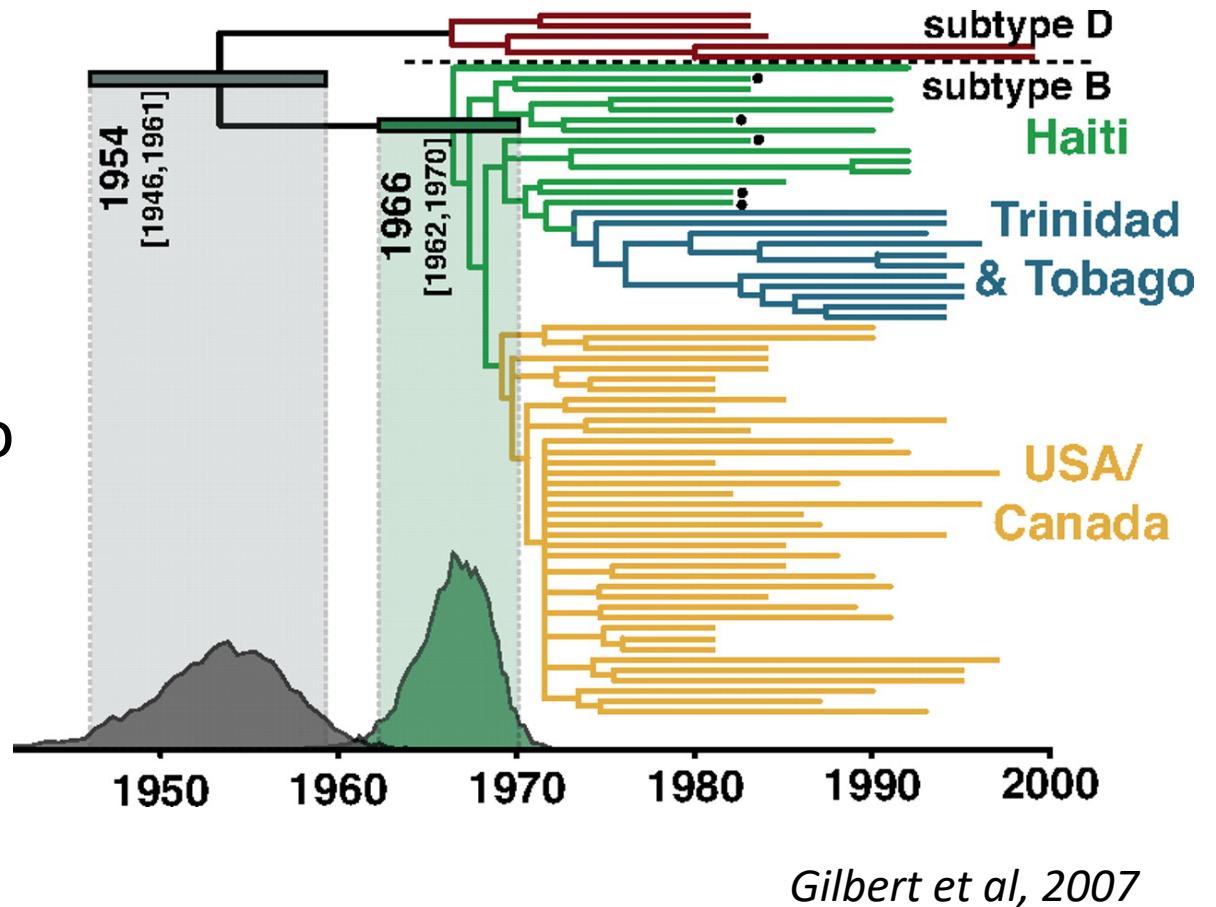


Test-and-treat for HIV control

A peer review exercise

The story so far...

- HIV is a devastating global epidemic that emerged in the 1980s
- Currently it is not curable, and no effective vaccine exists...
- *But* it is treatable with antiretroviral drugs



Gilbert et al, 2007

Successive improvements in treatment



Late 1980s: reverse transcriptase inhibitors
Some improved survival, but had toxicities
Expensive

1990s: protease inhibitors in combination therapy
Still problems with toxicity
Concerns about drug resistance



Recent years:
More effective treatment
Better tolerated
Simplified treatment
More affordable

HIV treatment reduces viral load and heterosexual transmission

The New England Journal of Medicine

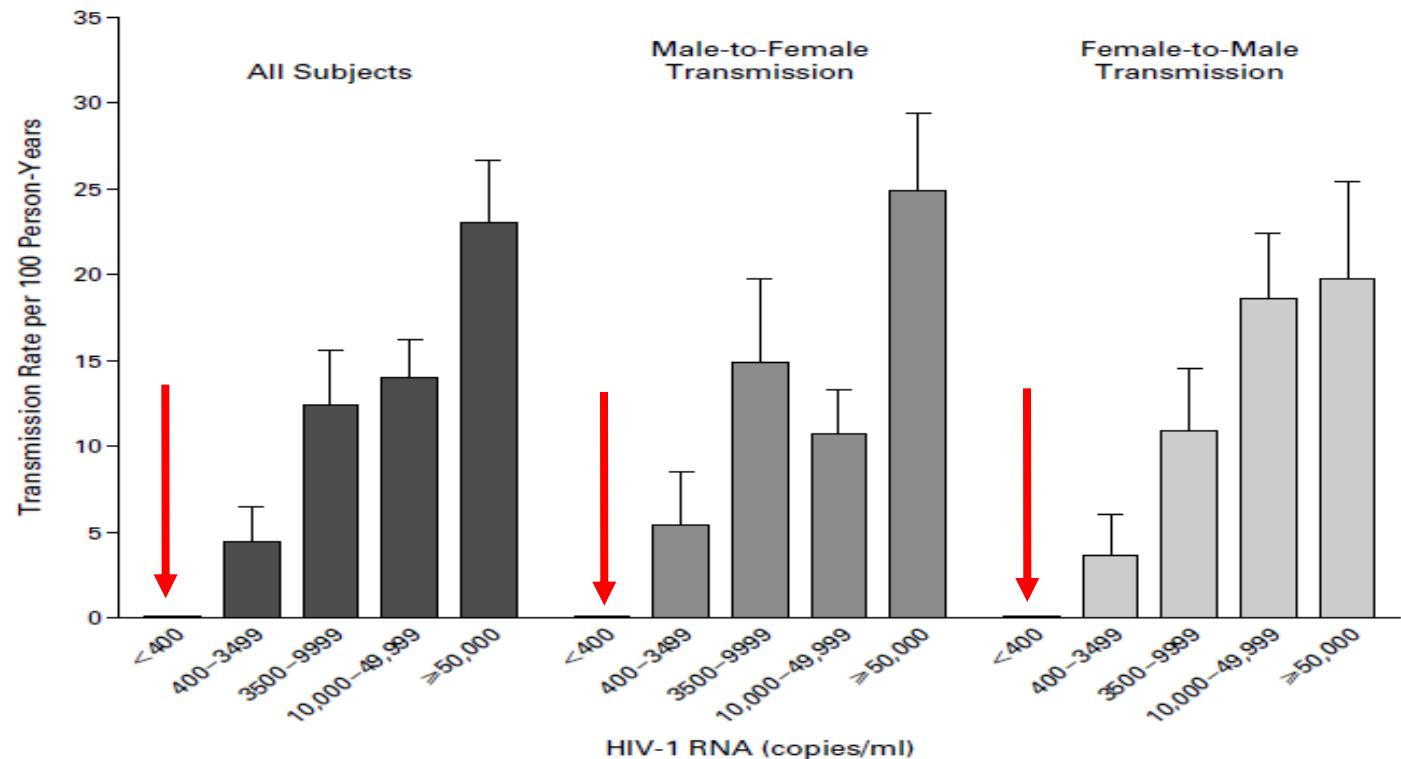


Figure 1. Mean (+SE) Rate of Heterosexual Transmission of HIV-1 among 415 Couples, According to the Sex and the Serum HIV-1 RNA Level of the HIV-1-Positive Partner.

At baseline, among the 415 couples, 228 male partners and 187 female partners were HIV-1-positive. The limit of detection of the assay was 400 HIV-1 RNA copies per milliliter. For partners with fewer than 400 HIV-1 RNA copies per milliliter, there were zero transmissions.

Quinn et al. NEJM. 2009;342(13):921-929.

Successive improvements in treatment

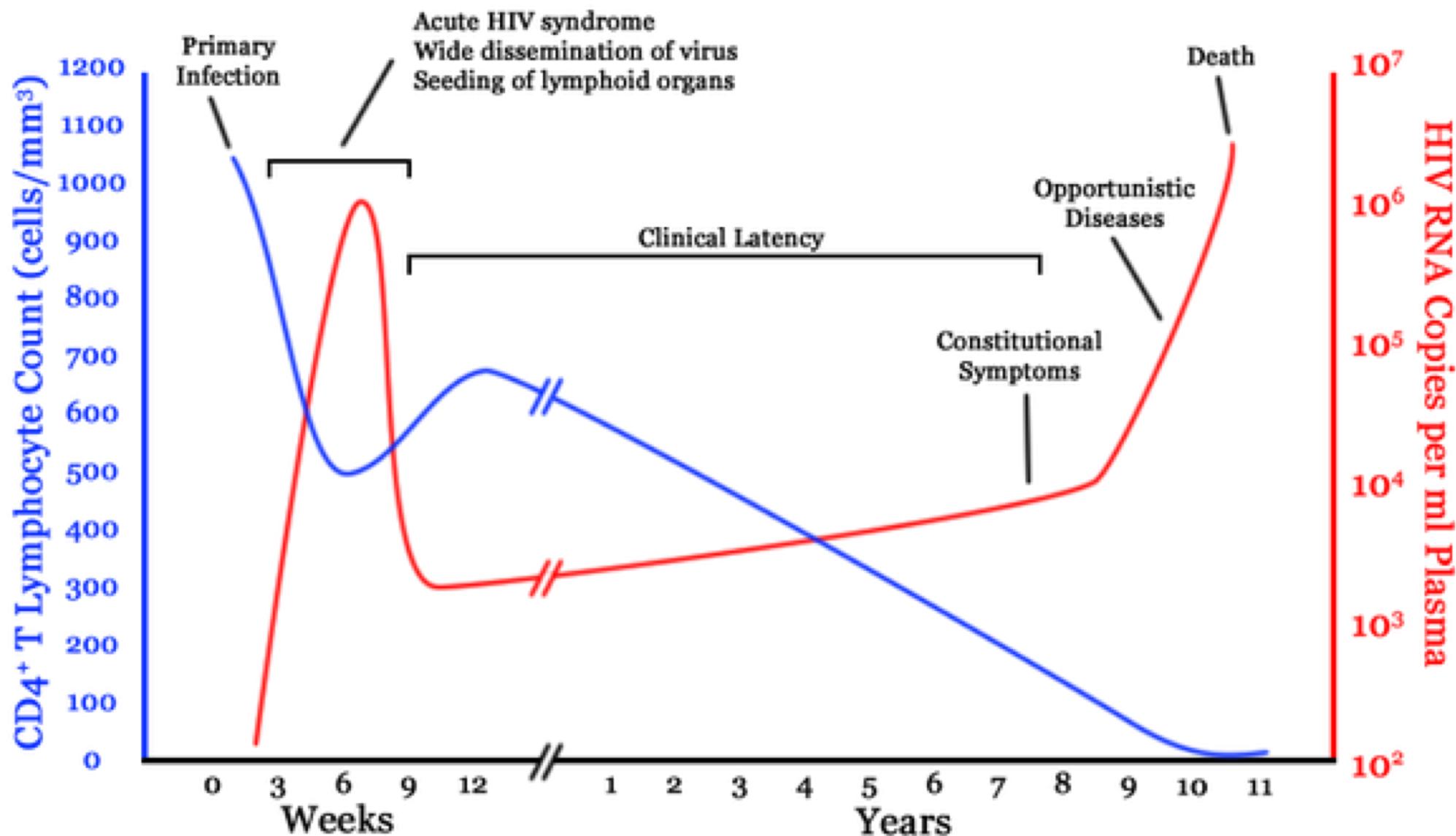


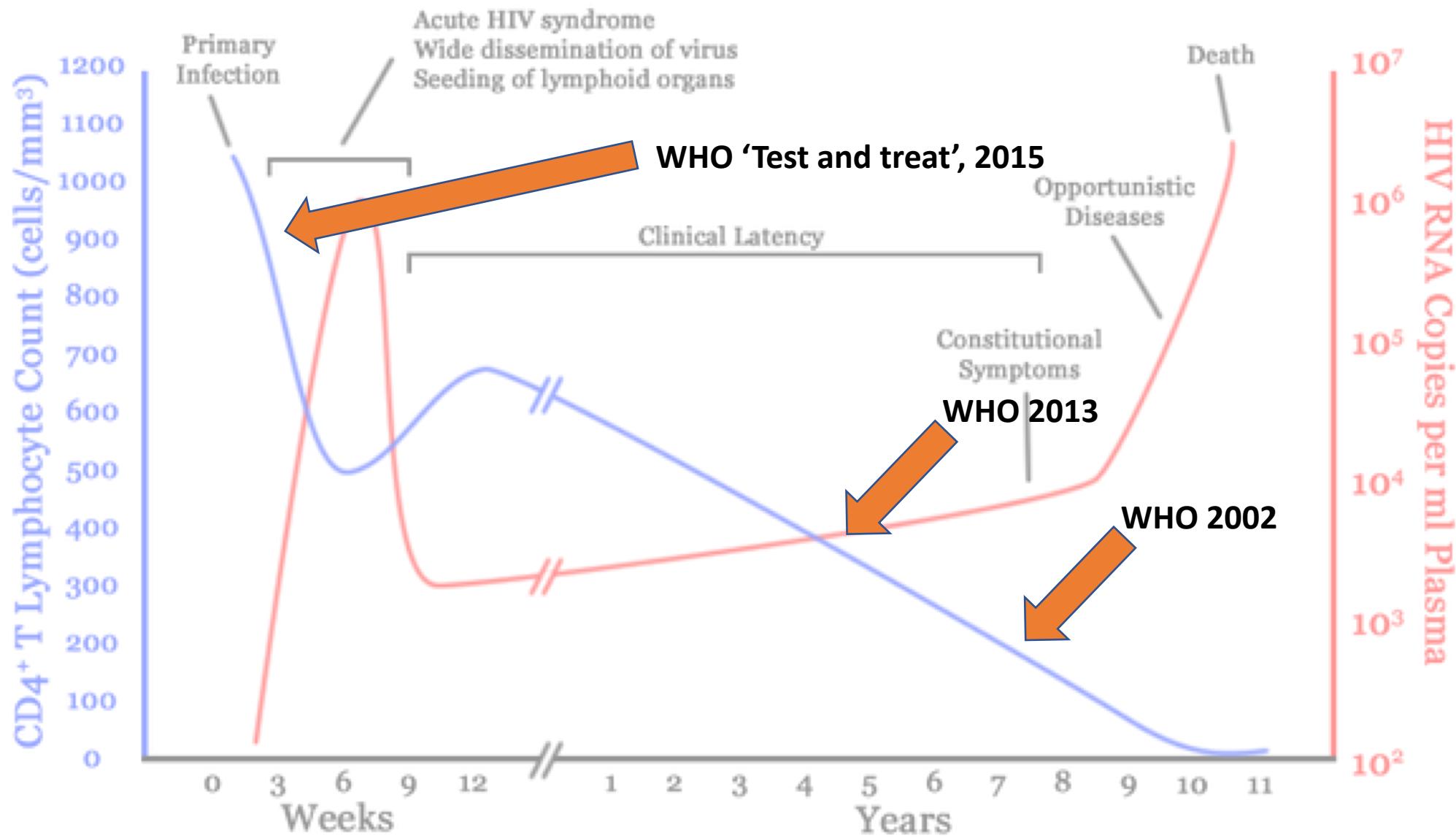
Late 1980s: reverse transcriptase inhibitors
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More effective treatment
Better tolerated
Simplified treatment
More affordable





Modelling to inform major policy decisions

Articles



Universal voluntary HIV testing with immediate antiretroviral therapy as a strategy for elimination of HIV transmission: a mathematical model

Reuben M Granich, Charles F Gilks, Christopher Dye, Kevin M De Cock, Brian G Williams

Summary

Lancet 2009; 373: 48-57

Published Online

November 26, 2008

DOI:10.1016/S0140-6736(08)61697-9

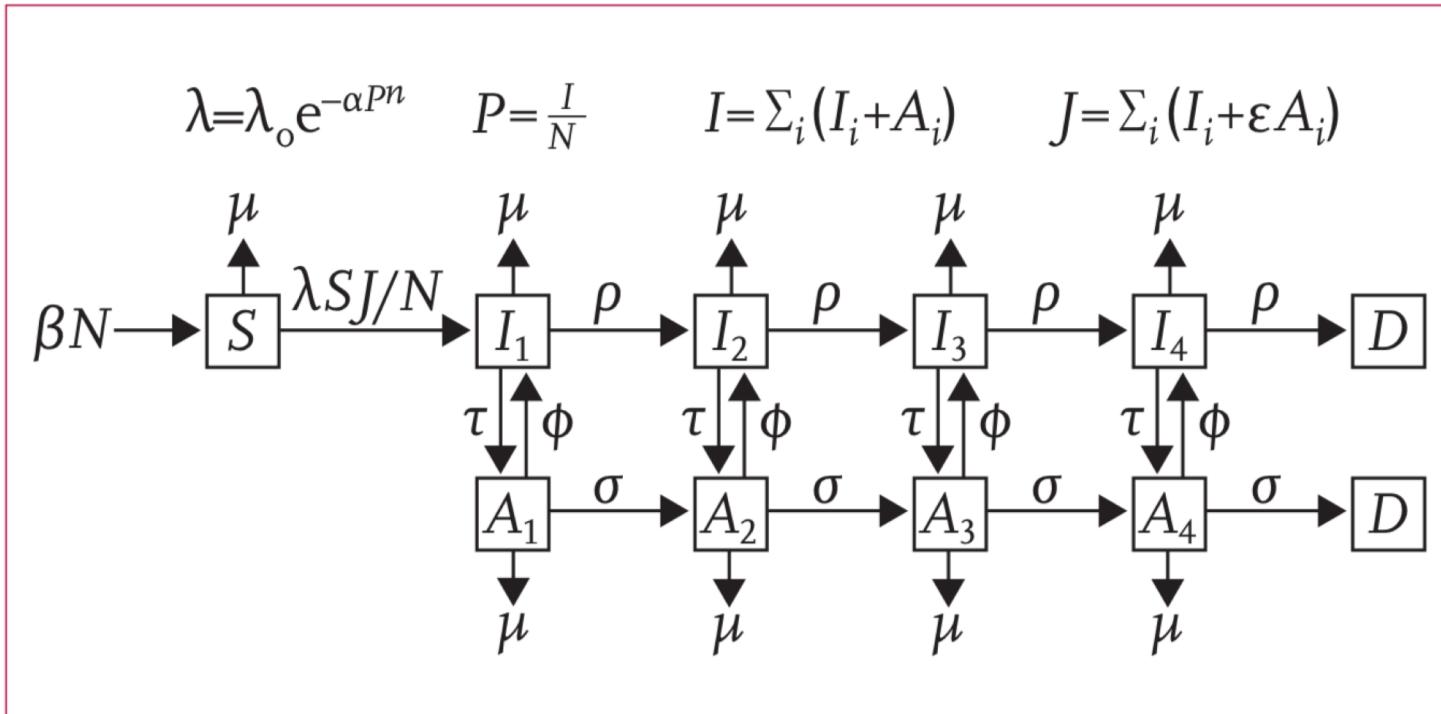
See [Comment](#) pages 7 and 9

Background Roughly 3 million people worldwide were receiving antiretroviral therapy (ART) at the end of 2007, but an estimated 6·7 million were still in need of treatment and a further 2·7 million became infected with HIV in 2007. Prevention efforts might reduce HIV incidence but are unlikely to eliminate this disease. We investigated a theoretical strategy of universal voluntary HIV testing and immediate treatment with ART, and examined the conditions under which the HIV epidemic could be driven towards elimination.

Granich et al, Lancet 2009

A tale with two models

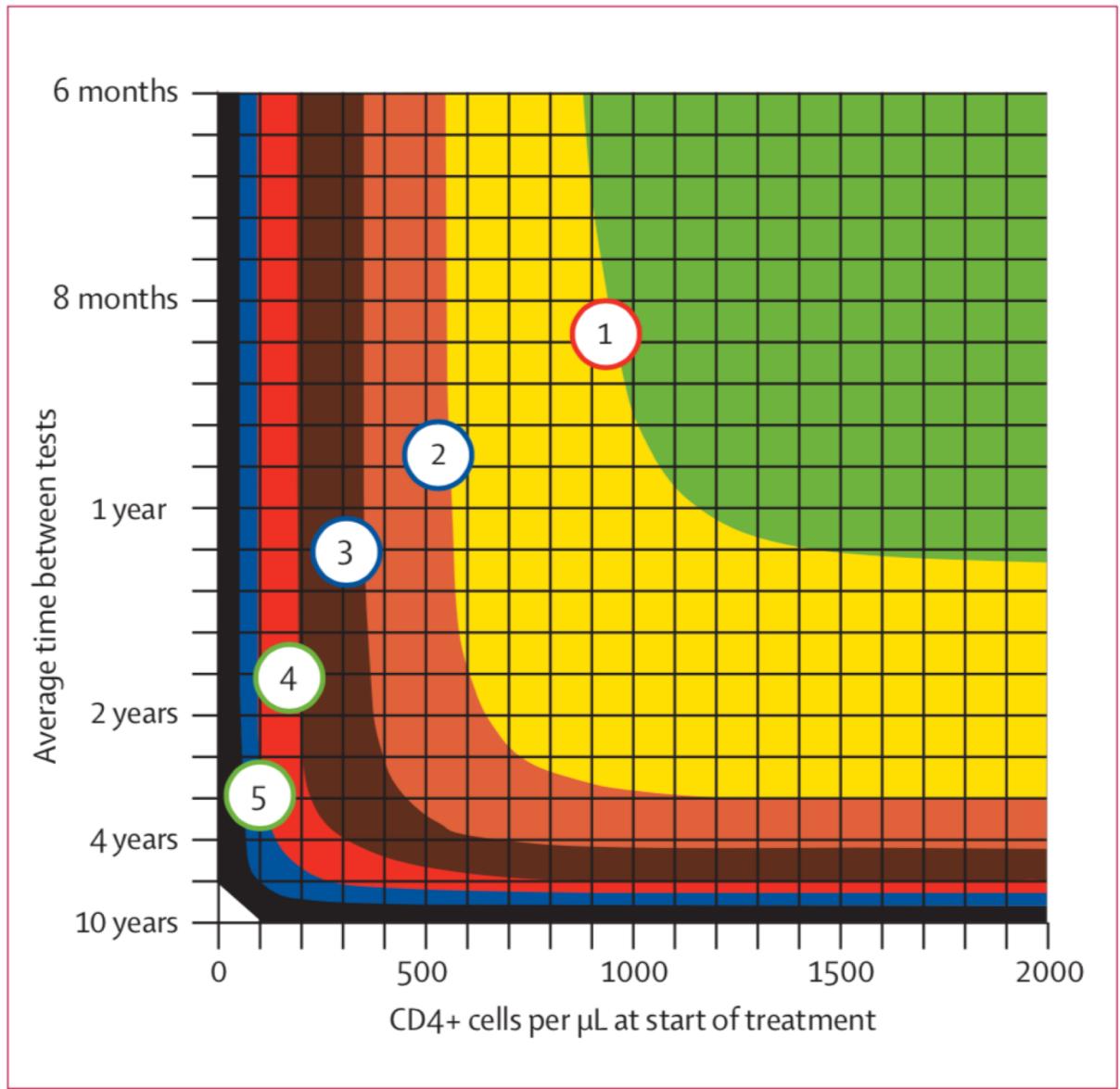
A deterministic model...



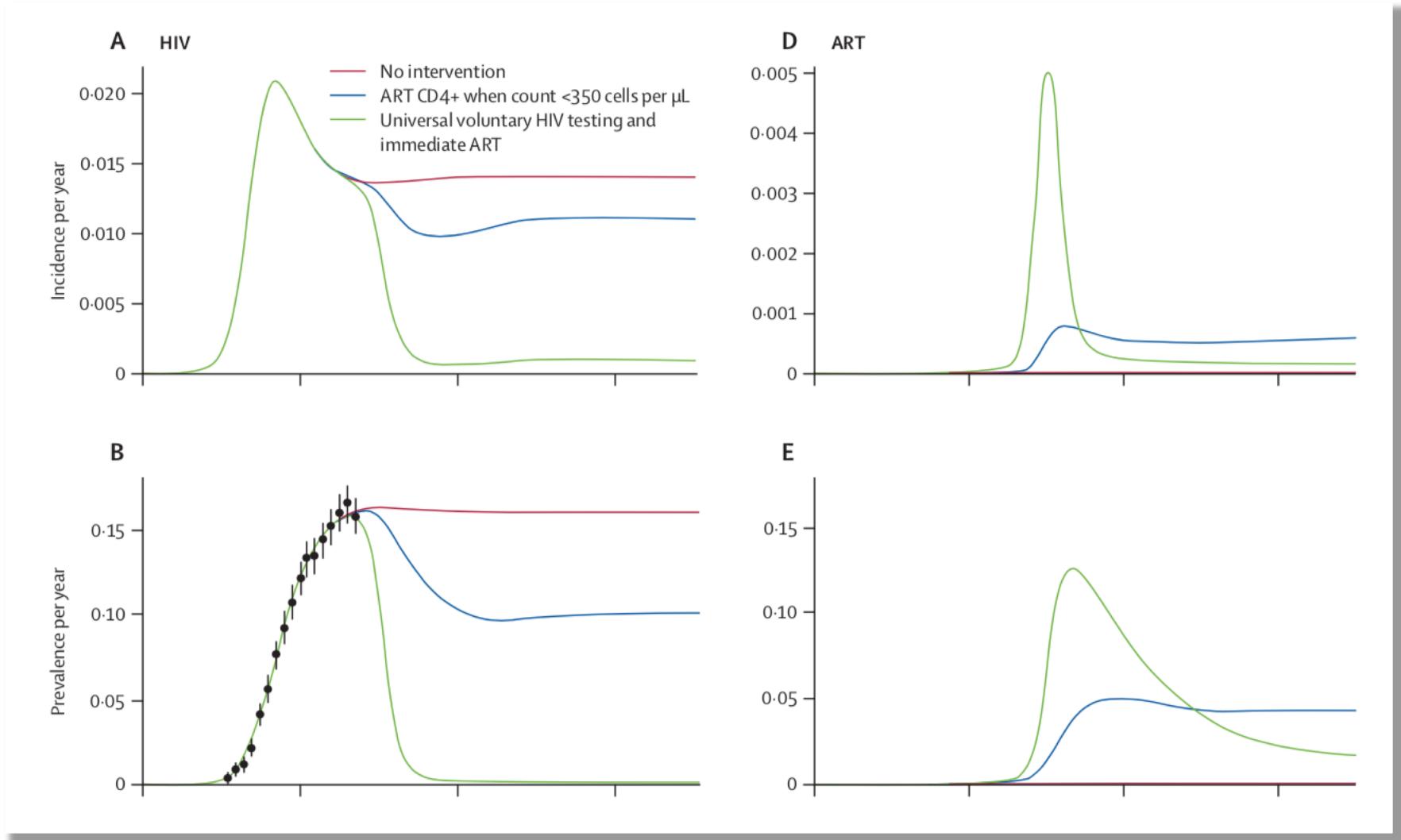
And a stochastic model...

Stochastic results

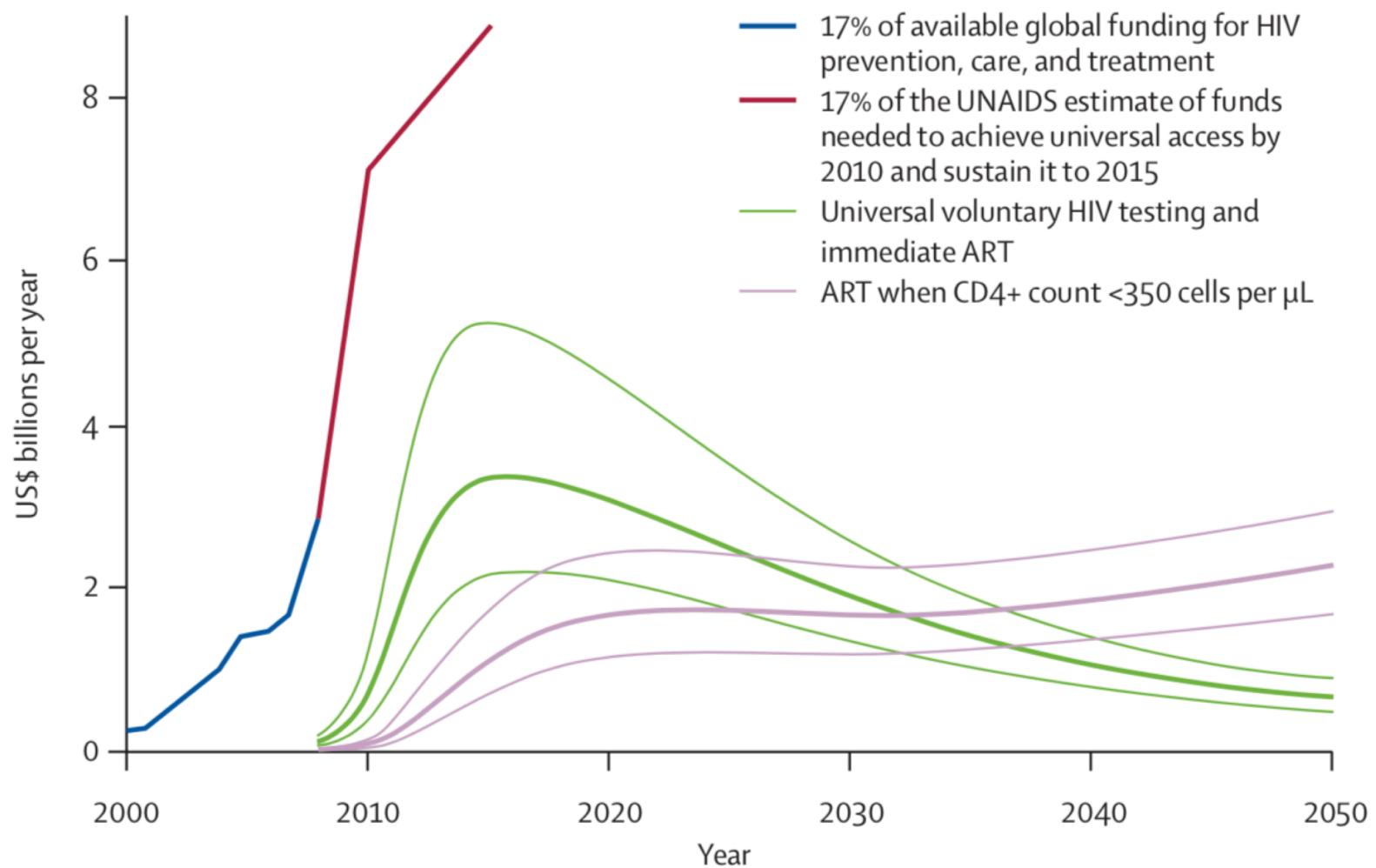
Figure 3: Relation between HIV testing frequency, CD4+ cell count, and R_0
 R_0 (the number of secondary infections resulting from one primary infection in an otherwise susceptible population) plotted against the CD4+ cell count at which treatment starts for different frequencies of HIV testing (average time between HIV tests represented in years and months). Numbers in circles represent R_0 values. Green shading: $R_0 < 1$; yellow: $1 < R_0 < 2$; orange: $2 < R_0 < 3$; brown: $3 < R_0 < 4$; red: $4 < R_0 < 5$; blue: $5 < R_0 < 6$; and black: $6 < R_0 < 7$.



Deterministic results

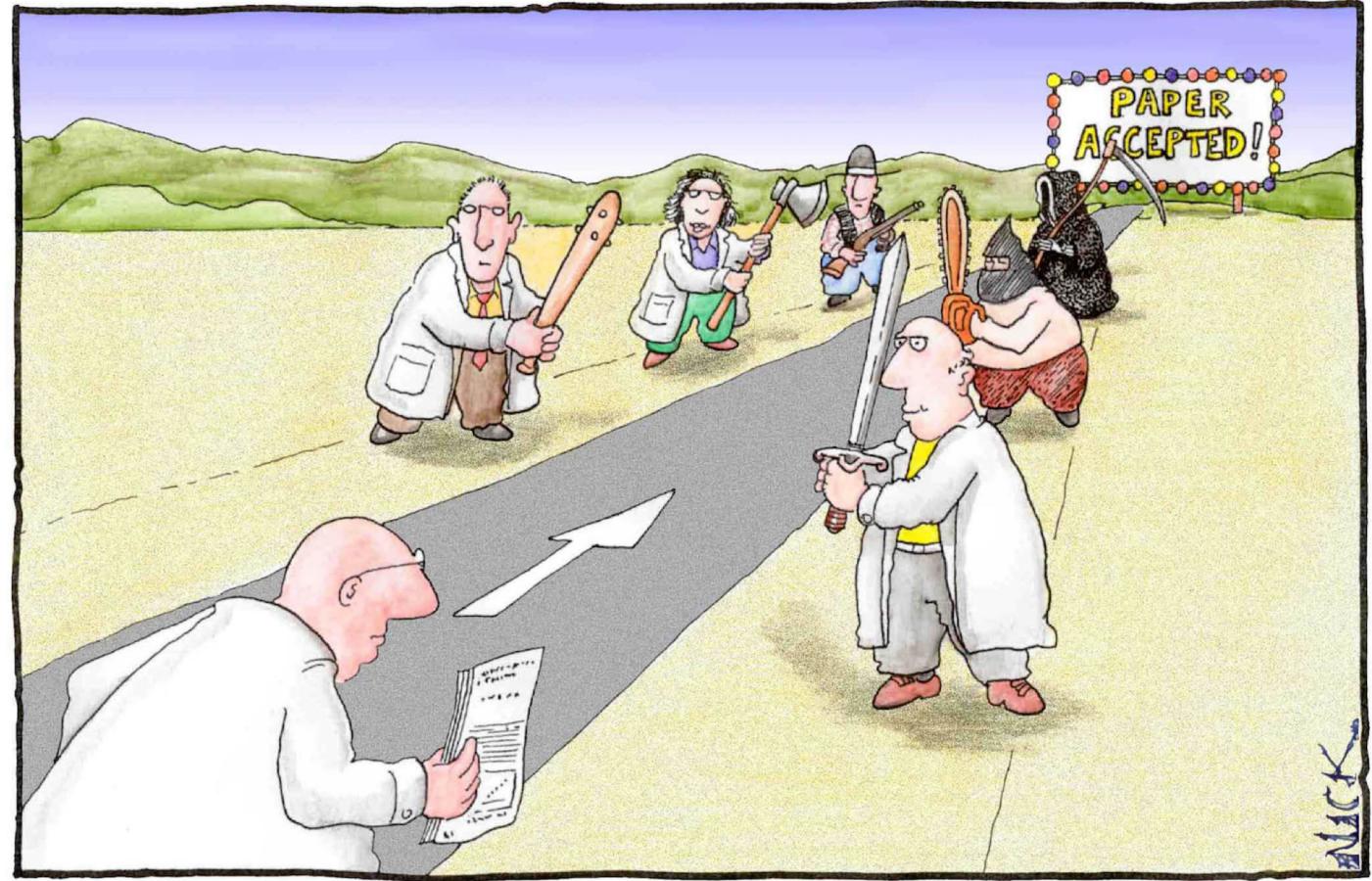


Economic projections



Over to you

- Groups of 3-4
- **What would you recommend** if you were a reviewer for this paper?
 - Accept outright
 - Revisions
 - Reject
- What would you suggest to *improve* the paper?



Helen Epstein
helenepstein@yahoo.com

424 West 144th Street, New York, NY 10031, USA

- 1 Granich RM, Gilks CF, Dye C, De Cock KM, Williams BG. Universal voluntary HIV testing with immediate antiretroviral therapy as a strategy for elimination of HIV transmission: a mathematical model. *Lancet* 2009; **373**: 48–57.

- 2 Mah TL, Halperin DT. Concurrent sexual partnerships and the HIV epidemic in Africa: evidence to move forward. *AIDS Behav* 2008; published online July 22. DOI: 10.1007/s10461-008-9433-x.

- 3 Abu-Raddad LJ, Longini IM Jr. No HIV stage is dominant in driving the HIV epidemic in sub-Saharan Africa. *AIDS* 2008; **22**: 1055–61.

- 4 Wellings K, Collumbien M, Slaymaker E, et al. Sexual behaviour in context: a global perspective. *Lancet* 2006; **368**: 1706–28.

- 5 Morris M, Goodreau S, Moody J. Sexual networks, concurrency, and STD/HIV. In: Holmes KK, Sparling PF, Stamm WE, et al, eds. Sexually transmitted diseases, 4th edn. New York: McGraw-Hill, 2007.

The theoretical model by Reuben Granich and colleagues¹ concludes that a massive scale-up of HIV testing with immediate initiation of antiretroviral therapy could nearly stop HIV transmission. Writing on behalf of a group of advisers to UNAIDS on HIV and human rights,² we welcome a model that proposes the attainment of universal access to HIV treatment and HIV testing, and confirms the link between HIV prevention and treatment; these are essential components of the right to health which must be pursued with much greater efforts.

Granich and colleagues acknowledge many barriers to implementation, but neglect a crucial issue: whether universal annual testing and immediate treatment can be applied safely and acceptably in the face of widespread HIV-related stigma, discrimination, and human rights abuses.

There is abundant evidence that the uptake of HIV prevention and treatment programmes is undermined by gender inequality and violence against women, stigma and discrimination against people living with HIV, and the criminalisation or denial of the existence by some governments of populations at high risk of HIV—eg, men who have sex with men, people who use drugs, and sex workers.

The model would have been stronger had it costed concrete programmes to reduce these barriers and support people's ability to access services. Without attention to such programmes, the model would not achieve the posited uptake necessary to achieve its goals. If efforts to determine the model's potential are deemed worthy of study, it is imperative that not only HIV testing and treatment be scaled up, but also programmes to protect and promote human rights of people living with and vulnerable to HIV.³ Additionally, people living with and affected by HIV should be involved.

We declare that we have no conflict of interest.

*Ralf Jürgens, Jonathan Cohen,
Daniel Tarantola, Mark Heywood,
Robert Carr
rjurgens@sympatico.ca

97, rue de Koninck, Mile-Isles, Quebec J0R 1A0, Canada (RJ); Public Health Program, Open Society Institute, New York, NY, USA (JC); School of Public Health and Community Medicine, Faculty of Medicine, University of New South Wales, Sydney, NSW, Australia (DT); South Africa National AIDS Council, Pretoria, South Africa (MH); and Caribbean Vulnerable Communities Coalition, Kingston, Jamaica (RC)

- 1 Granich RM, Gilks CF, Dye C, De Cock KM, Williams BG. Universal voluntary HIV testing with immediate antiretroviral therapy as a strategy for elimination of HIV transmission: a mathematical model. *Lancet* 2009; **373**: 48–57.

- 2 UNAIDS Reference Group on HIV and Human Rights. Time for action towards universal access to prevention, treatment, care and support: beyond theory towards practice and protection. Geneva: UNAIDS, 2008.

- 3 Open Society Institute. Human rights and HIV/AIDS: now more than ever. New York: Open Society Institute, 2008. http://www.soros.org/initiatives/health/focus/law/articles_publications/publications/human_20071017 (accessed March 10, 2009).

Reuben Granich and colleagues¹ suggest universal HIV testing and immediate treatment of those found positive, which is indeed “a bold move away” from the current approach of treatment on the basis of clinical need and prevention through behavioural education.

Granich and colleagues' modelling results depend heavily on the validity of assumptions about future or unrealised events. For example,

they assume that, with treatment, infectiousness fell to only 1% of untreated infectiousness. They also assume a yearly dropout rate of 1·5%, which would seem overly optimistic for a long-term “universal” programme. A sensitivity analysis with these model parameters would have allowed us to see how different values might affect the results qualitatively. Scientifically, their results merely indicate some possible future scenarios—if antiretroviral therapy strikingly lowers the infectivity of treated patients, if long-term compliance is sufficiently high, and if this programme does not lead to significantly more risky behaviour by the population owing to a false sense of security.

Furthermore, to remedy the inadequacies of implementing a universal testing programme, one could consider the experience of Cuba, where extensive random testing accompanied by contact tracing of infected individuals has resulted in a high HIV detection rate, estimated by two different methods at around 77%³ and 80%,⁴ respectively. This has resulted in Cuba having a significantly lower HIV prevalence than its neighbours in the Caribbean Basin.⁵ Moreover, contact tracing is less costly than universal testing, and hence is an ideal complement to large-scale intervention programmes in developing countries.

We declare that we have no conflict of interest.

*Ying-Hen Hsieh, Hector de Araozza
hsieh@mail.cmu.edu.tw

Department of Public Health and Institute of Biostatistics, China Medical University, Taichung, Taiwan (YHH); and Department of Mathematics, University of La Habana, Havana, Cuba (HdA)

- 1 Granich RM, Gilks CF, Dye C, De Cock KM, Williams BG. Universal voluntary HIV testing with immediate antiretroviral therapy as a strategy for elimination of HIV transmission: a mathematical model. *Lancet* 2009; **373**: 48–57.
- 2 Garnett GP, Baggaley RF. Treating our way out of the HIV pandemic: could we, would we, should we? *Lancet* 2009; **373**: 9–11.
- 3 Hsieh YH, Wang HC, de Araozza H, Lounes R, Twu SJ, Hsu HM. Ascertaining HIV underreporting in low HIV prevalence settings. *J Biol Systems* 2005; **13**: 441–54.

For lots more interesting discussion...

See Lancet, Vol. 373 (2009)