

SUPPLEMENTARY MATERIAL**Quantifying heterogeneity in sexual behaviour and distribution of sexually transmitted infections before and after pre-exposure prophylaxis among men who have sex with men**

Daphne van Wees^{1,2}, Sophie Diexer¹, Ganna Rozhnova^{1,3}, Amy Matser², Chantal den Daas⁴, Janneke Heijne⁵, and Mirjam Kretzschmar¹

¹ Julius Center for Health Sciences and Primary Care, University Medical Center Utrecht, Utrecht University, Utrecht, The Netherlands

² Department of Infectious Diseases, Research and Prevention, Public Health Service of Amsterdam, Amsterdam, The Netherlands

³ BioISI – Biosystems & Integrative Sciences Institute, Faculdade de Ciências, Universidade de Lisboa, Lisboa, Portugal

⁴ Aberdeen Health Psychology Group, Institute of Applied Health Sciences, Aberdeen, Scotland

⁵ Center for Infectious Diseases Control, National Institute for Public Health and the Environment, Bilthoven, The Netherlands

TEXT**Text S1. Definitions of behavioural variables**

Steady partnerships were defined as having one or several steady or 'committed' relationships in the past 6 months. Casual partners were defined as reporting to have had sex with anonymous casual partners (e.g., one-night stand) and known casual partners (e.g., sex buddy) in the past 6 months. Chemsex was defined as use of Gamma-Butyrolactone (GBL), Gamma-Hydroxybutyrate (GHB), mephedrone, methamphetamine, ketamine, amphetamine, cocaine, or ecstasy (XTC) during sexual intercourse.

Text S2. Extrapolation of missing data

Visits to the STI clinic before the next six-monthly ACS visit were common. At these extra STI visits, only STI/HIV tests were done, and no behavioural data was collected. However, as MSM who needed an extra STI visit were often notified by a partner or reported symptoms, STI positivity rates are expected to be higher at these visits. As excluding these visits would result in excluding a high number of STI diagnoses of MSM participating in the ACS, missing behavioural data at these extra STI visits were taken from the next visit of this unique individual, given this next ACS visit with behavioural data was within 365 days after the extra STI visit. To examine possible bias introduced by this method, we compared STI positivity rates and mean risk scores between extrapolated visits and non-extrapolated visits. Visits with one or more missing values of behavioural variables that could not be extrapolated (i.e., next visit after current visit was >365 days later or no next visit) were excluded from the statistical analysis.

FIGURES

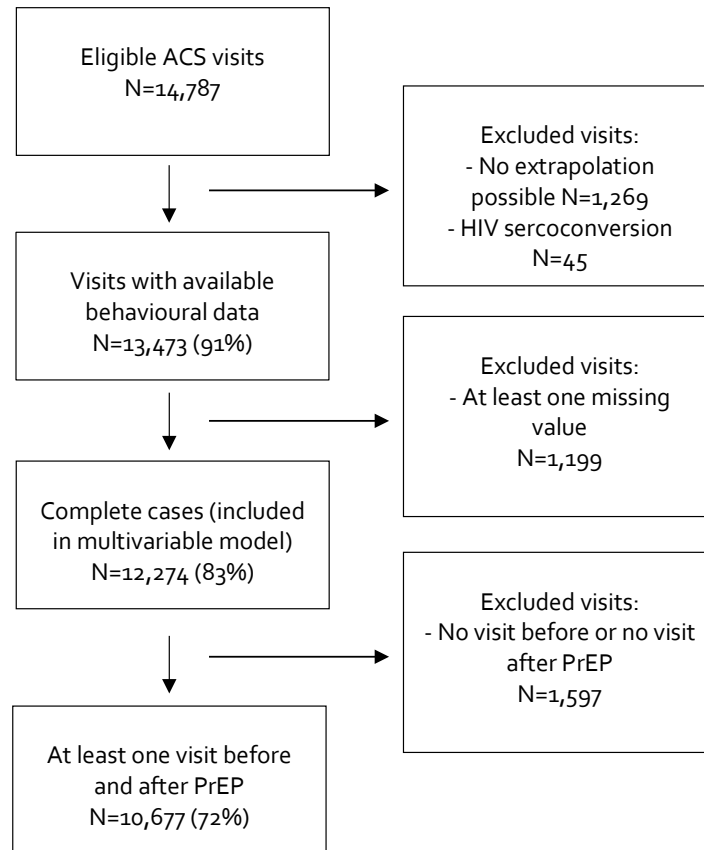


Figure S1. Flowchart of visits of MSM participating in the Amsterdam Cohort Studies between 2009 and 2019

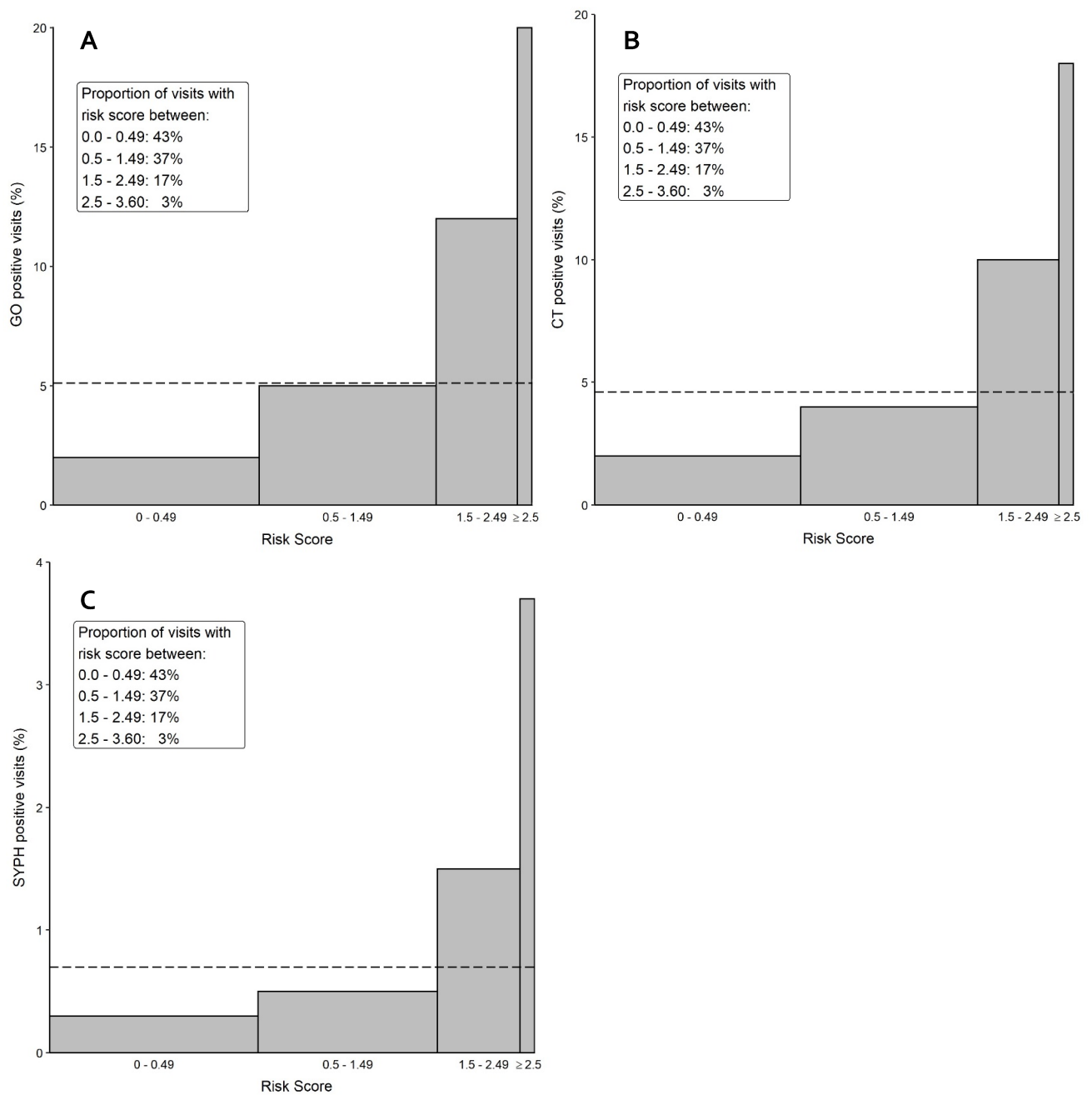


Figure S2. Distribution of gonorrhoea (A), chlamydia (B), and syphilis (C) diagnoses among MSM with different risk scores based on sexual behaviour. The width of the bars represents the proportion of visits with a specific risk score (the legend shows the distribution of the risk score over the population), and the height of the bars indicates the percentage of STI diagnoses in each risk score segment. Overall STI positivity is given by the dashed line. Note that the y-axis is different in each figure. Abbreviations: CT= Chlamydia; GO = Gonorrhoea; SYPH = Syphilis.

TABLES

Table S1. Sample characteristics

	N=971 N visits=13,473
Migration background ¹	
Dutch, n (%)	667 (69)
Non-Dutch, n (%)	255 (26)
Education level ²	
Low/medium, n (%)	215 (22)
High, n (%)	751 (77)
Age first visit, mean (SD)	35 (10)
Age sexual debut with a man, mean (SD)	18 (4)
HIV seroconversions during follow-up	
Yes, n (%)	39 (4)
No, n (%)	932 (96)
PrEP use	
Yes, n (%)	232 (24)
No, n (%)	739 (76)

* At first visit

¹ Migration background: Dutch = participant and both parents born in the Netherlands, and non-Dutch = first-generation and second generation migrants from all other countries)

² Education level at first visit: high=college degree/university, and low/medium=all others)

Table S2. Mean risk scores, positivity rates, estimated Gini coefficients and corresponding 95% confidence intervals for these coefficients for gonorrhoea, chlamydia, and syphilis in MSM participating in the Amsterdam Cohort Studies between 2009 and 2019 with at least one visit before PrEP (2009-mid 2015) and at least one visit after PrEP (mid 2015-2019) (n=630, n visits=10,677)

Before PrEP (n=5,997, 56%)			
<i>Risk score, mean (SD)</i>	0.70 (0.66)		
<i>STI diagnoses</i>	% positive	Gini coefficient	95% CI
Gonorrhoea	3.8*	0.46	0.40-0.52
Chlamydia	4.1	0.37	0.30-0.43
Syphilis	0.6	0.37	0.19-0.52
Sexually transmitted infections	7.9*	0.39	0.35-0.44
Anal gonorrhoea	1.9*	0.52	0.44-0.59
Anal sexually transmitted infection	4.4*	0.45	0.39-0.51
After PrEP (n=4,680, 44%)			
<i>Risk score, mean (SD)</i>	0.93 (0.80)		
<i>STI diagnoses</i>	% positive	Gini coefficient	95% CI
Gonorrhoea	5.7*	0.46	0.40-0.52
Chlamydia	4.6	0.43	0.36-0.49
Syphilis	0.8	0.50	0.32-0.66
Sexually transmitted infections	10.0*	0.43	0.39-0.47
Anal gonorrhoea	3.2*	0.56	0.48-0.63
Anal sexually transmitted infection	5.8*	0.48	0.42-0.54

Note. Sexually transmitted infections (STI) is a variable combining all gonorrhoea, chlamydia, and syphilis diagnoses, and anal gonorrhoea and anal STI includes diagnosed infections at the anorectal location only (i.e., excluding diagnoses at all other anatomical locations).

The percentage positive is the percentage of all visits with a positive gonorrhoea, chlamydia, and/or syphilis diagnosis. An asterisk represents a statistically significant (p-value <0.05) difference in positivity rate before and after PrEP, using chi-squared tests.

Abbreviations: CI = Confidence Interval

Table S3. Mean risk scores, positivity rates, estimated Gini coefficients and corresponding 95% confidence intervals for gonorrhoea and chlamydia per year in MSM participating in the Amsterdam Cohort Studies between 2009 and 2019 (n=959, n visits=12,274)

Year (number of visits)	Risk score (mean (SD))	% positive	Gonorrhoea		Chlamydia		
			Gini coefficient	95% CI	% positive	Gini coefficient	95% CI
2009 (n=885)	0.63 (0.62)	4.0	0.43	0.29-0.57	4.2	0.30	0.12-0.47
2010 (n=948)	0.67 (0.65)	3.8	0.36	0.18-0.52	4.4	0.38	0.22-0.53
2011 (n=934)	0.69 (0.65)	3.8	0.33	0.16-0.48	3.9	0.45	0.27-0.62
2012 (n=977)	0.70 (0.68)	5.1	0.52	0.39-0.64	4.6	0.32	0.16-0.48
2013 (n=1,103)	0.73 (0.67)	3.0	0.44	0.27-0.60	3.0	0.31	0.14-0.47
2014 (n=1,254)	0.78 (0.70)	5.1	0.48	0.38-0.58	5.2	0.41	0.29-0.53
2015 (n=1,331)	0.86 (0.74)	4.3	0.53	0.40-0.64	4.5	0.44	0.31-0.57
2016 (n=1,378)	0.95 (0.78)	6.0	0.49	0.41-0.57	5.0	0.38	0.25-0.51
2017 (n=1,338)	0.95 (0.81)	7.2	0.32	0.20-0.42	5.0	0.38	0.27-0.49
2018 (n=1,445)	1.01 (0.81)	6.9	0.41	0.32-0.50	5.7	0.40	0.27-0.51
2019 (n=681)	0.86 (0.77)	4.4	0.49	0.29-0.66	4.6	0.60	0.49-0.72

Note. The percentage positive is the percentage of all visits in each year with a positive gonorrhoea or chlamydia diagnosis.

Abbreviations: CI = Confidence Interval