**Supplemental Material**

**Table 1.** *List of articles included in review organized according to topic category*

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Author** | **Year** | **Country** | **Aim of the study** | **Study design/quality** | **Study size population (no. female/male)** | **Surgical specialties included** |
| ***Type of discrimination*** |  |  |  |  |  |  |  |
|  | Longo et al | 2008 | USA | Highlight women surgeons personal experiences and feelings as they encountered gender-related obstacles in their career paths, and to document how they coped with them. | Self-administered survey that would include our respondents’ background and ask open-ended questions.  | 100 women surgeons  | Miscellaneous |
|  | Salles et al  | 2020 | USA | Assess how healthcare professionals associate men and women with career and family and how surgeons associate men and women with surgery and family medicine.  | Data review and cross-sectional study collected from 2006 to 2017 from self-identified health care professionals. | 131 surgeons, 46 (35.1%) females and 85 (64.9%) males  | Miscellaneous  |
|  | Hutchinson et al | 2020 | Australia | Evaluate how women’s surgical bias due to 4 broad types of bias that affect women’s career: workplace factors, epistemic injustice, role stereotypes and experience of objectifications. | A structured interview study with women surgeons at different career stages, from trainee to senior consultants. | 46 women surgeons | Miscellaneous |
|  | Ross et al  | 2020 | USA | Determine if men surgeons are biased against women in surgery. | Questionnaires were sent to men surgeons at University of south Florida, which included 70 items of a 5-point Likert scale and 63 multiple choice and binary answers.  | 190 men surgeons.  | Miscellaneous |
|  | Bucknor et al | 2018 | USA, Netherlands | Analysis of whether the public prefers a specific gender or demeanour when considering plastic surgeons. | Members of the public were surveyed via the Amazon Mechanical Turk Crowdsourcing platform. Respondents read 1 of the 8 randomly assigned scenarios. | 341 members of the public, 190 (55.7%) were males, 151 (44.3%) were females.  | Plastic surgery  |
|  | Whicker et al | 2020 | USA | Assess the proportion of women orthopedic surgeons who reported having experienced sexual harassment during their residency.  | Anonymous 12-question on-line survey was distributed in 2019.  | 250 female surgeons members of the Ruth Jackson Orthopedic society  | Orthopedic surgery  |
|  | Ceppa et al | 2020 | USA | Assess the incidence of sexual harassment in cardiothoracic surgery.  | Survey based on the Sexual Experience Questionnaire-Workplace physician wellness, and burnout surveys. It was distributed through The Society of Thoracic Surgeons, Women in Thoracic surgery, and Thoracic Surgery Residents Association. | 790 responders, 591 (75%) were male, 185 (23%) were female, and 14 (2%) were other or do not disclose gender.  | Cardiothoracic surgery  |
|  | Barnes et al | 2020 | USA | Explore prevalence and impact of the sexist microaggressions female surgeons experience. | All residents, fellows, and attending female surgeons at the University of the New Mexico Health Sciences Center to participate in focus groups. Semistructured interview were conducted based on 7 domains of sexist microaggressions on the Sexist MESS revealing 4 themes:exclusion/ increased effort/ adaptation/ resilience The survey response rate was 64%.  | 64 surgeons  | Miscellaneous |
|  | Stephens et al | 2016 | USA | Evaluate the influence of gender on specialty interest, satisfaction, and career pathways of current residents in cardiothoracic surgery. | Data were acquired from the responses to the mandatory 2015 Thoracic surgery residents association/thoracic surgery Directors Association in-training examination survey | 354 residents, 71 (20%) females, 283 (80%) males.  | Cardiothoracic surgery  |
|  | Steklacova et al | 2017 | Europe | Assess the situation of women in neurosurgery in Europe and to evaluate the existence of gender inequality. | National neurosurgical societies of 39 countries forming the European Association of Neurosurgical societies were contacted to provide data stating the proportion of women in neurosurgery. Data were obtained with results of an online survey. | 237 participants, 166 (70%) males, 71 (30%) females.  | Neurosurgery  |
|  | Janjua et al | 2020 | Pakistan | explore gender discrimination and bias experienced by female surgeons in a low-income country like Pakistan | Single center, cross sectional anonymous online survey was sent to all surgeons practicing/training at a tertiary care hospital in Pakistan. | 194 surgeons, 47 (24.2%) were female, 147 (75.8%) were male  | Miscellaneous  |
| ***Discrimination in Authorship, Research productivity and Funding*** |  |  |  |  |  |  |  |
|  | Xiao et al. | 2018 | USA | Evaluate gender disparities in authorship in 5 general interest surgery journals | Retrospective review of published articles in 5 surgical journals. | 3604 authors of 1802 articles. 2791 (77.4%) first and senior authors were male and 813 (22.6%) were female.  | General surgery |
|  | Taira et al.  | 2008 | USA | Compare first authorship and reported funding of original articles by gender | Retrospective review of published articles in 4 surgical journals. | 664 original research articles. 522 (78.6%) first authors were male and 118 (17.8%) were female.  | General surgery |
|  | Farooq et al.  | 2019 | USA | Evaluate gender disparities in first or last authorship in hepatopancreaticobiliary (HPB) in 7 surgical journals | Retrospective review of published articles in 7 surgical journals. | 1473 HPB articles. 1059 (72%) first or last authors were male and 414 (28%) first or last authors were female. | General surgery (hepatopancreaticobiliary) |
|  | Brown et al  | 2019 | USA  | Evaluate gender disparities in first or senior authorship in 6 orthopedic journals  | Retrospective review of published articles in 6 orthopedic journals. | 880 senior authors and 1038 first authors. 865 (98.3%) senior authors were male and 15 (1.7%) were female. 992 (95.6%) first authors were male and 46 (4.4%) were female.  | Orthopedic surgery  |
|  | Rynecki et al | 2019 | USA | Evaluate gender disparities in 3 orthopedic journals’ editorial board composition in the previous two decades | Retrospective review of editorial board members of 3 orthopedic journals in 1997, 2007 and 2017.  | In 1997, 3 of 113 (3%) editorial board members were women, 3 of 105 (3%) in 2007 and 10 of 107 (9%) in 2017.  | Orthopedic surgery  |
|  | Kibbe et al | 2020 | USA | Evaluate whether there was a decrease in female authorship representation in manuscript submissions to JAMA Surgery during COVID-19 pandemic.  | Retrospective review of gender of first, last and corresponding author of manuscript submitted to JAMA Surgery in April-May 2019 and 2020.  | Manuscripts were 366 in 2019 and 702 in 2020. 119 (33%) first authors were female in 2019 and 205 (29%) in 2020.  | General surgery  |
|  | Caturegli et al | 2020 | USA | Evaluate gender disparities in middle authorship  | Retrospective review of publications of a sample of the American College of Surgeons surgery fellows  | 195 (40.8%) female and 195 (40.8%) male surgeon authors with publications  | General surgery  |
|  | Wu et al | 2020 | Canada | Evaluate gender differences in commenting published work. | Retrospective review of comments published over a 16-year period in PNAS and Science.  | 869 comments published in PNAS and 481 in Science. only 15% (202) of the comments have a female first author.  | Miscellaneous  |
|  | Aslan et al | 2020 | Turkey | Evaluate gender disparities in authorship in Neurosurgery | Retrospective review of published articles in 2 neurosurgical journals. | 3247 neurosurgical articles. 2729 (84%) first authors were male and 518 (16%) were female. 2884 (89%) senior authors were male and 352 (11%) were female.  | Neurosurgery  |
|  | Housri et al | 2007 | USA | Evaluate gender disparities in abstract presentations at Association for Academic Surgery (AAS) and Society of University Surgeons (SUS) annual meetings.  | Retrospective review of principal investigator of abstracts presented at AAS and SUS annual meetings in 2002, 2003, and 2004  | Of the 337 abstracts presented at the SUS conferences, 300 (89%) of principal investigators were male and 37 (11%) were women. Of the 657 abstracts presented at the AAS conferences, 590 (90.9%) of principal investigators were male and 59 (9.1%) were female. | General surgery  |
|  | Sharkey et al | 2019 | USA | Evaluate gender differences in abstract submission and acceptance rates in academic pediatric orthopedic surgery | Retrospective review of submissions at annual meetings of members of the Pediatric Orthopaedic Society of North America for the years 2012-2015.  | 534 men (83.8%) and 103 women (16.2%), whereas candidate members included 207 men (64.7%) and 113 women (35.3%).  | Orthopedic Surgery  |
|  | Atkinson et al | 2019 | USA | Evaluate gender differences in the awards winners from surgical societies. | Retrospective review of 20 surgical society award receipts from 1998 to 2017.  | 1642 awards were presented. 1222 (74.3%) of award recipients were male; 420 (25.5%) of award recipients were female.  | General surgery and subspecialties  |
|  | Silva et al | 2020 | USA  | Evaluate gender differences in NIH funding among faculty in neurosurgical departments | Retrospective review of NIH grants for 5 years (2014-2019).  | 1489 grants, for a total of 343 principal investigators. 1183 (79.4%) projects were led by male and 306 (20.6%) projects by female.  | Neurosurgery |
|  | Krebs et al | 2020 | USA | Evaluate gender differences in NIH R01 grants funding.  | Retrospective review of R01 NIH grants awarded to members of surgical departments.  | 212 grants, for a total of 159 principal investigators. 42 (26%) were female and 117 (73.6%) were male. | General surgery |
| ***Discrimination in Academic Surgery*** |  |  |  |  |  |  |  |
|  | Schroen et al | 2004 | USA | Evaluate differences between men and women general surgeons in Academic Careers; factors associated with productivity and satisfaction.  | Online survey to all female members of the American College of Surgeons and 2:1 male members.  | 317 surgeons in academic practice. 168 (52.9%) men and 147 (47.1%) women.  | General surgery  |
|  | Mueller et al | 2016 | USA | Evaluate gender disparities in research productivity (number of citations, publications, h-indices).  | Retrospective review of the on-line profile of full-time faculty members of surgery departments of three academic centers.  | 978 surgeons. 744 (76.1%) men and 234 (23.9%) women.  | General surgery  |
|  | Mueller et al | 2017 | USA | Evaluate gender differences in published surgical literature by both quantity and impact.  | Review of faculty members productivity in 3 academic centers.  | 212 surgical faculty members. 160 (75.5%) were men and 52 (24.5%) women.  | General surgery |
|  | Valsangkar et al  | 2016 | USA | Evaluate gender disparities in academic output, NIH-funding, and academic rank.  | Review top 50 university-based and 5 hospital departments of surgery based on NIH funding. | 4015 surgical faculty. 3087 (76.9%) were male and 928 (23.1%) were female.  | General surgery and subspecialties  |
|  | Carnevale et al | 2020 | USA  | Evaluate gender disparities in grant funding, leadership positions and publication impact.  | Review of academic faculty and leadership positions of institutions with vascular surgery training programs.  | 951 members of surgical faculty. 774 (81.4%) were male and 177 (18.6%) were female.  | Vascular surgery  |
|  | Sasor et al | 2018 | USA  | Evaluate gender differences in authorship trends and identify factors that affect scholarly output in academic plastic surgery. | Review of academic plastic surgeons. Number of published articles and h-index were obtained.  | 814 plastic surgeons. 136 (16.7%) were female and 678 (83.3%) were male | Plastic surgery |
|  | Smith et al | 2019 | USA | Evaluate gender differences in academic Plastic surgery and Leadership positions.  | Review of academic plastic surgeons.  | 938 academic plastic surgeons. 746 (79.5%) were male and 184 (19.6%) were female.  | Plastic surgery |
|  | Ence et al | 2016 | USA  | Evaluate the influence of h-index, geography, career duration, and sex on the academic rank.  | Review of faculty at 142 civilian academic orthopedic surgery departments. | 4663 orthopedic surgeons. 4176 (89.5%) were male and 487 (10.5%) were female.  | Orthopedic surgery  |
|  | Chen et al | 2020 | USA | Evaluate gender difference in faculty positions among academic shoulder and elbow surgeons  | Review of status of academic shoulder and elbow surgeons.  | 186 orthopedic surgeons. 176 (94.6%) were male and 10 were female.  | Orthopedic surgery  |
|  | Okoshi et al | 2014  | Japan | Evaluate gender difference in Japanese academic surgery.  | Retrospective review of medical doctors who worked at Kyoto University Hospital in 2009 and 2013.  | In 2009, 656 total. 524 (79.9%) were male and 132 (20.1%) female. In 2013 655 total. 523 (79.8%) were male and 132 (20.2%) were female.  | Miscellaneous  |
|  | Bernardi et al  | 2020 | USA  | Identify perceptions of the environment for women in surgery among 4 US Academic Institution.  | Retrospective review of 560 manuscripts in 14 specialties were reviewed. | 36 surgeons. 22 (61.1%) male, 14 (38.9%) female.  | Miscellaneous  |
|  | Cochran et al | 2013 | USA | Examine specific obstacles to women’s Academic career advancement in departments of surgery.  | A modified version of the Career Barriers Inventory-revised was administered to senior surgical residents and early career surgical faculty members at 8 academic medical centers.  | 154 surgeons. 84 (54.5%) were male and 70 (45.5%) female.  | Miscellaneous |
|  | Colletti et al | 2000 | USA | Evaluate the perceived obstacles to career success for women in Academic Surgery | Single center survey among general surgery faculty  | 54 surgeons. 45 (83.3%) were male and 9 (16.6%) were female  | General surgery |
|  | Robinson et al | 2020 | USA | Evaluate whether recommendations for improving gender bias are realized in plastic surgery programs and identify remaining institutional barriers to the advancement of women in academic plastic surgery.  | Online survey. Female faculty listed by the American Council of Academic Plastic Surgeon programs were preferentially selected as participants. | 959 plastic surgery faculty members. 758 (79%) were male and 201 (21%) were female.  | Plastic surgery |
|  | Odell et al | 2019 | USA, Canada | Evaluate factors contributing to differences in the academic ranks of male and female staff in academic neurosurgery in Canada and the United States  | Review of neurosurgeons in academic and leadership ranks and also the H index, citations, publications, citations per year, and publications per year. | 1811 neurosurgeons.  | Neurosurgery  |
|  | Berry et al | 2020 | USA | Evaluate the representation of Black/AA women surgeons in academic medicine among U.S. medical school faculty and assess the number of NIH grants awarded to Black/AA women surgeon-scientists over the past 2 decades. | Review of the Association of American Medical Colleges 2017 Faculty Roster and the number of grants awarded to surgeons from the NIH (1998–2017).  | 15671 surgical faculty members. 11853 were male. 3818 were female  | Miscellaneous |
|  | Crown et al  | 2021 | USA  | Evaluate perceived barriers to career advancement among Black/African American women in Academic Surgery in USA | Cross-sectional survey regarding demographics, employments, and perceived barriers to career advancement was distributed via email to faculty surgeon members of the Society of Black American Surgeons (SBAS) in September 2019. | 53 faculty members. 31 women (58.5%) and 22 (41.5%) men. | Miscellaneous  |
|  | Fassiotto et al | 2018 | USA  | Report trainee evaluations for male and female physicians and how these may interact with certain gender expectations.  | Retrospective review of prospective collected data from trainees and fellows annual evaluation at Stanford University.  | 1066 faculty members.  | Miscellaneous  |
|  | Lu et al | 2020 | USA | Examine academic surgical providers’ perceptions of factors driving burnout, with specific attention to gender-based differences. | A semi structured interview with 5 open-ended questions and sent to faculty members of a single academic surgical center.  | 23 faculty members. 14 (60.8%) female, 9 (39.2%) male  | Miscellaneous  |
|  | Tabata et al  | 2019 | USA  | Aim of the study was to assess the trend in the inclusion of black and female surgeons in Invited Visiting Professorships (VP). | Retrospective study collecting information from 25 top National Institutes of Health-ranked academic surgical programs from January 2007 through December 2017. | 1322 lectures. 645 men gave 1111 of the 1322 lectures (84%)118 women gave 211 of the 1322 lectures (16%) | Miscellaneous  |
|  | Anderson et al | 2020 | USA  | investigate the relationship between the number of female faculty and leader in general surgery programs and proportion of female residents. | The Fellowship and Residency Electronic Interactive Database Access system (FREIDA) was assessed for chair gender, program director gender, percentage of female faculty, and percentage of female residents at general surgery residency programs. | 304 general surgery programs.  | General surgery  |
| ***Discrimination in Leadership position*** |  |  |  |  |  |  |  |
|  | Weiss et al | 2014 | USA | Evaluate the percentage of women in Chair, PDs, Chief and Associate Directors positions in the United States | Internet search identified the sex of all chairs, Chiefs, PDs and any Associated Directors who were named by program from 2011 and 2012. | 2209 overall, 1984 (89.8%) were male, 225 (10.2%) were female  | General Surgery, Otolaryngology, Orthopedics.  |
|  | Epstein et al  | 2017 | USA | Identify how many women in the department are Chairs of Department or Full Professors.  | Pubmed Research for women in different surgical subspecialties. Number for American Neurosurgeons were identified through American Association of Neurological Surgery. | n/a | Cardiothoracic surgery, General surgery, Neurosurgery.  |
|  | Battaglia et al | 2020 | USA | Investigate the gender influence in leadership roles in academic surgery in the USA.  | Cross sectional study was lead to obtain a database of academic and administrative faculty members. Data was collected using American Medical Association’s Fellowship and Residency Electronic Interactive Database (FREIDA). | 4085 surgeons, 873 (21%) were women, 3212 (79%) were men | General surgery.  |
|  | Chen et al | 2019 | USA | Assess the current status of women in academic plastic surgery, from trainees to chairwomen and national leadership positions. | The Electronic Residency Applications Service, San Francisco Match, National Resident Matching Program, Association of American Medical Colleges, American Council of Academic Plastic Surgeons, Plastic Surgery Education Network, and professional websites for journals and national societies were accessed for demographic information from 2007 to 2017. | n/a  | Plastic surgery |
|  | Carpenter et al | 2018 | USA | Assess characteristics of women general surgery program directors and associate program directors in the USA. | Using Association for Program Directors in Surgery website, information about gender of program directors and associate program directors were identified. | 276 program directors. 51 (18.4%) were women and 225 (81.6%) were men.  | General surgery  |
|  | Filiberto et al | 2019 | USA | To evaluate data regarding sex and academic rank of the leadership of fellowship programs.  | Demographics and academic ranks for fellowship program directors were collected for 811 surgery fellowship programs across 14 specialties in the United States using a combination of information from the society websites and the individual program’s websites.  | n/a  | Miscellaneous  |
|  | Kawase et al | 2016 | International | Investigate factors that can promote or impede the advancement of women as leaders in Surgery | International survey was performed with women surgeons in Japan, USA, Finland, and Hong Kong, China, to assess various barriers faced by women surgeons in the respective countries | 225 women surgeons  | Miscellaneous  |
| ***Discrimination during conferences and in surgical societies leaderships*** |  |  |  |  |  |  |  |
|  | Davids et al | 2018 | USA | Evaluate the representation of women at the 2017 Colorectal Tripartite Meeting and assess for implicit gender bias. | Prospective observational study occurred at the 2017 Tripartite Meeting.  | In total 1,532 attendees for Tripartite colorectal Meeting in 2017. Of those, 32% (484) were women. | Colorectal surgery |
|  | Silva N | 2019 | USA | Evaluate how women are underrepresented at neurosurgical society conferences. | Retrospective study evaluating programs from 2014-2018 meetings of the three main American Neurosurgical Societies. | In the period 2014-2018, No female presidents of societies. Women account less than 15% of speakers and moderators.  | Neurosurgery |
|  | Gerull et al | 2020 | USA | Determine representation of women at surgical conferences among 14 USA Surgical societies in 2011 and 2016, for a total of 21 conferences. | Retrospective data solicited from 14 USA national societies for 2011 and 2016.  | In total 21 conferences analysed 120,351 members, of those28,591 women (23.8%).  | Miscellaneous |
|  | Weaver JL | 2020 | USA | Evaluate the roles of women at national trauma meetings in USA. | Retrospective data solicited from Scientific programs for the three main American Trauma Societies to assess women roles during conferences.  | Women made up 963 of 2746 (35.1%) of presenters, 252 of 1020 (24.7%) of discussants, 116 of 622 (18.6%) of moderators of scientific sessions, 189 of 707 (26.7%) of panelists, and 69 of 254 (27.2%) of panel moderators.  | Trauma |
|  | Chang et al | 2020 | USA | Evaluate gender representation and the impact of gender in The American Society of Breast Surgeons (ASBrS) Annual Meetings. | Retrospective overview of ASBrS meeting programs from 2009 to 2019. | Among the 5701 names from ASBrS Annual Meetings society, Women were 44.8% of Board of Directors, 54.8% of committee members and 41.7% of committee chair. | Breast surgery |
|  | Skinner et al | 2019 | UK | Gender representation within surgical organisation committees in the UK and the gender split within surgical organisation membership. | Retrospective study conducted among 16 surgical organizations in the UK available to provide gender data.  | In total, female represent 24.1% members, 8.3% president, 11.5% vice-president, 15.2% committee positions and 13.5% executive committee.  | Miscellaneous |
|  | Dumitra et al | 2018 | Canada | Purpose of the study is to determine if there are gender differences in advancement within the Society of American Gastrointestinal and Endoscopic Surgery (SAGES) leadership. | Retrospective Audit of all SAGES committee members (CM) from 1992 to 2018 was performed. The overall membership gender was available from 2010 and 2018.  | Women represent 21% of commission member, 18% chairs/co-chairs, 16% board members and 14% executives, 1 woman President.  | SAGES |
|  | McCulloug et al | 2020 | USA | Review of 5-Year of the Designated Leadership Positions of the American Society for Surgery of the Hand (ASSH) | Retrospective review from 2014 to 2018 membership rosters and compared by gender. | Active membership in ASSH increased from 1,732 in 2014 to 1,950 in 2018 (13%). In the same period, female Active Members increased from 184 to 246 (34%). There is a steady increase in the percentage of women within the ASSH. | Hand surgeons |
|  | Butler et al | 2020 | USA | Assess the level of achievement and demo- graphics of national surgical society presidents. | Review of 62 of the 64 presidents’ surgical societies societies CVs  | For American College Surgeons and American Surgeons Association, 87% of Presidents were male and 13% female.  | Miscellaneous |
|  | Olive et al | 2020 | USA | Evaluate the representation of women in Society of Thoracic Surgeons (STS) Authorship and Leadership Positions | Retrospective review of Online Archive from The society of Thoracic Surgeons (STS) 2015 and 2018 Annual Meetings. | In 2015, 10.7% presenting and senior authors were women (P<0.001 vs men). In 2018, women filled 12.9% and 7.9% senior author position (P<0.001 vs men).  | Thoracic surgery |

**Table 2.** *Different types of discrimination*

|  |  |
| --- | --- |
| **Type of discrimination** | **Description** |
| **Explicit gender bias** | Bias based on an individual’s sex. They were more present in the past and they included * Sexual and verbal harassment
* Workplace marginalization
* Bias in hiring
 |
| **Implicit gender bias** | Subconscious form of discrimination based on previous social and psychological experiences and interactions. These are often forms of bias that individuals are not aware of, or unable to control6. Different factors contribute to this:*Workplace discrimination:* including lack of flexibility, long work hours, leave policy, role models, lack of mentorship, and exclusion from networks. *Epistemic injustice*: or unfair assessments of women’s’ surgeons’ credibility by patients and colleagues. Misrecognition by patients who assume that women are not surgeons. *Stereotyped roles:* colleagues’ expectations about being friendly and caring domestic tasks and paperwork, patients’ expectations to be empathetic and having high level of communications style. *Objectification:* feeling objectified by colleagues and patients about physical appearance and clothes |
| **Sexual harassment** | Sexual harassment includes unwanted sexual advances, request for sexual favors and other unwelcome conduct that is sexual in nature. Different types:Physical assault: is the most aggressive formUnwanted sexual attention: is the most common form, include verbal or physical advancesDirect: targeted at an individualIndirect: general level of sexual harassment in an environment |
| **Gender microaggressions** | Microaggressions are subtle, unconscious, discriminating insulting actions that communicate demeaning or hostile messages aimed to marginalize groups. They include environmental indignities that communicate hostile, derogatory, or negative prejudicial slights and insult towards a group of people. They might be verbal or non-verbal behaviors, often insidious, which tend to marginalize female colleagues. Different types:Obvious and explicit forms: such as objectifications and jokes, use of sexist languageMansplaining: including men speaking over women during meeting, introducing them by name, explaining to a women situation in a condescending or oversimplify manner. Unintended forms of macroaggressions: including exclusion of women from unofficial networks with women losing the career and social advantages from networking outside the office.  |

**Table 3.** *Summary of Academic Productivity, Academic Rank position and Research Funding*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Author** | **Population****surgical specialties** | **Academic productivity** | **Academic rank** | **Funding** |
| SchroenUSA (2004) | 317 Members American College Surgeons (168 M and 149 W)Various surgical specialties | Number publicationsW 10 articlesM 25 articlesp<0.001 | Assistant ProfessorW 56M 27Associated ProfessorW 25M 32Full ProfessorW 11M 38 | N/A |
| MuellerUSA (2016) | 978 Surgical Faculty from 3 US Medical centre (744 M and 234 W)Various surgical specialties | Assistant Professor levelW 25.51 APM 40.57 APp<0.001Full Professor levelW 112.3 APM 181.60 APP=0.007 | InstructorW 87M 179Assistant ProfessorW 77M 193Associated ProfessorW 37M 156Full ProfessorW 33M 216 | N/A |
| MuellerUSA (2017) | 212 surgical faculty from 3 Academic centreVarious surgical specialties | Number publicationsW 33 AP M 52.3H-indexW 12.6M 16.4p<0.05 | Assistant Professor:W 23 M 51 Associate Professor:W 10 M 45 Full Professor:W 18 M 59  | N/A |
| ValsangkarUSA (2016) | 4,015 faculty member from 50 university based and 5 hospitals department of surgeryVarious surgical specialties | Number publicationsW 21 M 43p<0.001CitationsW 364M 723p<0.001 | Associated ProfessorW: 28.2%M: 36.8%Full ProfessorW: 22.7%M: 41.2% | NIH grantsW 21.3%M 24%P not significantSurgical departments with more W full professors have higher NIH funding ranking (R2 =0.14, p<0.05)  |
| Carnevale USA (2020) | 951 Academic vascular surgeons | Number publicationsW 42.3M 64.8 p<0.001CitationsW 655.2 M 1387p<0.001H-indexW 9.5 M 13.7p<0.001 | FacultyW 177 (18.6%)M 774 (81.4%)Assistant ProfessorW 50.3%M 33.9%P<0.001Associate ProfessorW 25.4% M 20.7% P=0.187Full ProfessorW 10.7% M 26.2% P<0.001 | NIH grantsW 9.6%M 4%P=0.017Industry paymentW $ 2,155.28M $ 8,452.43p<0.001 |
| SasorUSA (2018) | 814 Academic plastic surgeons | Number publicationsW 20M 50.2p<0.001H-indexW 7.0M 12.6p<0.001 | Assistant ProfessorW 33.9%M 57.9%P<0.001Associate ProfessorW 17.6%M 21.8%P=0.301Full ProfessorW 6.6%M 29%P<0.001 | NIH fundingW 5.1%M 6.9%P=0.57Mean amount of fundingW $2996734M $1853345P=0.57 |
| SmithUSA (2019) | 938 Academic plastic surgeons | N/A | FacultyW 19.7%M 80.3%Assistant ProfessorW 57.6%M 38.2%P<0.0001Associate ProfessorW 19.5%M 80.5%P=0.91Full ProfessorW 6.1%M 93.9%P<0.001Programs led by a female chair employed significantly more female faculty (32.5% vs 18.2%, P= 0.016) | N/A |
| EnceUSA (2016) | 3,511 academic orthopaedic surgeons  | H-indexW 3M 5P<0.001M-indexW 0.33M 0.38P=0.103 | Total Academic positionW 396 M 3,115Senior Academic positionW 114M 1,232p<0.001Assistant ProfessorW 12.9%M 87.1%Associate ProfessorW 11.3%M 88.7%Full ProfessorW 6.4%M 93.5% | N/A |

*W*: women, *M*: men, *AP*: articles published, *NIH*: National institute health

**Table 4.** *Solutions to reduce discrimination*

|  |  |  |
| --- | --- | --- |
| Backhus et al(2019) USA | Survey | Survey conducted via email towards member of *Society Thoracic surgeons (STS)* with 481/5,158 responders. Discrimination was perceived as a barrier by 22% participants. Suggested strategies towards improvement were:* Culture change/ prioritizing diversity (22%)
* Training the leaders (14%)
* Targeted recruitments (12%)
* Identify leaders within STS (10%)
* Mentorship (9%)
 |
| Phillips et al (2016) USA | Review article | Review of the literature to assess gender bias in plastic surgery and other fields, and interventions designed to address it.Solutions identified to reduce implicit gender bias are the following:* Recognise the problem: it is the powerful first step;
* Support female faculty retention;
* Implement institutional support for broad cultural change;
* Commit to gender equity on an individual and everyday scale;
* Adopt sponsorship model;
 |
| Pories et al (2019) USA | Review article | Review of the previous literature on the history of women in surgery and suggestions for increasing diversity in leadership.Different strategies:* Acknowledge the concept of second-generation gender bias, which is subtle assumptions or organizational barriers limiting women from assuming leadership roles;
* Education: to create a culture of inclusion for men and women
* Promote diversity: in work-place
* Mentorship: to promote inclusion, to create leadership identity
* Increasing equity: in surgical societies, meetings and workplace
* Flexible work-hours to increase share responsibilities in family with both parents working
* Association of women surgeons: to create a network for women in surgery
* Women in surgery committee:
 |
| Wood et al (2021) USA | Review article | Men are important sponsors for women colleagues. Men can help female colleagues in different way at different stage of their career.* Include women colleagues in out of work social functions
* Invite women to express their opinion in meetings
* Suggest women to be included in committee and panels
* Use formal title of “Doctor” when introducing women colleagues
* Be alert of harassment or bias directed to women
* Offer support to women subject to bias or harassment
* Speak up about discrimination or harassment
* provide mentorship and coaching to female colleagues
* provide sponsorship for inclusion in conferences, committees, leadership positions
* develop schedules and technology to support work-life integration (zoom access, avoidance of early and late meeting
 |
| DiBrito et al(2019) USA | Best practice recommendations TaskForce | TaskForce recommendations to reduce implicit gender bias:* Commit to a culture shift: leadership must first place value on bias eradication efforts and then attempt to gain buy-in from faculty, residents and other staff.
* Introduce Bias Literacy: introduce individual testing for implicit bias among faculty, residents and staff. This should be done using the standard Implicit Association Test.
* Provide counter-Stereotypic Exposure: for example inviting female or minority faculty from other institution to speak at grand rounds or for other prominent lectureships not only helps eliminate implicit bias for all of those attending conference, but also promotes the career of that individual, further elevating minorities.
* Conduct an Introspective Departmental Assessment: departmental leadership should perform an introspective evaluation of its environment to look at “the state of the department” and can help to create a baseline from which to see changes over the time.
* Implement deliberative processing strategies for hiring and promotion: recommendation of formal training on implicit bias for admissions and promotions committee members to combat implicit bias. Suggestion also to conduct standard interview for improving admissions and hiring. Choosing the best qualified candidate for the job is important to diversifying the workforce in surgical department.
* Encourage mentoring and sponsorship: the department head should identify strong mentors and engaging them in the bias eradication effort and a common pitfall in designing mentorship programs is to pair those with similar demographic backgrounds and/or similar interests. In addition to this, many national specialty groups have formal mentorship programs, which can provide mentorship to individuals at national levels.
* Empower the individual: personal empower, start with taking Implicit Association Test online to start fighting their own implicit biases. Search for opportunities where you can offer or receive mentorship and sponsorship.
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