Low prevalence of presumed predatory publications in a subset of Cochrane reviews

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Abstract

Objective: To examine the prevalence of presumed predatory publications in Cochrane reviews, which are considered the gold standard.

Study Design and Setting: We selected two Cochrane Networks with broad scope: the Musculoskeletal, Oral, Skin and Sensory (MOSS) Network and the Public Health and Health Systems Network. From reviews produced by all Review Groups in those Networks in 2018 and 2019, we extracted included study citations published after 2000. For each citation, we assessed the journal and publisher using an algorithmic process based on characteristics known to be common among predatory publishers. Knowing that predatory status can be

fluid and subjective, we scored citations on a spectrum from "reputable" to "presumed predatory" based on publication characteristics available at the time of assessment.
Results: We extracted 6965 citations from 321 reviews. Of these citations, 5734 were published by entities widely accepted as reputable, leaving 1591 for further assessment. We flagged 75 citations as concerning.
Discussion: Cochrane reviews across diverse topic areas included studies from flagged publishers, although this number is small. Because of this, there is potential for studies from predatory journals to influence the conclusions of systematic reviews. Researchers should stay aware of this potential threat to the quality of reviews.

Keywords: predatory publications, systematic reviews as topic, research integrity

Running title: Predatory publications in Cochrane reviews

What is new?

- Presumed predatory publications are being included in some Cochrane reviews, which are widely regarded as the "gold standard" of systematic reviews due to their rigorous methods and high quality. However, inclusion of these publications in Cochrane reviews appears to be relatively rare.
- While the extent of presumed predatory publications in Cochrane reviews is small in our sample, the potential for studies from predatory journals to infiltrate and sway the conclusions of systematic reviews remains and researchers should stay vigilant.
- Our team considered a number of factors when assessing the likelihood that journals were predatory. Assessing studies individually remains a sound method for

determining inclusion in reviews. Researchers should not simply rely on the presumed predatory status of the parent publication when screening studies for inclusion.

- The presence of presumed predatory journal articles in research databases and their limited, but still noteworthy, presence in Cochrane reviews suggests that education around scholarly publishing literacy and collaboration with a librarian or information specialist may help to facilitate sound assessment of studies considered for inclusion in reviews.

1. Background

Systematic reviews are a critical tool for evidence informed decision making, with reviews produced by Cochrane acknowledged to be of particularly high quality [1]. Systematic reviews use rigorous methods and are meant to locate all studies relevant to the research question. Healthcare professionals worldwide rely on systematic reviews to guide their practice and patient care. While the strength of systematic reviews is founded in their methodological rigor, potential weaknesses arise from the quality of the evidence they synthesize [2].

The emergence of "predatory journals" has potential implications for the quality and reliability of systematic reviews. The term "predatory" characterizes the typically aggressive tactics for soliciting manuscripts as well as the unscrupulously misleading claims such journals tend to make. A critical problem with these journals is their poor or absent peer review practices [2,3]. Research has yet to show whether articles published in predatory journals would be accepted elsewhere based on the quality of work [4]. The number of articles published in journals considered to be predatory has steadily increased over the past 10

years[5]. Shen and Bjork [6] found through a longitudinal study that the volume of predatory articles increased from 53,000 in 2010 to roughly 420,000 by 2014, from about 8,000 journals. Ross-White et al. [4] note the results of research syntheses are at risk due to this increased volume and the open accessibility of many of these publications.

Though peer review practices (or lack thereof) might be the most important indicator that a journal is predatory, these practices are often difficult to assess in depth. As a result, several other characteristics are typically considered when assessing a journal and are used as proxy indicators of a journal's legitimacy, giving rise to checklists of features researchers should consider when assessing journals [7–15]. Some features, like whether a journal lies about where it is indexed, are more definitive than others, such as the professional appearance of the website or the physical address of the publisher. As a result, it is not always obvious that a journal is predatory, and a definitive conclusion is not always possible.

The potential presence of content from predatory journals in systematic reviews is alarming. Poor quality or duplicated data can confound evidence synthesis while diluting the impact of credible evidence [5]. Recent work has shown that predatory publications have indeed made their way into systematic reviews. By conducting forward reference searches of articles by a known predatory publisher, Ross-White et al. found that articles from the publisher had been included in 157 systematic reviews. While 20 of those reviews were themselves published in predatory journals, book chapters, or dissertations, 137 were published in journals from established and reputable international publishers [4(p58)]. As another example, Collom et al. found 275 articles considered predatory in 78 reviews in the field of nursing published in reputable journals. Of these reviews, they found two-thirds relied on these questionable articles in substantive ways, particularly related to findings in education and clinical practice [16]. While curated research databases do consider quality when determining what they index, suspected predatory journals are present [17,18]. Confining

searches to reputable databases is not sufficient to avoid including predatory publications in systematic reviews.

Building on the previous studies on predatory publishing in systematic reviews, we undertook a mapping exercise to investigate the presence in Cochrane reviews of studies in journals suspected to be predatory. This information can provide insight into the extent to which this is a potential problem, even among the gold standard of systematic reviews and may justify further research on whether such studies influence the conclusions of Cochrane reviews. It can also speak to the need to develop strategies to educate reviewers on the risks of encountering predatory articles when conducting a review, and on how to recognize predatory and potentially predatory journal articles so they can be assessed and used accordingly.

2. Methods

In order to capture a broad range of subject areas while keeping data extraction feasible, we selected two of the eight Cochrane Networks with Review Groups of varying focus: the Musculoskeletal, Oral, Skin and Sensory (MOSS) Network (Review Groups: Back and Neck; Ears, Nose and Throat [ENT]; Eyes and Vision; Musculoskeletal; Oral Health; Pain, Palliative and Supportive Care; Skin; Wounds), and the Public Health and Health Systems Network (Review Groups: Consumers and Communication; Effective Practice and Organization of Care [EPOC]; Infectious Diseases; Public Health; Tobacco Addiction; Work). Using the Cochrane Database of Systematic Reviews (CDSR) (Cochrane Library, Wiley), we extracted the citations of all reviews produced by each group in the years 2018 and 2019.

Since predatory publishing is a relatively recent phenomenon coinciding with the rise of open access publications in the 2000s [19], we limited study extraction from each review to

those published in journals after the year 2000. Using CDSR to access full text, we extracted all references to studies included in each review and added publisher information using the Citation Finder tool (https://citation-finder.now.sh/) wherever possible, following up with Google searches as needed.

While Grudniewicz et al. [20] presented a standard definition of predatory publishers in 2019, the variety of identification checklists, safelists and flagged lists that currently exist [14,21] indicates predatory status can still be fluid and subjective. We therefore developed our own approach to assess publishers based on previous tools and processes and our own experiences [22]. The four authors co-designed an extraction template. Between November 2020 and January 2021, included reviews were divided among the authors for metadata extraction and a preliminary assessment. Each author completed this phase of the exercise independently.

We assessed all the citations using an agreed upon algorithmic process where we judged the journals' and publishers' place on a predatory spectrum: reputable, likely reputable, questionable, likely predatory, or presumed predatory (Figure 1). First, we identified all citations with known, reputable publishers or any of their subsidiaries (Table 1). These publishers were identified through the authors' knowledge and experiences as health sciences librarians. The remaining citations were divided between the authors to check each journal's or publisher's presence or absence on specific safe (Cabells Journalytics [23], the Directory of Open Access Journals [DOAJ]) [24] and flagged lists (Cabells Predatory Reports [25], Beall's List [26], and PredatoryJournals.com [27]).

"Big 5" Academic Publishers	● RELX (Elsevier) – Includes: Churchill Livingstone; Mosby; Lancet; Saunders; Mark Allen ● Wiley-Blackwell – Includes: BMJ Publishing Group ● Springer – Includes: Ovid; Wolters Kluwer; Lippincott; Nature; BioMed Central ● Informa – Includes: Taylor & Francis; Maney Publishing; Haworth ● SAGE Publishing – Includes: Corwin Press

Other widely recognizable publishers	● IOS Press ● Oxford University Press, Cambridge University Press, and other well-known university presses ● Public Library of Science (PLoS) ● Emerald ● Thieme ● Scielo
Trusted associations	● American College of Physicians ● American Medical Association ● American Psychological Association ● Canadian Medical Association ● World Health Organization

Table 1. List of known, reputable publishers and a selection of their subsidiaries

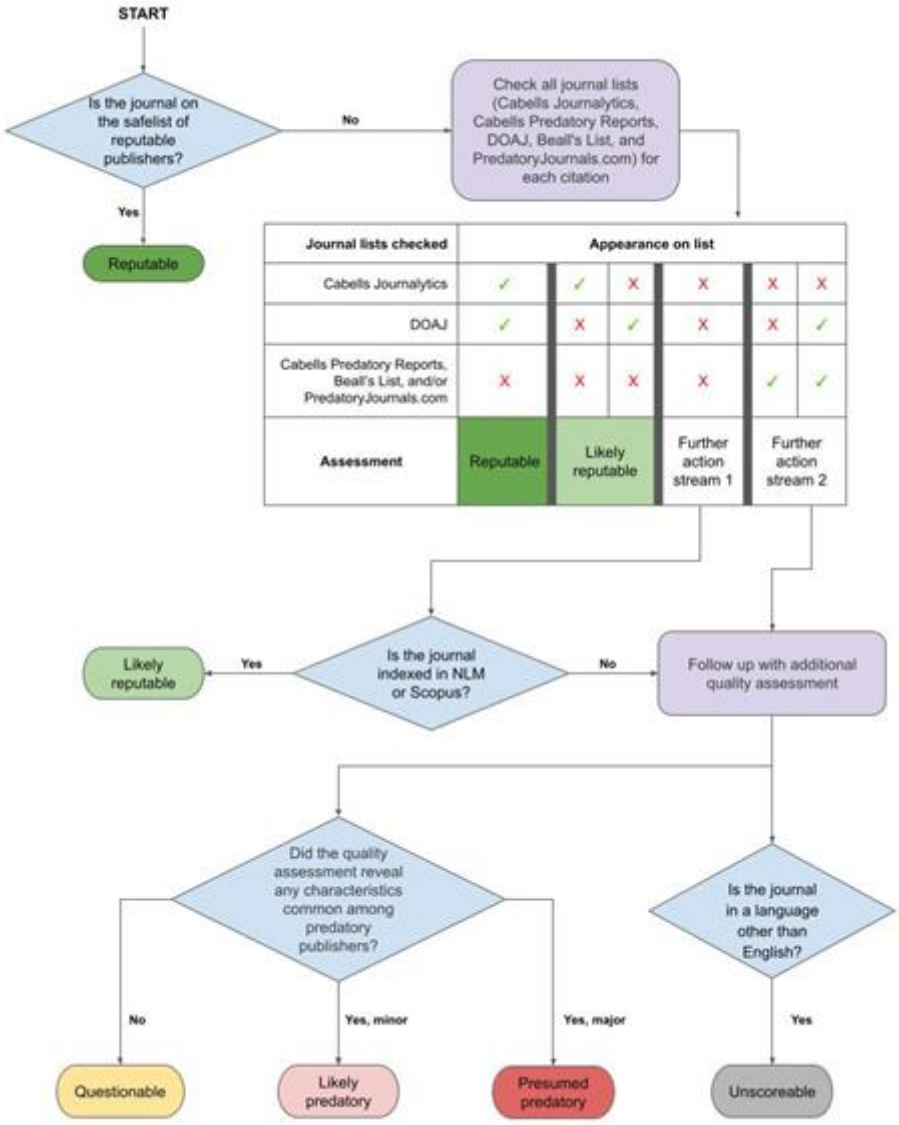


Figure 1. Algorithmic process used to place journals and publishers on the predatory spectrum

Presence on both safe lists and absence from all flagged lists earned an assessment of reputable. Likely reputable was the assessment for presence on either safe list and absence from all flagged lists. Absence from all lists prompted further investigation. At this stage, journals indexed in either the National Library of Medicine (NLM) or Scopus were deemed likely reputable. This ~~designation~~distinction was chosen to reflect that while presence in those databases alone does not guarantee a journal is reputable[17], the risk is relatively small, particularly when combined with the absence of warnings from the flagged lists.[13] The remaining citations were grouped with any journals or publishers appearing on any of the flagged lists to undergo additional quality assessment. Given the inconsistencies of flagged lists[14,15] we agreed presence on any flagged list alone was not sufficient to classify journals or publishers as questionable, likely, or presumed predatory.

Further quality assessment of the remaining journals and publishers was based on Grudniewicz et al.'s[20] definition of predatory publishing. This work was undertaken by the four authors, working collaboratively to achieve consensus in virtual meetings in January 2021. We investigated each journal and publisher together and evaluated characteristics commonly associated with predatory publishers (Table 2). We further noted study publication dates and investigated whether the journal or publisher were presumed predatory at the time of publication. A score of questionable was given when none of these characteristics were obvious, likely predatory when minor characteristics were found, and presumed predatory when these were major. During this stage, as the authors do not have non-English language capabilities, any remaining non-English journals were marked as unscoreable.

Characteristics	**Indicators**

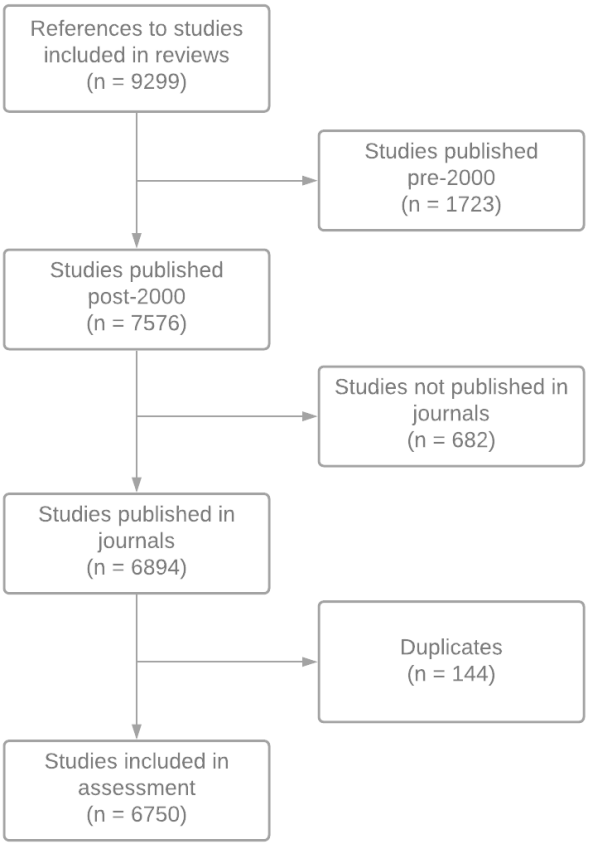
Questionable peer review practices	● Journal advertises quick peer review turnaround ● Journal website does not include information about peer review
Poor quality websites	● Use of broken or unprofessional language ● Broken links and/or empty pages ● Unable to access archive of articles
Websites presenting false or misleading information	● Misleading indexing information ● Misleading metrics presented ● False address and/or editorial board information
Evidence of negative reputation	● Reports about the journal's or publisher's potential predatory status in the media, social media, or in science blogs, uncovered using a Google search
Changes in indexing	● Journal was previously indexed in a reputable database, but has been removed ● Journal was not indexed in a reputable database during the date of the citation

Table 2. Characteristics commonly associated with predatory publishers

At the end of this process each citation had an assessment of reputable, likely reputable, questionable, likely predatory, presumed predatory or unscoreable. We then calculated the percentage of each Review Group's references placed into each category.

We also conducted an indexing analysis in October 2021 of citations classified as questionable, likely predatory, or presumed predatory (hereafter referred to as "flagged citations") to determine how reviewers may have come to include studies from potentially predatory publications in their reviews. For this analysis, we chose four databases that are commonly searched in Cochrane reviews: PubMed MEDLINE including PubMed Central (NCBI), Embase (Embase.com, Elsevier), Scopus (Scopus.com, Elsevier), and the Cochrane Central Register of Controlled Trials (CENTRAL) (Cochrane Library, Wiley). We noted whether each flagged citation was indexed in any of these commonly searched databases.

3. Results



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172 *Figure 2. Flow diagram of citations assessed for predatory characteristics*

Review Group	References to studies included in reviews	Studies published pre-2000 (excluded)	Studies published post-2000	Studies not published in journals (excluded)	Studies published in journals	Duplicates removed	Studies included in assessment
All	**9299**	**1723**	**7576**	**682**	**6894**	**144**	**6750**
MOSS	**3956**	**691**	**3265**	**208**	**3057**	**80**	**2977**
Back and Neck	94	8	86	0	86	0	86
ENT	144	38	106	8	98	0	98
Eyes and Vision	792	118	674	70	604	27	577
Musculoskeletal	305	35	270	15	255	1	254
Oral Health	651	116	535	44	491	0	491
Pain, Palliative and Supportive Care	815	72	743	28	715	45	670
Skin	848	212	636	18	618	5	613
Wounds	307	92	215	25	190	2	188
Public Health and Health Systems	**5343**	**1032**	**4311**	**474**	**3837**	**64**	**3773**

Consumers and Communication	124	8	116	14	102	0	102
EPOC	1276	230	1046	33	1013	1	1012
Infectious Diseases	1135	218	917	186	731	35	696
Public Health	789	74	715	46	669	11	658
Tobacco Addiction	1699	438	1261	148	1113	13	1100
Work	320	64	256	47	209	4	205

Table 3. Characteristics of reviews and their included studies

We identified 321 records produced by the Review Groups in 2018 and 2019, 21 of which were withdrawal notices rather than reviews, and therefore not eligible for inclusion in our analysis. The 300 reviews had a combined total of 9299 references to included studies. After excluding 1723 studies published prior to the year 2000, an additional 682 records (e.g., conference presentations, trial registrations, white papers, dissertations and theses) not published in journals, and 144 duplicate references extracted from within the same review, 6750 citations were screened and scored by the review team. A flow diagram describing the process of citation selection is shown in Figure 2, and numbers of studies at each stage of exclusion by Review Group are presented in Table 3.

Table 4 shows the number and percentage of scoreable citations in each category within each Review Group. The overwhelming majority of citations reviewed for this study were classified as either reputable or likely reputable, with a combined 99.2% of all scoreable citations in either of those two categories. This high proportion of reputable or likely reputable citations was consistent throughout all Review Groups, from a low of 94.7% of studies included in the ENT group reviews to a high of 100.0% of studies included in the Back and Neck group and the Work group reviews. Flagged citations comprised only 0.8% of all citations assessed in this study. Notably, two Review Groups with a high percentage of flagged citations (ENT with 5.3% and Consumers and Communication with 2.0%) had among the lowest numbers of published reviews and scoreable references to included studies.

Conversely, the Pain, Palliative and Supportive Care group had the highest number of flagged citations among Review Groups with a relatively high number of published reviews (n=28) and scoreable references to included studies (n=664). The combined percentage of flagged citations by Review Group is presented in Figure 3.

Review Group	**Studies included in this assessment**	**Scoreable citations**	**Reputable** *n (%)*	**Likely reputable** *n (%)*	**Questionable** *n (%)*	**Likely predatory** *n (%)*	**Presumed predatory** *n (%)*
All	**6750**	**6700**	**5329 (79.5%)**	**1316 (19.6%)**	**29 (0.4%)**	**17 (0.3%)**	**9 (0.1%)**
MOSS	**2977**	**2942**	**2170 (73.8%)**	**737 (25.1%)**	**22 (0.7%)**	**9 (0.3%)**	**4 (0.1%)**
Back and Neck	86	85	75 (88.2%)	10 (11.8%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
ENT	98	95	71 (74.7%)	19 (20.0%)	3 (3.2%)	1 (1.1%)	1 (1.1%)
Eyes and Vision	577	575	434 (75.5%)	138 (24.0%)	2 (0.3%)	0 (0.0%)	1 (0.2%)
Musculoskeletal	254	248	191 (77.0%)	54 (21.8%)	2 (0.8%)	1 (0.4%)	0 (0.0%)
Oral Health	491	488	272 (55.7%)	214 (43.9%)	2 (0.4%)	0 (0.0%)	0 (0.0%)
Pain, Palliative and Supportive Care	670	664	543 (81.8%)	107 (16.1%)	10 (1.5%)	3 (0.5%)	1 (0.2%)
Skin	613	603	435 (72.1%)	161 (26.7%)	3 (0.5%)	3 (0.5%)	1 (0.2%)
Wounds	188	184	149 (81.0%)	34 (18.5%)	0 (0.0%)	1 (0.5%)	0 (0.0%)
Public Health and Health Systems	**3773**	**3758**	**3159 (84.1%)**	**579 (15.4%)**	**7 (0.2%)**	**8 (0.2%)**	**5 (0.1%)**
Consumers and Communication	102	102	82 (80.4%)	18 (17.6%)	2 (2.0%)	0 (0.0%)	0 (0.0%)
EPOC	1012	1010	852 (84.4%)	150 (14.9%)	4 (0.4%)	0 (0.0%)	4 (0.4%)
Infectious Diseases	696	692	483 (69.8%)	204 (29.5%)	0 (0.0%)	5 (0.7%)	0 (0.0%)
Public Health	658	656	577 (88.0%)	75 (11.4%)	1 (0.2%)	2 (0.3%)	1 (0.2%)
Tobacco Addiction	1100	1097	998 (91.0%)	98 (8.9%)	0 (0.0%)	1 (0.1%)	0 (0.0%)
Work	205	201	167 (83.1%)	34 (16.9%)	0 (0.0%)	0 (0.0%)	0 (0.0%)

Table 4. Number (percentage) of scoreable citations classified under each category of the predatory spectrum

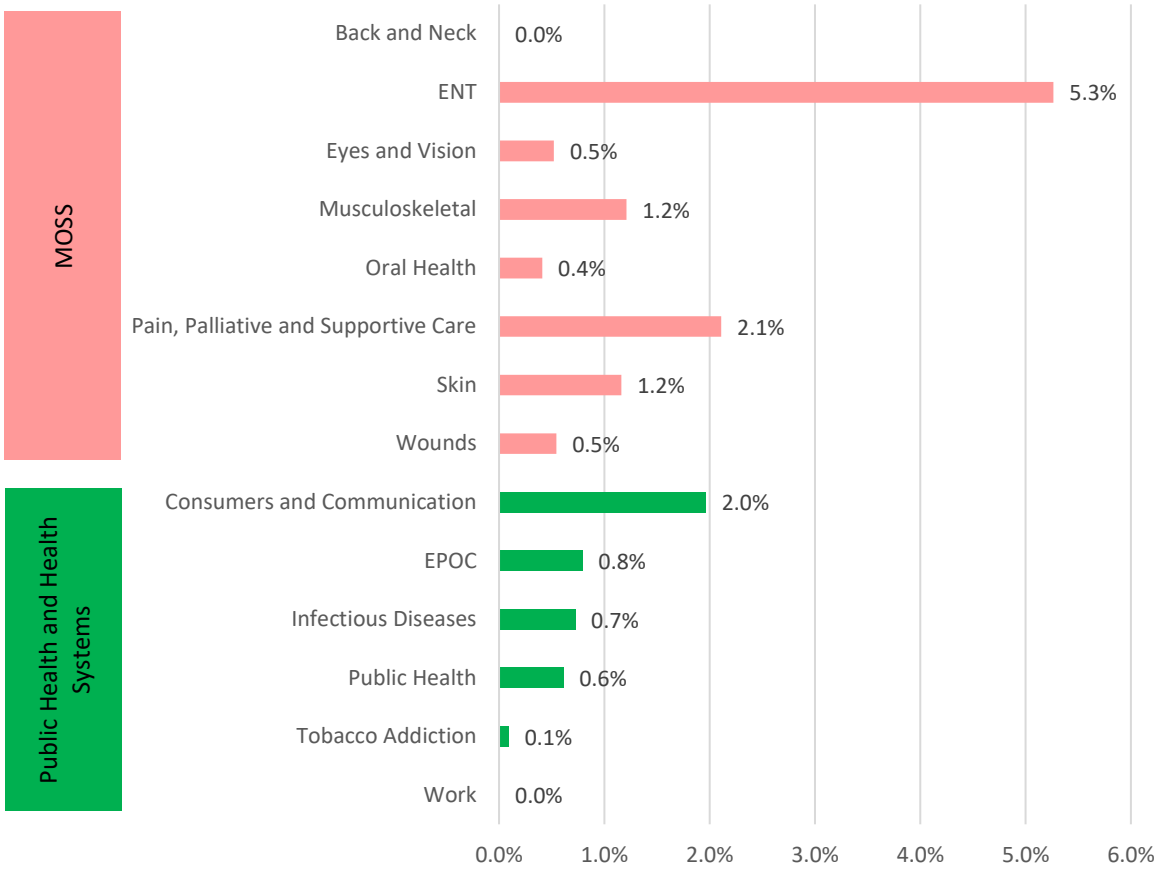

Figure 3. Combined percentage of scoreable citations flagged in each Review Group as being questionable, likely predatory, or presumed predatory

The 29 citations classified as questionable came from 12 different publishers. Only three of the publishers were included on Beall's List. Common characteristics of questionable journals or publishers observed in our assessment included discontinued or nonexistent indexing in MEDLINE or Scopus, associated articles or blog posts questioning the quality of the journal/publisher, and whether information about the journal (e.g., peer review process, editorial board) was difficult to access. The 17 citations classified as likely predatory came from 11 different publishers. For this classification, all but two were included on Beall's List, and eight were identified by Cabells Predatory Reports. Inclusion on these lists, in addition to the common characteristics of questionable publications described above, supported citations'

classification as likely predatory. Finally, the nine citations classified as presumed predatory came from just two different publishers: OMICS (7 citations) and Allied Academies (2 citations). Both publishers were included on Beall's List and Cabells Predatory Reports and are quite well known for their predatory publishing practices [28–30]. Detailed records of the assessment of each publication are located in the Supplementary Data.

Table 5 summarizes the findings of our indexing analysis of flagged citations. The numbers of citations in each database do not add up to the total number of citations, as many were indexed in more than one database. Of the 9 presumed predatory citations, 2 were indexed in PubMed, 7 were in Embase, 4 were in Scopus, and 8 were in CENTRAL; only 1 was not indexed in any of the databases. All of the likely predatory citations were indexed in at least one database, and almost all (15 of 17 citations) were indexed in CENTRAL. Of the 29 questionable citations, only 1 was not indexed in any of the databases, while 11 were indexed in all 4 databases, and again the highest number (24 of 29 citations) were indexed in CENTRAL.

Citation category	Total	PubMed	Embase	Scopus	CENTRAL	None
Presumed predatory	9	2	7	4	8	1
Likely predatory	17	5	10	11	15	0
Questionable	29	19	19	21	24	1

Table 5. Number of citations in each category indexed in commonly searched databases

4. Discussion

The low frequency of questionable, likely predatory, and presumed predatory articles in Cochrane reviews is encouraging. Despite some differences across topic areas, there was a lower frequency overall. In some cases, such as for the ENT and Consumers and Communications Review Groups, a higher percentage of flagged citations occurred with lower numbers of published reviews and references to included studies within those reviews.

The relatively small numbers of flagged citations included in those reviews may have had an outsized effect on the proportion of flagged citations as a whole in those groups. However, these observations were not consistent within the Pain, Palliative and Supportive Care Group, which had a relatively high percentage of flagged citations (2.1%) across a larger number of reviews and references to included studies.

Identifying potentially predatory publishers is not a straightforward process. We used an algorithmic process with independent assessors and a consensus process, rather than a checklist alone, allowing for more nuanced decisions that took multiple factors into account rather than relying on a purely quantitative score or inclusion on predatory publication lists. Given the increase in mistrust of Beall's and other so-called flagged lists that do not cite methodology [7,31,32], a publication's presence on these kinds of lists was only one factor in our decision-making process and was followed up by more in-depth assessment. Importantly, assessment should not be purely cross-sectional but should consider a publication's indexing and purchasing history. For example, if a journal was previously indexed by the National Library of Medicine but is no longer there, it is worth investigating any changes to the publisher or journal at that point in time. We conducted all of our final assessments as a group, coming to decisions by consensus after much discussion. Further, we erred on the side of classifying citations as questionable or likely predatory and applied the presumed predatory label only when we considered the evidence abundantly clear.

Considering all of the above factors meant that assessing each journal and publisher was a time-consuming and challenging process, and team members relied on one another to discuss each assessment at length before assigning judgment. We believe, however, that this level of in-depth assessment is required to make nuanced, thoughtful decisions. We therefore recommend that review authors take a similar team-based approach to investigating potentially predatory publications, preferably in consultation with a librarian, information

specialist, or someone with knowledge of characteristics of these types of journals. Our process is but one example of the avenues that could be taken in these kinds of investigations. Additionally, our team is aware of efforts from Cochrane and JBI to address this issue. Cochrane has released a new policy addressing problematic studies [33], and JBI has issued related guidance [34]. We encourage these groups and other knowledge synthesis organizations to continue issuing guidance to prospective authors on when and why studies from presumed predatory publications should be excluded from reviews.

Although we did not check each included review for their search methods that may have led to the identification of flagged citations for inclusion, our indexing analysis revealed that almost all of the flagged citations in this study are indexed in a major health database. The Cochrane Central Register of Controlled Trials (CENTRAL) was found to be the most common source of flagged citations, indexing 52 of them, including 10 from presumed predatory publishers like OMICS [28–30]. This could be because of CENTRAL's methods for identifying studies for inclusion in the database, which involve drawing studies directly from PubMed and Embase as well as other published and unpublished sources [35]. CENTRAL aims to be as comprehensive as possible, and the inclusion of potentially predatory publications may be an unfortunate side effect of that approach. As Cochrane encourages review authors to include CENTRAL in their search strategies, it is important for the organization (as well as JBI and other groups leading systematic review methodology) to advise reviewers on how best to consider presumed predatory publications for inclusion in reviews.

5. Limitations

This study is limited to Cochrane reviews published by a subset of Review Groups during a finite period of time (2018-2019). The search methods and inclusion criteria used by each individual review team may have affected the characteristics of citations included in our

sample (e.g., there is likely to have been a large proportion of clinical trials). We were also not able to assess non-English publications, which may have affected our data. Although we found that the percentage of flagged citations was higher in some Review Groups with lower numbers of reviews and references to included studies, a broader sample of reviews from additional Review Groups would be required to determine whether this is consistent across other Groups and Networks.

We did not publish a protocol for this study, as our methods evolved over the course of the project. Additionally, the assessment process used to categorize publications in this study ~~has not been formally validated~~lacked internal and external validation. We have presented our process as one example of how to investigate the trustworthiness of academic journals. The persisting ambiguity around the definition of predatory publications means that our assessment was not based on any single existing methodology, but rather on a combination of methods previously described in the literature [22] as well as our cumulative experience as health sciences librarians. Although we did not rely on common indicators such as inclusion on Beall's List as the sole method of identifying predatory publications, we did use them as a factor in our assessment. Additionally, although we made efforts to account for the publication date of flagged citations, it was often difficult to ascertain where each citation fell in the timeline of its journal's existence.

Because the purpose of our study was not to investigate the quality of individual flagged citations, we did not address whether inclusion of presumed predatory citations affected review conclusions. While the prevalence of predatory publications in our subset of Cochrane reviews was low, this does not measure the effect the citations in question had on the conclusions of the reviews. Future research could examine the impact of predatory publications on the conclusions of a Cochrane review, where they have been included. An area of potential to mitigate the impact of predatory publications is the risk of bias assessment

and critical appraisal, part of the existing Cochrane review process [34]. Future research could measure the effectiveness of tailoring these assessments to consider studies from presumed predatory journals.

6. Conclusion

In light of the increased discourse around the inclusion of predatory publications in systematic reviews, the small proportion of these publications cited in Cochrane reviews is encouraging. Systematic review authors should continue to be cautious, but the results of our study suggest that review organizations can continue to address this issue by recommending that the quality of studies be assessed on a case-by-case basis (e.g., through risk of bias assessments) rather than recommending blanket exclusions based solely on study sources. Areas for future research include additional analyses of reviews produced by other review organizations such as JBI, as well as reviews not formally affiliated with any organization. In the meantime, review organizations, health sciences librarians, and others who support systematic reviews should continue to educate researchers about the nuances of identifying potentially predatory publications and other research integrity issues.

Acknowledgements

The authors would like to acknowledge Dr. Jill Hayden for conceiving the idea for this work, for methodological support during the project, and for providing input on the manuscript.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Declarations of Interest

None to declare.

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2022-12

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Elsevier

https://doi.org/10.1016/j.jclinepi.2022.09.004