

Erasmus MC



Viroscience lab



PrEP cost, drug cost & cost-effectiveness

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PrEP and costs

- PrEP is highly effective in preventing HIV
 - A key tool for reaching the global goal of no new infections in 2030
- Only few countries reimburse PrEP
 - Political challenges
 - Costs

Costs and PrEP

- Costs are a key challenge for PrEP
 - An estimated 62 individuals have to use PrEP to prevent one HIV infection
 - Buchbinder et al. Lancet Infect Dis 2014
- Do the costs of PrEP outweigh the benefits of PrEP?
 - Health benefits
 - Reduction in future HIV related treatment costs

Cost-effectiveness

- Do the costs of PrEP outweigh the benefits of PrEP?
 - Aim of a cost-effectiveness study
- Reimbursement of PrEP frequently based on cost-effectiveness
 - The Netherlands
 - Nichols et al. Lancet Infect Dis 2016

Aim

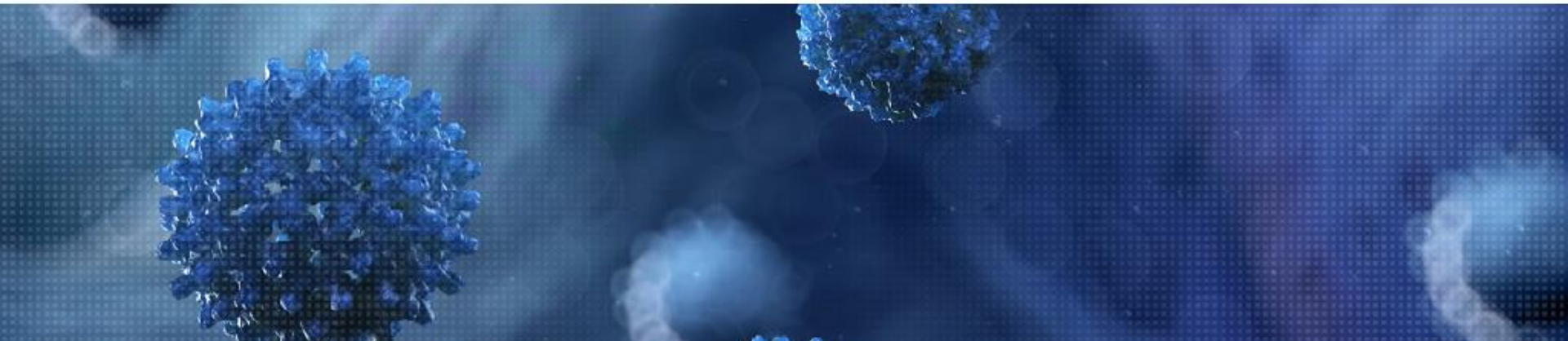


- How are cost-effectiveness studies performed?
- What is the cost-effectiveness of PrEP in the Netherlands and Germany?
 - Comparable HIV epidemic
 - Nichols et al. Lancet Infect Dis 2016
 - Van de Vijver et al. Eurosurveillance 2019

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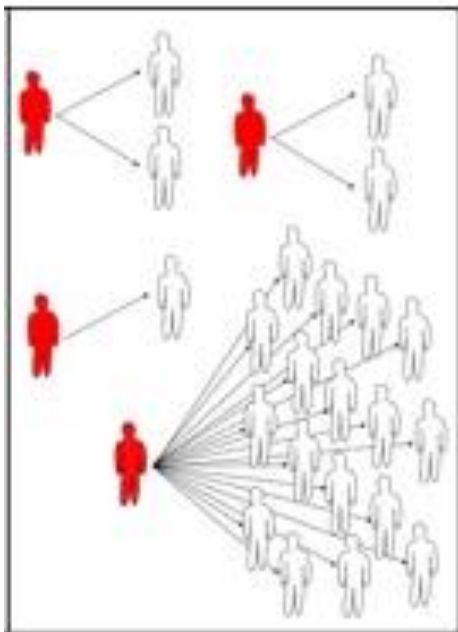
Methods used in cost-effectiveness

Studies on PrEP

- A large number of epidemiological studies have shown the benefits of PrEP
 - Randomized controlled trial
 - McCormack Lancet '15, Molina New Engl J Med '15
 - Users of PrEP in real-World settings
 - Marcus et al. Clin Infect Dis '17

Cost-effectiveness is complex

- Epidemiological studies only investigated individual benefit
 - PrEP will prevent infections in populations



Complex - time-horizon

- Investments in society may take decades to be gained back
 - Infrastructure



Complex - time-horizon

- Investments in society may take decades to be gained back
 - Infrastructure
- PrEP will cost money in the short-term
 - After how many years can costs be gained back?

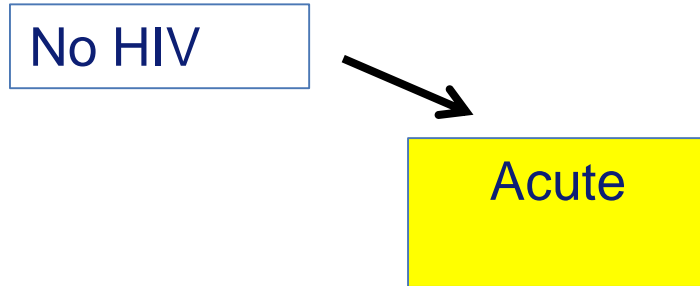
Cost-effectiveness

- Transmission models are popular in cost-effectiveness studies
 - Can include population benefit
 - Longer time horizon

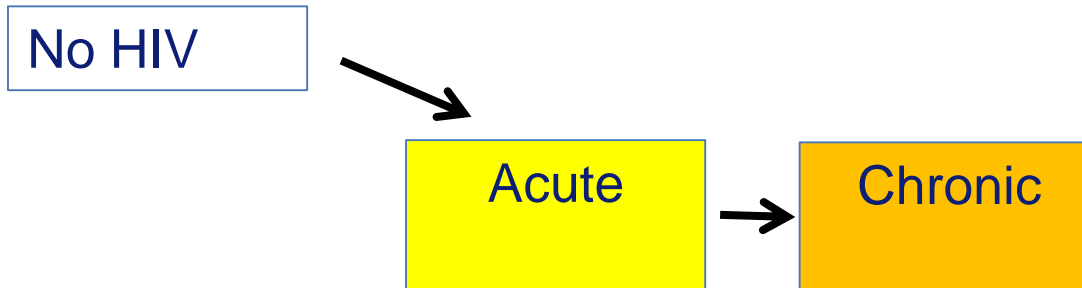
HIV- transmission model

No HIV

HIV- transmission model



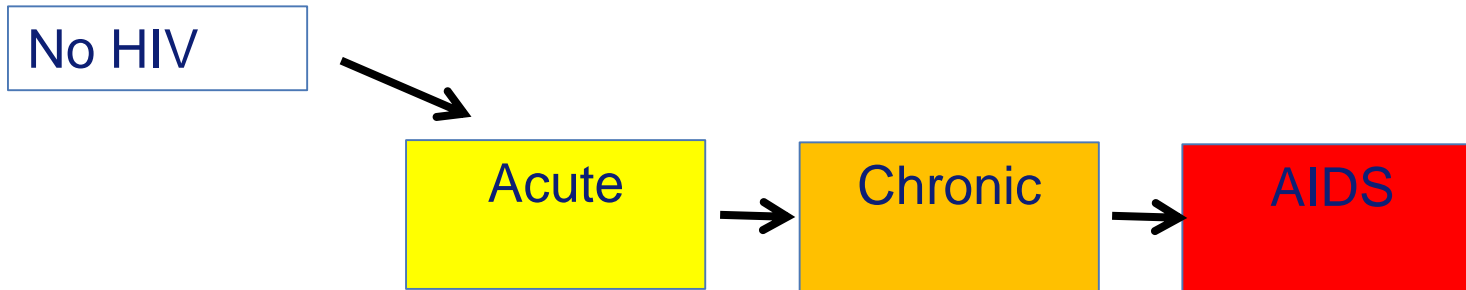
HIV- transmission model



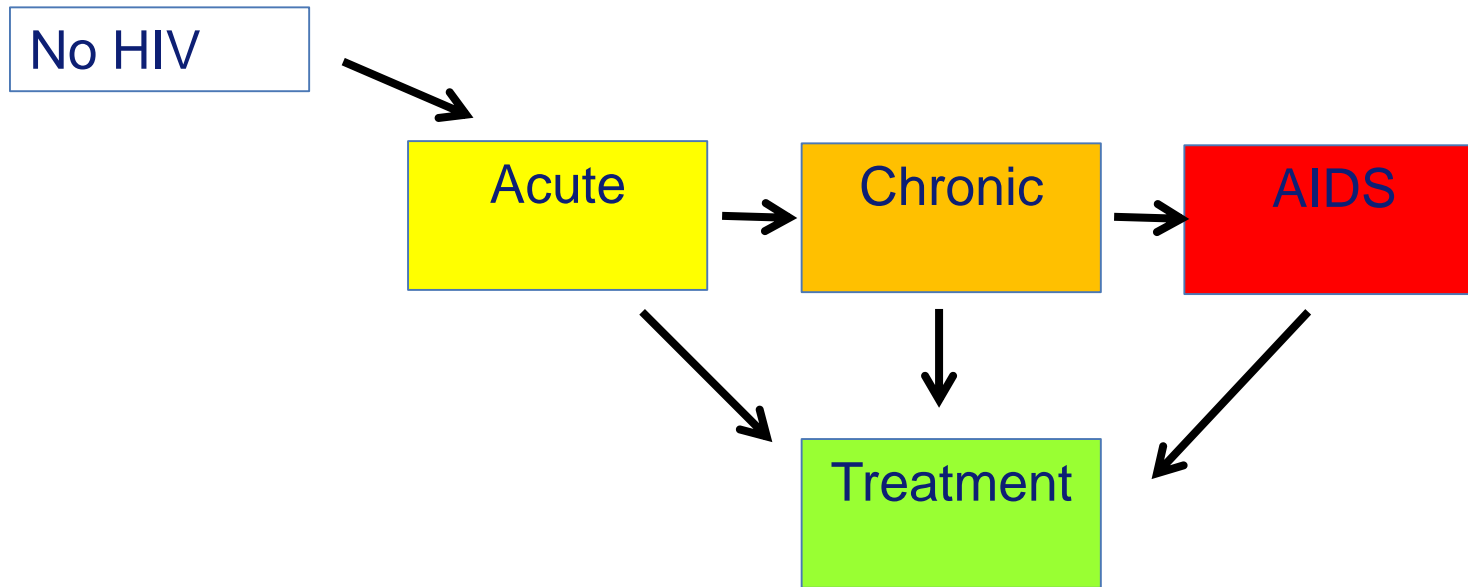
Chronic stage stratified based on CD4 cell count in three categories:

- 1) >500 cells/ μ l
- 2) between 350 and 500,
- 3) between 200 and 350

HIV- transmission model



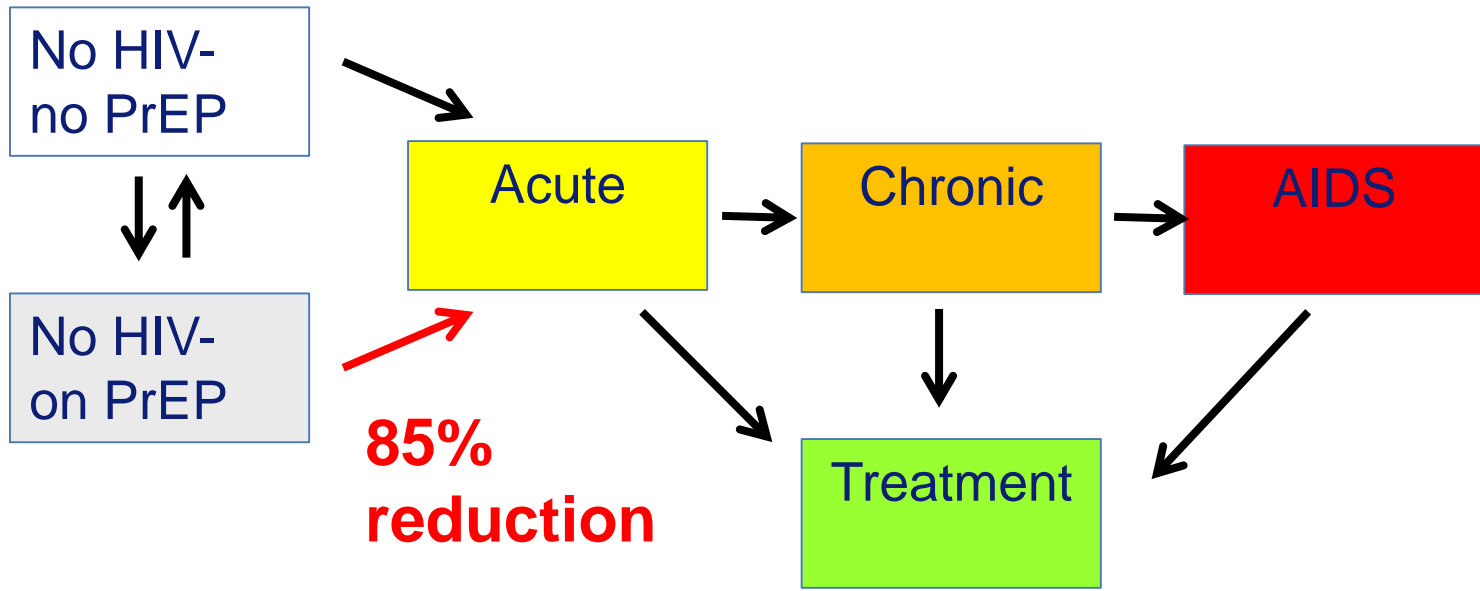
HIV- transmission model



Model is calibrated to historic epidemic

- Number of new and existing diagnosed individuals
- Proportion diagnosed at particular CD4 threshold

HIV- transmission model



Quality of life



- Measuring effectiveness
 - Quality Adjusted Life Years (QALY)

QALY	Value
PrEP	1
HIV, CD4 >350	0.94
HIV, CD4 between 200 & 350	0.82
HIV, AIDS	0.7
On treatment	0.94

Nichols et al. Lancet Infect Dis 2016 based on Simpson 2004

Cost effectiveness

- Compared to when PrEP is not available:

$$\frac{\text{Extra costs}}{\text{Gain in QALYs}}$$

- Discounting of 3%
 - 40 year time horizon
 - Willingness-to-pay: < €20 000 / QALY gained
 - UK <£ 30,000 / QALY

Annual costs



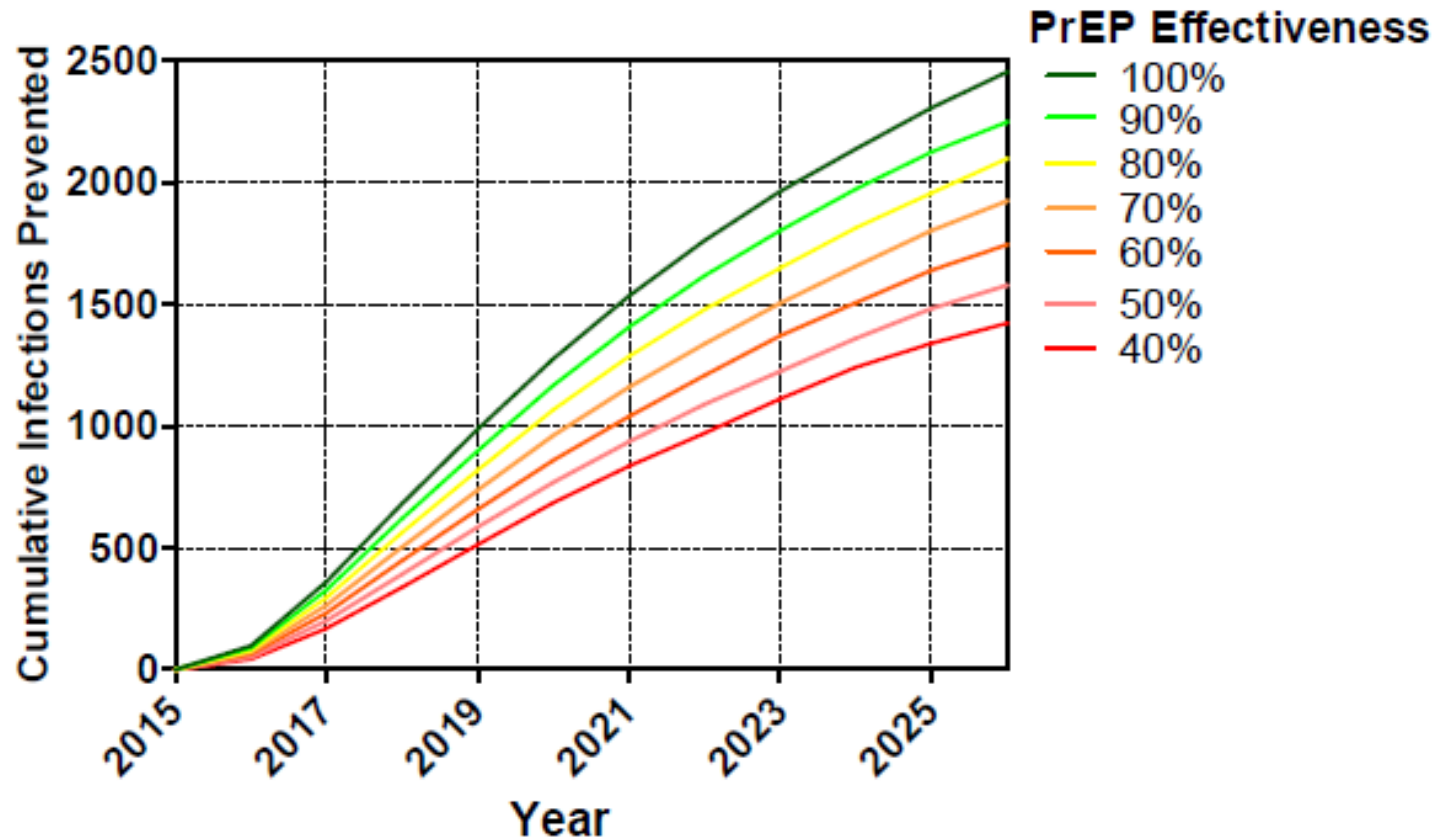
- PrEP
 - Generic PrEP: €50 per months
 - Costs of care (kidney function, HIV testing)
- Treatment with antiretroviral drugs
 - € 13 000 (Netherlands)
 - € 17 000 (Germany)

*Nichols et al Lancet Infect Dis 2016,
van de Vijver et al. Eurosurveillance 2019*

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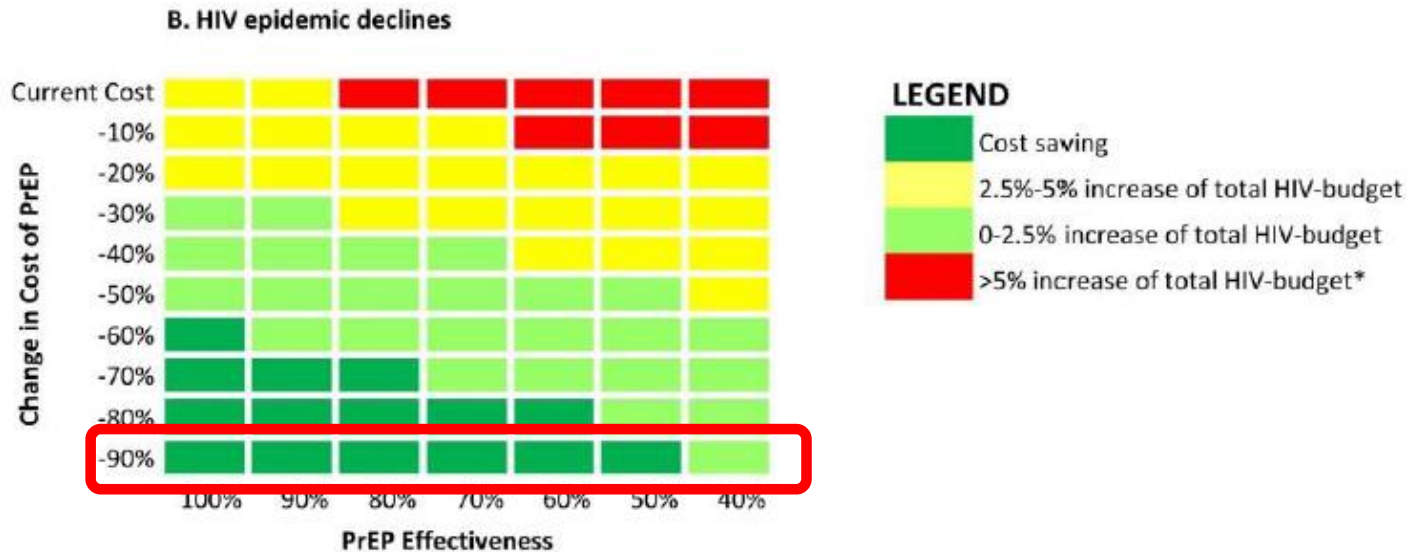
Impact on HIV - Netherlands



Reduction of 12%, PrEP targeted to 10% of high risk MSM

Nichols et al Lancet Infect Dis 2016

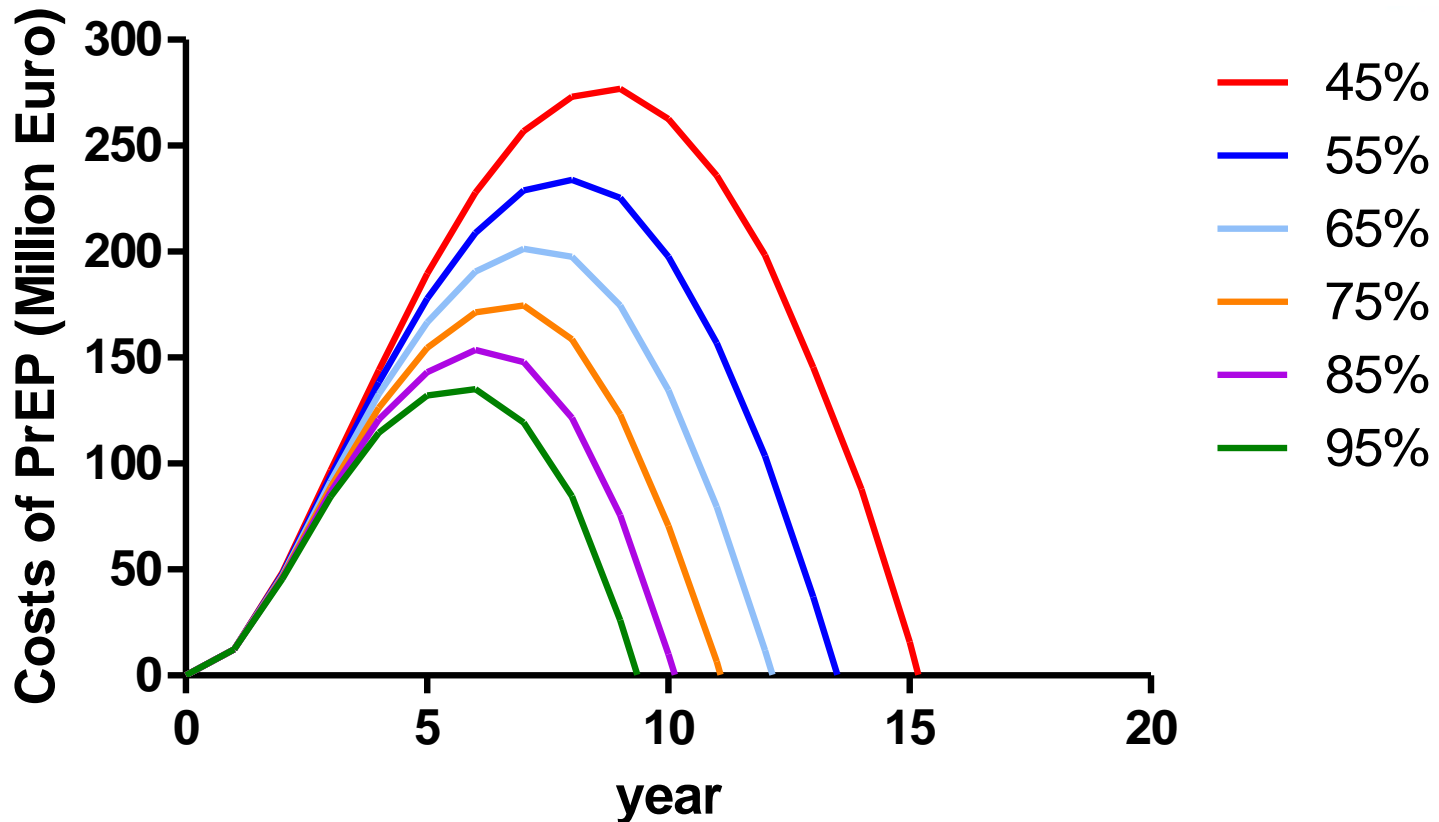
Budget impact



Generic PrEP is cost-saving

- In the Netherlands (Nichols et al. Lancet Infect Dis 2016)
- In Germany (van de Vijver, Eurosurveillance 2019)

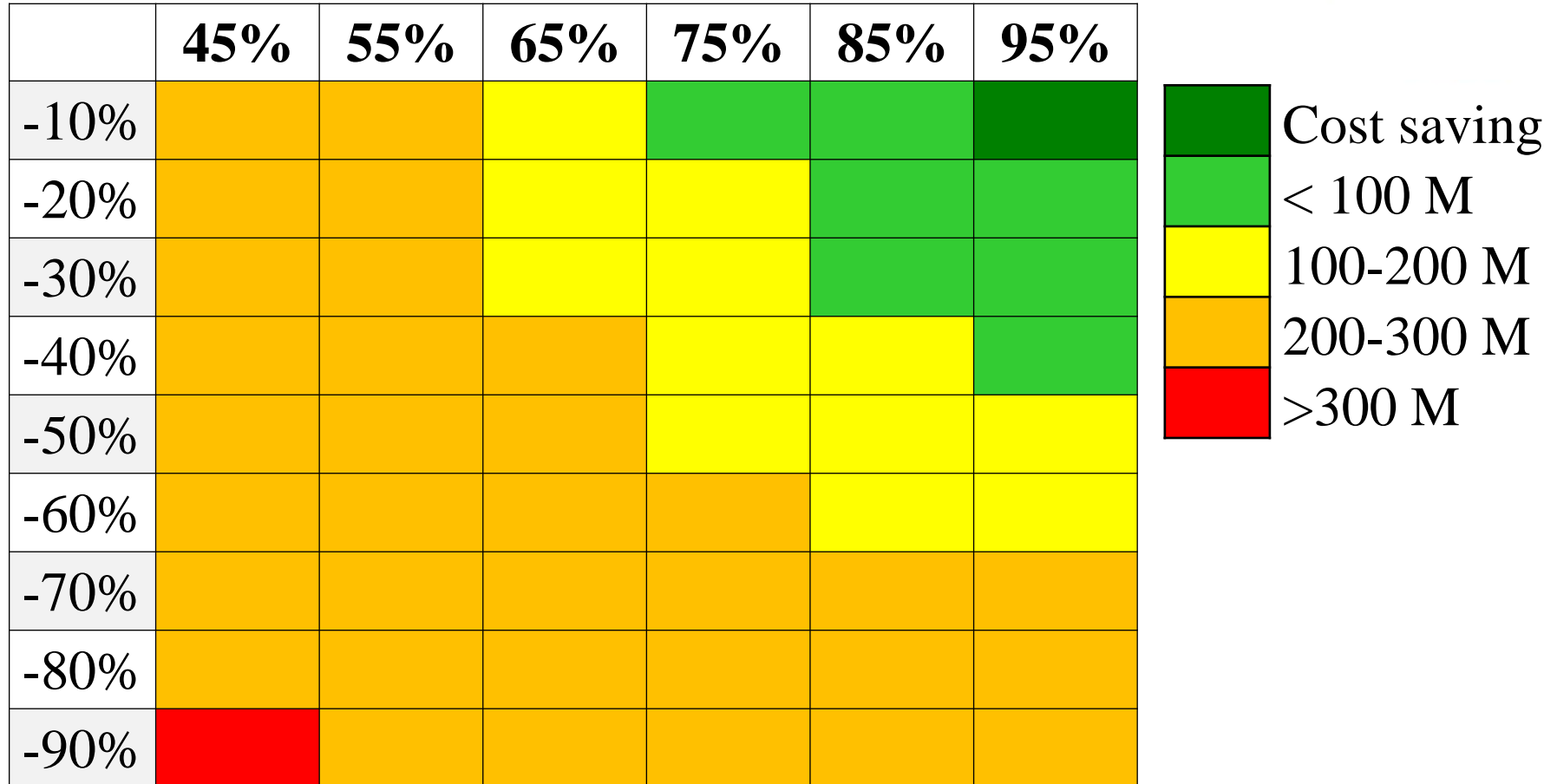
Break-even point



Price of treatment

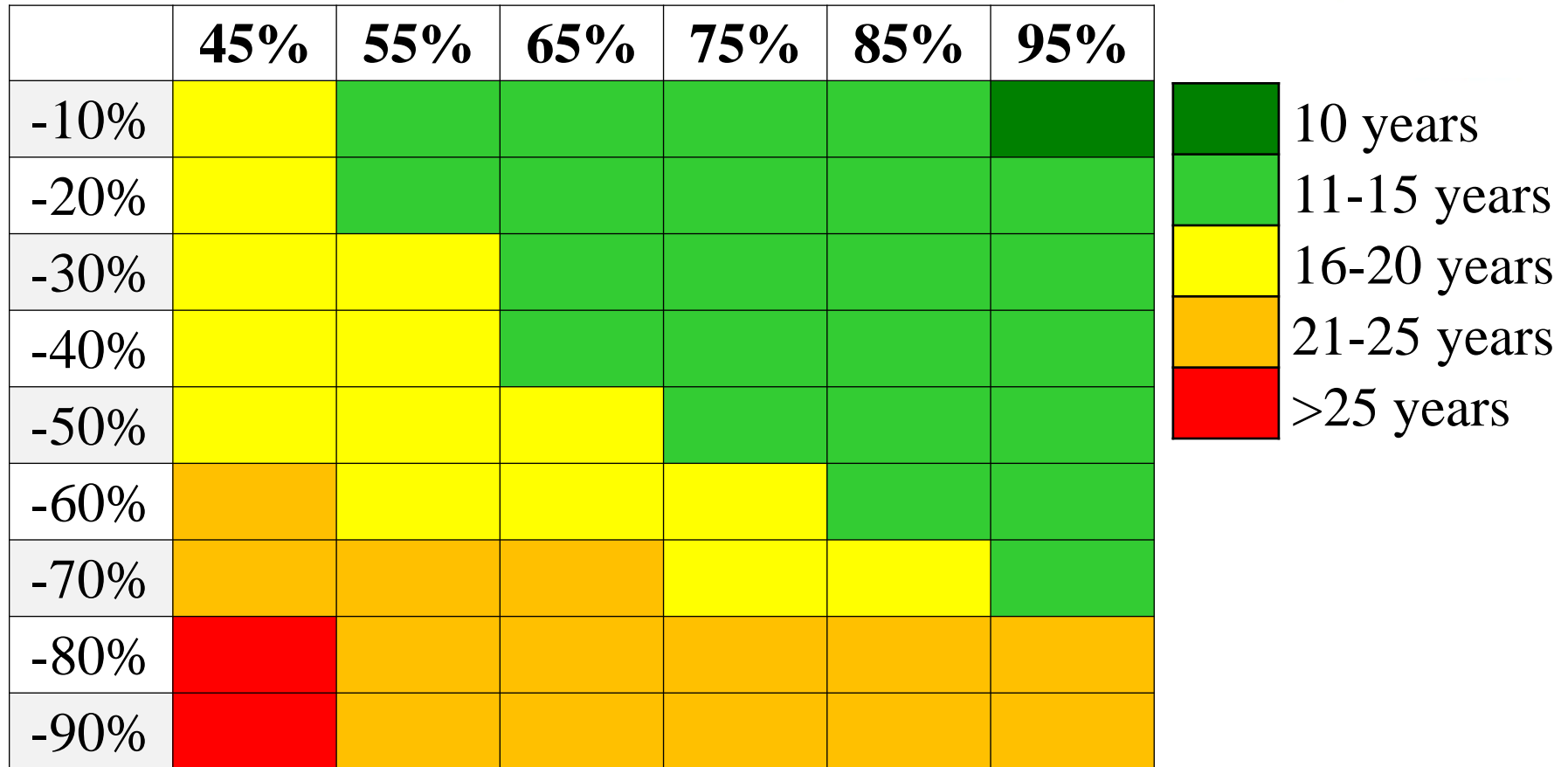
- Tenofovir and emtricitabine popular in first line regimens
 - Tenofovir disoproxil fumarate (TDF)
 - Generic versions can reduce price of treatment
- >80% price reduction unlikely
 - Dolutegravir remains branded
 - TAF

Reduced price of treatment



Costs after ten years

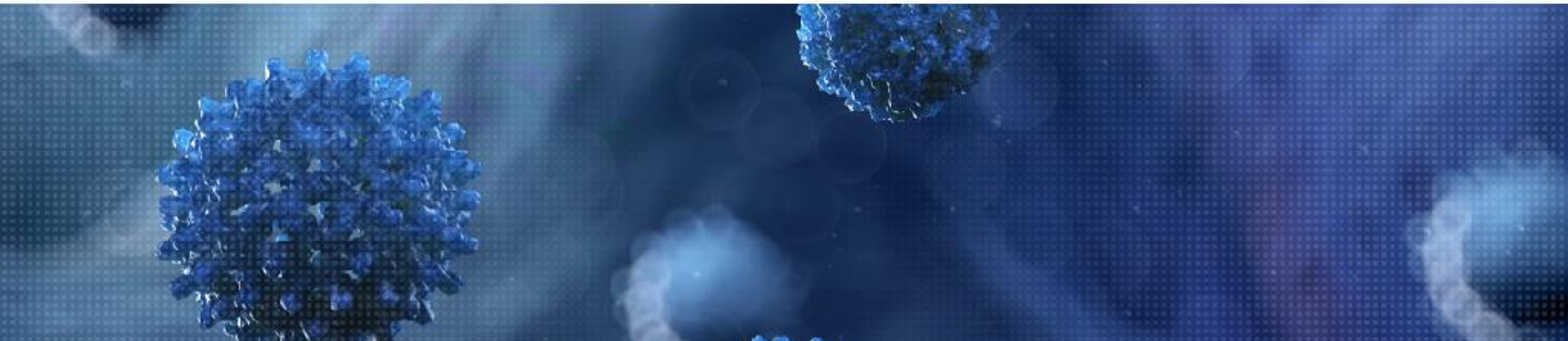
Break-even point (years)



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Conclusions

Limitations

- Transmission models are important, but have limitations
 - 40 year time horizon
 - Risk behaviour is difficult to assess

PrEP

- Implementation of PrEP is cost-saving
 - Strongly depends on difference between cost of PrEP and cost of treatment.
 - Germany and the Netherlands
 - Also in UK
 - Cambiano et al. Lancet Infect Dis 2018
- Requires economic investments
 - Invest now in PrEP and save money in the longer-term

Acknowledgments

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