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Current Effects of U.S. Preventive Care Quality Narratives on Preventive Health Services

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Abstract

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MBA, National University, 2015

BS Allied Health, National University, 2013

Dissertation Submitted in Partial Fulfillment

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Public Health Epidemiology

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Abstract

In the interest of improving patient outcomes, significant investments in operationalized quality of care within the Medicare space have promulgated a low-resolution narrative predicated on conflation of higher quality scores with improved population health. Concomitant financial incentivization of Medicare Advantage plans through aligned Star Measures places contracts as the fundamental unit of most care quality analyses, but no studies have considered how present incentivization schema have impacted physician use and associated quality scores over time for breast cancer screening (BCS), colorectal cancer screening (CCS), and annual flu vaccination (AFV) at a county level. Guided by the Evidence Based Model framework, this quantitative cross-sectional secondary data study used simple linear regression, Spearman Correlation, and Mann Kendall Trend tests to analyze public Medicare quality and physician claims data. Results showed that AFV utilization correlated with aligned quality scores for U.S. counties between 2012 and 2017, but no such association was found to exist for CCS or BCS. County-level physician use slightly increased over this period for BCS and AFV, but a small monotonic decline was observed for CCS. Year-over-year changes in quality scores did not correlate with changes in physician use of each preventive service. Study findings indicated that incentivized quality measures aimed at health plan performance are insufficient to produce measurable population-level impacts in the utilization of preventive services in the Medicare space. This study contributes to positive social change by highlighting that health plans can demonstrate improvements in incentivized quality measure performance without improving physician utilization at the aggregated county level.

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Table of Contents

List of Tables

Chapter 1: Introduction to the Study

Amid continual increases to Medicare spending allocations in the United States, efforts have been underway to improve efficiency of care and establish best practices that maximize cost-effective health management for the older U.S. population. Following formalized considerations of 50 definitions and 50 parameter sets spanning 24 delineated dimensions, the Institute of Medicine defined quality health care in 1990 as: "the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge" (Lohr & Schroeder, 1990, p. 707). In the 3 decades that followed, multiple instantiations of this conceptual framework have been developed, including various iterations of health information technology (HIT; Halamka & Micky, 2017) and defined quality measures published by organizations such as the National Committee for Quality Assurance (NCQA; Richter & Beauvais, 2018) and the Centers for Medicare and Medicaid Services (CMS; Schroeder, 2019; Sung-Heui Bae, 2017). By way of such measures, efforts to improve population health have been defined and subsequently enacted by health care administrators overseeing the standardization of medical care.

To engender adherence to recommendations, quality measures are typically incentivized through bonus payments, penalties, and withholds flowing from payers down through provider networks to individual physicians (Eckhardt, Smith, & Quentin, 2019). The concomitant, low-resolution narrative of quality measures improving health care rests upon three fundamental assumptions, the first of which posits that operational definitions of quality allow for meaningful differentiation between high- and low-quality

care processes and outcomes within the control of health care professionals (HCPs) and health care organizations. The second assumption is that receiving higher scores on health care quality measures will always translate into better outcomes and lower overall costs. Finally, the health care quality framework assumes that incentivizing HCP behaviors to align with prescribed best-practices, allegedly built upon empirical data, will result in positive population-level effects.

In practice, this approach of rewarding care quality instead of quantity has given rise to over 2,500 incentivized measurements, most of which have not resulted in the intended improvements to patient outcomes, care efficiencies, or aggregate cost-savings (Eijkenaar, Emmert, Scheppach, & Schöffski, 2013; Mendelson, et al., 2017). Valuck, Sampsel, Sloan, and Van Meter (2019) point out the additional difficulty of keeping operationalized quality up to date with evolving understanding, resulting in discrepancies between definitions of quality and optimal patient care. The accelerating proliferation of HIT-enabled, top-down control of medical standards by administrators incentivizing prescribed quality measures makes it more important than ever to evaluate population impacts.

Problem Statement

Policymakers for the U.S. healthcare system are presently testing whether administrator-led standardizations of care will result in both improved health outcomes and lower costs. However, the framework being used to incentivize adoption of predefined quality care metrics remains generally unproven in the healthcare field (Emanuel et al., 2016; Young, Roberts, and Holden, 2017). Observed effects have been

mixed: According to a Congressional Budget Office report, several "financial incentives" used "to encourage providers to follow" standards of care have been inconsequential to patient outcomes and may even potentially distract physicians from other processes (Hayford & Maeda, 2017, p. 2). A systematic review by Houle, McAlister, Jackevicius, Chuck, and Tsuyuki (2012) showed that physician pay-for-performance efforts may even enrich doctors without meaningfully impacting patient care at all. Extrinsic awards have corralled physician behavior even when prescribed measures have lacked empirical support (Herzer & Pronovost, 2015; Sobieski, 2016).

Within the United States, quality schemes such as NCQA's Health Plan Employer Data and Information Set (HEDIS) and CMS Star Ratings largely operationalize quality preventive health care in terms of defined optimal processes. Higher-scoring institutions receive more money and membership enrollment privileges, presumably for delivering better care, despite the persistence of population-level predictors suggesting that health systems are being largely awarded for factors beyond their control (Hu, Schreiber, Jordan, George, & Nerenz, 2017). While the literature is rife with granular examples of quality-improvement programs working in special cases, few studies have considered the aggregate impact of incentivizing quality scores standardizing utilization of preventive health services. This research confronted the problem of incentivizing preventive care regimens in the absence of proven aggregate impact. My study attempted to solve that problem by considering how more than a decade of preventive care incentivization has impacted annual flu vaccination (AFV), breast cancer screening (BCS), and colorectal cancer screening (CCS) rates within the U.S. Medicare population at the county level. I

also considered whether aligned quality scores representing appropriate preventive health care reflected changes in the aggregate utilization of these preventive care regimens at the county level from 2012 to 2017.

Purpose of the Study

The purpose of this quantitative study was to examine the impact of incentivized preventive care quality measures on physician use of preventive care at the population-level. Current financial incentives are tied to process measures defined by payer and health system administrators, and this research considered how these have impacted alignment to important public health processes. To estimate the effects of aligned physician behavior, a quantitative analysis was conducted on archived data from CMS. Specifically, I compared longitudinal utilization of incentivized preventive care including colonoscopies, mammograms, and influenza immunizations and evaluated these trends against county-aggregated performance on aligned quality measures. I looked at whether incentivizing quality measures have impacted longitudinal use of these preventive measures across the U.S. Medicare population at the health plan-agnostic, county level of analysis.

Nature of the Study

This research employed a quantitative design and considered established preventive care quality metrics using secondary analysis of archived data. My approach explored three iterations of a fundamental question: To what extent has incentivizing recommended preventive care practices, codified in current quality metrics, driven improvements in the use of preventive care in the Medicare population? I split my

investigation into 3 research questions (RQs). After confirming the association between pooled physician use of preventive services and aggregated quality scores (RQ1), I assessed retrospective longitudinal differences (RQ2). Next, I looked at whether any detected differences in physician utilization of incentivized preventive care correlated to changes in aligned quality score distributions (RQ3) from 2012 to 2017 at a county-aggregated level across the United States.

Research Questions and Hypotheses

RQ1: Were there county-level differences in physician utilization of preventive services that correlated to associated quality score distributions from 2012 to 2017?

$H_0$1: County-level physician utilization of preventive services were not correlated with associated quality measure score distributions.

H_a1: County-level physician utilization of preventive services were correlated with associated quality measure scores.

RQ2: Has Medicare physician utilization of colonoscopies, mammograms, and influenza immunizations changed at the county level from 2012 to 2017?

$H_0$2: Medicare physician utilization of colonoscopies, mammograms, and immunizations have not changed at the county level.

H_a2: Medicare physician utilization of colonoscopies, mammograms, and immunizations have changed at the county level.

RQ3: Were there observed correlations between changes in physician utilization of preventive services and associated county-level quality score distributions from 2012 to 2017?

$H_0$3: Changes in physician utilization of preventive care at the county-level did not correlate with associated quality measure score distributions.

H_a3: Observed associations in physician utilization of preventive care at the county-level correlated with associated quality measure score distributions.

Theoretical Framework

The Evidence Based Model (EBM) framework informed this longitudinal study. Masic, Miokovic, and Muhamedagic (2008) defined EBM as "the conscientious, explicit, judicious and reasonable use of modern, best evidence in making decisions about the care of individual patients" (p. 219). In practice, such efforts are predicated upon standardized processes of care that maximize efficiency, decrease health care costs, and optimize outcomes. Given the emphasis on U.S. quality care incentivization, the behavioral economic model discussed by Matjasko, Cawley, Baker-Goering, and Yokum (2016) was used to contextualize EBM applications within the present health care quality narrative.

My research considered how incorporation of incentives, establishment of norms, and HIT-driven default standards of care have impacted physician utilization of preventive services and associated CMS quality measures. The efficacy and reliability of EBM-based guidelines can vary, so I incorporated Mosadeghrad's (2012) pluralistic approach to defining quality care to address potential incongruencies in the operationalization of quality healthcare. Since quality scores built on an EBM model serve as a proxy for delivery of quality health care, this approach provided a means by which aggregate population-level health trends could be considered in the context of the current incentivization schema of public health preventive services.

Operational Definitions of Variables

- Preventive care: proactive medical procedures undertaken to decrease the prevalence of preventable disease or identify illnesses in their early stages to improve prognosis and outcomes at lower costs, including:
    - Influenza immunizations
    - Cancer screening
        - Colonoscopies
        - Mammograms
- Quality measures: operationalized proxies for desired patient outcomes, including conformance to processes expected to yield measurable improvements in health outcomes, efficiencies in care, and overall cost-savings (CMS 2019).
    - Percentage of plan members who received a flu shot in year of measure
    - Percentage of plan membership between 50 and 75 years of age who received appropriate colon cancer screen
    - Percentage of female plan membership between 52 and 74 years of age who received a mammogram in last 2 years

Limitations

For this study, a few methodological limitations were identified. First, data describing Medicare preventive service utilization came from two Medicare segments, physician-level fee-for-service (FFS) expenditures and aligned plan-level Medicare

Advantage quality scores. Potential differences in cancer screening and influenza immunization practices between FFS and Medicare Advantage populations may exist. Additionally, the lack of published data demonstrating population-level impact of incentivized preventive care makes it difficult to anticipate potential confounders to observable effects. Finally, factors such as care system fragmentation, differing market pressures in highly capitated areas, varying distributions of HIT-driven integrated delivery networks, and socioecological variables not considered in this study may impact both the use and effects of preventive care across the broader U.S. Medicare population. Future research might consider other variables that potentially impact subpopulations.

Another limitation of this study was the method by which physicians were associated with counties. The CMS public use file I used specified the National Plan and Provider Enumeration System (NPPES) zip code in which the physician was registered for each year, and that was used to group physicians into county aggregates. Physicians often practice in several zip codes, and this was not indicated in the public use file, with the greatest potential distortions identified in rural areas such as Alaska. Physicians moving from one state to another could also have accounted for some of the county-specific variations in billed preventive services from 2012 to 2017, but this was not considered in the context of my longitudinal analysis.

Scope and Delimitations

For the purposes of this study, I used secondary data describing medical care provided to Medicare beneficiaries and aligned preventive care quality measure scores. Only publicly available data were considered in this analysis. Quality measures and billed

services beyond influenza immunizations, colonoscopies, and mammograms were not considered. Available aggregate health expenditure data on AFV, CCS, and BCS do not discern between possible differences in patient risk groups and access to preventive care in general over the considered period.

The Significance of the Study

This research filled a gap in understanding how incentivized preventive health quality measures have impacted physician-level activity and associated population-level quality measures across the U.S. Medicare population at the county level. It was unique in its consideration of whether current narratives guiding definitions of "quality care in medical practice" have led to the adoption of a provider incentivization scheme that has meaningfully contributed to public health practice, particularly with respect to the use of incentivized preventive measures inconsistently supported by the literature. The results of this study clarified for public policy experts the extent to which data currently support U.S. preventive health care quality narratives and their alignment with present physician incentivization. Findings also demonstrated whether the use of extrinsic motivators to elicit conformance with administrator-led initiatives, intended to improve the efficiency and outputs of care, were associated with aligned, county-level quality measure performance across the United States.

Social Change Contribution

Findings contributed to positive social change by clarifying the relationship between incentivized quality score measures and their aggregate effect on preventive medicine in the public health domain, such that policymakers might continue to improve

alignment of financial incentivization with measures that meaningfully contribute to improvements in population health. Despite persisting narratives around the value of preventive care, the literature is sparse in demonstrated associations between preventive care utilization trends and their relationship to population-level quality measure performance. This study tested for observable associations between incentivization of quality scores and population-level changes in the utilization of preventive care services aimed at improving public health.

My study also helped fill a literature gap as to whether Medicare's preventive care quality framework is detectably associated with county-level improvements in utilization of preventive services aimed at lowering costs and improving population outcomes. Clarifying the relationship between physician utilization of incentivized preventive care and affiliated quality measure scores is critical to knowing whether the current approach is working. Testing for statistical significance at the aggregated county level helped me assess the assumed success of current quality programs intended to advance incentivization of processes that drive observable improvements to population health.

Summary and Transition

To improve access and utilization of effective health care, organizations such as CMS have incentivized several aligned quality measures. A low-resolution narrative has emerged supporting top-down administrative control of medicine in accordance with these quality standards, including preventive care regimens intended to improve patient outcomes, increase efficiencies in medical care, and decrease medical costs. Defining sufficient measurements of quality health care has proven challenging, but understanding

how evolving definitions have impacted physician use of preventive care in the Medicare space remains critically important for informed policy-making.

Chapter 2: Literature Review

A thorough literature review was conducted to place this study into context with respect to the evolution of health care quality operationalization, emphasizing preventive care measures and associated incentivization of idealized care processes. In the first subsection of this literature review, I explore historical definitions of health care quality leading to the establishment of preventive care standards. Then, I look at preventive care utilization, followed by a summary of limited data on population-level impact trends. In the third subsection, I consider disparities in the utilization of recommended preventive care in the Medicare population. Each section summarizes issues pertinent to my study variables and methodology, along with the existing literature gap on whether CMS Star Measures relating to immunizations, colorectal screening, and mammograms in the Medicare population are associated with detectable impacts in physician utilization or longitudinal improvements to population health. This chapter concludes with a synopsis of the literature gap that I attempted to fill with this study.

Literature Sources and Search Criteria

Using the Walden University Library, I accessed several search engines and databases to locate seminal literature and peer-reviewed research published after 2016. These included Science Direct, PubMed, Sage Publications, Google Scholar, Academic Premier, Academic Search Complete, and CINAHL. I used several combinations of keywords including *health care quality, preventive care, provider incentivization, outcomes, return on investment, impact modeling, immunizations, colorectal screening, breast cancer screening, population health,* and *longitudinal trends.*

Search Findings

Defining Quality Preventive Care

Preventive care has long been lauded as a prophylactic supporting population health, a way to maximize human thriving and minimize costs of medical care by constraining nascent rates of chronic and vaccine-preventable diseases (Levine, Malone, Lekiachvili, & Briss, 2019). To assist with the establishment of preventive care standards within the Medicare population, a subset of these services has been standardized and recommended for routine use in the older adult population by the U.S. Preventive Services Task Force. According to the United States' Agency for Healthcare Research and Quality (AHRQ; 2020), this task force was formed by a Congressional mandate in 1984 to serve as an independent expert panel informing recommendations of preventive care services. These recommendations are formulated by empirical data supplemented by expert opinion and have not always considered cost-effectiveness or transparent process (Saha et al., 2001). Complicating factors such as false positives in cancer screenings and variations in utilization (Narayan, Elkin, Lehman, & Morris, 2018) make it difficult to advance single standards of preventive care, a situation exacerbated by racial and ethnic disparities in utilization (Gray et al., 2017; Jack, 2018).

Multiple organizations have risen to the challenge of operationalizing quality healthcare in the preventive care space, such as the NCQA, a consultancy whose collaborations with industry stakeholders led to the creation of HEDIS (McIntyre, Rogers, & Heier, 2001). The NCQA, a non-profit organization incorporated in 1990, claimed total revenues and gains of over $84M in 2017 (ProPublica, n.d.) from its selling

of audits, earned accreditations, and various other quality score-related manuals and services, suggesting significant marketplace interest in improving measuring and targeted interventions that address preventable negative patient outcomes. According to NCQA (2020), "health care was operating data-free and 'in the dark'" before they formed their organization to sell measurements and improvements to "turn on the lights" (p. 1). Whether or not this is marketing hyperbole, grants and contracts with various health plans and governmental agencies have positioned NCQA as an authority in the quality domain; CMS contracted with NCQA to develop quality measures by which the performance of health plans managing its special needs populations could be benchmarked and incentivized sufficiently to drive performance (CMS, 2020; NCQA, 2020).

CMS (2019) also developed its own set of measurements called the Star Rating System, a set of defined processes and outcomes operationalizing standards for quality healthcare for Medicare Advantage plans. According to CMS, plans are assessed between 1 and 5 Stars for several measures across multiple domains, with higher scores earning plans quality bonus payments and increased opportunities to enroll new beneficiaries into their Part C and Part D plans. Average health plan Star Ratings on each of these measures have varied by year, and preventive care incentivized through these measures included recommended cancer screenings and annual flu vaccine as follows:

Table 1

Average Star Rating by Part C Measure, 2017-2020

2020 Measure number	Measure	2017 Average star score	2018 Average star score	2019 Average star score	2020 Average star score

C01	Breast cancer screening	4.1	3.1	3.4	3.5
C02	Colorectal cancer screening	3.2	3.4	3.8	3.8
C03	Annual flu vaccine	3.3	3.2	3.2	3.2

From "2020 Star Ratings Fact Sheet," by Centers for Medicare and Medicaid Services, 2020 (https://www.cms.gov/Medicare/Prescription-Drug-Coverage/PrescriptionDrugCovGenIn/PerformanceData).

Consistent reporting of these preventive measures highlights unequal utilization across various sociodemographic groups. Several studies emphasize lower immunization rates in Hispanic and African American communities (Hughes, Saiyed, & Chen, 2018; Nowalk, et al., 2019). Other research documents associations between socioecological variables, generally referred to as social determinants of health, and varying utilization of preventive health services (Hughes, Baker, Kim, and Valdes, 2019). Kim, Charlesworth, McConnell, Valentine, and Grabowski (2019) provide additional context around the need for special management of dual-eligible low-income subsidy (DE-LIS) populations, in line with CMS quality score corrections provided to health plans managing risk for patients simultaneously eligible for both Medicare and Medicaid benefits. Overall, the academic literature on quality measure performance focused on predictors of disparities in measure adherence and outcomes, qualitative reporting of experiences with quality improvement initiatives, and the effects of efforts to impact care disparities, rather than whole-population impact.

Preventive Care Utilization

Multiple efforts to improve utilization of preventive care were identified. Payers and providers have been increasingly incentivized to utilize general preventive care services despite inconsistent empirical corroboration for pay-for-performance programs (Ammi & Fortier, 2017; Frakt & Jha, 2018; Roberts, Zaslavsky, & McWilliams, 2018). Provisions in the Affordable Care Act (ACA) eliminated patient financial barriers by providing access in the form of first-dollar coverage for recommended preventive care services such as influenza and pneumococcal immunizations, wellness visits, and cancer screenings (Misra, Lloyd, Strawbridge, & Wensky, 2018; Xu, Wickizer, & Jung, 2019). Alharbi, Khan, Horner, Brandt, and Chapman (2019) found that eliminating cost-sharing did not impact use of some preventive care measures, such as mammograms and pap tests. However, comparison of pre- and post-ACA utilization of Medicare wellness visits showed significant increases in utilization, from 1.4% in 2005 to 12.3% in 2016 (Misra, Lloyd, Strawbridge, & Wensky, 2018). Overall, the data have been inconsistent, potentially confounded by geographic differences spanning Medicare, Medicaid, DE-LIS, and commercial insurance strata.

Such confounding has made it difficult to assess whether elimination of cost-sharing or physician incentivization has impacted preventive care use. For example, Misra, Lloyd, Strawbridge, and Wensky (2018) found that the post-ACA rate of Annual Wellness Visits (AWVs) were lower in non-Whites, men, beneficiaries lacking supplemental insurance, and geographies outside of the Northeast. Research by Chung, Romanelli, Stults, and Luft (2018) found persisting lower utilization of AWVs in

Medicare FFS compared to Medicare Advantage (i.e., health plan-managed) populations, as well as among cohorts of older or comorbid beneficiaries following the removal of cost-sharing. Lack of positive impact from billable preventive services can further complicate these assessments, such as Simpson and Kovich's (2019) conclusion that very limited evidence has been published supporting beliefs that AWVs will improve longevity in the older adult population.

Evidence of Population Impact Trends

Overall, very little evidence has been published on implemented, cost-effective preventive care standards in both general and vulnerable populations. One suggested contributor to this gap separating preventive care narrative from realized impacts is slow payer adoption of incentive schemes aligned with long-term population health benefit (Pryor & Volpp, 2018). Wilson et al. (2018) suggested that confirmation and publication biases may reflect a preventive care phenomenology reinforcing the criticality of democratized access to healthcare and equal utilization of preventive services despite lack of supporting longitudinal population-level studies. Other researchers have focused on alignment of care quality measures, expressing concern about ambiguities or inconsistencies in underlying methodologies applied to diverse populations (Bilimoria & Barnard, 2016; Frakt & Jha, 2018; Roberts, Zaslavsky, & McWilliams, 2018). Pryor and Volpp (2018) observed payer prioritization of palliative care with demonstrated short-term ROIs contributing to under- or mis-incentivization of preventive services. HCP unfamiliarity with behavioral interventions coupled with lack of awareness around

benchmarking and factors impacting low patient adherence were also suggested as barriers to preventive care uptake.

The literature also distinguished between access to preventive care and its utilization, such that the two were readily distinguishable within some populations. In the pre-ACA era, Benjamins, Kirby, and Bond Huie (2004) found that the ethnic composition of the county partially predicted preventive care use. This finding has remained consistent despite elimination of cost-sharing and persisting incentivization schemes associated with quality improvement frameworks. For example, multiple studies report sociodemographic and community-level predictors of preventive care including Medicare AWVs (Hohmann, Hastings, Quin, Curran, & Westrick, 2019), cancer screenings (Moss et al., 2019), and receipt of recommended immunizations (Shen et al., 2019). These findings suggest that factors beyond both payer health system control may predict aggregate health care quality scores.

Other studies highlight questionable associations between standardized care practices designed to impact quality metrics and actual impacts in a targeted Medicare population. Leung, Beadles, Romaire, and Gulledge (2019) found that a Medicare primary care practice demonstration defining preventive care process quality measures failed to demonstrate intended population improvements and increased avoidable hospitalizations in some cohorts. After five years of a direct pneumococcal immunization program launched for the 65 and older Medicare population, at a cost of billions of taxpayer dollars, little to no statistically significant impact was observed by the CDC (Matanock et al., 2019). Definitions of preventive health care practices, often connected

to prescribed actions within a best-practice paradigm, can include standardized preventive care practices without demonstrated population-level impact.

Disparities in Incentivized Preventive Care Uptake

Complexities in health care require coordination among provider groups including specialists, nurses, general practitioners, hospitalists, and other care management professionals. One difficulty in assessing the external validity of quality schema is the reduction of multifactorial complexities into single, measurable events such as vaccination or cancer screenings tied to differences in patient outcomes. Work on social determinants of health, for example, implicates population-level factors in rehospitalization, adherence to prescribed treatment, and health plan quality scoring on myriad measures that may be better predicted by local socioecological and demographic variables than by anything over which a health care facility has control. McCalman, Bainbridge, and Bailie (2019) found that less than 20% of health outcome improvements are due to healthcare services themselves and that sociocultural variables had a greater effect on patient outcomes.

Some research focused on disproportionate negative impacts of poorer populations on quality score performance, contributing additional confounding effects on comparisons between diverse geographies. Toseef, Jensen, and Terraf (2019) found higher preventable hospitalizations in Medicaid managed care segments than in FFS Medicaid counterparts. An examination of long-term care patient outcomes showed worse outcomes for non-White racial/ethnic groups (Gorges, Sanghavi, & Konetzka, 2019). These findings indicate that distributions both of DE-LIS populations and health

disparities impacting racial/ethnic minorities may differently impact health plan performance on quality measures. For this reason, CMS has been working with several states to enhance care coordination between Medicare and Medicaid to better manage these populations, a task made more difficult by complex coverage and data availability challenges (Kim, Charlesworth, McConnell, Valentine, & Grabowski, 2019). No studies were found associating interventions addressing these inequalities with population-level impact.

Within the preventive care domain, Shen et al. (2018) noted persistent lower influenza immunization rates among Medicare FFS Hispanic and Black populations compared to White and Asian cohorts, as well as lower overall vaccination rates of DE-LIS segments. Berland et al. (2019) found higher cancer mortality and barriers to cancer screening negatively impacting racial/ethnic minority groups and lower socioeconomic populations. For example, disparities observed in colon cancer screening trends may have been worsened due to high coinsurance costs associated with extended testing and polyp removal (Florea, Brown, Harris, & Oren, 2019; Montminy, Karlitz, & Landreneau, 2019). The reasons for overall disparities are multifactorial, including low reading levels among poor and uneducated older adults whose low health literacy is likely to negatively impact health outcomes (DeWalt, Berkman, Sheridan, Lohr, & Pignone, 2004; Marshall & Hale, 2019).

Summary and Conclusions

The literature indicated that effective preventive care can be expected to increase efficiencies, improve outcomes, and realize cost savings. Multiple organizations have

operationalized this care within an EBM framework, adopting metrics to serve as proxies for quality preventive care with varying degrees of evidence and success. In the Medicare space, CMS incentivizes utilization of defined preventive care such as influenza immunizations and cancer screenings. Disparities have been found in their utilization, with lower-socioeconomic populations less likely to receive recommended care, and this has received significantly more attention than overall population-level impacts associated with the uptake of such measures.

No studies were found associating population-level interventions addressing these inequalities with meaningful changes to either aggregate quality scores or preventive care utilization. No data were found in the literature associating longitudinal improvements in preventive care quality scores with population outcomes. Finally, no quantitative studies were found indicating that increased use of preventive care resulting from provider incentivization improved any population health outcomes in aggregate. My study helped to begin filling these gaps by testing whether changes in physician use of preventive services were associated with aligned health care quality measures in the Medicare space from 2012 to 2017.

Chapter 3: Research Method

In this section I provide the research methods used in my study to assess longitudinal trends in quality measure performance and preventive care use in the U.S. Medicare population through analysis of secondary data. Using a cross-sectional design, I looked at whether incentivization of preventive care resulted in any aggregate changes to their use within the Medicare FFS space at the population level using county aggregations. I also examined whether any longitudinal changes in such utilization are associated with scores on aligned, incentivized quality measures.

Research Questions and Hypotheses

RQ1: Were there county-level differences in physician utilization of preventive services that correlated to associated quality score distributions from 2012 to 2017?

$H_0$1: County-level physician utilization of preventive services were not correlated with associated quality measure score distributions.

H_a1: County-level physician utilization of preventive services were correlated with associated quality measure scores.

RQ2: Has Medicare physician utilization of colonoscopies, mammograms, and influenza immunizations changed at the county level from 2012 to 2017?

$H_0$2: Medicare physician utilization of colonoscopies, mammograms, and immunizations have not changed at the county level.

H_a2: Medicare physician utilization of colonoscopies, mammograms, and immunizations have changed at the county level.

RQ3: Were there observed correlations between changes in physician utilization of preventive services and associated county-level quality score distributions from 2012 to 2017?

$H_0$3: Changes in physician utilization of preventive care at the county-level did not correlate with associated quality measure score distributions.

H_a3: Observed associations in physician utilization of preventive care at the county-level correlated with associated quality measure score distributions.

Design of the Study

Through a secondary analysis of archived data, I designed my research to clarify the extent to which modern emphasis on selected preventive health measures within the Medicare population changed physician utilization and aligned quality measure scores. Quantitative analyses were selected to separately test for these associations, such that both the extent and nature of each association could be readily understood. This study design helped me support a novel application of public CMS data by splitting the extant preventive health narrative into component research questions directed at understanding trends at a geographically aggregated level of preventive health regimen utilization intended to positively impact population health.

Sampling

My research included all physician billing for medical services provided to the annual Medicare FFS population of the United States between 2012 and 2017. Quality scores associated with cancer screening and immunizations reflected the performance of all Medicare Advantage health plans over this same period, provided that they reported

on the associated measures and had a plan membership over 10 people, below which CMS blinds county-level data.

Data Sources and Variables

The secondary data utilized in this study came from downloadable, public use files published by CMS. Physician-level data from 2012 to 2017 on billed preventive care medical procedures is provided by CMS for all U.S. physicians billing Medicare directly for services and is accessible through Physician/Supplier Procedure Summaries built from complete claims data representing medical expenditures for the entire U.S. Medicare FFS population by year. Distinct Healthcare Common Procedure Coding System (HCPCS) codes delineate immunizations, colonoscopies, and mammograms within these files, aggregated to individual physicians at the zip code level. These zip-level data were mapped to corresponding county aggregates using United States Postal Service maps derived by way of a zip info crosswalk.

I downloaded Star Measure Quality data from CMS, which provided me with health plan performance scores on influenza immunization, colonoscopies, and mammograms. Scores pulled from this source represent Medicare Advantage health plans potentially operating across multiple counties, so a complementing CMS data set was pulled for each year to distribute memberships of reporting health plans across each included county. In this way, weighted averages of measure scores can be ascertained at a county level, reflecting a composite of multiple plans' performance on each. CMS Quality Score data is likewise provided by year, including for those measures reflecting

established operationalization of quality preventive care activities such as influenza immunizations, colonoscopies, and mammograms.

Data Analysis

My study tested for longitudinal changes at an aggregated county level in physician-level utilization of influenza immunization, colonoscopies, and mammograms, and whether these trends correlated with changes in associated quality scores. The public use CMS data file I used to determine county-level billed influenza immunizations, colonoscopies, and mammograms included all services provided to Medicare FFS beneficiaries and submitted for payment by HCPs across the United States. As such, it represented the entire sample of the FFS population considered in this analysis. Similarly, the annualized CMS Quality Score data that I used contains all Medicare Advantage plans reporting performance on included measures and likewise represented complete data with respect to the variables under analysis. As data represented the entirety of each considered population, minimum required sample sizes were considered as met for each research question.

Physician-level use of these preventive care services in the Medicare FFS population was aggregated to the county level, and I used Spearman's Rank-Order Correlation test to determine whether physician utilization of each service correlated with quality score distributions (RQ1). The independent variable (IV) in each test was the proportion of Medicare beneficiaries that have received each service, and the dependent variable (DV) was the average quality score for each associated measure (i.e., receipt of an influenza immunization or appropriate cancer screening). The reason this test was

used instead of Pearson's correlation is because I was looking for a directional monotonic relationship between DV and IV, rather than a strictly linear one.

To determine whether county-level changes in utilization trends existed from 2012 to 2017 (RQ2), a simple linear regression was performed on the county-aggregated dataset with year as the IV and physician use of each preventive service as the DV. If the data were not normally distributed or linearly correlated, a Mann Kendall Trend Test was also performed to test for the presence of a monotonic trend. Finally, if changes in preventive care use were found at the county level over time, I looked to see whether they correlated with changes in associated quality measures from 2012 to 2017 (RQ3) using linear regression tests on annual year-over-year (YoY) changes in physician utilization of each preventive care service as the IV and annual YoY changes in associated quality scores as the DV.

Limitations

Several limitations existed with this study design. Physician-level medical expenditure data is publicly available for Medicare FFS populations, but not for MA distributions. In contrast, while providers tend towards adoption of single standards of care regardless of whether Medicare patients are FFS or managed by a health plan (Callison, 2016), CMS Star scores represent Medicare Advantage plans and do not necessarily reflect preventive care provided to Medicare FFS patients. While this study emphasized changes and associations within each county, differently distributed demographics across national Medicare sub-populations were not considered. Finally, a

lack of statistical significance did not in itself indicate that no effect has occurred, just that no effect was detected using this analytic process.

Chapter 4: Results

This purpose of this study was to look at whether incentivized quality measures have detectably affected utilization of colonoscopies, mammograms, and influenza immunization at the county level. Specifically, I looked at whether county-aggregated differences in the use of these preventive services trended up or down between 2012 and 2017 and whether any identified trends were correlated with affiliated quality scores. My research questions and hypotheses for this analysis were the following.

RQ1: Were there county-level differences in physician utilization of preventive services that correlated to associated quality score distributions from 2012 to 2017?

$H_0$1: County-level physician utilization of preventive services were not correlated with associated quality measure score distributions.

H_a1: County-level physician utilization of preventive services were correlated with associated quality measure scores.

RQ2: Has Medicare physician utilization of colonoscopies, mammograms, and influenza immunizations changed at the county level from 2012 to 2017?

$H_0$2: Medicare physician utilization of colonoscopies, mammograms, and immunizations have not changed at the county level.

H_a2: Medicare physician utilization of colonoscopies, mammograms, and immunizations have changed at the county level.

RQ3: Were there observed correlations between changes in physician utilization of preventive services and associated county-level quality score distributions from 2012 to 2017?

$H_0$3: Changes in physician utilization of preventive care at the county-level did not correlate with associated quality measure score distributions.

H_a3: Observed associations in physician utilization of preventive care at the county-level correlated with associated quality measure score distributions.

Data Collection

To conduct this analysis, Medicare Advantage plan quality score data from 2012 to 2017 were downloaded from CMS for all contracts across the United States. Physician-level billing data representing 100% of FFS physician services were also downloaded from CMS for this period, as were totals of each county's Medicare eligible population and percentage enrolled in a Medicare Advantage plan for each individual year from 2012 to 2017.

Data Preparation

As the unit of analysis for this study was the county, I computed weighted averages for counties using standard Federal Information Processing Standard (FIPS) codes according to the respective contribution of each plan's membership to each county. The total membership of contracts reporting for BCS, CCS, and AFV, respectively, constituted the denominator for the weighted average calculation of each measure. All measures were included in the CMS Stars Quality Program for 2012 to 2017 except for BCS in 2015, when it was reported as a display measure. Thus, for 2015, I interpolated quality measure scores using both 2014 and 2016 cut points and found that the difference did not substantively impact statistical outputs.

Physician-level billing for all Medicare FFS patients were aggregated using HCPCS codes aligned to each included quality measure (Table 2). For cancer screening, I included HCPCS codes for colonoscopies and mammograms utilized between 2012 and 2017 with a "screening" designation from CMS. All HCPCS codes referencing influenza immunization were similarly included.

Table 2

HCPCS/CPT Codes Defining Each Preventive Measure

Breast cancer screening	Colorectal cancer screening	Annual flu vaccination
77057, G0202, 77063	G0121, G0105, G0120	Q2038, 90656, Q2036, 90661, 90686, Q2037, Q2035, 90662, Q2039, 90688, 90653, Q2034, 90673, 90687, 90654, 90657, 90685, 90672, 90660, 90655

CMS provides a NPPES zip code for each registered physician, 99.7% of which directly mapped to a corresponding FIPS county code. Of these, 95.9% (n = 3013) of counties maintained sufficient populations from 2012 through 2017 to allow for HIPAA-compliant reporting of Medicare-eligible populations at the county level. These excluded FIPS representing the least populated areas of the U.S., collectively accounting for less than 0.07% - 0.17% of the total national Medicare population between 2012 and 2017. These limitations were not found to substantively affect the analysis.

Of the 3,143 total U.S. counties, the above mapping resulted in inclusion of 3,013 counties accounting collectively for 97.3% of all BCS services and 99.9% of all CCS and

AFVs billed to Medicare between 2012 and 2017. As indicated in Table 3, the 264,228 unique physicians who billed Medicare for at least one of these preventive services between 2012 and 2017 were unevenly distributed across preventive services, with a greater number billing for AFV (n = 237,135) compared to physicians who billed for BCS (n = 41,072) or CCS (n = 26,410) over this same period. To account for variations in county populations, I calculated a proxy for Medicare FFS populations by subtracting Medicare Advantage populations from CMS-provided county totals of those who were Medicare eligible in December of each included year.

As expected, physicians who billed CMS directly for an AFV sometime between 2012 and 2017 were registered in NPPES in more counties across the 50 U.S. states (93.5%) compared to BCSs (50.9%) or CCSs (52.4%). Total FFS beneficiary preventive services ratios, as such, were intended only to assess longitudinal changes in the proportion of each service at the county level.

Table 3

Descriptive Statistics: NPIs and FIPS Included in Analysis

	Breast cancer screening	Colorectal cancer screening	Annual flu vaccination
Unique NPIs	41,072	26,410	237,135
Distinct FIPS	1,601 (50.9%)	1,648 (52.4%)	2,939 (93.5%)

I posed RQ1 to confirm the commonly assumed association between pooled physician use of preventive services and aligned quality scores using Spearman's Rank-Order Correlation test to look for a directional monotonic relationship. In RQ2, this relationship

was explored longitudinally to determine if any observed county-level changes in utilization trends and quality measures existed at the county level from 2012 to 2017 using simple linear regression and a Mann Kendall Trend Test. Finally, for RQ3 I used a linear regression test to determine whether YoY changes in physician utilization of each preventive care service correlated to changes in aligned quality scores. All statistical tests were performed in accordance with the planned implementation described in Chapter 3.

Study Results

Research Question 1

Spearman Rank-Order Correlation tests were performed using county-level physician utilization of billed Medicare FFS BCSs, CCSs, and AFVs as the IV and each associated county-level quality score average as the DV. I analyzed data from 2012 to 2017 to assess for a statistically significant relationship between IV and DV using SPSS Version 27 and derived the following outputs:

Table 4

Spearman Correlations: Breast Cancer Screen (BCS), Colorectal Cancer Screening (CCS), and Annual Flu Vaccination (AFV)

			Quality Score
Spearman's rho	BCS utilization	Correlation Coefficient	-.018
		Sig. (2-tailed)	.138
		N	6444
	CCS utilization	Correlation Coefficient	.003
		Sig. (2-tailed)	.792
		N	6828
	AFV utilization	Correlation Coefficient	.073**
		Sig. (2-tailed)	.000
		N	14458

**. Correlation is significant at the 0.05 level (2-tailed).

These statistics represent the strength of correlation between share of Medicare eligible patients not enrolled in a Medicare Advantage plan within each county for whom CMS was directly billed for a BCS, CCS, or AFV between 2012 and 2017.

Higher utilization of AFV in the Medicare FFS population at the county level was statistically significantly associated with AFV quality scores ($p < .001$). However, no statistically significant relationship between physician utilization and aligned quality measure was found for either BCS ($p = .138$) or CCS ($p = .792$). Therefore, the null hypothesis cannot be rejected for cancer screenings: County-level physician utilization of BCSs and CCSs were not correlated with associated quality measure score distributions. For AFV, the null hypothesis was rejected: County-level physician utilization of AFV was correlated with the associated quality measure score at the county level from 2012 to 2017.

Research Question 2

To assess whether the present Star Measure incentivization of BCS, CCS, and AFV has impacted county-aggregate utilization of these services over time, I performed separate linear regressions on these shares of physician utilization (DV) and each individual year, 2012 to 2017 (IV).

Table 5

Changes in Physician Utilization: Model Summaries

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate

BCS	.069[a]	.005	.005	.2586739
CCS	.015[a]	.000	.000	.3438280
AFV	.052[a]	.003	.003	.2135173

a. Predictors: (Constant), Year

Table 6

Changes in Physician Utilization: Model Coefficients[a]

		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
Model		B	Std. Error	Beta		
BCS	(Constant)	-20.933	3.801		-5.507	.000
	year	.011	.002	.069	5.566	.000
CCS	(Constant)	6.061	4.908		1.235	.217
	year	-.003	.002	-.015	-1.228	.220
AFV	(Constant)	-12.754	2.079		-6.136	.000
	year	.006	.001	.052	6.263	.000

a. Dependent Variable: Medicare FFS Billing Share in County

Based on the above data, the null hypothesis was rejected for both BCS and AFV services: Medicare physician utilization of screening mammograms ($p < .001$, $R^2 = .005$) and influenza immunizations ($p < .001$, $R^2 = .003$) changed at the county level from 2012 to 2017. However, no statistically significant changes in CCS were found and I failed to reject the null hypothesis: Medicare physician utilization of colonoscopies did not change at the county level from 2012 to 2017.

As described in my research plan, a Mann Kendall Trend Test was performed on CCS to test for a monotonic trend in the absence of a linear relationship. This was carried out using the XLSTAT statistics package by Addinsoft (2021) for Excel:

Table 7

Mann-Kendall Trend Test / Two-tailed Test (CCS Utilization):

Kendall's tau	-0.168
S	-3909757.000
Var(S)	35378008939.000
p-value (Two-tailed)	<0.0001
alpha	0.050

An approximation has been used to compute the p-value.

As seen in the above output, the computed *p*-value of this non-parametric test is <0.0001 so at an alpha of 0.05 the null hypothesis was rejected. Therefore, data indicate that colorectal cancer utilization decreased monotonically at the county-aggregate level between 2012 and 2017, though not linearly as was observed in both BCS and AFV.

Research Question 3

In RQ3, YoY changes in billed BCS, CCS, and AFV services provided by physicians to Medicare FFS beneficiaries were compared to aligned quality measures using simple linear regression in SPSS Version 27 to assess whether changes in one consistently correlated with changes in the other.

Table 8

Year-over-year Changes in Billed BCS, CCS, and AFV Services: Coefficients[a]

		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
Model		B	Std. Error	Beta		
BCS	(Constant)	.248	.006		43.027	.000
	Utilization Delta	-.001	.001	-.012	-.876	.381
CCS	(Constant)	.133	.010		12.845	.000
	Utilization Delta	-.009	.016	-.007	-.523	.601

AFV	(Constant)	.056	.006		9.359	.000
	Utilization Delta	.000	.001	.005	.604	.546

a. Dependent Variable: CMS Star Score Delta (YoY)

For BCS, CCS, and AFV models, we fail to reject the null hypothesis. No statistically significant correlation was found between YoY changes in provider utilization and associated quality scores for BCS (p = .381), CCS (p = .601), or AFV (p = .546).

Summary

AFVs billed directly to Medicare statistically significantly correlated with county-level quality score averages for the aligned AFV quality measure from 2012 to 2017. However, no correlations were found for county-aggregated physician billing of either BCSs or CCSs and their respective quality measure over this same period. Within this timeframe, physician utilization of BCSs and AFVs linearly trended up, and CCSs monotonically declined (Kendall's tau = -0.168, $p < 0.0001$). Changes in county-level utilization of BCSs, CCSs, and AFVs did not correlate with changes in associated quality measures at the county-aggregated level between 2012 and 2017.

Chapter 5: Discussion, Conclusions, and Recommendations

The purpose of this study was to determine how preventive care incentivized by Medicare impacted physician utilization from 2012 to 2017, as well as clarify the relationship between changes in physician utilization and associated county-averaged quality scores. Medicare preventive care utilization is usually considered at the individual health plan level in accordance with the low-resolution narrative that financially incentivizing health plans to increase BCS, CCS, and AFV through aligned performance scores on CMS Star measures should improve public health.

Consideration of population-level impact using geographic aggregations at the county level to analyze Medicare data from 2012 to 2017 yielded mixed results. While county-level physician billing of Medicare for influenza vaccinations were statistically significantly correlated with county-level performance on the AFV quality measure, no such correlation was found for BCS or CCS. Over this period, BCS and AFV linearly trended up while CCS monotonically trended down. However, YoY changes in county-aggregated physician billing for BCS, CCS, and AFV preventive care were not found to statistically significantly correlate with respective changes in quality scores.

Interpretation

As described in Chapter 2, the literature on how incentivization of preventive care impacts physician utilization of these services emphasizes inequities across population segments and plan-level analyses. This study looked at population-level effects of present incentivization policies on preventive care at the county level. The typical unit of analysis for CMS Star Measures is the health plan because that is the organization receiving

incentivization intended to drive uptake of recommended cancer screenings and influenza immunizations within the Medicare population.

However, when considered at the aggregated county level, only influenza immunizations correlated with the aligned incentivized quality measure. Changes in county-level utilization of BCSs, CCSs, and AFVs did not correlate with changes to performance on aligned quality measures between 2012 and 2017. Over this period, the share of each county's Medicare-eligible population receiving an AFV was correlated with the associated quality score, but no such correlations were found for either BCS or CCS. While health plans and providers may benefit from financial incentivization of cancer screenings, current incentivization of preventive care services in the Medicare space may be insufficient to impact population health trends.

Research Question 1

Between 2012 and 2017, higher county percentages of Medicare populations receiving flu vaccinations correlated with average quality score distributions at the county level, but higher BCSs and CCSs did not correlate with average quality score performance for their aligned measures. This is reminiscent of findings by Leung, Beadles, Romaire, and Gulledge (2019) that preventive care measures, however sensible they may seem, can fail to demonstrate population improvements. As described in Chapter 2, research emphasizes slow payer adoption of preventive care (Pryor & Volpp, 2018), or else focuses on disparities of utilization *within* a total population (Hohmann, Hastings, Quin, Curran, & Westrick, 2019; Moss et al., 2019; Shen et al., 2019), but my

findings showed that quality measure performance may not accurately reflect overall utilization when viewed at a population level.

This is an important finding in that population level effect, which is the intent of the EBM framework upon which quality measures are built (Masic, Miokovic, & Muhamedagic, 2008), becomes more difficult to detect at a population level if impact is diluted by low utilization of a medical service. This partially explains the dearth of published evidence on implemented, cost-effective preventive care standards in the general population. However, as predicted by Matjasko, Cawley, Baker-Goering, and Yokum's (2016) exposition of the behavioral economic model, the lack of public health effect may do little to offset payer and physician adherence to these measures. After all, these preventive measures are intended to help patients and not abstracted populations; these macro trends do not necessarily reflect an absence of either improvements to patient outcomes or long-term reductions in costs of care for payers focusing on quality measure score improvement.

Research Question 2

Medicare's incentivization scheme to increase use of aligned preventive care slightly improved county-level utilization of BCSs and AFVs between 2012 and 2017, but CCSs relative to Medicare population size appeared to marginally decline. The reasons for this are unclear, although it could be partially explained by socioecological predictors of cancer screenings (Moss et al., 2019). Changes in county shares of age, sex, and Medicare enrollment distributions may have contributed to these observations. It is

also important to note that R-Square values were very low for population level changes in physician billing for BCS (R^2 = .005) and AFV (R^2 = .003).

CCS did not linearly change over this time, though a small declining trend was detected (Kandall's tau = -0.168). The notable lack of meaningful, population-wide improvement in the utilization of these preventive services within Medicare populations is problematic. If the current approach is failing to advance meaningful use of preventive services, and if those services are an efficacious means by which population health could be improved, it would be prudent to propound a new method of incentivizing preventive care.

Research Question 3

One of the more surprising findings of my study was that, when viewed through a county lens, changes in physician utilization of preventive services did not correlate with changes in aligned quality scores from 2012 to 2017. This is somewhat counter-intuitive because each of the process measures under consideration are scored higher according to share of defined plan membership who received each service. Yet, even if health plans improved their scores over this period, quality score changes at an aggregate population level did not statistically significantly correlate with changes in physician use of each service.

One factor contributing to this observation is that the rubric for each measure changes over time, meaning that the same performance in subsequent years can result in a different number of Stars being awarded. As indicated in Chapter 2, neither this nor the specific operationalization of quality measures in general is widely understood. A health

plan's Star Scores are, in part, figured by the performance of all reporting plans in that category. In effect, CMS Star Measures award "the best" plans without reference to objective YoY improvements in preventive health measure use.

A few examples will clarify the point. In the case of BCS, 40% compliance in 2014 would have earned a health plan 1 Star, dropping to 39% would have earned 2 Stars in 2016, and if it jumped 3 percentage points to 42% in 2017 it would have been awarded 1 Star again. Similarly, maintaining a 58% for CCS would have earned a reporting Medicare Advantage plan 4 Stars in 2014 and 2015, but then 2 Stars in both 2016 and 2017. A reporting health plan consistently immunizing 68% of its membership every year with a flu vaccine would have received 3 Stars in 2014, 2 Stars in 2015 and 2016, and 3 Stars again in 2017.

While it is possible individual patients and health plans benefitted from these services, these moving targets are of questionable public health utility. In the absence of population-level changes in utilization, it is highly unlikely that aggregate impact on cost savings or public health outcomes presumed to result from adherence to these operationalized quality care efforts would be detectable. To date, no data have been published in the literature at the health plan level demonstrating pooled impact of performance variability on these quality measures and statistically significant differences in patient outcomes or costs.

Discussion

Incentivization of BCS and AFV from 2012 to 2017 may have driven increased county-level share of Medicare beneficiaries receiving those preventive services, but

county percentages of beneficiaries receiving a CCS slightly declined over this same period. This is consistent with Cooper, Kou, Schluchter, Dor, and Koroukian's (2016) analysis of changes to preventive care utilization following the ACA. They found that while Medicare mammography claims increased from 2009-2010 to 2011-2012, colonoscopy screenings declined. Using Medicare FFS claims data, Shen et al. (2018) found increases in AFV use in several geographic and patient cohorts for parts of 2006-2016 despite total estimated Medicare influenza vaccination rates remaining generally flat. Data altogether indicate that observed preventive care trend differences in the Medicare population remain sensitive to how these populations are aggregated. As my study results highlight, these differences contribute to discrepancies between plan-level and population-level impacts of incentivized quality measures.

The finding of diminishing aggregate CCSs over this period in the Medicare space appears to disagree with De Moor et al.'s (2018) analysis of NHIS survey data from 2008 to 2015, which found that coloscopies across the entire population in the U.S. from 50 to 75 years of age increased over this period. However, this observation was inclusive of a much wider population, concerned with the 2008 to 2015 time frame rather than 2012 to 2017, and included adults with both no insurance and commercial insurance in addition to Medicare. The decline my study observed may also be partially explained by their finding of statistically significantly lower coloscopy rates among those with Medicare but lacking private supplemental insurance, a difference that persisted even after multivariate adjustments for sociodemographic characteristics.

At least at the county level, changes in physician utilization of BCS, CCS, and AFV were not found to statistically significantly correlate with quality measure performance on aligned measures from 2012 to 2017. This means that regardless of observed health plan-level changes, the overall Medicare population may not be detectably impacted. Changes in physician utilization of each preventive service did not predict any aggregate quality score impacts at the county level using this method of analysis. The data therefore indicate that health plan improvements over this period did not impact counties sufficiently to detect a statistical signal linking changes in physician use of these preventive measures to county-aggregated performance.

As indicated in my literature search, the EBM applied to preventive health is based on the idea of benefits incurred to individuals receiving such services. The identified literature gap, however, pertains to the population-level impact of incentivizing such processes. My study found that there was no detectable correlation from 2012 to 2017 between changes in physician billing for routine preventive care and average county performance scores. Health plan-specific improvements proved insufficient to drive population-level impact across the United States over this period.

Limitations of the Study

There were several limitations to this study. As described in Chapter 3, preventive service utilization data reflects physician-level FFS expenditures whereas plan-level quality scores pertain to each county's Medicare Advantage population. I utilized available public data to consider county-level physician billing of preventive services in relation to aligned, county-averaged quality scores. Since county-level physician billing

of each service used a calculated Medicare FFS estimate for the denominator, longitudinal trends could have been impacted by large shifts in Medicare beneficiary age and sex characteristics within each county between 2012 and 2017.

Another limitation of this study was the method by which physicians were associated with counties. Public CMS data provided a primary NPPES zip code in which the physician was registered for each year, and I used that to group physicians into county aggregates. Physicians often practice in several zip codes, and this was not indicated in the public use file, with the greatest potential distortions identified in rural areas such as Alaska. Finally, physicians moving from one state to another could account for some of the county-specific variations in billed preventive services from 2012 to 2017, but this was not considered in the context of my analysis.

Recommendations

Future research should confirm plan-versus-geography differences in incentivized preventive care processes using more granular data. Effective public health policy requires consideration of aggregate impact, and significant literature gaps remain in impact metrics at any geographic aggregate level. These include demonstrated impacts in care efficiencies, costs, and improvements in patient outcomes associated with quality measures including, but not limited to, preventive care measures of BCS, CCS, and AFV.

Adjoining research might also consider whether incentivization of these and other quality measures have resulted in any detectable population-aggregate use or impact. Expanding consideration beyond the health plan as a unit of measurement will assist in demonstrating public health value and positive effect. Since the majority of health care

quality measures are process-compliance oriented activities prescribed to targeted population segments in the interest of lowering costs and improving patient outcomes, I recommend that aggregate impacts are considered in more depth. This would assist in aligning public health policy with effective initiatives that transcend current low-resolution quality narratives and provide the means to attain practical, population-level ends.

Implications

This study highlights a potential discrepancy between the low-resolution narrative conflating increasing health plan performance on preventive care quality measures with physician use of those measures, and further with county-level changes in preventive care utilization. This may be partially explained by dilution of effect, as there may have been insufficient uptake of each preventive service within lower-populated areas that masked improvements potentially detectable only in dense urban counties. However, I found no indication in the present literature of any aggregated, population-level improvements to preventive care utilization, reduced costs of care, or improved patient outcomes at the state or county level.

When analyzed at the county level, changes in physician billing of preventive services were not found to predict changes in associated quality measures. Overall, study data suggested that health plans could accurately report improvements in both physician utilization and quality score performance even as population-level impact remained undetectable. This lack of aggregate effect casts doubts upon health plans as a sufficient unit of analysis to inform public health policy in the aging U.S. population, suggesting a

need to complement the current plan-level approach with ongoing monitoring of how incentivization is impacting physician behavior and population health at the geographic aggregate level.

One positive social change advance of these findings is the demonstration of a novel method whereby plan-level data can be considered at the county level. Using this approach, public health officials will be able to distribute health plan quality measures to geographic aggregates, such as counties or Hospital Referral Regions, and analyze aligned data on hospitalizations, drug utilization, spending, patient outcomes, and social determinants of health. Analyses of socioecological predictors of changes in incentivized care processes and the subsequent testing of intended outcomes can also be similarly derived. This could help to recalibrate public health preventive care narratives and associated initiatives in demonstrated claims and meaningful longitudinal trends impacting the U.S. Medicare population.

This study's specific findings will also help to inform public policy reform in the preventive care space. Changes in average quality scores within counties do not necessarily reflect changes in either physician behavior or patient outcomes associated with that measure's operationalization of quality. For example, aggregate declines in Medicare physician billing for CCSs between 2012 and 2017 at the county-level indicate a need to focus on improving utilization of that preventive service. Future physician-specific analyses might yield interview cohorts of stratified providers to engender new thoughts around incentivization designs more likely to produce county- and population-level impacts to public health.

Conclusion

It is possible for health plans to demonstrate improvements in quality measure performance, including those measuring utilization of preventive care processes, without improving physician utilization at the aggregated county level. For all three preventive measures considered, YoY increases in BCS, CCS, and AFV quality measure scores did not correlate with changes in physician utilization from 2012 to 2017. A method by which plan-level performance in the Medicare Advantage space can be generalized to a geography such as a county was created and provided for future researchers.

Incentivized preventive health quality measures have only negligibly impacted preventive care utilization at the county level, and changes in Medicare physician use of BCS, CCS, and AFV between 2012 and 2017 did not correlate with changes in aligned quality scores at the county level. If such preventive health service use is to meaningfully impact patient outcomes and reduce cost, significant changes are required to stimulate measurable effects at the population level and improve public health outcomes within the U.S. Medicare population.

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