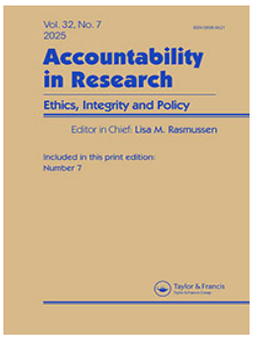

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Comparing companion open access journals to their traditional journal counterparts

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ABSTRACT

Background: Many traditional journals have launched companion open access (cOA) journals with similar scope and aims. These journals seek better article dissemination through removal of the paywall and use of article processing charges (APCs). Traditional journals often suggest transfer to their cOA journal, leaving authors with a decision to accept transfer and pay an APC or resubmit elsewhere. We aim to compare costs and impact of these journals to better inform authors.

Methods: The top 15 U.S.-based traditional journals within medicine, surgery, pediatrics, and OB/GYN were identified based on 2023 impact factor. Those with cOA journals were included, and all publication data between 2011 and 2023 were extracted. Citation counts were compared using Poisson regression; author demographics were analyzed using multivariable logistic regression.

Results: There were 14 traditional journals with cOA counterparts, constituting 52,232 publications from 36,577 authors. cOA articles had half the citations of traditional publications (9.4 vs 18.2) and collected an estimated $35 million in APCs. Female and low/middle income country (LMIC) authors were more likely to publish in cOA journals (aOR = 1.23, 1.14, respectively).

Conclusions: Authors publishing in companion open access journals incur higher publication costs, and yet, receive fewer citations per publication.

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KEYWORDS
Companion open access journal; traditional journal; article processing charge

Introduction

Open access journals aim to remove barriers to accessing scientific literature, accelerate research dissemination, and foster academic exchange of knowledge (Chan et al. 2002). Companion open access (cOA) journals are a newer type of open journal, which are affiliated with well-established traditional journals available through the same publisher or society. Authors are often invited to transfer their manuscript to the cOA journal after submitting their research for consideration in the traditional journal. This often occurs during the review process when a manuscript is deemed of sufficient merit but of lower priority for the traditional journal. The authors are reassured that their work will undergo the same rigorous peer review process but will have broader dissemination owing to the open access nature and absence of a paywall, for which authors incur an article processing charge (APC). These cOA journals share similar, if not the same, scope and aims (Bland 2020). Authors frequently agree to this option as the manuscript typically does not have to be reformatted for a different journal, may not have to go through another round of extensive review, and they get to work with a known entity that is part of their society or association (Bland 2020). Many leading publishers have now adopted this companion journal model as it has proven to be profitable. One prior study showed that spending on APCs at open access journals totaled 8.968 billion USD between 2019 and

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2023 (Haustein et al. 2024). Limited waivers currently exist for researchers planning to publish in cOA journals (Abdel-Razig et al. 2024).

However, it is unknown whether these journals truly amass better article dissemination and higher citations as promised. Many stand-alone open access journals have been successful in their pursuit of expanding their reach and impact (Saravudecha et al. 2023). However, the companion journal model has not been previously compared to its traditional counterpart. In addition, as more journals adopt the companion model, it has created a two-tiered system, where one pays to join the "lower-priority" tier, while the primary traditional journal remains free for authors. The process of determining priority is often nebulous and primed for implicit bias. Implicit bias can negatively impact journal editors' selection process of "high-priority" articles (Kibbe and Freischlag 2020; Shakiba et al. 2008). Editors and reviewers may implicitly favor submissions based on reputation, prestige or other institutional- and author-level factors over true scientific merit. *The Lancet* states that there are significant differences in reviewer and editor gender that may impact peer review, but it is unclear if this is also true of the companion open access model (J. Clark and Horton 2019; Lundine et al. 2018; Steinberg, Skae, and Sampson 2018).

In this context, we analyze the highest-impact traditional journals and their cOA counterparts within the fields of internal medicine, obstetrics & gynecology, pediatrics and surgery. We specifically examine whether cOA publications garner better dissemination through citation counts and whether there are disparities between authors publishing in cOA journals. The results may help inform authors, editors and publishers and highlight a need for changes in the current review process and publishing models.

Material and methods

Study design

Journal Citation Reports™ was used to identify the top 15 US-based journals within the fields of medicine, obstetrics & gynecology (OB/GYN), pediatrics and surgery based on journal impact factor between 2011 and 2023 (2023 Journal Impact Factor 2023; Sharma et al. 2014). These disciplines were chosen *a priori* because they represent a comprehensive spectrum of medical practice and science, from pediatric to geriatric, medical to surgical, and preventative to interventional across most health conditions from both a breadth and depth perspective. The journal impact factor reflects the average number of citations to articles published in the journal.

For each journal, we identified whether it had a companion open access (cOA) journal. A cOA journal is defined as one that receives transfers from the traditional journal, has similar aims and scope as defined on the publisher's website, and where a manuscript can only be published with an article processing charge (APC). We excluded journals that exclusively publish case reports, case series or techniques, as these do not have similar aims and scope. The selection tree methodology is shown in Figure 1. Articles published in traditional journals but are open access due to the authors selecting this option (i.e., hybrid access; fee-optional) are counted as traditional publications. To allow for meaningful comparison, publications from each cOA journal were tracked from cOA inception to the end of 2023 and that time frame matched for the traditional counterpart.

Next, the Scopus database was used for collection of individual publication data within each traditional and cOA journal (SCOPUS 2023). Publication data was exported into a metadata database including journal title, impact factor, first-author name, author address, publication year, citation counts, and APC. Authors with more than one article published in the same journal were consolidated to one publication per journal per author to avoid duplicity when examining author-level outcomes. First-author sex was determined using Gender-API, a previously validated artificial intelligence (AI) tool that can predict the sex of an individual based on author name (Perl 2024). Author sex was only included in sex-specific or multivariable analyses if the Gender-API accuracy threshold was greater than or equal to 90%.

Main exposure, independent variables, and outcome measures

The main exposure variable was first-author sex as determined by the AI tool. Other independent variables included author country of origin, journal specialty, and year of publication. Country of origin was further

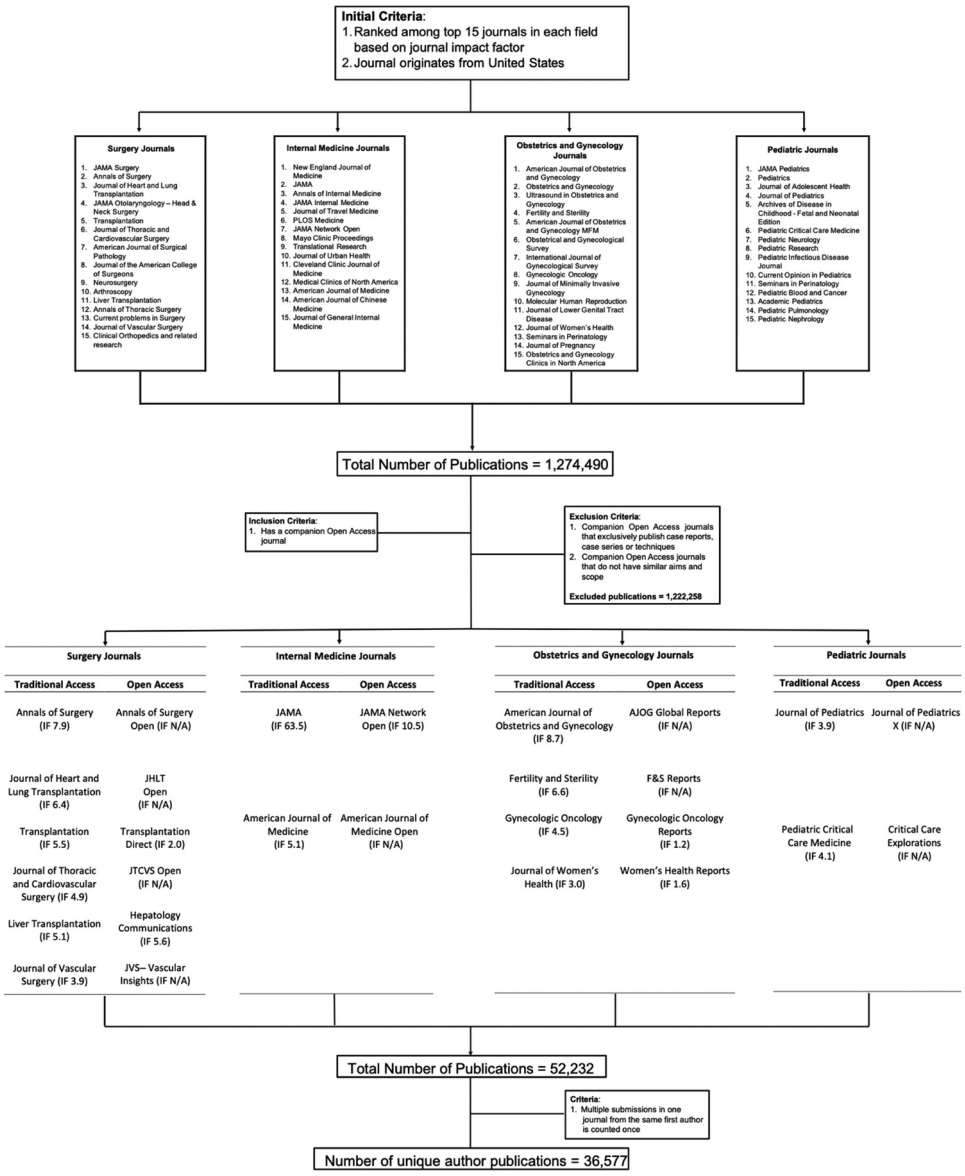

Figure 1. Consort diagram for journal selection.

classified as U.S. vs non-U.S. and by income status. Income status was determined based on the World Bank 2023 income classification and Gross National Income (GNI) per capita for each country of origin, and authors were split into low/middle-income and high-income groups. Journals were stratified based on access type into traditional journals and companion open access (cOA) journals. The main outcomes of interest were citation count and the predicted probability of publishing in the cOA journal versus the traditional journal.

Statistical analysis

Journal metadata were compared between traditional and cOA journals using Pearson $\chi 2$ for categorical variables and Student t-test for continuous variables. Two-sample Wilcoxon rank-sum (Mann-Whitney) test was used for continuous variables with a skewness range outside of −2 and +2. The number of citations was analyzed as a continuous variable that is not normally distributed.

To identify associations with cOA publishing, we used multivariable logistic regression modeling to predict the probability of publishing in cOA journals. The model adjusted for author sex, origin country, journal specialty and year of publication. From the model, a predicted probability of publishing in cOA

journals was estimated for the exposure. A second Poisson regression model was used to estimate association with citation counts while adjusting for the above independent variables.

All data and statistical analyses were conducted using Stata version 17.0SE (Stata Corp, College Station, TX). All tests were 2-sided using a p-value < 0.05. Confidence intervals are reported to a 95% confidence level.

Generative artificial intelligence

Generative Artificial Intelligence (ChatGPT) was used to compare the "Scope and Aims" of each traditional and cOA journal to determine overlap. The scope and aims were drawn from the web-page of each journal on 1 July 2024; these were put into the artificial intelligence model with the prompt "Describe differences and similarities in the scope and aims of these two journals." Results were confirmed by investigators to ensure there were no major differences in the topics covered or the types of articles accepted. In all doublet comparisons, the scope and aims between journals were identical or had minor wording differences with overarching similarities. The exact scope and aims of each journal can be seen in Supplementary Table S1.

Results

Of the 60 highest ranked U.S-based traditional journals across the four specialties, 14 had cOA journals. cOA journals belonged to four different publishers/societies: Elsevier, Wolters Kluwer, American Medical Association (AMA), and Mary Ann Liebert. There were 52,232 original articles written by 36,577 authors between both traditional and open access journals. About 12,365 (33.8%) of these were in cOA journals and 24,212 (66.2%) were in traditional journals. A full breakdown of these publications and associated author demographics by journal specialty (surgery, medicine, OB/GYN, and pediatrics) and journal access type (traditional vs cOA) is shown in Table 1.

At the publisher level, four cOA publishers (Elsevier, Wolters Kluwer, AMA, and Mary Ann Liebert), had total estimated APCs of 34.9 million USD. The AMA had the most articles and estimated total payments of 25.7 million USD (73.6% of all APCs). Wolters Kluwer and Elsevier were the next highest with 4.7 million USD

Table 1. Comparison of publication and author demographics by journal specialty and access type.

	Journal Specialty					Access Type		
	Surgery (n = 11,672 [31.9%])	Medicine (n = 12,630 [34.5%])	Obstetrics and Gynecology (n = 7,952 [21.7%])	Pediatrics (n = 4,323 [11.8%])	p-value	Traditional Access (n = 24,212 [66.2%])	Companion Open Access (n = 12,365 [33.8%])	p-value
First author gender, female	3,752 (32.2%)	5,280 (41.8%)	4,641 (58.4%)	2,174 (50.3%)	<0.001	10,256 (42.4%)	5,591 (45.2%)	<0.001
Region, non-US	5,910 (50.6%)	4,241 (33.6%)	3,539 (44.5%)	1,670 (38.6%)	<0.001	10,446 (43.1%)	4,914 (39.7%)	<0.001
Region, Low/ middle income country	899 (7.7%)	947 (7.5%)	886 (11.1%)	348 (8.1%)	<0.001	2,001 (8.3%)	1,079 (8.7%)	0.132
Unadjusted Citation count, median (IQR)								
Traditional	3 (0–11)	2 (0–16)	6 (1–19)	2 (0–8)	<0.001	3 (0–13)	3 (0–11)	0.602
Companion Open Access	3 (0–8)	5 (1–16)	1 (0–4)	2 (0–6)				
Article processing charge, mean USD (SD)	1742 (654.4)	2997 (44.9)	1190 (572.6)	1708 (39.7)	<0.001	–	2402 (820.7)	–
Access Type								
Traditional	8,914 (76.4%)	5,356 (42.4%)	6,254 (78.7%)	3,688 (85.3%)	<0.001			
Companion Open Access	2,758 (23.6%)	7,274 (57.6%)	1,698 (21.3%)	635 (14.7%)				

Table 2. Breakdown of cOA costs by publisher.

Publisher	cOA Journals	Year of Inception	Total number of published articles	Mean APC (USD)	Total estimated APC income (USD)
Elsevier	AJOG Global Reports	2021	2,797	1525.20	4,265,984.40
	American Journal of Medicine Open	2021			
	F and S Reports	2020			
	Gynecologic Oncology Reports	2011			
	JHLT Open	2023			
	JTCVS Open	2020			
	JVS-Vascular Insights	2023			
	Journal of Pediatrics: X	2019			
Wolters Kluwer	Annals of Surgery Open	2020	2,950	1582.30	4,667,785.00
	Critical Care Explorations	2019			
	Hepatology Communications	2017			
	Transplantation Direct	2015			
AMA	JAMA Network Open	2018	8,567	3000.00	25,701,000.00
Mary Ann Liebert	Women's Health Reports	2020	141	2000.00	282,000.00

(13.4%), and 4.3 million USD (12.2%), respectively. Table 2 shows a breakdown of articles and APCs for each publisher/society.

At the journal level, there were some differences in author demographics. OB/GYN journals had the highest proportion of female authors (58.4%), surgery had the highest proportion of non-US authors (50.6%), and internal medicine had the highest proportion of publications in cOA journals (57.6%). Median APC for all cOA journals was $2000. When comparing different specialties, median APC was highest for internal

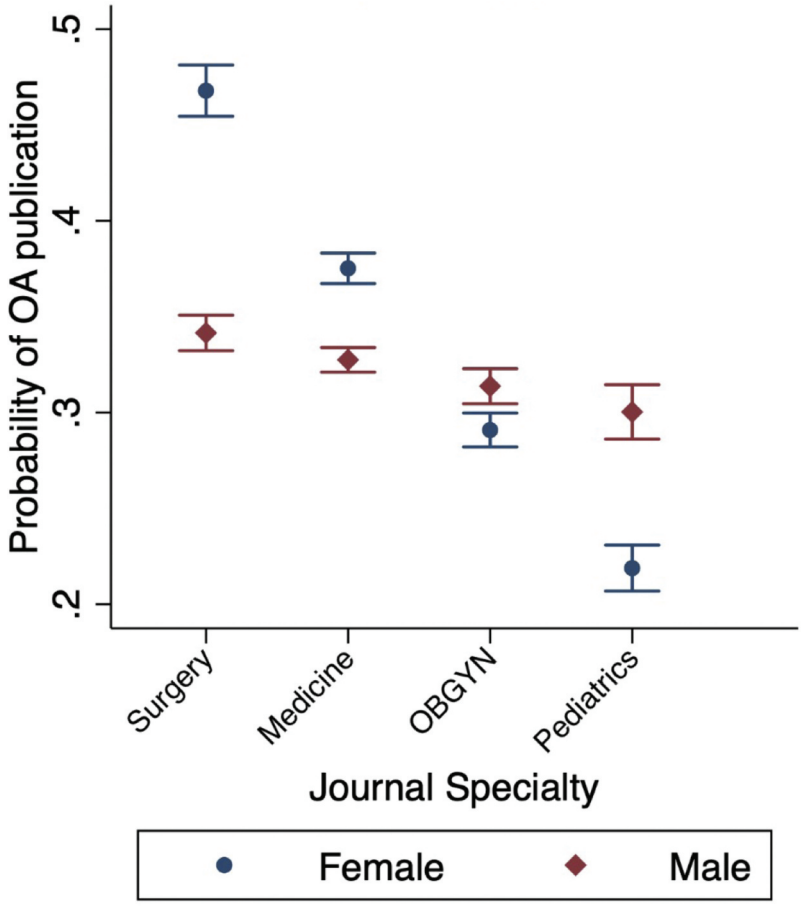

Figure 2. Sex-adjusted probability of publishing open access in different specialty journals. *OA – Open Access; OBGYN – Obstetrics and Gynecology.

Table 3. Multivariable logistic regression predicting the odds of companion open access publishment.

	Open access publishing		
Demographic	Adjusted Odds Ratio	95% confidence interval	p-value
First author gender, female	1.23	1.17 – 1.29	<0.001
Region, Non-US	1.05	1.00 – 1.11	0.047
Region, LMIC	1.14	1.04 – 1.24	0.004
Journal Specialty			
Surgery		Reference	
Internal Medicine	4.24	4.01 – 4.49	<0.001
Obstetrics and Gynecology	0.90	0.84 – 0.97	0.003
Pediatrics	0.52	0.48 – 0.57	<0.001

medicine journals at $3,000, but this was skewed by the high number of publications from JAMA Network Open, so means were used to compare APCs between journal specialties. Mean APC varied significantly between specialty, with the lowest being in OB/GYN at $1190 and the highest being in internal medicine at $2997 ($p < 0.001$). Despite having the highest mean APC, publications in internal medicine journals were most likely to be in cOA journals (57.6%; $p < 0.001$).

At the author level, 15,847 (43.3%) first authors were female. There was a higher proportion of female authors in cOA journals (45.2% vs 42.4%; $p < 0.001$) on univariate analysis. A multivariable logistic regression model was created to account for geography and sex to create a gender-adjusted probability of publishing in cOA journals as shown in Figure 2. Based on the multivariable model, females had a slightly higher probability of publishing in cOA surgical and internal medicine journals. On multivariable logistic regression accounting for author sex, geography, journal specialty and year of publication, female sex, non-US origin, and LMIC-origin were associated with publishing in cOA journals with adjusted odds ratios of 1.23 (95% CI [1.17, 1.29]), 1.05 (95% CI [1.00, 1.11]), and 1.14 (95% CI [1.04, 1.25]), respectively, as shown in Table 3.

Measured impact

The unadjusted median citation count was equal between traditional and cOA journals when comparing all publications (3 vs 3; $p = 0.602$). Crude mean citation counts were generally higher in traditional journals than their cOA counterpart; individual comparisons within journal pairs can be seen in Supplementary Table S2. After adjusting for year of publication and specialty, cOA journals were associated with 8.8 (48.4%) fewer citation counts compared to traditional journals (9.4 [9.1 – 9.7] vs 18.2 [17.8–18.7]; $p < 0.001$). Additionally, a Poisson regression model adjusting for publication year, first author sex, and specialty showed an increasing gap in citation counts over time between traditional and cOA journals as shown in Figure 3. cOA publications garnered fewer citations despite similar article age. For example, a paper published 5 years

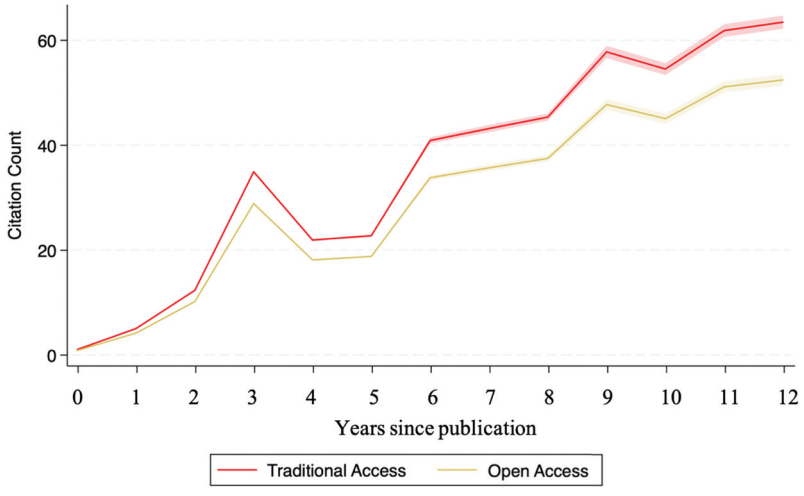

Figure 3. Poisson regression model adjusted citation count for publication year, access status, first author sex, and specialty.

ago in a cOA journal yielded four (21.3%) fewer citations compared to a paper published during the same time frame in a traditional journal when adjusting for author sex and specialty.

Post-hoc sensitivity analysis

As described above, we account for differences in number of publications between traditional and cOA journals, as well as differences between specialties through adjusted citation counts and probabilities created via multivariable logistic and Poisson regression. However, in order to further account for differences in individual journals within specialties and ensure there is no outsized effect from larger journals, such as JAMA, we also created separate adjustments with the same covariates, except for a categorical covariate encompassing individual journal pairs in place of specialty. Results were qualitatively similar with only minor changes in quantitative results. For example, adjusted counts were still 10.5 (54.4%) citations lower in the cOA versus traditional journals (19.3 [18.8 – 19.8] vs 8.8 [8.5–9.0], $p < 0.001$).

To assess the effect of other estimation models on adjusted citation counts, we ran a negative binomial regression using the same covariates. This showed similar trends to those previously reported in our Poisson model and can be seen in Supplementary Figure S1. Of note, there was some overdispersion in the Poisson model as evidenced by an overdispersion parameter (α) of 2.04 and resulting larger error bars in the negative binomial model. However, this appeared to primarily affect estimates of variance prior to 2016, likely owing to the small number of journals (2) and publications (242) within the companion open access type during this time period. After 2016, the model continued to show significant differences in citation counts between the two publishing models. Additionally, overall citation counts remained twice as high in traditional journals ($p < 0.001$) when using the negative binomial regression model, so overall results remained similar.

Discussion

In this study, examining the companion open access journal model, we analyzed over 52,000 publications in leading traditional journals and their companion open access journals. We found that publications in cOA journals garnered fewer citations compared to similar age publications in traditional journals despite the absence of a paywall. Since inception, these cOA journals have garnered an estimated 35 million USD in APCs. First authors in cOA journals were more likely to be female and from low- and middle-income countries.

Citations are often used as a metric to measure an article's impact in the topic of interest and provide evidence for practice (Aksnes, Langfeldt, and Wouters 2019; Colavizza et al. 2020). Article citation counts translate into a journal's impact factor, which authors often use to target certain journals that they believe appropriately fit the impact of their article. The scientific community frequently views citations and impact factor as a sign of quality. A prior study found that a low number of citations led to lower perception of a paper's quality and subsequently, less time spent reading it (Teplitskiy et al. 2022). However, some journals are inherently cited less, whether due to accessibility, reputation or other factors. Open access journals, which remove the paywall to the public, aim to increase accessibility and ultimately increase citations and impact. Yet, despite their inherent accessibility, we found that cOA journals had nearly half the citation count of traditional journal articles in the current study (18.2 vs 9.4) and there was greater separation in citations noted over time (Figure 3).

A number of elements can play into how many citations an article receives. One potential element is, of course, the underlying quality of the research. However, citations have previously been shown to be a poor indicator of statistical accuracy and evidential value (Dougherty and Horne 2022). Unfortunately, there was no way for us to objectively incorporate the quality of each article into our analysis, so it is possible that studies published in these cOA journals were methodologically sound but were judged to be less "flashy" and would have been cited less no matter what journal they were published in. In a way, this provides authors with a venue to publish studies that have negative results or studies that show contemporary results of a research question answered previously. Another potential reason is overall familiarity and views of the cOA journals. Many scientists within their respective fields may subscribe to the traditional journal and thus have a long history of trust in

that journal and its results, which may not transfer to a newer companion journal despite similar scope and aims (Supplementary Figure S1). Additionally, given that many of these journals arose within the last 5 years, it is possible that they will eventually garner similar citation counts once they become more established. However, at the current time, cOA journals do not appear to provide a clear citation advantage to authors. Therefore, it is important that authors consider and understand this when choosing where to publish their work.

It is also important to note that the aim of our study was to discuss the companion open access model rather than all open access journals. Many stand-alone open access or hybrid-models have been successful in their pursuit of expanding their reach and impact. For example, one prior study reported open access articles received 30% more citations than traditional access articles (Saravudecha et al. 2023). That article compared a conglomerate of open access and traditional articles rather than associated cOA and traditional journals as in our study, which could lead to differences in topic of interest and target audience. Another study reviewed 134 articles discussing open access citation advantage, and found that 47.8% confirmed an advantage and 27.6% did not find any advantage (Langham-Putrow, Bakker, and Riegelman 2021). Clearly, there is a mix of evidence on the effectiveness of open access journals for article dissemination, which may change depending on the individual journal or publishing model, such as the companion open access model in this study. Some of the most convincing evidence may come from hybrid access journals where the author chooses whether or not to pay to make their work free to the public. These journals provide some of the best supporting evidence for the open access model because all articles are published under the same journal name with the same aims and scope, so there should be no difference in perceived quality of an article based on the overarching journal name and no differences in specialty or scope (A. D. Clark et al. 2024). Many of these hybrid journals encourage open access publication and are able to directly present their own data on improved citation counts within their journal. It's possible that a shift to a similar model could improve results for these cOA journals, but this is not currently the reality.

It's important for authors to also understand associated costs with cOA journals regardless of their choice. The decision to publish open access is clearly an expensive one. As reported in our study, the range of average APCs was ~$1200–$3000 per publication. Originally, APCs were created to cover the costs associated with publishing the paper in physical format, which includes the selection, review, and processing of the manuscript. Yet, in general, reviewers rarely receive monetary compensation for their time, and most of these cOA journals are online only (Cheah and Piasecki 2022). This begs the question: what are the APCs actually covering? Ultimately, these high APCs have become a barrier to open access article submission and dissemination for many authors, particularly those without grant funding, those coming from smaller institutions or disadvantaged regions (Nabyonga-Orem et al. 2020; Rodrigues, Savino, and Goldenberg 2022; Sanderson 2023). Academic medicine has long perpetuated a "publish or perish" dogma. One analysis of APC prices revealed that they are increasing three times faster than the expected increase based on inflation, all of which appears to be occurring without any decrease in publication numbers (Khoo 2019). It appears that authors and institutions are willing to pay APCs with little regard to their high cost, leaving publishers able to set high APCs without adverse effects on their market share. This system allows for fewer publications in high-impact journals and more transfers to cOA journals leading to exponentially more revenue for publishing companies. Authors simply become lost between a "pay or perish" mentality.

There are a few potential solutions to address the balance between accessibility to readers and ability of authors to publish. First, journals may include a specific fee waiver program for underrepresented authors. While many journals provide APC waivers to authors from low/middle income countries, North American-based journals are least likely to offer these waivers regardless of impact factor, and criteria for them is often vague and not well publicized (Gardner et al. 2021). Prior studies have shown that high APCs have become a barrier to open access article submission and dissemination, particularly in low-to-middle income regions (Nabyonga-Orem et al. 2020; Rodrigues, Savino, and Goldenberg 2022; Sanderson 2023). Therefore, having dedicated waivers with clear and publicly available criteria for use, such as investigators from underrepresented regions, smaller institutions or those without grant funding, could go a long way in providing equal opportunity for everyone to publish their research. As a scientific community, it is imperative for us to reduce barriers for all investigators. Having established, peer-reviewed journals are vital to responsible publication and dissemination of scientific knowledge, but there are clearly areas in this process that could be improved.

Second, although it is unlikely that these journals will completely restructure their publishing model, it would be essential to provide more transparency or objectivity on which manuscripts are more likely to be transferred to the cOA journal, and that these criteria are consistent regardless of who the authors are. This is especially true when the "Aims and Scope" of these journal pairs are nearly identical as we demonstrated. For example, they may state on their websites that the traditional journal primarily publishes randomized controlled trials and prospective data, while the cOA journal publishes retrospective and database studies. This would allow authors to better estimate the outcome of their submission before spending months formatting their article for that journal, submitting it and going through multiple rounds of peer review and revisions. At the present time, it is possible for articles to go through multiple rounds of review before being transferred to a cOA journal, making authors feel forced into paying an APC because they've already catered their work to that specific journal. Therefore, being more transparent upfront will be paramount for the cOA publishing model to ensure authors understand the processes at the journal they are submitting to.

Other solutions may need to focus on reducing or covering costs associated with publication. We currently live in a world where most scientists consume knowledge from online articles and databases rather than print sources. Transitioning to online-only publications is one potential target for reducing publication costs. Some funding, however, will still be necessary to cover the cost of copy-editors and dedicated servers that host the articles. Currently, the two primary funding options are the author or subscriber, but there may be other options as well. Many journals are associated with professional societies that collect dues or have other sources of funding, such as industry sponsors, that could contribute to these journals. Most of these societies and sponsors contribute to national meetings where much of this scientific work is presented on a yearly basis. Of course, these sponsors and disclosures would need to be declared and kept separate from the review process to ensure an unbiased publication, but this is something that is already routinely done in professional societies and meetings. Other options could include grant funding directly for journals. Most investigators use their grant funds to cover the costs of publishing, but grants can be hard for young investigators to obtain, especially those from smaller, underrepresented or disadvantaged institutions and geographical regions. Additionally, certain research using retrospective databases or publicly available data may not require grant funding, so the only cost to investigators is in publishing their results. However, if these investigators don't have institutional funds or a coauthor with grant-funded research, then they won't be able to publish their work.

There are also areas in the review process that could be improved. Of note, we found a slight propensity for publication of female and LMIC authors' work in cOA journals (aOR 1.23, 1.14, respectively). Although this difference is modest, it represents a potential barrier to these authors that should be discussed. Female scientists have long been underrepresented in academic publishing, especially as first and senior authors. (Chander et al. 2023; Lariviere et al. 2013; Liu et al. 2023; Nguyen et al. 2021; Zhu 2017) One 2013 study reported that worldwide, women account for less than 30% of authorship and men are twice as likely to be listed as first author (Lariviere et al. 2013). A more recent 2023 study confirmed that only 26% of authors were female, and even more concerning, only 14% were editors and 8% were editors in chief (Liu et al. 2023). In our study, females constituted 43.3% of the entire cohort, so there is an obvious increase in female contribution to academia in recent years but it still remains under 50% (Gayet-Ageron, Poncet, and Perneger 2019; Jagsi et al. 2006). It is possible that smaller professional networks, lower amounts of research funding and fewer women in leadership positions at high-impact journals could contribute to fewer female publications, particularly in high-impact journals (Lundine et al. 2018). Similar causes may be true for LMIC authors, as well. Prior studies have shown that LMIC authors are much less likely to be listed as first or senior authors, so it's possible that these authors have publications in the journals we studied but simply weren't represented in our analysis because they were not the first author (Eldridge et al. 2024). Similarly, the discrepancy in female authors could change when analyzing those outside of the first author.

There are other plausible explanations outside of potential systemic issues for the results seen in our study as well. For one, as previously alluded to, LMIC authors are often eligible to receive waivers for free publication in open access journals, so it is possible that they elect to publish in cOA journals. It is also possible that smaller amounts of research funding leads to fewer publications and retrospective study designs that are inherently more likely to end up in the cOA journal. Although it's possible that these differences could represent bias in the review process, the current study does not provide enough evidence to determine an exact cause or come to these conclusions.

Regardless, future research within individual journals should focus on the scientific merits of the study, ensuring equity for all authors and aiming to reduce any potential sources of bias. For example, blinded peer review may be particularly useful in eliminating any question of favoring certain authors by sex, geographic region, institution, or any other factors outside of true scientific merit. Some journals have pushed back against blinding as it can sometimes be difficult to achieve since researchers frequently build upon prior work (Ucci, D'Antonio, and Berghella 2022). Some also suggest that open peer review allows for greater transparency and collaboration between authors and reviewers (Haffar, Bazerbachi, and Murad 2019). Multiple studies have found that open peer review had favorable effects on review reports and led to decreased manuscript rejection compared to blinded peer review (Bruce et al. 2016). However, we argue that despite a higher chance of rejection with blinded review, it may lead to more stringent review of the scientific evidence and therefore more accurate reports. Additionally, many journals accept requests for certain reviewers, which could introduce bias. Authors who come from larger professional networks or institutions may be close to well-known individuals in the field whom they may recommend as reviewers, giving them an unfair advantage in the peer review process. Regardless, more research is required into the optimal form of peer review to minimize bias and increase diversity, while also encouraging professionalism, transparency, and collaboration within the scientific field.

This study has several limitations. First, we selected the top U.S.-based journals based on 2023 impact factor and then searched for their cOA counterparts. Not all traditional journals had a cOA journal, not all specialties had the same number of cOA journals, and not all journals had the same number of publications. Similarly, we were unable to see exact topics and article types (original research, review article, etc.) within each journal, so this could present an unknown confounding factor. However, to account for these differences, we used multivariable regressions to adjust for access status, year of publication, and specialty. We also performed a post-hoc multivariable regression factoring in individual journal pairs as a covariate to further account for differences in publication numbers between journals and the results remained qualitatively the same. Additionally, the inclusion of only U.S.-based journals may limit generalizability to all journals, regions and studies completed outside of the United States. Second, we used artificial intelligence to predict author sex, which contains the potential for error including misclassification and inability to account for nonbinary authors. The use of this algorithmic resource with an accuracy threshold of 90% is supported by the literature, but naturally still contains room for error, and thus should be viewed as a proxy for author sex rather than a definitive measure (Sebo 2021). Clearly, there may be further intricacies in regard to author demographics that we simply could not capture in this study and would benefit from individual journal data with authors' self-declared demographics. Lastly, research publications are the result of teamwork by many authors; however, we only stratified by first author, so these results could change when considering all authors and particularly the senior author who is often listed last. Notwithstanding these limitations, we believe that the data reported in our study reflect disparities when it comes to the companion open access journal model that must be addressed to improve transparency, minimize bias and create the highest quality of scientific research and publication.

In conclusion, authors publishing in U.S.-based cOA journals incur higher publication costs totaling ~ $35 million across the top 15 journals in four major specialties, and yet, have fewer citations per publication compared to their associated traditional journal. This study aims to better inform authors across specialties of their options and the reality of the aims of the companion open access publishing model. Improvements to the cOA publishing model from the journals' perspective could include clearer, publicly available editorial policies, specific criteria for transfer to cOA journals, criteria for APC waivers, overall reduction in publication costs, and blinded peer review to increase transparency and decrease bias in the publication process.

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Authors' contributions

ZM was responsible for conceptualization, methodology, supervision, data curation, formal analysis, writing of original draft as well as reviews and editing. AP, AO, and SP were responsible for data curation, formal analysis, writing of the original draft, writing – reviews and editing, and visualization. LA, SB, JC assisted with validation, methodology and writing of the original draft. All authors had full access to the data and are responsible for final submission.

Availability of data and materials

The datasets used and analyzed during the current study are available from the Science Data Bank Repository under DOI 10.57760/sciencedb.27281.

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