

Industry-sponsored research payments to gastroenterologists in the United States

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Over the past two decades, research investment in gastroenterological diseases such as inflammatory bowel disease has been growing. Together with research funding from the public sector,¹research collaborations between gastroenterologists and the healthcare industry increasingly represent an important source of research funding for gastroenterologists leading to current advances in the treatment of gastroenterological diseases.^{2,3}

However, one previous study by Ying et al. found that the healthcare industry spent only 6% of all payments to gastroenterologists, equivalent to only \$27.5 million, for research and grant funding in the United States between 2014 and 2020.⁴ This study could significantly underestimate the magnitude and prevalence of gastroenterologists receiving research funding from the healthcare industry, as the author previously showed that majority of the healthcare companies provided their research funding to physicians via teaching hospitals and research institutions.⁵⁻⁸ For example, the healthcare industry spent more than \$799.9 million, 76.0% of all payments to pulmonologists, for research purposes between 2014 and 2021.⁵ One possible reason for the underestimation of industry-sponsored research funding for gastroenterologists is that the previous study only included research funds provided directly to individual gastroenterologists. Additionally, given that industry-sponsored clinical trials conducted by physicians are required to introduce new treatments to the market and patients, the evaluation of all industry-sponsored research funding to gastroenterologists is of particular importance in the United States.

This longitudinal cross-sectional study examined the magnitude and extent of

industry-sponsored research payments to pediatric and adult gastroenterologists, using the Open Payments Database from 2014 to 2021. All physicians whose primary specialty is classified as either gastroenterology, hepatology, transplant hepatology, pediatric gastroenterology, or pediatric transplant hepatology were extracted from the National Plan and Provider Enumeration System (NPPES) database, as previously noted.⁵⁻⁷ All grant and research payments directly provided to individual gastroenterologists (direct research payments) and research payments whose principal investigator is a gastroenterologist (associated research payments) were extracted from the Open Payments Database from 2014 to 2021. Most research payments came indirectly to physician researchers via teaching hospitals, universities, and other third parties.⁵⁻¹⁰ Grant and direct research payments were incorporated into one payment category, as both payments were directly provided to individual gastroenterologists.

The extracted payment data were descriptively analyzed. Per-physician payments were calculated among physicians who received payments, as most gastroenterologists did not receive research payments from the healthcare industry. The payments were analyzed by the content of research and companies making the largest payments. Payments with preclinical indicators were considered payments related to preclinical trials. Additionally, the study assessed yearly trends in the number of gastroenterologists receiving payments and per-physician payments using a population-averaged generalized estimating equation (GEE) model at the individual physician level, as noted previously.^{5-7,11} Inflation in US dollars was adjusted to the 2021 Consumer Price Index using the US Bureau of Labor Statistics inflation calculator. The detailed data analysis method was described in Supplemental Material 1.

After adjusting for inflation, a sum of \$1,527,127,494 was provided to gastroenterologists for research and grant payments by 284 companies between 2014 and 2021. Of 20,986 gastroenterologists included in this study, 3,338 (15.9%) received at least one grant, direct research, and/or associated research payments from the companies over the eight years. Among them, 89.6% (2,757 gastroenterologists) were listed as PIs for 97.6% of overall industry-sponsored research payments worth \$1,491.1 million (Table 1). Only 1.8% and 0.6% of the total research payments worth \$27.4 million and \$8.6 million were directly paid to individual gastroenterologists in direct research and grant payments, respectively. There were large gaps between median and average per-physician payments. The median per-physician eight-year combined payments were \$85,080 (interquartile range: \$19,899–\$382,206), while the average was \$540,848 (standard deviation: \$2,309,907) in associated research payments, indicating that only the small number of gastroenterologists received large amounts of research payments.

Of all gastroenterologists, 1.2%-2.2% and 5.8%-7.2% received direct and associated research payments each year, respectively. The total amounts of associated research payments decreased by \$2.8 million (95% confidence interval [95% CI]: -\$2,852,498

to -\$2,838,517, $p < 0.001$), equal to a 1.6% decrease in relative average percentage change, each year between 2014 and 2021. There were no continuing trends in per-physician amounts of direct research and grant

payments and associated research payments between 2014 and 2021. Meanwhile, the number of gastroenterologists receiving associated research payments increased from 1251 in 2014 to 1357 in 2021 with a peak of 1505 in 2019. The relative annual average percentage change in the number of gastroenterologists receiving associated research payments was 2.1% (95% CI: 1.3%–2.9%, $p < 0.001$) between 2014 and 2021 (Table 1).

Only 2.2% (\$33.2 million) of associated research payments were made for preclinical research. Meanwhile, 24.5% of associated research payments were provided for registered clinical trials (Supplemental Material 2). There was an increasing trend in the proportion of research payments to registered clinical trials from 14.0% in 2014 to 45.6% in 2021. The payment amounts to registered clinical trials increased by 165.7% from 2014 to 2021 (\$26.1 million to \$69.3 million). The top 20 registered clinical trials with the largest total associated research payments included 16 randomized controlled trials, 14 double-blind trials, and 12 trials for ulcerative colitis and/or Crohn’s disease. The number of trial participants ranged from 177 to 10,078.

Of 284 companies making at least one research payment to gastroenterologists, Gilead Sciences provided the largest amount, worth \$253.6 million, followed by AbbVie (\$224.2 million) and Pfizer (\$117.9 million). Payments from the top 10 and 20 companies accounted for 68.0% and 83.2% of all research and grant payments, respectively (Supplemental Material 3).

This cross-sectional analysis of the Open Payments Database demonstrated that more than \$1.5 billion were directly or indirectly provided by the small number of pharmaceutical companies for research where gastroenterologists served as principal investigators between 2014 and 2021. Additionally, the number of gastroenterologists receiving associated research payments significantly increased over the study period. Research payments for registered clinical trials increased by more than double from 2014 to 2021. These registered clinical trials that received research funding were generally rigorously designed in large numbers of patients aiming for new approvals or new indications. In contrast, the healthcare industry spent only a small amount of research payments on preclinical trials.

Compared to a previous study by Ying et al., the amount of research payments to gastroenterologists was 55.5 times larger than those previously reported.⁴ We found that the research payments provided to research via teaching hospitals and research institutions where gastroenterologists served as principal investigators were 41.4 times larger than research payments directly distributed to individual gastroenterologists. Such large industry research investments and industry-sponsored clinical trials have undoubtedly contributed to developing novel drugs, treating patients, and improving their quality of life in the field of gastroenterology.

However, as this study elucidated, the healthcare industry invests the majority of its resources and expense in clinical trials and were less likely to invest in preclinical research and research driven by basic knowledge products.^{5–10} As Scher and Schett noted,¹² the healthcare industry is primarily motivated by short-term market expansion. However, investments in knowledge products and innovative ideas lead to long-term growth, known as “knowledge spillovers.” Through this strategy, the National Institutes of Health has invested in these products for many years, resulting in many innovative drugs and treatments.¹² Given there was no change in the industry-sponsored research payments to gastroenterologists for preclinical research, the healthcare industry should provide more research payments to gastroenterologists for preclinical research and developing knowledge products for their long-term growth.

Meanwhile, physicians would receive financial and non-financial personal incentives (e.g., promotions, increased professional recognition, increased revenues, etc.) for participating in industry-sponsored trials and receiving research funding. Moreover, conflicts of interest are independently associated with more positive interpretation in industry-sponsored clinical trials.¹³ As many institutions, academic journals, scientific meetings, and medical societies require physicians and researcher to declare receipt of research funding as potential conflicts of interest, all gastroenterologists need to be transparent about their financial relationships with the healthcare industry and be aware of the impact on their practice.

The limitations of this study include the possibility of errors in public databases and unmeasured confounding factors that may influence payment trends. There was a difference in the definition of gastroenterologists

between this study and the previous study.⁴ Thus, the number of gastroenterologists included in this study was different from that in the previous study.⁴ Furthermore, research payments are primarily made to institutions and teaching hospitals: however, the Open Payments Database does not contain information on how these payments were internally distributed among physicians and staff within these institutions and hospitals.

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References

1. Ballreich JM, Gross CP, Powe NR, et al. Allocation of National Institutes of Health Funding by Disease Category in 2008 and 2019. *JAMA Network Open* 2021;4:e2034890-e2034890.
2. Kobayashi T, Hibi T. Improving IBD outcomes in the era of many treatment options. *Nature Reviews Gastroenterology & Hepatology* 2023;20:79-80.
3. Manns MP, Maasoumy B. Breakthroughs in hepatitis C research: from discovery to cure. *Nature Reviews Gastroenterology & Hepatology* 2022;19:533-550.
4. Ying X, Rosenblatt R, Fortune BE. Trends in Industry Payments to Gastroenterologists and Hepatologists in the United States From 2014 to 2020. *Gastroenterology* 2022;163:787-791.
5. Murayama A, Kugo H, Saito Y, et al. A Nine-year Investigation of Healthcare Industry Payments to Pulmonologists in the United States. *Ann Am Thorac Soc* 2023.
6. Murayama A, Hirota S. Industry payments to pathologists in the USA between 2013 and 2021. *J Clin Pathol* 2023.
7. Murayama A, Kamamoto S, Kugo H, et al. Research and Non-research Industry Payments to Nephrologists in the United States between 2014 and 2021 (in press). *Journal of the American Society of Nephrology* 2023.
8. Vanood A, Sharrak A, Karabon P, et al. Industry-Sponsored Research Payments in Neurosurgery-Analysis of the Open Payments Database From 2014 to 2018. *Neurosurgery* 2021;88:E250-e258.
9. Sharrak A, Nguyen T, Karabon P. Industry Research Payments to Urologists: The First 5 Years of Open Payments Research Data. *J Urol* 2020;204:408-410.
10. Kalva P, Kakkilaya A, Mekala P, et al. Trends and Characteristics of Industry Payments for Ophthalmology Research From 2014 to 2020. *JAMA Ophthalmol* 2022;140:1105-9.
11. Murayama A, Kamamoto S, Kawashima M, et al. Cross-sectional analysis of pharmaceutical payments to Japanese board-certified gastroenterologists between 2016 and 2019. *BMJ Open* 2023;13:e068237.
12. Scher JU, Schett G. Key opinion leaders - a critical perspective. *Nat Rev Rheumatol* 2021;17:119-124.
13. Ahn R, Woodbridge A, Abraham A, et al. Financial ties of principal investigators and randomized controlled trial outcomes: cross sectional study. *BMJ* 2017;356:i6770.

Table 1. Industry-sponsored grand, direct research and associated research payments between 2014 and 2021

Variables	Payment year	Payment year	Payment year
	2014	2015	2016
Direct research payments and grant payments			
Total payment amounts, \$ ^a	3,320,621	9,396,794	3,195,554
Number of physicians with payments, n (%)	256 (1.2)	465 (2.2)	326 (1.6)
Payments per physician, \$ ^{a,b}			

Variables	Payment year	Payment year	Payment year
Median (IQR)	1,672 (458–8,092)	4,107 (1,143–17,149)	2,404 (866–6,774)
Average (SD)	12,971 (36,768)	20,208 (109,817)	9,802 (24,611)
Associated research payments			
Total payment amounts, \$ ^a	185,784,945	177,006,324	211,589,680
Number of physicians with payments, n (%)	1251 (6.0)	1215 (5.8)	1310 (6.2)
Payments per physician, \$ ^{a,b}			
Median (IQR)	28,053 (7,139–115,306)	26,724 (6,824–102,184)	30,910 (9,297–97,393)
Average (SD)	148,509 (565,878)	145,684 (628,210)	161,519 (837,801)

Legend: ^a Inflation in US dollars was adjusted to 2021 value using the Consumer Price Index Inflation Calculator of the U.S. Bureau of Labor Statistics. ^b Per-physician payment was calculated among physicians receiving payments.

*p<0.001

Abbreviations: 95% confidence interval (95% CI), interquartile range (IQR), SD (standard deviation)

Supplemental Material 1. Detailed data analysis methodology

The extracted payment data was descriptively analyzed, including average, standard deviation, median, and interquartile range. Per-physician payments were calculated among physicians who received payments, as the majority of gastroenterologists did not receive research payments from the healthcare industry. The payments were analyzed by payment year and content of payments. For associated research payments, per-physician payments were calculated as total payments divided by the number of principal investigators in a research payment, and total research payments were calculated by the number of gastroenterologists times the payment per principal investigator because some research payments included principal investigators with other specialties.

Furthermore, the study assessed yearly trends in the number of gastroenterologists receiving payments and per-physician payments using population-averaged generalized estimating equations (GEE) at the individual physician level. The annual number of physicians receiving payments and per-physician payments were examined using log-linked GEE with Poisson distribution and negative binomial GEE, respectively. Additionally, the trend in the total amounts of annual research payments was assessed by a linear GEE model. Inflation in US dollars was adjusted to 2021-dollar values using a Consumer Price Index inflation calculator of the U.S. Bureau of Labor Statistics (https://www.bls.gov/data/inflation_calculator.htm). Institutional board review and approval were not required for this study, as the study was designed as a non-human subjects study of publicly-available data.

Supplemental Material 2. Associated research payments to preclinical trials and registered clinical trials between 2014 and 2021.

Year	Payments to preclinical trials (%) ^a , \$	Payments to registered clinical trials	Payments to registered clinical trials
		Payment amounts (%) ^a , \$	Number of clinical trials, n
2014	4,236,601 (2.3)	26,102,132 (14.0)	114
2015	5,608,733 (3.2)	24,139,114 (13.6)	117
2016	4,799,019 (2.3)	30,818,695 (14.6)	135
2017	2,029,356 (1.0)	28,874,960 (14.1)	160
2018	1,992,856 (1.2)	45,295,389 (27.5)	135
2019	5,385,369 (2.6)	71,808,850 (34.4)	143

Year	Payments to preclinical trials (%) ^a , \$	Payments to registered clinical trials	Payments to registered clinical trials
2020	3,026,593 (1.6)	68,622,026 (36.9)	121
2021	6,097,548 (4.0)	69,345,436 (45.6)	155
Overall	33,176,075 (2.2)	365,006,603 (24.5)	505

^a Percentage of research payments is relative to the total amount of associated research payments for each year or overall.

Supplemental Material 3. Grant, direct research, and associated research payments to gastroenterologists for top 10 companies between 2014 and 2021

Company name	Total direct research and grant payments, \$ (%)	Total associated research paym
Gilead Sciences Inc	1,781,302 (4.9)	241,799,108 (16.2)
AbbVie, Inc	1,701,140 (4.7)	222,508,752 (14.9)
Pfizer Inc	2,719,827 (7.6)	115,172,458 (7.7)
Intercept Pharmaceuticals, Inc	633,830 (1.8)	84,121,144 (5.6)
Janssen Research & Development, LLC	298,339 (0.8)	83,034,668 (5.6)
Allergan Inc	383,504 (1.1)	68,615,842 (4.6)
Merck Sharp & Dohme Corporation	122,994 (0.3)	66,068,174 (4.4)
E.R. Squibb & Sons, LLC	687,954 (1.9)	54,952,751 (3.7)
Takeda Pharmaceuticals U.S.A., Inc	569,071 (1.6)	51,034,542 (3.4)
Shire North American Group Inc	5,381 (0.01)	41,687,210 (2.8)