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Medicare Shared Savings Performance: Three-Year Pandemic Analysis

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MEDICARE SHARED SAVINGS PERFORMANCE: THREE-YEAR PANDEMIC ANALYSIS

by

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The Centers for Medicare and Medicaid's (CMS) Office of Actuary predicts that U.S. national health expenditures will surpass U.S. gross domestic product per capita by 1.1% annually until 2028, totaling $6.2 trillion in healthcare spending. A significant portion of this spending, 36%, is attributed to Medicare and Medicaid. To address this issue, CMS has implemented the Medicare Shared Savings Program (MSSP) to assist Accountable Care Organizations (ACOs) in reducing healthcare costs and improving the quality of care for beneficiaries. The main objectives of this dissertation are twofold. Firstly, it aims to investigate the relationship between various factors, such as quality score, savings rate, outpatient and inpatient emergency department visits, total primary care visits, total number of beneficiaries, and risk model selected, with the total savings or loss generated by MSSP ACOs during the 2019 and 2021 performance years. Secondly, this dissertation seeks to assess the impact of the 2020 COVID-19 Federal health response on these parameters, both before and after the pandemic, including the generated total savings, quality score, savings rate, outpatient and inpatient emergency department visits, total primary care visits, number of beneficiaries, and risk model selected. The analysis reveals sustained direct relationships over the 3-year period between generated total savings or loss, savings rates, and the number of beneficiaries. Additionally, quality scores, outpatient and inpatient emergency department visits show a decline during the same period.

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Chapter 1. Medicare Shared Savings Program

Background of the Problem

The uncoordinated and fragmented health care practiced in the United States through the early 2000s resulted in silos among patient stakeholders, such as primary care providers (PCP), specialists, Hospitalists, and post-acute care teams. Researchers find that care integration and establishing person-centered coordinated care across stakeholders reduce waste and improve quality, becoming the impetus for recent payment reforms (Lloyd et al., 2018). Coordinated health care holds stakeholders accountable for the value of care, including quality and outcomes. Will holding providers responsible for coordinated care continue to adequately assure that the patient is the recipient of appropriate and quality care while reducing waste through a global pandemic?

Past federal healthcare payment reform attempts include the Health Maintenance Act of 1973, which established Health Maintenance Organizations (HMOs) (Dorsey, 1975). In the capacity of medical insurance groups, HMOs attempted to reduce the total cost of care with pre-negotiated and fixed reimbursement contracts for a defined population, they simultaneously profited from limiting care. With HMO's foremost priority on cost savings, quality of care suffered, resulting in no defensible reduction in healthcare spending (Shin & Moon, 2007; Zwanziger et al., 2000). Non-effective HMOs fell out of the health market favor from 1998 to 2001. Following the decline of the HMOs, U.S. healthcare mostly reverted to profitable fee-for-service (FFS) contracts, resulting in increased hospital stays and higher health expenditures (Lesser et al., 2003). Elliot Fisher et al.'s (2007) seminal work outlined an alternative payment model to FFS, assuring quality and cost reduction, named the accountable care organization (ACO). ACOs financially incent care coordination across all patient stakeholders, with or

without hospitals, to improve quality and eliminate healthcare waste, holding providers accountable for cost and patient outcomes, e.g., reducing hospital stays.

Accountable Care Organizations

One significant change to the healthcare system in the United States as a result of the Affordable Care Act (ACA) was the recognition of Medicare ACO. These publicly funded healthcare entities are responsible for the total cost and quality of care provided to a designated group of beneficiaries (Matulis & Lloyd, 2018). The concept of ACOs aligns with the Institute for Healthcare Improvement's triple aim initiative, which aims to lower the cost of care, improve patient experience, and enhance overall patient health (Berwick et al., 2008; Matulis & Lloyd, 2018; McCarthy & Klein, 2010). As of 2018, it is estimated that over 900 ACO entities are operating across commercial, Medicare, and Medicaid populations (Matulis & Lloyd, 2018). In recognizing the Medicaid ACO, the federal government established the initial Pioneer ACO program and subsequent Medicare Shared Savings Program (MSSP).

Medicare Shared Savings Program

Initially, a total of 32 volunteer ACOs participated in the Pioneer ACO program, which was an alternative payment model (APM) aimed at aligning payer and provider incentives to improve quality and outcomes. This program commenced in 2011 and concluded in 2016, and involved a two-sided risk program (Centers for Medicare & Medicaid Services [CMS], n.d.). The participants in the program were motivated by the potential shared financial gain or loss, and their participation demonstrated the impact that alternative payment models (APMs) can have on healthcare spending. The CMS announced the initial performance year for the Pioneer program, which resulted in gross savings of $183 million across the 32 ACOs by the end of 2013,

including the nine ACOs that exited the program in mid-2013 (Bleser et al., 2019; Nyweide et al., 2015).

The Pioneer ACO program evaluated the performance of 32 ACOs based on 33 quality measures. By 2013, a significant increase of 14.8% in the mean quality scores was reported across 28 of the 33 measures (Liao et al., 2020). However, by the time the program concluded in 2016, only nine ACOs remained in the Pioneer ACO program. The success of the initial Pioneer program in reducing healthcare spending and improving care quality led to the launch of a more extensive and sustainable risk-based program called the MSSP by the CMS.

The ACA introduced the MSSP in subsection 3022, in 2011, after the initial Pioneer ACO program's success. MSSP offers upside (shared savings) only and up and downside (savings/losses) financial risk tracks for 3-year terms, 2012 to 2015, 2015 to 2018, and updating the tracks for 2019 to 2021. MSSP was broadly appealing nationwide without requiring downside financial risk. Four initial track options broadened the MSSP scope to include tracks 1, 1+, 2, and 3. Track 1 included only upside-shared savings, while 1+, 2, and 3 included various levels of two-sided risk, sharing savings, and losses. Most MSSP ACOs chose Track 1 to ease adverse financial risk in participating (CMS, 2022). The MSSP program allowed a relatively low-risk entry mechanism into federal APMs that would encourage incremental risk in later years.

Since the initial cohort of participating MSSP ACOs, CMS has amended the program to drive ACOs towards more financial accountability. CMS streamlined the MSSP program starting in 2019, reducing it to two tracks, including a downside financial risk track (Liao et al., 2020). Track one, also known as the Basic track, phases in downside risk across a 3-year gliding path, which CMS calls "Pathways to Success" (years 2021, 2022) which CMS extended,

accommodating the COVID-19 pandemic (CMS, 2020). For example, Basic track paths A and B have only one-sided risk (shared savings); subsequently, a forced move down the path to include two-sided risk contracts in C through E. Track two, known as the Enhanced track and starts at a steeper two-sided risk contract with shared savings of 75% of the first dollar saved to sharing 40% of the losses. The 2019 MSSP restructuring encourages faster adoption of downside risk, driving U.S. healthcare towards a more financially accountable and coordinated model of care.

The objective of the ACO initiative is to lower per capita costs and increase care and quality experience. Ultimately, the ACA was the foray for the U.S. government to recognize and financially incent cost reduction of ACOs via CMS's MSSP program. The initial 220 MSSP ACOs have grown to 483 as of 2022, encompassing 11 million beneficiaries with a total shared savings of $2.3 billion. The growth of MSSP participation is key to reducing healthcare cost projections through savings incentives based on accountability to care quality measures.

Statement of the Problem

In this quantitative study, I analyzed the pre- and post-pandemic impact of MSSP ACOs generated total savings/loss and the quality score, savings rate, outpatient emergency department visits, inpatient emergency department visits, primary care services, the total number of beneficiaries, and risk model selection in the 3-year MSSP ACO performance period 2019 – 2021. Further, I explored the impact of the 2020 COVID-19 Federal health response through the differences between the pre-and post-pandemic variable means of generated total savings/loss, quality score, savings rate, outpatient emergency department visits, inpatient emergency department visits, primary care services, the total number of beneficiaries, and risk model. In this study, I used secondary data from CMS public use files (PUF), a Health and Human Services resource, for the two MSSP ACO performance years. Researchers have identified mixed results

on the viability of MSSP-participating ACO constructs required to achieve reduced healthcare spending while increasing the quality of care (Bleser et al., 2019; Comfort et al., 2018; Duncan et al., 2022; Ouayogodé et al., 2017). My study's objective is to better understand the relationship between MSSP ACO generated total savings/loss over 3 years to aid in understanding MSSP outcomes and how sustainable the MSSP goal is through a pandemic, allowing for better guidance in future MSSP reform and adoption.

The office of the actuary within CMS projects the U.S. National Health Expenditures to outpace the country's gross domestic product per capita by 1.1% year over year through 2028, resulting in a spending of $6.2 trillion. As of 2020, 36.0% of national health expenditures originated from Medicare and Medicaid spending, representing the highest among hospitals, physicians, prescription drugs, private businesses, State and local government, and households (CMS, 2022). CMS administers various programs to pivot healthcare reimbursement from legacy FFS to alternative payment models (APM) focused on the overall value of care in order to reduce the Medicare and Medicaid contribution to growing health cost projections. The APM pivot to value-based care changes the focus from quantity of care to a reduced cost and improved quality of care. The foremost APM program CMS administers is the MSSP. Trombley et al. (2020) found significant savings from ACOs participating in their 1st and 2nd years (2016 and 2017) of the MSSP. However, research suggests that operating a successful MSSP ACO on a consistent basis remains elusive (Baker & Singer, 2022; Duncan et al., 2022). MSSP ACOs harness the potential to improve care quality for the 11 million beneficiaries, contributing to reducing the projected $6.2 trillion cost curve of U.S. health care through 2028. While much research has explored an array of factors contributing to financial and quality performance within the MSSP, the

relationship of contributing factors over 3 years, including the global COVID-19 pandemic Federal response, is unknown.

Building on Trombley et al. (2020), and Bleser et al. (2019) research, analyzing MSSP ACO financial performance over time, the two objectives of my research are listed above:

- Objective #1: To explore the relationship between the generated total savings/loss and the quality score, savings rate, outpatient emergency department (ED) visits, inpatient emergency department visits, primary care services, the total number of beneficiaries, and risk models in the 2019 and 2021 performance years.
- Objective #2: To explore the impact of the 2020 COVID-19 Federal health response on reported generated total savings/loss and quality score, savings rate, outpatient emergency department visits, inpatient emergency department visits, primary care services, the total number of beneficiaries, and risk models of MSSP participating ACOs performance in 2019 and 2021.

My dissertation analyzes the dependent variable (DV), generated total savings/loss, and the relationship to independent variables (IV) quality score, savings rate, outpatient emergency department visits, inpatient emergency department visits, primary care services, the total number of beneficiaries, and risk model (Table 1).

Research Question and Hypotheses

Utilizing CMS PUF data for 2019 and 2021, the hypothesis quantitatively explores the relationship between generated total savings/loss and quality score, savings rate, outpatient emergency department visits, inpatient emergency department visits, primary care services, total assigned beneficiaries, and risk model. Additionally, how the pre-post-pandemic healthcare

Table 1

CMS Variable Definitions

Variable	CMS Term Name	CMS Definition
Dependent	Generated Total Savings/Losses	Generated Savings: Total savings (measured as Benchmark Minus Expenditures, from first to the last dollar) for ACOs whose savings rate equaled or exceeded their Minimum Savings Rate (MSR). This amount does not account for the application of the ACO's final sharing rate based on quality performance, reduction due to sequestration, application of performance payment limit, or repayment of advanced payments. Generated Losses: Total losses (measured as Benchmark Minus Assigned Expenditures, from first to the last dollar) for ACOs in two-sided models whose losses rate equaled or exceeded their Minimum Loss Rate (MLR) and the negative of the MSR (for ACOs in one-sided models).
Independent	Quality Score	Quality Score: In Performance Year 1 of an ACO's first agreement period, the quality score is 100% if all measures were reported entirely and less than 100% if one or more measures were not wholly reported. Beyond Performance Year 1 of an ACO's first agreement period, the quality score will be determined not only by whether all measures were completely reported but also by their performance against established benchmarks and on quality improvement. For ACOs determined to have been affected by an Extreme and Uncontrollable Circumstance, the quality score is higher than the ACO's calculated initial quality score or the national mean quality score across all Shared Savings Program ACOs who met the quality performance standard before the application of the Extreme and Uncontrollable Circumstances policy.
Independent	Savings Rate	Total Benchmark Expenditures minus Assigned Beneficiary Expenditure as a percentage of Total Benchmark Expenditures.
Independent	Outpatient emergency department visits	Total number of visits in an outpatient emergency department per 1,000 person-years in the performance year an ED visit (EDV) is defined using both inpatient and outpatient claims and using the revenue center code filed on the claims: EDV in the hospital inpatient and hospital outpatient claims with the revenue center code values 0450-0459 and 0981. The restriction is imposed so that a beneficiary can have a maximum of EDV on a specific date.
Independent	Inpatient emergency department Visits	Total number of visits to on Ed that result in an inpatient stay per 1,000 person-years in the performance year. EDV that leads to hospitalizations is identified in the hospital inpatient claims with revenue center code values 0450-0459 and 0981.
Independent	Primary care services	Total number of primary care services per 1,000 person-years in the performance year. Primary care services are counted regardless of physician specialty.
Variable	CMS Term Name	CMS Definition

Independent	Total Assigned Beneficiaries	The number of assigned beneficiaries, performance N.A. year.
Independent	Risk Model	Indicates participation in a one-sided shared savings model or a two-sided shared savings/loss model for the performance year.

Source: *(CMS, 2022)*

environment impacted the differences between 2019 and 2021 for generated total savings/loss, quality score, savings rate, outpatient emergency department visits, inpatient emergency department visits, primary care services, total assigned beneficiaries, and risk model.

This dissertation focuses on finding the relationship between generated total savings/loss and quality score, savings rate, outpatient emergency department visits, inpatient emergency department visits, primary care services, total assigned beneficiaries, and risk model in the 3-year MSSP ACO performance period 2019 to 2021. Further, this study expects the generated total savings/loss in the 3 years of performance between 2019 and 2021 are directly and significantly related to the quality score, savings rate, outpatient emergency department visits, inpatient emergency department visits, primary care services, total assigned beneficiaries, and risk model.

Theoretical Framework

Boulding (1956) identifies applying mathematical constructs to general system relationships to organize a more coherent system as the foundation of the general systems theoretical framework, which enables the researcher to analyze an array of system attributes, including inputs, outputs, intersystem relationships, and the environmental impact on the system. The application of my study's approach within the General Systems Theory framework enables an exploration of the relationships between output and environmental factors within the context of the MSSP. Specifically, in this study, I examine the financial outcomes of MSSP ACOs in terms of total savings and loss, and their relationship with various variables, including quality

scores, savings rate, outpatient and inpatient emergency department visits, primary care services, number of beneficiaries, and risk model. Additionally, my study analyzes the impact of the Federal response to the 2020 COVID-19 pandemic on the named explanatory variables for both the 2019 and 2021 MSSP performance years. Specifically, the mathematical construct this study uses within the GST framework to organize the relationship between generated total savings/loss and the IVs are descriptive statistics, multivariate linear regression, and an independent *t*—test.

Significance of the Study

Projections of National Health Expenditures use a current-law framework that only considers the existing law and assumes no future changes. Therefore, understanding the interrelationships of MSSP constructs within the Federal pandemic response context can inform further CMS policy, with the potential to affect future projections of National Health Expenditures, MSSP ACO outcomes, and adoption. Finally, the broad impact spectrum of this study centers around the patient, aiming to lower costs and higher quality care.

CMS projects U.S. National Health Expenditures to outpace GDP per capita through 2028 without clarity on who will pay for or administer the healthcare services and goods (CMS, 2022). Historically, insurance, employers, and individuals, directly or via taxes, have borne the increasing cost burden of health care. Medicare continues to be the leading contributor to National Health Expenditures and administers programs such as MSSP to dampen the position. The MSSP objective to hold providers accountable for spending and care outcomes tied to their reimbursement.

Economics and demographics are the macro contributors impacting the health spending (Keehan et al., 2017). The 2020 pandemic response and the increasing amount of Medicare beneficiaries fall in the economic and demographic categories, respectfully. In the Federal

response to the COVID-19 pandemic, U.S. healthcare spending increased by 9.7%, a 5.4% increase over the previous year. Further, GDP and the insured decreased in 2020. The response resulted in 19.7% of the U.S. economy being dedicated to health care in 2020 (Hartman et al., 2022). With the increased healthcare spending and decreased GDP in 2020, the importance of efforts to reduce national health expenditure projections is elevated. What quality of care will the patient receive in 2028, and at what cost?

Limitations and Delimitations of the Study

The limitations of my study include program participation, tenure within the program, other value-based care program participation, rate of program change, and beneficiary eligibility. MSSP Participation is limited to a subset of ACOs who volunteered to participate. The population within my study is not random and cannot be generalizable outside the MSSP population. MSSP-participating ACOs may participate in multiple value-based programs that may unintentionally affect MSSP operations that are not measurable or knowable. The design does not factor in the tenure of the ACO in quality performance activities or their effects on outcomes. The varying amounts of experience operating MSSP ACOs can affect their performance (Ouayogodé et al., 2017). The study only accounts for Medicare beneficiaries participating in the MSSP within the 3-year period and is not representative of the whole patient population or beneficiaries participating in multiple CMS programs.

Chapter 2. Literature Review

In this chapter, a semi-systematic approach is employed for the literature review, as proposed by Snyder (2019). This approach is deemed suitable for topics that are analyzed from different disciplines and perspectives, where a systematic review may not be ideal or feasible. Given that MSSP ACOs are studied by various clinical and non-clinical disciplines, a semi-structured approach is adopted for the literature review. The review begins with a chronological examination of the transformational history of ACO adoption, followed by a chronological analysis of the evolution of the MSSP. Next, a methodological approach is used to differentiate the methods employed in analyzing MSSP ACOs, followed by a thematic approach to delimit the variables studied in relation to MSSP ACOs. The chapter concludes with a summary that provides a concluding overview of the reviewed literature.

Accountable Care Organization Transformation

Before President Nixon signed the Health Maintenance Organization Act of 1973, healthcare policy focused on three areas (Dorsey, 1975):

1. The first area related to the purchase of care by establishing the Medicare and Medicaid systems.
2. The second area related to the policies focused on planning, allocating, and distributing care with the Comprehensive Health Planning Act of 1966.
3. The third area related to securing access to care with the Hill-Burton and Health Manpower Act of 1946.

No prior policies focused on the framework of care delivery. The Health Maintenance Organization (HMO) concept proposed an alternative payment model to the existing fee system directed at reducing expenses through the HMO organizational framework. For this reason,

HMOs established the initial care transformation towards a lower cost of care. Cost reductions were elusive as HMO adoption increased significantly through the early 1990s. Structuring care delivery around tight utilization with a defined population and restricted provider access contributed to lower quality of care (Shin & Moon, 2007). The HMO structure is similar to selective contracting, where beneficiaries can access limited provider networks and coverage (Mobley, 1998; Shin & Moon, 2007; Zwanziger et al., 2000). Shin and Moon (2007) found that because HMO beneficiary populations required less care, cost savings was attained by reduced care, and not because of the HMO program.

In two ways, the conclusions made by Shin and Moon (2007) correspond closely with the conclusions from the Zwanzinger et al. (2000) study. First, both found that selective contracting and reduced coverage were more significantly attributed to the reduced cost of care than care programs that limit care resources. Second, reducing costs with selective contracting techniques contributes to an erosion of care quality. Thus, the HMO reputation and adoption waned, in part because of the mounting observations that HMO savings are attributed to factors outside the program, and the diluted quality of care administered. Furthermore, Shin and Moon (2007) extended their observations beyond Zwanzinger et al. (2000) to add the erosion of beneficiary satisfaction with the overall experience of care services received within the HMO program.

Shin and Moon's (2007) observation of reduced consumer sentiment toward healthcare services under HMOs is congruent with Lesser et al.'s (2003) qualitative study that detailed the erosion of care experience. The previous conclusion of Lesser et al. (2003) also adds that future cost and quality initiatives will be more difficult because of the diluted healthcare quality and experience.

The decreasing adoption of HMO beneficiaries in the late 1990s and early 2000s contributed to the exacerbation of care spending growth trajectories, resulting in unsustainable levels of expenditure and a dilution of the quality of care (Fisher et al., 2007; Lesser et al., 2003). This served as the impetus for the policy reform proposed by Fisher et al. in 2009, which outlined three driving principles (Fisher et al., 2009). The three seminal principles include

1. Break down care silos by aligning provider pay across all care stakeholders.
2. Decouple provider pay from volume pay (FFS) to value-based reimbursements (APMs).
3. Incentives providers based on care measures, reduced costs, and improved care quality.

These three driving principles lay the value-based care foundation for accountable care organizations, pivoting from HMO's limited access that hindered care quality and increase healthcare costs.

Fisher et al. (2009) propose the ACO framework, aligning accountability to all providers across total cost and patient care quality. Fisher's proposed ACO is rooted in the three principles and builds on the physician group practice demonstration approach, which distributes a portion of practice savings across physicians when they meet quality goals (Colla et al., 2012). The proposed ACO framework also aligns nicely with the Institute for Health Improvement's triple aim to reduce cost and improve quality and care experience.

McCarthy and Klein (2010), along with Berwick et al. (2008), found that simultaneously focusing on cost, quality, and experience accelerates coordinated care, beneficiary adoption, and resource stewardship. Further, McCarthy and Klein (2010) identified that the triple aim is possible when there is a collaborated effort to focus on a defined population. Interestingly,

McCarthy and Klein also support Fisher's three principles and the triple aim alignment in the ACO framework. Thus, the ACO operationalizes quality and incentivizes resource stewardship that remains attractive to beneficiaries.

Medicare Shared Savings Progression

To address the unsustainable cost projection of National Health Expenditures, the ACA established The Center for Medicare and Medicaid Innovation (CMMI) in 2010, to test new APMs and their effectiveness in reducing healthcare costs in the U.S. CMMI has established various models and initiatives across the following categories Episode-based Payment Initiatives, Primary Care Transformation, Medicaid and Children's Health Insurance Programs, new payment and service delivery, speed of adopting best practices, and Accountable Care Programs (CMS, n.d.). The Pioneer ACO program is CMMI's first established Accountable Care Program operationalizing both Fisher et al.'s (2007, 2009) three principles and policy recommendations while aligning to IHI's triple aim of lower cost, higher quality, and experience.

Pioneer ACOs established the framework for MSSP, providing insights and direction from initial success. Within the first year of 2012, 32 Pioneer ACOs generated $87.6 million in CMS savings (Toussaint et al., 2013; McWilliams et al., 2015). However, Toussaint et al. (2013) identify two weak points within the program's first 3 years, including a staff learning curve in operation adjustments and the need for broader coordination efforts to produce more meaningful savings. The study conducted by McWilliams et al. (2015) confirms that the Pioneer ACO holds the opportunity to increase shared savings systematically and is advisable. Specifically, McWilliams et al. conclude that adjusting shared savings benchmarks for market spending growth could achieve the desired sustainability of a shared savings program in the future. CMS

addresses these initial Pioneer ACO successes and learnings in the permanent MSSP with a continuous improvement framework.

The most adopted CMS ACO model is the MSSP, expanding the appeal for value-based care in three ways. First, provide a low-risk barrier to entry by establishing four tracks within the MSSP framework, including track one without downside risk (CMS, 2022; Comfort et al., 2018). Track one comprised 80% of MSSP participants within the first 3 years (Liao et al., 2020). The second appeal initiative assured program viability by building on previous learnings of ACO pilots in and out of the public sector (Toussaint et al., 2013; Zabawa et al., 2012). Third, CMS's MSSP eliminates selective contracting and collaboration, incorporating patient engagement and requiring beneficiary representation in the governing body (CMS, 2022; Zabawa et al., 2012).

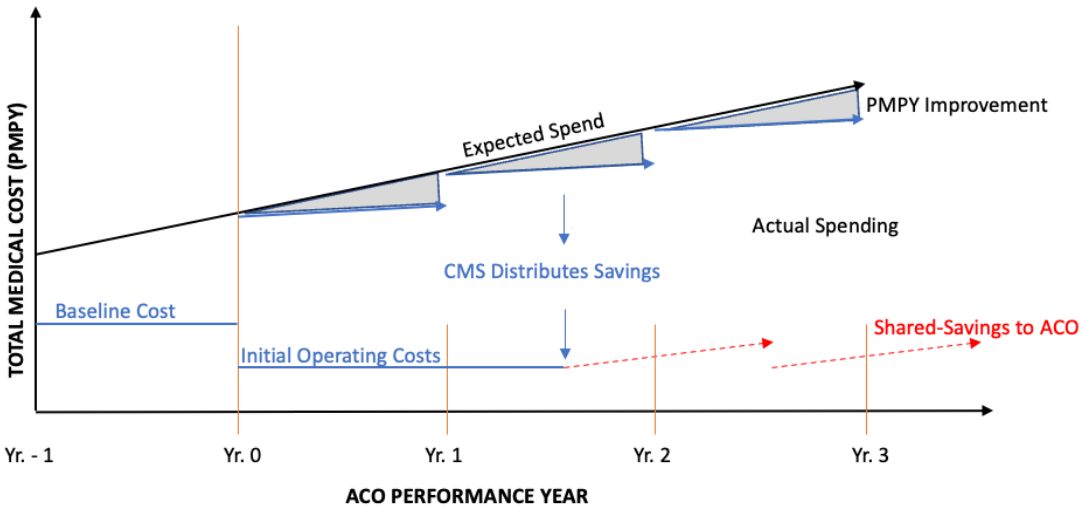
Financial incentives play a fundamental role in driving efficient care delivery within the MSSP. A key metric used is the counterfactual approach, which calculates shared savings or losses for participating ACOs. This involves subtracting the actual spending on attributed ACO beneficiaries from the expected spending for the same population. The resulting difference in outcomes from previous performance years is shared among ACOs based on the selected track. In a one-sided risk model, only gains are shared, while in a two-sided or downside risk model, losses are also shared. The expected costs in the counterfactual equation are adjusted for risk to ensure fairness across different populations (Kautter et al., 2014).

Figure 1 illustrates the gains and loss trajectories across a 3-year MSSP contract. Counterfactual gains and losses are represented as shaded triangles at the end of each performance year per member per year. In addition to the counterfactual delta, CMS requires ACOs to exceed a range of gain/loss savings before taking financial action. For MSSP ACOs with 60,000 or more attributed beneficiaries, a +/- 2% range is expected, and for smaller MSSP

ACOs, an incremental range is set down to the smallest MSSP ACO of 5,000 attributed beneficiaries at 4%.

Figure 1

Shared Savings Timeline

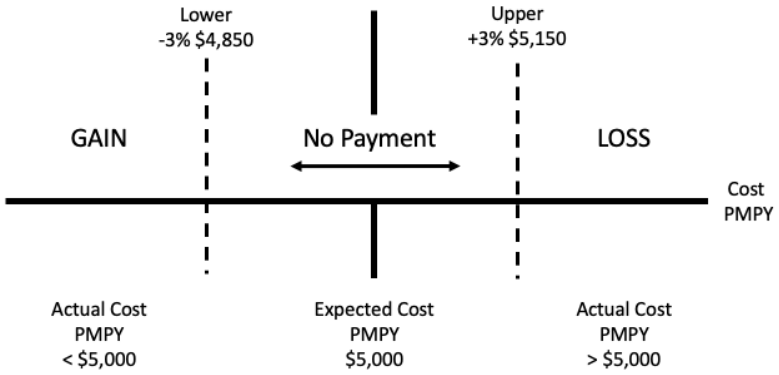


Note. This figure demonstrates MSSP's Total Medical Costs as per member per year over a duration of 3 years. Adapted from "Shared Savings Model Risk in the MSSP Program" by Duncan, Mackenzie, Bonfiglio, Wrigley, & Liao (2022). © 2022 by Duncan, Mackenzie, Bonfiglio, Wrigley, & Liao.

Meanwhile, Figure 2 illustrates an example of MSSP ACO's gain/loss range expectations for CMS to recognize the financial incentive. In this example, the actual cost range is set at 3% of the expected cost, or between $4,850 and $5,150 PMPY. Shared savings achievement is attained by exceeding the lower range equating to the total generated savings. In contrast, exceeding the upper range, results in total losses for the MSSP ACO.

Figure 2

Thresholds for Gain/Loss MSSP Risk



Note: The figure is adapted from "Shared Savings Model Risk in the MSSP Program" by Duncan, I., Mackenzie, A., Bonfiglio, E., Wrigley, T., & Liao, X. (2022).

The MSSP contract progresses toward a two-sided, also known as downside risk adoption (Baker & Singer, 2022; Mechanic et al., 2019). The initial four-track (1, 1+, 2, 3) is reduced to two tracks, Basic and Enhanced. In 2018, CMS called this modification the "Pathways to Success" program. To move the 80% of participants on a one-sided or upside-only Track 1 to what CMS calls a "Gliding" path toward incremental risk. Within the "Pathways to Success," the Basic track allows upside-only arrangements for 2 years, after which the participating ACO assumes a two-sided agreement (Baker & Singer, 2022; Mechanic et al., 2019). Due to the COVID-19 pandemic in 2020, CMS paused the Gliding path to two-sided risk. This has only delayed the inevitable adoption of two-sided contracts.

In addition to the Pioneer ACO, CMMI launched other shared savings programs. Across the six categories of APMs, the Independence at Home (shared savings program is one program launched alongside the Pioneer ACO. Rotenberg et al. (2018) found that the IAH achieved ten times more Savings in the first 2 years than the Pioneer ACO within the same timeframe. However, the Congressional Budget Office found that the IAH program was not scalable beyond

the initial 5,000 beneficiaries and thus capped enrollment and did not extend the program beyond the initial phase. Thus, the IAH program is an example of CMMI testing a wide variety of programs to support the continuous effort to improve the cost curve and an example of the various degrees of success these programs have that are not yet proven.

Upon examination of the ACO exits from MSSP, areas for improvement become apparent. A closer look at the 30% dropout rate within the first 5 years of MSSP reveals that the most significant departure rate occurred in the third performance year at 20.7% (Bleser et al., 2019). Bleser et al. (2019) identified six factors associated with the risk of departure, with participating in a two-sided contract (Track 2 or 3) being the most significant factor. On the other hand, Bleser et al. (2019) found four factors related to longevity in the MSSP, including achieving savings at all, having higher per capita benchmarks, being in a market with higher cost growth projections, and being in a market where more coordinated services are offered. Not achieving shared savings within the first 3 years is the most significant indicator of longevity. Bleser et al. (2019) identified that not achieving savings poses the risk of programmatic risk-bearing progression, and they advised that further research is needed to determine the ideal rate of progression.

Total generated savings performance within the MSSP is a crucial indicator of success in the program and the program's long-term viability (Berkson et al., 2020; Bleser et al., 2019; Duncan et al., 2022). Berkson et al. (2020) found that ACOs with high growth cost benchmarks at $13,000 were more than twice as likely to achieve savings as those ACOs in markets with low growth cost benchmarks of $9,000. This finding supports the factor analysis performed by Bleser et al. (2019). Additionally, Berkson et al. (2020) also found that higher per capita benchmarks are more likely to generate savings. In other words, having ideal positioning in per capita and cost

growth benchmarking is critical in the likelihood of attaining savings in the first 3 years, impacting the adoption and longevity of the MSSP.

Building on Bleser et al.'s (2019) studies and Berkson et al.'s (2020) studies, the study conducted by Duncan et al. (2022) finds that per capita benchmarks and high-cost growth projections are critical to success. Specifically, Duncan et al. (2022) add that CMS benchmarking can be attributed to inherent risk embedded in the model. The MSSP statistical model for assigning estimated cost gains and per capita expenses is relative and stochastic resulting in significant probability in the model generating false negatives and gains. Duncan et al. (2022) conclude that with the inherent cost projection error in the model, no reward exists for MSSPs in cost-reducing markets. Further finding that the model risk is attributed to random ebbs and flows of care utilization and costs within the ACO's market, minimizing relative control on generated total savings/loss.

To summarize, CMMI built the MSSP from past APMs and continues to evolve the program from four-track to two pathways and pausing 2-sided risk agreements post-pandemic; participant performance remains unpredictable. MSSP leverages shared savings as an incentive to operate a more balanced and integrated care model that hinges on the ability to generate savings. Thus, analyzing MSSPs constructs to generate those savings is essential in attaining a scalable program that eluded the debunked HMO.

Methods of Analyzing MSSP ACOs

Table 1 provides a list of studies analyzing various factors of MSSP effectiveness and performance, along with a description of each study's method and noteworthy results. The list includes a variety of study designs and methods used in evaluating MSSPs with distinct differences and limitations. Study designs include cross-sectional, longitudinal, differences in

differences (DID), mixed methods, cost-effective analysis, and quantitative modeling. Each deployment design has limitations affecting the methodologies deployed and various performance insights.

The cross-sectional design is the most prevalent design used in studying MSSP performance in the review. The non-experimental cross-sectional design focuses on observing the outcomes of populations exposed to variables at a given moment (Setia, 2016). The design is applicable for MSSP performance of a single year or repeating years. Cross-section design limits methodology that incorporates causal, corollary, or trend discovery. Researchers deployed two primary methods, linear and multivariate regression, to assess variable relationships in MSSP performance.

Cross-sectional designs using regression analysis assess variable relationships observed in a selected MSSP performance year. As mentioned, there is an inherent lack of visibility beyond a single point for population characteristics and outcomes. Further, the method does not fully account for macro or micro contextual forces leading to omitted variable bias vulnerability because of heterogeneity (Wang & Cheng, 2020). Kaufman et al. (2021), Pugh (2016), Rudisill et al. (2021), and Zhu et al. (2019) all addressed potential heterogeneity by applying fixed, random, or hybrid effects modeling to the regression analysis. Because Kaufman et al.'s (2021) study used a repeating cross-sectional design, the Hausman -Taylor fixed method was used to accommodate a comparative analysis.

Six studies deployed longitudinal designs to avoid the effects of assessing performance across different populations inherent in repeating cross-sectional designs. Counts et al. (2019), Rudisill et al. (2022), and Zhu et al. (2019) deployed a 2-year analysis, the shortest, whereas Markovitz et al. (2019), a 7-year study, the longest. According to White and Arzi (2005), the

minimum length of a rigorous longitudinal study is 1 year, validating all longitudinal studies in this review. Researchers assessed variable relationships with regression analysis on variables with adequate, trending, inter, and external affect. However, studies reviewed deploy observational non-experimental designs limiting causal dimension insights. Specifically, results hold the potential to omit variables and unobserved differences between ACOs and beneficiaries. Markovits et al. (2019) use instrument variable modeling and fixed effects modeling to address heterogeneity, whereas Rudisill et al. (2021) and Zhu et al. (2019) only use fixed and hybrid effects models. Parikh et al. (2022) and Counts et al. (2019) do not leverage any effects modeling. Thus, studies assessing longitudinal variable relationship trends provide richer MSSP performance insights than cross-sectional studies.

Alternatively, researchers can assess the variable effect on performance trends by deploying DID studies. Further, DID designs address background changes and secular trend effects, incorporating a pre-post effect dimension that applies to healthcare policy and programs like MSSP (Dimick & Ryan, 2014). Three studies deploy DID designs to assess MSSP performance pre-post MSSP participation across various attributes (McWilliams, 2016. McWilliams et al., 2017. McWilliams et al., 2018). Alternatively, DID is deployed to assess benchmark performance years with subsequent year performance (Trombley et al. 2019. Trombley et al. 2020). Linear regression models are used in all reviewed DID studies. Limiting considerations to the DID design are spillover effects. Specifically, unobserved behaviors, workflows, administrative decisions, or other aspects of the MSSP spill over to other areas of care not taking part in the MSSP. Spillover creates the potential for diluted attributed outcomes. Second, Trombley et al. (2019) identify the potential for efficiency gains to dilute attributed outcomes to the pre-post variable assessment. The value of DID design in assessing MSSP

performance is compared across affected and non-affected populations, assuming macro effects are the same across the groups.

D'Aunno et al. (2018) deploy an explanatory sequential design to broaden the analysis of effects beyond previously discussed designs on MSSP performance. The mixed method starts with a quantitative study followed by a qualitative analysis of the quantitative outcomes. Specifically, D'Aunno et al. (2018) connect the financial and quality outcomes to leadership style, collaboration, and operational efficiencies in an explanatory approach. A significant limitation includes the narrow sample size, decreasing applicability and relevance across all participant organizations and beneficiaries (Creswell et al., 2003; D'Aummo et al., 2008). Despite the limitations of explanatory sequential designs, they serve well in exploring narrow internal performance dynamics that can have broad implications.

Another approach to narrow the framework of analyzing MSSP performance is the cost-effectiveness analysis (CEA), as utilized by Dover and Kim (2021) on 23 quality measures included in the MSSP performance outcome calculation. The CEA approach assesses the efficacy of these specific measures in terms of cost and quality. However, CEA has some limitations as highlighted by Murry et al. (2000) and Dover and Kim (2021). Firstly, generalizing the findings can be challenging due to contextual factors such as organizational structure and efficiencies/inefficiencies, which may not be observed but could impact the measures analyzed, similar to spillover effects in difference-in-differences (DID) designs. Secondly, there is no standardized structure for assessing the effectiveness of measures in CEA studies. Finally, the assumption that findings drive decision prioritization in CEA studies may not account for broad contextual variances. In their study, Dover and Kim (2021) limit the sample population to MSSP participants and reduce macro contextual variances, and their use of the Tufts Medical Center

CEA Registry helps to reduce efficacy variability, ensuring the practical implications of the study.

Another way researchers assess MSSP efficacy and performance is by modeling synthetic financial reimbursements. Two significant studies incorporating a quantitative modeling design assessing the effectiveness of the MSSP program are Delia et al., 2012 and Duncan et al., 2022. Both studies use quantitative modeling to validate reimbursement accuracy and identify the variable impact on the probability of inaccurate reimbursements. The propensity of MSSP reimbursement calculations to generate false positives or negatives can have meaningful implications on the success and scalability of the program.

In conclusion, each study design brings limitations and strengths to assessing MSSP effectiveness and performance. Cross-sectional brings a broad variable assessment for a performance year. Trending variable relationships to performance are done with longitudinal studies. Assessing performance with DID incorporates pre-post intervention analysis. Specifically, pre-post MSSP deployment or pre-post 1st-year reimbursement. Broadening contextual explanation for variable impact is done with the explanatory sequential design, yet with limited sample size. CEA then further narrows applicability to specific components, like measures, of the MSSP. Finally, quantitative modeling assesses the MSSP's accuracy and effectiveness. Each of these frameworks brings to light a different aspect of MSSP performance.

Variables From Literature

The literature exploring the relationships of various MSSP variables related to performance is listed in Table 1. Study differences are observed in both variables assessed and the concluding validity of the MSSP. Understanding the relationship between various MSSP constructs is essential for establishing the program's validity, viability, and scalability. This

section's objective is to examine the variables researched related to viability and the concluding results relating to the validity of MSSP. The variables assessed are grouped into four categories: financial, beneficiary health condition, MSSP geography, and structure. The second categorical observation of the research is the program's validity.

Financial variables assessed in the MSSP program include beneficiary expenditures and the total generated savings, resulting in mixed performance outcomes. McWilliams (2016) finds significant savings after participating in an up-side-only MSSP track compared to previous years. Contributing to MSSP savings, McWilliams et al. (2017) find reduced hospital utilization and increased ambulatory care significant factors. Additionally, unlike HMOs, population targeting is not observed in high-risk beneficiaries of MSSPs.

MSSP savings targets are based on the previous year's market expenditure baselines. Exploring a deeper context of pre-post MSSP participation, both Ouayogodé et al. (2017) and Berkson et al. (2020) find that markets with higher expenditure baselines are more likely to have substantial savings than low baselines. Contributing to the market baseline and building on McWilliam et al.'s (2017) study, Trombley et al. (2019) find that lower previous beneficiary utilization significantly contributes to lower expenditure baselines, resulting in fewer savings. The same study identifies that the beneficiary population who participated in MSSP had lower expenditures than those who did not, regardless of baselines supporting the program's validity.

Understanding financial variability within performance years is essential to move from pre-post program participation. Ouayogodé et al.’s (2017) study found that in the 1st year, savings attainment was not uniform or consistent across MSSP ACOs. McWilliams et al.’s (2018) study found the same inconsistencies in financial performance from year 1 to the first 3 years. Building off previous research, Dover and Kim’s (2021) study assesses the economic

viability of the quality measures assessed within the MSSP program. The researchers find all 23 measures to hold cost-effective outcomes assuring that the quality measures incorporated support the MSSP objective (Dover & Kim, 2021).

Before the observed inconsistent financial outcomes of MSSP ACOs, the program's validity was studied. Delia et al.'s (2012) study first identified the statistical risk of false positive savings based on stochastic payment calculations. The study finds the number of beneficiaries the leading contributor to calculating false savings and losses. Subsequently, Duncan et al. (2017) support the statistical uncertainty that Delia et al. (2012) found. However, Duncan et al. (2017) refute McWilliam's et al. (2017) study that found high-risk beneficiaries have no significant impact on savings. In particular, Duncan et al. (2017) found that the stochastic variance in high-risk population cost distribution contributes to the risk-adjusted calculation resulting in false positives. The false positive attributes a loss in savings where no loss occurred in the performance year. The studies of Dalia et al. (2012) and Duncan et al. (2017) find errors in the validity of the MSSP, potentially threatening the probability of widespread adoption.

In summary, the overall financial assessment of the MSSP vary across research findings from profitable and break-even to non-viable. McWilliams (2016), McWilliams et al. (2017, 2018), Ouayogodé et al. (2017), and Trombly et al. (2019) found the MSSP program profitable. Conversely, Kahn and Sullivan (2022) find the MSSP, merely breaks even in comparison to other CMMI programs. Finally, Delia et al. (2012) and Duncan et al. (2022) refute the financial profitability and validity of the program. The basis for assessing various variables related to performance is the overall variability of MSSP performance.

Understanding the health condition of the beneficiary population within an MSSP and how they relate to performance is essential, given that these variables directly affect quality

measures and cost (Dover & Kim, 2021). A wide range of chronic and episodic beneficiary health conditions are studied across the research with diverse findings.

Conditions related to high-cost utilization, like cardiovascular disease and seriously ill beneficiaries, are attributed to increased savings and cost (Kaufman et al., 2021; Pugh, 2016). Pugh's (2016) study found that beneficiaries with cardiovascular disease residing in a county that previously held a high mortality rate contributed to MSSP savings. Pugh's findings emphasize the impact of baseline expenditures on savings that Ouayogodé et al. (2017) later find. In a similar vein, Bleser et al. (2018) and Kaufman et al. (2021) find that MSSP markets that previously included seriously ill beneficiaries are associated with increased savings. However, the studies differ in the implications where Kaufman et al. (2021) find that consistent inclusion of seriously ill beneficiaries comes at a high cost to the MSSP, potentially affecting future reimbursement. Nevertheless, Bleser et al. (2018) attribute seriously ill and older beneficiaries to high-performing MSSPs. Kaufman et al. (2021) study refutes McWilliams et al. (2017) findings that MSSP does not promote avoiding high-risk beneficiaries, reducing projected spending. Conversely, Blesser suggests MSSP's effectiveness on older, sicker beneficiaries promotes the adoption and scalability of the model.

Research also finds inconsistency across acute episodic care and chronic care conditions. Alternative to studying beneficiaries having chronic conditions like Pugh's (2016) cardiovascular diseases study, Rudisill et al.'s (2021) study explores the effect of MSSP beneficiaries that had a major acute cardiovascular event (MACE). Unlike the conclusive findings of Pugh, Rudisill et al. did not find anything conclusive in pre-post spending of the MACE event. Consistent with Rudisill et al.'s findings on an acute episodic condition's impact on MSSP savings, Markovitz et al. (2019) found that reduced spending and quality of care for hip fractures are not associated

with MSSP. Both studies find that participating in MSSP does not impact the cost or quality of acute episodes of care. However, Counts et al. (2019) found that chronic behavioral care outcomes were inconsistent with participating in MSSP. Thus, MSSP performance is not attributed solely to one or the other acute episodic care or chronic care conditions.

Ouayogodé et al. (2017) study explored the market baseline relationship to MSSP performance, as previously discussed, and MSSP organizational structure's relationship to performance. Ouayogodé et al. (2017) found that no organizational structure of an MSSP contributes to performance. Nevertheless, the inclusion of physician leadership and the more significant proportion of governing boards made up of physicians contributed to MSSP savings. Congruent with Ouayogodé et al. (2017) findings, Reimold et al. (2022) report that physician participation on the board of the MSSP does positively impacts performance.

In addition to physician involvement, the MSSP organizational affiliation and third-party consultancy engagement impact MSSP performance. Mcwilliams et al. (2018) found that MSSP savings were associated with organizational structures affiliated with physician groups, not hospital MSSPs. Conversely, Zhu et al. (2019) found that MSSPs affiliated with hospital systems were attributed to more significant savings. However, Harrison et al. (2018) found that the established physician networks for either hospital MSSP or physician group MSSP contribute to savings. Thus, regardless of MSSP affiliation to a hospital or physician group having a physician network is impactful.

Beyond organizational structure and affiliation, D'Aunno et al. (2018) used mixed methods to assess inter-organizational dynamics' relationship to MSSP performance. D'Aunno et al.'s (2018) study found that collaboration, effective feedback, and embedded care coordinators improved MSSP performance. Interestingly, Trombley et al. (2020) found that in addition to the

physician network, and regardless of hospital affiliation, MSSP ACOs working with management consultancy positively impact performance. Thus, a healthy collaborative MSSP management is critical enough that even leveraging third-party consultants contribute to performance.

Nattinger et al. (2018) conduct an assessment of MSSP geography to understand the impact of structure and internal operational relationships on MSSP performance. Their findings suggest that rural physician-based MSSPs have a stronger association with savings compared to rural hospital-based MSSPs. However, the performance of MSSPs was not impacted by whether they were rural or large. On the other hand, Zhu et al. (2019) contend that there is no meaningful advantage to rurality affiliation, disputing the findings of Nattinger et al. (2018). Zhu et al. (2019) conclude that hospital-based MSSPs, whether rural or not, are associated with more outstanding performance. In conclusion, the rurality of an MSSP does not have an observable impact, and the affiliation to a hospital has inconclusive performance according to these studies.

The literature on MSSP performance examines various relationships with diverse findings across four groups. This section highlights the relationship between baseline expenditures, profitability, economic effectiveness of quality measures, participation, number of beneficiaries, various episodic and chronic acute conditions, rurality, affiliation, and organizational structure. These factors have been studied in a given performance year and over time in relation to MSSP savings performance. Building on the findings of Bleser et al. (2018) who report improved quality and an inverse spending relationship to quality over 3 years (2013-2016), the longitudinal study of Markovitz et al. (2019) compares financial outcomes between MA and MSSP beneficiaries and found no difference in savings.

Much literature has examined the MSSP Generated savings, the number of beneficiaries, and readmissions, yet it has not been examined across 3 years (2019-2021) that includes a

healthcare response to a global pandemic (Berkson et al., 2020; D'Aunno et al., 2018; Delia et al., 2012; Duncan et al., 2022; Markovitz et al., 2019; McWilliams et al., 2018; Ouayogodé et al., 2017; Trombley et al., 2019; Trombley et al., 2020; Zhu et al., 2019). Therefore, the goal of my study is the examination of MSSP-generated total savings/loss and the relationship between quality score, savings rate, outpatient emergency department visits, inpatient emergency department visits, primary care services, the total number of beneficiaries, and risk model in the 2019 and 2021 performance year period. M study expands on previous research examination of MSSP effectiveness by contributing to a further understanding of MSSP validity, and scalability through a national health crisis.

Conclusion

The literature documents value-based health reform and explore ACO MSSP effectiveness and validity through various constructs with mixed results. With the winding down of the HMO, Fisher's (2006) idea of coordinated care through the accountable organization opened the door to a new era of potentially systematically reducing health costs in a coordinated healthcare matrix aligned with the triple aim. The onset and adoption of the ACO supported by the ACA through CMS's MSSP are now the widest adopted CMMI and alternative payment model programs. Research finds mixed MSSP financial and quality results across different health conditions, MSSP structures, and geographies.

The literature observes six different study designs and various methods of examining MSSP's effectiveness. Longitudinal cross-sectional designs with various regression analyses provide insight into MSSP progression, adoption, and effectiveness trends. Bleser et al.'s (2018) 3-year cross-sectional study (2013–2016) examines quality, structure, and beneficiary conditions, finding no savings in year 1 and subsequent years, resulting in profitability. Further, found an

inverse relationship between savings and quality, where quality increased over the study period to include seriously ill beneficiaries. Expanding on Bleser et al.'s research, Markovitz et al. add the combination of examining quality and savings attainment between 3 years of pre-MSSP and 3 years of post-MSSP participation (2009–2014), finding no savings differences with MSSP participation. This longitudinal study builds on these two studies to examine generated savings of MSSP through a 3-year period that includes significant delivery changes in response to a global pandemic. Further, my study accounts for various factors related to MSSP's generated total savings/loss. The findings of the analysis will inform future policy on the versatility and viability of the MSSP program through potential future care delivery changes.

Chapter 3 explores the method, data collection, and analysis design used in this study, including the approach for population selection. Chapter 3 includes the statistical model used to analyze MSSP performance through the chosen dependent and independent variables.

Chapter 3. Research Methodology and Data

This chapter provides an introduction to the research design and methods for a quantitative cross-sectional study that aims to analyze the relationship between generated total savings/loss and quality score, savings rate, outpatient emergency department visits, inpatient emergency department visits, primary care services, total assigned beneficiaries, and risk model in the context of the General Systems Theory framework. The General Systems Theory approach applies mathematical constructs to complex system relationships to improve organization and comprehensibility, which is beneficial for understanding the financial performance of MSSP ACOs in relation to internal and external explanatory factors, including the pre-post global pandemic environment. The chapter covers the design of the quantitative cross-sectional study, including population selection, data collection, summary statistics, instrumentation, and statistical model. It concludes with a summary of the final design, method, and data analysis, which serves as the foundation for the subsequent analysis results in Chapter 4.

Research Design

This is a comparative quantitative cross-sectional study analyzed through the lens of the General Systems Theory framework that assesses the impacts of various explanatory factors on MSSP ACO's savings and losses, including a comparative analysis of financial performance pre-post global pandemic environment. The non-experimental design aspect of this study is appropriate, as it used secondary data for the quantitative analysis, omitting any variable manipulation while quantifying the relationship of the independent variable to the dependent variable (Ham & LaLonde, 2005) The design's comparative quantitative aspect is appropriate as the study compares the outcomes of two or more independent variables on the outcome or dependent variable (Creswell, 2013).

Research Question and Hypothesis

In this study, I aim to quantify the relationship between generated total savings/loss of MSSP ACOs and quality score, savings rate, outpatient emergency department visits, inpatient emergency department visits, primary care services, total assigned beneficiaries, and type of risk model employed by the MSSP ACOs. Further, a comparative analysis of the 2019 performance year data representing the pre-pandemic healthcare environment to the 2021 performance year data representing the post-pandemic healthcare environment assesses the impact of the 2020 pandemic on MSSP ACO performance.

Research Question one (RQ1): What is the relationship between generated total savings/loss and quality score, savings rate, outpatient emergency department visits, inpatient emergency department visits, primary care services, total assigned beneficiaries, and risk model in reporting years 2019 and 2021?

Research Question two (RQ2): How has the pre-post-pandemic healthcare environment impacted the differences between 2019 and 2021 for generated total savings/loss, quality score, savings rate, outpatient emergency department visits, inpatient emergency department visits, primary care services, total assigned beneficiaries, and risk model?

Through this study, I expect to find that the generated total savings/loss is directly and significantly related to the quality score, savings rate, outpatient emergency department visits, inpatient emergency department visits, primary care services, total assigned beneficiaries, and risk model. In addition, the study expects a direct impact of the 2020 pandemic on the generated total savings/losses of MSSP ACOs. Therefore, the hypothesis this study tests include the following:

Ho1: There is no relationship between Generated Total Savings/Los and quality score, savings rate, outpatient emergency department visits, inpatient emergency department visits, primary care services, total assigned beneficiaries, and risk model.

Ha1: The generated total savings/loss significantly and positively relates to quality score, savings rate, outpatient emergency department visits, inpatient emergency department visits, primary care services, total assigned beneficiaries, and risk model.

Ho2: There is no difference between the MSSP performance data from 2019 and 2021 for generated total savings/loss quality score, savings rate, outpatient emergency department visits, inpatient emergency department visits, primary care services, total assigned beneficiaries, and risk model.

Ha2: There is a significant difference between 2019 and 2021 MSSP performance data for generated total savings/loss and quality score, savings rate, outpatient emergency department visits, inpatient emergency department visits, primary care services, total assigned beneficiaries, and risk model.

Methodology

The study intends to understand better the relationship between MSSP ACO's financial performance and potential variables that impact this performance, as listed in the hypotheses. Therefore, the study method takes a systematic review and comprehensive analysis of secondary PUF data for MSSP ACO participants in performance years 2019 and 2021. The sole dependent variable in this study is the generated total savings/loss. The independent variables are quality score, savings rate, outpatient emergency department visits, inpatient emergency department visits, primary care services, total assigned beneficiaries, and type of risk model selected. Linear regression analysis assesses the relationship between the dependent and independent variables,

comparing the impacts of each IV on the DV for the years 2019 and 2021. A *t*—test assesses the differences between the values of these variables from 2019 and 2021. The comprehensive results for 2019 and 2021 represent the impact of the global COVID pandemic on the financial performance of the MSSP ACOs.

Data Collection

The population of interest in this study includes MSSP ACO provider participants starting in January 2019 and 2021. CMS reported January 2019 MSSP performance year data for 475 participating ACOs. My dissertation does not include the 66 ACOs with a July 2019 MSSP start date to reduce variability in observed data and control for disparate variables. CMS provided the dual starting points in 2019 to accommodate the announcement of the "Pathways to Success" program intended to accelerate ACOs towards at-risk tracks. This study also evaluates CMS-reported January 2021 MSSP performance year data for 475 participating ACOs. The secondary quantitative data was obtained from the CMS MSSP ACO PUF government website (https://data.cms.gov/medicare-shared-savings-program/performance-year-financial-and-quality-results/data) for the years 2019 and 2021.

This dissertation uses the CMS-provided labels for each variable in Table 2. Performance year descriptive statistics for the participating MSSP ACOs can be found in Table 2, where 475 total observations for 2019 and 2021. Three variable ranges are scaled for subsequent statistical analysis, including *gensaveloss* by one million, *p_em_total,* and *n ab* by one thousand (Table 4).

Instrumentation

This study used a publicly published instrument developed by CMS, including 2019 and 2021 MSSP ACO performance data, available on CMS's website. The CMS instrument aligns with the objectives of the study because all variables of interest are captured in the instrument.

Table 2

2019, 2021 Variable Descriptive Statistics

	M		*SD*		Min		Max	
Variable	2019[a]	2021[a]	2019	2021	2019	2021	2019	2021
Dependent								
gensaveloss[b]	3.88	7.67	9.77	12.2	-31.04	-15.81	71.44	124.59
Independent								
qualscore	94.41	89.99	2.48	7.66	92.17	61.69	99.66	100
sav_rate	0.03	0.03	0.05	0.04	-0.14	-0.09	0.22	0.17
p_edv_vis	710.30	609.06	147.45	124.51	309	329	1585	1478
p_edv_vis_hosp	215.33	192.65	58.23	55.68	45	34	642	584
p_em_total[c]	10.97	10.98	2.05	2.36	7.10	7.37	28.08	32.12
n_ab[c]	21.05	21.31	22.17	22.69	2.19	3.01	239.92	220.37
risk_model	0.82	0.59	0.39	0.49	0	0	1	1
	2019	2021					2019	2021
R^2	0.600	0.683				Obs.	475	475
F-test	100.06	143.63				Prob>F	0.000	0.000

Note. risk_model = 0 is defined as a two-sided shared savings/loss model, and 1 is defined as a one-sided shared savings/loss model. [a]n = 475 Observations, [b]In millions, [c]In thousands

CMS designates this data for public consumption where no permission requirements exist for the download or use of the data. The instrument reliability is high as many researchers use the data set, as noted in Table 2 (shown in Appendix A). No counterfactual data is included in the instrument showing what an ACO would have spent not taking part in MSSP. However, the instrument has been used for MSSP ACO performance years from 2012 through 2021, with slight variations in measures and modes of interpretation. CMS indicates the intention to continue to use this instrument in the future.

This study leverages secondary data from CMS of participating MSSP ACO reported performance years of 2019 and 2021. Using secondary data is valid and appropriate for rigorous clinical and healthcare policy research (Kimberlin & Winterstein, 2008; Trinh, 2018). Due to the

size and comprehensive elements, and extensive use, the secondary data set is reliable. Many researchers leverage CMS PUF data to assess MSSP ACO performance, as noted in Table 2. Reliable secondary data sources are ideal; otherwise, collecting the data is both cost and time-prohibitive (Trinh, 2018). The data set used in this study was free of charge, easily accessible, and included extensive variables, including variables of interest, making the data set ideal for statistical analysis in this study.

Statistical Method

Simplicity and fit guided the criteria in selecting statistical models for this analysis. The two primary selection criteria used were—first, a model providing a complete and realistic explanation of the financial performance of MSSP ACO in relationship to listed variables and the comparison of 2019 and 2021, pre-post pandemic generated total savings/loss performance. Second, the ability to remove unnecessary regressors, ensure precision in fit, and systematically omit variables to narrow the statistical application to the most impactful construct. In selecting the model for RQ2, pre- and post-pandemic comparative analysis and independent *t*—test are utilized. All calculations and manipulations were performed using the latest release of STATA 17.

The null hypothesis H_o1 estimates no relationship between the dependent variable, generated total savings/loss, and the named explanatory independent variables. The alternative hypothesis H_a1 estimates a positive relationship between the dependent variable, generated total savings/loss, and the named explanatory variables. The null hypothesis for research question two, H_o2, estimates no significant difference between 2019 and 2021 reported performance for generated total savings/loss and the named explanatory variables between 2019 and 2021. The alternative hypothesis, H_a2, estimates a significant change between 2019 and 2021 named variables of participating MSSP ACOs.

MLR was performed on variables of interest from 2019 and 2021 MSSP ACO performance year data, expressed in standard matrix notation for regression analysis as shown below.

$$\boldsymbol{Y_{ij} = X_{ij}\beta_j + u_{ij}} \quad (\mathbf{1})$$

Where, *i* represents the observations for the dependent variable and all independent variables included in the matrix $\boldsymbol{X_{ij}}$; $\boldsymbol{\beta_j}$ represents the intercept of the regression and slopes for each corresponding independent variable for *j* = 1 and 2, where 1 represents the year 2019 and 2 represents the year 2021. Thus, the specific equation to be estimated for 2019 can be written as:

$$\widehat{\boldsymbol{gensaveloss_1}} = \boldsymbol{\beta_{01} + \beta_{11}qualscore + \beta_{21}savrate + \beta_{31}outEDV + \beta_{41}inEDV + \beta_{51}PCS + \beta_{61}benefi + \beta_{71}riskmodel}$$

$$\boldsymbol{Residuals\ for\ 2019}: \boldsymbol{u_{i1} = gensaveloss_1 - \widehat{gensaveloss_1}}$$

Similarly, the specific equation to be estimated for 2021 can be written as:

$$\widehat{\boldsymbol{gensaveloss_2}} = \boldsymbol{\beta_{02} + \beta_{12}qualscore + \beta_{22}savrate + \beta_{32}outEDV + \beta_{42}inEDV + \beta_{52}PCS + \beta_{62}benefi + \beta_{72}riskmodel}$$

$$\boldsymbol{Residuals\ for\ 2021}: \boldsymbol{u_{i2} = gensaveloss_2 - \widehat{gensaveloss_2}}$$

The estimated residuals from the MLR would then be tested for normality with Skewness and Kurtosis tests for the years 2019 and 2021. The null hypothesis for skewness is a normal distribution, represented by a *p* value of between 0.5 and -0.5. Following the residual Skewness and Kurtoses tests, a variance inflation factor (VIF) is used to assess the extent of multicollinearity. Independent variables that are highly correlated significantly hinder statistical interpretation and increase standard error bias parameter estimation. A multicollinearity level is acceptable when the VIF is >10, or the mean VIF is >1 (Hadi & Chatterjee, 2015). It is

acceptable for explanatory variables that are all statistically significant to remain regardless of the multicollinearity (Hadi & Chatterjee, 2015). When deciding on the inclusion or exclusion of variables into the model for this study, the degree of multicollinearity and what variables should be reintroduced, given the relationship to generated total savings/loss, were considered.

Núñez et al. (2011) find that the stepwise selection process has potential limits and cannot be assumed that all insignificant variables are removed or includes all significant explanatory variables. Therefore, the study does not include a stepwise regression analysis. However, this study does consider all contextual knowledge surrounding explanatory variables.

It is essential to consider the 2020 healthcare pandemic response as part of the estimation in some meaningful manner to explore MSSP performance for the year 2021. The 2020 healthcare pandemic response drastically impacted patient care, surgeries, and surgery outcomes (Kaye et al., 2021). Since many X_i variables were impacted by the pandemic directly, the traditional multivariate linear regression can lead to biased estimates of the dependent variable due to omitting the covariance between the explanatory variables and the exogenous instrumental variable. ANCOVA was not selected due to the violation of linearity between covariant and dependent variables and the violation of homoscedasticity. Accounting for model error from exogenous factors that influence explanatory variables, this study explores significant mean differences between 2019 and 2021 reported MSSP ACO performance for named variables with an independent *t*—test

$$\boldsymbol{t - value} = \frac{\bar{\boldsymbol{X}}\mathbf{1} - \bar{\boldsymbol{X}}\mathbf{2}}{\sqrt{\frac{(\boldsymbol{n}\mathbf{1}-\mathbf{1})\times\boldsymbol{\sigma}\mathbf{1}^{\mathbf{2}} + (\boldsymbol{n}\mathbf{2}-\mathbf{1})\times\boldsymbol{\sigma}\mathbf{2}^{\mathbf{2}}}{\boldsymbol{n}\mathbf{1}+\boldsymbol{n}\mathbf{2}-\mathbf{2}}} \times \sqrt{\frac{\mathbf{1}}{\boldsymbol{n}\mathbf{1}} + \frac{\mathbf{1}}{\boldsymbol{n}\mathbf{2}}}} \quad (2)$$

Where $\bar{\boldsymbol{X}}\mathbf{1}$ and $\bar{\boldsymbol{X}}\mathbf{2}$ are the mean values of each 2019 and 2021 independent variable data set. Then, $\boldsymbol{\sigma}1$ and $\boldsymbol{\sigma}2$ are the standard deviations of each sample set. Finally, $\boldsymbol{n}\mathbf{1}$ and $\boldsymbol{n}\mathbf{2}$ are the

observations in each sample set. The assumptions of homogeneity are tested with Levene's test; the effect size is calculated with Cohen's *d* test for each named variable.

Conclusion

In conclusion, chapter three outlines the study design, how the design aligns with the research question, the necessity for secondary data, and statistical methodology enabling the examination of the response variable, generated total savings/loss of MSSP ACOs, and relationship to the explanatory variables, quality score, savings rate, outpatient emergency department visits, inpatient emergency department visits, primary care services, total assigned beneficiaries, and risk model. Under the GST framework, two statistical models are deployed for this comparative quantitative analysis: an MLR and an independent *t*—test where normality and goodness of fit are assessed with skewness, kurtoses, and VIF. The following chapter includes detailed statistical results and interpretations of the regressions and *t*—test described. Additionally, a discussion of the study's results, and implications are also discussed in Chapter 4.

Chapter 4. Results of Analyses

CMS is concerned with National Healthcare Expenditure projections through 2028, which is why it established many programs in response. CMS established many programs. The MSSP is the foremost program for ACO that endured the Federal healthcare response to COVID-19. Chapter 4 contains the results of the estimates in the statistical model discussed in Chapter 3 that identifies the relationship between reported total generated savings/loss and the six explanatory variables for MSSP participants. The following questions guided this study to understand the relationship between the identified factors and the impact of the Federal healthcare response to COVID-19.

RQ1: What is the relationship between generated total savings/loss and quality score, savings rate, outpatient emergency department visits, inpatient emergency department visits, primary care services, total assigned beneficiaries, and risk model in reporting years 2019 and 2021?

RQ2: How has the pre-post-pandemic healthcare environment impacted the differences between 2019 and 2021 for generated total savings/loss, quality score, savings rate, outpatient emergency department visits, inpatient emergency department visits, primary care services, total assigned beneficiaries, and risk model?

This chapter begins by discussing the descriptive statistics for the PUF data provided by CMS. Thereafter, explicit identification of the factors that significantly contribute to the total generated savings/loss performance of MSSP ACOs in 2019 and 2021 is performed, followed by a presentation of the differences between MSSP performance between the pre-pandemic year 2019 and the post-pandemic year 2021. Specifically identifying statistically significant

differences for each variable in the 2019 and 2021 reporting years. The chapter finishes with a summary of the findings.

Summary Statistics Discussion

Descriptive statistics were obtained for the dependent variable and named independent variables for reporting years 2019 and 2021 (Table 10 as shown in Appendix B). Reported averages went up between 2019 and 2021 for *gensaveloss, sav_rate*, *p_em_total,* and *n_ab*. Conversely, averages went down between the same period for *qualscore, p_edv_vis, p_edv_vis_hosp*, and *risk_model*. Further, standard deviations increased between 2019 and 2021 for *gensaveloss, qualscore, p_em_total, n_ab,* and *risk_model.* These results provide a broad trend for the variables included, where each variable's descriptive statistic is examined below.

Generated Total Savings/Loss, Gensaveloss

The variable *gensaveloss* is the sole dependent variable of this dissertation due to the implications of the reported metric. Explicitly, an MSSP ACO's reported generated total savings and loss represents the overall economic effectiveness of the ACO in the program. Further, the key performance indicator, *gensaveloss,* incorporates performance benchmarks indicative of lowering cost and increasing quality of care, two primary purposes of the MSSP. The average MSSP ACO in 2019 achieved a savings of $3.884 million, with a standard deviation of $9.772 million. 68% of MSSP ACOs in 2019 reported losses and savings between $-5.888 and $13.656 million. Yet in 2021, the average *generated total savings/loss* rose by 98% to $7.673 million and a wider variance, with a standard deviation of $12.291 million. This indicates that 68% of MSSP ACOs reported *generated total savings/loss* between $-4.618 and $19.964 million. Thus, MSSP ACOs both reported fewer losses and greater savings in 2021. Greater average savings across MSSP ACOs post-pandemic suggests the MSSP program can withstand and improve economic

efficacy through adverse federal healthcare mandates to the pandemic response. It would be helpful to delve into the concept of accountable care organizations (ACOs) that experienced increased total savings following the pandemic, factors such as geography, organizational structure, beneficiary demographics, and more, which are beyond the scope of this dissertation.

Quality Score, Qualscore

Based on a combination of being fully reported and the delta of established quality measure benchmarks, the quality score variable is the primary independent variable. MSSP ACOs in 2019 averaged a *qualscore* of 94.4% with a standard deviation of 2.4%. The lowest reported quality score obtained in 2019 was 92.17%. The average 2021 MSSP quality score dropped by 4. 68% to 89.99%. In 2021, a greater standard deviation of 7.66% and a minimum quality score of 61.69% for the MSSP quality scores were observed. Thus in 2021, the minimum quality score decreased by 49.4%. Conversely, 34 ACOs achieved the maximum quality score of 100% in 2021, whereas no ACO reported the maximum in 2019. A few variables may impact the decrease in quality scores in 2021 that go beyond the scope of this dissertation, including procedure changes due to the pandemic, staff shortages, personal protection equipment shortages, and CMS change to no longer provide pay-for-reporting. Understanding factors that negatively impact MSSP quality scores post-pandemic helps to improve care outcomes, experience, and adoption of the program, all of which contributed to the abandonment of HMOs discussed in Chapter 1.

Savings Rate, Sav_Rate

The savings rate per attributed beneficiary in 2019 was 0.025 and grew by 36% to 0.034 in 2021. The standard deviation also narrowed from 0.046 in 2019 to 0.041 in 2021. The change in standard deviation aligns with a tighter variance in the minimum and maximum *savings rate*

between 2019 and 2021. Minimum savings rates narrowed from -0.137 to -0.086, and maximum savings rates from 0.223 to 0.169 between 2019 and 2021. Post-pandemic MSSP ACOs reduced waste per beneficiary resulting in greater reported savings rates. This indicates that the per-beneficiary economic outcome for MSSPs is sustainable after the pandemic response, suggesting a strong resilience to adverse external effects. This can improve adoption and support for the program across large and small institutions and geographies. Further research is required to understand how beneficiary conditions, demographics, and facility constructs impact the savings rate.

Outpatient Emergency Department Visits, P_Edv_Vis

MSSP ACOs Attributed beneficiaries reduced their average emergency department (ED) visits in the outpatient settings by 14.25%, from 710.295 in 2019 to 609.055 in 2021 per 1,000 person-years. A narrowed standard deviation was also observed between 147.447 in 2019 and 124.512 in 2021 per 1,000 person-years. Yet, the minimum number of visits to the outpatient emergency department increased by 20 from 309 to 329 in 2021 per 1,000 person-years. These averages indicate that fewer assigned beneficiaries who pursued care in emergency departments were admitted for an overnight stay. Reduced outpatient emergency department utilization can indicate many phenomena, including reduced sentiment toward seeking care from emergency rooms, increased fear of contracting COVID-19, increased urgent care utilization, beneficiary condition, stringency in patient triage and admittance policy, access barriers, and avoidance of care. Although ED visits are costly underutilization may pose a high risk to patient health and ultimately increase costs due to preventable care. Understanding these factors' relationship to the observed reduction of outpatient emergency department visits goes beyond the scope of this study and can provide insight related to the quality and care experience.

Inpatient Emergency Department Visits, P_Ed_Vis_Hosp

Hospital emergency department visits, on average, reduced by 10.53%, a lower average decline than ED visits in the outpatient setting. In 2019 the average number of hospital ED visits were 215.33, and in 2021, 192.65 per 1,000 person-years. Alternatively, 2021 ED visits in the hospital had lower counts in reported minimum and maximum visits compared to outpatient visits. The minimum number of visits reported in 2019 is 45, a reduction in 2021 to 34. The maximum number of visits reported in 2019 was 642, and 584 in 2021. Overall, the utilization of hospital emergency departments resulting in an overnight stay is reduced post-COVID-19 response. Reduced ED visits may indicate underutilization placing beneficiaries and quality of care at risk. Although ED utilization is one cost containment area, further research is required to assess the impact of inpatient emergency department underutilization on MSSP ACOs. Interesting factors that need further exploration beyond this dissertation's scope include a beneficiary sentiment to the ED, telehealth adoption and access, and limited resources, including staffing, beds, and PPE.

Primary Care Services, P_Em_Total

The average number of attributed lives in 2019 who visited primary care services regardless of specialty was 10,967 per 1,000 person-years in 2019; in 2021 was 10,975, an average increase of eight visits per 1,000 person-years. The standard deviation in 2019 of 2,050 and 2021 of 2,356 remained narrow. Similarly, the distributed minimum and maximum were also narrow. The minimum number of reported visits for 2019 is 7,103 and 7,373 for 2021. The maximum number of reported visits for 2019 is 28,084, and for 2021 is 32,123. Assigned beneficiaries visiting primary care stayed relatively the same across the 3 years. Consistency in primary care utilization through the Federal pandemic response may indicate robust

sustainability of the MSSP ACO care model. Compared to the reduction in outpatient and inpatient emergency department utilization, having primary care as a sustainable entry point to the care model may help future ACO operators maintain cost and quality performance when facing adverse environments.

Total Number of Attributed Lives, N_Ab

The average number of individuals who voluntarily attributed to MSSP ACOs is a secondary variable. In 2019, it was 21,048 per ACO, while in 2021, it increased to 21,314 per ACO. However, the standard deviation for both years is large, with 22,173 in 2019 and 22,692 in 2021. The large standard deviation reflects the respective minimum and maximum. 2019 minimum number of attributed lives to an MSSP ACO is 2,193, and the maximum of 239,924. Again in 2021, a wide range is observed, with 3,014 attributed lives to the lowest MSSP ACO and 220,365 lives to the largest MSSP ACO. This indicates the wide range of beneficiary participation in small and large MSSP ACOs. Relatively little change in beneficiary assignments is observed between 2019 and 2021. Although CMS's objective is to increase MSSP adoption through both ACO and beneficiary adoption, neither decreased through the 3-year period. It would be interesting to further study factors contributing to the lack of growth. The lack of growth observed can have negative impacts on MSSP longevity as a solution to cost and quality. In other words, not being able to grow MSSP adoption through a pandemic may indicate underlying weaknesses not covered in this dissertation that can aid in the broader reduction of health expenditures.

Risk Model, Risk_Model

In the data set, the value of 0 represents ACOs that opted for a two-sided risk agreement with MSSP, where both losses and savings are possible. The value of 1 is then attributed to

ACOs that have selected a one-sided risk agreement with MSSP, where no losses can be achieved. In 2019 a total of 389 MSSP ACOs participated in one-sided risk models, representing 82% of the 475 observations. The remaining 86 MSSP ACOs participated in two-sided risk model agreements, representing 18%. In 2021, the number of MSSP ACOs choosing a two-sided risk model rose by 127% to 195 MSSP ACOs, representing 41% of the 475 observations. Conversely, only 280 MSSP ACOs chose the one-sided risk model, representing a 28% decline for the option and 59% of the observations. This indicates an increase in ACOs opting for more risk post-COVID-19 pandemic. Greater risk adoption may indicate stronger confidence in the ability to achieve savings with the MSSP. Alternatively, the increased observation may indicate ACOs are more likely to adopt the "Pathways to Success" track early, which forces an increased risk position over 3 years, as discussed in Chapter 2. In April 2020, CMS issued a ruling providing MSSP participants the option to delay "Pathways to Success," thus delaying the adoption of more risk in an attempt to accommodate the volatility of the global pandemic (CMS, 2020). The movement towards an increased risk position of the ACOs is the direction CMS is promoting and may indicate MSSP administrators' confidence and alignment with the program's objective. The likelihood of MSSP adopting more risk post-pandemic may also indicate the maturity of organizational operations over the 9 years the program has been deployed.

Multivariate Linear Regression

To approach the economic factors of ACOs in the 2019 and 2021 MSSP performance years, a multivariate linear regression analysis (MLR) was conducted to evaluate the relationship of *total generated savings/loss* between the following explanatory variables, quality score, savings rate, outpatient emergency department visits, inpatient emergency department visits, primary care services, total assigned beneficiaries, and risk model (Table 5). The linear

regression analysis results for the year 2019 indicated that outpatient ED visits, inpatient ED visits, primary care services, and risk model were not statistically significant, as shown in Table 5, column 'p-value' ($p < .05$). Alternatively, 2021 results indicate quality score, outpatient emergency department visits, inpatient emergency department visits, and risk model were not statistically significant predictors of the model ($p < 0.5$) found in the ‘‘p-value’’ column.

Results for outpatient emergency department visits, inpatient emergency department visits, primary care services, and risk model support the rejection of H_o1, estimating no relationship between the dependent variable and explanatory variables, in 2019, and for 2021 savings rate, total primary care visits, and total assigned beneficiaries p-value supports the rejection of H_o1 (Table 5). Further, the 2019 results support H_a1, which estimates a positive relationship between *total generated savings/loss* and quality score, savings rate, and total assigned beneficiaries.

Yet, the 2021 MSSP results for savings rate, total primary care visits, and total assigned beneficiaries support H_a1 (Table 5). These results indicate both the savings rate and total assigned beneficiaries positively relate to *gensaveloss* in 2019 and 2021. Interestingly, the quality score results are statistically significant for 2019 and not 2021, and total primary care visit results are not statistically significant in 2019 and are in 2021. The weakening of the relationship between quality and generated total savings/loss from 2019 to 2021 indicates a post-pandemic shift potentially affecting a broader range of variables that go beyond the scope of this study. Further analysis of each significant variable follows.

Table 3

2019, 2021 Regression Model Results

	β		*t*-value	
gensaveloss	2019	2021	2019	2021
qualscore	0.239**	0.052	2.01	1.09
sav_rate	126.48***	152.30***	19.80	18.44
p_edv_vis	0.002	0.004	0.64	1.28
p_edv_vis_hosp	0.005	-0.005	0.59	-0.51
p_em_total	-0.249	0.589***	-1.31	3.30
n_ab	0.226***	0.363***	17.15	25.16
risk_model	0.557	-0.146	0.74	-0.21
Constant	-26.515	-18.046	-2.30	-3.38
	2019	2021		
R^2	0.600	0.683		
F-test	100.06	143.63		
Observations	475	475		
Prob > F	0.001	0.001		

*Note. ***p < .01, **p < .05 , *p < .1*

Table 4

2019 Qualscore Regression Results

gensaveloss	***β***	*t*-value
qualscore	0.548***	3.05
Constant	-47.842***	-2.82
R^2	0.019	
F-test	9.297	
Observations	475	
Prob>F	0.002	

*Note. ***p < .01, **p < .05, *p < .1*

Table 5

2019, 2021 sav_rate Regression Results

	$\boldsymbol{\beta}$		t-value	
gensaveloss	2019	2021	2019	2021
sav_rate	119.83***	146.90***	15.09	12.25
Constant	0.922	2.639	2.21	4.12
	2019	2021		
R^2	0.325	0.241		
F-test	227.652	150.004		
Observations	475	475		
Prob>F	0.001	0.001		

*Note. ***p < .01, **p < .05, *p < .1*

Controlling for the 2019 quality score, MLR resulted in a coefficient of $\boldsymbol{\beta}$ = 0.548 and $p < .05$, suggesting that with each additional increase in the quality score, *gensaveloss* increases by 0.548 and is positively related to each other (Table 6). The R^2 value of .019 associated with this regression model suggests that the savings rate accounts for 1.9% of the variation in *gensaveloss,* indicating that 98.1% of the variation in 2019 *gensaveloss* cannot be explained by the quality score alone. The *p*-value associated with the regression analysis supports the rejection of H_o1 that there is no relationship between the quality score and *gensaveloss*. Additionally, results support H_a1 estimating an observed positive relationship between *gensaveloss* and quality score. Similar results were found for the savings rate in 2019 and 2021.

Controlling for savings rate, the MLR resulted in a 27.01 increase in coefficients between 2019 and 2021. Specifically, a coefficient of $\boldsymbol{\beta}$ = 119.83 in 2019 to 146.90 in 2021, both with a $p<.05$ (Table 7). Interestingly, the increase suggests that with each additional savings rate increase, the *gensaveloss* increases more in 2021 and yet is less of a predictor than in 2019. The

2019 R^2 value of .325 associated with this regression model indicates that the savings rate accounts for 32.5% of the variation in *gensaveloss,* 8.4 base points higher than in 2021, with an R^2 of .241. In other words, 67.5% of the 2019 variation in *gensaveloss* cannot be explained by the savings rate, whereas in 2021, 75.9% cannot be explained by the savings rate alone.

The observed p-value ($p<.05$) associated with the 2019 and 2021 *sav_rate* regression analysis indicates that H_o1 can be rejected (Table 7). Additionally, the coefficients for 2019 and 2021 support H_a1 estimating an observed positive relationship between *gensaveloss* and savings rate. Similar results were found for the total assigned beneficiaries.

Table 6

2019, 2021 n_ab Regression Results

	β		t-value	
gensaveloss	2019	2021	2019	2021
n_ab	0.219***	0.339***	12.45	17.49
Constant	-0.724	0.438	-1.35	0.73
	2019	2021		
R^2	0.247	0.393		
F-test	154.916	305.849		
Observations	475	475		
Prob>F	0.001	0.001		

*Note. ***p < .01, **p < .05, *p < .1*

Controlling for the 2019 and 2021 total assigned beneficiaries, the MLR resulted in a 0.12 increase in coefficients between 2019 and 2021. Specifically, a coefficient of $\boldsymbol{\beta} = 0.219$ in 2019 to 0.339 in 2021, both with a $p<.05$ (Table 8). Interestingly, the increase suggests that with each additional total assigned beneficiary increase, the *gensaveloss* increases by 0.219 in 2019 and 0.339 in 2021.

Further, the model suggests *n_ab* supports more explanatory power in 2021 with an R^2 of 0.393 from 0.219 in 2019. The total assigned beneficiaries account for 39.3% of the variation in 2021 *gensaveloss,* 14.6 base points higher than in 2019, with only 24.7% variation attributed to total assigned beneficiaries. Put differently, 75.3% of the 2019 variation in *gensaveloss* cannot be explained by the total assigned beneficiaries, whereas in 2021, 60.7% cannot be explained by the total assigned beneficiaries alone. The confidence interval associated with the 2019 and 2021 regression analysis indicates that H_o1, estimating no relationship between savings rate and *gensaveloss,* can be rejected. Additionally, the results for both 2019 and 2021 support H_a1 estimating an observed positive relationship between *gensaveloss* and the total assigned beneficiaries. Similar results were found for the total primary care visits.

Table 7

2021 p_em_total Regression Results

gensaveloss	$\boldsymbol{\beta}$	t-value
p_em_total	0.421*	1.76
Constant	3.051	1.14
R^2	0.007	
F-test	3.102	
Observations	475	
Prob>F	0.079	

*Note. ***p < .01, **p < .05, *p < .1*

Controlling for 2021 total primary care visits, MLR resulted in a coefficient of $\boldsymbol{\beta} = 0.421$ and a $p < .1$, suggesting that with each additional total primary care visits increase, the *gensaveloss* increases by approximately 0.421. The R^2 value of 0.007 associated with this regression model suggests that the total primary care visits account for 0.7% of the variation in

gensaveloss, which means that 99.3% of the variation in *gensaveloss* cannot be explained by the total primary care visits alone. The *p*-value associated with the regression analysis surpasses this dissertation's alpha level of $p < .05$. However, the *p*-value observed $p < .1$ indicates a weaker level of evidence for rejecting H_o1, that there is no relationship between the 2021 total primary care visits and *gensaveloss*; therefore, the trend is discussed. Additionally, the model supports H_a1, estimating a positive relationship between *gensaveloss* and total primary care visits.

The growing importance of beneficiaries seeking primary care services during the 3-year study period after the COVID-19 pandemic may suggest the foundational significance of accessing care through primary care venues instead of alternatives such as the emergency ED. Further research is needed to investigate the factors driving this trend, including the observed decline in emergency department visits for inpatient and outpatient care, evolving geographies, ACO affiliations, and beneficiary sentiments. Additionally, it would be intriguing to observe this trend longitudinally beyond 2021 to gain a deeper understanding of the relationship between primary care specialties, beneficiary demographics, and these results.

2019 and 2021 *T*–Test

The objective of research question two (RQ2) is to explore the difference between the pre-and post-Federal response to COVID-19 on named variable means. An independent *t*—test was conducted for each named variable to test the H_o2, that there is no statistically significant change in the named variable means between the 2019 and 2021 reporting years. Validation of homogeneity was tested with Levene's test, and the effect size was tested with Cohen's d test. An alpha level of 0.05 was utilized.

Table 8 reveals that the average 2021 MSSP ACO reported *gensaveloss* ($\overline{\boldsymbol{x}}$ =7.67, $\boldsymbol{\sigma}$ = 0.56) is significantly higher than the 2019 *gensaveloss* ($\overline{\boldsymbol{x}}$ = 3.88, $\boldsymbol{\sigma}$ = 0.45), $t(474) = 5.47$, $p <$.

05. The effect size is medium (Cohen's $d = 0.241$). Variances were homogenous. These findings suggest that post-Federal COVID-19 response ACOs are more likely to have achieved total generated savings. Thus, rejecting H_o2 for *gensaveloss*. Alternative results were found for quality score results.

The average 2021 MSSP ACO reported *qualscore* ($\bar{x} = 89.99$, $\sigma = 7.66$) is significantly lower than the 2019 reported quality score ($\bar{x} = 94.41$, $\sigma = 2.48$), $t\ (572) = -11.98$, $p > .05$ (Table 8). The effect size is large (Cohen's $d = -0.777$). Variances were not found to be homogenous. For this reason, Welch's degrees of freedom are used. These findings suggest that quality scores pre-Federal COVID-19 response are more likely to be higher than post-Federal COVID-19 response. Thus, rejecting H_o2 for *qualscore.* Alternative results were found for the savings rate.

Table 8

*2019, 2021 T–*Test *Results*

	n	$\bar{x}$	σ	t-value	df
gensaveloss_2021	475	7.67	0.56	5.47	474
gensaveloss_2019	475	3.88	0.45		
qualscore_2021	475	89.99	7.66	-11.98	572
qualscore_2019	475	94.41	2.48		
sav_rate_2021	475	0.034	0.001	3.45	474
sav_rate_2019	475	0.024	0.002		
p_edv_vis_2021	475	609.05	124	-11.43	924
p_edv_vis_2019	475	710.29	147		
p_edv_vis_hosp_2021	475	192.65	56.6	-6.29	474
p_edv_vis_hosp_2019	475	215.33	58.2		
p_em_total _2021	475	10.974	0.108	0.055	474
p_em_total _2019	475	10.966	0.094		
n_ab _2021	475	21.31	1.04	0.183	474
n_ab _2019	475	21.05	1.02		
risk_model _2021	475	0.589	0.023	-8.12	474
risk_model _2019	475	0.819	0.018		

The average 2021 MSSP ACO reported *sav_rate* ($\bar{x}$ = 0.034, σ = 0.001) is significantly higher than the 2019 *sav_rate* ($\bar{x}$ = 0.024, σ = 0.002), *t* (474) = 3.45, *p* = .000 (Table 8). The effect size is medium (Cohen's *d* = 0.345). Variances were homogenous. These findings suggest that post-Federal COVID-19 response ACOs are more likely to have savings rates per assigned beneficiary. Thus, rejecting H_o2 for *sav_rate*. Similar results were found for outpatient emergency department visits.

The average 2021 MSSP ACO reported *p_edv_vis* ($\bar{x}$ = 609.05, σ = 124) is significantly lower than the 2019 *p_edv_vis* ($\bar{x}$ = 710.29, σ = 147), *t* (572) = -11.43, *p* = .000 (Table 8). The effect size is large (Cohen's *d* = - 0.741). Variances were not homogenous. Thus, Welch's degrees of freedom are used. These findings suggest that outpatient emergency department visits pre-Federal COVID-19 response are more likely to be higher than post-Federal COVID-19 response, thus, rejecting H_o2 for *p_edv_vis.* Similar results were found for the inpatient emergency department visits.

The average 2021 MSSP ACO reported *p_edv_vis_hosp* ($\bar{x}$ =192.65, σ = 56.6) is significantly lower than the 2019 *p_edv_vis_hosp* ($\bar{x}$ = 215.33, σ = 58.2), *t* (474) = -6.29, *p* = .000 (Table 8). The effect size is medium (Cohen's *d* = -0.398). Variances were homogenous. These findings suggest that post-Federal COVID-19 response ACOs beneficiaries are less likely to have been admitted through an inpatient emergency department visit. Thus, rejecting H_o2 for *p_edv_vis_hosp*. Alternative results were found for total primary care visits.

The average 2021 MSSP ACO reported *p_em_total* ($\bar{x}$ = 10.974, σ = 0.108) is not significantly different than the 2019 *p_em_total* ($\bar{x}$ = 10.966, σ = 0.094), *t* (474) = 0.055, *p* = .958 (Table 8). The effect size is small (Cohen's *d* = 0.004). Variances were homogenous. These findings suggest that post-Federal COVID-19 response ACOs beneficiaries are just as

likely to have visited their primary care provider regardless of specialty. Thus, failing to reject H_o2 for *p_em_total.* Similar results were found for the total assigned beneficiaries.

The average 2021 MSSP ACO reported *n_ab* ($\bar{\boldsymbol{x}}$ = 21.31, $\boldsymbol{\sigma}$ = 1.04) is not significantly different than the 2019 *n_ab* ($\bar{\boldsymbol{x}}$ = 21.05, $\boldsymbol{\sigma}$ = 1.02), *t* (474) = 0.183, *p* = .855 (Table 8). The effect size is small (Cohen's *d* = 0.012). Variances were found to be homogenous. These findings suggest that post-Federal COVID-19 response ACOs' total assigned beneficiaries are just as likely to have voluntarily been assigned as before the COVID-19 pandemic. Thus, failing to reject H_o2 for *n_ab.* Alternative results were found for the risk model.

The average 2021 MSSP ACO reported *risk_model* ($\bar{x}$ = 0.589, σ = 0.023) is significantly different than the 2019 *risk_model* ($\bar{x}$ = 0.819, σ = 0.018), *t* (474) = -8.12, *p* = .000 (Table 10). The effect size is medium (Cohen's *d* = -0.519). Variances were homogenous. According to these findings, post-Federal COVID-19 response ACOs' selecting two-sided risk models are more likely than before the COVID-19 pandemic, where they would be more likely to select a one-sided risk model. Thus, rejecting H_o2 for *risk_model.*

Conclusion

Chapter 4 outlines the results of testing the hypotheses for RQ1 and RQ2, specifically testing H_01, estimating no significant relationships between *generated total savings/loss* and quality score, savings rate, outpatient emergency department visits, inpatient emergency department visits, primary care services, total assigned beneficiaries, and risk model. The alternative Ha1 estimates a positive relationship between *generated total savings/loss* and named explanatory variables. Results for H_01, with 2019 data, suggest a failure to reject the hypothesis for the following explanatory variables: outpatient emergency department visits, inpatient emergency department visits, total primary care visits, and risk model. Alternatively, results

supporting the rejection of $H_0 1$ are observed for quality score, savings rate, and total assigned beneficiaries. Results for the 2021 data set show a failure to reject $H_0 1$ with the following explanatory variables: quality score, outpatient emergency department visits, inpatient emergency department visits, and risk model. However, the 2021 savings rate, total primary care visits, and total assigned beneficiaries result in support of rejecting $H_0 1$, having a significant relationship to the dependent variable *total generated savings/loss* of MSSP ACOs.

Upon comparing the results from 2019 and 2021, both datasets support rejecting H01 in relation to the savings rate and total assigned beneficiaries. This suggests that the positive relationship between total generated savings/loss and these explanatory variables may be sustainable even during a global pandemic. Alternatively, the significance of this relationship may indicate an administrative focus on these two outcomes over the 3 years, potentially impacting other performance variables, such as the quality score.

The results from 2019 show support for rejecting H01 in relation to the quality score, but not in the 2021 results, indicating that quality score is a less reliable predictor of total generated savings/loss post-pandemic. Testing H02, which assumes no significant difference in variable means between 2019 and 2021, supports its rejection due to a significantly negative difference in quality score means between the 2 years. These results suggest that following the Federal healthcare response to COVID-19, quality scores significantly decreased from pre-pandemic performance levels. Further research is needed to explore the relationship between the observed increase in savings rates and the number of assigned beneficiaries, and the lower quality results observed in 2021.

A failure to reject $H_0 2$, estimating no significant changes in named variable means between 2019 and 2021 data sets, is observed for total primary care visits and total assigned

beneficiaries. It is just as likely that the number of beneficiaries taking part in MSSP and the number of primary care visits they accessed remains the same in the 3 years. Put differently, the same average number of beneficiaries volunteered to be assigned to MSSP ACOs, and the same average volume of beneficiaries sought primary care in the 3 years.

Alternatively, significant differences in variable means between 2019 and 2021 were observed for total generated savings/loss, quality score, savings rate, outpatient emergency department visits, inpatient emergency department visits, and risk model, resulting in the rejection of $H_0 2$. Specifically, a significant positive increase is observed for the total generated savings/loss and savings rate. Suggesting MSSP ACOs are more likely to increase savings in the 3 years.

Conversely, significant negative mean differences in the same period were observed for quality score, outpatient emergency department visits, inpatient emergency department visits, total primary care visits, and risk model. In other words, it is more likely that fewer beneficiaries visit the inpatient emergency department, outpatient emergency department, and primary care providers' post-COVID-19. Further, it is more likely that MSSP ACOs achieved lower quality scores post-COVID-19. Finally, MSSP ACOs are more likely to have selected a two-sided risk model post-COVID-19.

Chapter 5 will summarize the conclusions, findings' implications and discuss future research areas. Lastly, it will discuss this dissertation's contribution to the MSSP ACO literature outlined in Chapter 2.

Chapter 5. Discussion and Conclusion

The objective of this dissertation was twofold. Firstly, it aimed to explore and analyze the pre-and post-1-year pandemic relationship between MSSP ACO reported generated total savings/loss and the quality score, savings rate, outpatient emergency department (visits, inpatient emergency department visits, primary care services, the total number of beneficiaries, and selected risk models for years 2019 and 2021. Secondly, my dissertation sought to analyze the impact of the 2020 COVID-19 Federal health response through the differences between the pre-and post-pandemic MSSP performance of generated total savings/loss, quality score, savings rate, outpatient emergency department visits, inpatient emergency department visits, primary care services, the total number of beneficiaries, and risk model selected. This study estimated no relationship between *generated total savings/loss* and named variables, along with no significant difference of variables pre-and post-pandemic. As discussed in earlier chapters, the Centers for Medicare and Medicaid Services (CMS) deployed the MSSP program to help reduce the rising cost curve of National Health Expenditures in the United States. Research needs to be more conclusive of the sustainability, performance, and scalability of MSSP. No research has incorporated the impact of a global pandemic on these named variables. Specifically, this study is focused on the intersystem relationships of MSSP ACOs pre-and post-pandemic to further the sustainability and adoption of MSSP, ultimately contributing to the reduction of the National Health Expenditures cost curve. Moreover, this research intended to advance the understanding of relationships between MSSP performance variables through a pandemic to improve policy, administration, operation, and performance.

This chapter reviews the research by summarizing the comparative quantitative cross-sectional analysis results to answer the two research questions and respective hypotheses. Next, a

discussion of the findings is explored, highlighting areas for practical application, followed by suggestions for future research with potential value added to the body of literature. The chapter finished with a concise conclusion of the dissertation.

Summary of Findings

This study utilized the secondary quantitative data provided by CMS public use files reported by participating ACOs in MSSP for years 2019 and 2021 to reject or fail to reject the study's hypotheses. A multivariate linear regression model was deployed to assess H_o1, estimating that no significant relationship between generated total savings/loss and named variables can be observed. The analysis of 2019 data failed to reject H_o1 for outpatient emergency department visits, inpatient emergency department visits, total primary care visits, and risk models, all with *p*-values > .05 (Table 5). Alternatively, significant relationships to generated total savings/loss were observed for quality score ($\beta = 0.548$, $p < .05$), savings rate ($\beta = 119.83$, $p < .05$), and total assigned beneficiaries ($\beta = 0.219$, $p < .05$), thus rejecting H_o1 with these three explanatory variables. The analysis of 2021 data failed to reject H_o1 with quality score, outpatient emergency department visits, inpatient emergency department visits, and risk model with p-values > 0.05 (Table 5). Alternatively, significant relationships to generated total savings/loss were observed for savings rate ($\beta = 146.90$, $p < .05$), total primary care visits ($\beta = 0.421$, $p < .1$), and total assigned beneficiaries ($\beta = 0.339$, $p < .05$), thus rejecting Ho1 with these three explanatory variables. Significant results for 2019 and 2021 were all directly related to generated total savings/loss failing to reject the alternative hypothesis (Ha1), estimating a significantly positive relationship of named variables (Table 5).

A *t*—test was deployed on the same CMS PUF data for 2019 and 2021 data sets to assess Ho2, estimating no significant differences can be observed in the means generated total

savings/loss, quality score, savings rate, outpatient emergency department visits, inpatient emergency department visits, total primary care visits, total assigned beneficiaries, and risk model. Results from the *t*—test support a failure to reject H_o2 for total primary care visits and total assigned beneficiaries, where no significant difference ($p > .05$) is observed in these variables means between 2019 and 2021 data sets (Table 10). However, data support a rejection of H_o2, finding significant differences between 2019 and 2021 data sets for generated total savings/loss, quality score, savings rate, outpatient emergency department visit, inpatient emergency department visit, and risk model ($p < .05$). More specifically, MSSP quality scores ($t(572) = -11.98$, $p > .05$), outpatient emergency department visits ($t(572) = -11.43$, $p = .000$), and inpatient emergency department visits ($t(474) = -6.29$, $p = .000$) were significantly reduced between 2019 and 2021. Further, MSSP generated total savings/loss ($t(474) = 5.47$, $p < .05$), savings rate ($t(474) = 3.45$, $p = .000$.) significantly increased between 2019 and 2021. Results for the MSSP risk model indicate a significant increase in MSSP ACOs selecting two-sided risk agreements with CMS between 2019 and 2021 ($t(474) = -8.12$, $p = .000$).

Discussion

As per the CMS, projected healthcare expenditures in the United States are expected to surpass the gross domestic product by 2028. A significant portion of this unsustainable growth in expenditure stems from Medicare and Medicaid (CMS, 2022). To mitigate the trajectory of health spending, CMS implemented the MSSP in 2012, with the initial performance data released in 2013. Early research indicates that the program has been effective in achieving its objective of reducing costs while improving the quality and patient experience (Toussaint et al., 2013; Trombley et al., 2019; Zabawa et al., 2012).

There has been extensive research focused on comprehending the impact, effectiveness, and scalability of the MSSP in reducing healthcare costs. The findings of this dissertation contribute to the existing body of literature on MSSP performance by incorporating unique sets of variables within the context of a global pandemic.

This study's research question inquires on two aspects of MSSP performance: the significance of the relationship between *generated total savings/loss* and named variables and the respective mean differences between pre-and post-pandemic performance, years 2019 and 2021. The research questions this dissertation addresses are as follows:

RQ1: What is the relationship between generated total savings/loss and quality score, savings rate, outpatient emergency department visits, inpatient emergency department visits, primary care services, total assigned beneficiaries, and risk model in reporting years 2019 and 2021?

RQ2: How has the pre-post-pandemic healthcare environment impacted the differences between 2019 and 2021 for generated total savings/loss, quality score, savings rate, outpatient emergency department visits, inpatient emergency department visits, primary care services, total assigned beneficiaries, and risk model?

Findings from this study indicate a significant and direct relationship between *generated total savings/loss* and quality score in 2019 and not in the 2021 performance year (Table 5). Further, a significant negative change in the average reported quality scores occurred from 2019 to 2021 (Table 10). At the same time, the total primary care visits related to generated total savings/loss is only significant in 2021, with no significant change in means between 2019 and 2021 (Table 10). These findings differ from Zhu et al. (2019) and Dover and Kim's (2021), where quality is positively associated with savings and primary care visits. The potential reversal

in findings may indicate that quality of care was deprioritized in this 3-year period, where beneficiary sentiment potentially contributed to decoupling quality and primary care visits. Lower reported quality over these 3 years may also have beneficiary experience implications. As previously discussed in Chapter 1, reduced HMO quality contributed to lower adoption and may be a harbinger for the MSSP.

Meanwhile, Berkson et al. (2020) observed an interesting positive relationship between quality and total savings, where lower quality scores in previous years were associated with higher generated savings. However, the findings of this study suggest a different trend compared to Berkson's findings, as the average quality scores were higher in 2019 compared to 2021. This supports the notion that the response to a global pandemic is likely to have a detrimental impact on the quality of care within MSSPs, regardless of the reported quality levels before the pandemic. These findings highlight the need for proactive measures to sustain the quality of care during or in anticipation of a global pandemic response.

MSSP savings rates remain significantly and directly related to *generated total savings/loss* in 2019 and 2021 (Table 5). Further, savings rate averages significantly increased along with generated total savings/loss in the same period (Table 10). Suggesting MSSP's economic efficiency's ability to withstand and grow through a global pandemic is likely. In combination with the observed savings growth, a significant reduction in the utilization of outpatient and inpatient emergency department services is observed (Table 10). This combination of increased savings and lower utilization supports earlier research from McWilliams et al. (2017) identifying the direct relationship between lower utilization with savings. It is interesting that through this 3-year period where a global pandemic occurred, fewer beneficiaries sought care through the ED while infection rates increased. This phenomenon may

be due to a change in ED access, sentiment changes to ED, and hospital visits, stay-in-shelter recommendations, or greater adoption of virtual care. Ultimately, the findings of increased savings through a global pandemic give evidence that MSSP cost savings are a sustainable and economically effective program for an ACO to consider.

While beneficiaries are less likely to visit an outpatient or inpatient emergency department between 2019 and 2021, no significant changes are observed for primary care visits in the same period (Table 8). Interestingly, the relationship between *generated total saving/loss* and total primary visits increased through the 3-year period to a significant level in 2021 (Table 5). When controlling for total primary care visits, significance rises above the study's alpha level ($p < .05$) to p-value = .079. The finding indicates a weaker relationship with *generated total saving/loss* yet may support a longer trend in beneficiary behavior. Combined with reduced outpatient and inpatient emergency department visits, total primary care visits impact on savings is positive. The findings support ACO's focus on beneficiary use of primary care in a post-pandemic environment.

Additionally, it would be interesting to explore further how greater virtual care utilization in the 3-year period impacted other avenues of care like the ED. Further, the finding of total primary care visits increased relationship to *generated total savings/loss* may be compensatory to a reduced sentiment of outpatient, inpatient emergency department visits. The findings support MSSP guidance of increasing accessibility to primary care services where ED utilization is receding. McWilliams et al. (2017), Ouayogodé et al. (2017), and Reimold et al. (2022) also observed a direct relationship between physician involvement in MSSPs and savings, further supporting the recommendation to focus on primary care as ED visits reduce.

In the 3 years, no significant increase in primary care visits is observed, suggesting a missed opportunity for MSSP administrators as the relationship of primary care visits increase with *generated total savings/loss* through this period. This study's findings support the anticipation of triaging patients or increasing patient accessibility to primary care providers to compensate for reduced ED utilization in order to increase savings.

Beneficiary participation in MSSPs between 2019 and 2021 remains consistent, along with the significant direct relationship to *generated total savings/loss.* These findings support previous research from McWilliams (2016) and Trombley et al. (2019), who observe a direct relationship between MSSP participation and the reduction of healthcare spending. Thus, MSSP administrators need to increase beneficiary participation to maximize savings at scale. The consistent participation rate between 2019 and 2020 suggests a sturdiness of the program, yet it does not support the program's ability to grow through a global pandemic. The observed participation stagnation may have long-term economic implications unfavorable to savings or sustainability. MSSP administrators' focus on increasing beneficiary participation is vital in sustaining savings through a global pandemic.

MSSP ACOs were more likely to select a two-sided risk model in 2021 than at the start of the 3-year period in 2019 (Table 10). However, the risk model selected has no significant relationship to *generated total savings/loss* (Table 5). The observation of MSSP's average move toward a two-sided risk is interesting, as CMS issued a ruling with the option to delay the requirement to move to a two-sided risk track in April 2020 (CMS, 2020). Thus, no MSSP ACO was required to increase risk, yet the average did so. This may represent increased confidence as *generated total savings* and savings rates increased simultaneously. This may also indicate MSSP administration support for operational momentum, implying ACOs that were preparing to

take on more risk maintained the course despite the eased ruling. MSSP ACO's willingness to take on more risk voluntarily supports the efficacy and adoption of the program.

It is important to acknowledge and consider the limitations of this study, as discussed in Chapter 1. These limitations include factors such as MSSP participation, tenure within the MSSP, participation in other value-based care programs, rate of program change, beneficiary eligibility, and access restrictions. The conclusions drawn from this study are specific to ACOs participating in the MSSP and should not be extrapolated without further research. Additionally, this study does not account for variations in mandates, restrictions, and supply chain constraints, and does not assess experiences or inclusion of tangential quality or cost-saving programs, as they are beyond the scope of this dissertation. Therefore, the conclusions of this study can only be generalized to MSSP ACOs participating in 2019 and 2021, considering the limitations. However, these conclusions, in the context of the limitations, provide insights into potential trends and opportunities for future research.

Future Research Scope

The recent 3-year period (2019-2021) examined in this study presents a unique opportunity to contribute meaningful research to the existing body of knowledge on MSSP ACOs, given the global pandemic and the U.S. Federal healthcare response to the pandemic, as discussed in Chapter 2. Specifically, further exploration of the independent variables used in this study to build more robust linear regression models could provide insights into the changes in MSSP performance post-pandemic. Additionally, investigating the relationship between decreasing quality scores and explanatory factors while accommodating covariates could offer a more contextual understanding of the findings. Covariate exploration could potentially include macroeconomic factors such as GDP, geographic infection rates, hospital bed availability, or

lockdown enforcement, which are beyond the scope of this dissertation. Future research could employ a two-stage least square model to quantify and analyze these contextual explanations of post-pandemic performance, going beyond the scope of this study and contributing to the body of literature on MSSP ACOs.

The beneficiary's condition in relation to MSSP performance is beyond the scope of this dissertation. Nevertheless, it is interesting that Kaufman et al. (2021) identify seriously ill beneficiaries as positively associated with MSSP saving rates. Expounding on the findings of this dissertation and Kaufman et al.'s research incorporating the pandemic-level infection rate and attributed deaths provides the opportunity for future research. The implications can help narrow the impact of specific beneficiary health conditions on MSSP performance in a global pandemic.

Expanding on this study's findings, outpatient emergency department, inpatient emergency department visits, and quality scores reduced while primary care visit's relationship to savings increased is needed. Specifically, exploring hospital emergency department protocols, beneficiary sentiment, and hospital resource limitation's relationship to MSSP performance is a potential research need. Additionally, understanding the relationship between virtual care as a primary care visit modality on MSSP performance is a strong potential for future research.

Potential future research may also explore the independent variable's relationship to the beneficiary's stagnate participation in ACOs within these 3 years. The implications may support the broader adoption of MSSP through adverse policy changes.

Ample opportunity exists for future qualitative research of MSSP performance through this 3-year period. Qualitative analysis may include exploring organizational policy, logistic and resource phenomena, or beneficiary sentiment analysis. Implications of qualitative research may add to the sustainability of MSSP performance.

Conclusion

In conclusion, this comparative quantitative cross-sectional study involved the examination of MSSP performance pre-and post-pandemic regarding implications of *generated total savings/loss* performance. Specifically analyzing 2019 and 2021 MSSP performance data sets obtained through CMS public use files. The findings highlight the increase in savings rates and generated total savings/loss through the 3-year period. The savings increase supports CMS first objective for MSSP, to aid in health expenditure reduction and reduce future expenditure projections. However, this study also highlights a reduction of MSSP quality scores in relationship to savings and score averages through the same period. The quality reduction threatens the second objective for MSSP, increase the quality of care given to beneficiaries.

Using a multivariate regression analysis, it was discovered that the quality score, savings rate, and the total number of assigned beneficiaries met the required *p*-value for significance at the .05 level for 2019. Alternatively, it was discovered that savings rate, total primary care visits, and total assigned beneficiaries met the required *p*-value threshold for 2021. Notably, the quality score dropped in relationship significance to *generated total savings/loss* in 2021 while the savings rate remained directly related.

The *t*—test analyses demonstrated that no significant differences were found for total primary care visits and total assigned beneficiaries between 2019 and 2021. However, significant increases were discovered for generated total savings and savings rates in the same period. However, a significant reduction is discovered in quality scores, outpatient, and inpatient emergency department visits. Further, the study discovered that MSSPs are more likely to take on more risk in 2021 than in 2019.

The findings of this dissertation contribute to the existing body of research on MSSP performance elucidated in Chapter 2 by expounding on a novel set of explanatory variables in a critical time frame that incorporates a global pandemic. This study highlights the fragility of quality and strength of savings MSSP ACOs exhibited through a global pandemic. The results of this study will better equip MSSP administrators to achieve future savings and higher quality of care for their beneficiaries.

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Appendices

Appendix A: Table 9: Literature on MSSP Performance

No.	Author(s)	Year	Key Explanatory Variables	Data	Design & Methodology	Results
1	Berkson et al.	2020	generated shared savings, utilization, baseline expenditures, quality score, total assigned beneficiaries, total assigned beneficiary expenditures, per capita benchmark expenditures	2013 MSSP ACO PUF	cross-sectional, multivariate regression, and stepwise regression	Higher baseline expenditures are more likely to generate savings. Lower utilization before the program is less likely to be rewarded in the current program year.
2	Bleser et al.	2018	Quality metrics over time, post-acute care changes, structure	2013- 2016 MSSP PUF, Levitt Partners	cross-sectional, linear regression, and fixed effects linear regression	MSSP ACOs improved performance despite sicker, older populations, suggesting that MSSPs might work in other settings and populations and could shift to the more advanced risk and payment models
3	Counts et al.	2019	depression remission, clinical depression screening, follow-up plan	2016 & 2017 MSSP ACO PUF	longitudinal analysis across 2016 - 2017 performance years, descriptive statistics	improving behavioral health is not conclusive
4	D'Aunno et al.	2018	geography, number of beneficiaries, % of beneficiaries with chronic disease, HCC score, collaborative relationships, technology use, effective Physician feedback, embedded care coordinators	2012 MSSP ACO PUF for 16 large ACOs, CMS Claims data, 60 interviews	mixed method explanatory sequential design, integrated coding index of quality measures	collaboration, technology use, effective feedback, and embedded care coordinators impact performance

5	Delia et al.	2012	the number of beneficiaries, risk-adjusted baseline per capita spending, risk-adj. performance year per capita spending, estimated Medicare per capita spending nationally	2012 MSSP ACO PUF	quantitative modeling on the probability of savings distribution formula	A statistically significant risk of inappropriate savings or loss exists in the MSSP model
6	Dover & Kim	2021	23 CMS quality measures	CMS Measures, Tufts Medical Center Cost-effective Analysis (CEA), Pub Med CEA	Cost-effective analysis using Donabedian's structure-process-outcome quality of care model and population, intervention, comparator, outcome, time horizon, and setting - framework.	CMS quality measures show evidence of cost-effectiveness
7	Duncan et al.	2022	Disease-Specific, diabetes, cancer, beneficiary age, number of the beneficiary, utilization, and cost within the ACO, risk-adj	2014 - 2016 CMS Claims PUF (5%) & Synthetic ACO performance estimates	quantitative modeling of HCC-risk score for each beneficiary and respective ACO savings	Evidence of high potential of incorrect reimbursements and most probable with high-risk populations.
8	Harrison et al.	2018	hospital performance, size, case mix, ACO ownership by a hospital, Physician, Hybrid, the degree ACO participates in a health system that is not for profit or for profit	American Hospital Association survey, 2015 CMS PUF	cross-sectional descriptive statistics, and multivariate logistic regression model	ACOs with hospital & physician networks are effective at controlling healthcare costs and reducing medical errors.

9	Kahn & Sullivan	2022	Physician group practice, Pioneer ACO, MSSP, and Next Gen ACO generated savings and loss	2018 and 2019 CMS Claims data, Medicare Payment Advisory Commissi on PUF	cross-sectional comparative analysis	Medicare ACO programs roughly broke even from CMS gross savings
10	Kaufman et al.	2021	inpatient claim, claim for home health, skilled nursing, durable medical equipment, serious chronic condition, multimorbidity, geography, sex, race	2014 - 2016 MSSP PUF, Medicare FFS claims data	cross-sectional Hausman test, linear regression analysis	Seriously ill lives are positively associated with savings. Seriously ill contributed to 1/2 the spending yet making up 8%-13% of the population. MSSPs with fewer seriously Ill lives have less spending and indirectly incent the avoidance of high-risk patients.
11	Markovit z et al.	2019	total spending, hospitalizations for hip fracture, diabetes, inpatient, outpatient, professional, skilled nursing, and clinical quality performance. Mammography, all-cause hospitalization, preventable hospitalization, all-cause 30-day readmissions, emergency department	2009-2014 CMS claims, 2012-2014 MSSP PUF	longitudinal analysis 2008-2014, linear regression modeling, and instrument variable modeling, fixed effects model	Lower spending, higher quality on hip fractures is not associated with MSSP participation. The selection effects of exiting high-cost clinicians may promote savings.
12	McWillia ms	2016	total spending, independent Physician, hospital-integrated Physician	2009-2014 CMS claims (20%), 2012-2014 MSSP PUFF	DID pre-post MSSP participation and between-group differences, linear regression model	MSSP participation is associated with exceeding savings bonus payments in Track1

13	McWilliams et al.	2017	total spending, inpatient admissions, ambulatory admissions for care-sensitive conditions related to cardiovascular and diabetes	2009-2014 CMS claims (20%), 2012-2014 MSSP PUFF	DID pre-post MSSP beneficiary participation, linear regression	MSSP is associated with reduced spending and hospitalizations increase in ambulatory car-sensitive conditions. Spending was not concentrated on high-risk patients
14	McWilliams et al.	2018	total spending, hospitalizations, admissions for care-sensitive conditions, 30-day readmissions all-cause, emergency utilization, post-acute facility stays, days in the post-acute facility, primary care visits	2009-2015 CMS claims (20%), 2012-2015 MSSP PUFF	DID pre-post MSSP participation and between-group differences, linear regression model	first three-year MSSP participation by physician groups is associated with savings; hospital-integrated ACOs did not associate with savings
15	Nattinger et al.	2018	Rural, mostly rural, rural/metropolitan, 1- and 2-sided risk, size, experience	2014 MSSP PUF data & Rural Policy Research Institute data	cross-sectional retrospective analysis, descriptive statistics, nonparametric (Spearman's) correlational analysis	Rural Physician-based MSSP is associated with savings over hospital-based physicians. No association between the size, experience, or ruralness of ACO to savings.
16	Ouayogodé et al.	2017	ACO provider composition, leadership structure, beneficiary characteristics, risk-bearing experience, quality and process improvement capabilities, physician performance management, market competition, CMS-assigned financial benchmark, ACO start date, gross savings	2011-2013 CMS claims, National Survey of ACOs, CMS ACO PUF	cross-sectional of the first contract year, multivariate linear regression model	First-year performance is heterogenous, yet the organizational structure is not associated with savings. Physician involvement is associated with savings. ACOs with large financial baseline benchmarks are associated with savings.

17	Parikh et al.	2022	diabetes, congestive heart failure (CHF), chronic kidney disease (CKD), or hypertension	2014-2018 CMS claims, MSSP PUF	longitudinal, retrospective economic evaluation, Wilcoxon rank-sum, logistic regression	MSSP participation was associated with higher spending than for MA beneficiaries, controlling for detailed clinical risk factors. MSSP participation is associated with higher outpatient hospital spending contributing to overall higher spending.
18	Pugh	2016	Internal factors: cardiovascular and diabetes management measures. External factors: Health insurance exchange participation, state Medicaid explanation, state corporate practice of medicine policy, county mortality associated with cardiovascular disease, chronic lower respiratory disease, county percentage of Medicare Advantage and Medicaid beneficiaries, primary care physician access, and median household income.	2013 MSSP ACO PUF, Common wealth Fund 2015, Kaiser Foundatio n 2015, County-level data, Center of Advanced Palliative Care, Health Resources and Services Administr ation, 2015	cross-sectional, multiple linear regression model, stepwise regression analysis, Akaike Information Criterion, variance inflation factor, Kepner Tregoe Bounded Decision Analysis, mixed effects model	Medicare Advantage Penetration, county mortality, and cardiovascular disease management measures are positively associated with MSSP financial performance.

19	Reimold et al.	2022	Governing board compositions, risk-standardized readmissions, unplanned admissions	2017 MSSP PUF	the cross-sectional observational study, 2-sided multiple linear regression, parsimonious model, Akaike information criterion, Bayesian information criterion,	ACO boards were predominantly Male and Physician-led. Physician involvement is positively associated with achieving goals.
20	Rudisill et al.	2021	Total spending, type 2 diabetes, hospitalization for a major acute cardiovascular event (MACE)	2015–2017 electronic medical record (EMR), 2015–2017 MSSP PUF for one ACO	longitudinal retrospective cohort analysis, nonparametric random forest model, RE-EM model - autocorrelation, and hybrid effects model	Variability in beneficiary spending pre-post MACE results in the need to explore spending drivers
21	Trombley et al.	2019	Beneficiaries with ACO providers and a cohort w/o ACO providers, Total spending, inpatient admissions, emergency visits not resulting in admissions, days of skilled nursing facility care, inpatient readmissions, demographic, zip code	2013 - 2016 CMS claims and MSSP PUF	DID, 2013-2015 baseline and 2016 performance period, weighted linear regression analysis	MSSP participation is associated with lowering spending per beneficiary than non-participation.

22	Trombley et al.	2020	ACO management composition, hospital-affiliated, fewer than 6500 Beneficiaries - rurality (AIM), Top quartile of rurality, had a discontinuous market, had above median total Medicare spending at baseline.	2016, 2017 MSSP PUF	DID in total spending from year one to year two, weighted linear regression analysis	Sustained savings in performance years one and two with AIM MSSP ACOs. Data suggested that working with a management company resulted in greater savings.
23	Zhu et al.,	2019	Hospital affiliation, number of beneficiaries, post-hospital follow-up rates, Geography, Structural, service provision, Overall quality score	2014, 2015 MSSP PUF, Rural Policy Research Institute, and Leavitt data	Cross-sectional and longitudinal, multiple linear regression, variance-components analysis, hybrid fixed-effects, and random-effects	No significant difference in average quality performance between rural and other ACOs. MSSP quality performance is positively associated with hospital system sponsorship, larger beneficiary count, and more posthospital follow-up rates

Appendix B: Table 10: CMS Variable Labels and Definitions

Variable	CMS Term Name	CMS Variable Label	CMS Definition
Dependent	Generated Total Savings/Losses	*gensaveloss*	Generated savings: Total savings (measured as Benchmark Minus Expenditures, from first to the last dollar) for ACOs whose savings rate equaled or exceeded their Minimum Savings Rate (MSR). This amount does not account for the application of the ACO's final sharing rate based on quality performance, reduction due to sequestration, application of performance payment limit, or repayment of advanced payments. Generated Losses: Total losses (measured as Benchmark Minus Assigned Expenditures, from first to the last dollar) for ACOs in two-sided models whose losses rate equaled or exceeded their Minimum Loss Rate (MLR) and the negative of the MSR (for ACOs in one-sided models).
Independent	Quality Score	*qualscore*	Quality score: In Performance Year 1 of an ACO's first agreement period, the quality score is 100% if all measures were reported entirely and less than 100% if one or more measures were not wholly reported. Beyond Performance Year 1 of an ACO's first agreement period, the quality score will be determined not only by whether all measures were completely reported but also by their performance against established benchmarks and on quality improvement. For ACOs determined to have been affected by an Extreme and Uncontrollable Circumstance,

			the quality score is higher than the ACO's calculated initial quality score or the national mean quality score across all Shared Savings Program ACOs who met the quality performance standard before the application of the Extreme and Uncontrollable Circumstances policy.
Independent	Savings Rate	*sav_rate*	Total Benchmark Expenditures minus Assigned Beneficiary Expenditure as a percentage of Total Benchmark Expenditures.
Independent	Outpatient emergency department visits	*p_edv_vis*	Total number of visits in an outpatient emergency department per 1,000 person-years in the performance year an ED visit (EDV) is defined using both inpatient and outpatient claims and using the revenue center code filed on the claims: EDV in the hospital inpatient and hospital outpatient claims with the revenue center code values 0450-0459 and 0981. The restriction is imposed so that a beneficiary can have a maximum of EDV on a specific date.
Independent	Inpatient emergency department Visits	*p_edv_vis_hosp*	Total number of visits to on Ed that result in an inpatient stay per 1,000 person-years in the performance year. EDV that leads to hospitalizations is identified in the hospital inpatient claims with revenue center code values 0450-0459 and 0981.
Independent	Primary care services	*p_em_total*	Total number of primary care services per 1,000 person-years in the performance year. Primary care services are counted regardless of physician specialty.

Independent	Total Assigned Beneficiaries	*n_ab*	The number of assigned beneficiaries, to an MSSP in a performance year.
Independent	Risk Model	*risk_model*	Indicates participation in a one-sided shared savings model or a two-sided shared savings/loss model for the performance year.

Source*: (CMS, 2022)*

Appendix C: IRB Letter

January 30, 2023

PI: Mr. Bryan Adams
Protocol title: Medicare Shared Savings Performance: Three-Year Pandemic Analysis
Project link: https://uiw.forms.ethicalreviewmanager.com/Project/Index/5727

Hello,

Your project described above has been reviewed and found not to meet the federal regulatory requirements for human subjects research based on the following criteria:

- There will be no interaction or intervention with human subjects;
- The researchers' data will be collected from a public-use data set(s);
- Data to be analyzed is secondary, de-identified data;
- The researchers will not involve merging any of the public use data set(s) in such a way that individuals might be identified; and
- The researchers will not enhance the public data set so that individuals might be identified.

Keep this document with your project records as your "**Not Regulated Research Determination**" letter. Please use IRB number 2023-1325-NRR when inquiring about or referencing this determination. Should you determine at any point you wish to add additional elements to the project, please contact us before initiating those components, as they may impact this determination.

Please contact us with any questions or for information regarding the IRB or the review process.

Sincerely,

Office of Research and Graduate Studies
Research Compliance
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IRB #: 00005059 / FWA #: 00009201