JAMA | Original Investigation

Types and Distribution of Payments From Industry to Physicians in 2015

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IMPORTANCE Given scrutiny over financial conflicts of interest in health care, it is important to understand the types and distribution of industry-related payments to physicians.

OBJECTIVE To determine the types and distribution of industry-related payments to physicians in 2015 and the association of physician specialty and sex with receipt of payments from industry.

DESIGN, SETTING, AND PARTICIPANTS Observational, retrospective, population-based study of licensed US physicians (per National Plan & Provider Enumeration System) linked to 2015 Open Payments reports of industry payments. A total of 933 295 allopathic and osteopathic physicians. Outcomes were compared across specialties (surgery, primary care, specialists, interventionalists) and between 620 166 male (66.4%) and 313 129 female (33.6%) physicians using regression models adjusting for geographic Medicare-spending region and sole proprietorship.

EXPOSURES Physician specialty and sex.

MAIN OUTCOMES AND MEASURES Reported physician payment from industry (including nature, number, and value), categorized as general payments (including consulting fees and food and beverage), ownership interests (including stock options, partnership shares), royalty or license payments, and research payments. Associations between physician characteristics and reported receipt of payment.

RESULTS In 2015, 449 864 of 933 295 physicians (133 842 [29.8%] women), representing approximately 48% of all US physicians were reported to have received $2.4 billion in industry payments, including approximately $1.8 billion for general payments, $544 million for ownership interests, and $75 million for research payments. Compared with 47.7% of primary care physicians (205 830 of 431 819), 61.0% of surgeons (110 604 of 181 372) were reported as receiving general payments (absolute difference, 13.3%; 95% CI, 13.1-13.6; odds ratio [OR], 1.72; $P < .001$). Surgeons had a mean per-physician reported payment value of $6879 (95% CI, $5895-$7862) vs $2227 (95% CI, $2141-$2314) among primary care physicians (absolute difference, $4651; 95% CI, $4014-$5288). After adjusting for geographic spending region and sole proprietorship, men within each specialty had a higher odds of receiving general payments than did women: surgery, 62.5% vs 56.5% (OR, 1.28; 95% CI, 1.26-1.31); primary care, 50.9% vs 43.0% (OR, 1.38; 95% CI, 1.36-1.39); specialists, 36.3% vs 33.4% (OR, 1.15; 95% CI, 1.13-1.17); and interventionalists, 58.1% vs 40.7% (OR, 2.03; 95% CI, 1.97-2.10; $P < .001$ for all tests). Similarly, men reportedly received more royalty or license payments than did women: surgery, 1.2% vs 0.03% (OR, 43.20; 95% CI, 25.02-74.57); primary care, 0.02% vs 0.002% (OR, 9.34; 95% CI, 4.11-21.23); specialists, 0.08% vs 0.01% (OR, 3.67; 95% CI, 1.71-7.89); and for interventionalists, 0.13% vs 0.04% (OR, 7.98; 95% CI, 2.87-22.19; $P < .001$ for all tests).

CONCLUSIONS AND RELEVANCE According to data from 2015 Open Payments reports, 48% of physicians were reported to have received a total of $2.4 billion in industry-related payments, primarily general payments, with a higher likelihood and higher value of payments to physicians in surgical vs primary care specialties and to male vs female physicians.

JAMA. 2017;317(17):1774-1784. doi:10.1001/jama.2017.3091

Supplemental content

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Financial relationships between physicians and the biomedical industry are common.[1] Concern for financial conflicts of interest and their effect on patient care, medical research, and education[2,3] prompted the creation of the Open Payments program,[4,5] a comprehensive, nationwide public data repository reporting industry payments to physicians and teaching hospitals. Prior to Open Payments, such data were gathered from physician self-report,[1] a limited number of state databases,[6] and third-party data sources.[7] Open Payments, implemented under section 6002 of the Affordable Care Act and managed by the Centers for Medicare & Medicaid Services' (CMS), requires biomedical manufacturers and group purchasing organizations (GPOs) to report all payments and ownership interests made to physicians starting in 2013. The recent release of the most current, complete, nationally representative Open Payments data[8] presents the opportunity to analyze the distribution and variability of these financial relationships among physicians.

Early studies of Open Payments data revealed specialty variation in payments[9,10] but did not account for other physician demographics. For example, sex differences in industry relationships, especially given differential sex makeup across specialties, are largely unexplored. In this study, Open Payments data from 2015 were analyzed to evaluate variability in general payments, ownership interests, and royalty or license payments, among specialty categories and by physician sex.

Key Points

Question What were the types and distribution of payments from industry to physicians in 2015?

Findings In 2015, 449 864 (approximately 48%) of US physicians were reported to have received a total of $2.4 billion in industry-related payments, with a higher likelihood and higher value of payments to physicians in surgical than to primary care specialties and to male than to female physicians.

Meaning A substantial proportion of US physicians were reported to have received payments from biomedical and pharmaceutical industries in 2015. With increased scrutiny of the relationship between industry promotion and clinical practice, understanding physician characteristics associated with these financial relationships is important.

Methods

The study design was an observational, retrospective, population-based analysis of physicians in the 2015 CMS National Plan & Provider Enumeration System (NPPES)[11] database linked to 2015 Open Payment reports of industry payments to allopathic and osteopathic physicians in the continental United States. This study was approved by the University of California San Diego Institutional Review Board.

Study Population

The study population consisted of all physicians or surgeons licensed to practice in the United States per the 2015 NPPES database.[5] The NPPES database includes all physicians with a National Provider Identifier (NPI) and is the database against which Open Payments physician records are verified; therefore, NPPES specialty counts were used to estimate the number of physicians eligible for having a report in the Open Payments database.[10] The analyses were limited to physicians in allopathic and osteopathic specialties within NPPES provider taxonomy.[11]

Data from the 2015 Open Payments program including physician general payments, ownership interests, and research payment files were linked to the August 2015 NPPES database as previously described.[9,10] Open Payments excludes medical residents (but not fellows) and physicians who are employees of a reporting entity. Inclusion and exclusion criteria of the NPPES study population and matched Open Payments physicians are shown in eFigure 1 in the Supplement. These data are generalizable to allopathic and osteopathic physicians licensed to practice in the United States.[12] Data were aggregated by specialty and grouped by nature of practice (surgery, primary care, medical subspecialists),[9] with medical subspecialists further divided into specialists (ie, pathology, neurology) and interventionalists (ie, cardiovascular disease, anesthesiology) based on the procedural nature of practice. Specifically, the definition of interventionalists was based on data showing that these subspecialties bill more relative-value units for common procedures, which determine payment based on procedural-based codes (ie, colonoscopies, cardiac catheterization, and epidural nerve blocks).[13] Several medical specialties, such as endocrinology and infectious disease, were categorized under internal medicine.

Physician and Practice Characteristics

Physician and practice characteristics were obtained from NPPES, including sex, status as sole proprietor, and geographic spending region via zip code. Sex was self-reported in NPPES as metavariable "provider gender code" with categories *M* and *F*, so physicians were thereby categorized accordingly. To account for regional variation in physician practice setting and spending, the NPPES physician practice zip code was linked to the Dartmouth Atlas hospital referral region and corresponding most recent (2013) total price-, age-, sex-, and race-adjusted Medicare spending per enrollee.[14] Practice spending region was categorized into 3 spending groups: low, average, and high.[10,15,16]

Payment Data

Physician payments were characterized into 3 categories by payment type: general payments, research payments, and ownership interests. Payment end points included: total number and value of payments, and number of physicians reported to receive each type of payment; annual per-physician mean, median, for both number and value of payments, nature (or reason) for general payments; and total value invested and interest received for ownership interests.[5] In addition, the proportion of physicians by specialty receiving greater than $10 000 in 2015 was evaluated because the US Department of Health and Human Services specifically identifies payments exceeding this threshold as significant conflicts of interest. General payments include all forms of payment (such as speaking fees or food and beverage) other than those classified for research purposes. Research payments are those specifically for research endeavors under a written

Table 1. United States Physician and Practice Characteristics in 2015

	No. (%) of Physicians								
		Sex[a]		Practice Spending Region[b]			Sole Proprietor Status[c]		
	Total	Men	Women	Low	Average	High	Yes	No	No Answer
All physicians	933 295			150 375	596 857	186 063	205 302	682 598	45 395
Men	620 166 (66.4)			97 527 (15.7)	396 881 (64.0)	125 758 (20.3)	141 944 (22.9)	444 935 (71.7)	33 287 (5.4)
Women	313 129 (33.6)			52 848 (16.9)	199 976 (63.9)	60 305 (19.3)	63 358 (20.2)	237 663 (75.9)	12 108 (3.9)
Specialty									
Surgical	181 372 (19.4)	136 327 (75.2)	45 045 (24.8)	28 436 (15.7)	115 821 (63.9)	37 115 (20.5)	40 521 (22.3)	132 632 (73.1)	8219 (4.5)
Primary care	431 819 (46.2)	255 564 (59.2)	176 255 (40.8)	71 016 (16.4)	274 927 (63.7)	85 876 (19.9)	95 305 (21.6)	317 630 (73.6)	18 884 (4.4)
Specialists	221 255 (23.7)	149 115 (67.4)	72 140 (32.6)	36 111 (16.3)	142 553 (64.4)	42 591 (19.3)	52 338 (24.1)	156 630 (70.8)	12 287 (5.6)
Intervention-alists	98 849 (10.6)	79 160 (80.1)	19 689 (19.9)	14 812 (15.0)	63 556 (64.3)	20 481 (20.7)	17 138 (17.3)	75 706 (76.6)	6005 (6.1)
Surgery									
Colorectal	1523 (0.8)	1216 (79.8)	307 (20.2)	200 (13.1)	970 (63.7)	353 (23.2)	295 (19.4)	1165 (76.5)	63 (4.1)
Neurosurgery	6759 (3.7)	6154 (91.1)	605 (9.0)	1097 (16.2)	4247 (62.8)	1415 (20.9)	1433 (21.2)	5091 (75.3)	235 (3.5)
Obstetrics/gynecology	47 838 (26.4)	22 492 (47.02)	24 346 (53.0)	7266 (15.2)	30 772 (64.3)	9800 (20.5)	9926 (20.8)	35 549 (74.3)	2363 (4.9)
Ophthalmology	21 509 (11.9)	16 490 (76.7)	5019 (23.3)	3445 (16.0)	13 628 (63.4)	4436 (20.6)	5171 (24.0)	15 137 (70.4)	1201 (5.6)
Oral/maxillofacial	887 (0.5)	809 (91.2)	78 (8.8)	167 (18.8)	535 (60.3)	185 (20.9)	196 (22.1)	612 (69.0)	79 (8.9)
Orthopedic	29 897 (16.5)	27 935 (93.4)	1962 (6.6)	5163 (17.3)	19 015 (63.6)	5719 (19.1)	5809 (19.4)	22 943 (76.7)	1145 (3.8)
Otolaryngology	11 778 (6.5)	9881 (83.9)	1896 (16.1)	1945 (16.5)	7386 (62.7)	2446 (20.8)	2554 (21.7)	8664 (73.6)	559 (4.8)
Plastic	4948 (2.7)	4139 (83.7)	809 (16.4)	723 (14.6)	3062 (61.9)	1163 (23.5)	2083 (42.1)	2605 (52.6)	260 (5.3)
General	39 354 (21.7)	31 678 (80.5)	7676 (19.5)	5956 (15.1)	25 363 (64.5)	8035 (20.4)	9800 (24.9)	27 942 (71.0)	1612 (4.1)
Thoracic	4903 (2.7)	4611 (94.0)	292 (6.0)	674 (13.8)	3130 (63.8)	1099 (22.4)	926 (18.9)	3790 (77.3)	187 (3.8)
Urology	11 976 (6.6)	10 921 (91.2)	1055 (8.8)	1800 (15.0)	7712 (64.4)	2464 (20.6)	2328 (19.5)	9133 (76.3)	515 (4.3)
Primary care									
Family medicine	144 236 (33.4)	90 034 (62.4)	54 202 (37.6)	28 454 (19.7)	87 288 (60.5)	28 494 (19.8)	34 238 (23.7)	104 012 (72.1)	5986 (4.2)
Internal medicine[d]	202 897 (47.0)	130 335 (64.2)	72 562 (35.8)	30 258 (14.9)	131 783 (65.0)	40 856 (20.1)	46 337 (22.8)	149 130 (73.5)	7430 (3.7)
Pediatrics	84 686 (19.6)	35 195 (41.6)	49 491 (58.4)	12 304 (14.5)	55 856 (66.0)	16 526 (19.5)	14 730 (17.4)	64 488 (76.2)	5468 (6.5)
Specialists									
Allergy and immunology	4346 (2.0)	2877 (66.2)	1469 (33.8)	688 (15.8)	2831 (65.2)	827 (19.0)	1176 (27.1)	2909 (66.9)	261 (6.0)
Dermatology	13 563 (6.1)	7446 (54.9)	6117 (45.1)	2291 (16.9)	8527 (62.9)	2745 (20.2)	3538 (26.1)	9423 (69.5)	602 (4.4)
Emergency medicine	50 979 (23.0)	37 158 (72.9)	13 821 (27.1)	8239 (16.2)	32 364 (63.5)	10 376 (20.4)	10 389 (20.4)	37 306 (73.2)	3284 (6.4)
Neurology	18 002 (8.1)	12 285 (68.3)	5717 (31.8)	2850 (15.8)	11 646 (64.7)	3506 (19.5)	3870 (21.5)	13 411 (74.5)	720 (4)
Pathology	19 030 (8.6)	11 755 (61.8)	7275 (38.2)	2938 (15.4)	12 135 (63.8)	3957 (20.8)	2929 (15.4)	14 800 (77.8)	1301 (6.8)
Physical medicine and rehabilitation	13 257 (6.0)	8343 (62.9)	4914 (37.1)	2179 (16.4)	8415 (63.5)	2663 (20.1)	3607 (27.2)	9049 (68.3)	601 (4.5)
Psychiatry	53 477 (24.1)	31 887 (59.6)	21 590 (40.4)	8965 (16.8)	35 859 (67.1)	8653 (16.2)	20 109 (37.6)	30 782 (57.56)	2586 (4.8)
Radiology	47 325 (21.4)	36 607 (77.4)	10 718 (22.7)	7735 (16.4)	29 951 (63.3)	9639 (20.4)	6346 (13.4)	38124 (80.6)	2855 (6.0)
Other specialty[e]	1276 (0.6)	757 (59.3)	519 (40.7)	226 (17.7)	825 (64.7)	225 (17.6)	374 (29.3)	825 (64.7)	77 (6.0)
Interventionalists									
Anesthesiology	53 949 (54.6)	40 272 (74.7)	13 677 (25.4)	8598 (15.9)	34 212 (63.4)	11 139 (20.7)	9503 (17.6)	40 125 (74.4)	4321 (8.0)
Cardiovascular disease	29 443 (29.8)	25 876 (87.9)	3567 (12.1)	3934 (13.4)	19 264 (65.4)	6245 (21.2)	4705 (16.0)	23 789 (80.8)	949 (3.2)
Gastroenterology	15 457 (15.6)	13 012 (84.2)	2445 (15.8)	2280 (14.8)	10 080 (65.2)	3097 (20.0)	2930 (19.0)	11 792 (76.3)	735 (4.8)

[a] Self-reported in National Plan and Provider Enumeration System (NPPES) and available as metadata variable "Provider Gender Code" with categories *M* or *F*.

[b] Based on 2013 Dartmouth Atlas price-, age-, sex-, and race-adjusted mean spending per beneficiary divided into quintiles then grouped into tertiles (low, average, high) with the lowest quintile (<20th percentile) and highest quintile (>80th percentile) as the distinct low and high categories, respectively. Mean spending per beneficiary differed among low (mean, $7699; median, $7723; range, $6763-$8145), average (mean, $9492; median, $9500; range, $8171-$10 357), and high (mean, $11 254; median, $11 234; range, $10 373-$13 524) tertiles.

[c] The Centers for Medicare & Medicaid Services National Plan & Provider Enumeration System defines a *sole proprietor* as the only owner of a business that is not incorporated.

[d] Includes hospitalists.

[e] Includes clinical pharmacology (n = 69), independent medical examiner (n = 121), medical genetics (n = 892), legal medicine (n = 97), phlebology (n = 97).

Table 2. Industry Payments and Ownership Interests by Specialty Category, United States Physicians in 2015

	All Physicians[a]	Specialty Category, No. (%)				
	(N = 933 295)	Surgery (n = 181 372)	Primary Care (n = 431 819)	Specialists (n = 221 255)	Interventionalists (n = 98 849)	*P* Value[b]
All payments	449 864	110 829	206 473	78 498	54 064	
General payments[c]						
Physician recipients	448 694	110 604 (61.9)	205 830 (47.7)	78 274 (35.4)	53 986 (54.6)	
General payments	10 232 314	1 455 096 (14.2)	5 696 193 (55.7)	1 524 961 (14.9)	1 556 064 (15.2)	
Value of payments, US $	1 771 544 617	760 807 951 (43.0)	458 429 902 (25.9)	293 690 371 (16.6)	258 626 392 (14.6)	
Annual per-physician general payment, median (IQR)[d]						
No. of payments	6 (2-22)	6 (2-16)	6 (2-27)	4 (1-17)	9 (2-39)	<.001
Payments, US $	201.27 (59.98-781.96)	242.24 (84.4-883.7)	179.08 (52.4-682.8)	150.00 (44.0-621.8)	323.80 (79.8-1296.3)	<.001
Research payments[c]						
Physician recipients	6373	1565 (0.9)	2810 (0.7)	1158 (0.5)	840 (0.9)	
Research payments	41 940	7158 (17.1)	20 745 (49.5)	8859 (21.1)	5178 (12.3)	
Value of payments, US $	75 116 830	15 161 922 (20.2)	34 504 622 (45.9)	17 610 782 (23.4)	7 839 504 (10.4)	
Ownership interests[c]						
Physicians with ownership interests	3302	1627 (0.9)	1286 (0.3)	214 (0.1)	175 (0.2)	
Ownership interests	3552	1804 (50.8)	1302 (36.7)	238 (6.7)	208 (5.9)	
Value invested, US $	164 940 439[e]	94 369 925 (57.2)	20 663 836 (12.5)	18 464 383 (11.2)	31 442 296 (19.1)	
Value of interest, US $	544 088 091	215 791 588 (39.7)	29 374 310 (5.4)	227 208 740 (41.8)	71 713 453 (13.2)	

Abbreviation: IQR, interquartile range.

[a] Percent of all physicians within that specialty analyzed in National Plan and Provider Enumeration System.

[b] Reported *P* values are comparing proportions across specialty categories using the Kruskal-Wallis test, 2-sided.

[c] Percent of total number or value of all general or research payments and ownership interests.

[d] Calculation based on only physicians receiving general payments.

[e] Total value invested was not included in the overall sum of total payment value to physicians ($2.4 billion) to avoid double counting for ownership interests in 2015.

contract or protocol, including payments for medical research writing or publication.[17] Ownership interests include stocks or stock options, partnership shares, limited liability company membership, bonds, or other financial instruments secured by the reporting entity that were held by physicians. Excluded from ownership interest were payments received as compensation (until exercised), as part of a retirement plan, or interest in a publicly traded security or mutual fund. “Amount invested” is the total amount of the interest holding gained by the physician during the reporting year. “Value of interest” describes the cumulative value of ownership interest per the most recent valuation.[17]

Statistical Analyses

Differences in industry payments among specialty categories were assessed with χ^2 and Kruskal-Wallis tests. Bivariable and multivariable analyses were performed to investigate the association between physician characteristics (primarily specialty, as well as sex, geographic spending region, sole proprietorship) and industry payments. Logistic regression models were also used to examine the association between physician characteristics and the odds of physicians receiving general payments, royalty or license payments, or holding ownership interests. Linear regression models were used to examine the association between physician characteristics and the value of general payments. Payment value data were log-transformed prior to analysis to account for skew.[10] Negative binomial regression models examined the association between physician characteristics and the per-physician annual number of general payments. All multivariable models controlled for potentially confounding variables available for analysis,[10] namely specialty, sex, geographic spending region, and sole proprietor status. To examine sex while accounting for varied sex composition across specialties, multivariable models included an interaction term between specialty and sex. A 2-tailed *P* value of <.001 was considered significant for all tests after Bonferroni correction for multiple comparisons (.05/86). Analyses were performed using SAS v9.4 (SAS Institute Inc).

Results

Study Population and Physician Characteristics

An estimated 933 295 allopathic and osteopathic physicians, including 620 166 male (66.4%) and 313 129 female (33.6%) physicians, were licensed to practice in the United States in 2015 (**Table 1**). Among them, 449 864 physicians, including 316 022 men (51.0%) and 133 842 women (42.7%), reportedly received an industry payment or held ownership interests in 2015.

Overall Payments

Reports of physician payments from industry totaled $2.4 billion, including approximately $1.8 billion for general payments,

Table 3. Nature of Identified General Payment to Allopathic and Osteopathic Physicians by Specialty Category in 2015

		Specialty Category[a]			
	Physician Recipients (N = 448 694)	Surgery (n = 110 604)	Primary Care (n = 205 830)	Specialists (n = 78 274)	Interventionalists (n = 53 986)
Total value, US $ (%)[b]	1 771 554 617	760 807 951	458 429 902	293 690 371	258 626 392
Charitable contribution[c]	4 109 815 (0.2)	3 925 907 (0.5)	110 984 (<0.01)	28 362 (<0.01)	44 562 (<0.01)
Services[d]	471 834 618 (26.6)	68 603 173 (9.0)	189 264 724 (41.3)	116 889 151 (39.8)	97 077 569 (37.5)
Faculty or speaker					
Accredited CME	23 420 919 (1.3)	3 674 157 (0.5)	4 578 827 (1.0)	7 534 792 (2.6)	7 633 142 (3.0)
Nonaccredited CME	1 223 962 (0.1)	215 089 (<0.01)	196 661 (<0.01)	331 235 (0.1)	480 977 (0.2)
Consulting fee	300 113 590 (16.9)	118 504 348 (15.6)	83 513 002 (18.2)	50 980 019 (17.4)	47 116 221 (18.2)
Ownership or investment interest[e]	43 075 340 (2.4)	28 079 824 (3.7)	3 367 322 (0.7)	1 017 250 (0.4)	10 610 943 (4.1)
Education	30 121 231 (1.7)	20 111 662 (2.6)	5 428 336 (1.2)	2 561 926 (0.9)	2 019 307 (0.8)
Entertainment	158 296 (<0.01)	56 440 (<0.01)	21 299 (<0.01)	47 644 (<0.01)	32 912 (<0.01)
Food and beverage	204 249 267 (11.5)	41 092 929 (5.4)	96 849 166 (21.1)	31 191 000 (10.6)	35 116 172 (13.6)
Gift	1 768 828 (0.1)	899 549 (0.1)	344 481.62 (0.1)	359 665 (0.1)	165 132 (0.1)
Grant	13 834 474 (0.8)	2 589 716 (0.3)	3 964 750 (0.9)	4 063 514 (1.4)	3 216 494 (1.2)
Honoraria	30 462 932 (1.7)	7 697 355 (1.0)	7 784 261 (1.7)	8 419 002 (2.9)	6 562 314 (2.5)
Royalty or license	483 751 540 (27.3)	414 799 752 (54.5)	11 341 736 (2.5)	39 964 598 (13.6)	17 645 454 (6.8)
Travel and lodging	163 429 808 (9.2)	50 558 050 (6.7)	51 664 352 (11.3)	30 302 212 (10.3)	30 905 194 (12.0)

[a] The proportion of general payments in each nature-of-payment category was statistically significantly different when compared across all specialty categories (χ^2 test, $P < .001$, 2-sided test).

[b] Percent of all general payments within column.

[c] Payment with tax-exempt status under the US Internal Revenue Code of 1986.

[d] Compensation for services other than consulting, including serving as a faculty or as a speaker at a venue other than continuing medical education (CME).

[e] Ownership or investment interests currently held by physicians, as well as ownership interests or investments that physicians have not yet exercised.

more than $544 million for cumulative value of ownership interests, and $75 million for research payments (**Table 2**).

Analyses by Payment Type: General, Ownership Interests, Research

Of all reported payments in 2015, 68% (≈$1.8 of $2.6 billion) of general payments were attributable to a physician recipient, with the remaining to teaching hospitals. The median per-physician value of general payments was $201 (interquartile range [IQR], $60-$782; Table 2). Analyses of value of general payments by nature (or reason) for payment are shown in **Table 3**. Although 88.7% of general payments were for food and beverage, the greatest proportion (27.3%) of value was from royalty or license payments (≈$484 million of $1.8 billion) followed by service fees (26.6%), such as faculty lectures ($472 million of $1.8 billion).

Although only 0.4% of physicians held ownership interests overall (3302 of 933 295 total physicians), 22.8% of the total value of all payments to physicians was attributable to the cumulative value of ownership interests ($544 million of $2.4 billion; Table 2). Of all reported payments in 2015, 2% ($75 million of $3.89 billion) of research payments were attributable to a physician recipient, with the remaining to teaching hospitals.

Analyses by Specialty

Distribution and values of general payments, research payments, and ownership interests by specialty category are shown in Table 2. Among the 4 specialty categories, interventionalists were reported to receive the highest median number (9 payments; IQR, 2-39) and value of payments per physician (≈$324, IQR; $80-$1296; $P < .001$). Distribution by nature of general payments significantly differed among specialties (Table 3), with surgeons receiving 54.5% of their value from royalty or license payments ($415 million of $761 million), whereas primary care physicians (41.3%), specialists (39.8%), and interventionalists (37.5%) all received the greatest proportion of payments from service fees like faculty lectures (χ^2 test, $P < .001$).

Reports of per-physician value of general payments by each specialty in 2015 are shown in **Table 4**. Of 29 443 cardiologist, 74.9% received payments, representing the highest proportion within physician specialties, followed by 72.2% of 15 457 gastroenterologists. Neurosurgery and orthopedics received the highest maximum reported values per-physician (≈$18 million and ≈$38 million, respectively), whereas cardiology ($862; IQR, $226-$2749) and thoracic surgery ($860; IQR, $192-$2780) received the highest median value per physician. Neurosurgery had the highest proportion of physicians to receive a personal total value of more than $10 000 (12.6%, 565 of 4468),), followed by cardiology (12.1%; 2661 of 22 044), and neurology (11.8%; 1275 of 10 794 physicians).

Unadjusted bivariable analyses of general payments are presented in **Table 5**. Surgeons (61.0%) were more likely to have received general payments than primary care physicians (110 604 of 181 372; absolute difference, 13.3%; 95% CI, 13.1%-13.6%; OR, 1.72; $P < .001$). After log-transformation to account for the skewed distribution of per-physician payment value, the ratio of means for interventionalists was the highest (1.74; 95% CI, 1.70-1.77; $P < .001$) relative to primary care physicians. Interventionalists were also the only group to receive more payments per physician than primary care physicians (mean, 28.8

Table 4. Per-Physician Value of General Payments to Allopathic and Osteopathic Physicians by Specialty in 2015

	No. of Physician Recipients (%)[a]	General Payments		No. (%) of Physicians Receiving >$10 000[c]
		Median Value (IQR), US $	Maximum Value, US $[b]	
Surgery				
Colorectal	1069 (70.2)	453 (154-1736)	312 558	68 (6.3)
Neurosurgery	4468 (66.1)	486 (132-2177)	17 827 878	565 (12.6)
Obstetrics/gynecology	27 126 (56.7)	148 (53-356)	1 415 335	462 (1.7)
Ophthalmology	13 241 (61.6)	201 (76-517)	9 638 955	552 (4.2)
Oral/maxillofacial	241 (27.2)	227 (85-901)	83 871	11 (4.6)
Orthopedic	20 300 (67.9)	420 (117-2041)	38 392 184	2232 (11.0)
Otolaryngology	7236 (61.4)	176 (73-464)	408 161	165 (2.3
Plastic surgery	3414 (69.0)	305 (115-930)	4 716 799	136 (4.0)
General	21 857 (55.5)	251 (81-1112)	7 936 543	990 (4.5)
Thoracic	3275 (66.8)	860 (192-2780)	4 272 727	295 (9.0)
Urology	8377 (69.9)	457 (153-1206)	1 365 346	520 (6.2)
Primary care				
Family medicine	68 706 (47.6)	186 (49-682)	872 116	640 (0.9)
Internal medicine[d]	103 588 (51.1)	248 (73-959)	4 536 302	5167 (5.0)
Pediatrics	33 536 (39.6)	94 (32-203)	1 171 472	559 (1.7)
Specialists				
Allergy and immunology	2922 (67.2)	462 (151-1261)	437 215	275 (9.4)
Dermatology	8588 (63.3)	371 (113-1028)	596 945	554 (6.4)
Emergency medicine	12 733 (25.0)	50 (18-125)	591 106	167 (1.3)
Neurology	10 794 (60.0)	541 (125-2120)	1 322 146	1275 (11.8)
Pathology	3855 (20.3)	86 (24-238)	579 175	201 (5.2)
Physical medicine and rehabilitation	5442 (41.1)	165 (53-562)	715 452	187 (3.4)
Psychiatry	19 922 (37.3)	171 (58-539)	838 468	722 (3.6)
Radiology	13 659 (28.9)	117 (34-442)	10 478 465	588 (4.3)
Other specialty[e]	359 (28.1)	230 (73-2677)	172 918	40 (11.0)
Interventionalists				
Anesthesiology	20 775 (38.5)	99 (29-301)	2 304 752	579 (2.8)
Cardiovascular disease	22 044 (74.9)	862 (226-2749)	4 395 653	2661 (12.1)
Gastroenterology	11 167 (72.2)	481 (155-1162)	1 546 850	766 (6.9)

Abbreviation: IQR, interquartile range.

[a] Percentage represents the proportion of physicians receiving general payments of all physicians within their specialty.

[b] Minimum values per physician were not included given the specific minimum thresholds for reporting payments by applicable manufacturers or group purchasing organizations (GPOs) for 2015 was $10.21.

[c] Percentage represents the proportion of physicians receiving general payments valuing more than $10 000 of all physicians receiving general payments within their specialty.

[d] Internal medicine includes hospitalists.

[e] Includes clinical pharmacology, independent medical examiner, medical genetics, legal medicine, phlebology.

vs 27.7 payments; absolute difference, 1.1 payments; 95% CI, 0.7-1.6; incident rate ratio [IRR], 1.09; $P < .001$; **Table 6**).

Surgeons held 57.2% of ownership interest value invested (≈$94 million of $165 million), whereas specialists received 41.8%, the highest proportion, of cumulative interest value (≈$227 million of $544 million; Table 2). Unadjusted analyses showed that surgeons were more likely to hold ownership interests and receive royalty or license payments compared with primary care physicians (**Table 7**). The greatest proportion of total number (49.5%) and value (45.9%) of physician research payments went to primary care physicians (Table 2).

Analyses by Sex

The distribution of nature of general payments significantly differed between sexes across specialties (χ^2 test, $P < .001$), eTable 1 in the Supplement. With all specialties combined, a greater proportion of men (50.8%) reportedly received a general payment than did women (42.6%; absolute difference, 8.2%; 95% CI, 8.0%-8.4%; OR, 1.39; $P < .001$; Table 5). Women had a lower mean value of general payments per physician than men ($1390 vs $5031; absolute difference, $3641; 95% CI, $3083-$4199; ratio of means, 1.81; $P < .001$; Table 5).

Multivariable models adjusted for specialty, sex, practice spending region, and sole proprietor status are presented in **Table 8**. The interaction between specialty and sex was significant ($P < .001$); thus, sex as a predictor was evaluated within each specialty category. Male physicians were significantly more likely than female physicians to receive general payments (ie, male interventionalists OR, 2.03; 95% CI, 1.97-2.10; $P < .001$; Table 8). Male physicians also reportedly received a greater mean per-physician payment value than female physicians within their specialty. For example, male interventionalists received 14.43% greater payment value (95% CI, 13.60-15.26; $P < .001$) than female interventionalists. The mean value per physician among men was $5252 (95% CI, $4895-$5609) vs $2141 among women (95% CI, $1515-$2768; absolute difference, $3111; 95% CI, $2217-$4005; eTable 2 in the Supplement). Overall, male physicians reportedly received a higher number of general payments per physician than did female physicians.

Table 5. Unadjusted Analysis of Physicians Receiving General Payments in 2015

	Physicians Receiving General Payments			Total Value of General Payments per Physician		
	No. (%) of Physicians	Absolute Rate Difference, % (95% CI)	OR (95% CI)[a]	Mean Value per Physician, US $ (95% CI)	Absolute Difference, US $ (95% CI)	Ratio of Means (95% CI)[b]
Specialty category						
Surgery	110 604 (61.0)	13.3 (13.1 to 13.6)	1.72 (1.70 to 1.74)	6879 (5895 to 7862)	4651 (4014 to 5288)	1.46 (1.44 to 1.48)
Primary care	205 830 (47.7)	0 [Reference]	1 [Reference]	2227 (2141 to 2314)	0 [Reference]	1 [Reference]
Specialists	78 274 (35.4)	−12.3 (−12.5 to −12.1)	0.60 (0.60 to 0.61)	3752 (3423 to 4081)	1525 (807 to 2242)	0.97 (0.95 to 0.98)
Interventionalists	53 986 (54.6)	6.9 (6.6 to 7.3)	1.32 (1.30 to 1.34)	4791 (4473 to 5109)	2563 (1737 to 3390)	1.74 (1.70 to 1.77)
Sex						
Men	315 251 (50.8)	8.2 (8.0 to 8.4)	1.39 (1.38 to 1.40)	5031 (4671 to 5391)	3641 (3083 to 4199)	1.81 (1.78 to 1.83)
Women	133 443 (42.6)	0 [Reference]	1 [Reference]	1390 (1283 to 1497)	0 [Reference]	1 [Reference]
Practice spending region						
Low	53 592 (35.6)	−13.4 (−13.7 to −13.2)	0.58 (0.57 to 0.58)	4375 (3743 to 5007)	402 (−401 to 1205)	0.82 (0.80 to 0.83)
Average	292 802 (49.1)	0 [Reference]	1 [Reference]	3973 (3616 to 4329)	0 [Reference]	1 [Reference]
High	102 300 (55.0)	5.9 (5.7 to 6.2)	1.27 (1.26 to 1.28)	3655 (3334 to 3977)	−317 (−938 to 304)	1.10 (1.09 to 1.12)
Sole proprietor status						
No	334 423 (49.0)	0 [Reference]	1 [Reference]	4243 (3911 to 4575)	0 [Reference]	1 [Reference]
Yes	97 248 (47.4)	−1.6 (−1.9 to −1.4)	0.94 (0.93 to 0.95)	2968 (2734 to 3202)	−1275 (−1898 to −652)	0.94 (0.93 to 0.95)
No response	17 013 (37.5)	−11.5 (−12.0 to −11.0)	0.62 (0.61 to 0.64)	3756 (2834 to 4678)	−487 (−1830 to 856)	0.76 (0.74 to 0.79)

[a] The odds ratio (OR) represents the exponent of the estimated percentage of physicians receiving 1 or more payments or holding ownership interests compared with the reference group. The statistical test via generalized unadjusted logistic regression model was significant after Bonferroni correction for multiple comparisons ($P < .001$, 2-sided P value; all tests).

[b] The ratio of the geometric mean value of payment of interest to the reference group was calculated using the log-transformed annual per-physician value of payments. The statistical test via generalized unadjusted linear regression model of the log of the mean value of payments was significant after Bonferroni correction for multiple comparisons ($P < .001$, 2-sided P value; all tests).

Compared with female physicians, male physicians had a higher odds of holding ownership interests and receiving royalty or license payments (Table 5). After adjusting for physician characteristics, male physicians were more likely than female physicians to receive reported royalty or license payments and to hold ownership interests in every specialty category except primary care physicians (OR, 0.84; 95% CI, 0.75-0.94; $P = .002$; (Table 8).

Discussion

According to data from the 2015 Open Payments reports, 449 864 US physicians (≈48%) were reported to have received a total of $2.4 billion in industry-related payments, including $1.8 billion for general payments, $544 million for cumulative ownership interests, and $75 million for research payments. There was a higher likelihood of receipt and higher value of reported payments to surgeons than to primary care physicians and a higher likelihood of receipt and higher value of payments to men than to women.

The Institute of Medicine has highlighted the tension that exists between "financial relationships with industry and the primary missions of medical research, education, and practice"[3]. Considerable data have shown that financial conflicts of interest, from small gifts and meals to large sums for consulting, may alter physician decision making.[2,18,19] The current population-based analysis of industry-to-physician payments in 2015 shows the far-reaching extent (more than 10 million transactions totaling $2.4 billion) of these reported financial relationships. There was considerable variability in the number, value, and nature of physician payments among specialties and by sex within specialty groups.

Similar to previous studies,[1,6] procedural specialties (surgery and interventional medicine)[6] had a higher incidence and greater values of reported industry payments. Interventionalists, such as cardiologists and gastroenterologists, received the highest median per-physician number of reported payments in 2015 (9 payments; IQR, 2-39), suggesting frequent interactions with the vast pharmaceutical and medical device industries for cardiac[20] and gastrointestinal disorders.[21] Orthopedics and neurosurgery reportedly received the highest maximum per-physician general payment values (38.4 million and 17.8 million per physician, respectively), reflecting a minority of physicians receiving large sums.[22] Surgical and interventional specialties have strong industry ties, dependence on devices and equipment, and perhaps a greater influence over industry-related expenditures.[20,22] Industry presence in the operating room[23] allows representatives to form relationships with proceduralists, providing device training and income-enhancing opportunity.[24]

Table 6. Unadjusted Analyses of the Total Number of General Payments per Physician in 2015

	Mean No. of Payments per Physician (95% CI)	Absolute Difference, No. (95% CI)	IRR (95% CI)[a,b]
Specialty category			
Surgery	13.2 (13.0 to 13.3)	−14.5 (−14.8 to −14.2)	0.90 (0.89 to 0.90)
Primary care	27.7 (27.5 to 27.9)	0 [Reference]	1 [Reference]
Specialists	19.5 (19.2 to 19.8)	−8.2 (−8.5 to −7.8)	0.82 (0.82 to 0.83)
Interventionalists	28.8 (28.4 to 29.2)	1.1 (0.7 to 1.6)	1.09 (1.09 to 1.10)
Sex			
Men	25.3 (25.1 to 25.4)	8.2 (7.9 to 8.5)	1.20 (1.19 to 1.20)
Women	17.0 (16.8 to 17.2)	0 [Reference]	1 [Reference]
Practice spending region			
Low	17.0 (16.7 to 17.3)	−6.3 (−6.7 to −5.9)	0.83 (0.82 to 0.84)
Average	23.3 (23.1 to 23.5)	0 [Reference]	1 [Reference]
High	24.4 (24.1 to 24.7)	1.1 (0.8 to 1.4)	1.04 (1.03 to 1.05)
Sole proprietor status			
No	23.1 (22.9 to 23.2)	0 [Reference]	1 [Reference]
Yes	22.5 (22.3 to 22.8)	−0.6 (−0.9 to −0.2)	0.98 (0.98 to 0.99)
No response	18.7 (18.1 to 19.3)	−4.4 (−5.0 to −3.7)	0.88 (0.87 to 0.89)

Abbreviation: IRR, incidence rate ratio.

[a] The incidence rate ratio represents the exponent of the log of annual per-physician number of payments compared with the reference group.

[b] The statistical test via generalized unadjusted negative binomial regression model was significant after Bonferroni correction for multiple comparisons ($P < .001$, 2-sided P value; all tests).

Primary care physicians had frequent but lower reported value of payments, which may reflect pharmaceutical-sponsored lunches.[2] Recent Medicare data show that the highest proportion of total drug costs were prescribed by family practice and internal medicine.[25] Alternatively, pediatrics received fewer industry payments. Pediatricians often treat a relatively healthy patient population, thus have less influence over drug expenditures. Although industry-physician research payments were rare (98% of research payments went directly to an institution), primary care physicians reportedly received the majority of research payments by number and value, which may be driven by pharmaceutical-based clinical trials or their ability to access and enroll study populations.[26]

Nature of reported payments differed among specialties, reflecting varying industry interactions. For example, the majority of general payment value to interventionalists, specialists, and primary care physicians were reported as service fees, such as faculty lectures. However, in surgical specialties, 54.5% of payment value was reported as royalty or license fees. Surgeons were significantly more likely to have been reported to receive royalty or license payments (such as a royalty payment for developing a hip implant) than other physicians. Surgical instruments comprise the largest single area of the medical device market (20.4% of $4.1 billion invested),[27] likely influencing the device industry's focus on research and design.[28] Companies rely heavily on physicians for innovation through licensing agreements, particularly orthopedic and general surgeons who hold the highest number of medical device patents.[29]

Although few physicians held ownership interests in industry, surgeons gained the highest reported value in 2015 ($94 million of $165 million, 57.2%). This could reflect ownership of ambulatory surgical centers, which have been shown to create conflicts of interest around physician self-referral.[30] Among urologists and orthopedic surgeons, ownership of ambulatory surgical centers is associated with greater use.[30,31] Medical specialists held the highest cumulative value of ownership interest ($227 million of $544 million, 41.8%). The vast majority was held by radiologists ($209 million, 92.2% of interest value received by specialists), perhaps related to diagnostic imaging equipment.[32]

Overall, male physicians had a higher likelihood of engaging with biomedical industry and at higher values than females. Female physicians may have different preferences for industry engagement[33] and have been shown to exhibit different clinical practice patterns with more patient-centered care.[34] Industry-based marketing may target male physicians more than female physicians, specifically by engaging with key opinion or thought leaders to establish product credibility and promotion.[35] Men were more likely than women to have been reported to receive royalty or license payments across all specialties, with the greatest difference among surgeons. Sex discrepancies in patenting show that women hold fewer patents than men.[36] Furthermore, women who obtain patents are less likely to have them commercialized or licensed than men.[37] Male physicians were also more likely than female physicians to hold ownership interests in most specialties. Previously, male sex has been shown to be associated with physician ownership among general surgeons and emergency physicians.[38,39]

Although physicians may consider themselves committed to ethical practice and professionalism, many do not recognize the subconscious bias that industry relationships have on their decision making.[40] Companies may preferentially market to profitable specialties such as cardiologists because these physicians influence the prescribing practices of nonspecialists.[41] However, industry also appears to target and influence primary care physicians who accepted frequent low-value payments. A recent study found that physicians who received industry-sponsored meals were more likely to prescribe brand-name medications, with mixed findings across sexes.[2] Some medical centers have restricted access of industry representatives to physicians.[40] Further studies are needed

Table 7. Unadjusted Analyses of Physicians Holding Ownership Interests and Receiving Royalty or License Payments in 2015

	No. Recipients (%)	Absolute Rate Difference, % (95% CI)	OR (95% CI)[a]	*P* Value[b]
Physicians Receiving Interest From Ownership				
Specialty category				
Surgery	1627 (0.90)	0.60 (0.55 to 0.65)	3.03 (2.82 to 3.26)	<.001
Primary care	1286 (0.30)	0 [Reference]	1 [Reference]	
Specialists	214 (0.10)	−0.20 (−0.22 to −0.18)	0.32 (0.28 to 0.38)	<.001
Interventionalists	175 (0.18)	−0.12 (−0.15 to −0.09)	0.59 (0.51 to 0.70)	
Sex				
Men	2584 (0.42)	0.19 (0.16 to 0.21)	1.82 (1.68 to 1.98)	<.001
Women	718 (0.22)	0 [Reference]	1 [Reference]	
Practice spending region				
Low	333 (0.22)	−0.14 (−0.16 to −0.11)	0.62 (0.55 to 0.70)	<.001
Average	2132 (0.36)	0 [Reference]	1 [Reference]	
High	837 (0.45)	0.09 (0.06 to 0.13)	1.26 (1.16 to 1.37)	<.001
Sole proprietor status				
No	2646 (0.39)	0 [Reference]	1 [Reference]	
Yes	463 (0.23)	−0.16 (−0.19 to −0.14)	0.58 (0.53 to 0.64)	<.001
No response	193 (0.43)	0.04 (−0.02 to 0.10)	1.10 (0.95 to 1.27)	.23
Physicians With Royalty or License Payments				
Specialty category				
Surgery	1647 (0.91)	0.90 (0.85 to 0.94)	80.75 (60.78 to 107.29)	<.001
Primary care	49 (0.01)	0 [Reference]	1 [Reference]	<.001
Specialists	121 (0.05)	0.04 (0.03 to 0.05)	4.82 (3.46 to 6.72)	
Interventionalists	110 (0.11)	0.10 (0.08 to 0.12)	9.82 (7.01 to 13.75)	
Sex				<.001
Men	1897 (0.31)	0.30 (0.28 to 0.31)	32.02 (22.33 to 45.93)	
Women	30 (0.01)	0 [Reference]	1 [Reference]	
Practice spending region				.13
Low	280 (0.19)	−0.02 (−0.04 to 0.01)	0.91 (0.80 to 1.03)	
Average	1227 (0.21)	0 [Reference]	1 [Reference]	.10
High	420 (0.23)	0.01 (−0.00 to 0.04)	1.10 (0.98 to 1.23)	
Sole proprietor status	1587 (0.23)	0 [Reference]	1 [Reference]	
No	269 (0.13)	−0.10 (−0.12 to −0.08)	0.56 (0.50 to 0.64)	<.001
Yes	71 (0.16)	−0.08 (−0.11 to −0.04)	0.67 (0.53 to 0.85)	.001

[a] The odds ratio (OR) represents the exponent of the estimated percentage of physicians receiving 1 or more payments or holding ownership interests compared with the reference group.

[b] Generalized unadjusted logistic regression model, 2-sided *P* value.

to understand the effects of industry payments on specialty- and sex-specific prescribing or operating practices.

Study Limitations

This study has several limitations. The Open Payments and NPPES databases may have inaccuracies and physicians may be unaware of their reported payments. The CMS suggests that all physicians review and dispute any incorrect data prior to publication in Open Payments; such vigilance will help improve the accuracy of the data. Yet, Open Payments remains the most comprehensive data for industry payments to date, and there have been improvements in accuracy and reporting in the most recent 2015 release compared with earlier years.[8] Although a minority of physicians in Open Payments did not have NPIs, 94.5% of Open Payments physicians were matched to NPPES, the same database CMS uses to verify all Open Payments records. It is possible that the extent of industry payments may actually be underreported in the current study. Certain potential confounding variables were unavailable in NPPES including age, career duration, or race/ethnicity. Specialty was grouped to facilitate multivariable analyses, classifying physicians by nature of practice because certain practice types have different relationships with industry. The direct association of payment receipt and drug or device use was not analyzed in this study and should be an area of active investigation. Although specialty categories were not completely homogeneous, they enabled the analysis of sex-specific differences, which to our knowledge has not been performed in previous studies.[1,7]

Conclusions

According to data from 2015 Open Payments reports, 48% of physicians were reported to have received industry-related

Table 8. Adjusted Analyses of Physicians Receiving General Payments, Holding Ownership Interests, and Receiving Royalty or License Payments in 2015[a]

	Physicians Receiving General Payments		Total per Physician Annual Value of Payments		Total per-Physician No. of Payments		Physicians With Ownership Interests		Physicians With Royalty or License Payments	
Covariable	OR (95% CI)[b]	*P* Value[c]	Difference, % (95% CI)[d]	*P* Value[c]	IRR (95% CI)[e]	*P* Value[c]	OR (95% CI)[a,b]	*P* Value[b]	OR (95% CI)[a,b]	*P* Value[c]
Surgery										
Men	1.28 (1.26 to 1.31)	<.001	13.10 (12.61 to 13.59)	<.001	1.45 (1.42 to 1.47)	<.001	5.47 (4.44 to 6.74)	<.001	43.20 (25.02 to 74.57)	<.001
Women	1 [Reference]		0 [Reference]		1 [Reference]		1 [Reference]		1 [Reference]	
Primary care										
Men	1.38 (1.36 to 1.39)	<.001	10.13 (9.82 to 10.45)	<.001	1.64 (1.62 to 1.66)	<.001	0.84 (0.75 to 0.94)	0.0016	9.34 (4.11 to 21.23)	<.001
Women	1 [Reference]		0 [Reference]		1 [Reference]		1 [Reference]		1 [Reference]	
Specialists										
Men	1.15 (1.13 to 1.17)	<.001	3.77 (3.24 to 4.30)	<.001	1.25 (1.23 to 1.28)	<.001	2.74 (1.88 to 4.00)	<.001	3.67 (1.71 to 7.89)	<.001
Women	1 [Reference]		0 [Reference]		1 [Reference]		1 [Reference]		1 [Reference]	
Interventionalists										
Men	2.03 (1.97 to 2.10)	<.001	14.43 (13.60 to 15.26)	<.001	1.96 (1.90 to 2.02)	<.001	5.95 (2.79 to 12.66)	<.001	7.98 (2.87 to 22.19)	<.001
Women	1 [Reference]		0 [Reference]		1 [Reference]		1 [Reference]		1 [Reference]	
Practice spending region										
Low	0.57 (0.56 to 0.58)	<.001	−3.8 (−4.11 to −3.47)	<.001	0.76 (0.75 to 0.77)	<.001	0.62 (0.55 to 0.70)	<.001	0.95 (0.83 to 1.08)	0.43
Average	1 [Reference]		0 [Reference]		1 [Reference]		1 [Reference]		1 [Reference]	
High	1.27 (1.25 to 1.28)	<.001	1.81 (1.56 to 2.06)	<.001	1.05 (1.04 to 1.06)	<.001	1.28 (1.18 to 1.38)	<.001	1.10 (0.98 to 1.23)	0.11
Sole proprietor										
No	1 [Reference]		0 [Reference]		1 [Reference]		1 [Reference]		1 [Reference]	
Yes	0.91 (0.90 to 0.92)	<.001	−0.90 (−1.15 to −0.65)	<.001	0.96 (0.96 to 0.97)	<.001	0.55 (0.50 to 0.61)	<.001	0.52 (0.49 to 0.80)	<.001
No response	0.61 (0.60 to 0.63)		−5.12 (−5.72 to −4.65)		0.81 (0.79 to 0.82)		1.11 (0.96 to 1.29)	0.15	0.63 (0.49 to 0.80)	

Abbreviations: IRR, incidence rate ratio; OR, odds ratio.

[a] Multivariable models were adjusted for the main effects of spending region, sole proprietor status, specialty, and sex and for the interaction between specialty and sex.

[b] The OR represents the exponent of the estimated percentage of physicians receiving 1 or more payments or holding ownership interests compared with the reference group.

[c] Generalized multivariable logistic regression model, 2-sided *P* value. All *P* values <.001 were significant after Bonferroni correction for multiple comparisons.

[d] Calculated using log-transformed annual per-physician payment value. The exponent of the B coefficient of the dependent variable can be interpreted as the percentage difference in the mean annual per-physician general payment value from the reference group for any variable.

[e] The exponent of the B coefficient can be interpreted as the IRR or the ratio of the logs of the annual mean number of payments received by a physician in each specialty classification compared with the reference group.

payments, primarily involving general payments, with a higher likelihood and higher value of payments to physicians in surgical than primary care specialties and to male than female physicians.

ARTICLE INFORMATION

Accepted for Publication: March 31, 2017.

Author Contributions: Ms Tringale had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.
Concept and design: Tringale, Marshall, Mackey, Murphy, Hattangadi-Gluth.
Acquisition, analysis, or interpretation of data: All authors.
Drafting of the manuscript: All authors.
Critical revision of the manuscript for important intellectual content: Tringale, Connor, Murphy, Hattangadi-Gluth.
Statistical analysis: Tringale, Marshall, Connor, Murphy, Hattangadi-Gluth.
Obtained funding: Hattangadi-Gluth.
Administrative, technical, or material support: Tringale, Mackey, Hattangadi-Gluth.
Supervision: Hattangadi-Gluth.

Conflict of Interest Disclosures: All authors have completed and submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest. Dr Hattangadi-Gluth reported receiving research grants from Varian Medical Systems. No other financial disclosures were reported.

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