AIDS and Behavior (2019) 23:3375–3383
https://doi.org/10.1007/s10461-019-02539-z

ORIGINAL PAPER

Distinct Profiles of Consumers of Psychoactive Substances in People Attending French Sexual Transmitted Infections Centers

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Published online: 17 May 2019
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Abstract

The objective of this cross-sectional survey was to assess the prevalence of psychoactive substance use (PSU) in people attending 11 French Sexual Transmitted Infection Centers, and to specify their profiles (PSU and link with risky sexual behaviors) using the ascending hierarchical clustering method. Among the 5220 individuals who completed the survey, 55.6% were men and the median age was 24 years [IQR: 20–31]. Among the participants, 2751 (52.7%) reported PSU at least once in their life. Ascending hierarchical clustering identified seven distinct profiles of participants based on their PSU. This study shows a high prevalence of PSU and alcohol consumption in this young population. Moreover, subgroup analysis allowed identifying groups of psychoactive substance users who presented specific risks or vulnerabilities and who should be priority targets for interventions, particularly sexual minority groups.

Keywords Psychoactive substance · Ascending hierarchical classification · Profile · Sexual transmitted infections centers

Resumen

El objetivo de esta encuesta trasversal era evaluar, en individuos que consultaron 11 centros franceses de Enfermedades de Trasmisión Sexual, la prevalencia del uso de sustancias psicoactivas y precisar el perfil de los participantes (sustancias psicoactivas y su relación con comportamientos de riesgo sexual) utilizando el método de clasificación jerárquica ascendente. Entre los 5220 individuos que completaron la encuesta, 55.6% eran hombres con una edad media de 24 años [IQR: 20–31]. Entre los participantes, 2751 (52.7%) declararon el uso de sustancias psicoactivas al menos una vez en su vida. El método de clasificación jerárquica ascendente identificó siete perfiles diferentes de participantes en base a su uso de sustancias psicoactivas. Esta encuesta muestra una elevada prevalencia del consumo de sustancias psicoactivas y alcohol en este grupo de población joven. Más aún, el análisis de subgrupos permite

H. Peyrière and Q. Mano have contributed equally to this work, and C. Rousseau and J. Reynes have contributed equally to this work.

Electronic supplementary material The online version of this article (https://doi.org/10.1007/s10461-019-02539-z) contains supplementary material, which is available to authorized users.

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identificar grupos de consumidores de sustancias psicoactivas que presentan riesgos o vulnerabilidades específicas, a quienes deberían proponerse intervenciones con prioridad, particularmente a los grupos de minorías sexuales.

Introduction

In France, sexually transmitted infection (STI) centers offer free and anonymous screening of HIV infection, as well as screening, diagnosis, and treatment of other STIs [1]. The role of these centers is to promote early screening/treatment/prevention of STIs, and to facilitate healthcare access to people in a precarious position who may be more at risk of such diseases [1, 2]. Compared with the general French population, people attending STI centers are at higher risk for STIs, younger, and more frequently homosexual or bisexual [1, 2].

At the end of 2013, the French Public Health Agency[1] ("Santé Publique France") alerted about the higher prevalence in Languedoc-Roussillon (a region in the South of France) of alcohol and psychoactive substance (PS) consumption or experimentation, particularly among the 15–30-year-old group of the general population [3]. Moreover, the analysis of the 2014 data from the mandatory HIV infection reporting in the Languedoc-Roussillon region showed a moderate increase of the number of HIV infections (total n = 189), predominantly among men who have sex with men (MSM) (n = 123; 65% of all HIV infections) [4]. The Gay and Lesbian Press survey data for 2011 indicated that in the Languedoc-Roussillon region, HIV prevalence was higher than nation-wide (19% of MSM were HIV-positive in Languedoc-Roussillon compared with 17% nationwide), as well as the frequency of high-risk sexual behaviors (58% of MSM had unprotected anal intercourse) [4]. These data were confirmed by the results of the 2015 PREVAGAY study on MSM subjects that reported that HIV prevalence was 14.3% in France and 16.9% in Montpellier, the head city of the Languedoc-Roussillon region [5].

PS consumption has been rarely evaluated in STI centers as well as the risks associated with their use, particularly sexual risk-taking behavior that can increase the risk of HIV/STI transmission [6]. In this context, we wanted to assess the prevalence of PS use in people attending the STI centers in the Languedoc-Roussillon region. Moreover, to better characterize the different groups of substance (PS/alcohol) users, especially their sexual behavior/orientation, we used hierarchical cluster analysis (HCA), a statistical method that allows stratifying a population in homogeneous groups [7, 8].

[1] More information on Santé publique France: https://www.santepubliquefrance.fr/Infos/About-Sante-publique-France.

Materials and Methods

This multicenter, cross-sectional descriptive survey was performed at the 11 STI centers (in French: Centres de Dépistage Anonymes et Gratuits—Centres d'Information, de Dépistage et de Diagnostic des Infections Sexuellement Transmissibles; Centers for free and anonymous screening—Centers of information, screening and diagnosis of STIs) of the Languedoc-Roussillon region, France, from January 2014 to end of April 2014 (4 months). These outpatient centers are operated by the regional department of public health, and receive patients for screening, diagnosis and treatment of HIV and other STIs by a multidisciplinary team (physician, psychologist, nurse, social worker). These centers are located in urban areas in cities of varying importance (Fig. 1).

All subjects who went at least once to one of the 11 STI centers during the study period were asked to participate in this survey, after signing an informed consent. No financial compensation was given for participation in the study. Participants filled in a self-administered questionnaire while waiting for their consultation (in the waiting room). This questionnaire included questions on sociodemographic characteristics (age, sex, nationality, educational level, professional situation, health insurance), the reasons for consulting, sexual behavior (sexual identity, type and number of sexual partners during the last 12 months, condom use frequency), STI/HIV history (number of tests and results in the last 2 years), and PS consumption as well as route of administration. The survey included a list of PS: cannabis and synthetic cannabinoids, heroin, psychostimulants (cocaine, amphetamine, and ecstasy), poppers, hallucinogens (hallucinogenic mushrooms, ketamine, lysergic acid diethylamide (LSD)), gamma hydroxybutyrate/gamma butyrolactone (GHB/GBL), synthetic cathinones and other new psychoactive substances. PS consumption frequency was categorized as follows: regular (several times during the last month), in the month (at least once during the last month), in the year (at least once in the last year), and experimentation (once in the lifetime). Multiple PS use was defined as the concomitant consumption of two of more drugs, according to the WHO definition [9].

In addition, risky sexual behavior associated with the use of PS or alcohol was addressed by a question with four possible answers: "frequently", "sometimes", "exceptionally" or "never". In one question, participants needed to specify the frequency of condom use (i.e., always, often, irregularly, or never) for sex with stable or occasional sexual partners in the last 12 months. The perceived risk of HIV acquisition was self-assessed by the participants using a scale going from 0 (no risk) to 10 (high risk) (0–2: low, 3–4: moderate, 5–7: moderately high, and 8–10: high).

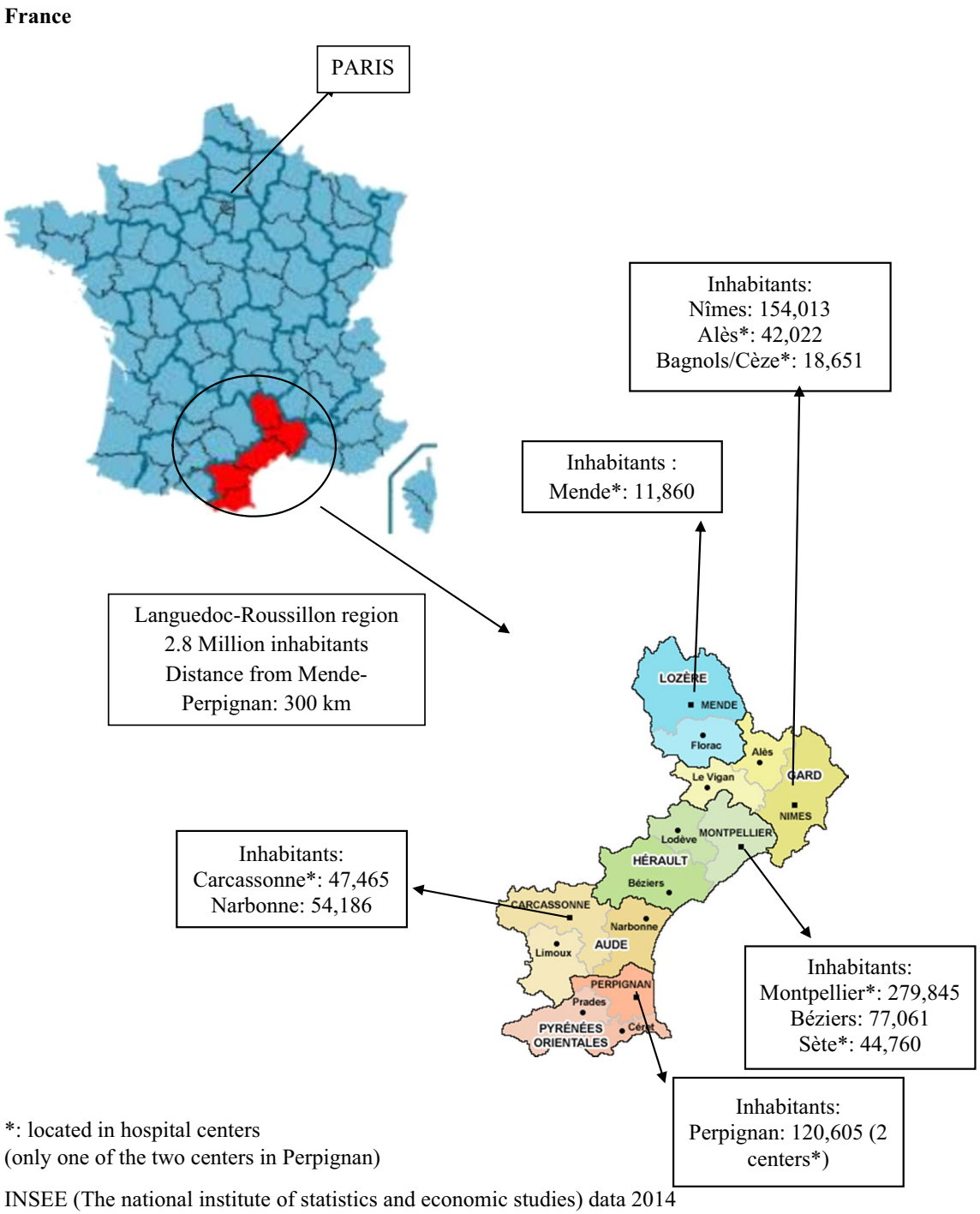

Fig. 1 Presentation of the region in which the study was conducted and location of the 11 participating centers

All variables were qualitative data, expect age and perceived risk of HIV acquisition that were discrete quantitative variables.

Statistical Analysis

The collected data were described using percentages (qualitative data) and means (quantitative data). Qualitative data were compared using the χ^2 and Fisher tests, with a 0.05 p value threshold.

Exploratory multivariate analyses were performed to optimize data modeling. A multiple correspondence analysis (MCA) followed by the ascending HCA enabled to determine the different PS consumer typologies. First, MCA gave a geographic representation on which individuals with the same PS consumption profile are close. For this analysis, the

consumption frequencies of the eight PS were used as active variables, and low-size modalities were grouped to avoid a too strong influence on the results. For the MCA, a Burt's table was created with all categorical variables. Only the first factorial axes with an explained inertia higher than the inverse of the number of non-zero eigenvalues ratio (in this case 0.05) from the MCA were kept for the HCA to eliminate the statistical noise (also corresponding to the factorial axes that explained 50% of the total inertia).

Then, the HCA was performed to determine the optimal number of clusters that summarized all the information. This iterative aggregation approach is based on the minimal loss of interclass inertia. A dendrogram (tree diagram illustrating the hierarchical clustering/relationships between similar sets of data) was built from the MCA results. The Ward's method (as homogeneity criterion) and Euclidean distance (as measure of dissimilarity) were used, and no weight variable was added to build the dendrogram [10, 11]. The Ward's method objective is to minimize the inter-class inertia and maximize the intra-class inertia to constitute clusters as homogeneous as possible. Then, the optimal number of clusters was chosen by analyzing the dendrogram and semi-partial R^2 (loss of interclass inertia), the local peaks of the cubic clustering criterion that measures the cluster quality and of the pseudo-F statistic that measures the separation between clusters, and the value of the pseudo-T^2 statistic that measures the separation between the last two grouped clusters.

Finally, clusters were described with means and percentages. Each cluster was compared to the global sample using the χ^2 and Fisher tests (p-value ≤ 0.05 as threshold) for qualitative variables, and the Student's *t*-test and ANOVA for quantitative data.

All analyses were carried out with SAS 9.3.

Results

Overall Population

Finally, 5220 individuals (73.1% of all people who came to the STI centers during the study period) were included in the analysis after exclusion of subjects who did not answer the question on gender (n = 10), who never had sex (n = 35), or with incomplete data on PS use frequencies (n = 103). The people included were mainly men (55.6%), with a median age of 24 years [IQR: 20–31]. This was a young population: 96.4% of participants were younger than 40 years, and 53.6% younger than 25 years of age (Fig. 2). Overall, women were younger (less than 25 years of age: 67.2% of women vs. 42.8% of men, $p < 0.05$) and more often students (54.3% vs. 31.1% of men, $p < 0.05$). Participants were mainly French (90.7%) and urban (91.1%). Their sociodemographic characteristics are presented in Table 1.

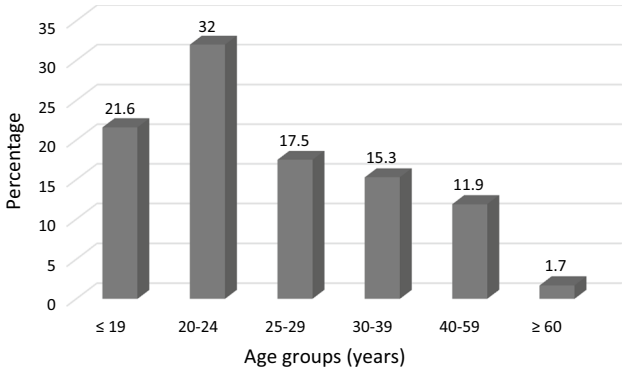

Fig. 2 Age groups of the study population

Previous STIs were reported by 754 participants (14.7%) who represented 10.2% of all heterosexual men (n = 233), 14.7% of all heterosexual women (n = 311), 33.9% of all gay, bisexual and other men who have sex with men (GBMSM) (n = 184), and 15.9% of all gay, bisexual and other women who have sex with women (GBWSW) (n = 22).

Non-optimal use of condoms (i.e., never, irregular or often use for penetrative sex with a casual partner) was reported by 55.2% of participants, whatever their gender and sexual orientation. For penetrative sex with a casual partner, condoms were never or irregularly used by 32.6% of heterosexual men, 31.7% of heterosexual women, 24.7% of GBMSM, and 36.6% of GBWSW.

PS Consumption

Among the 5220 individuals included in the analysis, 2751 (52.7%) reported the use of PS at least once in their life. PS consumption "more than once a year" concerned cannabis (38.8%), stimulants (11.3%), poppers (5.8%), and hallucinogens (5.2%).

Multiple drug use (≥ 2 PS) was reported by 32.3% of PS consumers. Multiple drug use was more frequent among men than women (29.6% vs 20.3%, $p < 0.05$), and among homosexual and bisexual men compared with heterosexual men (41.1% and 40.2%, respectively, vs. 26.8%, $p < 0.05$). Similarly, multiple drug use was more frequent among bisexual women than homosexual and heterosexual women (48.4% vs. 26.3% and 17.8% respectively, $p < 0.05$).

Concerning PS consumption modalities, the nasal route was used by 38.8% of consumers (n = 1074) and intravenous injection by 2.8% (n = 80). Slamming (i.e., the injection of psychostimulants in a sexual context) was reported by 12 subjects (0.4%). Injection drug users were mainly men (67.5%), heterosexual (91.3%), and unemployed (56.9%). Multi-drug use was reported by 70.4% of injecting drug users.

Table 1 Characteristics of the study population (n = 5220)

Characteristics	Study population	
	(%)	n
Sexual orientation/sex		
Heterosexual men	44.9	2323
GBMSM[a]	10.7	555
Heterosexual women	41.7	2159
GBWSW[b]	2.7	140
Educational level		
Primary school	1.1	55
Junior high school	16.2	822
High school	22.9	1161
University	59.9	3040
Housing		
Single	44.9	2316
In couple	12.4	641
Homeless	1.2	63
Other[c]	41.4	2133
Occupational activity		
Employed	36.6	1749
Unemployed	22.1	1057
Student	41.4	1978
Health insurance		
Statutory health insurance	82.3	4092
Other insurance[d]	13.1	649
None	4.7	231

[a]*GBMSM* gay and bisexual and other men having sex with men

[b]*GBWSW* gay and bisexual and other women having sex with women

[c]Shared accommodation with a friend or a family member

[d]Related to low income or illegal immigration

The nasal route was used mainly by men (63.5%), heterosexual (77%) and GBMSM (13.4%), employed people (38.3%), and students (32.9%). Multi-drug use was reported by 33.8% of people using the nasal route.

PS consumers and non-consumers did not differ by gender (p = 0.19), and sexual orientation for men (heterosexual 53.4% vs GBMSM 57.9%, p = 0.55). Conversely, PS consumers were more frequent among GBWSW than heterosexual women (67.9% vs. 49.9%, p < 0.05).

Finally, seven PS users' profiles were identified using the HCA. The main characteristics of each profile are reported in Fig. 3 and all data are in Supplementary Table S1.

Risky Sexual Behaviors and Perceived Risk of HIV Infection

Risky sexual behavior related to PS use was reported by 15.0% of participants: frequently by 1.1%, sometimes by 4.8%, and exceptionally by 9.1%. Men reported more risky sexual behavior related to PS consumption than women (17.0% vs. 12.5%, p = 0.02) and among them, particularly MSM (23.6% vs. 13.4% for heterosexual men, p < 0.05).

Risky sexual behavior related to alcohol consumption was reported by 37.5% of participants: frequently by 2.5%, sometimes by 13.0%, and exceptionally by 22.0%. More bisexual men (5.7%) reported having "always" (17.6% "often") a risky sexual behavior related to excessive drinking compared with 3.3% of heterosexual (15.5% "often") and 2.5% of homosexual men (11.2% "often") (p < 0.05). Among women, 10.2% of heterosexual women reported having "still or often" a risky sexual behavior related to excessive drinking, compared with 26.8% of bisexual and 28.6% of homosexual women (p < 0.05).

Heterosexual men estimated that their HIV risk was significantly lower compared with MSM and bisexual men (mean risk: 2.5/10, 3.6/10 and 4.0/10 respectively, p < 0.05). The mean perceived HIV risk by women did not vary with the sexual orientation (heterosexual women: 2.9/10, homosexual women: 2.9/10 and bisexual women: 3.4/10, p = 0.07).

Risky sexual behavior varied among the seven clusters obtained by HCA (Figs. 3, 4). The risk (suboptimal condom use with a casual partner, sex with alcohol/PS) increased from profile 4, and was especially high in profiles 4 and 7. Profile 4 included mainly MSM subjects with PS consumption for chemsex practices. Profile 7 comprised mainly heterosexual men, often in a more precarious situation, with high regular consumption of "classic" substances, such as stimulants or heroin, via the nasal or intravenous route. The sexual risk related to alcohol consumption was high (30–70% of participants according to their profile) and more frequent than the one associated with PS consumption (except for profile 7).

Overall, PS users thought that they were more at risk of HIV than non-users (men: 3.0/10 vs. 2.5/10, p < 0.05; and women: 3.1/10 vs. 2.6/10, p < 0.05). Profile 1 and profile 2 individuals, who had a lower PS consumption, estimated to be at lower risk of HIV infection. The perceived risk increased from profile 3 (i.e., profiles with higher PS use). HIV risk perception was comparable among individuals in profiles 3 to 6, whereas it was heterogeneous within profile 7 (Fig. 5).

Discussion

In this multicenter cross-sectional study, we evaluated the profile (PS consumption/risky sexual behavior) of subjects attending the 11 STI centers of a region in the South of France. Analysis of the survey responses brought several important insights. First, the population of the STI centers included mainly men (55.6%), and was young (the median age of participants was 24 years and 96.4% were younger

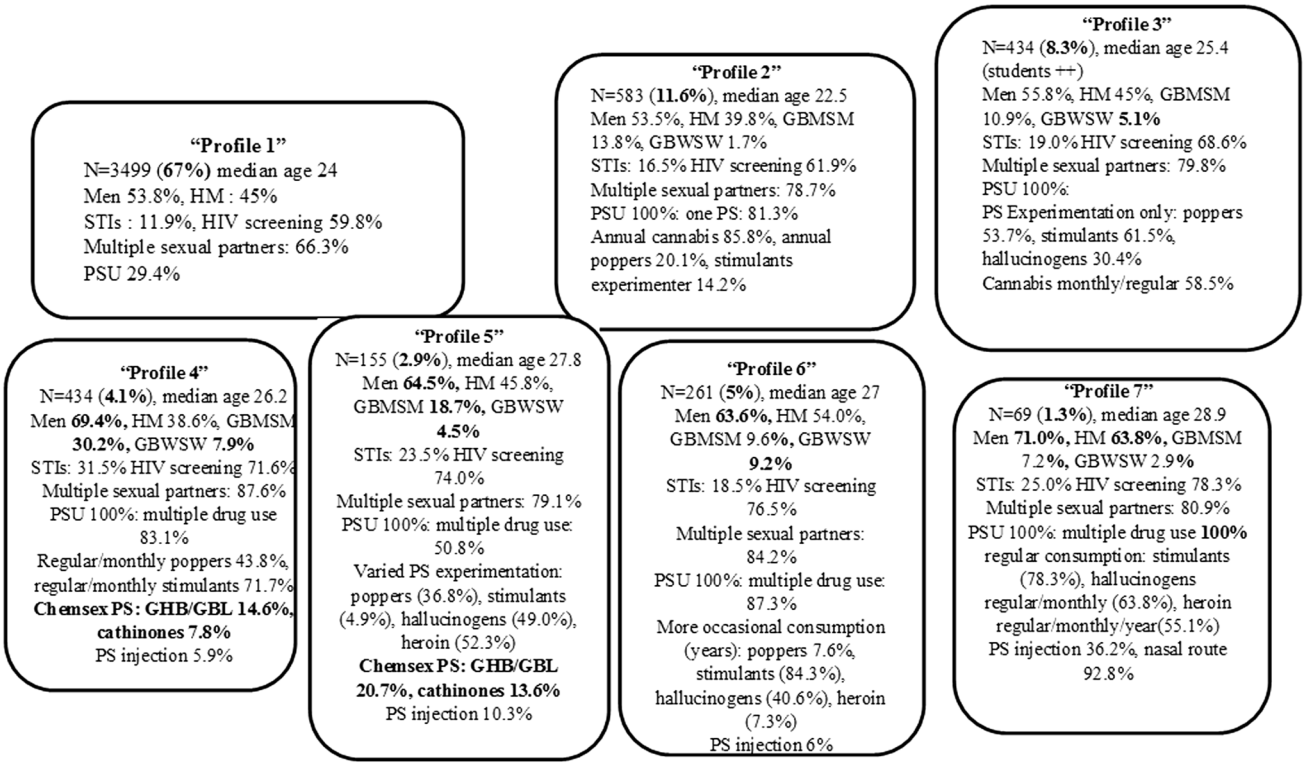

Fig. 3 Summary of the seven profiles of people visiting the STI centers. Some important data are highlighted in bold. *HM* heterosexual men, *GBMSM* gay, bisexual and other men who have sex with men, *GBWSW* gay, bisexual and other women who have sex with women, *PS* psychoactive substance, *PSU* psychoactive substance use, *GHB/GBL* hydroxybutyrate/gamma butyrolactone

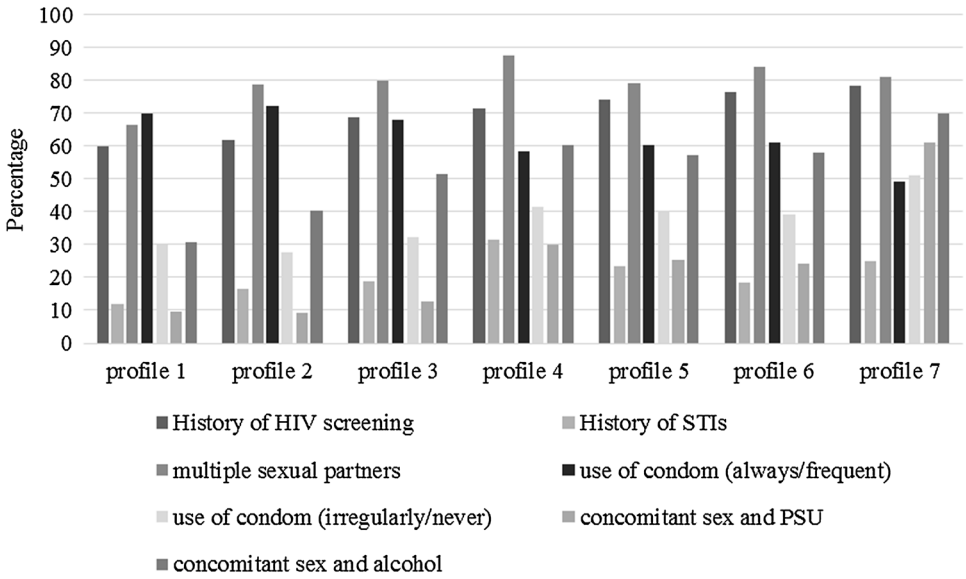

Fig. 4 Characteristics of the profiles according to the sexual risk behaviors. Profile 1: Ps experimenters/rare PS use. Profile 2: moderate consumers of classic PS. Profile3: experimenters of classic PS (cocaine, hallucinogens). Profile 4: multiple PS users, including for chemsex. Profile 5: experimenters of classic PS, chemsex, heroin use. Profile 6: multiple drug users. Profile 7: multiple drug users including heroin

than 40), in agreement with other studies on this type of centers (i.e., 59% of men and mean age of 30.9 years) [12, 13].

Moreover, many participants (52.7%) reported PS use, particularly cannabis (38.8%), stimulants (11.3%), poppers (5.7%) and hallucinogens (5.2%), at least once during the last year. The PS use during the last year was higher than what described for the 18–64 years age group in a French national health survey (including PS use) on the general population in 2014: cannabis 11.3% versus 10.6%, poppers 3.3% versus 0.9%, stimulants 5.5% versus 2.3%, hallucinogenic 3.3% versus 0.6%, and heroin 1.3% versus 0.2%, respectively [14].

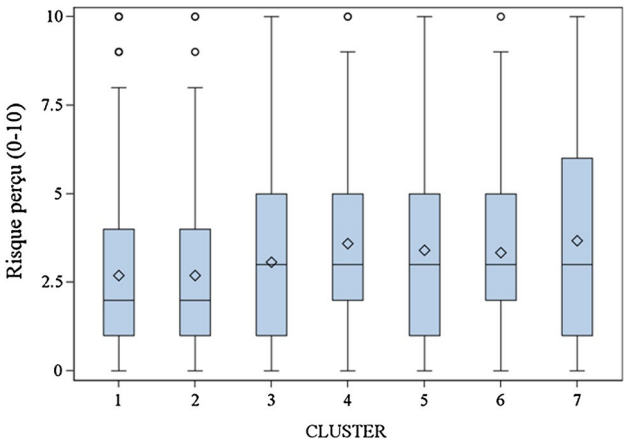

Fig. 5 Risk of HIV infection perceived by profile

In this national survey, the consumption frequency was highest in the 18–34 year-old group [14]. The frequency of PS consumption (experimentation or regular use) must be taken into account when assessing the risks (addiction, somatic or psychic complications, and risky sexual behavior).

Risky sexual behavior related to PS consumption and alcohol consumption was reported by 14.9% and 37.5% of participants, respectively. In another French study, 33% of participants made the link between PS consumption and sexual risk-taking [12]. The perceived HIV risk by users with very different PS consumption and sexual risk-taking profiles was quite homogeneous, and did not seem to match the actual risk level. Only rather young MSM who attend private commercial venues or parties had a more realistic perception of their risk of HIV exposure (i.e., high risk). Information efforts on the issues related to PS consumption and sexual behavior are justified.

The HCA-based profiles allowed individualizing among all study participants, PS users with specific risks or vulnerabilities. These at-risk subjects represent priority targets for interventions. For example, the prevalence of substance use disorders was higher in sexual minority groups (MSM, lesbian and bisexual women) than in the general population [15]. These populations could represent target groups, particularly GBMSM. Indeed, although they accounted for 10.7% of the study population, they were much represented in profile 4 (30.2%) and profile 5 (18.7%). These participants are close to their thirties with high frequency of sexual risk-taking (multiple partners: 87.6%; risk-taking related to PS use: 18.5%) and previous STIs. Similarly, another study reported that MSM with symptoms of multiple substance use dependencies are more likely to be engaged in sexual behavior that places them at risk of HIV and other STIs [16]. PS consumption and its association with risky sexual behavior among MSM have been documented worldwide, particularly in Western Europe, where transmission of HIV and other STIs remains high [17]. We also found that PS (GHB/GBL, synthetic cathinones) use in chemsex practices was more frequent among GBMSM. In recent years, chemsex and slamming have taken a considerable place in the MSM community. Chemsex describes intentional sex under the influence of PS. Slamming is defined as using PS by injection, particularly crystal methamphetamine, synthetic cathinones and GHB/GBL, in a sexual context [17, 18]. In our study, 65.3% of participants in profile 4 reported monthly use of stimulants; however, we could not distinguish between methamphetamine, cocaine or ecstasy. GHB/GBL and synthetic cathinones were used by 14.6% and 7.8% of profile 4 subjects and by 20.7% and 13.6% of profile 5 subjects, respectively. In this population, the frequency of risky sexual behaviors related to alcohol consumption also was high (about 35%).

Another target group may be represented by GBWSW. They accounted for 2.7% (140 participants) of our study population and were mainly present in profile 3, 4 and 6. In this population, risky sexual behaviors related to excessive drinking are more frequent than in heterosexual women. Several studies have found that GBWSW are at greater risk of alcohol and drug use disorders than heterosexual women [15, 19–21], with higher levels of substance abuse among bisexual than lesbian and heterosexual women [22], as found in our study. Sexual minority stress also might favor these disorders, and STI centers can be a place where people can talk, or be addressed to more specialized structures.

Our analysis also highlighted that students (more prevalent in profile 3) were mainly characterized as substance experimenters, as found in a French national study [14]. People in profile 7 (older, poly-consumers, precarious) should also be carefully followed.

Moreover, we found a high level of sexual risk related to alcohol consumption (30% to 70% of participants in function of their profile), much higher than for PS. In recent years, the emergence of new PS, such as synthetic cathinones, and the associated risky practices (chemsex), have masked the risky behaviors, including sexual ones, associated with alcohol consumption. In a recent study, one-third of the surveyed gay and bisexual men had high (20.4%) or severe (10.6%) risk levels of alcohol consumption [23]. Similar findings were reported for lesbian and bisexual women [24].

Recently, oral pre-exposure prophylaxis (PrEP) with a combination of the antiretroviral drugs tenofovir and emtricitabine has been recommended for preventing HIV infection among individuals at high risk [25]. In September 2015, the WHO recommended offering PrEP to all people at substantial risk of HIV infection, including MSM [26]. In our STI centers, PrEP can be rapidly prescribed to individuals who are identified as at high risk of HIV.

This study thoroughly described the population who come to STI centers in the South of France. Its main strength is the quasi-exhaustive nature because all centers of the region were

included, and 73.1% of visitors accepted to fill in the questionnaire. Moreover, the use of appropriate statistical tools made it possible to describe user profiles that could not have been easily identified in the context of the daily activity, by analyzing all the available information. This allowed highlighting useful elements for effective interventions, and specific profiles of individuals who may benefit from target preventive actions (brief risk reduction interventions during screening, for example for students). On the other hand, we did not question participants about HIV treatment or sex partner concurrency, and this is a study limitation. Moreover, we do not know why about 27% of people attending the STI centers did not want to participate in this study.

Conclusion

This study shows a high prevalence of PS use in this young adult population. The association of PS consumption and suboptimal condom use is worrying and constitutes a risky behavior for STIs. Prevention should focus on this issue. STI centers seem to be adapted to the detection and prevention of PS use in connection with risky sexual behaviors.

Acknowledgements Study conception and coordination: CR; protocol drafting: CR, JR, HP, VT, JMJ, MF, EDC, IB, JV, JD; data acquisition: VT, MF, EDC, IB, JV; data analysis: QM, CR; drafting of first manuscript: HP; revision of manuscript: HP, JR, CR, QM; final approval of manuscript: all authors.

Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflicts of interest.

Informed Consent Informed consent was obtained from all participants included in the study.

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