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Gender, race and ethnicity biases experienced by hospital physicians: an umbrella review to explore emerging biases in the evidence base

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ABSTRACT

Objectives To examine the authorship and content of systematic reviews (SRs) of biases experienced by medical professionals through a gender lens.

Design Review of SRs.

Data sources We searched PubMed, Embase, PsycINFO and CINAHL from inception. Searches were conducted in May 2022 and updated in October 2023.

Eligibility criteria Reviews of studies reporting biases experienced by hospital physicians at any stage of their careers and in any country. Reviews were included if they used systematic methods to search the literature and synthesise the data. Non-English language publications were excluded.

Data extraction and synthesis The main theme of each eligible review was identified through qualitative thematic analysis. We used NamSor to determine the first/last authors' gender and computed the proportion of female authors for each review theme.

Results 56 articles were included in the review. These covered 12 themes related to gender, race and ethnicity bias experienced by physicians at any stage of their careers. The overall proportion of female authors was 70% for first authors and 51% for last authors. However, the gender of authors by theme varied widely. Female authors dominated reviews of research on discrimination and motherhood, while male authors dominated reviews on burnout, mental health and earnings. Only six reviews were identified that included race and ethnicity; 9 out of the 12 first and last authors were female.

Conclusions Understanding the potential for a gendered evidence base on biases experienced by hospital physicians is important. Our findings highlight apparent differences in the issues being prioritised internationally by male and female authors, and a lack of evidence on interventions to tackle biases. Going forward, a more collaborative and comprehensive framework is required to develop an evidence base that is fit for purpose. By providing a point of reference, the present study can help this future development.

PROSPERO registration number CRD42021259409; Pre-results.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ This is the first study to examine the authorship of systematic reviews (SRs) of the bias experienced by medical professionals through a gender lens.
⇒ The findings indicate important differences in issues being prioritised for review by male and female authors, as well as key gaps in the emerging evidence base.
⇒ The NamSor algorithmic tool used could identify female and male authors but is unable to differentiate authors of different ethnic heritages.
⇒ Limiting searches to English-language papers may also mean some SRs are missed, and a focus on reviews may not reflect primary studies currently underway.

INTRODUCTION

Societal movements such as #MeToo and Black Lives Matter have encouraged a critical re-examination of gender, race and ethnicity in various areas of public life. In the UK, although women now make up the majority of doctors in training,[1] studies report that female physicians still earn less than men[2 3] and are more likely to leave medicine, citing 'family/work-life balance' as the reason.[4] Women who break through the 'glass ceiling' into leadership positions[5] may also find themselves facing a 'glass cliff' in such roles.[6 7] These differences still appear to persist with advancing seniority.[8] Meanwhile, policies to address some of these issues also appear to be lacking. For example, although over 90% of female doctors in England report experiencing sexism at work, with 35 000 sexual safety incidents recorded by 212 hospitals between 2017 and 2022,[9] fewer than 1 in 10 English hospital trusts has a dedicated policy to deal with such incidents.[10] In terms of academic medicine, women are also underrepresented in senior positions such as deanships, chair or division chief positions.[11 12]

Moreover, any differences associated with gender may be compounded for women, who additionally identify with other traditionally marginalised minority ethnic groups.[13]

Following an analysis of the global health workforce, the WHO has called for urgent action to address the inequities uncovered, while acknowledging that this may be 'limited by major gaps in data and research'.[14] The present study aims to analyse the growing body of evidence on gender, race and ethnicity bias in medicine through a gender lens and, for the first time, to delineate the agendas being addressed by male and female authors using computational topic modelling methods. Such methods have previously been applied in other academic fields to map changing research interests and to uncover differences in male and female researchers' interests.[15–17] By undertaking a comprehensive analysis of systematic reviews (SRs) on gender, race and ethnicity bias experienced by hospital physicians, we aim to map the number and content of SRs, identify areas of strength in the evidence base, explore patterns of researchers' engagement with

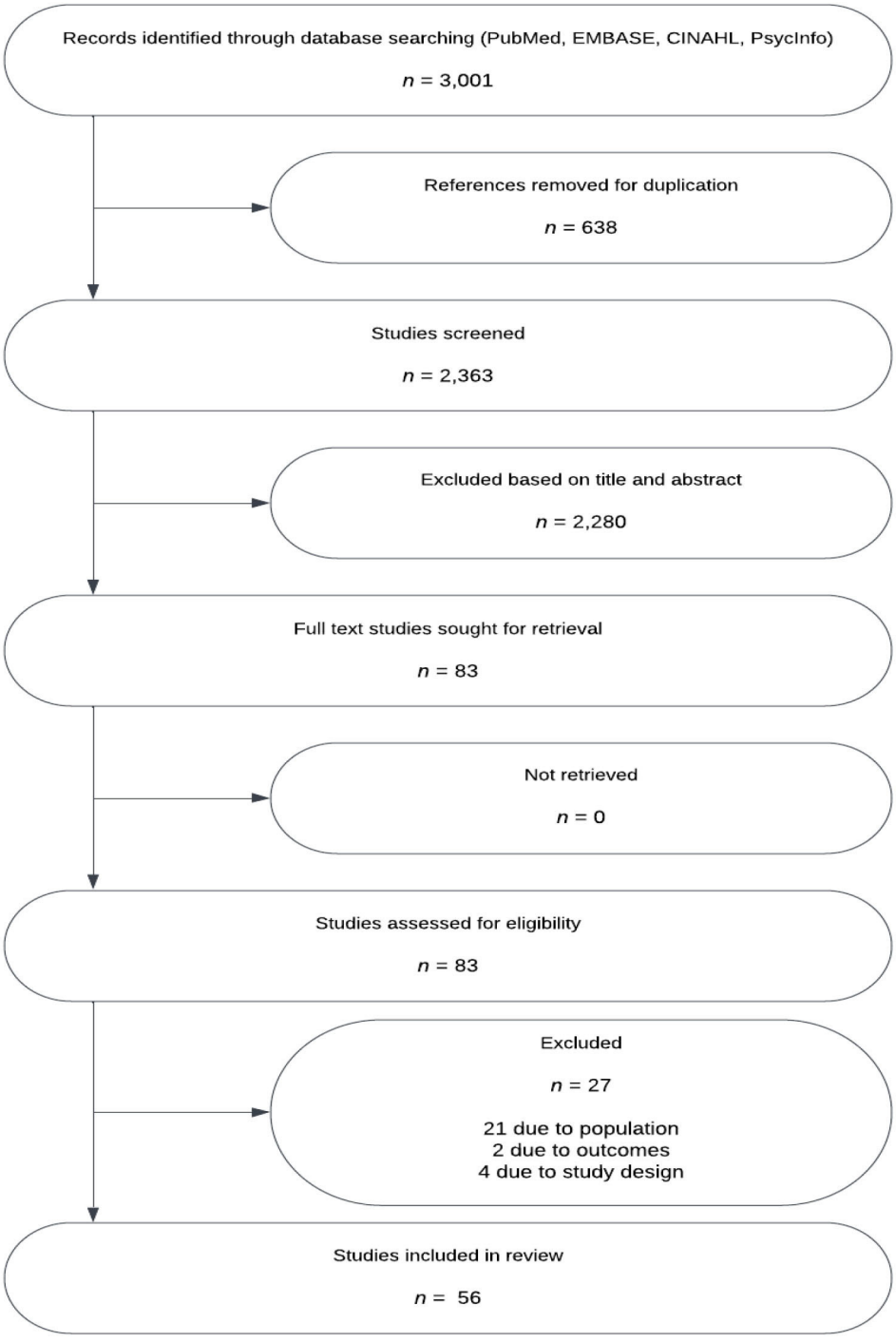

Figure 1 Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow diagram describing the review selection process.

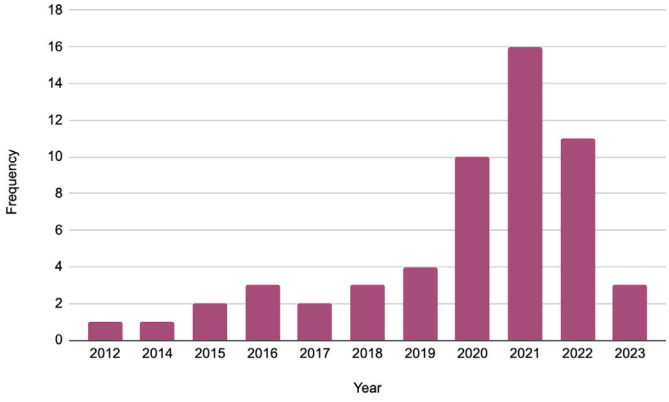

Figure 2 Annual number of reviews published on gender and ethnicity bias 2012–2023.

these pivotal issues and identify important gaps for future reviews.

METHODS

This study was conducted in accordance with Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines and guidance specific to qualitative reporting.[18 19] Analysis of authorship was undertaken using the demographic data held within articles. The review protocol was registered on the International Prospective Register of Systematic Reviews (PROSPERO ID: CRD42021259409) prior to conducting searches.

Search strategies

Comprehensive searches were undertaken by an experienced information specialist (AK). Search strategies were tailored to specific electronic databases: PubMed, Embase, PsycINFO and CINAHL. Databases were searched from inception. Searches were first conducted in May 2022 and updated on 25 October 2023. Example search strategies are provided in online supplemental file 1.

Eligibility criteria and article selection

Two authors independently screened each abstract using Rayyan (https://www.rayyan.ai/) against predefined inclusion/exclusion criteria. Conflicts were resolved by consensus. We included SRs published in the English language that investigated differences in the experiences of hospital doctors at any stage of their careers (including those practising in outpatient or research settings) based on gender and/or race and ethnicity. SRs were defined as studies that used systematic methods to search the literature and to synthesise the data. Articles were excluded if they (a) did not qualify as a SR; (b) focused on non-medical staff (eg, nurses) or non-hospital doctors (eg, community physicians) or (c) did not report on gender and/or race and ethnicity bias. The full text of each potentially eligible study was examined prior to final inclusion.

Data extraction and analysis and quality appraisal

Data were extracted from selected articles into a standardised, prepiloted proforma by one reviewer and checked for accuracy by a second. Recorded characteristics included article title, year of publication, SCImago Journal Rank (SJR), the main country of affiliation of the first and last author and names of both authors. NamSor (https://namsor.app/) was used to determine the likelihood that an author's name was male or female.[20–22]

The proportion of female first and last authors was computed. Because it is known that differences exist in publishing rates between men and women,[22–24] we also calculated a *weighted* contribution to adjust for over/under-representation of female/male authors. Weights were estimated as the contributions to a theme by female authors divided by the summed contributions of both men and women. All analyses were carried out with Excel. As the purpose of this first overview was to present an overview describing the current body of evidence contained in SRs,[25] we used an inductive approach, commonly used for thematic analysis of qualitative data,[26–28] to systematically code and group the content of reviews. Primary overarching themes were identified across a group of reviews, although a full thematic synthesis was not undertaken. Analysis of the patterns of female/male investigators among review authors, together with the topics reviewed, did not require appraisal of the quality of the SRs. Nevertheless, there was a level of quality assessment because the inclusion criteria for the study incorporated elements of the AMSTAR 2 critical appraisal tool for SRs.[29] For included articles, we also recorded the Journal Rank (SJR) and used Q1, Q2 and ≤Q3 rankings as a further proxy indicator of a publication's quality.

RESULTS

Search results

Figure 1 shows that a total of 3001 records were identified, of which 83 were potentially eligible reviews. Of these, 56 SRs were selected for inclusion in the final analysis (see online supplemental file 2 for details of included studies). These 56 articles were generally published in high-ranking journals (68% in Q1 journals, 23% in Q2 and only 9% in ≤Q3).

Description of evidence

Articles were published between 2012 and 2023, with annual numbers rising from 1 to a maximum of 16, as shown in figure 2. Numbers rose dramatically following #MeToo in 2017, peaking in 2021 and returning to a pre-2017 level by 2023. In terms of national origin, half of the reviews had first or last authors from the USA. The remaining 50% of reviews included authors from Europe (17%), the UK (10%), Asia (10%), Canada (9%) and Australia (4%).

Main themes

The analysis identified 12 themes (table 1). The most common theme was 'career lifecycle', with 15 SRs presenting evidence on the barriers faced by female and minority ethnic doctors. Two further major themes,

Table 1 Major themes identified from thematic analysis of 56 eligible SRs, definitions, review content and key findings

Theme	Definition	Content and key findings
1. Career lifecycle	This theme includes issues of recruitment, progression, promotion, retention and attrition at all stages of physicians' medical careers.	SRs consistently reveal obstacles to female and minority ethnic doctors advancing in medicine. These are mostly a culture of gendered norms and ingrained implicit bias,[36–40] as well as under-representation in leadership roles and progression pathways.[41–46] Two reviews identified a gap in evidence on how to address these inequalities[47 48]; one highlighted a worrying difference in doctors' intentions to leave the profession.[49] One review reported similar issues across the world.[50]
2. Burnout	This theme includes issues of emotional and physical exhaustion, depersonalisation and low personal accomplishment caused by the chronic stress of medical practice.	The current evidence base in this area is less consistent. Four reviews indicate higher burnout levels among women,[51–54] while one review concludes male residents suffer more burnout.[55] The remaining five reviews conclude that any differences cannot be reliably determined, largely due to fundamental differences in how burnout is conceptualised, measured and by whom it is experienced.[56–60]
3. Discrimination	This theme includes the unfair or prejudicial treatment of physicians in the workplace based on gender, race and/or ethnicity, including issues of sexual harassment, sexism, racism and microaggressions.	SRs analyse both explicit and more subtle forms of discrimination. There is evidence that the focus has shifted from the former to the latter over time.[61] Reviews of overt sexual harassment show female physicians are exclusively targeted.[62 63] For more subtle discrimination, SRs provide evidence that women experience lower levels of respect[64–66] and are asked illegal questions by senior colleagues.[67 68] Only two SRs consider explicit racism.[67 69] Both report a high prevalence of workplace discrimination, particularly among women physicians of colour.
4. Academic roles	This theme includes issues of academic publishing, citation-related publication productivity and faculty ranks.	SRs identify that even after adjusting for academic rank and specialty, female faculty have lower citation-related publications,[12 70] are less likely than male faculty to be full professors,[11] and fare worse than men in all aspects of academic activity.[71] The one review that investigated intersectional bias concluded that very few primary studies apply an intersectional lens.[72]
5. Motherhood	This theme includes issues of pregnancy, maternity leave and returning to work after giving birth.	SRs reveal experiences of discrimination and stigma related to pregnancy,[73] negative work-based attitudes before, during and after birth[74] and that this theme has persisted in the literature at least over the past 50 years.[75] Two reviews call for organisational policies to better support mothers and mothers-to-be and help address the challenges evidenced in reviews.[76 77]
6. Competencies	This theme includes issues of skills, abilities and confidence, both observed and subjectively assessed.	One SR found no evidence that women and men differ in their strengths or clinical performance,[78] while two concluded that women tend to perceive deficiencies in their abilities more often than their male counterparts.[79 80]
7. Mental health	This theme includes the unique pressures among physicians of depression and anxiety and the possible outcome of suicide.	One SR found gender to be one of the risk factors associated with higher levels of anxiety and depression,[81] while another found that women are at higher risk of suicide compared with men.[82]
8. Organisational factors	This theme includes issues of workforce planning, policy and management.	One SR found significant research gaps in studies of gender equity in HR planning, systems-level developments, change management, mentorship and professional development.[83] Another found that organisations need to introduce more flexible career pathways and work patterns to provide more family-friendly working conditions and provide female mentors.[84]
9. Violence	This theme includes acts or behaviours in which a person is abused, threatened or humiliated in the workplace. These acts and behaviours can be verbal or physical and can be overt or subtle.	One review reports the evidence is inconclusive due to issues of methodological quality.[85] Another identifies verbal abuse as the most common type of violence regardless of gender, with over three-quarters of physicians also experiencing physical violence.[86]

Continued

Table 1 Continued

Theme	Definition	Content and key findings
10. Earnings	This theme relates to direct financial remuneration.	One SR identifies that female doctors earn less than men despite having similar profiles, and that this earnings gap persists across time, medical specialty and country of practice.[2]
11. Mentorship	This theme includes professional relationships where peers or more senior colleagues act as advocates, advisors, coaches or counsellors.	One SR focused on the evidence of mentorship programmes for under-represented groups, reporting a positive impact and recommending training of more mentors from both dominant and under-represented groups.[87]
12. Patient outcomes	This theme relates to a physician's gender, race or ethnicity as a factor in the delivery of medicine.	A scoping review found evidence gaps regarding the relationship between patient outcomes and the gender, race or ethnicity of the physician.[88] We were unable to identify a SR on this topic.

SRs, systematic reviews.

covered in a relatively large number of reviews, were gender and 'burnout' (10 SRs) and 'discrimination' (9 SRs). A smaller number of published reviews chose to examine the evidence on gender bias associated with 'academic roles' and 'motherhood' (5 SRs each), with an even more limited evidence base for 'competencies' (3 SRs), 'mental health' (2 SRs), 'organisational context' (2 SRs) and 'violence' (2 SRs). Three minor themes identified were 'earnings', 'mentorship' and 'patient outcomes', each currently represented by a single SR.

Gender versus review theme

Gender was identified with >95% accuracy by NamSor for 78.6% of the first (n=44/56) and 80% of the last (n=44/55) authors as given by the calibrated probability returned by NamSor (probabilityCalibrated). For the remaining first and last authors, accuracy was 50–60%. Overall, the percentage of reviews with an identified female first author was 70%, and 51% had a female last author; one review was single-authored. Table 2 provides a more detailed breakdown for each theme. The final column indicates four areas in which there are fairly equal numbers of male and female authors (50–60% women): theme 4 (academic roles), theme 6 (competencies), theme 8 (organisational context) and theme 9 (violence). Male authors dominate in two areas: theme 2 (burnout) and theme 7 (mental health). Female authors dominate in reviews of the evidence on theme 1 (career lifecycle), theme 3 (discrimination) and theme 5 (motherhood).

Given that women were named authors on more reviews of gender bias overall, weighted figures were also calculated to adjust for an over-representation of women authors in absolute terms. These are shown in figure 3. This analysis of weighted authorship data continues to show different patterns for women and men depending on the theme. For example, when weighted first and last authors are taken together, SRs on career lifecycle, discrimination and motherhood are heavily dominated by women. In contrast, reviews on burnout, competencies,

Table 2 Number of reviews and proportion of female authors by theme (%)

Theme	Total number of reviews identified	Percentage of reviews with female first author (%)	Percentage of reviews with female last author (%)	Percentage with both first and last authors as female (%)
1. Career lifecycle	15	73	80	77
2. Burnout	10	30	20	25
3. Discrimination	9	100	63	82
4. Academic roles	5	80	40	60
5. Motherhood	5	100	60	80
6. Competencies	3	33	67	50
7. Mental health	2	50	0	25
8. Organisational factors	2	100	0	50
9. Violence	2	50	50	50
10. Earnings	1	0	0	0
11. Mentorship	1	100	100	100
12. Patient outcomes	1	100	0	50
Total	56	70	51	60

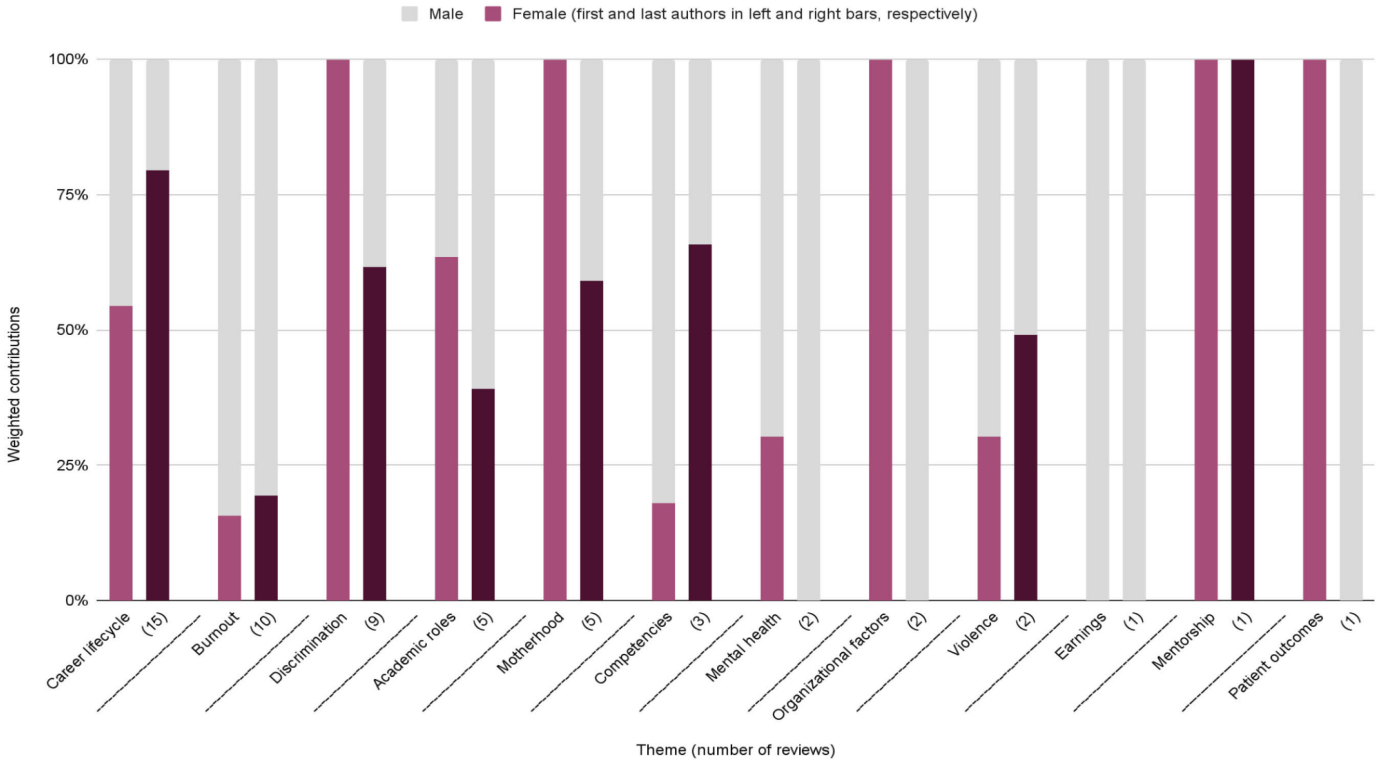

Figure 3 Weighted contributions to theme by gender.

mental health and earnings are heavily dominated by male first authors. It is worth noting that if weighted last authors are excluded from consideration, then discrimination, motherhood, organisational factors, mentorship and patient outcomes are exclusively reviewed by women. As a sensitivity check, calculations were re-run, including only those reviews with a >60% and a >80% likelihood that an author's name was male or female. The resulting patterns did not differ substantively.

DISCUSSION

The present analysis, facilitated by the use of computational topic modelling methods, for the first time, addresses the association between gender and publication bias in SRs of gender biases. In general, analysis of medical articles shows that women still constitute less than 40% of all the first authors and 25% of the last authors.[30] It is perhaps surprising that there has been no similar analysis of authors engaged in reviews of gender, race and ethnicity bias in medicine. This review has identified patterns of authorship in generating evidence within the context of a growing body of reviews, as well as highlighting important gaps.

The study found that notably more women are publishing reviews in the area of bias in medicine, with 70% of articles having a female first author and 51% a female last author. Interestingly, reviews considering aspects such as gender differences in burnout and mental health were found to be dominated by male authors; these identified inconclusive evidence of bias. In comparison, reviews in which female authors dominated were concentrated on aspects such as career lifecycle, discrimination and motherhood; these identified consistent evidence of bias. Reviews whose authorship might be considered 'gender neutral' (ie, containing roughly equal numbers of male and female authors) focused on aspects such as academic roles, competencies, organisational context and violence. Even after adjusting for an overrepresentation of female authors in absolute terms, the observed differences remained. The observed patterns may be viewed as dividing along entrenched gendered norms and societal expectations, with aspects such as motherhood exclusively reviewed by women first authors.

In terms of gaps in the developing evidence base, we were only able to identify six reviews focused on racial and ethnic bias; of these, 9 out of the 12 first and last authors were female. There was also an absence of reviews considering the intersection of gender with race and ethnicity. This may either point to a lack of interest or a dearth of research regarding this population. If not addressed, the limited evidence base in these areas might further perpetuate hidden inequalities. The WHO has also highlighted a lack of sex-disaggregated and intersectional data.[14]

Particularly striking was the lack of SRs of evidence on effective interventions, even for those aspects with a strong existing evidence base of bias. It appears that reviews to date primarily concentrate on documenting aspects of bias and do not consider evidence on effective solutions. Individual countries are adopting strategies to start to tackle the challenge of gender equality in the medical workforce in countries such as the USA,[31] Canada,[32] UK[33] and Australia.[34] In non-Western settings

such as India, there is reported to be an evidence gap with structural reforms being recommended for women physicians.[35]

The analysis presented here has some limitations. First, the number and content of SRs and their authorship have been used as a proxy for describing the growing body of evidence. This does not necessarily reflect the pattern of primary research studies currently underway that will eventually feed into reviews. Second, for some of the themes identified, the findings on bias are based on a small number of reviews. While a limited evidence base might be seen as a challenge to the generalisability of any conclusions, it does highlight areas where research is lacking. This may be because fewer researchers are reviewing the evidence or because editors are less interested in publishing their review findings. Third, because the NamSor algorithmic tool could not provide categories beyond the binary female and male, this precluded any analysis of the interests of physicians of different ethnic heritage or those of non-binary and LGBTQI+ doctors. Fourth, it is possible that NamSor has misidentified some first/last author genders. However, given the sensitivity around generated probabilities, we have reason to assume the risk of misclassification is low. Fifth, restricting the review to hospital physicians may inadvertently exclude valuable insights from biases experienced in other settings, and this will require further exploration. In addition, although our conclusions are drawn from international studies, these only include reviews published in the English language. Finally, even though the analysis presented here can identify themes for which academics have systematically collected and reviewed the evidence, important aspects of bias experienced by medical staff may still be missing.

CONCLUSIONS

Our study provides the first comprehensive analysis of SRs on bias experienced by the medical profession, explored through a gender lens. The review has identified a growing evidence base. However, it has also uncovered variations in the issues being prioritised for review by male and female authors. These different patterns need further investigation, including a debate about the possibility of unconscious biases. In particular, since the main goal of such an evidence base must be to reduce, or even remove, identified biases, the lack of reviews of effective interventions to tackle gender bias is worrying. The SRs identified primarily focus on gender alone. Only 1 in 10 reviews considered racial and ethnic bias, and only one investigated intersectional biases, with the authors concluding that very few primary studies to date apply an intersectional lens. Bearing in mind that at least half the medical workforce is now female in many countries and that ethnic diversity is increasingly prevalent, a strategic approach to developing the future evidence base is now required. Our literature review has revealed patterns and gaps which could form the foundation for this. By providing a point of reference, the present review will enable future trends in the choice of review topics, their authorship and publication patterns to be monitored.

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