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Persistent clusters sustain Netherlands HIV epidemic among men who have sex with men

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The resurgent HIV epidemic among men who have sex with men (MSM) in the Netherlands is driven by several large, persistent, self-sustaining, and, in many cases, growing sub-epidemics shifting towards new generations of MSM, according to new research published this week in *PLOS Medicine* by Daniela Bezemer from HIV Monitoring Foundation, Amsterdam, the Netherlands, and Anne Cori from Imperial College London, UK, and colleagues.

Despite advances in treatment and prevention of HIV infection, the HIV epidemic among MSM is resurgent in many Western countries. The researchers performed phylogenetic analysis, which uses genetic differences among viruses isolated from different individuals to derive patterns of HIV transmission, and mathematical modeling to determine whether the introduction of new strains or the spread of already circulating strains is responsible for the ongoing HIV epidemic occurring among MSM in the Netherlands.

The researchers took advantage of a large national observational HIV cohort, the ATHENA cohort, which includes anonymized data from HIV-infected patients followed longitudinally since 1996 in the 27 HIV treatment centers in the Netherlands. The study included 5,852 participants among whom the researchers were able to identify 106 large HIV transmission clusters, 91 of which were primarily among MSM. The researchers found that at least 54 (59%) of these 91 transmission clusters were already circulating before 1996, when combination antiretroviral therapy was introduced, and that they have persisted to the

present. Moreover, about a third of new HIV infections diagnosed among MSM since 1996 have involved viruses included in these long-lived clusters.

Using mathematical modelling to estimate the effective reproduction number (the number of secondary infections per primary infection) for all the transmission clusters among MSM, the researchers found that reproductive numbers were around one for the whole study period. Thus, these clusters were self-sustaining and not contracting. Notably, HIV transmission clusters (particularly the newer clusters) tended to have higher reproduction numbers in recent years. Moreover, although the average age at diagnosis for MSM within each of the clusters increased over the study period at a rate of 0.45 years/year, the average age at diagnosis was lower at initiation of new clusters and only increased by 0.28 years/ year. As with any modeling study, the validity of the results depends on the accuracy of assumptions used in the model, for example, that the probability of obtaining viral genetic information and the probability of surviving until 1996 were similar across clusters.

The authors conclude, "the analysis suggests that the epidemic amongst [MSM] is dispersed amongst a large number of self-sustaining or growing transmission clusters, many of which persisted throughout the 1990s, before increases in risk behavior became widespread [...] Our study highlights that many different sub-epidemics have independently persisted for decades, despite the widespread availability of treatment, steadily increasing rates of diagnosis, and increasing tendency for early treatment initiation. The fastest growing sub-epidemics are the newest ones, which also tend to be amongst the youngest men. Preventing further increases in rates of infection will require further developments in prevention services."

More information: Bezemer D, Cori A et al. (2015) Dispersion of the HIV-1 Epidemic in Men Who Have Sex with Men in the Netherlands: A

Combined Mathematical Model and Phylogenetic Analysis. *PLoS Med* 12(11): e1001898. DOI: 10.1371/journal.pmed.1001898