Immediate antiretroviral treatment as a strategy for controlling the HIV epidemic amongst men having sex with men

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Background

The HIV epidemic amongst men who have sex with men (MSM) in the Netherlands is near the epidemic threshold.

In 2010, 900 new infections are expected.

We investigated the impact of starting combination antiretroviral treatment (cART) immediately at the time of HIV diagnosis, irrespective of CD4 counts, on top of other interventions as a strategy to control the epidemic.

Methods

Mathematical model

A mathematical model based on Bezemer et al. was used to describe HIV transmission amongst MSM in the Netherlands.

Model parameters were obtained from literature or from data from the ATHENA national observational cohort, which contains demographic and clinical data of virtually all HIV-infected patients in clinical care in the Netherlands.

Changes in within-country transmission rates (≈ overall risk behaviour), diagnosis rates, and annual number of infections needed to explain observed national data on HIV and AIDS diagnoses in the Netherlands up to 2009 were estimated by fitting the mathematical model to these data.

Intervention strategies

We explored 3 interventions that started in 2010 and could potentially control the epidemic:

- immediate cART: starting cART at the time of HIV diagnosis.
- reduced risk: reduce overall risk behaviour to pre-cART levels, a reduction of 42% compared to 2009.
- earlier diagnosis: reduce average time between infection and diagnosis from 2.5 years in 2009 to 0.5 years; risk behaviour decreases by 50% after diagnosis.

Table 1: Number and percentage of infections averted compared to the 12269 new infections that would have occurred in the period 2010-2020 without any intervention.

intervention	infections averted	% averted
immediate cART	3615	29
earlier diagnosis	5308	43
+ immediate cART	7921	65
reduced risk	10209	83
+ immediate cART	10592	86
all 3 interventions	11118	91

Figure 1: Effect of individual interventions on the expected annual number of new infections. Interventions start in 2010 assuming that all other conditions remain the same as in 2010. N is the number of new infections expected in 2020.
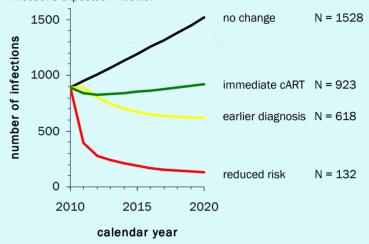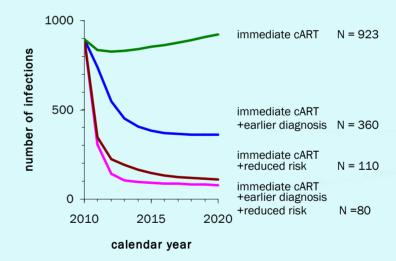

Figure 2: Annual number of new infections expected after implementation of starting cART immediately at the time of diagnosis. In combination with earlier diagnosis 360 new infections are expected in 2020. In combination with a reduction in risk behaviour 110 new infections are expected.

Conclusions

Reducing overall risk behaviour, and, to a lesser extent, earlier diagnosis give the largest reduction in the HIV epidemic amongst MSM over the coming decade.

Immediate treatment reduces the epidemic by 20-40% and has to be employed in combination with other interventions in order to reduce the epidemic compared to 2009.

Immediate treatment probably is the strategy that is most easily implemented as reducing risk behaviour and earlier diagnosis require behavioural changes.

Literature

Bezemer et al., A resurgent HIV-1 epidemic among men who have sex with men in the era of potent antiretroviral therapy. AIDS 2008, 22:1071-1077.

Bezemer et al., 27 years of the HIV epidemic amongst men having sex with men in the Netherlands: An in depth mathematical model-based analysis. Epidemics 2010, 2:66-79.