





ARTICLE



<https://doi.org/10.1057/s41599-023-02481-5>

OPEN

Breaking through the glass ceiling: unveiling women's representation by gender and race in the higher education hierarchy

Yunyu Xiao ^{1✉}, Edward Pinkney², Tianzi Li¹ & Paul S. F. Yip ^{2,3✉}

This retrospective study examined progress towards diversity at the intersection of gender and ethnicity amongst senior higher education academics and managers in England and Wales. The study aimed to assess any evidence of competing diversity agendas and the impact of diversity initiatives on female racial minorities. This study investigates the advancement of diversity at the nexus of gender and ethnicity within senior academic and management roles in higher education across England and Wales. Using employment records of senior staff from higher education institutions were used to assess trends in race and gender, it retrospectively examines trends in employment for ethnic minority women and the effectiveness of diversity awards from 2012 to 2019. We also collected data on the receipt of Athena SWAN or Race Equality Charter awards by higher education institutions. Mixed-effects modelling was employed to analyse the correlation between institutions awarded the Athena SWAN Silver or Race Equality Charter Bronze and variances in the representation of women from racial minorities. Results indicate that the representation of ethnic minority females in senior roles showed a marked increase over the study period. However, disparities were observed, with Black females showing fewer signs of advancement. Institutions that received Athena SWAN Silver or Race Equality Charter Bronze awards demonstrated increasing gender and racial diversity, with no evidence of competing diversity effects. The study found evidence of progress in advancing gender and ethnic diversity in senior academic and leadership positions in higher education in England and Wales. Despite this, certain racial groups, such as Black females, faced greater challenges in advancement. The positive impact of diversity initiatives was observed, with no evidence of conflicting diversity agendas. Further research is recommended to investigate structural factors affecting ethnic minorities in higher education, and to assess the potential influences of external factors like the COVID-19 pandemic on the diversity agenda.

¹ Department of Population Health Sciences, Weill Cornell Medicine, New York-Presbyterian, 425 East 61 Street, DV 306, New York, NY 10065, USA. ² The Hong Kong Jockey Club Centre for Suicide Research and Prevention, The University of Hong Kong, Hong Kong, China. ³ Department of Social Work and Social Administration, The University of Hong Kong, Hong Kong, China. ✉email: yux4008@med.cornell.edu; sfpyip@hku.hk

Introduction

Historical context of diversity in higher education. Higher education (HE) institutions have played a significant role in societal debates on gender and racial inequalities. While initiatives aimed at promoting female representation in academia date back to the 1960s (David 2015), continuing systemic barriers have prevented women, particularly women of racial minorities, from accessing senior positions, leading to concerns about the existence of a ‘glass ceiling’ effect (Oberholzer 2021; Jackson and O’Callaghan 2009). The intersectionality theory posits that female racial minorities face cumulative barriers rooted in gender and racial biases (Crenshaw 2017). For female racial minorities in the HE workplace, there may be a ‘double whammy’ of gender and racial barriers (Berdahl and Moore 2006; Logan and Dudley 2021).

Recent literature reveals that in the United Kingdom (UK), there continues to be an underrepresentation of women in senior academic ranks, particularly within the professoriate and senior leadership positions Higher Education Statistics Authority (HESA 2023; Shepherd 2017; Jarboe 2019; Meho 2021). Published figures from the HESA (2023) show that although female students in the UK surpassed their male counterparts, 29.6% of professors were women in the academic year 2021/2022. Various factors, ranging from sociocultural norms to employment structural hurdles, have been attributed to this disparity (Manfredi et al. 2019).

Racial diversity in HE persists as an ongoing concern. In 2021/2022, Black and Asian individuals represented only 1 and 4% of senior roles, respectively, while 88% were occupied by White individuals (ONS 2022). These figures starkly contrast with the demographic trends in the wider population in England and Wales, where the proportion of Asian (or Asian British, Asian Welsh) has increased from 7.5% in 2011 to 9.3% in 2021, and the proportion of Black (or Black British, Black Welsh, Caribbean, African) was 4%, up from 3.3% in 2011 (ONS 2022). Such discrepancies suggest considerable underrepresentation in academia relative to the wider population. The proportion of ethnic minorities in the professoriate was also considerably lower than the proportion among the staff and student body (Coughlan 2021). This declining diversity in advancing academic roles has been described as the ‘leaky pipeline’ phenomenon (Sarrajū et al. 2023; Ovseiko et al. 2020). Within staff ranks, ethnic minority academics were found to be more likely to move overseas (Bhopal et al. 2016), and a University College Union analysis found a significant pay gap between White and Black academics, with Black academics earning 14% less than their White counterparts (UCU 2019): Highlighting the absence of diversity at higher ranks, in 2019, there were reportedly just 25 Black female professors in the UK of the more than 20,000 professors (Adams 2020). These inequities are particularly striking when juxtaposed against the burgeoning diversity in the general and student population, with most recent figures showing that over a quarter of UK-domiciled students are ethnic minorities increasing annually (HESA 2023).

Though commendable strides have been made to foster gender equality in HE in recent years (Xiao et al. 2020), there are concerns that gender and racial initiatives may not always align (Bhopal 2023; Kalpazidou et al. 2020). A call to recalibrate these initiatives to more comprehensively address the nuances of ‘double marginalisation’ at the intersection of gender and race (Stockfelt 2018) is, therefore, both timely and critical for ensuring a more equitable environment.

Policy interventions and their real-world impact. Policy initiatives such as the Athena SWAN Charter emerged in the early 2000s as drivers of change to combat gender disparities

(Xiao et al. 2020). Since launching in 2005, the Charter has issued awards to higher education institutions for showing a commitment to gender equality, and the initiative has been found to have a positive effect (Ovseiko et al. 2017). Despite success in promoting gender equity, the Charter was criticised for insufficiently accounting for the experiences of female racial minorities (Tzanakou and Pearce 2019), and in 2015, the Athena SWAN Charter was revamped and expanded to include consideration for gender with race.

In parallel, the Equality Challenge Unit (now Advance HE) went a step further in 2016, launching the Race Equality Charter (REC), which applies many of the principles of the Athena SWAN Charter to tackling the issue of racial inequality. In terms of the effects of the REC on gender diversity, a 2021 report published by Advance HE suggested that it was too early to assess the impact (Oloyede et al. 2021); however, a recent study by Campion and Clark (2022) was less favourable, indicating that the award did not currently appear to be a driver of change.

The differential uptake between the Athena SWAN and REC memberships illustrates the complexity and challenges inherent in weaving together gender and racial equity agendas. As of February 2023, 141 institutions were members of the Athena SWAN Charter, holding 124 institutional awards; while there were 99 Race Equality Charter members, with only 38 awards between them. To date, there is very limited research focused on diversity at the confluence of gender and race within academia, with few studies investigating the challenges confronting women from ethnic minorities (Bhopal and Henderson 2021; Henderson and Bhopal 2022; Oloyede et al. 2021).

Our contributions. This study aims to bridge this research gap by analysing the trajectories of ethnic minority women in senior academic roles over time. We also critically evaluate the influence of policy initiatives such as Athena SWAN and REC on fostering ethnic female diversity in academia. In doing so, we aim to deepen our understanding of diversity dynamics in HE and shed light on the real-world efficacy of current diversity strategies.

Methods

Data source. The dataset for this study, comprising higher education (HE) staff records from 2012/2013 to 2018/2019 in the UK, was obtained through a custom data request from the HESA. Data were requested for senior staff using two categories of contract levels (see Supplementary Table 1): (1) managerial leaders (contract levels A–E2) and (2) academic leaders (contract level F1). Managerial leaders, as defined by HESA, include the Head of the Institution: Vice-Chancellor/Principal/equivalent (A0), Deputy Vice-Chancellor/Pro-Vice-Chancellor/Chief Operating Officer/Registrar/Secretary (B0), Head/Director of major academic area (C1), Director of the major function/group of functions (C2), Head of a distinct area of academic responsibility centre size (D1–D3), Head of a subset of an academic area/director of a small centre (E1), and Senior function head (E2); Academic leaders (F1) refer to professors that do not have line management responsibilities (HESA 2018). The dataset provided by HESA includes Ethnicity, which was self-selected by the staff and is used interchangeably with race in this study. For data protection purposes, the data were rounded to the nearest 5.

Data on Athena SWAN and Race Equality Charter award holders were collected from Advance HE. Athena SWAN supports gender equality in HE at Gold, Silver, and Bronze levels: Bronze awards are given to institutions that have an assessment of gender equality and a 4-year action plan; Silver awards honour the measurable success of the action plan

implementation; and Gold awards recognise the highest achievement in promoting gender equality (Kalpazidou et al. 2020). Some institutions are members of the Charter but do not have awards. REC awards recognise the HE institutions advancing Black, Asian, and Minority Ethnic staff representation according to their accomplishments, and receiving a REC Bronze reflects the start of the process to promote racial equality (Advance HE 2023b). Data on Athena SWAN and REC award holders were collected from Advance HE, with the study using award data updated in February 2023 (Advance HE 2023a c). The analysis included 169 institutions, with 78 institutions holding Athena Bronze, 26 institutions holding Athena Silver, and 38 institutions holding REC Bronze.

Measures. We collected data on the gender and racial demographics of each HE institution at the senior staff contract levels previously outlined. The outcomes were the percentages of racial minorities (RM) altogether, including Black, Asian, Mixed, and Other races, and the specific racial groups, Black, Asian, Mixed, and Other races females, defined as the number of female staff for the designated contract levels for each institution, year, and race divided by the number of staff in each institution and year. Staff selecting their ethnicity as Unknown/Not Applicable were excluded from the racial minority groups.

The independent variables are Athena SWAN and REC award status. Since no institutions held the Gold award, the study examined four categories of Athena SWAN award: non-Charter members, Charter members, Bronze, and Silver. Similarly, to date, no Silver or Gold REC has been awarded. Therefore, REC awards were studied at the level of non-Charter members, Charter members, and Bronze.

Statistical analysis. To assess the female racial diversity of senior staff in HE, the study followed a three-step process. First, it compared the trends of percentages by gender and racial minorities. Second, it examined the female racial percentages from 2012/2013 to 2018/2019 descriptively. Lastly, the association between Athena SWAN or REC awards and female percentages of Black, Asian, Mixed, Other races, and the combination of all four racial minority groups was assessed using mixed-effects modelling.

The models were specified as follows:

$$Female\ Percentage_{ij} = \beta_0 + \beta_1 Athena_j + \beta_2 Year_{ij} + u_{0j} + u_{1j} Year_{ij} + \epsilon_{ij} \tag{1}$$

$$Female\ Percentage_{ij} = \beta_0 + \beta_1 REC_j + \beta_2 Year_{ij} + u_{0j} + u_{1j} Year_{ij} + \epsilon_{ij} \tag{2}$$

$$Female\ Percentage_{ij} = \beta_0 + \beta_1 Athena_j + \beta_2 REC_j + \beta_3 Year_{ij} + u_{0j} + u_{1j} Year_{ij} + \epsilon_{ij} \tag{3}$$

where the dependent variable is the female percentage calculated using the number of females in each race divided by the total number of senior staff for year *i* and institution *j*; *Athena_j* is a four-level categorical variable indicating the Athena SWAN award status for institution *j* and the reference group is non-Charter members; *REC_j* indicates the REC award status for institution *j* and the reference group is non-Charter members; *Year_{ij}* is a categorical variable representing year 2012/2013 to 2018/2019 for each institution *j*; *u_{0j}* is the random-intercept term at the institution *j* level to allow for the variation in different institutions; *u_{1j} Year_{ij}* is the random-slope term at the institution *j* and year *i* level accounting for the effect of years on outcomes across different institutions; and *ε_{ij}* is the error term.

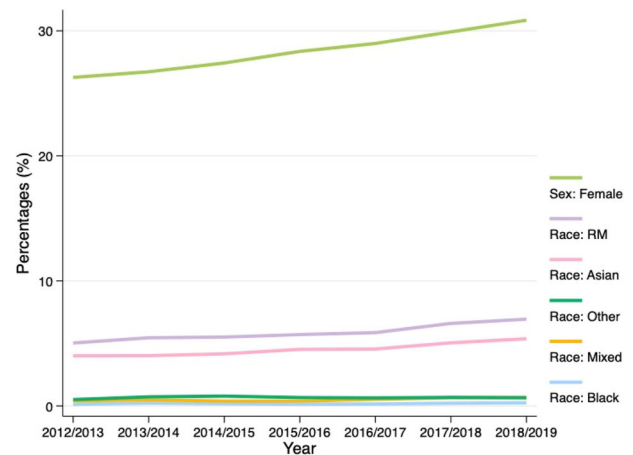


Fig. 1 Temporal trends of female and racial minority representation in high education. We calculated the percentages of female and racial minorities compared to male and White leaders.

We examined five models for each of the following three analyses in the study: (1) examining the association between Athena SWAN awards and female percentages of RM, Black, Asian, Mixed, and Other races; (2) examining the association between REC awards and female percentages of RM, Black, Asian, Mixed, and Other races; and (3) examining the association between both awards and female percentages of RM, Black, Asian, Mixed, and Other races. In addition, we repeated the above three analyses for two contract levels to identify any differences in the effects between managerial leaders and academic leaders. All analyses were conducted in Stata BE 17.0.

Results

Descriptive statistics. From 2012/2013 to 2018/2019, the percentage of female senior staff in HE increased from 26.3 to 30.8% (Fig. 1). The representation of racial minority senior female staff expanded by 1.9%, with the Asian female cohort showing the most pronounced increase at 1.4%.

Table 1 shows that the Mixed and Other racial subgroups experienced consistent growth during the period from 2012/2013 to 2018/2019. In contrast, the trend for Black senior female staff was less consistent. Over the period, the proportion of Asian females doubled, contributing to a similar increase for racial minorities. However, as of 2018/2019, Black females accounted for only 0.05% (15) of all senior staff, with the cumulative percentage of racial minority females standing at 1.6% (475 individuals).

Considering the separate contract levels for managerial and academic leaders (Supplementary Table 2), Asian managerial leaders' percentage more than doubled, from 0.4 to 1.0%, contributing to the overall percentage of racial minority managerial leaders rising from 0.4 to 1.3%. However, managerial leaders of Black, Mixed, and Other races showed no clear trend. Interestingly, racial minority representation was more pronounced among professorial roles than managerial ones, even though female representation was generally higher among managerial roles.

Mixed-effects modelling. Table 2 reveals that Athena SWAN Silver awards were positively associated with increased percentages of racial minority ($\beta = 0.75$, 95% CI [0.15, 1.35]) and Other ($\beta = 0.41$, 95% CI [0.11, 0.71]) race senior female staff compared to non-Charter members. Bronze award holders also showed a

Table 1 Trends of racial differences in females from 2012/2013 to 2018/2019.

Year	Total staff	All RM female	Black female	Asian female	Mixed female	Other female
2012/2013	26,720	190 (0.7%)	0 (0.0%)	160 (0.6%)	20 (0.1%)	10 (0.0%)
2013/2014	29,000	265 (0.9%)	20 (0.1%)	190 (0.7%)	30 (0.1%)	25 (0.1%)
2014/2015	28,695	275 (1.0%)	15 (0.1%)	190 (0.7%)	30 (0.1%)	40 (0.1%)
2015/2016	29,185	310 (1.1%)	5 (0.0%)	235 (0.8%)	35 (0.1%)	35 (0.1%)
2016/2017	29,685	340 (1.1%)	10 (0.0%)	250 (0.8%)	45 (0.2%)	35 (0.1%)
2017/2018	30,235	425 (1.4%)	15 (0.0%)	305 (1.0%)	60 (0.2%)	45 (0.1%)
2018/2019	30,635	475 (1.6%)	15 (0.0%)	360 (1.2%)	55 (0.2%)	45 (0.1%)

Table 2 Mixed-effects modelling on Athena SWAN awards.

	Model 1 RM female % OR (95% CI)	Model 2 Black female % OR (95% CI)	Model 3 Asian female % OR (95% CI)	Model 4 Mixed female % OR (95% CI)	Model 5 Other female % OR (95% CI)
Athena SWAN award					
Non-Charter member	Ref.				
Charter member	-0.17 (-1.02, 0.68)	0.27 (-0.20, 0.75)	-0.39 (-1.44, 0.67)	0.00 (-0.54, 0.54)	0.00 (-0.45, 0.46)
Bronze	0.28 (-0.21, 0.77)	0.08 (-0.22, 0.37)	0.13 (-0.45, 0.71)	0.11 (-0.24, 0.46)	0.04 (-0.22, 0.30)
Silver	0.75 (0.15, 1.35)	0.05 (-0.29, 0.39)	0.46 (-0.21, 1.14)	0.07 (-0.33, 0.47)	0.41 (0.11, 0.71)
Year					
2012/2013	Ref.				
2013/2014	0.11 (-0.14, 0.35)	0.11 (-0.08, 0.31)	0.01 (-0.25, 0.27)	0.03 (-0.08, 0.14)	0.07 (-0.07, 0.21)
2014/2015	0.16 (-0.09, 0.42)	0.19 (-0.01, 0.39)	-0.02 (-0.29, 0.26)	0.03 (-0.09, 0.15)	0.16 (0.02, 0.30)
2015/2016	0.39 (0.11, 0.66)	0.08 (-0.13, 0.29)	0.29 (0.01, 0.58)	0.02 (-0.11, 0.15)	0.18 (0.03, 0.32)
2016/2017	0.35 (0.06, 0.64)	0.10 (-0.12, 0.31)	0.23 (-0.07, 0.54)	0.03 (-0.12, 0.17)	0.14 (-0.02, 0.29)
2017/2018	0.65 (0.33, 0.97)	0.08 (-0.14, 0.31)	0.53 (0.21, 0.86)	0.09 (-0.07, 0.25)	0.17 (0.01, 0.34)
2018/2019	0.91 (0.56, 1.26)	0.19 (-0.06, 0.44)	0.81 (0.46, 1.16)	0.06 (-0.11, 0.24)	0.15 (-0.02, 0.32)

Note: Bolded values are significant at $P < 0.001$. RM racial minority.

Table 3 Mixed-effects modelling on REC awards.

	Model 1 RM female % OR (95% CI)	Model 2 Black female % OR (95% CI)	Model 3 Asian female % OR (95% CI)	Model 4 Mixed female % OR (95% CI)	Model 5 Other female % OR (95% CI)
REC award					
Non-Charter member	Ref.				
Charter member	0.44 (-0.00, 0.89)	0.16 (-0.10, 0.42)	0.29 (-0.21, 0.80)	0.11 (-0.19, 0.41)	0.16 (-0.07, 0.39)
Bronze	0.65 (0.16, 1.14)	-0.01 (-0.29, 0.27)	0.50 (-0.03, 1.04)	0.09 (-0.23, 0.41)	0.13 (-0.13, 0.39)
Year					
2012/2013	Ref.				
2013/2014	0.11 (-0.14, 0.35)	0.11 (-0.08, 0.31)	0.01 (-0.25, 0.27)	0.03 (-0.08, 0.14)	0.07 (-0.07, 0.21)
2014/2015	0.17 (-0.09, 0.42)	0.19 (-0.01, 0.38)	-0.01 (-0.28, 0.26)	0.03 (-0.09, 0.15)	0.17 (0.03, 0.31)
2015/2016	0.38 (0.11, 0.66)	0.08 (-0.13, 0.29)	0.29 (0.01, 0.58)	0.02 (-0.11, 0.15)	0.18 (0.03, 0.33)
2016/2017	0.35 (0.05, 0.64)	0.10 (-0.12, 0.31)	0.24 (-0.06, 0.54)	0.03 (-0.12, 0.17)	0.14 (-0.01, 0.29)
2017/2018	0.65 (0.33, 0.97)	0.09 (-0.14, 0.31)	0.53 (0.21, 0.86)	0.09 (-0.07, 0.25)	0.18 (0.01, 0.34)
2018/2019	0.91 (0.56, 1.26)	0.19 (-0.05, 0.44)	0.81 (0.46, 1.16)	0.06 (-0.11, 0.24)	0.14 (-0.03, 0.31)

Note: Bolded values are significant at $P < 0.001$. RM racial minority.

positive association for all races, although not significant. Concerning the REC awards (Table 3), REC Bronze recipients were significantly associated with increased percentages of racial minority senior female staff overall ($\beta = 0.65$, 95% CI [0.16, 1.14]) compared to non-Charter members.

After including both awards in the model (Table 4), neither the Athena SWAN Silver nor the REC Bronze awards were associated with the percentages of overall racial minority female staff. Institutions with Athena SWAN Silver awards were associated with an increase in Other race female percentages ($\beta = 0.44$, 95% CI [0.08, 0.80]) compared to non-Charter members. No

significant association between Athena SWAN or REC awards and female percentages was observed for Black, Asian, and Mixed races in Tables 2–4.

When examining contract levels separately, the association between Athena SWAN Silver and female racial minorities was insignificant for each staff level (Supplementary Table 3). In contrast, for academic leaders, REC membership ($\beta = 0.52$, 95% CI [0.07, 0.97]) and REC Bronze awards ($\beta = 0.60$, 95% CI [0.12, 1.09]) were associated with increased percentages of racial minority females overall compared to non-REC members (Supplementary Table 4). After adding Athena SWAN awards

Table 4 Mixed-effects modelling on Athena SWAN and REC awards.

	Model 1 RM female % OR (95% CI)	Model 2 Black female % OR (95% CI)	Model 3 Asian female % OR (95% CI)	Model 4 Mixed female % OR (95% CI)	Model 5 Other female % OR (95% CI)
Athena SWAN award					
Non-Charter member	Ref.				
Charter member	-0.31 (-1.17, 0.55)	0.22 (-0.25, 0.70)	-0.48 (-1.54, 0.57)	-0.04 (-0.59, 0.52)	-0.02 (-0.48, 0.44)
Bronze	0.09 (-0.44, 0.62)	0.08 (-0.24, 0.39)	-0.02 (-0.63, 0.60)	0.06 (-0.33, 0.46)	0.05 (-0.23, 0.33)
Silver	0.47 (-0.19, 1.13)	0.08 (-0.29, 0.44)	0.25 (-0.49, 0.98)	0.01 (-0.46, 0.48)	0.44 (0.08, 0.80)
REC award					
Non-Charter member	Ref.				
Charter member	0.37 (-0.10, 0.84)	0.13 (-0.14, 0.40)	0.26 (-0.27, 0.79)	0.10 (-0.23, 0.43)	0.06 (-0.17, 0.30)
Bronze	0.48 (-0.07, 1.02)	-0.04 (-0.34, 0.27)	0.41 (-0.17, 1.00)	0.07 (-0.31, 0.46)	-0.07 (-0.35, 0.22)
Year					
2012/2013	Ref.				
2013/2014	0.11 (-0.14, 0.35)	0.11 (-0.08, 0.31)	0.01 (-0.25, 0.27)	0.03 (-0.08, 0.14)	0.07 (-0.07, 0.21)
2014/2015	0.17 (-0.09, 0.43)	0.19 (-0.01, 0.38)	-0.01 (-0.29, 0.26)	0.03 (-0.10, 0.15)	0.16 (0.02, 0.30)
2015/2016	0.39 (0.12, 0.66)	0.08 (-0.14, 0.29)	0.30 (0.01, 0.58)	0.02 (-0.11, 0.15)	0.18 (0.03, 0.33)
2016/2017	0.36 (0.06, 0.65)	0.09 (-0.12, 0.31)	0.24 (-0.06, 0.54)	0.03 (-0.12, 0.17)	0.14 (-0.01, 0.29)
2017/2018	0.66 (0.34, 0.98)	0.08 (-0.15, 0.31)	0.54 (0.21, 0.86)	0.09 (-0.07, 0.25)	0.18 (0.01, 0.34)
2018/2019	0.92 (0.57, 1.27)	0.19 (-0.06, 0.43)	0.82 (0.46, 1.17)	0.06 (-0.11, 0.24)	0.15 (-0.02, 0.32)

Note: Bolded values are significant at $P < 0.001$. RM racial minority.

to the model (Supplementary Table 5), these positive associations between REC awards and RM female percentages remained significant (REC membership: $\beta = 0.50$, 95% CI [0.03, 0.96]; REC Bronze: $\beta = 0.53$, 95% CI [0.01, 1.05]). No association was found in Supplementary Tables 2–4 for Black, Asian, Mixed, and Other races, respectively.

Discussion

Gender and ethnic diversity within higher education institutions have gained attention in recent years thanks to initiatives such as Athena SWAN and the Race Equality Charter. While this study elucidates some positive strides towards increased diversity, the landscape of diversity, especially at the nexus of gender and ethnicity, remains uneven. While there was an overall increase in the percentage of females and a year-on-year increase in the percentage of ethnic minority females, certain racial subgroups, such as Black females, did not demonstrate consistent progress, and appear underrepresented compared to the wider population. Furthermore, our findings are that the general female trend is for the percentage of academic leaders to exceed the number of managerial leaders, suggesting a progressive pipeline towards greater diversity over time as staff is promoted through the ranks. Notably, Black females are the only racial group in the study that does not exhibit this trend, with very few academic leaders recorded across the study period.

The study found no evidence of competing diversity agendas and showed that higher awards in Athena SWAN or Race Equality Charter programs may have a modest positive impact on improving the representation of female racial minorities. Athena SWAN Silver and REC Bronze awards were associated with increased percentages of racial minority women in senior higher education ranks, although this association was not significant when including both awards in the models. For academic leaders, institutions that were REC members or received a REC Bronze award were associated with higher percentages of female racial minorities compared to non-REC members. Among racial minority subgroups, Athena SWAN Silver had a positive association with the percentages of Other race female staff compared to non-Charter members.

These findings may alleviate general concerns that focusing on gender diversity could hinder racial diversity (Henderson

and Bhopal 2022), but it is evident that more work is needed to address barriers faced by certain underrepresented groups, such as Black females. Concerns raised in the recent review of the Race Equality Charter that reporting on racial minorities as a single group may conceal the underrepresentation of specific racial subgroups (Oloyede et al. 2021) are also supported by this study, and the findings highlight that diversity figures should take intersectionality seriously by ensuring racial data is also broken down by gender. The lack of progress in increasing Black female representation in senior ranks is potentially concerning, especially considering the increasing diversity of the general and student populations (HESA 2020, 2023). Future research should further investigate the reasons for this underrepresentation, and diversity initiatives such as Athena SWAN and the Race Equality Charter should continue to take steps to ensure that institutions are recording progress at the intersection of race and gender.

Limitations

Several limitations of this study should be considered when interpreting the results. First, the study only includes data from a 7-year period, which may not capture longer-term trends in diversity in leadership positions. There are some concerns that the COVID-19 pandemic may have hampered the sectoral advancements made by women (Stadnyk and Black 2020), which would not be reflected in this study due to the period covered. The decision by the National Institute for Health Research (NIHR) to recently remove the prerequisite that institutions seeking funding have a Silver Athena SWAN award was also noteworthy, with the administrators citing an effort to reduce administrative burden (Ovseiko et al. 2020). Any effects of removing the NIHR link would not yet have been seen.

As educational institutions have resumed conventional teaching and research practices, up-to-date work is needed to understand and address gender and racial inequalities in the HE sectors. A longer time frame and the period since the COVID-19 pandemic would provide a more comprehensive understanding of the impact of diversity initiatives on representation in leadership positions. In addition, the study only examined two types of diversity initiatives (Athena SWAN and REC awards) and did not consider other

potential factors that could impact representation in leadership positions, such as organisational culture or prior award status. Furthermore, the study does not address the situation facing male ethnic minorities or attempt to determine what levels of representation would constitute proportionate representation for each racial group. Future research could examine the characteristics of institutions to identify barriers affecting the advancement of certain minorities, such as the Black community, in HE.

Recommendations

The results have confirmed the continuous improvements overall in the representation of racial minority women in higher education in the UK. The two types of diversity initiatives examined (Athena SWAN and REC awards) have been shown as potential catalysts to the improvement process, although some subsets may need particular attention. Improvements in representation in higher education can be a slow process, requiring a range of measures, and the commitment and leadership of senior management are crucial for their sustainability. One approach involves enhancing diversity in the hiring process through targeted recruitment efforts and blind review processes, which remove personal information from job applications (Ovseiko et al. 2020). In addition, universities can create a more inclusive and flexible work environment by offering improved work-life balance and family-friendly policies (Manfredi et al. 2019).

Another strategy to promote diversity in the HE sector is investing in mentorship and support programs for under-represented groups. This can include providing access to networking opportunities, professional development resources, and career guidance (Ovseiko et al. 2020). Universities can also cultivate a more inclusive culture by promoting and celebrating diversity and ensuring diverse voices are heard (Ovseiko et al. 2017).

On a broader scale, national diversity initiatives might benefit from improved data reporting, reduced administrative burdens, and the placing of attention not only on intent but also on outcomes (Oloyede et al. 2021; Campion and Clark 2022). To ensure the compatibility of these mandates, and to address concerns involving diversity at the intersection of gender and race, a closer relationship between the Athena SWAN and the Race Equality Charter could be beneficial. Given that this study found no statistical evidence of competing diversity agendas and that both initiatives are governed by Advance HE, further streamlining and integrating the two schemes should be feasible.

In conclusion, recognising and improving gender and racial inequalities in the HE sector is a complex and ongoing process, necessitating consistent efforts from institutions, policymakers, and individuals to create meaningful and lasting change. The focus should not be on adding superficial administrative burdens but rather on fostering an institutional mindset to remove structural barriers to equality and diversity. By collaborating in pursuing diversity and inclusion, it is possible to create a more equal and just higher education sector that benefits everyone.

Data availability

All data are available on the osf repository (osf.io/cwk86/).

Received: 11 July 2023; Accepted: 28 November 2023;

Published online: 20 December 2023

References

Adams R (2020) Fewer than 1% of UK university professors are black, figures show. *The Guardian*. <https://www.theguardian.com/education/2020/feb/27/fewer-than-1-of-uk-university-professors-are-black-figures-show>. Accessed 23 Feb 2023

- Advance HE (2023a). Athena Swan Charter Members. Advance HE. <https://www.advance-he.ac.uk/equality-charters/athena-swain-charter/members>. Accessed 20 Feb 2023
- Advance HE (2023b). Race Equality Charter. Advance HE. <https://www.advance-he.ac.uk/equality-charters/race-equality-charter>. Accessed 22 Feb 2023
- Advance HE (2023c). Race Equality Charter Members. Advance HE. <https://www.advance-he.ac.uk/equality-charters/race-equality-charter/members>. Accessed 10 Feb 2023
- Berdahl JL, Moor C (2006) Workplace harassment: double jeopardy for minority women. *J Appl Psychol* 91:426–436. <https://doi.org/10.1037/0021-9010.91.2.426>
- Bhopal K (2023) ‘We can talk the talk, but we’re not allowed to walk the walk’: the role of equality and diversity staff in higher education institutions in England. *High Educ* 85:325–339. <https://doi.org/10.1007/s10734-022-00835-7>
- Bhopal K, Brown H, Jackson J (2016) BME academic flight from UK to overseas higher education: aspects of marginalisation and exclusion. *Br Educ Res J* 42:240–257. <https://doi.org/10.1002/berj.3204>
- Bhopal K, Henderson H (2021) Competing inequalities: gender versus race in higher education institutions in the UK. *Educ Rev* 73:153–169. <https://doi.org/10.1080/00131911.2019.1642305>
- Campion K, Clark K (2022) Revitalising race equality policy? Assessing the impact of the Race Equality Charter mark for British universities. *Race Ethn Educ* 25:18–37. <https://doi.org/10.1080/13613324.2021.1924133>
- Coughlan S (2021) Only 1% of UK university professors are black. *BBC News*. <https://www.bbc.co.uk/news/education-55723120>. Accessed 23 Feb 2023
- Crenshaw KW (2017) On intersectionality: essential writings. *The New Press*
- David ME (2015) Women and gender in higher education? *Educ Sci* 5:10–25. <https://doi.org/10.3390/educsci501010>
- Henderson H, Bhopal K (2022) Narratives of academic staff involvement in Athena SWAN and race equality charter marks in UK higher education institutions. *J Educ Policy* 37:781–797. <https://doi.org/10.1080/02680939.2021.1891576>
- HESA (2018) Staff record 2018/19—Combined levels. HESA. https://www.hesa.ac.uk/collection/c18025/combined_levels. Accessed 22 Feb 2023
- HESA (2020) Higher Education Student Statistics: UK, 2018/19—Student numbers and characteristics. HESA. <https://www.hesa.ac.uk/news/16-01-2020/sb255-higher-education-student-statistics/numbers>. Accessed 23 Feb 2023
- HESA (2023) Who’s studying in HE? HESA. <https://www.hesa.ac.uk/data-and-analysis/students/whos-in-he#characteristics>. Accessed 23 Feb 2023
- Jarboe N (2019) Women’s Leadership in Higher Education. Advance HE. <https://www.advance-he.ac.uk/news-and-views/womens-leadership-in-higher-education>. Accessed 23 Feb 2023
- Jackson JFL, O’Callaghan EM (2009) What do we know about glass ceiling effects? A taxonomy and critical review to inform higher education research. *Res High Educ* 50:460–482. <https://doi.org/10.1007/s11162-009-9128-9>
- Kalpaizidou Schmidt E, Ovseiko PV, Henderson LR et al. (2020) Understanding the Athena SWAN award scheme for gender equality as a complex social intervention in a complex system: analysis of Silver award action plans in a comparative European perspective. *Health Res Policy Syst* 18:19. <https://doi.org/10.1186/s12961-020-0527-x>
- Logan SR, Dudley HS (2021) The “double whammy” of being Black and a woman in higher education leadership. *Research anthology on instilling social justice in the classroom*. IGI Global. 1545–1565. <https://doi.org/10.4018/978-1-7998-7706-6.ch087>
- Manfredi S, Clayton-Hathway K, Cousens E (2019) Increasing gender diversity in higher education leadership: the role of executive search firms. *Soc Sci* 8:168. <https://doi.org/10.3390/socsci8060168>
- Meho LI (2021) The gender gap in highly prestigious international research awards, 2001–2020. *Quant Sci Stud* 2:976–989. https://doi.org/10.1162/qss_a_00148
- Oberholzer L (2021) Is there a glass ceiling in Higher Education? *SAGE Perspectives*. <https://perspectivesblog.sagepub.com/blog/books/is-there-a-glass-ceiling-in-higher-education>. Accessed 22 Feb 2023
- Oloyede FD, Christoffersen A, Cornish T (2021) Race Equality Charter Review Phase. <https://www.advance-he.ac.uk/knowledge-hub/race-equality-charter-review-phase-2>. Accessed 22 Feb 2023
- ONS (2022) Ethnic group, England and Wales: Census 2021. Office for National Statistics. <https://www.ons.gov.uk/peoplepopulationandcommunity/culturalidentity/ethnicity/bulletins/ethnicgroupenglandandwales/census2021>. Accessed 23 Feb 2023
- Ovseiko PV, Chapple A, Edmunds LD et al. (2017) Advancing gender equality through the Athena SWAN Charter for Women in Science: an exploratory study of women’s and men’s perceptions. *Health Res Policy Syst* 15:12. <https://doi.org/10.1186/s12961-017-0177-9>
- Ovseiko PV, Taylor M, Gilligan RE et al. (2020) Effect of Athena SWAN funding incentives on women’s research leadership. *BMJ* m3975. <https://doi.org/10.1136/bmj.m3975>
- Sarraj A, Ngo S, Rodriguez F (2023) The leaky pipeline of diverse race and ethnicity representation in academic science and technology training in the

- United States, 2003-2019. *PLoS One* 18:4. <https://doi.org/10.1371/journal.pone.0284945>
- Shepherd S (2017) Why are there so few female leaders in higher education: a case of structure or agency? *Manag Educ* 31:82–87. <https://doi.org/10.1177/0892020617696631>
- Stadnyk T, Black K (2020) Lost ground: female academics face an uphill battle in post-pandemic world. *Hydrol Process* 34:3400–3402. <https://doi.org/10.1002/hyp.13803>
- Stockfelt S (2018) We the minority-of-minorities: a narrative inquiry of black female academics in the United Kingdom. *Br J Socio Educ* 39:1012–1029. <https://doi.org/10.1080/01425692.2018.1454297>
- Tzanakou C, Pearce R (2019) Moderate feminism within or against the neoliberal university? The example of Athena SWAN. *Gen Work Organ* 26:1191–1211. <https://doi.org/10.1111/gwao.12336>
- UCU (2019) Black academic staff face double whammy in promotion and pay stakes. University and College Union. <https://www.ucu.org.uk/article/10360/Black-academic-staff-face-double-whammy-in-promotion-and-pay-stakes>. Accessed 23 Feb 2023
- Xiao Y, Pinkney E, Au TKF et al. (2020) Athena SWAN and gender diversity: a UK-based retrospective cohort study. *BMJ Open* 10:e032915. <https://doi.org/10.1136/bmjopen-2019-032915>

Acknowledgements

This research is supported by a Suicide Prevention during Covid-19 grant (C7151-20G, P.S.F.Y.).

Author contributions

Concept and design: YX, EP, PSFY. Acquisition, analysis, or interpretation of data: YX, TL, EP. Drafting of the manuscript: YX, EP. Critical revision of the manuscript for important intellectual content: All authors. Statistical analysis: YX, TL. Obtained funding: PSFY. Administrative, technical, or material support: YX, PSFY.

Competing interests

The authors declare no competing interests.

Ethical approval

This article does not contain any studies with human participants performed by any of the authors. Ethical approval is not applicable due to data being supplied to the research team anonymously and rounded to avoid identification in accordance with UK data protection law.

Informed consent

This study contained data from an official statistics agency and involved no personal or identifiable information.

Additional information

Supplementary information The online version contains supplementary material available at <https://doi.org/10.1057/s41599-023-02481-5>.

Correspondence and requests for materials should be addressed to Yunyu Xiao or Paul S. F. Yip.

Reprints and permission information is available at <http://www.nature.com/reprints>

Publisher's note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this license, visit <http://creativecommons.org/licenses/by/4.0/>.

© The Author(s) 2023