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## Correlates of methamphetamine use severity among patients receiving methadone maintenance therapy for opioid use disorder in Vietnam

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### Abstract

**Objectives:** To assess the severity of methamphetamine use among MMT patients in Vietnam with opioid use disorder and concurrent methamphetamine use, and to identify risk factors associated with higher severity of methamphetamine use.

**Methods:** We used survey data and medical record abstractions from 428 people with opioid use disorder who also use methamphetamine while partaking in methadone treatment in five clinics in Hanoi, Vietnam. We used multinomial logistic regression to assess other risk factors and problems associated with high methamphetamine use severity.

**Results:** Those who reported injecting heroin in the past 3 months (AOR=4.05, 95% CI [1.30, 12.55], p=0.02), having a longer history of lifetime heroin use (AOR=1.13, 95% CI [1.03, 1.24], p<0.01), and having higher cravings (AOR=1.97, 95% CI [1.31, 2.98], p<0.01) and fatigue (AOR=1.25, 95% CI [0.96, 1.61], p=0.09) related to methamphetamine withdrawal had greater odds of high methamphetamine use severity. One of five clinics had a significantly higher percentage of methamphetamine use severity than others.

**Conclusions:** Successful methadone maintenance treatment in patients with opioid use disorder in Vietnam may additionally require methamphetamine-focused screening and intervention.

### Keywords

Methamphetamine; opioid; heroin; methadone maintenance treatment; polysubstance use; Vietnam

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Conflicts of interest:

The authors report no conflicts of interest.

## 1. Introduction

In 2015, 75% of substance use in Vietnam has been linked to opioid use according to the United Nations Office on Drugs and Crime. The prevalence of opioid use in Vietnam has remained relatively stable since 2015, but methamphetamine (MA) has increased, accounting for up to 90% of new substance use cases (United Nations Office on Drugs and Crime (UNODC), 2017). In Vietnam, MA use is often comorbid with opioid use, ranging between 24 to 51% of people who use opioids (Feelemyer et al., 2018; Michel et al., 2017). This parallels closely high rates of MA use among people with primary opioid use disorder (OUD) across the U.S. (Ellis et al., 2018; Jones & McCance-Katz, 2019; Jones et al., 2019; Strickland et al., 2019).

Information on risk factors for concurrent use of opioid and MA are scant worldwide. In China, those with concurrent opioid-MA use tended to be younger and have higher rates of mental health problems than those using opioids alone (Dong et al., 2017). Nationwide data for the U.S. indicated that among people receiving heroin treatment, those who were younger, first used heroin at a younger age, unemployed, homeless, referred to treatment by the criminal justice system, and had a history of injecting heroin were more likely to concurrently use MA (Jones et al., 2019). Studies in Vietnam have shown that MA use is associated with sexual sensation-seeking in men who have sex with men (MSM) (Vu et al., 2016), sex work in women (Ho et al., 2013), being a person living with HIV (Le et al., 2013), and injection heroin use (Feelemyer et al., 2018; Michel et al., 2017).

The extant literature on risk factors MA use in the context of OUD in Vietnam have captured individuals who were actively injecting heroin (Feelemyer et al., 2018; Michel et al., 2017), but there is a dearth of information on problem MA use in those with formal OUD diagnoses who currently receive methadone maintenance treatment (MMT) or another opioid treatment program. Concurrent opioid and MA use may exacerbate risk of health complications due to either substance alone such as non-lethal overdose (Al-Tayyib et al., 2017; Betts et al., 2015) and diminished gray matter volume in various regions of the brain (Noyan et al., 2016), which may have negative implications in those receiving MMT and actively using MA. MA use in people receiving MMT may increase risk of relapse and dropout, as shown in studies in Vietnam (Hoang et al., 2018), China (Liu et al., 2017), and in the U.S. (Wang et al., 2017). Understanding the risk factors linked to heightened severity of MA use among Vietnamese patients receiving MMT for OUD, will be important in developing adaptive, targeted prevention efforts against such negative treatment outcomes.

To address the emerging problem in Vietnam, research is needed to identify structural and psychosocial risk factors for severe, frequent MA use among people in Vietnam who actively use MA while receiving MMT for OUD. Therefore, this paper aims to assess the severity of MA use among MMT patients in Vietnam with OUD and concurrent MA use, and to identify risk factors associated with greater severity of MA use. Findings from this study are intended to inform clinical trials across MMT study sites in Vietnam that base adaptive intervention regimens on need and severity, particularly among patients with active MA use or potential for disordered use (Le et al., 2019).

## 2. Methods

### 2.1 Participants and procedures

The present study is a baseline analysis of 428 people in Vietnam partaking in methadone treatment for opioid addiction who also use methamphetamine (MA). Participants were eligible for the study if they were: (1) 18 years of age and above; (2) currently enrolled in one of five largest MMT clinics in Hanoi at the time of the study; (3) being able to provide informed consent at the time of the survey; and (4) testing positive for detectable MA in urine or having scores rated as 4 or greater on the Alcohol, Smoking and Substance Involvement Screening Test (ASSIST) (Humenuik et al., 2008). ASSIST scores of 0 to 3 indicate no active MA use in the past 3 months, and a score of 3 only indicates having ever used MA in one's lifetime. Therefore, the minimum ASSIST score of 4 helped to identify patients with active MA use or disordered use potential, as such patients would be the target for adaptive intervention trials for MA reduction at these study sites (Le et al., 2019).

In January 2018, five largest MMT clinics out of 17 clinics in Hanoi were invited to participate in the study. The study team trained members of community organizations owned by people who use drugs to use the ASSIST and urine screening kits to conduct screening at the clinics. All screening results were kept confidential and only the study team and the members who conducted screening knew the results. Out of 1968 patients on the list, the members of community-based organizations were able to reach 1605 patients within a little more than four weeks. Of those who assented to screening, 566 patients were eligible for the study. After screening, the study team was obtained informed consent from 428 of those eligible participants, who then completed an assessment of behaviors and psychosocial characteristics pertaining to methadone treatment, MA use, and other substances. Assessments were completed using face-to-face paper-based survey. Patients were compensated for their time participating in screening (equivalent to \$ 1 USD) and participating in the survey (\$ 5 USD). All procedures were approved by the Institutional Review Board of Hanoi Medical University.

### 2.2 Measures

Self-report demographic and social characteristics included gender, education level, marital status, income, and paid employment. Methadone treatment and adherence information was abstracted from medical records: current methadone dose, number of missing doses, date beginning methadone maintenance, and urine test results which are randomly conducted once per month during clinic visits.

The methadone maintenance treatment (MMT) related stigma questionnaire was adapted from an evaluation instrument previously used in the Medication Assisted Recovery Services (MARS) project, which aimed to provide peer recovery support to overcome MMT stigma during treatment (Woods & Joseph, 2012). The questionnaire including 9 statements about MMT related stigma was assessed using a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). Higher score indicates higher level of stigma toward MMT.

Participants were asked about their age of first use for each kind of drug (MA, heroin, alcohol, amphetamines, MDMA, ketamines, marijuana), injected drugs in past 3 months,

number of days using heroin and alcohol in past 30 days. The ASSIST was adapted to specifically assess MA use (versus “amphetamine-type stimulants”) in the past 3 months (Humeniuk et al., 2008). A score for each drug using standard ASSIST scoring algorithm ranges 0 – 39.

Health characteristics related to MA use was collected including HIV status, having an HIV test during past year, insurance status and depression. Screening for depression using Patient Health Questionnaire-2 (PHQ-2). The score ranges from 0 – 6, and coded PHQ-2 a cut-point of 3 or greater as possible depression based on prior sensitivity and specificity analysis (Löwe et al., 2005).

Amphetamine Cessation Symptom Assessment (ACSA) scale evaluated 3 components of MA withdrawal symptoms including anxiety and mood, fatigue and craving over 16 questions (McGregor et al., 2008). The severity of symptoms was assessed during the previous 24 hours using a 5-point scale: 0 = not at all, 1 = a little, 2 = moderately, 3 = quite a lot, 4 = extremely. The number of questions for anxiety and mood, fatigue and craving components was 11, 3 and 2 resulting in the total score ranged from 0 – 44, 0 – 12 and 0 – 8, respectively. Higher scores indicated greater withdrawal symptom severity.

The drug abstinence self-efficacy scale (DASE) included 20 situations that lead some people to use ATS and how confident participants felt they would not use ATS in each situation during the past week (Hiller et al., 2000). Four dimensions: (1) negative affect, (2) social/positive, (3) physical and other concerns, and (4) cravings and urges were measured with 5 situations for each dimension. Response to all items was made on a 5-point Likert scale with 1 = not at all and 5 = extremely.

### 2.3 Analysis

We conducted cross-tabulations with chi-square tests to assess bivariate associations between participant characteristics on nominal scales (sociodemographics, clinical site of methadone care, other substance use behaviors, and HIV-related variables) and severity of MA use. We conducted Kruskal-Wallis tests to assess differences in age and substance use measures by MA use severity. We then tested these associations in a multivariate, multinomial logistic regression with adjusted odds ratios. Covariates were selected for inclusion in these regression models if they were significantly ( $p < 0.05$ ) associated with MA use severity in the bivariate tests (i.e., chi-square and Kruskal-Wallis). These included age, methadone clinic site, HIV serostatus, years in MMT, reported injection heroin use in the past 3 months, testing positive for heroin in the past 12 months, reported years of heroin use, scores for the ACSA anxiety, fatigue, and craving domains. The DASE was not included in the multivariate model due to multicollinearity with the ACSA.

## 3. Results

The median age for the sample was 39 years. Most participants were assigned male at birth (97%), which is very similar to nationally representative samples of people in MMT in Vietnam (Hoang et al., 2018; Tran et al., 2017). Twelve percent of participants had completed their high school education, and 61% were married. The majority of participants

were employed (79%) at least periodically, and 50% of participants made more than 5 million VND per year. Less than half of participants had a positive urine test of heroin in the past 12 months (43%) or injected heroin in the past 12 months (27%). Almost 15% of participants were HIV-positive. The median number of years of past heroin use was 12. The median age of at which participants first used MA was 32.5 years.

Table 1 displays frequencies and percentages of sociodemographic and psychosocial characteristics of participants by MA severity with p-values from chi-square or Kruskal Wallis tests. Based on these bivariate analyses, there was a higher proportion of participants with high MA severity: in the Tay Ho clinic (17.2%) than other clinics (range 3.9% – 7.9;  $p < 0.01$ ), injecting heroin in the past 3 months (19.3 vs. 4.8%;  $p < 0.01$ ), testing positive for heroin in the past 12 months (12.6% vs. 5.8%;  $p = 0.02$ ), not having had an HIV test in the past year (14.3% vs. 7.6%;  $p = 0.02$ ), and being HIV-positive (13.3% vs. 8.1%;  $p = 0.03$ ).

Table 1 also displays medians and first- and third- quartiles for age and substance use variables by MA use severity, as well as p-values from the Kruskal-Wallis tests. MA severity was negatively associated with age ( $p < 0.01$ ) and years in MMT ( $p < 0.01$ ), but positively associated with years of heroin use ( $p < 0.01$ ), number of days of heroin use in the past 30 days ( $p < 0.01$ ), all DASE domains ( $p < 0.01$ ), and all ACSA domains ( $p < 0.01$ ).

In the final multinomial logistic model (Table 2), participants who injected heroin in the past 3 months had significantly greater odds of high (vs. low) MA use severity (AOR=4.05, 95% CI [1.30, 12.55],  $p = 0.02$ ) and high (vs. moderate) MA use severity (AOR=2.51, 95% CI [0.02, 6.21],  $p = 0.05$ ) than those who did not inject heroin in the past 3 months. A positive urine test for heroin in the past 12 months was associated with greater odds of high (vs. low) MA use severity (AOR=2.45, 95% CI [0.86, 7.01],  $p = 0.09$ ) and high (vs. moderate) MA use severity (AOR=2.38, 95% CI [0.96, 5.87],  $p = 0.06$ ). Each year of self-reported opioid use was associated with a 1.13 times (95% CI [1.03, 1.24],  $p < 0.01$ ) greater odds of high (vs. low) MA use severity and 1.06 times (95% CI [1.01, 1.11],  $p = 0.01$ ) greater odds of moderate (vs. low) MA use severity. Each additional year increase in age was associated with lower odds of moderate (vs. low) MA use severity (AOR=0.96, 95% CI [0.93, 1.00],  $p = 0.05$ ). Greater ACSA-craving scores were associated with greater odds of high (vs. low) MA use severity (AOR=1.97, 95% CI [1.31, 2.98],  $p < 0.01$ ) and greater odds of high (vs. moderate) MA use severity (AOR= 1.72, 95% CI [1.33, 2.22],  $p < 0.01$ ).

Participants from the Dong Da (AOR=0.11, 95% CI [0.02, 0.48],  $p < 0.01$ ), Hai Ba Trung (AOR=0.03, 95% CI [0.00, 0.18],  $p < 0.01$ ), Hoang Mai (AOR=0.17, 95% CI [0.03, 0.86]  $p = 0.03$ ), and Nam Tu Lien (AOR=0.15, 95% CI [0.03, 0.76],  $p = 0.02$ ) clinics had significantly lower odds of high (vs. low) MA use severity compared to the Tay Ho clinic. Participants from Dong Da (AOR=0.35, 95% CI [0.14, 0.87],  $p = 0.02$ ) and Hai Ba Trung (AOR=0.14, 95% CI [0.06, 0.34],  $p < 0.01$ ) had significantly lower odds of moderate (vs. low) MA use severity compared to Tay Ho clinic. Those from Nam Tu Lien had significantly lower odds of high (vs. moderate) MA use severity (AOR=0.25, 95% CI [0.06, 0.96],  $p = 0.04$ ) than Tay Ho.

## 4. Discussion

Findings from the present study indicate that higher severity of MA use in patients receiving MMT in Vietnam were associated with MA use withdrawal problems, negative opioid treatment outcomes, as well as differences in MMT clinic location.

Participants who received MMT from Tay Ho clinic had the greatest odds of having severe MA use compared to those from all other clinics. Among the five clinics, Tay Ho is the newest to be established (in 2015). Tay Ho had a smaller overall patient pool, but a higher proportion of patients with severe MA-opioid polysubstance use. This finding may allude to potential differences in community need and clinic characteristics across sites, warranting future investigation into site-level factors. The lack of a medication for methamphetamine complicates clinic-wide responses. Adaptive design trials in MMT clinics in Hanoi, Vietnam are investigating optimal combinations of effective behavioral therapies (e.g., contingency management, Matrix Model) for reducing methamphetamine use based on severity of use and treatment response (Le et al., 2019).

As expected, those who reported higher fatigue and craving-related MA withdrawals in the ACSA were more likely to have high MA use severity per the ASSIST compared to low and moderate MA use severity. This is consistent with prior research indicating that greater MA-withdrawals are correlated with using higher frequency of MA use (McGregor et al., 2008) and meeting a higher number of DSM-IV criteria for MA dependence (McGregor et al., 2005).

Prior research conducted in both Vietnam (Hoang et al., 2018) and other nations such as China (Liu et al., 2017) and in the U.S. (Tsui et al., 2020; Wang et al., 2017) have shown that MA use in people receiving treatment primarily for heroin increases risk of relapse. Our analysis expands upon this research, demonstrating that among MMT patients who use MA, severity of MA use is associated with negative MMT treatment outcomes. In both bivariate analysis and multiple logistic regression, having injected heroin in the past 3 months was associated with high MA use severity. Bivariate analysis also showed that having a positive urine test for heroin in the past 12 months was also associated with high MA use, but this association did not retain significance in multivariate analyses. These findings suggest that management of MA use and its related health problems may be necessary to prevent relapse with heroin or other negative treatment outcomes over the course of MMT. Having had a longer history of heroin use was also associated with greater severity of MA use. As such, MMT patients with a long history of heroin use and with active MA use should be assessed for additional care needs.

Our findings are limited by the cross-sectional nature of this analysis. As such, we cannot ascertain temporal relationships between measured risk factors and MA severity in MMT patients who use MA, though the agreement of this finding with those from U.S. illustrates the disorganizing influences of MA on the behaviors of persons receiving medications for opioid use disorder—both at the level of the individual and of the clinic. Inferences about risk factors for MA use in women is also limited by small representation, though the gender distribution of the sample is proportionate to other MMT clinics across Vietnam.



Additionally, data encompassed patients from largely urban-serving clinics, so findings may have limited generalizability to patients in rural settings.

## 5. Conclusions

The rise of MA use in people receiving MMT in Vietnam presents additional public health challenges and treatment complications that extend beyond opioid use disorder alone. Further research is needed to understand the impact of MA use in MMT patients on polysubstance use-related chronic health conditions as well as psychiatric conditions resulting from concurrent opioid-MA use. Monitoring risk factors for MA use and having available MA-focused intervention may be important for successful treatment of patients receiving MMT for OUD in Vietnam.

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## References

- Al-Tayyib A, Koester S, Langegger S, & Raville L (2017). Heroin and Methamphetamine Injection: An Emerging Drug Use Pattern. *Substance Use & Misuse*, 52(8), 1051–1058. 10.1080/10826084.2016.1271432 [PubMed: 28323507]
- Betts KS, McIlwraith F, Dietze P, Whittaker E, Burns L, Cogger S, & Alati R (2015). Can differences in the type, nature or amount of polysubstance use explain the increased risk of non-fatal overdose among psychologically distressed people who inject drugs? *Drug and Alcohol Dependence*, 154, 76–84. 10.1016/j.drugalcdep.2015.06.020 [PubMed: 26130335]
- Dong H, Yang M, Liu L, Zhang C, Liu M, Shen Y, Liu H, & Hao W (2017). Comparison of demographic characteristics and psychiatric comorbidity among methamphetamine-, heroin- and methamphetamine-heroin co- dependent males in Hunan, China. *BMC Psychiatry*, 17(1), 183. 10.1186/s12888-017-1346-7 [PubMed: 28499448]
- Ellis MS, Kasper ZA, & Cicero TJ (2018). Twin epidemics: The surging rise of methamphetamine use in chronic opioid users. *Drug and Alcohol Dependence*, 193, 14–20. 10.1016/j.drugalcdep.2018.08.029 [PubMed: 30326396]
- Feelemyer J, Duong Thi H, Khuê Pham M, Hoang Thi G, Thi Tuyet Thanh N, Thi Hai Oanh K, Arasteh K, Moles JP, Vu Hai V, Vallo R, Quillet C, Rapoud D, Michel L, Hammett T, Laureillard D, Nagot N, & Des Jarlais D (2018). Increased methamphetamine use among persons who inject drugs in Hai Phong, Vietnam, and the association with injection and sexual risk behaviors. *Journal of Psychoactive Drugs*, 50(5), 382–389. [PubMed: 30183558]
- Hiller ML, Broome KM, Knight K, & Simpson DD (2000). Measuring Self-Efficacy among Drug-Involved Probationers. *Psychological Reports*, 86(2), 529–538. 10.2466/pr0.2000.86.2.529 [PubMed: 10840908]
- Ho HT, Le GM, & Dinh TT (2013). Female sex workers who use amphetamine-type stimulants (ATS) in three cities of Vietnam: use and sexual risks related to HIV/AIDS. *Global public health*, 8(5), 552–569. [PubMed: 23679831]
- Hoang T, Nguyen H, Shiraishi RW, Nguyen M, Bingham T, Nguyen D, Nguyen T, Duong H, Lyss S, & Tran H (2018). Factors associated with concurrent heroin use among patients on methadone maintenance treatment in Vietnam: A 24-month retrospective analysis of a nationally representative sample. *International Journal of Drug Policy*, 55, 113–120. [PubMed: 29550740]

- Humeniuk R, Ali R, Babor TF, Farrell M, Formigoni ML, Jittiwutikarn J, De Lacerda RB, Ling W, Marsden J, & Monteiro M (2008). Validation of the alcohol, smoking and substance involvement screening test (ASSIST). *Addiction*, 103(6), 1039–1047. [PubMed: 18373724]
- Jones CM, & McCance-Katz EF (2019). Co-occurring substance use and mental disorders among adults with opioid use disorder. *Drug and Alcohol Dependence*, 197, 78–82. 10.1016/j.drugalcdep.2018.12.030 [PubMed: 30784952]
- Jones CM, Underwood N, & Compton W (2019). Increases in Methamphetamine Use among Heroin Treatment Admissions in the United States, 2008–2017. *Addiction*, 0(ja). 10.1111/add.14812
- Le GM, Dao T, Nguyen T, Okafor CN, Li M, & Shoptaw S (2019). Feasibility And Outcomes Of Evidence-Based Interventions To Reduce Methamphetamine Use Among Patients On Methadone Maintenance Therapy In Hanoi, Vietnam National Institute on Drug Abuse International Forum, San Antonio, Texas.
- Le GM, Ngoc LB, Hoang VH, Mulvey K, & Rawson RA (2013). Substance use disorders and HIV in Vietnam since Doi Moi (Renovation): an overview. *Journal of food and drug analysis*, 21(4), S42–S45. [PubMed: 25278736]
- Liu D, Gu J, Xu H, Hao C, Jiao M, Zhang X, Zhao Y, Andrew B, & Hao Y (2017). Club drugs and alcohol abuse predicted dropout and poor adherence among methadone maintenance treatment patients in Guangzhou, China. *AIDS care*, 29(4), 458–463. [PubMed: 27903083]
- Löwe B, Kroenke K, & Gräfe K (2005). Detecting and monitoring depression with a two-item questionnaire (PHQ-2). *Journal of psychosomatic research*, 58(2), 163–171. [PubMed: 15820844]
- McGregor C, Srisurapanont M, Jittiwutikarn J, Laobhripatr S, Wongtan T, & White JM (2005). The nature, time course and severity of methamphetamine withdrawal. *Addiction*, 100(9), 1320–1329. 10.1111/j.1360-0443.2005.01160.x [PubMed: 16128721]
- McGregor C, Srisurapanont M, Mitchell A, Longo MC, Cahill S, & White JM (2008). Psychometric evaluation of the Amphetamine Cessation Symptom Assessment. *Journal of Substance Abuse Treatment*, 34(4), 443–449. 10.1016/j.jsat.2007.05.007 [PubMed: 17629443]
- Michel L, Des Jarlais DC, Duong Thi H, Khuat Thi Hai O, Pham Minh K, Peries M, Vallo R, Nham Thi Tuyet T, Hoang Thi G, Le Sao M, Feelemyer J, Vu Hai V, Moles J-P, Laureillard D, & Nagot N (2017). Intravenous heroin use in Haiphong, Vietnam: Need for comprehensive care including methamphetamine use-related interventions. *Drug and Alcohol Dependence*, 179, 198–204. 10.1016/j.drugalcdep.2017.07.004 [PubMed: 28800503]
- Noyan CO, Kose S, Nurmedov S, Metin B, Darcin AE, & Dilbaz N (2016). Volumetric brain abnormalities in polysubstance use disorder patients. *Neuropsychiatric disease and treatment*, 12, 1355–1363. 10.2147/NDT.S107733 [PubMed: 27358566]
- Strickland JC, Havens JR, & Stoops WW (2019). A nationally representative analysis of “twin epidemics”: Rising rates of methamphetamine use among persons who use opioids. *Drug and Alcohol Dependence*, 204, 107592. 10.1016/j.drugalcdep.2019.107592 [PubMed: 31586804]
- Tran BX, Nguyen QL, Nguyen LH, Phan HTT, Le HT, Tran TD, Vu TTM, & Latkin CA (2017). Expanding co-payment for methadone maintenance services in Vietnam: the importance of addressing health and socioeconomic inequalities. *BMC Health Services Research*, 17(1), 480. 10.1186/s12913-017-2405-y [PubMed: 28701208]
- Tsui JI, Mayfield J, Speaker EC, Yakup S, Ries R, Funai H, Leroux BG, & Merrill JO (2020). Association between methamphetamine use and retention among patients with opioid use disorders treated with buprenorphine. *Journal of Substance Abuse Treatment*, 109, 80–85. 10.1016/j.jsat.2019.10.005 [PubMed: 31810594]
- United Nations Office on Drugs and Crime (UNODC). (2017). The Challenge of Synthetic Drugs in East and South-East Asia: Trends and Patterns of Amphetamine-type Stimulants and New Psychoactive Substances. UNODC. [https://www.unodc.org/documents/scientific/Trends\\_and\\_Patterns\\_of\\_ATS\\_and\\_NPS\\_2017.pdf](https://www.unodc.org/documents/scientific/Trends_and_Patterns_of_ATS_and_NPS_2017.pdf)
- Vu NTT, Holt M, Phan HTT, Le HT, La LT, Tran GM, Doan TT, Nguyen TNN, & de Wit J (2016). Amphetamine-type stimulant use among men who have sex with men (MSM) in Vietnam: Results from a socio-ecological, community-based study. *Drug and Alcohol Dependence*, 158, 110–117. [PubMed: 26656138]



- Wang L, Min JE, Krebs E, Evans E, Huang D, Liu L, Hser Y-I, & Nosyk B (2017). Polydrug use and its association with drug treatment outcomes among primary heroin, methamphetamine, and cocaine users. *International Journal of Drug Policy*, 49, 32–40. 10.1016/j.drugpo.2017.07.009 [PubMed: 28888099]
- Woods JS, & Joseph H (2012). Reducing stigma through education to enhance medication-assisted recovery. *Journal of addictive diseases*, 31(3), 226–235. [PubMed: 22873184]

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### Highlights

- MMT patients with a longer history of heroin use had higher methamphetamine use.
- MMT patients who injected heroin also had higher methamphetamine use.
- MMT patients with higher methamphetamine use reported more withdrawal symptoms.
- MMT patients showed differences in methamphetamine use between clinic sites.

**Table 1.**

Methamphetamine use severity by participant characteristics (N = 428)

	Methamphetamine use severity								
	Total		Low (n=97)		Moderate (n=293)		High (n=37)		p
	N	% <sup>a</sup>	n	% <sup>b</sup>	n	% <sup>b</sup>	n	% <sup>b</sup>	
Sex at birth									0.40
Male	414	96.7	93	22.5	285	68.8	35	8.5	
Female	14	3.3	4	28.6	8	57.1	2	14.3	
Education									0.16
Less than high-school	376	87.9	88	20.6	258	60.3	29	6.8	
High-school or more	52	12.1	9	17.3	35	67.3	8	15.4	
Marital status									0.19
Not married	168	39.3	32	19.0	124	73.8	12	7.1	
Married	259	60.7	64	24.7	169	65.3	25	9.7	
Ever treated for heroin									0.70
No	24	5.9	7	29.2	15	62.5	2	8.3	
Yes	383	94.1	85	22.3	263	68.9	34	8.9	
Clinic									<0.01
Dong Da	81	19.0	19	23.5	56	69.1	6	7.4	
Hai Ba Trung	79	18.3	40	51.3	35	44.9	3	3.9	
Nam Tu Liem	89	20.8	15	16.9	67	75.3	7	7.9	
Tay Ho	99	23.2	9	9.1	73	73.7	17	17.2	
Hoang Mai	80	18.7	14	17.5	62	77.5	4	5.0	
Insurance status									0.64
No	191	45.3	47	24.6	126	66.0	18	9.4	
Yes	232	54.7	50	21.6	163	70.3	19	8.2	
Income									0.23
<3 million VND	101	23.8	24	23.8	71	70.3	6	5.9	
3 – 5 million VND	113	26.6	32	28.3	70	62.0	11	9.7	
>5 million VND	211	49.7	39	18.5	152	72.0	20	9.5	
Paid employment									0.67
No	88	20.8	24	27.3	56	63.6	8	9.1	
Yes	194	45.8	43	22.2	136	70.1	15	7.7	
Sometimes	142	33.5	28	19.7	100	70.4	14	9.9	
Injected heroin (past 3 months)									<0.01
No	313	73.3	84	26.9	213	68.3	15	4.8	
Yes	114	26.7	12	10.5	80	70.2	22	19.3	
Injected methamphetamine (ever)									0.35
No	321	93.6	58	18.1	234	72.9	29	9.0	
Yes	22	6.4	4	18.2	14	63.6	4	18.2	
Alcohol use (past 30 days)									0.29

	Methamphetamine use severity								
	Total		Low (n=97)		Moderate (n=293)		High (n=37)		p
	N	% <sup>a</sup>	n	% <sup>b</sup>	n	% <sup>b</sup>	n	% <sup>b</sup>	
No	228	53.5	55	24.1	158	69.3	15	6.6	
Yes	198	46.5	42	21.2	135	68.2	21	10.6	
Positive heroin urine test (past 12 months)									0.02
No	243	57.2	62	25.5	167	68.7	14	5.8	
Yes	183	42.8	34	18.7	125	68.7	23	12.6	
Depression symptoms (PHQ2-3)									0.30
No	374	87.8	88	23.5	256	68.5	30	8.0	
Yes	52	12.2	9	17.7	35	68.6	7	13.7	
HIV test (past 12 months in HIV-negative only)									0.02
No	98	25.2	12	12.2	72	73.5	14	14.3	
Yes	291	74.8	68	23.4	201	69.1	22	7.6	
HIV serostatus									0.03
Negative	349	85.3	82	23.6	238	68.4	28	8.1	
Positive	60	14.7	6	10.0	46	76.7	8	13.3	
Ever did not take MMT for 5 days									0.16
No	390	92.0	92	23.7	265	68.1	32	8.2	
Yes	34	8.0	4	11.8	25	73.5	5	14.7	
	Mn	Q1, Q3	Mn	Q1, Q3	Mn	Q1, Q3	Mn	Q1, Q3	p
Age	39	34, 44	41	37, 47	38	34, 44	37	33, 42	<0.01
Years in MMT	2	1, 3	3	1, 4	2	1, 3	1	1, 2	<0.01
Years of heroin use	12	8, 17	10	7, 15	12	8, 17	15	10, 18	<0.01
Years of methamphetamine use	6	3, 9	5	2, 8	6	3, 9	7	3, 10	0.06
Number of days alcohol use (past 30 days)	10	3, 30	10	3, 28	10	3, 30	6	3, 20	0.74
Number of days heroin use (past 30 days)	5	2, 15	2	1, 7	5	2, 15	15	7, 30	<0.01
MMT Related Stigma	25	21, 29	25	21, 28	25	22, 29	24	19, 30	0.53
DASE-negative affect	15	10, 20	20	13, 20	15	10, 20	9	5, 15	<0.01
DASE-social	15	10, 20	18	13, 20	14	10, 20	9	6, 12	<0.01
DASE-physical	18	13, 21	20	15, 22	18	13, 21	15	8, 18	<0.01
DASE-cravings	16	12, 20	19	14, 20	16	12, 20	11	9, 14	<0.01
ACSA-anxiety	1	0, 4	0	0, 2	2	0, 4	4	2, 9	<0.01
ACSA-fatigue	2	0, 4	1	0, 3	2	1, 4	5	3, 7	<0.01
ACSA-craving	0	0, 0	0	0, 0	0	0, 0	2	0, 4	<0.01
MMT dose	70	50, 100	70	45, 90	65	50, 100	80	50, 110	0.25
Total # of days missed MMT in 2017	1	0, 4	1	0, 3	1	0, 4	1	0, 4.5	0.67

Note: Mn=Median, Q1=25<sup>th</sup> quartile, Q3=75<sup>th</sup> quartile

Adjusted odds ratios (AOR) from multinomial logistic regression of factors associated with methamphetamine use severity groups

**Table 2.**

Variable	High (vs. low)			Moderate (vs. low)			High (vs. moderate)		
	AOR	95% CI	P	AOR	95% CI	P	AOR	95% CI	P
Age	0.93	0.85, 1.00	0.05	<b>0.96</b>	<b>0.93, 1.00</b>	<b>.05</b>	0.96	0.89, 1.03	0.27
Clinic									
Tay Ho (ref)	1.00			1.00			1.00		
Dong Da	<b>0.11</b>	<b>0.02, 0.48</b>	<b>&lt;.01</b>	<b>0.35</b>	<b>0.14, 0.87</b>	<b>0.02</b>	0.31	0.09, 1.10	0.07
Hai Ba Trung	<b>0.03</b>	<b>0.00, 0.18</b>	<b>&lt;.01</b>	<b>0.14</b>	<b>0.06, 0.34</b>	<b>&lt;0.01</b>	0.21	0.04, 1.10	0.06
Hoang Mai	<b>0.17</b>	<b>0.03, 0.86</b>	<b>0.03</b>	0.63	0.22, 1.76	0.38	0.27	0.07, 1.03	0.05
Nam Tu Liem	<b>0.15</b>	<b>0.03, 0.76</b>	<b>0.02</b>	0.62	0.24, 1.59	0.32	<b>0.25</b>	<b>0.06, 0.96</b>	<b>0.04</b>
HIV positive	1.75	0.44, 6.94	0.43	1.72	0.66, 4.50	0.27	1.01	0.35, 2.94	0.98
Years in MMT	0.94	0.71, 1.26	0.69	0.97	0.83, 1.14	0.74	0.97	0.75, 1.25	0.80
Injected heroin (past 3 months)	<b>4.05</b>	<b>1.30, 12.55</b>	<b>0.02</b>	1.61	0.74, 3.48	0.23	<b>2.51</b>	<b>1.02, 6.21</b>	<b>0.05</b>
Positive urine test for heroin (past 12 months)	2.45	0.86, 7.01	0.09	1.03	0.56, 1.90	0.92	2.38	0.96, 5.87	0.06
Years of heroin/opioid use	<b>1.13</b>	<b>1.03, 1.24</b>	<b>&lt;0.01</b>	<b>1.06</b>	<b>1.01, 1.11</b>	<b>0.01</b>	1.07	0.99, 1.16	0.11
ACSA-anxiety	0.95	0.83, 1.10	0.51	0.97	0.88, 1.07	0.57	0.98	0.88, 1.09	0.73
ACSA-fatigue	1.25	0.96, 1.61	0.09	1.10	0.94, 1.30	0.24	1.13	0.91, 1.40	0.26
ACSA-craving	<b>1.97</b>	<b>1.31, 2.98</b>	<b>&lt;0.01</b>	1.15	0.81, 1.63	0.43	<b>1.72</b>	<b>1.33, 2.22</b>	<b>&lt;0.01</b>

Notes: ACSA = Amphetamine Cessation Symptom Assessment; DASE = Drug Abstinence Self-efficacy scale; AOR = adjusted odds ratio (i.e., Participants reporting injection drug use versus those who did not report injection drug use had 6 times greater odds of being in the high risk meth use group compared to the low risk meth use group).