HHS Public Access

Author manuscript

Pediatr Emerg Care. Author manuscript; available in PMC 2016 May 01.

Published in final edited form as:

Pediatr Emerg Care. 2015 May ; 31(5): 331–338. doi:10.1097/PEC.0000000000000421.

Substance Abuse and Mental Health Visits Among Adolescents Presenting to US Emergency Departments

Jahan Fahimi, MD, MPH,
Department of Emergency Medicine, Alameda Health System – Highland Hospital Department of Emergency Medicine, University of California, San Francisco Division of Epidemiology, University of California, Berkeley School of Public Health

Adrian Aurrecoechea, BA,
School of Medicine, University of California, San Francisco

Erik Anderson, MD,
Department of Emergency Medicine, Alameda Health System – Highland Hospital

Andrew Herring, MD, and
Department of Emergency Medicine, Alameda Health System – Highland Hospital

Harrison Alter, MD, MS
Department of Emergency Medicine, Alameda Health System – Highland Hospital

Abstract

Objectives—To identify factors associated with adolescent emergency department (ED) visits for substance abuse, including those complicated by mental health (dual diagnosis), and to analyze their effect on ED length of stay (LOS) and disposition.

Methods—We performed a secondary analysis of ED visits by adolescents (aged 11-24) using the National Hospital Ambulatory Medical Care Survey (1997-2010), identifying visits for mental health, substance use, and dual diagnosis. Univariate and multivariate statistics were used to analyze demographic and visit-level factors, factors associated with substance use and dual diagnosis visits, and the effects of substance use and mental health conditions on emergency department LOS and disposition.

Results—Substance use and mental health accounted for 2.1% and 4.3% of all adolescent visits, respectively, with 20.9% (95% confidence interval [CI] 18.3-23.5%) of substance abuse visits complicated by mental health. Factors significantly associated with substance use include: male gender, urban location, West region, ambulance arrival, night and weekend shift, anxiety disorders, mood disorders, and psychotic disorders. Additional LOS was 89.77 minutes for mental health, 71.33 minutes for substance use, and 139.97 minutes for dual diagnosis visits, as compared

Address for Correspondence: Jahan Fahimi, MD, MPH Department of Emergency Medicine Alameda Health System – Highland Hospital 1411 E. 31st Street Oakland, CA 94602 Tel: (510) 437-4564 Fax: (510) 437-8322 jahan.fahimi@ucsf.edu.

Supplemental Digital Content
SDC1. PDF
SDC2. PDF

Conflicts of Interest: For the remaining authors none were declared.

to visits where these conditions were not present. Both mental health and substance use were associated with admission/transfer as compared to other dispositions: mental health, odds ratio (OR) 5.93 (95% CI 5.14-6.84), illicit drug use, OR 3.56 (95% CI 2.72-4.64), and dual diagnosis, OR 6.86 (95% 4.67-10.09).

Conclusions—Substance abuse and dual diagnosis are common among adolescent ED visits and are strongly associated with increased use of prehospital resources, emergency department length of stay, and need for hospitalization.

Keywords

Adolescent; emergency medicine; substance use; dual diagnosis; NHAMCS

INTRODUCTION

Visits to emergency departments (EDs) for alcohol and illicit drugs among children and adolescents pose significant problems for public health and emergency care. Pediatric emergency physicians may struggle to provide effective care and consider the ED ill-suited to ensure continuity of care when treating alcohol related issues among adolescents.[1] Further, substance abuse may complicate presentations to the ED, specifically, visits for mental health conditions and crises. Nearly 15% of adolescent ED mental health presentations nationally were principally diagnosed with substance use.[2] The Substance Abuse and Mental Health Services Administration (SAMHSA)[3] reported on "co-occurring substance abuse disorders and mental disorders," addressing the growing problem of youths with substance abuse, mental disorders, or dual diagnosis. They highlighted the increased prevalence of mental health conditions in children and adolescents who used illicit drugs as compared to those who did not (26.2% versus 16.3%),[4] noting that nearly 43% of youth in the US with mental health conditions have been diagnosed with a concomitant substance disorder.[5] Evidence suggests that most youths with dual diagnosis receive inadequate care or no care at all,[3] adding to these patients' distinction as among the most difficult to manage in the emergency department.[6]

Substantial prior work has addressed psychological risk factors for adolescent substance abuse. Most authors identify attention deficit hyperactivity disorder and conduct disorder, including aggression and impulsivity, as predicting coexisting or future substance use.[7,8,9], While others also implicate depression and anxiety as risk factors,[10,11,12] none were ED-based analyses. Among ED reports of mental health visits, studies have focused largely on increased resource utilization, length of stay, and hospital admission.[2,13,14,15,16] Analyses of the overlap of substance use and mental health in the ED have highlighted limitations in assessing, counseling, and outpatient planning.[17,18] However, little research has filled the epidemiologic gap in understanding how substance abuse in adolescents, both as an independent clinical entity and as one component of dual diagnosis states, affects the emergency care system. Because the ED may be the primary site for managing acute substance abuse intoxications and mental health crises,[19,20] it is a natural venue for analysis of prevalence, associated factors, and clinical outcomes of substance use with or without associated mental illness.

The objective of this study was to identify demographic and clinical factors associated with adolescent ED visits for substance abuse, and the extent to which they are complicated by mental health conditions. Furthermore, we analyzed the effect of substance abuse and mental health conditions on outcomes, specifically ED length of stay and disposition.

METHODS

Study Design and Setting

We performed a cross-sectional, secondary analysis of publicly available and de-identified data from the National Hospital Ambulatory Medical Care Survey (NHAMCS), an annual survey of United States (US) ED and outpatient visits conducted by the Centers for Disease Control and Prevention's National Center for Health Statistics, for years 1997 through 2010. The NHAMCS collects a nationally representative sample of all visits to US EDs, excluding federal hospitals, hospital units of institutions, and hospitals with 6 beds or fewer. The NHAMCS methodology is described in detail on the Centers for Disease Control and Prevention's web site.[21] Our institutional review board designated this study as exempt from review; NHAMCS itself has been approved by the National Center for Health Statistics Research Ethics Review Board.

Definition of Study Population

We identified visits to US EDs by adolescents aged 11 to 24[22] with a chief complaint or diagnosis relating to substance use and/or mental health condition(s). NHAMCS collects up to 3 reasons for visit, 3 ED diagnoses coded using the International Classification of Diseases, Ninth Revision (*ICD-9*), and 3 causes of injury coded using *ICD-9* E-codes.

Substance use was defined as any visit directly influenced by alcohol or illicit drugs, following the definitions of Watkins *et al*,[23] including abuse, dependence, and diagnoses of substance-induced psychiatric symptoms. We divided illicit drug use into 4 categories: (1) opioid, sedative/hypnotic, or anxiolytic, (2) cocaine, amphetamine, psychostimulant, or sympathomimetic, (3) cannabis or hallucinogen, and (4) other/unspecified or combined. While we did not specifically include adverse effect of prescription drugs, in some instances, these visits may have been coded by NHAMCS into one of the above categories.

Our mental health classification was based on previous studies.[2,24,25,26] We created eight mental health subcategories similar to those used by Pottick *et al*.[26] and Claassen *et al*.[27] Our subcategories include: (1) adjustment disorders, (2) anxiety disorders, (3) manic/hypomanic disorders, (4) disruptive behavior disorders, (5) depressive disorders, (6) psychotic disorders, (7) other psychiatric disorders, and (8) suicide (including suicidality and self-harm). Our complete *ICD-9* and reason for visit coding and characterization schema is available online (see Table, Supplemental Digital Content 1, which demonstrates variable coding schema).

Some patients may have experienced mental health symptoms attributable to substance use. Except for suicide/self-harm visits, we excluded visits with a substance use component when using reason for visit to define our mental health designation. Those visits in question would still be included in our mental health variable if they contained a qualifying mental health

diagnosis. For example, if a reason for visit was coded as “anxiety,” but the ultimate diagnosis was “cocaine use,” then the visit would not have been designated as a mental health visit, unless a separate mental health *ICD-9* diagnosis was also assigned to the visit.

Because of potential concerns of the reliability of secondary diagnoses collected in large cross-sectional datasets, we separately identified and reanalyzed substance use and mental health visits only using the first reason for visit, *ICD-9* diagnosis, or *ICD-9* E-code.

Finally, a dual diagnosis visit was defined as a visit that included both mental health and substance use in any number of combinations of the 3 reason for visit codes, *ICD-9* diagnoses, or *ICD-9* E-codes. For example, dual diagnosis may be represented by any qualifying substance use reason for visit and any qualifying mental health *ICD-9* diagnosis. Alternatively, mental health may be coded as a primary *ICD-9* diagnosis and substance use as a secondary, or vice versa.

Study Variables

The following data were collected for each visit included in this analysis: age, sex, race/ethnicity, insurance status, geographic location (urban versus rural, and US region), mode of arrival, day of arrival, time of arrival, ED length of stay (LOS), and patient disposition.

Adolescent age categories were designated as 11 to 13 years, 14 to 18 years, and 19 to 24 years.[22] Urban areas were defined within the NHAMCS dataset according to the US Census Bureau’s metropolitan statistical area (MSA) designation. For day of arrival, we considered weekends versus weekdays, and for time of arrival, we split each day into 3 non-overlapping 8-hour shifts as follows: day shift (7am to 3pm), swing shift (3pm to 11pm), and night shift (11pm to 7am).[28] ED LOS was defined within NHAMCS as date and time of ED arrival to discharge. Because coding of disposition varies from year to year in NHAMCS, we created a binary, composite admission or transfer outcome variable. Hospitals may not have the capacity to admit adolescents or psychiatric patients, and patients requiring admission may thus be transferred. We considered these dispositions together since we could not identify the rationale or indication for admission versus transfer.

In instances where variables were not collected in all years of the dataset or when data were missing, we coded these as missing for the purposes of analysis and did not impute values. Proportions of missing values in the dataset for each variable of interest were as follows: age, sex, US region, and day of the week (0%); race/ethnicity (6.9%); insurance status (0.3%); MSA designation (20.3%), mode of arrival (20.4%); and shift (1.2%).

Data Analysis

We report descriptive statistics for demographic and visit-level factors. Our univariate analysis reveals counts of observations with associated survey-weighted proportions and 95% confidence intervals (CIs). Using two multivariate survey-weighted logistic regression models, we estimate adjusted odds ratios (ORs) for factors associated with: (1) any substance use visit and (2) a dual diagnosis visit. The model predicting dual diagnosis visits excluded individual mental health conditions as covariates since these were used to define the outcome. Because our goal was not to establish a parsimonious prediction model, but

rather to isolate the effects of demographic and visit characteristics, we specified that all *a priori* defined study variables remain in the model regardless of statistical significance. Then, three survey-weighted linear regression models were used to measure the association of: (1) substance use and mental health general categories, (2) individual substance use, mental health, and suicide/self-harm subcategories and (3) dual diagnosis designation on ED LOS (controlling for demographic and visit characteristics). Three similar survey-weighted logistic regression models were used to calculate ORs associated with admission or transfer.

Statistical analysis was performed by using Stata 11.1 (Stata Corp, College Station, TX), and to account for the sampling methodology, the *svy* command was used according to NHAMCS specifications. $P \leq 0.05$ was set as statistically significant.

RESULTS

Between 1997-2010, we identified total 87,855 visits for patients aged 11-24. Of these, 2,157 (2.1% weighted) involved substance use and 4,906 (4.3% weighted) involved mental health. Our dual diagnosis designation was identified in 542 (0.4% weighted) of all adolescent ED visits. Table 1 reports univariate proportions for each of the demographic and clinical variables among substance use, mental health, and dual diagnosis visits. Limiting our case definitions to only primary reason for visit, *ICD-9* diagnosis, or *ICD-9* E-code did not appreciably change these results (see Table, Supplemental Digital Content 2, which reports univariate proportions for primary fields only).

Among all substance use visits, 48.1% (95% CI 45.1-51.1%) involved alcohol, 58.8% (95% CI 55.8-61.8%) involved illicit drugs, and 6.9% (95% CI 5.4-8.5%) involved both. The majority of visits for illicit drug use were either unspecified as to the substance or they were mixed. Additionally, 20.9% (95% CI 18.3-23.5%) of substance use visits by adolescents were complicated by a co-existing mental health condition or state. Proportions of substance use visits for specific alcohol or illicit drugs, or with co-existing mental health conditions can be found in Table 2.

Multivariate analyses of demographic and clinical factors associated with substance use and dual diagnosis visits are in Table 3. Both 14-18 year old and 19-24 year old age categories had dramatically and similarly increased odds of substance use and dual diagnosis visits as compared to the younger age group. Males were also more likely to have similar visits. Compared to white adolescents, Black adolescents were about half as likely to present to the ED with substance related condition or dual diagnosis. Uninsured adolescents were slightly more likely to have visits for substance use as compared to those privately insured, but for dual diagnosis visits, this relationship is absent. However, Medicaid insurance was significantly higher among dual diagnosis visits as compared to private insurance. Urban location and Western region were associated with significantly more substance use visits among adolescents as compared to rural or other regions of the country, respectively. While this West-effect seemed to exist for dual diagnosis visits as well, it was not statistically significant as compared to all regions. Both substance use and dual diagnosis visits were strongly associated with ambulance use as compared to all other forms of arrival, and adolescents were more likely to present to an ED overnight as compared to during the day or

swing shifts. There were slightly higher odds of substance use visits occurring on a weekend. Adolescents with anxiety-related, manic or hypomanic, depressive, psychotic, and other psychiatric disorders were substantially more likely to have ED visits with substance use than other comparable adolescents.

The independent effect of substance use, mental health, or dual diagnosis visits on our outcomes of interest are represented in Table 4. The presence of any substance use added 79.32 minutes to the adolescent ED visit (95% CI 49.82-92.84 minutes) as compared to visits where there was not substance use, while the presence of mental health factors, in general, added 89.77 minutes (95% CI 66.25-113.29 minutes) as compared to when no mental health condition was present. Psychotic and depressive disorders added the most time to the ED LOS among all substance use or mental health subcategories, at 156.43 minutes (95% CI 99.90-212.96 minutes) and 118.68 minutes (67.48-169.88 minutes), respectively as compared to when no psychotic or depressive disorders were present. Dual diagnosis visits were associated with an additional 139.97 minutes (95% CI 77.78-202.17 minutes) of ED LOS as compared to visits without a dual diagnosis condition.

Mental health visits were strongly associated with admission or transfer (OR 5.93, 95% CI 5.14-6.84).. Similar to the ED LOS findings, visits for psychotic (OR 11.43, 95% CI 7.98-16.38) and depressive disorders (OR 9.88, 95% CI 7.15-13.64) had the highest odds, while anxiety disorders were significantly less likely to be admitted or transferred (OR 0.46, 95% CI 0.31-0.70). While substance use visits overall were associated with admission or transfer as compared to visits without substance use, the finding was largely driven by illicit drug use (OR 3.56, 95% CI 2.72-4.64) rather than alcohol. Dual diagnosis visits also had a dramatic association with admission or transfer (OR 6.86, 95% CI 4.67-10.09) as compared to visits without a dual diagnosis condition.

DISCUSSION

The management of adolescents with acute substance-related conditions, intoxication, or mental health crises poses a challenge for emergency providers.[11] The epidemiology of mental health visits among such patients has been studied previously[2,14,15] and our findings, from a larger and updated sample, corroborate these results. However, the present study expands the focus to a cohort of patients of adolescents whose ED visit includes substance abuse, dependence, or intoxication.

We show that older, male adolescents are more likely to present to EDs with conditions related to substance abuse, supported by earlier studies.[8,11] Black adolescents were significantly less likely to present to the ED with both substance use and dual diagnosis. Though cross-sectional studies suggest a recent increase in marijuana and nonmedical use of prescription drugs for this group, in general, black adolescents have lower drug and alcohol use than white adolescents and black adults.[29]

Our findings support the SAMHSA speculation that Medicaid patients would experience higher than average rates of dual diagnosis, given the link between poverty and dual diagnosis.[3] However, the link between urban location and adolescent substance abuse ED

visits is complex and may be confounded by treatment options. Prior work shows a higher likelihood of inpatient substance abuse treatment in rural areas for all substances except heroin and cocaine.[30] Thus the ED may be more commonly used for substance abuse care in urban areas while non-ED treatment or subacute facilities are more available in rural areas, and this association may be confounded by type of substance involved.

While the ED may remain a primary site for evaluation of adolescents with substance use problems, prior work has shown that primary care physicians and health maintenance organizations may have unique opportunities to effectively screen, identify, and refer adolescents to treatment programs.[31,32] However, for patients who do ultimately present to emergency care, it is critical for providers to be aware of and utilize established tools for intervention to reduce recidivism and future substance use.[33,34]

Most notably, we have found that substance abuse and mental health conditions presenting to the ED overlap considerably, with 1 in 5 visits for substances complicated by mental health comorbidity. Nearly every mental health subcategory was positively associated with substance use, particularly with manic or hypomanic disorders. Previous evidence suggests that mood and anxiety disorders may be the most common mental health components among dual diagnoses for the general community.[35] Our data support this finding for adolescents, adding that mood disorders are highly associated with substance use cases presenting to the ED. A slight increase in the likelihood of dual diagnosis for psychotic patients was surprising, given the lack of literature linking the two in adolescents but perhaps not surprising to clinicians who see dual diagnosis include psychosis but who wonder whether the psychosis is independent or substance-related. Despite the consensus in the literature in support of disruptive behavioral disorders as a risk factor for substance abuse in adolescents,[9,10,11] we did not find them to be associated among ED visits.

Interestingly, suicide/self-harm was not a statistically significant predictor of substance abuse visits, though this may be because use of illicit drugs and alcohol are less likely to be implicated than other causes in suicide visits. Specifically, firearms and suffocation account for up to 85% of youth suicide attempts with poisoning at only 8%.[36]

The medical burden of caring for adolescents with mental illness in the ED is high and influenced by available resources.[37,38] However, we show that these patients disproportionately utilize acute care facilities, ambulances, and time in the ED. This conclusion is supported in prior research.[14,14]

In terms of ED LOS, adolescents with illicit drug or alcohol abuse spend more than an hour longer in the ED than those without substance-related complaints. Reasons for this increased length of stay likely include delays related to caring for adolescents with altered mental status, waiting for patients to metabolize their intoxication, need for administration of sedatives, need for involvement of social work or child protective services, or delays related to involvement of parents or guardians. The increased length of stay is even more dramatic for adolescents with mental health visits, adding anywhere from 1 to 2.5 hours to the visit depending on the specific condition.

Aside from the burden in terms of additional time, mental health patients utilize more resources both before and after the actual ED visit. Use of emergency medical transport services is relatively higher, both to the ED and later on transfer. And, as expected based on earlier studies, most of our reported conditions also increase the need for hospital admission or transfer.[2,14] Among those who require transfer, ambulance transport is likely necessary to reach an equipped inpatient medical or psychiatric facility. The exception in our findings is visits for anxiety, which yield a very low rate of admission or transfer and do not seem to affect the length of stay. We postulate that the identification of anxiety, not complicated by other acute medical or psychiatric conditions, is frequently reassuring to providers, and is perhaps more easily treated and managed, and thus may result in more timely discharge.

Future research should focus on both the novel findings of this analysis, specifically identification of the highest-risk groups of adolescents, as well as the gaps it highlights. Understanding which specific factors contribute to increased length of stay, cataloging the indications and reasons for admission and transfer, as well as observing other metrics of resource utilization, such as need for pharmacologic intervention, laboratory testing, and/or specialty consultation, will better characterize the burdens of caring for adolescents with substance abuse and mental health conditions. Special attention should be paid to careful characterization and classification of diagnoses, utilizing routine toxicological screening and expert psychiatric evaluation as necessary. Further, as local, state, or national policies or practices change with respect to prevention, treatment, or management of substance use, abuse, and addiction in adolescents, investigators should audit the impact on our findings.

These findings should be viewed in light of study limitations. Though this study used a large, nationally representative data set over 14 years, there are some limitations that need to be addressed. First, our definitions of substance use or mental health visits included those coded in the second and third reasons for visit, *ICD-9* diagnoses, and *ICD-9* E-code cause variables from within NHAMCS. Some authors have suggested that these secondary and tertiary fields are less accurate than the primary field.[39] However, for our analysis, use of these additional fields is important, given than visits for substance use may occur simultaneously with other medical or traumatic conditions (i.e., alcohol abuse and head injury). Further, the creation of a dual diagnosis variable requires inclusion of these additional fields in order to capture where substance abuse and mental health overlap. We explored this potential misclassification bias through a sensitivity analysis, limiting our variable definitions to primary fields only, and found that there was no change in our demographic or clinical proportions. Lastly, it should be noted that in many cases, for example, with regard to manic behavior and suicidal behavior, ICD-9 diagnostic classifications are inconsistent with those published by the American Psychological Association in the Diagnostic and Statistical Manual of Mental Disorders.[40]

Second, additional misclassification bias may be introduced into the NHAMCS data when discharge diagnoses for mental health conditions are being applied. Similarly, without routine and ubiquitous toxicology screening for all these patients, the specific type of substance may not be recorded accurately. Nonetheless, the general substance use and mental health variables, as well as many subcategories, show very robust associations with

our demographic and clinical covariates and outcomes of interest, and even if overestimated, likely represent dramatic relationships.

Third, in any cross-sectional analysis of this kind, statements of causation cannot be made. As such, we are unable to identify the specific factors that cause increased ED LOS or contribute to admission or transfer. Specifically, we cannot ascertain the actual burden on providers, including ED physicians and nurses, pediatricians, psychiatrists, and social workers, nor can we identify if, when, and how each of these parties were involved managing these cases.

Finally, we must address the limitations in combining all substance abuse and all mental health into two large categories for some of our analyses. Certainly not all these entities are equal, and we have tried to create logical and precedential subcategories to address this limitation. However, the applications of these subcategories are limited themselves as noted above, and multiple stratifications limit our statistical power to find potentially provocative and important associations. Similarly, our coding scheme considers together acute intoxication by and dependence on a substance, when, in reality, intoxication and dependence may be very distinct clinical entities. Nonetheless, this study highlights the broad role of alcohol and illicit drugs in emergency visits and how they relate to mental health conditions.

CONCLUSIONS

This study emphasizes the role of alcohol and illicit drugs among adolescent ED visits, and highlights the significant overlap with concurrent mental health conditions. Substance abuse and dual diagnosis visits are powerfully associated with increased use of health care utilization and preferentially affects a specific subset of the adolescent population.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

ACKNOWLEDGEMENTS

The authors would like to thank Ross Andelman, MD and Kathleen Pottick, MSW, MA, PhD for their assistance with categorization of mental health subgroups.

Presentation of this work was made possible by R25MD006832 from the National Institute on Minority Health and Health Disparities. The views expressed do not necessarily reflect the official policies of the DHHS.

REFERENCES

1. Mabood N, Ali S, Dong KA, et al. Experiences of pediatric emergency physicians in providing alcohol-related care to adolescents in the emergency department. Pediatr Emerg Care. 2013; 29:1260–1265. [PubMed: 24257589]
2. Case SD, Case BG, Olfson M, et al. Length of stay of pediatric mental health emergency department visits in the United States. J Am Acad Child Adolesc Psychiatry. 2011; 50:1110–1119. [PubMed: 22023999]
3. Substance Abuse and Mental Health Services Administration. [Accessed September 30, 2013] How many people have cooccuring disorders? SAMHSA Report to Congress on the prevention and

treatment of cooccuring substance abuse disorders and mental disorders; 2002. Available at: www.samhsa.gov/reports/congress2002/chap1ucod.htm

4. Substance Abuse and Mental Health Services Administration. Results from the 2001 National Household Survey on Drug Abuse: Volume I. Summary of National Findings. SAMHSA, Office of Applied Studies; Rockville, MD: 2002.
5. Center for Mental Health Services. Mental Health Care for Youth: A national assessment, annual/final progress report. Substance Abuse and Mental Health Services Administration; Rockville, MD: 2001. January 2001-December 2001
6. Wolfe HL, Sorensen JL. Dual diagnosis patients in the urban psychiatric emergency room. J Psychoactive Drugs. 1989; 21:169–175. [PubMed: 2760757]
7. Ernst M, Luckenbaugh DA, Moolchan ET, et al. Behavioral predictors of substance-use initiation in adolescents with and without attention-deficit/hyperactivity disorder. Pediatrics. 2006; 117:2030–2039. [PubMed: 16740845]
8. Gau SS, Chong MY, Yang P, et al. Psychiatric and psychosocial predictors of substance use disorders among adolescents: longitudinal study. Br J Psychiatry. 2007; 190:42–48. [PubMed: 17197655]
9. Molina BS, Pelham WE Jr. Childhood predictors of adolescent substance use in a longitudinal study of children with ADHD. J Abnorm Psychol. 2003; 112(3):497–507. [PubMed: 12943028]
10. Whitesell M, Bachand A, Peel J, et al. Familial, Social, and Individual Factors Contributing to Risk for Adolescent Substance Use. J Addict. 2013 article ID 579310.
11. Sartor CE, Lynskey MT, Heath AC, et al. The role of childhood risk factors in initiation of alcohol use and progression to alcohol dependence. Addiction. 2007; 102:216–225. [PubMed: 17222275]
12. Costello, EJ.; Armstrong, TD.; Erkanli, A. Report on the developmental epidemiology of comorbid psychiatric and substance use disorders; Presented to the National Institute on Drug Abuse; Durham, NC: Duke University Medical Center; 2000.
13. Dolan MA, Mace SE, American Academy of Pediatrics; Committee on Pediatric Emergency Medicine; American College of Emergency Physicians; Pediatric Emergency Medicine Committee. Pediatric mental health emergencies in the emergency medical services system. Pediatrics. 2006; 118:1764–1767. [PubMed: 17015573]
14. Mahajan P, Alpern ER, Grupp-Phelan J, et al. Epidemiology of psychiatric-related visits to emergency departments in a multicenter collaborative research pediatric network. Pediatr Emerg Care. 2009; 25:715–720. [PubMed: 19864967]
15. Santiago LI, Tunik MG, Foltin GL, et al. Children Requiring Psychiatric Consultation in the Pediatric Emergency Department: Epidemiology, Resource Utilization, and Complications. Pediatr Emerg Care. 2006; 22:85–89. [PubMed: 16481922]
16. Zun, LS.; Chepenik, LG.; Mallory, MS., et al. Behavioral emergencies for the emergency physician. Cambridge University Press; Cambridge, UK: 2013.
17. Yu AY, Ata N, Dong K, et al. A Description of Emergency Care Received by Children and Youth with Mental Health Presentations for Alcohol and Other Drug use in two Alberta Emergency Departments. J Can Acad Child Adolesc Psychiatry. 2010; 19:290–296. [PubMed: 21037920]
18. Woolfenden S, Dossetor D, Williams K. Children and adolescents with acute alcohol intoxication/self-poisoning presenting to the emergency department. Arch Pediatr Adolesc Med. 2002; 156:345–348. [PubMed: 11929368]
19. Substance Abuse and Mental Health Services Administration. Center for Behavioral Health Statistics and Quality. The CBHSQ Report: A Day in the Life of American Adolescents: Substance Use Facts Update. Rockville, MD: 2013.
20. The DAWN Report: Drug Abuse Warning Network. Emergency department visits involving patients with co-occurring disorders. Substance Abuse and Mental Health Services Administration; Rockville, MD: 2006.
21. Centers for Disease Control and Prevention. [Accessed September 30, 2013] Ambulatory Health Care Data. NAMCS/NHAMCS Web site. Available at: www.cdc.gov/nchs/ahcd.htm
22. OPA, Office of Population Affairs. What is Adolescence?. U.S. Department of Health & Human Services; Web site. Available at: www.hhs.gov/opa/familylife/tech_assistance/etraining/adolescent_brain/Overview/what_is_adolescence/#2 [Accessed September 30, 2013]

23. Watkins KE, Burnam A, Kung F-Y, et al. A national survey of care for persons with co-occurring mental and substance use disorders. Psychiatr Serv. 2001; 52:1062–1068. [PubMed: 11474052]
24. Grupp-Phelan J, Harman JS, Kelleher KJ. Trends in mental health and chronic condition visits by children presenting for care at U.S. emergency departments. Public Health Rep. 2007; 122:55–61. [PubMed: 17236609]
25. Smith RP, Larkin GL, Southwick SM. Trends in U.S. emergency department visits for anxiety-related mental health conditions, 1992-2001. J Clin Psychiatry. 2008; 69:286–294. [PubMed: 18363455]
26. Pottick KJ, McAlpine DD, Andelman RB. Changing patterns of psychiatric inpatient care for children and adolescents in general hospitals, 1988–1995. Am J Psychiatry. 2000; 157:1267–1273. [PubMed: 10910789]
27. Claassen CA, Trivedi MH, Shimizu I, et al. Epidemiology of nonfatal deliberate self-harm in the United States as described in three medical databases. Suicide Life Threat Behav. 2006; 36:192–212. [PubMed: 16704324]
28. Durant E, Fahimi J. Factors associated with ambulance use among patients with low-acuity conditions. Prehosp Emerg Care. 2012; 16:329–337. [PubMed: 22494108]
29. Substance Abuse and Mental Health Services Administration. Center for Behavioral Health Statistics and Quality. The NSDUH Report: Substance Use among Black Adolescents. SAMHSA, Center for Behavioral Health Statistics and Quality; Rockville, MD: 2011.
30. Substance Abuse and Mental Health Services Administration. The TEDS Report: A Comparison of Rural and Urban Substance Abuse Treatment Admissions. SAMHSA, Center for Behavioral Health Statistics and Quality; Rockville, MD: 2012.
31. Sterling S, Valkanoff T, Hinman A, et al. Integrating substance use treatment into adolescent health care. Curr Psychiatry Rep. 2012; 14:453–461. [PubMed: 22872492]
32. Sterling S, Kohn C, Lu Y, et al. Pathways to chemical dependency treatment for adolescents in an HMO. J Psychoactive Drugs. 2004; 36:439–453. [PubMed: 15751482]
33. Walton MA, Chermack ST, Shope JT, et al. Effects of a brief intervention for reducing violence and alcohol misuse among adolescents: a randomized controlled trial. JAMA. 2010; 304:527–535. [PubMed: 20682932]
34. Bernstein E, Edwards E, Dorfman D, et al. Screening and brief intervention to reduce marijuana use among youth and young adults in a pediatric emergency department. Acad Emerg Med. 2009; 16:1174–1185. [PubMed: 20053238]
35. Grant BF, Stinson FS, Dawson DA, et al. Prevalence and co-occurrence of substance use disorders and independent mood and anxiety disorders: results from the National Epidemiologic Survey on Alcohol and Related Conditions. Arch Gen Psychiatry. 2004; 61:807–816. [PubMed: 15289279]
36. Centers for Disease Control and Prevention. Suicide Prevention. Injury Center: Violence Prevention; Web site. Available at: www.cdc.gov/violenceprevention/pub/youth_suicide.html [Accessed September 30, 2013]
37. Stewart C, Spicer M, Babl FE. Caring for adolescents with mental health problems: challenges in the emergency department. J Paediatr Child Health. 2006; 42:726–730. [PubMed: 17044902]
38. Newton AS, Ali S, Hamm MP, et al. Exploring differences in the clinical management of pediatric mental health in the emergency department. Pediatr Emerg Care. 2011; 27:275–283. [PubMed: 21490541]
39. Peabody JW, Luck J, Jain S, et al. Assessing the Accuracy of Administrative Data in Health Information Systems. Med Care. 2004; 42:1066–1072. [PubMed: 15586833]
40. American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 4th ed. Washington, DC: 2000.

Table 1

Patient demographic and hospital characteristics of adolescents presenting to US emergency departments with substance use and mental health conditions, 1997-2010.

	Any Substance Use Visit n = 2157		Any Mental Health Visit n = 4906		Dual Diagnosis Visit n = 542	
Characteristics	**Unweighted number of visits (n)**	**Weighted % (95% CI)**	**Unweighted number of visits (n)**	**Weighted % (95% CI)**	**Unweighted number of visits (n)**	**Weighted % (95% CI)**
Age Category						
11-13 years	39	2.4 (1.2-3.5)	511	10.2 (9.0-11.5)	12	3.1 (0.8-5.5)
14-18 years	706	34.2 (31.2-37.1)	1810	36.7 (34.7-38.9)	161	32.7 (25.6-39.7)
19-24 years	1412	63.5 (60.2-66.4)	2585	53.0 (50.8-55.3)	369	64.2 (56.8-71.6)
Sex						
Female	855	41.1 (38.1-43.8)	2588	54.1 (52.0-56.2)	234	44.4 (37.6-51.2)
Male	1302	58.9 (56.0-61.7)	2318	45.9 (43.8-48.0)	308	55.6 (48.8-62.4)
Race/Ethnicity						
White	1239	66.5 (63.0-70.0)	2597	66.0 (63.3-68.8)	282	67.0 (60.3-73.7)
Black	326	14.7 (12.4-17.0)	1050	19.1 (16.9-21.2)	102	14.4 (9.9-18.8)
Hispanic	400	15.5 (12.8-18.2)	832	12.3 (10.5-14.2)	106	15.1 (9.5-20.8)
Other	87	3.3 (2.3-4.3)	187	2.6 (1.8-3.3)	23	3.5 (1.8-5.3)
Insurance						
Private	667	32.7 (29.5-35.9)	1535	34.9 (32.7-37.1)	140	30.1 (23.6-36.6)
Medicare	16	0.3 (0.1-0.5)	112	2.6 (1.8-3.3)	7	0.6 (0-1.3)
Medicaid	477	21.0 (18.0-24.0)	1725	32.3 (30.0-34.7)	183	32.0 (25.4-38.7)
Uninsured	682	32.5 (29.7-35.2)	978	20.7 (19.0-22.5)	136	26.1 (20.1-32.1)
Other	310	13.5 (11.4-15.5)	541	9.4 (8.2-10.7)	71	11.1 (7.0-15.2)
Setting						
Urban	1675	89.3 (84.7-94.0)	3653	84.4 (78.0-90.8)	423	88.6 (82.1-95.1)
Rural	130	10.7 (6.1-15.3)	431	15.6 (9.2-22.0)	30	11.4 (4.8-17.9)
Region						
Northeast	652	20.1 (16.0-24.1)	1833	22.8 (18.8-26.8)	211	20.3 (14.3-26.2)
Midwest	388	21.2 (17.3-25.1)	922	25.8 (21.4-30.2)	68	19.7 (13.2-26.2)

	Any Substance Use Visit n = 2157		Any Mental Health Visit n = 4906		Dual Diagnosis Visit n = 542	
Characteristics	**Unweighted number of visits (n)**	**Weighted % (95% CI)**	**Unweighted number of visits (n)**	**Weighted % (95% CI)**	**Unweighted number of visits (n)**	**Weighted % (95% CI)**
South	567	32.3 (27.3-37.3)	1297	33.7 (29.4-38.0)	142	35.8 (27.8-43.8)
West	550	26.4 (22.1-30.7)	854	17.8 (14.7-20.8)	121	24.2 (17.4-31.0)
Ambulance Arrival	705	41.1 (38.0-44.2)	1059	26.2 (23.8-28.6)	157	39.5 (32.3-46.6)
Weekend	761	35.3 (32.3-38.4)	1187	25.8 (23.9-27.6)	149	28.5 (23.1-33.9)
Shift*						
Day	484	21.4 (19.0-23.8)	1546	30.3 (28.4-32.3)	151	22.2 (16.7-27.7)
Swing	820	38.5 (35.7-41.3)	2272	47.9 (46.0-49.8)	223	43.9 (38.2-49.6)
Night	813	40.1 (37.2-43.0)	981	21.8 (20.1-23.5)	161	33.9 (28.1-39.8)

*Day: 7a-3p; Swing: 3p-11p; Night: 11p-7a

Table 2

Proportions of substance use visits with alcohol, illicit drug, and co-existing mental health conditions among adolescents presenting to US emergency departments, 1997-2010.

	Unweighted Number of Visits (n)	Weighted Proportion (95% CI)
Substance Use	**2157** *	
Alcohol	1029	48.1 (45.1-51.1)
Illicit Drugs	1289	58.8 (55.8-61.8)
Opioid/Sedative/Hypnotic/Anxiolytic	118	4.5 (3.4-5.6)
Cocaine/Amphetamine/Stimulant/Sympathomimetic	130	5.0 (3.7-6.2)
Cannabis/Hallucinogen	161	6.2 (4.9-7.6)
Other/Unspecified/Combined	464	43.5 (40.5-46.6)
Mental Health	542	20.9 (18.3-23.5)
Adjustment Disorders	25	5.1 (2.2-7.9)
Anxiety Disorders	72	3.8 (2.7-4.9)
Manic/Hypomanic Disorders	59	2.0 (1.2-2.8)
Disruptive Behavior Disorders	42	1.4 (0.7-2.1)
Depressive Disorders	65	2.4 (1.5-3.3)
Psychotic Disorders	78	2.1 (1.2-2.9)
Other Psychiatric Disorders	192	8.2 (6.4-10.1)
Suicide/Self-harm	59	2.2 (1.4-3.1)

* Out of all adolescent visits, substance use made up 2.1% (95% CI: 2.0-2.2%)

Table 3

Multivariate analysis predictors of substance use and dual diagnosis visits among 87,855 adolescents presenting to US emergency departments, 1997-2010.

	Any Substance Use Visit n = 4,906	Dual Diagnosis Visit n = 542
Characteristics	**OR (95% CI)**	**OR (95% CI)**
Age Category		
11-13 years	Ref	Ref
14-18 years	4.19 (2.13-8.22)	3.68 (1.30-10.42)
19-24 years	4.78 (2.47-9.25)	4.81 (1.78-13.02)
Male	1.66 (1.42-1.94)	1.67 (1.16-2.41)
Race/Ethnicity		
White	Ref	Ref
Black	0.45 (0.37-0.56)	0.40 (0.25-0.65)
Hispanic	0.81 (0.65-1.02)	0.79 (0.48-1.30)
Other	0.78 (0.57-1.08)	0.76 (0.34-1.71)
Insurance		
Private	Ref	Ref
Medicare	0.21 (0.06-0.65)	0.73 (0.18-2.91)
Medicaid	1.06 (0.83-1.35)	1.91 (1.17-3.11)
Uninsured	1.31 (1.06-1.61)	1.20 (0.76-1.90)
Other	1.15 (0.86-1.53)	1.25 (0.68-2.32)
Rural	0.60 (0.47-0.77)	0.67 (0.37-1.20)
Region		
Northeast	Ref	Ref
Midwest	1.05 (0.83-1.33)	1.09 (0.66-1.79)
South	0.98 (0.80-1.20)	1.44 (0.94-2.22)
West	1.67 (1.35-2.07)	1.75 (1.05-2.90)
Ambulance Arrival	5.42 (4.59-6.40)	5.13 (3.62-7.26)
Weekend	1.38 (1.17-1.65)	1.09 (0.80-1.48)
Shift		
Day	Ref	Ref
Swing	1.25 (1.04-1.50)	1.40 (0.94-2.08)
Night	3.24 (2.63-3.98)	2.54 (1.63-3.98)
Adjustment Disorders*	2.79 (0.92-8.42)	—
Anxiety Disorders*	2.09 (1.50-2.93)	—
Manic/ Hypomanic Disorders*	5.76 (2.94-11.28)	—
Disruptive Behavior Disorders*	1.68 (0.75-3.77)	—
Depressive Disorders*	1.92 (1.04-3.57)	—

	Any Substance Use Visit n = 4,906	Dual Diagnosis Visit n = 542
Characteristics	**OR (95% CI)**	**OR (95% CI)**
Psychotic Disorders*	2.43 (1.16-5.10)	—
Other Psychiatric Disorders*	5.89 (3.67-9.45)	—
Suicide/ Self-harm*	1.20 (0.55-2.64)	—

*Reference categories for mental health subcategory definitions are the absence of that individual diagnostic condition.

Table 4

Mental health and substance use factors associated with ED outcomes among 87,855 adolescents presenting to US emergency departments, 1997-2010.*

	ED Length of Stay	Admission/Transfer Disposition
Categories	**Additional Minutes (95% CI)†**	**OR (95% CI)§**
Mental Health	89.77 (66.25-113.29)	5.93 (5.14-6.84)
Adjustment Disorders	73.83 (0.44-147.22)	1.36 (0.53-3.53)
Anxiety Disorders	−10.53 (−26.34-5.29)	0.46 (0.31-0.70)
Manic/Hypomanic Disorders	112.15 (30.00-194.31)	5.88 (3.79-9.13)
Disruptive Behavior Disorders	100.13 (44.37-155.90)	3.84 (2.40-6.17)
Depressive Disorders	118.68 (67.48-169.88)	9.88 (7.15-13.64)
Psychotic Disorders	156.43 (99.90-212.96)	11.43 (7.98-16.38)
Other Psychiatric Disorders	99.63 (72.72-126.53)	5.59 (4.34-7.21)
Suicide/Self-harm	79.32 (24.74-133.90)	6.21 (3.57-10.81)
Substance Use	71.33 (49.82-92.84)	2.48 (2.01-3.06)
Alcohol	64.46 (35.26-93.66)	1.17 (0.81-1.68)
Illicit Drugs	66.60 (40.17-93.03)	3.56 (2.72-4.64)
Dual Diagnosis	139.97 (77.78-202.17)	6.86 (4.67-10.09)

*Results of multivariate regression controlling for age, sex, race/ethnicity, insurance status, MSA, region, mode of arrival, day of week, and shift; the mental health model was further adjusted for the presence of substance use diagnosis and the substance use model was further adjusted for the presence of mental health diagnosis.

†Additional minutes of ED length of stay as compared to when the individual mental health or substance use condition or definition was not present.

§Odds ratio associated with admission/transfer as compared to when the individual mental health or substance use condition or definition was not present.