

Preplanned Studies

COVID-19 Vaccination Rates of People Who Use Drugs — Chengdu City, Sichuan Province, China, November 2021 – February 2022

Erri Du¹; Pengyu Jiang²; Chaowei Zhang³; Shan Zhang⁴; Xiangyu Yan⁴; Yongjie Li⁵; Zhongwei Jia^{4,6,7,#}

Summary

What is already known about this topic?

Few studies have reported that people who use drugs (PWUDs) have much lower coronavirus disease 2019 (COVID-19) vaccination rates than the general population, especially with no relative information reported in China specifically.

What is added by this report?

This study seminally uncovers that the vaccination rate among PWUDs was about 79.34% in one district of Chengdu City, Sichuan Province, China. Assuming that unvaccinated PWUDs with disease records were really not eligible for vaccination, the vaccination rate goes up to 87.25% among the studied PWUDs. The study implies that PWUDs were not left behind in the vaccination drive for COVID-19 in China.

What are the implications for public health practice?

In pandemics like COVID-19, government leadership and the overall planning and distribution of public health products are critical in achieving national health equity. However, in order to do this as well as avoid discrimination or exclusion among specific portions of the general population, it's necessary to understand the vaccination rates and behaviors of at-risk groups such as PWUD's.

Vaccination is expected as the most effective tool for protecting people from getting seriously ill or dying of COVID-19 in the absence of specialized treatment drugs (1). By June 10, 2022, the data of the World Health Organization (WHO) reported that about 11.83 billion doses had been administered globally and an average of 65.7% of the worldwide population have received at least 1 dose of a COVID-19 vaccine (2). However, vaccination coverage was significantly uneven across populations and geographically. Previous studies have already shown that people who use drugs (PWUDs) in particular are vulnerable and easily

neglected by public health infrastructure, and have lower vaccination coverage in comparison with the general population (3–8).

One reason is that, in many countries, PWUDs were not included in initial priority groups for vaccination of COVID-19. In addition, they are more likely to face barriers to vaccination on the basis of insufficient vaccine supplies (4). Third, PWUDs often possess lower vaccination acceptance rates compared to the general population (5). One study on patients with substance use disorders in the United States showed that nearly half of the patients expressed unwillingness to get a COVID-19 vaccine, even though they — particularly those with opioid use disorders — had been told they were at a higher risk of being infected and getting severely ill as a result of chronic lung or liver diseases (6). Two studies further reported that only 10% (*vs.* 60% of the general population) and 57% (*vs.* 77% of the general population) of people who inject drugs received COVID-19 vaccines during the early phase of COVID-19 in the United States and Australia, respectively (7–8).

China was one of the first countries to initiate nationwide vaccinations for COVID-19 and achieved a coverage rate of 87.85% by March 18, 2022 (9). However, it was not clear prior to this study how high COVID-19 vaccination rates might have been among PWUDs in China. As such, this study endeavored to investigate PWUD vaccination coverage rates by analyzing data from the Management and Control Database for Persons Who Use Drugs in one particular Sichuan district.

This research analyzed anonymous data in the Management and Control Database for Persons Who Use Drugs in one district of Chengdu City, Sichuan Province, China, from November 2021 to February 2022, which is part of National Dynamic Management and Control Database for Persons Who Use Drugs (10). The data included age, sex, drug categories, last treatment approaches, drug use history, drug use

modes, disease history, dosage of vaccine (single dose, double doses, and three doses), time of vaccination, and self-reported reasons of non-vaccination. All the data were updated in February 2022 to reflect participants' latest vaccination status. There were two reasons for this study to select this district in Sichuan Province in particular. One reason is that it is difficult to access the PWUD data necessary for this type of research in other districts. Second, Sichuan ranked 5th in drug users, 6th in terms of GDP, and 8th in the service industry nationally. Therefore, it has a fair degree of representativeness for PWUDs nationwide.

The PWUDs were divided into groups based on their vaccination information (i.e. presence of vaccination, type of vaccine, and time of vaccination). The vaccination rate was calculated by the number of fully vaccinated persons divided by the total of PWUDs who had clear vaccine information. The drugs that PWUDs used were divided into opioid drugs (ex. heroin), synthetic drugs (ex. methamphetamine), psychoactive substances (ex. marijuana, LSD), and polydrug use (ex. heroin and methamphetamine together) based on international classifications.

All data were double-checked by Erri Du and Pengyu Jiang. The chi-square test was used to compare the above characteristics between the two groups (vaccinated and unvaccinated); the odds ratios (ORs)

and their 95% Confidence Intervals (CIs) for the multivariable binary logistic regression were used to estimate factors associated with the vaccination of PWUDs.

A two-sided *P* value of 0.05 or less was regarded as significant. All the data cleaning was done using Excel (version 2017, Microsoft Corp., Redmond, WA, US) and WPS Office (version 3.9.6, Kingsoft Office Corp., Beijing, China). All analysis was done using IBM SPSS (version 24.0, IBM Corp., Armonk, NY, US). The data were anonymized without participant identifiers so that this research does not require additional regulation by the Institutional Review Board.

Among a total of 1,671 available records of PWUDs in the region, 310 PWUDs did not have vaccination information, 192 PWUDs could not specify their vaccination situation by type of vaccine and/or time of vaccine, 56 PWUDs had not finished vaccination, and 1,113 PWUDs with clear vaccinating information were included in the final analysis (Figure 1). The fully vaccinated PWUDs with single dose, double doses, and triple doses were 2, 869, and 12, respectively (Figure 1).

86.79% of the PWUDs were 30–59 years old. Men accounted for 74.39% of the sampled PWUDs. About 47.80% of the PWUDs had jobs, while 36.30% PWUDs reported being unemployed (Table 1).

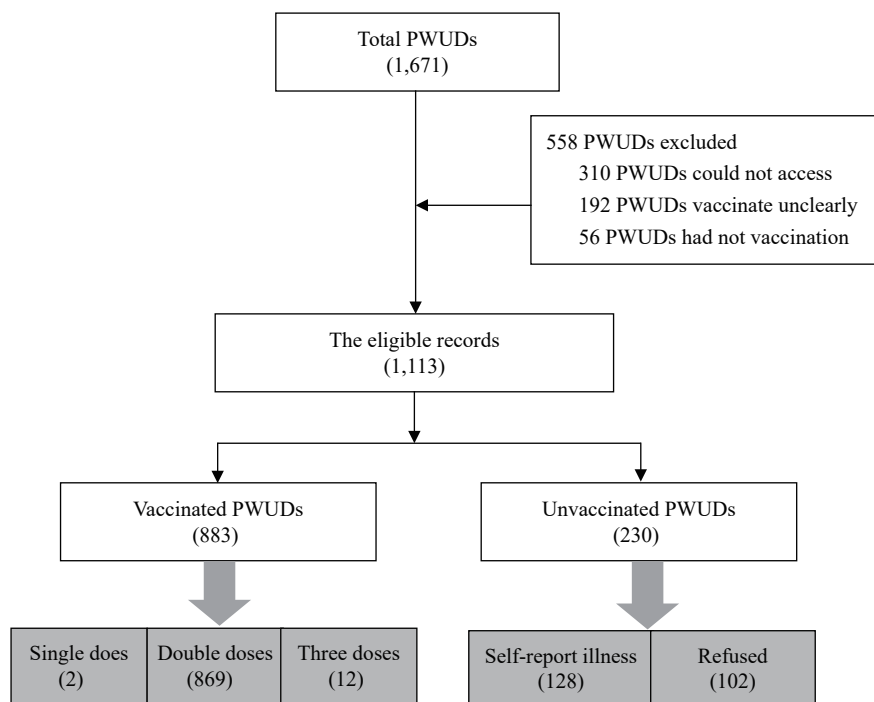


FIGURE 1. The management of data for PWUDs
Abbreviation: PWUDs=people who use drugs.

TABLE 1. The basic characteristics of people who use drugs.

Characteristic	Total, n (%)	Fully vaccinated, n (%)	Not vaccinated, n (%)	Vaccination rate (%)
Total	1,113	883	230	79.34
Sex				
Men	828 (74.39)	654 (74.07)	174 (75.65)	78.99
Women	285 (25.61)	229 (25.93)	56 (24.35)	80.35
Age (years)				
19–29	96 (8.63)	74 (8.38)	22 (9.57)	77.08
30–39	393 (35.31)	345 (39.07)	48 (20.87)	87.79
40–49	299 (26.86)	252 (28.54)	47 (20.43)	84.28
50–59	274 (24.62)	184 (20.84)	90 (39.13)	67.15
≥60	51 (4.58)	28 (3.17)	23 (10.00)	54.90
Occupation				
Public institution & enterprise	172 (15.45)	155 (17.55)	17 (7.39)	90.12
Service industry	360 (32.35)	297 (33.64)	63 (27.39)	82.50
Unemployed	404 (36.30)	292 (33.07)	112 (48.70)	72.28
Missing	177 (15.90)	139 (15.74)	38 (16.52)	78.53
Type of drugs used				
Only opioid	221 (19.86)	142 (16.08)	79 (34.35)	64.25
Only synthetic	745 (66.94)	630 (71.35)	115 (50.00)	84.56
New psychoactive substance	35 (3.14)	30 (3.40)	5 (2.17)	85.71
Polydrug	103 (9.25)	75 (8.49)	28 (12.17)	72.82
Missing	9 (0.81)	6 (0.68)	3 (1.30)	66.67
Status of last treatment				
Completed	218 (19.59)	189 (21.40)	29 (12.61)	86.70
Drug maintenance therapy	10 (0.90)	7 (0.79)	3 (1.30)	70.00
Compulsory isolated detoxication	75 (6.74)	58 (6.57)	17 (7.39)	77.33
Administrative detention	179 (16.08)	154 (17.44)	25 (10.87)	86.03
Community-based detoxification	240 (21.56)	176 (19.93)	64 (27.83)	73.33
Community-based rehabilitation	181 (16.26)	153 (17.33)	28 (12.17)	84.53
Missing	210 (18.87)	146 (16.53)	64 (27.83)	69.52
Years of using drugs				
≤5	624 (56.06)	520 (58.89)	104 (45.22)	83.33
6–10	170 (15.27)	139 (15.74)	31 (13.48)	81.76
11–15	186 (16.71)	135 (15.29)	51 (22.17)	72.58
≥16	32 (2.88)	18 (2.04)	14 (6.09)	56.25
Missing	101 (9.07)	71 (8.04)	30 (13.04)	70.30
Mode of using drugs				
Oral	907 (81.49)	742 (84.03)	165 (71.74)	81.81
Injection	89 (8.00)	57 (6.46)	32 (13.91)	64.04
Oral & injection	66 (5.93)	41 (4.64)	25 (10.87)	62.12
Missing	51 (4.58)	43 (4.87)	8 (3.48)	84.31
Diseases records				
No diseases	944 (84.82)	815 (92.30)	129 (56.09)	86.33
Only IDs	25 (2.25)	9 (1.02)	16 (6.96)	36.00
Only CDs	130 (11.68)	52 (5.89)	78 (33.91)	40.00
IDs & CDs	14 (1.26)	7 (0.79)	7 (3.04)	50.00

Abbreviation: IDs=infectious diseases; CDs=chronic diseases.

Synthetic drugs and opioids were the main drugs used by sampled PWUDs (66.94% and 19.84%, respectively). Oral use was the most popular reported drug use mode (81.49%). About 56.06% of the PWUDs started using drugs less than 5 years ago, and 84.82% had no disease records. More than 61.54% of the PWUDs were still in treatment (Table 1).

By February 2022, 883 PWUDs were fully vaccinated, and the vaccination rate reached 79.34% among all PWUDs included in this analysis (Table 1). However, 101 of the 230 unvaccinated PWUDs had illness records, so the vaccination rate could be calculated as 87.25% if this study excluded these 101 PWUDs (Table 1). Occupation and diseases were significant risk factors related to the vaccination rate of PWUDs (Table 2, Supplementary Table S1, available in <http://weekly.chinacdc.cn>). The finding indicated that the PWUDs unemployed and employed in service sectors were less likely to be vaccinated than those in public institutions and enterprises (the reference group), the risk of unvaccination were about 3 times [2.52 (1.33–4.77)] and 4 times [3.81 (2.03–7.14)] that of the reference group, respectively (Table 2). The PWUDs with infectious diseases, chronic diseases, or both infectious and chronic diseases were 9 times [9.49 (3.67–24.59)], 8 times [8.22 (5.19–13.03)], and 4 times [3.73 (1.12–12.41)] the risk of unvaccination compared to those who did not report any diseases, respectively (Table 2).

DISCUSSION

An unexpected finding is that the COVID-19 vaccination rate is about 79.34% among the studied PWUDs, which is much higher than that of many other regions globally (7–8,11). In fact, if 101 of the 230 unvaccinated PWUDs were not really eligible for the vaccine (Table 1, Supplementary Table S1, available in <http://weekly.chinacdc.cn>), the vaccination rate in the investigated PWUDs would increase to 87.25%, close to 87.85% in the whole population by March 18, 2022. This encouraging finding indicates that PWUDs have not been left behind in vaccination efforts for COVID-19 in China. Two phenomena might explain this result. First, China was one of the first countries to initiate nationwide COVID-19 vaccinations. Its national COVID-19 vaccination program provided free vaccines for all eligible people by June 16, 2022, China had provided a total of 3.39 billion vaccine doses (12). Second, it has benefited

from the development of community services for PWUDs. In China, each community has a social worker assistance group to help people with various difficulties, including PWUDs. Since the implementation of the Narcotics Control Law of the People's Republic of China, China's rehabilitation strategy for PWUDs has been changing from the "judicial punishment" model, led by compulsory institutions, to the "physiological social comprehensive rehabilitation" model, led by communities, which has been integral in providing support for PWUDs (13).

Each community (or village) rehabilitation worker can ensure that PWUDs are not forgotten or neglected and can provide health education to PWUDs about COVID-19 prevention and the benefits of vaccination. This helps PWUDs share the same rights as other residents, such as voluntarily accepting or refusing to become vaccinated (14). This study finds no significant difference in the risk of non-vaccination among people receiving different drug detoxification treatments, which indicates a degree of fairness in COVID-19 vaccination rates across different PWUD sub-groups (Table 1).

It is worth noticing that it is disease that discourages most PWUDs from getting fully vaccinated (Table 2). Of the 230 non-vaccinated PWUDs, 43.91% have disease records and 55.65% self-report illness — though this study cannot judge whether those 55.65% are really not eligible for vaccination (Table 1, Figure 1, Supplementary Table S1, available in <http://weekly.chinacdc.cn/>). This evidence can also be supported by occupation. The unvaccinated rate in unemployed PWUDs is four times higher than those in public institutions & enterprise; the obvious reason is most of the former have illnesses (Supplementary Table S1, available in <http://weekly.chinacdc.cn/>). But, this research cannot explain why PWUDs working in the service industry have a lower vaccination rate (Table 2).

Sex, age, type of drugs, years of use, and mode of usage are not uniquely associated with vaccination status in this study's findings. This is slightly different from a previous study in China, which indicated that vaccination rates were uneven across age groups, and that the vaccination coverage in older age groups was lower than that of younger age groups (15). However, evidence of other impact factors of COVID-19 vaccination among PWUDs is lacking worldwide, which prevents further comparison with this study.

The study had limitations. First, data were collected from a specific area (a district of Sichuan Province);

TABLE 2. The factors associated with unvaccination among people who use drugs by the characteristics.

Characteristic	OR (95% CI)	P value
Sex		
Men	1.00	
Women	0.82 (0.56–1.22)	0.336
Age (years)		
≥60	1.00	
50–59	0.68 (0.33–1.40)	0.297
40–49	0.45 (0.21–0.97)	0.040
30–39	0.57 (0.26–1.25)	0.160
19–29	1.31 (0.54–3.16)	0.547
Occupation		
Public institution&enterprise	1.00	
Service industry	2.52 (1.33–4.77)	0.040
Unemployed	3.81 (2.03–7.14)	<0.001
Missing	2.70 (1.33–5.46)	0.006
Type of drugs used		
Only opioid	1.00	
Only synthetic	0.61 (0.36–1.04)	0.071
New psychoactive substance	0.87 (0.27–2.84)	0.817
Polydrug use	0.68 (0.33–1.41)	0.300
Missing	4.01 (0.59–27.35)	0.156
Status of last treatment		
Completed	1.00	
Drug maintenance therapy	1.55 (0.31–7.87)	0.594
Compulsory isolated detoxication	1.10 (0.48–2.51)	0.820
Administrative detention	0.94 (0.49–1.79)	0.847
Community-based detoxification treatment	1.85 (1.06–3.23)	0.031
Community-based rehabilitation treatment	0.70 (0.35–1.37)	0.296
Missing	3.31 (1.83–5.96)	<0.001
Years of using drugs		
≤5	1.00	
6–10	1.14 (0.68–1.91)	0.608
11–5	1.16 (0.70–1.93)	0.565
≥16	2.05 (0.81–5.15)	0.129
Missing	1.50 (0.80–2.80)	0.203
Mode of using drugs		
Oral	1.00	
Injection	1.05 (0.51–2.15)	0.904
Oral & injection	1.96 (0.91–4.20)	0.086
Missing	0.33 (0.11–0.99)	0.048
Diseases records		
No diseases	1.00	
Only IDs	9.49 (3.67–24.59)	<0.001
Only CDs	8.22 (5.19–13.03)	<0.001
IDs & CDs	3.73 (1.12–12.41)	0.032

Abbreviation: OR=odds ratio; IDs=infectious diseases; CDs=chronic diseases.

Sichuan was chosen because it is culturally and socioeconomically representative, especially for the situation of PWUDs across most parts of China. Second, because it is an analysis of secondary data, this study cannot estimate whether the 101 of the 230 unvaccinated PWUDs are really ineligible for vaccination: the adjusted vaccination rate of 87.25% might be an optimistic assumption. Third, similarly to the above, this research could not get more details about why 102 of the PWUDs refused to be vaccinated, even though the real reasons for hesitation on vaccination are helpful to improve new vaccination policy. However, learning COVID-19 vaccination rates among PWUDs in this district in Sichuan is a strong basis for further study. The findings in this study have certain implications in a pandemic like COVID-19 for the government's leadership, overall planning, and as a prerequisite for the equitable distribution of public health products like COVID-19 vaccines across the general population (including across both subgroups as well as geographically).

Conflicts of interest: No conflicts of interest.

Funding: National Natural Science Foundation of China (91546203, 91846302), National Key Research and Development Program of China (2021YFC0863400), and Global Health and Infectious Diseases Group.

doi: 10.46234/ccdcw2022.170

* Corresponding author: Zhongwei Jia, urchinjj@163.com.

¹ SILC Business School, Shanghai University, Shanghai, China; ² School of Pharmacy, East China University of Science and Technology, Shanghai, China; ³ Public Security Bureau in Qingyang District, Chengdu City, Sichuan Province, Sichuan, China; ⁴ School of Public Health, Peking University, Beijing, China; ⁵ School of Basic Medical Sciences, Peking University, Beijing, China; ⁶ Center for Intelligent Public Health, Institute for Artificial Intelligence, Peking University, Beijing, China; ⁷ Center for Drug Abuse Control and Prevention, National Institute of Health Data Science, Peking University, Beijing, China.

Submitted: June 19, 2022; Accepted: September 07, 2022

REFERENCES

1. Centers for Disease Control and Prevention. Benefits of getting a

- COVID-19 vaccine. 2022. <https://www.cdc.gov/coronavirus/2019-ncov/vaccines/vaccine-benefits.html>. [2022-6-16].
- World Health Organization. WHO SEA Region COVID-19 vaccination dashboard. 2022. <https://www.who.int/southeastasia/health-topics/immunization/covid-19-vaccination>. [2022-6-10].
- Holloway IW, Spaulding AC, Ochoa AM, Randall LA, King AR, The HBOU Study Team, et al. COVID-19 vulnerability among people who use drugs: recommendations for global public health programmes and policies. *J Int AIDS Soc* 2020;23(7):e25551. <http://dx.doi.org/10.1002/jia2.25551>.
- Jain V, Schwarz L, Lorgelly P. A rapid review of COVID-19 vaccine prioritization in the U. S.: alignment between federal guidance and state practice. *Int J Environ Res Public Health* 2021;18(7):3483. <http://dx.doi.org/10.3390/ijerph18073483>.
- Yasmin F, Najeeb H, Asghar MS, Ullah I, Islam SMS. Increased COVID-19 infection risk, COVID-19 vaccine inaccessibility, and unacceptability: worrisome trio for patients with substance abuse disorders. *J Glob Health* 2021;11:03106. <http://dx.doi.org/10.7189/jogh.11.03106>.
- Mellis AM, Kelly BC, Potenza MN, Hulsey JN. Trust in a COVID-19 vaccine among people with substance use disorders. *Drug Alcohol Depend* 2021;220:108519. <http://dx.doi.org/10.1016/j.drugalcdep.2021.108519>.
- Cioffi CC, Kosty D, Nachbar S, Capron CG, Mauricio AM, Tavalire HF. COVID-19 vaccine deliberation among people who inject drugs. *Drug Alcohol Depend Rep* 2022;3:100046. <http://dx.doi.org/10.1016/J.DADR.2022.100046>.
- Dietze P, Hall C, Maher L, Stewart A, Price O, Crawford S, et al. COVID-19 impacts Bulletin No.3: COVID-19 vaccine acceptability among people who inject drugs in Melbourne. 2021. https://burnet.edu.au/system/asset/file/4469/1.1_IDRS_COVID_Vax_Bulletin_with_figures.pdf. [2022-8-15].
- National Health Commission: the vaccination rate of COVID-19 vaccine exceeds 87%. 2022. <https://www.chinanews.com.cn/gn/2022/03-18/9705706.shtml>. [2022-6-16]. (In Chinese).
- Zhang B, Yan XY, Li YJ, Zhu H, Liu ZM, Lu ZH, et al. Epidemic of HIV infection among persons who inject drugs in mainland China: a series, cross-sectional study. *Harm Reduct J* 2021;18(1):63. <http://dx.doi.org/10.1186/s12954-021-00511-6>.
- Iversen J, Peacock A, Price O, Byrne J, Dunlop A, Maher L. COVID-19 vaccination among people who inject drugs: leaving no one behind. *Drug Alcohol Rev* 2021;40(4):517 – 20. <http://dx.doi.org/10.1111/dar.13273>.
- COVID-19F vaccination status (as of June 16). 2022. http://www.gov.cn/fuwu/2022-06/16/content_5696029.htm. [2022-6-16]. (In Chinese).
- Jia ZW, Lu ZH, Fan WY, Ha Y, Zhang B, Zhao HQ, et al. Investigation on public health management model of drug users based on internet + and artificial intelligence technology. *J Syst Sci Math Sci* 2019;39(4):522 – 33. <http://dx.doi.org/10.12341/jssms13611>. (In Chinese).
- Guide special population groups to get COVID-19 vaccinated against COVID-19. http://ga.sz.gov.cn/SZJDZX/JDKF/content/post_8901595.html. [2022-6-16]. (In Chinese).
- Lü XY, Song L, Ma Z, Wang SG, Ma H, Shao YM, et al. Strengthening and optimization of immunization strategy for COVID-19 vaccines. *J Shanghai Jiao Tong Univ (Med Sci)* 2021;41(12):1545 – 50. <http://dx.doi.org/10.3969/j.issn.1674-8115.2021.12.001>. (In Chinese).

Supplementary

SUPPLEMENTARY TABLE S1. The basic characteristics of the PWUDs by record of disease history.

Characteristic	Total	Diseases (%)	No diseases (%)
	1,113	169	944
Vaccinated			
Yes	883 (79.34)	68 (40.24)	815 (86.33)
No	230 (20.66)	101 (59.76)	129 (13.67)
Sex			
Men	828	133 (78.70)	695 (73.62)
Women	285	36 (21.30)	249 (26.38)
Age (years)			
19–29	96	4 (2.37)	92 (9.75)
30–39	393	16 (9.47)	377 (39.93)
40–49	299	42 (24.85)	257 (27.22)
50–59	274	89 (52.66)	185 (19.60)
≥60	51	18 (10.65)	33 (3.50)
Occupation			
Public institution / enterprise	172	20 (11.83)	152 (16.10)
Service industry	360	41 (24.26)	319 (33.79)
Unemployed	404	87 (51.48)	317 (33.58)
Missing	177	21 (12.43)	156 (16.53)
Type of drugs			
Only opioid	221	69 (40.83)	152 (16.10)
Only synthetic	745	67 (39.64)	678 (71.82)
New psychoactive substance	35	3 (1.78)	32 (3.39)
Polydrug use	103	30 (17.75)	73 (7.74)
Missing	9	0 (0.00)	9 (0.95)
Status of last treatment			
Completed	218	19 (11.24)	199 (21.08)
Drug maintenance therapy	10	2 (1.18)	8 (0.85)
Compulsory isolated detoxication	75	19 (11.24)	56 (5.93)
Administrative detention	179	21 (12.44)	158 (16.74)
Community-based detoxification	240	54 (31.95)	186 (19.70)
Community-based rehabilitation	181	29 (17.16)	152 (16.10)
Missing	210	25 (14.79)	185 (19.60)
Years of using drugs			
≤5	624	75 (44.38)	549 (58.16)
6–10	170	21 (12.43)	149 (15.78)
11–15	186	37 (21.89)	149 (15.78)
≥16	32	10 (5.92)	22 (2.34)
Missing	101	26 (15.38)	75 (7.94)
Mode of using drugs			
Oral	907	110 (65.09)	797 (84.43)
Injection	89	32 (18.93)	57 (6.04)
Oral & injection	66	24 (14.20)	42 (4.45)
Missing	51	3 (1.78)	48 (5.08)