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Sexual attraction and the nonmedical use of opioids and sedative drugs among Chinese adolescents

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ABSTRACT

Objective: The nonmedical use of prescription drugs (NMUPD) is attracting public attention. We aimed to explore the association between sexual attraction and NMUPD among Chinese adolescents.

Method: A school-based survey was conducted in seven Chinese provinces, and a multi-stage stratified cluster sampling method was used in this study. A total of 150,822 students from seven Chinese provinces completed the questionnaire; the response rate was 95.93%. All data were collected between November 2014 and January 2015.

Results: Overall, 8.8%, 4.4%, and 2.2% of the students reported lifetime, past-year, and past-month NMUPD, respectively. Compared with heterosexual students (8.2%), sexual minority and unsure students were more likely to report lifetime NMUPD (14.4% and 10.0%, respectively; $\chi^2 = 244.34$, $P < 0.001$). In addition, sexual minority and unsure students were more likely to admit past-year and past-month use of NMUPD. After adjusting for social demographics and lifestyle covariates, sexual minority and unsure students were at an increased risk of lifetime NMUPD (adjusted odds ratio [AOR] = 1.68, 95% confidence interval [CI] = 1.54-1.83 and AOR = 1.33, 95% CI = 1.26-1.41, respectively).

Conclusions: Our study suggested that sexual minority and unsure adolescents have a higher risk of NMUPD. Moreover, our study suggested that sexual minority and unsure students are more likely to both try and continue to use prescription drugs. Further studies focusing on the mechanism of substance abuse and appropriate interventions among sexual minority and unsure adolescents are warranted.

1. Introduction

In the past few decades, sexual minority mental health disparities have been recognized as a global public health problem. It has been well demonstrated that sexual minority adolescents are more likely to report substance abuse (Goldberg et al., 2013; Homma et al., 2012). A *meta*-analysis revealed a higher prevalence of substance use among sexual minority adolescents than among their heterosexual peers (OR = 2.89) (Marshal et al., 2008). Moreover, previous studies reported that sexual minority adolescents were more likely to report cigarette (Corliss et al., 2012), alcohol (Ziyadeh et al., 2007), and illegal drug use (Hatzenbuehler et al., 2015). Recently, concern about the nonmedical use of prescription drugs (NMUPD) among adolescents has been increased due to the availability and popularity of these drugs.

NMUPD is defined as prescription drug use without a prescription solely for the feeling or experience caused by the drug (Guo et al., 2015; Wang et al., 2015). According to the 2016 Monitor the Future survey, the prevalence of lifetime, annual, and 30-day misuse of prescription drugs among U.S. 12th-grade students was 18.0%, 12.0%, and 5.4%, respectively (Johnston et al., 2017). Previous studies conducted among Chinese adolescents revealed that 4.8%-11.3% of students reported lifetime NMUPD (Guo et al., 2015; Wang et al., 2014; Wang et al., 2015). Opioids and sedatives were two of the most prevalent prescription drugs among Chinese adolescents (Wang et al., 2014; Wang et al., 2015). Compared with illegal drugs, prescription drugs are more easily obtained from peers and family (McCabe and Boyd, 2005) and can be misperceived as safer (Fleary et al., 2013), which makes drug use prevalent among young people. However, prescription drugs can be as addictive as other illegal drugs and can lead to physiological and psychological dependence (McCabe et al., 2007). NMUPD increases the

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risk of negative mental health outcomes, such as anxiety (Gros et al., 2013), depression (Zullig and Divin, 2012), and suicide (Guo et al., 2016), and it is also associated with other forms of substance abuse, including cigarette, alcohol, and other illegal drug use (Jayawardene and Youssefagha, 2014).

Previous studies reported a higher prevalence of NMUPD among sexual minorities (Cochran et al., 2004). A Youth Risk Behavior Survey conducted in the U.S. reported that 27.5% of sexual minority students had ever taken prescription drugs without a prescription (Kann et al., 2016). A longitudinal study among U.S. adolescents revealed that lesbian/gay and bisexual adolescents were at a higher risk of misuse of prescription drugs (RR = 3.16 and RR = 3.97, respectively) (Corliss et al., 2010). Kecojevic et al., (2012) found that the initiation of prescription drug misuse (e.g., opioids and tranquilizers) began at an earlier age in lesbian, gay, bisexual, and transgender (LGBT) youth than in their heterosexual peers (Kecojevic et al., 2012).

Adolescents who report unsure sexual orientation may suffer from sexual minority stress as well, such as bullying and discrimination (Birkett et al., 2014), which can cause mental health problems (Coulter et al., 2016; Corliss et al., 2014; Kann et al., 2016; Zhao et al., 2010). However, some previous studies did not include adolescents who were unsure of their sexual orientation in the analysis (Corliss et al., 2010; Homma et al., 2012), and some studies did not provide the option of unsure sexual orientation (Goldberg et al., 2013; Kecojevic et al., 2012). Only a few studies have investigated substance abuse among the unsure group (Kann et al., 2016).

A higher risk of NMUPD among sexual minority adolescents has been demonstrated in Western countries. The patterns of the association between sexual minority status and some mental health disparities (such as depression, suicide (Lian et al., 2015), and smoking (Zhang et al., 2017)) found in Chinese sexual minority adolescents were similar to those in Western countries. However, only a small amount of data is available concerning the association between sexual orientation and NMUPD among Chinese adolescents.

In the present study, we used data from the 2015 School-based Chinese Adolescents Health Survey (SCAHS) (1) to estimate the prevalence of NMUPD in sexual minority and unsure adolescents and (2) to examine the association between sexual attraction and NMUPD among adolescents.

2. Methods

2.1. Participants and procedures

SCAHS is an ongoing, large-scale, cross-sectional study of health-related behaviors, including NMUPD, among 7th- to 12th-grade Chinese adolescents (Guo et al., 2015; Wang et al., 2014; Wang et al., 2015). Since 2007, SCAHS has been conducted every two years. The latest version, the 2015 survey, was conducted in seven Chinese provinces. A multi-stage stratified cluster sampling method was utilized in the present study. All 34 province-level regions in China were divided into three strata according to economic level. Two or three provinces were selected randomly in each stratum. The seven provinces were Guangdong, Liaoning, Shandong, Hunan, Shanxi, Chongqing, and Guizhou. In each province, cities were divided into three strata according to economic level, and two cities were selected in each stratum. All eligible schools in each city were stratified according to the type (junior high school, senior high school, and vocational school) and size of the school. In each city, 6–7 junior high schools, 4–5 senior high schools, and 2–3 vocational schools were selected randomly. In each school, two classes were selected randomly from each grade. All of the students in these classes were invited to participate in the study. Finally, 150,822 students completed the questionnaire (reached sample N = 157,217; response rate 95.93%). Each student completed a self-administered questionnaire with the help of trained interviewers. To protect the privacy of the students, the questionnaire was completed anonymously and in the absence of a teacher. If a student requested question clarification, the interviewer encouraged the student to answer according to their own understanding of the question. When students returned the questionnaires, the interviewers did not review any questions. All the data were collected between November 2014 and January 2015.

2.2. Ethics statement

The study protocol was approved by the Institutional Review Board of Sun Yat-sen University, School of Public Health. Each school and the students' parents provided informed consent before the students participated in this study.

2.3. Measures

2.3.1. Sexual attraction

In this study, sexual orientation was measured by asking students the following question related to sexual attraction (Lesbian, Gay, and Bisexual (LGB) Youth Sexual Orientation Measurement Work Group, 2003): "In a romantic relationship, which type of person are you attracted to?" The response options included "opposite sex", "same sex", "both opposite and same sex", and "unsure". Students who responded "same sex" or "both opposite and same sex" were classified as sexual minorities.

2.3.2. Nonmedical use of prescription drugs

In this study, NMUPD was measured by asking whether the students had experienced nonmedical use of opioids, sedatives, or any of the prescription drugs listed below. The list of medications was provided by the Center for Adverse Drug Reaction (ADR) Monitoring of Guangdong and included medicines reported to be widely used by adolescent drug abusers in rehabilitation centers. In this study, opioids included compound licorice tablets (opium), cough syrup with codeine (codeine), diphenoxylate, and tramadol hydrochloride. Sedatives included diazepam (benzodiazepines), triazolam (benzodiazepines), scopolamine hydrobromide tablets (barbiturates), and compound aminopyrine phenacetin tablets (barbiturates). Lifetime, past-year, and past-month NMUPD were assessed in this study. NMUPD was assessed by asking the following question: "Have you ever used the following medications, even once, when you were not sick or just for the purpose of experimenting or getting high without a doctor's prescription?" The question was followed by the list of prescription drugs mentioned above, and the response options for each drug were either "yes" or "no". If the response was "yes", past-year NMUPD was assessed, and the students who reported past-year NMUPD were further asked about past-month NMUPD. The students who reported lifetime NMUPD were also asked about the main source of prescription drugs and their motivation for NMUPD. The main source of prescription drugs for nonmedical use was assessed by asking the following question: "Where did you usually get the abovementioned drugs for nonmedical use? (choose one option that is most suitable for your situation)". The response options for this question were 1) family, 2) peer, 3) pharmacy, 4) hospital, 5) entertainment venues (such as nightclub, bar, and disco), and 6) others. The main motivation for NMUPD was assessed by asking the following question: "Why did you nonmedically use the abovementioned drugs? (choose one option that is most suitable for your situation)". The response options for this question were 1) curiosity, 2) sensation seeking, 3) influenced by family or peer, 4) to relieve stress, and 5) others.

2.3.3. Covariates

Covariates that have previously been reported to be associated with NMUPD, including social demographics, lifestyle, interpersonal relationship (Guo et al., 2015; Wang et al., 2014; Wang et al., 2015), smoking (Kelly et al., 2015) and alcohol use (Messina et al., 2014), were also considered and adjusted in a logistic regression analysis. Social

demographics of the students included sex (male or female), age, and household socioeconomic status (HSS). Sex was measured by asking about the student's biological sex. HSS was measured by asking about the student's perceptions of his or her household's current socioeconomic status. Responses included "good", "average", and "poor". Parental marital status was measured by asking about the current marital status of the student's parents. Responses included "harmonious", "often quarrel", and "separated or divorced". Living arrangement was measured by asking who lived in the student's primary home; responses were as follows: "two biological parents", "only father or mother", and "others." Academic pressure was measured by asking about the student's personal appraisal of academic stress, and responses were as follows: "below average", "average", and "above average". Relationships with classmates and teachers were assessed based on the student's self-rating, ranging from "poor" to "good". Smoking and alcohol use were measured by asking "Have you smoked one or more cigarettes at least one day during the past month?" and "Have you drunk at least one glass of alcohol at least one day during the past month?" respectively. Responses included "yes" and "no".

2.4. Statistical analysis

In this study, the analysis accounted for the complex sampling design, which included sampling strata, clusters, and weights. The sampling weights were calculated based on sex, type of school, and grade. The weight information was obtained from the Educational Statistics Yearbook of China 2013. Variance estimation was determined using the Taylor series linearization method. Sexual attraction, NMUPD, source of prescription drugs, motivation for NMUPD, and other covariates were assessed using frequency tables for categorical variables and were compared using the Rao-Scott chi-square test. A logistic regression analysis was used to examine the association between sexual attraction and NMUPD. A univariate logistic regression analysis was also used to demonstrate stepwise increases in prevalence. A lack of overlap between the 95% confidence intervals on crude odds ratio (COR) of two categories was considered to indicate a statistically significant difference between the CORs (Cumming, 2009). In the logistic regression analysis, sexual attraction was treated as three variables (heterosexual (yes/no), same-sex attraction (yes/no), and unsure (yes/no)), and heterosexual was specified as the reference. Variables that were significant at the 0.10 level in the univariate analyses or had been widely reported in previous studies were entered into the multiple logistic regression models. ORs and their 95% CIs were estimated. All data were analyzed using SAS version 9.2 (SAS Institute, Inc., Cary, NC). All statistical tests of hypotheses were two-sided, and a P-value less than 0.05 was considered statistically significant.

3. Results

3.1. Characteristics of participants

The characteristics of the students are shown in Table 1. Of the 150,822 students who were analyzed, 51.8% were boys, and 48.2% were girls. The median (IQR) age of the students was 15 (14–17) years. Of the total students, 4.1% self-reported as sexual minorities, 78.6% as heterosexual, and 17.3% as unsure. In this study, compared with heterosexual students, sexual minority and unsure students were more likely to be girls ($\chi^2 = 182.90$, $P < 0.001$), be younger ($\chi^2 = 4169.44$, $P < 0.001$), come from a good or poor socioeconomic status family ($\chi^2 = 204.56$, $P < 0.001$), and live with a single parent or other individual ($\chi^2 = 44.97$, $P < 0.001$). The proportions of responses that parents often quarreled or were separated or divorced were higher among sexual minority and unsure students ($\chi^2 = 169.74$, $P < 0.001$). Sexual minority and unsure students were more likely to report above-average academic pressure ($\chi^2 = 567.69$, $P < 0.001$), poor relationships with classmates ($\chi^2 = 560.16$, $P < 0.001$) and teachers ($\chi^2 = 231.01$, $P < 0.001$), smoking ($\chi^2 = 288.12$, $P < 0.001$), and alcohol use ($\chi^2 = 818.05$, $P < 0.001$).

3.2. Prevalence of NMUPD by sexual attraction

Table 2 presents the prevalence of any NMUPD, opioid and sedative use. Overall, 8.8%, 4.4%, and 2.2% of the students reported lifetime, past-year, and past-month NMUPD, respectively. Table 2 also presents the prevalence of NMUPD in sexual minority, unsure, and heterosexual students. Compared with heterosexual students (8.2%), sexual minority and unsure students were more likely to report lifetime NMUPD (14.4% and 10.0%, respectively; $\chi^2 = 244.34$, $P < 0.001$). Sexual minority and unsure students were also more likely to report past-year and past-month NMUPD. The same pattern was shown for both opioid and sedative use.

3.3. Source of prescription drugs and motivation for NMUPD

The main source of prescription drugs and the main motivation for NMUPD are shown in Table 3. In this study, we found that prescription drugs were most commonly obtained from a family member (42.4%), followed by peer (21.7%) and others (20.4%). Moreover, we found that "to relieve stress" was the most common motivation for NMUPD (27.8%), followed by "influenced by family or peer" (24.3%) and "curiosity" (23.4%).

3.4. Association between sexual attraction and NMUPD

The association between sexual attraction and NMUPD is shown in Table 4. Without adjusting for any covariates, compared with their heterosexual peers, sexual minority and unsure students were more likely to report lifetime NMUPD (COR = 1.89, 95% CI = 1.74-2.05 and COR = 1.25, 95% CI = 1.18-1.32, respectively). In the multiple logistic regression model, sex, age, HSS, living arrangement, parental marital status, academic pressure, relationships with classmates, relationships with teachers, smoking, and alcohol use were associated with student NMUPD. After adjusting for these covariates, sexual minority and unsure students still had higher odds of lifetime NMUPD (adjusted odds ratio [AOR] = 1.68, 95% CI = 1.54-1.83 and AOR = 1.33, 95% CI = 1.26-1.41, respectively), and sexual minority students were more likely to report lifetime NMUPD than unsure students. Furthermore, the ORs of lifetime, past-year, and past-month NMUPD were increased among sexual minority and unsure students. Compared with their heterosexual peers, sexual minority and unsure students had higher odds of past-month NMUPD (AOR = 1.84, 95% CI = 1.58-2.13 and AOR = 1.78, 95% CI = 1.60-1.97, respectively), which were higher than their lifetime and past-year results.

4. Discussion

Mental health disorders, especially substance abuse, among sexual minority adolescents are of great concern. In this study, we explored the prevalence of NMUPD by sexual attraction among Chinese adolescents, and we tested the association between sexual attraction and NMUPD using a large, nationally representative sample (N = 150,822).

In this study, 8.8%, 4.4%, and 2.2% of the students reported lifetime, past-year, and past-month NMUPD, respectively. The prevalence of NMUPD was consistent with the results from previous studies conducted in Chinese adolescents (Wang et al., 2014; Wang et al., 2015), indicating that NMUPD is still prevalent among Chinese adolescents. Furthermore, we found a higher prevalence of NMUPD among sexual minority and unsure students. After adjusting for social demographics, living arrangements, parental marital status, academic pressure, relationships with classmates, relationships with teachers, smoking, and alcohol use, sexual minority and unsure students were more likely to report NMUPD than their heterosexual peers (Table 4). These results

Table 1
Characteristics of participants by sexual attraction (N = 150,822).

Characteristic	Total, n (%)	Sexual minorities[a], n (%)	Unsure, n (%)	Heterosexual, n (%)	χ^2	P
Total	150822 (100.0)	6685 (4.1)	27363 (17.3)	116774 (78.6)		
Sex					182.90	< 0.001
Male	72409 (51.8)	2483 (41.4)	12583 (49.7)	57343 (52.8)		
Female	78413 (48.2)	4202 (58.6)	14780 (50.3)	59431 (47.2)		
Age, years					4169.44	< 0.001
≤13	34452 (23.7)	1319 (20.7)	11773 (44.0)	21360 (19.4)		
14–15	50683 (34.3)	2364 (37.6)	9810 (36.3)	38509 (33.6)		
16–17	49748 (30.6)	2387 (32.0)	4666 (15.5)	42695 (33.9)		
≥18	15939 (11.4)	615 (9.7)	1114 (4.2)	14210 (13.1)		
HSS					204.56	< 0.001
Good	30766 (22.7)	1456 (24.2)	6498 (26.6)	22812 (21.8)		
Average	90894 (60.3)	3748 (55.4)	15840 (57.4)	71306 (61.1)		
Poor	29162 (17.0)	1481 (20.4)	5025 (16.0)	22656 (17.1)		
Living arrangement					44.97	< 0.001
Two biological parents	108484 (74.1)	4669 (72.2)	19274 (72.5)	84541 (74.6)		
Only father or mother	18210 (11.3)	903 (12.5)	3410 (11.5)	13897 (11.1)		
Others	24128 (14.6)	1113 (15.3)	4679 (16.0)	18336 (14.3)		
Parental marital status					169.74	< 0.001
Harmonious	89910 (60.6)	3450 (53.1)	16497 (61.0)	69963 (60.9)		
Often quarrel	49385 (32.6)	2416 (36.0)	8946 (32.8)	38023 (32.4)		
Separated or divorced	11527 (6.8)	819 (10.9)	1920 (6.2)	8788 (6.7)		
Academic pressure					567.69	< 0.001
Below average	23387 (15.8)	1060 (16.1)	5276 (19.8)	17051 (14.9)		
Average	69359 (46.5)	2648 (39.9)	13650 (49.8)	53061 (46.1)		
Above average	58076 (37.7)	2977 (44.0)	8437 (30.4)	46662 (39.0)		
Relationships with classmates					560.16	< 0.001
Poor	2688 (1.8)	305 (4.8)	756 (2.6)	1627 (1.4)		
Average	38169 (23.9)	1782 (25.8)	7935 (27.8)	28452 (23.0)		
Good	109965 (74.3)	4598 (69.4)	18672 (69.6)	86695 (75.6)		
Relationships with teachers					231.01	< 0.001
Poor	5211 (3.4)	483 (7.4)	1092 (3.9)	3636 (3.1)		
Average	63203 (40.8)	2929 (43)	11328 (40.3)	48946 (40.8)		
Good	82408 (55.8)	3273 (49.6)	14943 (55.8)	64192 (56.1)		
Smoking					288.12	< 0.001
No	143032 (94.6)	6212 (93.0)	26626 (97.3)	110194 (94.1)		
Yes	7790 (5.4)	473 (7.0)	737 (2.7)	6580 (5.9)		
Alcohol use					818.05	< 0.001
No	126765 (84.0)	5072 (76.6)	24784 (90.5)	96909 (82.9)		
Yes	24057 (16.0)	1613 (23.4)	2579 (9.5)	19865 (17.1)		

Abbreviations: HSS, household socioeconomic status; NMUPD, nonmedical use of prescription drugs.
All numbers were unweighted, whereas all percentages were adjusted for sampling weights.
[a] Sexual minorities included adolescents who reported same-sex or both-sex attraction.

Table 2
Prevalence of NMUPD by sexual attraction among adolescents (N = 150,822).

Variate	Total n (%)	Sexual minorities[a], n (%)	Unsure, n (%)	Heterosexual, n (%)	χ^2	P
Lifetime NMUPD						
Any NMUPD	14198 (8.8)	1015 (14.4)	2866 (10.0)	10317 (8.2)	244.34	< 0.001
Opioids	9439 (5.9)	719 (10.3)	1895 (6.7)	6825 (5.4)	193.76	< 0.001
Sedatives	9228 (5.5)	691 (9.7)	1875 (6.4)	6662 (5.1)	216.78	< 0.001
Past-year NMUPD						
Any NMUPD	7178 (4.4)	552 (7.8)	1554 (5.4)	5072 (4.0)	199.92	< 0.001
Opioids	4254 (2.7)	342 (4.9)	950 (3.4)	2962 (2.4)	151.20	< 0.001
Sedatives	4653 (2.8)	376 (5.3)	1006 (3.3)	3271 (2.5)	162.16	< 0.001
Past-month NMUPD						
Any NMUPD	3585 (2.2)	293 (4.2)	880 (3.1)	2412 (1.9)	206.32	< 0.001
Opioids	2104 (1.3)	183 (2.7)	542 (2.0)	1379 (1.1)	168.65	< 0.001
Sedatives	2305 (1.4)	196 (2.8)	576 (2.0)	1533 (1.2)	155.09	< 0.001

Abbreviations: NMUPD, nonmedical use of prescription drugs.
All numbers were unweighted, whereas all percentages were adjusted for sampling weights.
[a] Sexual minorities included adolescents who reported same-sex or both-sex attraction.

were consistent with previous studies conducted in Western countries (Corliss et al., 2010; Kann et al., 2016; Kecojevic et al., 2012) and indicated that Chinese sexual minority adolescents are at a higher risk of NMUPD.

One possible explanation for the higher risk of NMUPD among sexual minority adolescents is sexual minority stress. Meyer's minority stress model provides a framework to explore the association between sexual minority status and mental health outcomes (including substance abuse and NMUPD) (Meyer, 2003). In a negative social climate of same-sex orientation, sexual minority adolescents are more likely to be involved in stressful events, such as bullying (Varjas et al., 2008), violence (O'Malley-Olsen et al., 2014), and discrimination (Coulter

Table 3
Source of prescription drugs and motivation for NMUPD by sexual attraction among adolescents (N = 14,198)[b].

Variate	Total, n (%)	Sexual minorities[a], n (%)	Unsure, n (%)	Heterosexual, n (%)	χ^2	P
Source of prescription drugs					114.94	< 0.001
Family	6103 (42.4)	426 (41.8)	1101 (37.7)	4576 (43.6)		
Peer	3069 (21.7)	226 (23.2)	777 (27.6)	2066 (20.2)		
Pharmacy	1191 (8.4)	85 (8.1)	190 (6.5)	916 (8.9)		
Hospital	321 (2.2)	23 (1.9)	68 (2.5)	230 (2.2)		
Entertainment venues	688 (4.9)	84 (8.5)	98 (3.1)	506 (5.0)		
Others	2826 (20.4)	171 (16.5)	632 (22.6)	2023 (20.1)		
Motivation for NMUPD					81.83	< 0.001
Curiosity	3260 (23.4)	199 (19.7)	640 (22.5)	2421 (24.1)		
Sensation seeking	675 (5.0)	81 (8.9)	121 (4.2)	473 (4.7)		
Influenced by family or peer	3413 (24.3)	200 (19.2)	841 (29.9)	2372 (23.3)		
To relieve stress	4120 (27.8)	327 (31.5)	733 (25.0)	3060 (28.2)		
Others	2730 (19.5)	208 (20.7)	531 (18.4)	1991 (19.7)		

Abbreviations: NMUPD, nonmedical use of prescription drugs.
All numbers were unweighted, whereas all percentages were adjusted for sampling weights.
[a] Sexual minorities included adolescents who reported same-sex or both-sex attraction.
[b] Only included adolescents who reported lifetime NMUPD.

et al., 2015). For instance, O'Malley-Olsen et al. reported that sexual minority students were more likely to be involved in school violence and to feel unsafe in school (O'Malley-Olsen et al., 2014). Moreover, previous studies indicated that sexual minority stress increased the risk of substance abuse (Corliss et al., 2012; Hatzenbuehler et al., 2015; Ziyadeh et al., 2007); Drazdowski et al. found that exposure to violence was associated with NMUPD (Drazdowski et al., 2015). Stressful early-life experiences may also have an influence on NMUPD among sexual minority adolescents. A previous study found that childhood trauma, such as emotional, physical, and sexual abuse, increased the risk of prescription drug use among sexual minority adolescents (Reisner et al., 2013). In China and other Asian countries, filial piety is at the core of Confucianism and traditional family values, and homosexuality is considered a betrayal of this fundamental ideal (Lin et al., 2016). In most Chinese families, carrying on the family line is of the utmost importance. Same-sex orientation often means having no offspring, which is difficult for a traditional Chinese family to accept. Today, Confucianism and traditional family values still have an influence on Chinese young people's attitudes toward sexual orientation (Hu and Wang, 2013; Lin et al., 2016) and bring stress to sexual minority adolescents.

In this study, 17.3% of students reported unsure sexual attraction, and this proportion is consistent with previous studies (Saewyc et al., 2004). Our results showed that unsure students were more likely to report NMUPD than heterosexual students, despite the lower prevalence of NMUPD in this group than in sexual minority adolescents. Our findings were similar to the results from the YRBSS survey conducted in 2015 (Kann et al., 2016). Previous studies found that adolescents who identified their sexual orientation as unsure were at greater risk of abusing other substances, such as cigarettes (Corliss et al., 2014), alcohol (Coulter et al., 2016), and illegal drugs (Newcomb et al., 2014). Although unsure adolescents report uncertainty or fail to disclose their sexual orientation, some of them may show same-sex attraction or behaviors (Igartua et al., 2009) and thus may experience sexual minority stressful events, such as being a victim of school bullying (Birkett et al., 2014). Additionally, previous studies suggested that unsure adolescents may be truly uncertain about their sexual orientation, may feel confused by the wording of the question, or may choose the "unsure" category out of reticence due to stigma toward sexual minorities (Ott et al., 2011; Saewyc et al., 2004). Although it is inappropriate to include unsure adolescents in the sexual minority category, health disparities exist between unsure and heterosexual adolescents, such as depression, anxiety (Oswalt and Wyatt, 2011), and suicide (Zhao et al., 2010). Therefore, future research is warranted to explore the prevalence and mechanisms of mental health outcomes among unsure adolescents.

The ORs of lifetime, past-year, and past-month NMUPD were increased among sexual minority and unsure students compared with those in heterosexual students. Our results suggested that sexual minority and unsure students are not only more likely to try prescription drugs, but are also more likely to continue using prescription drugs.

Table 4
Association between sexual attraction and NMUPD among adolescents (N = 150,822).

Variates	Sexual minorities[a]		Unsure	
	COR (95% CI)	AOR (95% CI)[b]	COR (95% CI)	AOR (95% CI)[b]
Lifetime NMUPD				
Any NMUPD	1.89 (1.74, 2.05)	1.68 (1.54, 1.83)	1.25 (1.18, 1.32)	1.33 (1.26, 1.41)
Opioids	1.98 (1.79, 2.19)	1.78 (1.61, 1.97)	1.23 (1.15, 1.32)	1.32 (1.23, 1.42)
Sedatives	1.99 (1.81, 2.19)	1.72 (1.55, 1.90)	1.26 (1.18, 1.35)	1.37 (1.27, 1.46)
Past-year NMUPD				
Any NMUPD	2.02 (1.81, 2.25)	1.71 (1.53, 1.92)	1.36 (1.26, 1.47)	1.44 (1.33, 1.56)
Opioids	2.07 (1.80, 2.36)	1.78 (1.55, 2.04)	1.42 (1.30, 1.56)	1.51 (1.38, 1.66)
Sedatives	2.17 (1.91, 2.46)	1.76 (1.54, 2.00)	1.34 (1.22, 1.47)	1.44 (1.31, 1.58)
Past-month NMUPD				
Any NMUPD	2.30 (1.99, 2.65)	1.84 (1.58, 2.13)	1.65 (1.50, 1.82)	1.78 (1.60, 1.97)
Opioids	2.48 (2.06, 2.97)	2.02 (1.67, 2.43)	1.81 (1.60, 2.04)	1.93 (1.70, 2.21)
Sedatives	2.44 (2.05, 2.91)	1.83 (1.53, 2.19)	1.69 (1.50, 1.90)	1.86 (1.64, 2.12)

Abbreviations: COR, crude odds ratio; AOR, adjusted odds ratio; CI, confidence interval; HSS, household socioeconomic status; NMUPD, nonmedical use of prescription drugs.
[a] Sexual minorities included adolescents who reported same-sex or both-sex attraction.
[b] Adjusted for sex, age, HSS, living arrangement, parental marital status, academic pressure, relationships with classmates, relationships with teachers, smoking, and alcohol use.

These results may be explained by chronic exposure to sexual minority stress. A review demonstrated a dose-dependent relationship between chronic stress and drug use (Sinha, 2008). Multiple studies have indicated that exposure to chronic stress, such as from bullying victimization (Tharp-Taylor et al., 2009), family stressors (Butters, 2002), and negative life events (Siqueira et al., 2001), increases the risk of both the initiation and escalation of substance use among adolescents. Chronic stress exposure may result in neurobiological changes in brain reward pathways, such as the dopaminergic (Saal et al., 2003) and glucocorticoid pathways (Frank et al., 2011), and increase the vulnerability of students to substance abuse. In addition, neurobiological changes that result from chronic stress impair executive functions, such as self-control (Arnsten and Li, 2005), and increase the risk of substance abuse and relapse (Baler and Volkow, 2006; Wills et al., 2006). Moreover, we found that "to relieve stress" was the primary reason for NMUPD among the students in this study. Thus, appropriate interventions for substance abuse among sexual minority and unsure adolescents should be considered as follows: (1) schools and the Department of Education should formulate a policy to prevent students from experiencing sexual minority stress, such as that from bullying and discrimination; (2) families and communities should provide social support for sexual minority students; and (3) for adolescents with drug addictions, treatment that targets self-control may be more suitable considering that sexual minority stress is chronic (Sinha, 2008). Furthermore, we also found that family was the most common source of prescription drugs for adolescents. Therefore, parents should enhance the management of prescription drugs at home to prevent adolescent NMUPD.

There are several strengths of our study. First, we conducted the analysis using a large-sized and random sample (N = 150,822). The large sample size rendered sufficient statistical power, and the random sample allowed for analyses between groups (Meyer, 2003). Second, we explored NMUPD among sexual minority adolescents and unsure adolescents; the latter group is often neglected in studies concerning mental health disparities among sexual minority adolescents. However, this study has several limitations that should be noted when interpreting the results. First, because this was a cross-sectional study, it is difficult to make causal inferences. Second, because sexual orientation remains a sensitive topic in China, it was difficult to include each dimension of sexual orientation in our questionnaire. A previous study suggested that questions about sexual attraction are easier to answer than those concerning other dimensions of sexual orientation (Austin et al., 2007). Thus, we chose a question about sexual attraction to measure the sexual orientation of students. Third, the participants in this school-based study did not include adolescents who had dropped out of school or were not present in school on the day the survey was administered; the generalization of the results may thus be weakened. Fourth, the prescription drugs considered in this study included only opioids and sedatives, the most frequently used drugs among Chinese adolescents; therefore, the association between sexual orientation and NMUPD may not be generalizable to other prescription drugs.

5. Conclusion

In this study, we explored the association between sexual attraction and NMUPD among adolescents using a large, nationally representative sample (N = 150,822). Our study suggested that sexual minority and unsure adolescents are at greater risk of NMUPD. Moreover, our study suggested that sexual minority and unsure students are more likely to both try and continue using prescription drugs. Because of the high risk of NMUPD among sexual minority and unsure students, these findings highlight that more attention should be focused on substance abuse in this group of young people. Interventions for sexual minority stress must be considered in schools, families, and communities to improve the mental health of sexual minority adolescents. Further studies focusing on the mechanism of substance abuse and appropriate interventions among sexual minority and unsure adolescents are warranted.

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Nothing declared.

Contributors

Lu C. and Zhang WH. conceptualized and designed the study, reviewed and revised the manuscript and approved the final manuscript as submitted. Li P. conceptualized and designed the study, coordinated and supervised data collection, carried out the initial analyses, drafted the initial manuscript, and approved the final manuscript as submitted. Huang Y. and Guo L. carried out the analyses and interpreted data, reviewed and revised the manuscript and approved the final manuscript as submitted. Wang W., Lei Y., Xi C., Luo M., Pan S., and Deng X. designed the data collection instruments, coordinated and supervised data collection, reviewed and revised the manuscript, and approved the final manuscript as submitted. All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

Conflict of interest

No conflict declared.

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