

# Population Health in Primary Care: Cost, Quality, and Experience Impact

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## ABSTRACT

**OBJECTIVES:** To evaluate whether a primary care practice transformation that used population health strategies and predictive modeling to match clinical resources to patient needs reduced inpatient and total spending, while maintaining or improving quality and patient experience for adult Medicaid and Medicare patients.

**STUDY DESIGN:** Quasi-experimental analysis using an adjusted historical control.

**METHODS:** Measures included a quality composite metric, patient experience indicators, and total cost of care, as assessed by an independent actuary.

**RESULTS:** Payers saved a cumulative \$15.8 million (1.7%) across a 26-month program implementation period, which was substantially larger than the approximately \$3.9 million in program staffing expenses. Driven by reduced inpatient spending, the total cost of care for high-risk adults was reduced across all lines of business, ranging from -\$40.88 per member per month (PMPM) to -\$737.20 PMPM. Payer savings were larger for Medicare (5.5%) than for Medicaid patients (0.7%). Patient experience metrics improved during this time. Quality findings were mixed, likely confounded by the 2014 Medicaid expansion.

**CONCLUSIONS:** These findings suggest that risk-stratified primary care delivery models can achieve the Triple Aim and could be self-sustaining through alternative payment models that allow reinvestment of savings into program costs. These results are consistent with literature that finds that short-term return-on-investment requires carefully targeting patients at risk of hospitalization, that reducing Medicare hospitalizations may be more easily achieved than for Medicaid, and that opportunities may be greater among unmanaged fee-for-service populations. Differences in savings by payer and by year underscore the importance of all-payer approaches to program financial sustainability.

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Constraining healthcare cost growth has been a focus of health policy since the enactment of Medicaid and Medicare in the 1960s.<sup>1</sup> Despite substantial efforts, high medical inflation persists, governmental health spending continues to crowd out other priorities, and health outcomes remain poor compared with those of international peers.<sup>2-4</sup> Post Affordable Care Act, efforts to reverse these trends have focused on patient-centered medical homes (PCMHs), complex care management, transitions of care, and accountable care organizations (ACOs). Results to date have been inconsistent, with a limited number of multifaceted programs reducing healthcare expenditures.<sup>5-8</sup>

Programs that have lowered costs and improved quality and patient experience (the Triple Aim) often share features of Wagner's Chronic Care Model.<sup>9</sup> Most have implemented comprehensive team-based care, enabling proactive provider-patient interactions and tailoring care models to better support the needs of high-risk patients.<sup>10-15</sup> Clinical information systems to facilitate population health management have also been foundational, including high-risk patient identification, decision support, and clinical performance feedback.<sup>16,17</sup>

Most cost-saving initiatives have targeted Medicare or commercial populations and have achieved savings by reducing hospitalization.<sup>10,12,13,18-22</sup> Among the few well-designed Medicaid programs, evaluations assessing costs or hospitalizations have shown mixed findings.<sup>23-25</sup> This suggests the need to adapt successful interventions to Medicaid populations, which will likely require attending to social determinants of health.<sup>22,26,27</sup>

Finding effective Medicaid approaches takes on increased salience as Medicaid/Children's Health Insurance Program (CHIP) enrollment has outpaced that of Medicare.<sup>28,29</sup> To this end, the Center for Medicare & Medicaid Innovation (CMMI) funded Health Care Innovation Challenge Awards (HCIA) to accelerate at-scale, delivery system reform.<sup>30</sup> We describe the reach and Triple Aim outcomes of an HCIA-funded primary care practice transformation at a large urban safety-net institution. This intervention employed predictive risk modeling to segment patients according to clinical and financial criteria, and sought to target higher-risk patients for more, and more intensive, services. This evaluation tested whether a risk-stratified, enhanced primary care delivery model demonstrated savings through reduced inpatient spending, while improving quality and patient experience for Medicaid and Medicare adults.

## METHODS

### Setting

Denver Health (DH) is an integrated, academic safety-net delivery system and the largest provider of Medicaid and uninsured services in Colorado, serving approximately 200,000 patients annually. DH provides comprehensive outpatient and inpatient services and operates a managed care plan. This integration enables data capture across the care continuum.

### Target Population

Although the program targeted both adults and children in need of primary care services, this evaluation focused on Medicaid and Medicare beneficiaries older than 19 years, specifically: DH primary care users ( $\geq 1$  primary care visits in the prior 18 months); DH managed care members; or frequent users of DH's emergency department, urgent care, or hospital services ( $\geq 3$  services in a year). The target population was dynamically redefined monthly, according to a validated population attribution and risk-stratification algorithm, described briefly below and detailed elsewhere.<sup>31</sup> Excluded were individuals who could not be risk-stratified due to no claims history or short enrollment periods.

DH adapted commercial predictive risk modeling software to assign patients to 1 of 4 tiers of care needs. The algorithm relied primarily on age, gender, diagnosis, clinical procedure, and medication history. Through a multidisciplinary process, DH-defined rules were developed and integrated into the algorithm. These rules considered additional diagnostic information, clinical registries, and utilization patterns signaling unmet social or behavioral health needs. Algorithm development for high-risk tiers focused on defining patient groups at risk of hospitalization with distinctive care support needs, not solely on high costs. As noted, the algorithm was rerun monthly to capture new patients and changes in health status.

### Intervention: Tiered Population Health Approach to Primary Care

This population health intervention built on DH's National Committee for Quality Assurance–certified PCMHs and used Wagner Chronic Care Model principles to implement team-based care for complex populations.<sup>32-36</sup> Consistent with Wagner's vision of health information technology–enabled, proactive, prepared teams, DH provided real-time patient risk-tier information for care planning at the point of care. We specified a graduated set of enhanced clinical and electronic services appropriate to each risk tier, with more higher-intensity services targeted to higher-tier patients. Standard work that considers both tier and individual needs guided care teams' service provision.

All patients (tiers 1-4) were provided "usual care" medical home services, complemented by new, optional electronic messaging reminder services. DH also expanded primary care staffing to include new team members to provide disease management, care transition, and patient navigation services (tiers 2-4). This enhanced-care team included nurse care coordinators, clinical pharmacists, behavioral health consultants, and patient navigators. More comprehensive multidisciplinary care management support was available to complex patients (tiers 3-4) during and between visits.

For tier 4, separate high-intensity clinics were established for targeted subpopulations: children with special healthcare needs, medically complex adults with multiple admissions, and adults with severe mental health diagnoses. All high-risk teams sought to empower patients through multidisciplinary care planning, goal setting, and problem-solving approaches. Patients also received referrals for specialty care, substance abuse treatment, housing, and other community resources (Figure).

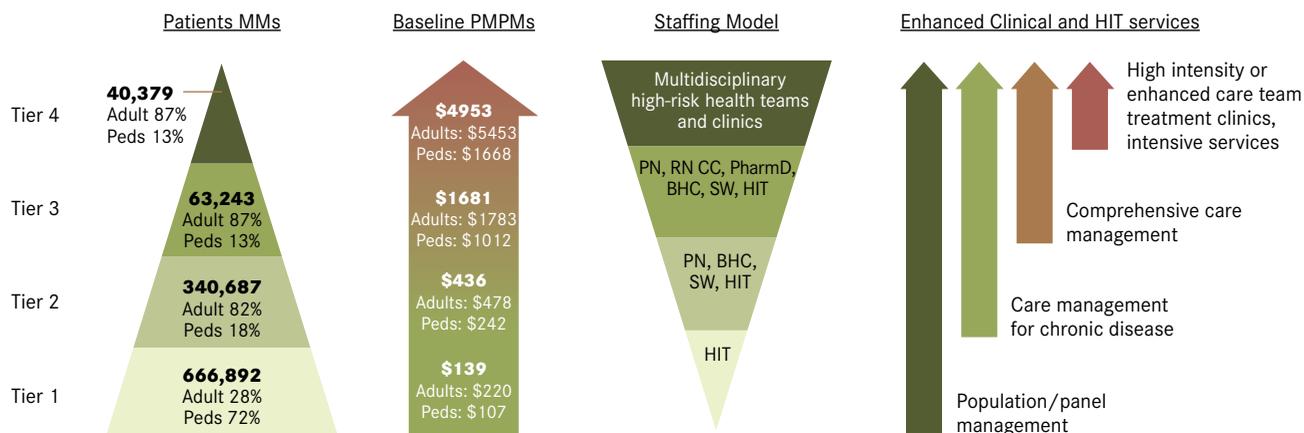
### Process and Outcome Measures

Primary outcomes were program reach, patient experience, quality, and total cost of care. Patient reach was quantified as the number of patients receiving any face-to-face or phone-based patient interaction by the HCIA-funded enhanced-care or high-intensity teams. Usual care clinical contacts were not included, nor were low-touch services, such as phone messages, letters, and text messages. These exclusions sought to avoid overstating program reach by focusing on new, intensive HCIA services.

To assess overall quality, DH uses an internal composite quality metric comprising individual indicators largely adapted from the Health Resources and Services Administration's Health Center Program Uniform Data System. DH used the Consumer Assessment of Healthcare Providers and Systems' PCMH-aligned items to assess patient experience.

Assessed from the payer perspective, the total cost of care measure was calculated by aggregating medical expenditures across all inpatient, outpatient, professional, and other services, and was expressed on a per-member per-month (PMPM) basis to account for differing

**Figure. The 21st-Century Care Model: Adult and Child Proportions, per Member per Month Costs, Staffing and Services by Population Segment (risk tier)<sup>a</sup>**



BHC indicates behavioral health consultant; HIT, health information technology; MM, member months; peds, pediatric patients; peds, pediatric patients; PharmD, clinical pharmacist; PMPM, per member per month; PN, patient navigator; RNCC, registered nurse care coordinator; SW, social worker.

<sup>a</sup>Baseline period is November 2011 through October 2012. Attributed patients included managed care members identified through member files. Fee-for-service patients were identified through billing data and re-determined on a monthly basis. Unpictured are 14,387 member months associated with untiered children.

Source: Johnson TL, Brewer D, Estacio R, et al. Augmenting predictive modeling tools with clinical insights for care coordination program design and implementation. *EGEMS (Wash DC)*. 2015;3(1):1181. doi: 10.13063/2327-9214.1181. The data have been updated from the original.

lengths of enrollment. DH had nearly complete data capture for its managed care members because the DH health plan pays members' medical claims. For those enrolled in fee-for-service (FFS) programs, spending estimates for non-DH services were derived from public sources (listed in the **eAppendix [eAppendices available at [ajmc.com](#)]**). Savings net of program expenses were also calculated.

Program expenses included salary and benefits of HCIA-funded staff, including the enhanced-care team, information technology, and evaluation personnel. Clinical staffing associated with reimbursable clinical care for program participants was not counted, nor were program development costs. This represented DH's annual, unreimbursed costs to continue the program post award (eAppendix).

### Analytical Approach

This quasi-experimental analysis compared trends in payer spending between a baseline performance period and 2 intervention performance periods. Because DH enrolls a majority of the Denver Medicaid market and the program was implemented at scale, no concurrent DH or non-DH control population exists. Therefore, it was necessary to develop an appropriate historical comparative population to estimate what the baseline costs would have been without the intervention. Observed costs were then compared with this historical cost benchmark. CMS uses a similar methodology to assess the financial performance of Medicare ACOs.<sup>37</sup> Consistent with CMS' approach, population-level cost outcomes were assessed whether or not targeted individuals were reached by the intervention. In the actuarial literature, this approach is known as quasi-experimental analysis using an adjusted historical control.<sup>38</sup>

To construct performance populations for analysis, DH used its patient attribution and tiering algorithm to identify the target population during each month of baseline and intervention performance periods, resulting in 38 cross-sections, each with different member month counts and tier distributions. These 38 cross-sections were subsequently aggregated into 3 performance periods: a 12-month baseline period, a 14-month early program period, and a 12-month mature program period. The decision to create 2 intervention periods balanced several considerations: distinguishing early and mature program effects, minimizing seasonal effects by selecting measurement periods of approximately equal length, and isolating the potentially confounding effect of the Medicaid expansion in 2014 into a separate performance period.

Changes in medical costs were calculated by subtracting observed costs during the 2 intervention periods from the historical cost benchmark. In contrast to a pre-post analysis that focuses on a single population cross-section that is reached by the intervention, we refresh the population (38 cross-sections). This addresses regression by accounting for population dynamics such as changes in health status. To the extent that high-risk patients became lower-risk, died, or left the population during the intervention periods, this phenomenon also occurred during the baseline period, enabling detection of performance improvement net of these effects.

During the intervention periods, observed member months (which differ by time period) were the denominator used to calculate PMPM costs, but were not the multiplier to calculate total costs. To ensure the intervention period costs were comparable to those of the baseline period, the PMPMs were applied to the baseline population's tier

distribution. This “tier mix” adjustment ensures that patient health status was comparable across performance periods, effectively holding tier mix constant (see eAppendix for details).

To establish the historical cost benchmark, against which the intervention period costs can be compared, we quantified payer spending for the baseline population, adjusted by a medical inflation factor to account for secular cost trends. This adjustment is necessary to enable direct comparison of costs during the baseline and intervention periods. The Medicaid trend factor was 3.7%, consistent with the trend developed during Colorado state Medicaid agency annual capitation rate setting for DH’s health plan. The 2.3% Medicare trend factor was derived from the National Health Expenditures Projections report. Baseline costs for the Medicaid expansion population were estimated according to insurance rate-setting methods for a new population (eAppendix). We stratified cost outcomes by payer to account for payer-specific reimbursement levels.

## RESULTS

### Population Characteristics

**Table 1** compares baseline and intervention populations according to tier, gender, and age. Member months are post adjustment, reflecting the above-described tier-mix adjustment.

### Program Reach Results

As intended, a greater proportion of higher-tier patients were reached by DH interventions than were lower-tier patients. More than half of adult tier 4 patients were reached by either primary care–based enhanced-care team members or visited a high-intensity clinic during the ramp-up (51.0%) and mature program periods (56.4%). Program reach was lower for lower-tier patients: for the ramp-up and mature program periods, respectively, the percentages were 24.6% and 25.6% for tier 3, 15.7% and 12.9% for tier 2, and 1.5% and 1.4% for tier 1.

### Quality and Patient Experience Results

The DH composite quality metric measured 77% at baseline. It increased to 82% during the intervention ramp-up, declined to 72% in 2014, and rebounded to 81% by mid-2015. Four of 6 patient experience metrics improved or remained constant during intervention ramp-up, and improved relative to baseline in 2014 and 2015 (**Table 2**).

### Total Cost of Care Results

Reductions in total costs were observed for the majority of periods and payer populations, except for Medicaid managed care during the ramp-up period and Medicare managed care in the mature program period (**Table 3**). DH achieved a cumulative \$10.9 million reduction in the total cost of care for its Medicaid and Medicare FFS populations across the 2 program implementation periods. These savings largely accrued to the state and federal governments. The largest share of this FFS cost avoidance (\$8.2 million) was attributable to Medicare FFS. An additional \$5.0 million reduction in the total cost of care was estimated for

DH’s capitated managed care during this same timeframe. The annualized personnel cost of the adult program totaled \$1.8 million.

During both the ramp-up and the mature program periods, reductions in the total cost of care for tier 4 adults were observed across all managed care and FFS payers, ranging from –\$40.88 PMPM to –\$737.20 PMPM. Reduced tier 4 spending was concentrated in inpatient reductions. For lower-risk populations (tiers 1-3), changes in claims costs varied by payer and by year. In aggregate, the analysis shows small cost reductions for tiers 1 and 3 (totaling \$1 million across years and payers).

Tier 2 costs consistently exceeded the benchmark, totaling \$4.8 million for Medicaid and \$2.6 million for Medicare. For both Medicare and Medicaid, this higher-than-expected tier 2 spending offset, but did not eliminate, overall cost reductions.

We conducted a subanalysis on DH’s Medicaid and Medicare managed care populations to further explore the changes in tier 4 inpatient costs. We chose these populations due to the more complete data capture. **Table 4** reveals that reductions in inpatient costs are not consistently observed in lower-risk tiers, suggesting that tier 4 inpatient cost reductions are not due to a broader secular trend affecting all DH populations. Consistent with prior research, **Table 4** reveals that tier 4 inpatient savings are offset by increased spending in other areas, possibly reflecting program-driven referrals that resulted in additional service provisions.<sup>12,24,20</sup>

## DISCUSSION

This study provides an important contribution to the literature as one of the first cost analyses of a major CMMI/HCIA initiative. Compared with an inflation-adjusted baseline period, net reductions in PMPM spending were observed in 5 out of 6 payers during 2 subsequent intervention periods. Patient satisfaction measures also improved during this same timeframe, suggesting that cost reductions were not achieved at the expense of patient experience. Overall quality improved in 2013 and 2015 over baseline performance. Reduced performance during 2014 may be partially explained by pent-up demand during the Medicaid expansion.

As hypothesized, reduced inpatient spending among high-risk adults drove the overall reduction in the total cost of care. High-risk (tier 4) adults with multiple chronic conditions and repeated hospitalizations were targeted for multiple interventions, and more than half were reached. The program reached fewer lower-tier patients and concomitant changes in associated payer spending were less pronounced, and even increased in some cases. This latter finding suggests that team-based care for lower-risk patients may need to be more targeted or evaluated over a longer time horizon.

Although we observed year-to-year fluctuations in performance, average cost reductions for Medicare exceeded Medicaid performance and FFS reductions were generally larger than those for managed care members. These results are consistent with literature that finds that short-term return on investment requires carefully targeting patients at risk of hospitalization, reducing Medicare

**Table 1. Risk-Adjusted Sociodemographic and Clinical Characteristics During the Baseline and Performance Periods by Payer: Population Proportions by Health Risk Tier, Gender, and Age**

PAYER (PROGRAM PERIOD)	TOTAL MONTHS IN PERIOD	TOTAL RISK-ADJUSTED MM	TIER 1 MM, %	TIER 2 MM, %	TIER 3 MM, %	TIER 4 MM, %	MALE, %	FEMALE, %	20-39 YEARS, %	40-64 YEARS, %	≥65 YEARS, %	UNKNOWN AGE/GENDER, %
<b>DH LINES OF BUSINESS</b>												
<b>Managed Care (capitated) Payers</b>												
Medicaid traditional (baseline period)	12	175,117	43.6	41.9	8.7	5.7	27.6	64.1	41.1	37.1	13.6	8.3
Medicaid traditional (ramp-up period, 2013+)	14	204,303	43.6	41.9	8.7	5.7	28.8	65.3	44.7	36.6	12.9	5.9
Medicaid traditional (mature program, 2014)	12	175,117	43.6	41.9	8.7	5.7	30.5	66.2	46.4	37.4	12.9	3.4
Medicaid expansion (baseline period)	12	N/A										
Medicaid expansion (mature program, 2014)	12	41,588	56.4	38.0	4.0	1.6	27.5	69.8	58.9	37.8	0.5	2.7
Medicare Advantage (baseline period)	12	40,538	5.4	62.4	19.3	13.0	41.7	49.7	2.9	35.7	52.7	8.6
Medicare Advantage (ramp-up period, 2013+)	14	47,294	5.4	62.4	19.3	13.0	43.1	51.2	3.3	37.6	53.4	5.7
Medicare Advantage (mature program, 2014)	12	40,538	5.4	62.4	19.3	13.0	44.9	53.6	3.6	38.8	56.1	1.5
<b>FFS Payers</b>												
Medicaid FFS traditional (baseline)	12	79,418	37.3	47.3	8.6	6.7	29.9	70.1	48.6	46.0	5.4	0
Medicaid FFS traditional (ramp-up period, 2013+)	14	92,654	37.3	47.3	8.6	6.7	32.1	67.9	48.3	46.8	4.9	0
Medicaid FFS traditional (mature program, 2014)	12	79,418	37.3	47.3	8.6	6.7	40.9	59.1	45.2	51.3	3.5	0
Medicaid expansion FFS (baseline)	12	N/A										
Medicaid expansion FFS (mature program, 2014)	12	19,136	20.6	60.3	12.3	6.8	48.3	51.7	24.2	74.6	1.2	0
Medicare FFS (baseline)	12	55,966	9.1	60.8	17.3	12.8	46.4	53.6	7.3	44.1	48.7	0
Medicare FFS (ramp-up period, 2013+)	14	65,294	9.1	60.8	17.3	12.8	46.8	53.2	7.0	43.1	49.9	0
Medicare FFS (mature program, 2014)	12	55,966	9.1	60.8	17.3	12.8	48.5	51.5	6.3	42.9	50.8	0

DH indicates Denver Health; FFS, fee-for-service; MM, member months.

inpatient costs may be easier than for Medicaid inpatient costs, and opportunities may be greater among unmanaged FFS populations. Differences in cost-avoidance by payer and by year underscore the importance of all-payer approaches to overall financial sustainability.

Gross cost reductions of nearly \$16 million over the entire 26-month intervention period are substantially larger than the approximately \$3.9 million in staffing expenses, supporting the self-sustaining potential of risk-stratified primary care delivery models. However, neither FFS nor experience-based capitation permits

ongoing reinvestment of savings into program costs. Cost reductions accrue to at least 3 separate payers: the federal and state government for FFS Medicare and Medicaid patients, and the DH health plan for its managed care members. Since DH owns and operates its own health plan—an unusual arrangement among safety net institutions—there is a direct means to “capture” a portion of the payer savings. Combined Medicaid and Medicare managed care cost avoidance was estimated at \$2.3 million (annualized) compared with the \$1.8 million in annual program costs. However, because capitation rates are based on historical claims costs, funds for program

**Table 2. Quality of Care and Patient Experience During the Baseline and Performance Periods**

METRIC	BASELINE PERFORMANCE PERIOD (NOVEMBER 2011-OCTOBER 2012)	RAMP-UP PERFORMANCE PERIOD (NOVEMBER 2012-DECEMBER 2013)	MATURE PROGRAM PERFORMANCE PERIOD (JANUARY 2014-DECEMBER 2014)	GRANT END (JUNE 2015)
Composite quality metric (adults and children)	77%	82%	72%	81%
Diabetes A1C control ≤9% (adults)	75%	75%	74%	72%
Hypertension control (adults)	73%	71%	69%	71%
Cervical cancer screening (adults)	74%	80%	78%	78%
First trimester entry into prenatal care (adults)	68%	63%	71%	70%
Dental visit or fluoride application (children)	82%	76%	82%	85%
Persistent asthma on a controller medication (children)	90%	88%	85%	95%
<b>Patient Experience*</b>	<b>Q1 2013</b>	<b>2013</b>	<b>2014</b>	<b>June 2015</b>
In the last 12 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?	44%	52%	54%	55%
In the last 12 months, how often did this provider explain things in a way that was easy to understand?	79%	77%	80%	83%
In the last 12 months, when this provider ordered a blood test, x-ray, or other test for you, how often did someone from this provider’s office follow up to give you those results?	60%	61%	70%	69%
In the last 12 months, how often did this provider seem informed and up-to-date about the care you got from specialists?	66%	62%	69%	74%
In the last 12 months, did anyone in this provider’s office talk with you about specific goals for your health?	61%	61%	65%	61%
In the last 12 months, was this provider’s use of text messages or automatic phone calls helpful to you?	77%	78%	93%	90%

A1C indicates glycated hemoglobin; q, quarter.

\*Baseline measurement and intervention performance periods were defined to align with total cost of care measurement periods. An additional June 2015 measurement period was also included, which aligns with the end of the CMS funding for the project. Quality performance was based on Denver Health’s internal composite quality metric that includes preventative service receipt and chronic care management as reported during the final month of the measurement period. Patient experience performance is reflective of reporting during the final quarter of the measurement period.

Table 3. Total Cost of Care Findings by Payment Model, Payer, and Performance Periods\*

PAYER (PROGRAM PERIOD)	RISK-ADJUSTED MEMBER MONTHS ADULTS	% CLAIMS COST CHANGE VS BASELINE	\$ CLAIMS COST CHANGE VS BASELINE	\$ CLAIMS COST CHANGE TIER 4 ADULTS <sup>b</sup> (\$ TOTAL SERVICES), PMPM TOTAL, PMPM INPATIENT	\$ CLAIMS COST CHANGE TIER 3 ADULTS <sup>b</sup> (\$ TOTAL SERVICES), PMPM TOTAL, PMPM INPATIENT
<b>DH Managed Care Lines of Business (net claims cost change: -\$4,958,547)</b>					
Medicaid traditional (ramp-up period, 2013+)	204,303	0.15%	\$400,788	(-\$2.3m) -\$199.97 PMPM \$-153.23 PMPM	(-\$1.0m) -\$55.75 PMPM -\$22.56 PMPM
Medicaid traditional (mature program, 2014)	175,117	-0.88%	-\$1,962,943	(-\$5.3m) -\$534.92 PMPM -\$481.55 PMPM	(\$0.1m) \$8.86 PMPM \$70.18 PMPM
Medicaid expansion (mature program, 2014)	41,588	-3.14%	-\$950,876	(-\$0.4m) -\$581.16 PMPM -\$607.18 PMPM	(\$0.6m) \$383.33 PMPM \$508.23 PMPM
Medicare Advantage (ramp-up period, 2013+)	47,294	-5.04%	-\$2,627,781	(-\$3.7m) -\$609.27 PMPM -\$477.17 PMPM	(\$0.1m) \$10.72 PMPM \$3.78 PMPM
Medicare Advantage (mature program, 2014)	40,538	0.41%	\$182,265	(-\$2.5m) -\$465.54 PMPM -\$343.27 PMPM	(\$0.8m) \$101.74 PMPM \$106.68 PMPM
<b>FFS Payers (net claims cost change: -\$10,851,010)</b>					
Medicaid FFS traditional (ramp-up period, 2013+)	92,654	-2.14%	-\$2,523,735	(-\$0.3m) -\$40.88 PMPM \$99.67 PMPM	(-\$0.8m) -\$101.91 PMPM -\$67.44 PMPM
Medicaid FFS traditional (mature program, 2014)	79,418	-0.06%	-\$58,089	(-\$0.7m) -\$133.87 PMPM -\$32.99 PMPM	(\$0.2m) \$23.98 PMPM -\$44.25 PMPM
Medicaid expansion FFS (mature program, 2014)	19,136	-0.10%	-\$21,530	(-\$0.2m) -\$140.12 PMPM -\$188.42 PMPM	(\$0.2m) \$98.26 PMPM -\$15.36 PMPM
Medicare FFS (ramp-up period, 2013+)	65,294	-5.44%	-\$2,828,360	(-\$1.8m) -\$210.12 PMPM -\$161.58 PMPM	(-\$0.4m) -\$33.96 PMPM -10.65 PMPM
Medicare FFS (mature program, 2014)	55,966	-12.15%	-\$5,419,297	(-\$5.2m) -\$737.20 PMPM -\$409.17 PMPM	(-\$0.6m) -\$58.32 PMPM -\$2.62 PMPM
<b>TOTAL</b>					
Combined Medicaid 2013+	296,958	-0.55%	-\$2,122,947	-\$2.6m	-\$1.8m
Combined Medicaid 2014	315,259	-0.81%	-\$2,993,438	-\$6.6m	\$1.1m
<b>TOTAL Medicaid</b>	<b>612,217</b>	<b>-0.68%</b>	<b>-\$5,116,385</b>	<b>-\$9.2m</b>	<b>-\$0.7m</b>
Combined Medicare 2013+	112,588	-5.24%	-\$5,456,141	-\$5.5m	-\$0.3m
Combined Medicare 2014	96,504	-5.88%	-\$5,237,032	-\$7.9m	\$0.2m
<b>TOTAL Medicare</b>	<b>209,092</b>	<b>-5.54%</b>	<b>-\$10,639,173</b>	<b>-13.2m</b>	<b>-\$0.1m</b>
<b>GRAND TOTAL</b>					
<b>Medicaid &amp; Medicare (2013+ and 2014)</b>	<b>821,309</b>	<b>-1.66%</b>	<b>\$15,809,557</b>	<b>-\$22.4m</b>	<b>-\$0.8m</b>

DH indicates Denver Health; FFS, fee-for-service; m, million; PMPM, per member per month; TCOC, total cost of care.

\*Risk-adjusted member months, percentage/dollar changes in TCOC, TCOC changes by tier, and inpatient spending changes by tier.

<sup>b</sup>There are 3 data points in each cell. One represents the total dollar amount saved or increased, the second translates that dollar amount into a PMPM, and the third quantifies how much saved/increases was due to INPATIENT on a PMPM basis.

\$ CLAIMS COST CHANGE TIER 2 ADULTS <sup>o</sup> (\$ TOTAL SERVICES), PMPM TOTAL, PMPM INPATIENT	\$ CLAIMS COST CHANGE TIER 1 ADULTS <sup>o</sup> (\$ TOTAL SERVICES), PMPM TOTAL, PMPM INPATIENT
(\$1.9m) \$22.70 \$19.85 PMPM	(\$1.8m) \$19.96 PMPM \$11.74 PMPM
(\$1.6m) \$22.05 PMPM \$14.25 PMPM	(\$1.6m) \$21.29 PMPM \$12.45 PMPM
(-\$1.0m) -\$60.6 PMPM -\$33.03 PMPM	(-\$0.2m) -\$10.41 PMPM -\$8.63 PMPM
(\$1.0m) \$35.41 PMPM \$14.13 PMPM	(\$0.0m) -\$10.38 PMPM -\$2.83 PMPM
(\$1.8m) \$71.74 PMPM \$27.36 PMPM	(\$0.0m) \$11.59 PMPM \$3.35 PMPM
(\$0.5m) \$10.70 PMPM -\$1.76 PMPM	(-\$1.9m) -\$55.68 PMPM -\$8.59 PMPM
(\$1.9m) \$49.75 PMPM -\$6.88 PMPM	(-\$1.4m) -\$46.45 PMPM -\$19.14 PMPM
(-\$0.1m) -\$6.45 PMPM -\$47.65 PMPM	(\$0.0m) \$1.07 PMPM -\$24.68 PMPM
(-\$0.6m) -\$16.25 PMPM -\$17.12 PMPM	(\$0.0m) -\$8.16 PMPM \$0.15 PMPM
(\$0.4m) \$12.06 PMPM \$15.08 PMPM	(-\$0.1m) -\$14.06 PMPM -\$2.50 PMPM
\$2.4m	-\$0.1m
\$2.4m	\$0.0m
<b>\$4.8m</b>	<b>-\$0.1m</b>
\$0.4m	\$0
\$2.2m	-\$0.1m
\$2.6m	-\$0.1m
<b>\$7.4m</b>	<b>-\$0.2m</b>

reinvestment will decline over time as capitation payments are rebased to reflect lower levels of medical expenditures.

Thus, current payment models—even capitated managed care—do not align incentives. Although both Medicare and Medicaid have implemented new FFS care coordination, care transitions, and integrated care reimbursement opportunities, requirements are often highly prescriptive, process-oriented, and not consistent across payers. As a result, staffing models and clinical work flows that meet Medicare rules do not necessarily satisfy those of Medicaid, and vice versa. However, multipayer approaches are necessary to ensure sufficient funds and to smooth out year-to-year variations, especially for high-volume Medicaid providers. This underlines the need to accelerate implementation of advance payment models that better align financial incentives.

Recognizing that current payment models do not adequately incentivize population health approaches, CMS has set a goal to have 90% of Medicare non-FFS arrangements by 2018.<sup>39</sup> This evaluation offers both programmatic and financing insights relevant to alternative payment model development, such as those being developed under the Medicare Access and CHIP Replacement Act.

### Limitations

First, although we applied a tier-mix adjustment and stratified by payer to ensure equivalence between the baseline and intervention populations, some differences in population characteristics remain that could partially account for the findings. Second, incomplete data capture is a concern. Although we estimated service use at non-DH facilities among FFS populations, we did not attempt to estimate cross-sector impacts to the criminal justice or social service systems. Third, there is no widely accepted best practice for trend assumptions to establish the cost benchmark. Because DH accounts for approximately 57% of the Denver Medicaid primary care market, we cannot use actual trend. We therefore selected trend assumptions that were based either on state rate-setting practices (3.7% for Medicaid) or national health spending trends (2.3% for Medicare). These trends are equivalent or lower than a recent CMS actuaries’ analysis that found that US health spending growth was “historically low” between 2009 and 2013, averaging 3.7%.<sup>3</sup> Our trends are also lower than a touted Oregon Medicaid program analysis, assuming a 5.4% trend on a 2011 baseline.<sup>31,40</sup> Although our approach does not exclude the possibility that savings result from a broader, secular phenomenon of lower inpatient spending, reductions were concentrated in tier 4 where program reach was greatest. Generalized inpatient reductions across all tiers were not observed. Finally, the program was implemented at a single institution; findings may not be generalizable.

### CONCLUSIONS

Recent leveling-off of costs is often attributed to the aggregate effect of readmission reduction programs nationally, most of which have been launched without formal research designs. Although at-scale implementation complicates efforts to identify unexposed, concurrent comparison groups, from an institutional perspective, improvements over past performance are relevant even while the broader sector also improves.<sup>34</sup> This analysis demonstrates that a large, multifaceted program may

**Table 4. Changes in Total Cost of Care by Service Type and Tier for Medicaid and Medicare Managed Care Members**

	CHANGE IN PMPM BASELINE VS RAMP-UP PERIOD				CHANGE IN PMPM BASELINE VS MATURE PROGRAM			
	Tier 1	Tier 2	Tier 3	Tier 4	Tier 1	Tier 2	Tier 3	Tier 4
<b>Medicaid Managed Care</b>								
Inpatient <sup>a</sup>	\$11.74	\$19.85	-\$22.56	-\$153.23	\$12.45	\$14.25	\$70.18	-\$481.55
Outpatient <sup>b</sup>	\$1.83	-\$5.18	-\$33.34	-\$78.77	\$6.89	\$4.93	-\$12.34	\$44.65
Professional <sup>c</sup>	\$6.08	\$3.15	-\$5.16	\$37.85	\$3.29	\$1.86	-\$48.75	-\$56.46
Other <sup>d</sup>	\$0.32	\$4.87	\$5.32	-\$5.81	-\$1.35	\$1.02	-\$0.23	-\$41.55
TOTAL	\$19.97	\$22.69	-\$55.74	-\$199.96	\$21.28	\$22.06	\$8.86	-\$534.91
<b>Medicare Managed Care</b>								
Inpatient <sup>a</sup>	-\$2.83	\$14.13	\$3.78	-\$477.17	\$3.35	\$27.36	\$106.68	-\$343.27
Outpatient <sup>b</sup>	-\$0.50	\$7.94	\$1.91	-\$40.41	\$9.51	\$25.56	\$21.51	\$48.46
Professional <sup>c</sup>	-\$6.43	\$4.99	-\$13.92	-\$57.76	-\$2.28	\$14.37	-\$24.87	-\$62.81
Other <sup>d</sup>	-\$0.62	\$8.35	\$18.96	-\$33.93	\$1.01	\$4.45	-\$1.59	-\$107.91
TOTAL	-\$10.38	\$35.41	\$10.73	-\$609.27	\$11.59	\$71.74	\$101.73	-\$465.53

PMPM indicates per member per month.

<sup>a</sup>Facility component of medical, surgical, or behavioral hospital admissions, nursing home, emergency department (ED) care that leads to hospital admission, etc.

<sup>b</sup>Facility component of labs, radiology, pathology, ED care, day surgery, etc.

<sup>c</sup>Primary and specialty care, urgent care, office administered drugs, professional component of ED care, surgery, etc.

<sup>d</sup>Lab and x-ray, durable medical equipment, dental, drugs, home health, transportation, waiver services, hospice, etc.

be evaluated by benchmarking against historical costs, using well-accepted actuarial methods to address regression to the mean.<sup>41</sup> We conclude that risk-stratified, enhanced primary care delivery models hold Triple Aim promise, assuming supportive payment models.

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This study was conducted for quality improvement/quality assurance purposes. Colorado Multiple Institutional Review Board (COMIRB) determined this project to be “not human subjects” research. Results are not generalizable.

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## **eAppendix**

### **Technical Appendix**

The content in this technical appendix was developed by Milliman actuaries and provides additional detail on the assumptions, data sources, measurement, and analytical approach to assessing performance related to the total cost of care.

#### **Total Cost of Care Measurement**

As noted, costs were assessed from the payer perspective. The total cost of care measure was calculated by aggregating medical claims expenditures across all inpatient, outpatient, professional, and other service types and was expressed on a per member per month (PMPM) basis to account for differing lengths of enrollment. DH had nearly complete data capture for managed care members through its health plan claims data, because all claims for those members are paid by DH. For those enrolled in fee-for-service (FFS) programs, spending estimates associated with use of non-DH services were derived from the All-Payer Claims Database and other public sources (see below). Results were stratified by payer and also by risk tier.

Using an intent-to-treat approach and to ensure a full picture of these patients' costs, DH evaluated medical claims costs for all patients eligible for the intervention in a particular month, whether or not they actually received intervention. DH's methodology for attributing patients to months within each performance period enables us to account for patients joining and leaving the system. This attribution methodology limits distortions due to regression to the mean that would otherwise occur in a pre-/post-analysis of a fixed cohort of patients.<sup>1</sup>

#### **Baseline Estimate of Total Cost of Care: Data Sources, Methodology, Assumptions**

Milliman relied on several different data sources to develop the baseline estimates of the total cost of care on a PMPM basis during the baseline period (November 2011 - October 2012). Separate baseline estimates were derived by line of business. The cost of services provided by DH or paid for by 1 of DH's managed care plans were directly measured. Other service costs were estimated, as further described below:

Medicaid Managed Care – Milliman used detailed medical claims and membership data from Denver Health’s billing data warehouse for services that are covered under the Medicaid managed care contract. The DH managed care contract includes services provided by both DH and non-DH providers. These data were supplemented with the reimbursement information for Medicaid reimbursed services that are not covered under the managed care contract from the annual Medicaid capitation rate setting process. As it is currently carved out of the capitation program, the cost of behavioral care was estimated using the Milliman Health Cost Guidelines and Milliman’s experience in setting behavioral capitation rates for Medicaid programs in various states. The costs of waiver services were estimated by studying the general relationship between inpatient costs and waivers costs observed in historical Medicaid FFS populations and applying that relationship to the inpatient costs apparent in the baseline period. The same process was used to estimate the cost of hospice care. The internal Denver Health encounter data were used to estimate the relative utilization and cost levels for each tier.

Medicare Advantage – Milliman used detailed medical claims and membership data from Denver Health’s billing data warehouse for services that are covered under the Medicare managed care contract. These covered services include those provided by Denver Health and those by non-Denver Health providers.

Medicaid FFS – Denver Health’s encounter data included only those services that were provided at Denver Health. It does not include services from non-Denver Health providers and therefore does not reflect the total cost of care for this population. Milliman used the summary data from the annual Medicaid capitation rate setting process by enrollment category to estimate non-Denver Health service use and the total cost of care. The cost of behavioral care was estimated using the Milliman *Health Cost Guidelines* and Milliman’s experience in setting behavioral capitation rates for Medicaid programs in various states. The costs of waiver services were estimated by studying the general relationship between inpatient costs and waivers costs observed in historical Medicaid FFS populations and applying that relationship to the inpatient costs apparent in the baseline period. The same process was used to estimate the cost of hospice care.

Medicare FFS – Denver Health’s encounter data included only those services that were provided at Denver Health, and therefore does not reflect the total cost of care for this population. Milliman used the publicly available Medicare 5% sample data for the state of Colorado, and made adjustments based on the Milliman *Health Cost Guidelines* information for Medicare populations. Since the Medicare FFS and Medicare Advantage members were tiered in our population using the same tiering algorithm, we assumed that the relative differences in costs by tiers would be consistent between these 2 Medicare populations. We used the cost ratios by tier from the Medicare Advantage claim data (which are complete data) when using the Medicare 5% sample aggregate spending data, to estimate spending by tier for the Medicare FFS population.

#### Medicaid-Expansion

The Medicaid “expansion” population in 2014 presented unique challenges, since these members had not had previous Medicaid coverage, and represented a significantly different demographic. Because baseline medical claims cost data did not exist for this new program, we created a synthetic baseline population. Briefly, Milliman estimated baseline costs for the Medicaid expansion population using standard insurance rate-setting methods for a new population that consider its demographic and health status profiles.

Unlike the other lines of business, a true historical baseline period did not exist for the Medicaid expansion population that newly qualified for Medicaid under federal healthcare reform in 2014. Milliman therefore created an adjusted version of the NON-expansion Medicaid population to serve the baseline Medicaid expansion population. Specifically, to adjust the Medicaid baseline costs for the Medicaid expansion population, Milliman used a blended approach that considered the level of risk adjustment already achieved through DH’s tiering algorithm, the differences in demographic mix on a tier-by-tier basis, and aggregate risk level differences expected based on proprietary risk-adjuster (MARA). In some cases, Milliman manually smoothed the data where it seemed warranted based due to the immaturity of the data available for the analysis.

#### **Quasi-Experimental Design: 3 Periods of Performance Measurement**

Since the program was implemented at scale, there is not a concurrent control population for the cost analysis. Therefore, it is necessary to develop an appropriate historical comparative population to estimate what the costs would have been if there had been no intervention. Then, the actual costs may be compared with historical costs (with appropriate adjustments for comparability), with the difference in cost being the estimated savings or cost increase. In the actuarial literature, this well-accepted approach is known as a quasi-experimental analysis using an adjusted historical control.<sup>2</sup>

This evaluation employed a quasi-experimental design comparing trends in payer spending between a baseline performance period and 2 intervention performance periods. To establish what would have happened without the intervention, we evaluated the total cost of care for patients who would have met program inclusion criteria during a baseline performance period, consisting of the 12 months immediately *prior to* program implementation (November 2011-October 2012). These costs represent the costs without intervention.

The total intervention performance period was divided into a 14-month ramp-up period and a 12-month mature program period. The selection of the evaluation time periods balanced several considerations: creating measurement periods of approximately the same number of months, distinguishing early and mature program effects, and minimizing the potentially confounding effect of the Medicaid expansion in 2014 under the Accountable Care Act (ACA). The special modeling requirements associated with the Medicaid expansion population are discussed later in this document.

### **Adjustments for Health Status**

To adjust for health-related differences in the underlying populations in each performance period, we reweighted the cost outcomes of the intervention performance periods according to the risk tier distribution of the baseline period. This adjustment ensures that patient health status characteristics are comparable between the performance periods and the adjusted baseline period. This adjustment is a standard part of this process, to ensure comparability of cohorts.

This adjustment is necessary because between the baseline and the program periods, the target population (counts of members) change somewhat for each payer. More importantly, within each payer, the mix of members by each of the tiers changes as well. It is important to

use the population distribution from the baseline period, when calculating the total savings percentage for the program period, so that changes in either the size of the population (eg, shifts in population by payer) or the underlying morbidity do not distort the results. The intent of this type of re-weighting adjustment is to remove the impact that changes in the population could have on the overall savings results. If there were an increase in the size of a population cohort that achieved larger savings, for example, it could distort the overall savings upwards. Therefore, it is important to hold constant the distribution by tier cohort constant when calculating the overall savings, to avoid distortion.

Operationally, we calculated per member per month (PMPM) savings for each tier, but then weighted these PMPMs based on the number of member months by tier in the baseline period (for both the baseline and program periods). Note that the baseline period was 12 months long, and the ramp-up program period was 14 months long. This calculation is illustrated below for the 2013+ Medicaid Managed Care Tier 4 savings calculation, as we have used a constant factor (14/12) to adjust the number of member months by tier between the baseline period and the program period. The effect of using this constant is that the proportion of members assumed in each tier is consistent with the risk tier distribution of the baseline population. To adjust for any health-related changes in the underlying populations over time, we multiplied the PMPM cost outcomes of the intervention performance periods by this adjusted intervention population. A sample calculation of this adjustment is also provided in the table below.

**Sample Calculation: Tier 4 Medicaid Managed Care Ramp-Up (2013+) Performance Period Versus Baseline Performance Period**

The table below includes an example of how the baseline population cohort normalization was applied, to ensure a comparable basis for comparison with the performance periods.

Description	Tier Adult	Formula	Notes
Baseline Member Months	9991	(b2)	Count based on membership data
Baseline Raw PMPM (\$)	\$9,480.21	(b3)	Calculated by aggregating medical expenditures across all inpatient, outpatient, professional, and other services during baseline period and expressed on a per member per month (PMPM) basis to account for differing lengths of enrollment
Baseline trend-adjusted PMPM (\$)	\$9,864.91	$(b4) = ((b3) * ((1 + 0.0374)^{13/12}))$	Secular trend is applied via the term: $(1 + 0.0374)^{13/12}$
Ramp-Up Member Months	11656	$(b5) = (b2) * 14/12$	The ramp-up performance period has 14 months, not 12, hence the 14/12 term.
Ramp-Up PMPM (\$)	\$9,664.94	(b6)	Calculated by aggregating medical expenditures across all inpatient, outpatient, professional, and other services during the ramp-up period and expressed on a per member per month (PMPM) basis to account for differing lengths of enrollment
Change in PMPM	\$199.97	$(b7) = (b6) - (b4)$	Subtracts trend-adjusted Baseline PMPM from Ramp-Up PMPM
Change in Total Cost of Care	\$2,330,831	$(b8) = (b5) * (b7)$	Uses whole (not fractional) months

## Validation of Risk Tiers as Measure of Health Status

### MARA Analysis for Managed Care Lines of Business (LOB):

Adjusting for health status across performance periods is a strength of our approach, but is only as good as our risk adjuster (risk tiers). DH's risk tiering approach employs a commercial risk adjuster (3M's Clinical Risk Groups) augmented with information about recent utilization and has been validated on DH charge data. The development of the DH risk tiering algorithm and an assessment of its prospective risk predictive properties are discussed elsewhere.<sup>3</sup>

To further validate the risk tiering methodology, Milliman used the independent risk adjustment tool—Milliman Advanced Risk Adjuster (MARA)—to calculate average risk score by line of business and tier. We used the MARA to measure the relative health statuses of the populations to ensure that estimated savings or costs were due to real effects as opposed to just changes in the underlying potential population. Overall, this MARA analysis further validates that the DH risk tiering algorithm stratifies patients into cohorts, which are increasingly unhealthy by tier. Using 1 risk adjuster in the development of the tiers, and another in the testing, validates that the approach is providing real stratification by tier.

Among all the different lines of business (LOBs), Medicare has the highest average risk scores, mostly driven by people in Tier 4. Across all lines of business, the risk score almost

doubles as people move from 1 tier up to the next, validating that the algorithm used to tier people is effectively stratifying people by risk level. Below is a table that includes the average risk scores by line of business and tier for adults and children.

#### Average Risk Score by LOB and Tier - Managed Care

LOB	Tier				Total
	1	2	3	4	
Medicare	5.31	7.05	13.15	23.65	<b>10.32</b>
Medicaid	0.90	4.15	9.40	20.27	<b>2.35</b>
Medicaid- Expansion	1.40	3.74	8.25	18.99	<b>2.81</b>

#### MARA Analysis for Non-Managed Care Lines of Business (LOB):

Similar to what we found in the Managed Care analysis, the average risk scores increase as people move to higher tiers. Note that the risk scores are, in some cases, lower than their Managed Care line of business counterpart, which is explained by the fact that for the Non-Managed Care population, we are only able to include the claims processed by Denver Health, which understates risk scores. Non-DH claims for these members are missing from this analysis.

#### Average Risk Score by LOB and Tier - Non-Managed Care

LOB	Tier				Total
	1	2	3	4	
Medicare FFS	1.11	2.28	4.75	5.88	<b>3.07</b>
Medicaid FFS	0.46	1.59	4.05	7.45	<b>1.12</b>
Medicaid - Expansion	1.08	2.82	6.11	11.69	<b>3.35</b>

These results represent 2014 DH claims experience and excluded members who were not tiered by the DH algorithm. Additionally, MARA is primarily designed for use with

commercial populations. As a result provides a good representation of the relative differences between tiers (the purpose of the validation exercise), but absolute risk score levels and differences between lines of business may not be as meaningful.

### **Analytical Approach: Actuarial Analysis of Payer Spending**

Adapting the methodology commonly used to assess the financial performance of Medicare Accountable Care Organizations (ACOs), Milliman compared total cost of care during each of the 2 intervention performance periods to the expected costs, as established during the baseline performance period. Changes in total costs PMPM were calculated according to intention to treat approach that included medical claims costs for all baseline and intervention period members for all eligible months, regardless of whether they received the intervention.

To estimate changes in the total cost of care, we compared the program period PMPM costs with the baseline period PMPM costs, separately by line of business, tier, and service category to determine a percent change amount. We trended the baseline period data forward to determine what the expected cost levels during the program period would have been without Denver Health's interventions under the CMMI grant. Specifically, aggregate medical claims costs during each payer's baseline performance period were adjusted for medical inflation using a conservative, externally developed trend assumption to create the expected total cost of care benchmark. This adjustment is necessary to enable direct comparison of medical claims costs during the baseline and intervention periods, because of cost increases from normal medical inflation. Payer-specific trend factors were applied.

We assumed a 3.7% trend for Medicaid, consistent with the trend developed by the State of Colorado Health Care Policy and Financing (HCPF) annual rate setting for Denver Health. The 3.7% trend factor is a blended adult-child trend factor consistent with state practice. We assumed a 2.3% trend for Medicare, based on the National Health Expenditures projections report. The change in total cost of care is estimated as the difference between what the expected cost levels during the program period would have been without Denver Health's intervention and the cost levels that were actually observed in the program period data provided for the analysis.

Results were reported by performance period, by line of business, by service category, and by risk tier. Although we calculated the specific cost change percentages by detailed service category, tier, and line of business, stratified estimates of cost changes are less credible than the aggregate findings. In some cases, we applied a cap of +/- 50% to the detailed savings estimates, as there are some categories with small utilization where small changes in absolute terms can yield large changes on a relative (percentage). However, in aggregate we believe these percentage changes produce reasonable and representative estimates.

### **Sensitivity Analysis: How Sensitive are Findings to Trend Assumptions?**

Because there is not a concurrent population against which to compare the actual program costs, we needed to develop an appropriate and comparable baseline against which the actual costs are compared with determine savings. Comparisons of that projected baseline cost versus actual observed claims costs are sensitive to “trend” assumptions around what medical inflation is assumed in the baseline. For this reason, we conducted a sensitivity analysis on the impact of those inflation (trend) assumptions. In other words, a higher trend results in a higher projected baseline, against which the actual costs are compared. The higher the baseline, the larger the estimated savings. Therefore, in addition to developing conservative and externally validated trends, Milliman also calculated the annual trend levels that would have resulted in no (zero) change in the total cost of care. That is, they estimated the trends level at which observed payer spending equals expected payer spending, or at which point this program’s savings cancelled out the impact of inflation. The table below provides the assumed annual trend thresholds as compared with the “zero change” trend, reported separately by payer and year. In 8 of the 10 scenarios, the assumed trend actually used could have been even lower without changing the finding of reduced total cost of care.

Line of Business	Assumed Annual Cost Trend	Were observed medical claims less than expected in 2013?	Trend at which 2013 change in total cost of care is \$0 (observed=expected)	Were observed medical claims less than expected in 2014?	Trend at which 2014 change in total cost of care is \$0 (observed=expected)
<b>Managed Care (Adults)</b>					
MCD	3.7%	No (cost increase)	3.88%	Yes	3.35%
MCR	2.3%	Yes	-2.36%	No (cost increase)	2.48%
MCD EXP	3.7%	N/A	N/A	Yes	2.34%
<b>Non-Managed Care (Adults)</b>					
MCD FFS	3.7%	Yes	1.77%	Yes (small, <0.1%)	3.71%
MCR FFS	2.3%	Yes	-2.73%	Yes	-3.35%
MCD EXP	3.7%	N/A	N/A	Yes (small, ~0.1%)	3.70%

Across the 10 payer/year scenarios, the total cost of care during the program periods was lower than expected for all lines of business except Medicaid managed care in 2013 and Medicare Advantage in 2014. Correspondingly, in the remaining 8 scenarios, the sensitivity analysis demonstrates that the assumed trend could have been lower and the finding of reduced total cost of care would be upheld. For these 8 payer/year scenarios, the percentage point difference between the assumed cost trend and “the zero change” cost trend varied from less than a percentage point to more than 5 percentage points.

## REFERENCES

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