Matching Industry Payments to Medicare Prescribing Patterns: An Analysis

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1 Summary

This analysis examined Medicare's Part D prescription data as well as pharmaceutical and medical device company payment data to see if there was a relationship between industry payments and brand-name prescribing. We found that physicians in five common medical specialties who accepted at least one industry payment were more likely to prescribe high rates of brand-name drugs than physicians who did not receive any payments. Then we compared average prescribing rates among physicians divided in several ways: those who received payments and those who didn't; those who received large dollar amounts of payments and those who received smaller amounts; and those who received certain types of payments (meals, speaking) and those who didn't. In all cases, the group receiving larger payments had a higher brand-name prescribing rate on average. Additionally, the type of payment made a difference: those who received meals alone from companies had a higher rate of brand-name prescribing than physicians who received no payments, and those who received speaking payments had a higher rate than those who received other types of payments.

2 Introduction

While it has long been theorized that pharmaceutical company payments to doctors influence their prescribing, empirical research on the topic has been scant. ProPublica launched its Dollars for Docs tool in 2010 to make it easier for consumers to look up whether their physicians received payments from certain drug companies that disclosed this information as part of lawsuit settlements. In 2013, ProPublica introduced Prescriber Checkup, a tool that allows users to compare their physicians' prescribing patterns in the Medicare Part D program to peers in the same specialty and state. Finally, in 2014, the government released robust data on payments by all pharmaceutical and medical device makers to all doctors in the U.S. The data is called Open Payments and has been integrated into ProPublica's Dollars for Docs tool. For the first time, this enables research into whether doctors who receive payments prescribe differently than their peers who do not.

An earlier report by ProPublica detailed how some of the highest prescribers

of certain heavily marketed drugs also received promotional speaking payments from the makers of those drugs. Another story described how the drugs most aggressively promoted to doctors typically weren't cures or even big medical breakthroughs, but instead were newer products that were similar to existing ones and that companies hoped would gain traction.

3 Methods

For this analysis, ProPublica joined Medicare Part D data with Open Payments data. The Part D data includes prescribing information by physicians and other providers under Medicare's drug benefit program for calendar year 2014, and was received from the Centers for Medicare and Medicaid Services (CMS) through a federal Freedom of Information Act request in February 2016. (This covers about 1.4 billion prescriptions to 37.1 million beneficiaries.) The Open Payments data contains payments to doctors from pharmaceutical and medical device companies made between January and December 2014. (This covers $2.5 billion in payments.) CMS released the Open Payments data in 2015 as a publicly released download.

3.1 How we matched provider identities

There is no common physician ID that connects the two databases. The Part D data uses as its unique ID each provider's National Provider Identifier number, as logged in NPPES (National Plan and Provider Enumeration System). The Open Payments system uses a randomly generated unique ID. By law, the government could not release doctors' National Provider Identifier numbers with the Open Payments data, but it could, and did, release their contact information from that system. Matching via full name and practice location address, ProPublica was able to locate the National Provider Identifier numbers of nearly all physicians in the Open Payments data. ProPublica then researched and hand-matched several thousand physicians who did not directly match to the NPPES database.

These methods allowed ProPublica to match more than 99.7 percent of physicians in the Open Payments database to the corresponding physician data in the NPPES database.

3.2 Determining the universe

The 2014 Part D database contained prescribing data for 1,073,358 health care providers (this figure includes non-physician providers, such as nurse practitioners and physician assistants). There were 605,680 providers in the Open Payments data who received at least one general payment from January to December 2014. These include payments for speaking, consulting, travel, meals and gifts, among others. We did not include research payments in our analysis. The Open Payments data does not include payments made to nurse practitioners or physician assistants, so those prescribers could not be matched.

Not all physicians who prescribed drugs to Medicare recipients received money

from the pharmaceutical or medical device industry. Conversely, not every physician who received a payment prescribed at least 1,000 prescriptions to Medicare beneficiaries.

To ensure robustness of data and to reduce potentially misleading percentages because of small overall claim counts, ProPublica only analyzed those providers who had 1,000 or more overall claims in 2014 in the Part D data (n = 266,284). The Part D program now covers about 40 million seniors and disabled people in the U.S.

ProPublica chose to look at the five most populous medical specialties of this subset because there was a precipitous drop off in provider counts below that. (The NPPES data links physicians with their self-reported primary medical specialty, e.g. internal medicine or dermatology.) This subset of data included 150,323 physicians in the five specialties we analyzed: "Family Medicine" (n = 65,651), "Internal Medicine" (n = 51,607), "Cardiovascular Disease" (n = 13,817), "Psychiatry" (n = 11,052) and "Ophthalmology" (n = 8,196).[1]

To determine how often physicians prescribed brand-name drugs, ProPublica calculated a variable named "p_brand," which is a physician's brand-name claim count in Part D divided by his or her total claim count.

CMS broke down prescriptions into three categories: generic, brand and other (which includes supplies) and provided tallies for each, by doctor. The agency, however, redacted data when the number of claims for a doctor in one category was less than 11 but greater than zero. In order to keep these doctors in our analysis, we assigned a value of 5 to those redacted fields (actual value of 1-10). This estimate would have little effect on "p_brand" because of our minimum threshold of 1,000 claims to be included in this analysis.

3.3 About time periods

Selecting the time period to study involved tradeoffs. Some experts theorize that payments in one time period may relate to prescribing in that time period. Others suggest that any relationship would show up in prescribing data from a subsequent time period. We chose to look at contemporaneous 12-month periods (from January to December 2014) for both the Open Payments and Part D data. Because the Centers for Medicare and Medicaid Services (CMS) has not yet publicly released 2014 Part D prescribing data, we received certain variables under FOIA.

We also analyzed prescribing in calendar year 2013 against the Open Payments data from August to December 2013 (the earliest period for which the data was gathered and released). That analysis showed nearly identical patterns as those in this report, even though the time overlap was uneven.

[1] "Nurse Practitioner, Family" came in fourth (n = 13,144) and "Physician Assistant" at sixth (n = 8,357), but were excluded from the analysis because the government does not report pharmaceutical payments to nurse practitioners or physician assistants.

3.4 Analysis

The goal of ProPublica's analysis was to determine if physicians who received industry money from pharmaceutical or medical device companies prescribed different rates of brand-name drugs than peers who didn't. We also wanted to determine any differences in brand-prescribing habits between physicians who received high or low amounts of industry money.

For the purposes of our analysis, physicians were considered to have received industry money if they received at least one cash, non-cash (in-kind), dividend or stock payment from pharmaceutical or medical device companies from January to December 2014. Figure 1 shows the number of doctors in each specialty who had at least 1,000 claims, how many of those matched to at least one payment in the Open Payments data and the percentage that matched.

Table 1: Rate of doctors who received payments, by specialty

	Total doctors with >1,000 claim count	Subset who received an industry payment	Percent who received a payment
Family Medicine	65,651	46,753	71.2%
Internal Medicine	51,607	36,329	70.4%
Cardiology	13,817	12,308	89.1%
Psychiatry	11,052	8,650	78.3%
Ophthalmology	8,196	7,117	86.8%

3.4.1 Relative incidence of doctors with high brand-name rates

Specialties have different underlying rates of brand-name prescribing, and we wanted to control for this effect. In most specialties, the vast majority of the drugs prescribed are generics, but in some (such as ophthalmology) most prescriptions are for brand-name products. Physicians with a p_brand of one standard deviation or more above the mean were deemed "high brand-name prescribers."

Table 2: Brand-name prescribing rate, by specialty

	μ_{p_brand}	σ
Family Medicine	0.1977	0.0456
Internal Medicine	0.2131	0.0600
Cardiovascular Disease	0.2136	0.0588
Psychiatry	0.1518	0.0522
Ophthalmology	0.5550	0.1388

To determine who should be considered a "high brand-name prescriber," ProPublica calculated the average and standard deviation of the p_brand variable for each specialty. ProPublica calculated incidence-rate ratios, also called risk ratios, to compare the likelihood of being a high brand-name prescriber for doctors receiving industry payments and those who don't. We assessed the statistical significance of the risk ratios with 95% confidence intervals. All were significant.

Table 3: High brand-name prescribing incidence rates for doctors who did and did not take industry payments

	Payments		No payments			95% CI	
	High p_brand (+)	High p_brand (−)	High p_brand (+)	High p_brand (−)	RR*	Lower	Upper
Family Medicine	6,114	40,639	1,212	17,686	2.04	1.92	2.16
Internal Medicine	4,334	31,995	768	14,510	2.37	2.20	2.56
Cardiology	1,865	10,443	98	1,411	2.33	1.92	2.84
Psychiatry	1,271	7,379	174	2,228	2.03	1.74	2.36
Ophthalmology	1,198	5,919	50	1,029	3.63	2.76	4.79

*All values statistically significant at 95% confidence.

Doctors who received payments were, in general, two times as likely to be high brand-name prescribers than doctors who did not receive payments.

We then compared very high brand-name prescribers to the rest of the population. "Very high brand-name prescribers" were defined as those whose brand-name prescribing percentage was at least two standard deviations above their specialty's mean.

Table 4: Very high brand-name prescribing incidence rates for doctors who did and did not take industry payments

	Payments		No payments			95% CI	
	Very high p_brand (+)	Very high p_brand (−)	Very high p_brand (+)	Very high p_brand (−)	RR*	Lower	Upper
Family Medicine	1,622	45,131	242	18,656	2.71	2.37	3.10
Internal Medicine	1,558	34,771	234	15,044	2.80	2.44	3.21
Cardiology	491	11,817	18	1,491	3.34	2.10	5.34
Psychiatry	367	8,283	46	2,356	2.22	1.64	3.00
Ophthalmology	156	6,961	9	1,070	2.63	1.35	5.13

*All values statistically significant at 95% confidence.

Doctors who received payments were two to three times as likely to have very high brand-name prescribing rates than those who did not receive payments.

3.4.2 Comparing mean brand-name prescribing rates

In the second stage of our analysis, our goal was to determine any difference in the brand-name prescribing rates between physicians who received a high dollar amount of industry payments and those who received low dollar amounts. First, we compared, by specialty, the mean brand-name prescribing rate of physicians who received payments to the mean rate of those who did not receive payments. All results were deemed statistically significant using Welch's t-test.

The brand-name prescribing rate of physicians who received any payments was around two percentage points higher than those who did not receive payments, with the exception of ophthalmology, where the difference was larger.

Table 5: Mean brand-name prescribing rate, doctors receiving at least one payment v. doctors receiving no payments, by specialty

	Mean brand-name prescribing rate			
	No Payments	N	Payments	N
Family Medicine	18.7%	18,898	20.2%	46,753
Internal Medicine	19.8%	15,278	22.0%	36,329
Cardiovascular Disease	19.2%	1,509	21.6%	12,308
Psychiatry	13.6%	2,402	15.6%	8,650
Ophthalmology	46.4%	1079	56.9%	7,117

ProPublica then looked exclusively at those physicians who received payments ($n = 111,157$), and compared brand-prescribing averages five ways using different dollar amounts as boundaries. The most striking difference is present for

those who received more than $5,000 in total payments.

To test the statistical significance of the difference in mean brand-name prescribing rates of the various payment-level groups of doctors, we conducted a one-way analysis of variance (ANOVA) test. An F-test reveals that the means of the different doctor groups vary significantly at the 95% confidence level.

To identify which individual payment-level groups have statistically significant differences, we conducted a pairwise t-test with a Holm p-value adjustment for each specialty. All pairs for all specialties were statistically significant.

Table 6: Mean brand-name prescribing rate by payment interval

	Mean brand-name prescribing rate				
Payments	$\$.01 \geq x < \$100$	$\$100 \geq x < \$500$	$\$500 \geq x < \$1000$	$\$1000 \geq x < \$5000$	$\geq \$5000$
Family Medicine	19.2%	19.8%	20.5%	21.6%	25.8%
Internal Medicine	20.7%	21.3%	22.1%	23.3%	30.1%
Cardiovascular Disease	19.6%	20.6%	21.7%	22.6%	24.1%
Psychiatry	14.2%	15.1%	15.9%	16.8%	18.9%
Ophthalmology	52.9%	55.8%	60.6%	62.0%	64.6%

3.4.3 Effects of different payment types

We also examined whether the nature of the payments received by physicians was associated with different prescribing patterns of brand-name drugs. For each payment, Open Payments indicates the nature of the interaction (speaking, consulting, meals) as well as the products involved. Some academic medical centers and other hospitals have banned physicians from delivering promotional talks on behalf of companies in the belief that their function is more marketing than education.

We found that physicians who received speaking payments had higher rates of brand-name prescribing than those who received other types of payments. Conversely, we found that physicians whose only payments were for meals had lower rates of brand prescribing than those who received other types of payments (either alone or in combination with meals.) That said, when compared to doctors who received no payments, those who received only meals still had higher rates of brand-name prescribing. All results were deemed statistically significant using Welch's t-test.

Table 7: Mean brand-name prescribing rate, speaking payments v. other payments only

	Mean brand-name prescribing rate	
	Only non-speaking payments	At least one speaking payment
Family Medicine	20.2%	22.7%
Internal Medicine	21.8%	28.1%
Cardiovascular Disease	21.3%	24.1%
Psychiatry	15.3%	18.4%
Ophthalmology	56.5%	63.6%

Table 8: Mean brand-name prescribing rate, meals v. other payments only v. no payments

	Mean brand-name prescribing rate		
	No payments	Meals only	Other types of payments
Family Medicine	18.7%	19.8%	20.8%
Internal Medicine	19.8%	21.3%	22.8%
Cardiovascular Disease	19.2%	20.8%	22.2%
Psychiatry	13.6%	14.9%	15.8%
Ophthalmology	46.4%	56.0%	59.3%

4 Discussion

Our analysis intended to see whether payments from the industry writ large were related to different prescribing rates of brand-name drugs. We have not established (nor did we try to establish) a causal link. This relationship between payments and increased brand-name prescribing rates could be an indication that these doctors believe more strongly in the value of brand-name products, either through their training or clinical practice, or that the pharmaceutical spending influenced their choices. There is certainly a plausible reverse causation here – that drug companies give money to physicians who already are heavy brand-name prescribers.

Some doctors might take issue with being labeled as receiving industry payments on the basis of one or two meals provided by a pharmaceutical company. Indeed, some doctors may not even be aware that those meals were provided by the industry. That said, our analysis found that physicians who receive meals alone (and no other payments) had higher rates of brand-name prescribing than

their counterparts who received no payments.

Characteristics of providers' practices could explain some of the variation. We did not adjust for patient case mix. Cardiologists who receive industry payments may treat more patients who require brand-name drugs because their cholesterol cannot be controlled by generic drugs. Likewise, ophthalmologists who receive payments may be experts in glaucoma or other retinal diseases that did not respond to generic drugs. And some internists specialize in treating patients with HIV/AIDS, for which brand-name medications are typically the standard of care.

This analysis was not designed to resolve the question of causality. As more years of Open Payments data become available there will be more possibility for further research in this area.

Our analysis was also not intended to gauge whether payments related to specific drugs were related to providers' prescribing more of those drugs. Further analysis also could focus on particular drug classes, particular products, or specific companies. Additional research is warranted into other specialties and into other demographic factors, both about doctors and the patients they serve.

Moreover, our analysis did not differentiate between payments for medical devices and those for drugs. In some cases, companies make payments for both drugs and devices, and in other cases, companies misclassified drugs as devices or vice versa. In some specialties, especially ophthalmology, the bulk of a physician's payments may not relate to prescriptions covered by Part D, but instead devices used in the eye and injectable medications covered by other parts of Medicare.

Finally, while our analysis achieved a very high match rate between the Open Payments data and the Part D prescribing data ($> 99\%$), there is a possibility that some providers who should have matched did not.

5 Findings

Our analysis shows physicians who accepted payments from drug and device companies were two to three times as likely to prescribe high rates of brand-name drugs.

We conducted two different sensitivity analyses. The first analysis varied the boundary designating doctors who received high payment amounts. The second analysis considered the type of payment received. Our finding, that doctors who receive high payment amounts are more likely to have high brand-name prescribing rates, remained consistent.

Olga Pierce, ProPublica deputy data editor, contributed to this methodology. Walid Gellad, associate professor of medicine at the University of Pittsburgh and co-director of its Center for Pharmaceutical Policy and Prescribing, and Aaron

Kesselheim, an associate professor of medicine at Harvard Medical School, reviewed early versions of this methodology.