BOLD THINKERS DRIVING REAL-WORLD IMPACT

# Evaluation of the Accountable Care Organization Investment Model

**Final Report Appendices** • Contract # HHSM-500-2014-00026I / T0004


**SUBMITTED TO:**

**Centers for Medicare & Medicaid Services**
CMS/CMMI/RREG/DRPA
*David Nyweide*
*Contracting Officer Representative*
7500 Security Blvd.
Baltimore, MD 21244

**SUBMITTED BY:**
**Abt Associates**
6130 Executive Boulevard, Rockville, MD 20852

**IN PARTNERSHIP WITH:**
**L&M Policy Research**
**Insight Policy Research**
**J. Michael McWilliams**


September 2020

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## Authors

**Abt Associates**
Betty Fout
Matthew Trombley
Ariana Bengtsson
Alan White
Elizabeth Axelrod
Val Aschenbach
Chao Zhou
Lauren Scarpati
Kimberly Groover
Rosanna Bertrand
Jaclyn Rappaport
Catherine Hersey
Johanne Germain

**L&M Policy Research**
Kathryn Linehan
Heather McPheron
Brant Morefield
Lisa Tomai

**Insight Policy Research**
Carla Bozzolo
Dominick Esposito


Abt Associates | 6130 Executive Boulevard | Rockville, MD 20852

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# Appendix 1A. Data Sources

Data sources include programmatic data on providers participating in the Shared Savings Program (SSP) and the beneficiaries assigned to them; Medicare enrollment and administrative claims data to identify beneficiary characteristics and determine beneficiary ACO assignment; market-level data to describe the markets within which AIM ACOs are located and define comparison groups; and primary data collection in the form of two rounds of interviews with ACO representatives, ACO physician interviews, a virtual focus group with CMS model leads, and an ACO Web survey. These data sources are described below.

## *Programmatic Data and Medicare Administrative Data*

We used the following AIM and SSP programmatic data:

- *ACO Provider Research Identifiable File (RIF)*: CMS constructed ACO research files that contain lists of entities participating in the Shared Savings Program by tax identification number (TIN) (practice-level identifier), national provider identifier (NPI) (individual practitioner-level identifier), and CMS certification number (CCN) (facility providers). These data were based upon the Medicare Provider Enrollment, Chain, and Ownership System (PECOS) and ACO participation lists. Provider RIF (ACO participant identifier) Files for 2013 through 2018 were available at the time of this report.
- *Master Data Management (MDM) Beneficiary Extract (Chronic Conditions Warehouse [CCW] Virtual Research Data Center [VRDC])*: This data source contains the programmatically assigned ACO beneficiaries. These data are updated frequently and contain both preliminary prospective assignment as well as final retrospective assignment for the AIM ACOs. We used the MDM Beneficiary Extract in in determining beneficiary assignment. We also used this file to determine beneficiaries attributed to entities in the Shared Savings Program, Pioneer ACO, Next Generation ACO, the Comprehensive ESRD Care (CEC) model, and the Comprehensive Primary Care (CPC) initiatives. In this report, we used data from MDD_BENE_EXTRACT_LINKED_190930 to assess participation in these models.
- *Benchmark files*: This data source, provided by the financial reconciliation contractor, contains the programmatically assigned ACO beneficiaries needed to construct the three-year baseline for financial reconciliation.[1] We used these files to conduct beneficiary assignment during the evaluation's baseline years.
- *National eligible lists*: This data source, provided by the financial reconciliation contractor, contains the list of beneficiaries nationwide who are eligible for assignment. This list was used to refine our comparison group of assignment-eligible beneficiaries residing in each AIM ACO's market.
- *Shared Savings Program ACO Public Use Files (SSP PUFs)*: These publicly available data sets contain ACO financial results as well as assigned beneficiary characteristics. We used the SSP PUFs to obtain ACO financial performance—including shared saving payments received by the ACO and shared losses owed by the ACO—AIM or Advance Payment (AP) ACO payments, and recoupment of AIM or AP payments from shared savings. We used the 2015, 2016, 2017, and 2018 SSP PUFs. We also used publicly available Shared Savings Program participation and financial track information for 2019 and 2020.

[1] https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/sharedsavingsprogram/Downloads/Shared-Savings-Losses-Assignment-Spec-V4.pdf

- *Expense Reports*: AIM ACOs were required to submit quarterly expense reports detailing how AIM payments were spent. AIM monthly funds only were paid to ACOs through the end for 2017, but AIM ACOs could spend their funds through the end of 2018. We analyzed expense reports for each AIM quarter through the end of 2018.

We used Medicare claims and enrollment data from the CCW VRDC to obtain beneficiary characteristics:

- *Master Beneficiary Summary File ([MBSF] CCW VRDC)*: This beneficiary summary file contains beneficiary characteristics such as demographic information, Medicaid dual eligibility status, and disability status. Importantly, we used these data to determine beneficiaries' residence between 2013 and 2018 to define FFS comparison groups within ACOs' markets.
- *Medicare Research Identifiable Files ([RIFs] CCW VRDC)*: We used Medicare claims data for 2013 through 2018 to assign beneficiaries to ACOs and to identify FFS beneficiaries in the ACOs' markets. We used 100 percent Carrier (Part B) and outpatient claims. Data were pulled in September 2019.
- *Hierarchical Condition Codes (HCC) Risk Scores (CCW VRDC)*: These files provide the HCC flags (a set of 70 condition flags) and risk scores for all Medicare beneficiaries that are used by Medicare to risk adjust beneficiary payments to Medicare Advantage plans. The HCC file for a particular year provides condition flags and risk scores based on diagnoses from the prior year. At the time of this report, the most recent file available on the CCW was for 2017 (based on 2016 conditions). We used files from 2013 to 2017.
- *Chronic Conditions File (CCW VRDC)*: The CCW maintains a data set of indicators for whether Medicare beneficiaries had one of 27 chronic conditions. We used the indicators for END (i.e., within a given year) to compile the history of chronic conditions for each beneficiary. We used data from 2013 to 2018.
- *Cost and Use File (CCW VRDC)*: The CCW maintains yearly beneficiary cost and utilization variables based on administrative claims data. Data used in this report were through 2018.

CMS provided the following beneficiary-level data on beneficiary involvement in Medicare's episode-based payment initiatives:

- *Oncology Care Model (OCM)*: OCM is a CMMI model for physician practices that administer chemotherapy. CMS provided files that list OCM beneficiaries and start and end dates for episodes of care. These files were created by the implementation contractor for OCM and report episodes of care that occurred between July 1, 2016 and December 31, 2018.
- *Comprehensive Care for Joint Replacement (CJR) Model*: CJR targets beneficiaries with hip and knee replacements. CMS provided files that list CJR beneficiaries and start and end dates for episodes of care. Data includes episodes of care from April 1, 2016 to December 31, 2018.
- *Bundled Payments for Care Improvement (BPCI) Initiative*: BPCI is an episode-based payment initiative that broadly targets beneficiaries with an inpatient stay in an acute care hospital. BPCI began in April 2013 as BPCI Classic and was implemented through 4 models. BPCI Classic ended on September 30, 2018 and was revised as BPCI Advanced, which began on October 1, 2018. CMS provided data on beneficiaries in BPCI Classic Models 2 and 3 and BPCI Advanced. We used episodes of care that that occurred between January 1, 2016 and December 31, 2018.

### *Market-level Data*

Publicly available market-level data were used to characterize ACOs' geographic locations:

- *RUCA Codes*: RUCA codes are measure the rurality of the market served by AIM ACOs. Data and information on RUCA code development are available from the University of North Dakota's Center for Rural Health.[2] The RUCA codes were based on 2010 Census work-commuting data, 2012 Census Bureau revised urban area definition based on 2010 Census data, and 2013 ZIP Codes. RUCA designations for older ZIP Codes were obtained from the University of Washington's Rural Health Research Center. These data are based on the 2000 Census and the 2004 ZIP Code information. To define ACOs' rurality, we mapped the RUCA codes at the ZIP Code level to the residence of AIM ACOs' assigned beneficiaries and determined the percentage of assigned beneficiaries residing in a location with a RUCA code equal to or greater than 4 on a scale of 1 to 10, with 10 indicating most rural.[3] For some analyses, indicated in the report, we use a RUCA code equal to or greater than 6 to distinguish the most rural areas.
- *Health Professional Shortage Areas (HPSA)*: HPSAs refer to geographic areas that lack sufficient health care providers to meet the population's needs. An area that receives a HPSA designation from the Health Resources and Services Administration (HRSA) receives additional resources to improve access to primary, mental, or dental care.[4] HPSA designations are available at the ZIP Code level for every year between 2013 and 2017.[5] We mapped them to AIM markets to obtain the percentage of AIM ACOs' assigned beneficiaries that were located in a HPSA-designated area for each corresponding year.
- *Area Deprivation Index (ADI)*: Disparities in health and socioeconomic status are closely related and underserved health care markets are often at a socioeconomic disadvantage. We use ADI estimates developed by the University of Wisconsin-Madison to determine if AIM ACOs located in disadvantaged markets.[6] The ADI is a measure of socioeconomic disadvantage developed using income, education, employment, and housing quality measures contained in the 2015 American Community Survey Five Year Estimates. A high ADI indicates areas at a greater socioeconomic disadvantage. We mapped ZIP Code level ADIs to the residence of ACO beneficiaries to determine average ADIs in these markets.
- *Favorability Score*: Marketplace characteristics differ by region and give rise to varying market conditions that may be more or less favorable to ACO formation. We identified marketplace characteristics that relate to ACO formation and sustainability, including measures of health care resource use, demographic and health characteristics, health care quality, health care access, and market structure. We then ranked markets on a scale of 0 to 100 as favorable or unfavorable to ACO formation based on these measures. Higher scores correspond to markets that are more favorable to ACO formation and sustainability. The geographic level for analysis was the hospital referral region (HRR). We mapped HRR-level scores to ACO beneficiaries' residence and

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2 https://ruralhealth.und.edu/ruca Last accessed on July 5, 2017

3 Specifically a RUCA score of four indicates an area that is a "Micropolitan area core: primary flow within an Urban Cluster of 10,000 to 49,999."

4 https://www.cms.gov/Outreach-and-Education/Medicare-Learning-Network-MLN/MLNProducts/downloads/HPSAfctsht.pdf

5 https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/HPSAPSAPhysicianBonuses/index.html?redirect=/hpsapsaphysicianbonuses/

6 https://www.neighborhoodatlas.medicine.wisc.edu/

calculated the average favorability score for ACO market areas. More detail on our approach to developing these scores, including complete lists of the variables and data sources used, is provided in the AIM Impacts in the First Performance Year report.[7]

### Primary Data Collection

This report draws from several types of primary data collection (see **Exhibit 1A-1**):

- *AIM ACO interviews*: We conducted two rounds of telephone interviews with representatives from 45 AIM ACOs. The first round covered topics related to AIM ACOs' reasons and goals for participating, how they have used AIM funds, and their structure and activities as a result of participating in AIM. The second round of interviews revisited topics from the first round and explored interviewees' reflections on their participation in AIM as well as AIM's effect on their decision to continue participating in SSP and assuming two-sided financial risk. The first round of telephone interviews was conducted between October and December 2016. The second round of telephone interviews was conducted in June 2017 with representatives from the two AIM ACOs that began participation in 2015, and in November to December 2017 with representatives from the 43 AIM ACOs that began participation in 2016. Interview guides are provided in the AIM Impacts in the Second Performance Year report.[8]
- *AIM physician interviews*: Between May and June 2017, we interviewed a convenience sample of 21 physicians participating in eight AIM ACOs. Using a semi-structured discussion guide, we collected information about (1) practitioners' overall perceptions of their participation in AIM, (2) practitioners' involvement in the allocation of AIM funds, (3) activities the ACO supports, and (4) the resources they provide to practitioners.
- *CMMI model leads interview*: We conducted a 90-minute interview in August 2018 with the three CMMI staff members who had been involved with implementing AIM and, prior to AIM, the AP ACO Model. We gathered information about their experiences working directly with the models. The semi-structured discussion guide focused on (1) the ease and/or difficulty in implementing each model; (2) role of the model leads in assisting ACOs with the implementation process; (3) the importance of management companies in helping ACOs achieve shared savings; (4) and challenges and lessons learned from working with ACOs.
- *ACO Web survey*: The AIM ACO Web survey gathered information on AIM ACOs' sustainability of AIM-funded activities since the completion of AIM funds, overall perceptions of AIM, and continued participation and risk-taking in the Shared Savings Program. For comparison, non-AIM SSP ACOs were also surveyed on their perceptions of the Shared Savings Program, continued participation, and increased risk taking. In fall of 2018, we surveyed 45 AIM ACOs and 101 non-AIM SSP ACOs. The AIM Impacts in the Second Performance Year report provides additional information on responses as well as the sample instrument. We also conducted an earlier ACO Web survey for only non-AIM SSP ACOs in 2016 to enable comparison with AIM ACOs along key dimensions such as organizational structure, care management activities, IT use, and quality measurement. Findings from this survey were discussed in the AIM Evaluation Performance Year 1 report.

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[7] The evaluation report of AIM's first performance year can be found here: https://innovation.cms.gov/initiatives/ACO-investment-model/

[8] The evaluation report of AIM's second performance year can be found here: https://innovation.cms.gov/initiatives/ACO-investment-model/

**Exhibit 1A-1. Timing of AIM Evaluation Primary Data Collection**

| | 2016 April-June | 2016 July-December | 2017 January-June | 2017 July-December | 2018 January-June | 2018 July-December |
|---|---|---|---|---|---|---|
| **Telephone Interviews** | | | | | | |
| ACO leadership | | ■ | ■ | ■ | | |
| Practitioners | | | ■ | | | |
| AIM model team | | | | | | ■ |
| **Web Surveys** | | | | | | |
| ACO leadership | | ■ | | | | ■ |

# Appendix 1B. Beneficiary Assignment

We assigned beneficiaries to AIM ACOs using the same beneficiary assignment algorithms that are used by CMS through its financial reconciliation contractor to calculate shared savings. In this appendix chapter, we describe the assignment methodologies, report our success in replicating the algorithm, and describe how we obtained the final list of ACO beneficiaries used for this evaluation.

## *SSP Beneficiary Assignment Algorithm*

To be eligible for assignment to an ACO according to the SSP assignment algorithm, beneficiaries must meet the following criteria during the year of assignment:

- At least 1 month of Part A and Part B enrollment and no months of only Part A or only Part B enrollment;
- No months of Medicare Advantage (private payer) health plan enrollment;
- Not assigned to any other Medicare shared savings initiative; and
- Residence in the U.S. or U.S. territories and possessions based on the most recent available data regarding beneficiary residence at the end of the assignment window.

**Between 2012 and 2015**, beneficiaries who received at least one primary care service from a physician who is deemed an ACO professional were assigned to the ACO based on a two-step process:[9]

- Step 1: The first step assigns a beneficiary to an ACO if the beneficiary received at least one primary care service from a primary care physician participating in an ACO. Primary care physicians are defined as those with the following specialties: internal medicine, general practice, family practice, or geriatric medicine. Primary care services, as measured by allowed charges associated with a set of Healthcare Common Procedure Coding System codes and revenue center codes,[10] with primary care physicians are aggregated to all TINs or CCNs associated with each ACO.[11] The aggregate allowed charges from primary care physicians in an ACO are then compared with a beneficiary's primary care services from primary care physicians under each non-ACO TIN/CCN to determine whether the beneficiary obtained a plurality of primary care from ACO providers. If so, the beneficiary is assigned to the ACO.
- Step 2: Those beneficiaries who did not receive a primary care service from a primary care physician inside or outside of the ACO are assigned to an ACO as long as the plurality of primary care services (measured by associated allowed charges) is from qualifying specialist physicians (including non-primary care physicians, nurse practitioners, clinical nurse specialists, and physician assistants) under TINs participating in an ACO.[12]

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9 CMS, "Medicare Shared Savings Program: Shared Savings and Losses and Assignment Methodology Specification, Applicable beginning Performance Year 2015," Version 3, December 2014.

10 See Table 1 of the "Medicare Shared Savings Program: Shared Savings and Losses and Assignment Methodology Specification, Applicable beginning Performance Year 2015," Version 3, December 2014.

11 Primary care received from ACO providers that are RHCs, FQHCs, method II CAHs, and Electing Teaching Amendment (ETA) hospitals is also used in assignment. We identified these entities using CCNs.

12 For the list of physician specialties, see Table 3 of the "Medicare Shared Savings Program: Shared Savings and Losses and Assignment Methodology Specification, Applicable beginning Performance Year 2015," Version 3, December 2014.

**Effective on January 1, 2016**, updated assignment rules were applied.[13] Changes to the assignment methodology included:

- Step 1 expanded from considering primary care services from only primary care *physicians* to primary care *practitioners* (nurse practitioners, clinical nurse specialists, and physician assistants).
- Primary care physician specialties were expanded to include the pediatric specialty.
- Certain specialty types whose services are not likely to be indicative of primary care services were removed from Step 2 to place a greater emphasis on primary care.
- The definition of primary care services was expanded to include transitional care management services following a beneficiary's discharge from a hospital or a skilled nursing facility (SNF) and chronic care management services for beneficiaries with two or more chronic conditions. Specifically, these services include CPT codes: 99490, 99495, 99496, and a new code for outpatient hospital claims, G0463.

**Effective January 1, 2017**, the definition of primary care services excludes services delivered to beneficiaries in SNFs (CPT codes 99304 to 99318) for claims that contain the place of service (POS) 31 modifier.[14] We assessed how this change affected assignment to ACOs. We found that approximately 5 percent of beneficiaries who were assigned using the previous methodology were no longer assigned. These beneficiaries tended to be more costly.

For ACOs participating in Track 1 (no down-side financial risk), the Shared Savings Program applies a **retrospective** assignment methodology, meaning that attribution of beneficiaries to ACOs is based on the provision of care during the performance year and final assignment is not conducted until after the year has concluded (though ACOs receive quarterly updates with beneficiaries that will likely be assigned to them). In contrast, for ACOs participating in Track 3 or Track 1+ (two-sided financial risk), the Shared Savings Program applies a **prospective** assignment methodology in which attribution to the ACO is determined by historical provision of care (specifically, the 12 months ending three months prior to the start of the participation year). Thus, these ACOs know with certainty which beneficiaries will be attributed to them throughout the participation year. All AIM ACOs participated in Track 1 in PY1. In PY2, one AIM ACO (Sunshine ACO), transitioned to Track 3. In PY3, three total AIM ACOs participated to a two-sided financial risk track (North Mississippi ACO, Sunshine ACO, and PremierMD ACO).

### *Applying the Assignment Algorithm*

We had access to the MDM Beneficiary Extract and Benchmark files to identify the officially assigned beneficiaries in each year from 2013 to 2018 (see **Appendix 1B** for a description of these files). For AIM Test 1 ACOs, the MDM Beneficiary Extract enabled us to identify assigned beneficiaries in each of the performance years. The Benchmark files allowed us to identify the beneficiaries who would have been assigned to an ACO in 2013 through 2015 based on the providers participating in the ACO in 2016, 2017,

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[13] CMS (79 FR 67802), "Medicare Program; Medicare Shared Savings Program: Accountable Care Organizations," June 9, 2015.

[14] CMS (42 CFR Parts 405, 4010, 411, et al., "Medicare Program: Revisions to Payment Policies Under the Physician Fee Schedule and Other Revisions to Part B for CY 2016," November 16, 2015. Also see https://www.naacos.com/news/Criticalchangesin2016Medicarephysicianfeeschedule392016.htm accessed May 24, 2016

and 2018, separately.[15] In other words, we constructed performance year-specific baselines.[16] In 2018, benchmark files were not available for ACOs that began in the Shared Savings Program in 2014 and 2015 (seven of the AIM ACOs) because they were not needed for the financial reconciliation. For these seven AIM ACOs, we applied only the Abt assignment algorithm to determine assignment in 2018 (PY3) and each of the 2013 to 2015 baseline years. PY1 and PY2 assignment were not affected.

We replicated assignment using the evaluation's CCW claims and enrollment data to ensure that the assignment algorithm was consistently applied to create the intervention group of ACO-assigned beneficiaries and comparison group of beneficiaries.

To evaluate AIM Test 2 ACOs, which existed in the Shared Savings Program for at least two years prior to joining AIM, we applied the assignment algorithm to the providers in each performance year since starting the Shared Savings Program to create two baseline years preceding their first performance year in AIM.[17] For PY1 analyses provided in the AIM Evaluation Performance Year 1 Report (2018), we used actual assignment rules in place during each year. That is, for a Test 2 ACO that began AIM in 2016, we used 2016 assignment rules in 2016 with the providers participating in the ACO that year and prior assignment rules in the prior years for the providers participating in the ACO in those years. In the AIM Evaluation Performance Year 2 Report (2019) and for this Final Report, we applied the new-in-2017 assignment rules for PY2 and PY3 (including the baseline). We found that removing beneficiaries who received care in a SNF setting from assignment (per the 2017 assignment rules updates) changed the composition of beneficiaries such that they were less costly even though only about 5 percent of beneficiaries were affected. We did not want the performance year beneficiaries to be artificially *less* costly beneficiaries than those in the baseline period due solely to the change in assignment rules.

We were able to closely match the officially assigned beneficiaries after replicating assignment. Overall, we identified 95 percent of officially assigned beneficiaries across AIM ACOs (see Exhibit 1B-1). The small percentage of officially assigned beneficiaries who were not assigned based on evaluation data were because the beneficiary did not meet eligibility criteria; was assigned to another ACO; or was not assigned to any ACO. These discrepancies in assignment likely arose from differences in the timing of the data sources used—Abt assignment was conducted with more claims run-out time than available to the financial reconciliation contractor. Our application of the algorithm did yield a number of assigned beneficiaries that were not on the official lists. Across AIM ACOs, Abt assigned, on average, 4 to 5 percent more beneficiaries than the number of Abt beneficiaries matching the official list of beneficiaries (last column of Exhibit 1B-1).

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[15] Five AIM Test 1 ACOs began SSP in 2015 and AIM in 2016. We still hypothetically assigned beneficiaries to performance year providers using claims data in 2015.

[16] That is, for PY1, we assigned beneficiaries to ACOs in 2016 and hypothetically assigned using ACO 2016 providers in 2013, 2014, and 2015. For PY2, we assigned beneficiaries to an ACO in 2017 and hypothetically assigned using ACO 2017 providers in 2013, 2014, and 2015. For PY3, we assigned beneficiaries to an ACO in 2018 and hypothetically assigned using ACO 2018 providers in 2013, 2014, and 2015.

[17] The exception was the Physicians Collaborative Trust of Mississippi Gulf Coast, which started the Shared Savings Program in 2012. For this ACO, we applied the assignment algorithm starting in 2013.

**Exhibit 1B-1. Comparing Official and Abt-Assigned Beneficiary Counts across AIM ACOs**

| Year | # of AIM ACOs [a] | Total # Official Beneficiaries | # Abt Beneficiaries | % Overlap | # Abt Additional | % Abt Additional |
|---|---|---|---|---|---|---|
| PY 1 | | | | | | |
| 2013 | 45 | 405,576 | 398,535 | 98.3% | 18,758 | 4.7% |
| 2014 | 47 | 438,542 | 429,914 | 98.0% | 19,221 | 4.5% |
| 2015 | 47 | 445,589 | 435,412 | 97.7% | 20,447 | 4.7% |
| 2016 | 45 | 419,237 | 412,750 | 98.4% | 16,890 | 4.1% |
| PY 2 | | | | | | |
| 2013 | 45 | 455.029 | 437,650 | 96.2% | 15,585 | 3.6% |
| 2014 | 47 | 492,367 | 470,928 | 95.6% | 16,623 | 3.5% |
| 2015 | 47 | 507,839 | 480,690 | 94.7% | 17,026 | 3.5% |
| 2017 | 45 | 470,129 | 449,428 | 95.6% | 24,275 | 5.4% |
| PY3 [b] | | | | | | |
| 2013 | 38 | 397,745 | 375,828 | 94.4% | 15,014 | 4.3% |
| 2014 | 38 | 411,602 | 387,707 | 94.1% | 15,347 | 4.1% |
| 2015 | 38 | 424,764 | 398,860 | 93.7% | 16,368 | 4.1% |
| 2018 | 45 | 491,916 | 467,755 | 95.1% | 20,299 | 4.2% |

Note:

[a] Two AIM Test 2 ACOs were not present in 2016-2018 because they exited the Shared Savings Program at the end of 2015. Two additional AIM Test 2 ACOs were not present in 2013 because they began the Shared Savings Program in 2014. For AIM Test 2 ACOs, actual SSP assignment was used to define the AIM baseline. In contrast, for AIM Test 1 ACOs, we compared Abt's hypothetical assignment to the Benchmark files for 2013 through 2015 (the baseline years for AIM Test 1 ACOs).

[b] In 2018, benchmark files in 2013 to 2015 were not created for SSP ACOs beginning the Shared Savings Program in 2014 or 2015. Thus, for those ACOs, we used only Abt assignment and did not compare to officially assigned beneficiaries.

Source: For Performance Year 1 (PY1): Master Data Management (MDD_BENE_EXTRACT_LINKED_170911), Benchmark files from 2013 to 2015 received from CMS in May 2017. For Performance Year 2 (PY2): Master Data Management (MDD_BENE_EXTRACT_LINKED_180920) accessed on November 20, 2018, updated Benchmark files from 2013 to 2015 received from CMS in August.

The Abt beneficiaries overlapping with the official lists were designated as ACO beneficiaries—or beneficiaries exposed to the intervention of being in an AIM ACO—for the purposes of this evaluation. Thus, both Abt additional beneficiaries and officially assigned beneficiaries not assigned by Abt were excluded from the ACO group. If they met the comparison group criteria (see **Chapter 3**), Abt additional beneficiaries may have appeared in an ACO's market comparison group; however, officially assigned beneficiaries that were not identified by Abt were excluded from both ACO and comparison groups. In 2018, seven AIM ACOs that began the Shared Savings Program in 2014 or 2015 were assigned beneficiaries only based on Abt's algorithm without comparison to official lists since they were not available for the baseline period.

# Appendix 1C. AIM Evaluation Performance Measures

| Measure | Description |
|---|---|
| Medicare payments (per beneficiary per month) | |
| Total payment | Total Medicare Payments (Parts A and B, includes Per Diem Payment for Acute & OIP) |
| Acute inpatient | Acute Medicare Payment + Acute Per Diem Payment<br>Acute Medicare Payment is the sum of the Medicare claim payment amounts (claim payment amount from each claim) in the acute inpatient setting for a given year.<br>Acute Per Diem Payment is the sum of the entire pass through per diem payment amounts (Claim pass through per diem amount from each claim) in the acute inpatient setting for a given year. Medicare payments are designed to include certain "pass-through" expenses such as capital-related costs, direct medical education costs, kidney acquisition costs for hospitals that are renal transplant centers, and bad debts. This variable is the sum of all the daily payments for pass-through expenses. It is not included in the Medicare Payment amount (Acute Medicare Payment). To determine the total Medicare payments for acute hospitalizations for the beneficiary, this field should be added to the total Medicare payment amount for acute hospitalizations. |
| Physician services | Anesthesia + E&M + imaging + procedures + physician visits (E&M in office setting) + tests + part B drugs<br>Procedures is the total Medicare payments for services considered part B other procedures (i.e., not anesthesia or dialysis) for a given year. Claims for other procedures are a subset of the claims, and a subset of procedures in the Part B Carrier data file. These other procedure claims are defined as those with a line BETOS code where the first 2 digits are ('P1','P2','P3','P4','P5','P6','P7', or 'P8').<br>Anesthesia is the total Medicare payments for part B anesthesia services for a given year. Anesthesia claims are a subset of the claims, and a subset of procedures in the Part B Carrier data file. Anesthesia claims are defined as those with a line BETOS code where the first 2 digits = “P0” and the units for the carrier line='2'.<br>E&M is the total Medicare payments for the part B evaluation and management services for a given year. E&M claims are a subset of the claims in the Part B Carrier and DME data files, and a subset of physician claims. The E & M claims are defined as those with a line BETOS code where the first digit ='M', but is not M1A or M1B, which are categorized as physician office care in this file.<br>Imaging is the total Medicare payments for imaging services for a given year. Claims for imaging procedures are a subset of the claims, and a subset of procedures in the Part B Carrier and DME data files. These imaging claims are defined as those with a line BETOS code (BETOS_CD) where the first digit =I (except for 'I1E', or 'I1F' – which are considered Part B drugs).<br>Physician visits (E&M in office setting) is the total Medicare payments for the part B physician office services for a given year. Physician office claims are a subset of the claims in the Part B Carrier and DME data files, and a subset of physician evaluation and management claims (note that E&M are tabulated separately in this data file). The physician visit claims are defined as those with a line BETOS code where the first three digits =M1A or M1B (the remainder of physician services which occur in different settings appear in E & M)<br>Tests is the total Medicare payments for part B tests for a given year. Claims for tests are a subset of the claims in the Part B Carrier data file. These claims are defined as those with a line BETOS code where the first digit =T.<br>Part B drugs is the total Medicare payments for Part B drugs for a given year. Part B drug claims are a subset of the claims in the |

| Measure | Description |
|---|---|
| | Part B Carrier and DME data files. The Part B drug claims are identified by BETOS codes with values of 'D1G','O1D','O1E','O1G','I1E', or 'I1F'. |
| Hospital outpatient + ambulatory surgery centers | Hospital outpatient is the total Medicare payments in the hospital outpatient setting for a given year. Calculated as the sum of CLM_PMT_AMT for all HOP claims where the CLM_PMT_AMT >= 0.<br>Ambulatory surgery center is the total Medicare payments in the part B ambulatory surgery center (ASC) setting for a given year. ASC claims are a subset of the claims in the Part B Carrier data file. The ASC claims are identified by the claim lines where the HCFA type service code = 'F'. The total ASC Medicare Payments are calculated as the sum of NCH payment amount where the processing indicator code was ('A','R', or 'S'). |
| SNF | This variable is the total Medicare payments in the skilled nursing facility (SNF) setting for a given year. The total Medicare payments for SNF are calculated as the sum of non-negative claim payment amounts for all SNF claims. |
| Home health | This variable is the total Medicare payments in the home health (HH) setting for a given year. Calculated as the sum of non-negative claim payment amounts for all HH claims. |
| DME | Total Medicare payments for part B durable medical equipment (DME) for a given year. Claims for DME are a subset of the claims in the Part B Carrier and DME data files.<br>These claims are defined as those with a line BETOS code where the first three digits are ('D1A','D1B','D1C','D1D','D1E', or 'D1F'). |
| Part D prescription drug spending | This variable is the dollar amount that the Part D plan covered for all covered drugs for a given year. The variable is calculated as the sum of the plan payments for covered prescription drug events and the low income cost sharing subsidy amount during the year. |
| Inpatient utilization | |
| Inpatient stays | This variable is the count of acute inpatient hospital stays (unique admissions, which may span more than one facility) for the year. An acute inpatient stay is defined as a set of one or more consecutive acute inpatient hospital claims where the beneficiary is only discharged on the most recent claim in the set. If a beneficiary is transferred to a different provider, the acute stay is continued even if there is a discharge date on the claim from which the beneficiary was transferred. |
| Any inpatient hospitalization | Indicator = 1 if inpatient stays > 0; 0 otherwise |
| All-cause 30-day readmission | Indicator = 1 for hospital readmission within 30 days of hospital discharge for beneficiaries that were hospitalized; 0 otherwise |
| Any ACSC admission | Indicator = 1 for any of the following 13 non-pediatric ambulatory care sensitive conditions (ACSCs): 1. Bacterial pneumonia, 2. Hypertension, 3. Dehydration, 4. Adult asthma, 5. Urinary tract infection, 6. Chronic obstructive pulmonary disease (COPD), 7. Perforated appendix, 8. Diabetes short-term complication, 9. Diabetes long-term complication, 10. Angina without procedure, 11. Uncontrolled diabetes, 12. Congestive heart failure (CHF), 13. Lower-extremity amputation among patients with diabetes; 0 otherwise (see AHRQ, AHRQ Quality Indicators, "Guide to Prevention Quality Indicators: Hospital Admission for Ambulatory Care Sensitive Conditions," October 2001). |
| Emergency department and observation utilization | |
| Any ED visits, no hospital admission | Indicator = 1 if the count of unique emergency department revenue center dates (as a proxy for an ED visit) in the hospital outpatient data file for the year is greater than zero. Revenue center codes indicating Emergency Room use were (0450, 0451, 0452, 0456, or 0459). |
| Any ED visits with hospital admission | Indicator = 1 if the count of emergency department (ED) claims in the inpatient setting for the year is greater than zero. The revenue center codes indicating Emergency Room use were (0450, 0451, 0452, 0456, 0459). |

| Measure | Description |
|---|---|
| Outpatient observation stays | Count of observation stays including those that did and did not result in an inpatient admission.<br>The observation stays that resulted in admission, and are included in the inpatient claim, are identified with revenue center code 0762 in the Inpatient claim file.<br>Medicare-paid observation stays that do not result in an inpatient admission will be found in the Medicare Outpatient file using revenue center code 0762. |
| Post-acute care and hospice utilization | |
| SNF days | Count of Medicare covered days in the skilled nursing facility (SNF) setting for the year. This variable equals the sum of the CLM_UTLZTN_DAY_CNT variables on the source claims. |
| Any hospice use | Indicator = 1 if any hospice spending in the year. |
| Physician services utilization | |
| Physician services: office-based E&M visits | Physician office E&M is the count of events in the Part B physician office services (PHYS) for a given year. An event is defined as each line item that contains the relevant service. Physician office claims are a subset of the claims in the Part B Carrier and DME data files, and a subset of physician evaluation and management claims (note that E&M are tabulated separately in this data file). The PHYS claims are defined as those with a line BETOS code where the first three digits =M1A or M1B (the remainder of physician services which occur in different settings appear in E&M). |
| Physician services: BETOS imaging | Count of events for imaging services (IMG) for a given year. An event is defined as each line item that contains the relevant service. Claims for imaging procedures are a subset of the claims, and a subset of procedures in the Part B Carrier and DME data files. These imaging claims are defined as those with a line BETOS code where the first digit =I (except for 'I1E', or 'I1F' – which are considered Part B drugs). |
| Physician services: BETOS procedures | Count of events for Part B other procedures for a given year. An event is defined as each line item that contains the relevant service. Claims for other procedures are a subset of the claims in the Part B Carrier data file.<br>These other procedure claims are defined as those with a line BETOS code where the first 2 digits are ('P1','P2','P3','P4','P5','P6','P7', or 'P8') |
| Physician services: BETOS tests | Count of events in for Part B tests for a given year. An event is defined as each line item that contains the relevant service. Claims for tests are a subset of the claims in the Part B Carrier data file. These claims are defined as those with a line BETOS code where the first digit =T. |
| Mortality | |
| Mortality | Indicator =1 for death in the year; 0 otherwise |

| Measure | Description |
|---|---|
| Patient or caregiver experience (CAHPS) | |
| Getting timely care, appointments, and information (ACO #1) | CAHPS survey measure, composite of responses to:<br>In the last 6 months, when you phoned this provider's office to get an appointment for care you needed right away, how often did you get an appointment as soon as you needed?<br>In the last 6 months, when you made an appointment for a check-up or routine care with this provider, how often did you get an appointment as soon as you needed?<br>In the last 6 months, when you phoned this provider's office during regular office hours, how often did you get an answer to your medical question that same day?<br>In the last 6 months, when you phoned this provider's office after regular office hours, how often did you get an answer to your medical question as soon as you needed?<br>In the last 6 months, how often did you see this provider within 15 minutes of your appointment time? |
| How well your doctors communicate (ACO #2) | CAHPS survey measure, composite of responses to:<br>In the last 6 months, how often did this provider explain things in a way that was easy to understand?<br>In the last 6 months, how often did this provider listen carefully to you?<br>In the last 6 months, how often did this provider give you easy to understand information about these health questions or concerns?<br>In the last 6 months, how often did this provider seem to know the important information about your medical history?<br>In the last 6 months, how often did this provider show respect for what you had to say?<br>In the last 6 months, how often did this provider spend enough time with you? |
| Patient's rating of doctor (ACO #3) | Using any number from 0 to 10, where 0 is the worst provider possible and 10 is the best provider possible, what number would you use to rate this provider? |
| Access to specialists (ACO #4) | CAHPS survey measure, composite of responses to:<br>In the last 6 months, how often was it easy to get appointments with specialists?<br>In the last 6 months, how often did the specialist you saw most seem to know the important information about your medical history? |
| Health promotion and education (ACO #5) | CAHPS survey measure, composite of responses to:<br>Your health care team includes all the doctors, nurses and other people you see for health care. In the last 6 months, did you and anyone on your health care team talk about specific things you could do to prevent illness?<br>In the last 6 months, did you and anyone on your health care team talk about a healthy diet and healthy eating habits?<br>In the last 6 months, did you and anyone on your health care team talk about the exercise or physical activity you get?<br>In the last 6 months, did anyone on your health care team talk with you about specific goals for your health?<br>In the last 6 months, did anyone on your health care team ask you if there was a period of time when you felt sad, empty, or depressed?<br>In the last 6 months, did you and anyone on your health care team talk about things in your life that worry you or cause you stress? |

| Measure | Description |
|---|---|
| Shared decision making (ACO #6) | CAHPS survey measure, composite of responses to:<br>Did you and this provider talk about the reasons you might want to take a medicine?<br>Did you and this provider talk about the reasons you might not want to take a medicine?<br>When you and this provider talked about starting or stopping a prescription medicine, did this provider ask what you thought was best for you?<br>Did you and this provider talk about the reasons you might want to have the surgery or procedure?<br>Did you and this provider talk about the reasons you might not want to have the surgery or procedure?<br>When you and this provider talked about having surgery or a procedure, did this provider ask what you thought was best for you?<br>In the last 6 months, did you and this provider talk about how much of your personal health information you wanted shared with your family or friends?<br>In the last 6 months, did this provider respect your wishes about how much of your personal health information to share with your family or friends? |
| Preventive health | |
| Depression screening (ACO #18) | GPRO Web Interface reported measure; Full measure name: Preventive Care and Screening: Screening for Clinical Depression and Follow-Up Plan – National Quality Strategy Domain: Community/Population Health; Percentage of patients aged 12 years and older screened for clinical depression on the date of the encounter using an age appropriate standardized depression screening tool AND if positive, a follow-up plan is documented on the date of the positive screen |
| Colorectal cancer screening (ACO #19) | GPRO Web Interface reported measure; Percentage of patients 50-75 years of age who had appropriate screening for colorectal cancer |
| Mammography screening (ACO #20) | GPRO Web Interface reported measure |
| At-risk populations | |
| Diabetes poor control (ACO#27) | GPRO Web Interface reported measure; Full measure name: Diabetes: Hemoglobin A1c Poor Control – National Quality Strategy Domain: Effective Clinical Care; Percentage of patients 18-75 years of age with diabetes who had hemoglobin A1c > 9.0% during the measurement period. For some analyses I the report, we reverse the scale so that higher is better. |
| Hypertension (blood pressure control) (ACO #28) | GPRO Web Interface reported measure; Percentage of patients 18 through 85 years of age who had a diagnosis of hypertension and whose blood pressure was adequately controlled (< 140/90 mmHg) during the measurement period |
| Ischemic vascular disease control (ACO#30) | GPRO Web Interface reported measure; Full measure name is: Ischemic Vascular Disease (IVD): Use of Aspirin or Another Antithrombotic – National Quality Strategy Domain: Effective Clinical Care; Percentage of patients 18 years of age and older who were discharged alive for acute myocardial infarction (AMI), coronary artery bypass graft (CABG) or percutaneous coronary interventions (PCI) in the 12 months prior to the measurement period, or who had an active diagnosis of ischemic vascular disease (IVD) during the measurement period, and who had documentation of use of aspirin or another antithrombotic during the measurement period |

Sources: Chronic Condition Data Warehouse, Master Beneficiary Summary File Cost & Use Segment Codebook, May 2017, Version 1.0; Accountable Care Organization 2015-2017 Quality Measure Narrative Specifications.

# Appendix 2A. AIM Test 1 ACO Characteristics Across Performance Years

**Exhibit 2A-1. Performance Year 1 (2016) Geographic Characteristics of AIM Markets**

| ACO Name | # of Assigned Beneficiaries | Area Deprivation Index | MA penetration | Favorability Score | Contiguity | Rurality | Primary Care HPSA | Mental Health HPSA |
|---|---|---|---|---|---|---|---|---|
| Access Care Oklahoma | 6,869 | 74.1 | 12.2% | 27.3 | 0 | 76.3% | 22.9% | 49.4% |
| Affiliated ACO | 5,352 | 57 | 52.1% | 23.3 | Yes | 99.3% | 7.8% | 100.0% |
| Akira Health of Los Angeles | 4,678 | 36.5 | 39.5% | 57.5 | Yes | 0.9% | 3.6% | 16.4% |
| Aledade Kansas ACO | 7,857 | 67.4 | 6.3% | 17.3 | 0 | 84.9% | 2.6% | 86.2% |
| Aledade Mississippi ACO | 11,659 | 76.4 | 16.8% | 30.6 | 0 | 87.0% | 38.3% | 86.8% |
| Aledade West Virginia ACO | 7,103 | 64.3 | 30.6% | 32.4 | 0 | 4.2% | 2.8% | 13.7% |
| Alliance ACO | 6,876 | 56.7 | 17.1% | 41.3 | 0 | 96.8% | 10.2% | 87.5% |
| AmpliPHY of Kentucky ACO | 6,523 | 65.7 | 21.4% | 30.5 | Yes | 99.1% | 32.2% | 100.0% |
| AmpliPHY of Texas ACO | 6,700 | 55.9 | 40.1% | 45.9 | 0 | 12.3% | 9.0% | 17.3% |
| Beacon Rural Health | 5,931 | 51.8 | 18.3% | 22.4 | Yes | 92.1% | 3.3% | 31.3% |
| California ACO | 9,968 | 37.9 | 18.4% | 35 | Yes | 78.0% | 3.5% | 77.7% |
| Carolina Medical Home Network ACO | 11,388 | 73.6 | 22.3% | 29.5 | 0 | 72.9% | 11.9% | 51.8% |
| Citrus County ACO | 8,712 | 62.7 | 33.5% | 47.6 | Yes | 0.3% | 0.0% | 0.0% |
| Deep South Regional ACO | 6,216 | 71.1 | 28.9% | 31.5 | 0 | 66.5% | 24.1% | 97.2% |
| Great Plains Care Organization | 9,172 | 59 | 4.9% | 7.5 | Yes | 98.8% | 15.5% | 100.0% |
| Heartland Physicians ACO | 5,645 | 56.6 | 37.4% | 18.8 | 0 | 34.3% | 3.3% | 94.7% |
| High Sierras-Northern Plains ACO | 7,271 | 44.6 | 9.3% | 34 | 0 | 97.5% | 24.6% | 50.4% |
| Illinois Rural ACO | 12,693 | 63.2 | 19.0% | 29.4 | 0 | 75.2% | 5.1% | 76.9% |
| Illinois Rural Community Care Org. | 17,402 | 67.6 | 16.0% | 28.2 | 0 | 91.7% | 23.8% | 97.1% |
| Indiana Rural ACO | 12,516 | 67.5 | 17.9% | 32.3 | 0 | 91.0% | 16.9% | 32.8% |
| Indiana Rural ACO II | 5,114 | 61.5 | 22.5% | 33.3 | Yes | 82.2% | 1.5% | 52.0% |
| Iowa Rural ACO | 10,191 | 68.9 | 8.4% | 13.3 | 0 | 97.7% | 14.6% | 98.9% |
| Kentucky Primary Care Alliance Region 2 | 3,967 | 76.5 | 24.4% | 35.1 | 0 | 85.8% | 38.4% | 58.0% |
| Magnolia-Evergreen ACO | 10,861 | 67.2 | 13.4% | 24.7 | 0 | 84.5% | 33.3% | 97.7% |
| Michigan Rural ACO | 10,163 | 72.6 | 26.5% | 24.8 | 0 | 96.7% | 15.9% | 98.8% |
| Minnesota Rural ACO | 4,630 | 52.8 | 49.2% | 14.2 | 0 | 97.6% | 3.1% | 50.6% |
| MissouriHealth+ | 5,876 | 67.4 | 21.5% | 22.9 | 0 | 52.1% | 26.5% | 52.8% |
| Mountain Prairie ACO | 11,969 | 61.6 | 12.7% | 17.5 | 0 | 80.7% | 42.7% | 100.0% |
| Mountain West ACO | 10,467 | 52 | 15.8% | 0.6 | 0 | 97.5% | 1.3% | 94.6% |
| New Hampshire Rural ACO | 10,999 | 50.9 | 5.2% | 15.4 | Yes | 97.2% | 4.3% | 53.9% |
| North Mississippi Connected Care Alliance | 17,390 | 72.4 | 7.9% | 25.7 | Yes | 99.9% | 31.1% | 99.7% |

| ACO Name | # of Assigned Beneficiaries | Area Deprivation Index | MA penetration | Favorability Score | Contiguity | Rurality | Primary Care HPSA | Mental Health HPSA |
|---|---|---|---|---|---|---|---|---|
| Ohio River Basin ACO | 13,056 | 65.7 | 29.9% | 36.7 | 0 | 78.4% | 14.4% | 48.5% |
| Oregon-Indiana ACO | 7,591 | 59.7 | 31.1% | 22.1 | 0 | 82.0% | 1.5% | 83.2% |
| Prairie Hills Care Organization | 9,319 | 58.6 | 16.9% | 6.8 | 0 | 100.0% | 14.8% | 99.9% |
| Reid ACO | 8,629 | 72.9 | 14.5% | 30.4 | Yes | 97.4% | 9.0% | 98.3% |
| Rocky Mountain ACO | 12,447 | 41.4 | 9.2% | 19.5 | 0 | 87.4% | 60.4% | 99.3% |
| San Juan ACO | 6,904 | 44.8 | 18.8% | 8.1 | Yes | 100.0% | 0.2% | 100.0% |
| Southern Michigan Rural ACO | 8,695 | 64.8 | 33.7% | 28.3 | 0 | 75.8% | 12.9% | 55.6% |
| Tar River Health Alliance | 8,400 | 68.7 | 19.7% | 36.9 | Yes | 13.9% | 0.4% | 87.2% |
| Texas Rural ACO | 5,946 | 63.3 | 26.8% | 42.5 | 0 | 60.6% | 26.2% | 58.5% |
| Winding River ACO | 5,870 | 73.6 | 31.7% | 36.9 | 0 | 86.2% | 5.0% | 67.9% |

Note: Markets are defined using the Primary Care Service Areas (PCSAs) where at least 0.5 percent of the ACOs' assigned beneficiares reside. See Chapter 2 of the report for defnitions of each of the geographic variables.

**Exhibit 2A-2. Performance Year 2 (2017) Geographic Characteristics of AIM Markets**

| ACO Name | # of Assigned Beneficiaries | Area Deprivation Index | MA penetration | Favorability Score | Contiguity | Rurality | Primary Care HPSA | Mental Health HPSA |
|---|---|---|---|---|---|---|---|---|
| Access Care Oklahoma | 7,682 | 70.2 | 13.8% | 27.1 | Yes | 65.4% | 20.0% | 46.0% |
| Affiliated ACO | 4,497 | 56.5 | 54.4% | 23.2 | Yes | 98.3% | 8.3% | 100.0% |
| Akira Health of Los Angeles | 4,769 | 38.9 | 39.8% | 54.8 | 0 | 0.7% | 5.7% | 35.8% |
| Aledade Kansas ACO | 10,579 | 64 | 6.5% | 16.3 | 0 | 71.1% | 3.0% | 89.7% |
| Aledade Mississippi ACO | 15,928 | 67.5 | 19.3% | 31.4 | 0 | 57.7% | 30.6% | 89.6% |
| Aledade West Virginia ACO | 7,270 | 64.7 | 32.7% | 32.2 | 0 | 8.0% | 3.6% | 19.3% |
| Alliance ACO | 10,179 | 48 | 23.0% | 40.2 | 0 | 54.3% | 5.9% | 53.7% |
| AmpliPHY of Kentucky ACO | 3,901 | 65.7 | 22.0% | 30.5 | Yes | 99.2% | 31.4% | 100.0% |
| AmpliPHY of Texas ACO | 5,421 | 58.3 | 42.3% | 46 | 0 | 15.0% | 13.2% | 21.5% |
| Beacon Rural Health | 5,759 | 50.8 | 20.5% | 22.4 | Yes | 92.8% | 5.6% | 29.1% |
| California ACO | 19,967 | 38.3 | 16.8% | 33.2 | Yes | 56.8% | 5.3% | 79.4% |
| Carolina Medical Home Network ACO | 13,184 | 71 | 25.0% | 27.4 | 0 | 59.1% | 10.7% | 45.5% |
| Citrus County ACO | 8,721 | 61.8 | 36.5% | 47.7 | Yes | 0.3% | 0.0% | 0.0% |
| Deep South Regional ACO | 8,004 | 74.2 | 31.0% | 29.2 | 0 | 72.2% | 23.1% | 71.6% |
| Great Plains Care Organization | 9,786 | 60.6 | 4.9% | 8.5 | 0 | 98.9% | 16.9% | 100.0% |
| Heartland Physicians ACO | 5,078 | 57.7 | 38.2% | 18.9 | 0 | 36.0% | 3.4% | 98.2% |
| High Sierras-Northern Plains ACO | 7,448 | 46.1 | 9.3% | 34.2 | 0 | 97.9% | 23.8% | 49.5% |
| Illinois Rural ACO | 13,359 | 62.6 | 20.2% | 29.6 | 0 | 72.4% | 5.4% | 73.0% |
| Illinois Rural Community Care Org. | 14,455 | 69.2 | 18.2% | 28.2 | 0 | 90.4% | 28.5% | 96.9% |
| Indiana Rural ACO | 11,764 | 67.4 | 18.9% | 32.1 | 0 | 91.6% | 28.2% | 28.6% |
| Indiana Rural ACO II | 5,106 | 60.1 | 23.4% | 33.8 | Yes | 81.7% | 0.8% | 59.0% |
| Iowa Rural ACO | 9,457 | 68.7 | 8.2% | 13.2 | 0 | 97.5% | 14.9% | 98.8% |
| Kentucky Primary Care Alliance Region 2 | 7,676 | 81.4 | 25.2% | 35.1 | 0 | 93.4% | 17.5% | 84.2% |
| Magnolia-Evergreen ACO | 9,716 | 65.1 | 15.2% | 23.8 | 0 | 77.4% | 22.1% | 97.6% |
| Michigan Rural ACO | 10,754 | 72.2 | 28.1% | 23.9 | 0 | 97.1% | 16.0% | 98.6% |
| Minnesota Rural ACO | 10,357 | 49.2 | 51.3% | 19.7 | 0 | 56.8% | 0.7% | 54.3% |
| MissouriHealth+ | 10,527 | 69.6 | 27.7% | 25.2 | 0 | 37.6% | 24.7% | 46.1% |
| Mountain Prairie ACO | 8,722 | 67.1 | 8.3% | 20.1 | 0 | 97.9% | 55.7% | 100.0% |
| Mountain West ACO | 8,767 | 51.5 | 15.6% | 0.2 | 0 | 97.5% | 2.3% | 94.2% |

| ACO Name | # of Assigned Beneficiaries | Area Deprivation Index | MA penetration | Favorability Score | Contiguity | Rurality | Primary Care HPSA | Mental Health HPSA |
|---|---|---|---|---|---|---|---|---|
| New Hampshire Rural ACO | 10,765 | 50.5 | 7.5% | 15.5 | Yes | 97.2% | 4.3% | 52.9% |
| North Mississippi Connected Care Alliance | 16,142 | 72.1 | 8.6% | 25.7 | Yes | 99.8% | 29.5% | 99.7% |
| Ohio River Basin ACO | 12,001 | 65.9 | 27.9% | 37.2 | 0 | 83.0% | 7.0% | 55.5% |
| Oregon-Indiana ACO | 6,212 | 75.9 | 19.7% | 25.8 | 0 | 94.9% | 9.2% | 82.0% |
| Prairie Hills Care Organization | 8,839 | 58.1 | 15.6% | 6.8 | 0 | 100.0% | 13.2% | 99.9% |
| Reid ACO | 9,365 | 72.9 | 14.6% | 30.3 | Yes | 97.4% | 8.1% | 97.8% |
| Rocky Mountain ACO | 12,689 | 40.6 | 9.8% | 18.5 | 0 | 88.7% | 58.9% | 99.4% |
| San Juan ACO | 7,582 | 44.8 | 18.7% | 8 | Yes | 100.0% | 2.1% | 100.0% |
| Southern Michigan Rural ACO | 8,135 | 64.6 | 35.1% | 28.3 | 0 | 74.1% | 23.0% | 54.1% |
| Tar River Health Alliance | 10,151 | 68.8 | 20.2% | 36.9 | Yes | 14.9% | 5.2% | 86.1% |
| Texas Rural ACO | 5,915 | 64 | 28.8% | 42.4 | 0 | 64.2% | 24.9% | 61.3% |
| Winding River ACO | 12,541 | 57 | 27.7% | 38.5 | 0 | 88.3% | 19.0% | 86.8% |

Note: Markets are defined using the Primary Care Service Areas (PCSAs) where at least 0.5 percent of the ACOs' assigned beneficiares reside. See Chapter 2 of the report for defnitions of each of the geographic variables.

**Exhibit 2A-3. Performance Year 3 (2018) Geographic Characteristics of AIM Markets**

| ACO Name | # of Assigned Beneficiaries | Area Deprivation Index | MA penetration | Favorability Score | Contiguity | Rurality | Primary Care HPSA | Mental Health HPSA |
|---|---|---|---|---|---|---|---|---|
| Access Care Oklahoma | 16,054 | 60.9 | 20.4% | 25.7 | Yes | 36.7% | 12.0% | 18.0% |
| Affiliated ACO | 4,091 | 56.0 | 54.3% | 23.0 | Yes | 98.1% | 17.0% | 100.0% |
| Akira Health of Los Angeles | 5,795 | 27.9 | 38.5% | 52.9 | 0 | 0.0% | 15.2% | 15.2% |
| Aledade Kansas ACO | 15,726 | 62.2 | 8.6% | 16.2 | 0 | 67.7% | 2.3% | 85.4% |
| Aledade Mississippi ACO | 15,298 | 66.8 | 21.4% | 31.6 | 0 | 54.5% | 30.1% | 89.3% |
| Aledade West Virginia ACO | 6,852 | 64.9 | 35.4% | 32.3 | 0 | 9.2% | 3.1% | 9.6% |
| Alliance ACO | 7,063 | 42.3 | 27.5% | 38.6 | 0 | 34.1% | 2.0% | 31.3% |
| AmpliPHY of Kentucky ACO | 4,743 | 65.6 | 24.6% | 30.6 | Yes | 99.3% | 28.9% | 100.0% |
| AmpliPHY of Texas ACO | 4,458 | 61.2 | 45.3% | 46.3 | Yes | 21.1% | 14.0% | 29.1% |
| Beacon Rural Health | 17,743 | 53.5 | 26.9% | 23.7 | 0 | 66.4% | 1.8% | 18.7% |
| California ACO | 15,723 | 40.1 | 14.5% | 31.7 | Yes | 50.1% | 26.8% | 82.9% |
| Carolina Medical Home Network ACO | 7,731 | 67.4 | 32.3% | 23.8 | 0 | 44.4% | 8.8% | 38.6% |
| Citrus County ACO | 12,009 | 59.8 | 39.5% | 48.1 | Yes | 0.2% | 0.0% | 0.0% |
| Deep South Regional ACO | 8,129 | 76.6 | 33.9% | 28.2 | 0 | 78.6% | 22.9% | 99.0% |
| Great Plains Care Organization | 9,679 | 60.7 | 5.6% | 8.5 | 0 | 98.8% | 19.7% | 100.0% |
| Heartland Physicians ACO | 5,149 | 57.9 | 37.7% | 18.6 | 0 | 39.9% | 3.6% | 97.5% |
| High Sierras-Northern Plains ACO | 8,267 | 45.2 | 10.0% | 32.3 | 0 | 98.4% | 35.4% | 62.8% |
| Illinois Rural ACO | 13,425 | 62.5 | 20.5% | 29.7 | 0 | 73.3% | 5.1% | 73.3% |
| Illinois Rural Community Care Organization | 22,094 | 67.9 | 18.3% | 28.9 | Yes | 86.7% | 30.6% | 97.8% |
| Indiana Rural ACO | 9,569 | 66.5 | 20.7% | 33.5 | 0 | 90.3% | 22.2% | 98.8% |
| Indiana Rural ACO II | 5,423 | 60.1 | 27.1% | 33.8 | Yes | 81.1% | 0.7% | 99.5% |
| Iowa Rural ACO | 10,012 | 68.9 | 8.6% | 13.3 | 0 | 97.8% | 13.8% | 74.6% |
| Kentucky Primary Care Alliance Region 2 | 7,543 | 81.2 | 27.4% | 35.2 | 0 | 93.4% | 31.4% | 87.1% |
| Magnolia-Evergreen ACO | 12,310 | 63.8 | 17.5% | 22.8 | 0 | 66.9% | 22.1% | 98.2% |

| ACO Name | # of Assigned Beneficiaries | Area Deprivation Index | MA penetration | Favorability Score | Contiguity | Rurality | Primary Care HPSA | Mental Health HPSA |
|---|---|---|---|---|---|---|---|---|
| Michigan Rural ACO | 8,177 | 72.9 | 30.4% | 27.4 | 0 | 95.3% | 11.9% | 98.4% |
| Minnesota Rural ACO | 10,387 | 48.8 | 51.8% | 19.8 | 0 | 56.6% | 6.9% | 56.7% |
| MissouriHealth+ | 8,250 | 71.0 | 31.0% | 25.9 | 0 | 36.7% | 12.8% | 10.2% |
| Mountain Prairie ACO | 10,534 | 66.1 | 7.2% | 20.8 | 0 | 98.7% | 59.2% | 100.0% |
| Mountain West ACO | 9,996 | 50.8 | 14.4% | 0.9 | 0 | 97.4% | 2.9% | 87.5% |
| New Hampshire Rural ACO | 11,243 | 50.7 | 9.7% | 15.2 | Yes | 97.4% | 4.0% | 55.2% |
| North Mississippi Connected Care Alliance | 17,637 | 72.0 | 9.5% | 25.7 | Yes | 99.9% | 31.2% | 99.7% |
| Ohio River Basin ACO | 9,637 | 67.2 | 30.2% | 38.0 | 0 | 87.6% | 1.8% | 55.1% |
| Oregon-Indiana ACO | 6,125 | 75.2 | 22.5% | 25.8 | 0 | 95.2% | 3.0% | 83.7% |
| Prairie Hills Care Organization | 8,872 | 57.9 | 14.8% | 7.1 | 0 | 100.0% | 12.4% | 51.4% |
| Reid ACO | 9,650 | 73.0 | 16.3% | 30.3 | Yes | 97.8% | 13.7% | 99.8% |
| Rocky Mountain ACO | 12,431 | 41.5 | 10.2% | 18.0 | 0 | 88.1% | 21.2% | 100.0% |
| San Juan ACO | 8,465 | 45.6 | 20.1% | 7.9 | Yes | 99.4% | 1.7% | 100.0% |
| Southern Michigan Rural ACO | 8,504 | 64.9 | 37.0% | 28.2 | 0 | 76.2% | 19.8% | 71.2% |
| Tar River Health Alliance | 9,211 | 68.5 | 24.6% | 36.8 | Yes | 15.5% | 5.4% | 86.0% |
| Texas Rural ACO | 5,652 | 63.2 | 33.3% | 41.8 | 0 | 62.4% | 37.2% | 43.1% |
| Winding River ACO | 11,594 | 57.4 | 29.9% | 38.5 | 0 | 88.2% | 19.8% | 90.1% |

Note: Markets are defined using the Primary Care Service Areas (PCSAs) where at least 0.5 percent of the ACOs' assigned beneficiares reside. See Chapter 2 of the report for defnitions of each of the geographic variables.

## Appendix 2B. Status of AIM Funds at the End of of 2018

| ACO Name | Total Aim Funds Received | Earned Shared Savings | Recouped Aim Funds | Aim Funds Outstanding |
|---|---|---|---|---|
| AIM Test 1 ACOs | | | | |
| Carolina Medical Home Network ACO | $2,530,000 | $0 | $0 | $2,530,000 |
| Illinois Rural Community Care Organization (IL-RCCO) | $2,530,000 | $0 | $0 | $2,530,000 |
| Reid ACO | $2,080,708 | $0 | $0 | $2,080,708 |
| Akira Health of Los Angeles | $1,459,912 | $0 | $0 | $1,459,912 |
| Texas Rural ACO | $1,773,220 | $0 | $0 | $1,773,220 |
| Access Care Oklahoma | $2,182,153 | $0 | $0 | $2,182,153 |
| Citrus County ACO | $2,220,244 | $16,920,039 | $2,220,244 | $0 |
| AmpliPHY of Texas ACO | $1,886,752 | $1,512,861 | $1,512,861 | $373,891 |
| AmpliPHY of Kentucky ACO | $1,966,720 | $1,110,552 | $1,110,552 | $856,168 |
| Winding River ACO | $2,078,824 | $0 | $0 | $2,078,824 |
| Prairie Hills Care Organization | $2,462,236 | $6,698,862 | $2,462,236 | $0 |
| Great Plains Care Organization | $2,054,932 | $1,992,047 | $1,992,047 | $62,885 |
| Mountain Prairie ACO | $2,522,800 | $4,568,040 | $2,522,800 | $0 |
| Iowa Rural ACO | $2,530,000 | $2,416,099 | $2,130,000 | $400,000 |
| Illinois Rural ACO | $2,530,000 | $0 | $0 | $2,530,000 |
| Indiana Rural ACO II / Suburban Health ACO 2 | $1,601,716 | $3,012,667 | $1,601,716 | $0 |
| Indiana Rural ACO | $2,530,000 | $0 | $0 | $2,530,000 |
| Michigan Rural ACO / Greater Michigan Rural ACO | $2,530,000 | $4,830,938 | $2,530,000 | $0 |
| Southern Michigan Rural ACO | $2,439,124 | $6,652,041 | $2,439,124 | $0 |
| New Hampshire Rural ACO | $2,530,000 | $2,344,335 | $2,344,335 | $185,665 |
| Ohio River Basin ACO | $2,530,000 | $0 | $0 | $2,530,000 |
| Magnolia-Evergreen ACO | $2,530,000 | $4,920,692 | $2,130,000 | $400,000 |
| North Mississippi Connected Care Alliance | $2,530,000 | $0 | $0 | $2,530,000 |
| Deep South Regional ACO | $2,324,608 | $0 | $0 | $2,324,608 |
| Minnesota Rural ACO | $1,898,116 | $0 | $0 | $1,898,116 |
| Oregon-Indiana ACO | $2,135,476 | $0 | $0 | $2,135,476 |
| Mountain West ACO | $2,519,920 | $0 | $0 | $2,519,920 |
| High Sierras-Northern Plains ACO | $2,229,940 | $1,710,469 | $1,710,469 | $519,471 |
| Aledade Kansas ACO | $2,093,344 | $5,640,999 | $2,093,344 | $0 |
| Aledade West Virginia ACO | $2,115,328 | $5,704,495 | $2,115,328 | $0 |
| Heartland Physicians ACO | $2,006,332 | $2,348,857 | $2,006,332 | $0 |
| Alliance ACO | $2,263,228 | $7,149,502 | $2,263,228 | $0 |
| Kentucky Primary Care Alliance | $1,924,516 | $3,811,314 | $1,924,516 | $0 |
| Aledade Mississippi ACO | $2,530,000 | $6,984,966 | $2,530,000 | $0 |
| Tar River Health Alliance | $1,871,695 | $0 | $0 | $1,871,695 |
| Affiliated ACO | $1,647,964 | $0 | $0 | $1,647,964 |

| ACO Name | Total Aim Funds Received | Earned Shared Savings | Recouped Aim Funds | Aim Funds Outstanding |
|---|---|---|---|---|
| California ACO | $2,530,000 | $2,679,597 | $2,530,000 | $0 |
| San Juan ACO | $1,966,804 | $0 | $0 | $1,966,804 |
| Rocky Mountain ACO | $2,530,000 | $2,114,878 | $2,114,878 | $415,122 |
| MissouriHealth+ | $2,227,192 | $5,730,958 | $2,227,192 | $0 |
| Beacon Rural Health | $1,745,716 | $0 | $0 | $1,745,716 |
| AIM Test 2 ACOs | | | | |
| Physicians Collaborative Trust of Mississippi Gulf Coast | $458,808 | $0 | $458,808 | $0 |
| Baroma Healthcare International | $620,550 | $5,194,226 | $620,550 | $0 |
| The Premier Healthcare Network | $1,094,544 | $11,143,451 | $1,094,544 | $0 |
| Akira Health | $1,490,004 | $0 | $1,490,004 | $0 |
| Sunshine ACO | $903,888 | $11,565,546 | $903,888 | $0 |
| PremierMD ACO | $1,026,936 | $2,985,922 | $1,026,936 | $0 |
| Total | $96,184,250 | $131,744,353 | $52,105,932 | $44,078,318 |

Note: As part of the participation agreement, AIM Test 2 ACOs were required to return any unrecouped AIM funds if they did not earn enough shared savings to pay back the funds. We thus assume all AIM payments to AIM Test 2 ACOs were fully recouped.
Source: Shared Savings Program Public Use Files for 2015-2018.

# Appendix 3A. AIM Test 1 Impacts: Risk Adjustment, Covariate Balancing, and Parallel Trends Testing

## *Risk Factors*

Despite careful construction of each ACO's market comparison group for each AIM ACO, the relative mix of beneficiary characteristics between the ACO and comparison group still may change over time for reasons external to the model (e.g., random chance or regulatory changes). If beneficiary characteristics are correlated with the outcome measures, then failure to control for changes in these beneficiary characteristics may bias the estimated impact of AIM. To address this possibility, the preferred model accounted for a rich set of observable characteristics carefully selected by reviewing prior literature related to ACO evaluations as well as incorporating additional factors based on theoretical considerations and rigorous empirical testing.[18]

The preferred model accounted for the following observable characteristics:

- *Sex, race/ethnicity (black, Hispanic, other), age (0-64, 65-74, 75-84, >85), ESRD, originally qualified for Medicare due to disability, dual Medicare/Medicaid eligibility, resident of long-term institutional facility*: These characteristics were used in prior peer-reviewed literature and are factors well known to influence health outcomes.
- *HCC score, squared HCC Score*: Previous studies included HCC score. While HCC score was designed to predict total spending, it was not designed to predict utilization outcomes or sub-categories of spending. We therefore hypothesized that the relationship between our measures and HCC score might be nonlinear and thus included HCC squared in models. This approach was confirmed by empirical tests showing that squared HCC score was strongly and significantly correlated with our measures of interest, even conditional on chronic condition indicators. Both HCC and HCC squared were lagged by three years so that AIM participation does not influence these characteristics. For example, for the 2016 Performance Year HCC scores were based on 2013 data. HCC scores in 2017 and 2018 were based on 2014 and 2015, respectively. HCC scores for each baseline year (2013-2015) were based on 2010-2012, respectively. For beneficiaries who were new to Medicare in the last three years, we applied the oldest new enrollee HCC score available. Applying a three-year lag (rather than a one-year lag) allows for consistent risk adjustment models through the three performance years for which this evaluation will cover.[19]

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[18] McWilliams JM, LA Hatfield, ME Chernew, BE Landon, and AL Schwartz. (2016). "Early Performance of Accountable Care Organizations in Medicare." *The New England Journal of Medicine*, Vol. 374. Pp.2357-2366.

McWilliams JM, ME Chernew, BE Landon, and AL Schwartz. (2015) "Performance Differences in Year 1 of Pioneer Accountable Care Organizations." *The New England Journal of Medicine*, Vol. 372. Pp.1927-1936.

McWilliams, JM, BE Landon, ME Chernew, and AM Zaslavsky. (2014) "Changes in Patients' Experience in Medicare Accountable Care Organizations." *The New England Journal of Medicine*, Vol. 371. Pp.1715-1724.

Nyweide DJ, W Lee, TT Cuerdon, HH Pham, M Cox, R Rajkumar, and PH Conway. (2015). "Association of Pioneer Accountable Care Organizations vs. Traditional Medicare Fee for Service with Spending, Utilization, and Patient Experience." *JAMA*, Vol. 313(21). Pp.2152-2161.

Schwartz, AL, ME Chernew, BE Landon, and JM McWilliams. (2015). "Changes in Low-Value Services in Year 1 of the Medicare Pioneer Accountable Care Organization Program." *JAMA Internal Medicine*, Vol. 175(11). Pp.1815-1825.

[19] If a beneficiary did not have a three-year lagged HCC score, then we used their "New Enrollee" HCC score as the lagged HCC score.

- *Chronic condition indicators, number of concurrent chronic conditions (two, three, four, five, six or more)*: Chronic conditions and counts of multiple chronic conditions influence health outcomes and were used to control for health status in the prior literature. We categorized the 27 available chronic condition indicators into 11 groups and included indicators for counts of the number of conditions. All chronic condition variables were also lagged by three years for the same reasons as described above.[20]
- *Received care from AIM participant but was not assigned to AIM ACO*: We included an indicator to differentiate beneficiaries in the comparison group who had received some care from AIM ACOs from those that did not. These beneficiaries who received "spillover" care were significantly less healthy and had higher spending on average than non-spillover comparison beneficiaries. We did not think it was valid to remove these beneficiaries from the analytic sample as they are part of the ACO's market, but we separately control for them since they clearly differ from pure comparison beneficiaries in important ways.
- *Death in year*: An indicator for a beneficiary dying in the year was included in all performance measure models except for the mortality regression. Prior literature is mixed on its inclusion.[21] If mortality is influenced by AIM, it would not be appropriate to control for it, but if mortality is unlikely to be influenced by AIM, not including it could bias our estimates because it is such a strong predictor of health care spending and is highly correlated with other outcomes. Therefore, small differential changes in the mortality rate over time between the AIM and comparison groups that were unrelated to AIM could bias our estimates. Ultimately, we included a control for mortality in the preferred specification, which errs on the side of conservative estimates of AIM impacts (i.e., potentially understating any spending reductions) attributable to AIM.
- *Months eligible for FFS Medicare during year*: We included controls for each beneficiary's number of eligible months in the year. The primary reason for fewer than 12 eligible months in a year is mortality but may also be from new Medicare enrollment.[22] Since utilization measures are "per year," controlling for eligible months ensures that measures are estimated on the same relative time across all beneficiaries. Although spending measures are "per month," a beneficiary's average monthly spending is more precise with 12 months of spending data than with fewer than 12 months of data. Therefore, controlling for eligible months accounts for variation in the spending measures.

Lastly, we included PCSA fixed effects[23] and year fixed effects in models to measure outcomes for each ACO. We did not include any market-level variables for each AIM ACO since market comparison groups were designed so that the ACO and comparison groups face similar market environments. Moreover, ACO markets are geographically confined, so there is little variation in rurality or economic conditions

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[20] If a beneficiary did not have three-year lagged chronic condition flags, then we coded the flags (and the sums of the flags) as zero. We included an additional indicator for "missing lagged variables" that equaled 1 if the lagged chronic condition flags were missing and 0 otherwise.

[21] Nyweide et al. (2015) control for death, while the other studies listed in footnote 27 do not.

[22] Per the Shared Savings Program eligibility criteria, we excluded beneficiaries with any months of Medicare Advantage (Part C) or any months of only Part A or B from the sample.

[23] All assigned beneficiaries outside of the defined ACO market were assigned to a single, artificial PCSA, so that the model controlled for "living outside of ACO market." For the average AIM ACO, 7.9 percent of beneficiaries lived outside the ACO market.

that could bias our impact estimates if they were excluded or that could improve the efficiency of our estimates (i.e., shrink the standard errors) if they were included.

When estimating overall AIM Test 1 impacts, we estimated "pooled" models whereby all ACO and comparison beneficiaries for the 41 ACOs were included in one model. The pooled models (also used in subgroup analyses) did not utilize PCSA fixed effects because the number of PCSAs was too numerous to include in our preferred nonlinear models. This approach allowed more possibility for within-market differences in geographic characteristics that may influence outcomes. Therefore, in all pooled models we also controlled for the following characteristics:

- *Rural-Urban Commuting Area (RUCA) code*: The RUCA score ranges from 1-10, with 1 indicating the most dense urban areas, and 10 the most sparse rural areas, as defined by both population and accessibility of more densely populated areas. A RUCA code of 4 or greater indicates a rural area. We had access to RUCA codes at the ZIP Code level, and we included indicator variables for beneficiaries residing in each unique RUCA score to allow for nonlinear impacts of rurality on the outcomes of interest.
- *Primary and Mental Health Professional Shortage Areas (HPSA)*: CMS uses ZIP Code-level designations of primary and mental health HPSAs to determine potential bonus payments to physicians in areas with low access to certain types of health care. We included separate indicators for beneficiaries residing in primary care HPSAs and mental health HPSAs.

The pooled model also includes market fixed effects, and market-specific time trends that are common to the AIM assigned beneficiaries and the comparison group. Mean risk factors for the AIM and comparison groups, in the baseline and in PY3, are reported in **Exhibit 3A-2**.

### Covariate Balancing

Covariate balancing refers to methods for ensuring that the risk factors selected are balanced (or proportional) in the ACO and comparison group. Balance between ACO and comparison beneficiaries is desirable because it reduces potential bias in the estimated ACO effect. Better balance also means that our ability to accurately estimate differences in outcomes between the AIM and comparison groups is less dependent on selecting the correct statistical specification for our regression models. The ACO market design of the comparison group and the inclusion of a rich set of risk adjustors are essential contributors to achieving balance in covariates between ACO and comparison groups.

To improve covariate balance, we estimated weights that account for observable differences between the ACO and comparison group. One popular approach to creating such weights is to estimate a binary model that predicts the probability that an observation is in the treated group (the propensity score), and weighting observations by the inverse of their propensity score. We opted instead to use a newer technique known as entropy balancing (EB).[24] EB balances distributions, not simply means, across ACO and comparison groups, so covariate balance under EB should be an improvement over the balance achieved by applying inverse propensity score weights. We calculated EB weights to balance covariates between the ACO and comparison groups[25] and then estimated weighted regressions.

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[24] Hainmueller, Jens. (2012). "Entropy Balancing for Causal Effects: A Multivariate Reweighting Method to Produce Balanced Samples in Observational Studies." *Political Analysis*, Vol. 20. pp.25-46.

[25] Hainmueller, Jens and Yiquing Xu. (2013) "eBalance: A Stata Package for Entropy Balancing." *Journal of Statistical Software*, Vol. 54(7). pp.1-18.

## *Parallel Trends Testing*

The parallel trends assumption stipulates that the outcomes of an ACO and comparison group should be on a parallel trajectory before an intervention begins so that any differences in outcomes after the intervention begins can be attributed to the intervention itself. We tested the parallel trends assumption for all performance measures at the pooled level and tested parallel trends for total Medicare spending for the subgroup analyses and the ACO-level impact estimates.

We conducted parallel trends tests according to the following approach:

- We limited the sample to the baseline period (2013-2015) so that AIM did not influence the outcome of interest.
- We estimated the full risk adjustment model (including EB weights) with two linear time trends across 2013-2015: one for beneficiaries assigned to an AIM ACO and one for comparison beneficiaries from the ACO's market.
- We used a t-test to determine whether the two time trends were significantly different from one another at the 5 percent level. A significant difference implies that the AIM ACOs and their market comparison groups were not following parallel trends in the baseline.

In the pooled DID models, our testing generally indicated parallel linear baseline trends for all outcomes, as shown in **Exhibit 3A-1** below. Baseline trends diverged for admission for ambulatory sensitive conditions, and office-based E&M visits at the 5 percent significance level. At the ACO-level, the parallel trends assumption for the total Medicare spending outcome failed for nine AIM ACOs at the 5 percent significance level and four AIM ACOs at the 1 percent significance level. However, failures were not all in the same direction: three of nine estimates at the 5 percent significance level indicated AIM ACOs were increasing total Medicare spending relative to their market in the baseline, and two of four estimates at the 1 percent significance level indicated a similar trend of increase relative to the market. Thus, while ACO-level estimates must be interpreted with some caution, our estimated reductions in Medicare spending at the pooled model level are not invalidated by potential differences in underlying baseline trends.

**Exhibit 3A-1. Baseline Parallel Trends Tests for Pooled DID Estimates**

| Outcome (Scale) | Differential Trend | P-value |
|---|---|---|
| Medicare payments ($ PBPM) | | |
| Total | -3.07 | 0.409 |
| Acute inpatient | 0.95 | 0.555 |
| Physician services | -0.50 | 0.270 |
| Hospital outpatient and ambulatory surgery centers | -1.36 | 0.119 |
| Skilled nursing facility | -0.50 | 0.736 |
| Home health | -0.18 | 0.587 |
| Durable medical equipment | -0.17 | 0.179 |
| Inpatient utilization | | |
| Any acute hospitalization (% points) | 0.0 | 0.975 |
| # Acute hospitalizations | 0.0 | 0.847 |
| All-cause 30-day readmission (% points) | 0.0 | 0.686 |
| Any ambulatory sensitive condition admission (% points) | 0.0 | 0.280 |

| Outcome (Scale) | Differential Trend | P-value |
|---|---|---|
| Emergency department and observation utilization | | |
| Any ED visit not resulting in hospital admission (% points) | 0.0 | 0.906 |
| Any ED visit resulting in hospital admission (% points) | -0.1 | 0.438 |
| Any observation stays (inpatient or outpatient) (% points) | -0.2 | 0.013 |
| Skilled nursing facility and hospice utilization | | |
| # SNF days | -0.0 | 0.767 |
| Any hospice use (% points) | -0.0 | 0.368 |
| Physician services utilization | | |
| # Office-based E&M visits | -0.1 | 0.029 |
| # Imaging events | -0.0 | 0.166 |
| # Procedures | -0.0 | 0.719 |
| # Tests | -0.0 | 0.758 |
| Mortality (% points) | -0.0 | 0.509 |

Note: Estimates are for 41 AIM Test 1 ACOs. Differential trends estimated by comparing AIM Test 1 ACO assigned beneficiaries to non-ACO FFS beneficiaries residing in the AIM ACOs' markets. The baseline period is 2013 to 2015.
Source: ACO Provider Research Identifiable Files for 2018, and 2013-2015 Medicare claims and enrollment data.

The parallel trends assumption also stipulates that trends in outcomes would have remained similar between the AIM and comparison groups during the performance period if AIM had never existed. While we cannot directly test this hypothetical scenario, we tested whether there were differential changes in any of our risk factors from the baseline to performance period. If known predictors of our outcomes do not differentially change from the baseline to the performance period, it would suggest that our outcomes of interest would not have drastically changed in the absence of AIM. Results are reported in **Exhibit 3A-2**. Although we estimated four differential changes in variables, differences were small in magnitude. The differential reduction in ESRD suggests that AIM-assigned beneficiaries became less complex (from lower expected spending), while the differential trend in number of chronic conditions suggests that AIM-assigned beneficiaries became more complex. If deliberate selection of healthier patients by ACOs were occurring, we would expect to observe notable differential decreases in multiple measures of complexity among AIM-assigned beneficiaries, such as advanced age, disability and HCC score. However, we do not see such a pattern. Results are not consistent with deliberate selection of healthier patients by AIM ACOs, nor large chance fluctuations in the composition of the AIM and comparison groups. These findings support the validity of our pooled impact estimates.

**Exhibit 3A-2. Mean Risk Factors and Estimated Differential Trends for Pooled Test 1 AIM ACOs**

| Characteristic | Baseline Period, 2013-2015 | | Performance Period, 2018 | | Differential change for AIM group versus comparison |
|---|---|---|---|---|---|
| | AIM ACO (N=1,260,931) | Comparison (N=6,241,748) | AIM ACO (N=447,005) | Comparison (N=1,994,771) | |
| Age (%) | | | | | |
| <65 years old | 20.7 | 21.9 | 18.7 | 20.7 | -0.7 [0.057] |
| 65-74 years old | 40.9 | 40.9 | 43.6 | 43.2 | 0.4 [0.057] |
| 75-84 years old | 26.5 | 25.6 | 26.5 | 25.2 | 0.4 [0.057] |
| 85+ years old | 11.9 | 11.6 | 11.1 | 10.9 | -0.1 [0.057] |
| Female (%) | 57.4 | 57.3 | 56.4 | 56.8 | -0.5 [0.005] |
| Race or ethnic group (%) | | | | | |
| White | 85.5 | 83.0 | 84.4 | 82.4 | -0.6 [0.741] |
| Black | 7.1 | 7.9 | 7.1 | 7.6 | 0.4 [0.741] |
| Hispanic | 3.6 | 3.8 | 3.9 | 4.0 | 0.1 [0.741] |
| Other | 3.7 | 5.3 | 4.5 | 6.0 | 0.1 [0.741] |
| Medicaid recipient (%) | 23.6 | 24.5 | 22.5 | 23.8 | -0.4 [0.525] |
| Disabled (%) | 26.6 | 27.5 | 25.6 | 26.9 | -0.4 [0.444] |
| End-stage renal disease (%) | 0.9 | 1.1 | 1.0 | 1.3 | -0.1 [0.003] |
| Long-term nursing home resident (%) | 2.4 | 3.0 | 2.0 | 2.7 | -0.1 [0.437] |
| HCC score | 0.99 | 1.01 | 0.96 | 0.99 | -0.01 [0.070] |
| Number of chronic conditions | 2.31 | 2.32 | 2.45 | 2.41 | 0.05 [0.016] |
| Died during year (%) | 3.6 | 3.9 | 3.6 | 3.9 | 0.0 [0.786] |
| Month enrolled during year | 11.67 | 11.65 | 11.69 | 11.65 | 0.02 [0.004] |
| Rural Zip Code (%) | 58.5 | 42.0 | 58.7 | 42.6 | -0.4 [0.776] |
| Primary Care Health Professional Shortage Area (%) | 13.6 | 11.4 | 15.6 | 12.5 | 0.9 [0.491] |
| Mental Health Professional Shortage Area (%) | 59.6 | 46.2 | 61.4 | 43.2 | 4.7 [0.131] |

Note: Findings are for 41 AIM Test 1 ACOs. Differential impacts estimated by comparing AIM Test 1 ACO assigned beneficiaries to non-ACO FFS beneficiaries residing in the AIM ACOs' markets. The performance year is 2018, and the baseline period is 2013 to 2015. Means and percentages were adjusted for geographic area (i.e., market fixed effects) to reflect comparisons within markets. p-values in brackets.
Source: ACO Provider Research Identifiable Files for 2018, and 2013-2015 and 2018 Medicare claims and enrollment data.

# Appendix 3B. Calculating Net Aggregate Reductions in Medicare Spending for AIM Test 1 ACOs

We calculated the net impact of the AIM Test 1 ACOs on total Medicare spending in each performance year in two steps. First, we computed gross aggregate changes in Medicare spending by multiplying estimated changes in spending at the PBPM level by 12 months (to annualize the estimates) and by the number of assigned beneficiaries in the performance year (to convert estimates from a per-beneficiary level to the model level). Next, from the aggregate gross change in spending, we subtracted the shared savings paid to AIM ACOs in a given year to obtain the net change in Medicare spending for a given year (**Exhibit 3B-1**).

We added an extra step for calculating the net change for PY3. Since PY3 represented the end of the AIM performance period for AIM Test 1 ACOs, we subtracted the total amount of AIM funds disbursed by CMS that were not recouped during the performance period from the gross PY3 estimates or subtracted from the shared savings paid to AIM ACOs in PY3. Funds were considered unrecouped if the AIM ACO did not pay back the funds by the end of 2018, even if the ACO recontinued to participate in the Shared Savings Program in 2019 (and the funds could be recouped in a future year).

**Exhibit 3B-1. AIM Test 1 was Associated with over $100 million in Reduced Medicare Spending in Each Performance Year**

| | DID Estimate (PBPM) | Enrolled beneficiaries | Estimated Gross Savings (Millions) | Earned Shared Savings (Millions) | Unrecouped AIM Funds (Millions) | Estimated Net Savings (Millions) |
|---|---|---|---|---|---|---|
| PY1 (2016) | -$28.21 | 387,017 | -$131.0 | $22.6 | - | $108.4 |
| PY2 (2017) | -$36.94 | 423,499 | -$187.7 | $34.3 | - | $153.4 |
| PY3 (2018) | -$38.73 | 446,958 | -$207.7 | $43.9 | $44.1 | $119.7 |
| Total | | | -$526.4 | $100.8 | $44.1 | $381.5 |

Note: DID = Difference in Difference. PBPM = Per Beneficiary Per Month. Findings are for 41 AIM Test 1 ACOs. DID impact findings estimated from comparing AIM Test 1 ACO assigned beneficiaries to non-ACO FFS beneficiaries residing in the AIM ACOs' markets. Performance years 1-3 were 2016-2018, respectively. The baseline period was 2013 to 2015.
Source: ACO Provider Research Identifiable Files for 2016-2018, 2013-2018 Medicare claims and enrollment data, and Shared Savings Program Public Use Files, 2015-2018 for financial results and AIM funds.

To translate net reductions to a percentage of the counterfactual AIM spending, we first converted aggregate net savings to net PBPM savings by dividing by 12 months, and then dividing by the number of assigned beneficiaries in a given year. We calculated counterfactual AIM spending as the change in mean spending from the baseline to performance period among the comparison group, added to mean AIM baseline spending. The net PBPM savings divided by the counterfactual AIM spending yielded the estimated percentage change in total Medicare spending (**Exhibit 3B-2**).

**Exhibit 3B-2: Calculating Net Savings as a Percentage of Counterfactual AIM Spending**

| | Estimated Net Savings (Millions) | Net Spending Reduction (PBPM) | Change in Comparison Group Spending (PBPM) | AIM baseline Spending (PBPM) | AIM Counterfactual Spending (PBPM) | Estimated Percentage Change |
|---|---|---|---|---|---|---|
| PY1 (2016) | $108.4 | -$23.34 | -$17.73 | $1,031.28 | $1,013.55 | -2.3% |
| PY2 (2017) | $153.4 | -$30.19 | -$35.21 | $1,037.31 | $1,002.10 | -3.0% |
| PY3 (2018) | $119.7 | -$22.32 | -$5.22 | $973.89 | $968.67 | -2.3% |

Calculating the net percentage savings across all three years required establishing a common counterfactual across all three performance years to ensure that percentage changes in all years were calculated against a common denominator. We calculated this counterfactual as the average across all three performance years, weighted by the proportion of AIM ACO assigned beneficiaries in a given

performance year. For example, the total number of assigned beneficiaries across all three performance years was 1,257,521. The weight on PY1 was thus 387,017 ÷ 1,257,521 = 0.355. The weighted average counterfactual AIM spending was $993.74, and the combined net spending reduction was -$75.85, yielding a net reduction of -7.6%.

# Appendix 3C. AIM Test 1 ACOs Results with Nonlinear Regression Models

**Exhibit 3-C1. Key PY3 (2018) Findings Remained the Same Regardless of Statistical Specification**

| Outcome (Scale) | OLS Estimates | | Nonlinear Estimates | |
|---|---|---|---|---|
| | Average Point Estimate [a] | Percentage Change from Baseline [b] | Average Point Estimate [a] | Percentage Change from Baseline [b] |
| Medicare payments ($ PBPM) | | | | |
| Total [c] | -$38.73*** | -4.0% | -$38.89*** | -3.7% |
| Acute inpatient [e] | -$13.63*** | -4.0% | -$13.82*** | -3.9% |
| Physician services [c] | -$1.85 | -1.0 | -0.73 | -0.4% |
| Hospital outpatient and ambulatory surgery centers[e] | -$8.71*** | -3.7% | -$11.37*** | -5.1% |
| Skilled nursing facility [e] | -$5.74** | -7.8% | -4.51*** | -5.9% |
| Home health [e] | -$3.53*** | -8.2% | -3.69*** | -7.3% |
| Durable medical equipment [e] | -$0.08 | -0.4% | -0.09 | -0.4% |
| Inpatient utilization | | | | |
| Any acute hospitalization (% points) [d] | -0.5*** | -2.3% | -0.5*** | -2.4% |
| # Acute hospitalizations [f] | -0.01*** | -3.8% | -0.0 | -3.9% |
| All-cause 30-day readmission (% points) [d] | -0.1*** | -4.4% | -0.2*** | -5.1% |
| Any ambulatory sensitive condition admission (% points) [d] | -0.1 | -2.8% | -0.1* | -3.0% |
| Emergency department and observation utilization | | | | |
| Any ED visit not resulting in hospital admission (% points) [d] | -0.7*** | -2.9% | -0.8*** | -3.0% |
| Any ED visit resulting in hospital admission (% points) [d] | -0.3* | -2.5% | -0.2 | -2.1% |
| Any observation stays (inpatient or outpatient) (% points) [d] | -0.5*** | -5.9% | -0.6*** | -6.6% |
| Skilled nursing facility and hospice utilization | | | | |
| # SNF days [f] | -0.1* | -5.3% | -0.1 | -3.0% |
| Any hospice use (% points) [d] | -0.1 | -4.3% | -0.1 | -3.6% |
| Physician services utilization | | | | |
| # Office-based E&M visits [c] | 0.1 | 0.8% | 0.0 | 0.5% |
| # Imaging events [c] | -0.1* | -2.1% | -0.1** | -2.1% |
| # Procedures [c] | 0.1 | 2.2% | 0.1 | 1.8% |
| # Tests [c] | 1.0*** | 10.5% | 0.9*** | 9.6% |
| Mortality (% points) [d] | 0.0 | -0.8% | 0.0 | -0.6% |

Note: Findings are for 41 AIM Test 1 ACOs. DID impact findings estimated by comparing AIM Test 1 ACO assigned beneficiaries to non-ACO FFS beneficiaries residing in the AIM ACOs' markets. The performance year is 2018, and the baseline period is 2013 to 2015. OLS is ordinary least squares; PBPM is per beneficiary per month; ED is emergency department; SNF is skilled nursing facility; E&M is evaluation and management.

[a] For non-payment measures denoted by (%), point estimates represent percentage points.

[b] Base values represents total Medicare spending or use by AIM ACO beneficiaries during the baseline period net of the change in total Medicare spending of non-ACO FFS beneficiaries between baseline and performance years in ACO markets.

[c]Nonlinear model was generalized linear model (GLM) with log link and gamma-distributed error.

[d]Nonlinear model was binary logistic.

[e]Nonlinear two-part model was: binary logistic (any spending) and GLM with log link and gamma-distributed error for non-zero spending

[f]Nonlinear two-part model was: binary logistic (any use) and GLM with log link and negative-binomial error distribution for non-zero use.

Source: ACO Provider Research Identifiable Files for 2018, and 2013-2015 and 2018 Medicare claims and enrollment data .

# Appendix 3D. Impact Findings by AIM Test 1 ACO in the Third Performance Year

**Exhibit 3D-1. AIM Test 1 ACO Per Beneficiary per Month Medicare Spending (Total, Acute inpatient, Outpatient and Physician)**

| ACO Name | Total Spending | | Inpatient Spending | | Outpatient Spending | | Physician Spending | |
|---|---|---|---|---|---|---|---|---|
| | Estimate | P-Value | Estimate | P-Value | Estimate | P-Value | Estimate | P-Value |
| Carolina Medical Home Network ACO | -65.28 | 0.009 | -10.11 | 0.524 | -9.67 | 0.055 | -13.83 | 0.000 |
| Illinois Rural Community Care Organization | 42.09 | 0.019 | 22.30 | 0.028 | 2.88 | 0.412 | -5.50 | 0.038 |
| Reid ACO | 77.69 | 0.011 | 24.14 | 0.174 | 20.99 | 0.003 | 9.99 | 0.004 |
| Akira Health of Los Angeles | 9.21 | 0.762 | 31.59 | 0.099 | -15.51 | 0.003 | -9.76 | 0.064 |
| Texas Rural ACO | -86.31 | 0.016 | -38.64 | 0.043 | -8.61 | 0.178 | -17.44 | 0.002 |
| Access Care Oklahoma | -8.22 | 0.623 | -4.17 | 0.652 | -12.63 | 0.001 | 15.20 | 0.000 |
| Citrus County ACO | -100.67 | 0.000 | -15.47 | 0.108 | -25.13 | 0.000 | -7.55 | 0.189 |
| AmpliPHY of Texas ACO | -135.05 | 0.001 | -58.04 | 0.005 | -19.08 | 0.002 | -20.33 | 0.002 |
| AmpliPHY of Kentucky ACO | -47.94 | 0.065 | -16.88 | 0.264 | -21.80 | 0.000 | 3.46 | 0.477 |
| Winding River ACO | 1.73 | 0.926 | 14.53 | 0.175 | 5.30 | 0.151 | -12.28 | 0.000 |
| Prairie Hills Care Organization | -72.03 | 0.011 | -38.01 | 0.014 | -7.69 | 0.402 | -9.50 | 0.003 |
| Great Plains Care Organization | -30.43 | 0.266 | -16.49 | 0.294 | -2.16 | 0.746 | -3.87 | 0.317 |
| Mountain Prairie ACO | 4.16 | 0.871 | 1.94 | 0.890 | -14.65 | 0.004 | -2.92 | 0.416 |
| Iowa Rural ACO | -10.15 | 0.664 | 13.21 | 0.308 | -2.99 | 0.615 | -4.72 | 0.104 |
| Illinois Rural ACO | 26.55 | 0.193 | 21.04 | 0.072 | 3.68 | 0.329 | 15.69 | 0.000 |
| Indiana Rural ACO II | 37.73 | 0.234 | 13.71 | 0.470 | 4.37 | 0.503 | -0.49 | 0.878 |
| Indiana Rural ACO | 12.52 | 0.614 | -0.49 | 0.974 | 6.28 | 0.250 | -1.65 | 0.564 |
| Michigan Rural ACO | 10.78 | 0.674 | 22.85 | 0.136 | 5.58 | 0.330 | 1.17 | 0.748 |
| Southern Michigan Rural ACO | -67.39 | 0.002 | -40.31 | 0.004 | -5.82 | 0.230 | -0.01 | 0.998 |
| New Hampshire Rural ACO | -65.15 | 0.015 | -36.47 | 0.022 | -23.80 | 0.000 | -3.27 | 0.170 |
| Ohio River Basin ACO | -71.22 | 0.002 | -52.89 | 0.000 | 7.94 | 0.118 | -3.94 | 0.173 |
| Magnolia-Evergreen ACO | -21.43 | 0.268 | -18.97 | 0.086 | -4.37 | 0.345 | 6.69 | 0.011 |
| North Mississippi Connected Care Alliance | -0.30 | 0.986 | -14.93 | 0.131 | 7.39 | 0.083 | 7.67 | 0.000 |
| Deep South Regional ACO | -11.08 | 0.671 | -19.74 | 0.145 | 6.37 | 0.147 | -1.33 | 0.768 |
| Minnesota Rural ACO | -31.48 | 0.146 | -17.82 | 0.219 | -27.16 | 0.000 | 7.09 | 0.003 |
| Oregon-Indiana ACO | 41.78 | 0.157 | 6.15 | 0.720 | 11.35 | 0.069 | 1.19 | 0.725 |
| Mountain West ACO | 46.91 | 0.044 | 22.69 | 0.107 | 3.87 | 0.539 | 2.34 | 0.369 |
| High Sierras-Northern Plains ACO | -45.41 | 0.083 | -30.76 | 0.061 | 14.62 | 0.006 | -16.36 | 0.000 |
| Aledade Kansas ACO | -42.35 | 0.006 | -12.16 | 0.144 | -8.99 | 0.007 | -3.27 | 0.247 |
| Aledade West Virginia ACO | -66.29 | 0.005 | -47.21 | 0.001 | -4.71 | 0.338 | -6.99 | 0.030 |
| Heartland Physicians ACO | -129.00 | 0.000 | -49.55 | 0.004 | -20.62 | 0.006 | -12.27 | 0.013 |
| Alliance ACO | -134.32 | 0.000 | -35.64 | 0.002 | -10.77 | 0.010 | -25.69 | 0.000 |
| Kentucky Primary Care Alliance Region 2 | -95.96 | 0.000 | -50.53 | 0.000 | -9.54 | 0.031 | -10.49 | 0.000 |
| Aledade Mississippi ACO | -70.24 | 0.000 | -15.97 | 0.068 | -14.00 | 0.000 | -1.09 | 0.672 |
| Tar River Health Alliance | -2.27 | 0.926 | -22.29 | 0.139 | -6.43 | 0.175 | 1.17 | 0.771 |
| Affiliated ACO | -95.78 | 0.023 | -22.18 | 0.408 | -39.57 | 0.000 | 3.47 | 0.479 |
| California ACO | -47.85 | 0.006 | -20.94 | 0.072 | -12.00 | 0.001 | 1.52 | 0.505 |
| San Juan ACO | -36.83 | 0.119 | -14.23 | 0.309 | 6.84 | 0.332 | 1.69 | 0.546 |
| Rocky Mountain ACO | -35.23 | 0.083 | -12.93 | 0.307 | 9.55 | 0.048 | -7.42 | 0.005 |
| MissouriHealth+ | -21.24 | 0.273 | 0.87 | 0.943 | -13.30 | 0.002 | -12.95 | 0.000 |
| Beacon Rural Health | -72.95 | 0.002 | -35.68 | 0.010 | -0.86 | 0.884 | -4.23 | 0.102 |

Note: Represent the estimated impact of AIM on the performance measure listed in each column based on the DID model described in Chapter 3. Statistical significance at the 5 percent level are shaded. The claims-based measures are described in Appendix 1C.

**Exhibit 3D-2. AIM Test 1 ACO Per Beneficiary per Month Medicare Spending (SNF, HHA, and DME)**

| ACO Name | SNF Spending | | HHA Spending | | DME Spending | |
|---|---|---|---|---|---|---|
| | Estimate | P-Value | Estimate | P-Value | Estimate | P-Value |
| Carolina Medical Home Network ACO | 0.44 | 0.936 | -10.07 | 0.000 | -2.24 | 0.022 |
| Illinois Rural Community Care Organization | 31.36 | 0.000 | -0.36 | 0.769 | -1.99 | 0.001 |
| Reid ACO | 18.32 | 0.013 | 5.53 | 0.017 | 1.98 | 0.074 |
| Akira Health of Los Angeles | 13.70 | 0.076 | -12.07 | 0.001 | -0.71 | 0.297 |
| Texas Rural ACO | 3.79 | 0.667 | -14.34 | 0.003 | 0.22 | 0.857 |
| Access Care Oklahoma | 0.72 | 0.858 | 1.71 | 0.484 | -0.11 | 0.882 |
| Citrus County ACO | -9.78 | 0.011 | -15.40 | 0.000 | -2.76 | 0.000 |
| AmpliPHY of Texas ACO | -2.98 | 0.697 | 1.89 | 0.744 | -0.66 | 0.632 |
| AmpliPHY of Kentucky ACO | -3.54 | 0.576 | -0.88 | 0.720 | -0.71 | 0.515 |
| Winding River ACO | 6.14 | 0.172 | -8.27 | 0.000 | 0.42 | 0.568 |
| Prairie Hills Care Organization | -19.92 | 0.059 | 0.29 | 0.820 | -0.57 | 0.469 |
| Great Plains Care Organization | -16.59 | 0.058 | 1.89 | 0.146 | 1.30 | 0.087 |
| Mountain Prairie ACO | 13.14 | 0.084 | -0.18 | 0.940 | -0.89 | 0.337 |
| Iowa Rural ACO | -0.30 | 0.970 | -3.34 | 0.020 | 1.07 | 0.144 |
| Illinois Rural ACO | -11.00 | 0.051 | 1.30 | 0.491 | 0.73 | 0.347 |
| Indiana Rural ACO II | 15.30 | 0.070 | 0.67 | 0.780 | 2.54 | 0.010 |
| Indiana Rural ACO | 11.41 | 0.113 | -1.10 | 0.565 | 1.16 | 0.220 |
| Michigan Rural ACO | -5.25 | 0.413 | -6.92 | 0.001 | 0.45 | 0.589 |
| Southern Michigan Rural ACO | -18.23 | 0.000 | 2.38 | 0.208 | -0.79 | 0.339 |
| New Hampshire Rural ACO | -10.49 | 0.206 | -6.59 | 0.002 | -2.78 | 0.000 |
| Ohio River Basin ACO | -15.96 | 0.001 | 2.97 | 0.156 | 1.69 | 0.065 |
| Magnolia-Evergreen ACO | -7.95 | 0.155 | -1.81 | 0.410 | 0.89 | 0.166 |
| North Mississippi Connected Care Alliance | -7.70 | 0.115 | -10.04 | 0.000 | 2.39 | 0.006 |
| Deep South Regional ACO | 0.26 | 0.971 | -0.56 | 0.818 | 5.74 | 0.000 |
| Minnesota Rural ACO | -0.18 | 0.972 | 1.26 | 0.286 | 0.50 | 0.444 |
| Oregon-Indiana ACO | 9.06 | 0.290 | 3.14 | 0.223 | -0.37 | 0.717 |
| Mountain West ACO | 20.55 | 0.002 | -1.76 | 0.230 | -0.09 | 0.902 |
| High Sierras-Northern Plains ACO | -0.94 | 0.895 | -6.72 | 0.000 | 1.91 | 0.008 |
| Aledade Kansas ACO | -5.57 | 0.256 | -6.79 | 0.000 | -0.61 | 0.356 |
| Aledade West Virginia ACO | -9.96 | 0.015 | 6.12 | 0.016 | 0.38 | 0.735 |
| Heartland Physicians ACO | -27.59 | 0.005 | -3.17 | 0.244 | -4.02 | 0.000 |
| Alliance ACO | -31.17 | 0.000 | -3.62 | 0.206 | -0.20 | 0.800 |
| Kentucky Primary Care Alliance Region 2 | -9.55 | 0.085 | -3.92 | 0.067 | -0.46 | 0.676 |
| Aledade Mississippi ACO | -2.18 | 0.594 | -23.58 | 0.000 | -2.75 | 0.000 |
| Tar River Health Alliance | 4.14 | 0.389 | 5.52 | 0.012 | 2.11 | 0.017 |
| Affiliated ACO | -30.38 | 0.011 | 2.95 | 0.158 | -0.23 | 0.872 |
| California ACO | -12.36 | 0.002 | -8.25 | 0.000 | -0.83 | 0.115 |
| San Juan ACO | -16.97 | 0.003 | -1.20 | 0.444 | -1.00 | 0.231 |
| Rocky Mountain ACO | -13.32 | 0.016 | -5.76 | 0.000 | -1.00 | 0.107 |
| MissouriHealth+ | -1.19 | 0.711 | 2.18 | 0.146 | 1.00 | 0.283 |
| Beacon Rural Health | -18.09 | 0.004 | -0.13 | 0.948 | 0.45 | 0.526 |

Note: Represent the estimated impact of AIM on the performance measure listed in each column based on the DID model described in Chapter 3. Statistical significance at the 5 percent level are shaded. The claims-based measures are described in Appendix 1C.

**Exhibit 3D-3. AIM Test 1 ACO Any and Total Stays (Acute Hospitalization, ED with and without Hospitalization)**

| ACO Name | Any Acute Stay | | Total Acute Stays | | ED Visit without Hospitalization | | ED Visit with Hospitalization | |
|---|---|---|---|---|---|---|---|---|
| | Estimate | P-Value | Estimate | P-Value | Estimate | P-Value | Estimate | P-Value |
| Carolina Medical Home Network ACO | -1.8 | 0.001 | 0.0 | 0.005 | 0.0 | 0.000 | 0.0 | 0.021 |
| Illinois Rural Community Care Organization | 0.2 | 0.571 | 0.0 | 0.707 | 0.0 | 0.001 | 0.0 | 0.000 |
| Reid ACO | 1.9 | 0.003 | 0.0 | 0.007 | 0.0 | 0.001 | 0.0 | 0.197 |
| Akira Health of Los Angeles | 0.7 | 0.162 | 0.0 | 0.740 | 0.0 | 0.440 | 0.0 | 0.732 |
| Texas Rural ACO | -1.4 | 0.038 | 0.0 | 0.203 | 0.0 | 0.051 | 0.0 | 0.024 |
| Access Care Oklahoma | -0.1 | 0.704 | 0.0 | 0.206 | 0.0 | 0.902 | 0.0 | 0.661 |
| Citrus County ACO | -2.5 | 0.000 | 0.0 | 0.000 | 0.0 | 0.000 | 0.0 | 0.000 |
| AmpliPHY of Texas ACO | -0.7 | 0.255 | 0.0 | 0.263 | 0.0 | 0.625 | 0.0 | 0.021 |
| AmpliPHY of Kentucky ACO | 0.4 | 0.581 | 0.0 | 0.368 | 0.0 | 0.419 | 0.0 | 0.329 |
| Winding River ACO | -0.3 | 0.550 | 0.0 | 0.525 | 0.0 | 0.263 | 0.0 | 0.085 |
| Prairie Hills Care Organization | -0.4 | 0.518 | 0.0 | 0.207 | 0.0 | 0.024 | 0.0 | 0.916 |
| Great Plains Care Organization | 0.7 | 0.237 | 0.0 | 0.764 | 0.0 | 0.079 | 0.0 | 0.016 |
| Mountain Prairie ACO | -1.3 | 0.021 | 0.0 | 0.074 | 0.0 | 0.487 | 0.0 | 0.022 |
| Iowa Rural ACO | 0.8 | 0.143 | 0.0 | 0.210 | 0.0 | 0.464 | 0.0 | 0.296 |
| Illinois Rural ACO | 0.9 | 0.058 | 0.0 | 0.002 | 0.0 | 0.829 | 0.0 | 0.129 |
| Indiana Rural ACO II | 1.1 | 0.112 | 0.0 | 0.237 | 0.0 | 0.000 | 0.0 | 0.077 |
| Indiana Rural ACO | 0.3 | 0.617 | 0.0 | 0.958 | 0.0 | 0.037 | 0.0 | 0.293 |
| Michigan Rural ACO | -1.0 | 0.088 | 0.0 | 0.369 | 0.0 | 0.132 | 0.0 | 0.000 |
| Southern Michigan Rural ACO | -0.7 | 0.182 | 0.0 | 0.173 | 0.0 | 0.212 | 0.0 | 0.255 |
| New Hampshire Rural ACO | -1.5 | 0.002 | 0.0 | 0.002 | 0.0 | 0.966 | 0.0 | 0.003 |
| Ohio River Basin ACO | -1.2 | 0.021 | 0.0 | 0.001 | 0.0 | 0.005 | 0.0 | 0.119 |
| Magnolia-Evergreen ACO | -0.3 | 0.569 | 0.0 | 0.089 | 0.0 | 0.896 | 0.0 | 0.708 |
| North Mississippi Connected Care Alliance | -0.1 | 0.742 | 0.0 | 0.525 | 0.0 | 0.778 | 0.0 | 0.285 |
| Deep South Regional ACO | -0.7 | 0.188 | 0.0 | 0.050 | 0.0 | 0.724 | 0.0 | 0.308 |
| Minnesota Rural ACO | 0.5 | 0.321 | 0.0 | 0.148 | 0.0 | 0.378 | 0.0 | 0.000 |
| Oregon-Indiana ACO | 0.1 | 0.837 | 0.0 | 0.725 | 0.0 | 0.569 | 0.0 | 0.124 |
| Mountain West ACO | 0.1 | 0.788 | 0.0 | 0.608 | 0.0 | 0.000 | 0.0 | 0.180 |
| High Sierras-Northern Plains ACO | -1.0 | 0.063 | 0.0 | 0.019 | 0.0 | 0.012 | 0.0 | 0.018 |
| Aledade Kansas ACO | -0.7 | 0.066 | 0.0 | 0.001 | 0.0 | 0.410 | 0.0 | 0.003 |
| Aledade West Virginia ACO | -1.5 | 0.007 | 0.0 | 0.013 | 0.0 | 0.000 | 0.0 | 0.084 |
| Heartland Physicians ACO | -3.2 | 0.000 | -0.1 | 0.000 | 0.0 | 0.000 | 0.0 | 0.004 |
| Alliance ACO | -1.9 | 0.000 | 0.0 | 0.000 | 0.0 | 0.002 | 0.0 | 0.372 |
| Kentucky Primary Care Alliance Region 2 | -1.9 | 0.000 | 0.0 | 0.000 | 0.0 | 0.006 | 0.0 | 0.034 |
| Aledade Mississippi ACO | -0.9 | 0.010 | 0.0 | 0.000 | 0.0 | 0.688 | 0.0 | 0.285 |
| Tar River Health Alliance | -0.9 | 0.099 | 0.0 | 0.484 | 0.0 | 0.202 | 0.0 | 0.912 |
| Affiliated ACO | 0.6 | 0.483 | 0.0 | 0.583 | 0.0 | 0.709 | 0.0 | 0.665 |
| California ACO | -0.2 | 0.535 | 0.0 | 0.079 | 0.0 | 0.255 | 0.0 | 0.528 |
| San Juan ACO | -1.0 | 0.079 | 0.0 | 0.289 | 0.0 | 0.049 | 0.0 | 0.986 |
| Rocky Mountain ACO | 0.1 | 0.760 | 0.0 | 0.696 | 0.0 | 0.466 | 0.0 | 0.236 |
| MissouriHealth+ | 0.2 | 0.597 | 0.0 | 0.355 | 0.0 | 0.254 | 0.0 | 0.302 |
| Beacon Rural Health | -0.5 | 0.347 | 0.0 | 0.121 | 0.0 | 0.074 | 0.0 | 0.107 |

Note: Represent the estimated impact of AIM on the performance measure listed in each column based on the DID model described in Chapter 3. Statistical significance at the 5 percent level are shaded. The claims-based measures are described in Appendix 1C.

**Exhibit 3D-4. AIM Test 1: SNF days, Observational Services, Any Hospice Use**

| ACO Name | SNF Days | | Observational Stays | | Any Hospice | |
|---|---|---|---|---|---|---|
| | Estimate | P-value | Estimate | P-value | Estimate | P-value |
| Carolina Medical Home Network ACO | -0.1 | 0.744 | -1.4 | 0.000 | -0.4 | 0.013 |
| Illinois Rural Community Care Organization | 0.6 | 0.000 | -0.7 | 0.015 | -0.3 | 0.040 |
| Reid ACO | 0.6 | 0.005 | 2.2 | 0.000 | -0.2 | 0.256 |
| Akira Health of Los Angeles | 0.1 | 0.283 | -0.2 | 0.628 | -0.3 | 0.061 |
| Texas Rural ACO | 0.1 | 0.704 | -0.3 | 0.522 | 0.0 | 0.887 |
| Access Care Oklahoma | 0.0 | 0.632 | -0.1 | 0.707 | 0.1 | 0.546 |
| Citrus County ACO | -0.3 | 0.002 | -2.3 | 0.000 | -0.6 | 0.000 |
| AmpliPHY of Texas ACO | -0.1 | 0.774 | -1.7 | 0.001 | 0.1 | 0.582 |
| AmpliPHY of Kentucky ACO | 0.0 | 0.833 | 0.6 | 0.268 | 0.1 | 0.766 |
| Winding River ACO | 0.3 | 0.007 | 0.0 | 0.888 | -0.4 | 0.005 |
| Prairie Hills Care Organization | -0.2 | 0.323 | -1.9 | 0.000 | 0.4 | 0.068 |
| Great Plains Care Organization | -0.1 | 0.489 | 0.2 | 0.652 | -0.1 | 0.529 |
| Mountain Prairie ACO | 0.2 | 0.091 | 0.9 | 0.044 | 0.1 | 0.718 |
| Iowa Rural ACO | 0.1 | 0.295 | -0.7 | 0.098 | -0.2 | 0.255 |
| Illinois Rural ACO | -0.3 | 0.081 | 0.1 | 0.770 | -0.1 | 0.311 |
| Indiana Rural ACO II | 0.6 | 0.008 | 0.1 | 0.905 | -0.6 | 0.011 |
| Indiana Rural ACO | 0.2 | 0.239 | -2.0 | 0.000 | -0.3 | 0.156 |
| Michigan Rural ACO | -0.1 | 0.584 | -0.7 | 0.084 | -0.6 | 0.000 |
| Southern Michigan Rural ACO | -0.3 | 0.007 | -0.6 | 0.129 | -0.4 | 0.022 |
| New Hampshire Rural ACO | 0.0 | 0.980 | -1.3 | 0.000 | 0.3 | 0.103 |
| Ohio River Basin ACO | -0.4 | 0.006 | 0.9 | 0.031 | -0.1 | 0.434 |
| Magnolia-Evergreen ACO | -0.4 | 0.000 | -0.5 | 0.120 | 0.1 | 0.669 |
| North Mississippi Connected Care Alliance | -0.1 | 0.300 | 0.9 | 0.004 | 0.4 | 0.029 |
| Deep South Regional ACO | -0.4 | 0.016 | -0.3 | 0.409 | -0.6 | 0.002 |
| Minnesota Rural ACO | -0.1 | 0.548 | -1.9 | 0.000 | 0.2 | 0.216 |
| Oregon-Indiana ACO | 0.4 | 0.109 | -0.5 | 0.279 | 0.5 | 0.087 |
| Mountain West ACO | 0.6 | 0.000 | 0.0 | 0.956 | 0.0 | 0.888 |
| High Sierras-Northern Plains ACO | -0.1 | 0.543 | -1.5 | 0.000 | -0.3 | 0.048 |
| Aledade Kansas ACO | -0.2 | 0.113 | -0.5 | 0.083 | 0.1 | 0.642 |
| Aledade West Virginia ACO | -0.3 | 0.002 | -0.9 | 0.036 | 0.0 | 0.822 |
| Heartland Physicians ACO | -0.4 | 0.057 | -0.3 | 0.538 | -0.5 | 0.025 |
| Alliance ACO | -0.8 | 0.000 | 0.2 | 0.555 | -0.2 | 0.196 |
| Kentucky Primary Care Alliance Region 2 | -0.2 | 0.088 | -1.4 | 0.001 | -0.1 | 0.549 |
| Aledade Mississippi ACO | -0.1 | 0.340 | -1.1 | 0.000 | -0.4 | 0.001 |
| Tar River Health Alliance | 0.0 | 0.788 | -0.3 | 0.501 | 0.3 | 0.038 |
| Affiliated ACO | 0.2 | 0.250 | -1.7 | 0.003 | -0.2 | 0.532 |
| California ACO | -0.2 | 0.027 | -2.7 | 0.000 | 0.0 | 0.807 |
| San Juan ACO | -0.3 | 0.010 | -0.7 | 0.070 | 0.1 | 0.680 |
| Rocky Mountain ACO | -0.1 | 0.330 | -1.0 | 0.000 | 0.0 | 0.953 |
| MissouriHealth+ | -0.1 | 0.367 | -0.5 | 0.162 | 0.0 | 0.814 |
| Beacon Rural Health | -0.2 | 0.066 | 0.0 | 0.944 | 0.2 | 0.183 |

Note: Represent the estimated impact of AIM on the performance measure listed in each column based on the DID model described in Chapter 3. Statistical significance at the 5 percent level are shaded. The claims-based measures are described in Appendix 1C.

**Exhibit 3D-5. AIM Test 1 ACO E&M Visits, Tests, Procedures, and Imaging Events**

| ACO Name | E&M Visits | | Tests | | Procedures | | Imaging Events | |
|---|---|---|---|---|---|---|---|---|
| | Estimate | P-value | Estimate | P-value | Estimate | P-value | Estimate | P-value |
| Carolina Medical Home Network ACO | -0.2 | 0.020 | 0.3 | 0.144 | -0.3 | 0.008 | -0.1 | 0.287 |
| Illinois Rural Community Care Organization | 0.1 | 0.127 | 0.1 | 0.689 | -0.2 | 0.028 | 0.0 | 0.483 |
| Reid ACO | 0.8 | 0.000 | 0.4 | 0.112 | 0.4 | 0.009 | 0.2 | 0.029 |
| Akira Health of Los Angeles | 0.2 | 0.088 | -1.4 | 0.000 | 1.0 | 0.001 | 0.0 | 0.687 |
| Texas Rural ACO | -0.5 | 0.000 | -0.5 | 0.073 | -0.6 | 0.000 | -0.4 | 0.000 |
| Access Care Oklahoma | 0.2 | 0.000 | 2.6 | 0.000 | 0.9 | 0.000 | -0.1 | 0.037 |
| Citrus County ACO | -0.4 | 0.000 | 10.8 | 0.000 | 0.1 | 0.637 | -0.4 | 0.000 |
| AmpliPHY of Texas ACO | 0.1 | 0.376 | 0.2 | 0.678 | 0.8 | 0.000 | -0.5 | 0.000 |
| AmpliPHY of Kentucky ACO | -0.3 | 0.039 | 0.9 | 0.009 | -0.3 | 0.246 | -0.3 | 0.006 |
| Winding River ACO | 0.0 | 0.832 | -0.4 | 0.034 | -0.1 | 0.423 | 0.1 | 0.159 |
| Prairie Hills Care Organization | -0.7 | 0.000 | 0.0 | 0.911 | 0.0 | 0.862 | -0.3 | 0.000 |
| Great Plains Care Organization | 0.6 | 0.000 | -0.1 | 0.469 | -0.3 | 0.088 | 0.3 | 0.000 |
| Mountain Prairie ACO | 0.0 | 0.680 | -1.1 | 0.000 | -0.4 | 0.004 | -0.1 | 0.409 |
| Iowa Rural ACO | -0.2 | 0.000 | 0.0 | 0.943 | -0.3 | 0.014 | -0.3 | 0.000 |
| Illinois Rural ACO | 1.2 | 0.000 | 1.0 | 0.000 | 0.4 | 0.013 | 0.4 | 0.000 |
| Indiana Rural ACO II | -0.2 | 0.064 | 0.0 | 0.856 | -0.4 | 0.000 | 0.4 | 0.000 |
| Indiana Rural ACO | 0.0 | 0.605 | 2.3 | 0.000 | -0.4 | 0.000 | -0.3 | 0.001 |
| Michigan Rural ACO | -0.3 | 0.000 | 0.2 | 0.221 | 0.1 | 0.688 | 0.1 | 0.177 |
| Southern Michigan Rural ACO | 0.2 | 0.009 | 0.4 | 0.001 | -0.3 | 0.027 | -0.2 | 0.004 |
| New Hampshire Rural ACO | -0.2 | 0.000 | 1.3 | 0.000 | 0.6 | 0.002 | -0.2 | 0.006 |
| Ohio River Basin ACO | 0.2 | 0.066 | 1.1 | 0.000 | 0.2 | 0.142 | 0.1 | 0.407 |
| Magnolia-Evergreen ACO | 0.5 | 0.000 | -0.3 | 0.023 | -0.4 | 0.004 | -0.1 | 0.242 |
| North Mississippi Connected Care Alliance | 0.2 | 0.010 | 1.8 | 0.000 | 0.3 | 0.025 | 0.2 | 0.019 |
| Deep South Regional ACO | 0.3 | 0.002 | -0.7 | 0.000 | 0.3 | 0.081 | 0.0 | 0.636 |
| Minnesota Rural ACO | -0.3 | 0.000 | 1.8 | 0.000 | 0.7 | 0.000 | 0.0 | 0.567 |
| Oregon-Indiana ACO | -0.1 | 0.296 | 1.3 | 0.000 | -0.3 | 0.006 | 0.2 | 0.061 |
| Mountain West ACO | 0.5 | 0.000 | 0.6 | 0.000 | -0.1 | 0.432 | 0.3 | 0.000 |
| High Sierras-Northern Plains ACO | -0.2 | 0.030 | 0.0 | 0.929 | -0.6 | 0.000 | -0.5 | 0.000 |
| Aledade Kansas ACO | 0.1 | 0.056 | 1.5 | 0.000 | -0.5 | 0.000 | -0.3 | 0.000 |
| Aledade West Virginia ACO | -0.4 | 0.000 | 0.4 | 0.050 | 0.5 | 0.011 | -0.4 | 0.000 |
| Heartland Physicians ACO | -0.4 | 0.002 | -0.9 | 0.003 | -0.7 | 0.001 | -0.2 | 0.027 |
| Alliance ACO | 0.2 | 0.126 | -0.7 | 0.015 | 0.5 | 0.049 | -0.4 | 0.000 |
| Kentucky Primary Care Alliance Region 2 | 0.1 | 0.136 | 0.1 | 0.804 | -0.3 | 0.002 | -0.4 | 0.000 |
| Aledade Mississippi ACO | -0.4 | 0.000 | 0.9 | 0.000 | 1.0 | 0.000 | -0.6 | 0.000 |
| Tar River Health Alliance | 0.1 | 0.526 | 2.6 | 0.000 | -0.4 | 0.014 | 0.1 | 0.099 |
| Affiliated ACO | -0.4 | 0.008 | 0.2 | 0.595 | -0.2 | 0.223 | -0.1 | 0.460 |
| California ACO | -0.5 | 0.000 | 2.7 | 0.000 | 0.4 | 0.002 | -0.2 | 0.000 |
| San Juan ACO | -0.1 | 0.585 | 0.6 | 0.000 | -0.3 | 0.143 | -0.1 | 0.345 |
| Rocky Mountain ACO | -0.1 | 0.046 | 0.7 | 0.000 | -1.3 | 0.000 | 0.1 | 0.046 |
| MissouriHealth+ | -0.2 | 0.010 | -0.6 | 0.001 | -0.5 | 0.000 | -0.2 | 0.007 |
| Beacon Rural Health | 0.2 | 0.034 | 0.4 | 0.013 | 0.0 | 0.871 | -0.1 | 0.077 |

Note: Represent the estimated impact of AIM on the performance measure listed in each column based on the DID model described in Chapter 3. Statistical significance at the 5 percent level are shaded. The claims-based measures are described in Appendix 1C.

**Exhibit 3D-6. AIM Test 1 ACO Any All-Cause 30-day Readmissions, Any ASC Stay, Mortality**

| ACO Name | Any Readmission | | Any ASC Stay | | Mortality | |
|---|---|---|---|---|---|---|
| | Estimate | P-value | Estimate | P-value | Estimate | P-value |
| Carolina Medical Home Network ACO | -0.3 | 0.153 | -0.6 | 0.037 | 0.1 | 0.835 |
| Illinois Rural Community Care Organization | 0.0 | 0.984 | 0.0 | 0.988 | 0.3 | 0.103 |
| Reid ACO | 0.5 | 0.037 | 1.0 | 0.007 | -0.5 | 0.147 |
| Akira Health of Los Angeles | 0.0 | 0.858 | -0.1 | 0.670 | 0.0 | 0.869 |
| Texas Rural ACO | -0.3 | 0.238 | 0.2 | 0.658 | 0.1 | 0.759 |
| Access Care Oklahoma | -0.1 | 0.655 | 0.0 | 0.873 | -0.2 | 0.260 |
| Citrus County ACO | -0.3 | 0.076 | -1.0 | 0.000 | -0.5 | 0.014 |
| AmpliPHY of Texas ACO | -0.1 | 0.689 | -0.3 | 0.363 | 0.6 | 0.070 |
| AmpliPHY of Kentucky ACO | -0.6 | 0.046 | -0.1 | 0.811 | -0.6 | 0.041 |
| Winding River ACO | 0.0 | 0.888 | -0.1 | 0.645 | -0.4 | 0.034 |
| Prairie Hills Care Organization | -0.5 | 0.046 | -0.2 | 0.556 | -0.5 | 0.119 |
| Great Plains Care Organization | -0.1 | 0.779 | 0.3 | 0.334 | -0.4 | 0.248 |
| Mountain Prairie ACO | 0.0 | 0.855 | -0.1 | 0.834 | 0.0 | 0.889 |
| Iowa Rural ACO | 0.2 | 0.371 | 0.2 | 0.405 | -0.1 | 0.834 |
| Illinois Rural ACO | 0.2 | 0.318 | -0.1 | 0.753 | -0.3 | 0.134 |
| Indiana Rural ACO II | -0.3 | 0.286 | 0.3 | 0.399 | -0.2 | 0.488 |
| Indiana Rural ACO | 0.1 | 0.567 | 0.6 | 0.041 | 1.2 | 0.000 |
| Michigan Rural ACO | 0.0 | 0.966 | -0.5 | 0.095 | 0.4 | 0.158 |
| Southern Michigan Rural ACO | 0.0 | 0.915 | -0.5 | 0.086 | -0.3 | 0.262 |
| New Hampshire Rural ACO | -0.2 | 0.341 | -0.5 | 0.081 | 0.0 | 0.899 |
| Ohio River Basin ACO | -0.4 | 0.066 | -0.1 | 0.738 | 0.3 | 0.178 |
| Magnolia-Evergreen ACO | -0.3 | 0.086 | 0.1 | 0.691 | -0.2 | 0.471 |
| North Mississippi Connected Care Alliance | 0.0 | 0.883 | 0.4 | 0.093 | 0.0 | 0.942 |
| Deep South Regional ACO | -0.5 | 0.010 | 0.4 | 0.251 | 0.0 | 0.994 |
| Minnesota Rural ACO | 0.0 | 0.946 | -0.1 | 0.673 | 0.3 | 0.239 |
| Oregon-Indiana ACO | 0.4 | 0.182 | 0.1 | 0.784 | 0.1 | 0.697 |
| Mountain West ACO | 0.0 | 0.963 | -0.7 | 0.006 | 1.4 | 0.000 |
| High Sierras-Northern Plains ACO | -0.1 | 0.460 | 0.1 | 0.699 | 0.1 | 0.606 |
| Aledade Kansas ACO | -0.1 | 0.500 | -0.2 | 0.379 | -0.1 | 0.662 |
| Aledade West Virginia ACO | -0.5 | 0.041 | -0.4 | 0.129 | 0.1 | 0.686 |
| Heartland Physicians ACO | -0.8 | 0.006 | -0.4 | 0.272 | -1.2 | 0.001 |
| Alliance ACO | -0.5 | 0.003 | -0.7 | 0.002 | -1.0 | 0.000 |
| Kentucky Primary Care Alliance Region 2 | -0.1 | 0.602 | -0.3 | 0.273 | -0.1 | 0.790 |
| Aledade Mississippi ACO | -0.3 | 0.084 | -0.5 | 0.008 | 0.1 | 0.475 |
| Tar River Health Alliance | 0.0 | 0.936 | -0.1 | 0.682 | 0.1 | 0.843 |
| Affiliated ACO | 0.3 | 0.315 | -0.4 | 0.319 | 0.1 | 0.795 |
| California ACO | -0.2 | 0.136 | 0.2 | 0.350 | 0.0 | 0.999 |
| San Juan ACO | 0.1 | 0.504 | -0.5 | 0.047 | 0.0 | 0.874 |
| Rocky Mountain ACO | -0.2 | 0.256 | -0.3 | 0.112 | -0.2 | 0.383 |
| MissouriHealth+ | -0.1 | 0.592 | 0.2 | 0.329 | -0.1 | 0.504 |
| Beacon Rural Health | -0.1 | 0.474 | 0.4 | 0.107 | -0.4 | 0.091 |

Note: Represent the estimated impact of AIM on the performance measure listed in each column based on the DID model described in Chapter 3. Statistical significance at the 5 percent level are shaded. The claims-based measures are described in Appendix 1C.

**Exhibit 3D-7. AIM Test 2 ACO-Level Results**

| Performance Measures | The Premier Healthcare Network | | Akira Health | | Sunshine ACO | | PremierMD ACO | |
|---|---|---|---|---|---|---|---|---|
| | Estimate | P-Value | Estimate | P-Value | Estimate | P-Value | Estimate | P-Value |
| Medicare payments (PBPM) | | | | | | | | |
| Total | -39.33 | 0.139 | 106.90 | 0.003 | -56.03 | 0.240 | 61.26 | 0.109 |
| Acute inpatient | -14.51 | 0.418 | 110.46 | 0.000 | -23.88 | 0.514 | 42.79 | 0.018 |
| Physician services | -5.90 | 0.374 | 10.12 | 0.171 | 3.78 | 0.496 | 19.33 | 0.276 |
| Hospital outpatient and ambulatory surgery centers | -12.45 | 0.040 | -4.75 | 0.436 | -14.52 | 0.005 | -18.43 | 0.001 |
| Skilled nursing facility | -2.90 | 0.541 | 10.15 | 0.419 | 7.93 | 0.475 | 24.17 | 0.004 |
| Home health | 0.28 | 0.926 | 11.11 | 0.044 | 1.12 | 0.947 | 5.76 | 0.632 |
| Durable medical equipment | -0.40 | 0.691 | 1.66 | 0.003 | 0.45 | 0.778 | 2.57 | 0.076 |
| Inpatient utilization | | | | | | | | |
| Any acute hospitalization (%) | 0.0 | 0.052 | 0.0 | 0.005 | -0.0 | 0.016 | 0.0 | 0.051 |
| # Acute hospitalizations | 0.0 | 0.358 | 0.0 | 0.020 | -0.0 | 0.141 | 0.0 | 0.223 |
| All-cause 30-day readmission (%) | -0.2 | 0.447 | 1.0 | 0.004 | 0.0 | 0.811 | 0.8 | 0.001 |
| Any ambulatory care sensitive admission (%) | 0.3 | 0.232 | 1.2 | 0.016 | -0.5 | 0.189 | 0.8 | 0.107 |
| Emergency department and observation utilization | | | | | | | | |
| Any ED visit not resulting in hospital admission (%) | -1.2 | 0.157 | -1.7 | 0.006 | 0.8 | 0.259 | -1.9 | 0.015 |
| Any ED visit resulting in hospital admission (%) | 1.7 | 0.000 | 2.3 | 0.001 | -1.4 | 0.013 | 0.3 | 0.516 |
| Any observation stays (inpatient or outpatient) (%) | -2.3 | 0.002 | -0.8 | 0.065 | -0.0 | 0.988 | -1.7 | 0.029 |
| Post-acute care and hospice utilization | | | | | | | | |
| # SNF days | -0.1 | 0.432 | 0.1 | 0.574 | 0.0 | 0.917 | 0.5 | 0.002 |
| Any hospice use (%) | 0.4 | 0.035 | -0.0 | 0.906 | -0.2 | 0.681 | -0.5 | 0.076 |
| Physician services utilization | | | | | | | | |
| # Physician office-based E&M visits | -0.1 | 0.619 | 0.2 | 0.429 | 0.2 | 0.091 | 0.5 | 0.313 |
| # Imaging events | -0.3 | 0.043 | 0.3 | 0.030 | -0.5 | 0.000 | 0.1 | 0.589 |
| # Procedures | -0.8 | 0.009 | -0.3 | 0.291 | 0.9 | 0.268 | 1.3 | 0.149 |
| # Tests | 2.1 | 0.027 | 1.6 | 0.033 | -2.1 | 0.001 | 1.4 | 0.284 |
| Mortality (%) | -0.6 | 0.036 | -0.1 | 0.449 | 1.1 | 0.000 | -0.1 | 0.784 |

Note: We compared each outcome between beneficiaries assigned to AIM ACOs and beneficiaries assigned to similar non-AIM SSP ACOs in the performance and baseline years using a DID approach. Statistically significant estimates at the 5 percent level are highlighted. PBPM is per beneficiary per month; ED is emergency department; SNF is skilled nursing facility; E&M is evaluation and management.

# Appendix 3E. List of Non-AIM SSP ACOs that are Similar to AIM ACOs

**Exhibit 3E-1. Non-AIM SSP ACO Comparison Groups for AIM Test 1 ACOs**

| SSP ACOs | PY1 (2016) | PY2 (2017) | PY3 (2018) |
|---|---|---|---|
| Comparison for Shared Savings Program 2015 Starters | | | |
| Frederick Integrated Healthcare Network | Yes | Yes | Yes |
| Holy Cross Physician Partners ACO | Yes | Yes | Yes |
| Health Alliance Integrated Care | Yes | No | No |
| PACN | Yes | Yes | Yes |
| St. Francis Accountable Health Network | Yes | Yes | Yes |
| RHS Regional Health Network | Yes | No | No |
| Capital Health ACO | Yes | Yes | Yes |
| Trinity Health Michigan ("St. Mary Mercy Hospital") | Yes | No | No |
| North Central Arizona Accountable Care | Yes | Yes | Yes |
| Physicians ACO | Yes | Yes | Yes |
| Connected Care | Yes | Yes | No |
| Healthcare Partners of the North Country | Yes | Yes | Yes |
| Advanced Premier Physicians ACO | Yes | Yes | No |
| Doctors ACO | Yes | Yes | Yes |
| CHWN ACO | Yes | Yes | No |
| Franciscan Riverview Health ACO | Yes | Yes | Yes |
| Carroll ACO | Yes | Yes | Yes |
| Quality Health Alliance-ACO | Yes | No | No |
| Springfield Clinic ACO | Yes | Yes | Yes |
| MissionPoint Evansville | Yes | Yes | Yes |
| MissionPoint Birmingham | Yes | Yes | Yes |
| Cape Fear Valley ACO | Yes | Yes | Yes |
| Bassett Accountable Care Partners | Yes | Yes | Yes |
| Adena Healthcare Collaborative | Yes | Yes | Yes |
| MHT-ACO | Yes | No | No |
| Aledade Primary Care ACO | Yes | Yes | Yes |
| Arkansas High Performance Network ACO of FQHC | Yes | Yes | No |
| West Tennessee Clinical Partners | Yes | Yes | Yes |
| Bluegrass Clinical Partners | Yes | Yes | No |
| Chrysalis - An ACO | Yes | Yes | Yes |
| Integrated Medical Staff of Jackson | Yes | Yes | Yes |
| Western Maryland Physician Network | Yes | Yes | No |
| BMC Integrated Care Services | Yes | Yes | Yes |
| SSMOK ACO | Yes | No | No |
| Pricare ACO | Yes | Yes | Yes |
| Orange Accountable Care of New York | Yes | Yes | Yes |
| ASPA-Connected | Yes | Yes | Yes |
| Arkansas High Performance Network ACO of CAH | Yes | No | No |
| Richmond Quality | Yes | Yes | Yes |
| Inspira Care Connect | Yes | Yes | Yes |
| PQN - Central Texas | Yes | Yes | Yes |
| PrimeCare Select | Yes | No | No |
| Pioneer Health Alliance | Yes | Yes | Yes |
| The Health Network of Western Kentucky | Yes | Yes | Yes |
| Keystone Clinical Partners | Yes | Yes | Yes |

| SSP ACOs | PY1 (2016) | PY2 (2017) | PY3 (2018) |
|---|---|---|---|
| Comparison for Shared Savings Program 2016 Starters | | | |
| UM ACO | Yes | Yes | Yes |
| Valley Health Alliance | Yes | Yes | Yes |
| Crescent City ACO | Yes | Yes | Yes |
| Think ACO | Yes | Yes | Yes |
| Central Florida ACO | Yes | Yes | Yes |
| Space Coast ACO | Yes | Yes | Yes |
| Eastern Kentucky Clinical Partners | Yes | Yes | Yes |
| Accountable Care Coalition of Northeast Georgia | Yes | Yes | Yes |
| Hudson Accountable Care | Yes | Yes | Yes |
| Baptist Physician Alliance ACO | Yes | Yes | Yes |
| CareAlliance: An ACO | Yes | Yes | Yes |
| Community Care Partnership of Maine | Yes | Yes | Yes |
| Matrix ACO | Yes | Yes | Yes |
| Next ACO of Nature Coast | Yes | Yes | Yes |
| Central Minnesota ACO | Yes | Yes | Yes |
| Mercy Accountable Care Network | Yes | No | No |
| Aledade Florida Central ACO | Yes | Yes | Yes |
| CHI Health Partners | Yes | Yes | Yes |
| Aledade Louisiana ACO | Yes | Yes | Yes |
| Sandhills Accountable Care Alliance | Yes | Yes | No |
| St. Josephs Health ACO | Yes | No | No |
| ACO of Floyd Medical Center | Yes | Yes | Yes |
| Delaware Care Collaboration DCC | Yes | Yes | Yes |
| Life Health Services | Yes | Yes | Yes |
| Milestone Health | Yes | Yes | Yes |
| Consolidated Medical Practices of Memphis | Yes | Yes | Yes |
| Kentucky Physicians for Accountable Care | Yes | Yes | Yes |
| Princeton HealthCare Partners | Yes | Yes | Yes |
| CPG Quality Care Alliance | Yes | Yes | Yes |
| Empire State Health Partners | Yes | Yes | Yes |
| Bay Area Medical Associates ACO | Yes | No | No |
| Western Kentucky Clinical Partners | Yes | Yes | Yes |
| AccoCare | Yes | Yes | Yes |
| GHN ACO | Yes | Yes | Yes |
| AVANT MSO | Yes | Yes | Yes |
| Accountable Care of NEFL | Yes | Yes | Yes |
| Prime Accountable care | Yes | Yes | Yes |
| CHRISTUS Santa Rosa Quality Care Alliance | Yes | No | No |
| CVCHiP | Yes | Yes | Yes |
| Peninsula Regional Clinically Integrated Network | Yes | Yes | Yes |
| Baxter Physician Partners | Yes | Yes | Yes |
| Care4Texans | Yes | Yes | Yes |
| Cayuga Area Preferred | Yes | Yes | Yes |
| Health First Partners | Yes | Yes | Yes |

Note: We selected similar non-AIM SSP ACOs that began the Shared Savings Program in the same year, were smaller in terms of number of assigned beneficiaries, did not participate in the Advance Payment ACO Model, and were in Shared Savings Program financial risk track 1 in PY1. We indicate in the table if the selected SSP ACO participated in PY1, PY2, and PY3.

**Exhibit 3E-2. Non-AIM SSP ACO Comparison Groups for AIM Test 2 ACOs**

| SSP ACOs | PY1 | PY2 | PY3 |
|---|---|---|---|
| Comparison for Physicians Collaborative Trust of the Mississippi Gulf Coast (Shared Savings Program 2012 Starters) | | | |
| Arizona Connected Care | Yes | Yes | Yes |
| Florida Physicians Trust | Yes | Yes | Yes |
| Premier ACO Physicians Network | Yes | Yes | Yes |
| ACO of the North Country | Yes | Yes | Yes |
| Accountable Care Coalition of Coastal Georgia | Yes | Yes | Yes |
| Comparison for Baroma Healthcare International, The Premier HealthCare Network & Akira Health (Shared Savings Program 2013 Starters) | | | |
| Accountable Care Coalition of Western Georgia | Yes | Yes | Yes |
| Primary Care Alliance | Yes | Yes | Yes |
| Indiana Lakes ACO | Yes | Yes | Yes |
| Commonwealth Primary Care ACO | Yes | Yes | Yes |
| APCN-ACO | Yes | Yes | Yes |
| Christie Clinic Physician Services | Yes | Yes | Yes |
| Keystone ACO | Yes | Yes | Yes |
| MCM ACO | Yes | Yes | Yes |
| Accountable Care Coalition of Georgia | Yes | Yes | Yes |
| Morehouse Choice ACO-ES | Yes | Yes | Yes |
| Integral Healthcare | Yes | Yes | Yes |
| Indiana Care Organization | Yes | Yes | No |
| Paradigm ACO | Yes | Yes | Yes |
| Southern Maryland Integrated Care | Yes | Yes | Yes |
| Comparison for Sunshine ACO & PremierMD ACO (Shared Savings Program 2014 Starters) | | | |
| ACO Providers | Yes | Yes | Yes |
| Redwood Community Care Organization | Yes | Yes | Yes |
| Primary Comprehensive Care ACO | Yes | No | No |
| Physician First ACO | Yes | No | No |
| North Collaborative Care | Yes | Yes | Yes |
| ACMG | Yes | Yes | Yes |
| Midwest Health Coalition ACO | Yes | Yes | Yes |
| Carolinas ACO | Yes | No | No |
| NEPA ACO Company | Yes | No | No |
| Orange Accountable Care of South Florida | Yes | Yes | Yes |
| Physician Direct ACO | Yes | Yes | Yes |
| ACONA | Yes | Yes | Yes |
| Allied Physicians ACO | Yes | No | No |
| FamilyHealth ACO | Yes | Yes | Yes |
| Allegiance ACO | Yes | Yes | Yes |
| Primary PartnerCare ACO Independent Practice Association | Yes | Yes | Yes |
| Premier Choice ACO | Yes | No | No |
| New York State Elite (NYSE) ACO | Yes | No | No |
| Huntington Care Network ACO | Yes | Yes | No |
| Live Oak Care | Yes | Yes | Yes |
| Central US ACO | Yes | Yes | Yes |
| Buena Vida y Salud | Yes | Yes | Yes |
| Emerald Physicians | Yes | Yes | No |
| Loudoun Medical Group ACO | Yes | Yes | Yes |
| Oklahoma Health Initiatives | Yes | Yes | Yes |
| St Vincents ACO | Yes | Yes | Yes |

| SSP ACOs | PY1 | PY2 | PY3 |
|---|---|---|---|
| Antelope Valley ACO | Yes | Yes | Yes |
| Accountable Care Alliance of Ventura | Yes | Yes | No |
| Health Point ACO | Yes | Yes | Yes |
| PMC ACO | Yes | Yes | Yes |
| St Joseph Health Partners ACO | Yes | Yes | Yes |
| Arkansas Accountable Care | Yes | No | No |
| Kansas Primary Care Alliance | Yes | Yes | No |
| Integrity Health Innovations | Yes | No | No |
| Augusta Care Partners | Yes | Yes | Yes |
| GGC ACO | Yes | Yes | Yes |
| Broward Guardian | Yes | Yes | Yes |
| JFK Health ACO | Yes | Yes | Yes |
| Community Health Accountable Care | Yes | Yes | No |
| UPSA ACO | Yes | Yes | Yes |
| Ingalls Care Network | Yes | Yes | Yes |
| Partners In Care ACO | Yes | Yes | Yes |
| Akira Health of Fresno | Yes | Yes | Yes |
| South Bend Clinic Accountable Care | Yes | Yes | Yes |
| Clinical Partners of Colorado Springs | Yes | Yes | Yes |
| Physicians Accountable Care of Utah | Yes | Yes | Yes |
| Louisiana Physicians ACO | Yes | Yes | Yes |
| RWJ Partners | Yes | Yes | Yes |
| Cleveland Quality Healthnet | Yes | Yes | No |
| Accountable Care Coalition of Mississippi | Yes | Yes | Yes |
| Accountable Care Coalition of Greater New York | Yes | Yes | Yes |
| Accountable Care Coalition of Maryland Primary Care | Yes | No | No |

Note: We selected similar non-AIM SSP ACOs that began the Shared Savings Program in the same year, were smaller in terms of number of assigned beneficiaries, did not participate in the AP model, and were in SSP financial risk track 1 in PY1. We indicate in the table if the selected SSP ACO participated in PY1, PY2, and PY3. For AIM Test 2 ACOs starting AIM in 2015, PY1-PY3 is 2015-2017. For AIM Test 2 ACOs starting AIM in 2016, PY1-PY3 is 2016-2018.

# Appendix 3F. Methodology for Comparing AIM ACOs to Non-AIM SSP ACOs

We compared AIM ACOs to non-AIM SSP ACOs to obtain the incremental effect of AIM funds on Shared Savings Program participation. AIM Test 1 and Test 2 ACOs were both compared to non-AIM SSP ACOs, but they each used different analytic methodologies since AIM Test 1 ACOs were new to the Shared Savings Program when they started AIM and AIM Test 2 ACOs were already participating in the Shared Savings Program when they started AIM.

**Performance measures and statistical specification:** We examined the 21 claims- or enrollment-based outcomes listed in **Chapter 1** and described in **Appendix 1C** (excluding the Part D prescription drug spending). We used standard linear regression models for all 21 performance measures.

**Risk adjustment and covariate balancing:** We used the same risk adjustors for beneficiary-level analyses as described in **Appendix 3B** with the following exceptions: since the comparison group is not from the same market, we did not include PCSA fixed effects, but rather controlled for rurality, primary care HPSA, mental care HPSA, and market favorability scores. Similar to the AIM Test 1 ACO analyses, we applied beneficiary-level entropy balancing weights in beneficiary-level analyses so that covariates were balanced between the ACO and comparison groups (see **Chapter 3**).

**Comparing AIM Test 1 ACOs to non-AIM SSP ACOs:** We compared AIM Test 1 ACOs to similar non-AIM ACOs on outcomes using the following steps:

1) Obtain a DID estimate for each AIM ACO and a DID estimate for each non-AIM SSP ACO using each ACO's non-ACO FFS market comparison beneficiaries (for the methodology, see **Chapter 3**).
2) Compute the average impact for similar non-AIM ACOs by SSP start year, using entropy balancing for the following characteristics of the accompanying AIM ACO in each performance year: percent rural, percent primary care HPSA, and number of beneficiaries, and marketplace favorability scores.
3) Compute the difference between the DID estimate for each AIM ACO (Step 1) and the mean DID estimate across each AIM ACO's similar non-AIM SSP ACOs (Step 2) and then averaging those differences across all non-AIM SSP ACOs based on the proportion of beneficiaries assigned to each ACO to create a non-AIM SSP ACO aggregate difference.
4) The difference between each AIM ACO difference and its corresponding non-AIM SSP ACO aggregate difference is the estimated incremental effect of AIM funds on Shared Savings Program participation for a given outcome.

**Comparing AIM Test 2 ACOs to non-AIM SSP ACOs:** We used a DID framework similar to the one used for AIM Test 1 ACOs to compare outcomes of AIM Test 2 ACOs with non-AIM SSP ACOs (**Chapter 3**). The key difference is that the comparison for each AIM Test 2 ACO is directly to the beneficiaries assigned to similar non-AIM SSP ACOs since AIM Test 2 ACOs were existing SSP ACOs when they began AIM. Our analytic approach is detailed below.

For AIM Test 2 ACOs, we used a baseline period of two years prior to AIM start, as shown in **Exhibit 1-6**. Since AIM Test 2 ACOs and their comparators existed as SSP ACOs in their baseline years, the actual participants in each baseline and performance year were used for beneficiary assignment (see **Appendix 1B**). For the four AIM Test 2 ACOs starting AIM in 2015, we used 2013 and 2014 as the baseline years, 2015 as the first performance year, 2016 as the second performance year, and 2017 as the third

performance year.[26] For the two AIM Test 2 ACOs starting AIM in 2016, we used 2014 and 2015 as the baseline years, 2016 as the first performance year, 2017 as the second performance year, and 2018 as the third performance year.

**Analysis:** For each outcome and each AIM ACO, we computed the mean difference for each AIM ACO between the performance period and the baseline period and the analogous difference across similar non-AIM SSP ACOs based on the weighting methodology described below. We then averaged this difference in each outcome among the non-AIM SSP ACOs by using the number of beneficiaries assigned in the performance year as a weight. The difference between each AIM ACO difference for a given outcome and the aggregated non-AIM SSP ACO difference represented the incremental effect of AIM funds on Share Savings Program participation.

**Parallel trends testing:** Our strategy of comparing beneficiaries assigned to AIM Test 2 ACOs to beneficiaries assigned to similar non-AIM SSP ACOs hinges on the assumption that the two groups would have experienced similar trends in outcomes in the absence of AIM. This comparison would be problematic if we observed substantial differences in key outcomes of interest relative to similar non-AIM SSP ACOs prior to AIM participation. We tested this parallel trend assumption for total Medicare spending. Three of the four AIM Test 2 ACOs passed parallel trends tests at the 5 percent statistical significance level for total Medicare spending. The difference in trends in total spending during the baseline period between Akira Health ACO and similar non-AIM ACOs was statistically significant at the 5 percent level. For Akira Health, the 95 percent confidence interval indicated a differential "pre-trend" of up to $259.24. Among the three Test 2 ACOs that did pass the parallel trends tests, the confidence intervals for the impact estimates were also large. These findings suggest that even statistically insignificant "pre-trends" could substantially influence the impact estimates, and estimates for Test 2 ACOs should be interpreted with caution.

We did not test for differences in baseline parallel trends between AIM Test 1 ACOs and their comparison non-AIM SSP ACOs, since results of that analysis were not intended to be causally interpretable.

[26] Note that we treated calendar year 2015 as the first performance year for ACOs starting AIM in 2015 even though these ACOs did not start AIM until April 2015. We do not anticipate the three-month discrepancy to affect our findings substantively, as AIM 2015 starters were all prior Shared Savings Program participants and likely anticipated the start of AIM.

# Appendix 3G. Additional Results Comparing AIM ACOs to Non-AIM SSP ACOs

**Exhibit 3G-1. Most AIM Test 1 ACOs Had Greater Reductions in Spending and Related Utilization than Similar Non-AIM SSP ACOs in All Performance Years**

| Number of ACOs with Higher or Lower Impact Estimates than the mean non-AIM ACO Impact | PY1 (2016) | | PY2 (2017) | | PY3 (2018) | |
|---|---|---|---|---|---|---|
| | Lower | Lower | Higher | Higher | Lower | Higher |
| Medicare payments | | | | | | |
| Total | 31 (6) | 34 (10) | 7 (0) | 10 (1) | 30 (8) | 11 (0) |
| Acute inpatient | 28 (5) | 27 (4) | 14 (0) | 13 (0) | 28 (2) | 13 (0) |
| Physician services | 35 (2) | 27 (1) | 14 (2) | 6 (0) | 20 (5) | 21 (6) |
| Hospital outpatient and ambulatory surgery centers | 25 (1) | 28 (5) | 13 (0) | 16 (1) | 29 (11) | 12 (0) |
| Skilled nursing facility | 29 (3) | 31 (7) | 10 (1) | 12 (1) | 24 (9) | 17 (3) |
| Home health | 26 (2) | 27 (3) | 14 (0) | 15 (0) | 27 (10) | 14 (0) |
| Durable medical equipment | 22 (1) | 28 (3) | 13 (1) | 19 (1) | 21 (10) | 20 (2) |
| Inpatient utilization | | | | | | |
| Any acute hospitalization | 26 (5) | 26 (2) | 15 (1) | 15 (1) | 30 (8) | 11 (0) |
| # Acute hospitalizations | 29 (5) | 25 (3) | 16 (0) | 12 (1) | 29 (4) | 12 (0) |
| All-cause 30-day readmission | 31 (6) | 28 (2) | 13 (0) | 10 (1) | 28 (5) | 13 (0) |
| Any ambulatory sensitive condition admission | 26 (2) | 34 (8) | 7 (1) | 15 (1) | 25 (3) | 16 (0) |
| Emergency department and observation utilization | | | | | | |
| Any ED visit not resulting in hospital admission | 26 (1) | 27 (4) | 14 (0) | 15 (0) | 28 (6) | 13 (0) |
| Any ED visit resulting in hospital admission | 22 (3) | 23 (4) | 18 (1) | 19 (2) | 26 (7) | 15 (5) |
| Any observation stays (inpatient or outpatient) | 29 (2) | 29 (0) | 12 (0) | 12 (0) | 25 (12) | 16 (3) |
| Post-acute care and hospice utilization | | | | | | |
| # Skilled nursing facility days | 28 (1) | 33 (3) | 8 (0) | 13 (3) | 21 (8) | 20 (4) |
| Any hospice use | 26 (0) | 20 (1) | 21 (1) | 15 (0) | 26 (8) | 15 (1) |
| Physician services utilization | | | | | | |
| # Office-based E&M visits | 24 (2) | 23 (7) | 18 (5) | 17 (1) | 14 (8) | 27 (18) |
| # Imaging events | 25 (4) | 20 (1) | 21 (0) | 16 (3) | 24 (5) | 17 (4) |
| # Procedures | 34 (1) | 30 (6) | 11 (1) | 7 (1) | 25 (9) | 16 (8) |
| # Tests | 24 (0) | 9 (0) | 32 (1) | 17 (1) | 14 (8) | 27 (24) |
| Mortality | 26(2) | 28 (1) | 13 (1) | 15 (2) | 25 (6) | 16 (2) |

Note: Analysis of 41 AIM Test 1 ACOs and their non-AIM SSP ACO comparators. Impact estimates were computed by comparing ACO assigned beneficiaries to non-ACO FFS beneficiaries located in the ACOs' markets. In parentheses is the number of AIM ACOs for which the estimated impacts were more than two standard deviations different than the impact estimate for similar non-AIM SSP ACOs. PBPM is per beneficiary per month; ED is emergency department; SNF is skilled nursing facility; E&M is evaluation and management.
Source: ACO Provider Research Identifiable Files for 2016-2018 and 2013-2018 Medicare claims data.

**Exhibit 3G-2. Results for AIM Test 2 ACOs Relative to Comparable non-AIM SSP ACOs Were inconsistent across Performance Years**

| Performance Measure | PY1 | PY2 | PY3 |
|---|---|---|---|
| Medicare spending ($ PBPM) | | | |
| Acute inpatient | -$1.75 | -$18.07 | $35.78 |
| Physician services | -$12.19 | -$5.25 | $7.63 |
| Hospital outpatient and ambulatory surgery centers | -$0.44 | -$13.43 | -$12.38 |
| Skilled nursing facility | $0.02 | -$16.13 | $10.53 |
| Home health | -$7.08 | -$0.73 | $5.07 |
| Durable medical equipment | -$0.06 | $0.23 | $1.19 |
| Inpatient utilization | | | |
| Any acute hospitalization (% points) | 0.0 | -0.4 | 0.0 |
| # Acute hospitalizations | 0.1 | 0.0 | 0.0 |
| All-cause 30-day readmission (% points) | -0.1 | 0.0 | 0.5 |
| Any ambulatory sensitive condition admission (% points) | 0.1 | 0.0 | 0.5 |
| Emergency department and observation utilization | | | |
| Any ED visit not resulting in hospital admission (% points) | 0.3 | -0.1 | -1.2 |
| Any ED visit resulting in hospital admission (% points) | 0.1 | -0.3 | 0.9 |
| Any observation stays (inpatient or outpatient) (% points) | -0.6 | -0.8 | -1.3 |
| Post-acute care and hospice utilization | | | |
| # SNF days | 0.0 | -0.3 | 0.2 |
| Any hospice use (% points) | 0.1 | 0.0 | -0.1 |
| Physician services utilization | | | |
| # Office-based E&M visits | -0.1 | 0.0 | 0.2 |
| # Imaging events | -0.1 | -0.3 | -0.1 |
| # Procedures | -0.4 | -0.2 | 0.3 |
| # Tests | -0.1 | 1.3 | 1.1 |
| Mortality (% points) | 0.0 | 0.1 | 0.0 |

Notes: Analysis of four Test 2 AIM ACOs and their non-AIM SSP ACO comparators. Estimate from the DID model, showing the marginal increase or decrease in an outcome for beneficiaries assigned to AIM ACOs compared to beneficiaries assigned to comparable non-AIM SSP ACOs in the second AIM performance year. For binary measures (%), the estimate represents the change in an outcome in terms of percentage points. For AIM Test 2 ACOs starting AIM in 2015, PY1-PY3 is 2015-2017. For AIM Test 2 ACOs starting AIM in 2016, PY1-PY3 is 2016-2018.
Source: ACO Provider Research Identifiable Files for 2015-2018 and 2013-2018 Medicare claims data.

# Appendix 3H. Methodology for Estimating the Effect of AIM on Quality

We applied differing approaches to examine the relationship between AIM and quality depending on the type of quality measure and data availability. We examined two types of quality measures: patient/caregiver experience measures based on survey data and ACO measures reported via the Merit-based Incentive Payment System (MIPS) Web interface addressing the domains of preventive health and at-risk populations.[27]

## *Patient or caregiver experience*

To examine the effect of AIM on patient or caregiver experience, we obtained beneficiary-level CAHPS survey responses for surveyed ACO-assigned beneficiaries and non-ACO FFS comparison beneficiaries residing in the ACOs' markets.[28]

We examined the following CAHPS questions, reflecting the patients' or caregivers' experiences in the previous six months across six quality domains.[29] Questions with asterisks below were discontinued in the 2018 CAHPS, which was the third performance year for most AIM ACOs. Therefore, composite scores comprising the domains for 2018 contain fewer items and thus are not fully comparable with the composite scores from the first and second performance years.

**Getting timely care, appointments, and information:**

- In the last 6 months, when you phoned this provider's office to get an appointment for care you needed right away, how often did you get an appointment as soon as you needed?
- In the last 6 months, when you made an appointment for a check-up or routine care with this provider, how often did you get an appointment as soon as you needed?
- In the last 6 months, when you phoned this provider's office during regular office hours, how often did you get an answer to your medical question that same day?
- In the last 6 months, when you phoned this provider's office after regular office hours, how often did you get an answer to your medical question as soon as you needed? *
- In the last 6 months, how often did you see this provider within 15 minutes of your appointment time? *

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[27] The MIPS Web interface was formerly known as the Group Practice Reporting Option (GPRO). For more information on ACO quality measures, please refer to the Medicare Shared Savings Program Quality Measure Narrative Specifications Document updated each year (https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/sharedsavingsprogram/program-guidance-and-specifications.html).

[28] A sample of beneficiaries assigned to each SSP ACO were surveyed using ACO CAHPS, as required by Shared Savings Program participation. Data for those in the non-ACO FFS comparison were drawn from the MIPS CAHPS (formerly PQRS) sample.

[29] For more information on CAHPS survey for ACOs, please reference the following report: Centers for Medicare & Medicaid Services, *Medicare Shared Savings Program and Next Generation ACO Model CAHPS Survey for Accountable Care Organizations Participating in Medicare Initiatives*, June 2018 Version #6, available at https://acocahps.cms.gov/globalassets/aco---epi-2-new-site/pdfs-for-aco/quality-assurance-guidelines/2018-aco-qag-v6---final.2.pdf, last accessed on February 2, 2019.

**How well your doctors communicate**

- In the last 6 months, how often did this provider explain things in a way that was easy to understand?
- In the last 6 months, how often did this provider listen carefully to you?
- In the last 6 months, how often did this provider give you easy to understand information about these health questions or concerns? *
- In the last 6 months, how often did this provider seem to know the important information about your medical history?
- In the last 6 months, how often did this provider show respect for what you had to say?
- In the last 6 months, how often did this provider spend enough time with you?

**Patient's rating of doctor**

- Using any number from 0 to 10, where 0 is the worst provider possible and 10 is the best provider possible, what number would you use to rate this provider?

**Access to specialists**

- In the last 6 months, how often was it easy to get appointments with specialists?
- In the last 6 months, how often did the specialist you saw most seem to know the important information about your medical history? *

**Health promotion and education**

- Your health care team includes all the doctors, nurses and other people you see for health care. In the last 6 months, did you and anyone on your health care team talk about specific things you could do to prevent illness? *
- In the last 6 months, did you and anyone on your health care team talk about a healthy diet and healthy habits?
- In the last 6 months, did you and anyone on your health care team talk about the exercise or physical activity you get?
- In the last 6 months, did anyone on your health care team talk with you about specific goals for your health? *
- In the last 6 months, did anyone on your health care team ask you if there was a period of time when you felt sad, empty, or depressed?
- In the last 6 months, did you and anyone on your health care team talk about things in your life that worry you or cause you stress?

**Shared decision making**

- Did you and this provider talk about the reasons you might want to take a medicine? *
- Did you and this provider talk about the reasons you might not want to take a medicine? *
- When you and this provider talked about starting or stopping a prescription medicine, did this provider ask what you thought was best for you?

- Did you and this provider talk about the reasons you might want to have the surgery or procedure? *
- Did you and this provider talk about the reasons you might not want to have the surgery or procedure? *
- When you and this provider talked about having surgery or a procedure, did this provider ask what you thought was best for you? *

### *Regression Specification*

For each performance year and quality measure, we specify the following contemporaneous regression model for estimating the difference in quality composite scores between beneficiaries assigned to AIM Test 1 ACOs and non-ACO FFS beneficiaries in the ACOs' markets. We use an analogous equation to estimate the difference between beneficiaries assigned to similar non-AIM SSP ACOs and non-ACO FFS beneficiaries in the ACOs' markets as well as for AIM Test 2 ACOs versus similar SSP ACOs.

$$Y_{bt} = \alpha_0 + \alpha_1 AIM_{bt} + \alpha_2 X_{bt} + \varepsilon_{bt}, \text{ where}$$

- $Y_{bt}$: represents a measure of patient or caregiver experience reported by beneficiary *b* in year *t*
- $AIM_{bt}$: represents beneficiaries assigned to AIM ACOs in the performance year
- $X_{bt}$: represents beneficiary characteristics, including gender, race/ethnicity (black, Hispanic, or other), Medicaid dual eligibility, disability, long-term institutional care, age category, lagged HCC score, lagged HCC score squared, flags for missing HCC score, flags for 11 chronic conditions, flags for the number of chronic conditions, number of months enrolled in Medicare, mortality, flags for high utilization of health care, flag for low functional status, flag for low overall health, flag for low mental health, RUCA flag, flag for HPSA primary care designation, flag for HPSA mental care designation, flag for censored beneficiaries, and a flag for spillover beneficiaries. For the comparison of AIM Test 2 ACOs and similar SSP ACOs, we also include ACO-level flags corresponding to SSP start year. In addition to including these characteristics as covariates, we use entropy balance (EB) weights. This approach ensures that comparison beneficiaries are similar to ACO beneficiaries in terms of those characteristics that likely affect patient experience.

The coefficient of interest, $\alpha_1$, represents the effect of AIM on the dependent variable. For each specification, standard errors are clustered at the ACO level.

We note that the analyses are solely cross-sectional, so we cannot rule out that pre-existing differences in outcomes across ACO and comparison groups affected the results. However, we do account for a rich set of beneficiary characteristics. The results are based on the sample of those beneficiaries responding to the survey. As shown in **Exhibits 3I-1** and **3I-2**, beneficiaries responding to the CAHPS survey appear similar to all beneficiaries assigned to AIM ACOs along key observable characteristics, though there were some differences. Thus, the results may not necessarily generalize to all beneficiaries assigned to AIM ACOs. Finally, since CAHPS collects data from approximately the same number of beneficiaries in each ACO, all ACOs in the analyses receive approximately equal weight no matter the size of the ACO.

### *Preventive health and at-risk population measures*

We relied upon publicly available, ACO-level data for examining non-CAHPS quality measures. We examined the ACO measures from two domains: preventive health and at-risk populations. These domains were selected because of their importance to health care provision in rural areas.[30]

For the ACO-level analysis of changes in quality between AIM ACOs and similar non-AIM ACOs, we adjusted for differences across the two groups using ACO-level entropy balancing weights:

- For Test 1 AIM ACOs, we used as weights the following three ACO characteristics: the number of assigned beneficiaries, percentage of assigned beneficiaries in rural areas, percentage of assigned beneficiaries residing in an area with a primary care HPSA designation, and mean favorability score associated with beneficiaries served by the ACO.
- For Test 2 AIM ACOs, we used as weights the following eight ACO characteristics: percentage of assigned beneficiaries who are women, percentage of assigned beneficiaries who are white, percentage of assigned beneficiaries diagnosed with ESRD, percentage of Medicaid dually eligible-assigned beneficiaries, percentage of assigned beneficiaries who are disabled, mean three-year lagged HCC score, mean age, and mean number of months that beneficiaries were eligible for Medicare during the year in that ACO.[31]

Note that since these are ACO-level measures, comparisons with non-AIM SSP ACOs are necessarily descriptive, and as such, none of the findings include statistical significance testing.

It important to note that in their first year of Shared Savings Program participation, ACOs are only required to report quality measures, not be accountable for performance on those measures; it is not until the second and subsequent years when eligibility to earn shared savings depends on quality measure performance. As a result, there may be some volatility in a measure between an ACO's first and second participation year. We indeed see lower quality measure performance in the first year of Shared Savings Program participation and observe the same pattern for the similar non-AIM ACOs.

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30 https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/sharedsavingsprogram/Downloads/2018-reporting-year-narrative-specifications.pdf

31 Since AIM application decisions for AIM Test 2 ACOs did not consider geographic characteristics, we excluded these characteristics from entropy balancing when comparing these ACOs.

# Appendix 3I. Effects of AIM on Quality – Additional Results

**Exhibit 3I-1. CAHPS Survey Respondents are Representative of Assigned Beneficiaries, on Average, for AIM Test 1 ACOs in PY1-PY3**

| | PY1 (41 ACOs) | | PY2 (41 ACOs) | | PY3 (41 ACOs) | |
|---|---|---|---|---|---|---|
| | All Assigned | CAHPS Sample | All Assigned | CAHPS Sample | All Assigned | CAHPS Sample |
| Total assigned beneficiaries | 423,499 | 12,404 | 447,005 | 12,885 | 387,017 | 13,194 |
| Mean number of assigned beneficiaries per ACO | 10,329 | 303 | 10,902 | 314 | 9,439 | 322 |
| Female | 56.5% | 60.1% | 56.2% | 58.5% | 56.7% | 60.7% |
| Mean age | 71.4 | 72.8 | 71.3 | 73.0 | 71.3 | 72.9 |
| White | 87.6% | 88.7% | 87.9% | 89.1% | 87.9% | 89.9% |
| Black | 6.2% | 5.9% | 5.9% | 5.7% | 6.1% | 5.5% |
| Hispanic | 3.0% | 2.5% | 2.9% | 2.5% | 2.9% | 2.1% |
| Other race | 3.2% | 2.9% | 3.2% | 2.7% | 3.1% | 2.5% |
| End stage renal disease (ESRD) Medicare entitlement | 0.9% | 0.7% | 0.9% | 0.8% | 0.9% | 0.7% |
| Medicare/Medicaid dual eligibility | 22.5% | 20.2% | 21.9% | 19.3% | 23.3% | 20.6% |
| Disabled Medicare entitlement | 25.6% | 23.5% | 25.4% | 23.2% | 26.0% | 24.6% |
| Mean HCC risk score | 1.01 | 1.07 | 0.94 | 1.02 | 0.99 | 1.04 |
| Mean number of chronic conditions | 2.4 | 2.7 | 2.4 | 2.8 | 2.3 | 2.8 |

Source: ACO, PQRS, and MIPS CAHPS beneficiary-level responses for 2015 to 2018 combined with Medicare claims data.

**Exhibit 3I-2. Beneficiaries Responding to the CAHPS Survey Are Generally Similar to All Beneficiaries Assigned to AIM Test 2 ACOs in PY1-PY3**

| | PY1 (4 ACOs) | | PY2 (4 ACOs) | | PY3 (4 ACOs) | |
|---|---|---|---|---|---|---|
| | All Assigned | CAHPS Sample | All Assigned | CAHPS Sample | All Assigned | CAHPS Sample |
| Total assigned beneficiaries | 34,514 | 1,432 | 24,020 | 1,062 | 25,859 | 1,086 |
| Mean number of assigned beneficiaries per ACO | 5,753 | 239 | 6,204 | 270 | 6465 | 272 |
| Female | 56.6% | 62.5% | 58.1% | 58.8% | 57.7% | 59.8% |
| Mean age | 72.0 | 73.1 | 71.8 | 73.6 | 72.6 | 71.4 |
| White | 49.7% | 52.5% | 49.4% | 55.1% | 50.9% | 56.2% |
| Black | 14.8% | 15.2% | 16.6% | 14.7% | 15.3% | 12.1% |
| Hispanic | 31.1% | 29.3% | 27.9% | 25.8% | 26.7% | 26.2% |
| Other race | 4.4% | 3.0% | 6.1% | 4.4% | 6.9% | 5.5% |
| End stage renal disease (ESRD) Medicare entitlement | 2.1% | 0.8% | 2.2% | 1.0% | 2.3% | 2.0% |
| Medicare/Medicaid dual eligibility | 36.6% | 32.0% | 31.8% | 28.5% | 30.7% | 28.5% |
| Disabled Medicare entitlement | 23.2% | 21.4% | 23.3% | 20.9% | 21.7% | 20.8% |
| Mean HCC risk score | 1.17 | 1.22 | 1.14 | 1.15 | 1.12 | 1.11 |
| Mean number of chronic conditions | 2.8 | 3.2 | 2.7 | 3.1 | 2.8 | 3.2 |

Note: For AIM Test 2 ACOs starting AIM in 2015, PY1-PY3 is 2015-2017. For AIM Test 2 ACOs starting AIM in 2016, PY1-PY3 is 2016-2018.
Source: ACO, PQRS, and MIPS CAHPS beneficiary-level responses for 2015 to 2018 combined with Medicare claims data.

**Exhibit 3I-3. Regression-Adjusted Differences in Patient/Caregiver Measures for Beneficiaries Assigned to Non-AIM SSP ACOs that are Similar to AIM Test 1 ACOs and Non-ACO FFS Beneficiaries in the ACOs' Markets**

| | PY1 (2016) | | | PY2 (2017) | | | PY3 (2018) | | |
|---|---|---|---|---|---|---|---|---|---|
| | AIM | FFS Comparison | Estimate | AIM | FFS Comparison | Estimate | AIM | FFS Comparison | Estimate |
| Getting timely care, appointments, and information | 76.3% | 77.0% | -0.7% | 76.6% | 76.4% | 0.2% | 88.6% | 86.2% | 2.3%** |
| How well your doctors communicate | 92.4% | 92.5% | -0.2% | 92.4% | 92.2% | 0.3% | 93.4% | 92.4% | 0.9%* |
| Patient's rating of doctor | 92.1% | 92.2% | -0.1% | 92.1% | 92.2% | -0.1% | 92.6% | 92.0% | 0.4% |
| Access to specialists | 83.1% | 83.0% | 0.1% | 83.2% | 82.9% | 0.3% | 81.9% | 80.6% | 1.3%* |
| Health promotion and education | 59.9% | 61.3% | -1.3%** | 62.1% | 61.3% | 0.8% | 60.6% | 59.7% | 0.8% |
| Shared decision making | 64.3% | 63.9% | 0.4% | 64.6% | 64.2% | 0.4% | 50.4% | 48.1% | 2.3%* |

Note: **Indicates statistical significance at 5% level. *Indicates statistical significance at 10% level.

Source: ACO, PQRS, and MIPS CAHPS beneficiary-level responses for 2015 to 2018 combined with Medicare claims data.

**Exhibit 3I-4. Regression-Adjusted Differences in Patient/Caregiver Measures for Beneficiaries Assigned to AIM Test 2 ACOs and Similar SSP ACOs by Health Status**

| | AIM Adjusted Means | | Non-AIM SSP ACOs Adjusted Means | | Estimate |
|---|---|---|---|---|---|
| | POOR HEALTH | NOT POOR HEALTH | POOR HEALTH | NOT POOR HEALTH | |
| Performance Year 1 | | | | | |
| Getting timely care, appointments, and information | 72.7% | 74.6% | 72.0% | 74.9% | 0.9% |
| How well your doctors communicate | 89.4% | 93.4% | 89.2% | 92.4% | -0.7% |
| Patient's rating of doctor | 90.5% | 93.6% | 89.4% | 92.4% | -0.1% |
| Access to specialists | 83.2% | 84.6% | 80.5% | 83.9% | 2.0% |
| Health promotion and education | 66.5% | 62.9% | 67.3% | 60.7% | -3.1% |
| Shared decision making | 64.8% | 63.3% | 67.4% | 63.0% | -2.9% |
| Performance Year 2 | | | | | |
| Getting timely care, appointments, and information | 76.9% | 76.9% | 73.3% | 74.9% | 1.5% |
| How well your doctors communicate | 94.4% | 93.2% | 90.5% | 92.7% | 3.4%** |
| Patient's rating of doctor | 91.4% | 92.7% | 90.2% | 92.8% | 1.3% |
| Access to specialists | 82.0% | 86.9% | 79.5% | 83.5% | -0.9% |
| Health promotion and education | 72.9% | 65.0% | 68.1% | 62.2% | 2.0% |
| Shared decision making | 68.6% | 61.9% | 67.9% | 62.3% | 1.1% |
| Performance Year 3 | | | | | |
| Getting timely care, appointments, and information | 85.2% | 85.6% | 81.2% | 84.1% | 2.5% |
| How well your doctors communicate | 91.8% | 93.4% | 90.2% | 92.9% | 1.1% |
| Patient's rating of doctor | 90.6% | 93.3% | 90.1% | 92.6% | -0.2% |
| Access to specialists | 80.2% | 85.5% | 78.2% | 83.7% | 2.8% |
| Health promotion and education | 69.9% | 62.1% | 67.9% | 60.1% | 0.1% |
| Shared decision making | 56.3% | 54.9% | 60.1% | 52.7% | -5.9% |

Note: **Indicates statistical significance at 5% level. *Indicates statistical significance at 10% level. Poor health is defined as being in the 25th percentile for self-reported functional status. For AIM Test 2 ACOs starting AIM in 2015, PY1-PY3 is 2015-2017. For AIM Test 2 ACOs starting AIM in 2016, PY1-PY3 is 2016-2018.

Source: CAHPS beneficiary-level responses for 2015 to 2018 combined with Medicare claims data.

# Appendix 4A. Approach for AIM Test 1 Subgroup Analysis

## Methods

To estimate regression-adjusted subgroup impacts, we included all *k* subgroup measures within a domain simultaneously to estimate a difference-in-difference-in-difference (DDD) model. Such a regression simultaneously estimates a DID impact estimate for ACOs with a given characteristic, a DID impact without a given characteristic, and the difference between impacts within each subgroup:

$DDD_k = DID_{1k} - DID_{0k}$

$DID_{1k}$ indicates the differential change in Medicare spending among AIM ACOs with the $k^{th}$ characteristic (e.g., using a management company) relative to the comparison group within the ACOs' markets. $DID_{0k}$ indicates the differential change in Medicare spending among AIM ACOs without the $k^{th}$ characteristic (e.g., not using a management company) relative to the comparison group within the ACOs' markets. $DDD_k$ is the estimated difference between the impact of AIM among AIM ACOs with the $k^{th}$ characteristic and the impact of AIM among AIM ACOs without the $k^{th}$ characteristic.

## Parallel Trends Testing

Valid estimates for differences in impacts between subgroups required three sets of trends to hold in parallel throughout the baseline period. For a given subgroup, trends between AIM-assigned and comparison beneficiaries had to be parallel for both subsets within a given group. The difference in the differences between AIM and comparison beneficiaries between the two subsets of a given group must also remain parallel.

As an illustrative example, take our model with two subgroups of interest: AIM ACOs with higher average baseline spending than their local-market comparison group, and AIM ACOs with lower average baseline spending than their local-market comparison group.

For our analysis of these groups to be valid, it must be the case that:

1.) AIM-assigned and comparison beneficiaries in markets where AIM-assigned beneficiaries had higher baseline spending on average must have parallel baseline trends

2.) AIM-assigned and comparison beneficiaries in markets where AIM-assigned beneficiaries had lower baseline spending on average must have parallel baseline trends.

3.) The difference between AIM and comparison beneficiaries in the high-spending ACO category must have a baseline trend parallel to the difference between AIM and comparison beneficiaries in the low-spending ACO category.

If (1) or (2) hold, then estimated differences between AIM-assigned and comparison beneficiaries are valid for that particular subgroup. However, if (1), (2), or (3) fail, then it is invalid to compare impacts within the two groups against one another.

**Exhibit 4A-1** below shows the results of each of our subgroups in the parallel trends tests for the baseline assigned to each performance year.

**Exhibit 4A-1: Parallel Trends Tests for Subgroup Regression Analyses for AIM Test 1 ACOs**

| Subgroup Characteristics | (1) | (2) | (3) |
|---|---|---|---|
| PY1 (2016) | | | |
| ACO Formation | | | |
| Management company | Passed | Passed | Passed |
| Fewer than 6,500 assigned beneficiaries | Failed | Passed | Failed |
| Partnered with hospital | Passed | Passed | Passed |
| ACO Market Geography | | | |
| High rurality (RUCA > 6) | Passed | Passed | Passed |
| Disparate market | Passed | Passed | Passed |
| Baseline Market Cost | | | |
| AIM baseline spending exceeds ACO's FFS market | Passed | Passed | Passed |
| PY2 (2017) | | | |
| ACO Formation | | | |
| Management company | Passed | Passed | Passed |
| Fewer than 6,500 assigned beneficiaries | Passed | Passed | Passed |
| Partnered with hospital | Passed | Passed | Passed |
| ACO Market Geography | | | |
| High rurality (RUCA > 6) | Failed | Passed | Passed |
| Disparate market | Passed | Failed | Failed |
| Baseline Market Cost | | | |
| AIM baseline spending exceeds ACO's FFS market | Passed | Passed | Failed |
| PY3 (2018) | | | |
| ACO Formation | | | |
| Management company | Passed | Passed | Passed |
| Fewer than 6,500 assigned beneficiaries | Passed | Passed | Passed |
| Partnered with hospital | Passed | Passed | Passed |
| ACO Market Geography | | | |
| High rurality (RUCA > 6) | Passed | Passed | Passed |
| Disparate market | Passed | Passed | Passed |
| Baseline Market Cost | | | |
| AIM baseline spending exceeds ACO's FFS market | Passed | Passed | Passed |

Note:

(1) Parallel trends between AIM and comparison beneficiaries in subgroup with a given characteristic
(2) Parallel trends between AIM and comparison beneficiaries in subgroup without a given characteristic
(3) Parallel trends between the differences between AIM and comparison beneficiaries in subgroup with a given characteristic and the difference between AIM and comparison beneficiaries in subgroup without a given characteristic.
Blue shading indicated larger differential baseline trends- those that if extrapolated to the performance year, would bias estimates by more than $10PBPM.

In PY3, baseline trends in the AIM and comparison group were statistically indistinguishable within and between subgroups, suggesting that estimates are valid. Results indicate that in PY2, all estimates in the ACO formation domain are valid, although the parallel trends test failed for at least one of the three necessary criteria for the measures in the geography and cost domains, in which case we cannot say with certainty whether impacts in one subgroup category differed from impacts in the other subgroup category. In PY1, all estimates passed the test of baseline parallel trends, except for the comparison of ACOs with fewer than 6,500 beneficiaries to those with more than 6,500 beneficiaries.

We note that because our subgroup analyses stratify the data, while the main analysis does not, subgroup analyses have substantially less statistical precision than in our primary impact analysis. This makes it more difficult to reject the null hypothesis of baseline parallel trends between subgroups. Moreover, the more time that elapses between the baseline and performance period, the greater is the potential for differential trends in the baseline to bias our results. For example, in PY3, among AIM ACOs without a hospital partner, the AIM and comparison groups diverged by an average of -$7.32 per year in the baseline, which was not statistically significant. If this difference was extrapolated to PY1, this would only bias estimates by $7.32 and not affect our overall conclusion. If we extrapolated the differential trend to PY3, this difference at baseline would bias estimates by $21.96, and render differences in impact between AIM ACOs with hospital partners and those without statistically insignificant. This demonstrates that insignificant differences in baseline trends do not definitely rule out the possibility for substantive bias. Estimates with the potential for substantial bias (highlighted blue in **Exhibit 4A-1)** may not be causally interpretable. Given the increased risk that bias from differential baseline trends could manifest in later performance years, the number of shaded cells increases in each performance year.

### *Sensitivity Test*

Our preferred specification for subgroup analysis entailed simultaneously modeling outcomes for all subgroups within a domain. To test the sensitivity of our results to this approach, we re-estimated outcomes for each of our subgroups independent of the other subgroups in the same domain. For example, we estimated the impact of an ACO having a management company, without controlling for whether that ACO partnered with a hospital or had fewer than 6,500 assigned beneficiaries. We report results of this sensitivity analysis in **Exhibit 4A-2** below. Since the baseline market cost domain only had a single subgroup, results for that subgroup were already independent of all other subgroups, and we do not replicate those results here.

**Exhibit 4A-2: Independent Subgroup Regression Analyses**

| Subgroup Characteristics | (1) | (2) | (3) |
|---|---|---|---|
| PY1 (2016) | | | |
| ACO Formation | | | |
| Management company | -33.21 | -9.01 | -24.20 |
| Fewer than 6,500 assigned beneficiaries | -34.42 | -27.24 | -7.18[#] |
| Partnered with hospital | -32.12 | -22.20 | -9.92 |
| ACO Market Geography | | | |
| High rurality (RUCA > 6) | -23.14 | -30.38 | 7.24 |
| Non-contiguous market | -29.82 | -25.31 | -4.51 |
| PY2 (2017) | | | |
| ACO Formation | | | |
| Management company | -43.49 | -22.27 | -21.22 |
| Fewer than 6,500 assigned beneficiaries | -28.18 | -38.19 | 10.01 |
| Partnered with hospital | -35.65 | -39.59 | 3.94 |

| Subgroup Characteristics | (1) | (2) | (3) |
|---|---|---|---|
| ACO Market Geography | | | |
| High rurality (RUCA > 6) | -52.17 | -32.51 | -19.66 |
| Non-contiguous market | -40.51 | -27.65 | -12.86# |
| PY3 (2018) | | | |
| ACO Formation | | | |
| Management company | -38.16 | -40.16 | 2.00 |
| Fewer than 6,500 assigned beneficiaries | -94.38 | -34.54 | -59.85 |
| Partnered with hospital | -25.70 | -63.40 | 36.70 |
| ACO Market Geography | | | |
| High rurality (RUCA > 6) | -27.35 | -42.11 | 14.76 |
| Non-contiguous market | -38.84 | -38.75 | -0.09 |

Note:

(1) Differential change in total Medicare spending between AIM and comparison beneficiaries in subgroup with a given characteristic
(2) Differential change in total Medicare spending between AIM and comparison beneficiaries in subgroup without a given characteristic
(3) Estimated difference in impacts between AIM and comparison beneficiaries in subgroup with a given characteristic and the difference between AIM and comparison beneficiaries in subgroup without a given characteristic.
Blue shading indicates estimates significant at the 5 percent level.
#Indicates that baseline differences failed parallel trends and results may not be valid.

Point estimates from the sensitivity analysis were very similar to those from the preferred specification, and the simplified models used in the sensitivity analysis were less prone to failure of the parallel trends assumption, particularly in PY2. Findings from our sensitivity analysis thus support the conclusions in the main body of the report.

# Appendix 4B. Characteristics of AIM ACO Beneficiaries by Number of Years Assigned, PY3 (2018)

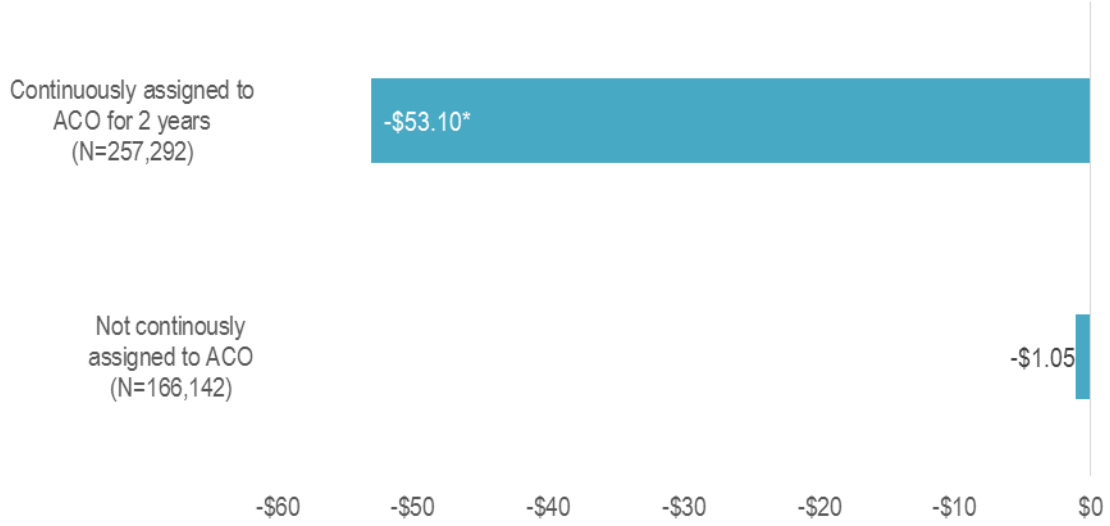
**AIM ACO Beneficiaries Differed by Number of Years Previously Assigned, 2018**

| Characteristics in 2018 | Died in 2018 | Assigned in 2018 Only | Assigned in 2016 and 2018 | Assigned in 2017-2018 | Assigned in 2016-2018 |
|---|---|---|---|---|---|
| Number of assigned beneficiaries | 16,577 (3.7%) | 139,224 (31.1%) | 22,025 (4.9%) | 94,724 (21.2%) | 174,455 (39.0%) |
| Female | 53.0% | 55.3% | 56.6% | 55.9% | 57.4% |
| Average age | 79.4 | 68.7 | 71.4 | 70.3 | 73.1 |
| White | 90.6% | 87.3% | 88.7% | 86.9% | 88.8% |
| Black | 5.4% | 5.0% | 6.0% | 6.8% | 6.2% |
| Hispanic | 2.1% | 3.7% | 2.6% | 3.1% | 2.2% |
| Other race | 1.9% | 4.1% | 2.6% | 3.2% | 2.7% |
| Disabled | 23.0% | 27.5% | 26.1% | 26.1% | 23.6% |
| End stage renal disease (ESRD) Medicare entitlement | 3.4% | 0.9% | 1.0% | 0.8% | 0.6% |
| Medicare/Medicaid dual eligibility | 32.7% | 24.0% | 21.8% | 21.2% | 19.7% |
| Average HCC risk score | 1.64 | 0.89 | 0.88 | 0.89 | 0.96 |
| Number of chronic conditions | 3.50 | 1.87 | 2.51 | 2.20 | 2.88 |
| Mean PBPM Medicare payment | $4,996.22 | $865.80 | $830.54 | $801.45 | $825.97 |
| Any inpatient visits | 69.9% | 17.3% | 17.3% | 16.6% | 17.3% |
| Any ED visit | 30.1% | 25.5% | 27.2% | 24.2% | 27.0% |
| SNF days | 8.97 | 1.68 | 1.66 | 1.28 | 1.55 |
| Long-term institutional facility | 14.4% | 1.7% | 2.3% | 1.9% | 1.7% |
| Died | 100.0% | 0.0% | 0.0% | 0.0% | 0.0% |

Note: This table shows characteristics for beneficiaries assigned to the 41 AIM Test 1 ACOs in 2018 (PY3) by whether the beneficiary was assigned in one or multiple years, with those beneficiaries who died in 2018 pulled out separately.
Source: ACO Provider Research Identifiable Files for 2016–2018 combined with Medicare claims data.

# Appendix 4C. Estimated Effect of Continuous Assignment on Medicare Spending, PY2 (2017)

**Continuously Assigned Beneficiaries Associated with Greater Differential Reductions in PBPM Medicare Spending in 2017**




Note: Bars represent the heterogenous effect of AIM ACO by number of years the beneficiary was assigned between 2016-2017 using the DID impact methodology that compared the 41 AIM Test 1 ACO assigned beneficiaries to non-ACO FFS beneficiaries residing in the AIM ACOs' markets in performance year 2017 and baseline period of 2013 to 2015. "Not continuously assigned to ACO" includes beneficiaries who were only assigned in 2016. * Indicates statistical significance at the 5 percent level.
Source: ACO Provider Research Identifiable Files for 2016-2017 and Medicare claims data from 2013-2017.

## Appendix 4D. Annual Wellness Visit, Chronic Care Management, and Transitional Care Management Codes

| Code | Description | Billing Restrictions | Providers Eligible to Bill | Patient Eligibility and Other Considerations |
|---|---|---|---|---|
| G0438 | Annual Wellness Visit (AWV), Including Personal Prevention Plan Services (PPPS), first visit | 1) Billable only after 12 months from date of Medicare enrollment AND bene has not had IPPE or AWV within the past 12 months<br>2) If billed within first 12 months of Part B enrollment, will be denied per bene eligibility for IPPE (G0402, also known as the "Welcome to Medicare Visit") | MD, DO, PA, NP, CNS. Also: other medical professional including health educator, reg. dietician, nutritionist, or other licensed practitioner--under direct supervision of MD | No coinsurance or deductible; Goal: health promotion, disease detection, coordination of screening and prevention |
| G0439 | Annual Wellness Visit, including Personal Prevention Plan Services (PPPS), subsequent visit | 1) Billable only after 12 months from date of Medicare enrollment AND bene has not had IPPE or AWV within the past 12 months<br>2) If billed within first 12 months of Part B enrollment, will be denied per bene eligibility for IPPE (G0402) | MD, DO, PA, NP, CNS. Also: other medical professional including health educator, reg. dietician, nutritionist, or other licensed practitioner--under direct supervision of MD | No coinsurance or deductible; Goal: health promotion, disease detection, coordination of screening and prevention |
| 99490 | Chronic Care Management (CCM), at least 20 minutes clinical staff time, directed by a physician or other qualified health care professional, per calendar month | Only 1 provider paid for CCM per calendar month; the provider can report either CCM or Complex CCM (not both) per calendar month; Assumes 15 minutes of work by billing provider per calendar month; CCM cannot be billed during same service period as: G0181/G0182 (Home care supervision/hospice) or 90951-90970 (ESRD services) or 99495/99496 (30-day transitional care management service period); CCM cannot be billed in the same calendar month as prolonged E/M services | MD, NP, PA, Certified Nurse Midwives | For patients with multiple (2 or more) chronic conditions expected to last 12 months or more |
| 99487 | Complex Chronic Care Management, moderate or high complexity medical decision making, 60+ minutes of clinical staff time directed by MD or other qualified health care professional, per calendar month | Only 1 provider paid for CCM per calendar month; the provider can report either CCM or Complex CCM (not both) per calendar month; CCM cannot be billed during same service period as: G0181/G0182 (Home care supervision/hospice) or 90951-90970 (ESRD services) or 99495/99496 (30-day transitional care management service period); CCM cannot be billed in the same calendar month as prolonged E/M services | MD, NP, PA, Certified Nurse Midwives | For patients with multiple (2 or more) chronic conditions expected to last 12 months or more |

| Code | Description | Billing Restrictions | Providers Eligible to Bill | Patient Eligibility and Other Considerations |
|---|---|---|---|---|
| 99489 | Complex Chronic Care Management, each additional 30 minutes of clinical staff time, per calendar month | Bill in conjunction with 99487, not alone; Only 1 provider paid for CCM per calendar month; the provider can report either CCM or Complex CCM (not both) per calendar month; CCM cannot be billed during same service period as: G0181/G0182 (care plan oversight in home care or hospice) or 90951-90970 (ESRD services) or 99495/99496 (30-day transitional care management service period--see below); CCM cannot be billed in the same calendar month as prolonged E/M services | MD, NP, PA, Certified Nurse Midwives (CNM) | For patients with multiple (2 or more) chronic conditions expected to last 12 months or more |
| G0506 | Chronic Care Management Planning: Comprehensive assessment of and care planning by the physician or other qualified health care professional for patients requiring chronic care management services (billed separately from monthly care management services) | Code is for additional work of the billing provider in: 1) personally performing a face-to-face assessment; 2) personally performing CCM care planning. NOTE: CCMCP could be face-to-face and/or non face-to-face, but the time spent doing the CCMCP must not already be reflected in the CCM initiating visit itself or in the time spent during the monthly CCM (i.e., in CPT 99490, 99487, 99489); Billable once per beneficiary during the initiation of the patient into CCM | MD, NP, PA, Certified Nurse Midwives, Clinical Nurse Specialists and their clinical staff | Billable once per beneficiary during the initiation of the patient into CCM; Can be billed in addition to CCM services 99490, 99487, 99489 |
| 99495 | Transitional Care Management (TCM) w/moderate medical decision complexity, face-to-face visit within 14 days of discharge | Billable 30 days from discharge (begins date of discharge + 29 days); only 1 provider can bill TCM services; can be same as discharge provider but cannot be on the same day as discharge; E/M services billed separately as applicable; No TCM allowed within 30-day global procedure period for the same provider; not billable during same period as G0181/G0182 (care plan oversight services in home care or hospice) or 90951-909710 (ESRD services) or CCM | MD, NP, PA, CNS, CNM; Billable upon discharge from: IP Acute Care Hospital, IPF, LTC facility, SNF, IRF, hospital OP observation or partial hospitalization, partial hospitalization in community MH center | |
| 99496 | Transitional Care Management w/high medical decision complexity, face-to-face visit within 7 days of discharge | Billable 30 days from discharge (begins date of discharge + 29 days); only 1 provider can bill TCM services; can be same as discharge provider but cannot be on the same day as discharge; E/M services billed separately as applicable; No TCM allowed within 30-day global procedure period for the same provider; not billable during same period as G0181/G0182 (care plan oversight services in home care or hospice) or 90951-909710 (ESRD services) or CCM | See above | |

# Appendix 4E. Chronic Condition and Transitional Care Management Shares of Primary Care Allowed Charges

**Chronic Condition and Transitional Care Management Shares of Total Primary Care Allowed Charges, 2018**

| | Had CCM | | Had TCM | |
|---|---|---|---|---|
| | AIM ACO | Comparison | AIM ACO | Comparison |
| (1) Allowed charges for CCM & TCM | $211 | $192 | $262 | $255 |
| (2) All primary care allowed charges | $941 | $1,006 | $1,225 | $1,089 |
| Percent (1)/(2) | 22.4% | 19.1% | 21.4% | 20.7% |

Note: Shares of Chronic Condition Management (CCM) and Transitional Care Management (TCM) allowed charges to total primary care allowed charges used for determining ACO assignment for the 45 AIM ACOs in 2018. Mean expenditures for beneficiaries assigned to the AIM ACOs and comparison beneficiaries identified for AIM ACOs in 2018 (PY3).
Source: ACO Provider Research Identifiable Files for 2018 combined with Medicare claims data.

## Appendix 6A. Status of Advanced Payment ACOs

| ACO ID | ACO Name | Start Date | SSP Exit Year | Participation Status in 2020 |
|---|---|---|---|---|
| A1037 | RGV ACO Health Providers, | 4/1/12 | - | Enhanced |
| A1051 | Coastal Carolina Quality Care | 4/1/12 | - | Enhanced |
| A1052 | Quality Independent Physicians | 7/1/12 | - | Basic-E |
| A1225 | Cumberland Center for Healthcare Innovation | 7/1/12 | - | Basic-E |
| A1251 | Coastal Medical | 7/1/12 | - | Basic-E |
| A1540 | ACO Health Partners | 1/1/13 | - | Basic-B |
| A1617 | NOMS ACO | 1/1/13 | - | Basic-B |
| A1637 | American Health Network of Ohio Care Organization | 1/1/13 | - | Basic-E |
| A1702 | American Health Alliance | 1/1/13 | - | Enhanced |
| A1722 | Central Florida Physicians Trust | 1/1/13 | - | Basic-E |
| A1769 | Rio Grande Valley Health Alliance | 1/1/13 | - | Enhanced |
| A1393 | Physicians ACO | 7/1/12 | 2019 | Exit |
| A1669 | Integrated ACO | 1/1/13 | 2019 | Exit |
| A1153 | Texoma ACO | 7/1/12 | 2019 | Exit |
| A1544 | SERPA ACO | 1/1/13 | 2019 | Exit |
| A1458 | Physicians Collaborative Trust ACO | 1/1/13 | 2018 | Exit |
| A1653 | KCMPA-ACO | 1/1/13 | 2018 | Exit |
| A1647 | National ACO | 1/1/13 | 2017 | Exit |
| A1011 | Primary Partners ACIP | 4/1/12 | 2016 | Exit |
| A1047 | Jackson Purchase Medical Associates | 4/1/12 | 2016 | Exit |
| A1092 | North Country ACO | 4/1/12 | 2016 | Exit |
| A1097 | Accountable Care Partners | 7/1/12 | 2016 | Exit |
| A1129 | Maryland Accountable Care Organization of Western MD | 7/1/12 | 2016 | Exit |
| A1130 | Maryland Accountable Care Organization of Eastern Shore | 7/1/12 | 2016 | Exit |
| A1145 | St. Thomas Medical Group | 7/1/12 | 2016 | Exit |
| A1152 | Harbor Medical Associates, PC | 7/1/12 | 2016 | Exit |
| A1207 | MPS ACO Physicians | 7/1/12 | 2016 | Exit |
| A1338 | Golden Life Healthcare | 7/1/12 | 2016 | Exit |
| A1404 | Reliance Healthcare Management Solutions | 7/1/12 | 2016 | Exit |
| A1481 | Primary Partners ACIP | 1/1/13 | 2016 | Exit |
| A1555 | Nature Coast ACO | 1/1/13 | 2016 | Exit |
| A1627 | Lower Shore ACO | 1/1/13 | 2016 | Exit |
| A1838 | Owensboro ACO | 1/1/13 | 2016 | Exit |
| A1383 | Medical Mall Services of Mississippi | 7/1/12 | 2015 | Exit |
| A2003 | Fort Smith Physicians Alliance ACO | 1/1/13 | 2015 | Exit |
| A1154 | PriMed | 7/1/12 | 2014 | Exit |

Source: CMS Shared Savings Program Public Use Files, 2014-2020.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