Evaluation of non-research and research industry payments to pediatric hematologist/oncologists in the United States between 2013 and 2021

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Abstract

Background

Although financial interactions between healthcare industry and pediatric hematologist/oncologists (PHOs) contribute to and are vital for improving patient care, they could be conflicts of interest among PHOs. Nevertheless, little is known about financial relationships between healthcare industry and PHOs in the United States.

Methods (procedure)

This cross-sectional analysis of the Open Payments Database examined general and research payments to PHOs from healthcare industry in the United States between 2013 and 2021. PHOs were considered as physicians whose primary specialty was pediatric hematology/oncology in the National Plan and Provider Enumeration System. Payments to the PHOs were analyzed descriptively. Trends in payments were assessed using generalized estimating equation models.

Results

Of 2784 PHOs, 2142 (76.9%) PHOs received payments totaling $187.3 million from the healthcare industry between 2013-2021. Approximately $46.3 million (24.8%) were general payments and $137.7 million (73.5%) were funding for research where PHOs served as principal investigators (associated research funding). While 40.1% of PHOs accepted associated research funding, 72.7% of PHOs received general payments from the healthcare industry. Both general payments and associated research funding considerably increased between 2014-2019. The number of PHOs receiving general payments and associated research funding annually increased by 2.2% (95% CI: 1.2%–3.3%, p<0.001) and 5.0% (95% CI: 3.3%–6.8%, p<0.001) between 2014-2019, respectively.

Conclusions

This study found that majority of PHOs received non-research payments related to novel hemophilia and cancer drugs. The healthcare industry spent three fourth of their payments for research purposes. Both research and non-research payments significantly increased over the study period.

Abstract content goes here
Title: Evaluation of non-research and research industry payments to pediatric hematologist/oncologists in the United States between 2013 and 2021

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Conflicts of interest:
We declared there were no conflicts of interest.

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Conclusions
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**Introduction**

The financial interaction between healthcare professionals and the healthcare industry have been the focus of attention in recent decades. These interactions have played a crucial role in the development of innovative treatments and furthering research. Nevertheless, they have also led to several medical scandals and biased recommendations that could potentially compromise patient care. Responding to the growing public concerns regarding such financial relationships, the Physician Payments Sunshine Act was enacted in 2010 in the United States (US) to improve transparency. This legislation mandates that pharmaceutical and medical device manufacturers disclose nearly all financial transfers made to physicians on the federal website, the Open Payments Database (OPD).

In specialties like pediatric hematology and oncology, where only a small number of physicians with extensive knowledge treat patients with rare diseases, collaboration between medical professionals and the healthcare industry is inevitable and vital for enhancing patient care and developing innovative treatments through research. However, transparency in financial relationships is especially important to establish patients' confidence and to prevent undue influence from the healthcare industry on clinical practices among pediatric hematology and oncology specialists. Evidence accumulated from the OPD suggests that personal payments, such as meals and compensation, from the healthcare industry significantly influence physicians' prescribing behavior. Our previous research in Japan demonstrated an increase in such personal payments made to pediatric hematologist/oncologists (PHOs) by the healthcare industry in recent years, due to fierce competition and the introduction of novel hemophilia and pediatric cancer drugs. A similar trend of increased industry payments was observed among oncologists in the United States. Nevertheless, to date, no research has specifically investigated the financial relationships between PHOs and the healthcare industry in the US.

**Methods**

**Study design**

This cross-sectional study assessed all financial transfers made to PHOs from healthcare industry between August 2013 and December 2021 in the US. The OPD was initiated in August 2013 as a result of the Physician Payments Sunshine Act and includes all financial transfers greater than $10 per payment or $100 in aggregated annual payments made to physicians and teaching hospitals by the healthcare industry, including pharmaceutical companies, medical device companies, and group purchasing organizations. The payments were reported into three categories: general payments, research payments, and ownership and investment interests in the OPD. The study included general and research payments to PHOs, and the definition and examples of payment categories were outlined on the OPD website.

**Participants and data collection**

To collect payment information, we matched the OPD with the National Plan and Provider Enumeration System (NPPES) database. We extracted demographic data of all active physicians whose primary specialty was classified as "Pediatric Hematology-Oncology" from the NPPES database. We then matched the NPPES database and the
OPD physician profile database by National Provider Identifier numbers. Next, we downloaded all general and research payments made to the matched PHOs from the OPD between August 2013 and December 2021. This study included all research payments whose principal investigator was a matched PHO (associated research funding) and research payments directly made to matched PHOs (direct research payments) in order to assess the whole magnitude of industry research investments to PHOs.\textsuperscript{13,14} The research payments extracted from the OPD contained payments related to preclinical research, US Food and Drug Administration phase 1-4 clinical trials, and investigator-initiated studies.\textsuperscript{13,14} Additionally, the associated research payments contains indirect research payments to teaching hospitals and other institutions for the costs related to conducting research such as costs for patient recruitment and screening; data/safety monitoring committee; article publication charge and proofreading services; and drugs, supplies, and equipment used in research.\textsuperscript{15,16} To exclude physicians who retired between 2013 and 2021 or who newly become physicians between 2013 and 2021, this study excluded physicians who deactivated or newly activated after August 2013. PHOs practicing outside the US were excluded, as the OPD only covers physician in the US.\textsuperscript{17}

Statistical analyses
Descriptive analyses were performed on payment data. Because many physicians did not receive any payments each year, the descriptive statistics of overall and annual payments were calculated only for PHOs receiving any payments over nine years and each year, respectively.\textsuperscript{18-23} General payments were analyzed by payment categories. Payment concentration to individual PHOs was evaluated by the Gini index and the share of payments by specific proportions of PHOs.\textsuperscript{24} We used the Gini index, which ranges from 0 indicating complete equality to 1 indicating complete inequality, to assess payment concentration.\textsuperscript{25,26} Furthermore, we examined trends in industry payments to PHOs by generalized estimating equation (GEE) models with panel-data of annual payments. Due to the sudden decrease in payments in 2020 caused by the COVID-19 pandemic, we employed the interrupted time series (ITS) analysis.\textsuperscript{18-21} We used the modified log-linked GEE model with Poisson distribution for the number of PHOs with payments and the negative binomial regression GEE model for payments per PHO, as all payment categories were right-skewed. The relative average annual percentage change (RAAPC) in payments was reported.\textsuperscript{9,27,28} The inflation of US dollars from 2014 to 2021 was adjusted by dividing the payment values each year by relative consumer price index (CPI) compared to that in 2014 from the US Bureau of Labor Statistics CPI Inflation Calculator, as previously noted.\textsuperscript{15,16} All analyses were performed using Microsoft Excel for Microsoft 365 MSO, version 2202 (Microsoft Corp), Python 3.9.12 (Python Software Foundation), and Stata version 17.0 (StataCorp). As this study was a cross-sectional analysis of publicly available information and was designed as non-human subjects study, institutional review and approval were not needed.

Results
Summary of the general and research payments to the pediatricians

Of 2784 active PHOs recorded in the NPPES database, 2142 (76.9%) PHOs received one or more payments from the healthcare industry from August 2013 to December 2021. A total of $187,272,888 were made to the PHOs by 541 different companies. Of all industry payments, $46,348,492 (24.8%) were general payments, $137,730,171 (73.5%) were associated research funding, and only $3,194,225 (1.7%) were research payments directly made to individual PHOs. Per-PHO median payments were $5,788 (interquartile range [IQR]: $310–$48,237). The Gini index for per-PHO total payments was 0.890, indicating high levels of inequality.

General payments

Of all PHOs, 72.7% received at least one general payment from the healthcare industry over the nine years period (Table 1). The total amounts of payments were 65,863 in the payment number and $46,348,492. Median nine-year combined general payments per physician were $883 (IQR: $141–$7,250), while the average payments were $22,910 (standard deviation [SD]: $97,032). 23.7% to 37.8% of all PHOs received general payments each year. Median annual total general payments per PHO ranged from $166 to $565. Among them, 40.5%, 75.3%, 89.3%, and 98.4% of overall general payments were concentrated on only top 1%, 5%, 10%, and 25% of all PHOs (Figure 1A). The Gini index for per-physician general payments was 0.922.

Among several categories, the consulting payments, speaking compensations for non-continuous medical education (CME) events, and travel and accommodation payments accounted for 44.5% ($20,624,188), 26.5% ($12,263,300), and 16.1% ($7,464,596) of all general payments in amounts (Table 2). Meanwhile, food and beverage payments, travel and accommodation payments, and consulting payments occupied 56.6% (37,299), 22.5%, and 9.2% of general payments in payment numbers.

For products with the largest general payments, the product with the largest total general payments was emicizumab (Hemlibra from Genentech) with $1,471,205, followed by antihemophilic factor-recombinant (Kovaltry from Bayer HealthCare) with $1,427,097, asparaginase (Erwinaze from Porton Biopharma) $1,340,682, defibrotide (Defitelio from Jazz Pharmaceuticals) with $1,290,945, pegaspargase (Oncaspar from Servier Pharmaceuticals) with $1,091,265, and tisagenlecleucel (Kymriah from Novartis Pharmaceuticals) with $897,565. Among top ten products with the largest general payments, four were approved for acute lymphoblastic leukemia and three were for hemophilia A or hemophilia B.

Direct research payments and associated research funding

332 (11.9%) PHOs directly received $3,194,225 from 56 companies over the nine years (Table 1). Also, 1115 (40.1%) received a total of $137,730,171 in associated research fundings to research where PHOs served as principal investigators. Only 1.4% to 3.5% of PHOs were directly paid research payments from the healthcare industry each year. Prevalence of PHOs receiving associated research funding ranged from 17.4% to 22.9% each year. Median total payments per PHO were $2,547 (IQR: $845–$9,087) in direct research payments and $22,892 (IQR: $5,149–$94,574) in associated research fundings. Gini index was 0.969 for direct research payments and 0.918 for associated research payments.
fundings. Only 1% and 10% of all PHOs received 55.7% and 99.7% of overall direct research payments (Figure 1B) and 39.6% and 87.4% of associated research fundings, respectively (Figure 1C).

The clinical trials with the largest associated research funding was a phase 1, multicenter, open-label study of ivosidenib in patients with advanced solid tumors, including glioma with IDH1 mutation (ClinicalTrials.gov Identifier: NCT02073994) receiving $662,843, followed by a phase I & II safety and pharmacokinetic study of REGN2810 in pediatric patients with relapsed or refractory solid or central nervous system tumors (ClinicalTrials.gov Identifier: NCT03690869) receiving $355,665, and a phase III randomized trial for newly diagnosed high risk B-lymphoblastic leukemia evaluating combination chemotherapy (ClinicalTrials.gov Identifier: NCT01406756) receiving $327,409.

Trends in industry payments
Before the pandemic period, the total annual amounts of general payments continuously increased $4,368,237 in 2014 to $7,372,464 in 2019. Similarly, the total associated research funding annually increased more than double from $8,564,329 in 2014 to $17,717,610 in 2019, while there was no continuous trend in direct research payments over years. The number of PHOs receiving general payments, direct research payments, and associated research funding annually increased by 2.2% (95% CI: 1.2%–3.3%, p<0.001), 18.9% (95% CI: 12.0%–26.2%, p<0.001), and 5.0% (95% CI: 3.3%–6.8%, p<0.001) between 2014 and 2019, respectively (Table 3). Per-PHO payments also increased by 9.2% (95% CI: 4.7%–14.0%, p<0.001) in general payments and 12.2% (95% CI: 2.6%–22.7%, p=0.01) in associated research funding during the same period. Among major categories of general payments, the number of PHOs receiving payments annually increased by 2.7% (95% CI: 1.5%–3.8%, p<0.001) in food and beverage payments, 4.1% (95% CI: 1.5%–6.7%, p=0.002) in consulting fees, and 7.7% (95% CI: 2.8%–12.8%, p=0.002) in non-CME speaking compensations. Per-PHO payments increased by 22.5% (95% CI: 12.6%–33.1%, p<0.001) in non-CME speaking compensations, while CME-speaking fees per PHO decreased by -24.6% (95% CI: -36.6% to -10.3%, p=0.001) each year.

In 2020, the number of PHOs receiving general payments and annual general payments per PHO significantly decreased by 43.9% (95% CI: -49.8% to -37.3%, p<0.001) and 41.0% (95% CI: -55.9% to -21.1%, p<0.001) than those between 2014 and 2019, respectively. Of particular, the food and beverage payments and travel and lodging payments significantly decreased in 2020, the year when the COVID-19 pandemic begins. Meanwhile, there were no significant changes in the direct research payments and associated research funding. The number of PHOs receiving general payments gradually recovered from 2020 to 2021, while the number of PHOs receiving direct and associated research funding significantly decreased during this period.

Discussion
In this nine-year analysis of the Open Payments Database, more than $187 million was made to 76.9% of all pediatric hematologist/oncologists from the healthcare industry in
the United States between 2013 and 2021. More than 70% of PHOs increasingly received
general payments from the healthcare industry for marketing expensive drugs approved
for hemophilia and acute lymphocytic leukemia before the COVID-19 pandemic period.
These increased marketing payments were made to the PHOs in the form of food and
beverage and speaking compensations for non-CME related lecturing events sponsored
by the healthcare industry.

While more than three-fourths of PHOs received at least one general payment over the
nine-year period, the minority of PHOs received the general payments each year. Per-
PHO annual general payments were $166-$565 in median. Considering that Parikh and
his colleagues reported that median per-pediatrician general payments were $88 in
2014, this study suggests that the PHOs might have stronger financial ties with the
healthcare industry than general pediatricians. Additionally, our rigorous regression
analysis showed that there were increasing trends in the number of PHOs receiving
general payments and per-PHO general payments over the study period, especially for
meal and speaking compensations unrelated to medical education, typically at events
where influential physicians speak for the marketing of new drugs for hemophilia and
blood cancers. These findings indicate that these financial interactions for marketing
novel drugs for hemophilia and blood cancers between the healthcare industry and PHOs
have increased over the past several years. These findings were consistent with our
previous study among Japanese PHO and a study by Tarras et al. showing that the per-
physician general payments significantly increased among oncologists in the US. A
recent report showed that 80% of physicians specializing in hemophilia treatment
received any payments from the healthcare industry in the US between 2018 and 2020.
Given the increasing size of the hemophilia drug market, general payments from the
healthcare industry to PHOs will continue to increase.

Even though the general payments per physician were small, accumulating evidence
demonstrated that these payments are significantly associated with increased
prescriptions and higher healthcare costs. Mitchell et al. found that physicians receiving
general payments significantly prescribed more drugs for chronic myeloid leukemia
including dosatinib, mesylate, and nilotinib than those who did not. Similarly, there were
positive associations between general payments for compensations and increased cancer
drugs across cancer types among oncologists in the US. Not all of the association
between industry payments and physician prescribing necessarily leads to harm or danger
to patients, but all PHOs need to pay more attention to their financial relationships with
the healthcare industry and the impact on their clinical practice. Future studies must
investigate the associations between industry payments to PHOs and PHOs’ clinical
practice, as well as the consequences of the impact on patients.

The novelty of this study is inclusion of not only research payments directly distributed
to the PHOs but also research payments from the healthcare industry via teaching and
other institutions where PHOs served as principal investigators. This comprehensive
assessment of research payments to PHOs demonstrated that more than third-fourth of
overall payments to PHOs were directly or indirectly made for research purposes such as
conducting clinical trials for pediatric cancers such as glioma and acute lymphoblastic
leukemia. Surprisingly, more than 40% of PHOs were registered as principal investigators
of associated research funding from the healthcare industry. Previous studies reported that the prevalence of physicians accepting associated research funding ranged from 2.7% in pathology to 13.5% in pulmonology. Simultaneously, total research payments to PHOs increased more than double from $8 million in 2014 to $17 million in 2019 and reached the highest at $26 million in 2021. Both the number of PHOs receiving research payments and per-PHO research payments significantly increased annually for the study period. This finding highlights that increasing and large industry attention to research for pediatric cancers and that future studies must explore the allocation and consequences of industry research funding to PHOs.

Meanwhile, we note that the receipt of research funding from industry does not necessarily lead to conflicts of interest endangering patients and need not recognize it as evidence of undue influence of healthcare industry to PHOs’ research activities. Industry-sponsored research is more likely to initiate in order to show positive outcome in safety and efficacy of treatment and is more rigorous study design and larger sample size to meet US Food and Drug Administration requirements than research not supported by industry. However, physicians generally gain large financial and non-financial incentives from the participation in industry-sponsored research, such as increased professional recognition, trust from patients, promotion in workplace, academic achievement, additional revenue, and stronger connection with the healthcare industry. Additionally, financial conflicts of interest are associated with authors’ favorable interpretations of trial findings. Therefore, many academic journals, professional medical societies, and the government require physicians to declare their participation in industry-sponsored research and receipt of funding in academic journals, conferences, board membership, and committees. Nevertheless, such information sometimes undeclared or under-declared by physicians. At least, all physicians including PHOs need to be transparent in their financial relationships with the healthcare industry if they involve in research sponsored by the healthcare industry.

Our study has several important limitations. Firstly, this study only included physicians whose primary specialty is pediatric hematology/oncology, but there would be physicians who treat and manage patients with pediatric cancer but not whose primary specialty is registered as pediatric hematology/oncology in the NPPES database. Second, there could be errors in the OPD, as indicated by previous studies. Third, though physicians can dispute the data on their payments but only a few physicians dispute due to the complicate dispute process. Therefore, even if PHOs find errors in their payment data, PHOs might not dispute and correct the data. Fourth, as the OPD only covers payments from companies manufacturing FDA approved drugs or medical devices, there might be undisclosed financial relationships between the PHOs and healthcare companies uncovered by the OPD. Additionally, the OPD does not disclose the distribution and nature of research payments to teaching hospitals and other institutions where PHOs served as principal investigators, and this study could not assess the internal allocation of associated research funding to physicians and staff within the institution receiving funding. Finally, physicians self-report their primary specialty in the NPPES. Therefore, some PHOs extracted from the NPPES database may not be board-certified as PHOs, as there was difference in the number of PHOs listed in the NPPES database and number of PHOs estimated by the American Board of Pediatrics.
In conclusion, majority of PHOs received payments for non-research purposes totaling $46.3 million from the healthcare industry between 2013 and 2021 in the United States. These payments had been increasing during the study period. However, the healthcare industry distributed majority of their payments to PHOs for research purposes.

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Conflicts of interest:
We declared there were no conflicts of interest.

Funding
We did not receive any financial and technical support from any companies for this study.

Author Contributions
Anju Murayama and Sae Kamamoto had full access to all of the data in the study and Anju Murayama take responsibility for the integrity of the data and the accuracy of the data analysis.

Concept and design: All authors
Data acquisition: Anju Murayama
Software: Anju Murayama
Visualization: All authors
Statistical analysis: Anju Murayama and Sae Kamamoto
Drafting of the manuscript: All authors
Critical revision of the manuscript for important intellectual content: Anju Murayama, Sae Kamamoto
Administration: Anju Murayama
References


16. Murayama A, Hirota S. Industry payments to pathologists in the USA between


Table 1. General payments, direct research payments, and associated research funding to pediatric hematologist/oncologists between 2013 and 2021

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<td>611 (22.0)</td>
<td>909 (32.7)</td>
<td>1023 (36.8)</td>
<td>1000 (35.9)</td>
<td>969 (34.8)</td>
<td>1052 (37.8)</td>
<td>1053 (37.8)</td>
<td>661 (23.7)</td>
<td>737 (26.5)</td>
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<td>Median (IQR)</td>
<td>103 (77–1,295)</td>
<td>203 (74–1,387)</td>
<td>166 (60–1,565)</td>
<td>183 (57–2,347)</td>
<td>198 (57–3,006)</td>
<td>173 (65–1,910)</td>
<td>206 (79–2,656)</td>
<td>267 (37–4,675)</td>
<td>565 (68–5,462)</td>
<td>883 (141–7,250)</td>
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<td>Average (SD)</td>
<td>2,810 (9,528)</td>
<td>4,806 (15,030)</td>
<td>5,136 (17,033)</td>
<td>5,047 (15,971)</td>
<td>6,696 (28,500)</td>
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<td>Number of physicians with payments, n (%)</td>
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<td>50 (1.8)</td>
<td>38 (1.4)</td>
<td>59 (2.1)</td>
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<td>87 (3.1)</td>
<td>98 (3.5)</td>
<td>93 (3.3)</td>
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<td>332 (11.9)</td>
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<td>Median (IQR)</td>
<td>1,969 (1067– 10,000)</td>
<td>1,185 (606–6,462)</td>
<td>384 (217–2,695)</td>
<td>906 (462–1,434)</td>
<td>1,334 (795–3,236)</td>
<td>969 (216–3,632)</td>
<td>975 (476–3,770)</td>
<td>2,623 (1,130– 5,023)</td>
<td>2,250 (780–5,795)</td>
<td>2,547 (845–9,087)</td>
</tr>
<tr>
<td>Average (SD)</td>
<td>9,683 (17,992)</td>
<td>7,316 (20,289)</td>
<td>4,244 (10,534)</td>
<td>2,440 (6,338)</td>
<td>2,948 (4,483)</td>
<td>6,115 (15,833)</td>
<td>3,572 (6,526)</td>
<td>4,849 (6,231)</td>
<td>6,354 (21,690)</td>
<td>9,592 (26,107)</td>
</tr>
<tr>
<td>Range</td>
<td>20-102,835</td>
<td>18–144,000</td>
<td>20–60,000</td>
<td>40–40,410</td>
<td>37–24,000</td>
<td>35–12,649</td>
<td>26,42,186</td>
<td>71–32,284</td>
<td>16–185,000</td>
<td>16–354,660</td>
</tr>
<tr>
<td>Gini index</td>
<td>0.994</td>
<td>0.997</td>
<td>0.994</td>
<td>0.997</td>
<td>0.994</td>
<td>0.994</td>
<td>0.994</td>
<td>0.986</td>
<td>0.993</td>
<td>0.969</td>
</tr>
<tr>
<td>Associated research funding</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total payments</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Payment amounts, $</td>
<td>4,477,975</td>
<td>8,564,329</td>
<td>13,698,123</td>
<td>11,242,424</td>
<td>11,821,181</td>
<td>18,277,975</td>
<td>17,717,610</td>
<td>23,870,049</td>
<td>26,060,544</td>
<td>137,290,171</td>
</tr>
<tr>
<td>Number of payment contracts, n</td>
<td>2,223</td>
<td>3,630</td>
<td>8,281</td>
<td>5,013</td>
<td>7,892</td>
<td>6,592</td>
<td>8,266</td>
<td>7,604</td>
<td>5,450</td>
<td>56,491</td>
</tr>
<tr>
<td>Number of physicians with payments, n (%)</td>
<td>285 (10.4)</td>
<td>500 (18.0)</td>
<td>483 (17.4)</td>
<td>579 (20.8)</td>
<td>588 (21.1)</td>
<td>625 (22.5)</td>
<td>638 (22.9)</td>
<td>620 (22.3)</td>
<td>1,115 (40.1)</td>
<td></td>
</tr>
<tr>
<td>Payments per physician, $</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median (IQR)</td>
<td>2,958 (300– 10,309)</td>
<td>3,984 (822– 12,161)</td>
<td>3,840 (700– 15,360)</td>
<td>5,156 (1,588– 21,219)</td>
<td>5,010 (1,959– 19,638)</td>
<td>6,720 (1,382– 25,393)</td>
<td>4,552 (1,037– 20,938)</td>
<td>7,147 (1,699– 27,029)</td>
<td>7,691 (1,797– 32,011)</td>
<td>22,892 (5,149– 94,574)</td>
</tr>
<tr>
<td>Average (SD)</td>
<td>15,712 (47,655)</td>
<td>17,129 (53,185)</td>
<td>26,695 (142,791)</td>
<td>23,276 (266,633)</td>
<td>23,871 (69,444)</td>
<td>31,865 (66,480)</td>
<td>28,369 (64,718)</td>
<td>37,413 (154,804)</td>
<td>42,035 (372,279)</td>
<td>125,529 (406,801)</td>
</tr>
<tr>
<td>Range</td>
<td>3,577,369</td>
<td>2,244,652</td>
<td>4,305,547</td>
<td>1,611,498</td>
<td>4,149,375</td>
<td>1,268,682</td>
<td>2,122,716</td>
<td>5,465,642</td>
<td>3,526,521</td>
<td>3,706,613</td>
</tr>
<tr>
<td>Gini index</td>
<td>0.980</td>
<td>0.960</td>
<td>0.969</td>
<td>0.956</td>
<td>0.953</td>
<td>0.952</td>
<td>0.955</td>
<td>0.954</td>
<td>0.955</td>
<td>0.918</td>
</tr>
</tbody>
</table>

Abbreviations: interquartile range (IQR), SD (standard deviation)
† The payment data in 2013 were payments made to physicians between August 1 and December 30.
Table 2. General payments by categories

<table>
<thead>
<tr>
<th>Payment categories</th>
<th>Monetary amounts, $ (%)</th>
<th>Number of payments, n (%)</th>
<th>Number of physicians with payments, n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consulting fee</td>
<td>20,624,188 (44.5)</td>
<td>6,042 (9.2)</td>
<td>697 (25.0)</td>
</tr>
<tr>
<td>Non-CME speaking compensation</td>
<td>12,263,300 (26.5)</td>
<td>4,565 (6.9)</td>
<td>369 (13.3)</td>
</tr>
<tr>
<td>Travel and lodging</td>
<td>7,464,596 (16.1)</td>
<td>14,840 (22.5)</td>
<td>757 (27.2)</td>
</tr>
<tr>
<td>Honoraria</td>
<td>2,205,134 (4.8)</td>
<td>974 (1.5)</td>
<td>286 (10.3)</td>
</tr>
<tr>
<td>Food and beverage</td>
<td>1,916,848 (4.1)</td>
<td>37,299 (56.6)</td>
<td>1915 (68.8)</td>
</tr>
<tr>
<td>Grant</td>
<td>1,007,680 (2.2)</td>
<td>120 (0.2)</td>
<td>66 (2.4)</td>
</tr>
<tr>
<td>CME speaking compensation</td>
<td>637,570 (1.4)</td>
<td>231 (0.4)</td>
<td>72 (2.6)</td>
</tr>
<tr>
<td>Education</td>
<td>183,733 (0.4)</td>
<td>1,682 (2.6)</td>
<td>526 (18.9)</td>
</tr>
<tr>
<td>Current or prospective ownership or investment interest</td>
<td>35,723 (0.1)</td>
<td>6 (0.01)</td>
<td>1 (0.04)</td>
</tr>
<tr>
<td>Gift</td>
<td>5,742 (0.01)</td>
<td>84 (0.1)</td>
<td>27 (1.0)</td>
</tr>
<tr>
<td>Royalty or license</td>
<td>2,719 (0.01)</td>
<td>5 (0.01)</td>
<td>1 (0.04)</td>
</tr>
<tr>
<td>Entertainment</td>
<td>1,259 (0.003)</td>
<td>15 (0.02)</td>
<td>15 (0.5)</td>
</tr>
</tbody>
</table>

*aNon-CME speaking payments included “compensation for services other than consulting, including serving as faculty or as a speaker at a venue other than a continuing education program.”

*bCME speaking payments included “compensation for serving as faculty or as a speaker for an accredited or certified continuing education program” (applicable to program years 2013-2020), “compensation for serving as faculty or as a speaker for an unaccredited and non-certified continuing education program” (applicable to program years 2013-2020), and “compensation for serving as faculty or as a speaker for medical education program” (applicable beginning with program year 2021 and subsequent program years).
### Table 3. Trends in industry payments between 2014 and 2021

<table>
<thead>
<tr>
<th>Variable</th>
<th>Relative average annual percentage change by payment duration, % (95% CI)</th>
<th>2014-2019</th>
<th>2014-2019 vs 2020-2021</th>
<th>2020-2021</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of physicians receiving payments</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General payments</td>
<td></td>
<td>2.2 (1.2 – 3.3)**</td>
<td>-43.9 (-49.8 – -37.3)***</td>
<td>9.1 (1.9 – 16.7)*</td>
</tr>
<tr>
<td>Consulting fees</td>
<td></td>
<td>4.1 (1.5 – 6.7)**</td>
<td>-22.6 (-35.6 – -6.9)**</td>
<td>24.9 (11.8 – 39.5)***</td>
</tr>
<tr>
<td>Non-CME speaking fees</td>
<td></td>
<td>7.7 (2.8 – 12.8)**</td>
<td>-15.1 (-34.7 – 10.3)</td>
<td>0.4 (-14.6 – 17.9)</td>
</tr>
<tr>
<td>CME-speaking fees</td>
<td></td>
<td>-7.5 (-18.3 – -4.7)***</td>
<td>-24.7 (-96.2 – 1403.0)</td>
<td>-63.9 (-96.2 – 246.2)</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td>-8.7 (-12.9 – -4.3)***</td>
<td>69.3 (8.7 – 163.6)</td>
<td>-15.4 (-36.2 – 12.1)</td>
</tr>
<tr>
<td>Food and beverage</td>
<td></td>
<td>2.7 (1.5 – 3.8)**</td>
<td>-63.1 (-68.2 – -57.0)***</td>
<td>12.8 (3.0 – 23.5)**</td>
</tr>
<tr>
<td>Honoraria</td>
<td></td>
<td>-3.0 (-8.2 – 2.4)</td>
<td>-44.9 (-66.9 – -8.1)*</td>
<td>74.4 (29.0 – 135.9)***</td>
</tr>
<tr>
<td>Travel and lodging</td>
<td></td>
<td>2.6 (0.3 – 4.9)*</td>
<td>-70.6 (-79.9 – -56.9)***</td>
<td>-8.3 (-27.9 – 16.6)</td>
</tr>
<tr>
<td>Direct research payments</td>
<td></td>
<td>18.9 (12.0 – 26.2)***</td>
<td>13.6 (-19.7 – 60.8)</td>
<td>-34.0 (-47.2 – -17.4)***</td>
</tr>
<tr>
<td>Associated research funding</td>
<td></td>
<td>5.0 (3.3 – 6.8)***</td>
<td>6.3 (-2.2 – 15.6)</td>
<td>-7.4 (-12.5 – -2.1)**</td>
</tr>
<tr>
<td><strong>Per-physician payments</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General payments</td>
<td></td>
<td>9.2 (4.7 – 14.0)***</td>
<td>-41.0 (-55.9 – -21.1)***</td>
<td>-8.4 (-20.0 – 4.8)</td>
</tr>
<tr>
<td>Consulting fees</td>
<td></td>
<td>8.1 (1.6 – 15.1)*</td>
<td>-16.5 (-47.1 – 31.8)</td>
<td>-4.7 (-20.9 – 14.7)</td>
</tr>
<tr>
<td>Non-CME speaking fees</td>
<td></td>
<td>22.5 (12.6 – 33.1)***</td>
<td>-51.6 (-66.7 – -29.7)***</td>
<td>-16.4 (-29.5 – -1.0)*</td>
</tr>
<tr>
<td>CME-speaking fees</td>
<td></td>
<td>-24.6 (-36.6 – -10.3)**</td>
<td>-89.6 (-99.6 – -198.1)</td>
<td>-12.7 (-91.9 – 840.7)</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td>-11.8 (-27.4 – 7.1)</td>
<td>-92.6 (-97.7 – -76.3)***</td>
<td>476.1 (164.1 – 1156.8)***</td>
</tr>
<tr>
<td>Food and beverage</td>
<td></td>
<td>-0.3 (-2.4 – 1.9)</td>
<td>-91.0 (-92.8 – -88.6)***</td>
<td>81.1 (59.1 – 106.2)***</td>
</tr>
<tr>
<td>Honoraria</td>
<td></td>
<td>5.9 (-7.6 – 21.4)</td>
<td>-42.0 (-69.6 – -10.9)</td>
<td>6.2 (-26.5 – 57.6)</td>
</tr>
<tr>
<td>Travel and lodging</td>
<td></td>
<td>3.3 (-1.0 – 7.8)</td>
<td>-81.6 (-90.4 – -64.5)***</td>
<td>-31.0 (-53.9 – 3.2)</td>
</tr>
<tr>
<td>Direct research payments</td>
<td></td>
<td>8.2 (-14.7 – 37.2)</td>
<td>19.0 (-57.9 – 236.6)</td>
<td>-9.2 (-62.2 – 118.2)</td>
</tr>
<tr>
<td>Associated research funding</td>
<td></td>
<td>12.2 (2.6 – 22.7)*</td>
<td>19.5 (-24.1 – 88.2)</td>
<td>-7.1 (-30.3 – 24.0)</td>
</tr>
</tbody>
</table>

*p<0.05, **p<0.01, ***p<0.001

Six categories of general payments which more than 100 pediatric hematologist/oncologists received, and CME related speaking compensations were specifically selected for trend analysis. The US dollar inflation rate was adjusted by dividing payments by the relative consumer price index for each year compared to that in 2014. The consumer price index for each year was collected from U.S. Bureau of Labor Statistics (https://data.bls.gov/timeseries/CUUR0000SA0)
Figure 1. Concentrations of general payments (Figure 1A), direct research payments (Figure 1B), and associated research funding (Figure 1C) to pediatric hematologist/oncologists between August 2013 and December 2021.