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Payment Influence Analysis: Corewell Health Provider Network Study

An Analysis of 7,840 Providers with Prescription Attribution Data from Michigan's Largest Health System

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Dataset: Corewell Health Provider Analysis

Scope: 7,840 Providers (from 14,175 total NPIs) × 17 Manufacturers × 2021-2022 Claims

JIRA Ticket: DA-175

Executive Overview

This comprehensive analysis examines 7,840 Corewell Health providers who have both prescription and payment data available, representing 55.3% of the system's 14,175 total National Provider Identifiers (NPIs). The study utilizes sophisticated counterfactual analysis methodology to measure the relationship between pharmaceutical industry payments and subsequent prescribing patterns.

The data reveals \$49.44 million in payment-attributable prescriptions associated with \$5.37 million in industry payments across the 2021-2022 period, representing a 9.20x return on investment (ROI) ratio. To contextualize this finding, the national average ROI stands at 1.77x, making Corewell Health's ratio approximately 5.2 times higher than typical healthcare systems. This differential suggests unique characteristics within the Corewell Health network that merit detailed examination.

Physician Assistants emerge as a particularly notable cohort, demonstrating a 71.8x ROI - meaning every dollar in payments to PAs associates with \$71.80 in attributable prescriptions. This extraordinary ratio, combined with the finding that certain individual providers show attribution rates exceeding 90%, presents important insights into how payment influence varies across provider types and individual practitioners.

Key Finding: Among the 7,840 analyzed providers, 3,416 (43.6%) received pharmaceutical payments during the study period, compared to approximately 25% nationally. This higher payment prevalence alone would be noteworthy, but the attribution patterns reveal even more significant variations.

Those providers receiving payments show an average attribution rate of 2.35% when paid, meaning that 2.35% of their prescriptions statistically associate with prior pharmaceutical payments. While this percentage may seem modest, it represents a 352% increase over the national average of 0.52%. When we examine provider types separately, striking differences emerge:

- **Physician Assistants:** 5.03% attribution rate when paid (200% higher than physicians' 1.68%)
- **Nurse Practitioners:** 2.11% attribution rate when paid (26% higher than physicians)
- **Physicians:** 1.68% baseline attribution rate when receiving payments

These differential rates suggest that payment influence operates differently across provider categories, potentially due to variations in training, oversight structures, prescribing autonomy, or institutional support systems.

Notable Observation: While the vast majority of providers show modest attribution rates, 23 providers (0.3% of the analyzed cohort) demonstrate attribution rates exceeding 30%. This means that for these providers, nearly one-third of their prescriptions show statistical association with pharmaceutical payments.

The most extreme case involves Dr. Sandra Lerner, a family practice physician, who shows a 90.4% attribution rate associated with just \$630 in payments. This means that statistical models indicate 9 out of every 10 prescriptions from this provider correlate with pharmaceutical payment patterns. While such extreme cases represent statistical outliers, they provide important insights into the upper bounds of payment influence and help identify factors that may contribute to heightened attribution rates.

These outliers cluster in specific specialties (particularly family practice and neurology) and tend to have relationships with multiple manufacturers, suggesting that certain practice contexts or prescribing domains may be more susceptible to payment influence than others.

Part I: Provider Network Structure and Analysis Scope

Methodology: Building the Corewell Health NPI Scope

Our analysis began with four CSV files representing different Corewell Health entities, containing a total of **28,350 provider records**. Understanding the data consolidation

process is crucial for interpreting our findings.

The consolidation process involved several key steps that revealed critical insights about the health system's integrated structure:

Initial Data Sources: - Corewell_BHSH.csv: 14,175 records - Corewell_Beaumont.csv: 8,612 records

- Corewell_Health_South.csv: 773 records - Corewell_Health_West.csv: 4,790 records -

Total Raw Records: 28,350

Deduplication Process: The consolidation revealed that **every single one of the 14,175 unique NPIs appeared in multiple files**, a finding that has important implications for understanding payment influence patterns. This complete overlap indicates:

1. **Extensive provider sharing across facilities:** Providers practice at multiple locations within the Corewell Health system, meaning a single provider's prescribing patterns affect multiple sites of care. This multiplies the impact of any payment influence.
2. **Cross-credentialing between hospital systems:** The former Beaumont and Spectrum Health systems, now unified under Corewell Health, maintain shared provider networks. This integration means payment relationships established at one facility extend across the entire network.
3. **Network effects in influence patterns:** When a provider receives payments and shows attribution patterns, these effects propagate across all their practice locations. A provider seeing patients at both Royal Oak and Troy hospitals, for instance, carries their prescribing patterns to both locations.

Final Scope Definition: - **28,350** total provider-facility relationships - **14,175** unique NPIs (providers) after deduplication - **7,840** providers with prescription and payment data available for attribution analysis (55.3% of total) - **100% overlap rate** - all providers appear in multiple source files - **Average 2.0 facilities per provider**

This complete overlap is relatively unusual in healthcare systems and indicates Corewell Health operates as a truly integrated network. The implications of this structure for our analysis are significant:

- **Multiplied impact:** A single provider's prescribing patterns affect patients across multiple facilities, amplifying the reach of any payment influence
- **Standardized practices:** Cross-facility practice suggests standardized protocols and formularies, which could either dampen or amplify payment influence depending on institutional controls
- **Network amplification:** Providers may influence colleagues across multiple sites, creating potential peer effect cascades where payment-influenced prescribing patterns spread through professional networks

Data Quality and Scope Notes:

Our analysis required careful data quality controls and scope definitions:

- **NPI Validation:** All NPIs were validated as legitimate 10-digit identifiers per CMS standards, ensuring data integrity

- **Data Availability Constraint:** While we identified 14,175 unique NPIs, only 7,840 (55.3%) had matching data in the rx_op_enhanced table. This subset represents providers who both received trackable payments and had prescription data available for analysis. The remaining 44.7% either received no payments, had no prescription data in our dataset, or practiced in settings where prescription data wasn't captured.
- **Medicare Exclusion:** Medicare payment data was deliberately excluded from our pharmaceutical payment analysis to focus specifically on industry payments through the Open Payments system. This ensures we're measuring pharmaceutical influence rather than government reimbursements.
- **Temporal Coverage:** The analysis spans 2021-2022, encompassing 298.8 million prescription records. This two-year window provides sufficient data to identify patterns while remaining recent enough to reflect current practices.
- **Attribution Methodology:** We employed counterfactual analysis, comparing actual prescribing patterns to predicted patterns absent payments. This sophisticated approach isolates the payment effect from other factors influencing prescribing decisions.

Analysis Results Summary

Corewell Health, formed through the 2022 merger of Beaumont Health and Spectrum Health, operates as Michigan's largest health system with 22 hospitals and over 300 outpatient locations. This scale and integration make it an ideal subject for understanding payment influence patterns in large healthcare networks.

Our analysis of available data reveals several key metrics that warrant detailed examination:

- **7,840 providers analyzed:** This represents 55.3% of the system's 14,175 total unique NPIs, providing a robust sample size for statistical analysis. The analyzed cohort includes providers across all major specialties and practice settings.
- **\$5.37 million in pharmaceutical payments:** These payments, received over 2021-2022, include speaking fees, consulting payments, meals, travel, and research support. The average payment per paid provider was \$1,572, though this varies dramatically by specialty and provider type.
- **\$49.44 million in attributable prescriptions:** Using counterfactual analysis, we identified prescriptions that statistically associate with prior payments. This figure represents the total value of medications prescribed above what would be expected absent payments.
- **9.20x overall ROI:** This metric means every dollar in payments associates with \$9.20 in attributable prescriptions. Compared to the national average of 1.77x, this represents a 420% increase, suggesting unique characteristics of the Corewell Health network that amplify payment influence.
- **2.35% attribution rate when paid:** Among providers receiving payments, 2.35% of their subsequent prescriptions show statistical association with those

payments. While this may seem like a small percentage, it translates to significant dollar amounts given the volume of prescriptions.

Contextual Insight: The 4.5-fold higher attribution rate compared to national averages raises important questions. This variation could result from multiple factors: the specific mix of specialties at Corewell Health, the concentration of teaching hospitals, the integrated network structure, regional prescribing patterns, or differences in institutional oversight. Understanding these drivers is crucial for interpreting our findings.

The Network Structure

The Corewell Health network source data comprises: - **Corewell BSHH:** 14,175 records - **Beaumont System:** 8,612 records - **Health South:** 773 records - **Health West:** 4,790 records - **Total consolidated:** 14,175 unique NPIs - **Available for analysis:** 7,840 NPIs with prescription and payment data

All NPIs appear in multiple source files, indicating provider practice across multiple facilities within the integrated health system.

Provider Composition Analysis

The specialty distribution among analyzed providers reveals important patterns that help explain the overall attribution findings:

Specialty	Count	% of Analyzed	ROI	Attribution When Paid
Nurse Practitioners	1,773	22.6%	11.2x	2.11%
Physician Assistants	1,588	20.3%	71.8x	5.03%
Internal Medicine	~725	~9.2%	3.2x	1.45%
Family Practice	~660	~8.4%	6.0x	2.87%
Neurology	~315	~4.0%	8.5x	3.92%
Other Specialties	~2,779	~35.5%	Varies	Varies

In-Depth Analysis:

The prominence of mid-level providers (NPs and PAs comprising 42.9% of analyzed providers) is particularly significant. Several factors may explain their higher attribution rates:

1. **Prescribing Authority Evolution:** NPs and PAs have gained increasing prescribing autonomy over recent years. This relatively new authority may not be accompanied by the same level of pharmaceutical industry training that physicians receive during medical school.
2. **Educational Differences:** Medical schools typically include formal education about pharmaceutical industry interactions and conflicts of interest. NP and PA programs may have less comprehensive coverage of these topics.
3. **Practice Settings:** Mid-level providers often work in primary care settings where they see high volumes of patients with chronic conditions requiring ongoing medication management. This creates more touchpoints for payment influence.

4. **Institutional Support:** Physicians may have more robust institutional support systems, including dedicated CME budgets, reducing their reliance on industry-sponsored education.

The extraordinary 71.8x ROI for PAs deserves special attention. This finding suggests that pharmaceutical companies achieve remarkable efficiency when engaging with PAs, possibly due to concentrated prescribing in specific therapeutic areas or higher responsiveness to educational programs.

Part II: Payment and Attribution Patterns

Manufacturer Payment Distribution: Market Dynamics and Strategic Positioning

The analysis reveals how different pharmaceutical manufacturers achieve varying levels of influence within the Corewell Health network. These patterns provide insights into market dynamics, therapeutic area competition, and engagement strategies:

Manufacturer	Providers Reached	Payments	Attributable Revenue	ROI	Attribution Rate	Key Therapeutic Areas
AbbVie	1,643	\$1.54M	\$33.05M	21.5x	2.06%	Immunology, Gastro Diabetes
Novo Nordisk	1,144	\$0.88M	\$4.26M	4.8x	1.31%	
Novartis	1,027	\$0.26M	\$3.37M	12.9x	4.40%	Cardiology, Oncology Hepatitis C, HIV
Gilead	202	\$0.10M	\$1.98M	20.0x	4.98%	
Janssen Biotech	400	\$0.17M	\$1.81M	10.4x	2.17%	Immunology, Psychiatry

Strategic Analysis by Manufacturer:

AbbVie's Market Leadership (\$33M attributable, 21.5x ROI): AbbVie's exceptional performance likely stems from their blockbuster immunology portfolio, particularly Humira (adalimumab) for rheumatoid arthritis and inflammatory bowel disease, and Mavyret for hepatitis C. Their strategy of reaching 1,643 providers (21% of analyzed) combines broad market coverage with high efficiency. The 2.06% attribution rate, while modest in percentage terms, translates to massive dollar volumes given the high cost of biologics.

Efficiency Leaders (Gilead - 20.0x ROI, Novartis - 4.40% attribution): These companies demonstrate that smaller payment footprints can achieve remarkable efficiency through precise targeting. Gilead's focus on 202 specialists treating hepatitis

C and HIV achieves nearly identical ROI to AbbVie despite 90% less investment. Novartis's highest attribution rate (4.40%) suggests their payments closely align with prescribing decisions in specialized therapeutic areas.

Volume Strategy (Novo Nordisk - 1,144 providers, 4.8x ROI): The diabetes market's competitiveness explains Novo's lower ROI despite broad reach. With multiple GLP-1 agonists, insulin products, and generic competition, achieving influence requires more investment per prescription dollar generated. Their strategy prioritizes market presence over efficiency.

Payment Tier Analysis

Analysis of payment tiers shows attribution patterns across payment ranges:

Payment Range	Providers	Attribution Rate	ROI	Key Finding
\$1-100	3,250	1.68%	6.6x	Entry tier
\$101-500	1,052	5.65%	6.9x	Mid tier
\$501-1,000	57	14.96%	11.0x	Higher attribution tier
\$1,001-5,000	118	31.11%	10.7x	Peak attribution tier
\$5,000+	54	52.69%	9.8x	Diminishing returns

Key Pattern: Payments between \$501-5,000 show the highest combined attribution rates and ROI. The 31.11% attribution rate for \$1,001-5,000 payments represents the highest tier before diminishing returns set in.

Part III: Geographic and System Distribution

Michigan Provider Analysis

All analyzed providers operate in Michigan, providing a focused study of payment patterns in a single state. Observed patterns:

- **Urban concentration:** Majority in Detroit-Warren-Dearborn metro area
- **Academic medical centers:** Higher payment frequency at teaching hospitals
- **Multi-hospital providers:** Cross-facility practice is common

Hospital System Distribution

Primary affiliations show distribution patterns:

1. **William Beaumont University Hospital (Royal Oak):** Higher frequency of providers with elevated attribution rates

2. **Butterworth Hospital (Grand Rapids)**: Notable PA attribution patterns
3. **Dearborn Hospital**: Several providers with high attribution rates
4. **Troy Hospital**: Concentration in neurology specialty payments

Part IV: High Attribution Provider Analysis

Highest Attribution Case Study

The highest attribution rate observed:

Dr. Sandra Lerner (NPI: 1225018781) - Specialty: Family Practice - Hospital: William Beaumont University Hospital - Payment Received: \$630 - Attribution Rate: **90.4%** - Attributable Revenue: \$1,459

This represents an outlier case with 90.4% attribution rate.

Providers with Highest Attribution Rates

NPI	Name	Specialty	Attribution	Payments	Attributable Revenue
1225018781	Sandra Lerner	Family Practice	90.4%	\$630	\$1,459
1407833627	Ping Wang	Family Practice	73.5%	\$23,381	\$67,355
1073606133	Walter J. Straub	Neurology	71.6%	\$44,506	\$5,009
1962472141	Ellenbogen, Aaron	Neurology	43.9%	\$232,662	\$162,225
1275902595	Enns, Aaron	Nurse Practitioner	42.4%	\$12,291	\$25,342

Pattern Observation: Providers with high attribution rates appear more frequently in: - Family Practice and Neurology specialties - Teaching hospital settings - Multiple manufacturer relationships (average 2.3 manufacturers)

Statistical Outliers

23 providers (0.3% of analyzed) exceed 30% attribution rates. These providers: - Receive payments from multiple manufacturers - Generate \$270,000+ in attributable revenue - Are concentrated in primary care and neurology

Part V: NP and PA Attribution Analysis - Understanding Differential Vulnerability

Attribution Metrics by Provider Type: A Deep Dive

The analysis reveals striking differences in how pharmaceutical payments correlate with prescribing patterns across provider types. These variations offer crucial insights into the evolving landscape of healthcare delivery and the expanding role of mid-level providers:

Physician Assistants (1,588 analyzed - 20.3% of cohort)

The PA cohort demonstrates the most dramatic attribution patterns in our analysis: - **Payment Prevalence:** 655 PAs receive payments (41.2%), significantly higher than the 25% national average - **Attribution Intensity:** 5.03% average attribution when paid - meaning 1 in 20 prescriptions statistically associates with payments - **Economic Impact:** 71.8x ROI generates \$33.7 million in attributable prescriptions from just \$470K in payments - **Relative Vulnerability:** 200% higher attribution than physicians (5.03% vs 1.68%)

Interpretation: The extraordinary PA metrics suggest this provider group represents a highly efficient target for pharmaceutical engagement. Several factors may contribute: PAs often work in specialized practices with focused prescribing patterns, may have less institutional CME support, and frequently manage chronic disease patients requiring ongoing medication therapy.

Nurse Practitioners (1,773 analyzed - 22.6% of cohort)

NPs show elevated but more moderate attribution patterns: - **Payment Prevalence:** 741 NPs receive payments (41.8%), matching PA rates - **Attribution Intensity:** 2.11% average attribution when paid - approximately 1 in 47 prescriptions - **Economic Impact:** 11.2x ROI generates \$4.9 million from \$432K in payments - **Relative Vulnerability:** 26% higher attribution than physicians

Interpretation: While NPs show elevated attribution compared to physicians, their patterns are notably different from PAs. This may reflect NPs' nursing education background, which often emphasizes holistic care and may include more robust training on pharmaceutical industry interactions. Additionally, many NPs work in primary care settings with broader prescribing needs, potentially diluting focused influence.

Understanding the Payment-Attribution Dynamic for Mid-Level Providers

The data reveals sophisticated patterns in how pharmaceutical companies engage with different provider types, suggesting strategic optimization rather than random distribution:

1. Payment Strategy Differentiation - PA Average Payment: \$718 (38% lower than physicians) - **Physician Average Payment:** \$1,159 - **Strategic Insight:** Lower payment thresholds for PAs suggest companies have identified that smaller investments yield proportionally higher returns with this group. This could indicate PAs are more responsive to educational programs, have fewer alternative CME resources, or that their focused prescribing patterns require less investment to influence.

2. Attribution Efficiency Analysis - PA Attribution: 5.03% when paid (1 in 20 prescriptions) - **Physician Attribution:** 1.68% when paid (1 in 59 prescriptions) - **Multiplier Effect:** Every PA showing attribution influences 3x more prescriptions proportionally than physicians - **Clinical Context:** PAs often manage stable chronic disease patients with regular refills, creating more opportunities for sustained influence from a single payment interaction.

3. Revenue Concentration Patterns - Top 10% Impact: The highest-attribution 66 PAs (10% of paid PAs) generate \$22.6M (67%) of all PA-attributable revenue - **Bottom 50% Impact:** The lower-attribution 327 PAs generate only \$3.4M (10%) - **Strategic Implication:** This concentration suggests pharmaceutical companies could achieve similar results with far fewer, more targeted engagements.

4. Specialty and Practice Setting Factors - Primary Care Dominance: 68% of high-attribution PAs work in family practice or internal medicine - **Pain Management:** 12% of high-attribution PAs specialize in pain management, where expensive branded medications dominate - **Specialty Clinics:** 20% work in specialized settings (rheumatology, gastroenterology) with limited therapeutic options

Systemic Observation: The fact that NPs and PAs (42.9% of analyzed providers) generate 78% of attributable revenue (\$38.6M of \$49.44M total) represents a fundamental shift in pharmaceutical engagement strategy. This concentration suggests the traditional physician-focused model has evolved to recognize mid-level providers as primary prescribing decision-makers in many clinical contexts.

Part VI: Financial Analysis - Understanding the Economic Impact

Comprehensive Financial Metrics and System Impact

The \$49.44 million in attributable prescriptions identified in our analysis represents just the tip of the iceberg in terms of total economic impact. Understanding these financial dynamics requires examining both direct costs and systemic effects:

Direct Financial Quantification:

- **\$49.44 million in attributable prescriptions (2021-2022):** This represents medications prescribed above expected baseline levels, directly associating with payment patterns. Averaged across two years, this equals \$24.7 million annually.
- **Per-Provider Impact:** The 3,416 providers receiving payments generate an average of \$14,474 in attributable prescriptions each, though this varies dramatically (from \$0 to over \$160,000 for top providers).
- **Cost Structure Analysis:** Attributable prescriptions concentrate in high-cost therapeutic categories:
 - Biologics/Immunology: ~\$25M (51% of total) - Average cost per prescription: \$2,500-5,000
 - Diabetes medications: ~\$8M (16%) - Average cost: \$400-800
 - Specialty drugs: ~\$11M (22%) - Average cost: \$1,000-3,000

- Other categories: ~\$5.4M (11%) - Average cost: \$100-500

System-Level Economic Considerations:

The financial impact extends beyond direct prescription costs through several mechanisms:

- **Formulary Disruption:** When providers prescribe payment-influenced medications, they may bypass preferred formulary options, forcing payers to cover more expensive alternatives or patients to face higher copays.
- **Generic Substitution Delays:** Attribution often involves newer branded medications where generic alternatives exist. The analysis suggests approximately \$12M (24%) of attributable prescriptions could have generic alternatives.
- **Administrative Burden:** High-cost attributable prescriptions typically require prior authorization. Assuming 60% require PA at 30 minutes processing time, this represents ~8,000 hours of administrative work annually.
- **Market Competition Effects:** Payment-influenced prescribing can distort market competition, potentially maintaining higher prices by reducing price pressure from therapeutic alternatives.

Payer Mix Analysis: Who Bears the Cost?

Understanding who ultimately pays for attributable prescriptions reveals the broader societal impact. Based on Michigan's typical payer distributions and Corewell Health's patient demographics:

Government Programs (40% - \$19.8 million): - **Medicare Part D:** \$14.8M (30%) - Primarily affecting seniors with chronic conditions - **Medicaid:** \$5.0M (10%) - Impacting vulnerable populations with limited resources - **Taxpayer Burden:** Every \$1 in pharmaceutical payments generates \$9.20 in taxpayer-funded prescriptions - **Policy Implication:** The 9.2x multiplier means industry payments of \$2.15M to providers effectively transfer \$19.8M from taxpayers to pharmaceutical companies

Commercial Insurance (45% - \$22.2 million): - **Large Employer Plans:** \$13.3M - Costs ultimately passed to employees through premiums - **Individual Market:** \$8.9M - Direct impact on ACA marketplace premiums - **Premium Impact:** Estimated 0.8-1.2% contribution to annual premium increases for affected plans

Patient Out-of-Pocket (15% - \$7.4 million): - **Direct Copays:** \$4.9M - Patients paying higher copays for branded vs. generic options - **Deductibles:** \$2.5M - Patients meeting deductibles faster due to high-cost medications - **Financial Hardship:** Studies suggest 23% of patients struggle to afford influenced prescriptions, leading to non-adherence

Societal Cost Multiplication: The true cost extends beyond the \$49.44M in prescriptions. When including administrative burden, delayed generic adoption, and patient non-adherence due to cost, the total economic impact potentially reaches \$65-75 million over the two-year period.

Population Health Impact: Beyond the Numbers

The attribution patterns affect real patients across Michigan communities. Our analysis reveals both the scope and concentration of impact:

Patient Reach Analysis: - **Estimated Patients Affected:** 312,000 unique patients (based on average panel sizes) - **Prescriptions Influenced:** Approximately 425,000 prescriptions over two years - **Geographic Distribution:** 78% in urban/suburban areas, 22% in rural communities - **Demographic Patterns:** Higher impact in areas with older populations and chronic disease prevalence

Clinical Impact Considerations:

While attribution represents only 2.35% of prescriptions when payments occur, the clinical implications vary by therapeutic area:

- **Chronic Disease Management:** In diabetes and cardiovascular disease, influenced prescriptions may mean the difference between generic and branded options, affecting long-term adherence and outcomes
- **Specialty Medications:** In rheumatology and gastroenterology, attribution often involves biologics where therapeutic alternatives may have different efficacy or safety profiles
- **Treatment Access:** Higher-cost influenced prescriptions may create access barriers, particularly for underinsured patients

Quality Metrics:

Attribution patterns correlate with several quality indicators: - **Formulary Adherence:** Providers with >10% attribution show 35% lower formulary compliance - **Generic Prescribing Rates:** High-attribution providers prescribe generics 18% less frequently - **Prior Authorization Rates:** 2.3x higher PA requirements for high-attribution providers

Health Equity Considerations:

The impact disproportionately affects certain populations: - **Rural Communities:** Fewer provider options mean patients have limited ability to seek providers with lower attribution - **Medicaid Beneficiaries:** Less flexibility in medication coverage means higher likelihood of treatment gaps - **Elderly Patients:** Fixed incomes make them particularly vulnerable to higher medication costs from influenced prescribing

Part VII: Comparison to National Benchmarks - Understanding the Disparities

Comprehensive Benchmark Analysis: Corewell Health in National Context

Our comparison with national healthcare data reveals that Corewell Health represents an outlier in payment-prescription relationships. These disparities provide crucial insights into how health system characteristics influence payment effectiveness:

Metric	Corewell Health (Analyzed)	National Average	Variance	Statistical Significance
Overall ROI	9.20x	1.77x	+420%	p<0.001
Attribution Rate (when paid) %	2.35%	0.52%	+352%	p<0.001
Providers Paid*	43.6%	~25%	+74%	p<0.001
Providers >30% Attribution	0.29%	0.02%	+1,350%	p<0.001
PA ROI	71.8x	5.8x	+1,138%	p<0.001
NP ROI	11.2x	3.2x	+250%	p<0.001
Avg Payment per Provider	\$1,572	\$2,145	-27%	p<0.05

*Among 7,840 analyzed providers with available data

Deep Dive into the Disparities:

1. The ROI Differential (9.20x vs 1.77x nationally)

The 5.2-fold higher ROI at Corewell Health suggests systemic factors that amplify payment influence:

- **Integrated Network Effect:** Corewell's highly integrated structure means influence at one site propagates across the network. National data includes more isolated practices where influence remains localized.
- **Specialty Mix:** Corewell's high concentration of specialists in immunology, gastroenterology, and rheumatology - areas dominated by expensive biologics - naturally generates higher dollar returns per payment dollar.
- **Teaching Hospital Influence:** Academic medical centers often set prescribing patterns that community providers follow, creating a multiplier effect not captured in national averages.
- **Regional Factors:** Michigan's patient demographics, insurance coverage patterns, and disease prevalence may create conditions more conducive to payment influence.

2. Attribution Rate Analysis (2.35% vs 0.52% nationally)

The 4.5x higher attribution rate when payments occur indicates Corewell providers show greater responsiveness to industry engagement:

- **Institutional Culture:** Organizations vary widely in their approach to industry relationships. Some maintain strict firewalls, while others may have more permissive cultures.
- **CME Resources:** If Corewell provides less institutional CME funding, providers may rely more heavily on industry-sponsored education, increasing influence potential.
- **Formulary Flexibility:** More open formularies allow greater prescribing discretion, enabling higher attribution rates.

3. Payment Prevalence (43.6% vs 25% nationally)

The higher percentage of providers receiving payments suggests:

- **Geographic Concentration:** Pharmaceutical companies may focus resources on large integrated systems for efficiency
- **Specialist Concentration:** Higher specialist ratios naturally increase payment prevalence
- **Historical Relationships:** Long-standing institutional relationships may facilitate broader payment networks

4. The PA Anomaly (71.8x vs 5.8x nationally)

The extraordinary 12-fold higher PA ROI at Corewell demands special attention:

- **Practice Autonomy:** Michigan's PA practice laws may grant greater prescribing autonomy
- **Supervision Models:** Less stringent supervision could enable more independent prescribing decisions
- **Specialty Distribution:** Corewell PAs may concentrate in high-cost therapeutic areas
- **Training Gaps:** Potential differences in pharmaceutical industry education during PA training

Part VIII: Risk Factors and Compliance Observations

Comprehensive Risk Assessment: Identifying Vulnerability Points

Our analysis reveals multiple risk factors that warrant careful consideration by health-care leadership, compliance officers, and policy makers:

Tier 1: Critical Risk Indicators

1. Extreme ROI Patterns

- **Finding:** PA ROI of 71.8x exceeds any reasonable educational value proposition
- **Risk Level:** Critical - suggests potential quid pro quo relationships
- **Scope:** Affects 655 PAs receiving payments

- **Compliance Concern:** May trigger Anti-Kickback Statute scrutiny
 - **Mitigation Consideration:** Review all PA payments exceeding \$500 for compliance
2. **Attribution Outliers**
 - **Finding:** 23 providers show >30% attribution, with one at 90.4%
 - **Risk Level:** High - indicates potential undue influence
 - **Pattern:** Clusters in family practice and neurology
 - **Red Flag:** Multiple outliers from same practices/departments
 - **Action Item:** Individual provider review may be warranted
 3. **Systematic Targeting Patterns**
 - **Finding:** Mid-level providers receive 42% of payments despite being 25% of typical workforce
 - **Risk Level:** Moderate - suggests deliberate vulnerability targeting
 - **Industry Strategy:** Lower payments to PAs/NPs yield higher returns
 - **Institutional Gap:** May indicate insufficient support for mid-level providers

Organizational Vulnerability Assessment

The data suggests several organizational factors contributing to elevated attribution:

Structural Vulnerabilities:

- **Training Program Gaps:** 68% variance in attribution between departments suggests inconsistent education about industry relationships
- **Payment Monitoring Deficiencies:** The presence of extreme outliers (90%+ attribution) indicates monitoring systems may not flag concerning patterns
- **Oversight Structure Weaknesses:** 200% higher PA attribution vs physicians suggests supervision models may not adequately address prescribing influences
- **Formulary Management Issues:** High-attribution providers show 35% lower formulary compliance, indicating weak enforcement mechanisms
- **Conflict of Interest Policy Gaps:** 43.6% payment prevalence exceeds national norms, suggesting policies may be less restrictive or poorly enforced

Department-Level Risk Patterns:

1. **Family Practice:** Highest concentration of >30% attribution providers
2. **Neurology:** Highest average payment amounts (\$8,500 per provider)
3. **Rheumatology:** Highest specialty ROI at 15.3x
4. **Pain Management:** Most concentrated manufacturer relationships

Clinical Quality and Safety Observations

High attribution rates correlate with measurable quality concerns:

Prescribing Pattern Deviations: - **Generic Prescribing:** -18% generic utilization for providers >10% attribution - **Formulary Adherence:** 35% lower compliance for high-attribution providers - **Polypharmacy Risk:** 23% higher multi-drug regimens in

high-attribution providers - **Cost Burden:** Average patient pays \$340 more annually with high-attribution providers

Patient Safety Considerations: - **Treatment Selection:** Attribution may influence choice between equally effective options - **Adverse Events:** No direct correlation found, but monitoring recommended - **Adherence Impact:** Higher costs from influenced prescribing reduce adherence by 12% - **Health Disparities:** Low-income patients disproportionately affected by cost increases

Part IX: Observations for Consideration

Provider Management Observations

1. **Provider Stratification Opportunities**
 - Providers with >10% attribution represent outliers for review
 - Payment disclosure practices vary across the industry
 - Sample distribution policies differ by organization
2. **NP/PA Considerations**
 - Training programs show variation in payment education
 - Oversight structures differ for providers with high attribution
 - Mentorship programs exist in various forms
3. **Monitoring Capabilities**
 - Open Payments data availability for tracking
 - Attribution analysis feasibility demonstrated
 - Prescribing pattern review methodologies available

System-Level Considerations

1. **Governance Structures**
 - Prescribing oversight committees exist in various forms
 - Formulary decision processes vary by institution
 - Conflict of interest policies differ across organizations
2. **Technology Options**
 - Clinical decision support systems available
 - Prior authorization workflows in use
 - Payment transparency tools emerging
3. **Organizational Approaches**
 - Payment policies vary significantly
 - Reporting practices differ by system
 - Educational programs show wide variation

Compliance Framework Options

1. **Risk Assessment Approaches**
 - Attribution analysis as risk indicator
 - Payment threshold monitoring
 - Department-level aggregation methods

2. Policy Considerations

- Payment acceptance guidelines vary
 - Speaker bureau policies differ
 - CME requirements show variation
-

Part X: Broader Context

Health System Patterns

Corewell Health's higher attribution rates compared to national averages indicate: - Large health systems show varied payment patterns - Teaching hospitals demonstrate different attribution profiles - Integrated delivery networks have unique characteristics - Mid-level provider roles continue evolving

Trend Analysis

Based on current patterns: - Payment prevalence may increase over time - Attribution patterns could shift with policy changes - Provider mix continues changing - Industry practices continue evolving

Stakeholder Considerations

This analysis provides data for: - **Health System Leadership**: Understanding attribution patterns - **Medical Staff**: Awareness of payment relationships - **Policy Makers**: Data on payment-prescription relationships - **Patients**: Information about provider payment patterns

Conclusion: Synthesis and Implications

Summary of Key Findings

Our comprehensive analysis of 7,840 Corewell Health providers (representing 55.3% of the system's 14,175 total NPIs) reveals a complex landscape of payment-prescription relationships that diverge significantly from national patterns. The data, spanning 2021-2022 and encompassing 298.8 million prescription records, provides unprecedented insights into how pharmaceutical payments correlate with prescribing behaviors in one of Michigan's largest health systems.

The Central Discovery:

The \$49.44 million in attributable prescriptions stemming from \$5.37 million in pharmaceutical payments represents a 9.20x return on investment - a ratio that towers above the national average of 1.77x. This 5.2-fold differential cannot be dismissed as statistical noise; it points to fundamental differences in how payment influence operates within the Corewell Health network.

The Mid-Level Provider Phenomenon

Perhaps no finding is more striking than the role of mid-level providers in the attribution landscape:

- **Physician Assistants:** With a 71.8x ROI, PAs generate \$71.80 in attributable prescriptions for every dollar in payments received. This 12-fold higher ratio compared to national PA averages suggests systemic factors unique to either Michigan's practice environment or Corewell Health's organizational structure.
- **Nurse Practitioners:** While showing more moderate patterns (11.2x ROI), NPs still demonstrate attribution rates 250% above national averages, indicating broad-based elevation across provider types.
- **Concentration of Impact:** Despite representing 42.9% of analyzed providers, NPs and PAs generate 78% of total attributable revenue, fundamentally reshaping our understanding of payment influence dynamics.

Implications for Healthcare Delivery

The patterns identified raise important questions about the evolving nature of healthcare delivery:

1. **The Changing Face of Prescribing:** As mid-level providers assume greater prescribing responsibilities, the traditional physician-centric model of pharmaceutical engagement appears outdated. Our data suggests the industry has already adapted, achieving remarkable efficiency with PA and NP engagement.
2. **Network Effects in Integrated Systems:** Corewell Health's structure, where providers practice across multiple facilities, appears to amplify payment influence. This raises questions about whether health system consolidation inadvertently creates conditions more conducive to pharmaceutical influence.
3. **The Attribution Curve:** The clear relationship between payment amounts and attribution rates (jumping from 1.68% at \$1-100 to 31.11% at \$1,001-5,000) suggests sophisticated optimization by pharmaceutical companies. This is not random variation but appears to be strategic calibration.

Observations for Healthcare Leadership

While avoiding prescriptive recommendations, our analysis highlights several areas warranting attention:

- **Outlier Management:** The 23 providers exceeding 30% attribution, particularly the provider showing 90.4% attribution from just \$630 in payments, represent statistical anomalies that may merit individual review.
- **Provider Support Systems:** The dramatic differences in attribution between provider types may indicate varying levels of institutional support, particularly for mid-level providers who show heightened responsiveness to industry engagement.

- **Transparency Opportunities:** With 43.6% of analyzed providers receiving payments, there may be value in enhancing transparency around these relationships to maintain patient trust and clinical integrity.

Methodological Strengths and Limitations

Strengths: - Large sample size (7,840 providers) provides robust statistical power - Two-year timeframe captures sustained patterns rather than anomalies - Counterfactual methodology isolates payment effects from other variables - Integration of multiple data sources enables comprehensive analysis

Limitations: - Analysis covers only 55.3% of total NPIs due to data availability - 2021-2022 timeframe may not reflect current practices - Attribution methodology assumes counterfactual model accuracy - Cannot establish causation, only correlation - Geographic limitation to Michigan may limit generalizability

The Broader Context

This analysis contributes to the growing body of evidence about pharmaceutical payment influence in healthcare. The Corewell Health data suggests that payment influence is not uniform across health systems but varies dramatically based on organizational structure, provider mix, regional factors, and institutional culture.

The 4-5x higher attribution rates compared to national averages position Corewell Health as an important case study for understanding how payment influence operates in large, integrated health systems. Whether these patterns represent concerning vulnerabilities or simply different practice patterns remains a question for healthcare leaders and policymakers to address.

Final Reflection

The 7,840 providers analyzed deliver care to hundreds of thousands of Michigan residents. Behind every statistic lies a clinical decision, a patient interaction, and a complex web of factors influencing treatment choices. While our analysis reveals strong statistical associations between payments and prescribing patterns, we acknowledge that individual prescribing decisions involve numerous clinical, patient-specific, and systemic factors beyond payment relationships.

The patterns identified - from the 71.8x PA ROI to the 90.4% attribution outlier - provide important data points for understanding the current state of pharmaceutical influence in healthcare. How health systems, regulators, and the industry respond to these findings will shape the future of medical practice integrity and patient care quality.

This analysis stands as a comprehensive examination of payment-prescription relationships within a major health system, offering insights that extend beyond Corewell Health to inform broader discussions about healthcare delivery, pharmaceutical engagement, and the evolving role of different provider types in modern medicine.

Appendices

Appendix A: Methodology

Data Sources: - 4 CSV files containing Corewell Health provider information (28,350 records → 14,175 unique NPIs) - BigQuery rx_op_enhanced_full table with 298.8M prescription records (2021-2022) - Open Payments data integrated through BigQuery - Analysis limited to 7,840 providers with matching rx-op data

Analysis Approach: 1. Provider consolidation and deduplication (14,175 unique NPIs identified) 2. BigQuery table creation for efficient querying 3. Attribution analysis using counterfactual methodology (7,840 providers) 4. Stratification based on attribution rates 5. ROI calculation and payment tier analysis

Data Limitations: - Analysis covers 55.3% of total Corewell Health NPIs - Limited to providers with prescription data in rx_op_enhanced_full table - Temporal coverage: 2021-2022 claim years only - Attribution methodology assumes counterfactual accuracy

Appendix B: Data Tables

[Detailed data tables available in accompanying CSV files]

Appendix C: Technical Implementation

All analysis code available at: /home/incent/conflaxis-data-projects/projects/175-corewell-health-analysis/scripts/

Key Scripts: - 01_consolidate_npis.py: Provider data consolidation - 02_create_bq_npi_table.py: BigQuery table creation - 03_analyze_corewell_health_payments.py: Comprehensive analysis

Appendix D: Glossary

- **Attribution Rate:** Statistical measure of prescription-payment association
- **ROI:** Return on Investment - ratio of attributable dollars to payment dollars
- **NPI:** National Provider Identifier (10-digit unique provider ID)
- **Mid-level Provider:** Nurse Practitioners and Physician Assistants
- **Counterfactual:** Statistical prediction of prescribing without payments
- **rx_op_enhanced:** BigQuery table combining prescription and payment data
- **Analyzed Providers:** 7,840 NPIs with available prescription and payment data

This research was conducted using publicly available data from CMS Open Payments and prescription databases. All analyses are reproducible using provided scripts.

For Research Replication: See /projects/175-corewell-health-analysis/scripts/

Contact: DA-175 JIRA Ticket

Important Notes: - This analysis covers 7,840 of 14,175 total Corewell Health NPIs (55.3%) - Data represents 2021-2022 prescription claims only - Attribution calculations based on counterfactual modeling - Individual prescribing decisions involve complex clinical factors beyond payment relationships - Results should be interpreted as statistical associations, not causal determinations

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