

Centre for Sexual Health & HIV Research
Department of Infection & Population Health



Epidemiology of HIV Acquisition & Transmission in MSM

**Professor Graham Hart
Director**

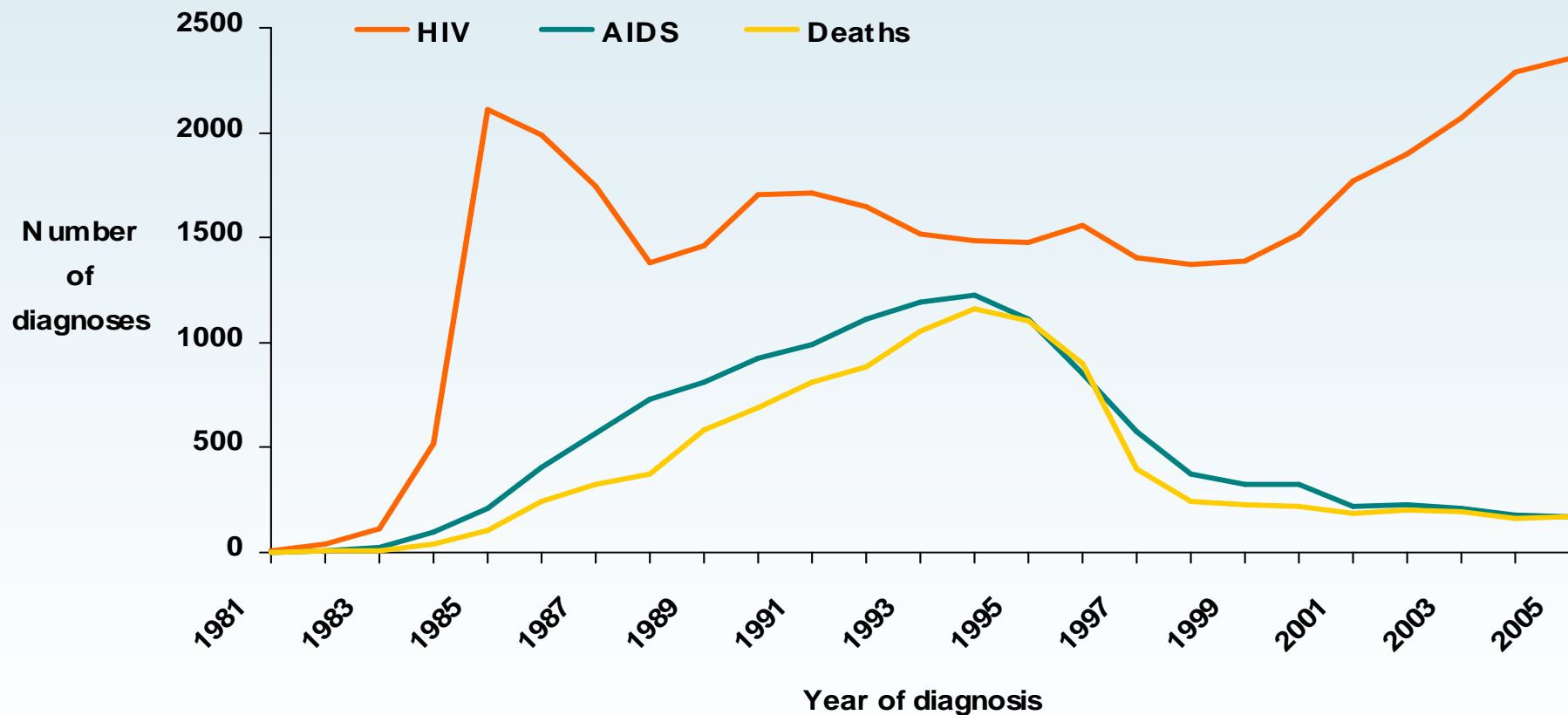
**Centre for Sexual Health & HIV Research
Research Department of Infection & Population Health**

OVERVIEW

- **Incidence and Prevalence**
- **Infectivity and Transmission**
- **Conclusion and Discussion**

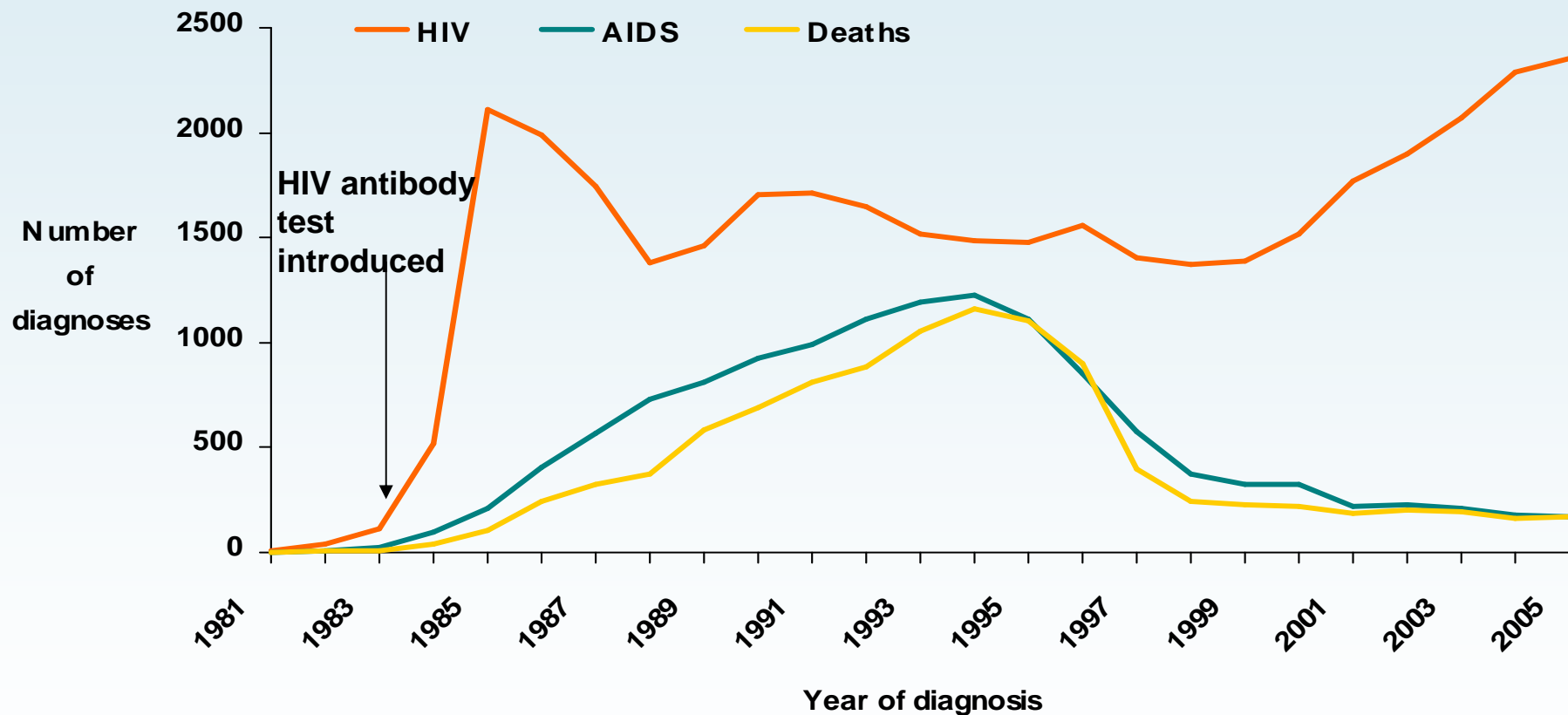
INCIDENCE & PREVALENCE

HIV and AIDS diagnoses and deaths for MSM, UK



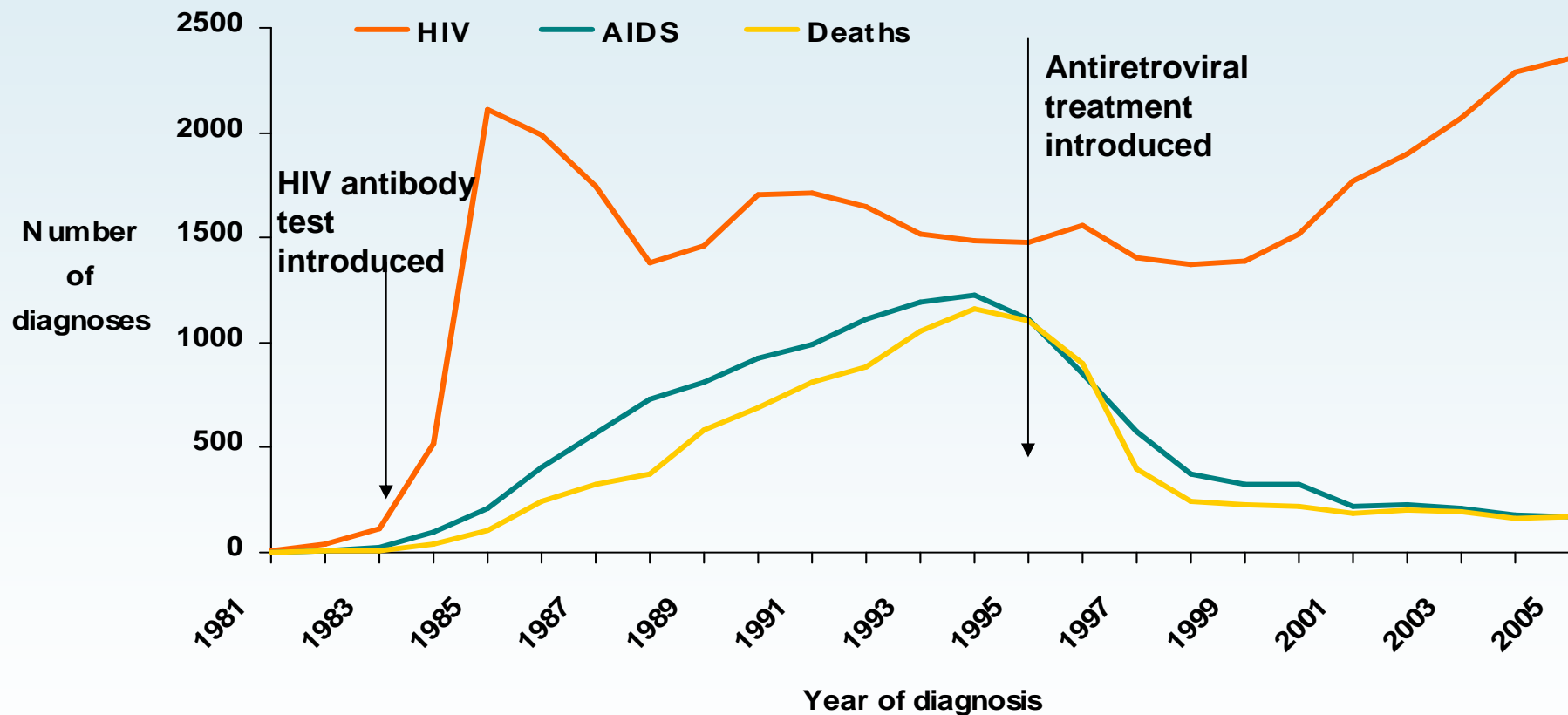
Numbers will rise for recent years as further reports are received
Clinician reports of new HIV/AIDS diagnosis

HIV and AIDS diagnoses and deaths for MSM, UK



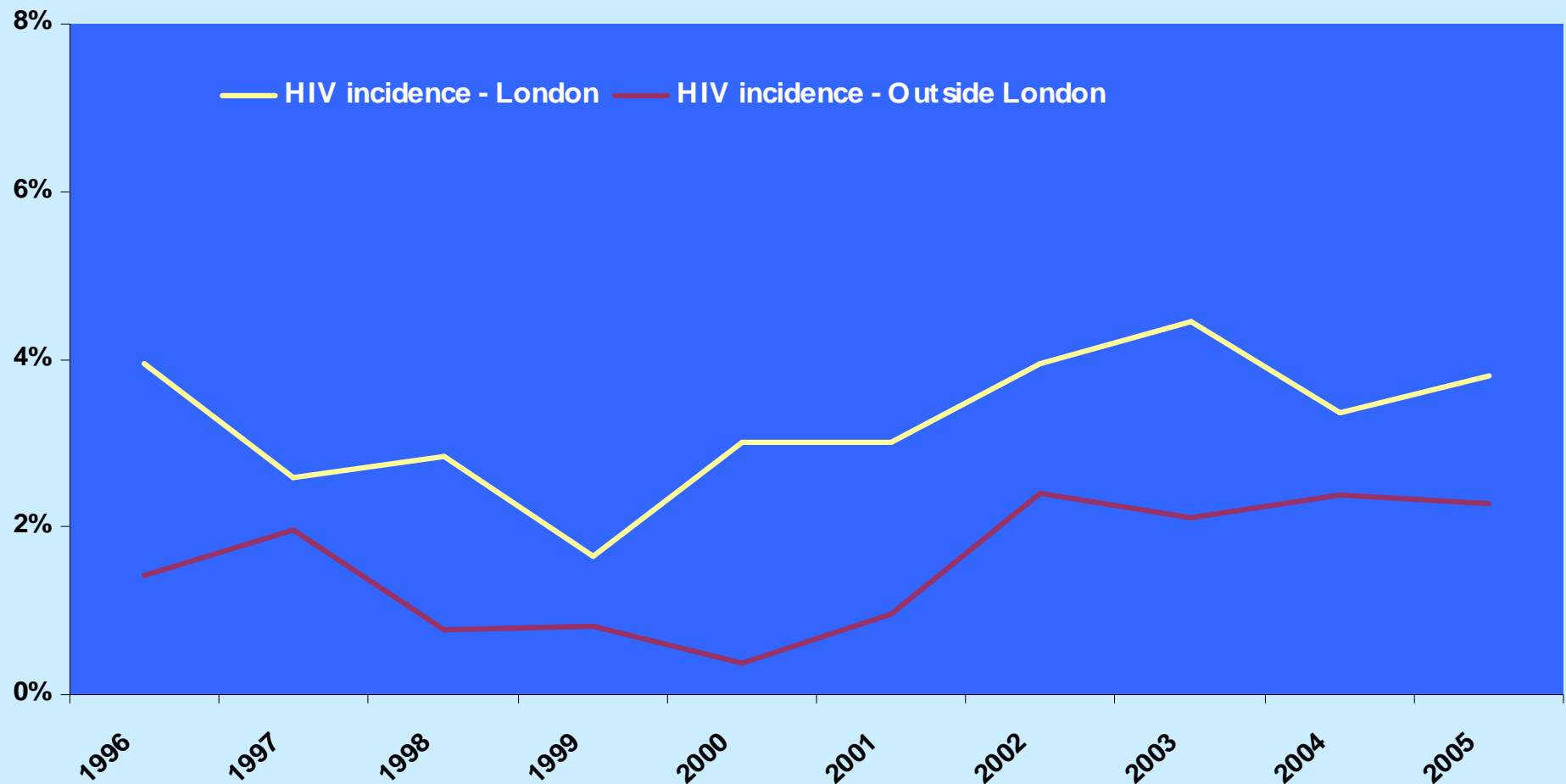
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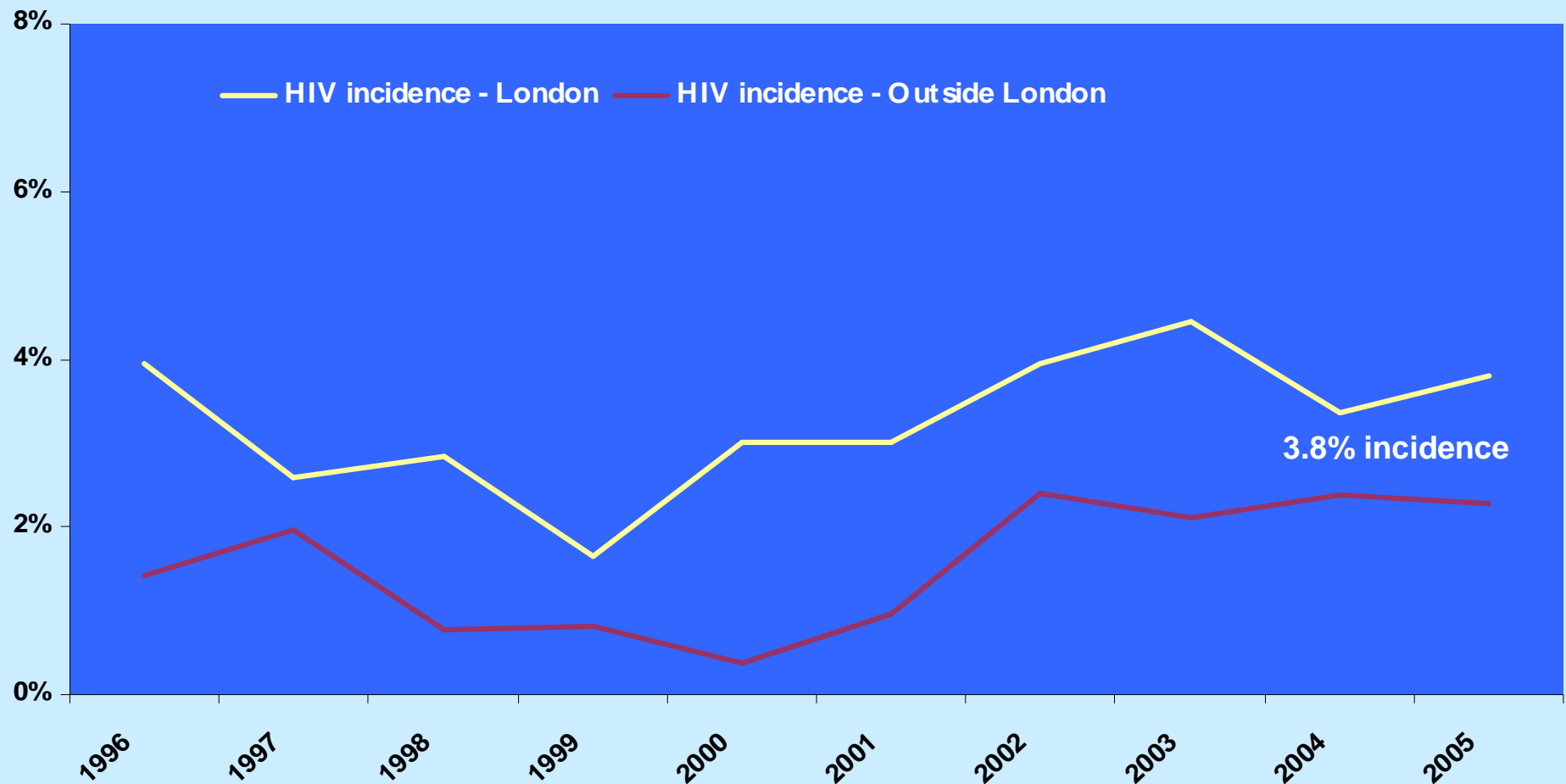
Estimated HIV incidence in MSM attending STD clinics



Estimated using the Serological Testing Algorithm for Recent HIV Seroconversion (STARHS)

Trend not significant

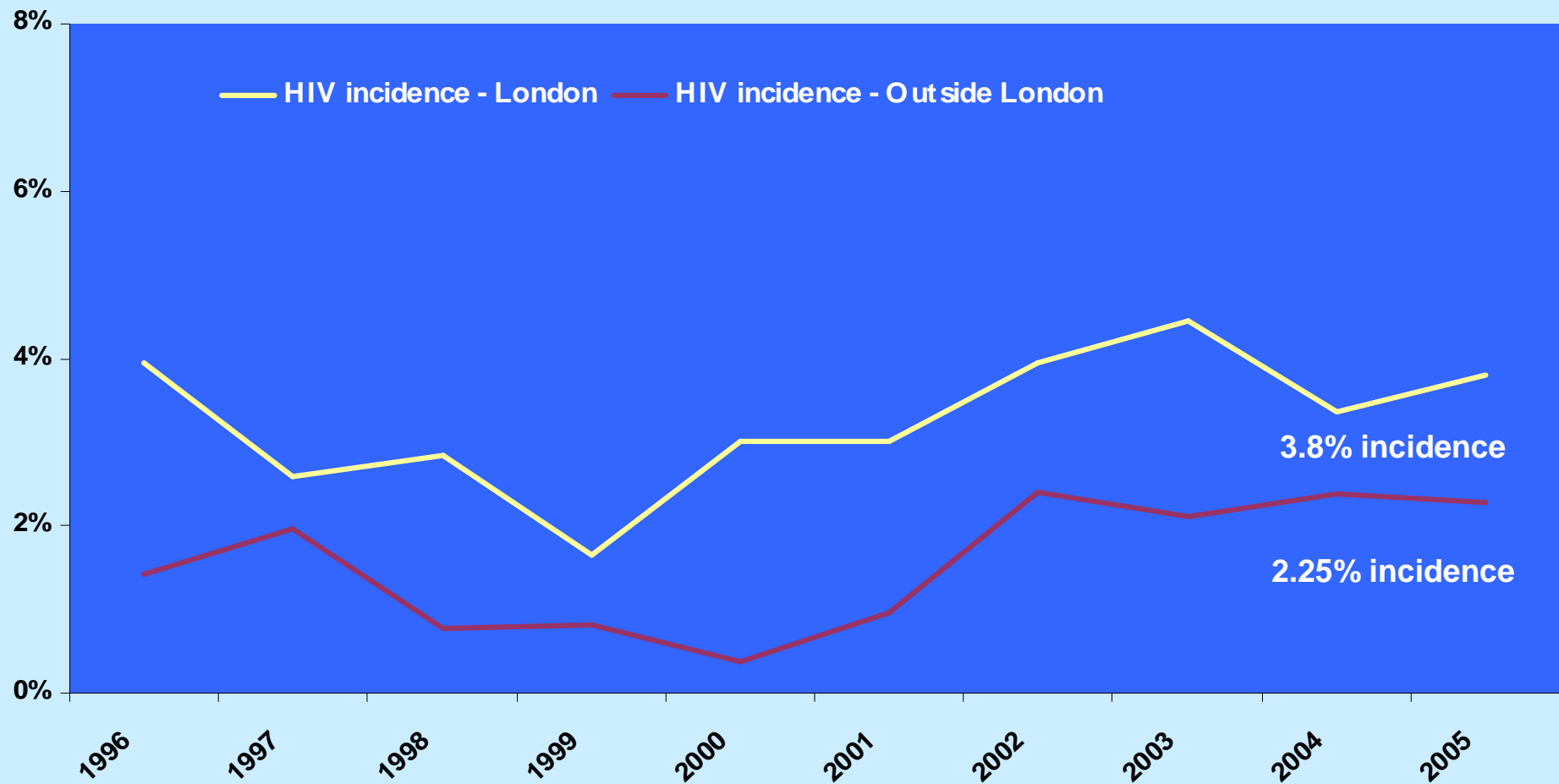
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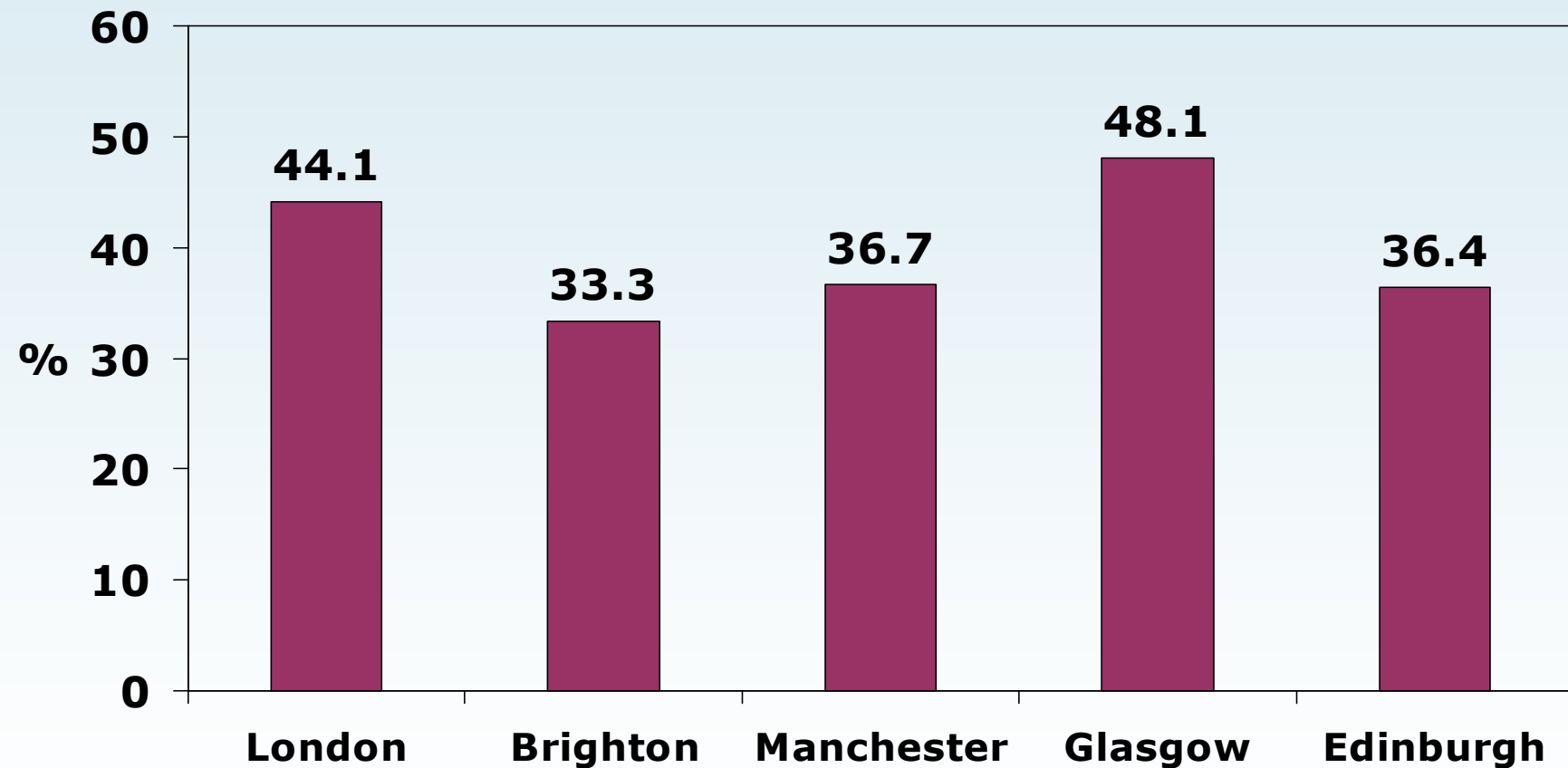
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Undiagnosed HIV infection in MSM in community samples in the UK, 2003-5



(Williamson et al, *AIDS* 2008, 22:1063–1070)

UNITED STATES: Incidence & Prevalence in African American MSM

Young MSM (ages 15-22) Substance Use Behavior

Drug use past 6 months	Black (n=814) (%)	White (n=1259) (%)
Injection drug use	3.1	9.9*
Needle sharing	0.6	4.3*
Uppers/ speed	16.2	49.6*
Powder cocaine	11.6	38.8*
Crack cocaine	4.6	12.2*
Nitrites/ poppers	6.4	28.8*

(Harawa et al., 2004)

*P < .05



Young MSM (ages 15-22) Sexual Risk Behavior

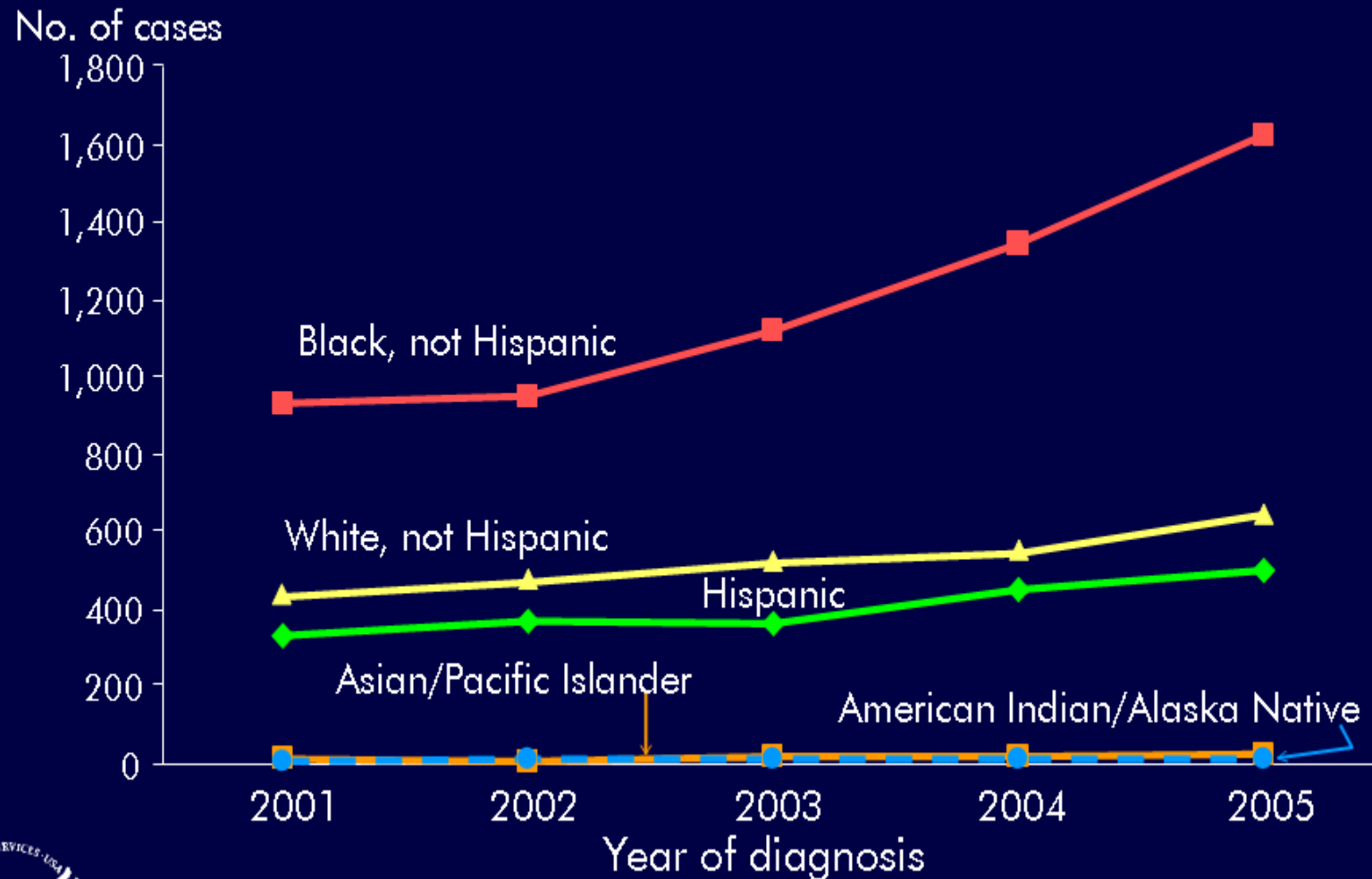
Sexual behavior past 6 months	Black (n=814) (%)	White (n=1259) (%)
Casual male sex partner	49.3	59.7*
IDU male sex partner	5.9	10.6*
HIV+ male sex partner	4.8	6.1*
UAI	48	59*

(Harawa et al., 2004)

*P < .05



HIV/AIDS Cases among Men Who Have Sex with Men Aged 13–24, by Race/Ethnicity, 2001–2005—33 States



Note. Data statistically adjusted for reporting delays and redistribution of cases in persons initially reported without an identified risk.



HIV Prevalence & Proportion with Undiagnosed HIV Infection in MSM in 5 US Cities – NHBS, 2004-2005

Characteristic	Total Tested	HIV Prevalence		Undiagnosed HIV Infection	
		N	(%)	N	(%)
Total	1767	450	(25)	217	(48)
Age					
18-24	410	57	(14)	45	(79)
25-29	303	53	(17)	37	(70)
30-39	585	171	(29)	83	(49)
40-49	367	137	(37)	41	(30)
≥ 50	102	32	(31)	11	(34)
Race					
White	616	127	(21)	23	(18)
Black	444	206	(46)	139	(67)
Hispanic	466	80	(17)	38	(48)
API	95	7	(7)	2	(29)
NA/AN	<10	<10	(29)	<10	(100)
Multiracial/Other	123	25	(20)	13	(52)



(MMWR, 6/24/05)



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HIV Prevalence and Young Black MSM

**Initial dx of HIV
among MSM ages
13-24**

White 9%; Latino 13%;

Black 16%

(MMWR, 1/14/00)

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(MMWR, 1/14/00)

Age	HIV Prevalence
15-22	15%
23-29	32%
Median age 32	46%

Sex Partners/ Networks

- **Sexual mixing by age and HIV infection risk** (Blower, 1995)
- **Black MSM more likely to have older partners** (Berry et al., 2007; Bingham et al., 2003)
- **Black MSM more likely to have Black partners** (Berry et al., 2007; Bingham et al., 2003; MMWR, 2005)

HIV infection in Black MSM partially explained by partner characteristics

(Bingham et al., 2003)

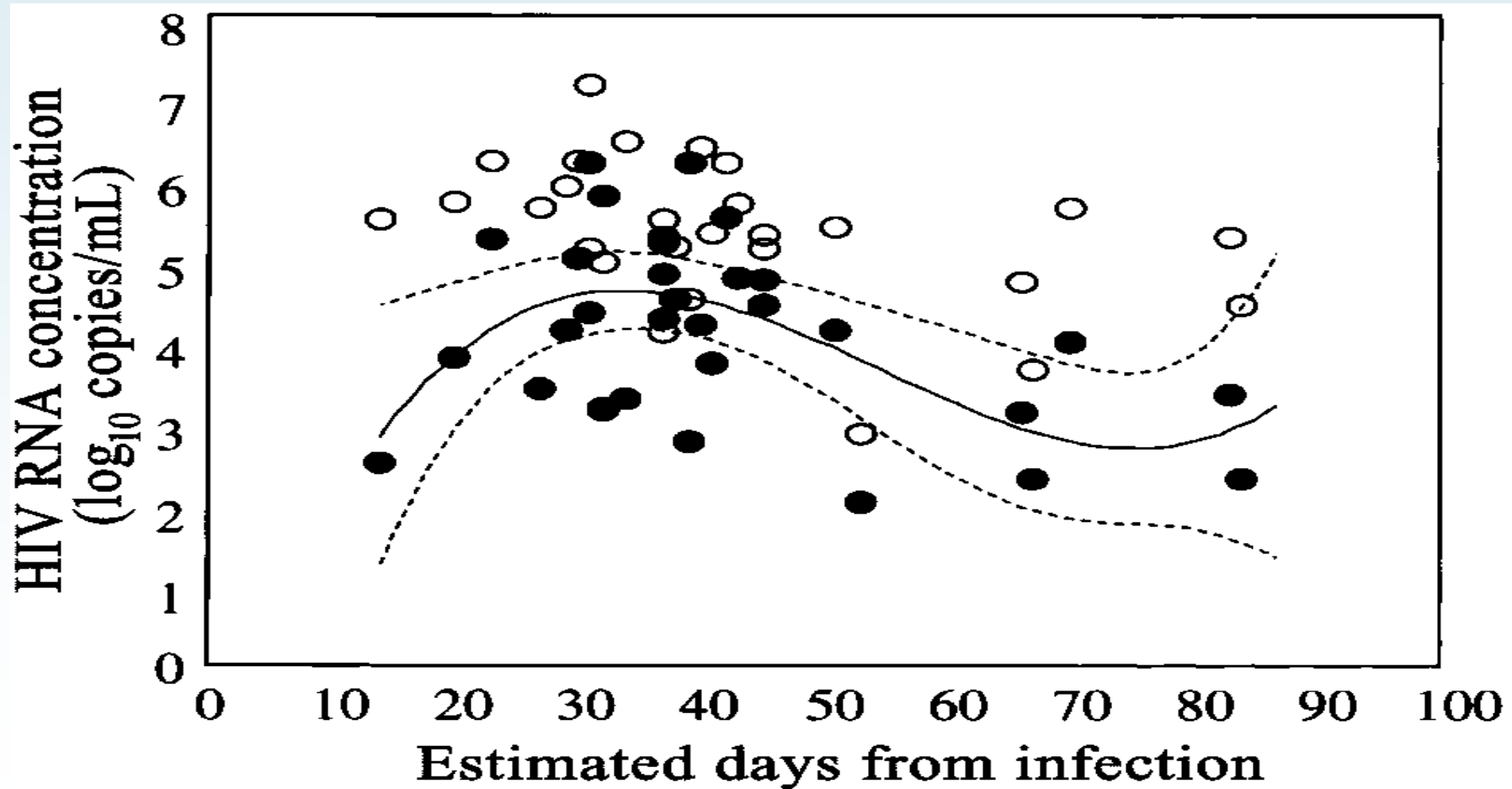


Incidence and prevalence - Summary

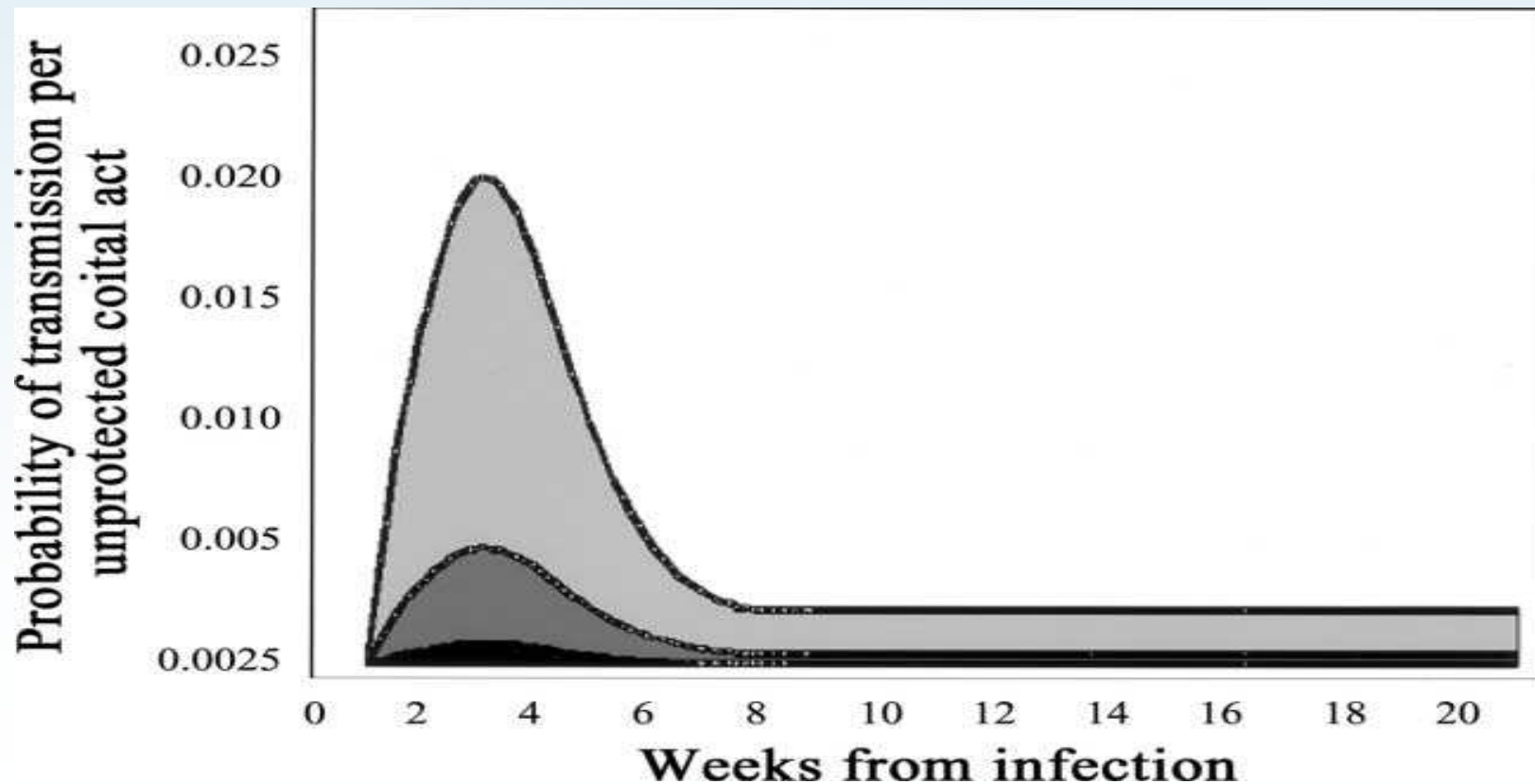
- **Increased HIV prevalence & incidence in MSM in UK**
- **High prevalence of undiagnosed infection in the community**
- **In US, higher community prevalence in African American MSM = increased risk for every sexual exposure, despite lower risk behaviour than White MSM**
- **Higher incidence & prevalence in London compared to outside London = increased risk for every sexual exposure in London versus outside London**

INFECTIVITY & TRANSMISSION

HIV-1 concentration in semen (*black circles*) & blood (*white circles*) versus time from acute HIV-1 infection (n=30)

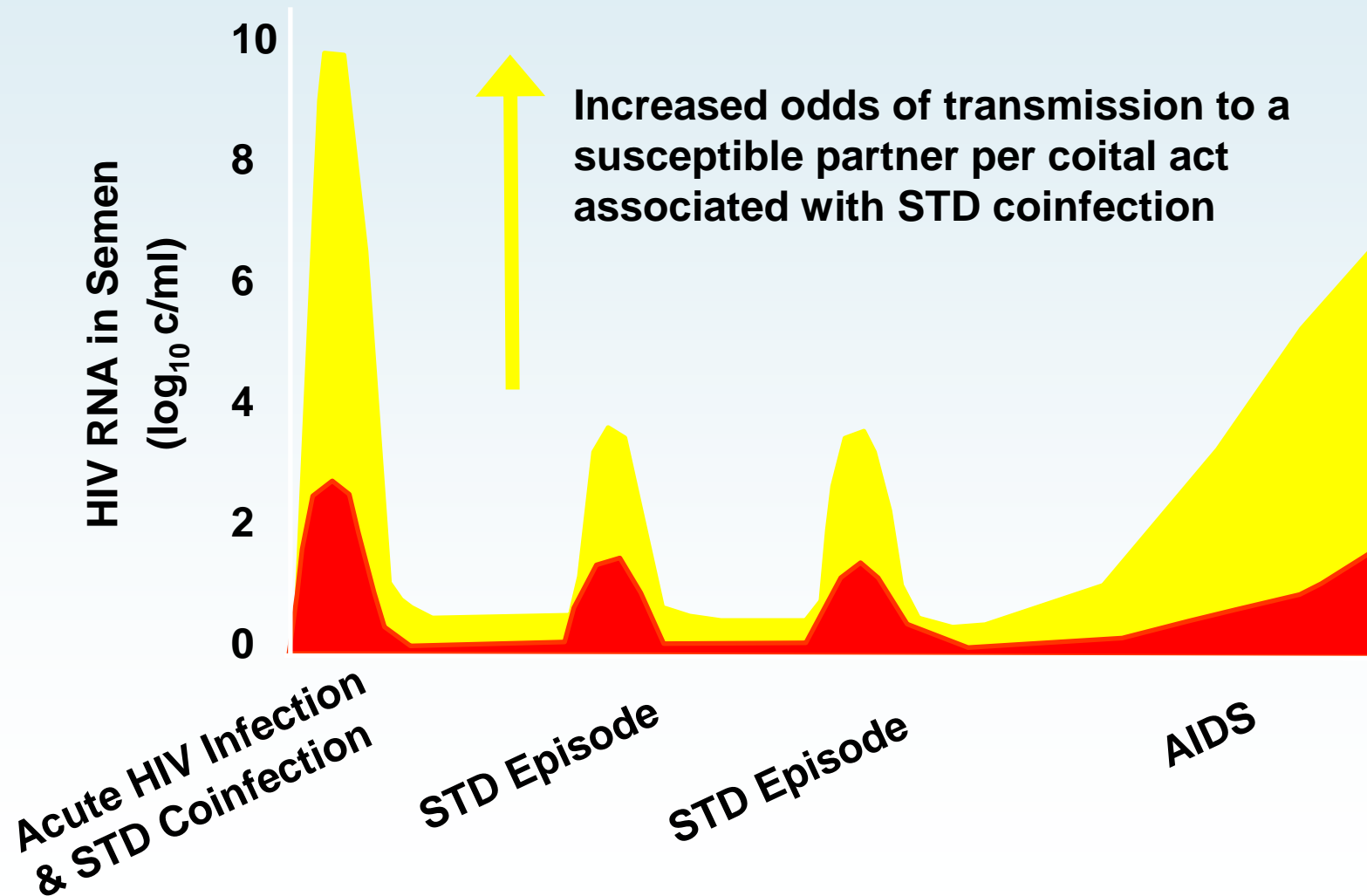


Calculated probabilities of transmission per coital act over time for individuals at 25th (black), 50th (dark grey) & 75th (light grey) percentile semen HIV-1 load values

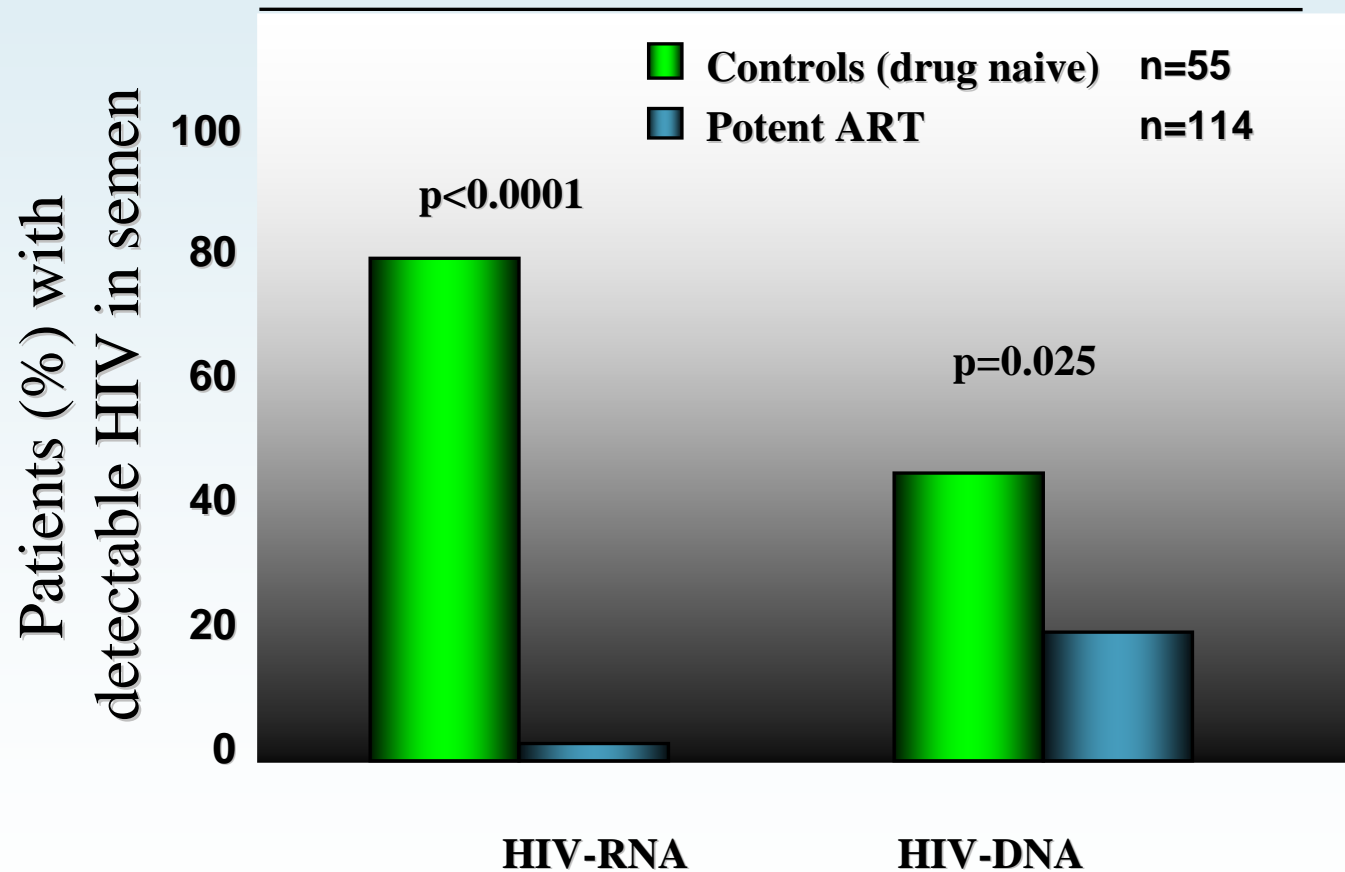


Pilcher et al, JID 2004

Amplified Transmission of HIV



Semen HIV in patients with suppressed viral load



Vernazza, Cohen *et al.*, AIDS, 2000

HIV in Semen with ART

Sheth et al CROI 2009, A50

- **25 subjects with undetectable blood VL**
- **HIV in semen in 12/25 (48%), >5000 copies ml in 4/25**
- **HIV in semen detected in 19/116 (16%)**

Genital Tract Shedding Persists

Brown et al. (submitted)

Cross-sectional studies [1-6]:

No HAART: 31-79% prevalence of shedding

HAART: 15-50% prevalence of shedding

1. Cu-Uvin et al. 2000

2. Fiore et al. 2003

3. Kovacs et al. 2001

4. Si-Mohammed et al. 2000

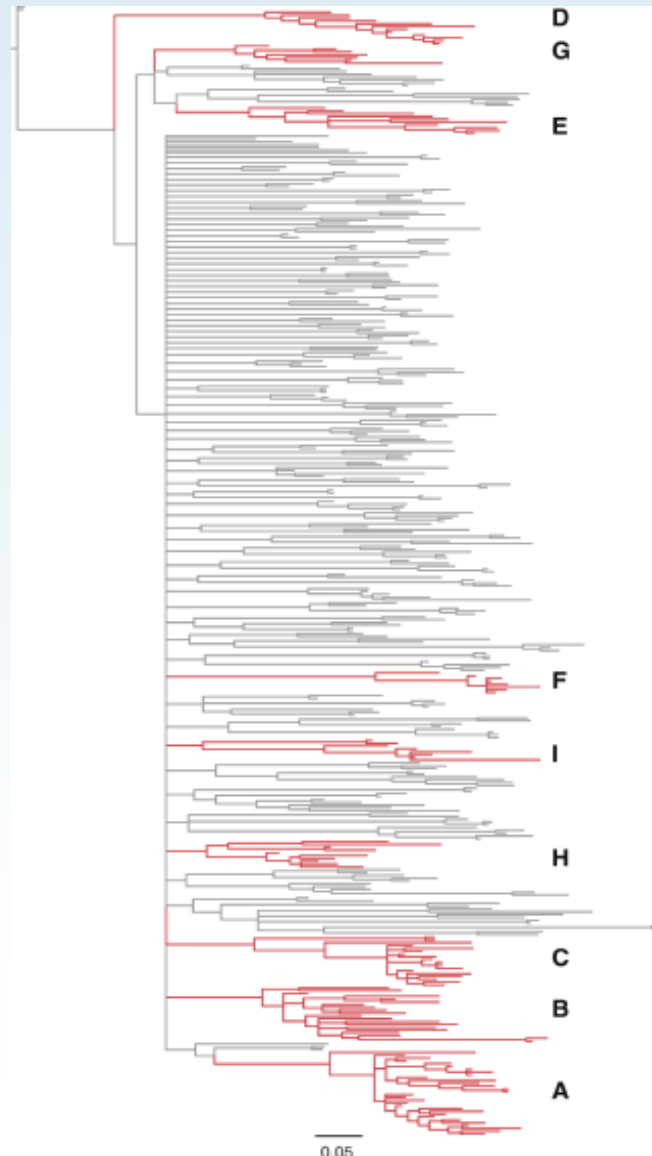
5. Vettore et al. 2006

6. Neely et al. 2007

Phylogenetic reconstructions of HIV transmission

- **Linking transmission events to biological factors (eg recent infection; ART treated; untreated)**
- **24-49% transmissions linked to recent infection (Brenner et al)**

Phylogenetic tree of sequences closely linked to at least one other (N = 402)



Clusters with 10 members are shown in red

Letters indicate the position of identified clusters

Lewis *et al*
PLoS Medicine 2008

Brighton Phylogenetics Project

Between 2000-06, 859 HIV *pol* sequences from MSM from Brighton:

- Infection category at diagnosis
- Infection category and clinical markers updated for each calendar quarter following diagnosis eg *'recent'* to *'chronic untreated'* to *'treated'*

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Most likely transmission source of 159 patients recently HIV-infected at diagnosis identified

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10 recently HIV-infected

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19 chronically infected, untreated

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19 chronically infected, untreated

2 chronically infected, treated

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10 recently HIV-infected

9 chronically infected, interrupting treatment

19 chronically infected, untreated

2 chronically infected, treated

Transmission rate ratio

(multivariate poisson regression model)

Factor	Rate ratio	95%CI	p value	
Age <i>per 5 years older</i>	0.69	0.55, 0.87	0.002	
Viral load <i>per log 10 higher</i>	1.61	1.14, 2.27	0.007	
Infection category	<i>Recent infection</i>	3.25	1.44, 7.31	0.005
	<i>Chronic infection, untreated</i>	1		
	<i>Chronic infection , treated</i>	0.24	0.05, 1.24	0.09
	<i>Chronic treatment interruption</i>	1.48	0.65, 3.41	0.35
STI at transmission	<i>No</i>	1		
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Infectivity and transmission - Summary

- Recent infection associated with greater transmission probability
- Transmission likelihood increased by co-infection with STI
- ART reduces infectivity significantly (Swiss Statement)
- BUT even with ART, virus still found in semen & genital tract
- Phylogenetic analysis identifies relative contribution of stage of infection

CONCLUSIONS

- **Any debate about partner numbers needs to take account of the epidemiology of HIV incidence & prevalence Post-ART**
 - ♦ **Increased HIV prevalence & incidence in MSM in UK**
 - ♦ **Higher incidence & prevalence in London compared to outside London = increased risk for every sexual exposure in London**
- **Any debate about partner numbers needs to take account of emerging knowledge about infectivity & transmission**
 - **Recent infection & STI co-infection increase transmission probability**
 - **ART reduces infectivity, but virus still present in semen**

FOR DISCUSSION

- **In high prevalence & incidence areas every episode of UAI is at higher risk**
- **MSM unaware of their HIV infection (recently infected; untested; untreated) who engage in UAI are likely to contribute disproportionately to transmission**
- **ART-treated MSM who have UAI partners of unknown HIV status may contribute to transmission**
- **Partner numbers matter more when there is more unsafe sex**

Acknowledgements



Greg Millett



Myron Cohen



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