AIDS AT 38:A MEMOIR

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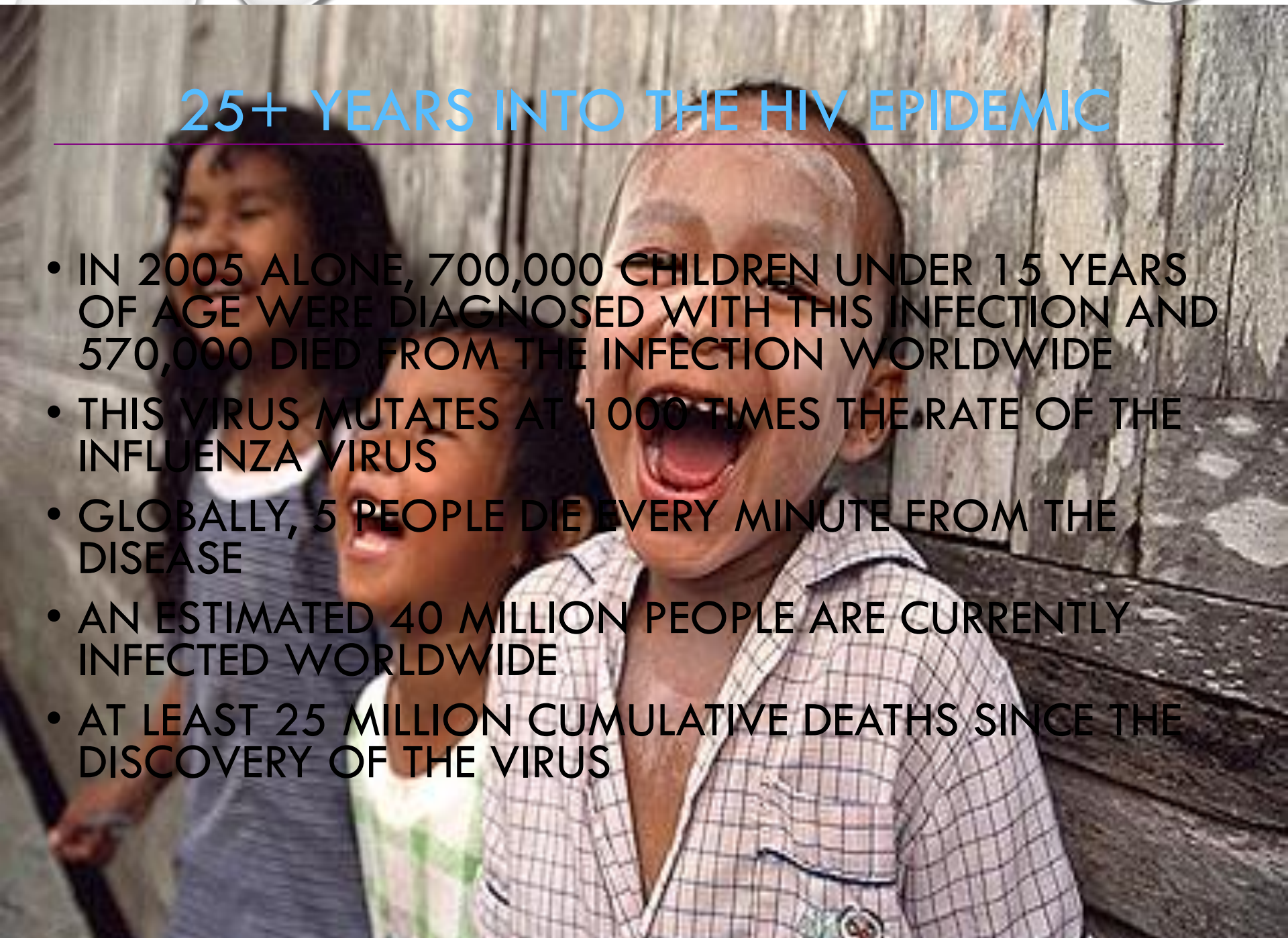
DISCLOSURES

- NONE

25+ YEARS INTO THE HIV EPIDEMIC



- IN 2005 ALONE, 700,000 CHILDREN UNDER 15 YEARS OF AGE WERE DIAGNOSED WITH THIS INFECTION AND 570,000 DIED FROM THE INFECTION WORLDWIDE
- THIS VIRUS MUTATES AT 1000 TIMES THE RATE OF THE INFLUENZA VIRUS
- GLOBALLY, 5 PEOPLE DIE EVERY MINUTE FROM THE DISEASE
- AN ESTIMATED 40 MILLION PEOPLE ARE CURRENTLY INFECTED WORLDWIDE
- AT LEAST 25 MILLION CUMULATIVE DEATHS SINCE THE DISCOVERY OF THE VIRUS

INITIAL REPORTS

- JUNE 5, 1981: 5 CASES OF PCP IN GAY MEN FROM UCLA (MMWR)

1981 June 5;30:250–2

Pneumocystis Pneumonia — Los Angeles

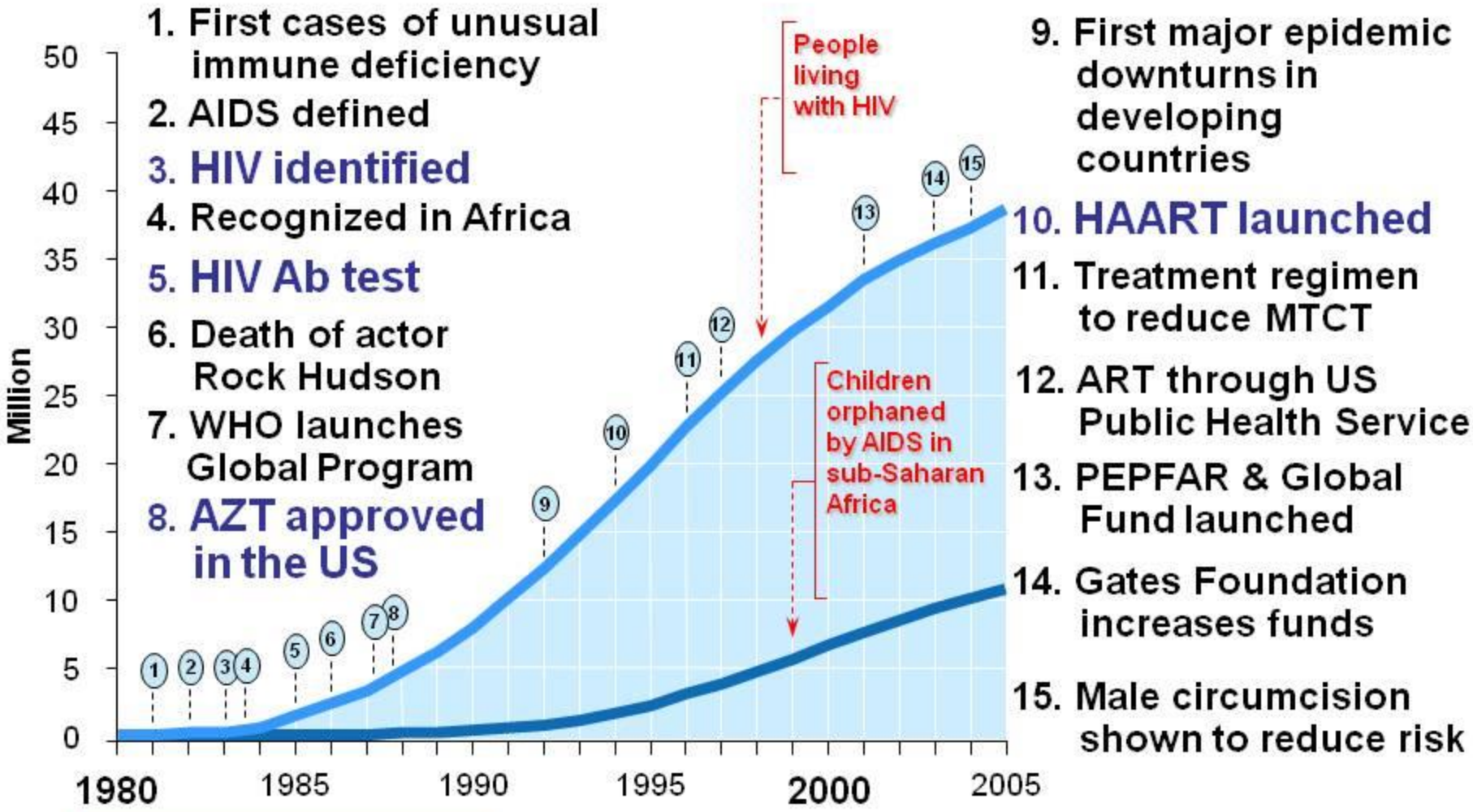
In the period October 1980-May 1981, 5 young men, all active homosexuals, were treated for biopsy-confirmed *Pneumocystis carinii* pneumonia at 3 different hospitals in Los Angeles, California. Two of the patients died. All 5 patients had laboratory-confirmed previous or current cytomegalovirus (CMV) infection and candidal mucosal infection. Case reports of these patients follow.

- JULY 3, 1981: 26 ADDITIONAL CASES

- DEC 10, 1981: 3 NEJM PAPERS DESCRIBE CASES

Gottlieb MS NEJM 2001;344:1788-91

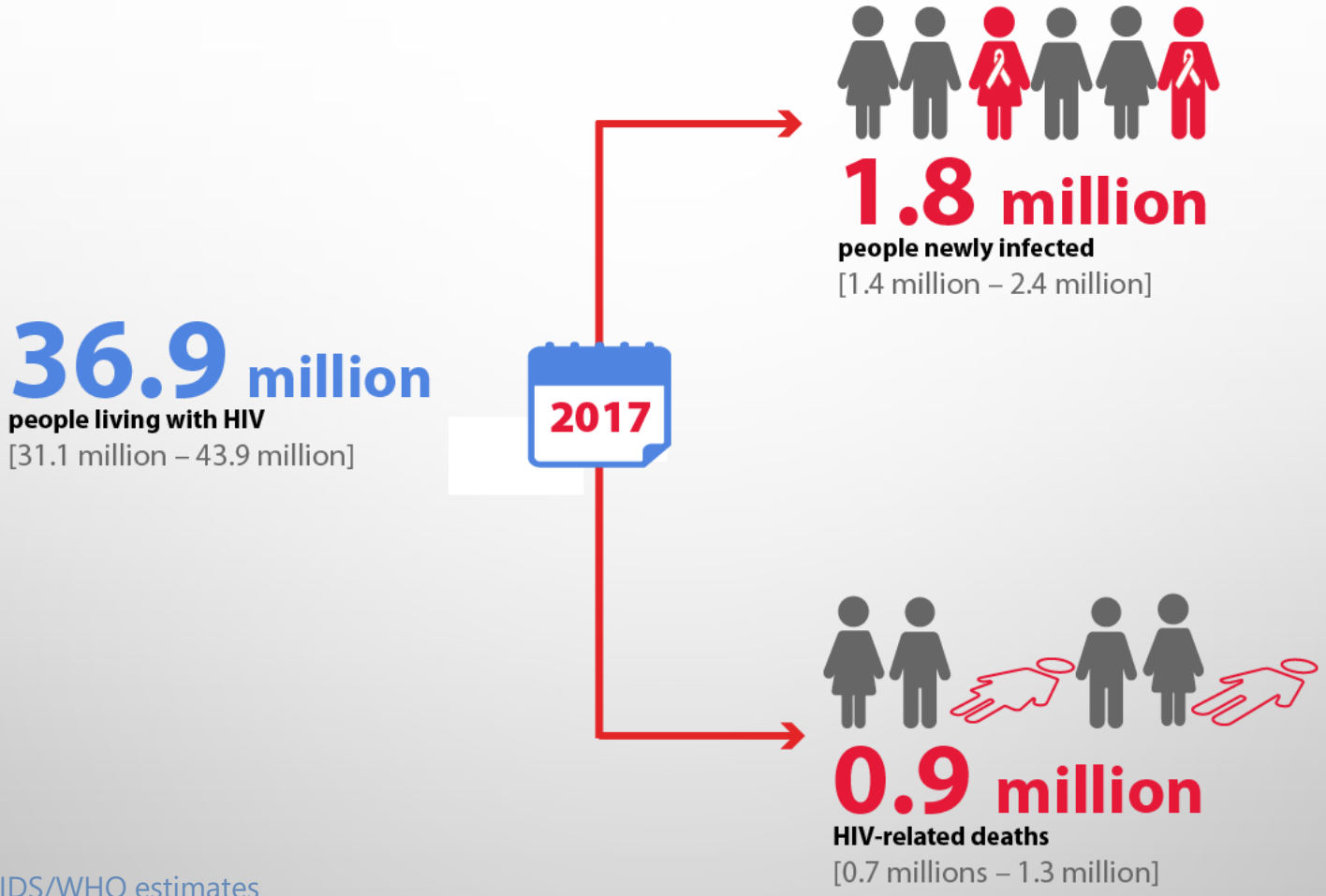
33 Years of AIDS



Since 2005, millions have access to ART

2011: HTPN 052, Treatment as Prevention

SUMMARY OF THE GLOBAL HIV EPIDEMIC (2017)



Source: UNAIDS/WHO estimates

GLOBAL HIV EPIDEMIC – PEOPLE LIVING WITH HIV

2017

Globally

36.9 million

People living with HIV

+14%

Relative to 2010

Source: UNAIDS/WHO estimates

Global HIV epidemic – incidence and mortality since 2010

2017

Globally

36.9 million

People living with HIV

- 18%

New infections annually relative to 2010

- 34%

Deaths annually relative to 2010

Source: UNAIDS/WHO estimates

GLOBAL HIV EPIDEMIC – INCIDENCE AND MORTALITY SINCE 2000

2017

Globally

36.9 million

People living with HIV

- 36%

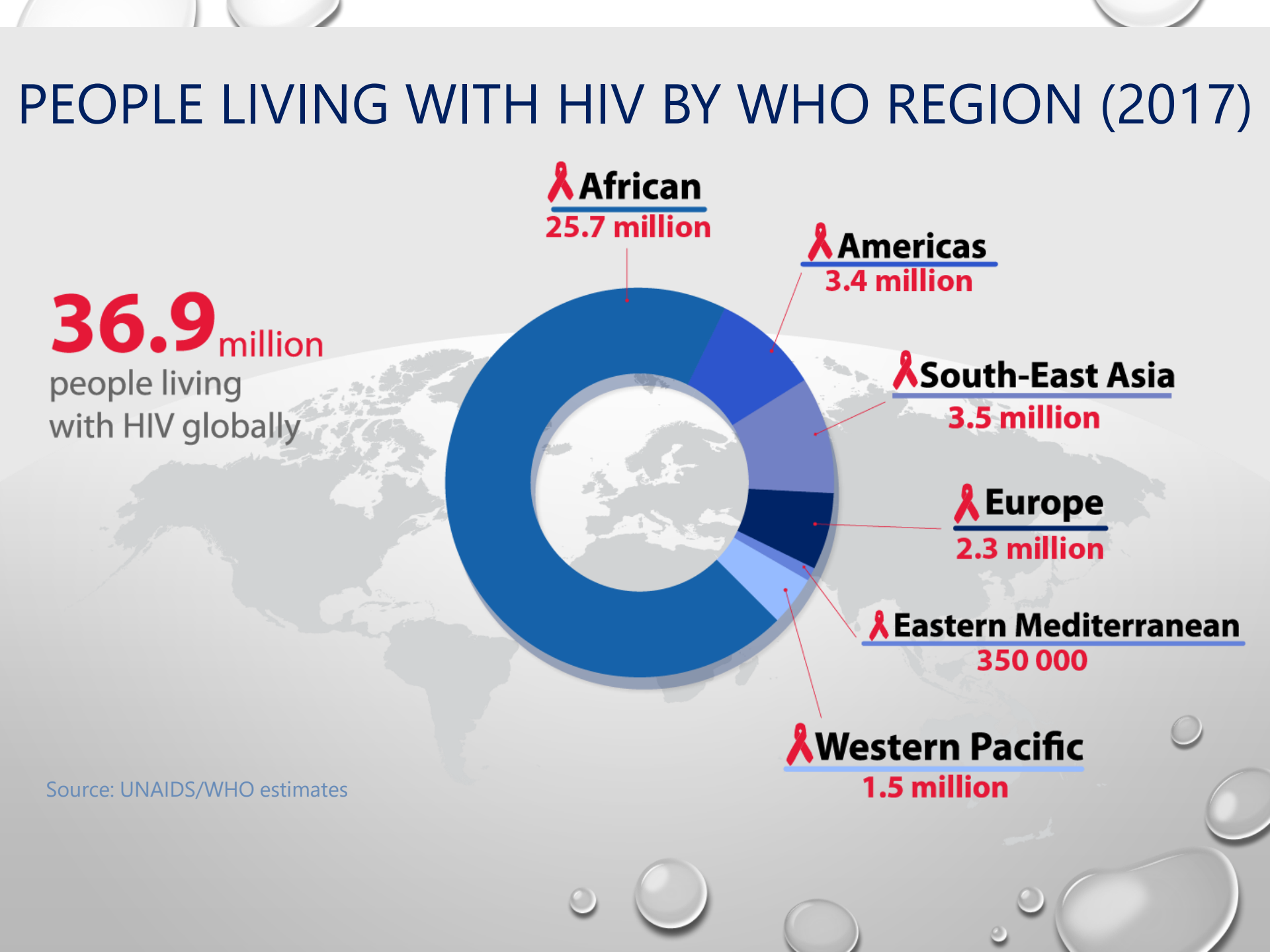
New diagnoses annually relative to 2000

- 38%

Deaths annually relative to 2000

Source: UNAIDS/WHO estimates

PEOPLE LIVING WITH HIV BY WHO REGION (2017)



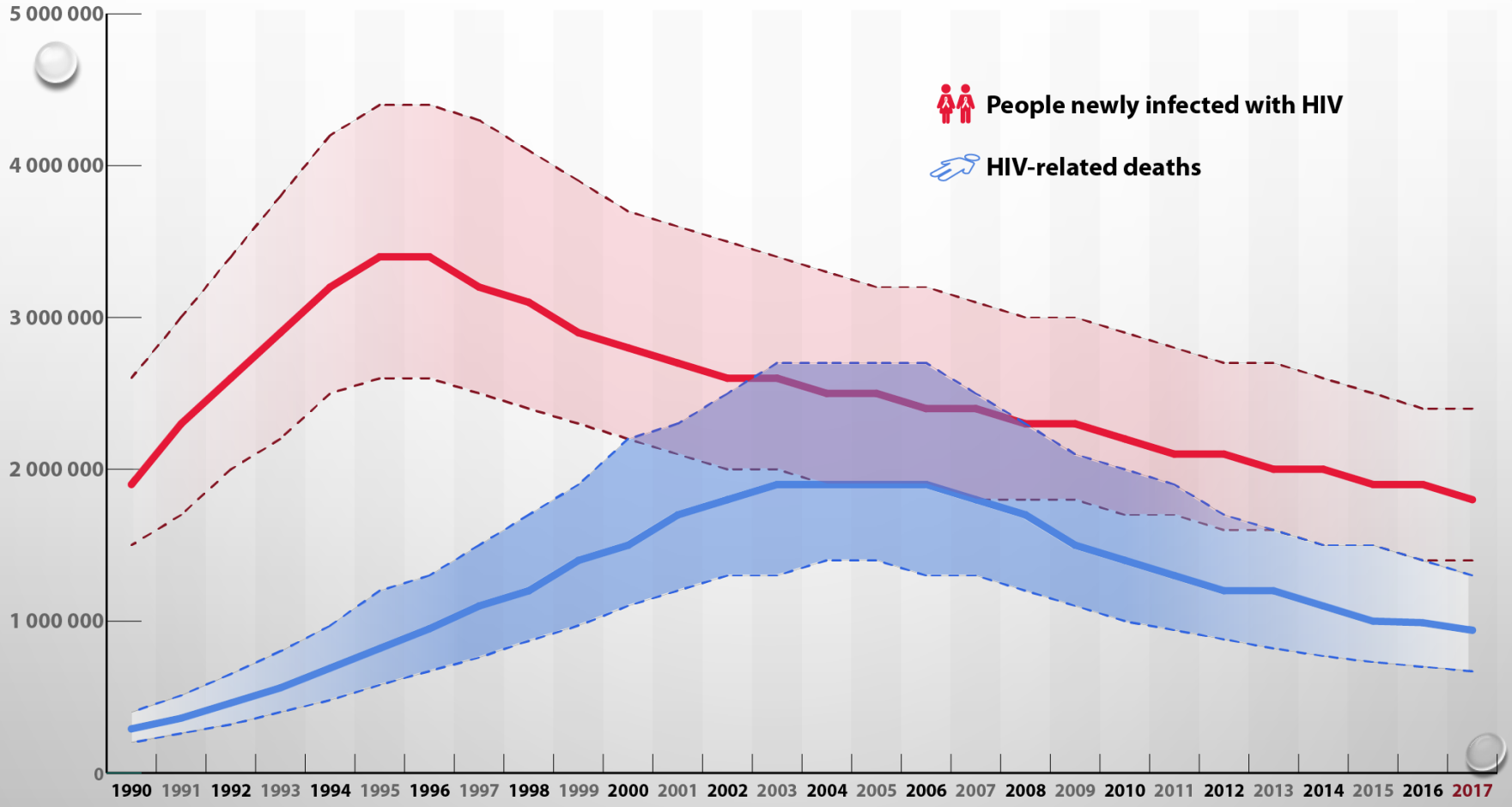
Source: UNAIDS/WHO estimates

SUMMARY OF THE GLOBAL HIV EPIDEMIC (2017)

	People living with HIV in 2017	People newly infected with HIV in 2017	HIV-related deaths 2017
Total	36.9 million [31.1 million – 43.9 million]	1.8 million [1.4 million – 2.4 million]	940 000 [670 000 – 1.3 million]
Adults	35.1 million [29.6 million – 41.7 million]	1.6 million [1.3 million – 2.1 million]	830 000 [590 000 – 1.2 million]
Women	18.2 million [15.6 million – 21.4 million]	–	–
Men	16.8 million [13.9 million – 20.4 million]	–	–
Children (<15 years)	1.8 million [1.3 million – 2.4 million]	180 000 [110 000 – 260 000]	110 000 [63 000 – 160 000]

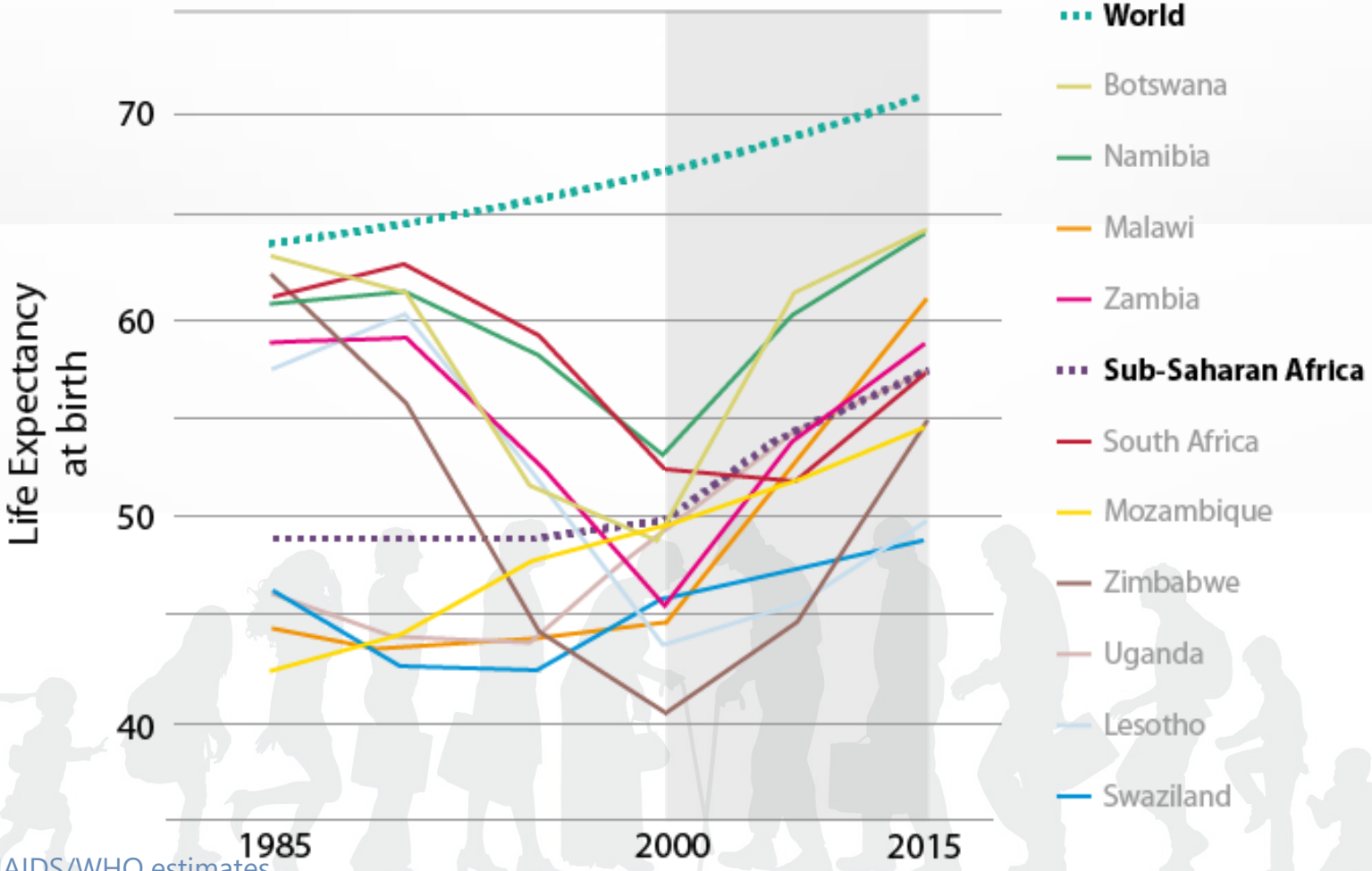
Source: UNAIDS/WHO estimates

Decline in HIV incidence and mortality over time



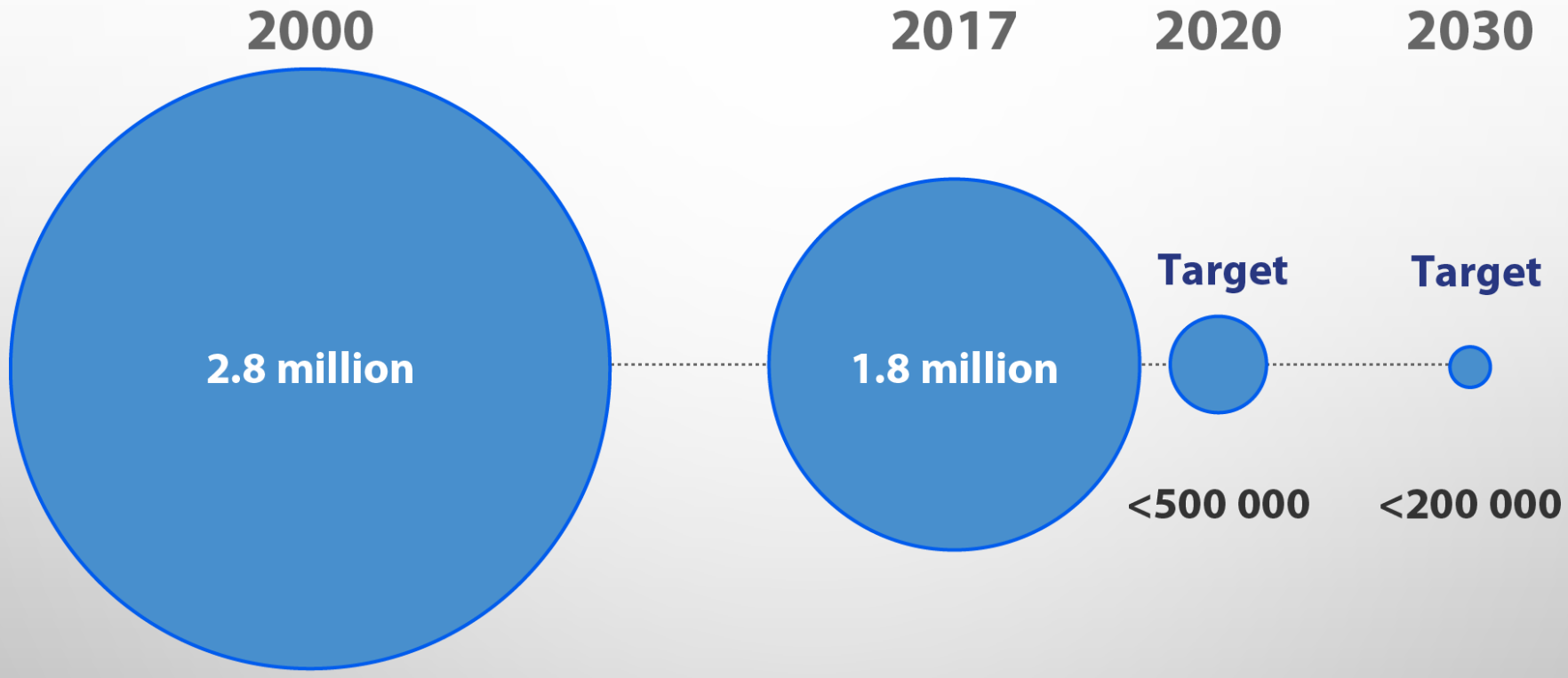
Source: UNAIDS/WHO estimates

Remarkable individual and population health benefits



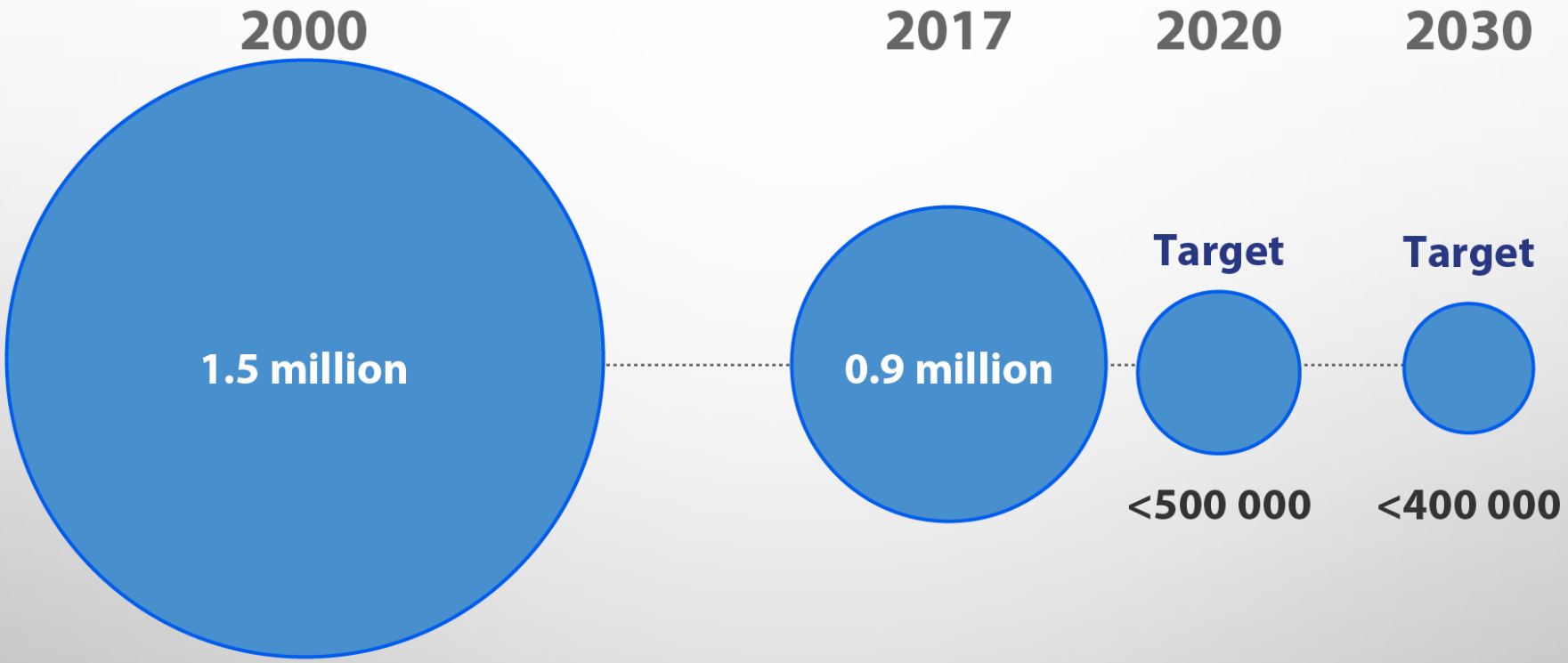
Source: UNAIDS/WHO estimates

NUMBER OF PEOPLE NEWLY INFECTED WITH HIV



Source: UNAIDS/WHO estimates

NUMBER OF HIV-RELATED DEATHS



Source: UNAIDS/WHO estimates

“THERE IS NO SINGLE AIDS EPIDEMIC.”

- UNAIDS/WHO DECEMBER, 2005

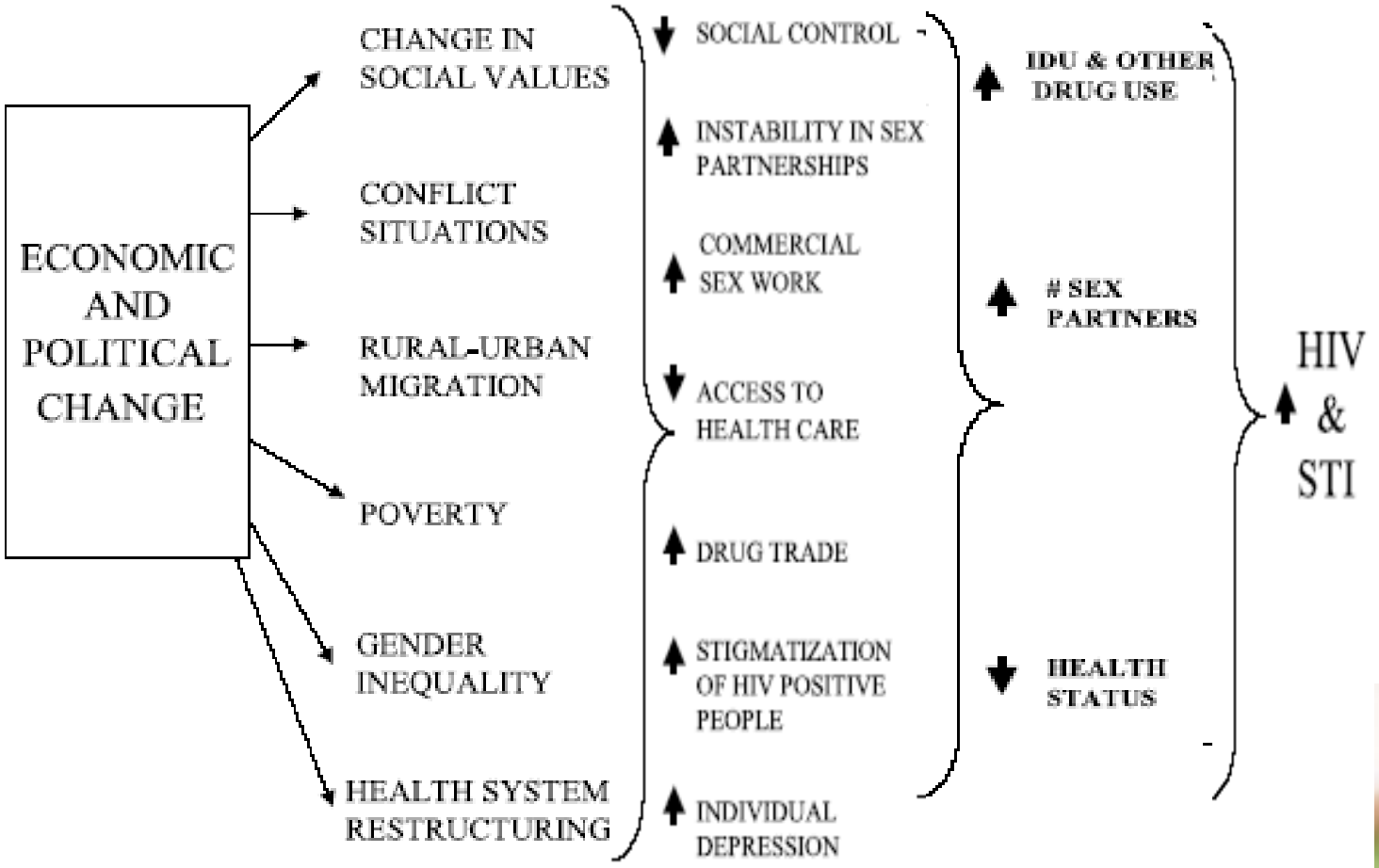
UNAIDS/WHO, 2005 UPDATE

JOINT COMMISSION OF THE UNITED NATIONS ON HIV/AIDS

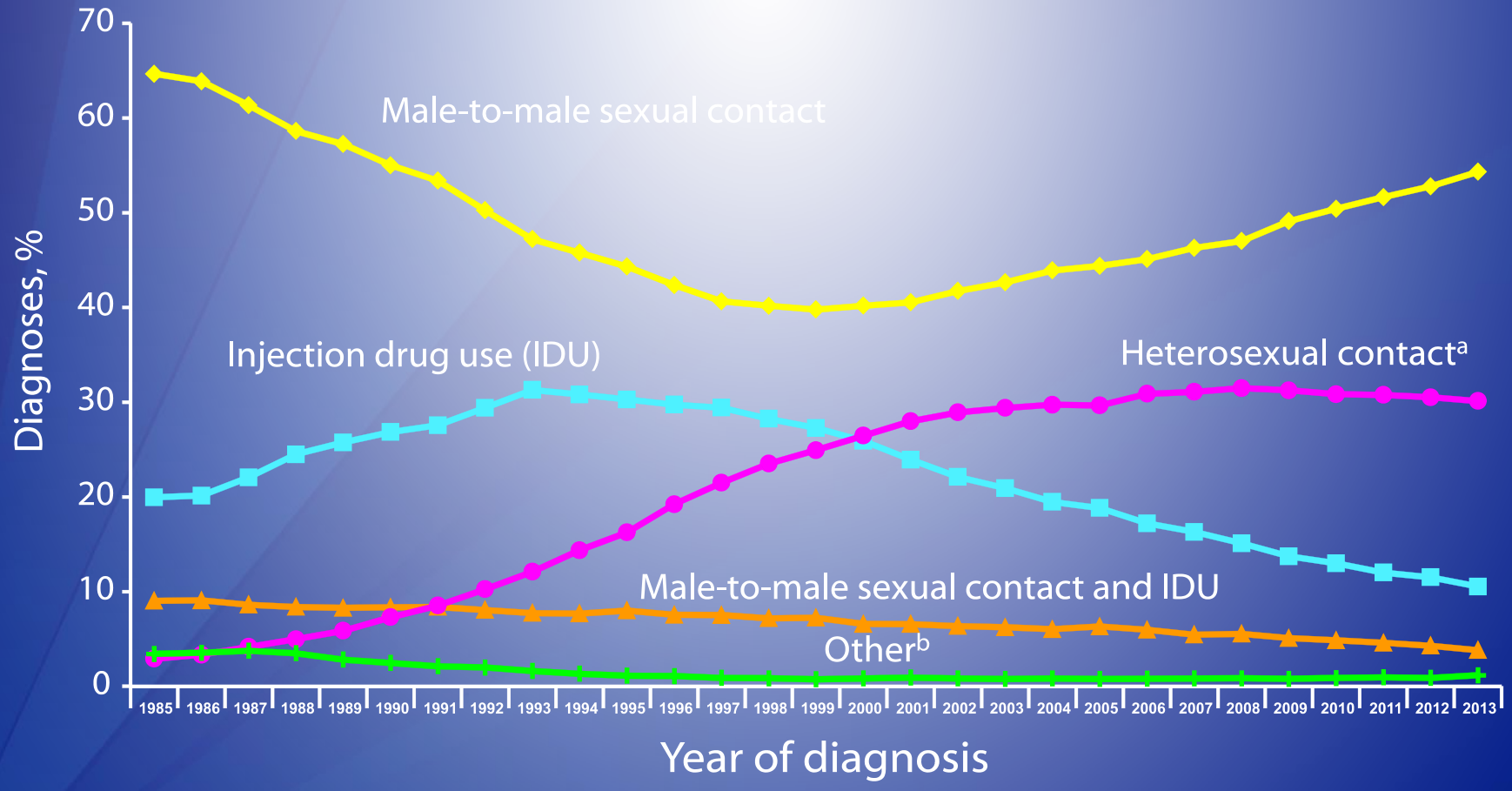
AND THE

WORLD HEALTH ORGANIZATION

The impact of social, economic and political forces on emerging HIV epidemics Gorbach *et al.*



PERCENTAGES OF STAGE 3 (AIDS) CLASSIFICATIONS AMONG ADULTS AND ADOLESCENTS WITH HIV INFECTION, BY TRANSMISSION CATEGORY AND YEAR OF DIAGNOSIS, 1985–2013—UNITED STATES AND 6 DEPENDENT AREAS



NOTE: ALL DISPLAYED DATA HAVE BEEN STATISTICALLY ADJUSTED TO ACCOUNT FOR REPORTING DELAYS AND MISSING TRANSMISSION CATEGORY, BUT NOT FOR INCOMPLETE REPORTING.

[A] HETEROSEXUAL CONTACT WITH A PERSON KNOWN TO HAVE, OR TO BE AT HIGH RISK FOR, HIV INFECTION.

[B] INCLUDES HEMOPHILIA, BLOOD TRANSFUSION, PERINATAL EXPOSURE, AND RISK FACTOR NOT REPORTED OR NOT IDENTIFIED.

The HIV Epidemic in the United States, 2010-2015

Prevalence[a]

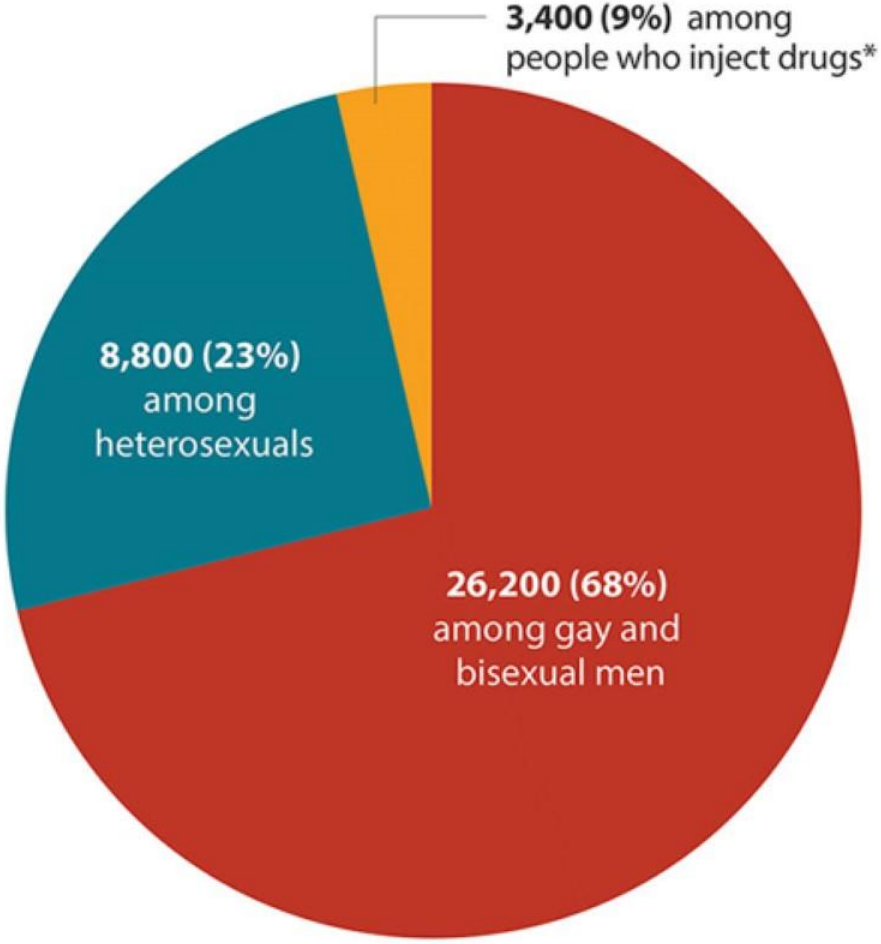
- 1.1 million persons aged 13 and older were living with HIV infection in the United States, including an estimated 162,500 persons (15%) whose infections had not been diagnosed
  - Adolescents and young adults were most likely to be unaware of their infection; among people aged 13 to 24 years with HIV, an estimated 51% did not know they were infected[b]

Incidence[a]

- Estimated number of new HIV infections in the United States was 38,500; estimated annual HIV infections in the United States declined by 8% from 2010 to 2015

a. CDC website. HIV Surveillance Report Supplemental 2018; b. CDC website. HIV in the United States: *at a glance.*

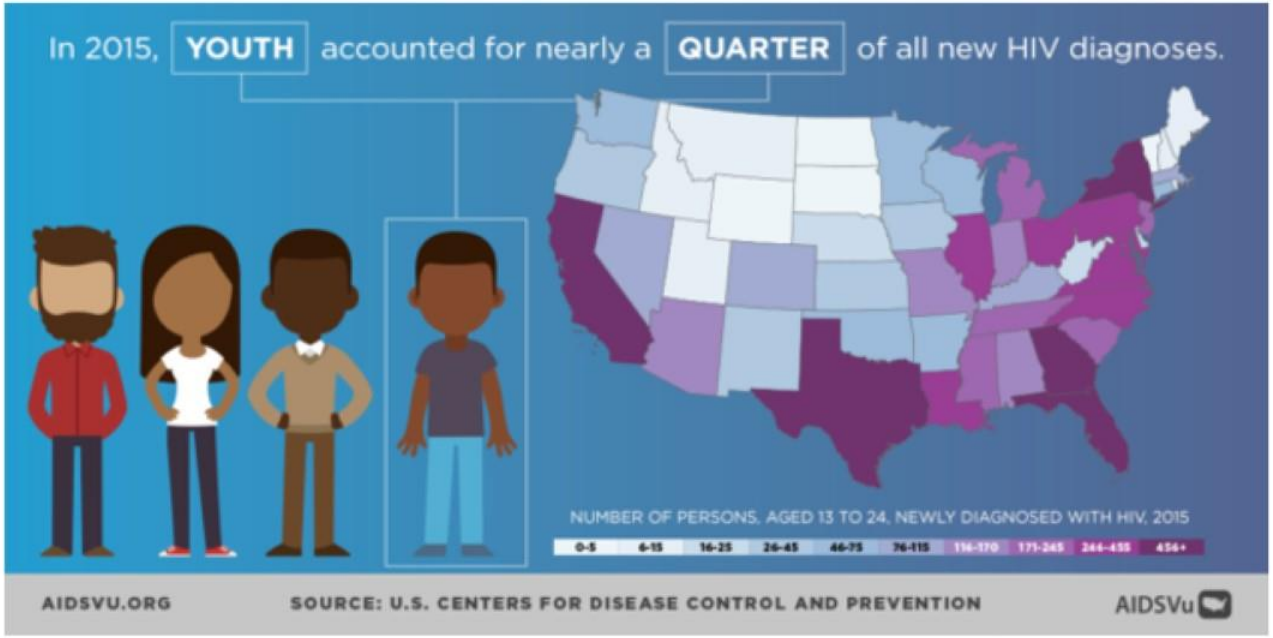
Estimated New HIV Infections in the United States by Transmission Category, 2015



*Includes infections among gay and bisexual men who inject drugs and therefore, have 2 risk factors.
CDC website. HIV in the United States: *at a glance*; CDC website. HIV Surveillance Supplemental Report 2018.

New HIV Diagnoses in the United States

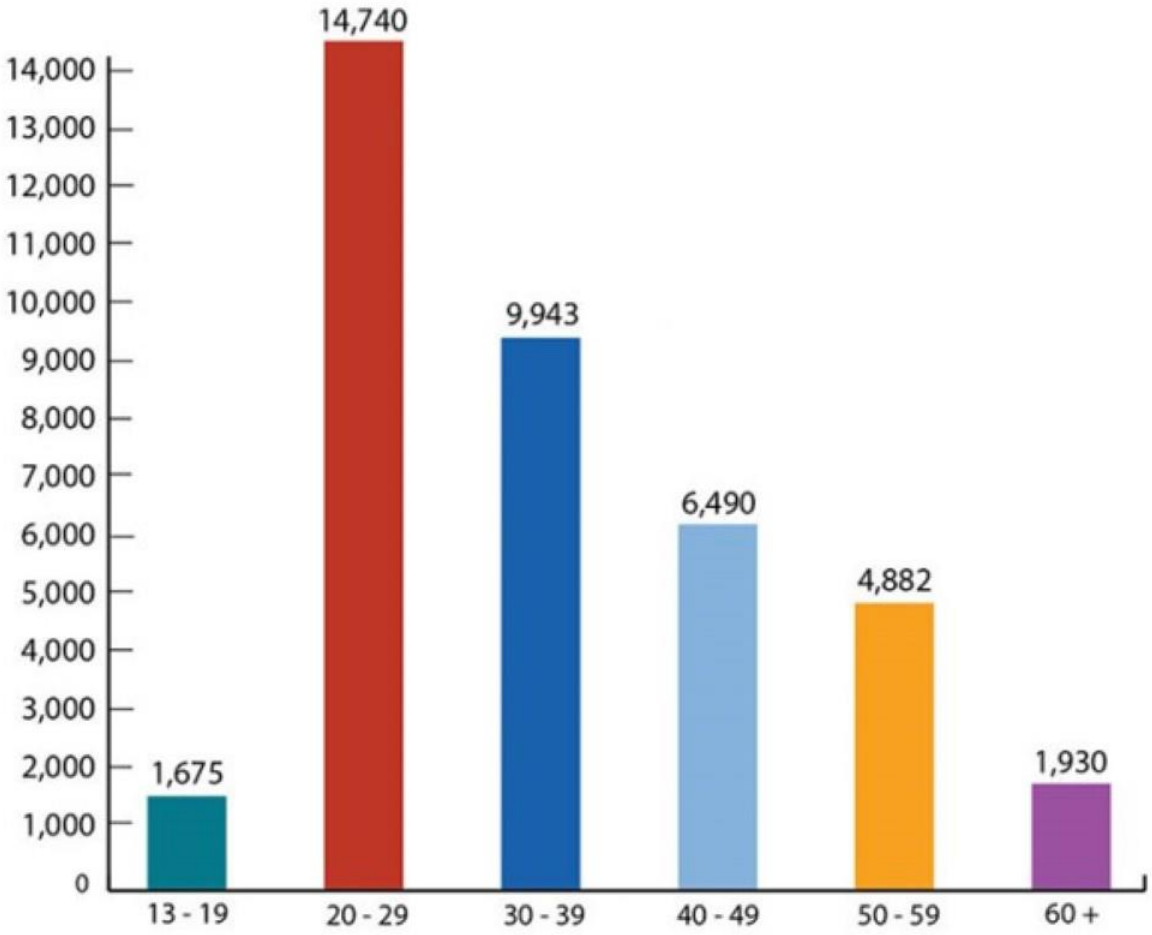
- Number of new HIV diagnoses in the United States in 2015 was 39,782
  - 32,131 diagnoses among adult and adolescent males (aged ≥ 13 years), 7529 among adult and adolescent females, and 122 among children younger than 13 years[a]



Data Source: AIDSVu (aidsvu.org). Emory University, Rollins School of Public Health.

a. CDC website. HIV Surveillance Supplemental Report 2018.

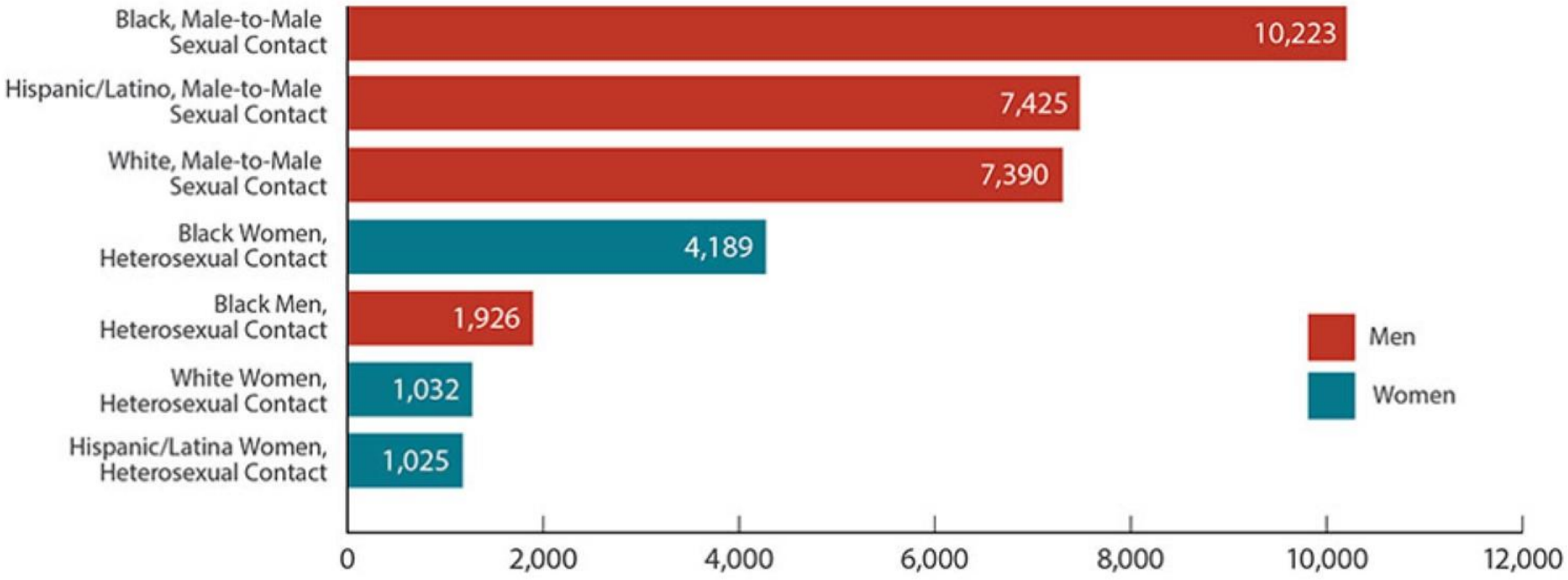
New HIV Diagnoses in the United States by Age (Years), 2016



CDC website. HIV in the United States: *at a glance*.

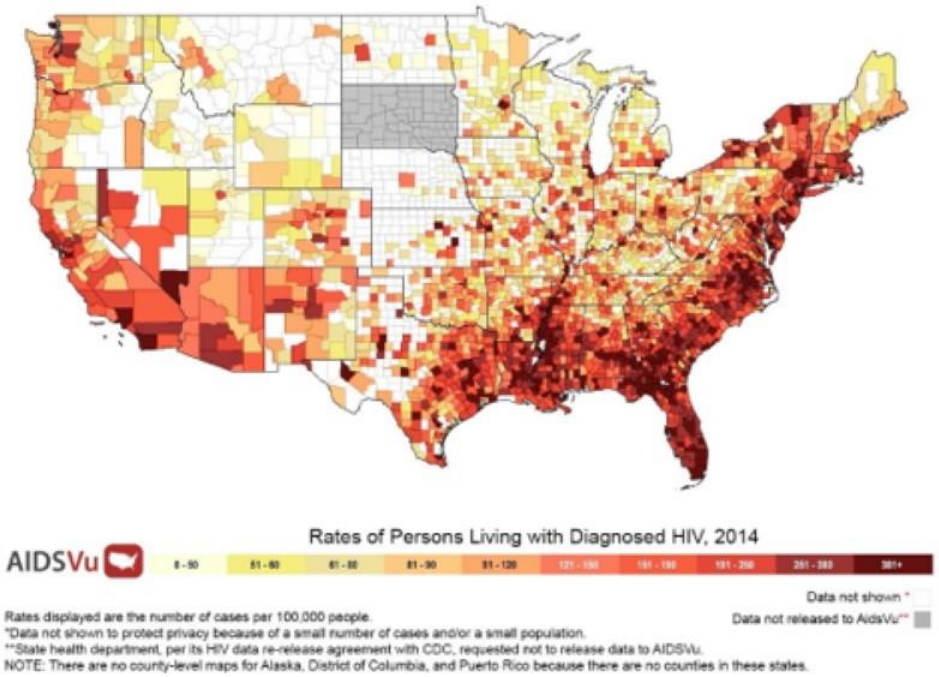
Significant Health Disparities Among Subgroups With HIV

New HIV Diagnoses in the United States for the Most Affected Subpopulations, 2016



CDC website. HIV in the United States: *at a glance*; CDC website. HIV Surveillance Supplemental Report 2018.

The Geography of HIV in the United States



Data Source: AIDSVu (aidsvu.org). Emory University, Rollins School of Public Health.

- Two-thirds of all new HIV diagnoses in United States in 2015 occurred in 2.5% of counties

AIDSVu website. New maps and resources.

HIV Trends in the United States

- Southern states experience the greatest burden of infection and deaths
  - The southern United States is home to nearly 37% of the country's population, but these states account for more than half of all new HIV diagnoses (52%) and deaths (49%) among persons diagnosed with HIV
- Racial disparities in HIV infection continue with African Americans being impacted most
  - African Americans, who make up just 12% of the US population, accounted for 45% of all new HIV diagnoses in 2015
- HIV diagnoses among youth continue to rise
  - Number of new HIV diagnoses among all persons in the United States decreased by 18% between 2008 and 2015; new diagnoses among youth (aged 13 to 24 years) increased by 2%

AIDSVu website. New maps and resources.

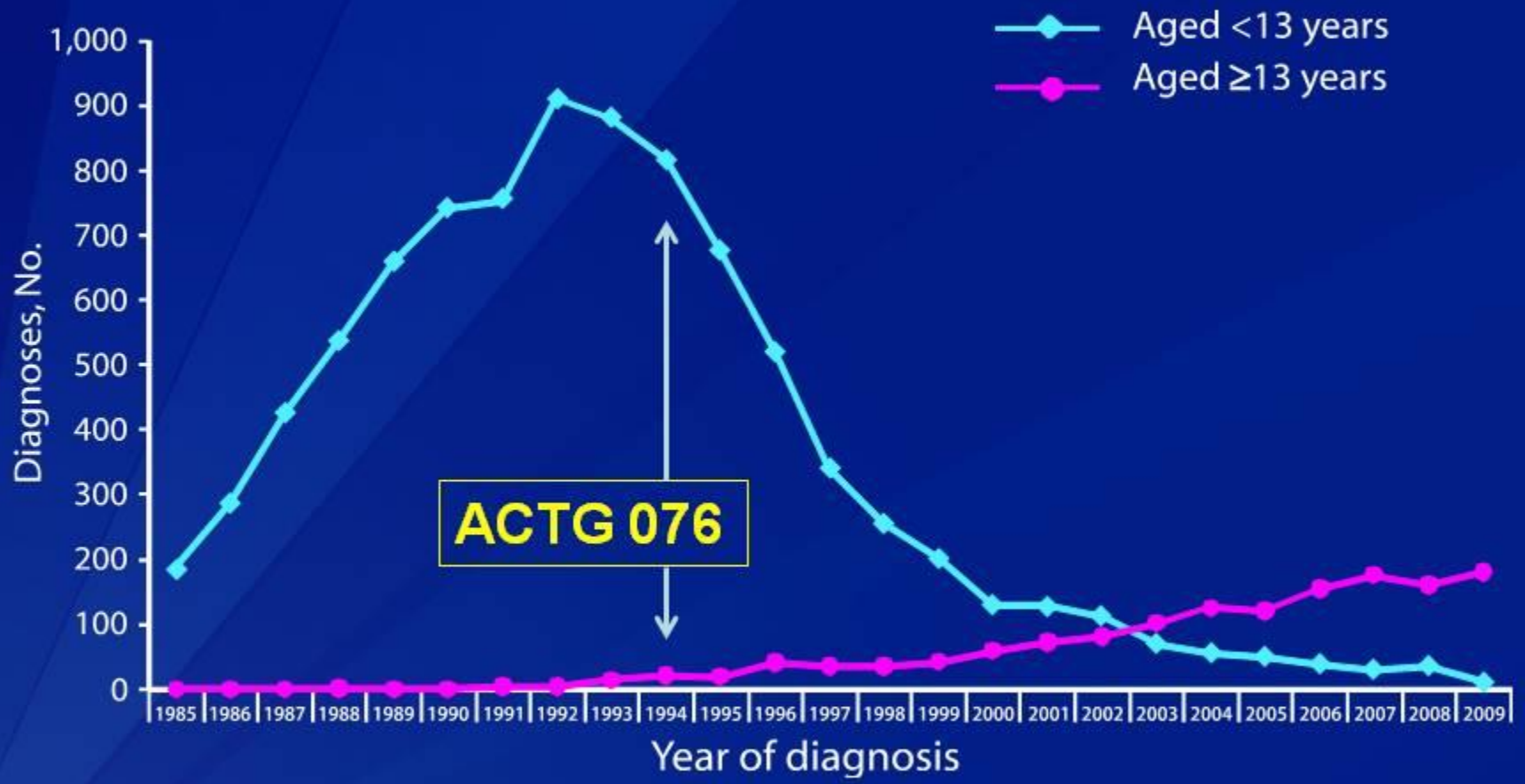
Mother-to-child transmission – global situation

- Estimate 2.4 million HIV-positive women give birth annually to 600,000 HIV-positive babies
- 1800 new infections each day
  - 90% in sub-saharan Africa
  - 1000 (<1%) in USA and Europe in 1997
- Transmission rates
  - USA/Europe: 13–30% without antiretroviral treatment, <7% with antiretroviral treatment
  - developing countries: 20–43% without antiretroviral treatment, lower rates even with short-course therapy

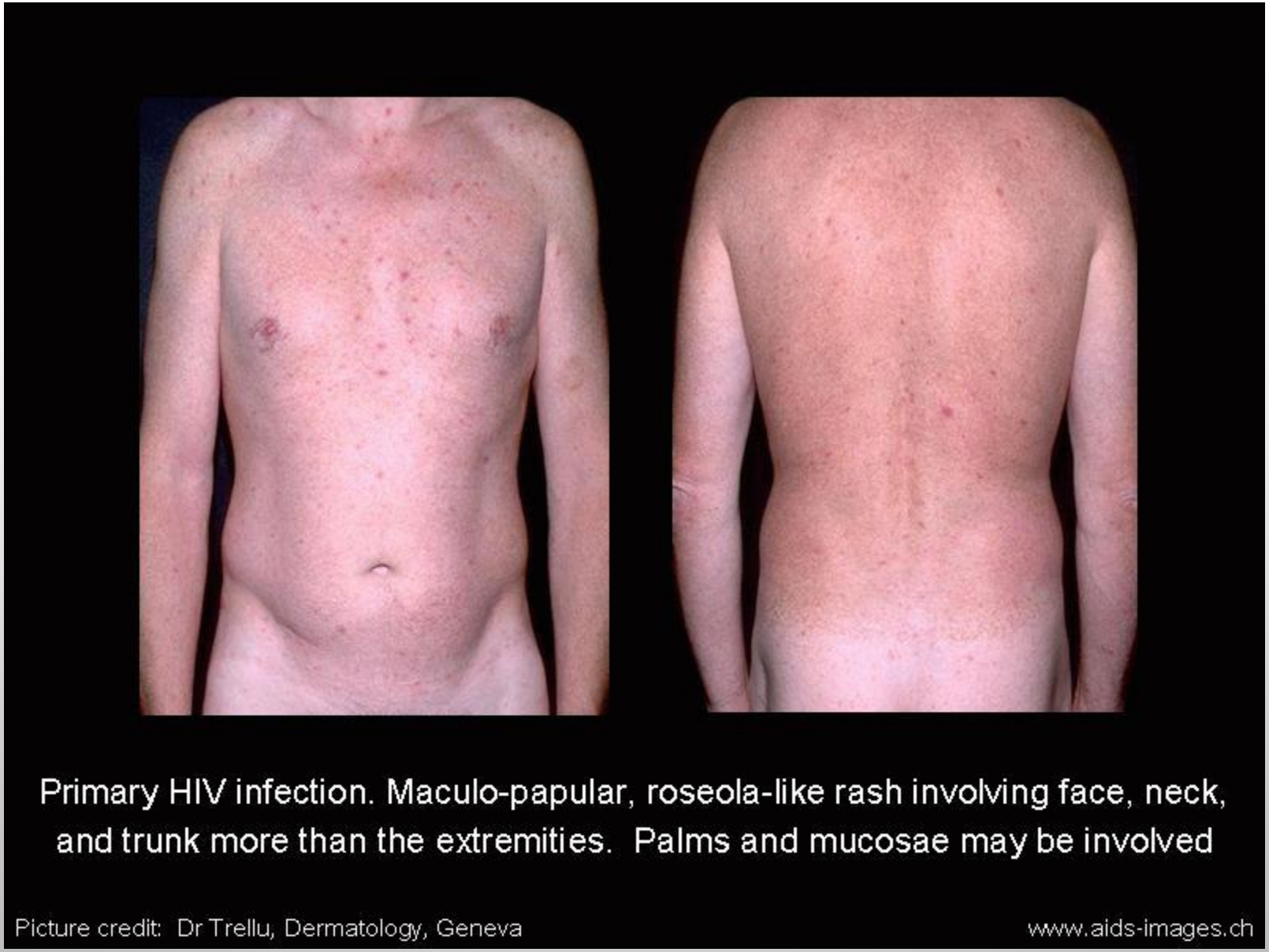
MTCT

- MTCT IS 23 TIMES HIGHER FOR AFRICAN-AMERICANS
- ALTHOUGH 90% REDUCTION IN US, RACIAL DISPARITY IS INCREASING
- 12.3/100,000 VS 0.5 IN WHITES
- 69% OF HIV <13 IS IN AFRICAN AMERICANS
- ISSUES-DX BEFORE PREGNANCY,PRENATAL CARE,ACCESS TO HIV CARE

AIDS Diagnoses among Perinatally Infected Persons, 1985–2009—United States and Dependent Areas



Note. All displayed data have been statistically adjusted to account for reporting delays, but not for incomplete reporting.

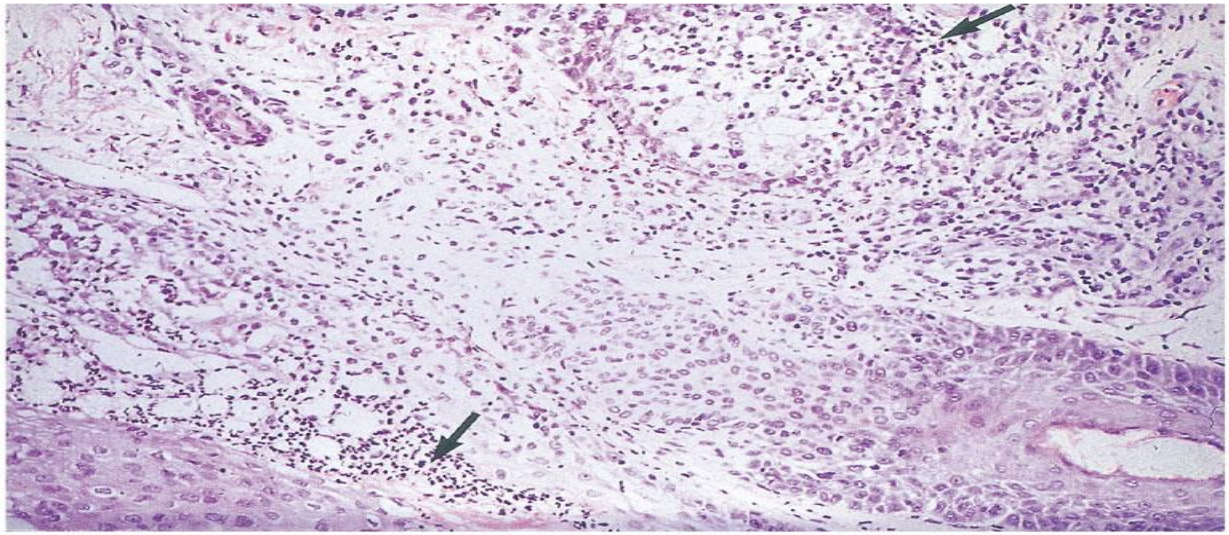


Primary HIV infection. Maculo-papular, roseola-like rash involving face, neck, and trunk more than the extremities. Palms and mucosae may be involved

Picture credit: Dr Trellu, Dermatology, Geneva

www.aids-images.ch

(a)



(b)

HIV-related cachexia (« Slim disease »)

The patient was a hemophiliac, infected in 1980. He developed incoercible diarrhea due to cryptosporidiosis, and CMV colitis

Picture credit: Dr. C. Pichard

www.aids-images.ch

Necrotizing gingivitis of 3 lower incisors.

Note use of resin to diminish their mobility

Picture credit: Pr J. Samson, Geneva

www.aids-images.ch

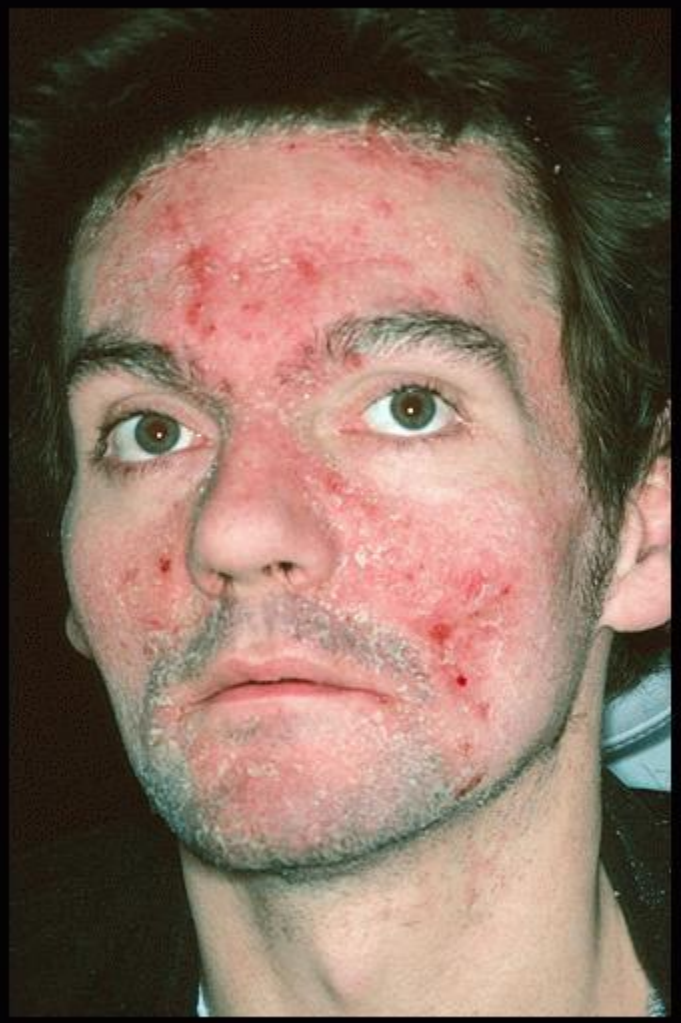
Non-specific ulcer in a patient with AIDS

Picture credit: Pr J Samson, Geneva

aids-images.ch

Oral leukoplakia: The crests are only evident at close inspection

Picture credit: Professor J. Samson, Geneva



Severe seborrheic dermatitis in an immune suppressed patient.

(a)

(b)

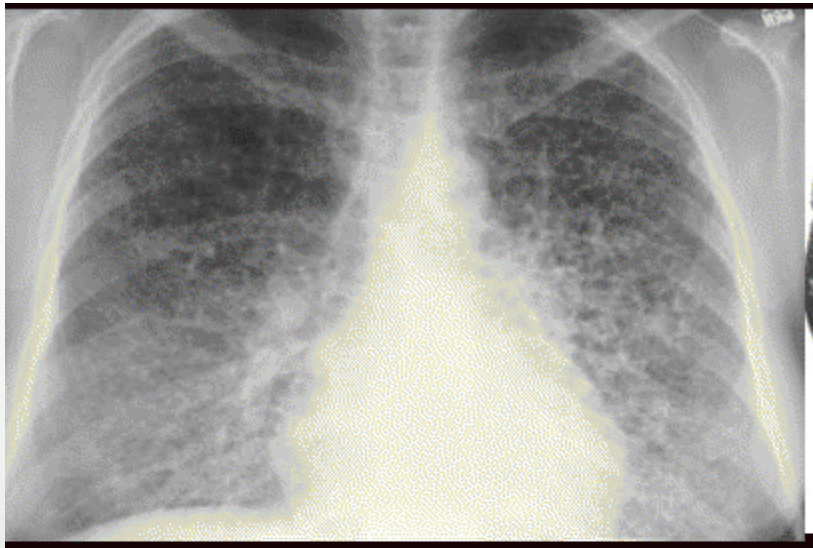
(c)

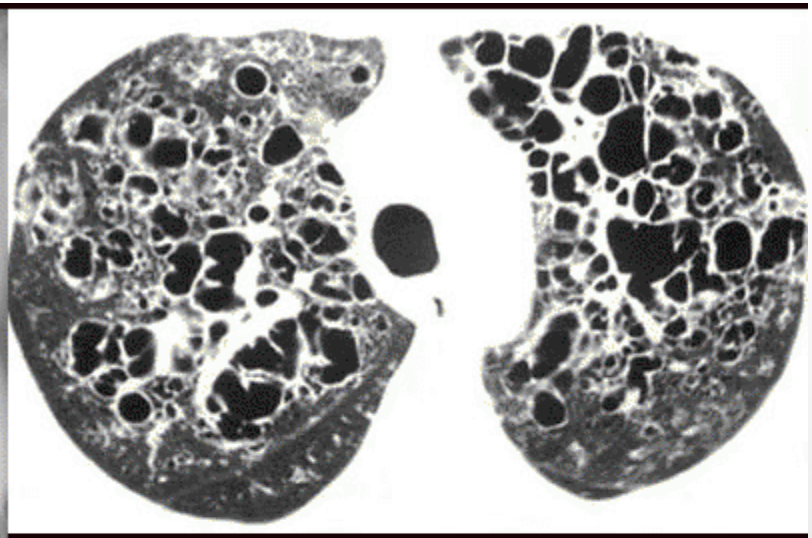
CMV Retinitis: Differential diagnosis (10)

Chorioretinitis in a case of disseminated PCP

This patient was extremely immune suppressed, with less than 10 CD4 lymphocytes/μL. For prevention of PCP, he inhaled pentamidine monthly.

www.aids-images.ch





PCP case 8

Extensive pneumocoele formation in PCP is evident in « honeycombing » (top left and right), and at autopsy. Note the extensive yellowish areas of consolidation.

Source:

pathhsw5m54.ucsf.edu/cts/unknown14/cysts.html

www.aids-images.ch

Erythematous candidiasis of the tongue with perleches

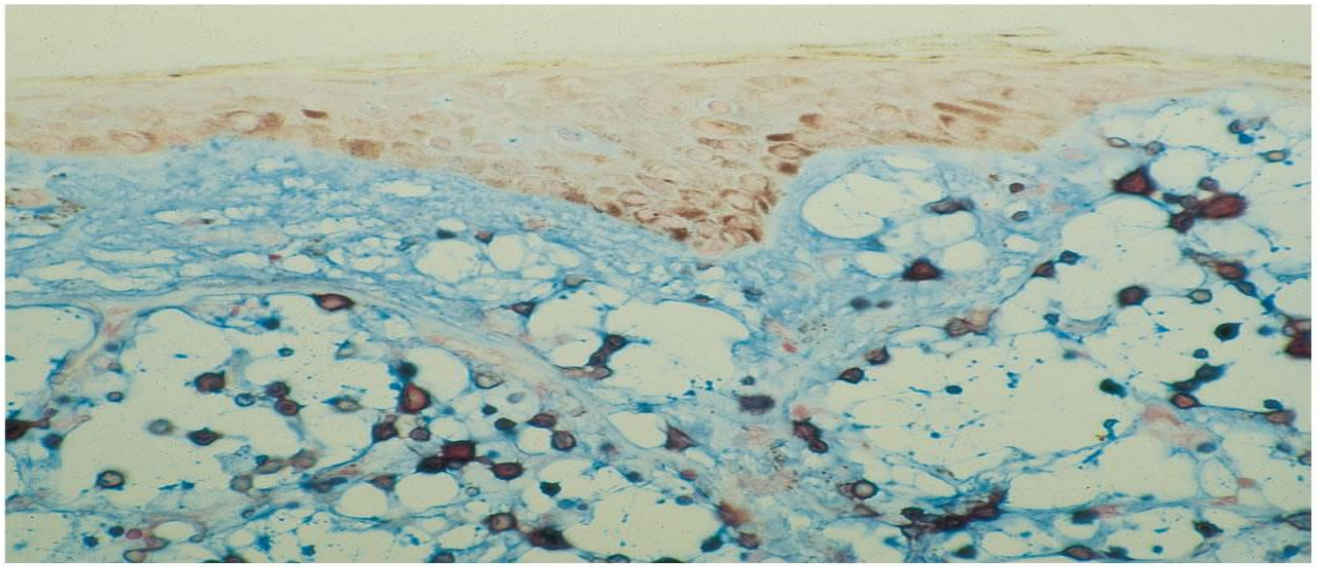
Picture credit: Pr J. Samson, Geneva

Oral thrush involving hard and soft palate

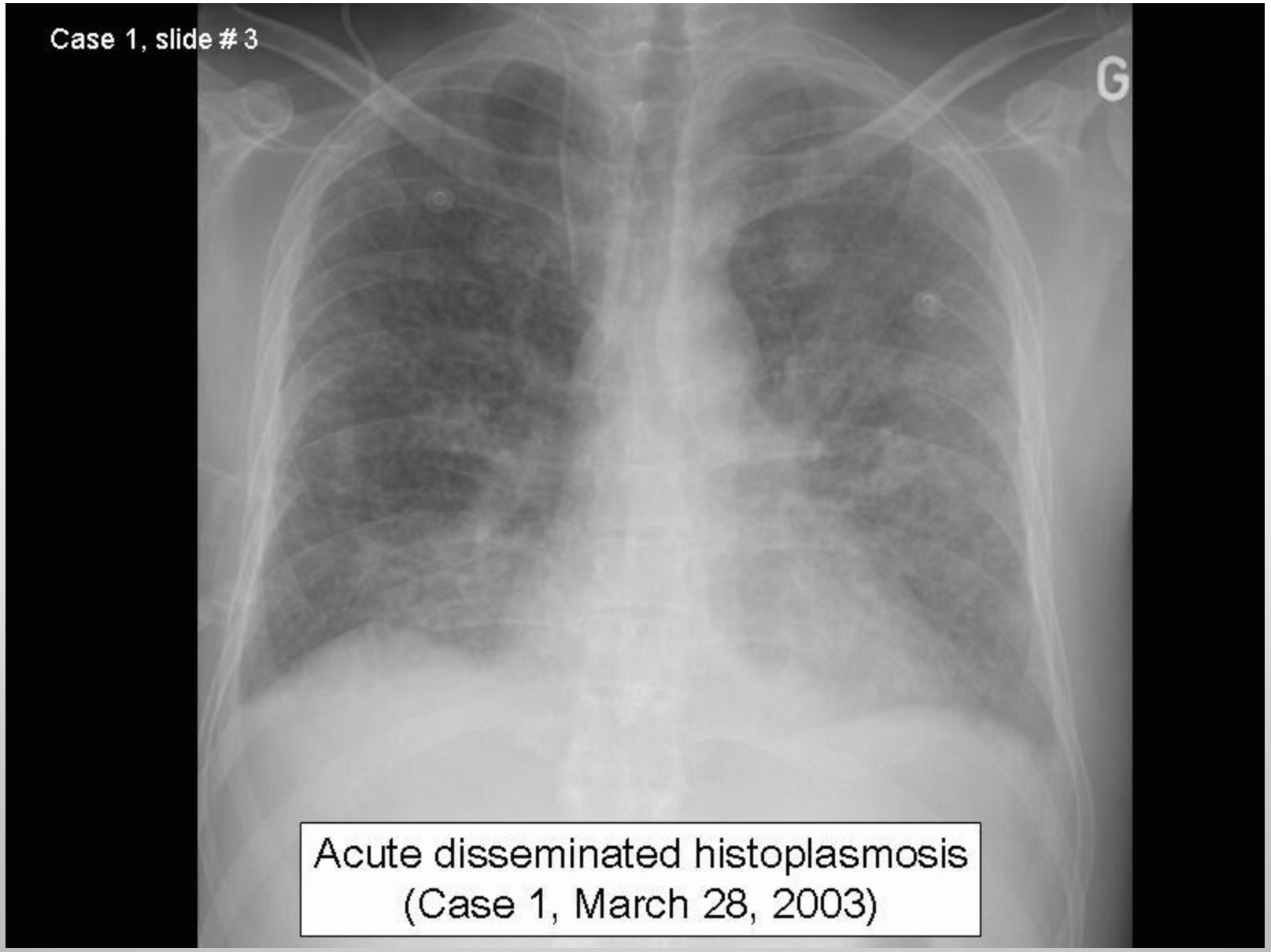
Picture credit: Pr J. Samson, Geneva


Perlèches, cheilitis, candidiasis
Picture Credit: Dr Sirisanthana
www.aids-images.ch

(a)



(b)


Case 1, slide # 3
G
Acute disseminated histoplasmosis
(Case 1, March 28, 2003)

Case 2, slide # 1

Case 2: Skin lesions in an HIV-infected patient with positive blood cultures for *H. capsulatum*

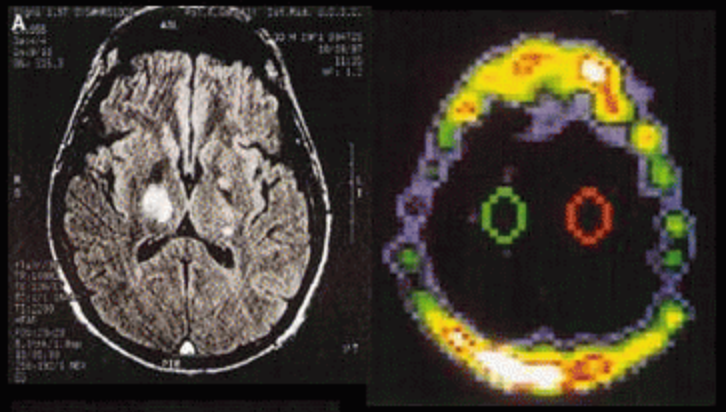
(courtesy: H. Günthard, Zurich)

Case 3, slide # 1: Lesions of skin and of oral mucosa in a case of biopsy-proven histoplasmosis from Zimbabwe.

Skin lesions in histoplasmosis may include nodules, papules, plaques, ulcers, vesicles, pustules, and abscesses. Lesions in the g.-i. tract may occur from the mouth to the anus; mouth lesions are painful, with ulceration, and hypertrophic areas suggesting malignancy (right)

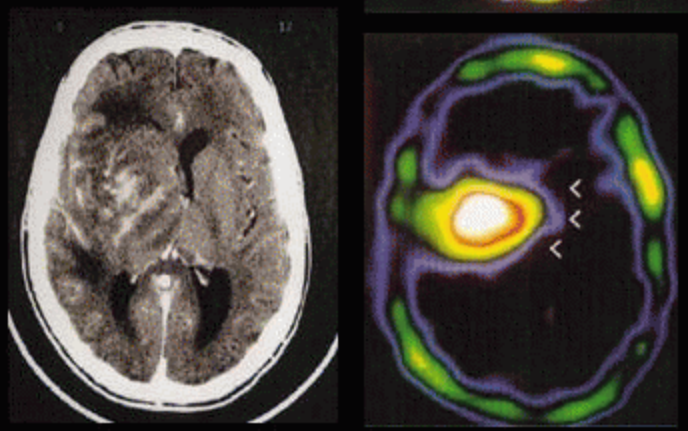
Photographs by R. Lüthy, Harare

www.aids-images.ch



Cases 9 and 10 .

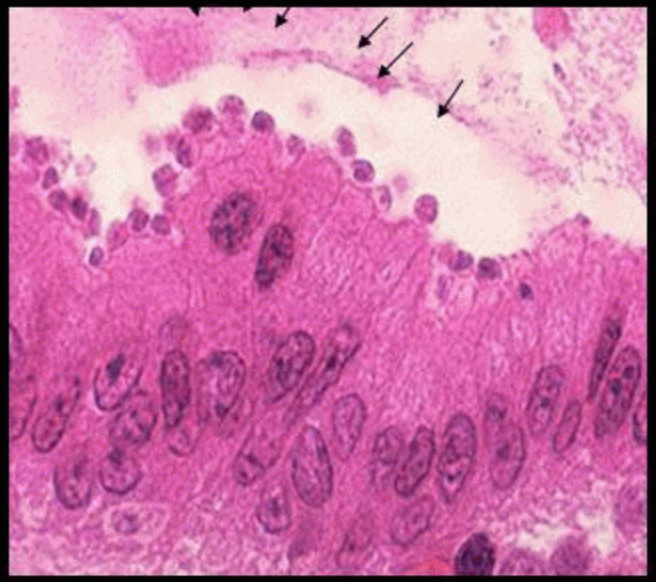
Toxoplasmosis

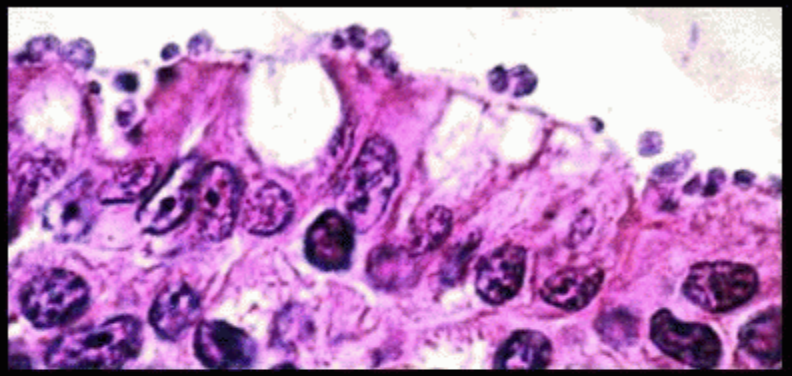


Lymphoma

Cases 9/10: Differential diagnosis using SPECT scan. Schematic view of differential diagnosis of toxoplasmosis and lymphoma using single photon emission computerized tomography (SPECT) scan. Neoplastic tissue, in particular lymphomas, accumulate Thallium-201, and give a strong signal, in contrast to toxoplasma abscesses. Source: Antinori A, J Clin Oncology, 1999;17:554.

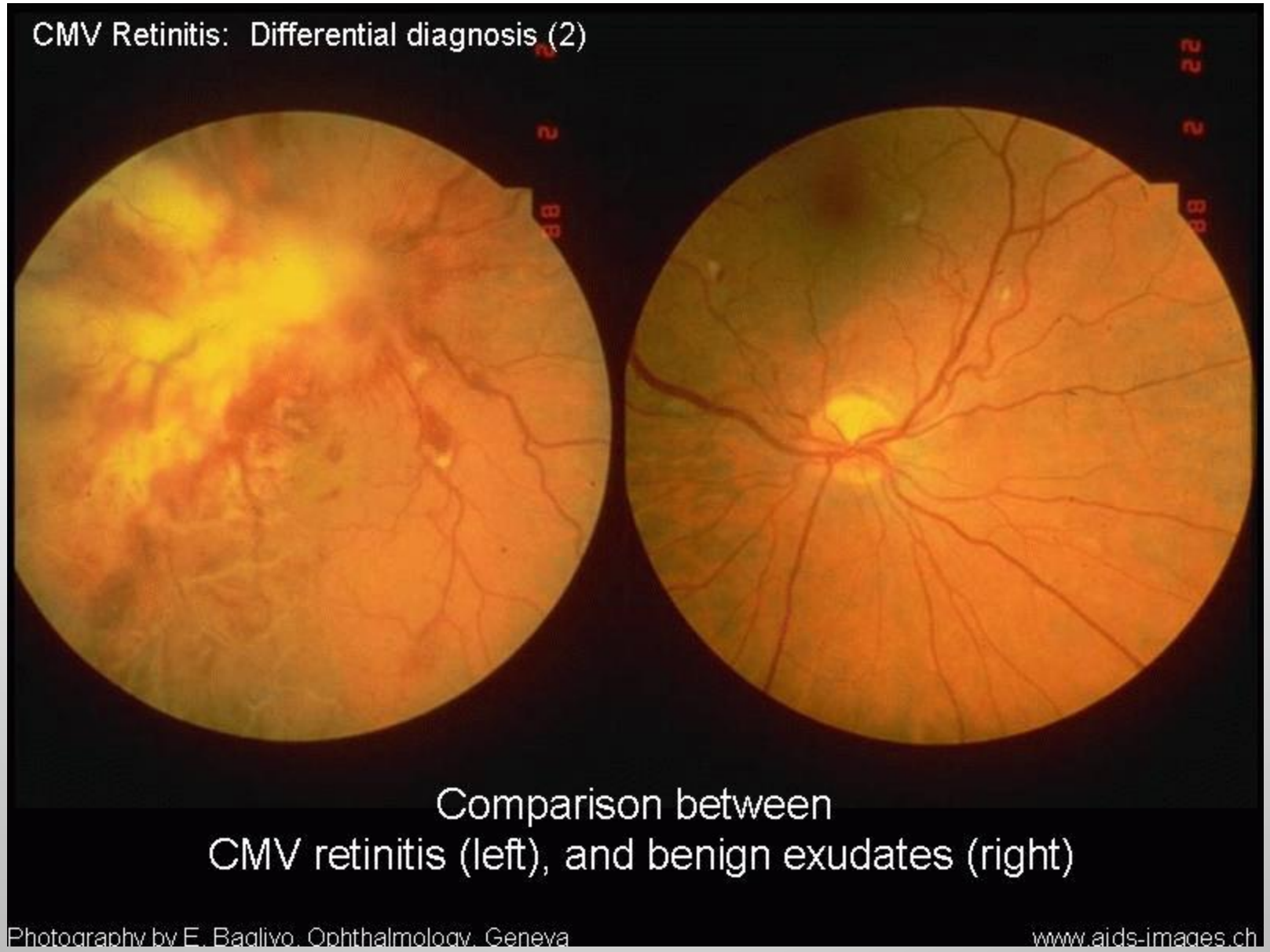
www.aids-images.ch





Intestinal (duodenal) biopsies: Cryptosporidia are seen adhering to the epithelial cells (arrows)

www.aids-images.ch


CMV Retinitis: Differential diagnosis (2)
Comparison between
CMV retinitis (left), and benign exudates (right)
Photography by E. Baglivo, Ophthalmology, Geneva
www.aids-images.ch

Extensive aciclovir-resistant herpes

www.aids-images.ch

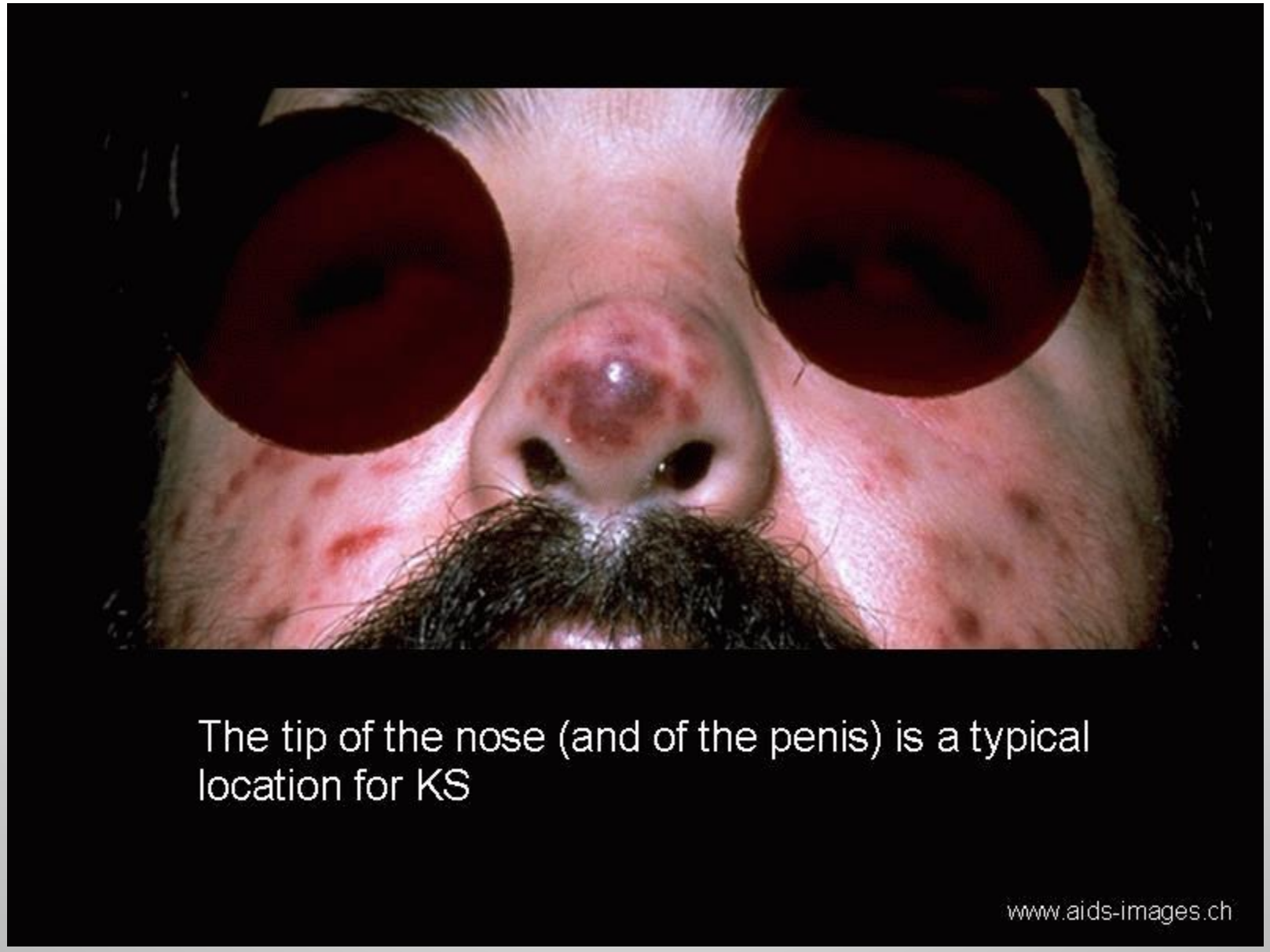
Ophthalmic zoster, due to involvement of the first branch of the trigeminal nerve

www.aids-images.ch

Oral lymphoma: Swilling and ulceration on the inside surface of the cheek

www.aids-images.ch


Kaposi's sarcoma: confluent
macules on black skin
www.aids-images.ch


The tip of the nose (and of the penis) is a typical location for KS
www.aids-images.ch

KS tumor of right hemi-palate, with underlying involvement of bone

Picture credit: Pr J. Samson, Geneva

www.aids-images.ch

(a)

(b)

Molluscum contagiosum

Photograph by R. Lüthy, Harare

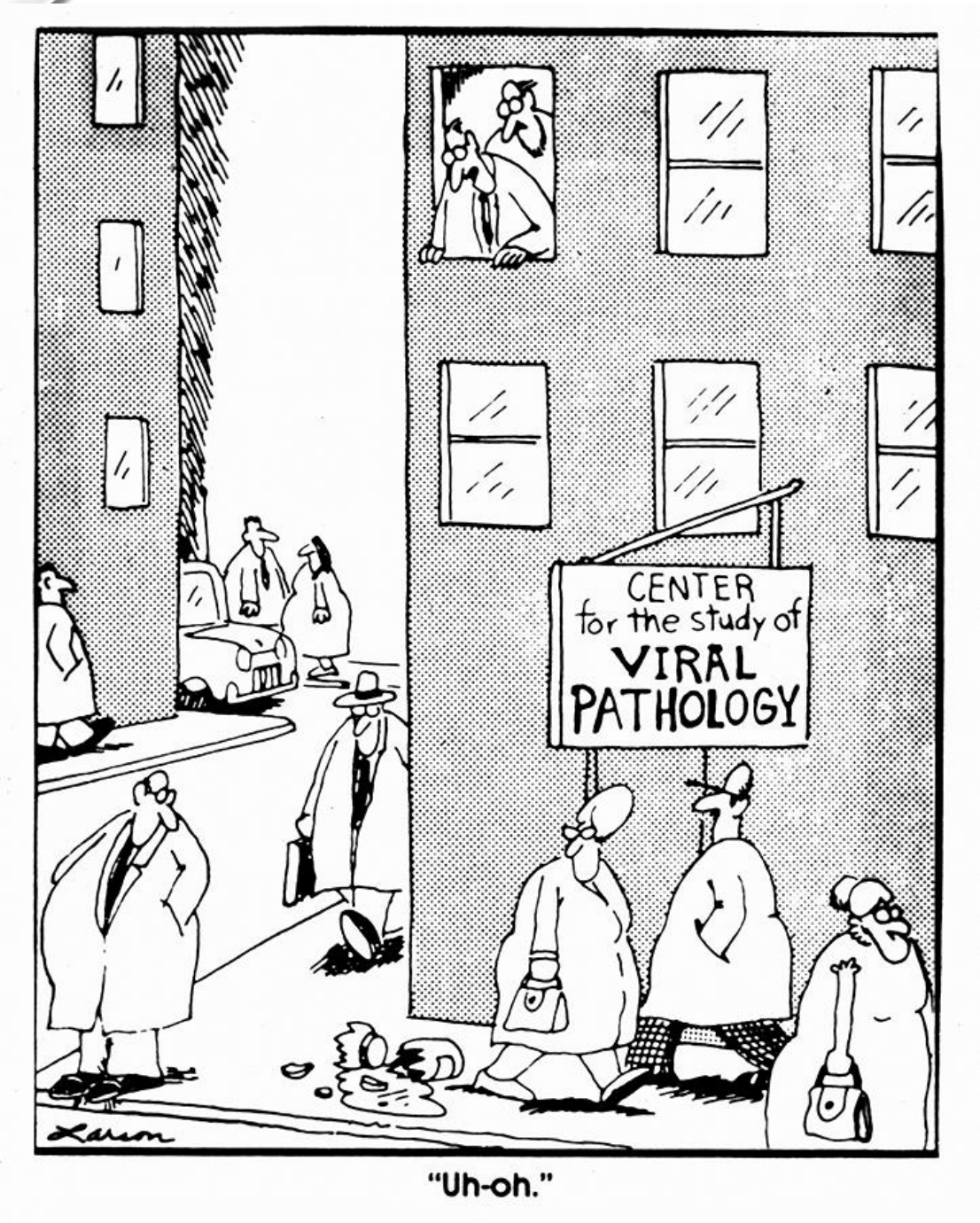
www.aids-images.ch

OTHER EARLY DEVELOPMENTS 羊1

- 1982:
  - TERM “AIDS” COINED
  - FIRST CASES IN WOMEN REPORTED
  - FIRST TRANSFUSION AND VERTICALLY TRANSMITTED CASES REPORTED
- 1983:
  - ISOLATION OF A RETROVIRUS FROM A PATIENT WITH AIDS
  - BY MONTAGNIER’S GROUP

- 1984:
  - DETECTION OF HTLV-III IN PTS WITH AND AT RISK FOR AIDS (GALLO)

Sepkowitz K NEJM 2001;344:1764-72



"Uh-oh."

WHERE DID HIV COME FROM? LESSONS FROM PRIMATE SIV INFECTIONS

- SIV INFECTS >30 PRIMATE SPECIES
  - HIGH DEGREE OF CROSS-SPECIES TRANSMISSION
  - RAPID RATE OF EVOLUTION
  - FREQUENT RECOMBINATION (SIMILAR TO INFLUENZA)[1]
- LIKELY LOCATION OF MONKEY ⇨ HUMAN TRANSMISSION: WEST CAMEROON
- LIKELY LOCATION OF INITIAL VIRAL CLADE DIVERSIFICATION: KINSHASA, DEMOCRATIC REPUBLIC OF THE CONGO
  - CITY LINKED BY TRANSPORT, KNOWN TO HAVE EARLY A, C, D, F, G, H, J, K CLADES
- BEST ESTIMATE OF YEAR OF TRANSMISSION: 1931
  - EXPONENTIAL SPREAD
    - 1960 – 2,000 CASES WORLDWIDE (UNRECOGNIZED)
    - 1980 – 200,000 CASES
    - 2000 – 40,000,000 CASES
- GROUP O EVOLVED FROM SIV IN GORILLAS, NOT CHIMPANZEES OR SOOTY MANGABEYS[2]

1. Sharp P. *HIV8*, Glasgow 2006, #KL1; 2. Van Heuverswyn F, *et al. Nature* 2006;444:164

Dating the origin of HIV

- Novel detection of 'molecular clock' within viral genome
- Method validated by HCV samples of known date originally transmitted in contaminated blood compared to present HCV isolate
- Using this method the following was determined
  - HIV-1-positive simian counterpart arose around 1700
  - human group M HIV-1 separated from its simian counterpart in 1930s
  - subtype B separated from the BD node of group M HIV-1 around 1950
- These data support and extend previous calculations regarding origin of HIV-1

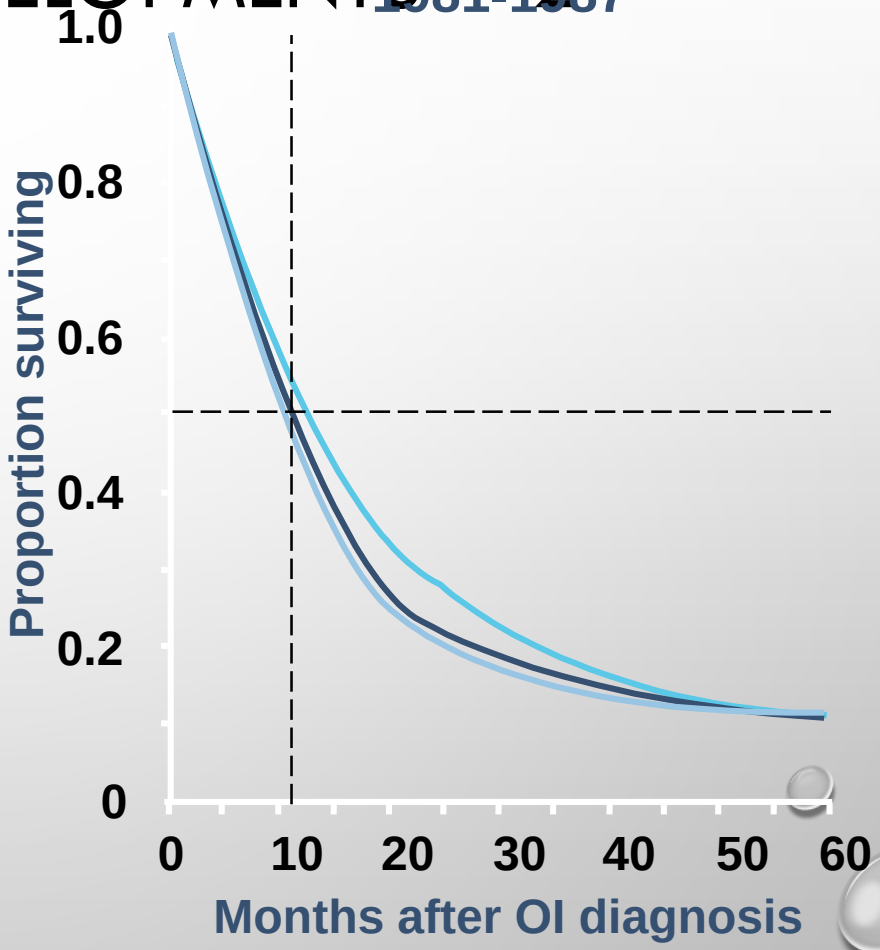
Vandamme A-M, *et al.* XIII IAC, Durban, 2000. Abstract 163

HIV NATURAL HX-FASTER OR SLOWER?

- YES!
- RECOMBINANT CRF19CPX IN CUBA-AIDS IN 3 YRS
- STUDY OF >2000 INFECTED AFRICAN WOMEN-HIV ADAPTATION TO HLA-B57 LEADS TO LESS VIRULENCE AND REDUCED ABILITY TO REPLICATE .

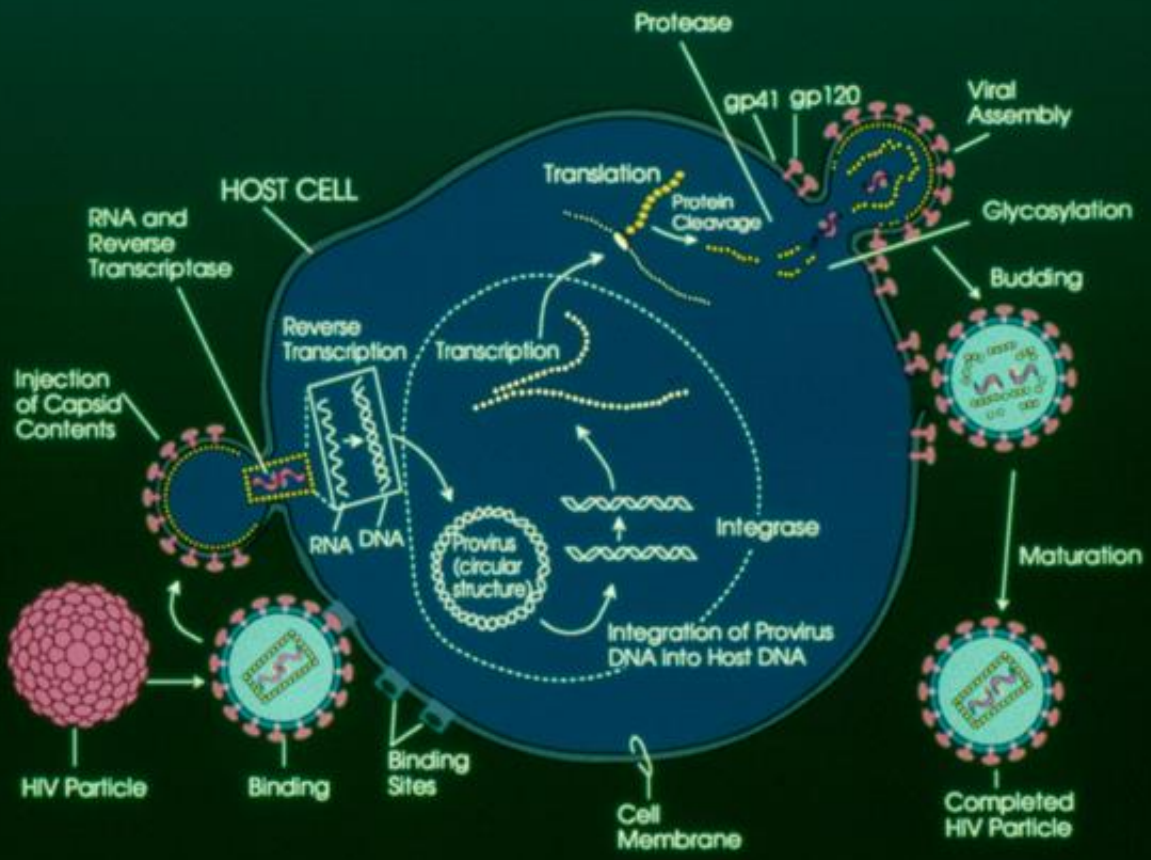
OTHER EARLY DEVELOPMENTS 羊2

- 1985:
  - FDA APPROVES FIRST COMMERCIAL HIV ANTIBODY TEST
- 1986:
  - NIH ESTABLISHES THE AIDS CLINICAL TRIALS GROUP
- 1987:
  - AZT = FIRST ANTIRETROVIRAL APPROVED BY FDA



Source : National AIDS case surveillance data, CDC

HIV Replication Cycle



Adapted from HIV/AIDS Handbook, Total Learning Systems, Inc., Boston, 1996. Reprinted with permission of Total Learning Concepts, Inc.; Godofsky EW, Bach MC Contemp Int Med 7(3):43–55, 1995

EARLY ANTIRETROVIRAL THERAPY 羊1

- 1991-92:
  - DDI, DDC APPROVED
  - SEQUENTIAL MONOTHERAPY
  - RYAN WHITE CARE ACT PASSED

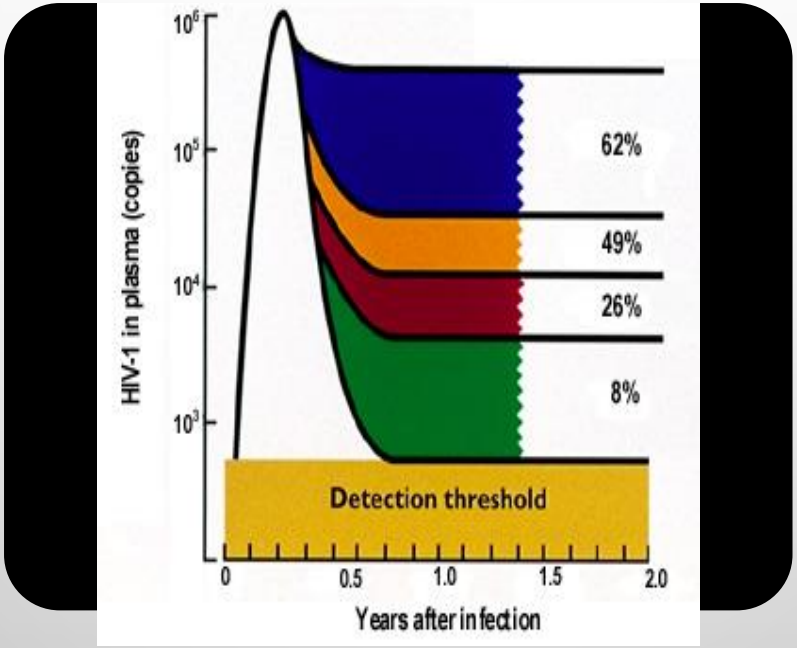
- 1993:
  - CONCORDE: NO DIFFERENCE IN CLINICAL ENDPOINTS OVER 3 YRS WITH EARLY VS. DEFERRED AZT

EARLY ANTIRETROVIRAL THERAPY 羊2

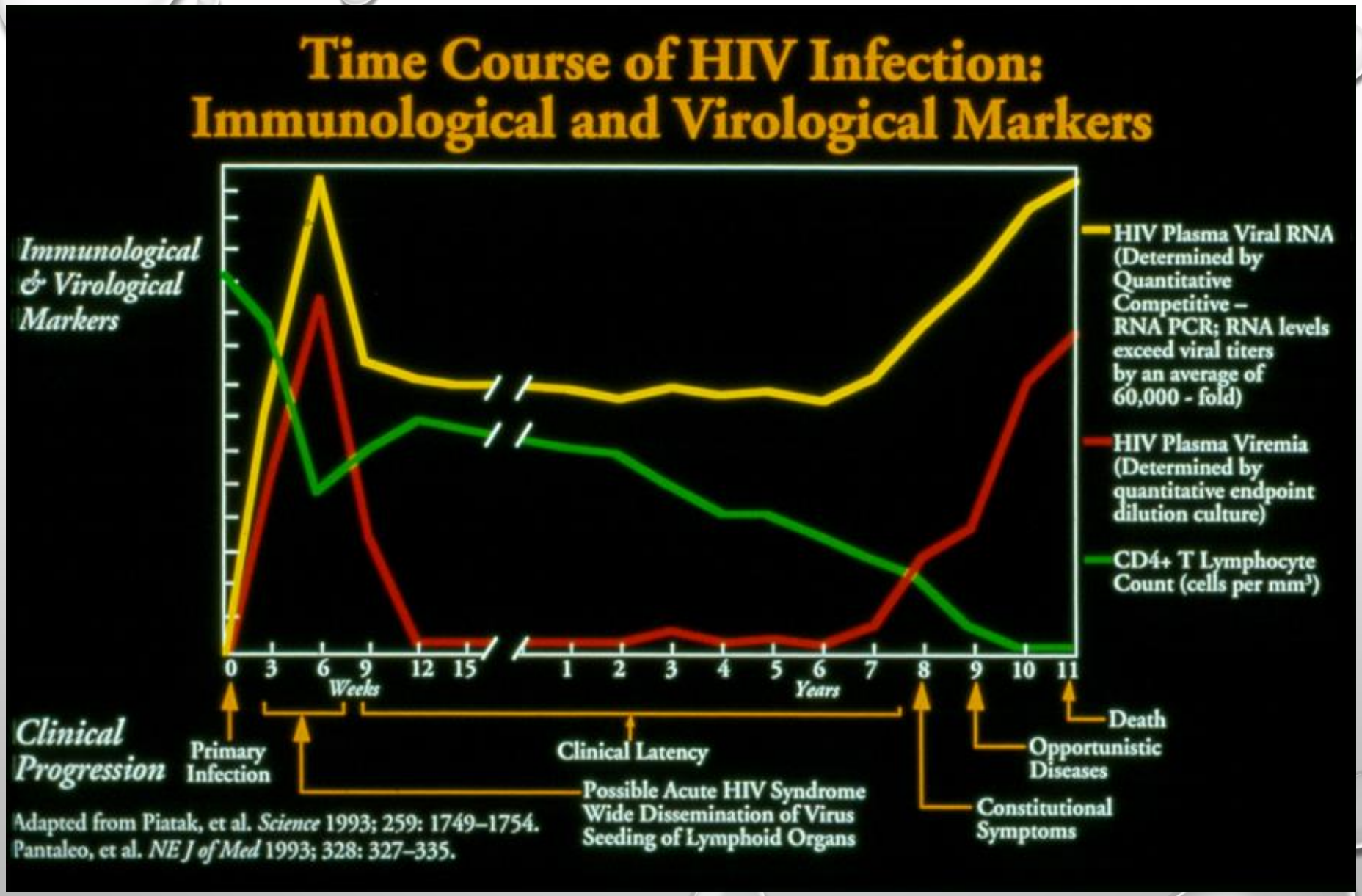
- 1994:
  - ACTG 076: AZT REDUCES MOTHER-TO-CHILD TRANSMISSION OF HIV
  - DUAL NUCLEOSIDE THERAPY BETTER THAN MONOTHERAPY (DELTA, ACTG 175, ZDV/3TC)
- 1994–95:
  - ERA OF DUAL COMBINATION THERAPY

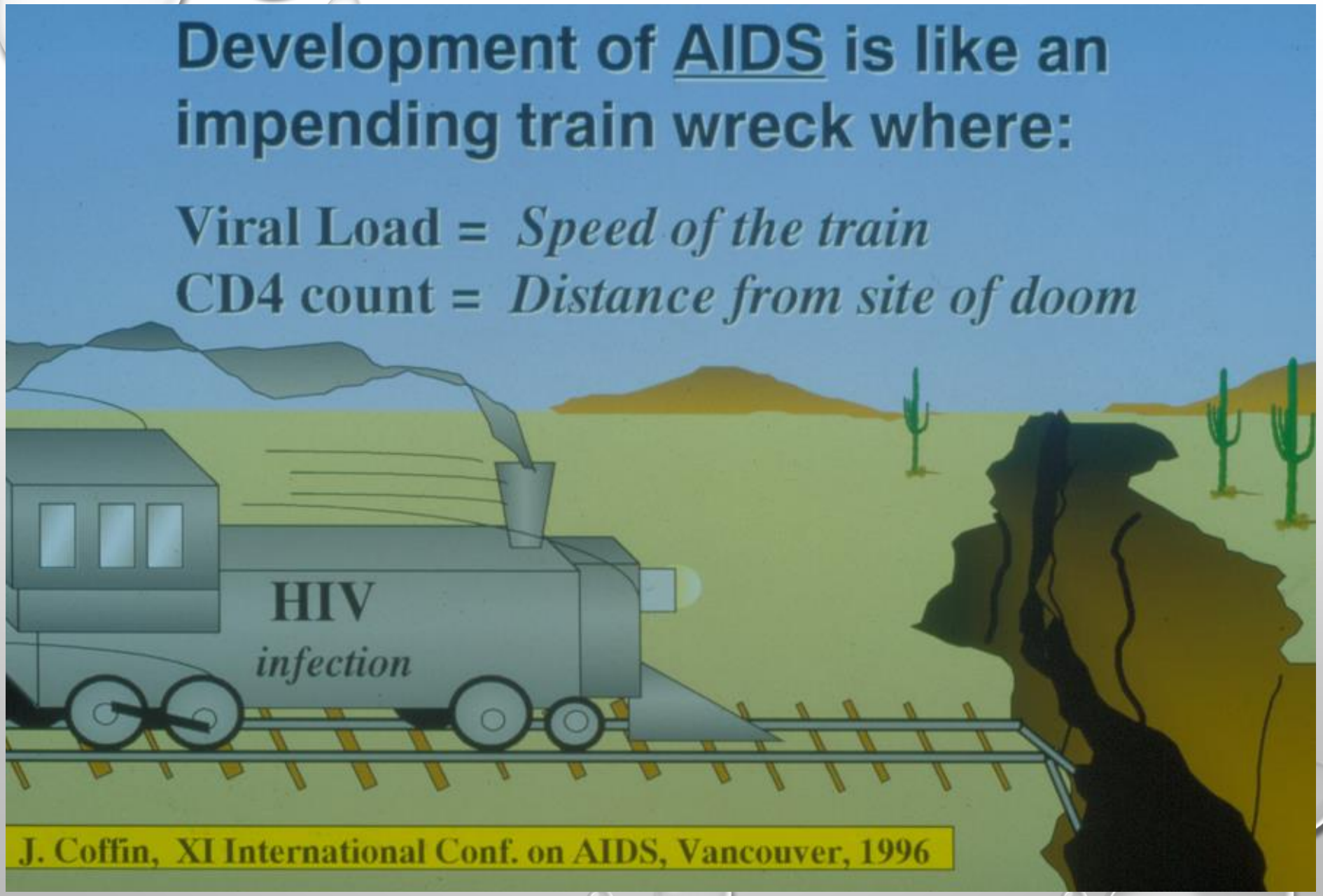
THE NEW TREATMENT ERA

- 1995-96:
  - HIV VIRAL LOAD TESTING BECAME AVAILABLE
    - CLINICIANS COULD DIRECTLY ASSESS THE EFFECT OF ANTIRETROVIRALS ON VIRAL REPLICATION (HIV RNA)



  - FIRST PROTEASE INHIBITORS APPROVED BY FDA


Time Course of HIV Infection:
Immunological and Virological Markers
Immunological & Virological Markers
HIV Plasma Viral RNA (Determined by Quantitative Competitive – RNA PCR; RNA levels exceed viral titers by an average of 60,000 - fold)
HIV Plasma Viremia (Determined by quantitative endpoint dilution culture)
CD4+ T Lymphocyte Count (cells per mm³)
0 3 6 9 12 15
Weeks
1 2 3 4 5 6 7 8 9 10 11
Years
Clinical Progression
Primary Infection
Clinical Latency
Possible Acute HIV Syndrome
Wide Dissemination of Virus
Seeding of Lymphoid Organs
Constitutional Symptoms
Opportunistic Diseases
Death
Adapted from Piatak, et al. Science 1993; 259: 1749–1754.
Pantaleo, et al. NE J of Med 1993; 328: 327–335.

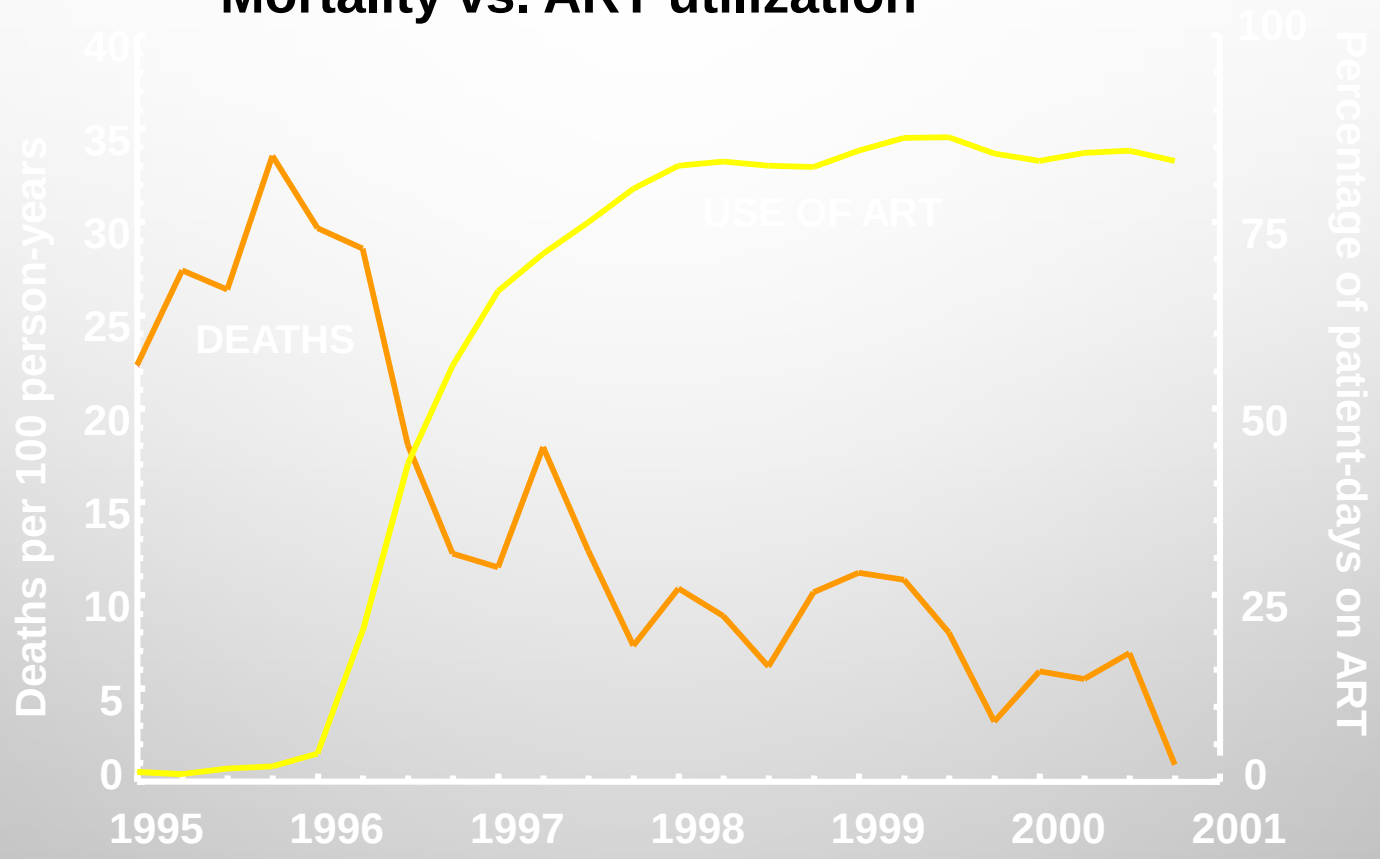

Development of AIDS is like an impending train wreck where:
Viral Load = Speed of the train
CD4 count = Distance from site of doom
HIV
infection
J. Coffin, XI International Conf. on AIDS, Vancouver, 1996

THE ERA OF HAART

- PARADIGM: AIM TO ACHIEVE DURABLE SUPPRESSION OF HIV VIREMIA
- STRIKING REDUCTIONS IN HIV-RELATED MORBIDITY AND MORTALITY
- AGGRESSIVE TREATMENT GUIDELINES: "HIT HARD, HIT EARLY!"
- MATHEMATICAL MODELS SUGGESTED THAT 3 YEARS OF VIRAL SUPPRESSION WOULD RESULT IN ERADICATION

AIDS MORTALITY RATES: 1996-2001

Mortality vs. ART utilization



Palella F *et al*. 8th CROI 2001; abstract 268b.

1998 - 2000 REALISM

- HIV ERADICATION IS NOT POSSIBLE WITH CURRENT THERAPY
  - VIRAL "RESERVOIR" IN RESTING T-MEMORY LYMPHOCYTES
  - VIRAL REPLICATION CONTINUES IN LYMPH NODES EVEN WHEN HIV RNA IN PLASMA IS <50 COPIES/ML
- AWARENESS THAT HIV IS A CHRONIC DISEASE
- RECOGNITION OF LONG-TERM TOXICITIES:
  - FAT REDISTRIBUTION (LIPODYSTROPHY)
  - METABOLIC ABNORMALITIES (INSULIN RESISTANCE, DIABETES, INCREASED LIPIDS)
- 2000: DURBAN AIDS CONFERENCE – MOMENTUM BUILDS TO BRING ANTIRETROVIRALS TO THE DEVELOPING WORLD

2001- 2006

- INTEREST IN PI-SPARING REGIMENS
    - EMERGENCE OF NNRTI-BASED REGIMENS
- DEFERRED INITIATION OF ANTIRETROVIRAL THERAPY
- INTEREST IN TREATMENT INTERRUPTION STRATEGIES
    - ULTIMATELY NOT SUPPORTED BY CLINICAL TRIALS
- SIMPLER, ONCE DAILY REGIMENS WITH FEWER PILLS
- OPTIMISM ABOUT NEW CLASSES OF DRUGS
- CDC RECOMMENDS ROUTINE OPT-OUT HIV SCREENING

2007-2009

- APPROVAL OF NEW CLASSES OF DRUGS PROVIDE TREATMENT OPTIONS FOR HEAVILY TREATMENT EXPERIENCED PATIENTS
  - 2ND GENERATION NNRTI, INTEGRASE INHIBITOR, CCR5 INHIBITOR
- SETBACK IN HIV VACCINE RESEARCH AS NIH-FUNDED STEP STUDY OF AN HIV VACCINE IS HALTED EARLY DUE TO LACK OF EFFICACY*
  - UNCIRCUMCISED MEN WITH HIGH ADENOVIRUS ANTIBODIES IN THE VACCINE ARM HAD HIGHER RATES OF HIV ACQUISITION THAN THOSE IN PLACEBO ARM

*Buchbinder SP et al, Lancet 2008;372:1881-93.

2007-2009

- OBSERVATIONAL DATA SUGGEST THAT EARLIER INITIATION OF ANTIRETROVIRAL THERAPY IS ASSOCIATED WITH REDUCED MORBIDITY AND MORTALITY[1]
  - 2009: DHHS GUIDELINES RECOMMEND INITIATION OF ART FOR CD4 < 500 AND PANEL SPLIT 50-50 FOR RECOMMENDING (VS OFFERING) INITIATION AT CD4 > 500[2]

[1]Kitahata M et al, N Engl J Med 2009; 360:1815-26. [2]Panel on Antiretroviral Guidelines for Adults and Adolescents. Guidelines for the use of antiretroviral agents in HIV-1-infected adults and adolescents. Department of Health and Human Services. December 1, 2009; 1-161. Available at http://www.aidsinfo.nih.gov/ContentFiles/AdultandAdolescentGL.pdf.

GOALS OF TREATMENT

- REDUCE HIV-RELATED MORBIDITY; PROLONG DURATION AND QUALITY OF SURVIVAL
- RESTORE AND/OR PRESERVE IMMUNOLOGIC FUNCTION
- MAXIMALLY AND DURABLY SUPPRESS HIV VIRAL LOAD
- PREVENT HIV TRANSMISSION

It Begins With Testing
How Are We Doing?

- 50% of people with HIV have had the virus at least 3 years before diagnosis[a]
- 70% of people at high risk for HIV who were not tested last year saw a healthcare provider during that year; > 75% were not offered a test[a]
- 40% of people aged 55 years and older had late-stage infection (AIDS) at the time of HIV diagnosis[b]

a. CDC website. HIV testing.
b. CDC website. HIV among people aged 50 and over.

Who Should Be Tested for HIV and Why?

Who?

- Everyone between the ages of 13 and 64 years should be tested for HIV at least once
  - Sexually active gay and bisexual men may benefit from more frequent testing (eg, every 3 to 6 months)

Why?

- People with HIV who are aware of their status can get HIV treatment (ART) and remain healthy for many years
- The sooner people start treatment after diagnosis, the more they benefit from ART

CDC website. HIV testing.

TOOLS TO ACHIEVE TREATMENT GOALS

- SELECTION OF ARV REGIMEN
- MAXIMIZING ADHERENCE
- PRETREATMENT RESISTANCE TESTING

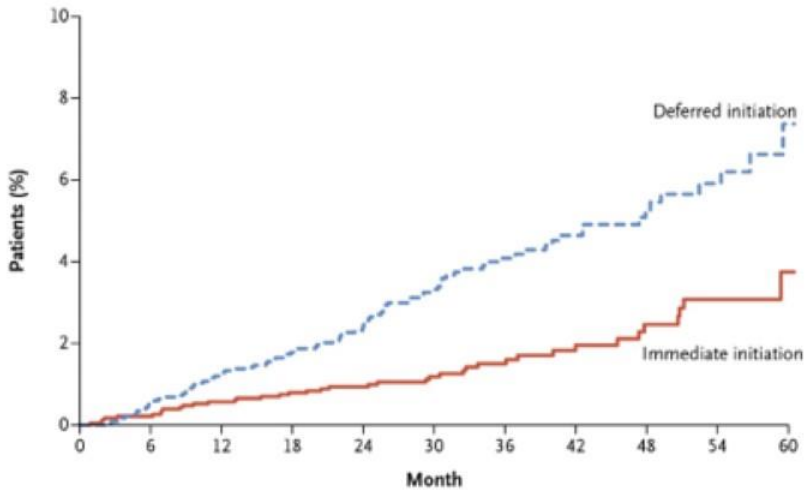
Who Should Be Treated for HIV?

- All persons with HIV should be treated
  - Including those who use alcohol and drugs
- Treatment should begin as soon after diagnosis as possible

Early Treatment Is Beneficial

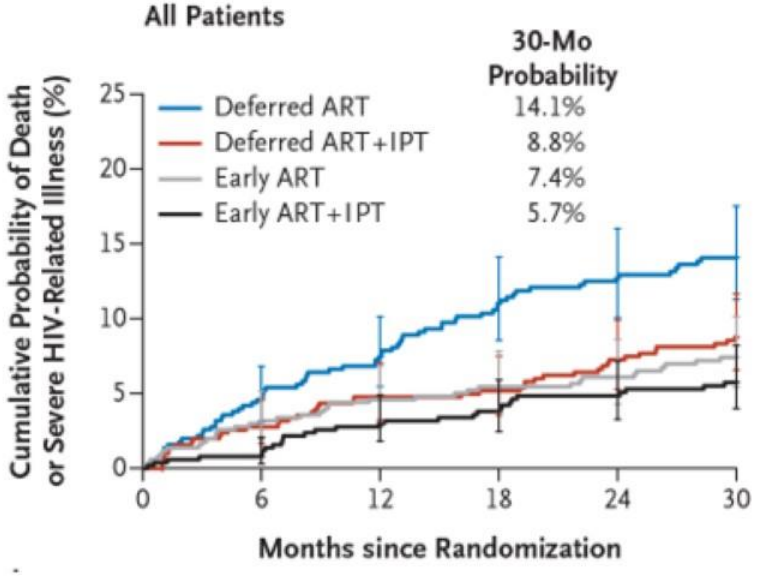
Better on ART Than Off, Regardless of CD4 Cell Count

INSIGHT START[a]



From *N Engl J Med*, INSIGHT START Study Group, Initiation of Antiretroviral Therapy in Early Asymptomatic HIV Infection,373: 795-807, © 2015 Massachusetts Medical Society. Reprinted with permission from Massachusetts Medical Society."

TEMPRANO[b]



From *N Engl J Med*, The TEMPRANO ANRS 12136 Study Group, A Trial of Early Antiretrovirals and Isoniazid Preventive Therapy in Africa, 373:808-822. © 2015. Massachusetts Medical Society. Reprinted with permission from Massachusetts Medical Society."

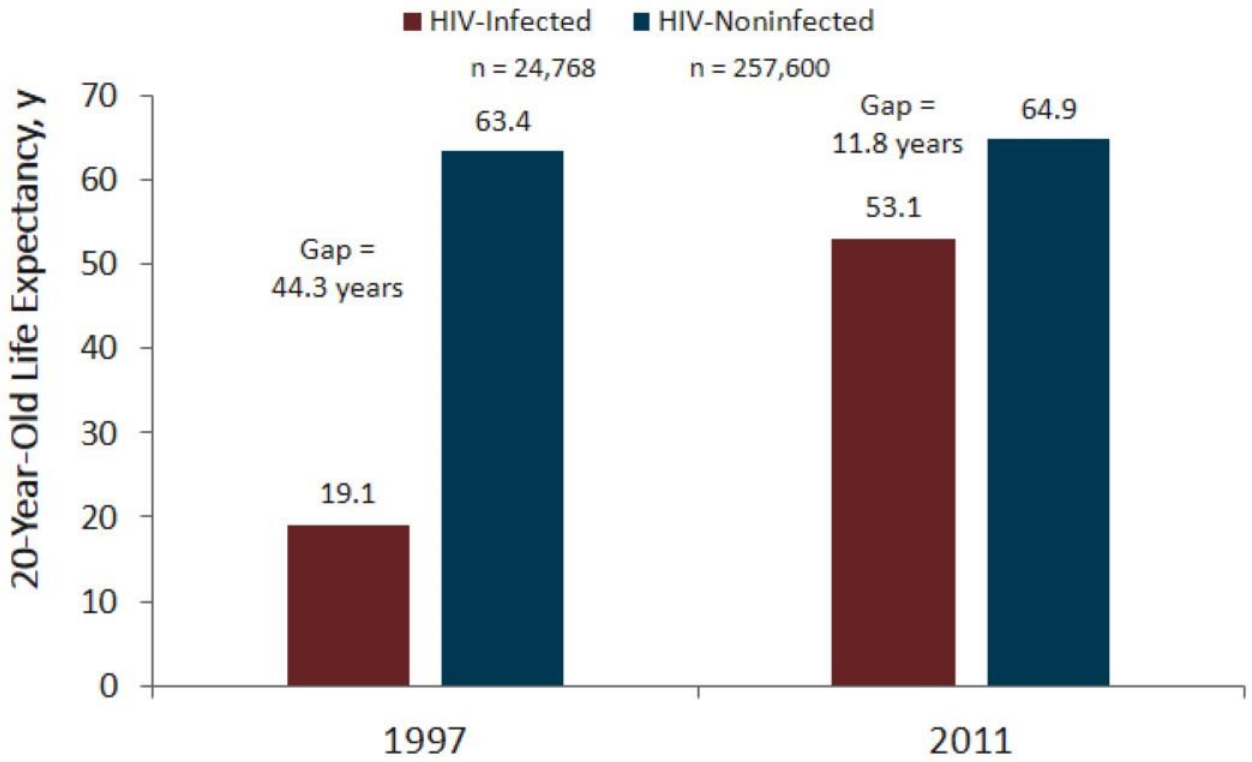
a. INSIGHT START Study Group. *N Engl J Med*. 2015;373:795-807.
b. TEMPRANO ANRS 12136 Study Group. *N Engl J Med*. 2015;373:808-822.

Benefits of Treating HIV-Infected Persons

- Individual health benefits in the near term
  - Preserves health: prevention of AIDS-defining illnesses
- Individual health benefits in the long term
  - Early treatment associated with better long-term outcomes
  - HIV is a chronic, manageable disease
  - "Near-normal" life expectancy in some groups[a-d]

a. Marcus JL, et al. COOI 2016. Abstract 54; b. The Antiretroviral Therapy Cohort Collaboration. *Lancet HIV*. 2017;4:e349-e356; c. Samji H, et al. *PLoS One*. 2013;8:e81355; d. Katz IT, et al. *Lancet HIV*. 2017;4:e324-e326.

ART Increases Life Expectancy
HIV-Infected vs HIV-Noninfected Individuals



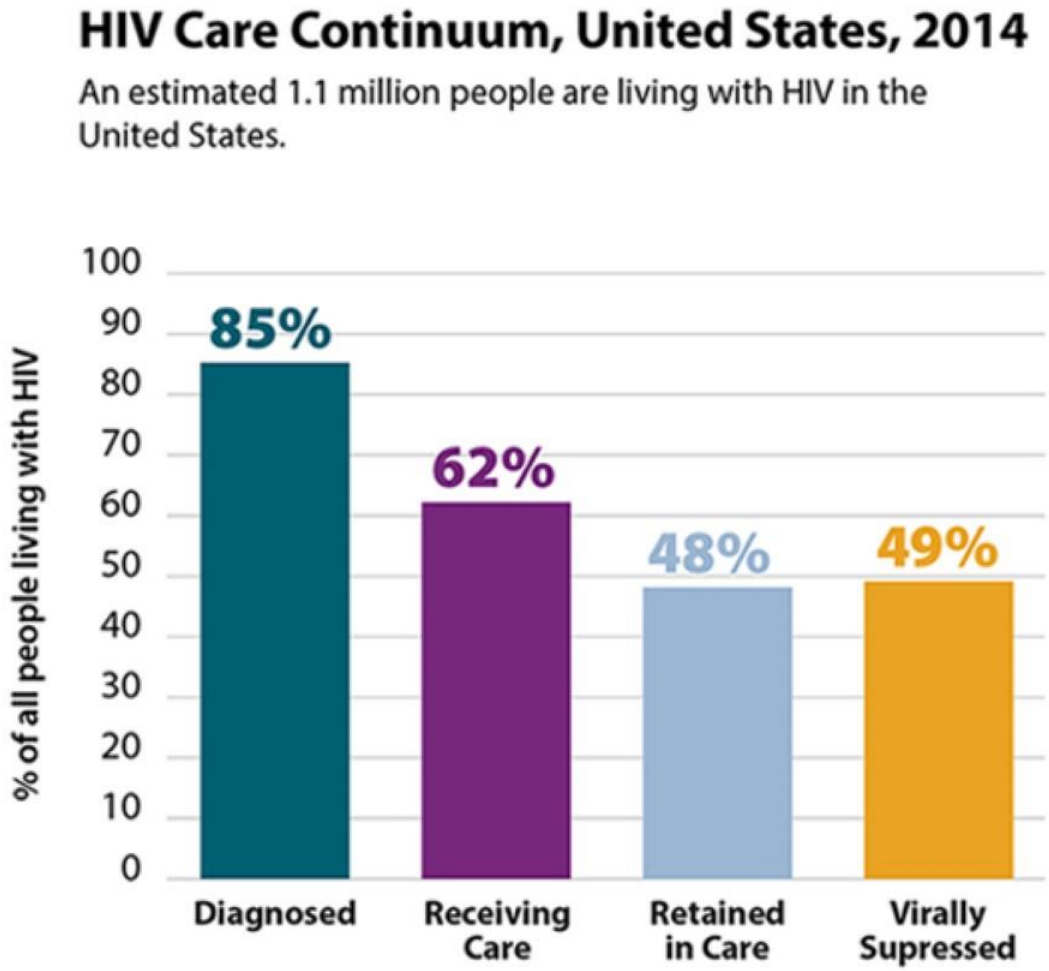
Marcus JL, et al. *J Acquir Immune Defic Syndr*. 2016;73:39-46.

Benefits of Treating HIV-Infected Persons

- Societal benefits
  - Public health: treatment as prevention of transmission
  - Healthcare system

HIV Cascade of Care

Who Is At Risk of Dropping Out of Care?



CDC website. HIV continuum of care.

Treatment Is Effective, Safe, Simple, and Well Tolerated

Once-Daily, Single-Tablet Regimens

- EFV/TDF/FTC (Atripla®)[a]
- RPV/TDF/FTC (Complera®)[b]
- RPV/TAF/FTC (Odefsey®)[c]
- **EVG/Cobi/TDF/FTC (Stribild®)[d]**
- **EVG/Cobi/TAF/FTC (Genvoya®)[e]**
- **DTG/ABC/3TC (Triumeq®)[f]**
- DTG/RPV (Juluca)[g]
- **BIC/TAF/FTC (Biktarvy®)[h]**

a. Atripla® PI 2006; b. Complera® PI 2011; c. Odefsey® PI 2016; d. Stribild® PI 2012; e. Genvoya® PI 2016; f. Triumeq® PI 2014; g. Juluca® PI 2017; h. Biktarvy® PI 2018.

HealthHIV's Third Annual State of HIV Primary Care National Survey

Primary care providers and HIV specialists were asked to identify the most significant barriers to HIV care they face in providing HIV care

- Structural barriers
- Patient barriers
- Challenges to the HIV care continuum

HealthHIV web site. HealthHIV's Third Annual State of HIV Primary Care National Survey.

Most Identified Structural Barriers

- Lack of clinical and support staff time to take on new roles/new procedures
- Clinical hours of operation
- Lack of referral partners for services not offered in our organization
- No or minimal reimbursement for services
- Transportation

HealthHIV web site. HealthHIV's Third Annual State of HIV Primary Care National Survey.

Most Identified Patient Barriers to Seeking HIV Care

- Mental illness
- Ability to pay
- HIV stigma in community
- Homelessness
- Lack of transportation/HIV treatment center too far
- Substance use
- Lack of HIV healthcare providers in the community

HealthHIV web site. HealthHIV's Third Annual State of HIV Primary Care National Survey.

Guidelines for the Use of Antiretroviral Agents in Adults and Adolescents Living With HIV

Preferred Regimens: All Are Integrase Inhibitors

- DTG/abacavir/lamivudine* -- only for patients who are HLA-B*5701-negative[a]
- DTG plus tenofovir/FTC[a],*†
- EVG/Cobi/tenofovir/FTC[a],†
- Raltegravir plus tenofovir/FTC[a],*†
- BIC/TAF/FTC[b],‡

*Lamivudine may be substituted for FTC or vice versa.
†TAF and TDF are 2 forms of tenofovir approved by the FDA. TAF has fewer bone and kidney toxicities than TDF, whereas TDF is associated with lower lipid levels. Safety, cost, and access are among the factors to consider when choosing between these drugs.
‡Based on clinical trial results, the Panel on Antiretroviral Guidelines for Adults and Adolescents recommends the use of BIC/TAF/FTC 50/25/200 mg once daily as one of the recommended initial regimens for most people with HIV.
a. AIDS*info* website. Adult/adolescent ART guidelines; b. AIDS*info* website. Statement on bictegravir.

90-90-90

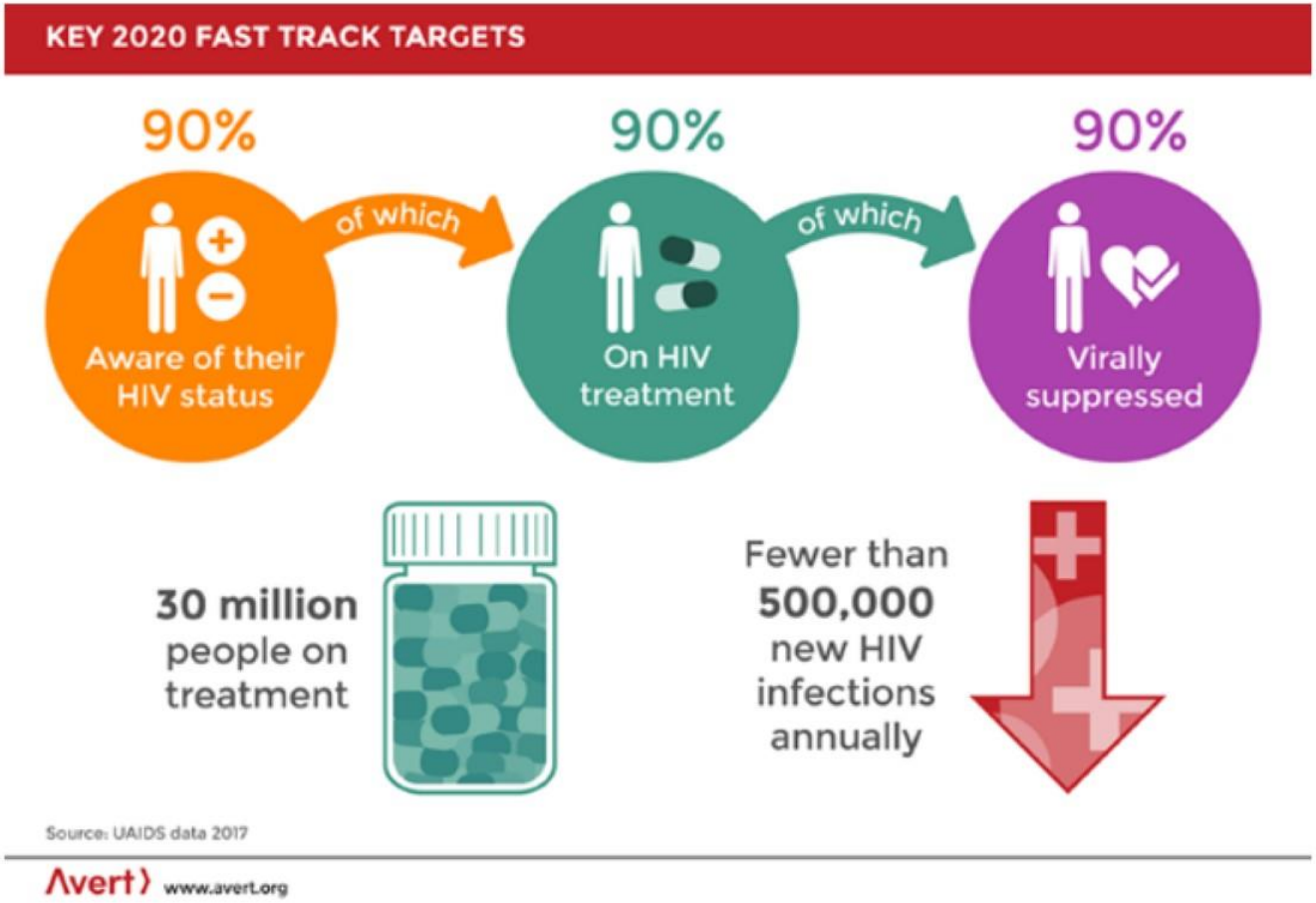


Figure provided by: https://www.avert.org/please-donate-now

AVERT website. Global HIV targets.

Test and Treat: Same-Day ART

San Francisco Program for Rapid ART Initiation and Linkage to Care

- Clinic-based cohort consisting of consecutive patients who were referred with new HIV diagnosis between June 2013 and December 2014
- Among 86 patients, 39 were eligible and managed on the RAPID protocol; 37 of 39 (94.9%) in RAPID began ART within 24 hours
- Subset of patients with acute or recent infection (< 6 months) or CD4 count < 200/mm^3 were managed according to a "RAPID" care initiation protocol

Pilcher CD, et al. *J Acquir Immune Defic Syndr*. 2017;74:44-51.

Test and Treat: Same-Day ART (cont)

- Minor toxicity with the initial regimen occurred in 2 (5.1%) patients in the intervention group vs none in the nonintervention group
- Loss to follow-up was similar in intervention (10.3%) and nonintervention patients (14.9%) during the study
- Time to virologic suppression (< 200 copies HIV RNA/mL) was significantly faster (median, 1.8 months) among intervention-managed patients vs patients treated in the same clinic under prior recommendations for universal ART (4.3 months; *P* = .0001)

Pilcher CD, et al. *J Acquir Immune Defic Syndr*. 2017;74:44-51.

Same Day/Test and Treat

- Ideal
- Realistic barriers
  - Availability of drugs
  - Baseline laboratory tests
  - Prior authorization, ADAP
  - Provider availability

What Can You Do?

- Routinely provide HIV testing to all people aged 13 to 64 years, according to CDC guidelines
  - Screen others based on individual risk
- Screen all teenagers and adults for HIV risk, and test people at high risk at least once a year, including some gay and bisexual men who may benefit from more frequent testing (eg, every 3 to 6 months)
- Start people on HIV treatment as quickly as possible after diagnosis

2009-2010

- NEW FOCUS ON POTENTIAL CONTRIBUTIONS OF INFLAMMATION AND IMMUNE ACTIVATION TO MORBIDITY IN HIV-INFECTED PATIENTS EVEN IN THE SETTING OF SUPPRESSED HIV VIREMIA
- THE "BERLIN PATIENT" RENEWS DISCUSSION OF THE POTENTIAL TO CURE HIV
  - 40 YEAR-OLD HIV-INFECTED MAN WITH ACUTE MYELOID LEUKEMIA RECEIVED AN ALLOGENEIC STEM CELL TRANSPLANT FROM A DONOR HOMOZYGOUS FOR THE CCR5 *DELTA32* ALLELE ASSOCIATED WITH NATURAL RESISTANCE TO HIV INFECTION*
  - NO ACTIVE, REPLICATING HIV DETECTABLE 20 MONTHS AFTER DISCONTINUING HAART

*Hütter G, et al N Engl J Med. 2009;360:692-8.

NEW TRENDS

- SHOCK AND KILL-NEW 20 MILL COLL OF UNC AND GLAXO
- MONOCLONAL ABS AND HYBRIDS.
- THERAPEUTIC VACCINES
- TARGETING ONGOING INFLAMMATION

HIV Eradication
(Robert F. Siliciano, MD, PhD)

Major barrier to cure is the latent CD4 cell reservoir

↓

Activate HIV without activation of uninfected T cells

↓

Variables that impact outcome

- **May require therapeutic vaccine**
- **Duration of reservoir reduction to rebound depends on clearance**

HIV PREVENTION combined interventions

Male circumcision

Auvert B, PloS Med 2005
Gray R, Lancet 2007
Bailey R, Lancet 2007

Harm reduction/needle exchange

Treatment of STIs

Grosskurth H, Lancet 2000

Microbicides for women

Abdool Karim Q, Science 2010

Male & female condoms

STRUCTURAL

Oral preexposure prophylaxis (PrEP)

Grant R, NEJM 2010 (MSM)
Baeten J , NEJM 2012 (couples)
Thigpen, NEJM, 2012 (heterosexuals)

Prevention of MTCT

HIV counseling and testing

Coates T, Lancet 2000

Postexposure prophylaxis (PEP)

Scheckter M, 2002

Behavioral intervention

Treatment as prevention

Donnell D, Lancet 2010
Cohen M, NEJM 2011

2010-2011: NEW HOPE FOR HIV PREVENTION

- CAPRISA 004 STUDY DEMONSTRATES EFFICACY OF 1% TENOFOVIR VAGINAL GEL IN PREVENTING HIV INFECTION[1]
- IPREX STUDY SHOWS EFFICACY OF PRE-EXPOSURE PROPHYLAXIS WITH TENOFOVIR IN PREVENTING HIV INFECTION IN MEN WHO HAVE SEX WITH MEN[2]
- MIXED RESULTS FROM OTHER PREP STUDIES
- HPTN 052 SHOWS 96% REDUCTION IN HIV TRANSMISSION WITHIN SERODISCORDANT COUPLES (NEARLY ALL HETEROSEXUAL) WITH EARLY INITIATION OF ART [3]

[1]Q Abdool Karim et al. Science 2010;329:1168-1174. [2]Grant R et al, N Engl J Med 2010;363:2587-99. [3]Cohen M et al, N Engl J Med. 2011;365:493-505.

HIV PREVENTION STRATEGIES

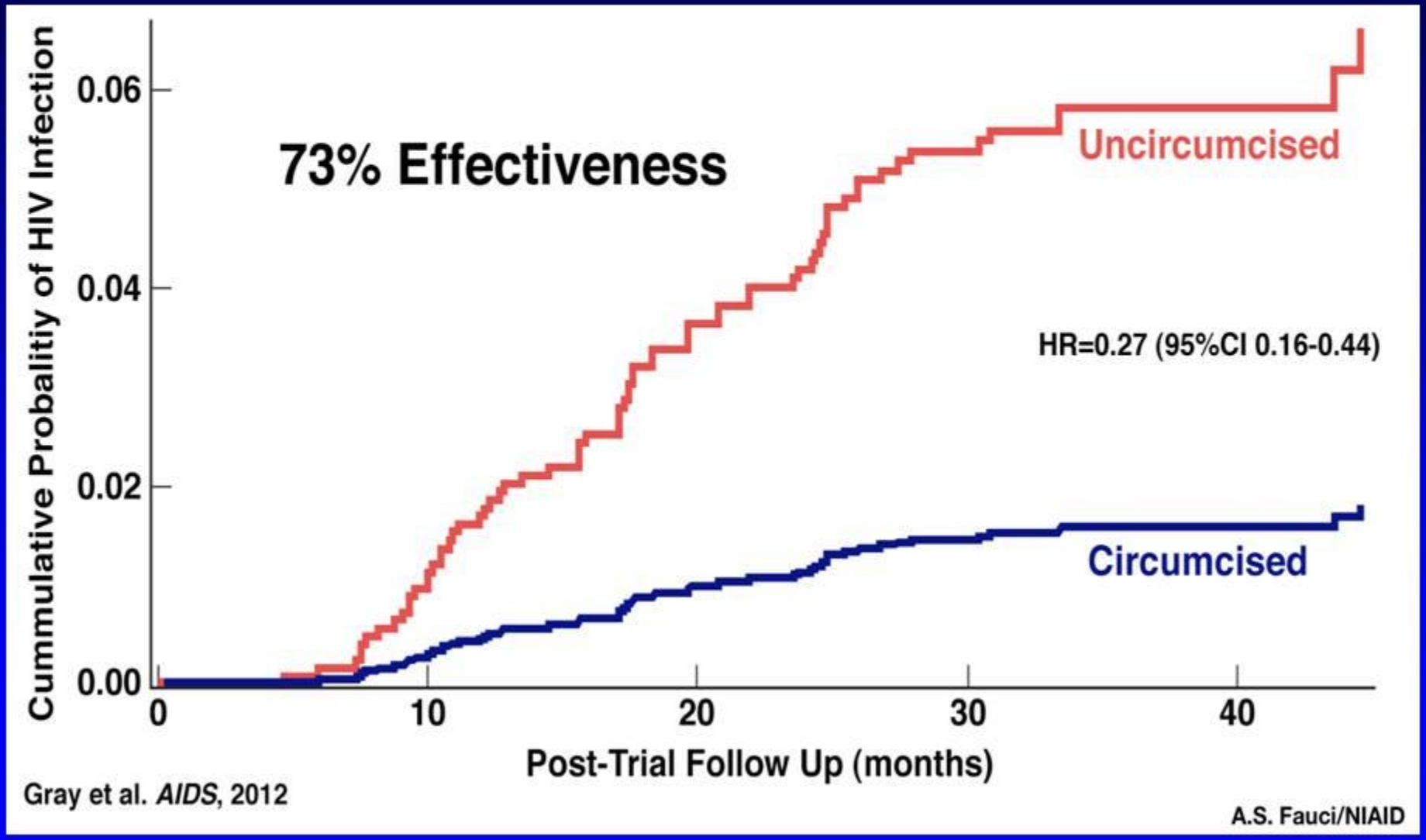
- PRIORITIES
- 1)MAKE VOLUNTARY HIV TESTING A ROUTINE PART OF MEDICAL CARE.
- 2)IMPLEMENT NEW MODELS FOR DIAGNOSING HIV OUTSIDE OF MEDICAL SETTINGS
- 3)PREVENT NEW INFECTIONS BY WORKING WITH PERSONS WITH HIV AND PARTNERS
- 4) FURTHER REDUCTION IN PERINATAL TRANSMISSION

Prevention – needle-exchange programs

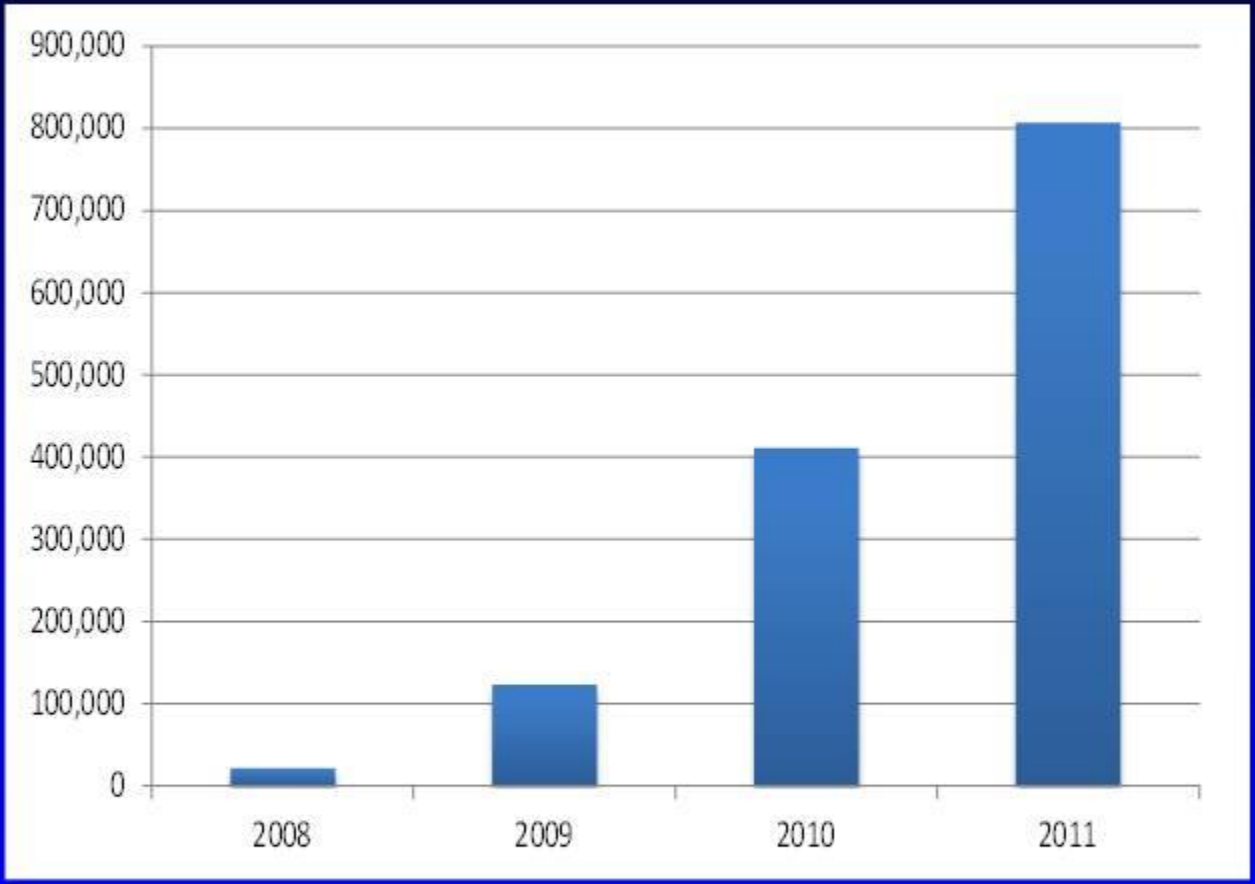
- New York City 1990–1997[1]
  - needle exchange increased from 20–50% among injection drug users
  - unsafe sex fell from 18% to 11%
  - HIV incidence decreased from 4.4 to 0.8 per person–years at risk
- Bilbao, Spain (prison) 1997–1999[2]
  - needle exchange administered by outside agency
  - no increase in drug use seen
  - no safety issues have arisen
  - facilitates link to drug-treatment programs

[1] De Jarlais D, *et al.* XIII IAC, Durban, 2000. Abstract 1124; [2] Menoyo C, *et al.* XIII IAC, 2000, Durban, 2000. Abstract 322

Adult male circumcision provides long-lasting protection against HIV infection in Rakai, Uganda



Effective prevention interventions have not been brought to scale



Goal:
~20 million by 2016

Total MCs through 2011:
~1.35 million,
6.5% of target

Number of male circumcisions performed annually in 14 priority countries in eastern and southern Africa

Source: WHO

PREP EFFICACY:CURRENT STATUS

STUDY		RESULTS
Caprisa OO4(S Afr)	889 F vaginal TFV gel	39% efficacy
iPrEX(MultiNat)	2499 MSM Truvada	44% efficacy
TDF2(Botswana)	1200 M+ F Truvada	62% efficacy
Partners PrEP(Kenya,Uganda)	4758 Hetero couples	67% TDF efficacy,75% Truvada efficacy
Fem-PrEP(Ken,SA Tan)	1950 F Truvada	Futility/halted
Voice(SA,UG,Zim)	5029 F	TDF futility,V TDF gel futility,Truvada ongoing
FACTS001(SA)	2200 F	Enrolling

HPTN 052 study: Key finding

1,763 sero-discordant couples (97% heterosexual)
HIV infected partners: 890 men, 873 women

+ 39 HIV Transmissions

28 linked HIV transmissions

11 unlinked

Immediate ART: 1 transmission

Deferred ART: 27 transmissions

☑ **96% Protection**

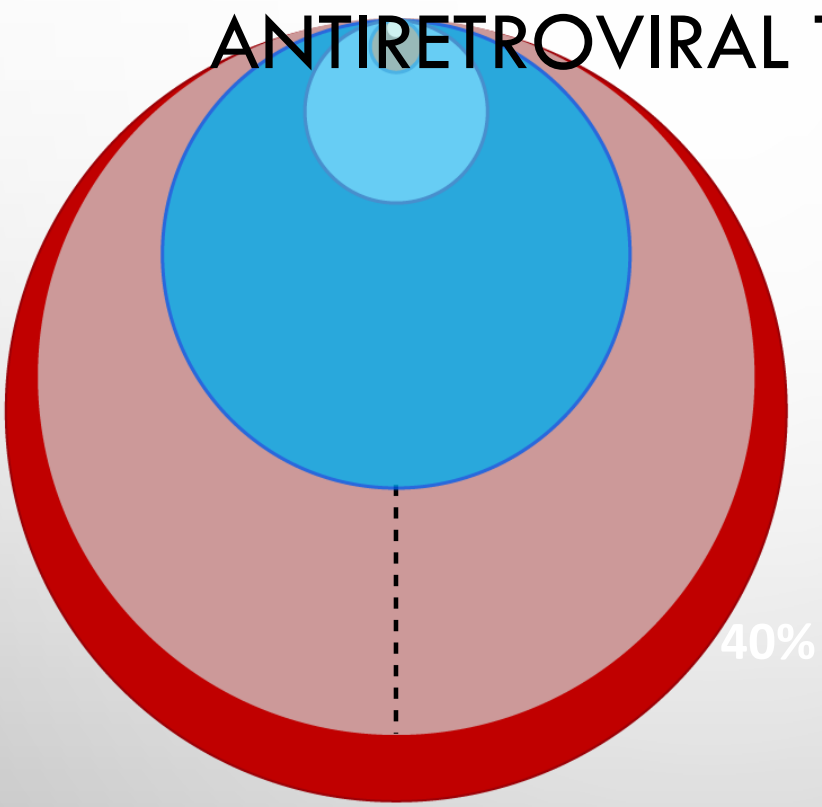
HEALTH SYSTEMS STRENGTHENING

"OF ALL THE FORMS OF INEQUALITY, INJUSTICE IN HEALTHCARE IS THE MOST SHOCKING AND INHUMANE."

- MARTIN LUTHER KING, JR.

Your insurance company only authorized me to take out one. You pick.

NUMBER OF PEOPLE RECEIVING ANTIRETROVIRAL TREATMENT

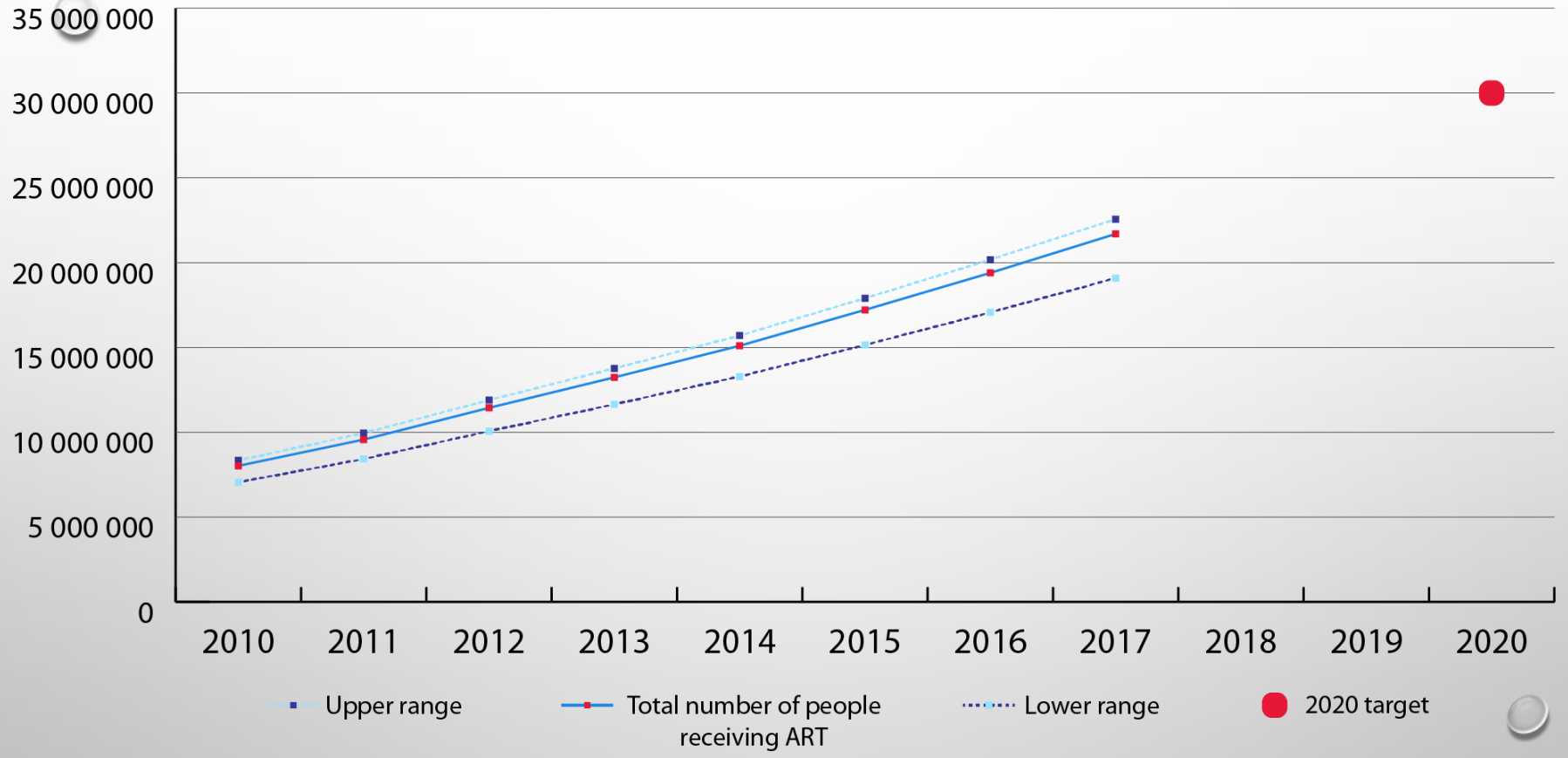


2000 – 611 000
2005 – 2.0 million
2010 – 8.0 million
2017 – 21.7 million
2020 – 30 million
2030 – 33 million

Future targets

Source: UNAIDS/WHO estimates

Increase in people receiving ART over time



Source: UNAIDS/WHO estimates

Towards Universal Access

FINAL THOUGHTS