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LIVING REVIEWS/LIVING GUIDELINES

Yet another problem with systematic reviews: a living review update

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Abstract

Background: In February 2023, the *Journal of Clinical Epidemiology* published 'The Problems with Systematic Reviews: A Living Systematic Review.' In updating this living review for the first time a new problem and several themes relating to research culture have emerged.

Methods: Literature searches were rerun to identify articles published or indexed between May 2022 and May 2023. Thematic analysis coded articles and problems across four domains of systematic review conduct (1. comprehensive, 2. rigour, 3. transparent, 4. objective).

Results: One hundred fifty-two newly included articles bring the total number of relevant articles to 637. A new problem (the lack of gender diversity of systematic review author teams) brings the total number of problems with systematic reviews up to 68. This update also reveals emerging themes such as: fast science from systematic reviews on COVID-19; the failure of citation of methodological or reporting guidelines to predict high-quality methodological or reporting quality; and the influence of vested interests on systematic review conclusions. These findings coupled with a proliferation of research waste from ''me-too'' meta-research articles highlighting well-established problems in systematic reviews underscores the need for reforms in research culture to address the incentives for producing and publishing research papers. This update also reports where the identified flaws in systematic reviews affect their conclusions drawing on 77 meta-epidemiological studies from the total 637 included articles. These meta-meta-analytic studies begin the important work of examining which problems threaten the reliability and validity of treatment effects or conclusions derived from systematic reviews.

Conclusion: This living review has captured an emerging theme in the published literature relating to the composition of the review author team and highlights a potential effect on the equity reporting of the systematic reviews. We recommend that meta-research endeavors evolve from merely documenting well-established issues to understanding lesser-known problems or consequences to systematic reviews.

Keywords: Systematic review; Research integrity; Research culture; Author influence; Research team diversity; Metaresearch

1. Introduction

Systematic reviews, when done well, are the gold standard in evidence syntheses. However, published systematic reviews have previously been found to suffer from 67 discrete problems through a comprehensive analysis of 485 metaresearch and editorial academic articles, compiled in a living systematic review (''Systematic Reviewlution'' www.systematicreviewlution.com) [1]. The primary aim of this article is to describe insights and emerging themes identified from newly published literature in the living review update.

A secondary goal is to determine the extent to which these identified issues impact the overall conclusions of systematic reviews. Problems which can potentially alter conclusions indicate that the problem should be regarded as severe, as they may jeopardize the reliability and validity

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What is new?

Key findings

- An update of the living systematic review brings the total problems with published systematic reviews up to 68.
- Themes derived from 152 newly included articles highlight the influence of research culture on the systematic reviews being produced.
- Metaresearch articles which describe well-established problems in systematic reviews, but are not conducted comprehensively, rigorously, transparently or objectively themselves, are proliferating.

What this adds to what is known?

- Lack of gender diversity in review authorship teams influences whether research teams report equity characteristics.
- Fast science; research waste; and vested interests influence published systematic reviews and academic papers are being produced which do not represent the rigor that systematic reviews should uphold.
- Metaresearch publications which scrutinize systematic reviews are mostly produced by research teams from the global west and China.

What is the implication and what should change now?

- Diverse research workforces and teams of authors are needed to produce research which represents real-world populations.
- While the strong incentive to produce academic journal papers in academia remains, researchers will continue to publish flawed systematic reviews and redundant metaresearch papers.
- Metaresearchers are encouraged to ensure future research endeavors in this field build upon what is already well-established to continually evolve and improve the reliability and validity of future systematic reviews.

of systematic reviews. Metaepidemiological research included in Systematic Reviewlution examines this by analyzing samples of systematic reviews to assess whether specific problems affect the summary treatment effect of the studies included. In particular, some replicate or modify methodological strategies, such as including unpublished trials, using different analytical techniques like metaregression, or replicating meta-analyses with alternative statistical approaches to see if these changes influence summary effect estimates. Furthermore, research may assess whether the observed changes in results significantly impact the overall qualitative conclusion or direction of effect of the original systematic reviews. Metaresearchers also focus on methodological and reporting characteristics that correlate with specific problems, such as declared conflicts of interest or sponsorship bias, to determine if these factors correlate with favorable review conclusions or exaggeration of results in systematic reviews.

The living systematic review underpinning this article (www.systematicreviewlution.com) organizes these identified problems thematically to guide improvement in future systematic reviews. In addition to sharing new themes emerging from studies included in the first update, this article also aims to highlight which problems documented may affect systematic review conclusions.

2. Materials and methods

The first iteration of this living systematic review fully describes its underlying methods [1]. Two reviewers (LU & LF) consistently conducted study selection, data extraction, and data synthesis in alignment with the initial version of the living review.

2.1. Literature searches

Update searches were run on 22 May 2023 covering the period from May 2022. Sources searched include MEDLINE, Embase, Science Citation Index, Social Sciences Citation Index, Library and Information Science Abstracts, Cochrane Central Register of Controlled Trials, Cochrane Database of Systematic Reviews and Campbell Systematic Reviews. All search strategies are provided in the supplementary appendix.

Literature searches for this living review will be manually reviewed every 6 months by the project's information specialist (LF) and will be rerun every 12 months until December 2026.

2.2. Data collection and analysis

This living review update reports the number of newly included articles and new problems identified including qualitative themes from recent problems with systematic reviews. Further this article highlights articles that assess how identified problems impact the interpretation and conclusions of systematic reviews.

3. Results

Literature searches yielded 7935 citations after duplicates were removed (see Fig. 1). Screening of titles and

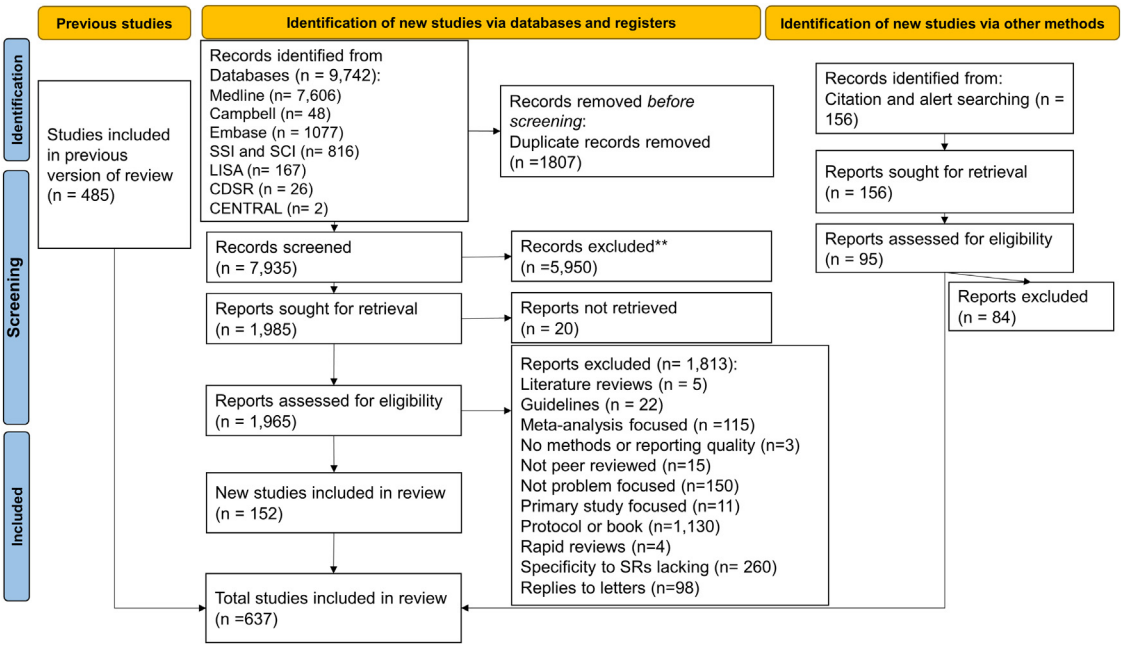

Figure 1. PRISMA Flow diagram of identification and screening of articles included in the first update of the living systematic review.

abstracts led to 1965 full-text reviews with 152 articles included. An additional problem—the lack of diversity among review authorship teams was noted in newly added articles. This problem classified under "objectivity" raises the total number of problems in systematic reviews up to 68.

3.1. Themes emerging from newly included studies highlighting problems with systematic reviews

Themes relating to methods or clinical specialty, as captured in the author keywords of the newly included articles, are depicted in Figure 2.

3.2. Review team composition and the effects on review reporting

Recently included metaresearch examines gender representation in teams of systematic review authors. Separate analyses of Cochrane reviews found that three-quarters of first authors of gastroenterology reviews [2] or any authors of general surgery reviews [3] were male. While analysis of systematic reviews in eyes and vision find approximately equal representation of women and men in Cochrane reviews, representation appears markedly lower for women as corresponding authors than other positions in non-Cochrane reviews [4]. Authorship team diversity is not just a problem of gender representation in systematic review teams but also appears to affect the conduct of systematic reviews. A metaepidemiological analysis of Cochrane reviews found a correlation between the reporting of gender in the included studies with the review's authorship gender. Presence of female authors in Cochrane reviews (either first or last author) was correlated with reporting data regarding sex from the included studies in at least one of the review sections than reviews with no female author [5].

3.3. Fast science and research waste

Good science usually takes times but the COVID-19 pandemic exemplified a growth in "fast science." Recent articles added to the living systematic review indicate an abundance of systematic reviews in the field of COVID-19 with critically low methodological and reporting quality [6], duplication and inconsistency [7], error [8], lack of registration [9], lack of certainty of evidence [10] and perpetuation of poor quality evidence or retracted studies [11]. New studies included in this update highlight further contributions to research waste from redundant systematic reviews. An analysis of 144 systematic reviews in acute venous thromboembolism found that two-thirds (67.7%) equated to excessive replications (duplications) of existing systematic reviews [12].

3.4. Citation of methodological and reporting guidelines is not protective of review quality

Newly added articles strengthen the existing problem that citation of, and in some cases, adherence to, reporting or methodological guidelines for systematic reviews are not protective of flawed or biased reviews. Analysis of

Figure 2. Wordcloud frequently ascribed keywords for the included articles identified between 2022 and 2023, indicating problems with published systematic reviews.

adherence to PRISMA (2009) guidelines from a random sample of 300 systematic reviews found no evidence that using a reporting guideline resulted in systematic reviews being more completely reported than reviews not using a guideline [13]. Further most systematic reviews reporting adherence to AMSTAR 2 had critically low methodological quality in a cross-sectional metaresearch study [14]. However, higher adherence to PRISMA (2009) guidelines in systematic reviews published in rehabilitation journals was found to correlate with lower risk of bias indicating that reporting guidelines can still be a helpful indicator of good conduct in systematic reviews [15]. Published Cochrane reviews continue to be scrutinized in both editorial and empirical articles [16]. For metaresearchers, Cochrane reviews provide a readily available sample of systematic reviews which can be obtained without time-consuming literature searches and therefore papers which scrutinize their conduct and reporting are inevitable. Cochrane reviews require adherence to methodological and reporting guidelines and are seen as the gold standard for reviewing evidence of interventions. Therefore, editorials and metaresearch studies that find flaws in the conduct of Cochrane reviews do not bode well for non-Cochrane systematic reviews, which are not usually held to the same standards and requirements for publication by journal editors and peer reviewers.

3.5. Vested interests

The personal interests of systematic review team authors have been investigated for potential influences on systematic review results. Systematic reviews of vaccines with industry sponsorship were significantly correlated with lower methodological quality than reviews of vaccines without industry funding [17]. Systematic reviews in alcohol and cardiovascular disease authored by individuals with prior industry funding report protective effects of alcohol, broader outcomes such as ‘‘cardiovascular disease,’’ and are published in broader general medical journals, as opposed to cardiology journals, which are much more heavily cited. Reviews with no prior industry funding yield mixed (protective, inconclusive or no protective effects) findings, report outcomes that are more specific and are published in field-specific journals [18].

An association between author conflicts and the favorability of the reviews’ conclusions toward the treatment group was found in systematic reviews of glaucoma interventions conducted by at least 1 author with an undisclosed conflict of interest [19]. Other research studying reviews of erectile dysfunction and opioid use disorder have not found a relationship between conflicts of interest and favorability of review conclusions but did find that reviews declaring no conflicts of interest in the review team contained

undisclosed conflicts of interest as identified by the study authors [20,21]. Editorial bias, which represents a nonfinancial conflict of interest was also noted to be undisclosed by Cochrane review authors who were also editors of the corresponding Cochrane Review Group [22].

3.6. Metaresearch production from the Global West and China

The most prolific countries to publish Cochrane systematic reviews are higher-income nations such as the USA, China, the UK, and other European countries [2–4]. But inequity in global representation is also evident in metaresearch of systematic reviews through a continued proliferation of metaresearch studies scrutinizing published systematic reviews from the Global North and West. Low- and middle-income countries have much lower representation in studies questioning the research integrity of systematic reviews [2,3]. A choropleth map indicating the frequency of all 637 included articles that assess shortcomings of systematic reviews following this update is presented in Figure 3.

3.7. Impact of the problems on systematic reviews

Most of the 637 articles included in this review primarily describe observations on the conduct or reporting of systematic reviews. However, some articles go further, assessing the correlations, consequences or impact of these problems on their sample of systematic reviews. During data extraction, we identified 77 articles that examined whether the problem/s highlighted affected the interpretation, treatment effect or conclusion of the systematic reviews. Of these, 55 articles concluded that the problems likely impacted the interpretation of the systematic reviews assessed. Table 1 shows a breakdown of study designs from the 637 included articles, including citations of studies which performed this further analytical step on systematic review samples. Definitions and documentation of all included articles are available from www.systematicreviewlution.com.

The 55 included articles which found that the interpretation of systematic reviews was impacted were associated with 40 problems, which are depicted in Figure 4.

Descriptions of the particular effects from systematic review problems described in the included articles obtained through data extraction, are provided in the supplementary appendix.

Table 2 lists problems that the 637 included articles have not formally analyzed to assess their potential impact on systematic review conclusions.

4. Discussion

This living research project aims to document existing and emerging problems with systematic reviews to

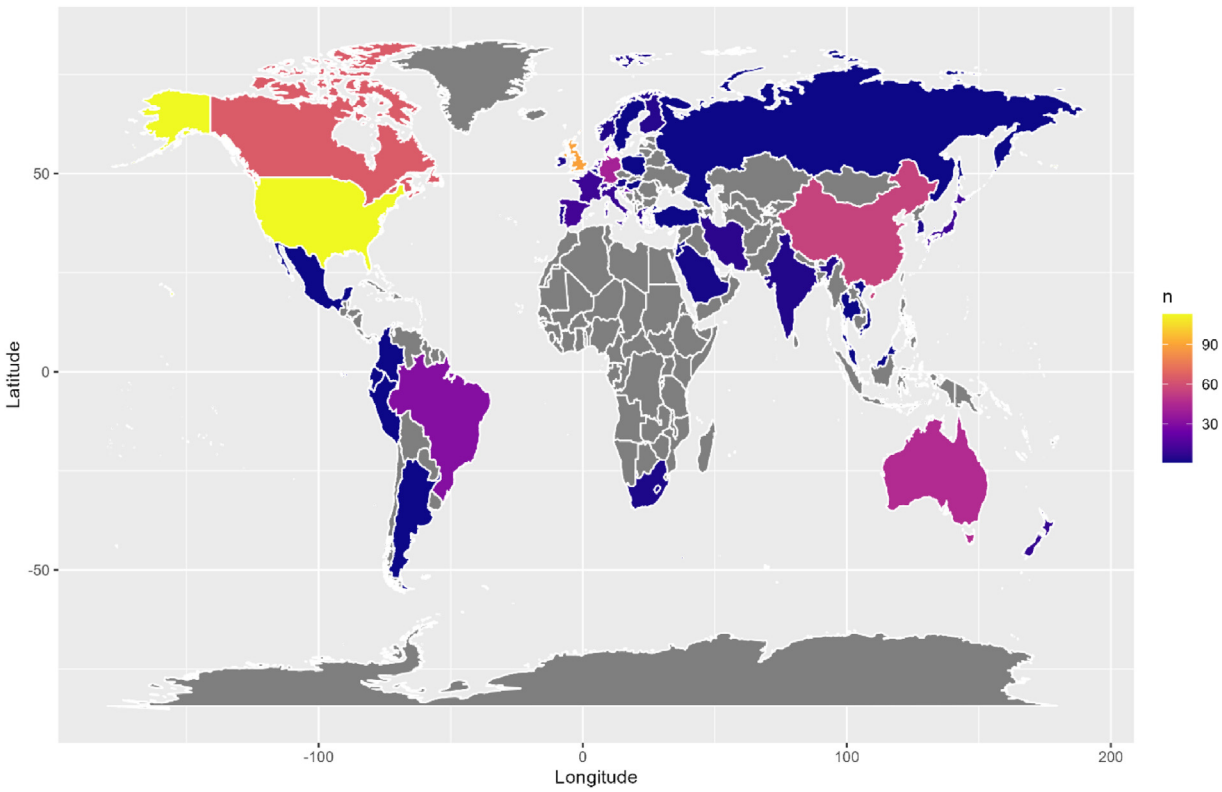

Figure 3. Choropleth map of included article frequency by country.

Table 1. Included articles that assess the impact or correlation of problems on the reliability or validity of the systematic reviews sampled

Study design and number of included articles (% of all included articles)	Number of articles examining whether the problems impacted the treatment effects of the systematic reviews	Number of articles finding that the problems led to changes in the interpretation of the systematic reviews
1. Cross-sectional survey/Methodological systematic review 444 (70%)	17[18],[23–39]	12[18,23,24,26,28–31,36–39]
2. Metaepidemiological analysis 46 (7%)	36[19–21],[40–72]	25[19,41–44,50–55,57–60, 62–66,68–72]
3. Inter-rater reliability study 13 (2%)	4[73–76]	4[73–76]
4. Survey/questionnaire 15 (2%)	2[77,78]	2[77,78]
5. Small analytical study 7 (1%)	4[79–82]	4[79–82]
6. Nonsystematic literature review 14 (2%)	5[83–87]	4[83–85,87]
7. Discussion piece 29 (5%)	2[88,89]	2[88,89]
8. Comment/letter 69 (11%)	6[90–95]	2[91,93]
Total = 637 (100%)	77	55

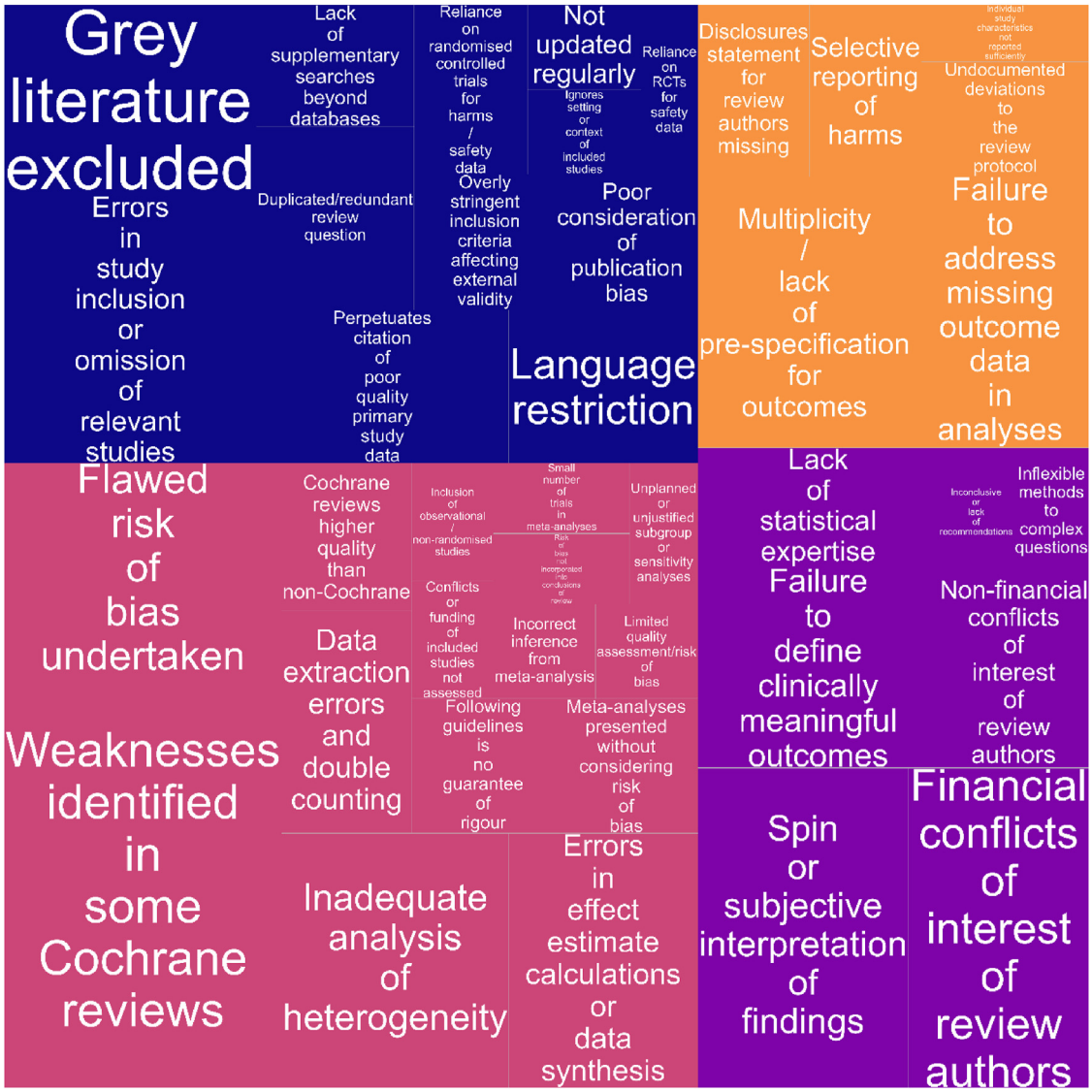

Figure 4. Treemap of problems found by 55 included articles to affect systematic review conclusions. Larger cells represent more frequently studied problems. Domains of systematic review conduct: Blue = Comprehensive; Orange = Transparent; Pink = Rigorous; Purple = Objective.

Table 2. Problems which have not been formally analyzed by the 637 included studies to assess their potential impact on systematic review conclusions

Domain	Problem
Comprehensive	Insufficient literature searches
	Errors or omissions in search strategy
	Outdated searches
	Untimely (taking too long) or resource intensive
Rigorous	Intervention not described/defined
	Inclusion of observational/nonrandomized studies
	No quality assessment undertaken or reported
	Incorrect interpretation or statistical inference error from metaanalysis
	Poor execution of narrative synthesis
	Low reporting or methodological quality (OTHER GUIDANCE)
	Lack of guidance or consistency in systematic overview/umbrella/review of systematic reviews
Transparent	Funding or sponsor of systematic review not reported
	Methods not described to enable replication
	Search strategy not provided
	Unwieldy/difficult to read
	Low reporting (PRISMA) quality
Objective	Review question not justified/important
	Lack of clinical expert/stakeholder/user perspective
	Failure to consider equity, different socioeconomic groups or disadvantaged populations
	Literature searches not validated by information specialist
	Interpreted without considering certainty or overall quality of the evidence base
	Guest/gift/ghost authorship

continually improve the conduct and quality of systematic reviews using existing research. A key benefit of a living approach is the ability to assess new trends in the context of previous research. Although systematic reviews are upheld as being objective and scientific processes, poor execution can render them misleading and even harmful, especially when they influence critical clinical decisions. The high number of articles scrutinizing systematic reviews in the 12 months following the initial review (up to May 2022) suggests that not only are systematic reviews often failing to live up to their trustworthy reputation, but also that metaresearch studies of systematic review problems which do not build upon previous research are increasingly common in academic literature.

4.1. The effect of research culture on the research being produced and published

Themes emerging from recent findings highlight issues rooted in research culture. Incentives underpinning the research environment, such as the pressure to publish academic journal papers, can impact the evidence ecosystem. Where regular publication in academic journals is valued for contract security and promotion, cheaper and faster routes to obtaining publications will be valued. Systematic reviews, being central to identifying, and synthesizing relevant research are at the pinnacle of the evidence-based hierarchy, and as such may be seen as certainty for publication which may lead to rushed or poorly executed studies [96].

A lack of gender diversity in systematic review author teams may speak to the gender representation, or other characteristics in the research workforce. This homogeneity can perpetuate biases, affecting outputs like systematic reviews. For example, 1 included study found that teams lacking diversity reported equity characteristics less thoroughly, underscoring the importance of varied perspectives for research that serves diverse populations [5].

Solutions to the existing problems have been suggested previously [1]. Effective research environments in any research endeavor require inclusive collaboration, transparent research reporting, rigorous methodological planning and objective participation from team members. However, traditional academic publishing rarely addresses the influence of research culture on these factors. While research integrity initiatives progress the conversation on open science platforms [97], researchers doing this work may not access traditional audiences and may miss out on the recognition in traditional academic spaces that rewards high-impact journal citations. Consequently, researchers committed to integrity risk hindering their own academic progress. Senior academics could help drive cultural change by modeling open science practices, as current metrics often emphasize journal publication volume over research quality.

4.2. Metaresearch and research waste: request for a new metaresearch agenda

Meta-analyses which may not have been conducted in the context of a systematic review (and would therefore be ineligible for study in this review) have proliferated [96] highlighting a research culture that values publication volume for career progression. Meta-analyses, metaresearch papers on systematic reviews and overviews of systematic reviews offer a relatively easy route to publication as they do not require ethics approval, comprehensive literature searches or adherence to methodological or

reporting guidelines, and so they can be performed with very little expertise or resources. Many such endeavors provide no protocol registration or evidence that they were conducted with a pre-established plan for analysis. The most abundantly studied problems by far involve inadequate adherence to reporting (PRISMA) and methodological (AMSTAR) guidelines. The observation that systematic reviews often do not closely adhere to systematic review guidelines has been made many times across many different specialties and academic journals. The number of ''me-too'' papers reiterating these observations without adding new insights continues to grow, yet few examine how low-quality reviews impact the validity of systematic reviews' conclusions and recommendations.

The rapid rise of overview/umbrella reviews (summaries of multiple systematic reviews) also raises concerns as many suffer from similar methodological weaknesses. There is a degree of irony that journals continue to publish these studies, while also continuing to accept substandard systematic reviews. To address these gaps the initiative www.systematicreviewlution.com aims to consolidate and advance discussions preventing research waste. A more productive metaresearch agenda would focus on evaluating whether and which well-established problems pose threats to the reliability of systematic review conclusions. We hope that by leveraging the insights and methodological designs from the metaepidemiological research cited in this article, along with the problems organized on www.systematicreviewlution.com, metaresearchers can advance the agenda of evaluating the consequences of substandard practices in systematic reviews, drawing on the extensive literature included in this living review.

5. Conclusion

The goal of this living review is to document issues raised across the academic literature to drive meaningful improvements. Newer findings suggest that research culture likely fuels flaws in systematic reviews and metaresearch studies. Systematic review authors, peer reviewers, and other users of systematic reviews are encouraged to use this living review to strive for best practice. Metaresearchers and other evaluators of systematic reviews can also benefit from this ongoing review by addressing known problems and refocusing efforts on assessing the impacts and solutions for both existing and emerging problems.

Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work, the authors used Open AI ChatGPT to revise the manuscript narrative from passive to active voice. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

CRediT authorship contribution statement

Lesley Uttley: Writing − review & editing, Writing − original draft, Visualization, Supervision, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Conceptualization. **Yuliang Weng:** Writing − review & editing, Software, Data curation. **Louise Falzon:** Writing − review & editing, Validation, Project administration, Investigation, Formal analysis, Data curation.

Declaration of competing interest

This work is funded by the UKRI Medical Research Council with the intention of upholding best practice for systematic reviews but is conducted independently to any methodological or systematic review organisation. The authors posit that there are problems with many published systematic reviews which aligns with the funded research topic but have no other conflicts of interest to declare.

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Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jclinepi.2024.111608.

Data availability

Data supplied as appendices and also available at www.systematicreviewlution.com or the Open Science Framework page (https://osf.io/2hmv9/).

References

[1] Uttley L, Quintana DS, Montgomery P, Carroll C, Page MJ, Falzon L, et al. The problems with systematic reviews: a living systematic review. J Clin Epidemiol 2023;156:30−41.
[2] Dhali A, D'Souza C, Rathna RB, Biswas J, Dhali GK. Authorship diversity in gastroenterology-related Cochrane systematic reviews: inequities in global representation. Front Med 2022;9:982664.
[3] Rathna RB, Biswas J, D'Souza C, Joseph JM, Kipkorir V, Dhali A. Authorship diversity in general surgery-related Cochrane systematic reviews: a bibliometric study. Br J Surg 2023;110:989−90.

[4] Qureshi R, Han G, Fapohunda K, Abariga S, Wilson R, Li T. Authorship diversity among systematic reviews in eyes and vision. Syst Rev 2020;9:1−9.
[5] Antequera A, Cuadrado-Conde MA, Roy-Vallejo E, Montoya-Martínez M, León-García M, Madrid-Pascual O, et al. Lack of sex-related analysis and reporting in Cochrane Reviews: a cross-sectional study. Syst Rev 2022;11(1):281.
[6] Whear R, Bethel A, Abbott R, Rogers M, Orr N, Manzi S, et al. Systematic reviews of convalescent plasma in COVID-19 continue to be poorly conducted and reported: a systematic review. J Clin Epidemiol 2022;151:53−64.
[7] Beresford L, Walker R, Stewart L. Extent and nature of duplication in PROSPERO using COVID-19-related registrations: a retrospective investigation and survey. BMJ Open 2022;12(12):e061862.
[8] Santamaria-Gadea A, de los Santos G, Alobid I, Mullol J, Marino-Sanchez F. Errors and biases in meta-analysis of the prevalence of olfactory dysfunction in patients with COVID-19. Otolaryngol Head Neck Surg 2021;164(2):455−6.
[9] Siemens W, Nothacker J, Stadelmaier J, Meerpohl JJ, Schmucker C. Three out of four published systematic reviews on COVID-19 treatments were not registered and one-third of those registered were published: a meta-research study. J Clin Epidemiol 2022;152:36−46.
[10] Martimbianco ALC, Pacheco RL, Latorraca C de OC, Ferreira RES, Riera R. Systematic reviews on interventions for COVID-19 have rarely graded the certainty of the evidence. Sao Paulo Med J 2021; 139:511−3.
[11] Deng J, Zhou F, Heybati K, Kavanagh K. Caution should be exercised when assessing ivermectin for the treatment of COVID-19 in systematic reviews. Rev Med Virol 2022;32(5):e2317.
[12] Chapelle C, Ollier E, Bonjean P, Locher C, Zufferey PJ, Cucherat M, et al. Replication of systematic reviews: is it to the benefit or detriment of methodological quality? J Clin Epidemiol 2023;162:98−106.
[13] Nguyen PY, Kanukula R, McKenzie JE, Alqaidoom Z, Brennan SE, Haddaway NR, et al. Changing patterns in reporting and sharing of review data in systematic reviews with meta-analysis of the effects of interventions: cross sectional meta-research study. BMJ 2022; 379:e072428.
[14] Bojcic R, Todoric M, Puljak L. Most systematic reviews reporting adherence to AMSTAR 2 had critically low methodological quality: a cross-sectional meta-research study. J Clin Epidemiol 2023;165: 111210.
[15] Innocenti T, Feller D, Giagio S, Salvioli S, Minnucci S, Brindisino F, et al. Adherence to the PRISMA statement and its association with risk of bias in systematic reviews published in rehabilitation journals: a meta-research study. Braz J Phys Ther 2022;26:100450.
[16] Durbhakula S, Broachwala M, Schuster NM, McCormick ZL. Striking Errors in the Methodology, Execution, and Conclusions of the Cochrane Library Review of Spinal Cord Stimulation for Low Back Pain by Traeger et al. Pain Med 2023;24(8):923−5.
[17] Pieper D, Hellbrecht I, Zhao L, Baur C, Pick G, Schneider S, et al. Impact of industry sponsorship on the quality of systematic reviews of vaccines: a cross-sectional analysis of studies published from 2016 to 2019. Syst Rev 2022;11(1):1−9.
[18] Golder S, McCambridge J. Alcohol, cardiovascular disease and industry funding: a co-authorship network analysis of systematic reviews. Soc Sci Med 2021;289:114450.
[19] Wise A, Mannem D, Anderson JM, Weaver M, Hartwell M, Vassar M. Do author conflicts of interest and industry sponsorship influence outcomes of systematic reviews and meta-analyses regarding glaucoma interventions? A cross-sectional analysis. J Glaucoma 2021;30(4):293−9.
[20] Corcoran A, Hillman C, Cole T, Anderson M, Weaver M, Johnson BS, et al. Association between author conflicts of interest and industry-sponsorship with the favorability of outcomes of systematic reviews focusing on treatments of erectile dysfunction. Andrology 2021;9(6):1819−27.
[21] Ferrell S, Demla S, Anderson JM, Weaver M, Torgerson T, Hartwell M, et al. Association between industry sponsorship and author conflicts of interest with outcomes of systematic reviews and meta-analyses of interventions for opioid use disorder. J Subst Abuse Treat 2022;132:108598.
[22] Pacheco RL, Latorraca COC, Martimbianco ALC, Miranda E, Fontes LES, Nunan D, et al. Adherence to conflicts of interest policy in Cochrane reviews where authors are also editorial board members: a cross-sectional analysis. Res Synth Methods 2022;13(1):6−11.
[23] Schroll JB, Moustgaard R, Gotzsche PC. Dealing with substantial heterogeneity in Cochrane reviews. Cross-sectional study. BMC Med Res Methodol 2011;11:22.
[24] French SD, McDonald S, McKenzie JE, Green SE. Investing in updating: how do conclusions change when Cochrane systematic reviews are updated? BMC Med Res Methodol 2005;5:33.
[25] Ioannidis JP, Trikalinos TA. The appropriateness of asymmetry tests for publication bias in meta-analyses: a large survey. CMAJ 2007; 176(8):1091−6.
[26] Papanikolaou PN, Ioannidis JP. Availability of large-scale evidence on specific harms from systematic reviews of randomized trials. Am J Med 2004;117(8):582−9.
[27] Williamson PR, Gamble C. Identification and impact of outcome selection bias in meta-analysis. Stat Med 2005;24(10):1547−61.
[28] Moher D, Pham B, Lawson ML, Klassen TP. The inclusion of reports of randomised trials published in languages other than English in systematic reviews. Health Technol Assess 2003;7(41):1−90.
[29] Imberger G, Thorlund K, Gluud C, Wetterslev J. False-positive findings in Cochrane meta-analyses with and without application of trial sequential analysis: an empirical review. BMJ Open 2016;6(8): e011890.
[30] McGrath TA, McInnes MDF, van Es N, Leeflang MMG, Korevaar DA, Bossuyt PMM. Overinterpretation of research findings: evidence of 'spin' in systematic reviews of diagnostic accuracy studies. Clin Chem 2017;63(8):1353−62.
[31] McGrath TA, Bowdridge JC, Prager R, Frank RA, Treanor L, Dehmoobad Sharifabadi A, et al. Overinterpretation of research findings: evaluation of 'spin' in systematic reviews of diagnostic accuracy studies in high-impact factor journals. Clin Chem 2020;66(7): 915−24.
[32] Oliveira CB, Elkins MR, Lemes IR, de Oliveira Silva D, Briani RV, Monteiro HL, et al. A low proportion of systematic reviews in physical therapy are registered: a survey of 150 published systematic reviews. Braz J Phys Ther 2018 May;22(3):177−83.
[33] Nascimento DP, Gonzalez GZ, Araujo AC, Moseley AM, Maher CG, Costa LOP. Eight out of every ten abstracts of low back pain systematic reviews presented spin and inconsistencies with the full text: an analysis of 66 systematic reviews. J Orthop Sports Phys Ther 2020; 50(1):17−23.
[34] Tricco AC, Cogo E, Page MJ, Polisena J, Booth A, Dwan K, et al. A third of systematic reviews changed or did not specify the primary outcome: a PROSPERO register study. J Clin Epidemiol 2016;79: 46−54.
[35] Jones AP, Remmington T, Williamson PR, Ashby D, Smyth RL. High prevalence but low impact of data extraction and reporting errors were found in Cochrane systematic reviews. J Clin Epidemiol 2005;58(7):741−2.
[36] Skoetz N, Goldkuhle M, Weigl A, Dwan K, Labonte V, Dahm P, et al. Methodological review showed correct absolute effect size estimates for time-to-event outcomes in less than one-third of cancer-related systematic reviews. J Clin Epidemiol 2019;108:1−9.
[37] Riva N, Puljak L, Moja L, Ageno W, Schunemann H, Magrini N, et al. Multiple overlapping systematic reviews facilitate the origin of disputes: the case of thrombolytic therapy for pulmonary embolism. J Clin Epidemiol 2018;97:1−13.
[38] van der Velde G, van Tulder M, Cote P, Hogg-Johnson S, Aker P, Cassidy JD, et al. The sensitivity of review results to methods used

to appraise and incorporate trial quality into data synthesis. Spine 2007;32(7):796−806.
[39] Marson Smith PR, Ware L, Adams C, Chalmers I. Claims of 'no difference' or 'no effect' in Cochrane and other systematic reviews. BMJ Evid Based Med 2020;07(3):07.
[40] Baudard M, Yavchitz A, Ravaud P, Perrodeau E, Boutron I. Impact of searching clinical trial registries in systematic reviews of pharmaceutical treatments: methodological systematic review and reanalysis of meta-analyses. BMJ 2017;356:j448.
[41] Parker LA, Saez NG, Porta M, Hernandez-Aguado I, Lumbreras B. The impact of including different study designs in meta-analyses of diagnostic accuracy studies. Eur J Epidemiol 2013;28(9):713−20.
[42] Prior M, Hibberd R, Asemota N, Thornton JG. Inadvertent P-hacking among trials and systematic reviews of the effect of progestogens in pregnancy? A systematic review and meta-analysis. BJOG 2017; 124(7):1008−15.
[43] Kahale LA, Khamis AM, Diab B, Chang Y, Lopes LC, Agarwal A, et al. Potential impact of missing outcome data on treatment effects in systematic reviews: imputation study. BMJ 2020;370:m2898.
[44] Xu C, Yu T, Furuya-Kanamori L, Lin L, Zorzela L, Zhou X, et al. Validity of data extraction in evidence synthesis practice of adverse events: reproducibility study. BMJ 2022;377:e069155.
[45] Wilson LM, Sharma R, Dy SM, Waldfogel JM, Robinson KA. Searching ClinicalTrials.gov did not change the conclusions of a systematic review. J Clin Epidemiol 2017;90:127−35.
[46] Hansen C, Lundh A, Rasmussen K, Hrobjartsson A. Financial conflicts of interest in systematic reviews: associations with results, conclusions, and methodological quality. Cochrane Database Syst Rev 2019;8(8):MR000047.
[47] Spineli LM. Missing binary data extraction challenges from Cochrane reviews in mental health and Campbell reviews with implications for empirical research. Res Synth Methods 2017;8(4):514−25.
[48] Khamis AM, El Moheb M, Nicolas J, Iskandarani G, Refaat MM, Akl EA. Several reasons explained the variation in the results of 22 meta-analyses addressing the same question. J Clin Epidemiol 2019;113:147−58.
[49] Page MJ, Forbes A, Chau M, Green SE, McKenzie JE. Investigation of bias in meta-analyses due to selective inclusion of trial effect estimates: empirical study. BMJ Open 2016;6(4):e011863.
[50] Page MJ, McKenzie JE, Kirkham J, Dwan K, Kramer S, Green S, et al. Bias due to selective inclusion and reporting of outcomes and analyses in systematic reviews of randomised trials of healthcare interventions. Cochrane Database Syst Rev 2014;2014(10):MR000035.
[51] Kontopantelis E, Springate DA, Reeves D. A re-analysis of the Cochrane Library data: the dangers of unobserved heterogeneity in meta-analyses. PLoS One 2013;8(7):e69930.
[52] Hacke C, Nunan D. Discrepancies in meta-analyses answering the same clinical question were hard to explain: a meta-epidemiological study. J Clin Epidemiol 2020;119:47−56.
[53] Bagg MK, O'Hagan E, Zahara P, Wand BM, Hubscher M, Moseley GL, et al. Systematic reviews that include only published data may overestimate the effectiveness of analgesic medicines for low back pain: a systematic review and meta-analysis. J Clin Epidemiol 2020;124:149−59.
[54] Bagg MK, O'Hagan E, Zahara P, Wand BM, Hübscher M, Moseley GL, et al. Reviews may overestimate the effectiveness of medicines for back pain: systematic review and meta-analysis. J Clin Epidemiol 2019;124:149−59.
[55] Kirkham JJ, Altman DG, Williamson PR. Bias due to changes in specified outcomes during the systematic review process. PLoS One 2010;5(3):e9810.
[56] Turner RM, Bird SM, Higgins JP. The impact of study size on meta-analyses: examination of underpowered studies in Cochrane reviews. PLoS One 2013;8(3):e59202.
[57] Brok J, Thorlund K, Wetterslev J, Gluud C. Apparently conclusive meta-analyses may be inconclusive–Trial sequential analysis adjustment of random error risk due to repetitive testing of accumulating data in apparently conclusive neonatal meta-analyses. Int J Epidemiol 2009;38(1):287−98.
[58] Raichand S, Dunn AG, Ong MS, Bourgeois FT, Coiera E, Mandl KD. Conclusions in systematic reviews of mammography for breast cancer screening and associations with review design and author characteristics. Syst Rev 2017;6(1):105.
[59] Potthast R, Vervolgyi V, McGauran N, Kerekes MF, Wieseler B, Kaiser T. Impact of inclusion of industry trial results registries as an information source for systematic reviews. PLoS One 2014;9(4):e92067.
[60] Ford AC, Guyatt GH, Talley NJ, Moayyedi P. Errors in the conduct of systematic reviews of pharmacological interventions for irritable bowel syndrome. Am J Gastroenterol 2010;105(2):280−8.
[61] Nussbaumer-Streit B, Klerings I, Dobrescu AI, Persad E, Stevens A, Garritty C, et al. Excluding non-English publications from evidence-syntheses did not change conclusions: a meta-epidemiological study. J Clin Epidemiol 2020;118:42−54.
[62] Savovic J, Turner RM, Mawdsley D, Jones HE, Beynon R, Higgins JPT, et al. Association between risk-of-bias assessments and results of randomized trials in Cochrane reviews: the ROBES meta-epidemiologic study. Am J Epidemiol 2018;187(5):1113−22.
[63] Onishi A, Furukawa TA. Publication bias is underreported in systematic reviews published in high-impact-factor journals: metaepidemiologic study. J Clin Epidemiol 2014;67(12):1320−6.
[64] Kirkham JJ, Dwan KM, Altman DG, Gamble C, Dodd S, Smyth R, et al. The impact of outcome reporting bias in randomised controlled trials on a cohort of systematic reviews. BMJ 2010;340:c365.
[65] Hart B, Lundh A, Bero L. Effect of reporting bias on meta-analyses of drug trials: reanalysis of meta-analyses. BMJ 2012;344:d7202.
[66] Tendal B, Nuesch E, Higgins JP, Juni P, Gotzsche PC. Multiplicity of data in trial reports and the reliability of meta-analyses: empirical study. BMJ 2011;343:d4829.
[67] de Rezende LFM, Rey-Lopez JP, de Sa TH, Chartres N, Fabbri A, Powell L, et al. Reporting bias in the literature on the associations of health-related behaviors and statins with cardiovascular disease and all-cause mortality. PLoS Biol 2018;16(6):e2005761.
[68] Bes-Rastrollo M, Schulze MB, Ruiz-Canela M, Martinez-Gonzalez MA. Financial conflicts of interest and reporting bias regarding the association between sugar-sweetened beverages and weight gain: a systematic review of systematic reviews. PLoS Med 2014;10(12):e1001578. ; dicsussion e1001578.
[69] Marret E, Elia N, Dahl JB, McQuay HJ, Moiniche S, Moore RA, et al. Susceptibility to fraud in systematic reviews: lessons from the Reuben case. Anesthesiology 2009 Dec;111(6):1279−89.
[70] Frosi G, Riley RD, Williamson PR, Kirkham JJ. Multivariate meta-analysis helps examine the impact of outcome reporting bias in Cochrane rheumatoid arthritis reviews. J Clin Epidemiol 2015;68(5): 542−50.
[71] Souza JP, Pileggi C, Cecatti JG. Assessment of funnel plot asymmetry and publication bias in reproductive health meta-analyses: an analytic survey. Reprod Health 2007;4:3.
[72] Hartling L, Featherstone R, Nuspl M, Shave K, Dryden DM, Vandermeer B. Grey literature in systematic reviews: a cross-sectional study of the contribution of non-English reports, unpublished studies and dissertations to the results of meta-analyses in child-relevant reviews. BMC Med Res Methodol 2017;17(1):64.
[73] Dunn AG, Arachi D, Hudgins J, Tsafnat G, Coiera E, Bourgeois FT. Financial conflicts of interest and conclusions about neuraminidase inhibitors for influenza: an analysis of systematic reviews. Ann Intern Med 2014;161(7):513−8.
[74] Tendal B, Higgins JP, Juni P, Hrobjartsson A, Trelle S, Nuesch E, et al. Disagreements in meta-analyses using outcomes measured on continuous or rating scales: observer agreement study. BMJ 2009; 339:b3128.
[75] Buttner F, Winters M, Delahunt E, Elbers R, Lura CB, Khan KM, et al. Identifying the 'incredible'! Part 2: spot the difference - a rigorous risk of bias assessment can alter the main findings of a systematic review. BJSM Online 2020;54(13):801−8.

[76] Bilandzic A, Fitzpatrick T, Rosella L, Henry D. Risk of bias in systematic reviews of non-randomized studies of adverse cardiovascular effects of thiazolidinediones and cyclooxygenase-2 inhibitors: application of a new Cochrane risk of bias tool. PLoS Med 2016;13(4):e1001987.

[77] Olsen O, Middleton P, Ezzo J, Gotzsche PC, Hadhazy V, Herxheimer A, et al. Quality of Cochrane reviews: assessment of sample from 1998. BMJ 2001;323(7317):829−32.

[78] Meursinge Reynders R, Ladu L, Di Girolamo N. Contacting of authors modified crucial outcomes of systematic reviews but was poorly reported, not systematic, and produced conflicting results. J Clin Epidemiol 2019;115:64−76.

[79] Rosen L, Suhami R. The art and science of study identification: a comparative analysis of two systematic reviews. BMC Med Res Methodol 2016;16:24.

[80] Oliver CJ, Myers SP. Validity of a Cochrane Systematic Review and meta-analysis for determining the safety of vitamin E. BMC Altern Med 2017;17(1):408.

[81] Alperson SY, Berger VW. Opposing systematic reviews: the effects of two quality rating instruments on evidence regarding t'ai chi and bone mineral density in postmenopausal women. J Altern Complement Med 2011;17(5):389−95.

[82] Bjordal JM, Bogen B, Lopes-Martins RA, Klovning A. Can Cochrane Reviews in controversial areas be biased? A sensitivity analysis based on the protocol of a Systematic Cochrane Review on low-level laser therapy in osteoarthritis. Photomed Laser Surg 2005;23(5):453−8.

[83] Hutton P, Morrison AP, Yung AR, Taylor PJ, French P, Dunn G. Effects of drop-out on efficacy estimates in five Cochrane reviews of popular antipsychotics for schizophrenia. Acta Psychiatr Scand 2012;126(1):1−11.

[84] Goodyear-Smith FA, van Driel ML, Arroll B, Del Mar C. Analysis of decisions made in meta-analyses of depression screening and the risk of confirmation bias: a case study. BMC Med Res Methodol 2012;12:76.

[85] Banaschewski T, Gerlach M, Becker K, Holtmann M, Dopfner M, Romanos M. Trust, but verify. The errors and misinterpretations in the Cochrane analysis by O. J. Storebo and colleagues on the efficacy and safety of methylphenidate for the treatment of children and adolescents with ADHD. Z Kinder Jugendpsychiatr Psychother 2016;44(4):307−14.

[86] Carroll C, Scope A, Kaltenthaler E. A case study of binary outcome data extraction across three systematic reviews of hip arthroplasty: errors and differences of selection. BMC Res Notes 2013;6:539.

[87] Pham B, Klassen TP, Lawson ML, Moher D. Language of publication restrictions in systematic reviews gave different results depending on whether the intervention was conventional or complementary. J Clin Epidemiol 2005;58(8):769−76.

[88] Hahn S, Garner P, Williamson P. Are systematic reviews taking heterogeneity into account? An analysis from the Infectious Diseases Module of the Cochrane Library. J Eval Clin Pract 2000;6(2):231−3.

[89] Jorgensen L, Gotzsche PC, Jefferson T. The Cochrane HPV vaccine review was incomplete and ignored important evidence of bias. BMJ Evid Based Med 2018;23(5):165−8.

[90] Malling HJ, Thomsen AB, Andersen JS. Heterogeneity can impair the results of Cochrane meta-analyses despite accordance with statistical guidelines. Allergy 2008;63(12):1643−5.

[91] Tian S. Statistically significant meta-analyses of surgical weight loss interventions are reevaluated by the Hartung-Knapp method. Obes Rev 2022;23(6):e13454.

[92] Furukawa TA, Watanabe N, Omori IM, Montori VM, Guyatt GH. Association between unreported outcomes and effect size estimates in Cochrane meta-analyses. JAMA 2007;297(5):468−70.

[93] Besen BAMP, Park M, Nassar AP. Accounting for single center effects in systematic reviews cannot be overlooked. Critical Care 2017;21(1):241.

[94] Padrao EMH, Rahhal H, Valente FS, Besen BAMP. Methodological issues in meta-analyses of observational studies: the need for attention to the details. Br J Anaesth 2022;128(5):e303−5.

[95] Papageorgiou SN, Koletsi D, Iliadi A, Peltomaki T, Eliades T. Comment on: treatment outcome with orthodontic aligners and fixed appliances: a systematic review with meta-analyses. Eur J Orthod 2020;42(3):344−6.

[96] Uttley L. Research culture's role in contributing to research waste: lessons from systematic reviewlution. Exch Interdiscipl Res J 2024;11(3):114−25.

[97] Hsing PY. A snapshot of the academic research culture in 2023 and how it might be improved [Internet]. Octopus 2023. Available at: https://zenodo.org/records/8165704. Accessed August 21, 2024.