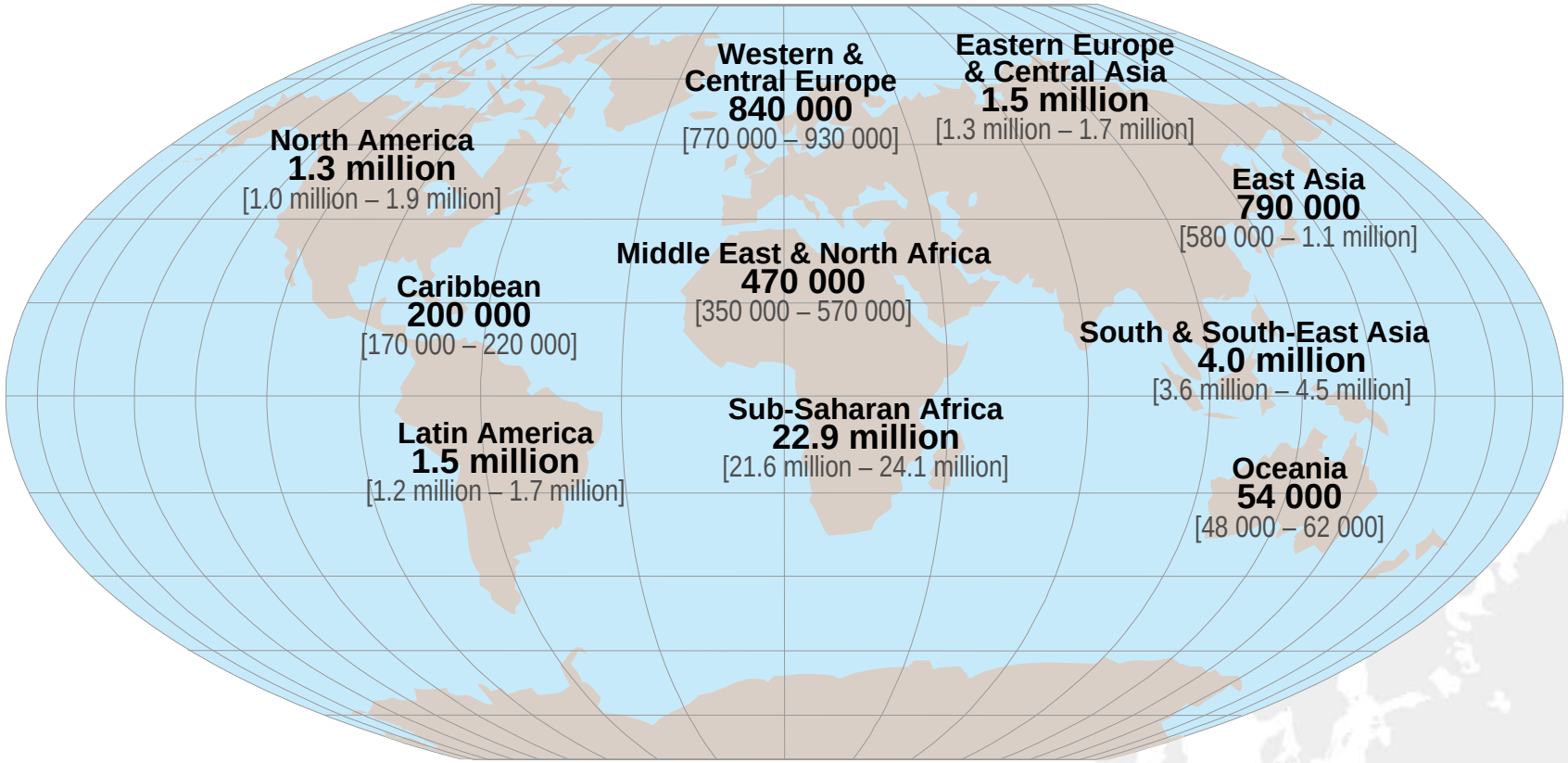
ECDC programme on HIV, STI and hepatitis B and C

Estimating HIV prevalence in European countries

Ard van Sighem, PhD
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

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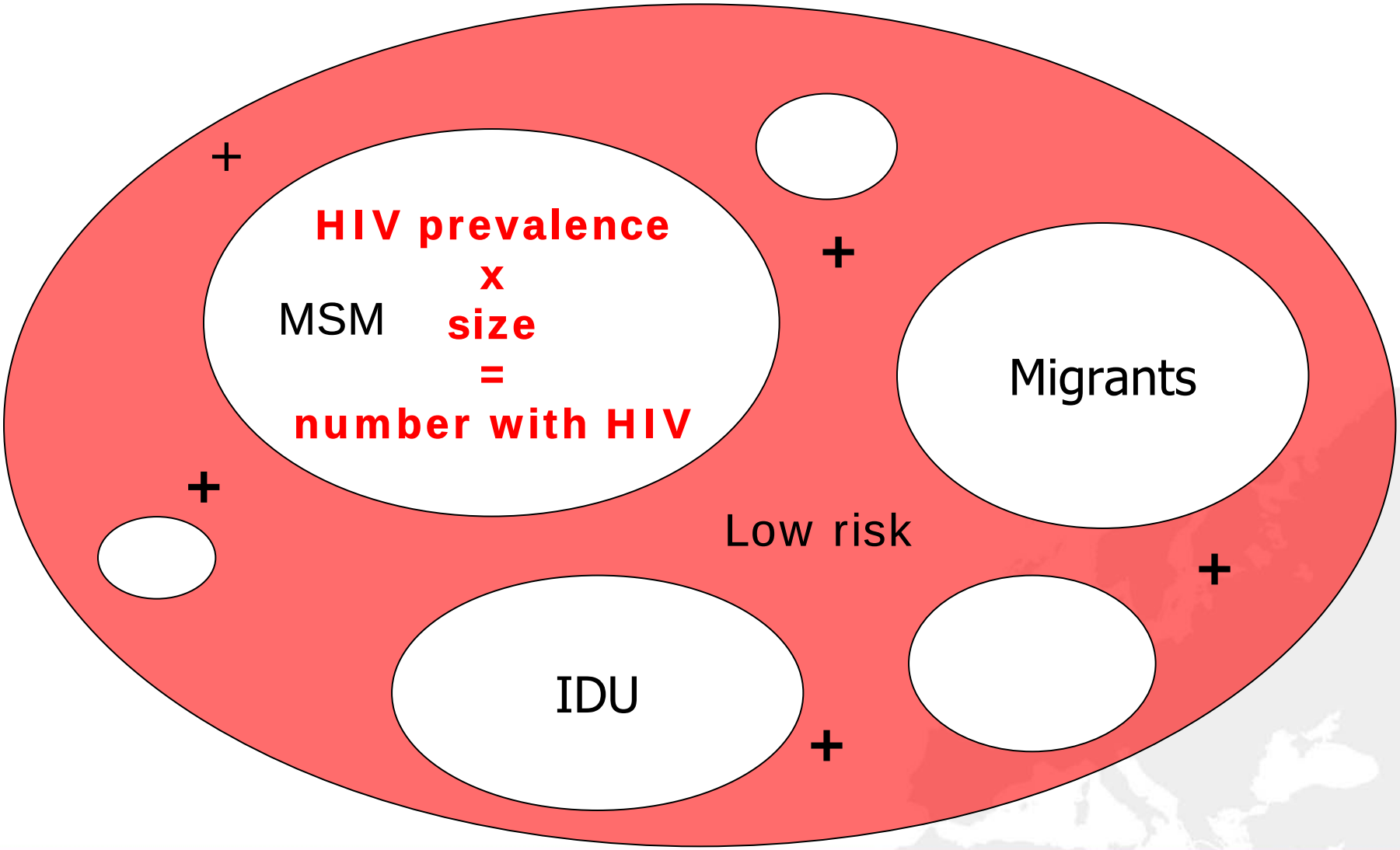
Prevalence and risk group size



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.

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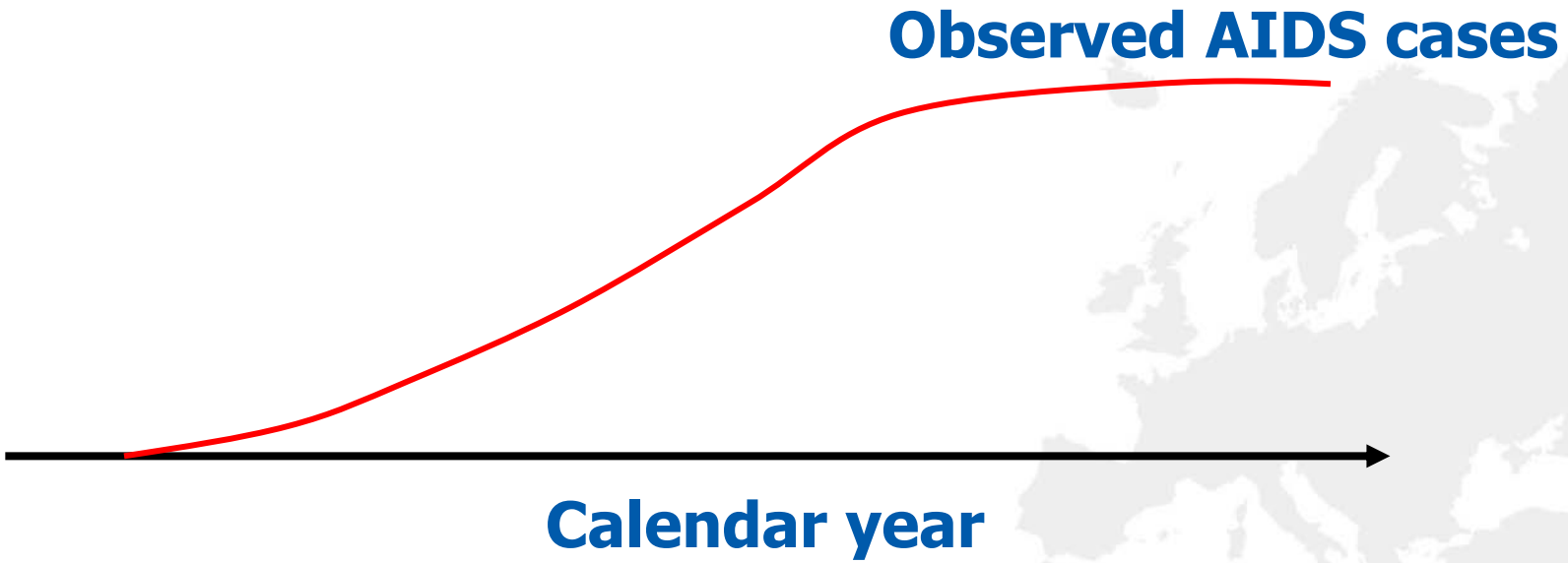
Original back-calculation: AIDS → HIV



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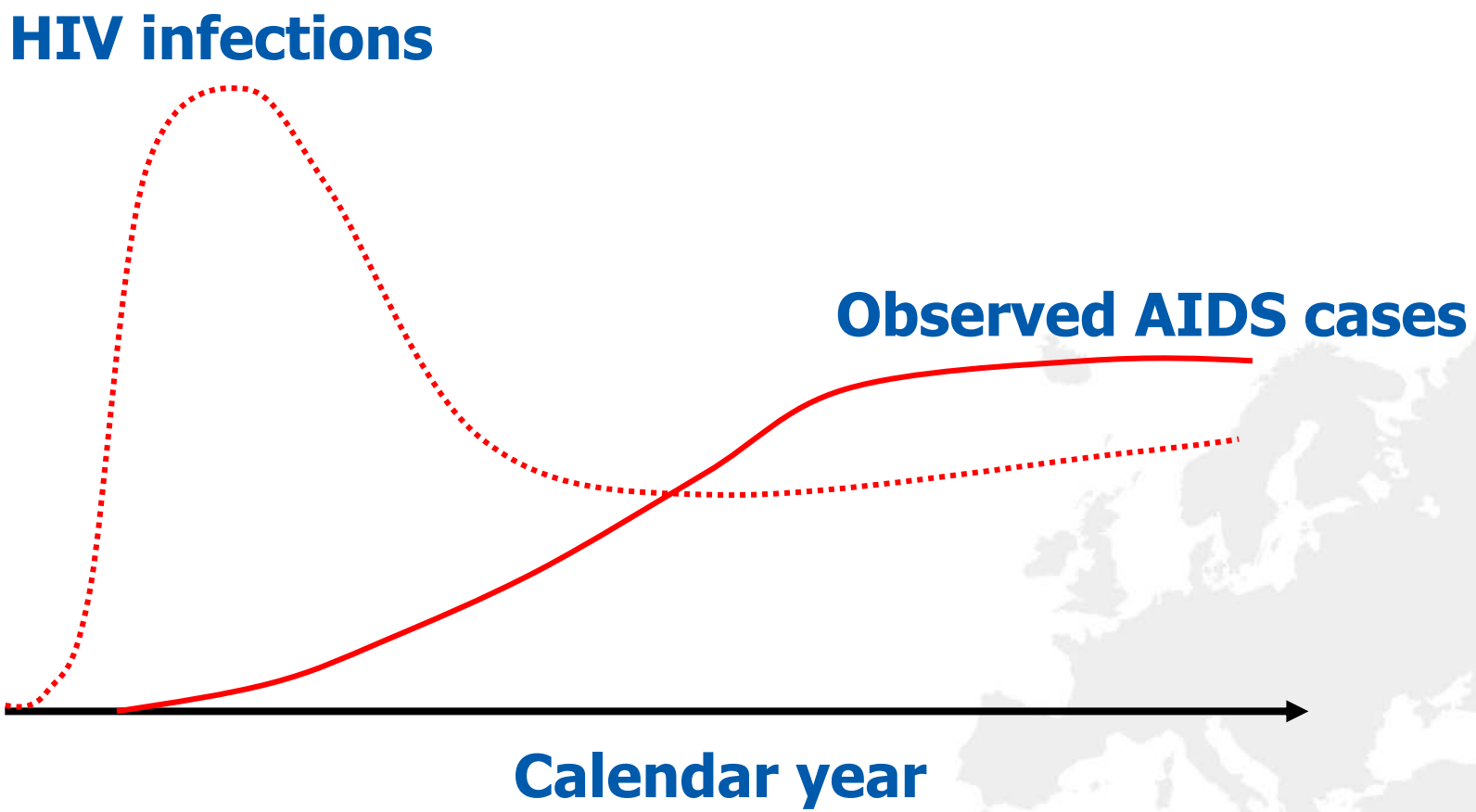
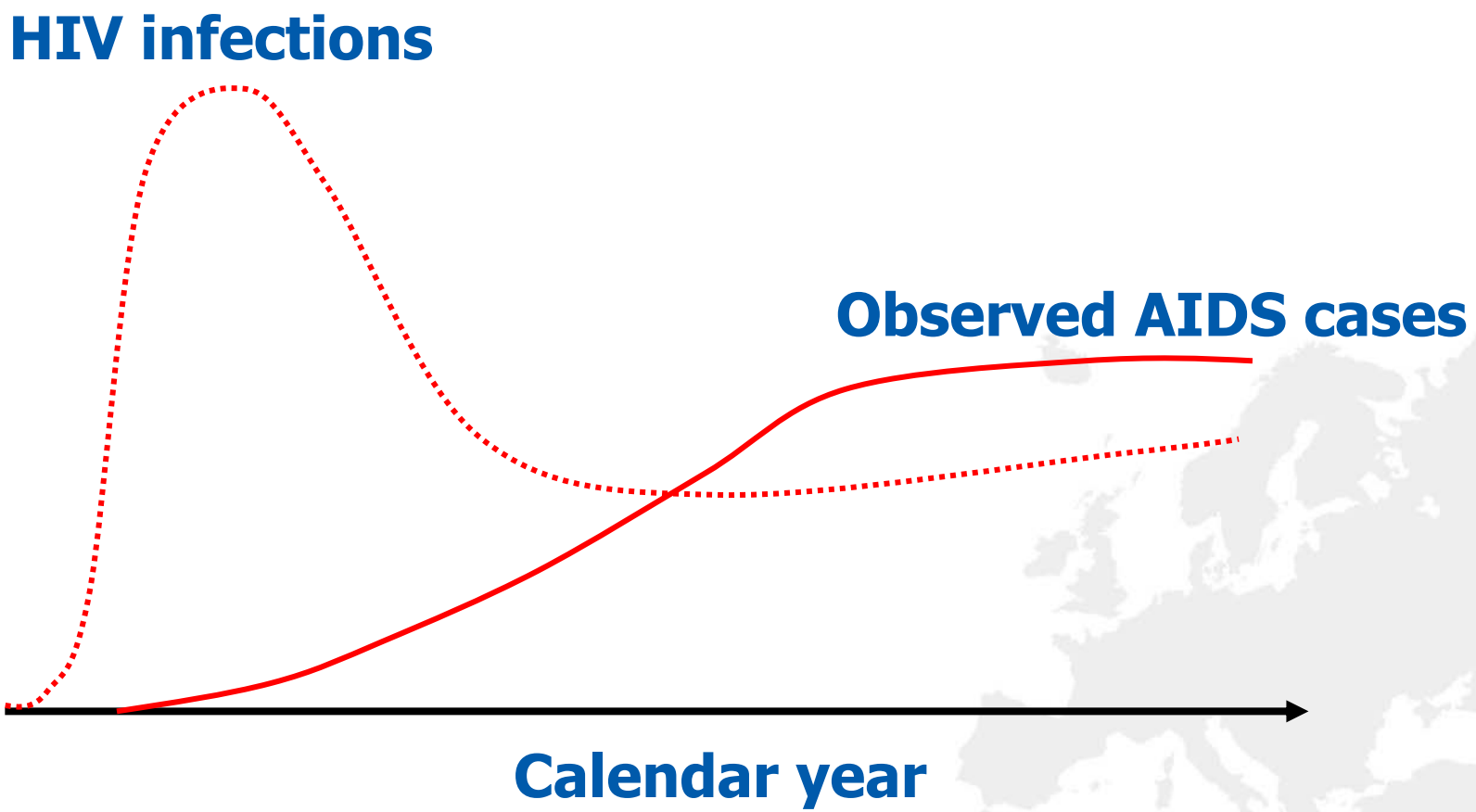


Original back-calculation: AIDS → HIV

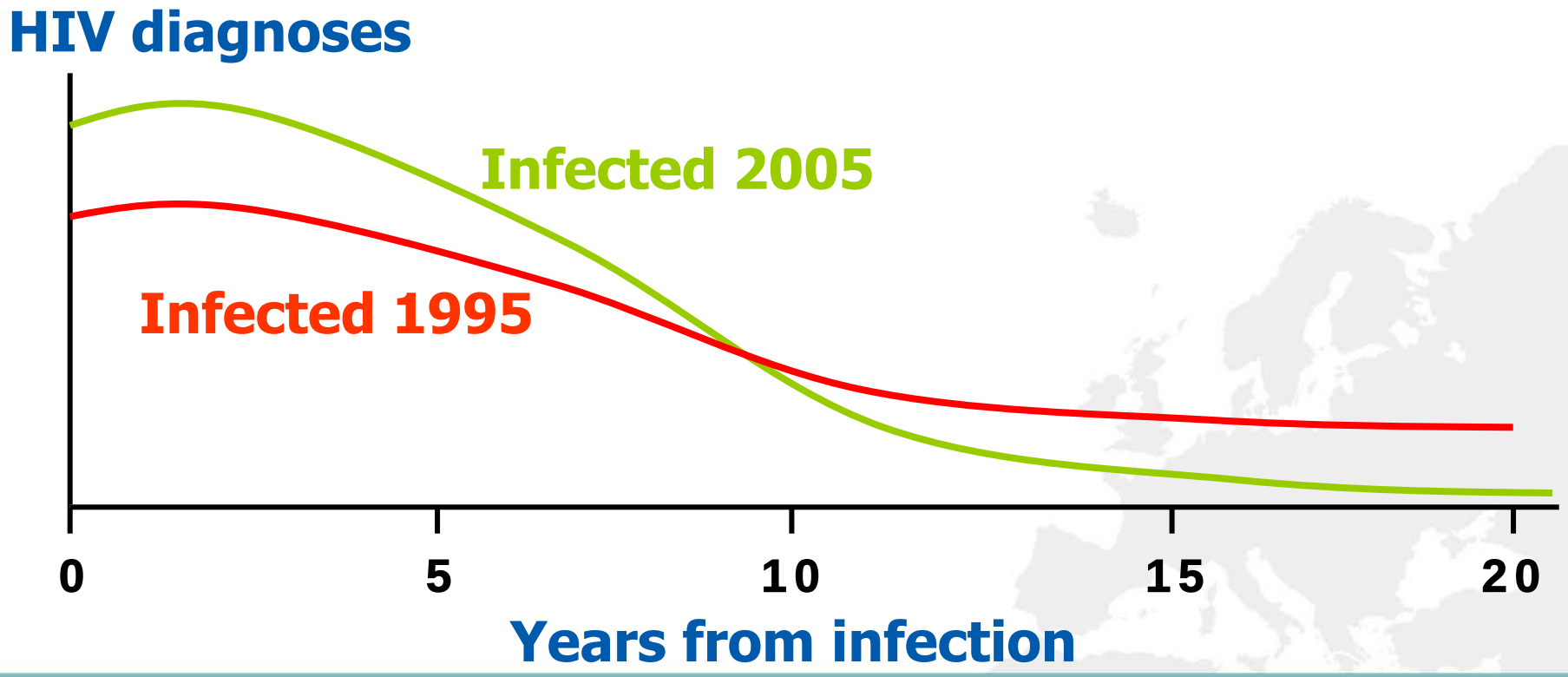
HIV population: number of infections – number of deaths



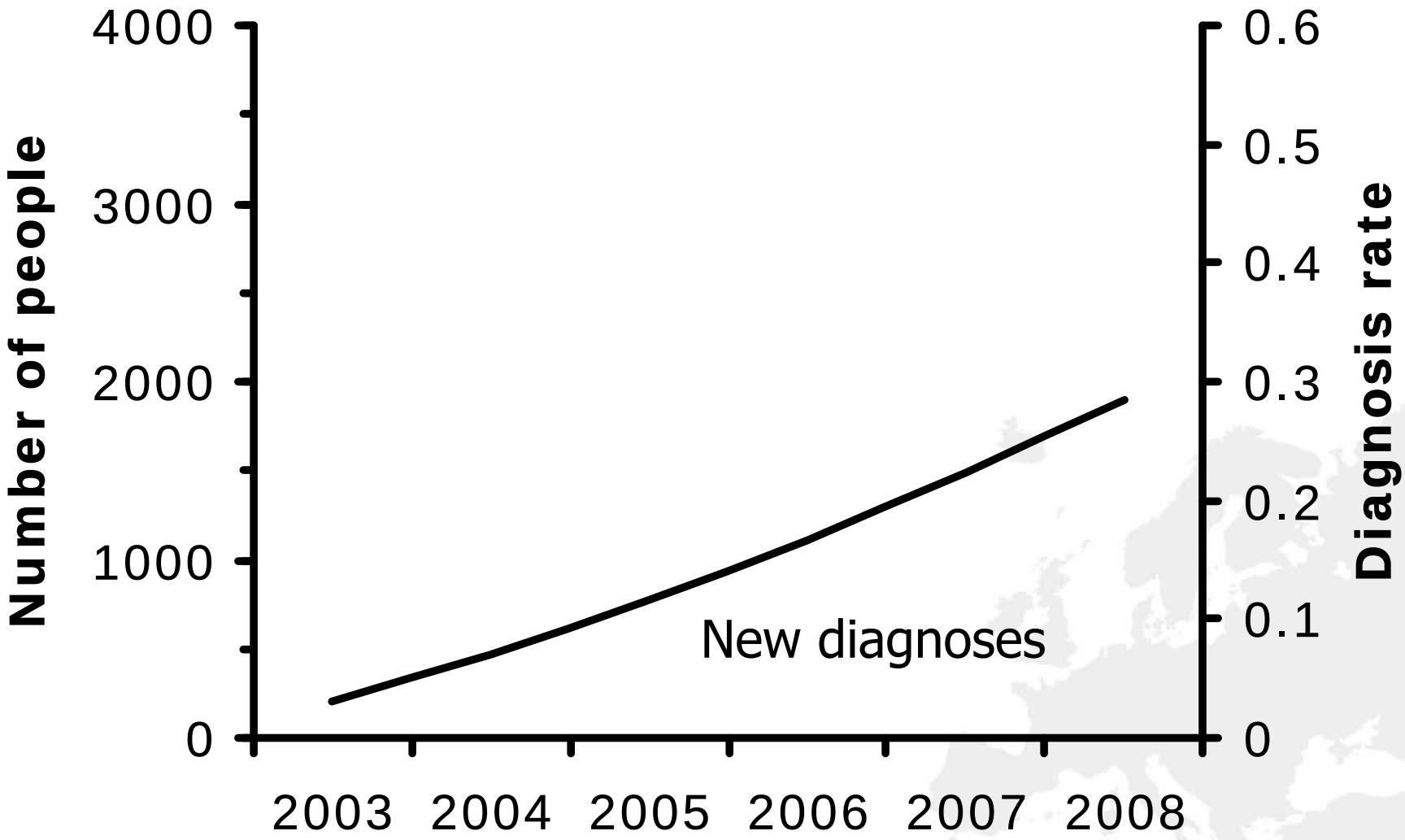
Curve linking infection and diagnosis

Complications:

- curve is unknown
- curve may change over time



New infections and diagnosis rate



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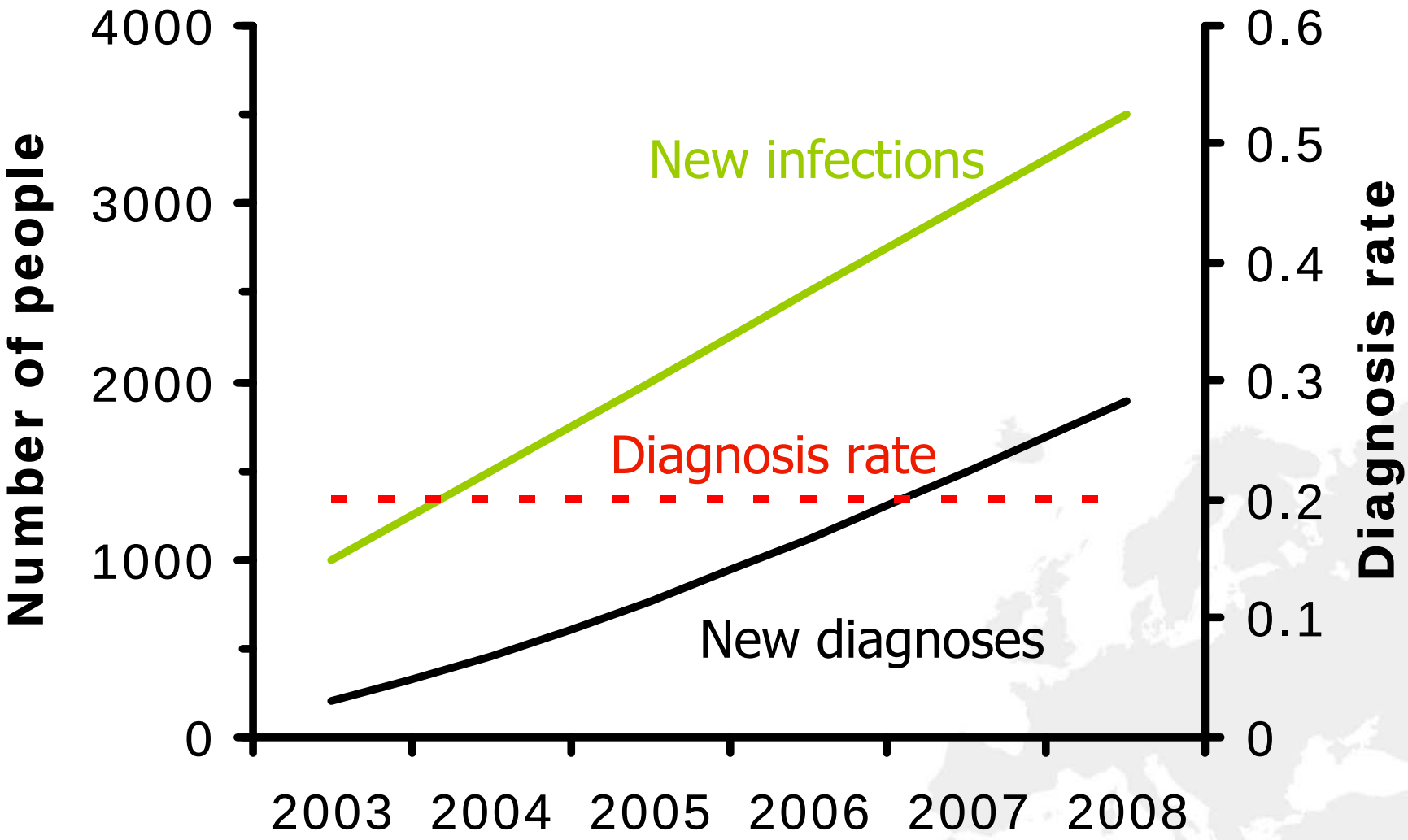

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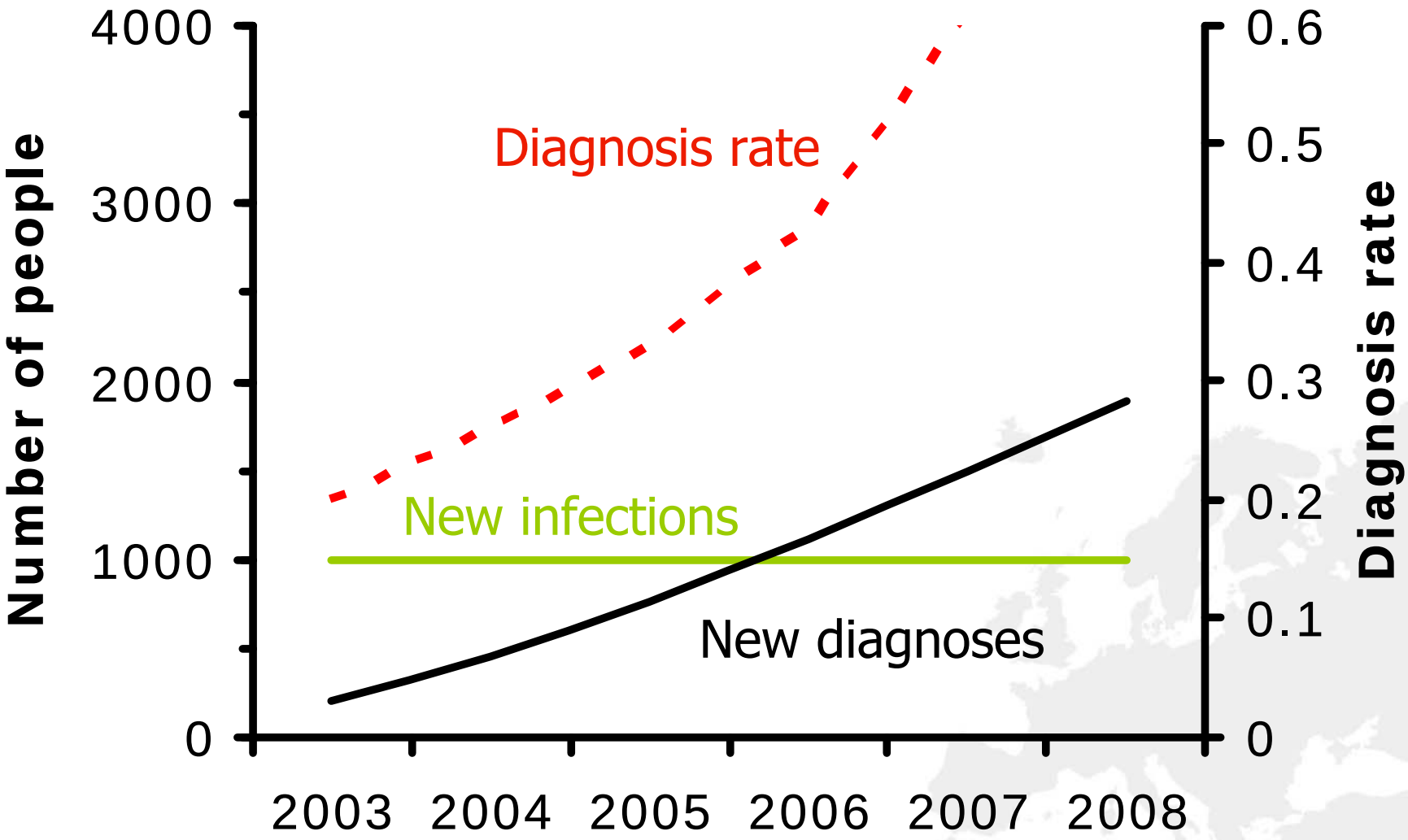

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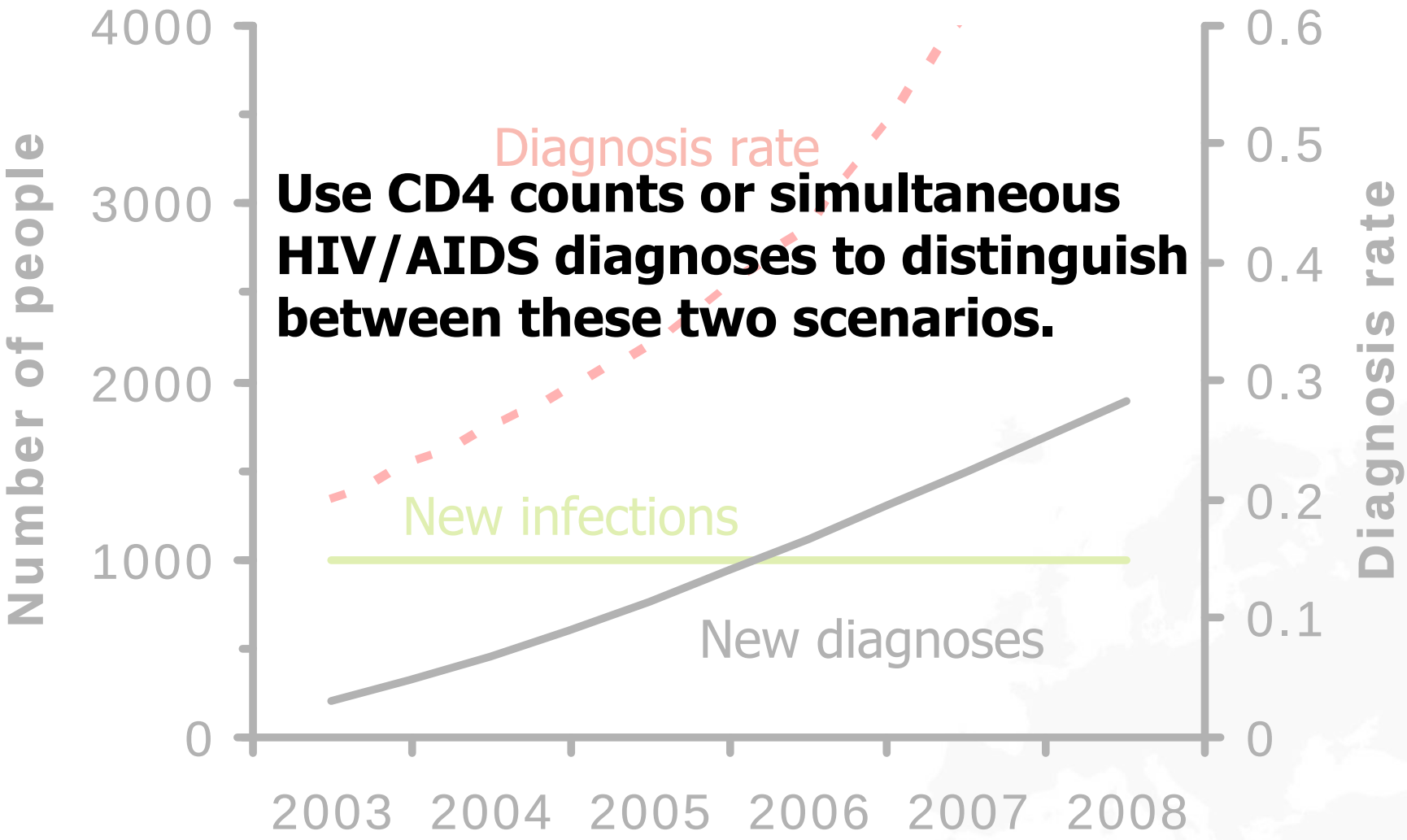


Use CD4 counts or simultaneous HIV/AIDS diagnoses to distinguish between these two scenarios.

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]

AIDS 2008, **22**:1071–1077

Estimation of HIV Incidence in the United States

H. Irene Hall, PhD
Ruiguang Song, PhD
Philip Rhodes, PhD
Joseph Prejean, PhD
Qian An, MS

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

Objective To estimate HIV incidence in the United States.

Design, Setting, and Patients Remnant diagnostic serum specim

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]

[1]*INSERM U897, Epidemiology and Biostatistics Research Center, Bordeaux, F-33076, France*
[2]*University of Bordeaux 2, Bordeaux, F-33076, France*

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

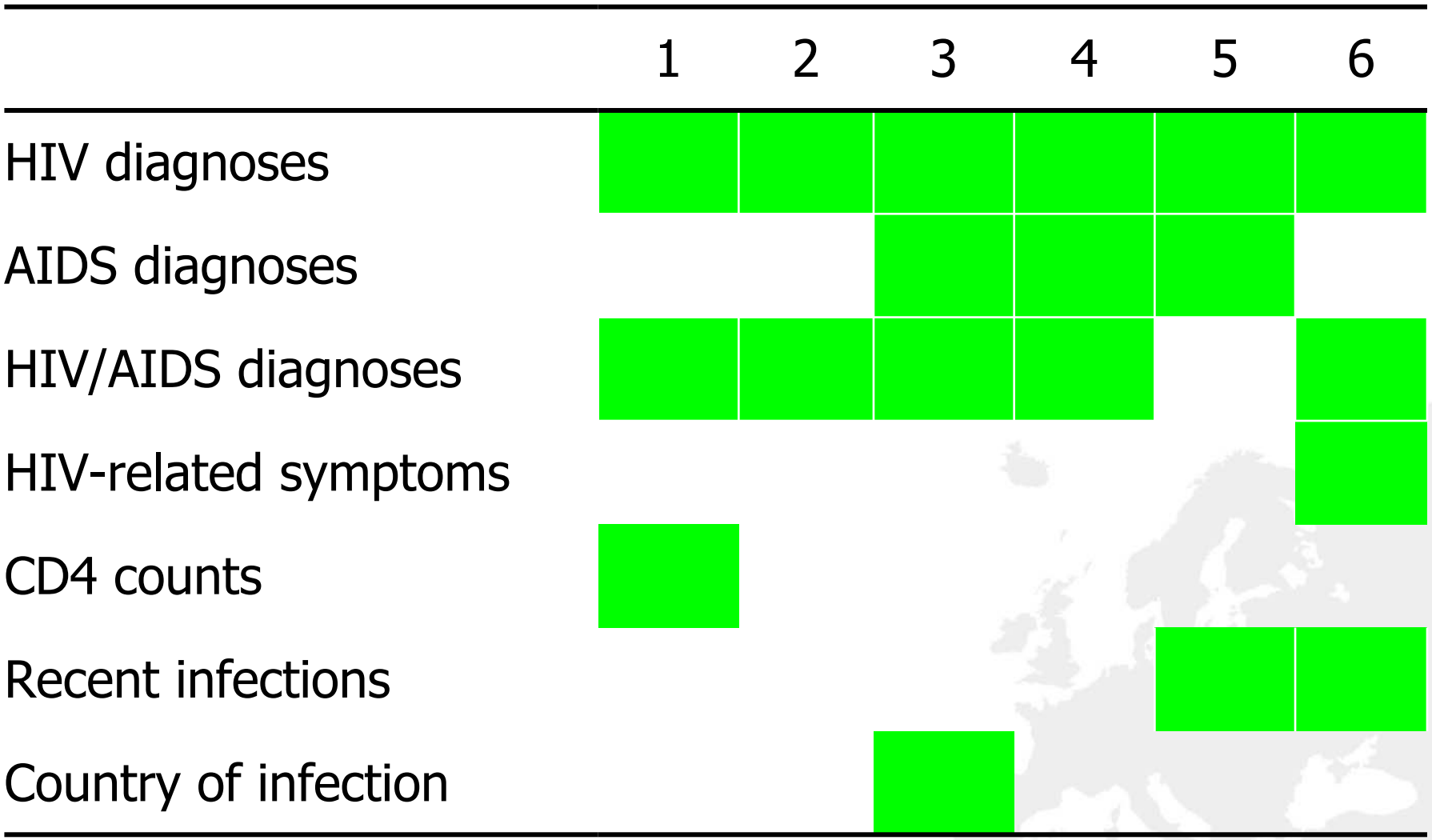
Increasing HIV transmission through male homosexual and heterosexual contact in Australia: results from an extended back-projection approach

H Wand,[1] P Yan,[2] D Wilson,[1] A McDonald,[1] M Middleton,[1] J Kaldor[1] and M Law[1]

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

HIV Medicine (2010)

Data needed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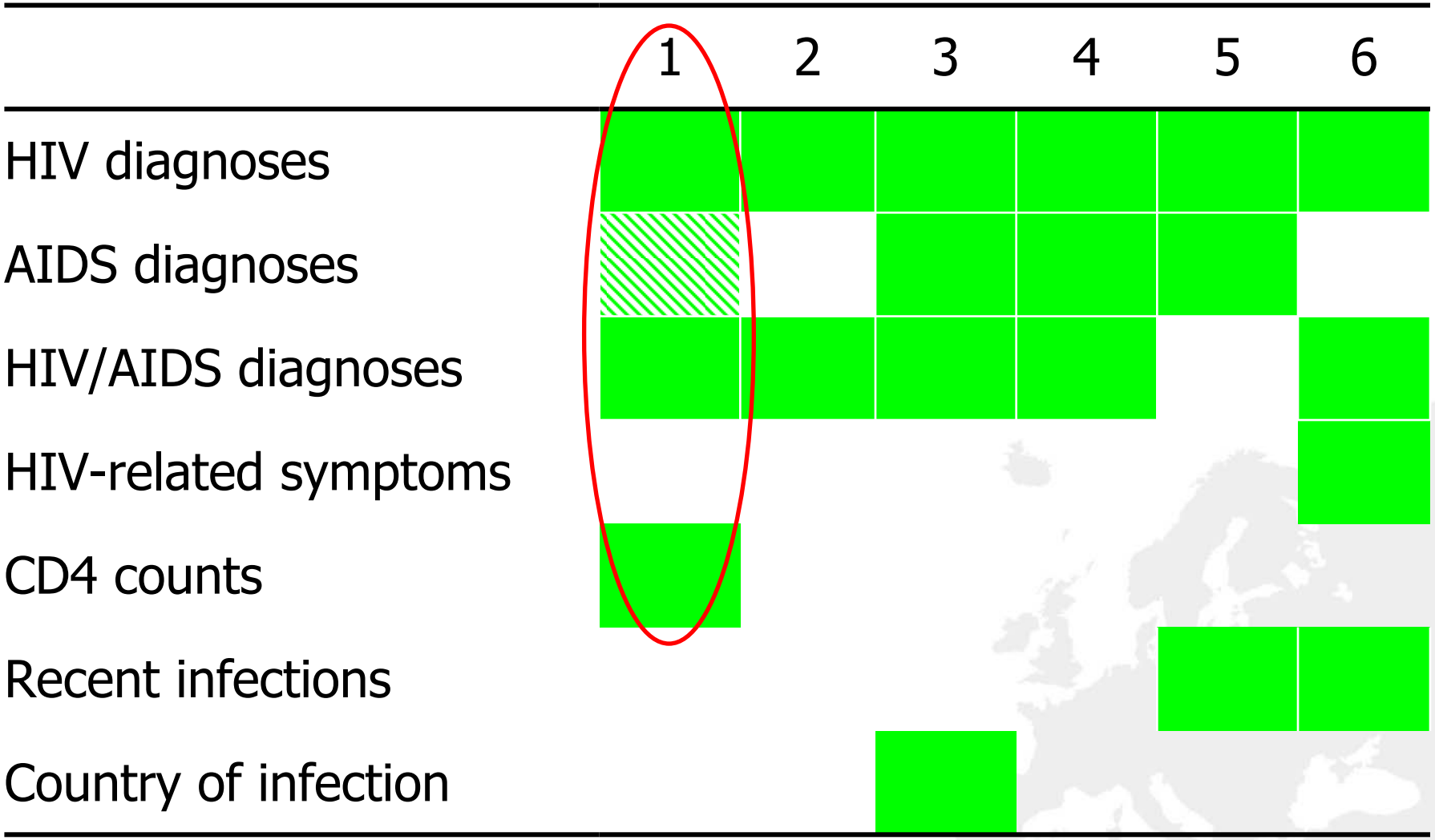
HIV diagnoses
AIDS diagnoses
HIV/AIDS diagnoses
HIV-related symptoms
CD4 counts
Recent infections
Country of infection

Data needed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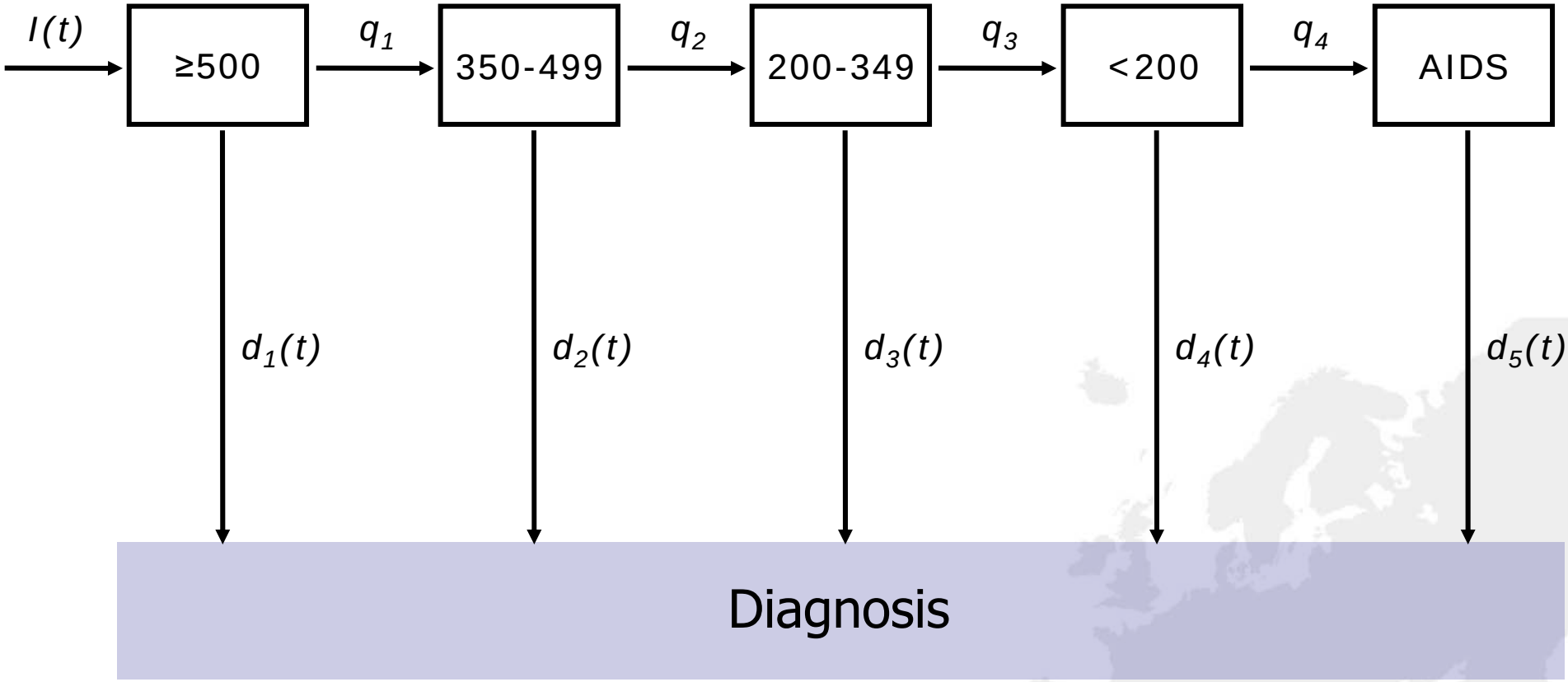
Underlying model



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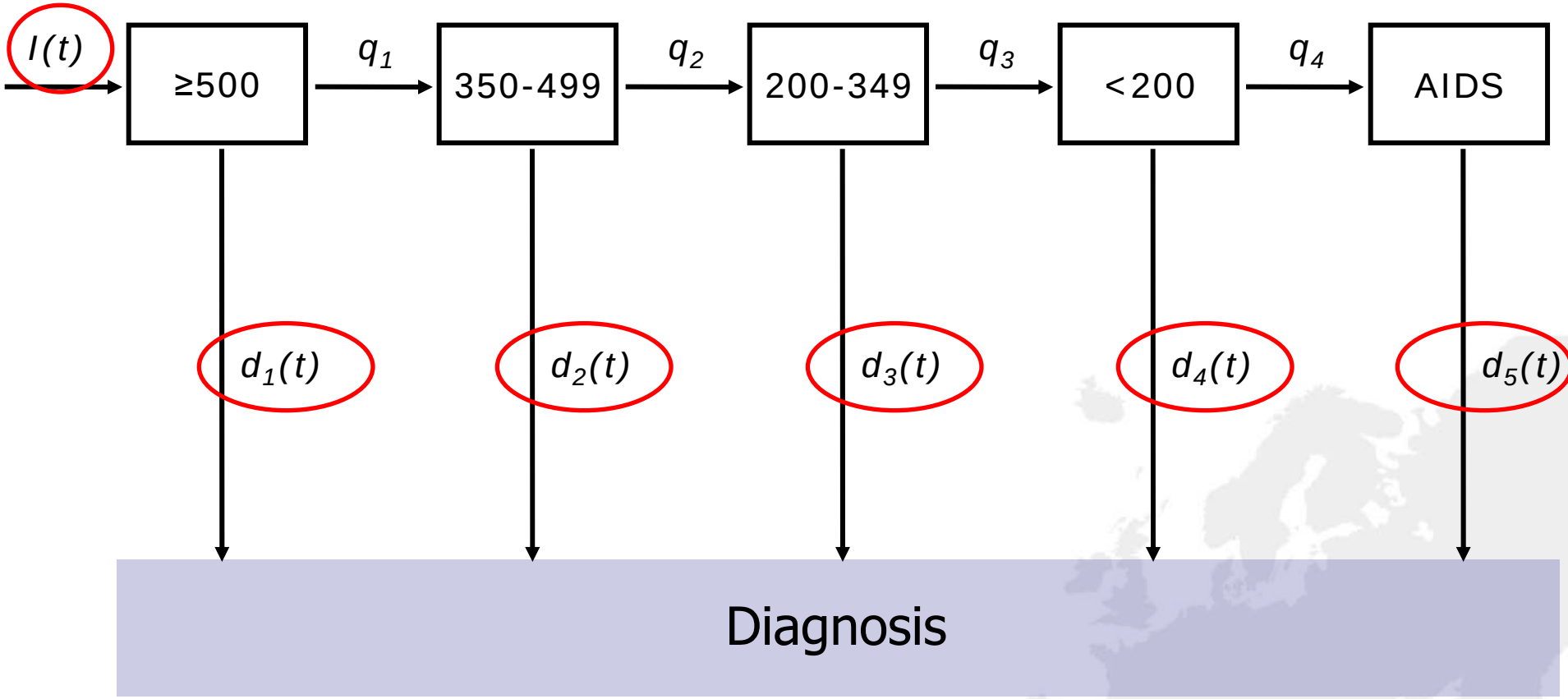
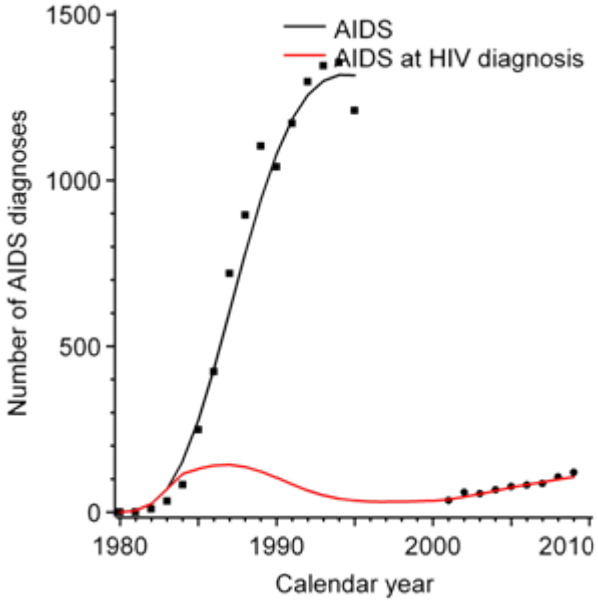
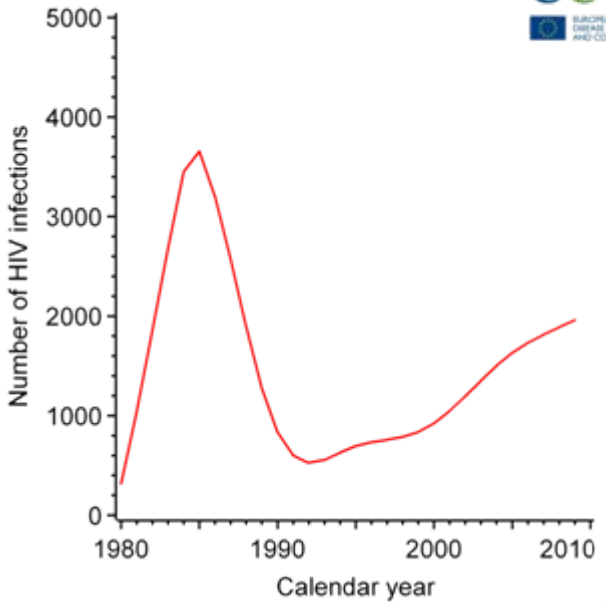


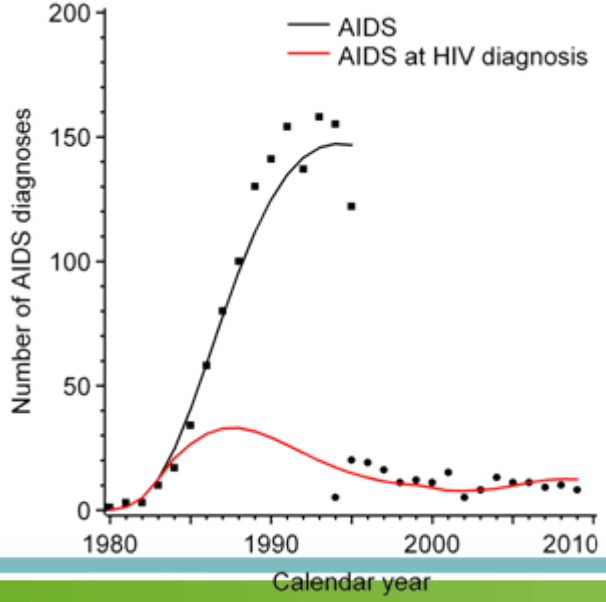
Pilot countries

Results – MSM Germany and Denmark

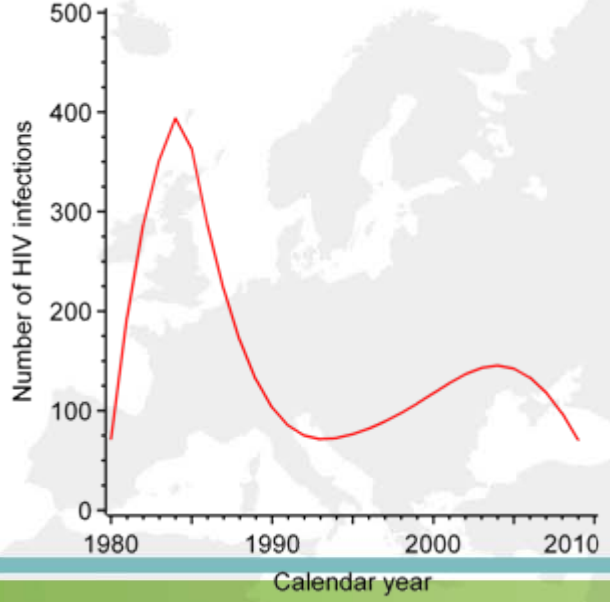


Germany





Denmark



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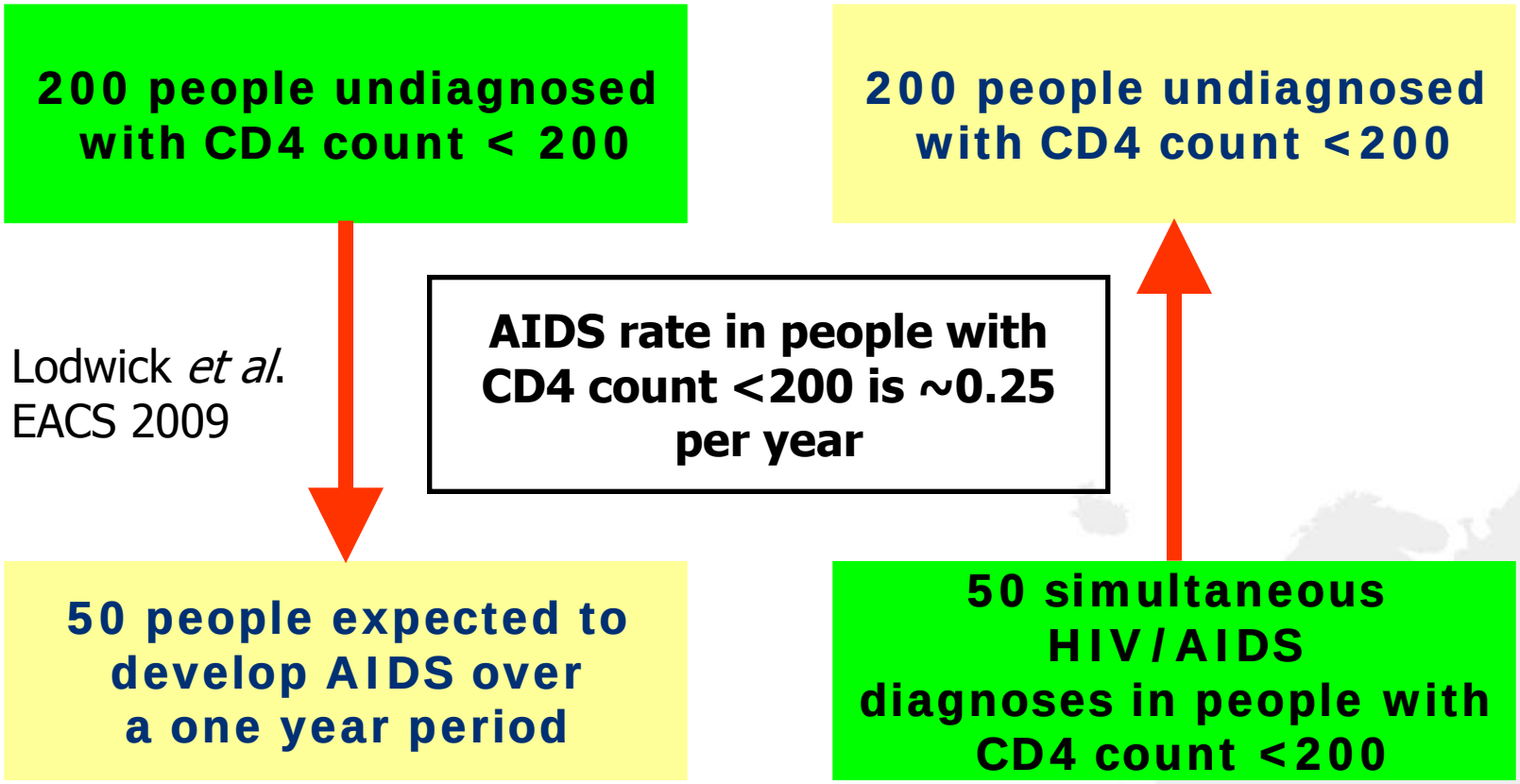
Relationship CD4 count and AIDS



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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