

# ***The Race for a HIV Vaccine***

Ruy Ribeiro



Unregistered HyperCam 2

Navigation icons

Santa Fe Capitol

Imagery © 2008 DigitalGlobe  
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Google

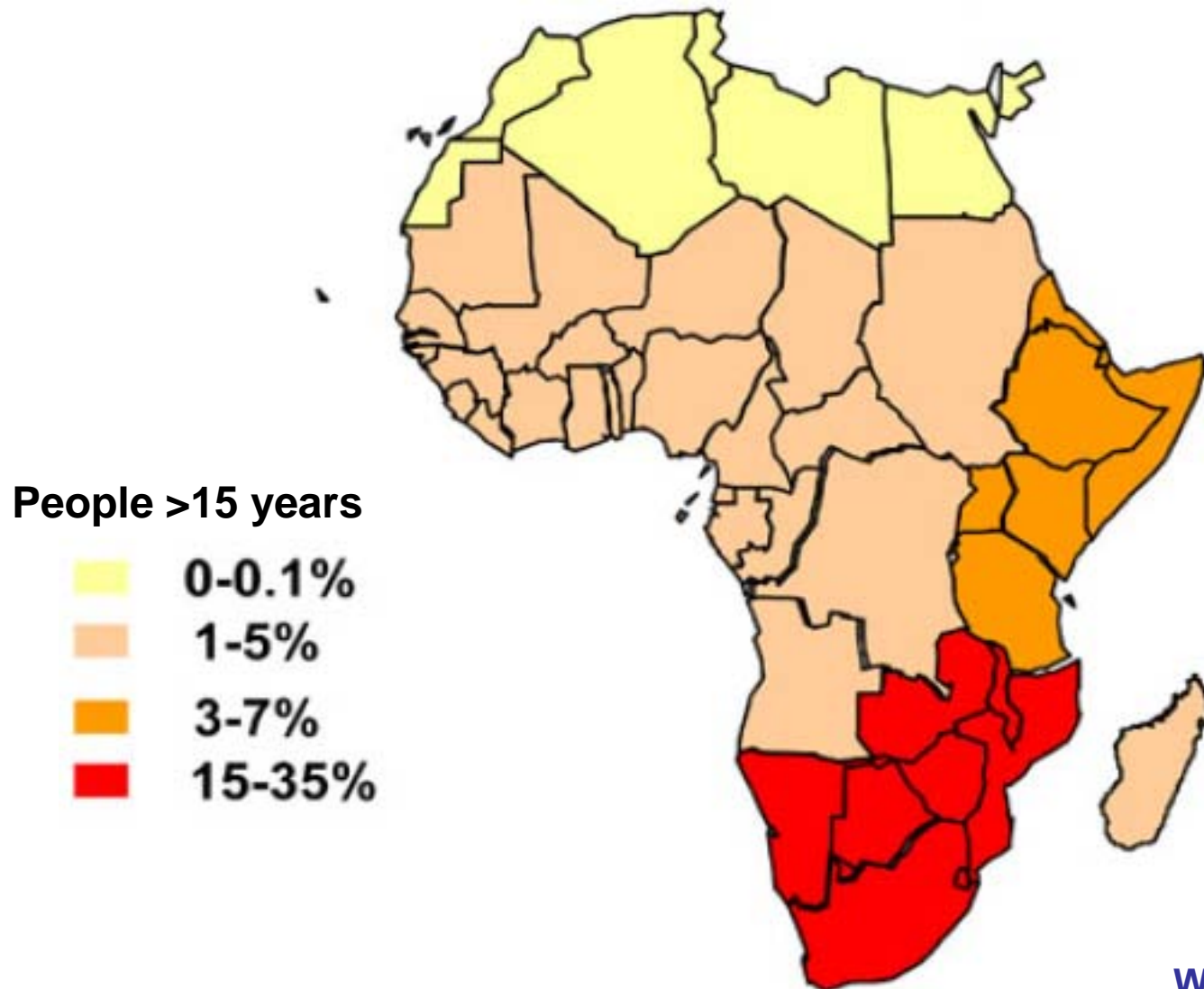
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Streaming: 1 | 100%

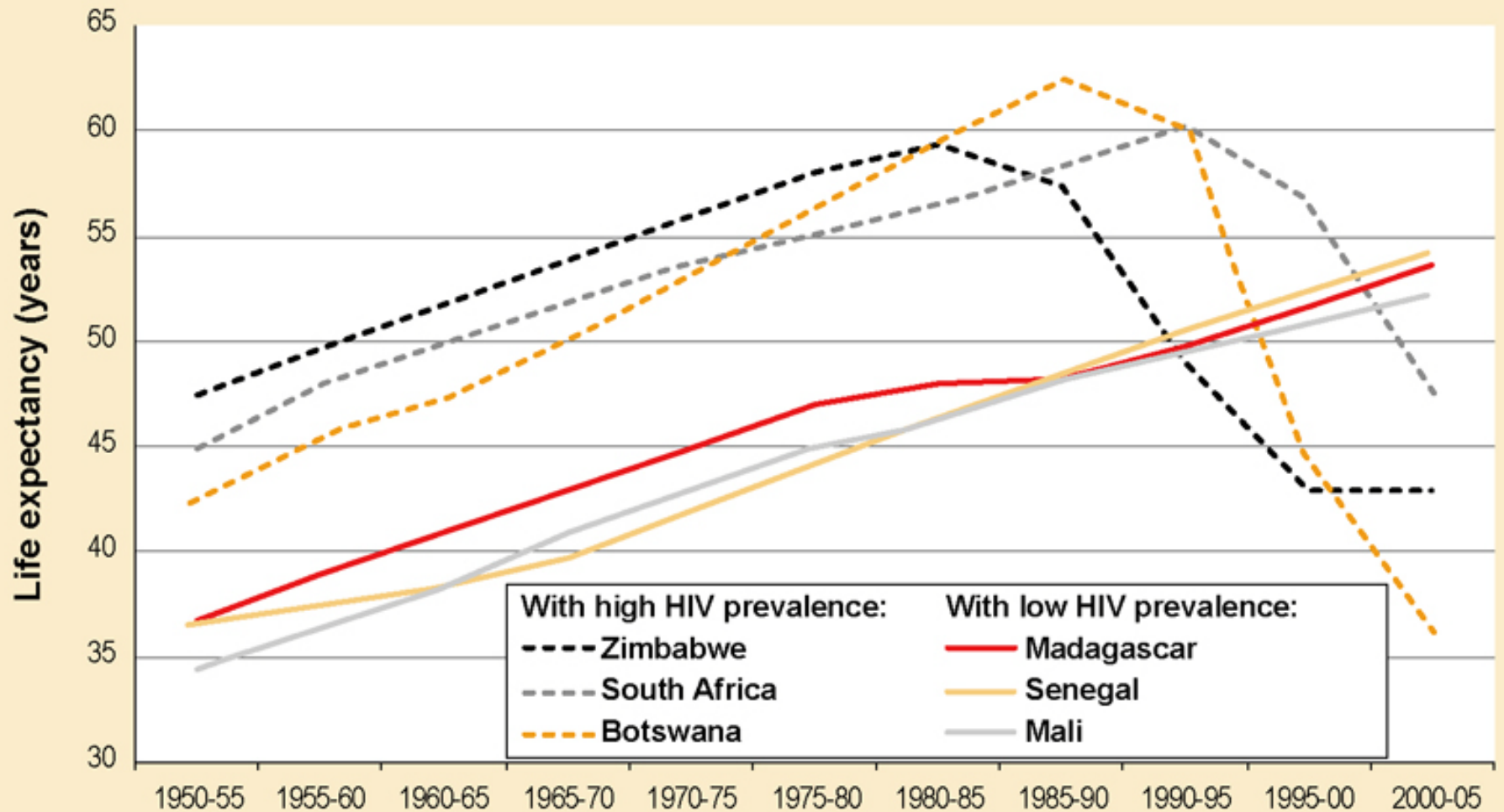
Eye Alt: 3613 ft

from-SF-to-Maputo0017.avi

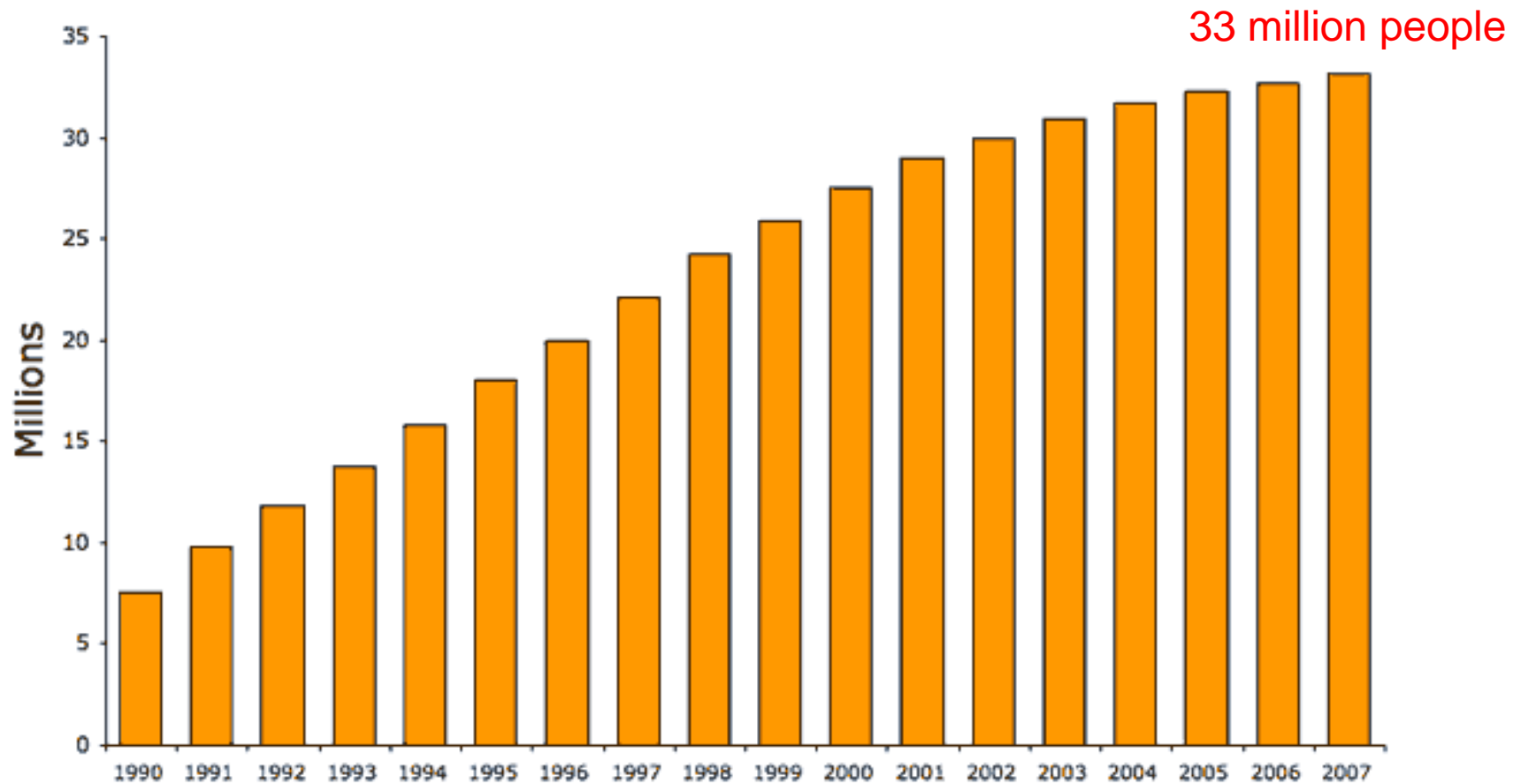
# Percentage people HIV infected



# Life expectancy in African countries

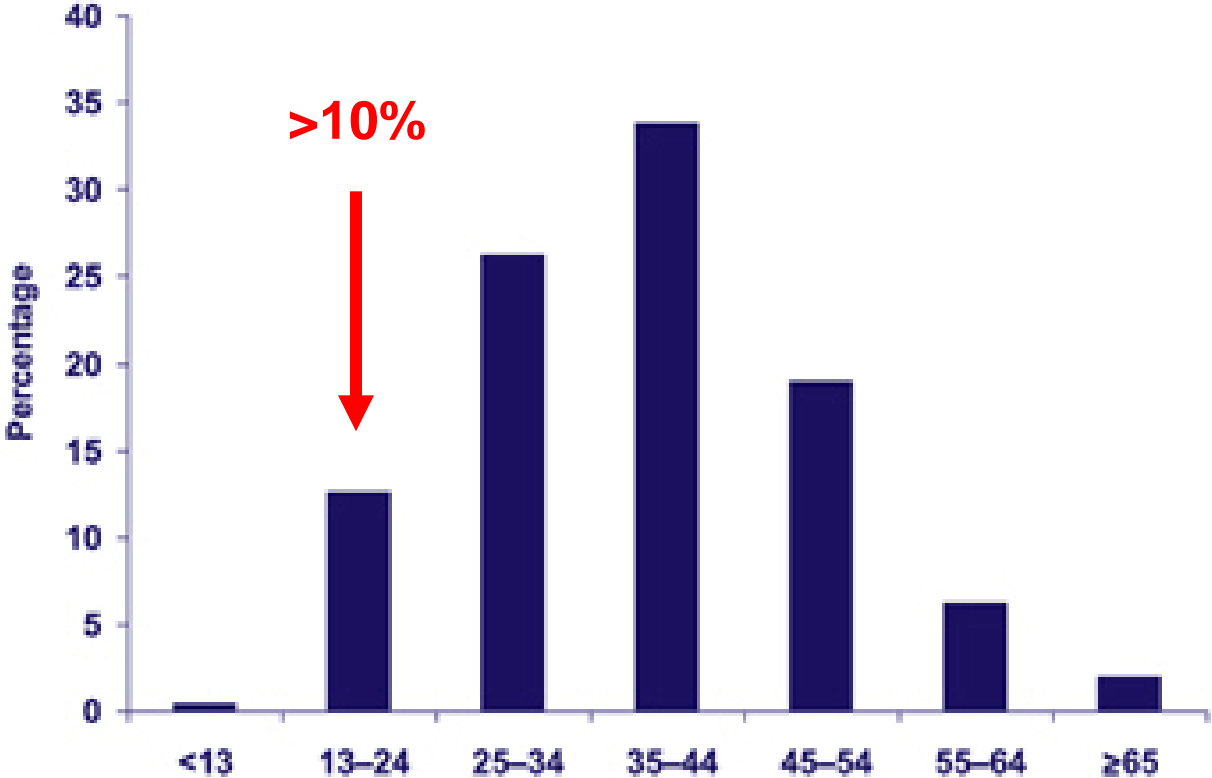


# Number of people infected





# 38730 HIV cases in the USA (2004)



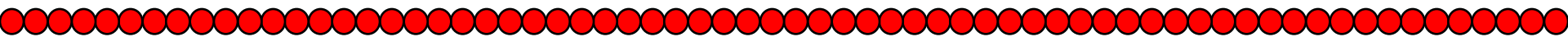
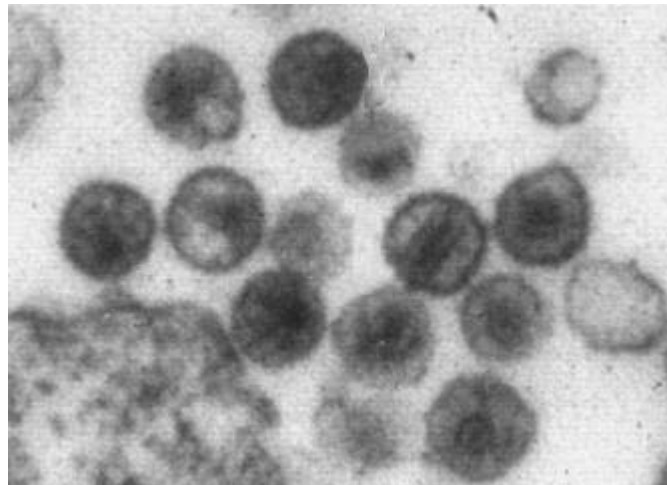
# Timeline

- 1981 First cases detected in California and New York
- 1982 “AIDS” used for 1<sup>st</sup> time
- 1984 HIV identified as cause of AIDS: virus → disease
- 1987 AZT – first drug approved
- 1991 An estimated 10 million people infected
- 1996 Combination treatment is introduced
- 2001 UN Special Session
- 2003 First vaccine trial fails / 2007 STEP trial also fails



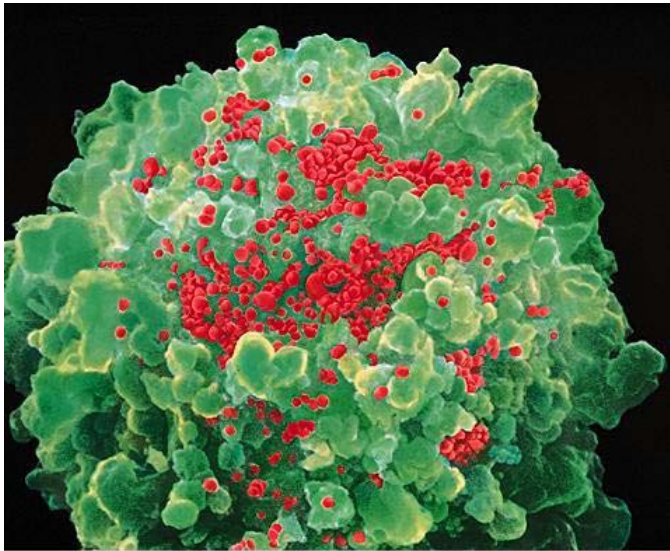
# What is a virus?

- “submicroscopic infective agents... that are capable of growth and multiplication only in living cells, and that cause various important diseases in humans, animals and plants” – *Merriam Webster’s*



# What is HIV infection?

## The cells



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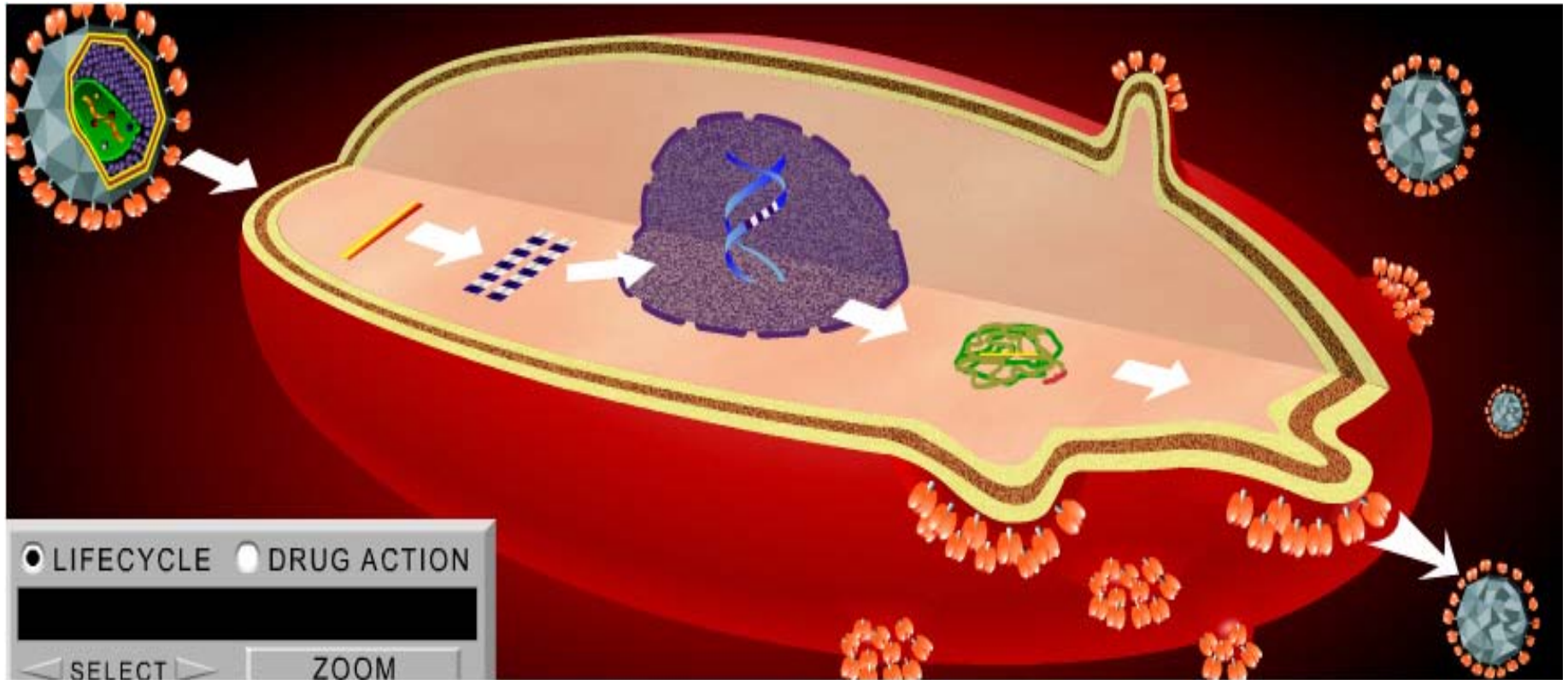
<http://www.medscape.com>

**HIV infects cells of the immune system**

**CD4+ T-cells or T-helper cells**

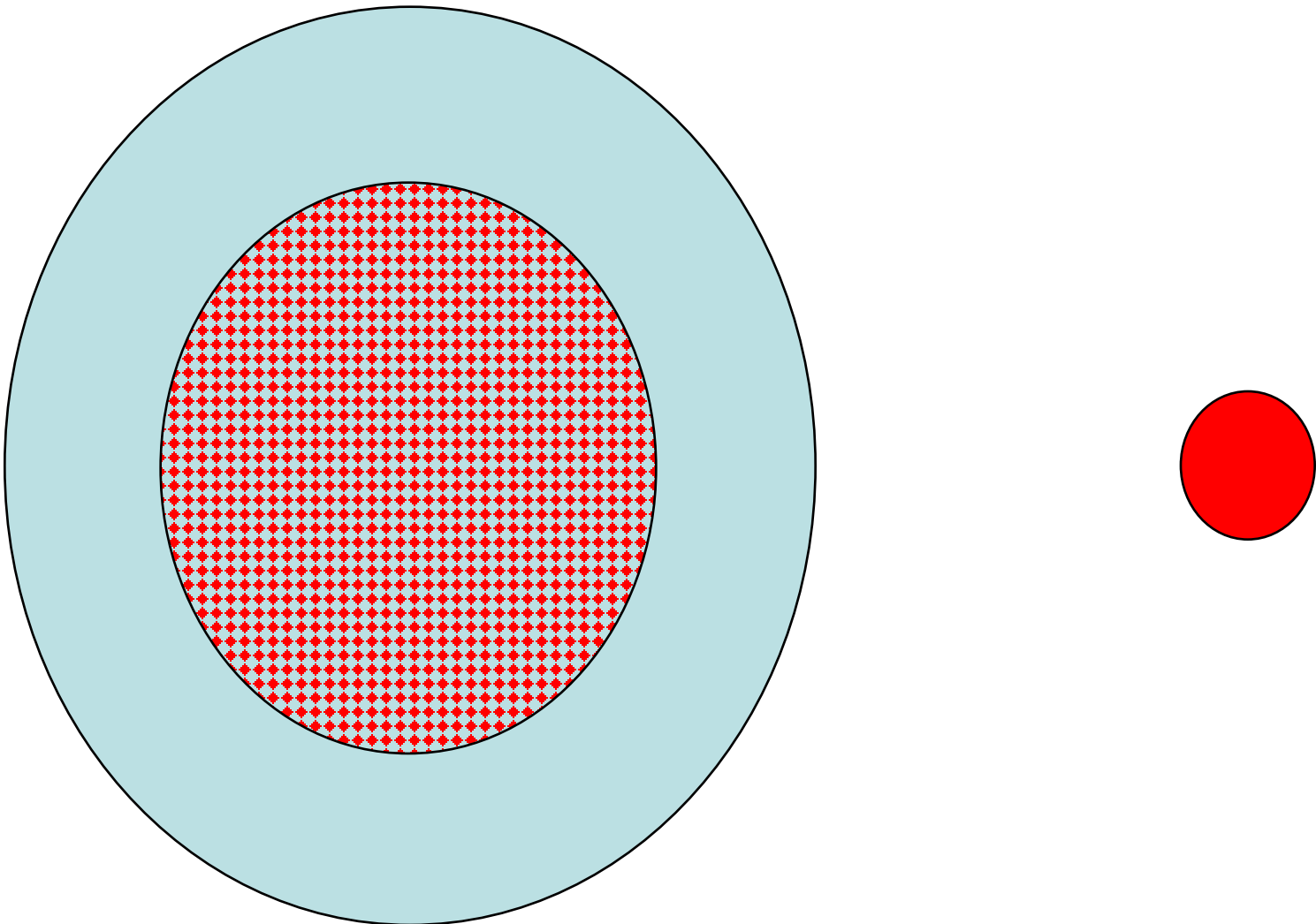
**The “Generals” of the immune system**

# HIV infecting a cell





# Vaccine: preparing the immune system



**Virus growth/spread**  
**Immune response**

# Challenges in Developing a HIV Vaccine

- **HIV is very variable**
- **How to measure immunity is unknown**
- **HIV infects and kills “commanding” cells**
- **Lack of appropriate animal models**
- **Natural immune responses “do not work”**
- **Clinical trials are long and costly**

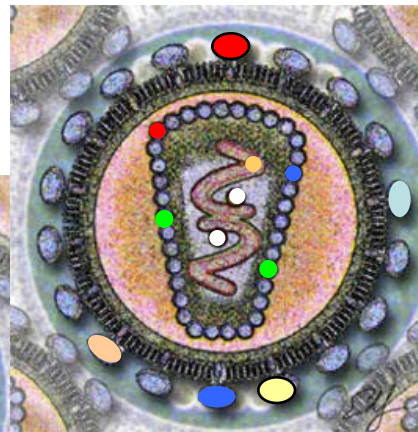
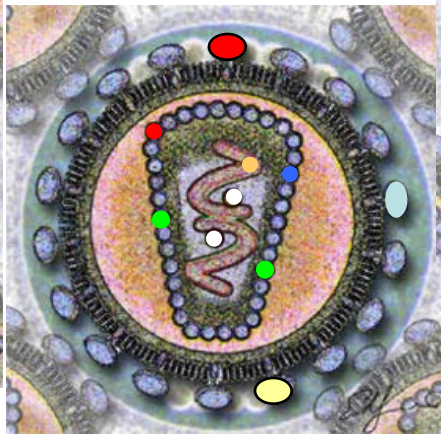
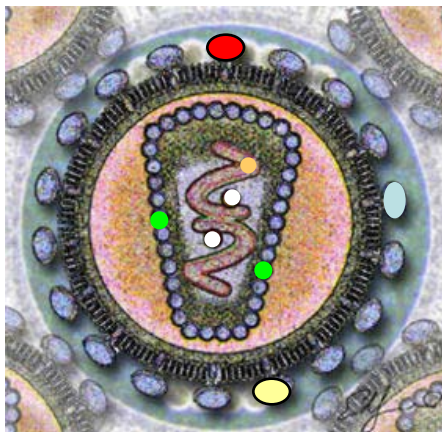
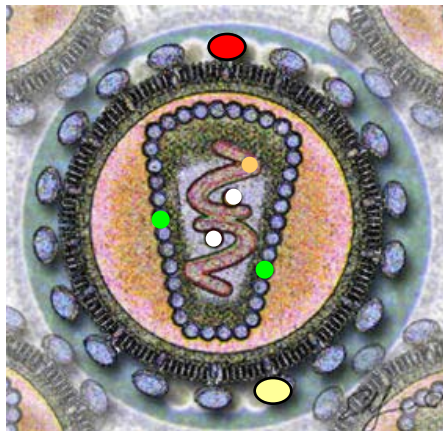
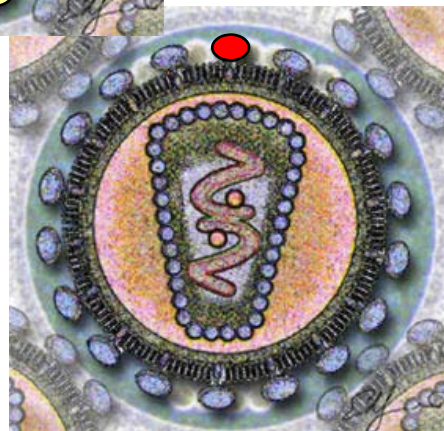
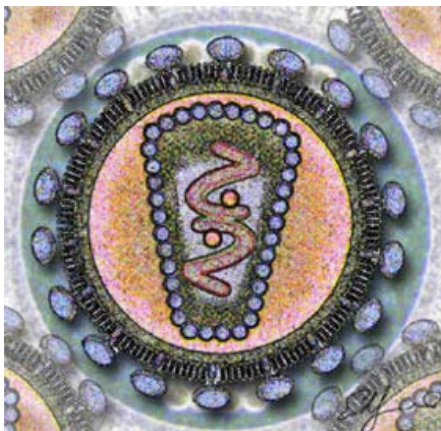
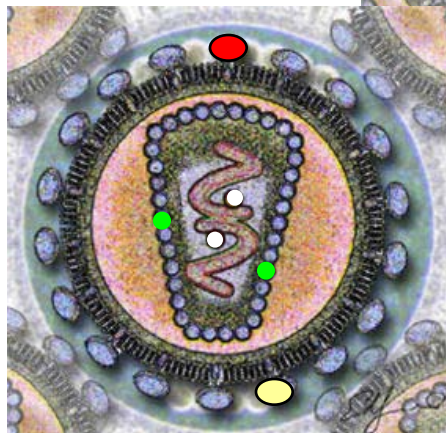
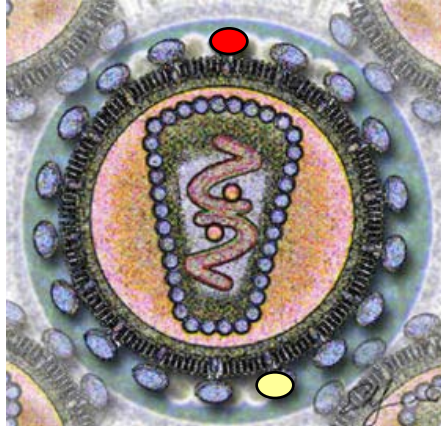
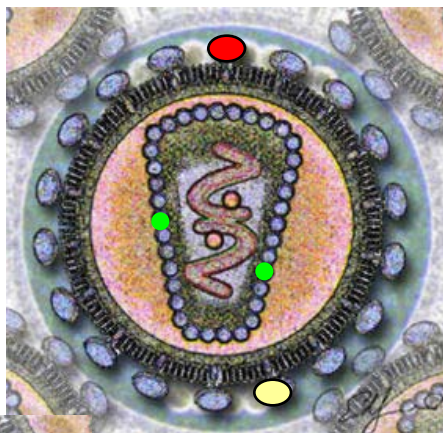
# Preventive AIDS vaccines in human clinical trials

The world urgently needs a vaccine that prevents HIV infection and AIDS.

Today, a record number of countries are conducting human trials of preventive AIDS vaccine candidates.









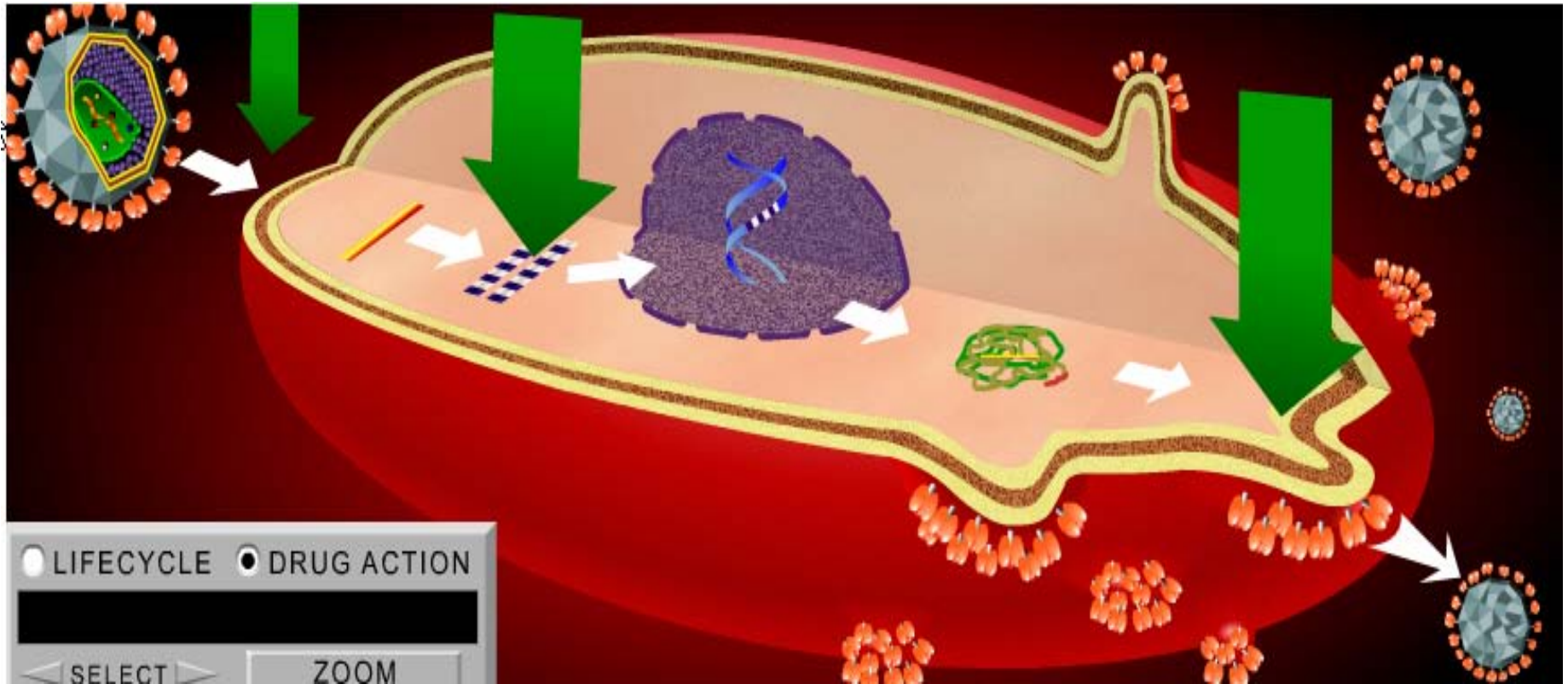
# Pediatric Vaccine Development

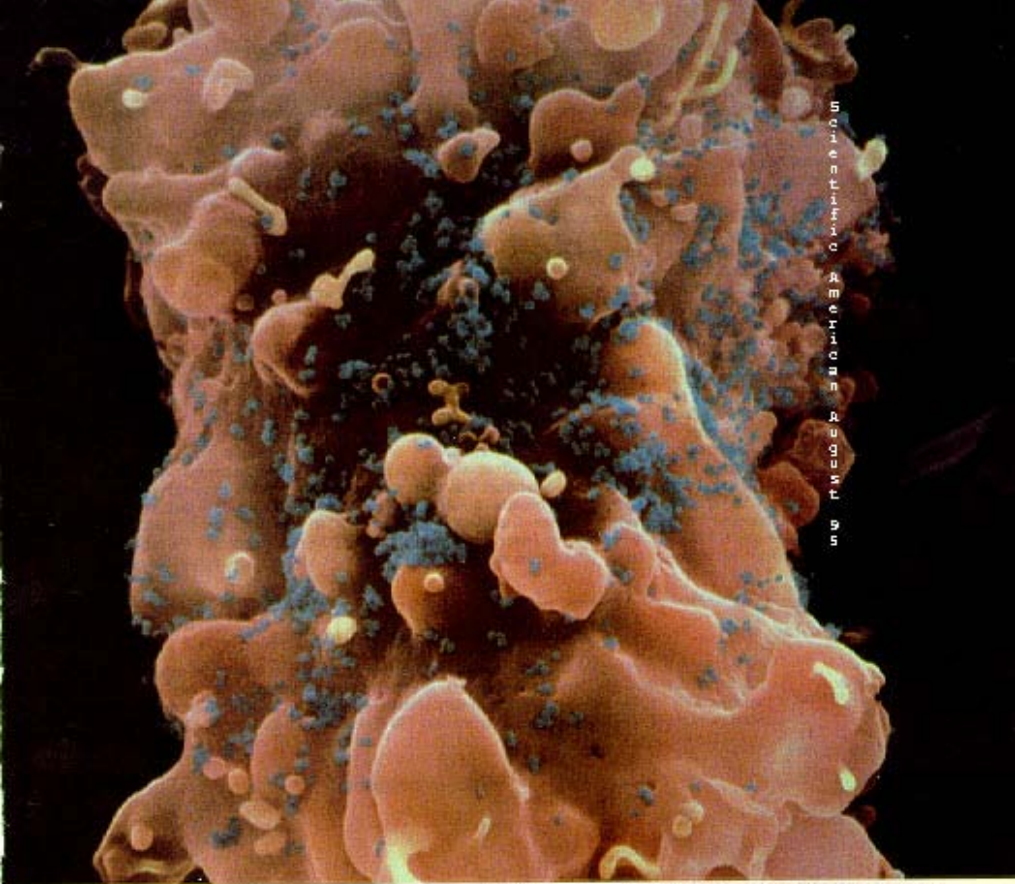


<b>Disease</b>	<b>Discovery of Cause</b>	<b>Vaccine Developed</b>	<b>Vaccine Type</b>	<b>Years to Develop</b>
Smallpox	N.A.	1796	Live attenuated	N.A.
Measles	1953	1963	Live attenuated	10
Polio	1908	1955, 1961	Live attenuated, Inactivated	47
Mumps	1934	1948, 1967	Inactivated, Live attenuated	14
Rubella	1938	1969	Live attenuated	31
Varicella	1954	1988	Live attenuated	34
Hepatitis B	1965	1981	Protein sub-unit	16
Hepatitis A	1973	1995	Inactivated	22
HIV	1983	??	??	20+++



# Drug treatment steps





SCANNING ELECTRON MICROGRAPH

PARTICLES OF HIV (*blue spheres*), the virus that causes AIDS, bud from an infected white blood cell before moving on to infect other cells. The immune system controls such spread at first but is eventually outmaneuvered by the virus.



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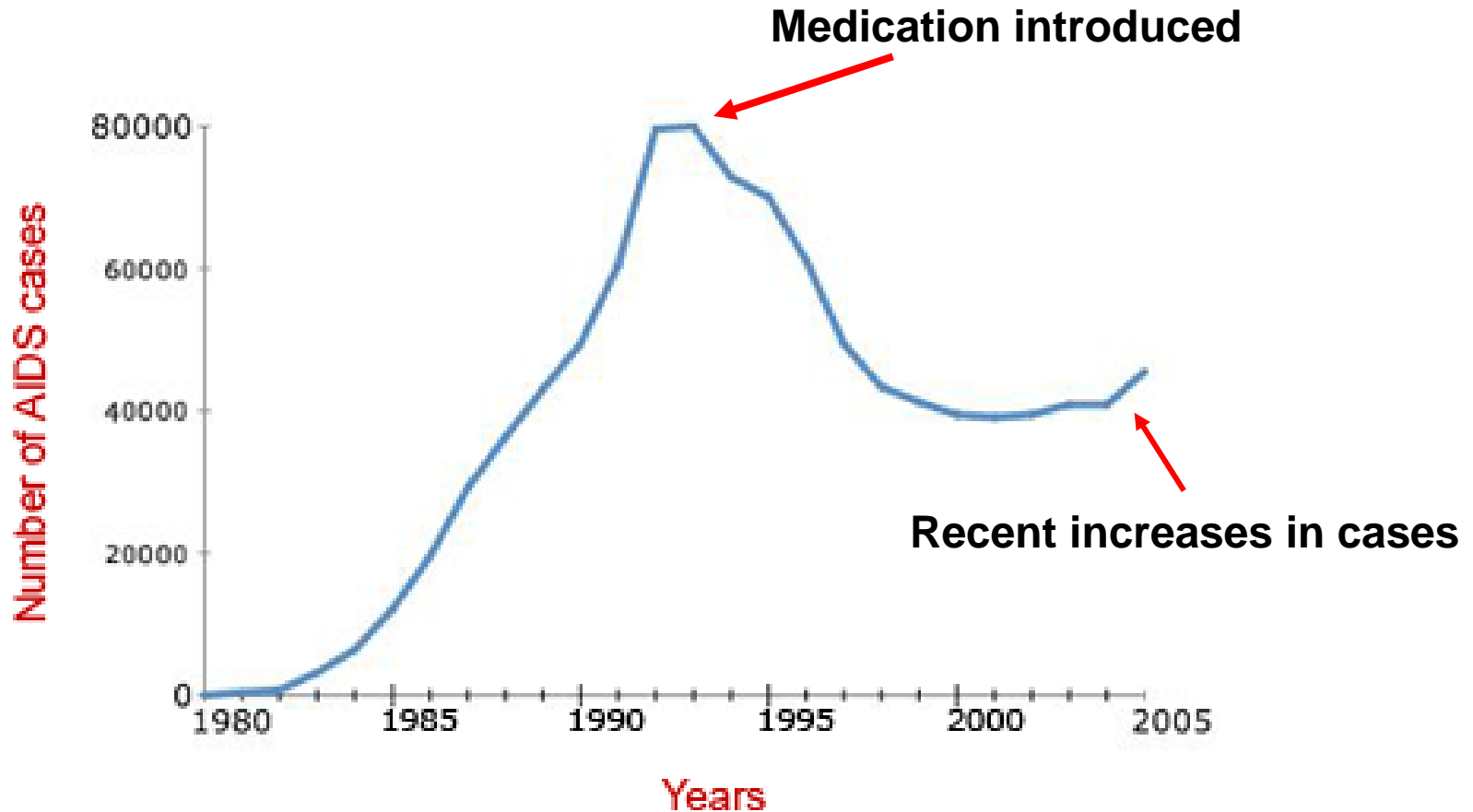
<http://www.medscape.com>

# The Epidemic in the USA

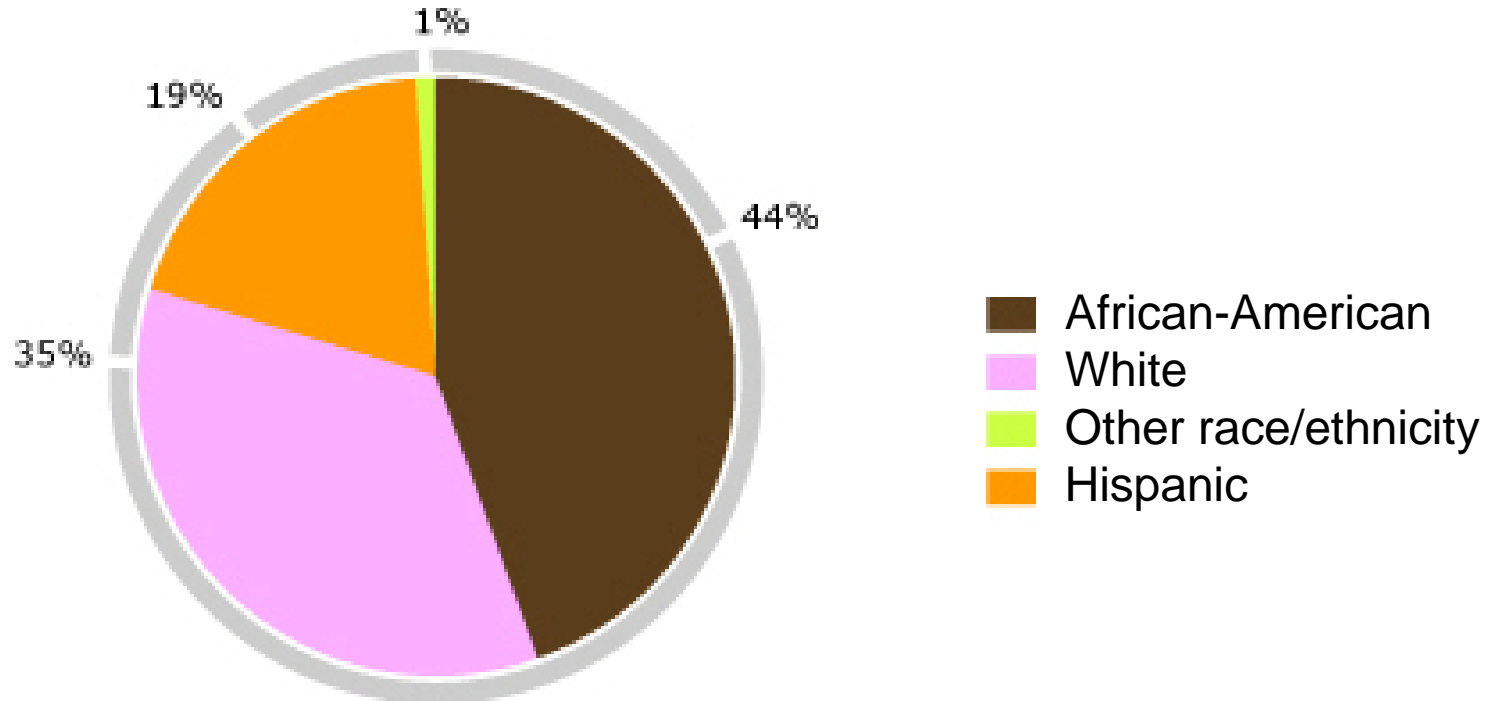
**Estimated numbers of AIDS diagnoses, deaths, and persons living with AIDS, 2001–2005**

	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>Cumulative (1981-2005)</b>
AIDS diagnoses	38,079	38,408	39,666	39,524	40,608	952,629
Deaths of persons with AIDS	16,980	16,641	17,404	17,453	16,316	530,756
Persons living with AIDS	331,482	353,249	375,511	397,582	421,873	NA

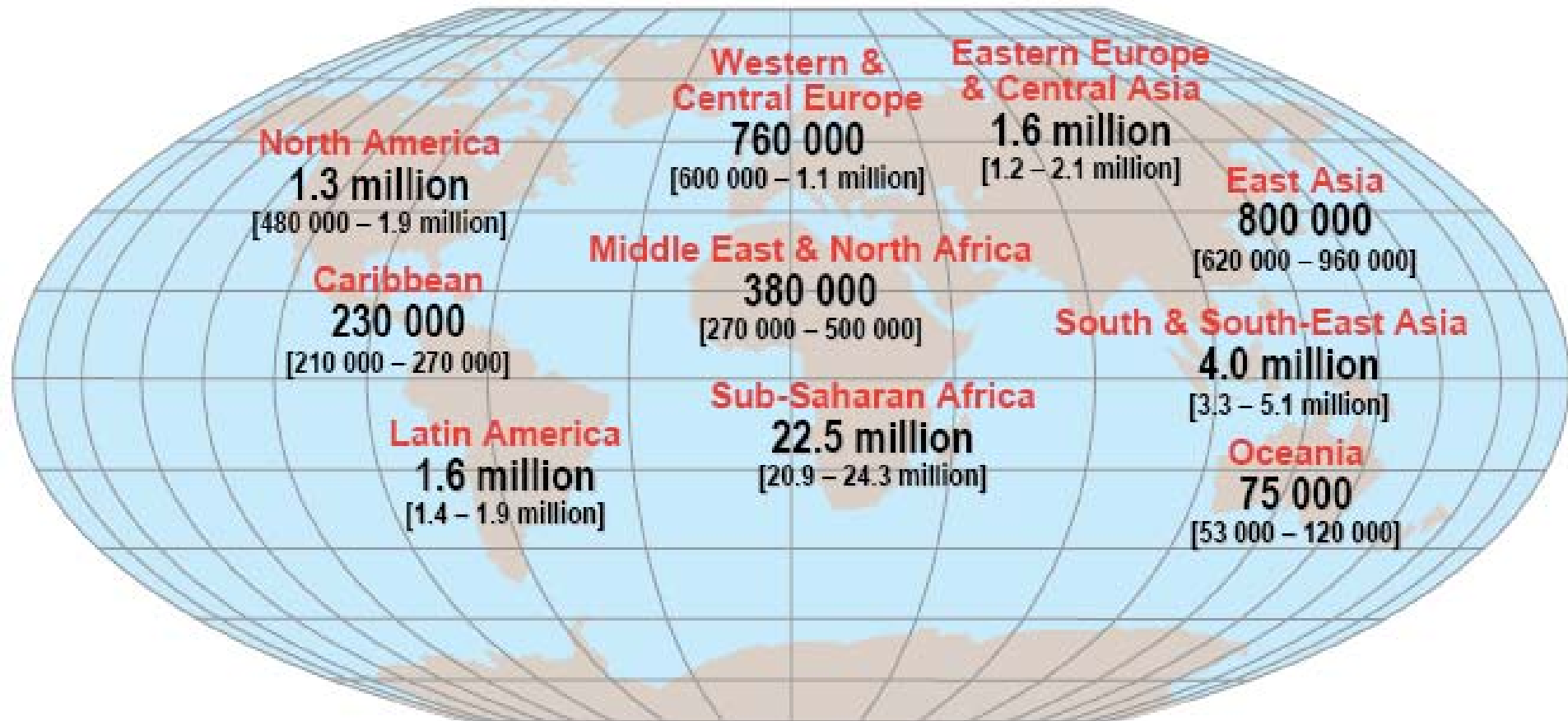
# Number of AIDS cases



# Ethnicity of HIV cases in the USA



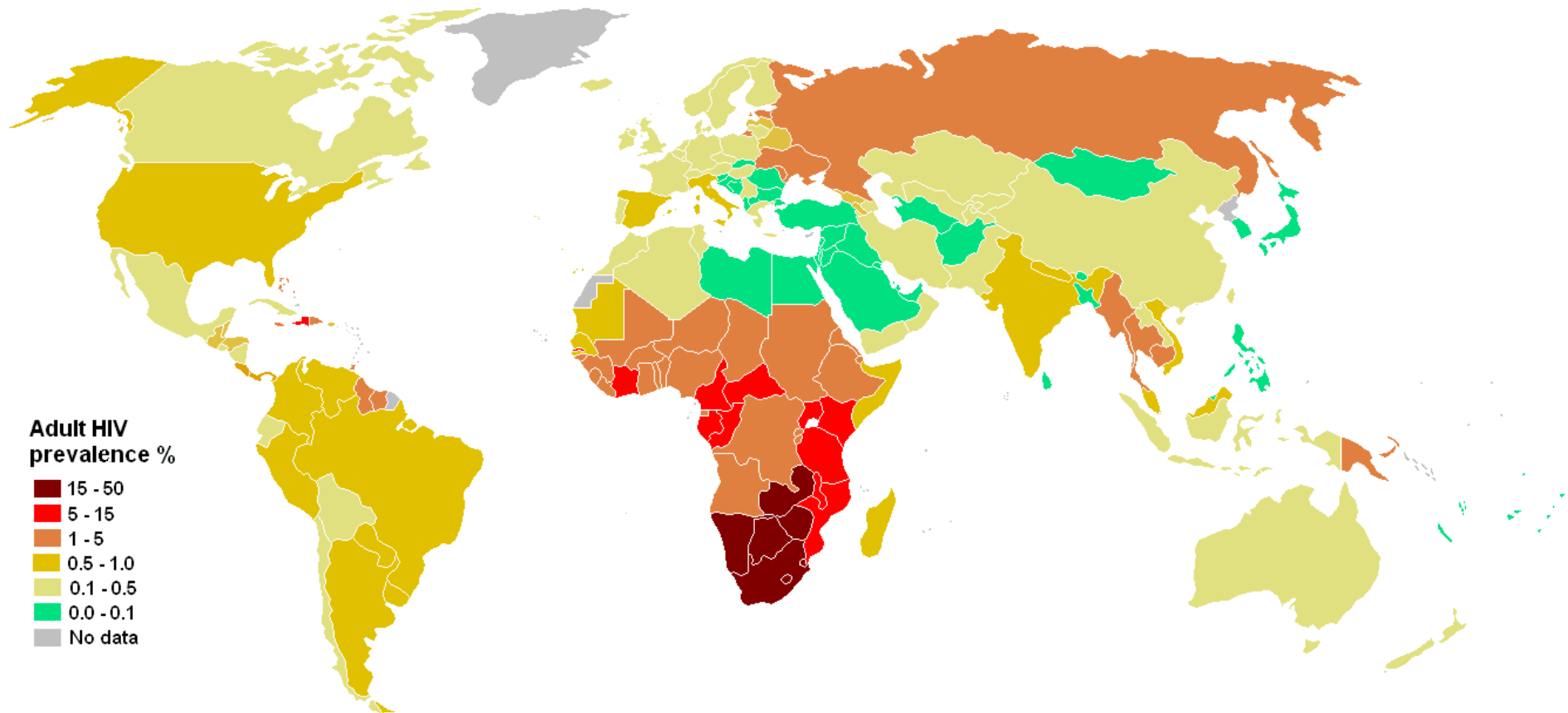
# Number of people infected



**Total: 33.2 (30.6 – 36.1) million**

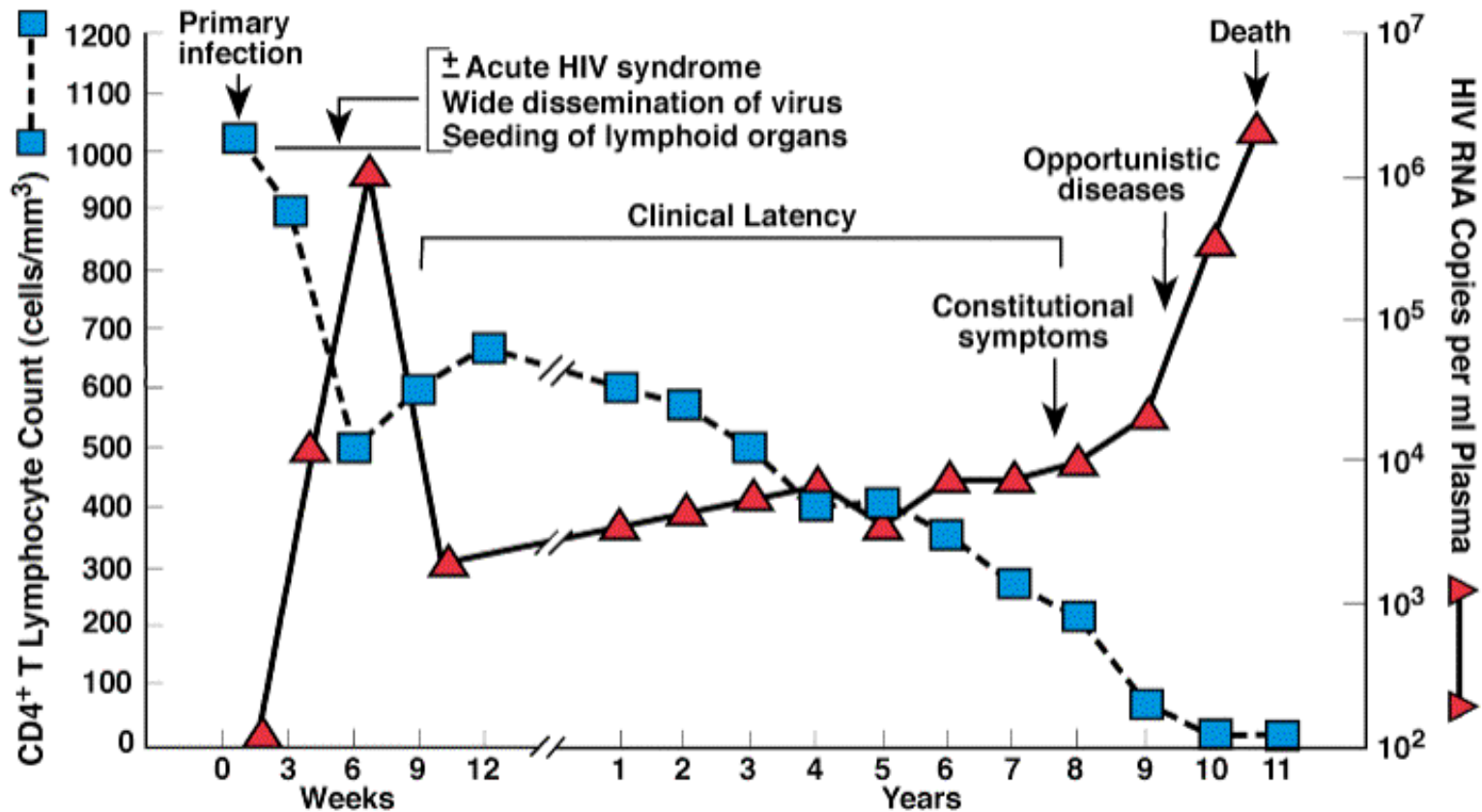


# Prevalence of HIV in the world

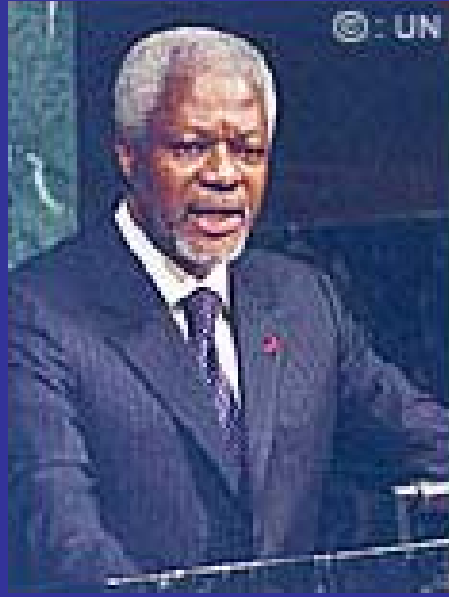


# Clinical course of HIV

## Typical Course of HIV Infection



Modified From: Fauci, A.S., et al, *Ann. Intern. Med.*, 124:654, 1996

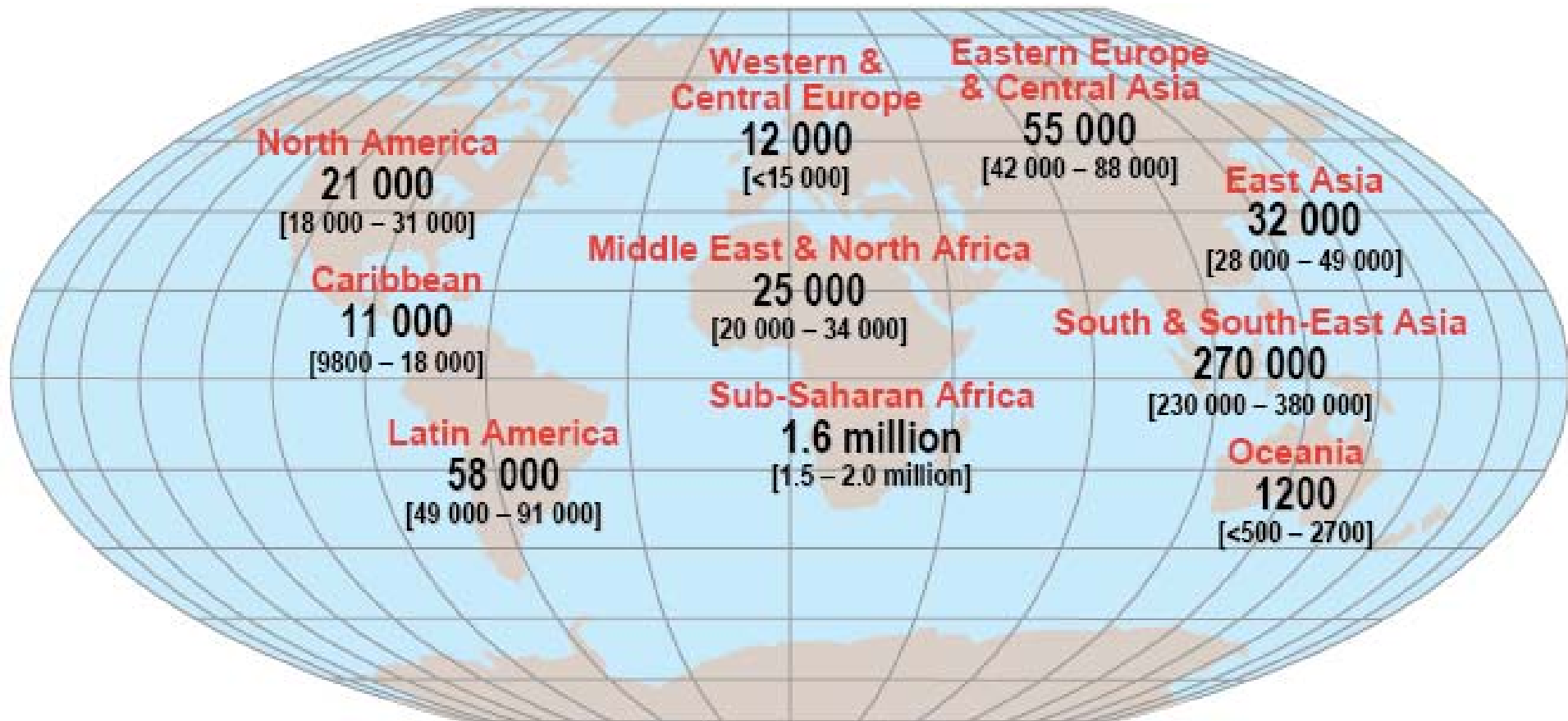


- *"In this effort, there is no us and them, no developed and developing countries, no rich and poor - only a common enemy that knows no frontiers and threatens all people."*

*Kofi Annan*

*UN Secretary General*

# Number of deaths



**Total: 2.1 (1.9 – 2.4) million**

# Orphans

