Proportion of HIV and STI cases among men who have sex with men (MSM) attributable to serosorting

Christine M. Khosropour[1], Lindley A. Barbee[2,3], Julia C. Dombrowski[2,3],
Roxanne P. Kerani[1,2,3], David A. Katz[2,3], Fred Swanson[4], Matthew R. Golden[2,3]

Departments of [1]Epidemiology and [2]Medicine at the University of Washington, Seattle, WA, USA,
[3]Public Health – Seattle & King County, and [4]Gay City Health Project, Seattle, WA, USA

Public Health
Seattle & King County

Contact: Christine Khosropour
ckhosro@uw.edu

CFAR
CENTER FOR AIDS RESEARCH
University of Washington

BACKGROUND

- Serosorting is a common practice among MSM
- Serosorting may be protective from HIV but whether serosorting increases or decreases an individual's risk of bacterial STI is not well studied
- The contribution of serosorting to HIV and bacterial STI disease burden is unknown

OBJECTIVES:

(1) To evaluate the association between serosorting and testing newly positive for bacterial STI
(2) To determine the proportion of HIV and bacterial STI cases attributable to serosorting or prevented by serosorting

METHODS

DATA COLLECTION:

- We used records of MSM visits from two HIV/STI testing sites in Seattle, Washington:
    1) Public Health – Seattle & King County (PHSKC) STD clinic (2002-2013)
    2) Gay City Health Project (GCHP) – a community-based HIV/STI testing center (2004-2013)

MEASURES:

Behavioral Categories:
- At both sites, MSM were asked about condom use with HIV-positive, HIV-negative and unknown-status partners in the prior 12 months. We classified behaviors into 3 mutually exclusive categories:
    1) No condomless anal intercourse (no CAI): always used condoms for anal sex or no anal sex
    2) Serosorting: CAI only with HIV-concordant partners
    3) Non-concordant CAI (NCCAI): CAI with HIV-discordant/unknown-status partners

HIV and bacterial STI Testing:
- HIV: Rapid HIV testing for men who had not previously tested HIV positive; HIV EIA and (beginning in 2003) pooled RNA testing for men who agreed to a blood draw
- Urethral and rectal gonorrhea/chlamydia (GC/CT): Urethral specimens were obtained from men with signs/symptoms of urethritis or who reported exposure to a partner with GC/CT; rectal specimens were obtained from men who reported receptive anal sex in the past year. We tested specimens via culture until 2010 and nucleic acid amplification testing (NAAT) thereafter.
- Early Syphilis: All men who agreed to a blood draw were tested using the RPR test. A single disease investigation specialist reviews all cases of syphilis in King County and assigns a stage based on laboratory and clinical findings.

STATISTICAL ANALYSIS:

- **Association between serosorting and HIV/bacterial STIs**: Multivariable log binomial regression models clustered by participant with robust variances to estimate the adjusted relative risk (aRR) of serosorting (exposure) and testing newly positive for the following outcomes: (1) HIV; (2) Urethral GC/CT; (3) Rectal GC/CT; (4) Early syphilis (primary, secondary, or early latent)

- **Population Attributable Risk Percent (PAR%)**: The proportion of HIV or STI cases attributable to serosorting (i.e., the proportion of HIV/STI cases that would be eliminated if everyone who serosorted had always used condoms or not had anal sex [no CAI])

$$PAR\% = \frac{aRR - 1}{aRR} \times \text{Proportion of cases who reported serosorting} \times 100\%$$

aRR = Risk of HIV/bacterial STI for serosorting relative to no CAI

- **Prevented Fraction (PF)**: The proportion of HIV or STI cases prevented by serosorting (i.e., the proportion of hypothetical HIV/STI cases that did not occur because men engaged in serosorting and not NCCAI)

$$PF\ (\%) = 1 - aRR \times \text{Proportion of cases who reported serosorting} \times 100\%$$

aRR = Risk of HIV/bacterial STI for serosorting relative to NCCAI

RESULTS

STUDY POPULATION:

Characteristics of visits by MSM attending the PHSKC clinic and GCHP, 2002-2013 (N=49,912)

Characteristic	Total Visits (N = 49,912)	HIV-negative MSM (N = 44,961)	HIV-positive MSM (N = 4,647)
	N (%)	N (%)	N (%)
Sexual behaviors, past 12 months			
Non-concordant CAI	13,432 (27)	11,566 (26)	1,866 (40)
Serosorting	17,502 (35)	15,725 (35)	1,777 (38)
No CAI	18,674 (37)	17,670 (39)	1,004 (22)
HIV/STI test positivity at visit*			
HIV	823 (2.1)	823 (2.1)	--
Rectal GC/CT	3,214 (14)	2,478 (13)	736 (24)
Urethral GC/CT	2,838 (10)	2,232 (9)	606 (18)
Early syphilis	951 (2)	592 (1)	349 (8)

*Of those tested for the infection. CAI = Condomless anal intercourse

ACKNOWLEDGEMENTS/FUNDING

RESULTS

Association between serosorting and testing newly positive for HIV/bacterial STIs among MSM attending the PHSKC STD clinic and GCHP 2002-2013
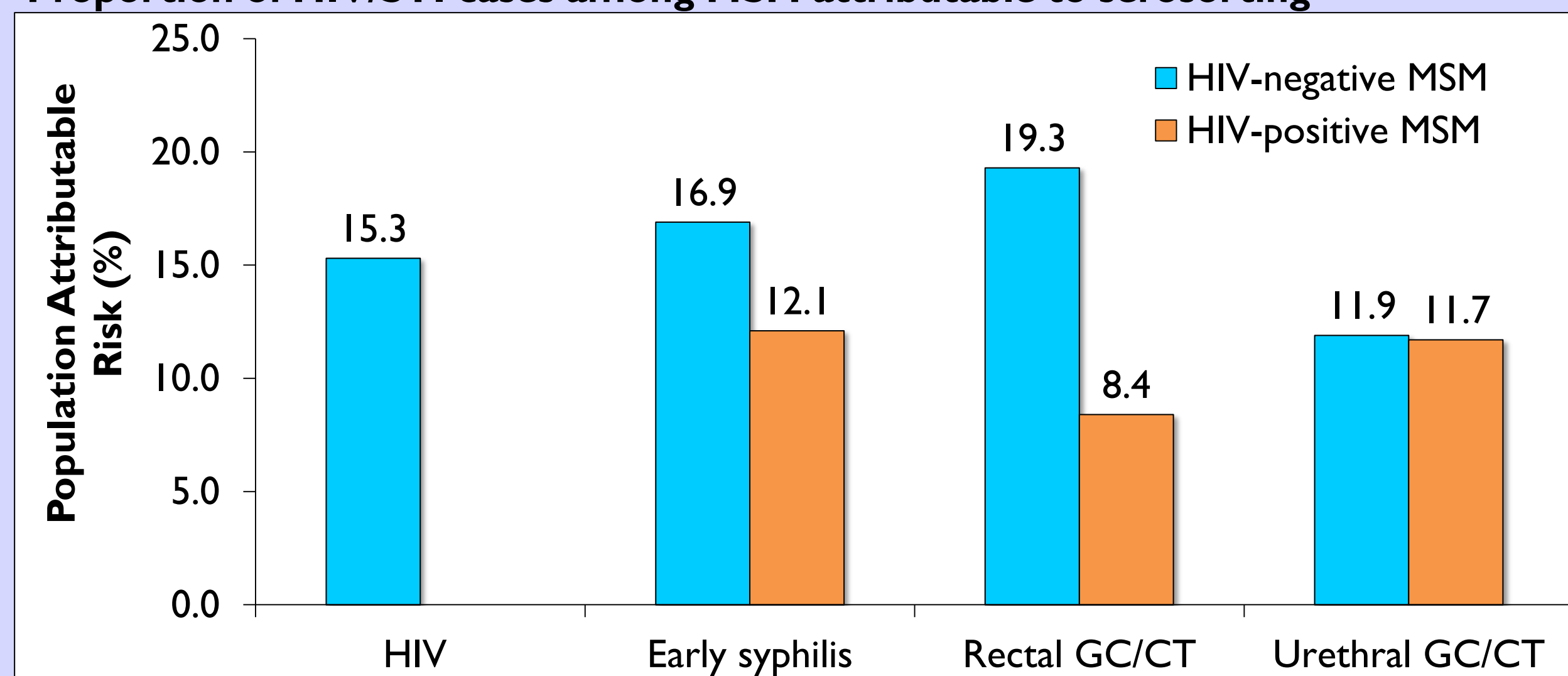
	Proportion of Cases who Reported Serosorting (%)	Serosorting test positivity n/N (%)*	aRR (95% CI)** Serosorting vs NCCAI	aRR (95% CI)** Serosorting vs no CAI
HIV-Negative MSM				
HIV	31.0	255/13,768 (1.9)	**0.53 (0.45-0.62)**	**1.98 (1.61-2.44)**
Urethral CT/GC	36.8	822/8,386 (9.8)	**0.89 (0.80-0.99)**	**1.48 (1.33-1.65)**
Rectal CT/GC	46.1	1142/7,661 (14.9)	1.02 (0.93-1.11)	**1.72 (1.54-1.91)**
Early syphilis	34.1	202/14,525 (1.4)	**0.76 (0.62-0.92)**	**1.98 (1.56-2.52)**
HIV-Positive MSM				
Urethral CT/GC	44.2	268/1,390 (19.3)	**1.22 (1.02-1.45)**	**1.36 (1.11-1.73)**
Rectal CT/GC	39.7	292/1,220 (23.9)	0.91 (0.80-1.05)	**1.27 (1.00-1.62)**
Early syphilis	42.4	143/1,642 (9.0)	1.02 (0.81-1.30)	**1.40 (1.02-1.92)**

*n/N = Among men who reported serosorting, number who tested positive for the infection out of the total number tested
**Models adjusted for: age, race, number of male sex partners in the past 12 months, methamphetamine use, clinic, and year

POPULATION ATTRIBUTABLE RISK % AND PREVENTED FRACTION*:
*Only infections with statistically significant aRR's are displayed on graphs below

Proportion of HIV/STI cases among MSM attributable to serosorting

Interpretation: E.g., 15.3% of HIV cases would have been prevented if all men who serosorted had instead not had condomless anal intercourse

Hypothetical proportion of HIV/STI cases among MSM prevented by serosorting
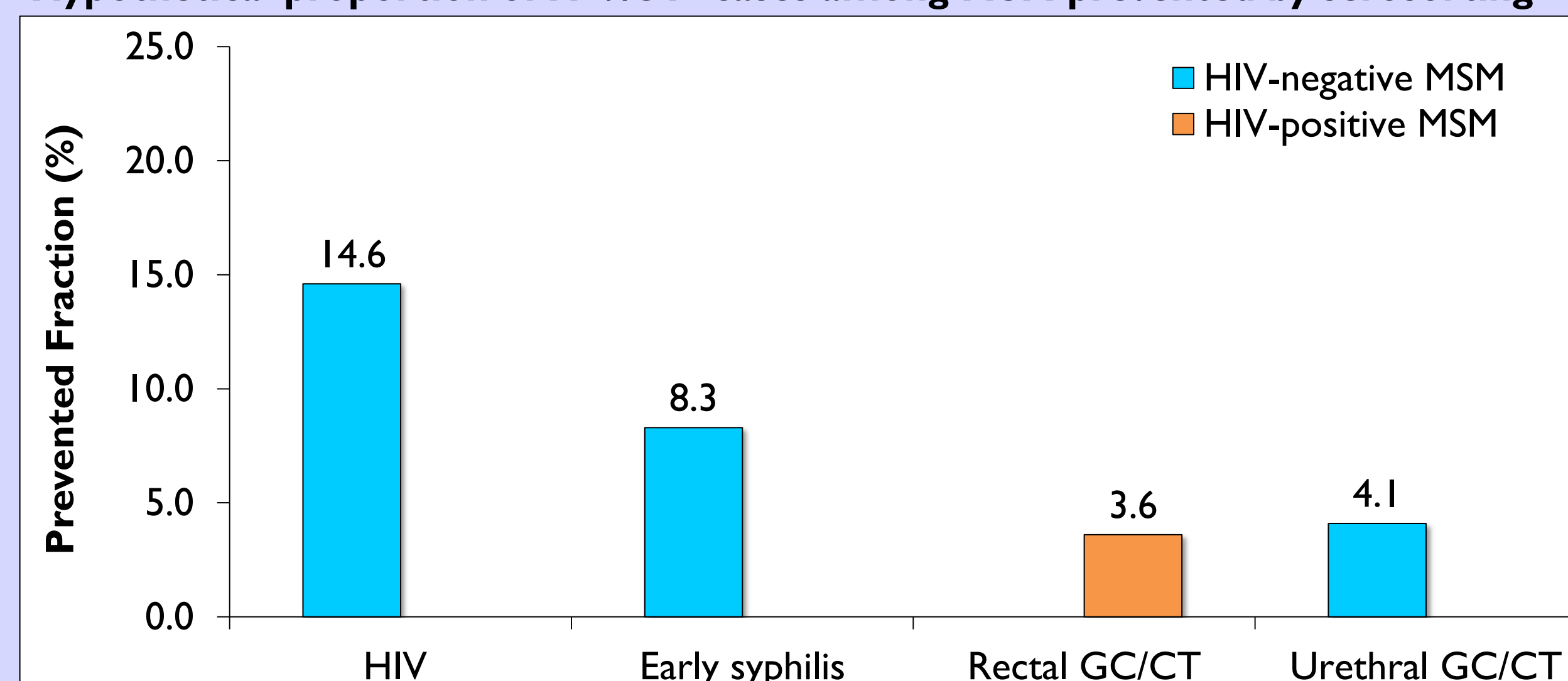
Interpretation: E.g., 14.6% of hypothetical HIV cases did not occur because men engaged in serosorting and not non-concordant condomless anal intercourse

DISCUSSION

SUMMARY:

- Among HIV-negative MSM, serosorting was protective from HIV and early syphilis
- For HIV-negative and HIV-positive MSM, serosorting was associated with a higher risk of all bacterial STIs relative to no CAI
- 15.3% of HIV cases and 8-19% of bacterial STI cases were due to men engaging in serosorting instead of not having anal sex or always using condoms
- 14.6% of hypothetical HIV cases and <10% of hypothetical bacterial STI cases did not occur because men engaged in serosorting and not NCCAI

LIMITATIONS:

- These are cross-sectional data collected during routine medical visits
- PAR% and PF are not dynamic and they assume that *all* men who serosorted would have instead had CAI or not had NCCAI, respectively; this assumption is likely unrealistic
- These data may not be generalizable to MSM populations outside of Seattle

CONCLUSIONS:

Among Seattle MSM, there appears to be no net effect of serosorting on HIV disease burden (i.e., the proportion of HIV cases attributable to or prevented by serosorting is approximately equal) but serosorting may be responsible for more STI cases than it prevents