

Sexual Mixing and HIV Risk Among Ethnic Minority MSM in Britain

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Abstract We conducted a cross-sectional online survey of men who have sex with men (MSM) living in Britain in 2007–2008 to examine sexual mixing among ethnic minority MSM. The sample comprised 115 black, 112 South Asian, 47 Chinese and 4,434 white MSM who reported unprotected anal intercourse (UAI) in the previous 3 months. In each ethnic minority group, MSM were three times more likely to report UAI with a partner of the same ethnicity than would be expected by chance alone ($\chi^2 > 8.43$, $p < 0.05$). Nonetheless, most (>80 %) ethnic minority MSM reported UAI with men from an ethnic group other than their own. In multivariable analysis there was statistical evidence that, compared with white British MSM, self-reported HIV seropositivity remained low for South Asian and Chinese MSM after adjusting for UAI with partners of the same ethnicity (e.g. South Asian MSM, adjusted odds ratio 0.35, 95 % CI 0.19–0.66). This analysis suggests that differences in self-reported HIV seropositivity between ethnic minority and white MSM in Britain cannot be explained by sexual mixing with partners from the same ethnic group.

Resumen LLevamos a cabo una encuesta transversal en línea de los hombres que tienen sexo con hombres (HSH) que vivían en Gran Bretaña en 2007–2008 para examinar la mezcla sexual entre los HSH de minorías étnicas. La muestra de HSH incluyó a 115 negros, 112 sudasiáticos, 47 chinos y 4434 blancos que habían declarado haber tenido coito anal no protegido en los tres meses anteriores. En cada grupo étnico minoritario, los HSH fueron tres veces más propensos a declarar haber tenido coito anal no protegido con un compañero de la misma étnia de lo que se esperaba por la pura casualidad ($\chi^2 > 8.43$, $p < 0.05$). Sin embargo la mayoría (>80%) de los HSH de minorías étnicas declararon haber tenido coito anal no protegido con hombres de un grupo étnico distinto del suyo. En el análisis multivariable hubo evidencia estadística de que, en comparación con los HSH británicos blancos, la seropositividad VIH autodeclarada siguió siendo baja para los HSH sudasiáticos y chinos después de ajustar para el coito anal no protegido con compañeros de la misma pertenencia étnica (p.ej. HSH sudasiáticos, odds ratio ajustado 0,35, intervalo de confianza del 95% 0,19, 0,66). Este análisis sugiere que las diferencias en la seropositividad VIH autodeclarada entre los HSH de minorías étnicas y blancos en Gran Bretaña no pueden explicarse por la mezcla sexual con compañeros del mismo grupo étnico.

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Introduction

A study conducted in 2007–2008 among ethnic minority men who have sex with men (MSM) living in Britain found

differences between ethnic groups in self-reported HIV seropositivity. HIV seropositivity was lower among South Asian and Chinese men than among black African, black Caribbean and white British men [1]. These differences could not be explained by individual risk factors for HIV such as age, recreational drug use, HIV treatment optimism and sexual behaviour. Indeed, one of the striking, yet paradoxical findings of the study was that there were no differences in high risk sexual behaviour between ethnic groups despite marked differences in HIV seropositivity. In all ethnic groups, a quarter of the men reported having unprotected anal intercourse (UAI) with a partner of unknown or discordant HIV status in the previous 3 months. This presents a risk for HIV transmission.

A number of studies in the USA have also found that differences in HIV prevalence between ethnic groups cannot be explained by individual risk factors such as condom use or number of sexual partners [2–10]. In the USA, there exist substantial racial disparities in the prevalence of HIV among MSM; black MSM have relatively high rates while Asian Pacific Islanders have relatively low rates compared with white MSM.

Several hypotheses have been put forward in the USA to explain the differences in HIV prevalence between MSM from different ethnic backgrounds [3, 5, 6]. One hypothesis is that the sexual networks of black MSM may place them at greater risk of HIV infection than other MSM [5]. This hypothesis rests on two postulates. Firstly, black men may create close-knit sexual networks with other black men (known as “assortative sexual mixing”). Secondly, these close-knit sexual networks could lead to the rapid spread of HIV since the background prevalence is relatively high within this group. There is evidence that assortative sexual mixing can promote the spread of other sexually transmitted infections within ethnic minority populations where disease prevalence is high [11, 12]. This raises the possibility that HIV could also be transmitted within sexual networks based on ethnicity.

While some studies have explored this hypothesis in the USA [7, 9, 13–17], little is known about sexual networks and assortative mixing among ethnic minority MSM in Britain. Could there be distinct sexual networks of South Asian and Chinese MSM in Britain which offer some degree of protection from HIV infection since HIV seropositivity is low in these groups? Conversely are there sexual networks of black or white MSM which may increase the risk of HIV transmission since HIV seropositivity is higher for these groups compared with South Asian and Chinese men?

This paper examines: (i) assortative sexual mixing among ethnic minority and white MSM in Britain and (ii) whether unprotected sex with partners of the same ethnicity can help us better understand differences in self-reported HIV seropositivity between ethnic groups in Britain.

Methods

Recruitment

For this study (the MESH project), we recruited a national sample of ethnic minority MSM both “online” (through the Internet) and “offline” (e.g. through sexual health clinics or gay venues) between August 2007 and April 2008. In addition we recruited, primarily through the Internet, a comparison group of white British MSM who were born in the UK. All men were asked to complete a questionnaire online which took 20–30 min. The methods have been described in detail elsewhere [18].

Questionnaire

Men were asked to provide information on their socio-demographic characteristics, sexual identity and behaviour, relationship status, HIV test history, HIV status, recreational drug use and HIV treatment optimism. If men reported UAI in the previous 3 months, we asked about the type of partner (regular or casual), as well as the HIV status and ethnicity of their partner(s). UAI was classified as either concordant (only with a partner of the same HIV status) or non-concordant (with a partner of unknown or discordant HIV status) [19, 20]. All information was self-reported.

Ethnicity of Respondents

Our question on ethnicity was based on the 2001 census for England and Wales [21]. Respondents were asked “What is your ethnic group?” They could tick one of the following: white British, white Irish, white Other, black Caribbean, black African, black Other, black Caribbean-and-white, black African-and-white, Indian, Pakistani, Bangladeshi, Indian–Pakistani–Bangladeshi (IPB)-and-white, Chinese, Other Asian, Arab, Other ethnic group. According to the census classification, people who tick white British, white Irish or white Other are classified as “white” while the other ethnic groups (13 in our study) are classified as “ethnic minority”.

Ethnicity of UAI Partner(s)

Men who reported UAI in the 3 months before the survey were asked about the ethnicity of their UAI partner(s). If they reported UAI with a main partner, they were asked to indicate their partner’s ethnicity using the ethnic group categories described above.

If men reported UAI with a casual partner they were asked to indicate their casual partner’s ethnicity using a restricted list of ethnic groups since it was anticipated that

respondents may not know or be able to recall the exact ethnic background of a casual partner. This restricted list comprised the following groups: black Caribbean, black African, black Other, Indian, Pakistani, Bangladeshi, Chinese, Arab and white.

On the questionnaire, men could indicate if they had had UAI in the previous 3 months with casual partners from more than one ethnic group. For example, a respondent could specify that he had had both a “white” and “black African” casual UAI partner. Although we asked men how many casual UAI partners they had had in the previous 3 months, we did not ask them to provide information about each partner. Consequently we could not count how many UAI partners a man may have had from each ethnic group. If a respondent said he had had four casual UAI partners and had ticked “black African” and “white”, he may have had UAI with one or more casual partner(s) of black African ethnicity. As a consequence, we could enumerate the number of men reporting UAI with a partner (or partners) of black African ethnicity but not the exact number of UAI partners belonging to that ethnic group.

Statistical Analysis

Ethnic Groups

Because of small numbers, some ethnic groups were combined for this analysis. The combined groups were: black MSM, comprising black Caribbean, black African, black other, black Caribbean-and-white, black African-and-white men; South Asian MSM, comprising Indian, Pakistani, Bangladeshi, IPB-and-white men.

The sexual mixing analysis was limited to respondents from four groups. These were: (i) black MSM, (ii) South Asian MSM, (iii) Chinese MSM and (iv) white MSM. UAI partners from these ethnic groups were also included in the analysis.

We excluded respondents who described themselves as white Irish or white Other to maintain comparability with our earlier analysis of ethnic differences in self-reported HIV seropositivity [1]. Respondents who described themselves as Other Asian, Arab or Other ethnic group and UAI partners from these ethnic groups were not included either because we did not collect this information or because of small numbers.

We calculated self-reported HIV positivity by dividing the number of men who said they had ever received a positive HIV test result by the number who said they had ever had an HIV test [1]. HIV seropositivity derived in this way has been used in other UK studies as a proxy for HIV prevalence where the collection of biological samples was not feasible [22, 23].

Differences in the background characteristics of the respondents who belonged to the four groups in the

analysis were examined using Chi square tests (χ^2 -test) and Mann–Whitney test for differences between medians (Table 1).

Same Ethnicity Partners

We calculated the number of men who would be expected to report UAI partners from the same ethnic group if there were no selection according to ethnicity; that is to say, if partners were selected at random with respect to ethnic background. For this calculation, we used the overall distribution of white, black, South Asian and Chinese MSM in our sample as the standard population. Of the men in our sample ($N = 12,696$), 311 (2.4 %) were black, 303 (2.4 %) South Asian, 138 (1.1 %) Chinese and 11944 (94.1 %) were white (Table 1). This method is an adaptation of that used by Raymond and McFarland in their analysis of racial mixing among MSM in San Francisco [13].

If there were no tendency to select partners according to ethnicity, we would expect 2.4 % of men who reported UAI with a *black partner* to also be black (reflecting the percentage of black men in the overall sample), 2.4 % to be South Asian (reflecting the percentage of South Asian men in the sample), 1.1 % to be Chinese and 94.1 % to be white. Using these standard percentages, we calculated the number of black, South Asian, Chinese and white men *expected* to report UAI with a black partner if partners were selected at random with respect to ethnicity.

We then compared the *observed* number of black, South Asian, Chinese and white MSM reporting UAI with a *black partner* with the number expected if there were no tendency to select partners according to their ethnic background. The observed and expected numbers were compared using a χ^2 -test in a 4×2 table (Table 2). In this way, the observed number of black men reporting UAI with a partner of the *same ethnicity* (i.e. with a partner who was also black) could be compared with the number expected if partners were selected at random (Table 2).

We repeated this calculation separately for men reporting UAI with (i) South Asian partner(s) (ii) Chinese partner(s) and (iii) white partner(s). For example, we would expect 2.4 % of men who reported UAI with a *South Asian partner* to be black, 2.4 % to be South Asian, 1.1 % to be Chinese and 94.1 % to be white (reflecting the overall distribution of the sample). For each ethnic group, the observed number of men reporting UAI with a partner of the *same ethnicity* was then compared with the expected number (Table 2).

Multivariable Analysis

To determine whether UAI with partners of the same ethnicity could account for differences in self-reported HIV

Table 1 Socio-demographic characteristics, sexual behaviour and HIV testing history

	Ethnicity of respondent				χ^2 ^a	<i>p</i> value ^a
	Black n (%)	South Asian n (%)	Chinese n (%)	White n (%)		
Total number of respondents	311 (100 %)	303 (100 %)	138 (100 %)	11944 (100 %)		
Median age [range]	31 [18–68]	29 [18–61]	29 [18–57]	36 [18–86]	198.6	<0.001
Born in the UK	217 (70 %)	194 (64 %)	18 (13 %)	11944 (100 %)	135.6	<0.001
Living in London	171 (55 %)	138 (46 %)	77 (56 %)	2268 (19 %)	457.8	<0.001
Higher education	241 (79 %)	275 (91 %)	131 (95 %)	8448 (71 %)	103.5	<0.001
Occupational status						
Employed	222 (72 %)	224 (74 %)	92 (67 %)	9465 (79 %)		
Student	60 (19 %)	61 (20 %)	40 (29 %)	1008 (8 %)	134.9	<0.001
Unemployed/retired/other	29 (9 %)	18 (6 %)	6 (4 %)	1471 (13 %)		
Sexuality						
Homosexual/gay	253 (81 %)	230 (76 %)	123 (90 %)	10195 (87 %)		
Bisexual	55 (18 %)	66 (22 %)	14 (10 %)	1585 (13 %)	24.9	<0.001
Relationship status						
In relationship with a man	98 (32 %)	92 (30 %)	67 (49 %)	4757 (40 %)	24.2	<0.001
HIV-treatment optimism						
Optimism 1	48 (15 %)	50 (17 %)	22 (16 %)	2119 (18 %)	1.8	0.627
Optimism 2	82 (27 %)	79 (27 %)	44 (32 %)	1987 (17 %)	59.3	<0.001
Recreational drug use in last 12 m	167 (54 %)	150 (50 %)	45 (33 %)	5963 (50 %)	18.3	<0.001
Unprotected anal intercourse						
Any UAI	128 (41 %)	120 (40 %)	52 (38 %)	4960 (42 %)	1.3	0.736
Concordant UAI	44 (14 %)	34 (11 %)	19 (14 %)	1675 (14 %)	1.9	0.586
Non-concordant UAI	84 (27 %)	86 (28 %)	33 (24 %)	3285 (28 %)	1.0	0.799
Median number of casual UAI partners (IQR) ^b	2 (1–4)	2 (1–5)	2 (1–3)	2 (1–5)		
Ever tested for HIV	246 (79 %)	205 (68 %)	106 (77 %)	7761 (65 %)	35.3	<0.001
HIV positive ^c	35 (14 %)	12 (6 %)	4 (4 %)	1013 (13 %)	16.6	0.001

HIV treatment optimism 1: number (%) of men who agreed with the statement “I am less worried about HIV infection now that treatments have improved”; *HIV treatment optimism 2*: number (%) of men who agreed with the statement “I believe that new drug therapies make people with HIV less infectious”

UAI unprotected anal intercourse

^a Chi squared test of homogeneity (except for median age, Mann–Whitney test)

^b Interquartile range

^c Expressed as a percentage of those who had ever tested for HIV

seropositivity between ethnic groups, a new four level variable was created. The variable distinguished between (i) respondents who did not report UAI, (ii) respondents who reported UAI only with partners of the same ethnicity, (iii) respondents who reported UAI only with partners from an ethnic group other than their own and (iv) respondents who reported UAI with men from both their own and another ethnic group. We used likelihood ratio tests (LRT) to examine the association between ethnicity and self-reported HIV seropositivity in the multivariable logistic models. Only men who had ever had an HIV test were included in the multivariable analysis.

Results

Self-reported HIV Seropositivity

The analysis is based on 12,696 MSM who provided complete information on their age, ethnicity, HIV status and UAI in the previous 3 months; 311 respondents (2.4 %) described their ethnicity as black, 303 (2.4 %) as South Asian, 138 as Chinese (1.1 %) and 11,944 (94.1 %) as white British.

The sampling, recruitment and background characteristics of the ethnic minority and white men in the study have been described in detail elsewhere [1]. The background

Table 2 Observed and expected number of men reporting UAI with a partner of black, South Asian, Chinese or white ethnicity

Ethnicity of respondent	Number of respondents reporting UAI	Ethnicity of UAI partner(s)							
		Black		South Asian		Chinese		White	
		Observed number	Expected number	Observed number	Expected number	Observed number	Expected number	Observed number	Expected number
Black	115	41	15	13	11	7	7	94	108
South Asian	112	18	15	33	11	7	7	99	108
Chinese	47	5	7	1	5	8	3	40	50
White	4,434	572	598	418	438	253	259	4,276	4,243
Total	4,708	636	636	465	465	275	275	4,509	4,509
O/E		2.73		3.00		2.67		1.01	
		$\chi^2 = 47.46, p < 0.001$		$\chi^2 = 48.48, p < 0.001$		$\chi^2 = 8.43, p = 0.038$		$\chi^2 = 4.82, p = 0.185$	

Observed number: the number of respondents who reported UAI with a partner from that particular ethnic group (i.e. a partner of white, black, South Asian or Chinese ethnicity); expected number: the number of respondents expected to report UAI with a partner from that particular ethnic group if partners were selected at random with respect to ethnicity. The expected number of MSM reporting UAI was derived using the ethnic group distribution of the overall sample as described in the “Methods”. Numbers were rounded to the nearest full number, resulting in rounding error in places; O/E the observed number of respondents reporting UAI with a partner of the *same ethnicity* divided by the number of respondents expected to report UAI with a partner of the *same ethnicity* if partners were selected at random. Observed and expected numbers of *same ethnicity* partners are highlighted in bold for each ethnic group

characteristics of the four groups included in the sexual mixing analysis are presented here (Table 1).

Nearly two-thirds (65.5 %, 8,318/12,696) of the overall sample indicated that they had ever had an HIV test. Of these 8,318 men, 1,074 men (12.9 %) reported a positive HIV diagnosis. There were differences in self-reported HIV seropositivity between ethnic groups, as has been reported previously [1]. Self-reported HIV seropositivity was 5.9 % for South Asian men, 3.8 % for Chinese men, 14.3 % for black men and 13.1 % for white British men ($\chi^2 = 16.6, p = 0.001$). In multivariable analysis, individual risk factors for HIV (e.g. age, place of residence, recreational drug use, HIV treatment optimism and UAI) did not explain the differences in self-reported HIV seropositivity between the groups (Table 4, model 2) [1].

Unprotected Anal Intercourse

Of the 12,696 men, 5,260 (41 %) reported UAI in the previous 3 months. The percentage of men reporting UAI did not differ between ethnic groups ($\chi^2 \leq 1.9, p \geq 0.6$) (Table 1) [1]. In all groups men reported a median of two casual UAI partners.

Of the 5,260 men who reported UAI, 4,708 provided information on the ethnicity of their UAI partners (data missing on 526 white British men, 13 Black men, 8 South Asian men and 5 Chinese men). Some men reported UAI with partners from more than one ethnic group (e.g. they ticked both “white” and “South Asian” to indicate the ethnicity of their UAI partners). Overall, 636 men reported UAI with black MSM, 465 with South Asian MSM, 275 with Chinese MSM and 4,509 with white MSM (Table 2, “Total” row).

UAI Partners of the Same Ethnicity

Of 636 men who said they had had UAI with a man of black ethnicity in the previous 3 months, 41 (6.4 %) described their own ethnicity as black (Table 2). If partners were selected at random with respect to ethnicity we would have expected 15 (2.4 %) of the 636 men to have been black (Table 2). Thus, for black MSM the ratio of the observed number (O) of men reporting same ethnicity partners to the expected number (E) was $41/15 = 2.73$ ($\chi^2 = 47.5, p < 0.001$) (Table 2).

The ratio of the observed number of men reporting same ethnicity UAI partners to the expected number was also elevated for South Asian men (O = 33, E = 11, O/E = 3.00, $\chi^2 = 48.5, p < 0.001$) and Chinese men (O = 8, E = 3, O/E = 2.67, $\chi^2 = 8.4, p < 0.038$) (Table 2). For white men there was no difference between the observed and expected number of men reporting UAI with white partners (O = 4,276, E = 4,243, O/E = 1.01, $\chi^2 = 4.8, p = 0.185$).

Of the 4,708 men reporting UAI, 3,018 (64.6 %) reported UAI with a casual partner(s) and 1,690 men (35.4 %) reported UAI only with a main partner. For black and South Asian MSM (but not Chinese), the observed number of men reporting UAI with a casual partner of the same ethnicity exceeded the expected number (black men, O/E = $36/14 = 2.57, \chi^2 = 38.9, p < 0.001$; South Asian men O/E = $25/10 = 2.50, \chi^2 = 21.7, p < 0.001$). This was also the case for black, South Asian and Chinese men reporting UAI with a main partner. However, statistical comparisons were not made for UAI with a main partner because of small numbers (black men, O/E = 5/1; South

Table 3 Number of men reporting UAI with a partner of the same or different ethnicity

Ethnicity of respondent	Number of respondents reporting UAI	Ethnicity of UAI partner(s)		
		Only the same n (row %)	Same and different n (row %)	Only different n (row %)
Black	115	20 (17 %)	21 (18 %)	74 (65 %)
South Asian	112	12 (10 %)	21 (19 %)	79 (71 %)
Chinese	47	5 (11 %)	3 (6 %)	39 (83 %)
White	4,434	3,560 (80 %)	716 (16 %)	158 (4 %)

Only the same: number (%) of respondents who reported UAI only with a partner from the same ethnic background as their own; *same and different*: number (%) of respondents who reported UAI with a partner from the same ethnic background as their own and with a partner from a different ethnic background; *only different*: number (%) of respondents who reported UAI only with a partner from a different ethnic background to their own

Asian men O/E = 8/1; Chinese men O/E = 5/0) (full data available from the authors on request).

UAI Partners of Different Ethnicity

In all three ethnic minority groups the majority of men said their UAI partners were from an ethnic group other than their own (Table 3). Indeed the largest group of men said they had had UAI *only* with men from another ethnic group. This was seen for both casual and main UAI partners (data available from authors on request). Overall, of the men who reported having UAI, 83 % of black men, 90 % of South Asian men and 89 % of Chinese men had UAI with partners from a different ethnic group (Table 3). Most of these men reported UAI with a white partner (Table 2). In contrast, of the white men who reported having UAI only 20 % had UAI with partners from a different ethnic group.

UAI Partners of the Same Ethnicity in the Multivariable Logistic Regression Model

In the multivariable logistic regression model, based on men who had had a previous HIV test, we found evidence of an association between ethnicity and self-reported HIV infection after adjusting for individual risk factors as has been reported elsewhere (Table 4, model 2, LRT for ethnicity, $\chi^2 = 21.7$, $p < 0.001$) [1]. We then added the “same ethnicity UAI” variable to the multivariable logistic model. The odds ratios for HIV infection among South Asian and Chinese MSM still remained reduced compared with white MSM after adjusting for “same ethnicity UAI” (Table 4, model 3, LRT for ethnicity, $\chi^2 = 20.7$, $p < 0.001$).

Discussion

Our study provides evidence of assortative sexual mixing among ethnic minority MSM in Britain. In this sample,

black, South Asian and Chinese MSM were three times more likely to report UAI with a partner from the same ethnic background than would be expected if partners were selected at random with respect to ethnicity. Nonetheless, the majority of black, South Asian and Chinese MSM reported unprotected sex with men from a different ethnic group, particularly with white men (disassortative mixing).

This study is, to the best of our knowledge, the first to report on assortative sexual mixing among ethnic minority MSM in Britain. A number of studies in the USA have found that Black American MSM are more likely to report a partner of the same ethnicity than would be expected by chance alone as is also the case for Asian and Pacific Islanders [6, 7, 9, 13–16]. However, it seems that sexual mixing *between* ethnic groups occurs to a greater extent in the UK than in the USA. Black MSM in our study were more likely to report partners from a different ethnic background (i.e. who were not black) compared with black American MSM in the USA [13]. Likewise, South Asian and Chinese men in our study were more likely to report partners from a different ethnic background than Asian Pacific Islanders in the USA [14].

Although there was some evidence of assortative sexual mixing among ethnic minority MSM in our study, the majority of black, South Asian and Chinese MSM reported unprotected sex with men from a different ethnic group, particularly with white men. We explored the sexual preferences of participants in the MESH study in one-to-one qualitative interviews with a sub-sample of nearly 50 ethnic minority MSM [24]. Those interviews revealed that ethnic minority MSM generally regarded white British gay men as being more desirable sexual or romantic partners than men from their own or other ethnic minority groups. Taken together, the findings from our quantitative and qualitative studies suggest that a considerable amount of sexual mixing occurs between ethnic minority and white MSM in Britain. The findings from multivariable regression modelling suggest that, among MSM living in Britain,

Table 4 Ethnicity and self-reported HIV seropositivity: multivariable analysis

	Unadjusted model	Adjusted for individual risk factors	Adjusted for individual risk factors and UAI with a partner of the same ethnicity
	Model 1 OR ^a (95 % CI)	Model 2 aOR ^b (95 % CI)	Model 3 aOR ^c (95 % CI)
Ethnicity of respondent			
Black	1.13 (0.78–1.62)	0.99 (0.67–1.46)	0.94 (0.62–1.43)
South Asian	0.42 (0.23–0.75)	0.38 (0.21–0.69)	0.35 (0.19–0.66)
Chinese	0.26 (0.10–0.71)	0.26 (0.09–0.73)	0.26 (0.09–0.74)
White (reference group)	1.00	1.00	1.00
Age	1.03 (1.02–1.03)	1.03 (1.02–1.04)	1.03 (1.02–1.34)
Place of residence ^d	1.87 (1.63–2.15)	1.80 (1.55–2.09)	1.71 (1.47–2.00)
Education ^e	0.74 (0.64–0.85)	0.77 (0.66–0.89)	0.79 (0.68–0.91)
Occupational status ^f	0.62 (0.54–0.72)	0.61 (0.52–0.72)	0.60 (0.51–0.71)
Recreational drug use	2.39 (2.07–2.76)	2.20 (1.88–2.56)	2.12 (1.81–2.48)
HIV treatment optimism ^g	2.83 (2.45–3.26)	2.54 (2.19–2.95)	2.47 (2.12–2.87)
UAI ^h	2.09 (1.83–2.39)	1.85 (1.60–2.12)	–
UAI only with partner(s) of same ethnicity ⁱ	1.58 (1.37–1.85)	–	1.46 (1.25–1.71)
UAI only with partner(s) of different ethnicity ⁱ	1.80 (1.28–2.52)	–	1.86 (1.26–2.75)
UAI with partners of the same and different ethnicity ⁱ	4.81 (3.96–5.84)	–	3.48 (2.83–4.30)

OR odds ratio, aOR adjusted odds ratio, CI confidence interval, UAI unprotected anal intercourse

All models are based on 7,993 men who reported ever having an HIV test and reported the ethnicity of their UAI partner(s)

^a Odds ratio for self-reported HIV seropositivity in unadjusted model

^b Adjusted odds ratio for self-reported HIV seropositivity in model adjusted for ethnicity, age, place of residence, education, employment, recreational drug use, HIV treatment optimism and UAI

^c Adjusted odds ratio for self-reported HIV seropositivity in model adjusted for ethnicity, age, place of residence, education, employment, recreational drug use, HIV treatment optimism and UAI with a partner of the same ethnicity, different ethnicity or both

^d London versus outside London (reference group)

^e Higher education and above versus no higher education (reference group)

^f Employed versus unemployed/students/retired/other (reference group)

^g HIV treatment optimism 2 as defined in Table 1. Optimistic versus not optimistic (reference group)

^h Any UAI versus no UAI (reference group)

ⁱ UAI only with partner(s) of the same ethnicity, UAI only with partner(s) of different ethnicity, UAI with partners of the same and different ethnicity versus no UAI (reference group)

differences in HIV seropositivity between ethnic groups cannot be explained by assortative sexual mixing with partners of the same ethnicity.

How then can we explain ethnic group differences in HIV infection among MSM in Britain if they cannot be explained by individual risk factors nor by assortative sexual mixing? Present-day differentials in HIV seropositivity provide us with a snapshot of risk behaviours in the past rather than the present. Consequently, the differences between ethnic groups in self-reported HIV seropositivity seen here could reflect corresponding differences in risk behaviour 5 or 10 years ago. It is possible that these differences in risk behaviour, if they existed, have been eroded over the last few years. A number of recent studies including our own have found that, at the present time,

patterns of sexual risk behaviour do not differ between ethnic groups in Britain [1, 25, 26]. Coupled with the high degree of sexual mixing seen in our study, it is possible that differences in HIV seropositivity between ethnic groups in Britain may diminish and even disappear over time. If that happens, HIV seropositivity among South Asian and Chinese MSM could rise to the same level as that currently reported by black as well as white British men. Our analysis highlights the importance of HIV prevention programmes targeting MSM from all ethnic groups in Britain in light of the substantial sexual mixing that occurs between them.

Only a minority of the Chinese MSM in our study were born in the UK. The majority were born in China or Malaysia and had lived in the UK for an average of 6 years

[1]. HIV prevalence among MSM in China and Malaysia has been, until recently, lower than that among MSM in Britain [27, 28]. Consequently, the low HIV seropositivity seen among Chinese MSM in our sample may reflect HIV prevalence in their country of origin. On the other hand, HIV seropositivity was also low among South Asian MSM in our sample, two-thirds of whom were born in the UK.

In the USA, it has been suggested that social, cultural and structural factors could play an important part in determining ethnic group differences in HIV infection among MSM [5, 6]. Exploring the role of these factors among ethnic minority MSM in Britain should now be granted priority.

There are some limitations to this study. The analysis is based on the respondents recalling the ethnicity of their UAI partners in the 3 months before they completed the survey. It is not clear how accurately men were able to recall the ethnicity of their partners during that time. It is possible that we *underestimated* the magnitude of assortative mixing among ethnic minority men who reported UAI with casual partners. This is because men were not asked to report the ethnicity of each individual casual partner. Our data tell us whether a respondent had UAI with a white, black, South Asian or Chinese partner, but not how many casual UAI partners he had from each ethnic group. For example, a black respondent who had *four* casual UAI partners who were also black and one that was not would be classified as having “same and different ethnicity partners” in our analysis. A black respondent who had *one* casual partner who was black and four that were not would also be classified as having “same and different ethnicity partners”. Our analysis did not allow us to capture the fact that the first respondent had engaged in assortative mixing to a greater extent than the second respondent. The lack of partner level data meant that we could not estimate the degree of assortativity [15]. However, in all ethnic groups, men reported a median of two casual UAI partners in the previous 3 months which suggests that the degree of underestimation in our analysis may have been modest.

On the other hand, we may have also *underestimated* the magnitude of disassortative mixing since we excluded from the analysis UAI with men of Other Asian, Arab or “other” ethnicity. While we used the MESH sample as a standard population to calculate the expected number of “same ethnicity” and “different ethnicity” UAI partners we do not know whether the MESH sample reflects the overall ethnic distribution of MSM in Britain. There is no national census of MSM in Britain with which we can compare our sample. However, the ethnic group distribution of the MESH sample is broadly similar to that of the Gay Men’s Sex Survey conducted annually in Britain [25, 26].

The strengths of this study, on the other hand, are its large size and the inclusion of MSM from different ethnic backgrounds with varying HIV seropositivity.

In conclusion, this study has provided some evidence of assortative sexual mixing among ethnic minority MSM in Britain. Black, South Asian and Chinese MSM were more likely to report UAI with a partner of the same ethnicity than would be expected by chance. However, we also observed that the vast majority of ethnic minority MSM reported unprotected sex with partners from ethnic groups other than their own, particularly with white partners. Our analysis suggests that, among MSM living in Britain, differences in HIV infection between ethnic groups *cannot* be explained by assortative sexual mixing with partners of the same ethnicity.

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References

1. Elford J, Doerner R, McKeown E, Nelson S, Anderson J, Low N. HIV infection among ethnic minority and migrant MSM in Britain. *Sex Transm Dis*. 2012 (published ahead of print). doi: [10.1097/OLQ.0b013e31825c8018](https://doi.org/10.1097/OLQ.0b013e31825c8018)
2. Harawa NT, Greenland S, Bingham TA, et al. Associations of race/ethnicity with HIV prevalence and HIV-related behaviors among young men who have sex with men in 7 urban centers in the United States. *J Acquir Immune Defic Syndr*. 2004;35:526–36.
3. Millett GA, Flores SA, Peterson JL, Bakeman R. Explaining disparities in HIV infection among black and white men who have sex with men: a meta-analysis of HIV risk behaviors. *AIDS*. 2007;21:2083–91.
4. Bing EG, Bingham T, Millett GA. Research needed to more effectively combat HIV among African-American men who have sex with men. *J Natl Med Assoc*. 2008;100:52–6.
5. Millett GA, Peterson JL, Wolitski RJ, Stall R. Greater risk for HIV infection of black men who have sex with men: a critical literature review. *Am J Public Health*. 2006;96:1007–19.
6. Wei C, Raymond HF, Wong FY, et al. Lower HIV prevalence among Asian/Pacific Islander men who have sex with men: a critical review. *AIDS Behav*. 2011;15:535–49.
7. Bingham TA, Harawa NT, Johnson DF, Secura GM, MacKellar DA, Valleroy LA. The effect of partner characteristics on HIV infection among African American men who have sex with men in the young men’s survey, Los Angeles, 1999–2000. *AIDS Educ Prev*. 2003;15:39–52.

8. Sifakis F, Hylton JB, Flynn C, et al. Racial disparities in HIV incidence among young men who have sex with men. The Baltimore Young Men's Survey. *J Acquir Immune Defic Syndr*. 2007;46:343–8.
9. Berry M, Raymond HF, McFarland W. Same race and older partner selection may explain higher HIV prevalence among black men who have sex with men. *AIDS*. 2009;85:367–9.
10. Wei C, Raymond HF, Guadamuz TE, et al. Racial/ethnic differences in seroadaptive and serodisclosure behaviors among men who have sex with men. *AIDS Behav*. 2011;15:22–9.
11. Aral SO. Patterns of sexual mixing: mechanisms for or limits to the spread of STIs. *Sex Transm Infect*. 2000;76:415–6.
12. Laumann EO, Youm Y. Racial/ethnic group differences in the prevalence of sexually transmitted diseases in the United States: a network exploration. *Sex Transm Dis*. 1999;26:250–61.
13. Raymond HF, McFarland W. Racial mixing and HIV risk among men who have sex with men. *AIDS Behav*. 2009;13:630–7.
14. Choi KH, Operario D, Gregorich SE, Han L. Age and race mixing patterns of sexual partnerships among Asian men who have sex with men: Implications for HIV transmission and prevention. *AIDS Educ Prev*. 2003;15:53–65.
15. Bohl DD, McFarland W, Raymond HF. Improved measures of racial mixing among men who have sex with men using Newman's assortativity coefficient. *Sex Transm Infect*. 2011;87:616–20.
16. Bohl DD, Raymond HF, Arnold M, McFarland W. Concurrent sexual partnerships and racial disparities in HIV infection among men who have sex with men. *Sex Transm Infect*. 2009;85:367–9.
17. Kraut-Becher J, Eisenberg M, Aral SO. Racial and ethnic disparities in HIV infection in the United States. *Focus*. 2009;24:1–4.
18. Elford J, McKeown E, Doerner R, Nelson S, Low N, Anderson J. Sexual health of ethnic minority MSM in Britain (MESH project): design and methods. *BMC Public Health*. 2010;10:419.
19. Elford J, Bolding G, Sherr L. High-risk sexual behaviour increases among London gay men between 1998 and 2001: what is the role of HIV optimism? *AIDS*. 2002;16:1537–44.
20. Elford J, Bolding G, Davis M, Sherr L, Hart G. Trends in sexual behaviour among London homosexual men 1998–2003: implications for HIV prevention and sexual health promotion. *Sex Transm Infect*. 2004;80:451–4.
21. Office for National Statistics. 2001 Census Forms. English Households form HI. In: Office for National Statistics. 2010. <http://www.statistics.gov.uk/census2001/pdfs/engh1.pdf>
22. Evans AR, Hart GJ, Mole R, et al. Central and Eastern European migrant men who have sex with men: an exploration of sexual risk in the UK. *Sex Transm Infect*. 2011;87:325–30.
23. Hickson F, Reid D, Weatherburn P, Stephens M, Nutland W, Boakye P. HIV, sexual risk, and ethnicity among men in England who have sex with men. *Sex Transm Infect*. 2004;80:443–50.
24. McKeown E, Nelson S, Anderson J, Low N, Elford J. Disclosure, discrimination and desire: experiences of Black and South Asian gay men in Britain. *Cult Health Sex*. 2010;12:843–56.
25. Hickson F, Weatherburn P, Reid D, Jessup K, Hammond G. Testing targets. Findings from the United Kingdom's gay men's sex survey 2007. *Sigma Research*; 2009.
26. Weatherburn P, Hickson F, Reid D, Jessup K, Hammond G. Multiple chances. Findings from the United Kingdom's gay men's sex survey 2006. *Sigma Research*; 2008.
27. van Griensven F, de Lind van Wijngaarden JW. A review of the epidemiology of HIV infection and prevention responses among MSM in Asia. *AIDS*. 2010;24(suppl 3):S30–40.
28. Baral S, Sifakis F, Cleghorn F, Beyrer C. Elevated risk for HIV infection among men who have sex with men in low- and middle-income countries 2000–2006: a systematic review. *PLoS Med*. 2007;4(12):e339.