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The Association between Stimulant, Opioid, and Multiple Drug Use on Behavioral Healthcare Utilization in a Safety-Net Health System

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Abstract

Background—Prior studies show an association between drug use and healthcare utilization. The relationship between specific drug type and emergent/urgent, inpatient, outpatient and behavioral healthcare utilization has not been examined. We aimed to determine if multiple drug use was associated with increased utilization of behavioral healthcare.

Methods—To assess healthcare utilization, we conducted a retrospective cohort study of patients who accessed healthcare at a safety-net medical center and affiliated clinics. Using electronic health records, we categorized patients who used stimulants, opioids, or multiple drugs based on urine toxicology screening tests and/or International Classification of Diseases, 9th Revision (ICD-9). Remaining patients were categorized as patients without identified drug use. Healthcare utilization by drug use group and visit type was determined using a negative binomial regression model. Associations were reported as incidence rate ratios. Utilization was described by rates of healthcare-related visits for inpatient, emergent/urgent, outpatient, and behavioral healthcare among patients who used drugs, categorized by drug types, compared to patients without identified drug use.

Results—Of 95,198 index visits, 4.6% (n=4,340) were by patients who used drugs. Opioid and multiple drug users had significantly higher rates of behavioral healthcare visits than patients without identified drug use (opioid incidence rate ratio [IRR]=7.2; 95% confidence interval [CI] 3.8–13.8; multiple drug use IRR=5.6, 95% CI 3.3–9.7). Patients who used stimulants were less likely to use behavioral health services (IRR=1.3, 95% CI 0.9–2.0) when compared to opioid and

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AUTHOR CONTRIBUTIONS

SLC contributed to the research conception and design, interpretation of results, writing and revision of the manuscript. AK contributed to the collection and management of data, data analysis, and interpretation of results. JB and TC contributed to the revision of the manuscript. IAB provided guidance in research conception and design, interpretation of results and revision of the manuscript.

multiple drug users, but were more likely to use inpatient (IRR=1.6, 95% CI 1.4–1.8) and emergent/urgent care (IRR=1.4, 95% CI 1.3–1.5) services as compared to patients without identified drug use.

Conclusions—Integrated medical and mental healthcare and drug treatment may reduce utilization of costly healthcare services and improve patient outcomes. How to capture and deliver primary care and behavioral healthcare to patients who use stimulants needs further investigation.

Keywords

stimulant; opioid; multiple drug use; healthcare; utilization

INTRODUCTION

Drug involved people access costly healthcare resources more frequently than people who do not use drugs^{1–6}. Utilization of costly healthcare resources by people who use drugs has been attributed to diseases associated with drug use such as infections and organ dysfunction^{1,7–14}. Comorbid drug use and mental health disorders are highly correlated^{15–17}. Individuals with mental health disorders may use drugs to self-medicate symptoms of depression or anxiety leading to poor health outcomes and use of costly healthcare resources^{17–20}. People who use drugs with poorly controlled medical and mental health disorders have a great need to obtain routine healthcare, but often lack access^{21,22}.

Traditionally, medical care, mental healthcare and drug treatment are provided in separate clinical sites. Among patients with HIV, the integration of addiction and HIV treatment improved antiretroviral adherence and HIV-related outcomes^{23–26}. Linkage between medical, mental healthcare and drug treatment in patients with multiple comorbidities would improve the quality of care delivered while benefiting both patients and providers^{27,28}. Service linkage can enhance patient compliance with medications and clinic appointments, allow for early identification of drug and alcohol use causing medical problems, and provide support for relapse prevention^{1,14,29–31}.

This study examined healthcare utilization by drug type in a large patient cohort. We aimed to identify if drug use type (opioid, stimulant, multiple drug) was associated with specific healthcare-related service utilization (emergent/urgent, inpatient, outpatient, behavioral healthcare). Prior work has shown an association between polysubstance use, psychiatric symptoms, and mental health instability^{32,33}. We hypothesized that patients who used multiple drugs would access behavioral health services more frequently than patients with monodrug use.

METHODS

Study Design and Setting

We conducted a retrospective cohort study of all patient visits to an urban safety-net medical center in 2010 (N=95,128). This study was approved by the Colorado Multiple Institutional Review Board. Denver Health Medical Center includes an emergency department, a 477-bed inpatient hospital, outpatient surgical and medical subspecialty clinics, and behavioral health

and drug use disorder clinics. Denver Health Medical Center is affiliated with eight federally qualified community health centers located across Denver County which deliver primary care and women's healthcare. Patients served are predominately uninsured and underinsured ethnic minorities^{34,35}.

Data Source and Participants

All patient visits between January 2010 and December 2010 were examined via an electronic query of existing electronic health records (EHR) in the Denver Health Data Warehouse. The Data Warehouse pools retrospective data from both administrative and clinical applications used in medical care delivery and includes demographic and laboratory data, and International Classification of Diseases, 9th Revision codes (ICD-9)³⁶.

The first patient encounter during 2010 was categorized as the index visit. At the index visit, patients were categorized based on ICD-9 codes consistent with drug abuse/dependence in EHR data and on positive urine drug screens (UDS) in the four years preceding their index visit. Patients were then categorized as users of stimulants, opioids, or multiple drugs to identify drug-specific healthcare utilization patterns. Stimulant users included patients with at least one encounter with an ICD-9 diagnosis of stimulant abuse (305.6, 305.7) or dependence (304.2, 304.4) or a positive UDS for cocaine or amphetamine. Opioid users included patients with at least one encounter with an ICD-9 diagnosis of opioid abuse (305.5) or dependence (304.0) with or without a positive UDS for opioids. Patients with a positive UDS for opioids without an ICD-9 diagnosis indicating opioid abuse or dependence were excluded from the opioid use group since these patients might have been using opioids to treat pain-related diagnoses. They were instead described as patients without identified drug use. Multiple drug users were defined as patients with at least one encounter with an ICD-9 diagnosis indicating combinations of drug dependence or use (304.7, 304.8), or if they had at least one UDS positive for 2 drugs in the same UDS, or if they had 2 positive UDS for cocaine, amphetamine, and/or opioids on separate occasions during the four years prior to their index visit. All other patients were defined as patients without identified drug use. Drug use categories were mutually exclusive.

Baseline Measures

Sociodemographic characteristics came from registration data collected at the index visit. Chronic health conditions, mental health disorders, tobacco use, alcohol abuse/dependence, and prior drug abuse treatment were determined by querying visits in the four years preceding the index visit using ICD-9 codes (2006–2009).

Primary outcome variable: Utilization events

Follow-up visits were defined as utilization events and were determined for each patient in the 364 days following their index visit. Utilization events were categorized by drug use group (stimulant, opioid, multiple drugs, none identified). Utilization events included any healthcare visit subsequent to, but not including, the index visit, and were categorized by visit type (inpatient, emergent/urgent, outpatient, and behavioral health). Services offered in outpatient and community clinics included primary and subspecialty care. Behavioral health clinics offered mental health, drug, alcohol treatment, and opioid replacement therapy with

methadone and buprenorphine. Pharmacotherapy for addiction treatment was not uniformly offered in outpatient or community clinics.

Statistical Analyses

Analyses were performed using SAS Enterprise Guide 4.3 (SAS Institute, Inc., Cary, North Carolina). Unadjusted associations between drug use groups and utilization events were assessed with one-way ANOVA or Kruskal Wallis test for continuous variables and chi-square test for categorical variables. Frequencies and proportions were reported for categorical data. Outcomes of interest found to be significant ($p < 0.25$) in the unadjusted analyses were included as covariates in the regression analyses. Healthcare utilization by drug use group and visit type was determined using a negative binomial regression model and associations were reported as incidence rate ratios. The multivariable (negative binomial) model was adjusted for age, gender, race/ethnicity, insurance status, tobacco use, mental health disorder and chronic health conditions. Mental health disorders identified included schizophrenia, bipolar, anxiety, depression, and personality disorders. Chronic health conditions identified included neoplasms, diabetes, hypertension, cardiac diseases, congestive heart failure (CHF), cerebrovascular disease, chronic obstructive pulmonary disease (COPD), end stage renal disease on dialysis, and HIV/AIDS. Utilization events by drug use groups were compared to patients without identified drug use with an incidence rate ratio (IRR) and a 95% confidence interval (95% CI).

RESULTS

Table 1 describes baseline characteristics. There were a total 95,198 index visits in 2010. There were 90,858 patients without identified drug use. Of these, females made up 54% ($n=48,873$) of the index visits, the majority of the visits were by Hispanics (42%, $n=37,928$), and the median age was 41 ± 16 years. Ten percent ($n=8,940$) had current or prior alcohol use, and the combined total of all mental health disorders was 9% ($n=8,351$). The prevalence of past or present smoking was 13% ($n=11,493$), the most prevalent chronic health condition was hypertensive diseases (18%, $n=16,405$), and the combined total of all chronic health conditions was 26% ($n=23,181$).

Among patients who used drugs ($n=4,340$), patients who used stimulants had the majority of the index visits 60% ($n=2,599$). Males predominated in each group and non Hispanic whites (NHW) comprised 36% ($n=940$) of stimulants users, 60% ($n=433$) of opioid users, and 53% ($n=542$) of multiple drug users. Comorbid alcohol use and mental health disorders were highly prevalent. Thirty-one percent ($n=808$) of patients who used stimulants, 25% ($n=178$) of patients who used opioids, and 53% ($n=544$) of patients who used multiple drugs had a dual diagnosis of alcohol abuse/dependence and mental health disorders. Fifty-nine percent ($n=1,526$) of stimulant users, 39% ($n=285$) of opioid users, and 50% ($n=507$) of multiple drug users had chronic health conditions.

Utilization Events (Inpatient, Emergent/Urgent, Outpatient, and Behavioral Healthcare)

Table 2 describes unadjusted and adjusted rates of utilization events among patients who used drugs as compared to patients without identified drug use. In the adjusted model,

patients who used stimulants, opioids, or multiple drugs, were more likely to utilize both emergent/urgent and inpatient care as compared to patients without identified drug use. Patients who used opioids were less likely to utilize outpatient care (IRR 0.7, 95% CI 0.7–0.8) but more likely to access behavioral healthcare (IRR 7.2, 95% CI 3.8–13.8) as compared to patients without identified drug use (ref IRR=1). In the adjusted model, there were no differences in utilization of outpatient care among patients who used stimulants or multiple drugs as compared to patients without identified drug use. There was no difference in rate of behavioral healthcare visits among stimulant users as compared to patients without identified drug use.

Stimulant users had the highest rate of inpatient visits overall as compared to patients with opioid and multiple drug use (IRR 1.6, 95% CI 1.4–1.8). Stimulant users were least likely to obtain outpatient care as compared to patients with opioid or multiple drug use. In adjusted analyses, those who used opioids (IRR 7.2, 95% CI 3.8–13.8) and multiple drugs (IRR 5.6, 95% CI 3.3–9.7) were more likely to access behavioral healthcare as compared to patients who used stimulants (IRR 1.3, 95% CI 0.9–2.0).

DISCUSSION

Our results reiterate previous studies in which people who used drugs had higher utilization of costly emergent/urgent and inpatient services^{37–40}. When examining utilization by specific drug type, patients who used multiple drugs accessed behavioral healthcare more frequently than stimulant users, but opioid users had the highest rate of behavioral healthcare utilization. This may be due, in part, to the fact that patients who used opioids could access both addiction and mental health treatment at our behavior health clinics. Patients who used stimulants had the lowest rate of behavioral healthcare utilization. This may be attributed to the lack of effective therapies to manage stimulant addiction, such as opioid replacement therapy used to treat opioid addiction. Patients who used stimulants may have had less incentive to obtain non-emergent behavioral healthcare on a regular basis. Prior studies demonstrated similar findings and showed that HIV infected people using stimulants were less likely to adhere to antiretroviral therapy as compared to HIV infected people using other drugs^{41–46}. Identifying patients who use stimulants in the emergent/urgent and inpatient setting, and encouraging their participation in behavioral healthcare treatment, may reduce utilization of costly healthcare resources while improving patient outcomes.

Combining primary medical care, behavioral healthcare and substance abuse services to improve patient outcomes has been advocated for more than a decade^{23,27,28,47,48}. Our findings also support an integrated healthcare delivery system. As shown here, patients who use opioids and multiple drugs are more likely to access behavioral healthcare services. By combining primary care and behavioral healthcare, we may be able to prevent costly healthcare utilization. A simple cellulitis due to injection drug use may be identified and treated early in the outpatient clinic if a patient, who injected drugs, were seen by a primary care provider immediately following their behavioral healthcare visit. Combined medical care and behavior healthcare delivery would potentially prevent the development of an abscess and a costly inpatient surgical procedure. Our findings demonstrate that this

healthcare system, and others like it, represents a missed opportunity for primary care delivery to patients who use drugs and are already obtaining behavioral healthcare.

This study had some important limitations. There was likely underascertainment bias due to the use of ICD-9 codes and UDS to categorize patients into drug use groups. The use of ICD-9 codes to categorize drug use depends on the accuracy of the diagnosis and consistent provider documentation. Patients in this study may have received subsequent healthcare at another institution and would not be captured in our follow-up period. Missed outpatient and behavioral healthcare visits at outside institutions are less likely because Denver Health is the primary safety-net institution in Denver and is the only institution which accepts discount healthcare programs (CICP/DFAP) or Denver Health Medicaid within the county for follow-up care.

Our study population was largely comprised of non Hispanic Whites and African Americans with a significant burden of chronic medical and mental health disorders. These characteristics represent many patients seeking care in safety-net healthcare systems nationwide. Future research is needed to determine how best to deliver primary care and behavioral healthcare to patients who use stimulants and multiple drugs.

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References

1. Binswanger IA, Takahashi TA, Bradley K, Dellit TH, Benton KL, Merrill JO. Drug users seeking emergency care for soft tissue infection at high risk for subsequent hospitalization and death. *Journal of studies on alcohol and drugs*. Nov; 2008 69(6):924–932. [PubMed: 18925351]
2. Cai R, Crane E, Poneleit K, Paulozzi L. Emergency department visits involving nonmedical use of selected prescription drugs in the United States, 2004–2008. *Journal of pain & palliative care pharmacotherapy*. Sep; 2010 24(3):293–297. [PubMed: 20718652]
3. Hendrickson RG, Cloutier R, McConnell KJ. Methamphetamine-related emergency department utilization and cost. *Academic emergency medicine : official journal of the Society for Academic Emergency Medicine*. Jan; 2008 15(1):23–31. [PubMed: 18211309]
4. Kassed, CA.; Levit, KR.; Hambrick, MM. Healthcare Cost and Utilization Project (HCUP) Statistical Briefs. Rockville (MD): Agency for Health Care Policy and Research (US); 2006. Hospitalizations Related to Drug Abuse, 2005: Statistical Brief #39.
5. London JA, Utter GH, Battistella F, Wisner D. Methamphetamine use is associated with increased hospital resource consumption among minimally injured trauma patients. *The Journal of trauma*. Feb; 2009 66(2):485–490. [PubMed: 19204525]

6. Richards JR, Bretz SW, Johnson EB, Turnipseed SD, Brofeldt BT, Derlet RW. Methamphetamine abuse and emergency department utilization. *The Western journal of medicine*. Apr; 1999 170(4): 198–202. [PubMed: 10344172]
7. Dausey DJ, Desai RA. Psychiatric comorbidity and the prevalence of HIV infection in a sample of patients in treatment for substance abuse. *The Journal of nervous and mental disease*. Jan; 2003 191(1):10–17. [PubMed: 12544594]
8. Nelson PK, Mathers BM, Cowie B, et al. Global epidemiology of hepatitis B and hepatitis C in people who inject drugs: results of systematic reviews. *Lancet*. Aug 13; 2011 378(9791):571–583. [PubMed: 21802134]
9. Vasica G, Tennant CC. Cocaine use and cardiovascular complications. *The Medical journal of Australia*. Sep 2; 2002 177(5):260–262. [PubMed: 12197823]
10. Restrepo CS, Carrillo JA, Martinez S, Ojeda P, Rivera AL, Hatta A. Pulmonary complications from cocaine and cocaine-based substances: imaging manifestations. *Radiographics : a review publication of the Radiological Society of North America, Inc*. Jul-Aug;2007 27(4):941–956.
11. Peterson PL, Roszler M, Jacobs I, Wilner HI. Neurovascular complications of cocaine abuse. *The Journal of neuropsychiatry and clinical neurosciences*. Spring;1991 3(2):143–149. [PubMed: 1821227]
12. Crowe AV, Howse M, Bell GM, Henry JA. Substance abuse and the kidney. *QJM : monthly journal of the Association of Physicians*. Mar; 2000 93(3):147–152. [PubMed: 10751233]
13. Westover AN, Nakonezny PA, Haley RW. Acute myocardial infarction in young adults who abuse amphetamines. *Drug and alcohol dependence*. Jul 1; 2008 96(1–2):49–56. [PubMed: 18353567]
14. Binswanger IA, Kral AH, Bluthenthal RN, Rybold DJ, Edlin BR. High prevalence of abscesses and cellulitis among community-recruited injection drug users in San Francisco. *Clinical infectious diseases : an official publication of the Infectious Diseases Society of America*. Mar; 2000 30(3):579–581. [PubMed: 10722447]
15. Merikangas KR, Mehta RL, Molnar BE, et al. Comorbidity of substance use disorders with mood and anxiety disorders: results of the International Consortium in Psychiatric Epidemiology. *Addictive behaviors*. Nov-Dec;1998 23(6):893–907. [PubMed: 9801724]
16. Swendsen J, Conway KP, Degenhardt L, et al. Mental disorders as risk factors for substance use, abuse and dependence: results from the 10-year follow-up of the National Comorbidity Survey. *Addiction (Abingdon, England)*. Jun; 2010 105(6):1117–1128.
17. Regier DA, Farmer ME, Rae DS, et al. Comorbidity of mental disorders with alcohol and other drug abuse. Results from the Epidemiologic Catchment Area (ECA) Study. *JAMA : the journal of the American Medical Association*. Nov 21; 1990 264(19):2511–2518. [PubMed: 2232018]
18. French MT, Fang H, Balsa AI. Longitudinal analysis of changes in illicit drug use and health services utilization. *Health services research*. Jun; 2011 46(3):877–899. [PubMed: 21143479]
19. Rounsaville BJ, Anton SF, Carroll K, Budde D, Prusoff BA, Gawin F. Psychiatric diagnoses of treatment-seeking cocaine abusers. *Archives of general psychiatry*. Jan; 1991 48(1):43–51. [PubMed: 1984761]
20. Kidorf M, Disney ER, King VL, Neufeld K, Beilenson PL, Brooner RK. Prevalence of psychiatric and substance use disorders in opioid abusers in a community syringe exchange program. *Drug and alcohol dependence*. May 10; 2004 74(2):115–122. [PubMed: 15099655]
21. Murri R, Fantoni M, Del Borgo C, et al. Intravenous drug use, relationship with providers, and stage of HIV disease influence the prescription rates of protease inhibitors. *Journal of acquired immune deficiency syndromes (1999)*. Dec 15; 1999 22(5):461–466. [PubMed: 10961607]
22. McGeary KA, French MT. Illicit drug use and emergency room utilization. *Health services research*. Apr; 2000 35(1 Pt 1):153–169. [PubMed: 10778828]
23. Selwyn PA, Budner NS, Wasserman WC, Arno PS. Utilization of on-site primary care services by HIV-seropositive and seronegative drug users in a methadone maintenance program. *Public health reports (Washington, DC: 1974)*. Jul-Aug;1993 108(4):492–500.
24. Palepu A, Horton NJ, Tibbetts N, Meli S, Samet JH. Uptake and adherence to highly active antiretroviral therapy among HIV-infected people with alcohol and other substance use problems: the impact of substance abuse treatment. *Addiction (Abingdon, England)*. Mar; 2004 99(3):361–368.

25. Palepu A, Tyndall MW, Joy R, et al. Antiretroviral adherence and HIV treatment outcomes among HIV/HCV co-infected injection drug users: the role of methadone maintenance therapy. *Drug and alcohol dependence*. Sep 15; 2006 84(2):188–194. [PubMed: 16542797]
26. Cunningham CO, Sohler NL, Cooperman NA, Berg KM, Litwin AH, Arnsten JH. Strategies to improve access to and utilization of health care services and adherence to antiretroviral therapy among HIV-infected drug users. *Substance use & misuse*. 2011; 46(2–3):218–232. [PubMed: 21303242]
27. Samet JH, Friedmann P, Saitz R. Benefits of linking primary medical care and substance abuse services: patient, provider, and societal perspectives. *Archives of internal medicine*. Jan 8; 2001 161(1):85–91. [PubMed: 11146702]
28. D'Aunno T. Linking substance abuse treatment and primary health care. *Treating drug abusers effectively*. 1997:311–331.
29. Sörensen TA, Bentsen K, Eghøj K, Orholm M, Höybye G, Offersen P. Prospective evaluation of alcohol abuse and alcoholic liver injury in men as predictors of development of cirrhosis. *The Lancet*. 1984; 324(8397):241–244.
30. Gao B, Bataller R. Alcoholic liver disease: pathogenesis and new therapeutic targets. *Gastroenterology*. 2011; 141(5):1572–1585. [PubMed: 21920463]
31. Furlanello, F.; Serdoz, LV.; De Ambroggi, L.; Cappato, R. *Drug Abuse and Addiction in Medical Illness*. Springer; 2012. Drug abuse in cardiovascular diseases; p. 393–406.
32. Martinotti G, Carli V, Tedeschi D, et al. Mono- and polysubstance dependent subjects differ on social factors, childhood trauma, personality, suicidal behaviour, and comorbid Axis I diagnoses. *Addictive behaviors*. Sep; 2009 34(9):790–793. [PubMed: 19446962]
33. Hakansson A, Schlyter F, Berglund M. Associations between polysubstance use and psychiatric problems in a criminal justice population in Sweden. *Drug and alcohol dependence*. Oct 1; 2011 118(1):5–11. [PubMed: 21419580]
34. Nuzum, R.; Fund, C. *Denver Health: a high-performance public health care system*. Commonwealth Fund; 2007.
35. Gabow P, Eisert S, Wright R. Denver Health: a model for the integration of a public hospital and community health centers. *Annals of internal medicine*. Jan 21; 2003 138(2):143–149. [PubMed: 12529097]
36. Centers for Disease Control and Prevention. [Accessed August 10, 2014, 2014] ICD-9. [Internet]. Ninth Revision: International Classification of Diseases, Ninth Revision (ICD-9) Classification of Diseases, Functioning, and Disability. 2009. Available at: <http://www.cdc.gov/nchs/icd/icd9.htm>
37. Gelberg L, Andersen RM, Leake BD. The Behavioral Model for Vulnerable Populations: application to medical care use and outcomes for homeless people. *Health services research*. Feb; 2000 34(6):1273–1302. [PubMed: 10654830]
38. Cherpitel CJ, Ye Y. Drug use and problem drinking associated with primary care and emergency room utilization in the US general population: data from the 2005 national alcohol survey. *Drug and alcohol dependence*. Oct 1; 2008 97(3):226–230. [PubMed: 18499355]
39. Billings J, Mijanovich T. Improving the management of care for high-cost Medicaid patients. *Health affairs*. Nov-Dec; 2007 26(6):1643–1654. [PubMed: 17978384]
40. Rittenhouse DR, Shortell SM. The patient-centered medical home: will it stand the test of health reform? *JAMA : the journal of the American Medical Association*. May 20; 2009 301(19):2038–2040. [PubMed: 19454643]
41. Berg KM, Demas PA, Howard AA, Schoenbaum EE, Gourevitch MN, Arnsten JH. Gender differences in factors associated with adherence to antiretroviral therapy. *Journal of general internal medicine*. Nov; 2004 19(11):1111–1117. [PubMed: 15566440]
42. Halkitis PN, Kutnick AH, Slater S. The social realities of adherence to protease inhibitor regimens: substance use, health care and psychological states. *Journal of health psychology*. Jul; 2005 10(4): 545–558. [PubMed: 16014391]
43. Cunningham CO, Sohler NL, Berg KM, Shapiro S, Heller D. Type of substance use and access to HIV-related health care. *AIDS patient care and STDs*. Jun; 2006 20(6):399–407. [PubMed: 16789853]

44. Tucker JS, Burnam MA, Sherbourne CD, Kung FY, Gifford AL. Substance use and mental health correlates of nonadherence to antiretroviral medications in a sample of patients with human immunodeficiency virus infection. *The American journal of medicine*. May; 2003 114(7):573–580. [PubMed: 12753881]
45. Sharpe TT, Lee LM, Nakashima AK, Elam-Evans LD, Fleming PL. Crack cocaine use and adherence to antiretroviral treatment among HIV-infected black women. *Journal of community health*. Apr; 2004 29(2):117–127. [PubMed: 15065731]
46. Crisp BR, Williams M, Timpson S, Ross MW. Medication compliance and satisfaction with treatment for HIV disease in a sample of African-American crack cocaine smokers. *AIDS and behavior*. Jun; 2004 8(2):199–206. [PubMed: 15187481]
47. McLellan AT, Arndt IO, Metzger DS, Woody GE, O'Brien CP. The effects of psychosocial services in substance abuse treatment. *JAMA : the journal of the American Medical Association*. Apr 21; 1993 269(15):1953–1959. [PubMed: 8385230]
48. Carey, TS.; Crotty, KA.; Morrissey, JP., et al. Future Research Needs for the Integration of Mental Health/Substance Abuse and Primary Care: Identification of Future Research Needs from Evidence Report/Technology Assessment No. 173. Rockville (MD): Agency for Healthcare Research and Quality (US); 2010. AHRQ Comparative Effectiveness Reviews.

Table 1

Characteristics of All Patients with a Healthcare Visit (Inpatient, Emergent/Urgent, Outpatient, or Behavioral Health) during 2010 (N =95,198)^a

	Stimulant	Opioids ^b	Multiple Drug	None Identified
Total	2,599	724	1,017	90,858
Sex, n (%)				
Male	1,578 (61)	454 (63)	570 (56)	41,985 (46)
Female	1,021 (39)	270 (37)	447 (44)	48,873 (54)
Race, n (%)				
Non Hispanic White	940 (36)	433 (60)	542 (53)	33,033 (36)
African American	723 (28)	59 (8)	147 (14)	13,281 (15)
Hispanic	853 (33)	210 (29)	294 (29)	37,928 (42)
Other or Unknown	83 (3)	22 (3)	34 (3)	6,615 (7)
Age (years)				
Mean	42 ± 11	44 ± 13	43 ± 11	41 ± 16
Median	44	46	43	39
Insurance, n (%)				
CICP/CHS*	785 (30)	151 (21)	218 (21)	21,891 (24)
Commercial	77 (3)	22 (3)	30 (3)	13,079 (14)
Medicare/Medicaid	1,165 (45)	191 (26)	396 (39)	26,497 (29)
Unknown	120 (5)	244 (34)	244 (24)	12,684 (14)
Self-Pay	452 (17)	116 (16)	129 (13)	16,707 (18)
Prior or Current Related Substance Abuse, n (%)				
Drug Abuse Treatment	5 (0.2)	68 (9)	52 (5)	90 (0.1)
Alcohol Use	1,551 (60)	449 (62)	758 (75)	8,940 (10)
Alcohol Use and Mental Health Condition	808 (31)	178 (25)	544 (53)	1,727 (2)
History of Mental Health Disorder, n (%)				
Schizophrenia	306 (12)	33 (5)	163 (16)	1,206 (1)
Bipolar	1,021 (39)	202 (28)	617 (61)	5,137 (6)
Anxiety	189 (7)	81 (11)	162 (16)	1,613 (2)
Depression	498 (19)	119 (16)	280 (28)	4,079 (4)
Personality Disorder	195 (8)	40 (6)	198 (19)	456 (0.5)
Combined Total of All Mental Health Disorders	1,304 (50)	270 (37)	706 (69)	8,351 (9)
History of Chronic Health Conditions, n (%)				
Cancer	101 (4)	27 (4)	33 (3)	1,990 (2)
Diabetes	337 (13)	57 (8)	82 (8)	7,320 (8)
Hypertensive Diseases	956 (37)	198 (27)	302 (30)	16,405 (18)
Ischemic Heart Disease	223 (9)	34 (5)	54 (5)	2,404 (3)
Cardiomyopathy	153 (6)	27 (4)	33 (3)	1,439 (2)

	Stimulant	Opioids ^b	Multiple Drug	None Identified
Cerebrovascular Disease	98 (4)	18 (2)	27 (3)	1,130 (1)
COPD	609 (23)	133 (18)	223 (22)	6,934 (8)
HIV/AIDS	298 (11)	12 (2)	108 (11)	1,018 (1)
Dialysis	64 (2)	9 (1)	24 (2)	411 (0.4)
Combined Total of All Chronic Health Conditions	1,526 (59)	285 (39)	507 (50)	23,181 (26)
Past or Present Smoking	1,507 (58)	343 (47)	612 (60)	11,493 (13)

^a Colorado Indigent Care Program requirements: Colorado resident or a migrant farm worker, and a citizen or legal immigrant; income/combined resources at or below 250% of FPL; not eligible for Medicaid

^b Excludes patients using opioids for chronic pain management (n = 969)

Unadjusted^a and Adjusted^{a, b} Incidence Rate Ratios (95% CI) of Healthcare Visits among Drug Use Group as Compared to People without Identified Drug Use^c

Table 2

	Stimulants		Opioids		Multiple Drug	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
Inpatient	3.0 (2.7, 3.4)	1.6 (1.4, 1.8)	2.2 (1.8, 2.8)	1.4 (1.1, 1.7)	2.8 (2.3, 3.4)	1.3 (1.1, 1.6)
Emergent/ Urgent	2.6 (2.4, 2.8)	1.4 (1.3, 1.5)	2.3 (2.0, 2.6)	1.4 (1.2, 1.6)	2.9 (2.5, 3.2)	1.5 (1.3, 1.7)
Outpatient	1.6 (1.5, 1.7)	1.1 (1.0, 1.2)	0.9 (0.8, 1.0)	0.7 (0.7, 0.8)	1.3 (1.2, 1.5)	0.9 (0.8, 1.0)
Behavioral Health	4.7 (2.9, 7.6)	1.3 (0.9, 2.0)	4.7 (1.9, 11.4)	7.2 (3.8, 13.8)	13.5 (6.4, 28.5)	5.6 (3.3, 9.7)

^aReference category: no identified drug use

^bAdjusted for age, gender, race/ethnicity, insurance, history of mental health disorder and/or alcohol use, history of cancer, diabetes, cardiac disease, cerebrovascular disease, COPD, HIV, smoking, and/or dialysis, using negative binomial regression.

^c**Bolded** values are significant to p<0.05