

HIV in Women: A Global View of the HIV Epidemic

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The Problem of the HIV Epidemic

Why Is it Occurring?

What Can We Do About It?

Global estimates for adults and children, 2007

- **People living with HIV** ----- **33.2 million** [30.6 – 36.1 million]
- **New HIV infections in 2007** ----- **2.5 million** [1.8 – 4.1 million]
- **Deaths due to AIDS in 2007** ----- **2.1 million** [1.9 – 2.4 million]

GLOBAL ESTIMATES FOR ADULTS AND CHILDREN, 2006

- People living with HIV ----- 39.5 million [34.1 – 47.1 million]
- New HIV infections in 2006 ----- 4.3 million [3.6 – 6.6 million]
- Deaths due to AIDS in 2006 ----- 2.9 million [2.5 – 3.5 million]

The ranges around the estimates in this table define the boundaries within which the actual numbers lie, based on the best available information.

Global summary of the AIDS epidemic, December 2007

Number of people living with HIV in 2007

Total	33.2 million [30.6 – 36.1 million]
Adults	30.8 million [28.2 – 33.6 million]
Women	15.4 million [13.9 – 16.6 million]
Children under 15 years	2.5 million [2.2 – 2.6 million]

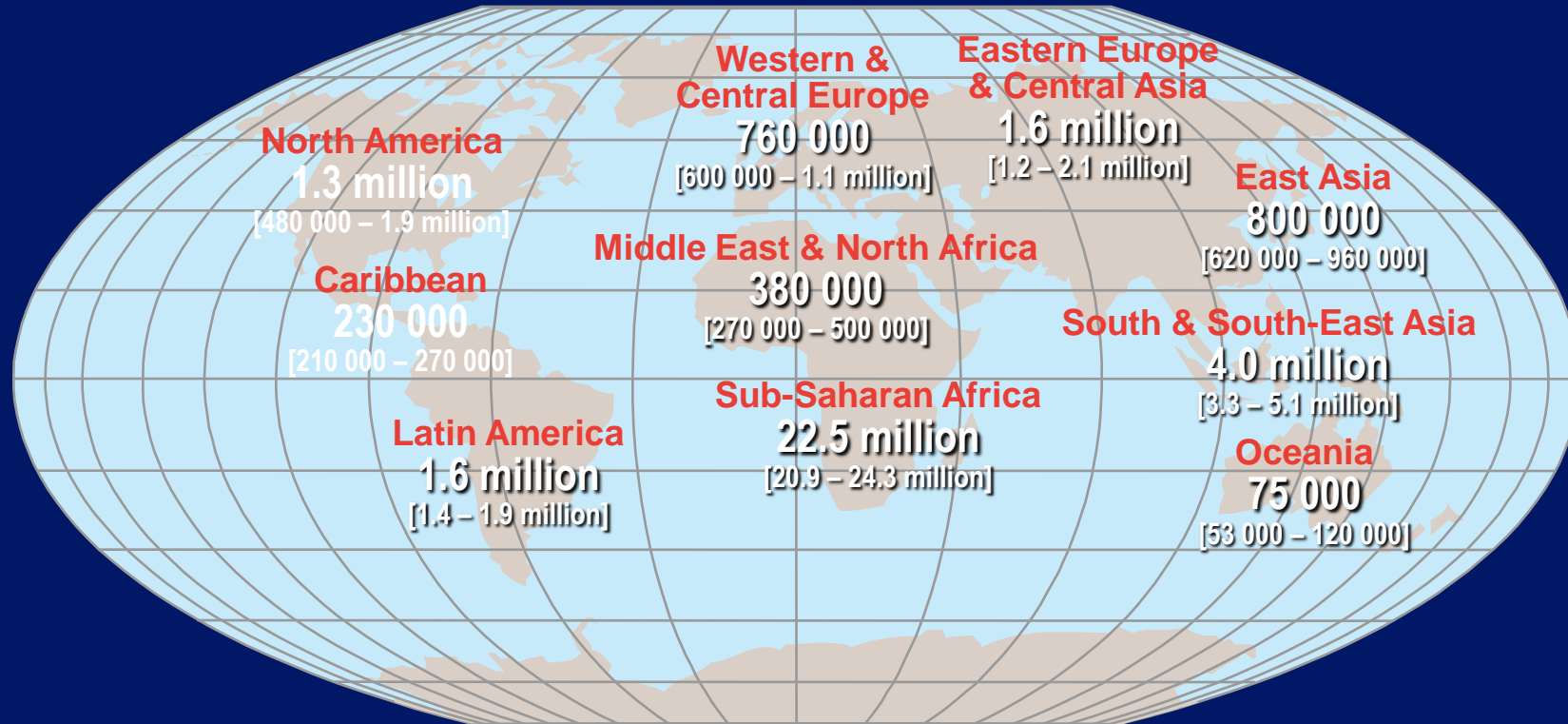
People newly infected with HIV in 2007

Total	2.5 million [1.8 – 4.1 million]
Adults	2.1 million [1.4 – 3.6 million]
Children under 15 years	420 000 [350 000 – 540 000]

AIDS deaths in 2007

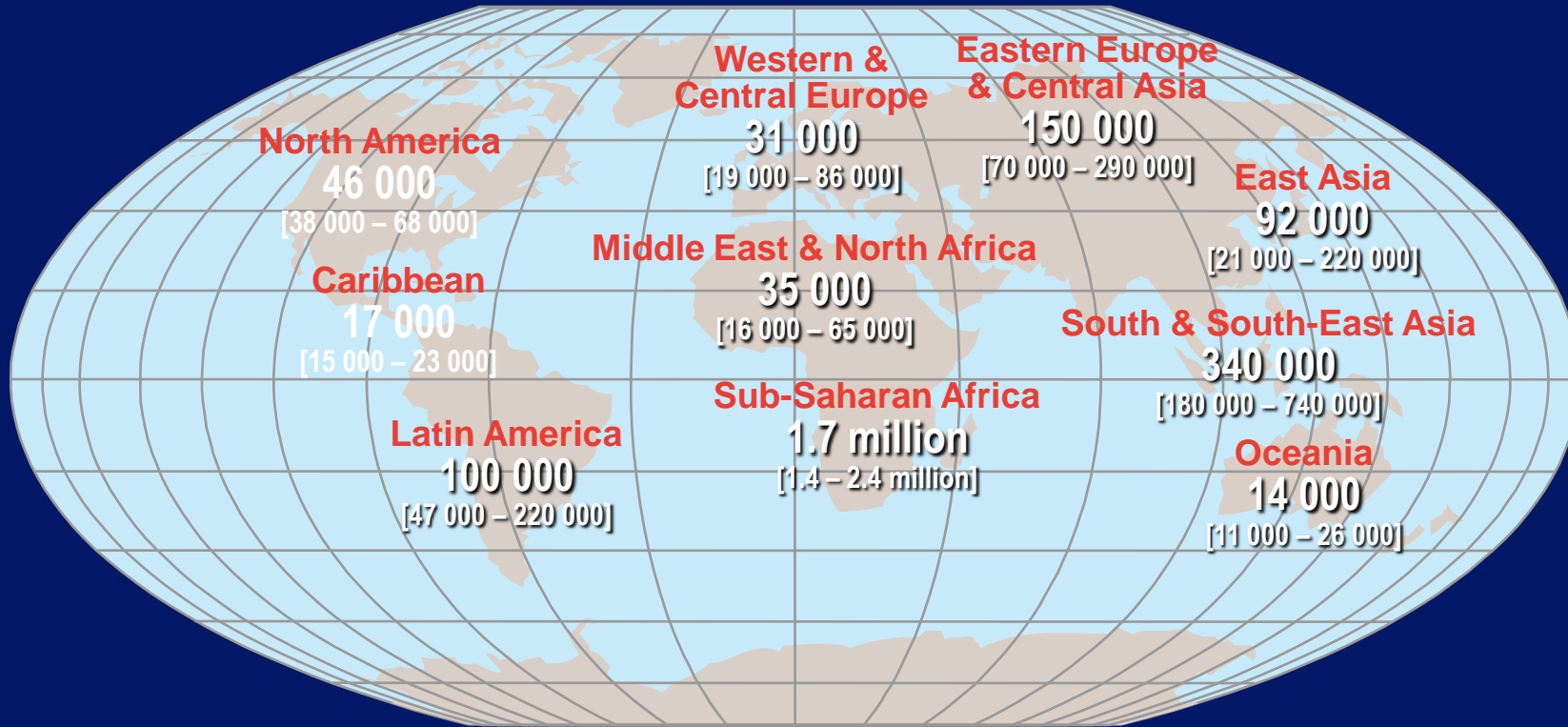
Total	2.1 million [1.9 – 2.4 million]
Adults	1.7 million [1.6 – 2.1 million]
Children under 15 years	330 000 [310 000 – 380 000]

Adults and children estimated to be living with HIV, 2007



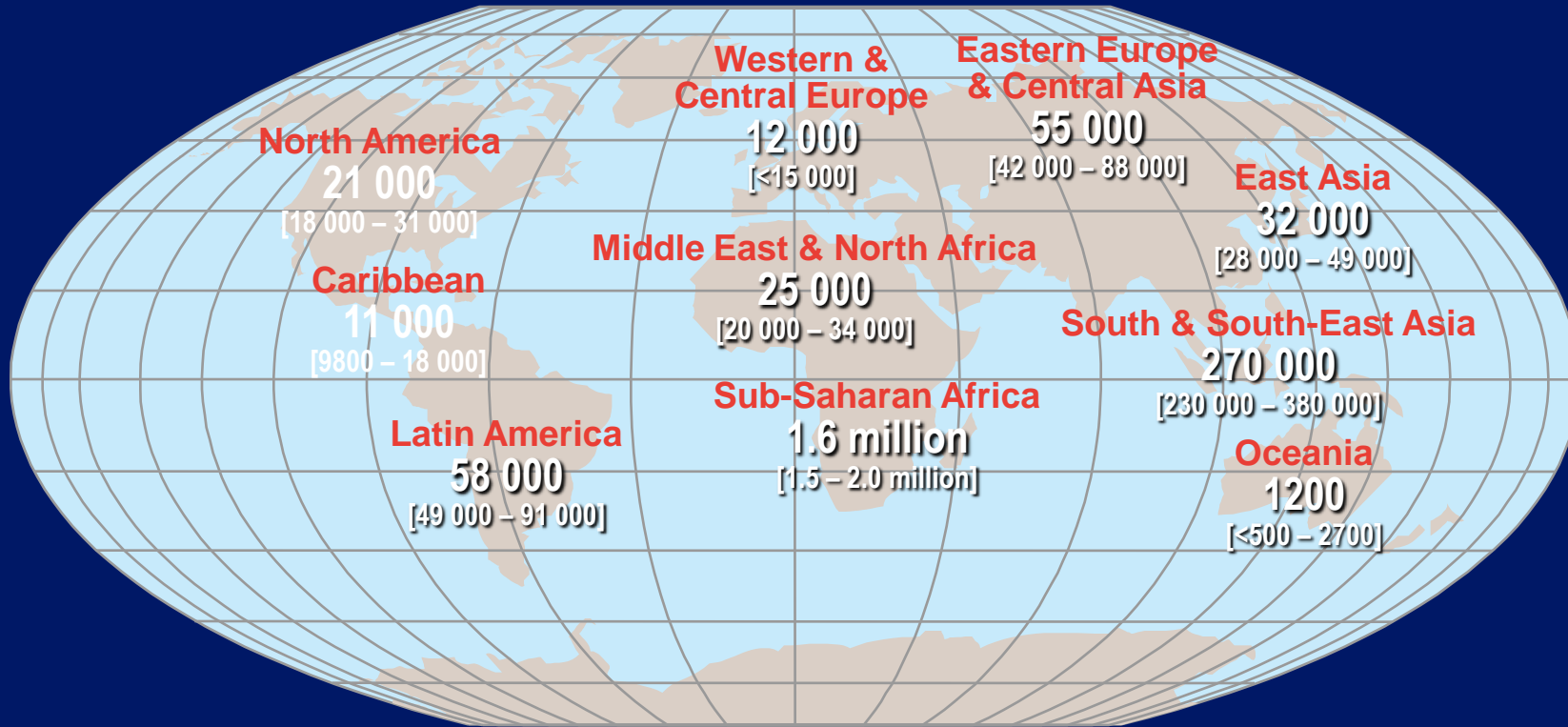
Total: 33.2 (30.6 – 36.1) million

Estimated number of adults and children newly infected with HIV, 2007



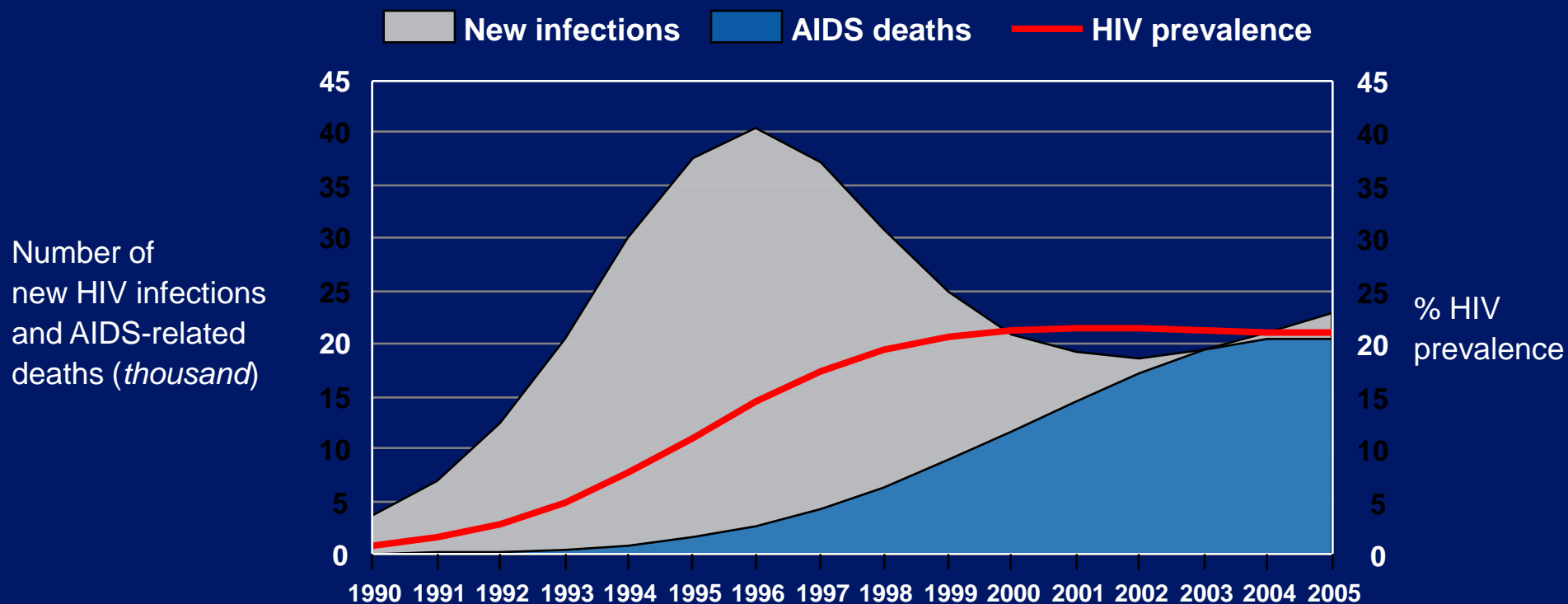
Total: 2.5 (1.8 – 4.1) million

Estimated adult and child deaths from AIDS, 2007



Total: 2.1 (1.9 – 2.4) million

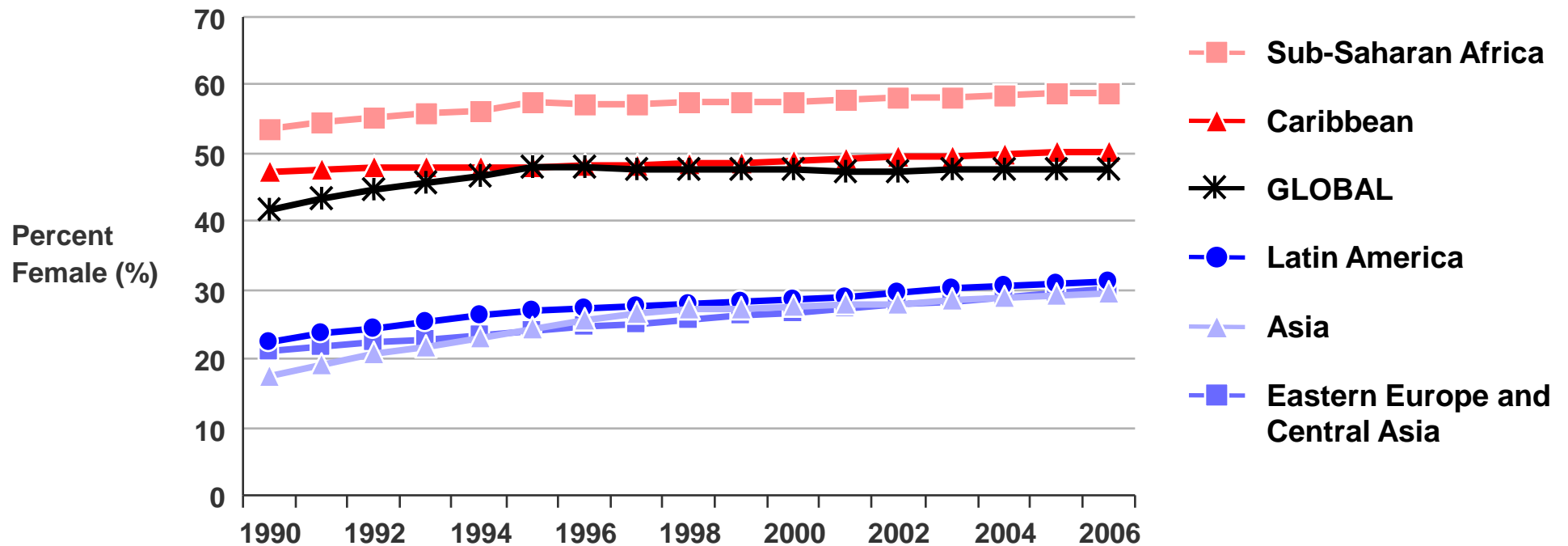
Estimated number of annual new infections and AIDS-related deaths among adults (15+) in relation to the stabilizing trend of estimated prevalence rate among adults (15–49), Lesotho, 1990–2005



Over 6800 new HIV infections a day in 2007

- **More than 96% are in low and middle income countries**
- **About 1200 are in children under 15 years of age**
- **About 5800 are in adults aged 15 years and older of whom:**
 - **almost 50% are among women**
 - **about 40% are among young people (15-24)**

Percent of adults (15+) living with HIV who are female (%), 1990–2006



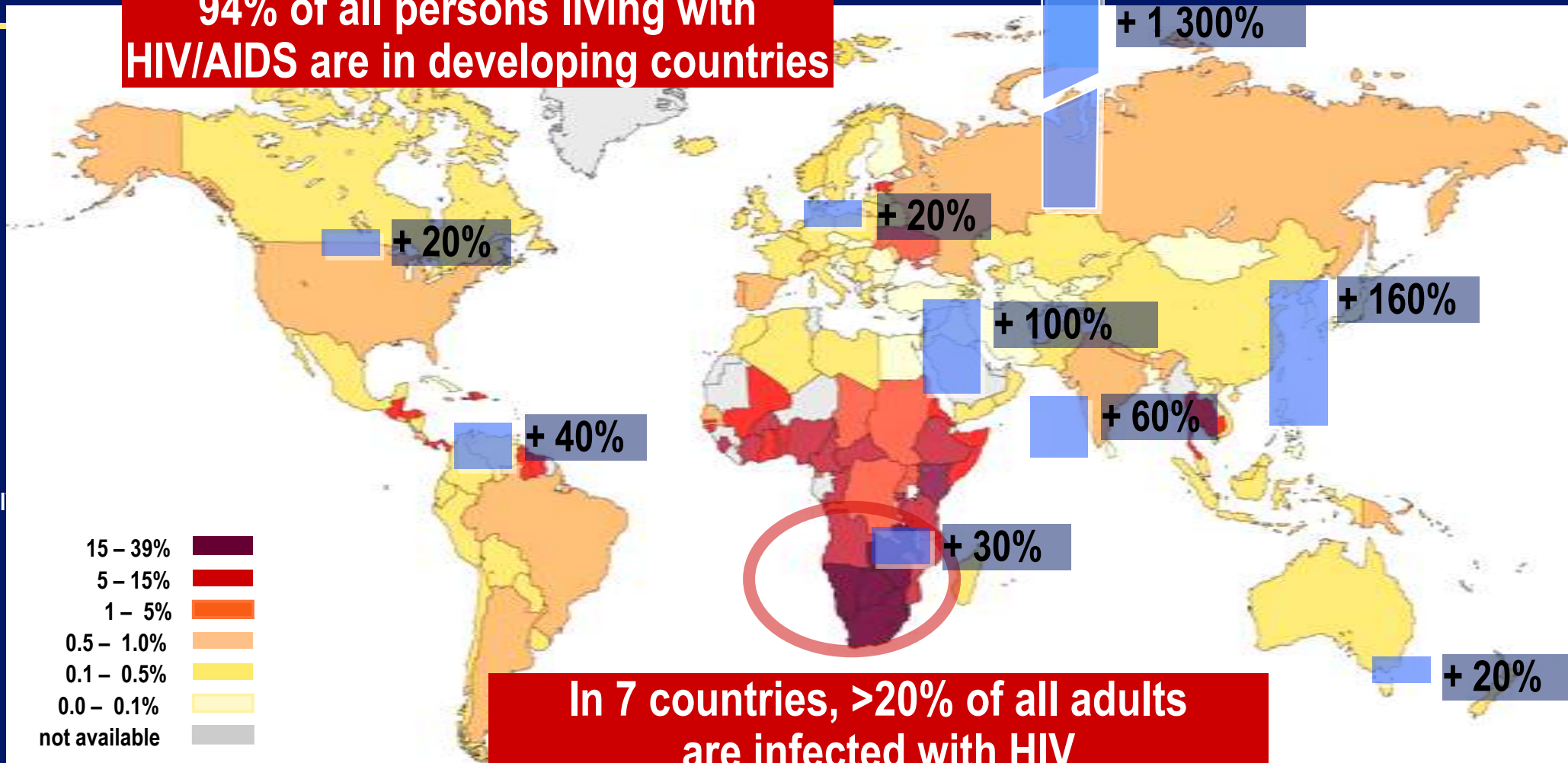
Regional HIV/AIDS statistics and features, end of 2002

	Epidemic started	Adults & children living with HIV/AIDS	Adults & children newly infected with HIV	Adult prevalence rate *	% of HIV-positive adults who are women	Main mode(s) of transmission for those living with HIV/AIDS **
Sub-Saharan Africa	late '70s early '80s	29.4 million	3.5 million	8.8%	58%	Hetero
North Africa & Middle East	late '80s	550 000	83 000	0.3%	55%	Hetero, IDU
South and South-East Asia	late '80s	6.0 million	700 000	0.6%	36%	Hetero, IDU
East Asia & Pacific	late '80s	1.2 million	270 000	0.1%	24%	IDU, Hetero, MSM
Latin America	late '70s early '80s	1.5 million	150 000	0.6%	30%	MSM, IDU, Hetero
Caribbean	late '70s early '80s	440 000	60 000	2.4%	50%	Hetero, MSM
Eastern Europe & Central Asia	early '90s	1.2 million	250 000	0.6%	27%	IDU
Western Europe	late '70s early '80s	570 000	30 000	0.3%	25%	MSM, IDU
North America	late '70s early '80s	980 000	45 000	0.6%	20%	MSM, IDU, Hetero
Australia & New Zealand	late '70s early '80s	15 000	500	0.1%	7%	MSM
TOTAL		42 million	5 million	1.2%	50%	

The global view of HIV, end 2001

Recent trends in HIV infection, 1996–2001

94% of all persons living with HIV/AIDS are in developing countries



In 7 countries, >20% of all adults are infected with HIV

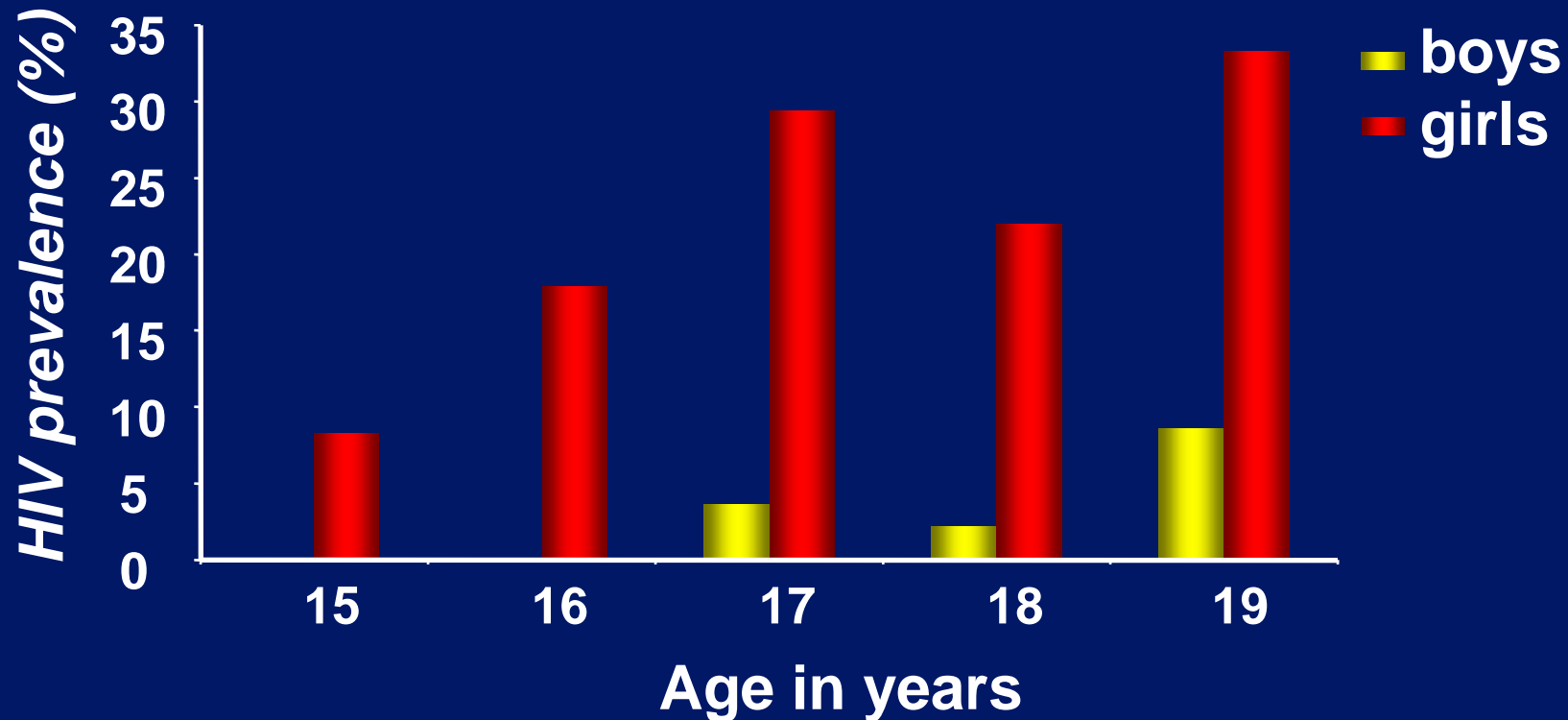
11.8 million young people (aged 15–24) living with HIV/AIDS

7.3 million young women and 4.5 million young men



Source: UNICEF/UNAIDS/WHO, 2002.

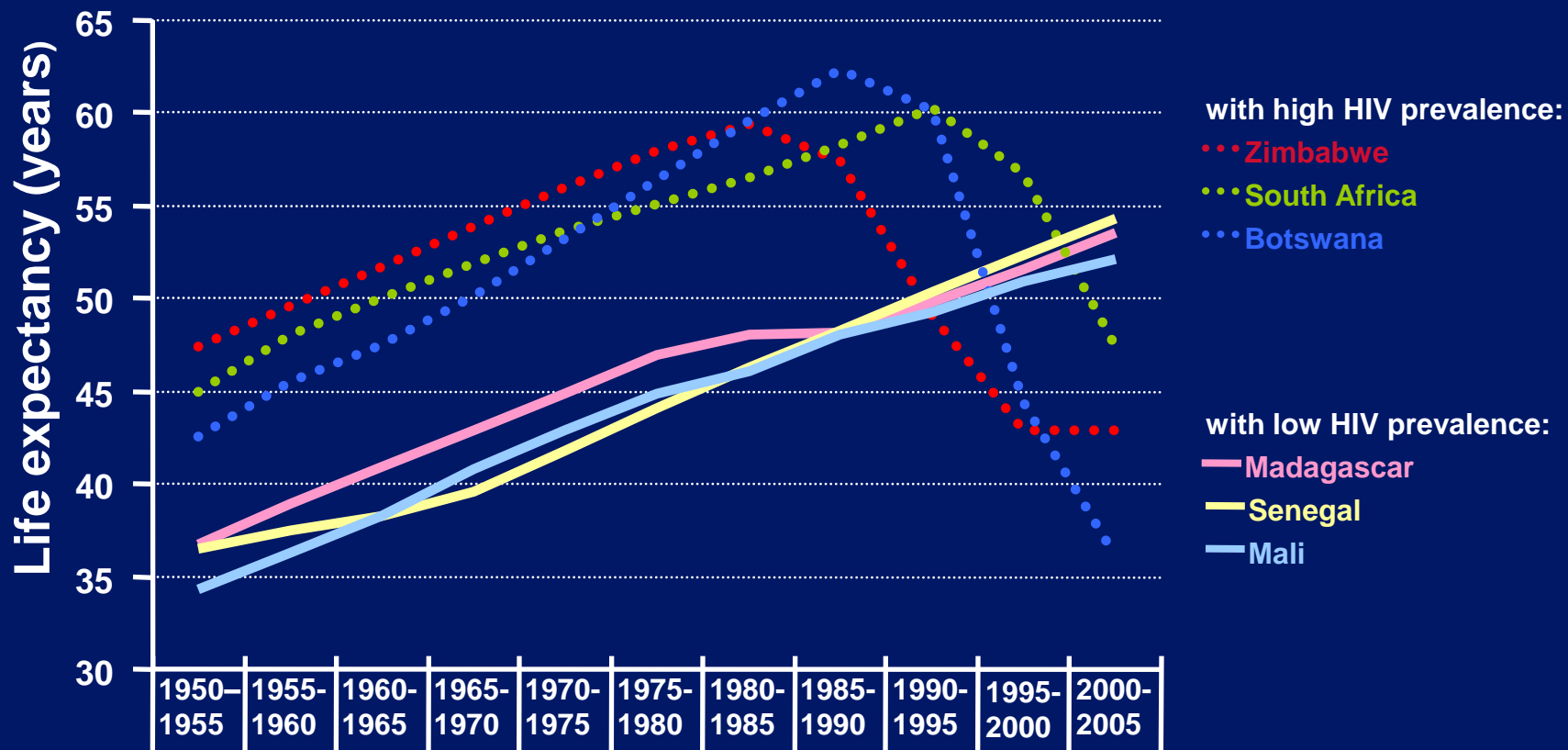
HIV prevalence rate among teenagers by age in Kisumu, Kenya



Source: National AIDS Programme, Kenya, and Population Council, 1999

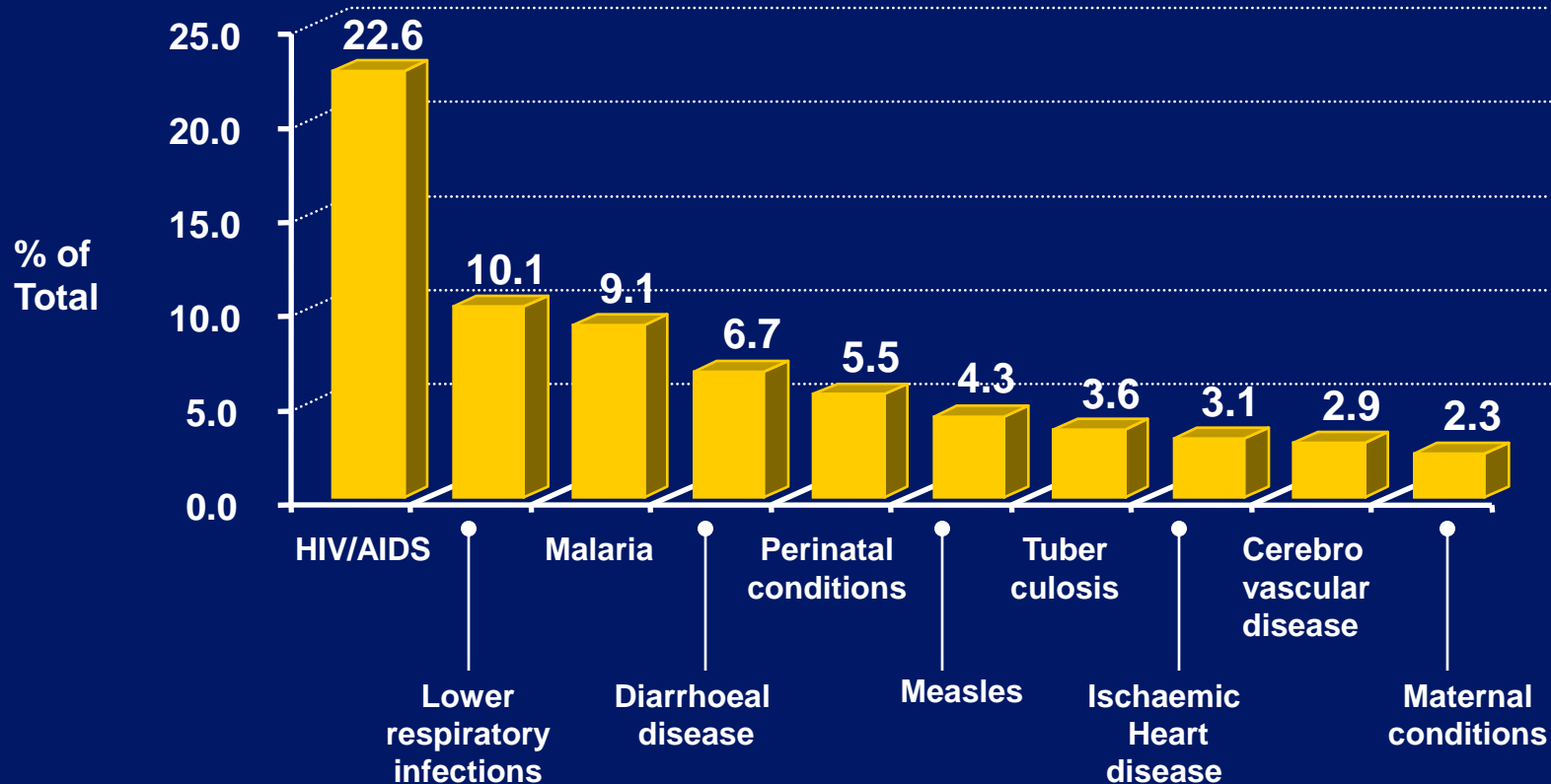
The Impact of HIV/AIDS

Changes in life expectancy in African countries with high and low HIV prevalence: 1950 - 2005



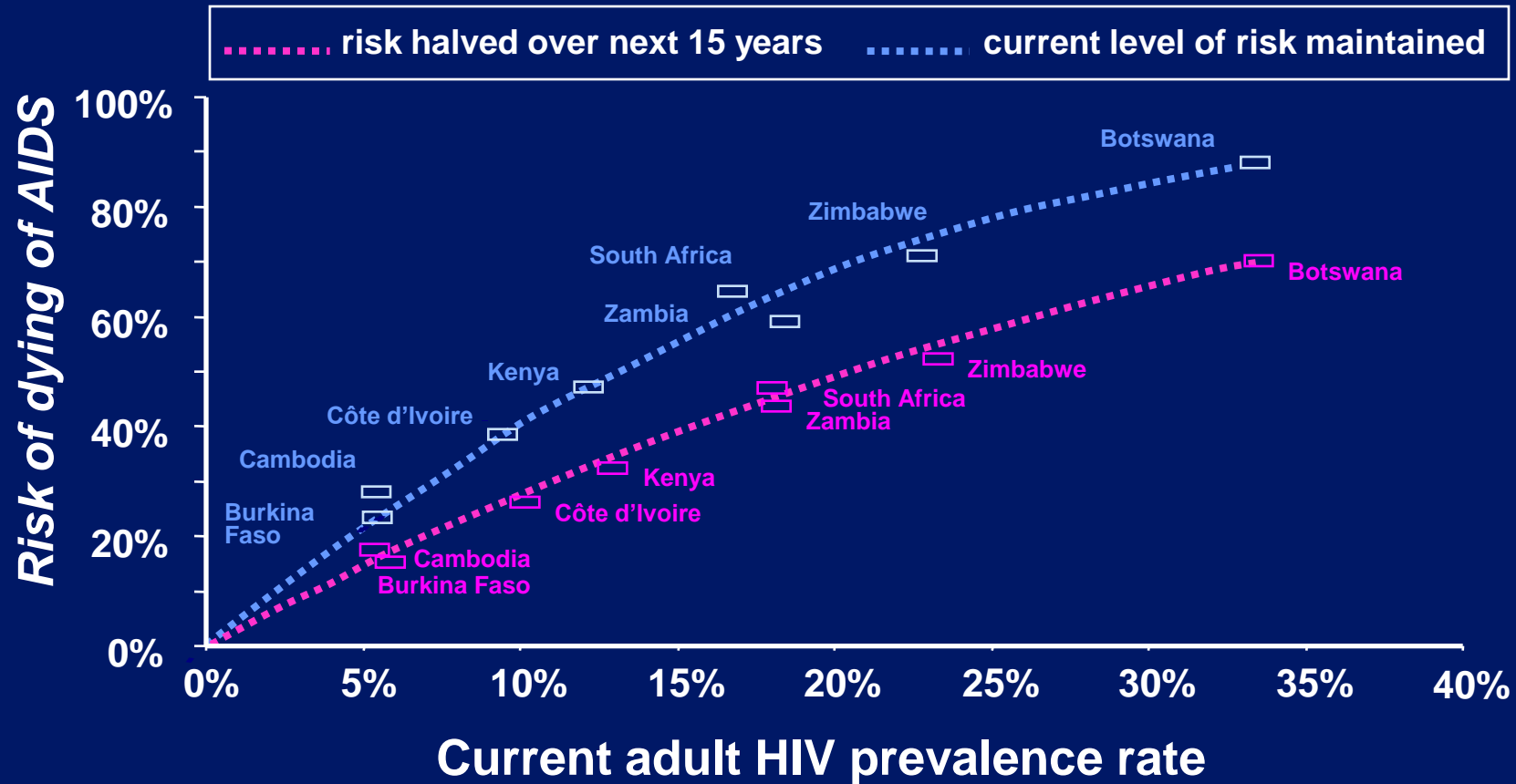
Source: UN Department of Economic and Social Affairs (2001) *World Population Prospects, the 2000 Revision*.

Leading causes of death in Africa, 2000



Source: *The World Health Report 2001, WHO*

Lifetime risk of AIDS death for 15-year-old boys, assuming unchanged or halved risk of becoming infected with HIV, selected countries



Source: Zaba B, 2000 (unpublished data)

Why Is the HIV Epidemic Occurring?

Risk Factors (for Women)

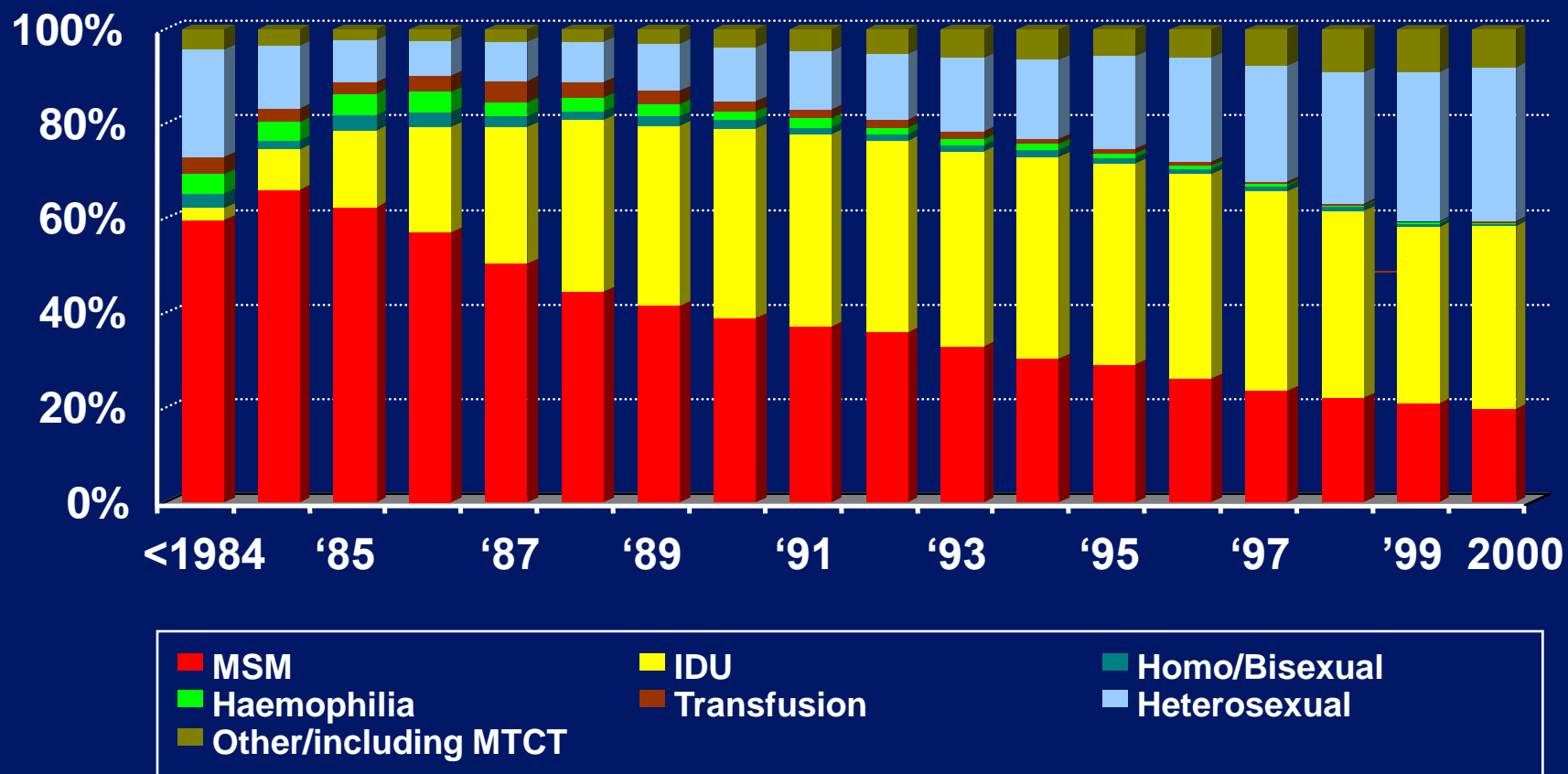
Unsafe transfusion

Unsafe injection practices

Unsafe injection drug use

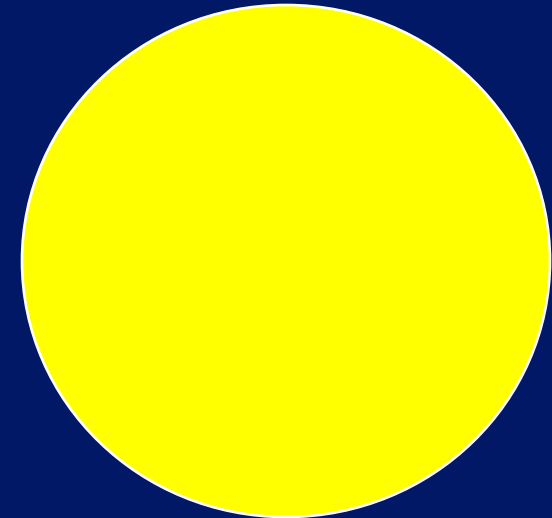
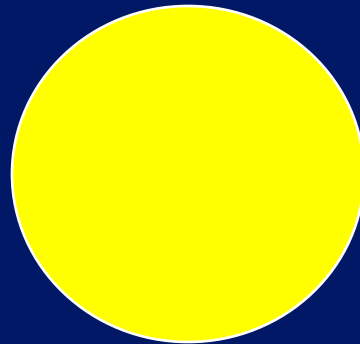
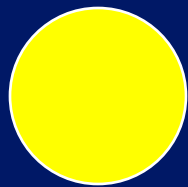
Unsafe sex

Distribution of AIDS cases by the route of transmission—Eastern Europe



Concept of Bridging Populations in HIV Transmission

Concentrated epidemics \longrightarrow Generalized epidemics



“Core” (risk) group

IDUs, sex workers,
MSMs

Bridging population

Sex partners of IDUs, sex
workers, MSMs

General population

1. Sexual norms
2. STIs

Sexual Transmission of STIs, Including HIV¹

$$R_o = \beta c D$$

R_o = reproductive rate

β = transmission efficiency

C = rate of partner change

D = duration of infectiousness

¹among people having sex

Male to Female Transmission Efficiency

Study	Per 1000 acts
Padian et al (1987)	0.8-1
Peterman et al (1988)	0.5-2.3 ¹
Wiley et al (1989)	0.8-1 ¹
Duerr et al (1994)	0.6-2.6
Downs et al (1996)	0.5-1.2
Leynaert et al (1998)	0.6-0.8
Shiboski et al (1998)	0.6-0.9
Gray et al (2001)	0.9

β (Transmission efficiency) Cofactors

- Cofactor effect of STIs
- Cofactor effect of young age
- Cofactor effect of hormonal contraceptives
- Negative cofactor effects of condom use
- Negative cofactor effect of microbicides (we hope!)
- Negative cofactor effect of circumcision (we think—but now—March 2007—we are sure!)

β (Transmission efficiency) Model

- Concentration of virus in seminal secretions¹
- Viral phenotype
- Number of receptors for HIV in endocervix (or vagina)

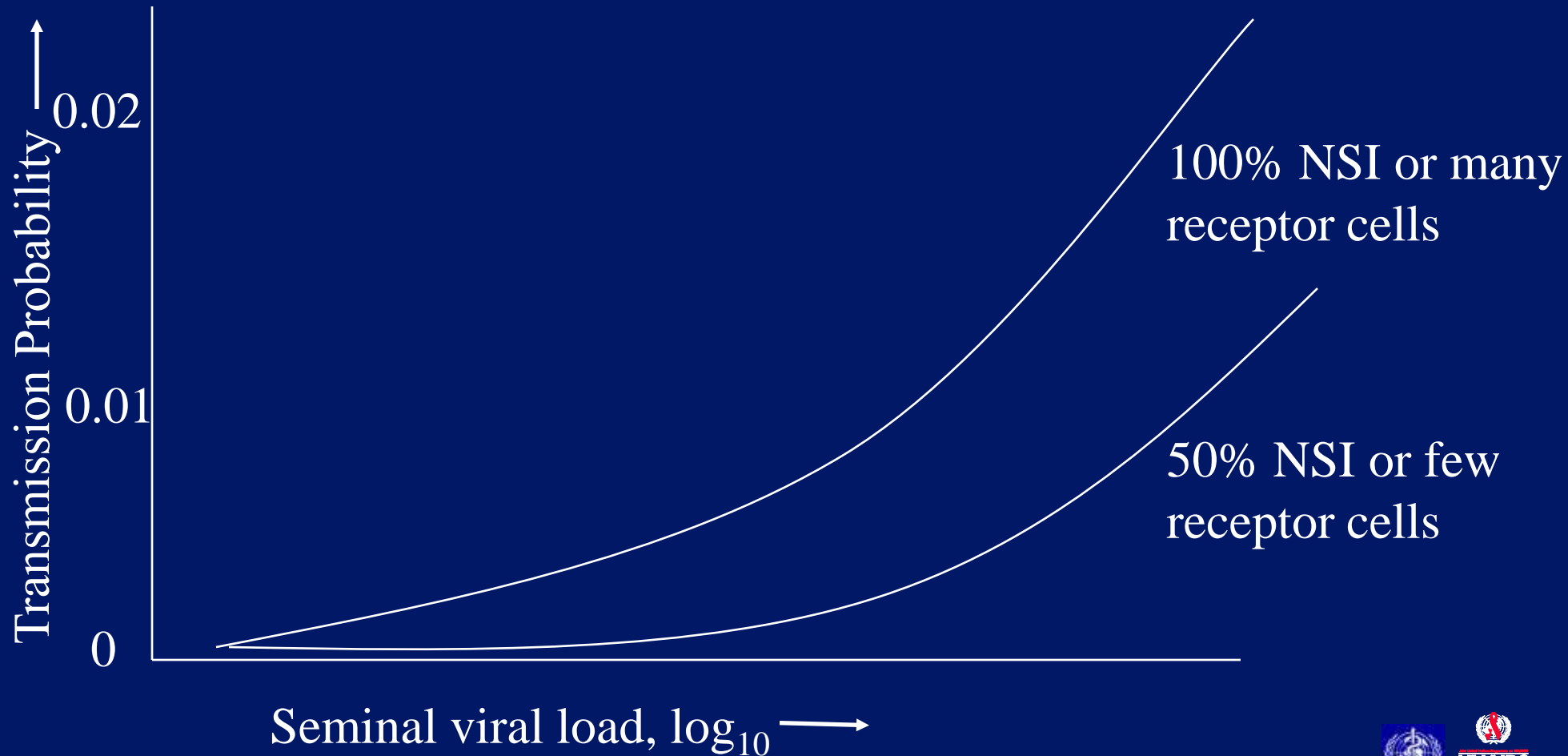
Seminal Fluid Characteristics, 132 Samples

CD4 count	5-1240
Semen volume (ml)	
Median	2.4
Minimum	0.1
Maximum	7.3
NSI HIV-1 RNA count per sample	
Median	4,904
Mean	522,656
Minimum	42
Maximum	27,870,835

CCR5 Receptor Cell Count, Endocervix

Median	184/mm ³
Mean	176/mm ³
Minimum	13/mm ³
Maximum	450/mm ³

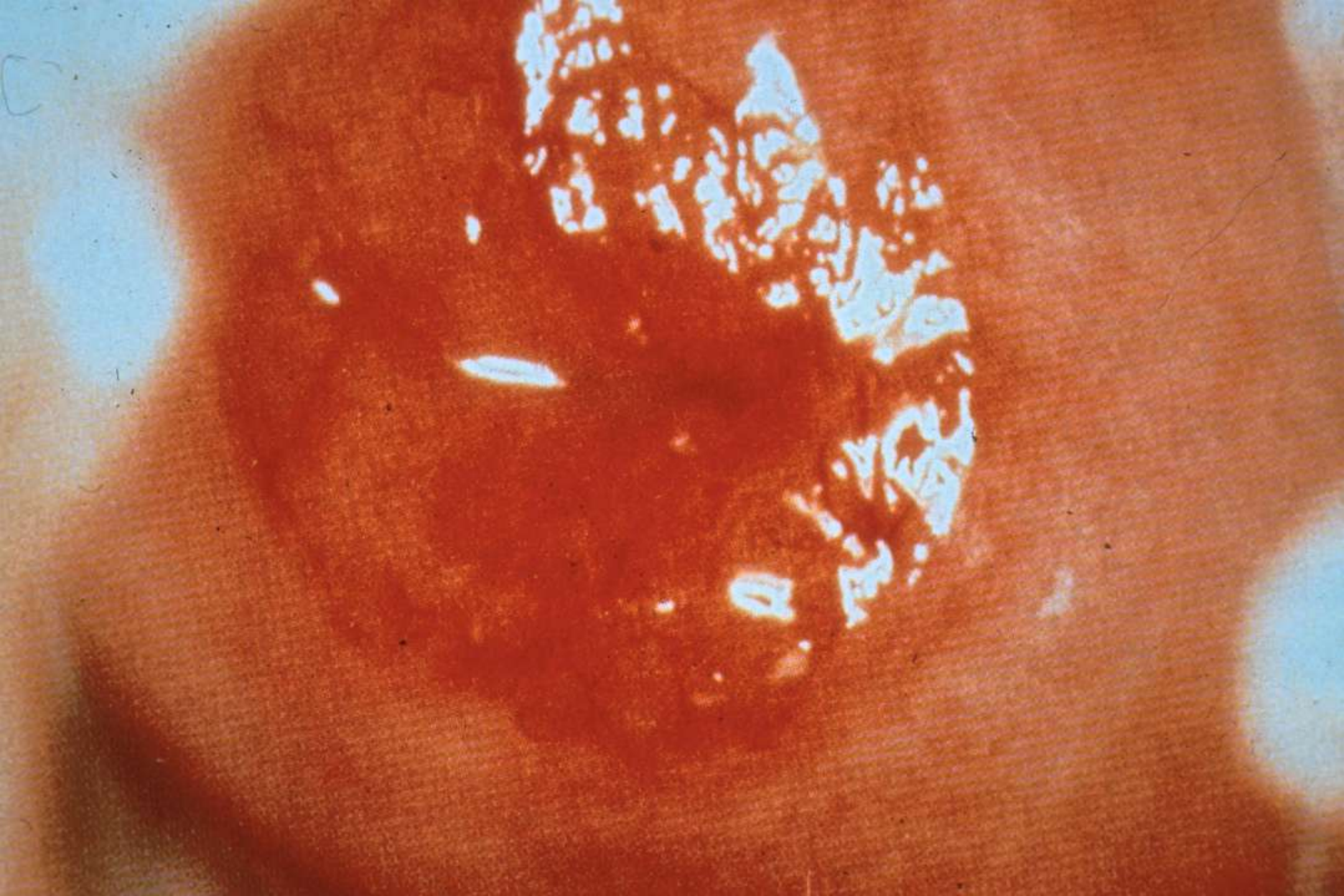
Probability of Transmission by Seminal Viral Load, Number of Receptor Cells, or Proportion of HIV Virions that are NSI

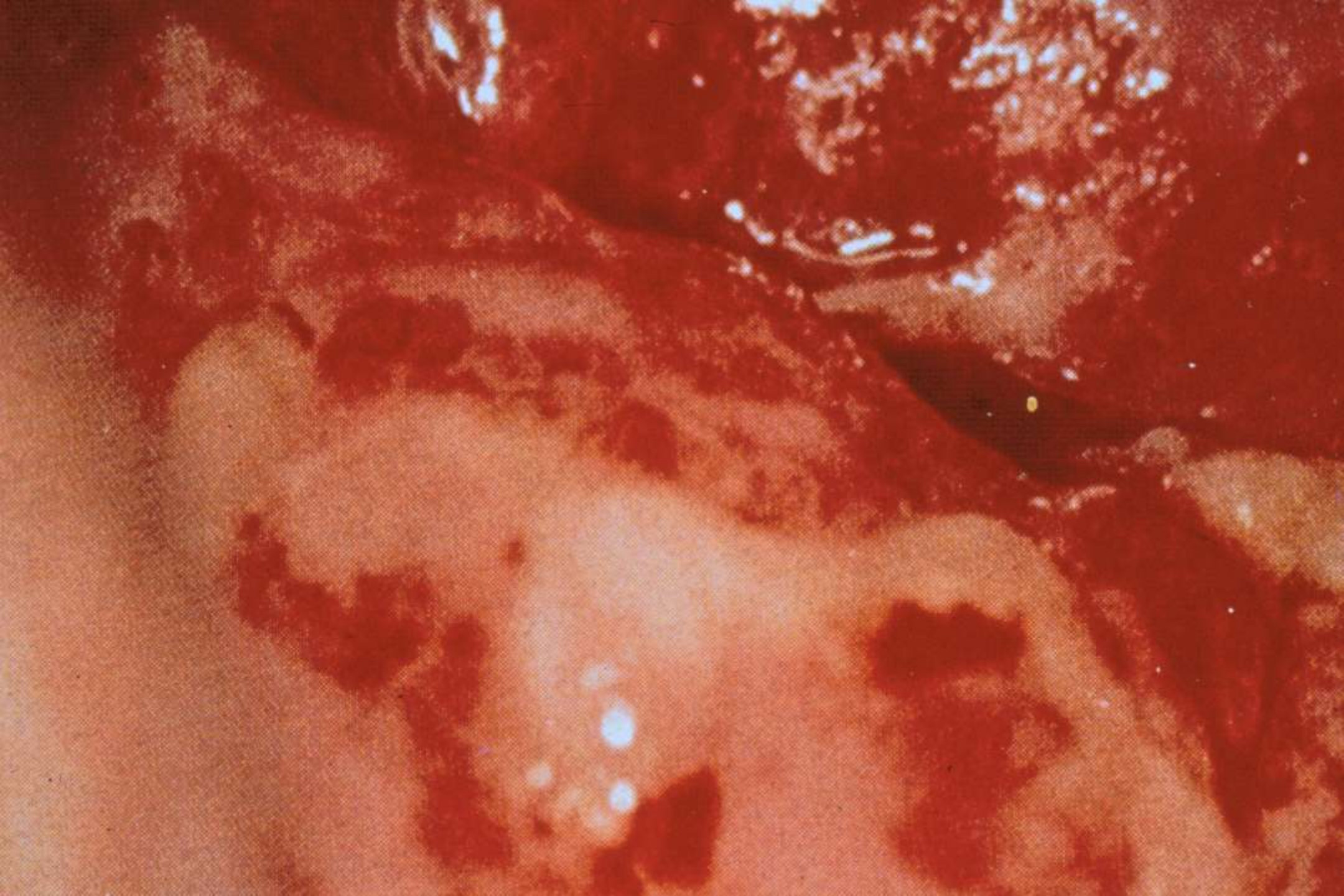


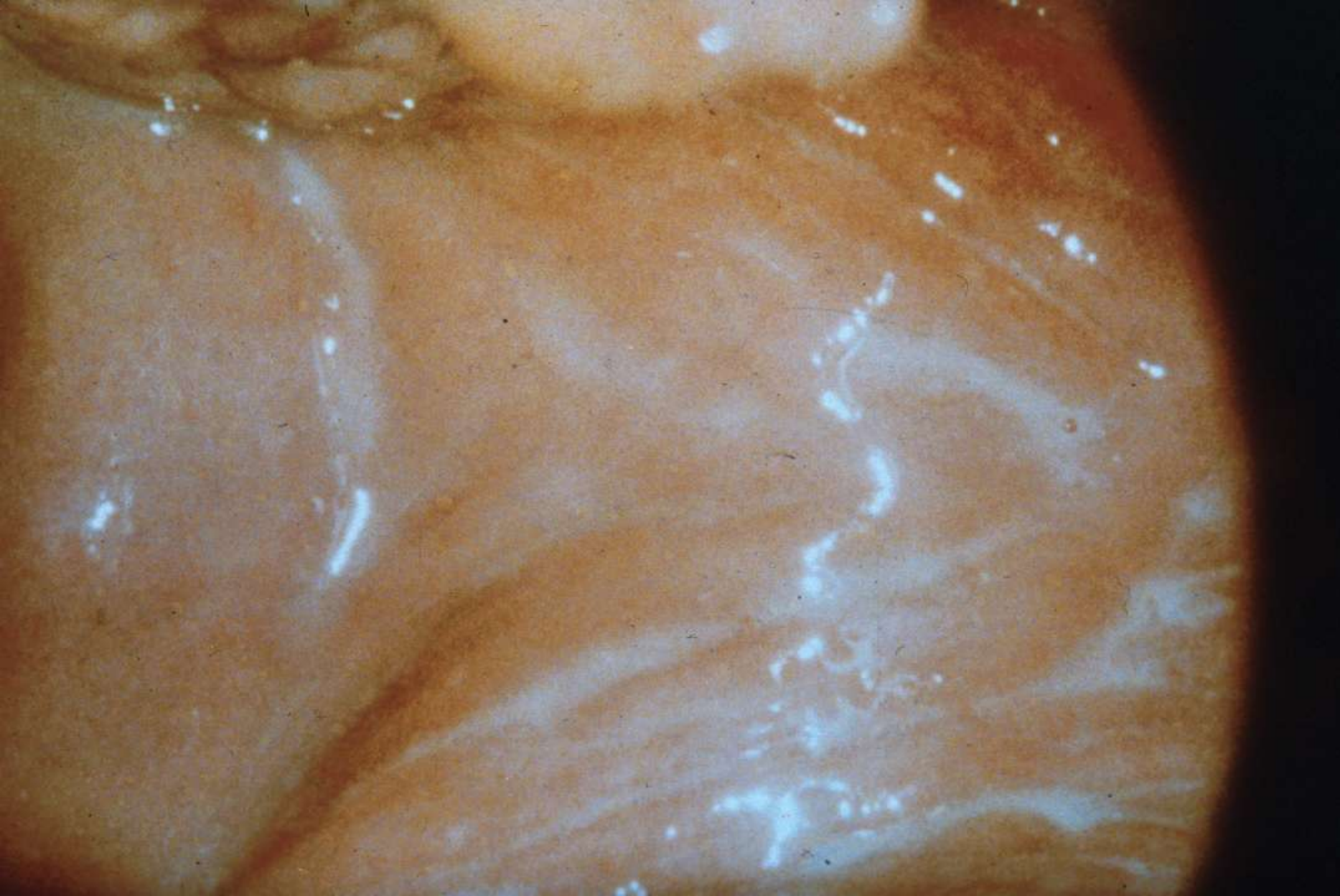
β (Transmission efficiency)—Cofactors again

- Amount of seminal secretions
- Young age
- STIs,
- Etc.











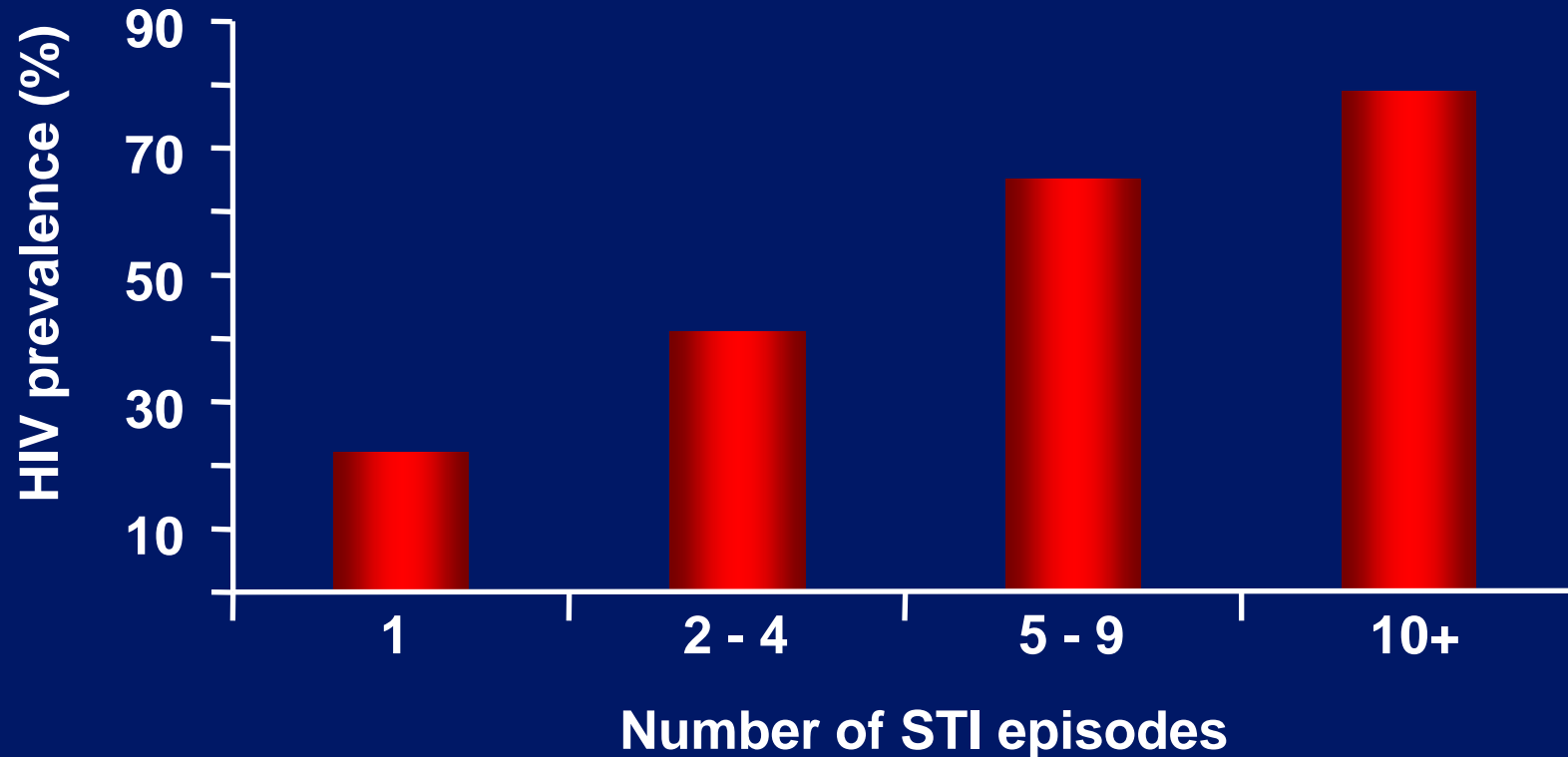
Presence of HIV in Ulcer Secretions

Disease	PCR for HIV (Pos./Tested)
Chancroid ²	6/7 (86%)
Chancroid ³	2/6 (33%)
Syphilis	1/2 (50%)
Unknown	2/3 (67%)
Genital herpes	1/3 (33%)
Genital herpes ⁴	25/26 (96%)

¹ Kreiss J et al. J Infect Dis 1989;160:380 ² Plummer FA et al. J Infect Dis 1990;161:810

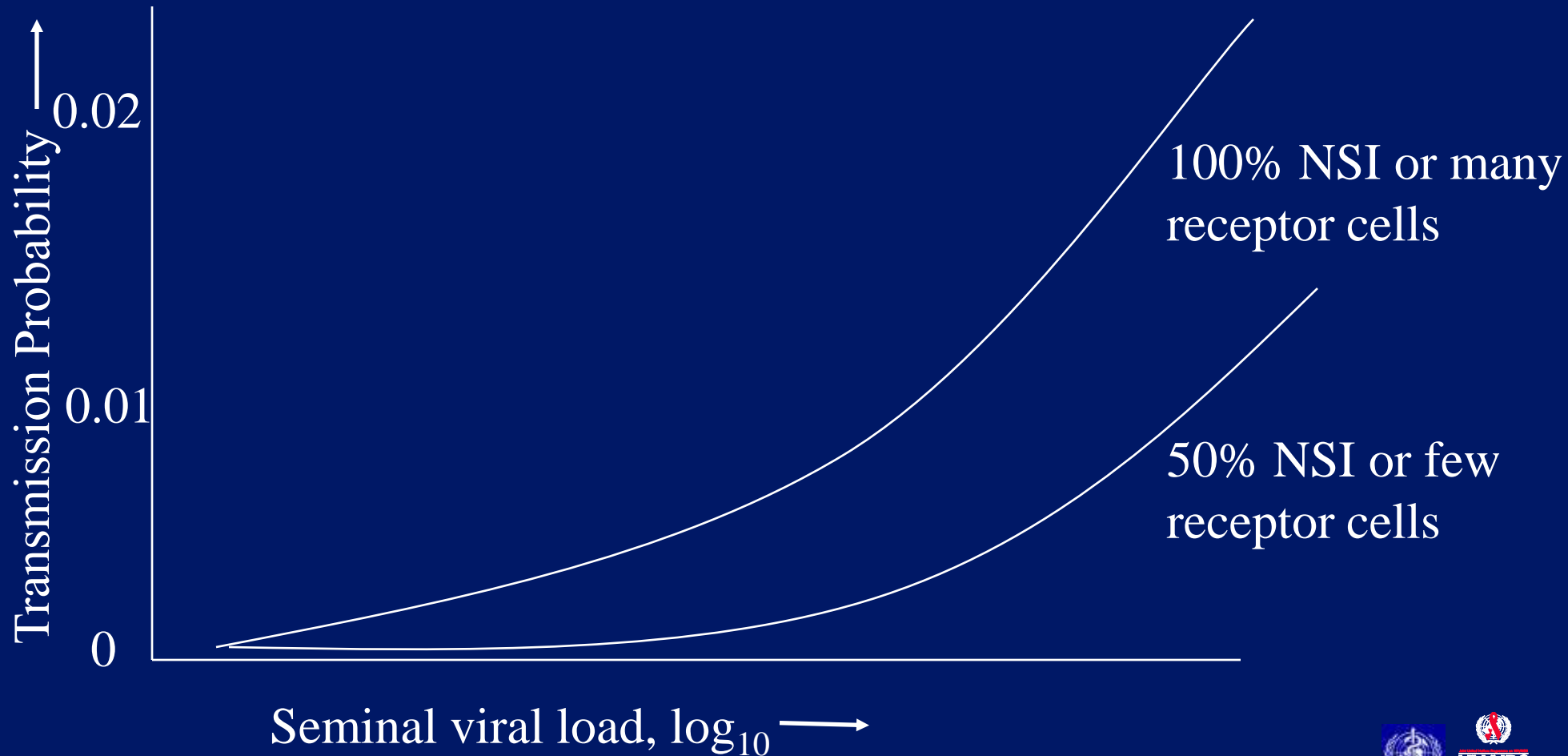
³ Mertz KJ et al. J Infect Dis 1998;178:1795 Schacker T et al. JAMA 1998;280:61

HIV prevalence rate and frequency of sexually transmitted infection (STI) episodes, Carletonville miners, South Africa, 1991-1998



Source: Ballard R, 2000 (unpublished data).

Probability of Transmission by Seminal Viral Load, Number of Receptor Cells, or Proportion of HIV Virions that are NSI



If These Transmission Efficiencies are so Low, Why is there an HIV Epidemic?

Cohort study, Nairobi

- 73 HIV-negative men with an STD
- All men had had one act of sexual intercourse with a prostitute
- The men were counseled, given condoms, told to avoid sex with prostitutes, and followed every 2 weeks for three months for HIV seroconversion
- 85% of prostitutes were HIV-positive

Proportion of Men Developing HIV Infection After a Single Act of Sexual Intercourse

Unstratified	Circumcised		Uncircumcised	
	Urethritis	Ulcer	Urethritis	Ulcer
13%	0%	7% (6*)	0%	43% (15)

- Standard Error

An Outbreak of HIV Infection, United States

- Of 42 teenaged girls having only vaginal sex with one teenaged boy, 13 (31%) became infected
- Of 15 girls with a brief time period of sexual activity, seven (47%) became infected. Infected girls, compared to uninfected girls, had more exposures:

Partners	Infected	Uninfected
Median	3	1
Range	2-6	1-2

Sexual Transmission of STIs, Including HIV¹

$$R_o = \beta \ c \ D$$

R_o = reproductive rate

β = transmission efficiency

C = rate of partner change

D = duration of infectiousness

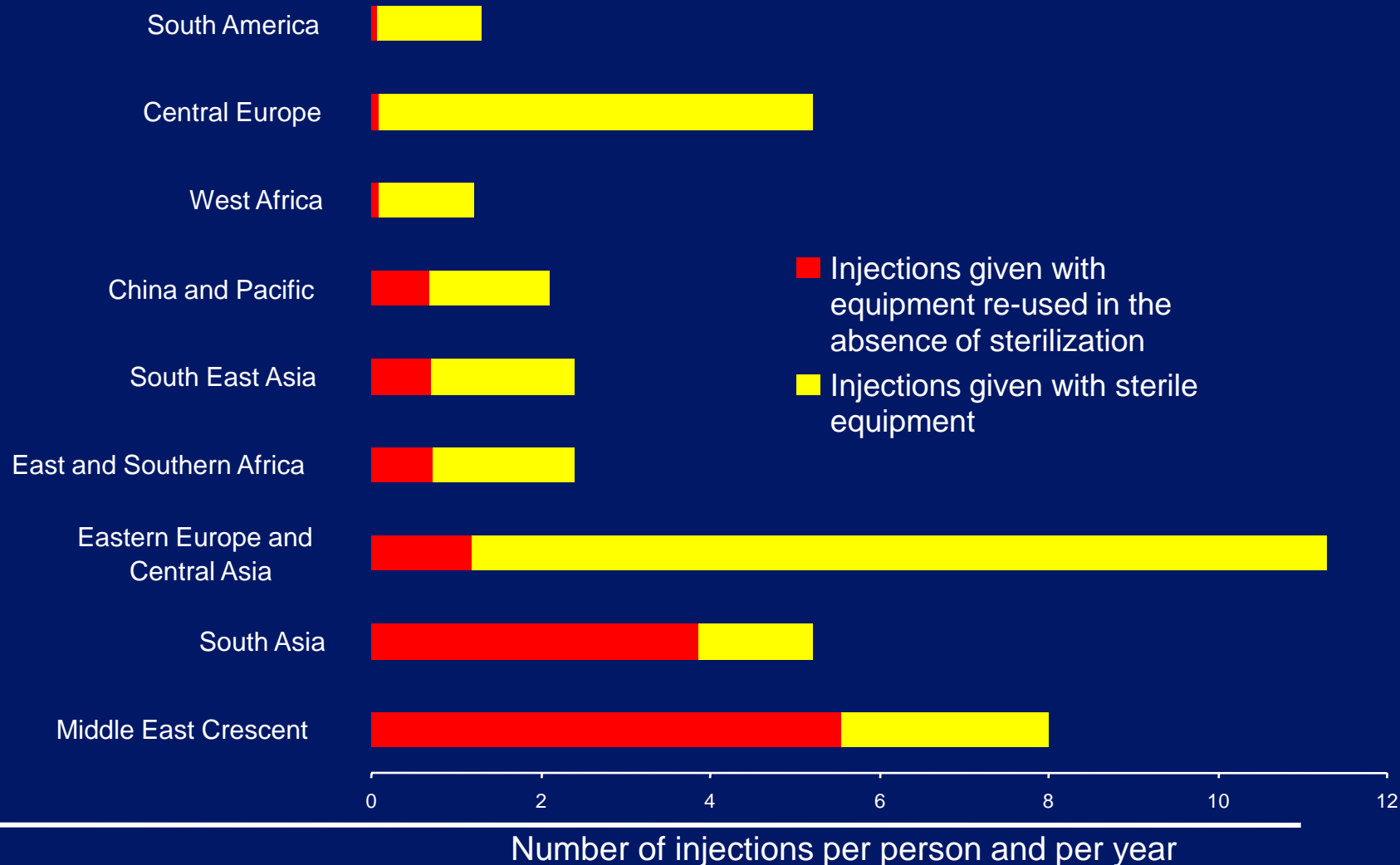
¹among people having sex

Alternately, Maybe Something Else is Going On?

Unsafe Injections in the Developing World

WHO estimates that 5% of all infections, world-wide, are from unsafe injections (2.5% in sub-Saharan Africa)

Injections Given with Sterile and Unsafe Equipment Worldwide



“The Solution to Pollution is Dilution”

In Addition, HIV “Acts” Like an STI

Figure 1
HIV prevalence by age and sex,
Addis Ababa, Ethiopia, 1994 (ref. 52)

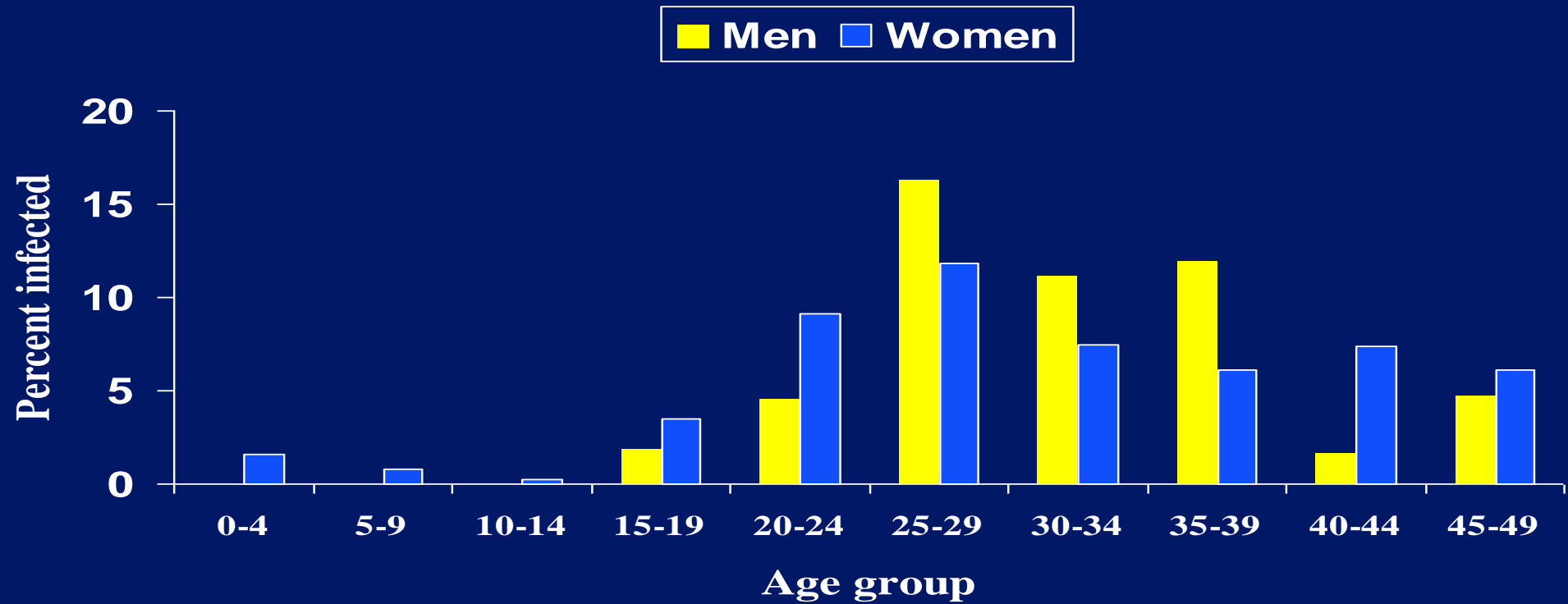


Figure 2A
HIV and HSV-2 prevalence
by age and sex in Kisumu, Kenya

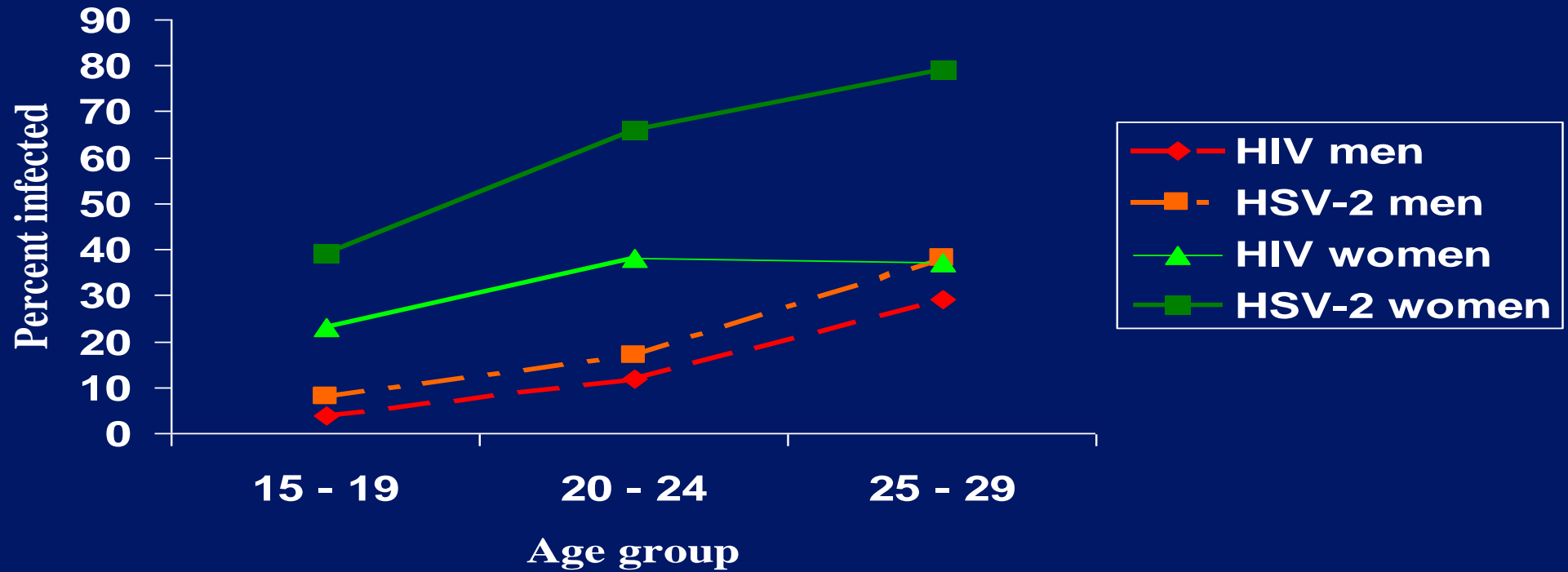
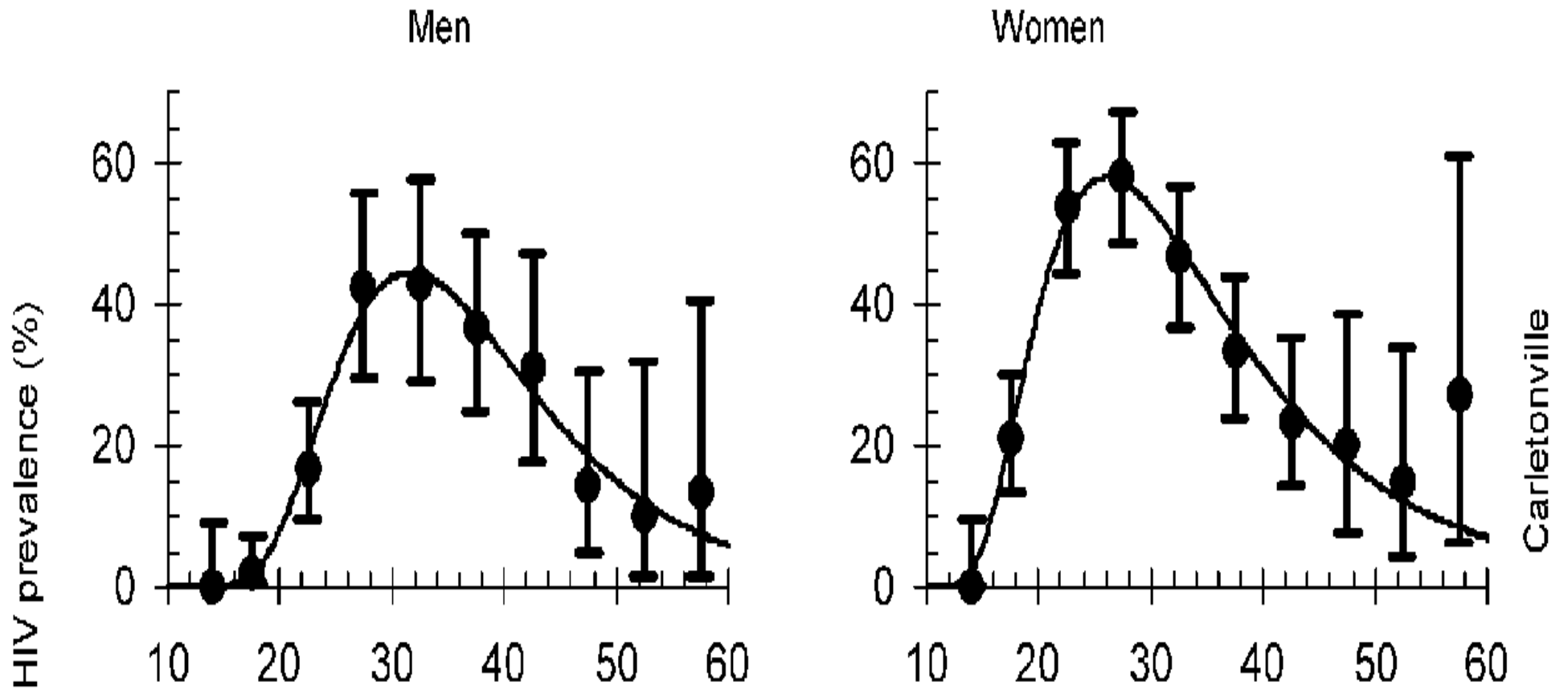


Figure 4

Infection Rates, by Gender, Carletonville, South Africa



What Can We Do About the HIV Epidemic?

The HIV Epidemic Should Be Easily Controlled

- 1. Don't have unsafe transfusions**
- 2. Don't have unsafe injections**
- 3. Don't inject drugs (if you do, do it safely)**
- 4. Don't have sex (if you do, do it safely)**

Stopping the HIV Epidemic

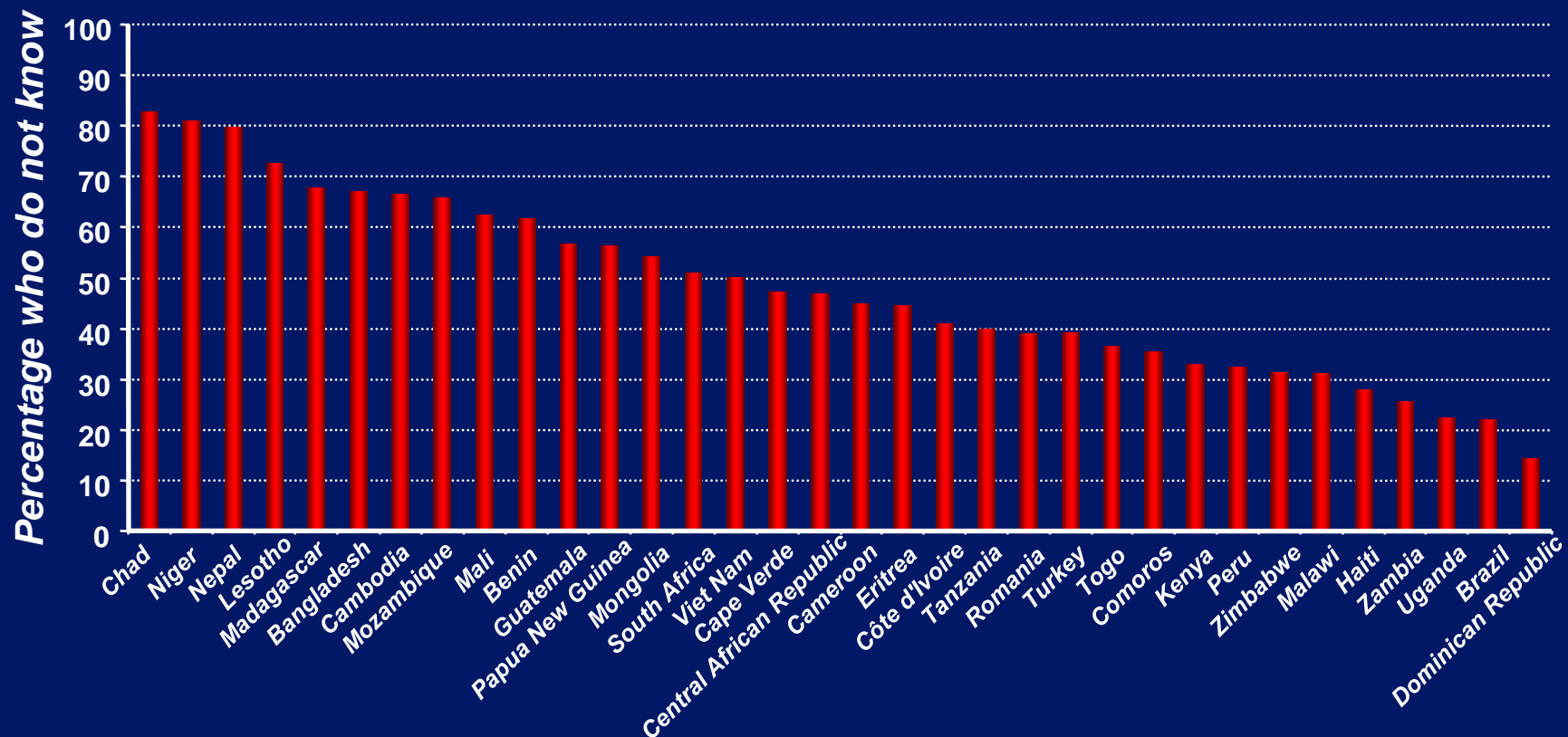
Personal Responsibility

Giving people the means to effect personal
responsibility

Don't have sex (if you do, do it safely)

1. Education

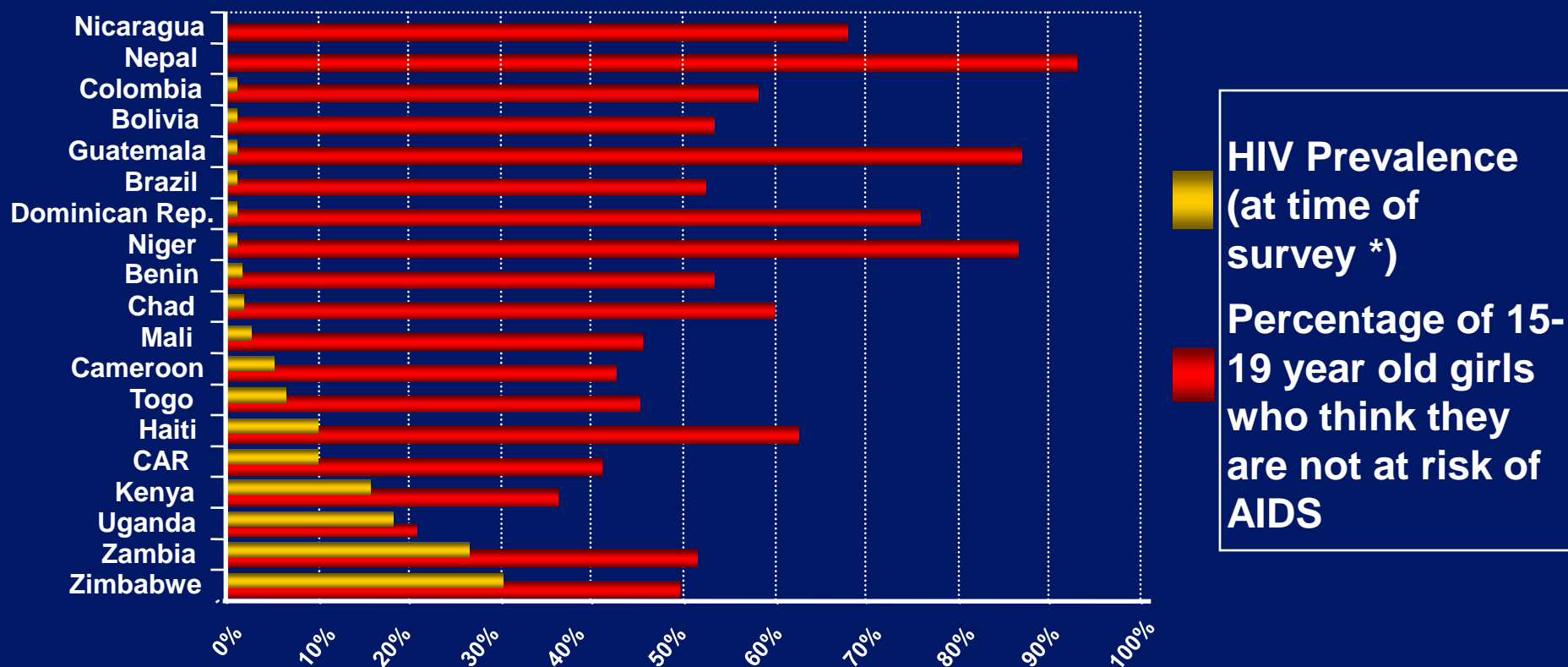
Percentage of 15-19 girls who do not know that an HIV-infected person may look healthy, 1994-1999



Sources: UNICEF, DHS surveys and other nationwide surveys, 1994-99.

Risk perception

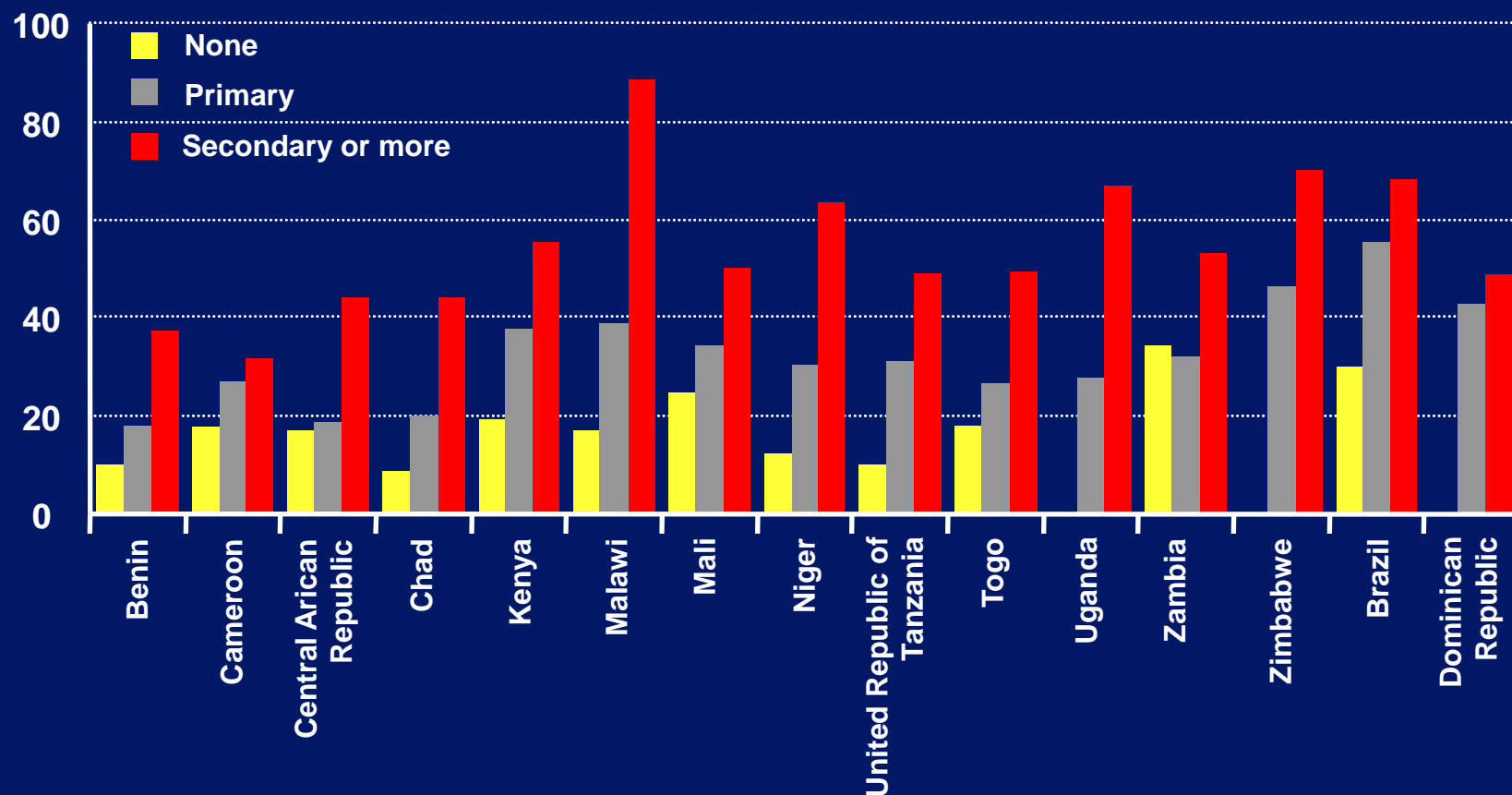
percentage of sexually active women (15-19)
who perceive themselves to be at no risk of getting AIDS



**HIV prevalence in women attending antenatal care clinics in major urban areas*

Sources: UNICEF, DHS surveys, 1994-1999

Percentage of men who used a condom with a recent non-regular partner, by level of formal education: 1995-2000



Source: Macro International (1995-2000) Demographic and Health Surveys; UNICEF

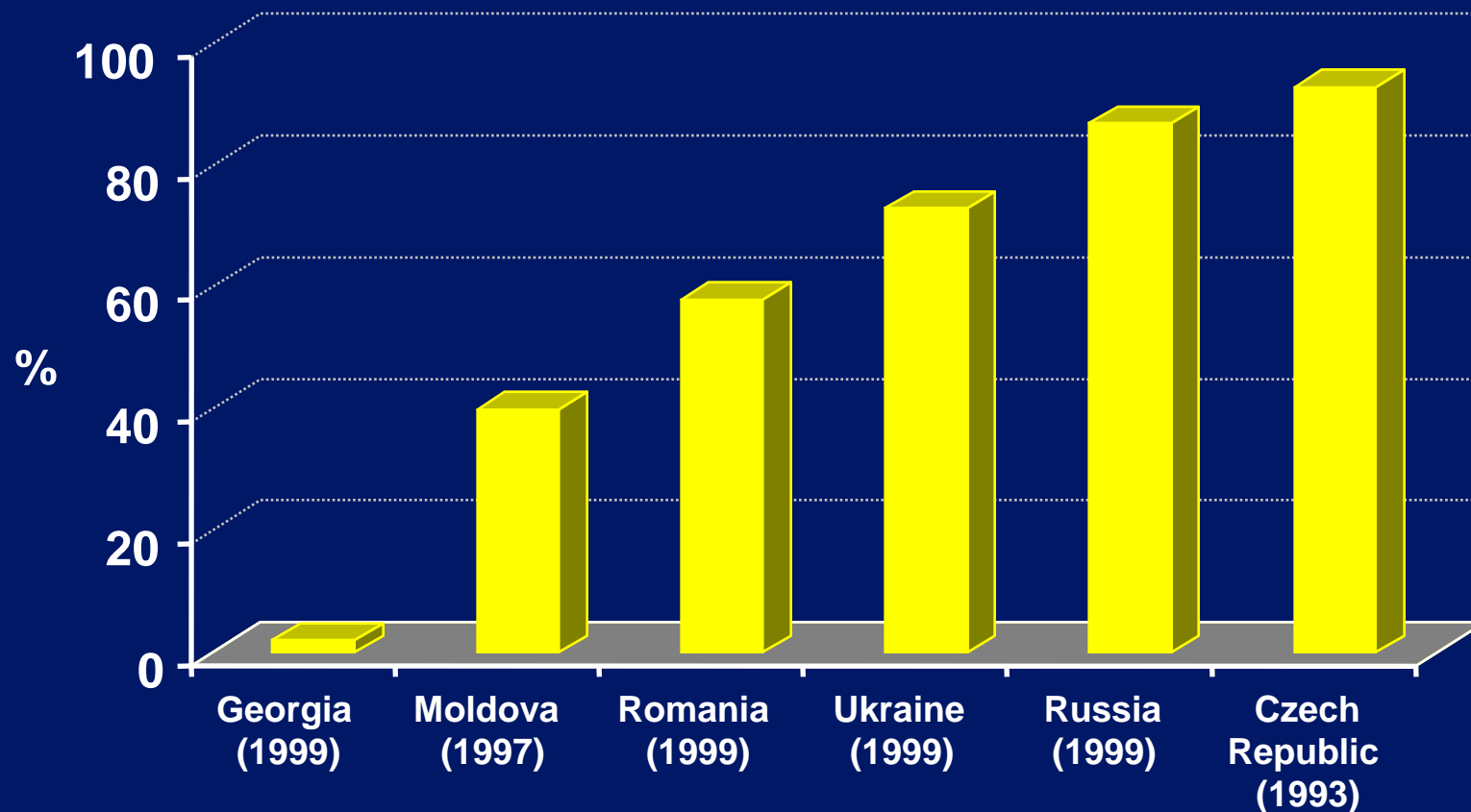
Don't have sex (if you do, do it safely)

1. Education

2. Change societal norms

Pre-marital sex

% of women (age 20-24) that report pre-marital sex, various countries in Eastern Europe



Two "Drivers" of the HIV Epidemic

Male Circumcision--1

(which may require changing norms)

- A biologic intervention
- Probably the intervention with the strongest and most consistent evidence that it works
- ~60% reduction in HIV infection in circumcised men*
- Women will benefit:
 - Lower population prevalence
 - Women may be protected (although, biologically, how is uncertain)

*March 2007 WHO/UNAIDS conference—www.who/hiv/en for summary mid-March

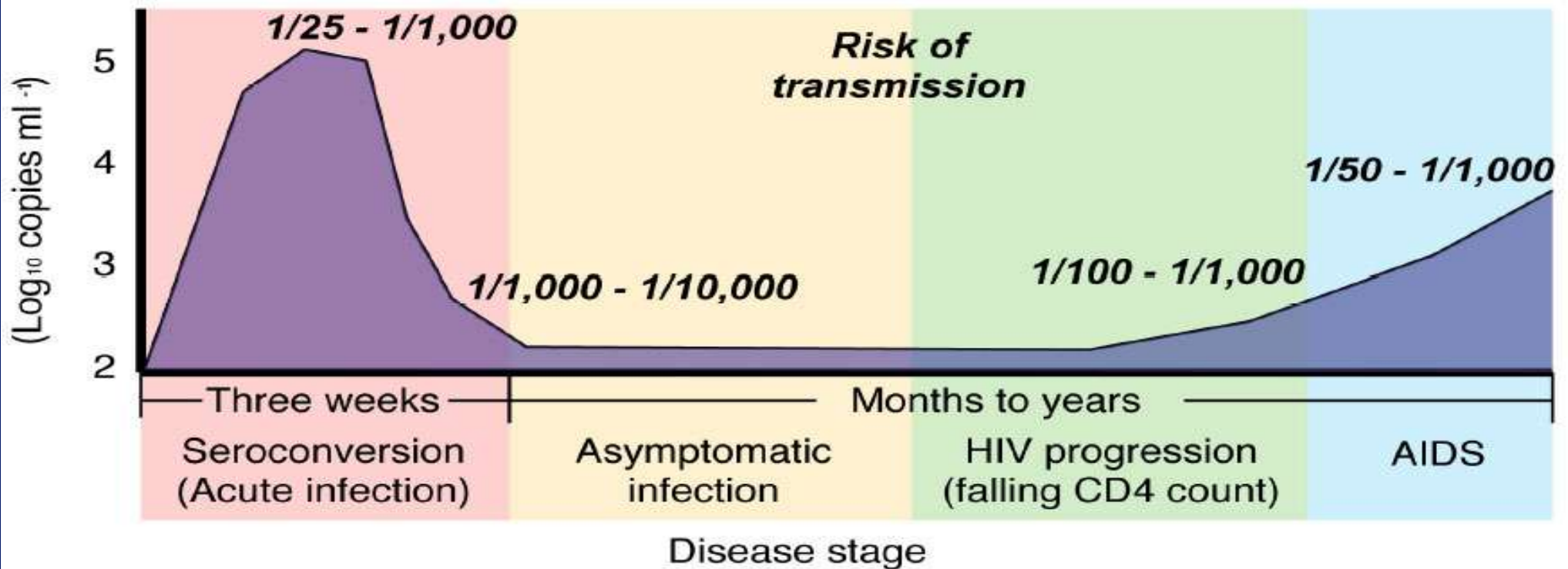
Avoid Concurrent Partnerships--2 (may require changing norms)

- Concurrent partnerships, as opposed to sequential partnerships, are particularly dangerous.

Transmission efficiency

“Mathematical models estimate the average probability of male–female transmission of HIV-1 per unprotected coital act to be between 0.0005 and 0.003% during chronic HIV infection, which in itself would not sustain an epidemic.”

-Pao et al, AIDS (2005)

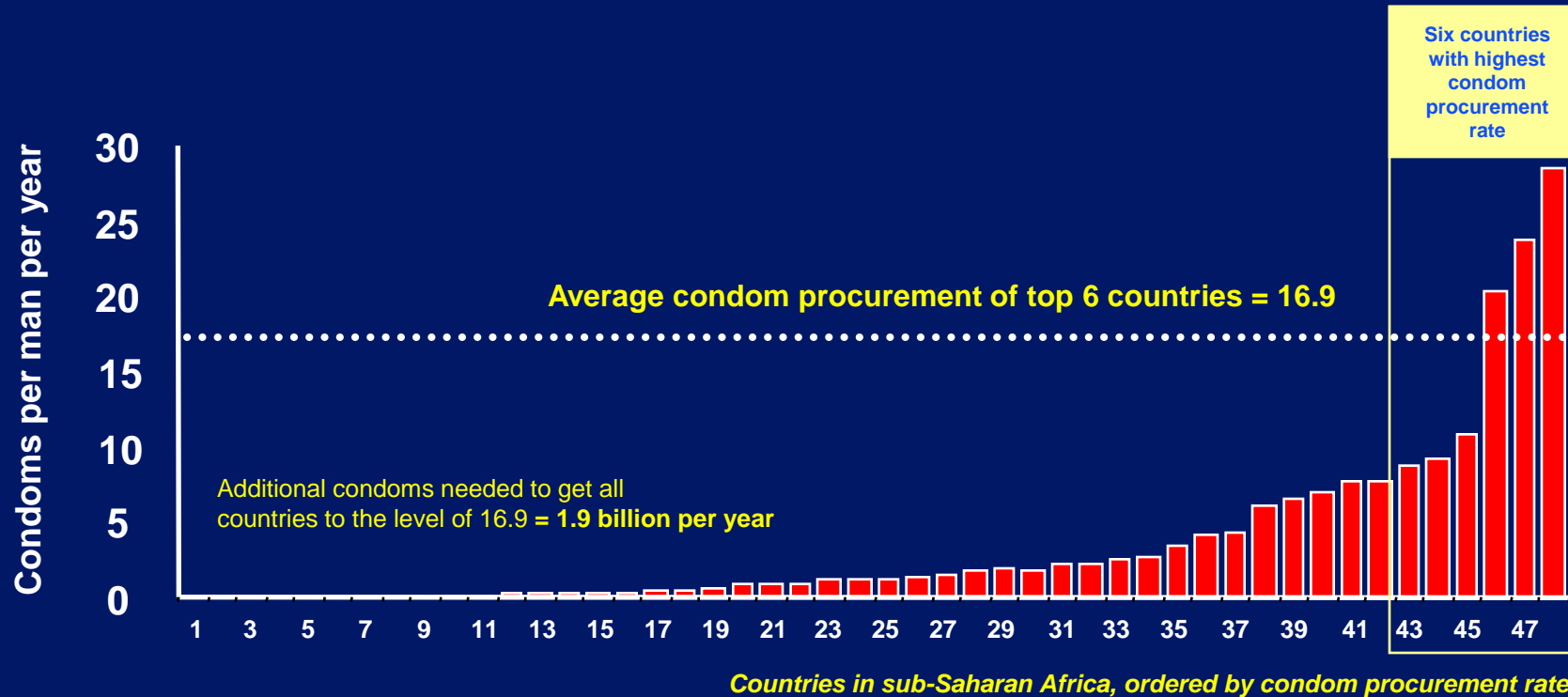


Source: Galvin, S.R. & Cohen, M.S. (2004) The role of sexually transmitted diseases in HIV infection. *Nature Reviews Microbiology*, 2(1).

Don't have sex (if you do, do it safely)

1. Education
2. Change societal norms
- 3. Enable safe behaviours**

Condom gap in sub-Saharan African countries in 1999



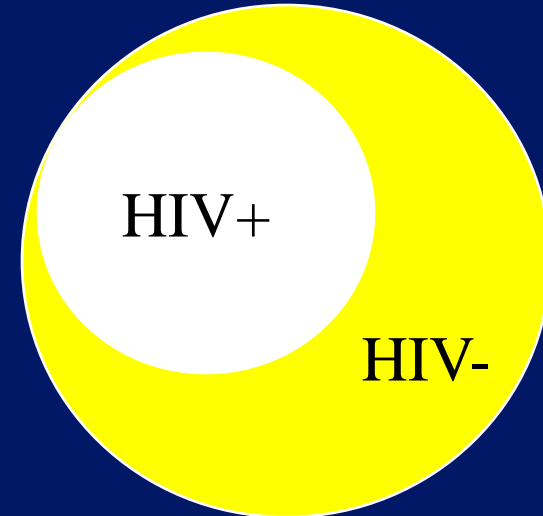
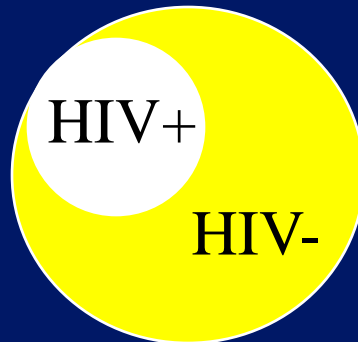
Source: Shelton JD, Johnston B (2001) Condom gap in Africa: evidence from donor agencies and key informants, *British Medical Journal*

Concept of Bridging Populations in HIV Transmission

Concentrated epidemics



Generalized epidemics



“Core” (risk) group

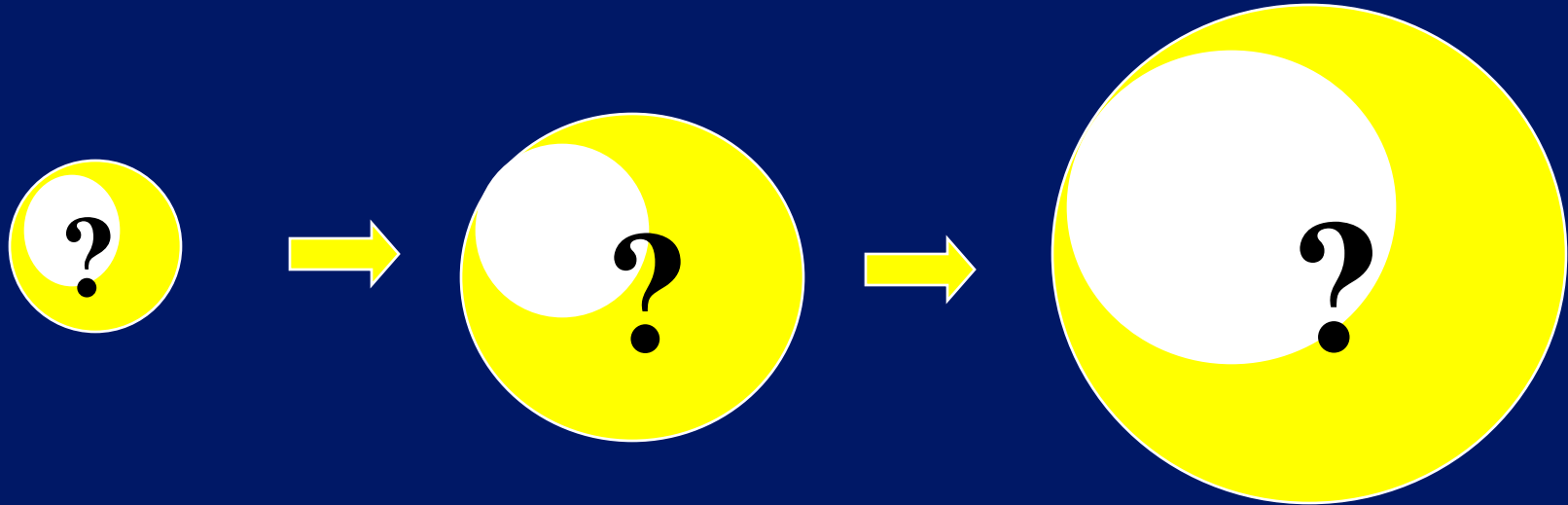
Bridging population

General population

1. Sexual norms
2. STIs

Concept of Bridging Populations in HIV Transmission

Concentrated epidemics \longrightarrow Generalized epidemics



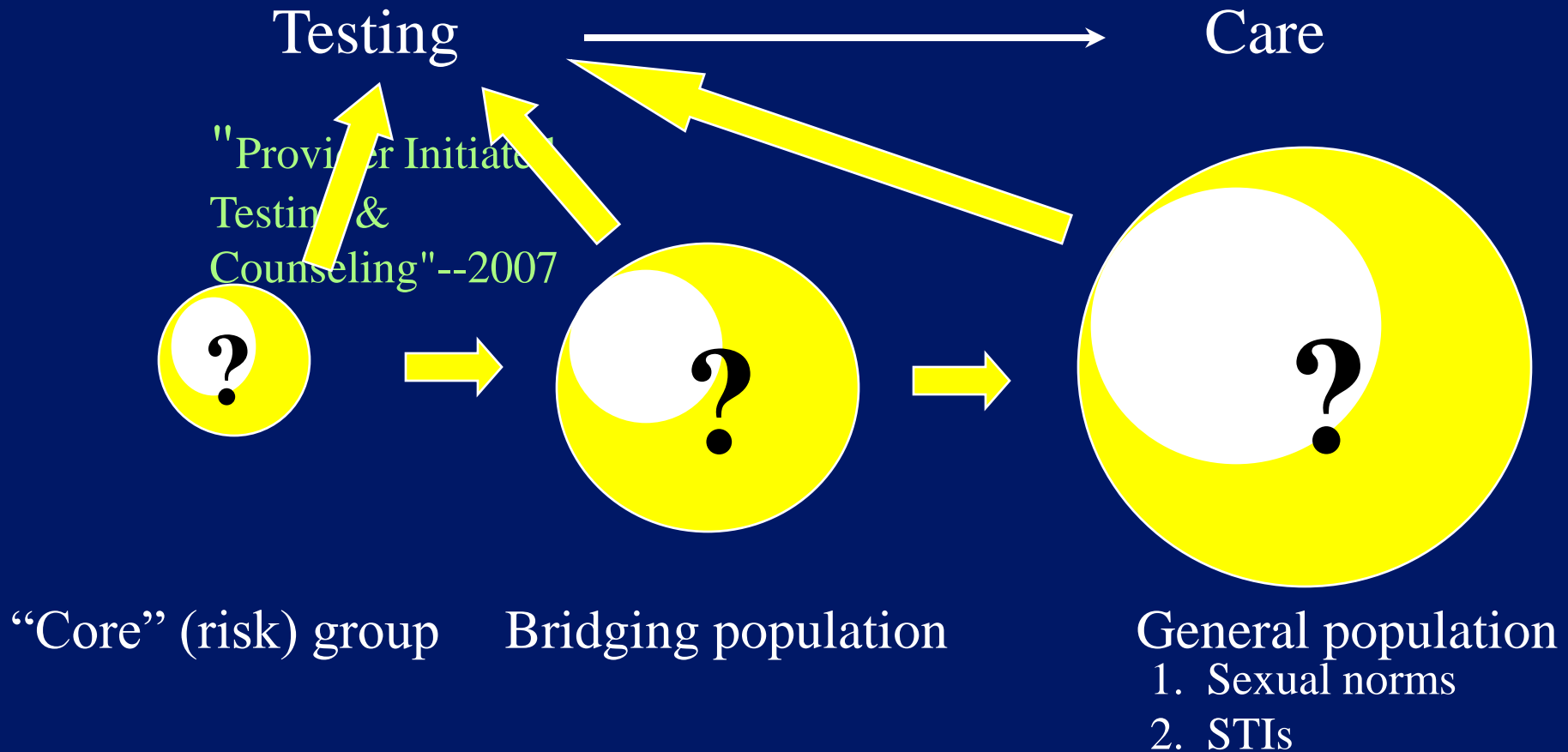
“Core” (risk) group

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Concept of Bridging Populations in HIV Transmission



“Care”

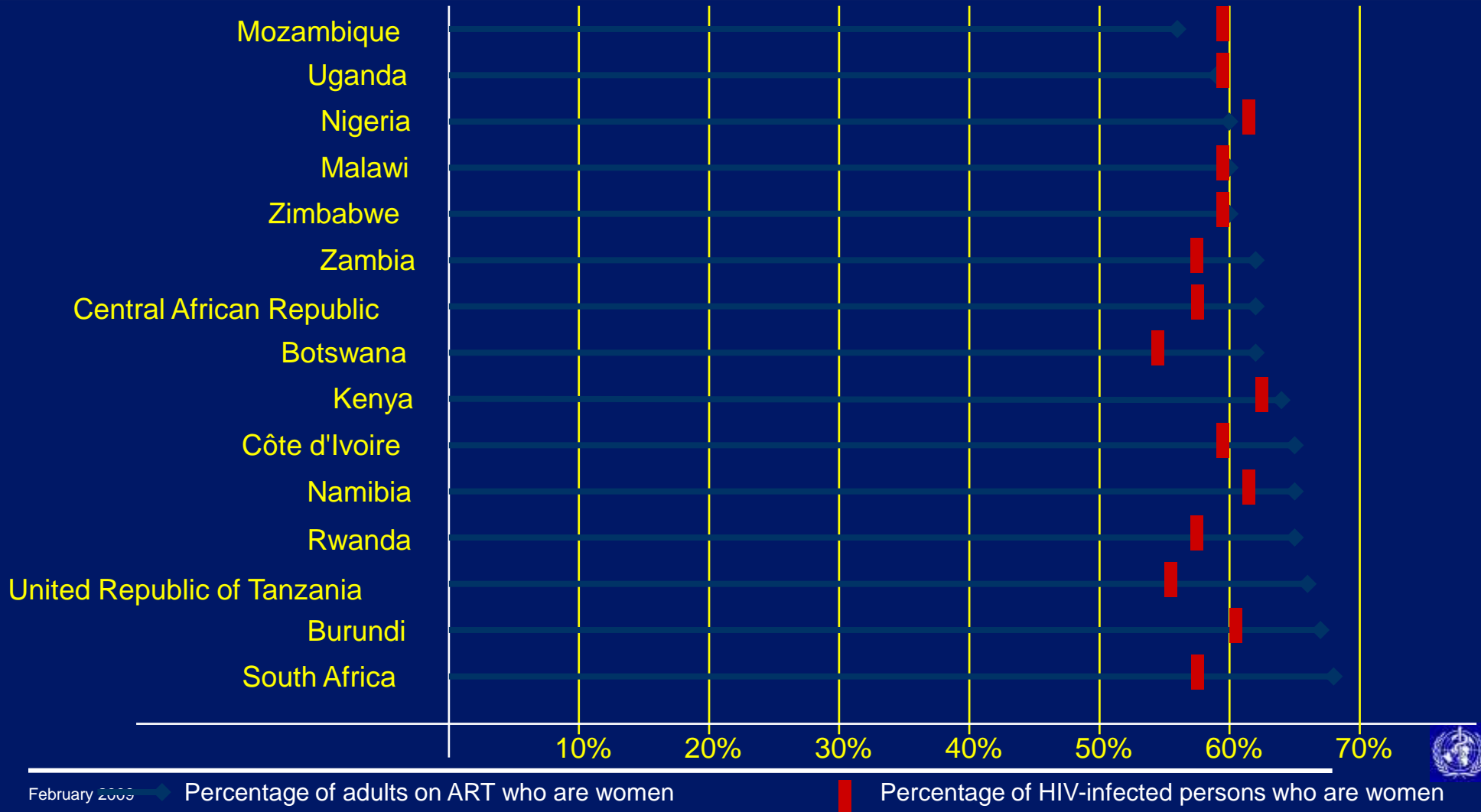
Purposes (benefits)

- Medical, psychological, social care
- Altering behaviour

Challenges

- Decreasing stigma
- “Streamlining counseling and testing”
- Financial
- Operational

Women's access to HIV treatment, June 2006



February 2006 → Percentage of adults on ART who are women

■ Percentage of HIV-infected persons who are women

Children's access to HIV treatment, June 2006

- Africa

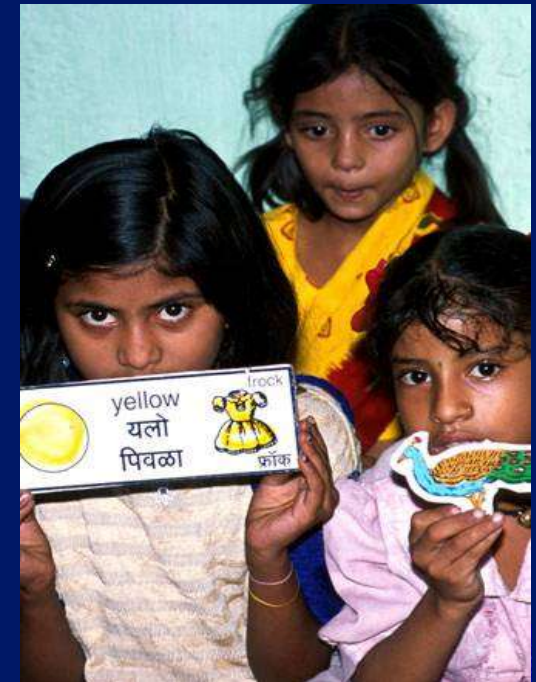
- Median: 8%

- Latin America

- Median: 8%

- Asia

- Median: 5 %



Access to PMTCT services in sub-Saharan Africa, 2005

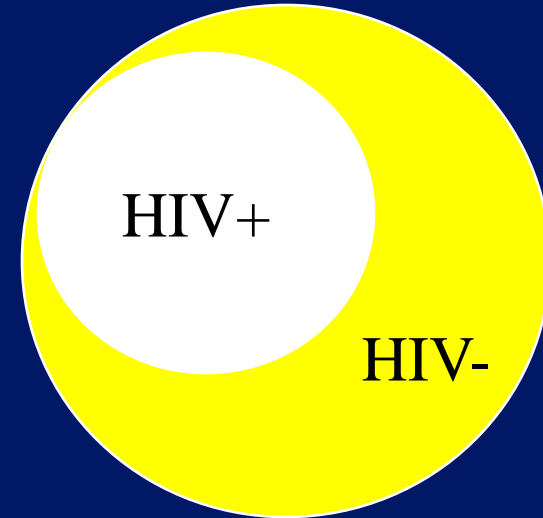
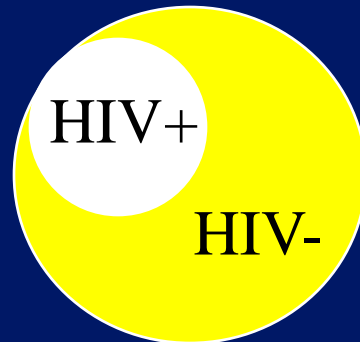


Concept of Bridging Populations in HIV Transmission

Concentrated epidemics



Generalized epidemics



“Core” (risk) group

Bridging population

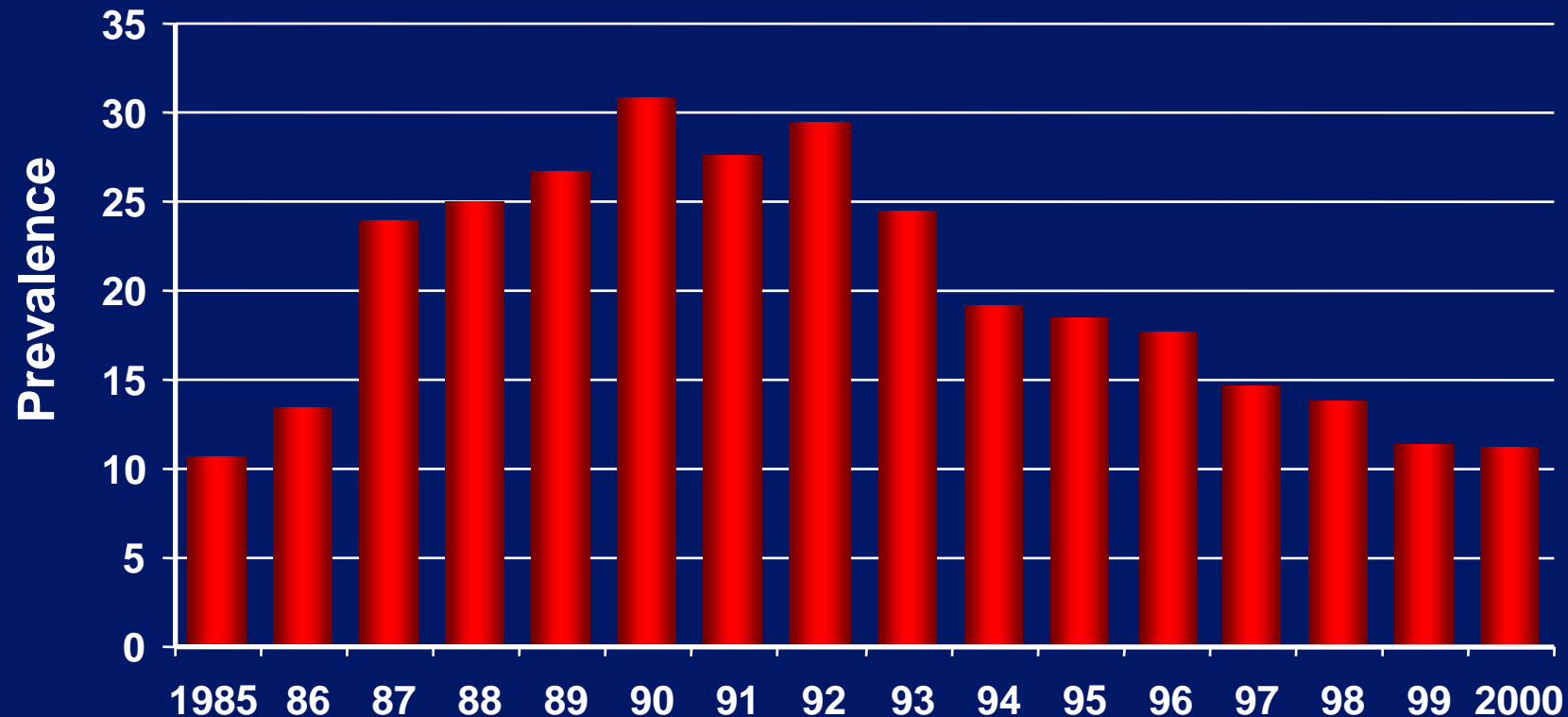
General population

1. Sexual norms
2. STIs

Success Story

(Why?)

Prevalence among pregnant women in major urban areas, Uganda

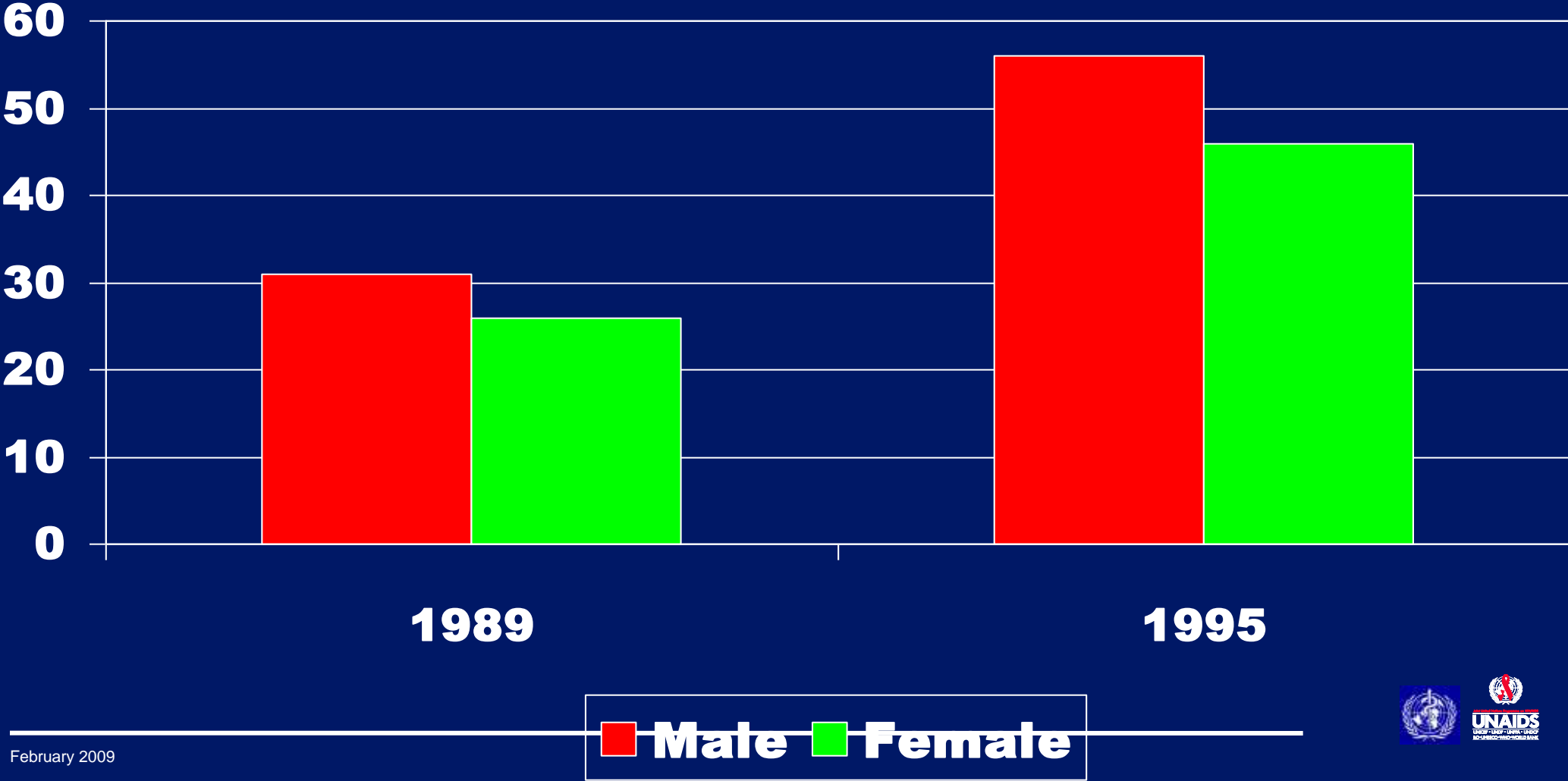


Source: Uganda National AIDS Programme

February 2009



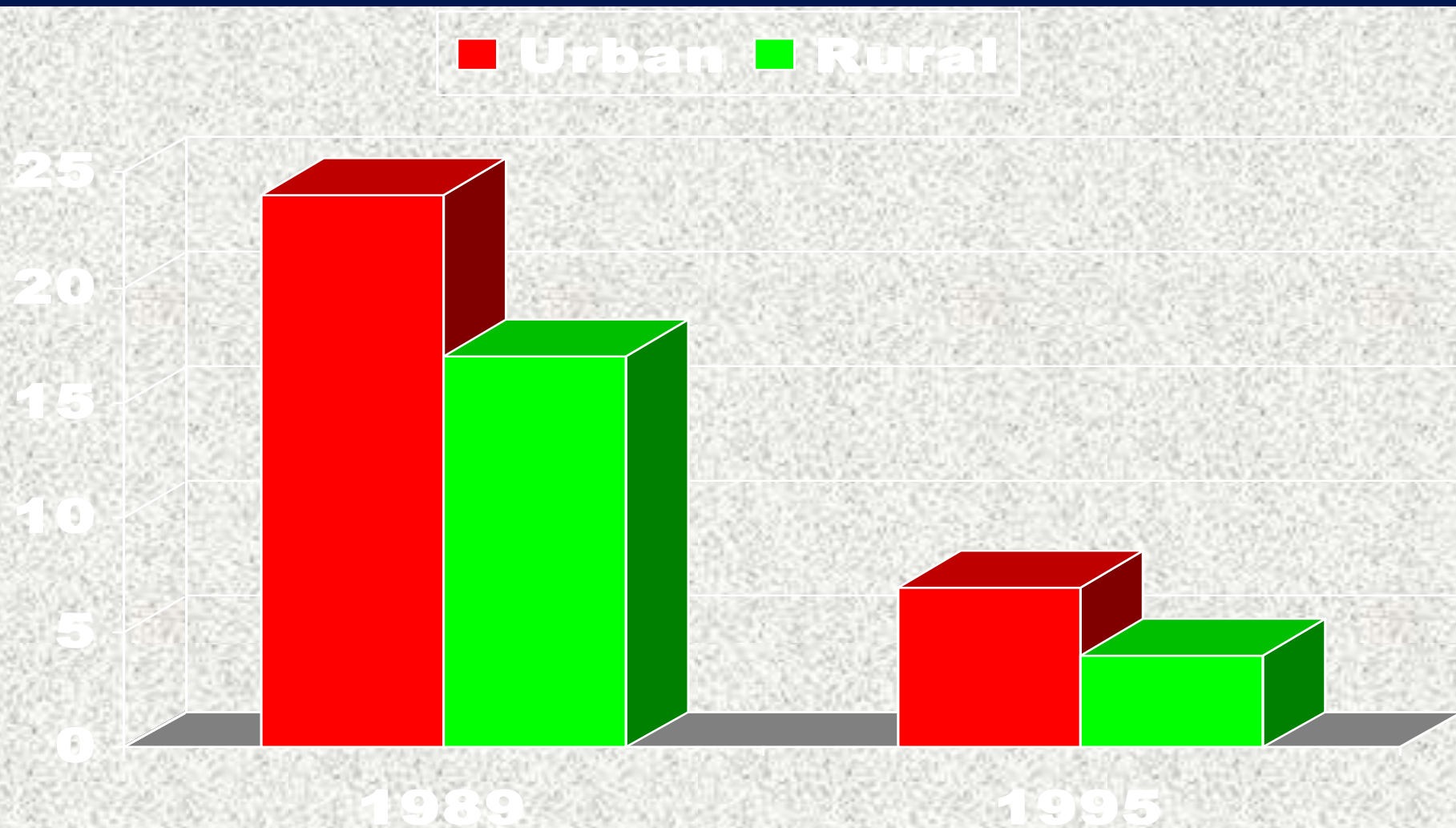
Ugandans aged 15-19 reporting virginity, 1989-1995



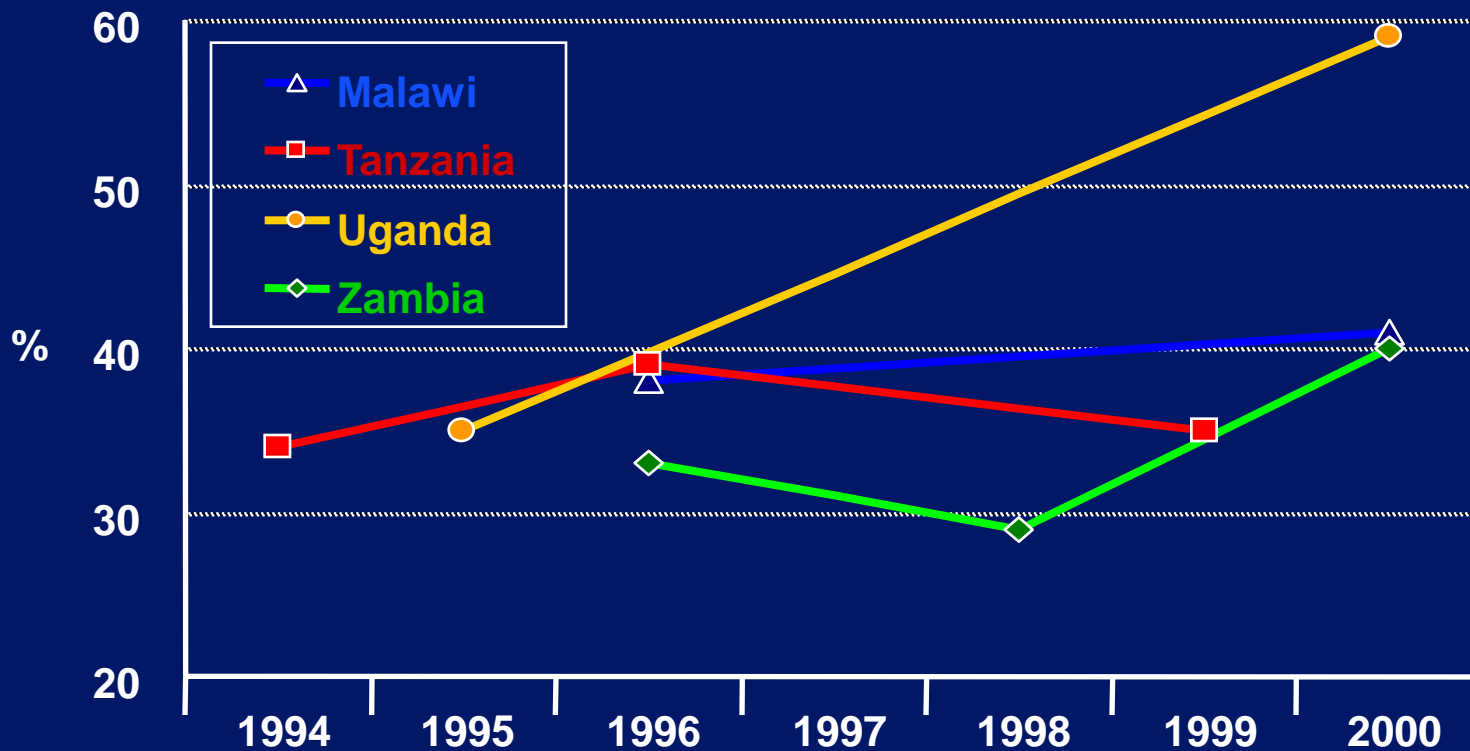
ABC trends in Uganda

- **Sexual deferral important, in itself and as determinant of subsequent sexual behavior**
- **Later sexual debut may be associated with fewer partners in adulthood**

Ugandan females reporting no casual sex in past year, 1989-1995



Condom use among men with non-regular partners over time in selected sub-Saharan African countries: 1994-2000



Source: Macro International (1994-2000) Demographic Health Surveys; Measure Evaluation

Summary

1. HIV/AIDS is a HUGE problem in the world
2. Women make up 1/2 of cases
3. Altering the course of the epidemic is theoretically simple, but operationally difficult

Thank you!