Surveillance Reports 2007

State of Care for Veterans with HIV/AIDS: 2009 Report

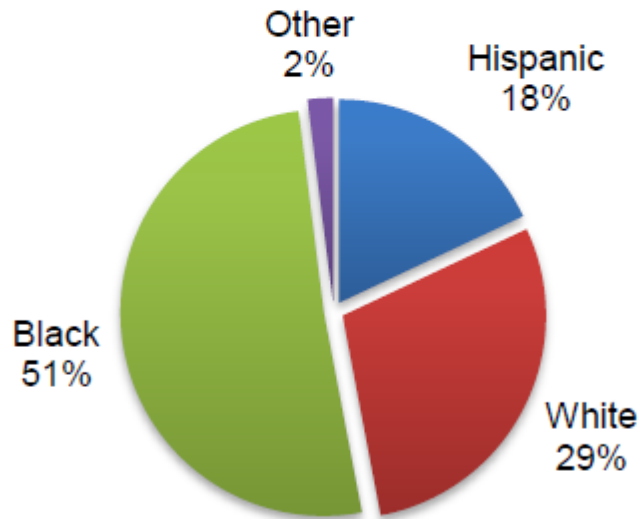
Figure 5. HIV Infected Veterans in VHA Care 2008 - Age by Decade of Life



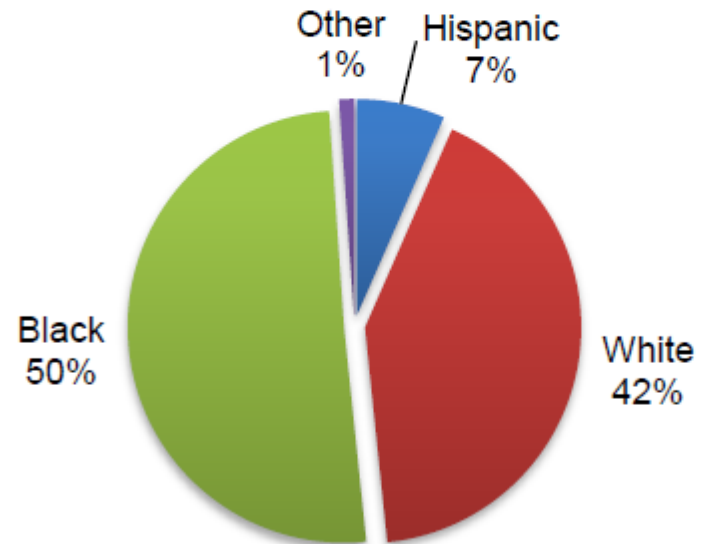
State of Care for Veterans with HIV/AIDS: 2009 Report

Figure 4a/b. Comparison of Race/Ethnicity for New AIDS Cases Reported to the CDC in 2007 and All Veterans with HIV/AIDS in Care in 2008.

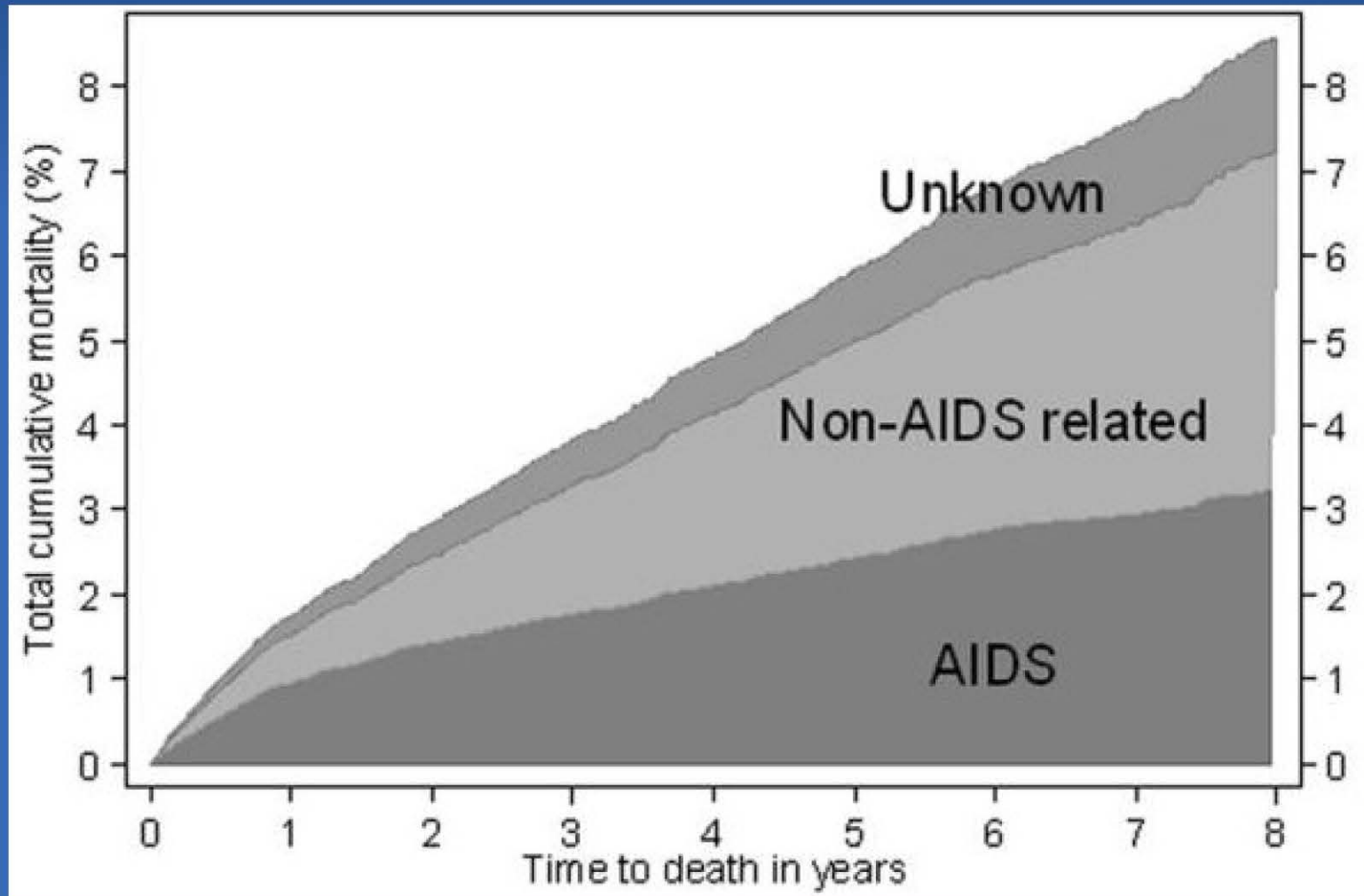
**4a. Race/Ethnicity
CDC New AIDS Cases 2007**



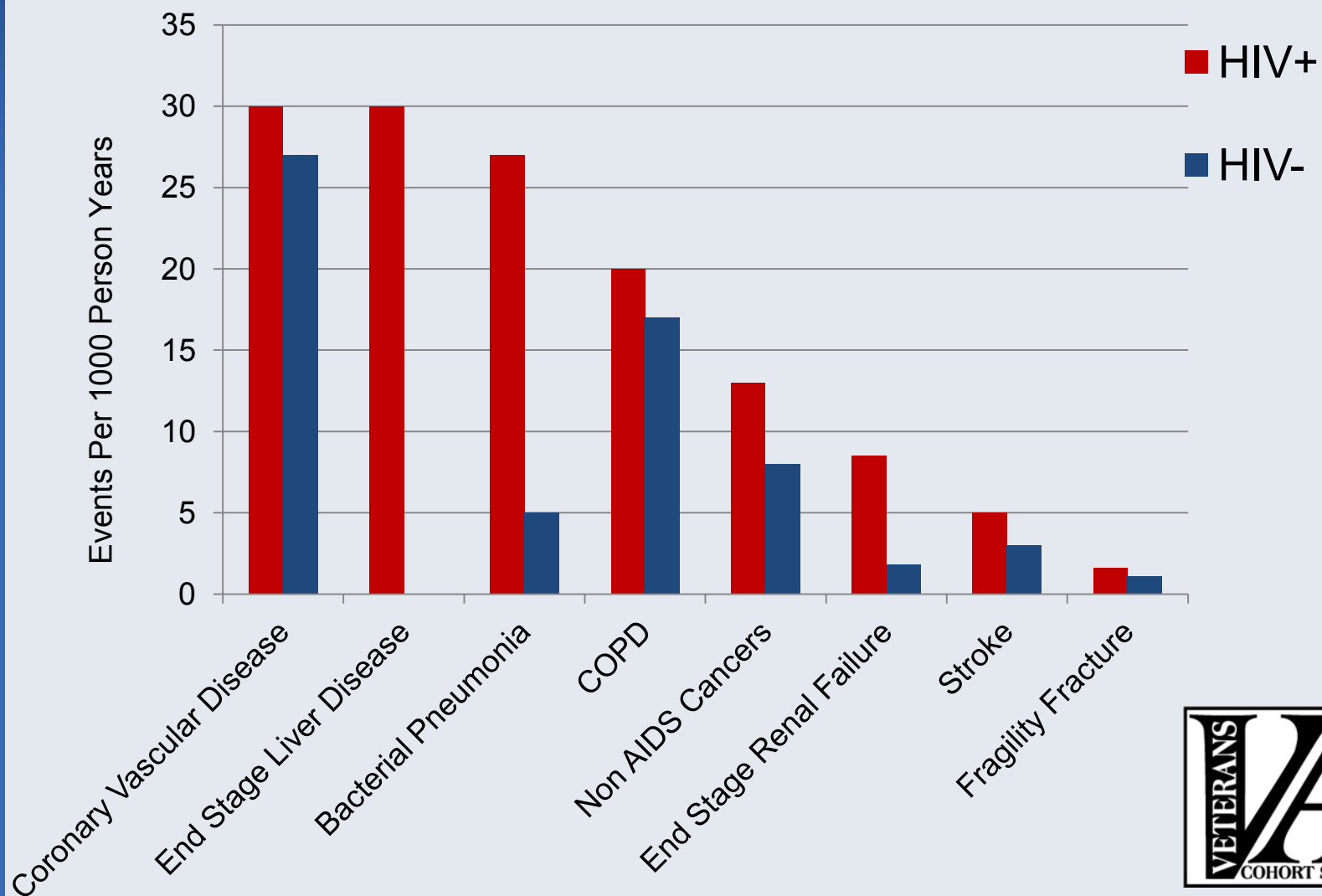
**4b. Reported Race/Ethnicity for HIV
Infected Veterans in Care - 2008**



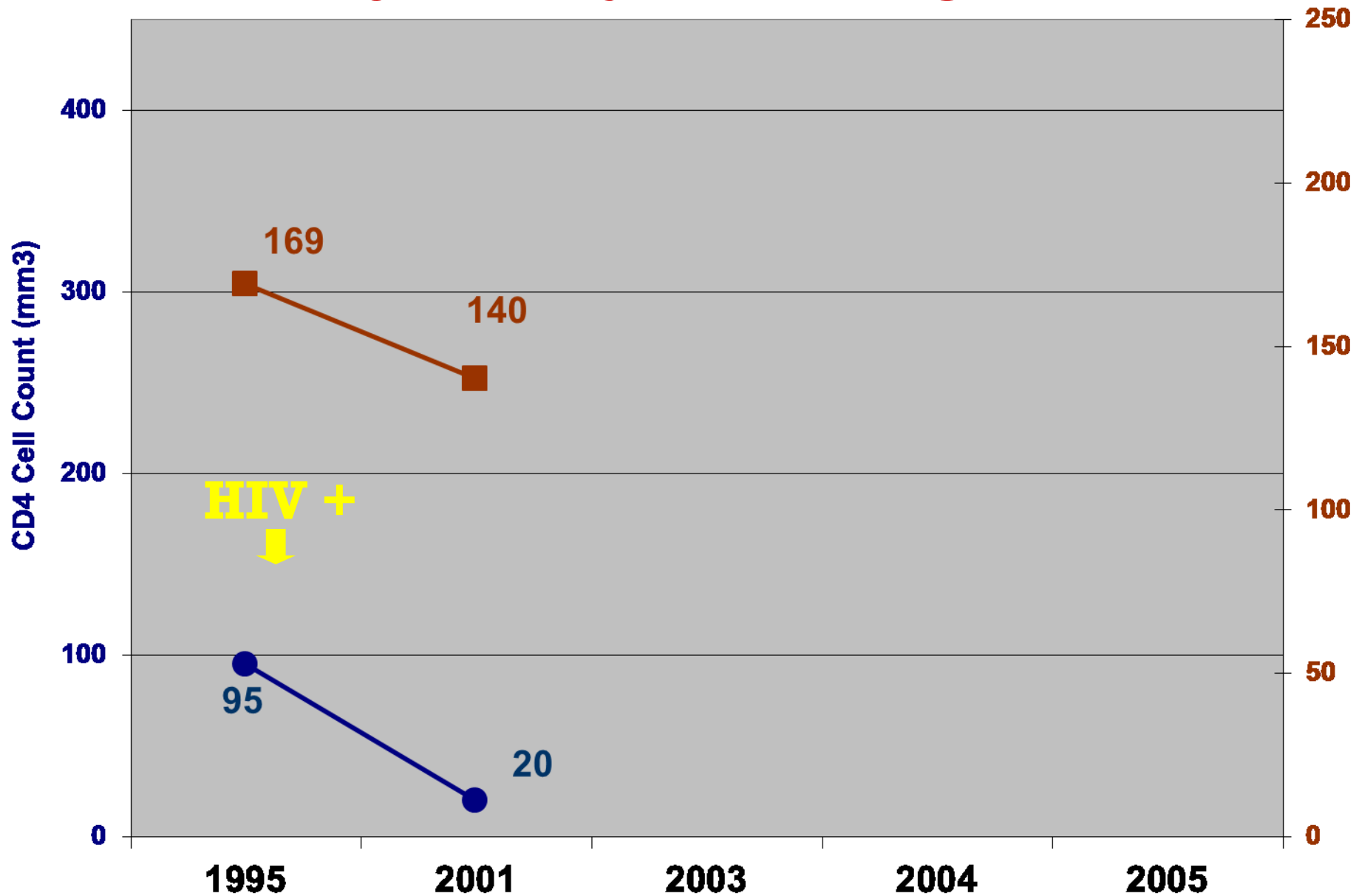
> 50% of Deaths Attributed to Non-AIDS Events



Incident Non AIDS Events by HIV Group

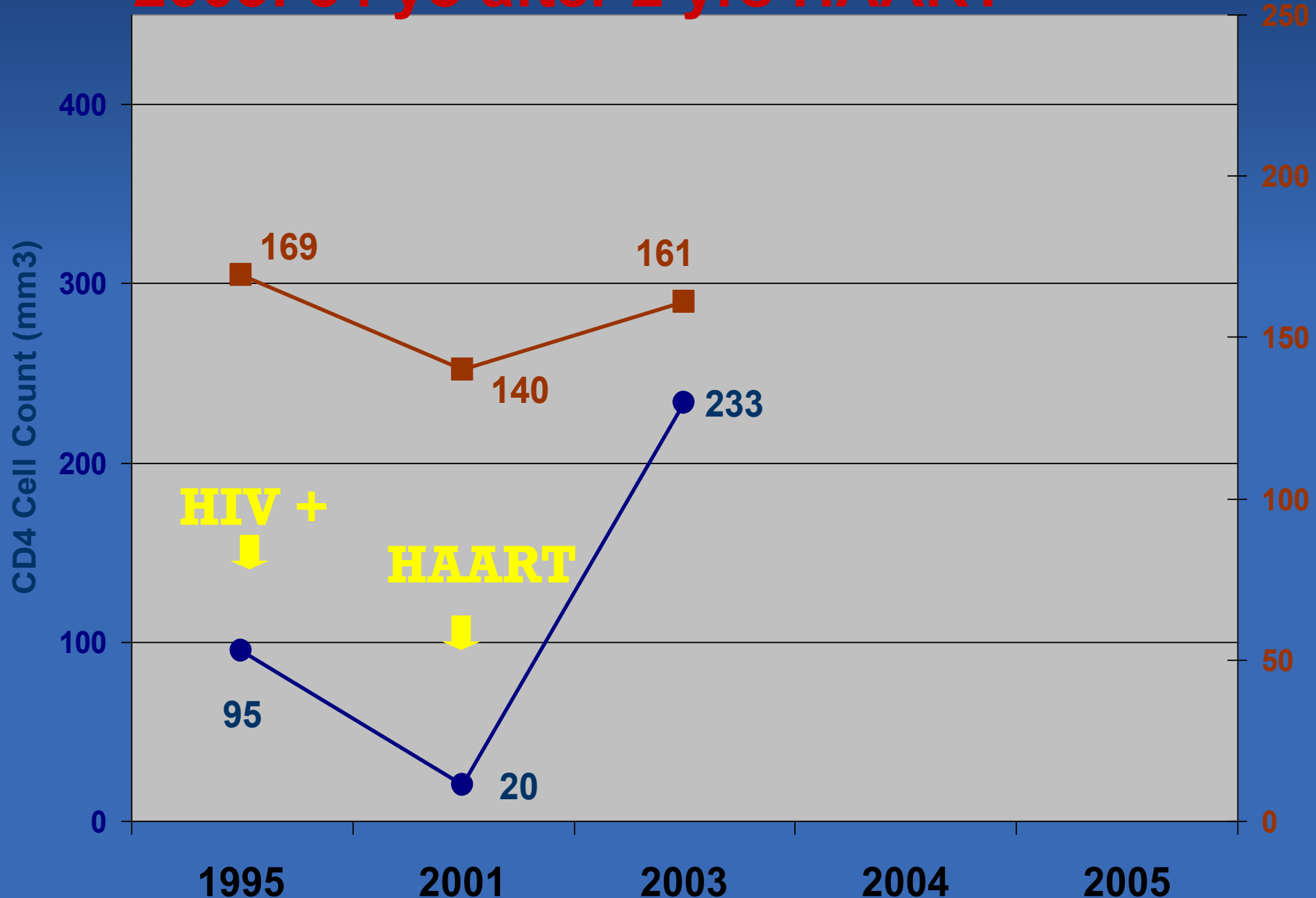


1995: 46 year old man diagnosed HIV 6 more years injection drug use

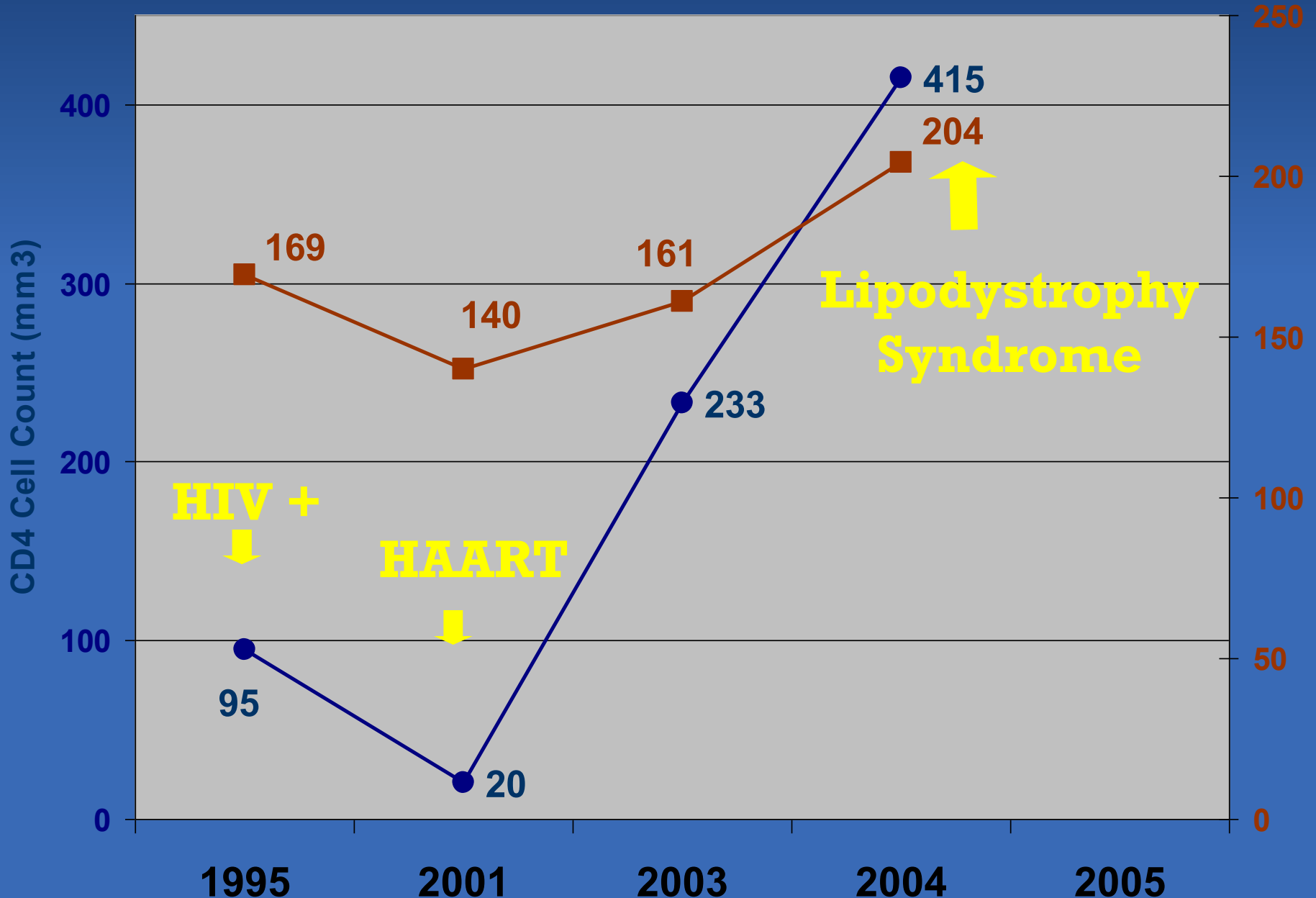


2001: Depression and SA treatment

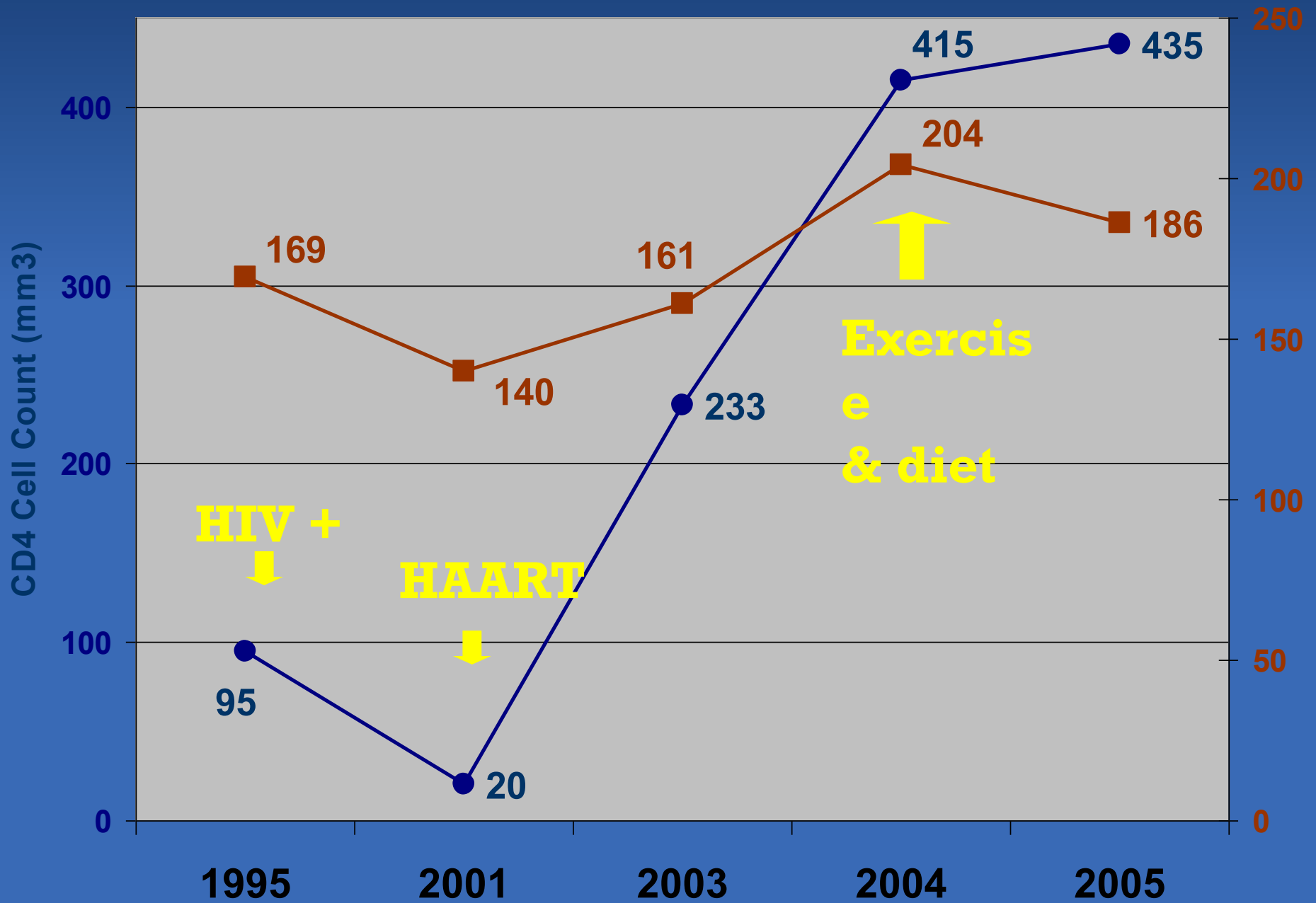
2003: 54 yo after 2 yrs HAART



2004: 55 yo with DM, obesity



2005: healthy and fit 56 year old



Healthy Aging with HIV



Take Home Points

1. Identify the virus that causes HIV
2. Explain the natural course of HIV infection
3. Understand the treatments associated with HIV
4. Discuss trends in epidemiology associated with HIV

Take Home Points

1. Identify the virus that causes HIV
 - Requires body fluid for transmission
 - Infection and destruction of CD4 cells
 - HIV vs. AIDS: infection vs disease

Take Home Points

2. Explain the natural course of HIV infection
 - Long latency period
 - CD4 Cells below- loss of viral control
 - AIDS Defining Illness

Take Home Points

3. Understand the treatments associated with HIV
 - Multiple drug classes in effective combination
 - Side effects and metabolic toxicity
 - Adherence is key to prevent drug resistance
 - Individualized balancing Act

Take Home Points

4. Discuss trends in epidemiology associated with HIV
 - Increased Life Expectancy
 - Age as the new wrinkle in the epidemic
 - Non-HIV related morbidity and mortality

www.HIV.va.gov

UNITED STATES
DEPARTMENT OF VETERANS AFFAIRS



VA NATIONAL HIV/AIDS WEBSITE

[HIV/AIDS Home](#)

[For Veterans and the Public](#)

[For Health Care Providers](#)

[Publications and Products](#)

[Web Resources](#)

[About Us](#)

VA Clinical Public Health Programs

HIV/AIDS



The Image Library

More than 200 images of clinical symptoms of HIV infection

[Go to library >](#)

[Home >](#)

SEARCH THIS WEBSITE:

GO

[SEARCH TIPS >](#)

[+ Share this page](#)

For Content Updates

Email Address

Subscribe

for HEALTH CARE PROVIDERS

ENTER

for VETERANS and the PUBLIC

ENTER

VA | Defining
HEALTH CARE | EXCELLENCE
In the 21st Century

Additional Web resources

- Patient education material
 - aidsinfonet.org
 - aidsmeds.com
- aidsinfo.nih.gov
 - See education/materials/glossary
- aids-ed.org
- hivinsite.org
- hivandhepatitis.com