Hospital Response to Reimbursement Change: Evidence from California Medicaid
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Overview: Over the last decade, fiscally constrained states have been struggling to slow cost growth associated with state Medicaid programs. This research will evaluate hospital response to changes to reimbursement policy by California’s state Medicaid program, Medi-Cal. As public insurance programs cut rates, hospitals are forced to take on more of the risk inherent to treating patients. It is therefore important to understand their decision making process, and how it impacts patient care. The study will take advantage a 2008 decrease in fee-for-service (FFS) reimbursement rates to some of the hospitals in the state. I will evaluate how hospitals reacted on four primary outcome measures: length of stay (LOS), intensity of care, likelihood of admission, and patient mix. For each of the first three measures, I will estimate results for both Medicaid FFS patients (primary response) and patients with Medicare or private insurance (spillover response). Secondary outcome measures in this study will include hospital readmissions and mortality in the hospital. Data for this research will come from the California Office of Statewide Health Planning and Development (OSHPD). Hospital response to comprehensive reimbursement change is not yet well understood. This work will inform policymakers and other stakeholders of the potential effects of reductions in payments that are often used to slow the growth of state spending.

Objectives, significance, and impact: The primary research question that will be addressed in this project is: how do hospitals respond to major changes in reimbursement? Hospitals face different reimbursement rates and methods of payment from a number of insurers, and I am interested in understanding their response to major changes in reimbursement from a large insurer (Medicaid). Specifically, I propose to study how hospitals respond to a broad decrease in reimbursement rates, which expose the hospital to more risk, especially from the vulnerable populations covered by the Medicaid program. I will assess hospital response to a 2008 fee decrease by California Medicaid that cut reimbursement by 10% to many of the hospitals in the state. There are a number of ways hospitals can respond to such changes in reimbursement. As such, the primary objectives are:

1. To assess the impact on LOS.
2. To assess the impact on intensity of care.
3. To assess the impact on hospital-level patient mix.
4. To assess the impact on likelihood of admission from the emergency department (ED), given a visit to the ED.

The secondary objectives reflect how these changes may have affected patient outcomes:

1. To assess the impact on readmissions.
2. To assess the impact on in-hospital mortality.

This research will contribute to the health policy and health economics literature in a number of ways. First, there is a general paucity of research in the health economics literature regarding state Medicaid insurance programs. As they are administered by states as opposed to federally, this poses a substantial time investment in terms of institutional knowledge. Second, research regarding hospital response to payment changes has largely centered on either payment increases, or relative changes in rates. This work will explore the effects of broader fee cuts that impact all general acute care inpatient services. Furthermore, payment cuts expose the hospital to more risk from costly procedures not being reimbursed at their full cost, and should therefore be studied separately from payment increases. With states increasingly turning to provider rate cuts to rein in Medicaid costs
under the argument that this will improve efficiency without harming patient care, this work will serve to inform policymakers of the impacts on patient care and outcomes of policies intended to cut costs.

**Research plan:** The Selective Provider Contracting Program (SPCP) allows the California Department of Health Care Services (DHCS) to contract on a competitive basis with hospitals willing to provide inpatient care to Medi-Cal beneficiaries at a negotiated per diem (daily) rate. However, DHCS is required to ensure sufficient access to care for Medi-Cal beneficiaries. Accordingly, geographic areas of the state known as Health Facility Planning Areas (HFPAs) were designated as “closed” areas or “open” areas. In closed HFPAs, SPCP contracts have been signed with some hospitals, and Medi-Cal beneficiaries are required to receive inpatient care at a contract hospital (with some exceptions). In open HFPAs, the SPCP is not in effect, primarily because the amount of competition in the market is not sufficient to induce hospitals to contract. To ensure sufficient access to care for Medi-Cal beneficiaries in these areas, beneficiaries can receive inpatient care at any hospital. Non-contract hospitals in open HFPAs were reimbursed on a fee-for-service basis, initially paid a percentage of hospital charges, then later adjusted based on allowable, audited costs.¹

Due to state fiscal constraints, effective October 1, 2008, DHCS was required to reduce the payment made for inpatient services to many non-contract hospitals by ten percent.² Non-contract hospitals that were subject to this fee decrease include: all non-contract hospitals in closed HFPAs; non-contract hospitals in open HFPAs that were closed at any point on or after July 1, 2005, but were open on October 1, 2008; and non-contract hospitals in open HFPAs on October 1, 2008, regardless of whether the area had ever been closed, if there were three or more hospitals with licensed general acute care beds. Exemptions existed for small and rural hospitals.

I will utilize OSHPD patient discharge data and emergency department data from 2007-2009, surrounding the July 2008 policy change. I will use a difference-in-differences (D-D) approach for this analysis. LOS is given in the data, but to measure intensity of care, I will examine both the total charges associated with a given discharge, as well as the total number of procedures associated with the discharge. I will use a linear regression technique with LOS or intensity of care as the dependent variable, and the coefficient of interest will be the coefficient on the interaction of the post-policy dummy variable and the affected hospital dummy variable. The regression will be as follows:

\[ Y_{ijkt} = \beta_0 + \beta_1 \cdot Post_t + \beta_2 \cdot Treated_i + \beta_3 \cdot (Post \times Treated)_{ij} + \beta_4 \cdot X_i + \beta_5 \cdot Z_j + \beta_6 \cdot W_k + \varepsilon \] (1)

In the equation above, *Post* indicates the admission occurred following the fee decrease, *Treated* indicates that the hospital was subject to the fee decrease, and the variable of interest, *Post \times Treated*, is the interaction of the two. *X* is a vector of patient-level covariates, *Z* is a vector of hospital-level covariates, and *W* is a vector of county-level covariates. I will also include each of these dummies separately in the equation to control for each of their individual impacts on the

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outcome, as well as controls for patient characteristics, hospital characteristics, and county characteristics. Patient level covariates will include demographic and health characteristics related to the admission. Hospital level covariates include a hospital fixed effect, the total number of discharges by quarter, and the average number of available beds by year. County level variables will include unemployment and income levels, to control for potential effects of the economic recession that occurred in 2008, as well as Medicaid penetration rates to predict the magnitude of any potential effects. These regressions will be run separately for Medicaid FFS patients to assess the primary effects, and for Medicare/privately insured patients to assess spillover effects. Standard errors will be clustered at the hospital level.

To estimate the likelihood of admission, I will estimate the following equation using logistic regression:

$$\Pr(\text{Adm}_{ijk} = 1) = \beta_0 + \beta_1 \cdot \text{Post}_t + \beta_2 \cdot \text{Treated}_i + \beta_3 \cdot (\text{Post} \times \text{Treated})_{ij} + \beta_4 \cdot \mathbf{X}_i + \beta_5 \cdot \mathbf{Z}_j + \beta_6 \cdot \mathbf{W}_k + \varepsilon$$ (2)

The outcome is the probability of hospital admission for a given patient who is treated in the ED, and the right hand side variables are defined as in Equation 1. The coefficient of interest will again be the coefficient on the interaction of dummies for time period post-policy and hospitals subject to the policy change. This regression will be run separately for Medicaid FFS patients and for patients with Medicare or private insurance to examine both direct effects on Medicaid patients and spillover effects on patients with other insurers.

To understand the effect of the fee decrease on hospitals’ patient mix, I will estimate a linear regression with a logit transformation of the outcome variable (the proportion of Medi-Cal FFS in a given hospital at a given time):

$$\ln \left( \frac{y_{ijk}}{1 - y_{ijk}} \right) = \beta_0 + \beta_1 \cdot \text{Post}_t + \beta_2 \cdot \text{Treated}_i + \beta_3 \cdot (\text{Post} \times \text{Treated})_{ij} + \beta_4 \cdot \mathbf{Z}_j + \beta_5 \cdot \mathbf{W}_k + \varepsilon$$ (3)

I use the logit transformation of the outcome variable to ensure that the predicted values for the proportion remain in [0,1]. Right-hand side variables will be the same as in the regressions described above, though patient-level variables will be aggregated at the hospital level when possible, or omitted if necessary.

The identification strategy for this part of the analysis relies on the fact that the fee decrease only applied to certain hospitals (non-contract hospitals). As a sensitivity analysis, I will also conduct these analyses comparing non-contract hospitals to contract hospitals in open HFPAs only, as well as analyses comparing non-contract hospitals to contract hospitals in closed HFPAs only. These hospitals will be more similar to each other in terms of other, unobservable characteristics.

A potential issue with my analysis plan is that this strategy may suffer from omitted variable bias if hospitals subject to the fee decrease differ in unobservable ways from hospitals not subject to the fee decrease. It is also possible that the parallel trends assumption needed for a difference-in-differences analysis may not hold. To address these issues, I will also conduct analyses using a
matched sample approach. For the analyses of length of stay, intensity of care, and likelihood of admission, I will use propensity score matching to match patients in affected hospitals to multiple control patients in hospitals unaffected by the rate cut. The optimal number of controls with which to match each treated patient will be determined from the data. Using multiple controls per treated individual will reduce the variance of the differences in outcomes between treatment and control pairs.

**Data collection:** I currently have access to the OSHPD public use patient discharge data for 2007-2009. To answer the questions I describe above, I also need the emergency department data for 2007-2009. Furthermore, I need access to the restricted discharge data to gain access to a patient-level identifier that would allow me to identify readmissions. I have therefore applied for the OSHPD non-public patient discharge data and the non-public emergency department data for 2007-2009. My application has been approved, and the data will be sent to me as soon as the paperwork is processed. Currently, I am conducting preliminary analyses using the public use files that I have in hand.

Hospital level covariates come from publicly available financial and utilization reports that can be found on the OSHPD website. Hospital contracting status and HFPA data were hand-assembled from hospital financial reports and annual hospitals reports to the legislature. Medi-Cal penetration information comes from publicly available Medi-Cal eligibility and enrollment statistics. Finally, county-level unemployment information comes from the Bureau of Labor Statistics Local Area Unemployment Statistics, and county-level income information comes from the U.S. Census Bureau Small Area Income and Poverty Estimates.

**Next steps:** With the OSHPD public use discharge files, I am conducting preliminary analyses of LOS, intensity of care, and patient mix following the 2008 policy change using these data. After I receive the non-public data, I will conduct the bulk of the main analyses for the project, and prepare the materials for my accepted presentation at the Academy Health Annual Research meeting.

**Purpose of Funding:** I request $1,430 of funding from the Russell Ackoff Doctoral Student Fellowship for the purpose of this study. The funding requested in this application will be used to fund travel to the Academy Health Annual Research Meeting, taking place on June 14 – 16, 2015, in Minneapolis, Minnesota. I submitted an abstract to this conference and have been selected for presentation. Attendance at this conference will provide me with an excellent opportunity to present the preliminary results of this research to health economics and health policy experts and get their valuable feedback. This feedback will be essential to the preparation of my job market paper and job talk in anticipation of being on the academic job market during the coming fall.