Association of STI Diagnosis with Incident HIV in a Southern Statewide Cohort

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BACKGROUND

- STI rates reached an all-time high in the US in 2018[1]
- The Southern US has one of the highest rates of STIs[1] and the greatest rates of HIV infection[2]
- STI diagnosis is an HIV acquisition risk[3-6] and may indicate condomless sex or persistent STIs in a sexual network [7-8]
- STIs biologically augment HIV infectivity and susceptibility[9-10]
- Identifying STIs associated with high risk of HIV could improve targeting HIV prevention efforts
- We therefore studied incident HIV following STI diagnoses in a southern statewide cohort of men and women, regardless of sexual practices

METHODS

Study Population: HIV(-) individuals ≥13 years old with an STI (chlamydia, gonorrhea, all stages of syphilis) reported to the TN Department of Health (TDH) from 1/1/2013 – 12/31/2017

- Prevalent HIV infections at entry were excluded
- Individuals were followed from date of first STI until date of HIV infection or end of study

Data Collection: STI case surveillance registry (PRISM) and HIV surveillance registry (eHARS)[11] were matched with Registry Plus Link Plus software[12], using first and last names, date of birth, social security number, sex

- STI diagnoses defined per CDC case definitions[13]
- Syphilis diagnoses combined into early (primary, secondary and early latent) and late (late latent or unknown/unrecorded duration) diagnoses
- STI co-infection was defined as simultaneous diagnosis of ≥2 different STIs

Statistical Analysis: Multivariable Cox regression with time-varying STI yielded adjusted hazard ratios (aHR) and 95% confidence intervals (CI) for incident HIV.

- Age, gender, race/ethnicity, injection drug use, region of STI test, year of study entry, and an interaction term for MSM and gender were included
- Additional analyses stratified by cisgender MSM status

RESULTS

- There were 148,465 HIV-negative individuals followed for 377,823 person-years and diagnosed with 203,730 reportable STIs in TN during the study (**Table 1**). Median follow-up was 2.6 p-y.

Table 1. Demographic characteristics at cohort entry of individuals diagnosed with reportable STIs in TN from 2013-2017

Characteristic	Total Cohort n=148,465 N	%	HIV-Negative n=147,992 N	%	HIV-Positive n=473 N	%	p-value
Median Age (years)	22 (IQR: 19, 27)		22 (IQR: 19, 27)		24 (IQR: 20, 30)		p < 0.001
Gender							p < 0.001
Cisgender Male	55,483	37.4	55,062	37.2	421	89.0	
Cisgender Female	92,970	62.6	92,918	62.8	52	10.7	
Unknown	12	0.0	12	0.0	0	0.0	
Race/Ethnicity							p < 0.001
Black non-Hispanic	72,146	48.6	71,818	48.5	328	69.3	
White non-Hispanic	61,658	41.5	61,525	41.6	133	28.1	
Hispanic	6,202	4.2	6,190	4.2	12	2.5	
Other	2,248	1.5	2,248	1.5	0	0.0	
Unknown	6,211	4.2	6,211	4.3	0	0.0	
MSM							p<0.001
non-MSM	144,634	97.4	144,383	97.6	251	53.1	
MSM	3,831	2.6	3,609	2.4	222	46.9	
Injection Drug Use Last 12 Months							p<0.001
Yes	624	0.4	612	0.4	12	2.5	
No	147,841	99.6	147,380	99.6	461	97.5	

Table 2. Unadjusted and adjusted HRs with time-varying STI exposure

Characteristic	Unadjusted HR	95% CI	*Adjusted HR	95% CI
STI Diagnosis				
Chlamydia	Ref.	Ref.	Ref.	Ref.
Gonorrhea	**7.1**	5.6 - 9.0	**4.0**	3.1 - 5.2
Early Syphilis	**40.8**	30.4 - 54.7	**5.6**	4.0 - 8.0
Late Syphilis	**20.8**	14.5 - 29.9	**6.0**	4.0 - 9.0
Coinfection (Any)	**5.0**	3.8 - 6.7	**1.9**	1.4 - 2.6
Age (years)				
20	0.87	0.7 - 1.1	1.3	1.0 - 1.6
25	Ref.	Ref.	Ref.	Ref.
30	1.1	0.9 - 1.3	1.0	0.9 - 1.2
40	**1.3**	1.1 - 1.6	1.0	0.8 - 1.3
50	**1.6**	1.2 - 2.2	1.0	0.7 - 1.4
Gender				
Cisgender Female	Ref.	Ref.	§	§
Cisgender Male	**13.3**	9.9 - 17.7	§	§
MSM Status				
non-MSM	Ref.	Ref.	§	§
MSM	**29.2**	24.4 - 35.1	§	§
Race/Ethnicity				
Black non-Hispanic	Ref.	Ref.	Ref.	Ref.
White non-Hispanic	**0.5**	0.4 - 0.6	**0.7**	0.5 - 0.9
Hispanic	**0.4**	0.2 - 0.7	0.6	0.3 - 1.0
Other	0.0	.-.	0.0	.-.
Unknown	0.0	.-.	0.0	.-.
Injection Drug Use Last 12 Months				
No	Ref.	Ref.	Ref.	Ref.
Yes	**4.5**	2.5 - 8.2	**3.5**	1.9 - 6.7

*Adjusted for all variables included in the table, in addition to calendar year of study entry. An interaction term was used for gender-by-MSM status. **Bold** estimates are significant with p <0.05

RESULTS (continued)

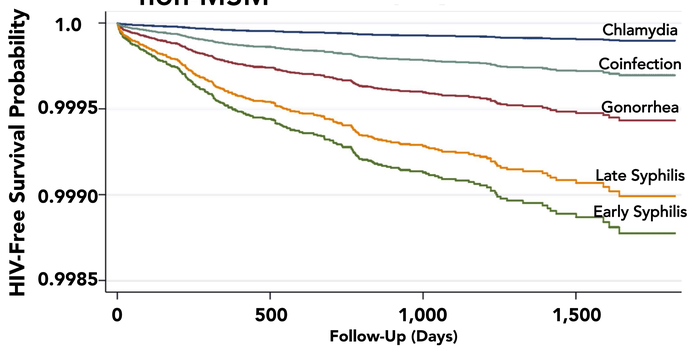
- All STIs were associated with increased HIV risk vs. chlamydia, both overall (**Table 2**), and for non-MSM (**Table 3**); all but coinfection were associated with increased HIV risk among MSM (**Table 3** / **Figure 1**).

Table 3. Adjusted HRs of incident HV, stratified by self-reported MSM status

	Non-MSM (n=145,535; HIV events=270)				MSM (n=3,822; HIV events=203)			
STI Diagnosis	HIV Incidence (per 1000 p-y)	aHR	95% CI		HIV Incidence (per 1000 p-y)	aHR	95% CI	
Chlamydia	0.4	Ref.	Ref.		16.1	Ref.	Ref.	
Gonorrhea	2.8	**4.8**	3.6 - 6.5		25.0	**1.9**	1.2 - 3.0	
Syphilis, Early	9.1	**11.0**	6.1 - 19.6		39.3	**3.3**	2.0 - 5.4	
Syphilis, Late	5.8	**12.4**	7.2 - 21.6		29.4	**2.8**	1.5 - 5.1	
STI Coinfection	1.7	**1.7**	1.1 - 2.6		43.5	1.4	0.9 - 2.3	

p-y: person-years; MSM: Men who have sex with men; Model adjusted for age at cohort entry, self-reported MSM status, race/ethnicity, history of intravenous drug use, TN region/metro, year of study entry; an interaction term was used for gender by MSM status. **Bold** estimates are significant with p <0.05

Figure 1. HIV-free Survival by STI type among non-MSM



CONCLUSIONS

- Though we made use of surveillance data for both STIs and HIV, we may have overestimated time-at-risk in certain risk-sets due to lack of information on migration out-of-state or lapses in receipt of regular HIV tests
- Results may help identifying risk of HIV acquisition at time of contact with healthcare system
- While HIV prevention efforts often focus on MSM, non-MSM with STIs should be a population of interest

ACKNOWLEDGEMENTS & REFERENCES

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