Pharmacy Benefit Carve-in Versus Carve-out: Cost and Medical Events Two-year Retrospective Cohort Study

S. Lam, PharmD[1]; C. Lockwood, PhD[1]; C. Pegus, MD, MPH[1]; J.J. Smith, MS[1]; Y. Qiu, MS[2]; P.P. Gleason, PharmD[2,3]. [1]Cambia Health Solutions, Portland, OR; [2]Prime Therapeutics LLC, Eagan, MN, United States; [3]University of Minnesota College of Pharmacy, Minneapolis, MN, United States.

BACKGROUND

- Rising medical and pharmacy costs can lead to difficulty accessing needed treatments, lower treatment rates, and lower medication adherence, which presents challenges for patients managing chronic conditions and employers making benefit decisions.[1,2]

- When considering coverage for employees, employers are faced with the question of whether to include the pharmacy benefit as part of the total integrated health package—a carve-in model—or to purchase it as a separate benefit administered by an external pharmacy benefit manager (PBM)—a carve-out model.

- Three separate carve-in versus carve-out comparisons by Blue Plans were reported from 2010 to 2012 and found per member per year (PMPY) associated lower medical costs in the carve-in populations ranged from $116 to $217 or 6% to 7%. However, the finding was statistically significant in only the largest study.[3,4,5]

- The national BCBS Association (2013) found a statistically significant 11% ($330 PMPY) lower medical costs in the carve-in group, and the most recent study by BCBS Rhode Island (2018) found 7% ($57 per employee per month [PEPM]) lower medical costs.[6,7] Chronic condition PEPM findings from the BCBS Rhode Island study were lower medical costs in cancer (3%), hypertension (10%), diabetes (18%) and substance use disorder (19%).[7]

- A large portion of self-insured employers choose a carve-out pharmacy benefit design possibly due to rapidly rising drug costs and/or consultant influence. Cambia Health Solutions has large populations with both carve-in and carve-out, providing the opportunity to investigate medical costs and health care utilization rates between the two groups.

OBJECTIVE

- To compare total PMPY allowed medical cost and health care utilization over two years between Cambia Health Solutions commercially insured Blue Plan members with carve-in benefits and those with carve-out benefits, overall and by seven chronic condition sub-groups.

METHODS

- This study used a limited dataset convenience sample of 1.6 million Cambia Health Solutions members in Oregon, Washington, Utah and Idaho who were continuously enrolled in a self-insured commercial product from 2017–2018 with no major benefit changes.

- Approximately 65% of members had carve-in pharmacy benefits and 35% had carve-out pharmacy benefits.

- Members were excluded if there was a major change in benefit design over the 2017–2018 study period, including a change to or from a consumer-directed health plan, change in insured product type (e.g., preferred provider organization to health maintenance organization), change in pharmacy coverage, or change in payment amount from a government program (e.g., Medicare).

- Member characteristics included age, gender, state of residence, enrollment in health plan care management or disease management (CM/DM), plan paid to total paid ratio, group size, member predicted DxCG risk score, and seven chronic conditions.

- DxCG Intelligence risk scores from Cotiviti® were generated for each member. The DxCG Intelligence risk score is a proxy for illness severity with the primary purpose of predicting future health care expenditure based on the individual's age, gender, and diagnoses generated from patient encounters with the medical system, excluding pharmacy.

- The conditions were identified by Optum Impact Pro software and include asthma, coronary artery disease (CAD), chronic obstructive pulmonary disease (COPD), congestive heart failure (CHF), depression, diabetes mellitus (DM), and rheumatoid arthritis (RA).[9]

- The plan paid to total paid ratio is used as a proxy for the group benefit generosity, also known as the "actuarial value."

- Descriptive statistics, distribution of covariates, and unadjusted outcomes were tested for differences between carve-in and carve-out groups using the ANOVA for continuous and chi-square test for categorical variables.

- The total medical PMPY comparison was made using a multivariate general linear model with gamma distribution to adjust for DxCG Intelligence risk score, age, gender, state of residence, seven chronic conditions, insured group size, member enrollment in case or disease management, and plan paid to total paid ratio between the two groups.

- Medical events were statistically assessed using multivariate logistic regression models, comparing the two-year odds of hospitalization or emergency department (ED) visit adjusting for the same covariates. Sub-analyses for members with each of seven chronic conditions, including asthma, CAD, COPD, CHF, DM, depression and RA, were performed using the same methods.

RESULTS

- The final analytic cohorts consisted of 205,835 carve-in and 125,555 carve-out members, as seen in **Figure 1**.

- In unadjusted comparisons **(Table 1)**, the carve-out group was on average one year older and had marginally higher rates of asthma, CAD, COPD, CHF, DM, and depression.

- The difference in mean risk score between the groups was of small effect size (Cohen's d=0.02), but the carve-out group had marginally higher risk scores in the top two quartile risk score groups, resulting in a significant risk score difference.

- A modified Park test indicated the total medical costs were gamma distributed. Unadjusted total medical cost PMPY was lower for the carve-in group at $4,166 (standard deviation [SD] $14,130) compared to the carve-out group at $4,575 (SD $16,185), yielding an unadjusted relative cost estimate of 0.91, p<0.001. Thus, the carve-in group had 9% lower medical costs PMPY than the carve-out group prior to baseline characteristic adjustment.

- The adjusted primary outcome of total medical cost PMPY was a relative cost estimate of 0.96, indicating the carve-in group had an associated significantly 4% lower PMPY, p<0.001, compared to the carve-out group. Transformed to dollar amounts, this equates to an associated $148 lower medical cost PMPY for the carve-in group **(Figure 2)**.

- The carve-in group had a lower unadjusted two-year hospitalization rate of 4.4% versus a carve-out rate of 5.2%, p<0.001, and ED visit rate of 19.3% versus 21.1%, p<0.001.

- As shown in **Table 2**, after adjustment, two-year odds were 15% lower for hospitalization, p<0.001, and 7% lower for ED visits, p<0.001, among the carve-in members.

- **Table 3** shows medical costs were also significantly lower for the carve-in group on average for sub-groups of members with five of the seven chronic conditions, including asthma (12%, $926 PMPY), CAD (17%, $4,351 PMPY), COPD (14%, $3,177 PMPY), DM (12%, $1,363 PMPY), and depression (17%, $1,708 PMPY).

- There was no significant difference in total medical cost PMPY for the subgroups of members with CHF (p=0.078) or RA (p=0.519).

- **Table 3** shows health care utilization odds were lower for sub-groups of the carve-in group for the same five of seven chronic conditions found to have significantly lower medical costs as follows: asthma (25% and 17% lower two-year odds of hospitalization and odds of ED visit, respectively), CAD (36% and 16%, respectively), COPD (22% and 20%, respectively), DM (26% and 16%, respectively), and depression (24% and 17%, respectively).

- There was no significant difference in two-year odds of hospitalization or odds of ED visits for the subgroups of members with CHF (p=0.486 and p=0.373, respectively) and RA (p=0.955 and p=0.121, respectively).
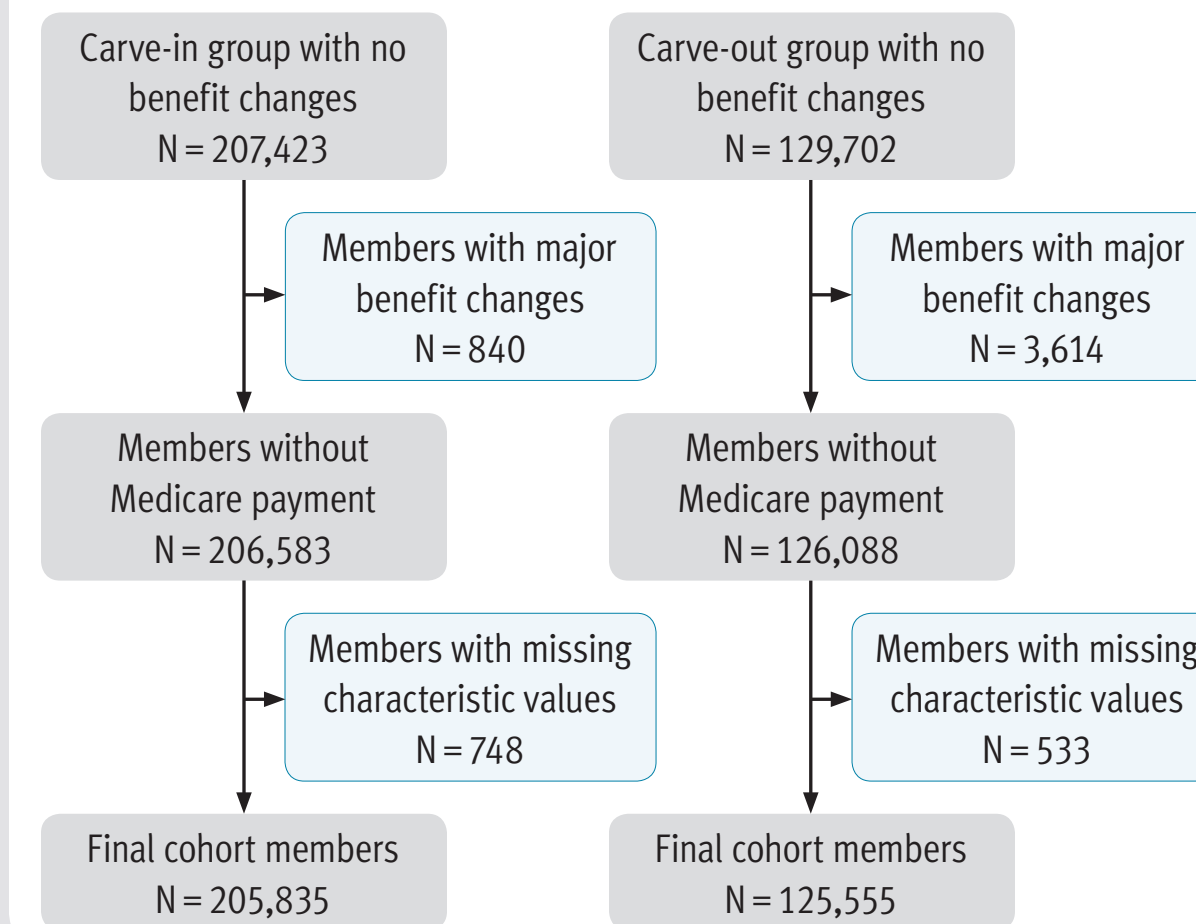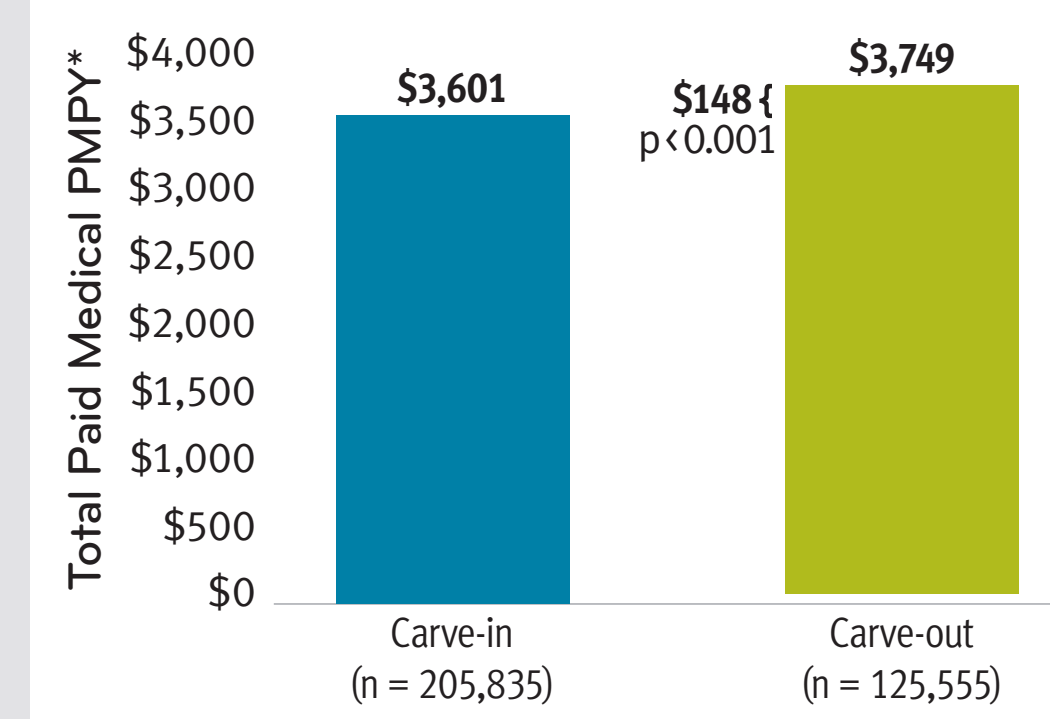
FIGURE 1
Study Population Identification

Carve-in group with no benefit changes
N = 207,423
→ Members with major benefit changes N = 840
→ Members without Medicare payment N = 206,583
→ Members with missing characteristic values N = 748
→ Final cohort members N = 205,835

Carve-out group with no benefit changes
N = 129,702
→ Members with major benefit changes N = 3,614
→ Members without Medicare payment N = 126,088
→ Members with missing characteristic values N = 533
→ Final cohort members N = 125,555

LIMITATIONS

- We did not have access to drug costs for the carve-out group, limiting our ability to control for pharmacy cost differences or conduct a total cost of care assessment.

- Claims data is subject to coding error. However, it is assumed any errors would be equally distributed across medical claims and independent of carve-in or carve-out benefit design.

- The analysis only used medical claims data and the findings only indicate associations, not causation. Multivariate modeling was used to adjust for baseline cohort differences; however, selection bias may exist due to characteristics unavailable in medical claims data (e.g., social determinants).

- The analysis was limited to self-insured commercial groups, and findings may vary for members of government programs or members with other types of insurance.

FIGURE 2
Adjusted Mean Per Member Per Year (PMPY) Medical Costs

Carve-in (n = 205,835): $3,601
Carve-out (n = 125,555): $3,749
$148 { p<0.001

*PMPY during 2017 through 2018 adjusted for baseline differences.
Adjusted for age, DxCG Intelligence risk score, plan paid to total paid ratio, state, group size, care management/disease management enrollment, and presence of seven chronic conditions (asthma, rheumatoid arthritis, coronary artery disease, chronic obstructive pulmonary disease, congestive heart failure, depression, and diabetes).

TABLE 2
Multivariate Logistic Regression Model* for Hospitalizations and Emergency Department Visits over Two Years for Carve-in Group Versus Carve-out Group

Carve-in 205,835 members Carve-out 125,555 members	Odds Ratio	95% Confidence Interval	p-value
2-year hospitalization	0.85	0.82–0.89	<0.001
2-year emergency department visit	0.93	0.91–0.95	<0.001

*Adjusted for age, DxCG Intelligence risk score, plan paid to total paid ratio, state, group size, care management/disease management enrollment, and presence of seven chronic conditions (asthma, rheumatoid arthritis, coronary artery disease, chronic obstructive pulmonary disease, congestive heart failure, depression, and diabetes).

CONCLUSIONS[10]

- This large regional study found that carve-in pharmacy benefits were associated with a small, but statistically significant and financially important 4% lower PMPY medical costs at $148 PMPY, health care utilization at 15% lower odds of a hospitalization event, and 7% lower odds of an ED visit from 2017 to 2018.

- This study found associated lower medical costs and events in five common chronic conditions (asthma, chronic obstructive pulmonary disease, coronary artery disease, diabetes mellitus, and depression) adding to our understanding of value from integrating pharmacy and medical benefits.

- Findings for the conditions rheumatoid arthritis and congestive heart failure were not significant.

- Integrating pharmacy with medical benefits provides care managers and clinicians a full picture of members' health, resulting in more targeted interventions, a single, uniform picture of the member's health status and, ultimately, the potential to improve medication adherence and overall health outcomes. In addition, value-based care agreements can be enhanced with carve-in pharmacy benefits, providing more complete contractual care performance metrics and reporting.

REFERENCES

1. Goldberg SE, et al. Popul Health Manag. Mar 22 2019. doi: 10.1089/pop.2018.0184.
2. Anbil P, Bajpai S. Manag Care. Oct 2014;23(10):38-41.
3. Culley EJ, et al. Highmark. Benefits & Compensation Digest 2010;47(11):22-26.
4. Smith-McLallen A. Independence Blue Cross. Benefits Magazine 2012;49(2):1-6.
5. Wells P, Ness D. Premera Blue Cross, 2011. Washington Healthcare News. https://www.healthcarenewssite.com/newsletters/wa-premera-0412.pdf.
6. Gleason PP, et al. J Manag Care Pharm 2014;20(10a):S10-11. https://www.bcbs.com/news/press-releases/blue-cross-blue-shield-association-and-prime-therapeutics-study-demonstrates.
7. BCBS Rhode Island white paper, 2018. "The Importance of Integration," https://www2.bcbsri.com/employerrx-pharmacy-brochuredownload.
8. DxCG Intelligence. Atlanta, GA. Cotiviti; 2019.
9. Impact Pro. Eden Prairie, MN. Optum; 2019.
10. Smith JJ et al. J Manag Care Pharm 2020 Mar. https://doi.org/10.18553/jmcp.2020.19411.

TABLE 1
Member Characteristics

Characteristic	Carve-in N=205,835	Carve-out N=125,555	p-value[a]
Age, years, n (SD)	Mean 34.23 (18.63)	Mean 35.21 (19.29)	<0.001
Risk Score[b]	Mean 1.07 (2.30)	Mean 1.12 (2.36)	<0.001
Employer Group Size, n (SD)	Mean 8,352 (9,978)	Mean 13,399 (9,877)	<0.001
Chronic Conditions, % (n)			
Asthma	7.49 (15,425)	8.19 (10,289)	<0.001
Coronary Artery Disease	1.43 (2,951)	1.59 (1,995)	<0.001
Chronic Obstructive Pulmonary Disease	0.77 (1,575)	0.91 (1,145)	<0.001
Congestive Heart Failure	0.46 (957)	0.55 (685)	0.001
Diabetes Mellitus	4.65 (9,562)	5.43 (6,814)	<0.001
Depression	7.06 (14,532)	7.81 (9,800)	<0.001
Rheumatoid Arthritis	0.40 (832)	0.38 (482)	0.367
Gender, % (n)			
Female	49.52 (101,930)	49.71 (62,408)	0.300
Male	50.48 (103,905)	50.29 (63,147)	
Plan Paid to Total Paid Ratio,[c] (SD)	Mean 0.68 (0.31)	Mean 0.69 (0.30)	<0.001
CM/DM (yes), % (n)	8.87 (18,249)	12.29 (15,435)	<0.001

[a] P-value from ANOVA test for continuous variables and chi-square test for categorical and ordinal variables
[b] Risk score derived using the Cotiviti DxCG Intelligence software[8]
[c] Plan Paid to Total Paid Ratio is medical benefit actuarial value (i.e., benefit generosity proxy)
ANOVA = analysis of variance; CM/DM = care management/disease management; SD = standard deviation

TABLE 3
Chronic Conditions per Member per Year Medical Costs and Health Care Utilization Adjusted for Baseline Differences in Carve-in Group Versus Carve-out Group

Chronic Condition	Per Member Per Year adjusted costs* Carve-in	Per Member Per Year adjusted costs* Carve-out	Per Member Per Year cost difference Relative costs (95% confidence interval), p-value	2-year hospitalization Odds Ratio (95% confidence interval), p-value	2-year emergency department visit Odds Ratio (95% confidence interval), p-value
Asthma Carve-in (N=15,425) Carve-out (N=10,289)	$6,782	$7,708	$926 0.88 (0.86, 0.91) p<0.001	0.75 (0.67, 0.84) p<0.001	0.83 (0.78, 0.89) p<0.001
Coronary Artery Disease Carve-in (N=2,951) Carve-out (N=1,995)	$21,546	$25,896	$4,351 0.83 (0.78, 0.88) p<0.001	0.64 (0.53, 0.78) p<0.001	0.84 (0.73, 0.96) p=0.012
COPD Carve-in (N=1,575) Carve-out (N=1,145)	$20,248	$23,425	$3,177 0.86 (0.78, 0.96) p<.001	0.78 (0.63, 0.96) p=0.021	0.80 (0.68, 0.95) p=0.009
Congestive Heart Failure Carve-in (N=957) Carve-out (N=685)	$39,237	$44,265	$5,029 0.89 (0.77, 1.01) p=0.078	0.92 (0.74, 1.15) p=0.486	0.90 (0.73, 1.13) p=0.373
Diabetes Mellitus Carve-in (N = 9,562) Carve-out (N=6,814)	$9,721	$11,084	$1,363 0.88 (0.85, 0.91) p<0.001	0.74 (0.65, 0.85) p<0.001	0.84 (0.77, 0.91) p<0.001
Depression Carve-in (N=14,532) Carve-out (N=9,800)	$8,543	$10,250	$1,708 0.83 (0.81, 0.86) p<0.001	0.66 (0.60, 0.73) p<0.001	0.83 (0.78, 0.89) p<0.001
Rheumatoid Arthritis Carve-in (N=832) Carve-out (N=482)	$16,753	$17,596	$842 0.95 (0.82, 1.11) p=0.519	0.99 (0.67, 1.46) p=0.955	1.25 (0.94, 1.65) p=0.121

COPD=chronic obstructive pulmonary disease
*Multivariate general linear model (GLM) with gamma distribution adjusted for age, DxCG Intelligence risk score, plan paid to total paid ratio, state, group size, and care management/disease management enrollment.