

A sexual behavior risk score for HIV infection during sexual careers in men who have sex with men

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Background:

Sexual risk behavior changes during a person's life course. Insights in sexual careers of men who have sex with men (MSM) may provide starting points for the timing of HIV prevention methods.

Objectives:

1. To develop a behavioral risk score that predicts HIV seroconversion in MSM.
2. To study longitudinal trajectories of sexual risk behavior over time since first sexual contact.

Conclusions:

- We developed a behavioral risk score that is predictive of HIV seroconversion in MSM.
- Preliminary results suggest that the risk score can be used to identify different trajectories of sexual careers.

Future aims:

- To examine trajectories of sexual careers in light of the effects of age, calendar time and time since first sexual contact.
- To implement sexual career trajectories in a mathematical transmission model in order to investigate HIV transmission dynamics and the effectiveness of pre-exposure prophylaxis (PrEP) as time tailored intervention.

Methods:

- **Study population:** HIV-negative MSM (N=820) who participated in the Amsterdam Cohort Studies on HIV infection and AIDS (ACS) between May 2007 and April 2016 (total of 7,992 visits).
- **Data collection:** MSM were bi-annually tested for HIV and asked to complete a self-administered questionnaire about their sexual behavior in the preceding six months.
- **Behavioral variables:** see Table 1.
- **Analysis:** effects of behavioral factors on seroconversion were examined using poisson regression analysis. Regression coefficients were used to calculate a behavioral risk score. Trajectories of sexual risk behavior over time were estimated using growth mixture models.

Results:

- During follow-up 49 MSM seroconverted.
- Predictors of seroconversion in multivariable analyses were:
 - Number of casual partners with receptive anal intercourse (AI).
 - Number of condomless insertive AI partners with unknown or positive HIV status (Table 1).
- The area under the receiver operating characteristic curve (AUC) was 0.77, indicating that the behavioral risk score is fairly accurate in predicting HIV acquisition.
- Preliminary results of linear growth mixture modeling showed three trajectories of sexual risk behavior over time (Figure 1):
 - **Decreasing high risk (7%):** high risk behavior at start of sexual career and decreasing risk over time.
 - **Increasing high risk (3%):** low risk behavior at start of sexual career and rapidly increasing risk over time.
 - **Low risk (90%):** predominantly low risk behavior throughout sexual career.
- MSM in the 'Decreasing high risk' and 'Increasing high risk' trajectories reported higher number of receptive casual partners and more often AI during group sex than MSM in the 'low risk' trajectory (Figures 2-3).
- MSM in the 'Decreasing high risk' trajectory were younger at first sexual contact (mean 16.1 years) than MSM in the 'Low risk' trajectory (mean 18.3 years; $p < .001$).

Table 1. Univariable and multivariable incidence rate ratio's (IRR) of sexual behavior factors for HIV acquisition among MSM participating in the Amsterdam Cohort Study (n=795).

Sexual behavior factors	Univariable			Multivariable		
	IRR	95% CI	P value	IRR	95% CI	P value
Receptive AI						
Number of one-night stand partners * condom use ¹	3.07	2.16 ; 4.36	<.001	1.08	0.62 ; 1.86	.796
Number of multiple-time casual partners * condom use ¹	4.71	2.41 ; 9.21	<.001	0.92	0.36 ; 2.36	.864
Number of regular casual partners * condom use ¹	5.33	2.73 ; 10.42	<.001	1.56	0.67 ; 3.66	.306
Total number of casual partners	2.14	1.72 ; 2.66	<.001	1.63	1.20 ; 2.22	.002
Insertive AI						
Number of condomless casual partners with unknown or positive hiv status	2.35	1.03 ; 3.03	<.001	1.73	1.24 ; 2.42	.001
AI during group sex (yes)	3.91	2.23 ; 6.85	<.001	1.70	0.87 ; 3.32	.119

Note. ¹Number of partners was multiplied by condom use. Condom use was coded on a 5-point scale from 0 'always use condom' to 1 'never use condom'. Count variables are log transformed. AI = anal intercourse.

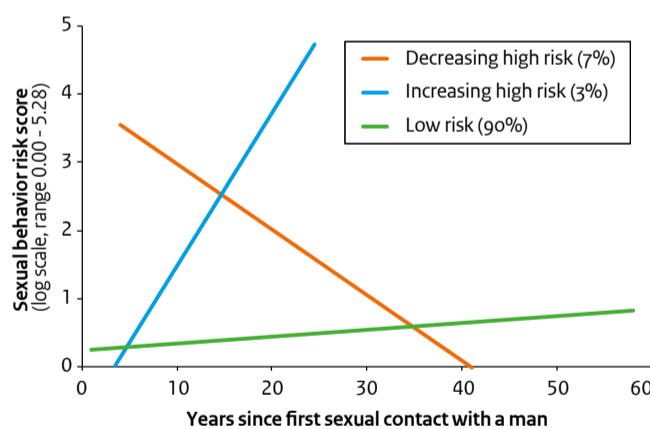


Figure 1. Trajectories of sexual risk behavior in MSM since first sexual contact with a man (preliminary results). Note: length of plotted trajectories depends on observed values of years since first sexual contact in each trajectory.

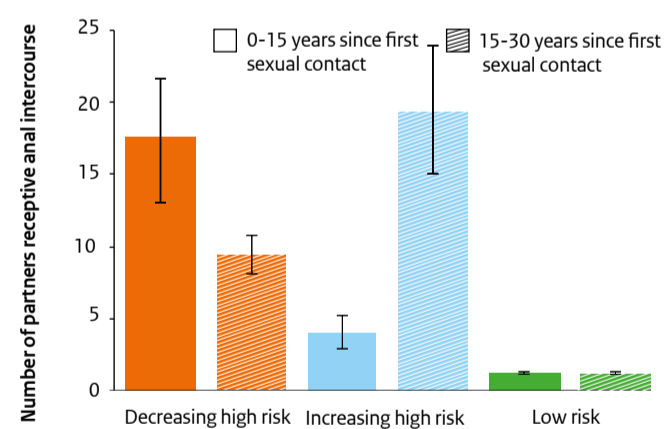


Figure 2. Number of casual partners with receptive anal intercourse in the past 6 months for each sexual behavior trajectory during 0-15 years and 15-30 years since first sexual contact.

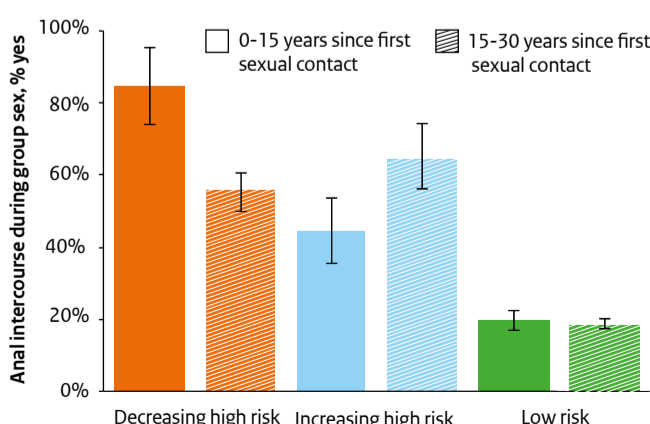


Figure 3. Anal intercourse during group sex (%) in the past 6 months for each sexual behavior trajectory during 0-15 years and 15-30 years since first sexual contact.



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