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HIV in MSM in the UK: Prevention effects of ART in perspective

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Background

- Transmission of HIV in MSM in Europe remains at high levels.
- Greater rates of HIV testing and earlier ART initiation are proposed as means to reduce HIV incidence, by decreasing the number of MSM living with unsuppressed HIV viral load.
- In the UK, ~60% of HIV+ MSM (diagnosed and undiagnosed) are estimated to have viral suppression on ART

Questions to be addressed

Taking the specific example of the HIV epidemic in MSM in the UK, and considering potential future increases in testing and changes in ART initiation threshold:

- What proportion of people with HIV should have viral suppression in order to reduce incidence below 1 per 1000 person years ? (i.e. ~ 600 new infections per year)
- Will policies to increase testing be cost-effective ?

HIV Synthesis Model

- Individual based stochastic simulation model
- Each time model program is run it simulates a dataset of the experience of the entire adult population of a country
- Variables in simulated data set:-

Whole adult MSM population
Age
Gender
Condomless anal sex
Current STI

HIV positive MSM
Time from infection
CD4 count
Viral load
Specific drugs
Currently on ART
Current adherence level
Drug resistance mutations
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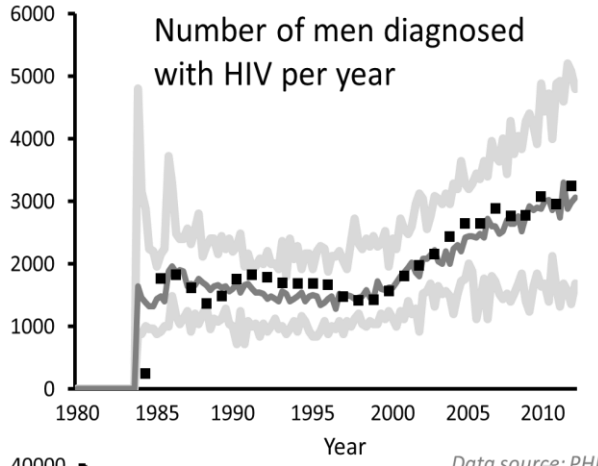
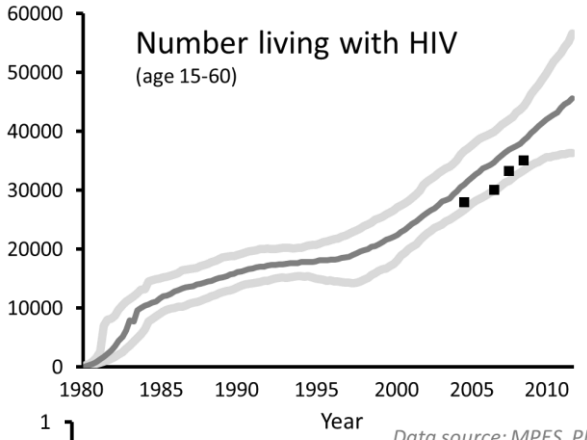
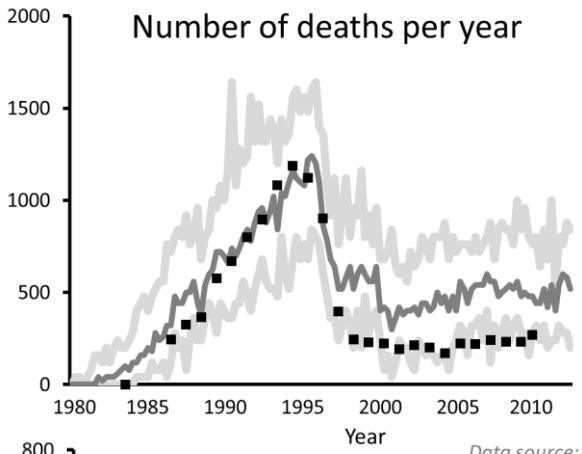
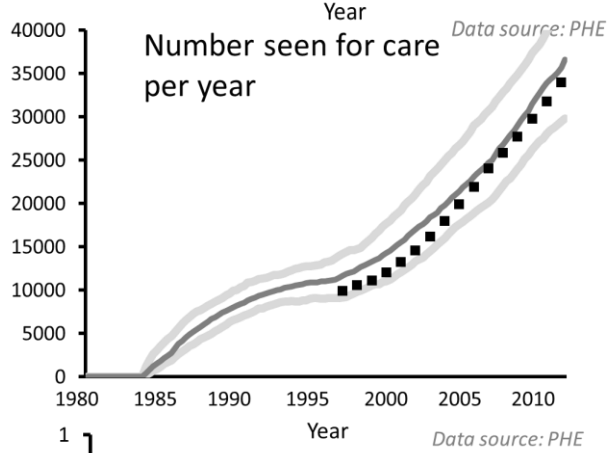
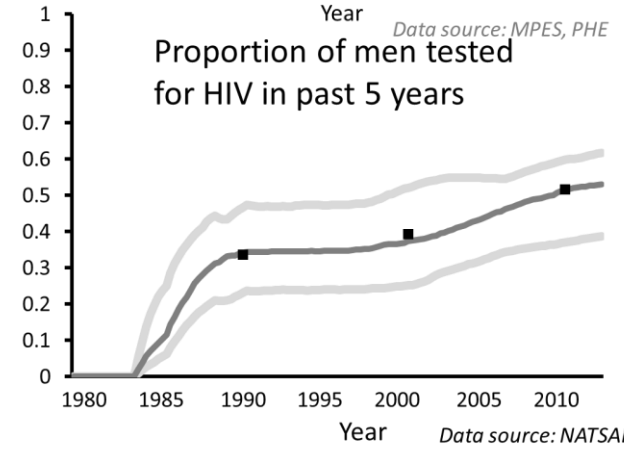
Model-based analysis of the UK epidemic in MSM

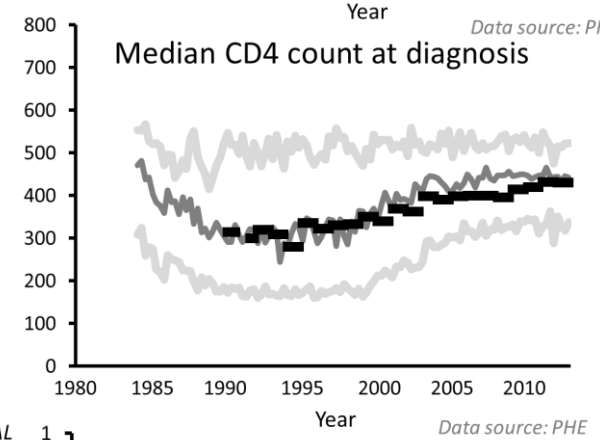


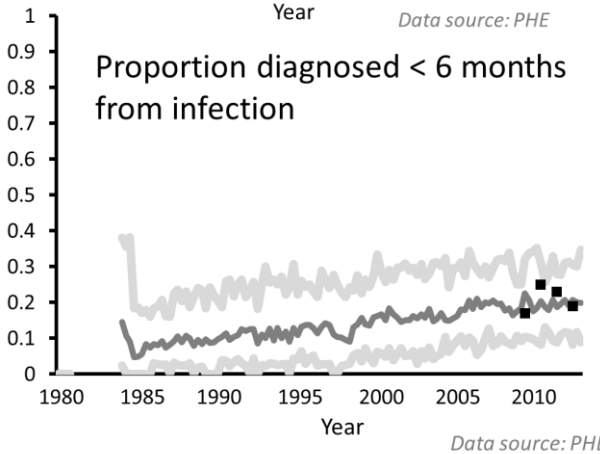


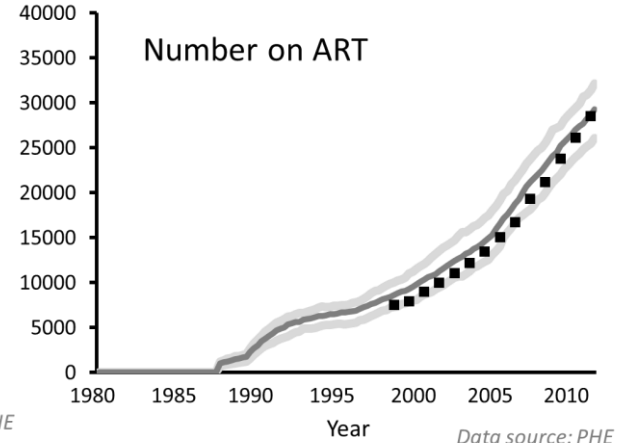


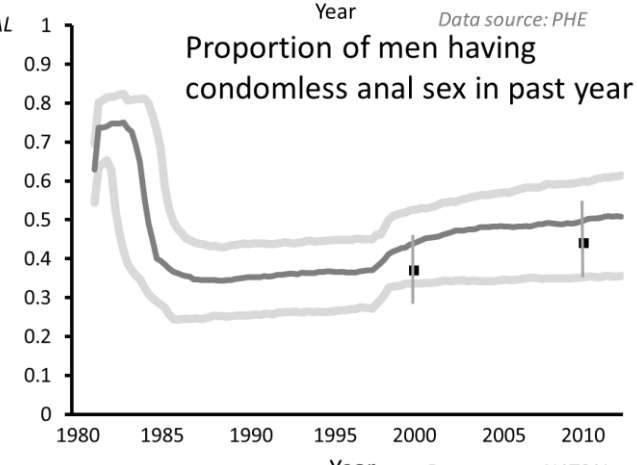






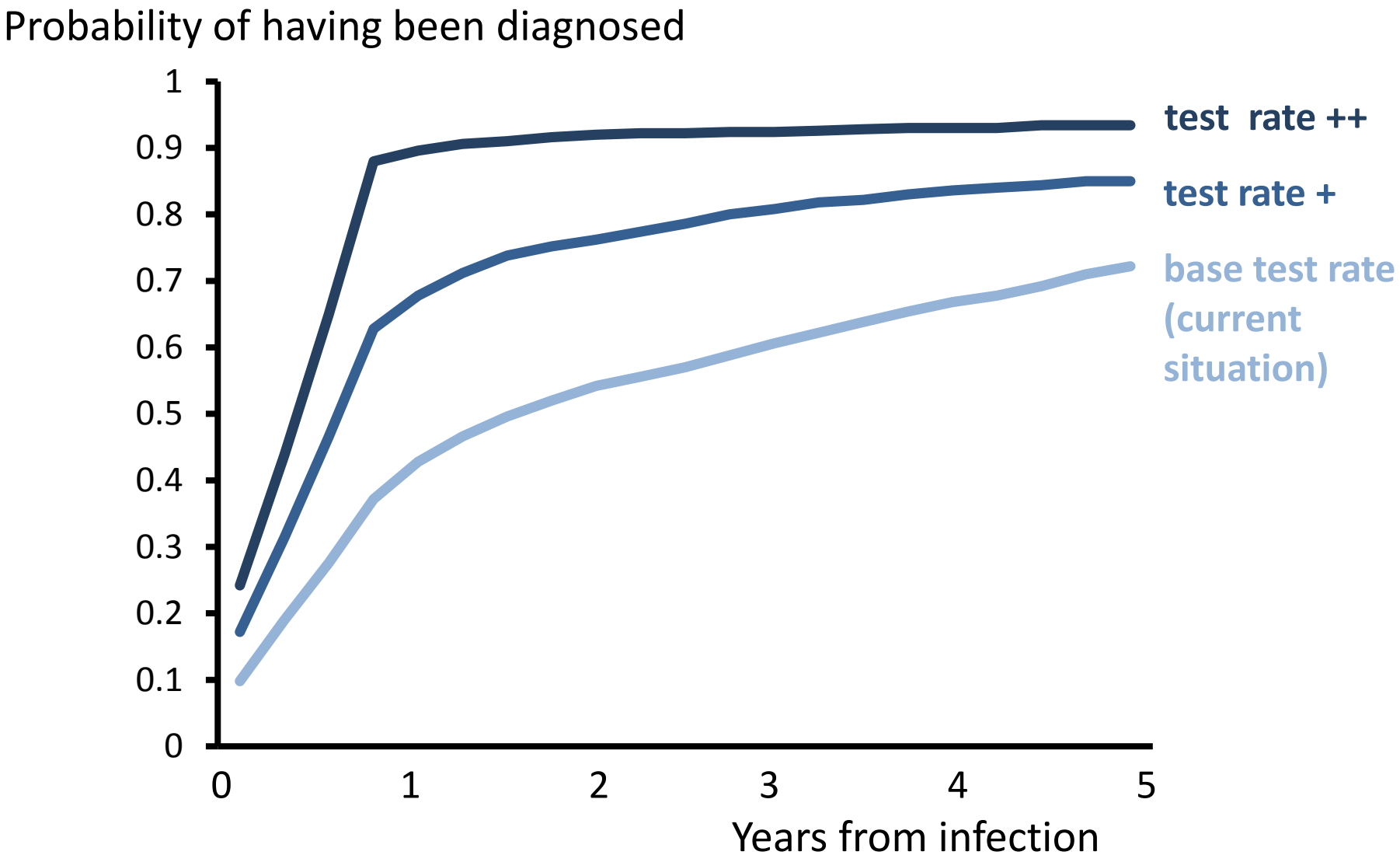




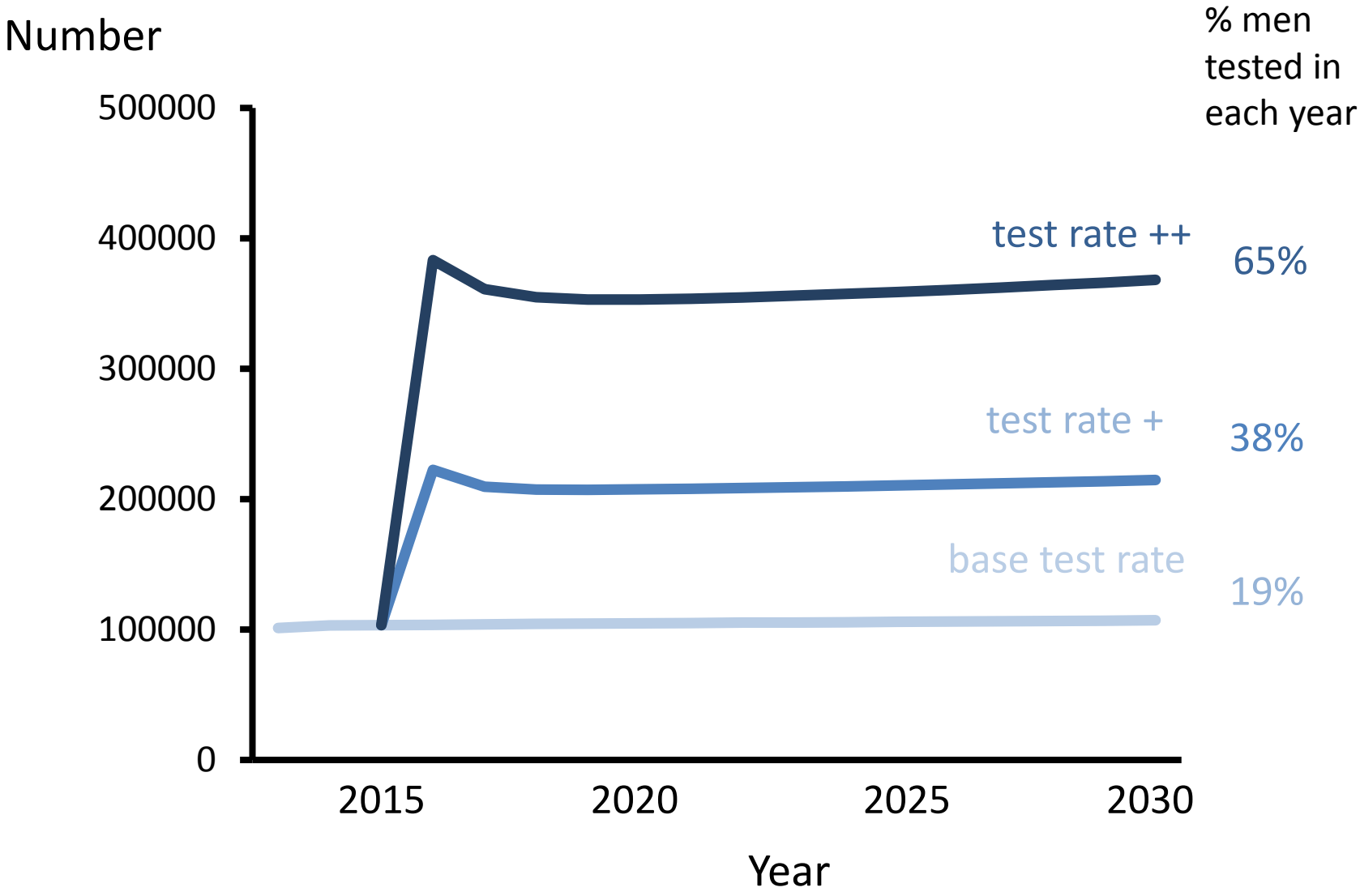


Potential increases in testing: Probability of diagnosis by time from infection

For those infected after 2015

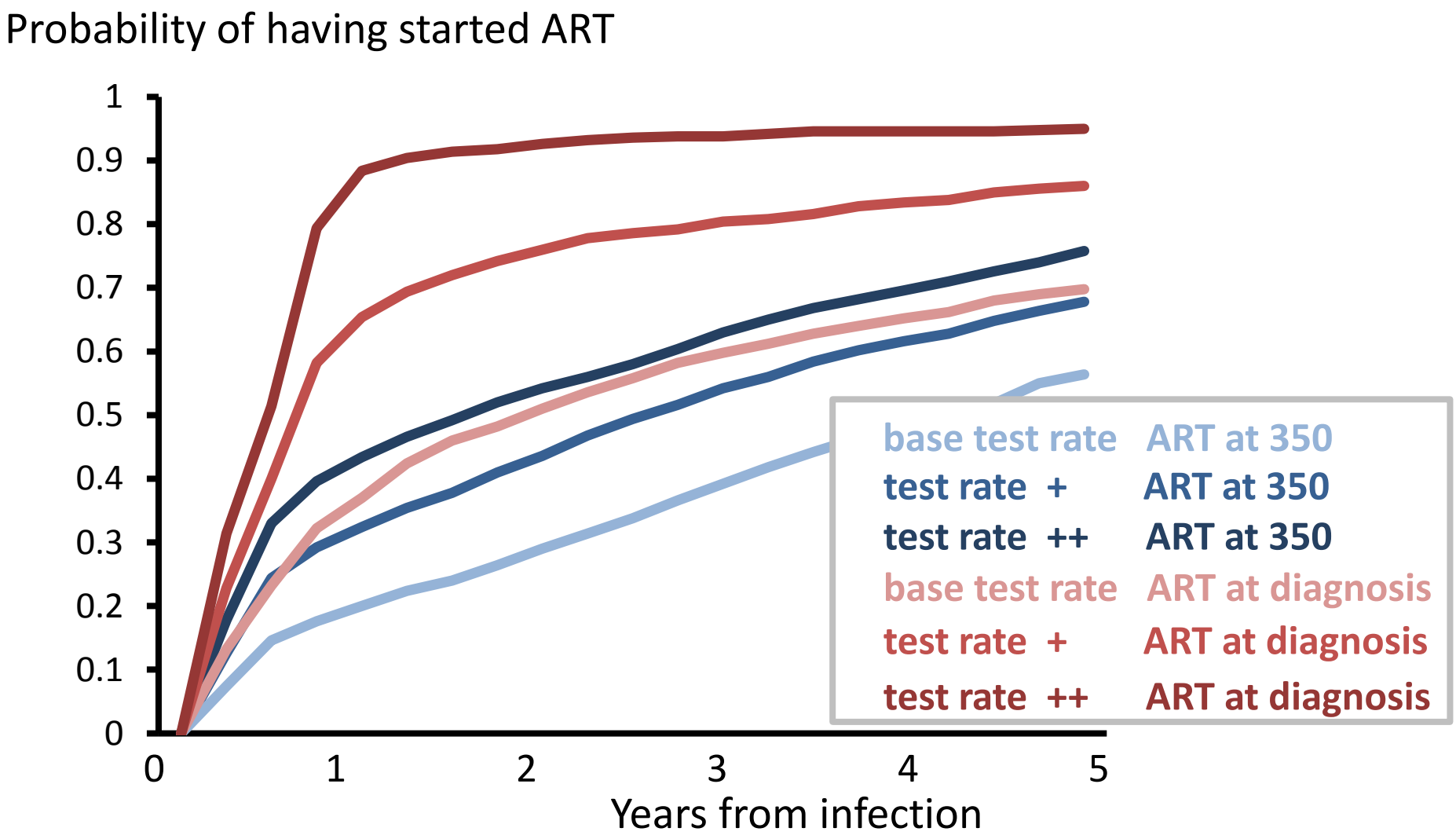


Potential increases in testing: Number of tests done per year

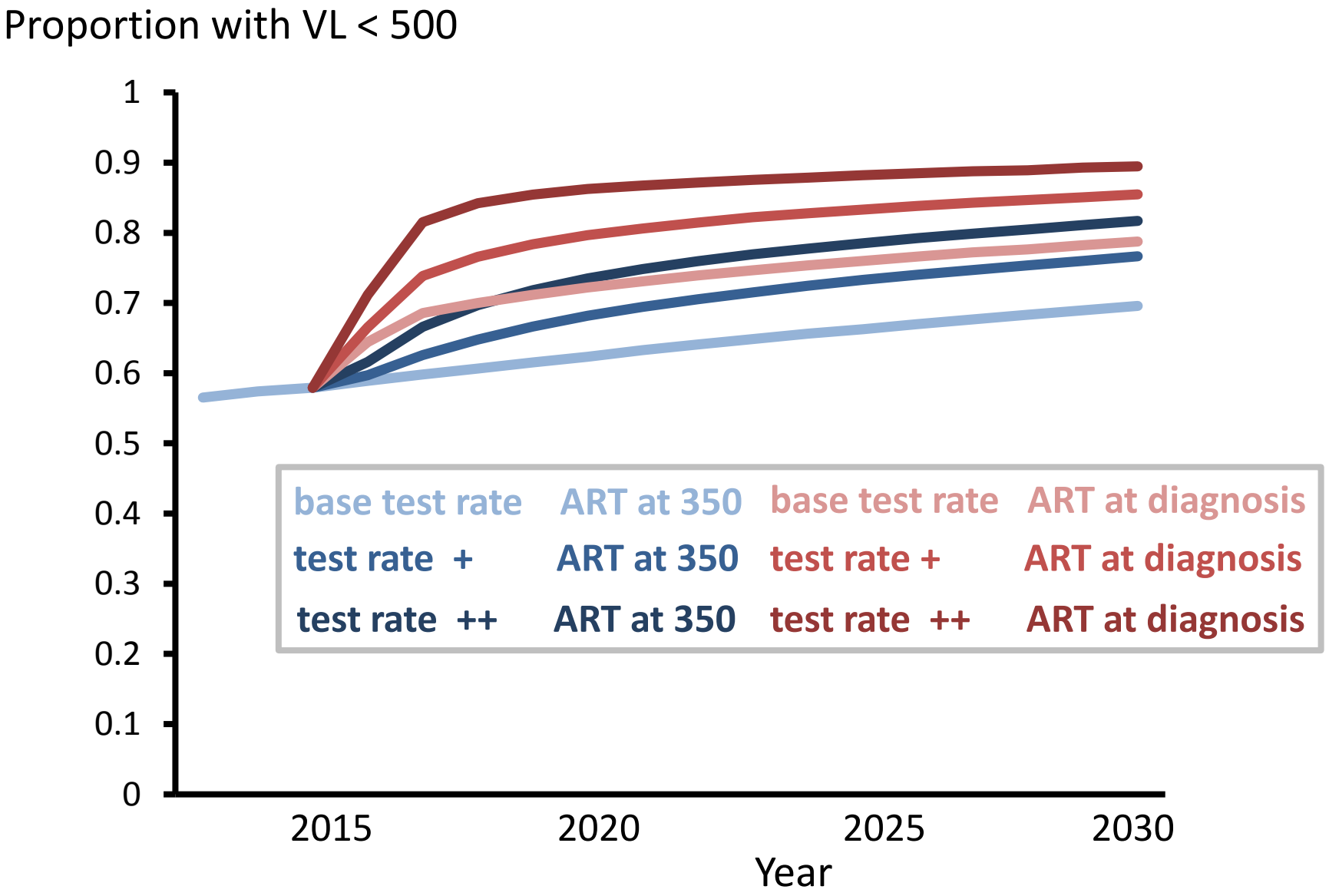


Potential increases in testing and change in ART initiation criteria: Initiation of ART by time from infection

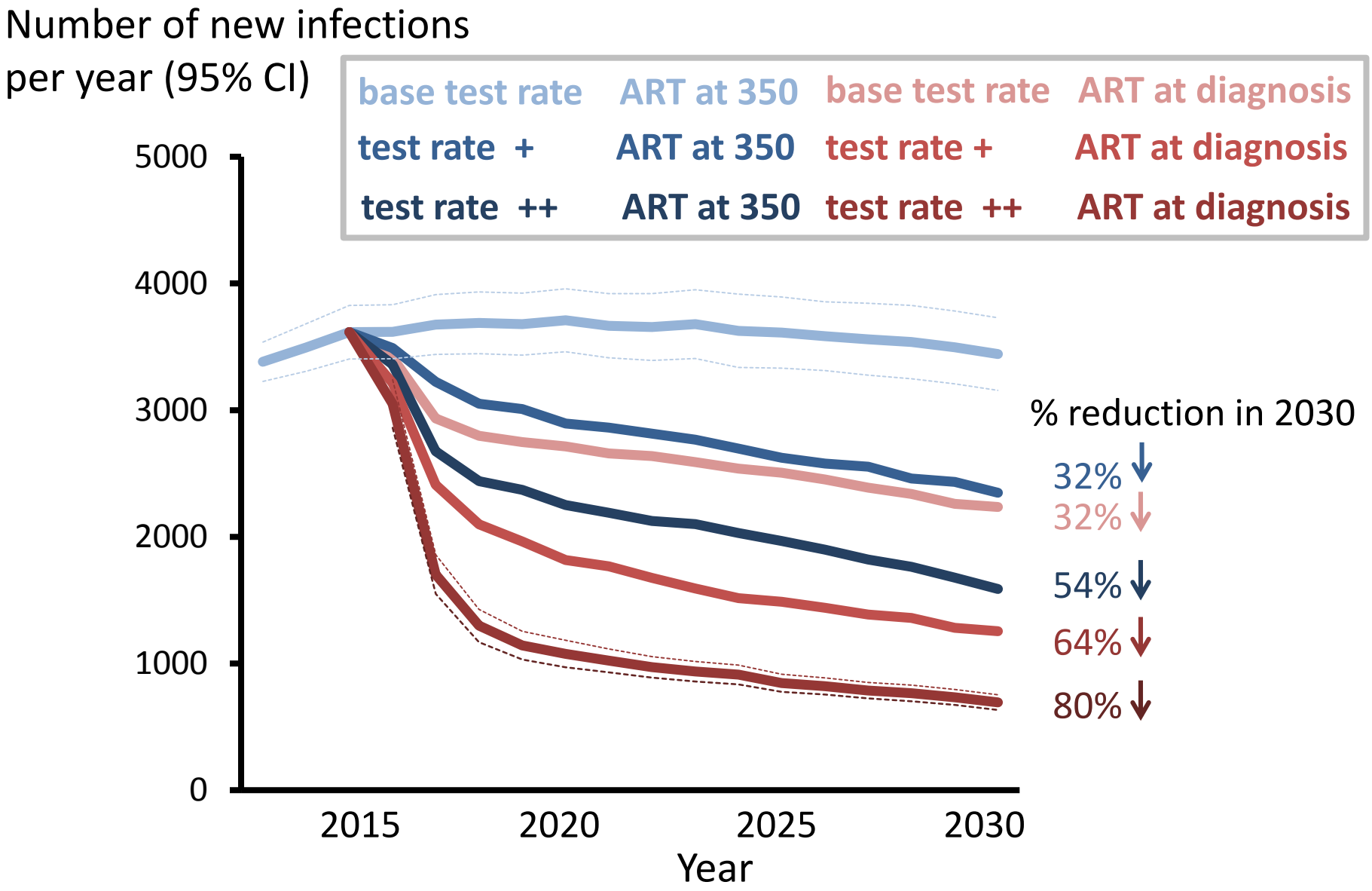
For those infected after 2015



Proportion of all HIV positive people with VL < 500

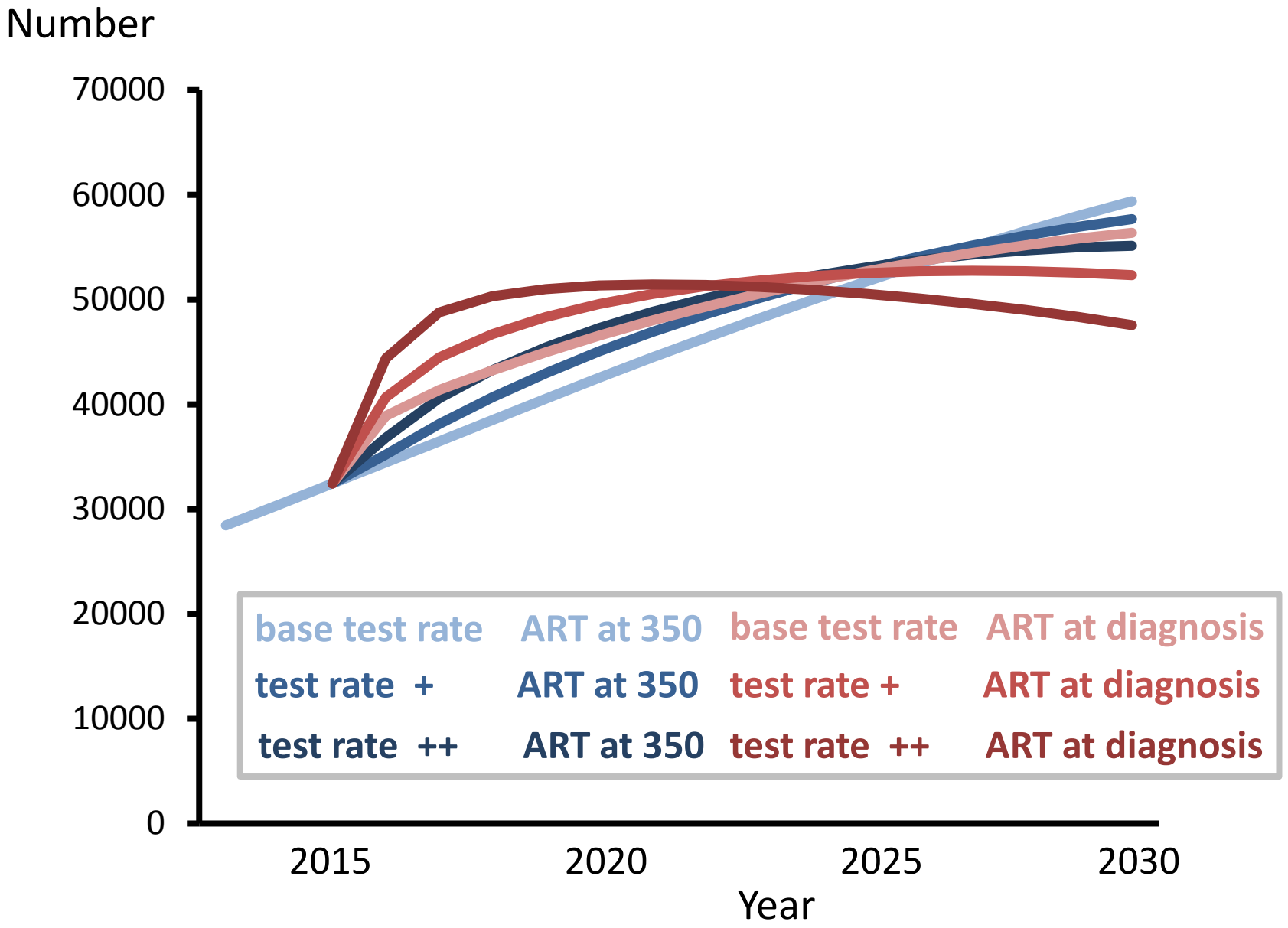


HIV incidence

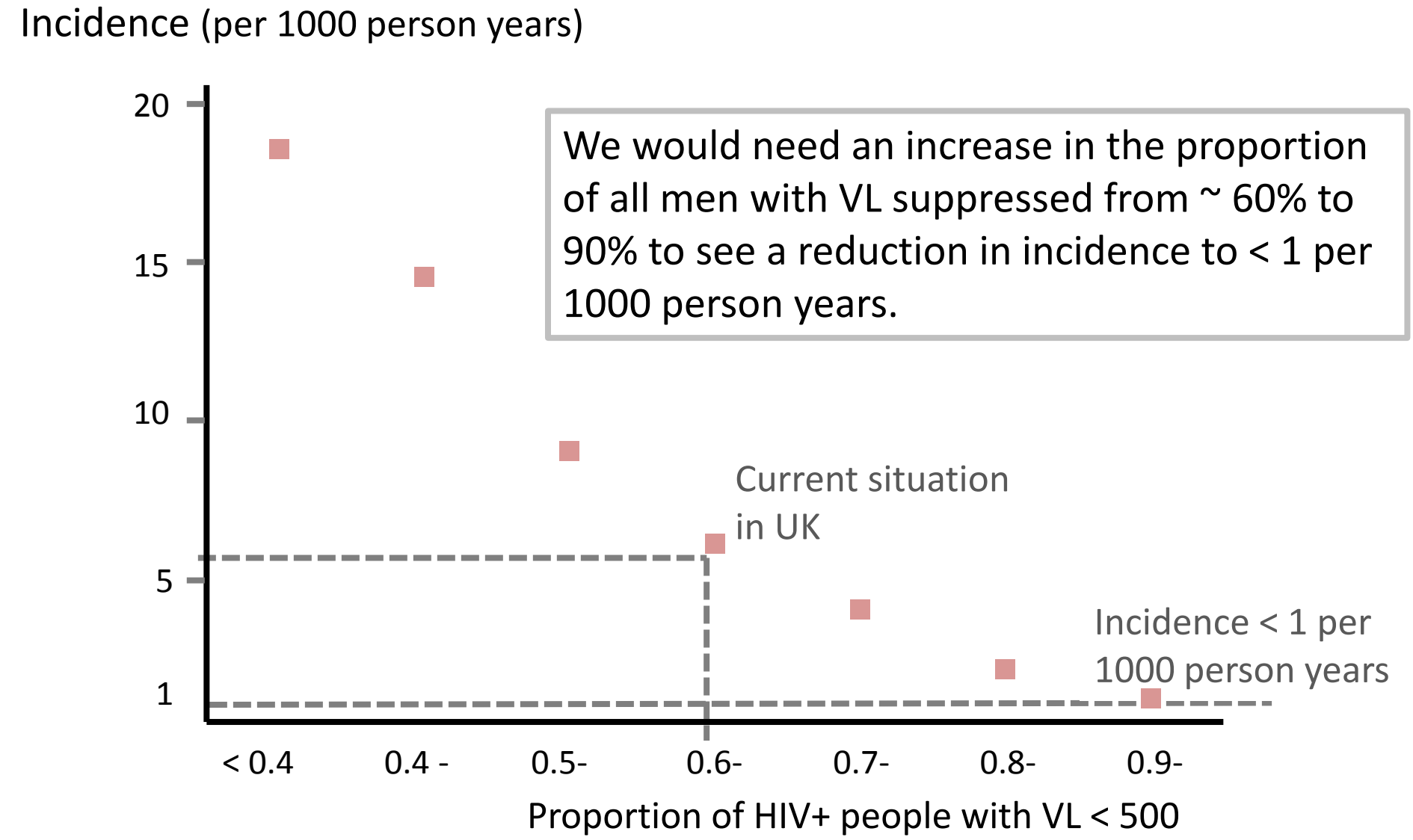


95% CI given for two lines to illustrate uncertainty over mean effect

Number of men on ART

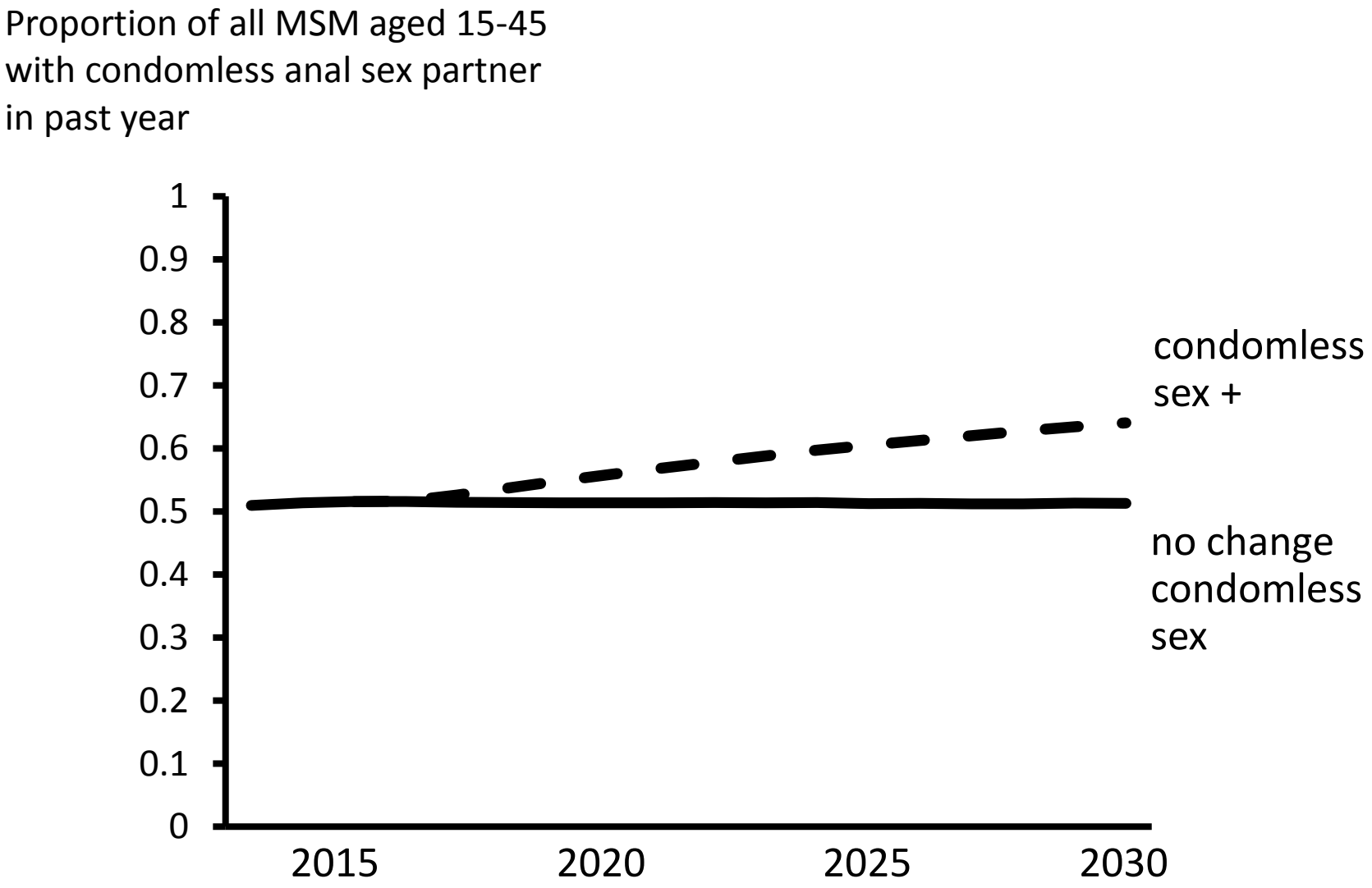


Mean number of new infections per year according to proportion of people with HIV who have VL < 500

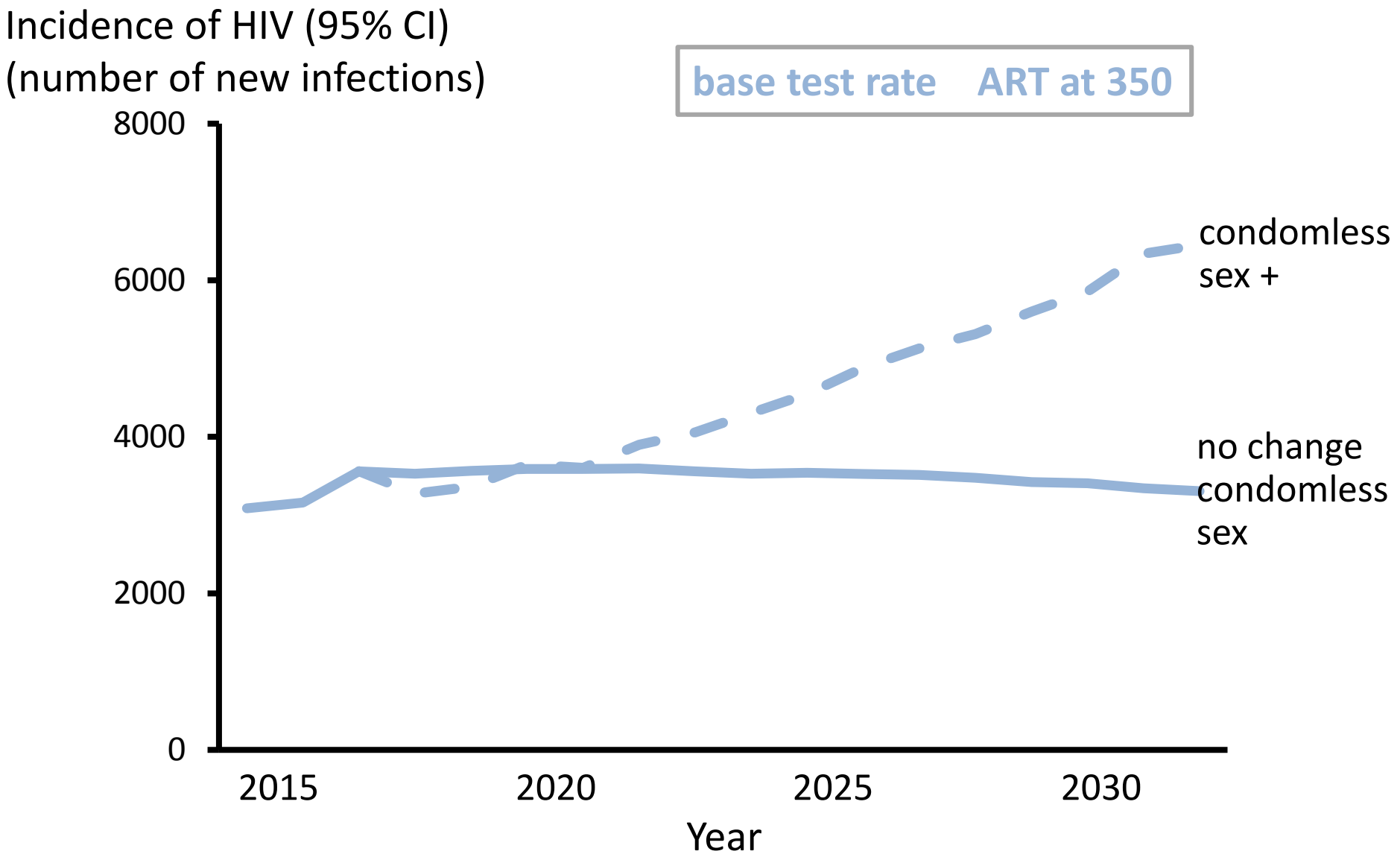


95% confidence intervals are within squares.

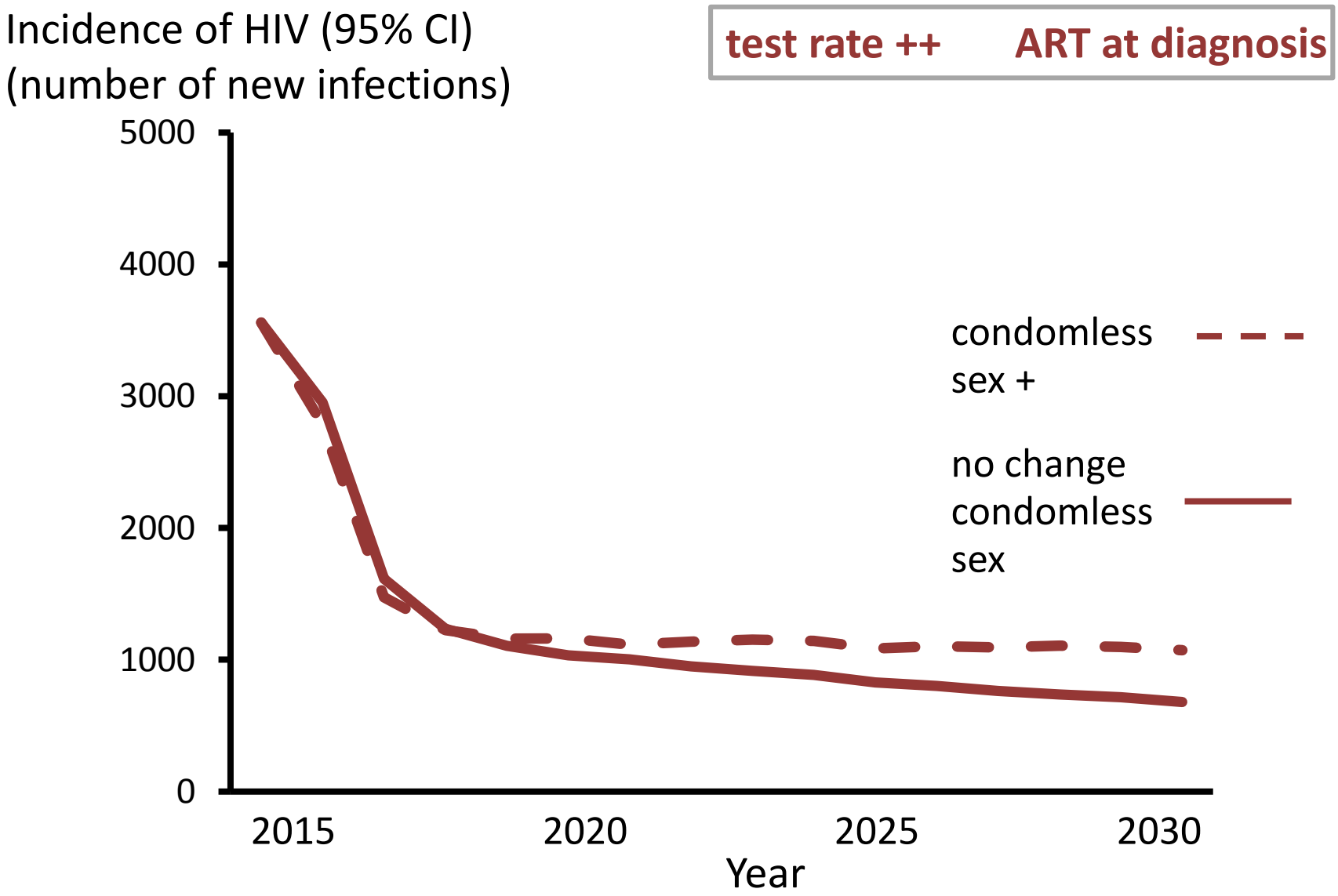
Change in condomless sex (CLS)



Predicted effect of changes in condomless sex on HIV incidence



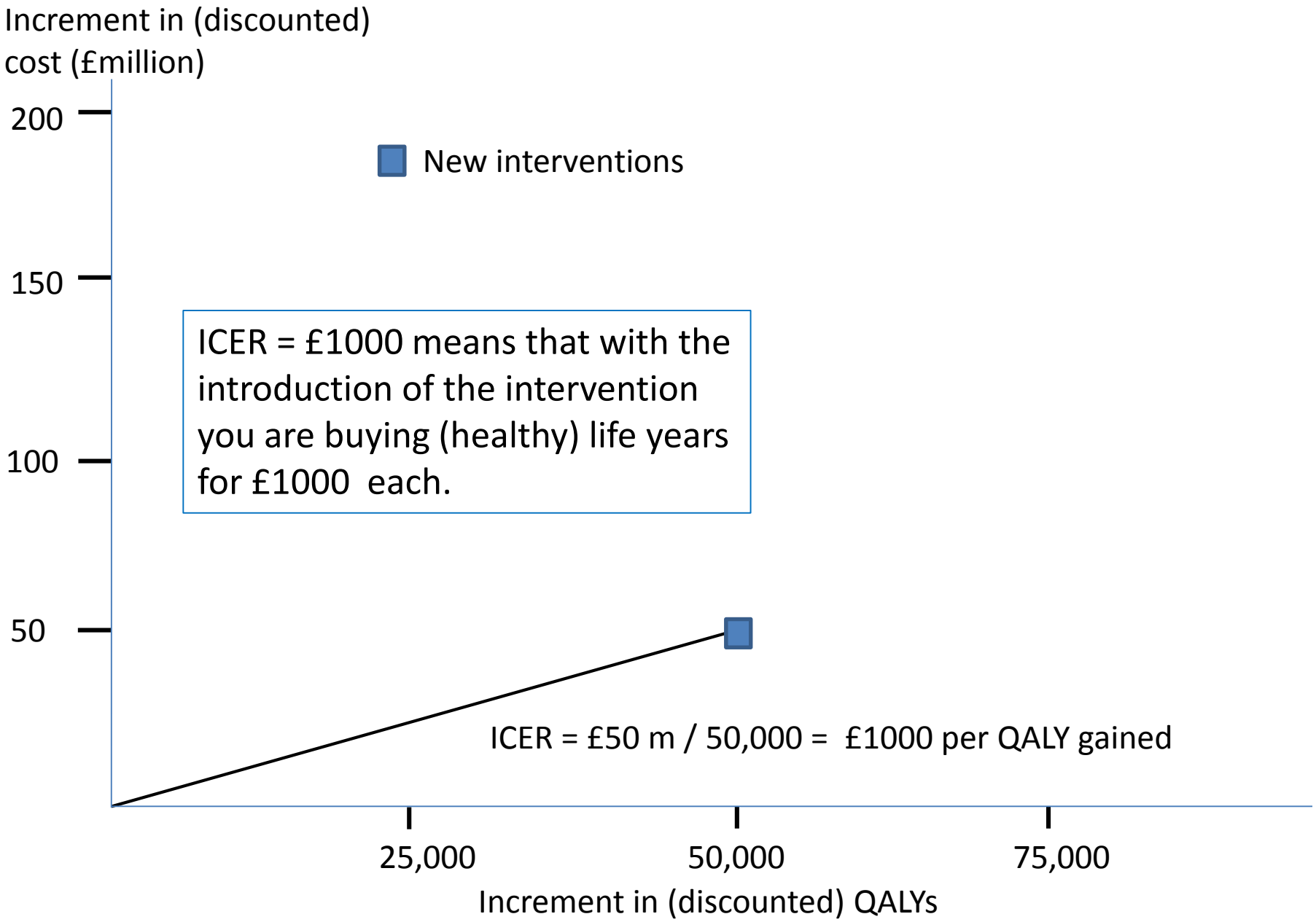
Effect of change in condomless sex on HIV incidence according to change in condomless sex.



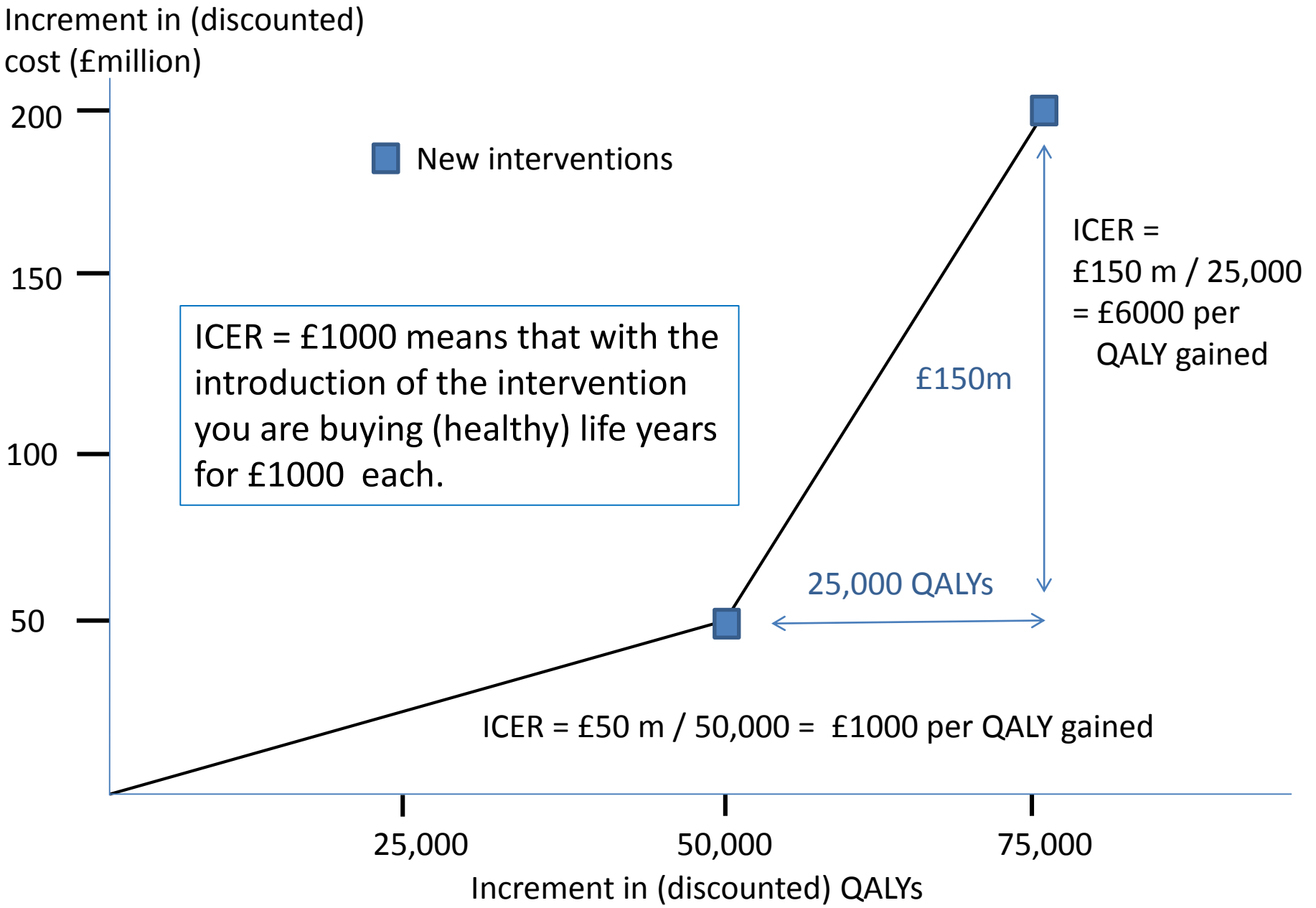
Cost effectiveness analysis

- A certain amount of resource spent on an effective intervention is buying (healthy) life years
- Cost effectiveness is about allocating resources such that any resources available for health care are used to buy the maximum number of (healthy) life years.
- Quality adjusted life year (QALY) = 1 year of healthy life

Incremental cost effectiveness ratio (ICER) - concept



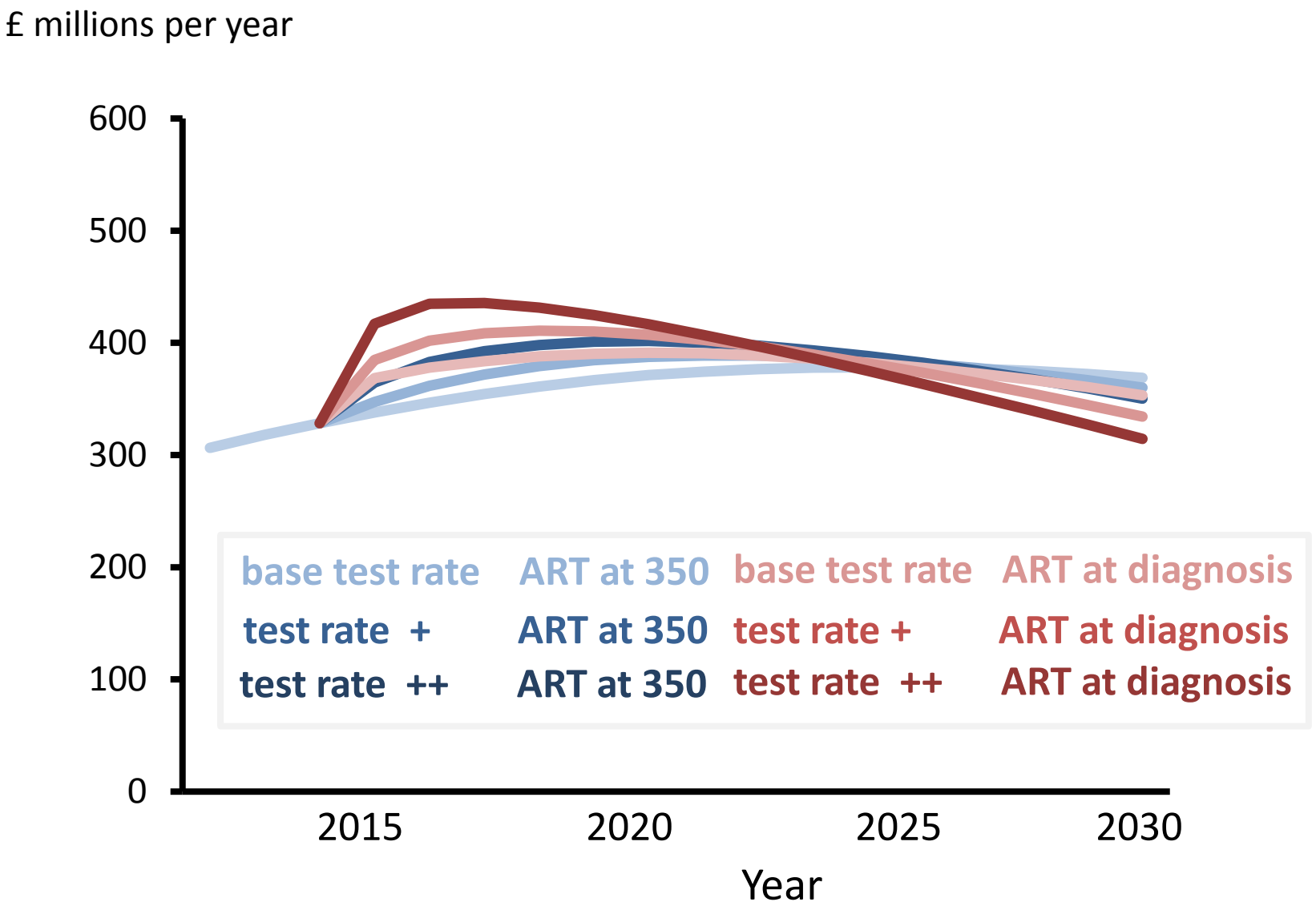
Incremental cost effectiveness ratio (ICER) - concept



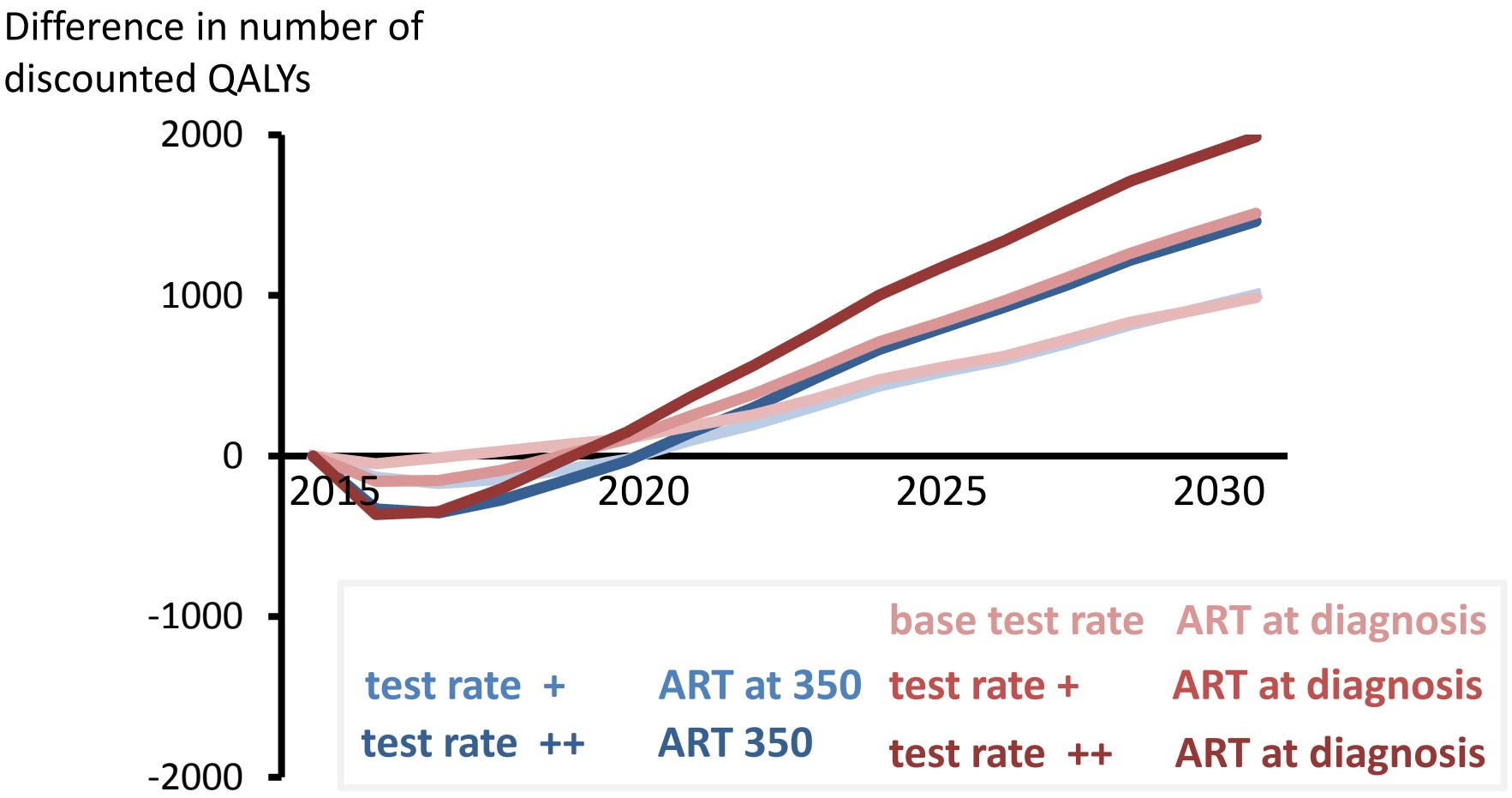
Cost effectiveness analysis

- How low does the cost of the healthy life years produced (the ICER) need to be ?
- Consider ICER associated with every possible activity that results in health benefit.
- Implement them from cheapest up, until we have exhausted the health budget.
- Current UK working threshold £20,000 - £30,000
- For fixed or declining health budget, adopting any new intervention that incurs costs means displacing other interventions.

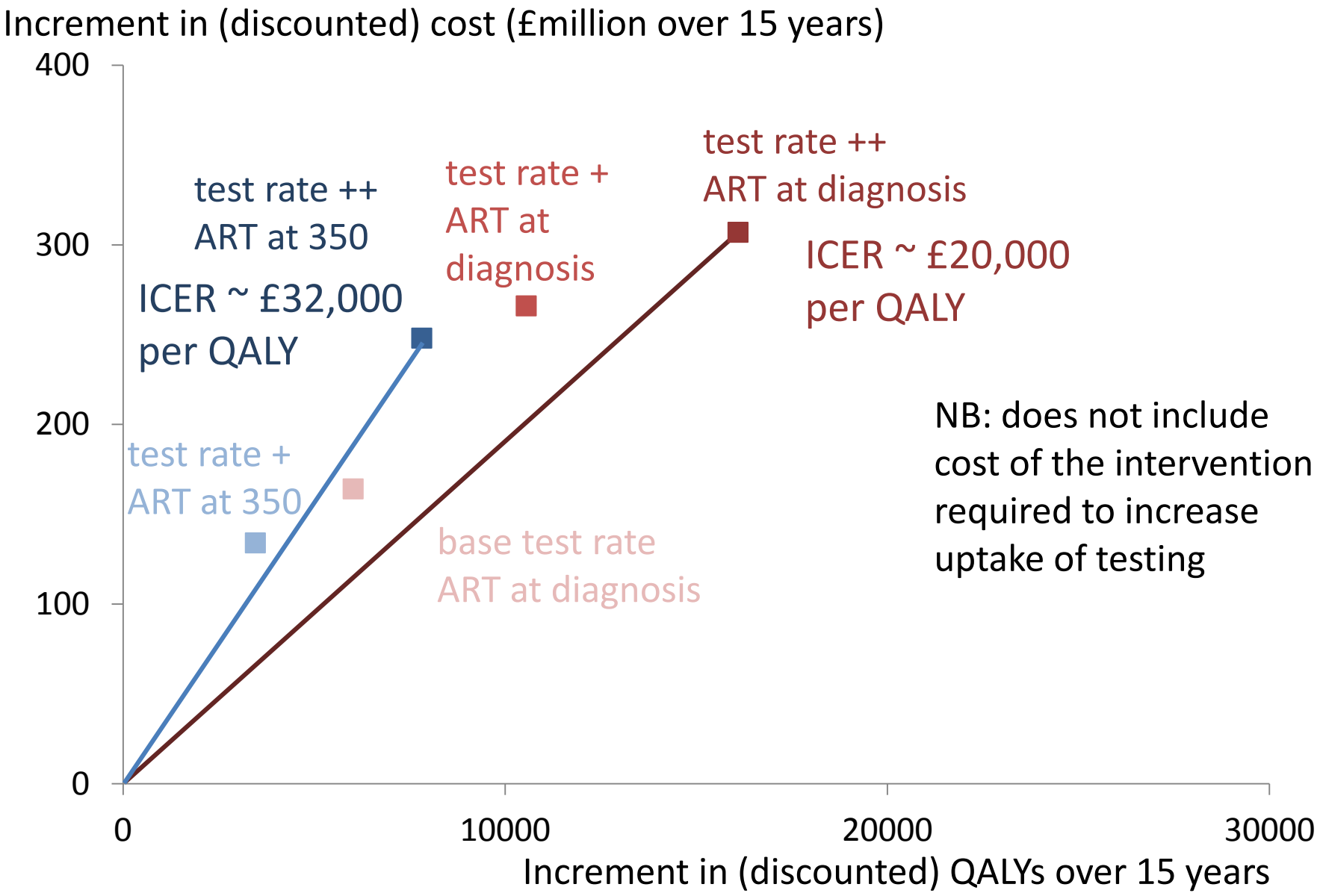
Total cost of HIV care (discounted at 3.5% per year)



Difference in QALYs lived per year in entire MSM population compared with base test rate, ART at 350



Incremental costs and QALYs over 15 years compared with base test rate, ART at 350



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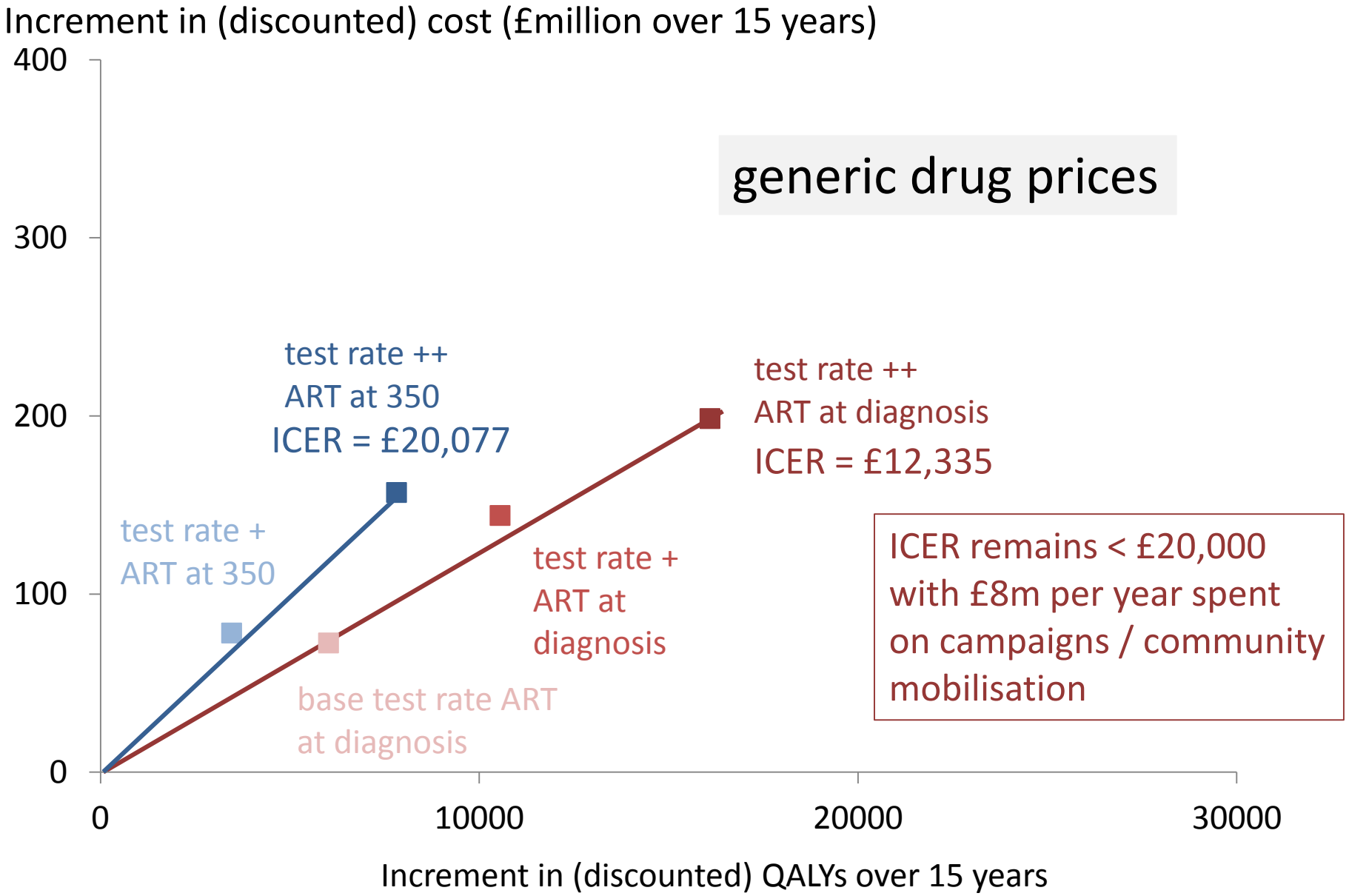

Comments / Other issues

- Infections from men in primary infection
- Assume men with large numbers of condomless sex partners are not differentially resistant to testing or taking ART
- ART coverage in MSM visiting from abroad who have sex in the UK
- PrEP has been introduced in model (Cambiano et al presented at BASHH)

Summary and conclusions

- What proportion of people with HIV should have viral suppression in order to reduce incidence below 1 per 1000 person years ?

  Around 90%. To achieve this requires:

  - *around 90% of people are diagnosed within 1 year of infection (currently < 50%),*
  - *linkage, adherence and retention remain high*
  - *ART is initiated at diagnosis (trial results awaited).*
  - *levels of condomless sex do not increase significantly.*

Summary and conclusions

- Will policies to increase testing in UK MSM be cost-effective ?

  Considering current drug prices, over a time horizon of 15 years or more, increased testing is likely to be cost effective.

  If antiretroviral drug costs are substantially reduced with introduction of generics then increased testing is cost effective over a much shorter time horizon, and highly cost-effective if ART is initiated at diagnosis.

Acknowledgements

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Extra data analyses to compare with: Cath Mercer, Lisa McDaid.

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