

Gender differences in question-asking at the 2019 American Society of Hematology Annual Meeting

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Key Points

- Men asked more questions than women at a professional meeting.
- If a woman asked the first question, women in the audience were more likely to ask subsequent questions.

Attendance at professional conferences is an important component of career development, because conferences are a major forum for presenting new research, interacting with colleagues and networking. An extensive literature documents differences in the professional experiences of women and men, including experiences at professional conferences. We hypothesized that women are less likely than men to ask questions at conferences, thus forgoing opportunities for professional development. To address this issue, we analyzed the question-asking behavior of women and men at the 2019 Annual Meeting and Exposition of the American Society of Hematology. In all, 112 sessions (55% of those eligible) were randomly chosen for coding, yielding data on 577 presentations. Although approximately 50% of moderators and speakers were women, the proportion of questions asked by women was significantly lower compared with the estimated proportion of women attending the conference (23% vs 39%; $P < .0001$). Women were more likely to ask questions if another woman asked the first question or if the session topic was red cells. These results suggest that although women are represented equally as moderators and speakers, they are less likely to engage in the postpresentation discourse by asking questions. Encouraging women to speak up in professional situations and providing training on question-asking skills can help address this gender gap that potentially contributes to disparities in professional visibility and career advancement for women in hematology.

Introduction

Gender disparities in science and medicine have received greater attention in the last decade,¹ including the roles that men and leaders can play in identifying and rectifying disparities. Although more than half of matriculating medical students² and recipients of doctorates³ in the biological and biomedical sciences and health sciences are women, there is a well-documented attrition of women along the career trajectory.⁴ This “leaky pipeline” has been attributed to many factors, both personal and societal, and several studies document bias against professional women.^{5,6}

There has been controversy over whether women have different goals and behaviors that could be contributing to observed differences.⁷ One study found that although women and men start their medical careers with similar aspirations in terms of publications, patient care, and teaching, men were more likely to list salary, reputation, and leadership positions as goals, and less likely to list work-life balance than women.⁸ If men value professional prominence more than women, they may behave in ways that call attention to themselves. Women may be adapting their behavior to cultural expectations

for women's behavior or feel less confident in question asking at professional conferences. Our study focused on gender differences in question asking in a public forum.

We chose to study gender differences in question asking at an international biomedical conference. Attendance at professional conferences is recognized as a means to promote one's work and oneself, to form new connections and collaborations, and to become known to other professionals outside one's local sphere of colleagues. Educational, scientific, and oral abstract presentations are core components of conferences. Studies have shown that women are less likely to attend conferences and to be involved as invited speakers.⁹⁻¹¹ There are 3 prominent roles during presentations: moderator, speaker, and questioner. We hypothesized that women were less likely than men to engage in question asking from the audience.

Materials and methods

Study design

This study was a retrospective evaluation of recorded conference sessions. Four women (S.M., E.D., J.D., and S.J.L.) reviewed the online recordings of the 2019 American Society of Hematology (ASH) Annual Meeting to abstract the research data; no machine learning analysis was used. Abstractions were completed independently and then merged for comparison and analysis. Eligible sessions consisted of any session open to the public with the traditional structure of formal presentations followed by a period for asking questions that was recorded. All plenary and large special sessions (eg, joint symposia with other organizations) were coded. Interactive sessions, round tables, and other sessions with different structures were excluded. Sessions were randomly selected from alphabetized lists (eg, by selecting every sixth session in iterative rounds) and randomly assigned to coders with a goal of coding at least 50% of eligible sessions. Although we did not perform a formal power calculation, given the number of sessions and speakers, we felt that coding all sessions was not necessary for the analysis, as long as sessions were randomly chosen. Sessions included 1 or more speakers; scientific and education presentations were generally 25 to 60 minutes long, and abstract presentations were 15 minutes long, including time for questions. Scientific and education speakers were chosen by the ASH Program Committee. Oral abstract presenters were chosen by small working groups on the basis of blinded peer reviews.

Training occurred by coding identical sessions in small batches and then meeting and reconciling differences. Once >95% agreement was achieved, coders worked independently. Information on the gender of moderators and speakers and how many first and subsequent questions were asked by men and women was determined visually from the online recording and from the recorded voice of questioners from the audience.¹² The questions were additionally categorized as either moderator questions or audience questions. Video recordings almost never captured the images of audience questioners, and few introduced themselves when posing a question. If coders were not confident about the gender of audience questioners based on voice, or if questions were submitted via text or an anonymous digital question-asking system, the gender of the question asker was coded as "unknown." We coded only three categories: men, women, and unknown.

The following rules were used to code nontraditional verbal interactions: (1) If the questioner asked multiple new and clarifying questions in a back-and-forth discussion with the speaker, only new questions were counted. Although this situation was not common, it accounted for many of the inter-rater discrepancies in coding. (2) People (both moderators and audience members) who made only a statement without a question were counted as one question. (3) If questions were held until the end of a session and the questioner directed a question to multiple speakers on a panel, the question was counted for the speaker who answered first.

We did not code whether questioners introduced themselves or the nature of questions (eg, clarifying, technical, or about the interpretation or future directions). We also did not know the rank, specialty, or job description of the questioners. We categorized sessions according to type (plenary, scientific and education program, or abstract session), topic (red cells, coagulation/platelets, hematologic malignancies, or other nonmalignant hematology), and research focus (clinical or basic, with translational research grouped according to whether there was a more clinical or laboratory focus). The Fred Hutchinson Cancer Research Center Institutional Review Board reviewed the study and determined that it was exempt from human subjects research oversight.

Statistical analyses

Median number and percentages of questions asked by men and women across talks were compared using the Wilcoxon signed-rank test and χ^2 test, respectively. The percentage of questions asked by women in the audience was calculated and compared by the gender of the speaker, gender of the moderators, and characteristics of the sessions (type, topic, focus) using a univariable χ^2 test. Multiple logistic regression was used to examine the associations ($P < .05$) found in the univariable analyses in combination. In additional analyses of whether subsequent questions differed by gender of the first questioner or by topic, the first question was excluded from the count of questions. All analyses were performed using SAS version 9.4 software.

Results

Content of the 2019 ASH meeting

A total of 29 962 people from 114 countries attended the 61st ASH Annual Meeting in Orlando, FL, 7-10 December 2019. Of the 25 869 professional attendees, 15 521 (52%) were from North America and 5763 (19%) were from Europe. Self-reported gender information was available for 8,739 (39% women and 61% men) attendees where only "female" and "male" options were offered. Based on self-reported gender information available in the ASH membership database, these proportions were similar to the gender distribution among the total ASH membership (35% women, 65% men), as well as the ASH members who attended the meeting (37% women, 63% men). Other attendees ($n = 16\,500$) were not asked their gender during registration. The number and proportion of women attending each talk was not available.

A total of 243 sessions were available on the recording for review, and of these, 38 sessions were excluded, leaving 205 sessions eligible for inclusion. Of these, 112 (55%) were randomly selected for coding. Table 1 shows the content of the meeting along with the characteristics of the coded sessions, demonstrating that the coded sessions reflected the overall meeting. The proportions of

Table 1. Components of the 2019 ASH meeting

	Complete meeting sessions		Coded sessions		Women moderators (n = 95 of 201 total moderators)		Women speakers (n = 211 of 577 total speakers)		P	
	No.	%	No.	%	No.	%	No.	%	Moderator	Speaker
Session type										
Plenary	7	3	7	6	2	20	9	43	.18	.007
Educational/scientific	43	21	25	22	17	53	48	62		
Abstract	155	76	80	71	76	48	207	43		
Session type*									.94	.60
Clinical					60	47	170	46		
Laboratory					33	48	86	44		
Session topic†									.07	.03
Red cells					17	59	48	59		
Coagulation/platelets					17	63	38	48		
Hematologic malignancies					47	40	141	41		
Other nonmalignant topic					12	52	31	49		

*Based on 196 moderators and 561 speakers. Excluded 5 sessions for moderators and 16 for speakers because both clinical and laboratory topics were presented.

†Based on 197 moderators and 565 speakers. Excluded 4 sessions for moderators and 12 for speakers because more than one topic was presented.

women moderators and speakers were ~50%, except for the plenary sessions in which the Society President, who was a man in 2019, usually served as the sole moderator.

Question asking

Sessions ranged from 1 to 6 speakers with 1 or 2 moderators. Among the 577 analyzed presentations, 2114 questions were asked, 1475 (70%) by men and 585 (28%) by women. Three percent of questioners (n = 54) were of unknown gender. Men moderators asked 308 questions (56%) whereas women moderators asked 240 questions (44%), a proportion that did not differ compared with the proportion of women moderators (47%; *P* = .40). Women moderators asked the same number of questions whether they were paired with another woman moderator or with a man moderator (mean, 0.45 vs 0.5 questions; *P* = .26). No questions at all were asked after 15 presentations, and no audience questions were asked after 50 presentations.

Excluding questions asked by moderators and questions from audience members of unknown gender, Table 2 shows that men in the audience asked questions significantly more often than women (77% vs 23%; *P* < .0001). Men asked a median of 2 (range, 0-7) audience questions per session compared with a median of 0 (range, 0-6) questions asked by women. The proportion of questions asked by women was significantly lower compared with the gender distribution of professional member attendees for which we had information (23% vs 39%; *P* < .0001). Although we did not know the proportion of women attending each session, when the analysis was limited to the plenary sessions for which there were no competing sessions, results were similar but not statistically significant because of the smaller number of speakers (25% vs 39%; *P* = .10).

Because of concerns about the validity of assigning gender based on voice, we calculated the misclassification rate that would have resulted in nonsignificant differences. If 35.5% of questions were

asked by women instead of the 22.8% that we coded, the *P* value would not have been significant (*P* = .011). To see this change, 16.5% of questions asked by men would have to be recoded as questions asked by women and no questions asked by women reclassified as questions asked by men. A lesser change, such as 10% of men question askers being reclassified as women, would still result in a significant difference (*P* < .001) between proportions of women question askers and conference attendees.

Predictors of question asking

In univariable analyses shown in Table 3 based on total number of questions asked, women in the audience asked significantly more questions if at least one moderator was a woman (25% vs 17%; *P* = .003), or if a woman asked the first question during a session (45% vs 15%; *P* < .0001). Percent of questions asked by women also differed by session topic (*P* < .0001), with the highest percent of questions asked by women in sessions about red cells (35%), followed by coagulation/platelets (30%), other nonmalignant topics (23%), and hematologic malignancies (17%). No difference was found in the percent of questions asked by women by the speaker's gender, session type, or session focus.

Table 2. Audience question asking according to gender

Variable	Total, N	Women	Men	P
All questions				
No. of questions (%)	1512	345 (23)	1167 (77)	<.0001
Median questions per talk (range)	577*	0 (0-6)	2.0 (0-7)	<.0001
Excluding the first question†				
No. of questions (%)	1119	272 (24)	847 (76)	<.0001
Median questions per talk (range)	553*	0 (0-4)	1 (0-6)	<.0001

*Number of talks.

†Excludes 24 talks with no questions asked or unknown gender of first questioner.

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Table 3. Univariable and multivariable predictors of percent of audience questions asked by women

Variable	Univariable					Multivariable	
	All questions	Questions asked by women			P	OR (95% CI)	P
		No.	%	P			
Gender of first questioner*	1486				<.0001		<.0001
Man	1123	168	15		Reference		
Woman	363	165	45		4.7 (3.5-6.2)		
Topic	1496				<.0001		<.0001
Hematologic malignancies	819	139	17		Reference		
Red cells	256	89	35		2.5 (1.8-3.5)		<.0001
Platelet/coagulation	223	66	30		1.4 (1.0-2.1)		.07
Other nonmalignant	198	45	23		1.2 (0.8-1.8)		.43
At least 1 woman moderator					.003		.46
No	381	66	17		Reference		
Yes	1131	279	25		0.9 (0.6-1.2)		
Gender of speaker					.43		
Man	791	174	22				
Woman	721	171	24				
Session type					.61		
Plenary	32	8	25				
Education/scientific	222	56	25				
Abstract	1258	281	22				
Focus	1487				.80		
Clinical	943	215	23				
Basic	544	121	22				

Total of 1512 questions, unless otherwise indicated.

*Excludes 24 talks with no questions asked or unknown gender of first questioner.

Multivariable modeling results showed that women in the audience were more likely to ask questions if the first questioner was a woman (odds ratio [OR], 4.7; 95% confidence interval [CI], 3.5-6.2; $P < .0001$) and if the topic was about red cells (OR, 2.5; 95% CI, 1.8-3.5; $P < .0001$) or platelet/coagulation (OR, 1.4; 95% CI, 1.0-2.1; $P = .07$) than for hematologic malignancy topics.

To address the question of whether the gender and role of the first questioner predicted subsequent questions by women in the audience, we conducted another analysis in which we excluded the first question from the total number of questions asked. No questions were asked in 15 talks, and the gender of the first questioner could not be determined for 9 talks, leaving 553 talks with 1119 questions for analysis. Women asked 145 (26%) of first questions and men asked 407 (74%). Table 4 shows that women asked more questions when a woman moderator (34%) or woman audience member (35%) asked the first question compared with when a man moderator (19%) or man audience member (21%) asked the first question ($P < .0001$).

Discussion

Although approximately half the moderators and speakers at the 2019 ASH Annual Meeting were women, women in the audience asked significantly fewer questions than men and fewer than would be expected based on their estimated representation at

the meeting. This difference decreased if a woman asked the first question, and it varied based on session topic ranging from women asking 35% of the questions for sessions with topics pertaining to red cells to 17% for hematologic malignancy topics. There was no difference in the proportion of questions asked by women based on the gender of the speaker, whether it was a plenary, educational/scientific, or oral abstract session, or whether the session focused on clinical vs laboratory research.

The phenomenon of women asking fewer questions than men has been observed in other science, technology, engineering, and mathematics (STEM) conferences.¹³⁻¹⁵ In 1 study, women were more likely than men to endorse internal factors, such as lack of confidence, when asked why they did not ask questions despite wanting to.¹³ This suggests that encouraging women to ask questions and giving them a safe space to do so could decrease gender disparities. Indeed, 1 study showed an increase in question asking by women when the conference implemented a policy of offering the first question to a trainee.¹⁶ Men allies and conference organizers can also support women at conferences, making gender equality an expectation.¹⁷ People who control question asking can support more women asking questions by calling on them first, endorsing their questions, encouraging additional questions from the audience, and giving women the space and time to ask questions.

Table 4. Univariable and multivariable predictors of subsequent question asking by female audience members

	All questions	Univariable			Multivariable	
		No.	%	P	OR (95% CI)	P
Gender of first questioner	1119			<.0001		.0003
Man						
Moderator	154	30	19		Reference	
Audience member	663	138	21		1.0 (0.6-1.5)	.96
Woman						
Moderator	140	47	34		1.9 (1.1-3.4)	.02
Audience member	162	57	35		1.9 (1.1-3.2)	.02
Topic	1111			<.0001		<.0001
Hematologic malignancies	605	115	19		Reference	
Red cells	195	73	37		2.5 (1.7-3.6)	<.0001
Platelet/coagulation	157	45	29		1.5 (1.0-2.3)	.05
Other nonmalignant	154	37	24		1.3 (0.8-1.9)	.35

Our results are consistent with a body of literature that gender differences are common in professional activities. Some studies show that women are less likely to publish,^{4,18} be first or last authors,¹⁹ obtain grant funding,^{18,20} and achieve senior leadership roles⁴ compared with men. Women's start-up packages²¹ and salaries are lower than those of men,^{22,23} and women report receiving less concrete sponsorship from their mentors²⁴ and are underrepresented in fast-track programs to faculty positions.²⁵ Faculty men, particularly those leading high-achieving laboratories, are less likely to have women trainees than similarly accomplished women faculty.²⁶ Men chairs are less likely to invite women to be speakers²⁷⁻²⁹ and to introduce women by their professional titles³⁰ than women chairs. Because there are fewer women at higher ranks, seniority of men is hypothesized to be one reason for some of these observed differences. However, similar differences are seen in newer fields such as hospital medicine where no one has decades of seniority, suggesting that seniority of men is not the only reason for these gender disparities.³¹ Efforts to address gender disparities have had mixed results, with some showing success³²⁻³⁴ and others not.³⁵ The SARS-CoV-2 pandemic may be exacerbating gender disparities.³⁶

Although we do not have any direct evidence that asking questions at conferences can promote career advancement, studies suggest that when students, trainees, colleagues, and even potential dating partners ask questions and engage, evaluators tend to favor them.^{37,38} Publicly asking a question provides professional visibility to the question asker. By introducing themselves, they share information about their academic achievement, place of work, and career trajectory. Asking a clearly articulated, insightful question to the presenter in front of a large audience takes courage and the questioner gains the attention of the moderator and speakers as well as the audience.

Our study has several limitations. We could not tell if women were more likely than men to ask questions by texting or online, a mechanism that is thought to encourage question asking from people who are not comfortable asking questions at the microphone. However, very few questions were asked this way. This mechanism of question asking may become more popular with

greater technological capacity and the robust advent of virtual conferences and symposia, but it does not afford the questioner the same professional recognition, even if the moderator states the questioner's name.

A major limitation of this study is that we do not know the gender ratio of audience members in individual sessions. When women asked fewer questions than men, they may have made up a smaller proportion of the audience, although we found the same pattern in plenary sessions intended for all attendees. The ASH membership is approximately 35% women, and 39% of professional attendees of known gender were women, but we did not have information on the remaining attendees. ASH is in the process of updating its database to capture gender, including nonbinary and transgender status, on all members, which will aid future research, but we do not currently have this information. Another limitation of this study is that we coded the binary gender of audience question askers based on voice, which we acknowledge is subjective and may have led to inaccurate coding in some cases. It would have been better to know the self-classified gender or gender-diverse identity of the question askers. One study showed 96% accuracy in classification based on voice for 20 samples coded by 15 listeners but validity and reliability data are otherwise lacking.¹² Our analysis shows that we would have had to reclassify 16.5% of questions asked by men as instead asked by women to erase the significance ($P < .01$) of our finding. We also did not analyze questions that may have happened after the session ended, such as when questioners approach the podium to interact with speakers. Finally, if there were several people waiting at the microphones to ask questions, it is possible that the moderator(s) tended to call upon men more often than women to ask their questions. We did not collect data on how often this occurred, but the coders' recollection is that time permitted most audience questions to be asked.

Of note, women constituted about half the moderators and speakers at the 2019 ASH Annual Meeting, and they asked about half the moderator questions. ASH has made a commitment to ensure that more women are invited for speaker and moderator roles. However, women in the audience are engaging in less question asking than men, potentially missing a valuable opportunity

to advance their careers and become speakers and moderators themselves. What motivates or prevents people from asking questions publicly is unknown, but question asking can be viewed as a skill. Skills can be taught, practiced, encouraged, and modeled. Our data demonstrate this clearly because we found that when a woman asked the first question, other women were more likely to ask questions after her.

These findings should prompt further discussion about conscious and unconscious professional behaviors that differ between men and women and whether these differences contribute to other gender-based imbalances observed in professional advancement. An opportunity exists to provide mentoring and training for women in medicine on the art and skill of question asking as part of professional advancement.

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Authorship

Contribution: S.M., L.O., E.D., and S.J.L. designed the research; S.M., E.D., J.D., and S.J.L. performed the research; B.R. contributed vital data; L.O. analyzed the data; and all authors helped write the paper.

Conflict-of-interest disclosure: The authors declare no competing financial interests.

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