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# An Evaluation of the Affordable Care Act's Effects on Hospital Finances: Differential Impacts on Disproportionate Share Hospitals

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AN EVALUATION OF THE AFFORDABLE CARE ACT'S EFFECTS ON HOSPITAL FINANCES:  
DIFFERENTIAL IMPACTS ON DISPROPORTIONATE SHARE HOSPITALS

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Submitted in partial fulfillment of the prerequisite for Honors in Economics.

April 27, 2018

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## I. INTRODUCTION

In 2010, Congress passed the Affordable Care Act (ACA), commonly referred to as “Obamacare”. The policy aimed to close gaps in insurance coverage by requiring insurers to provide insurance regardless of preexisting conditions, requiring individuals to purchase insurance or face a tax penalty, and by providing subsidies, the largest of which was the expansion of Medicaid. This was the largest change in health insurance policy in a generation, targeting low-income households to bring about greater equity in healthcare.

Prior to the ACA, in 2013, 44 million individuals, about 15 percent of the nonelderly population (younger than age 65) were without health insurance. By 2016, less than 28 million individuals, less than 10 percent of the nonelderly population, were uninsured (Kaiser Family Foundation 2017). With insurance acting as an intermediary in the exchange of services between providers and patients, this change in the insurance status of millions of individuals likely impacted hospital finances. In particular, uninsured, low-income patients who were previously unable to pay their medical bills would now be able to compensate providers through their insurance coverage. Previous to the ACA, these costs remained unpaid and fell on the burden of the hospital. It is possible that gaining Medicaid coverage takes some of the financial burden of uncompensated care off of hospitals by reimbursing them for their care towards low-income and previously uninsured individuals.

A federal program called the Disproportionate Share Hospital Program (DSH) subsidizes hospitals that serve a large proportion of the low-income population to relieve the financial burden of unpaid medical bills. It identifies hospitals that serve a disproportionately high proportion of low-income patients by using the ratio of the low-income and Medicaid-insured patients to the total number of patients (California Department of Health Care Services n.d.). These hospitals

receive federal and state funding for providing care to low-income individuals (O'Neill 2010). DSH program design and eligibility is described in greater detail in Section II-A of this paper.

In 2008, 114 of the 399 hospitals and care providers identified by the California Office of Health Planning and Development were DSH funded. The ACA and the state of California intended to decrease DSH funding as it increased insurance availability, but delayed these reductions until 2020 (Lauer 2012) (MACPAC 2017). As a result of the increase in insurance coverage with the ACA and the delay in DSH subsidy reductions, that DSH-participating hospitals could be expected to perform better financially after the ACA's enactment. In fact, studies have indicated that in many states, the amount of uncompensated care decreased (Dranove, Garthwaite and Ody 2016) (Dranove, Garthwaite and Ody 2017). These studies, however, exclude California.

However, as of 2018, Medicaid reimbursement rates are about 70 percent those of Medicare reimbursement rates, and Medicaid reimbursement rates in California, the state observed in this study, are about 50 percent those of Medicare rates (Zuckerman, Skopec and Epstein 2017). With the impending DSH reductions, it is critical to evaluate the condition of DSH hospitals, the finances of which would be impacted by these lowered reimbursement rates.

Thus, with the increasing availability of Medicaid (MediCal in California) and the opening of the Covered California exchange, with subsidies for some individuals ineligible for Medicaid, there is an empirical question to be asked about the overall financial performance of hospitals after the enactment of the ACA, and particularly about those hospitals which serve the populations and whose insurance status was most affected by the policy.

This thesis provides empirical evidence on this impact, using data on California hospitals. It explores the relationship between rising rates of insurance coverage and hospital finances in

California. Using a difference in difference approach the impact of the ACA on the hospitals whose patients were most impacted by the insurance expansions is identified.

I find that, as a result of the ACA, the patient mix of DSH hospitals changes differentially in comparison to non-DSH hospitals, with MediCal, Medicare, and private insurance patient-days all increasing, indigent patient days decreasing, and total patient days increasing. Further, I find that hospital finances are impacted by this change in patient mix, with a significant increase in profits and a significant decrease in costs for DSH hospitals. No change is observed for bad debts. In breaking down the changes in patient mix and hospital financial outcomes by department, I find that total acute care patient days remain the same, with a change in the types of insurance coverage. Further, I find that the ACA had different effects on different hospital departments.

## **II. BACKGROUND**

### *A. Public Health Insurance Prior to the ACA*

California first attempted to address the problem of uninsurance with the Health Care Coverage Initiative (HCCI) in September 2007. The HCCI program expanded insurance eligibility in participating counties to individuals who were residents of those counties, between the ages of 19 and 64, uninsured, ineligible for Medicaid, and citizens or Legal Residents of the US (UCLA Center for Health Policy Research 2012). The goal of the program was to decrease episodic, temporary, or acute care and increase preventative care for low-income individuals.

In 2011, three years after the start of the HCCI program, California made a preliminary expansion of Medicaid called the Low-Income Health Program (LIHP). This program was intended to test the viability of the ACA, which had been passed a year earlier but would not take effect until 2014. LIHP continued the HCCI program's coverage for individuals at or below 200

percent of the FPL within the ten counties that participated in the HCCI program. California individuals and families up to 130 percent of the FPL received MediCal coverage, and those between 130-200 percent of the FPL received HCCI coverage (UCLA Center for Health Policy Research 2012). The LIHP program showed an increase in the insurance rate and a significant decrease in the uninsurance rate, with spillover effects for children in affected households (Sommers, et al. 2015). On December 31, 2014, on the eve of opening of the Covered California insurance exchange, individuals participating in the LIHP program either transitioned to MediCal coverage or gained insurance through the Covered California exchange.

Since January 2014, when the ACA was rolled out, health insurance coverage has risen in California substantially, particularly among low-income individuals (Hayes, et al. 2017); 4.7 million Californians gained insurance coverage (California Department of Health Care Services 2016). This represents a 7.9 percent decrease in the rate of uninsurance, with substantial increases in access to and utilization of healthcare (Sommers, Gunja and Finegold 2015). Furthermore Simon, Aparna and Cawley show that these increases in insurance rates correspond to increases in preventative care without increasing risky behavior across the United States (2017). Finally, the availability of Medicaid increased the fraction of total Medicaid and insured discharges from hospitals and decreased the number of uninsured discharges from hospitals, with the total number of discharges remaining constant (Freedman, et al. 2017).

### *B. Indigent Patients*

Medically indigent adults (MIAs) are patients who are uninsured and who are ineligible for public insurance programs like Medicaid. Because they are uninsured, these patients are more likely to expensive episodic care, including emergency care, acute care, and are unable to pay their

medical bills, they are costly to medical providers. Unpaid medical bills accumulate as ‘bad debts’ for hospitals.

Because MediCal was only available to certain groups prior to the ACA, many of the 58 counties in California supplemented the state’s health safety net with county programs for MIAs, with most setting their limits at 200 percent of the FPL in order to compensate providers for their care to indigent patients and to provide a safety net for these individuals. California law stipulates that counties bear the responsibility as the ‘last resort’ for individuals who are low-income and uninsured. These programs are meant to provide insurance temporarily, with some counties providing coverage for no more than six months, and no counties providing coverage for any more than a year.

Of the 58 counties, 32 counties provide benefits through a “County Medical Services Program” (CMSP) contracted to Anthem Blue Cross Life and Health Insurance Company. Patients covered through these county programs are limited to the Anthem provider network. The other 24 counties operate programs independently, called Medically Indigent Service Programs (MISP). These programs provide medical services through contracts with county-operated provider centers (McMahon and Newman 2009).

The HCCI program, described above, was an attempt to transition low-income uninsured patients from expensive episodic care and dependence on county MISPs and CMSPs to a more sustainable system by assigning individuals to a “medical home”, or a specific provider that is responsible for a patient’s healthcare. This program took place in ten of the MISP counties, and, as stated above, was a preliminary step in California toward the MediCal expansion with the ACA.

Though these programs do support both indigent patients and their care providers, they are not a long-term solution to the gap in health insurance coverage and the costs associated with

episodic care. The disproportionate share hospital program, described below, also aims to resolve this issue.

### *C. Disproportionate Share Hospital (DSH) Program*

The DSH program was started in 1976 as a federal-state partnership to compensate hospitals that serve a large proportion of low-income patients, as stated above, due to low reimbursement rates for Medicaid and the inability of low-income, uninsured individuals to pay medical bills. There are Medicaid and Medicare versions of the DSH program. Because of the expansion of Medicaid with the ACA, this study focuses on the Medicaid-DSH program.

There are two measures to determine eligibility for DSH funding. Federal law, under Title XIX Section 1923 of the Social Security Act, outlines these two measures. The Medicaid Inpatient Utilization Rate (MUR) expresses the fraction of inpatient days, or days which a patient is an inpatient in the hospital, where the patient was eligible for medical assistance under the state plan. The Low-Income Utilization Rate (LUR) expresses the fraction of total hospital revenues derived from cash subsidies for patient services and from patient services under the State plan (Committee on Ways and Means 1988). The following excerpt from a report on Disproportionate Share Hospitals in California describes the conditions of eligibility for DSH subsidies in California (Office of Statewide Health Planning and Development 2014).

Eligibility is determined annually according to criteria established in state and federal law. The Medicaid inpatient utilization rate (MUR) and low-income utilization rate (LIUR) measure the proportion of Medicaid and uninsured care to the total care for each hospital. To be eligible, a hospital must have either a LIUR in excess of 25.0 percent with a MUR of at least one percent or a MUR of at least one standard deviation above the statewide mean. Utilization rates are based on Medicaid paid claims data, County Organized Health System (COHS) data, and reports filed with the Office of Statewide Health Planning and Development (OSHPD).

Over the years of observation in this study, the MUR and LUR eligibility formulas did not change. The MUR and LUR levels for eligibility remained around 40 percent for MUR and 25 percent for LUR. The number of DSH program participating hospitals in California each year ranges from 393 to 405. Finally, as mentioned before, though DSH reductions were scheduled to occur with the enactment of the ACA in 2014, they were delayed until 2020. The consistency of DSH conditions in California across the years observed in this study allows for observation of the relationship between MediCal availability, indigence, and hospital finances and for evaluation of the role of the DSH program in the new health care environment.

#### *D. Provisions of the ACA and California*

President Barack Obama signed the Patient Protection and ACA into law on March 23, 2010; most of the provisions of the policy were rolled out beginning in 2014. As discussed above, the ACA aimed to increase health insurance coverage particularly for low-income individuals by creating a tax penalty for those who remained uninsured, by expanding Medicaid coverage, and by creating subsidies to help low-income households ineligible for Medicaid to buy private insurance.

Prior to the enactment of the ACA, in 2013, the median national Medicaid income eligibility limit among all states was 61 percent of the federal poverty line (FPL) (Paradise 2015). With the ACA, Medicaid income eligibility limit increased to 138 percent of the FPL. Per the Supreme Court, this Medicaid expansion was optional on a state-by-state basis. Thirty-two states, including the District of Columbia, opted to expand Medicaid. California was one of these states. Prior to the ACA, California had the highest number of uninsured individuals in the country.

Further, MediCal was traditionally only available on a categorical basis, meaning that only certain groups of people were eligible for coverage. The Medicaid and CHIP programs provided full coverage of medical expenses for individuals that fall within any of the following categories; individuals above age 65 and individuals with disabilities at 123 percent of the FPL, working parents at or below 106 percent of the FPL, non-working parents at or below 100 percent of the FPL, children at or below 250 percent of the FPL, and pregnant women at 300 percent of the FPL. This notably did not include childless adults. With the ACA, California opted to expand Medicaid and terminate categorical eligibility. Thus, childless adults at or below 138 percent of the FPL became eligible for Medicaid, with expansions of eligibility in all other categories (California Health Care Foundation 2013) (The Kaiser Family Foundation 2015).

Access to MediCal and other insurance plans were made available through the state-based insurance exchange, “Covered California”. On the exchange, any uninsured individual can purchase health insurance, with Californians at or below 400 percent of the poverty line eligible for federally-subsidized insurance plans. Individuals closer to the poverty line qualify for more support, with potential for subsidies called cost-sharing reductions (CSR). A CSR subsidizes the copay of an individual at 250 percent of the poverty line or less without charging a higher premium. Those eligible can also gain MediCal coverage on the exchange.

These expansions in MediCal and other health insurance availability were anticipated to increase insurance coverage by over 5 million, with low-income individuals benefitting most from the policy change (Gruber and Long 2011).

#### *E. Impact of ACA on California hospital finances.*

Dranove et al (2016) found that uncompensated care decreased in states that expanded Medicaid coverage, but did not change in states that didn’t expand Medicaid (Dranove, Garwaithe

and Ody 2016). However, the study excluded four states, one of which was California, because of California's early expansion of Medicaid in 2011.

My study will contribute to the existing literature by examining the impact of the ACA on hospital finances and uncompensated care in California.

### **III. DATA**

The primary source of data is the Hospital Annual Financial Dataset from the California Office of Health Planning and Development (OSHPD). The unit of observation is the hospital-year. Hospitals submit their reports by fiscal year, which does not necessarily coincide with the calendar year. Year is determined by the year in which the report was submitted. Below, I further describe these data and give some preliminary descriptive statistics.

#### *A. Data*

California is the most populous state in the US and has the fifth largest economy in the world. As seen in Table 1, California hospitals show variability in profit margins along with other financial outcomes, and thus this state is a useful context for observing differences between hospitals facing changing payer mixes.

Data from the California Office of Health Planning and Development (OSHPD) include detailed financial and utilization data, breaking down the revenues and costs of each hospital by the department or type of services provided. Data are available between 2002 and 2015, and the observed years in this study are 2007 to 2015. Variables of interest for this study include measures of hospital finances and utilization. The OSHPD variables also include the patient utilization by insurance status.

The data include 451 health care facilities including many psychiatric care providers, children’s hospitals and acute-care hospitals. Certain providers are authorized by the CA OSHPD to submit modified or shortened reports; these include Kaiser Hospitals, long-term care (LTC) emphasis hospitals, psychiatric health facilities (county-operated), Shriner’s hospitals, state hospitals and short period hospitals. As a result, some variables of interest are not observed for some hospitals. This problem is addressed in the ‘Missing Data’ section below.

Finally, the California OSHPD data identify the quantity of DSH funding for Medicaid each hospital receives. The receipt of funding in the base year of 2008 is used to identify which hospitals serve a disproportionate share of low-income populations and are therefore most likely to be affected by the ACA and the expansions of MediCal in 2011 and 2014.

### *B. Missing Data (and other obstacles)*

Table 2 shows the main variables of interest in this study. As can be seen in the rightmost column, many variables are not observed across all hospitals. In order to address this issue, a subset of the data has been created, which includes only hospitals that are observe across all financial variables listed in Table 2 for all years. Of the 3593 observations in the full dataset, 2664 remain in the subset. Results from the subset of data analyzed in the body of this paper, while results from the full set of data are shown in the appendix.

### *C. Preliminary descriptive statistics*

In this study, DSH Hospitals will be the “treatment group”. Table 3 describes OSHPD financial data based on the DSH status of hospitals. The first column shows number of observations divided by ownership type; the second column shows the number of DSH-funded hospitals of each

ownership type. Out of the 391 hospitals in the 2014 sample, 125 hospitals, or 32 percent, were DSH-funded. While most of DSH-funded hospitals are non-profit, it is most likely for a government hospital to be DSH-funded. This shows that non-profit hospitals care for the most low-income patients, while government hospitals are most likely to care for low-income patients.

The summary data of profits, revenues and costs per patient day shown in Table 1 show that profits for DSH-participating hospitals are, on average, higher than those of non-DSH hospitals. Due to the lower reimbursement rates for Medicaid (and Medicare) and the amount of care given to low-income patients at DSH-participating hospitals, it may have been expected that DSH-hospitals do not fare as well financially in comparison to non-DSH participating hospitals. Thus, it is unclear whether the ACA does indeed differentially impact the finances of hospitals that disproportionately serve low-income patients. Further, Figure 1A shows the bad debts of DSH and non-DSH hospitals over time.

Table 2, as stated earlier, summarizes the variables of interest across all hospitals and years. Of the hospitals in the full dataset, 28 percent of the hospitals are DSH-funded hospitals. Revenues and costs per patient day are approximately equal on average, though the variation in each is quite large as shown by the standard deviations. Table 2 also shows that on average, an individual hospital cares for about 50,000 patient days. Patient days are used in this study as a measure of utilization, and can be broken down by insurance type. Twenty-eight percent of patient days at the average California hospital were patients covered by MediCal. Of the annual 50,000 patient days for the average hospital, only about 2,000, or about 4 percent, of the patients are considered indigent. The ACA and expansion of Medicaid was designed specifically to expand insurance coverage for individuals with characteristics of the indigent population (low-income without any formal insurance). The empirical strategy outlined in Section IV confirms this change in patient

mix and tests the impact on hospital finances, targeting differences between DSH and non-DSH hospitals.

Figures 2-4 descriptively demonstrate patient mix and patient behavior over the years observed and provide some preliminary insight into the changes that occurred as a result of the ACA. In Figure 2, the number of patient days in DSH hospitals remains fairly constant relative to the number of patient-days in non-DSH hospitals, which decline slightly over time. This can be interpreted as a relative increase in the number of patient days at DSH hospitals.

Figure 3 shows that DSH hospitals experience a bigger drop in the number of indigent patient days after the expansion of the ACA in 2014 in comparison to non-DSH hospitals. Figure 5A presents one possible explanation for this; MediCal coverage increases in both DSH and non-DSH hospitals after the passage of the ACA in 2014, while Medicare, which was unaffected by the ACA, stays the same.

Times-series graphs of financial outcome variables, measured in dollars per patient day, show that there may have been possible effects of the ACA on hospitals finances. In Figure 5A, profits increase over the years observed, and the gap in profits between DSH and non-DSH hospitals closes after the ACA, suggesting a possible differential impact. In Figure 8, bad debts in both DSH and non-DSH hospitals distinctly decline after the ACA. The empirical strategy outlined below targets these changes.

#### **IV. EMPIRICAL STRATEGY**

The empirical strategy of this paper aims to identify the impact of the Affordable Care Act on hospitals whose patient populations are largely low-income. These hospitals are identified by their participation in the DSH program in base year 2008 and are considered the treatment group.

Hospitals that do not receive DSH funding in 2008 comprise the control group. The first stage of the empirical strategy targets the differential change in patient mix between treatment and control hospital. Then, it assesses the impact of this change in patient mix on financial outcomes; in theory, previously uninsured low-income patients unable to pay medical bills. As the ACA expanded Medicaid and created subsidies for low-income families, patients became more able to compensate providers for their services. Thus, because of the differing prevalence in these low-income uninsured patients between the treatment and control groups, it is expected that the ACA will have a differential impact on their financial outcomes.

It is assumed that no other differences between DSH- and non-DSH-hospitals impact the time trends of their fiscal health. Thus, these two groups will reflect the differences between hospitals that are differently affected by the ACA's insurance expansions.

Because key insurance expansions of the ACA took effect on January 1, 2014, the impact of the policy will be seen after that time, the 'post' period in the empirical strategy includes the years 2014-2015. The 'pre' period includes the years 2007-2013.

In the first phase of the analysis, I examine the ACA's impact on the patient-mix of hospitals. A difference-in-difference strategy is used to estimate this impact.

$$\begin{aligned}
 (1) \text{ Patient Mix}_{it} &= B_0 + B_1 \text{Post2014}_t + B_2 \text{DSH}_i + B_3 \text{Post2014}_t * \text{DSH}_i + B_4 \text{YearFE}_t \\
 &+ B_5 \text{HospitalFE}_i + \text{Error}_{it}
 \end{aligned}$$

where *Patient Mix<sub>it</sub>* denotes patient days by insurance type, including MediCal patient days, privately insured patient days, indigent patient days, Medicare patient days, and "other" patient days. The subscript *i* denotes an individual hospital, and the subscript *t* denotes a year.

In model 1, via the parallel trend assumption, non-DSH hospitals are assumed to provide an adequate control for any trends in patient mix. The addition of year and hospital fixed effects ( $YearFE_t$  and  $HospitalFE_i$ ), make this assumption more rigorous by controlling for changes in patient mix over time common to all hospitals, and for fixed differences in patient mix between hospitals. The results for the coefficient of interest,  $B_3$ , indicates differential changes in patient-mix at DSH hospitals after the implementation of the ACA relative to changes in non-DSH hospitals at that time. With these results, I proceed onto assessing differences in financial outcomes for hospitals.

I approach this issue with a difference in difference strategy, shown below.

$$(2) Y_{it} = B_0 + B_1 Post2014_t + B_2 DSH_i + B_3 Post2014_t * DSH_i + B_4 YearFE_t + B_5 HospitalFE_i + Error_{it}$$

Where  $Y_{it}$  represents one of several hospital financial outcome variables including Profits, Costs, and Revenues, and Bad Debts, all scaled by number of patient days.

Equation 2 assumes parallel trends over the observed year, assuming that there is no mechanism that differentially impacts the trend in finances between the treatment and control hospitals other than the policy change. Retaining hospital and year fixed effects makes these assumptions more convincing

The variables of interest above are further broken down to better explain the phenomena observed in the first phases of the experiment. First, we explore changes in utilization of acute care departments by insurance type, following model 1A. Acute care can be categorized as a form of episodic care, which, as discussed earlier, is utilized more by uninsured patients. Additionally, we further break hospital finances, by looking at the finances of individual departments to see if any single department drives the results. Using the model in equation 2A to add analysis on profits

derived from individual departments expected to be impacted by the ACA due to patterns of patient behavior, we observe imaging, drugs sold to patients, acute care and emergency departments.

## V. RESULTS

### *A. Patient Mix*

In the first stage of the empirical analysis in this paper, the change in patient mix of hospitals in California is assessed in order to ensure that results of previous studies that show increases in Medicaid coverage and decreases in uninsurance are reflected in this dataset. The empirical framework is described in the previous section; particularly by equations 1A and 1B. This stage is essential in order to determine whether the underlying mechanisms that might alter the finances of these hospitals actually took place.

Table 4A shows estimates of the differential change in inpatient days after the ACA for hospitals with non-DSH hospitals as the control group. A significant increase in the number of MediCal patient-days is observed, with the number of MediCal patient days per year increasing in DSH hospitals by 1,365.1, which is an 8.9 percent increase from the average of 15,274.38 patient days reported in Table 3. Further, the number of indigent patient days significantly decreased by 1,784.3 patient days per year, which is a 90 percent decrease from the average number of indigent patient days reported in Table 3. These effects can likely be explained by the expansion of MediCal with the ACA.

In addition to the results above, which are supported by the literature and the descriptive statistics and tables in this paper, there are also significant increases in the number of Medicare and private insurance patient days, along with the number of total patient days. A possible explanation for the increases in privately insured patient-days is that the opening of the Covered

California exchange, along with the fact that health insurance coverage was made mandatory with the enactment of the ACA, may have caused individuals to enroll in private insurance plans. Finally, the effect on Medicare is not well understood and requires further study.

The cumulative effect, which can be seen in column 6 of Table 4, is an increase in the total number of patient days for DSH participating hospitals in comparison to non-DSH hospitals; the increase in patient days from MediCal, Medicare and privately-insured patients offsets the decrease in patient days from indigent patients. One potential explanation is that the effect of increased coverage caused moral hazard.

### *B. Hospital Finances*

The first stage of the empirical analysis confirmed that MediCal patient days increased and that indigent patient days decreased at DSH hospitals as a result of the ACA. These changes appear to have coincided with increased private insurance coverage and possibly increased Medicare coverage. With hospital and year fixed effects to control for regional differences in trends in patient-mix, along with time-variation of trends in patient-mix, it is likely that these changes are due to the ACA. I hypothesize that these changes improve the financial standing of hospitals, particularly hospitals that were more likely to serve low income patients. This seems particularly likely because the increase in insurance coverage was not offset by any discontinuation of the DSH program.

The second stage of the empirical analysis, is designed to estimate this impact of the change in patient mix on the financial standing of California hospitals.

The results shown in table 5A identify these effects; the ACA appears to have had a statistically significant effect on costs per patient day and profits per patient day, with an increase

in revenues that was statistically significant at the 10 percent level. Results in this table suggest that costs fell over the course of the enactment of the ACA. Because the increase in profits per patient day is smaller than the decrease in costs per patient day, this further supports a possible simultaneous decrease in revenues, reflected in the negative point-estimate for revenues in Table 5A.

The decreasing costs to the hospital and potentially decreasing revenues can do not contradict the increase in the number of patient days. Rather they suggest increased efficiency, since revenue, cost, and profit outcomes are scaled by patient days. The decrease in costs could be explained in particular by a decrease in episodic care, which tends to be costly. The simultaneous increase in total patient days suggests a potential increase in preventative care and in moral hazard. Cumulatively, the effects of these changes would be an increase in the profit per patient day.

Bad debts, reported in column four of table 5A, do not significantly increase or decrease. If fully uninsured patients were gaining insurance coverage, I might expect to see bad debt values would decline. It is possible that because the DSH program continued to fund DSH hospitals, because MediCal reimbursement rates tend to be lower than reimbursement rates of private insurance companies, and because the HCCI, LIHP, and county indigent insurance programs existed prior to the ACA's MediCal expansion, bad debts did not decrease.

It is possible that profit per patient day increases because of the increasing numbers of insured patients. With insurance coverage, it is possible that patients spend more time in the hospital after a procedure. In the first day of their visit, the patient accumulates the most cost for the hospital. In subsequent days, the insured patient represents an opportunity to generate revenue for the hospital. Thus, it is possible that a provider would keep a patient in the hospital longer, because it would be advantageous to him.

From the patient-side, when a patient has a procedure, if they are not insured, they will try to get out of the hospital as fast as possible because the accumulated costs over the course of their visit fall on them. If the patient is insured, then the patient will make a different decision at the margin with the knowledge that they will not be completely responsible for the financial burden of the extra day that they stay at the hospital.

### *C. Utilization and Finances of Costly Care Departments*

With evidence of substantive change in patient-mix and an increase in profits and no impact on bad debt, further analysis is performed. In order to better describe the change in patient-mix and the change in profit, additional analysis observes the ACA's impact on a smaller scale, within specific departments. I specifically examine the impact of the ACA on acute care and inpatient acute medical-surgical care. Further, I analyze the revenues and costs for these services. I expected that increased insurance coverage might affect these services because they are generally utilized in an episodic manner. I also examine the impact on imaging and drugs sold to patients because I expect that increased insurance coverage may lead to increase use of these services. Results from our analysis are shown in tables 7A.

The results in table 7A reflect the differential change in utilization of acute medical-surgical care, another form of episodic care, before and after the ACA between DSH and non-DSH hospital. Significant effects are observed for Medicare, MediCal, Indigent, and privately-insured patients, though the total number of patients does not significantly change. While Medicare, MediCal, and private insurance days are all increasing by 845.7, 639.1 and 501.7 patient days respectively, indigent patient days drastically decrease by 1,427.3 patient days. These results closely mirror the results observed on the hospital-wide scale. While on the hospital-wide scale,

the decrease in indigent patient days is more than offset by an increase in insured patient days, increasing the total number of patient days, this does not occur in acute care. The decrease in patient utilization by indigent patients is about as large, in magnitude, as the increase in Medicare, MediCal, and privately-insured patient days, thus offsetting the effect of the decrease in indigent emergency patient days.

Finally, table 9A builds on the analysis done on the changes in patient-mix in acute and emergency care departments by unpacking the financial outcomes of these two departments, along with profit per patient day derived from imaging and from drugs sold to patients. In table 9A, profit per patient day from imaging services decline over the course of the ACA while profit from acute care increases. The coefficient for other departments is significantly positive at the 10 percent confidence interval. These results indicate that there is a change in the composition of services that are being provided to patients. The significant value for other departments indicates that further research is needed to illuminate the changes in patient and provider behavior as a result of the ACA.

## **VI. DISCUSSION**

These results show that the change in patient mix resulting from the ACA corresponded with changes in hospital financial outcomes. The changing insurance status of many patients likely impacted their behavior and their ability to access medical care. These behaviors are likely what caused the changing financial outcomes for hospitals.

Interestingly, though profits per patient day increased, costs per patient day decreased, and episodic care decrease, a change in bad debt is not observed. The DSH program, which aims to compensate hospitals for the uncompensated care that accumulates as bad debt, continued as the

previously uninsured and indigent patients, the main causes of bad debt accumulation, gained insurance coverage after the ACA. Though it may have been expected that bad debt decrease as a result of the continuation of the DSH program, there are several explanations why this did not occur.

Figure 8 shows bad debts in DSH and non-DSH hospitals over the course of the period of observation. In the figure, there is a stark decline in bad debt after the enactment of the ACA in 2014. Thus, it appears that though there may have been an impact of the ACA on bad debts, this impact was not differentially observed in DSH hospitals.

As Dranove et al. (2016) point out by excluding California in their analysis of the change in uncompensated care after the ACA on a national scale, California began its MediCal expansion in 2011 with the LIHP program, with insurance expansion happening as early as 2009. Though these programs were only implemented in 10 of 58 counties in California, these are 10 of the top 14 most populous counties in California, comprising a large proportion of the California population.

Thus, the significant increase in hospital profits per patient day and the significant decrease in hospital costs per patient day could be caused, as mentioned before, by changes in patient or provider behavior in response to changing insurance statuses.

Analysis on acute care departments across California illuminates the changes in patient behavior. Changes in patient-mix are reflective of those on the hospital-wide scale. Interestingly, as a service that is considered episodic care, the number of total acute patient days does not decline. This may indicate that due to moral hazard, newly insured patients may still be using episodic care in addition to more frequent preventative care. Further research will be needed to unpack this and understand the impact of the ACA on individual departments.

Some preliminary data is shown on individual departments in this paper. Unexpectedly, profits derived from imaging decline, while profits derived from acute care increase.

As mentioned earlier, based on the statistically significant result for the “Other Departments” coefficient, more research is needed to better understand specifically how patient and provider behaviors adjusted as a result of the ACA, and how changes on a departmental level can impact finances at the hospital level.

Overall, with the retention of the DSH program, it appears that previously indigent patients did gain insurance coverage and that DSH hospitals did differentially benefit from the ACA in comparison to non-DSH hospitals.

## **VII. CONCLUSIONS**

The aim of this paper is to determine the financial impact of the ACA on hospitals that serve low-income populations. By observing changes in patient mix and financial outcomes on a hospital and on a hospital level, I was able to determine whether DSH or non-DSH hospitals faced a greater change in patient mix, and whether this change in patient mix impacted hospital finances. First, DSH hospitals saw an increase in MediCal, Medicare and privately insured patient days, and a simultaneous decrease in the number of indigent patient days. Cumulatively, this resulted in an increase in the number of total patient days. DSH hospitals also saw a differential increase in hospital profits and a differential decrease in hospital costs in comparison to non-DSH hospitals. This decrease in costs is likely to a shift toward preventative care measures. Though Acute care did not see a decrease in total patient days, it is likely that preventative care increased, bringing down the average costs per patient day. Further research can illuminate which departments and services are costly, and which ones are not costly.

Results illuminated potential effects of the ACA beyond those on hospitals. The impact of increased insurance coverage impacts patient behavior primarily through the phenomenon of moral hazard. Similarly, it impacts physicians' willingness to treat a patient. These changes in behavior have an impact on a larger scale.

It will be interesting to watch and see how DSH hospitals fare as DSH benefits to hospitals are rolled back. Particularly with the lower reimbursement rates for MediCal, the impact of removing DSH subsidies is unclear. Who will bear the burden of uncompensated care?

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Table 1. Hospital Profits, Costs and Revenues per Patient Day by DSH participation

	All Hospitals	DSH Hospitals	Non-DSH Hospitals
Profit	-25.62	177.23	-113.38
	3295	995	2300
Profit, lowest decile	-3,627.69	-1001.78	-4,400
	330	75	255
Profit, highest decile	981.29	961	989.64
	329	95	234
Total Costs	4,435.18	3,587	4,806
	3258	991	2267
Total Costs, lowest profit decile	6,019.80	4,414	6,492
	339	75	255
Total Costs, highest profit decile	5,678	4,976	5,968
	325	95	230
Total Patient Revenue	4,366	3,759	4,627
	3288	991	2297
Total Patient Revenue, lowest profit decile	2,429	3,604	2,100
	325	71	254
Total Patient Revenue, highest profit decile	6,573	5,937	6,832
	329	95	234

Number of observations shown below average values in each category.

<b>Table 2. Descriptive Statistics</b>		
<b>Variable</b>		<b>Observations</b>
<b>Total Hospitals</b>		440
<b>Total Observations</b>		3620
<b>Fraction DSH Hospitals</b>	.2802672	3593
	.4491922	
<b>Fraction Psych Facilities</b>	.1055936	3504
	.3073606	
<b>Profit per Patient Day</b>	-25.62523	3513
	.3215613	
<b>Revenue per Patient-Day</b>	4365.546	3288
	4629.107	
<b>Costs per Patient Day</b>	4435.176	3258
	3856.207	
<b>Bad Debts per Patient Day</b>	254.31	3591
	427.14	
<b>DSH Payments per Patient Day</b>	207.59	1043
	367.49	
<b>Total Patient Days</b>	49776.24	3593
	54886.13	
<b>Medi-Cal Patient Days</b>	15274.38	3593
	26887.52	
<b>Private Patient Days</b>	11357.77	3593
	16773.74	
<b>Medicare Patient Days</b>	16802.29	3593
	17033.36	
<b>Indigent Patient Days</b>	1980.122	3593
	5782.06	
<b>Other Insurance Status, Patient days</b>	4365.33	3591
	32566.52	
<b>% Medi-Cal Patient Days</b>	.2779467	3593
	.248489	
<b>% Medicare Patient Days</b>	.3783907	3593
	.2230665	

Sample means shown with standard deviation below.

Table 3. Hospital Ownership and DSH Status in 2014

	Observations	Number of DSH	Percent DSH
Non-Profit	219	56	26%
For-Profit	108	32	30%
Public	64	37	58%
Total	391	125	32%

Figure 1A. Bad Debt in millions, subset

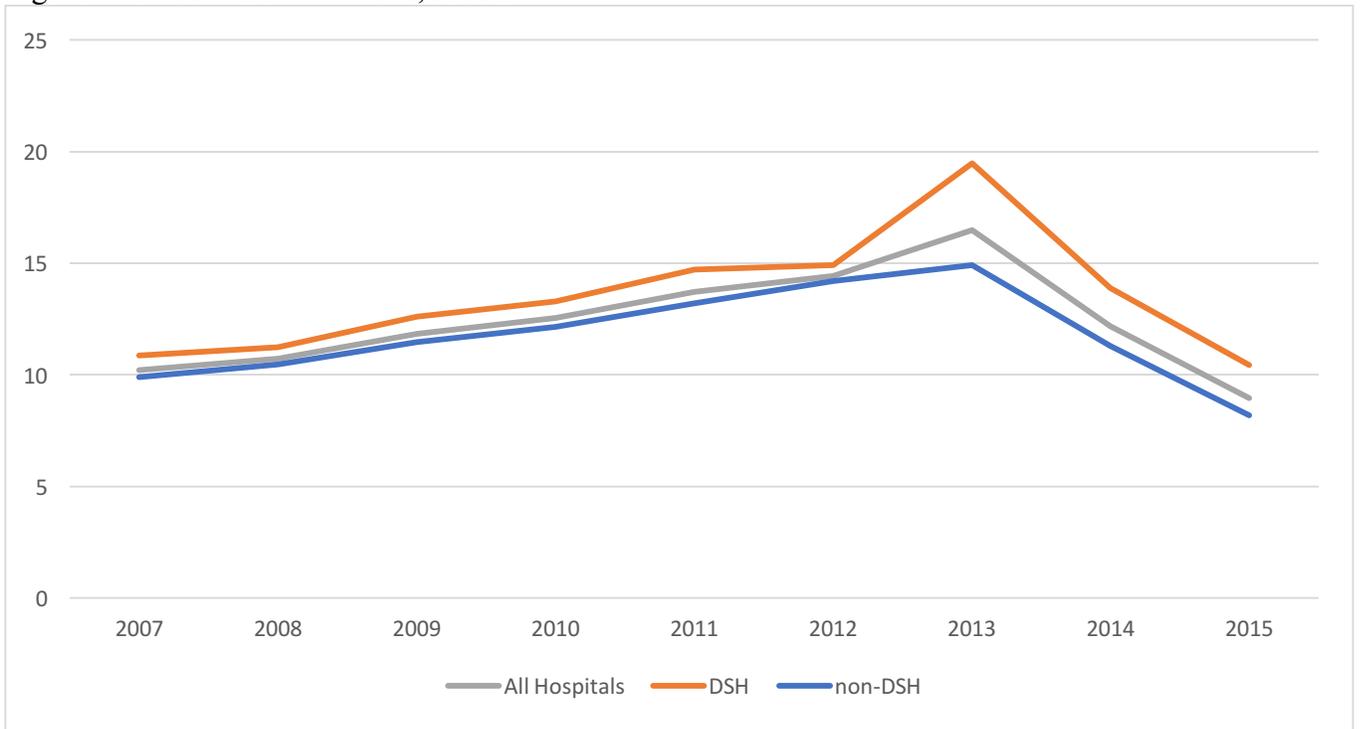


Figure 2A. Total Patient Days, in thousands

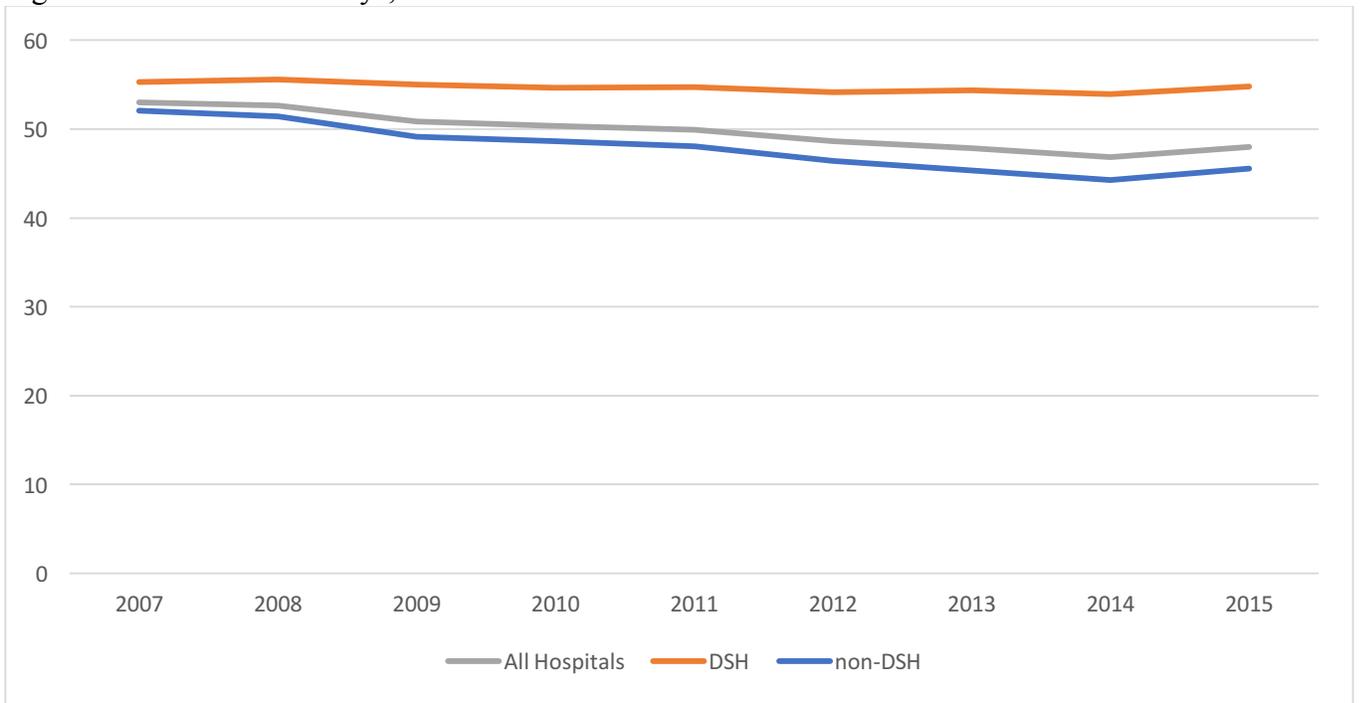


Figure 3A. Total Indigent Patient Days

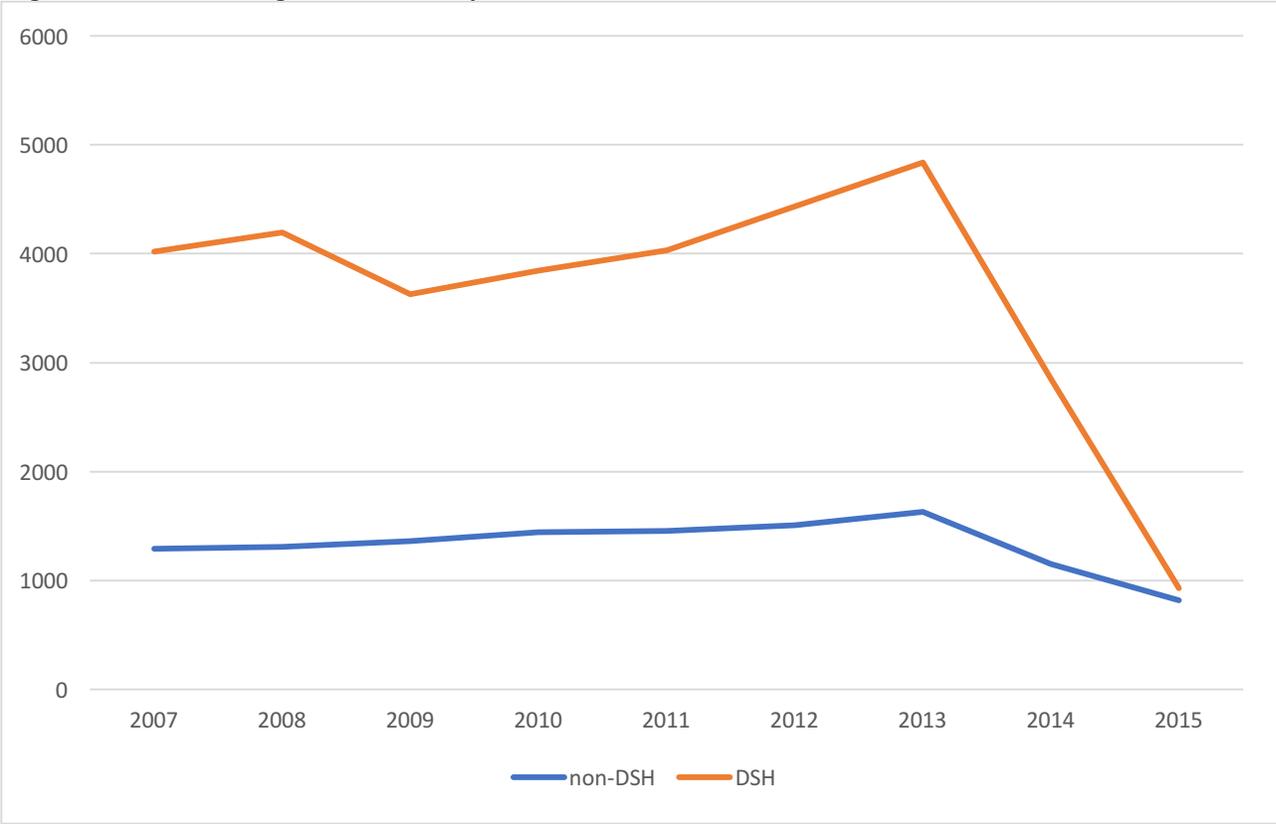


Figure 4. Proportion of Total Patient Days, by Insurance Type

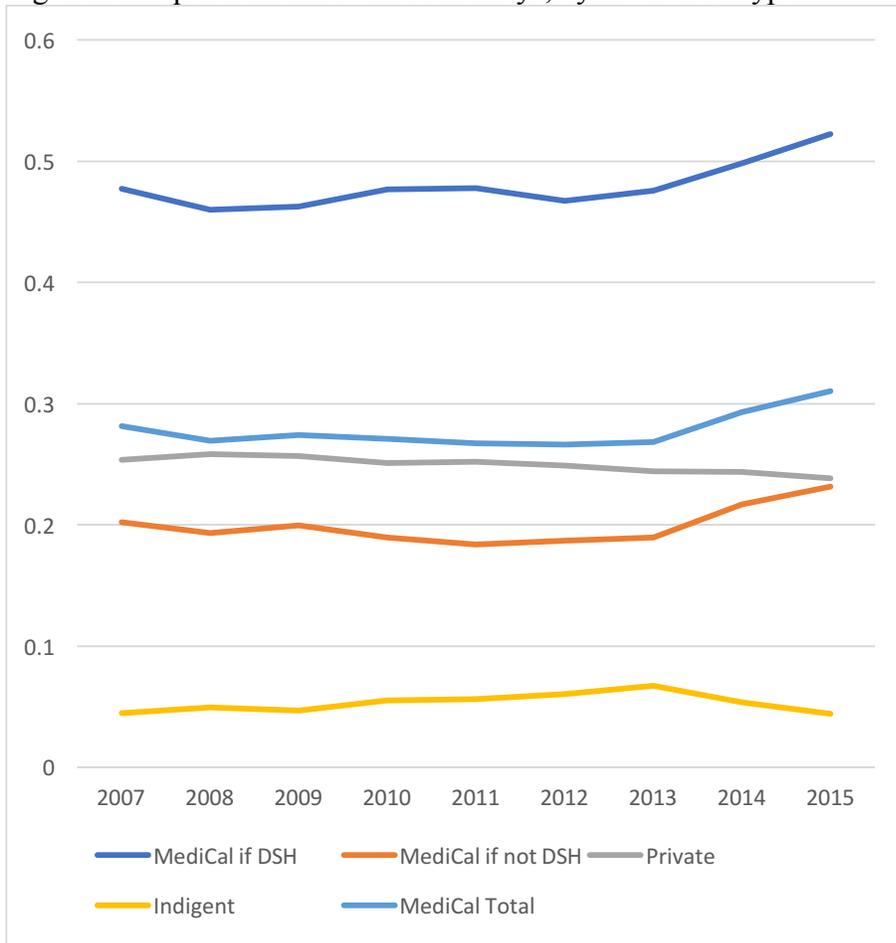


Figure 5A. Profits per Patient Day in millions, subset

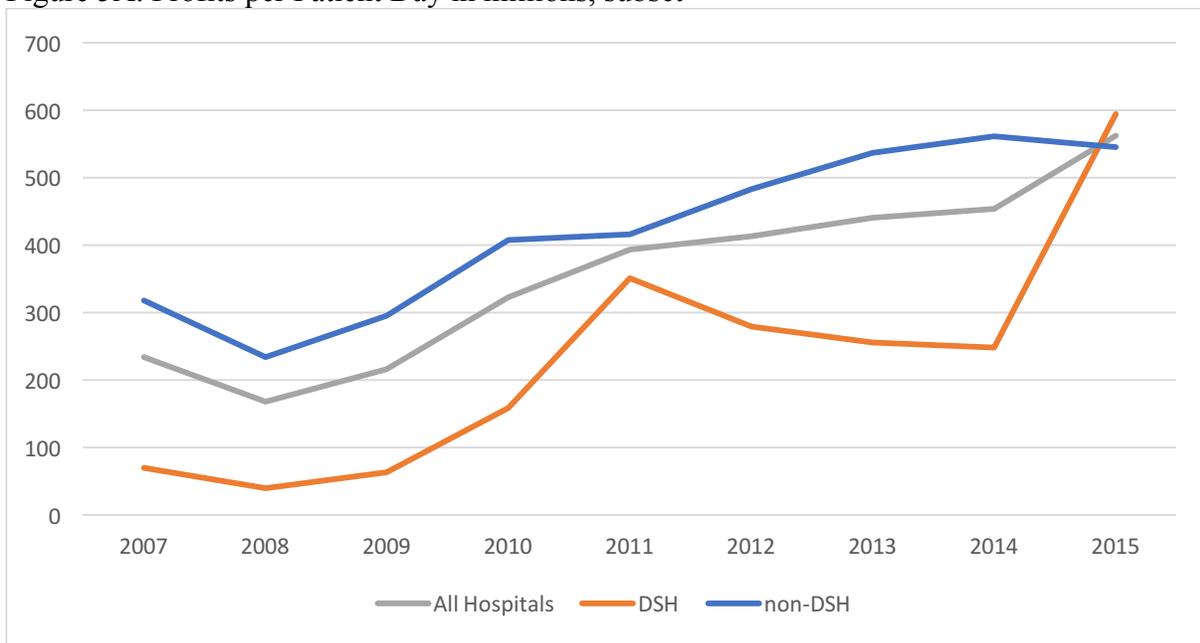


Figure 6A. Revenue per Patient Day, subset

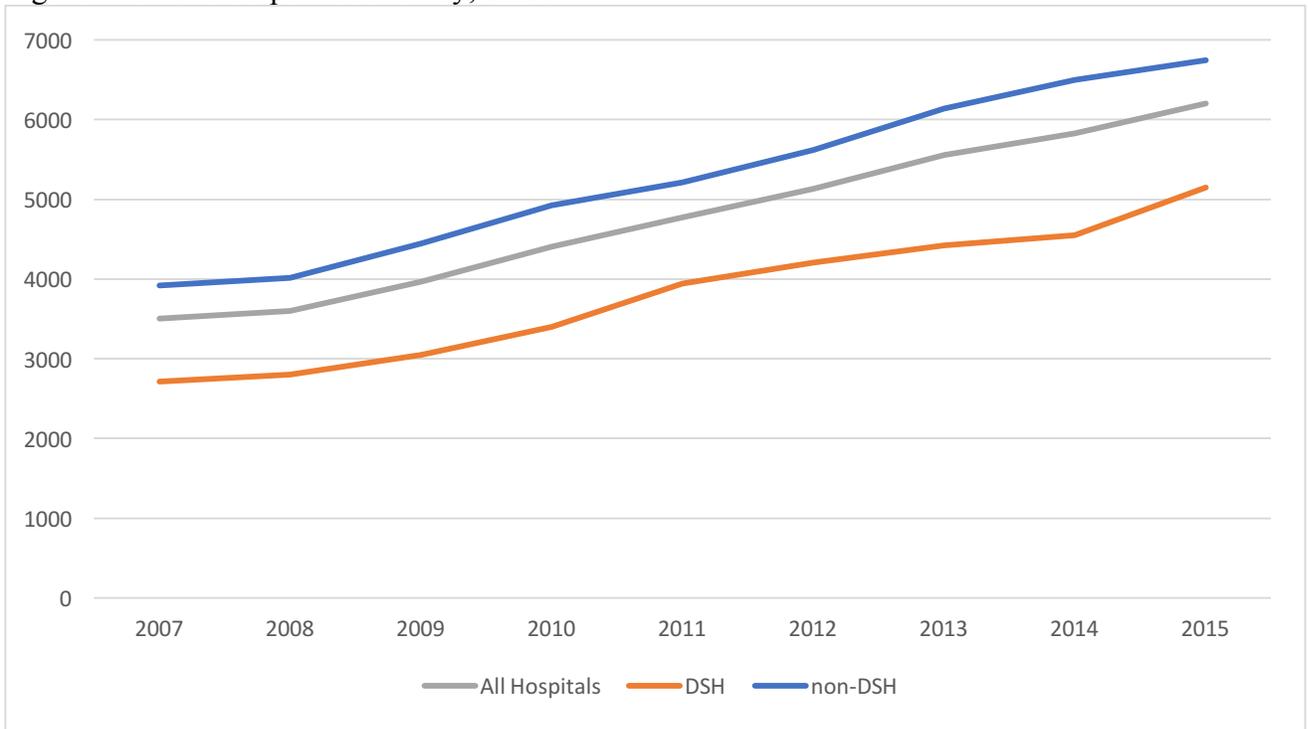


Figure 7A. Costs per patient day, subset

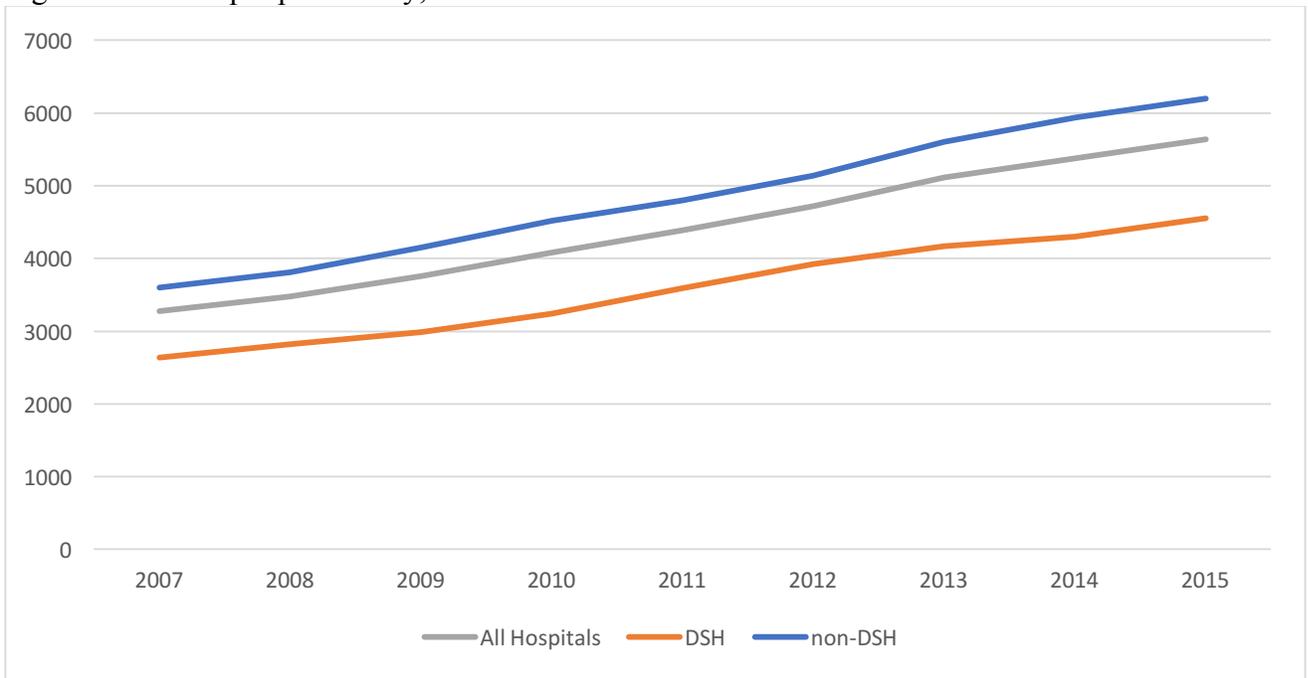


Figure 8. DSH payments in millions

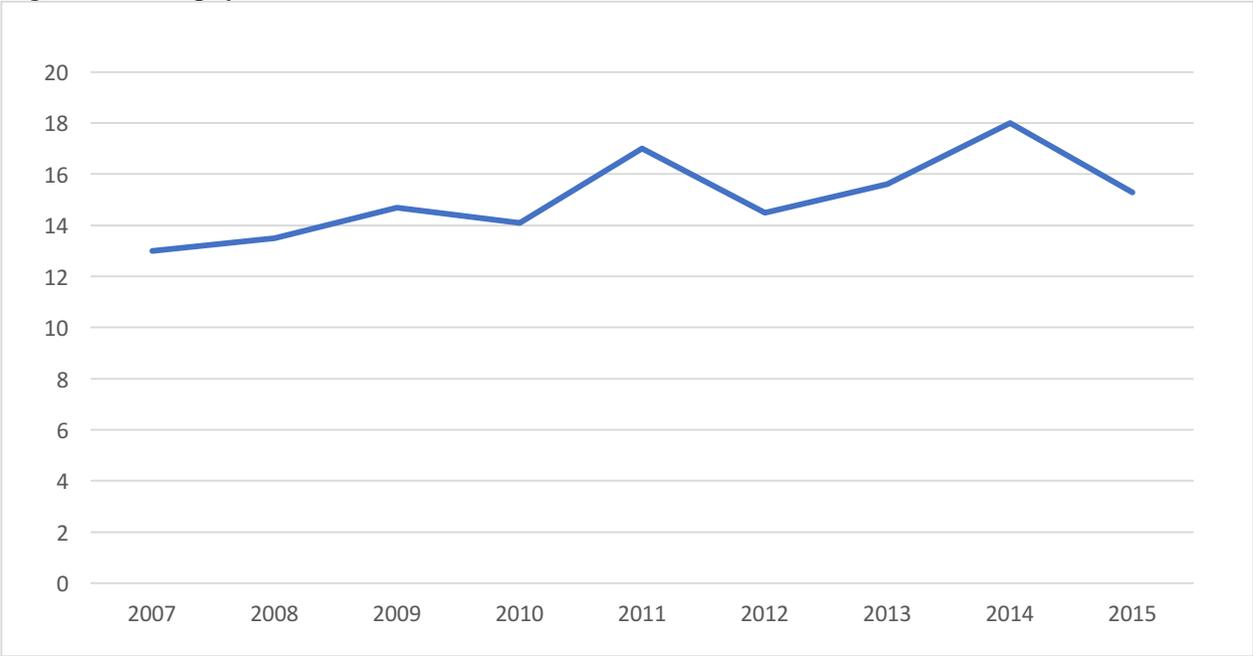


Table 4A. Inpatient Days by Insurance Type

	(1) MediCal	(2) Indigent	(3) Private Insurance	(4) Medicare	(5) Other	(6) Total
DSH*Post	1365.8*** (3.37)	-1784.3*** (-8.49)	904.1*** (3.81)	1370.0*** (4.42)	-53.03 (-0.57)	1802.7** (2.87)
Constant	40309.9*** (28.90)	836.6 (1.16)	40244.2*** (49.16)	36607.0*** (34.28)	1681.8*** (5.27)	119679.6*** (55.31)
N	2664	2664	2664	2664	2664	2664

t statistics in parentheses

\* p&lt;0.05    \*\* p&lt;0.01    \*\*\* p&lt;0.001"

Table 5A. Total Financial Outcomes per Inpatient Day (dollars per patient day)

	(1) Revenue	(2) Cost	(3) Profit	(4) Bad Debt
DSH*Post	-205.7 (-1.64)	-376.2*** (-3.48)	166.4*** (3.51)	11.43 (0.62)
Constant	4038.0*** (9.35)	3786.5*** (10.16)	246.9 (1.51)	99.98 (1.56)
N	2664	2664	2664	2664

t statistics in parentheses

\*p&lt;0.05    \*\* p&lt;0.01    \*\*\* p&lt;0.001

Table 6A. Total Acute Care Patient Days, by Insurance Type

	(1)	(2)	(3)	(4)	(5)	(6)
	Medicare	MediCal	Indigent	Private Insurance	Other	Total
DSH*Post	845.7*** (3.38)	639.1* (2.53)	-1427.3*** (-8.73)	501.7** (2.67)	17.34 (0.24)	473.8 (1.14)
Constant	23718.0*** (28.70)	29684.4*** (34.15)	839.3 (1.49)	27313.4*** (42.17)	1474.8*** (5.83)	83024.1*** (57.74)
N	2365	2664	2664	2664	2664	2664

t statistics in parentheses

\* p&lt;0.05    \*\* p&lt;0.01    \*\*\* p&lt;0.001

7A. Profit by Department

	(1)	(2)	(3)	(4)	(5)
	Emergency	Imaging	Drugs Sold to Patients	Medical- Surgical Acute	Other Departments
DSH*Post	22.50 (1.70)	-28.42* (-1.99)	4.956 (0.17)	66.75* (2.49)	91.22 (1.73)
Constant	-36.23 (-0.87)	-44.65 (-0.37)	137.8 (1.36)	-9.351 (-0.11)	124.8 (0.29)
N	2144	1787	2580	2300	1636

t statistics in parentheses

\* p&lt;0.05    \*\* p&lt;0.01    \*\*\* p&lt;0.001

# APPENDIX

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Figure 1B. Bad Debt in millions, total dataset

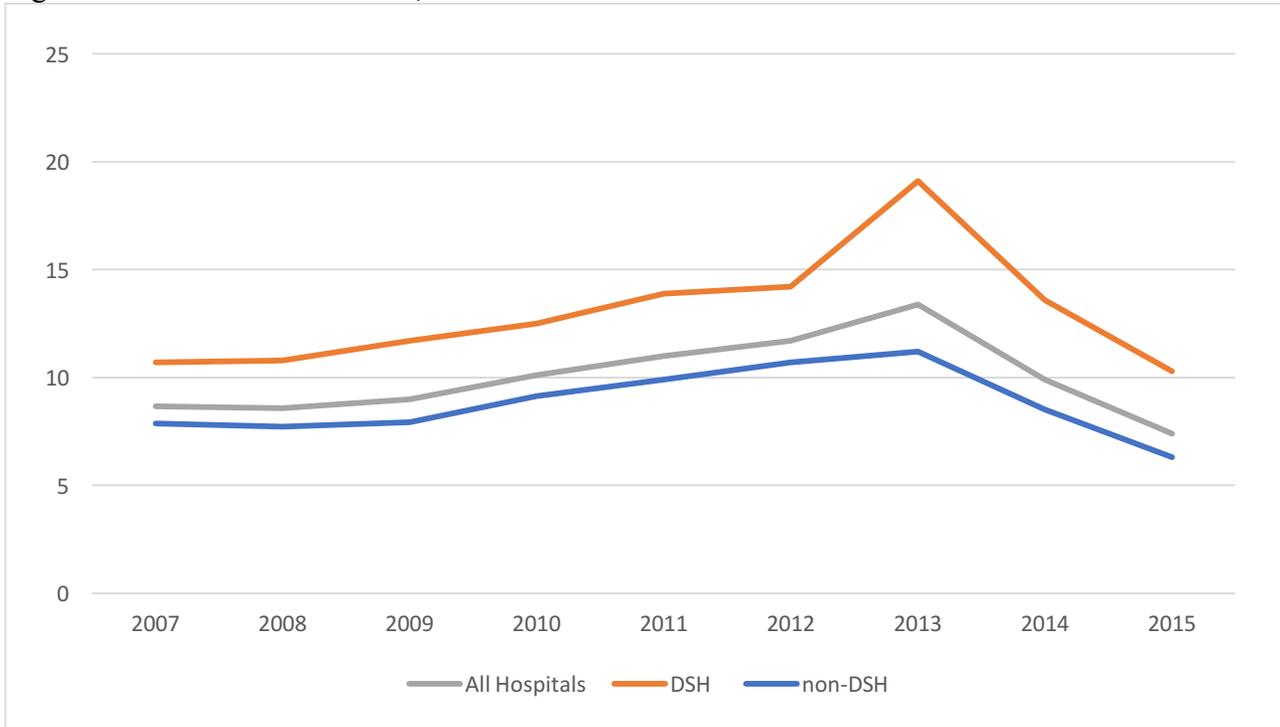


Figure 5B. Profits in millions, full dataset

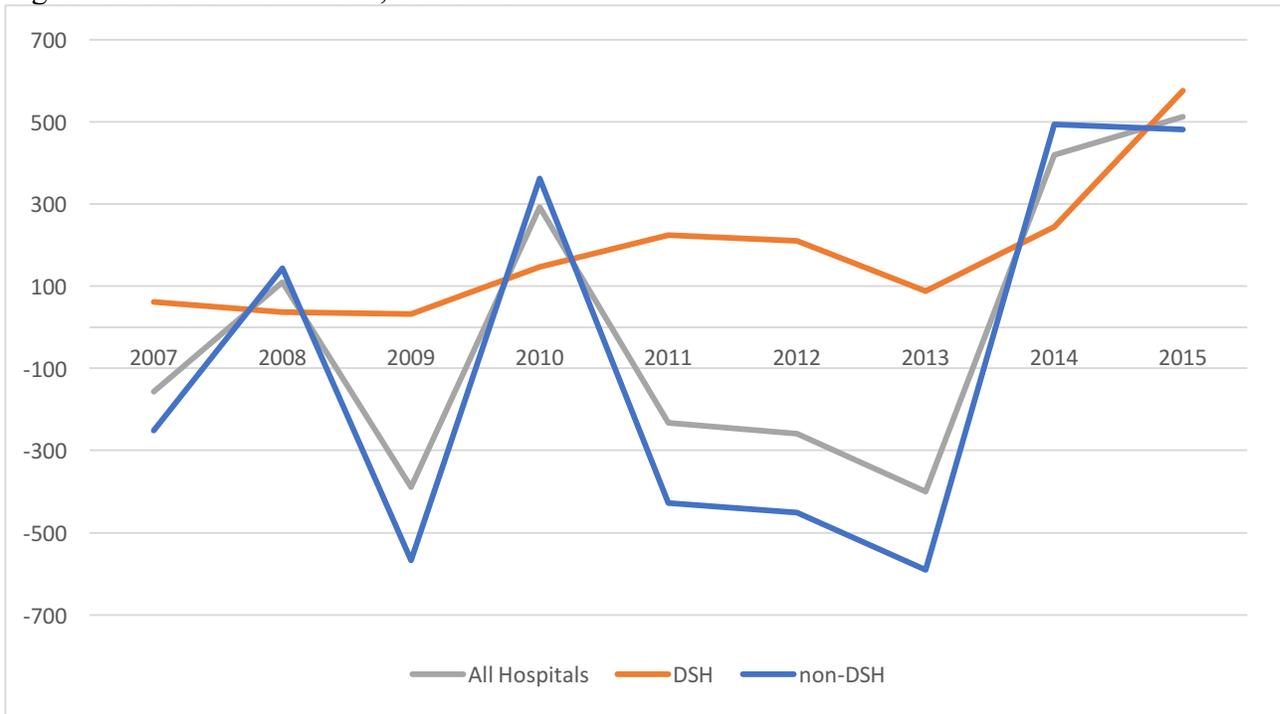


Figure 6B. Revenue per Patient Day, full dataset

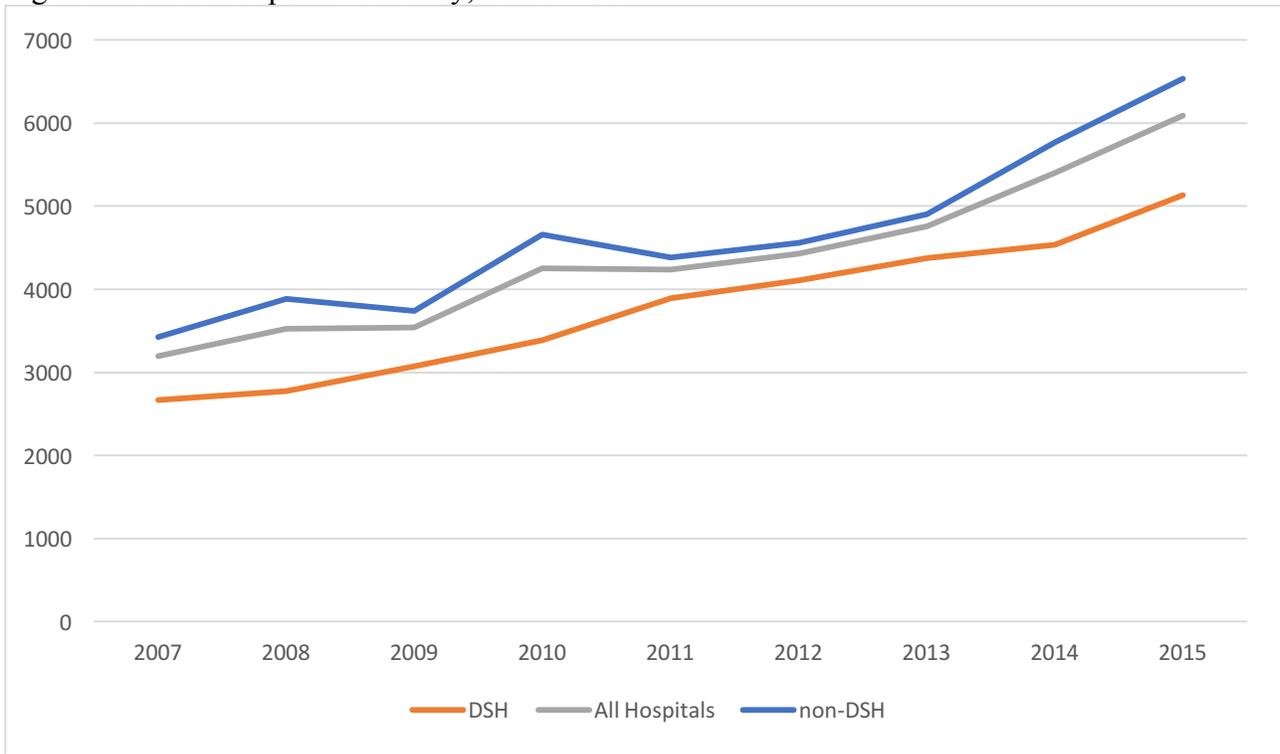


Figure 7B. Costs per patient day, full dataset

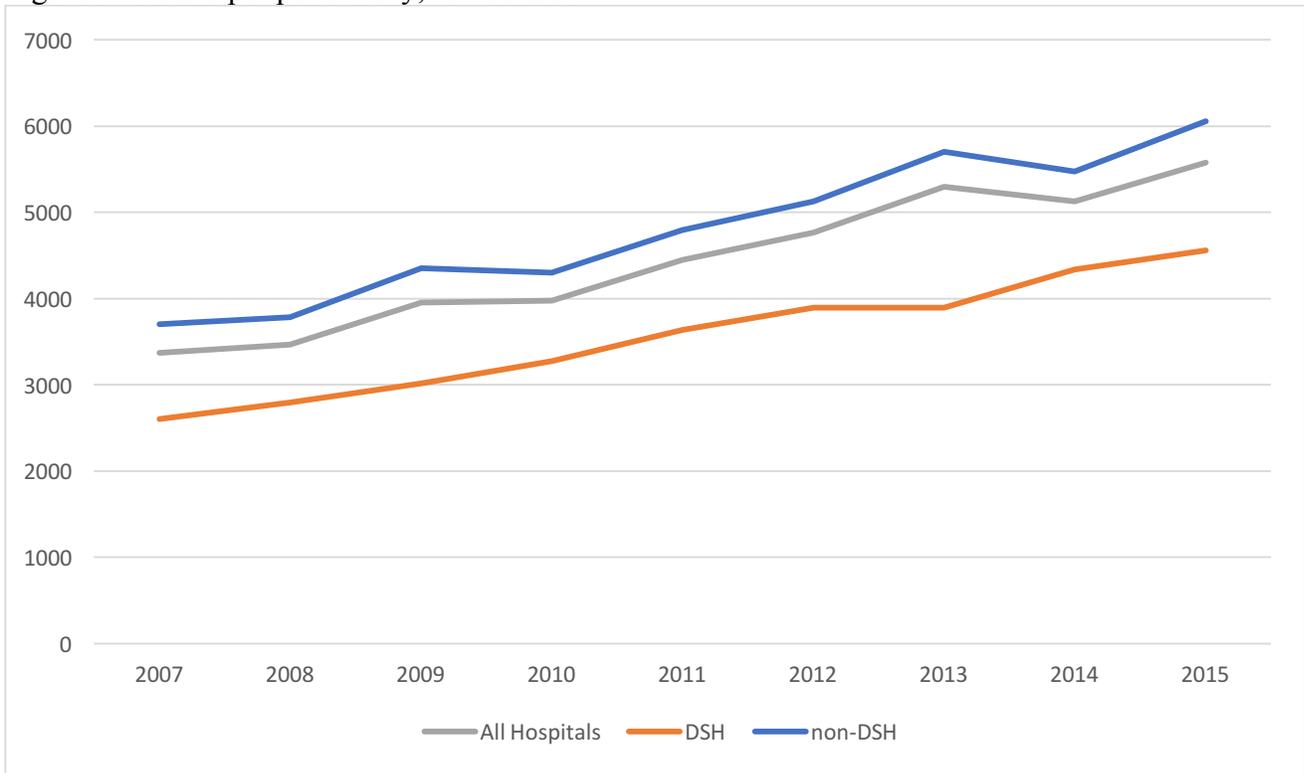


Table 4B. Patient Days by Insurance Type, full dataset

	(1)	(2)	(3)	(4)	(5)	(6)
	MediCal	Indigent	Private Insurance	Medicare	Other	Total
DSH*Post	1356.6** (2.81)	-1919.1*** (-10.88)	920.4* (2.02)	888.6* (2.15)	-26.55 (-0.04)	1220.0 (1.50)
Constant	40871.4*** (22.86)	776.6 (1.19)	40255.9*** (23.89)	36637.8*** (23.86)	1712.7 (0.70)	120254.5*** (39.90)
N	3585	3585	3585	3585	3585	3585

t statistics in parentheses

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

5B. Total Financial Outcomes per Patient Day (dollars per patient day)

	(1)	(2)	(3)	(4)
	Revenue	Cost	Profit	Bad Debt
DSH*Post	-107.4 (-0.89)	-221.3 (-1.95)	98.57 (1.33)	11.93 (0.68)
Constant	4166.9*** (9.60)	3761.1*** (9.25)	400.3 (1.51)	108.3 (1.67)
N	3280	3250	3287	3585

t statistics in parentheses

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

6B. Total Acute Care Patient Days, by Insurance Type, full

	(1)	(2)	(3)	(4)	(5)	(6)
	Medicare	MediCal	Indigent	Private Insurance	Other	Total
DSH*Post	1076.9*** (4.11)	-16.82 (-0.07)	-1492.3*** (-11.23)	578.6* (2.23)	-55.45 (-0.84)	-105.6 (-0.21)
Constant	23943.5*** (26.06)	29759.7*** (31.36)	814.8 (1.65)	27515.8*** (28.67)	1482.9*** (6.05)	83469.4*** (44.22)
N	2949	3585	3585	3585	3585	3585

t statistics in parentheses

\* p<0.05    \*\* p<0.01    \*\*\* p<0.001"

7B. Profit by Department, dollars per patient day

	(1)	(2)	(3)	(4)	(5)
	Emergency	Imaging	Drugs Sold to Patients	Medical-Surgical Acute	Other Departments
DSH*Post	10.18 (0.71)	-27.27* (-2.00)	-2.228 (-0.08)	46.05 (1.56)	40.53 (0.75)
Constant	-20.42 (-0.44)	-40.30 (-0.34)	133.4 (1.39)	-8.286 (-0.08)	96.20 (0.21)
N	2498	1969	2941	2563	1809

t statistics in parentheses

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