SAFETY NET CUTBACKS AND HOSPITAL SERVICE PRO-VISION: EVIDENCE FROM PSYCHIATRIC CARE*

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Abstract

This paper explores how the closure of unprofitable safety net care at one hospital affects the utilization of services at nearby hospitals, the capacity choices of those nearby hospitals, and patient outcomes. I focus on the effects of inpatient psychiatric unit closures, one of the least profitable services for hospitals. Exploiting sharp variation in the timing of psychiatric unit closures across local hospital markets in California, I find that neighboring hospitals treat less than a third of the number of patients that would have been seen in the closing units. Psychiatric unit losses double at neighboring hospitals due to spillovers of the least profitable and most severe patients. Nearby hospitals strategically respond to closures by decreasing their supply of psychiatric services. Lower access to inpatient psychiatric care shifts patients to high-cost emergency room settings and has spillovers onto the criminal justice system. Taken together, my findings suggest that preventing cutbacks at one hospital can have a multiplier effect in preserving market-level access to care for vulnerable populations.

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1. INTRODUCTION

A critical issue in U.S. health care is how to treat low-income and vulnerable patients. Hospitals are not fully reimbursed for the costs of caring for these populations and must make difficult decisions about when to provide socially valuable, but privately unprofitable care.¹ To remain financially viable, hospitals face pressure to scale back safety net services used by patients with poor or no insurance. These service cutbacks do not occur in isolation, but rather in markets where they affect both patients and neighboring hospitals. While a large body of literature examines price and quality competition across hospitals, few papers focus on market interactions surrounding safety net care.

It is unknown whether hospitals are more or less willing to provide charitable care when their neighbors do so. Yet, whether hospitals crowd-in or crowd-out one another in markets for safety net care has important implications for patients, communities, and policymakers interested in strengthening the safety net. On the one hand, nearby hospitals may expand service offerings following closures to fill-in for the now missing charity, serving as strategic substitutes. On the other hand, neighbors may preserve their financial margins by scaling back capacity in the face of increased demand from unprofitable patients, serving as strategic complements. In the latter case, cutbacks in unprofitable services can have adverse effects on nearby providers, magnifying the impact of initial reductions on patients and communities.

This paper explores how closures of unprofitable inpatient psychiatric units at one hospital affect patients and nearby hospitals. Inadequate compensation and high demand from uninsured patients make psychiatric care one of the least profitable services for hospitals (Horwitz (2005)). Inpatient psychiatric units, which provide crisis stabilization for those with severe mental illness, accounted for six percent of all community hospital stays in 2014 (McDermott et al. (2017)). Over thirty-five states report psychiatric bed shortages and 80 percent of emergency departments report boarding psychiatric patients due to a lack of available beds (Lutterman et al. (2017)). Newspapers regularly highlight the strains unmet demand for psychiatric care place on other areas of government spending such as crime, homelessness, housing, work, and disability.

¹ In 2016 hospitals reported \$38 billion in losses treating uninsured patients and \$23 billion in losses serving Medicaid beneficiaries (AHA (2017)). The government relies on hospitals to provide unreimbursed care because approximately 60% are nonprofit entities exempt from taxes on account of being charitable organizations (AHA (2019)). This tradeoff between providing charitable services and maintaining profits is not unique to hospitals and health care organizations. Private organizations administering aspects of the social safety net in areas such as education, housing, and social services must make similar decisions about when to provide social goods.

I examine the effects of psychiatric unit closures using data on hospital discharges and finances from the California Office of Statewide Planning and Development (OSHPD). Over a fifth of hospitals providing inpatient psychiatric care in California between 2002 and 2014 closed their units due to financial concerns. Hospital financial data, state reports, and local newspaper stories establish that these unit closures occurred suddenly and differentially across hospitals with similar characteristics, despite growing demand for care statewide. These closures were not a result of low demand for the services at closing institutions. Rather, closures reflect idiosyncratic financial or other difficulties at the closing hospital.

I employ a matched difference-in-differences strategy that exploits variation in the sharp timing of closures across hospital markets in California. I match closing hospitals to control hospitals in different counties based on hospital type, local income and population density, and psychiatric unit characteristics. I then compare the volume and characteristics of patients at neighbors of closing hospitals to neighbors of control hospitals. Neighbors are defined as hospitals within five miles of the closing unit, with an analogous definition for the neighbors of control units. I also explore the impact on neighbors within a larger fifteen-mile radius.

I find neighboring hospitals within five miles treat 26 percent of patients that would have been seen in the closing units. Non-full volume absorption is not a result of a too-small geographic market definition; hospitals within fifteen miles only absorb 38 percent of closing volume.

Neighboring hospitals experience negative financial spillovers as a result of closures. Care at nearby hospitals shifts towards the most severe and least profitable patients, individuals with schizophrenia and Medicaid beneficiaries. As a result, loss margins double at nearby psychiatric units. Additional psychiatric unit losses translate into a 30 percent decrease in total hospital profits or a 1.5 percentage point decrease in overall hospital margins.

Since hospitals operating psychiatric units have limited discretion over which patients they treat, the key decision they can make following nearby closures is whether to adjust capacity. I examine whether nearby hospitals respond to closures by increasing or decreasing the resources they devote to psychiatric patients. I specifically focus on neighboring safety net and non-safety net hospital actions post-closure, since ownership and mission likely affect hospitals' willingness to provide additional charitable services (Newhouse (1970); Duggan (2000)). I identify safety net hospitals using a mixed approach based on public ownership and Medicaid and uninsured caseload.

I find non-safety net hospitals close psychiatric beds and units at the same time neighbors close. These cutbacks are consistent with non-safety net hospitals preserving profits post-closure by avoiding psychiatric patients. Increases in care are thus concentrated at safety net hospitals. In the short term, safety net hospitals expand some measures of capacity, but they ultimately scale back services after two years.

Finally, I show that psychiatric unit closures and subsequent cutbacks in care at neighboring providers affect patients and communities. While significant increases in total outpatient mental health care provision at hospitals and community health centers occur post-closure, they do not fully substitute for closed psychiatric beds. Increased emergency room use by individuals with mental illness suggests that patients both have less access to care following closures and rely more on high-cost emergency settings. Yearly data from police agencies on county arrest rates and data from county jails on the incidence of mental health conditions among inmates provides evidence that some patients spillover onto the criminal justice system.

My results indicate that cutbacks in charitable care have negative effects on not only patients, but also neighboring providers, for whom closing hospitals help defray the cost of care. My findings suggest that hospitals are strategic complements in safety net service provision - providers respond to neighboring closures by reducing their own capacity. Some providers may only offer unprofitable safety net services if nearby hospitals do as well. Thus, charitable actions by one hospital can crowd-in, or increase, charitable actions by nearby hospitals.

My work highlights the important role of targeted safety net funding. Spillovers between providers mean that a dollar of funding spent preserving safety net care results in more than a dollar of healthcare provision overall. This finding is significant since cuts to state and local budgets for mental health care and federal and state hospital subsidies are regularly proposed and implemented.²

The rest of the paper proceeds as follows: Section 2 provides background on existing research surrounding the supply of social goods and charity in hospital markets and describes the relevant institutional details related to inpatient psychiatric care provision. Section 3 introduces the data, and Section 4 describes the sample of psychiatric unit closures. Section 5 studies the spillovers onto other hospitals. Section 6 evaluates

² See MACPAC (https://www.macpac.gov/subtopic/disproportionate-share-hospital-payments/) for current status and history of expected DSH hospital payment reductions and Khullar et al. (2018) for discussion of their implications for safety net providers. NAMI (2011) provides an overview of state funding and related cuts for behavioral health.

whether neighboring hospitals strategically respond to closures, and Section 7 looks at the implications for patients and communities. Section 8 concludes and provides suggestions for future research.

2. CONCEPTUAL FRAMEWORK AND BACKGROUND

2.1. SUPPLY OF CHARITABLE CARE IN HOSPITAL MARKETS

Hospitals must make difficult calculations about when to offer care that is socially valuable, but privately unprofitable. This charitable care includes not only medical care for uninsured patients, but also services that attract large numbers of patients that have low reimbursement relative to cost.

Hospitals offer charitable care for different reasons. While some hospitals provide unprofitable care to comply with government mandates, others provide charity based on mission or in response to financial incentives. Public hospitals operate as providers of last resort and serve patients regardless of ability to pay. Many private hospitals also act in the public interest. Over 60 percent of general acute care hospitals in the U.S. qualify for nonprofit tax exemptions because they are classified as charitable organizations (AHA (2019)). Furthermore, the government provides financial incentives for hospitals to provide charitable care through programs such as Medicaid and Medicare Disproportionate Share Hospital (DSH) and other supplemental payments. Research shows private hospitals respond strongly to financial incentives when deciding whether to offer services that attract indigent patients (Horwitz (2005); Duggan (2000)). Public payments for charity may also lead hospitals to perceive themselves as having soft budget constraints with regards to charity if hospitals expect the government to bail them out on account of providing valuable services in short supply. (Capps et al. (2017); Shen and Eggleston (2009)).

Regardless of ownership status or motivation for providing charity, hospitals have to make complicated decisions about whether to offer charitable care. Hospitals are business enterprises, and as such, must strive for financial viability. Hospitals will naturally want to eliminate unprofitable services and add profitable ones when under financial stress. One charitable service particularly vulnerable to these cuts is inpatient psychiatric care.

2.2. BACKGROUND ON INPATIENT PSYCHIATRIC CARE

DEMAND FOR INPATIENT PSYCHIATRIC CARE

Inpatient care involves an overnight or longer stay in a psychiatric unit of a general hospital or specialty psychiatric hospital. Hospitalization provides crisis stabilization for individuals with severe mental illness under around-the-clock supervision of a psychiatrist.³ Inpatient care is the most intense level of mental health treatment and appropriate for patients who are at risk of harming themselves or others, or are no longer able to care for themselves.⁴ Patients may voluntarily admit themselves to a unit or be involuntarily admitted by family members, health care professionals, or law enforcement.

Psychiatric care accounts for a large portion of total hospital care - in 2014, one in every fourteen hospital stays in California was at an inpatient psychiatric unit or specialty psychiatric hospital. Despite advances in the treatment of mental disorders through medication and outpatient care, quality-of-care guidelines continue to underscore the importance of inpatient care for serious, acute, and complex disorders.⁵ Nationwide, the inpatient psychiatric admissions rate has been increasing since 2000 (Banta et al. (2010); Blader (2011)). News organizations, policymakers, and advocacy groups regularly highlight the existence and impact of bed shortages in psychiatric care. Experts estimate a need for fifty psychiatric beds per 100,000 people (CHA (2018)). In California, there were only 17 beds per 100,000 people in 2016, while nationwide there were 20 beds per 100,000 people. Over time, California's shortage has become particularly acute due to a decreasing number of psychiatric beds and large population growth.⁶

THE PROFITABILITY OF PSYCHIATRIC CARE

Prior work documents that inpatient psychiatric care, along with emergency psychiatric care, substance abuse, and trauma, is one of the least profitable hospital services (Vladeck (2006); Horwitz (2005); Chen et

³ Other, less intense, levels of mental health care include outpatient care, day treatment, and residential treatment.

⁴ Examples of patients that would qualify for hospitalization include those with realistic plans or attempts to commit suicide and those with impairments or delusions that compromise their safety and health. To qualify for inpatient psychiatric hospitalization, a professional needs to evaluate the severity of a patient's current condition and symptoms and deem that hospitalization is medically necessary. Acute dangerousness, functional impairment, mental status changes, and psychosocial factors all contribute to patient severity (Aetna, 2018).

⁵ Specialized treatments, such as patient stabilization, complex drug therapy, coordinated psychotherapy, short-term detoxification, intense observation, and crisis care, are often provided best by specialized psychiatric or medical units (Stensland et al., 2012)

⁶ Between 2002 and 2014, the number of psychiatric beds decreased by 12% while the population grew by 11%.

al. (2009)).⁷ Studies show that many hospitals rely on other service lines to cross-subsidize inpatient psychiatric care and that following financial shocks, hospitals cut psychiatric services (David et al. (2014); Dranove et al. (2017)). Inpatient psychiatric care is unprofitable for two main reasons: patient demographics and low provider reimbursements.

First, psychiatric services disproportionately attract a poor, uninsured, and sick population. Rates of uninsurance are high in this population because of the nature of mental illness and related difficulties associated with obtaining coverage for mental health care.⁸ Patients with severe mental illness are also costly to manage and treat due to the nature of these diseases. For example, schizophrenia is the most common diagnosis in psychiatric units and the least profitable across public and private payers due to the high cost of treatment (Stensland et al. (2012)).⁹ It is also difficult for hospitals to avoid treating many psychiatric patients. Under the Emergency Medical Treatment and Active Labor Act (EMTALA), hospitals must stabilize all emergency patients before discharging them from the hospital. This means hospitals must treat all emergent psychiatric patients that enter their hospital, regardless of ability to pay or other demographic characteristics (Zibulewsky (2001)).

Second, low provider reimbursements plague psychiatric care. Public sector payers, such as Medicare and Medicaid, pay for over ~60 percent of psychiatric admissions and tightly restrict their reimbursement levels for hospital services (Sharfstein and Dickerson (2009)). Among private payers, reimbursement is also low relative to cost and uncertain. In my study period, parity requirements for mental health and substance use did not apply to all insurers. As a result, many private and public insurers did not cover mental illness or provide equal benefits for mental health care and other medical and surgical care (Barry et al. (2010)). Many private plans also reimburse for inpatient psychiatric care at lower rates than other hospital services and try to keep psychiatric payments down through utilization management (Beronio et al. (2014)).

It is important to note that despite these conditions driving psychiatric care to be unprofitable, some hospitals make money in inpatient psychiatric care. I observe a growing number of free-standing for-profit

⁷ While the profitability of services is certainly influenced by hospital production decisions, distortions embedded in payment systems and the positive relationship between socioeconomic status and certain diseases lead these services to lose money across providers.

⁸ Incomplete coverage of mental health is an issue even among high-income groups. To combat adverse selection, insurers often limit coverage for mental health care and discourage individuals with these conditions from selecting their plans through network and formulary design (Beronio et al. (2014); Rose et al. (2017); McGuire (2016)).

⁹ Bipolar disorder is always also one of the least profitable. Alcohol and drug use are in the middle, but vary between groups, likely due to demographic differences in who uses these services, and depression is always among the most profitable.

private psychiatric hospital beds in my data. This reflects a larger trend nationwide since 2004. In California, standalone private psychiatric providers serve a significantly different mix of patients - patients at standalone for-profit facilities are significantly less likely to have severe mental illness and significantly more likely to be privately insured. The growth in these standalone psychiatric facilities can be attributed to tight industry capacity and a favorable competitive and regulatory landscape that provides them with increased discretion over patients they admit and dictates that they cannot service large portions of the Medicaid population (Hutchins et al. (2011)).¹⁰

GOVERNMENT PROVISION OF PSYCHIATRIC CARE IN CALIFORNIA

Local governments play a significant role in financing and delivering psychiatric care in California. On the payer side, counties manage specialty services for severe mental illness in both Medicaid fee-for-service and Medicaid managed care through County Mental Health Plans. Counties also run indigent services programs that fund inpatient behavioral health and other medical care for a subset of low-income individuals that are not eligible for Medicaid (Duggan et al. (2019)). On the provider side, counties operate facilities to provide outpatient and inpatient mental health care and specialty health care districts run public hospitals that provide medical services to underserved populations and fill in gaps in local services. In 2010, 15 percent of licensed psychiatric beds in California were at public county or district hospitals. When counties cannot provide care for indigent patients themselves, they will subsidize and contract with local private providers.

2.3. POTENTIAL HOSPITAL RESPONSES TO CUTBACKS IN CARE

Given that psychiatric care is unprofitable and many hospitals are nonprofits entities exempt from taxes on account of being charitable, it is unclear how psychiatric unit closures should affect nearby hospitals' decisions to offer psychiatric care.¹¹ On the one hand, nearby hospitals may expand psychiatric service offerings to fill in for the now missing charity, acting as strategic substitutes. On the other hand, neighbors might

¹⁰ Because free-standing psychiatric hospitals neither operate emergency departments (EDs) nor provide other medical services, they can avoid medically complicated patients and exercise discretion over the patients they accept from private referrals and external EDs. The Federal Institute for Mental Disease (IMD) Exclusion also prohibits the federal government from reimbursing standalone facilities over sixteen beds for inpatient services for Medicaid beneficiaries over age twenty-one, and thus and shields standalone providers from demand from the adult Medicaid population. Despite their increased prevalence, the quality and efficiency of private standalone psychiatric facilities remains unknown (Shields and Rosenthal (2016)).

¹¹ Much of the policy debate about nonprofit hospitals asks whether they are doing their part in providing social goods given that they are exempt from state, federal, and local taxes on account of being charitable. Nonprofits are generally viewed as selling services to payers at a positive margin and then due a non-distribution constraint and altruistic preferences using the net revenue to supply social goods or higher quality care (Lakdawalla and Philipson (1998); Weisbrod (1988)). This question of how hospitals respond to closures of unprofitable services at nearby hospitals directly speaks to the larger question of how nonprofit entities behave in markets given their tax advantages.

preserve their financial margins by scaling back their own psychiatric capacity and units, acting as strategic complements.

A number of theories suggest that hospitals will respond to closures by expanding services. In traditional models of nonprofit behavior, hospitals are altruistic and maximize their own output (a mix of quality and quantity of care) subject to a budget constraint (Newhouse (1970)). A key implication of these models is that hospitals meet community needs where market and government failures leave them unmet (Weisbrod (1988)). These models predict that hospitals will react to closures by increasing their provision of psychiatric services to offset the behavior of the closing hospital.¹²

Meanwhile, other theories suggest that hospitals will decrease their provision of psychiatric services in response to nearby closures. Frank and Salkever (1991) propose a model termed "impure altruism" where nonprofit hospitals aim to provide the same level of charity as their neighbors. Other variants of traditional nonprofit models include profits and neighboring hospital output in the utility function (Malani et al. (2003); Lakdawalla and Philipson (1998)). Under these models, hospitals may shift away from providing charity if neighboring hospitals close.

Closures may also cause neighboring hospitals to reduce capacity in order to satisfy their budget constraint. Research shows that following hospital closures, other hospitals in a market absorb the full cost of care for non-psychiatric uninsured patients (Garthwaite et al. (2018)). Furthermore, when nearby public and safety net providers treat unprofitable patients, private hospitals are able to cream-skim and serve higher paying patient groups (Hsuan et al. (2019); Duggan (2000)). If neighboring hospitals close money-losing services, nearby hospitals face increased demand from unprofitable patients. Absent the ability to choose which patients to treat, hospitals may strategically respond to closures by eliminating beds and services.

Restricted capacity mechanically bounds the potential for overall losses. It also creates potential opportunities to avoid financial losses in the long-term by increasing the provider's ability to screen patients and decreasing the attractiveness of the hospital to those seeking psychiatric care. As a result, hospitals may only provide safety net care when nearby providers do as well.

¹² Empirical work looking at service provision and quality of care provide support for this class of models (See Horwitz and Nichols (2009) or Chang and Jacobson (2012) for overview). It is also important to note that much of the hospital closures literature finds non-psychiatric patients continue to get care at remaining hospitals post-closure and that any changes in access are due to increased travel costs (Bazzoli et al. (2012); Carroll (2019); Lindrooth et al. (2003)).

3. Data

3.1. CALIFORNIA INPATIENT PSYCHIATRIC CARE DATA

My primary data on hospital psychiatric care consists of hospital financial and utilization records from the California Office of Statewide Planning and Development (OSHPD) between 2002 and 2014. Three features of the OSHPD data make it ideal for understanding psychiatric care provision.

First, the utilization data include patient-level discharge data on the universe of inpatient hospitalizations at general acute care and specialty psychiatric hospitals. This allows me to study visits across payer types and providers. Payer-specific claims datasets, like Medicare Carrier files or Medicaid Analytic eXtract, only cover certain groups. Many claims and discharge databases also suppress information on inpatient psychiatric care or do not report information for standalone psychiatric hospitals. California, on the other hand, requires licensed providers to report every hospital stay and indicate whether patients were discharged from licensed psychiatric beds. Additionally, I use data on other hospital discharges between 2002 and 2014 and ED visits for psychiatric conditions between 2005 and 2014.¹³ A notable shortfall of my data is that it is limited to inpatient and emergency hospital care and does not include information on other providers, such as office-based providers and residential treatment facilities.

Second, each discharge record includes detailed information on primary payer, patient demographics, diagnoses, and procedures, and details on admission and discharge locations. I can therefore compare trends and outcomes for patients with similar characteristics, diseases, and insurance seen at different providers. I also link these records across patient visits for a sample of years through a version of the OSHPD data purchased through the Hospital Cost and Utilization Project (HCUP).

Finally, the OSHPD financial data provides information on the finances and operations of psychiatric units within larger hospitals. The financial reports identify revenue, costs, staffing, and beds at the hospital unit and full hospital level.

¹³ As is standard in discharge data, ED visits that result in hospitalization only appear as hospital discharges. However, all discharge records indicate whether the stay originated in an ED at a given hospital or another hospital.

I link the utilization files and financial records together for each calendar year.¹⁴ I restrict my sample of hospitals to general acute care and standalone psychiatric care hospitals available to the general public.¹⁵ My ultimate sample consists of 568 unique hospital facilities, 212 of which offer psychiatric care at some point during my sample period. The data include approximately 200,000 psychiatric unit discharges per year.

I organize hospitals into two groups - safety net hospitals and non-safety net hospitals. These providers face different objectives and constraints in offering unprofitable services. The Institute of Medicine defines safety net providers as providers who are driven by mandate or mission offer access to care regardless of a patient's ability to pay and treat a large number of uninsured, Medicaid, and other vulnerable patients. Since there is no consensus on how to empirically identify safety net hospitals, I use a mixed approach based on public ownership and low-income (defined as Medicaid, county insurance, and (defined as Medicaid, county insurance, and self-pay/charity) caseload (Popescu et al. (2019)). I assign safety net status by whether a hospital is owned and operated by the county or hospital district, is above the 75th percentile of total low-income discharges, or above the 75th percentile of total psychiatric unit low-income discharges. A hospital is designated a safety net hospital if it meets this definition in the majority of the years it is in operation in my sample. Overall, 33 percent of all hospitals and 50 percent of hospitals down by whether they are general acute or standalone psychiatric providers.

Each psychiatric unit discharge is classified on two dimensions: disease and payer. Diseases are based on primary ICD-9 diagnosis code and aggregated into six categories following the procedure in Appendix C based on Stensland et al. (2012). The categories are Schizophrenia, Bipolar Disorder, Depression, Alcohol

¹⁴ There are a few caveats related to linking the financial data to the discharge records. First, the reporting periods in the utilization records do not correspond precisely with the financial records. OSHPD consolidates discharges to the calendar year, but fiscal reports generally cover the individual hospital's fiscal year. Therefore, financially data that I refer to as being from a certain year may actually report some portion of the previous year. Second, several hospitals submit multiple reports covering less than one year. I combine multiple reports for the same year accordingly, and adjust relevant data for fiscal years not equal to 365 days. Finally, financial data is not available for 4% of hospital-year observations. OSHPD exempts hospitals in the Kaiser Permanente system from reporting for each individual facility. A select number of other facilities report the financials of standalone psychiatric units with their own OSHPD identification number, as part of the larger hospitals financials. These shortfalls have been previously documented by Kirby et al, 2005 and my approach is based on their methodology.

¹⁵ As a result, I exclude chemical dependency, other specialty care, and a handful of state-run hospitals. There are very few chemical dependency and other specialty hospitals, and none operate licensed psychiatric care beds. While many state-run hospitals offer psychiatric care, the care they provide is not substitutable with other hospitals. Five of California's state hospitals provide care for incarcerated individuals and are not available to the general public. The other six state facilities provide care to institution-alized populations with developmental disabilities.

Use Disorder, Drug Use Disorder, and Other. Payer classifications come from Duggan et al. (2019) and include Private, Medicare, Medicaid, County, Self/Charity, and Other.¹⁶

3.2. IDENTIFYING CLOSURES IN THE DATA

I use data on the number of patients discharged from licensed psychiatric beds and a given hospital to identify psychiatric unit closures.¹⁷ Since California OSHPD identification numbers are based on hospital location, not ownership, they can be used to track a provision of psychiatric care at certain locations over time.¹⁸

I identify two types of closures based on psychiatric units that stop discharging patients in the OSHPD data. First, I identify hospitals that continue operating, but close their psychiatric unit. Second, I identify hospitals operating psychiatric units that close completely.¹⁹ Since hospital closures sometimes span more than one calendar year, I define the closing year as the first year discharges fall by more than fifty percent.

To ensure my analysis is based on legitimate psychiatric unit closures, not phantom closures (i.e., those that are a result of administrative consolidations and/or mergers with facilities), I verify all closures using two sources. I confirm closures were legitimate by looking at licensed and staffed psychiatric bed data for the closing psychiatric unit and all other hospital psychiatric units under the same owner in the health service area in the OSHPD data. Then, I use local news articles and other publicly available information when available to corroborate that the closure occurred. Finally, I eliminate closures of units with fewer than fifty discharges due to their small size. I repeat an equivalent procedure for all psychiatric unit openings that occur. A list of all closures and openings along with their validation is available in Appendix C.

¹⁶ Medicare and Medicaid include both traditional and managed care populations. County covers patients paid for the county indigent health programs discussed above. Self encompasses both uninsured and self-pay patients. Other includes smaller insurers like government employees and worker's compensation along with those with unspecified coverage.

¹⁷ This approach represents an objective measure of actual service utilization and is ultimately more accurate and straightforward than using hospital reports of whether they operate psychiatric units (Kirby et al. (2006)).

¹⁸ This makes identifying closures far more straightforward than in national datasets like the Medicare Cost Reports where there are well-known problems with identification numbers changing over time or disappearing for reasons other than closures (Carroll (2019)).

¹⁹ I classify hospitals as closing a unit when they continue to discharge patients but stop discharging patients from psychiatric beds for two consecutive years after having discharged patients from those beds in the two prior years. I classifying hospitals as closing if they disappear from the data.

3.3. ADDITIONAL NON-HOSPITAL DATA

I link the OSHPD data to a variety of other county and zip-code level data. In order to compare hospitals in similar areas, I incorporate zip-code level data on household income and population density from the Census Bureau. Reduced supply of inpatient psychiatric services can result in patients shifting to outpatient settings, or if demand is unmet, potentially spilling over onto the criminal justice system. To look at changes in service utilization outside of hospitals, I use additional data from OSHPD on the operations and utilization of community health centers in California. Finally, I link data on psychiatric units to data on arrests and county jail inmates to see if closures affect crime. These data include information on the share of county jail inmates with mental health conditions from the California Board of State and Community Corrections and local police agency reports on the number of violent, property, disorderly conduct, and drug arrests in their jurisdiction from the FBI Uniform Crime Reporting Data.

4. PSYCHIATRIC UNIT CLOSURES IN CALIFORNIA

Psychiatric unit closures occurred frequently in California over my sample period. Over a fifth of all hospitals offering inpatient psychiatric services in California eliminated psychiatric facilities between 2002-2014. Figure 1 details the stock of inpatient psychiatric care in California over time. Panel A shows that out of the 166 hospitals operating inpatient psychiatric care units in 2002, only 119 of them continue to operate psychiatric units in 2014. While seventeen hospitals opened new units over this period, the percent of lost capacity is far higher than the percent of capacity opened. Panel B highlights that the overall number of staffed beds in California dropped by 12 percent between 2002 and 2014. Panel C shows that the overall utilization of psychiatric care remained constant or increased, despite the substantial number of patients seen.

Figure 2 focuses on the forty-six validated legitimate closures (see Appendix C for list). While closures took place across the state, urban areas around Los Angeles and the San Francisco Bay Area experienced higher than average rates of closures. In Los Angeles county, the rate of closure was 29 percent, while in the rest of the state the closure rate averaged at 19 percent.

Across the state, closures primarily transpired at units within safety net and non-safety net general acute care hospitals. Very few standalone psychiatric hospitals closed. The difference in the closure rate across standalone psychiatric and general acute care hospitals further highlights the discrepancies in the financial viability of inpatient psychiatric care across hospital types. Since a common strategy among hospitals struggling to stay financially viable is to cut unprofitable services, it is unsurprising that hospital psychiatric unit closures occur at three times the rate of full hospital closures at general acute care hospitals.

Many hospital closures in my data occur over multiple calendar years. Actual closures likely occur over shorter periods, but take longer in the data since information is only available at the calendar year level. The average closing unit had 682 discharges the year prior to closing. This translates to closing just over twentyfive beds.

Among the sample of hospitals that close psychiatric units and the sample of hospitals that that never close psychiatric units, there are substantial differences in hospital type, financial status, and psychiatric unit operations. Table 1 details these differences. The first column presents the mean of each variable among the sample of hospitals with psychiatric units that never close. The second column presents the mean among and hospitals with psychiatric units that close. The closing sample only includes the pre-closure data for hospitals so that closure is not conflated with reduced provision and poor financial outcomes. The third column reports the difference in these variables, conditional on year, and the associated p-value.

Hospitals that close are in worse financial circumstances on average - their overall financial margins average less than half that of hospitals that do not close their psychiatric units. Their psychiatric units also suffer from poor financial performance -- hospitals that close their psychiatric units lose almost twice as much per psychiatric unit discharge (-\$5,263 versus -\$2,718), despite keeping patients for the same number of days. While hospitals operating smaller units and having lower occupancy rates partially explain lower profits, these factors alone do not explain the significant differences in psychiatric unit profitability.

Closing hospitals are more likely to operate emergency departments, so they are less able to control the types of patients they see. Only 15 percent of patients at closing units are privately insured compared to 24 percent at non-closing hospitals, and closing units see significantly more patients with schizophrenia. The hospitals that close are not more likely to be safety net hospitals or see patients covered by Medicaid and county indigent programs. There are a few potential explanations. Many hospitals seeing the least profitable

patients may operate these units and tolerate significant losses because they are mission-oriented and have altruistic objectives. County programs also appear to contract with non-closing providers more and may help psychiatric units avert closures.

While financial losses appear to be a necessary condition for closure, they are not a sufficient condition. An examination of the distribution of total yearly profits across the non-closing and closing sample of psychiatric units in Figure 3 highlights that hospitals in the worst financial positions are not always the ones that close. While very few hospitals that close make money on psychiatric patients, a large share of hospitals that continue to operate psychiatric units lose money. Financial gain is only one component of non-profit and government hospital objectives and many providers are willing to tolerate losses to provide essential services.

Newspaper articles discussing closures in this period make it clear that hospitals do not usually close their psychiatric units due to sharp changes in profitability, but rather a combination of factors including hospital objectives, financial goals, and changes to the long-term sustainability of operating a psychiatric unit. Hospitals closing units frequently cite hospital specific factors (sustained losses for too many years, transitions in ownership and potential for acquisitions, and increased opportunity cost of using hospital space for psychiatric units), factors unique to California in this period (minimum nurse staffing upgrades, shortages of psychiatric providers, and seismic upgrades to facilities) and some nationwide trends (Medicare shifts to a prospective payment system in psychiatric care and psychiatric provider shortages). For example, Cedars Sinai Medical Center in Los Angeles, a large academic medical center that is consistently included in lists of the top hospitals in the U.S. and sees a large share of privately insured patients, closed their inpatient psychiatric unit and outpatient programs to "focus on what it does well and what it will continue to need to do well to serve the community."20 Desert Regional Medical Center in Palm Springs closed its twenty-seven bed psychiatric unit to expand a surgery center in 2005, following a local specialty surgical hospital closure, leaving the entire Coachella Valley region with just one sixteen-bed site.²¹ These examples from specific closures highlight how psychiatric unit closures reflect idiosyncratic financial or other difficulties at the closing hospital, not low demand for services or sharp changes in the profitability of psychiatric care.

²⁰ https://www.latimes.com/health/la-xpm-2011-dec-01-la-me-cedars-mental-20111201-story.html

²¹ https://www.desertsun.com/story/news/health/2016/08/08/psychiatric-patients-strain-localers/87625382/

5. SPILLOVERS ONTO NEARBY HOSPITALS

To understand how hospital psychiatric unit closures affect the volume and provision of psychiatric care by other providers in the same market, I use an event study design to capture changes in markets before and after closures. The previous section showed that hospitals that closed were on average different from nonclosing hospitals. I address these differences by matching closing hospitals to non-closing control hospitals in other markets with similar characteristics. This section first describes the market definition, matching procedure, event study design, and identification assumptions. It then presents the results from the event study analysis on overall utilization and analyzes the financial implications of closures for nearby hospitals.

5.1 Empirical Strategy

I estimate the effect of hospital psychiatric unit closings by comparing the volume and characteristics of patients receiving psychiatric care in markets experiencing a closure to markets that do not experience a closure in the same period. Specifically, I use a difference-in-differences (DD) event study analysis of psychiatric unit discharges. The motivation for this strategy is that psychiatric unit closures are sharp, occur for heterogenous reasons, and not driven by decreases in demand at the closing hospital or market overall.

My first approach is to graphically analyze changes in the number of patients seen by neighboring psychiatric units in the same market. A key question is how to define the market affected by the psychiatric unit closure. Unfortunately, there is no generally accepted method for defining hospital markets (Dranove and White (1994); Garthwaite et al. (2018)). If the market definition is too narrow, I will not capture patients seen at hospitals outside of the market. At the same time, if the market is too large, I will lack power to detect economically significant changes. Two traditional market definitions in the literature, hospital service area (HSA) and hospital referral region (HRR), are not appropriate for my setting because they are either too large or too small. HSAs, which are local areas where the residents primarily use the hospitals located within the area, are too small because they often include just one hospital. Meanwhile, HRRs, which are collections of HSAs whose residents were referred for cardiovascular and neurosurgery treatments, are too large a market to be affected by changes at singular hospitals. To address this issue, I define the market as all other hospitals operating psychiatric units within five miles of a closed unit. I also present results for psychiatric units within 15 miles from the closed unit to assess how results change when I expand the definition of the market. This approach has previously been used to study the effect of hospital closures (Lindrooth et al. (2003)) and is often employed by the State of California in impact evaluation reports surrounding hospital closures and mergers.

I rely on the sample of psychiatric unit closures with at least one year of data pre-and post-closure. This limits my sample to thirty-six unique psychiatric unit closures. Twenty-five of these hospitals have neighbors operating psychiatric units within five miles. The closing units account for 30 percent of capacity on average in the market. Within fifteen miles, thirty-one hospitals that close their psychiatric unit have neighbors. These hospitals with closing units account for 14 percent of the market on average.

For each closure, I define a matched comparison group as follows. First, I construct a propensity score for all hospitals by estimating their probability of closing. The specification models closure as a function of mean household income and population density in the hospital's zip code, the number of licensed beds in the psychiatric unit, and the share of patients seen in the psychiatric unit that are privately insured and covered by county programs. Next, I match closed hospitals to hospitals operating in a different county in the year prior to closure using nearest-neighbor matching with no replacement based on the propensity score. The nearest neighbor is defined as the hospital in the same group (Safety Net or Non-Safety Net) and of the same type (standalone psychiatric or general acute care) with the closest propensity score that did not close or open at any point in my sample and had competitors in the same market. This specification improves on traditional propensity score matching because it requires an exact match on key characteristics and matches on a limited number of variables (King and Neilson (2019)).²²

Figure 4 shows raw plots of the volume of psychiatric unit discharges in closing hospital and matched hospital markets relative to the year of closing. The drop in closing units is apparent, while matched units follow a smooth stable trend. For the remaining hospitals in the market, there is a stable trend, but a clear deviation in the post-period.

To estimate the effects of the closings on the volume of patients seen at all other hospitals in the market in regression form, I estimate the following equations on the sample:

$$Y_{ht} = \alpha_h + \gamma_t + \sum_{\tau} D_{ht}^{\tau} + \sum_{\tau} \delta_{\tau} (Treated_h * D_{ht}^{\tau}) + \epsilon_{ht}$$
(1)

²² Coarsened exact matching, an alternative to propensity score matching suggested in King and Neilson (2019), is not ideal for my data due to sample restrictions and substantial variation in key variables across counties (for instance, nowhere in the state is as urban as Los Angeles).

$$Y_{m(r-h)t} = \alpha_{m(r-h)} + \gamma_t + \sum_{\tau} D_{m(r-h)t}^{\tau} + \sum_{\tau} \beta_{\tau} \left(Treated_{m(r-h)} * D_{m(r-h)t}^{\tau} \right) + \epsilon_{m(r-h)t}$$
(2)

Where in equation (1), Y_{ht} is an outcome (e.g. the total number of patients seen in the psychiatric unit) for hospital unit b in calendar year t. The α_h are hospital fixed effects, and γ_t are calendar year fixed effects. The variable *Treated*_h is an indicator equal to one if hospital psychiatric unit b is a closing (treated) unit and zero if it is a non-closing matched (control) unit. The D_{ht}^{τ} are indicators equal to one if year t is τ years before or after the year of the closure or zero otherwise. The coefficients of interest, δ_{τ} , capture the change in outcomes for the closing hospital relative to the non-closing matched hospital.

In equation (2), $Y_{m(r-h)t}$ is the same outcome aggregated over all other hospitals in the market, defined as all other hospitals in radius *r* of the closing or non-closing matched hospital psychiatric unit, in calendar year *t* (e.g. the total number of patients seen at any hospital within five miles of the closing hospital in a given year). $\alpha_{m(r-h)t}$ are hospital market fixed effects, and γ_t are calendar year fixed effects. The coefficients of interest, β_{τ} , capture the change in outcomes for the closing hospitals' market relative to non-closing hospital's market. All regressions are weighted by the size of the psychiatric unit closure.

I plot the estimates for volume of patients at the closing hospital (δ_{τ}) and and surrounding market (β_{τ}) against the years relative to closure. Since I am ultimately interested in the share of closing psychiatric unit volume absorbed by the remaining hospitals in the market, the key variable of interest is the ratio $\beta_{\tau}/\delta_{\tau}$.²³

For table estimates, I present a pre-post version of equations (1) and (2).

$$Y_{ht} = \alpha_h + \gamma_t + \sum_{\tau} D_{ht}^{\tau} + \delta(Treated_h * Post_{ht}) + \epsilon_{ht}$$
(3)

$$Y_{m_{(r-h)}t} = \alpha_{m_{(r-h)}} + \gamma_t + \sum_{\tau} D_{m_{(r-h)}t}^{\tau} + \beta \left(Treated_{m_{(r-h)}} * Post_{m_{(r-h)}t} \right) + \epsilon_{m_{(r-h)}t}$$
(4)

In addition to running the pre-post specification with one post-treatment interaction, I run an additional version of the pre-post specification with separate post-treatment interactions for $\tau = [0,1,2]$ and $\tau = [3,4]$. This allows me to identify short-term effects separately from long-term effects.

²³ To estimate this coefficient, I stack the data and run one regression with each term interacted for whether the observation is for a hospital or market.

The main identification assumption is that there is no unobserved shock that is both contemporaneous with hospital psychiatric unit closures and correlated with differential trends isolated to the surrounding market. A key concern is that hospitals are closing psychiatric units in markets where psychiatric care is becoming less profitable. Matching on area characteristics and the mix of patients at closing hospitals should alleviate this concern because it allows me to identify the effects off of differences between hospitals and markets with similar characteristics. In the figures presented below, I demonstrate that both the closing and matched hospitals and their surrounding markets exhibit parallel pre-trends in the year before closure in the total volume of patients they see.

5.2. EFFECT OF CLOSURES ON TOTAL PATIENTS SEEN

PSYCHLATRIC UNIT VOLUME ABSORBED

Figure 5 documents how the volume of patients seen by remaining hospitals with psychiatric units changes in response to a closure. Panel A plots the coefficients from a basic event study with no matched comparison group. Panel B plots the coefficients for an event study with a matched comparison group coefficients δ_{τ} and β_{τ} for $\tau = [-5,4]$ from estimating equations (1) and (2).

Prior to closure, the volume of patients seen at the closing hospital and hospitals remaining open is relatively stable in the preferred specification shown in Figure 5 Panel B. The number of patients seen at the closing hospital falls sharply by 1050 patients in the two years following closure. At remaining hospitals in the market, the aggregate volume of patients seen in any psychiatric unit increases by 400 patients in the two years following the closure. This is 38 percent the size of the closure (Figure 6 Panel B). The market absorption effect is not persistent in subsequent years. Five years out, the rest of the market returns to its preclosure volume. On average, only 26 percent of the total volume is absorbed in the five years following closure (Figure 6 Panel A). When I look at psychiatric unit patient days instead of psychiatric unit discharges, the overall share is only 19 percent (Appendix Figure A.2) In Appendix Figures B.1 and B.2, I show that non-full volume absorption is not a result of too small a market definition, only 38 percent of patients are absorbed within fifteen miles.

One interesting aspect of these results is that there is little or no pre-trend in the number of patients closing hospitals see in the pre-period. In the hospital closure literature, identifying the effect of closures can be difficult because closures are often preceded by many years of reduced demand. While hospitals tend to go out with a whimper, psychiatric units go out with a bang. In psychiatric units, closures occur suddenly and sharply. The lack of pre-trend supports prior evidence that it is financial strain, not decreased demand, that causes units to close. This sharp decrease holds with and without the difference-in-differences comparison with matched psychiatric units in Figure 5 Panel A and B and persists at fifteen miles (Appendix Figure B.1).

VARIATION ACROSS PATIENT SUBGROUPS

Lost market volume as a result of closures has different implications depending on which patients continue to be seen. Figure 6 plots the ratio coefficients of interest from the post-treatment specification in equations (3) and (4) for the main insurers - Private, Medicare, and Medicaid - and conditions - Schizophrenia, Bipolar Disorder, and Depression. Regression coefficients for the volume of patients seen and closing and neighboring hospitals, along with the calculated offset, are available for all insurers and conditions in Appendix Table A.1. My results indicate that other hospitals in the market increase treatment for the least profitable patients following neighboring psychiatric unit closures. On the insurance side, the highest paying patients, privately-insured patients, are absorbed at a much lower rate than publicly-insured Medicare and Medicaid enrollees. On the condition side, other hospitals in the market absorb almost the full volume of patients with schizophrenia, but very few patients with bipolar disorder or depression. Publicly-insured psychiatric patients and those with schizophrenia appear to crowd-out inpatient care for privately-insured psychiatric patients. Hospitals appear to have limited discretion over which patients they treat in their psychiatric units and face difficulties avoiding many of the most severe and least profitable patients. An implication of these results is that when a hospital closes, there are large spillovers of unprofitable patients onto nearby hospitals.

TESTING ALTERNATIVE EXPLANATIONS

The identifying assumption behind my difference-in-differences design is that absent closures, markets surrounding closing and matched hospitals would experience the same trend in psychiatric utilization. Figure 5 already shows that the parallel pre-trends assumption holds. However, it is possible that changes in the local area concurrently make psychiatric care less profitable and cause closures. One mechanism could be decreased reimbursement rates for psychiatric care. To probe this possibility, I use the average Medicaid reimbursement rate for psychiatric care at neighboring hospitals as an outcome variable in equation (2). While a small bump occurs in the year of the closure, the reimbursement rate is otherwise steady across the pre and post-period (Appendix Figure A.3).

It is also possible that county mental health department decisions to shift care towards specific providers may drive closures. To probe whether local governments changed their contracts and funding with closing and neighboring providers, I look at total Medicaid DSH payments and county indigent care funds to hospitals as outcomes in equations

(1) and (2). These subsidies are the primary levers outside of Medicaid reimbursement rates that counties use to subsidize hospitals they contract with in California. Hospital subsidies neither decrease at closing hospitals pre-closure nor increase at neighbors post-closure (Appendix Figure A.3). This confirms that county decisions to direct care from closing hospitals to nearby hospitals do not explain my findings.

5.3 MAGNITUDE OF FINANCIAL SPILLOVERS ON NEIGHBORING HOSPITALS

Figure 7 depicts changes in the psychiatric unit margin at the average nearby hospital. Psychiatric unit margins are defined as total psychiatric unit revenue divided by total psychiatric unit costs.²⁴ Similar to previous estimates, these results are derived using equation (2), and compare average margins at hospitals within five miles of closures to hospitals within five miles of matched non-closing hospitals. The results show that hospitals in the closing market are becoming slightly more profitable in the pre-period, but then become much less profitable in the post period. Two years following closure, psychiatric margins decrease by 40 percentage points (equivalent to losing 40 cents more per dollar of psychiatric unit revenue).

Back of the envelope calculations demonstrate that decreased margins translate into large negative spillovers on neighboring psychiatric units. Prior to closure, neighboring hospitals operating psychiatric units lost \$3.45 million dollars serving 1,284 patients on average (\$9.7 million in revenue and \$13.2 million in cost). These losses, which equate to a psychiatric margin of -35 percent (or 35 cents of losses on every dollar made), are comparable to average losses across non-closing psychiatric units in Figure 3.

Two years post closure, psychiatric unit margins decrease by 40 percentage points (Figure 7). As a result, losses per dollar or revenue at neighboring hospitals more than double. Holding revenue constant, back of the envelope calculations suggest hospitals go from losing \$3.45 million to \$7.38 million in their psychiatric units.²⁵

²⁴ Costs include both direct and allocated costs in the psychiatric unit.

²⁵ For hospitals within 15 miles, the average change in losses is much smaller (\$2.65 million to 3.76 million), confirming that most of the closing volume is absorbed by psychiatric units within five miles.

This represents a substantial cut to overall total hospital profits and margins. Nearby hospitals operating psychiatric units only made \$12.9 million in profits (5.1 percent total margin since \$254 million in revenue), so the additional \$3.93 million in losses from the psychiatric unit translate to a 30 percent decrease in overall hospital profits, or 1.5 percentage point decrease in total hospital margins. While this is not large enough to make the average neighboring hospital go from having positive to negative margins overall, it is still substantial.

I find that additional losses at neighboring hospitals were attributable to not only treating more patients, but also treating less profitable patients. In the pre-period, neighboring hospitals lost \sim \$2,630 per discharge, which is similar to the average of \$2,718 across non-closing hospitals in Table 1. In order for margins to decrease so substantially, losses per average patient had to double. Such large decreases in profits are consistent with results from the patient subgroup analysis that show hospitals expanding services for the least profitable patients more than overall services (Appendix Table A.1 Column 2). Neighboring hospitals lose money following closures because they have limited discretion over which patients they treat. The set of patients they treat post-closure is less profitable than the set of patients they treated pre-closure.

6. NEIGHBORING HOSPITAL RESPONSES TO CLOSURES

I have shown neighboring hospitals absorb less than half of closing hospital volume and experience large financial spillovers post closure. I now explore two questions. First, are increases in patient care, and thus financial spillovers, concentrated at certain groups of providers? Second, do other nearby hospitals strategically respond to closures by increasing or decreasing their supply of psychiatric services?

6.1 TYPES OF HOSPITALS EXPERIENCING VOLUME INCREASES

Thus far, I have restricted my analysis to the total quantity of patients seen by neighboring hospitals, ignoring heterogeneity across hospitals. If only a few providers see more patients, unprofitable psychiatric care becomes can become concentrated in markets. Therefore, I look at whether patient absorption differs between neighboring safety net and non-safety net hospitals post-closure.

To test how closures change the volume of patients at safety net and non-safety net neighbors, I reestimate equation (2) using the volume of patients at neighboring safety net and non-safety net hospitals as the dependent variable. Seventy-six percent of closing hospitals with neighbors in five miles have a neighbor that is a safety net hospital, and 64 percent have a neighbor that is not a safety net hospital. Meanwhile, 94 percent of closing hospital with neighbors in fifteen miles have a neighbor that is a safety net hospital, and 87 percent have a neighbor that is not a safety net hospital.

Figure 8 Panel A plots the results from estimating equation (2) separately for neighboring safety net and non-safety net hospitals. The results illustrate that increases in care are concentrated among safety net providers. Overall, the volume of patients treated by safety net providers increases by 50 percent of the closing unit amount, while non-safety net providers experience no increase in volume (Figure 8 Panel B).²⁶ Differences in volume absorption are particularly acute for the least profitable groups, publicly-insured and schizophrenic patients. When I break my responses up by whether the closing hospital was a safety net hospital, I find that safety net and non-safety net hospitals only differentially absorb patients when it is a safety net hospital closing. (Appendix Table A.2). This is likely due to differences in the composition of patients previously seen at closing safety net and non-safety net hospitals.

6.2. STRATEGIC RESPONSES

In this section, I ask whether safety net and non-safety net hospitals strategically respond to nearby closures by increasing or decreasing the amount of psychiatric care they supply. Since hospitals operating psychiatric units have limited discretion over which patients they treat, the key decision they can make following nearby closures is whether to adjust their capacity and supply of services. I measure hospital supply of psychiatric services three ways. The first measure, beds, captures the total size of the psychiatric unit. Since most hospitals in California only actively staff a portion of the beds they are licensed to operate, I examine both staffed and licensed beds. The second, staff, proxies for total hospital investment in the psychiatric unit.²⁷ Most care provided by psychiatric units is provider, not technology based, so hospitals can change the amount of care they provide by employing more or fewer social workers, psychologists, psychiatrists, etc. The final measure, units, captures whether hospitals offer inpatient psychiatric services. In addition to psychiatric units, I look at locked psychiatric units, since these are special portions of psychiatric units utilized by most acute psychiatric patients.

²⁶ Discrepancies in 8 Panel A and B for Non-SN hospitals can be attributed to pre-trends and the drop two years prior to closure.

²⁷ Since California has minimum nurse staffing ratios post-2004, decreases in staff absent decreases in beds must be nonnursing staff.

Figure 9 shows that hospitals, especially non-safety net hospitals, strategically change their service offerings in response to closures. The righthand side of Panel A shows that non-safety net hospitals decrease their supply of beds and close units at the same time neighboring hospitals close. Appendix Figure A.4 show nonsafety net hospitals also decrease their supply staffed beds, full time equivalent (FTE) staff, and locked psychiatric units when neighboring hospitals close. These cutbacks are consistent with non-safety net hospitals strategically avoiding psychiatric patients post-closure. Meanwhile, nearby safety net hospitals expand their beds and staff for a few years following neighboring closures, but scale back three years post-closure.

The magnitudes of the spillover results are summarized in Panel B of Figure 9. Overall, non-safety net hospitals shutter an additional 1.69 licensed beds for every bed closed. While safety net hospitals expand, they only open half the number of beds (.88) non-safety net hospitals shut-down.²⁸ Both of the responses are statistically significant. Since some of the measures exhibit significant pre-trends, the DD results do not accurately represent the observed change in every case.

Appendix Figure A.5 shows that non-safety net hospitals cut back more when it is a safety net closing. Appendix Figure B.5 confirms that non-safety net cutbacks are also significant at fifteen miles. The results surrounding safety net hospital expansions are not robust across closure types or market definitions. In fact, many measures of safety net responses also show cutbacks at the time of closure.

My results show that when a provider scales back money-losing psychiatric services, nearby providers scale back in response. This suggests that hospitals are strategic complements, not substitutes, in safety net service provision. When providers treat unprofitable patients, they not only help patients directly, but also benefit nearby providers. In the presence of positive spillovers, hospitals are willing to provide more money-losing services. Thus, charitable actions of one hospital can crowd-in, or increase, charitable actions of nearby providers.

An important topic for future research is understanding how ownership status, financial operations, and market characteristics contribute to hospital decisions to scale back capacity. The degree of competition in a

²⁸ One interesting feature of these results, is that competing non-SN hospitals appear to close beds faster than closing hospitals. This result does not hold across other measures such as staffed beds or unit closures. A potential explanation is that hospitals close licensed beds quickly after closures to maintain control over which patients they see and avoid appearing like they having open beds available for new patients.

market, differences in hospital objective functions, and differences in financial constraints could all contribute to differences in responses across neighboring providers.

7. PATIENT OUTCOMES

In this section, I study what happened to patients following closures. My empirical investigation focuses on two questions related to patient and community outcomes. First, is there any evidence that psychiatric care utilization shifted to higher or lower cost types of care? Second, did patients spillover onto the criminal justice system as a result of psychiatric unit closures?

7.1. SHIFTS IN PSYCHIATRIC CARE UTILIZATION

To study the impact of closure on area-level care utilization patterns, I look at the volume of hospital and community health center services provided in an area. This includes care provided both at the closing and neighboring hospitals.

Using the total amount of care provided in a five or fifteen mile market, I estimate the following difference-in-differences specification:

$$Y_{m(r)t} = \alpha_{m(r)} + \gamma_t + \sum_{\tau} D_{m(r)t}^{\tau} + \beta \left(Treated_{m(r)} * Post_{m(r)t} \right) + \epsilon_{m(r)t}$$
(5)

where $Y_{m_{(r)}t}$ is the total volume of a given type of care in market $m_{(r)}$ (defined by radius r = [5,15] miles from closing hospital) in year *t*. The main difference between this specification and equation (4), is that it aggregates care provided at the closing and neighboring hospitals in one single outcome measure. Since data on ED visits are only available for 2005 onwards, I restrict my data to $\tau = [-3,2]$, when studying ED visits to account for the shorter sample period.

To study whether care shifted to higher cost and less appropriate areas of the hospital, I look at emergency department visits and inpatient stays outside of psychiatric units. I specifically look at emergency department visits with primary ICD-9 codes for mental illness. Prior evidence suggests that hospitals may bear a large portion of expenses associated with decreased psychiatric services in the emergency department (Nesper et al. (2016)). To understand whether care shifted towards lower-cost outpatient settings, I focus on the number of visits to hospital partial hospitalization programs and outpatient clinics within five or fifteen miles. Given nationwide shifts towards treating psychiatric conditions in outpatient settings over the past half century and the lower costs associated with such care, hospitals may increase provision of outpatient care post-closure. I also use additional data on visits to community health centers, which provide care for undeserved, under-insured and uninsured patients, to see if outpatient care increased elsewhere in the community.²⁹ My data do not include information on office-based psychiatrist visits and other outpatient mental health providers in California.³⁰

Table A.3 presents difference-in-differences results for total service utilization in a five and fifteen mile market. Overall, decreases in access to inpatient services shift patients to both high-cost emergency department settings and low-cost outpatient providers. While spillovers were not significantly different across five and fifteen miles for inpatient visits, they are for ED utilization. Emergency room visits increase by 9 percent (p<0.001) at the broader fifteen mile definition. At five miles, they only increase by 7 percent. At neither five nor fifteen miles do patients spillover into other inpatient areas of the hospital.

Increases in emergency room utilization overall are primarily driven by significant increases for Medicaid beneficiaries and individuals with schizophrenia. Figure 10 depicts the event study version of the results for these two groups. The DD coefficients for patient subgroups are included in Appendix Table A.3. Overall, emergency department visits not resulting in admission for Medicaid beneficiaries increases by sharply 27 percent at five miles and 52 percent at fifteen miles post-closure. For individuals with schizophrenia, emergency room visits not resulting in admission increase by 21 percent at five miles and 25 percent at fifteen miles.

These results indicate that patients have less access to psychiatric care following closures. Since EDs are considered providers of last resort, increased use of ED-only psychiatric care post-closure signals that adequate mental health resources are likely not available in the community. Even though EDs are also not an appropriate setting for many mental health issues, one in eight visits to EDs nationwide is related to a mental health or substance use disorder (Weiss et al. (2016)). Most EDs are poorly equipped to address psychiatric

²⁹ Yearly data on licensed community health centers and their locations comes from OSHPD. Community health centers represent one of main sources of outpatient mental health care available to low-income patients in California.

³⁰ This is likely not an issue in my setting. First, many of these providers only take private or self pay patients. Most outpatient care provided to low-income patients would occur at community health centers, hospitals, or community mental health centers. Second, I am studying trends in care utilization, not patient specific outcomes, and increases in outpatient care at hospitals and community health centers likely proxy for changes in outpatient care in private practices or community mental health centers.

patients' needs. Additionally, psychiatric boarding, the process of holding patients in emergency departments until other resources become available, places large strains and costs on emergency departments.

However, at the same time, care is also shifting to lower-cost outpatient settings. Hospital outpatient therapy visits more than double at five miles and fifteen miles (Table 2). It is important to note that these increases in outpatient care are primarily occurring at nearby hospitals, not the hospitals closing psychiatric units. Visits to psychiatrists at community health centers also increase significantly. While increases in outpatient settings, documented increases in emergency room care demonstrate that outpatient providers do not fully substitute for closed psychiatric for the most severe patients.

To compare the cost of psychiatric care provision across hospital services, I translate each inpatient discharge, outpatient visit, and emergency psychiatric visit reported by hospitals in the OSHPD financial data into dollars using data on the average cost of each service. Information on variable cost of each service is derived from the OSHPD financial reports.³¹ Average variable cost per unit of service is listed for relevant hospital services in Table 2. While the reported dollar measures assumes that services cost a constant amount across patients, hospitals, and time, it is valuable because it allows me to directly compare hospital expenditures on other psychiatric services post-closure to expenditures on closed inpatient psychiatric services. It is also natural because it is in dollar units. Effectively, it answers the question, for each dollar of services no longer provided in inpatient psychiatric units, how much of that cost is picked up by nearby hospitals in other psychiatric services. The answer could be more or less than one dollar depending on the severity of patient needs.

The magnitude of the cost estimates in Table 2 suggests that at five miles hospitals increase spending on ED visits by a very small amount, but increase spending on outpatient therapy by 30 percent of the closing unit costs. At five miles, the offset is less than one-for-one. At fifteen miles, the total costs of additional ED visits increases substantially to 68 percent of the closing unit costs. The costs of additional outpatient therapy is 80 percent of closing unit costs. At fifteen miles, the offset is far greater than one-to-one.³² Even though

³¹ Average variable costs come from data on Adjusted Direct Expenses in the financial reports. They do not include any allocated fixed costs or costs attributable to research and education.

³² These results likely provide a lower bound for hospitals. Crowding of EDs by patients with primary psychiatric diagnosis creates spillovers to other people needing to use the ED for care. Patients with psychiatric conditions may also use ED or other hospital care at for other conditions at an increased rate post-closure. These results should not be interpreted as and overall

these results have large standard errors, they suggest that closing psychiatric units does not decrease overall hospital spending on psychiatric patients. It just transfers the cost of care to both high-cost and poorly equipped ED settings and low-cost outpatient settings. Future research will use Medicaid claims data from California to follow patients across psychiatric care settings.

7.2. SPILLOVERS ONTO CRIMINAL JUSTICE SYSTEM

A key question is whether individuals with severe mental illness spillover onto the criminal justice system. There is a strong link between severe mental illness and crime - severe mental illness is five times more common among inmates than the general adult population, and the presence of severe mental illness elevates the lifetime risk of arrest. While numerous articles point to the association between psychiatric bed shortages and the rise of mental illness in prisons and jail, there is limited empirical evidence that changes in psychiatric bed supply by local providers causes crime to increase.

Raphael and Stoll (2013) provide causal evidence that deinstitutionalization led to an increase in incarceration and the share of mentally ill patients behind bars between 1980 and 2000. However, deinstitutionalization represented a nationwide effort to move severely-ill patients out of large state institutions based on the principle that severe mental illness should be treated in the least restrictive setting. While other researchers do find convincing causal connections between mental illness and crime in more relevant settings, a review of the literature by Frank and McGuire (2010) finds that the magnitude of such results are small and limited to specific groups and patients at different stages of their illness.

The psychiatric closures I study in California are driven by financial strain on providers and represent sizable shocks to the overall supply of inpatient psychiatric care in markets. Therefore, they constitute a natural experiment to look at whether reductions in psychiatric treatment resources lead to increases in crime. To explore whether closures cause individuals with mental illness to spillover onto the criminal justice system, I link my data on psychiatric unit closures to Federal Bureau of Investigation Uniform Crime Reporting Statistics (UCR) arrest data from California and information on mental health in county jails from the California Board of State and Community Corrections (BSCC) between 2002 and 2014.

estimates of spending on psychiatric care. My results also only capture the costs of hospital care for patients, not overall health care.

Local law enforcement agencies provide data to the FBI UCR program on violent crime (murder and non-negligent manslaughter, rape, robbery, and aggravated assault, property crime (burglary, larceny-theft, and motor vehicle theft), and a variety of other arrest and offense measures every month.

Research shows that mental illness makes individuals both more likely to commit violent crimes and be a victim of such crimes (Frank and McGuire (2010)). Other illegal acts that are a byproduct of mental illness (e.g. disorderly conduct, vagrancy, public intoxication) and drug offenses are also relevant, but data on these measures in the UCR are generally less reliable due to incomplete reporting. Data from the BSCC include statistics on the average share county inmates with open mental health cases and the share of inmates using psychotropic medication in counties in California each month. Since county jails house inmates awaiting sentences (either currently making appearances in court or unable to make bail) and those serving terms for less severe crimes, they are an appropriate place to look for spillovers onto the criminal justice system.

I limit my analysis to nine California counties that experienced psychiatric unit closures, but did not experience multiple closures more than a year apart, in my sample period. This focuses my analysis on one event per county. In each county, I identify the share of total inpatient psychiatric unit capacity lost in the three years post closure. This allows me to capture both the effect of the initial closures and subsequent cutbacks by nearby providers.³³

To study the spillovers onto the criminal justice system, I match each of the nine counties experiencing closures to a similar county that did not experience psychiatric unit closures in my study period. The match is based on the county population, population density, median household income, and the average daily census county jail inmates in 2010. I estimate the impact on crime using the following specification.

$$Y_{ct} = \alpha_c + \gamma_t + \sum_{\tau} D_{ct}^{\tau} + \sum_{\tau} \beta_{\tau} (Treated_c * D_{ct}^{\tau}) + \epsilon_{ct}$$
(6)

Where the outcome variable is either log of the yearly arrest rate per 1000 population in the county or the log of the share county jail inmates with mental illness. α_c are county fixed effects and γ_t are year fixed effects. I weight each event by the share of inpatient psychiatric capacity lost due to closure.

³³ Three counties lost over 90 percent of psychiatric capacity as a result of closures. Another six counties lost between 10 and 35 percent of capacity.

Figure 11 shows local arrests and measures of psychiatric illness in county jails increase following psychiatric unit closures. The results from a pre-post version of the specification show significant increases for all measures besides the share of open mental health cases in county jail. My results indicate that violent and property arrests both increase by 10 percent post-closure (p<0.01, means 2.7 and 3.0 arrests per 1,000 population) and disorderly conduct and drug arrests increase both increase 30 percent (p<0.001, means 4.1 and 5.7 arrests per 1,000 population). Meanwhile, the share of county jail inmates on psychotropic medication increases by 40 percent post-closure (p<0.001, mean 13 per 100 inmates) and the share with open mental health cases increases by 30 percent (not significant at p=0.05, mean 23 per 100 inmates). My finding that the share of county jail inmates on psychotropic medications is particularly convincing since it directly captures individuals in the criminal justice system with a wide range of mental illnesses.

My ability calculate the exact magnitude of spillovers onto criminal justice system is hampered by the low power of the data - even in a state as big as California, it is difficult to have a large enough sample to make definitive statements. My results only capture the effect of closures in nine counties. Regardless of the certainty of effect sizes, these results provide new evidence on how reductions in the availability psychiatric care impact the criminal justice system. Future research should use detailed individual crime location data in areas near closing hospital to identify potential effects with greater certainty.

8. CONCLUSION

In this paper, I study the effect of psychiatric unit closures on neighboring hospitals and patient outcomes. I find nearby providers absorb less than half of closing facilities' volume and experience negative financial spillovers as a result of closures. I further show that few hospitals expand capacity to treat psychiatric patients. Rather, remaining hospitals strategically respond to closures by reducing their supply of psychiatric services. Following closures, overall access to psychiatric care decreases, utilization shifts to high-cost emergency department settings, and individuals with psychiatric conditions spillover onto the criminal justice system. My findings ultimately suggest that hospital provision of unprofitable psychiatric care crowds-in neighboring hospital provision, which indicates that psychiatric services at neighboring hospitals are strategic complements.

As hospitals undergo financial difficulties, they face strong incentives to eliminate critical, but unprofitable services. While full hospital closures are the focus of an extensive literature, by looking solely at full hospitals, researchers fail to address significant changes in service provision occurring in hospital markets.³⁴ By studying hospital unit closures in inpatient psychiatric care, I show that cutbacks in charitable care have negative effects on not only patients, but also neighboring providers, for whom closing hospitals help defray the cost of care. These results are relevant for thinking about how we should pay for psychiatric care and how much responsibility nonprofit providers should take for serving difficult and vulnerable populations when new pressure is applied to the health system. My findings can also help explain the puzzle of why many communities struggle to maintain access to psychiatric care and other safety net services – hospitals may rely on positive spillovers from other providers and be unwilling to serve as the sole source of care.

While my work does not directly look at sources of funding for safety net care, it highlights the important role of targeted safety net funding. When governments subsidize one hospital, there is a multiplier effect on neighboring hospitals that receive positive financial spillovers. This means that the returns to a dollar of care invested in preserving the safety net, may actually result in more than a dollar of care in markets overall. This finding is significant since cuts to state and local budgets for mental health care and federal and state hospital subsidies are regularly proposed and implemented.

My analysis has several limitations and suggests potential topics for future research. First, my study focuses exclusively on psychiatric care, and aspects of my results may not apply directly to other services. Second, I study cutbacks in charitable care in a state with a robust public safety net. Future work could test whether responses vary across states where public hospitals and insurance for low-income patients are less widespread. Third, my results do not study implications for quality of care at remaining providers. Finally, my results for patient outcomes only use market-level data on utilization trends and linked hospital records for a portion of years. Additional research should explore how psychiatric unit closures affect patient outcomes using insurance claims data that covers patients across different care settings.

There is growing concern about the financial stability of safety net providers. I present evidence from psychiatric care that reductions in safety net services lead to reduced access to care and negative spillovers on remaining providers. Understanding how public policy can be designed to maximize care given these spillovers across providers is a natural avenue for future work.

³⁴ Previous work by Kirby et al. (2006) using cross-sectional data on service closures in California supports this point.

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Tables and Figures

Figure 1: Supply of Acute Inpatient Psychiatric Care in California 2002 - 2014





Panel C: Total Psychiatric Unit Discharges



NOTE: These figures plot the total number of hospitals operating psychiatric units (Panel A), staffed psychiatric beds (Panel B), and psychiatric unit discharges in thousands (Panel C) in California in each year from 2002 to 2014. The orange region depicts the stock of care available over time at hospital psychiatric units that were open in 2002. The blue region depicts the stock of care available over time at hospital units that were not open in 2002. All data comes from hospital financial and utilization reports from the Office of Statewide Health Planning and Development (OSHPD). The figures do not include data from five very large, state-owned hospitals California, since their beds are typically not available to the general public and most patients are admitted to them by court order (CHA (2018)).



Figure 2: Map of Validated Psychiatric Unit Closures in California and Closure Details

SOURCE: Author's mapping based on OSHPD data. X's represent hospitals with psychiatric units that close between 2002-2014. Dots represent hospitals operating psychiatric units between 2002-2014 that do not close. Safety Net and Non-Safety Net refer to hospital types. Safety net status is assigned based on whether a hospital is owned and operated by the county or hospital district, is above the 75th percentile of total low-income discharges, or above the 75th percentile of total psychiatric unit low-income discharges, A hospital is designated a safety net hospital if it meets this definition in the majority of the years it is in operation in my sample. Psych Hosp. refers to standalone psychiatric facilities (either a acute psychiatric hospital or a psychiatric health facility) and General Hosp. refers to general acute care hospitals that operate psychiatric units.





NOTE: This figure is a histogram of the annual profits of psychiatric units in the closing and non-closing sample. Observations are at the hospital-year level. Profits are in 2014 dollars and are calculated using revenues and costs attributed to acute inpatient psychiatric units by hospitals in the OSHPD financial data. Costs include allocated hospital costs. The period of analysis is 2002 to 2012. The histogram only includes pre-closure data for the closing sample. For scaling purposes, I restrict the sample to psychiatric units with annual unit profits of less than 25 million and greater than -25 million.



Figure 4: Raw Plots of Number of Psychiatric Unit Discharges in Closing and Matched Sample

NOTE: These figures plot the raw (non-regression adjusted) number of psychiatric unit discharges in the closing and matched sample relative to the year of closure. Hospitals are matched based on hospital type, psychiatric unit size, local income, population density, and patient demographics using nearest neighbor matching requiring exact matches on some components. The remaining hospital markets represent the aggregate of all other hospitals within 5/15 miles of the closing or matched psychiatric unit.

Years Relative to Closure

Remaining 15 mile Market

Matched Sample Remaining 15 mile Market

Closing Unit

Matched Sample Closing Unit

Figure 5: Changes in Closing Hospital and Remaining Market Psychiatric Provision



Panel B: Changes in Total Patient Volume Matched Event Study - Main Specification



NOTE: These figures plot the event study coefficients for total volume of psychiatric unit patients seen before and after closures. The blue line shows the closing hospital and the orange line shows the aggregate of all other remaining hospitals in the five mile market. The points in Panel A are regression coefficients from a basic event study with year and hospital fixed effects. The points in Panel B are regression coefficients from equations (1) and (2) where matched hospitals and their surrounding markets are used as controls. Regressions are weighted by the size of the closing or matched psychiatric unit in the year prior to closure. See Section 5.1 for more information.

Figure 6: Share of Closing Volume Absorbed by Patient Subgroup



Panel A: Coefficients for Post-Treatment Interaction

Panel B: Coefficients for Split Post-Treatment Interaction



NOTE: These figures graphically depict the share of closing hospital volume absorbed by remaining hospitals within 5 miles. All estimates are listed in Table A1 and are derived from equations (3) and (4). Panel A shows the total share of patient volume absorbed by neighboring psychiatric units in the five years following closure for the main insurance groups and psychiatric conditions. Panel B shows the coefficient broken down by the share absorbed in the first three years and the following two years.





Change in Average Neighboring Psychiatric Unit Margin (Profits/Revenue)

NOTE: This figure plots the average psychiatric unit margin ((total revenue - total costs)/total revenue) for psychiatric units within 5 miles of a closing hospital compared to psychiatric units within 5 miles of a matched non-closing hospital. The sample is limited to hospitals in the OSHPD financial data reporting both costs and revenues for psychiatric units in a given year. The coefficients and standard errors are derived from equation (2).

Figure 8: Share of Closing Volume Absorbed by Safety Net and Non-Safety Net Hospitals

Panel A: Changes in Volume at Safety Net and Non-Safety Net Hospitals



Non-Safety Net Hospitals



Panel B: Differences Between Safety Net and Non-Safety Net Hospitals



NOTE: These figures plot the event study coefficients for the total volume of psychiatric unit patients seen before and after closure. In Panel A, The blue line shows the closing hospital, the green line on the left shows the aggregate of all other safety net hospitals in the five mile market, and the orange line on the right shows the aggregate of all other non-safety net hospitals in the five mile market. On average \sim 90% of closing and matched hospitals have at least one neighboring safety net hospital offering psychiatric care and \sim 60% have at least one neighboring non-safety net hospital offering psychiatric care within five miles. Panel B highlights differences in the volume of patients absorbed by safety net and non-safety net hospitals across patient subgroups.

Figure 9: Changes in Psychiatric Capacity at Safety Net and Non-Safety Net Hospitals



Panel A: Changes in Capacity at Safety Net and Non-Safety Net Hospitals

Panel B: Differences in Unit and Bed Operations for Safety Net and Non-Safety Net Hospitals



NOTE: These figures plot the event study coefficients for measures of psychiatric capacity before and after closure. Panel A shows changes in total licensed psychiatric beds and psychiatric units (# of hospitals with units) in the five mile market. The blue line shows capacity at the closing hospital, the green line on the left shows the aggregate capacity of all other safety net hospitals in the five mile market, and the orange line on the right shows the aggregate capacity of all other non-safety net hospitals in the five mile market. On average \sim 90% of closing and matched hospitals have at least one neighboring safety net hospital offering psychiatric care and \sim 60% have at least one neighboring non-safety net hospital offering psychiatric care within five miles. Panel B highlights differences in the responses of Safety Net and Non-Safety Net hospitals across measures of capacity related to psychiatric bed, staff, and units in operation.



Figure 10: Emergency Department Visits for Select Patient Groups

NOTE: These figures show the number of emergency department visits that didn't result in admission for patients with schizophrenia and on Medicaid in markets experiencing closures. The outcome is the total number of visits in a market - both at closing and remaining hospitals. The number of visits within five miles of the closing unit is on the left and the number of visits within 15 miles of the closing hospital are on the right. The points in the plot are coefficients from equation (5) where markets with matched non-closing hospitals are controls. The pre-post regression version of these results is presented in Appendix Table A3.

Figure 11: Changes in Arrests and County Jail Population



Panel A: County Arrest Rate (Yearly Arrests per 1,000 Population)

Panel B: County Jail Inmates with Mental Illness (Daily Census per 100 Inmates)

Inmates on Psychotropic Medications



Inmates with Open Mental Health Cases



NOTE: These figures plot the event study coefficients for changes in criminal justice outcomes following closure. All data are from 2002-2014. Regressions compare the nine California counties that experienced psychiatric unit closures, but did not experience multiple closures more than a year apart, to matched counties that experienced no psychiatric unit closures. All regressions are weighted by the share of psychiatric volume lost in the three years following closures. Counties are matched based on 2010 population, population density, median household income, and the average daily census of jail inmates. Panel A shows the event study coefficients for log of violent crime arrests (mean 2.7), property crime arrests (mean 3.0), total disorderly conduct crime arrests (mean 4.1), and drug crime arrests (mean 5.7) rate per 1000 population each year. Data on crime is reported by local agencies to the FBI Uniform Crime Reporting Program. Panel B shows event study coefficients for the the log of the daily census of county jail inmates on psychotropic medications (mean 13 per 100 inmates) and the daily census of county jail inmates with open mental health cases (mean 23 per 100 inmates). Data on county jail inmates comes from the California State Board of Community Corrections.

Variable	Non-Closing	Closing	Difference
	Sample	Sample	
Hospital Group	0.400	a a a a	0.400
Share Safety Net Psych	0.182	0.039	-0.132***
Share Safety Net General	0.320	0.374	0.043
Share Other General Acute	0.299	0.581	0.277***
Share Other Psych	0.200	0.006	-0.188***
Hospital Characteristics			
Hospital Size (Beds)	217.578	267.274	47.002***
Medicaid DSH Hospital	0.329	0.397	0.078**
Total Hospital Margin	0.045	0.019	-0.028**
Share with ED	0.557	0.838	0.270***
Share with Psych ED	0.499	0.687	0.184***
Psychiatric Unit Characteristics			
Psych Beds (Staffed)	40.069	27.168	-13.299***
Occupancy (Staffed)	0.826	0 746	-0.056***
Psych Unit LOS	9.936	9 931	-0.089
Profits Per Discharge (\$)	-2,718.259	-5,262.813	-2,337.763***
Psuchiatric Unit Payer Characteri	istics		
Share Private Insurance	0 241	0 151	-0 100***
Share Medicare	0.294	0.506	0.211***
Share Medicaid	0.251	0.257	0.017
Share County	0.065	0.018	-0.046***
Share Self-Pay	0.055	0.031	-0.021***
Share Other Pay	0.095	0.037	-0.061***
Psychiatric Unit Condition Chara	ctorictics		
Share Schizophrenia	0 346	0 373	0 036**
Share Bipolar	0.218	0.192	-0.014*
Share Depression	0.210	0.172	0.014
Share Alcohol Use Disorder	0.207	0.006	_0.011
Share Drug Use Disorder	0.010	0.000	-0.011
Share Other Montal Illness	0.029	0.013	-0.010
Share Other Illnoss	0.005	0.005	-0.004 _0.007
Share Other Inness	0.040	0.043	-0.002
	1 (10	180	1 000
Observations	1,619	179	1,898

Table 1: Summary Statistics for Closing and Non-Closing Psychiatric Units in Sample

NOTE: This table shows summary statistics for the sample of closing and non-closing hospitals at the hospital-year level. The period of analysis is 2002-2012. The closing sample includes hospitals who close their psychiatric units. There are 36 closing hospitals that have at least one year of data pre-closure. The table only includes pre-closure data for these hospitals so that closure is not conflated with reduced provision and poor financial outcomes. The non-closing sample includes yearly observations for hospitals operating psychiatric units that never close (166 hospitals). All data comes from the OSHPD financial and utilization reports. Profits are in 2014 dollars.

5 Mile Market								
	ED Visits for M	fental Health	Psychiatric	Other	Partial	Hospital	Community H	ealth Center
	Not Admitted	Total	Unit	Inpatient	Hospitalization	Psychiatric Therapy	Mental Health	Psychiatrist
	(Post - 2005)	(Post - 2005)	Discharges	Discharges	(Days)	(Sessions)	(Encounters)	(Encounters)
Total Change	602.3	325.1	-817.8***	-11.5	-2375.5	18971.5^{**}	3260.1	1077.4^{**}
I	(340.9)	(375.7)	(123.5)	(37.4)	(2581.3)	(6754.3)	(2009.9)	(397.6)
Mean of Dep. Var.	9088	11211.1	5273	789.6	16995.5	33047.3	19294.1	3442.3
Percent Change	7%	3%	-16%	-1%	-14%	57%	17%	31%
)								
Variable Cost of Service	ı	\$561	\$4,103	ı	\$103	\$62	ı	ı
Est. Change in Costs		\$182,381	-\$3,355,433	ı	-\$244,677	\$1,176,233	ı	ı
15 Mile Market								
	ED Visits for N	fental Health	Psychiatric	Other	Partial	Hospital	Community H	ealth Center
	Not Admitted	Total	Unit	Inpatient	Hospitalization	Psychiatric Therapy	Mental Health	Psychiatrist
	(Post - 2005)	(Post - 2005)	Discharges	Discharges	(Days)	(Sessions)	(Encounters)	(Encounters)
Total Change	2939.8***	3382.9***	-675.0**	11.9	-6201	35650.9***	5833.6	1518.5**
	(745.6)	(916.1)	(207.4)	(72.0)	(4360.8)	(7514.6)	(3261.7)	(504.8)
Mean of Dep. Var.	32596.7	39531.8	16732.1	3253.1	70210.6	70597.4	61347.2	8793.9
Percent Change	%6	%6	-4%	%0	%6-	50%	10%	17%
Variable Cost of Service	·	\$561	\$4,103	ı	\$103	\$62	ı	ı
Est. Change in Costs	ı	\$1,897,807	-\$2,769,525	ı	-\$638,703	\$2,210,300	ı	ı
Standard errors in parent * p<0.05 **p<0.01 *** p<(heses 0.001							

Table 2: Overall Psychiatric Care Utilization

psychiatric concerns. Primary psychiatric concerns. Primary by whether thé primary numeric ICD-9 code was for mental illness. The sample for these regression is restricted post-2005 closures due to data availability. Since a smaller set of years are available (2005-2014 only), the DD uses a shorter time frame [$\tau = -3$, 2]. Column 3 shows changes in psychiatric unit discharges and Column 4 shows changes in non-psychiatric unit inpatient treatment. Column 5 shows changes in partial hospitalization program visits. Column 6 show the number of individual or group therapy visits at hospital outpatient facilities. Columns 7 and 8 show the total number of mental health encounters and visits with psychiatrists at community health centers and other free or hospital markets. The outcomes are the total number of visits in a market - both at closing and non-closing hospitals. Column 1 shows emergency department visits for primary reduced cost clinics. Average variable costs per unit of psychiatric emergency, psychiatric unit, and psychiatric outpatient care are calculated using data on "adjusted direct expenses" in the OSHPD financial data between 2002 and 2014 across hospitals offering psychiatric services in California. All costs are in 2014 dollars. These costs are lower than NOTE: This table presents DD estimates of the effect of a psychiatric unit closure on other psychiatric care utilization, comparing closing psychiatric unit markets to matched the full cost of care - direct expenses include neither hospital allocated costs nor costs artifibutable to research and education.

Appendix

Appendix A: Additional Figures and Tables Referenced in Text

Figure A1: Comparing Psychiatric Unit Profits With and Without Allocated Costs



NOTE: This figure is a histogram of the annual profits of psychiatric units with and without allocated costs. Observations are at the hospital-year level. Profits are in 2014 dollars and are calculated using revenues and costs attributed to acute inpatient psychiatric units by hospitals in the OSHPD financial data. For scaling purposes, I restrict the sample to psychiatric units with annual unit profits with and without allocated costs of less than 25 million and greater than -25 million.

Figure A2: Changes in Closing Hospital and Remaining Market Total Psychiatric Patient Days

NOTE: These figures plot event studies of total number of psychiatric unit patient days before and after closure. The blue line shows the closing hospital and the orange line shows the aggregate of all other remaining hospitals in the five mile market. The points in Panel B are regression coefficients from equations (1) and (2) where matched hospitals and their surrounding markets are used as controls. Regressions are weighted by the size of the closing or matched psychiatric unit in the year prior to closure. See Section 5.1 for more information.

Figure A3: Testing Alternative Explanations: Local Hospital Funding

Panel A: Average Medicaid Daily Inpatient Psychiatric Care Reimbursement Rate

Panel B: Medicaid DSH + Indigent Care Grants

NOTE: These figures plot the event studies of the average daily Medicaid payment rate for inpatient psychiatric care and total Medicaid DSH and Indigent Care grants. All points are regression coefficients from equations (1) and (2) where matched hospitals and their surrounding markets are used as controls. Regressions are weighted by the size of the closing or matched psychiatric unit in the year prior to closure. In Panel A, The blue line shows the closing hospital and in Panels A and B the orange line shows the remaining hospitals within 5 miles.

Figure A4: Additional Measures of Changes in Safety Net and Non-Safety Net Hospital Capacity Following Closures

Staffed Psychiatric Beds

NOTE: These figures plot the event study coefficients for additional psychiatric capacity measures before and after closure. These figures supplement Figure 9. Additional measures are discussed in Section 6.2. They include staffed psychiatric beds (derived from financial data), FTE psychiatric unit staff, and locked psychiatric units in operation. The blue line shows capacity at the closing hospital, the green line on the left shows the aggregate capacity of all other safety net hospitals in the five mile market, and the orange line on the right shows the aggregate capacity of all other non-safety net hospitals in the five mile market.

Figure A5: Differences in Hospital Responses to Safety Net and Non-Safety Net Hospital Closures

Panel A: Changes in Licensed Psychiatric Beds in Response to Safety Net Closures

Non-Safety Net Hospitals

NOTE: These figures recreate the event study plots in Figure 9 separately for closures occurring at safety net hospitals (Panel A) and non-safety net hospitals (Panel B). The blue line shows capacity at the closing hospital, the green line on the left shows the aggregate capacity of all other safety net hospitals in the five mile market, and the orange line on the right shows the aggregate capacity of all other non-safety net hospitals in the five mile market.

Remaining Hospitals	
Absorbed by	
of Patients	
of the Share	
1: Estimates	
Table A	

	Closing	After Market	Ratio x 100	Af Closing	ter - Years Market	0 - 2 Ratio x 100	A. Closing	fter - Years (Market	3-4 Ratio x 100
Total	-1102.1*** (82.07)	284.4* (130.7)	25.80* (10.24)	-1050.6*** (88.74)	400.1** (140.9)	38.08** (12.01)	-1247.1*** (126.2)	-41.23 (200.3)	-3.306 (13.45)
<i>Payer</i> Private Insurance	-417.2***	33.67	8.071	-363.5***	39.50	10.87	-537.9***	20.55	3.820
Medicare	(26.71) -440.9***	(30.19) 314.1^{***}	(6.855) 71.25***	(28.71) -420.2***	(33.38) 282.6*** (70.00)	(8.615) 67.27***	(37.78) -494.4***	(43.93) 395.3^{***}	(7.622) 79.97***
Medicaid	(39.54) -591.1*** (70.00)	(55.13) 264.5**	(13.36) 44.75^{**}	(42.97) -610.5***	(59.89) 332.5***	(14.95) 54.46*** (4.5.65)	-518.3***	(81.91) 9.614	(18.46) 1.855
County	(58.28) 33.64	(90.46) -174.5*	(14.10) 518.8	(62.04) 51.88^{**}	(95.77) -59.33	(15.05) 114.4	(98.60) -52.85	(152.2) -720.7***	(24.75) -1363.7
Self-Pay	(17.36)-346.0***	(82.19) -7.445	(933.0) -2.152	(17.29) -342.2***	(77.20) -16.94	(163.8) -4.950	(31.27) -356.3***	(139.6) 18.56	(2617.4) 5.209
Other	(50.87) -14.95	(27.77) 0.566	(11.86) 3.788	(55.49) -62.07	(30.26) -17.32	(13.09) -27.90	(78.82) 82.38	(42.98) 37.51	(17.86) -45.53
	(56.03)	(51.09)	(359.6)	(60.85)	(55.77)	(97.79)	(75.06)	(68.80)	(96.19)
Condition									
Schizophrenia	-590.2***	562.4***	95.29***	-599.2***	631.7*** (01.000	105.4***	-557.3***	310.0*	55.62*
Bipolar Disorder	(64.32) -280.9***	(89.46) -89.46**	(18.23) -31.85***	(68.69) -261.2***	(94.97) -72.40*	(20.10) -27.72*	(108.3) -333.4***	(149.7) -135.0**	(26.83) -40.48**
Dantaceion	(17.99)	(30.90) 53 03	(9.460) 15.85	(19.42) _207 7***	(33.59) 69 56	(10.91) 73 36*	(27.09)	(46.87) 12 57	(12.40) 2 050
	(20.66)	(35.38)	(8.780)	(22.13)	(38.72)	(10.89)	(29.90)	(52.31)	(10.05)
Alcohol Use Disorder	-48.04***	-17.74	-36.93	-50.24^{***}	-8.195	-16.31	-43.02**	-39.51	-91.83
Drug Use Disorder	(11.07) -62.89***	(18.34) -45.88***	(33.68) -72.95***	(12.17) -75.53***	(20.13) -35.13**	(33.60) -46.52*	(15.94) -38.99*	(26.36) -66.20***	(68.86) -169.8*
D	(12.13)	(10.32)	(22.16)	(13.57)	(11.54)	(18.40)	(16.86)	(14.33)	(20.06)
Other MI	-79.41***	-25.77**	-32.45**	-66.33***	-16.12	-24.31	-106.3^{***}	-45.54^{***}	-42.86**
Other Non-Mi	(9.381) -40.05***	(9.294) 39.64***	(12.36) 98.98*	(10.32) -31.02*	(10.28) 39.71**	(15.98) 128.0	(13.10) -55.70***	(13.05) 39.52*	(13.39) 70.96*
	(10.80)	(12.02)	(40.14)	(12.09)	(13.52)	(67.18)	(14.37)	(16.07)	(33.57)
Standard errors in parent * p<0.05 ** p<0.01 *** p<(neses 0.001								

NOTE: This table presents estimates of the share of total closing psychiatric unit volume absorbed by other hospitals within 5 miles. All estimates are from equations are from the DD specification in equations (3) and (4). The first set of estimates is for a specification with one post-treatment period and the second and third are for the specification with split post-treatment periods. In each set of estimates, the first column is the total decrease in patients attributable to the closing unit. The second is the total compensating increase at all other hospitals within 5 miles. The third column is the ratio of the two presented in percentage points. Regressions are weighted by the size of the closing or matched psychiatric unit in the year prior to closure.

Table A2: Share of Closing Volume Absorbed by Safety Net and Non-Safety Net Hospitals

	Sat	etv Net Provi	ders	Non- Safety Net Providers		
	Closing	ŚN Market	Ratio x 100	Closing	Non-SN Market	Ratio x 100
			All Closures			
Total	-1102.1***	559.6***	50.77***	-1102.1***	-275.2***	-24.97***
	(82.07)	(114.2)	(10.13)	(82.07)	(73.28)	(7.286)
Private Insurance	-417.2***	55.94***	13.41**	-417.2***	-22.27	-5.340
N 11	(26.71)	(14.39)	(5.188)	(26.71)	(23.99)	(6.094)
Medicare	-440.9***	342.9***	(12 72)	-440.9***	-28.75	-6.520
N 1 · · 1	(39.54)	(48.54)	(12.72)	(39.54)	(36.51)	(8.650)
Medicaid	-591.1***	330.6***	55.94***	-591.1***	-66.13	-11.19
	(58.28)	(85.59)	(14.19)	(58.28)	(34.90)	(8.178)
Schizophrenia	-590.2***	588.6***	99.72***	-590.2***	-26.16	-4.432
	(64.32)	(85.45)	(18.10)	(64.32)	(27.06)	(8.368)
Bipolar Disorder	-280.9***	-5.981	-2.129	-280.9***	-83.48***	-29.72***
	(17.99)	(22.29)	(7.222)	(17.99)	(22.37)	(7.548)
Depression	-334.6***	84.95***	25.39***	-334.6***	-31.92	-9.541
	(20.66)	(22.36)	(6.648)	(20.66)	(27.70)	(7.348)
		Safety	Net Hospital C	Closures		
TF (1	1004 (***	F 01 F ***	(0.00***	1004 (***	FF0 0***	44 05***
Iotal	-1234.6***	/81.5***	63.30***	-1234.6***	-572.3***	-46.35***
	(139.2)	(181.7)	(15.51)	(139.2)	(115.1)	(11.40)
Private Insurance	-272.8***	6.156	2.257	-272.8***	-186.5***	-68.38***
	(31.20)	(11.86)	(8.669)	(31.20)	(34.77)	(14.69)
Medicare	-445.6***	440.5***	98.86***	-445.6***	-208.1***	-46.70**
	(69.25)	(75.19)	(22.89)	(69.25)	(42.08)	(14.24)
Medicaid	-631.1***	321.5**	50.93**	-631.1***	-91.01	-14.42
	(85.95)	(122.1)	(18.83)	(85.95)	(50.66)	(11.33)
Schizophrenia	-676.2***	683.0***	101.0***	-676.2***	-81.13*	-12.00
· · · · · · · · · · · · · · · · · · ·	(102.6)	(133.2)	(25.06)	(102.6)	(38.80)	(11.59)
Bipolar Disorder	-279.2***	9.660	3.460	-279.2***	-167.5***	-60.02***
Bipolai Bisolael	(28.14)	(30.19)	(10.49)	(28.14)	(37.89)	(13.99)
Depression	-315 2***	118 5***	37 59***	-315 2***	-164 0***	-52 02***
Depression	(30.66)	(33.70)	(10.95)	(30.66)	(42.88)	(13.37)
	(00100)	(00110)	(1000)	(00100)	(12100)	(10.07)
		Non-Safe	ety Net Hospita	al Closures		
Total	-864.7***	197.0	22.78*	-864.7***	205.9**	23.81**
	(56.90)	(118.9)	(11.09)	(56.90)	(73.08)	(7.809)
Privato Incurance	116 0***	37 80	8 174	116 0***	32 02	7 1 0 1
r fivate insurance	-440.0	(20.25)	(7.027)	-440.0	32.03 (22.4E)	(8,208)
Mallin	(39.23)	(20.25)	(7.057)	(39.23)	(55.45)	(0.200)
Medicare	-383.4***	158.6**	41.36***	-383.4***	172.7**	45.04***
	(28.83)	(55.43)	(12.51)	(28.83)	(58.63)	(13.26)
Medicaid	-305.6***	269.4**	88.18**	-305.6***	75.67*	24.76*
0.1.1.1.	(29.83)	(98.18)	(31.66)	(29.83)	(37.84)	(11.49)
Schizophrenia	-225.7***	216.2**	95.80**	-225.7***	142.9***	63.32***
	(22.52)	(77.54)	(35.04)	(22.52)	(38.65)	(16.59)
Bipolar Disorder	-272.4***	-27.48	-10.09	-272.4***	29.18	10.71
	(20.95)	(32.23)	(10.03)	(20.95)	(18.35)	(7.270)
Depression	-322.1***	64.23*	19.94*	-322.1***	120.2***	37.32***
	(22.99)	(26.88)	(7.942)	(22.99)	(31.58)	(9.180)

Standard errors in parentheses * p<0.05 ** p<0.01 *** p<0.001

NOTE: This table presents estimates of the share of total closing psychiatric unit volume absorbed by other safety net and non-safety net hospitals within 5 miles. All estimates are from equations are from the DD specification in equations (3) and (4).

	Mental He Not A (Post - 20)	ental Health ED Visits Mental Hea Not Admitted Tr Post - 2005 Closures) (Post - 200		alth ED Visits otal 05 Closures)	Psychia Disc	atric Unit harges
	Pt. Est.	Var. Mean	Pt. Est.	Var. Mean	Pt. Est.	Var. Mean
5 Mile Market						
Payers						
Private	-28.7	1684.7	-64.8	2207.6	-383.5***	1226.6
	(94.3)		(110.7)		(35.5)	
Medicare	109.8	1287.7	78.7	2019.5	-126.8**	1533.8
	(65.6)		(63.6)		(47.8)	
Medicaid	698.8**	2590.3	569.5*	3311.8	-326.6***	1815.9
	(222.7)		(243.2)		(87.3)	
Conditions						
Schizophrenia	313.8*	1493.2	211	2278.5	-27.8	2335.5
	(125.1)		(130.40)		(71.00)	
Bipolar	2.7	560.5	-135.1*	1236	-370.4***	1158.5
Dipolai	(49.9)	00010	(62.6)	1200	(34.2)	110010
Depression	140.1*	1102.0	58.1	1524.8	-281 6***	1457 8
Depression	(66.5)	1102.0	(75.5)	1021.0	(39.3)	1107.0
	(00.0)		(10.0)		(0).0)	
15 Mile Market						
Payers						
Private	68.6	5834.2	116.1	6948.2	-240.7**	3185.8
	(246.2)		(213.1)		(80.9)	
Medicare	991.3***	5109.1	694.1***	7946.8	-243.1**	5576.9
	(213.6)		(157.6)		(78.2)	
Medicaid	4339.2***	8351.0	3761.1***	10811.7	-111.6	5630.5
	(772.0)		(654.8)		(99.3)	
Conditions						
Schizophrenia	1367 9***	5542.8	847 4***	8502.6	205.4	7994 1
Seruzopineniu	(255.7)	0012.0	(182.2)	0002.0	(136.9)	, , , , 1.1
Bipolar	62	1881 7	96.9	2968 5	-258.3***	3672 5
Dipolai	(90.7)	1001.7	(74.1)	2700.0	(54.1)	0072.0
Depression	72 7	3520.4	85.6	4603 5	-329 7***	4144 1
Depression	(100.5)	5520.4	(93.0)	4000.0	(78.5)	4144.1
	(100.5)		(95.0)		(70.5)	

Table A3: Spillovers Onto Other Types of Psychiatric Care

Standard errors in parentheses

* p<0.05 **p<0.01 *** p<0.001

NOTE: This table presents DD estimates of the effect of a psychiatric unit closure on other psychiatric care utilization, comparing closing psychiatric unit markets to matched hospital markets. The outcomes are the total number of visits in a market - both at closing and non-closing hospitals. Responses are broken down by primary payer and diagnosis for the top categories. Column 1 shows emergency department visits for primary psychiatric concerns that did not result in admissions. Column 2 shows all ED visits for primary psychiatric concerns are determined by whether the primary numeric ICD-9 code was for mental illness. The sample for these regression is restricted post-2005 closures due to data availability. Since a smaller set of years are available (2005-2014 only), the DD uses a shorter time frame [$\tau = -3$, 2]. Columns 3 shows changes in psychiatric unit discharges.

Appendix B: Results at 15 Miles

Figure B1: Changes in Closing Hospital and Remaining Market Psychiatric Provision - 15 Miles

Panel B: Changes in Total Patient Volume Matched Event Study - Main Specification

NOTE: These figures plot event studies of total volume of psychiatric unit patients seen before and after closure. The blue line shows the closing hospital and the orange line shows the aggregate of all other hospitals in the fifteen mile market. The points in Panel A are regression coefficients from a basic event study with year and hospital fixed effects. The points in Panel B are regression coefficients from equations (1) and (2) where matched hospitals and their surrounding markets are used as controls. Regressions are weighted by the size of the closing or matched psychiatric unit in the year prior to closure. See Section 5.1 for more information.

Figure B2: Share of Closing Volume Absorbed by Patient Subgroup - 15 Miles

Panel A: Coefficients for Post-Treatment Interaction

Panel B: Coefficients for Split Post-Treatment Interaction

NOTE: These figures graphically depict the share of closing hospital volume absorbed by remaining hospitals within 15 miles. All estimates are listed in Table A1 and are derived from equations (3) and (4). Panel A shows the total share of patient volume absorbed by neighboring psychiatric units in the five years following closure for the main insurance groups and psychiatric conditions. Panel B shows the coefficient broken down by the share absorbed in the first three years and the following two years.

Change in Average Neighboring Psychiatric Unit Margin (Profits/Revenue)

NOTE: This figure plots the average psychiatric unit margin ((total revenue - total costs)/total revenue) for psychiatric units within 15 miles of a closing hospital compared to psychiatric units within 15 miles of a matched non-closing hospital. The sample is limited to hospitals in the OSHPD financial data reporting both costs and revenues for psychiatric units in a given year. The coefficients and standard errors are derived from equation (2).

Figure B4: Share of Closing Volume Absorbed by Safety Net and Non-Safety Net Hospitals - 15 Miles

Panel A: Changes in Volume at Safety Net and Non-Safety Net Hospitals

Panel B: Differences Between Safety Net and Non-Safety Net Hospitals

NOTE: These figures plot event study coefficients for the total volume of psychiatric unit patients seen before and after closure. In Panel A, The blue line shows the closing hospital, the green line on the left shows the aggregate of all other safety net hospitals in the fifteen mile market, and the orange line on the right shows the aggregate of all other non-safety net hospitals in the fifteen mile market. Panel B highlights differences in the volume of patients absorbed by safety net and non-safety net hospitals across patient subgroups.

Figure B5: Changes in Psychiatric Capacity at Safety Net and Non-Safety Net Hospitals - 15 Miles

Panel A: Changes in Capacity at Safety Net and Non-Safety Net Hospitals

Panel B: Differences in Unit and Bed Operations for Safety Net and Non-Safety Net Hospitals

NOTE: These figures plot the event study coefficients for measures of psychiatric capacity before and after closure. Panel A shows changes in total licensed psychiatric beds and psychiatric units (# of hospitals with units) in the five mile market. The blue line shows capacity at the closing hospital, the green line on the left shows the aggregate capacity of all other safety net hospitals in the fifteen mile market, and the orange line on the right shows the aggregate capacity of all other non-safety net hospitals in the fifteen mile market. Panel B highlights differences in the responses of safety net and non-safety net hospitals across measures of capacity related to psychiatric bed, staff, and units in operation.

Appendix C: Select Data Tables

Table C1: Psychiatric Condition Classifications

Туре	ICD 9 Codes
Schizophrenia	295.xx , 298.1x - 298.9x
Bipolar Disorder	296.0x - 296.1x , 296.4x-296.9
Depression	296.2x - 296.3x , 298.0x , 300.4x , 301.12 , 309.0x - 309.1x , 311.xx
Alcohol Use Disorder	291.xx , 303.xx , 305.1x
Drug Use Disorder	292.xx , 304.xx , 305.2x - 305.9x
Other	other codes between 290.xx and 319.xx

SOURCE: Stensland, Watson, Grazier. Psychiatric Services, July 2012

OSHPD ID	Year Closure Began	Closure Type	Facility Name	City	Size (Discharges)
560468	2002	Η	Anacapa Hospital	Port Hueneme	206
190240	2002	U	Lakewood Regional Medical Center - South	Lakewood	287
190348	2002	U	Granada Hills Community Hospital	Granada Hills	194
190500	2002	U	Daniel Freeman Marina Hospital	Marina Del Rey	532
190605	2002	Н	Pine Grove Hospital	Canoga Park	1638
301242	2002	Н	Orange County Comm Hosp - Buena Park	Buena Park	949
190155	2002	U	Century City Hospital	Los Angeles	842
190200	2002	U	San Gabriel Valley Medical Center	San Gabriel	785
301175	2002	U	Fountain Valley Rgnl Hosp & Med Ctr - Euclid	Fountain Valley	369
190125	2002	U	California Hospital Medical Center	Los Angeles	215
14113	2003	Н	S.T.A.R.S PHF	San Leandro	87
361370	2003	U	Victor Valley Community Hospital	Victorville	1367
430837	2003	U	O'Connor Hospital	San Jose	164
560525	2003	U	Simi Valley Hosp & Hlth Svcs - Sycamore	Simi Valley	798
190053	2004	U	St. Mary Medical Center	Long Beach	180
190366	2004	Η	Robert F. Kennedy Medical Center	Hawthorne	1269
190810	2004	Η	Northridge Hospital Medical Ctr - Sherman	Van Nuys	1163
190631	2004	U	Presbyterian Intercommunity Hospital	Whittier	492
190708	2004	U	Sherman Oaks Hospital & Health Center	Sherman Oaks	423
451019	2005	U	Shasta Co Mental Health Svcs - PHF	Redding	893
10937	2005	U	Alta Bates Summit Med Ctr - Summit-Hawthorne	Oakland	125
331164	2005	U	Desert Regional Medical Center	Palm Springs	858
380964	2005	U	St. Luke's Hospital	San Francisco	253
560529	2005	U	St. John's Regional Medical Center	Oxnard	441
490919	2005	U	Sutter Medical Center Of Santa Rosa	Santa Rosa	913
190148	2006	U	Centinela Freeman Reg Med Ctr-Centinela	Inglewood	246
191230	2006	U	LAC/Martin Luther King Jr/Drew Med Ctr	Los Angeles	224
491064	2006	U	Santa Rosa Memorial Hospital	Santa Rosa	1072
560492	2006	U	Los Robles Hospital & Medical Center	Thousand Oaks	207
331194	2007	U	Hemet Valley Medical Center	Hemet	543
301566	2007	U	Western Medical Center-Santa Ana	Santa Ana	559
551061	2008	U	Tuolumne General Medical Facility	Sonora	633
190522*	2008	U	Glendale Memorial Hospital And Health Center	Glendale	513
304426	2008	Η	Royale' Mission Viejo - PHF	Mission Viejo	235
410891	2009	U	Sequoia Hospital	Redwood City	945
484028	2009	Н	North Valley-Solano County PHF	Fairfield	763
334048	2010	U	Kaiser Foundation Hospital - Moreno Valley	Moreno Valley	864
10805	2010	Н	Eden Medical Center	Castro Valley	405
190555	2010	U	Cedars-Sinai Medical Center	Los Angeles	1369
190066	2011	Η	Bellflower Medical Center	Bellflower	1352
190854	2011	U	Los Angeles Metropolitan Medical Center	Los Angeles	3540
194219	2011	U	Keck Hospital of USC	Los Angeles	189
370787	2011	U	Promise Hospital Of San Diego	San Diego	1274
301097	2013	U	Anaheim General Hospital	Anaheim	51
331168	2013	U	Eisenhower Medical Center	Rancho Mirage	162
440755	2013	U	Dominican Santa Cruz Hospital - Soquel	Santa Cruz	786

Table C2: Validated Psychiatric Unit Closures

OSHPD ID	Year Closure Began	Closure Type	Facility Name	City	Size (Discharges)	Eliminated
190352	2002	U	Greater El Monte Community Hospital	South El Monte	<15	Too Small
301297	2002	U	Placentia-Linda Community Hospital	Placentia	<15	Too Small
331216	2002	U	John F. Kennedy Memorial Hospital	Indio	<15	Too Small
430743	2002	U	Community Hospital Of Los Gatos	Los Gatos	<15	Too Small
104008	2002	U	Cedar Vista Hospital	Fresno	1714	System
374141	2002	U	UCSD/La Jolla - Thornton Hospital	La Jolla	130	System
400512	2002	U	San Luis Obispo County Mental Health	San Luis Obispo	1112	System
420528	2002	Н	St. Francis Medical Ctr-Santa Barbara	Santa Barbara	279	System
154044	2006	Н	Bakersfield Behavorial Healthcare Hospital	Bakersfield	1102	System
501016	2007	U	Stanislaus Behavioral Health Center	Modesto	1779	System
10983	2007	U	Valley Memorial Hospital	Livermore	223	System
514037	2007	Η	Sequoia Psychiatric Center	Yuba City	471	System
190646	2009	U	Kaiser Fnd Hosp - Mental Health Center	Los Angeles	2248	System
154147	2012	Н	Crestwood PHF	Bakersfield	236	System
190814	2012	Н	Hollywood Community Hospital Of Van Nuys	Van Nuys	3138	System

Table C3: Closures Eliminated from Sample

OSHPD ID	Year Opening Began	Facility Name	City	Size (Discharges)
334048	2003	Moreno Valley Community Hospital	Moreno Valley	852
14207	2005	Telecare Heritage Psychiatric Health Facility	Oakland	327
514033	2005	North Valley Behavioral Health	Yuba City	111
14226	2007	Telecare Willow Rock Center	Alameda	193
514037	2007	Sequoia Psychiatric Center - Phf	Yuba City	471
154147	2008	Crestwood Psychiatric Health Facility	Bakersfield	388
304426	2008	Royale' Mission Viejo - Phf	Mission Viejo	235
190661	2009	Silver Lake Medical Center	Los Angeles	624
190708	2009	Sherman Oaks Hospital & Health Center	Sherman Oaks	289
344170	2010	Crestwood Psychiatric Health Facility-Carmichael	Carmichael	378
434218	2010	Kaiser Permanente P.H.F Santa Clara	Santa Clara	113
190200	2011	San Gabriel Valley Medical Center	San Gabriel	123
434220	2011	Crestwood Psychiatric Health Facility-San Jose	San Jose	402
344188	2012	Crestwood Psychiatric Health Facility-Sacramento	Sacramento	213
370673	2012	Rady Children'S Hospital - San Diego	San Diego	300
190522	2013	Glendale Memorial Hospital And Health Center	Glendale	381
444029	2013	Telecare Santa Cruz Phf	Santa Cruz	527
494048	2013	Aurora Behavioral Healthcare - Santa Rosa	Santa Rosa	1301
197931	2014	Exodus Recovery P.H.F.	Culver City	302
454068	2014	Restpadd Psychiatric Health Facility	Redding	567
484062	2014	Crestwood Solano Psychiatric Health Facility	Vallejo	334
504081	2014	Telecare Stanislaus County - Phf	Ceres	789

Table C4: Validated Psychiatric Unit Openings

OSHPD ID	Year Opening Began	Facility Name	City	Size (Discharges)	Eliminated
196404	2007	Joyce Eisenberg Keefer Medical Center	Reseda	<15	Too Small
331168	2010	Eisenhower Medical Center	Rancho Mirage	<15	Too Small
301262	2014	Mission Hospital Regional Medical Center	Mission Viejo	<15	Too Small
400511	2003	San Luis Obispo General Hospital	San Luis Obispo	507	System
404046	2003	San Luis Obispo Co Psychiatric Health Facility	San Luis Obispo	555	System
500852	2007	Doctors Medical Center	Modesto	3356	System
14050	2008	Valleycare Medical Center	Pleasanton	233	System
154160	2010	Crestwood Psychiatric Health Facility-Bakersfield 2	Bakersfield	15	System
190429	2010	Kaiser Foundation Hospital - Sunset	Los Angeles	2373	System
190380	2013	Southern California Hospital At Hollywood	Hollywood	3389	System

Table C5: Openings Eliminated from Sample