Industry payments to pediatricians in the United States between 2013 and 2021

Anju Murayama (ange21tera@gmail.com)
Tohoku University  https://orcid.org/0000-0002-4279-4748

Research Article

Keywords: Conflicts of interest, ethics, United States, Open Payments, COVID

Posted Date: July 24th, 2023

DOI: https://doi.org/10.21203/rs.3.rs-3190642/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License. Read Full License
Abstract

Objectives

To evaluate the extent of research and non-research industry payments to pediatricians over a nine-year period between 2013 and 2021.

Study design

Using the general and research payments from the Open Payments Database between 2013 and 2021, this cross-sectional analysis examined the industry payments made to physicians whose primary specialty was pediatrics in the National Plan and Provider Enumeration System. Descriptive analyses were performed for the payment data overall and other pediatrician demographics. Trends in industry payments were analyzed by generalized estimating equation models.

Results

Of 99,764 pediatricians, 59,984 (60.1%) received a total of $297 million (12.8%) in general and $2 billion in associated research payments over the nine years. Median nine-year per-physician payments were $288 (interquartile range [IQR]: $88-958) in general and $65,343 (IQR: $16,763-255,208) in associated research payments. Pediatric allergists and immunologists received the highest per-physician median payments ($1,565), followed by pediatric endocrinologists ($1,368) and pediatric transplant hepatologists ($1,006). Male pediatricians were 1.06 (95% confidence interval [CI]: 1.05-1.09, p<0.001), 1.92 (95% CI: 1.73-2.13, p<0.001), and 1.56 (95% CI: 1.49-1.65, p<0.001) times more likely to receive general, direct research, and associated research payments than females, respectively. The number of pediatricians receiving general payments annually decreased by 1.5% (95% CI: -1.7% to -1.4%, p<0.001).

Conclusions

Most pediatricians received relatively small amounts of general payments and the number of pediatricians receiving the payments decreased annually.

Introduction

A controversial debate exists among the general public, professionals, and policy makers regarding the relationship between healthcare professionals and the healthcare industry, as to whether this relationship causes benefit or harm to patients. Proponents point out that the healthcare industry can contribute to continuous medical education among physicians as well as prompt collaboration in the development of drugs and medical devices. Furthermore, many physicians believe that accepting payments from the healthcare industry is appropriate and useful and has no influence on their practice whatsoever. However, several scandals caused by financial conflicts of interest between physicians and the healthcare industry have seriously damaged the trust in health and patient care in the United States.

In response to the growing concern that hidden financial relationships negatively influence patient care, the Physician Payments Sunshine Act was enacted in 2010 in the United States. This law mandates pharmaceutical and medical device manufacturers to disclose payments greater than $10 made to physicians and teaching hospitals on the federal website, namely the Open Payments Database.

Pediatricians are less likely to receive payments from the industry than other primary care specialists. Owing to the Open Payments program, many physicians accept non-research payments. In 2014, 42% of pediatricians received non-research payments from the industry. Furthermore, the proportion of physicians receiving payments and the median total payments per pediatrician was lower than most other specialties. Additionally, these payments were predominantly made to male physicians, indicating the lower representation of female physicians in several specialties outside of pediatrics.

However, these previous studies only assessed the relationship in a single year. To date, no analysis has been conducted to examine trends in payments from industry, the magnitude of research funding, and the characteristics of payments by pediatrician gender. This study aimed to evaluate the extent of payments for research and non-research purposes over the nine years since the inception of the Open Payments Database in 2013. Additionally, the study examined the differences in payments to pediatricians of both genders.

Methods

Study design and participants

This cross-sectional analysis of the Open Payments Database evaluated general and research payments made to pediatricians between August 2013 and December 2021 in the United States. Payments are reported as general payments; research payments; and ownership and investment interests.

Data collection

Demographic data of all active physicians whose primary specialty was classified as pediatrics and pediatric subspecialties were extracted from the Centers for Medicare & Medicaid Services National Plan and Provider Enumeration System (NPPES) database. Then, the NPPES database and the Open Payments physician profile database were matched by National Provider Identifier number, and downloaded all general payments and research payments made to matched pediatricians during the period.

To evaluate the size of research investments to pediatricians from the healthcare industry, this study included all research payments whose principal investigator was a matched pediatrician (associated research payments) and research payments made directly to individual pediatricians (direct research payments).
patients with COVID-19 (ClinicalTrials.gov Identifier: NCT04425629).

The associated research payments are largely made to institutions or teaching hospitals where a clinical trial is conducted, and include costs for investigated drugs, devices, and other equipment.

**Statistical analyses**

Descriptive analyses were performed on payment data overall and annually. The descriptive statistics of overall and annual payments were calculated only for physicians receiving payments over nine years and each year.9,14,19 Payments were analyzed by category, physician demographics, and company ID. The concentration of payments were evaluated by the share of payments by specific proportions of physicians and the Gini index.20 Gender differences in the proportion of pediatricians receiving payments and median per-physician payments were evaluated by chi-square test and Mann-Whitney rank sum test, respectively. Associations between gender and the likeliness of payment receipt were assessed by the multivariate modified log-linked Poisson regression model,21 and associations between the monetary values and the demographic data was evaluated by the multivariate negative binomial regression models,17,22,23 adjusting for other covariables including subspecialties and practicing divisions.

The trends in industry payments were examined by generalized estimating equation (GEE) models with panel-data of annual general payments. Since there was a sudden decrease in payments in 2020 due to the COVID-19 pandemic, the study employed the interrupted time series (ITS) analysis.24,25 A modified log-linked GEE model with Poisson distribution for the number of pediatricians with payments and a negative binomial regression GEE model for payments per physician were employed, as the general and research payments were right-skewed. A relative average annual change in payments was reported as a relative change percentage from the previous year. To adjust the impact of changes due to pediatricians receiving new licenses or retiring, pediatricians who retired or those qualifying after 2014 were excluded.26,27 This study also excluded payments for acquisitions, debt forgiveness, long-term medical supply or device loans, ownership interests, and royalties and licenses in the trend analysis of general payments because substantial amounts of general payments for royalties and licenses in several years or the payment categories were added in 2021. 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.

**Ethical clearance**

As this study is designed as a non-human subject study analyzing publicly available data, ethical review and approval was not required for this study. This study adhered to the strengthening the reporting of observational studies in epidemiology (STROBE) guideline.

**Results**

**Demographic characteristics and industry payments**

A total of 99,764 pediatricians were registered in the NPPES database. Of those, 69.0% were general pediatricians, 61.9% were female, and 18.9% practiced in the South Atlantic division. In total, 60.6% of all pediatricians received $2,322,632,121 in industry payments, including $296,779,873 in general payments, $24,164,619 in direct research payments, and $2,001,687,624 in associated research payments from 1,414 companies between August 2013 and December 2021. Payments were concentrated among a small number of pediatricians who accounted for a large share of the total payments.

**General payments**

In total, 60.1% of all pediatricians in the United States accepted $296,779,873 in general payments, entailing 1,763,214 payment contracts between them (Table 1). Among these general payments, 141 were under dispute, but 87.2% of payments were unchanged and 1.4% were changed. Median and average nine-year combined general payments per physician were $288 and $4,948, respectively. The top 1%, 5%, and 10% of pediatricians with general payments received 69.4%, 87.4%, and 91.5% of overall general payments, respectively. The Gini index for per-physician general payments was 0.935, indicating that only a few pediatricians received the vast majority of general payments.

Payments for food and beverages occupied 89.0% of general payments in the number of payments and $37,327,004 in monetary value (Supplemental Material 1). Speaking compensations not related to continuing medical education events were 29.3% of the total general payments. Consulting payments were 28.7%, but accounted for only 1.9% in the number of payment contracts. A total of 58.4%, 12.7%, and 5.5% of pediatricians received payments for food and beverages, education, and consulting payments from the companies, respectively.

A total of $127.2 million in general payments were made for specific medical products. Products for neuroscience and neurological diseases accounted for the largest amounts of general payments, totaling 5.9% of total 2016-2021 general payments, followed by allergy and immunology (4.7%), hematology (4.6%), vaccines (3.4%), and oncology (3.2%).

**Direct research and associated research payments**

In total, 1.5% and 5.1% of pediatricians received $24,164,619 in direct research payments and $2,001,687,624 in associated research payments, occupying 87.2% of all payments. Median nine-year combined payments per physician were $65,343 in associated research payments, while they were $2,544 in direct research payments. The top 1% of pediatricians received 33.5% of overall direct research payments and 31.7% of overall associated research payments, respectively. The Gini index for per-physician payments was 0.997 in direct research payments and 0.991 in associated research payments. Of 253,349 associated research payments, 1.2% were made for preclinical research, totaling $55.2 million of overall associated research payments. Overall, 14.4% of associated research payments were made for 929 different registered clinical trials. The largest associated research payments of $25,286,201 were made to a clinical trial evaluating safety, tolerability, and efficacy of anti-spike SARS-CoV-2 monoclonal antibodies for the treatment of ambulatory adult and pediatric patients with COVID-19 (ClinicalTrials.gov Identifier: NCT04425629).
Among the 23 pediatric subspecialties, more than 50% of pediatricians received at least one general payment over the nine years in 16 subspecialties (Supplemental Material 2). Overall, 24.5% of general payments were distributed to 41,545 general pediatricians, while median general payments per general pediatrician ($283) ranked 13th in the 23 subspecialties. Pediatric allergy and immunology physicians received the highest median general payments, followed by endocrinologists, transplant hepatologists, and pulmonologists (Figure 1). As for research payments per physicians by subspecialties, more than 30% of neonatal-perinatal medicine, transplant hepatology, and rheumatology physicians received one or more associated research payments. Pediatric emergency and neurodevelopment disability physicians received the largest median direct research payments of $19,465 and $10,427, respectively, while sleep medicine and pulmonology physicians received the largest associated research payments of $321,020 and $135,292, respectively (Supplemental Material 2).

Of 38,000 male pediatricians, 62.6% received one or more general payments over the nine years, while 58.6% of female pediatricians received the same. Male pediatricians received significantly higher per-physician general payments than females. Additionally, male pediatricians were more likely to receive direct and associated research payments than females. Both per-physician research payments were significantly larger for male pediatricians in direct and associated research payments than those for females. In the multivariable regression models adjusting other covariables, male pediatricians were 1.06 (Figure 2A), 1.92 (Figure 2B), and 1.56 (Figure 2C) times more likely to receive general, direct research, and associated research payments than females, respectively. Per-physician payments among pediatricians receiving each payment were 2.00 (Figure 3A) times higher in general payments and 1.38 (Figure 3B) times higher in direct research payments for males than for females. There was no significant association between gender and amounts of per-physician associated research payments (Figure 3C).

### Trends in industry payments

Total general payments ranged from $31,632,172 in 2015 to $59,006,018 in 2014 (Table 1). Per-physician general payments did not significantly change between 2014 and 2019. Meanwhile, 22.7% to 38.6% of pediatricians received general payments each year, and, after excluding pediatricians who started practicing or retired after 2014, the number of pediatricians receiving general payments annually decreased by 1.5% (Supplemental Material 3).

In 2020, the total general payments decreased to $24,216,209 from $33,078,845 in 2019, and the median payments per physician and the number of pediatricians receiving general payments also decreased to $53 from $96 and 22.7% from 32.6% in 2019, respectively. The ITS regression model showed that per-physician general payments and the number of pediatricians receiving general payments decreased by 44.7% and 34.5%. There was a recovering trend in the number of pediatricians receiving general payments by 3.8% per year.

Total amounts of associated research payments constantly increased from $157,077,965 in 2014 to $387,813,076 in 2021. Only 0.3-0.4% and 2.4-2.6% of pediatricians received one or more direct and associated research payments annually, respectively. Per-physician payments per year ranged from $1,212-2,623 in direct research and $16,832-26,988 in associated research payments. While there were no significant trends in direct research payments, the number of pediatricians receiving associated research payments and per-physician associated research payments increased by 2.3% and 8.3% between 2014 and 2019.

### Discussion

This study found that 60.1% of all pediatricians accepted $297 million in general payments and more than $2 billion in research payments from the healthcare industry during the period. While most pediatricians received general payments which were non-research, personal payments, only 5.1% received research payments over nine years. Male pediatricians had significantly higher opportunities to receive general and research payments from the healthcare industry than females. The COVID-19 pandemic significantly decreased the general payments to pediatricians but had no impact on research payments.

The pediatricians received much lower general payments than most of the other specialists. The median per-physician payments to pediatricians were the third lowest among 25 specialties in 2015, and family medicine, internal medicine, and other primary care physicians received $186 and $248 in median per-physician general payments in 2015, respectively. Most general payments were distributed to the majority of pediatricians in the form of food and beverages. Since the inception of the Open Payments Database, the influence of industry payments to physician clinical practice has been explored. Even though most physicians believe that financial interactions with the healthcare industry do not impact on their clinical practice and are beneficial, useful, and educational, a substantial amount of evidence has shown the contrary. Even a small payment, such as for food and beverages worth less than $20, is associated with an increase in brand-name drug prescriptions for statins, β-blockers, angiotensin-converting enzyme inhibitors and angiotensin-receptor blockers, and selective serotonin and serotonin-norepinephrine reuptake inhibitors. Additionally, these payments to physicians increase healthcare costs and prescriptions of drugs, with less safety and lower effectiveness. A recent systematic review proved that payments influence physician clinical practices. Non-research payments may be harmful to patients, since these decrease the patient's ability to make independent therapeutic decisions. Additionally, pediatricians may be influenced by financial interactions with pharmaceutical companies. Meanwhile, the healthcare industry made large non-research payments to the pediatricians for vaccines. Payments from manufacturers of these products might be beneficial for children, patients, and public health, and future studies must elucidate the association between pediatrician prescription patterns and industry payments by type of product.

There were differences in the genders regarding the likeliness to receive non-research and research payments from the industry. Gender gaps in payments are described among several specialists. This might be due to gender differences in patterns and motivations to receive industry payments. Despite the increasing number thereof, female pediatricians earn $51,000 less compared to male pediatricians in the United States. Even after adjusting for covariables, the average wages were $8,000 lower among female pediatricians than males. Female physicians may not be able to negotiate to increase their earnings and accept a lower salary for non-work benefits such as flexibility of work time and location for their household and childcare responsibilities.
industry-sponsored dinners and lectures require time outside of working hours, female pediatricians may have refused to attend and accept these non-research payments from the healthcare industry and might not have negotiated increasing the associated payments.\textsuperscript{11}

Meanwhile, the healthcare industry made most payments for research purposes. Male pediatricians were twice more likely to receive associated research payments than females, while the per-physician amounts did not differ between genders. This indicates the lower representation of females in research fields, though female pediatricians predominate in the United States. Female pediatricians gained fewer research grants from the National Institute of Health.\textsuperscript{44,45} The research funds to female pediatricians were also lower from the healthcare industry. As the industry makes general and research payments to physicians with extensive clinical and research experience, the lower payments to female pediatricians may be the result of a smaller proportion thereof in influential or authoritative positions.\textsuperscript{46} This study provide a starting point to examine gender differences in payments to pediatricians, and future studies should evaluate the gender differences in payments adjusting for other confounding factors, including positions in affiliations and professional societies and graduation schools.

The study demonstrated that there were different trends in general and associated research payments to pediatricians since the inception of the Open Payments Database. While the number of pediatricians receiving general payments decreased, the amounts constantly increased. The Open Payments Database was initiated to increase the transparency in the physician-industry financial relationships, and public pressure and critique were expected to lead to physicians declining payments from the healthcare industry. To the contrary, Marshall et al. reported that the general payments to primary care physicians, including pediatricians, decreased annually by 3.7\% in total payments and by 8.0\% in the number of physicians receiving payments between 2014 and 2018.\textsuperscript{47} Considering extensive evidence that physician-industry financial interactions influence physician patient care, all physicians, including pediatricians, should be aware of and pay attention to the influence of payments, and refrain from receiving the payments for the sake of their patients.

This study had several limitations. First, the Open Payments Database might include errors and possibilities of inaccuracies of data, though the payment data can be reviewed and disputed by physicians. Second, there might be differences in physician demographic data between the NPPES database and other databases such as the American Board of Pediatrics and the Association of American Medical Colleges databases, as these are structured based on different methods. Third, the associations between the payments and pediatrician demographic characteristics might be influenced by other non-measured factors such as physician age, workplace type, position, and school. However, these variables are not available from the NPPES and the Open Payments Database. Fourth, the Open Payments Database includes financial transfers from the companies making products approved by the Food and Drug Administration and, therefore, there would be financial relationships between the pediatricians and other companies not covered by the Open Payments Database.

**Conclusion**

Most pediatricians received relatively small amounts of general payments between 2013 and 2021. Male pediatricians were more likely to receive general, direct research, and associated research payments from the healthcare industry than females. The number of pediatricians receiving general payments decreased, while per-pediatrician associated research payments constantly increased since the inception of the Open Payments Database in the United States.

**List of Abbreviations**

- CPI Consumer price index
- GEE Generalized estimating equation
- ITS Interrupted time series
- NPPES National Plan and Provider Enumeration System

**Declarations**

**Conflicts of interest**

The author declared no financial and non-financial conflicts of interest.

**Funding**

The author did not receive any financial support for this study.

**Data Sharing**

All data the author used in this study is available from the Open Payments Database (https://openpaymentsdata.cms.gov/) and the National Plan and Provider Enumeration System (https://npiregistry.cms.hhs.gov/search).

**Acknowledgement**

The author would like to thank Editage (www.editage.com) for English language editing and Ms Megumi Aizawa for her dedicated support of my research project.

**Author Contribution**
References


33. Zezza MA, Bachhuber MA. Payments from drug companies to physicians are associated with higher volume and more expensive opioid analgesic prescribing. PLOS ONE. 2018;13:e0209383.


Table

Table 1. Summary of annual general and research payments to pediatricians between 2013 and 2021
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General payments</strong></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 payment amounts, $</td>
<td></td>
<td>11,460,920</td>
<td>59,006,018</td>
<td>31,632,172</td>
<td>42,878,635</td>
<td>33,426,682</td>
<td>35,522,717</td>
<td>33,078,845</td>
<td>24,216,209</td>
<td>25,557,675</td>
</tr>
<tr>
<td>Number of physicians with payments, n (%)$</td>
<td></td>
<td>22,523 (26.9)</td>
<td>30,754 (30.5)</td>
<td>34,516 (38.6)</td>
<td>33,934 (36.9)</td>
<td>32,599 (34.7)</td>
<td>32,712 (34.0)</td>
<td>31,724 (32.6)</td>
<td>22,285 (22.7)</td>
<td>23,623 (23.7)</td>
</tr>
<tr>
<td>Payments per physician, $</td>
<td></td>
<td>51 (23–113)</td>
<td>104 (38–230)</td>
<td>94 (32–202)</td>
<td>96 (33–211)</td>
<td>97 (33–214)</td>
<td>98 (33–212)</td>
<td>96 (33–209)</td>
<td>53 (23–126)</td>
<td>74 (27–186)</td>
</tr>
<tr>
<td><strong>Direct research payments</strong></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 payment amounts, $</td>
<td></td>
<td>1,571,012</td>
<td>2,635,067</td>
<td>1,862,189</td>
<td>3,671,048</td>
<td>2,250,453</td>
<td>2,041,296</td>
<td>2,179,341</td>
<td>3,597,467</td>
<td>4,356,746</td>
</tr>
<tr>
<td>Number of physicians with payments, n (%)$</td>
<td></td>
<td>291 (0.4)</td>
<td>314 (0.4)</td>
<td>333 (0.4)</td>
<td>410 (0.5)</td>
<td>346 (0.4)</td>
<td>288 (0.3)</td>
<td>320 (0.3)</td>
<td>315 (0.3)</td>
<td>312 (0.3)</td>
</tr>
<tr>
<td>Payments per physician, $</td>
<td></td>
<td>2,031 (759–3,682)</td>
<td>2,392 (900–4,642)</td>
<td>1,212 (379–3,007)</td>
<td>1,645 (821–3,000)</td>
<td>1,530 (776–3,546)</td>
<td>1,530 (542–5,547)</td>
<td>2,623 (899–6,225)</td>
<td>2,108 (511–6,061)</td>
<td></td>
</tr>
<tr>
<td><strong>Associated research payments</strong></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 payment amounts, $</td>
<td></td>
<td>61,317,279</td>
<td>157,077,965</td>
<td>181,677,465</td>
<td>183,096,271</td>
<td>216,687,502</td>
<td>242,142,903</td>
<td>251,809,647</td>
<td>320,065,516</td>
<td>387,813,076</td>
</tr>
<tr>
<td>Number of physicians with payments, n (%)$</td>
<td></td>
<td>1,418 (1.7)</td>
<td>2,122 (2.5)</td>
<td>2,266 (2.5)</td>
<td>2,284 (2.5)</td>
<td>2,451 (2.6)</td>
<td>2,410 (2.5)</td>
<td>2,381 (2.4)</td>
<td>2,450 (2.5)</td>
<td>2,368 (2.4)</td>
</tr>
</tbody>
</table>

1. Direct research payment data includes payments made to individuals, organizations, and institutions.
2. Associated research payment data includes payments made to individuals, organizations, and institutions.

$ - Denotes statistical significance at the 0.05 level.
Abbreviations: interquartile range (IQR), SD (standard deviation)

† The payment data in 2013 were payments made to physicians between August 1 and December 30.

‡ The proportion of pediatricians receiving payments each year were calculated based on the total number of pediatricians registering in the year when they received the payment.

**Figures**

**Figure 1**

Median per-physician general payments by subspecialties

Legend: Pediatric allergy/immunology physicians included physicians categorized as “Pediatric Clinical & Laboratory Immunology”.
Figure 2

Proportion of pediatricians receiving general (A), direct research (B), associated research (C), and total payments (D) between 2013 and 2021 by gender.

Figure 3

Nine-year combined per-physician general (A), direct research (B), associated research (C), and total payments (D) by gender.
Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- SupplementalMaterials.docx