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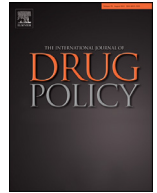
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## Research Paper

## “Maintaining HIV and HCV prevention and care for people who inject drugs despite COVID-19 in Hai Phong, Vietnam”<sup>☆</sup>



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## ABSTRACT

**Background:** After the emergence of COVID-19, a one-month strict lockdown was imposed in April 2020 in Vietnam, followed by lighter social distancing restrictions over the year. We investigated whether those measures affected people who inject drugs (PWID) in terms of risk behaviors for HIV and HCV and access to prevention and care in the city of Haiphong, a historic hotspot for HIV and drug use.

**Methodology:** We carried out a ‘before-after’ study from 2019 to 2020 using respondent-driven sampling method to enroll PWID. They were interviewed on their socioeconomic situation, drug use and sexual behaviors, relations to care services and tested for drugs and methadone in the urine, for HIV, HCV, and HIV plasma viral load when HIV-positive. Changes following the restrictions were assessed by comparing ‘before’ to ‘after’ data.

**Results:** 780 PWID were enrolled. Mean age was 44 years; 94% were male. All were actively injecting heroin ‘before’, versus 56% ‘after’. Among those, frequency of consumption decreased from 24 to 17 days per month. No changes were observed in the frequency and practices of methamphetamine smoking. The proportion of PWID on MMT increased from 68.7% to 75.3%, and that of PWID engaging in risky behaviors related to drug injection decreased from 6.0% to 1.5%. No HIV seroconversions were observed; HCV incidence was 2.6/100 person-years (95% CI [0.7–6.7]). 9% of PWID reported a monthly income of less than 130USD ‘before’ versus 53% ‘after’.

**Conclusion:** The case of Hai Phong shows that it is possible, during times of COVID-19 pandemic, to maintain access to harm reduction and care and to prevent HIV and HCV transmission among PWID in a resource-limited setting where severe social distancing restrictions are implemented. Further research is needed to assess the consequences of long-term economic difficulties and the impact of actual spread of SARS-Cov2 that has since emerged in Haiphong.

## Introduction

People who inject drugs (PWID) have been for long the main key-population affected by HIV and hepatitis C in Vietnam. Hai Phong is a large harbour city with a population of 2 million inhabitants and a his-

toric hotspot for drug use (primarily heroin, and more recently methamphetamine use), where HIV prevalence among PWID peaked at 60% in 2006 (Ahmed et al., 2015 Jan 29).

A dual capture-recapture study estimated that 5000 (+/–1000) out of the 10,000 PWID in the city are actively injecting drugs, including

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1000 that receive methadone maintenance treatment (MMT) in 14 clinics (Des Jarlais et al., 2018 Apr 1). HIV prevalence among this population is around 30%, while HCV prevalence is approximately 70% (Des Jarlais et al., 2016; Duong et al., 2018; Molès et al., 2020).

Combined interventions have been successfully implemented by local health authorities and non-governmental organizations (NGO), together with bilateral and multilateral partners (including PEPFAR, the Global Fund, international NGO and research organizations), as well as civil society whose role has become substantial since 2009. Needle and syringe exchange programs were set up from 2005. Medication for Opioid Use Disorder (MOUD) began with MMT in 2008, then expanded up to 2017, when it stabilized nationwide, and buprenorphine is currently being piloted in several provinces. Treatment with antiretrovirals (ART) for people living with HIV started in 2005, with increased coverage in 2015 and universal free ART from 2016. Direct-acting antivirals for hepatitis C infection have been available and partially covered by national health insurance since 2018 – however, the remaining cost is still high for the most vulnerable persons, and most PWID are neither diagnosed nor treated for chronic hepatitis C.

Our research group has been working in the field of drug use and HIV/HCV infections for the past seven years in Hai Phong, initially through the DRIVE (DRug use and Infections in ViEtnam) research project (Des Jarlais et al., 2016; New York University 2021). The objective of DRIVE was to stop HIV transmission among PWID in the city, using innovative mass screening strategy based on repeated respondent-driven sampling (RDS) surveys, and support from members of community-based organizations (CBO) for harm reduction, access to ART, mental health, and addiction care. HIV incidence decreased from 0.8/100 person-years at risk (95% CI [0.9, 2.5]) (2014-2015) (Des Jarlais et al., 2016 Jun) down to 0.085/100 person-years (95% CI [0.02;0.25]) (2016-2019) (Des Jarlais et al., 2020), demonstrating for the first time the end of an HIV epidemic among PWID in a resource-limited setting. At the end of 2019, there were very few PWID still engaging in risk behaviours related to injecting (<5% syringe/needle sharing) or to sexual activity (<5% condomless sex with casual partners) (Des Jarlais et al., 2020).

Unlike for HIV, the HCV epidemic is still quite dynamic, with an HCV incidence estimated in 2015 at 18.8/100 person-years among active PWID in Hai Phong (95% CI [11.2–29.8]) (Molès et al., 2020 Apr 24).

The COVID-19 epidemic started in Vietnam in January 2020 (Phan et al., 2020). Since then, the country has experienced 4 successive waves, with more than 1,500,000 cases and 29,000 deaths reported in total, mainly during the 4<sup>th</sup> wave (since May 2021). Thanks to a response strategy set up very early on, based on the systematic screening of people who had been in direct or indirect contact with anyone who tested positive for COVID-19, the epidemic was kept under control until May 2021. Neighbourhoods, streets, communes, districts, cities and provinces were strictly quarantined when deemed necessary, in addition to the standard physical distancing measures applied nationwide. Vietnamese borders were closed beginning in March 2020, with only Vietnamese citizens and some foreign experts being allowed to enter the country with compulsory quarantine upon arrival. At the end of March 2020, a one-month national strict lockdown was implemented, with stringent measures that included closing all non-essential services, restricting people from leaving their homes, except for buying food or for medical emergencies, reducing public transportation by 80%, and banning gatherings of more than two people in public. After the lockdown was lifted in May, 2020, some restrictions were applied differently in each province, depending on the geographic COVID-19 situation.

Recent research shows that COVID-19 can pose a serious threat through both its associated morbidity and mortality risks, but also the collateral social, economic, psychological and health system-wide effects of the measures taken to control it, particularly on vulnerable populations like PWID - for multiple physiological, social and environmental reasons (Volkow, 2020). In addition to a higher risk of contracting

the disease (World Health Organization 2020) and of its potential complications (Dietze, Maher and Stooze, 2020), COVID-19 may also have an indirect impact on the health of PWID, even in settings not yet affected by the epidemic, through the restrictive measures taken to fight the epidemic that may affect the continuity of prevention, treatment, and peer-support programs for common pathologies among PWID such as HIV and HCV infections (LeSaint & Snyder, 2020; Mistler et al., 2021; Santos et al., 2020; EMCDDA 2022).

Six months after the beginning of the restriction period, Hai Phong had not recorded any COVID-19 cases, but strict preventive measures had been implemented that could have an impact on the HIV and HCV epidemics among PWID in the city by modifying access to harm reduction and care services. We conducted the ANRS COV22 DRIVE-COVID study with the objective of evaluating the impact of the COVID-19 associated restrictions on risk behaviours and access to HIV and HCV prevention and treatment programs among PWID in Hai Phong. This study was conducted after the first two waves of COVID-19 in Vietnam but before the large spread of COVID-19 in Hai Phong that occurred one year later.

## Methods

### Study design

A before-after design approach was used (Fig. 1). ‘Before’ data are data that had been collected during the fourth and final respondent-driven sampling (RDS) survey conducted as part of the DRIVE project (RDS4) which took place from October 2019 to January 2020, before the implementation of COVID-19-related restrictive measures (Des Jarlais et al., 2021). ‘After’ data were collected through a dedicated cross-sectional survey (DRIVE-COVID survey) conducted among RDS4 participants from August to October 2020, after around six months of restrictions. Potential changes that occurred during the restriction period were assessed retrospectively by comparing data ‘before’ and ‘after’ for the same population. We considered that the period of strict restrictive measures was that of the national lockdown that lasted one month, from the end of March (28/03/2020) to the end of April (27/04/2020). However, people might have encountered difficulties both earlier, as restrictions and fear of the virus started with the first diagnosed COVID-19 cases in Vietnam, and later, through local measures taken during the second wave of COVID-19.

### Study population and sampling

1268 PWID (including 328 persons living with HIV) had been enrolled in DRIVE RDS4 in Hai Phong (Des Jarlais et al., 2021). Briefly, twenty non-randomly identified seeds were recruited by CBO members to initiate the survey and RDS procedures were applied (Des Jarlais et al., 2020). RDS4 participants were active PWID living in Hai Phong, aged 18 years and above, with urine testing positive for heroin or methamphetamine, and presenting recent skin injection marks (ascertained by CBO members).

Around six months after the end of RDS4, all RDS4 participants that had previously agreed to be contacted for future studies were recalled by CBO members and were invited to participate in DRIVE-COVID survey. Contacting methods including phone calls, home visits, reaching out in methadone clinics, HIV outpatient clinics, hepatitis C clinics, and small hot spots for heroin use. They were enrolled after providing written informed consent. The comparative data analysis ‘before’ versus ‘after’ included only those who participated in both surveys.

### Data collection

During both visits (‘before’ and ‘after’), participants were welcomed in one of two CBO offices located in Hai Phong. Urinary drug testing for heroin, methamphetamine, methadone and cannabis, was per-

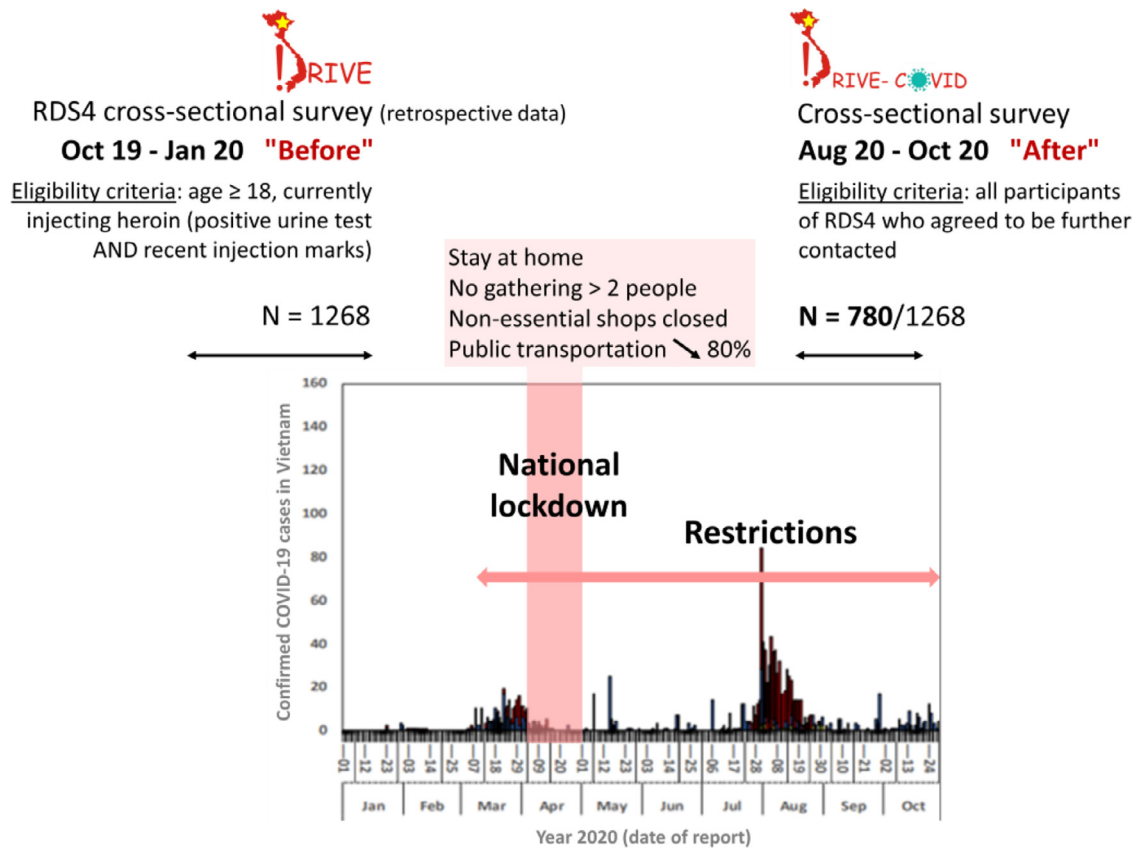


Fig. 1. Study design.

(Source: adapted from WHO – COVID-19 in Viet Nam Situation Report 39) (Tran et al., 2020 Nov 1)

formed using either Nal Von Minden Drug-screen Multi card (Germany) or FaStep Rapid Diagnostic Test (USA). Questionnaires were administered in Vietnamese by trained CBO members on demographics; socio-economic characteristics; sexual, drug use, and other behaviours focusing on HIV and HCV infection risk; relations with treatment services (MMT, ART); perception of COVID-19 and of related restriction and lockdown measures at the 'after' visit. In this study, 'MMT' refers to receiving methadone as MOUD in dedicated clinics; MMT-related peer counselling and support, which is mainly provided outside of MMT clinics by CBO, is not included in the term 'MMT'. After completing the interview, blood was collected, and HIV and HCV serologies were performed on site by the nurses of Haiphong Provincial AIDS Control Centre (PAC) using SD Bioline HIV1/2 3.0 rapid test and SD Bioline HCV rapid test (Standard Diagnostics Inc., Gyeonggi-do, Republic of Korea), respectively. HIV confirmation was performed at Viet Tiep Hospital (Hai Phong provincial hospital) according to National Guidelines using Determine™ HIV-1/2 (Alere™, Waltham, USA) plus HIV Ag/Ab Combo test (Abbott, Illinois, USA). HIV viral load testing was performed for all participants with a confirmed HIV positive result at Viet Tiep Hospital using the COBAS® TaqMan® HIV-1 test (Roche Diagnostics, Switzerland). All test results were returned to participants within 8 days. Participants newly diagnosed with HIV were immediately referred to ART.

#### Data analysis

'Before-after' comparative analysis: indicators were measured 'before' and 'after' for the same group of individuals who participated both in RDS4 and in DRIVE-COVID survey. For categorical variables, the absolute number with percentage is given. For HIV and HCV prevalence and incidence, the proportion with 95% binomial confidence interval is given. For continuous variables, the median and interquartile range are

given. For each indicator, we tested if the difference between 'before' and 'after' was significantly different from 0 by using McNemar test for the qualitative variables, and paired T-test or Wilcoxon matched-pairs signed-ranks test for the quantitative ones. A probability level of 0.05 or less was considered significant. For drug use and sexual activity, indicators were compared for subsamples of participants who had used drugs or had sexual activity both 'before' and 'after'. STATA software (version 15.1, Texas, USA) was used.

#### Ethical consideration

The study was conducted in accordance with the funder's (INSERM-ANRS) Ethics Charter for research in developing countries (July 2017), with the International Conference on Harmonization (ICH) guidelines for good clinical practice, with the National Institute on Drug Abuse (NIDA) procedures for protecting human subjects, and in respect with national legislations and regulations. The study protocol was submitted to and approved by the Institutional Review Board of Haiphong University of Medicine and Pharmacy. Participation in the study was voluntary. Signed written informed consent was obtained before any study-specific assessments were completed and after explanation by the investigator of the objectives, nature, constraints, and foreseeable risks of the study.

#### Results

Out of the 1268 RDS4 participants, 780 PWID participated in DRIVE-COVID survey (61.5%). Reasons for not participating included the following: could not be contacted by CBO members (phone number and address not valid anymore) (40.6%); refused to participate (14.4%); were incarcerated (12.8%); were too busy working (12.4%); were in rehabilitation centres (10.5%); moved to another province (5.6%); died (2.0%); reported health issues (1.7%).

**Table 1**  
Characteristics of DRIVE-COVID participants (vs non-participants).

	RDS4 participants, not enrolled in DRIVE-COVID (n=488)	RDS4 participants, enrolled in DRIVE-COVID (n=780)	p-value
Median Age	40.7 ± 9.2 [39.9; 41.5]	44.1 ± 8.4 [43.5; 44.7]	<0.001
Gender			0.527
Female	27 (5.5%)	46 (5.9%)	
Male	461 (94.5%)	732 (93.8%)	
Transgender	0	2 (0.3%)	
Marital status			0.025
Single	155 (31.8%)	229 (29.3%)	
Legally married	163 (33.3%)	311 (39.9%)	
Living in couple	13 (2.7%)	34 (4.4%)	
Divorced/Separated	151 (31.0%)	193 (24.7%)	
Widowed	6 (1.2%)	13 (1.7%)	
Salaried	359 (73.6%)	580 (74.36%)	0.753
Arrested/Incarcerated	49 (10.4%)	63 (8.1%)	0.233
Smoked methamphetamine in the last 30 days	209 (42.8%)	300 (38.5%)	0.122
Duration of heroin injection			0.001
< 5 years	27 (5.5%)	91 (11.7%)	
5 - <10 years	116 (23.8%)	176 (22.6%)	
10 - <15 years	148 (30.3%)	186 (23.9%)	
≥ 15 years	197 (40.4%)	326 (41.85%)	
Other drug use in the past 6 months			
Cannabis	25 (5.1%)	77 (9.9%)	0.002
Ketamine	7 (1.4%)	48 (6.1%)	<0.001
Cocaine	1 (0.2%)	14 (1.8%)	0.01
Self-reported on MMT	158 (32.4%)	462 (59.2%)	<0.001
Methadone detection in urine	242 (49.6%)	536 (68.7%)	<0.001
HIV seroprevalence	82 (16.8%)	246 (31.5%)	<0.001
HCV seroprevalence	332 (68.2%)	591 (75.8%)	0.003

**Table 2**  
Socio-economic characteristics 'Before' vs 'After' (n=780).

		Before	After	p-value
Sources of income	With regular salary	580 (74.4)	529 (67.8)	0.001*
	All other sources of income	200 (25.6)	251 (32.2)	
Personal monthly income	< 3M VND (130 USD)	73 (9.4)	410 (52.6)	<0.001*
	≥ 3M VND (130 USD)	707 (90.6)	370 (47.4)	
Marital status	Legally married or living in couple without marriage	345 (44.2)	338 (43.3)	0.43*
	Others (single, divorced, separated, widowed)	435 (55.8)	442 (56.7)	

\* McNemar test.

Similar to the demographics of the RDS4 full sample, the vast majority of DRIVE-COVID participants were male (93.8%). The mean age was 44.1 years; HIV prevalence was 31.5%, and HCV prevalence was 75.8% (Table 1). In comparison to RDS4 participants that did not take part in DRIVE-COVID survey, DRIVE-COVID participants were older, living more in couple, included PWID that started injecting drugs more recently, and were more living with HIV and/or HCV, and more on MMT.

#### Socio-economic situation

Both the proportions of PWID with a regular salary and with a personal monthly income above 3 million VND (130 USD) were significantly higher 'before' compared to 'after' the implementation of the restrictions (74.4% vs 67.8%,  $p=0.001$ , and 90.6% vs 47.4%,  $p<0.001$ , respectively). Approximately 48% of participants reported that they had no sources of income at all during the one-month strict lockdown. No meaningful changes were observed in terms of marital status (Table 2).

#### Drug use

All 780 participants were actively injecting heroin at the time of DRIVE RDS4 ('before'). Among them, 56% were still actively injecting heroin 'after' (self-report and urinalysis). For those actively injecting, the frequency of heroin injection decreased from  $24.4 \pm 8.6$  down to  $16.5 \pm 11.3$  days per month ( $p<0.001$ ), and from  $1.7 \pm 0.8$  down to  $1.3 \pm 0.7$

times per day ( $p<0.001$ ). The proportion of participants injecting heroin indoors increased from 82.0% 'before' up to 89.1% 'after' ( $p=0.001$ ) (Table 3).

The use of some other non-injecting drugs also significantly decreased during the restriction period: amphetamine (5.4% vs 0.4%,  $p<0.001$ ), ketamine (3.1% vs 0.4%,  $p<0.001$ ), ecstasy (3.5% vs 0.5%,  $p<0.001$ ), and cannabis (7.3% vs 2.6%,  $p<0.001$ ). No significant changes were identified regarding methamphetamine and cocaine use (Table 3).

The proportion of participants smoking methamphetamine remained high (38.6% 'before' vs 36.8% 'after'). Among the 191 participants who reported smoking methamphetamine both 'before' and 'after', their frequency of smoking did not change (Table 3). 46.0% of methamphetamine users reported smoking in group even during the strict lockdown.

Around a half of the participants considered heroin less available (51.0%) and more expensive (48.3%) in the market during the restriction period. About a quarter reported the same observations for methamphetamine (26.9% and 26.0%, respectively).

The main source of syringes remained pharmacies 'before', 'after', and even during the one-month strict lockdown for 83% of participants. The proportion of participants who engaged in risky behaviours (injecting with a syringe/needle already used; or sharing or dividing drugs with a syringe/needle already used; or using a used bottle of water or Novocain) significantly decreased from 6.2% 'before' to 1.6% 'after' ( $p=0.001$ ) (Table 3).

**Table 3**  
Drug use ‘Before’ vs ‘After’.

		Before	After	p-value
<i>In the last 30 days</i>				
Heroin injection	Self-reported	780 (100)	439 (56.3)	-
	Positive urine test	780 (100)	441 (56.5)	-
	Number of days using heroin (n=439)	24.4 ± 8.6	16.5 ± 11.3	<0.001**
	Number of times/day (n=439)	1.7 ± 0.8	1.3 ± 0.7	<0.001**
	Place of injection = Indoor (n=439)	360 (82.0)	391 (89.1)	0.001*
Other non-injecting drug use, self-report (n=780) (n, %)	Methamphetamine	301 (38.6)	287 (36.8)	0.33*
	Cannabis	57 (7.3)	20 (2.6)	<0.001*
	Ketamine	24 (3.1)	3 (0.4)	<0.001*
	Ecstasy	27 (3.5)	4 (0.5)	<0.001*
	Amphetamine	42 (5.4)	3 (0.4)	<0.001*
	Cocaine	5 (0.6)	1 (0.1)	0.1*
Methamphetamine, urine test positive		247 (31.7)	265 (34.0)	0.2*
Number of days using methamphetamine (n=191) (mean ± SE; 95%CI)		7.3 ± 0.61 [6.09 – 8.50]	7.6 ± 0.62 [6.34 – 8.77]	0.92**
Number of times/day (n=191) (mean ± SE; 95%CI)		1.3 ± 0.06 [1.17–1.43]	1.25 ± 0.08 [1.10 – 1.40]	0.18**
Main source of syringes (n=439)	Pharmacists/chemists	362 (82.7)	363 (82.9)	0.92*
Engaged in behaviors at risk for HIV and/or HCV <sup>a</sup> (n,%) (n=439)	Never	412 (93.8)	432 (98.4)	0.001*
	At least once/No answer	27 (6.2)	7 (1.6)	

\* McNemar test.

\*\* paired T-test.

<sup>a</sup> Behaviors at risk for HIV and/or HCV: injecting with a syringe already used or sharing or dividing drugs using a used syringe or using a used bottle of water/Novocain.

**Table 4**  
Sexual activity ‘Before’ vs ‘After’.

		Before	After	p-value <sup>a</sup>
<i>In the last 30 days</i>				
Sexual activity (n=780)	Sexual intercourse with primary partner	356 (45.6)	352 (45.1)	0.75
	Sexual intercourse with casual partner	45 (3.5)	22 (2.8)	<0.01
	Sexual intercourse with sex worker	61 (7.8)	34 (4.4)	<0.001
Frequency of condom use with primary partner (n=273)	Never, occasionally, or almost always	190 (69.6)	193 (70.7)	0.65
	Always	83 (30.4)	80 (29.3)	
Frequency of condom use with casual partner (n=7)	Never, occasionally, or almost always	4 (57.1)	3 (42.9)	0.32
	Always	3 (42.9)	4 (57.1)	
Frequency of condom use with client (n=7)	Never, occasionally, or almost always	2 (28.6)	2 (28.6)	-
	Always	5 (71.4)	5 (71.4)	

\* McNemar test.

**Sexual activity**

The rate of participants having sexual intercourse with casual partners decreased from 3.5% down to 2.8% (p<0.01). A decrease was also recorded in the proportion of participants having sexual intercourse with sex workers from 7.8% down to 4.4% (p<0.001). No significant changes in sexual activity with their primary partner were reported (Table 4). No changes were reported in the frequency of condom use with primary or casual partners. 96.4% of PWID reported no issue with getting condoms during the restriction period.

**Access to prevention and care services**

Among 185 participants who took part in a peer-support group in the last 6 months preceding the ‘after’ survey, 50.4% reported an interruption of activities organized by peers (mainly counselling) during the strict lockdown. Nonetheless, there was an increase in the proportion of participants on MMT, both through self-report and urinalysis when comparing ‘before’ to ‘after’ (59.2% vs 70.3%, p<0.001, and 68.7% vs 75.3%, p<0.001, respectively) (Table 5). Among 341 participants who were not actively injecting heroin anymore ‘after’, 223 were already on MMT ‘before’; out of the 118 who were not, 60 were on MMT ‘after’. All those who started MMT between ‘before’ and ‘after’ but 3 reported initiating MMT before the implementation of restrictions. There was no association between not actively injecting heroin anymore and being on MMT at the “after” survey.

No significant changes were observed regarding both the proportion of participants living with HIV on ART, and the proportion of participants living with HIV with undetectable HIV viral load (Table 5). The proportion of patients receiving ART every 2 or 3 months instead of every month increased from 51% to 66% during the restriction period. While 83.2% of PWID registered in MMT clinic and 85.1% of those registered in HIV OPC reported no change in the quality of care services provided, 16.3% and 14.4% reported a better quality of services in MMT clinic and OPC, respectively.

**HIV & HCV incidence**

From ‘before’ to ‘after’: regarding HIV, 424 person-years were accumulated with 0 HIV seroconversion; regarding HCV, 153 person-years were accumulated with 4 HCV seroconversions, which gives an HCV incidence of 2.6 for 100 PY (95% Poisson interval: [0.7;6.7]) and an HCV prevalence of 76.3%.

**Perception of COVID-19**

577 PWID (74%) reported that COVID-19 epidemic affected their life in the last 6 months. This was mainly due to the social distancing restrictions for 61.2% (Table 6). 53% reported still feeling impacted at the time of the second survey. 93% reported totally respecting the social distancing and lockdown measures.

**Table 5**  
Access to prevention & care services 'Before' vs 'After'.

	Before	After	p-value*
Participation in peer-support group in last 6 months (n=780)	293 (37.6)	185 (23.7)	<0.001
On MMT (self-report) (n=780)	462 (59.2)	548 (70.3)	<0.001
Methadone positive in urine test (n=780)	536 (68.7)	587 (75.3)	<0.001
On ART (self-report and/or those with HIV VL<1000 cp/mL) (HIV seroprevalence, n=246)	232 (94.3)	236 (95.9)	0.16
VL <1000 cp/mL (n=246)	221 (89.8)	221 (89.8)	1.0
VL <20 cp/mL (n=246)	201 (81.7)	213 (86.6)	0.06

\* McNemar test.

**Table 6**  
Perception of PWID about the effects of Covid-19 epidemic on their life.

		n	%
Perception of COVID-19 (n=780)	No effect	203	26.0
	Some effect	367	47.1
	Large effect	210	26.9
The effect was due to social distancing (n=577)	No	0	0
	Yes, mainly	353	61.2
	Yes, partially	224	38.8

## Discussion

As a port city with an international airport, thus connected to the rest of the world, and close to both the capital Hanoi and the Chinese border, Hai Phong was considered a potentially high-risk area for the pandemic. Local health authorities implemented very early on the whole suggested infection prevention and control strategy, although no COVID-19 case had been detected and without any indication of a local epidemic. Active screening, contact tracing, and strict quarantining of people coming from pandemic areas were applied. Hai Phong followed the national decision to implement a strict lockdown in April 2020, with health care checkpoints deployed all over the city (Tran et al., 2020 Nov 1).

Social distancing implemented to fight the COVID-19 epidemic had consequences on the drug use scene and posed major challenges to the lives of PWID. Indeed, they were forced to change their drug use behaviours due to both individual and environmental causes, and to adapt to the new context due to distance requirements, that most of them complied with.

Firstly, our results show some important changes in their income (both in terms of source and amount) following the restrictions. Since the social networks of PWID often consist of people of similarly low socioeconomic status, their usual support resources were also depleted under the impact of COVID-19. This result is consistent with the economic situation of the general population during the pandemic in the whole country. According to the Vietnamese General Statistics Office's report, as of December 2020, Vietnam had 32.1 million people aged 15 and over negatively affected by the pandemic including people who lost their jobs, had to take time off/rotate leave, had reduced working hours, and reduced income (General Statistics Office of Vietnam 2022). The difficulties that our participants experienced echo what has been found in other studies with a comparable level of constraints. Globally, PWID are a population who have been most disadvantaged during the COVID-19 crisis (Nanda, 2021). In Australia, Dietze P. and colleagues showed that 19% of PWID experienced changes in employment with most of them losing their jobs or reducing their working hours (Dietze, Maher and Stooove, 2020). Research in the U.S. also recorded an unemployment figure of 16% (Genberg et al., 2021 Apr 1). In another study in the U.K., this number reached 45.5%, and 70.9% of PWID reported an income under 10,000 USD during the previous year (Mistler et al., 2021 Mar 26).

As a direct consequence of the socioeconomic changes, drug use was also impacted worldwide but the observed changes vary by population, substance use, and geographical location (EMCDDA, 2020; Sutherland et al., 2020). Most countries recorded a decrease in drug use directly related to social distancing (Dietze, Maher, & Stooove, 2020; EMCDDA, 2020; Grebely, Cerdá, & Rhodes, 2020). Meanwhile, having more time and boredom were reasons for increased cannabis use according to several cross-sectional online surveys in Australia and Europe (Sutherland et al., 2020; Global Drug Survey Special Edition on COVID-19 [Internet] 2021). In particular, the closure of borders by countries affected drug supply, including availability, price, quality of production and opportunities to meet for drug use (Genberg et al., 2021; Grebely, Cerdá, & Rhodes, 2020; Grierson, 2020; UNODC 2020). A study from K. Lindqvist and colleagues conducted in Sweden during COVID-19 epidemic showed that 60% of PWID rather injected heroin alone at home at that time (Lindqvist et al., 2021 May 10). In Vietnam, social distancing measures to control COVID-19 had similar effects on drug market availability that went down, and prices that went up, especially for heroin and methamphetamine which are the most commonly used illegal drugs. In our study, 56% of the participants were still actively injecting heroin 'after' the period of restrictions. First, it is noteworthy that this may be related to the intervention of CBO members who supported PWID with counselling and for starting MMT as part of the DRIVE project right after RDS4 and before the emergence of COVID-19. Indeed, almost all participants who started MMT after RDS4 reported doing it prior to the start of COVID-19-related restrictions. This decrease is consistent with what was observed in DRIVE: a follow-up survey conducted among a cohort of DRIVE participants recruited through consecutive RDS surveys showed that 71% of them were still actively injecting after between 6 and 30 months (Michel et al., 2022). Among participants who were still actively injecting at the time of the 'after' survey, we observed a decrease in heroin use in both the number of injections per day and the number of days of use. In contrast, there were no changes in the frequency of methamphetamine use. In addition, we found a shift in terms of places where PWID usually inject drugs, with an increase in the proportion of PWID using heroin preferentially indoors (at home or in friend's house) rather than outdoors (on the street or in hotspots). On the other hand, methamphetamine use practices in group did not change during the lockdown. The decrease in heroin but not in methamphetamine use could be partly explained by the fact that changes in terms of cost and supply were not as drastic for methamphetamine as for heroin. Additionally, the urgency of COVID-19 crisis may have changed PWID's perception of MMT – and they actually reported a better quality of services provided in MMT clinics at the time. Physical distancing measures and restrictions on drug availability may motivate them to seek more MMT services, as they are forced to find an alternative to heroin in the new context. Qualitative interviews conducted among PWID in Hai Phong support this assumption (Nguyen et al., 2022), and similar phenomenon was observed in other places (EMCDDA 2020) (Gérome and Gandilhon, 2020). In contrast, no intervention or treatment program exist for methamphetamine users in Hai Phong. Such unchanged methamphetamine uses in a context of rising prices, falling incomes and social distancing measures, shows that methamphetamine remains of great



concern in the community (Des Jarlais et al., 2021; Feelemyer et al., 2020).

COVID-19 and the efforts taken to stem its spread have resulted in interruptions regarding HIV prevention, testing and treatment services worldwide (Santos et al., 2020 Jul 11). However, in our study, we saw an increase in the proportion of PWID living with HIV participating in ART from 88.6% 'before' the implementation of the restrictions compared to 92.7% 'after', although the difference was not statistically significant. In Myanmar, with the aim of ensuring that ART is not interrupted during the restriction time due to COVID-19, the distribution of antiretroviral drugs every 6 months has been applied nationwide, in addition to people living with HIV being allowed to receive ART at the nearest public outpatient clinic (OPC) when they were unable to go to their initially registered OPC due to restrictions on movement (Global Drug Survey Special Edition on COVID-19 [Internet] 2021). In Hai Phong, ART was preferentially delivered every 2 or 3 months rather than monthly during the social distancing period. However, in our study, the increase in the proportion of PWID on MMT and on ART could also both be due as mentioned before to the DRIVE intervention and support from peers after RDS4.

Although peer-support group activities were drastically reduced after the lockdown started, PWID were still able to buy sterile syringes in pharmacies that remained open. In this context of maintained access to harm reduction materials and treatment services, risk practices for HIV and HCV related to injecting drug use did not increase during the restriction period in our study. However, the impact of social distancing may be more severe on female sex worker PWID and lead to increased sexual practices that create risk for HIV infection. Night-time curfews and bar closures adversely affect sex work, reducing customer numbers and payments. Indeed, in the last six months preceding the 'after' survey, we saw a significant decrease in the frequency of sexual activity with casual partners and sex workers from 'before' to 'after' social distancing. The financial pressure resulting from the containment measures could lead sex worker PWID to accept condomless sex, as described in the qualitative survey conducted among five sex workers as part of DRIVE-COVID study, reported elsewhere (Nguyen et al., 2022). The link between drug use disorders and acceptance of condomless sex for more money has been reported in some other studies. Due to COVID-19, nearly 15% of female sex workers experienced violence from clients, primary partners or non-paying sex partners during social restrictions in Kenya (Mantell et al., 2021), working conditions became more difficult and sheltering-in-place presented challenges for women having no safe housing to work as a sex worker in Canada (Shareck et al., 2021 Jul 8).

Together, COVID-19 restrictions in Hai Phong during the study period has not profoundly modified the risk of HIV transmission, and no new HIV infections were recorded. Few HCV infections were recorded, but the HCV incidence was lower to that previously observed (Molès et al., 2020 Apr 24). To date, the main route of HCV transmission within this population has not been clearly identified and additional prevention and treatment interventions focusing on hepatitis C are still needed in order to reach the elimination of HCV transmission.

While this study provides valuable and informative data about a key-population, it has limitations. Firstly, the before-after design, with no control group, does not allow to determine a causal link between the COVID-19-related restrictions and our observations. Secondly, the study location was not the most affected by COVID-19 in the country, with no COVID-19 cases reported yet at the time of our study. Hai Phong also benefits from a strong Provincial AIDS Committee that has implemented together with local CBO a huge prevention work in the past years through different programs (Global Fund, PEPFAR, DRIVE). For these reasons, we will not generalize our results to other cities or provinces in Vietnam. Thirdly and most importantly, our results are limited to a subpopulation of PWID that seemed to mostly include those already engaged in some care services (for HIV, hepatitis C, MMT), which is consistent with the sampling method that was used. Therefore, we cannot extrapolate our findings to PWID that either could not be con-

tacted, or were in rehabilitation centres or incarcerated at the time. A further RDS survey would help reach many of those persons and assess the long-term impact of the restrictions on the whole PWID population in the city. According to the high mortality rate in this population, although we were aware of 10 deaths among RDS4 participants, a non-negligible number of participants that could not be reached may also have died between both surveys (Vinh et al., 2021).

However, our results highlight some specificities of Hai Phong during the early phase of COVID-19-related restrictions that deserve to be explored further for drug policy implications. Overall, although the imposed measures momentarily disrupted support from CBO, both MMT and ART programs were resilient in continuing to provide services, and PWID themselves showed resilience in seeking treatment and using sterile syringes. Qualitative follow-up including in-depth interviews with participants and focus group discussions with CBO members would help better understand PWID's response to drug scarcity, including the motivation to seek MMT. Additional research would be conducted after the later waves of COVID-19 transmission, i.e. after a large number of COVID-19 cases and the re-imposition of restrictions in Hai Phong.

## Conclusion

Access to harm reduction materials and to MMT and ART care services was maintained for PWID in Hai Phong despite the implementation of COVID-19 related restrictions, with no increase in the frequency of risky behaviours for HIV and HCV related to injecting drug use, no new HIV infections and very few new HCV infections. However, their socio-economic life was strongly affected because of narrow job opportunities and reduction of working hours, and the most vulnerable ones such as female sex workers faced major financial challenges that could lead them to engage into risky behaviours, more precisely condomless sex (Marcus and Snowden, 2020). As drugs became less available and more expensive, heroin consumption decreased but the frequency and practices of methamphetamine use remained unchanged, even with the risk of COVID-19 transmission through gathering and pipe sharing, which emphasizes the need for methamphetamine-targeted interventions. Longitudinal follow-up and further qualitative studies are needed for a more comprehensive evaluation on the efforts of PWID in coping with the pandemic and exhibiting psychological resilience. Finally, the COVID-19 situation in Vietnam has become much more severe than it was in 2020. PWID might currently experience greater challenges than our report shows.

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## Author contributions

HTG and DR are coordinating investigators and acquired funding for the study; Study conception: HTG, DR, DL; Protocol preparation and interpretation of data: HTG, DR, DDJ, LM, VHV, JPM, PMK, DL, NN, KTHO, JF, DTH, RV, LSM, NTT; Study management: HTG, DR, NQD, PTN, and CQ; Data analysis: NQD; Drafting of the manuscript: HTG; Editing the manuscript: DR, DDJ, JF, LM, JPM. All authors significantly contributed to the manuscript and approved the final version of the manuscript.

## Ethics approval

The authors declare that they have obtained ethics approval from an appropriately constituted ethics committee/institutional review board where the research entailed animal or human participation.

## Declaration of Competing Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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