

Mortality amongst HIV-infected patients in the Netherlands compared to the general population



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Background

The initial virological and immunological response to HAART is a strong predictor for disease outcome. Using this response we estimated the probability of future death for previously antiretroviral therapy naïve patients. These estimated probabilities were compared with those observed in the general population in the Netherlands.

Statistical model

- a multivariate hazards model was used to predict the time from 24 weeks after start of HAART to death
- hazard of death written as sum of :
 - expected hazard h_0 : dependent on patient's age and gender and estimated from the annual mortality of the general population in the Netherlands.
 - positive function ν containing patient specific covariates
- standardised mortality ratios (SMR) were calculated as ratios of one-year mortality for HAART treated HIV-infected patients and one-year mortality for the general population, matched by age and gender.
- SMRs were compared to those observed in of diabetes patients.

Study group

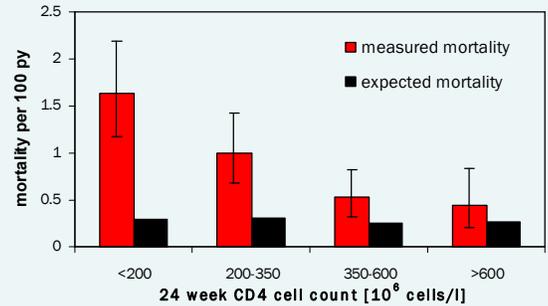
- data were extracted from the ATHENA national observational cohort in the Netherlands (31 December 2003: 9181 HIV-infected patients included)
- selection of antiretroviral therapy naïve patients initiating HAART who
 - are not intravenous drug-users
 - have >24 weeks of follow-up since start of HAART
 - have a viral load and CD4 count measurement between 12 and 36 weeks after start of HAART

Patient characteristics (N=3520)

age (years), median (IQR)	37 (32-45)
male gender	2772 (79%)
transmission: homosexual	1959 (56%)
heterosexual	1168 (33%)
other/unknown	393 (11%)
CDC-status at start: B	497 (14%)
C	910 (26%)
follow-up after start HAART (years)	3.5 (1.8-5.6)
CD4 (10^6 cells/l) at start HAART	250 (80-420)
CD4 at 24 weeks: <200	872 (25%)
200-350	958 (27%)
350-600	1120 (32%)
>600	570 (16%)
\log_{10} RNA at start HAART	5.0 (4.5-5.4)

Results – Mortality

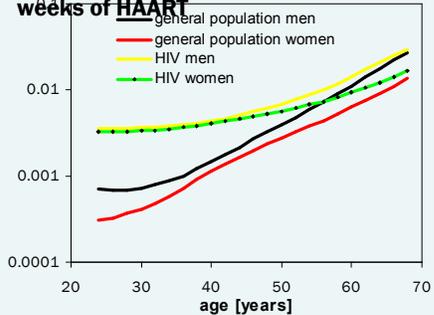
- 101 deaths (3%) in 11373 person-years (py) of follow-up
- overall mortality 0.89 (95% CI 0.72–1.08) per 100 py
- expected mortality between 25 and 0.30 per 100 py
- mortality decreased with increasing CD4 count after 24 weeks of HAART ($P < 0.001$).



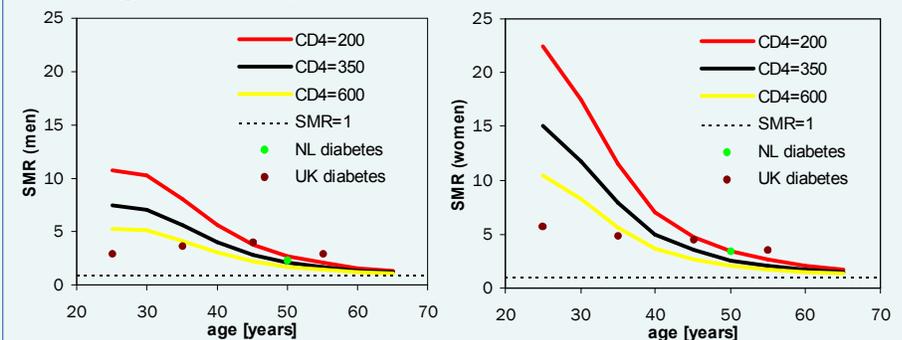
Results - Survival Model

- only predictors associated with faster progression to death (contained in ν):
 - $\log(\text{CD4})$ after 24 weeks of HAART hazard ratio: 0.47 (0.37–0.61)
 - RNA at 24 weeks $>10^5$ vs. $<10^5$ cp/ml hazard ratio: 0.31 (0.11–0.72)
- no additional effect of age and gender once taking these into account in h_0

Probability of death within one year for the general population and for HIV-infected patients with 600×10^6 CD4 cells/l and viral load $<10^5$ cp/ml after 24 weeks of HAART



SMRs for HIV-infected patients with various 24 week CD4 counts and viral load $<10^5$ copies/ml compared with SMR for diabetes patients from the Netherlands and the United Kingdom (Epidemiology 1999, 10:184-187; Diabetic Medicine 1999, 16:459-465)



Conclusions

- The higher mortality in HIV-infected patients compared to the general population is independent of age and gender.
- SMRs decrease with older age and higher CD4 counts.
- SMRs are higher for women than for men as the general population mortality of women is lower than for men of the same age.
- For successfully HAART treated ($\text{CD4} \geq 600 \times 10^6$ cells/l) patients SMRs are comparable to those in diabetes patients.
- However, only 16% of the patients accomplish these CD4 counts after 24 weeks.

Our model will be used by the Netherlands Association of Insurers for the assessment of life insurances for HIV-infected patients on HAART