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13 Trends in the proportion of women provincial and national residency organization award
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16 recipients across Canada from 2000 to 2018
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ABSTRACT

Background: Women physicians are underrepresented in academia, leadership, and administration. Previous evidence suggests that women physicians are evaluated differently than men physicians; this manifests as lower teaching evaluation scores, student evaluation scores, grant attainment, and award distribution. While gender bias has been demonstrated at the level of academic and national research awards, awards selected by resident physicians have not previously been examined.

Methods: A cross-sectional analysis of resident-selected awards for residents and staff physicians was conducted from 2000-2018 using data on award distribution from provincial and national residency organizations in Canada. Based on award name and/or description, we classified awards into either education and teaching awards or professionalism, advocacy and wellness awards.

Results: Women residents and women staff physicians had significantly lower odds of receiving resident-selected awards than men (OR 0.57, 95% CI 0.39-0.81; $p < 0.01$ and OR 0.74, 95% CI 0.57-0.95; $p = 0.02$, respectively). Compared with men, women had significantly lower odds of receiving education and teaching awards, compared with professionalism, advocacy and

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3 wellness awards as residents and staff physicians (OR 0.32, 95% CI 0.11-0.96; $p < 0.03$ and OR
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6 0.30, 95% CI 0.16-0.53; $p < 0.0001$, respectively).
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10 **Interpretation:** Between 2000 and 2018, women residents and staff physicians in Canada,
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12 compared to men, had significantly lower odds of receiving awards selected by residents from
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14 provincial and national residency associations. Reasons for possible implicit and explicit bias
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16 influencing evaluation and recognition of women physicians need to be further explored.
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INTRODUCTION

The number women admitted to medical schools has exceeded the number of men in both Canada and the United Kingdom for nearly twenty-five years (1, 2). In contrast, men medical students continued to outnumber female medical students in the United States in 2018 (3). Despite over two decades of numerical gender equality in Canadian medical schools, evidence demonstrates that women physicians continue to be underrepresented in academia, leadership, and administration both in Canada and worldwide (4-11). The reasons for this underrepresentation are unclear. Substantial evidence exists that female physicians are held to a higher standard than their male peers in evaluations, assessment, grant applications, academic publishing, and reference letters (12-21). Though there is evidence for explicit bias against women physicians (22-24), the majority of this bias is implicit, manifesting in subtle ways such as word choice when describing trainees and differential access to operating time for female residents (13, 25-30).

Awards from provincial and national residency associations are an opportunity for residents to recognize resident and staff physicians for their contributions to mentorship, education, and advocacy. In addition to increasing the visibility of recipient physicians, these awards may contribute to promotion, hiring, prestige, and recognition (31, 32). For these

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3 reasons, if there exists a bias against women physicians in the selection of residency
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6 association awards, this bias may further perpetuate inequities in hiring, promotion, and grant
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9 attainment. Previous studies that have examined award recipients by gender have focused on
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12 those given to staff physicians by national societies (31, 33-36). To our knowledge, resident
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15 nominated awards have not been examined by gender. As such, our study seeks to evaluate
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18 whether men staff and resident physicians are more likely to receive an award from a Canadian
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21 residency association than women physicians.
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29 **METHODS**

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32 We conducted a cross-sectional study of award recipient gender for resident and staff
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35 physicians who received awards from provincial and national residency associations for the
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38 years 2000-2018.
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42 **Data Source for Staff and Resident Award Recipients**

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45 To identify award recipients, we contacted all eight provincial and one national resident
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48 organizations in Canada by email (Resident Doctors of British Columbia, Professional
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51 Association of Resident Physicians of Alberta, Resident Doctors of Saskatchewan, Professional
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54 Association of Residents and Interns of Manitoba, Professional Association of Residents of
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3 Ontario, Fédération des Médecins Résidents du Québec, Maritime Resident Doctors, and
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6 Professional Association of Residents of Newfoundland and Labrador and the Resident Doctors
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9 of Canada). If there was no email available or if there was no response to email, we contacted
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12 the organization by telephone. Each organization was contacted a minimum of two times
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15 requesting records of awards given to resident and staff physicians from 2000-2018. Data on
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18 award recipients was also extracted from publicly available sources, including organization
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21 websites, university websites, and the association's official social media accounts (Twitter and
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24 Facebook), where available. We collected the names, faculty status (resident versus staff), year
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27 of award, and award category (teaching, wellness, professionalism, etc).
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32 We defined recipient's gender based on the accompanying profile on the organization's
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35 webpage page. If the recipient's gender was not specified, other publicly available records of the
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38 recipient were used to determine gender, including faculty and research laboratory profiles on
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41 university webpages, licensing college archives, obituaries, news interviews, and conference
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44 programs. Individual recipients who received multiple awards were included for each award
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51 **Data Sources for Staff Physicians**

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4 The total number of men and women staff physicians eligible to receive awards per year
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7 was determined by two methods. First, we defined faculty physicians by using publicly available
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10 data from the Association of Faculties of Medicine of Canada (37), which provides the number
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13 of female and male physician members of Canadian faculties of medicine. Physicians from
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16 academic faculties are more likely to interact with residents and therefore may more accurately
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19 reflect those were truly eligible to be nominated by residents. This data was available for 2011-
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22 2017. The number of female and male faculty members in Canada for 2000-2011 and 2018 was
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25 extrapolated based on the mean change in numbers of male and female faculty physicians per
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28 year for 2011-2017.
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32 To perform sensitivity analyses, we used a second method to estimate the number of
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35 male and female staff physicians eligible to receive awards. In this method, we defined
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38 practicing physicians as the total number of male and female physicians per year practicing in
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41 Canada determined by registration with the Canadian Medical Association (CMA) (38). This
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44 data was available by request for 2005-2018. Data for the years 2000-2004 was extrapolated
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47 using a similar method as described above.
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51 **Data Sources for Residents**

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4 The total number of male and female residents per year eligible to win awards at each
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7 university was determined using publicly available data from the Canadian Post-MD Education
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10 Registry (39). Universities with missing award recipient data were excluded from analyses. For
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13 example, data on resident award recipient gender for 2003 was available only from the
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16 University of Toronto and Western University; therefore, we only included male and female
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19 residents registered at University of Toronto and Western University as those eligible to receive
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22 awards for that year.
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24 25 26 **Award Category**

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29 We classified each award into one of two categories: 1) education and teaching; or 2)
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32 professionalism, advocacy and wellness, based on the award name or description on the
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35 residency association website. Some awards were not classifiable based on available
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38 information or did not fit into these two categories (for example, resident research awards). For
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41 analyses based on award category subgroups, we excluded awards that did not clearly indicate
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44 its category subgroup.
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48 **Statistical Analysis**

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51 Odds ratios were defined as the odds of women staff or resident physicians receiving
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54 awards from residency associations compared to the odds of men staff or resident physicians
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3 receiving awards. These odds ratios, their exact 95% confidence intervals and two-sided
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6 Fisher's exact p-values were calculated. Linear regression was used to determine the change in
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9 proportion of women receiving awards during the study period. All analyses were performed
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13 using Stata release 15 (StataCorp. 2017, College Station, TX, USA).
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16 RESULTS

17 Staff Physician Award Recipients

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22 Data for award recipients were available for at least one year between 2000 and 2018
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25 from seven associations, including six provincial and one national medical residency
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28 associations. One residency association did not issue any awards during the study time period
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31 and one association did not respond to two requests for data. There were 298 individual staff
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34 physician award recipients for the years 2000-2018. A range of 4 and 27 awards were
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37 distributed per year (Table 1).
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42 The mean proportion of female recipients for staff physicians per year was 26.3% \pm SD
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44 11.0%, range: 0% (n=0 of 5 awards, 2006) to 44.4% (n=4 of 9 awards, 2004; Figure 1, Table 1).
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47 In total, for all years combined, 84 staff physician award recipients were women (28.2%). The
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50 proportion of women staff award recipients did not significantly increase during the study period
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53 (change per year 0.4%, 95% CI -0.6% to 1.4%, p=0.42).
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4 The odds ratios for women staff physicians receiving residency association awards,
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7 considering only eligible faculty members (based on Association of Faculties of Medicine of
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10 Canada data), is presented in Table 1. The odds of a women staff physician receiving an award
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13 was significantly lower than men physicians (OR 0.74, 95% CI 0.57-0.95; $p=0.02$). This result
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16 did not change when all eligible physicians were practicing physicians based on Canadian
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19 Medical Association data (OR 0.70, 95% CI 0.53-0.92; $p=0.01$ (data not shown)).
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22 **Resident Physician Award Recipients**

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26 Data was available for resident award recipients from six provincial residency
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29 associations and the national residency association. There were 128 individual resident
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32 physician awards between the years 2002 and 2018. Fifty award recipients were women
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35 resident physicians for the time period analyzed (39.0%). Between 2 and 21 total awards were
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38 distributed per year of analysis (Table 2). The mean proportion of women award recipients each
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41 year was 31.2% (SD 20.6%). Women resident physicians received 0 awards in 2002, 2003,
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44 2004 and 2007 (of two awards each year), and in 2011 (of five awards). Women resident
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47 physicians won greater than 50% of available awards in only one of the 17 years analyzed
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50 (2015, $n=8$ of 15 awards), despite accounting for greater than 45% of the eligible resident
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53 population every year since 2003 (Figure 2, Table 2). The proportion of women resident
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3 physicians receiving awards significantly increased each year during the study period, by 2.5%
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6 per year (95% CI 0.1% to 4.3%, $p=0.01$).
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10 Overall, the odds of women residents receiving an award was significantly lower than
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12 men residents (OR 0.57, 95% CI 0.39-0.81, $p=0.002$, Table 2).
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16 **Award Categories**

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19 The proportion of women staff and resident award recipients separated by award
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21 category is shown in Table 3 and Table 4. For staff physicians, women accounted for 20.7% of
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23 recipients of education and teaching awards ($n=45$ of 217 awards) and 47.3% of
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25 recipients of professionalism, advocacy & wellness awards ($n=35$ of 74 awards) from 2000-2018 (Table 3).
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29 The odds of a woman physician receiving an education and teaching award were significantly
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31 lower than receiving a professionalism, advocacy and wellness Award (OR 0.29 95% CI 0.16-
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33 0.53; $p<0.0001$).
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42 Similarly, women residents received 27.7% of education and teaching awards ($n=18$ of
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44 65 awards) and 54.2% of professionalism, advocacy and wellness awards ($n=13$ of 24; Table
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47 4). The odds of a women resident receiving an education and teaching award were significantly
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49 lower than receiving a professionalism, advocacy and wellness award (OR 0.32, 95% CI 0.11-
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51 0.96; $p=0.03$).
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DISCUSSION

Our study demonstrates that from 2000 to 2018, women physicians had significantly lower odds than men of receiving awards at both the staff and residency levels. There were no years where there were more women staff physician award recipients than men. There were only five years when the proportion of women staff award recipients were greater than the total proportion of eligible women physicians (2013, 2011, 2005, 2004 and 2001). Notably, though women residents have outnumbered men residents in Canada since 2007, the proportion of women resident award recipients never exceeded the proportion of eligible women residents during the study period ((39) Figure 2). Together, these results suggests that women physicians were consistently underrepresented as award recipients relative to their overall proportion in Canada from 2000-2018.

In addition, when women physicians do receive awards, our analyses show that compared with men physicians, women physicians were significantly more likely to receive professionalism, advocacy and wellness awards rather than education and teaching awards. While education and teaching awards are known to be performance measures that are used for promotion decisions, it is less clear what value receiving a wellness award serves in advancing an individual's career (40). In every year of our analyses, women physicians consistently

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3 received fewer education and teaching awards than men. This finding is consistent with
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6 literature that demonstrates that woman physicians receive lower ratings on teaching
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9 evaluations than male colleagues; factors that contribute to this phenomenon may be the same
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12 as those present in overall award nomination and selection processes (20), rather than actual
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15 teaching quality. In previous deception studies, students rated teachers that they perceived as
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18 women lower than those they perceived as male, even when the true gender of the instructor
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21 varied (41).
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26 Our results are consistent with existing literature on the underrepresentation of women
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28 physicians as award recipients from medical and surgical specialty societies (33-35, 42).
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32 Women medical students have also been shown to be less likely to receive an honours
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34 distinction on research thesis than men peers, even when adjusting for mentorship, advanced
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36 degrees, and time spent on the project (43). Overall, our study on resident association awards
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39 adds to the current body of literature suggesting that women physicians are being evaluated
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42 less favourably than men physicians in multiple settings, including on teaching evaluations (20),
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45 student evaluations (13), prestigious research awards (44), and grant applications (21, 45),
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48 although these sex/gender differences are not always consistently demonstrated (46).
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4 This study is limited by the small number of awards presented per year. For resident
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7 award recipients in particular, there were fewer than five awards per year prior to 2010. This
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10 limits our power to detect significant differences for individual years. Second, not all residency
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13 organizations kept consistent records of award winners. As well, the number of women and men
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16 physicians in residency, active practice, and faculty members had to be estimated for some
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19 years (2000-2010 and 2018 for staff physicians). Third, we were only able to compare the
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22 proportion of women and men physicians who received awards, but not the proportion of those
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25 who were nominated for awards. Therefore, we are not able to determine if disadvantages faced
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28 by women physicians in receiving awards occurred on the basis of award criteria, nominations,
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31 or in recipient selection processes. Fourth, our data sources did not allow non-binary
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34 categorizations of gender. Finally, without access to the actual awards applications, we cannot
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37 control for the effects of application quality. Nonetheless, given the significant disparities
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40 identified in our study, it would still be prudent for groups that distribute awards to physicians,
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43 residents, and medical students to more closely examine their nomination criteria, processes,
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46 and materials for potential bias. Many organizations have not previously tracked award winners,
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49 and only one has begun monitoring for gender imbalance of nominees or recipients. Best
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52 practice guidelines on how to avoid wording in applications that discourage female applicants
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may be helpful. We recommend that processes be developed within organizations to foster a more gender equitable nomination pool for awards.

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Table 1. Number and proportion of women and men faculty physician recipients of an award from a Canadian residency association compared to the number and proportion of eligible faculty physicians (Association of Faculties of Medicine of Canada data) from 2000-2018.

Year	Total Number of Eligible Faculty Physicians	Number of Women Award Winners (% of total awards)	Total number of Women Faculty Physicians (% of eligible physicians)	Number of Men Award Winners (% of total awards)	Total number of Men Faculty Physicians (% of eligible physicians)
2018*	13,932	9 (33.3)	5,418 (38.9)	18 (66.6)	8,514 (61.1)
2017	13,505	6 (30.0)	5,201 (38.5)	14 (70.0)	8,304 (61.5)
2016	13,048	4 (23.5)	4,859 (37.2)	13 (76.4)	8,189 (62.8)
2015	12,878	7 (30.4)	4,776 (37.1)	16 (69.6)	8,102 (62.9)
2014	12,604	5 (22.7)	4,644 (36.8)	17 (77.3)	7,960 (63.2)
2013	11,521	7 (36.8)	4,175 (36.2)	12 (63.2)	7,346 (63.8)
2012	11,205	8 (32.0)	3,993 (35.6)	17 (68.0)	7,212 (64.4)
2011	10,717	9 (39.1)	3,777 (35.2)	14 (60.9)	6,940 (64.8)
2010*	10,506	3 (16.7)	3,776 (35.9)	15 (83.3)	6,730 (64.1)
2009*	10,079	2 (13.3)	3,559 (35.5)	13 (86.7)	6,520 (64.5)
2008*	9,652	5 (26.3)	3,342 (34.6)	14 (73.7)	6,310 (65.4)
2007*	9,225	4 (28.6)	3,125 (33.9)	10 (71.4)	6,100 (66.1)
2006*	8,798	0	2,908 (33.1)	5 (100.0)	5,890 (66.9)
2005*	8,371	4 (33.3)	2,691 (32.1)	8 (66.7)	5,680 (67.9)
2004*	7,944	4 (44.4)	2,474 (31.1)	5 (55.6)	5,470 (68.9)
2003*	7,517	1 (11.1)	2,257 (30.0)	8 (88.9)	5,260 (70.0)
2002*	7,090	4 (36.3)	2,040 (28.8)	7 (63.4)	5,050 (71.2)
2001*	6,663	1 (16.7)	1,823 (27.4)	5 (83.3)	4,840 (72.6)
2000*	6,236	1 (25.0)	1,606 (25.8)	3 (75.0)	4,630 (74.2)

Total*	191,491	84 (28.2)	66,444 (34.7)	214 (71.8)	125,047 (65.3)
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*Contains estimates where data was not available and the number of men and women faculty physicians were extrapolated.

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Table 2 Number and proportion of women and men resident physician recipients of an award from a Canadian residency association compared to the number and proportion of eligible resident physicians from 2000-2018.

Year	Total Number of Eligible Resident Physicians	Number of Female Resident Award Winners (% of total awards)	Number of Female Residents	Number of Male Resident Award Winners	Number of Male Residents
			(% of eligible resident physicians)	(% of total awards)	(% of eligible resident physicians)
2018*	14,128	8 (38.1)	7,502 (53.1)	13 (61.9)	6,626 (61.9)
2017*	14,045	7 (41.2)	7,449 (53.0)	10 (58.8)	6,596 (47.0)
2016*	13,999	7 (43.8)	7,474 (53.4)	9 (56.3)	6,525 (46.6)
2015*	13,685	8 (53.3)	7,393 (54.0)	7 (46.7)	6,292 (46.0)
2014*	13,379	5 (45.5)	7,314 (54.7)	6 (54.5)	6,065 (45.3)
2013*	12,951	4 (40.0)	7,034 (54.3)	6 (60.0)	5,917 (45.7)
2012*	12,467	3 (42.9)	6,785 (54.4)	4 (57.1)	5,682 (45.6)
2011†	4,256	0	2,180 (51.2)	5 (100.0)	2,076 (48.8)
2010*	11,081	3 (50.0)	5,945 (53.7)	3 (50.0)	5,136 (46.3)
2009‡	3,306	2 (50.0)	1,713 (51.8)	2 (50.0)	1,593 (48.2)
2008‡	3,078	1 (33.3)	1,594 (51.8)	2 (66.7)	1,484 (48.2)

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2007 [§]	2,482	0	998 (40.2)	2 (100.0)	1,005 (59.8)
2006 [§]	1,892	1 (50.0)	934 (49.4)	1 (50.0)	958 (50.60)
2005 [‡]	2,492	1 (33.3)	1,203 (48.3)	2 (66.7)	1,289 (51.7)
2004 [§]	1,725	0	778 (45.1)	2 (100.0)	947 (54.9)
2003 [§]	1,673	0	747 (44.7)	2 (100.0)	926 (55.3)
2002	353	0	126 (35.7)	2 (100.0)	227 (64.3)
Total	126,513	50 (39.0)	67,169 (53.1)	78 (60.9)	59,344 (46.9)

* All Canadian residents included.

† Includes residents from Western University, University of Toronto, University of British Columbia and University of Manitoba

‡ Includes residents from Western University, University of Toronto, and University of British Columbia

§ Includes residents from Western University and University of Toronto

|| Includes Western University data

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Table 3. Number of women staff physician recipients for awards from Canadian resident associations by award category between 2000-2018.

Year	Education & Teaching Awards		Professionalism, Advocacy & Wellness Awards		All Award Types	
	Total Awards	Number of Women Winners (%)	Total Awards	Number of Woman Winners (%)	Total Awards	Number of Woman Winners (%)
2018	20	5 (25.0)	7	4 (57.1)	27	9 (33.3)
2017	15	2 (13.3)	5	4 (80.0)	20	6 (30.0)
2016	12	1 (8.3)	5	3 (60.0)	17	4 (23.5)
2015	17	6 (35.3)	6	1 (16.7)	23	7 (30.4)
2014	16	5 (31.3)	6	0	22	5 (22.7)
2013	14	3 (21.4)	5	4 (80.0)	19	7 (36.8)
2012	17	2 (11.8)	6	6 (100.0)	25	8 (32.0)
2011	17	6 (35.3)	6	3 (50.0)	23	9 (39.1)
2010	13	1 (7.7)	5	2 (40.0)	18	3 (16.7)
2009	11	2 (18.2)	4	0	15	2 (13.3)
2008	15	2 (13.3)	4	3 (75.0)	19	5 (26.3)
2007	11	3 (27.3)	3	1 (33.3)	14	4 (28.6)
2006	3	0	2	0	5	0
2005	10	3 (30.0)	2	1 (50.0)	12	4 (33.3)
2004	7	2 (28.6)	2	2 (100.0)	6	4 (44.4)
2003	6	0	2	0	9	1 (11.1)
2002	7	3 (42.9)	3	1 (33.3)	11	4 (36.4)

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2001	5	0	0	n/a*	6	1 (16.7)
2000	1	0	1	0	4	1 (25.0)
Total	217	45 (20.7)	74	35 (47.3)	298	84 (28.2)

* n/a denotes not available

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Table 4. Number of women resident physician recipients for awards from Canadian resident associations by award category between 2002-2018.

Year	Education & Teaching Awards		Professionalism, Advocacy & Wellness Awards		All Award Types	
	Total Awards	Number of Women Winners (%)	Total Awards	Number of Woman Winners (%)	Total Awards	Number of Woman Winners (%)
2018	10	3 (33.3)	5	1 (20.0)	21	8 (38.1)
2017	8	1 (12.5)	4	2 (50.0)	17	7 (41.2)
2016	6	1 (16.7)	4	4 (100.0)	16	7 (43.8)
2015	6	3 (50.0)	3	2 (66.7)	15	8 (53.5)
2014	4	2 (50.0)	2	2 (100.0)	11	5 (45.5)
2013	3	1 (33.3)	2	1 (50.0)	10	4 (40.0)
2012	4	1 (25.)	2	2 (100.0)	7	3 (42.9)
2011	3	0	1	0	5	0
2010	4	3 (75.0)	1	0	6	3 (50.0)
2009	3	1 (33.3)	0	n/a*	4	2 (50.0)
2008	2	0	0	n/a*	3	1 (33.3)
2007	2	0	0	n/a*	2	0
2006	2	1 (50.0)	0	n/a*	2	1 (50.0)
2005	2	1 (50.0)	0	n/a*	3	1 (33.3)
2004	2	0	0	n/a*	2	0
2003	2	0	0	n/a*	2	0
2002	2	0	0	n/a*	2	0

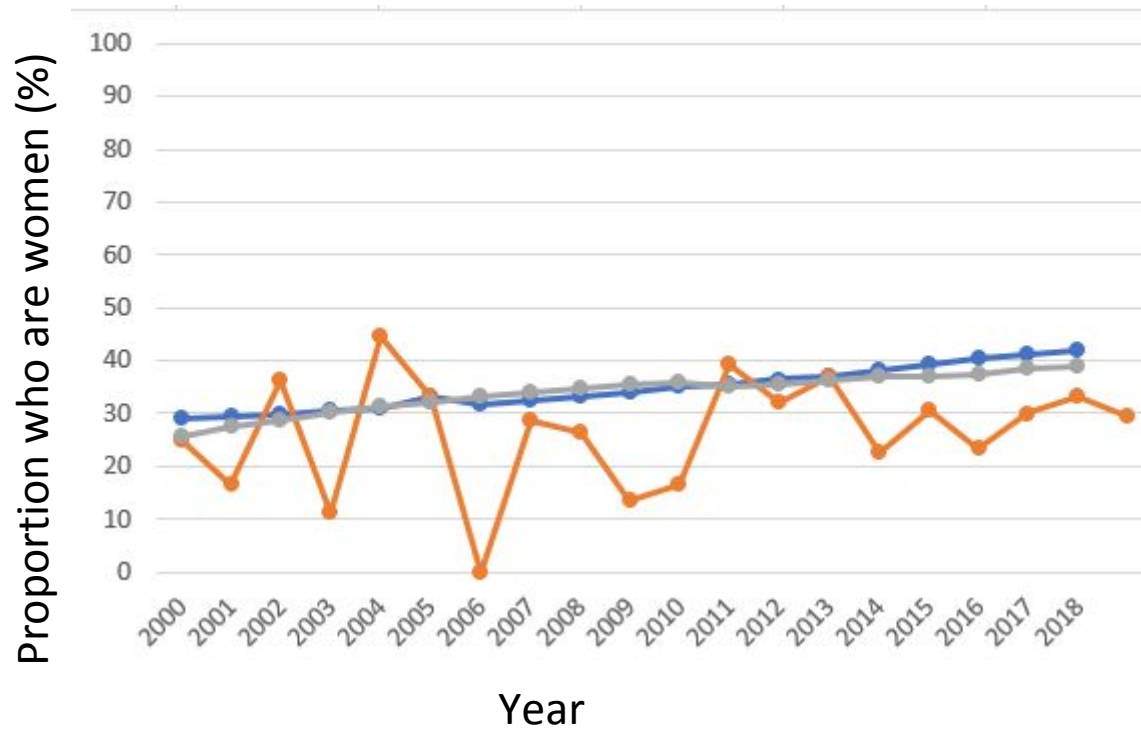
Total	65	18 (27.7)	24	13 (54.2)	128	50 (39.1)
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* n/a denotes not available

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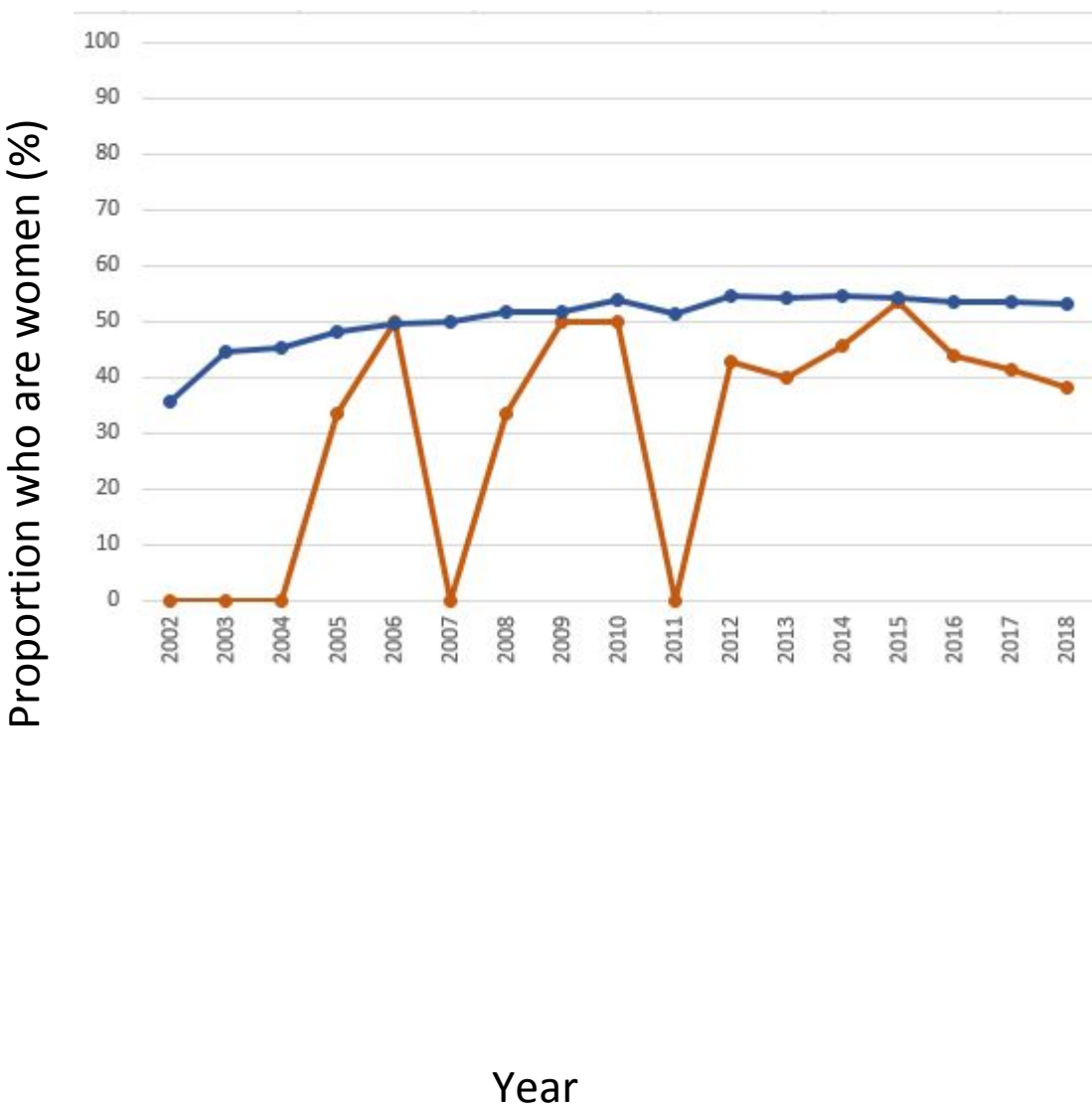
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Figure 1. Proportion of Canadian residency association award recipients who were women staff physicians (orange) per year compared to the proportion of medicine faculty members who were women (blue, based on Association of Faculties of Medicine of Canada data) and the proportion of practicing physicians who were women (grey, based on Canadian Medical Association data) in Canada from 2000-2018.



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Figure 2. Proportion of Canadian residency award recipients who were women resident physicians (orange) per year compared to the proportion of Canadian residents who were women (blue) in Canada from 2002-2018.



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60STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation	Page No
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3
Objectives	3	State specific objectives, including any prespecified hypotheses	3
Methods			
Study design	4	Present key elements of study design early in the paper	4
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	4
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	4
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	4-5
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	4-5
Bias	9	Describe any efforts to address potential sources of bias	4
Study size	10	Explain how the study size was arrived at	4
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	5
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	5
		(b) Describe any methods used to examine subgroups and interactions	4-5
		(c) Explain how missing data were addressed	4
		(d) If applicable, describe analytical methods taking account of sampling strategy	5
		(e) Describe any sensitivity analyses	4-5
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	6
		(b) Give reasons for non-participation at each stage	n/a
		(c) Consider use of a flow diagram	n/a
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	6-7
		(b) Indicate number of participants with missing data for each variable of interest	Table 1, 2
Outcome data	15*	Report numbers of outcome events or summary measures	6-7
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	7

		(b) Report category boundaries when continuous variables were categorized	y
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	n/a
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	7
Discussion			
Key results	18	Summarise key results with reference to study objectives	7-8
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	8-9
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	9
Generalisability	21	Discuss the generalisability (external validity) of the study results	9
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	1

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.