THE INFLUENCE OF MEDICAID AND MEDICARE POLICIES ON HOSPITALIZATIONS

By

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Preface and Acknowledgments

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INTRODUCTION

Preventable hospitalizations and readmissions have recently garnered a significant amount of attention among researchers and policymakers.[1-5] In a 2007 report to Congress, the Medicare Payment Advisory Commission (MedPAC) estimated that 17.6 percent of Medicare hospitalizations resulted in readmission within 30 days, accounting for $15 billion annually, with $12 billion going towards preventable rehospitalizations.[4] Wide geographic variation in hospitalizations indicates that many are discretionary, implying that higher rates may be an indicator of poor quality of care.[3, 4] Reduced rates of hospitalization represent a potential means to simultaneously improve the quality of care and reduce costs.[3, 4]

Factors contributing to higher rates of preventable hospitalizations include a lack of coordination of care, untimely discharge, inadequate communication of information upon discharge, patients' ability to self-manage treatment at home, and discharge to unsuitable settings.[4] However, the quality of care received in hospitals and misaligned financial incentives have also been associated with increased hospitalizations.[4, 6]

This dissertation examines the effects of two types of payment policies, Medicare's post-acute care transfer policy and states' Medicaid bed-hold programs, on hospitalizations. Both of these policies altered financial incentives for providers, which may have affected treatment decisions.

The first chapter evaluated the association between implementation of Medicare's post-acute care transfer policy and reduced length of stay on rehospitalization of patients

discharged to skilled nursing facilities. The effect of length of stay on rehospitalization is difficult to assess in observational studies due to the endogenous relationship between the treatment and outcome. Sicker patients will have longer hospital stays and are more likely to be rehospitalized. This study makes a unique contribution to the literature by using implementation of the post-acute care transfer policy as a quasi-experiment.

The second chapter assessed the impact of states' Medicaid bed-hold policies on the likelihood of hospitalization of long-stay nursing home residents. The use of a nationwide longitudinal file covering a period when four states implemented or terminated bed-hold policies allowed assessment of their affect on hospitalizations. Previous studies of the association between bed-hold policies and hospitalizations were not longitudinal, limited to a narrow geographic area, or examined populations not directly affected by them.[7-9] Utilizing the same data source, Chapter 3 extended the study of bed-hold policies and evaluated their effect on racial disparities in hospitalizations of long-stay residents occurring within nursing homes. Evaluating racial disparities associated with bed-hold programs is important to ensure that the policies do not negatively impact the equity of care provided to nursing home residents. To our knowledge, this was the first study to examine the association between states' Medicaid bed-hold policies and racial disparities arising within facilities.

As payment reform policies for health care services are implemented, the potential for unforeseen consequences will increase and may not be immediately apparent. The analyses undertaken in this dissertation demonstrate the need to develop

protocols to evaluate experience with policy as changes are made to the nation's health care system.

CHAPTER 1

DOES REDUCING LENGTH OF STAY INCREASE REHOSPITALIZATION?

1.1 INTRODUCTION

Rehospitalizations cost the federal Medicare program approximately $15 billion annually and expose patients to additional health risks.[4] For these reasons, providers and policy makers have engaged in substantial efforts to reduce rates of rehospitalization.[1, 5]

Increased rates of rehospitalization over the last decade have been accompanied by decreases in hospital length of stay,[1, 10, 11] raising the possibility that these two trends are related. However, empirical research on the causal effect of length of stay on rehospitalization is limited. Observational studies of the relationship are confounded by unobserved differences in severity of illness among patients.[12-15] Sicker patients will have longer length of stay and are more likely to be readmitted irrespective of the number of days hospitalized. Conducting a randomized clinical trial would be unethical and clinically imprudent.

Medicare's post-acute care transfer policy offers an experiment to elucidate the relationship between length of stay and rehospitalization. The policy reduces payments for certain diagnosis related groups (DRGs) if a patient is discharged to Medicare-paid post-acute care following a hospitalization with length of stay at least one day less than the DRG's national geometric mean.[16] Assuming that Medicare's post-acute care transfer policy would alter hospital length of stay, we used the date of the policy change as a quasi-experiment to examine the effect of changes in length of stay on the likelihood of

rehospitalization in a national population of Medicare fee-for-service beneficiaries discharged to skilled nursing facilities.

1.2 METHODS

1.2.1 Design overview

We evaluated the effect Medicare's post-acute care transfer policy on length of stay and 30-day rehospitalization for discharges to skilled nursing facilities associated with the following DRGs: acute myocardial infarction (DRG 121 and DRG 122), heart failure and shock (DRG 127), and kidney or urinary tract infections (DRG 320 and DRG 321). These five DRGs were initially classified under the transfer policy beginning October 1, 2003. Within each DRG, we used the transfer policy as an exogenous source of variation to assess the effect of length of stay on 30-day rehospitalization. Septicemia (DRG 416) was the most common non-transfer DRG at the time of the policy change that subsequently fell under the post-acute care transfer policy's domain after the study period. Patients hospitalized for septicemia exhibited similar trends in length of stay and utilization of post-acute services prior to the DRG's absorption by the transfer policy.[17] Based on these characteristics, septicemia patients (DRG 416) were used as a control group. All analyses were carried out using SAS version 9.2 and Stata SE version 11. The study was approved by the Human Research Protections Office of Brown University.

1.2.2 Data source and study population

Our primary data source was a longitudinal data file composed of Medicare claims and enrollment files, the Minimum Data Set, the Online Survey Certification and

Reporting System, and Area Resource File. The dataset includes Medicare hospital discharges to skilled nursing facilities for the period beginning January 1, 1999 through September 30, 2005, with many people observed more than once. We limited the study population to individuals age 65 and older in order to exclude younger beneficiaries that have very different characteristics and clinical needs than the general Medicare population.[18] Patients with hospital lengths of stay of 50 days or more were excluded to reduce the influence of outliers.

1.2.3 Variables

Our primary outcome measure was all-cause readmission within 30 days of hospital discharge (yes or no), regardless of whether the patient left the skilled nursing facility before rehospitalization. Explanatory variables included age, age-squared, race, any intensive care unit utilization during the hospital stay (yes or no), and indicators for levels of the Charlson Comorbidity Index.[19] Other covariates included binary indicators for case DRGs, length of stay measured in days, and identifiers for the hospital and month/year of discharge. A dichotomous variable was used to indentify whether hospital admissions occurred before or after implementation of Medicare's post-acute care transfer policy.

1.2.4 Statistical analysis

We used assignment of each DRG to Medicare's post-acute care transfer policy as an instrumental variable for length of stay. Simple trend analyses may be biased due to unobserved differences in patients' severity of illness or underlying health. Conversely,

the instrumental variable should be unrelated to unobserved patient characteristics and influence rehospitalization only through its effect on length of stay. The instrument was incorporated into a model with additional controls for gender, race, age, indicators for case DRGs, intensive care unit utilization, and Charlson Comorbidity Index. An interaction term for the case DRG indicator and the policy variable identified the primary effect of interest in each model. Variables for the Charlson Comorbidity Index were interacted with the instrument to test whether the policy had differential effects dependent on the complexity of a patient's condition. Additional indicators were included for the year and month of hospital discharge. These controlled for seasonal trends or other shocks occurring within specific time periods.

Our primary outcome measure was a dichotomous variable indicating rehospitalization within 30 days of discharge. We used two-stage least squares to obtain parameter estimates. In the first-stage, length of stay was regressed on the instrument and other independent variables. First-stage specifications were also estimated with hospital fixed effects to test the influence of unobserved time-invariant characteristics of the facilities. In the second-stage, observed length of stay for each discharge is replaced by the predicted value from the first-stage. We treated length of stay as a continuous measure in the first-stage and ignored the dichotomous nature of the dependent variable for 30-day rehospitalization in the second-stage. Results are reported with 95 percent robust confidence intervals adjusted for clustering at the level of the hospital-year.

1.3 RESULTS

Table 1 indicates that the observable characteristics were similar for hospital discharges to skilled nursing facilities before and after each DRG was incorporated into Medicare's post-acute care transfer policy. The percentage of black patients rose in the post-policy period for all groups with the exception of those with kidney or urinary tract infections with major complications. The proportion of other racial minorities rose slightly for all DRGs. Use of intensive care units increased for all DRGs apart from acute myocardial infarction without major complications. Consistent with national trends for comorbid illness, the Charlson Comorbidity Index increased modestly for all five DRGs in the post-policy period.[10]

The minimum length of stay thresholds specified by Medicare's post-acute care transfer policy led to decreases in length of stay for our case DRGs (Figure 1), but not our control group of patients with septicemia (Figure 2). First-stage model estimates of the policy's effect on length of stay (Figure 3) revealed declines of 0.17 days (95% confidence interval [CI], -0.27 to -0.07) for acute myocardial infarction with major complications, 0.32 days (95% CI, -0.47 to -0.16) for acute myocardial infarction without major complications, and 0.27 days (95% CI, -0.35 to -0.20) for heart failure and shock. Kidney or urinary tract infections with and without major complications had declines of 0.20 days (95% CI, -0.27 to -0.13) and 0.19 days (95% CI, -030 to -0.09), respectively. First-stage models incorporating hospital fixed effects were not substantially different.

The instrumental variable regression estimates shown in Figure 4 indicate increases in 30-day rehospitalization associated with the introduction of the transfer

policy for two of the five case DRGs. A one day decrease in length of stay was associated with an absolute increase in 30-day rehospitalization of 1.56 percentage points (95% CI, 0.30 to 2.82) for acute myocardial infarction with major complications and 0.81 percentage points (95% CI, 0.03 to 1.60) for kidney or urinary tract infections without major complications. Patients with more complex conditions in the highest category of the Charlson Comorbidity Index were less likely to be rehospitalized following declines in length of stay (Figure 4). In these cases, one day declines in length of stay were associated with decreases in 30-day readmissions of 1.00 percentage point (95% CI, -1.86 to -0.13) for acute myocardial infarction with major complications, 1.01 percent (95% CI, -1.65 to 0.38) for heart failure and shock, and 1.32 percent (95% CI, -2.12 to -0.52) for urinary tract infections with major complications.

We also examined the percentage of discharges that did not meet the minimum length of stay thresholds in the year prior to, and the year following, implementation of the transfer policy. For acute myocardial infarction without major complications, the difference in the percentage of early discharges was statistically insignificant between the two periods. However, early discharges decreased from 6.19 percent to 5.97 percent ($P = 0.03$) for acute myocardial infarction with major complications, but increased for the other three DRGs. Among heart failure patients, early discharges increased from 35.38 percent in the year leading up to the policy change to 36.58 percent ($P < 0.001$) in the following year. For those treated for kidney and urinary tract infections with and without major complications, early discharges rose from 44.19 percent to 45.02 percent ($P < 0.001$) and 40.83 percent to 42.77 percent ($P = 0.01$), respectively.

1.3.1 Sensitivity analysis and falsification test

Death is a competing outcome and its influence on the estimated effect of length of stay on hospital readmission needs to be considered.[20] As a sensitivity analysis, samples were created with controls for the two groups that exhibited increased rehospitalization in our primary analysis (acute myocardial infarction with major complications and urinary tract or kidney infections without major complications) that did not include patients who died within 30 days of hospital discharge. Using the same analytical approach as in our initial analysis allowed us to determine if changes in length of stay were associated with mortality, which could have influenced estimates of 30-day rehospitalization.

Estimates from our sensitivity analysis showed that the effects of a one day reduction in length of stay on rehospitalization were consistent with our initial results at 1.17 percentage points (95% CI, -0.12 to 2.45) and 1.15 percentage points (95% CI, 0.37 to 1.93) for acute myocardial infarction with major complications and kidney or urinary tract infections without major complications, respectively. However, unlike our initial results, patients with acute myocardial infarction and major complications in the highest category of the Charlson Comorbidity Index did not exhibit a lower risk of rehospitalization when deaths were excluded. The risk of rehospitalization remained non-differential for patients of higher acuity with urinary tract or kidney infections without major complications after limiting the sample to individuals who survived at least 30 days following hospital discharge.

Next, as a falsification test, we examined length of stay for a group that should not have been affected by Medicare's post-acute care transfer policy. This sample included heart failure (DRG 127) patients 55 to 64 years old with private insurance coverage from the Nationwide Inpatient Sample (NIS), Healthcare Cost and Utilization Program, Agency for Healthcare Research and Quality.[21] We found no discernable change in length of stay associated with implementation of the transfer policy for these discharges (Figure 2).

1.4 DISCUSSION

Declines in hospital length of stay associated with Medicare's post-acute care transfer policy had heterogeneous effects on 30-day readmissions among patients discharged to skilled nursing facilities. Patients hospitalized for acute myocardial infarction with major complications and kidney or urinary tract infections without major complications were at greater risk of rehospitalization following declines in length of stay. Rehospitalization was unaffected by reduced length of stay for those with acute myocardial infarction without major complications, heart failure, and kidney or urinary tract infections with major complications. However, significant declines in the likelihood of rehospitalization were seen for the most acute patients in more complex DRGs: Acute myocardial infarction with major complications, heart failure and shock, and kidney or urinary tract infections with major complications.

Clinicians must make decisions that balance the increased risk of iatrogenesis resulting from longer stays against a higher likelihood of hospital readmission for earlier discharges. Our results highlight the additional risk of rehospitalization presented by

shorter stays for certain groups, indicating that physicians should be particularly vigilant with these patients when considering early discharge. Conversely, the declines in hospital length of stay observed in three of the case DRGs did not produce increases in rehospitalization, suggesting that inefficiencies may have existed in the treatment of these patients.

In our sensitivity analysis excluding patients who died within 30 days of discharge for the two groups that had statistically significant increases in rehospitalization in our initial results (acute myocardial infarction with major complications and kidney or urinary tract infections), the estimated effects of declines in length of stay were consistent with our original estimates. However, a lower likelihood of rehospitalization for more complex patients with acute myocardial infarction with major complications was no longer observed. This indicates that the apparent benefit of decreased length of stay seen among the sickest patients in more complex DRGs in our primary analysis may have been a result of higher mortality rates among these individuals after implementation of the policy. In addition to the increased likelihood of death for patients, this result has important implications for payment reform policies aimed at reducing rates of rehospitalization. For example, Medicare's Hospital Readmissions Reduction Program will begin to assess financial penalties on hospitals with higher than expected readmission rates for acute myocardial infarction, heart failure, and pneumonia beginning in October of 2012.[22] Our results indicate that higher mortality rates may influence estimated rates of rehospitalization, particularly for sicker patients. This indicates that mortality may influence expected readmission rates leading to misguided

assessments of rehospitalization, potentially yielding overly positive depictions of poorer performing hospitals.

The results of our study demonstrate that policy makers and insurers must be conscious of incentivizing universal reductions in length of stay. For example, without prior guidelines in place, providers may have perceived the minimum length of stay requirements imposed by Medicare's post-acute care transfer policy as a new floor, creating an impetus to reduce time to discharge. Moreover, the structure of payments established by the policy could have increased the incentive for early discharge and greater utilization of our case DRGs. For discharges that did not meet minimum length of stay thresholds, Medicare paid twice the per diem for the first day of care and the per diem for each additional day.[16] If the larger payments for the first day of care led to higher marginal profits, providers may have sought to discharge patients earlier and possibly increase the volume of these DRGs. When we compared the pre/post proportions of early discharges among our case DRGs, we found mixed results. If providers were reacting to the marginal profit associated with first-day payments, the differential changes in the percentage of discharges meeting the minimum length of stay thresholds among our case DRGs may reflect the financial benefit associated with early discharge for each condition. However, as discussed in more detail below, we found no apparent changes in volume associated with the implementation of the policy.

Our results suggest that declines in length of stay initiated by Medicare's DRG-based prospective payment system may have partially contributed to upward trends in rehospitalizations for certain patient populations.[23] This implies that a systems-based

approach for payments, with a focus on episodes of care beginning prior to hospitalization and extending to periods following discharge, may have a beneficial impact on the cost and quality of care. For example, by pooling the financial risk of hospitals, post-acute care providers, and physicians through bundled payments, providers would have an incentive to coordinate care,[24] including appropriate lengths of stay. If clinicians are able to make informed decisions regarding length of stay, bundled payments may entice providers to consider earlier hospital discharge for patients with a low risk of rehospitalization while encouraging more vigilance for those at higher risk of readmission.

Our study has important limitations to consider. First, the sample was limited to Medicare discharges to skilled nursing facilities. If Medicare's post-acute care transfer policy led to changes in the volume or case-mix of discharges to skilled nursing facilities, our results may be biased. We found no evidence of discontinuous changes in the frequency of our case DRGs or the complexity of patients relative to other discharges in our sample. Additionally, we examined the volume of our case DRGs among all Medicare discharges before and after the policy change using data from the NIS. We found no trend breaks associated with the policy change among the broader population of Medicare hospitalizations.

Understanding the implications of reduced length of stay has important consequences for the treatment of patients and policy decisions targeting the cost and quality of care. As significant changes are made to the federal Medicare program to contain costs, the potential for unintended consequences will compound. Our research

design provides credible estimates of the causal effect of length of stay on rehospitalization for three common conditions. The results demonstrate that reducing hospital length of stay for some patients may significantly increase the risk of readmission, while increasing the likelihood of mortality for the sickest patients. These findings should be taken into consideration as treatment guidelines are developed and policy is formulated to reverse upward trends in rehospitalization.

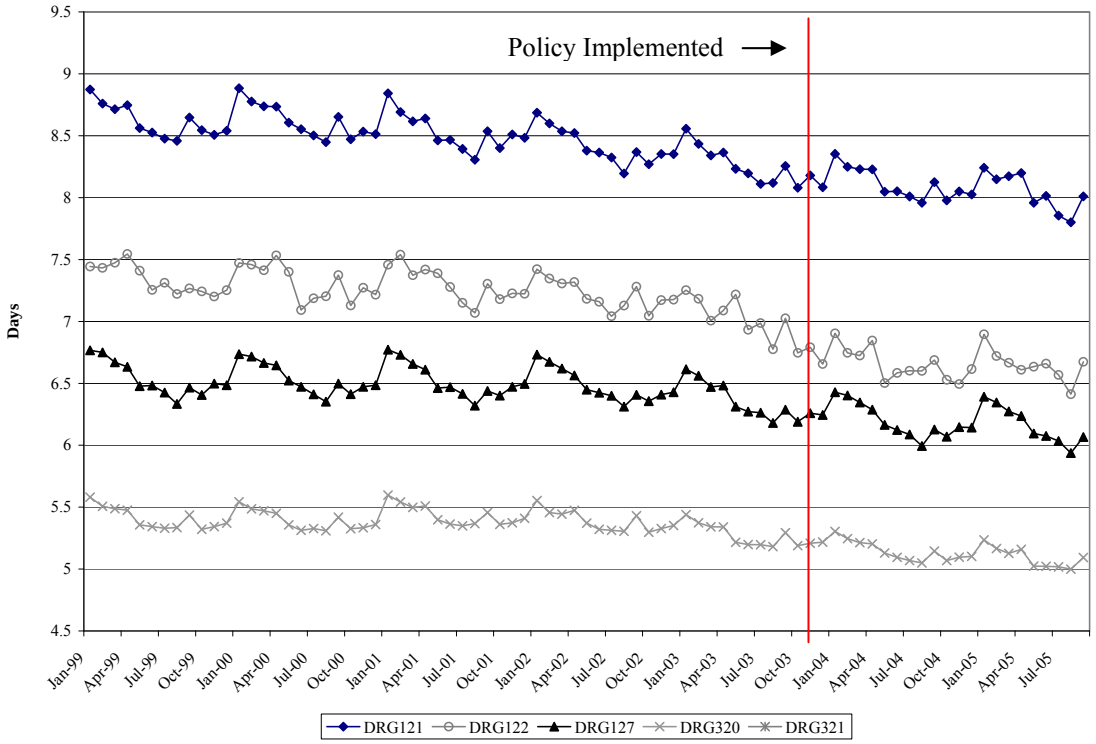
Table 1.1 Characteristics of discharges pre/post policy implementation

	AMI with major cc			AMI no major cc		
	Pre	**Post**	**P Value**	**Pre**	**Post**	**P Value**
N	*184,203*	*83,930*		*33,097*	*12,920*	
Mean age (yr)	83.4	83.8	<0.001	82.4	83.0	<0.001
Male (%)	33.7	34.7	<0.001	34.0	33.2	0.130
Race (%)						
Black	7.0	7.8	<0.001	7.4	8.3	<0.001
White	90.4	89.2	<0.001	89.9	88.5	<0.001
Other race	2.2	2.8	<0.001	2.4	2.9	<0.001
Unknown race	0.5	0.3	<0.001	0.3	0.3	0.374
ICU use (%)	43.7	46.1	<0.001	64.4	61.4	<0.001
Mean Charlson	3.1	3.1	<0.001	2.2	2.2	0.001

	Kidney/UT infections with major cc			Kidney/UT infections no major cc		
	Pre	**Post**	**P Value**	**Pre**	**Post**	**P Value**
N	*332,773*	*171,359*		*34,334*	*17,563*	
Mean age (yr)	83.3	83.2	<0.001	83.4	83.3	0.200
Male (%)	26.1	25.7	0.007	23.8	22.4	<0.001
Race (%)						
Black	13.0	12.6	<0.001	10.5	10.6	0.761
White	83.8	83.9	0.383	86.5	85.9	0.096
Other race	2.8	3.2	<0.001	2.6	3.2	<0.001
Unknown race	0.5	0.3	<0.001	0.4	0.2	0.002
ICU use (%)	11.0	13.7	<0.001	6.2	8.0	<0.001
Mean Charlson	1.5	1.5	<0.001	0.8	0.8	0.010

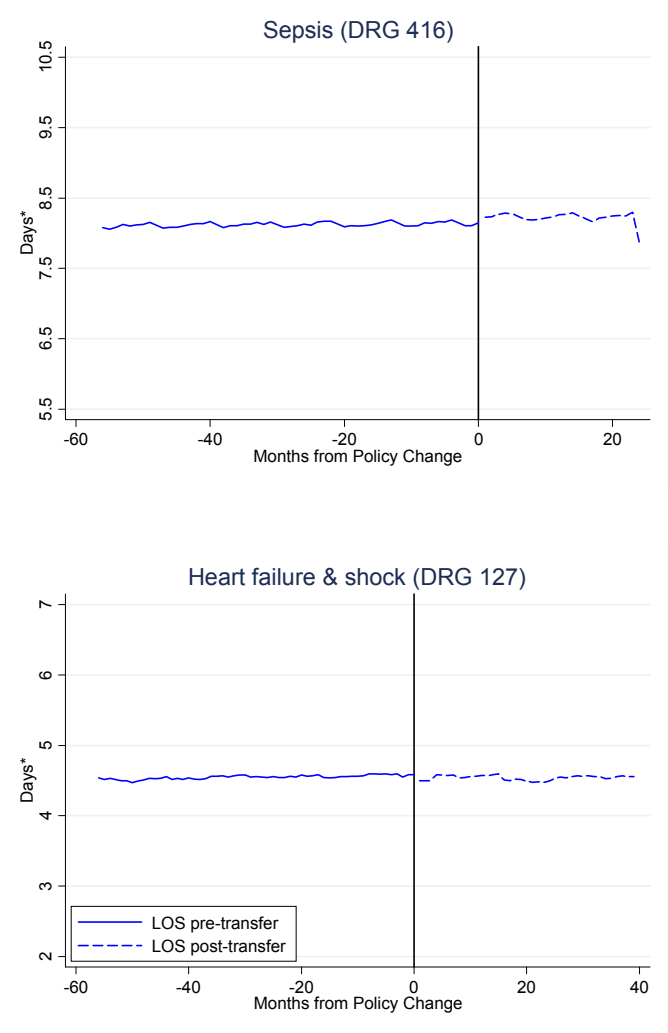
	Heart failure and shock			Septicemia		
	Pre	**Post**	**P Value**	**Pre**	**Post**	**P Value**
N	*539,334*	*255,800*		*272,735*	*163,433*	
Mean age (yr)	83.1	83.3	<0.001	81.9	81.6	<0.001
Male (%)	30.3	31.6	<0.001	35.6	37.9	<0.001
Race (%)						
Black	9.4	10.0	<0.001	14.5	14.8	<0.001
White	8.8	8.7	<0.001	81.9	80.9	<0.001
Other race	2.1	2.4	<0.001	3.2	4.0	<0.001
Unknown race	0.4	0.3	<0.001	0.4	0.3	<0.001
ICU use (%)	38.5	42.3	<0.001	26.1	34.9	<0.001
Mean Charlson	2.5	2.6	<0.001	1.7	1.7	<0.001

Figure 1.1 Adjusted* mean lengths of stay for case DRGs



* Adjusted for policy status, age, gender, race, ICU use, Charlson Comorbidity Index, and month/year of discharge

Figure 1.2 Risk adjusted* mean lengths of stay for discharges not affected by Medicare's post-acute care transfer policy



*Adjusted for age, gender, race, and Charlson Comorbidity Index

Figure 1.3 First-stage estimates of the effect of Medicare's post-acute care transfer policy on length of stay (95% robust confidence intervals)

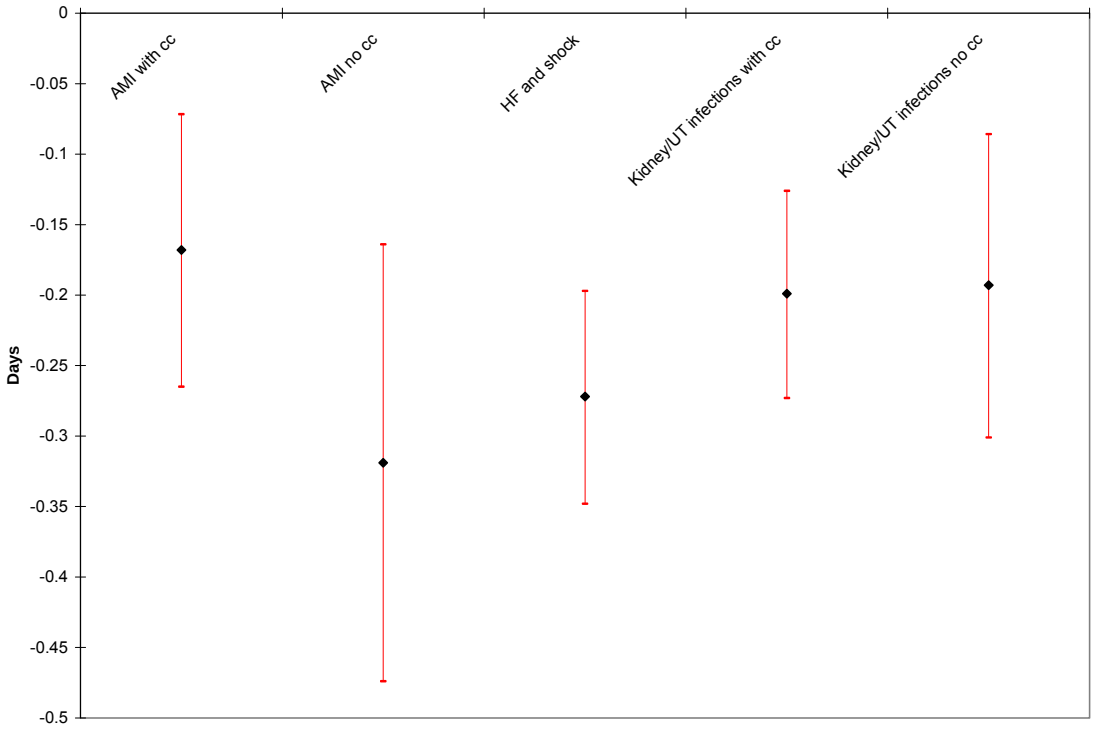
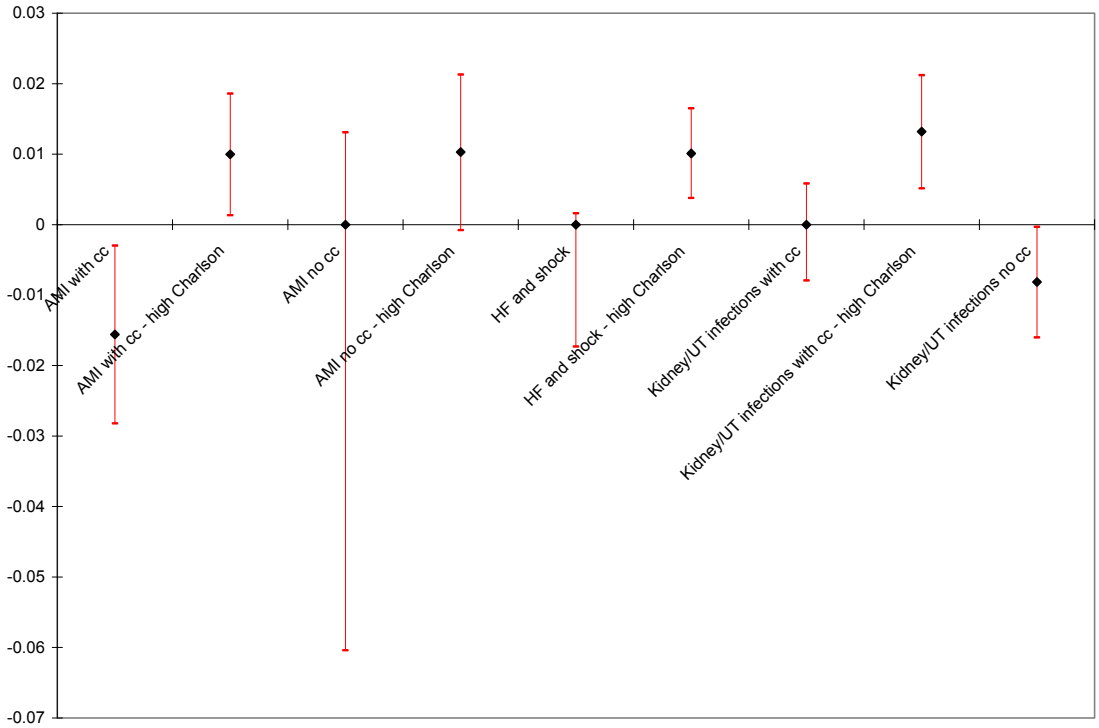


Figure 1.4 Instrumental variable estimates of the effect of a one day decline in length of stay on 30-day rehospitalization (95% robust confidence intervals)



CHAPTER 2

MEDICAID BED-HOLD POLICIES AND HOSPITALIZATION OF LONG-STAY NURSING HOME RESIDENTS

2.1 INTRODUCTION

Many states have enacted bed-hold programs with the intent of providing continuity of care for Medicaid beneficiaries residing in nursing homes. These states pay nursing homes to reserve beds so that Medicaid residents may return to their facility of occupancy following an acute hospitalization. To this extent, the policies appear to be effective.[25] However, reimbursements made to nursing homes for days that residents are hospitalized may influence facilities' propensity to hospitalize occupants. The goal of this paper is to examine the effect of state Medicaid bed-hold policies on hospitalizations of long-stay nursing home residents. Understanding the influence Medicaid bed-hold policies have on the cost and quality of care will inform policy makers as they consider the benefits of these programs in the context of competing budget priorities. Our study addresses the magnitude of the impact of bed-hold policies on hospitalizations and also gives indications on the costs they impose on the federal Medicare program.

2.2 BACKGROUND

Prior studies have examined the relationship between state Medicaid bed-hold policies and hospitalization of nursing home residents, but differ in their methods and populations studied. Freiman and Murtaugh[26] used data from the 1987 National Medical Expenditures Survey and did not find a statistically significant association between states' bed-hold policies and hospitalizations. Intrator et al.[8] used cross-sectional data

consisting of assessments from the Minimum Data Set and Medicare inpatient claims from 2000 to estimate the impact of bed-hold policies on hospitalizations among nursing home residents. This study found a highly significant association between presence of bed-hold policies and hospitalization of long-stay nursing home residents. However, the study's finding may have resulted from its inability to assess policy changes over time, leading to estimates reflecting heterogeneity in nursing home hospitalization rates that may have existed in the absence of bed-hold policies. A more recent examination of nursing home residents found an increased likelihood of hospitalization after residents became eligible for a state's bed-hold policy.[9] The study was limited to residents in a single state and was able to assess bed-hold policy changes over time. Bed-hold policies have also been associated with hospitalizations of short-stay nursing home residents covered by Medicare through hypothesized spillover effects.[7]

Hospitalization of nursing home residents often leads to functional and cognitive decline and exposes individuals to iatrogenic disease.[27-29] Additionally, hospitalization of nursing home residents is frequent and costly.[30] As noted by Grabowski,[31] these issues have led to increased interest in hospitalizations of nursing home residents among policy makers.

2.3 CONCEPTUAL FRAMEWORK

Given the narrow financial margins that many nursing homes operate under, payment changes created by new or modified state and federal policies have been hypothesized to necessitate adaptive responses by nursing homes in the context of local market forces to avoid performance failure.[32] Organizational response to increase profit

margins may affect the case-mix of residents, staffing levels, among other aspects of care that impact its quality.[8, 33-36] Our conceptual framework posits a relationship between Medicaid bed-hold reimbursements to nursing homes and hospitalization of residents. States with bed-hold policies provide payments to nursing homes as an incentive to reserve beds for residents during acute hospitalizations. These policies differ between states in terms of the amount of daily reimbursements and the number of qualifying days, in addition to some states requiring sufficient occupancy rates to receive payments. However, these policies create an incentive to hospitalize Medicaid nursing home residents when the marginal profit associated with bed-hold payment surpasses the marginal profit associated with caring for an individual in the nursing home. Grabowski and colleagues[7] also hypothesized this relationship and conjectured that spillover effects arising from Medicaid bed-hold policies increased rehospitalization of Medicare patients receiving skilled nursing care in nursing homes. The results of their study were consistent with the stated hypothesis.

Long-stay residents should be in stable health, similar to community dwelling older adults.[36] Therefore, hospitalizations of long-stay nursing home residents are a marker of the quality of care received, controlling for patients' underlying health and severity of illness. Due to the potentially endogenous relationship between rehospitalization and complications arising from the preceding hospitalization, residents with short-stays were excluded from our study.[5, 35, 36]

2.4 METHODS

2.4.1 Sources of data/study population

Our primary data source was a longitudinal file composed of the Minimum Data Set Resident Assessment Instrument (MDS), Medicare inpatient claims, the On-line Survey of Certification and Reporting (OSCAR), and the Area Resource File (ARF) for the period beginning January 1, 2000 through December 31, 2005. The MDS includes data on over 400 items and imparted details on case-mix acuity, diagnoses and health conditions, cognitive and physical functioning, among other factors. Many of these items have been previously validated.[37] Medicare inpatient claims provided information on hospital discharges, including primary and secondary diagnosis fields. OSCAR supplied nursing homes characteristics, such as occupancy rates, staffing, case-mix, size, proprietary status, hospital affiliation, in addition to other traits. Characteristics of counties, which we used as a proxy for markets, were obtained from the ARF. These included, but were not limited to, the Herfindahl index, demographic characteristics, and supply of hospital beds. Data on state policies, collected through a comprehensive survey conducted by the Center for Gerontology and Health Care Research at Brown University, were incorporated. Our primary analytic file consisted of a 25 percent random sample of long-stay residents (N=754,592), defined as individuals residing in nursing homes for 90 days or more. In a secondary analysis, three samples were created. Each nursing home from a case state was matched to a control facility from a state that did not experience a bed-hold policy change. Nursing homes were matched on for-profit status, the proportion of registered nurses among a facility's licensed practical nurses and registered nurses, the

average total hours per day registered nurses spent with each resident, in addition to the presence of a medical doctor and/or a physician extender, such as a nurse practitioner.[38] All residents from the matched nursing homes were used in the analyses. In all samples, many residents are observed more than once with a different number at risk of hospitalization in each quarter.

Our study population was restricted to long-stay residents at least 65 years old since non-elderly residents have conditions that differ from the broader nursing home population.[39-43] Additionally, nursing home residents participating in Medicare managed care were not included since we lacked access to claims data for these individuals. Due to unique geographic and political features, individuals residing in facilities in Alaska, Hawaii, and the District of Columbia were excluded.

Two additional national samples were created for sensitivity analyses. The first was limited to individuals in nursing homes where 85 percent or more of the residents were covered by states' Medicaid programs. Bed-hold programs only reimburse nursing homes for residents who are Medicaid beneficiaries and a more concentrated effect of the policy should be seen among this population. The second excluded residents who were hospitalized and died in the same quarter. This was done to assess the effect of mortality on hospitalization rates. If bed-hold policies were associated with mortality, estimates of the likelihood of hospitalization may be biased.[20]

2.4.2 Variables

An active state Medicaid bed-hold policy was the determinant of interest for hospitalizations of long-stay nursing home residents. The variable was coded to indicate the presence of a bed-hold policy if one was in effect at any time during a given quarter in the state in which a nursing home was located. Four states implemented or repealed bed-hold policies over the six year study period. In 2001, Michigan implemented a new bed-hold policy, which it maintained through the remaining years of the study period. Illinois terminated a bed-hold policy in July 2003 and reinstated it in August 2004, but with a required minimum occupancy rate for Medicaid residents of 90 percent. In July 2004, Massachusetts repealed its policy only to reinstate it six months later with retroactive payments for the termination period. Tennessee both repealed and reinstated the state's bed-hold policy within a two month period in 2005. Since the policy was discontinued and reinstated in the same quarter, the structure of our data file precluded us from evaluating it for this state.

Our primary outcome measure was any hospitalization with admission directly from a nursing home during a given quarter. This was a binary indicator that did not differentiate between the number, or length, of hospitalizations. Thus, our estimates indicate the likelihood of a resident experiencing at least one hospitalization during the quarter. Death occurring within the quarter (yes/no) was also assessed as an outcome to evaluate the association between bed-hold policies and the likelihood of mortality. Control variables at the patient level were derived from residents' most recent MDS assessments. On average, these were completed about 51 days prior to the beginning of

the quarter. These measures consisted of basic demographic characteristics, including gender, race, and age. Variables from the MDS reflecting health and mobility were used to signify clinical risk of hospitalization. These included chronic diagnoses, symptoms predictive of hospitalization, cognitive impairment, and other signs of poor health. Specifically, indicators for a diagnosis of diabetes, cancer, emphysema or chronic obstructive pulmonary disease were used to account for chronic conditions associated with hospitalization;[44] binary measures of fever and weight loss, as these are symptoms that may be linked to higher likelihood of hospitalization;[8] Cognitive Performance Scale above three;[45] high body mass index (>30); low body mass index (<19); required assistance for activities of daily living; current use of nine or more prescription drugs;[8] receipt of antipsychotics or hypnotics; use of restraints; or any hospice utilization. Advance directives reduce the chances of hospitalization with documented restrictions on treatment and also potentially through undocumented limitations on care.[46, 47] As such, an indicator for presence of a do-not-resuscitate order was also used as a control. Variables for each level of the Changes in Health, End-Stage Disease and Symptoms and Signs (CHESS) scale, which is predictive of declining health, were also included.[48]

Nursing home fixed effects were used to absorb time-invariant characteristics of facilities. Other nursing home variables included quarterly occupancy rates, percent of black residents, the proportions of Medicare and Medicaid residents, total registered nurse hours/day per resident, and the mean value of Resource Utilization Groups across residents in each facility.

Medicaid per diem rates paid by states to nursing homes (adjusted for the Consumer Price Index) and the use of case-mix adjustment for reimbursements have been shown to independently influence hospitalization.[33, 49] Measures of each were used in our analysis. Competitive nursing home markets have also been previously associated with hospitalizations. This warranted inclusion of an indicator for a Herfindahl Index less than 0.10.[8]

2.4.3 Statistical analyses

The following model specification was used with the person-quarter as the unit of analysis:

$$\text{HOSP}_{ijt} = \alpha\text{POLICY}_{jt} + \beta X_{ijt} + \eta_i + \mu_t + \varepsilon_{ijt} \qquad (1)$$

Residents, states, and quarters were indexed by i, j, and t, respectively. HOSP is an indicator for any hospitalization of a long-stay resident admitted directly from a nursing home during the quarter. POLICY is a measure for presence of a state bed-hold policy; X is a set of patient, nursing home, and market characteristics; and η_i and μ_t represent nursing home and year-quarter fixed effects, respectively. These absorbed unobserved time-invariant characteristics of facilities and controlled for seasonal trends or other shocks occurring within specific time periods. Thus, our model identified the impact of bed-hold policies on hospitalizations through the implementation and termination of states' programs over time.

Equation (1) was treated as a linear probability model. This overlooks the dichotomous nature of the outcome, but should yield consistent estimates given the

extremely large number of observations in our analytic file and the broad collection of independent variables used in the model. The standard errors were adjusted for clustering at the level of the state-quarter. All analyses were carried out using SAS version 9.2 and Stata SE version 11.

2.5 RESULTS

Hospitalization rates rose over the study period for each of our case states, but appeared to experience abrupt increases when bed-hold policies were implemented (Figure 1). Compared to residents in non-bed-hold states, those in states with active policies tended to be older, were less likely to be racial minorities, and differed in the prevalence of some co-morbidities (Table 1). Nursing homes in bed-hold states tended to have lower proportions of Medicare patients, higher occupancy rates, residents of slightly higher acuity, and were more likely to be located in competitive markets. States with bed-hold policies had higher Medicaid reimbursements to nursing homes, but fewer adjusted payments for patient case-mix.

Regression estimates using our nationwide 25 percent random sample indicated a higher likelihood of hospitalization associated with bed-hold policies (Table 2 (i)). Presence of an active policy was associated with a statistically significant absolute increase of 0.493 percent points in the likelihood of any hospitalization, representing a 3.883 percent relative increase over the unadjusted baseline mean (12.698 percent) for all states during the study period. As would be expected, an increased risk of hospitalization was associated with a higher score on the CHESS scale. However, regression estimates for interactions between CHESS levels and the policy indicator did not reveal an

increased risk of hospitalization for patients of higher acuity. Rather, residents with a score of 1 on the CHESS scale had a lower risk of hospitalization compared to the reference group (CHESS=0) when a bed-hold policy was in effect. Higher Medicaid daily rates paid to nursing homes did not appear to influence hospitalizations. Conversely, use of case-mix reimbursement by states significantly lowered the likelihood of hospitalization.

We found heterogeneous effects associated with bed-hold policies in our secondary analysis that examined residents in nursing homes from each case state that were matched with facilities in states that did not experience a policy change. An increase of 3.790 percent increase (an absolute increase of 0.535 percent) in the likelihood of hospitalization relative to the state's unadjusted baseline mean for the study period was associated with Illinois' bed-hold policy (Table 2 (ii)). The effect of the state's policy did not vary significantly by resident acuity. Massachusetts' bed-hold policy was not associated with higher overall rates of hospitalization among long-stay nursing home residents (Table 2 (iii)). However, policy interactions with CHESS variables showed that the risk of hospitalization was significantly higher under bed-hold for all levels, compared to the reference group (CHESS=0), with the exception of the least stable residents (CHESS=5). The estimated effect of Michigan's bed-hold program just missed statistical significance at the 5 percent level, but indicated a modest absolute increase of 0.315 percentage points in the likelihood of hospitalization, representing a relative increase of 0.028 percent compared to the state's unadjusted mean hospitalization rate (Table 2 (iv)). Similar to Massachusetts, the risk of hospitalization associated with implementation of the state's policy was significantly higher for residents of all levels of

CHESS compared to the reference group, with the exception of the most severely impaired.

2.5.1 Sensitivity analyses

Bed-hold programs only reimburse nursing homes for days associated with the hospitalization of residents participating in states' Medicaid programs. If nursing homes are more likely to hospitalize residents to generate additional revenue from bed-hold reimbursements, a stronger effect should be seen among residents with Medicaid as their primary source of payment. Our data source did not include payment information for individuals, but we were able to identify nursing homes with a high percentage of Medicaid residents (≥85 percent) in our national sample. Using the sample of residents in high-Medicaid facilities, the estimated effect of bed-hold policies on the likelihood of hospitalization derived from model (1) increased substantially compared to our primary analysis. Presence of a bed-hold policy was associated with a 5.446 percent increase over the baseline mean (14.138 percent) among residents in these nursing homes.

Death is a competing outcome and its influence on the estimated effect of bed-hold policies on hospitalization needs to be considered.[7, 8, 20] We addressed this issue in two ways. First, we repeated our primary analysis using death in the quarter (yes/no) as the outcome for model (1). The results indicated that bed-hold policies were not significantly associated with a higher likelihood of death. Secondly, we created a national sample that excluded patients who were hospitalized and died during the same quarter. Estimating parameters with this sample using model (1) allowed us to compare them with the results from our main analysis to determine if bed-hold policies influenced

mortality, which could have biased estimates of the policy's effect on hospitalization. The parameter estimate associated with the presence of a bed-hold policy obtained with the new sample was somewhat smaller in magnitude, but consistent with our initial result. However, unlike our initial estimate, the result from the modified sample was not statistically significant at the 5 percent level.

2.6 DISCUSSION

Medicaid bed-hold policies appear to be effective at increasing the likelihood of residents returning to the nursing homes they occupied prior to hospitalization.[25] However, these policies place a significant financial burden on states. Given the budgetary stress that many states are experiencing in the current financial climate, some have considered eliminating their policies.[50] Although we do not have information on the costs to states, policy makers should consider whether the benefit of continuity of care outweighs the expense of these policies, keeping their impact on the quality of care in mind.

The increases in hospitalization of long-stay nursing home residents associated with bed-hold policies not only reflects a serious concern for the quality of care, but also imposes costs on the federal Medicare program. We identified 752,061 long-stay nursing home residents in states with an active bed-hold policy in the last quarter of 2005. Our estimated 0.493 percent point increase in the hospitalization of long-stay nursing home residents associated with states' bed-hold policies translates to 14,830 additional acute hospital stays annually for this population. Assuming an average cost of $8300 per hospitalization, a simple calculation to approximate the additional expense to Medicare

yields an estimate of $123M yearly.[3, 7] This is likely a conservative estimate given that the outcome used in our primary analysis only measured whether residents had any hospitalization in a quarter and did not account for individuals having multiple hospital stays in the same period. Moreover, the estimated expense to Medicare did not include costs associated with higher payments for skilled nursing care when residents returned to nursing homes. Similarly, spillover effects from bed-hold policies that have previously been shown to influence hospitalizations of patients receiving skilled nursing care in nursing homes were not incorporated into the estimate.[7] If these expenditures were included, the overall estimated cost to Medicare would be substantially higher.

Our study has limitations that warrant discussion. We were unable to evaluate the influence of changes in specific components of states' bed-hold policies: the proportion of the average Medicaid daily rate paid to nursing homes, the number of qualifying days, and minimum required occupancy rate. Among our case states, only Illinois changed its requirements for bed-hold payments. When the state's policy was reinstated in 2004, it required a minimum occupancy rate of 93 percent for Medicaid residents. Despite the new Medicaid occupancy requirement, our estimates indicated that the state's bed-hold policy led to increased hospitalization rates for long-stay nursing home residents. Grabowski and colleagues[7] previously noted that little monitoring and enforcement of occupancy rates occurs, indicating that they may have little effect on the behavior of nursing homes. Additionally, we controlled for unobserved time-invariant factors affecting hospitalizations of nursing home residents as well as a variety of influences that may have changed over time. However, we cannot rule out the possibility of bias arising from unobserved time-varying factors.[51] For example, nursing homes may alter their

behavior and work to reduce hospitalizations if state officials threatened to repeal a bed-hold program, which would bias our results towards the null.

In conclusion, Medicaid bed-hold polices may have important budgetary consequences for both state and federal programs in addition to implications for the quality of care received by nursing home residents. Given these concerns, states with bed-hold policies may wish to reconsider their value as budget priorities compete for sparse resources. In a broader context, bed-hold policies highlight the inefficiencies created by fragmentation of health care services for nursing home residents participating in both Medicaid and Medicare. Reconsideration of bed-hold policies should be part of larger reforms aimed at coordination of care.

Table 2.1 Description of variables by policy status (mean or percentage)†‡

	No Bedhold	Bedhold	P-value
Residents			
Age	82.87	83.26	<0.001
Male (%)	27.96	27.71	0.0625
Black (%)	10.47	9.13	<0.001
Other race (%)	5.97	3.74	<0.001
Do-not-resuscitate order (%)	52.50	52.25	0.0991
CHESS1 (%)	31.80	32.13	0.0164
CHESS2 (%)	22.42	23.91	<0.001
CHESS3 (%)	9.88	10.96	<0.001
CHESS4 (%)	3.26	3.50	<0.001
CHESS5 (%)	0.34	0.33	0.5388
Complete ADL impairment (%)	8.71	7.91	<0.001
Cognitive Performance Scale > 3 (%)	57.88	56.77	<0.001
Weight loss (%)	13.37	13.09	0.005
Unstable status (%)	38.61	37.16	<0.001
Fever (%)	1.79	1.72	0.0786
Diabetes mellitus (%)	24.64	24.65	0.9716
Congestive heart failure (%)	14.88	17.74	<0.001
Emphysema/COPD (%)	9.96	12.10	<0.001
Cancer (%)	4.14	5.33	<0.001
9+ medications in last 7 days (%)	40.88	40.69	0.1929
Any antipsychotics/hypnotics use (%)	28.02	27.03	<0.001
Restraint use (%)	5.62	4.42	<0.001
Hospice care (%)	2.45	1.96	<0.001
Nursing Homes			
Percent Medicaid ≥ 85%	16.50	16.81	0.6544
Percent Medicare ≥ 15%	19.49	17.35	0.0031
Percent Black	8.73	8.19	0.0698
Occupancy Rate ≥ 95%	23.13	29.10	<0.001
Total direct care hrs./day/resident	3.46	3.41	0.2102
Mean RUGS across nursing home	0.79	0.80	0.0112
Percent in a competitive market	38.83	48.02	<0.001
States			
Medicaid daily rate (CPI adj.)	112.64	120.24	<0.001
Casemix reimbursement (%)	73.91	64.77	
Bedhold policy (%)	20.47	79.53	

†Note that the first observation of each resident and nursing home was used.

‡State information was from 2005.

Table 2.2 Estimates for samples of case states and matched controls†

VARIABLES	(i) National 25% sample	(ii) IL & matched controls	(iii) MA & matched controls	(iv) MI & matched controls
Policy	0.00493**	0.00535**	-0.00143	0.00315*
	(0.000393 - 0.00946)	(0.000283 - 0.0104)	(-0.00695 - 0.00410)	(-0.000318 - 0.00662)
Medicaid daily rate/$10 (CPI adj.)	0.000497	0.00208***	-0.00167**	0.000868***
	(-0.000120 - 0.00111)	(0.00105 - 0.00311)	(-0.00302 - -0.000330)	(0.000261 - 0.00148)
Casemix reimbursement	-0.00302*	0.00458	-0.00522	-0.00999***
	(-0.00631 - 0.000267)	(-0.00169 - 0.0109)	(-0.0119 - 0.00148)	(-0.0161 - -0.00384)
Herfindahl Index < 0.10	0.00319**	-0.000164	0.00305	-0.000333
	(2.31e-05 - 0.00636)	(-0.00502 - 0.00469)	(-0.00433 - 0.0104)	(-0.00855 - 0.00788)
Percent Medicaid ≥ 85%	-0.00245***	-0.00371**	-0.00355**	-0.00176
	(-0.00385 - -0.00105)	(-0.00654 - -0.000879)	(-0.00691 - -0.000197)	(-0.00501 - 0.00149)
Percent Medicare ≥ 15%	0.00555***	0.00510***	0.00399***	0.00736***
	(0.00448 - 0.00662)	(0.00310 - 0.00709)	(0.00175 - 0.00623)	(0.00505 - 0.00968)
Percent Black	0.0168**	0.0460***	0.0468**	0.0606***
	(0.00301 - 0.0306)	(0.0155 - 0.0766)	(0.00955 - 0.0841)	(0.0247 - 0.0965)
Occupancy Rate ≥ 95%	-0.00256***	-0.00425***	-0.000769	-0.00309***
	(-0.00344 - -0.00168)	(-0.00589 - -0.00262)	(-0.00251 - 0.000972)	(-0.00508 - -0.00109)
Total direct care hrs./day/resident	0.000313	-0.000539	0.000160	0.000412
	(-0.000221 - 0.000848)	(-0.00160 - 0.000524)	(-0.00114 - 0.00146)	(-0.000959 - 0.00178)
Mean RUGS across nursing home	0.0298***	0.0280**	0.0284***	0.0502***
	(0.0198 - 0.0399)	(0.00488 - 0.0512)	(0.00791 - 0.0490)	(0.0247 - 0.0757)
CHESS 1	0.0285***	0.0326***	0.0204***	0.0240***
	(0.0260 - 0.0311)	(0.0290 - 0.0361)	(0.0167 - 0.0240)	(0.0217 - 0.0264)
CHESS 2	0.0629***	0.0757***	0.0444***	0.0546***
	(0.0588 - 0.0671)	(0.0684 - 0.0831)	(0.0386 - 0.0501)	(0.0512 - 0.0580)
CHESS 3	0.112***	0.150***	0.0894***	0.0929***
	(0.106 - 0.118)	(0.121 - 0.178)	(0.0825 - 0.0962)	(0.0870 - 0.0987)
CHESS 4	0.123***	0.163***	0.0907***	0.100***
	(0.114 - 0.131)	(0.135 - 0.191)	(0.0784 - 0.103)	(0.0883 - 0.112)
CHESS 5	0.122***	0.177***	0.100***	0.118***
	(0.103 - 0.141)	(0.144 - 0.210)	(0.0611 - 0.139)	(0.0915 - 0.145)
Policy*CHESS1	-0.00304**	-0.00320*	0.00542***	0.00111
	(-0.00578 - -0.000287)	(-0.00696 - 0.000549)	(0.00153 - 0.00931)	(-0.00156 - 0.00378)
Policy*CHESS2	0.000131	-0.00558	0.0184***	0.00629***
	(-0.00424 - 0.00450)	(-0.0124 - 0.00119)	(0.0122 - 0.0247)	(0.00236 - 0.0102)
Policy*CHESS3	0.00126	-0.0229*	0.0178***	0.0108***
	(-0.00550 - 0.00802)	(-0.0502 - 0.00438)	(0.00959 - 0.0260)	(0.00379 - 0.0178)
Policy*CHESS4	0.00592	-0.0122	0.0276***	0.0157**
	(-0.00318 - 0.0150)	(-0.0391 - 0.0148)	(0.0136 - 0.0416)	(0.00152 - 0.0299)
Policy*CHESS5	0.000640	-0.0309*	0.0294	-0.00474
	(-0.0201 - 0.0213)	(-0.0649 - 0.00305)	(-0.0129 - 0.0716)	(-0.0342 - 0.0247)
Age	0.00635***	0.00823***	0.00745***	0.00515***
	(0.00577 - 0.00694)	(0.00719 - 0.00928)	(0.00631 - 0.00860)	(0.00395 - 0.00635)
Age-squared	-4.27e-05***	-5.33e-05***	-5.03e-05***	-3.64e-05***
	(-4.62e-05 - -3.92e-05)	(-5.95e-05 - -4.72e-05)	(-5.70e-05 - -4.35e-05)	(-4.34e-05 - -2.94e-05)
Male	0.0303***	0.0325***	0.0313***	0.0295***
	(0.0295 - 0.0312)	(0.0310 - 0.0340)	(0.0295 - 0.0330)	(0.0280 - 0.0311)
Black	0.00740***	0.00544***	0.00932***	0.0141***
	(0.00610 - 0.00871)	(0.00302 - 0.00785)	(0.00646 - 0.0122)	(0.0106 - 0.0175)
Other race	-0.000726	-0.00784***	0.00435**	-0.00153
	(-0.00313 - 0.00168)	(-0.0110 - -0.00466)	(0.000208 - 0.00850)	(-0.00567 - 0.00261)
Do-not-resuscitate order	-0.0187***	-0.0183***	-0.0225***	-0.0252***
	(-0.0196 - -0.0178)	(-0.0197 - -0.0169)	(-0.0240 - -0.0209)	(-0.0274 - -0.0230)
Complete ADL impairment	0.0485***	0.0525***	0.0372***	0.0495***
	(0.0469 - 0.0501)	(0.0496 - 0.0554)	(0.0337 - 0.0408)	(0.0471 - 0.0519)
Cognitive Performance Scale > 3	-0.0116***	-0.0120***	-0.0145***	-0.0168***
	(-0.0125 - -0.0108)	(-0.0131 - -0.0109)	(-0.0159 - -0.0131)	(-0.0182 - -0.0154)
Weight loss	0.0653***	0.0563***	0.0611***	0.0649***
	(0.0633 - 0.0672)	(0.0524 - 0.0602)	(0.0586 - 0.0637)	(0.0622 - 0.0676)
Unstable status	0.0582***	0.0568***	0.0633***	0.0567***
	(0.0566 - 0.0599)	(0.0546 - 0.0590)	(0.0609 - 0.0658)	(0.0542 - 0.0591)
Fever	0.195***	0.178***	0.249***	0.232***
	(0.189 - 0.202)	(0.171 - 0.185)	(0.229 - 0.269)	(0.217 - 0.246)
Diabetes mellitus	0.0284***	0.0303***	0.0271***	0.0282***
	(0.0277 - 0.0292)	(0.0290 - 0.0316)	(0.0257 - 0.0286)	(0.0270 - 0.0295)
Congestive heart failure	0.0704***	0.0698***	0.0543***	0.0450***
	(0.0668 - 0.0740)	(0.0617 - 0.0779)	(0.0505 - 0.0581)	(0.0405 - 0.0495)
Emphysema/COPD	0.0617***	0.0612***	0.0430***	0.0441***
	(0.0586 - 0.0649)	(0.0545 - 0.0678)	(0.0388 - 0.0471)	(0.0400 - 0.0482)
Cancer	0.0333***	0.0303***	0.0122***	0.0190***
	(0.0304 - 0.0361)	(0.0224 - 0.0382)	(0.00817 - 0.0162)	(0.0148 - 0.0232)
9+ medications in last 7 days	0.0386***	0.0424***	0.0437***	0.0385***
	(0.0377 - 0.0394)	(0.0410 - 0.0437)	(0.0419 - 0.0455)	(0.0373 - 0.0398)
Any antipsychotics/hypnotics use	-0.00619***	-0.00815***	-0.00433***	-0.00736***
	(-0.00696 - -0.00542)	(-0.00927 - -0.00703)	(-0.00570 - -0.00296)	(-0.00866 - -0.00605)
Restraint use	-0.00509***	-0.00224	-0.00892***	-0.00845***
	(-0.00649 - -0.00369)	(-0.00495 - 0.000469)	(-0.0118 - -0.00606)	(-0.0113 - -0.00560)
Hospice care	-0.120***	-0.131***	-0.108***	-0.107***
	(-0.122 - -0.117)	(-0.137 - -0.125)	(-0.113 - -0.102)	(-0.111 - -0.104)
N	5,541,274	2,101,621	1,350,541	1,339,097

Robust confidence intervals in parentheses adjusted for cluste
*** p<0.01, ** p<0.05, * p<0.1
†All models include nursing home and year/quarter fixed effects.

Figure 2.1 Unadjusted weekly hospitalization rates of nursing home residents

Figure 2.1.a Illinois

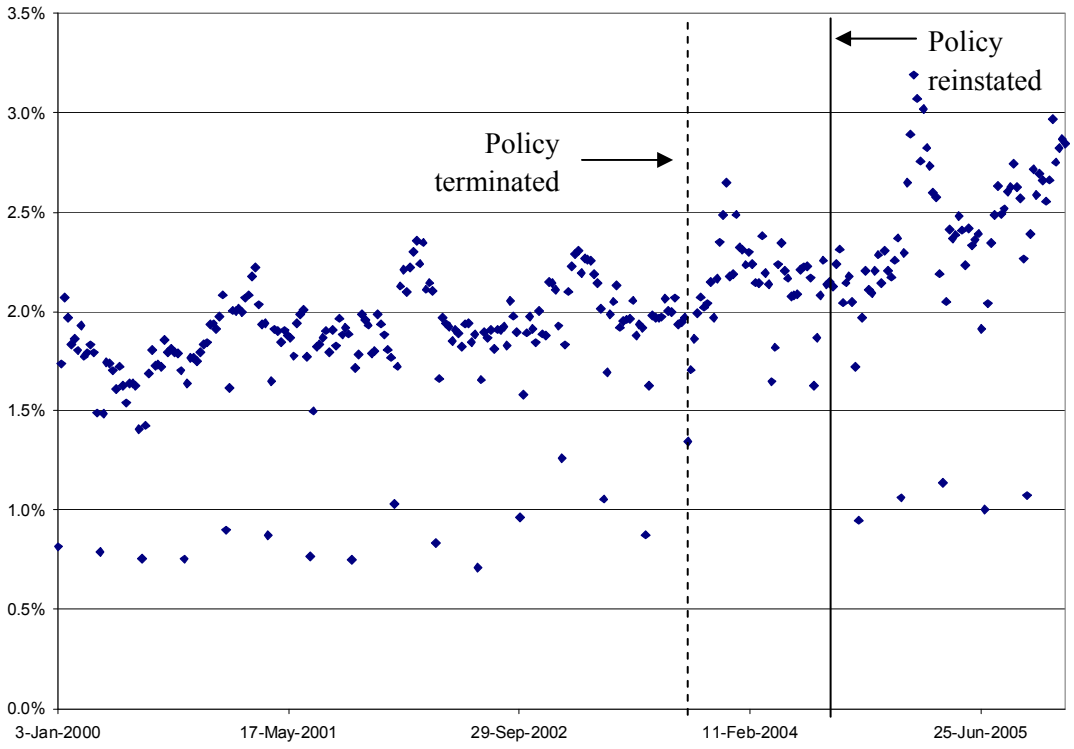


Figure 2.1.b Massachusetts

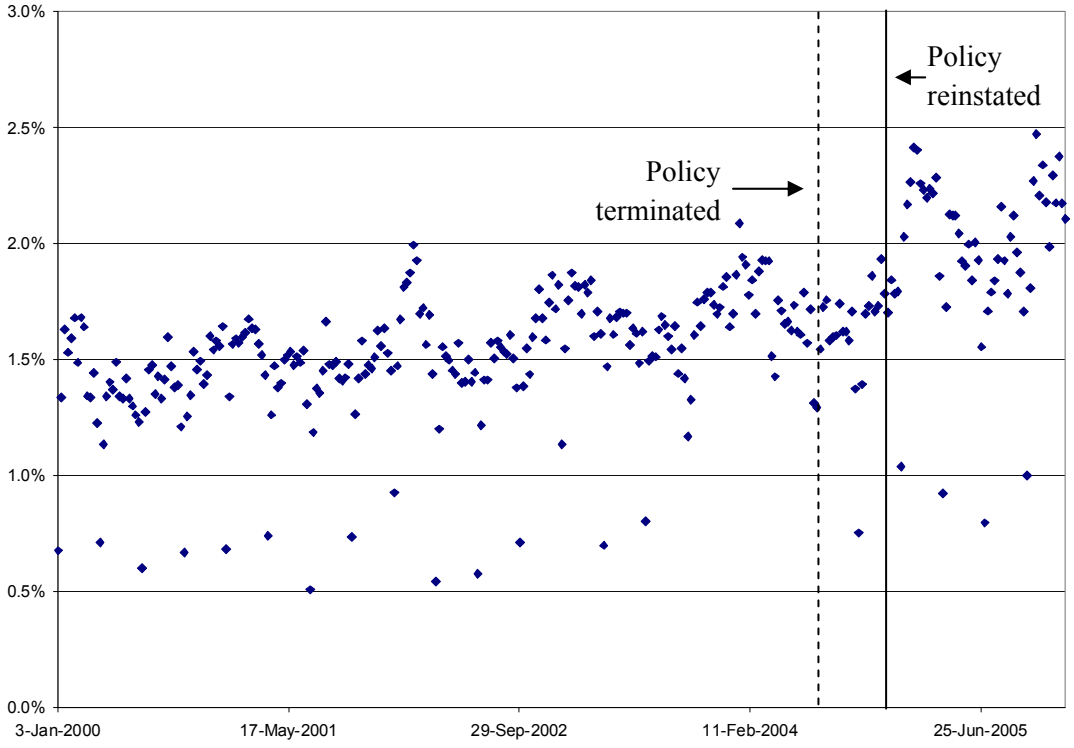
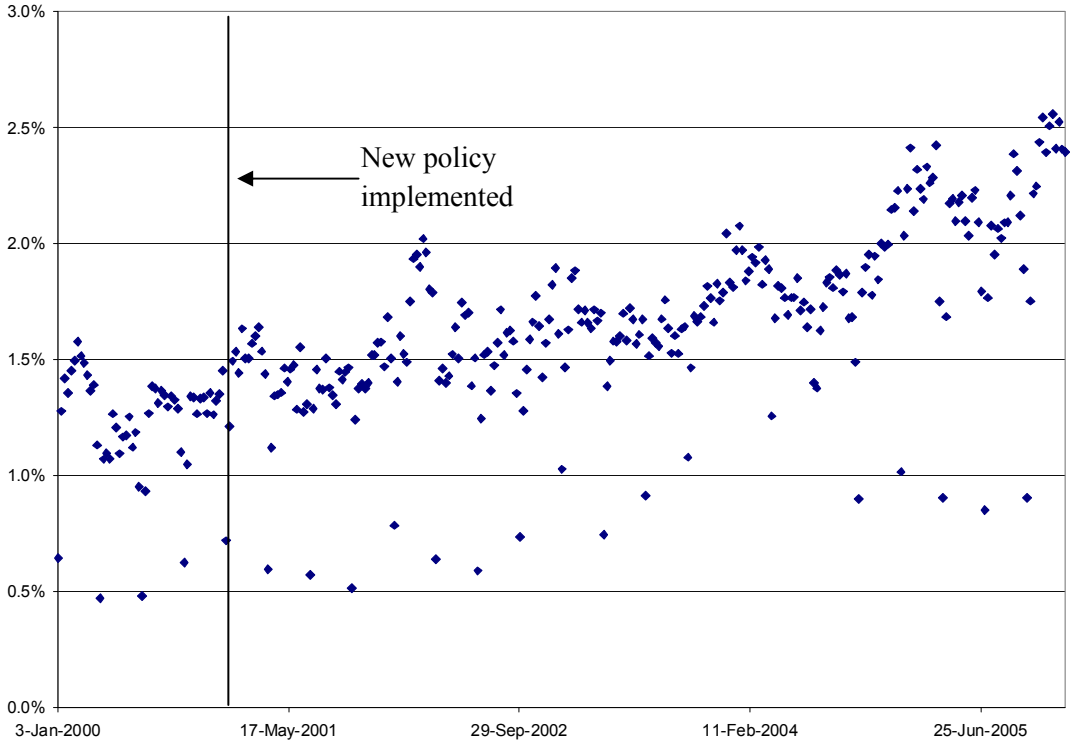


Figure 2.1.c Michigan



CHAPTER 3

THE EFFECT OF STATE MEDICAID BED-HOLD POLICIES ON RACIAL DISPARITIES IN HOSPITALIZATIONS OF NURSING HOME RESIDENTS ARISING WITHIN FACILITIES

3.1 INTRODUCTION

Previous studies have noted a link between Medicaid bed-hold policies and hospitalization of nursing home residents.[7-9, 26] The effect of these policies on racial disparities in hospitalizations among nursing home residents within the same facility is unknown. Reducing racial disparities has been defined as a key component of efforts to improve the equity and quality of care in the United States.[52, 53] Nursing homes in the United States are segregated with black patients being more concentrated in facilities that provide lower quality of care.[54-57] Additionally, black nursing home residents have a higher likelihood of being hospitalized than white residents.[34, 58-60] If efforts aimed at reducing disparities among nursing home residents are to be effective, it is important to identify sources behind them occurring within facilities.[58] Understanding if policies affect racial disparities within nursing homes is necessary to meet goals of improving equity and the quality of care provided to individuals residing in them. The objective of this study was to estimate the effect of changes in states' Medicaid bed-hold policies on within-facility disparities in the likelihood of hospitalization between black and white nursing home residents. To our knowledge, no previous studies have examined the influence of Medicaid bed-hold policies on racial disparities occurring within nursing homes.

3.2 METHODS

Seven bed-hold policy changes took place in four states over the period spanning January 1, 2000 through December 31, 2005. The four states with bed-hold policy changes were Illinois, Massachusetts, Michigan, and Tennessee. On average, there were approximately a dozen states that never had a bed-hold program during this period, leaving roughly 36 states that consistently maintained policies. We undertook an analysis based on a national sample, in addition to secondary analyses that examined each state that experienced a policy change during the study period and compared it to a neighboring control state that consistently maintained a policy or never had a bed-hold program. Illinois eliminated its policy in July 2003 and reinstated it in August 2004 with a change in the required minimum occupancy rate of Medicaid residents. Massachusetts terminated its bed-hold policy in July 2004 and reinstated it approximately six months later with retroactive payments allowed for the period of discontinuity. Michigan implemented a new bed-hold program in January of 2001. Tennessee terminated and reinstated its policy during the third quarter of 2005. As explained below, the unit of analysis is the person-quarter and a bed-hold policy was treated as active if it was in effect at any time during a given quarter. Therefore, Tennessee was treated as having an active bed-hold policy throughout the study period.

3.2.1 Data

Our primary data source was a longitudinal file composed of the Minimum Data Set Resident Assessment Instrument (MDS), Medicare inpatient claims, the On-line Survey of Certification and Reporting (OSCAR), and the Area Resource File (ARF) for

the period beginning January 1, 2000 through December 31, 2005. The MDS includes data on over 400 items and imparted details on case-mix acuity, diagnoses and health conditions, cognitive and physical functioning, among other factors. Many of these items have been previously validated.[37] Medicare inpatient claims provided information on hospital discharges, including primary and secondary diagnosis fields. OSCAR supplied nursing homes characteristics, such as occupancy rates, staffing, case-mix, size, proprietary status, hospital affiliation, in addition to other traits. Characteristics of counties, which we used as a proxy for markets, were obtained from the ARF. These included, but were not limited to, the Herfindahl index, demographic characteristics, and supply of hospital beds. Data on state policies, collected through a comprehensive survey conducted by the Center for Gerontology and Health Care Research at Brown University, were incorporated. Our primary analytic file consisted of a 25 percent random sample of long-stay residents (724,208 residents, 5,314,772 observations), defined as individuals residing in nursing homes for 90 days or more. In a secondary analysis, we used a 100 percent sample for each of the three states that experienced a change in its bed-hold policy and a neighboring comparison state that did not experience a change in its bed-hold policy. We also plotted weekly hospital inpatient rates for case states. In each sample, many residents are observed more than once with a different number at risk of hospitalization in each quarter.

Our study population was restricted to elderly black and white long-stay nursing home residents. Non-elderly residents under age 65 were not included since these individuals have conditions that differ from the broader nursing home population.[39-43] Additionally, nursing home residents participating in Medicare managed care were not

included since we lacked access to claims data for these individuals. Due to unique regional and political features that differ from the contiguous United States, residents in Alaska, Hawaii, and the District of Columbia were excluded.

3.2.2 Measures

At the patient level, controls for basic demographic characteristics available in the MDS were utilized. These included gender, race, and a quadratic function for age. Additionally, variables from the MDS reflecting health and mobility were used to signify clinical risk of hospitalization. These consisted of chronic diagnoses, symptoms predictive of hospitalization, poor signs of health, and patient reported outcomes such as cognitive impairment and activities of daily living. Specifically, indicators for a diagnosis of diabetes, cancer, emphysema or chronic obstructive pulmonary disease were used to account for chronic conditions associated with hospitalization;[44] fever and weight loss dummies, as they are symptoms that may be linked to a higher likelihood of hospitalization;[8] Cognitive Performance Scale above three;[45] as well as high body mass index (BMI>30), frailty (BMI<19), required assistance for activities of daily living, and a dummy for current use of nine or more prescription drugs were used.[8] Additionally, the Changes in Health, End-Stage Disease and Symptoms and Signs (CHESS) scale, which is predictive of declining health, was used as a predictor of hospitalization.[48] An indicator for presence of a do-not-resuscitate (DNR) order was also utilized. A previous study concluded that DNR orders reduce the chances of hospitalization with both documented and undocumented limitations on care.[46, 47]

Nursing home fixed effects were used to absorb time-invariant characteristics of facilities. Other nursing home variables included quarterly occupancy rates, percent of black residents, the proportions of Medicare and Medicaid residents, total registered nurse hours/day per resident, and the mean value of Resource Utilization Groups across residents in each facility.

Medicaid per diem rates paid by states to nursing homes (adjusted for the Consumer Price Index) and the use of case-mix adjustment for reimbursements have been shown to independently influence hospitalization.[33, 49] Measures of each were used in our analysis. Competitive nursing home markets have also been previously associated with hospitalizations. This warranted inclusion of a measure for competitive markets, indicated by a Herfindahl Index less than 0.10.[8]

3.2.3 Analytical approach

Our analytical approach utilized the following model:

$$HOSP_{ijt} = \beta_1 POLICY_{jt} + \beta_2 BLACK_i + \beta_3 POLICY*BLACK_{ijt} + \gamma X_{ijt} + \eta_i + \mu_t + \varepsilon_{ijt} \quad (1)$$

Residents, states, and quarters were indexed by i, j, and t, respectively. The outcome variable, HOSP, is an indicator for any hospitalization of a long-stay resident admitted directly from a nursing home during the quarter. POLICY indicates the presence of a state bed-hold policy and BLACK reflects patients' race. Other patient characteristics and nursing home influences were included in X, and η_i and μ_t represent nursing home and year-quarter fixed effects, respectively. The inclusion of facility fixed effects yielded estimates based on variation occurring within nursing homes. Therefore, the coefficient

associated with the interaction of POLICY and BLACK represents within-facility differences in the hospitalization of black and white residents when bed-hold policies were in effect.

Equation (1) was treated as a linear probability model. This overlooks the dichotomous nature of the outcome, but is a suitable estimation approach given the abundant use of dummy variables in the specification and the large sample size provided by our analytic file.[61] The standard errors were adjusted for clustering at the level of the state-quarter. All analyses were carried out using SAS version 9.2 and Stata SE version 11.

3.3 RESULTS

Table 1 indicates that black residents tended to be younger with lower CHESS scores compared to white residents and also differed in the prevalence of some comorbidities. For example, black residents were more likely to have complete ADL impairment, lower cognitive functioning, higher rates of diabetes mellitus, and lower prevalence of COPD and emphysema. White residents received more medications and were much more likely to have a DNR order.

Unadjusted hospitalization rates were much higher for black residents compared to whites with trends increasing for both groups during the study period (Figure 1). Figure 2 shows unadjusted weekly hospitalization rates among black nursing home residents in states that experienced a bed-hold policy change during the study period. There is no discernable difference in trends for black residents associated with policy

changes in Illinois. Similarly, no clear drop in hospitalizations for black residents is seen when Massachusetts' bed-hold policy was repealed, but the variance associated with black/white differences in hospitalization appears to have increased following its reinstatement. Hospitalization of black residents in Michigan increased once the state established a bed-hold policy, with the black/white disparity increasing over time.

Regression estimates using our nationwide 25 percent random sample did not indicate a significant within-facility racial disparity in hospitalizations associated with bed-hold policies (Figure 3). This was not the case when we repeated our analysis with the same specification using 100 percent samples of black and white long-stay nursing home residents for each case state with a neighboring comparison state that did not undergo a bed-hold policy change. No significant disparities were seen with policy changes in Illinois. Marginally significant estimates for Massachusetts and Michigan showed absolute increases of 0.57 percent and 0.71 percent, respectively, of any hospitalization for black residents relative to whites in the same facility when a state's bed-hold policy was in effect. However, we also limited the samples for Massachusetts and Michigan to residents in nursing homes with large proportions of Medicaid residents (≥85%) to examine whether race may have acted as a proxy for payer status. The estimated disparity for Massachusetts became statistically insignificant, but increased to 2.53 percent (P=0.004) for Michigan.

3.4 DISCUSSION

We did not see within-facility disparities in hospitalizations of black and white nursing home residents at the national level. Medicaid bed-hold policies affect large

numbers of nursing home residents across the country, and given that the policies have been previously linked to increased hospitalization, the absence of within facility disparities at the national level is reassuring. However, the heterogeneous results seen in analyses of case states raise questions.

Race may act as a proxy for Medicaid status, which would explain why the estimate for Massachusetts became insignificant when the sample was limited to residents in facilities with high percentage of occupants covered by Medicaid. It is not clear why the estimated effect rose substantially for residents in high Medicaid nursing homes in Michigan. Limiting the sample to residents in high Medicaid nursing homes decreased the number of observations over 90 percent (from 339,704 to 26,064). Unique traits of the reduced sample could have lead to the difference in the two estimates for Michigan. Our analysis controlled for time-invariant nursing home characteristics in addition to a handful of time-varying confounders. If other nursing home influences that changed over time were omitted from our analysis, the estimated effect of bed-hold policy changes on within-facility disparities could have introduced bias. Unobserved economic and political influences in states' legislative processes may have motivated changes in Medicaid bed-hold policies.[51] This could explain the heterogeneous effects seen among states in our results. However, the pathway through which endogenous payment policies would affect within-facility disparities after controlling for patient characteristics is not clear.

In conclusion, determining the effect of Medicaid bed-hold payments on within-facility racial disparities is important to ensure that the quality and equity of care

provided to frail elderly nursing home residents is not diminished by unintended consequences of policies. Although we did not find widespread disparities of this nature, the results of state level analyses obscures the overall impact of bed-hold policies and creates a more complicated picture for policy makers to assess.

Table 3.1 Characteristics of residents, nursing homes, and states[†‡]

	Residents			
	Black		White	
		Std. Dev.		Std. Dev.
Age	80.65	8.55	83.59	7.69
Male (%)	33.04	47.04	26.78	44.28
CHESS1 (%)	31.43	46.42	32.18	46.72
CHESS2 (%)	18.76	39.04	24.25	42.86
CHESS3 (%)	7.26	25.94	11.41	31.79
CHESS4 (%)	2.02	14.05	3.62	18.68
CHESS5 (%)	0.14	3.79	0.35	5.92
Complete ADL impairment (%)	14.34	35.05	7.24	25.92
Cognitive Performance Scale > 3 (%)	61.88	48.57	56.38	49.59
Weight loss (%)	12.24	32.77	13.29	33.95
Unstable status (%)	34.94	47.68	37.74	48.47
Fever (%)	1.61	12.57	1.78	13.21
Diabetes mellitus (%)	35.75	47.93	22.84	41.98
Congestive heart failure (%)	15.15	35.85	17.49	37.99
Emphysema/COPD (%)	8.64	28.09	12.04	32.54
Cancer (%)	4.73	21.23	5.18	22.16
9+ medications in last 7 days (%)	32.40	46.80	41.84	49.33
Any antipsychotics/hypnotics use (%)	26.18	43.96	27.32	44.56
Restraint use (%)	4.71	21.18	4.44	20.60
Hospice care (%)	1.48	12.07	2.10	14.35
Do-not-resuscitate order (%)	23.12	42.16	56.37	49.59
	Nursing Homes (Black)		**Nursing Homes (White)**	
		Std. Dev.		Std. Dev.
Percent Medicaid >= 85%	31.80	46.57	9.60	29.46
Percent Medicare >= 15%	18.66	38.96	22.00	41.43
Percent Black	36.06	25.82	5.76	10.31
Occupancy Rate >= 95%	29.26	45.49	33.60	47.23
Total direct care hrs./day/resident	3.09	0.87	3.16	1.14
Mean RUGS across nursing home	0.80	0.08	0.80	0.08
Percent in a competitive market	62.22	48.48	46.34	49.87
	States			
Medicaid daily rate (CPI adj.)	135.40			
Casemix reimbursement (%)	72.92			
Bedhold policy (%)	77.08			

†Note that the first observation of each resident and nursing home was used.

‡State information was from 2005.

Figure 3.1 Unadjusted quarterly hospitalization rates nationally for black and white nursing home residents

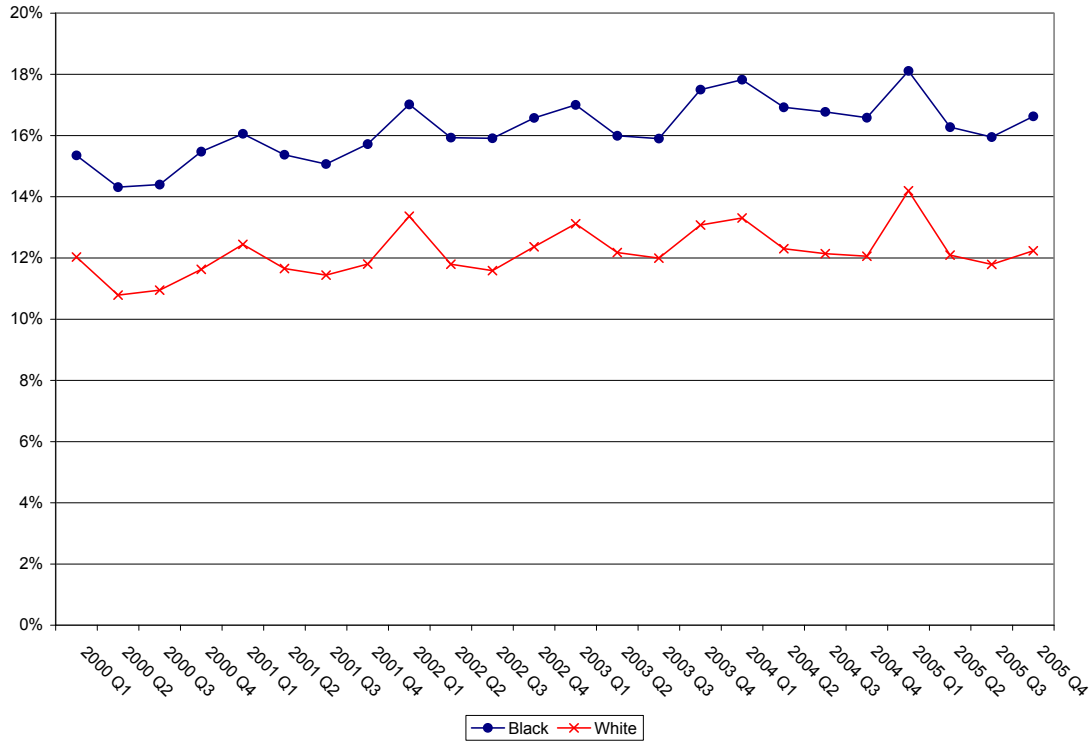


Figure 3.2 Weekly proportion of black nursing home residents hospitalized and black/white differences in hospitalization rates in case states

Figure 3.2.A.i Illinois – Black residents

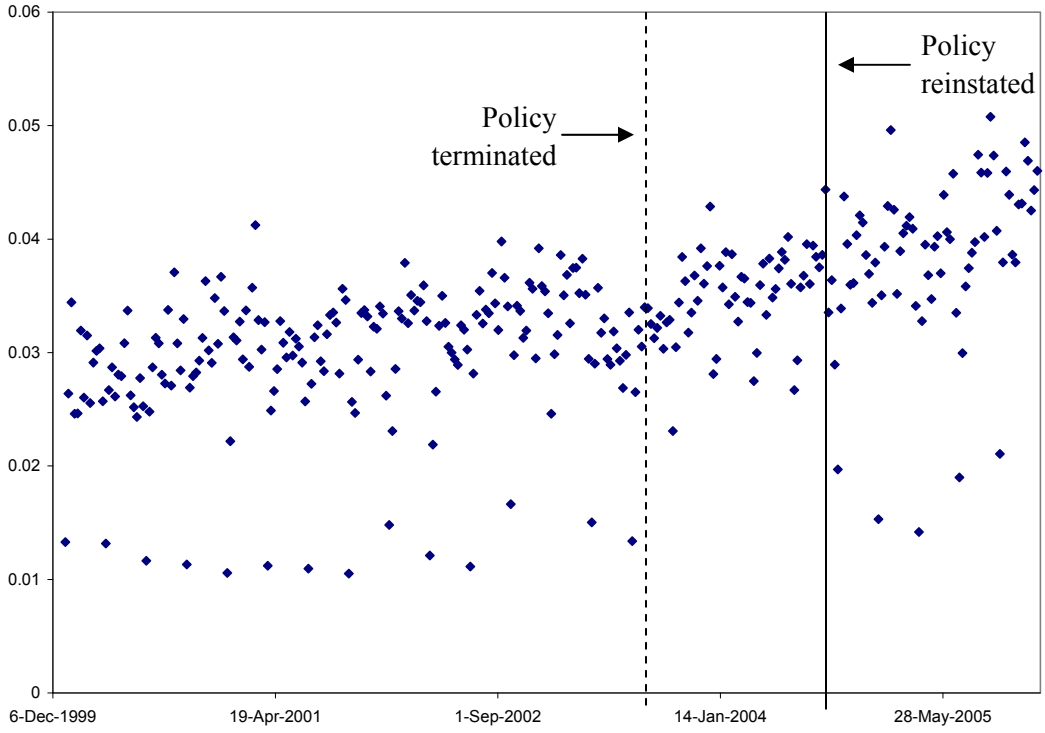


Figure 3.2.A.ii Illinois – Black/white differences

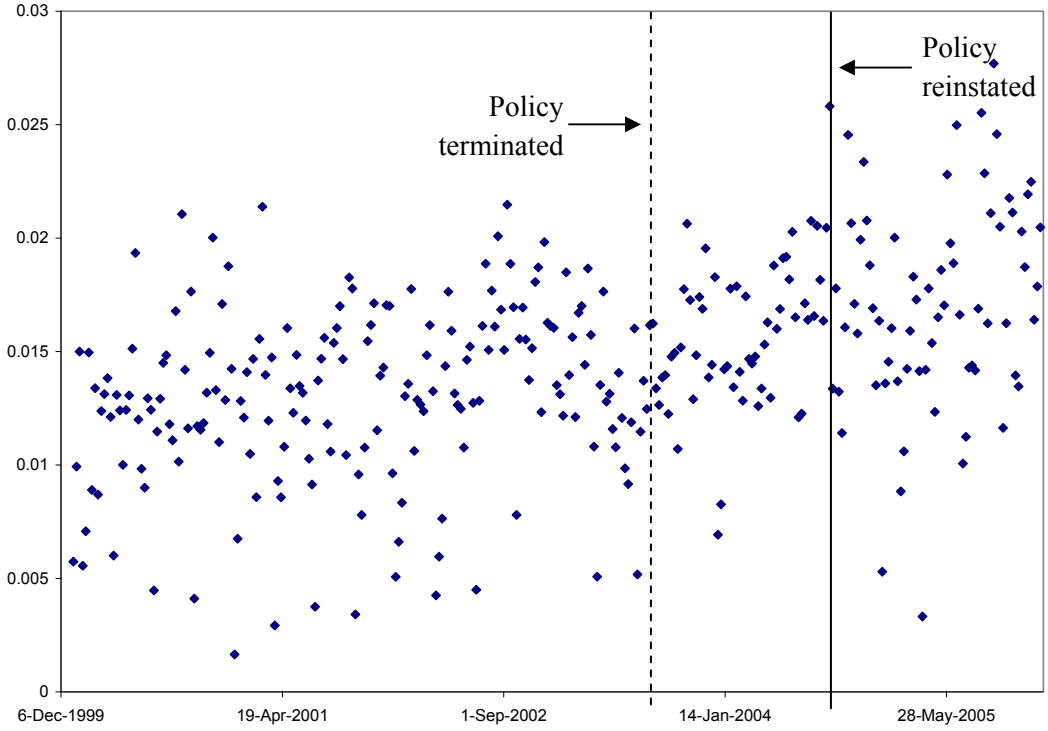


Figure 3.2.B.i Massachusetts – Black residents

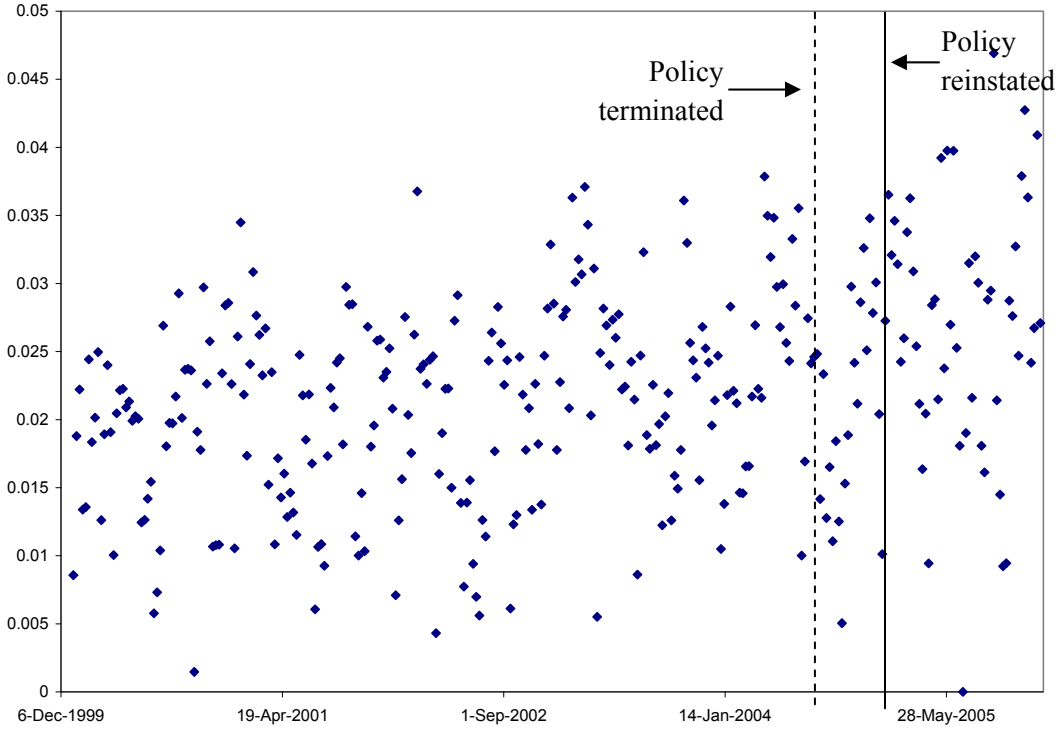


Figure 3.2.B.ii Massachusetts – Black/white differences

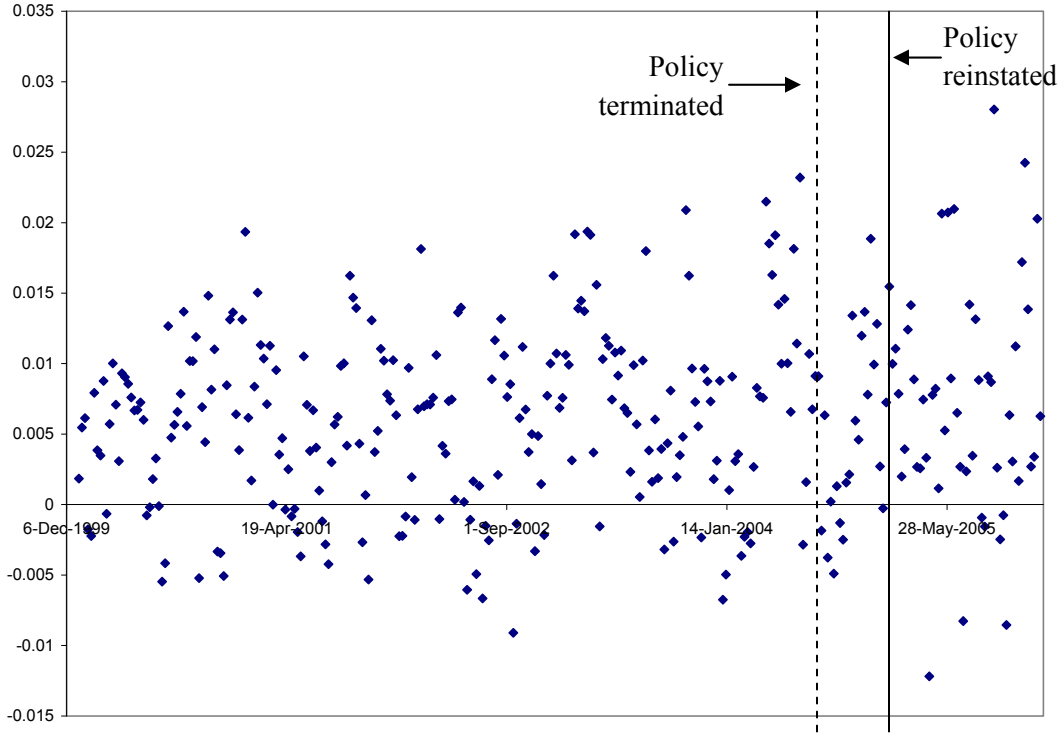


Figure 3.2.C.i Michigan – Black residents

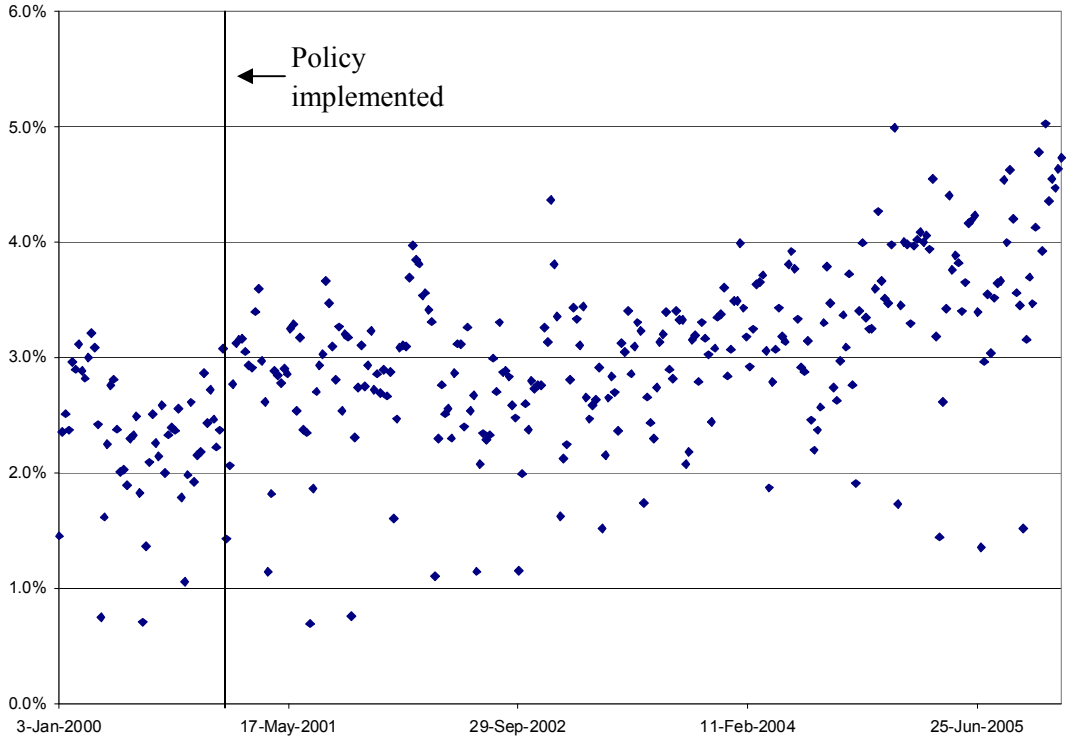


Figure 3.2.C.ii Michigan – Black/white differences

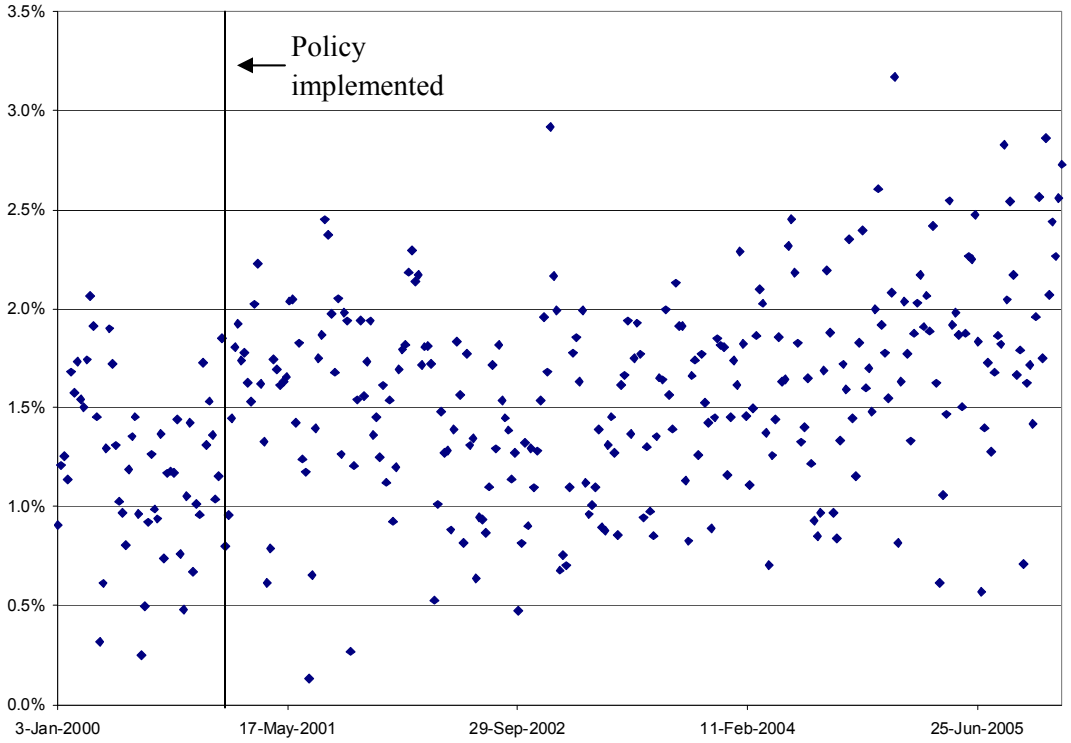
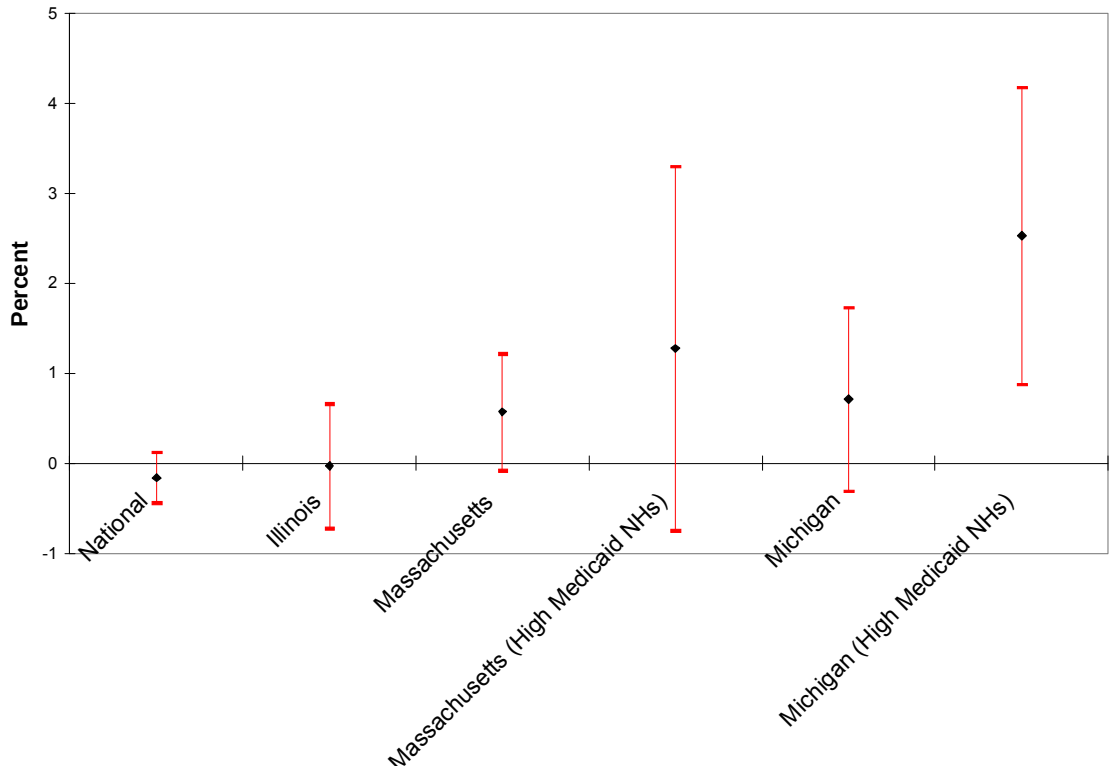


Figure 3.3 Regression estimates of within-facility racial disparity in hospitalizations associated with bed-hold policies



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