



ECDC programme on HIV, STI and hepatitis B and C

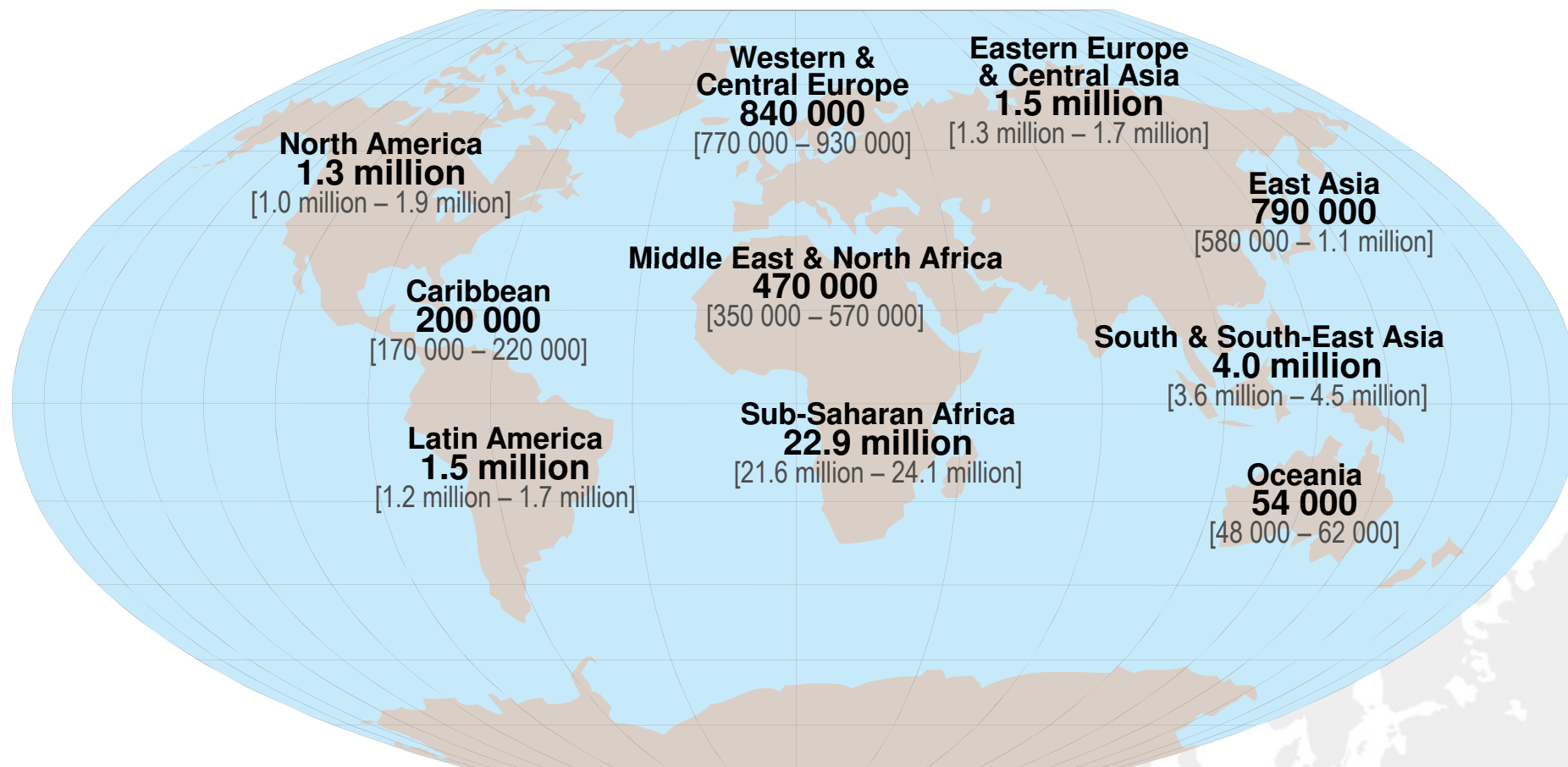
Estimating HIV prevalence in European countries

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Stichting HIV Monitoring on behalf of the HIV modelling project team

Copenhagen, 19 March 2012

HIV in 2010



34 million living with HIV
2.7 million new infections

Source: UNAIDS

HIV in Europe

- Ca. 1 million people living with HIV/AIDS in Europe.
- Infection with HIV does not always produce symptoms that lead to diagnosis around the time of infection.
- Many people with HIV are not aware of their infection.
- Accurate estimates of the number of people with HIV for all countries in the region are necessary for a full response to the HIV epidemic.

Estimating number of HIV infections

Three approaches:

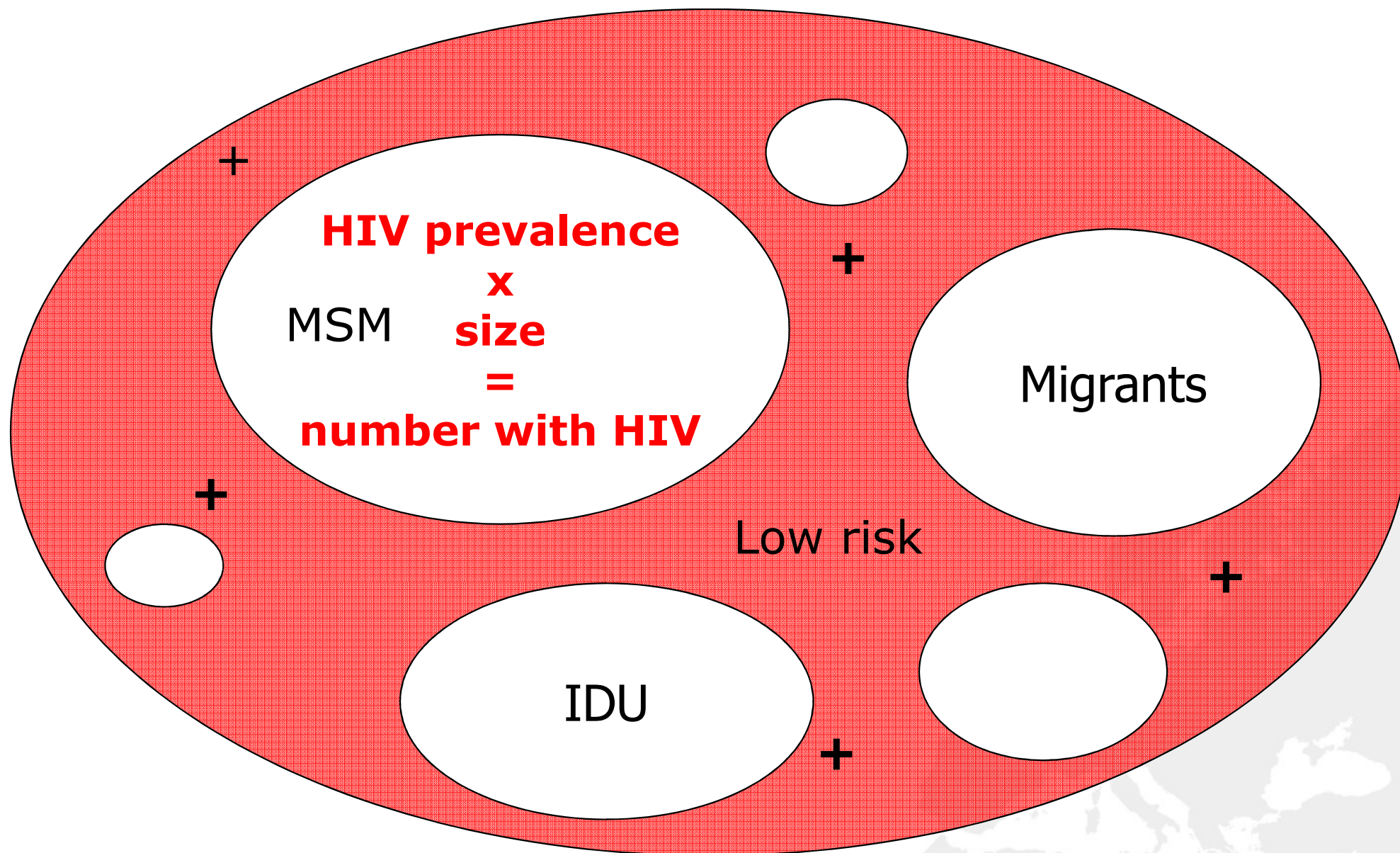
- based on prevalence surveys
- based on reconstructing HIV incidence curves
- based on relationship between CD4 count and AIDS

Estimating number of HIV infections

Three approaches:

- based on prevalence surveys
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Prevalence and risk group size



Limitations and issues

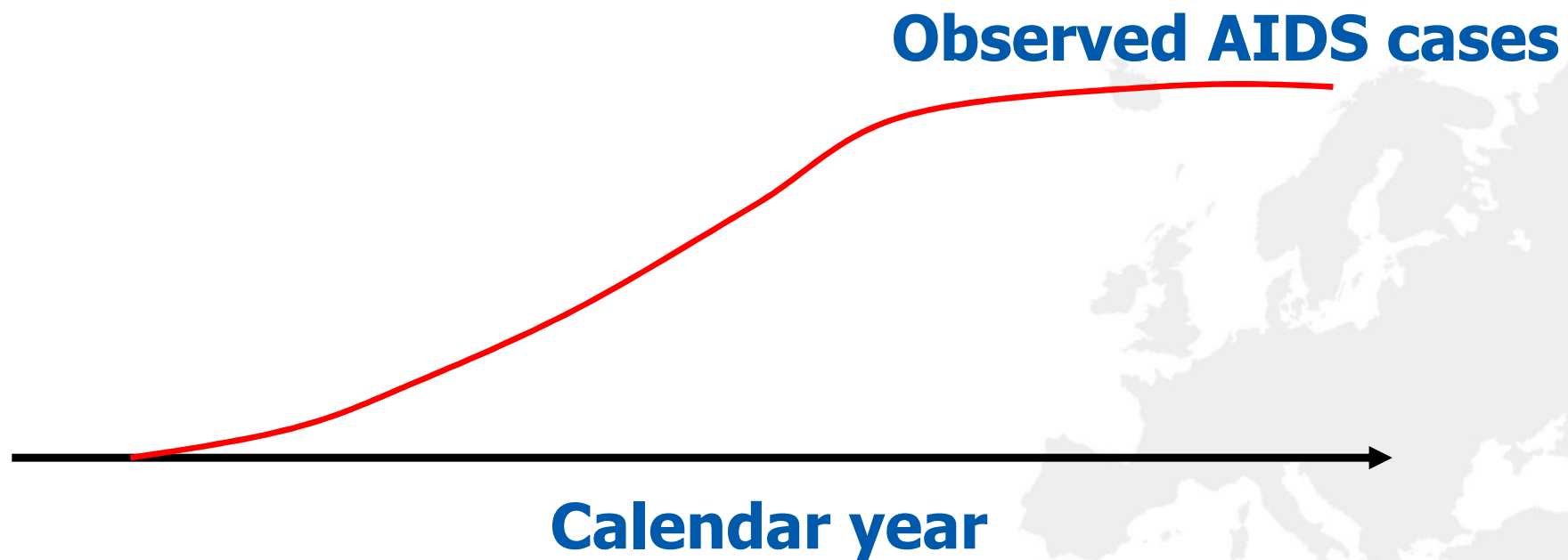
- Matching prevalence and risk group size:
 - same population.
 - same time period.
- Difficult to measure prevalence and risk group size.
- What risk groups to divide the population into?
- No or sparse information for certain risk groups.

Estimating number of HIV infections

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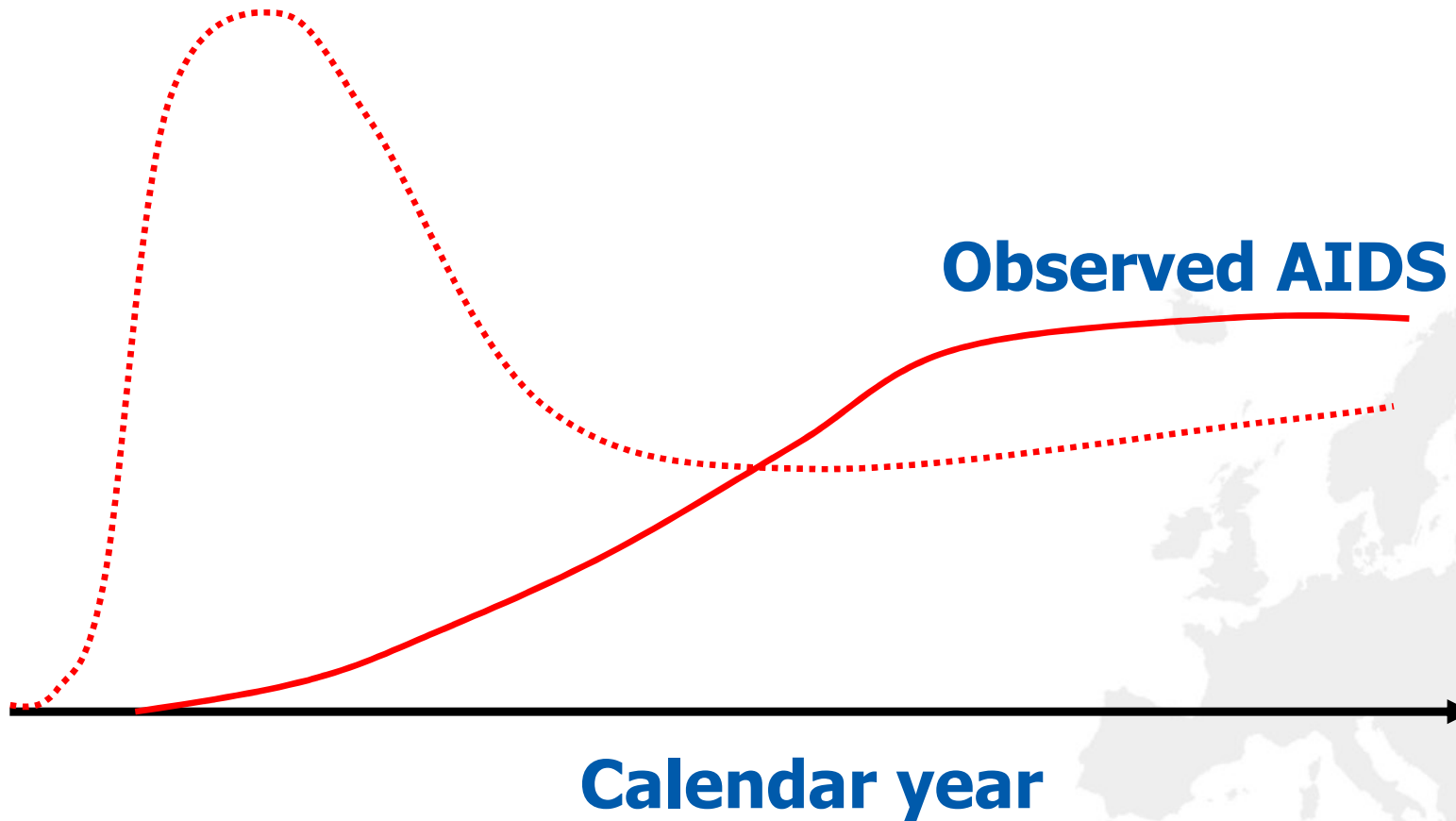
Original back-calculation: AIDS → HIV



Original back-calculation: AIDS → HIV

HIV infections

Observed AIDS cases

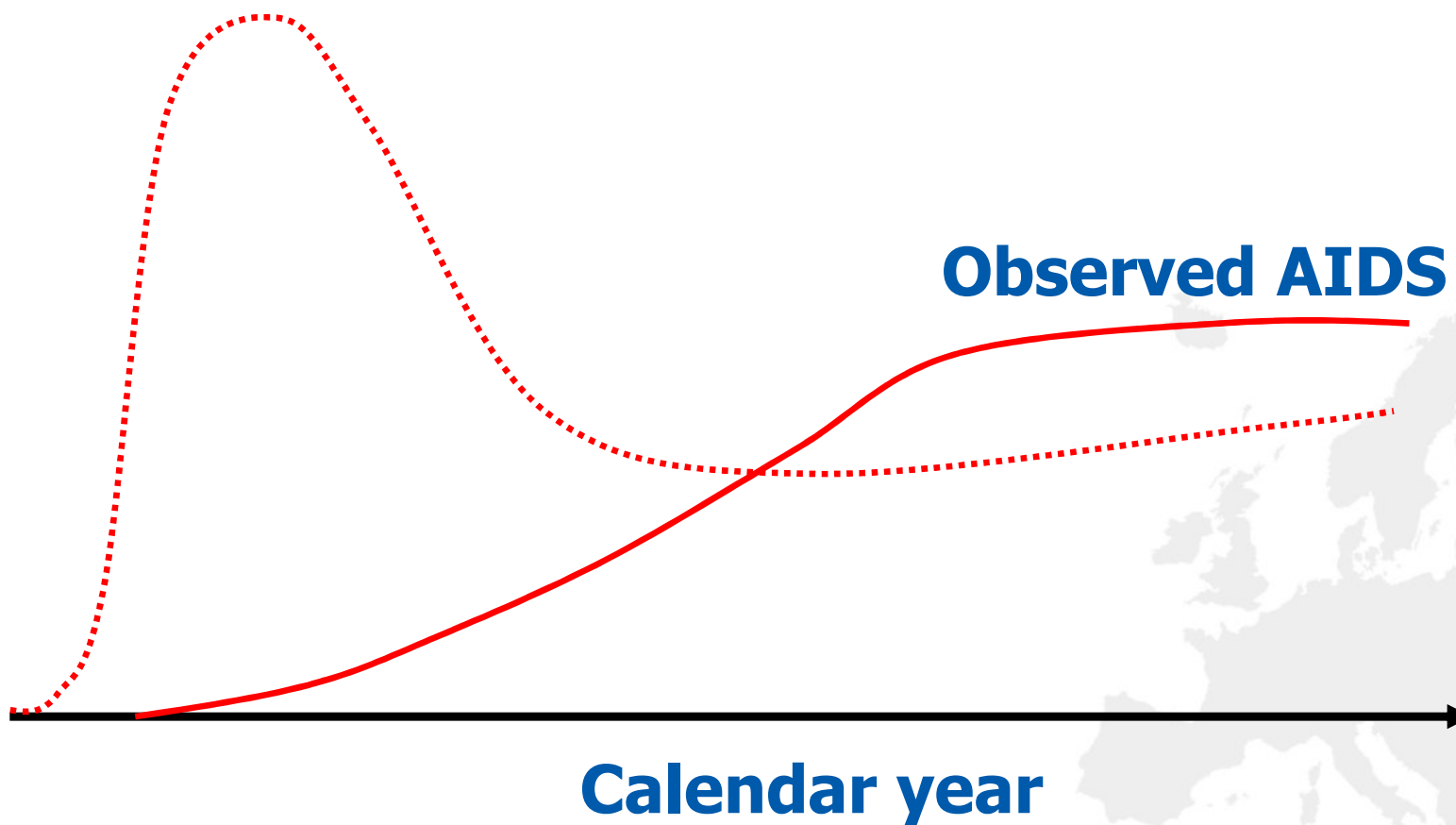


Original back-calculation: AIDS → HIV

HIV population: number of infections – number of deaths

HIV infections

Observed AIDS cases

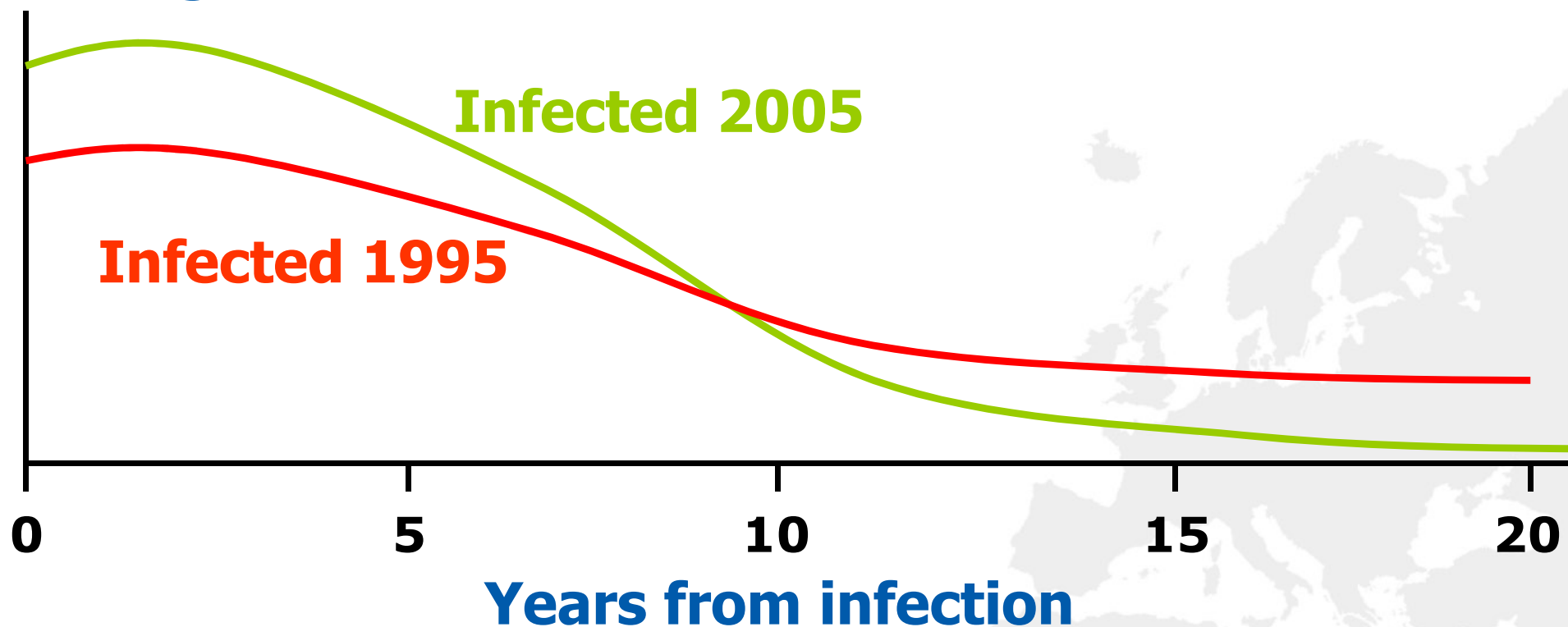


Curve linking infection and diagnosis

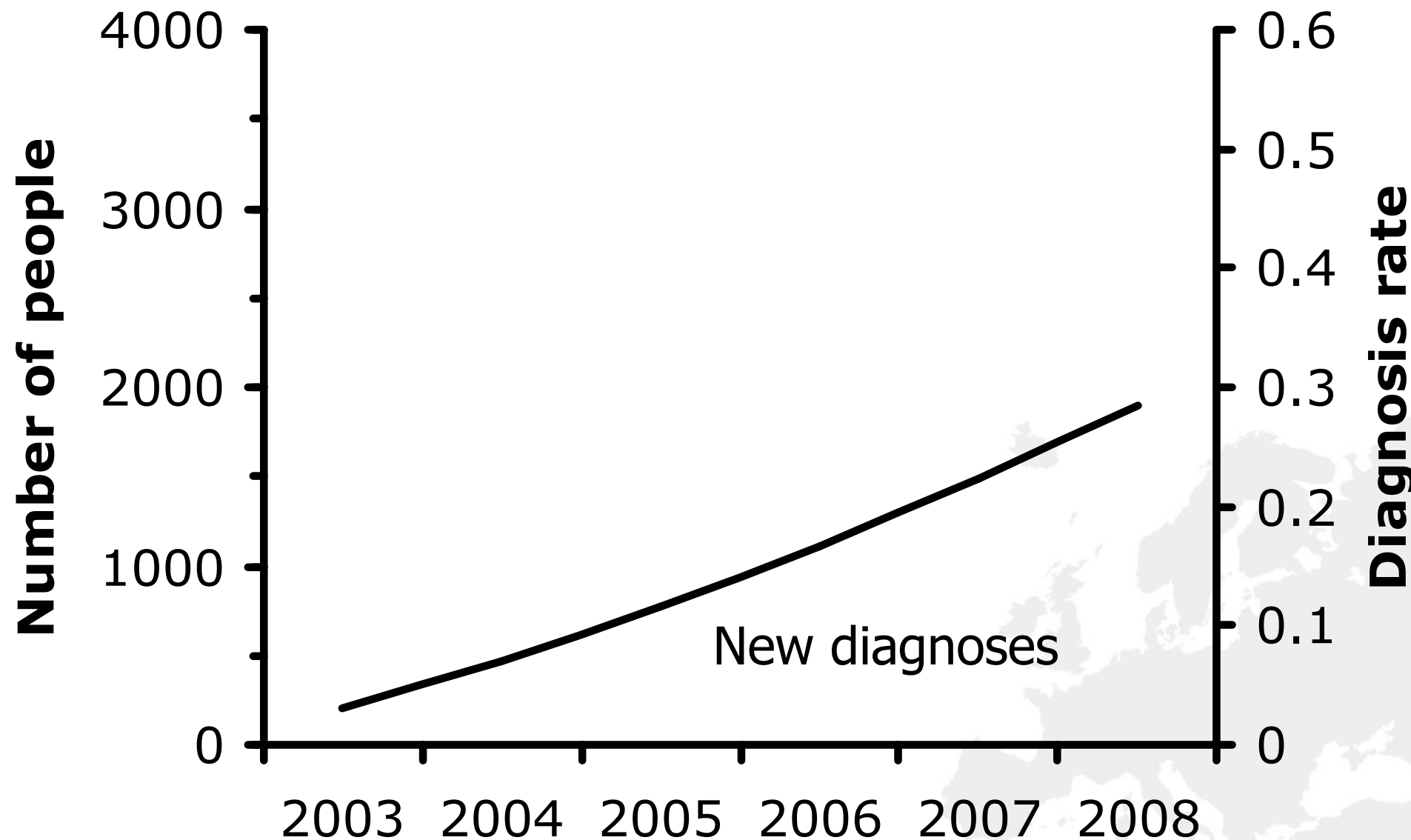
Complications:

- curve is unknown
- curve may change over time

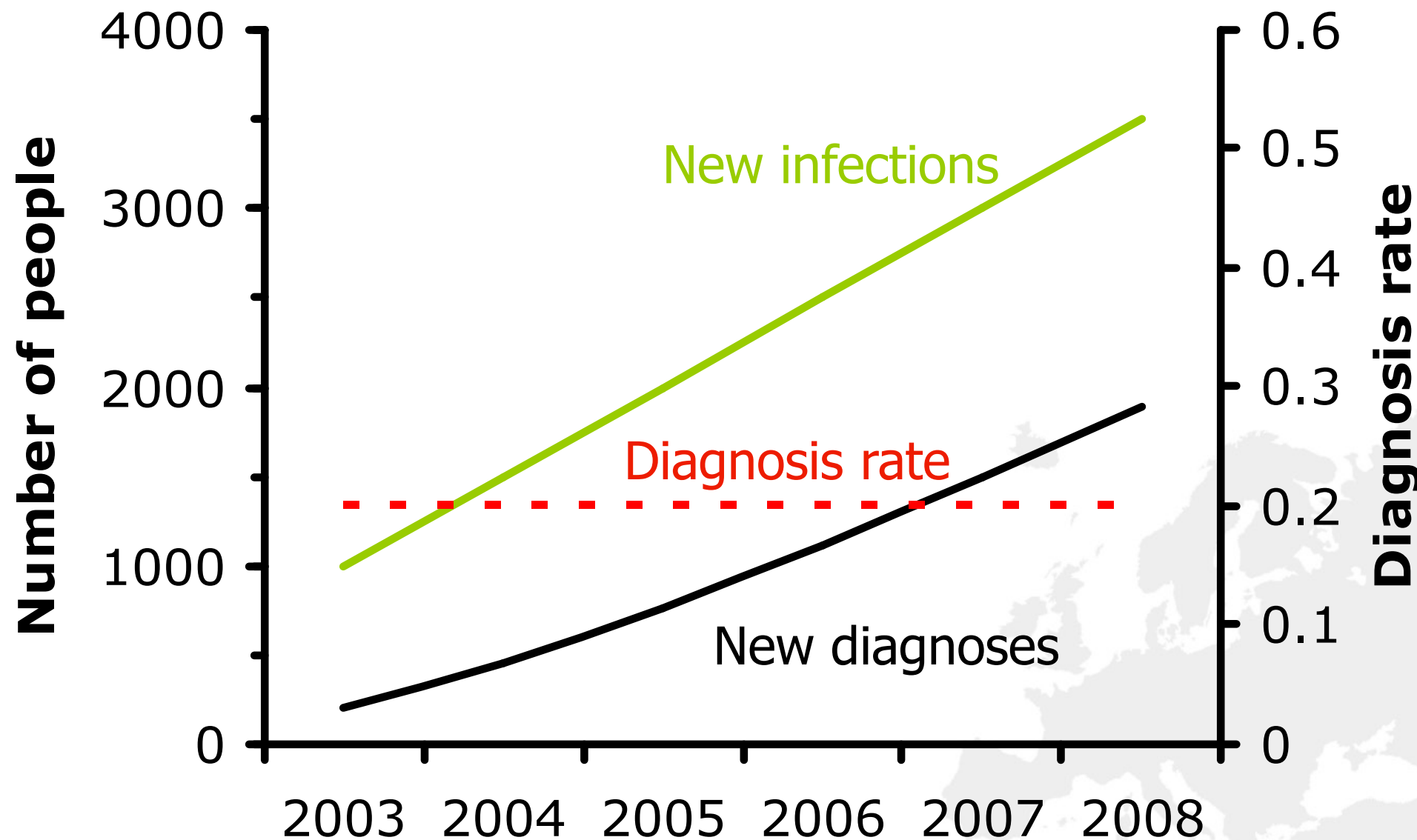
HIV diagnoses



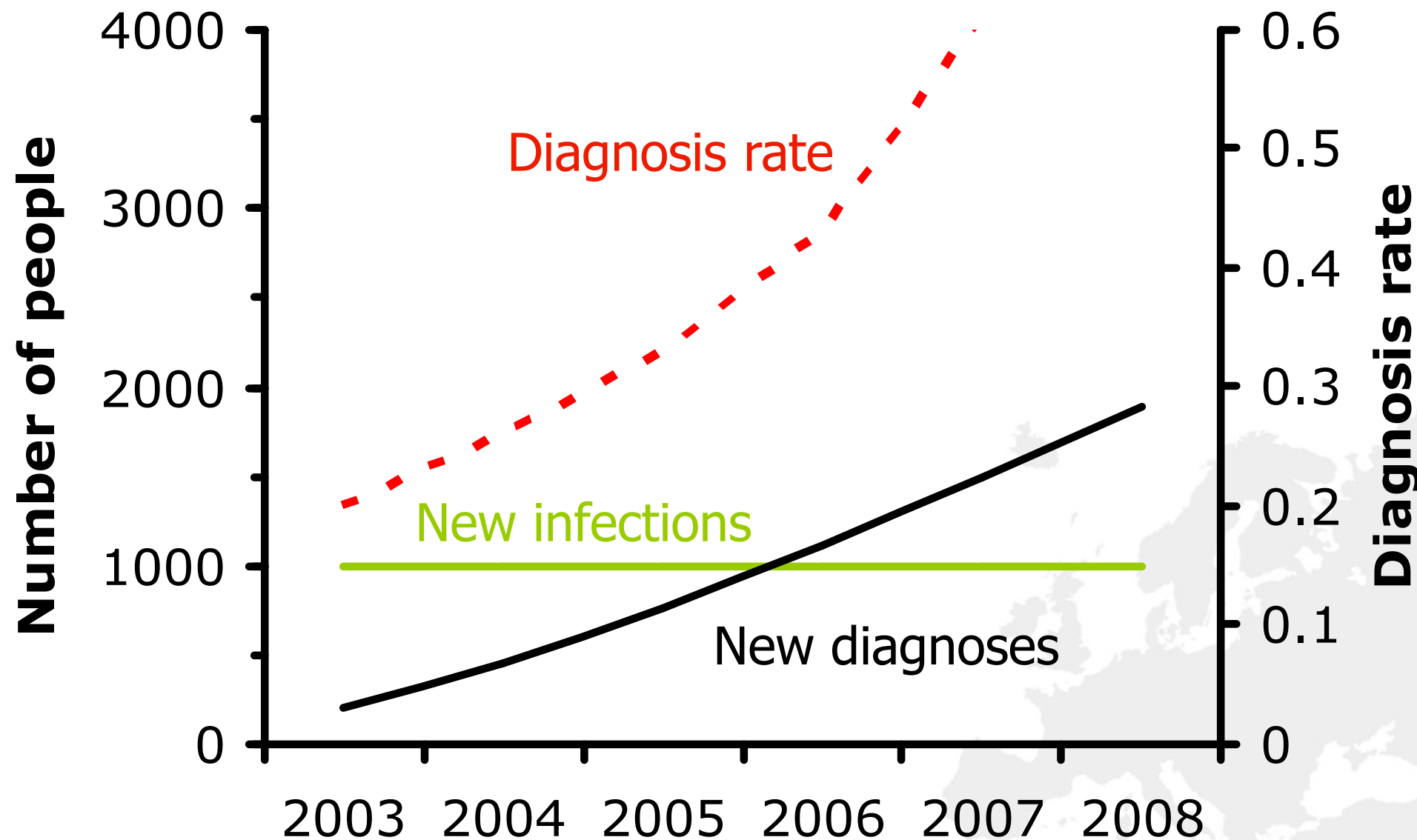
New infections and diagnosis rate



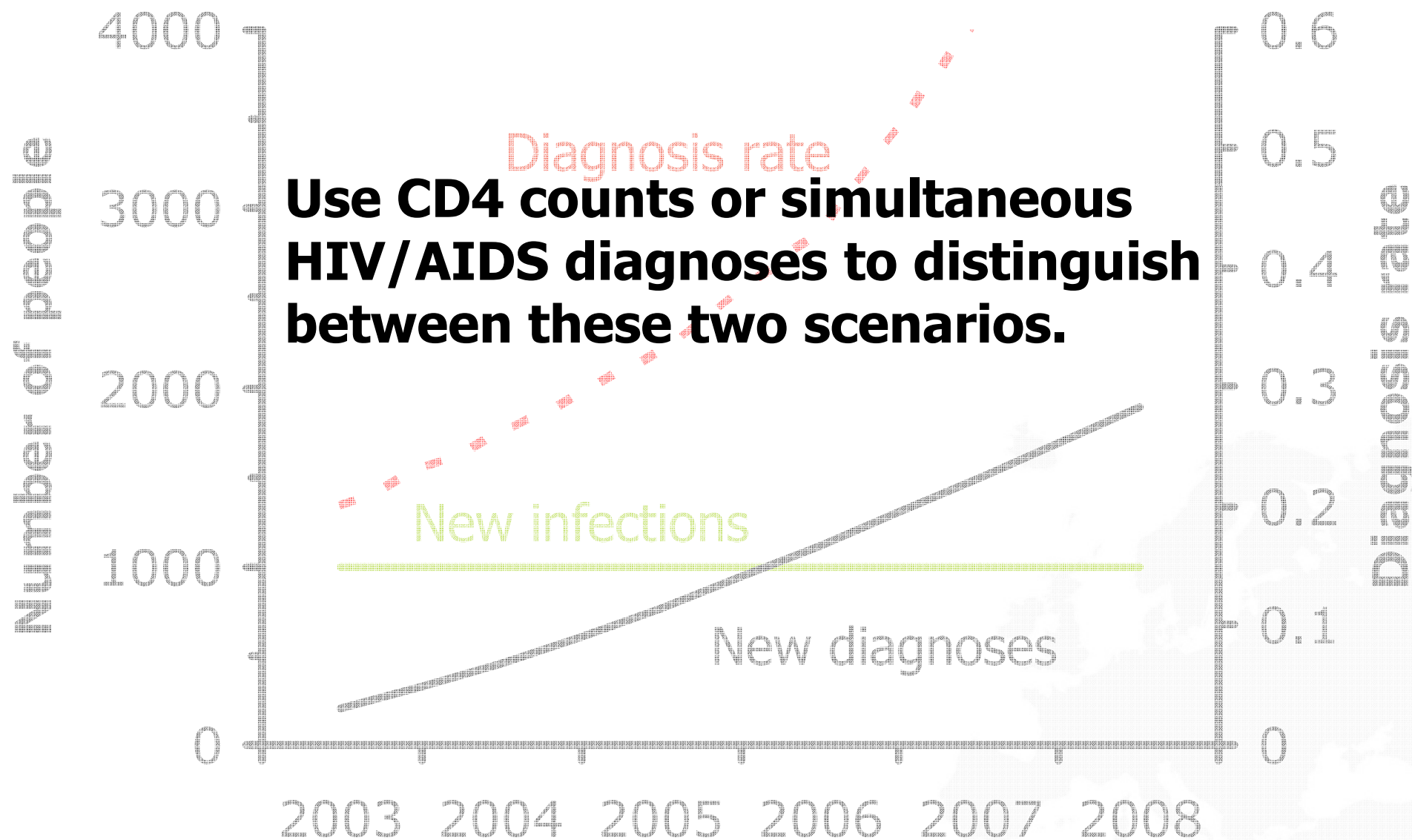
New infections and diagnosis rate



New infections and diagnosis rate



New infections and diagnosis rate



Existing methods



Bayesian back-calculation using a multi-state model with application to HIV

Michael J. Sweeting^{1,*†}, Daniela De Angelis^{1,2,‡} and Odd O. Aalen

STATISTICS IN MEDICINE
Statist. Med. 2005; **24**:3991–4007

A resurgent HIV-1 epidemic among men who have sex with men in the era of potent antiretroviral therapy

Daniela Bezemer^a, Frank de Wolf^{a,b}, Maarten C. Boerlijst^c,
Ard van Sighem^a, T. Deirdre Hollingsworth^b, Maria Prins^{d,e},
Ronald B. Geskus^{d,f}, Luuk Gras^a, Roel A. Coutinho^{g,h}
and Christophe Fraser^b

Estimation of HIV Incidence in the United States

AIDS 2008, **22**:1071–1077

H. Irene Hall, PhD

Ruiguang Song, PhD

Philip Rhodes, PhD

Joseph Prejean, PhD

Olan An MS

Context Incidence of human immunodeficiency virus (HIV) in the United States has not been directly measured. New assays that differentiate recent vs long-term infections allow improved estimation of HIV incidence.

Objective To estimate HIV incidence in the United States.

Design, Setting, and Patients Remnant diagnostic serum specimens

JAMA. 2008;300(5):520–529

New method for estimating HIV incidence and time from infection to diagnosis using HIV surveillance data

Jacques D.A. Ndawinz^{a,b}, Dominique Costagliola^{a,b,c}
and Virginie Supervie^{a,b}

AIDS 2011, **25**:1905–1913

A multistate approach for estimating the incidence of human immunodeficiency virus by using HIV and AIDS French surveillance data

Cécile Sommen^{1,2,*†}, Ahmadou Alioum^{1,2} and Daniel Commenges^{1,2}

¹INSERM U897, Epidemiology and Biostatistics Research Center, Bordeaux, F-33076, France

²University of Bordeaux 2, Bordeaux, F-33076, France

STATISTICS IN MEDICINE
Statist. Med. 2009; **28**:1554–1568

Increasing HIV transmission through male homosexual and heterosexual contact in Australia: results from an extended back-projection approach

H Wand,¹ P Yan,² D Wilson,¹ A McDonald,¹ M Middleton,¹ J Kaldor¹ and M Law¹

¹National Centre in HIV Epidemiology and Clinical Research, Sydney, Australia and ²Center for Infectious Disease Prevention and Control Population and Public Health Branch, Ottawa, Canada

HIV Medicine (2010)

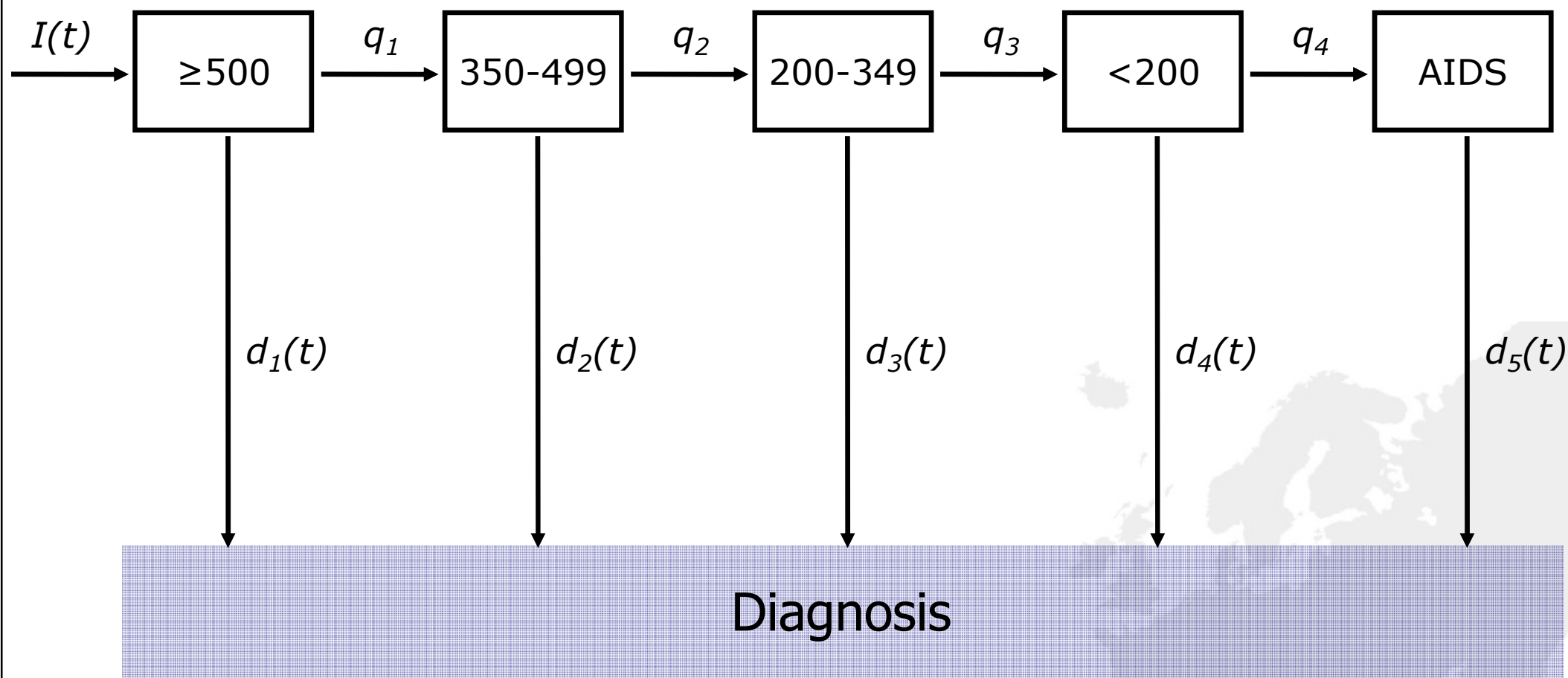
Data needed

	1	2	3	4	5	6
HIV diagnoses						
AIDS diagnoses						
HIV/AIDS diagnoses						
HIV-related symptoms						
CD4 counts						
Recent infections						
Country of infection						

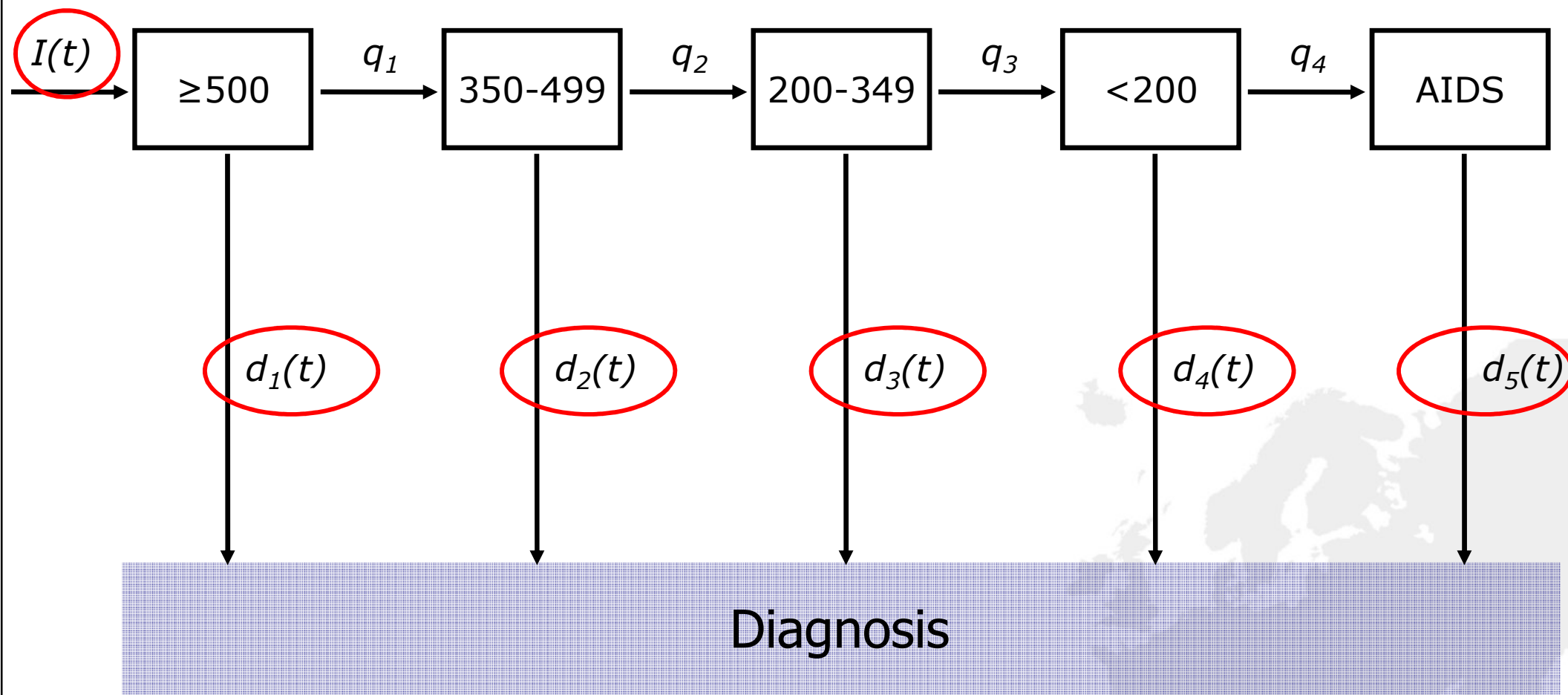
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Underlying model



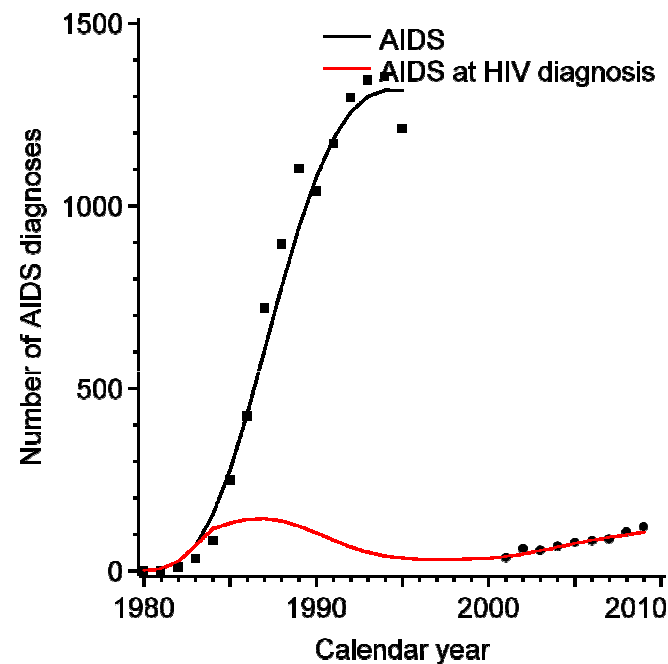
Underlying model



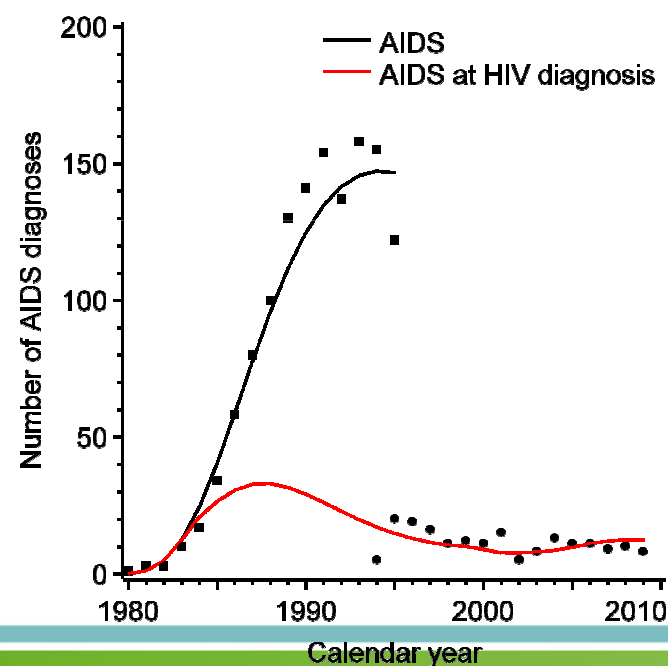
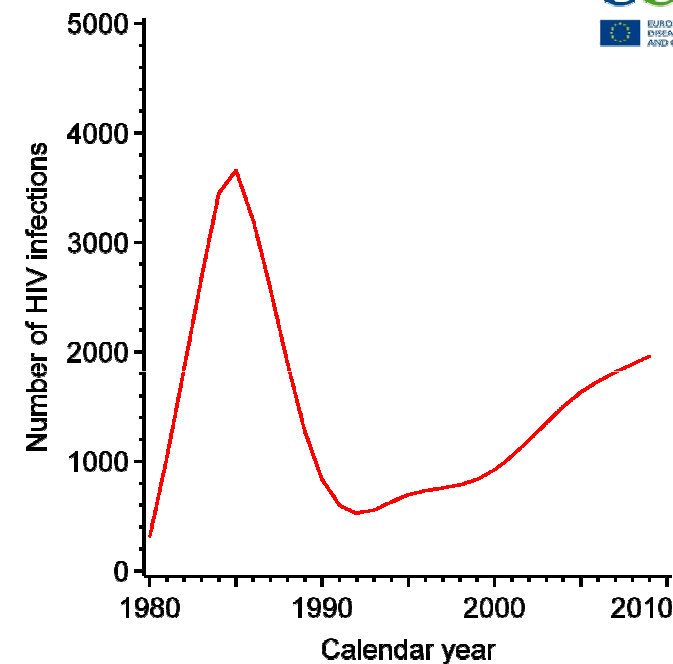
Pilot countries



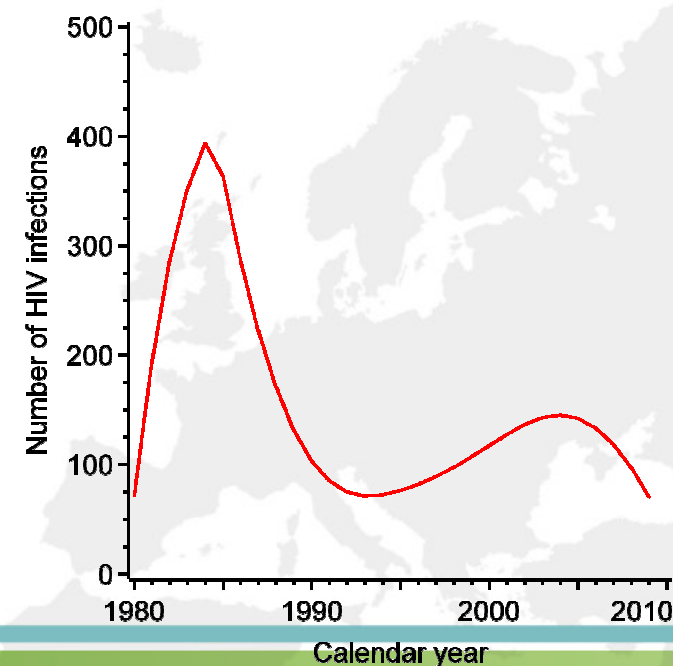
Results – MSM Germany and Denmark



Germany



Denmark

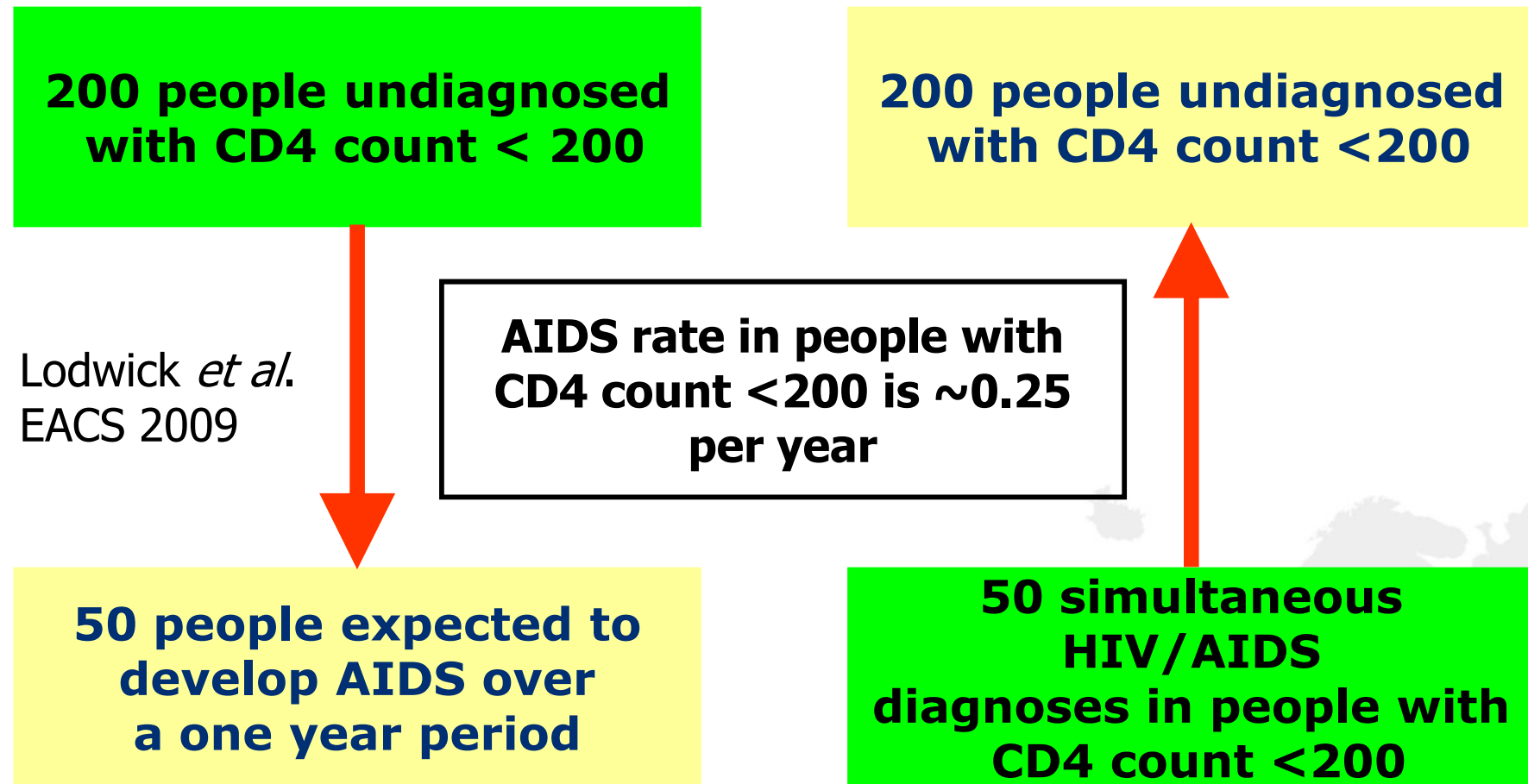


Estimating number of HIV infections

Three approaches:

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Relationship CD4 count and AIDS



Can be done on one year's data collection!

Complications - data

- Underreporting.
- Double counting.
- Delayed reporting to national surveillance system.
- Incomplete information.
- Implicit assumption: everyone will be diagnosed eventually.
- Mortality in HIV-infected individuals.
- More data appear to be available outside TESSy.

Complications - methods

- Choosing parameters
 - infection curve
 - time intervals
- CD4 – AIDS model underestimates undiagnosed population:
 - people sometimes test due to pre-AIDS symptoms.
 - need to include also cases of HIV-related symptoms at diagnosis.
- Need estimates of uncertainty.

Summary and conclusions

- Three methods to estimate HIV prevalence.
- Reconstruction of the infection curve looks promising.
- CD4 – AIDS method needs further testing on country data.
- Understanding of the data is crucial!



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