Title

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Journal

Substance use & misuse, 53(10)

ISSN

1082-6084

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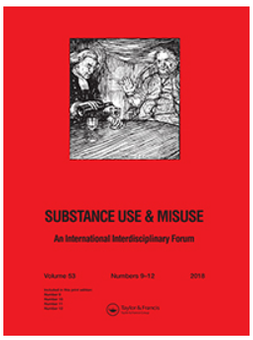
Publication Date

2018-08-01

DOI

10.1080/10826084.2018.1424913

Peer reviewed



Substance Use & Misuse

ISSN: 1082-6084 (Print) 1532-2491 (Online) Journal homepage: http://www.tandfonline.com/loi/isum20

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To cite this article: Nan Feng, Chunqing Lin, Julie Hsieh, Keming Rou & Li Li (2018) Family Related Factors and Concurrent Heroin Use in Methadone Maintenance Treatment in China, Substance Use & Misuse, 53:10, 1674-1680, DOI: 10.1080/10826084.2018.1424913

To link to this article: https://doi.org/10.1080/10826084.2018.1424913

Published online: 29 Jan 2018.

SUBSTANCE USE & MISUSE
2018, VOL. 53, NO. 10, 1674–1680
https://doi.org/10.1080/10826084.2018.1424913

Taylor & Francis
Taylor & Francis Group

ORIGINAL ARTICLE

Family Related Factors and Concurrent Heroin Use in Methadone Maintenance Treatment in China

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ABSTRACT

Background: The use of heroin during Methadone Maintenance Treatment (MMT) is a challenging problem that contributes to poor treatment outcomes. Families may play an important role in addressing concurrent heroin use during MMT, especially in collectivist societies such as China. *Objectives*: In this study, we explored the relationship between family-related factors and concurrent heroin use during MMT in China. *Methods*: This study was conducted at 68 MMT clinics in five provinces of China. There were 2,446 MMT clients in the analysis. Demographic information, MMT dosage, family members' heroin use status, family support of MMT, family problem, and self-reported heroin use were collected in a cross-sectional survey. The most recent urinalysis of opiate use was obtained from clinical records. *Results*: Of the 2,446 participants, 533 (21.79%) self-reported heroin use in the previous seven days or had a positive urine morphine test result in the clinic record. Participants whose family member[s] used heroin were 1.59 times (95% CI: 1.17, 2.15) more likely to use concurrently during treatment. Those with family members who totally support them on the MMT were less likely to use (AOR: 0.75, 95% CI: 0.60, 0.94). Having more family problems was positively associated with concurrent heroin use (AOR: 2.01, 95% CI: 1.03, 3.93). *Conclusions*: The results highlight the importance of the family's role in concurrent heroin use during MMT programs. The study's findings may have implications for family-based interventions that address concurrent heroin use.

KEYWORDS
Family; heroin use; methadone maintenance treatment; China

Introduction

Methadone Maintenance Treatment (MMT) is widely accepted as effective in reducing opioid use and its related HIV transmission (Beyrer et al., 2010; Dole & Joseph, 1978; Haig, 2003; Zou, Ling, & Zhang, 2015). However, the benefits of treatment can be negatively affected by various factors. One of the many such challenges is concurrent heroin use while undergoing treatments, as reported in several studies (Joseph, Stancliff, & Langrod, 2000; Li, Lin, Wan, Zhang, & Lai, 2012; Lin, Wu, & Detels, 2011; Mattick et al., 2003). Concurrent heroin use has a significant impact on adherence to MMT (Raffa et al., 2007) and can contribute to poor treatment outcomes (Magura, Nwakeze, & Demsky, 1998; Rowan-Szal, Chatham, & Simpson, 2000; Sofuoglu, Gonzalez, Poling, & Kosten, 2003). Clinically, a higher methadone dose is associated with less concurrent heroin use, a higher retention rate, and fewer illicit drug-seeking behaviors (Caplehorn, Bell, Kleinbaum, & Gebski, 1993; Faggiano, Vigna-Taglianti, Versino, & Lemma, 2003; Farré, Mas, Torrens, Moreno, & Camí, 2002; Ling, Blakis, Holmes, Klett, & Carter, 1980). In addition to treatment-related factors, social networks are identified as an important factor related to concurrent heroin use. Seeing active heroin-using friends frequently was found to be associated with concurrent heroin use behavior while undergoing methadone treatment (Sullivan, Wu, Cao, Liu, & Detels, 2014).

In China, MMT was introduced in 2004 and initialized with eight clinics to address the HIV epidemic that was driven by injecting drug users (Pang et al., 2007). The program expanded rapidly to 767 clinics that served nearly 184,000 clients by the end of 2014 (UNAIDS. 2015 China AIDS Response Progress Report, 2015). Despite this impressive growth, China's MMT program faces several serious challenges, including a high drop-out rate and frequent concurrent heroin use during treatment (Lin et al., 2010; Liu et al., 2008; Tang & Hao, 2007). A recent study conducted in the Guangdong province of China reported that of the 6,848 participants, 75% had used heroin more than once during the first 12 months of treatment (Luo et al., 2016). Previous studies have suggested that the influence of family, including family relationships and support, might be more significant in collectivist societies such as China, due to the values of collectivistic cultures, than in Western countries, which have individualistic

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cultures (Lin, Wu, & Detels, 2011; Liu, Li, Lu, Liu, & Zhang, 2010; Sullivan et al., 2014). Li and colleagues found a higher proportion of concurrent heroin use among MMT clients who reported having a family member who used drugs, although the difference was not statistically significant (Li et al., 2012). Two studies in China determined that during methadone treatment, having a weak family relationship was associated with concurrent heroin use during MMT (Luo et al., 2016; Sullivan et al., 2014). Additionally, in China, perceived family support was identified to be negatively correlated with concurrent drug use and positively associated with the physical, psychological, and social health of MMT clients (Lin, Wu, & Detels, 2011). Building on previous findings, we explored the role of family-related factors on concurrent heroin use during MMT in China. Our results may provide some insights into family-related interventions that address concurrent heroin use during MMT.

Methods

Participants

This study used the baseline data from a randomized controlled intervention trial conducted in five Chinese provinces (Guangdong, Hunan, Jiangsu, Shanxi, and Sichuan). The data were collected between September 2012 and August 2013. In those regions, 68 MMT clinics were randomly selected from a list of MMT clinics that each had more than 80 current clients. With a systematic sampling approach and random allocation software, 36 clients were randomly selected from each MMT clinic. To be eligible for study participation, MMT clients had to (1) be at least 20 years old; (2) be enrolled in methadone treatment at a participating clinic, and (3) not have criminal or civil convictions or have severe mental disabilities.

Potential participants who met the eligibility criteria were referred to the research staff, who explained the study procedures using a standardized script. Written informed consents were obtained from all participants before assessment. Additionally, the participants were told that their participation was entirely voluntary and that the data collected would be kept confidential. A total of 2,448 MMT clients were recruited for the study, and the refusal rate was less than 10%. The study protocol was approved by the Institutional Review Boards of participating institutes in the U.S. and China.

Data collection

Questionnaires were administered by trained interviewers using the Computer-Assisted Personal Interview (CAPI) method in a private room in the MMT clinic. Trained interviewers read the questions to the participants and then directly keyed the responses into laptop computers. The CAPI method, a precreated database with automatic skip patterns, was selected for this study to reduce data-entry errors. Each participant received 30 yuan (U.S. $4.60) for completing the assessment, which took approximately 45–60 minutes to complete. In addition, each participant's most recent urine morphine test result was obtained from his/her clinical record.

Measures

Family-related measures: *Family members' heroin use status* was measured by asking participants if there was anyone using heroin in their family. *Family support of MMT* was measured using the question "Do your family members support you on MMT (totally supportive; somewhat supportive; not supportive; don't know that I am using MMT)?" *Having family problems* were measured using the family/social functioning score from the Addiction Severity Index (ASI). The ASI is a semistructured interview instrument that assesses both lifetime and recent (30 days prior to treatment entry) events and behaviors. It has high inter-rater and test–retest reliability (McLellan et al., 1992). This instrument is widely used in addiction research to quantify problem areas among drug users and has been successfully validated in China (Luo, Wu, & Wei, 2010; McLellan et al., 1992; Zhao, Li, Wang, Xu, & Zhang, 2004). The composite scores of each of its seven domains range from 0 (no problems) to 10 (severe problems). In this study, we used one of the domains, family/social functioning, to measure participants' family problems. Family/social functioning has thirteen items, which include questions such as "Are you satisfied with your current marital status?" "In the past 30 days, have you had significant periods in which you have experienced serious problems getting along with your Mother?," and "How many days in the past 30 have you experienced family problems?" A score reflecting family/social functioning was calculated based on the ASI equation (McLellan et al., 1992). A higher score indicates a higher level of family problems.

Concurrent heroin use measures: A participant was considered a concurrent heroin user if he/she reported heroin use in the past seven days before the assessment or if his/her clinical record showed that his/her most recent urine test was positive for morphine use. *Self-reported heroin use*was measured by asking participants if they had used heroin in the past seven days (yes or no). *The most recent urine morphine test result* was obtained from each participant's clinical record. Per Chinese MMT program

policy, approximately once every month, every client is requested to provide a urine sample to assess his/her continued opiate use (Cao et al., 2014).

Other measures: *Demographic information*, including gender, age, marital status, education, and monthly household income (Yuan), were collected during the assessment. *MMT dosage* was measured by asking each participant what his/her average dose (ml) of methadone was over the past 30 days.

Statistical analysis

The SAS statistical software version 9.4 was used for data analysis (SAS Institute Inc., Cary, NC, USA). The study included a total of 2,446 participants. Two participants were excluded from the sample because they did not answer the heroin-use questions. First, we compared the proportion of concurrent heroin use across demographic characteristics, MMT dosage, and family-related factors. *P*-values were generated using the Chi-squared test or Student's *t*-test. Then, a logistic regression model was built to estimate the odds ratio of concurrent heroin use by involving the covariates simultaneously. The covariates included the participants' gender, age, years of schooling, monthly household income, marital status, current methadone dose, family members' heroin use status, family members' support on MMT, and having family problems. For covariates with three categories (age, years of schooling, and monthly household income), two dummy variables were created for each variable by using the last category as the reference group (Age, REF: more than 45; Education, REF: 10 years or more; Monthly household income, REF: 10,001 or more). The adjusted odds ratios (AOR) and corresponding 95% confidence intervals (CI) are presented in Table 2. Methadone dosage was treated as a dichotomous variable using "60 ml or less" as the reference group.

Results

Demographic characteristics, MMT dosage, and family-related factors are summarized in Table 1. Of the 2,446 subjects, the majority were male (N = 1,937, 79.2%). Slightly over half of the participants (N = 1,291, 52.8%) were between 36 and 45 years old, approximately one-quarter (N = 615, 25.1%) were 35 years old or younger, and the remaining 22.1% (N = 540) were older than 45 years. More than half of the sample included participants who were married or living with a partner (N = 1,368, 55.9%). Slightly over half of the participants (N = 1,222, 50.2%) had completed 7 to 9 years of school, and about one-third (N = 853, 35.0%) had finished ten or more years. More than three quarters (N = 1,907,

Table 1. Demographic characteristics, methadone dosage, and family related factors, all and by concurrent heroin use (N = 2,446).

Characteristics	All (N = 2,446) N (%)	Concurrent heroin use		*P*-value
		Yes (N = 533) N (%)	No (N = 1,913) N (%)	
Gender				0.99
Male	1,937 (79.2)	422 (21.8)	1,515 (77.9)	
Female	509 (20.8)	111 (21.8)	398 (78.2)	
Age				0.03
35 or younger	615 (25.1)	138 (22.4)	477 (77.6)	
36–45	1,291 (52.8)	300 (23.2)	991 (76.8)	
More than 45	540 (22.1)	95 (17.6)	445 (82.4)	
Marital status				<0.001
Single/divorced/separated/widowed	1,077 (44.1)	282 (26.2)	795 (73.8)	
Married/living with a partner	1,368 (55.9)	251 (18.4)	1,117 (81.7)	
Education				
1–6 years	362 (14.9)	84 (23.2)	278 (76.8)	0.59
7–9 years	1,222 (50.2)	271 (22.2)	951 (77.8)	
10 years or more	853 (35.0)	177 (20.8)	676 (79.2)	
Monthly household income (Yuan)				0.70
5,000 or less	1,907 (78.1)	416 (21.8)	1,491 (78.2)	
5,001–10,000	399 (16.3)	90 (22.6)	309 (77.4)	
10,001 or more	136 (5.6)	26 (19.1)	110 (80.9)	
Methadone dosage (ml/day), M (SD)	55 (29.6)	60 (29.2)	54 (29.6)	<0.001
60 ml/day or less	1,660 (69.3)	336 (20.2)	1,324 (79.8)	
More than 60 ml/day	737 (30.7)	194 (26.3)	543 (73.7)	
Family members heroin use				0.03
Yes	282 (11.6)	76 (27.0)	206 (73.1)	
No	2,159 (88.4)	455 (21.1)	1704 (78.9)	
Family members' support on MMT				0.002
Totally support	1,842 (75.6)	373 (20.3)	1,469 (79.7)	
Somewhat support/not support/don't know them on MMT	594 (24.4)	156 (26.3)	438 (73.7)	
Family problem, M (SD)	0.13 (0.15)	0.15 (0.16)	0.12 (0.24)	<0.001

Table 2. Logistic regression on concurrent heroin use ($N = 2,446$).

	Outcome = Concurrent heroin use	
	Adjusted Odds Ratio	95% CI
Female	0.96	(0.74, 1.23)
Age (REF: More than 45)		
35 or younger	1.29	(0.95, 1.75)
36–45	1.36	(1.04, 1.78)
Education (REF: 10 years or more)		
1–6 years	1.23	(0.91, 1.68)
7–9 years	1.12	(0.90, 1.40)
Monthly household income (yuan) (REF: 10,001 or more)		
5,000 or less	0.97	(0.61, 1.53)
5,001–10,000	1.14	(0.70, 1.87)
Married/living with a partner	0.63	(0.51, 0.77)
Methadone dose more than 60 ml/day	1.35	(1.10, 1.66)
Having family members who use heroin	1.59	(1.17, 2.15)
Family members totally support them on MMT	0.75	(0.60, 0.94)
Family problem	2.01	(1.03, 3.93)

78.1%) of the participants reported a monthly household income of 5,000 yuan (approximately 750 U.S. Dollars) or less. The mean MMT dosage (ml) was 55, with a standard deviation of 29.6. Of the 2,446 participants, 11.6% ($N = 282$) had family member[s] who used heroin. Roughly three-quarters of the participants ($N = 1,842$, 75.6%) reported that their family members totally support them on MMT. The mean of participants' family/social functioning was 0.13, with a standard deviation of 0.15 (see Table 1).

Among all the participants, 533 (21.8%) self-reported concurrent heroin use during the past seven days or had a positive urine morphine test result in the clinical record. The proportion of concurrent heroin use significantly differed by age ($P = 0.03$), marital status ($P < 0.001$), and methadone dosage ($P < 0.001$). Additionally, the study showed a high rate of concurrent heroin use (27.0% vs. 21.1%) among participants whose family member[s] also used heroin ($P = 0.03$). Those who reported their family members' totally support them on MMT had a lower rate of concurrent heroin use as compared to participants who reported less or no family support (20.3% vs. 26.3%, $P = 0.002$). Concurrent heroin users also reported a higher level of family problems (0.15 vs. 0.12, $P < 0.001$).

The factors associated with concurrent heroin use are presented in Table 2. Controlling for the other covariates, the odds of concurrent heroin use among participants who had heroin using family member(s) was 1.59 times higher (95% CI: 1.17, 2.15) than participants who did not. Participants who reported that their family totally supports them on MMT were 0.75 times less likely to use heroin during treatment (95% CI: 0.60, 0.94). Having more family problems was positively correlated with concurrent heroin use (AOR: 2.01, 95% CI: 1.03, 3.93). People in the age range of 36 to 45 years old were more likely to use heroin during MMT, in comparison to older people (AOR: 1.36; 95% CI: 1.04, 1.78). Being married or living with a partner was negatively associated with concurrent heroin use (AOR: 0.63, 95% CI: 0.51, 0.77). Having a higher methadone dose was positively associated with concurrent heroin use (AOR: 1.35, 95% CI: 1.10, 1.66).

Discussion

This study showed that the proportion of concurrent heroin use was 22%, which is lower than that reported in previous studies. In the most recent study conducted in the Guangdong province of China, of the 6,848 MMT clients, 75% of them had used heroin more than once during the first 12 months of treatment (Luo et al., 2016). The difference between the findings may be attributed to a different definition of concurrent heroin use and the duration of the assessment. In Luo et al. (2016)'s study, concurrent heroin use was measured by positive urine morphine test results during the 12-month follow-up. In our study, we used both self-reported heroin use in the past seven days and the most recent urine morphine test result. Li et al. (2012) and Sullivan et al. (2014), both used the same two definitions to assess concurrent heroin use in China. Their results showed that concurrent heroin use was 44.9% and 39%, respectively. However, these two studies used self-reported heroin use in the past 30 days, which was longer than the assessment period of this study. This might explain the lower proportion of concurrent heroin use reported in this study. Nonetheless, a 22% concurrent heroin use rate within a one-week period is an alarming number. It confirms that concurrent drug use is a challenging problem for the MMT program in China and that there is an urgent need to take actions to address this critical issue.

In this study, having a family member who used heroin was shown to be positively associated with concurrent heroin use during MMT. Studies had identified that having a drug-using friend and having frequent contacts with a drug-using friend were both related to concurrent heroin use (Li et al., 2012; Sullivan et al., 2014). Negative social influences make it more difficult for MMT clients to stop using heroin because those influences make the drug more available and elicit cravings (Goehl, Nunes, Quitkin, & Hilton, 1993). Family tie, as in a relatively more intimate social circle, was found to have an influence on clients' heroin use behavior in our study. The negative influence associated with having drug-using family member[s] has also been revealed in Wan (2012)'s study. Drug-using couples were found to be more

vulnerable to continued substance use and premature treatment termination compared to single users (Wan, 2012). These results indicate that special efforts should be made to support those clients with drug using family members in order to improve their treatment outcome.

Findings in this study also showed that family support of MMT and the level of family problems perceived by MMT clients were both associated with concurrent heroin use. The same relationship had been reported in previous studies in China that identified concurrent heroin use was associated with poor family relationships (Luo et al., 2016; Sullivan et al., 2014). The role of the family in drug treatment has been considered more important in China than in individualist western cultures because of the family-oriented traditional Chinese culture (Chen & Fan, 2010; Liu et al., 2010). In the traditional Chinese culture, family members often share their experiences with each other and would consult family members first and consider their suggestions when making decisions about their lives (Muller & Desmond, 1992). Therefore, in the field of drug-dependence treatment in China, families are considered an essential element in encouraging drug users to initiate and remain in treatment. Most drug users stay with their families before and after attending treatment programs (Jiang, 1995). Thus, family relationships could play a crucial role in drug treatment because harmonious relations could potentially encourage treatment participation and compliance (Liu et al., 2010). The involvement of family members in interventions for drug users is highly recommended because the understanding and support from family members will improve the treatment outcome in the long run (Lin, Wu, & Detels, 2011; Liu et al., 2010).

We also found that clients who were married or living with a partner were less likely to use heroin during treatment. In Cao, Wu, Rou, Pang, Luo, and Wang (2012)' study in MMT clinics in China, living with family members or friends was found to be positively associated with treatment retention. The result underscores the role of clients' relationship to family members or intimate partners in drug treatment programs. Wan (2012)'s study of MMT clients in China found that a stable sex partner can be the best person to prevent clients' continued drug use and to monitor their adherence to MMT. More studies are needed to investigate how regular partners can actively support clients' MMT.

Contrary to many previous studies, we found that a high methadone dose was positively related to concurrent heroin use (Caplehorn, Bell, Kleinbaum, & Gebski, 1993; Faggiano, Vigna-Taglianti, Versino, & Lemma, 2003; Farré et al., 2002; Ling et al., 1980). Similar results had been reported in another MMT study in China (Wan, 2012), which showed that participants who received a higher dose of methadone at baseline were more likely to drop out of treatment within three months of enrollment. Moreover, two other MMT studies in China revealed no association between methadone dose and concurrent heroin use (Luo et al., 2016; Sullivan et al., 2014). It is important to note that in this study the participants' average methadone dosage was 55 ml. A previous study showed that methadone dosage ranging from 60 to 100 mg/day was more effective in reducing the use of heroin during treatment (Faggiano, Vigna-Taglianti, Versino, & Lemma, 2003). The lowered average dose could be a possible explanation for the contradictory results. Another reason may be that clients with a more severe addiction were more likely to receive a higher dose in the program.

Our findings should be interpreted within the context of the limitations of this study. First, we used the baseline data from a randomized control trial, which is limited to making causal inferences. Second, the self-reported information regarding concurrent heroin use, family members' heroin use, family members' support of MMT, and having family problems might be subjective and may introduce a potential bias. In addition, family members' support on MMT was measured using a single-item question, which lacks reliability and validity. Nevertheless, the findings from this study concur that family members play an essential role in dealing with concurrent heroin use among MMT clients in China. It is suggested that providers pay additional attention to clients who have drug-using family members. Intervention programs to improve treatment outcomes for methadone clients are encouraged to involve family members in order to achieve the highest impacts possible.

Disclosure of potential conflicts of interest

No potential conflicts of interest were disclosed.

Acknowledgments

We would like to thank the project team members in the Sichuan, Guangdong, Shaanxi, Jiangsu, and Hunan Provincial Center for Disease Control and Prevention for their contributions to this study.

Funding

This study was supported by the National Institute on Drug Abuse (NIDA)/NIH Grant R01DA033130.

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