EMERGENCY DEPARTMENT USE FOR MENTAL AND SUBSTANCE USE DISORDERS

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Executive Summary

Background

The U.S. community hospital emergency department (ED)—described as "at the breaking point" by the Institute of Medicine—has responsibilities under the law to treat all who walk through their doors. A complex type of patient that hospital EDs must treat are those with mental and/or substance use (M/SU) disorders, sometimes co-occurring in the same individual and typically treated disjointedly or inadequately in the community. While the ED is a critical source of care for people without access to community care, the use of EDs for mental health and substance abuse (MHSA) treatment is considered less than optimal.

Objective

This study aimed to learn how the ED is used by adults for MHSA treatment and how that compares to ED use for two other chronic diseases—diabetes and chronic respiratory disease We defined asthma and chronic obstructive pulmonary disease as "chronic respiratory disease" for this study because clinicians may not discriminate carefully between them in the rushed atmosphere of EDs. These comparator conditions, chronic respiratory disease and diabetes, were selected because they too are chronic conditions that when untreated or not managed well frequently require emergency treatment.

Methods

The study population was limited to adults (age 18 and older) who used the ED at least once for the selected conditions during 2002.

Three types of ED visits were examined: 1) inpatient admissions that occur as a result of an ED visit (i.e., admission through the ED), 2) repeated inpatient admissions through the ED within a year for the same individual, and 3) repeated treat and release ED visits within a year for the same individual. These visits were explored in relation to patient, hospital, and community characteristics to learn what explains ED service use.

Four main questions were studied in relation to how ED services are used:

- Which of the study conditions are most likely to lead to repeat ED service use? Did patients' severity of illness influence their use of emergency services?
- Did an individual's insurance or coverage for health care costs influence ED utilization, after controlling for severity differences and other factors across conditions?
- Do hospital characteristics, such as the availability of hospital specialty services for a condition, influence the use of inpatient services following an ED visit and influence the repeated use of ED services?
- Do community resources for MHSA treatment influence the use of ED services?

The data came from HCUP State Emergency Department Databases (SEDD) and State Inpatient Databases (SID) for two states—one in the Midwest and one in the South —for the year 2002. These states developed unique, reliable, synthetic patient identifiers which enabled tracking over time and across settings of care (inpatient and EDs within hospitals and across hospitals within the state). Specialty psychiatric and chemical dependency hospitals were not studied, only community hospitals.

Results

Results are based on models that control for patient, hospital, and community factors and handle the bias from clustering in the data.

Patients with more severe mental and/or substance use disorders (M/SU Disorder) (i.e., in terms of social functioning) were more likely to have multiple ED visits during a year. Also, among the five study conditions—Mental Disorders Only, Substance Use Disorders (SUD) Only, Co-Occurring Mental Disorders & SUD (M/SUD) during the year, diabetes, and chronic respiratory disease—patients with Co-Occurring M/SUD are most likely to use ED services repeatedly and at almost twice the rate of patients with the other conditions. This pattern was evident across all measures with one exception—patients in the ED with diabetes were most likely to be admitted for inpatient care.

Payers influenced ED use in interesting ways. First, there was a two to three times higher rate of uninsured ED visits for patients with SUD Only, compared to mental disorders and the two physical study conditions (40% to 50% of visits for SUD Only between the two states versus 15% to 25% for the other conditions). Second, although uninsured ED visits for M/SU disorders were less likely to result in hospital admission than similar ED visits billed to private insurance, uninsured ED patients with M/SU disorders who were treated and released were more likely to have multiple treat and release ED visits than privately insured patients with the same conditions, controlling for patient characteristics. These results may be a consequence of the uninsured's poor access to primary care in the community, of the law that requires EDs to be a last resort for treatment of all, or some type of practice variation.

For patients with Medicare and Medicaid, the probability of multiple treat and release ED visits was similar to the uninsured, despite our expectation that Medicare and Medicaid patients, because of their health care coverage, would have a lower probability of repeat ED visits. However, unlike uninsured patients with Co-Occurring M/SUD, Medicare and Medicaid patients with Co-Occurring M/SUD were more likely to have multiple ED visits resulting in hospital admission than privately insured patients. Policies on Medicare-covered and Medicaid-covered services for M/SU disorders and program participation rates for MHSA specialists may factor into this result.

Hospital characteristics were less striking as factors in promoting or restraining ED utilization. ED visits for M/SU disorders at larger hospitals were more likely to result in admission, although the effect of hospital size varied across the study conditions. Hospital size was strongly related to ED visits resulting in admission for psychiatric conditions (Mental Disorders Only and Co-Occurring M/SUD) compared to the other study conditions in one of the states.

Community resources did not show any statistically significant results as an explanatory factor in ED service use. This raised concerns about the possibility of error in the measures used to assess MHSA community services in this study.

Patient characteristics, and not hospital or community characteristics, overwhelmingly drove ED utilization in this study. By understanding this, policy makers may be able to establish better policies for reducing the burden on EDs and for improving the delivery of MHSA treatment in the community.

Introduction

The Community Hospital Emergency Department

Hospital emergency departments (EDs) are required by law (the Emergency Medical Treatment and Active Labor Act of 1986 (EMTALA)) to accept and stabilize all patients who come through their doors (EMTALA, 1985). The Institute of Medicine (IOM) has declared hospital-based emergency care in the U.S. as "at the breaking point" (IOM, 2006a). The IOM report describes EDs as over-crowded, under-reimbursed, and carrying large loads of uncompensated care. In the face of these problems, some hospitals have closed their EDs, putting more pressure on those remaining. While the U.S. population rose by 12 percent between 1993 and 2003 and ED visits grew by 26 percent, a net of 425 hospital-based EDs closed during that time (IOM, 2006a).

Not only do EDs fill a traditional role of rapid response to life-threatening and potentially disabling health-related events, but they also have taken on additional responsibilities over time. Today's ED provides emergency preparedness for natural disasters and bioterrorism, surveillance for public health problems such as childhood neglect and abuse and substance abuse warning systems, boarding-care services for inpatient systems that have severely cut their bed supply, on-call services for physician office practices, and safety-net care to a growing uninsured and underinsured population (IOM, 2006a). In addition, as hospitals have dramatically cut the number of psychiatric and chemical dependency beds (CMHS, 2004), the ED has taken on responsibilities to treat, board, and place patients with complicated mental and/or substance use (M/SU) disorders.

While the ED serves as a critical refuge for people without access to health care, the use of EDs for primary care is less than optimal (IOM, 2006a). First, it is many times more expensive than an office visit for the same condition. In a statistical brief of the Medical Expenditure Panel Survey, Machlin (2006) found that median charges for treatment in the ED were 5 times as expensive as treatment in the physician office in 2003. Using median charges attenuated the effect of more expensive surgical treatments in the ED that may or may not be performed in doctors' offices. While this statistical brief did not limit the comparison to conditions that are treated in both the ED and office settings, an earlier work did. Baker and Baker (1994) found that in 1987 ED visits of various types were about 3 times as expensive as physician office visits for the same reason, based on the National Medical Expenditures Survey.[1] In deliberating these and other studies, the IOM acknowledged that while results of studies are mixed, they "suggest that non-emergency care in the ED is more costly than that in alternative settings." (IOM, 2006a, p. 2)

[1] This comparison is made on charges (ED department and professional fees) and does not address the controversy in the literature about whether ED visits have a higher marginal cost than physician office visits. The American College of Emergency Physicians (ACEP) promotes the view that ED visits are no more expensive than physician office visits because of documented economies of scale in 5 Michigan hospital EDs in 1991-1993 which implied a marginal cost of an ED visit comparable to an office visit (ACEP, 2003; ACEP 2005; and Williams, 1996). However, another study at RAND and the University of Southern California did not support this view using 1998 hospital cost report and discharge records for all California hospitals (Bamezei et al., 2005).

Second, the ED is not designed for primary care or for managing chronic illnesses. "[T]he ED is designed for rapid, high-intensity responses to acute injuries and illnesses. Physicians in the ED face constant interruptions and distractions, and typically lack access to the patient's full medical records." (IOM, 2006a, p. 2). Moreover, EDs are frequently dealing with patients in situations when they cannot coherently recall medical history. Because of incomplete information and the rush of oncoming emergencies, ED treatments have more potential for error than other settings. Furthermore, EDs cannot provide the continuity of care that many underserved patients need.

Repeat Users of Hospital Emergency Departments

A few studies have documented how people without health care access use the EDs, repeatedly visiting a hospital ED or moving among EDs for treatment (Cook et al., 2004; Curran et al., 2003; Dhossche and Ghani, 1998; Friedmann et al., 2001; Sun et al., 2003; Washington State Department of Social and Health Services, 2004; Zuckerman and Shen, 2004). These are individuals who are poor, uninsured, and often ineligible for Medicaid, who have high rates of chronic illnesses, including mental illnesses and substance use conditions. Visitors with M/SU disorders require resources usually not available in EDs—mental health services, detoxification and treatment for substance use, and case management services for appropriate placement in treatment programs (IOM, 2006a). Repeated use of the ED for management of chronic diseases puts a strain on infrastructure designed for immediate responses to life-threatening health emergencies. Such non-critical use of EDs is an indicator of more serious health system problems.

The Treatment Gap for Mental Disorders and Substance Use Disorders

Analysts of treatment services for M/SU disorders have documented a wide gap between the number of people *needing* and *receiving* treatment in a year. A national household survey in the U.S. on mental disorders and problems (including substance use) and related health care—the National Comorbidity Survey–Replication (NCS-R)—revealed that among adults with M/SU disorders, only 41 percent received treatment (Wang et al., 2005). That treatment or related services were provided by health care professionals (psychiatrists, non-psychiatrist professionals, and general medical physicians) or by non-health care professionals (human services and complementary and alternative medicine professionals) during a 12-month period between 2002 and 2003. For substance abuse and dependence on alcohol or illicit drugs, the NCS-R found that only 38 percent of those in need received treatment. This treatment gap also has been documented for many years in reports related to an annual Substance Abuse and Mental Health Services Administration (SAMHSA) survey, now called the National Household Survey of Drug Use and Health (SAMHSA, 2004).

Co-Occurring Mental and Substance Use Disorders

While it is difficult to define and estimate the number of people with co-occurring M/SUD, co-occurring problems are likely common for people in treatment for one or the other condition. Two national studies of the U.S. household population provide estimates for people in or out of treatment and many other studies offer estimates for people in treatment.

One estimate for the U.S. household population was made for SAMHSA from the NCS-R (described above) for the period between 2001 and 2003 (Kessler, 2005a). The results of a special analysis of the NCS-R revealed the proportion of co-occurrence over two population bases. Of those with SUD in the last 12 months, about 60 percent also exhibited mental

disorder within the year. Of individuals with a mental disorder in the past 12 months, 9 percent also had a SUD within the year. The estimates were higher when lifetime periods were considered and would likely have been higher if schizophrenia[2] had been included in the mental assessment instrument (SAMHSA, 2004).

Another national study on substance use, the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), applied a more conservative approach—assessing the "independent" co-occurrence of mental disorder defined by mental disorders outside the timeframe of the substance abuse (Grant et al., 2004). Schizophrenia and other psychotic disorders also were excluded in that study. The NESARC study found that 18 to 20 percent of the general population with a substance use disorder in the past 12 months also had an independent mood or anxiety disorder in that period. NESARC also made estimates for people in treatment. For clients in drug or alcohol treatment, the prevalence estimates for independent co-occurring mood or anxiety disorders were substantially higher—33 to 61 percent.

Other studies of people in treatment for SUD or mental disorder in specific facilities used a variety of definitions and methods and found a wide range of estimates. In 26 studies conducted from 1990 to 2004, the prevalence of co-occurring disorders varied from 84.7% of opiate dependent clients in an outpatient methadone maintenance program who also had a mental illness (Abbott et al., 1994) to 4.4% among a population of privately insured patients with mental health claims who also had a primary or secondary diagnosis of alcohol or drug abuse or dependence sometime during a three year period (Garnick et al., 1996). The latter study was limited by underreporting of substance abuse on medical claims.

The degree to which SUD are underreported in administrative data has been documented. A study in seven Tennessee hospitals found that 1 percent of ED patients received a diagnosis of substance abuse or dependence that was recorded in administrative ED records, while 27 percent of ED patients needed treatment based on a separate assessment of substance use and toxicology (Rockett et al., 2003). Analyses of administrative records for SUD will underestimate the prevalence of those conditions in the ED because of incomplete recording of such diagnoses. Underreporting occurs because of stigma and reimbursement policies and confidentiality issues. Until 2001, the Uniform Accident and Sickness Policy and Provision Law (UPPL) of 1947 proposed model insurance policies for states that recommended policy exclusions for health care for people who are intoxicated (Rosenbaum et al., 2004). Despite reversal of the Uniform Accident and Sickness Policy and Provision Law (UPPL) by State Insurance Commissioners in some states, insurers have continued to win court judgments blocking payment in such situations for emergency care (Rosenthal et al., 2004). For this reason, physicians may still be hesitant to identify substance use when apparent in patients seen in the ED.

These studies support the likelihood of a high prevalence of M/SUD co-occurring in the same individuals, as well as to higher estimates of co-occurrence of M/SUD than is documented in administrative records among people presenting in the ED for treatment. These patients may be difficult to treat in the ED because of their confounding medical conditions and the probability that their care in the community (if any) is poorly coordinated.

[2] The NCS-R, which is described in Kessler et al. (2005b), excluded from prevalence estimates people with schizophrenia and other non-affective conditions because they are "dramatically overestimated in lay-administered interviews." This may mean that the percents above for people with co-morbidities are underestimated because people with schizophrenia are more likely to have substance use conditions than people with other mental illness (SAMHSA, 2002).

Uncoordinated Mental Health and Substance Abuse Treatment

Historically, the diagnosis and treatment of M/SU disorders have been separate and relatively uncoordinated activities. The division is evident in the providers of services (Mark et al., 2005). Hospitals organize psychiatric units to handle patients with mental disorders and chemical dependency units to handle patients with SUD. Community mental health centers primarily treat people with psychiatric conditions, and specialty substance abuse centers treat those with alcohol and drug dependence. Generally, psychiatrists treat mental disorders, and addiction counselors treat SUD. This separation raises barriers for people with both problems. For example, a recent study of adolescents in substance abuse treatment facilities found that while virtually all facilities conduct full assessments of clients for substance abuse and dependence, only half of the facilities assess clients for mental illnesses and only 40 percent test for any of the high-risk medical conditions associated with substance abuse (sexually transmitted diseases, HIV, or hepatitis) (Mark et al., 2006). The lack of client assessments for co-occurring disorders and related health problems allows services to remain uncoordinated and co-occurring conditions to be undetected and untreated, further complicating the client's stabilization and recovery. SAMHSA has identified coordination and/or integration of services for M/SU disorders as a priority for improving the delivery of such treatments (SAMHSA, 2002).

The Quality of Care for Mental Disorders and Substance Use Disorders

The recently conducted assessment of care for M/SU disorders by the IOM (sponsored by SAMHSA and other organizations), acknowledged that while effective treatments exist, deficiencies in the delivery of care prevent many from getting treatment. *Improving the Quality of Health Care for Mental and Substance-Use Conditions* (IOM, 2006b) identified seven areas for improvement: patient-centered treatment, more evidence-based practices, better coordination of services, better information about quality of care, workforce education on what constitutes high-quality care, purchaser education to create the right incentives, and research support for therapeutic advances.

These priorities depend on better measures and improved information to assess healthcare quality and track performance. The National Outcomes Measures (NOMs), initiated by SAMHSA, aimed to standardize state data collection on the outcomes of care in publicly funded MHSA treatment programs (SAMHSA, 2006). Over half of all spending on treatment of mental disorders and over three-quarters of spending on treatment of SUD was publicly funded in 2001 (Mark et al., 2005). Currently, seven of the 10 types of NOMs measures are client centered: abstinence, employment/education, criminal justice involvement, housing stability, social connectedness, retention in treatment, and client perception of care. Three are centered on services: access/capacity, cost effectiveness, and evidence-based practice.

Specifics of NOMs measures differ between the MHSA areas. One measure, retention in mental health treatment in the community, aims to lower readmissions to State psychiatric hospitals within 30 days of a discharge; no other utilization measures are currently included in NOMs. Because a substantial proportion of people with M/SU disorders (23%) is treated by general non-specialty providers (Wang et al., 2005), quality-of-care measures for people with M/SU disorders should encompass general health care settings in addition to publicly funded treatment programs. Routine analyses of general hospital records for EDs and inpatient stays related to M/SU disorders could help fill that gap.

Objectives of the Study

This study aimed to compare the utilization of community hospital ED services by adults with M/SU disorders against the use of such services by adults diagnosed with other chronic diseases, specifically, diabetes and chronic respiratory disease. The study examined the factors related to ED visits resulting in hospital admission, the factors related to patients having repeated ED visits followed by hospitalizations, and the factors related to patients having repeated treat and release ED visits. Who are the people who use repeated ED services for M/SU disorders? Are they similar to people who use the ED for acute events related to other chronic illnesses? How do hospital characteristics and community resources for treatment influence the patterns of ED utilization?

There were two derivative papers from this work. One paper focused on insurance coverage for ED patients with M/SU disorders. The other paper examined the predictive validity of two measures of M/SU severity using administrative data. One measure was based on expected functioning and the other measure was based on expected resource use.

An Inter-Agency Collaboration

Collaboration between four parties made this study possible: the Agency for Healthcare Research and Quality (AHRQ), the Substance Abuse and Mental Health Services Administration (SAMHSA), and two Healthcare Cost and Utilization Project Partners – one in the Midwest and one in the South. The collaboration brought together powerful databases for studying community hospital services that reside with the two states and AHRQ, and the policy-focus on substance abuse and mental health of SAMHSA. Staff at Thomson Reuters designed and conducted the analysis.

Methods

Comparison Conditions

To give context to utilization findings for M/SU disorders, we selected two medical conditions for comparison—diabetes and chronic respiratory disease —because when untreated, they also require emergency care. These conditions have interesting parallels with M/SU disorders, described below. We defined asthma and chronic obstructive pulmonary disease as “chronic respiratory disease” for this study because clinicians may not discriminate carefully between them in the rushed atmosphere of EDs. See *Study Population,* below, for definitions.

We selected diabetes and chronic respiratory disease as the comparison conditions because:

- They are chronic conditions that generally must be dealt with for a lifetime and often involve other comorbid health problems.
- They can have acute life-threatening events requiring emergency treatment.
- Untreated, they evolve into serious medical conditions.
- Evidence-based treatment, ongoing clinical management, and patient education can help people with these conditions lead more normal and healthier lives.
- Excellent personal management by patients is required for them to live better lives and to minimize crises and the need for emergency care.
- Despite good clinical and personal management, some people with these conditions may still experience life stressors and situations that push them into crises requiring emergency help from health care professionals.

Parallels of people that have M/SU disorders are:

- They have a chronic condition; they frequently have other physical health problems; and they can have co-occurring M/SUD.
- They can have life-threatening or frightening emergencies related to their disease—for example, substance overdose, psychotic behavior, or suicide attempt.
- Untreated in early life (for example, substance abuse), their problems can evolve into life-threatening conditions (for example, substance dependence and its physical ravages) as well as into major societal problems (such as neglect of children or violence against others).
- Managing the disease requires evidence-based treatments, patient education, and ongoing clinical care.
- Patient compliance with treatment is essential and is a special challenge.
- Despite treatment compliance, emergency care may still be needed for acute exacerbations of the disease.

Efforts toward improving the quality of treatment for these conditions have differed. Medical professionals who treat diabetes have been working the longest to improve patient care and have developed standardized measures for quality diabetes care (AHRQ, 2009). Clinicians treating asthma have developed many measures of care processes and outcomes, but have not yet condensed these to a few standard measures that can be promulgated effectively (Coffey et al., 2006b). And clinicians who treat M/SU disorders have developed primarily outcome measures, not specific process measures, for treatment of broad concepts of disease (separately for SUD and mental disorders). Further, the complex treatment of co-occurring M/SUD is not well coordinated among care providers (IOM, 2006b).

The similarities and contrasts among these conditions make diabetes and asthma interesting comparison conditions for exploring the ED utilization of people with M/SU disorders.

Data

Information on ED visits, both treat and release and those resulting in hospitalization, was needed for this study. The Agency for Healthcare Research and Quality (AHRQ) assembles, from most states, hospital discharge and ED visit records into a family of databases called the Healthcare Cost and Utilization Project (HCUP). HCUP contained the two types of data needed for this study: inpatient records that originated in the ED from the State Inpatient Databases (SID) and ED treat and release records from the State Emergency Department Databases (SEDD). At the time this study was designed, five of the states in HCUP included both of these types of data and also contained unique patient-level indicators for tracking multiple hospitalizations and ED visits state-wide.

Two States in HCUP—one in the Midwest and one in the South —were selected for this study. They were selected because their patient-level indicators appeared to be reliably coded across time and three dimensions: two settings (inpatient and ED), multiple discharges, and multiple hospitals. These two states' databases, in combination with other data sources, were an untapped opportunity to study repeat use of ED visits for M/SU disorders and other chronic conditions state-wide. For the purposes of confidentiality and anonymity, the states' identities are not revealed in this manuscript, and they will be subsequently referred to as State A and State B.

We used 2002 data from short-term community, non-Federal, non-rehabilitation hospitals (includes obstetrics and gynecology; ear, nose and throat; orthopedic; cancer; pediatric; acute care county and other public hospitals and academic tertiary care medical hospitals). This study

excludes specialty psychiatric and chemical dependency hospitals. Such hospitals were not included consistently in the databases available for this study. We analyzed the states separately because we expected different demographic, health system, and regulatory environments in the two states.

Profiles of Two States

We supplemented our study with additional information from the Census Bureau and from sources compiled by the American Association of Retired People. Table 1 shows population and economic profiles of the two states, compared to the Nation, for the year 2002.

In 2002, the two states were similar to each other in age distribution and extent of the rural population, but dissimilar in racial/ethnic and socioeconomic composition. Also, the two states were identical to the Nation in age distribution, but much more rural than the Nation overall, and the two states straddled the Nation on racial/ethnic and socioeconomic measures. State B appears to have done better in covering its sizable poor population with healthcare benefits of some type than is true nationwide.

In 2002, State A had a larger population than State B (5.68 versus 4.10 million) but with the same age distributions, which were comparable to the Nation. The states had the same proportion of the population in rural areas (32% versus 30%), but these two states were much more rural than the national population as a whole (only 20%).

In terms of racial and socioeconomic makeup, State A had a much lower proportion of residents of minority race/ethnicity than State B (15% versus 31%); State B's minority representation was as great as the Nation's (at 31%). State A's population was wealthier than State B ($29,000 versus $25,000 per capita personal income in 2002), but both were poorer than the Nation (which had per capita personal income of $31,000 in 2002).

Table 1: Profiles of Two States

Characteristic	State A	State B	U.S.
Population (millions), 2002[1]	5.68	4.10	287.8
Rural population (% of total), 2002[2]	32.0%	29.8%	19.7%
Age distribution, 2002[1]			
0-18 yrs	26.5%	26.4%	26.9%
19-64 yrs	60.1%	61.4%	60.7%
65+ yrs	13.4%	12.2%	12.4%
Minority race/ethnicity (%, 2002)[2]	14.9%	31.0%	30.9%
Per capita personal income, 2002[2]	$28,841	$25,395	$30,832
Poverty rate, 2002[3]	10.9%	14.0%	12.4%
Health insurance coverage among persons <65 yrs, 2001[2]			
Private	77.5%	73.5%	72.1%
Public	10.9%	12.3%	11.4%
Medicaid	9.6%	10.1%	9.3%
Other public	1.3%	2.2%	2.1%
Uninsured	11.6%	14.1%	16.5%
Medicaid total payments per enrollee, 1999-2000*[2]	$2,824	$3,173	$3,466
ED visits (per 1,000 population)[2]			
2001	443	488	383
1991	371	431	376
% change	19.4%	13.2%	1.9%

Sources: [1]US Census Bureau, State SC-EST2009-agesex-res: Annual Estimates of the Resident Population by Single-Year of Age and Sex for the United States and States: April 1, 2000 to July 1, 2009; [2]American Association of Retired People (Flowers et al., 2003); and [3]Census Bureau (De Navas-Walt et al., 2005, p. 25);
* Calculated from Flower et al. (2003) by dividing the FY1999 Total Medicaid Payments for All Enrollees by the

2000 Medicaid enrollment.

State A had a smaller portion of its total population in poverty than State B (11% versus 14%) while State B had a higher portion of people in poverty than the U.S. nationwide (14% versus 12%). State B had a higher proportion of uninsured people under age 65 than State A, but lower than the Nation (14% and 12% versus 17% in 2002.

"Medicaid total payments per enrollee" is a measure of the generosity of healthcare coverage for poor and disabled populations in the states. State B is more generous than State A, based on this measure. However, both states are below the national average.

Between 1991 and 2001, ED visits per capita in the states rose dramatically compared to the Nation (19% and 13% growth respectively, compared to 2% nationally). As this striking difference suggests, that 10-year percent change (which was supposed to include admissions through the ED, although States may differ on this (Flowers et al., 2003)) varied greatly across the states (ranging from a 26% *increase* in one Midwestern state to a 32% *decline* in a Western state). The limited availability of ED statistics in some states especially in 1991 and definitional differences make these state estimates of varying reliability.

Although the data are not shown in the table, SAMHSA canvassed State financing of services for people with M/SU disorders who also were Medicaid eligible (Robinson et al., 2005). As of July 2003, both states had a proportion of their Medicaid populations under managed care organizations, but to different extents—47 versus 6 percent, respectively. Also, both pay for MHSA treatment services in those programs. State A had a comprehensive managed care organization program, while State B managed care organization beneficiaries received MHSA services under managed care organization and fee-for-service arrangements.

According to the same report, mandatory services under Medicaid included MHSA services in inpatient, outpatient, publicly funded health centers, and in offices of physicians and other authorized counselors. Optional Medicaid services have been supported in both states, although the services have been defined differently. More optional programs have been specified for mental disorders, rather than substance use disorders in both states. State B used prior authorization for more of its MHSA services than State A.

Study Population

The study populations for both states were created by selecting *all* "ED visits" from the combined HCUP SEDD and SID databases. These included:

- Visits to the ED that resulted in treatment and release—referred to as "Treat and Release ED visits." Transfers from the ED to other short-term hospitals also were counted as "Treat and Release ED visits" and were small (less than 3% in either state). These records were obtained from the SEDD.

- Visits to the ED that resulted in inpatient admission—referred to as "ED-IP stays." These records were obtained from the SID and identified by admission source of emergency department.

We use "All ED visits" to refer to all encounters in the ED—both patients who were treated and released or transferred to other hospitals (Treat and Release ED visits), and those who were admitted as an inpatient (ED-IP stays).

All visit records were linked, using an encrypted patient-level identifier, age, and gender, to create a continuum of patient-level encounters, and all additional records for those patients were extracted, regardless of diagnosis.

In addition, the population and its relevant visits were defined with inclusion and exclusion criteria as follows:

Inclusion Criteria:

- Age 18 or older
- Had at least one treat and release ED visit or ED-IP stay with one of the following "study" conditions based on primary diagnoses identified during an ED visit or principal diagnoses identified during a hospital stay (see Appendix A for diagnosis codes):
  - Substance use disorders only (SUD Only),
  - Mental disorders only,
  - Co-occurring mental disorders and substance use disorder (M/SUD)
  - Diabetes, or
  - Chronic respiratory disease

Exclusion Criteria:

- Inpatient stays that did not begin in the ED.
- People with an ED visit, regardless of discharge status, that had more than one "study" condition (as primary/principal or secondary diagnosis) with the exception that patients with co-occurring M/SUD were retained.

Persons with behavioral (SUD Only, Mental Disorder Only, or Co-Occurring M/SUD) study conditions *combined with* physical study conditions (diabetes or chronic respiratory disease) were excluded so that estimates of repeat utilization would be independent across the study conditions. Note that during the study year, study members could have any combination of one "study" condition and any other "non-study" conditions as comorbidities.

Thus, we classified patients into one of five study categories:

1. **SUD Only**: Substance use conditions without primary/principal or secondary mental disorder, diabetes, or chronic respiratory disease during the year
2. **Mental Disorder Only**: Mental illness without primary/principal or secondary substance use conditions, diabetes, or chronic respiratory disease during the year
3. **Co-occurring M/SUD**: Co-occurring mental disorders and substance use disorders during the year, without primary/principal or secondary diabetes or chronic respiratory disease
4. **Chronic Respiratory Disease**: Chronic respiratory disease during the year, without primary/principal or secondary mental or substance use disorder, or diabetes
5. **Diabetes**: Diabetes during the year without primary or secondary mental or substance use disorder, or chronic respiratory disease

Measures

Outcome Utilization Measures

For each state, and for each of the five study categories, we developed three binary outcome measures of utilization among people who use ED services:

1. Among ED visits for patients with the study conditions, an indicator of whether or not the visit resulted in an inpatient stay
    a. Outcome: ED visits resulting in hospital admission
    b. Population: All ED visits for patients with the study conditions

2. Among patients with the study conditions with at least one ED-IP stay, an indicator of whether or not they had more than one ED-IP stay
    a. Outcome: Patients with the study conditions with more than one hospitalization through the ED
    b. Population: Patients with the study conditions with at least one hospitalization that began in the ED

3. Among patients with the study conditions with at least one treat and release ED visit, an indicator of whether or not they had multiple treat and release ED visits
    a. Outcome: Patients with the study conditions with multiple treat and release ED visits
    b. Population: Patients with the study conditions with at least one treat and release ED visit

Control and Impact Measures

Three different groups of measures were developed to estimate the impact, or control for the effects, of various factors on the outcome utilization measures:

- Patient characteristics
- Hospital characteristics and services
- County or community attributes and resources

These types of factors were expected to affect the likelihood that inpatient stays, repeat ED-IP stays, and repeat treat and release ED visits would occur. Measures for these factors were:

Patient Characteristics (Source: 2002 HCUP State Inpatient Data (SID) and State Emergency Department Data (SEDD))

- Age in years
- Gender
- Race/Ethnicity:
    - White, Black, Hispanic, Asian, and other(State A)
    - White/other, Black (State B) due to small sample size
- Median income of the patient's ZIP-code
- Residence location: Small rural, large rural, small metropolitan, and large metropolitan
- Primary expected payer type: Private, Medicare, Medicaid, other government (defined below), and uninsured
- Overall patient severity as measured by the Disease Staging Resource Demand Scale (described below); for patient-level analyses, we used the maximum Disease Staging severity over all of a patient's ED visits
- Severity of M/SU disorders (described below): for patient-level analyses, we used the maximum M/SU Disorder Severity over all of a patient's M/SU disorder-related ED visits

For patient-level analyses, demographic information including age, gender, race/ethnicity, median income, residency, and primary expected payer were based on the index visit.

Hospital Characteristics/Services (Source: American Hospital Association's 2002 Hospital Survey data)

- Teaching status
- Hospital location: Small rural, large rural, small metropolitan, and large metropolitan
- Bed size: Log of the number of beds
- Ownership type: Public, private non-profit, and private for-profit
- Specialty services available:
  - Hospital Inpatient Substance Abuse Services (i.e., beds for treatment of alcohol/chemical dependency)
  - Hospital Outpatient Substance Abuse Services
  - Hospital Crisis Prevention Services (primarily outpatient but also includes inpatient crisis prevention) (Note: We also included an indicator for whether the hospital provided both outpatient substance abuse services and crisis prevention services.)
  - Hospital Inpatient Psychiatric Services (i.e., beds for psychiatric treatment)
  - Hospital Outpatient Psychiatric Services
  - Hospital Specialty Psychiatric Services (i.e., inpatient or outpatient psychiatric services related to adolescents, elderly, emergencies, and partial hospitalization programs)

County Characteristics (Source: 2002 data from the Area Resource File)

- Related to SUD Only, Mental Disorder Only, Co-Occurring M/SUD:
  - Whether there is a shortage in the county of mental health practitioners
  - The number of community mental health centers (CMHCs)
  - The number of short term psychiatric and chemical/dependency beds set up per capita
- Diabetes and Chronic Respiratory Disease:
  - Whether there is a shortage in the county of primary care practitioners
  - The number of federally qualified health centers
  - The number of short term general hospitals with EDs
  - The number of short-term general hospitals with primary care departments

A few measures require more explanation: "other government," two measures of patient severity measures, and measures of community resources for substance abuse treatment services.

"Other government" payer is a category we relabeled from "other" payer because all of the examples under "other" payer in both states were other government services—CHAMPUS, CHAMPVA, Maternal and Child Health, Hill Burton, Workers' Compensation, and other state and county government support. State, county, and municipal governments in both states pay for services for people with M/SU disorders who are in special programs. The "other" category for chronic physical conditions is likely to be military benefits (CHAMPUS, CHAMPVA) and other government charity care for people who were low income but were not eligible for Medicaid.

"Disease Staging (DS) Resource Demand Scale" relates to all conditions. The DS scale was developed using all principal and secondary conditions found in all-payer inpatient discharge data (Medstat, 2006). It accounts for the stage of disease corresponding to the principal diagnosis as well as the severity of the diseases represented by the secondary diagnoses. A

value of 100 indicates that the value of the patient's expected resource use is comparable to the average value of *all hospitalized patients*. Based on the distribution of this measure in the ED data, we defined four ordinal levels of DS severity: 1) minimal, 2) less intensive, 3) moderate, and 4) severe. The respective cut-points of the scale were 1) less than 30, 2) 30 to 37.5, 3) 37.5 to 45, and 4) over 45. The average severity among the study ED patients with M/SU disorders was less than the average severity among all hospitalized patients. This is consistent with MHSA treatments that involve less expensive services compared to all other conditions admitted to hospitals.

"M/SU Disorder Severity" categories specific to M/SU disorder were developed for this study. For each mental disorder or SUD diagnosis, we developed ordinal measures of severity based on an article by Kessler, et al. (2005b). Kessler and his colleagues analyzed household survey data from the National Comorbidity Survey – Replication (NCS-R). They determined the degree of social disability and impairment associated with specific M/SU disorders which they diagnosed through survey questions related to M/SU disorders administered to household respondents.[3] The NCS-R diagnoses were based on the Diagnostic and Statistical Manual, Edition IV (DSM-IV) which aligns with the International Classification of Diseases (ICD-9-CM) available on discharge records.

In Kessler and colleagues' work, individual cases were considered "serious" if they had any of the following:

- A suicide attempt with serious lethality intent within the 12-month recall period
- Work disability or substantial limitation due to mental or substance use disorders
- Positive screen results for non-affective psychosis
- Bipolar I or II disorder
- Substance dependence with serious role impairment (specific to disorder)
- Impulse control disorder with repeated serious violence
- Any disorder that resulted in 30 or more days out of their normal social role (e.g., work or school) in the year

While "moderate" and "mild" levels of severity were also defined by Kessler and colleagues, we did not draw on those directly. We used the percent of cases found by Kessler to have the above listed serious consequences in each diagnosis group to rank diagnosis categories (see Table 2). Those rankings of diagnoses were then used to define three ordinal categories of diagnoses that could be used with administrative discharge data: *mild* (diagnoses that had only 10% to 30% serious consequences), *moderate* (those with 30% through 45% serious consequences), and *severe* (50% to 83% serious consequences). We also classified "schizophrenia and other affective conditions" (which the NCS-R did not classify) as *severe*. The resulting categories group the M/SU disorder diagnoses by the probability of low, medium, and high severity of the consequences of their disorder.

Community resources for substance abuse treatment, as opposed to resources for mental disorders, is sparsely reflected in the Area Resource File. We did not in this exploratory work attempt to incorporate more specific measures of substance abuse treatment in communities from surveys not included in the Area Resource File. Thus, we might expect to find certain hypotheses related to the impact of community resources to be stronger for mental health than

[3] One category—schizophrenia and other affective conditions—were not assigned in the survey because they are overestimated with lay-administered questions. We assigned these when found in the discharge data to the most serious group.

substance abuse treatment. Future research should incorporate measures from the National Survey of Substance Abuse Treatment Services conducted by SAMHSA.

Analytic Plan

This study was designed to examine the utilization of emergency services for MHSA treatment compared to diabetes and chronic respiratory disease. The juxtaposition of these conditions was to judge how treatment for chronic behavioral conditions compared to that for chronic physical conditions. We explored hypotheses about the factors that might be associated with frequent use of ED services among those who used ED services. The major hypotheses related to patients' severity of illness, insurance or program coverage for care, and availability of hospital specialty services. We also explored the data with respect to availability of community resources for care. The main hypotheses are described below, followed by the statistical models used to test them.

Table 2: Classification of Severe, Moderate, and Mild Severity of Mental Disorders and Substance Use Disorders in this Study, Based on the National Comorbidity Survey Replication (NCS-R)*

Primary diagnoses selected for this study by severity = √	Description	NCS-R evaluation of consequences		
		Percent serious	Percent moderate	Percent serious + moderate
Severe				
√	Psychoses (not in NCS-R)**	--	--	--
√	Bipolar I and II conditions	82.9	17.1	100
√	Drug dependence	56.5	43.5	100
√	Obsessive-compulsive disorder	50.6	34.8	85.4
	3 or more conditions	49.9	43.1	93
√	Dysthymia (chronic depression)	49.7	32.1	81.8
√	Oppositional defiant disorder	49.6	40.3	89.9
Moderate				
	Any mood disorder	45	40	85
√	Panic disorder	44.8	29.5	74.3
√	Separation anxiety disorder	43.3	24.8	68.1
√	Attention deficit/hyperactivity conditions	41.3	35.2	76.5
√	Agoraphobia without panic	40.6	30.7	71.3
√	Conduct conditions	40.5	31.6	72.1
√	Post-traumatic stress disorder	36.6	33.1	69.7
√	Drug abuse	36.6	30.4	67
√	Alcohol dependence	34.3	65.7	100
	Any impulse control conditions	32.9	52.4	85.3
√	Generalized anxiety disorder	32.3	44.6	76.9
√	Major depressive disorder	30.4	50.1	80.5
Mild				
√	Social phobia	29.9	38.8	68.7
	Any substance disorder	29.6	37.1	66.7
√	Alcohol abuse	28.9	39.7	68.6
	2 conditions	25.5	46.4	71.9
√	Intermittent explosive disorder	23.8	74.4	98.2
	Any anxiety disorder	22.8	33.7	56.5
	Any disorder	22.3	37.3	59.6
√	Specific phobia	21.9	30	51.9
	1 disorder	9.6	31.2	40.8

*Kessler RC, Chiu WT, Demler O, Walters EE. Prevalence, severity, and comorbidity of 12-month DSM-IV conditions in the National Comorbidity Survey Replication. Arch Gen Psychiatry 62:617-627, June 2005b.

**The NCS-R excludes questions related to schizophrenia and other non-affective conditions because they are "dramatically overestimated in lay-administered interviews" (Kessler et al., 2005b).

Hypotheses

H1: Frequent use of emergency hospital services among those with at least one ED visit increases with the severity of chronic conditions. This hypothesis was tested with each outcome variable defined for this study: probability of an ED visit resulting in admission, visit, more than one ED-IP stay per person, and multiple treat and release ED visits per person.

While generally it was not possible to hypothesize across physical or mental conditions which was more serious, individuals with greater severity within specific conditions were expected to require more emergency services. Greater severity of illness included three types: 1) later stages of a given physical disease progression, 2) mental disorder or SUD that likely had more severe personal or social functional consequences, or 3) combined complicated comorbidities. For example, patients with Co-Occurring M/SUD would be more likely than patients with those single conditions to require an ED-IP stay or multiple treat and release ED visits. We also expected that more severe mental illnesses would involve more of such services.

However, because we did not know how, on average, M/SU disorders as a class compare to diabetes and chronic respiratory disease with respect to severity, we could not hypothesize which disease groupings would exhibit more use of ED services. Nevertheless, we were able to observe which of them leads people who visit the ED to use more community hospital ED services.

H2: Individuals who use the ED and who have evidence of third-party health care coverage (e.g., insurance or subsidy programs expected to pay the bill) use fewer subsequent hospital ED services. This hypothesis can be tested with each outcome variable defined for this study, as noted in H1, using expected primary payer as evidence of coverage.

Evidence of insurance or public health programs should mean few hospital services because of better chronic disease management and MHSA treatment, presumably because of better access to primary care. One qualification of this presumption is that some health care programs (such as Medicaid and Medicare) have historically limited specific services for SUD during a year; this may jeopardize treatment for chronic M/SU disorders and may result in poor outcomes and thus more ED utilization for patients with M/SU disorders in these programs compared to those with other chronic conditions. Also, because the uninsured tend to be younger and healthier, age and severity of illness must be controlled to test this hypothesis.

H3: ED visits for patients with M/SU disorders at hospitals with services for treating M/SU disorders are more likely to result in admission than ED visits at other hospitals. This hypothesis was tested with one outcome variable defined for this study: probability of an ED visit resulting in admission.

Emergency medical transport personnel know which hospitals specialize in treatment of which diseases. Whether a center for trauma and burns, a hospital known for its cardiac care, or hospitals with specialists who treat mental and substance use emergencies, hospital specialties are well known to ambulance drivers and emergency medical technicians. In addition, the largest hospital in a city or metropolitan area typically will provide comprehensive services to deal with all types of emergencies. Furthermore, these large hospitals are often inner city public hospitals that are a primary source of care for people with otherwise poor access to health care,

emergency-related or not. We anticipated that M/SU disorder-related ED visits at the largest hospitals in an area would be more likely result in admission than similar visits at smaller hospitals. We also expected ED visits for patients with M/SU disorders at hospitals with specific MHSA-related services to more likely to result in hospital admissions than ED visits for such conditions at hospitals without such services.

Statistical Models

To test these hypotheses, multiple factors that might influence utilization had to be taken into account. Hierarchical linear models controlled for multiple factors at the same time and in addition handled the problem of data clustered at multiple levels. Potentially ED visits cluster within individuals, patients cluster within hospitals, and hospitals within communities. Clustering also can occur among communities within States; however, the two States in this study were analyzed separately. Clustering often implies some degree of similarity among members of the cluster and this similarity decreases the variance of outcomes from within the cluster compared to a simple random sample from the population. Without proper statistical techniques, the statistical significance of the results would be overstated.

For each state, and for each of the five conditions, we modeled three outcomes:

1. The probability of an ED visit resulting in admission
2. Among patients with at least one ED-IP stay, the probability of more than one ED-IP stay
3. Among patients with at least one treat and release ED visit, the probability of multiple treat and release ED visits

Rather than model the number of ED-IP stays and the number of ED visits per patient, we modeled the dichotomous outcomes described above. We fit several negative binomial regressions (not reported) to model the average number of visits and stays, and the results were substantially the same as those obtained for the logistic models used to fit the dichotomous outcomes. Therefore, we elected to model the more commonly-used logistic model for these analyses.

The minimum number of inpatient stays through the ED was zero because an inpatient stay was not a selection requirement. However, the minimum number of ED visits was one (not zero) because every patient was required to have an ED visit to be in the study. Therefore, all analyses were conditional on patients having had at least one ED visit for the study condition. These analyses implicitly omitted individuals with the study conditions who had no treatment at all or who had *only* some combination of physician office visits and/or inpatient stays not admitted through the ED.

While the count of ED visits, treat and release ED visits, and ED-IP stays per patient could be regarded as “annual,” some patients might have had other visits and stays at institutions outside of the study states, resulting in an undercount for those patients. Also, we could not determine when patients first acquired their study condition. Some acquired their condition prior to 2002 while others acquired their condition during 2002. Such unmeasured factors contributed to unexplained variation in the count of ED visits and ED-IP stays to the extent that the omitted factors had an effect on the outcome that was independent of the effects included in the models.

Models for the Probability of an ED Visit Resulting in Admission. For this analysis, the ED visit was the unit of analysis. We were interested in estimating the effect of the previously described predictor variables on the probability of admission. For binary outcomes such as this, it is usual to fit a standard logistic regression model:

$$\ln\left(\frac{p_i}{1-p_i}\right) = \alpha + \boldsymbol{\beta}'\mathbf{x}_i + \boldsymbol{\delta}'\mathbf{z}_i + \boldsymbol{\lambda}'\mathbf{w}_i \qquad \text{(eqn. 1)}$$

Where p_i is the probability of an ED visit resulting in admission; $\mathbf{x}_i$ is a vector of patient characteristics (such as age, gender, and severity); $\mathbf{z}_i$ is a vector of hospital characteristics (such as ownership, teaching status, and bed size); and $\mathbf{w}_i$ is a vector of county characteristics (such as the county's supply of mental health centers). The parameters to be estimated were the vectors of regression coefficients β, δ, and λ. Usually, parameters are estimated by maximizing the likelihood function on the assumption that the individual outcomes were independent and distributed as binomial.

This is an example of a "disaggregated" model, so called because the hospital and county characteristics are disaggregated to the ED visit level. The problem with fitting such models is that observations within these hospital and community "clusters" are not necessarily independent of one another. All ED visits in one hospital have the same values for their hospital-level variables. Similarly, all ED visits within one county have the same values for their county-level variables. These groupings of visits within hospitals and within counties often generate correlated outcomes, which violate the independence assumption usually associated with standard logistic regression.

To address this clustering issue, we fit hierarchical logistic regression models (Rasbash et al., 2005; Goldstein et al., 2002; Raudenbush and Bryk, 2002). Hierarchical models incorporate separate error terms for each level in the hierarchy: ED visit, patient, hospital, and county.

Regular hierarchical models deal with units of analysis that are strictly hierarchical, such as students nested within classrooms nested within schools. In our application, we had the hierarchy of ED visits nested both within patients and within hospitals. However, some patients are treated in more than one hospital. Therefore, patients have "multiple membership" with respect to hospitals. Alternatively, the ED visits can be viewed as being nested within a cross-classification of patients and hospitals.

Special hierarchical models have been developed to account for such cross-classifications and multiple memberships (Goldstein et al., 2002). However, convergence failed when we attempted to fit these complex models to our data. The problems stemmed partly from the fact that about 40 percent of patients had only one ED visit, which might have thwarted the estimation of within-person variance. Consequently, we ignored the effect of clustering within patients and treated the ED visits as being nested only within hospitals.

Likewise, hospitals were nested within counties. However, preliminary analyses revealed that the county-to-county variation was not significant after accounting for patient and hospital characteristics. Also, the number of hospitals per county was relatively small. Therefore, our models did not further adjust for variation at the county level.

We fit the simplest form of a hierarchical model: a two-level hierarchical random intercept model. The ED visits were at the first level and hospitals were at the second level. The intercept was a random effect that varied over hospitals while other regression coefficients were considered fixed:

$$\ln\left(\frac{p_{ij}}{1-p_{ij}}\right) = \alpha_j + \boldsymbol{\beta}'\mathbf{x}_{ij} + \boldsymbol{\delta}'\mathbf{z}_j + \boldsymbol{\lambda}'\mathbf{w}_i$$
$$\alpha_j = \gamma_{00} + u_j \qquad \text{(eqn. 2)}$$
$$u_j \sim \mathrm{N}(0, \tau_{00})$$

Here, *i* denotes visits at level 1 and *j* denotes hospitals at level 2. The term p_{ij} is the probability that the ith event in the jth hospital resulted in admission. The random intercepts for hospitals are represented by u_j, and the average hospital intercept is represented by γ_{00}.

To illustrate the difference between using a standard logistic regression and a hierarchical logistic regression, we fit both types of models for each of the five study condition categories. We fit the standard logistic regression using SAS PROC LOGISTIC, and we fit the hierarchical logistic regression using SAS PROC GLIMMIX. The estimated coefficients are similar between the two methods. However, as is typical, the standard errors of the coefficients tend to be much larger for the hierarchical model compared with the standard logistic model.

We calculated the exponent of each of the regression coefficients to produce estimated odds ratios associated with each of the predictors. These are presented in Tables embedded in the text.

Models for the Probability of Multiple ED-IP Stays for Patients with at Least One ED-IP Stay. For this analysis, the patient was the unit of analysis. We were interested in estimating the effect of predictor variables on the probability of having more than one ED-IP stay, given that the patient has at least one ED-IP stay. In contrast to the regressions described in the previous section, this analysis had the patient as the unit of analysis and thus had a smaller number of observations. The numbers of observation for all types of visits studied are given in Appendix B.

Some individual patients stayed at more than one hospital, so it is not possible to include hospital-level variables at the patient level. Also, a multiple membership model seemed out of order because the number of hospitals a patient used was related to the outcome (multiple hospitalizations). However, for some regressions, we employed hospital supply variables at the county level such as the number of short-term general hospitals with EDs.

Some patients belonged to more than one county during 2002, implying a "multiple membership" data structure. We attempted to fit these models. However, because the percentage of patients residing in multiple counties was so low—often around 7 percent—the multiple membership models did not converge. Instead, for patients that resided in multiple counties, we substituted the patient's average of the county-level variables (weighted by the number of the patient's observations in each county).

We fit hierarchical logistic regressions with patients at level 1 and counties at level 2:

$$\ln\left(\frac{p_{ij}}{1-p_{ij}}\right) = \alpha_j + \boldsymbol{\beta}'\mathbf{x}_{ij} + \boldsymbol{\lambda}'\mathbf{w}_j$$
$$\alpha_j = \gamma_{00} + u_j \qquad \text{(eqn. 3)}$$
$$u_j \sim \mathrm{N}(0, \tau_{00})$$

Here, *i* denotes patients at level 1 and *j* denotes counties at level 2. The term p_{ij} is the probability that the ith patient in the jth county has more than one ED-IP stay. The random intercepts for counties are represented by u_j, and the average county intercept is represented by γ_{00}.

We fit the hierarchical logistic regression using SAS PROC GLIMMIX, and took the exponent of each of the regression coefficients to produce estimated odds ratios associated with each of the predictors.

Models for the Probability of Multiple Treat and Release ED Visits for Patients with at Least One Treat and Release ED Visit. For this analysis, the patient was the unit of analysis. We were interested in estimating the effects of predictor variables on the probability of having more than one treat and release ED visit, given that the patient had at least one treat and release ED visit. In contrast to the regressions described in the previous sections, this analysis omitted ED-IP stays because we were interested only in multiple treat and release ED visits (where the patient was treated and released or transferred).

We fit hierarchical logistic regressions with patients at level 1 and counties at level 2. The model was the same as equation 3 above, except that the term p_{ij} is the probability that the ith patient in the jth county had more than one ED visit. Again, we used SAS PROC GLIMMIX, and took exponents of each of the regression coefficients to produce estimated odds ratios associated with each of the predictors.

Results and Interpretation

Descriptive Statistics

Before conducting multivariate analyses, we constructed statistics describing the study members across the five clinical categories, in terms of outcomes and all other independent measures used in the multivariate analysis.

Tests of statistical significance across the five conditions overall found that, because of the large sample sizes, essentially all (167 of the 169) comparisons across conditions were statistically significant. Below we assess similarities and dissimilarities in terms of magnitudes of differences.

The following similarities and differences between the two states were evident (Appendix B, Tables B.1 through B.8, shows the descriptive statistics):

- **ED visits resulting in admission** (Tables B.1 and B.2)**:** Percent of ED visits that resulted in an admission were highest for diabetes (about 30%, for both states) and second highest for Co-Occurring M/SUD (26% and 16% for State A and State B, respectively). Admission rates for SUD Only, Mental Disorders Only and Co-Occurring M/SUD were all substantially higher in State A than in State B.
- **Multiple ED-IP stays** (Tables B.3 and B.4)**:** The mean number of ED-IP stays per person was as high for Co-Occurring M/SUD (1.12 and 0.71) as for diabetes (0.70 and 0.70), while for other conditions, it was much lower. This was consistent across the two states.
- **Multiple treat and release ED visits** (Tables B.3 and B.4)**:** Many more patients with Co-Occurring M/SUD were likely to have had multiple treat and release ED visits—about 75 percent—compared to patients with diabetes—54 and 58 percent for State A and State B; other conditions were comparable to diabetes.
- **Lack of insurance** (Tables B.3 and B.4)**:** The percent of ED users with study conditions who were uninsured was exceptionally high among patients with SUD conditions, whether single or co-occurring. In State A and State B, respectively, 41 and 51 percent were uninsured for SUD Only, and 28 and 43 percent were uninsured for Co-Occurring M/SUD. The percentage of patients with other conditions who lacked insurance was lower. For example, 12 and 15 percent of patients with diabetes were uninsured, respectively, in State A and State B.
- **Severity Resource Demand** (Tables B.3 and B.4)**:** The percentage of patients with diagnoses requiring "highly intensive" hospital resources at some time during the year based on their various diagnoses was greatest for patients with Co-Occurring M/SUD (59% and 55% in State A and State B, respectively), compared to patients with Mental Disorder Only (about 40%) and patients with SUD Only (about 30%); patients with the chronic physical conditions were in between at about 50 percent for diabetes and about 40 percent for chronic respiratory disease.
- **Comorbidities (not shown):** A large percentage of patients who visited the ED for any of the five conditions had multiple health problems during the year:
  - Between 40 and 50 percent of patients' treat and release ED visits were to treat a condition other than that for which they were selected into the study
  - Between 55 and 80 percent of patients' ED-IP stays were to treat a condition other than that for which they were selected into the study

  Thus, many in the study population had multiple health problems.
- **Hospitals** (Tables B.5 and B.6)**:** Hospitals in the two states were similar in average bed size and in the proportion that were teaching hospitals. State B had a disproportionate share of hospitals that were private for profit and publicly owned compared to State A, while the large majority of State A hospitals were private non-profit owned. A much greater proportion of State A hospitals had specialty MHSA services than in State B.
- **Counties** (Tables B.7 and B.8)**:** County-level health care resources were more abundant in State A than they were in State B. For example, the number of short-term psychiatric and chemical dependency care beds per population was two to three time higher in State A than State B.

Multivariate Statistics

This section presents the results of the multivariate analysis for each of the three models: 1) probability of an ED visit resulting in a hospital admission, 2) probability of multiple ED-IP stays

for patients with at least one ED-IP stay, and 3) probability of multiple treat and release ED visits for patients with at least one treat and release ED visit. Each model controlled for confounding effects of multiple factors and was estimated using hierarchical logistic modeling (HLM) to handle the clustered data.

Before the HLM analyses, traditional logistic models were fit. Tables C.1A-C.5A for State A and C.1B-C.5B for State B in Appendix C show those traditional results for one outcome—the probability of an ED visit resulting in hospital admission.

However, we present only the HLM results in the text below because standard logistic regression models tend to underestimate standard errors and hence overstate statistical significance compared with HLM when applied to clustered data.

For each of the three study outcomes, we fit one model for each of the five study conditions. The 15 detailed tables of results for these models are contained in Appendix C (Tables C.6A-C.20A and C.6B-C.20B). Here, we highlight the main findings for each of the three outcomes. We focused on SUD Only, Mental Disorder Only, and Co-Occurring M/SUD conditions, with comparative results for diabetes and chronic respiratory disease.

The Probability of an ED Visit Resulting in Admission (Visit Level)

The estimated odds ratios of an ED visits resulting in admission in relation to patient-level, hospital-level, and county-level factors are shown in Table 3.

Patient Characteristics

Age: Age had a nonlinear effect on the probability of an ED visit resulting in admission that fit a quadratic form. Because quadratic results are difficult to interpret from tables, we graphed the results for age in Figure 1. For each condition, the plots show the effect of age throughout the age range of 18 to 95 years for a typical patient with average values for the other predictor variables.

The effects of age were highly similar between the two states. The difference between the two state intercepts reflects the difference between the overall admission rates, and not a difference in the effect of age of the population. For ED visits for SUD Only patients, the probability of hospital admission increased until about age 65, after which it declined. For Mental Disorder Only, Co-Occurring M/SUD, and chronic respiratory disease patients, the estimated probability of an ED visit resulting in admission increased steadily with age. For Mental Disorder Only, this is consistent with general increases in depression and anxiety that occur with age, according to the Surgeon General's Report on Mental Illness (USDHHS, 1999). The pattern for diabetes was different—with the probability of an ED visit resulting in admission being higher in youth, decreasing to about age 50 years, and then increasing markedly thereafter.

Table 3: Likelihood of an ED Visit Resulting in Admission in Two States (Visit-Level Analysis): Estimated Odds Ratios from the HLM Logistic Regressions, 2002

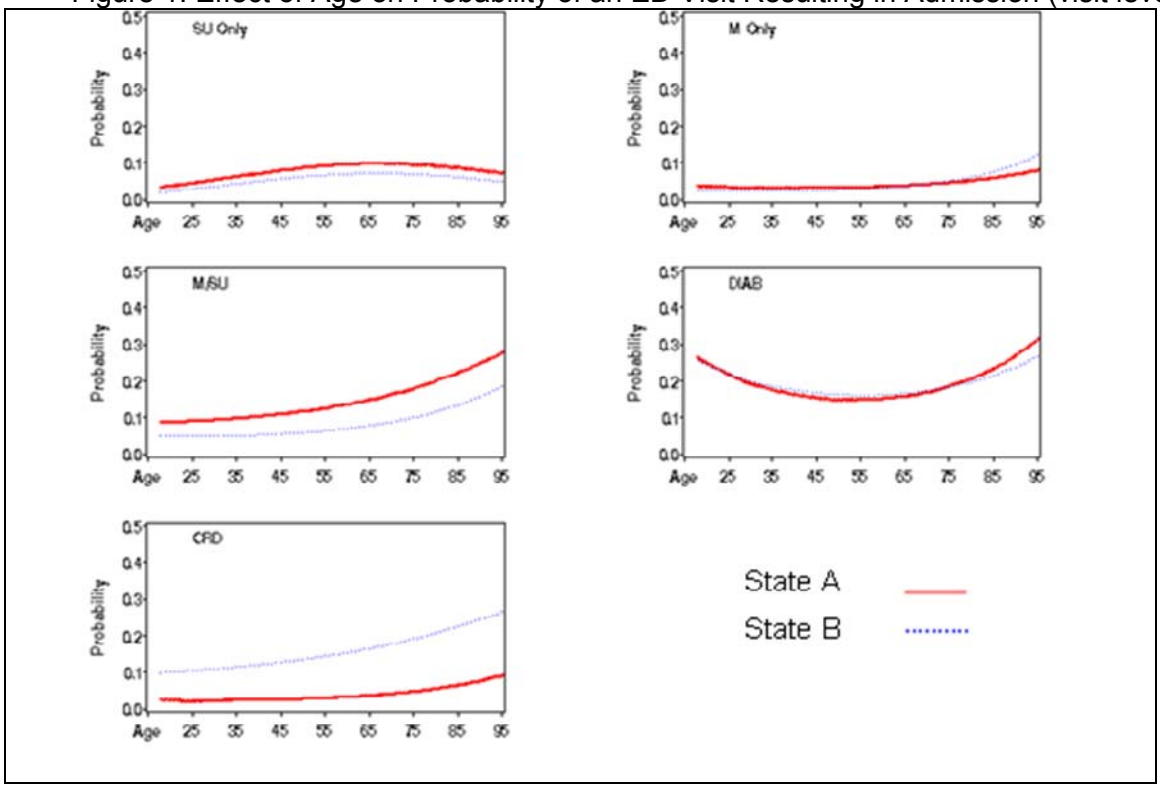
Characteristics	SUD Only		Mental Disorder Only		Co-Occurring M/SUD		DIAB		CRD	
	State A	State B	State A	State B	State A	State B	State A	State B	State A	State B
Patient Characteristics										
(Age – 40) / 10 (i.e., centered on 40 and scaled to decades)	1.288***	1.332***	0.992	1.061**	1.132***	1.101***	0.858***	0.882***	1.082***	1.129***
$((Age – 40) / 10)^2$	0.956***	0.948***	1.035***	1.048***	1.017*	1.029**	1.058***	1.042***	1.031***	1.011*
Median ZIP Income / $10,000	1.087***	1.116***	0.999	1.018	1.050***	1.028	0.979	0.997	1.021	0.991
Female (reference = Male)	0.728***	0.956	1.060	1.011	0.889***	0.798***	0.803***	0.758***	0.804***	0.800***
Ethnicity (reference = White for State A/White and others for State B)										
..Black	1.104	1.123	0.860**	0.739***	0.959	0.831**	0.892	0.855***	1.074	0.856***
..Hispanic	1.092	4.513***	0.427***	1.002	0.651	2.795*	1.042	0.691	0.546**	0.491*
..Asian	0.246		1.889*		0.786		6.600***		2.061*	
..Other Race	1.260		1.276		1.422		1.035		1.027	
..Unknown Race	1.536		0.797		1.398		2.006*		1.443*	
Insurance (reference = Private)										
..Medicare	0.876	0.748*	0.808***	0.601***	0.607***	0.547***	0.752***	0.724***	1.126**	0.936
..Medicaid	0.800*	0.714**	0.748***	0.671***	0.638***	0.743***	0.540***	0.717***	0.829***	0.743***
..Other Government	1.151	2.418***	1.204	1.376**	1.921***	1.852***	0.613*	1.608***	0.673***	1.914***
..Uninsured	0.827*	0.455***	0.559***	0.356***	0.653***	0.516***	0.683***	0.700***	0.637***	0.477***
DS Resource Demand Scale (reference = Minimal <30)										
..Less intensive	2.102***	2.190***	1.342***	1.160	1.318***	1.465***	2.293***	2.223***	1.631***	2.782***
..Moderate	2.858***	3.924***	3.086***	2.212***	2.008***	2.375***	6.086***	3.916***	4.540***	7.092***
..Highly intensive	22.087***	30.723***	16.216***	10.507***	8.551***	10.946***	74.069***	45.468***	74.664***	99.883***
M/SU Disorder Severity (reference = None)										
..Mild	7.933***	3.959***	2.289***	1.514***	7.043***	4.328***				
..Moderate	24.264***	14.939***	2.121***	1.303***	14.440***	8.628***				
..Severe	24.730***	16.777***	6.521***	3.951***	28.276***	19.727***				
Hospital Characteristics										
Hospital Teaching Status	0.984	0.938	1.534	0.367	1.473	0.977	1.872*	0.748	1.916	0.890
Log of Number of Beds	1.699**	1.556*	2.186***	2.077**	1.598*	1.553	1.504***	1.621***	1.876***	1.627***
Log of Number of Chemical Dependency Care Beds	0.896	1.079								

Characteristics	SUD Only		Mental Disorder Only		Co-Occurring M/SUD		DIAB		CRD	
	State A	State B	State A	State B	State A	State B	State A	State B	State A	State B
Log of Number of Psychiatric Care Beds			0.621	2.746						
Log of Number of Chemical Dependency and Psychiatric Care Beds					0.677	1.293				
Hospital Ownership (reference = Public)										
..Private, Not-for-Profit	0.575	1.019	1.029	0.888	1.255	1.150	1.141	1.110	0.899	1.035
..Private, For-Profit	0.464	1.318	0.413	1.141	0.368*	1.842	0.610	1.116	0.336*	1.275
Safety Net Hospital	1.264	1.311	1.307	1.186	1.198	1.380	1.188	1.104	1.028	1.020
Hospital Location (reference = Large Metropolitan)										
..Small Metropolitan	1.327	0.453	0.572	0.609	0.538	1.276	0.651	0.652	0.605	0.783
..Large Rural	1.140	1.092	0.569	0.886	0.770	1.594	0.481*	0.984	0.451	1.292
..Small Rural	1.126	0.596	1.182	0.972	0.876	1.636	0.825	0.834	1.163	1.062
Hospital Inpatient Substance Abuse Services	0.862	0.674			0.658	0.433				
Hospital Outpatient Substance Abuse Services	2.138	1.946			3.636	1.137				
Hospital Outpatient/Inpatient Crisis Prevention Services	1.322	1.188			1.049	1.058				
Both Hospital Outpatient Substance Abuse and Outpatient/Inpatient Crisis Prevention Services	0.566	0.363			0.509	0.328				
Hospital Inpatient Psychiatric Services			5.458	0.113	3.611	0.489				
Hospital Inpatient/Outpatient Psychiatric Services			2.184	0.660	1.631	1.234				
Hospital Outpatient Psychiatric Services			0.869	1.530	1.310	2.373				
Community Characteristics										
Number of Community Mental Health Centers in the County	0.910	1.075	0.905**	0.880	1.050	0.760*				
Number of Psychiatric and Chemical Dependency Beds in Short Term General Hospitals Set Up per Capita in the County	1.139	0.372**	0.921	0.408***	1.001	0.614*				
Shortage Area for Mental Health Practitioners	0.956	1.052	1.225*	1.080	1.103	0.978				

Characteristics	SUD Only		Mental Disorder Only		Co-Occurring M/SUD		DIAB		CRD	
	State A	State B	State A	State B	State A	State B	State A	State B	State A	State B
Number of Federally Qualified Health Centers in the County							1.133***	0.969	1.092***	1.020
Shortage Area for Primary Care Physicians							0.774	1.214	0.975	1.083
Number of Short Term General Hospitals with EDs in the County							0.867	1.057	0.960	0.980
Number of Short Term General Hospitals with Primary Care Departments in the County							1.058	1.001	0.919*	0.870**

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases;
Note: SUD = substance use disorder; M/SUD = mental and substance use disorder; DIAB = diabetes; CRD = chronic respiratory disease; DS = Disease Staging
*** P-value ≤ .001, ** P-value ≤ .01, * P-value ≤ .05

Figure 1: Effect of Age on Probability of an ED Visit Resulting in Admission (visit level)



Note: SU Only = Substance Use Disorder Only; M Only = Mental Disorder Only; M/SU = Co-Occurring Mental Disorder and Substance Use Disorder; CRD = Chronic Respiratory Disease; DIAB = Diabetes

Gender: For the majority of conditions, the estimated odds ratio of an ED visit resulting in admission for females was significantly lower than for males (Odds Ratio, [OR]=0.73 to 0.89). The exceptions were for SUD Only in State B, and for Mental Disorder Only in both states, where ED visits for females were as likely as males to result in an admission (i.e., the gender odds ratio was not statistically significantly different from 1.0).

Income: For ED visits for people with SUD Only in both states, the estimated odds ratio of an ED visit resulting in admission increased by approximately 10 percent for every $10,000 increase in median income for the patient's ZIP Code. For Co-Occurring M/SUD in State A, the odds ratio increased by an estimated 5 percent for every $10,000 increase. For other conditions, there was no effect of income on the probability of an ED visit resulting in admission.

Race/Ethnicity: In State B, ED visits for blacks were roughly 15 to 25 percent less likely to result in hospitalization than ED visits for whites for all conditions (OR=0.74 to 0.86) except SUD Only, for which the odds ratios were not statistically different. Also in State B, ED visits for Hispanics with SUD Only or Co-Occurring M/SUD were more likely than ED visits for whites to result in hospitalization (OR=4.51 and 2.80 respectively), but ED visits for Hispanics with chronic respiratory disease were less likely to result in admission than similar ED visits for whites (OR=0.49). In State A, ED visits for blacks and Hispanics with Mental Disorder Only were less likely than ED visits for whites to result in hospital admission (OR=0.86 and 0.43, respectively). For chronic respiratory disease in both states, the odds of ED visits resulting in admission for Hispanics were only about half of the odds of ED visits resulting in admission for whites (OR=0.55 and 0.49 for State A and B, respectively). In State A, ED visits for Asians with Mental Disorder Only, diabetes or chronic respiratory disease were much more likely to result in

hospitalization than ED visits for whites with similar conditions, after controlling for other factors. Due to small cell sizes for other minorities in State A, a similar comparison was not available for State B.

Primary Expected Payer: For all conditions in both states, ED visits billed as uninsured had significantly lower odds of resulting in admission —by between 17 percent and 65 percent— compared with the odds of ED visits billed to private insurance resulting in admission. Lack of insurance was generally more of a deterrent to admission after an ED visit in State B than State A (except for diabetes). ED visits billed to Medicaid also had lower odds of such admissions compared to ED visits billed to private insurance, with odds ratios similar to that for uninsured ED visits (OR=0.54 to 0.83). ED visits for 4 of the 5 study conditions (except for chronic disease) that were billed to Medicare were similarly less likely to result in hospitalization than similar ED visits billed to private insurance, with the lowest odds ratios in State B (OR=0.55 to 0.81). The much greater penetration of for-profit hospitals in the South (28% of hospitals are under for-profit ownership in the South compared to 6% in the Midwest (calculated from American Hospital Association data)) may explain this between-state disparity in the probability of hospital admission for ED visits billed to public payers or as uninsured. We suspect this because the lower odds of admission for these groups (compared to ED visits billed to private insurance) generally exist for the physical study conditions too.

The exception is the "other government" payer category in State B which has much higher odds of an ED visit resulting in hospitalization across all conditions. "Other government" supported services for M/SU disorders are likely influenced by the vitality and funding levels of state and local agencies whose mission is to support MHSA treatment programs. As noted in *Methods* above, the one measure available for state funding per person, Medicaid total payments per enrollee, is higher in State B than in State A. This does not necessarily mean that resources for MHSA programs were similarly disparate between the two states. That cannot be determined from available data sources.

Severity: For all conditions the probability of an ED visit resulting in admission increased dramatically as severity of the patient's condition increased for both severity measures—general resource demand compared to the average hospital patients across all conditions (not just study conditions), and MHSA-specific severity based on the likely personal and social consequences of M/SU disorders. For the MHSA severity measure, the reference category is "none" because some ED visits for Mental Disorder Only and SUD Only patients were for other physical conditions. As mentioned earlier, the M/SU Disorder Severity measure did not apply to ED visits for diabetes and chronic respiratory disease patients because patients who also had M/SU disorders were specifically excluded from the diabetes and chronic respiratory disease cohorts.

M/SU Disorder Severity had a strong and significant effect even after controlling for the general severity measure (the Disease Staging Resource Demand Scale) taking into account all of a patient's complications and comorbidities. The estimated odds of an ED visit resulting in admission for patients in the most severe categories were especially high. For the Disease Staging "highly intensive" category, the odds ratios ranged between 8 and 100. For ED visits for patients with Co-Occurring M/SUD "severe" category, the odds ratios ranged roughly between 4 and 28.

Hospital Characteristics

Hospital size: Of the hospital-level measures, only the number of beds (in logarithmic form) was consistently significant in estimating the likelihood of an ED visit resulting in hositalization. The odds of an ED visit resulting in admission increased steadily as the number of beds in the

hospital increased. The coefficients on log of beds were greater than 1.0, which implies that the odds of such admission increased at an increasing rate with bed size. For example, for an odds ratio of 1.5, the odds of an ED-IP stay in a hospital with 100 beds would be about 2.8 times that in a hospital with 50 beds. However, the odds of such admission in a hospital with 200 beds would be about 8 times that in a hospital with 50 beds. Thus, hospitals with more beds were much more likely to have ED visits resulting in admission compared with smaller hospitals.

Hospital MHSA Services: MHSA specialty services available at the hospital were not significantly related to the probability of an ED visit resulting in admission. This is most likely because large hospitals are more likely than small hospitals to provide MHSA specialty services. The high correlation between bed size and MHSA specialty services and the lack of variation in services supplied among larger hospitals (a separate analysis not shown here) resulted in no statistically significant effect of hospital MHSA services on admission probability.

Note that hospital specialty-MHSA-services measures were included only in the regressions for SUD Only, Mental Disorder Only, and Co-Occurring M/SUD because there was no reason to think that the presence of those services would have an effect on the odds of an ED visit resulting in admission for patients without M/SU disorders who had diabetes or chronic respiratory disease.

County Characteristics

The county measures used in each regression also depended on the condition. County services related to M/SU disorders were included in the regressions for those conditions; more general measures of county health care resources were included for diabetes and chronic respiratory disease.

Community Outpatient Resources: Some of the State A results showed that more community resources reduce the demand for inpatient treatment. In State A, ED visits by patients with Mental Disorder Only were less likely to result in an admission if patients resided in counties with more community mental health centers. It is possible that more readily available outpatient treatment helped patients maintain stability, resulting in fewer ED visits resulting in hospitalizations. The association between ED visits for SUD Only resulting in hospital admission and presence of community mental health centers was not statistically significant. However, there were no county measures available in the Area Resource File specifically for specialty substance abuse centers. Although the community-resources results were in the expected direction when they were statistically significant, they were not significant for most of the regressions. It is also important to realize that specialty psychiatric and chemical dependency hospitals are not counted in these community resource measures, nor in the study population.

In State A, ED visits for patients with diabetes and chronic respiratory disease who were from communities with more Federally Qualified Health Centers were more likely to result in hospitalization that similar patients from communities without such centers. This measure of community resources also may have reflected the low socioeconomic status and poor health status of the population in those counties—effects that other measures may not have captured fully. For example, income of the patient's community (Zip Code) was not statistically significant for these conditions.

Community Short Term Hospital Inpatient Resources: After controlling for patient and hospital factors, only one county measure was consistently significant: for State B—the number of available psychiatric and chemical dependency beds in short term general hospitals per

capita in the county. This was negatively related to the likelihood of an ED visit for SUD Only, Mental Disorder Only, and Co-Occurring M/SUD resulting in hospital admission. We expected the contrary—that ED visits would more likely result in admission for patients from counties with more MHSA specialty beds in general hospitals. We expected this because more beds per capita should indicate a greater capacity to admit patients and because the literature consistently documents higher hospitalization rates in areas with more beds per capita. One limitation is that psychiatric and chemical dependency hospitals and their beds were not factored into the analysis because they were not available in the Area Resource File. They could have a strong influence on the referral of ED patients with M/SU disorders to other specialty hospitals and the likelihood of admission to community hospitals. Another explanation for the counterintuitive results is that more MHSA specialty beds in general hospitals reflected more need in a county and a stronger propensity to use EDs as sources of primary care. This *culture* of using EDs for primary care might attract less severe, more discretionary ED users, who would be less likely to need hospitalization.

While the descriptive statistics did not indicate a higher proportion of low severity cases in State B state-wide, a subsequent analysis (not shown here) confirmed different results by severity level. At higher levels of severity ("moderate" and "severe") the effect of beds on ED visits resulting in admission was as expected. At lower severity, it was the opposite. ED visits for patients with lower M/SU Disorder Severity existed in counties with more specialty MHSA beds, and ED visits for lower M/SU Disorder Severity was associated with lower admission probability.

The Probability of Multiple ED-IP Stays (Patient Level)

Table 4 presents the estimated odds that a patient with an ED-IP stay had more than one ED-IP stay. While the previous results in Table 3 were based on the ED visit as the unit of analysis, Table 4 is based on the patient as the unit of analysis. Table 4 shows the estimated odds ratios of multiple ED-IP stays associated with patient-level and county-level factors, given that a patient had at least one ED-IP stay. Individual hospital factors were not modeled because some patients were treated at multiple hospitals.

Patient Characteristics

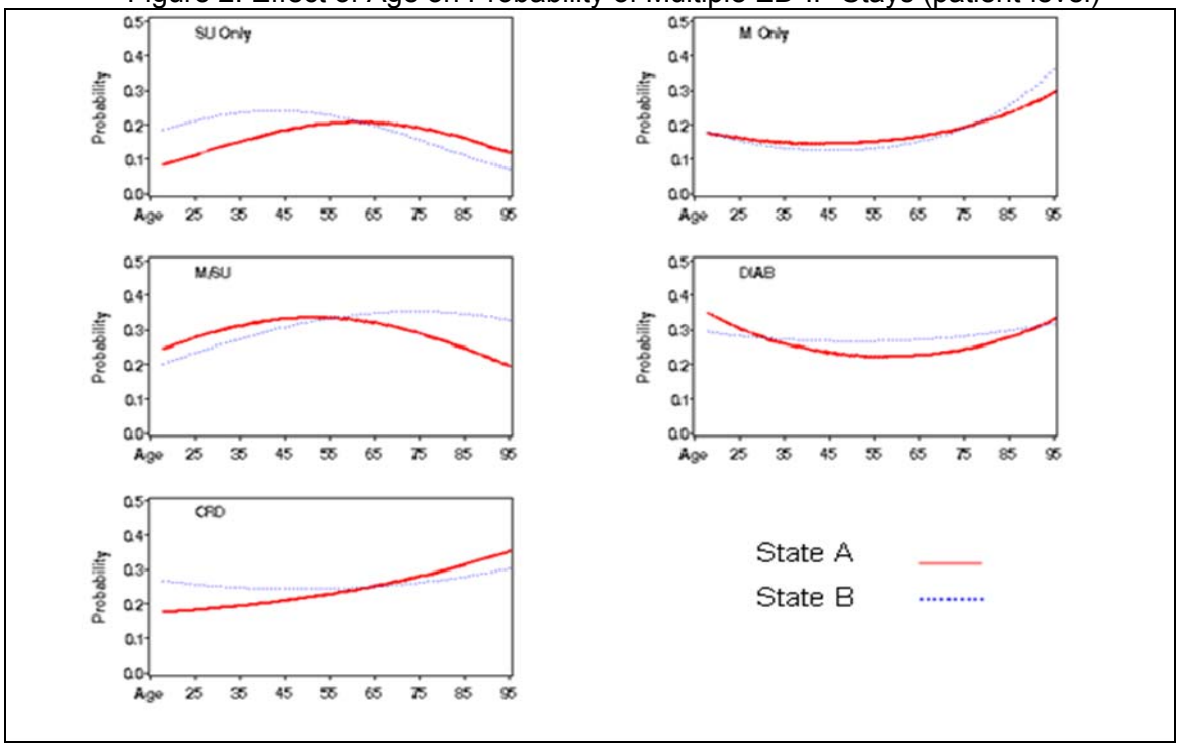
Age: Age had a nonlinear effect on the probability of having multiple inpatient stays that fit a quadratic form. The plots for each condition in Figure 2 show the effect of age throughout the range of 18 to 95 years for a patient with average values for the predictor variables other than age. The effects of age are fairly similar between the two states. For patients with SUD Only and Co-Occurring M/SUD, the probability of multiple ED-IP admissions for patients with at least one ED-IP ED visit increased until about age 45 in State A and age 65 in State B, after which it declined. For patients with Mental Disorder Only, the probability of such multiple ED-IP stays declined until roughly 45 years, and increased thereafter, in both states.

The patterns for diabetes and chronic respiratory disease differ between the two states. For State A, the curves are both relatively flat across the age range. For chronic respiratory disease in State B, the probability increased throughout the age range. For diabetes in State B, the probability decreased until age 60 and increased beyond that age.

Comparing Figure 2 with Figure 1, the patterns differ most for Co-Occurring M/SUD. In Figure 1, the probability of an ED visit for Co-Occurring M/SUD resulting in a hospital admission increased throughout the age range. In Figure 2, the probability of multiple ED-IP stays among patients with at least one ED-IP admission for Co-Occurring M/SUD increased only until the age of 50 in State A, after which it declined rapidly; that probability increased until age 65 in State B,

after which it leveled out. A decline in the probability of multiple ED-IP admissions in older age groups would be expected if these admissions are primarily for the severe and persistently mentally ill, because the severity of severe mental illness appears to wane in later life (USDHHS, 1999).

Figure 2: Effect of Age on Probability of Multiple ED-IP Stays (patient-level)



Note: SU Only = Substance Use Disorder Only; M Only = Mental Disorder Only; M/SU = Co-Occurring Mental Disorder and Substance Use Disorder; CRD = Chronic Respiratory Disease; DIAB = Diabetes

Gender: The effect of gender was significant for patients with Co-Occurring M/SUD in both states, with females about 20 percent less likely than males to have multiple ED-IP admissions (OR=0.822 and 0.80 for States A and B, respectively). The only other significant gender effect was in State B, where females are about 30 percent less likely than males to be hospitalized more than once for chronic respiratory disease (OR=0.71).

Income: The median income for the patient's ZIP Code was not a significant predictor of multiple ED-IP stays in either state for any of the five conditions.

Race/Ethnicity: Due to small samples for some race/ethnicity categories, we modeled only the effects of black and Hispanic versus all other categories (which was dominated by white). Race was a significant predictor in only a few of the regressions. In State A, blacks with SUD Only were much more likely than whites with the same condition to have two or more ED-IP stays (OR=1.48). In both states, blacks with chronic respiratory disease were also more likely than whites with the same condition to have multiple ED-IP stays (OR=1.50 and 1.20 for States A and B, respectively), while in State A, blacks with diabetes were more likely than whites with the diabetes to have multiple ED-IP stays (OR=1.39). There were no statistically significant results for Hispanics which, judging from the large effects, were limited by small sample size.

Expected Primary Payer: In contrast to the results for the probability of an ED visit resulting in hospital admission (Table 3), patients whose primary expected payer was Medicare or Medicaid were much more likely than patients whose primary payer was private insurance to have two or more ED-IP stays. This held strongly for essentially all conditions in both states (except for Mental Disorder Only in State B and for Medicaid and Mental Disorder Only in State A). The odds ratio for Medicare patients relative to private patients ranged from 1.5 to 2.5. The odds ratio for Medicaid patients relative to private patients ranged from 1.4 to 1.9. At the visit level, the odds ratios of an ED visit resulting in admission were less than 1, for all but one condition/state combination (chronic respiratory disease in State A). Thus, while the odds of an ED visit resulting in admission was lower for ED visits for Medicare and Medicaid patients, once an admission had occurred and the model was configured at the patient-level, the odds of another admission were much greater for Medicare and Medicaid patients.

While the odds of an ED visit resulting in a hospital admission were lower for ED visits for uninsured patients than patients with private insurance as the primary payer (Table 3), the odds of multiple ED-IP stays for the uninsured patients were not significantly different than patients with private insurance as the expected payer (Table 4). The only exception was for Mental Disorders Only in State A, where the odds of multiple ED-IP stays were lower for uninsured than for private-pay patients. Also, while the odds of an ED visit resulting in hospitalization were higher for ED visits for patients with "other government" as the expected payer (Table 3), the odds of multiple ED-IP stays for patients with "other government" were not significantly different than for patients with private insurance as the expected payer (Table 4). The only exception here was for higher readmissions for CRD patients in State B (OR=1.67).

Regardless of conditions, the results from Table 3 indicated that ED visits billed to Medicare, Medicaid, and uninsured tend to be less likely to result in admission than ED visits billed to private insurance, even after controlling for patient age and patient severity. However, once admitted during the year (Table 4) and examining the analysis from the patient perspective, the odds for Medicare and Medicaid patients tended to be much higher to have a second ED-IP stay compared with private-pay patients. On the other hand, the chances of a second admission for uninsured and for "other government" patients (again regardless of condition) did not increase relative to private-pay patients.

Explanations for these differentials in readmissions probably differ by payer group. We speculate on some explanations next.

The circumstances surrounding readmissions of Medicare and Medicaid patients may be uniquely related to why they are eligible for Medicare and/or Medicaid—severe mental or physical disability (which may not have been fully captured in the M/SU Disorder Severity measure). Alternatively, these patients may have been readmitted due to an inability to cope with frailty and living circumstances at advanced ages (which were not measured in these analyses).

ED visits resulting in admission may be more likely to result in the patient obtaining insurance during the hospitalization, thereby over-inflating the admission rate for ED visits billed to insurance. Additionally, uninsured patients may be more transient than patients with private coverage and thus, less likely to be readmitted within a state. Thus, the number of ED visits including the number of ED-IP stays may have been undercounted for the uninsured.

Table 4: Likelihood of Multiple ED-IP Stays in Two States (Patient-Level): Estimated Odds Ratios from the HLM Logistic Regressions, 2002

Characteristics	SUD Only		Mental Disorder Only		Co-Occurring M/SUD		DIAB		CRD	
	State A	State B	State A	State B	State A	State B	State A	State B	State A	State B
Patient Characteristics										
(Age – 40) / 10 (i.e., centered on 40 and scaled to decades)	1.270**	1.033	0.975	0.945	1.096***	1.183***	0.868**	0.974	1.100*	0.977
$((Age – 40) / 10)^2$	0.946*	0.948*	1.035***	1.057***	0.962**	0.975	1.041***	1.013	1.008	1.014
Median ZIP Income / $10,000	1.063	1.064	0.949	0.959	1.030	0.919	1.024	1.059	0.971	0.946
Female (reference = Male)	0.774	1.143	1.060	1.160	0.822**	0.803*	1.017	1.133	0.896	0.710***
Ethnicity (reference = White for State A/ White and others for State B)										
..Black	1.478*	1.236	1.087	1.201	0.993	0.875	1.385**	1.160	1.495***	1.198*
..Hispanic	1.164	0.638	0.865	1.556	0.802	1.441	0.561	0.428	0.154	0.232
Insurance (reference = Private)										
..Medicare	1.458	2.494***	1.489***	1.009	1.687***	1.556***	2.282***	1.775***	1.944***	2.052***
..Medicaid	1.943***	1.935**	1.179	1.061	1.425***	1.504**	1.738***	1.484**	1.733***	1.752***
..Other Government	1.001	1.690	0.629	0.893	0.718	1.155	0.540	0.773	0.819	1.670*
..Uninsured	1.320	1.091	0.663**	0.881	1.005	0.893	0.823	0.946	0.893	0.968
Patient Location (reference = Large Metropolitan for State A, Urban for State B)										
..Small Metropolitan	1.151		1.168		1.123		0.949		0.974	
..Large Rural	0.852		0.902		0.989		0.763		0.794	
..Small Rural	0.862		0.824		0.731		0.956		0.791	
..Rural (Small + Large Rural)		0.939		1.081		0.882		0.928		1.165
M/SU Disorder Severity† (reference = Mild)										
..Moderate	1.931**	2.121***	1.443	1.313	1.399	0.578				
..Severe	1.674*	1.735*	1.682**	1.318	1.761	0.652				
DS Resource Demand Scale† (reference = Minimal to Less Intensive<37.5)										
..Moderate	1.790*	2.892*	1.923*	5.807*	1.608**	2.835**	4.464*	2.000	1.267	2.563
..Highly intensive	4.527***	15.705***	9.384***	20.267***	4.500***	7.128***	38.092***	12.988***	6.032***	12.910***
Community Characteristics										
Number of Community Mental Health Centers in the County	0.906	0.552	0.882	1.053	0.976	0.643*				

Characteristics	SUD Only		Mental Disorder Only		Co-Occurring M/SUD		DIAB		CRD	
	State A	State B	State A	State B	State A	State B	State A	State B	State A	State B
Number of Psychiatric and Chemical Dependency Beds in Short Term General Hospitals Set Up per Capita in the County	1.012	1.493	0.955	0.550	0.931	1.562				
Shortage Area for Mental Health Practitioners	1.036	1.339	0.703	0.794	1.048	1.169				
Number of Federally Qualified Health Centers in the County							1.031	0.968	1.016	0.978
Shortage Area for Primary Care Physicians							0.995	1.044	0.810	1.289
Number of Short Term General Hospitals with EDs in the County							0.970	0.952	0.994	1.059
Number of Short Term General Hospitals with Primary Care Departments in the County							1.009	0.981	0.952	0.964

Source: AHRQ Healthcare Cost and Utilization Project, State Inpatient Databases and State Emergency Department Databases.
Note: SUD = substance use disorder; M/SUD = mental and substance use disorder; DIAB = diabetes; CRD = chronic respiratory disease; DS = Disease Staging
[†]Maximum scores based upon all visits were assigned each patient. *** P-value ≤ .001, ** P-value ≤ .01, * P-value ≤ .05

The “other government” expected payer category is a puzzle. While ED visits billed to public insurance were much more likely to result in hospital admission, patients covered by public services were not more likely to be readmitted. This is despite the presumption that patients with co-occurring M/SUD are in the local public MHSA treatment system because they are the most complicated patients to manage. Here, a possible explanation is that many of these “other government” cases became assigned to public programs because of their first encounter with emergency services. Hospitals typically have discharge planners who work during an uninsured patient’s stay to get that patient enrolled in public services. If successful, the patient becomes a “covered” patient, and their hospital care is reimbursed by the state or local government. Once enrolled in public services, these patients may be better managed and less likely to need emergency hospitalization in the future.

***Severity measures*:** The Disease Staging Resource Demand Scale had a strong, positive, and significant effect on the probability of multiple ED-IP stays in both states across all five conditions. After accounting for that generalized measure, the M/SU disorder-specific severity categories were significant for patients with SUD Only in both states and for those with Mental Disorder Only in State A.

Hospital Characteristics

Because there were multiple hospital members for individual patients, the hierarchical linear model of multiple-ED-IP-stay outcomes could not converge. Thus, the multiple-ED-IP-stay models do not include hospital characteristics.

County Characteristics

Community Outpatient Resources: County factors were not significant predictors of multiple ED-IP stays with one exception. Among patients with at least one ED-IP stay, the odds of multiple ED-IP stays were lower for patients with Co-Occurring M/SUD in State B who resided in counties with more community mental health centers. Community mental health centers sometimes have crisis teams in hospitals that screen possible admissions in EDs and divert them to community based services, when possible. The presence of more mental health centers in counties in State B may have helped patients with Co-Occurring M/SUD who had an ED-IP stay avoid readmission. However, because community characteristics were insignificant for all other conditions, this is not a consistent finding. Again, it is also important to note that specialty psychiatric and chemical dependency hospitals are not counted in these community resource measures.

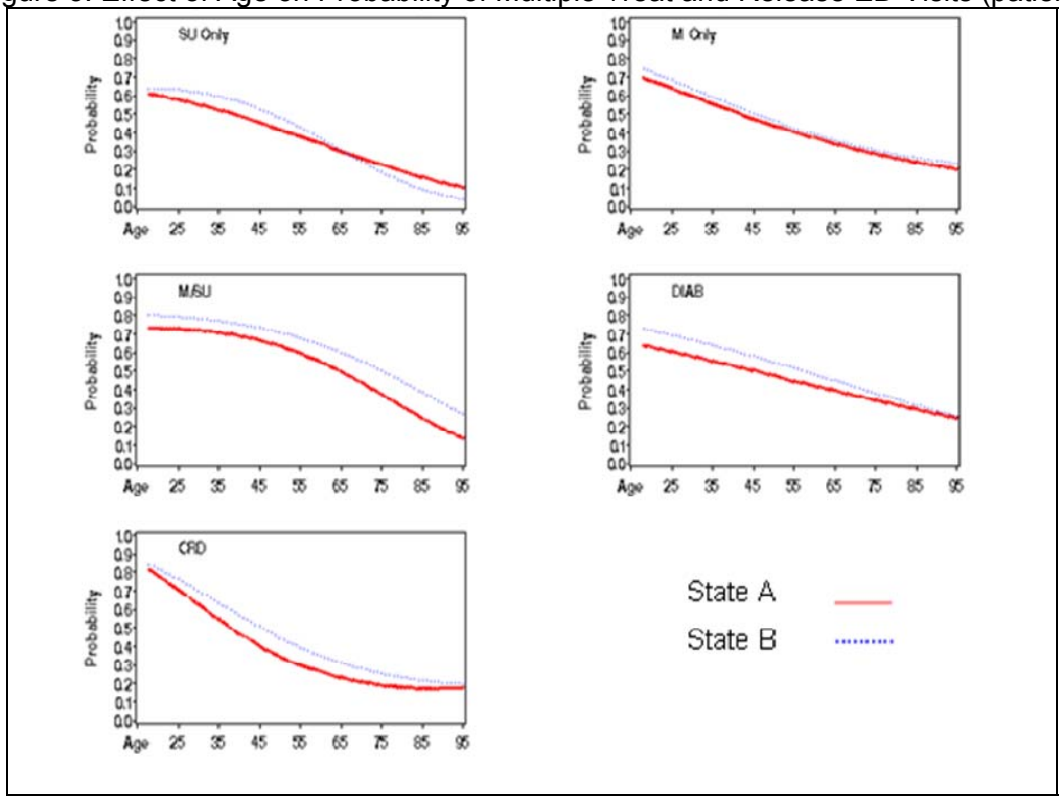
The Probability of Multiple Treat and Release ED Visits (Patient Level)

This section focuses exclusively on *patients* who had multiple ED visits that did not result in hospitalization (treat and release ED visits). The outcome was binary—whether or not a patient had more than one treat and release ED visit. The patient was the unit of analysis. And, ED visits that resulted in a hospitalization (ED-IP stay) were excluded. Table 5 shows the estimated odds ratios that a patient had more than one treat and release ED visit.

Patient Characteristics

Age: Figure 3 shows the effect of age on the probability of multiple treat and release ED visits, holding other factors constant at their sample averages. Unlike previous models, the probability of multiple treat and release ED visits starts high and declines steeply with age for both states and across all conditions. Youth 18 years of age had about a 60 to 80 percent probability of having multiple treat and release ED visits after an initial visit in 2002. This suggests that many repeat treat and release ED visits for patients are related to youth in crisis, whether related to M/SU disorders or chronic conditions of diabetes or chronic respiratory disease. The striking similarities across states and across conditions of high rates at young ages raise important questions: Were these chronic diseases managed well for youth in the health system before 2002? Has there been enough attention paid to prevention and comprehensive treatment of addiction among the young population with M/SU disorders?

Figure 3: Effect of Age on Probability of Multiple Treat and Release ED Visits (patient-level)



Note: SU Only = Substance Use Disorder Only; M Only = Mental Disorder Only; M/SU = Co-Occurring Mental Disorder and Substance Use Disorder; CRD = Chronic Respiratory Disease; DIAB = Diabetes

Gender: The effect of gender was significant for three of the six study conditions. In both states, the estimated odds of multiple treat and release ED visits for patients with Mental Disorders Only were over 22 percent higher for females than for males. The odds of multiple treat and release ED visits for patients with diabetes were 18 and 26 percent higher for females than males in States B and A, respectively. However, the odds of multiple treat and release ED visits for patients with chronic respiratory disease were 6 and 11 percent lower for females than for males in State A and B, respectively.

Income: Whether significant or not, the estimated effect of the median income for the patient's ZIP Code was almost always negative—the higher the income, the lower the probability of repeat treat and release ED visits. The significant results are as follows: In State A, for chronic

respiratory disease, every $10,000 increase in median income of the ZIP Code lowered the odds of multiple treat and release ED visits by about 4 percent. Income is not significant for any other conditions in State A.

In State B, for every $10,000 increase in median ZIP Code income, the estimated odds of multiple treat and release ED visits drop by 6% for SUD Only, by 12 percent for Mental Disorders Only, by 10 percent for Co-Occurring M/SUD, and by 6 percent for chronic respiratory disease. Consequently, in State B, patients from more affluent neighborhoods tend to have fewer ED visits.

Race/Ethnicity: The estimated odds of multiple treat and release ED visits are higher for black patients than for white patients in six out of 10 study groups. The odds ratios for black patients with diabetes and chronic respiratory disease relative to white patients ranged from 1.3 to 1.5. For SUD Only in State A, the odds for blacks are an estimated 45 percent higher. For Mental Disorder Only in State B, the odds for blacks are about 11 percent higher.

***Primary Expected Payer*:** For both states and for every condition, the odds of multiple treat and release ED visits are significantly higher for patients whose primary expected payer is Medicare, Medicaid, or uninsured compared with patients who have private insurance. The only exception is that the odds ratios for diabetes are not statistically significant for the uninsured in either state. For Medicare, the odds ratios range from 1.3 to 1.9; for Medicaid, from 1.3 to 2.6; and for the uninsured, from 1.1 to 1.5.

These results are consistent with the assumption that patients with Medicare, Medicaid, or who are uninsured are less likely than privately insured patients to have a usual source of ambulatory care. Different experiences and learned attitudes across patient populations with different payers about where to go for emergency care—the hospital ED or first call the primary care doctor or private insurance hotline—may be reflected in these results. Also, the severity of conditions among Medicare, Medicaid, and uninsured patients may not be fully captured in severity measures and may be reflected in these payer-specific results.

Severity: The estimated effects of the severity measures are similar to the previous two models' results—more severe patients have higher odds of multiple treat and release ED visits—with one notable exception. For Mental Disorder Only in both states, the estimated odds of multiple treat and release ED visits are lower for severe patients compared with mild and moderate patients. For the patients with Mental Disorder Only, Tables 6 and 7 compare the frequency of where the patient was discharged from the ED (patient disposition) between severe patients and mild or moderate patients for State A and State B, respectively. In both States, severe patients had a significantly greater tendency than mild and moderate patients to be sent, after stabilization in the ED, to another short-term hospital (presumably with a psychiatric/chemical dependency unit or possibly to a psychiatric or chemical dependency hospital). Therefore, one possible explanation for the fewer repeat treat and release ED visits for Mental Disorder Only is that the most severe Mental Disorder Only patients are treated at community hospitals with specialty psychiatric services or at psychiatric hospitals, and through those services people, with severe mental illness were more likely to be placed into appropriate treatment programs and less likely to return repeatedly for treat and release ED services.

Hospital Characteristics

Because there were multiple hospital members for individual patients, the hierarchical linear model of multiple-treat and release ED outcomes could not converge. Thus, the multiple treat and release ED models do not include hospital characteristics.

Table 5: Likelihood of Multiple Treat and Release ED Visits in Two States (Patient Level): Estimated Odds Ratios from the HLM Logistic Regressions, 2002

Characteristics	SUD Only		Mental Disorder Only		Co-Occurring M/SUD		DIAB		CRD	
	State A	State B	State A	State B	State A	State B	State A	State B	State A	State B
Patient Characteristics										
(Age – 40) / 10 (i.e., centered on 40 and scaled to decades)	0.765***	0.759***	0.725***	0.700***	0.819***	0.820***	0.809***	0.776***	0.559***	0.586***
$((Age – 40) / 10)^2$	0.979	0.939***	1.011*	1.019**	0.950***	0.967*	0.998	0.996	1.061***	1.043***
Median Zip Income / $10,000	0.959	0.936*	0.991	0.876***	0.977	0.899**	1.037	0.973	0.965**	0.944***
Female (reference = Male)	1.123	0.987	1.240***	1.223***	1.039	0.893	1.257***	1.176**	0.942*	0.893***
Ethnicity (reference = White for State A/White and others for State B)										
..Black	1.451***	1.048	1.081	1.106*	1.063	0.843	1.331**	1.522***	1.335***	1.441***
..Hispanic	1.446	0.279**	1.259	0.544**	0.802	0.573	0.821	0.541	0.748*	0.920
Insurance (reference = Private)										
..Medicare	1.701***	1.775***	1.330***	1.645***	1.853***	1.542**	1.324**	1.383***	1.603***	1.423***
..Medicaid	2.635***	2.004***	1.921***	1.893***	2.083***	1.808***	1.874***	1.349**	2.293***	1.960***
..Other Government	1.929**	0.866	1.343**	1.138	0.895	0.698	0.879	1.107	1.370***	1.198
..Uninsured	1.507***	1.298**	1.145**	1.145**	1.314***	1.401***	1.194	1.097	1.184***	1.285***
Patient Location (reference = Large Metropolitan for State A, Urban for State B)										
..Small Metropolitan	1.203		1.063		0.925		0.993		1.154	
..Large Rural	1.487		1.139		1.091		1.020		1.054	
..Small Rural	1.077		1.060		1.052		1.147		1.021	
..Rural (Small + Large Rural)		1.075		0.870		0.907		1.183		0.937
M/SU Disorder Severity† (reference = Mild)										
..Moderate	1.362***	1.523***	1.937***	2.026***	2.300***	2.168***				
..Severe	1.547***	1.809***	0.845**	0.701***	1.937***	2.151***				
DS Resource Demand Scale† (reference = Minimal to Less Intensive < 37.5)										
..Moderate	14.296***	15.226***	5.425***	6.160***	4.442***	5.280***	5.613***	7.854***	3.995***	4.276***
..Highly intensive	13.832***	17.322***	7.996***	10.507***	6.633***	9.679***	8.516***	16.330***	8.741***	11.450***

Characteristics	SUD Only		Mental Disorder Only		Co-Occurring M/SUD		DIAB		CRD	
	State A	State B	State A	State B	State A	State B	State A	State B	State A	State B
Community Characteristics										
Number of Community Mental Health Centers in the County	0.993	1.210	0.783***	0.706	0.803*	0.773				
Number of Psychiatric and Chemical Dependency Beds in Short Term General Hospitals Set Up per Capita in the County	0.852	2.149***	1.161**	3.004***	1.014	2.633**				
Shortage Area for Mental Health Practitioners	0.957	0.781**	1.089	1.319	1.176	1.079				
Number of Federally Qualified Health Centers in the County							0.872*	1.045	0.767***	0.990
Shortage Area for Primary Care Physicians							1.169	0.885	1.041	0.634**
Number of Short Term General Hospitals with EDs in the County							1.030	0.948	1.107	1.022
Number of Short Term General Hospitals with Primary Care Departments in the County							1.029	0.940	0.945	0.860**

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases;
Note: SUD = substance use disorder; M/SUD = mental and substance use disorder; DIAB = diabetes; CRD = chronic respiratory disease; DS = Disease Staging
[†]Maximum scores based upon all visits were assigned each patient. *** P-value ≤ .001, ** P-value ≤ .01, * P-value ≤ .05

Table 6: Patient Disposition by M/SU Disorder Severity for Patients with Mental Disorder Only and a Treat and Release ED Visit in State A, 2002

	Index Visit Disposition						
	Routine*	Other Short-Term Hospitals*	Another Type of Facility*	Home Care*	Against Medical Advice*	Died in hospital	Total
Minimum to Moderate	9,456 (93.64%)	150 (1.49%)	337 (3.34%)	16 (0.16%)	129 (1.28%)	3 (0.03%)	10,098
Severe	2,624 (74.38%)	286 (8.11%)	541 (15.33%)	12 (0.34%)	59 (1.67%)	2 (0.06%)	3,528

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases
Note: 1. The sample used for this analysis was limited to those patients without ED-IP stays.
2. Seven cases were missing disposition data for mild to moderate categories and 4 cases were missing for the severe category.
* Differences between minimum-to-moderate and severe categories are statistically significant at the 5 percent level.

Table 7: Patient Disposition by M/SU Disorder Severity for Patients with Mental Disorder Only and a Treat and Release ED Visit in State B, 2002

	Index Visit Disposition						
	Routine*	Other Short-Term Hospitals*	Another Type of Facility*	Home Care*	Against Medical Advice*	Died in hospital	Total
Minimum to Moderate	7,670 (92.25%)	69 (0.83%)	464 (5.58%)	2 (0.02%)	85 (1.02%)	5 (0.06%)	8,314
Severe	2,108 (75.94%)	126 (4.54%)	490 (17.65%)	2 (0.07%)	37 (1.33%)	3 (0.11%)	2,776

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases
Note: 1. The sample used for this analysis was limited to those patients without ED-IP stays.
2. Nineteen cases were missing disposition data through the moderate category and 10 cases were missing for the severe category.
* Differences between the minimum-to-moderate and the severe categories are statistically significant at the 5 percent level.

County Characteristics

Community Outpatient Resources: In State A, the likelihood of multiple treat and release ED visits for patients with Mental Disorder Only and Co-Occurring M/SUD declined as the number of community mental health centers increased across counties. In State B, the probability of multiple treat and release ED visits for patients with SUD Only was significantly lower in counties that had a shortage of mental health practitioners vs. those counties that did not have a shortage, contrary to expectations. Community resources results were also inconsistent in the models for physical conditions. Again, note that specialty psychiatric and chemical dependency hospitals are not counted in these community resource measures.

Conclusions

This section summarizes results for M/SU disorders by study hypotheses. There were 18 M/SU disorder-related analyses in this study—3 dependent variables, by 3 M/SU disorder categories, by 2 states—in which we examined the relationships among various factors and the use of ED services. We note below the number of analyses that supported each hypothesis.

H1: Frequent use of emergency hospital services among those with at least one ED visit increases with the severity of chronic conditions.

Overall, the analyses strongly supported this hypothesis, especially for patients with complicated Co-Occurring M/SUD. The simple descriptive statistics showed that patients with Co-Occurring M/SUD were much more likely than those with any of the other four study conditions to use ED services of all types (Table 8, below, derived from Tables B.3 and B.4). The per-person mean number of ED visits for those with Co-Occurring M/SUD was almost twice that of the other conditions, suggesting that patients with Co-Occurring M/SUD put a disproportionate strain on hospital EDs with their repeated use of ED services. This pattern was evident across all measures, except that ED visits for patients with diabetes were more likely to result in admission than ED visits for patients with M/SU disorders. Despite the fact that ED visits for patients with diabetes more often have circumstances requiring the visits to result in admission, patients with diabetes do not have high rates of multiple treat and release visits to the ED compared to patients with M/SU disorders.

Table 8: ED Utilization, By State and Condition, 2002

Type of Utilization	State A					State B				
	SUD Only	Mental Disorder Only	Co-Occurring M/SUD	DIAB	CRD	SUD Only	Mental Disorder Only	Co-Occurring M/SUD	DIAB	CRD
Mean number of ED visits per person	2.41	2.70	4.27	2.32	2.36	2.56	2.77	4.38	2.51	2.57
Mean number of ED-IP stays per person	0.39	0.37	1.12	0.70	0.32	0.35	0.24	0.71	0.70	0.33
Percent of ED Visits or Patients with:										
ED-IP stays (% of visits)	16.3	13.7	26.3	30.3	13.4	13.5	8.9	16.2	28.0	13.0
Multiple ED-IP stays (% of patients)	6.3	5.8	23.7	13.9	6.1	6.7	3.5	13.8	14.2	6.5
Multiple treat and release ED visits (% of patients)	51.9	57.3	74.6	54.1	55.4	54.0	59.1	76.5	58.5	58.1

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.
Note: SUD = substance use disorders; M/SUD = mental and substance use disorders; DIAB = diabetes; CRD = chronic respiratory disease

In multivariate analyses, we were surprised by the strength of the M/SU Disorder Severity measure that reflected the likely mild, moderate, or severe social dysfunction of patients with specific M/SU disorders. The M/SU Disorder Severity measure was especially important for patients with Co-Occurring M/SUD, despite the fact that a general severity measure also controlled for the expected resource demands of these patients compared to *all types* of hospital patients' conditions and comorbidities.

As shown in Table 9 (derived from Tables 3-5), the severity measure on functioning was strongly related to the probability of an ED visit for M/SU disorders resulting in admission. At the visit level, mild, moderate, and severe Co-Occurring M/SUD showed increasingly greater effects on the likelihood of the visit resulting in admission, doubling in effect at each severity level. For example, in one state it was from 7 times, to 14 times, to 28 times those patients admitted for some other reason. This severity measure for patients with Co-Occurring M/SUD also related positively to multiple treat and release ED visits. However, "moderate" and "severe" conditions showed little difference in their effect on the likelihood of multiple treat and release ED visits; they both were associated with double the odds of having multiple treat and release ED visits compared to patients with mild conditions.

Table 9: Summary of Odds Ratios of ED Utilization by M/SU Disorder and Severity of Illness, Controlling for Patient, Hospital, and County Characteristics, by State, 2002**

Condition and	State A			State B		
Type of Utilization	Mild	Moderate	Severe	Mild	Moderate	Severe
SUD Only						
Probability of admission (visit level)	7.93*	24.26*	24.73*	3.96*	14.94*	16.78*
Probability of multiple ED-IP stays (patient-level)	Ref.	1.93*	1.67*	Ref.	2.12*	1.74*
Probability of multiple treat and release ED visits (patient level)	Ref.	1.36*	1.55*	Ref.	1.52*	1.81*
Mental Disorder Only						
Probability of admission (visit level)	2.29*	2.12*	6.52*	1.51*	1.30*	3.95*
Probability of multiple ED-IP stays (patient level)	Ref.	1.44	1.68*	Ref.	1.31	1.32
Probability of multiple treat and release ED visits (patient level)	Ref.	1.94*	0.85*	Ref.	2.03*	0.70*
Co-Occurring M/SUD						
Probability of admission (visit level)	7.04*	14.44*	28.28*	4.33*	8.63*	19.73*
Probability of multiple ED-IP stays (patient level)	Ref.	1.40	1.76	Ref.	0.58	0.65
Probability of multiple treat and release ED visits (patient level)	Ref.	2.30*	1.94*	Ref.	2.17*	2.15*

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases
Note: SUD = substance use disorder; M/SUD = mental and substance use disorders
*P-value ≤ 0.05 or better.
**Reference group for ED-IP stay is visits for non-Mental Disorder-Only and non-SUD-only conditions; reference group for multiple ED-IP stays and multiple treat and release ED visits are those with mild Mental Disorder Only or mild SUD Only.

This "flatter" (though substantial) impact could be because people who show up at the ED and who are treated and released are by definition "less severe" among the most "severe" group. It could also be because decisions about who is admitted for inpatient care are controlled by physicians and hospital personnel who evaluate severity and base their admission decisions on it. However, hospital personnel cannot control who visits the ED, and people with a tendency to return frequently to the ED may be using it as a source of primary health care—less driven by severity. This is consistent with another study that showed that repeat ED users have less severe problems and continue to be serial users over time (Cook et al., 2004). Thus, for people with Co-Occurring M/SUD, repeat visitors to the ED may not be the most severe of the "severe" clients.

For patients with SUD Only, the impact of functional severity was also important—fairly strong and fairly consistent by severity levels. However, for patients with Mental Disorder Only, the results were more equivocal. For them, the most severe patients were less likely to visit the ED multiple times than patients with mild conditions. This may be related to the fact that based on national spending estimates (Mark et al., 2005), people with mental disorders are more likely to be admitted to specialty hospitals (psychiatric hospitals) than are people with SUD.

Of the 42 effects between severity categories and ED visits shown in Table 9, 32 show higher severity groups with increased utilization of ED services. Of the 18 state-specific, condition-specific utilization analyses (ED visits resulting in admission, multiple ED-IP stays, and multiple treat and release ED visits for the three Co-Occurring M/SUD and two states), 7 show monotonic increases in use as severity increases (each severity category successively higher).

The results for this hypothesis suggest that severity of M/SU disorders related to functioning is an important correlate of inpatient utilization and repeated use of EDs. Severity of illness should be controlled in evaluating effects of other factors on outcomes of care.

Other patient characteristics (in addition to severity) affected the use of ED services for people who had at least one ED visit. The effects of age varied by disease and type of ED use, but were essentially identical for the two states (Figures 1, 2, and 3). Income and insurance status (see H2, below) had an effect. Depending on the study condition, ED visits for patients with lower income were less likely to result in admission than ED visits for patients with higher income (Table 3); the lower the income of the patients, the higher the likelihood of multiple treat and release ED visits (Table 5). The effects of gender were usually statistically significant. ED visits for females were less likely than ED visits for males to result in admission (Table 3), but females with only mental disorders or diabetes were more likely to have had multiple treat and release ED visits (Table 5). The effects of minority races were often statistically significant compared to whites for some study conditions. ED visits for blacks with Mental Disorders Only, and in State B those with Co-Occurring M/SUD, diabetes or chronic respiratory disease were less likely to result in admission (Table 3), but black patients with SUD Only or diabetes in State A or those with chronic respiratory disease in State A or B were more likely to have had multiple ED-IP stays (Table 4). Black patients with chronic respiratory disease, diabetes, SUD only (State A), or Mental Disorder only (State B) were more likely to have multiple treat and release ED visits (Table 5). Effects for Hispanics differed across conditions and between the states, sometimes with large effects. In general, patient characteristics were stronger than any hospital or community characteristics.

H2: Individuals who use the ED and who have evidence of third-party health care coverage (e.g., insurance or subsidy programs expected to pay the bill) use fewer subsequent hospital ED services.

The converse of this hypothesis is that people who visit the ED and have no coverage—the uninsured—use more subsequent ED services, presumably because of poorer access to primary care.

Our analysis found mixed, but explainable, results for this hypothesis (Table 10, derived from Tables 3-5). People with M/SU disorders (regardless of whether it was co-occurring or a single diagnosis) who were uninsured were more likely to have multiple treat and release ED visits, as expected, during the year compared to the privately insured. However, uninsured ED visits were not more likely to result in admission compared to visits billed to private insurance nor were uninsured patients more likely to have multiple ED-IP admissions. This finding held even when

controlling for patients' demographic characteristics and severity of illness, indicating that the lack of insurance, rather than the characteristics of the uninsured, affected their lower probability of admissions.

Table 10: Summary of Odds Ratios of ED Utilization by M/SU Disorders and Type of Payer, Controlling for Patient, Hospital, and County Characteristics, by State, 2002**

Condition and Type of Utilization	State A				State B			
	Uninsured	Oth.Govt.	Medicaid	Medicare	Uninsured	Oth.Govt.	Medicaid	Medicare
SUD Only								
Probability of admission (visit level)	0.83*	1.15	0.80*	0.88	0.46*	2.42*	0.71*	0.75*
Probability of multiple ED-IP stays (patient level)	1.32	1.00	1.94*	1.46	1.09	1.69	1.94*	2.49*
Probability of multiple treat and release ED visits (patient level)	1.51*	1.93*	2.64*	1.70*	1.30*	0.87	2.00*	1.78*
Mental Disorder Only								
Probability of admission (visit level)	0.56*	1.20	0.75*	0.81*	0.36*	1.38*	0.67*	0.60*
Probability of multiple ED-IP stays (patient level)	0.66*	0.63	1.18	1.49*	0.88	0.89	1.06	1.01
Probability of multiple treat and release ED visits (patient level)	1.15*	1.34*	1.92*	1.33*	1.15*	1.14	1.89*	1.65*
Co-Occurring M/SUD								
Probability of admission (visit level)	0.65*	1.92*	0.64*	0.61*	0.52*	1.85*	0.74*	0.55*
Probability of multiple ED-IP stays (patient level)	1.01	0.72	1.43*	1.69*	0.89	1.16	1.50*	1.56*
Probability of multiple treat and release ED visits (patient level)	1.31*	0.90	2.08*	1.85*	1.40*	0.70	1.81*	1.54*

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases
Note: SUD = substance use disorder; M/SUD = mental and substance use disorder
**Reference Group: Private insurance as expected payer
*P-value ≤ 0.05 or better.

The admission-related results may have been influenced by hospital policies. Hospitals may have been particularly vigilant about keeping the uninsured out of the hospital to reduce "bad debt." This may explain why the uninsured visits were less likely to result in admission to the hospital and uninsured patients were as likely to have multiple ED-IP stays as privately insured patients. However, hospitals cannot control who comes to the ED. In addition, hospitals are required by Federal regulation for Medicare certification (EMTALA) to stabilize everyone who comes to the ED. Thus, patients who were uninsured were more likely to visit EDs repeatedly (perhaps as a usual source of care) but were less likely to be admitted—either appropriately or inappropriately.

The puzzling result in the analysis was that the probability of multiple treat and release ED visits by patients without insurance is no higher (compared to the privately insured) than Medicaid and Medicare (compared to the privately insured). We expected individuals under Medicaid or Medicare, once analyzed with severity held constant, to require and use fewer ED services than those without healthcare coverage. We expected this because people in the public Medicare and Medicaid programs presumably had better access to care for physical and mental conditions, resulting in better chronic disease management and less need for ED care.

One explanation is that these programs do not measure up to care received by people with private insurance in terms of access to care or management of chronic diseases. Psychiatrist

and psychologist participation in Medicaid has been substantially lower than other specialists. In the mid-1990s, only 28 percent of psychiatrists versus 56 percent of all specialists and 36 percent of primary care physicians participated in Medicaid (Perloff et al., 1995).

Another possible explanation is that the severity-of-illness measures are not fully capturing the problems of Medicare beneficiaries and Medicaid recipients, or the disabilities that make them eligible for the various health insurance programs (e.g., Social Security Disability Insurance for those on Medicare or poverty related to unemployment resulting from M/SU-related disabilities). Medicare or Medicaid patients with M/SU disorders, who have qualified for insurance based on disability, may by definition be more impaired than uninsured patients with M/SU disorders; and thus utilize more ED services.

Other government payers (state or county mental health or substance abuse agencies partly funded by Federal block grants as well as the Department of Veterans' Affairs and the Department of Defense) supported clients with M/SU disorders who sometimes used more emergency services than enrollees of private insurance. Six out of 18 analyses showed statistically significant and substantially higher utilization for patients with other government services as the expected payer compared to private insurance.

H3: ED visits for patients with M/SU disorders at hospitals with services for treating M/SU disorders are more likely to result in admission than ED visits at other hospitals. We expected that use of repeated ED visits for patients with M/SU disorders and ED visits related to M/SU disorders resulting in admission would take place more likely at the largest hospitals with comprehensive services and at hospitals with specific MHSA-related services. Note that we could only test this hypothesis for the probability of an ED visit resulting in admission because the hospital-specific statistical results would not converge for the other outcome measures (multiple ED-IP stays and multiple treat and release ED visits per patient) because of multiple hospital use by some patients.

The analysis strongly supported the expectation that the odds of ED visits for M/SU disorders resulting in admission was greater for the largest hospitals than the odds of admission for visits occurring in the smaller hospitals (Table 11, derived from Table 3). In fact, the statistically significant and large logarithmic effect of number of beds indicated that the larger the hospital, the much more likely an ED visit would result in admission. In State A, this was especially true for psychiatric conditions (Mental Disorder Only and Co-Occurring M/SUD) compared to the other study conditions. In State B, the effect of hospital size on admission probability was the same across all five conditions studied. For SUD in both states, the increased likelihood of an ED visit resulting in admission in larger hospitals was comparable to the magnitude of the effect for physical health conditions studied (diabetes and chronic respiratory disease).

However, we were surprised to find a paucity of specific hospital characteristics related to the probability of an ED visits resulting in admission, regardless of condition analyzed. The only hospital characteristic other than size related to the probability of an ED visit resulting in admission for more than one condition was for-profit hospital ownership (Table 3). For two conditions in State A (Co-Occurring M/SUD and chronic respiratory disease), for-profit hospitals were much less likely than public hospitals to have ED visits resulting in admission for patients with the study conditions. For the other study conditions treated in State A, the results were not statistically significant. In State B, there was no statistically significant effect in the association between for-profit ownership and probability of an ED visit resulting in admission for any study condition. The greater concentration of for-profit ownership in the South compared to the

Midwest might explain this inconsistency. Where hospital ownership for-profit commonly exists, these hospitals may operate more like typical community hospitals, whether public or private.

Table 11: Summary of Odds Ratios of ED Visit Resulting in Admission and Associated with the Number (in logarithms) of Beds in the Hospital by M/SU Disorders, Controlling for Patient, Other Hospital, and County Characteristics, by State, 2002.

	Probability of admission in relation to the log of beds setup and staffed (visit level)	
Condition	State A	State B
SUD Only	1.70*	1.56*
Mental Disorder Only	2.19*	2.08*
Co-Occurring M/SUD	1.60*	1.55
DIAB	1.50*	1.62*
CRD	1.88*	1.63*

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases;
Note: SUD = substance use disorder; M/SUD = mental and substance use disorders DIAB = diabetes; CRD = chronic respiratory disease
*P-value =<0.05 or better.

Community Resource Effects on ED Use

Most associations between county-level resources (i.e., number of community mental health centers and county designation as a shortage area for mental health professionals) and ED utilization were not statistically significant (Table 12, derived from Tables 3-5). Only 5 of the 18 tests for the effect of community mental health centers were as expected and statistically significant. Only 1 of the 18 tests for the effect of a county as a designated shortage area for mental health professionals was significant and in the expected direction of raising ED use; one other test was significant but in the opposite direction than expected.

Table 12: Summary of Odds Ratios of ED Utilization Associated with the Level of Community Resources in the County by M/SU Disorders, Controlling for Patient, Hospital, and County Characteristics, by State, 2002.

	State A		State B	
Condition and Type of Utilization	Number of CMHCs	Shortage area for mental health professionals	Number of CMHCs	Shortage area for mental health professionals
SUD Only				
Probability of admission (visit level)	0.91	0.96	1.08	1.05
Probability of multiple ED-IP stays (patient level)	0.91	1.04	0.55	1.34
Probability of multiple treat and release ED visits (patient level)	0.99	0.96	1.21	0.78*
Mental Disorder Only				
Probability of admission (visit level)	0.91*	1.23*	0.88	1.08
Probability of multiple ED-IP stays (patient level)	0.88	0.70	1.05	0.79
Probability of multiple treat and release ED visits (patient level)	0.78*	1.09	0.71	1.32
Co-Occurring M/SUD				
Probability of admission (visit level)	1.05	1.10	0.76*	0.98
Probability of multiple ED-IP stays (patient level)	0.98	1.05	0.64*	1.17
Probability of multiple treat and release ED visits (patient level)	0.80*	1.18	0.77	1.08

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.
Note: SUD = substance use disorder; M/SUD = mental and substance use disorders; CMHC = Community Mental Health Centers
*P-value =<0.05 or better.

The results related to county-level resources suggest that better measures of county resources for MHSA treatment may be needed. For example, there were no measures of county resources for substance abuse treatment. The Area Resource File, the source of county statistics in this study, only contains information on certified Medicare providers. Two data sources of the SAMHSA may be a better source. The Inventory of Mental Health Organizations maintains a record of community mental health centers, and the Inventory of Substance Abuse Treatment Services maintains a record of substance abuse treatment facilities. These sources could be evaluated and compared with Medicare's inventory and new measures could be proposed to the Health Resources and Services Administration for the Area Resource File.

Limitations of the Study

There are several limitations of this study that need to be taken into account when interpreting the results of this study.

Generalization of the results is limited. Only two states in HCUP for 2002 data were judged at the outset to have data sufficiently reliable to support analysis at the patient level. Thus, we could not make national generalizations from the findings. In addition, the data were not appropriate to assess overall ED utilization by the total U.S. population, state population or population of individuals with M/SU disorders (including those who did not use any ED services during the year).

The data source for this study was administrative discharge records that summarize the hospital experience of the patient, typically, for the purpose of submitting claims for payment. These records undoubtedly were influenced by payment policies of payers. Because services for SUD are often not covered by private insurance, are limited as optional Medicaid services, and are subject to the ED physicians' experiences with, or knowledge of the intoxication exclusion of, the Uniform Accident and Sickness Policy and Provision Law (UPPL) incentives, SUD may be underreported in these data. Other research suggests that the true prevalence of SUD in EDs may be close to 30 times what is observed in ED records (Rockett et al., 2003). A SUD may be reported as a mental disorder to assure payment or may be omitted from the records of patients with other primary or principal physical or mental diseases. Thus, the prevalence of SUD and co-occurring M/SUD in hospital treatment settings may be underestimated in this study, in general, and the number of ED events including the number of ED-IP stays may have been undercounted for the uninsured.

All analyses were conditional on patients having had at least one ED event. Thus, analyses omitted certain people with the study condition: 1) those with the condition, but undiagnosed; 2) those diagnosed, but who had no treatment at all during the year; 3) those who had some combination of treatment that did not involve EDs—those with only ambulatory care visits (in private offices or public health centers), and 4) those with inpatient stays not admitted through the ED. These omissions limit the view of this study to people with at least one ED event.

The patient-level counts might underestimate the average per-person ED use. Only one year of data (2002) was examined in a cross-sectional analysis. Thus, the counts of repeat hospitalizations and ED visits were truncated by the annual observations. Some patients may have had other visits and stays at institutions outside of the study states. These two limitations would have an effect on descriptive statistics, but probably little effect on comparative results across conditions, because all conditions should be affected by these phenomena.

This study did not examine service use by specific types of M/SU disorders. For example, it did not address the questions of how people with schizophrenia use ED care compared to people with mood and anxiety disorders, or how people with alcoholism use services compared to people with drug abuse/dependence, or how use of specific substances affected service use. Patterns may differ considerably by diagnosis. Future analysis of HCUP data could explore many of these distinctions.

The study is limited in the exploration of the relationship between use of ED services and insurance coverage. HCUP data in this study include information on primary expected payer, by definition, a mutually exclusive concept. The data do not include information on health insurance coverage, in which individuals may have multiple types of insurance or be intermittently enrolled in an insurance plan over the course of a year. Because HCUP data are based on billing records, the data contain information on which type of insurance is billed or may be expected to pay for the care, but not necessarily which insurance ultimately pays for the care.

The measures of community ambulatory care resources lacked precision and were probably inadequate in this study. The Area Resource File does not indicate whether specialty substance abuse centers are included in the measure of community mental health centers, which typically are separate from substance abuse centers. Community mental health centers in the Area Resource File are derived from mental health centers certified by the Centers for Medicare and Medicaid Services through its Online Survey and Certification Reporting System. Without examining the Online Survey and Certification Reporting System list of centers against the SAMHSA-identified universe of substance abuse centers (based on Inventory of Substance Abuse Treatment Services), the extent to which substance abuse centers are included cannot be determined. Also, the level of residential services available in counties is not captured by the Area Resource File. In addition, the measure for availability of mental health professionals may be imprecise given the complex relationships between payment and willingness of mental health professionals to participate in programs. For example, psychiatrists and psychologists have a very low participation rate in Medicaid programs (IOM, 2006b, p. 328). Furthermore, while services for treating M/SU disorders may be available in a community, we did not examine whether individual patients had access to or used services. Thus, the test of the effect of community resources on use of emergency services is a weak test.

Policy Implications

This analysis provided insights into the use of ED services by patients with M/SU disorders. Four implications for consideration by organizations that influence the care of people with M/SU disorders are discussed below.

The Health Care Utilization

Among those who used the ED in 2002, patients with M/SU disorders used the ED as frequently, and sometimes more frequently than, patients with diabetes and chronic respiratory disease. While there is no *a priori* notion about what the level of ED utilization should be for a particular chronic disease, even higher utilization for patients with Co-Occurring M/SUD raises two issues. First, it supports the idea that M/SU disorders are conditions that need to be treated as chronic conditions and managed well (McLellan et al., 2000). Otherwise they result in repeated demands for costly emergency services, which, to some extent, should be avoidable.

Second, it raises questions about access to outpatient care and to effective preventive services for people with M/SU disorders. Can MHSA treatment be improved to reduce ED utilization? What are the attributes of high users of emergency services?

Use of MHSA services appears to be more problematic for people with Medicaid and no insurance. ED visits billed to Medicaid or as uninsured are much less likely to be admitted for inpatient treatment than ED visits billed to private insurance, even when severity, age, and other attributes of the patient are held constant. And, people with Medicaid and no insurance are more likely to have multiple treat and release ED visits during the year than the privately insured. However, these patterns appear not only for patients with M/SU disorders, but also for those with diabetes or chronic respiratory disease, suggesting that unmeasured attributes of Medicaid and uninsured patients may be contributing to their high utilization. The potential for low Medicaid reimbursement rates and lack of insurance to encourage the use of high-cost services (inpatient and ED) should be explored further to understand the contributions of coverage policies and underlying disease prevalence.

People with Co-Occurring M/SUD are a particular concern. They use ED services about twice as frequently as those with only one or the other M/SU disorder or with diabetes or chronic respiratory disease, judging from people who appear at EDs at least once in a year. They have more ED-IP stays, although patients with diabetes also have high numbers of stays in a year. They have four to five times the probability of having multiple inpatient stays in a year compared to patients with single mental disorder or SUD diagnosis. And, they are more likely than all other study conditions to have multiple treat and release ED visits—30 percent or more likely, depending on the comparison condition. They comprised 20 to 23 percent of the people who sought ED care among the study population, but used 30 to 33 percent of the ED services provided.

What are the characteristics of patients with co-occurring M/SUD? Descriptive statistics show that they have more complicated clinical problems, and based on their use of ED services, they have issues of access to ambulatory care. ED visits for co-occurring M/SUD require more intensive hospital care—as high as ED visits for diabetes, the group most likely to be admitted—but these ED visits are on the lower end of the M/SU disorder severity spectrum indicating that their reason for admission is frequently physical health problems. Also, patients with Co-Occurring M/SUD, compared to patients with the other study conditions, are more likely to be younger, male, of white race, and from higher income communities. However, another large proportion of them are on Medicaid in State A and uninsured in State B.

Patient characteristics, and not hospital or community characteristics, overwhelmingly drive the utilization of ED services in this study. There was an astoundingly high rate of uninsured ED visits with SUD Only, compared to mental disorders, diabetes and respiratory disease (40% to 50% versus about 12% to 26% of visits). To the extent that high utilization reflects poor community care and lack of insurance coverage, these findings suggest that community-based care for people with SUD may be a major short-coming of the U.S. healthcare system.

Challenges for Public Programs

The above findings suggest that public programs, in particular, face the challenge of managing the care of people with co-occurring M/SUD. High proportions of these patients are on Medicaid or are uninsured. They have complicated problems. And, they use costly emergency services rather than being effectively managed in the community. The high levels of repeated use of

emergency services for clients of Medicaid indicate that this program is paying a high price for services on a per client basis.

By contrast, beyond Medicaid, other-government-program patients (VA, DOD, and state-and county-supported patients) often have probabilities of inpatient admission and multiple ED visits that are similar to the privately insured. Also, the effects of other-government payers differed considerably between the two states. For people supported by other government programs, inpatient admission probabilities were higher in State B than State A, and multiple treat and release ED visit propensities were higher in State A than State B. Because DOD and VA payment policies do not differ across states, these diverse effects of other government programs suggest that state and local resources matter, and they affect treatment.

More Research Needed on Impacts of Community MHSA Services

One unexpected result was the lack of an effect of MHSA-devoted community resources on the emergency care for people with M/SU disorders. We expected counties that had more community mental health centers or that were not designated "mental health professional shortage areas" would have lower ED use and fewer emergency hospitalizations. There was no significant difference.

In the *Limitations of the Study*, above, we noted that the measures we used to capture community resources may not have been specific enough, especially for substance abuse treatment, to reveal an effect. In particular, we did not attempt to determine if the specialty substance abuse centers of the Inventory of Substance Abuse Treatment Services were included in the Medicare Online Survey and Certification Reporting System that certifies Medicare facilities and that was the basis of community mental health center counts in our data source. Furthermore, counts of mental health professionals from surveys do not address the willingness of professionals to participate in publicly funded programs such as Medicaid and Medicare. In addition, county-level measures may be too broad to represent the level of community care available to people who live in large counties. In short, the community resource measures available may cover too large a geographic area to be aligned with effects on hospital utilization. Assuming that these measures are at fault, better measures need to be developed. Future research should build measures for community resources for MHSA treatment directly from the SAMHSA inventories of providers.

Alternatively, we cannot rule out the possibility that disappointing county and hospital results in this study may be related to the appropriate statistical techniques employed here that handled bias from clustered hospitals within counties and patients within hospitals in the data set. Past research has found strong effects of hospital characteristics on hospital utilization patterns and the absence of them here raises the question of whether they and county effects really matter after all. The problem may not be measurement, but rather may reflect the fact that community behavioral services across the country are not of sufficient quality or quantity to stave off crises of patients with M/SU disorders that result in ED use and hospitalizations.

The Value of Administrative Health Data in Developing Indicators on the Quality of Care for Mental Disorders and Substance Use Disorders

Parallels between M/SU disorders and other chronic conditions such as diabetes and chronic respiratory disease suggest that service-level administrative health care data may be a useful tool for tracking health care provided to people with M/SU disorders. Diabetes and respiratory diseases represent 7 of the 14 measures that comprise the "preventable hospitalizations" of the AHRQ Prevention Quality Indicators (PQIs). The PQIs were developed for use with

administrative data as indicators for assessing the quality of ambulatory care for specific conditions. While not definitive measures of the quality of ambulatory care for these conditions, the PQIs are considered "indicators" of potentially avoidable hospitalizations for these conditions. When the rates of these indicators are high in a geographic area or for a vulnerable population, it calls for more in-depth investigation.

Similar tools for exploring administrative data might be created for tracking potential quality of care issues for M/SU disorders. M/SU disorders might be candidates for AHRQ PQIs tracked on an ongoing basis like diabetes and respiratory diseases.

For example, for many years, leading clinicians who treat diabetes have targeted that disease for quality improvement, developed performance measures for care processes that are now tracked nationally, and championed the responsibility of clinicians to improve the process of care for diabetes. Those measures include HbA1c testing and blood glucose control, doctor visits for routine monitoring, lipid tests and control, and routine retinal eye exams. And, population-wide rates of hospitalizations have been used to track the outcomes of these changes in the care for diabetes. More recently, asthma specialists have been developing measures and championing better care for people with asthma, but the performance measures are many and the quality improvement message is not yet as honed as that for diabetes. The same process might be developed for MHSA treatment so that, in the future, administrative health care data could be used to track the outcomes of treatments for M/SU disorders, as it is for people with other chronic diseases.

While use of administrative data to monitor the outcomes of care for M/SU disorders lags behind its use for other conditions (AHRQ, 2009), more research might have substantial payoffs for understanding MHSA services (IOM, 2006b). For example, several administrative-data-based disease classification systems were developed over 20 years ago for medical conditions in general, and they have evolved into sophisticated severity classification systems. The "Diagnosis Related Groups, All Patient Refined" and the "Disease Staging, Resource Demand Scale," among others, were based on historical resource use patterns to define severity-of-illness classes across the spectrum of diseases. However, there have been no administrative-data-based, severity-of-illness classification systems developed for use with administrative data for M/SU disorders, except at a high-level for M/SU disorders compared to other conditions.

In this study, we attempted to use information on social dysfunction and ICD-9-CM diagnoses (based on Kessler et al., 2005b) as a simple metric for classifying severity of M/SU disorders into mild, moderate, and severe. A more severe M/SU disorders classification was associated with ED visits resulting in hospital admission and with patients having repeat ED visits. This suggests that severity-of-illness classification systems, an important tool for control in any study of the impact of interventional programs on outcomes of care, could evolve with more careful development, for routine use in analyses of administrative data to understand MHSA treatment services.

In terms of performance measures for MHSA treatment, general hospital administrative records might be used to track the progress of behavioral health treatment in the community. If people with M/SU disorders have access to health professionals, are managed well with medications, therapies, and recovery services, then they should require less hospitalization, ED treatment, and repeated ED care.

Emergency department data nation-wide are becoming more readily available. The Healthcare Cost and Utilization Project assembles State Emergency Department Databases for 27 states

(AHRQ, 2009). “Patient-level” metrics, necessary for repeat utilization statistics as used in this study, require more states to develop patient-specific linkages in their data systems. In addition, for nationwide and regional estimates, the Healthcare Cost and Utilization Project has created the Nationwide Emergency Department Sample beginning in 2006.

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Appendix A: Definitions of Study Conditions

Hospital coding of the data for this study was based on the International Classification of Diseases, Ninth Edition, Clinical Modification (ICD-9-CM). The table below provides the ICD-9-CM codes associated with the mental disorders, substance use disorders, diabetes, and chronic respiratory disease that defined this study.

Table A.1: ICD-9-CM Diagnosis Codes Used in Defining Study Conditions

Description	ICD-9-CM codes
Mental and Substance Use Disorders	
Adjustment disorders	3090 -3099
Anxiety disorders	30000-31383
Attention-deficit, conduct, and disruptive behavior disorders	31200-3149
Elimination disorders	3076 -3077
Other disorders usually diagnosed in infancy, childhood, or adolescence	3073, 30921, 31323, 31389, 3139, 29900, 29901, 29910-29991, 30720-30723
Eating disorders	3071, 30750-30759
Impulse control disorders, not elsewhere classified	31230-31239
Miscellaneous mental conditions	30012-30019
Psychogenic disorders	3060-3069
Sexual and gender identity disorders	3020-3029, 30651
Sleep disorders	30740-30749
Somatoform disorders	30011, 3007, 30081, 30082, 30780-30789
Bipolar disorders	29600-29699
Depressive disorders	29620-29636, 3004, 311
Personality disorders	3010-3019
Schizophrenia and other psychotic disorders	29500-2989, 33392
Alcohol-related disorders	2910-2919, 30300-30393, 30500-30503, 3575, 4255, 5353, 5710-5713, 7903
Drug abuse disorders	2920-2929, 30400-30493, 30520-30593
Drug dependence in pregnancy	6483-64834, 6555-65553, 7795, 76072, 76073, 76075, 76071
Mental disorders in pregnancy	6484-64844
Poisoning by opiates and related narcotics	965000-96509
Miscellaneous history codes related to substance abuse	V6542
Miscellaneous history or injury codes related to mental illness	E95n.n, V110-V113, V118, V119, V154-V1549, V402, V403, V409, V663, V673, V7101, V7102, V7109, V790, V798, V799
Physical Conditions	
Diabetes	
Diabetes without complications	79021, 79022, 79029, V4585, V5391, V6546, 25000, 25001, 7902, 7915, 7916
Diabetes with complications	25002, 25003, 25010-25013, 25040-25043, 25050-25053, 25060-25063, 25070-25073, 25090, 25091, 25020-25023, 25030-25033, 25080-25083, 25092, 25093
Chronic respiratory disease	
Asthma	49300, 49301, 49302, 49310, 49311, 49312, 49320, 49321, 49322, 49381, 49382, 49390, 49391, 49392
Chronic obstructive pulmonary disease	490, 4910, 4911, 4912, 49120, 49121, 49122, 4918, 4919, 4920, 4928, 494, 4940, 4941, 496
Other chronic respiratory disease	495n, 500-505, 5064, 515 and 516n

Appendix B: Descriptive Statistics by Five Conditions for Two States

This appendix displays descriptive statistics for both outcome measures and other measures used as independent variables in the multivariate analyses. There are eight tables, paired for State A and State B, as follows:

Tables (for State A & State B)	Level of Analysis	Outcomes	Other Measures
B.1 & B.2	ED Visits	ED visits resulting in admission (%)	Visit-level patient characteristics
B.3 & B.4	Patient	ED visits per patient ED-IP stays per patient Multiple treat and release ED visits (%) Multiple ED-IP stays (%) Multiple counties (%)	Patient-level patient characteristics
B.5 & B.6	Hospital	None	Hospital characteristics
B.7 & B.8	County	None	County characteristics

Statistical significance was determined by using the Tukey multiple comparisons test for significance of mean differences across conditions and Mantel-Haenszel Chi-square for significance of categorical differences overall, not pair-wise, across conditions. Essentially all (167 of 169 measures) comparisons, because of the large sample size, were statistically significant. NS, next to the row label, denotes the two measures that were not statistically different across the conditions.

Following each set of tables is a summary of the main similarities and dissimilarities between the two states.

Visit Statistics

Tables B.1 and B.2, below, show that for each of the five study conditions the sample sizes—the number of ED visits—are similar between the two states. The smallest sample size is 13,316 ED visits for SUD Only in State A, and the largest sample size is 66,421 ED visits for chronic respiratory disease in State A.

For each condition, the averages per ED visit for patient age and gender are also similar between the two states. For example, in both states the average ages range from about 30 years for SUD Only to about 67 years for Mental Disorder Only. The average age for Co-Occurring M/SUD is around 44 years, which falls between that for SUD Only and Mental Disorder Only. The percentage of ED visits for females is lowest for SUD Only at 30 percent and highest for Mental Disorder Only at 67 percent.

In State A, the greatest percent of ED visits is for patients located in large metropolitan areas. In State B, by contrast, the largest percent of ED visits is for patients located in small metropolitan areas.

For all conditions, except diabetes in State B, the majority of ED visits are by whites, and blacks make up most of the balance, with very low percentages of other race/ethnicities.

For every condition, the percentage of uninsured ED visits is greater in State B than it is in State A. The primary expected payer distribution for diabetes is quite different from the distribution for other conditions, with around 45 percent of diabetic ED visits having Medicare as the primary expected payer.

About half of the ED visits for mental disorder and SUD have a Disease Staging severity below moderate. However, over half of ED visits for diabetes and chronic respiratory disease are at moderate or above. This is consistent with the older average ages for the latter two conditions.

By definition, the M/SU disorder severity is “none” for diabetes and chronic respiratory disease ED visits. For people with SUD Only, Mental Disorder Only and Co-Occurring M/SUD, some of their ED visits were for conditions other than mental disorders or SUD, which did not invoke the M/SU disorder severity measure. For SUD Only visits, severity (personal or social consequences of their disease) tended to be moderate or severe, and for Mental Disorder Only visits, such severity tended to be mild or moderate.

Table B.1: Description of ED Visits for Study Conditions (visit level), State A, 2002

Characteristics		Condition				
		(1) SUD Only	(2) Mental Disorder Only	(3) Co-Occurring M/SUD	(4) DIAB	(5) CRD
Total ED Visits		13,316	51,250	32,217	14,005	66,421
Inpatient admission (%)		16.35	13.68	26.27	30.26	13.36
Age	**Mean**	39.22	38.81	36.84	53.87	44.51
	S.D.	13.60	16.59	10.86	19.00	20.11
Median ZIP Income	**Mean**	39,587.54	40,942.50	40,483.33	39,235.23	38,541.81
	S.D.	15,930.58	16,017.94	15,650.02	16,384.23	14,055.84
Females (%)		30.20	66.89	44.78	55.91	63.77
Patient Location (%)						
..Large Metropolitan		59.98	47.56	54.06	55.17	46.19
..Small Metropolitan		17.60	20.61	21.61	14.99	20.68
..Large Rural		11.81	15.52	12.45	12.79	16.69
..Small Rural		10.62	16.30	11.89	17.04	16.44
Ethnicity (%)						
..White		72.48	84.00	80.63	67.21	77.90
..Black		23.39	12.99	16.82	28.99	18.64
..Hispanic		1.21	0.81	0.84	1.17	0.70
..Asian		0.10	0.23	0.08	0.19	0.14
..Other Race		1.24	0.86	0.83	1.17	0.65
..Unknown		1.58	1.10	0.80	1.26	1.97
Insurance (%)						
..Private		22.18	28.97	20.44	23.62	27.00
..Medicare		10.87	18.92	13.63	43.64	26.79
..Medicaid		25.63	32.11	38.38	18.57	26.48
..Other Government		3.89	3.55	2.45	2.31	3.09
...Uninsured		37.93	16.16	24.83	11.60	16.37
DS Resource Demand Scale (%)						
..Minimal		43.77	21.09	22.44	22.58	11.45
..Less Intensive		24.09	33.44	28.27	22.03	34.99
..Moderate		14.70	22.61	21.21	17.34	25.23
..Highly Intensive		17.45	22.85	28.07	38.04	28.33
M/SU Disorder Severity (%)						
..None		42.26	48.85	41.94	100.0	100.0
..Mild		7.47	20.16	29.73	.	.
..Moderate (NS)		23.62	23.92	20.07	.	.
..Severe		26.64	7.07	8.26	.	.

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.
Note: SUD = substance use disorders; M/SUD = mental and substance use disorders; DIAB = diabetes; CRD = chronic respiratory disease; DS = Disease Staging

Table B.2: Description of ED Visits for Study Conditions (visit level), State B, 2002

Characteristics		Condition				
		(1) SUD Only	(2) Mental Disorder Only	(3) Co-Occurring M/SUD	(4) DIAB	(5) CRD
Total ED Visits		14,371	38,497	22,829	18,749	52,859
Inpatient admits (%)		13.46	8.85	16.19	28.01	13.01
Age	**Mean**	40.88	38.63	38.20	55.10	44.37
	S.D.	13.13	15.92	11.61	18.47	19.06
Median ZIP Income	**Mean**	38,758.06	38,892.70	39,354.89	36,881.33	37,766.84
	S.D.	11,482.11	10,988.04	11,310.98	10,777.88	10,573.48
Females (%)		29.44	66.90	43.05	58.87	63.12
Patient Location (%)						
..Large Metropolitan (NS)		3.04	2.82	2.69	2.28	2.33
..Small Metropolitan		72.88	68.83	75.90	64.01	68.80
..Large Rural		19.30	20.52	16.88	21.76	20.87
..Small Rural		4.77	7.84	4.52	11.95	8.01
Ethnicity (%)						
..White		58.31	62.03	72.94	33.95	53.74
..Black		39.42	36.16	26.47	64.67	44.85
..Hispanic		0.72	0.61	0.17	0.30	0.38
..Asian		0.08	0.11	0.05	0.25	0.13
..Other Race		1.44	1.08	0.37	0.83	0.90
..Unknown		0.03	0.00	0.00	0.00	0.00
Insurance (%)						
..Private		16.03	25.62	16.44	21.30	25.34
..Medicare		12.36	19.72	18.20	47.91	25.79
..Medicaid		17.44	23.92	21.02	13.40	20.56
..Other Government		4.39	3.09	3.73	2.71	2.62
...Uninsured		48.27	26.15	39.45	14.11	24.79
DS Resource Demand Scale (%)						
..Minimal		36.56	18.52	20.61	19.59	9.19
..Less Intensive		24.60	32.49	28.73	20.58	33.22
..Moderate		17.65	24.93	23.47	20.18	28.72
..Highly Intensive		21.19	24.06	27.19	39.65	28.87
M/SU Disorder Severity (%)						
..None		43.87	49.37	43.15	100.0	100.0
..Mild		5.36	17.40	23.21	.	.
..Moderate (NS)		24.86	23.71	24.40	.	.
..Severe		25.91	9.52	9.25	.	.

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.
Note: SUD = substance use disorders; M/SUD = mental and substance use disorders; DIAB = diabetes; CRD = chronic respiratory disease; DS = Disease Staging

Patient Statistics

Tables B.3 and B.4, below, present statistics similar to the prior two tables, but at the patient level, rather than ED-visit level, which means that a few statistics differ:

- The two severity scores represent a *maximum severity* taken over all of the severity scores for each patient's ED visits. Consequently, there were larger percentages of patients at a high severity than there were ED visits at a high severity, for both the Disease Staging severity and for the M/SU Disorder severity measures.
- Additional statistics are calculated per patient:
  - mean number of ED visits
  - mean ED-IP stays per patient
  - percent of patients with multiple ED treat and release visits
  - percent of patients with multiple ED-IP stays
  - percent of patients who resided in multiple counties during the year

The average number of ED visits and ED-IP stays per patient were highest for people with Co-Occurring M/SUD because they had to have at least one mental disorder and one SUD diagnosis and the two diagnoses often occurred on different visits. For each condition, the average number of ED visits was similar between the two states. However, the average number of ED-IP stays for SUD Only, Mental Disorder Only, and Co-Occurring M/SUD were all substantially lower in State B compared with State A.

For each condition, the percent of patients with multiple treat and release ED visits was similar between the two states. About 75 percent of people with Co-Occurring M/SUD had multiple treat and release ED visits. For the other conditions, between 50 and 60 percent of the patients had multiple treat and release ED visits.

The rates of ED-IP stays were similar between the two states except that the rates for State B were lower for the Mental Disorder Only and Co-Occurring M/SUD cohorts. The percentage of patients with multiple ED-IP stays ranged from 3.5 percent for Mental Disorder Only in State B to 23.7 percent for Co-Occurring M/SUD in State A.

Table B.3: Description of ED Patients with Study Conditions (patient level), State A, 2002

Characteristics		Condition				
		(1) SUD Only	(2) Mental Disorder Only	(3) Co-Occurring M/SUD	(4) DIAB	(5) CRD
Total Patients		5,509	18,944	7,531	6,012	28,017
Number of ED visits per Patient	Mean	2.41	2.70	4.27	2.32	2.36
	S.D.	3.16	3.10	5.37	2.28	2.20
Number of ED-IP stays per Patient	Mean	0.39	0.37	1.12	0.70	0.32
	S.D.	0.74	0.72	1.31	1.04	0.73
Multiple Treat and Release ED Visits (%)		51.93	57.31	74.56	54.06	55.38
Multiple ED-IP Stays (%)		6.34	5.82	23.73	13.87	6.14
Multiple Counties (%)		7.43	7.34	15.12	3.77	4.61
Patient Age	Mean	38.67	40.25	36.96	54.56	46.52
	S.D.	14.20	17.03	11.70	18.80	20.06
Median ZIP Income	Mean	41,079.08	42,349.01	42,503.03	40,259.21	39,570.35
	S.D.	17,017.09	16,999.96	16,681.52	16,838.12	14,871.19
Females (%)		29.70	64.05	42.88	53.14	61.60
Patient Location (%)						
..Large Metropolitan		61.14	52.28	58.96	56.99	49.35
..Small Metropolitan		17.12	18.86	19.52	14.04	18.26
..Large Rural		11.44	14.31	11.26	12.59	16.20
..Small Rural		10.31	14.55	10.26	16.38	16.19
Ethnicity (%)						
..White		72.54	81.79	79.39	67.20	77.45
..Black		21.96	13.96	17.04	27.79	18.11
..Hispanic		1.18	0.92	0.68	1.36	0.85
..Asian		0.18	0.33	0.12	0.28	0.19
..Other Race		1.60	1.08	0.93	1.48	0.81
..Unknown		2.54	1.92	1.85	1.88	2.59
Insurance (%)						
..Private		28.34	35.69	28.10	29.14	32.90
..Medicare		9.68	19.10	12.39	42.22	27.96
..Medicaid		18.17	24.48	29.48	14.16	20.06
..Other Government		2.89	3.40	2.31	2.71	2.91
...Uninsured		40.75	17.10	27.58	11.61	15.92
Maximum DS Resource Demand Scale (%)*						
..Minimal		41.95	12.81	7.98	18.78	2.28
..Less Intensive		18.15	24.88	15.32	16.80	27.22
..Moderate		13.40	22.64	17.86	13.94	29.09
..Highly Intensive		26.50	39.66	58.84	50.48	41.41

Characteristics		Condition				
		(1) SUD Only	(2) Mental Disorder Only	(3) Co-Occurring M/SUD	(4) DIAB	(5) CRD
Maximum M/SU Disorder Severity (%)*						
..None		0.49	0.30	0.21	100.0	100.0
..Mild		16.10	40.08	71.42	.	.
..Moderate		44.24	45.09	26.17	.	.
..Severe		39.17	14.53	2.19	.	.

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.
Note: SUD = substance use disorders; M/SUD = mental and substance use disorders; DIAB = diabetes; CRD = chronic respiratory disease; DS = Disease Staging
* Maximum scores based upon all visits were assigned for each patient

Table B.4: Description of ED Patients with Study Conditions (patient level), State B, 2002

Characteristics		Condition				
		(1) SUD Only	(2) Mental Disorder Only	(3) Co-Occurring M/SUD	(4) DIAB	(5) CRD
Total Patients		5,546	13,782	5,177	7,409	20,400
Number of ED visits per Patient	**Mean**	2.56	2.77	4.38	2.51	2.57
	S.D.	3.12	3.21	5.52	2.27	2.74
Number of ED-IP stays per Patient	**Mean**	0.35	0.24	0.71	0.70	0.33
	S.D.	0.72	0.57	1.02	1.08	0.75
Multiple Treat and Release ED Visits (%)		54.00	59.08	76.53	58.48	58.06
Multiple ED-IP Stays (%)		6.71	3.47	13.83	14.16	6.52
Multiple Counties (%)		7.59	7.27	14.23	4.16	4.54
Patient Age	**Mean**	40.82	39.52	37.90	55.55	45.91
	S.D.	13.78	15.99	11.88	18.17	19.22
Median ZIP Income	**Mean**	39,625.61	39,646.54	40,192.06	37,403.46	38,222.86
	S.D.	11,639.92	11,344.64	11,359.31	10,932.17	10,853.25
Females (%)		28.49	63.96	40.47	55.62	62.13
Patient Location (%)						
..Large Metropolitan		3.84	3.83	3.96	2.46	2.66
..Small Metropolitan		72.81	68.63	74.31	65.61	67.99
..Large Rural		18.36	20.13	17.29	20.97	21.19
..Small Rural		4.99	7.40	4.44	10.96	8.17
Ethnicity (%)						
..White		59.90	62.49	72.44	37.49	55.94
..Black		36.66	35.06	26.75	60.67	42.44
..Hispanic		1.08	0.93	0.35	0.49	0.51
..Asian		0.13	0.18	0.06	0.20	0.19
..Other Race		2.16	1.34	0.41	1.15	0.92
..Unknown		0.07	0.00	0.00	0.00	0.01
Insurance (%)						
..Private		19.98	30.95	21.40	25.46	30.04
..Medicare		10.85	18.58	14.31	45.32	26.50
..Medicaid		12.57	18.45	16.98	10.57	16.09
..Other Government		4.27	3.27	3.34	3.17	2.60
...Uninsured		51.41	27.61	43.33	15.08	24.04
Maximum DS Resource Demand Scale (%)*						
..Minimal		37.02	12.24	9.04	17.25	1.77
..Less Intensive		17.56	23.40	17.00	15.91	25.06
..Moderate		15.07	23.74	19.20	15.20	30.57
..Highly Intensive		30.35	40.62	54.76	51.64	42.59

Characteristics		Condition				
		(1) SUD Only	(2) Mental Disorder Only	(3) Co-Occurring M/SUD	(4) DIAB	(5) CRD
Maximum M/SU Disorder Severity (%)*						
..None		0.20	0.20	0.19	100.0	100.0
..Mild		12.16	33.99	59.47	.	.
..Moderate		48.81	45.98	36.58	.	.
..Severe		38.33	19.82	3.75	.	.

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.
Note: SUD = substance use disorders; M/SUD = mental and substance use disorders; DIAB = diabetes; CRD = chronic respiratory disease; DS = Disease Staging
* Maximum scores based upon all visits were assigned for each patient

Hospital Statistics

Tables B.5 and B.6, below, contain hospital statistics weighted by the number of ED visits for each condition because these measures are used as predictors in the regressions of the probability of ED visits resulting in admission, described in the main text, which have ED visits as the unit of analysis. These hospital measures were derived from the 2002 Annual Survey Database of the American Hospital Association. There were ED visits in 107 hospitals in State A and in 57 hospitals in State B.

In the regressions, we transformed the number of beds by the logarithm, which provided a better fit than the untransformed number of beds. The weighted average for the logarithm of bed size was about the same between the two states, except that in community hospitals, there were larger average numbers of psychiatric care beds and alcohol/drug dependency care beds in State A than in State B.

State B had more ED visits than State A in teaching hospitals for Mental Disorders Only and Co-Occurring M/SUD. In State A, about half of the ED visits were at hospitals in large metropolitan areas, while in State B, two-thirds to three-fourths of the ED visits were at medium metropolitan areas.

In both states, the highest percentage of ED visits was in private non-profit hospitals. However, State B had a much larger percentage of visits in public hospitals.

The percentage of ED visits in hospitals with substance abuse services was about the same between the two states. However, State A had a much higher percentage of visits in hospitals with outpatient SA services, crisis prevention programs, mental health services, and mental health specialty programs.

Table B.5: Community Hospital Characteristics of ED Visits for Patients with Study Conditions, State A, 2002

Characteristics		Condition				
		(1) SUD Only	(2) Mental Disorder Only	(3) Co-Occurring M/SUD	(4) DIAB	(5) CRD
Total Hospitals		105	106	105	107	107
Log Number of Beds	**Mean**	5.42	5.20	5.38	5.29	5.14
	S.D.	0.91	1.01	0.94	0.98	1.01
Log Number of Alcohol/Drug Abuse Dep Care Beds	**Mean**	0.14	.	.	.	.
	S.D.	0.60	.	.	.	.
Log Number of Psychiatric Care Beds	**Mean**	.	2.37	.	.	.
	S.D.	.	1.75	.	.	.
Log Number of Alcohol/Drug Abuse Dep Care and Psychiatric Care Beds	**Mean**	.	.	2.76	.	.
	S.D.	.	.	1.94	.	.
Teaching status (%)						
..Non-teaching		64.75	79.08	71.12	68.28	78.92
..Teaching		35.25	20.92	28.88	31.72	21.08
Hospital location (%)						
..Large Metropolitan		60.30	48.77	54.42	56.35	46.82
..Small Metropolitan		19.18	22.67	23.65	17.16	22.37
..Large Rural		13.43	17.91	14.51	15.25	19.35
..Small Rural		7.09	10.65	7.36	11.24	11.45
Hospital ownership (%)						
..Private for Profit		12.44	11.59	13.25	11.52	10.77
..Private Nonprofit		73.46	70.59	72.37	71.67	69.98
..Public		14.09	17.82	14.39	16.81	19.25
Hospital Inpatient Substance Abuse Services (%)		27.11	28.36	34.91	20.83	21.80
Hospital Outpatient Substance Abuse Services (%)		36.95	37.80	45.64	32.83	31.02
Hospital Outpatient/Inpatient Crisis Prevention (%)		64.77	54.57	61.91	57.13	49.33
Hospital Inpatient Psychiatric Services (%)		62.39	67.00	72.22	62.92	62.33
Hospital Outpatient Psychiatric Services (%)		58.88	58.73	65.71	53.47	52.37
Hospital Inpatient/Outpatient Psychiatric Services (%)		84.88	78.67	85.54	78.58	74.71

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.
Note: SUD = substance use disorders; M/SUD = mental and substance use disorders; DIAB = diabetes; CRD = chronic respiratory disease

Table B.6: Community Hospital Characteristics of ED Visits for Patients with Study Conditions, State B, 2002

Characteristics		Condition				
		(1) SUD Only	(2) Mental Disorder Only	(3) Co-Occurring M/SUD	(4) DIAB	(5) CRD
Total Hospitals		57	57	57	57	57
Log Number of Beds	**Mean**	5.28	5.27	5.40	5.24	5.23
	S.D.	0.95	0.88	0.92	0.85	0.83
Log Number of Alcohol/Drug Abuse Dep Care Beds	**Mean**	0.13	.	.	.	.
	S.D.	0.63	.	.	.	.
Log Number of Psychiatric Care Beds	**Mean**	.	1.47	.	.	.
	S.D.	.	1.78	.	.	.
Log Number of Alcohol/Drug Abuse Dependency Care and Psychiatric Care Beds	**Mean**	.	.	2.01	.	.
	S.D.	.	.	2.11	.	.
Teaching Status (%)						
..Non-teaching		65.03	66.80	56.43	70.07	73.05
..Teaching		34.97	33.20	43.57	29.93	26.95
Hospital Location (%)						
..Large Metropolitan		3.18	3.05	2.73	2.43	2.45
..Medium Metropolitan		74.13	70.58	77.35	66.84	70.23
..Large Rural		18.85	20.39	16.66	22.31	21.08
..Small Rural		3.84	5.98	3.25	8.42	6.23
Hospital Ownership (%)						
..Private for Profit		22.70	23.73	19.65	23.31	26.10
..Private Nonprofit		45.73	45.59	46.94	47.94	47.36
..Public		31.57	30.68	33.41	28.74	26.54
Hospital Inpatient Substance Abuse Services (%)		26.25	24.20	29.89	25.91	22.38
Hospital Outpatient Substance Abuse Services (%)		27.19	23.72	29.50	25.04	20.08
Hospital Outpatient/Inpatient Crisis Prevention (%)		18.07	17.31	19.61	13.82	18.29
Hospital Inpatient Psychiatric Services (%)		41.54	40.64	49.32	40.54	34.54
Hospital Outpatient Psychiatric Services (%)		42.44	39.70	48.03	40.88	33.51
Hospital Inpatient/Outpatient Psychiatric Services (%)		59.60	57.94	64.57	59.98	55.94

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.
Note: SUD = substance use disorders; M/SUD= mental and substance use disorders; DIAB = diabetes; CRD = chronic respiratory disease

County Statistics

Tables B.7 and B.8 show statistics for county variables weighted by the number of patients. Patient weights were used because these variables were used as predictors in the patient-level regressions, described in the main text, which had patients as the unit of analysis. These variables were taken from the Area Resource File. Patients from up to 115 counties in State A and from 46 counties in State B were included in this study.

Community mental health centers were more abundant in State A counties than in State B counties. For example, for patients with SUD Only in State A, EDs had available 1.03 facilities per county compared with only 0.16 facilities per county in State B. All of the county-level measures of health care resources were higher in State A than they were in State B. For one item measured against population, the disparity remained—the number of short term psychiatric and chemical dependency care beds per population was two to three time higher in State A than State B. Also, State B patients more often lived in shortage areas for mental health practitioners and primary care practitioners.

Table B.7: County Characteristics of ED Patients with Study Conditions, State A, 2002

Characteristics		Condition				
		(1) SUD Only	(2) Mental Disorder Only	(3) Co-Occurring M/SUD	(4) DIAB	(5) CRD
Total Counties		111	115	111	114	115
Number of Community Mental Health Centers in the County	**Mean**	1.03	0.74	0.84	0.94	0.82
	S.D.	1.08	0.89	0.95	1.02	0.99
Number of Short Term Psychiatric and Chemical Dependency Beds Set Up / Capita in the County	**Mean**	0.44	0.35	0.46	0.38	0.33
	S.D.	0.92	0.77	0.88	0.79	0.66
Number of Federally Qualified Health Centers in the County	**Mean**	2.70	1.69	2.25	2.38	1.91
	S.D.	3.71	3.08	3.56	3.55	3.16
Number of Short Term General Hospitals with EDs in the County	**Mean**	4.89	3.42	4.27	4.19	3.62
	S.D.	4.83	4.01	4.45	4.71	4.29
Number of Short Term General Hospitals with Primary Care Departments in the County	**Mean**	2.85	1.92	2.45	2.39	2.04
	S.D.	3.00	2.50	2.74	2.92	2.70
Shortage Area for Mental Health Practitioners (%)		39.99	50.11	42.45	44.28	53.04
Shortage Area for Primary Care Practitioners (%)		89.46	88.41	87.00	91.70	90.83

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.
Note: SUD = substance use disorders; M/SUD = mental and substance use disorders; DIAB = diabetes; CRD = chronic respiratory disease

Table B.8: County Characteristics of ED Patients with Study Conditions, State B, 2002

Characteristics		Condition				
		(1) SUD Only	(2) Mental Disorder Only	(3) Co-Occurring M/SUD	(4) DIAB	(5) CRD
Total Counties		46	46	46	46	46
Number of Community Mental Health Centers in the County	**Mean**	0.16	0.17	0.18	0.12	0.16
	S.D.	0.36	0.37	0.37	0.33	0.36
Number of Short Term Psychiatric and Chemical Dependency Beds Set Up / Capita in the County	**Mean**	0.16	0.15	0.18	0.14	0.14
	S.D.	0.20	0.18	0.20	0.18	0.19
Number of Federally Qualified Health Centers in the county	**Mean**	2.65	2.23	2.52	2.26	2.22
	S.D.	2.67	2.47	2.64	2.40	2.34
Number of Short Term General Hospitals with EDs in the County	**Mean**	2.22	2.03	2.20	1.89	1.94
	S.D.	1.49	1.44	1.49	1.38	1.43
Number of Short Term General Hospitals with Primary Care Departments in the County	**Mean**	0.47	0.38	0.43	0.45	0.36
	S.D.	0.92	0.81	0.85	0.87	0.75
Shortage Area for Mental Health Practitioners (%)		78.28	83.57	81.97	82.73	84.94
Shortage Area for Primary Care Practitioners (%)		96.76	96.27	95.60	96.65	95.50

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.
Note: SUD = substance use disorders; M/SUD = mental and substance use disorders; DIAB = diabetes; CRD = chronic respiratory disease;

Appendix C: Complete Regression Results by Five Conditions for Two States

Tables C.1A: – C.5A:	**Standard Logistic Regressions for One Model (Probability of an ED Visit Resulting in Admission), by Five Conditions for State A**
Tables C.1B: – C.5B:	**Standard Logistic Regressions for One Model (Probability of an ED Visit Resulting in Admission), by Five Conditions for State B**
Tables C.6A: – C.20A:	**Hierarchical Logistic Regressions for All Three Models, by Five Conditions for State A**
Tables C.6B: – C.20B:	**Hierarchical Logistic Regressions for All Three Models, by Five Conditions for State B**

Table C.1A: Standard Logistic Model for the Likelihood of an ED Visit for SUD Only Resulting in Admission, State A, 2002

Characteristic	Estimated Coefficient	Standard Error	Wald Chi-square	p-value
Intercept	-7.081	0.390	329.4163	<.0001
(Age – 40) / 10 (i.e., centered on 40 and scaled to decades)	0.239	0.029	67.3783	<.0001
((Age – 40) / 10)^2	-0.046	0.011	16.6497	<.0001
Median Zip Income / $10,000	0.091	0.023	15.3186	<.0001
Female (reference = Male)	-0.319	0.072	19.7821	<.0001
Ethnicity (reference = White)				
..Black	0.152	0.090	2.8849	0.0894
..Hispanic	0.003	0.294	0.0001	0.9930
..Asian	-0.925	1.252	0.5462	0.4599
..Other Race	0.227	0.274	0.6884	0.4067
..Unknown Race	0.018	0.241	0.0055	0.9410
Insurance (reference = Private)				
..Medicare	-0.160	0.124	1.6556	0.1982
..Medicaid	-0.277	0.095	8.5178	0.0035
..Other Government	0.122	0.176	0.4827	0.4872
..Uninsured	-0.239	0.086	7.7131	0.0055
DS Resource Demand Scale (reference = Minimal <30)				
..Less intensive	0.730	0.089	66.7649	<.0001
..Moderate	1.044	0.103	103.2961	<.0001
..Highly intensive	3.016	0.085	1256.0080	<.0001
M/SU Disorder Severity (reference = None)				
..Mild	1.952	0.102	366.6308	<.0001
..Moderate	3.081	0.092	1133.3113	<.0001
..Severe	3.198	0.115	775.9542	<.0001
Hospital Teaching Status	-0.116	0.097	1.4339	0.2311
Log of Number of Beds	0.294	0.055	28.9433	<.0001
Log of Number of Chemical Dependency Care Beds	-0.031	0.061	0.2670	0.6053
Hospital Ownership (reference = Public)				
..Private, Not-for-Profit	-0.204	0.114	3.1901	0.0741
..Private, For-Profit	0.053	0.150	0.1241	0.7246
Safety Net Hospital	0.223	0.053	17.4405	<.0001
Hospital Location (reference = Large Metropolitan)				
..Small Metro	0.588	0.135	19.0071	<.0001
..Large Rural	0.384	0.152	6.3570	0.0117
..Small Rural	0.160	0.207	0.6006	0.4383
Hospital Inpatient Substance Abuse Services	-0.108	0.110	0.9635	0.3263
Hospital Outpatient Substance Abuse Services	0.747	0.151	24.4829	<.0001
Hospital Outpatient/Inpatient Crisis Prevention Program	0.266	0.113	5.5294	0.0187
Both Hospital Outpatient Substance Abuse and Outpatient/Inpatient Crisis Prevention	-0.739	0.158	21.9149	<.0001

Characteristic	Estimated Coefficient	Standard Error	Wald Chi-square	p-value
Number of Community Mental Health Centers in the County	-0.095	0.045	4.4373	0.0352
Number of Short Term Psychiatric and Chemical Dependency Beds Set Up per Capita in the County	0.091	0.054	2.8007	0.0942
Shortage Area for Mental Health Practitioners	-0.046	0.128	0.1297	0.7188

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.
Note: M/SU = mental and/or substance use; DS = Disease Staging; SUD = substance use disorder

Table C.1B: Standard Logistic Model for the Likelihood of an ED Visit for SUD Only Resulting in Admission, State B, 2002

Characteristic	Estimated Coefficient	Standard Error	Wald Chi-square	p-value
Intercept	-7.050	0.531	176.0458	<.0001
(Age – 40) / 10 (i.e., centered on 40 and scaled to decades)	0.267	0.038	50.3171	<.0001
$((Age – 40) / 10)^2$	-0.050	0.014	13.2418	0.0003
Median Zip Income / $10,000	0.093	0.032	8.3780	0.0038
Female (reference = Male)	-0.035	0.077	0.2046	0.6510
Ethnicity (reference = White or Others)				
..Black	0.116	0.075	2.3599	0.1245
..Hispanic	1.415	0.363	15.1630	<.0001
Insurance (reference = Private)				
..Medicare	-0.259	0.123	4.4141	0.0356
..Medicaid	-0.359	0.111	10.3924	0.0013
..Other Government	0.826	0.150	30.3897	<.0001
..Uninsured	-0.823	0.097	71.6132	<.0001
DS Resource Demand Scale (reference = Minimal <30)				
..Less intensive	0.788	0.119	43.9112	<.0001
..Moderate	1.342	0.120	125.5870	<.0001
..Highly intensive	3.401	0.099	1172.3869	<.0001
M/SU Disorder Severity (reference = None)				
..Mild	1.353	0.100	182.5995	<.0001
..Moderate	2.641	0.088	897.1846	<.0001
..Severe	2.721	0.138	391.3282	<.0001
Hospital Teaching Status	0.108	0.144	0.5699	0.4503
Log of Number of Beds	0.352	0.079	19.6918	<.0001
Log of Number of Chemical Dependency Care Beds	0.130	0.060	4.6644	0.0308
Hospital Ownership (reference = Public)				
..Private, Not-for-Profit	0.160	0.101	2.5247	0.1121
..Private, For-Profit	0.441	0.113	15.2846	<.0001
Safety Net Hospital	0.147	0.063	5.4397	0.0197
Hospital Location (reference = Large Metropolitan)				
..Small Metro	-0.593	0.192	9.5282	0.0020
..Large Rural	0.193	0.201	0.9195	0.3376
..Small Rural	-0.340	0.284	1.4387	0.2303
Hospital Inpatient Substance Abuse Services	-0.274	0.123	4.9672	0.0258
Hospital Outpatient Substance Abuse Services	0.554	0.126	19.2442	<.0001
Hospital Outpatient/Inpatient Crisis Prevention Program	0.086	0.142	0.3629	0.5469
Both Hospital Outpatient Substance Abuse and Outpatient/Inpatient Crisis Prevention	-0.669	0.266	6.3114	0.0120
Number of Community Mental Health Centers in the County	-0.352	0.145	5.9110	0.0150

Characteristic	Estimated Coefficient	Standard Error	Wald Chi-square	p-value
Number of Short Term Psychiatric and Chemical Dependency Beds Set Up per Capita in the County	-1.570	0.250	39.2886	<.0001
Shortage Area for Mental Health Practitioners	0.162	0.105	2.3562	0.1248

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.
Note: M/SU = mental and/or substance use; DS = Disease Staging; SUD = substance use disorder

Table C.2A: Standard Logistic Model for the Likelihood of an ED Visit for Mental Disorders Only Resulting in Admission, State A, 2002

Characteristic	Estimated Coefficient	Standard Error	Wald Chi-square	p-value
Intercept	-6.998	0.222	995.8530	<.0001
(Age – 40) / 10 (i.e., centered on 40 and scaled to decades)	-0.017	0.014	1.3727	0.2413
((Age – 40) / 10)^2	0.035	0.004	65.6754	<.0001
Median Zip Income / $10,000	0.026	0.012	4.4869	0.0342
Female (reference = Male)	0.071	0.035	4.1036	0.0428
Ethnicity (reference = White)				
..Black	-0.122	0.053	5.3173	0.0211
..Hispanic	-0.607	0.233	6.7552	0.0093
..Asian	0.580	0.283	4.2165	0.0400
..Other Race	0.190	0.162	1.3769	0.2406
..Unknown Race	-0.489	0.142	11.8936	0.0006
Insurance (reference = Private)				
..Medicare	-0.211	0.052	16.3922	<.0001
..Medicaid	-0.319	0.047	46.5531	<.0001
..Other Government	0.237	0.100	5.5753	0.0182
..Uninsured	-0.587	0.061	91.4145	<.0001
DS Resource Demand Scale (reference = Minimal <30)				
..Less intensive	0.294	0.078	14.3663	0.0002
..Moderate	1.158	0.075	237.8308	<.0001
..Highly intensive	2.778	0.073	1458.6455	<.0001
M/SU Disorder Severity (reference = None)				
..Mild	0.798	0.074	115.9446	<.0001
..Moderate	0.741	0.052	204.2202	<.0001
..Severe	1.781	0.043	1741.4911	<.0001
Hospital Teaching Status	0.318	0.050	40.7538	<.0001
Log of Number of Beds	0.417	0.035	142.2050	<.0001
Log of Number of Psychiatric Care Beds	-0.543	0.046	139.2884	<.0001
Hospital Ownership (reference = Public)				
..Private, Not-for-Profit	0.260	0.061	18.0639	<.0001
..Private, For-Profit	-0.298	0.080	13.7090	0.0002
Safety Net Hospital	-0.055	0.028	3.8594	0.0495
Hospital Location (reference = Large Metropolitan)				
..Small Metro	-0.709	0.072	96.6182	<.0001
..Large Rural	-0.606	0.075	64.9838	<.0001
..Small Rural	-0.831	0.113	53.8064	<.0001
Hospital Inpatient Psychiatric Services	2.468	0.160	238.4140	<.0001
Hospital Inpatient/Outpatient Psychiatric Services	-0.050	0.085	0.3392	0.5603
Hospital Outpatient Psychiatric Services	0.336	0.054	39.0031	<.0001
Number of Community Mental Health Centers in the County	-0.146	0.027	29.8869	<.0001

Characteristic	Estimated Coefficient	Standard Error	Wald Chi-square	p-value
Number of Short Term Psychiatric and Chemical Dependency Beds Set Up per Capita in the County	0.007	0.033	0.0428	0.8361
Shortage Area for Mental Health Practitioners	0.336	0.059	32.2354	<.0001

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.
Note: M/SU = mental and/or substance use; DS = Disease Staging

Table C.2B: Standard Logistic Model for the Likelihood of an ED Visit for Mental Disorders Only Resulting in Admission, State B, 2002

Characteristic	Estimated Coefficient	Standard Error	Wald Chi-square	p-value
Intercept	-5.829	0.392	221.3033	<.0001
(Age – 40) / 10 (i.e., centered on 40 and scaled to decades)	0.057	0.019	8.5635	0.0034
((Age – 40) / 10)^2	0.048	0.006	65.3815	<.0001
Median Zip Income / $10,000	0.007	0.022	0.1202	0.7289
Female (reference = Male)	0.031	0.047	0.4415	0.5064
Ethnicity (reference = White)				
..Black	-0.254	0.049	27.1973	<.0001
..Hispanic	-0.164	0.284	0.3314	0.5649
Insurance (reference = Private)				
..Medicare	-0.539	0.068	62.6491	<.0001
..Medicaid	-0.410	0.065	40.2052	<.0001
..Other Government	0.253	0.114	4.9871	0.0255
..Uninsured	-1.064	0.074	208.8123	<.0001
DS Resource Demand Scale (reference = Minimal <30)				
..Less intensive	0.133	0.113	1.3765	0.2407
..Moderate	0.787	0.109	52.3423	<.0001
..Highly intensive	2.327	0.104	499.5344	<.0001
M/SU Disorder Severity (reference = None)				
..Mild	0.433	0.094	21.0746	<.0001
..Moderate	0.299	0.071	17.6373	<.0001
..Severe	1.317	0.056	551.9934	<.0001
Hospital Teaching Status	-0.279	0.128	4.7430	0.0294
Log of Number of Beds	0.344	0.066	26.8154	<.0001
Log of Number of Psychiatric Care Beds	0.987	0.080	151.4846	<.0001
Hospital Ownership (reference = Public)				
..Private, Not-for-Profit	-0.480	0.057	71.1191	<.0001
..Private, For-Profit	0.130	0.078	2.8176	0.0932
Safety Net Hospital	0.069	0.045	2.3249	0.1273
Hospital Location (reference = Large Metropolitan)				
..Small Metro	-0.470	0.141	11.0463	0.0009
..Large Rural	-0.095	0.144	0.4386	0.5078
..Small Rural	-0.117	0.204	0.3263	0.5678
Hospital Inpatient Psychiatric Services	-2.012	0.261	59.4559	<.0001
Hospital Inpatient/Outpatient Psychiatric Services	-0.412	0.099	17.3966	<.0001
Hospital Outpatient Psychiatric Services	0.321	0.105	9.3124	0.0023
Number of Community Mental Health Centers in the County	-0.755	0.074	103.2522	<.0001

Characteristic	Estimated Coefficient	Standard Error	Wald Chi-square	p-value
Number of Short Term Psychiatric and Chemical Dependency Beds Set Up per Capita in the County	-0.954	0.161	35.0717	<.0001
Shortage Area for Mental Health Practitioners	0.108	0.073	2.2303	0.1353

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.
Note: M/SU = mental and/or substance use; DS = Disease Staging

Table C.3A: Standard Logistic Model for the Likelihood of an ED Visit for Co-Occurring M/SUD Resulting in Admission, State A, 2002

Characteristic	Estimated Coefficient	Standard Error	Wald Chi-square	p-value
Intercept	-5.212	0.246	450.1655	<.0001
(Age – 40) / 10 (i.e., centered on 40 and scaled to decades)	0.112	0.016	46.6853	<.0001
$((Age – 40) / 10)^2$	0.017	0.008	4.2355	0.0396
Median Zip Income / $10,000	0.073	0.014	27.8254	<.0001
Female (reference = Male)	-0.109	0.035	9.7414	0.0018
Ethnicity (reference = White)				
..Black	-0.164	0.054	9.0592	0.0026
..Hispanic	-0.440	0.220	4.0018	0.0455
..Asian	-0.036	0.511	0.0051	0.9432
..Other Race	0.320	0.181	3.1247	0.0771
..Unknown Race	0.031	0.173	0.0331	0.8556
Insurance (reference = Private)				
..Medicare	-0.482	0.062	60.4393	<.0001
..Medicaid	-0.517	0.049	110.1011	<.0001
..Other Government	0.527	0.112	21.9847	<.0001
..Uninsured	-0.431	0.052	68.1868	<.0001
DS Resource Demand Scale (reference = Minimal <30)				
..Less intensive	0.296	0.055	29.2341	<.0001
..Moderate	0.724	0.056	167.1498	<.0001
..Highly intensive	2.127	0.051	1720.4390	<.0001
M/SU Disorder Severity (reference = None)				
..Mild	1.901	0.081	550.9849	<.0001
..Moderate	2.638	0.062	1817.8240	<.0001
..Severe	3.270	0.059	3106.7751	<.0001
Hospital Teaching Status	0.386	0.060	40.6300	<.0001
Log of Number of Beds	-0.023	0.036	0.4169	0.5185
Log of Number of Chemical Dependency and Psychiatric Care Beds	-0.057	0.029	3.9114	0.0480
Hospital Ownership (reference = Public)				
..Private, Not-for-Profit	0.253	0.075	11.4968	0.0007
..Private, For-Profit	-0.174	0.091	3.6413	0.0564
Safety Net Hospital	-0.018	0.032	0.3068	0.5796
Hospital Location (reference = Large Metropolitan)				
..Small Metro	-0.144	0.082	3.0895	0.0788
..Large Rural	-0.105	0.089	1.3982	0.2370
..Small Rural	-0.732	0.142	26.5605	<.0001
Hospital Inpatient Substance Abuse Services	-0.471	0.060	61.9859	<.0001
Hospital Outpatient Substance Abuse Services	0.525	0.096	29.8548	<.0001
Hospital Outpatient/Inpatient Crisis Prevention Services	-0.100	0.084	1.4009	0.2366

Characteristic	Estimated Coefficient	Standard Error	Wald Chi-square	p-value
Both Hospital Outpatient Substance Abuse and Outpatient/Inpatient Crisis Prevention Services	-0.218	0.100	4.7272	0.0297
Hospital Inpatient Psychiatric Services	0.801	0.105	57.6958	<.0001
Hospital Inpatient/Outpatient Psychiatric Services	0.027	0.114	0.0582	0.8093
Hospital Outpatient Psychiatric Services	0.738	0.069	114.2224	<.0001
Number of Community Mental Health Centers in the County	0.055	0.027	4.0001	0.0455
Number of Short Term Psychiatric and Chemical Dependency Beds Set Up per Capita in the County	-0.148	0.033	20.2964	<.0001
Shortage Area for Mental Health Practitioners	0.217	0.072	9.0944	0.0026

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.
Note: M/SU = mental and/or substance use; DS = Disease Staging; M/SUD = mental and substance use disorders

Table C.3B: Standard Logistic Model for the Likelihood of an ED Visit for Co-Occurring M/SUD Resulting in Admission, State B, 2002

Characteristic	Estimated Coefficient	Standard Error	Wald Chi-square	p-value
Intercept	-8.536	0.478	318.8020	<.0001
(Age – 40) / 10 (i.e., centered on 40 and scaled to decades)	0.097	0.023	18.5011	<.0001
$((Age – 40) / 10)^2$	0.029	0.010	8.0087	0.0047
Median Zip Income / $10,000	0.038	0.023	2.8648	0.0905
Female (reference = Male)	-0.220	0.050	19.2997	<.0001
Ethnicity (reference = White)				
..Black	-0.161	0.058	7.8530	0.0051
..Hispanic	1.118	0.471	5.6239	0.0177
Insurance (reference = Private)				
..Medicare	-0.678	0.079	72.8794	<.0001
..Medicaid	-0.332	0.076	19.1521	<.0001
..Other Government	0.524	0.122	18.5006	<.0001
..Uninsured	-0.721	0.069	108.9341	<.0001
DS Resource Demand Scale (reference = Minimal <30)				
..Less intensive	0.395	0.090	19.2057	<.0001
..Moderate	0.874	0.091	93.1266	<.0001
..Highly intensive	2.356	0.082	822.4926	<.0001
M/SU Disorder Severity (reference = None)				
..Mild	1.462	0.107	187.3675	<.0001
..Moderate	2.112	0.079	715.7973	<.0001
..Severe	2.891	0.074	1525.8465	<.0001
Hospital Teaching Status	-0.423	0.155	7.4921	0.0062
Log of Number of Beds	0.362	0.079	21.0480	<.0001
Log of Number of Chemical Dependency and Psychiatric Care Beds	0.576	0.039	216.2997	<.0001
Hospital Ownership (reference = Public)				
..Private, Not-for-Profit	0.506	0.088	32.7156	<.0001
..Private, For-Profit	0.853	0.096	79.6354	<.0001
Safety Net Hospital	0.228	0.052	19.4520	<.0001
Hospital Location (reference = Large Metropolitan)				
..Small Metro	0.795	0.189	17.7477	<.0001
..Large Rural	1.174	0.179	42.7933	<.0001
..Small Rural	1.407	0.252	31.1796	<.0001
Hospital Inpatient Substance Abuse Services	-1.059	0.102	108.4962	<.0001
Hospital Outpatient Substance Abuse Services	0.035	0.089	0.1500	0.6986
Hospital Outpatient/Inpatient Crisis Prevention Services	0.554	0.118	22.1452	<.0001
Both Hospital Outpatient Substance Abuse and Outpatient/Inpatient Crisis Prevention Services	-1.711	0.210	66.6830	<.0001
Hospital Inpatient Psychiatric Services	-0.934	0.159	34.3720	<.0001
Hospital Inpatient/Outpatient Psychiatric Services	-0.265	0.120	4.8440	0.0277

Characteristic	Estimated Coefficient	Standard Error	Wald Chi-square	p-value
Hospital Outpatient Psychiatric Services	1.139	0.135	70.9877	<.0001
Number of Community Mental Health Centers in the County	-0.703	0.098	51.1510	<.0001
Number of Short Term Psychiatric and Chemical Dependency Beds Set Up per Capita in the County	-1.479	0.173	73.2822	<.0001
Shortage Area for Mental Health Practitioners	0.018	0.081	0.0506	0.8220

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.
Note: M/SU = mental and/or substance use; DS = Disease Staging; M/SUD = mental and substance use disorders

Table C.4A: Standard Logistic Model for the Likelihood of an ED Visit for Diabetes Resulting in Admission, State A, 2002

Characteristic	Estimated Coefficient	Standard Error	Wald Chi-square	p-value
Intercept	-4.515	0.329	188.0746	<.0001
(Age – 40) / 10 (i.e., centered on 40 and scaled to decades)	-0.155	0.027	34.3129	<.0001
((Age – 40) / 10)^2	0.057	0.007	65.7828	<.0001
Median Zip Income / $10,000	0.005	0.019	0.0638	0.8006
Female (reference = Male)	-0.246	0.051	23.6309	<.0001
Ethnicity (reference = White)				
..Black	-0.097	0.067	2.0808	0.1492
..Hispanic	-0.142	0.262	0.2923	0.5887
..Asian	1.810	0.517	12.2499	0.0005
..Other Race	0.052	0.244	0.0448	0.8324
..Unknown Race	0.617	0.231	7.1584	0.0075
Insurance (reference = Private)				
..Medicare	-0.293	0.077	14.3926	0.0001
..Medicaid	-0.600	0.083	51.9763	<.0001
..Other Government	-0.541	0.198	7.4541	0.0063
..Uninsured	-0.400	0.102	15.2528	<.0001
DS Resource Demand Scale (reference = Minimal <30)				
..Less intensive	0.845	0.125	45.3441	<.0001
..Moderate	1.829	0.118	240.6949	<.0001
..Highly intensive	4.276	0.109	1537.8501	<.0001
Hospital Teaching Status	0.311	0.072	18.6191	<.0001
Log of Number of Beds	0.269	0.040	45.8305	<.0001
Hospital Ownership (reference = Public)				
..Private, Not-for-Profit	0.263	0.086	9.2500	0.0024
..Private, For-Profit	0.084	0.114	0.5442	0.4607
Safety Net Hospital	0.078	0.042	3.4513	0.0632
Hospital Location (reference = Large Metropolitan)				
..Small Metro	-0.403	0.091	19.5259	<.0001
..Large Rural	-0.678	0.104	42.7081	<.0001
..Small Rural	-0.296	0.126	5.4956	0.0191
Number of Federally Qualified Health Centers in the County	0.174	0.030	33.3310	<.0001
Shortage Area for Primary Care Physicians	-0.256	0.122	4.3992	0.0360
Number of Short Term General Hospitals with EDs in the County	-0.165	0.044	13.6867	0.0002
Number of Short Term General Hospitals with Primary Care Departments in the County	0.033	0.054	0.3652	0.5456

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.
Note: DS = Disease Staging

Table C.4B: Standard Logistic Model for the Likelihood of an ED Visit for Diabetes Resulting in Admission, State B, 2002

Characteristic	Estimated Coefficient	Standard Error	Wald Chi-square	p-value
Intercept	-5.220	0.330	250.2929	<.0001
(Age – 40) / 10 (i.e., centered on 40 and scaled to decades)	-0.131	0.023	32.5478	<.0001
((Age – 40) / 10)^2	0.042	0.006	54.3991	<.0001
Median Zip Income / $10,000	0.011	0.022	0.2618	0.6089
Female (reference = Male)	-0.260	0.042	37.4000	<.0001
Ethnicity (reference = White)				
..Black	-0.110	0.045	6.0645	0.0138
..Hispanic	-0.269	0.430	0.3912	0.5317
Insurance (reference = Private)				
..Medicare	-0.333	0.064	27.5110	<.0001
..Medicaid	-0.330	0.074	19.6354	<.0001
..Other Government	0.384	0.128	9.0259	0.0027
..Uninsured	-0.376	0.078	23.2577	<.0001
DS Resource Demand Scale (reference = Minimal <30)				
..Less intensive	0.779	0.109	50.8366	<.0001
..Moderate	1.336	0.104	166.2556	<.0001
..Highly intensive	3.750	0.094	1577.2894	<.0001
Hospital Teaching Status	-0.144	0.074	3.8162	0.0508
Log of Number of Beds	0.414	0.043	92.8037	<.0001
Hospital Ownership (reference = Public)				
..Private, Not-for-Profit	0.135	0.052	6.6698	0.0098
..Private, For-Profit	0.248	0.064	14.8097	0.0001
Safety Net Hospital	0.077	0.038	4.0628	0.0438
Hospital Location (reference = Large Metropolitan)				
..Small Metro	-0.222	0.139	2.5502	0.1103
..Large Rural	0.039	0.150	0.0663	0.7968
..Small Rural	-0.031	0.175	0.0320	0.8581
Number of Federally Qualified Health Centers in the County	-0.023	0.013	3.2319	0.0722
Shortage Area for Primary Care Physicians	0.003	0.121	0.0007	0.9793
Number of Short Term General Hospitals with EDs in the County	-0.007	0.022	0.1109	0.7391
Number of Short Term General Hospitals with Primary Care Departments in the County	-0.039	0.027	2.0612	0.1511

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.
Note: DS = Disease Staging

Table C.5A: Standard Logistic Model for the Likelihood of an ED Visit for Chronic Respiratory Disease Resulting in Admission, State A, 2002

Characteristic	Estimated Coefficient	Standard Error	Wald Chi-square	p-value
Intercept	-6.102	0.219	774.6446	<.0001
(Age – 40) / 10 (i.e., centered on 40 and scaled to decades)	0.077	0.017	20.4560	<.0001
((Age – 40) / 10)^2	0.031	0.004	59.5167	<.0001
Median Zip Income / $10,000	0.039	0.013	9.3436	0.0022
Female (reference = Male)	-0.206	0.029	49.5270	<.0001
Ethnicity (reference = White)				
..Black	0.109	0.050	4.7129	0.0299
..Hispanic	-0.251	0.239	1.1036	0.2935
..Asian	0.693	0.331	4.3892	0.0362
..Other Race	0.010	0.192	0.0027	0.9589
..Unknown Race	-0.042	0.109	0.1490	0.6994
Insurance (reference = Private)				
..Medicare	0.131	0.046	8.0590	0.0045
..Medicaid	-0.175	0.050	12.1524	0.0005
..Other Government	-0.406	0.118	11.7319	0.0006
..Uninsured	-0.442	0.066	45.1979	<.0001
DS Resource Demand Scale (reference = Minimal <30)				
..Less intensive	0.411	0.153	7.1683	0.0074
..Moderate	1.435	0.148	94.1842	<.0001
..Highly intensive	4.214	0.144	861.3694	<.0001
Hospital Teaching Status	0.194	0.046	17.9304	<.0001
Log of Number of Beds	0.304	0.021	201.2938	<.0001
Hospital Ownership (reference = Public)				
..Private, Not-for-Profit	0.175	0.045	14.9156	0.0001
..Private, For-Profit	-0.065	0.065	0.9908	0.3195
Safety Net Hospital	-0.055	0.024	5.1515	0.0232
Hospital Location (reference = Large Metropolitan)				
..Small Metro	-0.381	0.050	58.4808	<.0001
..Large Rural	-0.506	0.055	84.3486	<.0001
..Small Rural	-0.077	0.065	1.4108	0.2349
Number of Federally Qualified Health Centers in the County	0.097	0.016	35.4268	<.0001
Shortage Area for Primary Care Physicians	-0.197	0.067	8.5635	0.0034
Number of Short Term General Hospitals with EDs in the County	-0.061	0.023	7.3189	0.0068
Number of Short Term General Hospitals with Primary Care Departments in the County	-0.049	0.028	3.0844	0.0790

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.
Note: DS = Disease Staging

Table C.5B: Standard Logistic Model for the Likelihood of an ED Visit for Chronic Respiratory Disease Resulting in Admission, State B, 2002

Characteristic	Estimated Coefficient	Standard Error	Wald Chi-square	p-value
Intercept	-6.815	0.324	443.0335	<.0001
(Age – 40) / 10 (i.e., centered on 40 and scaled to decades)	0.109	0.019	32.8839	<.0001
((Age – 40) / 10)^2	0.013	0.005	8.1440	0.0043
Median Zip Income / $10,000	-0.009	0.017	0.2695	0.6036
Female (reference = Male)	-0.230	0.032	51.7543	<.0001
Ethnicity (reference = White)				
..Black	-0.125	0.035	12.6754	0.0004
..Hispanic	-0.688	0.316	4.7203	0.0298
Insurance (reference = Private)				
..Medicare	-0.042	0.051	0.6724	0.4122
..Medicaid	-0.288	0.057	25.7594	<.0001
..Other Government	0.571	0.097	34.9370	<.0001
..Uninsured	-0.762	0.061	154.3742	<.0001
DS Resource Demand Scale (reference = Minimal <30)				
..Less intensive	0.996	0.225	19.6065	<.0001
..Moderate	1.941	0.220	78.0397	<.0001
..Highly intensive	4.504	0.217	431.1766	<.0001
Hospital Teaching Status	0.058	0.057	1.0286	0.3105
Log of Number of Beds	0.356	0.033	117.7818	<.0001
Hospital Ownership (reference = Public)				
..Private, Not-for-Profit	0.065	0.041	2.5177	0.1126
..Private, For-Profit	0.292	0.049	35.6115	<.0001
Safety Net Hospital	-0.015	0.027	0.3031	0.5819
Hospital Location (reference = Large Metropolitan)				
..Small Metro	-0.223	0.095	5.4742	0.0193
..Large Rural	0.166	0.104	2.5208	0.1124
..Small Rural	0.124	0.126	0.9724	0.3241
Number of Federally Qualified Health Centers in the County	-0.008	0.010	0.7448	0.3881
Shortage Area for Primary Care Physicians	0.200	0.085	5.5448	0.0185
Number of Short Term General Hospitals with EDs in the County	-0.047	0.016	8.4740	0.0036
Number of Short Term General Hospitals with Primary Care Departments in the County	-0.055	0.023	5.7428	0.0166

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.
Note: DS = Disease Staging

Table C.6A: HLM Logistic Regression for the Likelihood of an ED Visit for SUD Only Resulting in Admission, State A, 2002

Effect	Estimated Coefficient	Standard Error†	t-value	p-value
Intercept	-8.290	1.106	-7.50	<.0001
(Age – 40) / 10 (i.e., centered on 40 and scaled to decades)	0.253	0.030	8.43	<.0001
$((Age – 40) / 10)^2$	-0.045	0.012	-3.86	0.0001
Median Zip Income / $10,000	0.083	0.025	3.34	0.0008
Female (reference = Male)	-0.318	0.074	-4.31	<.0001
Ethnicity (reference = White)				
..Black	0.099	0.096	1.03	0.3048
..Hispanic	0.088	0.309	0.28	0.7766
..Asian	-1.401	1.329	-1.05	0.2920
..Other Race	0.231	0.280	0.83	0.4086
..Unknown Race	0.429	0.294	1.46	0.1446
Insurance (reference = Private)				
..Medicare	-0.132	0.130	-1.01	0.3102
..Medicaid	-0.223	0.099	-2.26	0.0241
..Other Government	0.141	0.183	0.77	0.4405
..Uninsured	-0.190	0.090	-2.11	0.0345
DS Resource Demand Scale (reference = Minimal <30)				
..Less intensive	0.743	0.092	8.07	<.0001
..Moderate	1.050	0.106	9.89	<.0001
..Highly intensive	3.095	0.089	34.68	<.0001
M/SU Disorder Severity (reference = None)				
..Mild	2.071	0.106	19.59	<.0001
..Moderate	3.189	0.096	33.37	<.0001
..Severe	3.208	0.119	26.95	<.0001
Hospital Teaching Status	-0.016	0.420	-0.04	0.9699
Log of Number of Beds	0.530	0.193	2.74	0.0061
Log of Number of Chemical Dependency Care Beds	-0.110	0.363	-0.30	0.7626
Hospital Ownership (reference = Public)				
..Private, Not-for-Profit	-0.554	0.368	-1.51	0.1321
..Private, For-Profit	-0.767	0.490	-1.57	0.1175
Safety Net Hospital	0.234	0.221	1.06	0.2892
Hospital Location (reference = Large Metropolitan)				
..Small Metro	0.283	0.425	0.67	0.5044
..Large Rural	0.131	0.404	0.32	0.7460
..Small Rural	0.119	0.451	0.26	0.7921
Hospital Inpatient Substance Abuse Services	-0.148	0.525	-0.28	0.7788
Hospital Outpatient Substance Abuse Services	0.760	0.664	1.14	0.2529
Hospital Outpatient/Inpatient Crisis Prevention Services	0.279	0.362	0.77	0.4412
Both Hospital Outpatient Substance Abuse and Hospital Outpatient/Inpatient Crisis Prevention Services	-0.569	0.730	-0.78	0.4357

Effect	Estimated Coefficient	Standard Error†	t-value	p-value
Number of Community Mental Health Centers in the County	-0.094	0.062	-1.51	0.1307
Number of Short Term Psychiatric and Chemical Dependency Beds Set Up per Capita in the County	0.130	0.068	1.93	0.0636
Shortage Area for Mental Health Practitioners	-0.045	0.160	-0.28	0.7800

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.
Note: Random effect of the intercept is estimated at 1.170 with the se of 0.284. M/SU = mental and/or substance use; DS = Disease Staging
† Standard errors were adjusted using the hospital as the grouping variable.

Table C.6B: HLM Logistic Regression for the Likelihood of an ED Visit for SUD Only Resulting in Admission, State B, 2002

Effect	Estimated Coefficient	Standard Error	t-value	p-value
Intercept	-7.718	1.493	-5.17	<.0001
(Age – 40) / 10 (i.e., centered on 40 and scaled to decades)	0.287	0.038	7.47	<.0001
$((Age – 40) / 10)^2$	-0.053	0.014	-3.75	0.0002
Median Zip Income / $10,000	0.110	0.036	3.08	0.0021
Female (reference = Male)	-0.045	0.078	-0.58	0.5628
Ethnicity (reference = White or Others)				
..Black	0.116	0.078	1.49	0.1365
..Hispanic	1.507	0.377	4.00	<.0001
Insurance (reference = Private)				
..Medicare	-0.291	0.127	-2.29	0.0222
..Medicaid	-0.337	0.114	-2.96	0.0031
..Other Government	0.883	0.155	5.70	<.0001
..Uninsured	-0.787	0.100	-7.83	<.0001
DS Resource Demand Scale (reference = Minimal <30)				
..Less intensive	0.784	0.121	6.50	<.0001
..Moderate	1.367	0.121	11.27	<.0001
..Highly intensive	3.425	0.102	33.68	<.0001
M/SU Disorder Severity (reference = None)				
..Mild	1.376	0.103	13.42	<.0001
..Moderate	2.704	0.090	30.02	<.0001
..Severe	2.820	0.140	20.12	<.0001
Hospital Teaching Status	-0.064	0.477	-0.13	0.8940
Log of Number of Beds	0.442	0.223	1.98	0.0474
Log of Number of Chemical Dependency Care Beds	0.076	0.216	0.35	0.7238
Hospital Ownership (reference = Public)				
..Private, Not-for-Profit	0.019	0.292	0.06	0.9484
..Private, For-Profit	0.276	0.328	0.84	0.3998
Safety Net Hospital	0.271	0.194	1.40	0.1617
Hospital Location (reference = Large Metropolitan)				
..Small Metro	-0.792	0.836	-0.95	0.3430
..Large Rural	0.088	0.857	0.10	0.9186
..Small Rural	-0.518	0.950	-0.55	0.5852
Hospital Inpatient Substance Abuse Services	-0.394	0.426	-0.93	0.3542
Hospital Outpatient Substance Abuse Services	0.666	0.468	1.42	0.1547
Hospital Outpatient/Inpatient Crisis Prevention Services	0.172	0.560	0.31	0.7582
Both Hospital Outpatient Substance Abuse and Hospital Outpatient/Inpatient Crisis Prevention Services	-1.014	1.115	-0.91	0.3633
Number of Community Mental Health Centers in the County	0.072	0.215	0.34	0.7368

Effect	Estimated Coefficient	Standard Error	t-value	p-value
Number of Short Term Psychiatric and Chemical Dependency Beds Set Up per Capita in the County	-0.990	0.326	-3.04	0.0024
Shortage Area for Mental Health Practitioners	0.051	0.183	0.28	0.7808

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.
Note: Random effect of the intercept is estimated at 0.568 with the se of 0.163. M/SU = mental and/or substance use; DS = Disease Staging
† Standard errors were adjusted using the hospital as the grouping variable.

Table C.7A: HLM Logistic Regression for the Likelihood of an ED Visit for Mental Disorders Only Resulting in Admission, State A, 2002

Effect	Estimated Coefficient	Standard Error†	t-value	p-value
Intercept	-9.821	1.283	-7.66	<.0001
(Age – 40) / 10 (i.e., centered on 40 and scaled to decades)	-0.008	0.015	-0.57	0.5689
((Age – 40) / 10)^2	0.034	0.005	7.48	<.0001
Median Zip Income / $10,000	-0.001	0.013	-0.09	0.9300
Female (reference = Male)	0.058	0.036	1.59	0.1129
Ethnicity (reference = White)				
..Black	-0.151	0.060	-2.54	0.0111
..Hispanic	-0.852	0.242	-3.52	0.0004
..Asian	0.636	0.297	2.15	0.0319
..Other Race	0.244	0.165	1.48	0.1388
..Unknown Race	-0.227	0.177	-1.28	0.2001
Insurance (reference = Private)				
..Medicare	-0.213	0.054	-3.94	<.0001
..Medicaid	-0.290	0.049	-5.98	<.0001
..Other Government	0.186	0.107	1.75	0.0805
..Uninsured	-0.582	0.063	-9.21	<.0001
DS Resource Demand Scale (reference = Minimal < 30)				
..Less intensive	0.294	0.078	3.77	0.0002
..Moderate	1.127	0.076	14.86	<.0001
..Highly intensive	2.786	0.074	37.88	<.0001
M/SU Disorder Severity (reference = None)				
..Mild	0.828	0.075	10.96	<.0001
..Moderate	0.752	0.053	14.20	<.0001
..Severe	1.875	0.044	42.40	<.0001
Hospital Teaching Status	0.428	0.448	0.96	0.3394
Log of Number of Beds	0.782	0.236	3.31	0.0009
Log of Number of Psychiatric Care Beds	-0.477	0.382	-1.25	0.2111
Hospital Ownership (reference = Public)				
..Private, Not-for-Profit	0.029	0.370	0.08	0.9384
..Private, For-Profit	-0.884	0.533	-1.66	0.0971
Safety Net Hospitals	0.268	0.233	1.15	0.2497
Hospital Location (reference = Large Metropolitan)				
..Small Metro	-0.558	0.478	-1.17	0.2433
..Large Rural	-0.564	0.464	-1.22	0.2242
..Small Rural	0.167	0.461	0.36	0.7179
Hospital Inpatient Psychiatric Services	1.697	1.231	1.38	0.1679
Hospital Inpatient/Outpatient Psychiatric Services	0.781	0.446	1.75	0.0797
Hospital Outpatient Psychiatric Services	-0.140	0.377	-0.37	0.7110
Number of Community Mental Health Centers in the County	-0.100	0.040	-2.50	0.0125

Effect	Estimated Coefficient	Standard Error†	t-value	p-value
Number of Short Term Psychiatric and Chemical Dependency Beds Set Up per Capita in the County	-0.082	0.041	-2.00	0.0454
Shortage Area for Mental Health Practitioners	0.203	0.088	2.31	0.0207

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.
Note: Random effect of the intercept is estimated at 1.681 with the se of 0.313. M/SU = mental and/or substance use; DS = Disease Staging
† Standard errors were adjusted using the hospital as the grouping variable.

Table C.7B: HLM Logistic Regression for the Likelihood of an ED Visit for Mental Disorders Only Resulting in Admission, State B, 2002

Effect	Estimated Coefficient	Standard Error	t-value	p-value
Intercept	-8.191	1.579	-5.19	<.0001
(Age – 40) / 10 (i.e., centered on 40 and scaled to decades)	0.059	0.020	2.95	0.0031
$((Age – 40) / 10)^2$	0.047	0.006	7.66	<.0001
Median Zip Income / $10,000	0.018	0.023	0.77	0.4414
Female (reference = Male)	0.011	0.048	0.24	0.8142
Ethnicity (reference = White or Others)				
..Black	-0.302	0.051	-5.90	<.0001
..Hispanic	0.002	0.291	0.01	0.9955
Insurance (reference = Private)				
..Medicare	-0.509	0.070	-7.29	<.0001
..Medicaid	-0.399	0.067	-5.99	<.0001
..Other Government	0.319	0.119	2.69	0.0072
..Uninsured	-1.032	0.075	-13.69	<.0001
DS Resource Demand Scale (reference = Minimal <30)				
..Less intensive	0.148	0.114	1.30	0.1936
..Moderate	0.794	0.110	7.24	<.0001
..Highly intensive	2.352	0.105	22.35	<.0001
M/SU Disorder Severity (reference = None)				
..Mild	0.415	0.096	4.33	<.0001
..Moderate	0.265	0.072	3.68	0.0002
..Severe	1.374	0.057	23.95	<.0001
Hospital Teaching Status	-1.002	0.653	-1.54	0.1247
Log of Number of Beds	0.731	0.255	2.86	0.0042
Log of Number of Psychiatric Care Beds	1.010	0.539	1.87	0.0612
Hospital Ownership (reference = Public)				
..Private, Not-for-Profit	-0.119	0.293	-0.40	0.6860
..Private, For-Profit	0.132	0.332	0.40	0.6910
Safety Net Hospital	0.171	0.193	0.89	0.3748
Hospital Location (reference = Large Metropolitan)				
..Small Metro	-0.496	0.937	-0.53	0.5969
..Large Rural	-0.121	0.925	-0.13	0.8962
..Small Rural	-0.028	1.037	-0.03	0.9788
Hospital Inpatient Psychiatric Services	-2.179	1.650	-1.32	0.1865
Hospital Inpatient/Outpatient Psychiatric Services	-0.415	0.376	-1.10	0.2704
Hospital Outpatient Psychiatric Services	0.425	0.483	0.88	0.3788
Number of Community Mental Health Centers in the County	-0.128	0.138	-0.92	0.3561

Effect	Estimated Coefficient	Standard Error	t-value	p-value
Number of Short Term Psychiatric and Chemical Dependency Beds Set Up per Capita in the County	-0.896	0.193	-4.65	<.0001
Shortage Area for Mental Health Practitioners	0.077	0.138	0.56	0.5780

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.

Note: Random effect of the intercept is estimated at 0.638 with the se of 0.163. M/SU = mental and/or substance use; DS = Disease Staging

† Standard errors were adjusted using the hospital as the grouping variable.

Table C.8A: HLM Logistic Regression for the Likelihood of an ED Visit for Co-Occurring M/SUD Resulting in Admission, State A, 2002

Effect	Estimated Coefficient	Standard Error†	t-value	p-value
Intercept	-8.165	1.232	-6.63	<.0001
(Age – 40) / 10 (i.e., centered on 40 and scaled to decades)	0.124	0.017	7.24	<.0001
$((Age – 40) / 10)^2$	0.017	0.008	2.05	0.0402
Median Zip Income / $10,000	0.049	0.015	3.35	0.0008
Female (reference = Male)	-0.118	0.036	-3.25	0.0012
Ethnicity (reference = White)				
..Black	-0.042	0.059	-0.71	0.4755
..Hispanic	-0.429	0.225	-1.90	0.0569
..Asian	-0.241	0.530	-0.46	0.6489
..Other Race	0.352	0.189	1.86	0.0630
..Unknown Race	0.335	0.200	1.68	0.0937
Insurance (reference = Private)				
..Medicare	-0.499	0.065	-7.72	<.0001
..Medicaid	-0.450	0.051	-8.80	<.0001
..Other Government	0.653	0.120	5.45	<.0001
..Uninsured	-0.426	0.054	-7.87	.0001
DS Resource Demand Scale (reference = Minimal < 30)				
..Less intensive	0.276	0.056	4.91	<.0001
..Moderate	0.697	0.058	12.11	<.0001
..Highly intensive	2.146	0.053	40.37	<.0001
M/SU Disorder Severity (reference = None)				
..Mild	1.952	0.083	23.57	<.0001
..Moderate	2.670	0.063	42.19	<.0001
..Severe	3.342	0.060	55.33	<.0001
Hospital Teaching Status	0.387	0.437	0.89	0.3761
Log of Number of Beds	0.469	0.220	2.13	0.0333
Log of Number of Chemical Dependency and Psychiatric Care Beds	-0.390	0.280	-1.39	0.1640
Hospital Ownership (reference = Public)				
..Private, Not-for-Profit	0.227	0.377	0.60	0.5469
..Private, For-Profit	-0.999	0.508	-1.97	0.0490
Safety Net Hospital	0.181	0.234	0.77	0.4399
Hospital Location (reference = Large Metropolitan)				
..Small Metro	-0.619	0.475	-1.30	0.1921
..Large Rural	-0.262	0.435	-0.60	0.5480
..Small Rural	-0.132	0.453	-0.29	0.7715
Hospital Inpatient Substance Abuse Services	-0.419	0.624	-0.67	0.5020
Hospital Outpatient Substance Abuse Services	1.291	0.734	1.76	0.0788
Hospital Outpatient/Inpatient Crisis Prevention Services	0.048	0.467	0.10	0.9176

Effect	Estimated Coefficient	Standard Error†	t-value	p-value
Both Hospital Outpatient Substance Abuse and Hospital Outpatient/Inpatient Crisis Prevention Services	-0.676	0.803	-0.84	0.3996
Hospital Inpatient Psychiatric Services	1.284	0.925	1.39	0.1652
Hospital Inpatient/Outpatient Psychiatric Services	0.489	0.502	0.97	0.3298
Hospital Outpatient Psychiatric Services	0.270	0.375	0.72	0.4714
Number of Community Mental Health Centers in the County	0.049	0.039	1.25	0.2112
Number of Short Term Psychiatric and Chemical Dependency Beds Set Up per Capita in the County	0.001	0.040	0.02	0.9863
Shortage Area for Mental Health Practitioners	0.098	0.096	1.02	0.3085

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.
Note: Random effect of the intercept is estimated at 1.444 with the se of 0.298. M/SU = mental and/or substance use; DS = Disease Staging; M/SUD = mental and substance use disorders
† Standard errors were adjusted using the hospital as the grouping variable.
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Table C.8B: HLM Logistic Regression for the Likelihood of an ED Visit for Co-Occurring M/SUD Resulting in Admission, State B, 2002

Effect	Estimated Coefficient	Standard Error	t-value	p-value
Intercept	-8.520	2.103	-4.05	0.0002
(Age – 40) / 10 (i.e., centered on 40 and scaled to decades)	0.096	0.023	4.13	<.0001
((Age – 40) / 10)^2	0.029	0.010	2.83	0.0047
Median Zip Income / $10,000	0.028	0.025	1.12	0.2626
Female (reference = Male)	-0.226	0.051	-4.39	<.0001
Ethnicity (reference = White or Others)				
..Black	-0.185	0.060	-3.06	0.0022
..Hispanic	1.028	0.469	2.19	0.0283
Insurance (reference = Private)				
..Medicare	-0.603	0.082	-7.36	<.0001
..Medicaid	-0.297	0.078	-3.79	0.0002
..Other Government	0.616	0.127	4.86	<.0001
..Uninsured	-0.661	0.072	-9.20	<.0001
DS Resource Demand Scale (reference = Minimal <30)				
..Less intensive	0.382	0.092	4.18	<.0001
..Moderate	0.865	0.092	9.38	<.0001
..Highly intensive	2.393	0.084	28.53	<.0001
M/SU Disorder Severity (reference = None)				
..Mild	1.465	0.108	13.51	<.0001
..Moderate	2.155	0.080	26.94	<.0001
..Severe	2.982	0.075	39.57	<.0001
Hospital Teaching Status	-0.023	0.808	-0.03	0.9768
Log of Number of Beds	0.440	0.340	1.29	0.1963
Log of Number of Chemical Dependency and Psychiatric Care Beds	0.257	0.289	0.89	0.3733
Hospital Ownership (reference = Public)				
..Private, Not-for-Profit	0.140	0.417	0.34	0.7374
..Private, For-Profit	0.611	0.439	1.39	0.1638
Safety Net Hospital	0.322	0.264	1.22	0.2221
Hospital Location (reference = Large Metropolitan)				
..Small Metro	0.244	1.281	0.19	0.8490
..Large Rural	0.466	1.253	0.37	0.7097
..Small Rural	0.492	1.399	0.35	0.7251
Hospital Inpatient Substance Abuse Services	-0.837	0.649	-1.29	0.1977
Hospital Outpatient Substance Abuse Services	0.128	0.649	0.20	0.8442
Hospital Outpatient/Inpatient Crisis Prevention Services	0.056	0.829	0.07	0.9458
Both Hospital Outpatient Substance Abuse and Hospital Outpatient/Inpatient Crisis Prevention Services	-1.116	1.610	-0.69	0.4884
Hospital Inpatient Psychiatric Services	-0.716	1.033	-0.69	0.4882
Hospital Inpatient/Outpatient Psychiatric Services	0.210	0.532	0.40	0.6926

Effect	Estimated Coefficient	Standard Error	t-value	p-value
Hospital Outpatient Psychiatric Services	0.864	0.667	1.30	0.1952
Number of Community Mental Health Centers in the County	-0.275	0.142	-1.93	0.0535
Number of Short Term Psychiatric and Chemical Dependency Beds Set Up per Capita in the County	-0.487	0.206	-2.36	0.0182
Shortage Area for Mental Health Practitioners	-0.022	0.145	-0.15	0.8814

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.

Note: Random effect of the intercept is estimated at 1.133 with the se of 0.300. M/SU = mental and/or substance use; DS = Disease Staging; M/SUD = mental and substance use disorders

† Standard errors were adjusted using the hospital as the grouping variable.

Table C.9A: HLM Logistic Regression for the Likelihood of an ED Visit for Diabetes Resulting in Admission, State A, 2002

Effect	Estimated Coefficient	Standard Error†	t-value	p-value
Intercept	-5.413	0.852	-6.36	<.0001
(Age – 40) / 10 (i.e., centered on 40 and scaled to decades)	-0.153	0.027	-5.61	<.0001
((Age – 40) / 10)^2	0.056	0.007	7.72	<.0001
Median Zip Income / $10,000	-0.021	0.022	-0.97	0.3312
Female (reference = Male)	-0.220	0.052	-4.19	<.0001
Ethnicity (reference = White)				
..Black	-0.114	0.078	-1.48	0.1400
..Hispanic	0.041	0.270	0.15	0.8795
..Asian	1.887	0.537	3.51	0.0004
..Other Race	0.034	0.247	0.14	0.8896
..Unknown Race	0.696	0.309	2.26	0.0240
Insurance (reference = Private)				
..Medicare	-0.285	0.080	-3.59	0.0003
..Medicaid	-0.617	0.087	-7.10	<.0001
..Other Government	-0.489	0.211	-2.32	0.0203
..Uninsured	-0.381	0.106	-3.58	0.0003
DS Resource Demand Scale (reference = Minimal < 30)				
..Less intensive	0.830	0.127	6.56	<.0001
..Moderate	1.806	0.120	15.09	<.0001
..Highly intensive	4.305	0.111	38.70	<.0001
Hospital Teaching Status	0.627	0.307	2.05	0.0408
Log of Number of Beds	0.408	0.137	2.97	0.0030
Hospital Ownership (reference = Public)				
..Private, Not-for-Profit	0.132	0.259	0.51	0.6089
..Private, For-Profit	-0.495	0.380	-1.30	0.1928
Safety Net Hospital	0.172	0.158	1.08	0.2780
Hospital Location (reference = Large Metropolitan)				
..Small Metro	-0.430	0.316	-1.36	0.1740
..Large Rural	-0.732	0.306	-2.39	0.0168
..Small Rural	-0.192	0.328	-0.59	0.5577
Number of Federally Qualified Health Centers in the County	0.125	0.043	2.93	0.0034
Shortage Area for Primary Care Physicians	-0.256	0.164	-1.56	0.1188
Number of Short Term General Hospitals with EDs in the County	-0.143	0.077	-1.55	0.0659
Number of Short Term General Hospitals with Primary Care Departments in the County	0.056	0.068	0.82	0.4118

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.
Note: Random effect of the intercept is estimated at 0.789 with se of 0.169. DS = Disease Staging
†Standard errors were adjusted using the hospital as the grouping variable.

Table C.9B: HLM Logistic Regression for the Likelihood of an ED Visit for Diabetes Resulting in Admission, State B, 2002

Effect	Estimated Coefficient	Standard Error†	t-value	p-value
Intercept	-5.693	1.074	-5.30	<.0001
(Age – 40) / 10 (i.e., centered on 40 and scaled to decades)	-0.125	0.023	-5.36	<.0001
((Age – 40) / 10)^2	0.041	0.006	6.95	<.0001
Median Zip Income / $10,000	-0.003	0.023	-0.11	0.9147
Female (reference = Male)	-0.277	0.044	-6.35	<.0001
Ethnicity (reference = White or Others)				
..Black	-0.157	0.047	-3.36	0.0008
..Hispanic	-0.370	0.432	-0.86	0.3916
Insurance (reference = Private)				
..Medicare	-0.323	0.065	-4.98	<.0001
..Medicaid	-0.333	0.077	-4.34	<.0001
..Other Government	0.475	0.130	3.66	0.0003
..Uninsured	-0.357	0.080	-4.46	<.0001
DS Resource Demand Scale (reference = Minimal <30)				
..Less intensive	0.799	0.110	7.26	<.0001
..Moderate	1.365	0.105	13.05	<.0001
..Highly intensive	3.817	0.096	39.83	<.0001
Hospital Teaching Status	-0.290	0.340	-0.85	0.3938
Log of Number of Beds	0.483	0.156	3.09	0.0020
Hospital Ownership (reference = Public)				
..Private, Not-for-Profit	0.104	0.212	0.49	0.6230
..Private, For-Profit	0.110	0.244	0.45	0.6521
Safety Net Hospital	0.099	0.141	0.70	0.4817
Hospital Location (reference = Large Metropolitan)				
..Small Metro	-0.428	0.655	-0.65	0.5137
..Large Rural	-0.016	0.673	-0.02	0.9806
..Small Rural	-0.181	0.729	-0.25	0.8033
Number of Federally Qualified Health Centers in the County	-0.031	0.023	-1.37	0.1711
Shortage Area for Primary Care Physicians	0.194	0.178	1.09	0.2778
Number of Short Term General Hospitals with EDs in the County	0.055	0.037	1.49	0.1367
Number of Short Term General Hospitals with Primary Care Departments in the County	0.001	0.053	0.01	0.9892

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.
Note: Random effect of the intercept is estimated at 0.366 with the se of 0.094. DS = Disease Staging
† Standard errors were adjusted using the hospital as the grouping variable.

Table C.10A: HLM Logistic Regression for the Likelihood of an ED Visit for Chronic Respiratory Disease Resulting in Admission, State A, 2002

Effect	Estimated Coefficient	Standard Error†	t-value	p-value
Intercept	-8.061	1.153	-6.99	<.0001
(Age – 40) / 10 (i.e., centered on 40 and scaled to decades)	0.079	0.018	4.49	<.0001
((Age – 40) / 10)^2	0.031	0.004	7.28	<.0001
Median Zip Income / $10,000	0.021	0.015	1.41	0.1574
Female (reference = Male)	-0.218	0.030	-7.15	<.0001
Ethnicity (reference = White)				
..Black	0.071	0.057	1.24	0.2157
..Hispanic	-0.606	0.248	-2.44	0.0146
..Asian	0.723	0.332	2.17	0.0297
..Other Race	0.027	0.195	0.14	0.8900
..Unknown Race	0.367	0.177	2.08	0.0380
Insurance (reference = Private)				
..Medicare	0.119	0.048	2.48	0.0132
..Medicaid	-0.187	0.052	-3.60	0.0003
..Other Government	-0.396	0.125	-3.17	0.0015
..Uninsured	-0.451	0.068	-6.63	<.0001
DS Resource Demand Scale (reference = Minimal < 30)				
..Less intensive	0.489	0.160	3.05	0.0023
..Moderate	1.513	0.155	9.75	<.0001
..Highly intensive	4.313	0.151	28.49	<.0001
Hospital Teaching Status	0.650	0.444	1.46	0.1431
Log of Number of Beds	0.629	0.191	3.29	0.0010
Hospital Ownership (reference = Public)				
..Private, Not-for-Profit	-0.107	0.352	-0.30	0.7612
..Private, For-Profit	-1.092	0.528	-2.07	0.0385
Safety Net Hospital	0.028	0.226	0.12	0.9023
Hospital Location (reference = Large Metropolitan)				
..Small Metro	-0.503	0.451	-1.12	0.2645
..Large Rural	-0.797	0.431	-1.85	0.0642
..Small Rural	0.151	0.439	0.34	0.7306
Number of Federally Qualified Health Centers in the County	0.088	0.024	3.63	0.0003
Shortage Area for Primary Care Physicians	-0.025	0.096	-0.26	0.7920
Number of Short Term General Hospitals with EDs in the County	-0.041	0.031	-1.32	0.1883
Number of Short Term General Hospitals with Primary Care Departments in the County	-0.084	0.037	-2.27	0.0232

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.
Note: Random effect of the intercept is estimated at 1.868 with the se of 0.329. DS = Disease Staging
† Standard errors were adjusted using the hospital as the grouping variable.

Table C.10B: HLM Logistic Regression for the Likelihood of an ED Visit for Chronic Respiratory Disease Resulting in Admission, State B, 2002

Effect	Estimated Coefficient	Standard Error†	t-value	p-value
Intercept	-7.590	1.112	-6.83	<.0001
(Age – 40) / 10 (i.e., centered on 40 and scaled to decades)	0.121	0.019	6.23	<.0001
((Age – 40) / 10)^2	0.011	0.005	2.18	0.0294
Median Zip Income / $10,000	-0.009	0.019	-0.47	0.6387
Female (reference = Male)	-0.223	0.033	-6.81	<.0001
Ethnicity (reference = White or Others)				
..Black	-0.155	0.037	-4.24	<.0001
..Hispanic	-0.711	0.324	-2.19	0.0283
Insurance (reference = Private)				
..Medicare	-0.066	0.052	-1.26	0.2060
..Medicaid	-0.297	0.058	-5.13	<.0001
..Other Government	0.649	0.099	6.55	<.0001
..Uninsured	-0.741	0.062	-11.87	<.0001
DS Resource Demand Scale (reference = Minimal <30)				
..Less intensive	1.023	0.230	4.45	<.0001
..Moderate	1.959	0.225	8.71	<.0001
..Highly intensive	4.604	0.222	20.72	<.0001
Hospital Teaching Status	-0.117	0.353	-0.33	0.7399
Log of Number of Beds	0.487	0.160	3.05	0.0023
Hospital Ownership				
..Private, Not-for-Profit	0.034	0.218	0.16	0.8765
..Private, For-Profit	0.243	0.251	0.97	0.3318
Safety Net Hospital	0.020	0.144	0.14	0.8881
Hospital Location (reference = Large Metropolitan)				
..Small Metro	-0.245	0.680	-0.36	0.7183
..Large Rural	0.256	0.698	0.37	0.7141
..Small Rural	0.060	0.753	0.08	0.9364
Number of Federally Qualified Health Centers in the County	0.020	0.019	1.05	0.2947
Shortage Area for Primary Care Physicians	0.080	0.141	0.57	0.5687
Number of Short Term General Hospitals with EDs in the County	-0.020	0.030	-0.68	0.4939
Number of Short Term General Hospitals with Primary Care Departments in the County	-0.139	0.045	-3.06	0.0022

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.
Note: Random effect of the intercept is estimated at 0.406 with the se of 0.099. DS = Disease Staging
† Standard errors were adjusted using the hospital as the grouping variable.

Table C.11A: HLM Logistic Regression for the Likelihood of Multiple ED-IP Stays for People with an ED-IP Stay for SUD Only, State A, 2002

Effect	Estimated Coefficient	Standard Error†	t-value	p-value
Intercept	-3.578	0.450	-7.94	<.0001
(Age – 40) / 10 (i.e., centered on 40 and scaled to decades)	0.239	0.078	3.06	0.0022
((Age – 40) / 10)^2	-0.056	0.025	-2.29	0.0221
Median Zip Income / $10,000	0.061	0.051	1.19	0.2333
Female (reference = Male)	-0.256	0.155	-1.65	0.0983
Ethnicity (reference = White or Others)				
..Black	0.391	0.181	2.16	0.0313
..Hispanic	0.152	0.625	0.24	0.8076
Insurance (reference = Private)				
..Medicare	0.377	0.252	1.50	0.1343
..Medicaid	0.664	0.197	3.38	0.0007
..Other Government	0.000	0.410	0.00	0.9993
..Uninsured	0.278	0.193	1.44	0.1514
Patient Location (reference = Large Metropolitan)				
..Small Metropolitan	0.141	0.325	0.43	0.6647
..Large Rural	-0.160	0.381	-0.42	0.6740
..Small Rural	-0.148	0.372	-0.40	0.6915
M/SU Disorder Severity* (reference = Mild)				
..Moderate	0.658	0.206	3.18	0.0015
..Severe	0.515	0.254	2.03	0.0426
DS Resource Demand Scale* (reference = Minimal to Less Intensive < 37.5)				
..Moderate	0.582	0.283	2.06	0.0395
..Highly intensive	1.510	0.211	7.15	<.0001
Number of Community Mental Health Centers in the County	-0.099	0.131	-0.76	0.4485
Number of Short Term Psychiatric and Chemical Dependency Beds Set Up per Capita in the County	0.012	0.050	0.25	0.8030
Shortage Area for Mental Health Practitioners	0.035	0.319	0.11	0.9132

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.
Note: Random effect of the intercept is estimated at 0.102 with the se of 0.112. M/SU = mental and/or substance use; DS = Disease Staging; SUD = substance use disorders
* Maximum scores based upon all visits were assigned for each patient.
† Standard errors were adjusted using the county as the grouping variable.

Table C.11B: HLM Logistic Regression for the Likelihood of Multiple ED-IP Stays for People with an ED-IP Stay for SUD Only, State B, 2002

Effect	Estimated Coefficient	Standard Error†	t-value	p-value
Intercept	-4.951	0.657	-7.54	<.0001
(Age – 40) / 10 (i.e., centered on 40 and scaled to decades)	0.032	0.086	0.37	0.7105
((Age – 40) / 10)^2	-0.053	0.028	-1.94	0.0529
Median Zip Income / $10,000	0.062	0.069	0.90	0.3661
Female (reference = Male)	0.134	0.149	0.89	0.3712
Ethnicity (reference = White or Others)				
..Black	0.212	0.145	1.46	0.1440
..Hispanic	-0.449	0.833	-0.54	0.5900
Insurance (reference = Private)				
..Medicare	0.914	0.241	3.80	0.0002
..Medicaid	0.660	0.225	2.93	0.0034
..Other Government	0.525	0.284	1.85	0.0645
..Uninsured	0.087	0.209	0.42	0.6764
Patient Rural Residence (reference = Urban)	-0.063	0.195	-0.32	0.7485
M/SU Disorder Severity* (reference = Mild)				
..Moderate	0.752	0.213	3.54	0.0004
..Severe	0.551	0.288	1.91	0.0557
DS Resource Demand Scale* (reference = Minimal to Less Intensive < 37.5)				
..Moderate	1.062	0.543	1.95	0.0509
..Highly intensive	2.754	0.464	5.93	<.0001
Number of Community Mental Health Centers in the County	-0.594	0.334	-1.78	0.0757
Number of Short Term Psychiatric and Chemical Dependency Beds Set Up per Capita in the County	0.401	0.297	1.35	0.1772
Shortage Area for Mental Health Practitioners	0.292	0.276	1.06	0.2896

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.
Note: Random effect of the intercept is estimated at 0.122 with the se of 0.066. M/SU = mental and/or substance use; DS = Disease Staging; SUD = substance use disorders
* Maximum scores based upon all visits were assigned for each patient.
† Standard errors were adjusted using the county as the grouping variable.

Table C.12A: HLM Logistic Regression for the Likelihood of Multiple ED-IP Stays for People with an ED-IP Stay for Mental Disorders Only, State A, 2002

Effect	Estimated Coefficient	Standard Error†	t-value	p-value
Intercept	-3.710	0.414	-8.95	<.0001
(Age – 40) / 10 (i.e., centered on 40 and scaled to decades)	-0.025	0.032	-0.78	0.4345
((Age – 40) / 10)^2	0.034	0.009	3.85	0.0001
Median Zip Income / $10,000	-0.052	0.028	-1.85	0.0639
Female (reference = Male)	0.058	0.076	0.76	0.4495
Ethnicity (reference = White or Others)				
..Black	0.083	0.117	0.71	0.4767
..Hispanic	-0.145	0.571	-0.25	0.8001
Insurance (reference = Private)				
..Medicare	0.398	0.105	3.81	0.0001
..Medicaid	0.165	0.105	1.57	0.1176
..Other Government	-0.463	0.298	-1.55	0.1200
..Uninsured	-0.411	0.167	-2.46	0.0140
Patient Location (reference = Large Metropolitan)				
..Small Metro	0.155	0.221	0.70	0.4845
..Large Rural	-0.103	0.233	-0.44	0.6577
..Small Rural	-0.193	0.229	-0.84	0.4008
M/SU Disorder Severity* (reference = Mild)				
..Moderate	0.367	0.222	1.66	0.0974
..Severe	0.520	0.206	2.52	0.0116
DS Resource Demand Scale* (reference = Minimal to Less Intensive < 37.5)				
..Moderate	0.654	0.338	1.93	0.0531
..Highly intensive	2.239	0.300	7.46	<.0001
Number of Community Mental Health Centers in the County	-0.126	0.107	-1.18	0.2392
Number of Short Term Psychiatric and Chemical Dependency Beds Set Up per Capita in the County	-0.046	0.094	-0.49	0.6252
Shortage Area for Mental Health Practitioners	-0.352	0.204	-1.73	0.0842

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.
Note: Random effect of the intercept is estimated at 0.140 with the se of 0.070. M/SU = mental and/or substance use; DS = Disease Staging
* Maximum scores based upon all visits were assigned for each patient.
† Standard errors were adjusted using the county as the grouping variable.

Table C.12B: HLM Logistic Regression for the Likelihood of Multiple ED-IP Stays for People with an ED-IP Stay for Mental Disorders, State B Only, 2002

Effect	Estimated Coefficient	Standard Error†	t-value	p-value
Intercept	-4.543	0.795	-5.72	<.0001
(Age – 40) / 10 (i.e., centered on 40 and scaled to decades)	-0.057	0.047	-1.22	0.2221
((Age – 40) / 10)^2	0.055	0.013	4.17	<.0001
Median Zip Income / $10,000	-0.042	0.052	-0.80	0.4210
Female (reference = Male)	0.148	0.113	1.31	0.1915
Ethnicity (reference = White or Others)				
..Black	0.183	0.115	1.59	0.1131
..Hispanic	0.442	0.586	0.75	0.4509
Insurance (reference = Private)				
..Medicare	0.009	0.164	0.06	0.9538
..Medicaid	0.059	0.159	0.37	0.7106
..Other Government	-0.113	0.307	-0.37	0.7139
..Uninsured	-0.127	0.194	-0.65	0.5129
Patient Rural Residence (reference = Urban)	0.078	0.139	0.56	0.5778
M/SU Disorder Severity* (reference = Mild)				
..Moderate	0.272	0.255	1.07	0.2859
..Severe	0.276	0.238	1.16	0.2474
DS Resource Demand Scale* (reference = Minimal to Less Intensive < 37.5)				
..Moderate	1.759	0.744	2.36	0.0182
..Highly intensive	3.009	0.718	4.19	<.0001
Number of Community Mental Health Centers in the County	0.052	0.187	0.28	0.7820
Number of Short Term Psychiatric and Chemical Dependency Beds Set Up per Capita in the County	-0.597	0.345	-1.73	0.0841
Shortage Area for Mental Health Practitioners	-0.231	0.174	-1.33	0.1846

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.
Note: Random effect of the intercept is estimated at 0.014 with the SE of 0.024. M/SU = mental and/or substance use; DS = Disease Staging
* Maximum scores based upon all visits were assigned for each patient.
† Standard errors were adjusted using the county as the grouping variable.

Table C.13A: HLM Logistic Regression for the Likelihood of Multiple ED-IP Stays for People with an ED-IP Stay for Co-Occurring M/SUD, State A, 2002

Effect	Estimated Coefficient	Standard Error†	t-value	p-value
Intercept	-2.592	0.437	-5.93	<.0001
(Age – 40) / 10 (i.e., centered on 40 and scaled to decades)	0.092	0.028	3.24	0.0012
((Age – 40) / 10)^2	-0.039	0.013	-3.03	0.0025
Median Zip Income / $10,000	0.030	0.025	1.21	0.2266
Female (reference = Male)	-0.196	0.063	-3.09	0.0020
Ethnicity (reference = White or Others)				
..Black	-0.007	0.099	-0.07	0.9443
..Hispanic	-0.221	0.477	-0.46	0.6435
Insurance (reference = Private)				
..Medicare	0.523	0.105	4.96	<.0001
..Medicaid	0.354	0.087	4.05	<.0001
..Other Government	-0.331	0.244	-1.36	0.1737
..Uninsured	0.005	0.093	0.06	0.9550
Patient Location (reference = Large Metropolitan)				
..Small Metro	0.116	0.175	0.66	0.5089
..Large Rural	-0.011	0.195	-0.05	0.9565
..Small Rural	-0.313	0.199	-1.58	0.1146
M/SU Disorder Severity* (reference = Mild)				
..Moderate	0.336	0.397	0.84	0.3985
..Severe	0.566	0.391	1.45	0.1480
DS Resource Demand Scale* (reference = Minimal to Less Intensive < 37.5)				
..Moderate	0.475	0.153	3.11	0.0019
..Highly intensive	1.504	0.127	11.81	<.0001
Number of Community Mental Health Centers in the County	-0.024	0.073	-0.33	0.7409
Number of Short Term Psychiatric and Chemical Dependency Beds Set Up per Capita in the County	-0.071	0.047	-1.50	0.1345
Shortage Area for Mental Health Practitioners	0.047	0.176	0.27	0.7882

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.
Note: Random effect of the intercept is estimated at 0.056 with the se of 0.030. M/SU = mental and/or substance use; DS = Disease Staging; M/SUD = mental and substance use disorders
* Maximum scores based upon all visits were assigned for each patient.
† Standard errors were adjusted using the county as the grouping variable.

Table C.13B: HLM Logistic Regression for the Likelihood of Multiple ED-IP Stays for People with an ED-IP Stay for Co-Occurring M/SUD, State B, 2002

Effect	Estimated Coefficient	Standard Error†	t-value	p-value
Intercept	-2.019	0.583	-3.46	0.0012
(Age – 40) / 10 (i.e., centered on 40 and scaled to decades)	0.168	0.044	3.82	0.0001
((Age – 40) / 10)^2	-0.025	0.018	-1.34	0.1811
Median Zip Income / $10,000	-0.084	0.046	-1.82	0.0682
Female (reference = Male)	-0.220	0.098	-2.25	0.0245
Ethnicity (reference = White or Others)				
..Black	-0.133	0.110	-1.21	0.2268
..Hispanic	0.365	1.158	0.31	0.7528
Insurance (reference = Private)				
..Medicare	0.442	0.149	2.97	0.0030
..Medicaid	0.408	0.145	2.81	0.0049
..Other Government	0.144	0.261	0.55	0.5818
..Uninsured	-0.113	0.136	-0.83	0.4074
Patient Rural Residence (reference = Urban)	-0.125	0.140	-0.89	0.3724
M/SU Disorder Severity* (reference = Mild)				
..Moderate	-0.548	0.466	-1.18	0.2391
..Severe	-0.427	0.456	-0.94	0.3491
DS Resource Demand Scale* (reference = Minimal to Less Intensive < 37.5)				
..Moderate	1.042	0.330	3.16	0.0016
..Highly intensive	1.964	0.297	6.61	<.0001
Number of Community Mental Health Centers in the County	-0.442	0.213	-2.08	0.0380
Number of Short Term Psychiatric and Chemical Dependency Beds Set Up per Capita in the County	0.446	0.285	1.57	0.1175
Shortage Area for Mental Health Practitioners	0.156	0.199	0.78	0.4334

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.
Note: Random effect of the intercept is estimated at 0.042 with the se of 0.036. M/SU = mental and/or substance use; DS = Disease Staging; M/SUD = mental and substance use disorders
* Maximum scores based upon all visits were assigned for each patient.
† Standard errors were adjusted using the county as the grouping variable.

Table C.14A: HLM Logistic Regression for the Likelihood of Multiple ED-IP Stays for People with an ED-IP Stay for Diabetes, State A, 2002

Effect	Estimated Coefficient	Standard Error†	t-value	p-value
Intercept	-4.918	0.790	-6.22	<.0001
(Age – 40) / 10 (i.e., centered on 40 and scaled to decades)	-0.141	0.050	-2.82	0.0049
((Age – 40) / 10)^2	0.040	0.012	3.28	0.0010
Median Zip Income / $10,000	0.024	0.034	0.70	0.4864
Female (reference = Male)	0.017	0.090	0.18	0.8536
Ethnicity (reference = White or Others)				
..Black	0.326	0.119	2.73	0.0063
..Hispanic	-0.578	0.569	-1.02	0.3091
Insurance (reference = Private)				
..Medicare	0.825	0.139	5.92	<.0001
..Medicaid	0.553	0.157	3.52	0.0004
..Other Government	-0.616	0.454	-1.36	0.1744
..Uninsured	-0.195	0.207	-0.94	0.3452
Patient Location (reference = Large Metropolitan)				
..Small Metro	-0.052	0.174	-0.30	0.7644
..Large Rural	-0.271	0.200	-1.35	0.1757
..Small Rural	-0.045	0.188	-0.24	0.8091
DS Resource Demand Scale* (reference = Minimal to Less Intensive < 37.5)				
..Moderate	1.496	0.764	1.96	0.0505
..Highly intensive	3.640	0.715	5.09	<.0001
Number of Federally Qualified Health Centers in the County	0.031	0.059	0.53	0.5962
Shortage Area for Primary Care Physicians	-0.005	0.248	-0.02	0.9836
Number of Short Term General Hospitals with EDs in the County	-0.030	0.089	-0.33	0.7382
Number of Short Term General Hospitals with Primary Care Departments in the County	0.009	0.109	0.08	0.9327

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.
Note: Random effect of the intercept is estimated at 0.016 with the se of 0.033. DS = Disease Staging
* Maximum scores based upon all visits were assigned for each patient.
† Standard errors were adjusted using the county as the grouping variable.

Table C.14B: HLM Logistic Regression for the Likelihood of Multiple ED-IP Stays for People with an ED-IP Stay for Diabetes, State B, 2002

Effect	Estimated Coefficient	Standard Error†	t-value	p-value
Intercept	-3.790	0.487	-7.78	<.0001
(Age – 40) / 10 (i.e., centered on 40 and scaled to decades)	-0.026	0.045	-0.58	0.5624
((Age – 40) / 10)^2	0.013	0.011	1.16	0.2464
Median Zip Income / $10,000	0.057	0.042	1.35	0.1772
Female (reference = Male)	0.125	0.081	1.54	0.1245
Ethnicity (reference = White or Others)				
..Black	0.148	0.085	1.75	0.0802
..Hispanic	-0.849	1.111	-0.76	0.4451
Insurance (reference = Private)				
..Medicare	0.574	0.125	4.58	<.0001
..Medicaid	0.395	0.152	2.61	0.0092
..Other Government	-0.257	0.244	-1.05	0.2923
..Uninsured	-0.056	0.160	-0.35	0.7277
Patient Rural Residence (reference = Urban)	-0.075	0.110	-0.68	0.4987
DS Resource Demand Scale* (reference = Minimal to Less Intensive < 37.5)				
..Moderate	0.693	0.437	1.58	0.1133
..Highly intensive	2.564	0.364	7.04	<.0001
Number of Federally Qualified Health Centers in the County	-0.033	0.028	-1.20	0.2293
Shortage Area for Primary Care Physicians	0.043	0.249	0.17	0.8630
Number of Short Term General Hospitals with EDs in the County	-0.049	0.049	-1.00	0.3180
Number of Short Term General Hospitals with Primary Care Departments in the County	-0.019	0.066	-0.29	0.7741

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.
Note: Random effect of the intercept is estimated at 0.020 with the se of 0.024. DS = Disease Staging
* Maximum scores based upon all visits were assigned for each patient.
† Standard errors were adjusted using the county as the grouping variable.

Table C.15A: HLM Logistic Regression for the Likelihood of Multiple ED-IP Stays for People with an ED-IP Stay for Chronic Respiratory Disease, State A, 2002

Effect	Estimated Coefficient	Standard Error†	t-value	p-value
Intercept	-2.993	0.497	-6.02	<.0001
(Age – 40) / 10 (i.e., centered on 40 and scaled to decades)	0.095	0.045	2.11	0.0350
((Age – 40) / 10)^2	0.008	0.009	0.92	0.3577
Median Zip Income / $10,000	-0.029	0.027	-1.06	0.2884
Female (reference = Male)	-0.110	0.060	-1.84	0.0661
Ethnicity (reference = White or Others)				
..Black	0.402	0.113	3.56	0.0004
..Hispanic	-1.870	1.031	-1.81	0.0697
Insurance (reference = Private)				
..Medicare	0.665	0.102	6.55	<.0001
..Medicaid	0.550	0.123	4.45	<.0001
..Other Government	-0.200	0.326	-0.62	0.5384
..Uninsured	-0.113	0.184	-0.61	0.5405
Patient Location (reference = Large Metropolitan)				
..Small Metro	-0.026	0.133	-0.20	0.8431
..Large Rural	-0.231	0.142	-1.63	0.1025
..Small Rural	-0.234	0.133	-1.76	0.0789
DS Resource Demand Scale* (reference = Minimal to Less Intensive < 37.5)				
..Moderate	0.237	0.476	0.50	0.6186
..Highly intensive	1.797	0.433	4.15	<.0001
Number of Federally Qualified Health Centers in the County	0.016	0.045	0.36	0.7165
Shortage Area for Primary Care Physicians	-0.211	0.184	-1.15	0.2509
Number of Short Term General Hospitals with EDs in the County	-0.006	0.061	-0.11	0.9159
Number of Short Term General Hospitals with Primary Care Departments in the County	-0.049	0.077	-0.63	0.5284

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.
Note: Random effect of the intercept is estimated at 0.036 with the se of 0.023. DS = Disease Staging
* Maximum scores based upon all visits were assigned for each patient.
† Standard errors were adjusted using the county as the grouping variable.

Table C.15B: HLM Logistic Regression for the Likelihood of Multiple ED-IP Stays for People with an ED-IP Stay for Chronic Respiratory Disease, State B, 2002

Effect	Estimated Coefficient	Standard Error†	t-value	p-value
Intercept	-3.971	0.660	-6.02	<.0001
(Age – 40) / 10 (i.e., centered on 40 and scaled to decades)	-0.023	0.048	-0.48	0.6288
((Age – 40) / 10)^2	0.014	0.010	1.39	0.1649
Median Zip Income / $10,000	-0.056	0.036	-1.53	0.1261
Female (reference = Male)	-0.342	0.068	-5.04	<.0001
Ethnicity (reference = White or Others)				
..Black	0.181	0.080	2.26	0.0236
..Hispanic	-1.461	1.055	-1.38	0.1663
Insurance (reference = Private)				
..Medicare	0.719	0.117	6.16	<.0001
..Medicaid	0.561	0.140	4.01	<.0001
..Other Government	0.513	0.236	2.17	0.0302
..Uninsured	-0.033	0.160	-0.21	0.8374
Patient Rural Residence (reference = Urban)	0.153	0.111	1.38	0.1691
DS Resource Demand Scale* (reference = Minimal to Less Intensive < 37.5)				
..Moderate	0.941	0.629	1.50	0.1348
..Highly intensive	2.558	0.597	4.29	<.0001
Number of Federally Qualified Health Centers in the County	-0.022	0.030	-0.73	0.4637
Shortage Area for Primary Care Physicians	0.254	0.223	1.14	0.2552
Number of Short Term General Hospitals with EDs in the County	0.057	0.051	1.11	0.2665
Number of Short Term General Hospitals with Primary Care Departments in the County	-0.037	0.076	-0.48	0.6307

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.
Note: Random effect of the intercept is estimated at 0.042 with the se of 0.028. DS = Disease Staging
* Maximum scores based upon all visits were assigned for each patient.
† Standard errors were adjusted using the county as the grouping variable.

Table C.16A: HLM Logistic Regression for the Likelihood of Multiple Treat and Release ED Visits for People with a Treat and Release ED Visit for SUD Only, State A, 2002

Effect	Estimated Coefficient	Standard Error†	t-value	p-value
Intercept	-1.437	0.216	-6.64	<.0001
(Age – 40) / 10 (i.e., centered on 40 and scaled to decades)	-0.268	0.030	-9.00	<.0001
((Age – 40) / 10)^2	-0.021	0.013	-1.59	0.1111
Median Zip Income / $10,000	-0.042	0.029	-1.47	0.1412
Female (reference = Male)	0.116	0.077	1.50	0.1340
Ethnicity (reference = White or Others)				
..Black	0.372	0.102	3.66	0.0003
..Hispanic	0.369	0.316	1.17	0.2432
Insurance (reference = Private)				
..Medicare	0.531	0.162	3.28	0.0011
..Medicaid	0.969	0.112	8.67	<.0001
..Other Government	0.657	0.217	3.03	0.0025
..Uninsured	0.410	0.089	4.61	<.0001
Patient Location (reference = Large Metropolitan)				
..Small Metro	0.185	0.197	0.94	0.3465
..Large Rural	0.397	0.211	1.88	0.0601
..Small Rural	0.074	0.215	0.34	0.7312
M/SU Disorder Severity* (reference = Mild)				
..Moderate	0.309	0.076	4.06	<.0001
..Severe	0.436	0.106	4.10	<.0001
DS Resource Demand Scale* (reference = Minimal to Less Intensive < 37.5)				
..Moderate	2.660	0.116	22.85	<.0001
..Highly intensive	2.627	0.113	23.27	<.0001
Number of Community Mental Health Centers in the County	-0.007	0.089	-0.08	0.9329
Number of Short Term Psychiatric and Chemical Dependency Beds Set Up per Capita in the County	-0.160	0.104	-1.54	0.1242
Shortage Area for Mental Health Practitioners	-0.044	0.194	-0.23	0.8188

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.
Note: Random effect of the intercept is estimated at 0.080 with the se of 0.064. M/SU = mental and/or substance use; DS = Disease Staging; SUD = substance use disorders
* Maximum scores based upon all visits were assigned for each patient.
† Standard errors were adjusted using the county as the grouping variable.

Table C.16B: HLM Logistic Regression for the Likelihood of Multiple Treat and Release ED Visits for People with a Treat and Release ED Visit for SUD Only, State B, 2002

Effect	Estimated Coefficient	Standard Error†	t-value	p-value
Intercept	-1.066	0.189	-5.65	<.0001
(Age – 40) / 10 (i.e., centered on 40 and scaled to decades)	-0.276	0.031	-8.81	<.0001
((Age – 40) / 10)^2	-0.063	0.014	-4.48	<.0001
Median Zip Income / $10,000	-0.066	0.032	-2.07	0.0387
Female (reference = Male)	-0.013	0.078	-0.16	0.8719
Ethnicity (reference = White or Others)				
..Black	0.047	0.078	0.60	0.5500
..Hispanic	-1.276	0.431	-2.96	0.0031
Insurance (reference = Private)				
..Medicare	0.574	0.162	3.55	0.0004
..Medicaid	0.695	0.130	5.36	<.0001
..Other Government	-0.144	0.202	-0.71	0.4756
..Uninsured	0.261	0.092	2.84	0.0045
Patient Rural Residence (reference = Urban)	0.072	0.094	0.77	0.4407
M/SU Disorder Severity* (reference = Mild)				
..Moderate	0.421	0.075	5.63	<.0001
..Severe	0.593	0.115	5.16	<.0001
DS Resource Demand Scale* (reference = Minimal to Less Intensive < 37.5)				
..Moderate	2.723	0.107	25.53	<.0001
..Highly intensive	2.852	0.107	26.67	<.0001
Number of Community Mental Health Centers in the County	0.191	0.103	1.86	0.0633
Number of Short Term Psychiatric and Chemical Dependency Beds Set Up per Capita in the County	0.765	0.205	3.73	0.0002
Shortage Area for Mental Health Practitioners	-0.247	0.095	-2.60	0.0093

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.
Note: Random effect of the intercept is estimated at 0.00 with the se of 0.01. M/SU = mental and/or substance use; DS = Disease Staging; SUD = substance use disorders
* Maximum scores based upon all visits were assigned for each patient.
† Standard errors were adjusted using the county as the grouping variable.

Table C.17A: HLM Logistic Regression for the Likelihood of Multiple Treat and Release ED Visits for People with a Treat and Release ED Visit for Mental Disorders Only, State A, 2002

Effect	Estimated Coefficient	Standard Error	t-value	p-value
Intercept	-1.581	0.136	-11.66	<.0001
(Age – 40) / 10 (i.e., centered on 40 and scaled to decades)	-0.322	0.015	-21.50	<.0001
((Age – 40) / 10)^2	0.011	0.005	2.27	0.0232
Median Zip Income / $10,000	-0.009	0.016	-0.59	0.5547
Female (reference = Male)	0.215	0.037	5.89	<.0001
Ethnicity (reference = White or Others)				
..Black	0.078	0.059	1.31	0.1917
..Hispanic	0.230	0.178	1.29	0.1965
Insurance (reference = Private)				
..Medicare	0.285	0.062	4.61	<.0001
..Medicaid	0.653	0.049	13.46	<.0001
..Other Government	0.295	0.098	3.02	0.0026
..Uninsured	0.135	0.051	2.63	0.0085
Patient Location (reference = Large Metropolitan)				
..Small Metro	0.061	0.129	0.48	0.6343
..Large Rural	0.130	0.128	1.01	0.3108
..Small Rural	0.058	0.123	0.47	0.6359
M/SU Disorder Severity* (reference = Mild)				
..Moderate	0.661	0.045	14.61	<.0001
..Severe	-0.169	0.053	-3.17	0.0015
DS Resource Demand Scale* (reference = Minimal to Less Intensive < 37.5)				
..Moderate	1.691	0.045	37.51	<.0001
..Highly intensive	2.079	0.054	38.69	<.0001
Number of Community Mental Health Centers in the County	-0.245	0.065	-3.74	0.0002
Number of Short Term Psychiatric and Chemical Dependency Beds Set Up per Capita in the County	0.149	0.053	2.80	0.0051
Shortage Area for Mental Health Practitioners	0.085	0.121	0.71	0.4783

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases
Note: Random effect of the intercept is estimated at 0.084 with the se of 0.024. M/SU = mental and/or substance use; DS = Disease Staging
* Maximum scores based upon all visits were assigned for each patient.
† Standard errors were adjusted using the county as the grouping variable.

Table C.17B: HLM Logistic Regression for the Likelihood of Multiple Treat and Release ED Visits for People with a Treat and Release ED Visit for Mental Disorders Only, State B, 2002

Effect	Estimated Coefficient	Standard Error†	t-value	p-value
Intercept	-1.511	0.201	-7.52	<.0001
(Age – 40) / 10 (i.e., centered on 40 and scaled to decades)	-0.357	0.018	-20.23	<.0001
((Age – 40) / 10)^2	0.019	0.006	2.99	0.0028
Median Zip Income / $10,000	-0.132	0.021	-6.32	<.0001
Female (reference = Male)	0.201	0.043	4.72	<.0001
Ethnicity (reference = White or Others)				
..Black	0.101	0.045	2.22	0.0265
..Hispanic	-0.608	0.216	-2.82	0.0048
Insurance (reference = Private)				
..Medicare	0.498	0.072	6.93	<.0001
..Medicaid	0.638	0.062	10.30	<.0001
..Other Government	0.129	0.117	1.10	0.2712
..Uninsured	0.135	0.052	2.59	0.0097
Patient Rural Residence (reference = Urban)	-0.139	0.100	-1.39	0.1635
M/SU Disorder Severity* (reference = Mild)				
..Moderate	0.706	0.052	13.48	<.0001
..Severe	-0.355	0.064	-5.55	<.0001
DS Resource Demand Scale* (reference = Minimal to Less Intensive < 37.5)				
..Moderate	1.818	0.054	33.54	<.0001
..Highly intensive	2.352	0.064	36.74	<.0001
Number of Community Mental Health Centers in the County	-0.348	0.196	-1.77	0.0767
Number of Short Term Psychiatric and Chemical Dependency Beds Set Up per Capita in the County	1.100	0.233	4.71	<.0001
Shortage Area for Mental Health Practitioners	0.277	0.178	1.56	0.1189

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.
Note: Random effect of the intercept is estimated at 0.083 with the se of 0.034. M/SU = mental and/or substance use; DS = Disease Staging
* Maximum scores based upon all visits were assigned for each patient.
† Standard errors were adjusted using the county as the grouping variable.

Table C.18A: HLM Logistic Regression for the Likelihood of Multiple Treat and Release ED Visits for People with a Treat and Release ED Visit for Co-Occurring M/SUD, State A, 2002

Effect	Estimated Coefficient	Standard Error	t-value	p-value
Intercept	-1.004	0.214	-4.69	<.0001
(Age – 40) / 10 (i.e., centered on 40 and scaled to decades)	-0.200	0.029	-6.97	<.0001
((Age – 40) / 10)^2	-0.051	0.014	-3.54	0.0004
Median Zip Income / $10,000	-0.023	0.027	-0.85	0.3949
Female (reference = Male)	0.038	0.064	0.60	0.5486
Ethnicity (reference = White or Others)				
..Black	0.061	0.101	0.60	0.5464
..Hispanic	-0.221	0.368	-0.60	0.5478
Insurance (reference = Private)				
..Medicare	0.617	0.120	5.14	<.0001
..Medicaid	0.734	0.090	8.19	<.0001
..Other Government	-0.111	0.207	-0.53	0.5931
..Uninsured	0.273	0.084	3.25	0.0011
Patient Location (reference = Large Metropolitan)				
..Small Metro	-0.078	0.194	-0.40	0.6893
..Large Rural	0.087	0.205	0.43	0.6701
..Small Rural	0.051	0.208	0.25	0.8062
M/SU Disorder Severity* (reference = Mild)				
..Moderate	0.833	0.079	10.52	<.0001
..Severe	0.661	0.081	8.14	<.0001
DS Resource Demand Scale* (reference = Minimal to Less Intensive < 37.5)				
..Moderate	1.491	0.079	18.93	<.0001
..Highly intensive	1.892	0.083	22.90	<.0001
Number of Community Mental Health Centers in the County	-0.219	0.090	-2.43	0.0151
Number of Short Term Psychiatric and Chemical Dependency Beds Set Up per Capita in the County	0.014	0.064	0.22	0.8234
Shortage Area for Mental Health Practitioners	0.162	0.191	0.85	0.3973

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.
Note: Random effect of the intercept is estimated at 0.121 with the se of 0.071. M/SU = mental and/or substance use; DS = Disease Staging; M/SUD = mental and substance use disorders
* Maximum scores based upon all visits were assigned for each patient.
† Standard errors were adjusted using the county as the grouping variable.

Table C.18B: HLM Logistic Regression for the Likelihood of Multiple Treat and Release ED Visits for People with a Treat and Release ED Visit for Co-Occurring M/SUD, State B, 2002

Effect	Estimated Coefficient	Standard Error†	t-value	p-value
Intercept	-0.803	0.296	-2.71	0.0094
(Age – 40) / 10 (i.e., centered on 40 and scaled to decades)	-0.199	0.035	-5.78	<.0001
((Age – 40) / 10)^2	-0.034	0.016	-2.13	0.0331
Median Zip Income / $10,000	-0.106	0.036	-2.99	0.0028
Female (reference = Male)	-0.113	0.077	-1.46	0.1433
Ethnicity (reference = White or Others)				
..Black	-0.171	0.090	-1.89	0.0584
..Hispanic	-0.556	0.598	-0.93	0.3524
Insurance (reference = Private)				
..Medicare	0.433	0.141	3.06	0.0022
..Medicaid	0.592	0.128	4.61	<.0001
..Other Government	-0.360	0.213	-1.69	0.0907
..Uninsured	0.337	0.095	3.56	0.0004
Patient Rural Residence (reference = Urban)	-0.098	0.149	-0.65	0.5127
M/SU Disorder Severity* (reference = Mild)				
..Moderate	0.774	0.106	7.33	<.0001
..Severe	0.766	0.112	6.82	<.0001
DS Resource Demand Scale* (reference = Minimal to Less Intensive < 37.5)				
..Moderate	1.664	0.095	17.51	<.0001
..Highly intensive	2.270	0.099	22.91	<.0001
Number of Community Mental Health Centers in the County	-0.258	0.256	-1.01	0.3134
Number of Short Term Psychiatric and Chemical Dependency Beds Set Up per Capita in the County	0.968	0.340	2.85	0.0044
Shortage Area for Mental Health Practitioners	0.076	0.235	0.32	0.7477

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.
Note: Random effect of the intercept is estimated at 0.107 with the se of 0.052. M/SU = mental and/or substance use; DS = Disease Staging; M/SUD = mental and substance use disorders
* Maximum scores based upon all visits were assigned for each patient.
† Standard errors were adjusted using the county as the grouping variable.

Table C.19A: HLM Logistic Regression for the Likelihood of Multiple Treat and Release ED Visits for People with a Treat and Release ED Visit for Diabetes, State A, 2002

Effect	Estimated Coefficient	Standard Error†	t-value	p-value
Intercept	-1.438	0.330	-4.36	<.0001
(Age – 40) / 10 (i.e., centered on 40 and scaled to decades)	-0.212	0.034	-6.20	<.0001
((Age – 40) / 10)^2	-0.002	0.010	-0.22	0.8293
Median Zip Income / $10,000	0.036	0.030	1.21	0.2277
Female (reference = Male)	0.229	0.068	3.36	0.0008
Ethnicity (reference = White or Others)				
..Black	0.286	0.097	2.93	0.0034
..Hispanic	-0.197	0.277	-0.71	0.4772
Insurance (reference = Private)				
..Medicare	0.281	0.107	2.64	0.0084
..Medicaid	0.628	0.110	5.73	<.0001
..Other Government	-0.129	0.206	-0.62	0.5325
..Uninsured	0.177	0.116	1.52	0.1278
Patient Location (reference = Large Metropolitan)				
..Small Metro	-0.007	0.204	-0.03	0.9739
..Large Rural	0.020	0.193	0.11	0.9153
..Small Rural	0.137	0.189	0.72	0.4686
DS Resource Demand Scale* (reference = Minimal to Less Intensive < 37.5)				
..Moderate	1.725	0.085	20.30	<.0001
..Highly intensive	2.142	0.083	25.73	<.0001
Number of Federally Qualified Health Centers in the County	-0.137	0.065	-2.11	0.0352
Shortage Area for Primary Care Physicians	0.156	0.255	0.61	0.5406
Number of Short Term General Hospitals with EDs in the County	0.030	0.085	0.35	0.7266
Number of Short Term General Hospitals with Primary Care Departments in the County	0.029	0.109	0.27	0.7878

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.
Note: Random effect of the intercept is estimated at 0.136 with the se of 0.059. DS = Disease Staging
* Maximum scores based upon all visits were assigned for each patient.
† Standard errors were adjusted using the county as the grouping variable.

Table C.19B: HLM Logistic Regression for the Likelihood of Multiple Treat and Release ED Visits for People with a Treat and Release ED Visit for Diabetes, State B, 2002

Effect	Estimated Coefficient	Standard Error†	t-value	p-value
Intercept	-1.241	0.269	-4.62	<.0001
(Age – 40) / 10 (i.e., centered on 40 and scaled to decades)	-0.254	0.034	-7.56	<.0001
((Age – 40) / 10)^2	-0.004	0.009	-0.44	0.6577
Median Zip Income / $10,000	-0.027	0.032	-0.83	0.4070
Female (reference = Male)	0.162	0.064	2.51	0.0121
Ethnicity (reference = White or Others)				
..Black	0.420	0.068	6.14	<.0001
..Hispanic	-0.615	0.509	-1.21	0.2272
Insurance (reference = Private)				
..Medicare	0.324	0.098	3.31	0.0009
..Medicaid	0.299	0.113	2.64	0.0083
..Other Government	0.102	0.208	0.49	0.6253
..Uninsured	0.093	0.101	0.92	0.3600
Patient Rural Residence (reference = Urban)	0.168	0.095	1.77	0.0769
DS Resource Demand Scale* (reference = Minimal to Less Intensive < 37.5)				
..Moderate	2.061	0.077	26.90	<.0001
..Highly intensive	2.793	0.079	35.44	<.0001
Number of Federally Qualified Health Centers in the County	0.044	0.024	1.82	0.0691
Shortage Area for Primary Care Physicians	-0.122	0.207	-0.59	0.5562
Number of Short Term General Hospitals with EDs in the County	-0.053	0.042	-1.26	0.2090
Number of Short Term General Hospitals with Primary Care Departments in the County	-0.062	0.058	-1.06	0.2871

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.
Note: Random effect of the intercept is estimated at 0.051 with the se of 0.023. DS = Disease Staging
* Maximum scores based upon all visits were assigned for each patient.
† Standard errors were adjusted using the county as the grouping variable.

Table C.20A: HLM Logistic Regression for the Likelihood of Multiple Treat and Release ED Visits for People with a Treat and Release ED Visit for Chronic Respiratory Disease, State A, 2002

Effect	Estimated Coefficient	Standard Error†	t-value	p-value
Intercept	-1.292	0.210	-6.15	<.0001
(Age – 40) / 10 (i.e., centered on 40 and scaled to decades)	-0.582	0.015	-39.82	<.0001
((Age – 40) / 10)^2	0.059	0.004	14.12	<.0001
Median Zip Income / $10,000	-0.036	0.015	-2.50	0.0124
Female (reference = Male)	-0.060	0.030	-2.03	0.0421
Ethnicity (reference = White or Others)				
..Black	0.289	0.046	6.34	<.0001
..Hispanic	-0.290	0.147	-1.97	0.0486
Insurance (reference = Private)				
..Medicare	0.472	0.051	9.26	<.0001
..Medicaid	0.830	0.041	20.20	<.0001
..Other Government	0.315	0.083	3.79	0.0002
..Uninsured	0.169	0.042	4.02	<.0001
Patient Location (reference = Large Metropolitan)				
..Small Metro	0.143	0.139	1.02	0.3061
..Large Rural	0.053	0.129	0.41	0.6821
..Small Rural	0.021	0.121	0.18	0.8611
DS Resource Demand Scale* (reference = Minimal to Less Intensive < 37.5)				
..Moderate	1.385	0.040	34.24	<.0001
..Highly intensive	2.168	0.048	45.54	<.0001
Number of Federally Qualified Health Centers in the County	-0.265	0.045	-5.91	<.0001
Shortage Area for Primary Care Physicians	0.040	0.178	0.22	0.8225
Number of Short Term General Hospitals with EDs in the County	0.102	0.058	1.77	0.0764
Number of Short Term General Hospitals with Primary Care Departments in the County	-0.057	0.076	-0.75	0.4508

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.
Note: Random effect of the intercept is estimated at 0.145 with the se of 0.037. DS = Disease Staging
* Maximum scores based upon all visits were assigned for each patient.
† Standard errors were adjusted using the county as the grouping variable.

Table C.20B: HLM Logistic Regression for the Likelihood of Multiple Treat and Release ED Visits for People with a Treat and Release ED Visit for Chronic Respiratory Disease, State B, 2002

Effect	Estimated Coefficient	Standard Error†	t-value	p-value
Intercept	-0.690	0.192	-3.59	0.0008
(Age – 40) / 10 (i.e., centered on 40 and scaled to decades)	-0.534	0.017	-30.79	<.0001
((Age – 40) / 10)^2	0.042	0.005	8.19	<.0001
Median Zip Income / $10,000	-0.058	0.018	-3.30	0.0010
Female (reference = Male)	-0.113	0.035	-3.25	0.0011
Ethnicity (reference = White or Others)				
..Black	0.365	0.036	10.22	<.0001
..Hispanic	-0.083	0.224	-0.37	0.7100
Insurance (reference = Private)				
..Medicare	0.353	0.061	5.75	<.0001
..Medicaid	0.673	0.052	12.98	<.0001
..Other Government	0.181	0.105	1.73	0.0841
..Uninsured	0.251	0.044	5.76	<.0001
Patient Rural Residence (reference = Urban)	-0.065	0.077	-0.84	0.4005
DS Resource Demand Scale* (reference = Minimal to Less Intensive < 37.5)				
..Moderate	1.453	0.048	30.44	<.0001
..Highly intensive	2.438	0.057	42.80	<.0001
Number of Federally Qualified Health Centers in the County	-0.010	0.022	-0.44	0.6592
Shortage Area for Primary Care Physicians	-0.456	0.157	-2.90	0.0038
Number of Short Term General Hospitals with EDs in the County	0.022	0.038	0.58	0.5592
Number of Short Term General Hospitals with Primary Care Departments in the County	-0.151	0.058	-2.59	0.0095

Source: AHRQ Healthcare Cost and Utilization Project, State Emergency Department Databases and State Inpatient Databases.
Note: Random effect of the intercept is estimated at 0.042 with the se of 0.019. DS = Disease Staging
* Maximum scores based upon all visits were assigned for each patient.
† Standard errors were adjusted using the county as the grouping variable.