Estimating Medical Cost Offsets from Continuous Adherence Improvement Using Commercially Insured Members' Real-World Data

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BACKGROUND

- Adherence support programs are common, and often justified through medical cost offset estimates.
- Quality measure-driven programs typically define annual medication adherence using standard proportion of days covered (PDC) cutoffs, over which a member is adherent and below which a member is considered nonadherent (80%/90%).[1]
- Few studies have evaluated potential medical cost offsets from adherence improvements which do not result in a member crossing an established threshold, e.g., PDC 80% during the year, yet the relationship between medication use and disease suggests that incremental improvements below established thresholds should result in some reduction in medical expenditures.

OBJECTIVE

- Estimate the relationship between incremental improvements in medication adherence and medical spending reduction across a range of drug categories for a commercially insured population initially nonadherent to drug therapy.

METHODS

Study Design

- Retrospective analysis of integrated medical and pharmacy claims from over 16 million commercially insured members across a 4-year period (2018–2021). **(Figure 1)**
- Two separate analytic samples were identified; each separate analytic population consisted of a 3-year measurement period (2018–2020 and 2019–2021) and used identical analytic methods. The two separate analytic populations were combined in the statistical assessment.

Inclusion/Exclusion

- Members were continuously enrolled in commercial line of business for 3 years (Pre 12-month period, Base 12-month period, and Post 12-month period).
- For each medication adherence measure, members were required to have at least 2 fills of qualifying drugs in the measure-specific drug category with the first fill at least 90 days before the end of the year for both Pre and Base years. This aligns with the method used by the Pharmacy Quality Alliance for its endorsed adherence measures.[1]
- Members were required to be nonadherent in the Pre year, with proportion of days covered (PDC) less than 80% for all adherence measures except for the antiretroviral adherence measure, which required members to have PDC less than 90%.
- Members were required to have >$0 medical claim spending in Base year and Post year.

Statistical Analysis

- Adherence Measures
  - The primary independent variable was the change in annual continuous PDC between the Pre period and Base period for each measure-specific drug category.
  - Separate multivariable regression models were created for each of the following drug category adherence measures for each Base year (i.e., 2019 and 2020):
    - Antidepressants
    - Antihypertensives
    - Antipsychotics
    - Antiretrovirals
    - Non-insulin diabetes medications (NIDM)
    - Statins
    - Renin-angiotensin system antagonists (RASA)
- Medical Cost Outcome
  - The dependent variable across all models was the change in annual medical costs between the Base period and the Post period, winsorized at 99th percentile due to skewed data.
  - Annual medical costs were calculated by summing the allowed amount, which includes member share and takes into account network discounts, for all medical claims and adjusted to 2021 dollars using the medical services consumer price index (CPI).[2]
- Model Covariates
  - Age, gender, change in Charlson Comorbidity Index score[3] (first difference and lagged first difference), and enrolled Blue Plan.
- Modeling Approach **(Figure 1)**
  - Two Base years were used for this study: 2019 and 2020.
  - Following a lagged first difference approach for panel data analysis,[4] the change in PDC from the Pre year to Base year (e.g., 2018 to 2019) was correlated with changes in medical costs from the Base year to the Post year (e.g., 2019 to 2020).
  - Both sets of Base years were combined into a single linear regression model controlling for demographic and clinical differences to estimate changes in average medical cost associated with changes in PDC.

TABLE 1

Demographics, Clinical Characteristics and Analytic Results

Variable	Antidepressants	Antihypertensives	Antipsychotics	Antiretrovirals	NIDM	Statins	RASA
N	243,933	302,887	19,552	3,672	108,899	218,075	213,582
Age Category, 18–34 years	54,094 (22.2%)	23,383 (7.7%)	6,386 (32.7%)	838 (22.8%)	6,478 (5.9%)	3,416 (1.6%)	7,928 (3.7%)
35–49 years	86,582 (35.5%)	98,303 (32.5%)	6,376 (32.6%)	1,392 (37.9%)	32,600 (29.9%)	47,436 (21.8%)	62,021 (29.0%)
50–64 years	96,465 (39.5%)	166,023 (54.8%)	6,371 (32.6%)	1,412 (38.5%)	63,710 (58.5%)	149,848 (68.7%)	130,469 (61.1%)
65+ years	6,612 (2.7%)	15,082 (5.0%)	413 (2.1%)	30 (0.8%)	6,091 (5.6%)	17,329 (7.9%)	13,116 (6.1%)
Gender (% Female)	175,011 (71.7%)	160,391 (53.0%)	12,231 (62.6%)	854 (23.3%)	55,933 (51.4%)	90,692 (41.6%)	92,599 (43.4%)
Change in CCI Score, Base to Pre, Mean (95% CI)	0.04 (0.03 to 0.04)	0.08 (0.08 to 0.09)	0.04 (0.01 to 0.07)	0.20 (0.14 to 0.25)	0.12 (0.11 to 0.13)	0.07 (0.06 to 0.08)	0.08 (0.08 to 0.09)
Change in CCI Score, Post to Base, Mean (95% CI)	0.03 (0.02 to 0.04)	0.05 (0.05 to 0.06)	0.06 (0.03 to 0.09)	-0.05 (-0.11 to 0.00)	0.06 (0.05 to 0.07)	0.06 (0.05 to 0.07)	0.08 (0.07 to 0.08)
Adherence PDC, Pre Year, Among Non Adherent, Mean (95% CI)	59.4% (59.3% to 59.4%)	60.7% (60.6% to 60.7%)	56.7% (56.5% to 57.0%)	61.9% (61.4% to 62.4%)	59.8% (59.7% to 59.9%)	61.6% (61.5% to 61.6%)	62.2% (62.1% to 62.2%)
Adherence PDC, Base Year, Among Non Adherent, Mean (95% CI)	73.4% (73.3% to 73.5%)	75.8% (75.8% to 75.9%)	70.1% (69.7% to 70.4%)	73.2% (72.4% to 73.9%)	74.6% (74.4% to 74.7%)	76.1% (76.0% to 76.2%)	76.8% (76.7% to 76.9%)
Total Unadjusted Allowed Medical Cost, Base Year, Mean (95% CI)	$10,322 ($10,174 to $10,470)	$10,902 ($10,739 to $11,066)	$16,457 ($15,837 to $17,076)	$10,909 ($9,301 to $12,516)	$10,365 ($10,148 to $10,581)	$10,403 ($10,221 to $10,585)	$9,928 ($9,767 to $10,089)
Total Unadjusted Allowed Medical Cost, Post Year, Mean (95% CI)	$10,663 ($10,509 to $10,817)	$11,480 ($11,304 to $11,656)	$16,129 ($15,430 to $16,828)	$12,668 ($9,914 to $15,422)	$11,707 ($11,444 to $11,970)	$11,203 ($10,995 to $11,410)	$11,225 ($11,035 to $11,415)
Change in Total Unadjusted Allowed Medical Cost Difference, Post to Base Truncated at 99th Percentile, Mean (95% CI)	$263 ($184 to $342)	$433 ($352 to $514)	-$290 (-$680 to $99)	$44 (-$695 to $783)	$947 ($808 to $1,087)	$535 ($440 to $631)	$996 ($899 to $1,093)

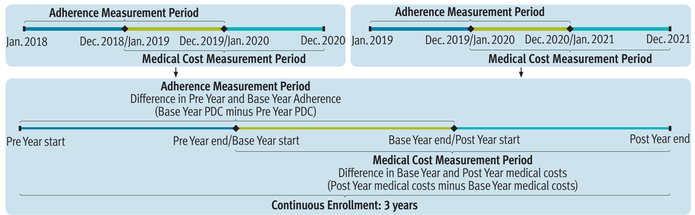
Measure N is the total count of member-year (e.g., members fully eligible for a measure in the 2019 Base year and 2020 Base year are counted twice). CI = confidence interval; PDC = Proportion of Days Covered; CCI = Charlson Comorbidity Index; NIDM = Non-Insulin Diabetes Medications; RASA = Renin-angiotensin System Antagonists

RESULTS

- Of the more than 16 million commercially insured members enrolled in a given year, 12.5 million were enrolled for the 3-year period with 2019 as the Base year and 12.8 million for the 2020 Base year. **(Figure 2)**
- Applying inclusion criteria reduced the sample to 1.85 million unique members fully eligible in either Base year 2019 or 2020, with 644,355 who were nonadherent to at least one measure in the Pre year. These 644,355 nonadherent members represented 1,110,600 total member-drug category measure-year combinations.
- Average PDC in the Pre year ranged from 56.7% for members using antipsychotics to 62.2% for members using RASA and increased by 12 to 15 percentage points across measures to 70.1% for antipsychotics to 76.8% for RASA in the Base year. **(Table 1)**
- Average total unadjusted allowed medical costs in the Base year ranged from $9,928 for members using RASA to $16,457 for members using antipsychotics. Medical costs in the Post year ranged from $10,663 for antidepressants to $16,129 for antipsychotics. Medical costs across most conditions increased between years, with winsorized spending differences as high as $947 for NIDM and $966 for RASA. Costs were unchanged, however, for antiretrovirals and had a nonsignificant decrease for antipsychotics.
- Improvements in continuous medication adherence was correlated with medical cost savings for 6 of the 7 adherence measure drug categories, with a range of associated medical cost savings for every 1 percentage point increase in PDC adherence: from $11 for RASA to $25 for antipsychotics. **(Figure 3)**
- Improvements in antiretroviral adherence was associated with a $13 savings in medical spending, but the 95% confidence interval ranged from a $14 increase medical cost to a savings of $40, with a p-value of 0.349.

FIGURE 1

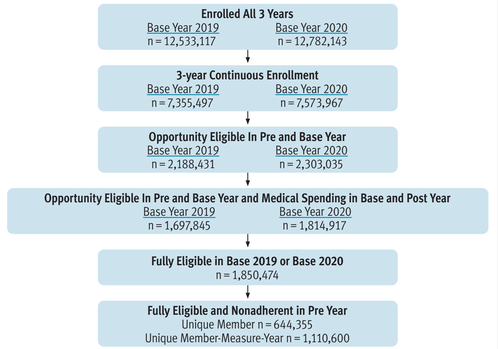
Study Schema



PDC: Proportion of Days Covered

FIGURE 2

Analytic Population Identification Flow Diagram



Unique member N is the count of members eligible for at least one measure in at least one Base year; Unique member-measure-year is the total unique combinations of members by measure and year.

FIGURE 3

Associated Medical Spending Reduction from a 1 Percentage Point Medication Adherence PDC Change

Drug Category (N)	Savings Estimates (95% CI; P-value)
Antidepressants (243,933)	$12 ($9 to $15; <0.001)
Antihypertensives (302,887)	$21 ($18 to $25; <0.001)
Antipsychotics (19,557)	$25 ($10 to $39; 0.001)
Antiretrovirals (3,672)	$13 (-$14 to $40; 0.349)
NIDM (108,899)	$15 ($9 to $21; <0.001)
RASA (213,582)	$11 ($7 to $16; <0.001)
Statins (218,075)	$19 ($15 to $24; <0.001)

PDC = Proportion of Days Covered; NIDM = Non-insulin Diabetes Medications; RASA = Renin-angiotensin System Antagonists; Medical costs adjusted to 2021 dollars; Estimates obtained from lagged-first multivariate regression models controlling for age, gender, Blue Plan and change in Charlson Comorbidity Index score[3]

LIMITATIONS

- Generalizability is limited to members who were nonadherent in Pre year, continuously enrolled for 3 years, and had at least some medical spending in Base and Post year.
- Members who were not medication adherence measure-eligible (i.e., nonpersistent or had only one fill) in the Base year were not included in the study.
- Modeling approach assumes a constant relationship between a 1 percentage point change and Pre year PDC (e.g., impact of PDC improvement from 50%–55% is the same as 70%–75%).
- Findings are limited to commercially insured members and may not be representative of members insured through government programs.
- While the methods employed eliminate time-invariant confounders, potential bias may remain due to time-varying unobserved confounders.

CONCLUSIONS

- A 1 percentage point increase in medication adherence, among commercially insured members, was associated with $11 to $25 reduction in annual medical costs across 6 out of the 7 drug categories assessed in this study. The small analytic population for antiretrovirals contributes to lack of statistical significance found with that drug category.
- These results can be used to support medical cost offsets from adherence programs even when improvements in PDC don't exceed standard adherence thresholds. For example, if a 10,000-member population had 190 members nonadherent to a statin and a clinical program improved PDC by an average of 5 points across those members, this would be a total of $18,050 in estimated medical care total savings (190 members X 5 percentage point average change X $19 per percentage point), equating to $0.15 PMPM.

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