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Comparative Profiles of Men and Women with Opioid Dependence: Results from a National Multisite Effectiveness Trial

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Abstract

Background—Accumulating evidence indicates important gender differences in substance use disorders. Little is known, however, about gender differences and opioid use disorders.

Objectives—To compare demographic characteristics, substance use severity, and other associated areas of functioning (as measured by the Addiction Severity Index–Lite; ASI) among opioid-dependent men and women participating in a multisite effectiveness trial.

Methods—Participants were 892 adults screened for the National Institute on Drug Abuse's (NIDA) Clinical Trials Network (CTN) investigation of the effectiveness of two buprenorphine tapering schedules.

Results—The majority of men and women tested positive for oxycodone (68% and 65%, respectively) and morphine (89% each). More women than men tested positive for amphetamines (4% vs. 1%, $p<0.01$), methamphetamine (11% vs. 4%, $p<0.01$) and phencyclidine (8% vs. 4%, $p=0.02$). More men than women tested positive for methadone (11% vs. 6%, $p=0.05$) and marijuana (22% vs. 15%, $p=0.03$). Craving for opioids was significantly higher among women ($p<0.01$). Men evidenced higher alcohol ($p<0.01$) and legal ($p=0.04$) ASI composite scores, whereas women had higher drug ($p<0.01$), employment ($p<0.01$), family ($p<0.01$), medical ($p<0.01$), and psychiatric ($p<0.01$) ASI composite scores. Women endorsed significantly more current and past medical problems.

Conclusions—Important gender differences in the clinical profiles of opioid-dependent individuals were observed with regard to substance use severity, craving, medical conditions, and impairment in associated areas of functioning. The findings enhance understanding of the characteristics of treatment-seeking men and women with opioid dependence, and may be useful in improving identification, prevention, and treatment efforts for this challenging and growing population.

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Introduction

The use of opioids, particularly prescription narcotic analgesics, has increased substantially over the past decade (1–4). Epidemiologic data from the 2006 National Survey of Drug Use and Health (NSDUH) examining new initiates of drug use found that more people initiate nonmedical use of pain relievers than any other substance (5). Moreover, treatment entry censuses reflect the prominence of opioid addiction among individuals seeking services for substance abuse. The Substance Abuse and Mental Health Services Administration's (SAMHSA) Treatment Episode Data Set (TEDS) revealed that 18% of the 1.8 million annual admissions to drug and alcohol abuse treatment centers were accounted for by opioid use disorders (6). Treatment admissions for opioid addiction were second only to admissions for alcohol use disorders.

The increasing number of opioid abusers confers increasing societal costs (e.g., uninsured health care costs, productivity losses). The estimated annual cost of prescription opioid abuse in the U.S. is $9.2 billion (7). More indirect societal costs of opioid abuse can also be seen, for example, in hospital emergency departments where patients with legitimate pain are sometimes denied access to pain relieving medications due to concerns regarding abuse liability (8).

Gender and Opioids

The importance of gender with regard to substance use disorders has gained increasing attention as evidence highlights significant gender differences in prevalence rates, health service utilization, treatment outcome, and physiological consequences of alcohol and drug consumption (9–14). In general, the data suggest that women progress from use to dependence more quickly than men, suffer more severe emotional and physical consequences of drug use as compared to men, yet underutilized treatment. Thus far, little attention has been given to gender differences in opioid use disorders. Such information is important as it may help inform the development of multimodal treatment approaches needed for women with opioid dependence.

Prescription Opioids—Studies investigating gender differences in rates of nonmedical prescription opioid use among community and treatment-seeking samples are equivocal. In one study (N=3,185), Simoni-Wastila and colleagues (15) found that female gender increased the odds of past year nonmedical use of narcotic analgesics by 43%. Among 5,663 outpatients enrolled at methadone maintenance treatment programs in 33 different states, Rosenblum and colleagues (16) found that women were more likely than men to abuse prescription opioids in the past 30 days. More recent data from the Addiction Severity Index Multimedia Version Connect database (17) reported that women were 1.6 times more likely than men to report prescription opioid use. Data from the NSDUH data (N=55,279), however, revealed significantly higher rates of lifetime and past year prescription opiate nonmedical use among men as compared to women (4, c.f. 18). Similarly, the Research Abuse, Diversion and Addiction-Related Surveillance (RADARS) system found that men were more likely than women to abuse OxyContin® (19; c.f. 20). Still other investigators report no gender differences in rates of prescription opioid use (5, 21) and some report gender differences in the type of aberrant prescription opioid behaviors displayed (e.g., crushing and snorting pills) (22). Studies of college-aged populations and young adults (e.g., 18–25 years old) also reveal mixed results (4, 23–28).

Heroin—Data from the NSDUH suggests that past year and lifetime rates of heroin use are higher among men (men = 0.2% vs. women = 0.1%; 2.3% vs. 0.8%, respectively; 5), while equivalent rates of men and women have been found to inject heroin (42.0% vs. 40.7%; 29).

Among adolescent drug users in the NSDUH, Wu and Howard (30) reported that girls were 3.9 times as likely as boys to inject heroin.

Examination of comorbid psychopathology in individuals with heroin use disorders reveals significant gender differences. The Australian Treatment Outcome Study (ATOS; 31) revealed that heroin-dependent women were more likely than men to be depressed (35% vs. 25%, OR=1.66, 95% CI: 1.21–2.26) and meet criteria for borderline personality disorder (52% vs. 44%, OR=1.37, 95% CI: 1.03–1.83). Suicide attempts and poor physical health have also been shown to be higher among heroin-dependent women than men (31–33). With regard to co-occurring substance use, male heroin users have been shown to use other illicit drugs more often than their female counterparts (34).

Beyond this limited data, little systematic investigation of gender differences in opioid dependence has been undertaken. The current study aims to expand upon previous research by investigating gender differences in the clinical presentation of opioid-dependent individuals participating in a large, multisite effectiveness trial. Specifically, gender differences in demographic characteristics, substance use, withdrawal symptomatology and craving, and the impact of substance use on associated areas of functioning (e.g., physical health, legal status) were examined. Understanding how men and women differ in clinical presentation may aid in enhancing assessment and treatment planning practices.

Methods

Design

This study represents a secondary data analysis of CTN-003, a multisite effectiveness trial sponsored by NIDA's Clinical Trials Network (CTN). The parent study (35) was a randomized, parallel-group, open-label trial investigating the effectiveness of two buprenorphine tapering schedules among opioid-dependent individuals. Briefly, participants in the parent study completed the informed consent process and were then administered a battery of assessments at the initial intake visit to determine eligibility for randomization. No medication was administered during the initial intake visit. All data for the current analyses were collected from the initial assessment visit, prior to participants receiving any treatment.

Participants

Between 2003 and 2005, a total of 990 individuals agreed to participate in the parent study and following initial screening, 894 were deemed eligible to participate. Two individuals did not report gender, and thus, the final sample for this secondary analysis consisted of 892 individuals (599 men, 293 women) (Figure 1).

Eligible participants were seeking to enroll in a study examining short-term detoxification treatment for opioid dependence at one of 11 participating treatment programs in 10 U.S. cities in Colorado, Washington, Oregon, Connecticut, New York, Virginia, and North Carolina. Participants were recruited via word of mouth, public service announcements, newspaper advertisements, and referrals. Complete inclusion/exclusion criteria of the parent study are published elsewhere (35). The parent study was approved by each of the participating Institutional Review Boards (IRB) and all participants in the parent study were provided written informed consent prior to any study procedures. This secondary data analysis was approved by the IRB at the Medical University of South Carolina.

Materials

Substance Use—Opioid dependence was assessed using the DSM-IV checklist for substance dependence administered at baseline (36). Jant's Accutest MultiDrug Screen-10 or ABI's SureStep Drug Screen Card were used for toxicology testing of morphine, methadone, amphetamines, barbiturates, benzodiazepines, cocaine, methamphetamines, phencyclidine (PCP), marijuana, and tricyclic antidepressants. In addition, oxycodone was tested at all sites using Rapid One Oxycodone.

Addiction Severity Index-Lite (ASI-Lite; 37): The ASI-Lite is a standardized, semi-structured clinical interview that assesses multiple domains including demographic information, alcohol and drug use (e.g., use of alcohol/drugs in the past month, number of treatment episodes), medical (e.g., presence of chronic medical conditions, number of times hospitalized), psychiatric (e.g., depression, anxiety, hallucinations), legal (e.g., legal charges and incarceration), family/social (e.g., relationship difficulties with family and friends, physical and sexual abuse history), and employment (e.g., occupation, income). To collect additional information not included on the ASI-Lite, a one-page addendum was constructed and administered as a companion to the instrument. Examples of information collected include nicotine use and a distinction of illicit and prescribed methadone use.

Withdrawal Symptoms and Craving

Adjective Rating Scale for Withdrawal (ARSW; 38): The ARSW is a self-report measure that assesses 16 signs and symptoms of opioid withdrawal (e.g., muscle cramps, hot or cold flashes). Participants use a scale ranging from 0 (none) to 9 (severe) to rate each item during the past 24 hours, with a maximum possible score of 144 indicating the most severe withdrawal experience.

Clinical Opiate Withdrawal Scale (COWS; 39): This clinician-administered 11-item questionnaire provides a description of signs and symptoms of opiate withdrawal (e.g., resting pulse rates, sweating, anxiety or irritability) during the past 30 minutes. The total score ranges from 0 (none) to 48 (severe) withdrawal.

Visual Analog Scale (VAS; 40, 41): The VAS is a self-report measure that assessed the extent to which participants experienced craving for opioids ("How much do you currently crave opiates?") and withdrawal symptoms ("How would you rate your current opiate withdrawal symptoms?"). The VAS uses a 100-point line anchored with "not at all" or "none" on one end and "extremely" or "severe" on the other.

Medical Conditions—Medical history was assessed by a study clinician. Active and past history for each of the following 17 conditions was dichotomously assessed (yes/no): cardiovascular; hepatic; renal; psychiatric; respiratory; gastrointerstinal; genitourinary; endocrine; seizure; dermatological; eyes, ears, nose and throat; skin test positive for tuberculosis (TB); X-ray positive for TB; symptoms of TB; musculoskeletal; neurological; and allergies.

Data Analysis

Measures of substance use, withdrawal symptoms, craving, medical history and addiction severity were evaluated among men and women presenting for the initial baseline assessment. Wilcoxon ranked sum tests (t-tests for demographic variables) and Pearson chi-square test statistics were used to test the equality of mean ranks (or means) and frequencies, respectively, in these variables between gender levels. Alpha was set at 0.05 and no

adjustments were made for multiple comparisons given the preliminary nature of this secondary analysis.

Results

Demographic Characteristics

Table 1 includes the demographic characteristics. The mean age was 35.9 (SD=10.3) years and the majority of participants were Caucasian (69%). The mean number of years of education was 12.9 years (SD=2.1). As can be seen in Table 1, women were more educated than men, but men were more likely to be employed. Gender differences in race were also observed with higher rates of Caucasian women than men.

Substance Use

Past Month and Lifetime Substance Use—Comparison of substance use during the past 30 days and lifetime is presented in Table 2. Comparisons between men and women were made with regard to the percent that reported any use (past 30 days and lifetime). Of those who reported some use, comparisons addressed the amount used in the past 30 days and lifetime.

During the past 30 days, men were more likely than women to use alcohol to intoxication and to use heroin. In contrast, women were significantly more likely than men to use other opiates, barbiturates, sedatives, and amphetamines during the past 30 days. Women also used amphetamines more often than males.

Examination of lifetime substance use revealed that men were significantly more likely than women to use alcohol, marijuana, and multiple substances. Men also used alcohol, heroin, marijuana, multiple substances, and nicotine for a greater number of years than women. Women, conversely, were significantly more likely than men to use other opiates and amphetamines.

Urine Toxicology Screen Results—As can be seen in Table 2, the majority of both men and women tested positive for oxycodone and morphine. Women, however, were significantly more likely than men to test positive for amphetamines, methamphetamine and phencyclidine. In contrast, men evidenced significantly more positive urine test results for methadone and marijuana use.

Substance Use Severity and Associated Areas of Functioning—In comparison to women, men evidenced significantly higher scores on the alcohol and legal ASI composite scores. Women demonstrated significantly higher drug, employment, family, medical, and psychiatric ASI composite scores as compared to men. Due to the large sample size, these differences are mostly small with absolute effect sizes ranging from 0.12 to 0.41 (Table 4).

Opiate Withdrawal Symptoms and Craving—Withdrawal symptoms were assessed using the COWS, ARSW and VAS (see Table 4). While a gender difference was revealed with the COWS instrument, this difference was small (effect size = 0.12), and no statistically significant gender differences in withdrawal symptoms were revealed with the ARSW or VAS.

Subjective craving was measured with the VAS. In response to the question, “How much do you currently crave opiates,” women reported significantly higher craving as compared to men.

Medical Conditions

Women reported significantly more past and active medical problems than men (see Table 4). With regard to past medical problems, rates of endorsement were higher among women than men for 15/17 health categories and significantly higher among women than men for 8/17 health categories. Similar results were observed regarding current medical conditions. Only one medical condition (i.e., active hepatic condition) was higher among men than women. It is also important to note that almost half (45%) of women reported a past history of psychiatric problems and one quarter (24%) reported current psychiatric problems.

Discussion

The current study examined gender differences in clinical presentation among 892 treatment-seeking, opioid-dependent individuals participating in a national, multisite effectiveness trial. The findings demonstrate significant differences in the clinical profiles of men and women with opioid dependence with regard to substance use severity, craving, medical conditions, and impairment in associated areas of functioning.

Consistent with previous studies of treatment-seeking inpatient and outpatient samples, less than one-third (32.8%) of the current sample was comprised of women (42–47). Although variations may occur depending on the type of opioid examined, treatment setting, and geographic location, rates of women presenting for opioid-related treatment rarely exceed 35%. For example, Carise and colleagues (20) examined OxyContin® use among 27,816 patients admitted to 157 addiction treatment programs in the U.S. and found that 31% of those who endorsed using OxyContin® were women.

Overall, women in the current study demonstrated a more severe clinical profile than men, as evidenced by significantly higher ASI composites score on all of the following: drug, employment, family/social, medical and psychiatric. As compared to men, women also reported more past and active medical conditions (e.g., genitourinary, neurological, allergies) and were more likely to be currently unemployed. These findings are in agreement with previous research of treatment-seeking opiate dependent patients (13, 17, 31) and strengthen the notion that substance abuse treatment for women needs to be multimodal and address multiple issues. Integrated treatments for opioid dependence and co-occurring psychiatric conditions are needed, as well as interventions and systems of care that address collateral areas of functioning in women's lives (e.g., vocational rehabilitation and other social services).

Comorbid substance use was common for both men and women (17, 34, 42, 44, 48). Men, however, demonstrated more severe alcohol use, higher rates of past month and lifetime use of alcohol and other substances (e.g., heroin, marijuana), and were more likely to test positive for marijuana and methadone than women. In contrast, women evidenced higher rates of past month use of other opiates, amphetamines, sedatives, and barbiturates, and were more likely to test positive for amphetamines and methamphetamine than men. It is also notable that women reported more intense craving for opioids at treatment entry.

Significant gender differences in psychiatric comorbidity were revealed, with women being more likely than men to report current and past history of psychiatric problems. Almost half (45%) of the women reported experiencing psychiatric problems in the past, and a quarter (24%) reported current psychiatric problems. The higher rates of comorbid psychiatric conditions among women have been found in other studies, as well (13, 17, 31, 43). Most recently, Green and colleagues (17) found significantly higher rates of depression and anxiety among opioid-dependent, treatment-seeking women compared to men (69.4% vs. 56.6% depression; 78.7% vs. 63.9 anxiety, respectively). In general, among treatment-

seeking and community samples of individuals with substance use disorders, women consistently demonstrate higher rates of psychiatric comorbidities than men (9, 11, 49). These comorbidities, which typically precede the development of substance use disorders in women, are compatible with the self-medication hypothesis and suggest that women often use substances to cope with negative affect (9, 50). Notable gender variations in the stress and reward systems of the brain may also help explain the higher levels of comorbidity observed among women substance abusers (51). For example, significant gender differences in responsivity of the hypothalamic-pituitary-adrenal (HPA) axis to stress and drug cues have been noted. Fluctuations in sex hormones, particularly progesterone, across the menstrual cycle and their impact on stress-related disorders is also important to consider.

There are several limitations to consider. Only treatment-seeking individuals were included in the study, so the findings may not generalize well to nontreatment-seeking individuals. In addition, participants were recruited from numerous programs across the country and program-specific factors may have influenced the sample. Despite the limitations, the study has several strengths. Most importantly, because the data is derived from a multicenter trial, the current sample may be a better representation of opioid dependent individuals than previous research, as it reflects a large and geographically diverse sample. In addition, the use of objective measures, as well as clinician-administered and self-report instruments to assess substance use enhances the findings.

In summary, prominent gender differences were observed among treatment-seeking men and women with opioid dependence. Women presented with a broader range of collateral symptomatology, such as, greater psychiatric comorbidity, medical problems, employment and family/social impairment. Integrated behavioral as well as pharmacologic treatments for opioid dependence and co-occurring psychiatric conditions are needed, as many opiate-dependent women, in particular, likely use opiates as a means of coping with psychiatric symptoms. The current finding also highlight the need for multimodal systems of care that address collateral areas of functioning in women's lives (e.g., vocational rehabilitation and other social services) as well as physical health needs. Finally, the findings demonstrate that women with opiate dependence also reported a greater use of prescription drugs (e.g., barbiturates, sedatives) and emphasize the need for education regarding the dangers of drug interactions. As rates of opioid misuse and dependence continue to rise, it will become increasingly important for researchers to utilize data from multisite effectiveness trials, such as the current study, to better understand clinically-relevant gender differences.

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References

1. Hopfer CJ, Mikulich SK, Crowley TJ. Heroin use among adolescents in treatment for substance use disorders. J Am Acad Child Adolesc Psychiatry. 2000; 39(10):1316–1323. [PubMed: 11026188]
2. Hopfer CJ, Khuri E, Crowley TJ, Hooks S. Adolescent heroin use: a review of the descriptive and treatment literature. J Subst Abuse Treat. 2002; 23(3):231–237. [PubMed: 12392810]
3. Substance Abuse and Mental Health Services Administration. Results from the 2002 National Survey on Drug Use and Health: National Findings. Office of Applied Studies; Rockville, MD: 2003.

4. Back SE, Payne RA, Simpson AN, Brady KT. Gender and prescription opioids: Findings from the National Survey on Drug Use and Health. Addict Behav. 2010; 35:1001–1007. [PubMed: 20598809]
5. Substance Abuse and Mental Health Services Administration. Results from the 2006 National Survey on Drug Use and Health: National Findings. Office of Applied Studies; Rockville, MD: 2007.
6. Substance Abuse and Mental Health Services Administration. Treatment Episode Data Set (TEDS) Highlights - 2006 National Admissions to Substance Abuse Treatment Services. Office of Applied Studies; Rockville, MD: 2007.
7. Birnbaum HG, White AG, Reynolds JL, Greenberg PE, Zhang M, Vallow S, Schein JR, Katz NP. Estimated costs of prescription opioid analgesic abuse in the United States in 2001: a societal perspective. Clin J Pain. 2006; 22(8):667–676. [PubMed: 16988561]
8. Tamayo-Sarver JH, Dawson NV, Cydulka RK, Wigton RS, Baker DW. Variability in emergency physician decision making about prescribing opioid analgesics. Ann Emerg Med. 2004; 43(4):483–493. [PubMed: 15039692]
9. Brady, KT.; Back, SE.; Greenfield, S. Women and Addiction: A Comprehensive Handbook. New York, NY: Guilford Press; 2009.
10. Darke S, Ross J, Teesson M, Lynskey M. Health service utilization and benzodiazepine use among heroin users: findings from the Australian Treatment Outcome Study (ATOS). Addiction. 2003; 98(8):1129–1135. [PubMed: 12873247]
11. Hernandez-Avila CA, Rounsaville BJ, Kranzler HR. Opioid-, cannabis- and alcohol-dependent women show more rapid progression to substance abuse treatment. Drug Alcohol Depend. 2004; 74(3):265–272. [PubMed: 15194204]
12. Hser YI, Anglin DA, Booth MW. Sex differences in addict careers. Addiction Am J Drug Alcohol Abuse. 1987; 13(3):231–51.
13. Kosten TR, Rounsaville BJ, Kleber HD. Ethnic and gender differences among opiate addicts. Int J Addict. 1985; 20(8):1143–1162. [PubMed: 4077316]
14. Randall CR, Roberts JS, Del Boca FK, Carroll KM, Connors GJ, Mattson ME. Telescoping of landmark events associated with drinking: a gender comparison. J Stud Alc. 1999; 60(2):252–260.
15. Simoni-Wastila L, Ritter G, Strickler G. Gender and other factors associated with the nonmedical use of abusable prescription drugs. Subst Use Misuse. 2004; 39(1):1–23. [PubMed: 15002942]
16. Rosenblum A, Parrino M, Schnoll SH, Fong C, Maxwell C, Cleland CM, Magura S, Haddox JD. Prescription opioid abuse among enrollees into methadone maintenance treatment. Drug Alcohol Depend. 2007; 90(1):64–71. [PubMed: 17386981]
17. Green TC, Serrano JMG, Licari A, Budman SH, Butler SF. Women who abuse prescription opioids: Findings from the Addiction Severity Index-Multimedia Version Connect® prescription opioid database. Drug Alcohol Depend. 2009; 103(1–2):65–73. [PubMed: 19409735]
18. Tetrault JM, Desai RA, Becker WC, Fiellin DA, Concato J, Sullivan LE. Gender and non-medical use of prescription opioids: Results from a national US survey. Addiction. 2008; 103(2):258–268. [PubMed: 18042194]
19. Cicero TJ, Inciardi JA, Munoz A. Trends in abuse of OxyContin and other opioid analgesics in the United States: 2002–2004. J Pain. 2005; 6(10):662–672. [PubMed: 16202959]
20. Carise D, Dugosh KL, McLellan AT, Camilleri A, Woody GE, Lynch KG. Prescription OxyContin abuse among patients entering addiction treatment. Am J Psychiatry. 2007; 164(11):1750–1756. [PubMed: 17974941]
21. Becker WC, Sullivan LE, Tetrault JM, Desai RA, Fiellin DA. Non-medical use, abuse, and dependence on prescription opioids among US adults: Psychiatric, medical, and substance use correlates. Drug Alcohol Depend. 2008; 94(1–3):38–47. [PubMed: 18063321]
22. Back SE, Payne RA, Waldrop AE, Smith A, Reeves S, Brady KT. Prescription opioid aberrant behaviors: A pilot study of sex differences. Clin J Pain. 2009; 25(6):477–484. [PubMed: 19542794]
23. McCabe SE, Cranford JA, Boyd CJ, Teter CJ. Motives, diversion and routes of administration associated with nonmedical use of prescription opioids. Addict Behav. 2007; 32(3):562–575. [PubMed: 16843611]

24. McCabe SE, Teter CJ, Boyd CJ, Knight JR, Wechsler H. Nonmedical use of prescription opioids among U.S. college students: prevalence and correlates from a national survey. Addict Behav. 2005; 30(4):789–805. [PubMed: 15833582]
25. McCabe SE, Teter CJ, Boyd CJ. Illicit use of prescription pain medication among college students. Drug Alcohol Depend. 2005; 77(1):37–47. [PubMed: 15607840]
26. Substance Abuse and Mental Health Services Administration. The NSDUH Report: Patterns and Trends in Nonmedical Prescription Pain Reliever Use: 2002 to 2005. Office of Applied Studies; Rockville, MD: 2007.
27. Boyd CJ, McCabe SE, Teter CJ. Medical and nonmedical use of prescription pain medication use by youth in a Detroit-area public school district. Drug Alcohol Depend. 2006; 81(1):37–45. [PubMed: 16040201]
28. Wu LT, Pilowsky D, Patkar AA. Non-prescribed use of pain relievers among adolescents in the United States. Drug Alcohol Depend. 2008; 94(1–3):1–11. [PubMed: 18054444]
29. Substance Abuse and Mental Health Services Administration. The NSDUH Report: Demographic and Geographic Variations in Injection Drug Use. Office of Applied Studies; Rockville, MD: 2007.
30. Wu LT, Howard MO. Is inhalant use a risk factor for heroin and injection drug use among adolescents in the United States? Addict Behav. 2007; 32(2):265–281. [PubMed: 16713124]
31. Ross J, Teesson M, Darke S, Lynskey M, Ali R, Ritter A, Cooke R. The characteristics of heroin users entering treatment: Findings from the Australian Treatment Outcome Study (ATOS). Drug and Alcohol Rev. 2005; 24(5):411–418. [PubMed: 16298835]
32. Darke S, Ross J. Suicide among heroin users: Rates, risk factors and methods. Addiction. 2002; 97(11):1383–1394. [PubMed: 12410779]
33. Darke S, Hall W. Levels and correlates of polydrug use among heroin users and regular amphetamine users. Drug Alcohol Depend. 1995; 39(3):231–235. [PubMed: 8556972]
34. Chatham LR, Hiller ML, Rowan-Szal GA, Joe GW, Simpson DD. Gender differences at admission and follow-up in a sample of methadone maintenance clients. Subst Use Misuse. 1999; 34(8): 1137–1165. [PubMed: 10359226]
35. Ling W, Hillhouse M, Domier C, Doraimani G, Hunter J, Thomas C, Jenkins J, Hasson A, Annon J, Saxon A, Selzer J, Boverman J, Bilangi R. Buprenorphine tapering schedule and illicit opioid use. Addiction. 2009; 104(2):256–265. [PubMed: 19149822]
36. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders. 4. Washington, DC: American Psychiatric Press, Inc; 2000.
37. Cacciola JS, Alterman AI, McLellan AT, Lin YT, Lynch KG. Initial evidence for the reliability and validity of a ‘Lite’ version of the Addiction Severity Index. Drug Alcohol Depend. 2007; 87(2–3):297–302. [PubMed: 17045423]
38. Bickel WK, Stitzer ML, Bigelow GE, Liebson IA, Jasinski DR, Johnson RE. A clinical trial of buprenorphine: comparison with methadone in the detoxification of heroin addicts. Clin Pharmacol Ther. 1988; 43(1):72–78. [PubMed: 3275523]
39. Wesson DR, Ling W. The clinical opiate withdrawal scale (COWS). J Psychoact Drugs. 2003; 35(2):253–259.
40. Childress AR, McLellan AT, O’Brien CP. Abstinent opiate abusers exhibit conditioned craving, conditioned withdrawal and reductions in both through extinction. Br J Addct. 1986; 81(5):655–660.
41. Kaplan RF, Cooney NL, Baker LH, Gillespie RA, Meyer RE, Pomerleau OF. Reactivity to alcohol-related cues: physiological and subjective responses in alcoholics and nonproblem drinkers. J Stud Alcohol. 1985; 46(4):267–272. [PubMed: 4033125]
42. DiPaula BA, Schwartz R, Montoya ID, Barrett D, Tang C. Heroin detoxification with buprenorphine on an inpatient psychiatric unit. J Subst Abuse Treat. 2002; 23(3):163–169. [PubMed: 12392802]
43. Teesson M, Havard A, Fairbairn S, Ross J, Lynskey M, Darke S. Depression among entrants to treatment for heroin dependence in the Australian Treatment Outcome Study (ATOS): Prevalence, correlates and treatment seeking. Drug Alcohol Depend. 2005; 78(3):309–15. [PubMed: 15893162]

44. Oreskovich MR, Saxon AJ, Ellis MLK, Malte CA, Reoux JP, Knox PC. A double-blind, double-dummy, randomized, prospective pilot study of the partial Mu agonist, buprenorphine, for acute detoxification from heroin. Drug Alcohol Depend. 2005; 77(1):71–79. [PubMed: 15607843]
45. Ponizovsky AM, Grinshpoon A, Margolis A, Cohen R, Rosca P. Well-being, psychosocial factors, and side-effects among heroin-dependent inpatients after detoxification using buprenorphine versus clonidine. Addict Behav. 2006; 31(11):2002–2013. [PubMed: 16524668]
46. White R, Alcorn R, Feinmann C. Two methods of community detoxification from opiates: an open-label comparison of lofexidine and buprenorphine. Drug Alcohol Depend. 2001; 65(1):77–83. [PubMed: 11714592]
47. Potter JS, Hennessy G, Borrow JA, Greenfield SF, Weiss RD. Substance use histories in patients seeking treatment for controlled-release oxycodone dependence. Drug Alcohol Depend. 2004; 76(2):213–215. [PubMed: 15488345]
48. Yu E, Miotto K, Akerele E, Montgomery A, Elkashef A, Walsh R, Montoys I, Fischman MW, Collins J, McSherry F, Boardman K, Davies DK, O'Brien CP, Ling WL, Kleber H, Herman BH. A Phase 3 placebo-controlled, double-blind, multi-site trial of the alpha-2-adrenergic agonist, lofexidine, for opioid withdrawal. Drug Alcohol Depend. 2008; 97(1–2):158–168. [PubMed: 18508207]
49. Compton WM, Cottler LB, Abdallah AB, Phelps DL, Spitznagel EL, Hortone JC. Substance dependence and other psychiatric disorders among drug dependent subjects: Race and gender correlates. Am J Addict. 2000; 9(2):113–125. [PubMed: 10934573]
50. Brady KT, Randall CL. Gender differences in substance use disorders. Psychiatric Clinics of North America. 1999; 22(2):41–52.
51. Fox HC, Sinha R. Sex differences in drug-related stress-system changes: implications for treatment in substance-abusing women. Harv Rev Psychiatry. 2009; 17(2):103–119. [PubMed: 19373619]

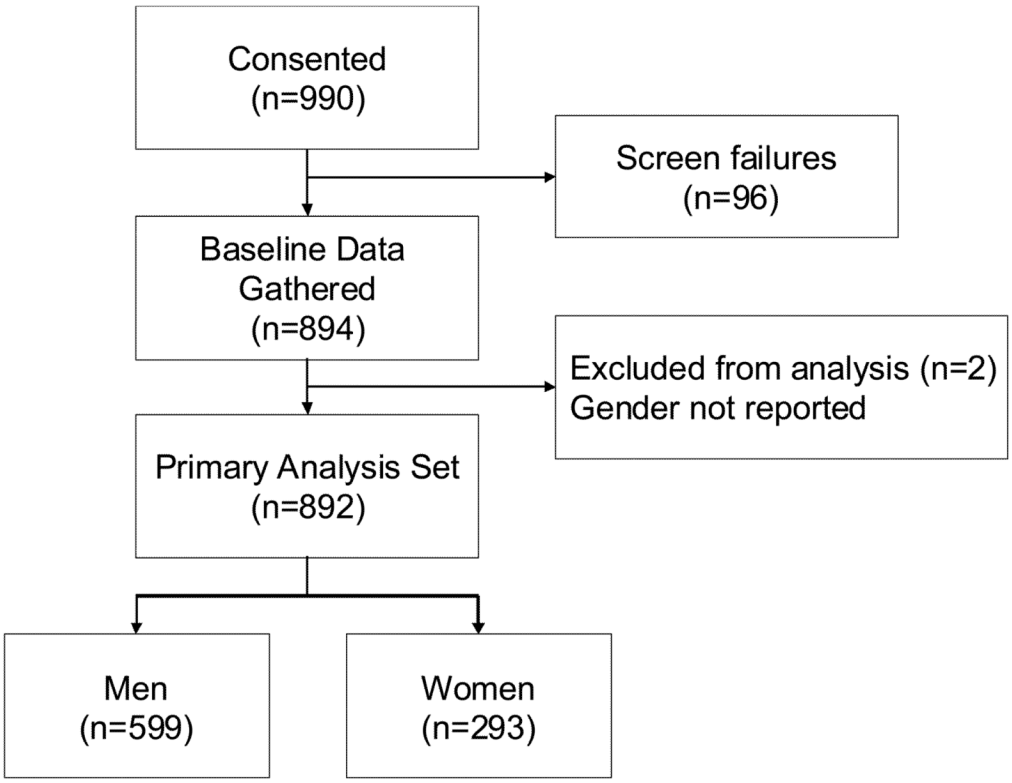

Figure 1.
Flowchart of Participants

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Table 1

Demographics

	Men		Women		
	n=599		n=293		
Variable	**n**	**%**	**n**	**%**	**p-value[a]**
Race					< .01
African American	96	16%	21	7%	
Multiple	42	7%	27	9%	
Other	11	2%	10	3%	
Spanish	51	9%	19	6%	
White	398	67%	216	74%	
Ethnicity					.21
Hispanic	65	11%	24	8%	
Not Hispanic	534	89%	269	92%	
Marital Status					.30
Divorced	94	16%	53	18%	
Legally Married	116	19%	60	20%	
Living with Partner	53	9%	29	10%	
Never Married	290	48%	119	41%	
Separated	36	6%	25	9%	
Widowed	10	2%	7	2%	
Employment[b]					< .01
Employed	469	78%	200	68%	
Unemployed	62	10%	50	17%	
Other	68	11%	43	15%	
Employment[c]					
Employed	326	54%	114	39%	< .01
Unemployed	219	37%	136	46%	
Other	54	9%	43	15%	

	Men		Women		
	n=599		n=293		
Variable	**n**	**%**	**n**	**%**	**p-value**{a}
	Mean	**SD**	**Mean**	**SD**	
Age (years)	36.4	10.7	34.7	9.5	.03
Education (years)	12.8	2.2	13.1	2.0	.03

{a} categorical variables were compared with Pearson chi-square tests; continuous variables were compared with t-tests

{b} Employed: full time, part time regular, part time irregular, service; Other: student, controlled environment, retired, disability, homemaker for past 3 years

{c} Same as {b} except for past 30 days

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Table 2

Rates of Current and Lifetime Substance Use

Current Use Profile													
	Any Use Past 30 Days					Mean Use {a}					Mean Use		
	Men		Women			Men		Women					
Variable	N	%	N	%	p-value{b}	Mean	SD	Mean	SD	p-value{b}	Mean Difference [Women-Men]	SD of difference	Effect Size
Any alcohol	311	52%	135	46%	.10	7.1	8.5	5.5	7.2	.04	−1.63	8.11	−0.20
Alcohol to intoxication	122	20%	44	15%	.05	5.8	7.6	6.3	8.7	.77	.0.41	7.89	0.05
Heroin	521	87%	239	82%	.03	27.6	5.7	28.4	4.5	.05	0.75	5.38	0.14
Methadone - prescribed	5	1%	5	2%	.25	4.2	2.8	2.0	1.2	.14	−2.20	2.14	−1.03
Methadone - illicit	99	17%	43	15%	48	3.0	2.7	3.0	3.7	91	0.07	3.01	0.02
Other opiates	198	33%	127	43%	< .01	16.0	12.2	15.2	12.5	55	−0.84	12.33	−0.07
Barbiturates	1	0%	5	2%	< .01	1.0	--	10.2	9.0	.40	9.20	8.98	1.02
Sedatives	123	21%	82	28%	.01	4.4	5.7	4.1	5.7	.71	−0.30	5.68	−0.05
Cocaine	288	48%	134	46%	.51	7.3	8.5	9.0	9.5	.06	1.72	8.86	0.19
Amphetamines	45	8%	47	16%	< .01	3.7	4.0	8.0	8.8	< .01	4.33	6.89	0.63
Marijuana	259	43%	107	37%	.06	9.6	10.2	8.8	9.5	.45	−0.88	9.98	−0.09
Hallucinogens	8	1%	4	1%	.97	1.8	1.4	1.3	0.5	.51	−0.50	1.19	−0.42
Inhalants	2	0%	3	1%	.19	3.5	3.5	10.7	16.7	.61	7.17	13.82	0.52
Multiple substances	526	88%	252	86%	.45	11.3	9.8	12.3	10.1	.17	1.04	9.90	0.10
Nicotine	507	85%	249	85%	.98	29.0	4.2	29.3	3.7	.39	0.26	4.07	0.06

Lifetime Use Profile													
	Any Lifetime Use					Mean Use {a}					Mean Use		
	Men		Women			Men		Women					
	N	%	N	%	p-value{b}	N	%	N	%	p-value {b}	Mean Difference (Women-Men)	SD of difference	Effect Size
Any alcohol	418	70%	184	63%	.04	11.3	9.5	7.5	7.3	< .01	−3.75	8.92	−0.42
Alcohol to intoxication	342	57%	152	52%	.14	7.9	7.6	6.4	6.2	.03	−1.44	7.24	−0.20
Heroin	515	86%	239	82%	.09	9.2	9.1	6.3	6.2	< .01	−2.90	8.32	−0.35
Methadone - prescribed	200	33%	110	38%	.22	3.1	3.2	2.9	2.7	.57	−0.21	3.04	−0.07

Lifetime Use Profile													
	Any Lifetime Use					Mean Use {a}					Mean Use		
	Men		Women			Men		Women					
	N	%	N	%	p-value{b}	N	%	N	%	p-value {b}	Mean Difference (Women-Men)	SD of difference	Effect Size
Methadone - illicit	57	10%	23	8%	.41	2.5	3.4	1.5	1.5	.06	−1.03	3.01	−0.34
Other opiates	247	41%	150	51%	< .01	4.2	5.0	4.5	4.8	.58	0.28	4.93	0.06
Barbiturates	24	4%	20	7%	.07	3.9	5.4	3.7	3.3	.90	−0.18	4.59	−0.04
Sedatives	114	19%	85	22%	.27	2.9	3.5	3.0	4.0	.83	0.13	3.72	0.03
Cocaine	348	58%	168	57%	.81	5.9	6.4	5.6	6.0	.55	−0.35	6.25	−0.06
Amphetamines	102	17%	82	28%	< .01	4.3	5.5	3.8	4.9	.56	−0.46	5.26	−0.09
Marijuana	459	77%	188	64%	< .01	10.3	8.5	7.7	6.8	< .01	−2.67	8.07	−0.33
Hallucinogens	144	24%	60	20%	.23	3.4	4.4	2.7	3.8	.29	−0.69	4.21	−0.16
Inhalants	15	3%	4	1%	.27	1.6	1.1	1.3	0.5	.56	−0.35	1.04	−0.34
Multiple substances	501	84%	228	78%	.04	8.9	8.0	7.0	6.6	< .01	−1.85	7.60	−0.24
Nicotine	522	87%	263	90%	.31	17.1	10.8	15.6	9.4	.04	−1.51	10.35	−0.15

{a}Of those reporting more than zero use, mean number of days in the past 30 (current) or mean number of years at regular use - at least three times per week (lifetime)

{b}categorical variables were compared with Pearson chi-square tests; continuous variables were compared with t-tests

Table 3

Gender Differences in Urine Toxicology Screen Results

	Men n=599		Women n=293		
Variable	**n**	**%**	**n**	**%**	**p-value**
Amphetamines	6	1%	12	4%	< .01
Barbiturates	6	1%	5	2%	.36
Benzodiazepines	64	12%	20	7%	.07
Methadone	58	11%	17	6%	.05
Cocaine	211	38%	103	39%	.94
Methamphetamine	24	4%	30	11%	< .01
Morphine	490	89%	238	89%	.93
Marijuana	119	22%	41	15%	.03
Oxycodone*	372	68%	173	65%	.44
Phencyclidine (PCP)	23	4%	22	8%	.02
Tricyclic Antidepressant	7	1%	8	3%	.08

*The oxycodone test is highly sensitive but not specific to oxycodone; thus these high positive rates may reflect other opioid use as well.

Table 4

Substance Use Severity, Withdrawal and Craving

	Men		Women					
	n=599		n=293					
	Median	IQR	Median	IQR	p-value{a}	Mean Difference (Women-Men)	SD of difference	Effect Size
ASI subscale								
Alcohol	0.06	(0.00, 0.08)	0.00	(0.00, 0.05)	< .01	−0.02	0.10	−0.20
Drug	0.32	(0.29, 0.37)	0.33	(0.31, 0.38)	< .01	0.02	0.07	0.24
Employment	0.50	(0.16, 0.74)	0.50	(0.22, 1.00)	< .01	0.08	0.32	0.25
Family	0.00	(0.00, 0.16)	0.03	(0.00, 0.28)	< .01	0.08	0.21	0.41
Legal	0.00	(0.00, 0.19)	0.00	(0.00, 0.07)	.04	−0.03	0.17	−0.19
Medical	0.00	(0.00, 0.18)	0.00	(0.00, 0.41)	< .01	0.07	0.28	0.26
Psychiatric	0.09	(0.00, 0.34)	0.23	(0.00, 0.39)	< .01	0.06	0.21	0.31
Withdrawal Symptoms								
COWS	8.0	(6.0, 10.0)	9.0	(6.0, 11.0)	.05	0.47	3.82	0.12
ARSW	61.0	[36.0, 84.0)	65.5	(38.0, 91.0)	.08	4.46	32.58	0.14
VAS (current opiate withdrawal symptoms)	51.0	[37.0, 70.0)	54.5	(38.0, 74.0)	.12	2.79	23.56	0.12
Subjective Craving								
VAS (currently craving opiates)	73.0	(53.0, 85.0)	80.0	(59.5, 91.0)	< .01	6.02	23.80	0.25

{a} continuous variables were compared with Wilcoxon ranked sum tests

Table 5

Past and Current Medical Conditions

	Past History					Active History				
	Men		Women			Men		Women		
Variable	**n**	**%**	**n**	**%**	**p-value**{a}	**n**	**%**	**n**	**%**	**p-value**{a}
Cardiovascular	72	12%	39	13%	.65	49	8%	21	7%	.55
Hepatic	142	24%	81	28%	.26	84	14%	27	9%	.03
Renal	16	3%	19	6%	< .01	3	1%	3	1%	.38
Psychiatric	158	27%	133	45%	< .01	88	15%	70	24%	< .01
Respiratory	96	16%	64	22%	.04	56	10%	32	11%	.51
Gastrointestinal	107	18%	69	24%	.06	68	12%	44	15%	.14
Genitourinary	27	5%	79	27%	< .01	11	2%	26	9%	< .01
Endocrine	14	2%	15	5%	.03	13	2%	11	4%	.18
Seizure	17	3%	23	8%	< .01	5	1%	2	1%	.79
Dermatological	151	26%	92	31%	.07	138	23%	92	31%	.01
Eyes, ears, nose, and thoat	92	16%	51	17%	.50	74	13%	51	17%	.05
Skin test positive for TB	47	8%	19	6%	.43	26	4%	10	3%	.48
X-ray positive for TB	3	1%	5	2%	.08	0	0%	2	1%	.04
Symptoms of TB	4	1%	2	1%	1.00	--	--	--	--	---
Musculoskeletal	168	29%	95	32%	.23	107	18%	76	26%	< .01
Neurological	59	10%	47	16%	.01	34	6%	28	10%	.04
Allergies	141	24%	94	32%	.01	110	19%	81	23%	< .01
	Mean	**SD**	**Mean**	**SD**	**p-value**{b}	**Mean**	**SD**	**Mean**	**SD**	**p-value**{b}
Total number of conditions	2.2	1.8	3.2	2.2	< 0.01	1.4	1.5	2.0	1.7	< 0.01

{a} compared by Pearson chi-square tests

{b} compared by t-tests