



Original Article

Equity and Game-Theory Strategies to Promote Gender Diversity and Inclusion in an Academic Health Science Centre

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ABSTRACT

Background: Achieving diversity, inclusion, and gender equity remains an elusive challenge for many institutions worldwide and is understudied in Canadian academic health science centres.

Methods: McMaster University's Department of Medicine undertook surveys and analyses to determine whether there was inequity in leadership positions and salaries, or unprofessional behaviour within the department. Measures of academic productivity in relation to gender for both educators and researchers were analyzed. The department began shifting policies to foster greater gender diversity and inclusion. A revision of the leadership selection process, incorporating tenets of equity and a new game theory–based strategy called *Diversitive Agreement Versus Nash Equilibrium (DAvNE)* was evaluated.

Results: The department's survey revealed underrepresentation of women and people of colour in leadership positions, with perceived barriers to their promotion. Both women and people of colour reported

RÉSUMÉ

Contexte : La mise en place des conditions nécessaires à la diversité, à l'inclusion et à l'équité des genres demeure un défi difficile à relever pour de nombreux établissements dans le monde entier. C'est une démarche peu étudiée dans les centres universitaires canadiens des sciences de la santé.

Méthodologie : Le département de médecine de l'Université McMaster a mené des sondages et des analyses en vue de déterminer s'il existait en son sein même des iniquités en matière d'attribution des postes de direction et de fixation des salaires, ou des comportements non professionnels. Des mesures de la productivité universitaire des éducateurs et des chercheurs ont été analysées en fonction des genres. Le département a entrepris une réforme de ses politiques afin de favoriser une plus grande diversité et inclusion des genres. Une révision du processus de sélection des candidats aux postes de direction, intégrant les principes d'équité et une nouvelle stratégie fondée sur la théorie des jeux appelée *Diversitive Agreement Versus*

In August 2018, the National Academies of Sciences, Engineering, and Medicine published a report showing that high rates of harassment in academic sciences and medicine were creating organizational climates that threatened the integrity of the workplace.¹ Several other studies have demonstrated that women are paid less than men for equal work, are underrepresented at higher levels of academic promotion or leadership positions, and work within academic health science centres, where there is a preponderance of male-dominated hierarchies.²⁻⁴ A recent update of a longitudinal cohort

study of academic medical centres shows that a 35-year trend of women being less likely to receive promotion to associate professor, full professor, or department chair has not improved over time.^{5,6} Although this study was limited in that it did not adjust for academic productivity, its large sample size was compelling.⁵ Accordingly, there has been a call to flatten academic hierarchies on the basis of fairness, and uncertainty as to when hierarchy is potentially beneficial and when it is predominantly harmful.^{7,8} As a result, the Department of Medicine (DoM) of the Faculty of Health Sciences at McMaster University investigated whether issues of diversity, inclusion, inequity, and unprofessional behaviour existed within the department and explored solutions attempting to address them.

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Ethics Statement: Prior to the initiation of the demographic survey and all the DoM changes made to leadership selection processes, the Hamilton Integrated Research Ethics Board was consulted, and they declared that these activities did not require their approval, as there was no involvement of patients or vulnerable study subjects.

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See page S60 for disclosure information.

Methods

Data sources

In January 2019, an anonymous online survey was sent to all 304 DoM members in regard to their self-reported demographic characteristics and experiences. Additional data on

experiencing unprofessional behaviour directed toward them. A gender gap in base salary was observed, with female full professors being paid less. No difference in academic productivity was seen between male and female educators or researchers. The leadership competitions conducted under new selection processes emphasizing diversity resulted in 66% of participating women securing a leadership position, in comparison to 25% of participating men. People of colour made up 27% of members participating in these leadership competitions, but none was successful in obtaining a position.

Conclusions: Diversity and inclusion disparities in the Department of Medicine at McMaster University indicate a need for further efforts and innovation to bring about greater gender and racial equity.

academic rank, leadership positions, and nonclinical financial remuneration (stipends for teaching and administrative roles) were obtained directly from the DoM's database. The DoM academic productivity data, which are collected annually to determine remuneration from an alternative funding program (AFP) for teaching and research activity, were also analyzed. Although the academic productivity data are self-reported, they are reviewed for face validity by the division directors, the associate chairs of research and education, and the DoM budget manager.

Departmental structural changes

In order to address issues of inequity within the DoM, its leadership embarked upon the development of broad strategies to promote greater equity and foster inclusion. An Associate Chair of Equity and Diversity position was created, and educational sessions regarding equity issues in academic medicine were presented at various member forums. Division director and associate chair term limits were more strictly enforced, promoting a higher turnover of leadership opportunities, to which female members and people of colour were encouraged to apply by broad declarations but also through direct personal encouragement (ie, "shoulder tapping"). Focus was put on division director roles, as these leaders are directly responsible for the career advancement of all the members in their respective divisions.

The next challenge was determining how to ensure all candidates had an equal opportunity in these leadership competitions. The first step taken to try and flatten the hierarchical structure was the creation of larger selection committees with a more diverse representation. Each committee member was given real voting powers, in contrast to the more traditional model of a chair having the privilege of making all selection decisions. Such voting was also blinded, to ensure anonymity. All questions posed to the candidates during interviews were standardized, to eliminate preferential treatment. Despite these measures, the first leadership selection

Nash Equilibrium (DAvNE [accord de diversité vs équilibre de Nash]), a été évaluée.

Résultats : Le sondage du département a révélé qu'il existait une sous-représentation des femmes et des personnes de couleur parmi les titulaires des postes de direction, ainsi que des obstacles perçus à leur promotion. Tant les femmes que les personnes de couleur ont fait état de comportements non professionnels à leur endroit. Un écart entre les genres a été observé au chapitre de la rémunération de base, les professeurs titulaires de sexe féminin étant moins rémunérées. Aucune différence n'a été observée sur le plan de la productivité universitaire entre les femmes et les hommes au sein de l'effectif des éducateurs et des chercheurs. Les concours pour les postes de direction ont été organisés en fonction de nouveaux processus de sélection mettant l'accent sur la diversité. Au final, 66 % des candidats qui ont vu leur candidature retenue étaient des femmes et 25 %, des hommes. Dans le cadre de ces concours, 27 % des candidats étaient des personnes de couleur, mais aucun n'a réussi à obtenir un poste.

Conclusions : Les disparités notées en matière de diversité et d'inclusion au sein du département de médecine de l'Université McMaster montrent que l'atteinte d'une plus grande équité des genres et des races passe par des efforts et une innovation soutenus.

committee run under these new protocols did not achieve a result that was in the direction of rebalancing gender inequity. This outcome occurred in spite of what was arguably a superior curriculum vitae for the female candidate, thus calling into question whether all the measures taken to that point had been sufficient. This led to calls for an equity solution of rebalancing through quotas. However, the DoM leadership maintained that they could not compromise their fundamental principle that candidate selection be made primarily on the basis of merit. As a result, analysis of DoM members was undertaken to look more closely at merit, using the academic productivity data.

Innovation in leadership selection

The DoM developed an alternative and new strategy to aid in the process of leadership selection for new division directors. This strategy was called Diversitive Agreement Versus Nash Equilibrium (DAvNE), named after physicist and game theory pioneer John Nash.⁹ The strategy was designed to allow candidate selection on a merit basis only if there were enough votes to pass a threshold that would vary based on the diversity of the committee members and the overall parameters of the competition (see [Supplemental Appendices S1 and S2](#)). For instance, a DAvNE committee with only 30% female membership would require at least a 71% consensus, in contrast to a traditional "democratic" process in which the threshold only needed to exceed 50%. This ensured that when the DAvNE strategy was used, no represented minority group within the DoM could be routinely outvoted by the majority. In deciding upon the removal or selection of any given candidate using the DAvNE strategy, failure to exceed a voting threshold resulted in the decision being made instead by random selection (see online [Supplemental Appendix S3](#)) from the pool of eligible candidates. This process was applied through all steps, from earlier decisions to eliminate candidates when there were more than 2, to the final selection between the last 2 remaining candidates. In this way, using

the DAvNE strategy incentivized the department chair and all others involved to create a more diverse selection committee and process in order to lower the threshold needed to avoid random selection. Although McMaster University DoM members were motivated to avoid random selection during this process, they were comfortable with it as a fallback for uncertainty, as it paralleled their frequent use of randomization in clinical trials for situations of equipoise.^{10,11}

Statistical analysis

During leadership selection competitions for division director, candidates were scored by committee members on a Likert scale from 1 (highest performance) to 5 (lowest performance) based on the following domains: their curriculum vitae, their initial 10-minute presentation to the committee, and each of their answers to the selection committee's standardized questions. Selection committee members scored candidates using their own computers or mobile devices, and the scoring and subsequent voting was blinded. Scoring was not made available to the selection committee during their deliberations or voting. Although individual committee member scores remained anonymous, aggregate data on candidates were made available for ANOVA and post hoc testing using the least significant difference and Bonferroni tests. Analyses of aggregate scores were then compared with committee member voting and final candidate selection.

Ethics statement

Prior to the initiation of the demographic survey and all the DoM changes made to leadership selection processes, the Hamilton Integrated Research Ethics Board was consulted, and they declared that these activities did not require their approval, as there was no involvement of patients or vulnerable study subjects. Although the results presented here represent separate initiatives undertaken by the DoM (demographic, salary, and merit surveys vs departmental structural change and leadership selection processes), they have been reported together, as they are linked by their implications for the interest in equality and right to fair process that all department members share.

Results

Demographic survey results

Of the 304 DoM members, 182 (60%) responded to the January 2019 online survey (see [Supplemental Tables S1](#) and [S2](#)). The proportion of faculty completing the survey ranged between 58% and 71% across an age range of 31–70 years, and survey completion by gender was 76% for female members and 52% for male members. There were no significant differences in gender between the proportion of educators vs researchers responding to the survey (see [Supplemental Table S3](#)). The self-reported survey data on demographic characteristics and experiences, as well as data on academic rank, leadership positions, and nonclinical financial remuneration, are summarized in [Table 1](#). Survey results revealed that inequity was present in the leadership structure of the DoM and that many domains of the department were lacking in diversity. Although 40% of the DoM was made up

of female members, the proportion of women dropped with each successively higher rank from 45% at the assistant professor level, to 30% at the associate professor level, to 25% at the full professor level. Departmental data did not demonstrate any gender difference in the rate of promotional success. The most cited barriers to applying for promotion were current leadership, lack of diversity, bias (unconscious, gender, race, division specialty) and parenting/paternity leave (see [Supplemental Table S4](#)). Male full professors received a \$27,000 higher base salary than did their female counterparts of the same rank. Furthermore, only 24% of division director leadership positions were occupied by women. Compared with men, women reported a 3-fold increase in being subjected to sexist remarks or being denied opportunities due to their gender. Reports of unwanted sexual advances were comparable for men and women. Although nearly 40% of the DoM members identified themselves as a person of colour, there were very few faculty members who identified as Black, and none identified as Indigenous. Only 12% of division director leadership positions were occupied by a person of colour. Compared to White Caucasians, people of colour reported a 2-fold increase in being subjected to racist remarks, and a nearly 7-fold increase in being denied opportunities due to their race. Other disparities observed included a low representation for people of nonbinary gender, those with non-heterosexual orientation, and people with disability.

Academic productivity data

The 2018 DoM academic productivity data for teaching and research activity are shown in [Figure 1](#). There were no gender differences seen in either the educational or research academic productivity curves ([Fig. 1](#), A and B). Although the frequency distribution for the educational productivity of members was normally distributed (Gaussian; [Fig. 1A](#)), it was clearly not normally distributed for their research productivity ([Fig. 1B](#)).

Division director selections

Four successive division director selection committees were formed from June 2019 to March 2020, with further competitions temporarily halted due to the declaration of the coronavirus disease–2019 pandemic.¹² One competition was conducted as a simple democratic process, and the other 3 incorporated the DAvNE strategy to some degree, as increasing DoM experience, familiarity, and comfort with the strategy developed. The committees created using the DAvNE approach were slightly larger, more diverse with respect to both gender and race/ethnicity, and required a voting threshold from 68.5%–73.5%, compared with the 54% required in the sole democratic contest ([Table 2](#)).

The candidates' mean performance scores are plotted against their final ranking positions in [Figure 2](#), with lower performance scores reflecting better performance. For Division 1, performance scores correlated with voting, as the female candidate with better scores was chosen by a unanimous (100%) vote ([Fig. 2A](#)). This selection was carried out as a traditional democratic contest, as the DAvNE procedures were still being developed, but clearly, any DAvNE voting threshold to avoid randomization would have been exceeded here, given the unanimous vote. In Division 2, a DAvNE

Table 1. Demographics, finances, ranking, and diversity survey results (182 anonymous respondents) from 304 McMaster University (Hamilton, Ontario, Canada) Department of Medicine members in January 2019

| Sex/gender | <u>Male</u> | | <u>Female</u> | | <u>Nonbinary</u> | | | |
|---|---------------------|--------------------|-------------------|---------------------------|-------------------------------|-------------------------|-----------------------------------|--------------|
| | 59% | | 40% | | 1% | | | |
| Sexual orientation | <u>Heterosexual</u> | | | | | <u>Non-heterosexual</u> | | |
| | 90% | | | | | 10% | | |
| Race/ethnicity | <u>White</u> | <u>South Asian</u> | <u>East Asian</u> | <u>Other Asian</u> | <u>Middle Eastern</u> | <u>Black</u> | <u>Indigenous</u> | <u>Other</u> |
| | 61.5% | 15% | 11% | 4% | 3% | 0.5% | 0% | 5% |
| Disability | <u>Not disabled</u> | | | <u>Visible disability</u> | | | <u>Invisible disability</u> | |
| | 95% | | | 1% | | | 4% | |
| Gender gap (rank, senior remuneration) 2018 | | | | | <u>Male</u> | | <u>Female</u> | |
| Assistant professor | | | | | 55% | | 45% | |
| Associate professor | | | | | 70% | | 30% | |
| Full professor | | | | | 75% | | 25% | |
| Full professor base salary per year | | | | | \$115,000 | | \$88,000 | |
| Division Director leadership positions 2018 | | | | | <u>Male</u> | | <u>Female</u> | |
| | | | | | 76% | | 24% | |
| Race/ethnicity | | | | | <u>White</u> | | <u>Person of colour</u> | |
| | | | | | 88% | | 12% | |
| Sexual discrimination | | | | | <u>Men reporting</u> | | <u>Women reporting</u> | |
| Witnessed unprofessionalism | | | | | 52% | | 66% | |
| Experienced unprofessionalism | | | | | 31% | | 52% | |
| Subjected to sexist remarks | | | | | 19% | | 58% | |
| Subjected to unwanted sexual advances | | | | | 19% | | 15% | |
| Denied opportunities due to gender | | | | | 15% | | 48% | |
| Racial discrimination | | | | | <u>White people reporting</u> | | <u>People of colour reporting</u> | |
| Witnessed unprofessionalism | | | | | 63% | | 47% | |
| Experienced unprofessionalism | | | | | 40% | | 41% | |
| Subjected to racist remarks | | | | | 22% | | 43% | |
| Denied opportunities due to race | | | | | 3% | | 20% | |

process was utilized, and voting exceeded the 71.5% threshold (diversity agreement) needed to avoid randomization, at all stages of candidate elimination (2 votes with counts of 78% and 85%, respectively) through to the final selected White

male candidate, who received a vote count of 73% (Fig. 2B). Although there was a trend toward better performance scores for the higher-ranked candidates, this was not statistically significant. Consequently, the ranking and final selection in

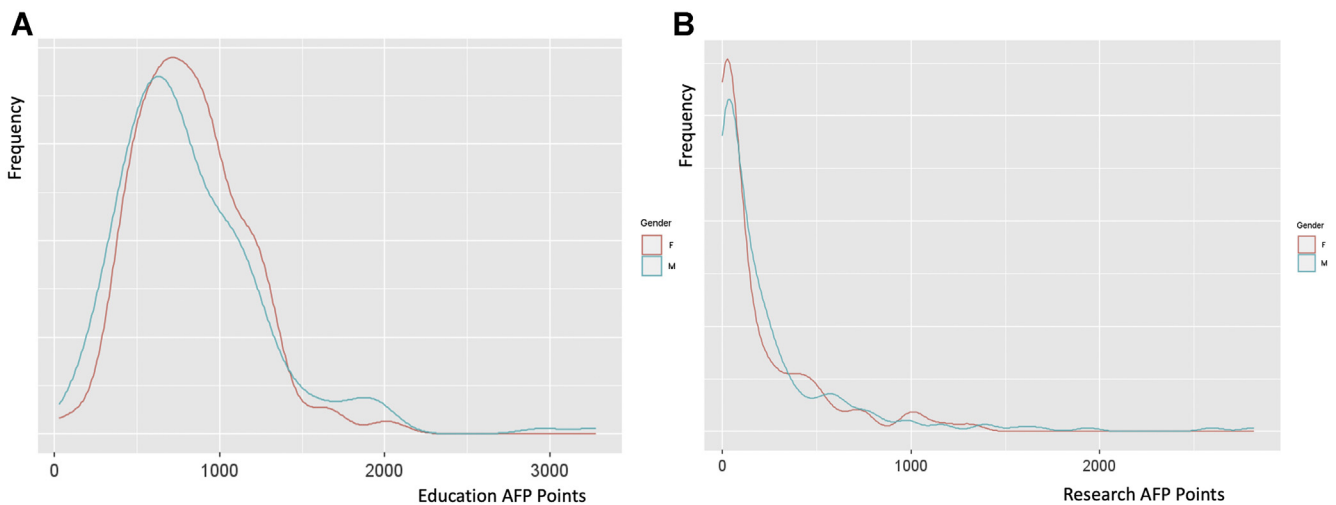


Figure 1. Academic productivity for members of the Department of Medicine at McMaster University in 2018. (A) Frequency distribution of educational productivity for department members. (B) Frequency distribution of research productivity for department members. AFP, alternative funding plan; M, male; F, female.

Table 2. Division director leadership selection results for 4 competitions conducted from June 2019 to March 2020 in the Department of Medicine, McMaster University (Hamilton, Ontario, Canada)

| | | |
|----------------------------|---|---|
| Sex/gender, n (%) | <u>Committee members</u> Male: 35 (62) Female: 20 (36) Nonbinary: (2) | <u>Candidates</u> <u>Total competing</u> Male 8 (73) Female: 3 (27) <u>Winning leadership position</u> Male: 2/8 (25) Female: 2/3 (66) |
| Race/ethnicity, n (%) | <u>Committee members</u> White: 28 (50) Person of colour: 28 (50) | <u>Candidates</u> <u>Total number competing</u> White Caucasian: 8 (73) Person of colour: 3 (27) <u>Winning leadership position</u> White Caucasian: 4/4 (100) Person of colour: 0/3 (0) <u>% votes required to select candidate</u> 54 (7 of 13 votes) |
| Democratic (1 competition) | <u>Committee diversity</u> Committee size: 13 members Female: 2/13 (15%) Person of colour: 5/13 (38%) | <u>% votes required to select candidate</u> 54 (7 of 13 votes) |
| DAvNE (3 competitions) | <u>Committee diversity</u> Committee size: 14.3 members Female: 19/43 (43%) Person of colour: 23/43 (53%) Division 2 Female 47% Person of colour 53% Division 3 Female 43% Person of colour 50% Division 4: Female 35% Person of colour 57% | <u>% votes required to select candidate</u> 68.5–73.5 71.5 68.5 73.5 |

DAvNE, Diversitive Agreement vs. Nash Equilibrium

Division 2 of one candidate over another were an almost archetypal representation of the professed myth of meritocracy.¹³ There were no substantive competency differences between these candidates as reflected in their performance scores, but despite this, committee members still voted unequivocally as if there were.

In Division 3, the DAvNE strategy was used initially, and candidate performance scores were not significantly different, although there was a trend toward better scores for the male candidate (Fig. 2C). For Division 3, the vote count was 60%, which did not reach the 68.5% threshold (diversitive disagreement), and therefore randomization was used, with the male candidate being randomly selected. However, the final decision by the committee and department chair was to disregard the randomization result and instead select the female candidate, on the basis of gender equity, as well as democratically, as she did have a 60% majority of votes despite not reaching the 68.5% voting threshold required by the DAvNE approach.

In Division 4 (Fig. 2D), it was agreed beforehand that all DAvNE principles would be strictly followed, including random selection if the voting threshold of 73.5% was not reached. Such process commitment helped convince reluctant candidates that they would have a fair chance at winning the director position. Subsequently, for the first time in these 4 leadership competitions, an actual full diversity of candidates, based on both gender and race, agreed to participate. An initial round reached a vote of 93% to eliminate the third candidate (diversitive agreement). The final candidate, a

White male, had statistically superior performance scores, which correlated with his being selected by a vote count of 87%, thus avoiding DAvNE randomization (diversitive agreement). Division 4 was the most research-intensive division in the DoM, and interestingly, it was the only DAvNE competition of the 3 that selected a highly productive researcher as Director.

Discussion

After multiple lines of investigation, inequities in base salary, leadership, and perceptions of barriers to promotion were identified in the DoM, consistent with what has been reported at other academic health science centres.¹ The DoM leadership made attempts to restructure the department to create more equitable processes with an openness to consideration of many strategies, including equity quotas and a novel approach using the game theory–based DAvNE strategy. The initial target for equality change was the selection of division director leadership positions, given their integral role in the mentoring and career advancement of all DoM members. Although the primary focus was on addressing gender inequity, it became increasingly clear from the data that racial inequity was also an issue within the DoM. After these first 4 division director selection committees were completed, the need was clear for further adaptation of the DAvNE strategy and other DoM policies to broaden the scope to foster greater racial equity. Although these efforts had been temporarily stalled due to the coronavirus disease–2019 pandemic, plans

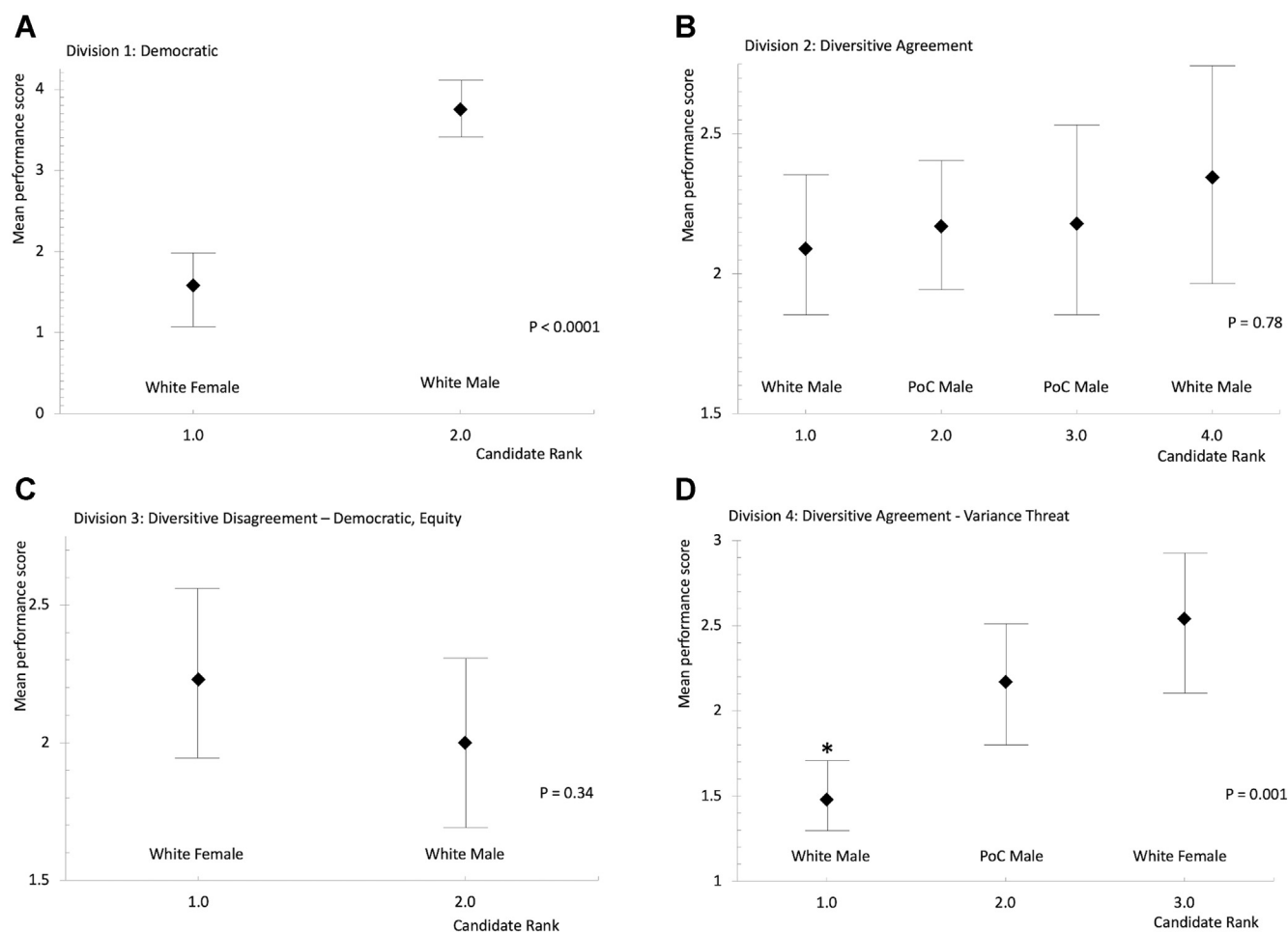


Figure 2. Division director leadership selections. Y-axes plot candidates' mean performance, which was scored as 1-5, with *lower scores given for better performance*. X-axes plot candidates' final ranking, with position 1.0 being selected as division director. (A) Division 1 results from process in which the leadership candidate was selected democratically. (B) Division 2 results from Diversitive Agreement vs. Nash Equilibrium strategy (DAvNE) process in which the certainty requirement for candidate selection was reached. (C) Division 3 results from DAVNE process in which certainty requirement was not reached but randomization selection was disregarded, and candidate was instead selected on the basis of slim democratic majority and equity. (D) Division 4 results from approach in which chair, committee, and candidates were all a priori aware of the DAVNE process and there was consensus agreement to accept the results, including the possibility of random selection. But the voting threshold was reached, allowing avoidance of randomization for candidate selection. PoC, person of colour. *Post hoc analysis of variance testing showing that the median performance score for the first-ranked candidate was statistically significantly different than the median scores for both the second- and third-ranked candidates.

are in place to implement further division director selection processes using the DAVNE approach.

Although the DoM is made up of 40% women and 40% people of colour, only 27% of candidates participating in these leadership competitions came from these demographics. Possible reasons for lower than expected participation rates include the following: female candidates passing up promotion opportunities owing to time constraints related to having young children¹⁴; candidates feeling that applying was futile because of an already apparent preferred candidate; and anxiety related to imposter syndrome.¹⁵ The presence of imposter syndrome in any organization indicates a need to further develop policies that foster more inclusion at earlier career stages, particularly for members from minority groups.¹⁵ Of the few women who did participate in these competitions, 66% actually won a leadership position, a success rate higher than the 25% for men that competed (Table 2). This result

showed how unwarranted gender imposter syndrome is, as women clearly were not inferior to men on any merit basis. Nevertheless, even if the DAVNE approach is able to provide equal opportunity for women, this does not guarantee that gender equity will be achieved. Under conditions of greater opportunity, the gender gap has in some instances become even larger, the reasons for which are unclear but potentially are related to gender preferences.¹⁶

Given that no McMaster University policies explicitly promote systemic discrimination, it was assumed, based on the equity literature, that the root cause for the inequities observed in the DoM was implicit (unconscious) bias.¹⁷ Since the concept of cognitive bias was first described, it has been assumed to have a principal role in erroneous judgment.¹⁸ But critics of this approach, including those involved in academic health sciences research, question whether it properly assigns thought rationality and consequently lacks validity for

real-world decision-making.¹⁹ Therefore, the use of cognitive bias methodology to solve a problem as complex as inequality ultimately might be unsuccessful, and this possibility seems to be supported by the literature, in which implicit association testing (IAT) has been shown to be such a poor predictor of discriminatory behaviour and decision-making that its construct validity has been questioned.²⁰ In addition, studies of unconscious bias training (UBT) have shown that it is mostly ineffective at improving equity,^{21,22} and in some instances, worsens discrimination.²³ Therefore, in these DoM leadership competitions, IAT and UBT were encouraged but not mandated for selection committee members. Still, 69% (34 of 49) of selection committee members responding to a survey reported having recently taken UBT.

The failure of IAT and UBT to significantly reduce systemic discrimination has led to calls for an equity solution, defined as a strategy of rebalancing through affirmative action quotas.²⁴ However, the DoM leadership maintained a fundamental principle of not compromising merit-based candidate selection. Therefore, further analysis of the DoM members was undertaken to look more closely at their merit, and no gender differences were seen in either educational or research academic productivity (Fig. 1). Although the frequency distribution for the educational productivity of members was normally (Gaussian) distributed, it was clearly not normally distributed for their research productivity. This finding has implications for candidate selection, as prior studies demonstrate that whereas Gaussian distributions suggest that the majority of members are equally productive, a non-normal (Pareto) distribution indicates that they are not.²⁵ In such Pareto distributions, the overall mean productivity of an organization is largely being driven by relatively few highly productive performers, thus making it vital to that organization's prosperity to identify, select, and retain them.²⁵ Using equity quotas to choose candidates based only on their belonging to demographically underrepresented groups risks missing highly productive candidates from the majority demographics. Conversely, in order for any organization to reach optimal success, the highly productive performers from underrepresented minorities must not be overlooked. It was for these reasons that a strategy other than equity quotas was explored by the DoM and resulted in the DAVNE methodology being tested in hopes that highly productive performers from all demographics would be equally considered.

The results of these DoM leadership selections did not effectively address racial inequities, as no people of colour who participated were successful at securing a director position. However, taking into account overall ranking, people of colour did garner all the second- and third-place voting positions for competitions they participated in (Fig. 2, B and D), suggesting some fairness in the process. With adjustment of the DAVNE strategy to foster greater inclusion, not only for gender but also race, more people of colour might secure leadership positions. One such adjustment may be in regard to the DAVNE randomization voting threshold. In Divisions 1 and 4, both final candidates were selected with vote counts ranging from 87% to 100%, so in these instances, much higher voting thresholds could have been met easily (Fig. 2, A and D, respectively). Division 3 actually had the lowest required voting threshold (68.5%) of all 3 of the DAVNE contests but still failed to reach it, with a vote count of only

60%, presumably due to the 2 candidates being very close in merit. Taken together, the findings suggest that these DAVNE contests were not over-randomizing, as distinct candidates were still able to be selected and randomization avoided. Indeed, the DAVNE approach actually may have led to under-randomizing, as reflected in Division 2 (Fig. 2B), where there seemed to be a pretense of merit sorting, as all candidates actually had similar merit scores.

By modifying the DAVNE approach to magnify the degree to which diversity raises the voting threshold, the frequency of randomization would be increased, thereby giving all candidates, including those from minority groups, a greater chance of being randomly selected. For example, if Division 2 under a revised DAVNE approach had been given a 10% penalty due to its lack of female candidates, its voting threshold would have been raised to 81.5%. This higher voting threshold would not have been exceeded by 2 of the 3 vote counts reached in Division 2, thus triggering random selection twice, which may have led to one of the people of colour being randomly selected instead of the White male who was eventually chosen. In this way, the DAVNE strategy could leverage gender inequality against race inequality, creating a positive intersection between 2 targets of discrimination that usually intersect synergistically in a negative manner.²⁶ Of course, making the DAVNE randomization disincentives more impactful also would have had greater influence on Division 2, leading it to avoid running an all-male contest in the first place. In this way, the true advantage of game theory is illustrated, as exploitative strategies are automatically mitigated by their greater vulnerability as they get farther from equilibrium.^{9,27}

Lastly and most importantly, the very low demographic numbers in the DoM for both Black and Indigenous members is unacceptable and cannot be solved by use of the DAVNE strategy, as that degree of inequity is too high to rebalance using game theory without invoking excessive randomization. For inequities this steep, only an affirmative quota strategy, put in place upstream at the point of hiring new department members, is sufficient to gain the much-needed representation from these demographics. Although the DAVNE strategy can be a tool to help reach diversity and inclusion goals, it is only one part of a comprehensive equality strategy.

Limitations

A number of important limitations in this report must be considered. The first limitation is the relatively small number of both candidates and committee members, and the strict application of the DAVNE approach to only 2 of the 4 leadership contests, thus making it difficult to determine if the data being analyzed are truly trending in certain equity directions or simply reflect the random drift of small sample size. Still, there was enough power to detect statistical differences in candidate mean performance scores, and these mostly correlated with voting selection. Another limitation relates to the initial DoM demographic survey, to which only 60% of department members responded. This level of response could potentially skew the data toward respondent perspectives, as people who did not respond to the survey may be different from those that did. Important to note is that the difference in frequency distributions between educational and research

productivity seen in Figure 1 is an empirical observation of the DoM and is not an implication about the relative importance of these academic activities. The reasons for the observed difference in pattern are not fully known. It may be due in part to the educational AFP being based on time-compensation, whereas the research AFP is allocated more on the basis of achieved results (mainly successful grant applications and article publications) that have candidate performance and stochastic determinants. If educational AFP allocation was dependent instead on candidate teaching-evaluation scores, educational productivity theoretically could shift from a Gaussian to a Pareto distribution similar to that seen for research.

Conclusions

Achieving full diversity, inclusion, and equity remains an ongoing and elusive challenge for academic health science centres, just as it does for many other organizations worldwide striving for greater resilience and anti-fragility.²⁸ Various strategies, such as affirmative action equity quotas, DAVNE, and others, should all be explored and improved upon in the attempt to innovate toward progressive changes that do not compromise merit but provide equal opportunity for everyone.

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Disclosures

The authors have no conflicts of interest to disclose.

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Supplementary Material

To access the supplementary material accompanying this article, visit *CJC Open* at <https://www.cjopen.ca/> and at <https://doi.org/10.1016/j.cjco.2021.09.008>.