

Point Prevalence of Co-Occurring Behavioral Health Conditions and Associated Chronic Disease Burden Among Adolescents

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Objective: To examine the point prevalence of behavioral health conditions (BHCs) and co-occurring chronic medical conditions among adolescents in an integrated health system.

Method: The sample consisted of adolescents in an integrated health care system diagnosed with at least 1 of the 5 most prevalent BHCs in 2014 ($n = 30,643$), and patients without a BHC matched on age, sex, and medical home facility ($n = 30,643$). Electronic health record data was used to identify all adolescents aged 11 to 18 years with at least 1 BHC diagnosis on their diagnosis list, which included current and pre-existing diagnoses from an outpatient (including psychiatry and chemical dependency specialty treatment), inpatient, or emergency department visit at a Kaiser Permanente Northern California (KPNC) facility between January 1, 2014, and December 31, 2014. The odds of having general medical conditions and specific chronic diseases were compared between adolescents with and without BHCs.

Results: Among adolescents with at least 1 BHC in 2014, the 5 most common BHCs were: depressive disorders (42%), anxiety disorders (40%), attention-deficit/hyperactivity disorders (ADHDs; 37%), substance use

disorders (SUDs; 10%), and bipolar spectrum disorders (8%). Overall, patients with a BHC did not have higher odds of any medical comorbidity compared with non-BHC patients. However, compared to individuals without BHCs, adolescents with depression (odds ratio [OR] = 1.16, 95% CI = 1.08–1.26), anxiety (OR = 1.30, 95% CI = 1.20–1.41), and substance use (OR = 1.25, 95% CI = 1.05–1.49) disorders had significantly higher odds of any medical comorbidities; individuals with ADHD and bipolar disorder did not differ from patients without BHCs.

Conclusion: BHCs were common and were associated with a disproportionately higher burden of chronic medical disease among adolescents in a large, private health care delivery system. As comorbidity can lead to elevated symptom burden, functional impairment, and treatment complexity, the study findings call for implementation of effective collaborative models of care for these patients.

Key words: behavioral health disorders, co-occurring conditions, chronic conditions, mental health disorders, adolescents

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Behavioral health conditions (BHCs), including both mental health and substance use disorders (SUDs), are highly prevalent among adolescents.¹ These disorders often result in considerable distress for adolescent patients and their families, and, particularly if left untreated, are associated with negative outcomes.^{2,3} Research on adults has found that there is significant comorbidity between BHCs and many chronic medical conditions, and that this co-occurrence can complicate treatment for all of the conditions.^{4–8} The pediatric literature on the co-occurrence of mental health, substance use, and medical conditions is less robust, but has begun to document comorbidity between BHCs and some common chronic medical conditions.^{9–11}

A recent national population survey found that among 18-year-olds, 31.9% reported having an anxiety disorder, 14.3% a mood disorder, 19.6% a behavioral disorder, including attention-deficit/hyperactivity disorder (ADHD), and 11.4% a SUD at some point in their lives.¹² High rates of mental health and SUD comorbidity have also been documented, particularly in clinical samples.^{10,13–15} ADHD has been found to co-occur frequently with a number of other mental health conditions, including anxiety^{16,17} and SUDs.¹⁸ Furthermore, studies have found high rates of SUDs among adolescents with ADHD.^{19–21} Mood disorders have also been found to be significantly associated with SUDs, including alcohol, marijuana, tobacco, and polysubstance use.^{22,23}

Despite the high prevalence of BHCs among adolescents, many go unidentified and untreated. The Affordable Care Act and federal and state mental health and addiction treatment parity laws all contain provisions aimed at increasing access to treatment for BHCs. An important first step for health systems is to measure the prevalence of BHCs, and of common BHCs' comorbidity with other BHCs and common chronic medical conditions. This study addresses a critical gap in the literature and provides important



This article is discussed in an editorial by Dr. Eva Szigethy on page 357.



Supplemental material cited in this article is available online.

information for policymakers and program planners by examining the point prevalence and comorbidities of BHCs in a large health care system. Studies have found higher rates of comorbid medical conditions among adolescents with BHCs; a recent national survey found that more than one-third of respondents reported at least 1 mental disorder and 1 physical disorder.¹¹ Asthma, diabetes, heart disease, infectious diseases, and digestive disorders have all been found to be associated with an increased prevalence of BHCs at some point in their lives.^{11,24} Comorbidity between BHCs and medical conditions can also complicate treatment regimens,²⁵ increase health care use and costs,²⁶ and compromise health outcomes,^{9,27} which supports the need for a better understanding of the prevalence of these comorbidities.

This study contributes to the literature by examining the point prevalence of BHCs among adolescent members of a large integrated health system. We compare the burden of medical comorbidity and common chronic diseases among those adolescent health plan members with a behavioral health condition to matched members without. This study provides the opportunity to examine behavioral and medical condition comorbidity in a health system population compared to the clinical and national survey populations more frequently studied.

METHOD

Setting. Kaiser Permanente of Northern California (KPNC) is a nonprofit, integrated health care delivery system providing comprehensive health services to more than 3.8 million members, 45% of the commercially insured population in the region. Outpatient behavioral health services are provided internally rather than contracted to outside vendors.

Study Patients. Electronic health record data was used to identify all adolescents who were aged 11 to 18 years, had a visit to a KPNC facility in 2014, and had at least 1 BHC on their diagnosis list in 2014. The BHCs examined included both mental health and SUDs, specifically the following: depressive disorders, bipolar spectrum disorders, anxiety disorders, ADHDs, autism spectrum disorders, personality disorders, SUDs, dementia, schizophrenia spectrum disorders, disruptive behavioral disorders, and other psychoses (see Supplement 1, available online, for relevant *International Classification of Diseases–9th Revision* [ICD-9] codes). These categories were selected based on collaborations with the National Institute of Mental Health's Mental Health Research Network²⁸ and KPNC's Regional Mental Health Leadership and were used in our prior work.⁸ The first mention for each BHC during the study period was included, so BHCs were not mutually exclusive. Patients insured by Medicare or Medicaid were excluded from the study.

The analytical sample included adolescents aged 11 to 18 years with at least 1 of the 5 most prevalent BHCs, which were determined to be depressive disorders, anxiety disorders, ADHDs, SUDs, and bipolar spectrum disorders. Each patient with a BHC was matched to a patient without a BHC on sex, age, and medical facility, the latter accounting for any potential differences in services offered, or types of conditions by geographic region. The final analytical sample consisted of 61,286 individuals: 30,643 individuals with at least 1 of the top 5 BHCs, including 13,602 patients with depressive disorders, 12,554 with anxiety disorders, 11,888 with ADHDs, 2,984 with SUDs, 2,505 with bipolar spectrum disorders, and 30,643 patients without BHCs.

Institutional review board approval was obtained from the Kaiser Research Foundation Institute for this retrospective, database-only study.

Measures

Patient Characteristics. Sex, age, and race/ethnicity were pulled from the electronic health records. Race/ethnicity was collapsed into 5 categories: white, African American, Hispanic, Asian, and other. All psychiatric and medical comorbidities were determined based on diagnoses noted in the electronic health records during patient visits made over the course of the study period, which included current and pre-existing diagnoses.

Psychiatric Conditions. Depressive disorders, bipolar spectrum disorders, anxiety disorders, ADHDs, autism spectrum disorders, personality disorders, SUDs, dementia, schizophrenia spectrum disorders, and other psychoses were examined. The ICD-9 codes for these conditions can be found in Supplement 1, available online.

Medical Conditions. All ICD-9 main categories were examined to determine medical comorbidities; however, only the most prevalent categories were selected and used for the final analyses, which included the following: infectious and parasitic diseases (ICD-9 CM codes: 001–139 inclusive), neoplasms (ICD-9 CM codes: 140–239 inclusive), endocrine, nutritional and metabolic diseases, and immunity disorders (ICD-9 CM codes: 240–279 inclusive), diseases of the blood and blood-forming organs (ICD-9 CM codes: 280–289 inclusive), diseases of the nervous system and sense organs (ICD-9 CM codes: 320–389 inclusive), diseases of the circulatory system (ICD-9 CM codes: 390–459 inclusive), diseases of the respiratory system (ICD-9 CM codes: 460–519 inclusive), diseases of the digestive system (ICD-9 CM codes: 520–579 inclusive), diseases of the genitourinary system (ICD-9 CM codes: 580–629 inclusive), diseases of the skin and subcutaneous tissue (ICD-9 CM codes: 680–709 inclusive), diseases of the musculoskeletal system and connective tissue (ICD-9 CM codes: 710–739 inclusive), injury and poisoning (ICD-9 CM codes: 800–999 inclusive), and symptoms, signs, and ill-defined conditions (ICD-9 CM codes: 780–799 inclusive). An indicator was created for any medical comorbidity.

Chronic Medical Conditions. We developed a list of 7 chronic conditions based on the extant literature on chronic pediatric diseases and in consultation with clinical experts in the health system.^{25,29} These conditions included the following: asthma (ICD-9 CM code: 493), arthritis (ICD-9 CM codes: 710–719 inclusive), rhinitis (ICD-9 CM code: 477), sinusitis (ICD-9 CM codes: 461 or 473), diabetes mellitus (ICD-9 CM code: 250), irritable bowel disorder/inflammatory bowel disease (ICD-9 CM code: 546.1 or 555.9 or 560.89), and migraine (ICD-9 CM code: 346).

Data Analysis

All analyses were performed using SAS software, version 9.3 (SAS Institute Inc., Cary, NC); statistical significance was defined at $p < .01$. All BHC study patients were aged 11 to 18 years, had a visit to a KPNC facility in 2014, and had at least 1 of the top 5 BHCs on their diagnosis list in 2014, which contained new diagnoses and pre-existing conditions. We then extracted a similar sample of patients aged 11 to 18 years with a visit to a KPNC facility in 2014 who did not have a BHC diagnosis on their record during that time period. Patients were matched on a 1–1 basis based on age, gender, and medical home facility, resulting in unique matched pairs of individuals.

Frequencies were used to describe patient characteristics and psychiatric comorbidities across each of the 5 BHCs. Conditional logistic regression models were used to examine the odds of medical

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