









BMJ Open Global evidence of gender equity in academic health research: a scoping review

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ABSTRACT

Objectives To chart the global literature on gender equity in academic health research.

Design Scoping review.

Participants Quantitative studies were eligible if they examined gender equity within academic institutions including health researchers.

Primary and secondary outcome measures Outcomes related to equity across gender and other social identities in academia: (1) faculty workforce: representation of all genders in university/faculty departments, academic rank or position and salary; (2) service: teaching obligations and administrative/non-teaching activities; (3) recruitment and hiring data: number of applicants by gender, interviews and new hires for various rank; (4) promotion: opportunities for promotion and time to progress through academic ranks; (5) academic leadership: type of leadership positions, opportunities for leadership promotion or training, opportunities to supervise/mentor and support for leadership bids; (6) scholarly output or productivity: number/type of publications and presentations, position of authorship, number/value of grants or awards and intellectual property ownership; (7) contextual factors of universities; (8) infrastructure; (9) knowledge and technology translation activities; (10) availability of maternity/paternity/parental/family leave; (11) collaboration activities/opportunities for collaboration; (12) qualitative considerations: perceptions around promotion, finances and support.

Results Literature search yielded 94 798 citations; 4753 full-text articles were screened, and 562 studies were included. Most studies originated from North America (462/562, 82.2%). Few studies (27/562, 4.8%) reported race and fewer reported sex/gender (which were used interchangeably in most studies) other than male/female (11/562, 2.0%). Only one study provided data on religion. No other PROGRESS-PLUS variables were reported. A

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ A high-quality scoping review was conducted using the latest guidance from the JBI.
- ⇒ Results are reported using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension to scoping reviews.
- ⇒ An equity and intersectoral lens was used to categorise results.
- ⇒ The original intent was a living review; however, additional updates were unfeasible due to the expansive literature and COVID-19 lockdowns.

total of 2996 outcomes were reported, with most studies examining academic output (371/562, 66.0%).

Conclusions Reviewed literature suggest a lack in analytic approaches that consider genders beyond the binary categories of man and woman, additional social identities (race, religion, social capital and disability) and an intersectionality lens examining the interconnection of multiple social identities in understanding discrimination and disadvantage. All of these are necessary to tailor strategies that promote gender equity.

Trial registration number Open Science Framework: <https://osf.io/8wk7e/>.

INTRODUCTION

The importance of sex and gender identity as determinants of health and well-being has long been recognised in health research.^{1–4} According to the WHO, sex refers to ‘different biological and physiological characteristics of females, males and intersex persons, such as chromosomes, hormones and reproductive organs’, whereas ‘gender refers to the socially

constructed roles, behaviours, expressions and identities of girls, women, boys, men, and gender diverse people'.⁵ Gender has been defined previously as a fixed and binary (girl/woman and boy/man) concept, yet there is now recognition that there is considerable diversity in how individuals act, perceive, experience and express their gender identity,⁵ and this can change over time. Sex and gender interact to impact health and contribute to factors, such as healthcare utilisation and access to care.^{6–8} However, less attention has been given to the complex interplay of global factors⁹ involving sex and gender, which hamper scientific careers and diminish contributions to the knowledge base of modern societies.

Evidence suggests that those who self-identify as gender(s) other than men face substantial barriers, preventing them from fully participating in science.^{10 11} Identifying who can fully participate in science is important to promote fairness and the extent to which people's rights of inclusion are upheld.¹² For example, a recent survey of 3345 Brazilian academics found that those who self-identify as men who were academics without children were the least impacted regarding their academic output (eg, funding and publications) during COVID-19, whereas the most impacted groups were academics who self-identified as black women or women who were mothers.¹³

To deliver scientific excellence, quality, integrity and patient care, the extent of gender equity requires further examination.⁹ As such, the research objective was to chart and catalogue the literature of gender equity and interacting social identities within academic institutions among independent researchers who conduct health research through a scoping review.

METHODS

Protocol

Prior to project commencement, all team members participated in a reflective exercise on their positionality on the team regarding their perceived advantages and disadvantages in life and experiences of power and oppression.¹⁴ This exercise was important, as the topic of the scoping review was focused on equity, and this allowed the team to be grounded within the concepts of equity and social justice. The activity was completed to provide a space for the team where everyone's opinions were welcomed. Team members were encouraged to reflect on equity issues throughout the conduct of this research including: team composition, research questions posed, literature search conduct, abstract screening, data charting, and writing and disseminating the results.¹⁵ We also characterised the team composition according to the PROGRESS-PLUS variables by Cochrane Collaboration (an acronym used to identify characteristics that stratify opportunities and outcomes, such as gender/sex, race/ethnicity, religion, socioeconomic status, among others) to make transparent the privilege, potential biases and power differentials that may exist within our

study team. Through this exercise, of the 36 coauthors, 18 self-reported their race (77.8% white, 22% racialised (or self-identified as non-White or non-Caucasian in racial origin, regardless of birthplace or citizenship), 19 reported occupation (52.6% researchers, 15.8% research staff, 31.6% other positions), 18 reported gender (66.7% women and 33.3% men), 17 reported religion (52.9% Christians, 29.4% none/not applicable and 17.6% other), 19 reported education (84.2% PhD, 15.8% MA/MSc), 18 reported socioeconomic status (83.3% high status, 16.7% middle) and 17 reported social capital (70.6% reported high, 17.6% intermediate and 11.8% low/low-mid). The team was not representative of the Canadian population yet this was a useful exercise, as it provided the team with lived experience about being asked questions about the PROGRESS-PLUS variables, such as their sex and gender and allowed the team to reflect on their positionality.

A protocol was developed by the research team. The protocol included input from those who are positioned to act on the findings (knowledge users) from several organisations, such as Canadian Academy of Health Sciences, leaders of Canada's research-intensive universities, the science publisher Elsevier, an editor from *The Lancet* and members of the WHO, Science in Australia Gender Equity (SAGE) and the South African Medical Research Council (SAMRC). The protocol was registered with the Open Science Framework (<https://osf.io/8wk7e/>) and published in a peer-reviewed journal.¹⁶ The 2020 JBI (formerly Joanna Briggs Institute) guide was used to inform our scoping review methods.¹⁷ The results are reported using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension to scoping reviews (PRISMA-ScR)¹⁸ and Sex and Gender Equity in Research (SAGER) guidance¹⁹ (online supplemental appendices 1 and 2).

Patient and public involvement statement

Patients or the public were not involved in the design, or conduct, or reporting, or dissemination plans of our research.

Data sources and searches

The MEDLINE, Embase, PsycINFO, Cochrane, JBI, Campbell and CINAHL databases were searched from inception until 28 October 2019 and are all outlined in online supplemental appendix 3. Grey (ie, difficult to locate for reasons such as being non-indexed, only available online or unpublished) literature was identified through multiple sources, such as the Web of Science, GreyNet International, System for Information on Grey Literature in Europe (SIGLE), Science in Australia Gender equity, WHO – Global Health Workforce Network, Science in Australia Gender Equity, Centre for Research Libraries Foreign Dissertation, UK Equality Challenge Unit – Athena SWAN Charter, European Gender Portal for Equality in Science and other sources outlined in online supplemental appendix 4. The literature search was conducted by a professional librarian

(BS) and peer-reviewed by another using the Peer Review of Electronic Search Strategies (PRESS) checklist.²⁰ All searches were updated on 26 October 2020. No language restrictions were applied.

Study selection

Only quantitative studies with primary data (experimental, quasi-experimental, mixed methods including a quantitative component and observational) were eligible if they reported on professional outcomes related to gender equity within academic institutions with the population including individuals working in academic context and independent researchers conducting health-related research. Due to feasibility constraints, we were unable to include qualitative studies in this scoping review. The full eligibility criteria and definitions for all components of the eligibility criteria are provided in online supplemental appendices 5 and 6.

Following one pilot test with 90% agreement among the team, pairs of reviewers (VN, ND, PR, PAK, MG, HM, FY, YL, RW, AA, OC) independently screened titles and abstracts using the criteria outlined in online supplemental appendix 5. Conflicts were resolved by a third reviewer. For full-text screening, four pilot tests were required to obtain 75% agreement. Subsequently, pairs of reviewers (VN, ND, PR, PAK, MG, HM, FY, YL, RW, AA, OC) independently screened full-text articles using the criteria outlined in online supplemental appendix 6. Conflicts were resolved by a third reviewer consistently.

Data extraction

Data were charted using a prespecified form presented in online supplemental appendix 7 that was pilot tested on 14 articles. Subsequently, all data were charted by one reviewer and verified by another (VN, ND, PR, PK, MG, HM, FY, YL, RW, AA, OC). Non-English studies were translated using Google Translate, as research has shown this to be a “viable, accurate tool for translating non-English language trials” included in systematic reviews.²¹ For country of conduct, the corresponding author’s country was used as a proxy when not reported. The PROGRESS-PLUS criteria²² were used to collect data related to variables focused on equity, such as gender identity, race, socioeconomic status and religious orientation. The intersection^{23 24} of these variables was examined including consideration of systems and impact of power and oppression, if reported.

Quality assessment

Quality assessment was not conducted, as per the JBI guidance on scoping reviews.¹⁷

Data synthesis and analysis

The results were summarised descriptively. Frequencies, means and medians were calculated, as appropriate, in Excel. In scoping reviews, a pre-existing categorisation guide can be used or developed.²⁵ Here, a pre-established (ie, deductive) categorisation guide was developed by the team to categorise the outcomes, as follows: (1) academic

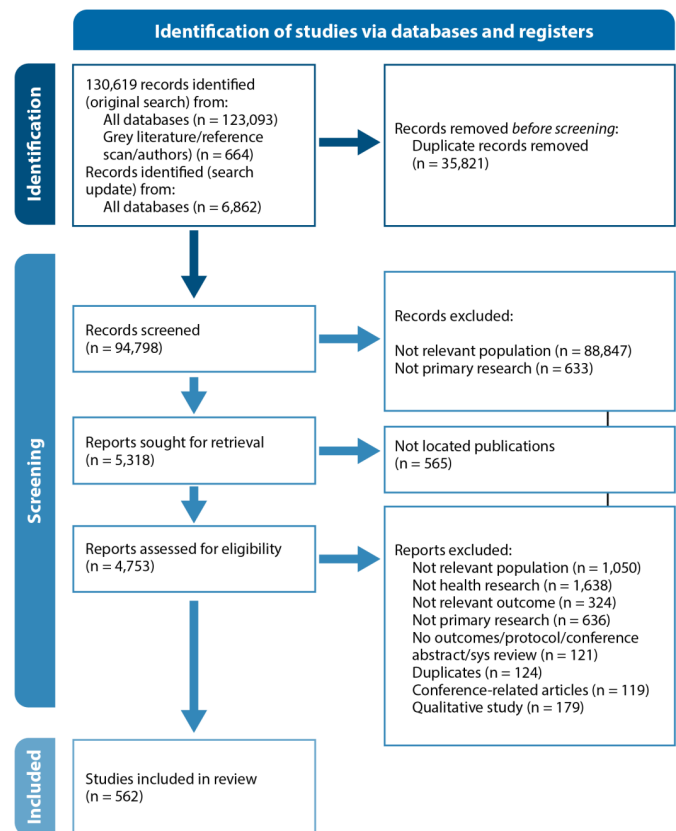


Figure 1 Study selection flow.

output; (2) faculty workforce outcomes; (3) academic activities outcomes; (4) academic leadership; (5) recruitment/hiring/retention/turnover; (6) promotion; (7) recognition/awards and (8) other outcomes (online supplemental appendix 8, table 1).

RESULTS

Literature search

After screening 94 798 titles and abstracts and 5318 full-text articles, 562 studies were included (figure 1). There were 179 qualitative studies that were excluded. A list of the included studies can be found in online supplemental appendix 9. The studies were written in English (553/562, 98.4%), Spanish (4/564, 0.7%) and German, Italian, French, Norwegian and Portuguese (one each, 0.18%). The first study was published in 1970.²⁶ All of our abstracted data are freely available on the Open Science Framework (https://osf.io/w3x5j/?view_only=029f9dbe189a43259a8f6093bc77662c).

Study characteristics

Most studies (489/562, 87.1%) were published since 2000, with more than half published since 2015 (301/562, 53.6%) (online supplemental appendix 10, figure 1).

Geographic location

Most studies were conducted in North America (462/562, 82.2%), followed by Europe (60/562, 10.7%), Asia (14/562, 2.5%), South America (10/562, 1.8%), Australia

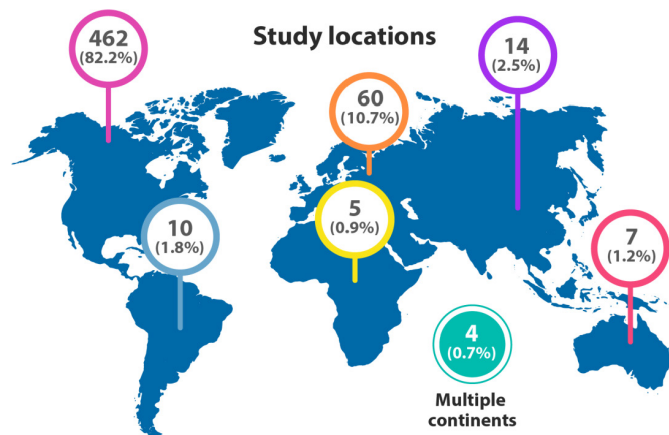


Figure 2 Geographic locations of included studies.

(7/562, 1.2%) and Africa (5/562, 0.9%), while four studies emanated from two or more continents (4/562, 0.7%) (figure 2). The country producing the most research on this topic was the USA (400/562, 71.2%), followed by Canada (31/562, 5.5%), Spain (10/562, 1.8%) and UK (10/562, 1.8%) (online supplemental appendix 11, table 2). There were 29 studies (5.2%) including samples from both Canada and the USA in the same study (online supplemental appendix 11, table 2).

Publication status

Most studies were published in academic journals (543/562, 96.6%) as research articles (532/562, 94.7%), letters to the editor (7/562, 1.2%) or commentaries (4/562, 0.7%). The remaining 19 studies were disseminated as theses (12/562, 2.1%), online reports (3/562, 0.5%) and book chapters (3/562, 0.5%), and one study was only available as a conference abstract (1/562, 0.2%) (figure 3). The five most common journals were *Academic Medicine* (41/544, 7.5%), *Scientometrics* (14/544, 2.5%), *Journal of Women's Health* (10/544, 1.8%), *Cureus* (9/544, 1.6%), *PLoS ONE* (8/544, 1.4%) and *Journal of the American Medical Association* (JAMA) (8/544, 1.4%) (online supplemental appendix 12, table 3).

Setting

Most studies (536/562, 95.4%) took place in a university or college setting (online supplemental appendix 13, table 4), followed by a teaching hospital (16/562, 2.8%),



Figure 3 Publication status of included studies.

academic research institute (5/562, 0.9%), other (1/562, 0.2%) or mixed setting (4/562, 0.7%). The setting was at the multinational level (58/562, 10.3%), national level (292/562, 52.0%), province or state level (9/562, 1.6%), conducted across multiple sites (eg, universities) (138/562, 24.6%) or single sites (65, 11.6%) (online supplemental appendix 14, figure 3). The source of data for the participants was most commonly from professional societies (173/562, 30.8%), individual institutions (103/562, 18.3%), faculty rosters across institutions (98/562, 17.4%), funding databases (82/562, 14.6%) and national databases (40/562, 7.1%) (online supplemental appendix 15, table 5).

Discipline/specialty

The five most common disciplines/specialties examined were surgery (90/562, 16%), multiple disciplines/specialties (87/562, 15.5%), medicine (unspecified) (83/562, 14.8%), psychology (48/562, 8.5%) and radiology (20/562, 3.6%) (online supplemental appendix 16, table 6).

Career stage

Most studies (248/562, 44.1%) examined all career stages, whereas this information was not specified in 38.3% of studies (215/562) (online supplemental appendix 17, table 7). Early career faculty were the focus of 5% of the studies (28/562), whereas 0.4% (2/562) focused on mid-career faculty and 2.3% (13/562) focused on senior faculty. Twelve studies (2.1%) focused on early career and mid-career faculty, whereas 1.6% (9/562) focused on mid-career and senior career. Some studies reported leadership positions. Twenty-seven (4.8%) included all career stages and leadership positions, whereas eight studies (1.4%) focused on leadership positions only.

Study design

Most studies (551/562, 98.0%) used an observational design, while the rest used a mixed methods design with a quantitative component (5/562, 0.9%), experimental (4/562, 0.7%) or quasi-experimental (2/562, 0.4%) design (online supplemental appendix 18, figure 4).

Funding for the research

Most studies (308/562, 54.8%) did not report funding, whereas 30% (168/562) were funded by non-profit research funders, and 15.3% (86/562) reported that they received no funding to conduct their research (online supplemental appendix 19, figure 5). None of the included studies reported for-profit funding.

Outcome frequencies

Across the 562 included studies, there were 2966 outcomes reported (online supplemental appendix 8, table 1). Academic output outcome measures included measures such as publications, funding, patents and other productivity measures. Academic output outcomes were reported 1228 times in 66.1% (371/562) of the studies. Faculty workforce outcome measures included items such

as academic rank and salary. Faculty workforce outcomes were reported 637 times in 60.5% (340/562) of the studies. Academic activity outcome measures included measures such as administration activities, number of hours worked and number of years worked. Academic activity outcomes were reported 274 times in 22.4% (126/562) of the studies. Academic leadership outcome measures included measures, such as gender representation in leadership positions. Academic leadership outcomes were reported 174 times in 19.9% (112/562) of the studies. Recruitment and retention outcomes were reported 55 times in 5.7% (32/562) of the studies. Promotion outcome measures included elements, such as promotion opportunities and time to promotion. Promotion outcomes were reported 45 times in 5.2% (29/562) of the studies. Recognition outcomes, such as awards, were reported 18 times in 2.7% (15/562) of the studies. Other types of outcomes, such as contextual factors, parental leaves and qualitative considerations, were reported 535 times in 21.4% (120/562) of the studies.

Academic output

The academic output outcome measures included publications (519 times, 217/562 or 38.6% of studies), funding (391 times, 161/562 or 28.6% studies), productivity scores (191 times, 116/562 or 20.6% studies), presentations (67 times, 28/562 or 49.8% studies), research activity (48 times, 36/562 or 6.4% studies) and intellectual property (12 times, 5/562 or 0.9% studies) (online supplemental appendix 20, table 8).

Faculty workforce

The faculty workforce outcome measures included academic rank (274 times in 237/562 or 42.2% studies), workforce representation (162 times in 131/562 or 23.3% studies), academic status (106 times in 71/562 or 12.6% studies) and salary (95 times in 53/562 or 9.4% studies) (online supplemental appendix 21, table 9).

Academic activity

The academic activity outcome measures included the number of hours/years worked across activities (99 times in 54/562 or 9.6% studies), time allocation (79 times in 33/562 or 5.9% studies), administrative or non-teaching activities (59 times in 29/562 or 5.2% studies), career length (31 times in 26/562 or 4.6% studies), professional development (five times in 5/562 or 0.9% studies) and teaching activities (one time in 1/562 or 0.2% studies) (online supplemental appendix 22, table 10).

Academic leadership

The academic leadership outcome measures were leadership representation (161 times in 107/562 or 19.0% studies), leadership training (seven times in 5/562 or 0.9% studies) and supervision (six times in 5/562 or 0.9% studies) (online supplemental appendix 23, table 11).

Recruitment and retention

The recruitment and retention outcome measures were related to recruitment data (37 times in 16/562 or 2.8% studies) and faculty retention and turnover (18 times in 16/562 or 2.8% studies) (online supplemental appendix 24, table 12).

Promotion

The promotion outcome measures included promotion opportunities (28 times in 19/562 or 3.4% studies) and time to promotion (17 times in 12/562 or 2.1% studies) (online supplemental appendix 25, table 13).

Recognition

Recognition outcomes included awards, which were reported 18 times in 2.7% (15/562) of the studies (online supplemental appendix 26, table 14).

Other

The five most common other types of outcomes were related to perceptions on equity/equality (80 times, 33/562 or 5.9% studies), perceptions on promotion (79 times, 24/562 or 4.3% studies), perceptions on productivity (49 times, 31/562 or 5.5% studies), perceptions on mentorship (49 times, 25/562 or 4.4% studies) and perceptions on infrastructure (38 times, 17/562 or 3.0% studies) (online supplemental appendix 27, table 15). Nine studies (1.6%) reported on perceptions of harassment across 29 outcomes.

PROGRESS-PLUS variables

Place of residence

Studies only reported where the study was conducted (place of work) versus the place of residence for participants, as reported above.

Race/ethnicity/culture/language

Sixty-four studies (11.4%) reported on race/ethnicity of the faculty studied. However, the proportion of the participants by race or ethnicity or culture, including Indigenous status, was only reported in 27 studies (table 1). Most studies (3.9%, 22/562) used self-identification for race or ethnicity or culture or Indigenous status; five studies used other approaches, such as faculty databases (online supplemental appendix 28, table 16). Across the 27 studies reporting proportions, the most common race of participants was White (3.7%, 21/562 studies, proportion of participants ranging from 54% to 93.3%), followed by Asian (2.7%, 15/562, proportion of participants ranging from 2.8% to 27.5%), Black (2.5%, 14/562, proportion of participants ranging from 0 to 14%) and Hispanic (2.0%, 11/562, proportion of participants ranging from 2.0% to 14.0%). No studies reported the language spoken of participants.

Occupation

By definition, all studies included participants who were academics.

Table 1 Studies reporting on gender/sex by race/ethnicity/Indigenous status of the faculty studied (out of 27 studies reporting percentages regarding the race/ethnicity/indigeneity of the faculty studied, 10 reported the breakdown by both race and gender)

Race/ethnicity/indigeneity and gender or sex of studied sample(s)	Number of studies reporting percentages	Average percentage (% range) of faculty sample(s)
White (all genders)	21	73.4 (54–93.3)
White males/men	6	66.3 (30–78)
White females/women	7	69.7 (39–82)
Black (all genders)	14	5.4 (0–14)
Black males/men	–	–
Black females/women	2	7.5 (3–12)
Hispanic (all genders)	11	4.9 (2–14)
Hispanic males/men	–	–
Hispanic females/women	1	3
Asian (all genders)	15	17 (2.8–27.5)
Asian males/men	2	22.3
Asian females/women	3	19.5 (16–21.3)
Asian/Pacific Islanders (all genders)	2	16.9 (14.5–19.3)
Asian/Pacific Islander males/men	2	13.6 (7.5–19.6)
Asian/Pacific Islander females/women	2	13.8 (8.5–19.1)
White/Asian (both genders)	1	93.3
White/Asian males/men	–	–
White/Asian females/women	–	–
Pacific Islanders (both genders)	3	0.7 (0–2)
Pacific Islanders males/men	–	–
Pacific Islanders females/women	–	–
Racialised (all genders)	4	8.1 (4–11)
Racialised males/men	4	7.3 (2–13)
Racialised females/women	4	9.4 (6–13)

Continued

Table 1 Continued

Race/ethnicity/indigeneity and gender or sex of studied sample(s)	Number of studies reporting percentages	Average percentage (% range) of faculty sample(s)
Indigenous (all genders)	1	0.4
Indigenous males/men	–	–
Indigenous females/women	–	–

Gender/sex

Most studies (65.3%, 367/562) did not report how gender or sex were determined (online supplemental appendix 29, table 17). Of the studies reporting how gender or sex were determined, 61 (10.9%) used existing databases and listings, 57 (10.1%) used self-identification and 77 (13.7%) used other methods (eg, looking at pictures online, pronouns on websites, name association or a combination of methods). There were 6.4% (36/562) studies that included only female/women academics in their study, whereas 0.4% (2/562) studies included only male/men faculty in their study. Eleven studies reported data falling into the ‘other’ category in cases when faculty gender or sex was not recorded (eg, when a person declined to respond to a gender self-identification question on a survey, or faculty names could not be identified for a gender, or gender was listed as ambiguous). No study specifically identified genders beyond man/woman. In one study, those who self-identified as being transgender or those unwilling to disclose their gender were excluded.²⁷ One study acknowledged that the methods did not account for non-binary or gender fluid individuals.²⁸ None of the studies reported on proportion of participants according to their gender identities or gender roles.

Religion

One study (0.2%) reported participants’ religion, which took place in India and reported that 91.6% of the participants were Hindu.²⁹

Education

No studies reported the level of education. However, according to our eligibility criteria, these were all academics, so we assume that everyone had at least a university degree.

Socioeconomic status

No studies reported socioeconomic status.

Social capital

No studies reported social capital.

Additional PROGRESS-PLUS variables

Out of 562 studies, 42 studies (7.3%) reported the overall age of the faculty. Of these, 31 reported the faculty mean age (45.7 years), four reported faculty median age (ranging from 34 to 48 years) and seven reported faculty age ranges (ranging from 21 to 70 years). Of the 36 studies reporting on females/women faculty age, 32 reported mean age (mean of 43.7 years, range of 33.1 to 53.4 years), two reported medians (44 and 48.2 years) and two reported age ranges (ranging from 30 to 70 years). In contrast to the studies reporting the age of females/women, 27 studies reported the ages of males/men faculty, 25 reported mean age (mean of 48.6 years, range of range 38.6 to 58 years) and two studies reported age ranges (ranging from 30 to 70 years). No studies reported on disability, sexual orientation, features of relationships or time-dependent relationships.

Intersectionality

Ten studies reported the intersection of race and gender (table 1). These studies reported on White males/men (1.1%, 6/562 studies), White females/women (1.2%, 7/562 studies), Black females/women (0.4%, 2/562 studies), Hispanic females/women (0.2%, 1/562 studies), Asian males/men (0.4%, 2/562 studies), Asian females/women (5.3%, 3/562 studies), Asian or Pacific Island males/men (0.4%, 2/562 studies), Asian or Pacific Island females/women (0.4%, 2/562 studies), racialised males/men (0.7%, 4/562 studies) and racialised females/women (0.7%, 4/562 studies).

Of the 562 included studies, only three mentioned the term intersectionality. One study mentioned intersectionality in the introduction section, yet only reported on gender/sex and did not report on intersecting factors.³⁰ The second study examined the intersectional effects of gender and race/ethnicity on the interpretations and reactions to grant feedback.³¹ They found that gender impacted interpretation of grant feedback. The third study examined the intersection of gender equality in STEMM (Science, Technology, Engineering, Mathematics and Medicine) and ethnicity, sexual orientation, disability and age.³² However, when relevant disciplines to health research were selected (eg, medicine, dentistry), only binary sex and gender categories (man/male and woman/female) remained. No studies reported on the intersection of these social and political characteristics within systems of power and oppression to produce potential discrimination or privilege.

DISCUSSION

We conducted a comprehensive scoping review on gender equity in academic health research using the JBI guidance for conduct and PRISMA-ScR guidance for reporting. Despite gender bias being a known issue in academic health research for more than 50 years,²⁴ most of the 562 included studies were published in the past 20 years with half published in the past 7 years. These findings suggest

that while there is awareness of issues related to gender (in)equity, this is a rapidly developing field.

Most of the studies come from the USA, yet there is a need for understanding of these issues globally. Very few studies on gender equity were conducted in other high-income countries or in low- and middle-income economy countries. In addition, few of the included studies reported having funding to conduct this research. This suggests this is underfunded area of research, with academics volunteering their time to conduct this research without being properly funded to do this important work.

A major finding of this scoping review was the inappropriate use of gender categories and/or the binary use of the concept.^{33,34} Several studies used names or pictures to determine the sex and gender of participants, and most studies used these terms interchangeably. This approach severely limits the field, as it is unclear whether the studies were examining sex as a biological variable or gender as a socially constructed one. There was also an underrepresentation of genders beyond man and woman. Our results suggest that the researchers either relied on existing faculty data depositories that used the binary male/female categories to stratify faculty's gender or the surveys used contained the binary male/female categories asking faculty to self identify (ie, a small number of studies reporting 'other' category beside male/female). To move towards equitable science, the focus must be on gender and include genders beyond man and woman. However, it must be acknowledged that reporting gender beyond man and woman is a newly emerging area and the research may require some time to catch up. Researchers conducting primary studies in this area need to try to elicit and report on all genders to advance the field.

Furthermore, only three studies mentioned the term intersectionality.²⁴ Intersectionality is a powerful way to examine the intersection between multiple social and political identities that can lead to power and oppression. An intersectional lens is of particular importance for women who self-identify as black, Indigenous and people of colour (BIPOC). Very few studies reported on the PROGRESS-PLUS variables, which limit interpretation of results. To develop effective gender equity strategies, the intersection between gender and other social identities, such as race, religion, social capital and other PROGRESS-PLUS factors, is necessary. Otherwise, we will be unable to tailor interventions to specific characteristics and settings. Furthermore, exploring confounders, effect modifiers and mediators impacting gender equity comparisons is required. Examples include the roles of caregiving, mentorship and sponsorship on outcomes, such as opportunity and career progression. Such an approach will also allow the identification of targets for interventions, as well as tailoring strategies to promote gender equity. Research needs to be designed to capture the longitudinal nature of the relationship between discrimination and the outcomes of interest: research productivity, senior leadership roles and other measures. Prospective studies on



gender equity interventions that examine PROGRESS-PLUS variables, and their interactions, confounders, and mediators are required.

Our results also highlight the lack of standardised methods, outcomes and definitions in this area. Most studies focused on surgery and academic output outcomes, such as publications and funding. Future research should co-produce core outcome measures focusing on gender equity across all areas, disciplines and specialties. Identifying the measurable outcomes that are important for gender equity will allow comparisons within and across organisations because it is of particular importance to the measurement of research impact equitably. Outcome measures need to move beyond counting publications and grant funding. Institutions need to balance these outcomes with other metrics that bring value and sustainability to organisations that go unnoticed, such as mentorship, sponsorship, administrative work and emotional support that disproportionately represents contributions done predominantly by women.^{35 36} To target equity, individual institutions and funders will need to find a way to 'measure' or account for the value of this equally important work to allow for equitable career advancement.

Most of the included studies were observational, as the focus of this review was on professional outcomes related to gender equity. However, studies using an experimental design are required to test the effectiveness of interventions to promote gender equity. The field needs to move from documenting the issues to developing strategies to address them. We are currently working on a scoping review of the randomised trials across all disciplines to advance gender equity at all levels of organisations (Dr Tricco, personal communication).

There are several limitations to our scoping review worth noting. We originally planned to include qualitative research but were unable to, due to feasibility constraints, which is an important protocol deviation. For example, in 18 of the 179 qualitative studies that were excluded, intersectionality was mentioned in the abstracts. These studies could have provided more insight into the gender equity gaps. Another protocol deviation was our inability to conduct a planned living scoping review; due to the vast literature that had to be screened and conducting this review during the pandemic with the team being impacted by school closures, COVID-19 infections, losses due to COVID-19, burnout, redeployment to clinical duties and high turnover, several delays were experienced and resources were limited. However, it is not anticipated that our results will change since our last literature search. We suggest that this review be updated every 5–10 years. We also excluded studies in anthropology and engineering if they were not explicitly reported as being biomedical research, which may have resulted in potentially relevant studies being excluded.

CONCLUSIONS

In conclusion, several gaps were identified in the literature and especially regarding research in high-income countries beyond the USA and in low-income and middle-income economy countries, the PROGRESS-PLUS items, genders beyond man and woman, and issues related to intersectionality. Few studies reported appropriate definitions for gender and sex. Most of the studies were retrospective, and prospective studies are required. Few of the studies reported having funding to conduct this research, suggesting that this is an underfunded area. Wide variation was observed in the types of outcomes used to measure gender equity, and these outcome measures need to move beyond merely counting publications and grant funding. Future research should entail more consistency in definitions and outcomes, as well as identifying interventions to promote gender equity at all levels of organisations.

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