

Sexual and prevention practices in men who have sex with men in the era of combination HIV prevention: results from the Presse Gays et lesbiennes survey, France, 2011

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To better understand the diversity of practices and behaviours to prevent HIV with casual partners, data from a large convenience sample of men who have sex with men (MSM) in France were categorised into different prevention profiles: no anal intercourse, consistent condom use during anal intercourse, risk-reduction practices (serosorting, seropositioning) and no discernible prevention practice (NDPP). Categories were applied to HIV-positive respondents with controlled (CI; n=672) and uncontrolled infection (UI; n=596), HIV-negative (n=4,734) and untested respondents (n=663). Consistent condom use was reported by 22% (n=148) of HIV-positive-CI respondents, 13% (n=79) of HIV-positives UI, 55% (2,603) of HIV-negatives, and 50% (n=329) of untested ($p<0.001$). Corresponding figures for NDPP were 45% (n=304), 55% (n=327), 21% (n=984) and 34% (n=227) ($p<0.001$). Logistic regressions showed that, regardless of respondents' serostatus, NDPP was associated with regularly frequenting dating websites, drug use, exposure to sperm during oral sex, and with HIV diagnosis after 2000 for HIV-positive respondents (CI and UI), with age <30 years for HIV-positive-CI, and with low education for HIV-negatives. Risk-taking remains high, despite implementation of risk-reduction practices. A global health approach should be central to prevention programmes for MSM, to include target behavioural intervention, promotion of condom use, and encouragement of regular HIV testing and early initiation of ART.

Introduction

Sex between men remains the most frequent mode of HIV transmission in men in North America, Australia and western Europe [1]. Newly diagnosed HIV infections among men who have sex with men (MSM) increased in Europe by 33% between 2004 and 2013 [2]. Similar trends have been observed in France, where MSM are increasingly predominant among newly diagnosed

cases [3]. Incidence in MSM in France is 200 times higher than in the French heterosexual population [4].

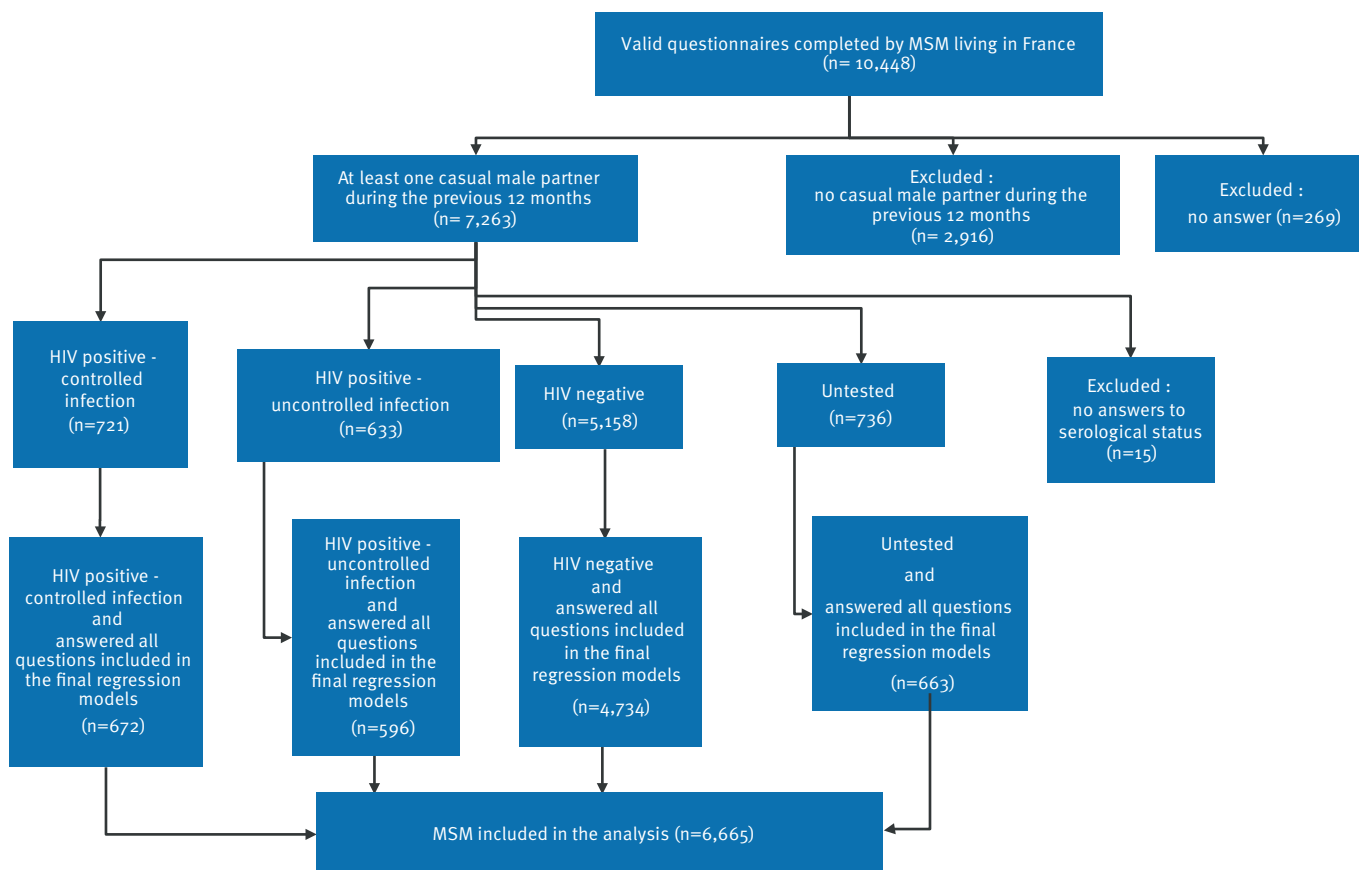
Studies conducted since the epidemic began have shown how MSM have profoundly changed their sexual behaviours by implementing different strategies to manage the risk of HIV transmission. During the second half of the 1980s, MSM reduced their number of partners and began condom use on a widespread basis. During the 1990s, alternative strategies to systematic condom use emerged, such as negotiated safety with a steady partner [5]. Since 2000, condom use has fallen consistently regardless of partner type and HIV serostatus [5]. Simultaneously, alternative risk-reduction strategies have materialised under the umbrella term 'seroadaptation' [6,7]. These strategies include serosorting (engaging in unprotected anal intercourse (UAI) with partners of the same HIV status), seropositioning (HIV-positive men engaging in receptive and HIV-negative men in insertive UAI) and selective avoidance of anal intercourse.

In the meantime, the effectiveness of antiretroviral treatment has contributed to the medicalisation of prevention [8], although more evidence is needed on the efficacy of treatment as prevention among MSM [9]. More frequent testing among sexually active MSM [10] might shorten the delay between contamination and diagnosis [11], so that treatment could start as early as possible [9]. Furthermore, the availability of pre-exposure prophylaxis (PrEP) might reduce the risk of transmission in uninfected people [12]. In this context, preventive-behavioural and biomedical approaches need to complement each other [13].

In this article, we first describe the prevalence of sexual preventive behaviours by categorising the different risk-reduction practices according to respondents'

FIGURE

Flowchart of inclusion of respondents in the analysis, Presse Gays et lesbiennes survey, France, 2011



MSM: men who have sex with men.

HIV status. Second, we characterise the profiles of respondents with high-risk sexual practices to improve our understanding of the determinants of risk-taking.

Methods

The Presse Gays et lesbiennes survey (Enquête Presse Gays et lesbiennes, EPGL) is one of the tools used for behavioural surveillance of HIV and other sexually transmitted infections (STI) among MSM in France [14]. The survey is anonymous, cross-sectional, self-administered and voluntary. The most recent survey questionnaire was inserted in paper format in a monthly gay magazine in June 2011 and posted on the Internet between May and July 2011, accessible through a study-specific website. Participants were recruited through more than 60 information and dating websites for MSM. Web banners, personalised messages and recommendations via Facebook were used to invite MSM Internet users to participate online. There were no inclusion criteria, but the voluntary nature of this study led to the exclusion of some respondents from the analysis. The exclusion rate was higher on the Internet than in the press (9% v. 5%). Of the 10,286 questionnaires completed by men from the Internet, 112 were excluded because respondents reported

having had sex exclusively with women, three because respondents reported that they were younger than 14 years-old, and 779 because respondents reported they were not resident in France. Of the 1,110 questionnaires from the press, 54 from men not residing in France were excluded.

The questions asked in the paper and Internet questionnaires were identical. Data were collected on sociodemographic characteristics, social behaviours, sexual and preventive practices. Specifically, respondents were asked to provide, separately for each steady or casual partner in the previous 12 months, information about oral sex, insertive and receptive anal intercourse, condom use, number of UAI episodes, and knowledge of partners' serostatus.

Questions were also asked about HIV testing, both lifetime and during the previous 12 months, and self-reported HIV status at the time of the survey (HIV-negative, HIV-positive). The HIV status indicator is based on the lifetime HIV testing question and self-reported current HIV status.

TABLE 1

Definitions of four categories of sexual prevention behaviours, Presse Gays et lesbiennes survey, France, 2011

Category of sexual prevention behaviour	Definition
No anal intercourse	This category comprises respondents who did not report anal intercourse with casual partners in the previous 12 months but who may have had other types of sexual practices (mutual masturbation, oral sex, fisting, etc.).
Consistent condom use	This category comprises respondents who had had anal intercourse with casual partners in the previous 12 months and had systematically used condoms both insertive and receptive intercourse.
Risk-reduction practices	<p>Exclusive serosorting Respondents who reported they were HIV-positive or HIV-negative and had at least one episode of unprotected anal intercourse only with casual partners of the same serostatus as themselves in the previous 12 months, were classified in this category.</p> <p>Exclusive seropositioning This category comprises respondents who reported they were HIV-positive or HIV-negative and had at least one episode of UAI with casual partners of different or unknown serostatus from themselves in the previous 12 months, and had exclusively insertive anal intercourse for HIV-negative respondents and exclusively receptive anal intercourse for HIV-positive respondents.</p> <p>Serosorting and seropositioning Respondents who declared they were HIV-positive or HIV-negative and had at least one episode of UAI with casual partners in the previous 12 months, and who reported serosorting and seropositioning, were classified in this category.</p>
No discernible prevention practice (NDPP)	Respondents who had had UAI with casual partners in the previous 12 months without implementing any of the risk reduction practices (serosorting, seropositioning), regardless of their HIV serostatus, were classified in this category.

Seropositive MSM also answered questions about treatment (if any), viral load, and CD4 count over the past 12 months. They were then classified into two categories – with controlled or uncontrolled infection. In accordance with the Swiss statement recommendations [15], control was defined in relation to both HIV infection and other STIs (urogenital or rectal gonorrhoea, syphilis, hepatitis B, genital herpes, genital warts, chlamydia infection and lymphogranuloma venereum). Thus, regardless of whether they were on treatment, HIV-positive respondents who reported an undetectable viral load and a CD4 count greater than 500 cells/ μ L in the previous 12 months and no other STI over the same period were considered to have controlled infection. All other HIV-positive respondents were classified with uncontrolled infection.

Reported sexual prevention behaviours with casual partners in the previous 12 months were categorised into four mutually exclusive categories (Table 1): no anal intercourse, consistent condom use, risk-reduction strategies, and no discernible prevention practice (NDPP). These sexual prevention behaviour categories were applied to each serostatus: HIV-positive respondents with controlled infection, HIV-positive respondents with uncontrolled infection, HIV-negative respondents and untested respondents.

Statistical analyses

All statistical analyses were stratified on HIV status. Logistic regressions were performed to investigate bivariate associations between NDPP and sociodemographic and behavioural factors. All factors significantly

associated in bivariate analyses with NDPP in at least one HIV status stratum were considered candidate variables for the multivariable analyses. Correlation and multicollinearity between these candidate variables were examined before entering them in multivariable logistic regression models. Interactions were also evaluated. The Hosmer-Lemeshow test was used to evaluate the goodness-of-fit of the final four multivariable models. Statistical analyses were performed with Stata software version 12.0.

Results

Overall, 10,448 men living in France responded to the survey, principally over the Internet (90%; n=9,392). Our analysis was restricted to those who reported sexual intercourse with casual partners during the previous 12 months, self-reported their current HIV status and answered all the questions used in the multivariate analysis (n=6,665) (Figure).

Their median age was 37 years (range: 15–87 years), 72% (n=4,765) had a university degree and 32% (n=2,127) lived in large urban areas (more than 500,000 inhabitants) (Table 2). In the previous 12 months, 49% (n=3,239) had had a steady male partner, and 23% (n=1,532) had regularly frequented sex venues. The median number of sexual partners was 10 (range: 1–100). Among all respondents, 14% (n=938) reported at least one STI in the previous 12 months, and among HIV-positive respondents, 31% (n=388).

TABLE 2

Sociodemographic and behavioural characteristics of respondents who had a casual partner at least once in the previous 12 months, according to HIV serological status, Presse Gays et lesbiennes survey, France, 2011 (n=6,665)

Item	HIV-positive: controlled infection (n=672)		HIV-positive: uncontrolled infection (n=596)		HIV-negative (n=4,734)		Untested (n=663)		Total (n=6,665)	
	N	%	N	%	N	%	N	%	N	%
Age (years)										
<30	29	4.3	71	11.9	1,518	32.1	400	60.3	2,018	30.3
30–44	306	45.5	335	56.2	2,043	43.2	144	21.7	2,828	42.4
45 or more	337	50.1	190	31.9	1,173	24.8	119	17.9	1,819	27.3
Higher education										
No	227	33.8	175	29.4	1,226	25.9	272	41.0	1,900	28.5
Yes	445	66.2	421	70.6	3,508	74.1	391	59.0	4,765	71.5
Activity status										
Student	7	1.0	13	2.2	634	13.4	244	36.8	898	13.5
Employee or self-employed	540	80.4	477	80.0	3,531	74.6	350	52.8	4,898	73.5
Other (retired, unemployed)	125	18.6	106	17.8	569	12.0	69	10.4	869	13.0
Urban area (inhabitants)										
<20,000	151	22.5	114	19.1	1,302	27.5	244	36.8	1,811	27.2
20,000 to 500,000	252	37.5	200	33.6	1,991	42.1	284	42.8	2,727	40.9
>500,000	269	40.0	282	47.3	1,441	30.4	135	20.4	2,127	31.9
Frequented sex venues regularly during the previous 12 months										
Yes	241	35.9	243	40.8	947	20.0	101	15.2	1,532	23.0
No	431	64.1	353	59.2	3,787	80.0	562	84.8	5,133	77.0
Frequented dating websites regularly during the previous 12 months										
Yes	446	66.4	479	80.4	2,914	61.6	431	65.0	4,270	64.1
No	226	33.6	117	19.6	1,820	38.4	232	35.0	2,395	35.9
Steady partner during the previous 12 months										
No	352	52.4	322	54.0	2,308	48.8	444	67.0	3,426	51.4
Yes	320	47.6	274	46.0	2,426	51.2	219	33.0	3,239	48.6
More than 10 male partners during the previous 12 months										
Yes	427	63.5	441	74.0	1,758	37.1	112	16.9	2,738	41.1
No	245	36.5	155	26.0	2,976	62.9	551	83.1	3,927	58.9
Exposure to semen during oral sex during the previous 12 months (at least once)										
Yes	503	74.9	485	81.4	2,605	55.0	356	53.7	3,949	59.2
No	169	25.1	111	18.6	2,129	45.0	307	46.3	2,716	40.8
Drug use during the previous 12 months (at least once)										
Yes	522	77.7	517	86.7	2,613	55.2	273	41.2	3,925	58.9
No	150	22.3	79	13.3	2,121	44.8	390	58.8	2,740	41.1
HIV test during the previous 12 months										
Yes	215	35.5	222	40.1	3,258	68.8	n.a.	n.a.	3,695	62.7
No	391	64.5	331	59.9	1,476	31.2	n.a.	n.a.	2,198	37.3
HIV diagnosis (year)										
Before 1997	282	42.0	135	22.7	n.a.	n.a.	n.a.	n.a.	417	32.9
1997–2000	90	13.4	70	11.7	n.a.	n.a.	n.a.	n.a.	160	12.6
After 2000	300	44.6	391	65.6	n.a.	n.a.	n.a.	n.a.	691	54.5
At least one STI during the previous 12 months										
Yes	0	0.0	388	65.2	520	11.0	30	4.6	938	14.1
No	672	100.0	207	34.8	4,206	89.0	629	95.4	5,714	85.9

n.a.: not applicable; STI: sexually transmitted infection.

TABLE 3

Prevalence of sexual preventive behaviour with casual partners during the previous 12 months according to respondent's HIV status, Presse Gays et lesbiennes survey, France, 2011, (n=6,665)

	HIV-positive: controlled infection ^a (n=672)		HIV-positive: uncontrolled infection ^b (n=596)		HIV-negative (n=4,734)		Untested (n=663)		Total (n=6,665)		p values
	N	%	N	%	N	%	N	%	N	%	
No anal intercourse	20	3.0	13	2.2	393	8.3	107	16.2	533	8.0	p<0.001
Consistent condom use during anal intercourse	148	22.0	79	13.3	2,603	55.0	329	49.6	3,159	47.4	p<0.001
Unprotected anal intercourse											
Risk reduction practices											
• Exclusive serosorting	104	15.5	86	14.4	389	8.2	n.a.	n.a.	579	8.7	p<0.001
• Exclusive seropositioning	82	12.2	80	13.4	260	5.5	n.a.	n.a.	422	6.3	p<0.001
• Serosorting and seropositioning	14	2.1	11	1.8	105	2.2	n.a.	n.a.	130	2.0	p=0.831
No discernible prevention practice	304	45.2	327	54.9	984	20.8	227	34.2	1,842	27.6	p<0.001
Total	672	100.0	596	100.0	4,734	100.0	663	100.0	6,665	100.0	

n.a.: not applicable.

^a Positive controlled infection: HIV-positive respondents reported that during the previous 12 months they had either antiretroviral treatment, and an undetectable viral load, and no other STI or no treatment but an undetectable viral load and a CD4 count greater than 500 cells/ μ L, and no other STI.

^b Positive uncontrolled infection: HIV-positive respondents who did not meet the criteria for controlled infection.

Prevalence of sexual preventive behaviours with casual male partners

The proportion of respondents practicing no anal intercourse with their casual partners in the previous 12 months was low: ranging from 2% (n=13) among HIV-positive respondents with uncontrolled infection to 16% (n=107) among untested respondents (Table 3). Consistent condom use during anal intercourse was more frequent among HIV-negative respondents (55%; n=2,603) and untested (50%; n=329) than HIV-positive respondents (Table 3). HIV-positive respondents with uncontrolled infection reported less consistent condom use than those with controlled infection (13% (n=79) vs 22% (n=148), p<0.001). Risk-reduction practices were reported more often by HIV-positive respondents (30%; n=377), regardless of infection control status, than by HIV-negative respondents (16%; n=754). Exclusive serosorting was practiced more than exclusive seropositioning, regardless of HIV status. No difference was found between HIV-positive respondents with controlled and uncontrolled infection for risk-reduction practices (Table 3). NDPP was reported more frequently by HIV-positive respondents with uncontrolled (55%; n=327) and controlled infection (45%; n=304), than by untested (34%; n=227) or HIV-negative respondents (21%; n=984) (Table 3).

Factors associated with no discernible prevention practice

Univariate analysis (Table 4) showed associations between NDPP and a set of common variables, regardless of serostatus. These variables included age younger than 30 years, no university degree, and each of the following within the previous 12 months: regular

frequentation of sex venues and dating websites, a high number of sexual partners, drug use, and exposure to sperm during oral sex. For HIV-positive respondents with controlled or uncontrolled infection, they also included HIV diagnosis after 2000. Multivariate analyses (Table 4) highlighted significant differences in the profiles of NDPP-classified respondents according to their serostatus.

For HIV-positive respondents with controlled infection, NDPP was associated with age younger than 30 years (adjusted odds ratio (aOR)=2.9, (95% confidence interval (CI): 1.1–8.0)), HIV diagnosis after 2000 (aOR=2.0, (95% CI: 1.3–3.0)), and each of the following within the previous 12 months: regular frequentation sex venues (aOR=1.7, (95% CI: 1.2–2.4)), more than 10 partners (aOR=2.3, (95% CI: 1.6–3.4)), and exposure to sperm during oral sex (aOR=1.9, (95% CI: 1.3–3.0)) (Table 4).

For HIV-positive respondents with uncontrolled infection, NDPP was associated with unemployment (aOR=1.8; (95% CI: 1.1–3.0)), residence in a medium-sized urban area (aOR=1.5; (95% CI: 1.0–2.3)), post-2000 diagnosis (aOR=1.7; (95% CI: 1.1–2.7)), and each of the following in the previous 12 months: regular frequentation sex venues (aOR=1.5; (95% CI: 1.0–2.1)), more than 10 partners (aOR=2.6; (95% CI: 1.7–4.0)) and exposure to sperm during oral sex (aOR=2.6; (95% CI: 1.6–4.3)) (Table 4).

For HIV-negative respondents, NDPP was associated with age younger than 45 years (<30 years: aOR=1.4; (95% CI: 1.2–1.8); 30–44 years: aOR=1.3; (95% CI: 1.0–1.5)), no university degree (aOR=1.5; (95%

TABLE 4A

No discernible prevention practice with casual partners of respondents who had a casual partner at least once in the previous 12 months, according to HIV serological status: bivariate and multivariate analysis, Presse Gays et lesbiennes survey, France, 2011

	HIV-positive: controlled infection (n=672)			HIV-positive: uncontrolled infection (n=596)			HIV-negative (n=4734)			Untested (n=663)						
	OR	95% CI	aOR	OR	95% CI	aOR	OR	95% CI	aOR	OR	95% CI	aOR	95% CI			
Age (years)																
<30	2.4	1.1-5.2 ^a	2.9	1.1-8.0 ^a	1.6	0.9-2.8	1.0	0.5-2.0	1.4	1.1-1.6 ^b	1.4	1.2-1.8 ^b	0.9	0.6-1.4	1.0	0.6-1.7
30-44	1.4	1.0-1.9 ^a	1.1	0.8-1.6	1.2	0.9-1.8	1.1	0.7-1.7	1.3	0.9-1.4	1.3	1.0-1.5 ^a	0.6	0.4-1.1	0.7	0.4-1.3
≥45	1.0	Ref	1.0	Ref	1.0	Ref	1.0	Ref	1.0	Ref	1.0	Ref	1.0	Ref	1.0	Ref
Higher education																
No	1.4	1.0-1.9 ^a	1.4	0.9-2.0	1.0	0.7-1.4	0.9	0.6-1.4	1.6	1.4-1.9 ^c	1.5	1.3-1.8 ^c	1.5	1.1-2.1 ^a	1.4	0.9-1.9
Yes	1.0	Ref	1.0	Ref	1.0	Ref	1.0	Ref	1.0	Ref	1.0	Ref	1.0	Ref	1.0	Ref
Activity status																
Student	1.0	1.0-1.0	1.0	1.0-1.0	2.0	0.6-6.5	2.4	0.6-9.9	1.2	0.9-1.5	1.2	0.9-1.5	1.2	0.9-1.7	1.2	0.8-1.9
Employee or self-employed	1.0	Ref	1.0	Ref	1.0	Ref	1.0	Ref	1.0	Ref	1.0	Ref	1.0	Ref	1.0	Ref
Other (retired, unemployed)	0.6	0.4-0.9 ^a	0.7	0.4-1.1	1.3	0.9-2.1	1.8	1.1-3.0 ^a	1.3	1.0-1.6 ^a	1.1	0.9-1.4	1.7	0.9-2.8	1.6	0.9-2.8
Urban^a area (inhabitants)																
<20,000	1.2	0.8-1.8	1.2	0.8-2.0	1.2	0.7-1.8	1.6	1.0-2.5	1.3	1.1-1.5 ^b	1.3	1.0-1.5 ^a	1.0	0.7-1.6	1.0	0.6-1.7
20,000 to 500,000	1.1	0.8-1.6	1.2	0.8-1.8	1.3	0.9-1.9	1.5	1.0-2.3 ^a	1.1	0.9-1.2	1.1	0.9-1.3	1.3	0.8-1.9	1.3	0.8-2.0
>500,000	1.0	Ref	1.0	Ref	1.0	Ref	1.0	Ref	1.0	Ref	1.0	Ref	1.0	Ref	1.0	Ref
Frequented sex venues regularly during the previous 12 months																
Yes	2.1	1.5-2.9 ^c	1.7	1.2-2.4 ^b	1.8	1.3-2.5 ^c	1.5	1.0-2.1 ^a	1.8	1.5-2.1 ^c	1.4	1.1-1.6 ^c	1.9	1.3-3.0 ^c	1.5	0.9-2.5
No	1.0	Ref	1.0	Ref	1.0	Ref	1.0	Ref	1.0	Ref	1.0	Ref	1.0	Ref	1.0	Ref
Frequented dating websites regularly during the previous 12 months																
Yes	1.8	1.3-2.5 ^c	1.3	0.9-1.9	1.6	1.1-2.4 ^a	1.3	0.8-2.1	1.6	1.4-1.9 ^c	1.3	1.1-1.5 ^b	1.5	1.1-2.1 ^a	1.5	1.1-2.2 ^a
No	1.0	Ref	1.0	Ref	1.0	Ref	1.0	Ref	1.0	Ref	1.0	Ref	1.0	Ref	1.0	Ref
Steady partner during the previous 12 months																
No	0.8	0.6-1.1	0.8	0.5-1.1	0.9	0.7-1.3	0.8	0.6-1.2	1.5	1.3-1.7 ^c	1.3	1.1-1.5 ^c	Ref	Ref	Ref	Ref
Yes	1.0	Ref	1.0	Ref	1.0	Ref	1.0	Ref	1.0	Ref	1.0	Ref	Ref	Ref	Ref	Ref

aOR: adjusted odds ratio; CI: confidence interval; n.a.: not applicable; OR: odds ratio; Ref: reference category.

Positive controlled infection: HIV-positive respondents reported that during the previous 12 months they had either antiretroviral treatment, and an undetectable viral load, and no other sexually transmitted infection or no treatment but an undetectable viral load and a CD4 count greater than 500 cells/ μ L, and no other sexually transmitted infection.

Positive uncontrolled infection: HIV-positive respondents who did not meet the criteria for controlled infection.

^a $p < 0.05$

^b $p < 0.01$

^c $p < 0.001$

TABLE 4B

No discernible prevention practice with casual partners of respondents who had a casual partner at least once in the previous 12 months, according to HIV serological status: bivariate and multivariate analysis, Presse Gays et lesbiennes survey, France, 2011

	HIV-positive: controlled infection (n = 672)			HIV-positive: uncontrolled infection (n = 596)			HIV-negative (n = 4,734)			Untested (n = 663)		
	OR	95% CI	aOR	95% CI	OR	95% CI	aOR	95% CI	OR	95% CI	aOR	95% CI
More than 10 male partners during the previous 12 months												
Yes	3.1	2.2–4.4 ^c	2.3	1.6–3.4 ^c	3.4	2.3–5.0 ^c	2.6	1.7–4.0 ^c	2.2	1.9–2.5 ^c	1.6	1.4–1.9 ^c
No	1.0	Ref	1.0	Ref	1.0	Ref	1.0	Ref	1.0	Ref	1.0	Ref
Exposure to semen during oral sex during the previous 12 months (at least once)												
Yes	2.7	1.9–4.0 ^c	1.9	1.3–3.0 ^b	3.3	2.1–5.1 ^c	2.6	1.6–4.3 ^c	3.0	2.5–3.5 ^c	2.3	1.9–2.7 ^c
No	1.0	Ref	1.0	Ref	1.0	Ref	1.0	Ref	1.0	Ref	1.0	Ref
Drug use during the previous 12 months (at least once)												
Yes	1.5	1.0–2.1 ^a	1.1	0.7–1.7	1.6	1.0–2.6 ^a	1.3	0.7–2.1	2.0	1.7–2.3 ^c	1.7	1.5–2.0 ^c
No	1.0	Ref	1.0	Ref	1.0	Ref	1.0	Ref	1.0	Ref	1.0	Ref
HIV test during the previous 12 months												
Yes	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	1.3	1.1–1.6 ^c	1.1	0.9–1.3
No	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	1.0	Ref	1.0	Ref
HIV diagnosis (year)												
Before 1997	1.0	Ref	1.0	Ref	1.0	Ref	1.0	Ref	n.a	n.a	n.a	n.a
1997–2000	1.7	1.0–2.7 ^a	1.6	0.9–2.8	0.8	0.5–1.5	0.7	0.4–1.3	n.a	n.a	n.a	n.a
After 2000	2.2	1.6–3.0 ^c	2.0	1.3–3.0 ^c	1.6	1.1–2.4 ^a	1.7	1.1–2.7 ^a	n.a	n.a	n.a	n.a
Hosmer-Lemeshow test (p)	0.1539			0.4052			0.9722			0.6048		

aOR: adjusted odds ratio; CI: confidence interval; n.a.: not applicable; OR: odds ratio; Ref: reference category.

Positive controlled infection: HIV-positive respondents reported that during the previous 12 months they had either antiretroviral treatment, and an undetectable viral load, and no other sexually transmitted infection or no treatment but an undetectable viral load and a CD4 count greater than 500 cells/μL, and no other sexually transmitted infection.

Positive uncontrolled infection: HIV-positive respondents who did not meet the criteria for controlled infection.

^a p < 0.05

^b p < 0.01

^c p < 0.001

CI: 1.3–1.8)), residence in an urban area of fewer than 20,000 inhabitants (aOR=1.3; (95% CI: 1.0–1.5)), and each of the following during the previous 12 months: regular frequentation sex venues (aOR=1.4; (95% CI: 1.1–1.6)), regular frequentation dating websites (aOR=1.3; (95% CI: 1.1–1.5)), no steady sexual partner (aOR=1.3; (95% CI: 1.1–1.5)), more than 10 partners (aOR=1.6; (95% CI: 1.4–1.9)), exposure to sperm during oral sex (aOR=2.3; (95% CI: 1.9–2.7)) and drug use (aOR=1.7; (95% CI: 1.5–2.0)) (Table 4).

For untested respondents, NDPP was associated with all of the following activities in the previous 12 months: regular frequenting dating websites (aOR=1.5; (95% CI: 1.1–2.2)), exposure to sperm during oral sex (aOR=2.3; (95% CI: 1.6–3.3)) and drug use (aOR=1.9; (95% CI: 1.4–2.7)) (Table 4).

Discussion

Description of survey

The Presses Gays et lesbiennes survey is one of the very few surveys in France that describe the sexual behaviours of MSM in detail, based on a large sample of volunteers. Its use of the Internet as its principal mode of recruitment brought forth a wide variety of respondents, in terms of age, place of residence and sociodemographic profile. Because most respondents had had at least one casual partner in the previous 12 months, these data gave us a good understanding of prevention practices used by MSM in such relationships.

Major results

Because our categorisation of sexual prevention behaviours captures the diversity of preventive practices among MSM, we were able to obtain a detailed description of them. Thirty years after the HIV epidemic started, condom use during anal intercourse was not widespread, regardless of HIV status [1]. More detailed information about the determinants of consistent condom use would be interesting, but it seemed to us most useful to describe specific profiles of MSM engaged in high risk-taking in order to implement target prevention programs according to HIV status. Risk-reduction strategies were used to a limited degree by HIV-positive respondents, with no difference according to disease control status, and to a lesser degree by their seronegative counterparts. Nevertheless, a large proportion of respondents had NDPP, a finding consistent with other European studies which used unprotected anal intercourse as the principal indicator of risk-taking [7,16,17]. The factors associated with this lack of protection reflect a number of common characteristics generally associated with risk-taking. These include frequenting Internet meeting sites, using drugs, and exposure to sperm during oral sex [17–19]. In particular, HIV-positive respondents with NDPP most often belonged to the post-AIDS generation and had an adventure-oriented sexuality [20]. HIV-negative respondents with NDPP were characterised by a low education level.

Importance of HIV testing

In this context, HIV testing and knowledge of status are major issues. More than one third of untested respondents and one in five of the HIV-negative respondents engaged in high-risk practices that put them and their sexual partners at risk for HIV infection and other STIs. MSM unaware of their status who engage in these behaviours contribute to driving the hidden epidemic, estimated in France to be more than 9,000 MSM [11]. A seroprevalence study in Paris showed that 20% of undiagnosed HIV-positive respondents reported that they either had never previously been tested or were HIV-negative, but had the same sexual risk behaviours as HIV-positive men aware of their status [17]. It is crucial that untested MSM be encouraged to go for HIV testing and receive counselling on risk-reduction strategies. Accordingly, structural and psychological barriers to testing must be reduced, especially denial about practicing at-risk behaviours and fear of positive HIV test results [21]. It is also essential for HIV-negative respondents to regularly update their HIV status. However, our results did not show any association between NDPP and testing within the previous 12 months. This suggests that these HIV-negative men had not actually recognised that they engaged in risk-behaviours and wrongly believed themselves to be HIV-negative. Encouraging MSM to test for HIV as frequently as possible to confirm their negative status is vital [21].

Risk-reduction practices and their limitations

MSM have taken up serosorting or seropositioning as alternative risk-reduction practices to condom use [7]. Studies have previously associated these practices with positive HIV-status [22,23]. In our study, a substantial proportion of HIV-positive respondents used them, regardless of whether their infection was controlled or not. HIV-negative respondents also engaged in these practices, although at a rate lower than in other studies [22]. Nevertheless, the efficacy of both serosorting and seropositioning has been questioned. Their levels of scientific validation differ, and randomised trials have failed to demonstrate their efficacy. Some studies have shown they have a positive effect on the epidemic's dynamics [6], while others have not [24]. Unlike condom use, these practices do not protect against STIs and are only effective for HIV transmission if both partners have up-to-date knowledge of their serostatus [25]. Moreover, they must discuss the issue, something that cannot always be taken for granted, given the nature of meeting places and the problems of discrimination against seropositive MSM.

Vulnerability of HIV-negative men who have sex with men

HIV-negative respondents displaying NDPP appeared to be more socially vulnerable than other subgroups in our study. Although they were part of the gay community, they had profiles associated with high-risk sexual behaviours: young, with low education levels, and living in non-urban areas. The increase in newly

diagnosed HIV cases among MSM under 30 years old in Europe [2,26], and in France more specifically [3], confirms our findings. Interventions targeting younger MSM are urgently needed to prevent a resurgence of the epidemic.

Moreover, as in our study, a low educational level was found to be associated with risk-taking behaviours in the EMIS network [16] and with an increased risk of HIV seroconversion in European studies [26,27]. These findings must be integrated into prevention campaigns to tailor prevention messages as well as possible to ensure the widest possible participation by this specific population.

Heterogeneity of practices among HIV-positive MSM

Our findings underline the heterogeneity of preventive behaviours among HIV-positive MSM and the need to take this diversity into account to improve therapeutic care. In accordance with the Swiss statement's recommendations [15], in view of the different transmission issues, we categorised HIV-positive MSM according to whether their infection was controlled or uncontrolled and analysed them separately. Randomised trials have shown that treatment, by controlling viral load, reduces the risk of transmission in heterosexual couples [8] and in steady MSM couples [28]. No such result has been observed in MSM for casual relationships [9,29].

Interestingly, in our study, HIV-positive respondents with controlled infection were less likely to show NDPP than those whose infection was uncontrolled. This finding might be due in part to how we constructed the infection control status categories, by considering STI infections as well as viral load over the last 12 months. But this finding is also consistent with a seroprevalence study which showed that HIV-positive MSM in Paris with a low viral load reported a lower proportion of UAI episodes with casual partners of unknown or different HIV status than their counterparts with high viral loads [30].

The association of diagnosis after 2000 with NDPP, regardless of infection control status, demonstrates the generational impact and the effect of treatment on sexual behaviours [31]. A high proportion of the HIV-positive respondents in this study were diagnosed after 2000, at a time when barebacking was emerging and engendering fierce debates and long-term divisions between MSM in France [32]. Some of these men also started their sexual life after the arrival of antiretroviral treatment (ART). Furthermore, the hypothesis of behavioural disinhibition linked to treatment seems to be true for this sub-population [33]. These results highlight the urgent need to implement targeted information campaigns for HIV-positive MSM and thus to remind individuals and groups about the importance of treatment adherence, about STI care and about the place of condoms in sexual practices with casual partners.

Study limitations

Our study also has some limitations that must be considered in interpreting our results. First, the methodological limitations must be underlined. As is often the case for surveys related to MSM [14], our study is based on a non-random sample with participant self-selection through the Internet and gay press. Furthermore, the absence of both a sample frame and controls during the inclusion process means that our results cannot be extrapolated to the entire MSM population [1]. We did, however, use websites as varied as possible to invite MSM to participate. MSM recruited through the press have a more established sexual identity and sex life as well as higher educational and economic levels [34]. Those recruited through the Internet are younger and less urban [35]. Furthermore, the serological data based on self-reporting probably underestimated the real proportion of HIV-positive MSM as some respondents were probably unaware that they were HIV-positive. This point has previously been highlighted in studies on seroprevalence in MSM [17,36].

Second, the categorisation we used also has limitations. It was constructed retrospectively, based on the answers to questions about sexual behaviours and self-reported health status. It was not based on questions about a deliberate choice to use serosorting or seropositioning instead of condoms [37,38]. Nevertheless, a comparison of the risk-reduction practices and strategies matched the responses well: 90% of the respondents classified as engaging in serosorting declared they did so to avoid contamination by or transmission of HIV. Another limitation of the categorisation used is that making the risk-reduction categories mutually exclusive is simplistic and inaccurate. It does not take into account the protean reality of different sexual behaviours over time (in this case 12 months) [37] and is the result of a theoretical compromise.

Conclusions

The study captured the diversity of preventive practices among MSM. Our findings highlight the ongoing nature of the normalisation of HIV in this post-AIDS era [39], when HIV has lost the central meaning it had in the lives of gay men in the 1980s and 1990s. Furthermore, the ever-decreasing use of condoms means that HIV testing and treatment are not sufficient to invert the epidemic's trend. Combination prevention is legitimate in the current context where HIV incidence remains very high worldwide. Accordingly, promoting condom use, encouraging regular HIV testing, offering treatment – be it post-exposure (PeP) or pre-exposure (PreP) – to HIV-negative MSM at high risk of exposure, prompt treatment of HIV-positive MSM and, finally, follow-up for STIs are all interventions that belong in prevention programmes for MSM within a global health approach.

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Conflicts of interest

None declared.

Authors' contributions

AV was the principal investigator of the Presse Gays et lesbiennes survey 2011, carried out the statistical analysis, and conceived and wrote the paper. LS carried out the statistical analysis, commented on the first draft and approved the final version. CSommen carried out the statistical analysis, commented on the first draft and approved the final version, PB carried out the statistical analysis, commented on the first draft of the paper and approved the final version, NB commented on the first draft of the paper and approved the final version, CSemaille commented on the first draft of the paper and approved the final version.

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