AN EXAMINATION OF UTILIZATION AND EFFECTIVE CARE MEASURES IN
MEDICARE SHARED SAVINGS PROGRAM ACCOUNTABLE CARE ORGANIZATIONS: A
RESOURCE DEPENDENCE PERSPECTIVE

A DISSERTATION
SUBMITTED ON THE 19TH DAY OF APRIL, 2017
TO THE DEPARTMENT OF GLOBAL HEALTH MANAGEMENT AND POLICY
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
OF THE SCHOOL OF PUBLIC HEALTH AND TROPICAL MEDICINE
OF TULANE UNIVERSITY
FOR THE DEGREE
DOCTOR OF SCIENCE

BY

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ACKNOWLEDGEMENTS

I would like to thank my doctoral committee for their support, guidance, and patience. I am forever grateful to Dr. Diana for his mentorship and look forward to many years of collaboration. I am indebted to Dr. Stoecker, an extraordinary economist, for his stewardship and guidance. I am thankful for Dr. Theall’s unique insight and perspective. I am grateful to Dr. Aratow, an ED physician by trade, for his progressive pragmatism.

Special thanks to my classmates - your keen insight, and our always rigorous classroom discourse, made our shared time memorable. I am grateful to Alison Rinehart, and Vanessa Bailey with Global Health Management and Policy for the support.

Finally, profound thanks to my family. I am forever grateful to my wife and daughters for their love, support, and understanding. To my wife, for standing in the gap, and to my father, for his faith and encouragement.
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ABSTRACT

Background
A policy implication of the Affordable Care Act (ACA) of 2010 is the evolution of provider integration as Accountable Care Organizations (ACOs). These consolidations are motivated by environmental uncertainty, including requirements for public policy initiatives, and disruptive market conditions. A supposition is that the amalgamation of clinical, financial and operational expertise and resources allows mitigation of uncertainty. Resource dependence theory (RDT) offers a useful foundation for studying the effectiveness of ACOs within the framework of uncertainty. RDT examines local market constraints as informing theoretical constructs. This study measures the effectiveness of MSSP ACOs in reducing high-cost utilization and Prevention Quality Indicators (PQI) using the RDT framework.

Methods
Employing retrospective panel analysis, and publicly available MSSP ACO data, 2016 HRSA’s Area Resource File, and CMS’ Geographic Variation Public Use File, this research examines MSSP ACO performance through the lens of RDT to determine the marginal effect of ACOs on health services utilization and PQI using a set of Difference in Differences equations. The model also examines a States choice for Medicaid expansion on MSSP ACO performance.

Results
Difference in Differences Four-year State-level panel analysis finds mixed results on ACO performance. Analysis supports a nominal decrease in ED visits but finds no association with readmission rates, and PQI. RDT constructs show anomalies in their association with healthcare utilization. Munificence constructs - physicians per capita, specialists per capita and income per capita are not associated with utilization. Dynamism constructs - poverty rate and unemployment rate are associated with decreasing utilization. Study finds support for decreasing utilization in Medicaid expansion States.

Conclusion
Poor integration severely limits MSSP ACO effectiveness in measurable care management or reducing avoidable utilization. Medicaid expansion findings are sober reminders for those predicting massive runs on high-cost ED and inpatient utilization in the aftermath of insurance expansion.
CHAPTER 1: BACKGROUND AND SIGNIFICANCE

Introduction, Statement of Problem and Research Rationale

The Patient Protection and Affordable Care Act (PPACA) and the Health Care and Reconciliation Act of 2010, collectively known as the Affordable Care Act \(^1\) (ACA) are ambitious initiatives driving U.S. public health policy. ACA establishes the framework for expanded health insurance coverage and outlines the health services delivery and financial framework between patients, payers, and providers.

ACA has at least six major objectives\(^2\):

- Make coverage more secure for those who have insurance, and extend affordable coverage to the uninsured
- Improve health care quality and patient safety
- Emphasize primary and preventive care, linked with community prevention services
- Reduce the growth of health care costs while promoting high-value, effective care
- Ensure access to quality, culturally competent care, including long-term services and supports, for vulnerable populations
- Improve health care and population health through meaningful use of health information technology (2)

While these represent the ambitions of ACA policies and regulations, an accompanying assumption is that ACA regulations are creating massive transformation and disruptive dynamics in the U.S. healthcare environment.\(^3\)

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ACA policy initiatives seek measurable clinical quality improvement, lower healthcare cost, improved care coordination, and complex care management across providers and health systems. The objective is substantially better patient care management resulting in better clinical outcomes and cost efficiencies in a disorganized healthcare delivery system (3).

As a subset of the ACA, these federal policies create Accountable Care Organizations (ACOs), an integrated network of healthcare providers with established protocols for care management and care coordination between participating providers, and health systems.4

A key mandate for ACOs is to develop strategies and interventions to mitigate health inequalities through the management of chronic and complex care conditions in the most clinically appropriate and cost-effective care settings (4).

The ACA also establishes the hospital readmissions reduction program and requires CMS to reduce payments to hospitals for excessive 30-day readmissions.5 Regarding Medicare beneficiaries, the 30-day readmission includes risk-standardized all condition readmissions (ACO measure #8), 30-day unplanned readmissions for AMI, heart failure, pneumonia, COPD, Hip/Knee Replacement and Coronary artery bypass graft surgery (5).

Hospitalizations for preventable 30-day readmissions serve as a measure of the effectiveness of care transitions and care coordination based interventions and access to

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5 CMS Readmissions Reduction Program (HRRP). Retrieved April 9, 2017, from http://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/Readmissions-Reduction-Program.html
the most clinically appropriate and cost-efficient care setting. Studies have shown 30-day readmissions are related to the care quality or management of care transitions or missed episodes of care. As a quality measure, 30-day readmissions represent a significant area of process and clinical improvement. The ACO structure demands healthcare management in the most appropriate clinical and cost-effective care setting. Therefore, excessively high readmission rates serve as a proxy measure for health care access, and management of complex health conditions in the most appropriate care setting and therefore reducing avoidable readmissions.

Similarly, regarding ACO impact on system-wide cost, the total per member per month cost, and especially total per member per month cost for high-risk patients serve as proxy cost measures in gauging ACO effectiveness.

In theory, ACOs may benefit from economies of scale and scope. As an example, potentially increased leverage with payers via an increase in market power and enhanced coordination among providers who are part of the ACO. However, the prevalence of ACOs leads to a natural inquiry of these delivery system initiatives.

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Resource dependence theory offers a useful foundation for studying the effectiveness of integration initiatives in provider organizations (10). Resource dependence theory can help inform the efficacy of these integrating arrangements, and their impact on healthcare cost and quality outcomes by examining munificence, dynamism, competition, and organizational conditions as foundational environmental determinants, and contributing factors.¹⁰

OVERVIEW OF LITERATURE

This research includes a systematic review (Chapter 2) which considers the statistical relationships between ACO components and the outcomes across 45 included studies. The systematic review is revealing in its synthesis. The analysis groups study outcomes into eight categories based on the findings in the reviewed study sample. Common themes emerging from the amalgamation of studies included in the review are as follows:

1. Quality of care
2. ED utilization
3. Hospital utilization
4. Effect of market and demographic factors on study outcomes
5. Cost and spending (either per patient or system-level)
6. Payment models (fee-for-service, capitated models, bundled payments) related to improved outcomes or the ability to manage financial risk

7. Linkages among health care providers related to improved outcomes

8. Health information technology related to improved outcomes.

The research included an “other” category to capture categories which do not fit in those above.

Burke et al. (11) extend the dialog for moving beyond readmission penalties and creating an “ideal” process to improve care transitions. The authors contend that the focus on readmissions is inadequate, and instead designing an ideal discharge process can address incongruities in care continuum which often result in readmissions. The authors suggest that factors which influence readmissions are not managed well within the hospital; rather outpatient outreach can lead to better health outcomes. The study extends a framework which includes coordination between hospitals and outpatient providers, home health services, and nursing homes. Interventions include discharge planning, medication management, patient education, and intensive outpatient monitoring, among others (11). The authors suggest that ACOs with a primary care medical home structure can align financial incentives via comprehensively designed care transitions and induce a positive impact on avoidable readmissions. 

Cloonan et al. (12) investigate health literacy strategies as a means of reducing 30-day readmissions. The authors rely on literature which shows success in reducing readmissions through a four-part process - one, ‘enhancing patient-centered discharge procedures,’ two,
‘focusing on medication reconciliation,’ three, ‘improved care coordination with outpatient providers’, and four, ‘effective patient self-management of their disease and treatment.’

The study highlights costs associated with readmissions – estimated at one-third of total healthcare expenditure in the United States. Nationally, readmission rate estimates approach 20% within 30 days of discharge, and $12 billion of the estimated $17.5 billion in Medicare readmissions spending is preventable (12). The study highlights some of the reasons for high readmission rates such as ‘disease profile of hospitalized patients; lack of care coordination between community-based providers and hospital-based providers; and perhaps significantly, reimbursement schemes which incentivize shorter length of stays, while not rewarding care coordination across different care settings.’ Not surprisingly, the population at greatest risk for readmissions is described as 75 years or older, male, African-American, predominantly insured by Medicare, and with multiple chronic conditions (12).

The authors propose that the ‘increased acuity level in patients, shorter lengths of stay, and an unreasonably high expectation for self-management enhances the risk for readmissions.’ They suggest health literacy strategies, like Project RED (reengineered discharge), and University of Pennsylvania’s Transitional Care Model, as strategies to decrease readmission rates.12

Landon et al. (13) suggest an interesting relationship where higher practice intensity correlates with better care quality, but surprisingly, more avoidable admissions for Medicare patients. The authors analyze cross-sectional physician survey data linked to

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Medicare claims. The study finds that patients treated by costlier physicians are more likely to receive recommended preventive services, but unintuitively, are also more liable to experience preventable readmissions. As an example, doctors in the lowest quartile of costliness perform A1C monitoring 72.8% of the time versus 81.9% for physicians in the highest quartile of costliness. However, patients treated by doctors in the lowest quartile of costliness are admitted at the rate of 1.8 per 100, compared with patients treated by physicians in the highest quartile of costliness who are admitted at the rate of 2.9 per 100 for both chronic and acute Prevention Quality Indicators (PQIs).13

Chukmaitov et al. (14) study the association between delivery system characteristics and ACO competencies. Specifically, the study examines the effect of centralized hospital structures, hospital/physician integration, and health information technology, on risk-adjusted 30-day all-cause mortality rates along with case mix adjusted inpatient costs for Medicare patients. The article begins by establishing the premise that Accountable Care Organizations have reached critical mass, despite the limited evidence on advantages of the ACO model. Using a panel study design, and controlling for hospital market characteristics, the study finds hospitals in centralized health systems have significantly larger reductions in mortality when compared with hospitals that remain freestanding. Peculiarly, the study also finds that tightly integrated hospital–physician arrangements are linked with increased mortality (14). The authors recommend that provider organizations implementing ACOs

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consider a centralized service delivery model as a quality of care improvement mechanism.\textsuperscript{14}

**Synthesis of Literature Review**

As explained earlier, the literature review (Chapter 2) amalgamates eight common themes from the study sample. At a high level, the systematic review’s distribution of these topics is as follows. Regarding various measures related to the quality of care, seven studies find mixed results, where some aspects of quality are positively associated (improvement in outcome), whereas others have a negative association (decrease in outcome). Ten studies in the review find a positive association with components of quality of care, while eight studies find no difference in the quality of care outcomes under consideration.

Regarding utilization, three studies find no difference in ED utilization, while six studies find no difference in hospital utilization. The results are slightly better regarding hospital utilization – here eight studies find a positive association with ACO components.

Demographic factors which relate to outcomes show a positive association in one of the studies, no difference in another, and mixed results in a third study.

The cost of spending as an outcome shows the most consistent improvement, albeit still with mixed results - here fourteen studies find a positive association, three studies find mixed results, and seven studies show no difference in the outcome.

Results around payment models and ACO ability to manage financial risk are similarly mixed - here four studies find no difference in outcome, two studies show a positive association, and one study finds mixed results. Two studies in the review show no difference in outcomes related to linkages among health care providers; however, one study shows a positive association and another a negative association.

Similarly, two studies show mixed results about health information technology and improved outcomes, while two studies show a positive association.

Lastly, in the “other” category, Dorr et al. (2015) suggest a study protocol which includes a cluster randomized controlled trial to test elements related to improved quality, utilization, and patient experience. Hacker et al. (2014) find a positive association between ACO elements and access to care, and patient experience. McWilliams et al. (2014) find no difference as it relates to the stability of patient assignment and ACO elements. Nambudiri et al. (2013) identify strategies for cost reduction and effective care based on baseline data. One of the elements they consider is patient/provider/ACO goal alignment.

Not surprisingly, only one study in the sample utilizes a theoretical framework, however, this framework is weakly developed.

The systematic review illuminates significant gaps in the current understanding of Accountable Care Organizations and their impact on utilization, and effective care measures using an established theoretical framework. This research aims to address these gaps and enhance understanding of these nascent organizational structures.
OVERVIEW OF THEORETICAL FRAMEWORK

ACA and Hospital Organizational Process

An interesting phenomenon of the Affordable Care Act of 2010 is the evolution of provider integration as Accountable Care Organizations. These consolidations are motivated by environmental uncertainty, including requirements for public policy initiatives, and disruptive market conditions. A supposition is that the amalgamation of clinical, financial and operational expertise and resources allows mitigation of uncertainty, along with reduced costs and better patient health outcomes. Resource dependence theory (RDT) offers a useful foundation for studying the effectiveness of ACOs within the framework of uncertainty.

Young et al. (9) conduct a review of provider integration and local market in measuring the environment in healthcare organizations. The review provides a useful framework for analyzing ACA repercussions on provider integration and effect of local market conditions. The authors find that healthcare provider networks have been in a constant state of metamorphosis in the U.S. Independent providers are joining larger group practices and individual hospitals are amalgamating into large health systems. Findings suggest that physician-hospital alliances offer the promise of more comprehensive care management and coordination. Furthermore, the study finds, industry forces are driving this massive system-wide consolidation. These forces or constraints include the prevalence of managed care arrangements, and cuts in Medicare payments. Collectively, these constraints are compelling provider organizations to reduce cost, and improve health outcomes for their patient population (9).
Jeffrey Pfeffer and Gerald Salancik’s seminal work - The External Control of Organizations (Originally published: New York: Harper & Row, 1978), describes the framework for the resource dependence perspective. In the introduction to this classic edition, Pfeffer describes three themes which are central to the resource dependence framework:

The first topic explains the importance of the environment. As Pfeffer explains, organizational decisions and actions depend on local environmental constraints. Pfeffer elucidates an "inherent tension" between the action of leaders and the limiting effect of the environment which, in large part, explains the organizations’ behavior. Pfeffer explains resources (financial, physical, information) as fundamental components of the environment. The quest to obtain these resources motivates organizational dependence on external sources of these resources. Therefore, the phrase - resource dependence.

The second topic explains the constraints imposed by the environment, and the organizations’ tactics and strategies to mitigate these limitations. As Pfeffer explains, organizations respond to environmental constraints via various strategies. Ideally, these strategies are constructed to both mitigate constraints and enhance the organization’s position within its environment. One of the key ideas is the ‘continuing evolution of environment and the reciprocal action in organizational structure.’ Pfeffer and Salancik term this “dynamic interaction” - where organizations employ strategies to more effectively manage resource dependencies.

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The third major topic is power as a construct for predicting intra-organizational, and inter-organizational behavior. Power results from organizations mitigating environmental constraints. As Pfeffer clarifies, government as a significant provider of resources has more power than its contractors. These contractors are competing for government contracts and are dependent on contracts for survival. The government can, therefore, exert considerable influence (power) on suppliers and contractors. While this example can be debated, as an overarching theme, power establishes a link with competition in the environment.

Pfeffer summarizes resource dependence as a continuing interaction of organizational response to environmental constraints, organizations' attempts to influence its environment, and the effect on internal structure because of these organizational actions. Dess and Beard\(^\text{16}\) divide six environmental dimensions into three dimensions of organizational task environments. The authors' central premise is that an organization's resource requirements are primary characteristics which define the organization's environment. The authors divide the organization/environment relationship into two broad categories: one, 'the degree of interaction between the organization and the environment,' and two, 'the level of objectivity and the subjectivity in describing the environment.' As offshoots of these broad classifications, the authors describe three dimensions of organizational task environments.

These include:

- **Environmental munificence** - which includes sustained growth, competitive position in a given market, and levels of profitability

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Environmental Dynamism - which includes organizational/environmental uncertainty, unpredictability in determining environmental changes, and the degree of dependencies between organization.

Environmental Complexity - which involves the effect of complex environments on information processing, the level of an organization’s expansion strategy, and the extent of concentration and dispersion in the environment.

As background, the authors use five munificence variables - sales, price-cost margin, total employment, value-added, and the number of establishments to establish this construct. Five complexity variables - specialization, geographic concentrations related to sales, value add, total employment, and the number of facilities establish this construct. Five dynamism variables - sales, price-cost margin, total employment, value-added, and intermediate market orientation establish this construct (16).

ACA has accelerated hospital-physician integration (480 MSSP ACOs as of January 2017), certainly as a competitive mechanism to acquire necessary and needed resources. ACA propelled financial incentives, or penalties are a force multiplier urging this momentum towards formally integrated healthcare delivery structures. The move from fee for service to value-based care should incentivize providers, with a combination of penalties and shared savings, to measurably improve health outcomes for their patients. Resource dependence theory offers a useful foundation for studying the relative efficacy of provider driven integrating arrangements.

17 CMS Shared Savings Program. Retrieved April 9, 2017, from https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/sharedsavingsprogram/
Yeager et al. (10) conduct a systematic review of resource dependence theory and its use in measuring the environment in healthcare organizational studies. After a systematic search, a total of 20 articles are included in the review - 13 studies focus on hospitals, five articles concentrate on long-term care facilities (LTCs), and one each in medical practices and public health. There were no studies on accountable care organizations. In studies where resource dependence theory is explicitly the theoretical framework, the dependent variables include service delivery innovation, referrals to home health agencies, hospital alliance or contract management, total quality management adoption, participation in managed care, change in cost per discharge and changing mix of services offered, electronic health record adoption, availability of subacute care services, hospital efficiency, and type of health information technology strategy implemented. Munificence is activated by rural location, per capita income, physician mix, total population, and the unemployment rate (10). The proportion of Medicaid costs usually activates dynamism, along with the percentage of total county population enrolled in HMOs, changes in the level of unemployment, Medicare share, and the number of managed care contracts (10). Herfindahl Index usually activates Complexity, along with excess capacity, and HMO penetration (10).

In conclusion, not one study focuses on cost and quality outcomes attributable to accountable care organizations using a resource dependence theory perspective, which highlights the significant gap, and strengthens the argument that fundamental research in this area is necessary.
Structural Hurdles and Challenges in Hospital Reorganization Process

ACOs in practice may face many organizational, environmental and policy hurdles. The growth in ACOs and the accompanying integrating arrangements leads to examining the effectiveness, if any, of these arrangements.

Marmor and Oberlander (19) explain the progression of US health policy from “HMOs, PPOs, managed care, capitation, integrated delivery networks, health saving accounts and consumer-directed care, pay for performance, HIT and comparative effectiveness research to now bundled payments, value-based purchasing, patient-centered medical homes, and ACOs as solutions du jour propelled forward by the 2010 ACA”. They suggest that ACOs will have difficulty meeting current expectations. Furthering this argument is CMS’ meager savings estimate of $470 million between 2012-2015 from Medicare Shared Savings Program (MSSP) Accountable Care Organizations.

The study argues that a recent review by the Congressional Budget Office\(^\text{18}\) (CBO) finds that the current strategies and tactics around care coordination, chronic care management, and value-based payments will not reduce Medicare spending. These evaluations suggest that the effort surrounding ACOs is inadequate (19).

The authors argue that the policy intent of the ACA will suffer from on the ground implementation issues with structural or political constraints in the provider space. The

authors argue that the incentives to create ACOs will drive consolidation to the point where healthcare spending increases.\textsuperscript{19}

Burns and Pauly (20) postulate that Accountable Care Organizations may experience failures analogous to failures of IDNs in the 1990s. ACOs propose to improve quality, and lower cost of healthcare via mechanisms such as "disease management, care coordination, and aligning financial incentives for hospitals and physicians." Several of these mechanisms emulate the structure of IDNs formed by providers in the 1990s (20). IDNs failed due to several factors: 'one, financial losses arising from buying physician networks, two, failing to align incentives, and three, failing to manage risk.' ACOs are facing similar issues in implementing care coordination and supporting IT systems. Compounding these risks is the shortage of primary care providers who will support these initiatives (20). The authors suggest that success may depend on targeting specific populations where immediate gains can be made, such as individuals with acute and chronic conditions, and uncontrolled comorbidities.\textsuperscript{20}

James Robinson (21) provides an empirical analysis of cost shift vs. Medicare Payment Advisory Commission (MedPAC) viewpoints by examining data on hospital margins for Medicare and private insurance in competitive and concentrated hospital markets. The study explains how hospitals may respond to Medicare payment shortfalls because of ACA coverage expansion. As background, ACA coverage expansion is financed in part by reducing


\textsuperscript{20} Lawton Burns and Mark Pauly. Accountable Care Organizations May Have Difficulty Avoiding The Failures Of Integrated Delivery Networks of the 1990s. Health Affairs, 31, no 11 (2012):2407-2416
Medicare payment to hospitals, and this results in hospitals which operate in a multi-payer environment increasing prices to private insurers (cost shifting) (21). The authors argue that Medicare payments shortfalls lead to negative margins on Medicare-insured patients. These negative margins make an appealing case that Medicare is partially responsible for higher prices passed on to private insurers. In summary, the authors argue that hospitals must choose between revenue enhancements vs. cost reduction. As background, they offer that implicit in cost shift perspective is that hospitals have available bargaining power with private insurers. When hospitals experience a shortfall in Medicare reimbursements, they raise prices to private insurers because hospitals have some degree of market power (22). In the cost-shift perspective - *cost drives price, prices do not drive cost*. The MedPAC perspective changes the direction of causality: “high prices charged to private insurers result in high hospital costs which lead to negative Medicare margins.” The differentiator is the role of market structure in influencing hospital margins. The study empirically shows hospitals in concentrated markets raise prices to private insurers, while hospitals in competitive markets focus on cost-cutting when managing Medicare payment deficits.21

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STUDY OUTLINE

Using publicly available performance year 2012 - 2014 MSSP ACO data, 2016 HRSA’s Area Resource file, and CMS’ geographic variation public use file, this research examines MSSP ACOs performance through the lens of munificence, dynamism, and competition to determine the marginal effect of ACOs on health services utilization and prevention quality indicators. The model also examines a States choice for Medicaid expansion on MSSP ACO performance.

CHAPTER STRUCTURE

The following chapters are organized as follows.

Chapter 2: Literature Review

This systematic review aims to examine studies which inform utilization, cost, and quality of care trends, either empirically observed or hypothesized, within the Accountable Care Organization framework. The research also seeks to examine relationships, if any, between cost and utilization trends in ACOs and the inherent uncertainty within these environments. Finally, resource dependence, where discussed in these studies, is examined as a theoretical construct which may inform future research. This research will identify gaps in the current literature on cost, access, quality of care, and utilization within the ACO framework, and suggest a research agenda which includes the key hypotheses and supporting theoretical framework.
Data Sources and Searches

A bibliographic search on PubMed is employed to arrive at a complete set of studies which focus on healthcare cost, access, quality, and utilization within the ACO framework.

The keyword search used in PubMed include - “Accountable Care Organization” or "Accountable Care Organizations" and "payment models" or "cost" or "health care utilization" or "Medicare shared savings program" or "resource based theory" or "uncertainty" or "patient access" or "quality of care".

The search resulted in a total of 556 articles.

Selection of Studies

Since the first ACO formed in spring of 2012, the search filters on articles published from January 1, 2013, to present. This filter results in a total of 366 studies. The review includes all 366.

As ACO structures are relatively new to the healthcare landscape, and their results on cost, quality, access, and utilization still in nascent stages, this review carefully examines studies which contribute empirically and meaningfully to current literature.

The first level of the review focuses on empirical research and results in discarding 249 studies which were not empirical in nature. An additional 72 studies are not relevant to the topic and discarded. This culling results in a total of 45 studies. In all cases, the abstract review is thorough; in numerous cases where abstracts are not sufficient (or not available) in gleaning adequate information in the article, the full article text is used to make the inclusion assessment.
Chapter 3: Theoretical Model and Research Hypothesis

The chapter begins with the historical and theoretical foundation of resource dependence, relying on Pfeffer and Salancik’s seminal work which describes - resources, constraints, and power as components of an organization’s environment. The framework is extended by first, a discussion of the central issues surrounding resource dependence, and second, the application of resource dependence in health services research.

Finally, resource dependence rests as the theoretical foundation for modeling Accountable Care Organizations. The framework includes a conceptual model for quantitative research and articulated research hypothesis.

In each successive domain extending from a macro view of resource dependence to its application in modeling Accountable Care Organizations, seminal research and their hypotheses are presented, and discussed as a mechanism for explicitly extending knowledge and applicability of RDT to this research.

Chapter 4: Methods and Material

The methodology chapter outlines and details the research design, data sources, identification and measurement of variables, and the analytical approaches that address the research questions and hypotheses.

Using publicly available performance year 2012 - 2014 MSSP ACO data, 2016 HRSA’s Area Resource file, and CMS’ geographic variation public use file, this research examines MSSP ACOs performance through the lens of munificence, dynamism, and competition to
determine the marginal effect of ACOs on health services utilization and prevention quality indicators. The model also examines a States choice for Medicaid expansion on MSSP ACO performance.

The stated hypothesis is tested via a set of Difference in Differences equations. Difference in Differences controls for trends in the treatment group by comparing these with trends with a comparison group. The main advantages of Difference in Differences are that we can find the counterfactual for any treatment group given a suitable comparison group, and it is an ideal technique for examining state-level policy changes. Difference in differences relaxes the assumption that the pre-and post-periods are the same (impact of time is constant across groups), the treatment and comparison groups are the same (impact of the group is constant across time), and the groups have parallel trends in outcomes (22). Instead, Difference in Differences uses changes in the comparison group as the counterfactual for variations in the treatment group.\textsuperscript{22} Difference in Differences design estimates the impact of a program by examining ‘differences in baseline means’ between the treatment group and the comparison group (23). That is, \textit{does the treatment group differs from its baseline mean by a greater or lesser amount than the comparison group?}\textsuperscript{23} The foremost identifying assumption in Difference in Differences is as follows: \textit{The Treatment group and Comparison group have similar trends over time in the absence of the program (treatment)}.

\textsuperscript{22} Charles Stoeker. Policy Analysis with Panel Data. Tulane University School of Public Health, September 2014

This assumption introduces considerable concern regarding the influence of time-varying factors. Mitigating these concerns the analysis includes time varying controls variables in the munificence, dynamism, and competition constructs. These time varying controls also aid in more precise standard errors. State fixed effects, which control for the averages differences across States in observables and unobservable predictors, and Year fixed effects, which control for average differences over time that are common to all State, are part of the structured equation. The analysis also tests the common trends assumptions and examines treatment effect dynamics.

Chapter 5: Results

The results chapter builds on the framework developed in chapter 4 and enumerates the analyses of the previously proposed methodology. Using publicly available data sources, which include MSSP ACO data files, the 2016 HRSA Area Resource File, and CMS’ geographic variation public use file, the results highlight the effect of MSSP ACOs on health services utilization and prevention quality indicators through the lens of munificence, dynamism, and competition. The results also illustrate a state’s choice for Medicaid expansion on MSSP ACO performance.

In order to test the hypothesis 1 and hypotheses 2, the analysis utilizes the generalized difference-in-differences to estimate:

\[Y_{st} = \alpha_0 + \beta_1 \text{ Percent ACO Medicare Market}_{st} + \alpha s + \delta t + \gamma \text{ RDT Var}_{st} + \epsilon_{st}\]

Where:

\[Y_{st} = \]
- Total acute care readmissions (all-cause 30 day) - (Rate)
- Total (inpatient or hospital outpatient) emergency department visits per 1000
- Total number of admissions for congestive heart failure (CHF) per 100,000
- Total number of admissions for bacterial pneumonia per 100,000

$\alpha_s =$ Set of state indicators

$\delta_t =$ Set of year indicators

RDT variables = Munificence, Dynamism and Competition variables (Number of physicians per capita, Number of specialists per capita, Income per capita, Percentage of Poverty, Unemployment rate, and HHI)

To test the hypothesis 3 and hypotheses 4, we estimate:

$$Y_{st} = \alpha_0 + \beta_1 \text{ Percent ACO Medicare Market}_{st} + \beta_2 \text{ Percent ACO Medicare Market}_{st} \times \text{Expanded}_{st} + \beta_3 \text{ Expanded}_{st} + \alpha_s + \delta_t + Y \text{ RDT Var}_{st} + \varepsilon_{st}$$

Where:

$Y_{st} =$ variables as defined above

- Total acute care readmissions (all-cause 30 day) - (Rate)
- Total (inpatient or hospital outpatient) emergency department visits per 1000
- Total number of admissions for congestive heart failure (CHF) per 100,000
- Total number of admissions for bacterial pneumonia per 100,000

$\alpha_s =$ Set of state indicators

$\delta_t =$ Set of year indicators

The results include several robustness checks and an analysis of pre-trends and treatment effect dynamics.
Chapter 6: Discussion

This chapter describes the results of hypothesis testing enumerated in chapter 5, including an examination of MSSP ACO performance, and a detailed review of resource dependence constructs and supporting variables. A discussion of implications for Accountable Care Organizations, including the potential impact of the evolving financial framework between patients, payers, and providers follows, accompanied by a review of Medicaid expansion and its implications. Lastly, limitations, contribution to the literature, and areas of future research are enumerated and suggested.
REFERENCES (CHAPTER 1)


17. CMS Shared Savings Program. Retrieved April 9, 2017, from https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/sharedsavingsprogram/


CHAPTER 2: LITERATURE REVIEW

BACKGROUND

As part of the Affordable Care Act (ACA) charter, Accountable Care Organizations (ACOs) are an integrated network of healthcare providers with formalized care management and care coordination between participating providers and health systems. A key mandate for ACOs is to develop strategies and interventions to mitigate health disparities through the management of chronic conditions in the most clinically appropriate and cost-effective care settings.

The ACA creates the hospital readmissions reduction program and requires CMS reduce payments for disproportionate 30-day readmissions using a readmissions payments adjustment factor. For Medicare beneficiaries, the 30-day readmission includes risk-standardized all condition readmissions (ACO measure #8), 30-day unplanned readmissions for AMI, heart failure, pneumonia, COPD, Hip/Knee Replacement and Coronary artery bypass graft surgery (1).

Hospitalizations for preventable 30-day readmissions serve as a measure of the effectiveness of care transitions and coordination based interventions and access to the most clinically appropriate and cost-efficient care setting. Studies have shown 30-day

1 CMS Readmissions Reduction Program (HRRP). Retrieved April 9, 2017, from http://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/Readmissions-Reduction-Program.html

readmissions are frequently related to care quality or management of care transitions or missed episodes of care (2). As a quality measure, 30-day readmissions represent a critical area of process and clinical improvement.\(^3\) The ACO structure demands healthcare management in the most appropriate clinical and cost-effective care setting. Therefore, disproportionately high readmission rates serve as a proxy measure for health care access, and management of complex health conditions leading to avoidable readmissions.

Similarly, regarding ACO impact on system-wide cost, the total per member per month cost and total per member per month cost for high-risk patients\(^4\) can serve as core cost measures in evaluating any efficiencies gained by ACO participation.

**OBJECTIVE**

Understanding of the current state of literature is vital given the expectation on Accountable Care Organizations to create a model care design focused on cost efficiencies and improved clinical outcomes. The aim of this review to discover areas where ACOs have achieved measurable success, but also outline gaps in the current understanding of how this model can be more efficient.

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In theory, ACOs may benefit from economies of scale. As an example, increased leverage with payers via an increase in market power. The prevalence of ACO and similar provider integration arrangements leads to a natural inquiry of these delivery systems.\(^5\)

This systematic review aims to examine studies which inform utilization, cost, and quality of care trends, either empirically observed or hypothesized, within the Accountable Care Organization framework. The research also seeks to examine relationships, if any, between cost and utilization trends in ACOs and the inherent uncertainty within these environments. Finally, resource dependence, where discussed in these studies, is examined as a theoretical construct which may inform future research. This review will identify gaps in the current literature on cost, access, quality of care, and utilization within the ACO framework, and suggest a research agenda which includes the key hypotheses and supporting theoretical framework.

**STUDY DATA AND METHODS**

**Data Sources and Searches**

A bibliographic search on PubMed is employed to arrive at a complete set of studies which focus on healthcare cost, access, quality, and utilization within the ACO framework.

The keyword search used in PubMed include - “Accountable Care Organization” or “Accountable Care Organizations” and "payment models" or "cost" or "health care

utilization" or "Medicare shared savings program" or "resource based theory" or
"uncertainty" or "patient access" or "quality of care".

The search results in a total of 556 articles.

Selection of Studies

Since the first ACO formed in spring of 2012, the search filters on articles published from
January 1, 2013, to present. This filter results in a total of 366 studies. The review includes
all 366.

As ACO structures are new to the healthcare landscape, and their results on cost, quality,
access, and utilization still in nascent stages, this review carefully examines studies which
contribute empirically and meaningfully to current knowledge.

The first level of the review focuses on empirical research and results in discarding 249
studies which are not empirical in nature. An additional 72 studies are not relevant to the
topic and are discarded. This culling results in a total of 45 studies. In all cases, the abstract
review is thorough; in numerous cases where abstracts are not sufficient (or not available)
in gleaning adequate information in the article, the full article text is used to make the
inclusion assessment.
DISCUSSION

Discussion includes a summary of the main findings from the current literature on cost, quality and healthcare utilization within the ACO framework. This systematic review will note theoretical constructs employed in current literature, as a means of informing and guiding future research. Key variables and their operationalization in informing cost, quality or utilization constructs will be examined for soundness and use in future studies. Finally, this systematic review will elucidate gaps in the current literature examining healthcare cost, quality, access, and utilization trends within ACO structures.

DATA EXTRACTION AND SYNTHESIS

A standardized abstraction criterion is used to analyze the studies included in this review. The abstraction criteria focus on common and emergent themes across the studies, along with the frequency of themes. Finding are linked to the relative effectiveness of Accountable Care Organizations across cost, quality of care, and utilization domains. Lastly, aggregations of these findings complete this review.

LIMITATIONS

This review has several limitations. First, this review does not include studies on Accountable Care Organizations published before January 1, 2013. However, as noted above, because the first pioneer Accountable Care Organizations came into existence in the
spring of 2012, it is safe to assume that little empirical research on ACO effectiveness occurred before 2013.

A review of research articles published before January 1, 2013, focused more on generic versions of integrated delivery networks, while this review focuses exclusively on ACOs as manifestations of the 2010 Patient Protection and Affordable Care Act. Articles published prior to January 1, 2013, do not account for the observed associations between these healthcare delivery structures and their impact on cost, quality of care, and health services utilization as a direct manifestation of federal policy and statute driven mandates.

Second, this review does not include studies on ACO evaluations conducted by industry stakeholders, government and other interested entities not included in peer-reviewed literature. More comprehensive analyses of agencies conducting ACO evaluations will certainly complement the findings of this review.

Third, while this review focuses on articles published in peer-reviewed literature, research on ACOs is being conducted in a much larger ecosystem. This research acknowledges that there are potentially important evaluations which may offer substantial value to informing ACO effectiveness but fail to meet the criteria of the present review.
Figure 1: Steps to Identify Articles

STEP 1: PubMed Keyword Search
"Accountable Care Organization" or "Accountable Care Organizations" and ("payment models" or "cost" or "health care utilization" or "medicare shared savings program" or "resource based theory" or "uncertainty" or "patient access" or "quality of care"); Filter: 1.1.2013 – 7.25.2016: 366

All relevant, English-language, peer-reviewed papers were considered for inclusion. N = 366

Step 2: Rejected after Step 1: Not an empirical study (N = 249)
N = 117 included for further review after Step 1

STEP 3: Rejected after Step 2:
Not relevant to the topic under review after reviewing abstract (N = 72)

N = 45 papers identified for consideration following Steps 1, 2 and 3

Additional Rejected (N = 0)
Additional Included (N = 0)

A total of 45 articles are included in this review
STUDY RESULTS

Table 1 summarizes the research setting, key design elements, methodological approach, and operationalization of ACO concepts. The studies in majority examined either physician group practices as a proxy for ACOs or ACOs at either aggregate level or individual hospital or multispecialty level.

Seven studies focus on ACO beneficiaries or likely ACO beneficiaries as a unit of analysis. Anderson et al. (2014), focus on 3.1 million Medicare beneficiaries; McWilliams et al. (2014), rely on a random 20% sample of beneficiaries attributed to 145 ACOs; McWilliams et al. (2013), focus on elderly fee-for-service Medicare beneficiaries in Massachusetts; Friedberg et al. (2013), focus on patients attributable to PCPs based on office visits, but not part of the medical home practice; Ayanian et al. (2013), focus on Medicare HMO traditional Medicare beneficiaries; McWilliams, Chernew et al. (2013) concentrate on a random sample of traditional fee-for-service Medicare beneficiaries; and Miller et al. (2013) focus on a cohort of patients undergoing selected inpatient surgeries within integrated delivery systems matched with patients in non-integrated delivery systems.

Liu and Wu (2014), suggest a predictive analytics model for simulation study of ACO patients. Busch et al. (2016) examine MSSP, and Pioneer ACO contracts for mental health beneficiaries, Colla et al. (2016) focus on a subset of Medicare beneficiaries, McWilliams et al. (2016) and McWilliams et al. (2015) focus on beneficiaries attributed to Pioneer ACOs.

Regarding research design, 25 studies (nearly 56% of the sample) employ a more rigorous quasi-experimental design, where a control group is used to mitigate threats to internal and
external validity. The most common quasi-experimental design is a pre-post statistical comparison. Other designs include near equal dispersion of pre-post statistical comparison with no control, cross-sectional data analysis, descriptive analysis, difference in differences and comparative case studies. In a proposed study, Dorr et al. (2015), uses cluster randomized controlled trial as the suggested research design.

Most of the studies utilize secondary data in the analysis. These include practice level data, provider level data, claims data, Medicare beneficiary data, a national survey of ACOs survey instrument, commercial health plan data, American Hospital Association (AHA) data, ACO-level data and Health Information and Management Systems Society (HIMSS) data. While the majority of the studies use quantitative analysis, four studies utilize mixed methods in the form of combining secondary data with semi-structured, in-depth interviews (Dorr et al., 2015; Lewis et al., 2014; Hacker et al. 2014; and Spencer, 2014), and two of the studies in the sample are purely qualitative utilizing semi-structured and unstructured interviews and observations (Addicott and Shortell, 2014; Muhlestein et al., 2013).

The 45 studies included in the sample essentially meet the criteria of ACO research in the way they operationalize the ACO concept. In the sample of 45 studies, the most common study outcomes focus on quality process indicators, utilization and cost analyses (as examples - Greene et al., 2015; Kelleher et al., 2015; Kralewski et al., 2015; Pope et al., 2014; Colla et al., 2013; Anderson et al., 2014; Spencer, 2014; Chukmaitov et al., 2015; Nambudiri et al., 2013; Ayanian et al., 2013; and Miller et al., 2013). Patient safety (this can serve as a proxy for quality of care) along with health information technology and comorbid load are discussed by Greisbach et al. (2015), and Rittenhouse et al. (2015). In a proposed cluster randomized
controlled trial, Dorr et al. (2015), suggest focused practice facilitation and targeted incentives as outcomes of interest. The remaining studies in the sample operationalize process optimization, provider and services integration, payment models, the stability of patient assignment, the economic impact of focused clinical interventions, shared services contracts, and market and demographic factors associated with ACOs. Interestingly, seven of the studies in our sample focus on per beneficiary spending and spending by service and type of service (as examples - McWilliams et al., 2013; McWilliams, Chernew et al., 2013). Not surprisingly, only one study in our sample utilizes a theoretical framework, however, this framework is weakly developed.

<table>
<thead>
<tr>
<th>Study</th>
<th>Research setting</th>
<th>Research design</th>
<th>Type(s) of data included in study</th>
<th>Operationalization of ACO concept</th>
<th>Theoretical framework used</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Greisbach et al. (2015)</td>
<td>Multi-specialty physician group practice in WI</td>
<td>Pre-post statistical comparison</td>
<td>Secondary: Internal (Drug safety communication and patient records)</td>
<td>Patient safety and Health Information Technology</td>
</tr>
<tr>
<td>3</td>
<td>Rittenhouse et al. (2015)</td>
<td>Level II trauma center part of an ACO</td>
<td>Cross-sectional data analysis</td>
<td>Secondary: Internal (All trauma admissions of patients 65 and older)</td>
<td>Patient safety and comorbid load</td>
</tr>
<tr>
<td>4</td>
<td>Kelleher et al. (2015)</td>
<td>Pediatric ACO serving an Ohio Medicaid population</td>
<td>Quasi Experimental: Longitudinal data analysis</td>
<td>Secondary: Internal (claims data)</td>
<td>Four quality measures and cost analysis</td>
</tr>
<tr>
<td>5</td>
<td>Dorr et al. (2015)</td>
<td>Multiple primary care clinics</td>
<td>Cluster randomized control trial</td>
<td>Primary: Stakeholder interviews; Focused practice facilitation,</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Authors</td>
<td>Setting</td>
<td>Study Design</td>
<td>Secondary:</td>
<td>None</td>
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<tr>
<td>6</td>
<td>Brummel et al. (2014)</td>
<td>A Pioneer ACO multi-location pharmacy</td>
<td>Quasi-experimental: Observational Study</td>
<td>Secondary: (All payer claims database, CG-CAHPS surveys, Clinician staff questionnaire (CQS), Team Development Measure (TDM), Collaborative Practice Assessment Tool (CPAT))</td>
<td>targeted incentives and HIT enabled quality improvement</td>
</tr>
<tr>
<td>7</td>
<td>Lewis et al. (2014)</td>
<td>All ACOs as of 8/2013 Cross-sectional data analysis</td>
<td>Primary: Survey data on contracts, organizational structure, providers, and infrastructure; plus, semi-structured, in-depth phone interviews</td>
<td>Process optimization (Medication Management), cost and quality implications</td>
<td>None</td>
</tr>
<tr>
<td>8</td>
<td>Kralewski et al. (2015)</td>
<td>Medical group practices Cross-sectional data analysis</td>
<td>Secondary: 2009 national survey of 211 GPs linked to medicare claims data of attributed beneficiaries</td>
<td>Utilization and Cost, Quality of Care</td>
<td>None</td>
</tr>
<tr>
<td>10</td>
<td>Colla et al. (2013)</td>
<td>Physician group practice demonstration Quasi-experimental: Pre-post statistical comparison</td>
<td>Secondary: medicare fee for service claims data</td>
<td>Cost, Crude quality measures</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Author(s)</td>
<td>Sample/Methodology</td>
<td>Data Analysis &amp; Finding</td>
<td>Model/Methodology/Findings</td>
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</tr>
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</tr>
<tr>
<td>11</td>
<td>Anderson et al. (2014)</td>
<td>3.1 M Medicare beneficiaries with CVD or Diabetes and linked provider group</td>
<td>Cross-sectional data analysis</td>
<td>Secondary: Medicare claims data</td>
<td>None</td>
</tr>
<tr>
<td>12</td>
<td>Loving et al. (2014)</td>
<td>A fee for service health system and a bundled payment system</td>
<td>Monte Carlo simulation model</td>
<td>Fee for Service, Bundled Payments</td>
<td>None</td>
</tr>
<tr>
<td>13</td>
<td>Hacker et al. (2014)</td>
<td>A public integrated delivery system in MA</td>
<td>Descriptive Analysis</td>
<td>Mixed Methods: Interviews, document review, cost/quality/utilization data</td>
<td>None</td>
</tr>
<tr>
<td>14</td>
<td>Bartlett and Siola (2014)</td>
<td>A small community hospital affiliated with an ACO</td>
<td>Pre-post statistical comparison, no control</td>
<td>Primary: Acquisition cost and defined daily doses data</td>
<td>None</td>
</tr>
<tr>
<td>15</td>
<td>McWilliams et al. (2014)</td>
<td>Random 20% sample of beneficiaries attributed to 145 ACOs</td>
<td>Cross-sectional data analysis</td>
<td>Secondary: 2010-2011 Medicare claims and rosters of physicians participating in ACOs</td>
<td>None</td>
</tr>
<tr>
<td>16</td>
<td>Liu and Wu (2014)</td>
<td>Modeling settings of the simulation study of ACO CHF patients</td>
<td>Model to provide predictive analytics for ACOs (an agent-based simulation model)</td>
<td>Secondary: Derived from literature and include CHF survival curve, CHF transition probabilities, healthcare costs Preventable Hospitalization (Utilization) and Payment Model</td>
<td>Agent-based model (developed)</td>
</tr>
<tr>
<td>17</td>
<td>Spencer (2014)</td>
<td>A multi-specialty physician group practice</td>
<td>Descriptive Analysis: Case Study</td>
<td>Primary: Physician Interviews/Observations, data on quality measures, EHR data</td>
<td>Utilization and cost of care</td>
</tr>
<tr>
<td>18</td>
<td>Chukmaitov et al. (2015)</td>
<td>All short-term general hospitals in Florida</td>
<td>Panel study design</td>
<td>Secondary: Panel data of inpatient hospital discharge, vital stats, AHA, HIMSS</td>
<td>Contingency Theory</td>
</tr>
<tr>
<td></td>
<td>Author(s)</td>
<td>Study Type</td>
<td>Case Setting</td>
<td>Data Sources</td>
<td>Study Design</td>
</tr>
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<tr>
<td>19</td>
<td>Epstein et al. (2014)</td>
<td>Quasi-experimental</td>
<td>Observational Study</td>
<td>Medicare characteristics, Program ACOs</td>
<td>Secondary: Medicare claims and enrollment data; AHA data</td>
</tr>
<tr>
<td>20</td>
<td>Addicott and Shortell (2014)</td>
<td>Descriptive</td>
<td>Case Study</td>
<td>AHA data Quality metrics</td>
<td>Secondary: 34 semi-structured interviews, 22 hours of observations, documentary materials from each ACO</td>
</tr>
<tr>
<td>21</td>
<td>Dubois et al. (2014)</td>
<td>Descriptive</td>
<td>Case Study</td>
<td>National Survey of ACOs survey instrument, modified by authors</td>
<td>National Survey of ACOs</td>
</tr>
<tr>
<td>22</td>
<td>McWilliams et al. (2013)</td>
<td>Quasi-experimental</td>
<td>Pre-post study design</td>
<td>Medicare beneficiaries in MA</td>
<td>Secondary: Medicare enrollment and claims data for all beneficiaries in MA</td>
</tr>
<tr>
<td>23</td>
<td>Nambudiri et al. (2013)</td>
<td>Descriptive</td>
<td>Case study</td>
<td>MGH 2011 data on volume, billing/coding, provider prescribing behavior; Hospital pharmacy data</td>
<td>Secondary: MGH 2011</td>
</tr>
<tr>
<td>24</td>
<td>Friedberg et al. (2013)</td>
<td>Quasi-experimental</td>
<td>Cross-sectional data analysis</td>
<td>Patients attributable to PCPs based on office visits, but not part of a medical home practice</td>
<td>Secondary: Commercial Health Plan data</td>
</tr>
<tr>
<td>25</td>
<td>Lewis et al. (2013)</td>
<td>Cross-sectional data analysis</td>
<td>Cross-sectional data analysis</td>
<td>All ACOs in the US as of August 2012</td>
<td>Secondary: ACOs identified from multiple sources, 2010 American</td>
</tr>
<tr>
<td></td>
<td>Auerbach et al. (2013)</td>
<td>116 MSSP ACOs and 32 Pioneer ACOs in 2012; 77 private-sector ACO-like entities as controls</td>
<td>Quasi-experimental: Observational Study</td>
<td>Community Survey, 2010 Medicare FFS data</td>
<td>Regional factors associated with ACO formation</td>
</tr>
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<td>------------------------</td>
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</tr>
<tr>
<td>26</td>
<td>Muhlestein et al. (2013)</td>
<td>57 ACOs</td>
<td>Descriptive analysis</td>
<td>Structured interviews with 45 hospital-led ACOs and 12 physicians group-led ACOs (results are limited to 38 operational ACOs as of June 2012)</td>
<td>Fee for service and risk based contracts</td>
</tr>
<tr>
<td>28</td>
<td>McWilliams, Chernew et. al (2013)</td>
<td>Random sample of traditional FFS Medicare beneficiaries</td>
<td>Quasi-experimental: pre-post study design</td>
<td>Secondary: Medicare enrollment and claims data; AMA group practice file</td>
<td>Per beneficiary spending, utilization, and quality of care measures</td>
</tr>
<tr>
<td></td>
<td>Study</td>
<td>Design Type</td>
<td>Primary Data Source</td>
<td>Analysis Type</td>
<td>Outcome Measures</td>
</tr>
<tr>
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<td>----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>30</td>
<td>Lewis et al. (2013)</td>
<td>Simulated ACOs</td>
<td>Longitudinal Claims</td>
<td>Secondary</td>
<td>Attributing patient populations to ACOs - prospective vs. performance year</td>
</tr>
<tr>
<td>31</td>
<td>Miller et al. (2013)</td>
<td>Cohort of patients</td>
<td>Observational study</td>
<td>Secondary</td>
<td>Quality of care and episode payments (cost)</td>
</tr>
<tr>
<td>32</td>
<td>Muhlestein et al. (2016)</td>
<td>Hospital ACOs</td>
<td>Descriptive Analysis</td>
<td>Secondary</td>
<td>Value Based Purchasing, HRRP, HAC</td>
</tr>
<tr>
<td>33</td>
<td>Busch et al. (2016)</td>
<td>MSSP and Pioneer ACO contracts for mental health beneficiaries</td>
<td>Quasi-experimental: Difference in Differences</td>
<td>Secondary: Medicare claims 2008-2013</td>
<td>Per beneficiary spending, utilization, and quality of care measures</td>
</tr>
<tr>
<td>34</td>
<td>Han et al. (2016)</td>
<td>Single Urban ACO</td>
<td>Quasi-experimental</td>
<td>Secondary: ACO Claims</td>
<td>Per beneficiary spending</td>
</tr>
<tr>
<td>35</td>
<td>Colla et al. (2016)</td>
<td>Subset of Medicare beneficiaries</td>
<td>Quasi-experimental: Difference in Differences</td>
<td>Secondary: random sampling of Medicare FFS</td>
<td>Per beneficiary spending, and utilization</td>
</tr>
<tr>
<td>36</td>
<td>McWilliams et al. (2016)</td>
<td>2012-2013 ACO cohort</td>
<td>Quasi-experimental</td>
<td>Secondary: Medicare claims 2009-2013</td>
<td>Per beneficiary spending</td>
</tr>
<tr>
<td>37</td>
<td>Herrel et al. (2016)</td>
<td>106 ACO hospitals and 2561 control hospitals</td>
<td>Quasi-experimental: Difference in Differences</td>
<td>Secondary: Medicare beneficiaries &gt; 65 undergoing major surgery</td>
<td>Utilization and quality of care measures</td>
</tr>
<tr>
<td>38</td>
<td>Heisey-Grove D, Patel V. (2016)</td>
<td>Nationally representative cohort of physicians</td>
<td>Quasi-experimental</td>
<td>Primary: survey of physician cohort</td>
<td>Health IT usage and participation in payment reform programs</td>
</tr>
<tr>
<td>40</td>
<td>Christensen EW, Payne NR. (2016)</td>
<td>One Children’s Hospital part of ACO</td>
<td>Quasi-experimental</td>
<td>Secondary: Medicaid claims for</td>
<td>Utilization – Readmissions</td>
</tr>
</tbody>
</table>
The analysis groups study outcomes into eight categories based on the results of the reviewed study sample. Common themes emerging from the amalgamation of studies included in the review are as follows:

1. Quality of care
2. ED utilization
3. Hospital utilization
4. Effect of market and demographic factors on study outcomes
5. Cost and spending (either per patient or system-level)
6. Payment models (fee-for-service, capitated models, bundled payments) related to improved outcomes or the ability to manage financial risk
7. Linkages among health care providers related to improved outcomes, and
8. health information technology related to improved outcomes.

The analysis includes an “other” category to capture categories which did not fit into those above. These eight categories are also commonly referenced in ACO literature as elements related to cost, quality of care, and population health improvements within the ACO framework.

Table 2 represents statistical relationships between ACO components and the outcomes across the 45 studies in the review. Regarding various measures related to the quality of care, seven studies find mixed results, where some aspects of quality are positively associated (improvement in outcome), whereas others have a negative association (decrease in outcome). Ten studies in the review find a positive association with components of quality of care, while eight studies find no difference in the quality of care outcomes under consideration.

Regarding utilization, three studies find no difference in ED utilization, while six studies find no difference in hospital utilization. The results are slightly better regarding hospital utilization - here eight studies find a positive association with ACO components.

Demographic factors which relate to outcomes show a positive association in one of the studies, no difference in another, and mixed results in a third study.

The cost of spending as an outcome shows the most consistent improvement, albeit still with mixed results - here fourteen studies find a positive association, three studies find mixed results, and seven studies show no difference in the outcome.
Results around payment models, improved outcomes and ACO ability to manage financial risk are similarly mixed - here four studies find no difference in outcome, two studies show a positive association, and one study finds mixed results. Two studies in our review show no difference in outcomes related to linkages among health care providers; however, one study shows a positive association and another a negative association.

Similarly, two studies show mixed results about health information technology and improved outcomes, while two studies show a positive association.

Lastly, in the “other” category, Dorr et al. (2015) suggest a study protocol which includes a cluster randomized controlled trial to test elements related to improved quality, utilization, and patient experience. Hacker et al. (2014) find a positive association between ACO elements and access to care, and patient experience. McWilliams et al. (2014) find no difference as it relates to the stability of patient assignment and ACO elements. Nambudiri et al. (2013) identify strategies for cost reduction and effective care based on baseline data. One of the elements they consider is patient/provider/ACO goal alignment. Further synthesis of the findings is noted as a footnote to Table 2.
<table>
<thead>
<tr>
<th>Study / Themes</th>
<th>QoC</th>
<th>ED Util.</th>
<th>Hospital Util.</th>
<th>Market &amp; Demo. factors</th>
<th>Cost and Spend</th>
<th>Payment Model related to Improved Outcomes</th>
<th>Ability to manage financial risk</th>
<th>Linkages among healthcare providers related to Improved Outcomes</th>
<th>IT related to Improved Outcomes</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greene et al. (2015)</td>
<td>ND (1)</td>
<td>+ (2)</td>
<td>ND (3)</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>+ (2)</td>
<td></td>
</tr>
<tr>
<td>Greisbach et al. (2015)</td>
<td>ND</td>
<td>+ (2)</td>
<td>ND</td>
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**Note:**

ACO = Accountable Care Organizations  
ND = No significant change found in outcome associated with aspects of Accountable Care Organizations  
‘+’ = Improvement in outcome related to aspects of Accountable Care Organizations  
‘-’ = decrease in outcome associated with aspects of Accountable Care Organizations  
1 = Vascular care, Diabetes Care, and Cancer Screening used for quality measures  
2 = Quality of Care is measured in prevented adverse drug events, HIT was a positively associated enabler  
3 = Study period was pre-ACO designation and identified factors to reduce readmissions within the ACO  
4 = Quality of Care improved on 5 measures and declined significantly on 3 measures  
5 = Proposed study: cluster randomized control trial  
6 = Medication management program in an ACO, data reviewed predated ACO formation  
7 = Mixed methods study on the clinical, financial, and organizational integration of behavioral health in ACO. Weak influence of payment models  
8 = Medical Group Practices (predate ACOs, precursor to ACOs), mixed results on QOC screening measures, mixed effect of geographic variations in cost, mixed effect of EHRs on QOC measures, ND on utilization and cost  
9 = Medicare Physician Group Practice (PGP)  
10 = Medicare Physician Group Practice (PGP)  
11 = Study examines differences in outcomes between large (ACO-like) and small provider groups  
12 = Monte Carlo Simulation, Bundled payments resulted in modest cost reductions, FFS resulted in cost reduction and improved clinical outcomes  
13 = Modest improvements in a safety net setting  
14 = Limited to implementation of one program within an ACO  
15 = Mixed results on efficacy of ACO contracts and stability of patient assignment  
16 = Study suggests a simulation model examining cost/spending and QoC  
17 = Case Study  
18 = Crude measure of quality of care, HIT statistically significant with improved quality and increased cost  
19 = Baseline characteristics of ACOs vs. non-ACOs  
22 = Early commercial (BCBS of MA) ACO initiative  
23 = Study identifies strategies for cost reduction and effective care based on baseline data  
24 = Option pricing strategy to reduce volatility  
25 = HSA level characteristics associated with outcomes  
26 = Study only considers ACO association factors  
28 = Comparison of beneficiaries in Medicare Advantage HMOs vs. traditional Medicare  
29 = Group size used as proxy for likely ACO participation
30 = Prospective method vs. Performance year method for attributing patients
31 = Comparison of IDS vs, non-IDS.
REFERENCES (CHAPTER 2)

1. Greene J, Hibbard JH, Overton V. Large performance incentives had the greatest impact on providers whose quality metrics were lowest at baseline. Health affairs. Health Affairs, 34, no.4 (2015):673-680 DOI: 10.1377/hlthaff.2014.0998


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CHAPTER 3 – THEORETICAL MODEL AND RESEARCH HYPOTHESIS

RESOURCE DEPENDENCE THEORY (RDT) AND HEALTH SERVICES RESEARCH

PREAMBLE AND CHAPTER STRUCTURE

The chapter begins with the historical and theoretical foundation of resource dependence, relying on Pfeffer and Salancik's seminal work which describes resources, constraints, and power as components of an organization's environment. The framework is extended by first, a discussion of the central issues surrounding resource dependence, and second, the application of resource dependence in health services research.

Finally, resource dependence rests as the theoretical foundation for modeling Accountable Care Organizations. The framework includes a conceptual model for quantitative research and articulated research hypothesis.

In each successive domain extending from a macro view of resource dependence to its application in modeling Accountable Care Organizations, seminal research and their hypotheses are presented, and discussed as a mechanism for explicitly extending knowledge and applicability of RDT to this research.

RESOURCE DEPENDENCE – HISTORY AND THEORETICAL FOUNDATION

Jeffrey Pfeffer and Gerald Salancik’s seminal work - The External Control of Organizations\(^1\)

(Originally published: New York: Harper & Row, 1978), describes the framework for the

\(^1\) The External Control of Organizations: A Resource Dependence Perspective by Jeffrey Pfeffer, Gerald Salancik, Stanford University Press
resource dependence perspective. In the introduction to this classic edition, Pfeffer describes three themes which are central to the resource dependence framework:

The first topic explains the importance of the environment. As Pfeffer explains, organizational decisions and actions depend on local environmental constraints. Pfeffer elucidates an "inherent tension" between the action of leaders and the limiting effect of the environment which, in large part, explains the organizations' behavior. Pfeffer explains resources (financial, physical, information) as fundamental components of the environment. The quest to obtain these resources motivates organizational dependence on external sources of these resources. Therefore, the phrase - resource dependence.

The second topic explains the constraints imposed by the environment, and the organizations' tactics and strategies to mitigate these limitations. As Pfeffer explains, organizations respond to environmental constraints via various strategies. Ideally, these strategies are constructed to both mitigate constraints and enhance the organization's position within its environment. One of the key ideas is the 'continuing evolution of environment and the reciprocal action in organizational structure.' Pfeffer and Salancik term this "dynamic interaction" - where organizations employ strategies to more effectively manage resource dependencies.

The third major topic is power as a construct for predicting intra-organizational, and inter-organizational behavior. Power results from organizations mitigating environmental constraints. As Pfeffer clarifies, government as a significant provider of resources has more power than its contractors. These contractors are competing for government contracts and are dependent on contracts for survival. The government can, therefore, exert considerable
influence (power) on suppliers and contractors. While this example can be debated, as an overarching theme, power establishes a link with competition in the environment. Pfeffer summarizes resource dependence as a continuing interaction of organizational response to environmental constraints, organizations' attempts to influence its environment, and the effect on internal structure because of these organizational actions.

CENTRAL ISSUES SURROUNDING RESOURCE DEPENDENCE THEORY

This section provides a general overview and background on resource dependence theory (RDT) and is not unique to resource dependence application in health services research. The studies considered in this section emphasize resource dependence as a lens for explaining organizational integration mechanisms, organizational behavior (as a response to environmental constraints), and power and mutual dependence. These instructive studies and their stated hypotheses are presented, and discussed as a mechanism for explicitly extending knowledge and applicability of RDT to this research.

Hillman et al.² conduct a systematic review of resource dependence theory. They frame Pfeffer's (1987) original perspectives on resource dependence and inter-organizational associations as follows: Organizations as a microcosm of society, operate under assumed constraints imposed by their environment. The inherent uncertainty in their operating environment, and accompanying dependence on external resources for survival leads to mitigating strategies and approaches to manage, and to a degree, control these external

dependencies. These mitigating strategies in turn lead to continuing, and new cycles of
dependence, which lead to shifts in organizational power and behavior.

Hillman and colleagues (2) describe the conceptual framework development, empirical
research and future direction of resource dependence theory in this review. Specifically,
they describe five actions firms take to minimize environmental constraints: one, mergers
and vertical integration, two, joint ventures and other inter-organizational relationships,
three, Board of Directors, four, political action, and five, executive succession.

Regarding mergers and resource dependence theory, the authors find that resource
dependence theory offers an externally focused viewpoint of mergers and acquisitions.

Included in this systematic review, Pfeffer suggests three reasons which help explain
mergers and acquisitions: "first, to reduce competition by absorbing an important
competitor organization; second, to manage interdependence with either sources of input or
purchasers of output by them; and third, to diversify operations and thereby lessen
dependence on the present organizations with which it exchanges." The authors conclude
that resource dependence theory is only partially successful in explaining mergers as a
mechanism which enhances competitive position in the environment.

Regarding joint ventures, the authors find that resource dependence theory explains the
rationale behind acquisition of resources to reduce uncertainty and interdependence.

Regarding power, the authors find support in the literature where firms exercise control
over resource providers by forming complementary alliances with competing providers of
these resources. Regarding joint ventures, the authors find that the organizations which
control more ‘desirable’ resources also retain strategic control. The authors find resource dependence only partially successful in explaining the incentive(s) for joint ventures. Nienhuser and Werner\(^3\) examine the effectiveness of resource dependence theory in explaining the behavior of organizations. In a conceptual framework, adapted from a diagram by Pfeffer and Salancik, the authors study the connection between environment, organizations and organizational decisions. They propose that the environment is a source of uncertainty and constraints, and connect this uncertainty to the allocation and control of power outside and within organizations. Externally and internally this leads to aligned organizational actions and new structures. The authors outline five key propositions along with empirical support in the literature for these propositions. These are as follows:

**Proposition 1:** Organizations controlling resources that other executives need have power over these executives.

**Proposition 2:** The larger the dependency of resources of Actor A from Actor B, the more likely A is to meet the demands of B.

**Proposition 3:** Uncertainty triggers strategies to reduce uncertainty.

**Proposition 4:** Implementing correct strategies to reduce uncertainty has a positive effect on organizational performance.

**Proposition 5:** Powerful executives try to extend their power over and above their contribution to resource control. Their powers are reinforced and cannot easily be reduced again by changes in resource demands of the organizations.

Given the focus on uncertainty within the current healthcare reform landscape, an examination of **Proposition 3** highlights research which supports the following very

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pertinent correlations. The authors suggest the following five associations - One, 'high uncertainty in industries leads to mergers.' Two, 'greater resource dependency translates to significantly higher friendly or hostile takeovers.' Three, 'resource dependency has an effect on interindustry mergers and acquisitions.' Four, 'individuals with control of critical resources tend to cooperate more.' Five, 'organizations gain control of new technologies and information to reduce dependency or increase resource control'; and curiously, Six, 'company founders react to the dependency on employees who possess qualifications as critical resources by reducing their dependency on these employees'.

Davis and Cobb⁴ discuss the past and future of resource dependence. They suggest three core ideas of the theory - “one, social context matters; two, organizations have strategies to enhance autonomy and pursue interests; and three, power (not just rationality or efficiency) is important for understanding internal and external actions of organizations.” The authors emphasize power as a key component which differentiates resource dependence theory from other theoretical perspectives. Stating empirical literature, they postulate that power stems from resource control, and intuitively power and dependence are inversely related. This interdependence is a direct byproduct of mutually exerted power. Perhaps more noteworthy is that this interdependence leads to a greater probability for alliances. The authors contend that industry mergers are most common where there are average levels of concentration, likely because of a decreasing likelihood of any antitrust implications.

Similarly, they postulate, that highly competitive industries with fewer interdependencies, are less likely to seek integration.

The authors caution against generalizing, since analyses conducted at industry level may not apply at the organizational level - "a relationship that holds in the aggregate need not be true for its constituents, and vice versa." The authors note that revival of resource dependence theory is expected since the current sociopolitical environment is comparable to the period during which Pfeffer hypothesized RDT – the authors cite global economic crisis, and dissatisfaction with political leadership as issues which are favorable fodder for issues related to power, control of resources, and circumstances leading to interdependencies. The authors postulate three ‘master trends’ which elucidate structure of power and dependence, and organizational actions in managing uncertainty - these are, ‘a deeper infusion of information technologies, finance as a central tenet, and globalization.’

The authors suggest examining new foundations of power along with developing trends in managing dependence as frameworks for future research.

Casciaro and Piskorski address power imbalance, mutual dependence and constraint absorption through the lens of resource dependence theory. The authors principally focus on ‘constraint absorption’ as a mechanism which addresses dependencies. They offer a comprehensive application of constraint absorption indicating that partial constraint absorption is represented by joint ventures, mergers, and acquisitions. The authors contend that “constraint absorption differs significantly from other tactics for the management of

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resource dependencies and that it is the only tactic that gives the dependent organization direct control over valued resources.” Referencing Pfeffer and Salancik, the authors suggest that organizations which have a high dependence on others have the propensity to acquire these dependent resources. Extending the seminal work of Pfeffer and Salancik, the authors illustrate a matrixed relationship between the inter-dependence of Organization j and i. As the authors explain, Power is balanced when j and i are equally dependent on each other. Intuitively, when i’s dependence on j is higher, the power imbalance favors j. When j’s dependence on i is higher, the power imbalance favors i. An observation suggested by the authors - even when there is symmetry in Power Imbalance, mutual dependence can vary depending on the magnitude of dependence. In a low mutual dependence scenario, the organizations may not rely on each other for critical resources, but high mutual dependence signifies a relationship where i and j hold substantial power over each other.

As it relates to power imbalance, the authors suggest the following three hypotheses:

Hypothesis 1a: The greater the power imbalance between two organizations, the less likely they are to enter a constraint absorption operation initiated by the power disadvantaged organization.

Hypothesis 1b: The greater the power imbalance between two organizations, the less likely they are to enter a constraint absorption operation initiated by the power advantaged organization.

Hypothesis 1c: The greater the power imbalance between organizations, the lower the likelihood of constraint absorption operations between them.
As it relates to mutual dependence, the authors suggest the following hypotheses:

*Hypothesis 2: The greater the mutual dependence between two organizations, the higher the likelihood of constraint absorption operations between them.*

In testing the hypotheses, the authors find that the power of organization i over organization j is the inverse of j's dependence on i. However, they find a negative effect of power imbalance in its association with successful constraint absorption, contradicting the proposed hypotheses. Lastly, they find a positive effect of mutual dependence on the probability of successful constraint absorption.

**RESOURCE DEPENDENCE THEORY’ APPLICATION IN HEALTH SERVICES RESEARCH**

This section provides a more detailed overview and background on resource dependence theory (RDT), and its implementation in health services research. The included studies emphasize resource dependence as a lens for explaining organizational integration mechanisms, organizational realignment in response to environmental constraints, and multi-hospital contract management in healthcare services. These instructive studies and their stated hypotheses are presented, and discussed as a mechanism for explicitly extending knowledge and applicability of RDT in health services to this research.

Banaszak-Holl, Zinn, and Mor⁶ use a resource dependence theory perspective to discuss the impact of market and organizational characteristics on nursing care facility innovations. Specifically, they investigate the organizational and environmental factors associated with

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health services delivery innovation. They suggest that “all things being equal, as dependency on key resource providers increases so does organizational accommodation.” The authors suggest the following - as healthcare delivery systems respond to market demands, their response creates dependency relationships to address these market drivers. As an example of this demand and response, Banaszak-Holl and colleagues study a delivery system adding Alzheimer's care service lines as a response to the private pay market, and adding subacute care service lines as a response to managing hospital Medicare discharges. The study forwards the argument that managed care has forced hospitals to be more cost-effective, and hospitals have an incentive to provide coordinated post-discharge care, and this is accomplished via acquiring facilities and services which accommodate this demand. The authors suggest these market demands are primary contributors which compel delivery systems to augment services. Within this framework, the authors suggest the following four hypotheses:

Hypothesis 1: facilities in areas with more hospitals relative to the supply of nursing homes will be more likely to develop units specializing in the provision of subacute care.

Hypothesis 2: facilities in areas with greater HMO penetration will be more likely to develop units specializing in the provision of subacute care.

Hypothesis 3: facilities accepting Medicare recipients will develop a broad range of diversified services that includes the provision of subacute care and dedicated units. However, facilities with a high proportion of Medicare recipients will be more likely to provide subacute care on a facility-wide basis and less likely to develop dedicated units.
Hypothesis 4: facilities located in areas with a higher proportion of Medicare hospital discharges will be more likely to develop units specializing in the provision of subacute care.

Regarding environmental factors, specifically munificence and uncertainty, the authors suggest that organizational responses correlate with resource abundance or constraints in the environment. As mentioned previously, abundant resource environments offer little incentive for an organization to accommodate external demands, inversely, constraint environments encourage organizations to accommodate these market demands. The authors suggest the following four hypotheses:

Hypothesis 5: facilities located in more competitive markets will be more likely to develop special care units of both types.

Hypothesis 6: facilities located in states with active Certificate of Need (CON) programs or moratoria on new construction will be less likely to develop units dedicated to the provision of special care.

Hypothesis 7: in markets with higher Medicaid reimbursement rates, facilities with higher Medicaid census will be more likely to develop units dedicated to the provision of special care.

Hypothesis 8: in markets with more stringent forms of Medicaid reimbursements, facilities with higher Medicaid census will be less likely to develop units dedicated to the provision of special care.

The study utilizes Medicare/Medicaid automated certification survey data, along with 1992 Area Resource File data containing local market variables, and state-level administrative data. The study uses presence of Alzheimer’s unit, and subacute care unit as dependent variables. Dependent relationships included the ratio of hospitals and nursing homes at the county level, HMO membership, the proportion of Medicare patients, the number of
hospital discharges. Competitive measures include Herfindahl index of nursing home market share, excess skilled nursing facility capacity, the number of hospital units in County providing Alzheimer’s, hospice, or skilled nursing facility care, and hospital-based outpatient services. State policy variables and facility characteristics complete the model. The study findings are largely congruent with the hypotheses above.

Alexander and Morrisey⁷ postulate a resource dependence model of hospital contract management, more specifically they examine the determinants of a hospital joining multihospital systems. The authors develop a resource dependence framework which considers market characteristics, regulatory structure of the environment, management characteristics, and “enabling factors” which connote the hospitals’ proclivity to join multihospital systems. Within this framework, they propose the following hypotheses:

Hypothesis 1: Given management conditions, hospitals operating in favorable markets are less likely to enter development contracts than hospitals operating in unfavorable markets.

Hypothesis 2a: Given management and market conditions, hospitals operating under long-standing CON (certificate of need) programs will be less likely to enter into management contracts.

Hypothesis 2b: Given management and market conditions, hospitals operating in a rate regulated state will be more likely to enter into management contract arrangements.

Hypothesis 3: Given existing market and regulatory conditions, hospitals operating under weak management are more likely to enter contract management arrangements than those operating under strong management.

Hypothesis 4: Given existing market, regulatory, and management conditions, larger hospitals will be less likely to participate in contract management arrangements than smaller hospitals.

Hypothesis 5: Given existing market, regulatory, and market conditions, the presence of an investor-owned system hospital in the state will increase the likelihood that a hospital will enter into a management contract.

Hypothesis 6: Given existing market, regulatory, and management conditions, a large number of established physicians in the community will affect the likelihood that the hospital will enter into a management contract arrangement.

Hypothesis 7: Given market, regulatory, and management conditions, investor-owned hospitals are less likely than private voluntary hospitals to enter into contract management arrangements at multihospital systems.

Hypothesis 8: teaching hospitals will be less likely to enter into contract management arrangements at multihospital systems and nonteaching hospitals.

Using data from American Hospital Association annual survey data, Area Health Resources File, and the American Hospital Association multihospital system data, the study (7) utilizes a pooled sample of contract managed and traditionally managed hospitals. The authors find significant support for their hypotheses. Notably, one, demand for external management expertise increases in parallel with hospital capacity as measured by beds per capita. Two, weak management is an indicator of hospitals pursuing external management services, and three investor-owned hospitals are less likely than nonprofit hospitals to enter contract management arrangements. Regarding resource dependence, the study finds that increased competition and overcapacity of beds in each market is a significant indicator of inter-organizational affiliation(s) and acquisition of external resources. The study also finds that areas with a large proportion of elderly reduce the likelihood of hospitals entering
contract management associations. Lastly, the authors note that regulatory programs introduce significant complications in resource acquisition.

Kareem and Mitchell\(^8\) study the framework around the reconfiguration of business resources via acquisitions in the US medical sector. They use behavioral assumptions, description of the firm, and efficiency criteria as a framework for studying reconfiguration of business resources via acquisition. As background, the authors find no consensus regarding Acquisition in literature and infer that the absence of consensus shows a gap in understanding the role of acquisition in obtaining resources. The authors postulate the following:

- **Hypothesis 1a**: Acquired businesses change more than continuing businesses.
- **Hypothesis 1b**: Continuing businesses that acquire targets change more than continuing businesses that do not acquire targets.
- **Hypothesis 2a** (resource deepening argument): The greater the overlap of acquirer and target resources, the more likely that acquirers will retain targets’ resources and their own resources.
- **Hypothesis 2b** (resource extension argument): Acquirers tend to retain target resources that are distinct from the acquirer’s pre-acquisition resources.

Using multiple year data from medical and healthcare marketplace guide, the authors find significant support for the proposed hypotheses.

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RESOURCE DEPENDENCE THEORY AND MODELLING ACCOUNTABLE CARE ORGANIZATIONS

- THEORETICAL FOUNDATION FOR QUANTITATIVE RESEARCH

This section provides a more detailed overview and background on resource dependence theory (RDT), its application in health services research, and specifically in modeling Accountable Care Organizations. The included studies emphasize resource dependence as a lens for explaining dimensions of organizational task environment, and quality improvement programs; a systematic review where resource dependence explains the ‘environment’ in healthcare organizations; and a resource dependence perspective on hospitals’ proclivity to join Accountable Care Organizations.

Dess and Beard⁹ divide six environmental dimensions into three dimensions of organizational task environments. The authors’ central premise is that an organization’s resource requirements are primary characteristics which define the organization’s environment. The authors divide the organization/environment relationship into two broad categories: one, ‘the degree of interaction between the organization and the environment,’ and two, ‘the level of objectivity and the subjectivity in describing the environment.’ As offshoots of these broad classifications, the authors describe three dimensions of organizational task environments.

These include:

- Environmental munificence - which includes sustained growth, competitive position in a given market, and levels of profitability

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Environmental Dynamism - which includes organizational/environmental uncertainty, unpredictability in determining environmental changes, and the degree of dependencies between organization.

Environmental Complexity - which involves the effect of complex environments on information processing, the level of an organization’s expansion strategy, and the extent of concentration and dispersion in the environment.

As background, the authors use five munificence variables - sales, price-cost margin, total employment, value-added, and the number of establishments to establish this construct.

Five complexity variables - specialization, geographic concentrations related to sales, value add, total employment, and the number of facilities establish this construct. Five dynamism variables - sales, price-cost margin, total employment, value-added, and intermediate market orientation establish this construct.

Yeager et al.\textsuperscript{10} conduct a systematic review of resource dependence theory and its use in measuring the environment in healthcare organizational studies. After a systematic search, a total of 20 articles are included in the review - 13 studies focused on hospitals, five concentrated on long-term care facilities (LTCs), and one each in medical practices and public health. There are no studies on accountable care organizations. In studies where resource dependence theory is explicitly the theoretical framework, the dependent variables included service delivery innovation, referrals to home health agencies, hospital alliance or contract management, total quality management adoption, participation in

managed care, change in cost per discharge and changing mix of services offered, electronic health record adoption, availability of subacute care services, hospital efficiency, and type of health information technology strategy implemented.

Munificence is usually described by rural location, per capita income, physician mix, total population, and unemployment rate. The proportion of Medicaid costs usually describes dynamism, the as did a percentage of total county population enrolled in HMOs, changes in the level of unemployment, Medicare share, and the number of managed care contracts. Herfindahl Index usually describes complexity, as did the number of hospital beds per capita, excess capacity, and HMO penetration. However, not one study focused on outcomes related to accountable care organizations using a resource dependence theory perspective, which highlights the gap and strengthens the argument that fundamental research in this area is necessary.

More specifically regarding health services research where resource dependence theory, and specifically munificence, dynamism, and complexity are operationalized as environmental variables which seek to explain quality improvement outcomes, Yeager et al. examined the relationship of environmental factors with quality improvement initiatives and county and local health departments. They find percentage of zip-codes with healthy food outlets, and the number of primary care physicians per capita (munificence variables) positively associated with quality improvement (QI). Smoking prevalence and

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obesity rates (complexity variables) are positively related to QI, and change in population size over a five-year period (dynamism variable) positively related to QI.

As resource dependence theory (RDT) relates to accountable care organizations, Yeager et al. examined determinants of hospital accountable care organization participation using the RDT perspective. They operationalize number of physicians per capita, the number of specialists per capita, income per capita and rural location as independent munificence variables; the number of hospital beds per capita change, the percentage of poverty change, and the unemployment rate as independent dynamism variables; Herfindahl-Hirschman Index (HHI) and HMO penetration as independent competition variables. They find a positive association between income per capita, and HMO penetration and ACO participation.

CONCEPTUAL MODEL AND HYPOTHESIS

CONCEPTUAL MODEL

As a care delivery model, ACOs, motivated by constraints and uncertainty in the environment, hold the promise of economies of scale through the resulting increase in market power. Resource dependence theory offers a remarkably useful foundation for studying the relative effectiveness of ACOs within the framework of uncertainty. Resource dependence theory informs the effectiveness of ACOs by examining local market conditions, munificence, dynamism and competition as contributing theoretical constructs. A

A conceptual model, which builds on the research above by Yeager and colleagues\textsuperscript{12}, and considers provider characteristics, population and geography, patient characteristics and associated risks, health-system capacity, and local market conditions is described below.

HYPOTHESIS

Using publicly available performance year 2012 - 2014 MSSP ACO data, 2016 HRSA's Area Resource file, and CMS' geographic variation public use file, this research examines MSSP ACOs performance through the lens of munificence, dynamism, and competition to determine the marginal effect of ACOs on health services utilization and prevention quality indicators. The model also examines a States choice for Medicaid expansion on MSSP ACO performance.
Accountable Care Organizations as offshoots of ACA policy initiatives are committed to measurable quality improvement, and significantly improved care coordination across different providers and health systems. The ACO intent is to create substantially better patient care management and better health outcomes while introducing efficiencies in a disconnected health system. Hypothesis 1 and 2 below follow these assumptions:

**Hypothesis 1:** ACOs will have significantly lower ED and Inpatient utilization than per capita market-level utilization, all else being equal.

**Hypothesis 2:** ACOs will have significantly lower prevention quality indicators (as measured by CHF and Bacterial Pneumonia admissions) than market-level prevention quality indicators, all else being equal.

One of the provisions of the Affordable Care Act is an expansion of healthcare benefits through expanded Medicaid coverage for low-income adults. Medicaid expansion as part of ACA mandates coverage for low-income adults between the ages of 18 to 65. As of January 1, 2017, 32 states including DC have adopted Medicaid expansion, 19 states have not. Our analysis examines the effect of Medicaid expansion on our utilization outcomes, if any, in CY 2014 when 27 states including DC had adopted Medicaid expansion.14

Medicaid expansion should, in theory, create substantially better patient care management, and better health outcomes for this previously uninsured population, and

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add substantially to the munificence in these environments. Based on a State’s CY 2014 Medicaid expansion participation status, Hypothesis 3 and 4 follow these assumptions:

**Hypothesis 3:** ACOs in States with Medicaid expansion will have significantly lower ED and Inpatient utilization when compared to ACOs in States without Medicaid expansion, after adjusting for market-level utilization, and all else being equal.

**Hypothesis 4:** ACOs in States with Medicaid expansion will have significantly lower prevention quality indicators (as measured by CHF and Bacterial Pneumonia admissions) when compared to ACOs in States without Medicaid expansion, after adjusting for market-level utilization, and all else being equal.
REFERENCES (CHAPTER 3)

1. The External Control of Organizations: A Resource Dependence Perspective by Jeffrey Pfeffer, Gerald Salancik, Stanford University Press


CHAPTER 4: METHODS AND MATERIALS

This chapter outlines and details the research design, data sources, identification and measurement of variables, and the analytical approaches that address the research questions and hypotheses.

Using publicly available performance year 2012 - 2014 MSSP ACO data, 2016 HRSA's Area Resource file, and CMS' geographic variation public use file, this research examines MSSP ACOs performance through the lens of munificence, dynamism, and competition to determine the marginal effect of ACOs on health services utilization and prevention quality indicators. The model also examines a States choice for Medicaid expansion on MSSP ACO performance.

Accountable Care Organizations as products of ACA policy initiatives are committed to quantifiable quality improvement, and significantly improved care coordination across different providers and health systems. Accountable Care Organizations are committed to significantly better patient care management and better health outcomes while simultaneously introducing process and clinical efficiencies in a disconnected health system.

Hypothesis 1 and 2 below follow these assumptions:

**Hypothesis 1:** ACOs will have significantly lower ED and Inpatient utilization than per capita market-level utilization, all else being equal

**Hypothesis 2:** ACOs will have significantly lower prevention quality indicators (as measured by CHF and Bacterial Pneumonia admissions) than market-level prevention quality indicator, all else being equal
One of the provisions of the Affordable Care Act is an expansion of healthcare benefits through expanded Medicaid coverage for low-income adults. As of January 1, 2017, 32 states including DC have adopted Medicaid expansion, 19 states have not (1). Medicaid expansion as part of ACA mandates coverage for low-income adults between the ages of 18 to 65. Medicaid expansion should, in theory, create substantially better patient care management, and better health outcomes for this previously uninsured population, and add substantially to the munificence in these environments. The analysis examines the effect of Medicaid expansion on utilization outcomes, if any, in CY 2014 when 27 states including DC had adopted Medicaid expansion.  

Based on a State’s CY 2014 Medicaid expansion participation status, Hypothesis 3 and 4 follow these assumptions:

Hypothesis 3: ACOs in States with Medicaid expansion will have significantly lower ED and Inpatient utilization when compared to ACOs in States without Medicaid expansion, after adjusting for market-level utilization, and all else being equal

Hypothesis 4: ACOs in States with Medicaid expansion will have significantly lower prevention quality indicators (as measured by CHF and Bacterial Pneumonia admissions) when compared to ACOs in States without Medicaid expansion, after adjusting for market-level utilization, and all else being equal.

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State Medicaid Expansion Status – Calendar Year 2014

STATUS OF STATE MEDICAID EXPANSION (2014)

Figure 1: 2014 Medicaid Expansion - 27 States, including DC

Data Sources

Using publicly available performance year 2012 - 2014 MSSP ACO data, 2016 HRSA’s Area Resource file, and CMS’ geographic variation public use file, this research examines MSSP ACO performance through the lens of munificence, dynamism, and competition to determine the marginal effect of ACOs on health services utilization and prevention quality indicators. The model also examines a States choice for Medicare expansion on MSSP ACO performance.
Medicare Shared Savings Program (MSSP) Accountable Care Organization Data

The research utilizes Center for Medicare and Medicaid Services (CMS) shared saving program data files for performance years 2012, 2013 and 2014. The performance year 2013 and 2014 data files contain information on assigned beneficiaries, savings rate, expenditures, assigned risk scores, hospital utilization, primary care services, and physician capacity. Per CMS, the 2013 data file delineates MSSP ACO’s as follow:

- **April 2012 starters (27 ACOs)** - all variables are for 21-month period (4/1/2012-12/31/2013)
- **July 2012 starters (87 ACOs)** - all variables are for 18-month period (7/1/2012-12/31/2013)
- **January 2013 starters (106 ACOs)** - all variables are for CY2013 (1/1/2013-12/31/2013)

The 2014 data file assigns benchmark years based on an ACO’s agreement start date as follows:

- **April 2012 (26 ACOs) and July 2012 (85 ACOs) starters** – the benchmark years are 2009, 2010, and 2011.
- **January 2013 (103 ACOs) starters, benchmark years are 2010, 2011, and 2012**
- **January 2014 (119 ACOs) starters, benchmark years are 2011, 2012, and 2013**

The shared saving program data files collect information on savings rate, expenditures, quality score, beneficiary makeup, hospital discharges, primary care services, participating

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primary care practitioners and specialists, and care transitions between tertiary and primary care.

The table below shows the relevant variables and description in the MSSP 2013 and 2014 data files.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Brief Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACO_Name</td>
<td>ACO name</td>
</tr>
<tr>
<td>ACO_State</td>
<td>State(s) where beneficiaries reside</td>
</tr>
<tr>
<td>Start_Date</td>
<td>ACO Start Date (2012, 2013 or 2014)</td>
</tr>
<tr>
<td>N_AB</td>
<td>Total number of assigned beneficiaries</td>
</tr>
</tbody>
</table>

Health Resources and Services Administration (HRSA) - Area Health Resources Files (AHRF)

The AHRF\(^3\) collects county level, state level and national data on health resources, socio-economic indicators, and health care demand. The dataset includes healthcare facilities related data, hospital utilization variables, and expenditures. The dataset includes population and economic data by County, including demographics, employment, income levels, housing statistics, vital statistics, and health insurance status. The data set also includes information on medical discharges - including, prevention quality

\(^3\) Health Resources & Services Administration (Data Warehouse). Retrieved on April 10, 2017, from https://datawarehouse.hrsa.gov/
indicators such as bacterial pneumonia discharges and CHF discharges, and capacity measures – such as the number of physicians per capita, the number of specialists per capita, hospital-based physicians, medical specialists, and primary care physicians.

**Centers for Medicare and Medicaid (CMS) Geographic Variation Public Use File**

The Centers for Medicare and Medicaid geographic variation public use file[^4] is ideal for studying geographic variations in quality and utilization of health care services for the Medicare fee for service population. The geographic variation public use files aggregate quality and utilization information at three different levels - state, hospital referral region, and county level.

The geographic variation public use file derives information from data in CMS’ Chronic Conditions Data Warehouse. A point of note - this file excludes information on Medicare Advantage plan beneficiaries and beneficiaries in Medicare part A or Medicare part B[^5] only any time during the year. These same beneficiaries and excluded by regulation from participation in an Accountable Care Organization.

Additionally, CMS standardizes Medicare payment amounts to remove geographic differences in reimbursement rates; geographic differences in health are also standardized using a risk adjustment model.

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The geographic variation public use file calculates four metrics for all-cause hospital readmissions and emergency room use, these are:

- Total number of all-cause hospital readmissions
- All cause hospital readmission rate
- Total number of ER visits
- Total number of ER visits per 1000 beneficiaries

This research will utilize all-cause hospital readmission rate and ER visits per 1000 beneficiaries.

The geographic variation public use data file also provides rates for CHF, and Bacterial Pneumonia admissions segmented by age groups. All outcome variables in this research are available in CMS' Geographic Variation Public Use File.

**Independent Variables**

This research examines the marginal effect of ACO’s on health care utilization at the state level. ACO beneficiaries must have the ‘original’ Medicare, which is Medicare Fee for Service with Part A (hospital insurance), and Part B (medical insurance).

Using publicly available performance year 2013 and 2014 MSSP ACO data, 2016 HRSA’s Area Resource file, and CMS’ geographic variation public use file, this research examines the marginal effect of 2012, 2013 and 2014 MSSP ACOs on healthcare utilization through the lens of munificence, dynamism, and competition. The model also examines a States choice for Medicaid expansion on MSSP ACO performance.
This research uses a resource dependence theory perspective, and based on the initial examination of Accountable Care Organizations by Yeager and colleagues\(^6\), introduces munificence, dynamism, and competition as key constructs in the model.

Physicians per capita, specialists per capita, and income per capita operationalize **Munificence**. Hospital beds per capita, percentage of poverty, and unemployment rate operationalize **Dynamism**. HHI operationalizes **Competition**.

The table below organizes the constructs, related variables and data sources:

<table>
<thead>
<tr>
<th>Construct</th>
<th>Variables</th>
<th>Data Sources</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Outcomes</strong></td>
<td>Inpatient and Outpatient ED Utilization</td>
<td>CMS Geographic Variation PUF</td>
<td>Continuous</td>
</tr>
<tr>
<td></td>
<td>Acute care all-cause 30 day Readmissions</td>
<td>CMS Geographic Variation PUF</td>
<td>Continuous</td>
</tr>
<tr>
<td></td>
<td>CHF admissions (PQI)</td>
<td>CMS Geographic Variation PUF</td>
<td>Continuous</td>
</tr>
<tr>
<td></td>
<td>Bacterial pneumonia admissions (PQI)</td>
<td>CMS Geographic Variation PUF</td>
<td>Continuous</td>
</tr>
<tr>
<td><strong>Munificence</strong></td>
<td>Number of physicians per capita</td>
<td>AHRF 2016</td>
<td>Continuous</td>
</tr>
<tr>
<td></td>
<td>Number of specialists per capita</td>
<td>AHRF 2016</td>
<td>Continuous</td>
</tr>
<tr>
<td></td>
<td>Income per capita</td>
<td>AHRF 2016</td>
<td>Continuous</td>
</tr>
<tr>
<td><strong>Dynamism</strong></td>
<td>Number of hospital beds per capita change</td>
<td>AHRF 2016</td>
<td>Continuous</td>
</tr>
<tr>
<td></td>
<td>Percentage of poverty change</td>
<td>AHRF 2016</td>
<td>Continuous</td>
</tr>
<tr>
<td></td>
<td>Unemployment rate change</td>
<td>AHRF 2016</td>
<td>Continuous</td>
</tr>
<tr>
<td><strong>Competition</strong></td>
<td>HMO Penetration (Proposed)</td>
<td>TBD</td>
<td>Continuous</td>
</tr>
</tbody>
</table>

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Dependent Variables

The research organizes utilization into the following four measures: total inpatient and outpatient ED utilization, acute care all cause 30-day readmissions, CHF admissions, and bacterial pneumonia admissions. CHF admissions and bacterial pneumonia admissions serve as prevention quality indicators which are useful in identifying utilization for ambulatory care sensitive conditions.

This research examines the marginal effect of ACO’s on these measures of utilization. A secondary set of hypotheses examines the marginal effect of ACO’s on these measures of utilization and the effect, if any, of a State’s decision to expand Medicaid.

Sampling Plan

Per CMS, the 2013 data file delineates MSSP ACO’s as follow:

- **April 2012 starters (27 ACOs) - all variables are for 21-month period (4/1/2012-12/31/2013)**
- **July 2012 starters (87 ACOs) - all variables are for 18-month period (7/1/2012-12/31/2013)**
- **January 2013 starters (106 ACOs) - all variables are for CY2013 (1/1/2013-12/31/2013)**

The 2014 data file assigns benchmark years based on an ACO’s agreement start date as follows:

- **April 2012 (26 ACOs) and July 2012 (85 ACOs) starters – the benchmark years are 2009, 2010, and 2011.**
- **January 2013 (103 ACOs) starters, benchmark years are 2010, 2011, and 2012**
- **January 2014 (119 ACOs) starters, benchmark years are 2011, 2012, and 2013**

### ACO Primary State Assignment

CMS delineates 66 ACOs in the 2013 data file, and 104 ACOs in the 2014 data file with multi-state affiliation. For each one of these ACOs, the study reviews the ACO website for central business office location and primary location of healthcare facilities in the assignment of the primary state affiliation for the ACO. The table below illustrates this methodology.

<table>
<thead>
<tr>
<th>ACO Num</th>
<th>ACO NAME</th>
<th>ACO State</th>
<th>ACO Business Office</th>
<th>Health Care Facilities</th>
<th>Assigned State</th>
</tr>
</thead>
<tbody>
<tr>
<td>A38665</td>
<td>Chinese Community Accountable Care Organization, Inc.</td>
<td>New York, New Jersey</td>
<td>New York</td>
<td>Physician-owned and operated (NYC Boroughs)</td>
<td>NY</td>
</tr>
<tr>
<td>A76261</td>
<td>Hackensack Physician-Hospital Alliance ACO, LLC</td>
<td>New Jersey, New York</td>
<td>New Jersey</td>
<td>New Jersey</td>
<td>NJ</td>
</tr>
<tr>
<td>A38596</td>
<td>Concord Elliot ACO LLC</td>
<td>New Hampshire, Massachusetts, Maine</td>
<td>New Hampshire</td>
<td>New Hampshire</td>
<td>NH</td>
</tr>
<tr>
<td>A58483</td>
<td>AHS ACO, LLC</td>
<td>New Jersey, Pennsylvania</td>
<td>New Jersey</td>
<td>New Jersey</td>
<td>NJ</td>
</tr>
<tr>
<td>A64206</td>
<td>Crystal Run Healthcare ACO, LLC</td>
<td>New York, Pennsylvania</td>
<td>New York</td>
<td>Multi-specialty group practice (NY)</td>
<td>NY</td>
</tr>
<tr>
<td>A09903</td>
<td>Jackson Purchase Medical Associates, PSC</td>
<td>Kentucky, Illinois</td>
<td>Kentucky</td>
<td>Multi-specialty group practice (KY)</td>
<td>KY</td>
</tr>
<tr>
<td>A05657</td>
<td>Quality Independent Physicians</td>
<td>Kentucky, Indiana</td>
<td>Kentucky</td>
<td>Multi-specialty group practice (KY)</td>
<td>KY</td>
</tr>
<tr>
<td>A01714</td>
<td>Essentia Health</td>
<td>Wisconsin, Minnesota, North Dakota</td>
<td>Minnesota</td>
<td>Integrated health system (MN, ND, WI, ID)</td>
<td>OMIT</td>
</tr>
<tr>
<td>A27119</td>
<td>Accountable Care Coalition of Northwest Florida, LLC</td>
<td>Alabama, Florida</td>
<td>Texas</td>
<td>Multi-specialty group practice (FL)</td>
<td>FL</td>
</tr>
</tbody>
</table>
The final sample of 2012, 2013, and 2014 ACOs in the 2013 and 2014 ACO PUF are determined as follows:

<table>
<thead>
<tr>
<th>A70756</th>
<th>Accountable Care Coalition of Coastal Georgia, LLC</th>
<th>South Carolina, Georgia</th>
<th>Texas</th>
<th>Multi-specialty group practice (GA)</th>
<th>GA</th>
</tr>
</thead>
<tbody>
<tr>
<td>A20167</td>
<td>North Country ACO</td>
<td>New Hampshire, Vermont</td>
<td>New Hampshire</td>
<td>Multi-specialty group practice (NH)</td>
<td>NH</td>
</tr>
<tr>
<td>A88776</td>
<td>MARYLAND ACCOUNTABLE CARE ORGANIZATION OF WESTERN MD LLC</td>
<td>Maryland, Pennsylvania, West Virginia</td>
<td>Maryland</td>
<td>Multi-specialty group practice (MD)</td>
<td>MD</td>
</tr>
</tbody>
</table>

The above sampling methodology, which omits some multi-state ACOs, acknowledges that the coefficient of interest is biased towards zero. Therefore, the analysis will examine three ways of opportuning coverage for multi-state ACOs.

Sensitivity analysis will follow the criteria below:

- Analysis 1 uses the sampling methodology described in the figure above.
- Analysis 2 appropriations ACO attributed lives equally among the assigned States.
- Analysis 3 appropriations ACO attributed lives in direct correlation to the number of facilities in each State.
Data Evaluation and Transformation

The dataset will include merging and constructing variables from the various disparate datasets – including, CMS’ 2013 and 2014 MSSP ACO datasets, HRSA’ Area Health Resource File, and CMS’ Geographic Variation File. The data is explored, modified, and managed using descriptive statistical techniques for outliers, missing values, normality, linearity, multicollinearity, heteroscedasticity, and autocorrelation. Descriptive statistics will describe the distribution of variables including measures of central location (mean, and median), measures of spread (range, variance, and standard deviation), measures of lopsidedness (skewness), and measures of peakedness (kurtosis). Issues arising from missing values, normality, linearity, multicollinearity, heteroscedasticity, and autocorrelation will be addressed using established methodologies.

Specifically, missing value are not expected to be an issue. The numerical values for the outcome variables are readily available in the public use data sets. Non-normality in the data, if any, will be examined by a careful review of extreme values, which will be included in the analyses unless there is no reasonable explanation, in which case they will be treated as outliers and omitted. The analysis will cluster by State to address correlated shocks within a State.
Analysis

The table below illustrates the structure of the data file and variables included in the analysis. The ACO market years are 2012, 2013, and 2014. CY 2009, 2010, and 2011 are included to examine pre-trends. The research will examine the interaction of year dummies in pre-period and the intensity of treatment in CY 2013.

<table>
<thead>
<tr>
<th>Construct</th>
<th>Variables</th>
<th>Data Sources</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outcomes</td>
<td>Inpatient and Outpatient ED Utilization</td>
<td>CMS Geographic Variation PUF</td>
<td>ED Visits Per 1000 Medicare FFS Beneficiaries by State, Year</td>
</tr>
<tr>
<td></td>
<td>Acute care all-cause 30-day Readmissions</td>
<td>CMS Geographic Variation PUF</td>
<td>Hospital Readmission Rate (%) for FFS Beneficiaries by State, Year</td>
</tr>
<tr>
<td>PQI</td>
<td>CHF admissions (Age &lt; 65, 65 – 74, 75 Plus)</td>
<td>CMS Geographic Variation PUF</td>
<td>CHF admissions per 100,000 FFS Beneficiaries in specified age groups by State, Year</td>
</tr>
<tr>
<td>PQI</td>
<td>Bacterial pneumonia admissions (Age &lt; 65, 65 – 74, 75 Plus)</td>
<td>CMS Geographic Variation PUF</td>
<td>PN admissions per 100,000 FFS Beneficiaries in specified age groups by State, Year</td>
</tr>
<tr>
<td>Munificence</td>
<td>Number of physicians per capita</td>
<td>AHRF 2016</td>
<td>PCPs Per 100,000 (Population), by State, Year</td>
</tr>
<tr>
<td></td>
<td>Number of specialists per capita</td>
<td>AHRF 2016</td>
<td>Specialists, Per 100,000 (Population), by State, Year</td>
</tr>
<tr>
<td></td>
<td>Income per capita</td>
<td>AHRF 2016</td>
<td>Per Capita Income by State, Year</td>
</tr>
<tr>
<td>Dynamism</td>
<td>Percentage of poverty</td>
<td>AHRF 2016</td>
<td>Percent in Poverty by State, Year</td>
</tr>
</tbody>
</table>
Difference in Differences controls for trends in the treatment group by comparing these with trends with a comparison group. The main advantages of Difference in Differences are that we can find the counterfactual for any treatment group given a suitable comparison group, and it is an ideal technique for examining state-level policy changes. Difference in differences relaxes the assumption that the pre-and post-periods are the same (impact of time is constant across groups), the treatment and comparison groups are the same (impact of the group is constant across time), and the groups have parallel trends in outcomes (7).

Instead, Difference in Differences uses changes in the comparison group as the counterfactual for variations in the treatment group. Difference in Differences design estimates the impact of a program by examining ‘differences in baseline means’ between the treatment group and the comparison group (8). That is, does the treatment group differs from its baseline mean by a greater or lesser amount than the comparison group? The foremost identifying assumption in Difference in Differences is as follows: The Treatment group and Comparison group have similar trends over time in the absence of the program (treatment).

7 Charles Stoeker. Policy Analysis with Panel Data. Tulane University School of Public Health, September 2014
This assumption introduces considerable concern regarding the influence of time-varying factors. Mitigating these concerns the analysis includes time varying controls variables in the munificence, dynamism, and competition constructs. These time varying controls also aid in more precise standard errors. State fixed effects, which control for the averages differences across States in observables and unobservable predictors, and Year fixed effects, which control for average differences over time that are common to all State, are part of the structured equation. The analysis also tests the common trends assumptions and examines treatment effect dynamics.

To test hypothesis 1 and hypotheses 2, we use the generalized difference-in-differences⁹ to estimate:

\[ Y_{st} = A_0 + \beta_1 \text{Percent ACO Medicare Market}_{st} + \alpha_s + \delta_t + \gamma \text{ RDT Var}_{st} + \varepsilon_{st} \]  

(1)

Where:

\[ Y_{st} = \]

- Acute care all-cause 30-day Readmissions
- Total inpatient or outpatient emergency department visits per 1000
- Congestive heart failure (CHF) admissions per 100,000
- Bacterial pneumonia admissions per 100,000

\( \alpha_s = \text{Set of state indicators} \)

\( \delta_t = \text{Set of year indicators} \)

---

RDT variables = Munificence, Dynamism and Competition variables (Number of physicians per capita, Number of specialists per capita, Income per capita, Number of hospital beds per capita, Percentage of Poverty, Unemployment rate, HHI)

To test the hypothesis 3 and hypotheses 4, we estimate:

\[
Y_{st} = A_0 + \beta_1 \text{Percent ACO Medicare Market}_{st} + \beta_2 \text{Percent ACO Medicare Market}_{st} \times \\
\text{Expanded}_{st} + \beta_3 \text{Expanded}_{st} + \alpha_s + \delta_t + Y \text{ RDT Var}_{st} + \epsilon_{st}
\]  \hspace{1cm} (2)

Where:

\[
Y_{st} =
\]

\begin{itemize}
  \item Acute care all-cause 30-day Readmissions
  \item Total inpatient or outpatient emergency department visits per 1000
  \item Congestive heart failure (CHF) admissions per 100,000
  \item Bacterial pneumonia admissions per 100,000
\end{itemize}

\[\alpha_s = \text{Set of state indicators} \]

\[\delta_t = \text{Set of year indicators} \]

RDT variables = Munificence, Dynamism and Competition variables (Number of physicians per capita, Number of specialists per capita, Income per capita, Number of hospital beds per capita, Percentage of Poverty, Unemployment rate, HHI)

RHS variables include percent ACO Medicare market, which is a ratio derived by adding the Medicare population of all ACO's operating in each state in 2012, 2013 and 2014, divided by the total Medicare FFS population in the State. The equation includes a series of state and year fixed effects \(\alpha_s\) and \(\delta_t\).
In testing the effect of Medicaid expansion on the marginal effect of ACOs on health services utilization, the key variable of interest is the expanded Medicaid states interacted with percent ACO Medicare market. The equation probes the marginal influence of ACO-participating Medicare population on the health services utilization outcomes relative to non-ACO participating Medicare population, and any effect of Medicaid expansion. Lastly, the analysis controls for the potential effect of ACO's through a series of eight control variables, represented by munificence, dynamism and competition constructs.

The outcome table is as follows:

Percent ACO Medicare Market * Expanded States = $\beta_2$

Percent ACO Medicare Market (Pre-expansion in States which expanded Medicaid, and non-expansion States) = $\beta_1$

Impact of Expanded States = $\beta_3$

**Over controlling**

The analysis examines the impact of ACOs on utilization outcomes. One way ACOs may control for inappropriate utilization may be via the organizational attributes. This analysis will test for any significance in the association between percent ACO Medicare Market (2012, 2013 and 2014) and the numbers of physicians per capita, specialists per capita, hospital beds per capita, and HHI via a set of difference in differences regressions. The equation is as follows:

\[ Y_{st} = \alpha_0 + \beta_1 \text{Percent ACO Medicare Market}_{st} + \gamma \text{ RDT Var}_{st} + \alpha_s + \delta_t + \varepsilon_{st} \]  

(3)

Where:
\[ Y_{st} = \text{Number of physicians per capita, Number of specialists per capita, Number of hospital beds per capita change, HHI} \]

RDT variables = Income per capita, Percentage of Poverty, Unemployment rate

\[ \alpha_s = \text{Set of state indicators} \]

\[ \delta_t = \text{Set of year indicators} \]

**Study Limitations**

As stated earlier, some the main advantages of difference in differences are that we can find the counterfactual for any treatment group given a comparison group, and it is most suitable for examining state-level policy changes. However, Difference in Differences relaxes the assumption that the pre- and post- periods are the same and that groups have parallel trends in outcomes. This assumption leads to significant concern about the effect of time-varying factors. Our solution is to include resource dependence theory informed time varying control variables in the munificence, dynamism, and competition constructs alongside the state and year fixed effects.

This research assumes that the treatment group, (Medicare fee for service ACO participants) will have similar trends to the control group (all Medicare fee for service participants). The research assumes that threats to identification mitigate by the geographic dispersion of ACOs, and Medicare fee for service ACO participants as a representative subset of the aggregate Medicare fee for service population.
Robustness Checks

The following robustness checks are part of the analysis.

1. Examining outcomes not affected by policy change

The research will examine populations and outcomes that should not be affected by policy and practical implications of ACO participation. America’s Health Rankings tracks health measures at the state level for every year since 1990. The Health Rankings (http://www.americashealthrankings.org) are a collaborative effort between United Health Foundation and the American Public Health Association (APHA). Health rankings track several core measures including, pollution, behaviors, disease-specific debts, poverty, community and environment, immunization, infant mortality, mental health days, and preventable hospitalizations. The research proposes to examine populations which are not directly affected by policy and real-world implications of ACO participation, and outcomes which are not directly affected by policy and real consequences of ACO participation. This research will examine the rate of injury-related deaths, and violent crime at the state level and nationally for 2012, 2013 and 2014.

\[ Y_{st} = A_0 + \beta_1 \text{Percent ACO Medicare Market}_{st} + \alpha_s + \delta_t + \varepsilon_{st} \]  

Where \(Y_{st}\) = rate of injury related deaths, and violent crime at the state level in 2012, 2013, and 2014.
2. Pre-trends test

The ACO market years in the analysis are 2012, 2013, and 2014. The calendar year 2009, 2010, and 2011 are included to examine trends in the pre-periods. The research will examine the interaction of year dummies in the pre-period and the intensity of treatment in 2013, expressed as follows:

\[ Y_{st} = A_0 + \beta_1 \text{Percent ACO Medicare Market}_{st} + \beta_2 (\text{Year}=2009) \times \text{ACO (2013)}_{s} + \beta_3 (\text{Year}=2010) \times \text{ACO (2013)}_{s} + \beta_4 (\text{Year}=2011) \times \text{ACO (2013)}_{s} + \alpha_s + \delta_t + \epsilon_{st} \]  

(5)

3. Alternate Populations

The analysis will examine the impact on outcomes in non-Medicare populations. The research will investigate National Inpatient Sample (2012, 2013 and 2014), the National Ambulatory Medical Care Survey (NAMCS, 2012 – 2014), and Market Scan datasets to arrive at an appropriate and available study population. The regression is as follows:

\[ Y_{st} = A_0 + \beta_1 \text{Non-Medicare Population}_{st} + \alpha_s + \delta_t + \epsilon_{st} \]  

Where:

\[ Y_{st} = \]

- Acute care all-cause 30-day Readmissions
- Total inpatient or outpatient emergency department visits per 1000
- Congestive heart failure (CHF) admissions per 100,000
- Bacterial pneumonia admissions per 100,000

\[ \alpha_s = \text{Set of state indicators} \]
\( \delta_t = \text{Set of year indicators} \)

RDT variables = Munificence, Dynamism and Competition variables (Number of physicians per capita, Number of specialists per capita, Income per capita, Number of hospital beds per capita change, Percentage of Poverty, Unemployment rate, HHI)

4. Treatment Effect Dynamics

Treatment effect dynamics address the impact of policy changes over time - snowballing effects or effects that may fade over time.\(^{10}\)

The regression equation is expressed as follows:

\[
Y_{st} = \alpha_0 + \beta_1 \text{Percent ACO Medicare Market}_{st} + \beta_2 (\text{Year}=2012) \ast \text{ACO (2012)}_s + \beta_3 (\text{Year}=2013) \ast \text{ACO (2013)}_s + \beta_4 (\text{Year}=2014) \ast \text{ACO (2014)}_s + \alpha_s + \delta_t + \epsilon_{st}
\]  

The descriptive statistics, the results of the regressions, and robustness tests are presented in Chapter 5.

REFERENCES (Chapter 4)


13. Paul D. Allison. Multiple Regression: A Primer

CHAPTER 5 - RESULTS

The results chapter builds on the framework developed in chapter 4 and enumerates the analyses of the previously proposed methodology. Using publicly available data sources, which include MSSP ACO data files, the 2016 HRSA Area Resource File, and CMS' geographic variation public use file, the results highlight the effect of MSSP ACOs on health services utilization and prevention quality indicators through the lens of munificence, dynamism, and competition. The results also illustrate a state's choice for Medicaid expansion on MSSP ACO performance.

As such, this chapter outlines a deterministic test of our hypotheses which are as follows:

Hypothesis 1: ACOs will have significantly lower ED and Inpatient utilization than per capita market-level utilization, all else being equal

Hypothesis 2: ACOs will have significantly lower prevention quality indicators (as measured by CHF and Bacterial Pneumonia admissions) than market-level prevention quality indicators, all else being equal

Hypothesis 3: ACOs in States with Medicaid expansion will have significantly lower ED and Inpatient utilization when compared to ACO's in states without Medicaid expansion, after adjusting for market-level utilization, and all else being equal

Hypothesis 4: ACOs in States with Medicaid expansion will have significantly lower prevention quality indicators (as measured by CHF and Bacterial Pneumonia admissions) when compared to ACOs in States without Medicaid expansion, after adjusting for market-level utilization, and all else being equal
Two issues encountered as part of the analysis are as follows.

One, the sampling methodology as explained in Chapter 4 reviews multistate ACO websites and assigns them to a State based on the central business office location, and primary place of healthcare facilities. This method assumes that some ACOs beneficiaries are excluded where the ACO cannot reasonably be assigned to a State. In a careful review, no ACOs (except for one ACO in Puerto Rico, which fell outside the parameters of the study) are omitted from the analysis, and therefore the first sampling methodology (Method 1) captures all the ACO beneficiaries in 2012, 2013 and 2014.

However, the results also include a secondary analysis (Method 2) where a multi-state ACO attributed lives are proportioned equally among the assigned states. The study proposed a third methodology where a multi-state ACO attributed beneficiaries are proportioned in direct correlation to the number of ACO facilities in each state. This methodology proves to be problematic for at least two major reasons: one, a significant number of multistate ACOs do not list affiliate members on their website; and two, a significant number of multistate ACOs which do list affiliated members, do not provide location information. For these reasons, the results detail the analysis using attribution Method 1, and Method 2.

Two, the study proposes several robustness checks as part of the analysis. The study proposes an examination of the impact on the utilization outcomes in non-Medicare populations. This check is problematic for several reasons - one, obtaining utilization data (readmissions, ED visits, CHF admissions, and bacterial pneumonia admissions) is problematic for privately insured
populations, and, two, this difficulty is compounded by the study requirement of a four-year panel (2011 to 2014), which includes all 50 States, and the District of Columbia.

However, the study offers a rich examination of outcomes not affected by the policy change, includes the pre-trend test, and treatment effect dynamics which review the impact of policy over time.

The Results chapter is sequenced as follows: First, the derivation of the sample is detailed. Second, sample descriptive statistics is derived, including the percentage ACO market share from 2012 to 2014. These statistics include count, mean, standard deviation, skewness, kurtosis, and percentile data for each variable. The initial analysis which highlights the policy effect in the absence of control variables precedes testing the model for over controlling. Finally, the full model results are elaborated, along with the robustness checks.

**Sample Derivation**

As mentioned previously, no ACOs (except for one ACO in Puerto Rico, which fell outside the parameters of the study) are omitted from the analysis, and therefore sampling methodology captures all the ACO beneficiaries in 2012, 2013 and 2014. The final sample of 2012, 2013, and 2014 ACOs in the 2013 and 2014 ACO PUF are determined as follows:

**Method 1**

<table>
<thead>
<tr>
<th>2012 MSSP ACOs (N=104)</th>
<th>All the ACOs in 2013 MSSP ACO File assigned to a State (Removed PR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013 MSSP ACOs (N=220)</td>
<td>(2012 N=104)</td>
</tr>
<tr>
<td>2014 MSSP ACOs (N=333)</td>
<td>(2013 N=219)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>All the ACOs in 2014 MSSP ACO File assigned to a State (Removed PR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(2012 N=104)</td>
</tr>
<tr>
<td>(2013 N=219)</td>
</tr>
<tr>
<td>(2014 N=332)</td>
</tr>
</tbody>
</table>
Method 1: The primary beneficiary allocation methodology is explained in Chapter 4. For each ACO, the study reviewed the ACO website for central business office location and primary setting of healthcare facilities in the assignment of the primary state affiliation for the ACO beneficiaries.

Method 2

2012 MSSP ACOs (N=104)
2013 MSSP ACOs (N=220)
2014 MSSP ACOs (N=333)

All the ACOs in 2013 MSSP ACO File assigned to a State or States (Removed PR)
(2012 N=104)
(2013 N=219)

All the ACOs in 2013 MSSP ACO File assigned to a State or States (Removed PR)
(2012 N=104)
(2013 N=219)
(2014 N=332)

Method 2: Multi-state ACO attributed lives are proportioned equally among the assigned states.

The table below illustrates the percent ACO market segmented by year (2012, 2013, and 2014), and the number of ACO and Medicare Fee for Service (FFS) beneficiaries covered in each of these groups. The analysis did not drop any ACOs (except one ACO in Puerto Rico), and therefore includes all beneficiaries within each of these groups.

<table>
<thead>
<tr>
<th>Year</th>
<th>ACO Ben</th>
<th>FFS Ben</th>
<th>% ACO Ben</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>0</td>
<td>32361820</td>
<td>0.00%</td>
</tr>
<tr>
<td>2010</td>
<td>0</td>
<td>32861648</td>
<td>0.00%</td>
</tr>
<tr>
<td>2011</td>
<td>0</td>
<td>33564334</td>
<td>0.00%</td>
</tr>
<tr>
<td>2012</td>
<td>2055032</td>
<td>33921193</td>
<td>6.06%</td>
</tr>
<tr>
<td>2013</td>
<td>3661938</td>
<td>34100114</td>
<td>10.74%</td>
</tr>
<tr>
<td>2014</td>
<td>5316013</td>
<td>33935438</td>
<td>15.67%</td>
</tr>
</tbody>
</table>

Constructs, supporting variables, data sources, and description as follows:

<table>
<thead>
<tr>
<th>Construct</th>
<th>Variables</th>
<th>Data Sources</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outcomes</td>
<td>Inpatient and Outpatient ED Utilization</td>
<td>CMS Geographic Variation PUF</td>
<td>ED Visits Per 1000 Medicare FFS Beneficiaries by State, Year</td>
</tr>
<tr>
<td></td>
<td>Acute care all-cause 30-day Readmissions</td>
<td>CMS Geographic Variation PUF</td>
<td>Hospital Readmission Rate (%) for FFS Beneficiaries by State, Year</td>
</tr>
<tr>
<td>PQI</td>
<td>CHF admissions (Age &lt; 65, 65 - 74, 75 Plus)</td>
<td>CMS Geographic Variation PUF</td>
<td>CHF admissions per 100,000 FFS Beneficiaries in specified age groups by State, Year</td>
</tr>
<tr>
<td>PQI</td>
<td>Bacterial pneumonia admissions (Age &lt; 65, 65 - 74, 75 Plus)</td>
<td>CMS Geographic Variation PUF</td>
<td>PN admissions per 100,000 FFS Beneficiaries in specified age groups by State, Year</td>
</tr>
<tr>
<td>Munificence</td>
<td>Number of physicians per capita</td>
<td>AHRF 2016</td>
<td>PCPs Per 100,000</td>
</tr>
</tbody>
</table>
Summary Statistics

Table 1 shows a sample detailing the data layout for the utilization variables.

<table>
<thead>
<tr>
<th>STATE</th>
<th>Year</th>
<th>FFS Ben.</th>
<th>RR</th>
<th>ED/1000</th>
<th>CHF &lt;65</th>
<th>CHF 74</th>
<th>65-74</th>
<th>CHF 75+</th>
<th>PN &lt;65</th>
<th>PN 65-74</th>
<th>PN 75+</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA</td>
<td>2009</td>
<td>2608638</td>
<td>19.36</td>
<td>553</td>
<td>869</td>
<td>589</td>
<td>1,854</td>
<td>668</td>
<td>479</td>
<td>1,502</td>
<td></td>
</tr>
<tr>
<td>CA</td>
<td>2010</td>
<td>2653042</td>
<td>19.46</td>
<td>561</td>
<td>860</td>
<td>567</td>
<td>1,790</td>
<td>598</td>
<td>461</td>
<td>1,473</td>
<td></td>
</tr>
<tr>
<td>CA</td>
<td>2011</td>
<td>2722379</td>
<td>19.38</td>
<td>568</td>
<td>833</td>
<td>537</td>
<td>1,712</td>
<td>565</td>
<td>430</td>
<td>1,370</td>
<td></td>
</tr>
<tr>
<td>CA</td>
<td>2012</td>
<td>2800886</td>
<td>19.06</td>
<td>573</td>
<td>813</td>
<td>496</td>
<td>1,589</td>
<td>500</td>
<td>376</td>
<td>1,249</td>
<td></td>
</tr>
<tr>
<td>CA</td>
<td>2013</td>
<td>2832345</td>
<td>18.46</td>
<td>569</td>
<td>919</td>
<td>545</td>
<td>1,740</td>
<td>486</td>
<td>366</td>
<td>1,205</td>
<td></td>
</tr>
<tr>
<td>CA</td>
<td>2014</td>
<td>2759046</td>
<td>18.01</td>
<td>559</td>
<td>879</td>
<td>499</td>
<td>1,651</td>
<td>449</td>
<td>311</td>
<td>1,001</td>
<td></td>
</tr>
<tr>
<td>RI</td>
<td>2009</td>
<td>98,602</td>
<td>20.59</td>
<td>723</td>
<td>733</td>
<td>851</td>
<td>2,940</td>
<td>882</td>
<td>602</td>
<td>1,752</td>
<td></td>
</tr>
<tr>
<td>RI</td>
<td>2010</td>
<td>103,029</td>
<td>20.66</td>
<td>723</td>
<td>733</td>
<td>832</td>
<td>2,795</td>
<td>725</td>
<td>542</td>
<td>1,663</td>
<td></td>
</tr>
<tr>
<td>RI</td>
<td>2011</td>
<td>105,446</td>
<td>20.04</td>
<td>728</td>
<td>485</td>
<td>680</td>
<td>2,587</td>
<td>745</td>
<td>551</td>
<td>1,718</td>
<td></td>
</tr>
<tr>
<td>RI</td>
<td>2012</td>
<td>107,186</td>
<td>19.48</td>
<td>749</td>
<td>588</td>
<td>693</td>
<td>2,178</td>
<td>622</td>
<td>502</td>
<td>1,382</td>
<td></td>
</tr>
<tr>
<td>RI</td>
<td>2013</td>
<td>110,095</td>
<td>18.42</td>
<td>747</td>
<td>582</td>
<td>701</td>
<td>2,398</td>
<td>433</td>
<td>396</td>
<td>1,277</td>
<td></td>
</tr>
<tr>
<td>RI</td>
<td>2014</td>
<td>111,170</td>
<td>19.06</td>
<td>738</td>
<td>736</td>
<td>732</td>
<td>2,711</td>
<td>347</td>
<td>327</td>
<td>1,059</td>
<td></td>
</tr>
</tbody>
</table>

Table 2 details the data layout for the percent ACO market for the two beneficiary allocation methodologies, along with the control variables.

<table>
<thead>
<tr>
<th>STATE</th>
<th>Year</th>
<th>% ACO M1</th>
<th>% ACO M2</th>
<th>PCP</th>
<th>SPC</th>
<th>PerCapInc</th>
<th>%Poverty</th>
<th>%Unempl</th>
<th>HHI</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA</td>
<td>2009</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>42395</td>
<td>14.2</td>
<td>11.4</td>
<td></td>
</tr>
</tbody>
</table>

110
Table 3 presents the summary statistics for outcome variables. Summary statistics are for 2011-2014, yielding 204 observations across 50 states plus the District of Columbia. Readmissions rate and emergency department visits are normally distributed with skewness approaching zero, and kurtosis approaching three. CHF admissions for the under 65 age group are positively skewed, while CHF admissions for the 65 to 74, and the 75+ age groups have a relatively normal distribution. Bacterial Pneumonia admissions for the 65 to 74 age group are positively skewed, while Bacterial Pneumonia admissions for the under 65 age group, and the 75+ age group shows a relatively normal distribution.
Table 4 presents summary statistics for control variables. Summary statistics are for 2011-2014, yielding 204 observations across 50 states plus the District of Columbia. Primary care physicians, specialists, and per capita income are not normally distributed - all three are positively skewed, with heavy tails. In contrast, poverty rate, unemployment rate, and individual insurance market competition show a relatively normal distribution.

<table>
<thead>
<tr>
<th>TABLE 4</th>
<th>count</th>
<th>mean</th>
<th>SD</th>
<th>skewness</th>
<th>kurtosis</th>
<th>p10</th>
<th>p25</th>
<th>p50</th>
<th>p75</th>
<th>p99</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCP Per 100000</td>
<td>204</td>
<td>89.19</td>
<td>19.70</td>
<td>1.78</td>
<td>8.47</td>
<td>70.54</td>
<td>75.34</td>
<td>85.47</td>
<td>97.65</td>
<td>170.01</td>
</tr>
<tr>
<td>SPC per 100000</td>
<td>204</td>
<td>89.62</td>
<td>39.61</td>
<td>2.39</td>
<td>10.90</td>
<td>54.05</td>
<td>67.62</td>
<td>82.61</td>
<td>95.75</td>
<td>274.77</td>
</tr>
<tr>
<td>Per Capita Income</td>
<td>204</td>
<td>43752</td>
<td>7782</td>
<td>1.35</td>
<td>5.69</td>
<td>3568</td>
<td>3787</td>
<td>4237</td>
<td>4736</td>
<td>7378</td>
</tr>
<tr>
<td>Poverty Rate</td>
<td>204</td>
<td>15.14</td>
<td>3.19</td>
<td>0.22</td>
<td>2.29</td>
<td>11.2</td>
<td>12.3</td>
<td>15.2</td>
<td>17.8</td>
<td>22.8</td>
</tr>
<tr>
<td>Unempl. Rate (16+)</td>
<td>204</td>
<td>7.01</td>
<td>1.85</td>
<td>0.22</td>
<td>3.12</td>
<td>4.5</td>
<td>5.75</td>
<td>6.9</td>
<td>8.2</td>
<td>11.3</td>
</tr>
<tr>
<td>HHI</td>
<td>204</td>
<td>4066.24</td>
<td>1805</td>
<td>0.69</td>
<td>2.84</td>
<td>1959</td>
<td>2719</td>
<td>3723</td>
<td>5376</td>
<td>8724</td>
</tr>
</tbody>
</table>

Table 5 presents the summary statistics for the percent ACO market in 2012, 2013 and 2014, yielding 153 observations across 50 states plus the District of Columbia. As expected, both method 1 and method 2 beneficiary allocation methodologies are not normally distributed - both are positively skewed, with heavy tails.

<table>
<thead>
<tr>
<th>TABLE 5</th>
<th>count</th>
<th>mean</th>
<th>SD</th>
<th>skewness</th>
<th>kurtosis</th>
<th>p10</th>
<th>p25</th>
<th>p50</th>
<th>p75</th>
<th>p99</th>
</tr>
</thead>
<tbody>
<tr>
<td>%ACO Ben (Method 1)</td>
<td>153</td>
<td>9.709</td>
<td>10.08</td>
<td>1.65</td>
<td>7.20</td>
<td>0</td>
<td>0.56</td>
<td>8.15</td>
<td>14.42</td>
<td>45.93</td>
</tr>
<tr>
<td>%ACO Ben (Method 2)</td>
<td>153</td>
<td>10.588</td>
<td>9.93</td>
<td>2.07</td>
<td>10.82</td>
<td>0</td>
<td>3.98</td>
<td>8.54</td>
<td>14.56</td>
<td>36.37</td>
</tr>
</tbody>
</table>
Correlation Matrix

Table 6 presents the association between the outcome variables. CHF admissions in the 65 - 74 age group and the 75 plus age group show moderate correlation with readmissions rate and ED visits. Similarly, ED visits show moderate correlation with the readmissions rate.

<table>
<thead>
<tr>
<th>TABLE 6</th>
<th>RR</th>
<th>ED/1000</th>
<th>CHF &lt;65</th>
<th>CHF 65-74</th>
<th>CHF 75+</th>
<th>PN &lt;65</th>
<th>PN 65-74</th>
<th>PN 75+</th>
</tr>
</thead>
<tbody>
<tr>
<td>RR</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ED/1000</td>
<td>0.5646</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHF &lt;65</td>
<td>0.6551</td>
<td>0.3462</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHF 65-74</td>
<td>0.7782</td>
<td>0.7364</td>
<td>0.7208</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHF 75+</td>
<td>0.805</td>
<td>0.7375</td>
<td>0.5416</td>
<td>0.8994</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PN &lt;65</td>
<td>0.1952</td>
<td>0.1959</td>
<td>0.1656</td>
<td>0.4068</td>
<td>0.3682</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PN 65-74</td>
<td>0.2674</td>
<td>0.4345</td>
<td>0.1464</td>
<td>0.5893</td>
<td>0.509</td>
<td>0.8366</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>PN 75+</td>
<td>0.0954</td>
<td>0.2837</td>
<td>-0.0481</td>
<td>0.37</td>
<td>0.3619</td>
<td>0.8173</td>
<td>0.9193</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 7 presents the association between the control variables. Specialist per capita and Primary care providers (PCP) are moderately correlated, while per capita income also shows moderate correlation with PCPs and Specialists.

<table>
<thead>
<tr>
<th>TABLE 7</th>
<th>PCP</th>
<th>SPC</th>
<th>PerCapInc</th>
<th>%Poverty</th>
<th>%Unempl</th>
<th>HHI</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCP</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPC</td>
<td>0.8592</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PerCapInc</td>
<td>0.7302</td>
<td>0.7283</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>%Poverty</td>
<td>0.3093</td>
<td>0.111</td>
<td>-0.5317</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>%Unempl</td>
<td>0.003</td>
<td>0.2167</td>
<td>-0.1786</td>
<td>0.4545</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>HHI</td>
<td>0.1955</td>
<td>0.1137</td>
<td>0.0644</td>
<td>-0.0376</td>
<td>-0.1633</td>
<td>1</td>
</tr>
</tbody>
</table>
Distribution of MSSP ACO Beneficiaries

Figure 1 and 2 show the MSSP ACO market share for States in 2014 for Method 1 and 2 of beneficiary allocation. The geographic dispersion of ACO beneficiaries is particularly mottled in the South and North East.

Figure 1

MSSP ACO Market Segment of Medicare FFS Beneficiaries (2014)

Figure 2

MSSP ACO Market Segment of Medicare FFS Beneficiaries (2014)
Introductory & Exploratory Analysis

Unless otherwise noted, the all the regressions in this analysis are weighted to produce residuals with constant variance (homoscedasticity). The weight was assigned using Total Fee for Service (FFS) beneficiaries.

To test the hypothesis 1 and hypotheses 2, we use the generalized Difference-in-Differences to estimate:

$$Y_{st} = A_0 + \beta_1 \text{Percent ACO Medicare Market}_{st} + \alpha_s + \delta_t + \gamma \text{ RDT Var}_{st} + \epsilon_{st}$$

Table 8 shows the regression output in the absence of control variables (as specified in the model above) for Method 1 of the ACO beneficiary allocation. ED visits show statistical significance, where a one percentage point increase in ACO beneficiaries shows a decrease of half a percentage point in ED visits per 1000 beneficiaries and a 0.1% negative impact on ED visits per 1000 beneficiaries. The impact on Readmissions rate, CHF admissions, and Bacterial Pneumonia admissions are not statistically significant.

<table>
<thead>
<tr>
<th>%ACO Ben (Method 1)</th>
<th>RR ED_Per_l000</th>
<th>CHF_Less_65</th>
<th>CHF_65_74</th>
<th>CHF_75_Plus</th>
<th>PN_Less_65</th>
<th>PN_65_74</th>
<th>PN_75_Plus</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>b/se/ci95</td>
<td>b/se/ci95</td>
<td>b/se/ci95</td>
<td>b/se/ci95</td>
<td>b/se/ci95</td>
<td>b/se/ci95</td>
<td>b/se/ci95</td>
</tr>
<tr>
<td>%ACO Ben (Method 1)</td>
<td>-0.005</td>
<td>-0.543*</td>
<td>0.415</td>
<td>0.959</td>
<td>1.998</td>
<td>-0.04</td>
<td>0.321</td>
</tr>
<tr>
<td></td>
<td>0.008</td>
<td>0.295</td>
<td>1.106</td>
<td>0.635</td>
<td>1.561</td>
<td>0.848</td>
<td>0.795</td>
</tr>
<tr>
<td></td>
<td>-0.02,0.01</td>
<td>-1.14,0.05</td>
<td>-1.81,2.64</td>
<td>-0.32,2.23</td>
<td>-1.14,5.13</td>
<td>-1.75,1.66</td>
<td>-1.14,9.2</td>
</tr>
<tr>
<td>R-sqr</td>
<td>0.98</td>
<td>0.99</td>
<td>0.97</td>
<td>0.98</td>
<td>0.98</td>
<td>0.96</td>
<td>0.98</td>
</tr>
<tr>
<td>dfres</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>49</td>
<td>50</td>
</tr>
<tr>
<td>BIC</td>
<td>-12.493</td>
<td>1,461.36</td>
<td>2,126.07</td>
<td>1,859,13</td>
<td>2,226.57</td>
<td>1,980.41</td>
<td>1,935.79</td>
</tr>
<tr>
<td>Mean.Dep.Var.</td>
<td>18.337</td>
<td>653.524</td>
<td>952.603</td>
<td>700.777</td>
<td>2,119.02</td>
<td>723.41</td>
<td>561.151</td>
</tr>
<tr>
<td>%impact</td>
<td>-0.027</td>
<td>-0.083</td>
<td>0.044</td>
<td>0.137</td>
<td>0.094</td>
<td>-0.006</td>
<td>0.057</td>
</tr>
<tr>
<td>Obs</td>
<td>204</td>
<td>204</td>
<td>204</td>
<td>204</td>
<td>204</td>
<td>200</td>
<td>204</td>
</tr>
</tbody>
</table>

* p<.10, ** p<.05, ***p<.01
Table 9 shows the regression output in the absence of control variables (as specified in the model above) for Method 2 of the ACO beneficiary allocation. The impact on all the outcomes - readmissions rate, ED visits, CHF admissions, and Bacterial Pneumonia admissions is not statistically significant.

**TABLE 9: Effect of ACOs on Outcomes without controls (Method 2)**

<table>
<thead>
<tr>
<th>%ACO Ben (Method 2)</th>
<th>RR</th>
<th>ED_Per_1000</th>
<th>CHF_Less_65</th>
<th>CHF_65_74</th>
<th>CHF_7S_Plus</th>
<th>PN_Less_65</th>
<th>PN_65_74</th>
<th>PN_7S_Plus</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>b/se/cl95</td>
<td>b/se/cl95</td>
<td>b/se/cl95</td>
<td>b/se/cl95</td>
<td>b/se/cl95</td>
<td>b/se/cl95</td>
<td>b/se/cl95</td>
<td></td>
</tr>
<tr>
<td>-0.005</td>
<td>-0.012</td>
<td>0.392</td>
<td>1.295</td>
<td>1.415</td>
<td>3.03</td>
<td>0.936</td>
<td>0.387</td>
<td>1.654</td>
</tr>
<tr>
<td>0.001</td>
<td>0.072</td>
<td>1.448</td>
<td>1.927</td>
<td>1.34</td>
<td>0.942</td>
<td>0.719</td>
<td>1.686</td>
<td></td>
</tr>
<tr>
<td>-0.03,0.02</td>
<td>-1.07,0.28</td>
<td>-1.61,4.20</td>
<td>-0.45,3.28</td>
<td>-1.26,7.32</td>
<td>-0.96,2.83</td>
<td>-1.06,1.83</td>
<td>-1.73,5.04</td>
<td></td>
</tr>
<tr>
<td>R-sqr</td>
<td>0.98</td>
<td>0.99</td>
<td>0.98</td>
<td>0.98</td>
<td>0.96</td>
<td>0.98</td>
<td>0.98</td>
<td></td>
</tr>
<tr>
<td>dfres</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>49</td>
<td>50</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>BIC</td>
<td>-12.093</td>
<td>1,468.35</td>
<td>2,124.28</td>
<td>1,855.35</td>
<td>2,223.49</td>
<td>1,978.80</td>
<td>1,935.73</td>
<td>2,221.56</td>
</tr>
<tr>
<td>Mean.Dep.Var.</td>
<td>18.337</td>
<td>653.524</td>
<td>952.603</td>
<td>700.777</td>
<td>2,119.02</td>
<td>723.41</td>
<td>561.151</td>
<td>1,566.58</td>
</tr>
<tr>
<td>%Impact</td>
<td>-0.026</td>
<td>-0.06</td>
<td>0.136</td>
<td>0.202</td>
<td>0.143</td>
<td>0.129</td>
<td>0.069</td>
<td>0.106</td>
</tr>
<tr>
<td>Obs</td>
<td>204</td>
<td>204</td>
<td>204</td>
<td>204</td>
<td>204</td>
<td>204</td>
<td>204</td>
<td></td>
</tr>
</tbody>
</table>

* p<.10, ** p<.05, ***p<.01

**Medicaid Expansion**

To test the hypothesis 3 and hypothesis 4, we estimate:

\[ Y_{st} = \alpha_0 + \beta_1 \text{Percent ACO Medicare Market}_{st} + \beta_2 \text{Percent ACO Medicare Market}_{st} \cdot \text{Expanded} \\
+ \beta_3 \text{Expanded}_{st} + \alpha_1 + \delta_t + \gamma \text{RDT Var}_{st} + \epsilon_{st} \]

Table 10 shows the regression output in the absence of control variables (as specified in the model above), and weights, for Method 1 of the ACO beneficiary allocation. 'ACO in Expanded' is created as a product of percent ACO beneficiaries and Expanded (States' Medicaid expansion status). Results show a 10.5 per 1000 beneficiaries increase in ED utilization in States that chose...
Medicaid expansion - however, a one percentage point increase in ACO beneficiaries mitigates this 10.5 per 1000 beneficiary increase by 0.5. While the coefficients may indicate directionality of change, none of the other outcomes - readmission rate, ED Visits, CHF admissions, bacterial pneumonia admissions demonstrate statistical significance.

**TABLE 10: Effect of 2014 Medicaid Expansion without controls (Method 1)**

<table>
<thead>
<tr>
<th></th>
<th>RR</th>
<th>ED_Per_1000</th>
<th>CHF_Less_65</th>
<th>CHF_65_74</th>
<th>CHF_75_Plus</th>
<th>PN_Less_65</th>
<th>PN_65_74</th>
<th>PN_75_Plus</th>
</tr>
</thead>
<tbody>
<tr>
<td>%ACO_BEN_M1</td>
<td>0</td>
<td>-0.143</td>
<td>-0.524</td>
<td>0.675</td>
<td>-0.15</td>
<td>0.584</td>
<td>0.177</td>
<td>-0.727</td>
</tr>
<tr>
<td></td>
<td>0.004</td>
<td>0.182</td>
<td>1.278</td>
<td>0.551</td>
<td>1.332</td>
<td>0.584</td>
<td>0.177</td>
<td>-0.727</td>
</tr>
<tr>
<td></td>
<td>0.001</td>
<td>-0.510.22</td>
<td>-3.092.04</td>
<td>-0.431.78</td>
<td>-2.832.53</td>
<td>-1.532.70</td>
<td>-1.001.35</td>
<td>-3.722.27</td>
</tr>
<tr>
<td>ACO_In_Expanded_M1</td>
<td>0.002</td>
<td>-0.489**</td>
<td>0.67</td>
<td>-0.402</td>
<td>2.567</td>
<td>0.898</td>
<td>-0.3</td>
<td>-0.509</td>
</tr>
<tr>
<td></td>
<td>0.005</td>
<td>0.212</td>
<td>1.43</td>
<td>0.535</td>
<td>1.77</td>
<td>0.826</td>
<td>1.231</td>
<td>2.134</td>
</tr>
<tr>
<td></td>
<td>0.001</td>
<td>-0.910.06</td>
<td>-2.203.54</td>
<td>-1.480.67</td>
<td>-0.996.12</td>
<td>-0.762.56</td>
<td>-2.772.17</td>
<td>-4.803.78</td>
</tr>
<tr>
<td>Expanded</td>
<td>-0.222</td>
<td>10.491**</td>
<td>-11.279</td>
<td>14.698</td>
<td>-22.197</td>
<td>-0.176</td>
<td>-1.946</td>
<td>11.421</td>
</tr>
<tr>
<td></td>
<td>0.162</td>
<td>4.941</td>
<td>43.567</td>
<td>16.909</td>
<td>43.502</td>
<td>24.918</td>
<td>28.058</td>
<td>52.991</td>
</tr>
<tr>
<td></td>
<td>-5.50.10</td>
<td>0.5720.42</td>
<td>-98.7976.23</td>
<td>-19.348.7</td>
<td>-109.6.65.2</td>
<td>-50.349.9</td>
<td>-58.354.4</td>
<td>-95.01117.86</td>
</tr>
<tr>
<td>R-sqr</td>
<td>0.99</td>
<td>0.99</td>
<td>0.98</td>
<td>0.98</td>
<td>0.94</td>
<td>0.97</td>
<td>0.97</td>
<td></td>
</tr>
<tr>
<td>dfres</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIC</td>
<td>2.795</td>
<td>1481.13</td>
<td>2777.04</td>
<td>1975.32</td>
<td>2323.51</td>
<td>2115.98</td>
<td>2018.23</td>
<td>2316.33</td>
</tr>
<tr>
<td>Mean Dep.Var.</td>
<td>18.337</td>
<td>653.524</td>
<td>952.603</td>
<td>700.777</td>
<td>2119.02</td>
<td>723.41</td>
<td>561.151</td>
<td>1566.58</td>
</tr>
<tr>
<td>%Impact</td>
<td>0.002</td>
<td>-0.022</td>
<td>-0.055</td>
<td>0.096</td>
<td>-0.007</td>
<td>0.081</td>
<td>0.031</td>
<td>-0.046</td>
</tr>
<tr>
<td>Obs</td>
<td>204</td>
<td>204</td>
<td>204</td>
<td>204</td>
<td>204</td>
<td>200</td>
<td>204</td>
<td>204</td>
</tr>
</tbody>
</table>

* p<.10, ** p<.05, ***p<.01

Table 11 shows the regression output in the absence of control variables (as specified in the model above), and weights, for Method 2 of the ACO beneficiary allocation. Again, ‘ACO in Expanded’ was created as a product of percent ACO beneficiaries and Expanded (States’ Medicaid expansion status). While the coefficients may indicate directionality of change, States
that choose Medicaid expansion show no significant impact on any outcome. Interestingly, a one percentage point increase in ACO beneficiaries results in CHF admissions in the 65 to 74 age group increasing by 2.119% for ACOs in states without Medicaid expansion and the pre-expansion period in States with Medicaid expansion, an impact of 0.302%.

| TABLE 11: Effect of 2014 Medicaid Expansion without controls (Method 2) |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
|                  | RR              | ED_Per_1000     | CHF_Less_65     | CHF_65_74       | CHF_75_Plus     | PN_Less_65      | PN_65_74        | PN_75_Plus      | b/se/c195       | b/se/c195       | b/se/c195       | b/se/c195       | b/se/c195       | b/se/c195       | b/se/c195       | b/se/c195       | b/se/c195       | b/se/c195       | b/se/c195       | b/se/c195       | b/se/c195       |
| %ACO_BEN_M2      | -0.001          | -0.113          | 2.035           | 2.119**         | 0.7             | 0.842           | 0.107           | 1.864           |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |
|                  | 0.006           | 0.3             | 1.904           | 0.846           | 1.828           | 1.111           | 0.772           | 1.538           |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |
|                  | -0.01,0.01      | -0.72,0.49      | -1.79,5.86      | 0.42,3.82       | -2.97,4.37      | -1.39,3.07      | -1.44,1.66      | -1.23,4.95      |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |
| ACO_in_Expanded_M2 | -0.006          | 0.022           | 1.412           | -0.855          | 2.207           | 0.28            | 0.055           | -0.987          |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |
|                  | 0.006           | 0.366           | 1.829           | 0.779           | 1.571           | 1.257           | 1.218           | 1.833           |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |
|                  | -0.02,0.01      | -0.71,0.76      | -2.26,5.09      | -2.42,0.71      | -0.95,5.36      | -2.25,2.81      | -2.39,2.50      | -4.67,2.70      |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |
| Expanded         | -0.087          | 2.894           | -38.689         | 15.442          | -28.222         | 8.183           | -7.762          | 11.539          |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |
|                  | 0.162           | 7.353           | 44.909          | 18.558          | 42.697          | 28.493          | 28.556          | 49.712          |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |
|                  | -41,0.24        | -11.87,17.66    | -128.9,51.51    | -21.8,52.7      | -113.9,57.5     | -49.1,65.44     | -65.1,49.6      | -88.31,111.4    |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |
| R-sqr            | 0.99            | 0.99            | 0.98            | 0.98            | 0.98            | 0.94            | 0.97            | 0.97            |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |
| dfres            | 50              | 50              | 50              | 50              | 50              | 49              | 50              | 50              |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |
| BIC              | 0.375           | 1,505.79        | 2,263.57        | 1,957.70        | 2,321.15        | 2,117.74        | 2,018.96        | 2,315.03        |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |
| Mean.Dep.Ver.    | 18.337          | 653.524         | 952.603         | 700.777         | 2,119.02        | 723.41          | 561.151         | 1,566.58        |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |
| %Impact          | -0.003          | -0.017          | 0.214           | 0.302           | 0.033           | 0.116           | 0.019           | 0.119           |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |
| Obs              | 204             | 204             | 204             | 204             | 204             | 200             | 204             | 204             |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |

*p<.10, **p<.05, ***p<.01
Over controlling

The analysis examines the impact of ACOs on utilization outcomes. One way ACOs may control for inappropriate utilization may be via the organizational attributes. The analysis tests for any significance in the association between percent ACO Medicare Market (2012, 2013 and 2014) and the numbers of physicians per capita, the number of specialists per capita, and HHI via a set of Difference in Differences regressions. The equation is:

\[ Y_{st} = A_0 + \beta_1 \text{Percent ACO Medicare Market}_{st} + \gamma \text{RDT Var}_{st} + \alpha_s + \delta_t + \epsilon_{st} \]

Where:

\[ Y_{st} = \text{Number of physicians per capita, Number of specialists per capita, HHI} \]

\[ \text{RDT variables = Income per capita, Percentage of Poverty, Unemployment rate} \]

\[ \alpha_s = \text{Set of state indicators} \]

\[ \delta_t = \text{Set of year indicators} \]

As Table 12 shows, Specialists per capita are significant at \( p < 0.10 \) and is dropped in the model where the beneficiary allocation uses Method 1.

<table>
<thead>
<tr>
<th>TABLE 12</th>
</tr>
</thead>
<tbody>
<tr>
<td>* Over Controlling Test (Method 1)</td>
</tr>
<tr>
<td>PCPer100000</td>
</tr>
<tr>
<td>b/se</td>
</tr>
<tr>
<td>%ACO_BEN_M1</td>
</tr>
<tr>
<td>Per Capita Income</td>
</tr>
<tr>
<td>% Persons In Poverty</td>
</tr>
<tr>
<td>Unempl. Rate (16+)</td>
</tr>
</tbody>
</table>

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Full Model Results

To test the hypothesis 1 and hypotheses 2, we use the generalized difference-in-differences to estimate:

\[ Y_{st} = A_0 + \beta_1 \text{ Percent ACO Medicare Market}_{st} + \alpha_s + \delta_t + Y \text{ RDT Var}_{st} + \varepsilon_{st} \]

Where:

\[ Y_{st} = \]

- Total acute care readmissions (all-cause 30 day) - (Rate)
- Total (inpatient or hospital outpatient) emergency department visits per 1000
- Total number of admissions for congestive heart failure (CHF) per 100,000
- Total number of admissions for bacterial pneumonia per 100,000

\[ \alpha_s = \text{ Set of state indicators} \]
\[ \delta_t = \text{ Set of year indicators} \]

\text{RDT variables} = \text{ Munificence, Dynamism and Competition variables (Number of physicians per capita, Number of specialists per capita, Income per capita, Percentage of Poverty, Unemployment rate, and HHI)}
Table 13 shows the regression output for Method 1 of the ACO beneficiary allocation. ED visits are significant at p < 0.10, where a one percentage point increase in ACO beneficiaries shows a decrease of 0.5% in ED visits per 1000 beneficiaries holding all else constant and a 0.1% negative impact on ED visits per 1000 beneficiaries.

Interestingly, a one percentage point increase in poverty rate decreases ED utilization by 9.5%, and CHF admissions in the 75 plus age group by 46%, holding all else constant.

Similarly, a one percentage point increase in unemployment rate decreases CHF admissions in the below 65 age group by 20%; and, bacterial pneumonia admissions in the below 65 age group by 22%, the 65 to 74 age group by 18%, and the 75 plus age group by 35%, holding all else constant.

| TABLE 13: Effect of ACOs on Utilization - Method 1 (dropping Specialists per Capita) |
|-----------------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
|                                         | RR              | ED_Per_1000     | CHF_Less_65     | CHF_65_74       | CHF_75_Plus     | PN_Less_65      | PN_65_74        | PN_75_Plus      |
| %ACO_BEN_M1                             | -0.004          | -0.451          | 0.525           | 1.177           | 2.519           | 0.294           | 0.818           | 1.666           |
|                                         | 0.000           | 0.241           | 1.117           | 0.723           | 1.627           | 0.731           | 0.730           | 1.574           |
|                                           | -0.02,0.01      | -0.94,0.03      | -1.72,2.77      | -0.28,2.63      | -0.75,5.79      | -1.18,1.76      | -0.65,2.28      | -1.50,4.83      |
| PCP Per 100000                          | 0.051           | 2.024           | -1.195          | 1.157           | -2.776          | -2.663          | 0.702           | 1.946           |
|                                           | 0.048           | 1.679           | 7.280           | 4.370           | 11.619          | 5.685           | 4.033           | 9.564           |
|                                           | -0.05,0.15      | -1.35,5.40      | -15.82,13.43    | -7.62,9.93      | -26.11,20.56    | -14.09,8.76     | -7.40,8.80      | -17.26,21.16    |
| Per Capita income                        | 0.000           | -0.002          | -0.002          | 0.003           | 0.000           | -0.006          | 0.002           | -0.016          |
|                                         | 0.000           | 0.002           | 0.010           | 0.004           | 0.009           | 0.006           | 0.005           | 0.011           |
|                                         | 0.107           | 3.073           | 18.172          | 12.658          | 27.273          | 11.413          | 10.756          | 24.305          |
|                                           | -37,0.05        | -15.64, -3.29   | -26.11,48.89    | -32.7,18.20     | -100.80,8.76    | -28.7,17.14     | -24.2,18.98     | -63.94,33.70    |
|                                         | 0.075           | 2.340           | 9.745           | 4.980           | 12.426          | 6.164           | 5.158           | 12.143          |
Table 14 shows the regression output for Method 2 of the ACO beneficiary allocation. A one-unit increase in Specialists per capita increases CHF admissions in the 75 plus age group by 21 per 100,000 beneficiaries.

Again, a one percentage point increase in poverty rate decreases ED utilization by 10%, and CHF admissions in the 75 plus age group by 46%, holding all else constant.

Similarly, a one percentage point increase in unemployment rate decreases CHF admissions in the below 65 age group by 19%, holding all else constant. Also, one percentage point increase in unemployment rate decreases bacterial pneumonia admissions in the below 65 age group by 23%, the 65 to 74 age group by 17%, and the 75 plus age group by 36%, holding all else constant.

**TABLE 14: Effect of ACOs on Utilization - Method 2**

<table>
<thead>
<tr>
<th>RR</th>
<th>ED_Per_1000</th>
<th>CHF_Less_65</th>
<th>CHF_65_74</th>
<th>CHF_75_Plus</th>
<th>PN_Less_65</th>
<th>PN_65_74</th>
<th>PN_75_Plus</th>
</tr>
</thead>
<tbody>
<tr>
<td>b/se/95</td>
<td>b/se/95</td>
<td>b/se/95</td>
<td>b/se/95</td>
<td>b/se/95</td>
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<td>b/se/95</td>
<td>b/se/95</td>
</tr>
<tr>
<td>%ACO_BEN_M2</td>
<td>-0.004</td>
<td>-0.344</td>
<td>1.532</td>
<td>1.465</td>
<td>2.842</td>
<td>1.145</td>
<td>0.721</td>
</tr>
<tr>
<td></td>
<td>0.012</td>
<td>0.299</td>
<td>1.479</td>
<td>1.023</td>
<td>2.076</td>
<td>0.844</td>
<td>0.666</td>
</tr>
<tr>
<td>------------------------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
</tr>
<tr>
<td></td>
<td>-0.3, 0.02</td>
<td>-0.95, 0.26</td>
<td>-1.44, 1.50</td>
<td>-0.59, 3.52</td>
<td>-1.33, 7.01</td>
<td>-0.55, 2.84</td>
<td>-0.62, 2.06</td>
</tr>
<tr>
<td>PCP Per 100000</td>
<td>0.073</td>
<td>2.752</td>
<td>0.829</td>
<td>-0.897</td>
<td>-14.429</td>
<td>-3.695</td>
<td>2.222</td>
</tr>
<tr>
<td></td>
<td>0.050</td>
<td>2.152</td>
<td>8.622</td>
<td>4.174</td>
<td>10.761</td>
<td>6.282</td>
<td>4.495</td>
</tr>
<tr>
<td>SPC Per 100000</td>
<td>-0.040</td>
<td>-1.427</td>
<td>-4.233</td>
<td>3.651</td>
<td>21.121***</td>
<td>1.997</td>
<td>-2.612</td>
</tr>
<tr>
<td></td>
<td>0.040</td>
<td>1.540</td>
<td>6.445</td>
<td>3.353</td>
<td>7.569</td>
<td>7.248</td>
<td>5.349</td>
</tr>
<tr>
<td>Per Capita Income</td>
<td>0.000</td>
<td>0.002</td>
<td>-0.001</td>
<td>0.004</td>
<td>0.000</td>
<td>0.007</td>
<td>0.002</td>
</tr>
<tr>
<td>% Persons in Poverty</td>
<td>0.000</td>
<td>0.002</td>
<td>0.010</td>
<td>0.004</td>
<td>0.009</td>
<td>0.006</td>
<td>0.005</td>
</tr>
<tr>
<td></td>
<td>0.076</td>
<td>2.511</td>
<td>10.107</td>
<td>5.120</td>
<td>12.464</td>
<td>6.892</td>
<td>5.835</td>
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<tr>
<td>HHI</td>
<td>-0.20, 0.10</td>
<td>-8.52, 1.56</td>
<td>-39.06, 1.54</td>
<td>-15.06, 5.49</td>
<td>-41.97, 8.09</td>
<td>-36.7, -9.03</td>
<td>-28.4, -4.95</td>
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<tr>
<td>R-sqr</td>
<td>0.98</td>
<td>0.99</td>
<td>0.98</td>
<td>0.98</td>
<td>0.98</td>
<td>0.97</td>
<td>0.98</td>
</tr>
<tr>
<td>dfres</td>
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<td>50</td>
<td>50</td>
<td>50</td>
<td>49</td>
<td>50</td>
</tr>
<tr>
<td>BIC</td>
<td>-0.829</td>
<td>1.453, 9.4</td>
<td>2.143, 19</td>
<td>1.878, 25</td>
<td>2.232, 17</td>
<td>1.985, 62</td>
<td>1.940, 30</td>
</tr>
<tr>
<td>Mean.Dep.Var.</td>
<td>18.337</td>
<td>653.524</td>
<td>952.603</td>
<td>700.777</td>
<td>2.119, 02</td>
<td>723.41</td>
<td>561.151</td>
</tr>
<tr>
<td>%Impact</td>
<td>-0.021</td>
<td>-0.053</td>
<td>0.161</td>
<td>0.209</td>
<td>0.134</td>
<td>0.158</td>
<td>0.129</td>
</tr>
<tr>
<td>Obs</td>
<td>204</td>
<td>204</td>
<td>204</td>
<td>204</td>
<td>204</td>
<td>200</td>
<td>204</td>
</tr>
</tbody>
</table>

*p<.10, **p<.05, ***p<.01
To test the hypothesis 3 and hypotheses 4, we estimate:

\[ Y_{st} = \alpha_0 + \beta_1 \text{Percent ACO Medicare Market}_{st} + \beta_2 \text{Percent ACO Medicare Market}_{st} \times \text{Expanded}_{st} + \beta_3 \text{Expanded}_{st} + \alpha_s + \delta_t + \gamma \text{ RDT Var}_{st} + \varepsilon_{st} \]

Where:

- \( Y_{st} \) = variables as defined above
  - Total acute care readmissions (all-cause 30 day) - (Rate)
  - Total (inpatient or hospital outpatient) emergency department visits per 1000
  - Total number of admissions for congestive heart failure (CHF) per 100,000
  - Total number of admissions for bacterial pneumonia per 100,000

- \( \alpha_s \) = Set of state indicators

- \( \delta_t \) = Set of year indicators

For the right-hand side, we include percent ACO Medicare market, which is a ratio derived by adding the Medicare population of all ACO’s operating in each State in 2012, 2013 and 2014, divided by the total FFS Medicare population in the State. We include a series of state and year fixed effects \( \alpha_s \) and \( \delta_t \).

In testing the effect of Medicaid expansion on the marginal effect of ACOs on health services utilization, the key variable of interest is the expanded Medicaid states interacted with percent ACO Medicare market. The equation probes the marginal influence of ACO-participating Medicare population on health services utilization outcomes relative to non-ACO participating Medicare population, and any effect of Medicaid expansion. Lastly, we control for the potential effect of ACO’s through a series of six control variables, represented by munificence, dynamism and competition constructs.
The outcome table is as follows:

Percent ACO Medicare Market * Expanded States = $\beta_2$

Percent ACO Medicare Market (Pre-expansion in States which expanded Medicaid, and non-expansion States) = $\beta_1$

Impact of Expanded States = $\beta_3$

Table 15 below illustrates the effect of 2014 Medicaid expansion by States on the utilization outcomes using Method 1 of ACO beneficiary allocation.

Results show a 0.4% decrease in readmission rates in States that chose Medicaid expansion ($p < 0.10$). States that chose Medicaid expansion also decreased CHF admissions by 85 per 100,000 beneficiaries in the 75 plus age group, however, a one percentage point increase in ACO beneficiaries mitigates this 85 per 1000 beneficiary decrease by 4.4.

A one percentage point increase in poverty rate decreases ED visits by 8.8%, and, decreases CHF admissions in the 75 plus age group by 49%, holding all else constant.

Finally, a one percentage point increase in unemployment rate decreases ED visits by 4%, CHF admissions in the below 65 age group by 22%, holding all else constant. A one percentage point increase in unemployment rate decreases bacterial pneumonia admissions in the below 65, 65 - 74, and 74 plus age groups by 21%, 18.5%, and 36% respectively, holding all else constant.

TABLE 15: Effect of 2014 Medicaid Expansion - Method 1 (dropping Specialists per Capita)

<table>
<thead>
<tr>
<th>RR</th>
<th>ED_Per_1000</th>
<th>CHF_Less_65</th>
<th>CHF_65_74</th>
<th>CHF_75_Plus</th>
<th>PN_Less_65</th>
<th>PN_65_74</th>
<th>PN_75_Plus</th>
</tr>
</thead>
<tbody>
<tr>
<td>b/se/ci95</td>
<td>b/se/ci95</td>
<td>b/se/ci95</td>
<td>b/se/ci95</td>
<td>b/se/ci95</td>
<td>b/se/ci95</td>
<td>b/se/ci95</td>
<td>b/se/ci95</td>
</tr>
<tr>
<td>%ACO_BEN_M1</td>
<td>-0.002</td>
<td>-0.34</td>
<td>0.64</td>
<td><strong>1.121</strong></td>
<td>1.38</td>
<td>0.03</td>
<td>0.55</td>
</tr>
<tr>
<td>b/se/ci95</td>
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<td>b/se/ci95</td>
<td>b/se/ci95</td>
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<td>b/se/ci95</td>
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<tr>
<td>0.01</td>
<td>0.26</td>
<td>1.07</td>
<td>0.67</td>
<td>1.46</td>
<td>0.78</td>
<td>0.62</td>
<td>1.50</td>
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<tr>
<td>ACO_in_Expanded_M1</td>
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<td>-0.35</td>
<td>0.20</td>
<td>0.34</td>
<td>4.440*</td>
<td>0.76</td>
<td>1.14</td>
</tr>
<tr>
<td>--------------------</td>
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<td>-------</td>
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<td>------</td>
<td>--------</td>
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</tr>
<tr>
<td>Expanded</td>
<td>-0.348*</td>
<td>1.53</td>
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<td>-14.06</td>
<td>-85.311*</td>
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<td>PCP Per 100000</td>
<td>0.03</td>
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<tr>
<td>Per Capita Income</td>
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<td>0.99</td>
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<td>0.98</td>
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<td>0.97</td>
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<td>50</td>
<td>50</td>
<td>50</td>
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<td>BIC</td>
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<td>1,991.44</td>
<td>1,941.39</td>
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<tr>
<td>Mean. Dep. Var.</td>
<td>18.337</td>
<td>653.524</td>
<td>952.603</td>
<td>700.777</td>
<td>2,119.02</td>
<td>723.41</td>
<td>561.151</td>
</tr>
<tr>
<td>% Impact</td>
<td>-0.01</td>
<td>-0.052</td>
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<td>0.16</td>
<td>0.065</td>
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<td>0.098</td>
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</tbody>
</table>

*p<.10, **p<.05, ***p<.01
Table 16 illustrates the effect of 2014 Medicaid expansion by States on the utilization outcomes using Method 2 of ACO beneficiary allocation. A one percentage point increase in percent ACO beneficiaries results in CHF admissions increasing by 1.6% for ACOs in States without Medicaid expansion and the pre-expansion period in States with Medicaid expansion, an impact of 0.2%.

Furthermore, States that chose Medicaid expansion decrease CHF admissions by 107 per 100,000 beneficiaries in the 75 plus age group. However, a one percentage point increase in ACO beneficiaries mitigates this 107 per 1000 beneficiary decrease by 5.

Conversely, a one unit increase in specialist per capita increases CHF admissions by 22 per 100,000 beneficiaries in the 75 plus age group, holding all else constant.

A one percentage point increase in poverty rate decreases ED visits by 9.5%, and, decreases CHF admissions in the 75 plus age group by 45%, holding all else constant.

Finally, a one percentage point increase in unemployment rate decreases CHF admissions in the below 65 age group by 22%, and bacterial pneumonia admissions in the below 65, 65-74, and 74 plus age groups by 22%, 17.3%, and 37.3% respectively, holding all else constant.

### TABLE 16: Effect of 2014 Medicaid Expansion - Method 2

<table>
<thead>
<tr>
<th></th>
<th>RR</th>
<th>ED_Per_1000</th>
<th>CHF_Less_65</th>
<th>CHF_65_74</th>
<th>CHF_75_Plus</th>
<th>PN_Less_65</th>
<th>PN_65_74</th>
<th>PN_75_Plus</th>
</tr>
</thead>
<tbody>
<tr>
<td>%ACO_BEN_M2</td>
<td>0.002</td>
<td>-0.252</td>
<td>1.735</td>
<td>1.556*</td>
<td>1.026</td>
<td>0.949</td>
<td>0.819</td>
<td>2.048</td>
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<td>0.009</td>
<td>0.341</td>
<td>1.240</td>
<td>0.901</td>
<td>1.749</td>
<td>0.977</td>
<td>0.734</td>
<td>1.709</td>
</tr>
<tr>
<td>ACO_in_Expanded_M2</td>
<td>-0.006</td>
<td>-0.149</td>
<td>0.496</td>
<td>0.047</td>
<td>5.012**</td>
<td>0.308</td>
<td>-0.020</td>
<td>0.043</td>
</tr>
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<td></td>
<td>0.012</td>
<td>0.495</td>
<td>1.949</td>
<td>0.986</td>
<td>2.201</td>
<td>1.144</td>
<td>1.120</td>
<td>2.153</td>
</tr>
<tr>
<td></td>
<td>-0.03,0.02</td>
<td>-1.14,0.85</td>
<td>-3.42,4.41</td>
<td>-1.93,2.03</td>
<td>0.59,9.43</td>
<td>-1.99,2.61</td>
<td>-2.27,2.23</td>
<td>-4.28,4.37</td>
</tr>
<tr>
<td></td>
<td>0.208</td>
<td>9.093</td>
<td>40.182</td>
<td>22.397</td>
<td>42.854</td>
<td>27.110</td>
<td>29.161</td>
<td>54.858</td>
</tr>
<tr>
<td>PCP Per 100000</td>
<td>0.050</td>
<td>2.529</td>
<td>-1.923</td>
<td>-1.651</td>
<td>-15.733</td>
<td>-2.757</td>
<td>1.608</td>
<td>-0.874</td>
</tr>
<tr>
<td>SPC Per 100000</td>
<td>-0.026</td>
<td>-1.302</td>
<td>-2.589</td>
<td>4.098</td>
<td>22.121***</td>
<td>1.606</td>
<td>-2.251</td>
<td>3.731</td>
</tr>
<tr>
<td>Per Capita Income</td>
<td>0.032</td>
<td>1.558</td>
<td>6.052</td>
<td>3.356</td>
<td>7.362</td>
<td>7.238</td>
<td>5.269</td>
<td>8.763</td>
</tr>
<tr>
<td>% Persons in Poverty</td>
<td>-0.129</td>
<td>-2.589</td>
<td>4.098</td>
<td>22.121***</td>
<td>1.606</td>
<td>-2.251</td>
<td>3.731</td>
<td></td>
</tr>
<tr>
<td>HHI</td>
<td>0.000</td>
<td>-0.001</td>
<td>-0.010</td>
<td>0.004</td>
<td>0.000</td>
<td>-0.002</td>
<td>0.007</td>
<td>0.012</td>
</tr>
<tr>
<td>R-sqr</td>
<td>0.98</td>
<td>0.99</td>
<td>0.98</td>
<td>0.98</td>
<td>0.97</td>
<td>0.98</td>
<td>0.98</td>
<td></td>
</tr>
<tr>
<td>dfres</td>
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<td>50</td>
<td>50</td>
<td>49</td>
<td>50</td>
<td>50</td>
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<tr>
<td>BIC</td>
<td>-20.177</td>
<td>1,462.34</td>
<td>2,142.94</td>
<td>1,886.01</td>
<td>2,231.30</td>
<td>1,994.91</td>
<td>1,949.55</td>
<td>2,231.31</td>
</tr>
<tr>
<td>Mean.Dep.Var.</td>
<td>18.337</td>
<td>653.524</td>
<td>952.603</td>
<td>700.777</td>
<td>2,119.02</td>
<td>723.41</td>
<td>561.151</td>
<td>1,566.58</td>
</tr>
<tr>
<td>%Impact</td>
<td>0.012</td>
<td>-0.039</td>
<td>0.182</td>
<td>0.222</td>
<td>0.048</td>
<td>0.131</td>
<td>0.146</td>
<td>0.131</td>
</tr>
<tr>
<td>Obs</td>
<td>204</td>
<td>204</td>
<td>204</td>
<td>204</td>
<td>204</td>
<td>204</td>
<td>204</td>
<td>204</td>
</tr>
</tbody>
</table>

*p<.10, **p<.05, ***p<.01
Robustness Checks

The following robustness checks are part of the analysis.

Examining outcomes not affected by policy change

The study examines outcomes that should not be affected by policy and practical implications of ACO participation. America’s Health Rankings tracks primary health measures at the State level for every year since 1990. The Health Rankings (http://www.americashealthrankings.org) are a collaborative effort between United Health Foundation and the American Public Health Association (APHA). Health rankings track several core measures including, pollution, behaviors, disease-specific debts, poverty, community and environment, immunization, infant mortality, mental health days, and preventable hospitalizations. To augment the robustness of this study, we examine outcomes which are not directly affected by policy and real-world implications of ACO participation. The study examines the rate of violent crime at the State level for 2012, 2013 and 2014, and find no association between the policy change and violent crime. Table 17 shows the results of the regression.

\[ Y_{st} = A_0 + \beta_1 \text{Percent ACO Medicare Market}_{st} + \alpha_s + \delta_t + \epsilon_{st} \]

Where \( Y_{st} \) = Violent crime at the state level in 2012, 2013, and 2014

<table>
<thead>
<tr>
<th>Table 17: Examining outcome not affected by policy change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Violent Crime</td>
</tr>
<tr>
<td>b/se/ci95</td>
</tr>
<tr>
<td>%ACO_BEN_M1</td>
</tr>
<tr>
<td>0.365</td>
</tr>
<tr>
<td>-1.02,0.44</td>
</tr>
<tr>
<td>R-sqr</td>
</tr>
<tr>
<td>dfres</td>
</tr>
<tr>
<td>BIC</td>
</tr>
<tr>
<td>Mean.Dep.Var.</td>
</tr>
</tbody>
</table>
Pre-trends and Treatment Effect Dynamics

The ACO market years in the analysis are 2012, 2013, and 2014. The calendar year 2009, 2010, and 2011 are included to examine trends in the pre-periods. Treatment effect dynamics address the impact of policy changes over time - snowballing effects or effects that may fade over time.

The study examines the interaction of year dummies in the pre-period and the intensity of treatment in 2013. ACO2013M1, the treatment indicator, is generated by the interaction of ACO beneficiaries and the treatment year, 2013. In the equation below, $\beta_2$ and $\beta_3$ are the interactions of time dummies and the treatment indicator for the first two pre-treatment years - 2009, and 2010. The last year of pretreatment (pre-ACO), 2011, is omitted because of the 'dummy variable trap' - a circumstance when two or more of the independent variables are highly correlated.

$\beta_4, \beta_5,$ and $\beta_6$ are the interaction of post-treatment time dummies with the treatment indicator, i.e. the period after ACO formation - 2012, 2013, and 2014 respectively. $\beta_4, \beta_5,$ and $\beta_6$ show the impact of policy changes over time - snowballing effects or effects that may fade over time.

The full equation is expressed as follows:

$$Y_{st} = \alpha_0 + \beta_1 \text{ Percent ACO Medicare Market}_{st} + \beta_2 \text{ (Year=2009) } \times \text{ACO (2013)}_s + \beta_3 \text{ (Year=2010) } \times \text{ACO (2013)}_s + \beta_4 \text{ (Year=2012) } \times \text{ACO (2013)}_s + \beta_5 \text{ (Year=2013) } \times \text{ACO (2013)}_s + \beta_6 \text{ (Year=2014) } \times \text{ACO (2013)}_s + \alpha_s + \delta_t + \epsilon_{st}$$
<table>
<thead>
<tr>
<th>TABLE 18:</th>
<th>RR</th>
<th>ED_Per_1000</th>
<th>CHF_Less_65</th>
<th>CHF_65_74</th>
<th>CHF_75_Plus</th>
<th>PN_Less_65</th>
<th>PN_65_74</th>
<th>PN_75_Plus</th>
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</thead>
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<tr>
<td></td>
<td>b/se/cl95</td>
<td>b/se/cl95</td>
<td>b/se/cl95</td>
<td>b/se/cl95</td>
<td>b/se/cl95</td>
<td>b/se/cl95</td>
<td>b/se/cl95</td>
<td>b/se/cl95</td>
</tr>
<tr>
<td>YR2009AC02013M1</td>
<td>0</td>
<td>0.094</td>
<td>-1.763</td>
<td>0.216</td>
<td>-1.08</td>
<td>-2.328</td>
<td>-0.441</td>
<td>-2.546</td>
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<td>0.007</td>
<td>0.262</td>
<td>1.394</td>
<td>1.035</td>
<td>1.555</td>
<td>1.825</td>
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<td>1.386</td>
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<td>-0.01,0.02</td>
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<td>-4.20,2.04</td>
<td>-6.00,1.34</td>
<td>3.23,2.35</td>
<td>-5.33,0.24</td>
</tr>
<tr>
<td>YR2010AC02013M1</td>
<td>0.003</td>
<td>-0.062</td>
<td>-1.79</td>
<td>-0.196</td>
<td>-1.681</td>
<td>0.518</td>
<td>0.765</td>
<td>-2.632*</td>
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<tr>
<td></td>
<td>0.005</td>
<td>0.132</td>
<td>1.287</td>
<td>0.436</td>
<td>0.958</td>
<td>1.426</td>
<td>1.245</td>
<td>1.13</td>
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<tr>
<td></td>
<td>-0.01,0.01</td>
<td>-0.33,0.20</td>
<td>-4.37,0.80</td>
<td>-1.07,0.68</td>
<td>-3.61,0.24</td>
<td>-2.35,3.38</td>
<td>-1.74,3.26</td>
<td>-4.90,0.36</td>
</tr>
<tr>
<td>YR2012AC02013M1</td>
<td>0</td>
<td>0.01</td>
<td>-1.958</td>
<td>0.104</td>
<td>-0.429</td>
<td>-1.086</td>
<td>-1.178</td>
<td>-4.353**</td>
</tr>
<tr>
<td></td>
<td>0.008</td>
<td>0.223</td>
<td>1.511</td>
<td>0.923</td>
<td>3.392</td>
<td>1.367</td>
<td>1.46</td>
<td>1.427</td>
</tr>
<tr>
<td></td>
<td>-0.02,0.02</td>
<td>-0.44,0.46</td>
<td>-4.99,1.08</td>
<td>-1.75,1.96</td>
<td>-7.24,3.86</td>
<td>-3.83,1.66</td>
<td>-4.11,1.75</td>
<td>-7.22,1.49</td>
</tr>
<tr>
<td>YR2013AC02013M1</td>
<td>0.005</td>
<td>-0.085</td>
<td>-3.032</td>
<td>0.842</td>
<td>-0.212</td>
<td>0.383</td>
<td>-0.9</td>
<td>-5.964*</td>
</tr>
<tr>
<td></td>
<td>0.012</td>
<td>0.423</td>
<td>1.977</td>
<td>1.173</td>
<td>3.865</td>
<td>1.926</td>
<td>1.78</td>
<td>2.388</td>
</tr>
<tr>
<td></td>
<td>-0.02,0.03</td>
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<td>-7.00,0.94</td>
<td>-1.51,2.20</td>
<td>-7.97,7.55</td>
<td>-3.49,4.25</td>
<td>-4.47,2.67</td>
<td>-10.76,1.17</td>
</tr>
<tr>
<td>YR2014AC02013M1</td>
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<td>-0.501</td>
<td>-2.502</td>
<td>0.371</td>
<td>0.748</td>
<td>-0.495</td>
<td>-1.498</td>
<td>-7.032*</td>
</tr>
<tr>
<td></td>
<td>0.012</td>
<td>0.506</td>
<td>2.292</td>
<td>1.366</td>
<td>4.126</td>
<td>1.992</td>
<td>1.406</td>
<td>2.661</td>
</tr>
<tr>
<td></td>
<td>-0.01,0.03</td>
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<td>-7.10,2.10</td>
<td>-2.37,3.11</td>
<td>-7.54,9.03</td>
<td>-4.50,3.51</td>
<td>-4.32,1.33</td>
<td>-12.38,1.69</td>
</tr>
<tr>
<td>R-sqr</td>
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<td>0.98</td>
<td>0.97</td>
<td>0.98</td>
<td>0.97</td>
<td>0.92</td>
<td>0.96</td>
<td>0.97</td>
</tr>
<tr>
<td>dtres</td>
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<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>49</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>BIC</td>
<td>155.915</td>
<td>2,465.82</td>
<td>3,465.51</td>
<td>3,108.74</td>
<td>3,588.97</td>
<td>3,347.49</td>
<td>3,146.95</td>
<td>3,556.65</td>
</tr>
<tr>
<td>Mean.Dep.Var.</td>
<td>18.59</td>
<td>646.776</td>
<td>975.921</td>
<td>731.625</td>
<td>2,194.12</td>
<td>767.412</td>
<td>596.78</td>
<td>1,632.68</td>
</tr>
<tr>
<td>%Impact</td>
<td>-0.034</td>
<td>-0.014</td>
<td>0.155</td>
<td>0.008</td>
<td>0.035</td>
<td>0.153</td>
<td>0.181</td>
<td>0.222</td>
</tr>
<tr>
<td>Obs</td>
<td>306</td>
<td>306</td>
<td>304</td>
<td>306</td>
<td>306</td>
<td>300</td>
<td>306</td>
<td>306</td>
</tr>
</tbody>
</table>

* p<.05, ** p<.01, ***p<.001

The foremost identifying assumption in Difference in Differences is that the pre-treatment period has similar trends in the absence of treatment, i.e. the pre-ACO formation period has similar trends. If the outcome trends in the pre-treatment period are similar, then $\beta_2$ and $\beta_3$ are insignificant, and the assumption holds true. When examining this assumption in the regression
output above, the identifying assumption holds true for all the outcomes, except for bacterial pneumonia admissions in the 75 plus age group.

Figures 3, 4, 5 and 6 show these pre-trends and treatment effects.

Figure 3

![REMISSION RATE](image)

Figure 4

![ED VISITS](image)

Figure 5

![CHF DISCHARGES (75 PLUS AGE GROUP)](image)
With regards to treatment effect dynamics, readmission rate shows little movement, and ED visits show a nominal decrease. CHF admissions for the below 65 and the 65-74 age group shows an increase from 2012 to 2013, and a decrease from 2013 to 2014, while CFH admissions for the 75 plus group show a modest increase. Bacterial Pneumonia admissions for the below 65 and the 65-74 age group show a decrease from 2012 to 2013, and an increase from 2013 to 2014.

The collective results enumerated in this chapter are explored and described more comprehensively in the following Discussion chapter.
CHAPTER 6 - DISCUSSION

This chapter describes the results of hypothesis testing enumerated in chapter 5, including an examination of MSSP ACO performance, and a detailed review of resource dependence constructs and supporting variables. A discussion of implications for Accountable Care Organizations, including the potential impact of the evolving financial framework between patients, payers, and providers follows, accompanied by a review of Medicaid expansion and its implications. Lastly, limitations, contribution to the literature, and areas of future research are enumerated and suggested.

The Patient Protection and Affordable Care Act (PPACA) and the Health Care and Reconciliation Act of 2010, collectively known as the Affordable Care Act \(^1\) (ACA) are ambitious initiatives driving U.S. public health policy. ACA establishes a framework for expanded health insurance coverage and outlines the health services delivery and financial framework between patients, payers, and providers.

ACA policy initiatives seek measurable clinical quality improvement, lower healthcare cost, and improved care coordination across different providers and health systems. The objective is substantially better patient care management resulting in better clinical outcomes accompanied by cost efficiencies in a fragmented health care delivery system.\(^2\)

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As part of the ACA charter, these federal policies create Accountable Care Organizations (ACOs), an integrated network of healthcare providers with formalized referral processes and care coordination across participating providers, health systems, and ambulatory practices. A key mandate for ACOs is to develop strategies to eliminate, or mitigate, health disparities through prevention and management of chronic and complex care conditions in the most appropriate and cost-efficient care settings.

One of the provisions of the Affordable Care Act is an expansion of healthcare benefits through expanded Medicaid coverage for low-income adults. As of January 1, 2017, 32 states including DC have adopted Medicaid expansion, 19 States have declined. Our analysis examines the effect of Medicaid expansion on utilization outcomes, if any, in CY 2014 when 27 states including DC had adopted Medicaid expansion.

This research endeavors to answer the following research questions:

1. Do Accountable Care Organizations, predisposed to environment and uncertainty, influence health services utilization, and prevention quality indicators?

2. Do Accountable Care Organizations predisposed to environment and uncertainty, and a States' Medicaid expansion choice, influence health services utilization, and prevention quality indicators?

3. Does the influence of Accountable Care Organizations on health services utilization increase over time?

---


4. Does a States’ choice of adopting Medicaid expansion influence health services utilization, and prevention quality indicators?

The following hypotheses frame these research questions:

Hypothesis 1 (H1): ACOs will have significantly lower ED and Inpatient utilization than per capita market-level utilization, all else being equal

Hypothesis 2 (H2): ACOs will have significantly lower prevention quality indicators (as measured by CHF and Bacterial Pneumonia admissions) than market-level prevention quality indicators, all else being equal

Hypothesis 3 (H3): ACOs in States with Medicaid expansion will have significantly lower ED and Inpatient utilization when compared to ACO’s in states without Medicaid expansion, after adjusting for market-level utilization, and all else being equal

Hypothesis 4 (H4): ACOs in States with Medicaid expansion will have significantly lower prevention quality indicators (as measured by CHF and Bacterial Pneumonia admissions) when compared to ACOs in States without Medicaid expansion, after adjusting for market-level utilization, and all else being equal
Results of Hypothesis Testing

The following table describes the presentation terminology of the hypotheses. Additionally, ‘M1’ and ‘M2’ denote Method 1 and Method 2 of ACO beneficiary allocation.

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1a</td>
<td>ED Utilization</td>
</tr>
<tr>
<td>H1b</td>
<td>Readmission Rate</td>
</tr>
<tr>
<td>H2a</td>
<td>CHF Admissions</td>
</tr>
<tr>
<td>H2b</td>
<td>Bacterial Pneumonia Admissions</td>
</tr>
<tr>
<td>H3a</td>
<td>ED Utilization</td>
</tr>
<tr>
<td>H3b</td>
<td>Readmission Rate</td>
</tr>
<tr>
<td>H4a</td>
<td>CHF Admissions</td>
</tr>
<tr>
<td>H4b</td>
<td>Bacterial Pneumonia Admissions</td>
</tr>
</tbody>
</table>

Table 1 presents the effect of Accountable Care Organization on ED visits, readmission rates, and PQI admissions. The model includes resource dependence control variables and method 1 and 2 of ACO beneficiary allocation. ACOs are associated with a nominal decrease in ED visits.

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Outcome</th>
<th>ACO Market</th>
<th>Supported (M1)?</th>
<th>Supported (M2)?</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1a</td>
<td>ED Visits</td>
<td>Decrease</td>
<td>Yes (p&lt;0.10)</td>
<td>No</td>
</tr>
<tr>
<td>H1b</td>
<td>Readmission Rate</td>
<td>Decrease</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>H2a</td>
<td>CHF admissions</td>
<td>Decrease</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>H2b</td>
<td>Bacterial Pneumonia</td>
<td>Decrease</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

Table 1: Effect of ACOs on Utilization – Full Model - Method 1 & Method 2
Table 2 presents the effect on States' Medicaid expansion status on Accountable Care Organization performance on ED visits, readmission rates, and PQI. ‘Expanded’ denotes States’ Medicaid expansion status in CY 2014, ‘ACO*Expanded’ is a product of percent ACO beneficiaries and Expanded (States’ Medicaid expansion status), and ‘%ACO Ben’ denotes ACOs in States without Medicaid expansion and the pre-expansion period in States with Medicaid expansion.

The adjusted model is run with resource dependence control variables and utilizes Method 1 of ACO beneficiary allocation. As the model shows, the effect on CHF admissions and readmission rate is significant.

**Table 2: Method 1: Medicaid Expansion on Utilization – Full Model**

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Outcome</th>
<th>Expanded</th>
<th>ACO*Expanded</th>
<th>%ACO Ben.</th>
<th>Support for H?</th>
</tr>
</thead>
<tbody>
<tr>
<td>H3a</td>
<td>ED Visits</td>
<td>Not Significant</td>
<td>Decrease (hypothesized)</td>
<td>Not Significant</td>
<td>No</td>
</tr>
<tr>
<td>H3b</td>
<td>Readmission Rate</td>
<td>Decrease (p&lt;0.10)</td>
<td>Decrease (hypothesized)</td>
<td>Not Significant</td>
<td>No</td>
</tr>
<tr>
<td>H4a</td>
<td>CHF admissions</td>
<td>Decrease (p&lt;0.10)</td>
<td>Decrease (hypothesized)</td>
<td>Increase (p&lt;0.10)</td>
<td>No (Increase, p&lt;0.10)</td>
</tr>
<tr>
<td>H4b</td>
<td>Bacterial Pneumonia</td>
<td>Not Significant</td>
<td>Decrease (hypothesized)</td>
<td>Not Significant</td>
<td>No</td>
</tr>
</tbody>
</table>

Table 3 presents the effect on States’ Medicaid expansion status on Accountable Care Organization performance on ED visits, readmission rates, and PQI. The adjusted model is run with resource dependence control variables and utilizes Method 2 of ACO beneficiary allocation. As the model shows, the effect on CHF admissions is significant.
TABLE 3: Method 2: Medicaid Expansion on Utilization – Full Model

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Outcome</th>
<th>Expanded</th>
<th>ACO*Expanded</th>
<th>%ACO Ben.</th>
<th>Support for H?</th>
</tr>
</thead>
<tbody>
<tr>
<td>H3a</td>
<td>ED Visits</td>
<td>Not Significant</td>
<td>Decrease</td>
<td>Not Significant</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(hypothesized)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H3b</td>
<td>Readmission Rate</td>
<td>Not Significant</td>
<td>Decrease</td>
<td>Not Significant</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(hypothesized)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H4a</td>
<td>CHF Admissions</td>
<td>Decrease (p&lt;0.05)</td>
<td>Decrease</td>
<td>Increase (p&lt;0.05)</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(hypothesized)</td>
<td>(increase, p&lt;0.05)</td>
<td></td>
</tr>
<tr>
<td>H4b</td>
<td>Bacterial Pneumonia</td>
<td>Not Significant</td>
<td>Decrease</td>
<td>Not Significant</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(hypothesized)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Results of Resource Dependence Constructs

Munificence

The table below describes the munificence construct and associated variables.

<table>
<thead>
<tr>
<th>Munificence</th>
<th>Number of physicians per capita</th>
<th>AHRF 2016</th>
<th>PCPs Per 100,000 (Population), by State, Year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of specialists per capita</td>
<td>AHRF 2016</td>
<td>Specialists Per 100,000 (Population), by State, Year</td>
</tr>
<tr>
<td></td>
<td>Income per capita</td>
<td>AHRF 2016</td>
<td>Per Capita Income by State, Year</td>
</tr>
</tbody>
</table>
Table 4 presents the effect of Accountable Care Organization on ED visits, readmission rates, and PQI (H1 and H2). The model includes resource dependence control variables, and Method 1 and 2 of ACO beneficiary allocation. As the table shows, PCP per capita is not associated with any of the outcomes.

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Outcome</th>
<th>Results (M1)?</th>
<th>Results (M2)?</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1a/H3a</td>
<td>ED Visits</td>
<td>Not Significant</td>
<td>Not Significant</td>
</tr>
<tr>
<td>H1b/H3b</td>
<td>Readmission Rate</td>
<td>Not Significant</td>
<td>Not Significant</td>
</tr>
<tr>
<td>H2a/H4a</td>
<td>CHF Admissions</td>
<td>Not Significant</td>
<td>Not Significant</td>
</tr>
<tr>
<td>H2b/H4b</td>
<td>Bacterial Pneumonia</td>
<td>Not Significant</td>
<td>Not Significant</td>
</tr>
</tbody>
</table>

Similarly, as Table 5 below shows, Income is not associated with any of the outcomes.

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Outcome</th>
<th>Results (M1)?</th>
<th>Results (M2)?</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1a/H3a</td>
<td>ED Visits</td>
<td>Not Significant</td>
<td>Not Significant</td>
</tr>
<tr>
<td>H1b/H3b</td>
<td>Readmission Rate</td>
<td>Not Significant</td>
<td>Not Significant</td>
</tr>
<tr>
<td>H2a/H4a</td>
<td>CHF Admissions</td>
<td>Not Significant</td>
<td>Not Significant</td>
</tr>
<tr>
<td>H2b/H4b</td>
<td>Bacterial Pneumonia</td>
<td>Not Significant</td>
<td>Not Significant</td>
</tr>
</tbody>
</table>

However, as Table 6 below shows, Specialist per capita are significantly associated with CHF admissions. A unit increase in Specialists per capita increases utilization.

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Outcome</th>
<th>Results (M1)?</th>
<th>Results (M2)?</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1a/H3a</td>
<td>ED Visits</td>
<td>N/A</td>
<td>Not Significant</td>
</tr>
<tr>
<td>H1b/H3a</td>
<td>Readmission Rate</td>
<td>N/A</td>
<td>Not Significant</td>
</tr>
<tr>
<td>H2a/H4a</td>
<td>CHF Admissions</td>
<td>N/A</td>
<td>Not Significant/Increase (p &lt;0.01)</td>
</tr>
<tr>
<td>H2b/H4b</td>
<td>Bacterial Pneumonia</td>
<td>N/A</td>
<td>Not Significant</td>
</tr>
</tbody>
</table>
Dynamism

Our dynamism constructs relied on the variables described below:

<table>
<thead>
<tr>
<th>Dynamism</th>
<th>Percentage of poverty</th>
<th>AHRF 2016</th>
<th>Percent in Poverty by State, Year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unemployment rate</td>
<td>AHRF 2016</td>
<td>Unemployment Rate (%) 16+ by State, Year</td>
<td></td>
</tr>
</tbody>
</table>

As Table 7 and 8 show, poverty is associated with ED visits and CHF admissions. The increase in the incidence of poverty decreases utilization.

**TABLE 7: Poverty**

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Outcome</th>
<th>Results (M1)?</th>
<th>Results (M2)?</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1a</td>
<td>ED Visits</td>
<td>Decrease (p&lt;0.01)</td>
<td>Decrease (p&lt;0.01)</td>
</tr>
<tr>
<td>H1b</td>
<td>Readmission Rate</td>
<td>Not Significant</td>
<td>Not Significant</td>
</tr>
<tr>
<td>H2a</td>
<td>CHF Admissions</td>
<td>Decrease (p&lt;0.10)</td>
<td>Decrease (p&lt;0.10)</td>
</tr>
<tr>
<td>H2b</td>
<td>Bacterial Pneumonia</td>
<td>Not Significant</td>
<td>Not Significant</td>
</tr>
</tbody>
</table>

**TABLE 8: Poverty**

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Outcome</th>
<th>Results (M1)?</th>
<th>Results (M2)?</th>
</tr>
</thead>
<tbody>
<tr>
<td>H3a</td>
<td>ED Visits</td>
<td>Decrease (p&lt;0.05)</td>
<td>Decrease (p&lt;0.01)</td>
</tr>
<tr>
<td>H3b</td>
<td>Readmission Rate</td>
<td>Not Significant</td>
<td>Not Significant</td>
</tr>
<tr>
<td>H4a</td>
<td>CHF Admissions</td>
<td>Decrease (p&lt;0.10)</td>
<td>Decrease (p&lt;0.10)</td>
</tr>
<tr>
<td>H4b</td>
<td>Bacterial Pneumonia</td>
<td>Not Significant</td>
<td>Not Significant</td>
</tr>
</tbody>
</table>
As Table 9 below shows, when testing H1 and H2, the unemployment rate is associated with CHF and Bacterial Pneumonia admissions. The increase in unemployment rate decreases utilization.

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Outcome</th>
<th>Results (M1)?</th>
<th>Results (M2)?</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1a</td>
<td>ED Visits</td>
<td>Not Significant</td>
<td>Not Significant</td>
</tr>
<tr>
<td>H1b</td>
<td>Readmission Rate</td>
<td>Not Significant</td>
<td>Not Significant</td>
</tr>
<tr>
<td>H2a</td>
<td>CHF Admissions</td>
<td>Decrease (p&lt;0.05)</td>
<td>Decrease (p&lt;0.10)</td>
</tr>
<tr>
<td>H2b</td>
<td>Bacterial Pneumonia</td>
<td>Decrease (p&lt;0.01)</td>
<td>Decrease (p&lt;0.01)</td>
</tr>
</tbody>
</table>

As Table 10 shows, when testing H3 and H4, the unemployment rate is associated with ED Visits, and CHF and Bacterial Pneumonia admissions. Again, an increase in unemployment rate decreases utilization.

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Outcome</th>
<th>Results (M1)?</th>
<th>Results (M2)?</th>
</tr>
</thead>
<tbody>
<tr>
<td>H3a</td>
<td>ED Visits</td>
<td>Decrease (p&lt;0.10)</td>
<td>Not Significant</td>
</tr>
<tr>
<td>H3b</td>
<td>Readmission Rate</td>
<td>Not Significant</td>
<td>Not Significant</td>
</tr>
<tr>
<td>H4a</td>
<td>CHF admissions</td>
<td>Decrease (p&lt;0.05)</td>
<td>Decrease (p&lt;0.05)</td>
</tr>
<tr>
<td>H4b</td>
<td>Bacterial Pneumonia</td>
<td>Decrease (p&lt;0.01)</td>
<td>Decrease (p&lt;0.01, p&lt;0.01)</td>
</tr>
</tbody>
</table>

Competition

The table below describes the competition constructs:

<table>
<thead>
<tr>
<th>Competition</th>
<th>Individual Ins. Market Competition (HHI)</th>
<th>Kaiser Family Foundation</th>
<th>HHI value range from 0 to 10,000 by State, Year</th>
</tr>
</thead>
</table>

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As the Table 11 shows, the HHI measure has no association with any outcome.

**TABLE 11: HHI**

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Outcome</th>
<th>Results (M1)?</th>
<th>Results (M2)?</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1a/H3a</td>
<td>ED Visits</td>
<td>Not Significant</td>
<td>Not Significant</td>
</tr>
<tr>
<td>H1b/H3b</td>
<td>Readmission Rate</td>
<td>Not Significant</td>
<td>Not Significant</td>
</tr>
<tr>
<td>H2a/H4a</td>
<td>CHF admissions</td>
<td>Not Significant</td>
<td>Not Significant</td>
</tr>
<tr>
<td>H2b/H4b</td>
<td>Bacterial Pneumonia</td>
<td>Not Significant</td>
<td>Not Significant</td>
</tr>
</tbody>
</table>

The cumulative results are summarized in the table below. ACOs nominally decrease utilization, Medicaid expansion decreases utilization, specialist per capita increase utilization, poverty, and unemployment decrease utilization.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>ACOs</th>
<th>Medicaid Expansion</th>
<th>Spec Per Capita</th>
<th>Poverty</th>
<th>Unemployment</th>
</tr>
</thead>
<tbody>
<tr>
<td>ED Visits</td>
<td>Decrease</td>
<td>Not Significant</td>
<td>Not Significant</td>
<td>Decrease</td>
<td>Decrease</td>
</tr>
<tr>
<td>Readmission Rate</td>
<td>Not Significant</td>
<td>Decrease</td>
<td>Not Significant</td>
<td>Not Significant</td>
<td>Not Significant</td>
</tr>
<tr>
<td>CHF admissions</td>
<td>Not Significant</td>
<td>Decrease</td>
<td>Increase</td>
<td>Decrease</td>
<td>Decrease</td>
</tr>
<tr>
<td>Bacterial Pneumonia</td>
<td>Not Significant</td>
<td>Not Significant</td>
<td>Not Significant</td>
<td>Not Significant</td>
<td>Decrease</td>
</tr>
</tbody>
</table>
Examining MSSP ACO Performance

The Difference in Differences Four-year State-level panel analyses finds mixed results on ACO performance. While the analyses support a modest decrease in ED visits, the study finds no significant association between ACOs and readmission rates, and prevention quality indicators. Our findings are largely congruent with recent studies which show mixed to poor results for MSSP ACO effectiveness in measurable care management, reducing unnecessary utilization, or in significantly decreasing cost.

Recent studies have shown MSSP ACOs failed to decrease inpatient mental health admissions, had no bearing on inpatient mental health spending, and quality of care for these patients.5

An analysis of risk-standardized acute admission rates for patients with diabetes and heart failure shows mixed results6. The results indicate 45% of ACOs perform like the national Medicare fee-for-service (FFS) market, 40% of ACOs perform better than national FFS market, and 15% of ACOs perform worse than national FFS market for the diabetes measure. For the heart failure measure, 54% of ACOs perform like the national Medicare fee-for-service market, 32% of ACOs performed better than national rates, and 14% of ACOs performed worse than national rates (6). These results are far from encouraging.

Accountable Care Organizations have also been largely unsuccessful in integrating primary care capacity to benefit better health outcomes. A recent study finds no association

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5 Busch et al., Early Efforts by Medicare Accountable Care Organizations have Limited Effect on Mental Illness Care and Management, Health Affairs 35, no 7 (2016): 1247-1256
6 Spatz et al., Risk-Standardized Acute Admission Rates Among Patients with Diabetes and Heart Failure as a Measure of Quality of Accountable Care Organizations, Medical Care 2016; 54:528-537
between primary care and lower utilization. The study segments primary care capacity into four increasing quartiles, and finds no reduction in utilization at any level. Interestingly, the study finds ACOs with the highest PCP focus associated with higher levels of inpatient and ED utilization compared with ACOs with the lowest PCP focus. These findings are contrary to commonly held belief that primary care capacity is associated with better outcomes. A reasonable assumption is the lack of adequate integration with the ACO framework. Supporting this assumption of sub-optimal integration within Accountable Care Organizations is a study which finds that a preponderance of ACO beneficiaries seek treatment outside the ACO boundary. The study finds nearly 33% of total expenditures attributed to providers outside ACOs and nearly 90% of all beneficiaries seeking some care outside the ACO boundary. The study finds an increasing likelihood of beneficiaries with comorbid and complex conditions seeking out of ACO care. This complex care patient cohort presents an opportunity for ACOs to manage better and coordinate care but is also an area where ACOs have shown limited success to date.

Collectively, these studies raise concern regarding structural issues surrounding current implementations of MSSP Accountable Care Organizations. Physician integration, "medical neighborhood," carefully crafted care transitions, and optimal management of complex care patients are the bedrock of accountable care. However, recent research shows significant deficiencies in the Accountable Care Organization framework, particularly in realizing

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7 Herrel et al. Primary care focus and utilization in the Medicare shared savings program accountable care organizations. BMC Health Services Research (2017) 17:139
8 Han et al. Predictors of Out-of-ACO Care in the Medicare Shared Savings Program. Medical Care, Vol. 54, No. 7, July 2016
optimal levels of integration to best manage transitional care for patients with complex care requirements.

Resource Dependence Revisited

Background

Jeffrey Pfeffer and Gerald Salancik's seminal work - The External Control of Organizations⁹ (Originally published: New York: Harper & Row, 1978), describes the framework for the resource dependence perspective. In the introduction to this classic edition, Pfeffer describes three themes which are central to the resource dependence framework:

The first topic explains the importance of the environment. As Pfeffer explains, organizational decisions and actions depend on local environmental constraints. Pfeffer elucidates an "inherent tension" between the action of leaders and the limiting effect of the environment which, in large part, explains the organizations' behavior. Pfeffer explains resources (financial, physical, information) as fundamental components of the environment. The quest to obtain these resources motivates organizational dependence on external sources of these resources. Therefore, the phrase - resource dependence.

The second topic explains the constraints imposed by the environment, and the organizations' tactics and strategies to mitigate these limitations. As Pfeffer explains, organizations respond to environmental constraints via various strategies. Ideally, these strategies are constructed to both mitigate constraints and enhance the organization’s

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⁹ The External Control of Organizations: A Resource Dependence Perspective by Jeffrey Pfeffer, Gerald Salancik, Stanford University Press
position within its environment. One of the key ideas is the ‘continuing evolution of environment and the reciprocal action in organizational structure.’ Pfeffer and Salancik term this “dynamic interaction” - where organizations employ strategies to more effectively manage resource dependencies.

The third major topic is power as a construct for predicting intra-organizational, and inter-organizational behavior. Power results from organizations mitigating environmental constraints. As Pfeffer clarifies, government as a significant provider of resources has more power than its contractors. These contractors are competing for government contracts and are dependent on contracts for survival. The government can, therefore, exert considerable influence (power) on suppliers and contractors. While this example can be debated, as an overarching theme, power establishes a link with competition in the environment.

Pfeffer summarizes resource dependence as a continuing interaction of organizational response to environmental constraints, organizations’ attempts to influence its environment, and the effect on internal structure because of these organizational actions.

Dess and Beard¹⁰ divide six environmental dimensions into three dimensions of organizational task environments. The authors’ central premise is that an organization’s resource requirements are primary characteristics which define the organization’s environment. The authors divide the organization/environment relationship into two broad categories: one, ‘the degree of interaction between the organization and the environment,’ and two, ‘the level of objectivity and the subjectivity in describing the environment.’

offshoots of these broad classifications, the authors describe three dimensions of organizational task environments.

These include:

- **Environmental munificence** - which includes sustained growth, competitive position in a given market, and levels of profitability
- **Environmental Dynamism** - which includes organizational/environmental uncertainty, unpredictability in determining environmental changes, and the degree of dependencies between organization
- **Environmental Complexity** - which involves the effect of complex environments on information processing, the level of an organization's expansion strategy, and the extent of concentration and dispersion in the environment.

**Deconstruction of RDT**

**Munificence**

The resource dependence constructs show anomalies in their association with healthcare utilization. While not specified directly in the study hypotheses, the study expected munificence variables would negatively affect utilization. In fact, physicians per capita, specialists per capita and income per capita are not significantly associated with any of the outcome measures while testing hypothesis 1 and 2. However, while testing hypothesis 4, specialists per capita positively associate with CHF admissions in the 75 plus age group.
Medicare Shared Savings Plan (MSSP) Accountable care organizations face many structural complications. Notably, the misalignment between beneficiary assignment to an ACO\textsuperscript{11} (beneficiaries are allocated to an ACO if their primary care provider joins the ACO, and the beneficiary seeks a plurality of primary care services from providers within the ACO). However, this does not preclude beneficiaries from seeking ancillary services outside the ACO framework from other providers, thus marginalizing potential accrual of benefits from systematic care coordination and complex care management within the ACO framework (8).

Magnifying these complications is a misalignment of payment structure which continues to reward volume, while promoting value, but creates systematic chaos in the way ACOs mitigate maximizing reimbursements through volume while attempting to do the same in the value framework part of the equation.

A recent qualitative study examines the disadvantages of joining ACOs from the physician perspective.\textsuperscript{12} The study finds that primary care providers (PCPs) see value in increased levels of care coordination with specialists, rich data analytics to help identify high-risk patients and potentially greater leverage in negotiations with payers. Inversely, PCPs fear restrictions on external referrals, the prevalence and reliance on fee-for-service, monetary loss, and loss of independence (12).

Research shows that while MSSP ACOs differ in their primary care focus, primary care intensity is not associated with lower utilization or increasing savings, at any level (7).

\textsuperscript{11} Medicare Shared Savings Programs: https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/sharedsavingsprogram/Downloads/Shared-Savings-Losses-Assignment-Spec-V4.pdf

\textsuperscript{12} Berenson et al., Do Accountable Care Organizations (ACOs) help or hinder primary care physicians' ability to deliver high-quality care? HealthCare 4 (2016): 155-159
Herrell and colleagues (7) postulate patient profile (comorbid load), and primary care/specialty care capacity as limiting factors in improving utilization or cost. These factors, along with misaligned financial incentives create substantial disincentives in the system. Research\textsuperscript{13} finds State-level supply/demand primary care capacity deficit of up to 5%. Even as some studies show limited to no association between primary care capacity and lower avoidable utilization, these findings are based more on the lack of proper integration, and the misalignment of the larger referral and care coordination framework. An innocuous assumption remains that a deficit in primary care capacity, especially in areas of high demand, will lead to suboptimal integrations and health outcomes.

Compounding this deficit in primary care capacity is the suboptimal integration between primary care and specialty care within the MSSP ACO framework. Early findings\textsuperscript{14} indicate that specialists are underrepresented in Accountable Care Organizations. Intuitively, Primary and Specialty care integration is especially crucial to managing complex care patients successfully. However, as the study notes, there are a few incentives for Specialists to join ACOs. These barriers include considerable financial disincentives, and opposing priorities - ACOs are committed to lowering high-cost utilization, whereas surgeons and other specialists will likely seek higher clinical volume (14).

\textsuperscript{13} Elbert Huang and Kenneth Finegold, Seven Million Americans Live in Areas Where Demand for Primary Care May Exceed Supply by More Than 10 Percent, Health Affairs published online February 20, 2013
\textsuperscript{14} Hawken et al. Surgery and Medicare Shared Savings Program Accountable Care Organizations. JAMA Surgery, January 2016, Vol. 151, No. 1
Dynamism

Our analyses show a significant association between poverty and ED utilization (increasing poverty decreases ED visits), and poverty and PQI (increasing poverty decreases CHF admissions). Unemployment is associated ED utilization (increasing unemployment decreases ED visits) and with PQI outcomes (increasing unemployment decreases CHF admissions, and bacterial pneumonia admissions).

A reasonable set of explanations for these reductions in utilization within these demographics are around access to care, gaps in care processes, and missed episodes of appropriate care. A deeper analysis and discussion of poverty and unemployment follows next.

Poverty and Unemployment

A study on preventable hospitalization rates and neighborhood poverty\textsuperscript{15} finds preventable hospitalization rates as measured by diabetes, COPD, asthma, hypertension, heart failure, angina, dehydration, bacterial pneumonia, and urinary tract infection decline for all neighborhood poverty groups. The authors suggest quality and access to primary care as primary issues facing beleaguered poverty neighborhoods.

Haan and colleagues\textsuperscript{16} find a strong association between poverty and excess mortality. The study examines nine-year mortality rate for residents of a federally designated poverty

\textsuperscript{15} Angilica Bocour and Maryellen Tria, Preventable Hospitalization Rates and Neighborhood Poverty among New York City Residents, 2008-2013, Journal of Urban Health: Bulletin of the New York Academy of Medicine, Vol. 93, No. 6

area, compared to residents in non-poverty areas. The study finds higher adjusted mortality among residents of the federally designated poverty area. If poverty kills, a natural assumption is disproportionate underutilization of necessary medical services among the poor.

This argument is strengthened by a study which finds a strong association between mortality and economic status. The study finds that poor black and white older men have higher death rates than more affluent black and white older men. The study suggests an important policy implication in that “longevity-based transfer systems” are less progressive than understood. Poorer recipients of programs such as Medicare are less likely to reach the age when these benefits become available and are less likely to collect these benefits for as long as the more affluent.

Similarly, another study describes a strong association between social, economic status and health care utilization. Lower income families are disproportionately uninsured, which leads to suboptimal care. Additionally, the particularly destitute may not enroll in Medicaid or Medicare despite eligibility.

Studies have shown that unemployment is associated with an increased risk of not seeking necessary care, and this is largely linked to indications of depression. Additionally, these

19 Annika Maria Helén Åhs and Ragnar Westerling. Health care utilization among persons who are unemployed or outside the labour force. Health Policy, Volume 78, Issues 2–3, October 2006:178–193
stressors related to unemployment depress healthcare utilization despite access to health care as mandated by national policy.\textsuperscript{20}

There is a divergence in the literature surrounding the relationship between unemployment and poverty. An innocuous assumption is that not all unemployed are necessarily poor. Research shows that poverty leads to social isolation.\textsuperscript{21} Gallie et al. find support for an association between unemployment and rising risk of poverty. While they find no support for a causal relationship between unemployment and social isolation, they suggest that poverty acts as a mechanism for social isolation and progresses the difficulties in regaining employment (21). Extending this argument, it is reasonable to conclude depressed healthcare utilization among the unemployed.

DeFina\textsuperscript{22} presents a contrarian view where alternative measures of poverty are not associated with unemployment as is the traditional "headcount" rate, which is a measure of the proportion of the population that is poor. The study enumerates flaws in the headcount rate methodology such as lack of adjustment for "changes in real living standards," subjective dollar thresholds based on family size, and flawed measures of household income. DeFina suggests three other indicators of poverty - one, a revised rate based on higher poverty thresholds and exclusion of government related sources of income; two, a calculation which derives "the average poverty gap"; and three, a measure of income

\textsuperscript{20} M Harvey Brenner and Anne Mooney. Unemployment and health in the context of economic change. Social Science & Medicine, Volume 17, Issue 16, 1983, Pages 1125-1138
\textsuperscript{21} Duncan Gallie, Serge Paugam, Shiela Jacobs. Unemployment, Poverty and Social Isolation: Is there a vicious circle of social exclusion? European Societies, Volume 5, 2003 – Issue 1
dispersion. The analysis finds no meaningful relationship between the unemployment rate and the poverty gap or income dispersion methods.

An overwhelming consensus in the literature is that unemployment and especially long-term unemployment acts as a mechanism leading to poverty. An innocuous assumption suggests that the attributes associated with poverty, such as - quality and access to primary care, higher mortality rates, and lack of enrollment in Medicaid or Medicare may apply to the ‘chronically’ unemployed as well.

**Competition**

The state-level competition variable, Individual Insurance Market Competition, is not significantly associated with any utilization outcome. Competition is perhaps better described the local level, and an examination of local competition variables and variations in health outcomes may show associations.
**Medicaid Expansion**

As previously explained, a key mandate in the Affordable Care Act is an expansion of health care benefits (including improved access to primary care) through expanded Medicaid coverage for low-income adults. As of January 1, 2017, 32 states including DC have adopted Medicaid expansion, 19 states have not. This analysis examines the effect of Medicaid expansion on utilization outcomes, if any, in CY 2014 when 27 states including DC had adopted Medicaid expansion.

The analysis finds support for decreasing utilization in States that chose Medicaid expansion. Beneficiary allocation methodologies are largely congruent with these findings. As a reminder, Method 1 of beneficiary allocation finds a 0.4% decrease in readmission rates (p<0.10) in States that chose Medicaid expansion. States that chose Medicaid expansion also decrease CHF admissions by 85 per 100,000 beneficiaries in the 75 plus age group (p<0.10), however, a one percentage point increase in ACO beneficiaries mitigates this 85 per 1000 beneficiary decrease by 4.4.

Similarly, Method 2 of beneficiary allocation finds States that chose Medicaid expansion decrease CHF admissions by 107 per 100,000 beneficiaries in the 75 plus age group (p<0.05), however, a one percentage point increase in ACO beneficiaries mitigates this 107 per 1000 beneficiary decrease by 5.

A recent study finds mixed results in ED utilization after Medicaid expansion in California.23 The study finds that Medicaid ED utilization increased in the year following expansion, but

23 Sabik et al., Changes in Emergency Department Utilization After Early Medicaid Expansion in California. Medical Care, Vol. 00, No. 00, 2017
uninsured ED utilization decreased during the same period. The study finds no meaningful change in total ED utilization following expansion. The authors suggest a pattern where Medicaid expansion may not result in massive changes in ED utilization (23).

Gingold and colleagues24 examine the effect of Medicaid expansion on ED high utilizers with ambulatory care sensitive conditions. The study finds the proportion of high ED utilizers decreased after expansion, but ED utilization for those with ambulatory care sensitive conditions remained unchanged.

These findings are sober reminders for those predicting massive runs on high-cost ED and inpatient utilization in the aftermath of insurance expansion. While it may take some time for primary/specialty care integration, proper care transitions, and complex care interventions to fully mature and manifest in reducing unnecessary high-cost health care utilization, our findings indicate this transformation may well be underway in States which accepted Medicaid expansion.

State of Delivery System Integration

While CMS is now piloting 'Next Generation ACO Model,'25 which tests stronger financial incentives, but with higher-risk for 'experienced' ACOs, this research and those of others suggest that the current MSSP ACO model has been widely unsuccessful in demonstrating improved quality, lower high-cost utilization or substantial cost savings.

As provider driven organizations, at least three structural issues are facing Medicare Shared Savings Plan (MSSP) Accountable care organizations.

One, the misalignment between beneficiary assignment to an ACO26 (beneficiaries are allocated to an ACO if their primary care provider joins the ACO, and the beneficiary seeks a plurality of primary care services from providers within the ACO). However, as research has shown, this does not preclude beneficiaries from seeking ancillary services outside the ACO framework from other providers, thus marginalizing potential accrual of benefits from systematic care coordination and complex care management within the ACO framework (8).

Two, a misalignment of payment structure which continues to reward volume, while promoting value, but creates systematic chaos in the way ACOs mitigate maximizing reimbursements through volume while attempting to do the same in the value framework part of the equation.

Three, these misaligned incentives create disincentives for tighter integration among primary care providers and specialists, again, marginalizing potential accrual of benefits


from systematic care coordination and complex care management within the ACO framework.

These structural issues are supported by the findings of this research. Primary care capacity and Specialist capacity are not associated with lower utilization when optimally they should contribute to better efficiencies in care design and proper handoffs. Research referenced in this discussion supports the fact that a preponderance of MSSP ACO beneficiaries seek some care outside the boundaries of the ACO.

This research finds that expansion of benefits to the previously uninsured shows early indications of significant reduction in high-cost utilization. Providers are reimbursed for the care of this previously uninsured population creating natural incentives in the system.

Regarding an incrementally advancing health system strategy, the suggestions below are supported by the findings of this study, the resource dependence framework, and are largely congruent with a framework proposed by Porter and Lee\textsuperscript{27}. Porter and Lee suggest "a mutually reinforcing strategic agenda," which includes, integrated practice units, measuring outcomes for every patient, move towards bundled payments, integrating care delivery systems, expanding geographic reach, and enabling information technology platforms. Based on the finding of this research and complementary analyses, these mechanisms are condensed into three resource dependence informed 'pillars' which offer effective mechanisms to induce competition, affect market dynamics, incentivize via payment reform, and encourage patient participation. Collectively these pillars move the entire health system (delivery, payer, and patient) towards an equilibrium in power and

\textsuperscript{27} Michael Porter and Thomas Lee, 'The Strategy That Will Fix Healthcare', Harvard Business Review, 10/2013
shared dependencies which may help generate mutually beneficial integrations, accruing increments in improved health care delivery, and better clinical outcomes.

- **Integration and Transparency:** Provider-led, tightly integrated care networks (ICNs), built on the bedrock of primary care, and which compete on transparent health outcomes, quality, cost, and patient and provider satisfaction measures.

- **Induce Competition:** A consumer-driven market, where patients ‘shop’ for services based on these transparencies, and participate in competing ICNs based on a more objective assessment.

- **Maximize Incentives:** Discard fee-for-service for episode-based payment initiatives, along with shared risk and globally aligned financial incentives. Incentives should be structured in a manner where providers are sufficiently rewarded for a reduction in high-cost volume, and measurably improved health outcomes, especially for the complex care patient cohort.

**Study Limitations**

As stated earlier, some the main advantages of Difference in Differences are that we can find the counterfactual for any treatment group given an untreated group, and it is most suitable for examining state-level policy changes. However, Difference in Differences relaxes the assumption that the pre- and post- periods are the same (impact of time is constant across groups), and that groups have parallel trends in outcomes. The foremost identifying assumption is that treatment (ACO beneficiaries) and comparison (all fee-for-service beneficiaries) have the same baseline trends. An obvious threat is that the treatment and
comparison groups may have different baseline trends, which leads to significant concern regarding the effect of time-varying factors. A solution is to include time-varying controls, and this research includes resource dependence theory informed time varying control variables in the munificence, dynamism, and competition constructs alongside the state and year fixed effects. These time varying controls aid in more precise standard errors. State fixed effects, which control for the averages differences across States in observables and unobservable predictors, and Year fixed effects, which control for average differences over time that are common to all State, are part of the structured equation.

The analysis also tests the common trends assumptions and examines treatment effect dynamics, but ideally ‘matching’ ACO beneficiaries, and FFS beneficiaries at baseline may help reinforce the study findings. However, there is little support in empirical research of matched treatment/comparison design when using Difference in Differences.

Additionally, this research assumes that the treatment group, (MSSP ACO participants) will have similar trends to the control group (all Medicare fee for service participants). The study tests this assumption and finds support. Threats to identification are further mitigated with the geographic dispersion of ACOs, and Medicare fee for service ACO participants as a fully representative subset of the aggregate Medicare fee for service population.

Moreover, the study includes all MSSP ACO participants in 2012, 2013 and 2014 in our analyses. Therefore, the attrition bias or exclusion bias are likely not of significant concern. The MSSP ACO beneficiary allocation for multistate ACOs utilizes two methodologies: one, where multistate ACO beneficiaries assign to the State where the ACO is headquartered and provides a significant level of services; and, two, where multistate ACO beneficiaries are
assigned equally among states where the multistate ACO operates. Results show nominal differences in these two methodologies of ACO beneficiary allocation. Still, an exact count of MSSP ACO beneficiaries in each State will further strengthen, confirm and validate our results.

Also, the MSSP ACO public use file does not provide beneficiary level information, and therefore it is problematic to conclusively determine the differences in the patient panel comorbid load and additional complexities which may be markedly different between ACOs. However, these differences are very likely mitigated at the aggregate State level, the unit of analysis.

Primary care capacity is captured by adding hospital-based primary care providers, and outpatient primary care providers. However, registered nurses (RNs) are not included in this total. Since RNs provide a significant amount of primary care, the primary care capacity variable may not capture the full impact of this construct.

Income per capita shows no association with utilization. Relative income\(^{28}\) measures may serve as better indicators of any association between income levels, consumer behavior, and utilization.

Lastly, the outcome measures, although credible proxies for missed episodes of primary care engagement, care coordination, and complex care management, do not fully capture the complexity of these domains.

\(^{28}\) Income, Saving, and the Theory of Consumer Behavior by James S. Duesenberry
Contribution and Future Research

Limitations notwithstanding, the Difference in Differences four-year State-level panel analyses finds mixed results on ACO performance. While the analyses support a modest decrease in ED visits, the study finds no significant association between ACOs and readmission rates, and prevention quality indicators. The findings are largely congruent with recent studies which show mixed to poor results for MSSP ACO effectiveness in measurable care management, reducing unnecessary utilization, or in significantly decreasing cost. The resource dependence constructs showed similar anomalies in their association with healthcare utilization. While not specified directly in the study hypotheses, the study expected munificence variables would negatively affect utilization. In fact, physicians per capita, specialists per capita and income per capita are not significantly associated with any of the outcome measures while testing hypothesis 1 and 2. However, while testing hypothesis 4, specialists per capita positively associate with CHF admissions. This study finds a strong negative association between poverty and utilization and, unemployment and utilization.

The analysis examines the effect of Medicaid expansion on utilization outcomes in CY 2014 when 27 states including DC had adopted Medicaid expansion. The study finds support for decreasing utilization in States that chose Medicaid expansion. The beneficiary allocation methodologies are largely congruent with these findings. These findings are particularly unique since recent studies have shown no difference in utilization from the pre-expansion period, but none have shown a net reduction in high-cost utilization in preventive quality
indicators within the Medicare fee for service population in the first year of Medicaid expansion.

While this research utilizes resource dependence constructs, contingency theory may prove equally beneficial in examining constructs which influence and inform health services utilization. Regardless of the theoretical framework employed, the contribution of this research to existing literature is undeniable. This research is unique in employing a statistically robust study design, along with rigorous theoretical constructs. The research is unique in employing a Difference in Differences analyses of a four-year panel which covers the first three years of MSSP ACO formation and development.

Still, this research raises perhaps more questions than it answers. Future research should focus on the following provider, payment, environment and policy domains. Specifically, relationships between providers and appropriate incentive structures should be explored to determine optimal strategies which can aid in better downstream patient health outcomes. Future research should examine relationships between bundled payments, episode of care based payments, and full capitation and their correlation with quality of care and utilization. This research focused on State-level analyses, but competition is better described at the hospital referral region (HRR) level. Future research should also focus on the relationship between local market competition and variations in health outcomes. Future research should proactively analyze the efficacy, if any, of incremental policy shifts such as the Next Generation ACO Model. Lastly, future research should examine the longer-term association between insurance expansion and utilization, and impact of influencing environmental factors.
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