

A multistate approach for estimating the incidence of Human Immunodeficiency Virus by using HIV and AIDS French surveillance data

Cecile Sommen^{1,2}, Ahmadou Alioum^{1,2}, Daniel Commenges¹

¹ INSERM, U897, Epidemiology and Biostatistics Research Center, Bordeaux, F-33076, France

² ISPED- University of Bordeaux 2, Bordeaux, F-33076, France

Before the introduction of highly active antiretroviral therapy (HAART) in 1996, monitoring the epidemic of HIV infection was extensively based on back-calculating the number of new HIV infections from AIDS surveillance data and knowledge of the AIDS incubation period distribution. However, the increase in AIDS incubation period induced by HAART has complicated the use of AIDS diagnosis data only, and has pointed out the necessity of supplementing these data with HIV diagnosis data. We explore the advantage of combining HIV and AIDS surveillance data in the context where the HIV diagnosis data are available only for the most recent years. Extending earlier work of Aalen et al. [1] based on a discrete-time Markov model that describes simultaneously disease progression, HIV diagnosis and treatment intake, we propose a penalized likelihood approach to estimate smooth HIV incidence, together with HIV diagnosis rates. The choice of the smoothing parameter is achieved using an approximated cross-validation criterion. In a simulation study, we show that incorporation of HIV test information increases the precision of the estimation of new infections in recent periods. The method is illustrated using HIV and AIDS surveillance data collected by the Institut de Veille Sanitaire, France.

References

- [1] Aalen OO, Farewell VT, De Angelis D, Day NE, Gill ON . A markov model for hiv disease progression including the effect of hiv diagnosis and treatment: application to aids prediction in england and wales. *Statistics in medicine*, **16**:2191–2210, 1997.