Published in final edited form as:

Drug Alcohol Depend. 2015 February 1; 0: 151–159. doi:10.1016/j.drugalcdep.2014.11.025.

Treatment outcomes for substance use disorder among women of reproductive age in Massachusetts: A population-based approach

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Abstract

Introduction—Longitudinal patterns of treatment utilization and relapse among women of reproductive age with substance use disorder (SUD) are not well known. In this statewide report spanning seven years we describe SUD prevalence, SUD treatment utilization, and differences in subsequent emergency department (ED) use and post-treatment relapse rates by type of treatment: none, ‘acute only’ (detoxification/stabilization), or ‘ongoing’ services.

Methods—We linked a statewide dataset of hospital discharge, observation stay and ED records with SUD treatment admission records from hospitals and freestanding facilities, and birth/fetal death certificates, in Massachusetts, 2002–2008. We aggregated episodes into individual woman records, identified evidence of SUD and treatment, and tested post-treatment outcomes.

Results—Nearly 150,000 (8.5%) of 1.7 million Massachusetts women aged 15–49 were identified as SUD-positive. Nearly half of SUD-positive women (71,533 or 48.3%) had evidence of hospital or facility-based SUD treatment; among these, 12% received acute care/detoxification *only* while 88% obtained ‘ongoing’ treatment. Treatment varied by substance type; women with dual diagnosis and those with opiate use were least likely to receive ‘ongoing’ treatment. Treated women were older and less likely to have a psychiatric history or chronic illness. Women who

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received ‘acute only’ services were more likely to relapse (12.4% vs. 9.6%) and had a 10% higher rate of ED visits post-treatment than women receiving ‘ongoing’ treatment.

Conclusions—Many Massachusetts women of reproductive age need but do not receive adequate SUD treatment. ‘Ongoing’ services beyond detoxification/stabilization may reduce the likelihood of post-treatment relapse and/or reliance on the ED for subsequent medical care.

Keywords

substance use disorder; substance abuse treatment utilization; detox; gender; women’s health

1. INTRODUCTION

Gender differences in patterns of development of substance use disorder (SUD) and barriers to treatment entry are well established (Choo et al., 2014; Greenfield et al., 2010). In general, women progress more rapidly than men from onset to problem use, a phenomenon called telescoping (Randall et al., 1999; Hernandez-Avila et al., 2004). Women also have a higher prevalence of mental health disorders and experiences of victimization (Pinchevsky et al., 2013), and more health and social consequences (Bradley, et al., 1998), yet face specific barriers to treatment entry (Greenfield et al., 2007). Commonly encountered obstacles for women of reproductive age include unavailability of services for pregnant women, lack of child care, and fear of losing custody of children (Chen, 2004; Nolen-Hoeksema, 2004; Zilberman et al., 2003).

SUD among women of reproductive age affects the health of women, their children, their larger family circles and their communities (Fox et al., 2013). Women in general experience treatment effects similar to those of men; when differences have been identified, they are generally in a positive direction. For example, there is some data to suggest that when women enter treatment, they are likely to complete and three times more likely to be alcohol abstinent than men, post-treatment (Green, 2012), and equally likely to be cocaine abstinent (Kosten, et al., 1993). These positive treatment outcomes (Marsh, et al., 2004) suggest that it is critical to improve SUD treatment access for women in this age group.

Information about statewide treatment utilization for women in this age group is currently limited to national survey data (SAMHSA, 2013) and to admission records for single episodes, found either in State Profiles of Treatment Facilities in the National Survey of Substance Abuse Treatment Services (N-SSATS) data (Center for Behavioral Health Statistics and Quality, 2013^a) or in the Treatment Episode Data Set (TEDS; Center for Behavioral Health Statistics and Quality, 2013^b). These data systems are cross-sectional, not longitudinal, and lack the capacity to follow individuals over time. Moreover, most clinical trials are limited to women who present for treatment, representing only a minority of women with SUD in this age group (Babor, 2000; Colon et al., 2002).

For these reasons, we created a statewide, multi-source data set that links women’s emergency department (ED) visits, hospital inpatient admissions, birth certificate data, and substance abuse treatment system admissions occurring between 2002 and 2008 in Massachusetts. We used these linked data to identify longitudinal outcomes associated with

SUD treatment or lack of treatment for women seeking medical and/or SUD treatment services in the state.

The purpose of this study was to estimate statewide rates of relapse and subsequent hospital and emergency department admissions associated with evidence of SUD treatment, examining type of treatment received ('acute only' versus 'ongoing'). We analyzed longitudinal data across episodes of treatment using a population that included women with SUD who did not access SUD treatment as well as women with no SUD at all.

2. METHODS

2.1 Design

The study was a collaborative effort between Boston University and the Massachusetts Department of Public Health, and approved by Institutional Review Boards at both institutions, with special attention paid to protection of confidentiality. Data sets from all sources contained identifiable information. Once linkage was achieved, cases were de-identified for analysis. Because of the size of the sample, small cell suppression was not indicated.

This population-based, longitudinal analysis was designed to compare rates of admission to acute services (relapse) by treatment modality received and describe subsequent medical health care utilization rates (ED and inpatient) by receipt of 'acute only' vs. 'ongoing' treatment system services.

2.2 Data sources

We linked three major data sources: 1) Statewide hospital discharge data from the Massachusetts Center for Health Information and Analysis (CHIA) which provided ICD-9 diagnostic codes for all inpatient, observational stay, and ED discharges including inpatient substance abuse treatment services situated within general hospitals; 2) The Massachusetts Pregnancy to Early Life Longitudinal (PELL) data system which links birth certificates and fetal death records to hospital discharge data for delivering women and their infants, providing evidence of SUD from both maternal and infant records; 3) The Massachusetts Bureau of Substance Abuse Services (BSAS) Treatment Dataset which includes discharge data containing information about SUD treatment utilization in all specialty programs that contract with the state for public funding. All women in Massachusetts who utilized hospital based medical or SUD services, delivered a child and registered a birth certificate, or received care at a free-standing SUD treatment facility reporting admissions to the state during the study period were thus included.

2.3 Study population

The study population included all women who were 1) aged 15–49 at the time of their first appearance in the linked dataset and 2) received an inpatient hospital admission, observational stay, ED visit or SUD specialty treatment in Massachusetts hospitals or MA SUD treatment programs from January 1, 2002 to December 31, 2008, and any neonates. Information from neonates born to women in the sample during 2003–2007 was used to

identify women with SUD in the absence of indicators in their own records. The neonates themselves were not included in the analysis, but were considered to be part of the sample in both Institutional Review Board determinations. There were no exclusions other than male gender and age less than 15 or greater than 45.

2.4 Data linkage: Identification of individual women from incident-level data

A multi-step linkage algorithm was developed to identify multiple treatment records belonging to individual women in the CHIA dataset (see Figure 1). The CHIA hospital utilization data contained 6,347,310 discharge records from 2002–2008 for the study population. The patient's encrypted social security number, date of birth (DOB), and hospital medical record number were used to link together hospital records belonging to the same woman and match them to BSAS treatment system records. All records from women who were aged 15–49 at first encounter were included in the study.

2.5 SUD identification

Gender-neutral SUD identification tools have known limitations (Bao and Sturm, 2001; Chisolm and Kelleher, 2006; Elixhauser et al., 2011; Merrick et al., 2011; Saleh and Szebenyi, 2005). This study employs a new SUD identification algorithm, the Explicit Mention Substance Abuse Need for Treatment in Women (EMSANT-W), adapted from the Substance Need Index (McAuliffe et al., 1999^a, 1999^b; 2002) to enhance capture of SUD from women's own substance-related health conditions and those of their neonates. We classified women as affected by SUD based on 1) specific ICD-9 codes for women or their neonates included in EMSANT-W (code list available on request), 2) birth certificate/fetal death record mention of a positive toxicology screen, or 3) a BSAS treatment system record. Women who appeared in the hospital case mix dataset for reasons unrelated to SUDs, and having no other evidence of SUD, were classified as “non-SUD.”

2.6 Independent predictors

2.6.1 Medical and psychiatric history variables—The complex/chronic illness variable was derived from CHIA data using the schema developed by Mertens and Weisner (2003) for tracking alcohol and drug related conditions and tested using matched controls in a Kaiser HMO system database. The psychiatric history variable included codes for mood disorders, psychoses, paranoid and anxiety states, personality disorders, adjustment disorders, PTSD and stress reactions, and suicide gesture, attempt or suicidal ideation. It excluded codes from either end of the age spectrum (developmental disorders at one end and delirium, dementia, and organic brain disease at the other), drug related conditions (alcohol abuse and dependence, drug abuse and dependence, because these codes were included in the definition of SUD) and unspecified disorders.

2.6.2 Substance type—Use of specific substances was aggregated from several potential sources: 1) discharge ICD-9-CM codes from hospital admissions, ED visits, observation stays, and newborn hospital admissions, 2) the substance type data entry field from the substance abuse treatment system admissions data set, and 3) the substance type data field from birth and fetal death records. For example, opiates, defined by codes 96500, 96501, 96502, 96509, 9701x, E8500, E8501, E8502, E9350, E9800. Codes 3041x, 3054x, 9670x,

9671x, 9672x, 9673x, 9674x, 9675x, 9676x, 9678x, 9679x, 9682x, 9683x, E851x, E852x, E8551, E9801 were grouped as ‘Sedatives, Barbiturates, Hypnotics, Anesthetics.’ The Cannabis category included 3043x, 3052x, and E8541. Alcohol abuse or dependence was defined by the 303 (dependence), 305 (abuse) and 291 (alcohol induced disorders) code series, with the exception of code 303.3 (in remission), which was excluded.

2.7 Characterization of episodes of treatment

Treatment is defined as 1) professional services received in a substance abuse specialty treatment program, 2) inpatient or outpatient services as characterized by either ICD-9 codes for a hospital admission for detoxification, or 3) a record of admission for substance abuse specialty treatment in the BSAS data set. BSAS admission data available for this study included date of admission and date of discharge, reason for discharge, drug of choice, and treatment modality. Modalities listed in this data set included detoxification, outpatient treatment, residential treatment, medication-assisted treatment (methadone/ buprenorphine), transitional services, and a range of support services. Treatment records at Veterans’ Administration facilities and private facilities that did not contract with BSAS were not available for this study.

Multiple treatment strategies can be utilized concurrently, in an order selected by service providers, or in accordance with patient preference. We therefore grouped types of treatment into two categories: ‘acute only’, and ‘ongoing’ treatment program services. The ‘acute only’ category represents admission for inpatient detoxification and stabilization, either as a hospital inpatient or in a treatment system facility, for generally five or fewer days. ‘Ongoing’ treatment program services includes documented provision of treatment services (outpatient counseling, residential admission, methadone/suboxone program, transitional treatment and other support services). For example, an admission for transitional services might precede a residential admission or outpatient counseling, but all of these modalities were defined as one ‘ongoing’ continuum of care and categorized together as ‘ongoing’ treatment program services.

We examined three time periods related to treatment: 1) the pre-treatment year (365 days prior to the first or index treatment visit); 2) the treatment year (the index visit +364 days) occurring at any time during 2003–2007, and 3) the post-treatment year (365 days from the end of the treatment year). We utilized these three broad time periods in recognition that the process of treatment entry is rarely swift or smooth, and transition from one modality to another may involve waiting lists, repeated requests for admission, and variation in the order of modalities selected. We limited this analysis to the years 2003–2007 in order to obtain a full year prior to treatment and a full post-treatment year for the subset of women we analyzed for treatment effects.

2.8 Treatment outcomes: Definitions of relapse and medical care utilization

Relapse was defined as admission to a treatment facility for acute services (detoxification) during the year following the treatment year. Because the initial process of treatment commonly includes setbacks in establishing new patterns of behavior (DeLeon et al., 1997), we did not include acute events during the first treatment year as evidence of relapse.

Readmission for supportive services and/or additional treatment modalities (without a preceding acute admission) during the year following the treatment year was considered to be part of the continuing package of definitive services.

Medical care utilization outcomes included the number of ED visits and the number of inpatient medical admissions for any reason during the year following the treatment year. Visits to the ED are of particular interest because they represent acute, unplanned care utilization and are associated with high costs. We used the number of inpatient non-SUD medical admissions as a marker for serious or chronic illness.

2.9 Data analysis

Data linkages and analyses were performed using SAS 9.2 (SAS Institute, Inc., Cary, NC). We conducted descriptive analyses among SUD positive women of reproductive age in MA, across categories of race/ethnicity, age, and insurance status, to examine differences in treatment utilization. Chi-square tests of significance were performed to identify differences in demographic characteristics, medical and psychiatric conditions by SUD treatment modality ('acute only' or 'ongoing') and by type of substance used. Within the treated group, we compared the risk of admission for acute services during the post-treatment year, among those receiving 'acute only' versus 'ongoing' services for the treated group as a whole, and then in analyses stratified by type of drug mentioned in ICD-9 codes or BSAS treatment admission records.

Poisson regression was used to estimate the incident rate ratio (IRR) for association of type of treatment ('acute only' or 'ongoing' treatment program services) to two outcomes, both measured in the post-treatment year: 1) the rate of ED visits and 2) the rate of inpatient medical discharges. In the first model for each of these outcomes we adjusted only for time. In model two we adjusted for race, Hispanic ethnicity, private insurance, region of residence, history of psychiatric illness, and complex/chronic illness as well as time.

3. RESULTS

3.1 Sample characteristics

Figure 1 illustrates the contribution of different data sets to the new linked data system. Among 1,728,748 individual women identified in the linkage of these data sources spanning 2002–2008, 8.5% (n=147,998) were identified as having a SUD. The majority of SUD-positive women were identified in the statewide (CHIA) hospital data system (52.0%); 20,721 (13.7%) of the SUD positive women appeared in SUD treatment admissions records but not in CHIA; and 50,718 (34.3%) were identified in both data sets.

The mean age of women with an identified SUD was 29 years. The majority (76.2%) were white, followed by Hispanics (9.3%), Blacks (7.7%) and other races (6.8%). Over a third (38.5%) had private insurance. Half of the women with SUD had an associated psychiatric diagnosis code, and 30% had a chronic medical condition. During 2003–2007, 22,986 SUD-positive women had at least one recorded birth.

Table 1 describes demographic characteristics and psychiatric and medical conditions by receipt of ‘acute only’ services (detoxification/stabilization) or ‘ongoing’ treatment services, with data for untreated women provided as a reference point. Under half of SUD-identified women (n=71,533 or 48.3%) had any evidence of having received some mode of SUD treatment, with a mean of 3.9 treatment admissions per woman (s.d. 6.2, median 1) during the study period. Twelve percent of the women with an SUD treatment record had no documentation in this data set of any services beyond acute care. Women who received ‘acute only’ services were slightly older and more likely to be Black or Hispanic. Proportions of public and private insurance were statistically similar. Women with psychiatric conditions were less likely to enter treatment than the sample of SUD positive women as a whole (38.5% vs 48.3%), but among those who utilized treatment, there were only slight differences between ‘acute only’ and ‘ongoing’ services (36.7% and 38.7% respectively). Women in the ‘acute only’ treatment group were more likely to have co-occurring acute medical conditions such as anemia (13.9% vs. 12.0%) and pneumonia (8.2% vs. 7.8%) but slightly less likely to have any chronic illness (24.0% vs. 25.2%).

3.2 Treatment modalities

Women in this data set utilized a range of treatment modalities across the study period (Table 2, part 1). Among those who received ‘ongoing’ services during the specified treatment year (Table 2, part 2), outpatient treatment was most common (57.8%), followed by residential treatment (13.3%), and methadone/buprenorphine treatment (11.9%). Transitional services were utilized by 6.8%. In addition, 24% of the women who continued in treatment received a wide range of support services along with their ‘ongoing’ care.

At the record level, which includes multiple admissions per individual over the study period, treatment completion (discharge at the recommended time) was recorded for 64% of the women who completed ‘acute only’ care, but was lower for other modalities: 29.7% for outpatient, 14.7% for methadone/buprenorphine treatment, 26.2% for therapeutic communities, 33.6% for inpatient treatment, 44.4% for specialized residential setting for women and 56.4% for transitional support/stabilization (data not shown in table).

Table 3 describes the types of substances used, singly or in combination, by the women in the sample who received any type of treatment, with drug use of untreated women provided for reference. Among women who utilized SUD treatment services, those with alcohol, sedative or stimulant-associated ICD-9 codes were less likely to enter treatment than those using other substances. Treatment utilization was highest for women using cocaine, opiate and hallucinogens. Women using alcohol and drugs in combination were more likely to utilize SUD treatment than women who used alcohol only or drugs only (70.8% vs. 41.6% for alcohol only and 22.4% for drugs only). Women with cannabis, hallucinogen and/or stimulant use were most likely to receive ongoing treatment services (93.6%, 91.7% and 92.6% respectively). Women who used opiates were least likely to receive services beyond ‘acute only’ care (83.8%).

3.3 Rates of re-admission to acute services (relapse) by treatment modality received

We were able to follow 63,499 women from their index SUD treatment visit through a treatment year and then through a subsequent year (Table 4). Timing of the treatment year late in the study period resulted in right censoring of 8,034 women who were admitted to the treatment system. Among the women who could be followed for a full three year period in the data system (including the year prior to treatment, the treatment year, and the post-treatment year), 11,692 were admitted for ‘acute only’ services (12.4%), and 51,807 (87.6%) received ‘ongoing’ treatment services. Just over 10% of women with an index SUD treatment visit were admitted for acute care (relapse) in the year following their treatment year.

Women who received ‘acute only’ care during the treatment year for any substance were more likely to be re-admitted for repeat detoxification/ stabilization than their counterparts who received ‘ongoing’ treatment services (12.4% vs 9.6%, $p < .0001$). Women who used cocaine had higher rates of acute post-treatment admission overall, and in the subset of those who used cocaine, acute admission rates in the post treatment year were particularly high among those with ‘acute only’ versus ‘ongoing’ treatment services (17.4 vs 13.7%, $p < .0001$). A similar pattern of admission rates was observed for ‘acute only’ versus ‘ongoing’ treatment among women with alcohol abuse or dependence (14.7% vs 10.4%, $p < .0001$). Among women with opiate use, the difference in relapse by treatment type (‘acute only’ vs. ‘ongoing’) was not significant (15.2 vs. 15.9, $p = 0.17$).

3.4 Post-treatment health care utilization rates by receipt of acute vs. more definitive treatment system services

The mean number of ED visits during the year following the treatment year was 1.84 (s.d. 4.43) for women who received acute care only, and 1.76 (s.d. 3.41) for women who received ‘ongoing’ services. In an analysis adjusted only for time (see Table 5), women who received ‘acute only’ treatment were more likely than women who received ongoing services to have any ED visit during the post-treatment year (IRR 1.10, 95%CI 1.06, 1.14, $p < .0001$). This association was unchanged after adjusting for race, insurance status, psychiatric history, complex/chronic illness, age, geographic region within the state, and delivery during the study period in addition to time (IRR 1.10, 95%CI 1.07, 1.12, $p < .0001$).

Inpatient medical admissions (see Table 6) were not common for women who received substance abuse treatment (median 0 visits). Women who received ‘acute only’ care had a mean of 0.60 admissions (s.d. 1.68) vs. 0.57 (s.d. 1.71) for women who received ‘ongoing’ treatment. In an analysis adjusted only for time, receiving ‘acute only’ treatment only increased the incident rate ratio for inpatient medical hospitalization slightly (IRR 1.06, 95%CI 1.02, 1.12). When other predictors were entered into the analysis along with time, the type of SUD treatment received (‘acute only’ vs. ‘ongoing’) was no longer a significant factor (IRR 0.97, 95%CI 0.97, 1.03); race/ethnicity, insurance, pre-existing psychiatric history, complex/chronic illness, older age and region of the state were all stronger determinants of re-admission for acute care during the year following the treatment year.

4. DISCUSSION

This multi-source linked data set permitted us to follow multiple episodes of SUD treatment longitudinally over an extended time period. We were able to identify variation in treatment modalities overall and by type of drug used, follow individual women of reproductive age from their index contacts with the treatment system through their treatment year, and then measure outcomes of relapse, ED visits and medical admissions during a subsequent post-treatment year.

4.1 Comparison with national data: Need for treatment and treatment entry

As expected from national data, there was a large gap between the number of women in this age group in Massachusetts who needed services for SUD and the proportion with documented formal treatment services. Nationally, 23.1 million persons aged 12 or older were classified in the NSDUH 2012 survey (SAMHSA, 2013) as needing substance abuse treatment. This figure represents 8.9% of the population aged 12 and over. Among those who were classified as in need of treatment, only 2.5 million persons had received any type of specialty care in the last year within the SUD treatment system. National data are not available, unfortunately, for the specific age 15 to 49 age group by gender, but the NSDUH data for ages 12 and older, based on self-report, can be used as a rough reference point for our findings.

In contrast to the national treatment entry rate of 10.8%, we were able to document that 48.3% of reproductive-age women in our MA dataset with evidence for SUD received either 'acute only' or 'ongoing' SUD treatment at some point during the study time period. This higher rate of treatment utilization may represent evidence of increased access to treatment in Massachusetts, but could equally be the results of differences in time frame, ample composition (age and gender) or differences in study design (self-report for the NSDUH vs. administrative data set analysis for this investigation), or the result of direct linkage to treatment system data. TEDS data for Massachusetts record a yearly average of treatment admissions (episodes of care) for women in this age group as approximately 21,000 in 2008. Because those data are cross-sectional and not linked to unique women, it is not possible to compare TEDS admissions directly to our finding of 71,533 individual women who received SUD treatment over a seven year period. However correspondence between the mean completion rate of 67% for detoxification in the TEDS data set and our findings of 64% provides some corroboration for study findings.

4.2 Outcomes over time

The lack of a national, longitudinal dataset has made it difficult to follow patients who cycle in and out of detoxification in order to compare their outcomes against outcomes for women who enroll in transitional programs, residential settings, outpatient treatment, or other support services. There is some prior evidence that increased length of stay in treatment is associated with greater abstinence, employment and housing stability (Franey and Ashton, 2002; Hubbard et al., 2003; Westrich et al., 1997). Most studies, however, have been limited to small samples and have focused primarily on clients in therapeutic communities or methadone treatment programs in which women are dramatically underrepresented

nationally (Kleiber, 1996; Comfort et al., 2002). In this analysis we present statewide data for women's participation in treatment across a broad range of modalities and over time. Our findings suggest that increased length of stay in SUD treatment beyond 'acute only' care is associated with an improved post-discharge outcome, in terms of reduced risk of relapse and fewer ED visits in the year following treatment.

4.3 Differential access to treatment among women

We also found differences in treatment utilization associated with demographic characteristics, psychiatric and medical condition history, and type of drug reported. Knowledge about these differences will allow state policy makers to target programming toward groups of women with demonstrated underutilization of SUD services, particularly those with dual diagnosis. Attention can also be directed toward subgroups of women whose care is more likely to stop with detoxification/stabilization (e.g., Black and Hispanic women, and women with evidence for opioid-related SUD). In the last decade, Massachusetts has made major advances in transitioning acute care patients to effective treatment services, as seen by the number of women in our study who received more than acute care. However, a substantial number of women remained in the 'acute only' category, indicating that there is still work to do to increase utilization of ongoing services.

Massachusetts still has room to enhance motivation for and access to treatment, if the goal is for all persons with an SUD to receive definitive services. We found 20,721 women who had evidence for SUD by virtue of their admission to a specialty treatment program that reports to BSAS, but had no code suggesting serious alcohol or drug involvement in their hospital discharge data. SUD identification within the medical system provides an opportunity to assess and refer to treatment, perhaps early in the process, and for many women this opportunity appears to have been missed. These data support the state's central strategy to invest in screening and brief intervention (SBIRT) programming to enhance screening rates in emergency departments and in primary care settings, and provide training for intervention and referral for assessment and specialty treatment if appropriate.

4.4 Impact of 'acute only' treatment

During the years 2002 to 2008, there were over 300,000 drug-related ED visits nationally for women each year (Center for Behavioral Health Statistics and Quality, 2011). Reduction in the number of these visits is an important target for quality of care and health care cost containment. We found a higher rate of post-treatment ED visits among women who received 'acute only' care but no 'ongoing' services during their treatment year, yet the women who received 'acute only' care were not more likely to have a medical admission, suggesting that they were not visiting the ED more frequently because of increased acute or chronic medical illness. Transition to primary care from dependence on the ED as a primary source of care is an important outcome for judging the success of SUD treatment. Our findings support the importance of 'ongoing' treatment services in addition to detoxification/stabilization as part of a comprehensive strategy to address both cost and quality.

4.5 Policy considerations

SUD in Massachusetts is a major public health concern. For example, the Boston metropolitan area, which includes data from the 24-hour, general purpose EDs in Essex County, MA, Middlesex County, MA, Norfolk County, MA, Plymouth County, MA, Suffolk County, MA, Rockingham County, NH, and Strafford County, NH, leads the nation in opiate-related ED visits at 2.5 per 1,000 population annually, which is four times the national average (Center for Behavioral Health Statistics and Quality, 2011). The problem is being addressed actively by a variety of state agencies through legislation, regulation, program development and policy evaluation (Miller and Aarons, 2013). We found in our study that women who used opioids were most likely to obtain only acute care, and thus more likely to relapse. Massachusetts has declared a state of emergency related to opioid overdose. Clearly there is need for intervention to enhance the chance of engagement in treatment. The new longitudinal, population-level data system and the findings we present here offer an opportunity to monitor the experiences of critical subgroups of women as they seek treatment over time, and improve definitive treatment utilization for the women at greatest risk of consequences such as overdose.

4.6 Limitations

This study was limited to women who obtained medical care or formal SUD services in any Massachusetts hospital or BSAS-contracted treatment facility, but did not include patients treated in the Veterans Administration or treatment out-of-state. Our analysis included 1.7 million women, which corresponds well to the approximately 1.1 million women of reproductive age identified in MA in the 2000 census, with allowance for movement in and out of state. Some women with SUD who did not utilize SUD treatment were likely misclassified because their problems with substance were not revealed in the course of their medical care, or were not recorded in a hospital administrative dataset; these women who were missed were likely to have high risk substance use, but may not have progressed to SUD, but some women with SUD may not have been forthcoming with information about use or with substance-associated medical problems that triggered a diagnostic code. Data describing buprenorphine treatment are limited, and AA and NA attendance were not available. Furthermore, we were not able to adjust for severity of SUD, which might have offered more nuanced findings.

On the whole, however, these potential biases result in a conservative estimate of both need and treatment, offering information about a large number of women with SUD as they move in and out of the formal treatment system. Because study findings go beyond the limitations of self-report and cross-sectional analysis, they offer a new and different window into addiction and efforts toward recovery for women in this age group.

4.7 Conclusion

This study used a novel, multi-source data system to identify SUD, describe treatment modalities utilized by Massachusetts women of reproductive age, and investigate the association of treatment types with post-treatment relapse. Women who received acute services only had a higher rate of relapse in the year after the first treatment year, and

increased ED utilization compared to women who obtained ongoing treatment system services.

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Highlights

- In a multi-source data set, 8.5% of 1,728,748 Massachusetts (MA) women 15–49 were substance use disorder (SUD) -positive
- Half of the SUD positive women (48.3%) received SUD treatment
- 12% of those treated received ‘acute only’ care (detoxification/stabilization)
- Women with opiate use were least likely to receive ‘ongoing’ treatment
- ‘Acute only’ care was associated with relapse and increased emergency department (ED) utilization

Figure 1.

Strobe Diagram of Sample Selection: Linkage of Multi-source Discharge Datasets* to Identify Substance Use Disorder among Massachusetts Women of Reproductive Age, 2002–2008

Note. CHIA (Database of Massachusetts hospital discharge, ED visit, observational stay records);

BSAS (Massachusetts Bureau of Substance Abuse Dataset);

PELL (Pregnancy and Early Life Longitudinal Data System)

Sample characteristics at first record in sample, Massachusetts women aged 15–49, 2002–2008 with identified substance use disorder (ISUD), by treatment utilization.*

Table 1

	SUD IDENTIFIED WOMEN N=147,998			TREATED WOMEN, BY TYPES OF SERVICES N=71,533					
	SUD, NO TX (51.7%) n=76,465			SUD, TREATED (48.3%) n=71,533		ACUTE ONLY (12.4%) n=8,880		ONGOING TX (87.6%) n=62,653	
	n	%		n	%	n	%	n	%
Age									
mean(sd)	28.7 (10.5)			31.2 (9.5)		32.56 (9.5)		30.9 (9.5)	
median	26.0			32.0		33.0		31.0	
range	15–49			15–49		15–49		15–49	
Missing=0									
Race/Ethnicity									
White	56,615	76.6		54,153	75.8	6,566	74.0	47,587	76.0
Black	5,369	7.3		5,866	8.2	805	9.1	5,061	8.1
Asian/Pacific Islander	1,235	1.7		1,045	1.5	105	1.2	940	1.5
Hispanic	6,719	9.1		6,817	9.5	952	10.7	5,865	9.4
Other Race	3,903	5.3		3,569	5.0	443	5.0	3,126	5.0
Missing	2,624			83		9		74	
Insurance coverage									
Private	37,201	48.7		19,722	27.6	2,215	24.9	17,507	27.9
Public	25,361	33.2		22,709	31.7	2,477	27.9	20,232	32.3
Self-pay or free care	13,443	17.5		8,306	11.6	1,028	18.0	7,282	16.2
Missing	460	0.6		20,796	29.1	3,160	29.2	17,632	23.6
Psychiatric Conditions	47,338	61.9		27,512	38.5	3,259	36.7	24,253	38.7
Medical Conditions									
Any chronic illness	24,723	33.1		17,945	25.1	2,129	24.0	15,816	25.2
Anemia	8,853	11.6		6,196	12.2	796	13.9	5,400	12.0
Cardiac disease	7,467	9.8		4,454	8.8	578	10.1	3,876	8.6
Diabetes	4,424	5.8		2,389	4.7	299	5.2	2,090	4.6
Hepatitis (B or C) carrier	634	0.8		1,009	0.5	98	1.7	911	2.0

	SUD IDENTIFIED WOMEN N=147,998			TREATED WOMEN, BY TYPES OF SERVICES N=71,533					
	SUD, NO TX (51.7%)			SUD, TREATED (48.3%)		ACUTE ONLY (12.4%)		ONGOING TX (87.6%)	
	n=76,465	n	%	n=71,533		n=8,880		n=62,653	
Hypertension	9,162		12.0	5,851	11.5	737	12.9	5,114	11.3
Lupus erythematosus	483		0.6	246	0.5	28	0.5	218	0.5
Pneumonia	4,676		6.1	4,005	7.9	470	8.2	3,535	7.8
Renal disease	17,456		22.8	13,671	26.9	1,554	27.1	12,117	26.9
Seizure disorder	5,228		6.8	3,675	7.2	461	8.0	3,214	7.1
Women with delivery, 2003–2007†	11,463		15.0	11,523	16.1	1,196	13.5	10,327	16.5

* The span 2003–2007 was selected in order to permit analysis of the pre-delivery pregnancy year and the postpartum year during the study period of 2002–2008. All values significant at $p > .05$ except for differences among treatment modalities for diabetes, Hepatitis carrier, and Lupus erythematosus.

Table 2

Modalities of treatment among women who utilized the SUD treatment system

MODALITY, WOMEN WITH SUD, 2002–2008, Part 1 n=147,998	Treatment admissions by modality	
	n	%
Treatment category (exclusive)		
No known SUD treatment	76,465	51.7
SUD treatment (missing=0)	71,533	48.3
Acute only (detoxification/stabilization)	8,880	12.4
Ongoing treatment services	62,628	87.6
Missing	25	0.0
Other treatment modalities (non-exclusive categories)		
Outpatient treatment	39,815	63.6
Methadone/ buprenorphine treatment	11,354	18.1
Residential treatment	12,876	20.6
Transitional services	7,143	11.4
Other support services	20,862	33.3
Modality missing	653	1.0
MODALITY DURING A TREATMENT YEAR, Part 2 (index admission through 365 days), anytime during 2003–2007* n=68,801		
Treatment category (exclusive)		
Acute only	11,692	18.0
Ongoing services	51,807	82.0
Non-acute treatment modalities (non-exclusive categories)		
Outpatient treatment	29,960	57.8
Narcotic treatment (methadone, buprenorphine)	6,214	11.9
Residential treatment	6,938	13.3
Transitional services	3,556	6.8
Other support services	12,442	24.0
Modality missing	363	0.7

* Time period restricted to 2003–2007 to allow for a pretreatment year and a post-treatment year for each woman entered into the analysis for the study period 2002–2008.

Table 3

Differences in treatment system utilization by types of substances recorded among women with SUD, 2002–2008

	ALL SUD WOMEN n=147,998		DIFFERENCES BY UTILIZATION OF SUD SERVICES				TREATED WOMEN, BY TYPE OF SERVICES			
	n	%	No Services n=76,465	n	%	Rec'd Services n=71,533	n	%	Acute Only n=8,880	Ongoing Services n=62,653
SUD associated with mention of specific substance										
<i>By exclusive substance type:</i>										
Alcohol only	40,786 (27.5)		31,633		77.6	9,153		22.4	897	8,256
Drugs only	44,787 (30.2)		26,151		58.4	18,636		41.6	3,309	15,327
Alcohol plus drugs	59,906 (40.5)		17,468		29.2	42,438		70.8	4,631	37,807
Substance type missing	2,519 (1.7%)		1,213		1.6	1,306		1.8	43	1,263
<i>By specific drug (non-exclusive):</i>										
Alcohol	100,692		49,101		48.8	51,591		51.2	5,528	46,063
Cocaine	36,554		11,161		30.5	25,393		69.5	2,759	22,634
Opiates	40,069		12,629		31.5	27,440		68.5	4,445	22,995
Sedatives, barbiturates, hypnotics, anaesthetics	8,253		4,345		52.6	3,908		47.4	453	3,455
Cannabis	31,292		10,875		34.8	20,417		65.2	1,316	19,101
Hallucinogens	1,371		503		36.7	497		63.3	72	796
Stimulants	4,724		3,212		68.0	1,512		32.0	71	1,441

Readmission for acute treatment (detoxification/stabilization) in year following index treatment year, by type of treatment and type of drug mentioned

Table 4

Modality		Readmission		Chi-Sq value	RR (95% CI)	p-value
		n	%			
All drugs	Acute admission(s) only (n= 11,692)	1,452	12.4	83.2	1.29 (1.22–1.36)	<.0001
	Ongoing services (n= 51,807)	4,974	9.6			
Any opiate use	Acute admission(s) only (n= 11,692)	958	15.2	1.8	.95 (.8–1.009)	0.17
	Ongoing services (n=51,807)	3,008	15.9			
Any cocaine use	Acute admission(s) only (n=11,692)	765	17.4	39.3	1.27 (1.20–1.40)	<.0001
	Ongoing services (n=51,807)	2,595	13.7			
Any alcohol use	Acute admission(s) only (n=11,692)	1,146	14.7	126.8	1.42 (1.30–1.50)	<.0001
	Ongoing services (n=51,807)	3,945	10.4			

Table 5
Factors affecting the number of post-treatment year ED visits and inpatient admissions

	Factors affecting the number of post-treatment year ED visits			Factors affecting the number of post-treatment inpatient medical hospitalizations		
	IRR	(Wald 95% CI)	P-Value	IRR	(Wald 95% CI)	P-Value
UNADJUSTED						
Acute treatment only	1.10	(1.06, 1.14)	<.0001	1.06	(1.02, 1.12)	0.0102
ADJUSTED *						
Acute treatment only	1.10	(1.07, 1.12)	<.0001	0.97	(0.92, 1.03)	0.3208
Other Race	1.06	(1.03, 1.09)	<.0001	1.14	(1.08, 1.21)	<.0001
Hispanic	0.96	(0.94, 0.99)	0.0032	0.97	(0.92, 1.03)	0.3155
Black	0.96	(0.93, 0.98)	0.0015	0.90	(0.85, 0.95)	0.0003
Asian/Pacific Islander	1.01	(0.91, 1.11)	0.9248	1.81	(1.54, 2.14)	<.0001
Public insurance	1.04	(1.02, 1.05)	<.0001	0.87	(0.84, 0.90)	<.0001
Psychiatric history	1.01	(0.99, 1.03)	0.2936	1.26	(1.20, 1.32)	<.0001
Complex/chronic illness	1.00	(0.99, 1.02)	0.7434	1.60	(1.55, 1.66)	<.0001
Delivery during study period	1.00	(0.97, 1.03)	0.8656	1.20	(1.13, 1.27)	<.0001
Age 40+	1.08	(1.03, 1.14)	0.0010	1.71	(1.51, 1.94)	<.0001
Age 35–39	1.11	(1.06, 1.16)	<.0001	1.53	(1.35, 1.73)	<.0001
Age 30–34	1.10	(1.05, 1.15)	0.0002	1.58	(1.40, 1.79)	<.0001
Age 25–29	1.12	(1.07, 1.18)	<.0001	1.39	(1.22, 1.58)	<.0001
Age 20–24	1.08	(1.03, 1.13)	0.0021	1.15	(1.01, 1.30)	0.0310
Age 18–19	1.05	(1.00, 1.11)	0.0431	1.12	(0.98, 1.28)	0.0923
Region 6 (Boston)	0.98	(0.96, 1.01)	0.2211	0.86	(0.81, 0.91)	<.0001
Region 5 (SE MA)	1.00	(0.98, 1.03)	0.7300	0.65	(0.62, 0.68)	<.0001
Region 4 (MetroWest)	1.06	(1.03, 1.08)	<.0001	0.89	(0.84, 0.99)	<.0001
Region 3 (NE MA)	0.99	(0.96, 1.02)	0.3864	0.91	(0.86, 0.96)	0.0008
Region 2 (Central MA)	0.97	(0.94, 0.99)	0.0168	0.82	(0.77, 0.87)	<.0001

* adjusted solely for the variables listed in this table: acute treatment, race, insurance, psychiatric history, complex/chronic illness history, delivery during study period, age and region. Reference categories included ongoing treatment, white race, private insurance, no psychiatric history, complex/chronic illness or delivery during the study period, age 15–18, and region 1.