


# Rectal Douching Among Men Who Have Sex with Men in Paris: Implications for HIV/STI Risk Behaviors and Rectal Microbicide Development

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**Abstract** Rectal douching is a common but potentially risky practice among MSM; MSM who douche may be ideal candidates for rectal microbicides as HIV prevention. Herein we explored rectal douching and its association with condomless receptive anal intercourse (CRAI), group sex, rates of HIV and other STIs, and likelihood to use rectal microbicide gels. We recruited a sample of 580 MSM from a geosocial-networking smartphone application in Paris, France in 2016. Regression models estimated adjusted risk ratios (aRRs) for associations between rectal douche use and (1) engagement in CRAI, (2) group sex, (3) self-reported HIV and STI diagnoses, and (4) likelihood to use rectal microbicide gels for HIV prevention. 54.3% of

respondents used a rectal douche or enema in the preceding 3 months. Douching was significantly associated with CRAI (aRR: 1.77), participation in group sex (aRR: 1.42), HIV infection (aRR: 3.40), STI diagnosis (aRR: 1.73), and likelihood to use rectal microbicide gels (aRR: 1.78). Rectal douching is common among MSM, particularly those who practice CRAI, and rectal microbicide gels may be an acceptable mode of HIV prevention for MSM who use rectal douches.

**Resumen** Los hombres que tienen sexo con otros hombres (MSM – por sus siglas en inglés, men who have sex with men) suelen usar duchas rectales antes de sexo anal, pero esta práctica es potencialmente arriesgado; MSM quienes usan duchas rectales pueden ser candidatos ideales para microbicidas rectales como manera de prevención del VIH. En esta investigación exploramos el uso de duchas rectales entre MSM y su asociación con sexo anal receptivo sin condones (CRAI – por sus siglas en inglés, condomless receptive anal intercourse), el sexo en grupo, tasas del VIH y otras infecciones de transmisión sexual, y la probabilidad de usar geles microbicidas rectales. Recultamos una muestra de 580 MSM de usuarios de una aplicación de red social en París, Francia en el 2016. Modelos de regresión estimaron índices de riesgo ajustados (aRR – por sus siglas en inglés, adjusted risk ratio) para asociaciones entre el uso de duchas rectales y (1) practicando CRAI, (2) el sexo en grupo, (3) tasas del VIH y de otras infecciones de transmisión sexual autoinformadas, y (4) probabilidad de usar una microbicida rectal en gel para la prevención del VIH. 54,3% de nuestra muestra había usado una ducha o enema rectal durante las 3 meses anteriores. El uso de duchas rectales tenía una asociación con CRAI (aRR: 1.77), participación en sexo en grupo (aRR: 1.42), infección con el VIH (aRR: 3.40) y con otras enfermedades de transmisión

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sexual (aRR: 1.73), y probabilidad de usar una microbicides rectal en gel (aRR: 1.78). El uso de duchas rectales es común entre MSM, especialmente ellos quienes practican CRAI, y las microbicides rectales en gel pueden ser una modalidad de prevención del VIH para MSM quienes usan duchas rectales.

**Keywords** Rectal douching · Enema · Rectal microbicides · HIV prevention · Men who have sex with men

## Introduction

HIV remains a global health priority with more than 36 million people living with HIV worldwide in 2015 despite remarkable advances in treatment and prevention over the past three decades [1]. While HIV incidence is on the decline internationally, the world region containing Europe and Central Asia is one of only two world regions in which rates of new HIV infection continue to increase [2]. In France in particular, gay, bisexual, and other men who have sex with men (MSM) account for the majority of new HIV infections. Indeed, despite accounting for an estimated 3.9% of the male population in France [3], MSM accounted for 42% of all new infections among men in France in 2015 [4]. Moreover, between 2003 and 2014, the number of new HIV infections in France declined in nearly all groups except MSM [5].

Given that the HIV epidemic disproportionately affects MSM in France and many other countries, understanding the sexual behaviors and preferences contributing to ongoing sexual transmission of the virus in this key population is essential in developing effective prevention strategies. The advent of daily oral pre-exposure prophylaxis (PrEP) containing emtricitabine and tenofovir disoproxil fumarate (FTC-TDF) represented a major breakthrough in HIV prevention. The efficacy of PrEP in preventing HIV infection among MSM when taken in the form of a once daily pill was shown in the global iPrEx trials [6] and in the PROUD trial based in the United Kingdom [5]. In addition, the French-based IPERGAY trial showed efficacy for an intermittent dosing regimen, where individuals took two pills before a sexual encounter and two pills after a sexual encounter [7]. Oral PrEP became widely available in France in January 2016 and is available in both daily and on demand dosing regimens [8]. In the first 6 months following its rollout, 1077 individuals began receiving PrEP, the vast majority of whom (96.4%) were MSM [8]. This number is expected to rise given the increased capacity of sites to deliver PrEP and increased awareness of its availability.

However, concerns regarding short-term and long-term effects, the high costs of oral PrEP, and difficulties with adherence remain significant barriers to its consistent use [9]. Given these barriers, it is necessary to incorporate more practical strategies to administer PrEP into existing sexual practices. Rectal microbicides (also known as rectal PrEP) are topical preparations of antiretroviral medications that may be inserted into the anus prior to anal intercourse to prevent HIV transmission. Multiple microbicide delivery mechanisms are currently under study, including topical gels, which could be applied like lubricants, and enemas, which are expelled from a bulb into the colorectum and may coat the inside of the intestine more thoroughly than manually applied gels [10–12]. Microbicides may be an acceptable alternative to oral PrEP for HIV prevention among MSM who engage in condomless receptive anal intercourse (CRAI), given that microbicide gels can be applied on a per-event basis and would ostensibly not have the same potential for systemic side effects as an oral medication. A recent survey in the United States conducted among a sample of MSM on Facebook in 2015 demonstrated significant interest in PrEP modalities outside of the standard once daily pill, including on-demand pills, injections, and rectal gels [13]. Among a sample of Dutch MSM, 60.8% indicated a preference for a rectal microbicide that could be applied before or after anal intercourse compared to daily oral PrEP [14]. Notably, multiple Phase I studies have established the safety and acceptability of tenofovir gel as rectal PrEP, including CHARM-01 [15] and Project Gel [16], each of which found rectal microbicide gels to be safe and acceptable to participants, and multiple other studies of rectal microbicides, including tenofovir and maraviroc gels, are underway [11].

Given the considerable interest in rectally-based modalities for PrEP delivery among MSM, it is important to consider other behaviors that precede anal sex, such as rectal douching, the act of rinsing the rectum to cleanse it prior to intercourse. Indeed, as studies have reported that between 17 and 53% of MSM douche prior to anal intercourse [17–20], this practice has significant implications for understanding HIV transmission among MSM. There is some evidence to suggest that some douching preparations can break down the protective rectal epithelium, thereby increasing susceptibility to HIV and other sexually transmitted infections (STIs) [21]. Studies dating back to the 1980's have provided some evidence that douching among MSM is associated with an increased risk of HIV [22–24]. More recent studies among MSM have further established this link between rectal douching and HIV [20, 25, 26], with some evidence linking douching to chlamydia [27, 28] and Hepatitis B and C [25, 26, 29], though the association of rectal douching with other STIs is less well established.

MSM who douche are an important target population for rectal microbicides not only because of the potential risks of douching but also given findings that MSM who douche commonly engage in sexual risk behaviors, including condomless anal intercourse. For instance, Carballo-Diéguez and colleagues demonstrated that douching before receptive anal intercourse is associated with HIV-positive serostatus and is a common practice among MSM who engage in condomless receptive anal intercourse [21]. In addition, given that MSM who douche are already accustomed to preparing for sexual acts, they may be open to integrating a rectal microbicide into their pre-sex routine, particularly those who practice condomless receptive anal intercourse (CRAI). Indeed, in a 2011 study of U.S. MSM, Mitchell and colleagues found that MSM who douched or engaged in CRAI were more willing to use a rectal enema as an HIV prevention method compared to those who did not douche or practice CRAI [17].

It is therefore clear that MSM who douche are a worthy potential target population for rectal microbicides. Despite this, the literature exploring the association between rectal douching and willingness to use rectal microbicides among MSM is limited [15]. Besides Mitchell's recent U.S. study, a 2008 study conducted among Peruvian MSM found that MSM who practiced rectal douching were more willing to use a rectal microbicide than those who did not [30]. Other studies of willingness to use rectal microbicides conducted in South America [31], Thailand [32], and the USA [33] did not examine the relationship between douching and proposed rectal microbicide use. In addition, no studies have explicitly examined whether or not condomless receptive anal intercourse is more common among MSM who use rectal douches. Furthermore, while we are aware of one study based in Amsterdam that examined the risk of STIs associated with sharing douching equipment [34], no studies have examined whether rectal douching is associated with group sex, a HIV risk behavior among MSM. Finally, few studies on rectal douching practices have been conducted among MSM in France in particular, despite the high burden of HIV and STIs in this population and the fact that France has been a leader in PrEP rollout by approving both once-daily and on-demand oral regimens [8], suggesting that France may be among the first nations to approve rectal PrEP regimens when available.

The objective of this study was therefore to examine MSM who douche as a potential target population for rectal microbicides by determining associations between rectal douching and condomless receptive anal intercourse, group sex, diagnoses with HIV and other STIs, and likelihood to use hypothetical rectal microbicides to prevent sexual transmission of HIV among a sample of MSM in France. We chose to study geosocial network (GSN) application-using MSM in France because MSM commonly use GSN

apps to meet friends and romantic and sexual partners [35], and because app-using men often engage in HIV risk behaviors, including condomless receptive anal intercourse [36].

## Methods

### Sample Recruitment

This study utilized broadcast advertisements on a popular geosocial-networking smartphone application used by MSM to meet romantic and sexual partners for recruitment in October 2016. These advertisements were targeted to users of this application located in the Paris (France) metropolitan area. In line with previous research [35, 37], users were shown an advertisement with text encouraging them to click through the advertisement to complete an anonymous web-based survey. This advertisement read, "Looking to improve your health, and the health of those in your community? Share your thoughts with us on gay and bisexual men's health and have a chance to win € 65! Click more to get started!" (English version). The advertisements were shown to users during three consecutive 24-hour periods on the first instance a user logged onto the application in a 24-hour period. While users could have potentially seen the advertisement multiple times, precautions (e.g., use of the "Prevent Ballot Box Stuffing" feature on Qualtrics) were taken to avoid and eliminate duplicate responses as done in previous research [37]. No duplicate responses were apparent.

Our survey, which included 52 items, was translated from English into French using an adaptation of the TRAPD (translate, review, adjudicate, pretest, document) model [38]. The survey was translated by three native French speakers, and then reviewed and adjudicated by a fourth native French speaker. Finally, the survey was pretested through back-translation by a fifth French speaker and health researcher, yielding its final form. The survey took an average of 11.4 min (SD = 4.0) for users to complete. The survey was offered in French and English; 94.3% took the survey in French. At the end of the recruitment period (i.e., three 24-hour periods), 5206 users had clicked on the advertisement and reached the landing page of the survey, 935 users provided informed consent and began the survey, and 580 users completed the survey, representing an overall response rate of 11.1%. All protocols were approved by the New York University School of Medicine Institutional Review Board prior to data collection. All respondents reported being at least 18 years old at the time of survey administration.

## Measures

### *Rectal Douche or Enema Use*

Recent use of rectal douches or enemas was assessed in one item reading, “In the past 3 months, did you use an enema or douche rectally?” The following description of rectal douches or enemas was displayed to participants, “An enema or douche is a liquid, such as water, that you put inside your rectum and then expel.” Response options were “Yes” and “No”.

### *Condomless Anal Intercourse*

Participants indicated the number of partners with whom they had engaged in condomless insertive anal intercourse and condomless receptive anal intercourse in the preceding three months. For the purposes of these analyses, we included condomless receptive but not insertive anal intercourse, given that the physiologic effects of douching are most relevant for the receptive partner, and these count variables were transformed into categorical variables with two categories (0 partners and 1 or more partners).

### *Group Sex Participation*

We assessed engagement in group sex events with the question “Have you ever had group sex (sex with three or more people during a single sexual encounter)?” Response options were: “Yes, in the last three months”; “Yes, but not in the last three months”; and “No”. For the purposes of these analyses, this variable was dichotomized as “Yes” and “No”.

### *HIV and Other Sexually Transmitted Infections*

Participants were asked to self-report their HIV status with one item reading “What is your HIV status?” with three response options (negative, positive, and unknown). HIV status was recoded into a dichotomous (negative and positive). Responses as “unknown” (12.4%) were recoded as “Missing”. To ascertain recent diagnoses with various STIs, participants were asked, “In the past year, have you been diagnosed with any of the following?” Participants were asked to select from a list of six common sexually transmitted infections – gonorrhea, chlamydia, syphilis, herpes simplex virus (HSV), human papillomavirus (HPV), and hepatitis C (HCV). A composite variable was created to indicate any recent STI diagnosis versus no recent STI diagnosis.

### *Likelihood to Use Rectal Microbicides*

An introductory statement read, “Suppose a microbicide was at least 90% effective in preventing HIV as a gel applied to the rectum.” Participants were then asked, “How likely would you be to use it in the future?” Response options were “Very likely”, “Likely”, “Undecided”, “Unlikely”, and “Very unlikely”. We dichotomized this variable into those who indicated being “Likely” or “Very Likely” as being “willing” to use a rectal microbicide versus “unwilling” for all other responses. 90% effectiveness was the chosen figure for comparison given the finding from iPrEx that Truvada resulted in a 92% relative risk reduction of HIV transmission [6].

### *Socio-Demographic Characteristics*

Participants were asked to report their age (in years), sexual orientation (response options: gay, bisexual, straight, other), whether or not they had been born in France (response options: yes, no), employment status (response options: employed, unemployed, student, retired), and current relationship status (response options: single, relationship with a man, relationship with a woman). The continuous variable of age was categorized into five groups: 18–24, 25–29, 30–39, 40–49, 50 years and older.

## Statistical Analysis

First, descriptive statistics were calculated for all study variables. Next, the demographic and behavioral characteristics of MSM who reported rectal douche/enema use in the preceding three months were compared to those who did not using Chi square statistics. Log-binomial regression models with a log link function were then used to estimate risk ratios (RRs) and 95% confidence intervals (CI) for the associations between recent rectal douche/enema use and the following dichotomous outcomes: (1) engagement in condomless receptive anal intercourse, (2) engagement in group sex, (3) self-reported HIV infection; (4) self-reported recent STI diagnoses; and (5) likelihood of self-reported HIV-negative participants to use rectal microbicide gels to prevent HIV infection. We replaced the log link with a logit link, where convergence is not achieved. All demographic variables were included in these models as covariates. Analyses were conducted using Stata 14 (Stata Corp, College Station, TX) in November–December 2016.



## Results

Socio-demographic information from the sample are displayed in Table 1. The median age was 34 years old [interquartile range (IQR) 27–42], where 64.3% of respondents were 30 years old or older. Most respondents (77.6%) were born in France. Most identified their sexual orientation as either gay (84.0%) or bisexual (11.9%). Most respondents were employed (66.9%). In addition, most respondents were single (65.2%). About one-third reported currently being in a relationship with a man (29.7%) or woman (1.9%).

Overall, 39.0% engaged in receptive anal intercourse without a condom in the preceding three months with one or more partners. Participation in group sex was common: 65.3% of respondents reported group sex, ever or in the last 3 months. Most respondents (76.6%) reported their HIV status as negative. The prevalence of HIV infection based on self-report was 10.0%. With regard to STIs, 22.2% had been diagnosed with gonorrhea, chlamydia, syphilis, herpes simplex virus, or human papillomavirus, where 5.8% had been diagnosed with more than one of these infections in the past year. Approximately half (53.8%) of those who reported being HIV-negative were willing to use rectal microbicide gels. Among them, 52.2% reported being “Very Likely” to use them.

### Rectal Douching and its Association with Condomless Receptive Anal Intercourse, Group Sex, HIV Infection Other Sexually Transmitted Infections and Likelihood to Use Rectal Microbicides for HIV Infection

In this sample, 54.3% reported having used a rectal douche or enema in the preceding three months (Table 1). Differences in socio-demographic and behavioral characteristics between MSM who reported rectal douche/enema use and those who did not are also displayed in Table 1. Men who were gay-identified (vs. other), had 1 + partners (vs. 0), were in a relationship with a man (vs. not), participated in group sex (vs. not), reported being HIV-positive (vs. HIV-negative), and had 1 + STI diagnoses in the past year (vs. 0) were more likely to report use of a rectal douche or enema in the past 3 months.

At the univariate level, among those who engaged in condomless receptive anal intercourse, 71.2% reported recent rectal douche or enema use, compared with 43.5% of those who did not engage in CRAI. 60.1% of those who participated in group sex douched, compared with 44.4% of those who did not report participation in group sex. In addition, a higher proportion of HIV-positive MSM reported recent rectal douche or enema use (81.0%) than

those who reported their HIV status as negative (52.5%). A higher proportion of individuals who reported recent rectal douche or enema use also reported an STI diagnosis in the preceding year (27.9%) compared to those who did not (15.1%). Furthermore, a higher proportion of individuals who reported recent rectal douche or enema use reported being likely or very likely to use a hypothetical rectal microbicide to prevent HIV infection (58.5%) compared to those who did not (49.2%).

As noted in Table 2, association persisted in multivariate models after adjusting for socio-demographic covariates with recent rectal douche or enema use being positively associated with engagement in condomless receptive anal intercourse (aRR 1.77; 95% CI 1.39–2.25), with participation in group sex (aRR 1.26; 95% CI 1.09–1.41), HIV infection (aRR 3.40; 95% CI 1.68–6.88), recent infection with other STIs (aRR 1.73; 95% CI 1.22–2.46), and likelihood to use rectal microbicides to prevent HIV infection (aRR: 1.78 95% CI 1.17–2.70).

## Discussion

This is the first study to assess the prevalence of rectal douche use and the associations of this practice with condomless receptive anal intercourse, group sex, HIV and other STIs, likelihood to use rectal microbicides to prevent HIV infection among an app-using MSM sample in Paris, France, who may be at higher risk of HIV infection given a higher number of sexual partners, and possibly a higher risk of condomless anal intercourse when compared with MSM who do not use apps to meet sexual partners [39, 40]. A recent international survey on rectal douching among 1725 MSM in 112 countries showed that rectal douching was more common in Europe compared to other parts of the world, where 72.0% reported ever using a rectal douche before or after anal intercourse [41]; in the current study, we found that 54.3% of our sample of MSM in Paris, France used a rectal douche or enema in the three months preceding survey administration. This value is similar to 3-month pre-coital douching rates of 66.5 and 60.5% reported among recent samples of MSM in the U.S. [17, 41] and worldwide [41], affirming the significant international prevalence of this practice and the need to better understand its implications for population health within and beyond France.

MSM who reported using a rectal douche or enema in the current study commonly engaged in condomless receptive anal intercourse, were more likely to participate in group sex, more likely to report being HIV-positive, more likely to have been diagnosed with an STI in the preceding year, and more likely to be willing to use a rectal microbicide gel. These observed associations between

**Table 1** Sample characteristics by the use of rectal douches ( $N = 580$ )

	Total		Did not enema/douche rectally		Use enema/douche rectally		$P^a$
	N	%	N	%	N	%	
<i>Overall</i>	580	100	258	44.5	315	54.3	
<i>Age</i>							0.644
18–24	84	14.5	41	48.8	43	51.2	
25–29	103	17.8	46	44.7	57	55.3	
30–39	180	31.0	78	43.3	102	56.7	
40–49	139	24.0	58	41.7	80	57.6	
≥50	54	9.3	28	51.9	25	46.3	
<i>Sexual orientation</i>							<0.001
Gay	487	84.0	201	41.3	284	58.3	
Bisexual/other	79	13.6	51	64.6	26	32.9	
<i>Born in France</i>							0.102
Yes	450	77.6	194	43.1	255	56.7	
No	113	19.5	58	51.3	54	47.8	
<i>Employment status</i>							0.822
Employed	388	66.9	177	45.6	211	54.4	
Unemployed	84	14.5	36	42.9	46	54.8	
Student	81	14.0	34	42.0	47	58.0	
<i>Current relationship status</i>							0.024
Single	378	65.2	181	47.9	195	51.6	
Relationship with a man	172	29.7	65	37.8	107	62.2	
<i>Condomless receptive anal intercourse</i>							<0.001
0 partners	340	58.6	189	55.6	148	43.5	
≥1 partners	226	39.0	65	28.8	161	71.2	
<i>Group sex</i>							<0.001
Yes	378	65.3	150	39.7	227	60.1	
No	198	34.4	108	54.6	88	44.4	
<i>HIV status</i>							<0.001
Negative	444	76.6	208	46.9	233	52.5	
Positive	58	10.0	11	19.0	47	81.0	
Unknown	72	12.4	37	51.4	35	48.6	
<i>STI diagnosis</i>							<0.001
Yes	129	22.2	39	30.2	88	68.2	
No	451	77.8	219	48.6	227	50.3	
<i>Likelihood to use rectal microbicides</i>							0.027
Very unlikely	103	17.8	54	52.4	49	47.6	
Unlikely	52	9.0	22	42.3	30	57.7	
Undecided	95	16.4	47	49.5	47	49.5	
Likely	149	25.7	71	47.7	78	52.4	
Very likely	163	28.1	56	34.4	106	65.0	

Bold values indicate statistical significance ( $p < 0.05$ )

<sup>a</sup> Chi square statistic

rectal douching and our outcomes are consistent with those shown in the existing literature in different geographic regions [20, 21]. That is, our data contribute to a growing body of evidence that rectal douching is associated with condomless receptive anal intercourse, HIV, and other

STIs, and that those who douche are open to use rectal microbicide gels for HIV prevention.

Our finding that MSM who douche would be likely to use a rectal microbicide is concordant with the assertion that those who douche may be an ideal target for rectal

**Table 2** Multivariate association (aRRs) between rectal douching with condomless receptive anal intercourse, group sex, HIV status, STI status, and willingness to use rectal microbicides

	Condomless receptive anal intercourse aRR (95% CI)	Group sex aRR (95% CI)	HIV positive aRR (95% CI)	Recent STI aRR (95% CI)	Likelihood to use rectal microbicides <sup>a,b</sup> aRR (95% CI)
<i>Rectal Douching</i>					
Yes	1.77 (1.39, 2.25)*	1.24 (1.09, 1.41)*	3.40 (1.68, 6.88)*	1.73 (1.22, 2.46)*	1.78 (1.17, 2.70)*
No	Referent	Referent	Referent	Referent	Referent

Adjusted for age, sexual orientation, origin (born in France), employment and relationship status

aRR adjusted risk ratio

<sup>a</sup> This outcome was limited to HIV-negative participants

<sup>b</sup> Logit link function was used due to the convergence problems

\*  $p < 0.01$

microbicides, perhaps because MSM who douche are already used to preparing for sex in some way. The use of rectal microbicides as a mechanism of HIV prophylaxis remains in the realm of experimentation. That said, the existence of multiple Phase I and II trials of candidate gels [15, 42] speaks to both the potential efficacy surrounding this novel approach to HIV prevention and the need for investigators, clinicians, and public health professionals to be familiar with behavioral indicators of patients who may be particularly strong candidates for PrEP.

Finally, the prevalence of douching in our sample is significant in part because, as noted previously, some rectal douches damage the protective rectal epithelium [21]. Notably, however, not all douche preparations may be equally destructive to this mucosal barrier. In one study of enemas as potential vehicles for rectal microbicides, for example, while hyperosmolar enemas caused significant sloughing of the colonic epithelium, isoosmolar and hypoosmolar enemas had no significant effect on the epithelium [12]. This investigation supports the idea that the chemical composition of products applied rectally, whether douches, enemas, or microbicide gels, must be studied carefully to determine their potential effects on the protective colorectal mucosa.

### Future Research and Study Implications

HIV prevention interventions are especially needed for MSM who engage in rectal douching for at least two reasons: (1) as established in prior studies [20], their use predisposes individuals to HIV infection through mechanical denudation of the protective rectal mucosa as well as other STIs, and (2) as demonstrated in this study, men who douche commonly engage in condomless receptive anal intercourse. Rectal microbicide gels may be an acceptable form of HIV prevention if proven to be efficacious

among MSM, and other studies [17] have demonstrated considerable interest in microbicides as a mechanism of event-based PrEP among MSM. As rectal microbicides are not currently available, future research should examine potential barriers to MSM using rectal microbicides to improve use of rectal microbicides as an HIV prevention intervention once they become available. Previous research has also shown that certain types of commercial lubricants damage the lining of the rectum in a similar manner to douches and increase an individual's susceptibility to HIV and other STIs [43, 44], so future research should examine rectal douching prior to and lubricant use during anal intercourse to fully understand the impact of these types of products and practices on risk of HIV infection among MSM. Future research should also include a range of STIs, including Hepatitis B, particularly because data from 2012 suggested that less than half of French adolescents were vaccinated against this virus [45]. Given that the use of some douches may increase the risk of HIV transmission among other STIs, further studies are needed to assess the level of adherence to antiretroviral therapy and viral suppression among HIV-positive MSM who douche rectally in order to target preventive HIV/STI efforts.

### Study Limitations

This study is subject to limitations. As our study variables were measured via self-report, recall bias and social desirability bias is possible. For example, HIV-seropositive participants might be reluctant to report their seropositive status. Same-source bias [46], as the exposure and outcomes were measured via self-report, is also a possible concern. In addition, this was a cross-sectional study and therefore reverse causation is possible. Residual confounding might also be an issue, as the survey included limited number of variables and did not include potential

confounding covariates including perceived risk of acquiring HIV, the type or frequency of rectal douching or enema use, and reasons for using rectal douches or enema. This is potentially significant in that some respondents may have used enemas for reasons other than hygiene prior to sex, e.g., for relief of constipation or for delivery of medications. Moreover, we did not ask about rectal lubricant use, which may be significant given that certain rectal lubricants may also damage the rectal epithelium [37]. We also did not examine the full range of STIs; for example, the survey did not examine trichomoniasis or hepatitis B. Furthermore, we note that the current study was conducted in a single urban European geographic location among a sample of geo-social networking application users whom we did not ask to identify their race or ethnicity. Consequently, our findings might not be generalizable to other locations, including less populated non-European regions and non geo-social networking application users, and we cannot make judgments regarding how study participants' racial and ethnic identities may have influenced the sexual practices assessed in this study.

## Conclusions

Rectal douching was highly prevalent among our sample of MSM in Paris. We also found that rectal douching was significantly associated with condomless receptive anal intercourse, group sex, HIV and other STIs, as well as likelihood to use rectal microbicide gels to prevent HIV infection among our sample. Rectal microbicides may be an acceptable form of HIV prevention if found to be efficacious among MSM.

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## Compliance with Ethical Standards

**Conflicts of interest** The authors have no conflicts interests.

**Research Involving Human Participants** All procedures performed in studies involving human participants were in accordance with the ethical standards of our institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

**Informed Consent** Informed consent was obtained prior to participants' beginning the survey.

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