ED Boarding of Psychiatric Patients in Oregon

A Report to Oregon Health Authority

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Acknowledgment

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Executive Summary

The Oregon Health Authority (OHA) commissioned the College of Public Health and Human Sciences at Oregon State University to conduct a study regarding the problem of "boarding" of patients with mental illness in hospital emergency departments (ED) while patients wait for a bed in an appropriate setting. The report contains a thorough analysis of the breadth of the ED boarding practice; the current system and process, including system capacity, relevant statutes and reimbursements; causes and impacts of the ED boarding practice; and proposals for potential solutions. This report integrates from a comparative perspective results from (a) interviews with mental health experts and key stakeholders in Oregon and (b) analyses of three quantitative databases currently available to study psychiatric ED boarding in Oregon. Discussed below are highlights of results presented in this report.

Extent of Psychiatric ED Boarding Practice in Oregon

To quantify the extent of psychiatric ED boarding in Oregon, we linked and analyzed data from three independently-maintained administrative data sources: the Emergency Department Information Exchange (EDIE); hospital discharge abstracts; and Medicaid claims and enrollment data. The analytic sample contained 690,245 unique ED episodes on 290,181 unique persons from October 1, 2014 through September 30, 2015. This sample, which included only visits found in at least 2 of the 3 datasets, comprised about half of recent annual ED episodes in Oregon.

We estimate that for the one-year period, up to 29,763 ED visits or 2.1% of all hospital ED visits in Oregon were psychiatric ED boarding episodes, based on the definition of an ED boarding as a stay in the ED longer than 6 hours. The rate of psychiatric ED boarding represents 14.6% of all psychiatric ED visits, which is comparable to a national average for year 2008. This estimate of boarded psychiatric ED visits might be slightly overestimated due to psychiatric ED visits being more frequent in the analytic sample than in the overall universe of ED visits in Oregon. The rate of psychiatric ED boarding decreases as the cutoff threshold for the boarding definition is raised. The boarding rates for 8-, 12-, and 24-hour cutoffs were 9.8%, 7.1%, and 3.5%, respectively.

The rate of psychiatric ED boarding increased with the severity of psychiatric conditions identified during the ED visit. Over 24% of all severe-psychiatric ED visits were psychiatric boarding episodes, about twice as large in magnitude as that of non-severe psychiatric ED visits.

Boarding time, defined as the length of ED stay over 6 hours, was greater for psychiatric visits. Among boarded episodes, average boarding time for psychiatric and non-psychiatric visits were 18 and 17 hours, respectively. The severity of psychiatric conditions significantly increased boarding time in Oregon EDs. It was 27 hours for severe psychiatric ED visits, compared to 15 hours for non-severe psychiatric conditions. Therefore, taken together, the rate of psychiatric ED boarding and boarding time in Oregon suggest that the practice of ED boarding in Oregon was concentrated in a subset of ED episodes, particularly those for severe psychiatric conditions.

Among all boarded ED visits, the proportion of psychiatric ED boarding increased gradually over the year while the proportion of non-psychiatric ED boarding episodes continued to decrease. This is because between October, 2014 and September, 2015, the number of boarded ED episodes decreased by 29% while non-psychiatric ED boarding episodes decreased by 35%,

compared to a 13% decrease for psychiatric ED boarding episodes. As a result, the proportion of psychiatric visits among all boarded ED visits grew from 38% to 47% while the proportion on non-psychiatric visits in all boarded ED visits decreased from 62% to 53%.

ED boarding appears to increase expenditure during an ED visit. ED visits on average cost approximately $424. In comparison, the average cost of boarded psychiatric ED visits was $695. Psychiatric visits had a higher average per-visit ED cost than non-psychiatric visits for non-boarded patients. However, for boarded visits, non-psychiatric visits had a greater average ED cost than psychiatric visits ($1,196 vs. $695).

Causes of Psychiatric ED Boarding Practice in Oregon

Interviews of key stakeholders identified several broad causes of psychiatric boarding in hospital EDs in Oregon, including: lack of outpatient treatment capacity, which increases the probability of psychiatric ED visits; lack of crisis response or other alternative treatment options to ED utilization; barriers to discharge from the ED directly to community destinations ; and limited availability of inpatient or sub-acute care resources for patients with the most severe psychiatric emergencies.

Statistical analyses of the administrative data provided additional insights into potential determinants of psychiatric ED boarding in Oregon. Results show that psychiatric conditions during ED visits on average lead to a two-fold increase in the probability of boarding in hospital EDs. The severity of psychiatric conditions, substance abuse, rural residence, male gender, and hospital locations in the Portland metropolitan and Willamette Valley regions also significantly increased the likelihood of psychiatric ED boarding.

Suggested Solutions to Psychiatric ED Boarding Practice in Oregon

Interview respondents also indicated that an increase in inpatient psychiatric resources alone would not be sufficient to address the boarding problem. Instead, respondents felt that solutions should focus on preventing mental health crises and better managing patient needs in settings other than the ED, suggesting specifically the need to: expand community mental health services to reduce the number of psychiatric ED visits; expand the availability of ED alternatives such as crisis centers or psychiatric emergency centers like the new Unity Center in Portland; change the service delivery environment in the ED such as improved information tools such as Pre-Manage and Emergency Department Information Exchange (EDIE), a dedicated area in the ED for psychiatric care, and peer support services; increase alternatives to inpatient beds such as sub-acute beds and residential services; use alternatives to the State Hospital for the .370 population; improve the availability of services to assist patients discharging from inpatient psychiatric hospitals or the state hospital, such as supportive services, such as housing, in the community; expand alternative payment models for behavioral health care services; and address specific challenges for pediatric populations.

The statistical analysis of quantitative administrative data supported the key results from the stakeholder interviews. Focusing on the effect of county-level mental health capacity and the probability of psychiatric ED boarding, we found that an increase in the capacity of

either inpatient or community-based mental health resources for persons with severe mental illness could lead to a decrease in the magnitude of psychiatric ED boarding in Oregon.

Chapter 1. Introduction

"Boarding" patients with mental illness in hospital emergency departments (ED) routinely occurs across the U.S. A symptom of insufficient inpatient capacity and community mental programs, psychiatric boarding leads to overcrowding in hospital emergency departments. However, little is known about the extent of the problem of the ED boarding or the causes, impacts, or potential solutions in Oregon.

The OHA commissioned the College of Public Health and Human Sciences at Oregon State University to conduct a study regarding the problem of "boarding" of patients with mental illness in hospital emergency departments (ED) while patients wait for a bed in an appropriate setting. The report contains finding from analyses of interviews with key stakeholders who work in the mental health field in Oregon and ED utilization (claims) data retrieved from the Medicaid program, Emergency Department Information Exchange (EDIE), and hospital discharge databases. It presents the ED boarding in Oregon in terms of the breadth of the practice; the current system and process, including system capacity, relevant statutes and reimbursements; determinants and impacts of the boarding; and proposals for potential solutions.

The organization of the report is as follows. Chapter 2 summarizes the literature on boarding of psychiatric patients nationwide in terms of its extent, causes, and impacts as well as suggested solutions. Chapter 3 presents the extent and recent trends in psychiatric ED boarding as well as ED expenditures associated with psychiatric ED boarding in Oregon based on data from the three administrative data sources. Chapter 4 discusses results of stakeholder interviews in terms of the extent, causes and impacts of psychiatric ED boarding in Oregon. It presents data from interviews with a broad group of mental health experts and key stakeholders in Oregon and health systems. Chapter 5 presents results of statistical analysis of the quantitative data on hospital ED utilization in Oregon. We present our findings on determinants of psychiatric ED boarding and the role of mental health system capacity in mitigating the magnitude of the psychiatric ED boarding problem in Oregon. Chapter 6 comparatively synthesizes the national literature and Oregon data from the stakeholder interviews and quantitative data. Finally, Chapter 7 concludes the report.

Chapter 2. Literature Review: Causes, Impacts and Suggested Solutions

2.1. Definitions of ED Boarding in the Literature

The literature describes 'psychiatric boarding' in hospital EDs occurs when an individual with a mental health condition is kept in an ED after the decision to admit or transfer to another facility is made because appropriate mental health services are unavailable. Unfortunately, no standard definition exists that defines boarding in terms of the length of stay in the ED.

Alakeson et al. (2010) states, "The term boarding is generally understood to mean the time spent waiting in an emergency room for a hospital bed or for transfer to another inpatient facility." The Joint Commission similarly defines boarding in their accreditation manual as, "Patients being held in the emergency department or another temporary location after the decision to admit or transfer has been made." Rabin et al. (2012) defines boarding as, "Patients who remain in the emergency department beyond the time required to implement a timely transfer to an inpatient bed," but go on to state that, "Definitions of timely transfer vary. Experts often cite a period of less than two hours from the admission order as timely."

Other researchers and medical groups define psychiatric boarding based on the length of stay in the ED following a disposition decision. For instance, in a 2008 survey of ED directors, the American College of Emergency Physicians (ACEP) defines psychiatric boarding when a patient remains in the ED for 4 or more hours after there was a decision to admit. Nolan et al. (2010) defines boarding as a visit lasting more than 6 hours, Perimal-Lewis et al. (2014) defines boarding as a visit lasting more than 8 hours, and Wharff et al. (2011) as a stay in the ED longer than 12 hours following a decision to admit. The Arizona Hospital Association defines psychiatric boarding as a stay in the ED longer than 24 hours after an admit decision (Arizona Hospital and Healthcare Association, 2015). In a consensus statement from the Emergency Department Performance Measures and Benchmarking Summit (2005), it states that, "an admitted patient for whom the time interval between decision to admit and physical departure of the patient from the ED treatment area exceeds 120 minutes" is considered boarding.

2.2. National Extent and Trends

- The proportion of all ED visits related to mental health and substance abuse (MHSA) increased from 5.4% in 2000 to 12.5% in 2007 nationwide.
- In 2008, 21.5% of all MHSA patients in EDs nationwide experienced boarding.There was an increase in boarding of behavioral patients in EDs for 42% of U.S. hospitals.
- Psychiatric patients were more likely than other patients to stay in the ED for over 24 hours.
- Rates of psychiatric boarding vary across regions of the country.
- 43.4% of homeless MHSA patients nationwide experienced boarding in 2008.

Appendix A Exhibit 1 summarizes findings from the selected literature on the extent of psychiatric ED boarding nationwide and in other states.

Nationally mental health and substance abuse (MHSA) conditions accounted for approximately 12.0 million visits to EDs (12.5% of all ED visits) in 2007, of which MHSA was the primary diagnosis for 4.1 million visits (Owens et al., 2010). Of these visits, over half a million are made by children experiencing mental health problems (Dolan et al., 2011). In 2010, MHSA conditions were among the top 10 leading causes of ED admissions for children, accounting for almost 1.1 million ED visits (Wier et al., 2013). Between 2000 and 2007, the percent of ED visits related to MHSA increased from 5.4% to 12.5%. Nearly 41% of the MHSA visits led to a hospital admission, an admission rate over 2.5 times greater than for ED visits for other non-MHSA conditions (Owens et al., 2010).

Patients visiting EDs for MHSA conditions are more likely to be boarded than ED patients without MHSA conditions. In 2008, 21.5% of all ED visits for MHSA conditions experienced boarding, compared to only 10.3% of ED visits for non-MHSA conditions (Nolan et al., 2015). Furthermore, in a 2008 survey, more than 80% of ED directors reported boarding psychiatric patients; 90% of which reported boarding patients each week and 55% reported boarding patients daily or multiple times a week (American College of Emergency Physicians, 2008).

A 2007 survey of hospitals revealed an increase in boarding of behavioral patients in EDs for 42% of U.S. hospitals (Bender et al., 2008). The proportion of Medicare fee-for-service patients who had behavioral health related ED visits increased from 16% of all ED visits in 2006 to 22% in 2010 (American Hospital Association, 2012). Between 2001 and 2006, the average length of stay in EDs increased by 2.3% annually with mental health patients experiencing stays that were 42% longer than non-mental health patients (Slade, 2010). Similarly, between 2001 and 2008 pediatric mental health patients (median= 169 minutes) experienced significantly longer stays in the ED than non-mental health pediatric patients (median= 108 minutes) (Case et al, 2011). It is also reported that mental health patients were more likely than other patients to stay in the ED for over 24 hours (Stephens, 2014).

Rates of psychiatric boarding vary across regions of the country. An analysis of the 2008 National Hospital Ambulatory Medical Care Survey (NHAMCS) data shows that nearly one-third of MHSA patients in the Northeast region of the U.S. were boarded compared to less than 20% for all other regions (Nolan et al., 2015). In Maryland, psychiatric patients often board for days in the ED, while in Georgia psychiatric patients board in EDs for 34 hours on average (Bender et al., 2008). In 2013, 7% (3,240 patients) of Arizona's psychiatric patients visiting EDs were boarded for more than 24 hours (Arizona Hospital and Healthcare Association, 2015). In California, psychiatric patients were boarded on average 10 hours in 2010 (Stone et al., 2012).

Psychiatric boarding is more common among homeless populations. Approximately 43% of homeless MHSA patients nationwide ever experienced boarding in 2008, compared to 20.5% of persons in private residence and 27.5% nursing home patients (Nolan, 2011). Rural-urban difference in ED boarding is also significant: In 2008, 27.2% of MHSA patients in urban areas experienced ED boarding while only 10.7% of those livings in rural areas were boarded.

Psychiatric boarding also creates difficulties in collaboration between law enforcement and EDs. In a study by Beech et al., (2000) it was found that 9% of psychiatric ED referrals came from police services. Brunero et al., (2007) found that psychiatric patient police referrals were most often for schizophrenia, psychotic episode, and suicide risk, and that those referred by police services were more likely to attend the ED for psychiatric emergencies more often -

between two and three times during the 12-month study period as compared to only once. Kneebone et al., (1995) found that the majority of psychiatric police referrals presenting with psychotic disorder had longer admission times than those who presented for non-psychotic issues.

2.3. Causes Reported in the Literature

Appendix A Exhibit 2 summarizes findings from the selected literature on causes of psychiatric ED boarding.

Person-Level Determinants of ED Boarding

- Person-level predictors of ED boarding include homelessness, urban residence, sex, race/ethnicity, diagnosis of mental illness, substance abuse, suicidal/homicidal ideation, and a history of self-harm.
- Types of health insurance are a potential determinant of ED boarding.

To date, only one study has comprehensively assessed psychiatric boarding at a national level. Nolan et al. (2015) analyzed the 2008 National Hospital Ambulatory Medical Care Survey. The study reported that nationally (a) psychiatric ED boarding is more likely among 'homeless' mental health and substance abuse (MHSA) patients than MHSA patients living in a private residence or nursing home; (b) MHSA patients identifying themselves as Asian or multiple race were more likely to board than non-Hispanic whites; and (c) urban residents are more likely than rural residents to be boarded. However, the likelihood of boarding did not vary by patient's age, sex, insurance type, frequency of ED use, or community poverty and income levels.

The literature does not necessarily agree upon the national-level findings. For example, while Chang et al. (2012) reported homeless patients were more likely to experience ED boarding than non-homeless patients, consistent with Nolan et al. (2015), others found that psychiatric ED boarding was associated with health insurance status (e.g. Chang et al, 2012; Stephens et al., 2014; Misek et al., 2015; Warren et al., 2015). Specifically, publicly insured persons and those lacking insurance were significantly more likely to experience ED boarding than those with private insurance (Chang et al., 2012). Difficulty obtaining insurance authorization or uninsured status adds to the list of reasons for ED boarding of psychiatric patients (ACEP, 2008). In terms of race/ethnicity, Mansbach et al. (2003) reported blacks were more likely to be boarded than non-Hispanic whites.

Psychiatric boarding also appears to be associated with a person's diagnosis. Psychiatric patients with diagnoses of cognitive or personality disorders are reportedly more likely to experience ED boarding (Warren et al., 2015). In a study of adults on involuntary psychiatric holds, psychiatric boarding was more likely among patients who were intoxicated (Brennaman et al, 2015).

Children also experience psychiatric ED boarding. The likelihood of psychiatric boarding is greater for children experiencing suicidal ideation (Mansbach et al. 2003; Wharff et

al., 2013; Chakravarthy et al., 2015), homicidal ideation (Mansbach et al., 2003), or with a previous history of self-harm (Chakravarthy et al., 2015). Children diagnosed with a psychotic disorder are also more likely than children admitted for a substance-use disorder to experience psychiatric boarding (Chakravarthy et al., 2015). Patient sex in general does not appear to be associated with the likelihood of psychiatric ED boarding for children, except in Chakravarthy et al., (2015) which found females were more likely than males to board. Hispanic children are significantly less likely to board compared to non-Hispanic white children (Chakravarthy et al., 2015).

Strauss et al., (2005) found that psychiatric ED boarders referred by police services were more likely to be homeless, be known to mental health service providers, be male and have schizophrenia. For youth referred to the ED by police services those presenting with psychiatric conditions were more likely to experience domestic violence, poor caregiver competency, higher severity of mental illness, substance abuse, assaultive behavior and destructive behavior as compared to psychiatric youth brought to the ED by other means. Lee et al., (2008), in a study of a 350-bed community hospital, found that the majority of psychiatric ED boarding brought to the ED by police services occurred after working hours and on weekends while mental health services were least accessible.

System-Level Determinants of ED Boarding

- At the health system level, the following factors reported contribute to ED boarding of psychiatric patients:
  - Limited supply of inpatient psychiatric beds;
  - Limited availability and underfunding of community (outpatient) mental health programs;
  - Limited community alternatives to EDs;
  - Lack of care coordination for psychiatric patients;
  - Mental health workforce shortage; and
  - Insufficient training of ED staff.
  - Less generous mental and behavioral health benefits.

Limited Availability of Inpatient Psychiatric Beds. Deinstitutionalization is often cited as an underlying cause of psychiatric bed decline. The process has led to the massive transfer of severely mentally-ill persons out of institutional care in favor of community treatment (Grob, 1994). Data from American Hospital Association's Annual Survey of Hospitals show that between 2003 and 2009 the number of total psychiatric beds in the U.S. reduced by 10 beds per 100,000 persons from 34 beds in 2003.

A crucial aspect of deinstitutionalization involves significant structural changes in the public mental health system. From 1970 to 2000, 'public' psychiatric hospital beds dropped from 207 to 21 beds per 100,000 persons (Mandersheid et al. 2004). Torrey et al. (2012) report that from 2005 to 2010 state psychiatric beds reduced by 14% (from 17.1 per 100,000 in 2005 to 14.1 per 100,000 in 2010), and at least 25% bed reductions occurred in thirteen states. The declining capacity of public psychiatric hospitals has been linked to a greater incidence of psychiatric crisis in the population (measured by suicide rates) and a reduced likelihood of contacts with the

criminal justice system among persons with severe mental illness (Yoon & Bruckner, 2011; Yoon et al., 2014). Importantly, due to the limited number of inpatient psychiatric beds, many psychiatric patients in the ED end up boarding until a bed becomes available. Nesper et al. (2015) reported an average length-of-stay (LOS) in a university-based hospital in Sacramento County, California for psychiatric patients increased from 14.1 hours to 21.9 hours following a reduction in inpatient psychiatric beds. Similarly, LOS in an ED was significantly longer for psychiatric patients who were transferred to a psychiatric facility than for psychiatric patients who discharged home or who were admitted for medical treatment (Chang et al., 2011).

'Private' inpatient psychiatry has played an increasingly important role (Mandersheid et al. 2004). In 2000, private psychiatric and general hospitals accounted for 24 and 46% of all inpatient treatment episodes, respectively, as compared with only 12% in state psychiatric hospitals (Manderscheid et al. 2004). Between 1970 and the mid-1980's, the private share of hospital psychiatric beds, defined as the proportion of private to total psychiatric beds, dramatically increased from 7% to 35% (Dorwart & Schlesinger, 1998). In 2002, private psychiatric beds comprised approximately 65% of all psychiatric beds in inpatient psychiatric facilities (Foley et al., 2006). From 2000 to 2002, the proportion of discharges of patients with severe mental disorders in for-profit general hospitals nationwide increased from 13% to 28% (Wantanabe-Galloway & Zhang, 2007).

It is unclear whether these augmented services through the private sector could substitute for the reduction in public inpatient supply. There is a clear distinction of service clientele across different ownership types. Compared to public psychiatric hospitals, private psychiatric hospitals, particularly for-profit hospitals, preferentially treat insured patients and those with less severe, acute symptoms (Schlesinger et al. 1997; Mechanic 1999). Nonetheless, evidence suggests that private hospitals may increasingly serve patients similar to those of public hospitals (Olfson and Mechanic 1996; Mechanic, McAlpine, and Olfson 1998).

Underfunded Community Mental Health Programs. There has been a gradual growth of community-based mental health programs (Mandersheid et al., 2004). However, community programs have long been criticized for not adequately serving severely mentally-ill patients with a history of dangerousness, co-occurring disorders, or arrests due to its voluntary nature and chronic underfunding (Lamb, Weinberger, and Gross 2004).

The overall capacity of (outpatient) community programs remains limited (Weithorn, 2005). Services that are available may be unaffordable even for insured persons (Mental Health America, 2015). As of 2012, 20.8% of U.S. adults and 39.0% of U.S. children who needed mental health services were unable to access them (Mental Health America, 2015).

In 2012, 24.5% of Oregon adults and 34.2% of Oregon children reported unmet need for mental health services (Mental Health America, 2015). With limited access to community mental health services, mentally ill persons tend to resort to the ED for care (Giliberti, 2001).

Limited Community Treatment Options Alternative to ED Services. The lack of adequate community mental health services, including emergency mental health services, leads patients to seek care in the ED (Bender, Pande, & Ludwig, 2008). Even ambulance companies refusing to transfer psychiatric patients to outpatient facilities reportedly contributes to ED boarding of psychiatric patients (American College of Emergency Physicians, 2008).

Lack of Care Coordination and Management. The failure of the mental health system to provide patients with 'continuity of care' following a hospital discharge has been cited as an additional cause of ED boarding (Alakeson et al., 2010). Without continued mental health services following a hospital discharge, psychiatric patients often relapse and become repeat users of the ED (Bender, Pande, & Ludwig, 2008).

Shortage of Mental Health Workforce. A shortage of mental health providers in EDs has also been cited as a cause of psychiatric boarding (Alakeson et al., 2010). Numerous researchers have found that psychiatric patients are more likely to board in the ED on weekends and in the evening when mental health providers are not available to finalize a patient's discharge or transfer (Arizona Hospital and Healthcare Association, 2015; Mansbach et al., 2003; Warren et al., 2015). A survey of ED directors in California revealed that in 2010 more than 30% of California hospitals did not have access to an around-the-clock psychiatric evaluation service (Stone et al., 2012).

Insufficient Training of ED Staff and Inadequate Assessment. In addition to a lack of mental health providers in the ED, researchers have found that ED staff are generally not specially trained in the management of psychiatric patients (Bender, Pande, & Ludwig, 2008; Alakeson et al., 2010) and that this lack of training may lead to inappropriate care decisions (Stefan et al., 2006), making psychiatric patients unnecessarily wait for an inpatient bed. Stefan et al. (2006) also notes that psychiatric patients visiting the ED may be more likely than non-psychiatric patients to board, because there are few incentives to conduct a proper psychiatric assessment in the ED, and that ED providers may defer to the wishes of family, the police, or group home operators who escort psychiatric patients to the ED and admit the patient for inpatient care, even if the patient does not meet criteria for admission.

Moreover, insufficient training of ED staff may lead to the unnecessary use of restraints. This environment may then exacerbate the mental health crisis and cause the patient to need inpatient care, and thus be boarded in the ED (Stefan et al., 2006).

Lack of Health Insurance. Despite federal and state efforts to expand health insurance coverage, mental and behavioral health benefits have been less generous or more limited than physical health benefits. In many states, the lack of health insurance coverage for mental and behavioral health care limits access to community and inpatient treatments. The growth of managed behavioral health care, with its use of strict medical management techniques, can result in poorer access to care in the community; and increase the likelihood of mental health crises and the use of ED among psychiatric patients (Alakeson et al., 2010).

The 2014 expansion of the Oregon Health Plan (OHP, the state's Medicaid program) under the Affordable Care Act has significantly reduced the number of Oregonians with mental illness who are uninsured (Williams, 2015). In addition, OHP's Coordinated Care Organizations (CCOs) are explicitly designed to coordinate mental as well as physical health care for their members.

Legal and Regulatory Determinants of ED Boarding

- Major legal and regulatory factors contributing to ED boarding of psychiatric patients include:
  - Interpretation of Emergency Medical Treatment and Activity Labor Act;
  - State involuntary commitment statutes;
  - Institute for mental diseases (IMD) exclusion; and
  - Mental and behavioral health parity.

Exhibit 2-1 summarizes major statutes and regulations which have been documented or have potential to impact ED boarding of psychiatric patients.

Emergency Medical Treatment and Activity Labor Act. Unnecessary admissions to inpatient services due to 'legal and liability issues' have been identified as contributing to psychiatric ED boarding. ED providers may admit psychiatric patients to inpatient settings for the fear of legal repercussions. Liability concerns regarding Emergency Medical Treatment and Activity Labor Act (EMTALA) violations may impact ED physicians' care decisions of psychiatric patients. EMTALA requires hospitals with EDs that participate in Medicare to provide a medical screening examination to any person who comes to the ED, regardless of the individual's ability to pay. If a hospital determines that a person has an emergency medical condition, it must provide treatment to stabilize the condition or provide for an appropriate transfer to another facility (U.S. GAO, 2001). For psychiatric emergencies, an individual expressing suicidal or homicidal thoughts or gestures, if determined dangerous to self or others, would be considered to have an emergency medical condition (CMS, 2010).

In a report by the EMTALA Technical Advisory Group, the authors note confusion regarding the interpretation of the law that may be leading ED physicians to unnecessarily admit psychiatric patients for fear of violating EMTALA (Fuller et al., 2012). Consequently, patients who do not need inpatient services may board in the ED waiting for inpatient services to become available.

Stefan et al. (2006) found that providers were more likely to admit psychiatric patients when they considered liability issues. In particular, concerns regarding the potential for future suicidal and homicidal actions pose as potential liability issues for ED physicians, leading them to admit patients who may not medically qualify for inpatient services (Stefan et al., 2006; Lampert et al., 2007).

Civil commitment. State laws regarding civil commitment (involuntary hold) of psychiatric patients are also cited as a cause of psychiatric boarding (Washington State Institute for Public Policy, 2011; Arizona Hospital and Healthcare Association, 2015). In Washington, there have been substantial increases in state laws allowing for involuntary commitment, but the state has not increased funding for inpatient beds, which is cited as reason for seeing increases in psychiatric boarding (Washington State Institute for Public Policy, 2011). A report from the Arizona Hospital and Healthcare Association (2015) warns that a misapplication of numerous statutes and laws dictating the appropriate treatment of involuntarily committed psychiatric patients can lead to psychiatric boarding in the ED.

Between 1983 and 2003, in Oregon, the number of individuals in the civil commitment process grew, but those actually committed radically decreased; during this time civil commitment rates dropped by 50 percent (Bloom, 2006). However, the civil commitment population in Oregon State Hospital has increased since 2010. The annual average daily civil commitment population increased from 121 in 2010 to 138.5 in 2014[1] although it is still lower than 171 in 2002.[2]

Institutions for mental diseases: Social Security Amendments of 1972 expanded Medicaid coverage to include inpatient services for persons under 21 in 'institutions for mental diseases' (IMDs). An institution for mental diseases (IMD) is a hospital, nursing facility, or other institution that is *primarily* engaged in providing diagnosis, treatment, or care of persons with mental illness, including medical attention, nursing care, and related services (42 U.S.C. §1396d(i)). Later, the Medicare Catastrophic Act of 1988 (Pub.L. 100-360) further defined an IMD as a facility with more than 16 beds.

The result of these amendments is that while Medicaid is currently the largest financer of mental and behavioral health treatments, it does not pay for inpatient treatment of adults aged 21 to 64 in any acute or long-term care institutions with 16 or more beds that are primarily engaged in providing treatment for mental and behavioral health problems. This payment exclusion is referred to as the Medicaid IMD exclusion.

The Medicaid IMD exclusion provided an incentive to shift the cost of care for mental illness to other care modalities and facilities, where Medicaid matching funding was available, and indirectly contributed to the decrease in the number of publicly funded inpatient psychiatric beds available for emergency services. As a consequence, the Medicaid IMD exclusion may be a contributing factor to psychiatric boarding. In addition, facilities for the treatment of alcohol and drug addiction (e.g., community-based residential treatment centers) are unintentionally impacted because substance abuse treatment services are not distinguished from mental health services in statute or regulation.

Mental and behavioral health parity. Financial barriers in general and limited insurance coverage for mental and behavioral health care in particular pose a major barrier to access to treatment among individuals in need of mental and behavioral health treatment in the community. Despite federal and state efforts to expand benefits, coverage for mental and behavioral treatment have been more limited than that of treatment for physical illness in terms of cost sharing and treatment limitations (Busch, 2012).

The passage of the 2008 Mental Health Parity and Addiction Equity Act (MHPAEA) represents a bold step to address these discriminatory restrictions applauded by consumer advocates and the provider community. It prohibits differences between mental/behavioral health benefits and medical/surgical benefits in treatment limits, cost sharing, and in- and out-of-network coverage (Goodell et al., 2014). The MHPAEA rules apply to large group health plans, both fully and self-insured, and also public programs such as Medicaid managed care plans, state Children's Health Insurance Plans, Medicare Advantage plans offered through group health plans, and state and local government plans (Goodell et al., 2014).

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[1] Source: http://www.oregon.gov/oha/bhp/Documents/USDOJ%20Report%20Narrative%20Document_7.1.2015.pdf.

[2] Personal communication with Michael Morris, Behavioral Health Policy Administrator, Addictions and Mental Health Division, Oregon Health Authority.

The Affordable Care Act of 2010 (ACA) goes beyond the MHPAEA by *mandating* coverage rather than requiring parity only if coverage is provided. The ACA defines coverage of mental and behavioral health treatment as one of the ten essential health benefits (Frank et al., 2014). It applies the MHPAEA to insurers in the individual market and qualified health plans offered through the marketplace, including the small business exchange (Frank et al., 2014). As a result, all health insurance plans in the individual and small-employer market–both inside and outside marketplaces–must include coverage for the treatment of mental health and substance use disorders. Therefore, it is expected that by requiring mental and behavioral health benefits in parallel with medical/surgical benefits and expanding the scope of parity to public insurance programs, the ACA will reach a much larger population, leading to improved access to mental and behavioral health treatments in the public and private sectors.

Exhibit 2-1. Legislation, rules and regulations pertaining to psychiatric boarding

	Description	Impacts on boarding of psychiatric patients in EDs
Emergency Medical Treatment and Activity Labor Act (EMTALA) of 1986	Mandates US EDs accept, treat, and stabilize all patients regardless ability to pay, including those with psychiatric emergencies. It is also known as the patient antidumping statute.	The law is vague regarding the requirement for psychiatric hospitals to accept these patients from EDs after they have been medically cleared and determined to require hospitalization solely for psychiatric treatment. Especially, confusion regarding the interpretation of the law that may be leading ED physicians to unnecessarily admit psychiatric patients for fear of violating EMTALA. Thus, patients who do not need inpatient services may board in the ED waiting for inpatient services to become available.
Civil commitment	Persons with severe mental illness are court-ordered into psychiatric treatment in inpatient or outpatient settings if they are in imminent danger of harming themselves or others	Misapplication of numerous statutes and laws dictating the appropriate treatment of involuntarily committed psychiatric patients can leads to psychiatric boarding in the ED.
Institutions for mental diseases (IMD) exclusion	Medicaid law that prevents federal Medicaid funds from being used by states to reimburse treatment provided to persons aged 21 to 64 years old in institutions with more than 16 beds which specialize in the treatment of psychiatric disorders, known as institutions for mental diseases (IMDs)	The IMD exclusion provides states with a significant fiscal incentive to limit treatment in psychiatric facilities meeting the IMD definition. Also, facilities for the treatment of alcohol and drug addiction (e.g., community-based residential treatment centers) are unintentionally impacted because substance abuse treatment services are not distinguished from mental health services in statute or regulation. Therefore, the IMD exclusion poses a barrier to many who seek appropriate and effective mental health and substance abuse treatment in appropriate inpatient settings and thereby may contribute to psychiatric boarding.

Mental/behavioral health parity	Mandate differences between mental/behavioral health benefits and medical/surgical benefits in treatment limits, cost sharing, and provider network coverage.	The Mental Health Parity and Addiction Equity Act (MHPAEA) prohibits differences between mental/behavioral health benefits and medical/surgical benefits in treatment limits, cost sharing, and in- and out-of-network coverage. The Affordable Care Act (ACA) defines coverage of mental and behavioral health treatment as one of the ten essential health benefits. Together the MHPAEA and ACA can improve access to mental and behavioral health treatments in the public and private sectors.

2.4. Impacts

- Psychiatric patients receive sub-optimal quality of care in EDs: 62% California ED directors reported that patients boarded in the ED received no psychiatric care before admission or transfer.
- Psychiatric boarding reduces ED capacity and increases pressure on ED staff, thereby negatively affects care of other ED patients.
- Psychiatric boarding places significant financial strains on hospitals.

Appendix A Exhibit 3 summarizes findings from the literature on the impacts of psychiatric ED boarding on patients, ED staff and health system.

Impacts on Psychiatric Patients

EDs are not well-equipped to address needs of psychiatric patients and therefore psychiatric patients receive a sub-optimal quality of care in EDs. Hospital ED staff are generally not trained in psychiatry (Alakeson et al., 2010; Halmer, Beall, Shah, & Dark, 2015) and therefore hospital ED staffing is often unavailable to treat mental health and substance abuse patients in EDs (Bender, Pande, & Ludwig, 2008). The ED environment is loud and hectic, and use of restraints and seclusion are not uncommon, which is counterproductive to de-escalating a mental health crisis (Alakeson et al., 2010; Bender, Pande, & Ludwig, 2008). In a 2008 survey of medical directors of EDs conducted by American College of Emergency Physicians (ACEP), 62% reported that patients boarded in the ED received no psychiatric care before admission or transfer (American College of Emergency Physician, 2010). Psychiatric patients boarding on medical floors have to compromise all quality domains, including safety, efficiency, effectiveness and timeliness of care (Fieldston et al., 2014). Boarded ED patients also face the risk of having medication errors or no treatment for concurrent medical conditions (Bakhsh et al., 2014). The situation does not differ for children. Among pediatric psychiatric patients on involuntary holds, only 6% received counseling and 20% received medication (Claudius et al., 2014). In a small sample of children covered by Medicaid who were boarded, none received any of the psychiatric services Medicaid requires for children (Bender, Pande, & Ludwig, 2008).

Impacts on ED Staff and Other Patients

Boarding of psychiatric patients reduces overall ER capacity because psychiatric patients simply require more resources. In the 2008 ACEP survey, 72% of ED directors reported psychiatric patients in EDs required more nursing and other resources compared to non-psychiatric patients (American College of Emergency Physician, 2010). Also, distressed psychiatric patients may demonstrate violent behavior (American College of Emergency Physician, 2014), such as attacks on nurses. Therefore, the presence of boarded psychiatric patients can distract ED staff, increasing pressure on them. Overwhelmed and frustrated nursing staff may exhibit disrespectful and hostile behavior toward psychiatric patients (Bender, Pande, & Ludwig, 2008) and engage in bed hiding (Katz et al., 2006)

The impact of boarded patients appears to spill over to other ED patients. A reduced availability of ED resources leads to worsening ED crowding and longer ED wait time (American College of Emergency Physician, 2010 & 2014). The 2008 ACEP survey revealed that 85% of ED directors perceived that wait times in the ED would decrease for all patients if better psychiatric services were available (American College of Emergency Physician, 2010).

Impacts on Health System

Psychiatric boarding places significant financial strains on hospitals. Although not well studied, there is some anecdotal evidence that hospitals are not reimbursed for boarding psychiatric patients (Bender, Pande, & Ludwig, 2008). Under the EMTALA, hospitals must stabilize patients, regardless of a patient's ability to pay. Uninsured psychiatric patients thus cost the hospital until the patient is transferred or discharged. Nicks and Manthey (2012) estimated that psychiatric boarding cost an academic medical center ED $2,264 per patient in 2007-2008. In one pediatric ED, psychiatric boarding costed a hospital $4,269 per patient in 2010 (Claudius et al., 2014). Arizona Hospital and Healthcare Association estimated that cost of an average psychiatric boarding case was $6,220 that led to a total state-wide cost of over $20 million annually (Arizona Hospital and Healthcare Association, 2015)

2.5. Suggested Solutions

- Quantify and monitor the extent of boarding
- Invest in comprehensive community-based psychiatric emergency services such as 24 hour help line, mobile crisis outreach team, emergency walk-in clinic, and crisis stabilization unit
- Increase community mental health services
- Enhance continuity of care in community
- Promote collaboration between EDs and community programs
- Improve care of psychiatric ED patients
- Work with law enforcement
- Increase access to insurance
- Increase inpatient psychiatric care capacity

Quantify and Monitor the Extent of Boarding

Alakeson et al. (2010) suggests that quantifying and monitoring the extent and patterns of psychiatric boarding is the first step to deal with psychiatric ED boarding.

Invest in Community Psychiatric Emergency Services

Increasing comprehensive community psychiatric emergency services (PES)—such as 24 hour public help line, mobile crisis outreach team, 24 hour emergency walk-in clinic, crisis stabilization unit, emergency residential unit, crisis counseling unit—can reduce boarding of psychiatric patients in EDs (Alakeson et al., 2010).

In Alameda, California, psychiatric patients transferred to a regional PES ("regionally dedicated emergency psychiatric facility") experienced boarding times that were 80% shorter than the state average of 10 hours and 3 minutes (Zeller et al., 2014). Furthermore, the PES can reduce the need of inpatient psychiatric care by stabilizing more than three-quarters of patients experiencing psychiatric crisis. Zeller et al. (2014) also reported that approximately 25% of psychiatric patients transferred to the regional PES were admitted to inpatient services.

Similarly, Gillig et al. (1989) found that PES with 23-hour treatment capacity reduced inpatient utilization by 44%. Wolff et al. (2009) discovered transferring patients to a crisis stabilization program from ED led to 50% decrease in psychiatric hospitalizations. The award-winning Burke Mental Health Emergency Center in Texas began offering a new approach for PES, providing onsite care by counselors and nurses and supervised by psychiatrists via telemedicine. The Burke PES model has led to a 32% decrease in the use of inpatient psychiatric hospital beds in the participating counties.[3]

Similar suggestions have been made elsewhere. For example, the Arizona Hospital Association recommends expanding community crisis services, and working with law enforcement, group home staff, and other 'secondary utilizers' and training them to manage mental health crises prior to ED visits. In this approach, community mobile crisis teams and counselors work with a fire department to assess mental status on site and send patients to appropriate care facilities instead of an ED.

Increase Outpatient Community Mental Health Services

Increasing community outpatient resources and integrating behavioral health services into primary care supported by an alignment of financial incentives have been suggested as a strategy to reducing psychiatric ED boarding (Arizona Hospital and Healthcare Association, 2015). Also, availability of telemedicine services has been recommended to allow access to providers for people living in remote communities (Arizona Hospital and Healthcare Association, 2015).

It is well documented that intensive community programs such as ACT teams and intensive case management are effective in preventing ED utilization among psychiatric patients. For example, analyzing data on clients of full service partnership (FSP) programs in California,

[3] Source: http://www.cepamerica.com/news-resources/perspectives-on-the-acute-care-continuum/april-2015/regional-psychiatric-emergency-service

which build upon the ACT team model, Yoon et al. (2015) discovered a significant decrease in ED utilization among FSP clients following after the implementation of FSP services.

Enhance Continuity of Care in the Community

Adolescents who received aftercare following their first visit to an ED for psychiatric care were significantly less likely than adolescents who didn't receive aftercare to have a repeat ED visit (Carlisle, 2012). Therefore, Health Homes to enhance continuity of care in community settings can serve as an effective means to reduce ED boarding.

Collaboration between EDs & Community Outpatient Programs

Collaboration between EDs and community mental health programs can reduce psychiatric ED boarding; for example, having community mental health clinicians train ED staff on management and care of patients with severe mental illness; and having a social worker present to connect patients with community services at discharge. McCullum-Smith (2015) reported patients seen in a transitional psychiatry clinic within three days following an ED visit had significantly longer intervals before the next ED visit.

Improve Care of Psychiatric Patients in EDs

Training ED staff in psychiatric services can lead to better ER care of psychiatric patients. A pilot study to train ED physicians to treat boarded psychiatric patients led to increased comfort in working with these patients (Marciano, 2012). ED staff training in St. Anthony Hospital in Oklahoma City led to a decrease in LOS of psychiatric ED patients (Arizona Hospital and Healthcare Association, 2015). Implementation of a 'psychiatric assessment and planning unit' is associated with decreased LOS and reduction in the use of mechanical restraint (Browne, 2011). Likewise, a rapid emergency stabilization program for children is associated with a significant decrease in average ED LOS from 19.7 hours to 10.8 hours and a decrease in the average total ED cost per patient of $569 (38.7% decrease) (Rogers, 2015).

Telepsychiatry may be used to overcome an ED workforce issue. The use of a telepsychiatry network in South Carolina, for example, provides psychiatric evaluations through telephone and video conferencing for 27 hospital EDs. The program is associated with a reduction in the overall LOS in the hospital and financial savings of $150,000 in the first 8 months.[4] Polevoi et al. (2013) documented such a co-management model where attending psychiatrists and residents increased involvement with psychiatric patients in the ED led to a decrease in the median LOS in the ED.

It is also suggested to make more efficient use of existing capacity such as (a) review teams to improve inpatient capacity and timely discharges; (b) computerized bed management systems; and (c) electronic dashboards. For example, Virginia and Maryland have created state-

[4] Source: http://www.aha.org/research/reports/tw/12jan-tw-behavhealth.pdf.

wide electronic dashboards to allow ED staff to see all available psychiatric beds simultaneously, so they do not need to contact each facility separately to find a bed.[5]

Suggestions for short-term improvements of care of boarded patients include: (a) separate psychiatric EDs, holding areas, or separate waiting areas; (b) diversion center in the ED for triage; (c) adoption of the guidelines for Psychiatric Emergency Care & Use of Restraints provided by the American Psychiatric Association (APA) Task Force, Substance Abuse and Mental Health Service Administration (SAMHSA), and Joint Commission on Accreditation, Health Care, Certification (JCAHO)[6]; (d) use of inpatient or acute care hallway instead of an ED; (e) boarding psychiatric patients in a bed outside of an ED; and (f) advanced discharge planning for more timely hospital discharges (Bender, Pande, & Ludwig, 2008; Stover et al., 2015).

Work with Law Enforcement

Providing mental health training to law enforcement such as management of mental health crisis and information on local mental health resources can lead to a reduction in ED boarding (Alakeson et al., 2010). Webster and Harris (2004) propose that to facilitate collaboration between law enforcement and EDs to appropriately manage mental health patients presenting to EDs mental health liaison teams should be established between EDs and police services, and Lamb et al. (2002) suggest the need for outreach teams consisting of both police officers and mental health service professionals to assist in the adequate care of individuals presenting to EDs for mental illness.

Other Suggestions

Increased access to insurance and an increase in inpatient psychiatric care capacity (more hospital psychiatric beds) have also been suggested as strategies to reduce ED boarding (Arizona Hospital and Healthcare Association, 2015; Mental Health America, 2015).

[5] Source: http://www.acep.org/uploadedFiles/ACEP/Clinical_and_Practice_Management/Resources/Mental_Health_and_Substance_Abuse/Psychiatric%20Patient%20Care%20in%20the%20ED%202014.pdf.

[6] Source: http://www.jointcommission.org/assets/1/23/Quick_Safety_Issue_One_April_20142.PDF.

Chapter 3. Extent and Trends in Psychiatric ED Boarding in Oregon

3.1. Introduction

To examine the extent and trends in psychiatric ED boarding in Oregon, we analyzed data from three independently-maintained data sources, including the Emergency Department Information Exchange (EDIE), hospital discharge data, and Medicaid claims and enrollment files. The EDIE is a web-based, real-time intra- and inter-ED communication and information technology that allows ED clinicians to exchange patient information, develop notification systems, and coordinate care for patients with complex care needs. The Hospital ED discharge data were obtained from the Oregon Association of Hospital and Health Systems (OAHHS) and capture information on Oregon hospital ED visits, including patient demographic characteristics, admission and discharge date and time, length of stay in EDs, diagnoses, ED charges, and payment sources. Medicaid claims data were supplied by OHA's Office of Health Analytics.

Each data source has its own strengths and limitations, summarized below in <Exhibit 3-1>. The hospital discharge data contain ED utilization records for both Medicaid and non-Medicaid patients admitted to hospital EDs in Oregon. However, the discharge hour field is missing in approximately 81% of visits in the raw data set, which limits the investigation of the ED boarding problem based on information on hours of an ED episode. Furthermore, only billed amount is included, making it difficult to examine ED expenditures associated with psychiatric ED boarding.

The EDIE data contain hospital ED admission and discharge date and time, discharge destination, patient demographics, and diagnosis and procedure codes. The raw EDIE data set has almost complete information on ED admission and discharge date and time and also captured both Medicaid and non-Medicaid ED visits. However, it does not include charge or payment information. Also, data accuracy may be challenged by inconsistent EDIE adoption practices.

ED utilization and payment data for Medicaid patients were also retrieved from Medicaid claims and enrollment files. The Medicaid data include more reliable records of ED utilization for Medicaid patients, compared to the other data sources. It also represents the sole source of actual payment for ED services. Nonetheless, there are several significant limitations, including: (a) Medicaid claims include data only on Medicaid population; (b) discharge dates are often missing in the raw data files; and (c) there is no recorded admission and discharge time, which is critical to measure the extent of ED boarding based on hours of ED stay.

In additional to the source-specific caveats, all the data sources may also suffer from potential recording inaccuracy inherent in any administrative data source. Nonetheless, the databases analyzed here, individually and collectively, offer a unique opportunity to quantify the psychiatric ED boarding in Oregon. The databases in fact can serve as complementary sources to one another. For example, missing ED admission and discharge time in hospital discharge and Medicaid claims data can be filled with information from the EDIE data.

The OAHHS performed data linkage to uniquely identify the same patients across the three databases and assigned person identification numbers to unique individuals across the data sources. OAHHS removed personal identifiers such as name or address from the datasets before

providing them to OSU. These raw data sets were then de-duplicated and linked at the person-episode level by OSU researchers.

Exhibit 3-1. Strengths and weaknesses of data sources

	Hospital Discharge	EDIE	Medicaid
Strengths	• ED utilization records for all ED patients regardless of insurance status • Information on ED admission/discharge date and time	• ED utilization records not only for Medicaid patients but also for non-Medicaid patients • Complete information on ED admission and discharge date and time	• Reliable record of the care received by Medicaid patients • Information on actual ED facility payment.
Limitations	• 81% of discharge hour missing in the raw data • Only billed amount included • Potential reporting inaccuracy of administrative records	• May miss a non-trivial number of ED episodes • No charge or payment information • Potential reporting inaccuracy of administrative records, especially due to inconsistent EDIE adoption practices	• Missing discharge dates • Data only on Medicaid population • Admission and discharge hours not recorded

To address the limitations of each raw data set, OSU researchers augmented them with complementary information from one another. We filled in missing or absent information in each data set with information available in the alternative data sources. For example, missing ED discharge times in the raw hospital discharge data are filled with discharge time for the same ED episode available in the EDIE data. Complete episode-level data on admission and discharge time were also attached to the Medicaid claims data at the person-episode level. Our imputation algorithm is described in detail in <Appendix B1>.

Our analysis is restricted to the one-year sample period from October 1, 2014 through September 30, 2015 during which complete data were available from all three data sources. The raw data sets contain only records for ED patients who were linked across the three data sources based on full name and birth date, and therefore undercount actual ED visits in Oregon. For the study period, there were 564,151 unique ED visits in the hospital discharge data, 539,923 unique ED visits in the EDIE data, and 391,479 unique ED visits in the Medicaid claims data. In comparison, OAHHS reports approximately 1.4 million total hospital ED visits in 2015. Therefore, hospital ED visits captured in the hospital discharge and EDIE data represent roughly

40% of the annual total hospital ED visits in Oregon. Nonetheless, data on psychiatric ED boarding presented below are likely to be representative of all psychiatric ED visits and boarding data on the entire ED visits during the study period in Oregon.[7]

The rest of Chapter 3 is organized as following. Below in Sub-chapter 3.2 we first discuss briefly the definitions of psychiatric ED boarding applied in our analysis. In Sub-chapters 3.3 and 3.4, we present results on the extent of psychiatric ED boarding in Oregon as well as recent trends, using full-linked data that contain all unique ED episodes from all three raw data sets. The full-linked data set included 690,245 unique ED episodes on 290,181 unique persons between October 1, 2014 and September 30, 2015. A comprehensive discussion of the full-linked analytic data is found in <Appendix B1>.

We also analyzed the augmented data sets individually for reliability of each data source. Results of our comparative analysis are reported in Sub-chapter 3.5. Finally, we report our estimates of ED expenditures associated with psychiatric ED boarding in Oregon.

3.2. Definitions

ED boarding

No standard definition for ED boarding exists in the US (Lewin Group, 2009) although ED boarding may be conceptually characterized by patients for whom evaluation is complete and the decision has been made to admit or transfer but no bed is available to receive the patient (Nolan et al., 2015). Various practical definitions have been adopted in the U.S. and also in other countries. Australia has adopted national targets for public hospital ED stays of no more than 4 hours (Australian Government Department of Health and Ageing, 2009). Canada has set similar targets; total time spent in the ED should last no longer than 4 hours for low-acuity patients and 8 hours for high-acuity patients (Ontario Ministry of Health and Long-term Care, 2014). The Accreditation Council for Graduate Medical Education (2013), indicates that the maximum ED length of stay should be no more than 4 hours for discharged patients and 8 hours for admitted patients. Most recently, the council also suggested the 6-hour threshold for ED boarding in the U.S. Nolan et al. (2015) applied the practical definition to a national data source and suggested the ED boarding rate of 12.8% among psychiatric patients in EDs in 2008 nationwide, defined as the ratio of boarded ED episodes to the entire psychiatric ED visits.

In light of the current literature and information available in our data sources, we have adopted two most widely applied definitions of ED boarding based on the number of hours of ED stay: (a) a stay in the ED lasting greater than 24 hours (henceforth, 24-hour definition) and (b) a stay in the ED longer than 6 hours (henceforth, 6-hour definition). These distinct definitions of ED boarding allow us to compare our results to the most recent findings on the extent of ED boarding from other states such as Arizona (Arizona Hospital and Healthcare

Main definitions of ED boarding adopted:
(a) a stay in an ED longer than 24 hours, and
(b) a stay in the ED longer than 6 hours.

[7] To gauge whether the raw data containing ED visits only for linked patients are representative of all ED visits, we compared linked data to the entire data for Medicaid patients for which all ED utilization data became available. See <Appendix B1> for details.

Association, 2015) based on the 24-hour definition as well as to national estimates reported in the current literature such as Nolan et al. (2015) based on the 6-hour definition. It is worth noting that in this section, although both 24- and 6-hour definitions have been adopted to describe psychiatric ED boarding in Oregon, we consider the 6-hour definition as a more rigorous definition of boarding.

Psychiatric ED visit

Psychiatric ED visits describe ED episodes for both pediatric and adult patients who received ICD-9 codes of mental health conditions and related injury during their ED visits, including: 290-319 (all mental illness); 648.4, V40.2, V40.3, V40.9, V67.3 (other miscellaneous mental disorders and problems); 331.0, 331.1, 331.2, 331.8, 797 (delirium, dementia and other cognitive limitations); V40.0, V40.1 (other developmental problems); E950-E959, V628 (suicide related); V62.8, V66.3, V67.3, V70.1, V70.2 V71.0, V79.0, V79.8, V79.9 (mental health exam and screening). See <Appendix B2> for details.

Psychiatric ED visits were categorized into severe and non-severe psychiatric visits. Severe psychiatric ED visits include ED episodes that received diagnoses of severe mental illness. We adopted severe mental illness visit profiling developed by Yoon et al. (2014). The following ICD-9 codes were considered to indicate severe mental illness: 295—Schizophrenic Disorders, 296—Episodic Mood Disorders (except for 2962—Major Depressive Disorder, Single Episode), 297—Delusional Disorders, and 298—Non-organic Psychoses. All other psychiatric ED visits were classified as non-severe psychiatric ED visits.

Psychiatric visits were grouped into severe and non-severe episodes.

Psychiatric ED boarding

Psychiatric ED boarding is also defined in two ways according to the 24-hour and 6-hour definitions: (a) ED visit with psychiatric diagnoses and a stay of longer than 24 hours and (b) ED visit with psychiatric diagnoses and a stay of longer than 6 hours. We split psychiatric ED boarding into severe psychiatric ED boarding (defined as psychiatric ED boarding episodes that received diagnoses of severe mental illness) and non-severe psychiatric ED boarding (defined as other psychiatric ED boarding episodes that did not receive diagnoses of severe mental illness).

3.3. The Extent of Psychiatric ED Boarding in Oregon

As aforementioned, our main findings on the extent of psychiatric ED boarding in Oregon came from the full-linked data set which contains all unique ED visits in all three data sources. It included 690,245 unique ED visits on 290,181 unique patients between October 2014 to September 2015.

3.3.1. Boarding incidence

Unique ED visits

<Exhibit 3-2> presents results on ED visits and psychiatric ED boarding incidents in Oregon between October 2014 and September 2015 for the full-linked data set. We applied to our data two different definitions of ED boarding: One based on the '24-hour' definition (i.e., ED stay longer than 24 hours) and the other based on the '6-hour' definition (i.e., ED stay longer than 6 hours).[8]

During the one-year period, there were total 690,245 unique hospital ED episodes. Approximately 14% of the entire ED visits were psychiatric episodes. This rate is similar to national averages reported in Owens et al. (2010) and Nolan et al. (2015).[9] Based on the 6-hour definition, 37,760 visits in our data (5.5% of the total annual ED visits including both psychiatric and non-psychiatric visits) were identified as boarding episodes.

About two percent of the total ED visits, or 14,676 ED visits in our analytic data, satisfied the criteria for psychiatric ED boarding. Given that our analytic sample did not include all ED visits in Oregon (see <Appendix B3>, we extrapolate from our sample and estimate total 29,763 boarded psychiatric ED visits per year in Oregon.[10] In comparison, based on the 24-hour definition, 8,442 visits or 1.2% of the total ED visits were boarded visits, and 3,504 visits (0.5% of the total ED visits) were classified as psychiatric ED boarding.

2.1% of all hospital ED visits in Oregon or 29,763 ED visits from Oct. 2014 to Sep 2015, were psychiatric ED boarding episodes, based on the definition of an ED boarding as a stay in the ED longer than 6 hours.

The rate of boarding was substantially higher for psychiatric ED visits than for non-psychiatric visits. <Exhibit 3-3> shows the proportion of boarded visits separately for psychiatric and non-psychiatric visits. As shown in Panel A, based on the 6-hour definition, 14.6% of total psychiatric visits were boarding episodes, which is smaller than the national average of 21.5% from the 2008 National Hospital Ambulatory Medical Care Survey [NHAMCS] (Nolan et al., 2015). However, the national rate included both psychiatric and substance abuse conditions. Nolan et al. (2015) also reported that the rate of psychiatric ED boarding was significantly lower in the West than the nationwide average. Therefore, we view our estimate is roughly comparable to the most recent national estimate.

14.6% of all psychiatric ED visits were boarding episodes.

[8] The 24-hour definition helps us compare our results to findings from other states based on the same 24-hour definition such as Arizona (Arizona Hospital and Healthcare Association, 2015). The 6-hour definition allows for a comparison to national ED boarding rates reported in the literature in which experts suggested ED boarding to be defined as staying in ED longer than 6 hours in the U.S.

[9] Owens et al. (2010) estimated 12.5% in 2007 and Nolan et al. (2015) estimated 11% in 2008. However, both studies defined psychiatric visits more broadly including both mental health and substance abuse (MHSA) conditions.

[10] = 14,676 (from Exhibit 3-2) × 2.028 (expansion weight calculated as the ratio of 690,245 ED visits in our analytic data to total 1.4 million annual ED visits in Oregon)

The rate of boarding for psychiatric ED visits is more than three times greater than the rate for non-psychiatric ED visits. In comparison, based on the 24-hour boarding definition, approximately 3.5% of psychiatric ED visits were classified as boarding episodes (Panel B). This ED boarding rate is lower than 7% in hospital EDs in Arizona based on the same 24-hour definition (Arizona Hospital and Healthcare Association, 2015). However, it is worthwhile to note that diagnoses of substance abuse disorders were also included in the definition of psychiatric episodes for the Arizona estimate.

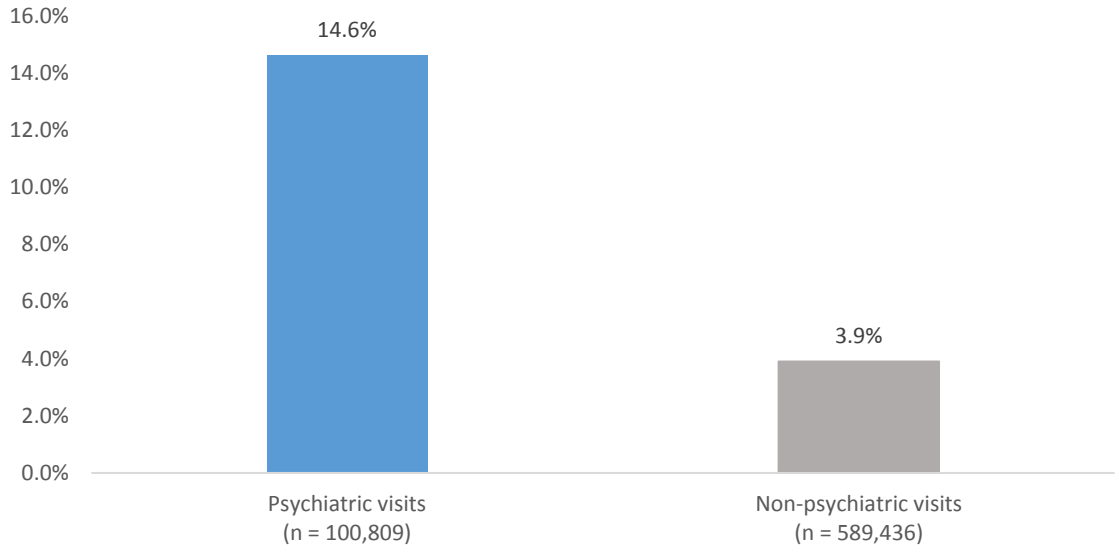
Exhibit 3-2. Unique ED visits (proportions[1]) in Oregon, Oct. 2014 – Sep. 2015

	Boarding definition:	
	24-hour definition	6-hour definition
Total ED visits	690,245	690,245
Psychiatric visits[2]	100,809 (14.6%)	100,809 (14.6%)
Boarded visits[3]	8,442 (1.2%)	37,760 (5.5%)
Psychiatric ED boarding[4]	3,504 (0.5%)	14,676 (2.1%)

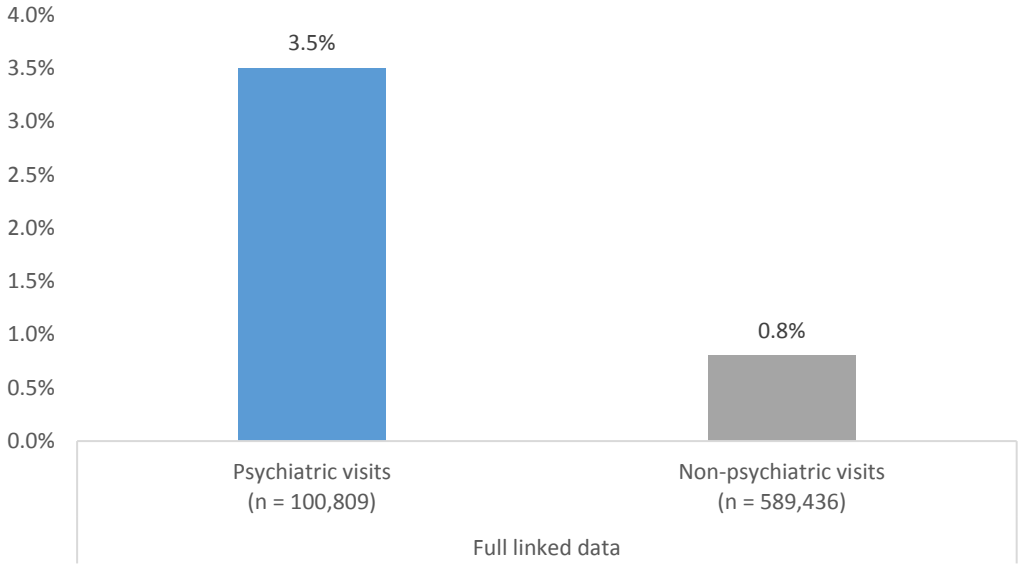
[1]The denominator is total ED visits (*N* = 690,245).
[2]Psychiatric visit defined as having ICD-9 diagnoses for mental illness and related injury, including: 290-319 (all mental illness); 648.4, V40.2, V40.3, V40.9, V67.3 (other miscellaneous mental disorders and problems); 331.0, 331.1, 331.2, 331.8, 797 (delirium, dementia and other cognitive limitations); V40.0, V40.1 (other developmental problems); E950-E959, V628 (suicide related); V62.8, V66.3, V67.3, V70.1, V70.2 V71.0, V79.0, V79.8, V79.9 (mental health exam and screening).
[3]The 24-hour definition defines ED boarding as staying in ED longer than 24 hours (AZHHA, 2015). The 6-hour definition defines ED boarding as staying in ED longer than 6 hours (Nolan et al., 2015).
[4]Meet both definitions of psychiatric and ED boarding episodes.

Exhibit 3-3. Proportions of boarded episodes for psychiatric and non-psychiatric ED visits in Oregon EDs, Oct. 2014 – Sep. 2015

Panel A: 6-hour definition



Panel B: 24-hour definition



The severity of psychiatric conditions appears to increase the chance of boarding during an ED visit. In <Exhibit 3-4> we focus on psychiatric ED visits and report ED boarding incidents by the severity of psychiatric diagnoses during ED visits. About 15% of all psychiatric visits were classified as severe psychiatric episodes and the remaining 85% identified as non-severe psychiatric episodes. Our data also show that based on the 6-hour definition 3,753 visits (3.7%

of all psychiatric ED visits, severe and non-severe) were boarded, severe psychiatric visits and 10,923 visits (about 11% of all psychiatric visits) were boarded, non-severe psychiatric visits.

Exhibit 3-4. Psychiatric ED visits (proportions[1]) in Oregon, Oct. 2014 – Sep. 2015: By severity of psychiatric conditions

	Boarding definition:	
	24-hour definition	6-hour definition
Total psychiatric ED visits[2]	100,809	100,809
Severe episodes[3]	15,394 (15.3%)	15,394 (15.3%)
Boarded	1,399 (1.4%)	3,753 (3.7%)
Non-severe episodes	85,415 (84.7%)	85,415 (84.7%)
Boarded	2,105 (2.1%)	10,923 (10.8%)

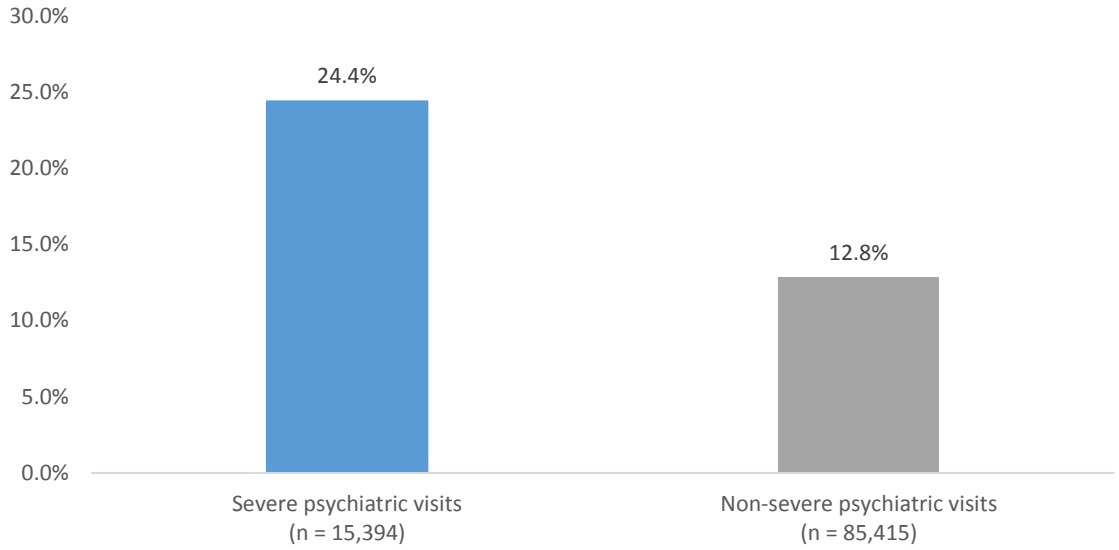
[1]The denominator is total psychiatric ED visits.
[2]Psychiatric visit defined as having ICD-9 diagnoses for mental illness and related injury, including: 290-319 (all mental illness); 648.4, V40.2, V40.3, V40.9, V67.3 (other miscellaneous mental disorders and problems); 331.0, 331.1, 331.2, 331.8, 797 (delirium, dementia and other cognitive limitations); V40.0, V40.1 (other developmental problems); E950-E959, V628 (suicide related); V62.8, V66.3, V67.3, V70.1, V70.2 V71.0, V79.0, V79.8, V79.9 (mental health exam and screening).
[3]Severe mental illness visit defined as having ICD-9 diagnoses for severe mental illness, including:295 (Schizophrenic Disorders), 296 (Episodic Mood Disorders), 297 (Delusional Disorders), 298 (Non-organic Psychoses)
[4]The 24-hour definition defines ED boarding defined as staying in ED longer than 24 hours (AZHHA, 2015). The 6-hour definition defines ED boarding as staying in ED longer than 6 hours (Nolan et al., 2015).

<Exhibit 3-5> shows the proportion of boarded visits separately for severe and non-severe psychiatric visits. As shown in Panel A, based on the 6-hour definition, one-fifth of all severe psychiatric visits (24.4%) were classified as boarding episodes, which is nearly twice larger than the boarding rate of 12.8% for non-severe psychiatric visits. Once again, the 6-hour definition led to much higher boarding rates than the 24-hour definition (Panel B).

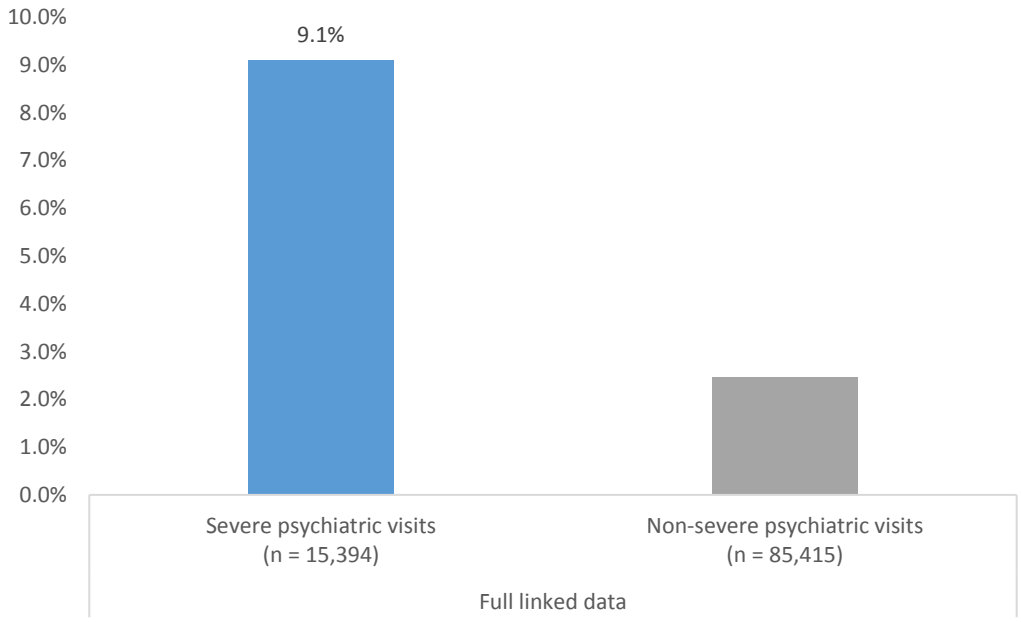
Over 24% of all severe psychiatric ED visits were boarding episodes, compared to 13% of all non-severe visits.

Exhibit 3-5. Proportions of boarded ED visits for severe and non-severe psychiatric episodes in Oregon, Oct. 2014 – Sep. 2015

Panel A: 6-hour definition



Panel B: 24-hour definition



Unique ED patients

<Exhibit 3-6> reports the count of total unique patients who used Oregon hospital EDs between October 2014 and September 2015. We again present ED boarding data separately for the 24-hour and 6-hour definitions.

Our analytic data set included total 290,181 unique ED patients. During the one-year study period, 11% of the entire ED patients received psychiatric diagnoses. Based on the 6-hour definition, 12,404 patients (4.3% of total ED patients including both psychiatric and non-psychiatric patients) were boarded. 3,893 patients (1.4% of all ED patients) were classified as psychiatric ED boarding patients. Based on the 24-hour definition, 2,459 patients (0.9% of all ED patients) were boarded, and 811 patients (0.3% of all ED patients) were classified as psychiatric ED boarding patients. The findings are consistent with the findings from the episode-level analysis given that overall the proportions for patient-level data were only slightly smaller than those for the episode-level data.

Exhibit 3-6. Unique ED patients (proportions[1]) in Oregon, Oct. 2014 – Sep. 2015

	Boarding definition	
	24-hour definition	6-hour definition
Total ED patients	290,181	290,181
Psychiatric patients[2]	31,824 (11.0%)	31,824 (11.0%)
Boarded patients[3]	2,459 (0.9%)	12,404 (4.3%)
Psychiatric ED boarding[4]	811 (0.3%)	3,983 (1.4%)

[1]The denominator is total ED patients.
[2]Psychiatric patient defined as having ICD-9 diagnoses for mental illness and related injury, including: 290-319 (all mental illness); 648.4, V40.2, V40.3, V40.9, V67.3 (other miscellaneous mental disorders and problems); 331.0, 331.1, 331.2, 331.8, 797 (delirium, dementia and other cognitive limitations); V40.0, V40.1 (other developmental problems); E950-E959, V628 (suicide related); V62.8, V66.3, V67.3, V70.1, V70.2 V71.0, V79.0, V79.8, V79.9 (mental health exam and screening).
[3]The 24-hour definition defines ED boarding as staying in ED longer than 24 hours (AZHHA, 2015). The 6-hour definition defines ED boarding as staying in ED longer than 6 hours (Nolan et al., 2015).
[4]Meet both definitions of psychiatric and ED boarding patients.

<Appendix B4> discusses additional results from the unique ED patient data in details. They are similar to the results from the unique ED visit data presented above.

3.3.2. Boarding Time

<Exhibit 3-7> reports average boarding time in our data set, defined as (a) ED stay time in hours *less* six hours for the 6-hour definition and (b) total ED hours *less* 24 hours for the 24-hour definition. Panel A reports average ED boarding time for all ED visits including both boarded and not-boarded ED visits while Panel B presents boarding time for the subset of boarded ED visits. As shown in Panel A, ED visits on average had a boarding time of 1.2 hours (i.e., a total of 7.2 hours in ED) based on the 6-hour definition and about a

Average boarding time for psychiatric ED visits was 3.2 hours.

half hour based on the 24-hour definition. Psychiatric episodes extended the average boarding time to 3.2 hours, compared to less than an hour for non-psychiatric visits. Among psychiatric visits, severe psychiatric visits had on average 9.2 hours of boarding time, four times longer than 2.3 hours of boarding time for non-severe psychiatric visits. Comparable patterns were discovered for the 24-hour definition.

Exhibit 3-7. Average boarding time (BT) in hours [standard deviation] in Oregon, Oct. 2014 – Sep. 2015

	24-hour definition[1]		6-hour definition[2]	
	ED visits (*n*)	BT [St. Dev.]	ED visits (*n*)	BT [St. Dev.]
	Panel A: All ED visits			
Average boarding time for ED visit	690,245	0.525 [12.3]	690,245	1.220 [15.1]
Psychiatric[3]	100,809	1.391 [16.6]	100,809	3.168 [20.3]
Severe[4]	15,394	3.831 [27.1]	15,394	9.187 [35.0]
Non-severe	85,415	0.952 [13.8]	85,415	2.266 [16.9]
Non-psychiatric	589,426	0.377 [11.4]	589,426	0.862 [13.9]
	Panel B: Boarded ED visits only			
Average boarding time for boarded ED visit	8,442	42.9 [103.0]	37,760	17.6 [54.8]
Psychiatric	3,504	40.0 [79.8]	14,676	18.2 [45.8]
Severe	1,399	42.2 [80.4]	3,753	27.0 [55.8]
Non-severe	2,105	38.6 [79.3]	10,923	15.2 [41.4]
Non-psychiatric	4,938	44.9 [116.7]	23,084	17.1 [59.8]

Notes. Boarding time is defined as total hours of a ED stay *less* six hours.
[1]ED boarding defined as staying in ED longer than 24 hours (AZHHA, 2015).
[2]ED boarding defined as staying in the ED longer than 6 hours (Nolan et al., 2015)
[3]Psychiatric visit defined as having ICD-9 diagnoses for mental illness and related injury, including: 290-319 (all mental illness); 648.4, V40.2, V40.3, V40.9, V67.3 (other miscellaneous mental disorders and problems); 331.0, 331.1, 331.2, 331.8, 797 (delirium, dementia and other cognitive limitations); V40.0, V40.1 (other developmental problems); E950-E959, V628 (suicide related); V62.8, V66.3, V67.3, V70.1, V70.2 V71.0, V79.0, V79.8, V79.9 (mental health exam and screening).
[4]Severe mental illness visit defined as having ICD-9 diagnoses for severe mental illness, including:295 (Schizophrenic Disorders), 296 (Episodic Mood Disorders), 297 (Delusional Disorders), 298 (Non-organic Psychoses)

As reported in Panel B, in the subset of boarded ED visits, the average boarding time for boarded ED visits was over 17 hours (total 23.6 hours of ED stay), based on the 6-hour definition. Boarded psychiatric ED visits on average had the boarding time of 18.2 hours (total 24.2 hours in ED), a one hour longer boarding time than boarded non-psychiatric ED visits. To put this into perspective, the total 24.2 hours of

Once boarded, average boarding time for psychiatric and non-psychiatric ED visits were 18 and 17 hours, respectively. It was 27 hours for boarded, severe psychiatric ED visits.

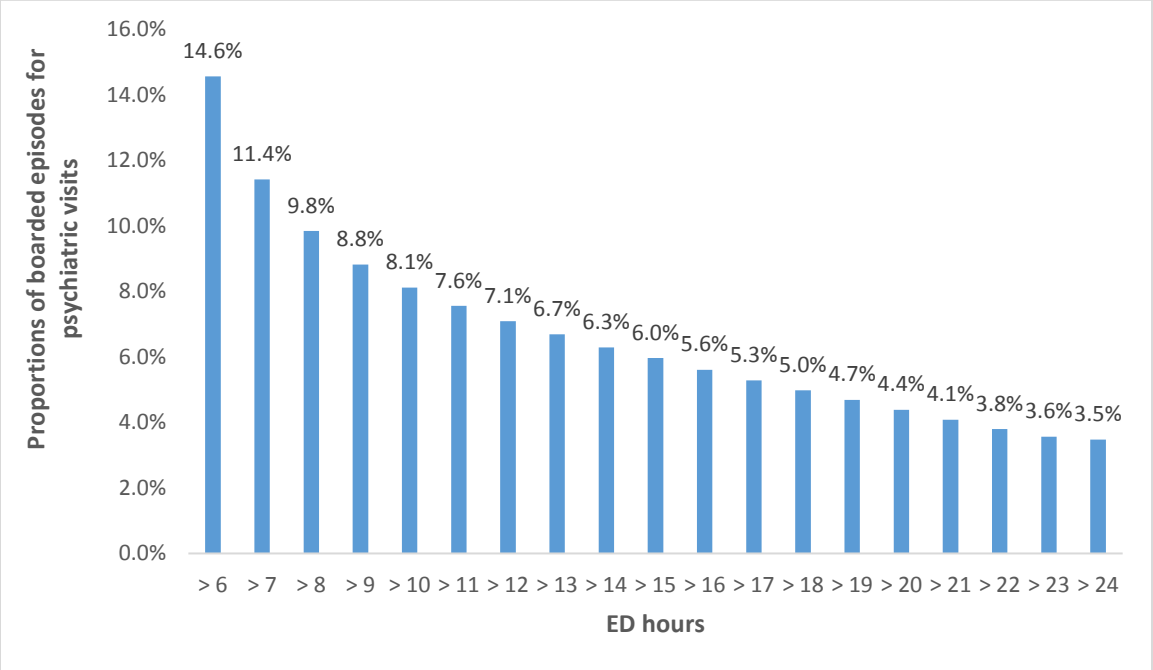
ED stay with psychiatric conditions were comparable to about 24 hours in Arizona (Arizona Hospital and Healthcare Association, 2015), longer than 10 hours in California (Stone et al., 2012), and shorter than 34 hours in Georgia (Bender et al., 2008). The average boarding time for boarded severe psychiatric visits was 27 hours (total 31 hours in ED), almost twice as large as 15.2 hours for boarded non-severe psychiatric visits.

The average boarding times reported in Panel B increased significantly when the 24-hour definition of ED boarding was used. This finding suggests that the overall magnitude of psychiatric ED boarding incidence in Oregon is driven largely by a subgroup of length ED visits.

3.3.3. Boarding incidences for different cutoffs for boarding definition

We have adopted two different definitions of ED boarding: The 6 and 24 hour definitions. The former uses longer than 6 hours of ED stay as the cutoff of boarding. Thus, it may define ED boarding somewhat generously although the definition has been adopted in prior national research (Nolan et al., 2015). In comparison, the 24-hour definition uses longer than one full day of ED stay to identify boarding episodes and therefore may define ED boarding narrowly. To gauge the sensitivity of the rate of psychiatric ED boarding over a range of cutoff points for boarding definition, we obtained the rate of psychiatric ED boarding for different cutoff hours, ranging from six to 24 hours.

Exhibit 3-8. The rate of psychiatric ED boarding[1] by different cutoffs for boarding definition in Oregon, Oct. 2014 – Sep. 2015



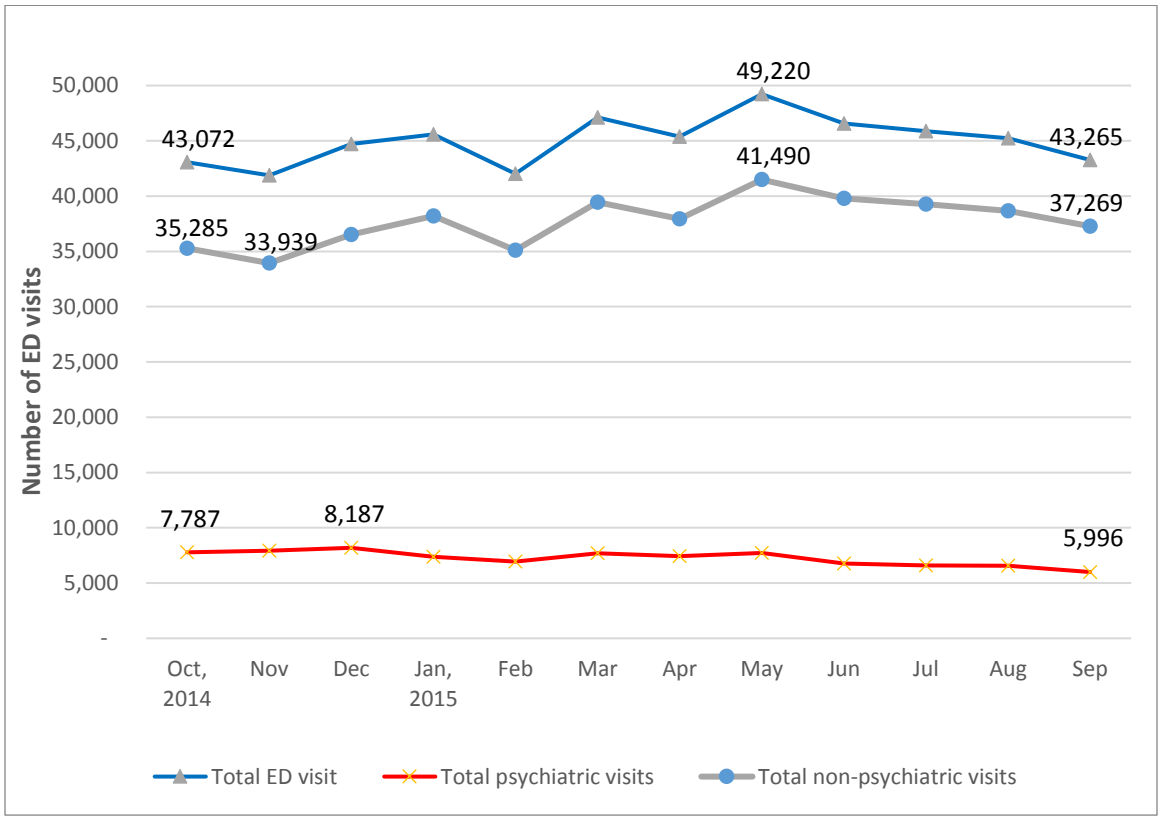
[1]The proportion of boarded ED visits in all psychiatric ED visits.

As shown above in < Exhibit 3-8>, the rate of psychiatric ED boarding decreases as the cutoff threshold for the boarding definition is raised . However, the boarding rate did not decreased monotonically. Relatively greater drops in the rate were found in the left-side of the cutoff hour range, implying that a significant portion of the psychiatric ED boarding problem could be addressed by reducing the length of ED time for patients who stay in EDs just above the 6-hour threshold.

3.4. Recent Trends in Psychiatric ED Boarding

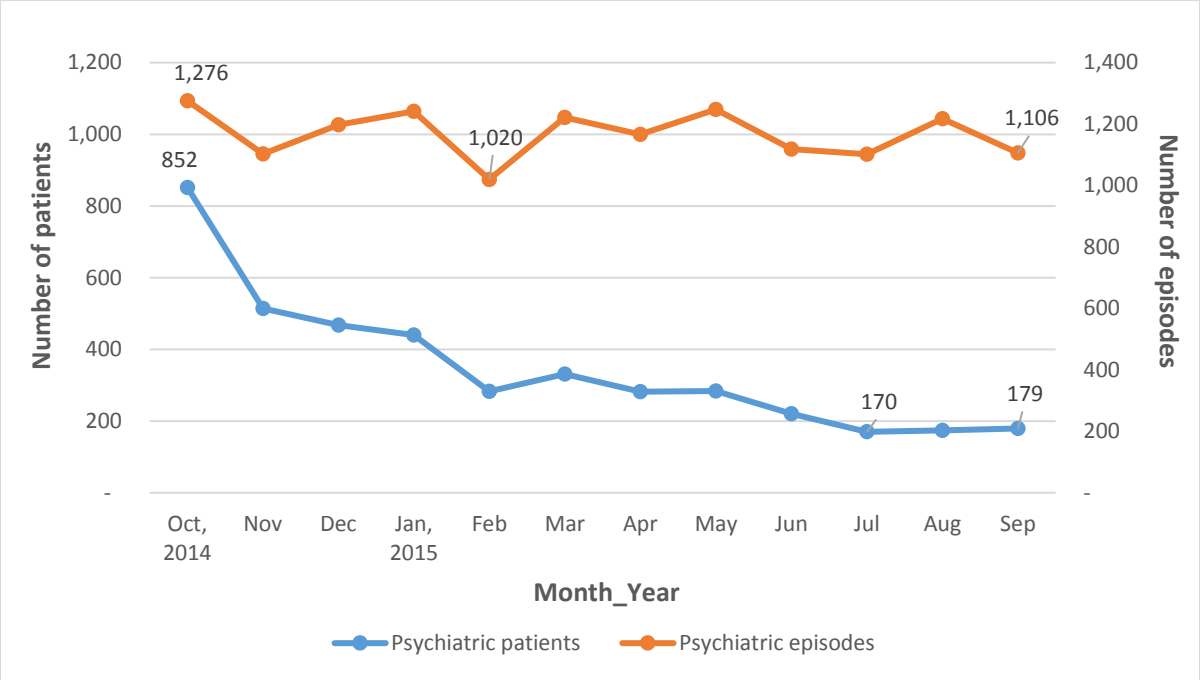
<Exhibit 3-9> shows the monthly trends in ED visits in Oregon, for total and also by the psychiatric visit status, from October 2014 to September 2015. The number of total ED visits in Oregon ranged from 41,874 to 43,072 per month. Total ED visits had an overall increase from October 2014 until it peaked in May 2015 with 49,220 visits. Then it decreased gradually. This trend was largely driven by the parallel trend in non-psychiatric ED visits. In comparison, the number of psychiatric ED visit had an overall decrease from 7,787 in October 2014 to 5,996 in September 2015.

Exhibit 3-9. Monthly trends in ED visits in Oregon, Oct. 2014 – Sep. 2015



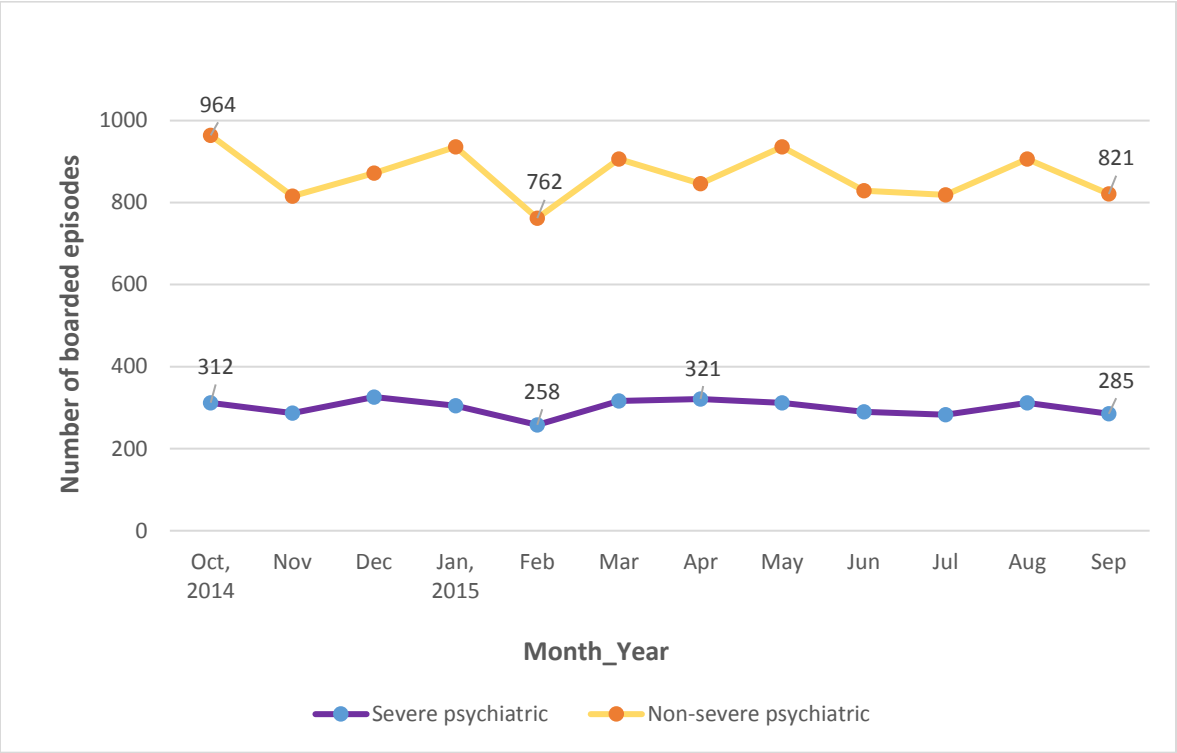
<Exhibit 3-10> presents monthly trends in unique psychiatric ED patients who were classified as boarded patients as well as unique psychiatric ED visits identified as boarding, based on the 6-hour definition of ED boarding. The number of unique psychiatric patients boarded in EDs steeply decreased from 852 patients in October, 2014 to 179 patients in September, 2015 with the lowest 170 patients in July, 2015. During the same period, boarded psychiatric ED episodes decreased relatively slightly from 1,276 to 1,106 ED visits. The trends together indicate that although the total number of boarded psychiatric patients decreased over the study period, the frequency of psychiatric ED boarding per patient in fact increased substantially, from 1.5 boarded psychiatric ED visits in October, 2014 to 6.3 boarded psychiatric ED visits in September, 2015.

Exhibit 3-10 Monthly trends in boarded psychiatric ED patients and boarded psychiatric ED visits in Oregon, Oct. 2014 – Sep. 2015 (6-hour definition)



As shown in <Exhibit 3-11>, the number of boarded non-severe psychiatric ED visits was usually three times greater than that for boarded severe psychiatric visits, based on the 6-hour boarding definition. The monthly number of boarded severe psychiatric ED episodes ranged from 258 to 312. The number of boarded non-severe psychiatric ED episodes were more fluctuating from month to month, ranging from 762 in February, 2015 to 964 boarded episodes in October, 2014. Nonetheless, the monthly trends in the numbers of psychiatric ED boarding episodes by the severity of mental illness did not show either increasing or decreasing pattern over time.

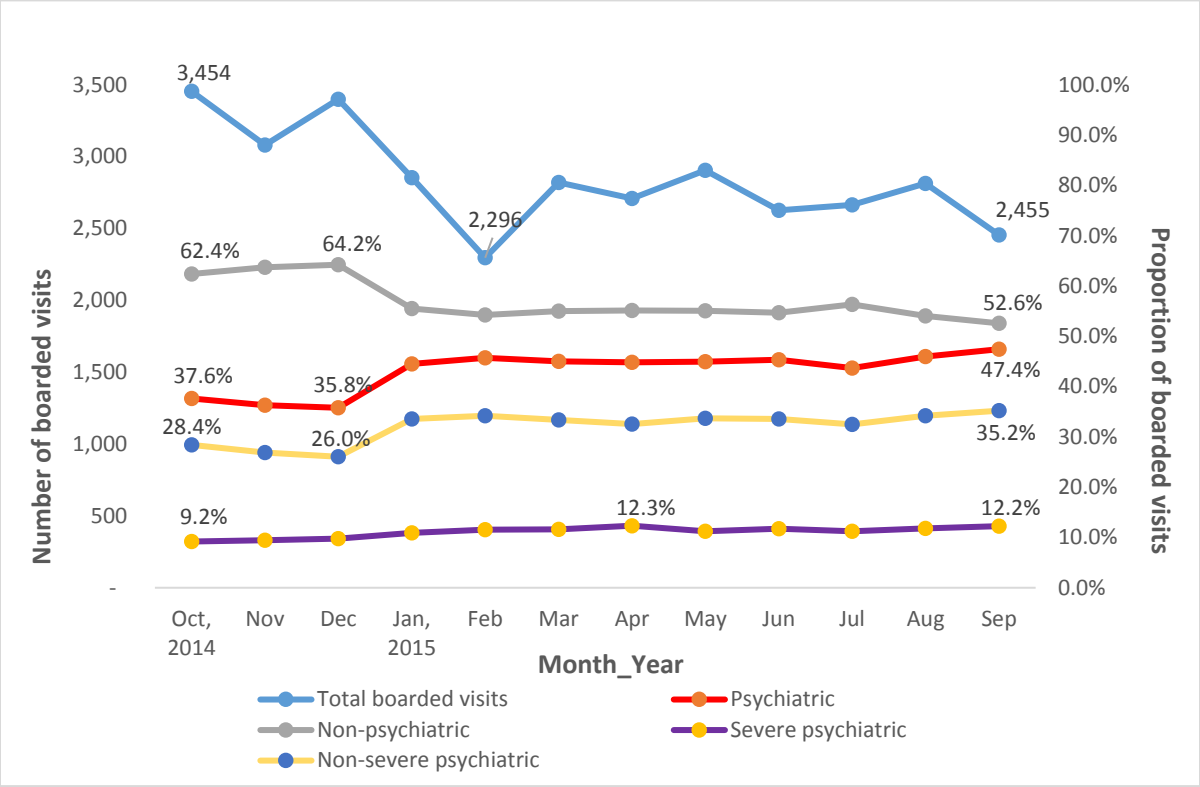
Exhibit 3-11. Monthly trends in boarded psychiatric ED visits in Oregon, Oct. 2014 – Sep. 2015: By severity of psychiatric conditions (6-hour definition)



<Exhibit 3-12> exhibits monthly trends in all boarded ED visits and the proportion of boarded ED visits by psychiatric visit status and severity of psychiatric conditions. Over the one-year period, the number of boarded ED visits decreased sharply from 3,454 to 2,455. The proportion of non-psychiatric ED boarding episodes in all boarded ED visits decreased overall from 62.4% to 52.6%–16% annual decrease. In contrast, the proportion of psychiatric visits in all boarded ED visits had an overall increase from 37.6% to 47.4%–26% increase over a year. The same trend was found for boarded non-severe-psychiatric visits which comprised 35.2% of all boarded episodes in September, 2015. The proportion of severe-psychiatric visits also shows an upward trend, increasing from 9.2% in October, 2014 to 12.2% in September, 2015. This increase represents 33% increase during the one-year period.

Despite the overall downward trend in the overall ED boarding rate, the portion of boarded psychiatric visits in all entire boarded ED visits increased.

Exhibit 3-12. Monthly trends in the proportions of boarded ED visits (6-hour definition) by psychiatric visit status and severity of psychiatric conditions in Oregon, Oct. 2014 – Sep. 2015



Taken together, results reported in <Exhibits 3-9, 3-10, 3-11, and 3-12> indicate that despite the overall downward trends in all psychiatric ED visits, boarded ED visits, and boarded psychiatric ED visits, the portion of boarded psychiatric episodes in the entire boarded ED visits in fact increased over time. This finding implies that while the overall boarding rate, both psychiatric and non-psychiatric, decreased over the sample period, the ED boarding problem had become more concentrated on psychiatric patients during the study period.

3.5. Comparison of Data from Independent Data Sources

This sections reports results from our analysis of data from each of the independent data sources, augmented with additional information available in the alternative data sources.

Unique ED visits

<Appendix B5> presents results on unique ED visits and boarding incidents in Oregon between October 2014 and September 2015, separately for the hospital discharge and EDIE data. ED utilization episodes were identified using ED admission date and hour information from the source data files. Results are reported for both 6-hour and 24-hour definitions of ED boarding. Data from the hospital ED discharge database revealed that during the one-year period, there

were total 564,151 unique ED utilization episodes. In comparison, the EDIE data captured 539,923 unique ED visits for the same study period, which is slightly less than the unique ED episodes captured in the hospital ED discharge database. Results from our analysis of each independent data sources were consistent with those from the combined dataset presented in the Chapter 3.3. See <Appendix B5> for details.

Unique ED Boarding Episodes Among Medicaid Patients

<Exhibit 3-13> presents ED visits and boarding rates only for Medicaid patients. Data from all three databases are reported so that we may gauge whether the hospital discharge and EDIE databases reliably capture psychiatric ED boarding episodes as compared to Medicaid claims data. As aforementioned, the Medicaid claims did not contain information on ED admission and discharge time. Therefore, to identify boarded ED visits, the raw Medicaid data were augmented with admission and discharge time data available in the EDIE and hospital discharge databases. Likewise, missing records of ED admission and discharge time in the hospital discharge database were filled with the data from the EDIE database, and vice versa.

Exhibit 3-13. Unique ED visits (proportions[1]) for Medicaid patients in Oregon, Oct. 2014 – Sep. 2015

	Medicaid Claims		EDIE		Hospital Discharge	
	24-hour definition	6-hour definition	24-hour definition	6-hour definition	24-hour definition	6-hour definition
Total ED visits	391,479	391,479	300,324	300,324	329,290	329,290
Psychiatric visits[2]	70,062 (17.9%)	70,062 (17.9%)	47,067 (15.7%)	47,067 (15.7%)	24,272 (7.4%)	24,272 (7.4%)
Boarded visits[3]	3,179 (0.8%)	18,328 (4.7%)	3,479 (1.2%)	18,295 (6.1%)	2,783 (0.9%)	17,083 (5.2%)
Psychiatric ED boarding[4]	1,900 (0.5%)	8,014 (2.1%)	1,828 (0.6%)	7,974 (2.7%)	1,434 (0.4%)	5,548 (1.7%)

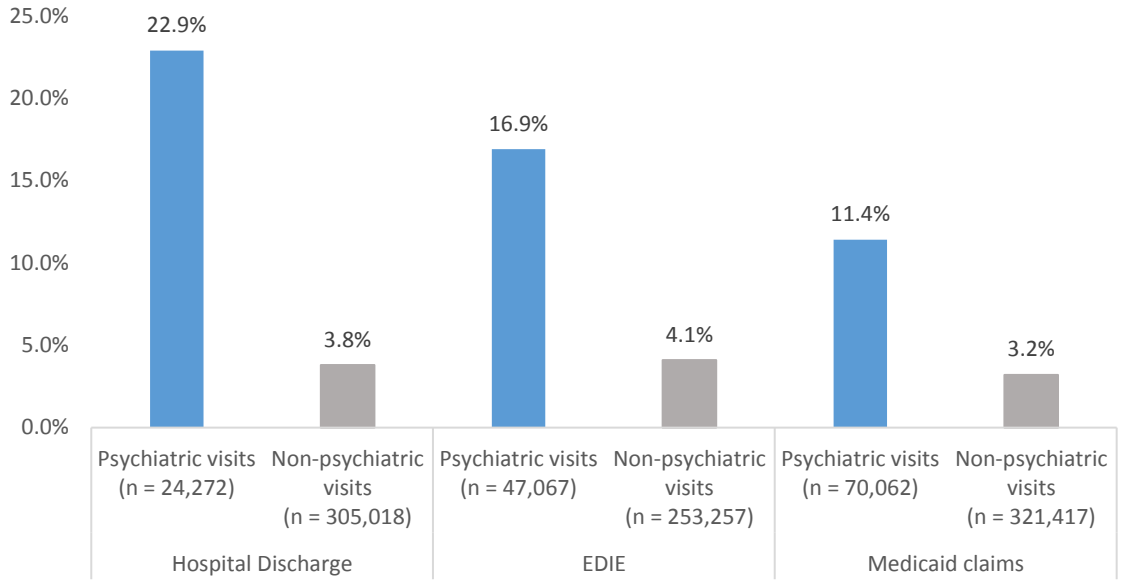
[1]The denominator is total ED visits.
[2]Psychiatric visit defined as having ICD-9 diagnoses for mental illness and related injury, including: 290-319 (all mental illness); 648.4, V40.2, V40.3, V40.9, V67.3 (other miscellaneous mental disorders and problems); 331.0, 331.1, 331.2, 331.8, 797 (delirium, dementia and other cognitive limitations); V40.0, V40.1 (other developmental problems); E950-E959, V628 (suicide related); V62.8, V66.3, V67.3, V70.1, V70.2 V71.0, V79.0, V79.8, V79.9 (mental health exam and screening).
[3]The 24-hour definition defines ED boarding as staying in ED longer than 24 hours (AZHHA, 2015). The 6-hour definition defines ED boarding as staying in ED longer than 6 hours (Nolan et al., 2015).
[4]Meet both definitions of psychiatric and ED boarding episodes.

The Medicaid claims data show that during the one-year period, there were a total of 391,479 unique ED episodes for Medicaid patients, as shown in <Exhibit 3-13>. 70,062 ED visits or approximately 18% of all ED visits by Medicaid patients were psychiatric visits. Based on the 6-hour definition, 18,328 visits were found to be boarded, either psychiatric or non-

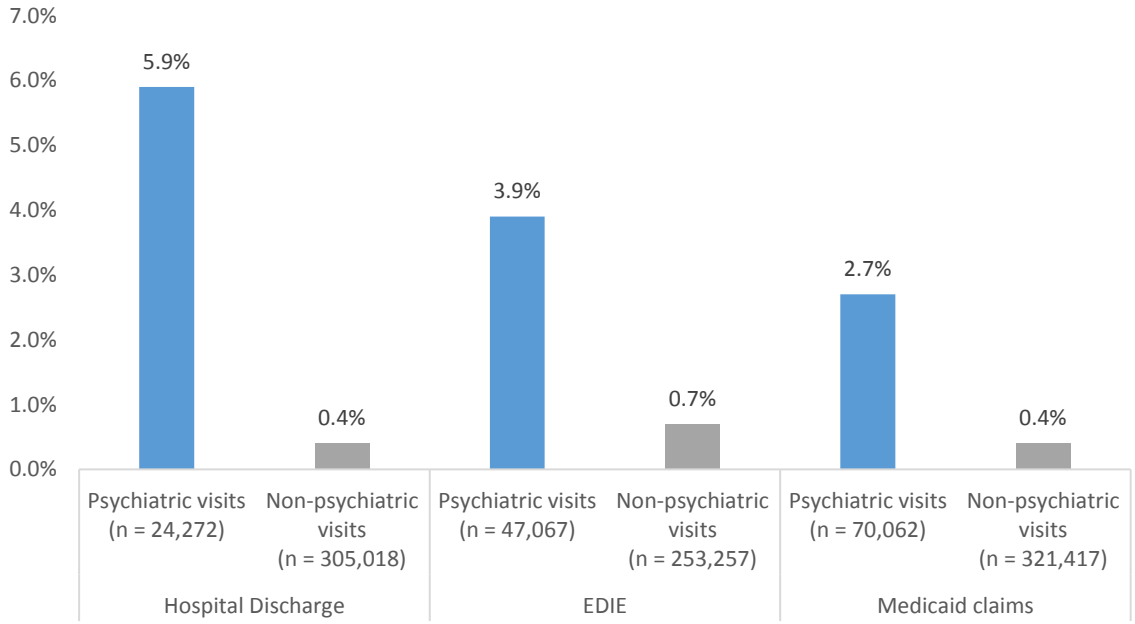
psychiatric, and 8,014 visits (2.1% of all ED visits for Medicaid patients) were classified as psychiatric ED boarding episodes. As shown in <Exhibit 3-14>, 11% of all psychiatric visits were identified as boarding episodes, nearly 4 times higher than that of non-psychiatric episodes.

Exhibit 3-14. Proportions of boarded episodes for psychiatric and non-psychiatric ED visits in Oregon, Oct. 2014 – Sep. 2015

Panel A: 6-hour definition



Panel B: 24-hour definition



The comparison of data from the three databases suggests that the EDIE database closely captures ED boarding episodes for Medicaid patients. Compared to the EDIE data which

included 300,324 unique ED episodes, the hospital discharge data captured total 329,290 unique hospital ED episodes for Medicaid patients, providing a count closer to the actual unique ED episodes in the Medicaid claims data, shown in <Exhibit 3-13>. However, the EDIE database better captured psychiatric and/or boarded episodes, based on either 24-hour or 6-hour definition. Based on the 6-hour definition, the EDIE data identified 7,974 unique ED visits which were boarded, psychiatric ED visits. The count of 7,974 is much closer to 8,014 boarded, psychiatric ED visits identified by the Medicaid claims, compared to 5,548 boarded, psychiatric ED visits captured by the hospital discharge data. <Exhibit 3-14> consistently shows that the EDIE data are closer to the Medicaid claims data than the hospital discharge data regarding the proportion of boarded episodes in psychiatric ED visits.

It is important to note that the rate of psychiatric ED boarding is considerably close between all ED visits and a subset of ED visits by Medicaid patients. For example, results reported in <Exhibits 3-2 and 3-13> indicate that 2.1% of all ED visits in Oregon captured in this report were psychiatric ED boarding cases and the same 2.1% of ED visits among Medicaid patients in Oregon were psychiatric ED boarding cases. Taken together, our results suggest that currently the EDIE data capture psychiatric ED boarding episodes somewhat more reliably than the hospital discharge data. This finding does not necessarily speak to the quality of the hospital discharge data but is rather likely to be an artifact that compared to the EDIE data, the hospital discharge data included less diagnoses codes available to OSU researchers and had more missing information on ED utilization time.

The Medicaid claims data show that based on the 6-hour definition of ED boarding, there were 2,190 severe-psychiatric ED boarding cases and 5,824 non-severe psychiatric ED boarding cases captured in our data, shown in <Exhibit 3-15>. Importantly, the severity of psychiatric conditions appears to increase the rate of ED boarding among Medicaid patients. For example, according to the Medicaid claims data, about 23% of all severe psychiatric visits were boarded, compared to less than 10% for non-severe psychiatric visits <Exhibit 3-16>. Again, the EDIE data better reflect the Medicaid claims data in terms of the rate of psychiatric ED boarding.

Exhibit 3-15. Unique ED visits (proportions[1]) for Medicaid patients in Oregon, Oct. 2014 – Sep. 2015: By severity of psychiatric conditions

	Medicaid Claims		EDIE		Hospital Discharge	
	24-hour definition	6-hour definition	24-hour definition	6-hour definition	24-hour definition	6-hour definition
Total psychiatric ED visits[2]	70,062	70,062	47,067	47,067	24,272	24,272
Severe episodes[3]	9,620 (13.7%)	9,620 (13.7%)	6,531 (13.9%)	6,531 (13.9%)	4,295 (17.7%)	4,295 (17.7%)
Boarded	838 (1.2%)	2,190 (3.1%)	815 (1.7%)	2,095 (4.5%)	676 (2.8%)	1,603 (6.65)
Non-severe episodes	60,442 (86.3%)	60,442 (86.3%)	40,536 (86.1%)	40,536 (86.1%)	19,977 (82.3%)	19,977 (82.3%)
Boarded	1,062 (1.5%)	5,824 (8.3%)	1,013 (2.2%)	5,879 (12.5%)	758 (3.1%)	3,945 (16.3%)

[1]The denominator is total psychiatric ED visits.

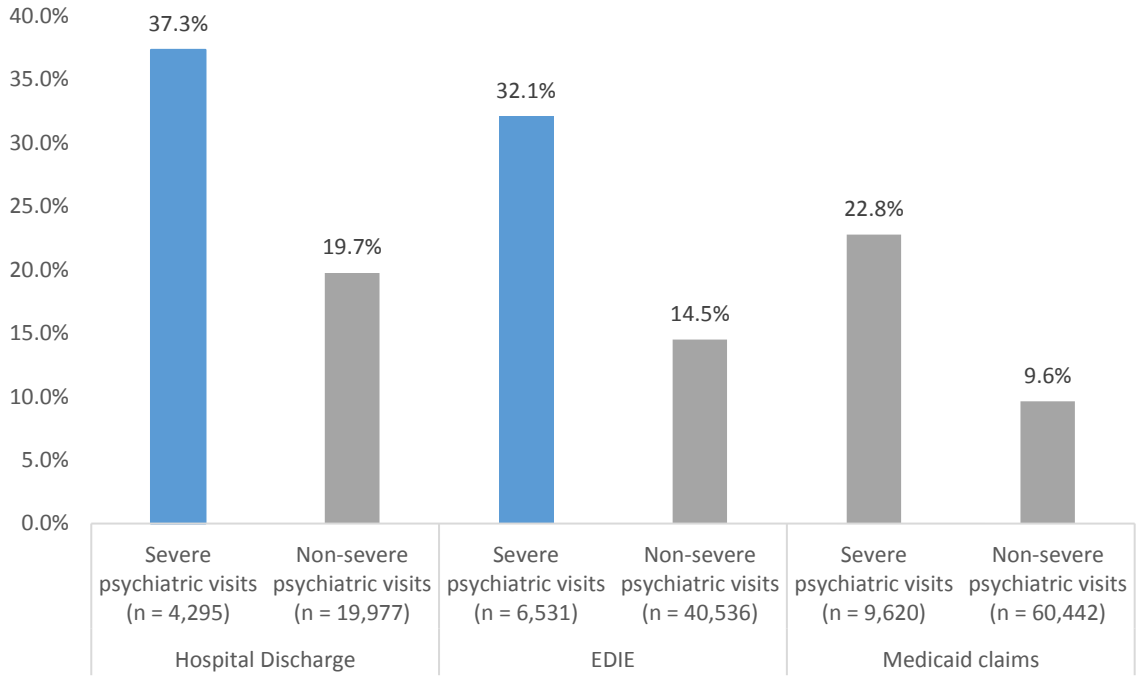
[2]Psychiatric visit defined as having ICD-9 diagnoses for mental illness and related injury, including: 290-319 (all mental illness); 648.4, V40.2, V40.3, V40.9, V67.3 (other miscellaneous mental disorders and problems); 331.0, 331.1, 331.2, 331.8, 797 (delirium, dementia and other cognitive limitations); V40.0, V40.1 (other developmental problems); E950-E959, V628 (suicide related); V62.8, V66.3, V67.3, V70.1, V70.2 V71.0, V79.0, V79.8, V79.9 (mental health exam and screening).

[3]Severe mental illness visit defined as having ICD-9 diagnoses for severe mental illness, including:295 (Schizophrenic Disorders), 296 (Episodic Mood Disorders), 297 (Delusional Disorders), 298 (Non-organic Psychoses)

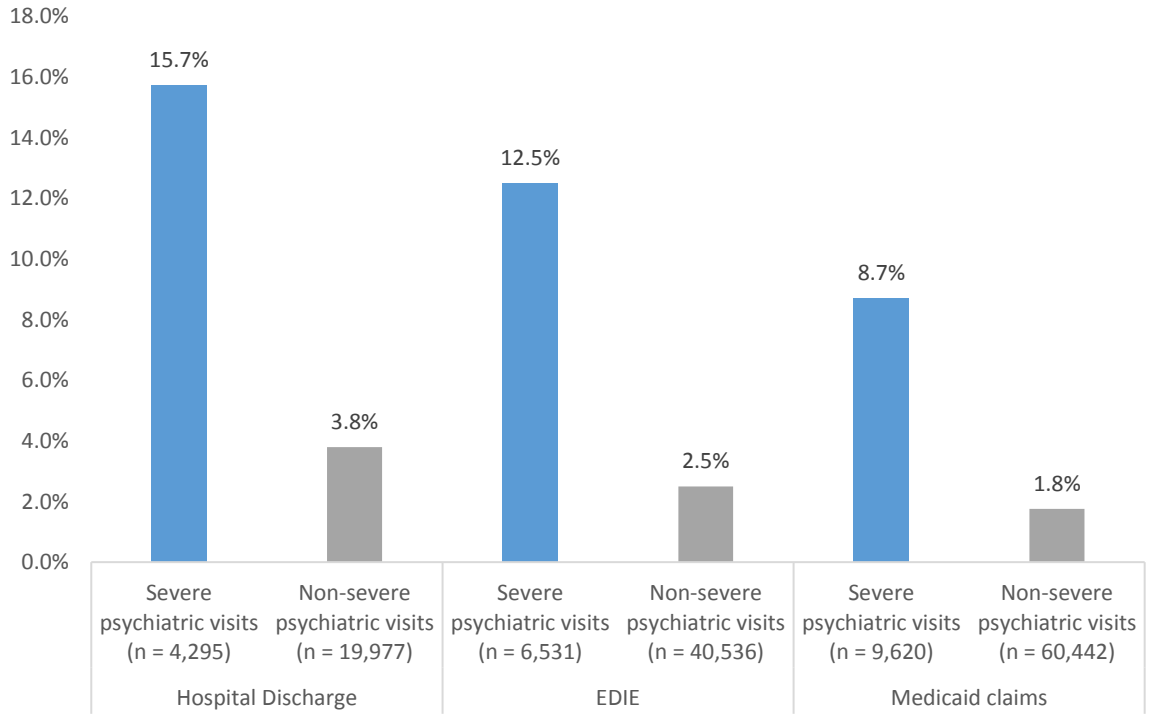
[4]The 24-hour definition defines ED boarding defined as staying in ED longer than 24 hours (AZHHA, 2015). The 6-hour definition defines ED boarding as staying in ED longer than 6 hours (Nolan et al., 2015).

Exhibit 3-16. Proportions of boarded episodes for severe and non-severe psychiatric ED visits for Medicaid patients in Oregon, Oct. 2014 – Sep. 2015

Panel A: 6-hour definition



Panel B: 24-hour definition



Unique ED Patients

We also report results from the unique patient-level data, rather than the unique episode-level data. <Appendix B6> support the results from the episode-level analysis presented above and in <Appendix B5>. Results are only slightly different between the patient-level and episode-level analysis. For example, based on the 6-hour boarding definition, the episode-level EDIE data show that approximately 16% of psychiatric ED episodes were boarding episodes during the one-year study period, compared to the corresponding 14.5% for the person-level EDIE data.

3.6. Costs of Psychiatric ED Boarding

We estimated the cost of ED visits based on payments to EDs and physicians by the Oregon Health Plan (Medicaid); this estimate is conservative to the extent that Medicare or commercial insurers reimburse EDs and physicians at higher rates than Medicaid. <Exhibit 3-17> presents mean and median ED cost per visit. The average cost of boarded ED episodes was $997 per visit, which is $605 greater than the average of $392 for all non-boarded ED episodes. For non-boarded patients, psychiatric visits cost about $30 more than non-psychiatric visits. Interestingly, severe-psychiatric ED visits, either boarded or not boarded, were slightly less costly than non-severe psychiatric ED visits. For all cost estimates the median average cost per ED episode is significantly less than the mean, suggesting that a small proportion of very cost visits skews our data to the right.

Boarded psychiatric ED visits cost $277 more, on average, than non-boarded psychiatric visits.

Our estimates are somewhat smaller than the national average of ED boarding expenditures reported in the literature. For example, nationally the average cost of boarded ED episodes ranged from $2000 to $4000 (Nicks and Manthey, 2012; Claudius et al., 2014). Nonetheless, our estimates of the overall mean and median cost of an ED visit are similar to recent national estimates. In 2013, the national mean of annual ED costs per person was $547.[11]

[11] $311 ($176) for physician services and $236 ($108) for facility use. National ED cost data were retrieved from the 2013 Medical Expenditure Panel Survey (MEPS) maintained by the Agency for Healthcare Research and Quality.

Exhibit 3-17. Per-visit costs of ED utilization, Oct. 2014 – Sep. 2015

	All visits	Boarded[1]					Not boarded				
		All	Psychiatric[2]			Non-psychiatric	All	Psychiatric			
			All	Severe[3]	Non-severe			All	Severe	Non-severe	Non-psychiatric
Mean	$424	$997	$695	$639	$713	$1,196	$392	$418	$395	$420	$388
(Median)	($125)	($174)	($171)	($171)	($171)	($180)	($124)	($125)	($122)	($124)	($122)
[St. Dev.]	[$849]	[$1,624]	[$1,115]	[$939]	[$1,167]	[$1,857]	[$771]	[$797]	[$836]	[$791]	[$797]

Notes: For Medicaid claims data, ED costs came from Medicaid payment to providers. For hospital ED discharge data, total charges were converted to estimated provider payment using payment to charge ratio from Medicaid claims data. ED boarding is based on the 6-hour definition.

[1]ED boarding defined as staying in ED longer than 6 hours (Nolan et al., 2015).

[2]Psychiatric visit defined as having ICD-9 diagnoses for mental illness and related injury, including: 290-319 (all mental illness); 648.4, V40.2, V40.3, V40.9, V67.3 (other miscellaneous mental disorders and problems); 331.0, 331.1, 331.2, 331.8, 797 (delirium, dementia and other cognitive limitations); V40.0, V40.1 (other developmental problems); E950-E959, V628 (suicide related); V62.8, V66.3, V67.3, V70.1, V70.2 V71.0, V79.0, V79.8, V79.9 (mental health exam and screening).

[3]Severe mental illness visit defined as having ICD-9 diagnoses for severe mental illness, including:295 (Schizophrenic Disorders), 296 (Episodic Mood Disorders), 297 (Delusional Disorders), 298 (Non-organic Psychoses)

Chapter 4. Qualitative Analysis of Stakeholder Interviews

This section describes results from interviews of various stakeholders regarding the causes and impacts of psychiatric ED boarding in Oregon as well as solutions to the boarding problem. Interview methods and characteristics of the sample of stakeholders are described in <Appendix C1>.

4.1. Causes of Psychiatric ED Boarding

Overview

Stakeholder interviews identified several broad causes of psychiatric boarding in hospital EDs in Oregon as following. Below we summarize the interview findings that describe how these conditions lead to psychiatric ED visits, and why some of these patients are then boarded in hospital EDs.

Underlying Behavioral Health Conditions. Respondents reported that psychiatric emergencies arise from a variety of underlying behavioral health conditions. Among individuals with severe and persistent mental illness (SPMI), schizophrenia and bipolar disorder were viewed as top causes of boarding. Respondents also noted that patients with acute anxiety or depression boarded, especially if they were potentially suicidal. Among children and adolescents, adverse childhood experiences were viewed as intimately linked with young people experiencing mental health crises and ultimately boarding in the ED.

Most respondents also identified substance abuse as a reason patients boarded. Intoxicated patients have to be held until sober in order to identify whether the substance is causing the mental health symptoms or if the mental health symptoms persist after the patient is no longer intoxicated. Respondents noted that this sobering period often increased the length of boarding.

Outpatient Treatment Capacity. Respondents argued that many psychiatric emergencies could be prevented, if a person has access to ongoing outpatient treatment. However, respondents reported a lack of outpatient treatment capacity or inadequate access in most communities, which can lead to an escalation of symptoms and a psychiatric emergency.

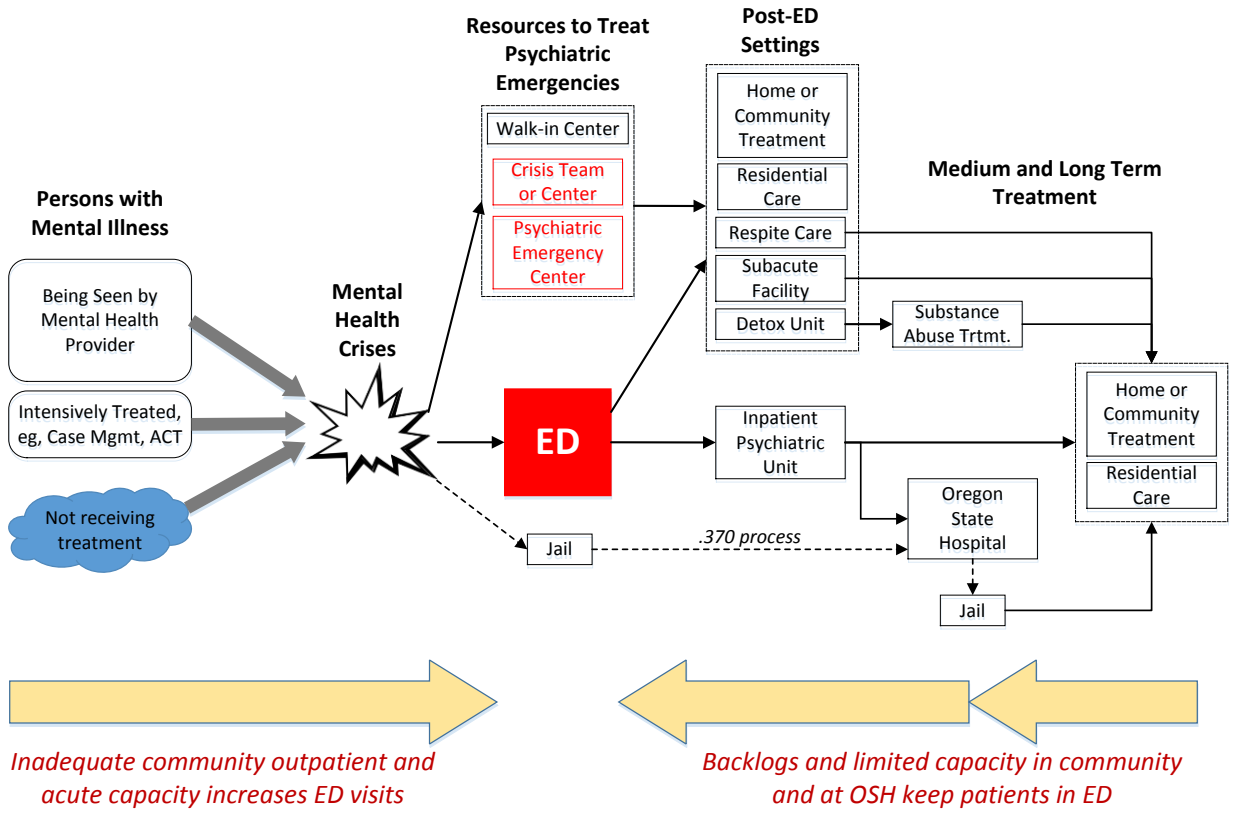
Urgent and Emergency Treatment Availability. Respondents felt that not all psychiatric emergencies required treatment in the ED, but few alternative response or treatment options are available. Without an ED alternative, patients with psychiatric emergencies board in the ED waiting for evaluation, and treatment is often suboptimal given a lack of trained mental health professionals in the ED.

Challenges to Community Discharge. Most ED patients with psychiatric emergencies can be discharged to home or other community settings, but ED discharge may be delayed—for example, due to unavailability of skilled personnel to determine which post-discharge setting is required, limited community program capacity, or reimbursement restrictions—and cause a patient to be boarded in the ED.

Inpatient and Sub-Acute Capacity. ED patients with the most severe psychiatric emergencies need inpatient or sub-acute care. However, respondents reported that inpatient, sub-acute, and OSH beds are often unavailable. Thus, patients waiting for a bed often board in the ED.

Exhibit 4-1 depicts these major causes by showing different potential paths of individuals whose mental illness requires urgent or emergency treatment. Each of the four broad causes of psychiatric boarding identified by interviewees is described in more detail below.

Exhibit 4-1. Causes of psychiatric boarding in Oregon



Outpatient Treatment Capacity and Preventable Psychiatric Emergencies

Wait Times. Many persons with mental illness reach a psychiatric crisis point—an emergency—that could have been avoided with adequate and timely access to outpatient treatment. However, respondents noted that wait times to see a behavioral health provider are so long that some people reach a crisis before they can be seen. Wait times for psychiatrists, often several months long, are particularly problematic. This happens even if a person has health insurance. Although the 2014 expansion of the Oregon Health Plan (OHP) has reduced the number of uninsured people, the capacity of behavioral health providers has not been able to expand fast enough to meet the rising demand. When asked about the ability of telemedicine to address this wait, respondents generally felt this was not a cost-efficient way to address the shortage of psychiatrists, due to issues like high no-show rates and the need to preschedule blocks of a remote psychiatrist's time.

Program Capacity. For the SPMI population, respondents noted that community outpatient treatment programs, such as ACT teams or intensive case management, can reduce psychiatric emergencies. However, in many communities these programs do not have adequate capacity or fidelity. Although the ideal treatment capacity can be estimated based on available estimates of a local community's population with SPMI, building that capacity requires both sustained funding and an available workforce of skilled behavioral health clinicians and staff.

Housing. Respondents also described how the limited availability of stable housing exacerbates the challenges of providing effective outpatient treatment. In the Portland area specifically, respondents noted that low housing vacancy rates have increased homelessness among persons with mental illness. More broadly, in almost all Oregon counties, residential care facilities for adults were perceived to have inadequate capacity. Similar capacity issues were identified for the child and adolescent population, especially for those suffering from severe adverse childhood events. A large number of residential child and adolescent beds were closed in 2015 further reducing the supply of housing options for this population.

Limited or Underutilized Alternatives to Hospital EDs

Although many psychiatric emergencies can be managed more appropriately in settings other than the hospital ED, these alternative options may not be accessible in some counties, or may not be utilized as often as they should be. Respondents discussed three ED alternatives and the current barriers to use: walk-in behavioral health centers, crisis response programs, and a dedicated psychiatric emergency center.

Walk-in Behavioral Health Centers. When asked about behavioral health services available in their community, many respondents identified walk-in behavioral health centers. Respondents described how patients could receive immediate assessment and response by trained staff. However, not all counties have them and most are not open evenings or weekends, limiting the number of mental health patients who can be served.

Crisis Response Programs. Respondents also spoke of the usefulness of crisis response programs. Crisis response programs can allow persons experiencing psychiatric emergencies to be treated at home or diverted to a community setting other than the ED. Respondents felt that telephone, physical, or mobile crisis response programs should be available 24 hours a day, 7 days a week for maximum benefit, but reported that keeping these programs funded and fully staffed is a challenge.

Crisis centers, or even crisis call-in lines, are specifically designed and staffed to address psychiatric emergencies. All counties have crisis call-in lines, but not all counties have crisis centers. Similarly, mobile crisis teams can go to a patient's home or other locations where a psychiatric emergency is occurring allowing the patient to be treated on-site or diverted to a treatment setting other than the ED. These units are now available statewide, although with limited geographic coverage in some counties. A major challenge for communities with these programs is the need for strong collaboration between behavioral health, law enforcement, and EMS professionals. However, each of these professions has a unique culture and approach to addressing psychiatric emergencies. Effective collaboration therefore requires training, experience working together, and support from local mental health program, police/sheriff, and EMS leaders.

Dedicated Psychiatric Emergency Centers. Many respondents also explained how dedicated psychiatric emergency centers are the ideal setting for managing most psychiatric emergencies, but that there are currently none in Oregon. The Unity Center will open soon in Portland, but will be the only one until other hospitals also open such centers. And the need for psychiatric emergency centers is not limited to the Portland metro area.

***Awareness*.** Unfortunately, even when alternatives to ED care for psychiatric emergencies are available in a community, respondents reported that persons with mental illness, their families, behavioral health and addiction providers, or law enforcement officers may not be aware of them. During our interviews, we asked respondents about the mental health services available in their communities. A number of respondents were unfamiliar with the variety of services available, which supports the respondents' claims.

Challenges in Discharging Psychiatric ED Patients to Community Settings

Respondents felt that approximately 3 out of 4 people who present to an ED with a psychiatric emergency can be safely discharged to home or community destinations. Even though many persons with relatively severe psychiatric emergencies need not receive inpatient care, they are often not discharged to those more appropriate settings for several reasons.

Capacity. Depending on their individual needs, patients can be discharged to a wide range of settings, including: residential care; transitional housing or a shelter with "wraparound" behavioral health treatments; respite care (eg. hotel room with professional or peer attendant); or supported home care. Despite the recognition of the utility of such settings, respondents stated that these ED alternatives are not available in all counties. Additionally, respondents commented that many existing programs have inadequate capacity to accept suitable patients from the ED, for a number of reasons. First, these programs are organizationally complex to set up. For example, a residential facility may be operated by one organization, but have behavioral health treatment provided by another organization. Another challenge is finding an adequate number of trained staff to allow for the continued operation of existing programs; this challenge is especially great in rural areas, where skilled personnel may not be available and the number of patients in a given community may be relatively small. Limited state and county funding is a further barrier to the availability of these programs.

Health Insurance. Respondents discussed a variety of health insurance reimbursement issues as barriers to the utilization of alternative psychiatric treatment settings. For instance, CCOs may reimburse respite care, but not residential care. Some respondents felt that residential care may now be less well connected to other services than when counties managed the entire continuum, but perspectives on this issue vary. Additionally, Medicare and commercial payers have very restrictive reimbursement for such services. For example, private insurance often does not cover community mental health services such as home care. Medicare covers mental health care provided by a physician, LCSW, or PhD, but not by an ACT team. And not all psychiatrists accept Medicare. Thus, the types of ED alternatives available vary based on a person's insurance status.

Weekend Admissions. Another barrier to the utilization of ED alternatives noted by respondents were admission hour restrictions. Many community programs are not staffed to assess or accept new patients on weekends. Combined with the fact that patients on a "hold" may wait up

to 72 hours to be evaluated by county mental health staff, patients may end up boarding in the ED, even when an appropriate, alternative mental health treatment center is accessible to them.

Coordination with EDs. A further concern voiced by respondents regarding the underuse of ED alternatives, is that EDs may not be well coordinated with these community destinations. Respondents identified several reasons for poor coordination. First, ED physicians and staff may lack knowledge about the available settings or the expertise to assess how a particular patient matches to potential settings (in clinical and reimbursement terms). Even with appropriate knowledge, a number of ED staff interviewed noted that they lacked adequate time to call multiple settings to find an available opening. Because few EDs have psychiatric social workers or other non-psychiatrist mental health staff, there are limited personnel to perform these tasks either on site or on call.

Several respondents felt that ED staff generally had inadequate training in the diagnosis and treatment of psychiatric emergencies. The ED staff we interviewed largely agreed with this sentiment, and also noted concerns about lawsuits as a driving force for inpatient versus outpatient discharge destinations.

Additionally, ED staff may be more comfortable discharging patients to an inpatient unit rather than a community setting. Some ED staff noted discomfort with discharging a patient to their home or a community setting, even when they did not need inpatient treatment, because the patient would be unable to access needed services in the community, could experience an exacerbation of symptoms, and would likely return to the ED in a worse condition. And unlike discharging to a community setting, discharging a mental health patient to inpatient care matches standard approaches to treating physical illness, for which EDs are optimized. Nevertheless, paper documentation to request inpatient psychiatric admission is less efficient than for admission to other inpatient units.

Furthermore, respondents felt that for many ED staff, placing a patient on a mental health hold may appear to be a conservative choice. In particular, ED staff noted they are conservative with respect to discharging patients who are homeless or may be suicidal. Oregon's commitment law requires two persons to sign a hold; one of them may be a qualified mental health practitioner rather than a physician, but the law does not require community mental health staff to be part of discharge planning.

Comorbidities. Even when respondents knew of alternative treatment settings and desired to connect their patients with such facilities, respondents noted that certain patients were particularly difficult to place. In particular, respondents stated that there were insufficient facilities and a lack of willingness of the part of existing facilities to accommodate patients with disruptive or violent behavior, severe substance abuse, dementia, and developmental disabilities.

Legal Constraints. For some respondents, the lack of a version of "Kendra's Law" in Oregon was seen as an impediment to the use of alternative treatment programs. Such laws, which are stronger than Oregon's current outpatient commitment law, can compel psychiatric patients who are a risk to themselves or others to enter and remain in Assisted Outpatient Treatment. Without this type of law, some respondents felt that discharging patients to alternative treatment settings would provide little benefit and that the patient would return to the ED for further treatment.

Taken together, respondents overwhelmingly believed that the lack of alternative community treatment options and underutilization of existing services contribute to ED boarding.

Inadequate Capacity in Inpatient, Detoxification, and Sub-Acute Facilities

ED patients with the most severe psychiatric emergencies must be discharged to a facility with 24/7 supervision and intensive treatment capabilities.

Inpatient Psychiatric Units. An inpatient psychiatric bed is the most common choice, but they are usually full, for a variety of reasons. In the worst case, this may mean that a psychiatric patient could board for days in the ED. Notably, respondents reported that patients are more likely to board in EDs whose hospitals do not have their own psychiatric inpatient units.

The main reason respondents identified for the lack of inpatient psychiatric beds related to OSH capacity. Many patients in psychiatric inpatient units are awaiting transfer to the OSH, which has a waiting list for admission. Although the OSH had reduced that waiting list by streamlining the assessment process for patients seeking admission, the waiting list has again grown. Respondents noted that a major reason for the increasingly long wait for OSH admission is that civil commitment beds at the OSH are being occupied by the "370" population, who have been arrested, but are unable to "aid and assist" in their own defense. One interviewee estimated that among the "370" population, approximately 40% were arrested for misdemeanors and could safely be treated in the community. Another reason respondents identified for the backlog of patients waiting for OSH admission in inpatient units is that community programs (described above) lack capacity to accept patients who are ready for discharge from OSH. They noted that without adequate community programs, OSH patients cannot be discharged.

Respondents also noted that the process for transferring patients from inpatient units to the OSH is slow. According to respondents, a patient must be a psychiatric inpatient for at least 14 days before the referral process to the OSH can start. That period of inpatient care is intended to assess whether patients can improve enough, so that they can be discharged elsewhere. For those who don't improve sufficiently, OSH staff must then assess whether the patient meets OSH admission criteria. If the patient meets admission criteria, then the patient can be placed on the OSH wait list. Until this time, the patient is "waiting for the wait list".

Detoxification treatment. The lack of alternative treatment facilities was another cause of boarding identified by respondents. Many psychiatric patients have co-occurring substance abuse conditions that would benefit from treatment in a detox facility. However, a lack of detox beds, especially in rural communities, means that patients often detox in the ED.

Sub-acute facilities. Respondents also discussed the limited availability of sub-acute facilities, that is, non-hospital units that provide 24/7 mental health treatment. Many respondents felt that such facilities are the best discharge destination for many psychiatric ED patients. However, there are very few such facilities in Oregon, especially in the urban areas where most psychiatric emergencies occur. For example, Portland has 3 subacute facilities with combined capacity of fewer than 40 beds. Additionally, even when sub-acute facilities exist, Medicare and commercial insurers have limited or no reimbursement for sub-acute care. This further limits access for many patients.

4.2. Impacts

There were no perceived benefits to psychiatric boarding for patients, ED staff, or ED operations. For all parties involved, boarding was viewed as stressful and frustrating.

Patients

For patients, boarding is stressful. ED staff communicate infrequently with the patient. Patients rarely receive any psychiatric care while boarding, and are left waiting without an understanding of what is being done for them.

Further, boarding is stressful for patients because the environment is chaotic and stimulating, which is not helpful to a person experiencing a psychiatric emergency. For patients boarded in safe hold rooms, the experience is similar to solitary confinement. The patient experiences very limited human interaction. Again, this is not perceived as helpful to a person experience a psychiatric emergency.

Respondents viewed boarding as a form of re-traumatization, which can exacerbate mental health problems, and may lead to the need for hospitalization.

Caregivers

Although respondents felt that boarding might be a form of respite for caregivers, they also expressed how defeating boarding can be. A caregiver might bring someone to the ED for care, but after a period of boarding the ED determines there is no way to fix the problem and sends the patient home.

ED Staff

Respondents described boarding as stressful for ED staff. ED staff lack training in the treatment of psychiatric patients and are often unable to find a proper placement for a person. This can cause ED staff to feel bad because they cannot help the person and simultaneously frustrated that the person remains in the ED.

Respondents expressed that disruptive behaviors, including yelling, can also be stressful for ED staff. If boarded patients exhibit disruptive behavior over long periods of time it can make it difficult for ED staff to do their jobs and reduce their job satisfaction.

ED Operations

For the hospital, boarding is a money loser and reduces the number of patients that may be seen by the ED staff. Mental health patients who board are occupying ED beds for a lengthier time period than other ED patients. A slower rate of bed turnover reduces the number of available beds to treat other ED patients.

Boarding further reduces the ED's ability to serve other patients because mental health patients often require intensive nursing. If nurses are caring for psychiatric patients, then they are not able to take care of the other patients with medical problems who are presenting to the ED.

Boarding thus may increase staffing needs for the ED without added reimbursement. In the worst case, the combination of slower bed turnover and increased nursing demands lead to backed up waiting rooms and may lead to ambulance diversion.

4.3. Solutions to ED Boarding in Oregon

Nearly all respondents stated that they did not believe an increase in inpatient beds alone would solve the boarding problem. Instead, respondents felt the focus needed to be on preventing mental health crises and better managing patient needs in alternative settings. The main themes that arose from the interviews for solutions to ED boarding are presented below.

Expand Community Services

Respondents overwhelmingly agreed that Oregon needs to expand community mental health services. Investing in community services was seen as a means both to prevent mental health emergencies and to allow people to transition out of inpatient or OSH care. Respondents recommended expanding the mental health workforce and increasing their presence in primary care offices. For areas of the state lacking a psychiatrist, respondents suggested the use of telemedicine to provide access to prescription drug care. With a greater availability of a variety of mental health providers in more accessible settings, respondents felt fewer people would reach the level of a mental health crisis, thereby reducing ED use. Additionally, the greater availability of providers would allow more robust support for patients leaving inpatient and OSH care. In turn, the higher level of support could prevent these individuals from seeking care at the ED.

For patients in crisis, respondents discussed the importance of increasing investment in mobile crisis units; the Legislature has recently authorized funding to expand these services. Respondents noted the ability of crisis teams to de-escalate mental health crises and connect patients with appropriate levels of mental health services. Additionally, respondents spoke of the need for lower acuity alternatives to the ED, including crisis resolution centers and crisis respite beds. Together respondents perceived that this collection of services would reduce the need for seeking emergency psychiatric services in the ED.

Modify the Handling of the .370 Population

Respondents perceived that the growing .370 population is occupying a substantial number of civil hold beds at the Oregon State Hospital. When OSH beds are full, patients remain in inpatient units, reducing the availability of inpatient beds for emergency patients and ultimately causing ED boarding. To address this backlog of patients, respondents suggested using alternatives to the State Hospital for the .370 population. Respondents advised that Oregon should increase the availability of aid-and-assist programs in the community to reduce the need for the State Hospital. In the case of misdemeanors, they felt communities should discourage arrests and provide alternative mental health service options.

Some efforts to address this problem are underway. HB 2420 requires courts to check whether community mental health services are available before sending a suspect to the State Hospital. In addition, several counties (including the handful of counties that account for the majority of .370 admissions) have received a total of $4 million to promote community restoration

programs as alternatives to the State Hospital. For example, in Marion County a .370 case manager works with clients in the jail offering brief case management and weekly classes on legal skills to restore people to mental fitness without having to be hospitalized. From 2011 to 2015, Marion County saw a decline in the number of people in the .370 population entering the OSH. Multnomah County has also initiated programs to address the .370 population. These programs include in-reach into jails for those with mental health problems and the creation of a 16-bed stabilization facility to connect people to resources and to smooth their transition from the jail or hospital to the community.

Change the Service Delivery Environment in the ED

Boarding will not cease to be a problem overnight. In the short term, respondents advise adopting practice improvements in the ED to improve patient care. Many of the suggested practice improvements are used in psychiatric emergency service centers around the country and have been recommended by national emergency medicine and psychiatric associations (e.g. ACEP, 2014). Respondents advised that psychiatric evaluations need to be more readily available in the ED to capture patients' needs in a timely fashion and to more appropriately provide care. Similarly, respondents suggested that ED staff utilize patient medical record tools, including Pre-Manage and EDIE to provide more personalized care to mental health patients.

Two other interventions were cited as mechanisms to reduce the trauma mental health patients experience in the ED. A primary recommendation was to create a dedicated area in the ED for psychiatric care. Many ED staff reported that psychiatric patients are usually boarded in isolated rooms with little contact with staff and few sources of distraction. Although ED staff generally felt that patients and staff were safe given these arrangements, they generally did not perceive these rooms were conducive to positive mental health outcomes. An alternative space away from the chaos of incoming trauma patients where psychiatric patients could readily interact with ED staff and watch television was perceived by many respondents as a better alternative to the current ED environment.

A number of respondents also spoke of the role of peer support services to improve the quality of care for psychiatric patients in the ED. Most respondents felt that persons experiencing psychiatric emergencies needed contact with others. Peer support is used in psychiatric emergency centers (e.g. Crisis Response Center- Connections Arizona). The main goals of peer support is to connect patients with social support and allow for rapport building with others who have previously experienced mental health crises and understand the challenges of navigating the health care system for mental health conditions.

Provide Alternatives to Inpatient Beds

Not all mental health patients require inpatient hospital treatment, but many cannot simply be released back home. Respondents overwhelmingly spoke of the need to increase the availability of alternative higher acuity placement options, so that patients can safely be discharged from the ED without unnecessary utilization of inpatient beds. The most commonly referenced need was for an increase in sub-acute beds, especially in the Portland area. Similarly, respondents spoke of the need for more residential services for children and adults across the state.

Although respondents reported the need for these alternative services, many felt that without a simultaneous increase in ED staff awareness of and comfort with alternatives to inpatient hospital beds that patients would continue to be discharged to inpatient units. Findings from this study support this argument. During interviews with ED staff members who have community services available to them, a number were unaware of these services.

Improve the Availability of Services to Assist People Transitioning out of an Inpatient Hospital Bed or the Oregon State Hospital

Patients transitioning out of inpatient psychiatric hospital placements need temporary, and sometimes permanent, assistance connecting with community resources to prevent the need for further ED utilization and hospitalization. Respondents discussed the need to expand several types of programs to meet these needs, including intensive case management and Intensive Transition Teams. In line with the Department of Justice recommendations for the state of Oregon, respondents also recommended greater utilization of ACT teams operating at full fidelity for persons with SPMI.

Notable accomplishments have been made with ACT teams in Oregon in the past few years. The Oregon Center of Excellence for Assertive Community Treatment began work in 2014 with the mission of promoting and implementing high fidelity ACT programs around Oregon. As of early 2016, there were 18 high fidelity ACT teams in Oregon with another 8 programs anticipated to achieve fidelity within the year. However, work is still needed in this area to better reach the SPMI population.

For young adult populations, several respondents spoke of the need for the continued use and expansion of EASA programs. Currently, Oregon's EASA program serves young adults ages 12 to 25 in 32 counties. Oregon also has an EASA Center for Excellence that provides resources to young adults and their families as well as mental health professionals.

Although controversial, some respondents spoke of enacting Kendra's Law in Oregon. Originally implemented in New York, the intention of Kendra's Law is to ensure continued utilization of outpatient community mental health services for individuals "who are unlikely to survive safely in the community without supervision" (New York Office of Mental Health). Respondents perceived Oregon's current outpatient commitment law as ineffective because there is no mechanism to enforce service utilization.

Provide Supportive Services

Mental health patients frequently have basic needs that are not being met. Providing for these basic needs may reduce the incidence of mental health emergencies. Respondents overwhelmingly advocated for increasing services in three main areas 1) housing resources, especially in the Portland area; 2) supportive employment services; and 3) substance abuse treatment programs, especially outside of the Portland area. Work is on-going in these areas. As of 2015, Oregon had nearly 800 supported/supportive housing units and provided rental assistance to 576 for persons experiencing mental health challenges. The legislature has also invested approximately $20 million in rental assistance for persons with SPMI and another $25 million in the development of housing for persons with SPMI. Additionally, supportive employment opportunity programs serve residents in 31 Oregon counties.

Insurance and Reimbursement Changes

People experience difficulty accessing specific levels of services dependent on their health insurance. Additionally, reimbursement for specific mental health services varies widely across payers. Because of the low level of reimbursement, some respondents felt that community mental health providers had little incentive to provide mental health services themselves. These respondents felt the lack of reimbursement perversely incentivized communities to send patients to the ED and to fail to provide adequate services to patients leaving the OSH.

A number of respondents suggested that alternative payment methods for mental health services, rather than just fee-for-service, would be a way to improve service access. Some efforts are being made in this arena both in Oregon and at the national level. For example, the Oregon Health Authority recently funded PacificSource Health Plans to explore alternative payment models for behavioral health services (PacificSource, 2016). At the national level, programs like the Centers for Medicare and Medicaid Comprehensive Primary Care Initiative (CMS CPCI, 2016) and forthcoming Comprehensive Primary Care Plus (CMS CPC+, 2016) may further advance alternative payment models to improve access to mental health services.

Increase the Transparency of Waitlists for Inpatient and Oregon State Hospital Beds

Respondents, especially ED staff, noted frustration with the lack of transparency about who qualified for an inpatient or OSH bed and how long they would be waiting. Numerous respondents desired to see the creation of a bed registry to provide greater clarity on their patient's admission status. Although such a registry may not reduce boarding, the registry would allow ED staff to identify open inpatient beds more quickly. Additionally, the registry could help hospital administrators plan for the use of their inpatient facilities if they knew what sort of wait to expect for patients needing OSH services.

The Unity Center: Solution and Fears

When asked specifically about the Unity Center, respondents were generally supportive of the creation of the Center. They felt its model of care would be superior to ED care, and it was noted that Unity should be able to develop more efficient inpatient admission processes. A new Medicaid reimbursement rate for emergency psychiatric care, plus clarifications to staffing requirements for such care, may also encourage other hospitals to open psychiatric emergency centers or provide more appropriate psychiatric care in their EDs.

However, respondents had mixed feelings about the ability of the Unity Center to solve boarding problems. Respondents perceived that the Unity Center's psychiatric emergency service has the potential to address concerns about inadequate evaluation and inappropriate treatment of mental health patients in the ED for the Portland metro area. However, they noted that that the Center would do little to address boarding problems in other parts of the state.

Other concerns were raised about the ability of the Unity Center to reduce the boarding problem even in the Portland area. Overwhelmingly respondents were concerned that there will not be adequate community services to which to discharge Unity patients. Without community service support, respondents feared that patients would board in the psychiatric emergency service center much as they currently do in the ED. Respondents also voiced a concern that the lack of

community services could lead to a 'revolving door' problem at the Unity Center. Respondents envisioned that patients might be stabilized, returned to the community without adequate support, and return to the Unity Center because no alternative exists.

A smaller number of respondents also noted concerns about the overall reduction in adult inpatient beds due to the creation of the Unity Center. These respondents feared the bed reduction would exacerbate the boarding problem.

Child and Adolescent Specific Changes

Respondents felt there were certain services needed specifically for children and adolescents experiencing mental health problems. Unlike with the adult population, most respondents felt there was a need to increase the number of inpatient beds for children and adolescents. The current limited availability of beds for this population and the fact that all of these beds are located in the Portland metro area were perceived as problematic.

Numerous respondents also spoke of the need to address child and adolescent mental health problems outside of a hospital setting. These respondents advocated for increasing the availability of therapeutic foster care. Additionally, they spoke of the need to utilize new models of care, including in-home services that allow children to stay with their families.

Chapter 5. Quantitative Analysis of Oregon Hospital ED Utilization Data

This section presents results of statistical analyses that empirically tested potential determinants of psychiatric ED boarding in Oregon as well as potential solutions. Three independent empirical analyses were conducted on the full linked ED utilization data set:

1) We examined person-level characteristics associated with the chance of boarding among psychiatric patients in Oregon hospital EDs. This analysis quantifies some of the important causes of ED boarding.
2) We then analyzed the extent to which the county-level inpatient and community-based capacity of the mental health system might influence psychiatric ED boarding in Oregon. These findings may have implications for potential solutions to current boarding problems.
3) We quantified the increased probability and length of ED boarding for patients with psychiatric conditions compared to non-psychiatric patients.

5.1. Determinants of Psychiatric ED Boarding in Oregon

In this sub-chapter, we report results from an empirical analysis of potential determinants of boarding of psychiatric patients in hospital EDs in Oregon. We estimated the two-part model (2PM) of psychiatric ED boarding (a psychiatric ED episode lasting longer than 6 hours from the time of admission) on the sample of psychiatric ED visits. In this approach, the first part of the two-part model estimates the probability of ED boarding using the entire sample of psychiatric ED episodes. The second part then predicts boarding time conditional on ED boarding status, using only the subsample of boarded psychiatric ED visits. Therefore, the first part examines factors associated with the probability of ED boarding while the second part tests the influence of potential determinants of boarding on boarding time after an ED visit becomes a boarding episode. Technical details are discussed in <Appendix D1>.

Below in <Exhibit 5-1> we first describe variables included in our statistical models as potential determinants of psychiatric ED boarding. As discussed in Chapter 3, severe psychiatric episodes comprised about 15% of the analytic sample (i.e., all psychiatric ED visits). About one-third of the psychiatric episodes involves diagnoses of substance abuse (see <Appendix D2> for the definition of substance abuse). 54% were Medicaid episodes. The sample was characterized by the mean age of 40, 52% female, 88% whites, and 5% Hispanic. Roughly 28% of all psychiatric ED visits started on weekends. About 78% of the visits were made by patients living in urban areas. The rurality variables were constructed based on the Rural-Urban Commuting Area Codes (RUCA) classification scheme. See Appendix 5A-2 for detail. In terms of the location of a hospital ED, the Portland metropolitan area was the most frequent location, comprising one-third of all psychiatric ED visits in Oregon, followed by 26% in the Willamette Valley area and 19% in the Southern Oregon area.

Exhibit 5-1. Descriptive characteristics of psychiatric ED visits, Oct. 2014 – Sep. 2015.

Variable	Mean	Std. Dev.
Severity of psychiatric conditions		
Severe psychiatric visit	15.3%	-
Non-severe psychiatric visit	84.7%	-
Substance abuse	27.0%	-
Medicaid status	54.1%	-
Age	39.9	16.5
Female	51.9%	-
Race		
White (reference)	87.5%	-
AIAN	2.5%	-
Asian	0.6%	-
Black	4.1%	-
NHPI	0.3%	-
Other	5.0%	-
Hispanic	5.3%	-
Weekend admission	27.8%	-
Rurality of patient residence		
Urban	77.5%	-
Large rural	20.2%	-
Small rural	3.6%	-
Hospital location		
Central Oregon (reference)	3.7%	
Eastern Oregon	8.2%	
Northern Oregon	8.2%	
Portland metropolitan area	34.7%	
Southern Oregon	19.1%	
Valley area	26.1%	

<Exhibit 5-2> reports results from the 2PM of psychiatric ED boarding. Results for the first and second parts are presented in Columns (1) and (2), respectively. Reported are marginal effects. Therefore, the findings have an interpretation of a percentage-point change in the probability of ED boarding associated with each of the potential determinants of psychiatric ED boarding, holding other things fixed. The models also controlled for countywide heterogeneity that might affect psychiatric ED boarding such as average distance to psychiatric facilities.

Our results indicate that the severity of psychiatric conditions was positively associated with both the probability and length of boarding among psychiatric patients in EDs. Severe psychiatric visits were significantly more likely than non-severe psychiatric visits to be boarded by 16 percentage-points. Given that 14.6% of all psychiatric ED visits were boarded in our data (see <Exhibit 3-2>), the probability of ED boarding for severe psychiatric visits was more than twice as large as that for non-severe psychiatric visits. Once being boarded, the length of boarding time became about 10 hours longer for severe psychiatric visits.

The severity of psychiatric conditions, substance abuse, rural residence, male gender, and hospital locations in the Portland metropolitan and Willamette Valley regions significantly increased the likelihood of ED boarding.

Diagnoses of substance abuse was significantly associated with an increase in the probability of psychiatric ED boarding, as reported in Column (1): Substance abuse on average was associated with about 5 percentage-point increase in the probability of psychiatric ED boarding. However, once boarded, a psychiatric ED visits involving substance abuse conditions is significantly associated with reduced boarding time, shown in Column (2): average boarding time in fact decreased by 6 hours for visits with diagnoses of substance abuse once patients become boarded.

Medicaid enrollment status did not affect the probability of ED boarding, but significantly reduced boarding time after psychiatric patients become boarded in EDs by an average of 2.7 hours. Patient age was negatively associated with the probability of psychiatric ED boarding but was positively associated with boarding time although the magnitude was small. Female sex was negatively associated with the probability of psychiatric boarding. Race and ethnicity overall were not significantly associated with psychiatric ED boarding.

Compared to admission during the weekdays, weekend admissions (defined as admission on Saturday and Sunday) were found to decrease the probability of boarding of psychiatric ED patients but was positively associated with boarding time conditional on boarding. Compared to living in an urban area, living in a large rural area was significantly associated with an increase in the probability of boarding among psychiatric patients in EDs, but was not associated with the conditional boarding time.

Hospital location also appears to matter. The probability of boarding of psychiatric ED patients was higher in hospital EDs located in the Portland metropolitan and Valley regions than in other regions of the state. The conditional boarding time was significantly longer in hospital EDs located in the Southern Oregon region followed by EDs in the Portland metropolitan region. Although not reported in the exhibit, county indicator variables were jointly significant, implying significant cross-county variations in psychiatric ED boarding.

Exhibit 5-2. Factors affecting the probability of psychiatric ED boarding and boarding time: Two-part model

	Part 1: Pr(psychiatric ED boarding)	Part 2: Psychiatric ED boarding time, conditional on boarding
	(1)	(2)
Severe psychiatric ED visit	0.1569***	9.8113***
	(0.0053)	(1.1530)
Substance abuse	0.0644***	–4.0724***
	(0.0037)	(0.9480)
Medicaid status	0.0014	–2.8591**
	(0.0031)	(0.8688)
Age	–0.0002*	0.1007***
	(0.0001)	(0.0276)
Female	–0.0082**	–0.4050
	(0.0031)	(0.8427)
Race (reference: White)		
AIAN	0.0026	0.5627
	(0.0096)	(2.1049)
Asian	–0.0429*	11.7012
	(0.0169)	(14.8144)
Black	0.0066	–1.8760
	(0.0096)	(1.7202)
NHPI	0.0371	–9.5666***
	(0.0302)	(2.7944)
Other	0.0114	–1.9076
	(0.0082)	(1.6609)
Hispanic	–0.0064	1.9359
	(0.0077)	(2.1942)
Admission on weekend	–0.0059*	2.4522*
	(0.0028)	(1.0717)
Rurality of patient residence (reference: Urban)		
Large rural	0.0150*	0.4664
	(0.0063)	(2.3696)
Small rural	0.0053	–1.0958
	(0.0094)	(2.8759)
Hospital location (reference: Central Oregon)		
Eastern Oregon	–0.0361*	2.8165
	(0.0151)	(4.3591)
Northern Oregon	0.0255*	11.8466**
	(0.0122)	(4.5056)
Portland metropolitan	0.1437***	17.7957***
	(0.0109)	(3.9207)
Southern Oregon	0.0208	32.4046***
	(0.0123)	(8.0907)

Valley area	0.0582***	10.3351*
	(0.0110)	(4.2581)
N	81,370	13,002

Notes: Cluster-robust standard errors are in parentheses. All models control for county fixed-effects.
* Statistically significant at the 95% level.
** Statistically significant at the 99% level.
*** Statistically significant at the 99.9% level.

5.2. Relationship between Mental Health System Capacity and Psychiatric ED Boarding in Oregon

This sub-chapter presents results of the analysis of the extent to which the capacity of the mental health system, separately for inpatient and community-based, is associated with the rate of psychiatric ED boarding in Oregon. We postulated that a greater capacity of the mental health system reduces the probability of psychiatric ED visit and thereby shrinks the volume of psychiatric boarding episodes in EDs. This is conceptually plausible because the availability of mental health resources should affect the incident of psychiatric ED boarding through a change in the chance of psychiatric ED visit.

Empirically, we constructed the so-called recursive simultaneous-equations model, a system of two simultaneous equations. In this approach, the first equation tests whether the capacity of the mental health system affects probability that an ED visit was a psychiatric episode. Therefore, a dichotomous indicator for a psychiatric ED visit was the dependent variable, and measures of mental health system capacity separately for inpatient and community-based systems served as key independent variables. In the second equation, a binary psychiatric ED boarding indicator was our dependent variable, and the binary psychiatric ED visit indicator from the first equation was the key independent variable. Therefore, the second equation examines a chance that a psychiatric ED visit becomes a boarding episode. Together, results from the two equations can answer the extent to which the capacity of mental health system influences the rate of psychiatric ED boarding in Oregon. Our empirical approach speaks to a strong causal inference in our results. See<Appendix D4> for details.

Descriptive characteristics of variables in our econometric models are presented below in <Exhibit 5-3>. There are several points that are noteworthy. First, the analysis presented above in <Exhibits 5-1 and 5-2> analyzed only the sample of psychiatric ED visits to examine potential determinants of psychiatric ED boarding. In comparison, the analytic sample here included all hospital ED visits in Oregon from October 2014 to September 2015. Descriptive characteristics are similar between the psychiatric ED visit sample (see <Exhibit 5-1>) and the entire ED visit sample (see <Exhibit 5-3>) for most of the variables. However, the probability of an ED visit with substance abuse is seven times as large as in the psychiatric ED visit sample than in the all ED visit sample, which confirms frequent dual diagnoses of mental illness and substance abuse.

<Exhibit 5-3> also describes inpatient and community-based mental health resources constructed to capture county-level mental health system capacity, separately for psychiatric inpatient and community resources. The 'ratio of the quarterly average of psychiatric inpatients in private and state facilities to the quarterly average number of persons with severe mental illness' from October 2013 to September 2014 (%Psychiatric inpatients) was constructed as a county-level proxy for the capacity of inpatient mental health system for persons with severe mental illness.

This variable captures inpatient mental health system capacity during the one year prior to our sample period (Oct. 2014 – Sep. 2015) to minimize concern that psychiatric ED visits might influence the number of persons with severe mental illness in psychiatric inpatient settings.

The 'ratio of the quarterly average of patients served by assertive community treatment (ACT) teams to the quarterly average number of persons with severe mental illness' for the October 2013 – September 2014 period (%ACT population) was used as a county-level proxy for the capacity of community mental health system especially for persons with severe mental illness. This variable is also lagged by one year to minimize concern that psychiatric ED visits might influence the number of ACT clients.

Exhibit 5-3. Descriptive Characteristics of Hospital ED Visits, Oct. 2014 – Sep. 2015.

Variable	Mean	Std. Dev.
Psychiatric visit	14.6%	-
Substance abuse	3.9%	-
Medicaid status	55.6%	-
Age	34.6	20.8
Female	56.6%	-
Race		
White (reference)	83.1%	-
AIAN	2.0%	-
Asian	1.2%	-
Black	5.5%	-
NHPI	0.5%	-
Other	7.7%	-
Hispanic	10.0%	-
Weekend admission	27.8%	-
Rurality		
Urban	84.0%	-
Large rural	12.9%	-
Small rural	2.8%	-
Hospital location		
Central Oregon (reference)	2.1%	
Eastern Oregon	4.9%	
Northern Oregon	8.2%	
Portland metropolitan area	36.4%	
Southern Oregon	19.0%	
Valley area	29.5%	
County-level system characteristics		
%Psychiatric inpatients	6.4%	3.1
%ACT population	1.1%	1.4
SMI population	3,458	2,954

We acknowledge that our county-level system capacity measures are not the absolute size of system capacity. Nonetheless, the proxy measures are useful for cross-county comparison of system capacity and associated relationship with psychiatric ED visit and boarding. We also included the quarterly average number of persons with severe mental illness per 1,000 persons by county, for the October 2013 – September 2014 period in our model to control for the underlying prevalence of severe mental illness by county.

<Appendix D5> reports descriptive characteristics of patient and system factors, stratified by ED boarding status. It shows that compared to non-boarded ED episodes, boarded ED episodes are significantly more likely to have diagnoses for both mental illness and substance abuse. All the other characteristics appear similar. This finding suggests a significant contribution of psychiatric visits to the problem of ED boarding in Oregon.

Effects of mental health system capacity on psychiatric ED visits

<Exhibit 5-4> presents main results from the analysis of the effect of county-level mental health system capacity (i.e., first equation), separately for inpatient and community-based mental health resources, on the probability of psychiatric ED visits. Full results are available in <Appendix D6>.

A greater supply of psychiatric inpatient and intensive community mental health resources was significantly associated with a reduction in the probability of psychiatric ED visit. Our estimate suggests that holding other things constant, a 1% higher capacity of the inpatient mental health system (which was proxied by the proportion of psychiatric inpatients to persons with severe mental illness) is associated with a 1.3 percentage-point lower probability of psychiatric ED visit. This result means that a 1% increase in the capacity of the inpatient mental health system, ceteris paribus, may lead to approximately 7% decrease in the probability of psychiatric ED visit because the rate of psychiatric visits was 14.6% (see <Exhibit 3-2>).

1% increase in psychiatric inpatient capacity, ceteris paribus, may lead to 7% decrease in the probability of psychiatric ED visit.

A response in psychiatric ED visit to a change in the inpatient mental health system capacity was even more elastic. A 1% increase in the capacity of community-based mental health resources (measured by the volume of ACT clients served), ceteris paribus, was significantly associated with a 1.8 percentage-point decrease (alternatively, 12% decrease) in the probability of psychiatric ED visit. Also to be consistent with our expectation, a greater prevalence of severe mental illness in a county was significantly associated with a higher probability of psychiatric ED visit in that county.

An increase in psychiatric inpatient or community-based mental health capacity, ceteris paribus, led to a decrease in the magnitude of psychiatric ED boarding in Oregon.

Exhibit 5-4. Effect of county mental health capacity on the likelihood of psychiatric ED visit

	Pr(psychiatric ED visit)
County-level system characteristics	
%Psychiatric inpatients	–0.0128***
%ACT population	–0.0180***
SMI population	0.0110***

Notes: Cluster-robust standard errors are in parentheses. All models control for the full covariates as well as county fixed-effects.
* Statistically significant at the 95% level.
** Statistically significant at the 99% level.
*** Statistically significant at the 99.9% level.

Effects of psychiatric episode on ED boarding

<Exhibit 5-5> reports our estimates on the effect of psychiatric ED visit on ED boarding (i.e., equation 2). We estimated the two-part model (2PM) and results for the first and second parts are presented in Columns (1) and (2), respectively. The first part of the 2PM estimates the effect of psychiatric ED visit on the probability of ED boarding and the second part measures the effect of psychiatric ED visit on boarding time conditional on ED boarding. Reported are marginal effects and therefore they have a percentage-point change interpretation. We report only main results and full results are available in <Appendix D7>.

As shown in Column (1), a psychiatric episode on average was significantly associated with 9.5 percentage-point increase in the probability of ED boarding. This effect is almost twice as large as the average boarding rate of 5.5% reported in <Exhibit 3-2> (based on the 6-hour boarding definition). Our finding is in line with a national estimate reported in Nolan et al. (2015), in that they discovered that psychiatric ED episodes status on average were associated with nearly five times greater odds of ED boarding when compared to non-psychiatric ED episodes.

Psychiatric episodes on average may lead to (a) a two-fold increase in the probability of boarding in hospital EDs, and (b) 5-hour increase in boarding time once being ED-boarded.

Results from the second part of the 2PM are presented in Column (2). Again, the second part estimates factors associated with boarding time only using the subsample of boarded ED visits. Therefore, it measures the influence of psychiatric ED episode on ED boarding time only for boarded ED episodes. Psychiatric visit status was significantly associated with additional five hour of ED stay. Our estimate is comparable to a national estimate. Nolan et al. (2015) found that at the national level, in 2008, ED boarding time was higher by 3.5 hours for psychiatric ED patients, compared to non-psychiatric ED patients. To summarize, psychiatric conditions increased both the

probability and length of ED boarding.

Exhibit 5-5. Factors affecting the probability of ED boarding and boarding time: Two-part model

	Part 1: Pr(psychiatric ED boarding) (1)	Part 2: Psychiatric ED boarding time, conditional on boarding (2)
Psychiatric ED visit	0.0954***	5.0520***
	(0.0019)	(0.7534)
N	510,773	31,854

Notes: Cluster-robust standard errors are in parentheses. All models controlled for the full covariates as well as county fixed-effects.
* Statistically significant at the 95% level.
** Statistically significant at the 99% level.
*** Statistically significant at the 99.9% level.

To summarize, we empirically examined the extent to which the capacity of the mental health system, separately for inpatient and community-based, may affect the rate of psychiatric ED boarding in Oregon. We tested using a system of recursive simultaneous equations (a) whether a greater capacity of the mental health system reduces the probability of psychiatric ED visit and (b) whether the lowered probability of psychiatric ED visit in turn may reduce boarded-ED episodes.

Taken together, our findings reported in <Exhibits 5-4 and 5-5> suggest that an increase in the capacity of either inpatient or community-based mental health system, ceteris paribus, may lead to a decrease in the rate of psychiatric ED boarding through a reduced probability of psychiatric ED visit.

Chapter 6. Synthesis of the Literature, Stakeholder Interviews, and Statistical Analyses of Quantitative Data

<Exhibit 6-1> compares findings from the national literature, the stakeholder interview, and statistical analyses of quantitative data in terms of causes of psychiatric ED boarding as well as potential solutions. Findings from the stakeholder interviews mirrored those from the national literature, often emphasizing the Oregon context. Results from our statistical analyses confirm key determinants of psychiatric ED boarding in Oregon discovered by the stakeholder interviews, suggesting increasing the capacity of the mental health system as a potential solution to the psychiatric ED boarding problem.

Exhibit 6-1. Synthesis of the Literature, Stakeholder Interviews, and Statistical Analyses of Quantitative Data

Literature (Nationwide)	Stakeholder Interviews (Oregon)	Quantitative analyses (Oregon)
Causes		
▪ Person-level determinants: Homelessness, urban residence, sex, race/ethnicity, diagnosis of mental illness, substance abuse, suicidal/homicidal ideation, a history of self-harm, types of health insurance	▪ Person-level determinants: Homelessness, urban residence, diagnosis of mental illness, substance abuse, suicidal/homicidal ideation, a history of self-harm, types of health insurance	▪ Person-level determinants: Severity of psychiatric conditions, substance abuse, Medicaid eligibility, rurality of patient residence
▪ System-level determinants: Limited capacity of inpatient care, lack of available community (outpatient) mental health programs, lack of community alternatives to EDs, lack of care coordination for psychiatric patients, mental health workforce shortage, insufficient training of ED staff, less	▪ System-level determinants: Limited capacity of inpatient care, lack of available community (outpatient) mental health programs, lack of community alternatives to EDs, lack of care coordination for psychiatric patients, mental health workforce shortage, insufficient training of ED staff, less	▪ System-level determinants: Weekend admissions, location of hospital ED

generous mental and behavioral health benefits ▪ Legal determinants: Interpretation of Emergency Medical Treatment and Activity Labor Act, involuntary commitment statutes, institute for mental diseases (IMD) exclusion, mental and behavioral health parity	generous mental and behavioral health benefits ▪ Legal determinants: Civil commitment population at OSH	
Solutions		
▪ Monitor psychiatric ED boarding ▪ ▪ Increase community mental health services; invest in comprehensive community-based psychiatric emergency services (such as 24 hour help line, mobile crisis outreach team, emergency walk-in clinic, and crisis stabilization unit) ▪ Enhance continuity of care in community ▪ Work with law enforcement	• Expand community mental health services to reduce the number of psychiatric ED visits • Expand the availability of ED alternatives such as crisis centers or psychiatric emergency centers like the new Unity Center in Portland • Increase alternatives to inpatient beds such as sub-acute beds and residential services • Use alternatives to the State Hospital for the .370 population • Improve the availability of services to assist patients discharging from inpatient psychiatric hospitals or the state hospital • Provide supportive services, such as housing, in the community • Address specific challenges for pediatric populations.	▪ Expand comprehensive community-based mental health resources for persons with severe mental illness

▪ Increase inpatient psychiatric care capacity ▪ Promote collaboration between EDs and community programs ▪ Improve care of psychiatric ED patients ▪ Increase access to insurance	▪ Increase inpatient psychiatric care capacity ▪ Promote collaboration between EDs and community programs; increase in ED staff awareness of and comfort with alternatives to inpatient placement. ▪ Change the service delivery environment in the ED such as improved information tools such as Pre-Manage and Emergency Department Information Exchange (EDIE), a dedicated area in the ED for psychiatric care, and peer support services ▪ Expand alternative payment models for behavioral health care services	▪ Increase inpatient psychiatric care capacity

Chapter 7. Conclusion

This chapter summarizes the results of our analysis of the breadth of the ED boarding practice, the current system and process, causes and impacts of the ED boarding practice, and potential solutions. This report integrates from a comparative perspective results from (a) interviews with mental health experts and key stakeholders in Oregon and (b) analyses of three quantitative databases currently available to study psychiatric ED boarding in Oregon. Discussed below are highlights of results presented in this report.

Stakeholders were interviewed from all regions of Oregon and a wide range of mental health expertise. Databases used to analyze ED boarding practice in Oregon included the EDIE, hospital discharge, and Medicaid data. Despite several limitations, these databases currently represented the only sources that provide the basis to quantify psychiatric ED boarding in Oregon. Quantitative results presented here are based on the 6-hour definition of ED boarding recommended by the Accreditation Council for Graduate Medical Education (2013) and adopted in the most recent national analysis of psychiatric ED boarding practice in Nolan et al. (2015).

Extent and cost of psychiatric ED boarding

The quantitative analytic data–which contained all 690,245 unique ED episodes on 290,181 unique persons between October 1, 2014 and September 30, 2015 from the three data sources–revealed several key results on the breath of ED boarding practice in Oregon as well as the current trend. Although the analytic sample data included only about half of recent annual ED episodes in Oregon, further investigation suggested that this sample was likely representative of the entire universe of Oregon ED visits; however, the analyses presented in this report may somewhat overestimate extent of the psychiatric ED boarding problem in Oregon due to data limitations.

We estimated that during the one-year sample period, up to about 30,000 hospital ED visits in Oregon (or 2.1% of all annual hospital ED visits) were psychiatric boarding episodes, based on the definition of an ED boarding as a stay in the ED longer than 6 hours. Among all psychiatric ED visits in Oregon, 14.6% were boarding episodes. This rate is smaller than the national estimate of 21.5% from the 2008 National Hospital Ambulatory Medical Care Survey (Nolan et al., 2015). However, the national rate included both psychiatric and substance abuse conditions. Nolan et al. (2015) also reported that the rate of psychiatric ED boarding was significantly lower in the West than the nationwide average. Therefore, we view our estimate is roughly comparable to the most recent national estimate.

The rate of psychiatric ED boarding decreases as the cutoff threshold for the boarding definition is raised beyond 6 hours, implying that a significant portion of the psychiatric ED boarding problem could be prevented by reducing the length of ED time for patients who stay in EDs just above the 6-hour threshold. For example, the corresponding rates for 8-, 12-, and 24-hour cutoffs were 9.8%, 7.1%, and 3.5%, respectively.

The rate of psychiatric ED boarding was greater for severe psychiatric conditions: One-fourth of all severe psychiatric visits (24.4%) were boarded episodes, compared to 13% of non-severe psychiatric visits.

Boarding time, defined as the length of ED stay over 6 hours, was greater for psychiatric visits than for non-psychiatric visits. While all ED visits on average had a boarding time of 1.2 hours (i.e., a total of 7.2 hours in ED), psychiatric visits had the boarding time of 3.2 hours. Among all psychiatric visits, severe psychiatric visits had on average 9.2 hours of boarding time, four times longer than 2.3 hours of boarding time for non-severe psychiatric visits. The average boarding time for the subset of boarded ED visits was over 17 hours (total 23.6 hours of ED stay). Boarded psychiatric ED visits on average had the boarding time of 18.2 hours (total 24.2 hours in ED), a one hour longer boarding time than boarded non-psychiatric ED visits.

The rate of psychiatric ED boarding increased gradually over the year while the rate of non-psychiatric ED boarding episodes continued to decrease. Between the last quarter of 2014 and the third quarter 2015, the proportion of psychiatric visits in all boarded ED visits grew constantly from 38% to 47%.

Comparative analysis of the independent data sets revealed that the EDIE data contained slightly fewer unique psychiatric ED boarding episodes than the hospital discharge data. The EDIE data suggest that based on the 6-hour definition of ED boarding, approximately 16% of psychiatric ED visits were boarded visits, compared to the corresponding rate of 22.3% in the hospital discharge data.

Other comparative analyses gauged the degree to which the hospital discharge and EDIE databases reliably capture psychiatric ED boarding episodes for Medicaid patients. This analysis shows that the rate of psychiatric ED boarding in Medicaid claims is similar to the rate in the EDIE data. It also revealed that the rate of psychiatric ED boarding is similar between the entire sample of ED visits and a subset of ED visits for Medicaid patients. Taken together, our results suggest that currently the EDIE data capture psychiatric ED boarding episodes somewhat more reliably than the hospital discharge data.

ED boarding appears to increase the cost of an ED episode. ED visits on average coste approximately $424 per visit. In comparison, the average cost of boarded psychiatric ED visits was $695 per visit. Psychiatric visits had a higher average per-visit ED cost than non-psychiatric visits for non-boarded patients. However, for boarded visits, non-psychiatric visits had a greater average ED cost than psychiatric visits ($1,196 vs. $695).

Stakeholder perspectives on causes of and solutions to ED boarding

Stakeholder interviews identified several broad causes of psychiatric boarding in hospital EDs in Oregon, including: lack of outpatient treatment capacity, which increases the probability of psychiatric ED visits; lack of crisis response or other alternative treatment options to ED utilization; barriers to discharge from the ED directly to community destinations; and limited availability of inpatient or sub-acute care resources for patients with the most severe psychiatric emergencies.

Several potential solutions were identified. First, nearly all respondents stated that although there is need for improved access to inpatient care settings, an increase in inpatient capacity alone would solve the boarding problem. Instead, they suggested a greater focus on preventing mental health crises and better managing patient needs in alternative settings. Respondents overwhelmingly agreed that Oregon needs to expand community mental health services, thereby reducing the need for seeking emergency psychiatric services in the ED.

Second, respondents recommended alternatives settings for the civil commitment population at Oregon State Hospital (OSH). Some efforts to address this problem are already underway including HB 2420 and community restoration programs as alternatives to Oregon State Hospital.

Third, respondents endorsed the further expansion of alternative settings to respond to mental health emergencies, including crisis centers, crisis teams, and psychiatric emergency centers like the new Unity Center in Portland.

Fourth, respondents advised practice improvements in the ED to capture patients' needs in a timely fashion and to more appropriately provide care, such as making psychiatric evaluations more readily available in the ED, a dedicated area in the ED for psychiatric care, and peer support services.

Fifth, respondents overwhelmingly recommended to increase the availability of alternative higher acuity placement options such as sub-acute psychiatric beds, accompanied by a simultaneous increase in ED staff awareness and comfort with alternatives to inpatient placement.

Sixth, respondents suggested assistance connecting patients transitioning out of inpatient settings or the state hospital to community resources to prevent the need for further ED utilization and hospitalization. It was recommended that although notable accomplishments have been made with ACT teams in Oregon in the past few years, work is still needed in this area to better reach the SMI population.

Finally, reimbursement for specific mental health services varies widely across payers. N Some respondents therefore felt that community mental health providers had inadequate incentive to provide some mental health services.

Statistical analyses of causes of and solutions to ED boarding

Statistical analyses of potential determinants of boarding of psychiatric patients affirm findings from the national literature and the stakeholder interviews regarding causes of psychiatric ED boarding in Oregon:

- Substance abuse was significantly associated with an increase in the probability of the boarding of psychiatric ED patients but with shorter boarding time once being boarded;
- Medicaid enrollment status was not significantly associated with the probability of ED boarding, but significantly reduced boarding time after psychiatric patients become boarded in EDs;
- Race and ethnicity overall were not significantly associated with psychiatric ED boarding;
- Weekend admissions were negatively associated with the probability of boarding but positively associated with boarding time conditional on boarding;
- Compared to living in an urban area, living in a large rural area was significantly associated with an increase in the probability of boarding among psychiatric patients in EDs, but was not associated with the conditional boarding time; and
- The probability of boarding of psychiatric ED patients was higher in hospital EDs located in the Portland metropolitan and Willamette Valley areas than the other regions of the state.

Other statistical analyses showed that an increase in the capacity of either inpatient or community-based mental health system, ceteris paribus, was associated with a decrease in the rate of psychiatric ED boarding through a reduced probability of psychiatric ED visits. This result supports stakeholders' view, suggesting that increasing the capacity of the mental health system could mitigate to the psychiatric ED boarding problem in Oregon.

Conclusion

Nearly 1 in 7 psychiatric ED visits in Oregon (14.6%) were boarding episodes, and almost 1 in 4 (24%) of severe-psychiatric ED visits were boarded. Taken together, our findings from stakeholder interviews and statistical analyses of quantitative data from Oregon affirm the national literature about the causes of psychiatric ED boarding as well as potential solutions, providing additional insights into the Oregon context.

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Appendix A. Summary of the literature

Appendix A Exhibit 1. Extent of Psychiatric ED Boarding

Study	Objectives	Setting	Findings
Nolan et al. (2015)	Determine the incidence, duration and factors associated with ED boarding in the U.S.	▪ Analyzed 2008 National Hospital Ambulatory Medical Care Survey. ▪ Sample of 34,134 children and adults who visited ED in non-institutional general and short-stay hospitals in the U.S.	▪ 21.5% of all psychiatric ED patients boarded. ▪ The odds of boarding for psychiatric patients 5 times higher than for non-psychiatric patients. ▪ Psychiatric patients boarded 2.8 hours longer, compared to non-psychiatric patients.
Dolan et al. (2011)	Address the roles that the ED and ED health care professionals play in emergency MH care of children and adolescents in the U.S.	▪ N/A	▪ Barriers to MH services for children include lack of information relating to pediatric illness, limitations of ED setting, need for education and training, and lack of access to inpatient and outpatient services ▪ Potential solutions include increase ED capacity to provide medical stabilization, proper suicide risk assessment tools (Suicidal Ideation Questionnaire (SIQ)), increased screening for MH conditions in pediatric patients (particularly depression)
Weiss et al. (2012)	Identify patient and clinical management factors related to ED length of stay for psychiatric patients.	▪ Sample of 1,000 adults with psychiatrics illness treated in 5 hospital-bases EDs in Boston between June 2008 and May 2009.	▪ Patients discharged to home had an average ED length of stay of 8.6 hours (95% CI: 7.7 to 9.5), whereas those admitted to a psychiatric unit within the hospital stayed 11 hours (95% CI: 8.7 to 13.9). ▪ Patients transferred within system stayed 12.9 hours (95% CI: 11.7 to 14.3), and patients transferred to a unit outside the system stayed 15 hours (95% CI: 12.7 to 17.6). ▪ Compared to those discharged home, ED boarding times of patients admitted, transferred within system and transferred outside system were 2.4, 3.5

Study	Objectives	Setting	Findings
			and 4.7 times higher, respectively.
Stephens et al. (2014)	Identify patient factors associated with extremely long length of stay (>24h) (EL-LOS) of mental health patients in ED	▪ Retrospective case-control study ▪ Sample of 242 patients in an ED of an urban academic hospital between October 2009 and May 2010	▪ Mental health patients were more likely to experience EL-LOS (OR = 105, 95%CI: 67-164) compared to non-mental health patients ▪ Median LOS for those experienced EL-LOS = 35 hours (SD =11.3)
Slade et al. (2010)	Estimate trends in duration of ED visits of mental health and non-mental health visits	▪ Analyzed National Hospital Ambulatory Medical Care Survey 2001-2006 ▪ Sample of 193,077 of ED visits	▪ Average duration of ED visits increased 2.3% per year for both mental health and non-mental health visits ▪ Mental health visit duration was 42.1% longer (1.25 hours) than non-mental health visits ▪ Duration was extremely long for mental health visits ended in transfer to different facility or patients with serious mental illness and substance abuse disorders
Wolf et al. (2015)	Describe US emergency nurses' estimates of lengths of stay (LOS) and factors affecting LOS for behavioral health patients in the US	▪ Mix-method study ▪ Purposive sample of 1229 emergency nurses recruited through online survey (September 10 to October 13, 2013).	▪ Average ED LOS = 18.5 hours for behavioral health patients ▪ Median ED LOS = 10 hours for behavioral health patients
Wharff et al. (2011)	Determine the extent and predictors of pediatric psychiatric boarding	▪ Retrospective cohort study ▪ Sample of 461 patients at an ED of a large urban pediatric teaching hospital (July 2007 – June 2008)	▪ 34.1% of patients boarded ▪ Mean boarding duration were 22.7 hours (SD = 8.1) ▪ Median boarding duration = 21.18 hours.

Study	Objectives	Setting	Findings
		▪ Comparing predictors of boarding for 2007-2008 and 1999-2000 patient cohorts	
Brennaman (2014)	Determine the extent and factors associated with psychiatric boarding for people meeting criteria for involuntary psychiatric examination	Sample of 170 ED patients requiring involuntary mental health examinations in 2 hospitals Florida	▪ 90% of patients waited longer than 4 hours for transfer to inpatient facility. ▪ 48.8% of patients waited longer than the 12 hour maximum allowed by Florida law. ▪ Mean boarding time was 14.9 hours (SD= 14.5) ▪ Median boarding time was 11 hours
Mansbach at el. (2003)	▪ Describe the extent of pediatric psychiatric ED boarding ▪ Compare patients who were placed successfully into psychiatric facilities with boarder	▪ Retrospective cohort study ▪ Sample of 315 psychiatric patients at a pediatric ED (July 1999 – June 2000)	▪ 33% of patients boarded on medical services
Chang et al. (2011)	Describe lengths of stay (LOS) of ED patients receiving psychiatric evaluation by hospital types	▪ Prospective study ▪ Sample of 1,000 adult patients treated between June 2008 and May 2009 at 5 hospitals in Boston (2 academic medical centers and 3 community hospitals)	▪ Median LOS ranged from 6.7 to 10.8 hours ▪ Time from disposition decision to ED discharge ranged from 3.2 to 5.9 hours.

Study	Objectives	Setting	Findings
Chakravarthy et al (2015)	Examine patient and hospital factors associated with lengths of stay (LOS) and prolonged lengths of stay (PLOS) of pediatric psychiatric ED patients	▪ Sample of 939 psychiatric patients (aged 3-17) in 2 urban EDs in Southern California (May 2010-May 2012) ▪ 2 EDs are the University of California, Irvine Medical Center in Orange County and Long Beach Memorial Medical Center in Los Angeles County	▪ Mean LOS = 4.9 hours
Warren at el. (2015)	Identify factors associated with prolonged lengths of stay (PLOS) of psychiatric ED patients	▪ Sample of 6335 ED patients receiving a psychiatric consultation at an academic hospital (September 2010 - September 2013)	▪ Median LOS = 4.1 hours ▪ 15% of visits (1424 out of 9247 visits) with prolonged LOS (8 hours or more)
Rhodes et al. (2015)	▪ Characterize behavioral health (BH) ED visits of older adults ▪ Determine risk factors of prolonged length of stay (PLOS) and adverse events (AEs) of BH ED visits in older adults	▪ Sample of 213 patients aged 65 or older with BH related ED visits in a community hospital trauma level 3 ED	▪ Median LOS = 16.2 hours. ▪ 6.6% of patients had LOS ▪ = 6 hours or less
Case et al. (2011)	Compare lengths of stay (LOS) of pediatric psychiatric ED visits with LOS of other pediatric ED	▪ Analyzed National Hospital Ambulatory Medical Care Survey 2001-2008 ▪ Sample of 73,015 visits of patients aged 18 or below	▪ Mental health visits were more likely to be admitted or transferred ▪ Median LOS of mental health visits = 2.8 hours compared to 1.8 hours of LOS of other visits ▪ Odds of LOS >4 hours for mental health visits were

Study	Objectives	Setting	Findings
	visits	(1,476 mental health visits and 71,539 other visits)	1.9 times higher then that for other visits
Miller (2014)	Describe psychiatric boarding and suggested solutions in Washington	▪ Literature review	▪ Steady reduction in psychiatric beds but not enough investment in community services in the state. ▪ 70% of involuntary patients in ER have never had any interaction with community system. ▪ 4,566 cases of psychiatric boarding per year. ▪ 70% of counties did not have involuntary psychiatric beds
Arizona Hospital and Healthcare Association (2015)	Describe the extents, causes, impacts and solutions to psychiatric boarding in Arizona	▪ Literature review	▪ Number of boarded patients (lengths of stay (LOS) > 24 hours) increased by 33% from 2012 to 2013 ▪ Boarded patients for attempted suicide rose 41% from 2012 to 2013
Nesper et al. (2015)	Evaluate the effect of decreasing county mental health services on the ED	▪ Retrospective before-after study at an academic university hospital adjacent to county mental health treatment center. ▪ EHRs collected for ED visits for 8 months before decrease (100 to 50 beds) in county services (October 2008 to May 2009) and 8 months after decrease (October 2009 to May 2010). ▪ Outcome measures included number of pts evaluated and ED LOS.	▪ Mean daily psychiatry consultations increased from 1.3 before closure to 4.4 after, with a difference in means of 3.0 visits. ▪ Average ED LOS for psychiatry consultation patients was 14.1 hours before closure and 21.9 hours after, with a difference in means of 7.9 hours. ▪ Ultimately, more than 5-fold increase in daily ED bed hours occupied by a patient receiving psychiatry consultation after decrease in county mental health services.

Study	Objectives	Setting	Findings
Chang et al. (2012)	Obtain perspectives on the rate-limiting steps (RLS) in patient care in the ED and compare them to patient's actual LOS	▪ Prospective cohort of clinicians' perspectives on the RLS among 1092 adult ED patients ▪ Medical records collected for ED LOS and other data (integrated HC network in NE US, 2008-2009) ▪ Main outcome measures included LOS and time from disposition decision to discharge	▪ 12.5% of 95 million visits to the ED in 2007 for psychiatric care ▪ 90 patients (8%) stayed 24 or more hours (median=31 hours) ▪ Two academic medical centers had higher proportions of extended stay patients than the three community hospitals (12% and 15% versus 1%, 7%, and 7%, respectively; ▪ Number inpatient psychiatric beds 524,878 in 1970, down to 211,199 in 2002
Claudius et al. (2014)	Evaluate rate of admission of psychiatric patients, care provided, and estimated costs of care	▪ Single-center retrospective chart review in LA County of all patients on involuntary psychiatric holds July 2009 to December 2010 ▪ Convenience sample of patients admitted to affiliated psychiatric hospital ▪ Main outcome measures were rates of medication administration, documented counseling in first 3 days of inpatient psychiatric hospitalization on pediatric medical inpatient unit	▪ 50.1% of patients on involuntary psychiatric holds were admitted to pediatric medical unit ▪ 94.2% were admitted for boarding because no psychiatric bed was available ▪ Psychiatric patients were boarded in medical beds for 1169 days at an estimated cost of $2,232,790 or $4269 per patient over the 18-month period ▪ In US, affective disorders are the fourth most common reason for non-newborn pediatric hospitalizations; ▪ Only 25% of EDs providing pediatric care are located in hospitals with in-house mental health resources

Study	Objectives	Setting	Findings
Fieldston et al. (2014)	Describe how psychiatric patients boarding on a medical floor receive little of the care they need while incurring high costs	▪ Retrospective chart review of all patients on involuntary psychiatric holds presenting to 1 pediatric ED from July 2009 to December 2010. ▪ Primary outcome measures were rate of admission to a medical unit, rate of counseling or psychiatric medication administration, and estimated cost of nonmedical admissions (boarding)	▪ Almost 50% of Pediatric Psychiatry Consultation/Liaison services in the United States report inadequate staffing to meet clinical needs ▪ More than 50% report insufficient funding to support the service in its current form
Nicks & Manthey (2012)	Examine the impact of resource utilization, throughput, and financial impact for psychiatric patients waiting for inpatient placement	▪ All psychiatric and non-psychiatric adult admissions in an Academic Medical Center ED (>68,000 adult visits) from January 2007-2008; ▪ De-identified financial facility-based data were obtained	▪ ED LOS was significantly longer for psychiatric admissions when compared to non-psychiatric admissions (1089 min vs. 340 min) ▪ In some states, available inpatient capacity for primary psychiatric care has decreased by nearly 100%; ▪ Nationally, patients with mental health complaints account for 7% to 10% of ED visits ▪ Survey of 328 ED Medical Directors in the United States, 79.2% report routine psychiatric pt boarding with 35.1% boarding greater than 1 patient per day and 38.9% boarding for between 8 and 24 hours
Wood et al. (2014)	Provide information on disposition and cost related to ED visits by juvenile hall patients transported for urgent psychiatric evaluation	▪ Retrospective cross-sectional descriptive study of patients presenting to 1 ED from juvenile detention centers for consideration of psychiatric holds	▪ 108 patients had 196 visits and were transported from juvenile hall for urgent psychiatric evaluation, ▪ 131 (67%) resulted in involuntary psychiatric hold, ▪ More than 50% on hold (75 patients) were admitted to a medical ward for boarding because of lack of psychiatric inpatient beds

Study	Objectives	Setting	Findings
		▪ Patients identified by search of ICD-9 discharge diagnosis codes and chart review	▪ Charges for 196 visits during 18-month period totaled US $1,357,884, with most of the costs due to boarding on the medical ward
Bakhsh et al. (2014)	Characterize medication errors in psychiatric patients boarded in ED, and identify risk factors associated with these errors	▪ Prospective observational study conducted between December 2012 and May 2013 in a 50-bed community medical center ED with an estimated annual census of 76.000 patients ▪ Study includes all patients seen in the ED for primary psychiatric complaints and remained in the ED pending transfer to a psychiatric facility	▪ Total of 288 medication errors in 100 patients ▪ 65 patients had one or more medication errors; majority of errors (n = 256, 89%) were due to errors of omission ▪ American Medical Association cited an average boarding time of 34 hours and noted many patients waited several days for placement ▪ Up to 40% of boarded pts experience missed or incorrectly timed medications
Mapelli et al. (2015)	Describe trends in utilization of pediatric Emergency Department (PED) resources by patients with mental health concerns over the past 10 years at a tertiary care hospital	▪ Retrospective cohort study (British Columbia Children's Hospital (BCCH)) of tertiary PED visits from 2003 to 2012. ▪ All visits with chief complaint or discharge diagnosis related to mental health were included ▪ Main outcome measures included number and acuity of mental health-related visits, length of stay, waiting time, admission rate, and return visits, relative to all PED visits	▪ Proportion of mental health visits triaged to high acuity level decreased whereas the proportion of visits triaged to mid-acuity level has increased ▪ LOS for psychiatric patients was significantly longer than for visits to the PED in general ▪ 23% increase in number of mental health-related visits resulting in admission ▪ Mental health disorders affect 1 in 4 to 1 in 5 children every year ▪ Rate of extended LOS for mental health visits is increasing over time ▪ 8183 mental health-related visits to the BCCH PED during study period ▪ Annual number of mental health visits increased over study period (529 visits in 2002; 983 in 2012);

Study	Objectives	Setting	Findings
			represents an 85.8% increase in number of mental health visits ▪ Repeat visits represented on average 32.3% of yearly mental health visits ▪ Proportion of mental health visits triaged to a high acuity level decreased by 42.3% (from 42.3% in 2002 to 24.42% in 2012), proportion of visits triaged to the mid-acuity level increased by 30.7%;
Simpson et al. (2014)	Describe the frequency and characteristics of adult PES boarders	▪ Extracted electronic medical records for adult patients presenting to the PES in an urban county safety-net hospital over 12 months in the state of Washington	▪ 521 of 5363 patient encounters (9.7%) resulted in boarding ▪ Compared to non-boarding encounters, boarding patient encounters were associated with diagnoses of a primary psychotic, anxiety, or personality disorder, or a bipolar manic/mixed episode ▪ Boarders were more likely to be referred by family, friends or providers than self-referred ▪ Boarders were more likely to arrive in restraints; experience restraint/seclusion in the PES; or be referred for involuntary hospitalization ▪ Boarders were more likely to present to the PES on the weekend

Study	Objectives	Setting	Findings
Zeller et al. (2014)	Assess the effects of a regional dedicated emergency psychiatric facility design known at the "Alameda Model" on boarding times and hospitalization rates for psychiatric patients in area EDs	▪ Studied 30-day period beginning in January 2013 ▪ 5 community hospitals in Alameda County, CA ▪ Tracked all ED patients on involuntary mental health holds ▪ Main outcome measures were boarding time, patients were also followed to determine percentage admitted to inpatient psychiatric units after evaluation and treatment in psychiatric emergency service	▪ Of 144 patients, the average boarding time was approximately 1 hour and 48 minutes ▪ 24.8% were admitted for inpatient psychiatric hospitalization from the psychiatric emergency service ▪ Past studies have shown average boarding times ranging from 6.8 hours to 34 hours
Alakeson et al. (2010)	Develop and/or find solutions to ED boarding crisis via interviews with key stakeholders and evaluation of current literature	▪ Literature review, consultations with experts in the field, and interviews at nine hospitals ▪ All hospitals were non-profit; 8 are urban or suburban, and 7 have a psychiatric ward; 3 have psychiatric emergency services in addition to a traditional ER	▪ 2008 survey of 328 emergency room (ER) medical directors, the American College of Emergency Physicians found that roughly 80 percent believed that their hospitals “boarded” psychiatric patients

Study	Objectives	Setting	Findings
Marciano et al. (2012)	Determine if targeted education of emergency physicians (EPs) regarding treatment of mental illness will improve their comfort level in treating psychiatric patients boarding in the ED awaiting admission	▪ Pilot study ▪ Surveys used before and after an educational intervention ▪ Each survey consisted of 10 scenarios of typical psychiatric patients ▪ EPs were asked to rate their comfort levels in treating described patients on visual analogue scale ▪ Main outcome measures were calculated summary scores for the non-intervention survey group (NINT) and intervention survey group (INT)	▪ 340 participating EDs, two thirds of the respondents reported increasing numbers of PBPs (American College of Emergency Physicians, American Psychiatric Assoc., Nat'l Alliance for Mental Ill) ▪ Psychiatric patients were more likely to be readmitted than medical patients within 30 days (21% vs 13.4%) ▪ 21.1% increase in state mental health admissions between 2002 and 2005 in 8 key states in the United States
Blumstein et al. (2012)	Assess the outcomes of rounds conducted in ED each weekday at North Carolina Baptist Hospital for psychiatric patients by faculty members of the Department of Psychiatry	▪ Retrospective data review was performed to assess the effect of these rounds on the LOS and disposition of these patients ▪ The LOS and dispositions of subjects before and after the initiation of psychiatry rounds were compared ▪ Subjects had a primary psychiatric diagnosis with a LOS of 12 hours or greater ▪ 355 subjects in pre-implementation period and 512 in post-implementation period	▪ Psychiatric patients in ED are disproportionately affected by crowding and wait times ▪ Psychiatric conditions requiring admission are growing in number and in time waiting for appropriate inpatient beds ▪ Proportion of patients discharged remained unchanged (pre-implementation 49.6%; post-implementation 49.0%) ▪ More patients were admitted to the hospital (24.2%, vs. 32.8%) and fewer were transferred to other psychiatric facilities (25.6% vs. 18.0%) ▪ Among subjects with the longest LOS, those in the post-implementation group experienced a reduction in their waiting times

Study	Objectives	Setting	Findings
Polevoi et al. (2013)	Compare traditional resident consultation with a new model (co-management) to reduce LOS for patients with psychiatric emergencies, and compare the costs of this model we to those of standard care	▪ Before-and-after study conducted in the ED of an urban academic medical center without an inpatient psychiatry unit from January 1, 2007 through December 31, 2009 ▪ Co-management model was fully implemented in September 2008 ▪ Interrupted time series analysis used to study the effects of intervention on LOS for all psychiatric patients transferred for inpatient psychiatric care ▪ Secondary outcomes included average number of hours on ambulance diversion per month, and average number of patients who left without being seen from the ED	▪ 1884 patient visits were considered; compared to the pre-intervention phase, median LOS for patients transferred for inpatient psychiatric care decreased by about 22% in the post-intervention phase ▪ Ambulance diversion hours increased by about 40 hours per month and average number of patients who left without being seen decreased by about 26 per month (although not stat. sign.) in the post-intervention phase ▪ prolonged boarding of psychiatric patients seen nationwide

Study	Objectives	Setting	Findings
Berstein, (2014)	N/A; Oregon Live article	▪ Legacy plans to consolidate psychiatric beds for both adults and adolescents that are at different hospitals in Portland at a remodeled building ▪ Would allow for 101 acute psychiatric beds available for estimated 25 percent of the patient population who arrive and are in need of in-patient care for up to seven or eight days	▪ About 75% of patients who arrive at Alameda County, CA, psychiatric emergency hospital are released within 23 hours, and referred to lower-level community-based care; other 25% are admitted into an inpatient facility on site ▪ A federal investigation in 2012 found Portland police engaged in pattern and practice of using excessive force against people in mental health crisis ▪ Police Bureau pledged to pair more officers with mental health experts ▪ Bring back a specialized team of experienced officers to respond to mental health calls and help re-route certain 911 calls to mental health providers
Zeller & Rieger (2015)	Discuss the most prominent models of psychiatric crisis care and compare the pros and cons of each, with additional focus on the newest and most innovative approaches	▪ Literature Review	▪ Health care systems across the country have adopted idiosyncratic designs to fit their particular situations best ▪ Most models tend to be variations of several distinct models ▪ In 2007 1/8 (approximately 12 million) of all ED contacts was due to either a psychiatric crisis, substance use disorder, or both, with psychiatric crises comprising 64 % of that total ▪ Design 1: MH consultants in hospitals ▪ Design 2: Telepsychiatry ▪ Design 3: Dedicated MH wing of ED ▪ Design 4: Psychiatric urgent care or voluntary crisis centers ▪ Design 5: Mobile crisis teams ▪ Design 6: Acute diversion units/crisis residential

Study	Objectives	Setting	Findings
McCullumsmith et al. (2015)	Describe predictors of ED return visits, and increased LOS in psychiatric patients	▪ Retrospective chart review data of 390 patients	▪ Patients with mental health complaints comprised 12.5 % of 95 million emergency department visits in 2007 ▪ Average ED length of stay is 42 % longer for patients with mental problems, averaging more than 11 hours.
Wier et al. (2013)	Overview of children in the ED in 2010; HCUP statistical brief	▪ Nationally representative data from the Healthcare Cost and Utilization Project (HCUP) on ED visits for children younger than 18 years (excluding births) in 2010	▪ Children with MHSA conditions accounted for 1,091,000 ED visits in 2010 ▪ MHSA conditions were in the top 10 leading causes of ED visits for children in 2010
American College of Emergency Physicians (2008)	Overivew of Psychiatric and Substance Abuse Survey of 2008 findings	▪ Survey conducted from February to April 2008; distributed to +1,400 ED directors. 328 physicians responded.	▪ 79% MHSA patients boarded in their EDs ▪ More than 90% boarded patients each week; 55% daily or multiple times per week ▪ Over 60% boarded for more than 4 hours; 33% mor than 8 hours ▪
Bender et al., 2008	Provide literature review on psychiatric ED boarding in U.S. and suggestions for system level changes	▪ N/A; literature review	▪ 2007 AHA survey of hospital leaders, 42% of hospitals reported increase in boarding MHSA patients in the ED ▪ NV declared state of emergency in 2004 because individuals with MHSA disorders were flooding EDs. ▪ Boarding times for MHSA patients in Georgia's EDs average 34 hours ▪ In Maryland, many EDs see and treat over a dozen psychiatric patients daily and may board up to a dozen for days at a time.

Study	Objectives	Setting	Findings
Beech et al (2000)	Examine police referrals to general hospital EDs and characteristics of boarder and hospital visits	▪ Assessment of an after hour on call psychiatric nurse service to a general hospital ED	▪ 9% of all psychiatric ED boarders were brought in to the ED by police services
Brunero et al (2007)	Examine police presentations to general hospital EDs and characteristics of boarder and hospital visits	▪ Sample of mental health consumers (n = 868) in a general hospital ED in Australia brought in by police services	▪ Psychiatric patient police referrals were most often for schizophrenia, psychotic episode, and suicide risk, and that those referred by police services were more likely to attend the ED for psychiatric emergencies more often - between two and three times during the 12-month study period as compared to only once.
Kneebone et al. (1995)	Study purpose-built psychiatric assessment centres in North America	▪ Retrospective study of police referrals (n = 634) to a 400-bed psychiatric hospital	▪ The majority of psychiatric police referrals presenting with psychotic disorder had longer admission times than those who presented for non-psychotic issues.

Appendix A Exhibit 2. Causes of Psychiatric ED Boarding

Study	Objectives	Setting	Findings
Nolan et al. (2015)	Determine the incidence, duration and factors associated with ED boarding in the U.S.	▪ Analyzed 2008 National Hospital Ambulatory Medical Care Survey. ▪ Sample of 34,134 children and adults who visited ED in non-institutional general and short-stay hospitals in the U.S.	▪ The odd of boarding was greater for the uninsured (vs. insured) and metropolitan hospitals (vs. nonmetropolitan); also increased with age. ▪ Psychiatric patients from non-private residences boarded 2 hours longer (vs. private residences). ▪ Psychiatric patients in the Northeast boarded 2.5 hours longer (vs. the South and the West).
Weiss et al. (2012)	Identify patient and clinical management factors related to ED length of stay for psychiatric patients.	▪ Sample of 1,000 adults with psychiatrics illness treated in 5 hospital-bases EDs in Boston between June 2008 and May 2009.	▪ Patients with commercial insurance boarded 3.7 hours [95%CI: 2.7 to 5.2] while the uninsured boarded 5.1 hours [95%CI: 2.6 to 10.0]) ▪ Restraint usage increased disposition decision to discharge time by 50% for patients admitted or transferred ▪ ED boarding duration for patients aged 60 and older was 28% higher than that of those less than 40
Stephens et al. (2014)	Identify patient factors associated with extremely long length of stay (>24h) (EL-LOS) of mental health patients in ED	▪ Retrospective case-control study ▪ Sample of 242 patients in an ED of an urban academic hospital between October 2009 and May 2010	▪ OR of EL-LOS for self-pay patients = 8.68 compared to patients having insurance ▪ OR of EL-LOS for admitted patients = 15.5 compared to patients who did not require hospital admission ▪ OR of EL-LOS for patients transferred to a remote facility = 14 compared to those who are not transferred to a remote facility.

Study	Objectives	Setting	Findings
Wolf et al. (2015)	Describe US emergency nurses' estimates of lengths of stay (LOS) and factors affecting LOS for behavioral health patients in the US	▪ Mix-method study ▪ Purposive sample of 1229 emergency nurses recruited through online survey (September 10 to October 13, 2013).	▪ Availability of behavioral health nurses, availability of protocol/standards of care and higher level of perceived nursing confidence/preparation to care were associated with shorter LOS ▪ Presence of dedicated inpatient space for managing the care of behavioral health patients was associated with a reduction of 5 hours in average LOS
Misek et al. (2015)	Identify factors associated with psychiatric ED boarding	▪ Retrospective cohort study of 671 patients assessed to require inpatient psychiatric hospitalization at two community EDs in Illinois from July 1, 2010 through June 30, 2012.	▪ The uninsured boarded longer than Medicare/Medicaid patients and privately insured patients. ▪ Privately insured patients boarded longer than publicly insured patients. ▪ ED lengths of stay for patients transferred to public funded psychiatric facilities (27.7 hours) were longer than those transferred to private facilities (11.8 hours)
Wharff et al. (2011)	Determine the extent and predictors of pediatric psychiatric boarding	▪ Retrospective cohort study ▪ Sample of 461 patients at an ED of a large urban pediatric teaching hospital (July 2007 – June 2008) ▪ Comparing predictors of boarding for 2007-2008 and 1999-2000 patient cohorts	▪ Boarding odds increased for patients with autism, mental retardation, and/or developmental delay and by severity of suicidal ideation ▪ Patients presenting during weekend or presenting in months without school vacation were more likely to board. ▪ Age, race, insurance status and homicidal ideation did not predict boarding in 2007-2008 patient cohort but they did in 1999-2000 patient cohort.
Brennaman (2014)	Determine the extent and factors associated with psychiatric boarding for people meeting	▪ Sample of 170 ED patients requiring involuntary mental health examinations in 2 hospitals Florida	▪ Men had longer waits for transfer (median= 13 hours) than did women (median = 8.5 hours) ▪ Men more frequently had episodes of boarding longer than 12 and 24 hours than did women ▪ Medicare beneficiaries had 30 times greater odds of encountering delays of 12 hours or longer than

Study	Objectives	Setting	Findings
	criteria for involuntary psychiatric examination		participants with private health insurance ▪ Non-intoxicated participants waited longer (median = 18 hours) than intoxicated participants (median =13 hours)
Mansbach et al. (2003)	▪ Describe the extent of pediatric psychiatric ED boarding ▪ Compare patients who were placed successfully into psychiatric facilities with boarder	▪ Retrospective cohort study ▪ Sample of 315 psychiatric patients at a pediatric ED (July 1999 – June 2000)	▪ Odds ratio of boarding for age 10 to 13 years = 3.5 (95%CI: 1.8 – 6.6) (compared to age >13) ▪ Odds ratio of boarding for African Americans = 2.3 (95%CI : 1.1 – 4.8) (compared to White Americans) ▪ Odds ratio of boarding for presenting on a weekend or holiday = 3.8 (95%CI : 1.6 – 8.8) ▪ Odds of boarding increased by severity of homocidal ideation ▪ Patients with capitated insurance were less likely to board (OR = 0.08, 95% CI: 0.02-0.4)
Chang et al. (2011)	Describe lengths of stay (LOS) of ED patients receiving psychiatric evaluation by hospital types	▪ Prospective study ▪ Sample of 1,000 adult patients treated between June 2008 and May 2009 at 5 hospitals in Boston (2 academic medical centers and 3 community hospitals)	▪ Academic medical centers had longest disposition decision to discharge times.
Chakravarthy et al (2015)	Examine patient and hospital factors associated with lengths of stay (LOS) and prolonged lengths of stay (PLOS) of pediatric psychiatric ED patients	▪ Sample of 939 psychiatric patients (aged 3-17) in 2 urban EDs in Southern California (May 2010-May 2012) ▪ 2 EDs are the University of California, Irvine Medical Center in Orange County and Long Beach Memorial Medical Center in Los Angeles County	▪ Patients with a psychotic disorder or suicide attempt/ideation experienced a longer LOS (35% and 55% increases, respectively) and increased odds of PLOS (odds ratio, 3.07 and 8.36, respectively) compared to those admitted with substance use disorders. ▪ Being female, previous history of self-harm, and the daily census were associated with both a longer LOS and PLOS.
Warren at el. (2015)	Identify factors associated with	▪ Sample of 6335 ED patients receiving a psychiatric	▪ Median LOS = 4.1 hours ▪ 15% of visits (1424 out of 9247 visits) with

Study	Objectives	Setting	Findings
	prolonged lengths of stay (PLOS) of psychiatric ED patients	consultation at an academic hospital (September 2010 - September 2013)	prolonged LOS (8 hours or more) ▪ Increased odds of PLOS in patient age 12 to 17 years (OR= 2.43) or ≥65 years (OR=1.46) ▪ Increased odds of PLOS in male patients (OR=1.24) and Medicare patients (OR=1.34) ▪ Increased odds of PLOS with use of restraints (OR=2.25); diagnoses of cognitive disorder (OR=4.62) or personality disorder (OR=3.45) ▪ Increased odds of PLOS in those transferred to an unaffiliated psychiatric hospital (OR=22.82); ED arrival from 11 pm through 6:59 am (OR=1.53) or on a Sunday (OR=1.76)
Bastiampillai et al. (2012)	Investigate relationships between duration in ED of patients requiring admission to the psychiatric ward, the day of the week of presentation and the daily number of discharges from the psychiatric ward.	▪ 1925 psychiatric patients at the Queen Elizabeth Hospital, Adelaide, Australia (July 2008-June 2009).	▪ Inverse correlation between duration in ED and number of discharges per day from psychiatric wards with fewer discharges per day from the psychiatric ward on weekends. ▪ Average duration in ED of patients requiring admission to the psychiatric ward was 17.9 hours (SD=14.5) for those days when there were vacant beds and 24.9 hours (SD=17.5) for those days when there were no vacant beds
Rhodes et al. (2015)	▪ Characterize behavioral health (BH) ED visits of older adults ▪ Determine risk factors of prolonged length of stay (PLOS) and adverse	▪ Sample of 213 patients aged 65 or older with BH related ED visits in a community hospital trauma level 3 ED	▪ Involuntary evaluation, aggression, medical or physical restraint, and failed discharge added nearly 30 hours on average to LOS ▪ 39.4% of patients attempted medical admission declined and 17.8% of patients failed discharged ▪ Patients from facilities (skilled nursing, long-term care, or assisted living) were more likely to be refused return compared with those coming from a private residence

Study	Objectives	Setting	Findings
	events (AEs) of BH ED visits in older adults		
Wilson et al. (2015)	Determine predicting factors of lengths of stay (LOS) for patients on involuntary mental health holds	▪ Sample of 590 patient (aged >18) or 640 visits placed on involuntary mental health holds in 2 general EDs (January 2009 – August 2010)	▪ Suicidal ideation increased LOS by 36% ▪ Using antipsychotics or benzodiazepines increased LOS by 32% and 23%, respectively ▪ Presentation on weekend increased LOS by 36%
Arizona Hospital and Healthcare Association (2015)	Describe the extents, causes, impacts and solutions to psychiatric boarding in Arizona	▪ Literature review	▪ Boarded patients are likely to be male, enrolled in Medicaid or uninsured, aged 25-64, diagnosed with anxiety or dissociative disorders ▪ Increased trend of boarding in commercial insured patients ▪ 50% boarded patients waited to be discharged home and 41% awaited transfer
Nesper et al. (2015)	Evaluate the effect of decreasing county mental health services on the ED	▪ Retrospective before-after study at an academic university hospital adjacent to county mental health treatment center. ▪ EHRs collected for ED visits for 8 months before decrease (100 to 50 beds) in county services (October 2008 to May 2009) and 8 months after decrease (October 2009 to May 2010). ▪ Outcome measures included number of pts evaluated and ED LOS	▪ Cutting funding to inpatient and outpatient mental health services affect emergency medical services ▪ Publicly insured wait longer than privately insured

Study	Objectives	Setting	Findings
Chang et al. (2012)	Obtain perspectives on the rate-limiting steps (RLS) in patient care in the ED and compare them to patient's actual LOS	▪ Prospective cohort of clinicians' perspectives on the RLS among 1092 adult ED patients ▪ Medical records collected for ED LOS and other data (integrated HC network in NE US, 2008-2009) ▪ Main outcome measures include LOS and time from disposition decision to discharge	▪ Limited ED staff availability increased LOS, ▪ Need to achieve clinical stability increased LOS ▪ Limited bed availability after ED discharge increased LOS ▪ Lack of comfort with acutely ill patients increased LOS ▪ EDs' relying on Master's level (or lower) clinicians associated with increase of 80 min in overall ED LOS ▪ More diagnostic testing increased ED LOS
Claudius et al. (2014)	Evaluate rate of admission of psychiatric patients, care provided, and estimated costs of care	▪ Single-center retrospective chart review in LA County of all patients on involuntary psychiatric holds July 2009 to December 2010 ▪ Convenience sample of patients admitted to affiliated psychiatric hospital ▪ Main outcome measures were rates of medication administration, documented counseling in first 3 days of inpatient psychiatric hospitalization on pediatric medical inpatient unit	▪ Insurance benefits for inpatient and outpatient mental health treatment capped ▪ Available psychiatric beds have decreased substantially ▪ Medical units are not designed with the same therapeutic milieu or attention to suicide and violence prevention ▪ Not conducive to the counseling, group therapy, and observation performed in psychiatric units ▪ 94.2% were admitted for boarding because no psychiatric bed was available
Fieldston et al. (2014)	Describe how psychiatric patients boarding on a medical floor receive little of the care they need while incurring high costs	▪ Retrospective chart review of all patients on involuntary psychiatric holds presenting to 1 pediatric ED from July 2009 to December 2010. ▪ Primary outcome measures were rate of admission to a	▪ Gross underfunding and reduction in inpatient psychiatric bed space ▪ Inadequate staffing ▪ Deinstitutionalization has led to a reduction in number of psychiatric beds ▪ Poor reimbursement or inadequate reimbursement

Study	Objectives	Setting	Findings
		medical unit, rate of counseling or psychiatric medication administration, and estimated cost of nonmedical admissions (boarding)	▪ 523 [94.2%]) admitted for boarding because no psychiatric bed was available.
Nicks & Manthey (2012)	Examine the impact of resource utilization, throughput, and financial impact for psychiatric patients waiting for inpatient placement	▪ All psychiatric and non-psychiatric adult admissions in an Academic Medical Center ED (>68,000 adult visits) from January 2007-2008; ▪ De-identified financial facility-based data were obtained	▪ State and federal budget cuts ▪ Substantial declines in mental health resources ▪ Declining reimbursements leading to inpatient unit closures ▪ Reduced availability of community-based referral ▪ Inadequate services for uninsured or underinsured
Wood et al. (2014)	Provide information on disposition and cost related to ED visits by juvenile hall patients transported for urgent psychiatric evaluation	▪ Retrospective cross-sectional descriptive study of patients presenting to 1 ED from juvenile detention centers for consideration of psychiatric holds ▪ Patients identified by search of ICD-9 discharge diagnosis codes and chart review	▪ More than 50% on hold (75 patients) were admitted to a medical ward for boarding because of lack of psychiatric inpatient beds ▪ Charges for 196 visits during 18-month period totaled US $1,357,884, with most of the costs due to boarding on the medical ward
Bakhsh et al. (2014)	Characterize medication errors in psychiatric patients boarded in ED, and identify risk factors associated with these errors	▪ Prospective observational study conducted between December 2012 and May 2013 in a 50-bed community medical center ED with an estimated annual census of 76.000 patients ▪ Study includes all patients seen in the ED for primary psychiatric complaints and	▪ 25% of the RXs patients are taking at home not recorded during initial assessment at the time of hospitalization ▪ Incomplete medication histories ▪ Concurrent medical issues, number of comorbidities; ▪ Psychiatric boarded patients have different needs than standard patients ▪ Increasing number of home medications (OR 1.17), and increasing number of comorbidities (OR 1.89)

Study	Objectives	Setting	Findings
		remained in the ED pending transfer to a psychiatric facility	were associated with occurrence of medication errors
Mapelli et al. (2015)	Describe trends in utilization of pediatric Emergency Department (PED) resources by patients with mental health concerns over the past 10 years at a tertiary care hospital	▪ Retrospective cohort study (British Columbia Children's Hospital (BCCH)) of tertiary PED visits from 2003 to 2012. ▪ All visits with chief complaint or discharge diagnosis related to mental health were included ▪ Main outcome measures included number and acuity of mental health-related visits, length of stay, waiting time, admission rate, and return visits, relative to all PED visits	▪ Suboptimal utilization of available community-based mental health services, because of complexity in accessing them ▪ Failure of EDs in establishing long-lasting and stable mental health services to prevent recurrent crises ▪ Decreased resilience in youth and their social support network in the face of present social stressors ▪ Limitations of the current system in meeting patients' needs ▪ Majority of mental health-related patients present to the ED after business hours, at a time when community resources are not accessible
Simpson et al. (2014)	Describe the frequency and characteristics of adult PES boarders	▪ Extracted electronic medical records for adult patients presenting to the PES in an urban county safety-net hospital over 12 months in the state of Washington	▪ ED processes ▪ Reduced inpatient psychiatric bed capacity and mental health financing ▪ Inefficient use of affordable community-based care ▪ Law enforcement processes, legal standards for emergency care ▪ Standard EDs lack the physical environment, therapeutic milieu, programming, and consistent provider teams of an inpatient unit
Zeller et al. (2014)	Assess the effects of a regional dedicated emergency psychiatric facility design known at the "Alameda Model" on boarding times	▪ Studied 30-day period beginning in January 2013 ▪ 5 community hospitals in Alameda County, CA ▪ Tracked all ED patients on involuntary mental health holds	▪ Limited, if any, onsite mental health services ▪ 2008 ACEP survey found that more than 60% of EDs board patients needing admission for over 4 hours, 33% board for over 8 hours, and 6% board for over 24 hours

Study	Objectives	Setting	Findings
	and hospitalization rates for psychiatric patients in area EDs	▪ Main outcome measures were boarding time, patients were also followed to determine percentage admitted to inpatient psychiatric units after evaluation and treatment in psychiatric emergency service	▪ Prolonged boarding times are a reflection of the time required in finding a placement and transferring patients to inpatient psychiatric beds ▪ Lack of available psychiatric clinicians to evaluate patients ▪ Requirements for pre-authorization of insurance prior to admission ▪ Lack of resources to conduct psychiatric evaluations ▪ Lack of appropriate lower levels of outpatient care
Vidhya et al. (2010)	Develop and/or find solutions to ED boarding crisis via interviews with key stakeholders and evaluation of current literature	▪ Literature review, consultations with experts in the field, and interviews at nine hospitals ▪ All hospitals were non-profit; 8 are urban or suburban, and 7 have a psychiatric ward; 3 have psychiatric emergency services in addition to a traditional ER	▪ Inability to gain timely access to community-based care ▪ Deinstitutionalization movement reduced amount/availability of inpatient psychiatric care (beginning 1960s) ▪ Low reimbursement rates from public health insurance deters providers/facilities ▪ Systems do not have reason to collaborate, because they don't share funding, governance, or licensing
Marciano et al. (2012)	Determine if targeted education of emergency physicians (EPs) regarding treatment of mental illness will improve their comfort level in treating psychiatric patients boarding in the ED awaiting admission	▪ Pilot study ▪ Surveys used before and after an educational intervention ▪ Each survey consisted of 10 scenarios of typical psychiatric patients ▪ EPs were asked to rate their comfort levels in treating described patients on visual analogue scale ▪ Main outcome measures were calculated summary scores for the non-intervention survey	▪ Crowding of ED's ▪ Lack of available inpatient beds ▪ Comfort level of emergency physicians affects treatment of mentally ill patients ▪ Demand for mental health services exceeds supply ▪ Budget cuts for mental-health programs and services ▪ EDs unable to bill for holding PBPs

Study	Objectives	Setting	Findings
		group (NINT) and intervention survey group (INT)	
Blumstein et al. (2012)	Assess the outcomes of rounds conducted in ED each weekday at North Carolina Baptist Hospital for psychiatric patients by faculty members of the Department of Psychiatry	▪ Retrospective data review was performed to assess the effect of these rounds on the LOS and disposition of these patients ▪ The LOS and dispositions of subjects before and after the initiation of psychiatry rounds were compared ▪ Subjects had a primary psychiatric diagnosis with a LOS of 12 hours or greater ▪ 355 subjects in pre-implementation period and 512 in post-implementation period	▪ ED often primary source of care for psychiatric patients, or gateway to care ▪ Mental health services budget cuts ▪ Conversion of two state psychiatric hospitals to outpatient services and only one inpatient facility with a net loss of state funded beds
Polevoi et al. (2013)	Compare traditional resident consultation with a new model (co-management) to reduce LOS for patients with psychiatric emergencies, and compare the costs of this model we to those of standard care	▪ Before-and-after study conducted in the ED of an urban academic medical center without an inpatient psychiatry unit from January 1, 2007 through December 31, 2009 ▪ Co-management model was fully implemented in September 2008 ▪ Interrupted time series analysis used to study the effects of intervention on LOS for all psychiatric patients transferred for inpatient psychiatric care	▪ Deinstitutionalization movement ▪ Lack of funding ▪ Political forces ▪ Critical limitation of inpatient psychiatric capacity ▪ Many different clinician "hand-offs";

Study	Objectives	Setting	Findings
		▪ Secondary outcomes included average number of hours on ambulance diversion per month, and average number of patients who left without being seen from the ED	
Berstein, (2014)	N/A; Oregon Live article	▪ Legacy plans to consolidate psychiatric beds for both adults and adolescents that are at different hospitals in Portland at a remodeled building ▪ Would allow for 101 acute psychiatric beds available for estimated 25 percent of the patient population who arrive and are in need of in-patient care for up to seven or eight days	▪ ERs aren't equipped to properly care for people in mental health ▪ Need to improve community-based services ▪ Hand-offs between organizations is not smooth
Zeller & Rieger (2015)	Discuss the most prominent models of psychiatric crisis care and compare the pros and cons of each, with additional focus on the newest and most innovative approaches	▪ Literature Review	▪ Design 1: Not always staffed, and have to come from home, on-call, or other areas in hospitals ▪ Design 1: No opportunity to observe and re-evaluate pt. disposition that assigned at intake, but may no longer be accurate upon discharge or after observation ▪ Design 2: Efficacy, safety, and patient satisfaction have been shown to be roughly equivalent to interactions with a psychiatrist in the same room ▪ Design 3: More therapeutically appropriate atmosphere ▪ Design 4: Most crisis centers exclude individuals who are dangerous, have a history of dangerous behavior, or who are acutely hallucinating,

Study	Objectives	Setting	Findings
			medically compromised, intoxicated, or in substance withdrawal; limits overall effectiveness in reducing ED utilization for psychiatric conditions ▪ Design 5: Can often help resolve patient's crisis without having to transport to hospital ▪ Design 6: Ideal for patients who would normally require inpatient psychiatric care, but are eager to engage in treatment, willing to participate in groups and activities, and have not reached a level of acuity or dangerousness that would necessitate only hospitalization
McCullumsmith et al. (2015)	Describe predictors of ED return visits, and increased LOS in psychiatric patients	▪ Retrospective chart review data of 390 patients	▪ Lack of availability of outpatient services ▪ Homelessness ▪ Lack of insurance/public insurance ▪ Predictors of ED return included psychosis, personality disorder and increased number of prior ED visits ▪ Longer wait for the TPC was associated strongly with non-attendance ▪ TPC appointment within 3 days was associated with significantly longer time in the community without ED presentation ▪ Rapid follow-up after ED visits increased attendance at aftercare and lengthened community tenure
Grob et al., 1994	Describe history of deinstitutionalization of MHSA patients in the U.S.	▪ N/A	▪ Process of deinstitutionalization has led to massive transfer of severely mentally-ill persons out of institutional care in favor of community treatment

Study	Objectives	Setting	Findings
Manderscheid et al., 2004	Examine trends in the availability and use of mental health services in state adult correctional facilities	▪ Results from the 1988 Inventory of Mental Health Services in State Adult Correctional Facilities of the Center for Mental Health Services were compared with those from the 2000 Census of State and Federal Adult Correctional Facilities survey of the Bureau of Justice Statistics	▪ From 1970 to 2000 public psychiatric hospital beds dropped from 207 to 21 beds per 100,000 persons
Weithorn, 2005	Book about U.S. response to children and adolescents with issues of mental health, substance abuse, and criminality	▪ N/A	▪ Overall capacity of community mental health programs has and is still limited
ACEP, 2008	Report on survey of ED medical directors from survey conducted from February to April 2008 and distributed to +1,400 ED directors. 328 respondents	▪ Psychiatric and Substance Abuse Survey from February to April 2008, distributed to +1,400 ED directors. 328 respondents	▪ Difficulty obtaining insurance authorization or uninsured status included in list of reasons for ED boarding of psychiatric patients
Strauss et al. (2005)	Describe characteristics of consumers brought into N. American ED by trained police officiers compared	▪ Sample of 485 North American consumers brought to ED by a team of police who had received intensive mental health training	▪ Individuals with mental illness brought in by police team were more likely to be homeless, be known to mental health services, and have schizophrenia

Study	Objectives	Setting	Findings
	with consumers not brought in by this team		
Lee et al (2008)	Determine the frequency profile and characteristics of consumers of mental health services brought in by police to the ED	▪ Data from the emergency department information system and psychiatric assessment from medical records of mental health presentations brought in by the police to a general ED between 2003 and 2005. The sample consisted of 542 consumers with a mental health problem brought in by the police to the ED of a 350-bed community hospital	▪ The majority of psychiatric ED boarding brought to the ED by police services occurred after working hours and on weekends while mental health services were least accessible

Appendix A Exhibit 3. Impacts of Psychiatric ED Boarding

Study	Objectives	Setting	Findings
Halmer et al. (2015)	Provide an overview of mental health and behavioral emergency treatment	▪ Literature review	▪ The boarding of psychiatric patients in overburdened EDs with inadequately trained staff creates a suboptimal acute care setting that negatively impacts patient care.

Study	Objectives	Setting	Findings
	in the US; address policy considerations to improve treatment for patients with acute mental health crisis		▪ Deficiencies in acute/chronic mental health care have contributed to growing rates of substance abuse, homelessness, and incarceration among the mentally ill in the United States.
Rhodes et al. (2015)	Characterize behavioral health (BH) ED visits of older adults; determine risk factors of prolonged length of stay (PLOS) and adverse events (AEs) of BH ED visits in older adults	▪ Sample of 213 patients aged 65 or older with BH related ED visits in a community hospital trauma level 3 ED	Adverse and potential adverse events increased by 20% for every additional 10 h in the ED
Abid et al. (2014)	Provide an overview of psychiatric boarding in the US	▪ Policy brief	▪ Low quality of care: inadequate psychiatric services during boarding ▪ Increase psychological stress due to chaotic environment in ED ▪ Require more nursing care and thus worsen crowding that leads to longer waits of other patients to be seen and treated.
Bender et al. (2008)	Provide a literature review on psychiatric ED boarding in the US and suggestions for system-level changes	▪ Literature review	▪ Psychiatric patients are more likely to be uninsured or enrolled in Medicaid that may provide inadequate reimbursement for hospitals. ▪ Hospitals are not reimbursed for boarding patients in some states. ▪ Financial strain leads to closure of psychiatric units or decline in number of psychiatric inpatient beds.

Study	Objectives	Setting	Findings
			▪ Reduce availability of emergency staffs ▪ Longer waits for patients in ED ▪ Create patient frustration ▪ Lower quality of care for other patients
Arizona Hospital and Healthcare Association (2015)	Describe the extents, causes, impacts and solutions to psychiatric boarding in Arizona	▪ Literature review	The average psychiatric boarding case costs upwards of $6,220, leading to a total statewide cost of over $20 million each year due to psychiatric boarding.
Chang et al. (2012)	Obtain perspectives on the rate-limiting steps (RLS) in patient care in the ED and compare them to patient's actual LOS	▪ Prospective cohort of clinicians' perspectives on the RLS among 1092 adult ED patients ▪ Medical records collected for ED LOS and other data (integrated HC network in NE US, 2008-2009) ▪ Main outcome measures included LOS and time from disposition decision to discharge	▪ Bottlenecks in EDs ▪ Most RLS in patient care were associated with actual increases in ED wait time for patients ▪ EDs' relying on Master's level (or lower) clinicians associated with increase of 80 min in overall ED LOS ▪ 1 in 12 adult patients receiving psychiatric consultations in study stayed in the ED for 24 hours or more (median=31 hours)

Study	Objectives	Setting	Findings
Claudius et al. (2014)	Evaluate rate of admission of psychiatric patients, care provided, and estimated costs of care	▪ Single-center retrospective chart review in LA County of all patients on involuntary psychiatric holds July 2009 to December 2010 ▪ Convenience sample of patients admitted to affiliated psychiatric hospital ▪ Main outcome measures were rates of medication administration, documented counseling in first 3 days of inpatient psychiatric hospitalization on pediatric medical inpatient unit	▪ Lack of psychiatric inpatient beds prolongs ED LOS ▪ Resulted in less psychiatric medication administration ▪ Less counseling services provided ▪ Patients' previously prescribed psychiatric medications were withheld those medications (often awaiting parental consent for administration) ▪ Among pediatric psychiatric patients on involuntary holds, only 6% received counseling and 20% received medication
Fieldston et al. (2014)	Describe how psychiatric patients boarding on a medical floor receive little of the care they need while incurring high costs	▪ Retrospective chart review of all patients on involuntary psychiatric holds presenting to 1 pediatric ED from July 2009 to December 2010. ▪ Primary outcome measures were rate of admission to a medical unit, rate of counseling or psychiatric medication administration, and estimated cost of nonmedical admissions (boarding)	▪ Delays in psychiatric treatment ▪ compromises all domains of quality (including safety, effectiveness, efficiency, timeliness, patient-centeredness, and equity) ▪ Thirty-two (6.1%) admitted for isolated psychiatric reasons had counseling documented ▪ 105 (20.1%) received psychiatric medications. ▪ Patients admitted to psychiatric hospital were significantly more likely to receive counseling and medications. ▪ Psychiatric patients were boarded in medical beds for 1169 days at an estimated cost of $2,232,790 or $4269 per patient over the 18-month period.

Study	Objectives	Setting	Findings
Nicks & Manthey (2012)	Examine the impact of resource utilization, throughput, and financial impact for psychiatric patients waiting for inpatient placement	▪ All psychiatric and non-psychiatric adult admissions in an Academic Medical Center ED (>68,000 adult visits) from January 2007-2008; ▪ De-identified financial facility-based data were obtained	▪ Increased risk of symptom exacerbation or elopement; medication errors ▪ Increased ancillary resource utilization ▪ Increased labor costs for safety attendants or security officers ▪ Increased transport delays ▪ Ambulance diversion ▪ Payer mix associated with 40% decrease in avg physician reimbursement when compared to non-psychiatric cohort ▪ Psychiatric pts remained in the ED 3.2 times longer than non-psychiatric patients, preventing 2.2 bed turnovers (additional patients) per psychiatric patient ▪ Financial impact of psychiatric boarding accounted for a direct loss of ($1,198) compared to non-psychiatric admissions ▪ Psychiatric boarding awaiting inpatient placement cost the department $2,264 per patient
Bakhsh et al. (2014)	Characterize medication errors in psychiatric patients boarded in ED, and identify risk factors associated with these errors	▪ Prospective observational study conducted between December 2012 and May 2013 in a 50-bed community medical center ED with an estimated annual census of 76.000 patients ▪ Study includes all patients seen in the ED for primary psychiatric complaints and remained in the ED pending transfer to a psychiatric facility	▪ Increase in medication administration errors; 288 medication errors in 100 patients ▪ 65 patients had one or more medication errors ▪ Concurrent medical conditions remain unknown, untreated or ignored; ▪ Psychiatric patients reside in ED for longer while waiting for transfer to psychiatric facility ▪ omission of needed home medications creates increased potential to cause harm

Study	Objectives	Setting	Findings
Mapelli et al. (2015)	Describe trends in utilization of pediatric Emergency Department (PED) resources by patients with mental health concerns over the past 10 years at a tertiary care hospital	▪ Retrospective cohort study (British Columbia Children's Hospital (BCCH)) of tertiary PED visits from 2003 to 2012. ▪ All visits with chief complaint or discharge diagnosis related to mental health were included ▪ Main outcome measures included number and acuity of mental health-related visits, length of stay, waiting time, admission rate, and return visits, relative to all PED visits	▪ Mean LOS in the PED for patients with mental health concerns was significantly longer than for the rest of the PED (279 minutes vs 183 minutes) ▪ Absolute number of admissions following mental health presentations to the PED increased by 53.7%
Simpson et al. (2014)	Describe the frequency and characteristics of adult PES boarders	▪ Extracted electronic medical records for adult patients presenting to the PES in an urban county safety-net hospital over 12 months in the state of Washington	▪ 521 patient encounters (9.7%, 466 unique patients) were converted to boarding status while in the PES ▪ Boarding episodes lasted a median of 27.2 hours ▪ Boarding encounters were more likely to involve physical restraint or seclusion in PES or referral for involuntary hospitalization
Vidhya et al. (2010)	Develop and/or find solutions to ED boarding crisis via interviews with key stakeholders and evaluation of current literature	▪ Literature review, consultations with experts in the field, and interviews at nine hospitals ▪ All hospitals were non-profit; 8 are urban or suburban, and 7 have a psychiatric ward; 3 have psychiatric emergency services in addition to a traditional ER	▪ Because ED not equipped, boarded patients do not receive high-quality care there ▪ Psychiatric patient presence affects care received by other patients ▪ Boarded patients reduce ER capacity and increase pressure on staff ▪ Boarding has negative financial impact on hospitals because reimbursement rates do not account for boarding

Study	Objectives	Setting	Findings
Marciano et al. (2012)	Determine if targeted education of emergency physicians (EPs) regarding treatment of mental illness will improve their comfort level in treating psychiatric patients boarding in the ED awaiting admission	▪ Pilot study ▪ Surveys used before and after an educational intervention ▪ Each survey consisted of 10 scenarios of typical psychiatric patients ▪ EPs were asked to rate their comfort levels in treating described patients on visual analogue scale ▪ Main outcome measures were calculated summary scores for the non-intervention survey group (NINT) and intervention survey group (INT)	▪ Lack/suboptimal appropriate treatment for psychiatric boarders ▪ Discharging psychiatric boarders when they are not completely stable ▪ Compromises in all patient care and safety ▪ Comparison of summary scores between 'NINT' and 'INT' groups showed a highly significant improvement in comfort levels with treating PBPs
Blumstein et al. (2012)	Assess the outcomes of rounds conducted in ED each weekday at North Carolina Baptist Hospital for psychiatric patients by faculty members of the Department of Psychiatry	▪ Retrospective data review was performed to assess the effect of these rounds on the LOS and disposition of these patients ▪ The LOS and dispositions of subjects before and after the initiation of psychiatry rounds were compared ▪ Subjects had a primary psychiatric diagnosis with a LOS of 12 hours or greater ▪ 355 subjects in pre-implementation period and 512 in post-implementation period	▪ Ed crowding has negative effects on patient care processes ▪ Significant costs to institutions ▪ Fewer beds available for other patients ▪ Boarding patients with longest waits were affected most by reduced wait times ▪ LOS is positive associated with ED wait time and use of physical restraints and seclusion for psychiatric patients ▪ In 6-month post-implementation period 3,123 bed hours were saved (equals opportunity to see additional 726 patients during time period)

Study	Objectives	Setting	Findings
Polvoi et al. (2013)	Compare traditional resident consultation with a new model (co-management) to reduce LOS for patients with psychiatric emergencies, and compare the costs of this model we to those of standard care	▪ Before-and-after study conducted in the ED of an urban academic medical center without an inpatient psychiatry unit from January 1, 2007 through December 31, 2009 ▪ Co-management model was fully implemented in September 2008 ▪ Interrupted time series analysis used to study the effects of intervention on LOS for all psychiatric patients transferred for inpatient psychiatric care ▪ Secondary outcomes included average number of hours on ambulance diversion per month, and average number of patients who left without being seen from the ED	▪ Crowding of ED's ▪ Difficulty placing psychiatric patients ▪ Resource-intensive ▪ Decreased quality of care for psychiatric patients ▪ Prolonged LOS ▪ Lack of patient turnover ▪ Negative financial impacts; compared to non-intervention ▪ With new model median ED LOS for patients transferred for inpatient psychiatric care decreased by about 22% ▪ Reduction in LOS resulted in increased capacity for new patients ▪ ED charges increased by $2.1 million (sum of professional and technical fees) in the post-intervention phase; resulting revenue was sufficient to cover cost of hiring 1.5 FTE psychiatrists and additional social workers, the additional personnel needed for this model
McCullumsmith et al. (2015)	Describe predictors of ED return visits, and increased LOS in psychiatric patients	▪ Retrospective chart review data of 390 patients	▪ Overcrowding ▪ Recidivism ▪ Poor patient outcomes ▪ Increased risks of harm to patients and staff ▪ Delays in care ▪ Compromises of privacy and confidentiality ▪ Elevated risk of morbidity and mortality upon discharge
Webster & Harris (2004)	Promote improvement in collaboration between law	▪ N/A	▪ to facilitate collaboration between law enforcement and EDs in appropriately managing mental health patients that present to EDs mental health liaison

Study	Objectives	Setting	Findings
	enforcement and EDs in treatment of individuals with mental illness		teams should be established between EDs and police services
Lamb et al. (2002)	Describe the outcomes from a police mental health team in the assessment and management of psychiatric ED referrals in a community service	▪ North American study of police mental health teams in management of psychiatric ED referrals	▪ Suggest the need for outreach teams consisting of both police officers and mental health service professionals to assist in the adequate care of individuals presenting to EDs for mental illness.

Appendix B1. Description of Quantitative Data Sources

Hospital ED Discharge

Hospital discharge data were obtained from Oregon Association of Hospital and Health Systems (OAHHS) and capture information on all Oregon hospital ED visits, including patient demographic characteristics, admission and discharge date and time, length of stay in EDs (measured in days), up to four ICD-9 diagnoses, charged amount, and discharge destination.

The hospital data contain ED utilization records for both Medicaid and non-Medicaid patients who were admitted to hospital EDs in Oregon. However, the data are administrative records and therefore potential reporting inaccuracy is expected. Further, approximately 81% of the discharge hour field in the raw data set is missing, which make it practically impossible to explore the ED boarding problem using information on hours of ED episodes. Finally, only billed amount is included in the raw data, making it difficult to analyze ED expenditures associated with ED boarding of psychiatric patients. To address such caveats, we augmented the raw hospital discharge data set by linking it to the EDIE and Medicaid claims data. See below for details.

EDIE

The EDIE is a web-based, real-time intra- and inter-ED communication and information technology that allows ED clinicians to exchange patient information, develop notification systems, and coordinate care for patients with complex care needs. For example, EDIE can design notifications to identify patients who utilize the ED more than five times in twelve months, or assist ED clinicians in directing patients to the right care setting based on current and previous healthcare utilization and needs.

Currently, all Oregon hospitals have completed the legal review and signed agreements with Collective Medical Technologies. The most recent report from Oregon Health Leadership Council (OHLC) indicates that 93% of Oregon hospitals have completed the IT process and are receiving EDIE notifications, with 77% considered "EDIE Utility Ready." EDIE is used by many Oregon Coordinated Care Organizations (CCOs) and Commercial Health plans. CCOs using EDIE currently include Family Care, Pacific Source, Columbia Pacific, Jackson Care Connect, Willamette Valley, Yamhill, and Health Share. Commercial plans using EDIE include Kaiser, Humana, Providence, Centene, and United Health. OHLC is facilitating implementation of EDIE throughout the state, communication among stakeholders and communities, financing, and expanding use.

EDIE data used for our analyses included ED utilization information for October, 2014 through September, 2015. The data contain hospital ED admission and discharge date and time, discharge destination, patient demographics, and ICD-9 diagnosis and procedure codes. In total, our EDIE data set includes information for 245,645 unique individuals and 539,923 unique ED visits.

The raw EDIE data set had almost complete information on ED admission and discharge date and time, capturing both Medicaid and non-Medicaid patients. However, it does not include charge or payment information. In addition, data accuracy may be challenged by inconsistent EDIE adoption practices. As discussed below, we augment the EDIE data using the hospital discharge and Medicaid data to overcome the identified shortcomings. See below for details.

Medicaid Claims and Eligibility

ED utilization and cost data for Medicaid patients were also retrieved from Medicaid claims files supplied by the Office of Heath Analytics, Oregon Health Authority (OHA). The OHA also provided Medicaid enrollment data, which were used to retrieve demographic data for Medicaid patients. The raw data included duplicate patient-episode records which were deleted based on unique person and claim identifiers. The final analytic Medicaid claims data set included unique person-episode information on ED admission and discharge date, charged and reimbursed amount, and ICD-9 diagnosis and procedure codes up to 13 codes per episode. Overall, our analysis of Medicaid data (as well as the other two data sets below) was restricted to October, 2014 through September, 2015 during which complete data were available from all three data sources. The final Medicaid analytic data set included 391,479 unique ED episodes from October, 2014 through September, 2015 on total 185,292 unique patients.

Medicaid claims provide a reliable record of the care received by the patient, and represent only source of actual payment for ED services. However, there are several significant limitations we endeavored to address in our analysis. First, Medicaid claims include data only on Medicaid patients. Second, discharge dates are often missing. Third, there is no recorded admission and discharge hours, which are critical to measure the extent of ED boarding based on hours of ED stay. To overcome the limitations, we augmented the Medicaid data using information from the two additional data sources, hospital discharge and EDIE. See below for details.

Procedure to Address Limitations of Independent Data Sources

The OAHHS performed the data linkage which identified the unique individuals across the three independently-maintained data sources and assigned random person identification numbers to unique individuals. OSU researchers then used the unique person identifier, ED admission date and time, and diagnoses to link the three data files at the person-episode level. When linking, we applied the following algorithm to overcome the caveats for each data set discussed above:

- Patient demographic information came first from Medicaid enrollment data. Missing information was then filled using hospital discharge and EDIE data.
- ED cost data came originally from Medicaid data. Missing information was filled using hospital discharge data. Charges or billed amount from hospital discharge data were converted to expected payment. To compute the expected payment, charges were multiplied by the average cost-to-charge ratio, defined as actual payment divided by billed amount for Medicaid patients. The charged amount from hospital discharge data includes only facility expenses. We computed a conversion factor, the ratio of national total ED cost (both facility and doctor costs) to ED facility cost, using data from the 2014 Medical Expenditure Panel Survey. We use the conversion factor to convert the expected payment for hospital ED facility to total ED cost.
- ED admission and discharge date and time came first from the EDIE data. Roughly 7% of discharge hour information is missing in the raw EDIE data. Missing date and time were

filled with information from hospital discharge data. Complete data on admission and discharge data and time were then appended to all three data sets.

- All augmented data sets contain unique ED visits for a one-year sample period from October 1, 2014 to September 30, 2015 during which complete data were available from all three data sources.

Full Linked Data

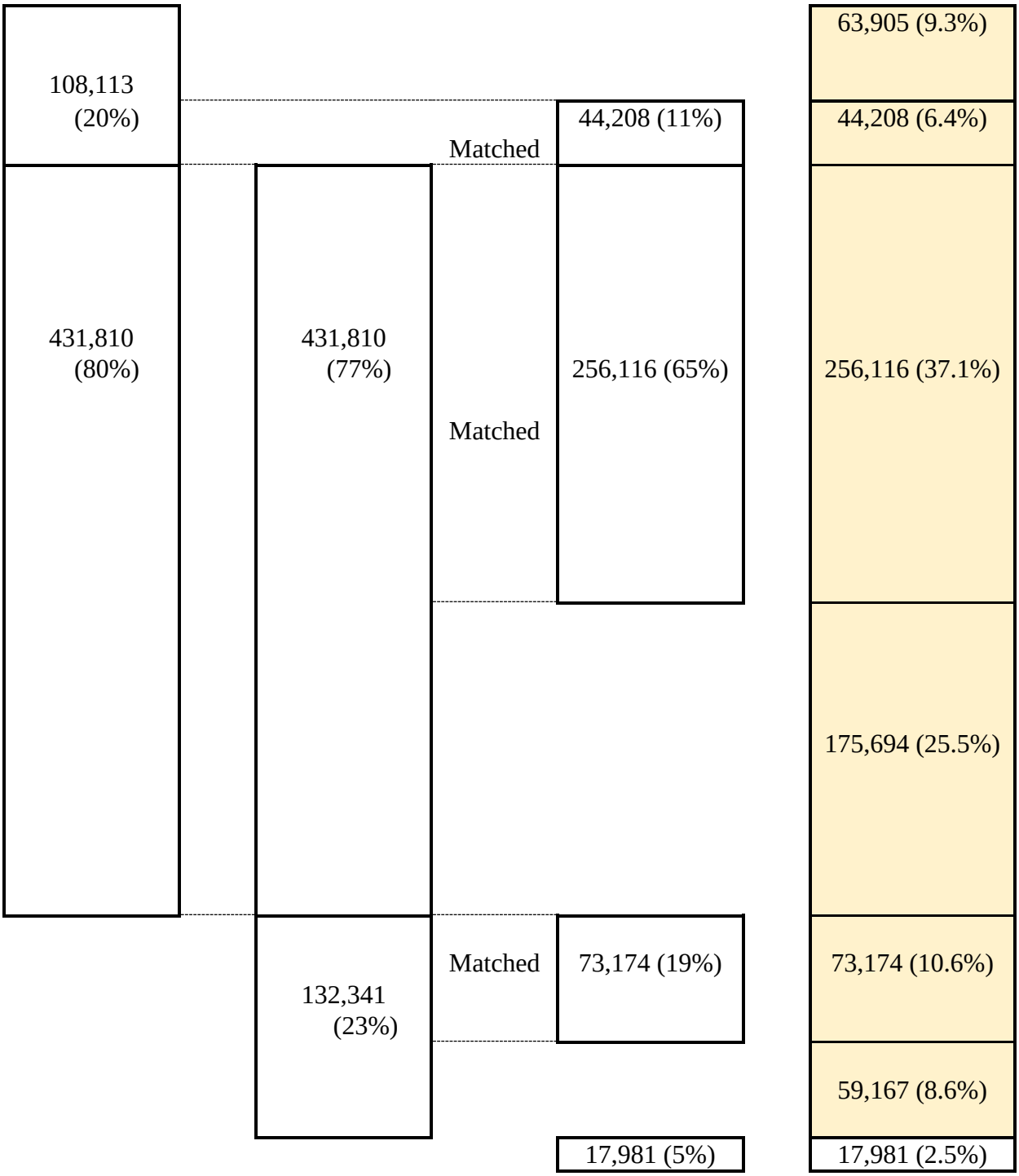
As we noted above, each data source has its own strengths and weaknesses and we addressed the identified caveats by augmenting the raw data sets individually. However, the raw data sets contain only records for ED patients who were successfully linked across the three data sources based on full name and birth date, and do not contain the universe of hospital ED visits in Oregon. To mitigate this concern, we combined all unique ED episodes from all three raw data sets into a single analytic 'full-linked' data set. Our analysis is also restricted to the one-year sample period.

<Appendix B1 Exhibit 1> illustrates the linkage process and shows the final fully linked data set. First, The EDIE data were linked to Hospital ED discharge data, according to unique person identifier and unique episode identifier. Eighty percent of observations in the EDIE data were uniquely match-merged with the hospital ED discharge data while 77% of hospital ED discharge data were matched with EDIE data.

Second, the Medicaid claims data were then linked to create the full-linked data set. Sixty-five percent of observations in Medicaid claims data were matched with both EDIE and hospital discharge data sets. Eleven percent of Medicaid claims records were linked uniquely to EDIE data only and 19% were matched with hospital ED discharge data only. Five percent of Medicaid claims data were not linked to either of the two data sources.

The full linked data set included 690,245 unique ED episodes on 290,181 unique individuals, with an average of approximately 2.4 ED episodes per patient during the one-year sample period. In the combined data set, the EDIE data captured 78% of total unique ED visits while hospital ED discharge data captured 82%. Twenty-seven percent of all ED visits in the full-linked data set or 256,116 observations were linked across all three data sets. In comparison, 6.4% of the total ED episodes or 44,208 observations were matched between EDIE and Medicaid claims; 10.6% or 73,174 observations were reported in both hospital ED discharge and Medicaid claims datasets; 9.3% or 63,905 observations came from EDIE data only; 8.6% or 59,167 observations were only reported in hospital ED discharge data; and 2.6% or 17,981 observations in Medicaid data did not match with either of the other data sets. Roughly 20% of the entire unique episodes or 141,055 observations originated from a single data source.

Appendix B1 Exhibit 1. Linkage of hospital discharge, EDIE and Medicaid claims



Appendix B2. Description of Psychiatric ED Visit

Psychiatric ED visit describes ED episodes for both pediatric and adult patients who have been admitted with an ICD-9 code corresponding to mental health conditions. The following table shows the ICD-9 codes and their corresponding diagnoses used to define psychiatric ED visits in Oregon hospital EDs for EDIE data, Hospital ED data, and Medicaid claims data. We adopted psychiatric visit profiling suggested by Slade & Goldman (2015) and Yoon et al. (2014). The following ICD-9 codes were considered to indicate a psychiatric visit.

ICD-9 codes for psychiatric ED visit

ICD-9 code	Description
290	Organic Psychotic Conditions
293	Transient Mental Disorders due to Conditions Classified Elsewhere
294	Persistent Mental Disorders due to Conditions Classified Elsewhere
295	Schizophrenic Disorders
296	Episodic Mood Disorders
2962	Major Depressive Disorder - single episode
297	Delusional Disorders
298	Non-organic Psychoses
299	Pervasive Developmental Disorders
300	Neurotic Disorders
301	Personality Disorders
302	Sexual Disorders
305	Nondependent Abuse of Drugs
306	Psycho-physiological Disorders
307	Special Mental Symptoms Not Elsewhere Classified
308	Acute Reaction to Stress
309	Adjustment Reaction
310	Nonpsychotic Brain Syndrome
311	Depressive Disorder Not Elsewhere Classified
312	Conduct Disturbance Not Elsewhere Classified
313	Emotional Disorders of Adolescence
314	Hyperkinetic Syndrome
315	Specific Delays in Development

316	Psychic Factors with Other Disorders
317	Mild Intellectual Disabilities
318	Moderate Intellectual Disabilities
319	Unspecified Intellectual Disabilities
797	Senility without Mention of Psychosis
3310	Alzheimer's Disease
3311	Pick's Disease
3312	Senile Degeneration of Brain
3318	Cerebral Degeneration
6484	Mental Disorders in Pregnancy
E95.0	Suicide and Self-inflicted Poisoning by Solid or Liquid Substances
E95.9	Late effects of Self-inflicted Injury
V40.0	Problems with Learning
V40.1	Problems with Communication
V40.2	Mental Problems (Other)
V40.3	Mental Problems (Other)
V40.9	Mental/Behavior Problem Not Otherwise Specified
V62.8	Other Psychological or Physical Stress Not Elsewhere Classified
V66.3	Mental Disorder Convalescence
V67.3	Psychiatric Follow-up
V70.1	Psychiatric Exam - Authority Requested
V70.2	General Psychiatric Examination
V71.0	Observation for Suspected Mental Condition
V79.0	Screening for Depression
V79.8	Screening for Other Specified Mental Disorders and Developmental Handicaps
V79.9	Screening for Unspecified Mental Disorders and Developmental Handicap

Appendix B3. Comparison of Matched and Full ED Visit Sample for Medicaid Patients

We assess whether the raw data only for linked patients are representative of all ED visits in Oregon using full Medicaid claims data for the one-year sample period which included ED data for both matched and unmatched patients. Presented below are descriptive characteristics separately for all ED visits from the full Medicaid claims data and the subset of all ED visits analyzed in this report.

First, our analytic data for Medicaid patients included 319,479 unique ED visits while the full claims data included 806,403 unique ED visits. Therefore, Medicaid ED visits in our analytic data represent 40% of the entire Medicaid ED visits. In comparison, the full-linked analytic data also contain 40% of all ED visits in Oregon regardless payers.

Second, basic demographic characteristics are similar between the matched and full Medicaid samples.

Third, the rate of psychiatric visits is higher for the matched Medicaid sample and the rate of substance abuse is also slightly higher for the matched Medicaid sample.

We also note that the rate of boarded psychiatric ED visits for Medicaid patients is identical to that for the fully-linked analytic data set as shown in <Exhibits 3-2 and 3-20>, suggesting that Medicaid ED data are representative of all ED data in Oregon. Therefore, taken together, our psychiatric ED boarding data presented in this report are likely to be representative of data for all ED visits in Oregon during the study period, although our estimates may slightly overestimate rates of psychiatric ED boarding in Oregon.

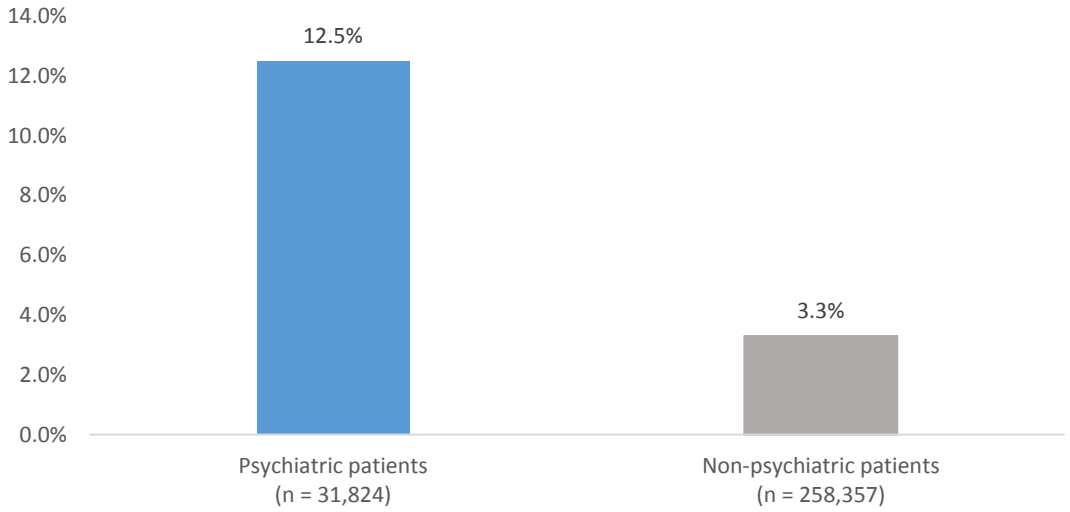
Variable	Matched Medicaid sample		Full Medicaid sample	
	Mean	Std. dev.	Mean	Std. dev.
Psychiatric visit	18.0%	0.38	12.1%	0.33
Severe psychiatric	2.5%	0.16	1.9%	0.13
Non-severe psychiatric	15.5%	0.36	10.2%	0.30
Substance abuse	4.6%	0.21	3.0%	0.17
Age	33.1	19.3	34.4	20.2
Female	58.0%	0.49	56.1%	0.50
Race				
White	86.9%	0.34	86.1%	0.35
Black	6.9%	0.25	6.3%	0.24
AIAN	2.5%	0.16	2.6%	0.16
Asian	1.5%	0.12	1.8%	0.13
NHPI	0.4%	0.06	0.4%	0.06
Other	1.7%	0.13	2.6%	0.16
Hispanic	11.3%	0.32	12.9%	0.34

Appendix B4. Analysis of the full-linked data set: Unique ED patients

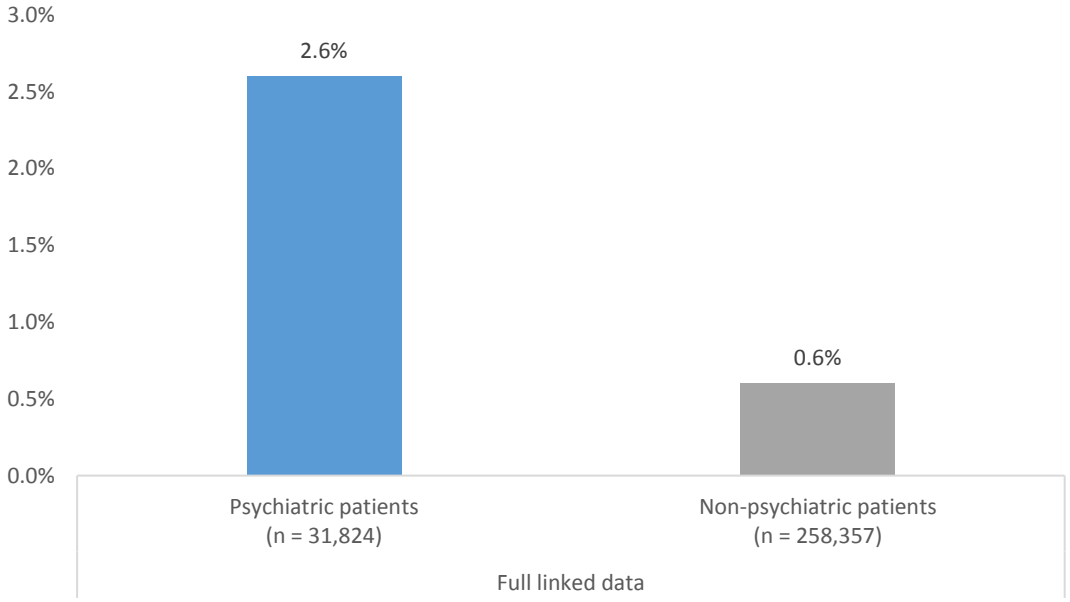
<Appendix B4 Exhibit 1> reports the proportion of boarded ED patients separately for psychiatric and non-psychiatric patients. As shown in Panel A, based on the 6-hour definition, 12.5% of all psychiatric patients were boarded, about four times larger than 3.3% for non-psychiatric ED patients.

Appendix B4 Exhibit 1. Proportions of boarded psychiatric and non-psychiatric ED patients in Oregon, Oct. 2014 – Sep. 2015

Panel A: 6-hour definition



Panel B: 24-hour definition



The severity of psychiatric conditions again appears to increase the chance of psychiatric boarding. As shown in <Appendix B5 Exhibit 2> about 12% of all psychiatric ED patients received diagnoses of severe mental illness and the remaining 88% identified as receiving diagnoses of non-severe mental illness. Based on the 6-hour definition, 865 patients (2.7% of all psychiatric ED patients) were boarded with severe psychiatric conditions while 3,118 patients (about 10% of all psychiatric patients in EDs) were boarded with non-severe psychiatric conditions. <Appendix B5 Exhibit 3> illustrates the rate of psychiatric ED boarding among severe psychiatric patients in EDs is twice as large as that for non-severe psychiatric patients in EDs. Again our findings closely mirror those from the episode-level analysis.

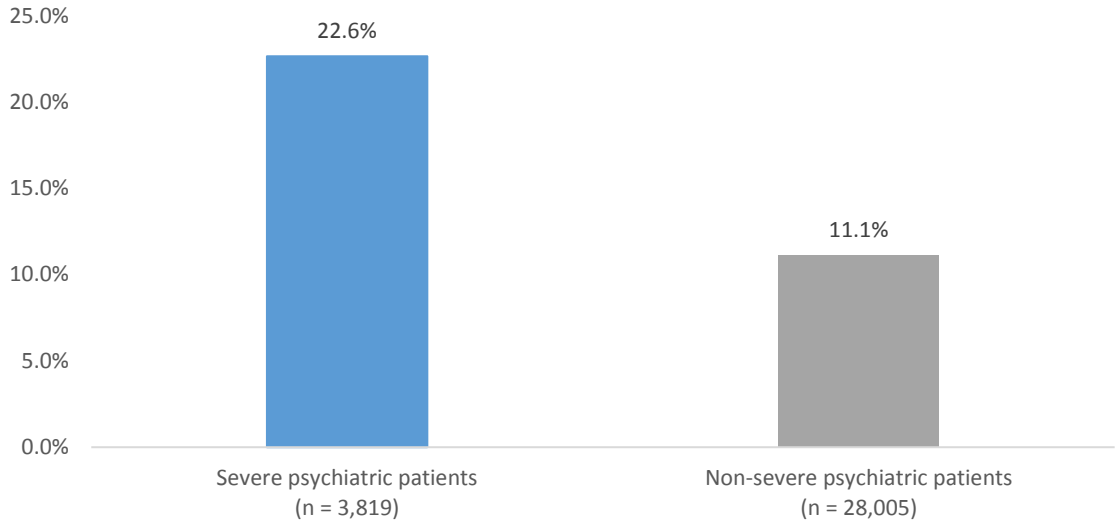
Appendix B4 Exhibit 2. Unique ED patients (proportions[1]) in Oregon, Oct. 2014 – Sep. 2015: By severity of psychiatric conditions

	Boarding definition	
	24-hour definition	6-hour definition
Total psychiatric ED patients[2]	31,824	31,824
Severe patients[3]	3,819 (12.0%)	3,819 (12.0%)
Boarded	319 (1.0%)	865 (2.7%)
Non-severe patients	28,005 (88.0%)	28,005 (88.0%)
Boarded	492 (1.5%)	3,118 (9.8%)

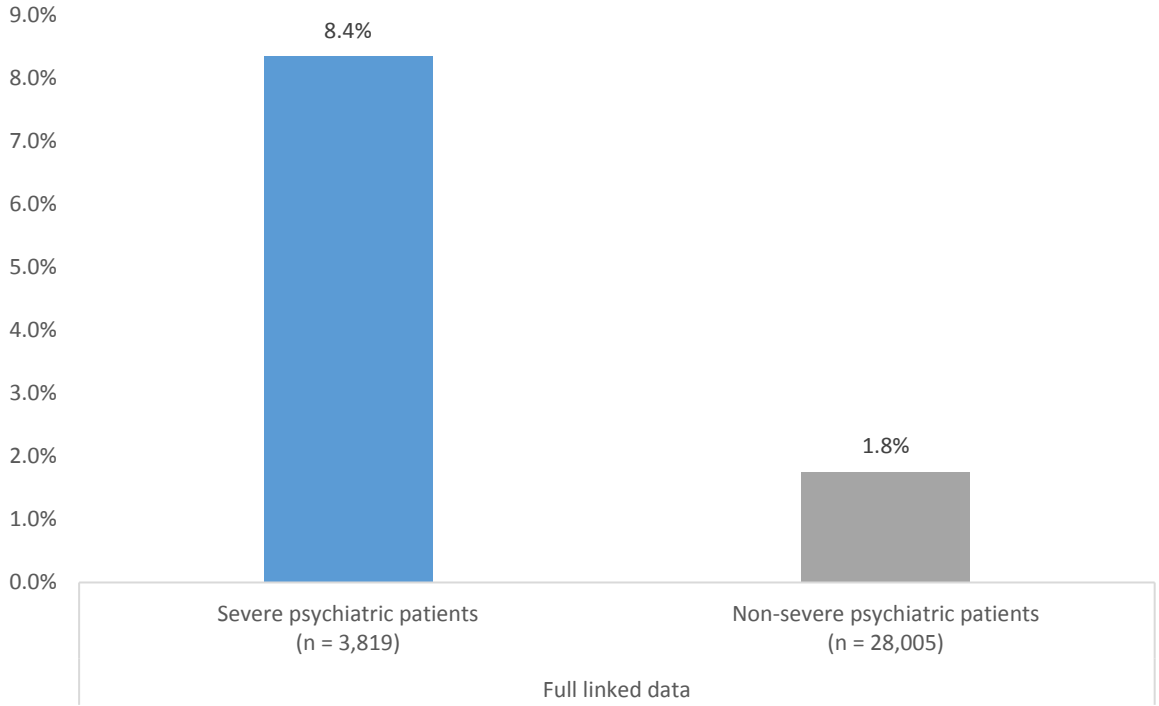
[1]The denominator is total psychiatric ED patients.
[2]Psychiatric patient defined as having ICD-9 diagnoses for mental illness and related injury, including: 290-319 (all mental illness); 648.4, V40.2, V40.3, V40.9, V67.3 (other miscellaneous mental disorders and problems); 331.0, 331.1, 331.2, 331.8, 797 (delirium, dementia and other cognitive limitations); V40.0, V40.1 (other developmental problems); E950-E959, V628 (suicide related); V62.8, V66.3, V67.3, V70.1, V70.2 V71.0, V79.0, V79.8, V79.9 (mental health exam and screening).
[3]Severe mental illness patient defined as having ICD-9 diagnoses for severe mental illness, including:295 (Schizophrenic Disorders), 296 (Episodic Mood Disorders), 297 (Delusional Disorders), 298 (Non-organic Psychoses)
[4]The 24-hour definition defines ED boarding defined as staying in ED longer than 24 hours (AZHHA, 2015). The 6-hour definition defines ED boarding as staying in ED longer than 6 hours (Nolan et al., 2015).

Appendix B4 Exhibit 3. Proportions of boarded severe and non-severe psychiatric ED patients in Oregon, Oct. 2014 – Sep. 2015

Panel A: 6-hour definition



Panel B: 24-hour definition



Appendix B5. Analysis of data from each of the independent data sources: Unique ED visits

<Appendix B5 Exhibit 1> presents results on unique ED visits and boarding incidents in Oregon between October 2014 and September 2015, separately for the hospital discharge and EDIE data. ED utilization episodes were identified using ED admission date and hour information from the source data files. Results are reported for both 6-hour and 24-hour definitions of ED boarding.

Data from the hospital ED discharge database revealed that during the one-year period, there were total 564,151 unique ED utilization episodes. Approximately 7% of all ED episodes, psychiatric and non-psychiatric, were psychiatric episodes. Using the 24-hour and 6-hour definitions, we find that about 0.9% and 5.5% of all ED visits, psychiatric and non-psychiatric, were classified as boarding episodes, respectively. Based on the 6-hour definition, 8,888 ED visits (1.6% of all ED visits) in the hospital discharge data were classified as psychiatric ED boarding episodes.

Appendix B5 Exhibit 1. Unique ED visits (proportions[1]) in Oregon, Oct. 2014 – Sep. 2015

	Data Source: Hospital ED discharge		EDIE	
	Boarding definition: 24-hour definition	6-hour definition	24-hour definition	6-hour definition
Total ED visits	564,151	564,151	539,923	539,923
Psychiatric visits[2]	39,887 (7.1%)	39,887 (7.1%)	87,005 (16.1%)	87,005 (16.1%)
Boarded visits[3]	5,230 (0.9%)	30,817 (5.5%)	7,255 (1.3%)	34,074 (6.3%)
Psychiatric ED boarding[4]	2,293 (0.4%)	8,888 (1.6%)	3,362 (0.6%)	14,110 (2.6%)

[1]The denominator is total ED visits.
[2]Psychiatric visit defined as having ICD-9 diagnoses for mental illness and related injury, including: 290-319 (all mental illness); 648.4, V40.2, V40.3, V40.9, V67.3 (other miscellaneous mental disorders and problems); 331.0, 331.1, 331.2, 331.8, 797 (delirium, dementia and other cognitive limitations); V40.0, V40.1 (other developmental problems); E950-E959, V628 (suicide related); V62.8, V66.3, V67.3, V70.1, V70.2 V71.0, V79.0, V79.8, V79.9 (mental health exam and screening).
[3]The 24-hour definition defines ED boarding as staying in ED longer than 24 hours (AZHHA, 2015). The 6-hour definition defines ED boarding as staying in ED longer than 6 hours (Nolan et al., 2015).
[4]Meet both definitions of psychiatric and ED boarding episodes.

In comparison, the EDIE data captured 539,923 unique ED visits for the same study period, which is slightly less than the unique ED episodes captured in the hospital ED discharge database. Sixteen percent of all psychiatric ED visits had a psychiatric diagnosis, more than twice larger than

the corresponding 7% in the hospital discharge data. It is worth noting that the difference is partially attributable to fewer discharge diagnoses recorded in the hospital discharge data. Nonetheless, the counts and proportions of all boarded ED visits are similar to those in the hospital discharge data. Likewise, the counts and proportions of boarded psychiatric ED visits are larger than those in the hospital discharge data. Based on the 6-hour definition, 14,110 ED visits (2.6% of all ED visits) in the EDIE data were psychiatric ED boarding episodes.

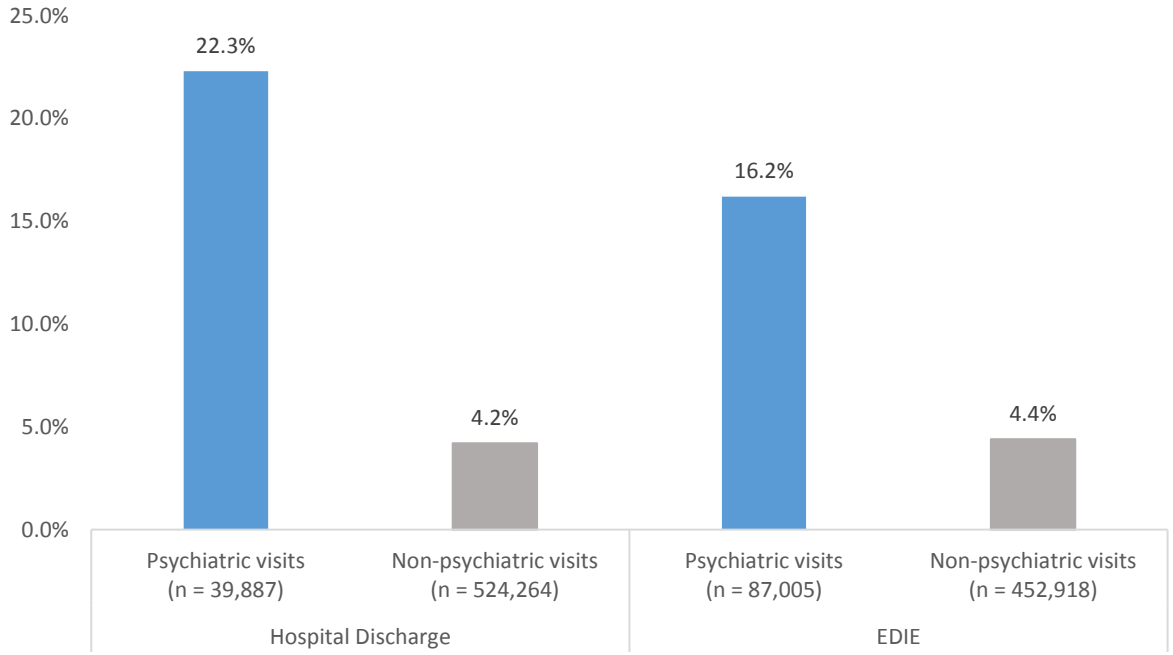
< Appendix B5 Exhibit 2> shows the proportion of boarded ED episodes separately for psychiatric and non-psychiatric visits. Data are also presented separately for the hospital discharge and EDIE databases. As shown in Panel A, based on the 6-hour definition, 22.3% of all psychiatric ED visits in Oregon were classified as boarding episodes, more than 5 times higher than that of non-psychiatric ED visits. In comparison, the EDIE data suggest that based on the 6-hour definition of ED boarding, approximately 16% of psychiatric ED visits were boarding episodes. It is smaller than the rate of 22.3% in the hospital discharge data because although more psychiatric ED boarding cases were identified in the EDIE data than in the hospital discharge data, much more psychiatric visits were identified in the EDIE data. The rate of psychiatric ED boarding from the EDIE data is closer to the national average of 12.8% in 2008 (Nolan et al., 2015).

Based on the 24-hour boarding definition, 2,293 ED visits (5.8% of all psychiatric ED visits) were classified as boarding episodes in the hospital discharge data (Panel B). The corresponding count (rate) of psychiatric ED boarding in the EDIE data was 3,362 (3.9% of all psychiatric ED visits). The Arizona Hospital and Healthcare Association similarly found 7% of psychiatric ED boarding rate in Arizona based on the same 24-hour definition (Arizona Hospital and Healthcare Association, 2015).

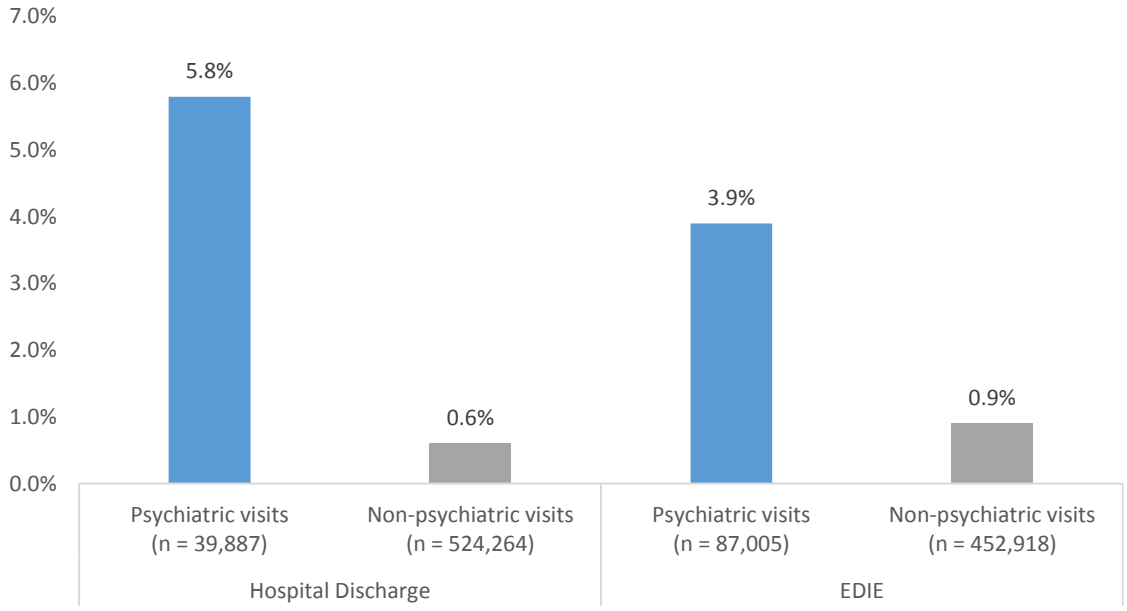
The severity of psychiatric conditions during the ED visit appears to increase the rate of ED boarding incidence, shown in < Appendix B5 Exhibit 3>. Again the EDIE data contained more psychiatric ED boarding cases than the hospital discharge data. This difference was larger for non-severe psychiatric visits than for severe psychiatric visits.

Appendix B5 Exhibit 2. Proportions of boarded episodes in psychiatric and non-psychiatric ED visits in Oregon, Oct. 2014 – Sep. 2015

Panel A: 6-hour definition



Panel B: 24-hour definition



Appendix B5 Exhibit 3. Unique ED visits (proportions[1]) in Oregon, Oct. 2014 – Sep. 2015: By severity of psychiatric conditions

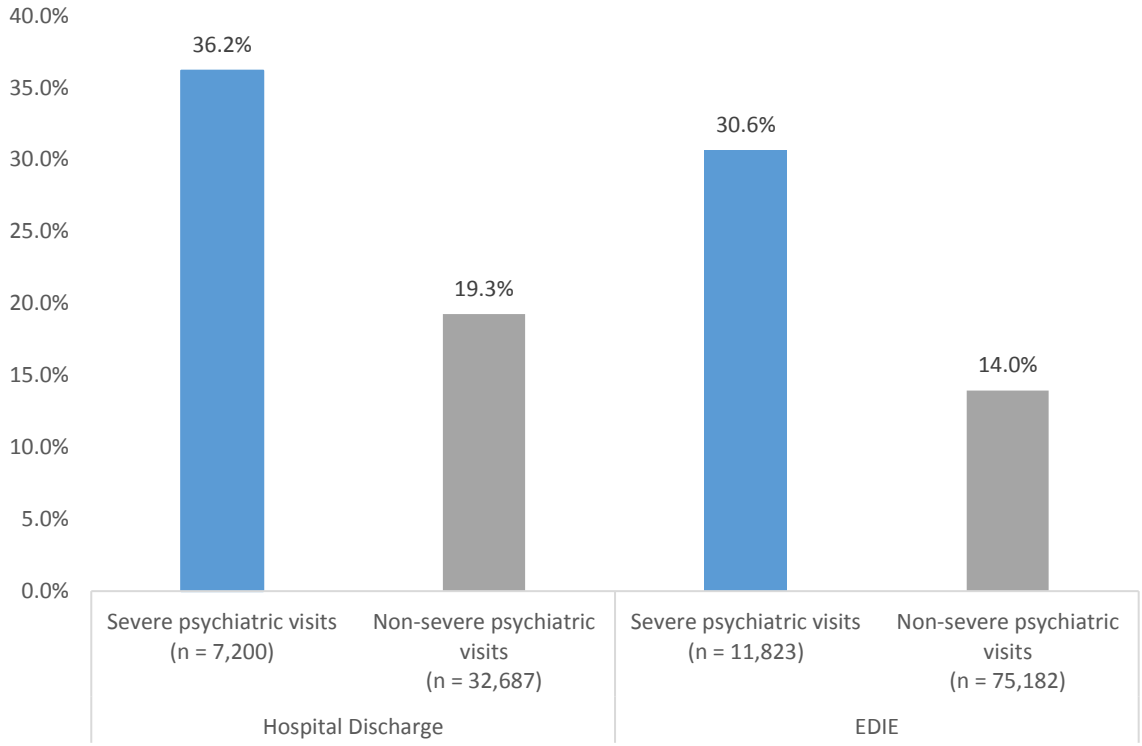
	Data Source: Hospital ED discharge		EDIE	
	Boarding definition: 24-hour definition	6-hour definition	24-hour definition	6-hour definition
Total psychiatric ED visits[2]	39,887	39,887	87,005	87,005
Severe episodes[3]	7,200 (18.1%)	7,200 (18.1%)	11,823 (13.6%)	11,823 (13.6%)
Boarded[4]	1,039 (2.6%)	2,605 (6.6%)	1,363 (1.6%)	3,619 (4.2%)
Non-severe episodes	32,687 (82.0%)	32,687 (82.0%)	75,182 (86.4%)	75,182 (86.4%)
Boarded	1,254 (3.1%)	6,283 (8.2%)	1,999 (2.3%)	10,491 (12.1%)

[1]The denominator is total psychiatric ED visits.
[2]Psychiatric visit defined as having ICD-9 diagnoses for mental illness and related injury, including: 290-319 (all mental illness); 648.4, V40.2, V40.3, V40.9, V67.3 (other miscellaneous mental disorders and problems); 331.0, 331.1, 331.2, 331.8, 797 (delirium, dementia and other cognitive limitations); V40.0, V40.1 (other developmental problems); E950-E959, V628 (suicide related); V62.8, V66.3, V67.3, V70.1, V70.2 V71.0, V79.0, V79.8, V79.9 (mental health exam and screening).
[3]Severe mental illness visit defined as having ICD-9 diagnoses for severe mental illness, including:295 (Schizophrenic Disorders), 296 (Episodic Mood Disorders), 297 (Delusional Disorders), 298 (Non-organic Psychoses)
[4]The 24-hour definition defines ED boarding defined as staying in ED longer than 24 hours (AZHHA, 2015). The 6-hour definition defines ED boarding as staying in ED longer than 6 hours (Nolan et al., 2015).

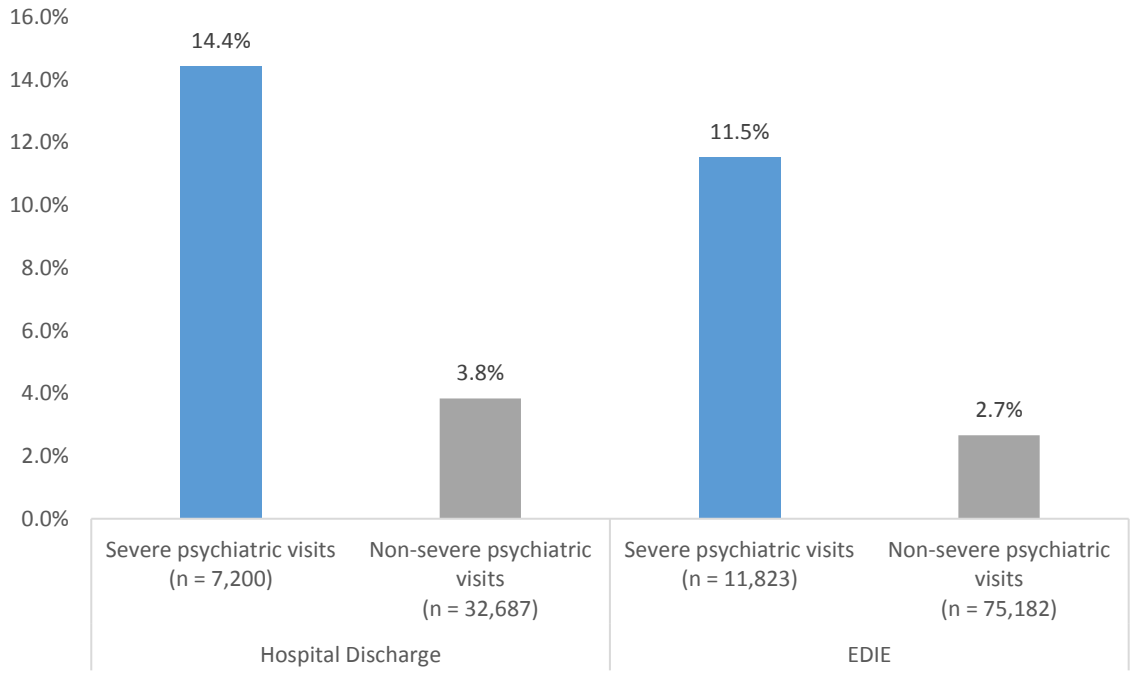
The rate of psychiatric ED boarding was greater for severe psychiatric ED visits (<Appendix B6 Exhibit 4>) in both hospital discharge and EDIE databases. Based on the 6-hour definition, 2,605 severe psychiatric ED visits (about 36% of all severe psychiatric ED visits) were classified as boarding episodes in the hospital discharge data, and 3,619 severe psychiatric visits (30.6% of all severe psychiatric visits) in the EDIE data. These rates are nearly twice greater than the rates for non-severe psychiatric ED visits.

Appendix B5 Exhibit 4. Proportions of boarded episodes in severe and non-severe psychiatric ED visits in Oregon, Oct. 2014 – Sep. 2015

Panel A: 6-hour definition



Panel B: 24-hour definition



Appendix B6. Comparison of Data from Independent Data Sources: Unique ED Patients

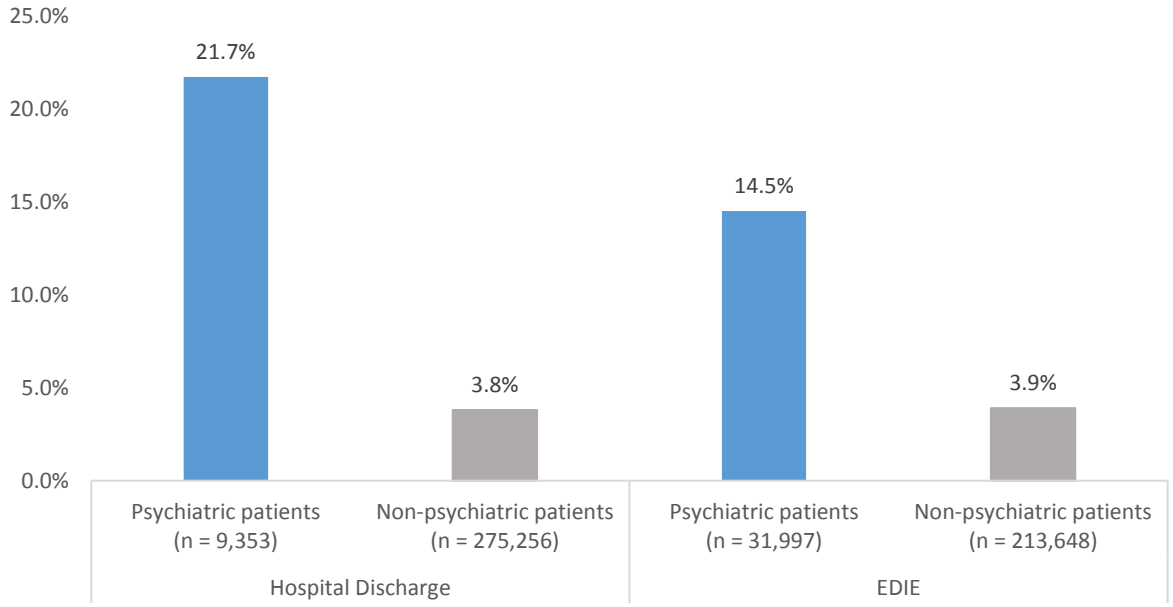
Appendix B6 Exhibit 1. Unique ED patients (proportions[1]) in Oregon, Oct. 2014 – Sep. 2015

	Data Source: Hospital ED discharge		EDIE	
	Boarding definition: 24-hour definition	6-hour definition	24-hour definition	6-hour definition
Total ED patients	284,609	284,609	245,645	245,645
Psychiatric patients[2]	9,353 (3.3%)	9,353 (3.3%)	31,997 (13.0%)	31,997 (13.0%)
Boarded patients[3]	2,009 (0.7%)	12,611 (4.4%)	2,496 (1.0%)	12,983 (5.3%)
Psychiatric ED boarding[4]	603 (0.2%)	2,029 (0.7%)	1,041 (0.4%)	4,633 (1.9%)

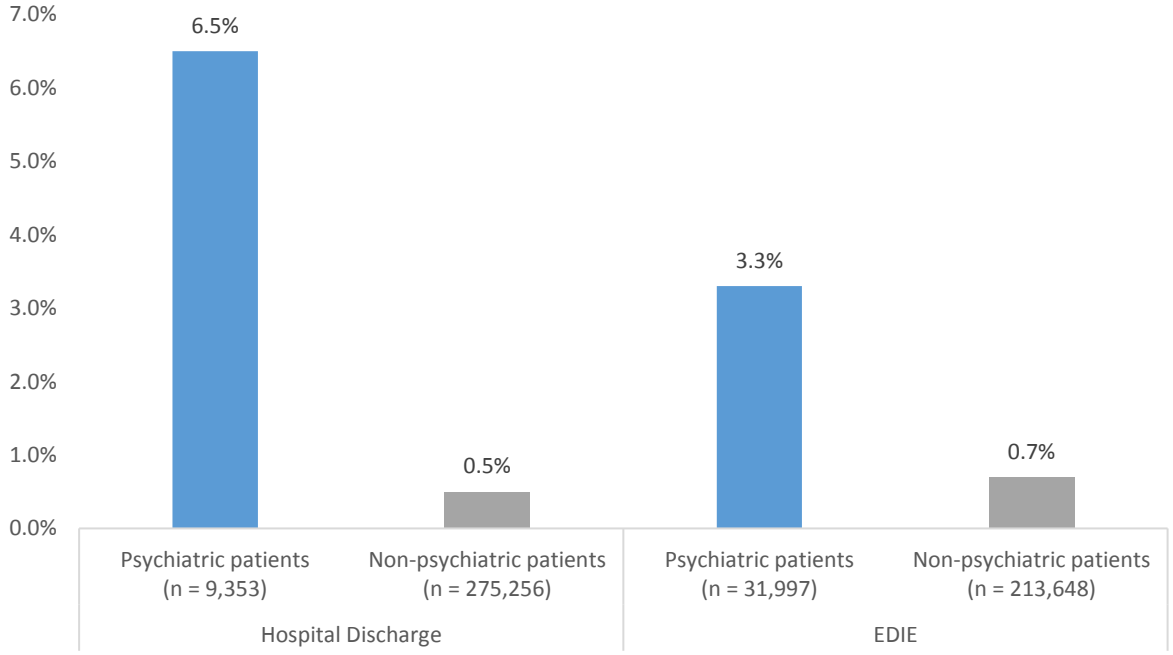
[1]The denominator is total ED patients.
[2]Psychiatric patient defined as having ICD-9 diagnoses for mental illness and related injury, including: 290-319 (all mental illness); 648.4, V40.2, V40.3, V40.9, V67.3 (other miscellaneous mental disorders and problems); 331.0, 331.1, 331.2, 331.8, 797 (delirium, dementia and other cognitive limitations); V40.0, V40.1 (other developmental problems); E950-E959, V628 (suicide related); V62.8, V66.3, V67.3, V70.1, V70.2 V71.0, V79.0, V79.8, V79.9 (mental health exam and screening).
[3]The 24-hour definition defines ED boarding as staying in ED longer than 24 hours (AZHHA, 2015). The 6-hour definition defines ED boarding as staying in ED longer than 6 hours (Nolan et al., 2015).
[4]Meet both definitions of psychiatric and ED boarding patients.

Appendix B6 Exhibit 2. Proportions of boarded ED patients in Oregon by psychiatric visit status, Oct. 2014 – Sep. 2015

Panel A: 6-hour definition



Panel B: 24-hour definition



Appendix B6 Exhibit 3. Unique ED patients (proportions[1]) in Oregon, Oct. 2014 – Sep. 2015: By the severity of psychiatric conditions

	Data Source: Hospital ED discharge		EDIE	
	Boarding definition: 24-hour definition	6-hour definition	24-hour definition	6-hour definition
Total psychiatric ED patients[2]	9,353	9,353	31,997	31,997
Severe patients[3]	1,592 (17.0%)	1,592 (17.0%)	3,571 (11.2%)	3,571 (11.2%)
Boarded	279 (3.0%)	615 (6.6%)	424 (1.3%)	1,075 (3.4%)
Non-severe patients	7,761 (83.0%)	7,761 (83.0%)	28,426 (88.8%)	28,426 (88.8%)
Boarded	324 (3.5%)	1,414 (15.1%)	617 (1.9%)	3,558 (11.1%)

[1]The denominator is total psychiatric ED patients.

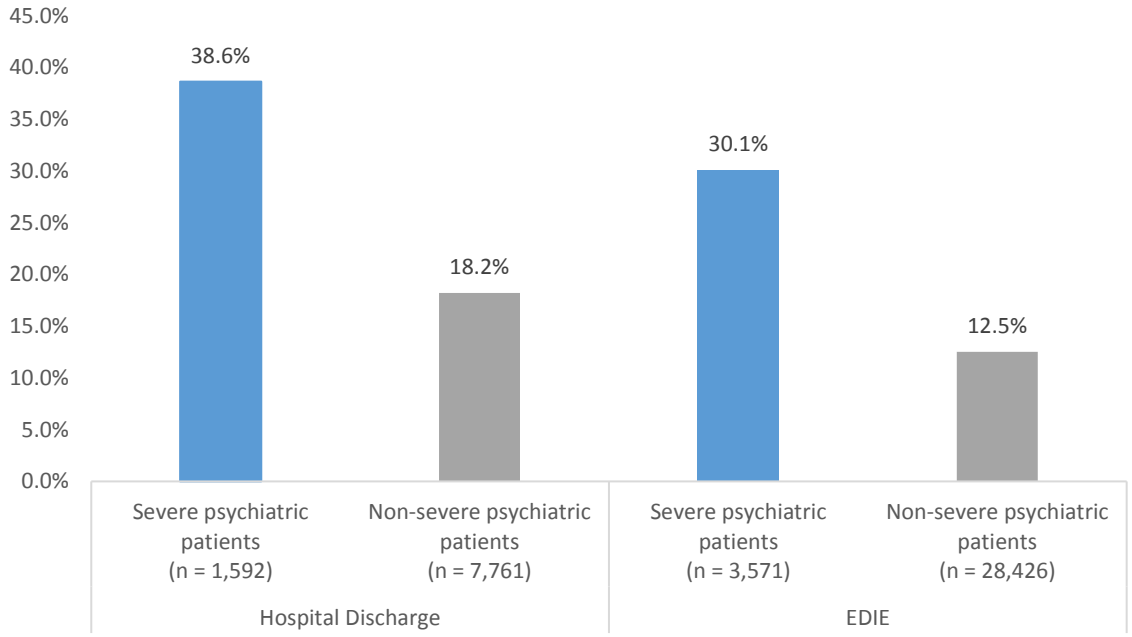
[2]Psychiatric patient defined as having ICD-9 diagnoses for mental illness and related injury, including: 290-319 (all mental illness); 648.4, V40.2, V40.3, V40.9, V67.3 (other miscellaneous mental disorders and problems); 331.0, 331.1, 331.2, 331.8, 797 (delirium, dementia and other cognitive limitations); V40.0, V40.1 (other developmental problems); E950-E959, V628 (suicide related); V62.8, V66.3, V67.3, V70.1, V70.2 V71.0, V79.0, V79.8, V79.9 (mental health exam and screening).

[3]Severe mental illness patient defined as having ICD-9 diagnoses for severe mental illness, including:295 (Schizophrenic Disorders), 296 (Episodic Mood Disorders), 297 (Delusional Disorders), 298 (Non-organic Psychoses)

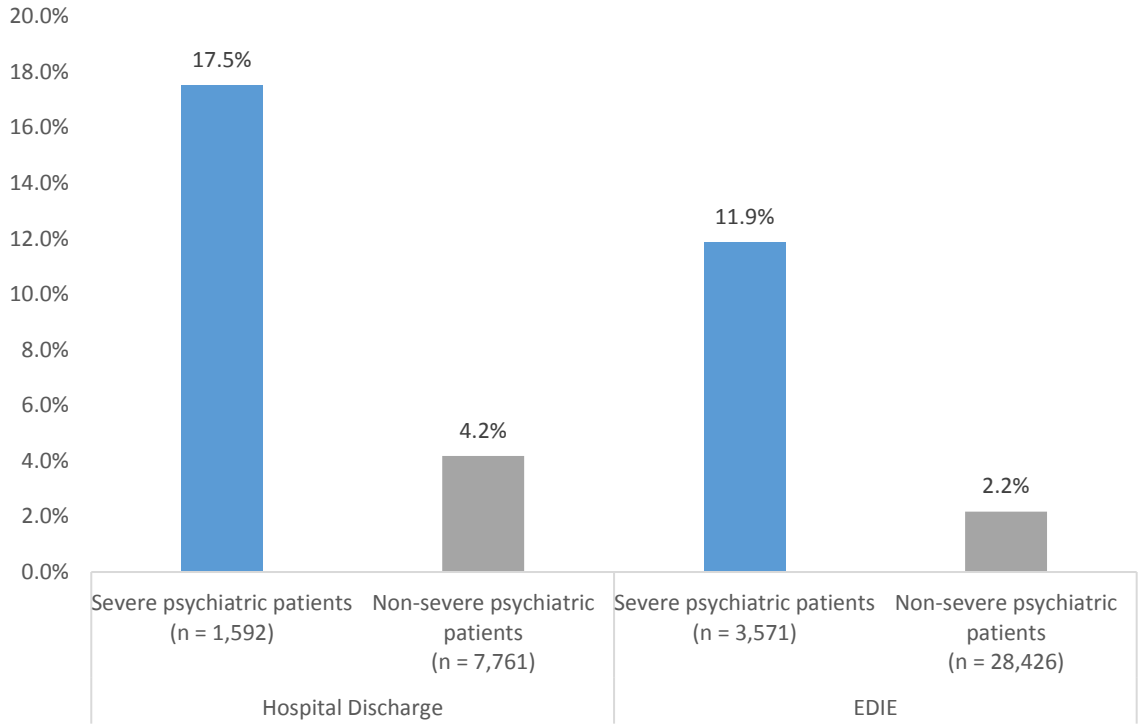
[4]The 24-hour definition defines ED boarding as staying in ED longer than 24 hours (AZHHA, 2015). The 6-hour definition defines ED boarding as staying in ED longer than 6 hours (Nolan et al., 2015).

Appendix B6 Exhibit 4. Proportions of boarded ED patients in Oregon by the severity of psychiatric conditions, Oct. 2014 – Sep. 2015

Panel A: 6-hour definition



Panel B: 24-hour definition



Appendix B6 Exhibit 5. Unique Medicaid patients (proportions[1]) in Oregon EDs, Oct. 2014 – Sep. 2015

	Data Source: Hospital ED discharge		EDIE		Medicaid claims	
	Boarding definition: 24-hour definition	6-hour definition	24-hour definition	6-hour definition	24-hour definition	6-hour definition
Total ED patients	161,438	161,438	136,621	136,621	185,292	185,292
Psychiatric patients[2]	5,343 (3.3%)	5,343 (3.3%)	16,423 (12.0%)	16,423 (12.0%)	26,096 (14.1%)	26,096 (14.1%)
Boarded patients[3]	1,000 (0.6%)	6,569 (4.1%)	1,148 (0.8%)	6,672 (4.9%)	1,188 (0.6%)	7,211 (3.9%)
Psychiatric ED boarding[4]	352 (0.2%)	1,165 (0.7%)	558 (0.4%)	2,475 (1.8%)	698 (0.4%)	2,787 (1.5%)

[1]The denominator is total ED patients.

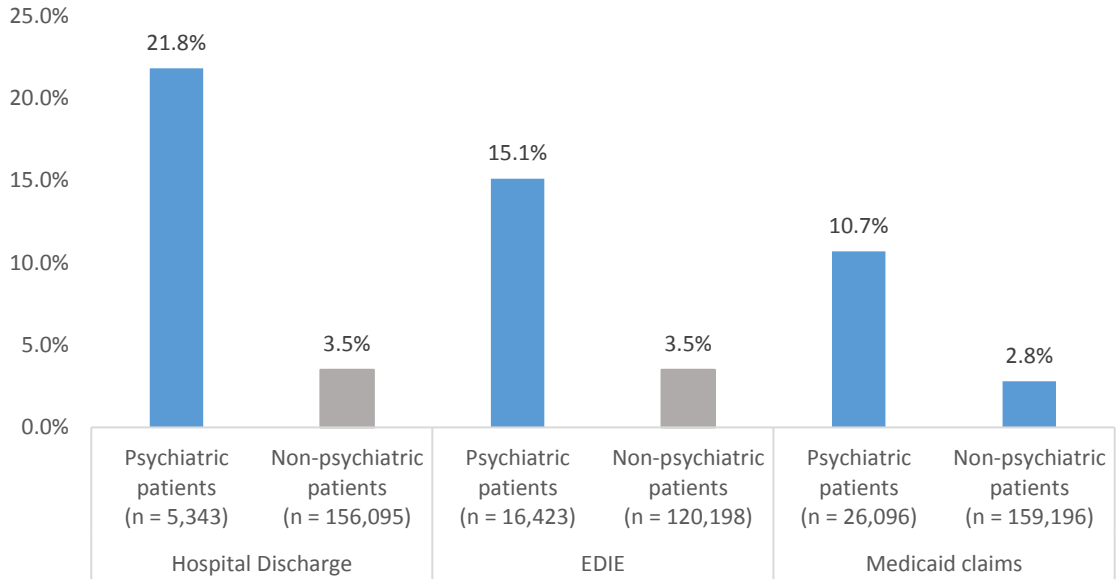
[2]Psychiatric patient defined as having ICD-9 diagnoses for mental illness and related injury, including: 290-319 (all mental illness); 648.4, V40.2, V40.3, V40.9, V67.3 (other miscellaneous mental disorders and problems); 331.0, 331.1, 331.2, 331.8, 797 (delirium, dementia and other cognitive limitations); V40.0, V40.1 (other developmental problems); E950-E959, V628 (suicide related); V62.8, V66.3, V67.3, V70.1, V70.2 V71.0, V79.0, V79.8, V79.9 (mental health exam and screening).

[3]The 24-hour definition defines ED boarding as staying in ED longer than 24 hours (AZHHA, 2015). The 6-hour definition defines ED boarding as staying in ED longer than 6 hours (Nolan et al., 2015).

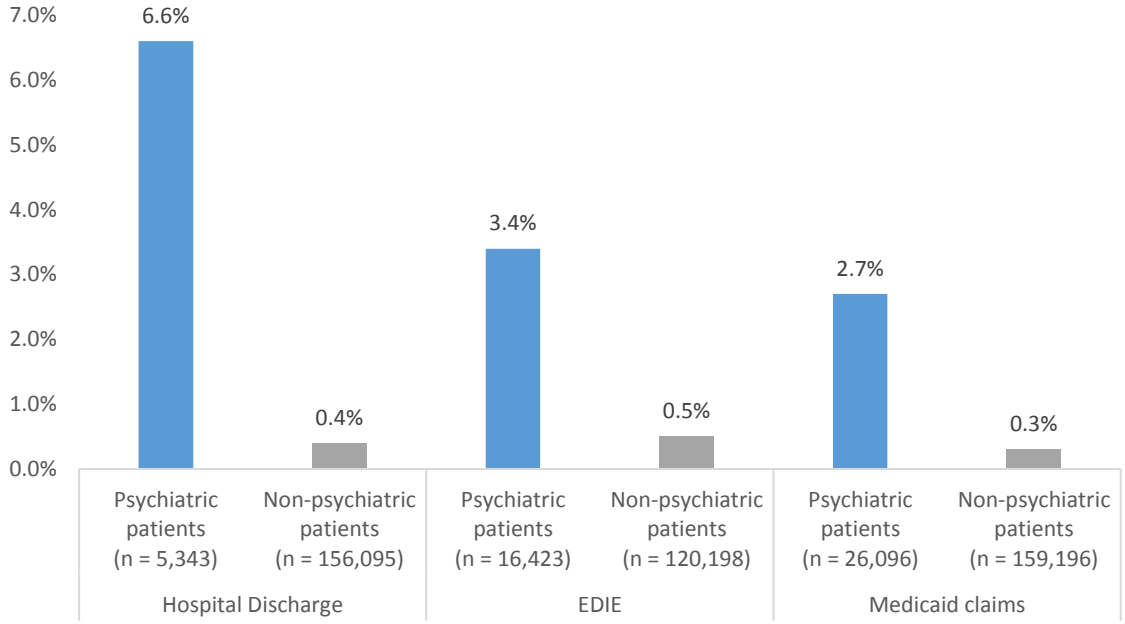
[4]Meet both definitions of psychiatric and ED boarding patients.

Appendix B6 Exhibit 6. Proportions of boarded ED patients in Oregon by psychiatric visit status, Oct. 2014 – Sep. 2015: Medicaid patients only

Panel A: 6-hour definition



Panel B: 24-hour definition



Appendix B6 Exhibit 7. Unique Medicaid patients (proportions[1]) in Oregon EDs, Oct. 2014 – Sep. 2015: By the severity of psychiatric conditions

	Data Source: Hospital ED discharge		EDIE		Medicaid claims	
	Boarding definition: 24-hour definition	6-hour definition	24-hour definition	6-hour definition	24-hour definition	6-hour definition
Total psychiatric ED patients[2]	5,343 (3.3%)	5,343 (3.3%)	16,423 (12.0%)	16,423 (12.0%)	26,096 (14.1%)	26,096 (14.1%)
Severe patients[3]	886 (16.6%)	886 (16.6%)	1,839 (11.2%)	1,839 (11.2%)	2,811 (10.8%)	2,811 (10.8%)
Boarded	169 (3.2%)	346 (6.5%)	243 (1.5%)	578 (3.5%)	299 (1.1%)	709 (2.7%)
Non-severe patients	4,457 (83.4%)	4,457 (83.4%)	14,584 (88.8%)	14,584 (88.8%)	23,285 (89.2%)	23,285 (89.2%)
Boarded	183 (3.4%)	819 (15.3%)	315 (1.9%)	1,897 (11.6%)	399 (1.5%)	2,078 (8.0%)

[1]The denominator is total psychiatric ED patients.

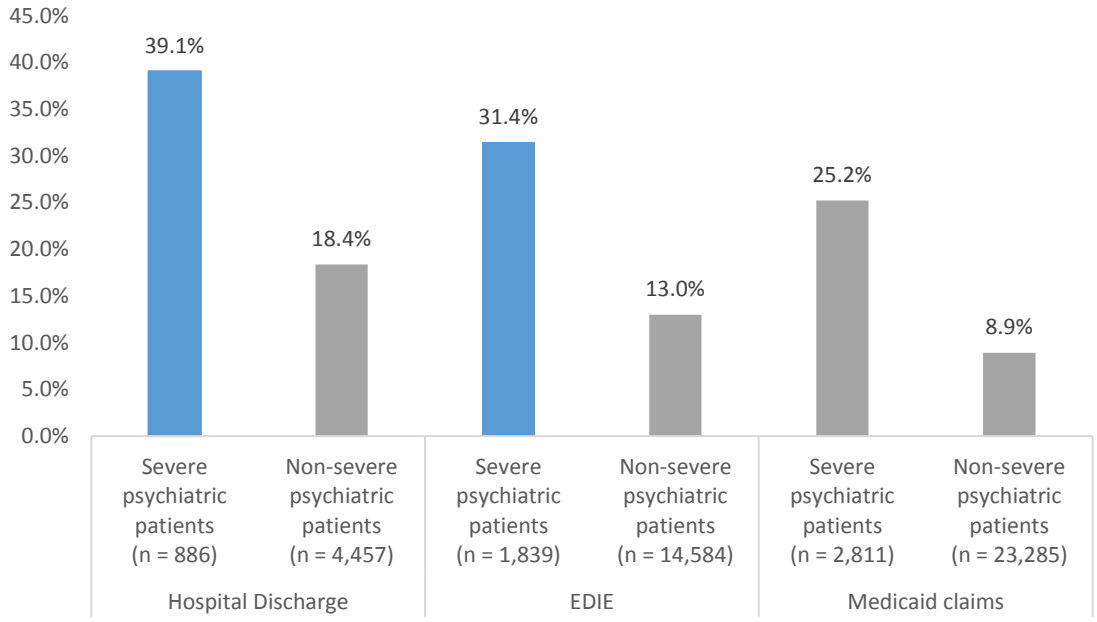
[2]Psychiatric patient defined as having ICD-9 diagnoses for mental illness and related injury, including: 290-319 (all mental illness); 648.4, V40.2, V40.3, V40.9, V67.3 (other miscellaneous mental disorders and problems); 331.0, 331.1, 331.2, 331.8, 797 (delirium, dementia and other cognitive limitations); V40.0, V40.1 (other developmental problems); E950-E959, V628 (suicide related); V62.8, V66.3, V67.3, V70.1, V70.2 V71.0, V79.0, V79.8, V79.9 (mental health exam and screening).

[3]Severe mental illness patient defined as having ICD-9 diagnoses for severe mental illness, including:295 (Schizophrenic Disorders), 296 (Episodic Mood Disorders), 297 (Delusional Disorders), 298 (Non-organic Psychoses)

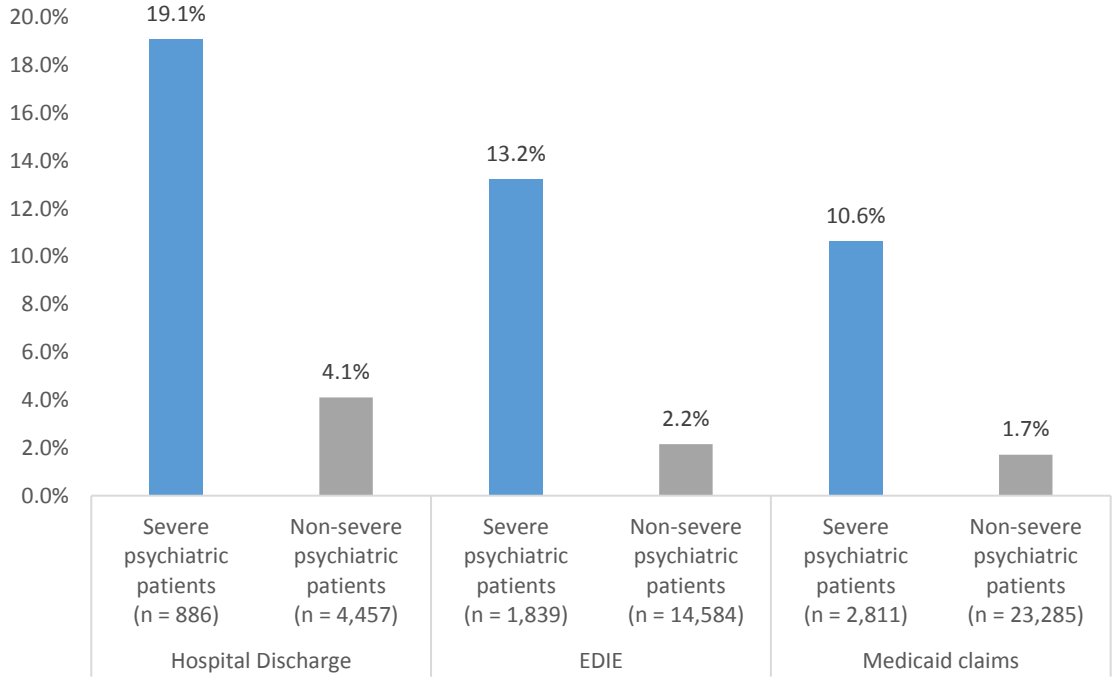
[4]The 24-hour definition defines ED boarding defined as staying in ED longer than 24 hours (AZHHA, 2015). The 6-hour definition defines ED boarding as staying in ED longer than 6 hours (Nolan et al., 2015).

Appendix B6 Exhibit 8. Proportions of boarded ED patients in Oregon by the severe of psychiatric conditions, Oct. 2014 – Sep. 2015: Medicaid patients only

Panel A: 6-hour definition



Panel B: 24-hour definition



Appendix C. Stakeholder Interview Methods and Sample

Interview Methods

We recruited stakeholders who work in the mental health field in Oregon, including mental health advocates; staff and administrators at hospitals, community mental health programs, and coordinated care organizations; and clinicians. Stakeholders were eligible to participate in an interview if they were 18 years of age or older and were knowledgeable about the problem of psychiatric boarding in Oregon. We identified interviewees through consultation with the Oregon Health Authority leadership, a review of publicly available sources, and referral from other interviewees. We aimed to include stakeholders from all regions of Oregon and a variety of mental health service areas.

We contacted potential interviewees by phone or email to request participation in the study. We then sent a formal recruitment letter soliciting their participation in the study. After we received a response from the stakeholder, we scheduled the interview.

Between January and February 2016, trained project staff conducted interviews over the phone and in-person with stakeholders. Interviews lasted 30 to 60 minutes and the interviewer recorded responses in writing.

We asked stakeholders about their experiences working in the mental health field and the mental health resources available in their community to provide context for the respondent's answers. We then asked for the stakeholder's perceptions about the causes, impacts, and potential solutions for psychiatric boarding in Oregon. All interview questions were open-ended. After we finished interviewing stakeholders, we aggregated the responses for each question and identified the main themes.

Sample Characteristics

Out of 38 potential stakeholders contacted, we completed interviews with 31 (82% response rate). We interviewed stakeholders who worked in all regions of the state. The largest proportion (29%) of stakeholders worked for organizations that serve the Portland metro area. Six respondents worked for organizations that serve all of Oregon, 5 worked in the Willamette Valley, 4 worked in Eastern Oregon, 3 worked in the coastal region, and 2 each worked in Central and Southern Oregon.

Interviewees also represented a variety of organizations. The majority (44%) of interviewees worked for a hospital system, many in the emergency department. Eight interviewees worked for county health departments, three each worked for community mental health organizations and advocacy groups, and two each worked for a Coordinated Care Organization and the state.

Appendix C Exhibit 1. Characteristics of Stakeholder Interview Sample

Regional characteristics		
	n	**%**
Portland metro	9	29
Coast	3	10
Willamette Valley	5)	16
Southern Oregon	2	6
Central Oregon	2	6
Eastern Oregon	4	13
Oregon-wide	6	19
Total	**31**	
Organizational Types		
	n	**%**
Hospital/ED Staff	14	44
Community Mental Health	3	9
County	8	25
Advocacy	3	9
CCO	2	6
State	2	6
Total	**32**	**note one interview represented 2 categories (CCO & Community Mental Health)

Appendix D1. Two-Part Models of Psychiatric ED Boarding

Model Specifications

To identify determinants of psychiatric ED boarding in Oregon, we estimated a two-part model (2PM) of psychiatric ED boarding time on the restricted sample of psychiatric ED visits. The first part estimates the probability of psychiatric ED boarding using all psychiatric ED visits, and the second part predicts psychiatric ED boarding time, conditional on psychiatric ED boarding (i.e., using only a sample of boarded, psychiatric ED visits). In our 2PM specified below, the first part predicts the extent to which psychiatric visit affects the probability of psychiatric ED boarding, defined as a psychiatric ED stay of longer than 6 hours. The second part examines factors associated with a change in continuous psychiatric ED boarding time.

Our two-part model (2PM) takes the following form:

$$\text{Part 1: } \Pr(BT_{ic} > 6) = X_{ic}\beta^1 + C_c\rho^1 + \epsilon_{ic}^1 \qquad (5\text{-}1)$$

$$\text{Part 2: } (BT|bt > 6) = X_{ic}\beta^2 + C_c\rho^2 + \epsilon_{ic}^2 \qquad (5\text{-}2)$$

where *i* and *c* index a psychiatric ED episode and a county of residence, respectively.

Potential determinants of psychiatric ED boarding were specified in the vector *X*, including: whether an episode had diagnosis of substance abuse; binary Medicaid enrollment status at the time of ED admission; whether an ED episode started during the weekend; patient demographic characteristics such as age, sex, race, ethnicity, and the rurality of patient residence based on patient ZIP code; and hospital's location (service region).

We also controlled for a set of county indicators (C). This variable set controls for fixed county effects – i.e., county-specific characteristics that affected the probability and length of ED boarding and did not change during the 1-year sample period. For example, county fixed effects may eliminate bias resulting from county-level omitted factors such as: county uninsurance rates; access to health care services for county residents, county mental health resources, average distance to psychiatric inpatient facilities for county residents, etc.

Estimation Methods

We estimate linear models for both parts of the 2PMs. For the first part of the model, we estimate linear probability models because coefficients in a linear probability model are marginal effects and thus give a more intuitive interpretation than coefficients in a non-linear model. Although there is a potential concern that linear probability models might lead to predicted probabilities (i.e. probability of ED boarding or probability of incurring ED costs) outside the unit range. In our case, all predicted probabilities for the first parts of 2PMs were contained within the unit range. We also estimated the logit model and obtained the so-called average marginal effects. Results are almost identical to those reported here.

Appendix D2. Definition: Substance Abuse

Substance abuse visit describes ED episodes for both pediatric and adult patients who have been admitted with an International Classification of Diseases (ICD-9) code corresponding to substance abuse conditions. The following ICD-9-CM codes were used to define substance abuse visits in Oregon emergency departments for EDIE data, Hospital ED data, and Medicaid claims data:

ICD-9 diagnosis code	Description
291	Acute Alcoholic Psychotic Condition
292	Drug-induced Mental Disorders
303	Chronic Disease in which a Person Craves a Drink that Contains Alcohol and is Unable to Control His or Her Drinking
304	Drug Dependence
305.0	Alcohol Abuse
305.2	Cannabis Abuse
305.9	Antidepressant Abuse
V79.1	Screening for Alcoholism

Appendix D3. Rural/Urban Definitions

Rural-Urban Commuting Area Codes (RUCA) are a new Census tract-based classification scheme that utilizes the standard Bureau of Census Urbanized Area and Urban Cluster definitions in combination with work commuting information to characterize the nation's Census tracts regarding their rural and urban status and relationships. More information is available at: http://depts.washington.edu/uwruca/.

We utilized a ZIP Code RUCA approximation from RUCA Version 2 codes, which are based on (a) 2000 Census work commuting information and (b) Urbanized Areas (cities of 50,000 and greater population) and Urban Clusters (cities/towns of from 2,500 through 49,999 populations) defined by the U.S. Census Bureau. We constructed three urban/rural indicators as following:

- **Urban**: Metropolitan area (population >50,000) or town of any size with high primary commuting flow (30-49%) to an urban core (UC) and/or > 30% secondary flow to an urban area (UA).
- **Large rural**: A large rural city/town (micropolitan) area (population of from 10,000-49,999) with > 10% primary commuting flow to an UC and/or < 29% secondary commuting flow to a UA.
- **Small rural**: A small rural and isolated small rural town. A city/town core with a population size of 2,500-9,999 with > 10% primary flow to a small UC and/or with 10-29% secondary commuting flow to a UA or a town with a population core < 2,500 with primary commuting flow to a tract outside an UA or UC and/or with > 10% secondary commuting flow to a UC or 10-29% secondary commuting flow to a UA.

Appendix D4. Recursive Simultaneous-Equations Model of ED Boarding

Econometric Specification

We constructed a system of recursive simultaneous equations to explore the effect of mental health system capacity on the extent of psychiatric ED boarding. In this approach, we posited that an increased capacity of the mental health system, especially for persons with severe mental illness, might reduce the frequency of psychiatric ED episodes and thereby the rate of psychiatric ED boarding. To test this hypothesis, we estimated the following equations:

$$BT_{ic} = \alpha^3 P_{ic} + X_{ic}\beta^3 + C_c\rho^3 + \epsilon_{ic}^3 \quad (5\text{-}3)$$

$$P_{ic} = MH_c\gamma^4 + \delta^4 SMI_c + X_{ic}\beta^4 + \epsilon_{ic}^4 \quad (5\text{-}4)$$

where *i* and *c* index an ED episode and patient's county of residence, respectively. BT refers to boarding time, the length of ED boarding.

The variable *P* was of main interest, and indicates whether an ED visit was related to psychiatric conditions. Thus, in Equation 5-3, α^3 captures the effect of the psychiatric episode on boarding time. In Equation 4, MH includes proxy variables for county mental health system capacity. Therefore its coefficients specified as γ^4 measures a relationship between the capacity of the mental health system and psychiatric ED visit, controlling for the influence of the underlying prevalence of SMI for each county. Taken together, the coefficients γ^4 and α^3 can serve as a test of (a) whether mental health system capacity influences the probability of psychiatric ED visit and at the same time (b) whether psychiatric diagnosis increase the extent of psychiatric ED boarding.

In Equation 5-4, the vector MH includes two measures of county-level mental health system capacity variables: county's inpatient and community-based mental health system capacity. The 'ratio of the quarterly average of psychiatric inpatients in private and state facilities to the quarterly average number of persons with severe mental illness' from October 2013 to September 2014 was included as a county-level proxy for the capacity of inpatient mental health system for persons with severe mental illness. This variable captures inpatient mental health system capacity during the one year prior to our sample period (Oct. 2014 – Sep. 2015) to minimize concern that psychiatric ED visits might influence the number of persons with severe mental illness in psychiatric inpatient settings. The 'ratio of the quarterly average of patients served by assertive community treatment (ACT) teams to the quarterly average number of persons with severe mental illness' for the October 2013 – September 2014 period, was included as a county-level proxy for the capacity of community mental health system especially for persons with severe mental illness. This variable is also lagged by one year to minimize concern that psychiatric ED visits might influence the number of ACT clients. SMI is the number of persons with severe and persistent mental illness per 1,000 persons. It is included to control for the prevalence of SMI population for each county, which captures underlying need factor that may affect ED boarding.

The vector *X* includes person and system characteristics that may be associated with the dependent variables: Substance abuse, Medicaid enrollment status at the time of ED admission, weekend admission, patient demographic characteristics, the place of patient residence based on patient ZIP code, and hospital's location. The vector C includes fixed county effects to control for county-specific characteristics that affected the probability and length of ED boarding.

Equation 5-3 was further specified as the two-part model of ED boarding as following:

$$\begin{cases} \Pr(BT_{ic} > 6) = \alpha^{3a} P_{ic} + X_{ic}\beta^{3a} + C_c\rho^{3a} + \epsilon_{ic}^{3a} \\ (BT_{ic} | BT_{ic} > 6) = \alpha^{3b} P_{ic} + X_{ic}\beta^{3b} + C_c\rho^{3b} + \epsilon_{ic}^{3b} \end{cases}$$

The first part estimates the degree to which a psychiatric episode increases the probability of boarding, based on the 6-hour definition. The second part predicts a change in continuous boarding time due to psychiatric visit, conditional on having ED boarding episode.

Estimation Strategy

We estimated the linear probability models separately for Equations (5-3) and (5-4). Results are reported in the report as main findings. Nonetheless, it is important to note that estimated coefficients from the simultaneous-equations system will be biased if the stochastic error terms (ϵ_{ic}^{3} and ϵ_{ic}^{4})are not independent of each other. Therefore, as a robustness check, we estimated equations (5-3) and (5-4) jointly using a bivariate probit procedure. The bivariate probit model, which is a variant of the instrumental variables method, yields consistent and efficient estimates of the effect of psychiatric ED visit on ED boarding in the presence of correlated error terms provided that valid instruments for the psychiatric episode variable are identified.

An instrument for a psychiatric visit must meet two fundamental conditions. First, the instrument must be substantially associated with the psychiatric visit variable in Eq. (5-4). [29] Second, the instrument must be validly excluded from the ED boarding equation, Eq. (5-3). [30] In our case, the mental health system capacity variables and SMI population, by design, served as prospective instruments. The instrumental variables specification checks confirm that all the candidate instruments are valid and reliable.

We confirmed that results from the bivariate probit model are qualitatively the same as our main results, providing strong support for causal interpretation of our findings.

Appendix D5. Descriptive Characteristics of Hospital ED Visits by Boarding Status, Oct. 2014 – Sep. 2015.

Boarded patients were more likely than non-boarded patients to received diagnoses of mental illness, both severe and non-severe, as well as diagnoses of substance abuse. About 39% of boarded ED episodes had psychiatric diagnoses. In comparison, psychiatric visits accounted for only 13% of the total non-boarded ED episodes. The proportion of severe-psychiatric episodes among boarded ED visits was almost 10%, 5.5 times higher than the corresponding rate for non-boarded ED episodes. Non-severe psychiatric episodes comprised about 29% of all boarded episodes, compared to 11% of non-boarded episodes. The proportion of substance abuse visits among boarded episodes was 4 times higher than that among non-boarded visits (13.6% vs. 3.4%).

Medicaid patients were relatively less likely to be present in boarded ED visits than in non-boarded visits (53.7% vs. 55.8%), suggesting that Medicaid eligibility might be associated with a reduced chance of ED boarding. On average, boarded patients were slightly older than non-boarded patients and more like to be female. In both groups, the majority of patients were whites whose visits accounted for approximately 83% in both boarded and non-boarded episodes. There was no significant difference in terms of racial composition between the two groups. ED visits by Hispanic patients comprised 7.2% of all boarded visits and 10.2% of all non-boarded visits. 26.5% and 29.1% of the entire boarded and non-boarded ED episodes started during weekends, respectively.

About 85% of ED visits were made by patients living in urban areas for both boarded and non-board patients. There was no discernable difference in terms of patients' rural/urban residence between the two groups. For non-boarded ED visits, boarded ED visits occurred more frequently in hospital EDs in the Portland metropolitan region and less frequently in the other regions of the state.

The county-level ratio of psychiatric inpatients to persons with severe mental illness was greater for the boarded group. The ratio of ACT clients to persons with severe mental illness was similar between the two groups. The boarded group had more persons with severe mental illness than non-boarded group, which suggests a positive relationship between the prevalence of severe mental illness and ED boarding.

Appendix D5 Exhibit 1. Patient and system characteristics stratified by hospital ED boarding status

Variable	Boarded (n = 32,866)		Not boarded (n = 657,379)	
	Mean	Std. Dev.	Mean	Std. Dev.
Psychiatric visit	38.8%	-	13.2%	-
Severe psychiatric	9.9%	-	1.8%	-
Non-severe psychiatric	28.9%	-	11.4%	-
Substance abuse	13.6%	-	3.4%	-
Medicaid status	53.7%	-	55.8%	-
Age	41.6	19.6	34.2	20.8

Female	55.3%	-	56.6%	-
Race				
White (reference)	83.5%	-	83.1%	-
AIAN	2.1%	-	1.9%	-
Asian	1.1%	-	1.2%	-
Black	6.5%	-	5.4%	-
NHPI	0.4%	-	0.6%	-
Other	6.4%	-	7.8%	-
Hispanic	7.2%	-	10.2%	-
Weekend admission	26.5%	-	29.1%	-
Rurality				
Urban	85.0%	-	84.0%	
Large rural	13.7%	-	14.0%	
Small rural	2.3%	-	2.9%	
Hospital location (reference: Central Oregon)				
Eastern Oregon	3.4%		5.0%	
Northern Oregon	6.6%		8.3%	
Portland metropolitan area	51.1%		35.5%	
Southern Oregon	15.9%		19.1%	
Valley area	21.5%		30.0%	
County-level system characteristics				
%Psychiatric inpatients	6.7%	2.9	6.4%	3.1
%ACT population	1.1%	1.3	1.1%	1.4
SMI population	4,018	3,190	3,426	2,936

Appendix D6. Effect of county mental health system capacity on psychiatric ED visits: Full results

A greater supply of psychiatric inpatient and intensive community mental health resources was significantly associated with a reduction in the probability of psychiatric ED visit. Our estimate suggests that holding other things constant, a 1% higher capacity of the inpatient mental health system (which was proxied by the proportion of psychiatric inpatients to persons with severe mental illness) is associated with a 1.3 percentage-point lower probability of psychiatric ED visit. This result means that a 1% increase in the capacity of the inpatient mental health system, ceteris paribus, may lead to approximately 7% decrease in the probability of psychiatric ED visit because the rate of psychiatric visits was 14.6% (see <Exhibit 3-2>).

A response in psychiatric ED visit to a change in the inpatient mental health system capacity was even more elastic. A 1% increase in the capacity of community-based mental health resources (measured by the volume of ACT clients served), ceteris paribus, was significantly associated with a 1.8 percentage-point decrease (alternatively, 12% decrease) in the probability of psychiatric ED visit. Also to be consistent with our expectation, a greater prevalence of severe mental illness in a county was significantly associated with a higher probability of psychiatric ED visit in that county.

Other findings deserve comments. Substance abuse appears to increase the probability of overall psychiatric ED visits by 86%. Medicaid patients and older patients were more likely to have psychiatric visits. Females were less likely to experience psychiatric ED visits compared to males. Compared to white patient, all other races had lower probability of having psychiatric ED visits. Hispanic patients were also less likely to have psychiatric ED visits. The probability of psychiatric ED visits was lower if an ED episode started on the weekend.

Appendix D6 Exhibit 1. Effect of county mental health capacity on the likelihood of psychiatric ED visit : Full results

	Pr(psychiatric ED visit[1])
County-level system characteristics	
%Psychiatric inpatients	–0.0128***
	(0.0004)
%ACT population	–0.0180***
	(0.0007)
SMI population	0.0110***
	(0.0004)
Substance abuse	0.8636***
	(0.0011)
Medicaid status	0.0155***
	(0.0012)
Age	0.0014***
	(0.0000)
Female	–0.0054***

	(0.0014)
Race (reference: White)	
AIAN	–0.0030
	(0.0050)
Asian	–0.0501***
	(0.0049)
Black	–0.0286***
	(0.0029)
NHPI	–0.0389***
	(0.0073)
Other	0.0011
	(0.0025)
Hispanic	–0.0485***
	(0.0021)
Admission on weekend	–0.0062***
	(0.0010)
Rurality of patient residence (reference: Urban)	
Large rural	0.0342***
	(0.0029)
Small rural	0.0098
	(0.0054)
Hospital location (reference: Central Oregon)	
Eastern Oregon	0.0745***
	(0.0079)
Northern Oregon	–0.0549***
	(0.0073)
Portland metropolitan	–0.1073***
	(0.0073)
Southern Oregon	–0.0387***
	(0.0072)
Valley area	–0.0902***
	(0.0073)
N	508,655

Notes: Cluster-robust standard errors are in parentheses. All models control for county fixed-effects.

[1]Either severe or non-severe psychiatric visit.

* Statistically significant at the 95% level.

** Statistically significant at the 99% level.

*** Statistically significant at the 99.9% level.

Appendix D7. Factors affecting the probability of ED boarding and boarding time: Two-part model

Column (1) below shows that a psychiatric episode on average was significantly associated with 9.5 percentage-point increase in the probability of positively associated with the probability of ED boarding. This effect is almost twice as larger as the average boarding rate of 5.5% reported in <Exhibit 3-2> (based on the 6-hour boarding definition). Our finding is in line with a national estimate reported in Nolan et al. (2015), in that they discovered that psychiatric ED episodes status on average were associated with nearly five times greater odds of ED boarding when compared to non-psychiatric ED episodes.

Results from the second part of the 2PM are presented in Column (2). Again, the second part estimates factors associated with boarding time only using the subsample of boarded ED visits. Therefore, it measures the influence of psychiatric ED episode on ED boarding time only for boarded ED episodes. Psychiatric visit status was significantly associated with additional five hour of ED stay. Our estimate is comparable to a national estimate. Nolan et al. (2015) found that at the national level, in 2008, ED boarding time was higher by 3.5 hours for psychiatric ED patients, compared to non-psychiatric ED patients.

Substance abuse was also associated with an increase in the probability of ED boarding. However, average boarding time in fact decreased by 6 hours for visits with diagnoses of substance abuse once patients become boarded. Medicaid enrollment status did not affect the probability of ED boarding while it significantly reduced an average of 5.3 hours in boarding time after patients become boarded in EDs.

Patient age was positively associated with both the probability and length of ED boarding although the magnitudes were small. Sex was not significantly associated with the probability of boarding, but the length of ED boarding was shorter for females. Race and ethnicity overall were not significantly associated with ED boarding.

Compared to admission during the weekdays, weekend admissions on average were negatively associated only with the probability of ED boarding. Rurality was significantly positively associated with the probability ED boarding: Patients living in more rural areas were more likely to experience ED boarding.

The location of hospital ED was significantly associated with both probability and length of ED boarding. When compared to EDs in Central Oregon, EDs in the Portland metropolitan, Valley, and Southern regions of Oregon had greater probability of ED boarding, in that order. In comparison, the conditional boarding time was longest in EDs located in Southern Oregon, followed by Portland metropolitan area and Northern Oregon. Although not reported in the exhibit, county indicator variables were jointly significant, implying significant cross-county variations in ED boarding.

Appendix D7 Exhibit 1. Factors affecting the probability of ED boarding and boarding time: Two-part model (Full results)

	Part 1: Pr(ED boarding)	Part 2: ED boarding time, conditional on boarding
	(1)	(2)
Psychiatric ED visit	0.0954***	5.0520***
	(0.0019)	(0.7534)
Substance abuse	0.0651***	–6.0937***
	(0.0036)	(0.8828)
Medicaid status	0.0005	–5.2616***
	(0.0008)	(0.6838)
Age	0.0007***	0.1523***
	(0.0000)	(0.0221)
Female	0.0010	–2.4669***
	(0.0009)	(0.7165)
Race (reference: White)		
AIAN	0.0008	–0.2988
	(0.0028)	(1.6487)
Asian	–0.0079*	0.4670
	(0.0034)	(3.5515)
Black	0.0012	–1.3291
	(0.0020)	(1.2035)
NHPI	–0.0041	6.8339
	(0.0041)	(7.7862)
Other	–0.0050**	–3.7061***
	(0.0016)	(1.0875)
Hispanic	–0.0004	0.2674
	(0.0014)	(1.1601)
Admission on weekend	–0.0056***	0.8983
	(0.0007)	(0.7003)
Rurality (reference: Urban)		
Large rural	0.0107***	1.8815
	(0.0024)	(1.5421)
Small rural	0.0154***	0.3830
	(0.0036)	(1.9738)
Hospital location (reference: Central Oregon)		
Eastern Oregon	–0.0085	0.9410
	(0.0071)	(3.5914)
Northern Oregon	0.0078	16.2135**
	(0.0048)	(5.2226)
Portland metropolitan	0.0715***	18.3321***
	(0.0046)	(3.1738)

Southern Oregon	0.0136**	25.5816***
	(0.0051)	(4.8084)
Valley area	0.0338***	8.3818**
	(0.0046)	(3.1734)
N	510,773	31,854

Notes: Cluster-robust standard errors are in parentheses. All models control for county fixed-effects.

* Statistically significant at the 95% level.

** Statistically significant at the 99% level.

*** Statistically significant at the 99.9% level.