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ORIGINAL RESEARCH

Research culture influences in health and biomedical research: rapid scoping review and content analysis

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Abstract

Background: Research culture is strongly influenced by academic incentives and pressures such as the imperative to publish in academic journals, and can influence the nature and quality of the evidence we produce.

Objective: The purpose of this rapid scoping review is to capture the breadth of differential pressures and contributors to current research culture, drawing together content from empirical research specific to the health and biomedical sciences.

Study Design and Setting: PubMed and Web of Science were searched for empirical studies of influences and impacts on health and biomedical research culture, published between January 2012 and April 2024. Data charting extracted the key findings and relationships in research culture from included papers such as workforce composition; equitable access to research; academic journal trends, incentives, and reproducibility; erroneous research; questionable research practices; biases vested interests; and misconduct. A diverse author network was consulted to ensure content validity of the proposed framework of i) inclusivity, ii) transparency, iii) rigor, and iv) objectivity.

Results: A growing field of studies examining research culture exists ranging from the inclusivity of the scientific workforce, the transparency of the data generated, the rigor of the methods used and the objectivity of the researchers involved. Figurative diagrams are presented to storyboard the links between research culture content and findings.

Conclusion: The wide range of research culture influences in the recent literature indicates the need for coordinated and sustained research culture conversations. Core principles in effective research environments should include inclusive collaboration and diverse research workforces, rigorous methodological approaches, transparency, data sharing, and reflection on scientific objectivity.

Keywords: Research culture; Research integrity; Scoping review; Academia; Incentives; Conflicts of interest

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What is new?

- This rapid scoping review finds that research culture is influenced by 1) the inclusivity of the scientific workforce, 2) the transparency of the data generated, 3) the rigour of the methods used and 4) the objectivity of the researchers involved.
- The research environment impacts the research outputs produced and diverse research teams are required to produce research which represents diverse populations.
- Researcher assessment is key to shaping academic incentives and in turn, research culture.

What this adds to what was known?

- Lack of diversity in academic workforce, dominance of high-income countries over low- and middle-income countries in research and layers of privilege in academic selection are barriers to an inclusive research culture.
- Incentives built on reductionist metrics that protect the status quo for established researchers and value novelty, ''impact'' and academic papers, fuel conflicts of interest and threaten objectivity in scientific research.
- Threats to rigour include lack of expertise, questionable research practices, fast science, and misconduct.

What is the implication and what should change now?

- A wide range of research culture influences in the recent literature indicates the need for coordinated and sustained research culture conversations.
- The traditional publishing model and the high value of academic journal papers in research assessment is a persistent cause of barriers to open research practices.
- Researcher evaluation should focus on the people and collaborative efforts, valuing a range of contributions and career pathways.

1. Introduction

Research culture refers to the values, expectations, behaviors, and norms in the research environment and can influence the evidence researchers produce. The impetus for the current review began in updating a living research integrity initiative on systematic reviews [1], in which a new theme pertaining to research culture emerged: a lack of diversity in authorship of systematic review teams [2]. In response, this rapid scoping review was designed to compile the differential pressures and contributors to health and biomedical research culture currently and to reflect on how challenges in research culture might influence the scientific workforce composition, as well as the production, generalisability, and validity of health and biomedical research. Opportunities for research culture change are proposed to fall under four core themes of (i) inclusivity, (ii) transparency, (iii) rigor, and (iv) objectivity, which have been previously highlighted to denote cornerstones of research integrity [1].

A positive research culture underpins ethical and good quality research as previously established by initiatives such as the San Francisco Declaration on Research Assessment (DORA) principles and the Hong Kong Principles [3,4]. However, ongoing threats to a positive research culture have been identified from cross-disciplinary research indicating that further research culture reform is required [5]. This work is of direct interest to health and biomedical researchers, but the findings are relevant for institutions, publishers, and funders. The ultimate beneficiaries of this research are patients and the public who rely on institutions to foster a flourishing research culture to underpin the health and biomedical research which affects health care and in turn the health of patients. By comprehensively drawing links between a wide range of topics relevant to research culture, we hope that this review will contribute positively to ongoing research culture conversations and help inform policy for positive research culture change.

1.1. Objectives

This scoping review aims to explore the breadth of relevant research that influences and contributes to research culture. The work maximizes learning and the impact of literature searches by allowing critical reflection and interpretation from a diverse author network across the research culture field. Using published academic literature from a health and the biomedical context and a previously proposed framework [1], the scoping review aims to narratively summarise the following:

1. Barriers to equity, diversity, **inclusion**, and global representation,
2. Barriers to **transparency** and open science,
3. Threats to **rigor** and trustworthiness of research,
4. Factors affecting the **objectivity** of health and biomedical research.

2. Methods

The protocol for this work was developed using the PRISMA scoping review (PRISMA-ScR) statement [6], the Joanna Briggs Institute 2020 guide to scoping reviews [7] and the World Health Organization rapid review guide [8]. The full methods and protocol for this research were

prespecified prior to conduct and are available from the Open Science Framework (https://osf.io/mgz93/; uploaded March 4, 2024).

2.1. Search

An experienced information specialist (LF) performed targeted literature searches of key phrases (research OR publishing) AND terms relevant to research culture. These initial searches were peer reviewed by another information specialist who is not a coauthor of this work (see acknowledgments). Research culture relevance was defined as pertaining to the incentives, assessment, workforce demographics, influences, and impacts in health or biomedical research [5]. A full list of phrases used in the searches is provided in the Supplementary Appendix. Heterogeneity in terminology and research designs was expected; therefore, literature searches evolved to incorporate emerging research culture themes from the initial searches using supplementary searches (below). Results were limited to studies published from 2012 (the inception of DORA principles [3]) to April 1, 2024; studies published in English (language restriction due to rapid review timelines); and studies in humans.

Databases: PubMed, Web of Science

Dates: Searching of all sources was conducted between February and April 2024.

Supplementary searches: Using results from the targeted searches, the following tools and sources were used to search for similar additional articles: PubMed Similar Articles, reference lists and the Cited References function in Web of Science, Google Scholar, Citation Chaser, Keenious, Research Rabbit, and Elicit artificial intelligence platforms.

2.2. Eligibility criteria

Studies were assessed for relevance by defining the research question using the Sample, Phenomenon of Interest, Design, Evaluation, Research type framework [9]. Eligible studies were restricted to research published in academic journals, as described in Table 1. Where sources contained multidisciplinary content, records focusing on health or biomedical research were selected.

2.3. Study screening and data charting

Articles identified as potentially relevant from the literature searches were imported into a shared Zotero library by one researcher (LF). Full screening of all citations for eligibility was performed by a second researcher (LU). Abstracts and full texts of relevant papers were subjected to content analyses by two authors (LU and LF). Content analyses involved noting key findings of eligible studies to find recurring themes, commonalities, and patterns between them and ascribing relevant keywords in Zotero of the research culture topic or finding discussed.

Table 1. Eligibility criteria used to judge studies for relevance in the rapid scoping review using the SPIDER framework

Sample	Health or biomedical research
Phenomenon of Interest	Research culture influences including incentives; recognition and reward; workforce composition; questionable research practices; conflicts of interest and research fraud.
Design	Empirical study designs including mixed methods, quantitative or qualitative.
Evaluation	Content analysis relating to contributors and impacts of research culture.
Research type	Papers published in peer-reviewed academic journals from 2012 to April 2024.

SPIDER, Sample, Phenomenon of Interest, Design, Evaluation, Research type.

2.4. Data items

Items of interest were research culture influences and impacts such as workforce composition; equitable access to research; academic journal trends, incentives, and reproducibility; erroneous research; questionable research practices (QRPs); biases vested interests; and misconduct.

2.5. Synthesis of results

The articles and keywords were deductively allocated to the framework of scientific conduct proposed previously by Uttley and colleagues [1], which included (i) inclusivity (ii) rigor (iii) transparency and (iv) objectivity, by one author (LU) and decisions were double checked by a second author (LF). Keywords from included articles were structured in a shared document for coauthors (ACT, CL, DM, FN, JAB, LM, MRM, TS) to confirm appropriate semantic interpretation of content analysis, that keywords were ascribed to the correct domain and to agree the conceptual organization of the framework.

2.6. Summary of evidence

Descriptive synthesis with corresponding figurative diagrams were created as a narrative storyboard of the relationships, influences, and impacts resulting from research culture in the health and biomedical context by one author (LU) in the shared document. Feedback was provided by coauthors to revise and refine the diagrams.

2.7. Protocol amendments

A change to the initial protocol was uploaded to the Open Science Framework (June 12, 2024) following feedback from coauthors to restrict eligible studies to 2012 onwards to focus on more recent research culture findings.

3. Results

Literature searches of bibliographic databases and supplementary searches resulted in 1674 citations after duplicate records were removed. All titles and abstracts were assessed for inclusion and 795 relevant articles were deemed as eligible in the review. The results of literature searches and the study selection process are summarized in Figure 1.

Narrative summary of results presents a description of general trends in the literature retrieved using selected examples of references below. The full list of relevant references included in the review but not cited in this article are included in the supplementary appendix.

Research culture findings are discussed and presented according to the proposed framework of (i) inclusivity, (ii) transparency, (iii) rigor, and (iv) objectivity.

3.1. Inclusivity and collaboration

3.1.1. Diversity in academic workforce

There are global disparities in gender representation across science, termed as the 'glass ceiling' where women are underrepresented in senior leadership roles in academia [10]. Women are acknowledged less in science than men [11]; acceptedforpublication by journals for submitted articles less than men [12,13], gifted authorship less than men [14], and cited less than men [15]. Assessment of academics is not equal as implicit gender biases are evidenced when curricula vitae from men, graded by both men and women, receive higher scores from researchers than otherwise identical curricula vitae from women [16]. Although gender imbalances have decreased over time globally, gender imbalances for top-cited authors in lower income countries show less improvement compared to high-income countries (HICs) [17].

The lack of diversity in academia extends to race [18], where structural discrimination is inherent in medical science [19]. Women of color and minority ethnic women face a double marginalization of the intersectionality of gender with systemic racism leading to an apparent 'concrete ceiling' for representation of women of color in senior leadership roles in academia [20]. In addition, however prevalent, persistent, and nuanced these issues are, research is still limited in terms of the binary lens that is applied for studying and reporting equity and intersectionality in academic health research [21]. Locally, institutional equality, diversity, and inclusion monitoring and strategies may address issues to differing degrees of effectiveness [10].

3.1.2. Dominance of research from high-income countries over low- and middle-income countries (LMICs)

Academic research institutions are inherently neocolonial and inequities persist in global health research and funding [22]. English language imperialism refers to general dominance of the English language on scientific literature [23]. Funding opportunities are not equitably available to empower researchers across LMIC countries to be prominent authors on the global stage [24]. Inequalities exist between LMIC and HIC in the representation and the citation of research [24,25]. Authorship parasitism refers to the tendency for HIC authors to dominate prominent authorship positions [26]. Resource limitation imbalances also apply across continents where there are specific institutional issues and infrastructure imbalances. Africa, for example, is a continent facing a high burden of disease in the context of substantial power and funding disparities

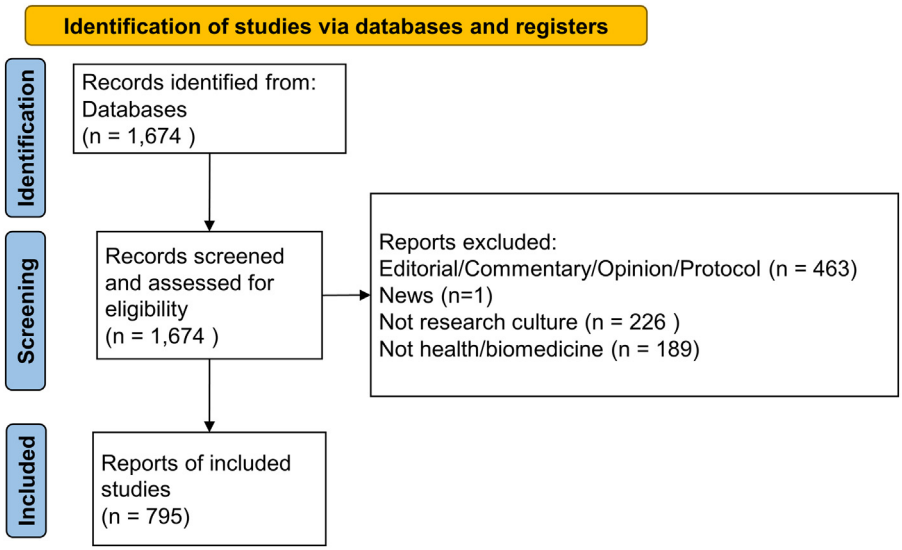

Figure 1. PRISMA flow diagram of included studies.

[27]. Promoting research integrity is at a relatively early stage in Africa and not yet a priority [28]. Women scholars in sub-Saharan Africa face substantial gender inequities in publishing in prestigious authorship positions in academic journals [29]. On a global scale, the Cape Town Statement [30] addresses fairness and equity as well as Africa-specific initiatives [31,32]. For genuine parity in global health research partnerships, engagement with LMIC authors should represent meaningful, as opposed to passive, collaboration [33].

3.1.3. *Layers of privilege in academic selection*

Using traditional criteria to evaluate researchers, such as papers and income, may give rise to an illusion of meritocracy in academia (see Fig 2). Senior leader teams, likely lacking in diversity [34], dictate prestigious leadership roles, promotion processes and other critical institutional decisions, which creates power imbalances that affect early career researchers (ECRs) who are more likely to have insecure employment contracts [35]. Within the system of research production and dissemination, research selected for publication in prestigious journals is filtered by those selected for powerful editorial roles. The appointment of journal editors and editorial boards can lack transparency and diversity which can influence the diversity of such editorial teams [36]. Cronyism and nepotistic behavior can infiltrate article handling and acceptance [37]. Peer reviewers are prone to biases regarding gender, status, and affiliation of research authors which further perpetuates elitism [38,39]. Figure 2 illustrates numerous levels of inequity in academia which filters people from certain backgrounds, inducing the mistaken impression that successful career researchers have made it on merit alone, and ignoring the accompanying privileges that have benefited many established researchers.

3.2. *Transparency and open science*

3.2.1. *Open science*

Open science initiatives are gaining traction but routine data sharing and publishing in open access journals is yet to permeate across the entire health and biomedical research spectrum [40]. Transparent research starts with careful protocol planning and registration, but unregistered research is still published [41]. Although publications in traditional academic journals remain the most valuable asset in researcher assessment, there may be limited appeal in investing effort into data sharing for researchers (see Fig 3) [42]. Chasing Journal Impact Factors can slow down research dissemination, as authors are more likely to face rejections and resubmissions when targeting prestigious journals. These journals often have higher submission volumes, stricter formatting/editorial requirements, and longer publication backlogs [43]. Scholars from less affluent institutions, or students, may be less able to afford the article processing charges (APCs) associated with publishing their work in an open access prestigious journal which can limit the visibility of research from some demographics, as well as the opportunity to bring social and economic benefits to the region [44]. Unequal access to institutional support for APCs and subscriptions likely impacts whether junior researchers and those from less-wealthy institutions can publish in their journal of choice [45]. Alternative models of publishing to traditional academic papers retrospectively include a collegial scholarly platform "Octopus"[5], preprint servers and selected journals that agree to publish registered reports to encourage conducting peer review prior to data collection. Figure 3 illustrates factors which impede open science publishing, potentially contributing to decreasing marginal benefit for researchers embracing this approach.

Figure 2. INCLUSIVE: Layers of privilege in the Ivory Tower of Academia.

3.2.2. Inadequate reporting

Despite the availability of guidelines to aid the reporting of research, work that cites or purports to adhere to them does not guarantee that reporting quality will be high [46,47]. Moreover, the lack of diversity in the academic workforce highlighted previously can also impact the generalisability and reporting of research in terms of equity characteristics and representing real-world populations [48,49].

3.2.3. Data sharing

Data for sharing includes biomedical code, protocols, individual patient data, and data management plans. Open science initiatives promote data sharing and FAIR (findable, accessible, interoperable, reusable) data principles [50,51]. A variety of barriers to data sharing have been identified (see Fig 4) [40]. Embracing open science platforms as a means of dissemination without the reward of high Journal Impact Factor publications can be understandably less appealing to ECRs who need to establish their academic career using the same currency accrued by established researchers [52]. Indeed, few funders stipulate requirements for such responsible research practices [53]. Moreover, data availability statements which rely on contacting the corresponding study author on reasonable request are frequently not honored [54]. For individual patient data, at least, there may be particular barriers to sharing and a gap between intention or initial willingness to share data and actual sharing behavior [55]. Embedding plans for data sharing into funder grant application templates could enhance data sharing practices where feasible. However, sharing qualitative and sensitive data poses challenges, as maintaining participant confidentiality is more difficult in such cases. Figure 4 depicts common barriers to data sharing which will persist whilst traditional journal papers continue to hold significant weight in assessing academic performance.

3.3. Rigor and best practice

3.3.1. Lack of expertise

Errors in published academic papers often result from a lack of clinical, methodological or statistical expertise in the author team [56,57], or amongst peer reviewers [58]. Common statistical errors can include errors in inferential statistical methods, in selecting appropriate methods for data analyses, in calculating and reporting effect sizes and in consideration of confounders [59,60]. Journal editors are tasked with the difficult challenge of identifying relevant experts to provide engaged and diligent peer review from a pool of time-poor academics, usually without being able to offer direct rewards [61]. Peer review itself is fraught with biases including affiliation and citation bias [39,62]. Status bias, in which willingness to review papers and decreased likelihood of rejecting papers, benefits more prominent authors compared with little-known authors [38]. ECRs may also be more vulnerable to the harmful effects of unprofessional or incomplete, inaccurate or unsubstantiated critiques [63]. Publishing peer review reports has been suggested as a way to ensure accountability of peer reviewers, as well as transparent editorial hierarchies, and online data publication to increase accountability [64]. Figure 5 highlights current threats to rigour in scientific research and, in turn, the greatest contributors to research waste.

Figure 3. TRANSPARENCY: The unraveling vortex of diminishing returns in open science.

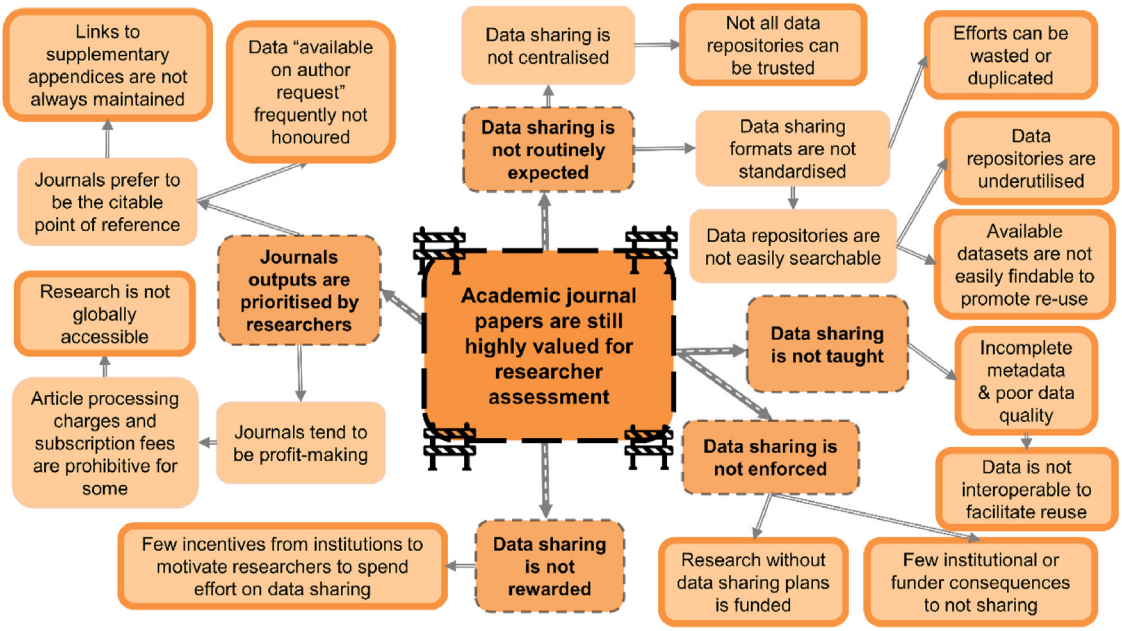

Figure 4. TRANSPARENCY: The route of all evil or persistent cause of barriers to data sharing.

3.3.2. *Questionable research practices*

There are a variety of activities that researchers can engage in which intentionally or unintentionally distort data in favor of a researcher's own hypotheses (see Fig 6) [65,66]. These ranges from failing to prespecify data analysis plans in advance to misconduct and fraud [67]. Common QRPs include p-hacking (performing multiple analyses until a significant result is found) and hypothesizing after the results are known (HARKing) [68]. To address issues of scientific rigor, it has been suggested that research integrity training should be instigated from undergraduate degree level and continue through the entire academic career [69]. Figure 6 depicts that at every stage of the research lifecycle, there are opportunities for questionnable research practices to infiltrate the scientific process.

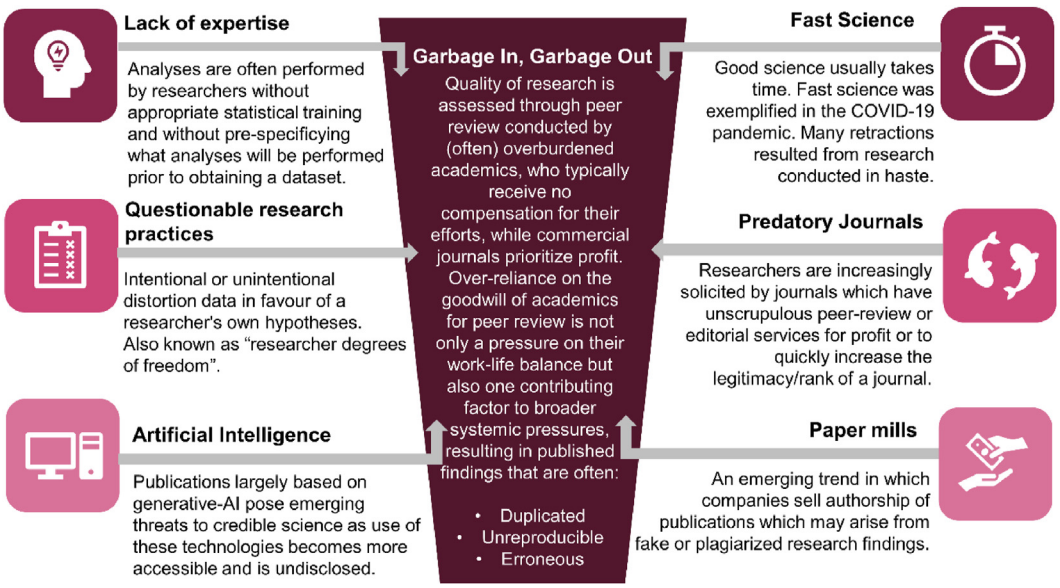

Figure 5. RIGOR: The dustbin of research waste: Threats to scientific rigor.

3.3.3. Fast science and data fabrication

Over the past 40 years, a few large commercial publishers have tightened their control over the scientific publishing system, prioritizing profit. These profits seldom benefit the time-poor peer reviewers — members of the scientific community — who serve as gatekeepers for these articles. Junior researchers often have no option but to publish in journals like those of Elsevier or Springer to advance their careers, whereas senior researchers remain tied to this system to secure their grants [70]. Sped-up science impacts the integrity of the evidence base when papers published in haste fail to meet basic standards of scientific conduct. Poorly conducted studies often lead to retractions [71], which are sometimes still cited despite their flaws [72]. Trends for some academic journals to publish exceptionally high numbers of articles each year as well as the emergence of ''paper mills'' (businesses which sell authorship on poor or fake journal papers) increases the likelihood that technically unsound articles will be published [73,74]. This was exemplified during the COVID-19 pandemic, resulting in over 400 journal retractions by 2024 [75–77]. The influence of generative artificial intelligence may be detected via identification of ''tortured phrases'' which indicate automated translation of text to avoid plagiarism detection and can lead to nonsensical content in fraudulent papers [78].

3.3.4. Postpublication correction

How journals respond to erroneous articles requiring correction is variable, with responses ranging from retractions, expressions of concern, corrections, and taking no action at all [79,80]. Retractions are increasing, albeit slower than they should be [81] and most frequently follow instances of misconduct [82] which damage the reputation of researchers and institutions and undermines trust in scientific literature. Retracted articles from paper mills can still accrue citations and continue to be cited and perpetuated by systematic reviews and beyond [72]. Erroneous scientific papers are not only contributors to research waste but negatively influence the evidence ecosystem by distorting accuracy and treatment effects across the evidence base (see Fig 5).

3.3.5. Misconduct

Academic institutions are concerned with maintaining reputation; therefore, misconduct investigations may be insufficiently enforced or kept quiet, preventing learning from these instances [83,84]. Misconduct includes unprofessional behaviors, such as bullying, harassment, and discrimination [85]. Unprofessional behavior among senior staff presents challenging power imbalances for ECRs who may leave academia when institutions do not properly manage behavioral issues [85,86].

3.4. Objectivity and accountability

3.4.1. Incentives

Securing or promoting researchers using reductionist metrics, can create perverse academic incentives which impact the quality and even the findings of research. Many universities around the world signed the DORA principles [3]. However, over 10 years later there is high variability in the implementation of these principles globally and current frameworks for assessing researchers in some areas

Figure 6. RIGOR: The wheel of fortune of questionable research practices.

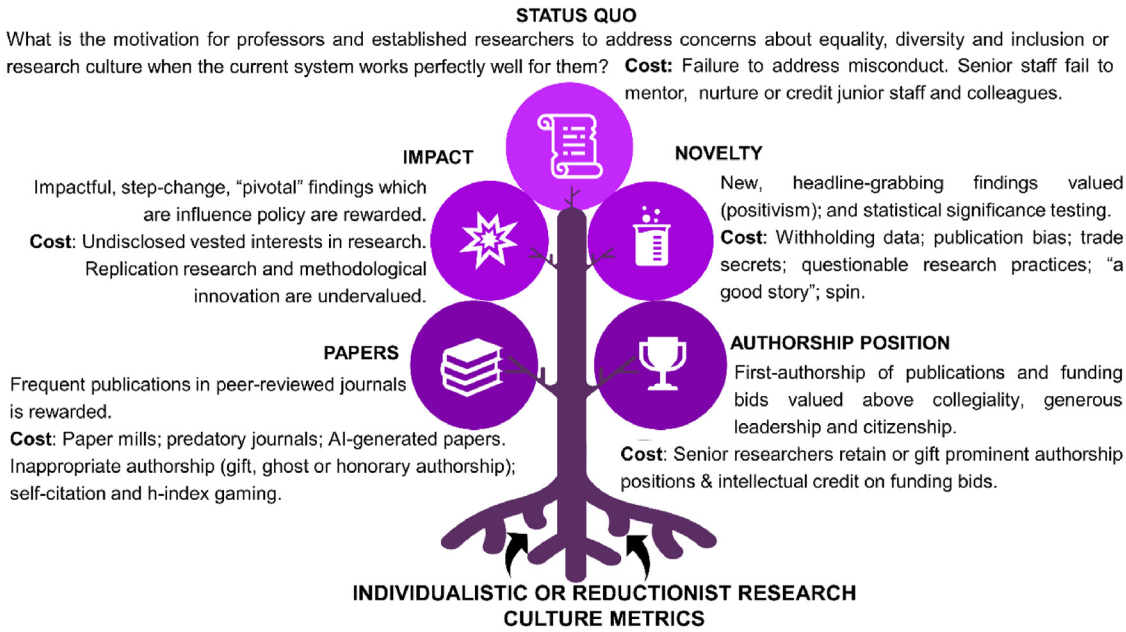

Figure 7. OBJECTIVITY: The tree of knowledge grown from the perverse incentives in research careers.

may still be heavily focused on the generation of publications in high-impact journals [87,88].

Although university rankings continue to maintain a strong focus on journal outputs, a "publish or perish" academic culture where researchers are rewarded for publishing papers in prestigious journals will pervade [89]. Journals favor positive findings over neutral or replication research [90] which reinforces the tendency for scientists to find something novel or significant in their published outputs, fueling publication bias. To assess the validity of research findings there should be ample space for replication research [91]. However, 83% of 1630 biomedical journal authors indexed from MEDLINE in 2020-21 perceived it would be harder to obtain funding to attempt to reproduce a study than to undertake a novel study [92]. Citation bias favoring statistically significant results further amplifies publication bias, making treatments seem more effective to the readers of medical literature than they really are [90,93]. A scientific environment which pressures researchers to produce scientific papers for career longevity

Figure 8. OBJECTIVITY: The web of self-deceit: The many conflicts of interest we avoid contemplating.

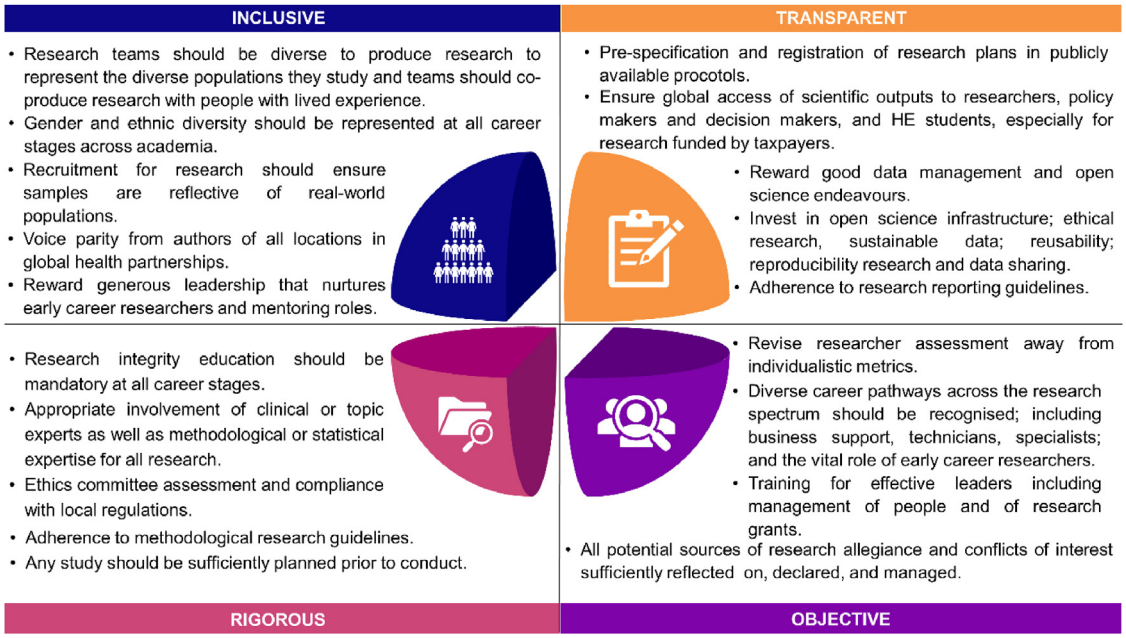

Figure 9. Cornerstones of progressive research culture: Four domains for a healthier scientific ecosystem. (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)

can create societal impact when papers are built on QRPs and findings cannot be replicated [94]. Pressure to publish also increases the risk that researchers fall prey to predatory journals or paper mills [95].

3.4.2. The status quo benefits senior established researchers

Precarious employment contracts for researchers fuel the need to generate academic publications. ECRs should be mentored to embrace open science but may feel that they are not fully supported to practice open science [52], particularly when other more senior authors do not model that behavior. Courtesy authors, where senior academics are gifted authorship without having met authorship criteria are more often male, older, and higher rank than first/senior authors [96]. Authorship practices such as gift, honorary, and sold or ghost authorship can inappropriately inflate publication metrics at an institutional level. This system of valuing quantity of publications and citations disproportionately benefits more established researchers who accrue authorship opportunities and gift authorship over time [97]. Figure 7 illustrates the costs of academic incentives which are propogated by reductionist academic metrics.

3.4.3. Conflicts of interest

Conflicts of interest and disclosure are wide-ranging, nuanced topics which are increasingly taxonomized to elaborate financial conflicts as well as nonfinancial conflicts or researcher allegiances [98]. Conflicts of interest may be the underlying motivation for embarking upon certain research endeavors. This is illustrated by studies finding positive correlations between the presence of conflicts of interest and favorability of study findings [99,100], notwithstanding the possibility of confounding from the methodological heterogeneity of included studies in such metaepidemiological studies. Not all vested interests represent clear-cut cases of conflicts of interest that would fit standard disclosure statements (see Fig 8 [2]). Missing or inaccurate disclosure statements may represent a potential red-flag that author conflicts of interests were not fully considered [101]. But not all personal interests in research preclude unbiased and valuable contributions from such authors [102]. Figure 8 elaborates some of the types of conflicts of interest that can be at play in a research setting.

Reforms in the domain of objectivity that relate to researcher assessment have been proposed for some time including DORA [3] and the Hong Kong Principles [4] and Coalition for Advancing Research Assessment [103]. In the UK, the research assessment framework has increased its focus on people, culture, and the environment to address some of the research culture challenges outlined here.

4. Discussion

Rather than simply "admiring the problem", the aim of this rapid scoping review has been to progress the conversation about research culture and influence change. This review highlights that research culture is a wide-ranging topic that encompasses the inclusivity of the scientific workforce,

transparency of the data generated, the rigor of the methods used, and the objectivity of the researchers involved. Research culture directly affects the quality of research produced. Systemic academic pressures and a lack of diversity among research teams increase the risk of blind spots and undermine the generalizability of results to real-world populations. These issues have specific implications for health research as patients rely on accurate biomedical research to guide medical decisions, build trust in medical science and to ensure that vulnerable groups benefit equitably from research advancements. This work focusing on the health and biomedical field builds on research culture insights from multidisciplinary research which highlighted further nuances in research culture not captured in this review [5] By presenting the range of relevant research categorized according to the four domains of inclusivity, transparency, rigor and objectivity, it is hoped that the complex underpinnings of research culture are explained and that further empirical work addressing these areas will be stimulated. Figure 9 proposes suggestions that may lead to a healthier research culture based on the findings of this review. We also suggest that publications on research culture need to occupy more space in traditional discipline-specific academic publications to avoid an echo chamber of research integrity enthusiasts.

The domains of this previously established framework [1], as applied to research culture, are not entirely discrete and there are interactions running through the narrative synthesis and the figurative diagrams presented. Central to each of the domains is the principle that researcher assessment is key to shaping academic incentives. Research value in academic metrics is currently heavily focused on the outputs rather than the process. Instead, researcher evaluation should focus on the people and collaborative efforts, valuing a range of contributions and career pathways. Merit should be placed on efforts to make research more transparent, rigorous and replicable.

In addition to researcher evaluation, self-reflection can be a powerful tool in affecting change in culture for our own research environment at an individual level. We all have the power to contemplate our own motivations for conducting research and to recognize biases in our own practices. As well as full disclosure and genuine accountability, we can make even small changes to increase diversity in research teams or amplify ECR challenges and speak up against biases in our own workplaces. We create culture, so we can improve it, even if it is already working well for us personally.

4.1. Limitations

As a rapid scoping review, some abbreviations to comprehensive scoping review methodology were applied including a focus on empirical articles published in traditional academic journals published in the English language. A qualitative approach to study selection was adopted whereby the objective was not to identify every single relevant paper but to cover the main research culture insights, themes, and trends across the health and biomedical field. As the primary consideration of interest of included studies was their relevance to research culture, no formal critical appraisal or risk of bias assessment of study quality was performed. The use of diagrams in the narrative synthesis to create figures for research culture was a reflexive, iterative exercise that relied on a degree of subjective interpretation. It is for this reason that consultation with a diverse author network was critical.

We invite feedback and discussion from the research community on the content and representation of the main challenges in research culture. As an unfunded review project, this rapid project aims to be a starting point from which to extend though future research culture endeavors. This scoping review was primarily targeted at health and biomedical research, but many findings may be applicable to other academic disciplines.

5. Conclusion

This review highlights a flourishing body of literature indicating the multifaceted nature of research culture. Research culture is strongly influenced by the metrics used to evaluate researchers and can create hidden incentives which may jeopardize the reliability and validity of research findings. A diverse research workforce which values a range of contributions will be best placed to produce research that represents real-world populations. Inclusive collaboration involves ensuring opportunities for meaningful, rather than passive, engagement with team members. Research institutions, publishers, editors, peer reviewers, and researchers are actors in the research environment who all have a role to play in shaping research culture. Rewarding transparent research practices and integrating research integrity awareness and training throughout research careers are recommended.

CRediT authorship contribution statement

Lesley Uttley: Writing − review & editing, Writing − original draft, Visualization, Validation, Supervision, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Conceptualization. **Louise Falzon:** Resources, Investigation, Data curation. **Jennifer A. Byrne:** Writing − review & editing, Visualization, Validation. **Andrea C. Tricco:** Writing − review & editing, Validation. **Marcus R. Munafò:** Writing − review & editing, Visualization. **David Moher:** Writing − review & editing, Validation. **Thomas Stoeger:** Writing − review & editing, Validation. **Limbanazo Matandika:** Validation. **Cyril Labbé:** Validation. **Florian Naudet:** Writing − review & editing, Visualization, Validation.

Declaration of competing interest

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Supplementary data

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Data availability

Data supplied as appendices

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