Supplementary material 1

Characteristics of the 40 articles reviewed from earliest date available – October 2019.

Citation	Country	Study Design	Study Purpose	Time Frame	N +/- RR	Data Source	Methodological limitations	MERSQI Score
Baecher-Lind 2012[55] ¶	USA	Retrospective cohort	Determine whether the proportion of leadership positions in OBS/GYNE held by women is consistent with the proportion of women entering residency.	July-Aug 2012	155 academic departme nt chairs	Department websites for name & sex of leader & state medical license databases for graduation year.	*Limited population*: no report on other leadership positions: vice-chairs, program directors, or unit heads. *Lack of contextual demographic data:* ethnicity, marital status, or age. *Lack of contextual career data*: career stage, dual leadership appointments, or formal leadership training. Does not differentiate community-based & academic programs.	10.5
Burden et al. 2015[56]	USA	Retrospective cohort	Determine the existence of gender disparities among academic hospitalists in leadership & scholarly productivity & compare the results	Oct, 2012 – Aug, 2014	69 Hospital Medicine (HM) Programs 80 General Internal Medicine	Graduate Medical Education Directory (AAMC listed members fully accredited by the Liaison Committee on Medical Education) for programs & department	No *information on* or *adjustment for* size, age or geographic location of HM or GIM departments. It was unclear whether HM departments were divisions or sections of GIM departments.	10.5

			with academic general internists.		(GIM) Programs	websites for sex of leaders, & number/sex of faculty, & Program contacted through email if necessary		
Cancian et al. 2018[57] ¶	USA	Cross-sectional	Determine the number of women in urological leadership positions.	July 2016	NA	Accreditation Council for Graduate Medical Education.	*Lack of contextual demographic data:* ethnicity, marital status, or age. *Lack of contextual career data*: dual leadership appointments, or formal leadership training. Not clear which departments were academic vs community.	8.5
Carr et al. 2018[58]$	USA	Retrospective cohort	Identify predictors of advancement, retention, & leadership for women faculty from a 1995 National Faculty Survey.	1995-2012/13	1995: 1801 faculty, RR = 60% 2012: 1273 faculty, RR = 48%	Mailed national faculty questionnaire conducted in 1995 & a follow-up online self-reported questionnaire in 2012-13	No methodological deficits were identified.	12
Cheng et al. 2006[59]	USA	Cross-sectional	Determine if there is an association between the gender	Dec, 2004	133 EM programs	Society for Academic Emergency	Authors claim retrospective design & although trend of chairperson gender is	9.5

			of the chairperson/program director & the gender of Emergency Medicine (EM) faculty.			Medicine online residency catalog, program websites, & program contacted through email if necessary.	reported, this does not qualify as a retrospective cohort. *Lack of contextual demographic data:* Ethnicity, marital status, or age. *Lack of contextual career data*: dual leadership appointments or formal leadership training.	
Counter et al. 2019[61]	USA and Canada	Cross-sectional	Assess the evidence of gender disparities and gender differences in academic performance in pediatric radiology departments in USA & Canada	Jan 2017 to Jan 2018	n=279 of 170 US and 13 Canadian programs	FREIDA and CaRMS	*Lack of contextual demographic data:* Ethnicity, marital status, or age. *Lack of contextual career data*: dual leadership appointments or formal leadership training	9.5
Dannels et al. 2009[60]#	USA	Cross-sectional	Elicit the perceptions of deans on their medical schools' organizational climate & its effect on faculty, policies affecting faculty, processes deans use for developing faculty leadership, and the impact of	May, 2006	142 medical school deans: Overall RR= 58% 72 men RR=57%	AAMC for medical schools & online self-reported questionnaire.	Small sample size of women deans limits detecting relevant statistical effect. *Lack of contextual demographic data:* Ethnicity, marital status, or age. *Lack of contextual career data*: dual leadership	10.5

			the ELAM Program for Women.		11 women RR=69%		appointments or formal leadership training.	
Dannels et al. 2008[62]#	USA	Pre/post intervention & prospective cohort	Determine the extent of leadership aspiration, mastery of leadership competencies, & attainment of leadership positions amongst graduates of the ELAM compared to 2 comparison groups (NON-ELAM & AAMC group).	2002-06	78 ELAM graduates, RR = 73% 63 NON-ELAM group, RR= 44% 468 AAMC group, RR= 38%	Online self-reported questionnaires.	No methodological deficits were identified.	12.5
Doyle et al. 2016[63]	USA	Cross-sectional	Investigate the causative factors contributing to gender disparity in senior leadership positions in academic psychiatry.	April, 2014	118 (final n =109) Overall RR = 39% 97 men chairs RR = 34% 12 women	Publicly available data: American Association of Chairs of Departments of Psychiatry (AACDP) for psychiatry chair names, department websites for demographic information, & online self-reported questionnaire.	Problematic survey design: Assumption of prior leadership knowledge. Objective does not align with study design: causation cannot be established in cross-sectional study designs.	8

					chairs, RR= 83%			
Ellinas et al. 2018[64]§	USA	Cross-sectional	Identify factors that promote medical faculty's engagement & gender difference in those factors.	June-Aug, 2013	1456 faculty members RR= 42% 227 women	Online self-reported questionnaire.	No methodological deficits were identified.	9
Epperson et al. 2019[65]	USA	Cross-sectional	Evaluates representation of women in otolaryngology holding residency and fellowship directorships, or chair positions.	2017-18	99 department chairs 102 residency directors 204 fellowship directors	Publicly available data: American Medical Association's Fellowship and Residency Interactive Database. Program websites	Lack of contextual demographic data: ethnicity, marital status, or age. Lack of contextual career data: dual leadership appointments, or formal leadership training.	9.5

Girod et al. 2016[66]	USA	Pre/post intervention	Investigate the implicit & explicit biases favoring men as leaders & assess whether these attitudes change following an educational intervention.	March 2012-April 2013	281 faculty members	Questionnaire for general perceptions of bias, measure of explicit attitudes related to gender & leadership, & Implicit Association Test (IAT).	Findings limited by lack of longitudinal data on effectiveness of intervention.	9.5
Han et al. 2017[67]§	USA	Cross-sectional	Determine the gender & subspecialty of those holding academic departmental, administrative & educational leadership roles in urology.	June-Aug, 2016	124 urology programs	Accreditation Council for Graduate Medical Education for programs & Urology department websites for main data. Program contacted if necessary.	*Lack of contextual demographic data:* Ethnicity, marital status, or age. *Lack of contextual career data*: dual leadership appointments or formal leadership training.	8.5
Helitzer et al. 2014[68]	USA	Cross-sectional	Explore whether skills acquired by women in career development programs implemented by AAMC & Drexel University would vary by career stage & program attended.	Feb – April, 2011	2537 women participants, RR = 35%	National online self-reported questionnaire.	*Limited population*: Loss of follow-up on participants who left academic medicine.	9

Hofler et al. 2016[69]^	USA	Cross-sectional	Compare the representation of women in OB/GYNE department-based leadership to leadership in other clinical specialties while accounting for the proportions of women in the residency cohorts of 1990.	Nov-2012 to Oct, 2013	851 eligible programs 105 OB/GYN programs	Accreditation Council for Graduate Medical Education 2012-13 for programs & program websites for leadership positions.	*Lack of contextual demographic data:* ethnicity, or age. Assumption that women choose academic medicine early in their career in equal proportion to men.	9.5
Komlenac et al. 2019[70]	Sweden, the Netherlands and Austria	Cross-sectional	Explore gender differences in clinical position among academic physicians at three university hospitals	2012	1333 participants	Questionnaire of the HOUPE II study	Low response rate Leadership positions were limited to clinical positions; no mention of academic leadership posts	8
Kuhlmann et al. 2017[71]	Sweden, Germany, Austria, &UK	Case study	Explore & compare the representation of women in leadership and management in European academic health centers.	May, 2016	4 academic health centers	Unspecified	No methodological deficits were identified.	NA
Kværner et al. 1999[72]	Norway	Cross-sectional	Determine the proportion of women leaders to men leaders.	Oct, 1997	Overall reported 13,844 physician	Norwegian Medical Association records.	No methodological deficits were identified.	9.5

					s; 3939 women. *N* in academic medicine 334; 94 women			
Levine et al. 2015[73]	USA	Pre/post intervention	Describe & evaluate a longitudinal cohort-based leadership program for women faculty at the Johns Hopkins University School of Medicine.	2010-2013	134 women RR cohort 2: 80%, 58% RR cohort 3: 86%, 76% RR cohort 4: 92%, 69%	Self-reported questionnaire.	No follow up on long term effect of program.	8.5
Long et al. 2011[74]	USA	cross-sectional	Compare the gender distribution of residency program directors with gender distribution of residents & faculty	NA	601 female program directors 75,156 Residents	Educational issue of JAMA, 2010 for information on the 10 largest residency specialties. ACGME website for number and program names.	No methodological deficits were identified.	9.5

			in the 10 largest specialties.			AAMC for gender distribution of medical school faculty.		
Marchant et al. 2007[15]	USA	Retrospective cohort	Examine whether the presence of the word "leader" in written tenure criteria may impact the promotion of women in elite medical school differently than men.	2004	24 medical schools	Carnegie Foundation classification system and the National Institutes of Health (NIH) for medical schools. School's website for tenure criteria.	Limited sample size (24/125), does not account for recruitment or departure of tenured female faculty, or the number of faculty who apply for tenure. Wide C.I. (1.02, 35.37) Uncertainty is greater with wider confidence intervals.	11.5
McDade et al. 2004[75]#	USA	Pre/post intervention	Measure the impact of the ELAM program on women academicians' leadership capacities.	1997-2001	79 participants RRs were nearly 100% (pre) & 69% to 76% (post)	Self-reported questionnaire	Only one group, lack of follow-up.	11
McLean et al. 2013[76]	USA	Retrospective cohort	Explore whether geographic mobility is associated with career advancement of women in U.S. medical schools who	2009	345 ELAM participants	ELAM database	Unclear whether Canadian participants were accounted for.	10.5

			are entering mid- to executive-level positions.					
Moghimi et al. 2019[77]	USA and Canada	Cross-sectional	Compare gender representation in academic and leadership positions among faculty members in nuclear medicine in USA & Canada. Study the influences to account for the existing disparity in academic nuclear medicine.	June-December 2016	n=249 Available faculty lists of 75 U.S. and 8 Canadian nuclear medicine programs	FREIDA, AMA, & CaRMS	*Lack of contextual demographic data:* Ethnicity, marital status, or age. *Lack of contextual career data*: dual leadership appointments or formal leadership training.	9.5
Monroe et al. 2015[78]	USA	Cross-sectional	Delineate leadership positions in the Department of Medicine held by faculty & compare leadership positions held by male & female.	2012	474 faculty, 181 were women.	Division websites &/or Johns Hopkins referral directory, or division heads.	*Lack of contextual demographic data:* ethnicity, or age. *Lack of contextual career data*: career stage, dual leadership appointments or formal leadership training. Lack of definition of leadership. Response bias.	8.5
Odell et al. 2019[79]	USA & Canada	Cross-sectional	Assess the factors contributing to gender differences in the academic ranks in academic neurosurgery	January - May 2017	n=319 faculty in leadership ranks 89 US and 9	FREIDA and CaRMS	*Lack of contextual demographic data:* ethnicity, or age. *Lack of contextual career data*: career stage, dual	9.5

			programs in Canada & USA		Canadian neurosurgery programs		leadership appointments or formal leadership training.	
Pololi et al. 2012[5]	USA	Cross-sectional	Assess & compare the experiences of women & men faculty of institutional culture including leadership.	2007-2009	4578 faculty, RR= 52%	Online self-reported questionnaire.	No methodological deficits were identified.	10.5
Puljak et al. 2008[80]	Croatia	Retrospective cohort	Determine the extent of women advancing to leadership positions.	1979-2006	NA	University of Split School of Medicine's archives.	*Lack of contextual demographic data:* Ethnicity, marital status, or age.	9.5
Reed et al. 2011[81]	USA	Retrospective cohort	Compare the publication records, academic promotions, & leadership appointments of women and men physicians.	2007	25 women 50 men	Mayo clinic faculty database (CVs).	*Lack of contextual demographic data:* Ethnicity, marital status, or age.	9.5
Rotbart et al. 2012[82]	USA	Retrospective cohort	Determine the extent of gender inequity in a pediatrics department including leadership attainment & to	2009	263 faculty members	Department databases: The Faculty Information Database Online (FIDO), department Web-based software contains data on faculty	No methodological deficits were identified.	9.5

			demonstrate an assessment methodology other departments can use.			members' careers, & PeopleSoft containing salary records.		
Shah et al. 2007[83]	USA	Cross-sectional	Determine if there is any association between the gender of the chairperson/residency program director & the gender of faculty & residents in radiology.	Dec, 2006	188 programs directors, RR= 45%	Online self-reported questionnaire.	Does not account for women self-selecting for leadership positions.	8
Shah et al. 2010[84]	USA	Cross-sectional	Determine if there is any association between the gender of the chairperson/residency program director & the gender of faculty & residents in ophthalmology.	July, 2007	121 program directors, RR=45.45%	Online self-reported questionnaire.	Only 2 women chairpersons, not large enough to detect association.	8
Skarupski et al. 2019[85]	USA	Cross-sectional	Report participants perceptions of a leadership program in 3 areas: 1)program impact; 2)leadership preparedness; and 3)barriers to	May- July 2017	RR =114, 40% of 8 cohorts	Online self-reported questionnaire.	Low response rate.	9

			leadership advancement					
Spalluto et al. 2017[86]	USA	Pre/post intervention	Describe development & implementation of LIFT-OFF leadership program.	June, 2015 – May, 2016	39 participants, needs assessment RR = 89.7% Questionnaire RR = 76.9%	Self-reported questionnaire.	Findings limited by lack of longitudinal data on effectiveness of intervention.	10
Stadler et al. 2018[87]	Singapore, Qatar, & UAE	Cross-sectional	Describe gender differences of international clinician educators & leaders in emerging international competency-based residency programs.	June 2013-June 2014	359 leaders, 69 were women RR = 76.3%	Program websites or through individual researchers who work for each respective institute.	No methodological deficits were identified.	10
Weiss et al. 2014[54]	USA	Cross-sectional	Evaluate number of women chairs, program directors, & division chiefs in surgical specialties.	NA	249 programs	National Residency Matching Program for programs, AAMC report for resident & faculty, & program websites for information on chairs.	*Lack of contextual career data*: dual leadership appointments or formal leadership training.	9.5

White et al. 2012[88]	USA	Retrospective cohort	Explore factors that may be involved in the persistent paucity of women leaders in U.S. academic medicine & to provide baseline gender-related data for developing strategies to promote gender equity in academic medicine leadership.	1980-2006	534 Medical school deans	AAMC faculty roster & Council of Deans database.	*Lack of contextual demographic data:* Ethnicity, marital status.	10.5
Willett et al. 2015[89]	USA	Cross-sectional	Determine whether salary disparities exist between women & men Internal Medicine residency program directors, & if so, to identify factors associated with the disparities.	Aug, 2012	370 program director, RR= 65.1%	Association of Program Directors in Internal Medicine for Programs, & online self-reported questionnaire.	*Lack of contextual demographic data:* Ethnicity, marital status, or age. *Lack of contextual career data*: medical specialty, dual leadership appointments, or formal leadership training.	10.5
Woodward et al. 2017[90]	USA	Cross-sectional	Determine the ratio of women occupying program directors' positions to division chiefs in gastroenterology fellowships, & to evaluate factors	2015	163 gastroenterology programs	American College of Gastroenterology, AAMC website, & program websites.	*Lack of contextual demographic data:* Ethnicity, marital status, or age. *Lack of contextual career data*: career stage, dual	9.5

			associated with this.				leadership appointments, or formal leadership training. Does not differentiate community-based & academic programs.	
Wright et al. 2003[91]§	USA	Cross-sectional	Determine reasons for gender disparities in leadership.	1999-2000	418 faculty, RR= 48%	College of Medicine Personnel database, Online self-reported questionnaire.	*Lack of contextual demographic data:* Ethnicity, marital status, or age. *Lack of contextual career data*: dual leadership appointments or formal leadership training.	7

Abbreviations: MERSQI, Medical Education Research Study Quality Instrument; N, Population; RR, response rate; ELAM, Executive Leadership in Academic Medicine; NA, not available.
¶ Studies that report various leadership positions within one specialty (e.g. editorship, society membership), here we report only those which are academic.
§ Studies with a study purpose beyond leadership (e.g. scholarly production).
^ reported in 2 papers Hofler et al., 2016 Hofler et al., 2015
# reported in 2 papers Dannels et al., 2008, Dannels et al., 2009, McDade et al., 2004 also reported in a 2nd paper Morahan et al., 2010