



Improving Healthcare
for the Common Good



Commonwealth of Kentucky

Department for Medicaid Services

Division of Program Quality and Outcomes

Kentucky Behavioral Health Study

FINAL REPORT
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ORGANIZATION OF SUMMARY REPORT AND TECHNICAL REPORT

- I. *The Summary Report* introduces the study rationale, presents study aims, and summarizes methods. Next, a comprehensive summary of findings is presented, including descriptive profiles and risk factor analyses for all outcomes. The discussion section interprets key findings about the Kentucky Medicaid Managed Care behavioral health population and relates these findings to the larger body of population health knowledge. Recommendations are provided to inform Plan and State quality improvement efforts. Therefore, *The Summary Report* is intended to summarize key points, shed insights for data-driven quality improvement, as well as to prepare the reader for the Technical Report.
- II. *The Technical Report* presents detailed methodology and findings, with supporting data in tables and figures. References and appendices are included at the end of the Technical Report. Therefore, The Technical Report provides comprehensive coverage of the evidence that supports study findings, interpretation and recommendations.

SUMMARY REPORT

INTRODUCTION

Effective January 1, 2014, the Medicaid program was expanded under the Affordable Care Act, and Medicaid eligibility was extended to an estimated 308,000 low income Kentuckians, who previously lacked health insurance (Commonwealth of KY, 2013). This subpopulation is characterized by a substantial prevalence of serious mental illness and substance use disorders at the national level (US DHHS, 2013). Serious mental illness and substance abuse are risk factors for suicide (CDC, 2010), and in Kentucky, suicide is a leading cause of death among youth and adults (CDC, 2010). People with serious mental illness die an average of 25 years earlier than the general population, face greater barriers to access established treatment for physical health conditions, and are also characterized by higher rates of modifiable risk factors such as obesity and alcohol consumption (Parks *et al.*, 2006). Moreover, much of the excess mortality among people with serious mental illness is attributable to preventable conditions such as cardiovascular and pulmonary disease (Nardone *et al.*, 2014).

Mental illness, as well as co-occurring physical morbidities, is pervasive among hospitalized Medicaid beneficiaries nationwide, and both mental illness and substance use disorders are associated with higher hospitalization rates (Boyd *et al.*, 2010). Further, hospitalization has been shown to be a risk factor for psychiatric emergency service re-visits (Arfken *et al.*, 2004); an indicator of unmet mental health care needs (Arfken *et al.*, 2004; Adams *et al.*, 2013). Thus, it is becoming increasingly important to identify Medicaid enrollees with behavioral health conditions, and to understand both their physical and mental health care needs in order to more efficiently and effectively integrate and coordinate their care.

The Kaiser Commission on Medicaid and the Uninsured recently examined a continuum of approaches to improve integration of physical and behavioral health care, from screening and referral to establishing patient-centered medical homes, as well as system-level integration of care for enrollees with serious mental illnesses (Nardone *et al.*, 2014). The Kaiser Commission's report concludes that no single approach provides a universal solution (Nardone *et al.*, 2014); however, an understanding of the physical and behavioral health care needs of Medicaid Managed Care enrollees in Kentucky is the first step towards development of an integrated strategy designed specifically for this vulnerable population.

STUDY AIMS:

1. Profile and quantify behavioral health disorder prevalence and service utilization patterns;
2. Profile and quantify chronic physical condition prevalence and service utilization patterns in order to identify susceptible subpopulations for targeted case management, care coordination and other quality improvement interventions;
3. Identify demographic and clinical risk factors for outcomes of all-cause hospitalization, behavioral health hospitalization, and all-cause and psychiatric Emergency Department (ED) re-visits within 30 days of behavioral health hospital discharge. In light of the risk for suicide associated with serious mental

illness, and because suicide is a leading cause of death in Kentucky, this study also evaluated risk factors for the outcome of hospitalization for possible self-harm.

METHODS

IPRO utilized KDMS electronic encounter files to identify the eligible study population, create the study data set, and populate with relevant study fields, e.g., clinical, demographic and utilization data elements. Three sets of clinical categories were created:

1. Behavioral health diagnostic categories were defined by assigning ICD9 codes, as indicated in Appendix A.
2. Specific physical health conditions were defined by assigning ICD9 codes, as indicated in Appendix B.
3. Chronic physical condition categories were created using the 2013 Agency for Healthcare Quality/ Health Care Utilization and Quality Chronic Condition Indicator File.

The KY Behavioral Health Eligible Study Population was defined according to the following criteria:

- Age: All **AND**
- Measurement Year: 1/1/13–12/31/13 **AND**
- Continuous enrollment during 1/1/13–12/31/13, with a one month allowable gap **AND**
- Clinical selection criteria: At least one encounter during 1/1/13–12/31/13 with any ICD9 code within the range of 290–319 (mental, behavioral and neurodevelopmental disorders) in any setting
OR members with claims for any of the specific drugs or drug classes, other than anxiolytics, indicated in Appendix C.

Statistical analysis was conducted using SAS version 9.3 (Cary, NC, 2010). Multiple logistic regression was used to evaluate associations between clinical, demographic and utilization factors and outcomes.

COMPREHENSIVE SUMMARY OF FINDINGS

Behavioral Health Disorder Prevalence

The behavioral health eligible population comprised 34% (245,011/713,888) of the total KY Medicaid Managed Care population in 2013; this represents 55% (151,828/278,290) of the total adult enrollee subset (aged 18 years and older) and 34% (93,183/435,598) of the total youth enrollee subset (aged 0–17 years). Among adults (aged 18 years and older; n = 151,828), prominent behavioral health diagnoses included anxiety (43%), depression (39%), and drug abuse (17%). Among adolescents (aged 13–17 years; n = 33,263), prominent behavioral health diagnoses included attention deficit disorder (43%), depression (25%), anxiety (17%), psychoses-all else (17%), and conduct disorder (15%). Among children

(aged 0–12 years; n = 59,921), prominent behavioral health diagnoses included attention deficit disorder (48%), conduct disorder (21%), speech delay (11%), and anxiety (10%). The corresponding proportions of adults, adolescents and children without a behavioral health diagnosis and who were eligible for the study by virtue of having a pharmacy claim for a psychotropic drug other than an anxiolytic were 6%, 5%, and 3%, respectively. The pharmacy claims used to identify these eligible enrollees included the following categories of medications: antipsychotic, antidepressant, antimanic, ADHD pharmacotherapy, drug addiction pharmacotherapy, and/or alcohol addiction pharmacotherapy.

Utilization Patterns

Hospitalization Utilization: The all-cause hospitalization rate was 13.67% (n = 33,483/245,011); the hospitalization for possible intentional self-harm rate was 0.15% (n = 364/245,011); the adult behavioral health hospitalization rate was 2.58% (n = 3,913/151,828); and the youth behavioral health hospitalization rate was 2.75% (n = 2,558/93,183).

The most prevalent principal diagnoses for adult all-cause hospitalizations included episodic mood disorder (n = 1,740/27,862 = 6%), chronic bronchitis (n = 1,555), pneumonia (n = 1,212), and septicemia (n = 920). The most prevalent principal diagnoses for youth all-cause hospitalizations included episodic mood disorder (n = 2,055/5,621 = 37%), depressive disorder (n = 291), disturbance of conduct (n = 226), asthma (n = 198), and epilepsy/recurrent seizures (n = 160). Among adults hospitalized with possible intentional self-harm, poisonings by psychotropics (n = 88) were most prevalent, and included poisoning by tranquilizers (n = 45), antipsychotics (n = 20), and antidepressants (n = 8). Poisonings by analgesics, antipyretics, antirheumatic drugs (n = 60) were also prevalent among adults.

Among the 30,948 adults with any diagnosis of a substance abuse disorder, there were 9,051 (29%) with at least one hospitalization episode. There were 14 adults with an inpatient stay at a substance abuse treatment facility, and two of these enrollees had more than one substance abuse treatment facility stay. There were only 4 youth with an inpatient stay at a substance abuse treatment facility.

Emergency Department (ED) Utilization: The adult ED re-visit within 30 days of discharge from behavioral health hospitalization rate was 24.87% (n = 973/3,913); the youth ED re-visit after behavioral health hospitalization rate was 10.05% (n = 257/2,558); and the adult psychiatric ED re-visit after behavioral health hospitalization rate was 7.39% (n = 289/3,913). Of note, 83% of adults with a behavioral health hospitalization lacked a follow-up mental health visit within 30 days of behavioral health hospital discharge.

The most prevalent principal diagnoses for adult ED re-visits after behavioral health hospitalization included respiratory symptoms (n = 115/973 = 12%), general symptoms (n = 61), symptoms of the abdomen/pelvis (n = 52), depressive disorder (n = 43), and anxiety (n = 40). The most prevalent principal diagnoses for youth ED re-visits after behavioral health hospitalization included depression (n = 18/257 = 7%), respiratory symptoms (n = 17), disturbance of conduct (n = 16), anxiety (n = 14), and episodic mood disorder (n = 13).

Among the 30,948 adults with a substance abuse disorder, there were 3,860 (12%) enrollees with at least one ED visit for a psychiatric principal diagnosis, and 19,864 (64%) enrollees with at least one ED visit for a non-psychiatric principal diagnosis.

Pharmaceutical Treatment Patterns: More than half (57%) of adults and adolescents (55%), and more than one third (36%) of children, had a pharmacy claim for psychotropic medication. Of members with a pharmacy claim, a single psychotropic drug class characterized the majority of members across all age groups. Among all members in the behavioral health study population, the percent with a claim for both an antidepressant and antipsychotic was 9% for adults and adolescents, and 4% for children. Among adults with a pharmacy claim, those with an antidepressant claim comprised the largest group, followed by adults with a claim for an anxiolytic, an antipsychotic, and drug addiction therapy. Among adolescents with a pharmacy claim, those with an antidepressant claim comprised the largest group, followed by adolescents with a claim for ADHD treatment, an antipsychotic and anxiolytic. Among children with a pharmacy claim, the greatest proportion had a claim for ADHD treatment, followed by antidepressant, antipsychotic, and anxiolytic therapy.

Chronic Conditions and Physical Co-morbidity Patterns

Physical Health Characteristics: *Among adults*, the most prominent chronic physical health conditions were endocrine, nutritional, metabolic, or immunity disorders (55%), diseases of the circulatory system (53%), diseases of the nervous system and sense organs (47%), diseases of the respiratory system (45%), and diseases of the musculoskeletal system (43%). Hypertension was the most prevalent specific physical health condition among adults (48%), followed by COPD (30%), obesity (24%), diabetes (22%), arthritis (19%), asthma (16%), ischemic heart disease (14%), and cancer (14%). Eighty-six percent of adults had at least one chronic physical condition.

Among adolescents, the most prominent chronic physical health conditions were diseases of the respiratory system (33%), followed by diseases of the nervous system and sense organs (14%), and endocrine, nutritional, metabolic, or immunity disorders (13%). Asthma was the most prevalent specific physical health condition among adolescents (14%), followed by obesity (8%) and migraines (5%). Forty-three percent of adolescents had at least one chronic physical condition.

Among children, the most prominent chronic physical health conditions were diseases of the respiratory system (36%), followed by diseases of the nervous system and sense organs (16%), congenital anomalies (7%), and endocrine, nutritional, metabolic, or immunity disorders (6%). Asthma was the most prevalent specific physical health condition among children (15%), followed by COPD (4%), obesity (3%), and epilepsy or seizure disorder (3%). Fifty-one percent of children had at least one chronic physical condition.

Demographic Risk Factor Analysis:

- Age is associated with elevated odds for hospitalization of any type; specifically, compared to children aged 0–12 years, adults and, more so, adolescents are at increased odds for hospitalization. Age is also associated with hospitalization for possible self-harm; specifically, compared to children, adults and adolescents showed increased odds. In addition, the odds for

a behavioral health hospitalization were elevated for younger adults compared to older adults, and for adolescents and children aged 0–12 years compared to younger children. On the other hand, the odds for an adult psychiatric re-visit subsequent to a behavioral hospitalization were elevated for adults aged 58–67 years compared to younger adults.

- Whereas males showed greater odds for any hospitalization and adult males showed greater odds than adult females for behavioral health hospitalization, females showed greater odds for hospitalization for possible self-harm. In addition, among children, females showed greater odds for behavioral health hospitalization and ED re-visits compared to males. Adult males, however, showed greater odds for psychiatric ED re-visits.
- Enrollees of black or other race/ethnicity showed elevated odds for all-cause hospitalization, youth behavioral hospitalization, and adult psychiatric ED re-visit. Asian youth showed elevated odds for behavioral health hospitalization compared to white youth.
- Urban residence showed elevated odds for hospitalization for possible intentional self-harm, adult behavioral hospitalization and youth behavioral hospitalization.
- Enrollees in foster care showed elevated odds for any hospitalization, and those in foster care or at risk for placement in foster care showed elevated odds for pediatric behavioral health hospitalization.
- MCO enrollment was associated with all outcomes except for adult ED Re-Visits, although MCO enrollment was also associated with adult psychiatric re-visits.

Clinical Risk Factor Analysis:

- The presence of one or more chronic physical co-morbid conditions was positively associated with all-cause hospitalization, hospitalization for possible intentional self-harm, adult and youth behavioral health hospitalization, adult and youth ED re-visits (for any principal diagnosis), and adult ED re-visits for psychiatric principal diagnosis.
- Substance abuse was positively associated with all outcomes except for youth ED re-visits.
- Enrollees with dual pharmacy claims for antidepressants and antipsychotics showed elevated odds for all outcomes and, compared to having a pharmacy claim for a single psychotropic drug class, enrollees with no pharmacy claim showed increased odds for all-cause hospitalization.
- Enrollees with a diagnosis of bipolar disorder, schizophrenia, depression, conduct disorder, or PTSD were at increased risk for all-cause and adult behavioral hospitalizations; enrollees with any diagnosis of bipolar disorder, depression, conduct disorder or PTSD were at increased risk for hospitalization for possible intentional self-harm; enrollees with any diagnosis of bipolar disorder, depression, conduct disorder, or PTSD were at increased risk for pediatric behavioral hospitalization; and enrollees with any diagnosis of bipolar disorder, schizophrenia, conduct disorder or PTSD were at increased risk for adult ED re-visit within 30 days of behavioral hospitalization.
- Enrollees with a dual diagnosis of substance abuse and either bipolar disorder, depression, conduct disorder, or PTSD were at increased risk for all outcomes except for pediatric ED re-visits; enrollees with a dual diagnosis of substance abuse and schizophrenia also showed this pattern, albeit statistical limitations with regard to quantifying risk for pediatric behavioral

health hospitalization; and enrollees with a dual diagnosis of substance abuse and ADD showed increased risk for all outcomes except adult and pediatric ED re-visits.

DISCUSSION

Psychiatric conditions, particularly depression and substance abuse, and physical co-morbidities, e.g., respiratory problems, drive hospital and ED use.

Findings support the scientific literature (Boyd *et al.*, 2010; Nardone *et al.*, 2014; Parks *et al.*, 2006) regarding the contribution of behavioral and physical co-morbid conditions to inpatient hospitalizations and ED visits among the Medicaid behavioral health population. The behavioral health population comprises over one third of the overall Kentucky Medicaid managed care population and, among this population, serious mental illness, such as episodic mood disorder and depressive disorder, contribute to a substantial volume of hospitalization and ED visits among all ages, and co-existing substance abuse shows synergistic effects. Of note, having a recurrent episode of severe depressive disorder was a prime driver of hospitalization in the current study, and substance abuse substantially potentiated the risk for hospitalization among enrollees with depression, both adults and youth. Physical health principal diagnoses characteristic of adult hospitalizations among the Kentucky behavioral health population include respiratory, infection, diabetes and cardiovascular problems, and youth hospitalizations are characterized by physical health principal diagnoses of asthma and epilepsy/seizures.

Systems need to be in place to ensure accurate detection, referral and treatment for depression and other serious mental illnesses.

Intensive case management and ongoing community-based care (Dieterich *et al.*, 2010; Loch 2014), as well as hospital discharge planning (Steffen *et al.*, 2014) and family and patient psychoeducation (Loch, 2014) are means to reduce hospitalization and increase treatment adherence among people with existing serious mental illness. Depression is of particular concern because it is the leading cause of disability worldwide, as well as a risk factor for suicide (Marcus *et al.*, 2012). The prevalence of depression among the adult and adolescent Kentucky behavioral population is 39% and 25%, respectively. Therefore, it is important that systems be in place to ensure accurate diagnosis, psychotherapy and follow-up, so that adults and adolescents can be screened for depression and referred for appropriate care (USPSTF, 2014). From a broader life cycle perspective, in order to reduce fetal exposures to factors that can impact future mental health, such as maternal depression, alcohol, and drugs (Lewis *et al.*, 2014), preventive measures should aim toward optimization of pregnancy health by providing preconception and interconception care (Johnson *et al.*, 2006).

To optimize outcomes, both physical and behavioral conditions need to be identified and managed.

There are opportunities to improve care by approaches tailored to both the physical and mental health needs of enrollees. For example, studies have shown that routine depression screening in adults with COPD can prevent symptom progression (Obradovic *et al.*, 2012), and there is evidence that children with well-controlled asthma may be protected from symptoms of anxiety and depression (Letitre *et al.*,

2014). Another consideration is the longer term cardiometabolic consequences of antipsychotic agents used to treat chronic schizophrenia (Ward *et al.*, 2013). The inter-relatedness of physical and behavioral health conditions supports intervention strategies such as co-location of physical and behavioral health care and patient-centered medical homes.

Depression and conduct disorder with co-existing substance abuse are drivers of youth hospitalization.

Depression, particularly in combination with substance abuse, is a prime driver of psychiatric morbidity among Kentucky Medicaid managed care youth. Hawton *et al.* (2013) reported findings that youth presenting to the ED with a behavioral disorder are characterized by depression, violent behaviors, and self-harm (Liu *et al.*, 2014). Consistent with these findings, episodic mood disorders, depressive disorder and conduct disorder were prominent principal diagnoses of KY youth with an ED re-visit after hospitalization. Moreover, in light of recently reported findings that youth with conduct disorder are at increased risk for initiating illicit substance use that extends into adulthood (Hopfer *et al.*, 2013), the considerable prevalence of conduct disorder among youth in the KY behavioral study sample, together with findings of increased risk for hospitalization and ED re-visits associated with a diagnosis of conduct disorder, both alone and, more so, in combination with substance abuse, indicates an opportunity for early intervention and prevention approaches that target conduct disorders as a means to reduce substance abuse and related morbidity, such as depression. (NICE, 2013).

Children with conduct disorders commonly have additional psychiatric conditions, particularly ADHD (NICE, 2013). Among the KY youth behavioral health eligible population, 6,700 (7%) enrollees have been diagnosed with both ADD/ADHD and conduct disorder. Among youth hospitalized for self-harm, ADHD and conduct disorder are common conditions (Hawton *et al.*, 2013). In the current study, 37% of youth hospitalized for possible intentional self-harm had a diagnosis of ADD/ADHD and 12% had a diagnosis of conduct disorder.

Close monitoring of psychiatric medication prescribing patterns is also merited, particularly among children.

The current study also showed increased risk for adverse outcomes associated with polypharmacy prescriptions, particularly the combination of antidepressants and antipsychotics. Although the extent to which this finding may represent confounding by indication, particularly among adults, as adults with greater severity of psychiatric illness may require more intensive pharmacotherapy combinations, the observation of a similar pattern among adolescents and children merits concern. The use of pediatric polypharmacy in the United States is growing despite lack of evidence for its safety (Morden and Goodman, 2012) or appropriate diagnostic indication (Penfold *et al.*, 2013). For example, the number and severity of medication side effects among children and adolescents has been reported to increase with increasing numbers of psychiatric medications taken (i.e., 1, 2, 3 or more psychiatric medications), and the reported risk of side effects associated with polypharmacy compared to monopharmacy was 77% greater for serotonin reuptake inhibitors (antidepressants) and 99% greater for antipsychotics (Hilt *et al.*, 2014). Therefore, as yet untested combination use in children and adolescents warrants greater caution. Further, managed care data from the Mental Health Research Network found that, among non-

white antipsychotic users aged 6–11, 11.9% had no mental health diagnosis, 57.9 had a non-Food and Drug Administration (FDA)-approved diagnosis of attention disorders and 39.9% had a non-FDA-approved diagnosis of disruptive behaviors (Penfold *et al.*, 2013).

Case managers can enhance coordination of care by collaborating with providers, patients and families for review and update of treatment plan goals and interventions for psychiatric medication.

Findings from the analysis of possible intentional self-harm hospitalizations provide evidence to suggest that monitoring of patient symptoms and appropriate use of medications such as tranquilizers, psychotropics and analgesics is warranted. Whether or not such poisonings were intentional or unintentional cannot be confirmed by the current study; however, there is evidence that many such poisonings are intentional (Wiegand *et al.*, 2013; Zosel *et al.*, 2013) and that follow-up after suicide attempts may be lacking (Horowitz *et al.*, 2009). The Substance Abuse and Mental Health Services Administration (SAMHSA) provides a decision support tool to guide health providers in selecting evidence-based interventions to prevent the non-medical use of prescription drugs, for example, community outreach and mobilization programs, and Project Success, a prevention program for high risk secondary school students, e.g., those with behavior problems and illicit drug use (SAMHSA, 2013a). Another recommended strategy is statewide Prescription Drug Monitoring Programs (PDMPs), such as the Kentucky All Schedule Prescription Electronic Reporting (KASPER) System in which providers are required to obtain a KASPER report on the patient’s controlled substance prescription history and review the treatment plan at regular intervals (SAMHSA, 2013b). As Kentucky has met the gold standard for PDMP implementation, there may be additional opportunities for case managers to enhance coordination of care by collaborating with providers, enrollees, and their families for regular review and update of treatment plans for these patients (SAMHSA, 2013b). On the other hand, antidepressants and antipsychotics are not controlled substances and, therefore, are not monitored using the KASPER system. In light of current study findings regarding the prevalence of hospitalizations for poisoning by antidepressants and antipsychotics, review of treatment plans for patients on these medications is also merited.

Children in foster care are a vulnerable subpopulation in need of care coordination.

Foster care status was also identified as a risk factor among the Kentucky behavioral health population. A majority of foster children are exposed to multiple forms of maltreatment, including neglect, physical abuse and sexual abuse (Oswald *et al.*, 2009). Compounding this vulnerable population’s history is a trajectory of multiple placement changes, with the resultant lack of health care continuity and poor health outcomes (Chisolm *et al.*, 2009). A recent review of the literature reported that the prevalence of PTSD and conduct disorder were between 2 and 4 times greater among foster youth compared to the general population, with lifetime prevalence rates at ages 17–18 years of 14–15% and 40–47%, respectively (Havlicek 2013). The reported lifetime prevalence for substance abuse disorder was 22% (Havlicek *et al.*, 2013), and rates for major depression and ADHD have been reported at 27% and 20%, respectively (Oswald *et al.*, 2009). Thus, it is important to identify foster children with these conditions, monitor their symptoms and coordinate their care. Psychiatric nurses can add medical knowledge to the treatment team important to understanding and addressing complex medical profiles and polypharmacy

(Bertram *et al.*, 2013) and, thus, may bridge an important gap in this currently social service-driven approach. In addition, Medicaid data-based profiles can address care fragmentation by consolidating and communicating computerized information on historical ambulatory care use, diagnoses, providers seen, medications used and inpatient admissions in order to help foster parents, social workers, and child protective service agencies optimize the health of this transient and susceptible subpopulation (Chisolm *et al.*, 2009).

Study limitations include the potential for residual confounding, i.e., unmeasured factors that may influence the relationship between the possible risk factor and the outcome, as in any observational study. What's more, hospital-coded clinical indicators, e.g., physical and behavioral diagnoses, discharge status, and follow-up mental health visits were not validated with chart review, so may be subject to misclassification bias due to coding inaccuracies. In addition, mental health conditions are also subject to clinician error in primary care practices (Joling *et al.*, 2011; Jensen-Doss *et al.*, 2014). Moreover, a limitation inherent to the use of ICD9 codes to identify specific mental health conditions is that the dichotomous nature of such coding, i.e., the condition is present or not present, is inconsistent with the continuous spectrum of how mental disorders clinically present (Baxter *et al.*, 2013). Discharge planning has also been shown to be efficacious in reducing hospital readmissions and enhancing aftercare adherence for patients with mental health disorders (Steffen *et al.*, 2010); however, the current study did not have access to this information. Furthermore, although acuity level was proxied based upon length of stay, standardized severity-adjustment was not conducted, and the high volume of different hospitals of service precluded adjustment for hospital-specific influences; therefore, findings regarding MCO-associated risk for hospitalization and ED visits should also be interpreted with caution. Finally, an inverse relationship was observed between follow-up mental health visits and psychiatric ED re-visits; this may be a spurious finding due to confounding by indication, particularly if the more severely ill enrollees were more likely to have both a mental health follow-up visit and a psychiatric ED re-visit.

Study strengths include using sufficient sample size to detect statistically significant differences in associations between possible risk factors and high volume, high risk outcome measures, as well as maximizing both internal validity and external validity so that the study answers the questions it intends to answer.

Internal validity is the extent to which the study measures what it intends to measure and, in the current study, is maximized by:

- Using standardized diagnosis codes for behavioral and physical health conditions, and
- Using multivariable logistic regression analysis to statistically control for potential confounders.

External validity is the extent to which findings may be generalized to the population of interest and, in the current study, is maximized by:

- Using a sample that is representative of the KY behavioral health population.

RECOMMENDATIONS

Kentucky Medicaid Managed Care plans can address the problems and risk factors identified in this report by identifying and sharing current gaps and best practices, as well as collaborating with providers for quality improvements by drawing on the following specific recommendations:

- Target care coordination/case management to susceptible subpopulations as indicated by risk factors and high volume with high utilization diagnostic subgroups.
- Identify best practices among providers; for example, universal screening, navigators, co-location, integration of behavioral health care into primary care practices, integrate physical health care into community mental health centers, develop patient-centered medical homes, intensive case management for enrollees with serious mental illness.
- Evaluate access to a follow-up visit after mental health hospitalization.
- Offer provider continuing education on clinical guidelines for the treatment of depression and other serious mental illness, as well as medication monitoring.
- Collaborate with providers to screen for substance abuse and depression among both inpatients and outpatients, and refer early for treatment.
- In addition to existing HEDIS measures, such as “Diabetic screening for people with schizophrenia or bipolar disorder who are using antipsychotic medication” (NCQA, 2014a), consider potential new measures for 2015 currently under review, e.g., body mass index screening and follow-up for people with serious mental illness (SMI), clinical depression screening and follow-up for people with alcohol or other drug use (AOD), controlling high blood pressure for people with SMI, follow-up after emergency department use for mental illness or AOD (NCQA, 2014b).
- Conduct Performance Improvement Projects to improve the integration of physical and behavioral health care in accordance with clinical guidelines recommendations. Recommended topics for consideration include the following:
 - ❖ Implement evidence-based early intervention and prevention approaches that target conduct disorders early in the life course as a means to reduce overall behavioral health morbidity and, more specifically, substance abuse and related morbidity, e.g., hospitalization and ED visits. One resource is the National Institute for Health and Care Excellence (NICE) clinical guideline, “Antisocial behavior and conduct disorders in children and young people: recognition, intervention and management” (NICE, 2013).
 - ❖ Consult the SAMHSA CAPT Decision Support Tool: Strategies to prevent the non-medical use of prescription drugs to guide the selection of prevention interventions for Performance Improvement Projects (SAMHSA, 2013a).

- ❖ Collaborate with providers, enrollees and their families for regular review and update of KASPER treatment plans for patients with a history of controlled substance prescriptions.
- ❖ Collaborate with providers, enrollees and their families for regular care plan monitoring and updates for patients on other psychotropic medications.

The Kentucky Department for Medicaid Services (KDMS) can provide guidance to MCOs and collaborate with the Department for Community Based Services (DCBS) in order to address the issues identified in this report and develop comprehensive strategies for quality improvement, care coordination, integration and continuity. Specific recommendations for KDMS include the following:

- Follow up on findings of increased risk for children in foster care as discussed during the May 19, 2014 conference call, i.e., IPRO to provide KDMS with a listing of children in foster care who were hospitalized so that KDMS can evaluate whether or not case management services were received in a timely manner.
- Collaborate with Child Welfare Services to develop and implement improvements in data sharing to enhance continuity of care for children in out-of-home placements, e.g., medical profiles to be used by Medicaid Managed Care Case Managers in partnership with Child Welfare Services Case Workers.
- Monitor inappropriate prescription of ADHD medication for children under age 5 years and develop and implement provider interventions.
- Conduct a follow-up focused study of adolescents and children who had a dual claim for antidepressants and antipsychotics in order to assess indications, sequence and side effects.
- Initiate a statewide Performance Improvement Project that aims to integrate physical and behavioral health care for Medicaid Managed Care enrollees with behavioral and chronic physical health conditions, with a focus on high volume, high risk behavioral health conditions such as depression.
- Pursue implementation of section 2703 of the Affordable Care Act, “State Option to Provide Health Homes for Enrollees with Chronic Conditions”.
- Integrate life course behavioral health prevention strategies into interconception programming.
- Future studies might address hospital discharge planning for behavioral health hospitalizations.

TECHNICAL REPORT

METHODS

IPRO utilized KDMS electronic encounter files to identify the eligible study population, create the study data set, and populate with relevant study fields, e.g., clinical, demographic and utilization data elements. Three sets of clinical categories were created:

1. Behavioral health diagnostic categories were defined by assigning ICD9 codes, as indicated in **Appendix A**.
2. Specific physical health conditions were defined by assigning ICD9 codes, as indicated in **Appendix B**.
3. Chronic physical condition categories were created using the 2013 Agency for Healthcare Quality/Health Care Utilization and Quality Chronic Condition Indicator File, which categorizes an ICD-9-CM diagnosis code as “chronic” if the condition lasts for 12 months or longer and meets one or both of the following tests: (a) it places limitations on self-care, independent living, and social interactions; (b) it results in the need for ongoing intervention with medical products, services, and special equipment (HCUP, 2011).

The KY Behavioral Health Eligible Study Population was defined according to the following criteria:

- Age: All **AND**
- Measurement Year: 1/1/13–12/31/13 **AND**
- Continuous enrollment from 1/1/13–12/31/13, with a one month allowable gap **AND**
- Clinical selection criteria: At least one encounter during 1/1/13–12/31/13 with any ICD9 code within the range of 290–319 (mental, behavioral and neurodevelopmental disorders) in any setting
OR members with claims during 1/1/13–12/31/13 for any of the specific drugs or drug classes, other than anxiolytics, indicated **Appendix C**.

The following outcomes were evaluated:

- First all-cause hospitalization (excluding subsequent hospitalizations) in 2013, any principal diagnosis, all ages.
- First hospitalization (excluding subsequent hospitalizations) in 2013, for possible intentional self-harm, not restricted to principal diagnosis, using the algorithm outlined in Patrick *et al.* (2010), as well as E-codes for suicide, all ages. This algorithm is intended to identify intentional self-harm hospitalizations using injury and psychiatric diagnosis codes in the absence of E-code reporting, with sensitivity and specificity of 74% and 99%, respectively (Patrick *et al.*, 2010). Only 7 of 549 differently-named hospitals in the KY behavioral health dataset utilized any E-code for hospitalization diagnoses 1–10, and none included codes for suicide, i.e., E950-E959.
- First adult (aged 18 years and older) hospitalization (excluding subsequent hospitalizations) in 2013, restricted to hospitalizations with a principal behavioral health diagnosis within the range

of 290–319, which are mental, behavioral or neurodevelopmental disorders, or perinatal ICD9 codes for drug dependence (6483) or mental disorders (6484). Excluded were inpatients who expired, were transferred to another inpatient institution, or who were still hospitalized.

- First youth (aged 0–17 years) hospitalization (excluding subsequent hospitalizations) in 2013, restricted to hospitalizations with a principal behavioral health diagnosis within the range of 290–319, which are mental, behavioral or neurodevelopmental disorders, or perinatal ICD9 codes for drug dependence (6483) or mental disorders (6484). Excluded were inpatients who expired, were transferred to another inpatient institution, or who were still hospitalized..
- Adult Emergency Department (ED) Re-Visit, any principal diagnosis, within 30 days of discharge from behavioral health hospitalization, excluding inpatients who expired, were transferred to another inpatient institution, or who were still hospitalized.
- Youth Emergency Department (ED) Re-Visit, any principal diagnosis, within 30 days of discharge from behavioral health hospitalization, excluding inpatients who expired, were transferred to another facility.
- Youth Psychiatric Emergency Department (ED) Re-Visit, ED principal diagnosis within the range of 290–319 or 6483 or 6494, within 30 days of discharge from behavioral health hospitalization, excluding inpatients who expired, were transferred to another inpatient institution, or who were still hospitalized. Note: ED facility was not restricted to psychiatric facilities.
- Youth Psychiatric Emergency Department (ED) Re-Visit, ED principal diagnosis within the range of 290–319 or 6483 or 6494, within 30 days of discharge from behavioral health hospitalization, excluding inpatients who expired, were transferred to another inpatient institution, or who were still hospitalized. Note: ED facility was not restricted to psychiatric facilities.

A supplemental analysis was also conducted to evaluate risk factors for the following outcomes:

- Adult Emergency Department (ED) Re-Visit, any principal diagnosis, within 30 days of discharge from a physical (non-behavioral principal diagnosis) hospitalization, excluding inpatients who expired, were transferred to another inpatient institution, or who were still hospitalized.
- Youth Emergency Department (ED) Re-Visit, any principal diagnosis, within 30 days of discharge from a physical (non-behavioral principal diagnosis), excluding inpatients who expired, were transferred to another inpatient institution, or who were still hospitalized.

Statistical analysis was conducted using SAS version 9.3 (Cary, NC, 2010). The *phi* coefficient was used to evaluate correlations between binary variables. The *chi*-squared statistic was used to evaluate statistically significant differences between proportions. For the analysis of differences between proportions, two tables are presented for each outcome, i.e., the first table presents findings for demographic and clinical characteristics and the second presents findings for behavioral health and substance abuse diagnostic combinations.

Multiple logistic regression was used to evaluate associations between clinical, demographic and utilization factors and outcomes. For multiple logistic regression results, two tables are presented for each outcome, i.e., the first table presents findings for demographic and clinical characteristics and the second presents findings for behavioral health and substance abuse diagnostic combinations. The tables presenting multiple logistic regression results for behavioral health and substance abuse diagnostic combinations show findings independent of the demographic and clinical characteristics included in the table showing multiple logistic regression findings for demographic and clinical characteristics. In this report, the phrase “statistical limitations” will be used to identify findings of questionable validity due to statistical considerations such as small sample size. Statistical significance was set at $p < 0.05$.

DESCRIPTIVE FINDINGS

The behavioral health eligible population comprised 34% (245,011/713,888) of the total KY Medicaid Managed Care population in 2013; this represents 55% (151,828/278,290) of the total adult enrollee subset (aged 18 years and older) and 34% (93,183/435,598) of the total youth enrollee subset (aged 0–17 years; data not shown). This population was predominantly adult (62%), white (72%), female (57%), with rural residence (56%) and living in regions 8 (22%) and 3 (21%), and without disability (54%; **Table 1**); however, a substantial proportion were disabled (46%; **Table 1**). Most were enrolled in WellCare of Kentucky (44%) and CoventryCares of Kentucky (36%; **Table 1**). Humana Caresource began enrolling members in January of 2013, with a total 2013 enrollment of only 18,000; hence their enrollees comprise a smaller proportion of the behavioral health eligible population.

Table 1. Demographic Characteristics of the Kentucky Medicaid Managed Care Total Behavioral Health Eligible Population

Demographic Characteristics	Count ^a	Percent
Age Group:		
Adults (18+ years)	151,828	62%
Youth (Children and Adolescents, 0–17 years)	93,183	38%
Race/Ethnicity:		
Asian	565	< 1%
Black	21,578	9%
Native American or Alaskan or Hawaiian Native	453	< 1%
Other	45,812	19%
White	176,603	72%
Sex:^b		
Male	104,506	43%
Female	140,505	57%
Density of Geographical Area of Residence:^c		
Rural	137,571	56%
Urban	107,419	44%
Region of Residence:		
Unknown	22	< 1%
1	10,947	4%
2	21,345	9%
3	52,536	21%
4	30,450	12%
5	39,803	16%
6	17,198	7%
7	18,227	7%
8	54,483	22%
Foster Care:		
No	236,573	97%
Yes	5,184	2%
At Risk	3,254	1%
Disability:^d		

Demographic Characteristics	Count ^a	Percent
No	131,204	54%
Disabled	113,346	46%
Blind	461	< 1%
MCO:		
WellCare of Kentucky	106,842	44%
Passport Health Plan	42,481	17%
Humana CareSource	4,127	2%
CoventryCares of Kentucky	88,453	36%
Other ^e	3,108	1%

^a Total N = 245,011

^b Twenty-one members with missing data on county for rural/urban designation

^c Defined based upon aid category.

^d Includes 1 member of Anthem Health Plan of Kentucky, 3,101 members of Kentucky Spirit Health Plan and 6 members with missing data for MCO

Prominent behavioral health diagnoses: Among adults, prominent behavioral health diagnoses included anxiety (43%), depression (39%), and drug abuse (17%; **Table 2**). Among adolescents, prominent behavioral health diagnoses included attention deficit disorder (43%), depression (25%), anxiety (17%), psychoses – all else (17%), and conduct disorder (15%; **Table 3**). Among children, prominent behavioral health diagnoses included attention deficit disorder (48%), conduct disorder (21%), speech delay (11%), and anxiety (10%; **Table 4**).

Table 2. Prevalence of Behavioral Health Conditions – Adults

Diagnostic Category ^a	Count	Percent
Total Number of Members ^b	151,828	100%
Chronic Mental Health Diagnosis ^c	142,450	94%
Anxiety	65,454	43%
Depression	58,929	39%
Drug Abuse	26,365	17%
Neurotic/Personality/Non-psychotic Disorders – All Else ^d	24,826	16%
Psychoses – All Else ^d	16,631	11%
Bipolar/Manic	15,372	10%
No BH Diagnosis ^e	9,004	6%
Alcohol Abuse	7,558	5%
Schizophrenia	7,323	5%
PTSD	6,684	4%
Attention Deficit Disorder	6,131	4%
Other Nonorganic Psychoses	5,449	4%
Organic Psychoses – All Else ^d	3,905	3%
Pain Disorder	3,764	2%
Personality Disorder	3,010	2%

Diagnostic Category ^a	Count	Percent
Conduct Disorder	2,422	2%
Sleep Disorder	2,411	2%
Other Anxiety Disorder	2,374	2%
Phobia	2,194	1%
Intellectual Disabilities – Moderate, Severe, Profound or Unspecified	1,750	1%
Obsessive Compulsive Disorder	1,232	1%
Other Conduct Disorder	1,021	1%
Dementia	994	1%
Intellectual Disabilities – Mild	988	1%
Delusional Disorders	560	< 1%
Dissociative Disorders	522	< 1%
Brain Damage	482	< 1%
Other Developmental Delay	451	< 1%
Autism	432	< 1%
Hyperkinetic Syndrome	367	< 1%
Eating Disorder	356	< 1%
Other Pervasive Developmental Disorder	344	< 1%
Stereotypy	253	< 1%
Speech Delay	91	< 1%
Other Dissociative Disorder	73	< 1%
Childhood Disintegrative Disorder	3	< 1%

^a Diagnostic categories were defined based upon 2013 ICD9 codes identified across all places of service, without limiting to principal diagnosis, and are not mutually exclusive; therefore, a member may fall into one or more categories; however, overlapping diagnostic categories are not double-counted, as indicated in footnote c. See **Appendix A** for assignment of ICD9 codes to diagnostic category.

^b Total number of Kentucky Behavioral Health eligible members aged 18+ years. The percentage of members with 0 behavioral diagnosis, 1 behavioral diagnosis, and 2 or more behavioral diagnoses was 6%, 39%, and 55%, respectively (data not shown).

^c Defined using the Chronic Condition Indicator, Healthcare Cost and Utilization Project (HCUP), Agency for Healthcare Research and Quality. Downloaded from: <https://www.hcup-us.ahrq.gov/toolssoftware/chronic/chronic.jsp> [Accessed 10 March 2014].

^d Excludes members with overlapping diagnostic categories, per **Appendix A**.

^e No diagnosis within the ICD9 code range from 290–319. These members were determined eligible by virtue of having a pharmaceutical claim for an antidepressant, antipsychotic or antimanic agent, or for medication to treat drug addiction, alcohol addiction, or ADHD.

Table 3. Prevalence of Behavioral Health Conditions – Adolescents

Diagnostic Category ^a	Count	Percent
Total Number of Members ^b	33,264	100%
Chronic Mental Health Diagnosis ^c	31,516	95%
Attention Deficit Disorder	14,146	43%
Depression	8,247	25%
Anxiety	5,804	17%
Psychoses – All Else ^d	5,681	17%
Conduct Disorder	4,941	15%
Neurotic/Personality/Non-psychotic Disorders – All Else ^d	2,942	9%
Bipolar/Manic Disorder	2,350	7%
No BH Diagnosis ^e	1,697	5%
Drug Abuse	1,724	5%
PTSD	1,626	5%
Hyperkinetic Disorder	1,092	3%
Other Anxiety Disorder	677	2%
Other Pervasive Developmental Disorder	645	2%
Other Nonorganic Psychoses	636	2%
Autism	617	2%
Alcohol Abuse	605	2%
Other Developmental Delay	577	2%
Pain Disorder	490	1%
Sleep Disorder	490	1%
Organic Psychoses – All Else ^d	471	1%
Personality Disorder	382	1%
Stereotypy	376	1%
Obsessive Compulsive Disorder	373	1%
Intellectual Disabilities – Mild	282	1%
Intellectual Disabilities – Moderate, Severe, Profound or Unspecified	282	1%
Speech Delay	262	1%
Phobia	247	1%
Other Conduct Disorder	216	1%
Eating Disorder	178	1%
Brain Damage	178	1%
Schizophrenia	116	< 1%
Dissociative Disorder	71	< 1%
Other Dissociative Disorder	22	< 1%
Delusional Disorders	18	< 1%
Dementia	5	< 1%
Child Disintegrative Disorder	1	< 1%

^a Diagnostic categories were defined based upon 2013 ICD9 codes identified across all places of service, without limiting to principal diagnosis, and are not mutually exclusive; therefore, a member may fall into one or more categories; however, overlapping diagnostic categories are not double-counted, as indicated in footnote c. See **Appendix A** for assignment of ICD9 codes to diagnostic category.

^b Total number of Kentucky Behavioral Health eligible members aged 13–17 years. The percentage of members with 0 behavioral diagnosis, 1 behavioral diagnosis, and 2 or more behavioral diagnoses was 5%, 21%, and 74%, respectively (data not shown).

^c Defined using the Chronic Condition Indicator, Healthcare Cost and Utilization Project (HCUP), Agency for Healthcare Research and Quality. Downloaded from: <https://www.hcup-us.ahrq.gov/toolssoftware/chronic/chronic.jsp> [Accessed 10 March 2014].

^d Excludes members with overlapping diagnostic categories, per **Appendix A**.

^e No diagnosis within the ICD9 code range from 290–319. These members were determined eligible by virtue of having a pharmaceutical claim for an antidepressant, antipsychotic or antimanic agent, or for medication to treat drug addiction, alcohol addiction, or ADHD.

Table 4. Prevalence of Behavioral Health Conditions – Children

Diagnostic Category ^a	Count	Percent
Total Number of Members ^b	59,919	100%
Chronic Mental Health Diagnosis ^c	58,297	97%
Attention Deficit Disorder	28,742	48%
Conduct Disorder	12,633	21%
Speech Delay	6,359	11%
Anxiety	6,160	10%
Neurotic/Personality/Non-psychotic Disorders – All Else ^d	5,390	9%
Other Developmental Delay	4,328	7%
Depression	3,871	6%
Psychoses – All Else ^d	3,820	6%
Hyperkinetic Disorder	2,254	4%
Autism	1,914	3%
No BH Diagnosis ^e	1,536	3%
PTSD	1,615	3%
Sleep Disorder	1,325	2%
Other Pervasive Developmental Disorder	1,285	2%
Bipolar/Manic Disorder	1,105	2%
Stereotypy	796	1%
Eating Disorder	502	1%
Organic Psychoses – All Else ^d	500	1%
Other Nonorganic Psychoses	421	1%
Personality Disorder	395	1%
Obsessive Compulsive Disorder	371	1%
Pain Disorder	318	1%
Intellectual Disabilities – Moderate, Severe, Profound or Unspecified	301	1%
Drug Abuse	292	< 1%
Other Conduct Disorder	243	< 1%
Other Anxiety Disorder	227	< 1%
Intellectual Disabilities – Mild	224	< 1%
Phobia	135	< 1%
Brain Damage	113	< 1%
Schizophrenia	38	< 1%

Diagnostic Category ^a	Count	Percent
Dissociative Disorder	32	< 1%
Other Dissociative Disorder	32	< 1%
Alcohol Abuse	32	< 1%
Child Disintegrative Disorder	16	< 1%
Delusional Disorders	11	< 1%
Dementia	0	< 1%

^a Diagnostic categories were defined based upon 2013 ICD9 codes identified across all places of service, without limiting to principal diagnosis, and are not mutually exclusive; therefore, a member may fall into one or more categories; however, overlapping diagnostic categories are not double-counted, as indicated in footnote c. See **Appendix A** for assignment of ICD9 codes to diagnostic category.

^b Total number of Kentucky Behavioral Health eligible members aged 0–12 years. The percentage of members with 0 behavioral diagnosis, 1 behavioral diagnosis, and 2 or more behavioral diagnoses was 3%, 18%, and 79%, respectively (data not shown).

^c Defined using the Chronic Condition Indicator, Healthcare Cost and Utilization Project (HCUP), Agency for Healthcare Research and Quality. Downloaded from: <https://www.hcup-us.ahrq.gov/toolssoftware/chronic/chronic.jsp> [Accessed 10 March 2014].

^d Excludes members with overlapping diagnostic categories, per **Appendix A**.

^e No diagnosis within the ICD9 code range from 290–319. These members were determined eligible by virtue of having a pharmaceutical claim for an antidepressant, antipsychotic or antimanic agent, or for medication to treat drug addiction, alcohol addiction, or ADHD.

Pharmaceutical treatment patterns: **Figures 1–5** present data on psychotropic pharmacy claims. More than half of adults and adolescents had a pharmacy claim for psychotropic medication (**Figure 1**). Of members with a pharmacy claim, a single psychotropic drug class characterized the majority of members across all age groups (**Figure 1**). Among all members in the behavioral health study population, the percent with a claim for both an antidepressant and antipsychotic was 9% for adults and adolescents, and 4% for children (**Figure 1**). Among adults with a pharmacy claim, those with an antidepressant claim comprised the largest group, followed by adults with a claim for an anxiolytic, an antipsychotic, and drug addiction therapy (**Figure 2**). Among adolescents with a pharmacy claim, those with an antidepressant claim comprised the largest group, followed by adolescents with a claim for ADHD treatment, an antipsychotic and anxiolytic (**Figure 3**). Among children with a pharmacy claim, the greatest proportion had a claim for ADHD treatment, followed by antidepressant, antipsychotic, and anxiolytic therapy (**Figure 4**). Enrollees with a claim for antidepressant drug therapy comprised the largest proportions of enrollees without a coded behavioral health diagnosis among adults (12%), adolescents (10%), and children (9%; **Figure 5**).

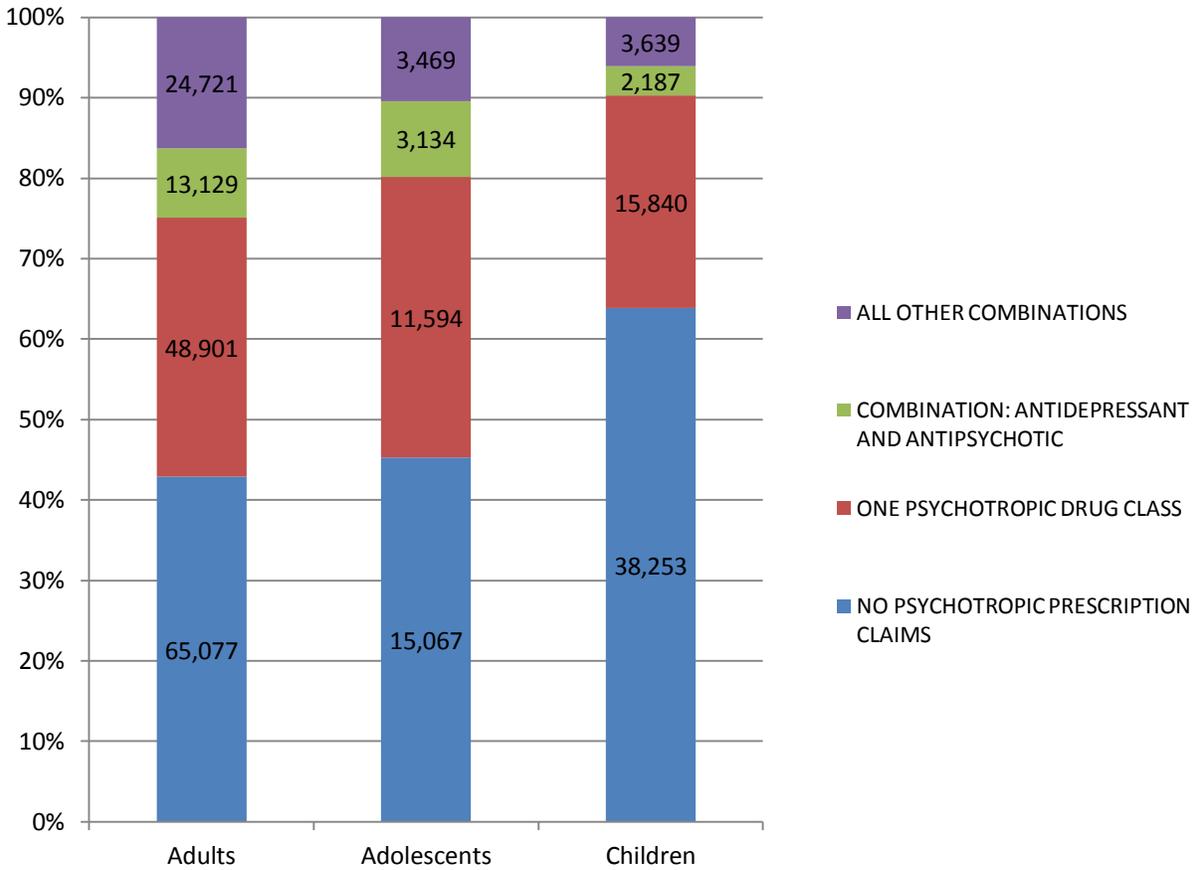


Figure 1. Polypharmacy by Age Group. Adult, adolescent, and child eligible members with prescription claims for one psychotropic drug class (red), for a combination of antidepressant and antipsychotics (green), for other combinations of drug classes (purple) and no psychotropic drug claims (blue).

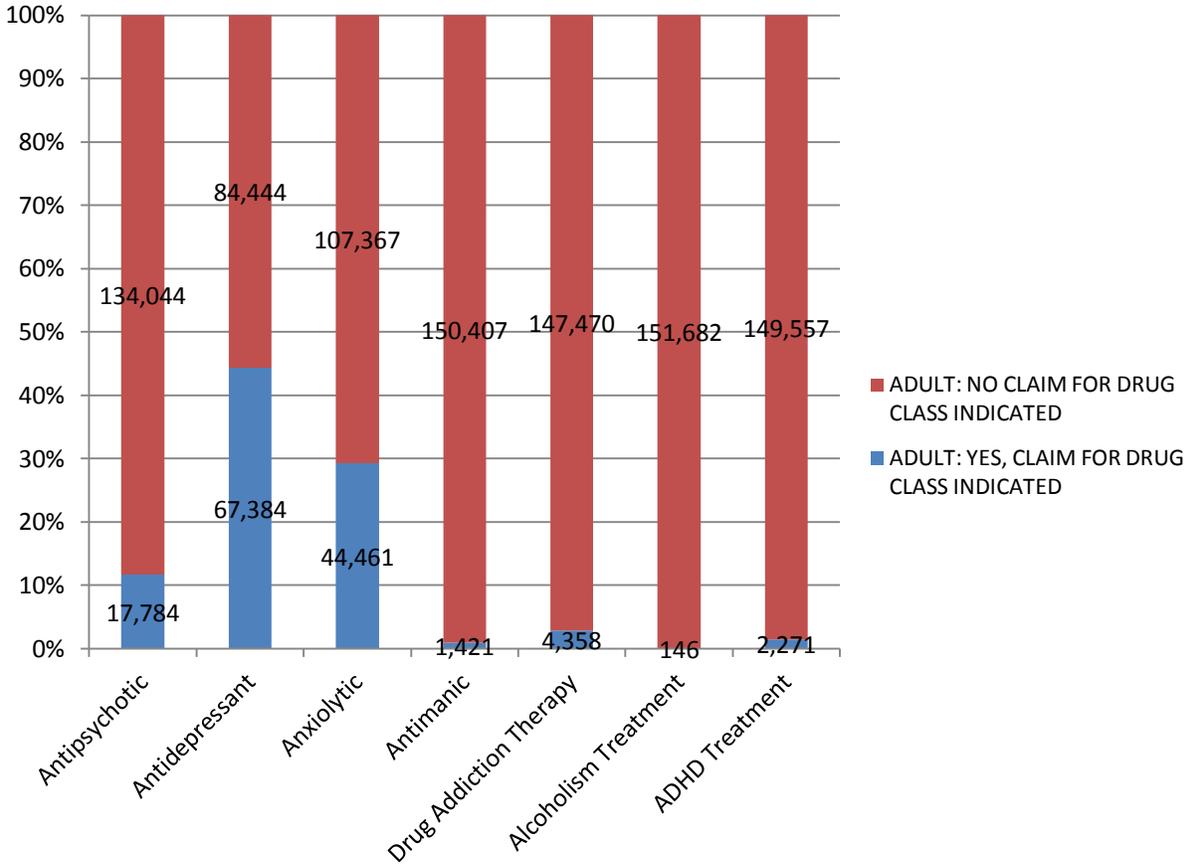


Figure 2. Adults with Behavioral Health Diagnosis or Pharmacy Claim by Drug Class. Adults with a behavioral health diagnosis or pharmacy claim (n = 151,828) with a specific drug class claim (blue) or without a specific drug class claim (red) by drug class of antipsychotic, antidepressant, anxiolytics, antimanic drugs and drug addiction, alcoholism, and ADHD treatments.

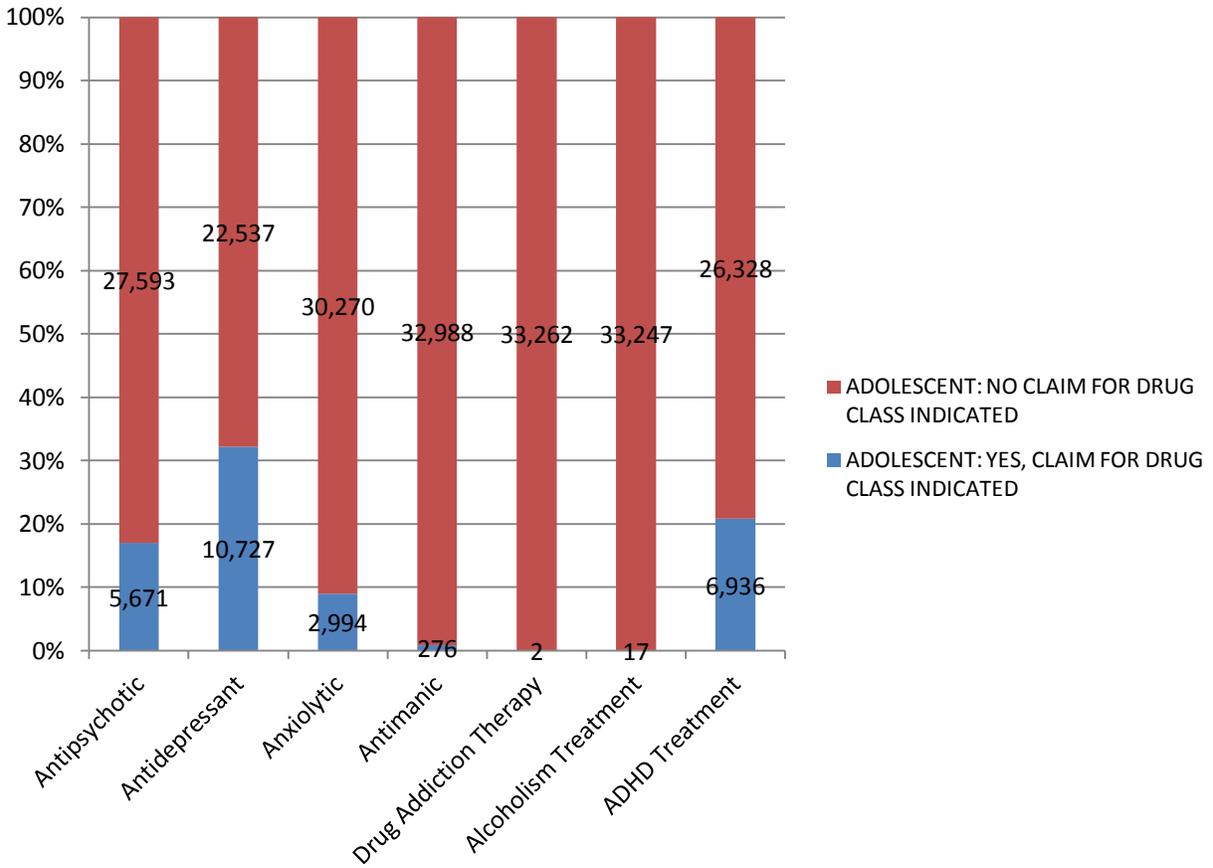


Figure 3. Adolescents with Behavioral Health Diagnosis or Pharmacy Claim by Drug Class. Adolescents with a behavioral health diagnosis or pharmacy claim (n = 33,264) with a specific drug class claim (blue) or without a specific drug class claim (red) by drug class of antipsychotic, antidepressant, anxiolytics, antimanic drugs and drug addiction, alcoholism, and ADHD treatments.

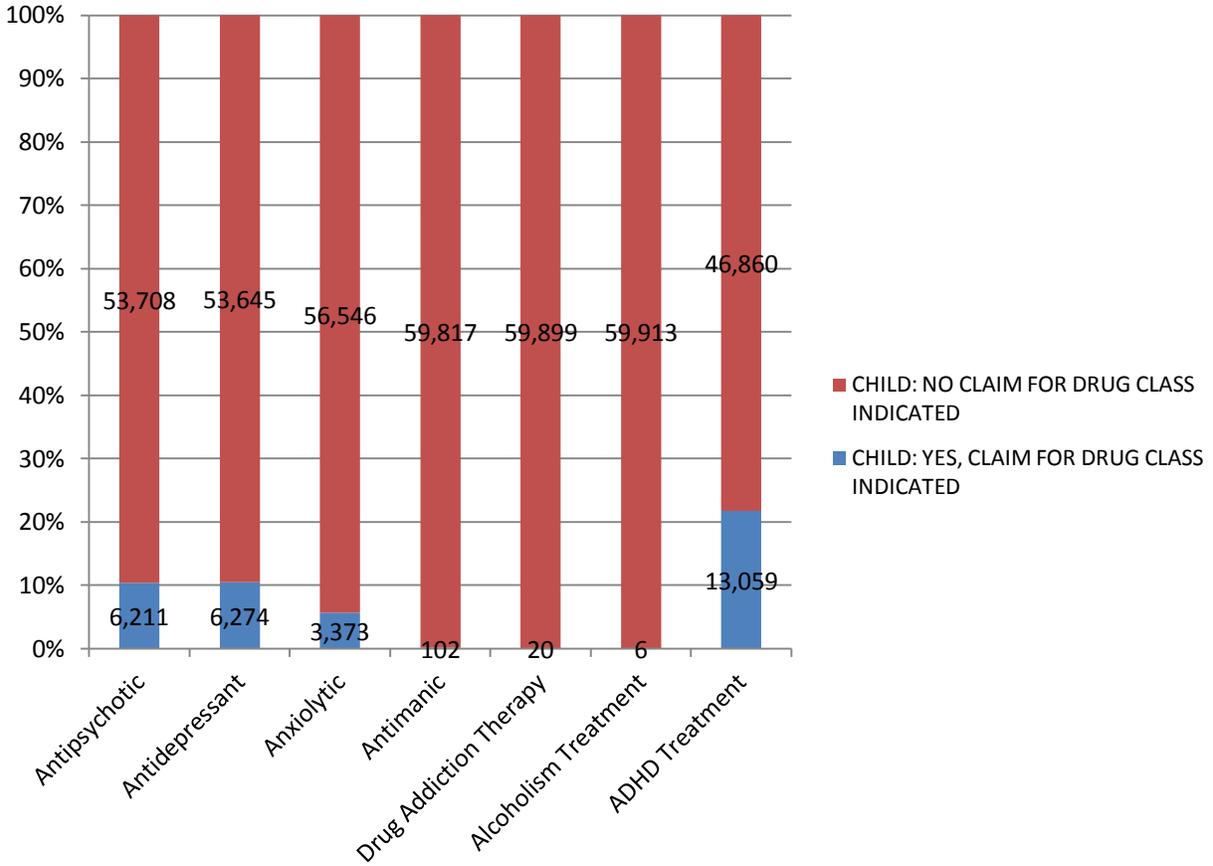


Figure 4. Children with Behavioral Health Diagnosis or Pharmacy Claim by Drug Class.

Children with a behavioral health diagnosis or pharmacy claim (n = 59,919) with a specific drug class claim (blue) or without a specific drug class claim (red) by drug class of antipsychotic, antidepressant, anxiolytics, antimanic drugs and drug addiction, alcoholism, and ADHD treatments.

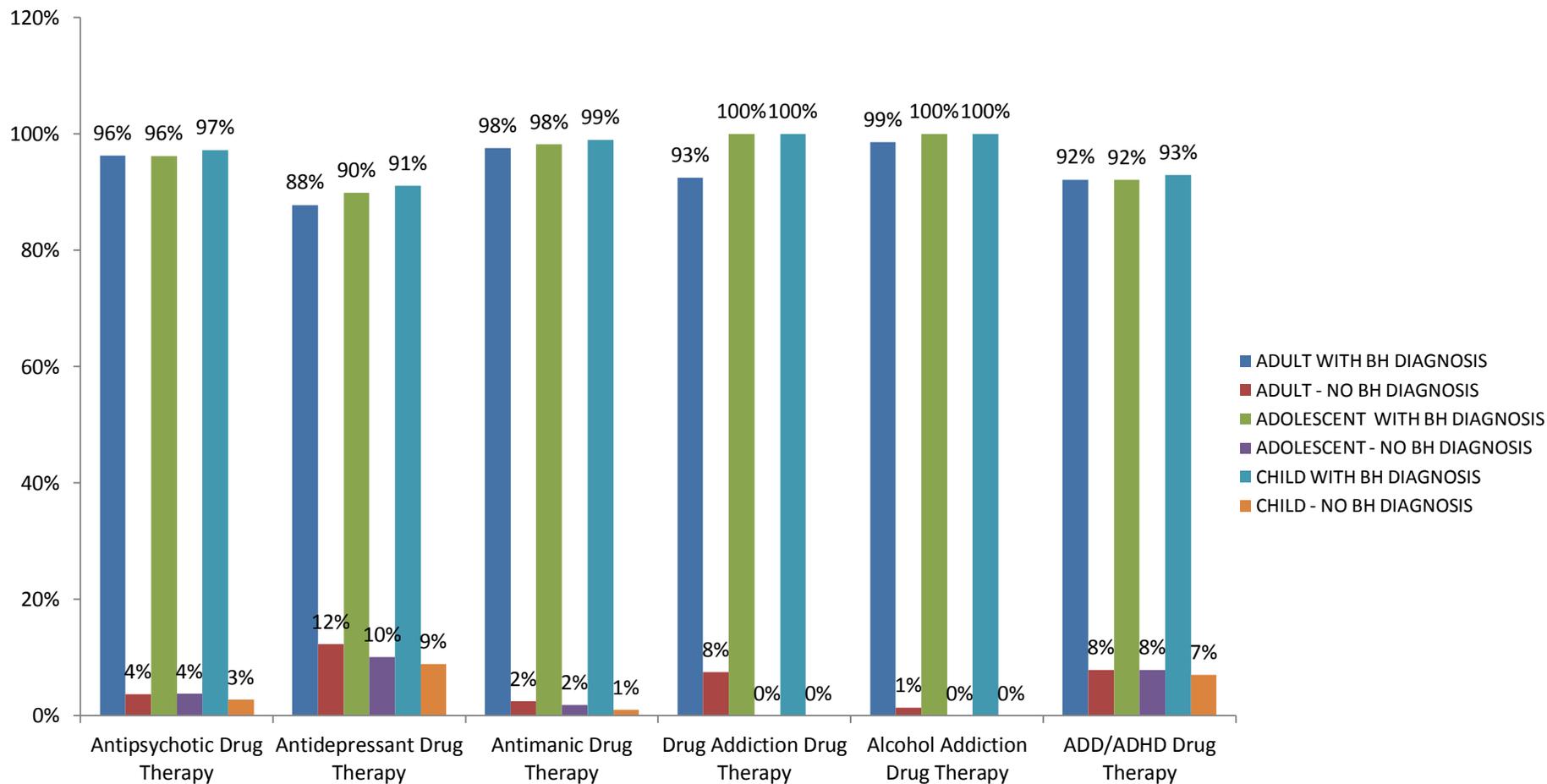


Figure 5. Members with/out Behavioral Health Diagnosis with Claim for Drug Therapy Class by Age Group. Adults (n = 151,828), adolescents (n = 33,264), and children (n = 59,919) with a claim for a drug therapy class of antipsychotic, antidepressant, antimanic, drug addiction, alcohol addiction, and ADD/ADHD drug therapies were analyzed by age group. Percentage of adults with behavioral health diagnoses (dark blue) and without (red), adolescents with behavioral health diagnoses (green) and without (purple), and children with behavioral health diagnoses (light blue) and without (orange) were calculated. Due to a large volume of medical conditions that indicate use of anxiolytics, e.g., central nervous system pathology (Griffin *et al.*, 2013), members with an anxiolytic claim who did not have a behavioral diagnosis were excluded from the study sample. Antidepressants are mostly indicated for depression; however, they may also have potential benefits for treatment of physical conditions such as many pain conditions as well as urological, gastroenterological and gynecological conditions (Mercier *et al.*, 2013).

Physical health characteristics: Among adults, the most prominent chronic physical health conditions were endocrine, nutritional, metabolic, or immunity disorders (55%), diseases of the circulatory system (53%), diseases of the nervous system and sense organs (47%), diseases of the respiratory system (45%), and diseases of the musculoskeletal system (43%; **Figure 6**). The presence of chronic endocrine, nutritional, metabolic, or immunity disorders was correlated with diseases of the circulatory system and diseases of the musculoskeletal system (**Figure 6**); the latter was also correlated with diseases of the circulatory system and diseases of the nervous system and sense organs (**Figure 6**).

Hypertension was the most prevalent specific physical health condition among adults (48%), followed by COPD (30%), obesity (24%), diabetes (22%), arthritis (19%), asthma (16%), ischemic heart disease (14%), and cancer (14%; **Figure 7**). The percentage of adults with no chronic physical health conditions, one chronic physical health condition, and two or more chronic physical health conditions was 14%, 13%, and 73%, respectively (data not shown). Among adolescents, the most prominent chronic physical health conditions were disease of the respiratory system (33%), followed by diseases of the nervous system and sense organs (14%), and endocrine, nutritional, metabolic, or immunity disorders (13%; **Figure 8**). Asthma was the most prevalent specific physical health condition among adolescents (14%), followed by obesity (8%) and migraines (5%; **Figure 9**). The percentage of adolescents with no chronic physical health conditions, one chronic physical health condition, and two or more chronic physical health conditions was 43%, 30%, and 27%, respectively (data not shown).

Among children, the most prominent chronic physical health conditions were diseases of the respiratory system (37%), followed by diseases of the nervous system and sense organs (16%), congenital anomalies (7%), and endocrine, nutritional, metabolic, or immunity disorders (6%; **Figure 10**). Asthma was the most prevalent specific physical health condition among children (15%), followed by COPD (4%), obesity (3%), and epilepsy or seizure disorder (3%; **Figure 11**). Chronic physical health conditions did not show statistically significant correlations among adolescents and children. The percentage of children with no chronic physical health conditions, one chronic physical health condition, and two or more chronic physical health conditions was 49%, 32%, and 19%, respectively (data not shown).

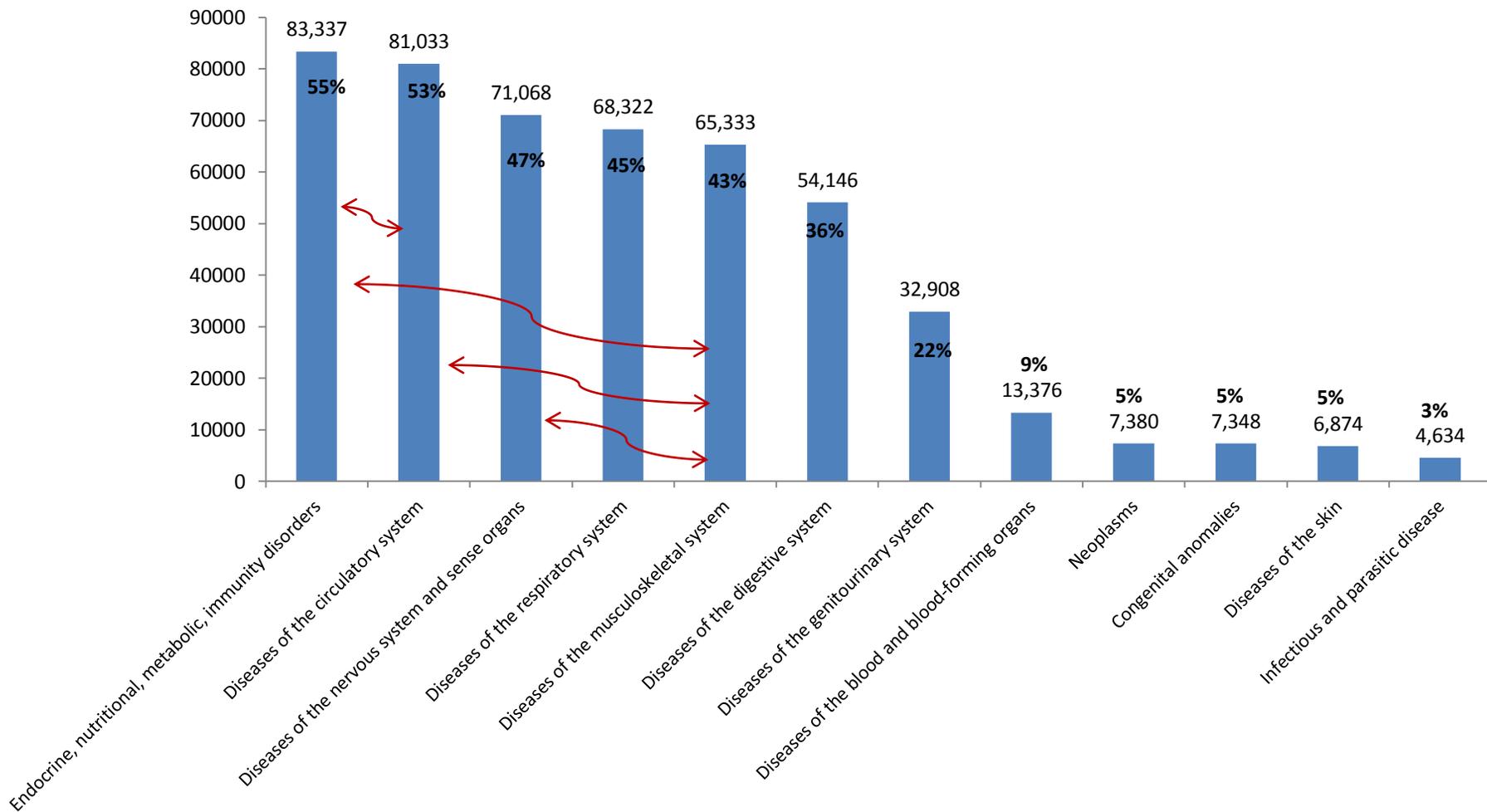


Figure 6. Prevalence of Chronic Physical Conditions – Adults. Percentage of Kentucky Behavioral Health eligible adults (n = 151,828) with chronic conditions based on the HCUP Chronic Condition Indicator File (AHRQ, 2014). Connectors (red double-headed arrows) indicate chronic conditions with statistically significant and moderate to strong positive correlations (ϕ coefficient ≥ 0.30 ; $p < 0.05$), i.e., co-occurring comorbid conditions.

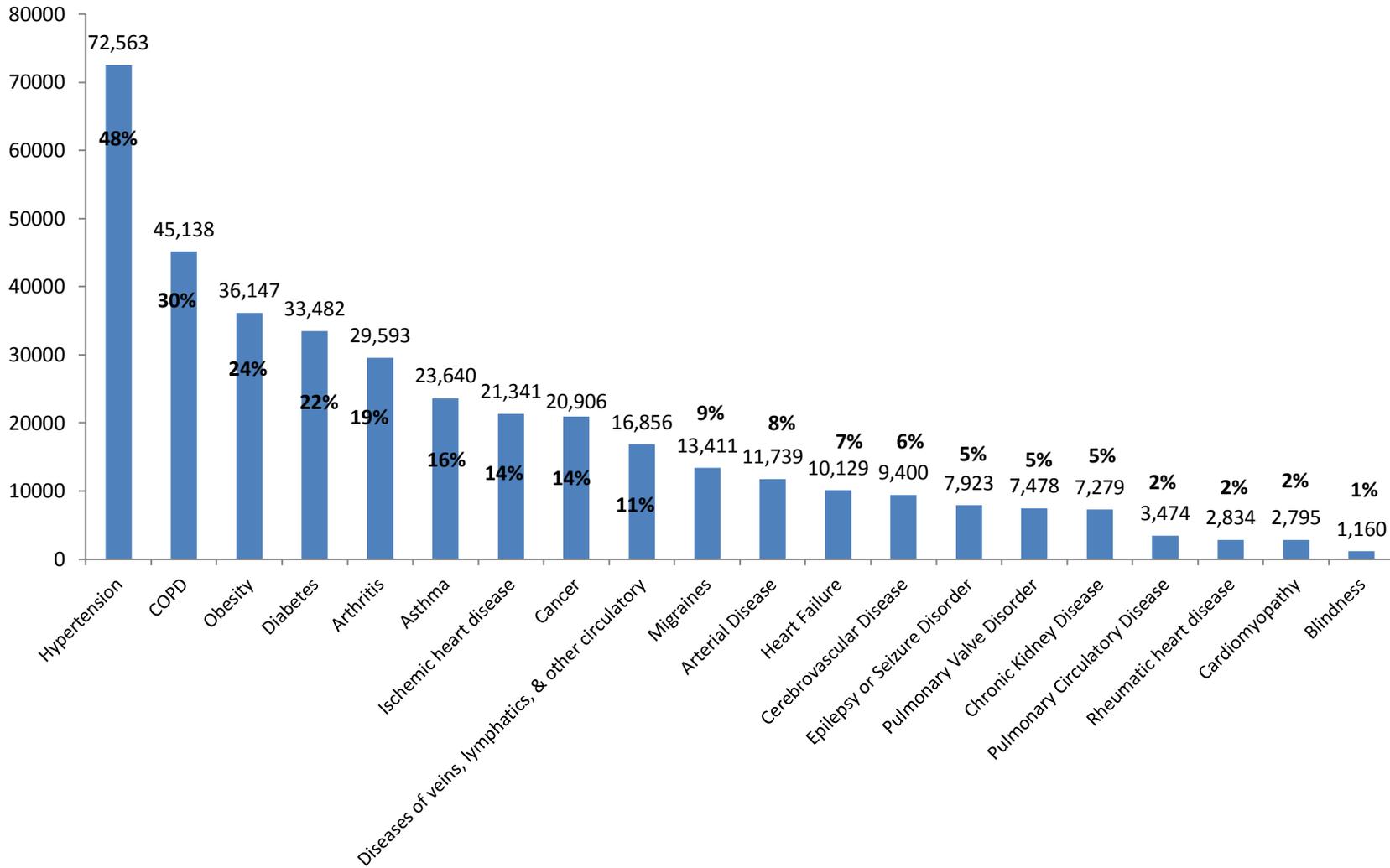


Figure 7. Prevalence of Specific Physical Conditions – Adults. Percentage of Kentucky Behavioral Health eligible adults (n = 151,828) with physical conditions categorized as defined by ICD9 codes in **Appendix B** was calculated. Conditions coded as cerebral palsy (n = 611), muscular dystrophy (n = 310), sickle cell disease (n = 109) and cystic fibrosis (n = 83) are not shown.

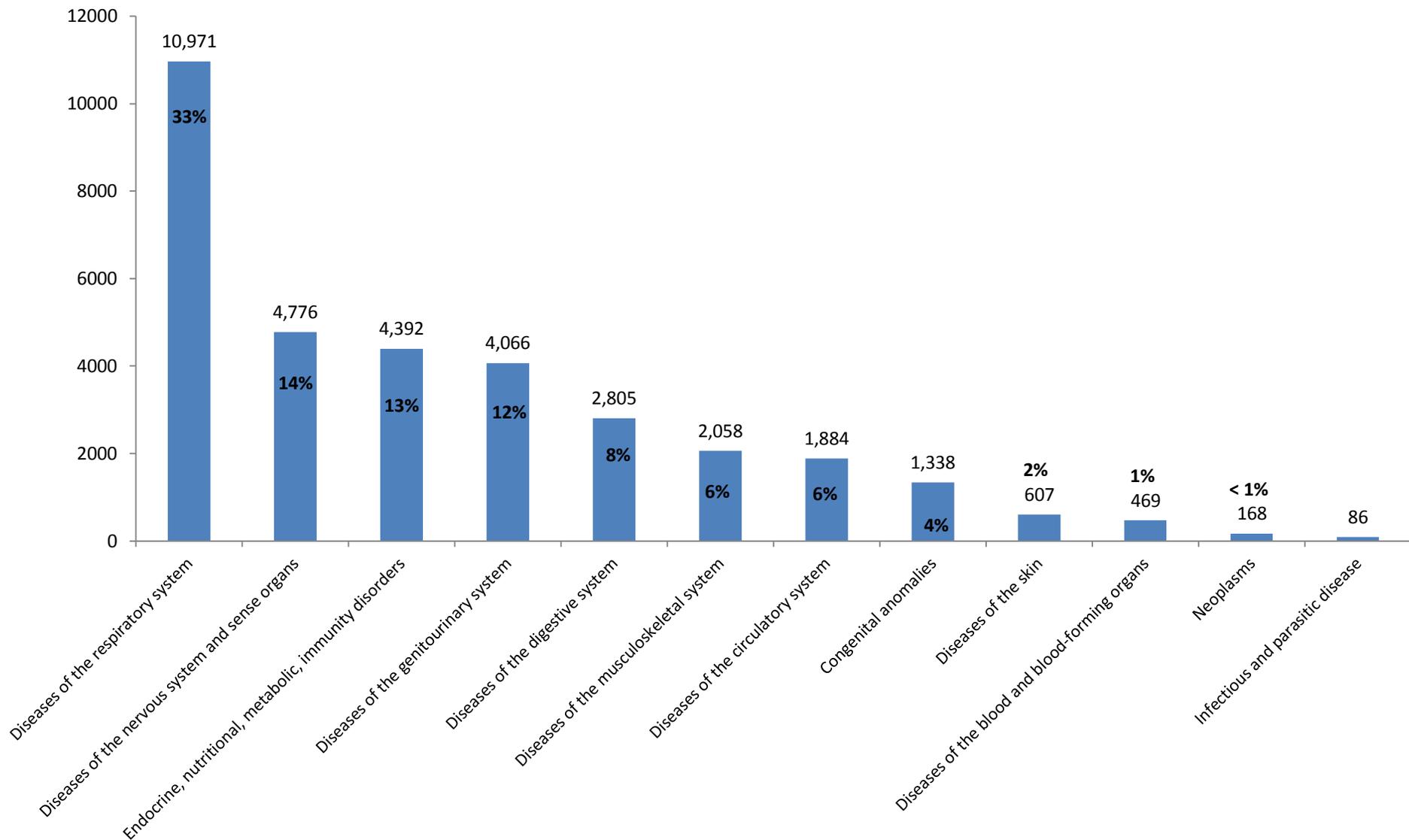


Figure 8. Prevalence of Chronic Physical Conditions – Adolescents. Percentage of Kentucky Behavioral Health eligible adolescents (n = 33,264) with chronic conditions categorized based on the HCUP Chronic Condition Indicator File (AHRQ, 2014) was calculated.

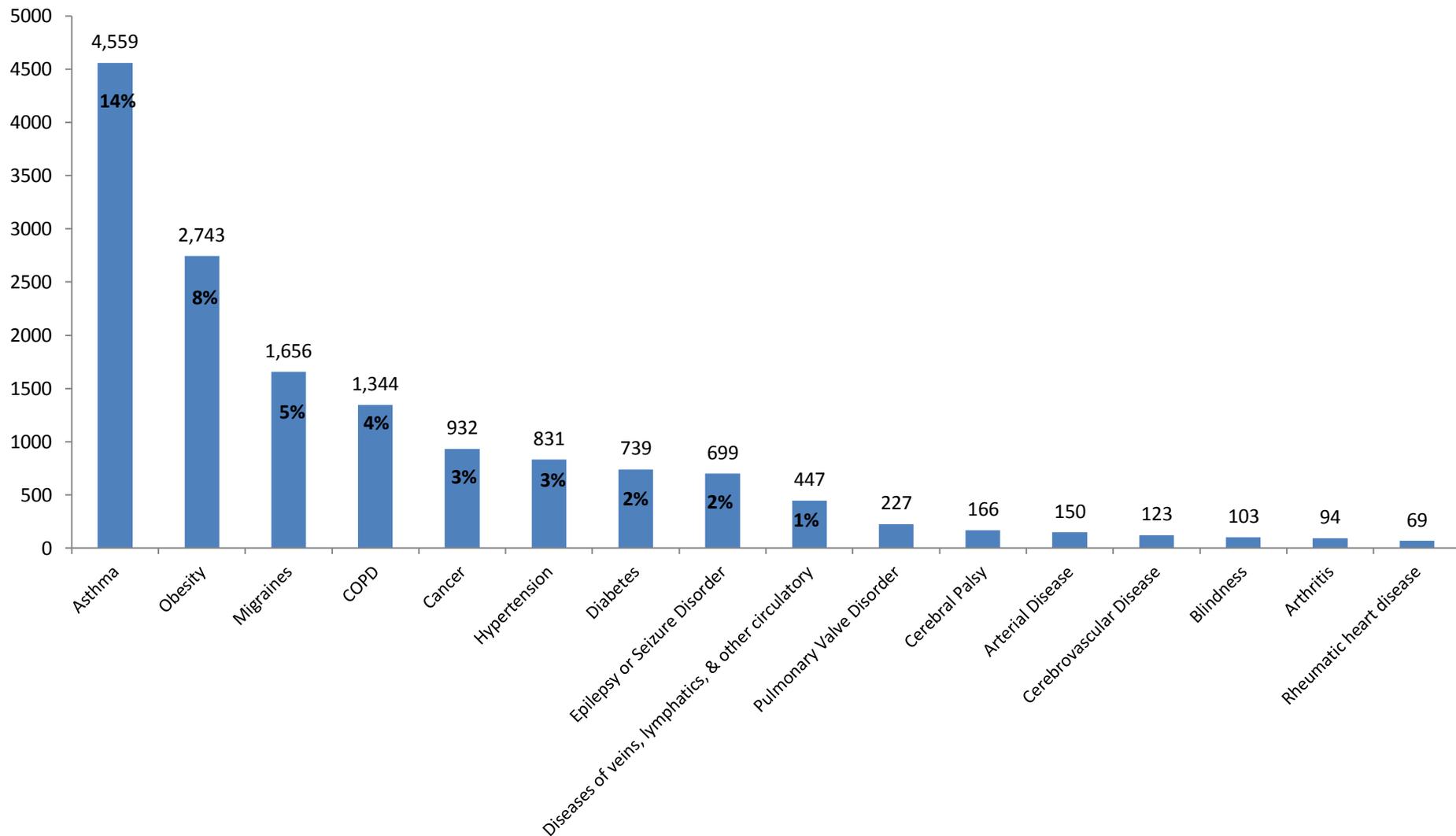


Figure 9. Prevalence of Specific Physical Conditions – Adolescents. Percentage of Kentucky Behavioral Health eligible adolescents (n = 33,264) with physical conditions categorized as defined by ICD9 codes in **Appendix B** was calculated. Conditions coded as chronic kidney disease (n = 41), ischemic heart disease (n = 29), muscular dystrophy (n = 28), heart failure (n = 25), and cardiomyopathy (n = 24) are not shown.

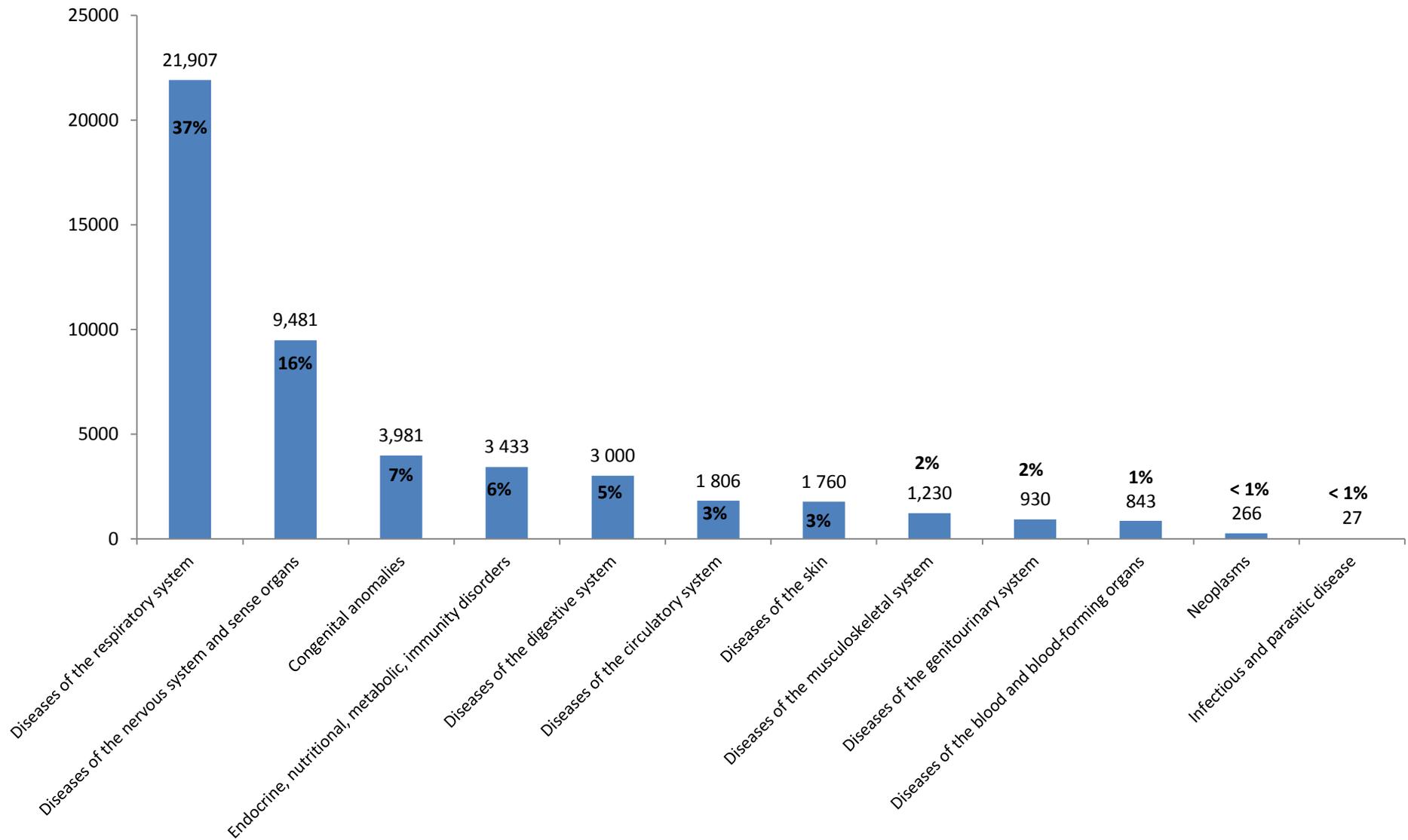


Figure 10. Prevalence of Chronic Physical Conditions – Children. Percentage of Kentucky Behavioral Health eligible children (n = 59,919) with chronic conditions categorized based on the HCUP Chronic Condition Indicator File (AHRQ, 2014) was calculated.

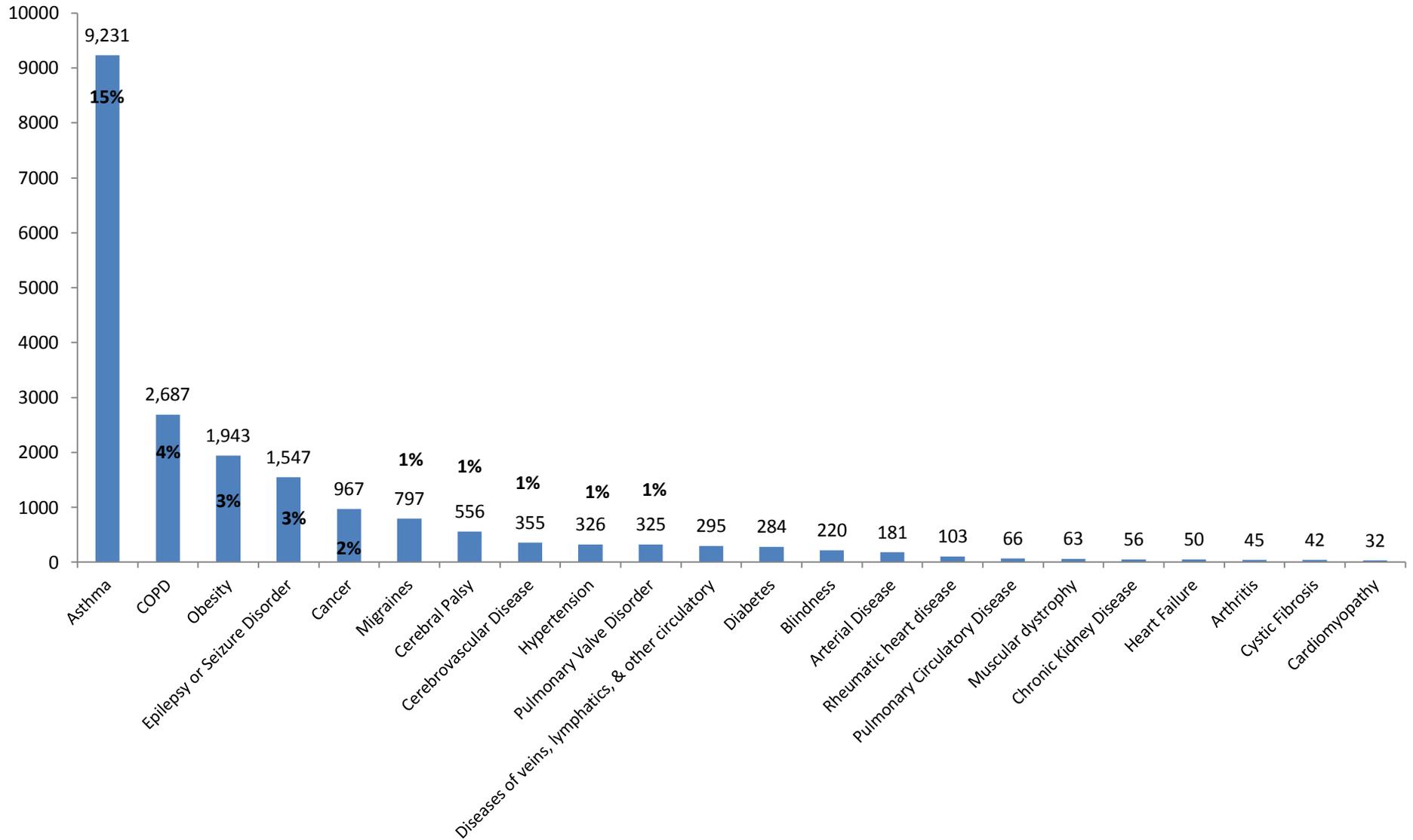


Figure 11. Prevalence of Specific Physical Conditions - Children. Percentage of Kentucky Behavioral Health eligible children (n = 59,919) with physical conditions categorized as defined by ICD9 codes in **Appendix B** was calculated. Conditions coded as sickle cell disease (n = 29) and ischemic heart disease (n = 18) are not shown.

Diagnostic characteristics of adult enrollees' first hospitalization and ED re-visit: **Figures 12a** and **13a** present 3-digit ICD9 code diagnostic categories with the code number indicated in parentheses following the code description in the legend, and the number of enrollees with each diagnostic category-specific encounter is indicated in the corresponding pie "slice." There were 27,862 adults with a hospitalization (n = 23,685 physical and 4,177 behavioral) during 2013 (data not shown); of these, the most prevalent principal diagnosis (based upon the 3-digit ICD9 code category) was episodic mood disorder (n = 1,740), followed by chronic bronchitis (n = 1,555), pneumonia (n = 1,212), septicemia (n = 920), cellulitis and abscess (n = 873), diseases of the lung (n = 734), schizophrenia (n = 728), and diabetes (n = 629; **Figure 12a**). Among adults hospitalized for episodic mood disorder, the most prominent specific (5-digit) ICD9-coded diagnosis was major depressive affective disorder, recurrent episode, severe (n = 347); followed by unspecified mood disorder (n = 295) and bipolar disorder, unspecified (n = 141; **Figure 12b**). Among the 973 adults whose first hospitalization was for a behavioral health diagnosis and who had an ED re-visit, prominent hospitalization diagnoses included episodic mood disorder, schizophrenic disorder, drug induced mental disorder, and depressive disorder (**Figure 13a**), and prominent ED re-visit diagnoses were respiratory/chest symptoms, general symptoms, symptoms abdomen and pelvis, depressive disorder, anxiety, other back disorders, and schizophrenia (**Figure 13b**).

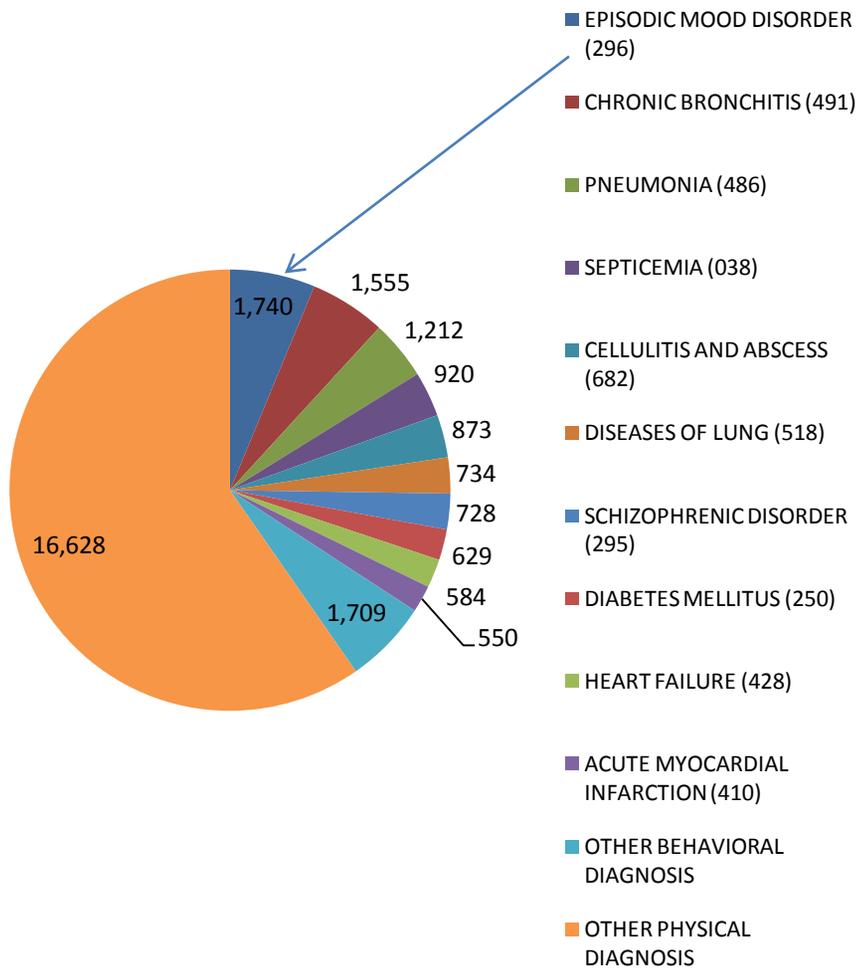


Figure 12a. Adult Hospitalization by ICD9 Hospital Discharge Category. The number of adult enrollees with an (all-cause) hospitalization (regardless of whether or not followed by ED visit) by high-volume ICD9 category-specific (3-digit) hospital discharge.

ICD9 Code	Description	Count
29633	Major Depressive Affective Disorder, Recurrent Episode, Severe	347
29690	Unspecified Mood Disorder	295
29680	Bipolar Disorder, Unspecified	141
29650	Bipolar I Disorder, Most Recent Episode Depressed	119
29634	Major Depressive Affective Disorder, Recurrent, Severe, with Psychotic Behavior	113
29630	Major Depressive Affective Disorder, Recurrent, Unspecified	106
29620	Major Depressive Affective Disorder, Single Episode	92
29632	Major Depressive Affective Disorder, Recurrent, Moderate	84
29640	Bipolar I Disorder, Most Recent Episode Manic	52
29652	Bipolar I Disorder, Most Recent Episode Depressed, Moderate	50

Figure 12b. Adult Episodic Mood Disorder Hospitalization by ICD9 Code. The 5-digit ICD9 code detail for the highest volume principal diagnoses for hospitalization for episodic mood disorder (adults with a hospitalization regardless of whether or not followed by ED visit).

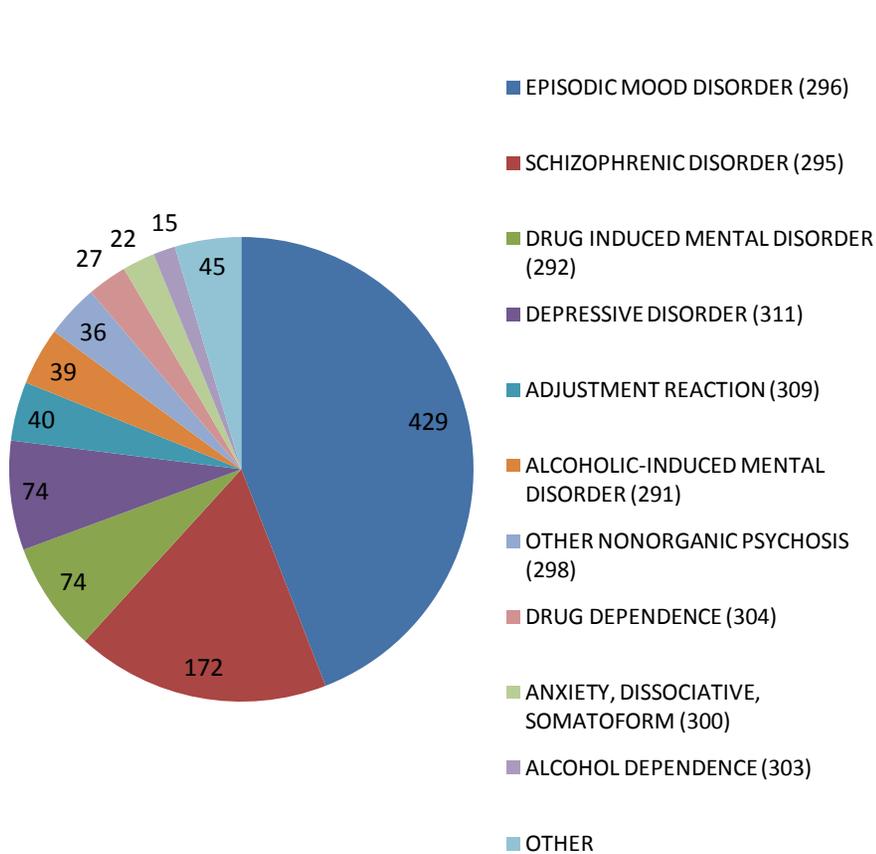


Figure 13a. Adult BH Hospitalization with Subsequent ED Visit by ICD9 BH Hospital Discharge Category. The number of adult enrollees with a behavioral health hospitalization and subsequent ED visit by high-volume ICD9 category-specific (3-digit) behavioral health hospital discharge.

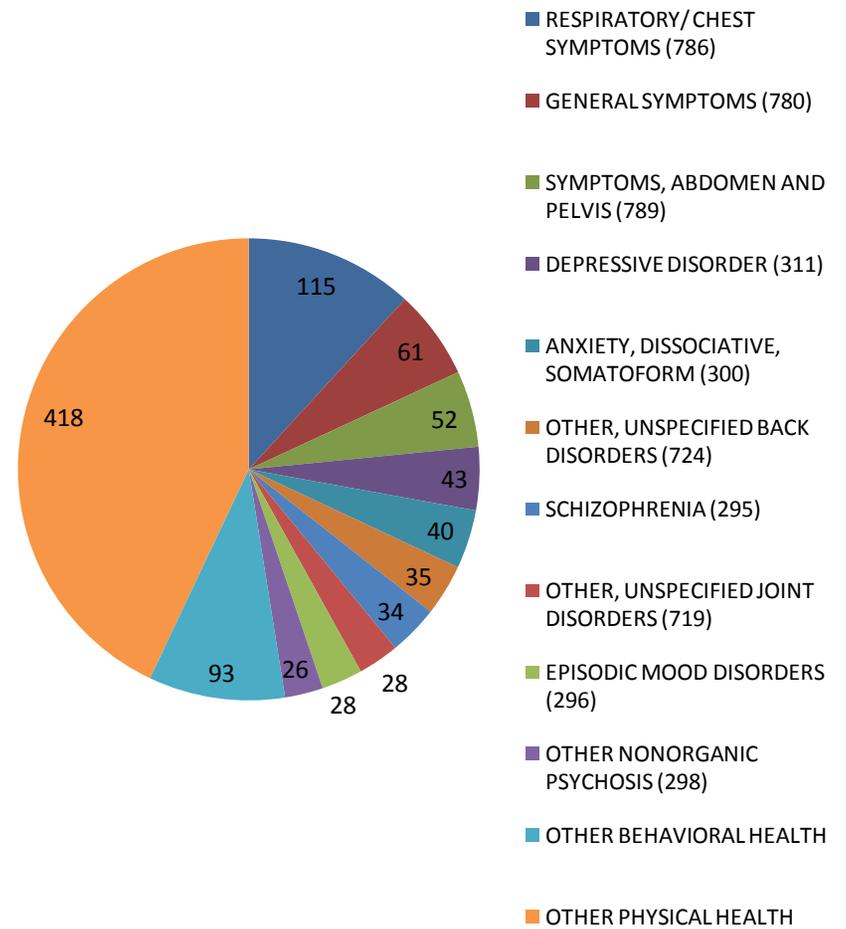


Figure 13b. Adult BH Hospitalization with Subsequent ED Visit by ICD9 ED Re-Visit Categories. The number of adult enrollees with a behavioral health hospitalization and subsequent ED visit by high-volume ICD9 category-specific (3-digit) ED re-visits (behavioral or physical health).

Diagnostic characteristics of adolescent and child enrollees' first hospitalization and ED re-visit: Figures 14a and 15a present 3-digit ICD9 code diagnostic categories with the code number indicated in parentheses following the code description in the legend, and the number of enrollees with each diagnostic category-specific encounter is indicated in the corresponding pie "slice." There were 5,621 adolescents and children with a hospitalization (n = 2,443 physical and 3,178 behavioral) during 2013; of these, the most prevalent principal diagnosis was episodic mood disorder (n = 2,055), followed by depressive disorder (n = 291), disturbance of conduct (n = 226), asthma (n = 198), and epilepsy/recurrent seizures (n = 160; **Figure 14a**). Among adolescents and children hospitalized for episodic mood disorder, the most prominent specific diagnosis (5-digit ICD9 code) was unspecified episodic mood disorder (n = 1,373); followed by bipolar disorder, unspecified (n = 176), and major depressive affective disorder, recurrent, severe (n = 139; **Figure 14b**). Among the 257 adolescents and children whose first hospitalization was for a behavioral health diagnosis and who had an ED re-visit, prominent hospitalization diagnoses (3-digit ICD9 category code) included episodic mood disorder, depressive disorder, disturbance of conduct and adjustment reaction (**Figure 15a**), and prominent ED re-visit diagnoses were depression, respiratory/chest symptoms, disturbance of conduct, anxiety, and episodic mood disorders (**Figure 15b**).

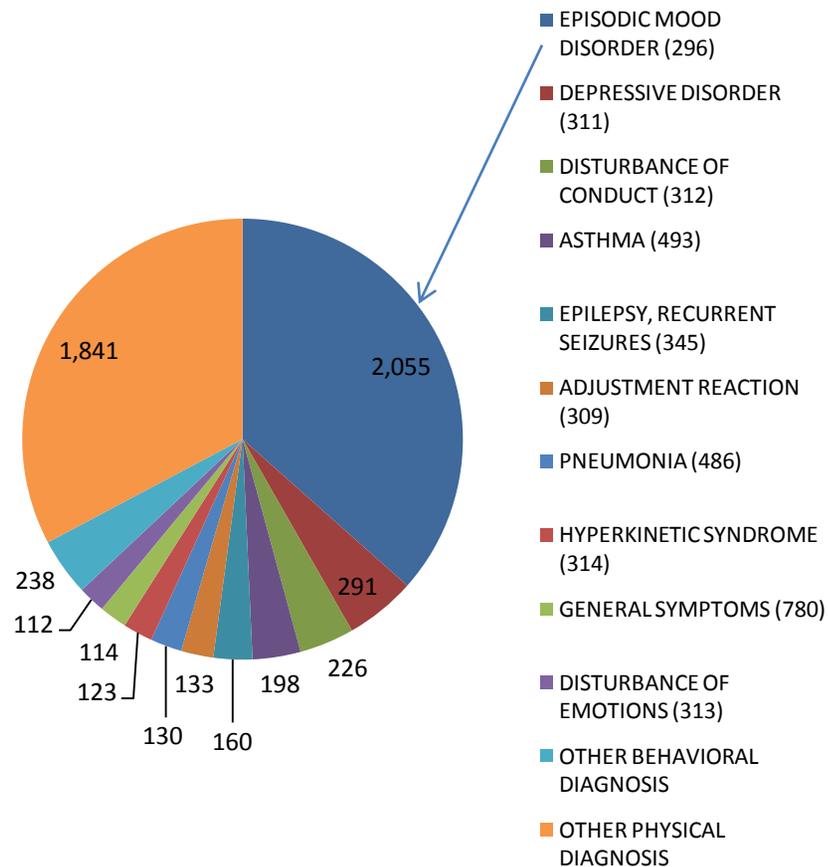


Figure 14a. Youth Hospitalization by ICD9 Hospital Discharge Category. The number of adolescent and child enrollees with an (all-cause) hospitalization (regardless of whether or not followed by ED visit) by high-volume ICD9 category-specific (3-digit) hospital discharge.

ICD9 Code	Description	Count
29690	Unspecified Episodic Mood Disorder	1,373
29680	Bipolar Disorder, Unspecified	176
29633	Major Depressive Affective Disorder, Recurrent, Severe	139
29623	Major Depressive Affective Disorder, Single Episode, Severe	62
29632	Major Depressive Affective Disorder, Recurrent, Moderate	55
29620	Major Depressive Affective Disorder, Single Episode	48
29630	Major Depressive Affective Disorder, Recurrent	38
29634	Major Depressive Affective Disorder, Recurrent, Severe, with Psychotic Behavior	37
29652	Bipolar I Disorder, Most Recent Episode Depressed, Moderate	31

Figure 14b. Youth Episodic Mood Disorder Hospitalization by ICD9 Code. The 5-digit ICD9 code detail for the highest volume principal diagnoses for hospitalization for episodic mood disorder (youth with a hospitalization regardless of whether or not followed by ED visit).

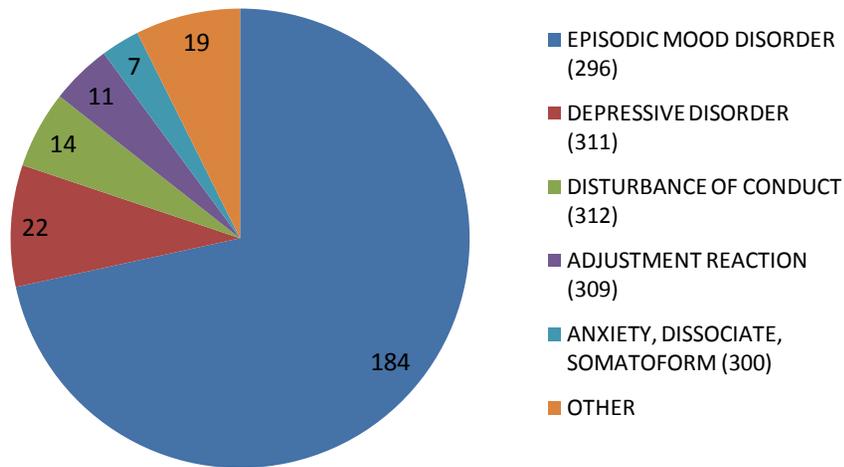


Figure 15a. Youth BH Hospitalization with Subsequent ED Visit by ICD9 BH Discharge Category. The number of adolescent and child enrollees (ages 0–17) with a behavioral health hospitalization and subsequent ED visit by high-volume ICD9 category-specific (3-digit) behavioral health hospital discharge.

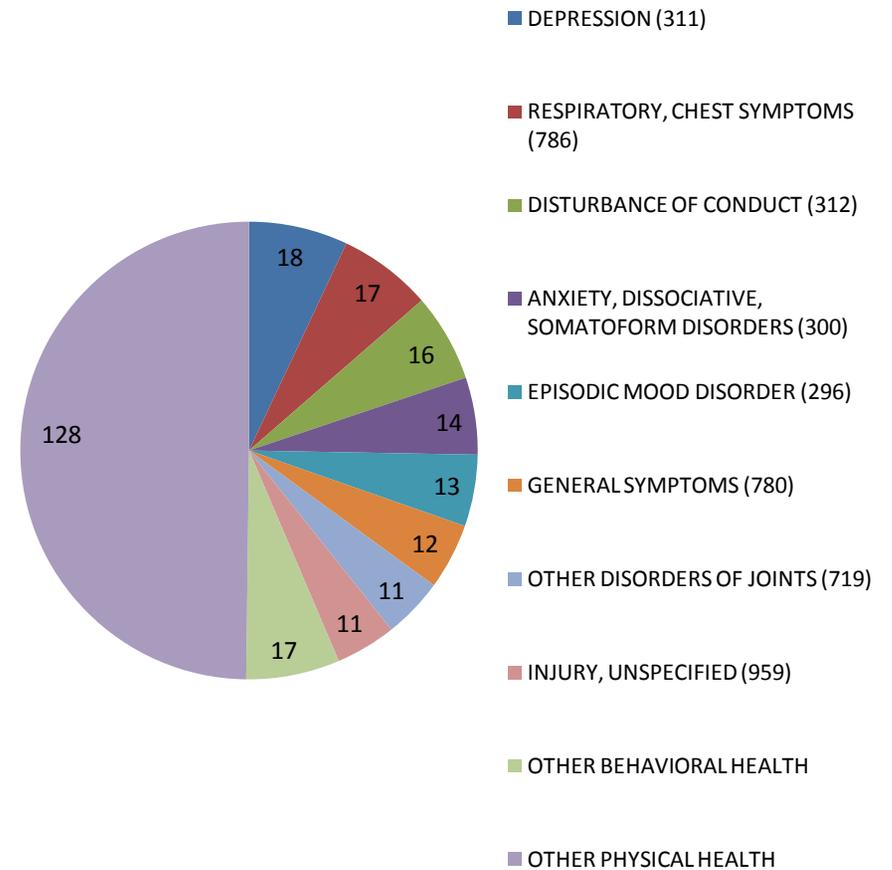


Figure 15b. Youth BH Hospitalization with Subsequent ED Visit by ICD9 ED Re-Visit Categories. The number of adolescent and child enrollees with a behavioral health hospitalization and subsequent ED visit, by high-volume ICD9 category-specific 3-digit ED re-visit categories (behavioral or physical health).

Profile of healthcare utilization among enrollees with any diagnosis of a substance abuse disorder:

Among the 30,948 adults with any diagnosis of a substance abuse disorder, there were 9,051 with at least one hospitalization episode. Those with a chronic nervous system disorder (as defined per the AHRQ/HCUP chronic condition indicator file) comprised the highest hospitalization volume, including the highest volume of multiple hospitalizations (**Figure 16**). The specific ICD9 diagnosis code profile comprising the KY BH population with a chronic nervous system disorder was not examined in this study; however, of a total of 811 diagnoses assigned to this chronic condition category, some examples of possible diagnoses include insomnia, dementia, cerebellar ataxia, spinal muscle atrophy, secondary parkinsonism, spinal cord disease, chronic pain, neoplasm related pain, multiple sclerosis, neuromyelitis optica, CNS demyelination, paraplegia, quadriplegia, neurogenic bladder, epilepsy, classical migraine, carpal tunnel syndrome, neuropathy in diabetes, hypertensive retinopathy, glaucoma, cataract, chronic otitis externa, and hearing loss. Adults with hypertension comprised the second highest subset of both overall and multiple hospitalizations (**Figure 16**). Additional high utilizers included adults with depression, COPD, and the correlated combined set with both chronic nervous system disorders and hypertension (**Figure 16**).

Also among adults with a substance abuse disorder, those with depression comprised the largest volume of psychiatric ED visits, followed by those with chronic nervous system disorders, hypertension and the correlated combination of depression and anxiety (**Figure 17**). Compared to psychiatric ED visits, the volume of non-psychiatric ED visits was substantially higher, with a clinical composition similar to that of hospitalized adults (**Figures 16 and 18**). There were only 18 enrollees with an inpatient stay at a substance abuse treatment facility (**Table 5**). Most (n = 11) were adults with a single stay and whose (first) hospitalization was not for a behavioral health condition. Only 4 youth (aged 12–17) had an inpatient stay in a substance abuse treatment facility (**Table 5**).

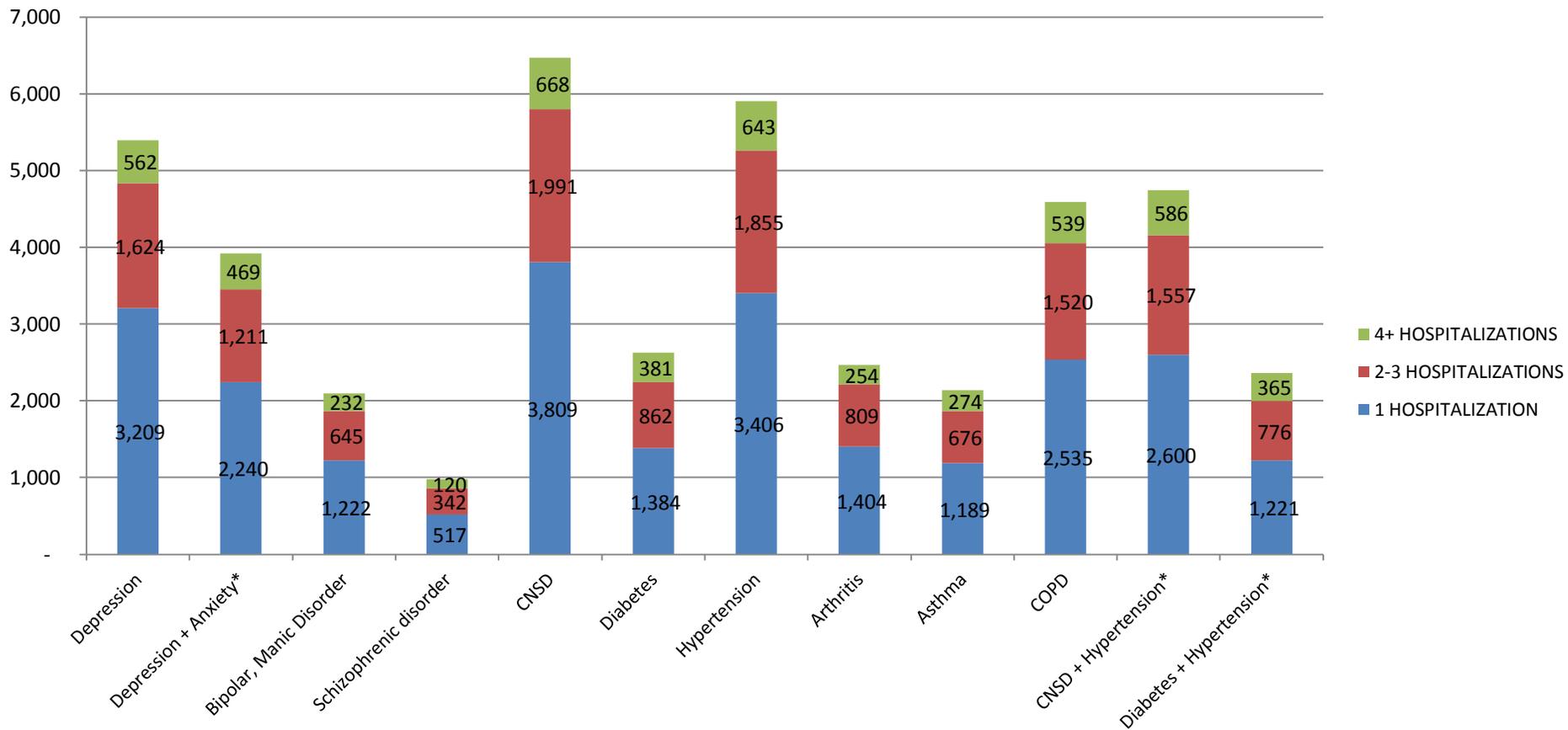


Figure 16. Hospitalization Episodes of Adults with Substance Abuse Disorder by Comorbid Conditions. The number of adults with substance abuse disorder (n = 30,948) with one (blue), 2–3 (red), or 4 or more (green) hospitalizations in 2013 by comorbid conditions. The number of adults without any hospitalization in 2013 was 21,897. Grouped conditions marked with (*) showed significant and moderate/large correlations (i.e., *phi* coefficient ≥ 0.30). CNSD: chronic nervous system disease; COPD: chronic obstructive pulmonary disease.

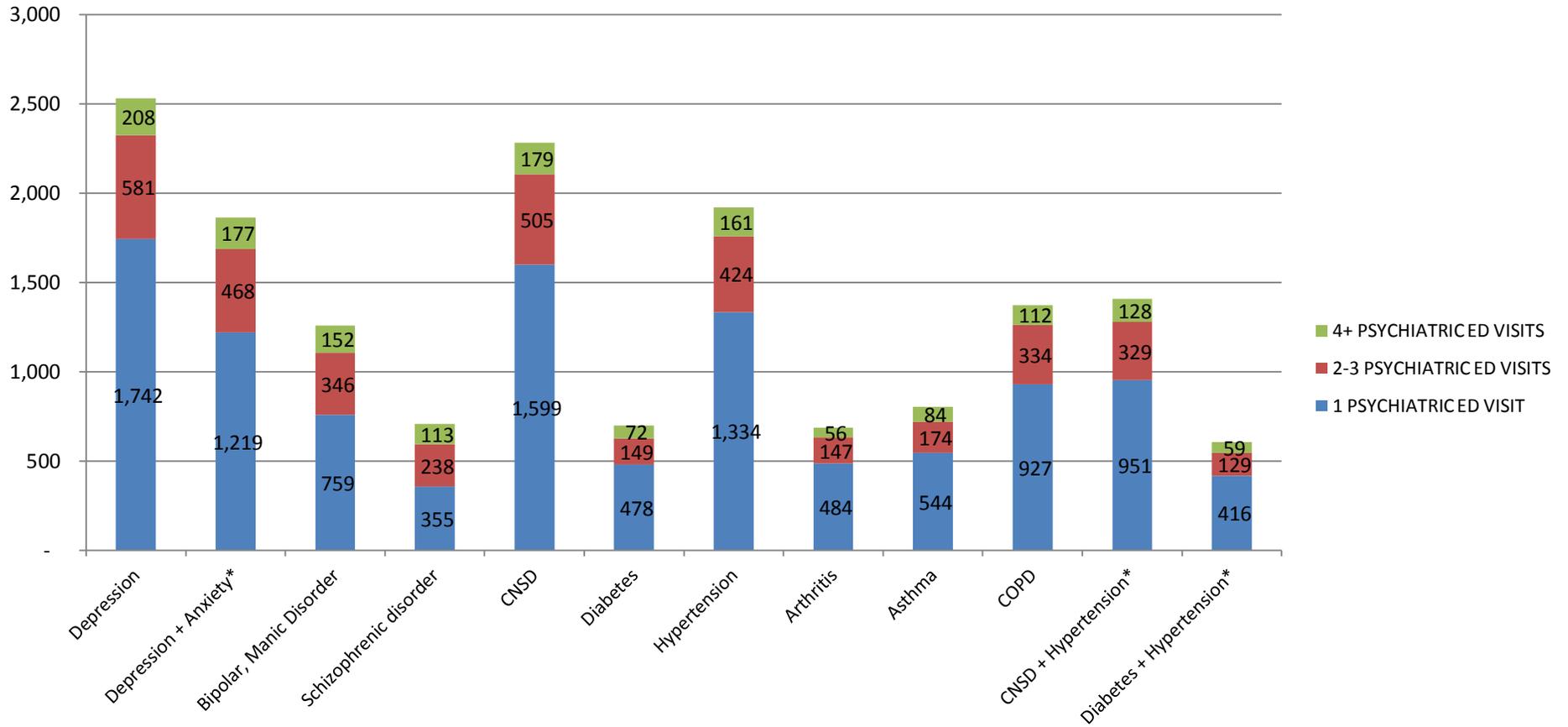


Figure 17. ED Visits for Psychiatric Principal Diagnosis by Comorbid Conditions – Adults with Substance Abuse Disorder. The number of adults with substance abuse disorder (n = 30,948) with one (blue), 2–3 (red), or 4 or more (green) psychiatric ED episodes in 2013 by comorbid conditions. The number of adults without any psychiatric ED visits in 2013 was 27,088. Grouped conditions marked with (*) showed significant and moderate/large correlations (i.e., *phi* coefficient ≥ 0.30). CNSD: chronic nervous system disease; COPD: chronic obstructive pulmonary disease.

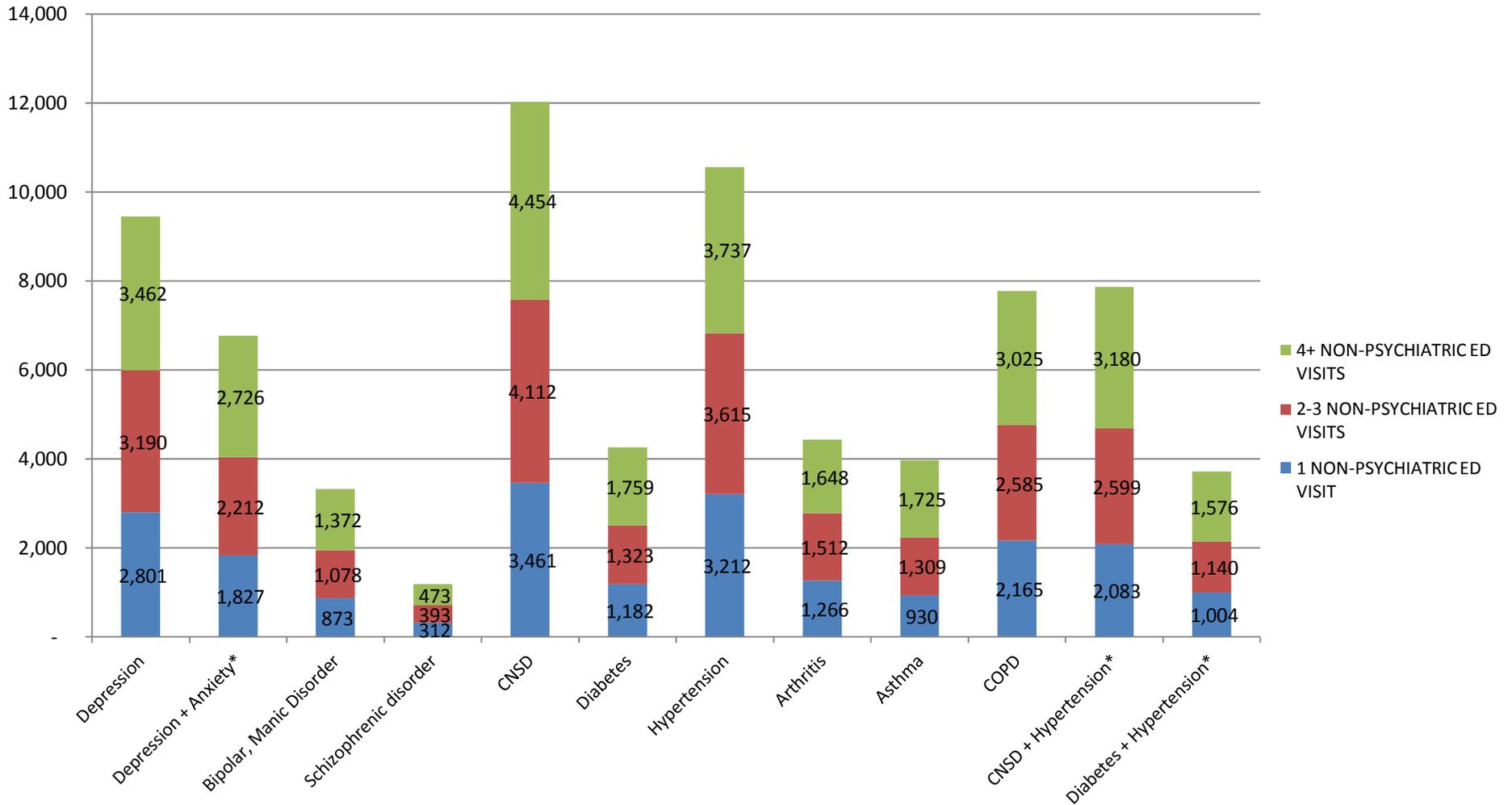


Figure 18. ED Visits for Non-Psychiatric Principal Diagnosis by Comorbid Conditions – Adults with Substance Abuse Disorder. The number of adults with substance abuse disorder (n = 30,948) with one (blue), 2–3 (red), or 4 or more (green) non-psychiatric ED episodes in 2013 by comorbid conditions. The number of adults without any non-psychiatric ED episodes in 2013 was 11,084. Grouped conditions marked with (*) showed significant and moderate/large correlations (i.e., *phi* coefficient ≥ 0.30). CNSD: chronic nervous system disease; COPD: chronic obstructive pulmonary disease.

Table 5. Substance Abuse Inpatient Stays in 2013

Stays in 2013	Adult		Youth*	
	BH Hospitalization**	No BH Hospitalization**	BH Hospitalization**	No BH Hospitalization**
1 Substance Abuse Inpatient Stay	1	11	1***	3
> 1 Substance Abuse Inpatient Stay	0	2	0	0

* Age 12–17

**First hospitalization 2013 was for a BH (behavioral health) principal diagnosis.

*** One adolescent in foster care

BH: behavioral health

Profile of enrollees hospitalized for possible intentional self-harm: **Figures 19** and **20** present 3-digit ICD9 code diagnostic categories with the code number indicated in parentheses following the code description in the legend, and the number of enrollees with each diagnostic category-specific encounter is indicated in the corresponding pie “slice.” Of the total 33,483 first hospitalizations identified (**Table 9**), 1% (364; **Table 13**) were characterized as hospitalizations involving possible self-harm using the algorithm specified in Patrick *et al.* (2010). Adults with a hospitalization for possible intentional self-harm (n = 323) comprised 0.21% of the total adult behavioral health eligible population. The drill-down analysis of principal diagnoses driving adult hospitalizations for possible self-harm shows that poisoning by psychotropics (n = 88) and poisoning by analgesics, antipyretics, and antirheumatics (n = 60) are most prevalent (**Figure 19**).

Tables 6, 7 and **8** also present ICD9 codes in parentheses following the code description. Among adults, highest volume psychotropic poisonings are due to overdoses of benzodiazepine-based tranquilizers; antipsychotics, neuroleptics, major tranquilizers; and antidepressants, and highest volume analgesic/antipyretic/antirheumatic drug poisonings are due to overdoses of drugs such as acetaminophen, opium and other opiates and related narcotics, heroin, and methadone, as well as agents such as salicylates and ibuprofen (**Table 6**).

The drill-down analysis of principal diagnoses driving youth hospitalizations for possible self-harm (n = 41 {0.04% of the total youth behavioral health eligible population}) shows that poisoning by analgesics, antipyretics, antirheumatics (n = 12) and poisoning by psychotropics (n = 9) are also relatively prevalent in this age group (**Table 7**). Among youth aged 10–17 years, the highest volume analgesics, antipyretics, antirheumatics poisonings are due to overdoses of drugs such as acetaminophen, salicylates and ibuprofen, and highest volume psychotropic poisonings are due to overdoses of antidepressants, as well as other antipsychotics, neuroleptics, major tranquilizers (**Table 8**).

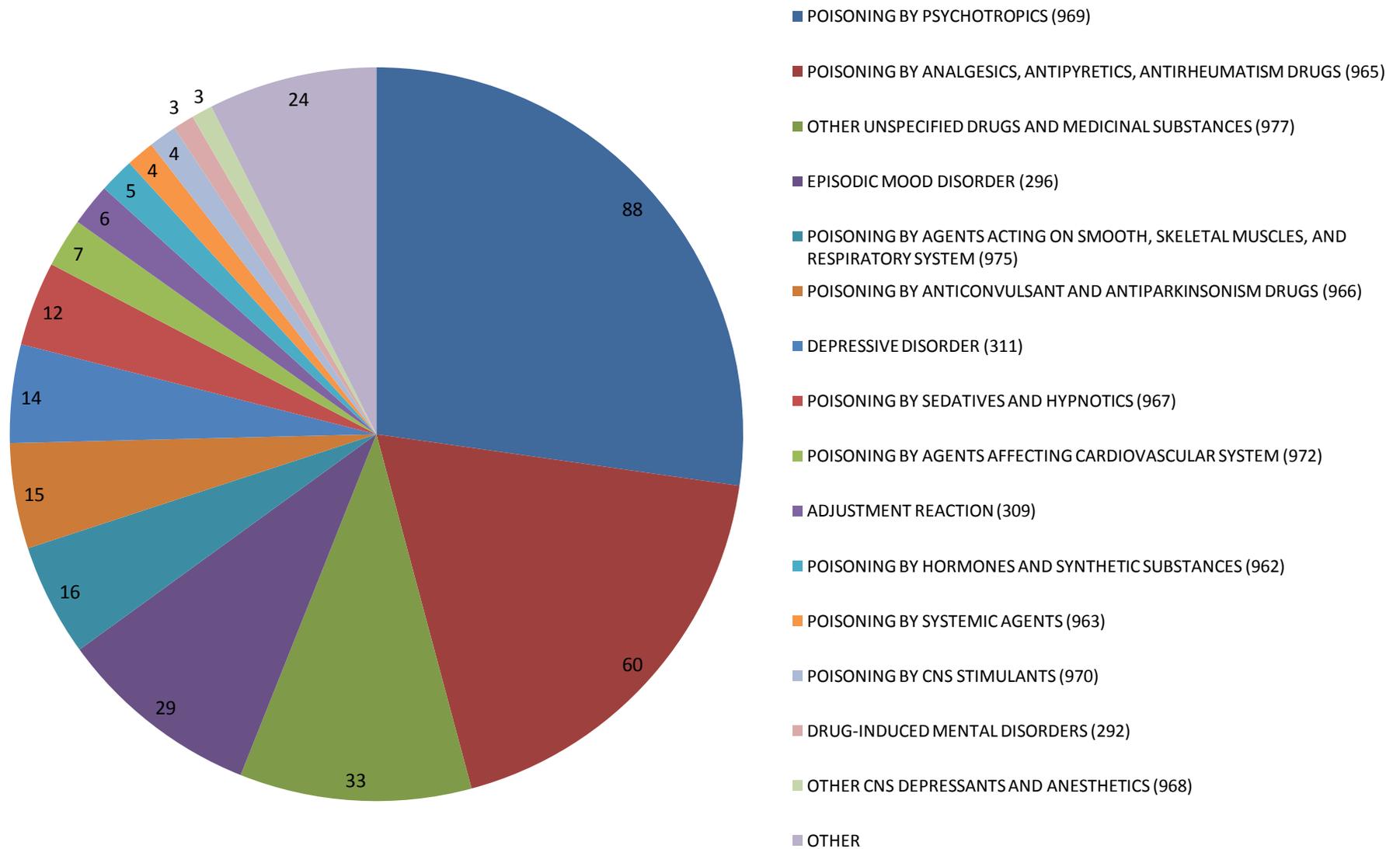


Figure 19. Hospitalization for Possible Intentional Self-Harm by Principal Diagnosis Category for Adults. The number of hospitalizations for possible self-harm for adults aged 18–63 years (n = 323) is shown by principal diagnosis category based on 3-digit ICD9 codes indicated in parentheses in the figure legend.

Table 6. Specific Diagnoses for Possible Intentional Self-Harm Hospitalizations by Poisoning – Adults

Diagnosis for Cause of Poisoning (ICD9 Code)*	Poisoning by Psychotropics (Code: 969; n = 88) frequency (%)	Poisoning by Analgesics, Antipyretics, Antirheumatics Drugs (Code: 965; n = 60) frequency (%)
Benzodiazepine-based Tranquilizers (9694)	45 (51%)	-
Antipsychotics, Neuroleptics, Major Tranquilizers (9693)	20 (23%)	-
Aromatic Analgesics, e.g., Acetaminophen (9654)	-	17 (28%)
Opium, Alkaloids (96500)	-	13 (22%)
Other Opiates and Related Narcotics (96509)	-	11 (18%)
Heroin (96501)	-	8 (13%)
Other Antidepressant (96909)	8 (9%)	-
Methadone (96502)	-	4 (7%)
Tricyclic Antidepressant (96905)	4 (5%)	-
Salicylates (9651)	-	3 (5%)
Amphetamines (96972)	3 (3%)	-
Propionic acid Derivatives, e.g., Ibuprofen	-	2 (3%)
Other (with frequency <2)	8 (9%)	2 (3%)
Total	88 (100%)	60 (100%)

* Adults aged 18–63 years hospitalized for possible self-harm with a principal ICD9 code of poisoning by psychotropics (n = 88) or poisoning by analgesics, antipyretics, antirheumatics (n = 60)

Table 7. Hospitalization for Possible Intentional Self-Harm by Principal Diagnosis Category for Youth

ICD9Category (3-digit code)	Frequency*
Poisoning by Analgesics, Antipyretics, Antirheumatics (965)	12
Episodic Mood Disorder (296)	10
Poisoning by Psychotropics (969)	9
Depressive Disorder (311)	3
Poisoning by Agent Affecting Cardiovascular System (972)	2
Disturbance of Emotions Specific to Childhood and Adolescence (313)	1
Poisoning by Hormones and Synthetic Substances (962)	1
Poisoning by Systemic Agents (963)	1
Poisoning by Anticonvulsant and Antiparkinsonism Drugs (966)	1
Other Unspecified Drugs and Medicinal Substances (977)	1

* Youth aged 10–17 (n = 41)

Table 8. Specific Diagnoses for Possible Intentional Self-Harm Hospitalizations by Poisoning – Youth

Diagnosis for Cause of Poisoning (ICD9 Code)*	Poisoning by Psychotropics (Code: 969; n = 9) frequency (%)	Poisoning by Analgesics, Antipyretics, Antirheumatics Drugs (Code: 965; n = 12) frequency (%)
Aromatic Analgesics, e.g., Acetaminophen (9654)	-	7 (58%)
Other Antidepressants (96909)	4 (44%)	-
Salicylates (9651)	-	3 (25%)
Propionic Acid Derivatives, e.g., Ibuprofen (96561)	-	2 (17%)
Other Antipsychotics, Neuroleptics, Major Tranquilizers (9693)	2 (22%)	-
Benzodiazepine-based Tranquilizers (9694)	1 (11%)	-
Hallucinogens (9696)	1 (11%)	-
Other Psychostimulants (96979)	1 (11%)	-
Total	9 (100%)	12 (100%)

* Youth aged 10–17 years (n = 27) hospitalized for possible self-harm with a principal ICD9 code of poisoning by psychotropics (n = 9) or poisoning by analgesics, antipyretics, antirheumatics (n = 12).

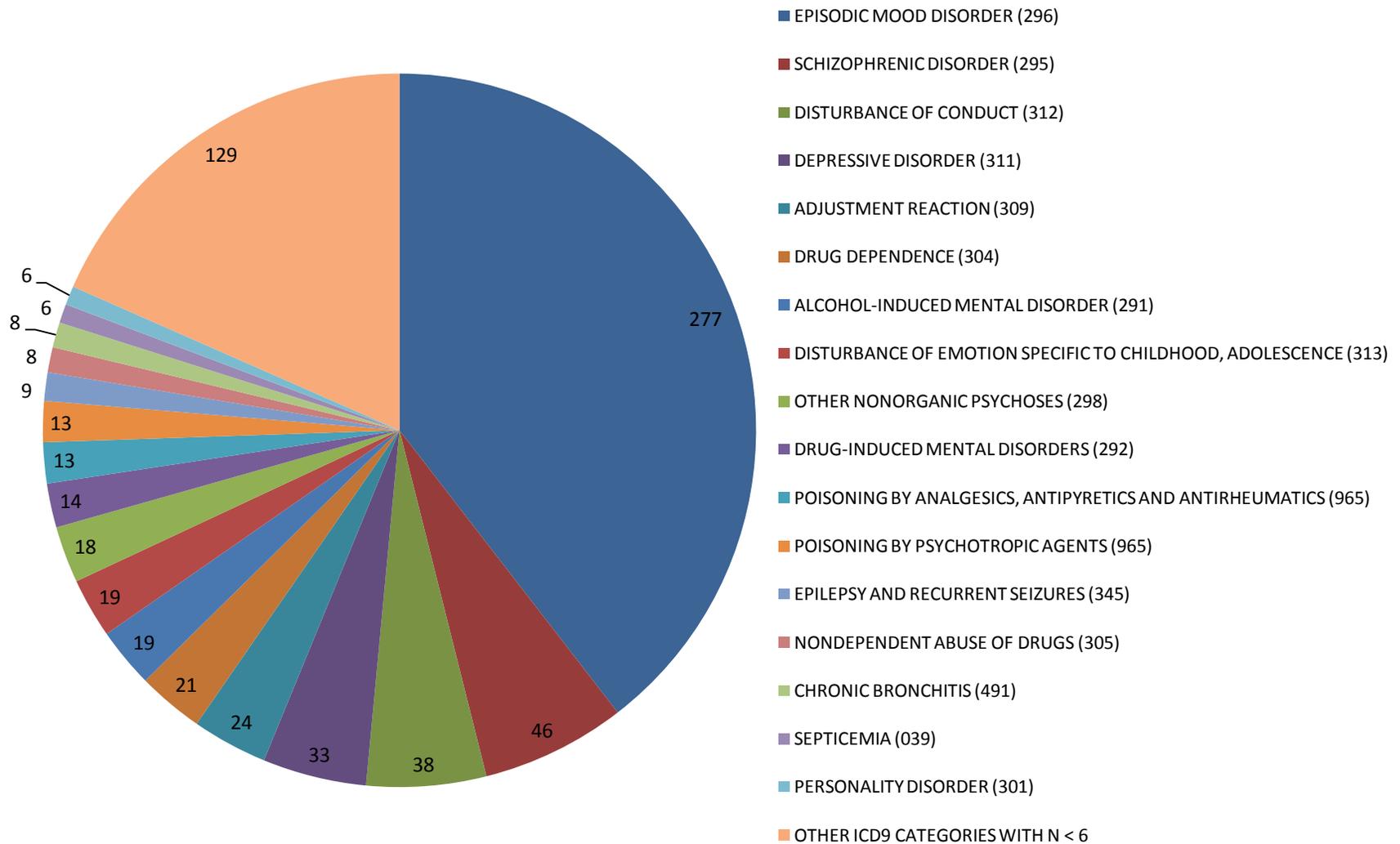


Figure 20. Hospitalization Principal Diagnosis Among All Members with Conduct Disorder and Substance Abuse. The number of members of any age with a diagnosis of both conduct disorder and substance abuse who were hospitalized in 2013 (n = 710) is shown by principal diagnosis category based on 3-digit ICD9 codes indicated in parentheses in the figure legend

STATISTICAL ANALYSIS FINDINGS

Findings for the outcome of first (excluding subsequent) all-cause hospitalization during 2013, including hospitalization for principal diagnosis of behavioral health or physical health for all ages: The overall first hospitalization rate, i.e., members with at least one hospitalization during the study period, was 33,483/245,011 = 13.67%. Demographic and clinical characteristics with significantly different proportions among those with and without hospitalization for either a behavioral health or a physical health condition were the following: age group, chronic physical conditions (one or more of the following: diseases of the respiratory system; diseases of the nervous system and sense organs; endocrine, nutritional, metabolic, immunity disorders; diseases of the musculoskeletal system; and diseases of the circulatory system), sex, race/ethnicity, substance abuse, and polypharmacy (**Table 9**). All behavioral health diagnostic categories with substance abuse combinations showed statistically significant differences in proportions (**Table 10**).

Demographic and clinical characteristics significantly associated with increased odds of hospitalization, independent of other demographic and clinical characteristics, included the following: adolescent age (OR = 1.54; 95% CI = 1.46, 1.63), presence of 4 or 5 chronic physical conditions (OR = 16.08; 95% CI = 15.30, 16.91), presence of 3 chronic physical conditions (OR = 6.88; 95% CI = 6.52, 7.26), presence of 2 chronic physical conditions (OR = 3.79; 95% CI = 3.60, 4.01), presence of 1 chronic physical condition (OR = 2.12; 95% CI = 2.01, 2.23), male sex (OR = 1.14; 95% CI = 1.11, 1.17), urban residence (OR = 1.24; 95% CI = 1.21, 1.28), black race/ethnicity (OR = 1.16; 95% CI = 1.10, 1.21), other race/ethnicity (OR = 1.17; 95% CI = 1.13, 1.21), substance abuse (OR = 2.39; 95% CI = 2.32, 2.47), foster care placement (OR = 1.98; 95% CI = 1.81, 2.17), and having a pharmacy claim for both an antidepressant and an antipsychotic (OR = 1.93; 95% CI = 1.85, 2.01; **Table 11**). Of note, relative to absence of a pharmacy claim for any psychotropic medication, a pharmacy claim for a single class of psychotropic agent was associated with 17% lesser odds for hospitalization (OR = 0.83; 95% CI = 0.81, 0.86; **Table 11**); one possible interpretation is that pharmacotherapy with a single drug class is protective against hospitalization in general. Relative to enrollment in WellCare of Kentucky, enrollment in Humana Caresource was associated with 48% greater odds for hospitalization (OR = 1.48; 95% CI = 1.33, 1.63), enrollment in Passport Health Plan was associated with 24% greater odds (OR = 1.24; 95% CI = 1.19, 1.29), and enrollment in CoventryCares with 13% greater odds (OR = 1.13; 95% CI = 1.10, 1.16; **Table 11**). It should be noted that MCO findings were not case-mix-adjusted, and should be interpreted with caution.

Among the combination diagnostic and substance abuse diagnostic subsets, relative to absence of both substance abuse and the specific psychiatric condition, the greatest odds for hospitalization was associated with dual diagnoses of substance abuse and conduct disorder (OR = 9.70; 95% CI = 8.58, 10.97; principal diagnosis detail in **Figure 20**), followed by schizophrenia (OR = 8.53; 95% CI = 7.63, 9.55), bipolar disorder (OR = 5.06; 95% CI = 4.74, 5.41), PTSD (OR = 4.85; 95% CI = 4.41, 5.32), depression (OR = 4.34; 95% CI = 4.15, 4.53), and ADD (OR = 4.13; 95% CI = 3.69, 4.63; **Table 12**). Odds for the outcome were also elevated for enrollees with the following single diagnoses: bipolar disorder, schizophrenia, depression, conduct disorder and PTSD. Of note, having a diagnosis of ADHD, but not substance abuse disorder, was inversely associated with hospitalization (**Table 12**).

Table 9. First (All-Cause) Hospitalization Rates by Demographic and Clinical Characteristics of KY BH Eligible Population

	Outcome: First Hospitalization during 2013 (Overall Rate = 33,483 ^a /245,011 ^b = 13.67%)			
Demographic and Clinical Characteristics	Denominator ^b	Prevalence (%)	Numerator ^a	Rate (%)
Age Group:^c				
Child (0–12 years)	59,919	24.46%	2,822	4.71%
Adolescent (13–17 years)	33,264	13.58%	2,799	8.41%
Adult (18+ years)	151,828	61.97%	27,862	18.35%
Number of High-Volume Chronic Physical Conditions:^{c,d}				
0	75,268	30.72%	2,593	3.45%
1	55,088	22.48%	3,797	6.89%
2	36,629	14.95%	4,305	11.75%
3	29,651	12.10%	5,708	19.25%
4 or 5	48,375	19.74%	17,080	35.31%
Sex:^c				
Female	140,505	57.35%	20,520	14.60%
Male	104,506	42.65%	12,963	12.40%
Geographic Area of Residence:				
Rural	137,571	56.15%	18,947	13.77%
Urban	107,419	43.84%	14,534	13.53%
Unknown	21	0.01%	2	9.52%
Managed Care Organization:				
WellCare of Kentucky	106,842	43.61%	14,440	13.52%
Passport Health Plan	42,481	17.34%	5,908	13.91%
Humana Caresource	4,127	1.68%	575	13.93%
CoventryCares of KY	88,453	36.10%	12,149	13.73%
Other ^e	3,108	1.27%	411	13.22%
Race/Ethnicity:^c				
White	176,603	72.08%	23,879	13.52%
Black	21,578	8.81%	2,976	13.79%
Asian	565	0.23%	79	13.98%
Other	46,265	18.88%	6,549	14.16%
Substance Abuse:^{c,f}				
No	211,796	86.44%	23,748	11.21%
Yes	33,215	13.56%	9,735	29.31%
Polypharmacy:^{c,g}				
No Psychotropic	118,397	48.32%	14,344	12.12%
One Psychotropic	76,335	31.16%	8,687	11.38%
Antidepressant + Antipsychotic	18,450	7.53%	4,800	26.02%
Other Combination	31,829	12.99%	5,652	17.76%
Foster Care Status:^b				
Not In/Not At Risk	236,573	96.56%	32,654	13.80%

	Outcome: First Hospitalization during 2013 (Overall Rate = 33,483 ^a /245,011 ^b = 13.67%)			
Demographic and Clinical Characteristics	Denominator ^b	Prevalence (%)	Numerator ^a	Rate (%)
In Foster Care	5,184	2.12%	665	12.83%
At Risk for Foster Placement	3,254	1.33%	164	5.04%

^a Enrollees hospitalized during 2013, overall (n = 33,483) and by demographic/clinical subgroups.

^b Eligible Kentucky Behavioral Health Study population, 2013, overall (n = 245,011) and by demographic/clinical subgroups.

^c Statistically significant difference between rates for demographic/clinical category subgroups at $p < 0.05$ using *chi-squared* test.

^d Any diagnosis during the measurement year. Presence of 1 or more of the following chronic conditions any time during the 2013 measurement year: diseases of the respiratory system; diseases of the nervous system and sense organs; endocrine, nutritional, metabolic, immunity disorders; diseases of the musculoskeletal system; and diseases of the circulatory system; as defined by the AHRQ/HCUP Chronic Condition Indicator File, 2014.

^e Anthem Health Plan of Kentucky (n = 1); Kentucky Spirit Health Plan (n = 3,101); missing data for MCO (n = 6)

^f Drug abuse and/or alcohol abuse any time during the 2013 measurement year, as defined by ICD9 code groupings in **Appendix A**.

^g Any pharmacy claim during the 2013 measurement year.

Table 10. First (All-Cause) Hospitalization Rates by High-Volume BH Diagnostic Categories and SA Combinations

	Outcome: First Hospitalization during 2013 (Overall Rate = 33,483 ^a /245,011 ^b = 13.67%)			
Diagnostic Combination:	Denominator ^b	Prevalence (%)	Numerator ^a	Rate (%)
Bipolar Disorder, Substance Abuse:^{c,d}				
Neither	197,704	80.69%	20,754	10.50%
Substance Abuse, Only	28,480	11.62%	7,417	26.04%
Bipolar Disorder, Only	14,092	5.75%	2,994	21.25%
Both	4,735	1.93%	2,318	48.95%
Schizophrenia, Substance Abuse:^{c,d}				
Neither	205,978	84.07%	22,371	10.86%
Substance Abuse, Only	31,556	12.88%	8,740	27.70%
Schizophrenia, Only	5,818	2.37%	1,377	23.67%
Both	1,659	0.68%	995	59.98%
Depression, Substance Abuse:^{c,d}				
Neither	154,749	63.16%	12,844	8.30%
Substance Abuse, Only	19,216	7.84%	3,927	20.44%
Depression, Only	57,047	23.28%	10,904	19.11%
Both	13,999	5.71%	5,808	41.49%
Conduct Disorder, Substance Abuse:^{c,d}				
Neither	193,138	78.83%	21,762	11.27%
Substance Abuse, Only	31,877	13.01%	9,025	28.31%
Conduct Disorder, Only	18,658	7.62%	1,986	10.64%
Both	1,338	0.55%	710	53.06%
Post-Traumatic Stress Disorder (PTSD), Substance Abuse:^{c,d}				
Neither	204,103	83.30%	22,253	10.90%
Substance Abuse, Only	30,983	12.65%	8,678	28.01%
PTSD, Only	7,693	3.14%	1,495	19.43%
Both	2,232	0.91%	1,057	47.36%
Attention Deficit Disorder (ADD), Substance Abuse:^{c,d}				
Neither	164,502	67.14%	21,140	12.85%
Substance Abuse, Only	31,490	12.85%	9,143	29.03%
ADD, Only	47,294	19.30%	2,608	5.51%
Both	1,725	0.70%	592	34.32%

^a Enrollees hospitalized during 2013, overall (n = 33,483) and behavioral health (BH) diagnostic category subgroups.

^b Eligible Kentucky Behavioral Health Study population, 2013, overall (n = 245,011) and by behavioral health diagnostic category subgroups.

^c Defined per ICD9 assignments as specified in **Appendix A**. Substance Abuse (SA) includes Drug Abuse and/or Alcohol Abuse

^d Statistically significant difference between rates for behavioral health combinations subgroups at $p < 0.05$ using *chi*-squared test.

Table 11. Multiple Logistic Regression: All-Cause Hospitalization – Demographic and Clinical Characteristics

Risk Factor	Odds Ratio ^a	95% Confidence Interval (CI)
Age Group:		
Child (0–12 years; referent)	1.00	
Adolescent (13–17 years)	1.54 ^b	1.46,1.63
Adult (18+ years)	1.16 ^b	1.10,1.22
Number of High-Volume Chronic Physical Comorbid Conditions:^c		
0 (referent)	1.00	
1	2.12 ^b	2.01,2.23
2	3.79 ^b	3.60,4.01
3	6.88 ^b	6.52,7.26
4 or 5	16.08 ^b	15.30,16.91
Sex:		
Female (referent)	1.00	
Male	1.14 ^b	1.11,1.17
Geographic Area of Residence:		
Rural (referent)	1.00	
Urban	1.24 ^b	1.21,1.28
Unknown	0.61	0.12,3.18
Managed Care Organization:		
WellCare of Kentucky (referent)	1.00	
Passport Health Plan	1.24 ^b	1.19,1.29
Humana Caresource	1.48 ^b	1.33,1.63
CoventryCares of Kentucky	1.13 ^b	1.10,1.16
Other ^d	1.65 ^b	1.47,1.85
Race/Ethnicity:		
White (referent)	1.00	
Black	1.16 ^b	1.10,1.21
Asian	1.16	0.89,1.51
Other	1.17 ^b	1.13,1.21
Substance Abuse:^e		
No (referent)	1.00	
Yes	2.39 ^b	2.32,2.47
Polypharmacy:^f		
No Psychotropic (referent)	1.00	
One Psychotropic	0.83 ^b	0.81,0.86
Antidepressant + Antipsychotic	1.93 ^b	1.85,2.01
Other Combination	1.00	0.97,1.04
Foster Care Status:		
Not In/Not At Risk (referent)	1.00	
In Foster Care	1.98 ^b	1.81,2.17
At Risk for Foster Placement	1.03	0.88,1.22

^a Multiple logistic regression analysis for the relationship between the outcome of first (all-cause) hospitalization and possible risk factors (demographic and clinical characteristics; n = 33,483 observations with the outcome, and 211,528 without the outcome).

^b Statistically significant at $p < 0.05$.

^c Presence of 1 or more of the following chronic conditions any time during the 2013 measurement year: diseases of the respiratory system; diseases of the nervous system and sense organs; endocrine, nutritional, metabolic, immunity disorders; diseases of the musculoskeletal system; and diseases of the circulatory system; as defined by the AHRQ/HCUP Chronic Condition Indicator File, 2014.

^d Anthem Health Plan of Kentucky (n = 1), Kentucky Spirit Health Plan (n = 3,101), missing data for MCO (n = 6).

^e Drug abuse and/or alcohol abuse any time during the 2013 measurement year, as defined by ICD9 code groupings in **Appendix A**.

^f Any pharmacy claim during the 2013 measurement year.

Table 12. Multiple Logistic Regression: All-Cause Hospitalization – BH Diagnostic Categories/SA Combinations

Diagnostic Combination	Odds Ratio ^a	95% Confidence Interval (CI)
Set: Bipolar Disorder, Substance Abuse:^b		
Neither (referent)	1.00	
Substance Abuse, Only	2.19 ^c	2.12,2.27
Bipolar Disorder, Only	1.56 ^c	1.49,1.64
Both	5.06 ^c	4.74,5.41
Set: Schizophrenia, Substance Abuse:^b		
Neither (referent)	1.00	
Substance Abuse, Only	2.29 ^c	2.22,2.36
Schizophrenia, Only	1.67 ^c	1.56,1.79
Both	8.53 ^c	7.63,9.55
Set: Depression, Substance Abuse:^b		
Neither (referent)	1.00	
Substance Abuse, Only	2.08 ^c	1.99,2.17
Depression, Only	1.63 ^c	1.58,1.69
Both	4.34 ^c	4.15,4.53
Set: Conduct Disorder, Substance Abuse:^b		
Neither (referent)	1.00	
Substance Abuse, Only	2.29 ^c	2.22,2.36
Conduct Disorder, Only	2.17 ^c	2.05,2.29
Both	9.70 ^c	8.58,10.97
Set: Post-Traumatic Stress Disorder (PTSD), Substance Abuse:^b		
Neither (referent)	1.00	
Substance Abuse, Only	2.32 ^c	2.25,2.40
PTSD, Only	1.68 ^c	1.58,1.80
Both	4.85 ^c	4.41,5.32
Set: Attention Deficit Disorder (ADD), Substance Abuse:^b		
Neither (referent)	1.00	
Substance Abuse, Only	2.29 ^c	2.22,2.37
ADD, Only	0.86 ^c	0.82,0.90
Both	4.13 ^c	3.69,4.63

^a Multiple logistic regression analysis for the relationship between the outcome of first (all-cause) hospitalization and high-volume behavioral health (BH) diagnostic categories and substance abuse (SA) combinations, adjusted for demographic and clinical characteristics (in **Table 11**); n = 33,483 observations with the outcome, and 211,528 without the outcome.

^b Defined per ICD9 assignments as specified in **Appendix A**. Substance Abuse includes Drug Abuse and/or Alcohol Abuse.

^c Statistically significant at $p < 0.05$.

Findings for the outcome of hospitalization for possible intentional self-harm during 2013 for all ages:

The overall rate for hospitalization for possible intentional self-harm (proxied using the coding algorithm for combinations of behavioral and physical injury diagnoses from Patrick *et al.*, 2010) was 364/245,011 = 0.15%. Demographic and clinical characteristics with significantly different proportions among those with and without hospitalization for possible intentional self-harm were the following: age, number of chronic conditions, sex, substance abuse, and polypharmacy (**Table 13**). All behavioral health diagnostic categories with substance abuse combinations showed statistically significant differences in proportions (**Table 14**).

Demographic and clinical characteristics significantly associated with increased odds of hospitalization for possible intentional self-harm were adolescent age (relative to child age; OR = 10.62; 95% CI = 3.25, 34.70), adult age (relative to child age; OR = 7.56; 95% CI = 2.36, 24.23), presence of 4 or 5 chronic physical conditions (OR = 2.34; 95% CI = 1.60, 3.42), presence of 3 chronic physical conditions (OR = 2.21; 95% CI = 1.47, 3.33), presence of 2 chronic physical conditions (OR = 1.85; 95% CI = 1.22, 2.80), presence of 1 chronic physical condition (OR = 1.59; 95% CI = 1.05, 2.40), female sex (calculated as the reciprocal, or inverse, of OR for male sex: OR = 1.67; 95% CI = 1.32, 2.13), enrollment in CoventryCares of Kentucky relative to enrollment in WellCare (OR = 1.41; 95% CI = 1.12, 1.77), substance abuse (OR = 10.33; 95% CI = 8.17, 13.06), having a pharmacy claim for both an antidepressant and an antipsychotic (OR = 5.43; 95% CI = 4.07, 7.25), having a pharmacy claim for another combination of psychotropic medication (OR = 2.07; 95% CI = 1.51, 2.85), and having a pharmacy claim for a one psychotropic drug class (OR = 1.49; 95% CI = 1.10, 2.03; **Table 15**).

Among the combination diagnostic and substance abuse diagnostic subsets, relative to absence of both substance abuse and the specific psychiatric condition, odds for the outcome were significantly elevated for all dual diagnoses (**Table 16**). Odds for the hospitalization for possible intentional self-harm were also elevated for enrollees with the following single diagnoses: bipolar disorder, depression, conduct disorder and PTSD.

Table 13. Hospitalization for Possible Intentional Self-Harm Outcome by Demographic and Clinical Characteristics

Outcome: Hospitalization for Possible Intentional Self-Harm^a (Overall Rate = 364 ^a /245,011 ^b = 0.15%)				
Demographic and Clinical Characteristics	Denominator^b	Prevalence (%)	Numerator^a	Rate (%)
Age Group:^c				
Child (0–12 years)	59,919	24.46%	3	0.01%
Adolescent (13–17 years)	33,264	13.58%	38	0.11%
Adult (18+ years)	151,828	61.97%	323	0.21%
Number of High-Volume Chronic Physical Conditions:^{c,d}				
0	75,268	30.72%	39	0.05%
1	55,088	22.48%	56	0.10%
2	36,629	14.95%	59	0.16%
3	29,651	12.10%	69	0.23%
4 or 5	48,375	19.74%	141	0.29%
Sex:^c				
Female	140,505	57.35%	270	0.19%
Male	104,506	42.65%	94	0.09%
Geographic Area of Residence:				
Rural	137,571	56.15%	202	0.15%
Urban	107,419	43.84%	162	0.15%
Unknown	21	0.01%	0	0%
Managed Care Organization:				
WellCare of Kentucky	106,842	43.61%	158	0.15%
Passport Health Plan	42,481	17.34%	45	0.11%
Humana Caresource	4,127	1.68%	8	0.19%
CoventryCares of KY	88,453	36.10%	148	0.17%
Other ^e	3,108	1.27%	5	0.16%
Race/Ethnicity:				
White	176,603	72.08%	271	0.15%
Black	21,578	8.81%	21	0.10%
Asian	565	0.23%	1	0.18%
Other	46,265	18.88%	71	0.15%
Substance Abuse:^{c,f}				
No	211,796	86.44%	109	0.05%
Yes	33,215	13.56%	255	0.77%
Polypharmacy:^{c,g}				
No Psychotropic	118,397	48.32%	83	0.07%
One Psychotropic	76,335	31.16%	84	0.11%
Antidepressant + Antipsychotic	18,450	7.53%	119	0.64%
Other Combination	31,829	12.99%	78	0.25%
Foster Care Status:				
Not In/Not At Risk	236,573	96.56%	357	0.15%
In Foster Care	5,184	2.12%	5	0.10%
At Risk for Foster Placement	3,254	1.33%	2	0.06%

^a Possible intentional self-harm defined by any diagnosis during the first hospitalization during the 2013 measurement year using the algorithm specified in Patrick *et al.* (2010): combination of inpatient psychiatric diagnoses and inpatient injury type diagnoses. Overall (n = 363) and by subgroups with demographic or clinical characteristic.

^b Total eligible behavioral health population overall (n = 245,011) and by subgroups with demographic or clinical characteristic.

^c Statistically significant difference between rates for demographic/clinical category subgroups at $p < 0.05$ using *chi*-squared test.

^d Any diagnosis during the measurement year. Presence of 1 or more of the following chronic conditions any time during the 2013 measurement year: diseases of the respiratory system; diseases of the nervous system and sense organs; endocrine, nutritional, metabolic, immunity disorders; diseases of the musculoskeletal system; and diseases of the circulatory system; as defined by the AHRQ/HCUP Chronic Condition Indicator File, 2014.

^e Anthem Health Plan of Kentucky (n = 1); Kentucky Spirit Health Plan (n = 3,101); missing data for MCO (n = 6).

^f Drug abuse and/or alcohol abuse any time during the 2013 measurement year, as defined by ICD9 code groupings in **Appendix A**.

^g Any pharmacy claim during the 2013 measurement year.

Table 14. Hospitalization for Possible Intentional Self-Harm Rates by BH Diagnostic Categories and SA Combinations

Outcome: Hospitalization for Possible Intentional Self-Harm^a				
(Overall Rate = 364^a/245,011^b = 0.15%)				
Diagnostic Combination:	Denominator^b	Prevalence (%)	Numerator^a	Rate (%)
Bipolar Disorder, Substance Abuse:^{c,d}				
Neither	197,704	80.69%	75	0.04%
Substance Abuse, Only	28,480	11.62%	140	0.49%
Bipolar Disorder, Only	14,092	5.75%	34	0.24%
Both	4,735	1.93%	115	2.43%
Schizophrenia, Substance Abuse:^{c,d}				
Neither	205,978	84.07%	101	0.05%
Substance Abuse, Only	31,556	12.88%	223	0.71%
Schizophrenia, Only	5,818	2.37%	8	0.14%
Both	1,659	0.68%	32	1.93%
Depression, Substance Abuse:^{c,d}				
Neither	154,749	63.16%	10	0.01%
Substance Abuse, Only	19,216	7.84%	20	0.10%
Depression, Only	57,047	23.28%	99	0.17%
Both	13,999	5.71%	235	1.68%
Conduct Disorder, Substance Abuse:^{c,d}				
Neither	193,138	78.83%	99	0.05%
Substance Abuse, Only	31,877	13.01%	229	0.72%
Conduct Disorder, Only	18,658	7.62%	10	0.05%
Both	1,338	0.55%	26	1.94%
Post-Traumatic Stress Disorder (PTSD), Substance Abuse:^{c,d}				
Neither	204,103	83.30%	88	0.04%
Substance Abuse, Only	30,983	12.65%	203	0.66%
PTSD, Only	7,693	3.14%	21	0.27%
Both	2,232	0.91%	52	2.33%
Attention Deficit Disorder (ADD), Substance Abuse:^{c,d}				
Neither	164,502	67.14%	91	0.06%
Substance Abuse, Only	31,490	12.85%	232	0.74%
ADD, Only	47,294	19.30%	18	0.04%
Both	1,725	0.70%	23	1.33%

^a Possible intentional self-harm defined by any diagnosis during the first hospitalization during the 2013 measurement year using the algorithm specified in Patrick *et al.* (2010): combination of inpatient psychiatric diagnoses and inpatient injury type diagnoses. Overall (n = 364) and by subgroups with specific behavioral diagnostic combination.

^b Total eligible behavioral health population overall (n = 245,011) and by subgroups with specific behavioral diagnostic combination.

^c Defined per ICD9 assignments as specified in **Appendix A**. Substance Abuse includes Drug Abuse and/or Alcohol Abuse.

^d Statistically significant difference between rates for behavioral diagnostic category subgroups at $p < 0.05$ using *chi*-squared test.

Table 15. Multiple Logistic Regression: Hospitalization for Possible Intentional Self-Harm – Demographic and Clinical Characteristics

Risk Factor	Odds Ratio ^a	95% Confidence Interval (CI)
Age Group:		
Child (0–12 years; referent)	1.00	
Adolescent (13–17 years)	10.62 ^b	3.25, 34.70
Adult (18+ years)	7.56 ^b	2.36, 24.23
Number of High-Volume Chronic Physical Comorbid Conditions:^c		
0 (referent)	1.00	
1	1.59 ^b	1.05, 2.40
2	1.85 ^b	1.22, 2.80
3	2.21 ^b	1.47, 3.33
4 or 5	2.34 ^b	1.60, 3.42
Sex:		
Female (referent)	1.00	
Male	0.60 ^b	0.47, 0.76
Geographic Area of Residence:		
Rural (referent)	1.00	
Urban	1.41 ^b	1.12, 1.78
Unknown	- ^d	-
Managed Care Organization:		
WellCare of Kentucky (referent)	1.00	
Passport Health Plan	0.91	0.63, 1.32
Humana Caresource	1.66	0.80, 3.44
CoventryCares of Kentucky	1.41 ^b	1.12, 1.77
Other ^e	1.50	0.61, 3.70
Race/Ethnicity:		
White (referent)	1.00	
Black	0.75	0.47, 1.20
Asian	1.87	0.26, 13.50
Other	1.06	0.82, 1.39
Substance Abuse:^f		
No (referent)	1.00	
Yes	10.33 ^b	8.17, 13.06
Polypharmacy:^g		
No Psychotropic (referent)	1.00	
One Psychotropic	1.49 ^b	1.10, 2.03
Antidepressant + Antipsychotic	5.43 ^b	4.07, 7.25
Other Combination	2.07 ^b	1.51, 2.85
Foster Care Status:		
Not In/Not At Risk (referent)	1.00	
In Foster Care	0.57	0.22, 1.46
At Risk for Foster Placement	1.94	0.46, 8.12

^a Multiple logistic regression analysis for the relationship between the outcome of hospitalization for possible self-harm and possible risk factors (demographic and clinical characteristics) [n = 364 observations with the outcome, and 244,647 without the outcome].

^b Statistically significant at $p < 0.05$.

^c Presence of 1 or more of the following chronic conditions any time during the 2013 measurement year: diseases of the respiratory system; diseases of the nervous system and sense organs; endocrine, nutritional, metabolic, immunity disorders; diseases of the musculoskeletal system; and diseases of the circulatory system; as defined by the AHRQ/HCUP Chronic Condition Indicator File, 2014.

^d Insufficient sample size

^e Anthem Health Plan of Kentucky (n = 1), Kentucky Spirit Health Plan (n = 3,101), missing data for MCO (n = 6).

^f Drug abuse and/or alcohol abuse any time during the 2013 measurement year, as defined by ICD9 code groupings in **Appendix A**.

^g Any pharmacy claim during the 2013 measurement year.

Table 16. Multiple Logistic Regression: Hospitalization for Possible Intentional Self-Harm Outcome – BH Diagnostic Categories/SA Combinations

Diagnostic Combination	Odds Ratio ^a	95% Confidence Interval (CI)
Set: Bipolar Disorder, Substance Abuse:^b		
Neither (referent)	1.00	
Substance Abuse, Only	9.59 ^c	7.17, 12.83
Bipolar Disorder, Only	3.38 ^c	2.22, 5.15
Both	30.02 ^c	21.73, 41.46
Set: Schizophrenia, Substance Abuse:^b		
Neither (referent)	1.00	
Substance Abuse, Only	10.13 ^c	7.93, 12.96
Schizophrenia, Only	1.49	0.71, 3.10
Both	18.42 ^c	11.96, 28.39
Set: Depression, Substance Abuse:^b		
Neither (referent)	1.00	
Substance Abuse, Only	12.75 ^c	5.88, 27.64
Depression, Only	17.36 ^c	8.93, 33.77
Both	155.27 ^c	80.44, 299.72
Set: Conduct Disorder, Substance Abuse:^b		
Neither (referent)	1.00	
Substance Abuse, Only	10.08 ^c	7.90, 12.86
Conduct Disorder, Only	2.53 ^c	1.27, 5.03
Both	23.22 ^c	14.66, 36.70
Set: Post-Traumatic Stress Disorder (PTSD), Substance Abuse:^b		
Neither (referent)	1.00	
Substance Abuse, Only	10.88 ^c	8.39, 14.11
PTSD, Only	3.82 ^c	2.35, 6.20
Both	23.60 ^c	16.38, 33.99
Set: Attention Deficit Disorder (ADD), Substance Abuse:^b		
Neither (referent)	1.00	
Substance Abuse, Only	10.38 ^c	8.10, 13.32
ADD, Only	1.46	0.83, 2.56
Both	15.01 ^c	9.20, 24.49

^a Multiple logistic regression analysis for the relationship between the outcome of hospitalization for possible self-harm and high-volume behavioral health (BH) diagnostic categories and substance abuse (SAO combinations, adjusted for demographic and clinical characteristics (in **Table 15**); n = 364 observations with the outcome, and 244,647 without the outcome).

^b Defined per ICD9 assignments as specified in **Appendix A**. Substance Abuse includes Drug Abuse and/or Alcohol Abuse.

^c Statistically significant at $p < 0.05$.

Findings for the outcome of hospitalization for behavioral health principal diagnosis during 2013 for adults: The overall adult behavioral health hospitalization rate was 3,913/151,828 = 2.58%. Demographic and clinical characteristics with significantly different proportions among those with and without an adult behavioral health hospitalization were the following: age, number of comorbid physical conditions (one or more of the following: diseases of the nervous system and sense organs; endocrine, nutritional, metabolic, immunity disorders; diseases of the musculoskeletal system; and diseases of the circulatory system) , sex, geographic area of residence, managed care organization, substance abuse, and polypharmacy (**Table 17**). All behavioral health diagnostic categories with substance abuse combinations showed statistically significant differences in proportions (**Table 18**).

Demographic and clinical characteristics with elevated odds for behavioral health hospitalization were age 18–27 years (odds ratios ranging from 1.33 to 2.56 relative to older age deciles {using reciprocals to represent comparison groups}), presence of 4 chronic physical conditions (OR = 1.54; 95% CI = 1.36, 1.75), presence of 3 chronic physical conditions (OR = 1.63; 95% CI = 1.45, 1.83), presence of 2 chronic physical conditions (OR = 1.50; 95% CI = 1.34, 1.68), presence of 1 chronic physical condition (OR = 1.41; 95% CI = 1.26, 1.57), male sex (OR = 1.51; 95% CI = 1.41, 1.62), substance abuse (OR = 7.31; 95% CI = 6.81, 7.83), having a pharmacy claim for both an antidepressant and an antipsychotic (OR = 6.91; 95% CI = 6.32, 7.55) and having a pharmacy claim for another combination (OR = 1.72; 95% CI = 1.55, 1.90; **Table 19**). In addition, relative to enrollment in WellCare of Kentucky, enrollment in Passport Health Plan was associated with 19% greater odds for behavioral health hospitalization (OR = 1.19; 95% CI = 1.07, 1.33), enrollment in Humana Caresource with 31% greater odds for behavioral health hospitalization (OR = 1.31; 95% CI = 1.03, 1.68), and enrollment in CoventryCares of KY with 27% greater odds for behavioral health hospitalization (OR = 1.27; 95% CI = 1.18, 1.37; **Table 19**). MCO results should be interpreted with caution due to possible residual confounding.

Among the combination diagnostic and substance abuse diagnostic subsets, relative to absence of both substance abuse and the specific psychiatric condition, odds for the outcome were significantly elevated for all dual diagnoses (**Table 20**). Odds for an adult behavioral health hospitalization were also elevated for enrollees with the following single diagnoses: bipolar disorder, schizophrenia, depression, conduct disorder and PTSD.

Table 17. Adult BH Hospitalization Rates by Demographic and Clinical Characteristics

	Outcome: Adult BH Hospitalization as First Hospitalization ^a (Overall Rate = 3,913 ^a /151,828 ^b = 2.58%)			
Demographic and Clinical Characteristics	Denominator ^b	Prevalence (%)	Numerator ^a	Rate (%)
Age Group:^c				
18–27 Years	29,206	19.24%	830	2.84%
28–37 Years	30,826	20.30%	971	3.15%
38–47 Years	28,081	18.50%	906	3.23%
48–57 Years	31,853	20.98%	799	2.51%
58–67 Years	20,474	13.48%	299	1.46%
68+ Years	11,388	7.50%	108	0.95%
Number of High-Volume Chronic Physical Conditions:^{c,d}				
0	33,166	21.84%	689	2.08%
1	26,632	17.54%	738	2.77%
2	30,726	20.24%	825	2.69%
3	32,526	21.42%	882	2.71%
4	28,778	18.95%	779	2.71%
Sex:^c				
Female	102,952	67.81%	2,295	2.23%
Male	48,876	32.19%	1,618	3.31%
Geographic Area of Residence:^c				
Rural	93,339	61.48%	2,126	2.28%
Urban	58,474	38.51%	1,787	3.06%
Unknown	15	0.01	0	0
Managed Care Organization:^c				
WellCare of Kentucky	69,471	45.76%	1,692	2.44%
Passport Health Plan	21,952	14.46%	625	2.85%
Humana Caresource	2,395	1.58%	79	3.30%
CoventryCares of KY	55,366	36.47%	1,462	2.64%
Other ^e	2,644	1.74%	55	2.08%
Race/Ethnicity:				
White	110,927	73.06%	2,815	2.54%
Black	11,767	7.75%	335	2.85%
Asian	350	0.23%	6	1.71%
Other	28,784	18.96%	757	2.63%
Substance Abuse:^{c,f}				
No	120,880	79.62%	1,384	1.14%
Yes	30,948	20.38%	2,529	8.17%
Polypharmacy:^{c,g}				
No psychotropic	65,077	42.86%	1,073	1.65%
One psychotropic	48,901	32.21%	742	1.52%
Antidepressant + Antipsychotic	13,129	8.65%	1,400	10.66%
Other combination	24,721	16.28%	698	2.82%

^a First adult (aged 18 years and older) hospitalization in 2013 restricted to those with a principal diagnosis used to identify eligible behavioral health population (**Appendix A**), or perinatal ICD9 codes for drug dependence (6483) or mental disorders (6483), excluding inpatients who expired, were transferred to another inpatient

institution, or who were still hospitalized; overall (n = 3,913) and by subgroups with demographic or clinical characteristic.

^bTotal adult eligible behavioral health population overall (n = 151,828) and by subgroups with demographic or clinical characteristic.

^cStatistically significant difference between demographic/clinical category subgroups at $p < 0.05$ using *chi*-squared test.

^dAny diagnosis during the measurement year. Presence of 1 or more of the following chronic conditions any time during the 2013 measurement year: diseases of the nervous system and sense organs; endocrine, nutritional, metabolic, immunity disorders; diseases of the musculoskeletal system; and diseases of the circulatory system; as defined by the AHRQ/HCUP Chronic Condition Indicator File, 2014.

^eAnthem Health Plan of Kentucky; Kentucky Spirit Health Plan; missing data for MCO

^fDrug abuse and/or alcohol abuse any time during the 2013 measurement year, as defined by ICD9 code groupings in **Appendix A**.

^gAny pharmacy claim during the 2013 measurement year.

Table 18. Adult BH Hospitalization Rates by BH Diagnostic Categories and SA Combinations

		Outcome: Adult Behavioral Health Hospitalization as First Hospitalization ^a (Overall Rate = 3,913 ^a /151,828 ^b = 2.58%)			
Diagnostic Combination:	Denominator ^b	Prevalence (%)	Numerator ^a	Rate (%)	
Bipolar Disorder, Substance Abuse:^{c,d}					
Neither	109,835	72.34%	775	0.71%	
Substance Abuse, Only	26,621	17.53%	1,472	5.53%	
Bipolar Disorder, Only	11,045	7.27%	609	5.51%	
Both	4,327	2.85%	1,057	24.43%	
Schizophrenia, Substance Abuse:^{c,d}					
Neither	115,195	75.87%	797	0.69%	
Substance Abuse, Only	29,310	19.30%	1,919	6.55%	
Schizophrenia, Only	5,685	3.74%	587	10.33%	
Both	1,638	1.08%	610	37.24%	
Depression, Substance Abuse:^{c,d}					
Neither	75,145	49.49%	382	0.51%	
Substance Abuse, Only	17,754	11.69%	549	3.09%	
Depression, Only	45,735	30.12%	1,002	2.19%	
Both	13,194	8.69%	1,980	15.01%	
Conduct Disorder, Substance Abuse:^{c,d}					
Neither	119,220	78.52%	1,178	0.99%	
Substance Abuse, Only	30,186	19.88%	2,258	7.48%	
Conduct Disorder, Only	1,660	1.09%	206	12.41%	
Both	762	0.50%	271	35.56%	
Post-Traumatic Stress Disorder (PTSD), Substance Abuse:^{c,d}					
Neither	116,246	76.56%	1,112	0.96%	
Substance Abuse, Only	28,898	19.03%	2,035	7.04%	
PTSD, Only	4,634	3.05%	272	5.87%	
Both	2,050	1.35%	494	24.10%	
Attention Deficit Disorder (ADD), Substance Abuse:^{c,d}					
Neither	115,676	76.19%	1,292	1.12%	
Substance Abuse, Only	30,021	19.77%	2,353	7.84%	
ADD, Only	5,204	3.43%	92	1.77%	
Both	927	0.61%	176	18.99%	

^a First adult (aged 18 years and older) hospitalization in 2013 restricted to those with a principal diagnosis used to identify eligible behavioral health population (**Appendix A**), or perinatal ICD9 codes for drug dependence (6483) or mental disorders (6483), excluding inpatients who expired, were transferred to another inpatient institution, or who were still hospitalized.

^b Total adult eligible behavioral health population overall (n = 151,828) and by behavioral diagnostic category subgroups.

^c Defined per ICD9 assignments as specified in **Appendix A**. Substance Abuse includes Drug Abuse and/or Alcohol Abuse.

^d Statistically significant difference between rates for behavioral diagnostic category subgroups at $p < 0.05$ using *chi*-squared test.

Table 19. Multiple Logistic Regression: Adult BH Hospitalization – Demographic and Clinical Characteristics

Demographic and Clinical Characteristics	Odds Ratio ^a	95% Confidence Interval (CI)
Age Group:		
18–27 Years (referent)	1.00	-
28–37 Years	0.75 ^b	0.68, 0.83
38–47 Years	0.67 ^b	0.60, 0.75
48–57 Years	0.51 ^b	0.46, 0.58
58–67 Years	0.39 ^b	0.33, 0.45
68+ Years	0.47 ^b	0.38, 0.58
Number of High-Volume Chronic Physical Conditions:^c		
0 (referent)	1.00	-
1	1.41 ^b	1.26, 1.57
2	1.50 ^b	1.34, 1.68
3	1.63 ^b	1.45, 1.83
4	1.54 ^b	1.36, 1.75
Sex:		
Female (referent)	1.00	-
Male	1.51 ^b	1.41, 1.62
Geographic Area of Residence:		
Rural (referent)	1.00	-
Urban	1.40 ^b	1.30, 1.51
Unknown	-	-
Managed Care Organization:		
WellCare of Kentucky (referent)	1.00	-
Passport Health Plan	1.19 ^b	1.07, 1.33
Humana Caresource	1.31 ^b	1.03, 1.68
CoventryCares of KY	1.27 ^b	1.18, 1.37
Other ^d	1.21	0.91, 1.60
Race/Ethnicity:		
White (referent)	1.00	-
Black	1.09	0.96, 1.24
Asian	0.96	0.42, 2.20
Other	1.06	0.97, 1.16
Substance Abuse:^e		
No (referent)	1.00	-
Yes	7.31 ^b	6.81, 7.83
Polypharmacy:^f		
No psychotropic (referent)	1.00	-
One psychotropic	1.07	0.97, 1.18
Antidepressant + Antipsychotic	6.91 ^b	6.32, 7.55
Other combination	1.72 ^b	1.55, 1.90

^a Multiple logistic regression results for the relationship between the outcome of adult (aged 18 years and older) behavioral health (BH) hospitalization (first hospitalization restricted to behavioral health principal diagnosis, i.e., those used to identify eligible behavioral health population (**Appendix A**), or perinatal ICD9 codes for drug

dependence (6483) or mental disorders (6484) and possible risk factors, i.e., demographic and clinical characteristics (n = 3,913 with the outcome of BH Hospitalization, and 147,915 without the outcome). Excludes inpatients who expired, were transferred to another inpatient institution, or who were still hospitalized

^b Statistically significant difference at $p < 0.05$.

^c Any diagnosis during the measurement year. Presence of 1 or more of the following chronic conditions any time during the 2013 measurement year: diseases of the nervous system and sense organs; endocrine, nutritional, metabolic, immunity disorders; diseases of the musculoskeletal system; and diseases of the circulatory system; as defined by the AHRQ/HCUP Chronic Condition Indicator File, 2014.

^d Anthem Health Plan of Kentucky; Kentucky Spirit Health Plan; missing data for MCO.

^e Drug abuse and/or alcohol abuse any time during the 2013 measurement year, as defined by ICD9 code groupings in **Appendix A**.

^f Any pharmacy claim during the 2013 measurement year.

Table 20. Multiple Logistic Regression: Adult BH Hospitalization – BH Diagnostic Categories and SA Combinations

Diagnostic Combination	Odds Ratio ^a	95% Confidence Interval (CI)
Set: Bipolar Disorder, Substance Abuse:^b		
Neither (referent)	1.00	
Substance Abuse, Only	8.05 ^c	7.35, 8.80
Bipolar Disorder, Only	5.09 ^c	4.54, 5.70
Both	27.50 ^c	24.73, 30.60
Set: Schizophrenia, Substance Abuse:^b		
Neither (referent)	1.00	
Substance Abuse, Only	9.68 ^c	8.88, 10.55
Schizophrenia, Only	11.88 ^c	10.56, 13.38
Both	55.84 ^c	48.91, 63.75
Set: Depression, Substance Abuse:^b		
Neither (referent)	1.00	
Substance Abuse, Only	6.43 ^c	5.63, 7.35
Depression, Only	4.32 ^c	3.83, 4.88
Both	31.19 ^c	27.73, 35.08
Set: Conduct Disorder, Substance Abuse:^b		
Neither (referent)	1.00	
Substance Abuse, Only	7.70 ^c	7.15, 8.29
Conduct Disorder, Only	9.61 ^c	8.13, 11.37
Both	35.68 ^c	30.02, 42.40
Set: Post-Traumatic Stress Disorder (PTSD), Substance Abuse:^b		
Neither (referent)	1.00	
Substance Abuse, Only	7.56 ^c	7.01, 8.16
PTSD, Only	4.35 ^c	3.78, 5.01
Both	22.26 ^c	19.60, 25.28
Set: Attention Deficit Disorder (ADD), Substance Abuse:^b		
Neither (referent)	1.00	
Substance Abuse, Only	7.08 ^c	6.59, 7.61
ADD, Only	0.94	0.76, 1.18
Both	11.29 ^c	9.36, 13.61

^a Multiple logistic regression results for the relationship between the outcome of adult (aged 18 years and older) behavioral health (BH) hospitalization (first hospitalization restricted to behavioral health principal diagnosis, i.e., those used to identify eligible behavioral health population (**Appendix A**), or perinatal ICD9 codes for drug dependence (6483) or mental disorders (6484) and behavioral health/substance abuse (SA) diagnostic combinations, adjusted for demographic and clinical characteristics (per **Table 19**); n = 3,913 with the outcome, and 147,915 without the outcome). Excludes inpatients who expired, were transferred to another inpatient institution, or who were still hospitalized.

^b Any diagnosis during the measurement year. Defined per ICD9 assignments specified in **Appendix A**. Substance Abuse includes Drug Abuse and/or Alcohol Abuse, and is evaluated within each behavioral health condition subset.

^c Statistically significant at $p < 0.05$.

Findings for the outcome of hospitalization for behavioral health principal diagnosis during 2013 for adolescents and children: The overall adolescent and child behavioral health hospitalization rate was 2,558/93,183 = 2.75%. Demographic and clinical characteristics with significantly different proportions among those with and without youth behavioral health hospitalization were the following: age group, number of comorbid physical conditions (one or more of the following: diseases of the respiratory system, diseases of the nervous system and sense organs; endocrine, nutritional, metabolic, immunity disorder), sex, geographic area of residence, managed care organization, race/ethnicity, substance abuse, polypharmacy, and foster care status (**Table 21**).

All behavioral health diagnostic categories with substance abuse combinations showed statistically significant differences in proportions (**Table 22**). Demographic and clinical characteristics with elevated odds for behavioral health hospitalization were age 13–17 years (OR = 1.56; 95% CI = 1.43, 1.71), age 6–12 years (calculated as the reciprocal of the OR for age 0–5 years: OR = 2.33; 95% CI = 1.79, 3.13), presence of 3 chronic physical conditions (OR = 2.17; 95% CI = 1.69, 2.78), presence of 2 chronic physical conditions (OR = 1.65; 95% CI = 1.45, 1.87), presence of 1 chronic condition (OR = 1.35; 95% CI = 1.23, 1.49), female sex (calculated as the reciprocal of the OR for male sex: OR = 1.32; 95% CI = 1.22, 1.45), urban residence (OR = 1.55; 95% CI = 1.41, 1.71), Black race (OR=1.40; 95% CI=1.23, 1.61) and Asian race (OR=3.13; 95% CI=1.47, 6.67), substance abuse (OR = 4.23; 95% CI = 3.69, 4.85), having a pharmacy claim for an antidepressant and an antipsychotic (OR = 24.75; 95% CI = 21.54, 28.43), having another pharmacy claim combination (OR = 7.30; 95% CI = 6.24, 8.54), and having a pharmacy claim for one class of psychotropic (OR = 4.27; 95% CI = 3.74, 4.89), in foster care (OR = 1.65; 95% CI = 1.45, 1.89) or at risk for foster care placement (OR = 1.36; 95% CI = 1.08, 1.71; **Table 23**). In addition, relative to enrollment in WellCare of Kentucky, enrollment in Passport Health Plan was associated with 22% greater odds for behavioral health hospitalization (OR = 1.22; 95% CI = 1.08, 1.36) and enrollment in CoventryCares of KY with 39% greater odds for youth behavioral health hospitalization (OR = 1.39; 95% CI = 1.25, 1.54); however, MCO results should be interpreted with caution due possible residual confounding (**Table 23**).

Among the combination diagnostic and substance abuse diagnostic subsets, relative to absence of both substance abuse and the specific psychiatric condition, odds for the youth behavioral health hospitalization were significantly elevated for all dual diagnoses (with calculable odds ratios; **Table 24**). Odds for youth behavioral health hospitalization were also elevated for enrollees with the following single diagnoses: bipolar disorder, depression, conduct disorder and PTSD. Although statistical limitations preclude interpretation of the odds for youth behavioral health hospitalization associated with a dual diagnosis of schizophrenia with comorbid substance abuse, it is notable that the youth behavioral health hospitalization rate was highest for this combination at 61.90% (**Table 22**).

Table 21. Youth BH Hospitalization Rates by Demographic and Clinical Characteristics

		Outcome: Children and Adolescent BH Hospitalization as First Hospitalization ^a (Overall Rate = 2,558 ^a /93,183 ^b = 2.75%)		
Demographic and Clinical Characteristics	Denominator ^b	Prevalence (%)	Numerator ^a	Rate (%)
Age Group:^c				
0–5 Years	15,240	16.35%	59	0.39%
6–12 Years	44,679	47.95%	862	1.93%
13–17 Years	33,264	35.70%	1,637	4.92%
Number of High-Volume Chronic Physical Conditions:^{c,d}				
0	50,723	54.43%	1,070	2.11%
1	31,266	33.55%	973	3.11%
2	9,890	10.61%	429	4.34%
3	1,304	1.40%	86	6.60%
Sex:^c				
Female	37,553	40.30%	1,221	3.25%
Male	55,630	59.70%	1,337	2.40%
Geographic Area of Residence:^c				
Rural	44,232	47.47%	856	1.94%
Urban	48,945	52.53%	1,702	3.48%
Unknown	6	0.01%	0	0
Managed Care Organization:^c				
WellCare of Kentucky	37,371	40.10%	845	2.26%
Passport Health Plan	20,529	22.03%	730	3.56%
Humana Caresource	1,732	1.86%	45	2.60%
CoventryCares of KY	33,087	35.51%	926	2.80%
Other ^e	464	0.50%	12	2.59%
Race/Ethnicity:^c				
White	65,676	70.48%	1,551	2.36%
Black	9,811	10.53%	369	3.76%
Asian	215	0.23%	8	3.72%
Other	17,481	18.76%	630	3.60%
Substance Abuse:^{c,f}				
No	90,916	97.57%	2,136	2.35%
Yes	2,267	2.43%	422	18.61%
Polypharmacy:^{c,g}				
No psychotropic	53,320	57.22%	314	0.59%
One psychotropic	27,434	29.44%	813	2.96%
Antidepressant + Antipsychotic	5,321	5.71%	1,046	19.66%
Other combination	7,108	7.63%	385	5.42%
Foster Care Status:^c				
Not in Foster Care	85,375	91.62%	2,077	2.43%
In Foster Care	4,625	4.96%	393	8.50%
At Risk for Foster Care Placement	3,183	3.42%	88	2.76%

^a First youth (aged 17 years and younger) hospitalization in 2013 restricted to those with a principal diagnosis used to identify eligible behavioral health (BH) population (**Appendix A**), or perinatal ICD9 codes for drug dependence

(6483) or mental disorders (6483); overall (n = 2,558) and by subgroups with demographic or clinical characteristic. Excludes inpatients who expired, were transferred to another inpatient institution, or who were still hospitalized

^bTotal adult eligible behavioral health population overall (n = 93,183) and by subgroups with demographic or clinical characteristic.

^cStatistically significant difference between rates for demographic/clinical category subgroups at $p < 0.05$ using *chi-squared* test.

^dAny diagnosis during the measurement year. Presence of 1 or more of the following chronic conditions any time during the 2013 measurement year: diseases of the respiratory system; diseases of the nervous system and sense organs; and endocrine, nutritional, metabolic, immunity disorders, as defined by the AHRQ/HCUP Chronic Condition Indicator File, 2014.

^eAnthem Health Plan of Kentucky; Kentucky Spirit Health Plan; missing data for MCO.

^fDrug abuse and/or alcohol abuse any time during the 2013 measurement year, as defined by ICD9 code groupings in **Appendix A**.

^gAny pharmacy claim during the 2013 measurement year.

Table 22. Youth BH Hospitalization Rates by BH Diagnostic Categories and SA Combinations

Outcome: Children and Adolescent Behavioral Health Hospitalization as First Hospitalization ^a (Overall Rate = 2,558 ^a /93,183 ^b = 2.75%)				
Diagnostic Combination:	Denominator ^b	Prevalence (%)	Numerator ^a	Rate (%)
Bipolar Disorder, Substance Abuse:^{c,d}				
Neither	87,869	94.30%	1,538	1.75%
Substance Abuse, Only	1,859	1.99%	263	14.15%
Bipolar Disorder, Only	3,047	3.27%	598	19.63%
Both	408	0.44%	159	39.97%
Schizophrenia, Substance Abuse:^{c,d,e}				
Neither	90,783	97.42%	2,108	2.32%
Substance Abuse, Only	2,246	2.41%	409	18.21%
Schizophrenia, Only	133	0.14%	28	21.06%
Both	21	0.02%	13	61.90%
Depression, Substance Abuse:^{c,d}				
Neither	79,604	85.43%	882	1.11%
Substance Abuse, Only	1,462	1.57%	116	7.93%
Depression, Only	11,312	12.14%	1,254	11.09%
Both	805	0.86%	306	38.01%
Conduct Disorder, Substance Abuse:^{c,d}				
Neither	73,918	79.33%	1,096	1.48%
Substance Abuse, Only	1,691	1.81%	239	14.13%
Conduct Disorder, Only	16,998	18.24%	1,040	6.12%
Both	576	0.62%	183	31.77%
Post-Traumatic Stress Disorder (PTSD), Substance Abuse:^{c,d}				
Neither	87,857	94.28%	1,672	1.90%
Substance Abuse, Only	2,085	2.24%	338	16.21%
PTSD, Only	3,059	3.28%	464	15.17%
Both	182	0.20%	84	46.15%
Attention Deficit Disorder (ADD), Substance Abuse:^{c,d}				
Neither	48,826	52.40%	908	1.86%
Substance Abuse, Only	1,469	1.58%	245	16.68%
ADD, Only	42,090	45.17%	1,228	2.92%
Both	798	0.86%	177	22.18%

^a First youth (aged 17 years and younger) hospitalization in 2013 restricted to those with a principal diagnosis used to identify eligible behavioral health (BH) population (**Appendix A**), or perinatal ICD9 codes for drug dependence (6483) or mental disorders (6483), excluding inpatients who expired, were transferred to another inpatient institution, or who were still hospitalized.

^b Total youth eligible behavioral health population overall (n = 93,183) and by behavioral diagnostic category subgroups

^c Defined per ICD9 assignments as specified in **Appendix A**. Substance Abuse (SA) includes Drug Abuse and/or Alcohol Abuse.

^d Statistically significant difference between rates for behavioral diagnostic category subgroups at $p < 0.05$ using *chi*-squared test.

^e 25% of cells have expected counts less than 5; therefore, *chi*-squared may not be a valid test.

Table 23. Multiple Logistic Regression: Youth BH Hospitalization – Demographic and Clinical Characteristics

Demographic and Clinical Characteristics	Odds Ratio ^a	95% Confidence Interval (CI)
Age Group:		
0–5 Years	0.43 ^b	0.32, 0.56
6–12 Years (referent)	1.00	-
13–17 Years	1.56 ^b	1.43, 1.71
Number of High-Volume Chronic Physical Conditions:^c		
0 (referent)	1.00	-
1	1.35 ^b	1.23, 1.49
2	1.65 ^b	1.45, 1.87
3	2.17 ^b	1.69, 2.78
Sex:		
Female (referent)	1.00	-
Male	0.76 ^b	0.69, 0.82
Geographic Area of Residence:		
Rural (referent)	1.00	-
Urban	1.55 ^b	1.41, 1.71
Unknown	-	-
Managed Care Organization:		
WellCare of Kentucky (referent)	1.00	-
Passport Health Plan	1.22 ^b	1.08, 1.36
Humana Caresource	1.07	0.78, 1.48
CoventryCares of KY	1.39 ^b	1.25, 1.54
Other ^d	1.62	0.88, 2.99
Race/Ethnicity:		
White (referent)	1.00	-
Black	1.40 ^b	1.23, 1.61
Asian	3.13 ^b	1.47, 6.67
Other	1.27 ^b	1.14, 1.40
Substance Abuse:^e		
No (referent)	1.00	-
Yes	4.23 ^b	3.69, 4.85
Polypharmacy:^f		
No psychotropic (referent)	1.00	-
One psychotropic	4.27 ^b	3.74, 4.89
Antidepressant + Antipsychotic	24.75 ^b	21.54, 28.43
Other combination	7.30 ^b	6.24, 8.54
Foster Care Status:		
Not in Foster Care (referent)	1.00	-
In Foster Care	1.65 ^b	1.45, 1.89
At Risk for Foster Care Placement	1.36 ^b	1.08, 1.71

^a Multiple logistic regression results for the relationship between the outcome of youth (aged 17 years and younger) behavioral health (BH) hospitalization (first hospitalization restricted to behavioral health principal

diagnosis, i.e., those used to identify eligible behavioral health population (**Appendix A**), or perinatal ICD9 codes for drug dependence (6483) or mental disorders (6484) and possible risk factors, i.e., demographic and clinical characteristics (n = 2,558 with the outcome of BH Hospitalization, and 90,625 without the outcome). Excludes inpatients who expired, were transferred to another inpatient institution, or who were still hospitalized.

^b Statistically significant difference at $p < 0.05$.

^c Any diagnosis during the measurement year. Presence of 1 or more of the following chronic conditions any time during the 2013 measurement year: diseases of the respiratory system; diseases of the nervous system and sense organs; and endocrine, nutritional, metabolic, immunity disorders, as defined by the AHRQ/HCUP Chronic Condition Indicator File, 2014.

^d Anthem Health Plan of Kentucky; Kentucky Spirit Health Plan; missing data for MCO

^e Drug abuse and/or alcohol abuse any time during the 2013 measurement year, as defined by ICD9 code groupings in **Appendix A**.

^f Any pharmacy claim during the 2013 measurement year.

Table 24. Multiple Logistic Regression: Youth BH Hospitalization – BH Diagnostic Categories and SA Combinations

Diagnostic Combination:	Odds Ratio ^a	95% Confidence Interval (CI)
Set: Bipolar Disorder, Substance Abuse:^b		
Neither (referent)	1.00	-
Substance Abuse, Only	5.44 ^c	4.64, 6.38
Bipolar Disorder, Only	3.95 ^c	3.52, 4.44
Both	6.49 ^c	5.14, 8.18
Set: Schizophrenia, Substance Abuse:^b		
Neither (referent)	1.00	-
Substance Abuse, Only	5.87 ^d	5.85, 5.89
Schizophrenia, Only	5.27 ^d	5.22, 5.32
Both	_ ^{d,e}	-
Set: Depression, Substance Abuse:^b		
Neither (referent)	1.00	_ ^{d,e}
Substance Abuse, Only	4.86 ^c	3.89, 6.07
Depression, Only	7.74 ^c	7.01, 8.57
Both	23.12 ^c	19.20, 27.85
Set: Conduct Disorder, Substance Abuse:^b		
Neither (referent)	1.00	-
Substance Abuse, Only	5.37 ^c	4.53, 6.36
Conduct Disorder, Only	5.14 ^c	4.67, 5.64
Both	10.90 ^c	8.76, 13.56
Set: Post-Traumatic Stress Disorder (PTSD), Substance Abuse:^b		
Neither (referent)	1.00	-
Substance Abuse, Only	4.94 ^c	4.27, 5.72
PTSD, Only	4.58 ^c	4.04, 5.20
Both	9.22 ^c	6.54, 12.99
Set: Attention Deficit Disorder (ADD), Substance Abuse:^b		
Neither (referent)	1.00	-
Substance Abuse, Only	5.09 ^c	4.25, 6.11
ADD, Only	0.93	0.85, 1.03
Both	3.12 ^c	2.54, 3.83

^a Multiple logistic regression results for the relationship between the outcome of youth (aged 17 years and younger) behavioral health (BH) hospitalization (first hospitalization restricted to behavioral health principal diagnosis, i.e., those used to identify eligible behavioral health population (**Appendix A**), or perinatal ICD9 codes for drug dependence (6483) or mental disorders (6484)) and behavioral health/substance abuse (SA) diagnostic combinations, adjusted for demographic and clinical characteristics (per **Table 23**); n = 2,558 with the outcome, and 90,625 without the outcome). Excludes inpatients who expired, were transferred to another inpatient institution, or who were still hospitalized

^b Any diagnosis during the measurement year. Defined per ICD9 assignments specified in **Appendix A**. Substance Abuse includes Drug Abuse and/or Alcohol Abuse, and is evaluated within each behavioral health condition subset.

^c Statistically significant at $p < 0.05$.

^d Statistically significant at $p < 0.05$; however, validity of model fit questionable; therefore, the odds ratio may not be a valid effect estimate.

^e The small number of enrollees with the combination (n = 21) likely limited resulted in statistical limitations that precluded estimation of a valid odds ratio; however, this combination shows the highest behavioral health admission rate of 61.90% (**Table 22**).

Findings for the outcome of ED re-visit within 30 days of discharge from behavioral health

hospitalization for adults: The overall adult ED re-visit rate was 973/3,913 = 24.87%. Demographic and clinical characteristics with significantly different proportions among those with and without adult ED re-visit after behavioral health hospitalization were the following: age group, presence of chronic physical conditions, substance abuse and polypharmacy (**Table 25**). All behavioral health diagnostic categories with substance abuse combinations showed statistically significant differences in proportions (**Table 26**). Demographic and clinical characteristics with elevated odds for an ED re-visit were presence of 4 chronic conditions (OR = 3.72; 95% CI = 2.78, 4.97), 3 chronic conditions (OR = 2.15; 95% CI = 1.62, 2.85), 2 chronic conditions (OR = 1.89; 95% CI = 1.44, 2.49), 1 chronic condition (OR = 1.33; 95% CI = 1.01, 1.77), substance abuse (OR = 1.34; 95% CI = 1.13, 1.58), and pharmacy claims for both an antidepressant and antipsychotic (OR = 1.37; 95% CI = 1.13, 1.68; **Table 27**). Among the combination diagnostic and substance abuse diagnostic subsets, relative to absence of both substance abuse and the specific psychiatric condition, odds for adult ED re-visit after behavioral health hospitalization were significantly elevated for all dual diagnoses except for Attention Deficit Disorder (ADD; **Table 28**). Odds for adult ED re-visit after behavioral health hospitalization were also elevated for enrollees with the following single diagnoses: bipolar disorder, schizophrenia, conduct disorder and PTSD.

Table 25. Adult ED Re-Visit Rates after BH Hospitalization by Demographic and Clinical Characteristics

Outcome: Adult ED Re-Visit after BH Hospitalization^a				
(Overall Rate = 973^a/3,913^b = 24.87%)				
Demographic and Clinical Characteristics	Denominator^b	Prevalence (%)	Numerator^a	Rate (%)
Age Group:^c				
18–27 Years	830	21.21%	172	20.72%
28–37 Years	971	24.81%	218	22.45%
38–47 Years	906	23.15%	243	26.82%
48–57 Years	799	20.42%	222	27.78%
58–67 Years	299	7.64%	90	30.10%
68+ Years	108	2.76%	28	25.93%
Number of High-Volume Chronic Physical Conditions:^{c,d}				
0	689	17.61%	104	15.09%
1	738	18.86%	141	19.11%
2	825	21.08%	202	24.48%
3	882	22.54%	231	26.19%
4	779	19.91%	295	37.87%
Sex:				
Female	2,295	58.65%	560	24.40%
Male	1,618	41.35%	413	25.53%
Geographic Area of Residence:				
Rural	2,126	54.33%	513	24.13
Urban	1,787	45.67%	460	25.74
Unknown	0	-	0	-
Managed Care Organization:				
WellCare of Kentucky	1,692	43.24%	404	23.88%
Passport Health Plan	625	15.97%	162	25.92%
Humana Caresource	79	2.02%	17	21.52%
CoventryCares of KY	1,462	37.36%	379	25.92%
Other ^e	55	1.41%	11	20.00%
Race/Ethnicity:				
White	2,815	71.94%	690	24.51%
Black	335	8.56%	87	25.97%
Asian	6	0.15%	1	16.67%
Other	757	19.35%	195	25.76%
Substance Abuse:^{c,f}				
No	1,384	35.37%	303	21.89%
Yes	2,529	64.63%	670	26.49%
Polypharmacy:^{c,g}				
No psychotropic	1,073	27.42%	256	23.86%
One psychotropic	742	18.96%	147	19.81%
Antidepressant + Antipsychotic	1,400	35.78%	405	28.93%
Other combination	698	17.84%	165	23.64%
Hospital Length of Stay:				
1 Day	324	8.28%	90	27.78%

Outcome: Adult ED Re-Visit after BH Hospitalization ^a (Overall Rate = 973 ^a /3,913 ^b = 24.87%)				
Demographic and Clinical Characteristics	Denominator ^b	Prevalence (%)	Numerator ^a	Rate (%)
2–4 Days	1,785	45.62%	445	24.93%
5–7 Days	1,011	25.84%	261	25.82%
8+ Days	793	20.27%	177	22.32%

^a Adult (aged 18 years and older) Emergency Department (ED) re-visits after behavioral health (BH) hospitalization in 2013, excluding inpatients who expired, were transferred to another inpatient institution, or who were still hospitalized ; overall (n = 973) and by subgroups with demographic or clinical characteristic

^b Total adult eligible behavioral health population overall (n = 3,913) and by subgroups with demographic or clinical characteristic.

^c Statistically significant difference between rates for demographic/clinical category subgroups at $p < 0.05$ using *chi*-squared test.

^d Any diagnosis during the measurement year. Presence of 1 or more of the following chronic conditions any time during the 2013 measurement year: diseases of the nervous system and sense organs; endocrine, nutritional, metabolic, immunity disorders; diseases of the musculoskeletal system; and diseases of the circulatory system; as defined by the AHRQ/HCUP Chronic Condition Indicator File, 2014.

^e Anthem Health Plan of Kentucky; Kentucky Spirit Health Plan; missing data for MCO

^f Drug abuse and/or alcohol abuse any time during the 2013 measurement year, as defined by ICD9 code groupings in **Appendix A**.

^g Any pharmacy claim during the 2013 measurement year.

Table 26. Adult ED Re-Visit Rates after BH Hospitalization by BH Diagnostic Categories and SA Combinations

Diagnostic Combination:	Outcome: Adult ED Re-Visit after BH Hospitalization ^a			
	(Overall Rate = 973 ^a /3,913 ^b = 24.87%)			
	Denominator ^b	Prevalence (%)	Numerator ^a	Rate (%)
Bipolar Disorder, Substance Abuse:^{c,d}				
Neither	775	19.81%	130	16.77%
Substance Abuse, Only	1,472	37.62%	318	21.60%
Bipolar Disorder, Only	609	15.56%	173	28.41%
Both	1,057	27.01%	352	33.30%
Schizophrenia, Substance Abuse:^{c,d}				
Neither	797	20.37%	160	20.08%
Substance Abuse, Only	1,919	49.04%	453	23.61%
Schizophrenia, Only	587	15.00%	143	24.36%
Both	610	15.59%	217	35.57%
Depression, Substance Abuse:^{c,d}				
Neither	382	9.76%	66	17.28%
Substance Abuse, Only	549	14.03%	118	21.49%
Depression, Only	1,002	25.61%	237	23.65%
Both	1,980	50.60%	552	27.88%
Conduct Disorder, Substance Abuse:^{c,d}				
Neither	1,178	30.10%	246	20.88%
Substance Abuse, Only	2,258	57.71%	560	24.80%
Conduct Disorder, Only	206	5.26%	57	27.67%
Both	271	6.93%	110	40.59%
Post-Traumatic Stress Disorder (PTSD), Substance Abuse:^{c,d}				
Neither	1,112	28.42%	224	20.14%
Substance Abuse, Only	2,035	52.01%	514	25.26%
PTSD, Only	272	6.95%	79	29.04%
Both	494	12.62%	156	31.58%
Attention Deficit Disorder (ADD), Substance Abuse:^{c,d}				
Neither	1,292	33.02%	283	21.90%
Substance Abuse, Only	2,353	60.13%	630	26.77%
ADD, Only	92	2.35%	20	21.74%
Both	176	4.50%	40	22.73%

^a Adult (aged 18 years and older) emergency department (ED) re-visits after behavioral health (BH) hospitalization in 2013, excluding inpatients who expired, were transferred to another inpatient institution, or who were still hospitalized; overall, (n = 973) and by BH diagnostic combination subgroups.

^b Total adult eligible behavioral health population overall (n = 3,913) and by BH diagnostic combination subgroups.

^c Defined per ICD9 assignments as specified in **Appendix A**. Substance Abuse (SA) includes Drug Abuse and/or Alcohol Abuse.

^d Statistically significant difference between rates for behavioral diagnostic category subgroups at $p < 0.05$ using *chi*-squared test.

Table 27. Multiple Logistic Regression: Adult ED Re-Visit after BH Hospitalization – Demographic and Clinical Characteristics

Demographic and Clinical Characteristics	Odds Ratio ^a	95% Confidence Interval (CI)
Age Group:		
18–27 Years (referent)	1.00	-
28–37 Years	0.88	0.69, 1.12
38–47 Years	0.90	0.70, 1.16
48–57 Years	0.87	0.67, 1.13
58–67 Years	0.96	0.69, 1.35
68+ Years	0.88	0.53, 1.47
Number of High-Volume Chronic Physical Conditions:^b		
0 (referent)	1.00	-
1	1.33 ^c	1.01, 1.77
2	1.89 ^c	1.44, 2.49
3	2.15 ^c	1.62, 2.85
4	3.72 ^c	2.78, 4.97
Sex:		
Female (referent)	1.00	-
Male	1.14	0.98, 1.33
Geographic Area of Residence:		
Rural (referent)	1.00	-
Urban	1.16	0.98, 1.38
Unknown	-	-
Managed Care Organization:		
WellCare of Kentucky (referent)	1.00	-
Passport Health Plan	1.13	0.89, 1.44
Humana Caresource	0.98	0.55, 1.73
CoventryCares of KY	1.18	0.99, 1.40
Other ^d	1.10	0.56, 2.19
Race/Ethnicity:		
White (referent)	1.00	-
Black	1.12	0.85, 1.49
Asian	0.69	0.08, 6.05
Other	1.10	0.91, 1.34
Substance Abuse:^e		
No (referent)	1.00	-
Yes	1.34 ^c	1.13, 1.58
Polypharmacy:^f		
No psychotropic (referent)	1.00	-
One psychotropic	0.85	0.67, 1.08
Antidepressant + Antipsychotic	1.37 ^c	1.13, 1.68
Other combination	1.00	0.79, 1.27
Hospital Length of Stay:		
1 Day (referent)	1.00	-
2–4 Days	0.90	0.69, 1.19
5–7 Days	0.94	0.70, 1.25

Demographic and Clinical Characteristics	Odds Ratio ^a	95% Confidence Interval (CI)
8+ Days	0.74	0.55, 1.01

^a Multiple logistic regression results for the relationship between the outcome of adult (aged 18 years and older) Emergency Department (ED) re-visit after behavioral health (BH) hospitalization in 2013 (excluding inpatients who expired, were transferred to another inpatient institution, or who were still hospitalized) and demographic and clinical characteristics (n = 973 with the outcome of ED re-visit after BH Hospitalization, and 2,940 without the outcome)

^b Any diagnosis during the measurement year. Presence of 1 or more of the following chronic conditions any time during the 2013 measurement year: diseases of the nervous system and sense organs; endocrine, nutritional, metabolic, immunity disorders; diseases of the musculoskeletal system; and diseases of the circulatory system; as defined by the AHRQ/HCUP Chronic Condition Indicator File, 2014.

^c Statistically significant difference at $p < 0.05$.

^d Anthem Health Plan of Kentucky; Kentucky Spirit Health Plan; missing data for MCO

^e Drug abuse and/or alcohol abuse any time during the 2013 measurement year, as defined by ICD9 code groupings in **Appendix A**.

^f Any pharmacy claim during the 2013 measurement year.

Table 28. Multiple Logistic Regression: Adult ED Re-Visit after BH Hospitalization – BH Diagnostic Categories and SA Combinations

Diagnostic Combination:	Odds Ratio ^a	95% Confidence Interval (CI)
Set: Bipolar Disorder, Substance Abuse:^b		
Neither (referent)	1.00	
Substance Abuse, Only	1.46 ^c	1.15, 1.84
Bipolar Disorder, Only	1.91 ^c	1.46, 2.51
Both	2.39 ^c	1.88, 3.04
Set: Schizophrenia, Substance Abuse:^b		
Neither (referent)	1.00	
Substance Abuse, Only	1.31 ^c	1.06, 1.63
Schizophrenia, Only	1.42 ^c	1.08, 1.86
Both	2.49 ^c	1.92, 3.24
Set: Depression, Substance Abuse:^b		
Neither (referent)	1.00	
Substance Abuse, Only	1.41 ^c	1.00, 1.99
Depression, Only	1.32	0.96, 1.80
Both	1.71 ^c	1.27, 2.29
Set: Conduct Disorder, Substance Abuse:^b		
Neither (referent)	1.00	
Substance Abuse, Only	1.31 ^c	1.11, 1.57
Conduct Disorder, Only	1.52 ^c	1.08, 2.16
Both	2.68 ^c	1.99, 3.59
Set: Post-Traumatic Stress Disorder (PTSD), Substance Abuse:^b		
Neither (referent)	1.00	
Substance Abuse, Only	1.41 ^c	1.16, 1.69
PTSD, Only	1.55 ^c	1.14, 2.11
Both	1.78 ^c	1.38, 2.29
Set: Attention Deficit Disorder (ADD), Substance Abuse:^b		
Neither (referent)	1.00	
Substance Abuse, Only	1.37 ^c	1.15, 1.62
ADD, Only	1.14	0.67, 1.94
Both	1.09	0.74, 1.62

^a Multiple logistic regression results for the relationship between the outcome of adult (aged 18 years and older) emergency department (ED) re-visit after behavioral health (BH) hospitalization in 2013 (excluding inpatients who expired, were transferred to another inpatient institution, or who were still hospitalized) and BH diagnostic combination subgroups, adjusted for demographic and clinical characteristics (per **Table 27**); n = 973 with the outcome of ED Re-Visit after BH Hospitalization, and 2,940 without the outcome.

^b Any diagnosis during the measurement year. Defined per ICD9 assignments as specified in **Appendix A**. Substance Abuse includes Drug Abuse and/or Alcohol Abuse.

^c Statistically significant difference at $p < 0.05$.

Findings for the outcome of ED re-visit within 30 days of discharge from behavioral health

hospitalization for adolescents and children: The overall youth ED re-visit rate was $257/2,558 = 10.05\%$. Demographic and clinical characteristics with significantly different proportions among those with and without youth ED re-visit after behavioral health hospitalization were the following: presence of one or more chronic physical conditions, sex, MCO, and polypharmacy (**Table 29**). The differences in proportions with and without youth ED re-visit after behavioral health hospitalization for behavioral health diagnostic categories with substance abuse combinations did not show statistically significant differences (**Table 30**). Demographic and clinical characteristics with elevated odds for an ED re-visit were female sex (calculated as reciprocal of male sex: OR = 1.43; 95% CI = 1.09, 1.89), presence of 3 chronic physical conditions (OR = 2.03; 95% CI = 1.08, 3.82), 2 chronic physical conditions (OR = 1.99; 95% CI = 1.39, 2.85), dual pharmacy claims for antidepressant and antipsychotic prescriptions (OR = 1.73; 95% CI = 1.04, 2.87), other combination pharmacy claim (OR = 2.11; 95% CI = 1.21, 3.66), and enrollment in WellCare of Kentucky relative to Passport Health Plan (OR calculated as reciprocal = 1.85; 95% CI = 1.23, 2.70); MCO findings should be interpreted with caution due to possible residual confounding (**Table 31**). Among the combination diagnostic and substance abuse diagnostic subsets, relative to absence of both substance abuse and the specific psychiatric condition, odds for youth ED re-visit after behavioral health hospitalization were non-significantly elevated for all dual diagnoses except for depression with substance abuse, which showed a non-significant inverse relationship (**Table 32**).

Table 29. Youth ED Re-Visit Rates after BH Hospitalization by Demographic and Clinical Characteristics

	Outcome: Children and Adolescent ED Re-Visit (Overall Rate = 257 ^a /2,558 ^b = 10.05%)			
Demographic and Clinical Characteristics	Denominator ^b	Prevalence (%)	Numerator ^a	Rate (%)
Age Group:				
0–5 Years	59	2.31%	7	11.86%
6–12 Years	862	33.70%	78	9.05%
13–17 Years	1,637	64.00%	172	10.51%
Number of High-Volume Chronic Physical Conditions:^{c,d}				
0	1,070	41.83%	84	7.85%
1	973	38.04%	93	9.56%
2	429	16.77%	66	15.38%
3	86	3.36%	14	16.28%
Sex:^d				
Female	1,221	47.73%	148	12.12%
Male	1,337	52.27%	109	8.15%
Geographic Area of Residence:				
Rural	856	33.46%	94	10.98%
Urban	1,702	66.54%	163	9.58%
Unknown	0	-	0	-
Managed Care Organization:^d				
WellCare of Kentucky	845	33.03%	100	11.83%
Passport Health Plan	730	28.54%	48	6.58%
Humana Caresource	45	1.76%	2	4.44%
CoventryCares of KY	926	36.20%	104	11.23%
Other ^e	12	0.47%	3	25.00%
Race/Ethnicity:				
White	1,551	60.63%	166	10.70%
Black	369	14.43%	29	7.86%
Asian	8	0.31%	1	12.50%
Other	630	24.63%	61	9.68%
Substance Abuse:^f				
No	2,136	83.50%	218	10.21%
Yes	422	16.50%	39	9.24%
Polypharmacy:^{d,g}				
No psychotropic	314	12.28%	21	6.69%
One psychotropic	813	31.78%	71	8.73%
Antidepressant + Antipsychotic	1,046	40.89%	117	11.19%
Other combination	385	15.05%	48	12.47%
Foster Care Status:				
Not in Foster Care	2,077	81.20%	215	10.35%
In Foster Care	393	15.36%	36	9.16%
At Risk for Foster Care Placement	88	3.44%	6	6.82%
Hospital Length of Stay:				

Outcome: Children and Adolescent ED Re-Visit (Overall Rate = 257 ^a /2,558 ^b = 10.05%)				
Demographic and Clinical Characteristics	Denominator ^b	Prevalence (%)	Numerator ^a	Rate (%)
1 Day	46	1.80%	8	17.39%
2–4 Days	721	28.19%	85	11.79%
5–7 Days	899	35.14%	86	9.57%
8+ Days	892	34.87%	78	8.74%

^aYouth (aged 17 years and younger) Emergency Department (ED) re-visits after behavioral health (BH) hospitalization in 2013, excluding inpatients who expired, were transferred to another inpatient institution, or who were still hospitalized; overall (n = 257) and by subgroups with demographic or clinical characteristic.

^bTotal youth eligible behavioral health population overall (n = 2,558) and by subgroups with demographic or clinical characteristic.

^cAny diagnosis during the measurement year. Presence of 1 or more of the following chronic conditions any time during the 2013 measurement year: diseases of the respiratory system; diseases of the nervous system and sense organs; and endocrine, nutritional, metabolic, immunity disorders, as defined by the AHRQ/HCUP Chronic Condition Indicator File, 2014.

^dStatistically significant difference between rates for demographic/clinical category subgroups at $p < 0.05$ using *chi*-squared test.

^eAnthem Health Plan of Kentucky; Kentucky Spirit Health Plan; missing data for MCO.

^fDrug abuse and/or alcohol abuse any time during the 2013 measurement year, as defined by ICD9 code groupings in **Appendix A**.

^gAny pharmacy claim during the 2013 measurement year.

Table 30. Youth ED Re-Visit Rates after BH Hospitalization - BH Diagnostic Categories and SA Combinations

Outcome: Children and Adolescent ED Re-Visit (Overall Rate = 257 ^a /2,558 ^b = 10.05%)				
Diagnostic Combination:	Denominator ^b	Prevalence (%)	Numerator ^a	Rate (%)
Bipolar Disorder, Substance Abuse:^c				
Neither	1,538	60.13%	148	9.62%
Substance Abuse, Only	263	10.28%	19	7.22%
Bipolar Disorder, Only	598	23.38%	70	11.71%
Both	159	6.22%	20	12.58%
Schizophrenia, Substance Abuse:^c				
Neither	2,108	82.41%	212	10.06%
Substance Abuse, Only	409	15.99%	37	9.05%
Schizophrenia, Only	28	1.09%	6	21.43%
Both	13	0.51%	2	15.38%
Depression, Substance Abuse:^c				
Neither	882	34.48%	79	8.96%
Substance Abuse, Only	116	4.53%	8	6.90%
Depression, Only	1,254	49.02%	139	11.08%
Both	306	11.96%	31	10.13%
Conduct Disorder, Substance Abuse:^c				
Neither	1,096	42.85%	108	9.85%
Substance Abuse, Only	239	9.34%	18	7.53%
Conduct Disorder, Only	1,040	40.66%	110	10.58%
Both	183	7.15%	21	11.48%
Post-Traumatic Stress Disorder (PTSD), Substance Abuse:^c				
Neither	1,672	65.36%	167	9.99%
Substance Abuse, Only	338	13.21%	27	7.99%
PTSD, Only	464	18.14%	51	10.99%
Both	84	3.28%	12	14.29%
Attention Deficit Disorder (ADD), Substance Abuse:^c				
Neither	908	35.50%	89	9.80%
Substance Abuse, Only	245	9.58%	18	7.35%
ADD, Only	1,228	48.01%	129	10.50%
Both	177	6.92%	21	11.86%

^a Youth (aged 17 years and younger) Emergency Department (ED) re-visits after behavioral health (BH) hospitalization in 2013, excluding inpatients who expired, were transferred to another inpatient institution, or who were still hospitalized; overall (n = 257) and by BH diagnostic combination subgroups.

^b Total youth with behavioral health hospitalization (n = 2,558) and by BH diagnostic combination subgroups.

^c Defined per ICD9 assignments as specified in **Appendix A**. Substance Abuse (SA) includes Drug Abuse and/or Alcohol Abuse.

^d Statistically significant difference between behavioral diagnostic category subgroups at $p < 0.05$ using *chi*-squared test.

Table 31. Multiple Logistic Regression: Youth ED Re-Visit after BH Hospitalization – Demographic and Clinical Characteristics

Demographic and Clinical Characteristics	Odds Ratio ^a	95% Confidence Interval (CI)
Age Group:		
0–5 Years	1.52	0.66, 3.53
6–12 Years (referent)	1.00	
13–17 Years	1.01	0.74, 1.37
Number of High-Volume Chronic Physical Conditions:^b		
0 (referent)	1.00	
1	1.25	0.91, 1.71
2	1.99 ^c	1.39, 2.85
3	2.03 ^c	1.08, 3.82
Sex:		
Female (referent)	1.00	
Male	0.70 ^c	0.53, 0.92
Geographic Area of Residence:		
Rural (referent)	1.00	
Urban	1.18	0.88, 1.58
Unknown	-	
Managed Care Organization:		
WellCare of Kentucky (referent)	1.00	
Passport Health Plan	0.54 ^c	0.37, 0.81
Humana Caresource	0.40	0.09, 1.71
CoventryCares of KY	0.96	0.71, 1.29
Other ^d	3.17	0.81, 12.45
Race/Ethnicity:		
White (referent)	1.00	
Black	0.91	0.59, 1.42
Asian	1.06	0.12, 9.70
Other	0.85	0.61, 1.18
Substance Abuse:^e		
No (referent)	1.00	
Yes	0.85	0.58, 1.25
Polypharmacy:^f		
No psychotropic (referent)	1.00	
One psychotropic	1.33	0.79, 2.22
Antidepressant + Antipsychotic	1.73 ^c	1.04, 2.87
Other combination	2.11 ^c	1.21, 3.66
Foster Care Status:		
Not in Foster Care (referent)	1.00	
In Foster Care	0.77	0.52, 1.14
At Risk for Foster Care Placement	0.71	0.30, 1.67
Hospital Length of Stay:		
1 Day (referent)	1.00	
2–4 Days	0.63	0.28, 1.42
5–7 Days	0.51	0.23, 1.16

Demographic and Clinical Characteristics	Odds Ratio ^a	95% Confidence Interval (CI)
8+ Days	0.52	0.23, 1.19

^a Multiple logistic regression results for the relationship between the outcome of youth (aged 17 years and younger) emergency department (ED) re-visit after behavioral health (BH) hospitalization in 2013 (excluding inpatients who expired, were transferred to another inpatient institution, or who were still hospitalized) and demographic and clinical characteristics (n = 257 with the outcome of ED Re-Visit after BH Hospitalization, and 2,301 without the outcome)

^b Any diagnosis during the measurement year. Presence of 1 or more of the following chronic conditions any time during the 2013 measurement year: diseases of the respiratory system; diseases of the nervous system and sense organs; and endocrine, nutritional, metabolic, immunity disorders, as defined by the AHRQ/HCUP Chronic Condition Indicator File, 2014.

^c Statistically significant difference at $p < 0.05$.

^d Anthem Health Plan of Kentucky; Kentucky Spirit Health Plan; missing data for MCO

^e Drug abuse and/or alcohol abuse any time during the 2013 measurement year, as defined by ICD9 code groupings in **Appendix A**.

^f Any pharmacy claim during the 2013 measurement year.

Table 32. Multiple Logistic Regression: Youth ED Re-Visit after BH Hospitalization – BH Diagnostic Categories and SA Combinations

Diagnostic Combination:	Odds Ratio ^a	95% Confidence Interval (CI)
Set: Bipolar Disorder, Substance Abuse:^b		
Neither (referent)	1.00	
Substance Abuse, Only	0.72	0.43, 1.20
Bipolar Disorder, Only	1.24	0.90, 1.71
Both	1.27	0.74, 2.18
Set: Schizophrenia, Substance Abuse:^b		
Neither (referent)	1.00	
Substance Abuse, Only	0.85	0.58, 1.26
Schizophrenia, Only	2.24	0.73, 5.73
Both	1.33	0.28, 6.22
Set: Depression, Substance Abuse:^b		
Neither (referent)	1.00	
Substance Abuse, Only	0.82	0.37, 1.79
Depression, Only	1.11	0.80, 1.54
Both	0.96	0.59, 1.56
Set: Conduct Disorder, Substance Abuse:^b		
Neither (referent)	1.00	
Substance Abuse, Only	0.74	0.44, 1.27
Conduct Disorder, Only	1.31	0.97, 1.78
Both	1.25	0.75, 2.09
Set: Post-Traumatic Stress Disorder (PTSD), Substance Abuse:^b		
Neither (referent)	1.00	
Substance Abuse, Only	0.77	0.50, 1.20
PTSD, Only	1.02	0.72, 1.45
Both	1.17	0.60, 2.28
Set: Attention Deficit Disorder (ADD), Substance Abuse:^b		
Neither (referent)	1.00	
Substance Abuse, Only	0.72	0.42, 1.24
ADD, Only	1.23	0.89, 1.70
Both	1.29	0.76, 2.21

^a Multiple logistic regression results for the relationship between the outcome of youth (aged 17 years and younger) emergency department (ED) re-visit after behavioral health (BH) hospitalization in 2013 (excluding inpatients who expired, were transferred to another inpatient institution) or who were still hospitalized and BH diagnostic combination subgroups, adjusted for demographic and clinical characteristics per **Table 31** (n = 257 with the outcome of ED Re-Visit after BH Hospitalization, and 2,301 without the outcome).

^b Any diagnosis during the measurement year. Defined per ICD9 assignments as specified in **Appendix A**. Substance Abuse includes Drug Abuse and/or Alcohol Abuse.

^c Statistically significant difference at $p < 0.05$. Of note, there were no statistically significant findings in this table.

Findings for the outcome of adult psychiatric ED re-visits after behavioral health hospitalization: Due to the restricted sample size, statistical limitations precluded generation of odds ratios for the youth psychiatric ED re-visits. Risk factors for adult psychiatric ED re-visits, i.e., psychiatric principal diagnosis for a visit to the ED within 30 days of discharge from behavioral hospitalization, included age 58–67 years, 3 or more chronic physical conditions, male sex, MCO membership, black race/ethnicity, having a pharmacy claim for both an antidepressant and antipsychotic, and longer behavioral health hospitalization length of stay (**Table 34**). Of the principal hospital diagnoses for behavioral hospitalization evaluated (data not shown), i.e., episodic mood disorder, depression, conduct disorder, alcohol abuse, and drug abuse, only a principal diagnosis of drug abuse showed a statistically significant relationship with the outcome (**Table 34**); however, an inverse relationship was shown, and the small number of cases with any diagnosis of substance abuse (n = 16; **Table 33**) limits interpretation of this finding. A substantial majority (83%) of adults with a behavioral health hospitalization were without a mental health follow-up visit (**Table 33**). Relative to having a follow-up mental health visit within 7 days of behavioral health hospitalization discharge, having no follow-up was inversely associated with having an adult psychiatric ED re-visit after behavioral health hospitalization (**Table 34**). Confounding by indication, e.g., the most severely ill were more likely to have a follow-up visit and ED re-visit, is a possible interpretation of this outcome.

Table 33. Adult Psychiatric ED Re-Visit Rates after BH Hospitalization by Demographic and Clinical Characteristics

	Outcome: Adult Psychiatric ED Re-Visit after BH Hospitalization ^a (Overall Rate = 289 ^a /3,913 ^b = 7.39%)			
Demographic and Clinical Characteristics	Denominator ^b	Prevalence (%)	Numerator ^a	Rate (%)
Age Group:^c				
18–27 Years	830	21.21%	41	4.94%
28–37 Years	971	24.81%	68	7.00%
38–47 Years	906	23.15%	78	8.61%
48–57 Years	799	20.42%	64	8.01%
58–67 Years	299	7.64%	32	10.70%
68+ Years	108	2.76%	6	5.56%
Number of High-Volume Chronic Physical Conditions:^{c,d}				
0	689	17.61%	31	4.50%
1	738	18.86%	48	6.50%
2	825	21.08%	62	7.52%
3	882	22.54%	77	8.73%
4	779	19.91%	71	9.11%
Sex:^c				
Female	2,295	58.65%	146	6.36%
Male	1,618	41.35%	143	8.84%
Geographic Area of Residence:				
Rural	2,126	54.33%	149	7.01%
Urban	1,787	45.67%	140	7.83%
Unknown	0	-	-	-
Managed Care Organization:				
WellCare of Kentucky	1,692	43.24%	109	6.44%
Passport Health Plan	625	15.97%	51	8.16%
Humana Caresource	79	2.02%	6	7.59%
CoventryCares of KY	1,462	37.36%	116	7.93%
Other ^e	55	1.41%	7	12.73%
Race/Ethnicity:				
White	2,815	71.94%	198	7.03%
Black	335	8.56%	36	10.75%
Asian	6	0.15%	0	-
Other	757	19.35%	55	7.27%
Principal Diagnosis of Drug Abuse:^{c,f}				
No	3,447	88.09%	273	7.92%
Yes	466	11.91%	16	3.43%
Polypharmacy:^{c,g}				
No psychotropic	1,073	27.42%	64	5.96%
One psychotropic	742	18.96%	44	5.93%
Antidepressant + Antipsychotic	1,400	35.78%	138	9.86%
Other combination	698	17.84%	43	6.16%
Hospital Length of Stay:^c				

	Outcome: Adult Psychiatric ED Re-Visit after BH Hospitalization ^a (Overall Rate = 289 ^a /3,913 ^b = 7.39%)			
Demographic and Clinical Characteristics	Denominator ^b	Prevalence (%)	Numerator ^a	Rate (%)
1 day	324	8.28%	13	4.01%
2–4 days	1,785	45.62%	121	6.78%
5–7 days	1,011	25.84%	77	7.62%
8+ days	793	20.27%	78	9.84%
Follow-up Mental Health Visit: ^{h,c}				
None	3,253	83.13%	214	6.58%
Within 7 days of BH discharge	223	5.70%	26	11.66%
Between 8 and 30 days of BH discharge	437	11.17%	49	11.21%

^a Adult (aged 18 years and older) emergency department (ED) re-visits, restricted to adults with a psychiatric ED principal diagnosis (but not restricted to psychiatric facilities), after behavioral health (BH) hospitalization in 2013, excluding inpatients who expired, were transferred to another inpatient institution, or who were still hospitalized; overall (n = 289) and by subgroups with demographic or clinical characteristic.

^b Total adult eligible behavioral health population overall (n = 3,913) and by subgroups with demographic or clinical characteristic.

^c Statistically significant difference between rates for demographic/clinical category subgroups at $p < 0.05$ using *chi-squared* test.

^d Any diagnosis during the measurement year. Presence of 1 or more of the following chronic conditions any time during the 2013 measurement year: diseases of the nervous system and sense organs; endocrine, nutritional, metabolic, immunity disorders; diseases of the musculoskeletal system; and diseases of the circulatory system; as defined by the AHRQ/HCUF Chronic Condition Indicator File, 2014.

^e Anthem Health Plan of Kentucky; Kentucky Spirit Health Plan; missing data for MCO.

^f Drug abuse and/or alcohol abuse any time during the 2013 measurement year, as defined by ICD9 code groupings in **Appendix A**.

^g Any pharmacy claim during the 2013 measurement year.

^h This measure uses specifications for the HEDIS measure, “Follow-Up After Hospitalization for Mental Illness”, with the following modifications: The HEDIS measure restricts a psychiatric hospitalization to those for which the enrollee has a principal diagnosis that includes one of the following ICD9 codes: 295–299, 300.3, 300.4, 308, 309, 311–314); however, the current study includes all ICD9 codes that were used to identify the behavioral health eligible population, i.e., 295-310, as well as the perinatal ICD9 codes for drug dependence (6483) and mental disorders (6484). Selection of revenue visit codes was also modified to include this expanded set of ICD9 diagnoses.

Table 34. Multiple Logistic Regression: Adult Psychiatric ED Re-Visit after BH Hospitalization – Demographic and Clinical Characteristics

Demographic and Clinical Characteristics	Odds Ratio ^a	95% Confidence Interval (CI)
Age group:		
18–27 Years (referent)	1.00	
28–37 Years	1.47	0.96, 2.23
38–47 Years	1.52	0.99, 2.34
48–57 Years	1.30	0.83, 2.05
58–67 Years	1.72 ^b	1.00, 2.95
68 + Years	0.95	0.37, 2.46
Number of High-Volume Chronic Physical Conditions:^c		
0 (referent)	1.00	
1	1.41	0.88, 2.27
2	1.50	0.94, 2.40
3	1.77 ^b	1.10, 2.82
4	1.87 ^b	1.14, 3.05
Sex:		
Female (referent)	1.00	
Male	1.55 ^b	1.21, 1.99
Geographic Area of Residence:		
Rural (referent)	1.00	
Urban	1.18	0.89, 1.57
Unknown	-	-
Managed Care Organization:		
WellCare of Kentucky (referent)	1.00	
Passport Health Plan	1.15	0.78, 1.71
Humana Caresource	1.28	0.51, 3.17
CoventryCares of KY	1.33 ^b	1.00, 1.78
Other ^d	2.49 ^b	1.07, 5.82
Race/Ethnicity:		
White (referent)	1.00	
Black	1.59 ^b	1.05, 2.39
Asian	-	-
Other	1.11	0.81, 1.54
Principal Diagnosis of Drug Abuse:^e		
No (referent)	1.00	
Yes	0.51 ^b	0.30, 0.86
Polypharmacy:^f		
No Psychotropic (referent)	1.00	
One Psychotropic	1.19	0.79, 1.81
Antidepressant + Antipsychotic	1.95 ^b	1.39, 2.74
Other Combination	1.30	0.85, 1.99
Hospital Length of Stay:		
1 Day (referent)	1.00	
2–4 Days	1.72	0.95, 3.10
5–7 Days	1.86 ^b	1.01, 3.43

Demographic and Clinical Characteristics	Odds Ratio ^a	95% Confidence Interval (CI)
8+ Days	2.57 ^b	1.39, 4.75
Follow-up Mental Health Visit:^g		
None	0.15 ^b	0.05, 0.41
Within 7 Days of BH Discharge (referent)	1.00	
Between 8–30 Days of BH Discharge	0.74	0.49, 1.11

^a Multiple logistic regression results for the relationship between the outcome of adult (aged 18 years and older) psychiatric emergency department (ED) re-visit after behavioral health (BH) hospitalization in 2013 (excluding inpatients who expired, were transferred to another inpatient institution, or who were still hospitalized) and demographic and clinical characteristics (n = 289 with the outcome of ED Re-Visit after BH Hospitalization, and 3,624 without the outcome).

^b Statistically significant difference at $p < 0.05$.

^c Any diagnosis during the measurement year. Presence of 1 or more of the following chronic conditions any time during the 2013 measurement year: diseases of the nervous system and sense organs; endocrine, nutritional, metabolic, immunity disorders; diseases of the musculoskeletal system; and diseases of the circulatory system; as defined by the AHRQ/HCUP Chronic Condition Indicator File, 2014.

^d Anthem Health Plan of Kentucky; Kentucky Spirit Health Plan; missing data for MCO

^e Drug abuse and/or alcohol abuse any time during the 2013 measurement year, as defined by ICD9 code groupings in **Appendix A**.

^f Any pharmacy claim during the 2013 measurement year.

^g This measure uses specifications for the HEDIS measure, “Follow-Up After Hospitalization for Mental Illness”, with the following modifications: The HEDIS measure restricts a psychiatric hospitalization to those for which the enrollee has a principal diagnosis that includes one of the following ICD9 codes: 295–299, 300.3, 300.4, 308, 309, 311–314); however, the current study includes all ICD9 codes that were used to identify the behavioral health eligible population, i.e., 295–310, as well as the perinatal ICD9 codes for drug dependence (6483) and mental disorders (6484). Selection of revenue visit codes was also modified to include this expanded set of ICD9 diagnoses.

Summary of Demographic Risk Factor Analyses

- Age is associated with elevated odds for hospitalization of any type; specifically, compared to children aged 0–12 years, adults and, more so, adolescents are at increased odds for all-cause hospitalization (**Appendix D**). Age is also associated with hospitalization for possible self-harm; specifically, compared to children, adults and adolescents showed increased odds. In addition, the odds for a behavioral health hospitalization were elevated for younger adults, i.e., aged 18–27 years compared to older adults, and for adolescents and school-aged children compared to younger children. On the other hand, the odds for an adult psychiatric re-visit subsequent to a behavioral health hospitalization were elevated for adults aged 58–67 years compared to younger adults (**Appendix D**).
- Whereas males showed greater odds for all-cause hospitalization and adult males showed greater odds than adult females for behavioral health hospitalization, females showed greater odds for hospitalization for possible self-harm (**Appendix D**). In addition, among youth, females showed greater odds for behavioral health hospitalization and ED re-visits compared to males. Adult males, however, showed greater odds for psychiatric ED re-visits.
- Enrollees of black or other race/ethnicity showed elevated odds for all-cause hospitalization and, among children, elevated odds for behavioral health hospitalization, as well as elevated odds for adult psychiatric re-visit. Enrollees of Asian race/ethnicity showed elevated odds for youth behavioral hospitalization (**Appendix D**).
- Urban residence showed elevated odds for all-cause hospitalization, hospitalization for possible intentional self-harm, adult behavioral health hospitalization and youth behavioral health hospitalization (**Appendix D**).
- Enrollees in foster care showed elevated odds for all-cause hospitalization, and those in foster care or at risk for placement in foster care showed elevated odds for pediatric behavioral health hospitalization.
- MCO enrollment was associated with all outcomes except for adult ED re-visits, although MCO enrollment was also associated with adult psychiatric re-visits (**Appendix D**).

Summary of Clinical Risk Factor Analyses

- The presence of one or more chronic physical comorbid conditions was positively associated with all outcomes, i.e., all-cause hospitalization – all ages; hospitalization for possible self-harm – all ages; adult behavioral health hospitalization; youth behavioral health hospitalization; adult ED re-visit after behavioral health hospitalization; adult psychiatric re-visit after behavioral health hospitalization; youth ED re-visit after behavioral health hospitalization (**Appendix D**), as well as adult ED re-visit after physical health hospitalization and youth ED re-visit after physical health hospitalization (data not shown).
- Substance abuse was positively associated with all outcomes except for pediatric ED re-visits (**Appendix D**); however, neither a principal diagnosis of drug abuse (**Table 34**) or of alcohol abuse (data not shown) for the behavioral health hospitalization was positively associated with an adult psychiatric re-visit.
- Enrollees with dual pharmacy claims for antidepressants and antipsychotics showed elevated odds for all outcomes (**Appendix D**) and, compared to having a pharmacy claim for a single

psychotropic drug class, enrollees with no pharmacy claim showed increased odds for all-cause hospitalization (**Appendix D**).

- Having any diagnosis of bipolar disorder, schizophrenia, depression, conduct disorder, or PTSD is associated with increased risk for all-cause and adult behavioral health hospitalizations; any diagnosis of bipolar disorder, depression, conduct disorder or PTSD is associated with increased risk of hospitalization for possible self-harm; any diagnosis of bipolar disorder, depression, conduct disorder, or PTSD is associated with increased risk for pediatric behavioral health hospitalization; any diagnosis of bipolar disorder, schizophrenia, conduct disorder or PTSD is associated with increased risk for adult ED re-visit within 30 days of behavioral health hospitalization (**Appendix E**).
- Enrollees with a dual diagnosis of substance abuse and either bipolar disorder, depression, conduct disorder, or PTSD showed elevated odds for all outcomes except for pediatric ED re-visits; a dual diagnosis of substance abuse and schizophrenia also showed this pattern, albeit statistical limitations with regard to quantifying risk for pediatric behavioral health hospitalization; a dual diagnosis of substance abuse and ADD showed elevated odds for all outcomes except adult and pediatric ED re-visits (**Appendix E**).

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APPENDICES

Appendix A. Assignment of ICD9 Codes to Behavioral Health Diagnostic Categories^a

Behavioral Health Diagnostic Grouping for Any Diagnosis in Any Setting	ICD9 Codes
Alcohol Abuse	291, 303, 305.0
Anxiety	300.0, 313.0
Attention Deficit Disorder	314.0
Autism	299.0
Bipolar/Manic Disorder	296.0, 296.1, 296.4, 296.5, 296.6, 296.7, 296.8
Brain Damage	310
Childhood Disintegrative Disorder	299.1
Conduct Disorder	309.3, 309.4, 312
Delusional Disorders	297
Dementia	290
Depression	296.2, 296.3, 298.0, 300.4, 301.12, 308.0, 309.0, 309.1, 311, 313.1
Dissociative Disorders	300.1
Drug Abuse	292, 304, 305.2 - 305.9
Eating Disorder	307.1, 307.5
Hyperkinetic Syndrome	314.1, 314.2, 314.8, 314.9
Intellectual Disabilities – Mild	317
Intellectual Disabilities – Moderate, Severe, Profound or Unspecified	318, 319
Neurotic/Personality/Non-Psychotic Disorders - All Else ^b	300–316
Obsessive Compulsive Disorder	300.3
Organic Psychoses – All Else ^b	290–294
Other Anxiety Disorder	300.5, 300.6, 300.7, 300.8, 300.9
Other Conduct Disorder ^c	V71.01-V71.02, 301.7, 302.1–302.9
Other Developmental Delay	315.0, 315.1, 315.2, 315.4, 315.5, 315.8, 315.9
Other Dissociative Disorder	300.5, 300.6, 300.7
Other Nonorganic Psychoses	298.1–298.4, 298.9
Other Pervasive Developmental Disorder	299.8, 299.9
Pain Disorder	307.8
Personality Disorder	302, excluding 301.12, 301.7
Phobia	300.2
Post Traumatic Stress Disorder (PTSD)	309.81
Psychoses – All Else ^b	295–299
Schizophrenia	295
Sleep Disorder ^b	307.4, 347.00–347.11
Speech Delay	315.3
Stereotypy	307.2, 307.3

^a Diagnostic categories are based solely on ICD9 codes and are not defined based upon pharmacy drug claims. Analyses of substance abuse include enrollees with a diagnosis of either alcohol abuse or drug abuse.

^b Excludes other overlapping diagnostic categories identified in this table.

^c Members with any one or more of ICD9 codes 290–319 (eligible population) and the indicated codes that do not fall within this range.

Appendix B. Assignment of ICD9 Codes to Physical Health Diagnostic Categories

Physical Health Diagnostic Grouping for Any Diagnosis in Any Setting	ICD9 codes
Arterial Disease	440–449
Arthritis	714.x (rheumatoid), 715.x (osteoarthritis)
Asthma	493
Blindness	369
Cancer	140–239
Cardiomyopathy	425
Cerebral Palsy	343
Cerebrovascular Disease	430–438
Chronic Kidney Disease	585
COPD	490–496, excluding 493
Cystic Fibrosis	277.0x
Diabetes	250
Diseases of Veins, Lymphatics, & Other Circulatory	451–459
Epilepsy or Seizure Disorder	345.x
Heart Failure	428.x (includes Congestive Heart Failure: 428.0)
Hypertension	401–405
Ischemic Heart Disease	410–414
Migraines	346.x
Muscular Dystrophy	359.x
Obesity	253.8, 255.8, 259.9, 278.00, 278.01, 278.03, 649.1
Pulmonary Circulatory Disease	415–417
Pulmonary Valve Disorder	424
Rheumatic Heart Disease	393–398
Sickle Cell Disease	282.6

Appendix C. Description of Drug Categories Used in KY Behavioral Health Study

Drug Therapy Description	Drug Categories Used in KY Behavioral Health Study						
	Anti-depressants	Anti-psychotics	Anti-anxiety	Anti-manic	Drug Addiction Therapy	Alcohol Addiction Therapy	ADD/ADHD Therapy
Antidepressants	X						
Monoamine Oxidase Inhibitors	X						
Selective Serotonin & Norepinephrine Reuptake Inhibitors	X						
Selective Serotonin Reuptake Inhibitors	X						
Serotonin Modulators	X						
Tricyclics & Other Norepinephrine Reuptake Inhibitors	X						
Antipsychotic Agents		X					
Atypical Antipsychotics		X					
Butyrophenones		X					
Phenothiazines		X					
Thioxanthenes		X					
Anxiolytics			X				
Barbiturates (Anxiolytic)			X				
Benzodiazepines (Anxiolytic)			X				
Antimanic Agents				X			
Methadone					X		
Buprenorphine					X		
Acamprosate						X	
Disulfiram						X	
Naltrexone						X	
Adderall							X
Concerta							X
Daytrana							X
Desoxyn							X

Drug Therapy Description	Drug Categories Used in KY Behavioral Health Study						
	Anti-depressants	Anti-psychotics	Anti-anxiety	Anti-manic	Drug Addiction Therapy	Alcohol Addiction Therapy	ADD/ADHD Therapy
Focalin							X
Metadate CD							X
Methylin							X
Ritalin							X
Strattera							X
Vyvanse							X

Appendix D. Summary: Relationships between Possible Demographic and Clinical Risk Factors and Study Outcomes

Demographic and Clinical Factors ^a	Outcomes ^a						
	All-Cause Hospitalization: All Ages	Hospitalization for Possible Self-Harm: All Ages	Behavioral Health (BH) Hospitalization: Adults, Only	Behavioral Health (BH) Hospitalization: Adolescents and Children, Only	ED Re-Visit after BH Hospitalization: Adults, Only	ED Re-Visit after BH Hospitalization: Adolescents and Children, Only	Psychiatric Re-Visit after BH Hospitalization: Adults, Only
Age	Adolescents to children: ++ Adults to children: +	Adolescents to children: ++++ Adults to children: ++++	18–27 yrs to 58–67 yrs: +++ 18–27 yrs to 28–37 yrs: + 18–27 yrs to other deciles: ++	School-age children to very young children: ++ Adolescents to school-age children: ++	NS ^b	NS ^b	58–67 yrs to 18–27 yrs: ++
# Physical Comorbid Conditions	1 to 0: ++ 2 to 0: +++ 3+ to 0: +++ +	1 or more to 0: ++	1 to 0: + 2 or more to 0: ++	1 to 0: + 2 or more to 0: ++	1 to 0: + 2 or 3 to 0: ++ 4 to 0: +++	2 or 3 to 0: ++	3 or more to 0: ++
Sex	Males to females: +	Females to males: ++	Male to female: ++	Female to male: +	NS ^b	Female to male: +	Male to female: ++
MCO	Largest OR to referent: ++	Largest OR to referent: +	Largest OR to referent: +	Largest OR to referent: +	NS ^b	Largest OR (referent) to comparison MCO: ++	Largest OR to referent: +
Race/Ethnicity	Black to white: + Other to white: +	NS ^b	NS ^b	Black to white: + Other to white: + Asian to white: +++ ^d	NS ^b	NS ^b	Black to white: ++
Rural/Urban Residence	Urban to rural: +	Urban to rural: +	Urban to rural: +	Urban to rural: ++	NS ^b	NS ^b	NS ^b
Substance Abuse	+	++++	++++	+++	+	NS ^b	Absence of hospitalization principal diagnosis of drug abuse to

Demographic and Clinical Factors ^a	Outcomes ^a						
	All-Cause Hospitalization: All Ages	Hospitalization for Possible Self-Harm: All Ages	Behavioral Health (BH) Hospitalization: Adults, Only	Behavioral Health (BH) Hospitalization: Adolescents and Children, Only	ED Re-Visit after BH Hospitalization: Adults, Only	ED Re-Visit after BH Hospitalization: Adolescents and Children, Only	Psychiatric Re-Visit after BH Hospitalization: Adults, Only
							presence: ++
Polypharmacy	None to 1: + Antidepressant and antipsychotic to none: ++	One to 0: ++ Antidepressant and antipsychotic to none: ++++ Other combinations to none: ++	Antidepressant and antipsychotic to none: ++++ Other combinations to none: ++	One to 0: ++++ Antidepressant and antipsychotic to none: ++++ Other combinations to none: ++++	Antidepressant and antipsychotic to none: +	Antidepressant and antipsychotic to none: ++ Other combination to none: ++	Antidepressant and antipsychotic to none: ++
Foster Care	In foster care to not in foster care nor at risk: ++	NS ^b	NA ^c	In foster care to not in foster care or at risk: ++ At risk for placement to not in foster care nor at risk: +	NA ^c	NS ^b	NA ^c
Hospital Length of Stay	NA ^c	NA ^c	NA ^c	NA ^c	NS ^b	NS ^b	5–7 days to 1 day: ++ 8 or more days to 1 day: +++

^a The relationship between demographic and clinical factors and the outcomes was interpreted using the effect size of odds ratio with a p-value of <0.05, per the following methodology to compare the subset(s) of interest to the referent group:

Very small effect size = +: $1.00 \leq OR < 1.44$;

Small effect size = ++: $1.44 \leq OR < 2.47$;

Moderate effect size = +++: $2.47 \leq OR < 4.25$;

Large effect size = ++++: OR = 4.25 and higher

(based upon methodology presented in: Chinn S. A simple method for converting an odds ratio to effect size for use in meta-analysis. *Statistics in Medicine* 2000;19:3127-31 and Osteen P, Bright C. Effect sizes and intervention research. 2010; <http://family.umaryland.edu>[13 May 2014]).

^b Difference between odds for the outcome is not statistically significant at $p < 0.05$.

^c Not Applicable.

^d 8 of 215 with a behavioral health hospitalization.

Appendix E. Summary: Relationships between Behavioral Health (BH) Diagnostic Categories and Substance Abuse (SA) Combinations and Study Outcomes

BH and SA Combination ^a	Outcomes ^a					
	All-Cause Hospitalization: All Ages	Hospitalization for Possible Self-Harm: All Ages	Behavioral Health (BH) Hospitalization: Adults, Only	Behavioral Health (BH) Hospitalization: Adolescents and Children, Only	ED Re-Visit after BH Hospitalization: Adults, Only	ED Re-Visit after BH Hospitalization: Adolescents and Children, Only
Bipolar Disorder, Substance Abuse (SA)	SA, only, to neither: ++ Bipolar disorder, only, to neither: ++ Both to neither: +++ ++++	SA, only, to neither: ++++ Bipolar disorder, only, to neither: +++ Both to neither: ++++	SA, only, to neither: ++++ Bipolar disorder, only, to neither: ++++ Both to neither: ++++	SA, only, to neither: ++++ Bipolar disorder, only, to neither: ++++ Both to neither: ++++	SA, only, to neither: ++ Bipolar disorder, only, to neither: ++ Both to neither: ++	NS ^e
Schizophrenia, Substance Abuse (SA)	SA, only, to neither: ++ Schizophrenia, only, to neither: ++ Both to neither: ++++	SA, only, to neither: ++++ Both to neither: ++++	SA, only, to neither: ++++ Schizophrenia, only, to neither: ++++ Both to neither: ++++	SA, only, to neither: ^c ++++ Schizophrenia, only, to neither: ^c ++++ Both to neither: ^{c,d} ++++	SA, only, to neither: + Schizophrenia, only, to neither: ++ Both to neither: +++	NS ^{e,f}
Depression, Substance Abuse (SA)	SA, only, to neither: ++ Depression, only, to neither: ++ Both to neither: ++++	SA, only, to neither: ++++ Depression, only, to neither: ++++ Both to neither: ++++	SA, only, to neither: ++++ Depression, only, to neither: ++++ Both to neither: ++++	SA, only, to neither: ++++ Depression, only, to neither: ++++ Both to neither: ++++	SA, only, to neither: + Both to neither: ++	NS ^{e,f}
Conduct Disorder, Substance Abuse (SA)	SA, only, to neither: ++ Conduct disorder, only,: ++ Both to neither: ++++	SA, only, to neither: ++++ Conduct disorder, only,: +++ Both to neither: ++++	SA, only, to neither: ++++ Conduct disorder, only,: ++++ Both to neither: ++++	SA, only, to neither: ++++ Conduct disorder, only,: ++++ Both to neither: ++++	SA, only, to neither: + Conduct disorder, only,: ++ Both to neither: +++	NS ^e
PTSD, Substance Abuse (SA)	SA, only, to neither: ++	SA, only, to neither: ++++	SA, only, to neither: ++++	SA, only, to neither: ++++	SA, only, to neither: +	NS ^e

BH and SA Combination ^a	Outcomes ^a					
	All-Cause Hospitalization: All Ages	Hospitalization for Possible Self-Harm: All Ages	Behavioral Health (BH) Hospitalization: Adults, Only	Behavioral Health (BH) Hospitalization: Adolescents and Children, Only	ED Re-Visit after BH Hospitalization: Adults, Only	ED Re-Visit after BH Hospitalization: Adolescents and Children, Only
	PTSD, only, to neither: ++ Both to neither: +++++	PTSD, only, to neither: +++ Both to neither: +++++	PTSD, only, to neither: +++++ Both to neither: +++++	PTSD, only, to neither: +++++ Both to neither: +++++	PTSD, only, to neither: ++ Both to neither: ++	
ADD, Substance Abuse (SA)	SA, only, to neither: ++ Neither to ADD, only: + Both to neither: +++++	SA, only, to neither: +++++ Both to neither: +++++	SA, only, to neither: +++++ Both to neither: +++++	SA, only, to neither: +++ Both to neither: +++++	SA, only, to neither: ++	NS ^e

^a The relationship between BH and SA combinations and the outcomes were interpreted using the effect size of odds ratio with a p-value of <0.05, per the following methodology to compare the subset(s) of interest to the referent group:

Very small effect size = +: $1.00 \leq OR < 1.44$;

Small effect size = ++: $1.44 \leq OR < 2.47$;

Moderate effect size = +++: $2.47 \leq OR < 4.25$;

Large effect size = +++++: $OR = 4.25$ and higher

(based upon methodology presented in: Chinn S. A simple method for converting an odds ratio to effect size for use in meta-analysis. *Statistics in Medicine* 2000;19:3127-31 and Osteen P, Bright C. Effect sizes and intervention research. 2010; <http://family.umaryland.edu>[13 May 2014])

^b Difference between odds for the outcome is not statistically significant at $p < 0.05$.

^c Statistical limitations.

^d Odds ratio not calculable. 13 were hospitalized of 21 who have both schizophrenia and substance abuse.

^e Not statistically significant.

^f < 10 cases with ED-Revisit in one or more BH and/or SA subsets.