Research Square

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Persistent gender pay gaps among Canadian allergists: a population based longitudinal study

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Abstract

Background:

Despite growing representation of women in medicine, a persistent gender pay gap remains. In Ontario, women make up over half of Clinical Immunology and Allergy (CIA) physicians, making the field well-suited for examining income disparities. This study uses Ministry of Health data obtained by the Ontario Medical Association to quantify the gender pay gap in CIA and identify contributing factors.

Methods:

We conducted a longitudinal analysis to investigate the gender pay gap among CIA physicians in Ontario, Canada from 2018 to 2023. Administrative health data, from the Ontario Health Insurance Plan, were analyzed to determine differences in clinical payments by gender. We used multivariable linear mixed-effects models (physician random intercepts) with log-transformed, inflation-adjusted annual clinical income as the outcome and adjusted for physician demographics, practice characteristics, and work patterns.

Results:

Among 211 CIA physicians in Ontario (2018–2023), mean annual gross clinical payments were higher for male than female physicians ($443,969 vs $279,835; $p<0.001$). In adjusted linear mixed-effects models, female physicians earned significantly less than male physicians ($\beta = -0.25$; 95% CI −0.37 to −0.13; $p<0.001$), corresponding to approximately 22% lower annual clinical income after adjustment for demographic factors, practice characteristics, and work patterns.

Interpretation:

Our analysis reveals that women physicians earned significantly less than their male counterparts, and the gap persisted even after adjusting for demographic variables, practice characteristics, and work patterns. These findings point to systemic inequities and emphasize the need to address gender-based disparities to support physician retention, satisfaction, and quality of care.

Introduction

In 2019, women made up 43% of Canadian physicians. (1), yet despite the growing presence of women in medicine, there is a clear gender pay gap that exists both locally and internationally (2–6). This has been seen across both surgical and medical specialties, even after adjusting for factors such as hours worked, years of experience, and practice setting (7). These inequities start at the early stages of a medical career and continue over time, affecting lifetime wealth, with one US-based study estimating this to be as high as $2.5 million over the span of a 30-year career (8).

Prior reports have found a gender pay disparity within the field of Clinical Immunology and Allergy (CIA), where women make up close to half of the physician workforce in Ontario; however, this has not previously been fully elucidated (2, 9). CIA is particularly suited for analysis of the gender pay disparity due to its unique practice characteristics: a mix of fee-for-service and salaried models, high patient visit volumes, and the integration of clinical care with both diagnostic and procedural services. These factors provide a comprehensive framework to explore how gender impacts earning potential within the specialty.

CIA provides a policy-relevant test case within a publicly funded, fee-for-service system where remuneration is closely tied to billing codes, referral patterns, and procedural mix. First, it aligns with broader efforts to promote equity, diversity, and inclusion within the medical profession. Second, addressing pay disparities is essential to improving job satisfaction and retention among female physicians. Finally, identifying and mitigating systemic barriers can enhance the overall efficiency and effectiveness of health care delivery by ensuring that all physicians are adequately supported and compensated.

This study aims to further analyze the gender pay gap in CIA in Ontario, using Ontario Health Insurance Plan (OHIP) data to quantify disparities and identify potential contributing factors. By doing so, we aim to provide actionable insights and recommendations to promote equity within the specialty and the healthcare system at large.

Methods

Study Design

This study employed a longitudinal analysis to investigate the gender pay gap among physicians practicing allergy and immunology in Ontario, Canada. Administrative health data, primarily derived from Ontario Health Insurance Plan (OHIP) billing records, were analyzed to determine differences in clinical payments by gender. The study adhered to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE).

Study Population and Data Sources

The study included all physicians who had a CIA practice, based on submitted OHIP claims, between fiscal years 2018 and 2023. Physicians were identified as having a CIA practice if they had a billing specialty of immunology/allergy (billing specialty code 62); or if they had a billing specialty of pediatrics (26) or internal medicine (13) and had submitted fee codes for a clinical immunology consultation (A625, A765), or a combination of a consultation (A135, A265) and provocation test (G190, G208). Physicians with incomplete records or anomalous billing data (e.g., total billings of $0) were excluded. Physicians billing for less than three days a week were considered part-time.

Data were obtained from the Ontario Ministry of Health through a data sharing agreement with the Ontario Medical Association. Data included clinical payments, physician demographics (e.g., age, sex, years since graduation), and practice characteristics, from the OHIP Claims History Database, the Corporate Provider Database and relevant administrative sources. Payments were aggregated annually to estimate the total payment each year and adjusted to reflect daily earnings by dividing the total payment by the number of days billed.

Details on statistical analysis and specific variables are included in Appendix A.

Results

Descriptive statistics

The sample included 211 physicians with a clinical immunology and allergy (CIA) practice (Table 1, Figures 1–2), of whom 52% were female. The mean annual total payment was $359,180 (SD = $213,688), with male physicians earning significantly more on average ($443,969 vs. $279,835, $p < 0.001$). The average time since graduation was 19 years (SD = 14), with male physicians having been in practice longer than females (24 vs. 15 years, $p < 0.001$). Part-time work was more common among female physicians (56% vs. 27%, $p < 0.001$). On average, physicians worked on weekends, holidays, or after-hours on 6% of billing days (SD = 10%), with males doing so slightly more frequently than females (8% vs. 5%, $p = 0.004$).

Approximately 31% of physicians practiced in rural areas, with no significant gender difference ($p = 0.7$). Practice settings varied: 55% of physicians worked in community settings, 31% in mixed settings, and 13% in hospitals, with no significant difference by gender ($p = 0.4$). About one-quarter (23%) of physicians operated under an alternative payment plan (APP), and 17% were affiliated with an academic institution, with no notable gender disparities in either category.

Most visits were billed under fee-for-service, averaging 95% of visits (SD = 19%), with male physicians billing a slightly higher proportion under fee-for-service than females (98% vs. 93%, $p = 0.047$). Female physicians had a significantly higher pediatric patient volume (48% vs. 29%, $p < 0.001$) and saw patients who were younger on average (27 vs. 39 years, $p < 0.001$). The mean number of visits per patient was 1.81 (SD = 0.65), with a marginally higher volume among male physicians (1.92 vs. 1.70, $p = 0.052$).

Primary Analysis: Overall Gender Pay Gap

We estimated a mixed-effects model to assess physician earnings across fiscal years, adjusting for sex, work status, care setting, patient characteristics, and service delivery (Table 2, Figure 3). Annual physician income was modeled on the log scale and then back-transformed for interpretation in dollars.

Female physicians earned significantly less than male physicians (Table 2). In the adjusted model female sex was associated with a -0.25 difference on the log income scale (95% CI: -0.37 to -0.13), corresponding to approximately 22% lower annual clinical income.

Physician practice characteristics were strongly associated with income. As expected, part-time physicians earned substantially less than full-time physicians, with an average income reduction of 39%. A higher proportion of visits delivered under fee-for-service payment was associated with a 61.6% increase in income, while those providing more weekend care earned nearly 88% more than peers with lower weekend workloads. Physicians with a greater proportion of pediatric patients earned significantly less, with income nearly 40% lower than those with more adult patients.

A notable decline in physician income was observed during the early years of the COVID-19 pandemic. Earnings dropped sharply in 2020 ($\beta = -0.23$, $p < 0.001$), and a more modest decline continued into 2021 ($\beta = -0.10$, $p < 0.01$). Estimates for 2022 and 2023 suggested a gradual rebound, though these later changes were not statistically significant.

Secondary Analysis: Gender Pay Gap Over Time

We estimated a linear mixed-effects model to examine gender differences in physician earnings over time (Table 3, Figure 4). The model was specified in the same way as the main analysis but included interactions between sex and fiscal year.

The analysis showed a persistent and statistically significant gender pay gap among physicians over the study period. At baseline (2018), female physicians earned substantially less than their male counterparts, with an estimated difference of -0.30 on the log-transformed income scale (95% CI: -0.44 to -0.15, $p < 0.001$), corresponding to approximately 26% lower income for women after adjusting for relevant covariates. Interaction terms between gender and fiscal year showed no statistically significant changes in the gender pay gap over time. Although the coefficients for the most recent years (2022 and 2023) were positive, suggesting a possible narrowing of the gap, none of these interactions reached statistical significance.

The gender pay gap remained consistent during the pandemic period, with no statistically significant change. In 2020, female physicians continued to earn significantly less than male physicians, and the interaction term for female physicians that year was small and non-significant ($\beta = -0.05$, 95% CI: -0.16 to 0.07).

Interpretation

Our analysis reveals that female physicians earn significantly less than their male counterparts, even after adjusting for demographic variables, practice characteristics, and work patterns. The findings of

this study support prior reports that have highlighted the physician pay gap both locally and nationally, but is the first to quantify this pay gap in CIA (2, 6).

Our data show that CIA physicians in Ontario, on average, earn substantially less than their male counterparts and this gap persists even when adjusting for years in practice, patient volumes, and fee-for-service (FFS) versus APP models. These findings are consistent with structural contributors to inequity, including differences in referral patterns, billing code utilization, and payment model exposure, though causality cannot be established from administrative data.

Further subgroup analyses indicate that the disparity was more pronounced in FFS settings compared to APP models, highlighting the role of billing practices. Discrepancies in billing practices are pervasive in medical practice and previous studies have found that female physicians are more likely to miss opportunities to bill higher visit codes (13, 14). A recent systematic review identified major contributing factors, including the absence of a formal billing curriculum during residency and a lack of structured feedback to improve billing accuracy (15). For trainees, integrating a formal billing curriculum into residency programs can help ensure that new specialists are equipped with tools for accurate and equitable billing. For practicing physicians, continuing medical education sessions focused on billing updates should be offered through national and provincial conferences. This standardized protocol (Appendix D) could serve as a foundation for these educational initiatives, thereby promoting consistency and equity across the field.

A contributing factor of the gender pay gap has been linked to gender disparities in career progression. This is influenced by a complex interplay of factors including but not limited to workplace bias, professional isolation, unequal access to leadership roles, and societal expectations around family responsibilities (16, 17). Systemic audits may be one way in which to address this. Drawing on a modified Delphi consensus in Emergency Medicine, core metrics can include compensation, promotion equity, and the presence of institutional equity strategies among others (11). Research in organizational behavior indicated that the formation of dedicated equity roles or committees was among the most effective interventions for institutional change, likely due to improved accountability (12). Evidence also suggests that formal mentorship programs through women-focused professional organizations can mitigate some of these challenges (18, 19). Lin et al. identified key outcomes from participating in such programs, including increased access to sponsorship, enhanced confidence through peer support, leadership skill development, and improved negotiation skills (19). Professional mentorship programs have demonstrated improvements in retention and advancement in other specialties (19) and in CIA, the "Women in Allergy" group has played a pivotal role in offering such opportunities. Continued support for such initiatives will be essential in advancing gender equity within the specialty.

Our data also showed that female CIA physicians tended to have lower patient visit volumes, and report spending more time on non-billable activities, such as patient education and administrative duties. Although our study did not define the length of patient encounters, a 2020 study found that female primary care physicians on average spent nearly 16% more time with patients, even after accounting for

confounding variables such as patient complexity (13, 32). These differences may arise from long-held sociocultural norms and expectations of female physicians (13, 20). As such, there have been previous suggestions on reforming FFS payment models to more accurately reflect time spent with patients and account for case complexity as a way to lessen the gender pay gap (6).

Previous studies have identified differences in referral patterns based on gender in Ontario, noting that part of the gender pay gap that exists may be secondary to male specialists receiving more lucrative referrals (14, 21, 22). A referring bias has also been identified, where even though physicians of the same gender were more likely to refer to one another; both genders still disproportionately refer to male specialists (14). This has significant implications for equitable allocation of referrals within specialties, including CIA. To mitigate this, a province-wide, centralized referral system can be considered. One such system was developed by the eHealth Centre of Excellence which enables referrals based on shortest wait times, geographic proximity, and specific provider or patient preference (23) and has improved access and administrative efficacy in multiple surgical and medical specialties (24–26). Expansion and adequate funding of this system could enhance both equity and operational efficiency within CIA and beyond.

The current study poses several limitations. Given that the study analyzed physician billing data from OHIP, it was not possible to account for physician overhead costs. Based on the 2017 Canadian Medical Association survey, specialists report that an average of 21.55% of their gross income goes towards overhead costs (27). Although a previous study has reported the differences in overhead based on specialty (28), overhead data specific to CIA is lacking. Future research is required to investigate whether a gender discrepancy is present with regards to overhead costs.

Additionally, given that the OHIP billing structure primarily offers payment based on the number of patients seen, the current study cannot assess the total number of hours worked per day by each physician or consider the varying case complexity. A common misconception may attribute the difference in earning to a difference in the number of hours worked per day. However, previous research reported that women earn 24% less than men on an hourly basis. In some specialties, this translated to a difference of $70 per hour (29).

Not all physician services are covered by OHIP. Administrative tasks, such as notes to employers and some health-related application forms (e.g. disability and insurance forms) are often compensated through out-of-pocket payment (30). These earnings are not captured in OHIP billings. Further evaluation on uninsured services would allow for a more comprehensive understanding of gender differences in earning. Additionally, our data does not capture shadow billing or APP models outside OHIP.

This study underscores the importance of addressing gender-based disparities to improve physician satisfaction, retention, and overall healthcare delivery. By fostering a more equitable work environment, the field of CIA can serve as a model for other specialties.

While a series of interventions has been proposed, it is critical to acknowledge the complexity of the issue. For example, while negotiation training may improve compensation outcomes in academic settings, it may also provoke negative reactions, as women are disproportionately penalized for assertive negotiation (31). Similarly, anti-bias education can inadvertently reinforce stereotypes (12). These unintended consequences highlight the deeply rooted nature of gender inequity and underscore the need for ongoing interdisciplinary research to address its psychological, sociological, and cultural underpinnings.

Declarations

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Competing Interests: Dr. Zainab Abdurrahman is a past president of the Ontario Medical Association. Dr. Samira Jeimy is a part chair of OMA Women, vice-chair of OMA Allergy and Immunology, chair of Women in Allergy and Immunology, and a board of director member of Canadian Society of Allergy and Clinical Immunology. Dr. Lyn Sibley, Donna Plett, Dr. Chunga Kim, and Dr. Sujata Mishra are employees of the Ontario Medical Association.

The other authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this article.

Author Contribution

Samina Nazarali and Xinxin Tang co wrote and revised the initial draft of the manuscript Zainab Abdurrahman, Tiffany Wong, Victoria E. Cook provided critical suggestions for conception and revision Donna Plett, Chunga Kim, Sujata Mishra, Lyn M. Sibley collected data and performed analysis Samira Jeimy conceived the idea, analyzed and revised the content, and created the final version of the manuscript

Data Availability

The Ontario Health Insurance Plan billing data that support the findings of this study were obtained from the Ontario Medical Association (OMA). Restrictions apply to the availability of these data, which were provided for the purposes of this study and are not publicly available. Access to the data may be available upon reasonable request and with permission from the Ontario Medical Association.

References

1. Canadian Medical Association. Canadian Medical Association. 2019 [cited 2025 Jan 31]. CMA masterfile. Available from: https://www.cma.ca/quick-facts-canadas-physicians

2. Cohen M, Kiran T. Closing the gender pay gap in Canadian medicine. Can Med Assoc J. 2020;192(35):E1011–7.
3. Read S, Butkus R, Weissman A, Moyer DV. Compensation disparities by gender in internal medicine. Ann Intern Med. 2018;169(9):658–61.
4. Weaver AC, Wetterneck TB, Whelan CT, Hinami K. A matter of priorities? Exploring the persistent gender pay gap in hospital medicine. J Hosp Med. 2015;10(8):486–90.
5. Jones M, Kaya E. The gender pay gap in medicine: evidence from Britain. Oxf Econ Pap. 2024;76(4):1033–51.
6. Steffler M, Chami N, Hill S, Beck G, Cooper SC, Dinniwell R et al. Disparities in physician compensation by gender in Ontario, Canada. JAMA Netw Open. 2021 Sept 1;4(9):e2126107.
7. Jagsi R, Griffith KA, Stewart A, Sambuco D, DeCastro R, Ubel PA. Gender differences in the salaries of physician researchers. JAMA 2012 June 13;307(22):2410–7.
8. Whaley CM, Koo T, Arora VM, Ganguli I, Gross N, Jena AB. Female physicians earn an estimated $2 million less than male physicians over a simulated 40-year career. Health Aff Proj Hope. 2021;40(12):1856–64.
9. Blumenthal KG, Bansal P, Youssef CM, Pappalardo AA. Women in Allergy and Immunology: The Future Is Female. Let Us Soar! J Allergy Clin Immunol Pract. 2023;11(12):3569–77.
10. Kralj B. Measuring rurality for purposes of health-care planning: an empirical measure for Ontario. Ont Med Rev. 2000.
11. Love JS, Zeidan AJ, Khatri UG, Samuels-Kalow ME, Mills AM, Hsu CH. WOMen profEssioNal developmenT oUtcome Metrics in Academic Emergency Medicine: Results from the WOMENTUM Modified Delphi Study. West J Emerg Med. 2022 Sept 12;23(5):660–71.
12. Kalev A, Dobbin F, Kelly E. Best practices or best guesses? Assessing the efficacy of corporate affirmative action and diversity policies. Am Sociol Rev. 2006;71.
13. Ganguli I, Sheridan B, Gray J, Chernew M, Rosenthal MB, Neprash H. Physician work hours and the gender pay gap — evidence from primary care. N Engl J Med 2020 Sept 30;383(14):1349–57.
14. Chami N, Weir S, Shaikh SA, Sibley LM, Simkin S, Wright JG, et al. Referring and specialist physician gender and specialist billing. JAMA Netw Open. 2023;6(8):e2328347.
15. Burks K, Shields J, Evans J, Plumley J, Gerlach J, Flesher S. A systematic review of outpatient billing practices. SAGE Open Med. 2022;10:20503121221099021.
16. Bishu SG, Alkadry MG. A systematic review of the gender pay gap and factors that predict it. Adm Soc. 2017;49(1):65–104.
17. Nguyen AXL, Ratan S, Biyani A, Trinh XV, Saleh S, Sun Y, et al. Gender of award recipients in major ophthalmology societies. Am J Ophthalmol. 2021;231:120–33.
18. Voytko ML, Barrett N, Courtney-Smith D, Golden SL, Hsu FC, Knovich MA, et al. Positive value of a women's junior faculty mentoring program: a mentor-mentee analysis. J Womens Health. 2018;27(8):1045–53.

19. Lin MP, Lall MD, Samuels-Kalow M, Das D, Linden JA, Perman S, et al. Impact of a women-focused professional organization on academic retention and advancement: perceptions from a qualitative study. Acad Emerg Med Off J Soc Acad Emerg Med. 2019;26(3):303–16.
20. Linzer M, Harwood E. Gendered expectations: do they contribute to high burnout among female physicians? J Gen Intern Med. 2018 June;33(6):963–5.
21. Dossa F, Zeltzer D, Sutradhar R, Simpson AN, Baxter NN. Sex differences in the pattern of patient referrals to male and female surgeons. JAMA Surg. 2022;157(2):95–103.
22. Valle L, Weng J, Jagsi R, Chu FI, Ahmad S, Steinberg M, et al. Assessment of differences in clinical activity and medicare payments among female and male radiation oncologists. JAMA Netw Open. 2019;2(3):e190932.
23. eHealth Centre of Excellence. eReferral Receivers Lists [Internet]. Available from: https://ehealthce.ca/eReferral-Receivers-Lists.htm
24. Long waits for specialist. care must end [Internet]. [cited 2026 Jan 17]. Available from: https://www.oma.org/news/2023/october/long-waits-for-specialist-care-must-end/
25. A centralized booking system for specialists would revolutionize health care. The Toronto Star [Internet]. 2023 Mar 25 [cited 2026 Jan 17]; Available from: https://www.thestar.com/opinion/contributors/a-centralized-booking-system-for-specialists-would-revolutionize-health-care/article_521b4220-9fcd-54f4-8ed6-ec496f6641f0.html
26. McAlister CN. Centralized referral systems can both shorten wait times and preserve patient autonomy. CMAJ 2020 June 15;192(24):E659.
27. CMA. CMA physician workforce survey - Canadian medical association [Internet]. [cited 2025 Mar 30]. Available from: https://surveys.cma.ca/
28. Petch J, Dhalla IA, Henry DA, Schultz SE, Glazier RH, Bhatia S, et al. Public payments to physicians in Ontario adjusted for overhead costs. Healthc Policy. 2012;8(2):30–6.
29. Dossa F, Simpson AN, Sutradhar R, Urbach DR, Tomlinson G, Detsky AS, et al. Sex-based disparities in the hourly earnings of surgeons in the fee-for-service system in Ontario, Canada. JAMA Surg. 2019;154(12):1134–42.
30. OMA. Physician's guide to uninsured services - a guide for Ontario physicians. 2024; Available from: https://www.oma.org/siteassets/oma/media/pagetree/pps/billing/uninsured-services/physicians-guide-uninsured-services2024.pdf
31. Bowles HR, Babcock L, Lai L. Social incentives for gender differences in the propensity to initiate negotiations: Sometimes it does hurt to ask. Organ Behav Hum Decis Process. 2007;103(1):84–103.
32. Kralj B, Sibley L, Kantarevic J, Clements K, Vanstone M, O'Toole D, et al. Association between family physician gender and patient service times. CFP. 2026;72(1):e17–25.

Tables

Table 1. Descriptive statistics comparing demographic variables, practice characteristics, and work pattern in male and female CIA physicians.

Characteristic	Overall N = 211[1]	Male N = 102[1]	Female N = 109[1]	p-value[2]
Total Pay	359,180 (213,688)	443,969 (242,748)	279,835 (143,308)	<0.001
Years Since Graduation	19 (14)	24 (16)	15 (11)	<0.001
Part-Time Status	89 (42%)	28 (27%)	61 (56%)	<0.001
Days Worked (incl. weekends/holidays)	0.06 (0.10)	0.08 (0.10)	0.05 (0.10)	0.004
Rurality	66 (31%)	33 (32%)	33 (30%)	0.7
Practice Setting				0.4
Community	117 (55%)	52 (51%)	65 (60%)	
Hospital	28 (13%)	14 (14%)	14 (13%)	
Mixed	66 (31%)	36 (35%)	30 (28%)	
Payment Model (APP vs FFS)	49 (23%)	24 (24%)	25 (23%)	>0.9
Academic Affiliation	36 (17%)	19 (19%)	17 (16%)	0.6
Percent Visits FFS	95% (19%)	98% (14%)	93% (22%)	0.047
Pediatric Patient Volume (<17)	38% (32%)	29% (29%)	48% (33%)	<0.001
Patient Volume (Avg Visits/Patient)	1.81 (0.65)	1.92 (0.78)	1.70 (0.48)	0.052
Mean Patient Age	32 (17)	39 (17)	27 (15)	<0.001

[1] Mean (SD); n (%)

[2] Wilcoxon rank sum test; Pearson's Chi-squared test

Table 2: Gender and Practice Characteristics Predicting Annual Clinical Income (log-transformed)

	Estimate (No Outliers)	95% CI	Estimate (Full Sample)	95% CI
Intercept	12.72***	[12.18 – 13.25]	13.12***	[12.37 – 13.87]
Female (vs Male)	-0.25***	[-0.37 – -0.13]	-0.25**	[-0.43 – -0.07]
Fiscal Year: 2019	-0.02	[-0.08 – 0.04]	-0.05	[-0.13 – 0.04]
Fiscal Year: 2020	-0.23***	[-0.29 – -0.17]	-0.27***	[-0.36 – -0.18]
Fiscal Year: 2021	-0.10**	[-0.16 – -0.04]	-0.15**	[-0.24 – -0.06]
Fiscal Year: 2022	-0.06	[-0.12 – 0.00]	-0.06	[-0.15 – 0.03]
Fiscal Year: 2023	-0.03	[-0.09 – 0.03]	-0.04	[-0.13 – 0.05]
Part-Time (vs Full-Time)	-0.49***	[-0.55 – -0.44]	-0.66***	[-0.74 – -0.58]
Rural Practice	0.13**	[0.04 – 0.22]	0.11	[-0.03 – 0.24]
Setting: Mixed (vs Community)	-0.05	[-0.20 – 0.10]	-0.00	[-0.20 – 0.20]
Setting: Hospital-Based (vs Community)	-0.06	[-0.14 – 0.02]	0.08	[-0.03 – 0.19]
Alternative Payment Plan	0.06	[-0.01 – 0.14]	-0.04	[-0.14 – 0.07]
% Fee-for-Service Visits	0.48***	[0.23 – 0.73]	0.23	[-0.09 – 0.55]
Years Since Graduation	0.00	[-0.00 – 0.01]	-0.00	[-0.01 – 0.00]
% Weekend/Holiday Billing Days	0.63**	[0.16 – 1.10]	-1.15***	[-1.61 – -0.69]
Academic Affiliation	-0.06	[-0.19 – 0.07]	-0.03	[-0.21 – 0.15]
Mean Patient Age	-0.01*	[-0.02 – -0.00]	-0.02*	[-0.03 – -0.00]
% Pediatric Patients	-0.51*	[-0.94 – -0.07]	-1.09**	[-1.70 – -0.48]

	Estimate (No Outliers)	95% CI	Estimate (Full Sample)	95% CI
Average Visits per Patient	0.15***	[0.10 – 0.21]	0.36***	[0.27 – 0.44]
Random Effects and Model Fit				
Residual variance (σ^2)	0.05		0.12	
Physician-level variance (τ_{00})	0.14		0.33	
Intraclass correlation (ICC)	0.74		0.74	
Number of physicians	211		228	
Observations	830		913	
Marginal R^2 / Conditional R^2	0.39 / 0.84		0.37 / 0.84	

* p < 0.05 | ** p < 0.01 | *** p < 0.001
Estimates are from linear mixed-effects models with random intercepts for physicians. Outcome is log-transformed, inflation-adjusted annual clinical income.

Table 3: Linear mixed-effects model of annual clinical income (log-transformed).

	Estimate	95% CI
Intercept	12.75***	[12.22 – 13.29]
Female (vs Male)	-0.30***	[-0.44 – -0.15]
Fiscal Year: 2019 (vs 2018)	-0.05	[-0.13 – 0.03]
Fiscal Year: 2020 (vs 2018)	-0.21***	[-0.29 – -0.13]
Fiscal Year: 2021 (vs 2018)	-0.11**	[-0.19 – -0.03]
Fiscal Year: 2022 (vs 2018)	-0.10*	[-0.18 – -0.02]
Fiscal Year: 2023 (vs 2018)	-0.08*	[-0.16 – -0.00]
Part-Time (vs Full-Time)	-0.50***	[-0.55 – -0.44]
Rural Practice (vs Urban)	0.13**	[0.04 – 0.22]
Setting: Mixed (vs Community)	-0.05	[-0.20 – 0.10]
Setting: Hospital-Based (vs Community)	-0.07	[-0.14 – 0.01]
Alternative Payment Plan (APP)	0.06	[-0.01 – 0.13]
% Fee-for-Service Visits	0.49***	[0.25 – 0.74]
Years Since Graduation	0.00	[-0.00 – 0.01]
% Weekend/Holiday Billing Days	0.68**	[0.20 – 1.15]
Academic Affiliation	-0.05	[-0.19 – 0.08]
Mean Patient Age	-0.01**	[-0.02 – -0.00]
% Pediatric Patients	-0.54*	[-0.98 – -0.11]
Average Visits per Patient	0.16***	[0.10 – 0.22]
Female × 2019	0.07	[-0.04 – 0.18]
Female × 2020	-0.05	[-0.16 – 0.07]
Female × 2021	0.01	[-0.10 – 0.13]
Female × 2022	0.08	[-0.03 – 0.19]
Female × 2023	0.10	[-0.01 – 0.21]
Random Effects and Model Fit		
Residual variance (σ^2)	0.05	
Physician-level variance (τ_{00})	0.14	
Intraclass correlation (ICC)	0.74	

	Estimate	95% CI
Number of physicians (groups)	211	
Total observations	830	
Marginal R^2 / Conditional R^2	0.39 / 0.84	

* $p < 0.05$ | ** $p < 0.01$ | *** $p < 0.001$

Estimates are from a linear mixed-effects model with random intercepts for physicians. Outcome is log-transformed, inflation-adjusted annual clinical income.

Figures

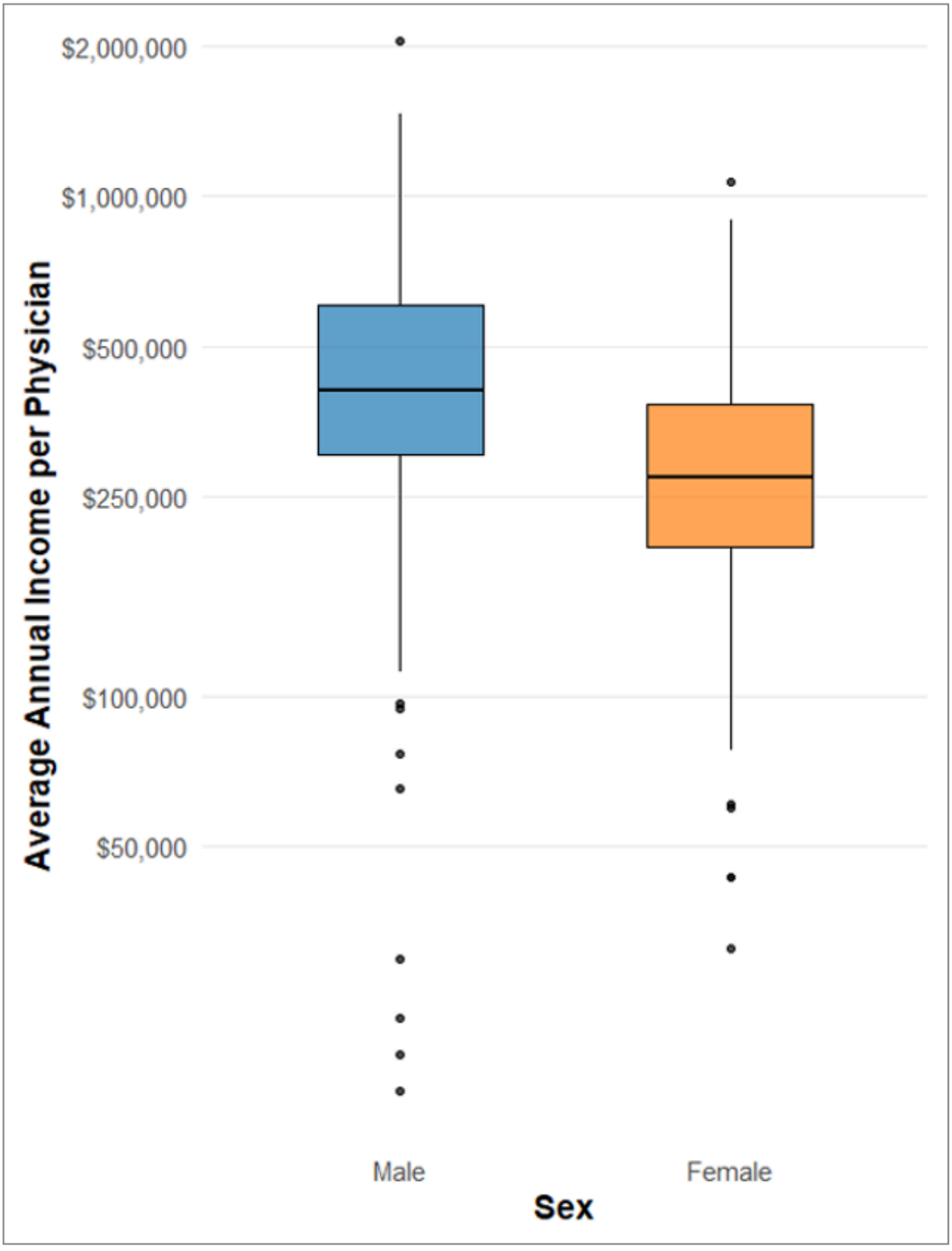


Figure 1

Distribution of average annual income per physician by sex, using boxplots on a log-transformed scale.

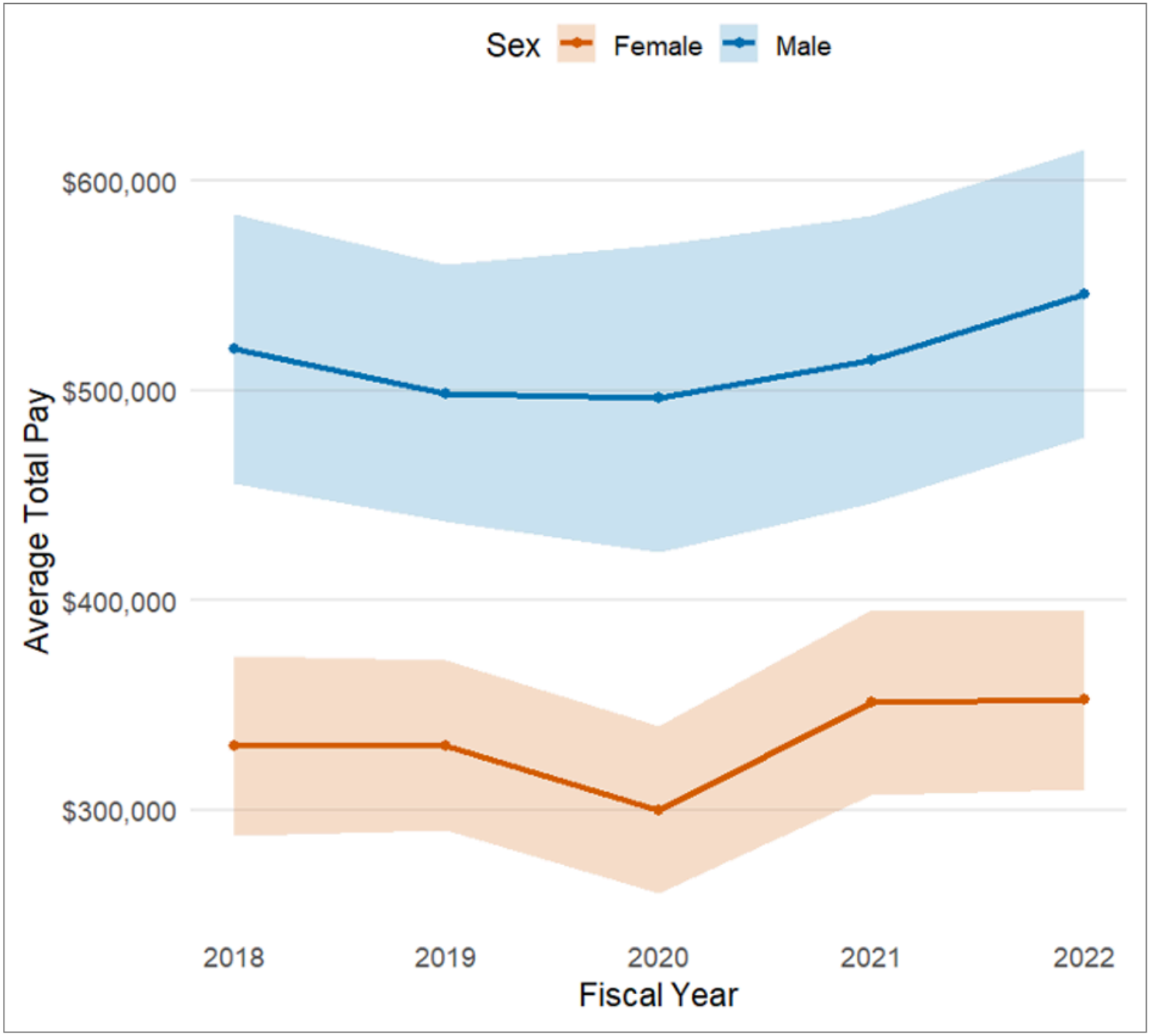


Figure 2

Average annual income by sex (2018-2023), with 95% confidence intervals.

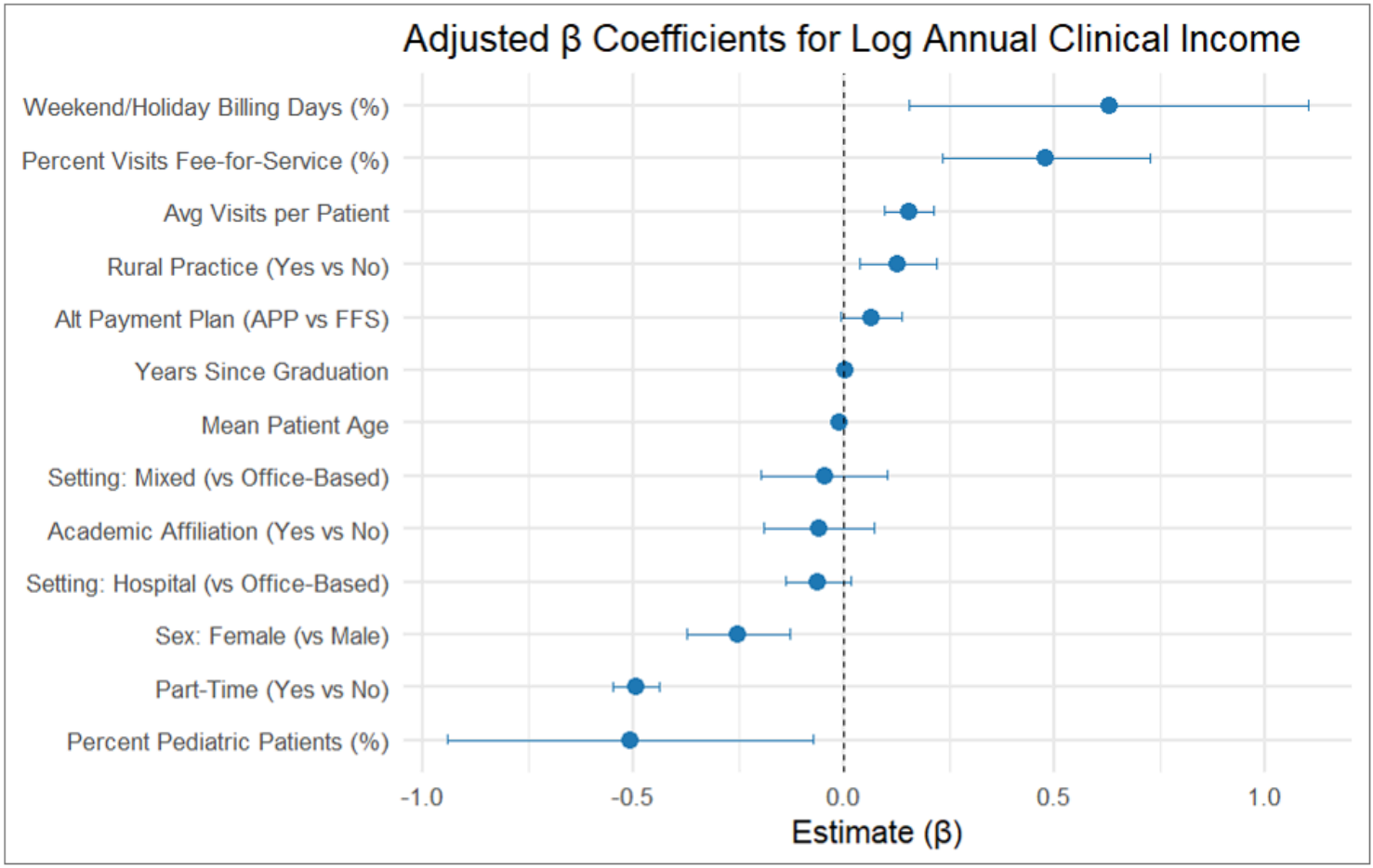


Figure 3

Adjusted coefficients for log annual clinical income. This plot shows adjusted beta coefficients from a linear mixed-effects model predicting log-transformed annual clinical income. Each point represents the estimated association between a covariate and income, with horizontal bars indicating 95% confidence intervals. Coefficients to the left of zero suggest a negative association, while those to the right indicate a positive association.

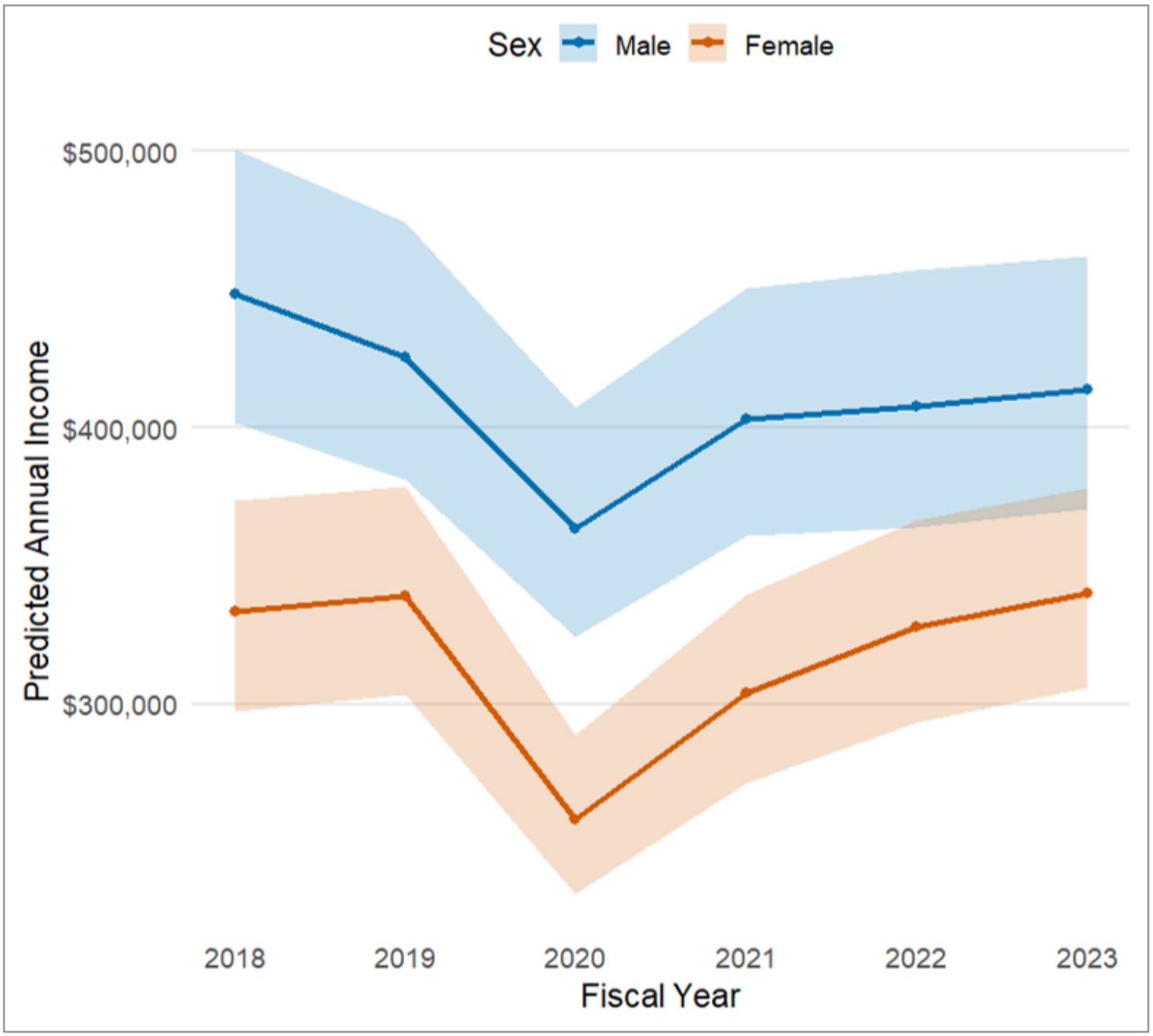


Figure 4

Predicted annual income by sex and fiscal year. This figure shows model-based predictions of average annual physician income by gender from 2018 to 2023. Lines represent predicted income from a linear mixed-effects model, with shaded bands showing 95% confidence intervals.

Supplementary Files

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

- AppendixAMethodsApril2026.docx

- AppendixDBillingCodes.docx