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NATURE PhD SURVEY 2019

REPORT BY: ELSIE LAUCLAN

KEY HEADLINES

- 37% of respondents are not studying in the country they grew up in. International (non-native) students are most likely to be completing their PhD in Europe (52%) and the US (25%).
- 19% of respondents have a job alongside their PhD studies. The main driver for this is to help make ends meet (53%), followed by a desire to develop additional skills (25%).

- Students were likely to rank their top concerns as uncertainty with career prospects, maintaining a work-life balance, completing studies on time and funding issues since starting their PhD.
- Interestingly, almost an even proportion of respondents believe their satisfaction has worsened (45%) since their graduate school experience, compared to increased (42%).

- 74% of respondents are satisfied with their decision to pursue a PhD. 71% of respondents are satisfied with their PhD experience. Factors which appear to correlate strongly with overall satisfaction include relationship with supervisor/PI, number of publications, hours worked, guidance from advisor in the lab and work-life balance.

- 27% of respondents report that they spend 41-50 hours on their PhD programme per week, and 25% report that they spend 51-60 hours. 85% of respondents who spend 41+ hours a week on their PhD are dissatisfied with their hours worked.
- 36% of respondents have sought help for anxiety or depression. 49% of respondents report a long-hours culture at their university.

- 21% of respondents have experienced bullying in their PhD programme. Supervisors (48%), other students (38%) and other staff (33%) were the most common perpetrators.
- 21% of respondents had experienced discrimination or harassment in their PhD programme. Gender (39%) and racial (33%) discrimination were the most common forms.

- 56% of respondents ranked academia as the sector they would most likely work in on completion of their PhD.
- The most popular career path is research in academia, followed by research in industry. Least popular paths appear to be non-research related roles.

- 41% of respondents suggest they are more likely to pursue a research career since commencing their PhD, compared to 26% who are less likely.
- Funding and work-life balance are key barriers to pursuing an academic research career.

- 67% of respondents believe their PhD will improve their job prospects either substantially or dramatically.
- A majority of respondents (46%) believe they will find a permanent position within the first 2 years of completing their PhD.

- Personal research is the main source of knowledge for students to base their current career decisions (60%). Observations and advice from supervisors and colleagues follows (30-28%).
- A third (33%) of respondents learn about non-academic career opportunities from people in their department.

- Over half of respondents (51%) agree that department staff are open to them pursuing a career outside academia, however only 29% agree that they have been given useful advice on this. Only a quarter agree that their programme is preparing them well for a non-research science-related career.
- 24% report that they would change their PI and 8% would not pursue a PhD at all, given the chance to start over.

The *Nature* team have run a biennial PhD Career survey since 2011. Shift Learning have supported on development, hosting and analysis of the 2019 results. To ensure topics covered within the survey were relevant and resonated with graduates, an initial exploratory qualitative phase took place. Findings from ten interviews informed development of the quantitative survey.

- The online survey was developed in collaboration with *Nature* and sent to their database and subscribers via a number of channels. In order to boost response in specific regions which have been previously under-represented, the survey was translated into 4 languages (Mandarin Chinese, Portuguese, Spanish and French) in addition to English. The survey was live for approximately 6 weeks. Only current PhD students were included within the final analysis. Respondents who provided poor quality responses were removed from the dataset, in addition to those with missing data.



The survey included up to 56 questions



We received up to 14,260 responses* to the survey



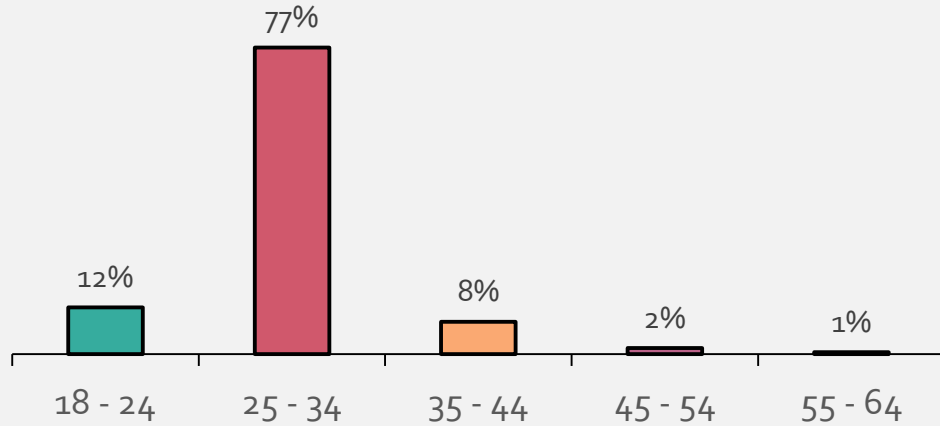
Following data cleaning, we had a usable sample of 6,320

*Including partial completes.

PROFILE OF RESPONDENTS

DEMOGRAPHIC BREAKDOWN

Q: What is your age?



Q: Are you...



49% male



50% female

6,320
respondents

Q: Do you have any caring responsibilities?



11% yes – child under 12

2% yes – child over 12

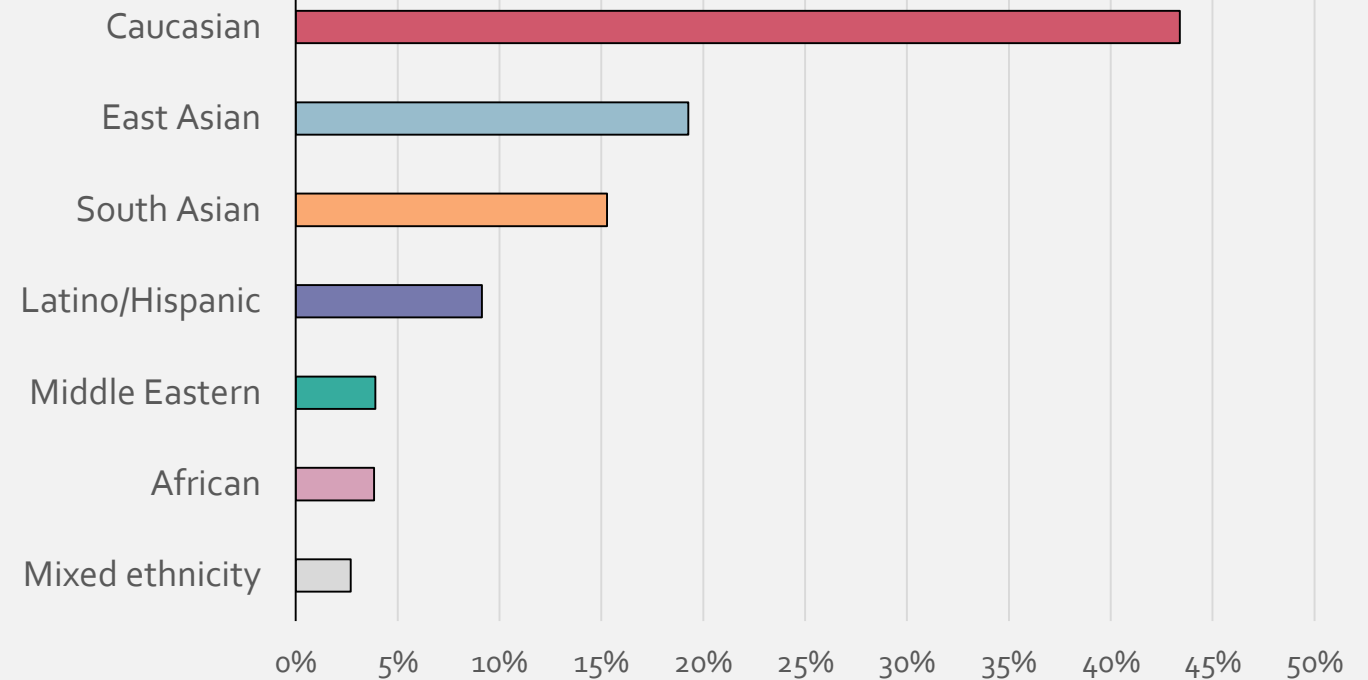


11% yes – adult

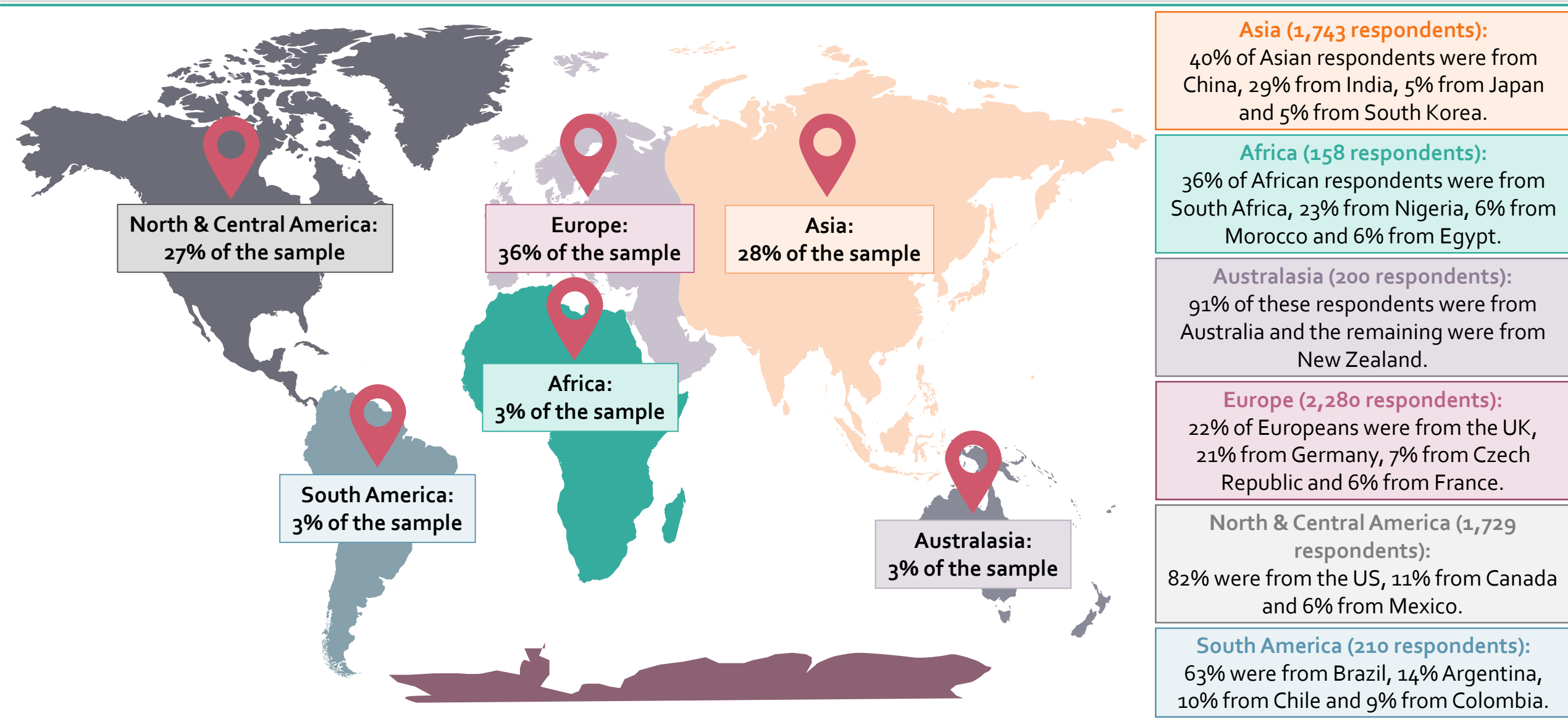


78% no caring responsibilities

Q: Which of the following best describes you?



REGIONAL BREAKDOWN

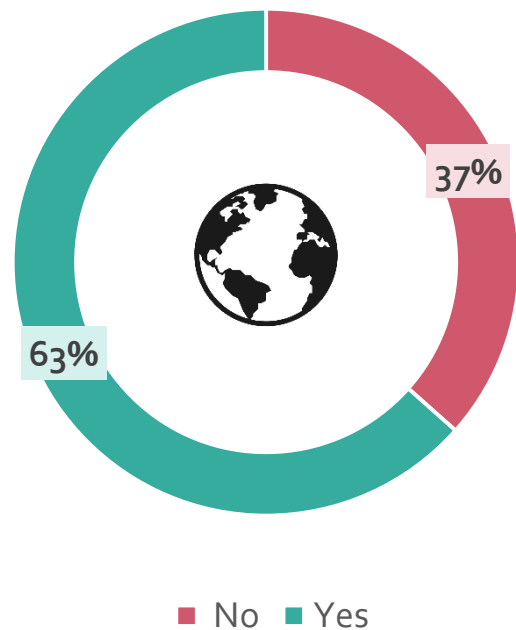


EMPLOYMENT AND STUDY DECISIONS

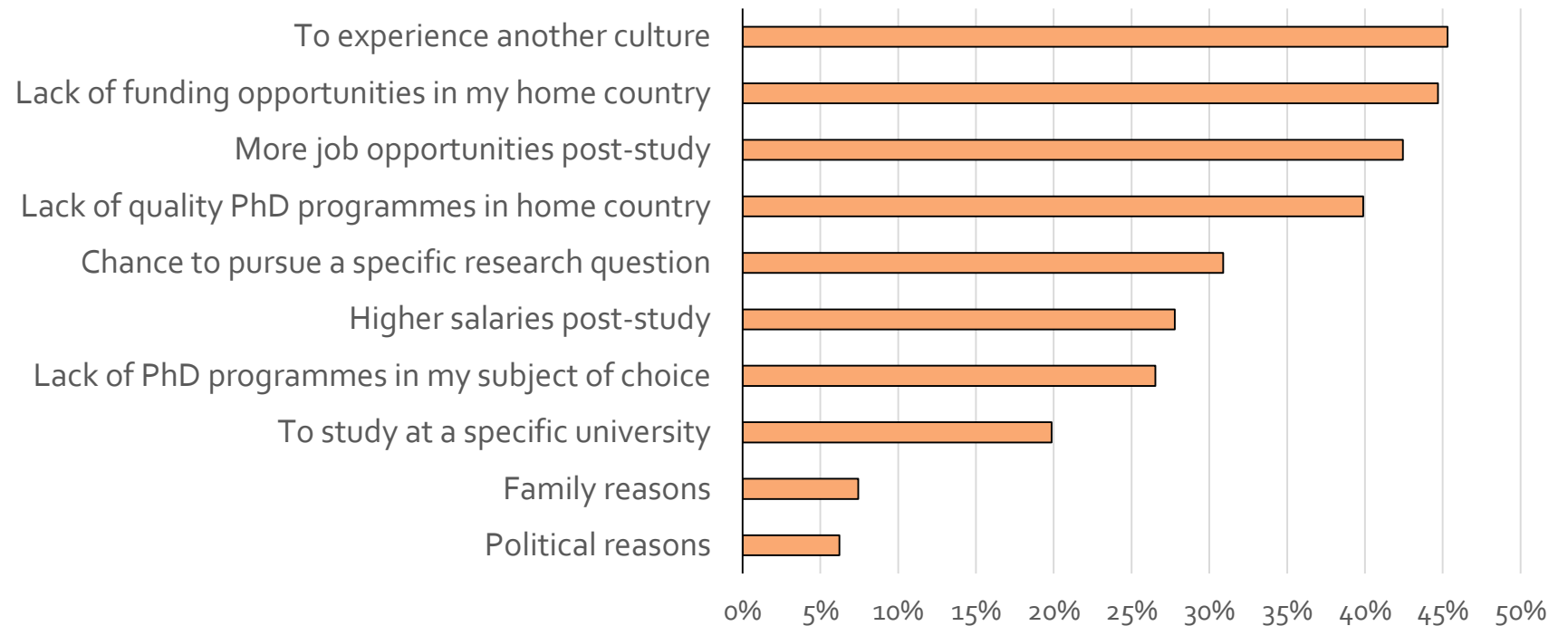
A LACK OF FUNDING IS DRIVING STUDENTS TO STUDY IN A DIFFERENT COUNTRY

37% of respondents are not studying in the country they grew up in. Students who are studying in a different country to that which they grew up in are most likely to be completing their PhD in Europe (52%) and the US (25%). Besides from experiencing a new culture, the main drivers for studying outside the country of origin were funding and employment considerations.

Q: Are you studying in the country you grew up in?



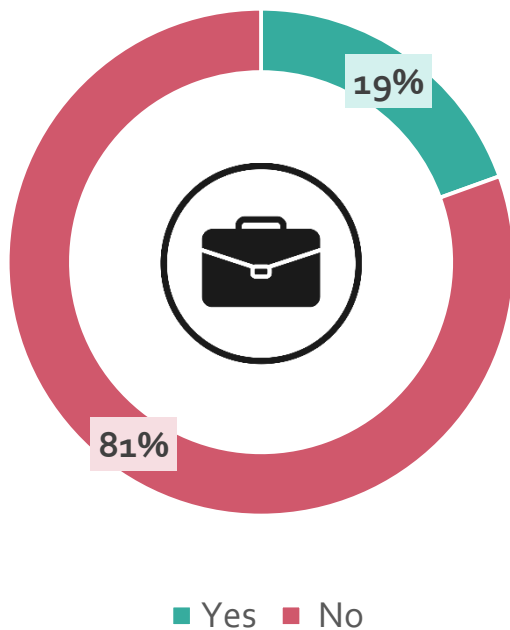
Q: What prompted you to study outside your country of upbringing?
(Multi choice)



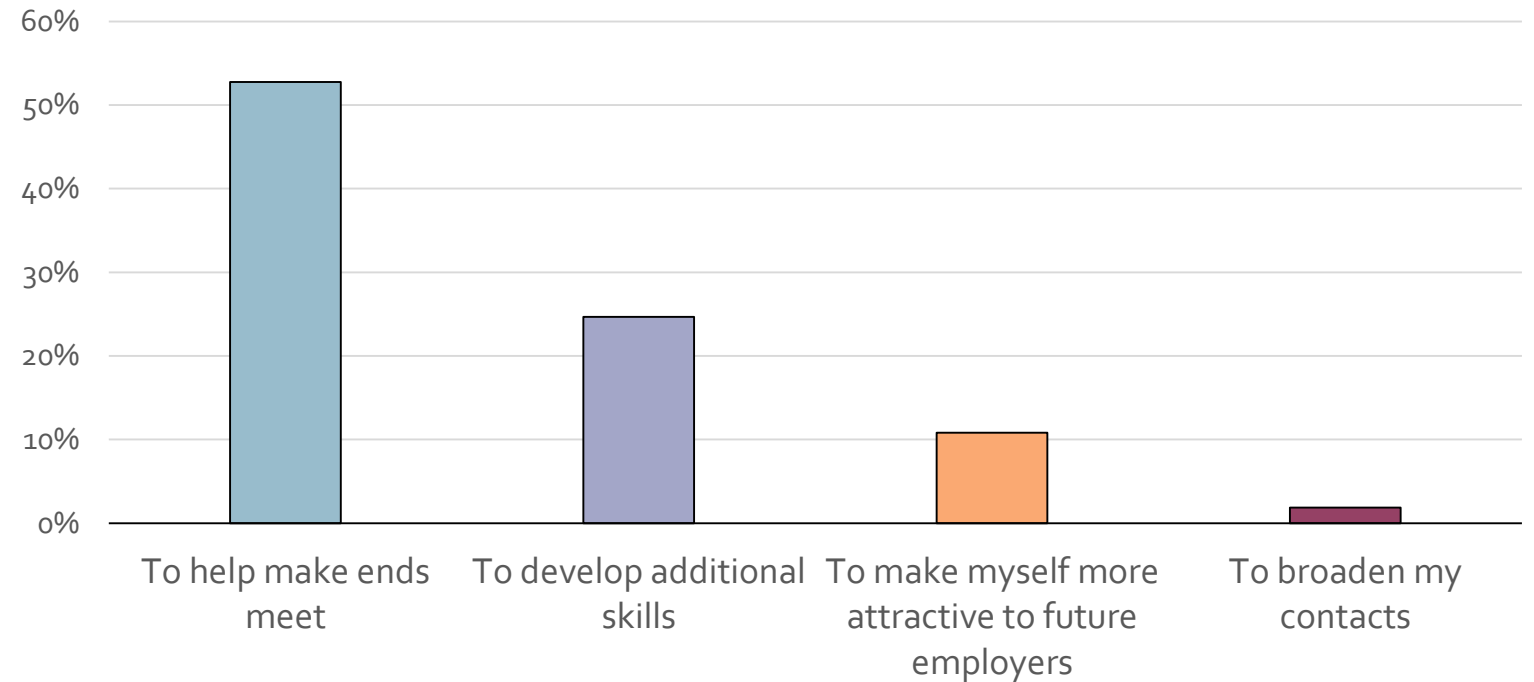
APPROXIMATELY A FIFTH OF STUDENTS HAVE A JOB ALONGSIDE THEIR STUDIES

19% of respondents have a job alongside their PhD studies. The main driver for this is to help make ends meet (53%), followed by a desire to develop additional skills (25%). Respondents aged 35+ years were significantly more likely to have a job than students aged 34 years and under. Carers were also significantly more likely to be in work.

Q: Do you have a job alongside your studies?



Q: What is your main reason for having a job?



STUDENT SATISFACTION

Q: What concerns you the most since you started your PhD?

Top concerns (% who ranked concern within top 5)

- Uncertainty about my job/career prospects (79%)
- The difficulty of maintaining a work/life balance (78%)
- Inability to finish my studies in the time period I had set out to (74%)
- The number of available faculty research jobs beyond postdoc (70%)
- The difficulty of getting funding / low success rates for grant applications (68%)
- Financial worries after my PhD (cost of living, inability to save for a house, children, retirement) (67%)

Mid level concerns (% who ranked concern 6th – 10th)

- Concern about my mental health as a result of PhD study (29%)
- The high numbers of PhD holders who are doing or have done multiple postdocs (37%)
- Uncertainty about the value of a PhD (31%)
- Poor support and acknowledgement of my parenting/elder care responsibilities (30%)
- Impact of a poor relationship with my supervisor/PI (23%)

Lower level concerns (% who ranked concern within bottom 4)

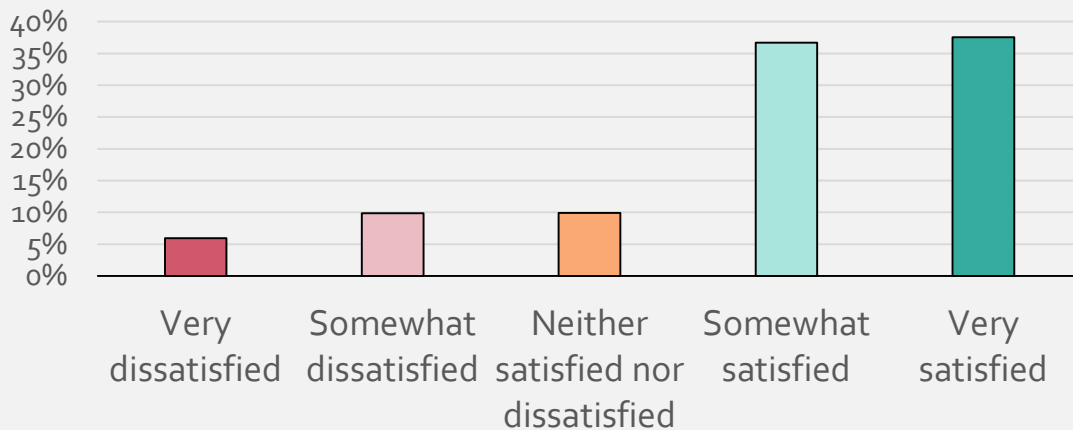
- Impostor syndrome (16%)
- Political landscape (29%)
- Student debt during my PhD (50%)
- Poor support and acknowledgement of my parenting/elder care responsibilities (42%)

- Students were presented with a list of concerns and were asked to rank them in relation to their own experiences. The top concerns were identified to be uncertainty with career prospects, maintaining a work-life balance, completing studies on time and funding issues.
- The top concerns* did vary by region, however.
- **Africa:** difficulty of getting funding, financial worries post-study, inability to finish studies on time, political landscape.
- **Australasia:** number of faculty research jobs available, uncertainty about career prospects, maintaining a work-life balance.
- **Asia:** uncertainty about career prospects, financial worries, uncertainty of the value of a PhD, poor support for elder care responsibilities.
- **Europe:** impact of poor supervisor relationship, maintaining a work-life balance, concern about mental health, imposter syndrome.
- **North or Central America:** imposter syndrome, the number of faculty research jobs available.
- **South America:** uncertainty about career prospects, political landscape, the number of faculty research jobs available.
- Respondents were asked to describe any other concerns they had since commencing their PhD. The most common concerns cited were publication pressures (10%), a lack of support, guidance and/or supervision (7%), financial pressures (7%), and progress and quality of work (7%).

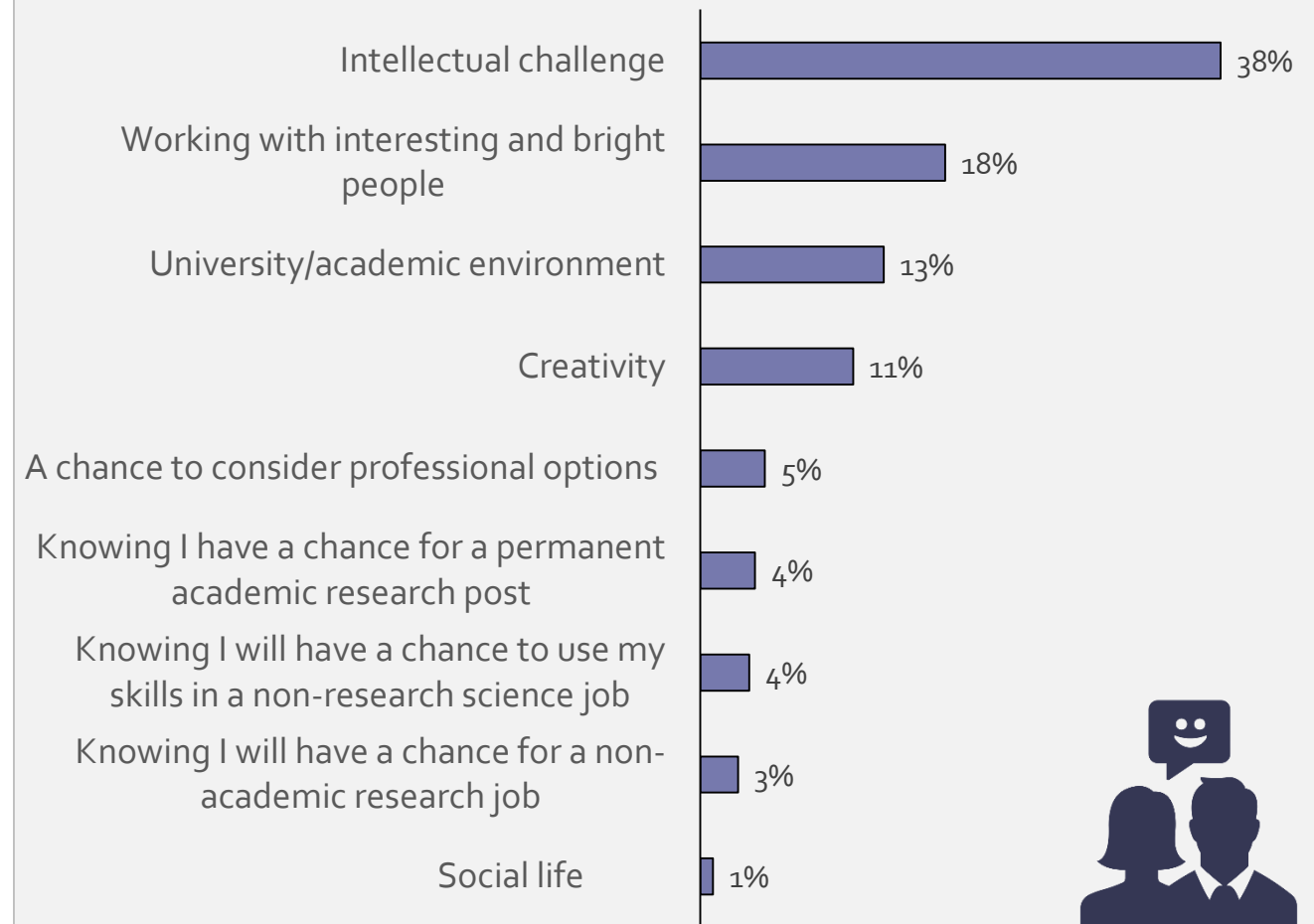
16% OF RESPONDENTS ARE DISSATISFIED WITH THEIR DECISION TO PURSUE A PhD

- 74% of respondents are satisfied with their decision to pursue a PhD.
- Students are most likely to enjoy the intellectual challenge of being a PhD student (38%) and working with interesting people (18%). They are least likely to enjoy the social life of a PhD student (1%).
- Other areas of enjoyment mentioned by respondents included flexibility, the positive impact of their work, independence, travel and personal development.

Q: How satisfied are you with your decision to pursue a PhD?

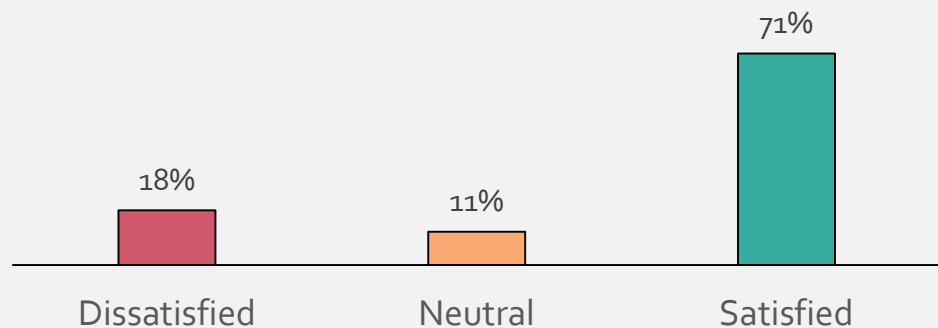


Q: Overall, what do you enjoy most about life as a PhD student?



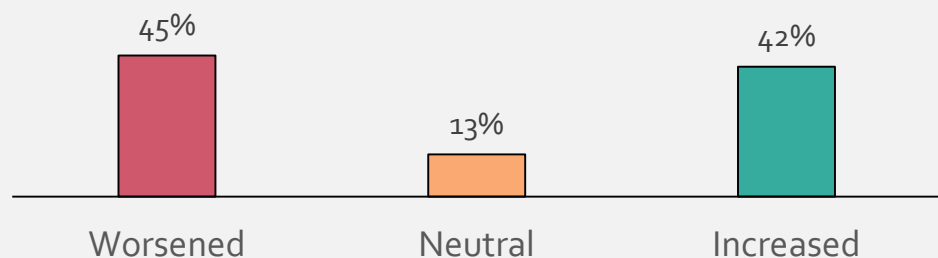
71% OF RESPONDENTS ARE SATISFIED WITH THEIR PhD EXPERIENCE

Q: How satisfied are you with your PhD experience?

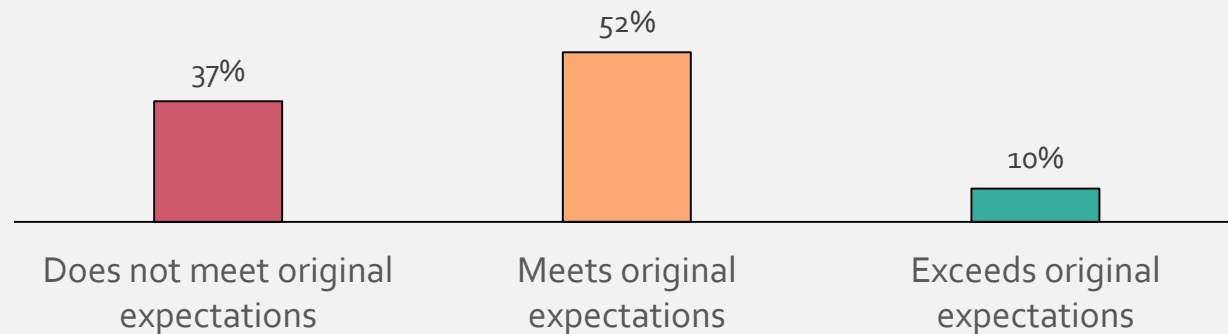


- Respondents rated their satisfaction with their PhD experience an average of 4.9 out of 7. Factors which appear to correlate strongly with overall satisfaction include relationship with supervisor/PI, number of publications, hours worked, guidance from advisor in the lab and work-life balance.
- Interestingly, almost an even proportion of respondents believe their satisfaction has worsened since their graduate school experience, compared to increased.
- Only 10% of respondents believe their PhD programme has exceeded their expectations, whereas 37% believe it hasn't met their expectations. The latter opinion particularly reflects those based in India (55%).

Q: Since the very start of your graduate school experience, would you say your level of satisfaction has:

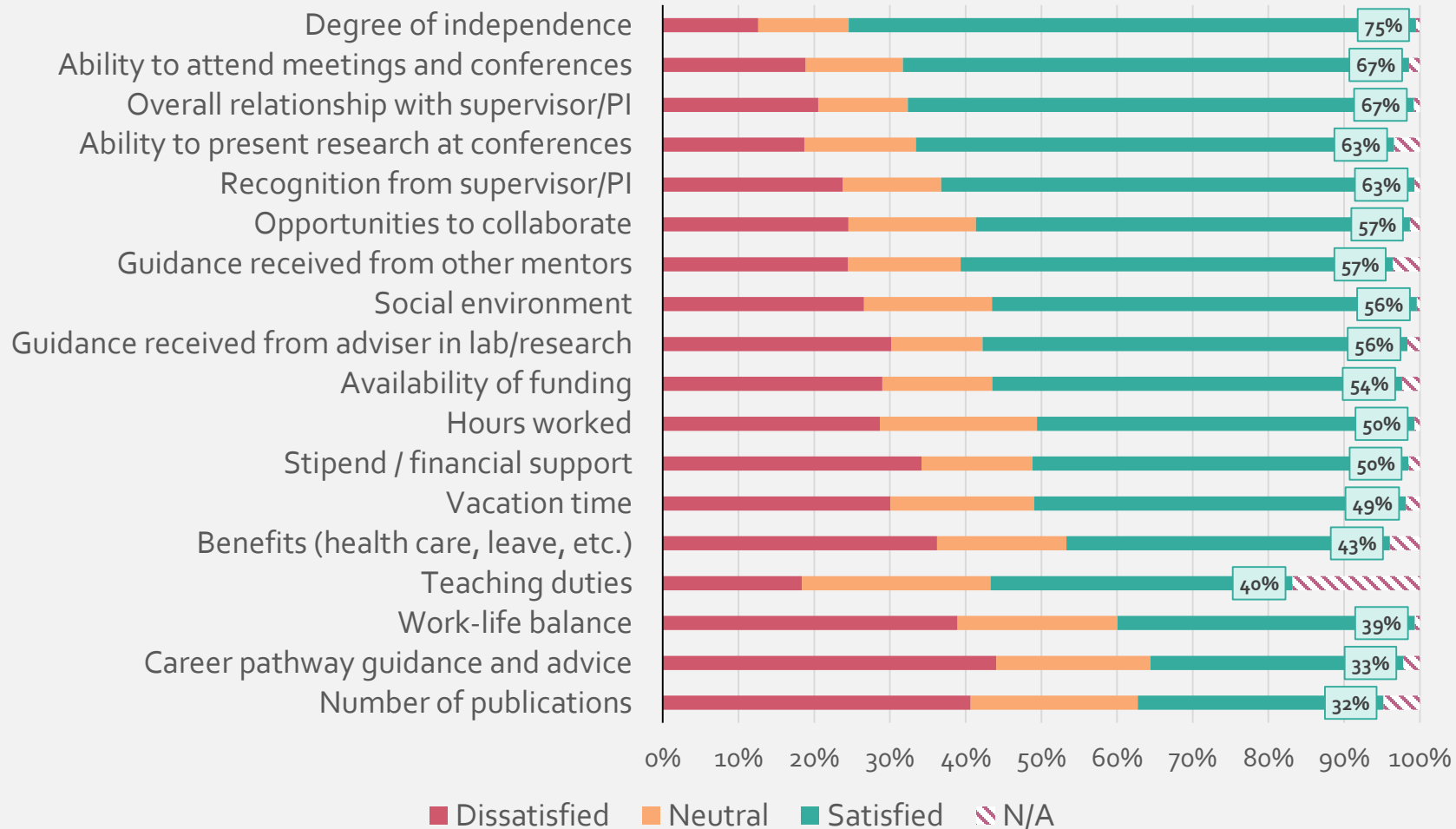


Q: To what extent does your PhD programme compare to your original expectations?



CAREER GUIDANCE, NUMBER OF PUBLICATIONS AND WORK-LIFE BALANCE ARE BIGGEST AREAS OF DISSATISFACTION

Q: How satisfied are you with each of the following attributes or aspects of your PhD?

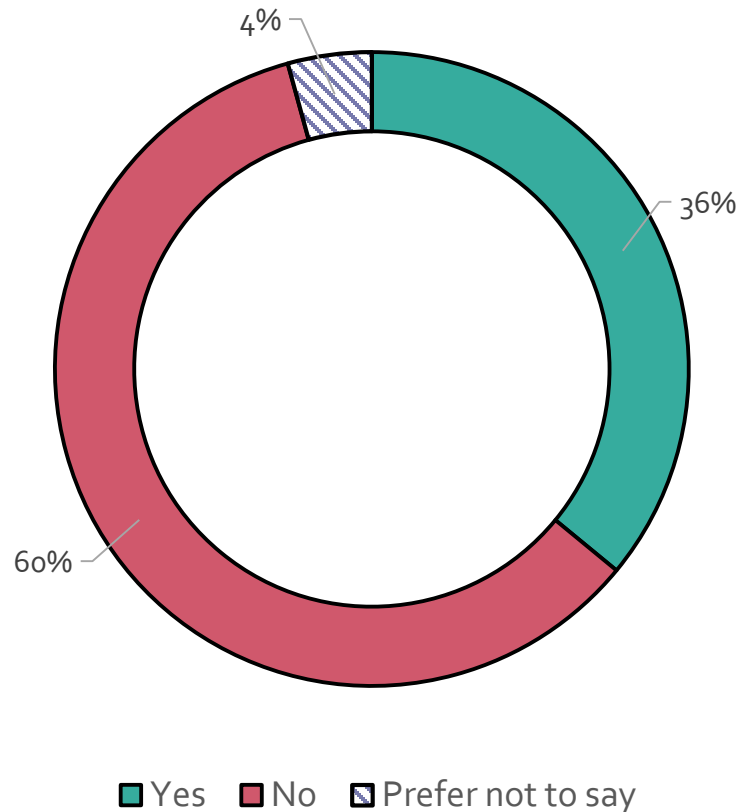


- Respondents are most satisfied with the degree of independence, relationship with their supervisor, ability to attend meetings and conferences, and the ability to present at conferences.
- Students' relationship with supervisor/PI does seem to have a particular impact on overall satisfaction. 53% of respondents who are dissatisfied overall with their PhD experience are dissatisfied with this relationship.
- They are least satisfied with career pathway guidance, number of publications, work-life balance, benefits, and stipend.
- Respondents from Africa are particularly dissatisfied with funding availability (57%) and stipend (56%).
- Funding dissatisfaction also seems most prevalent amongst older students (35+ years).
- Those based in Asia are significantly likely to be dissatisfied with vacation time (39%), opportunities to attend meetings (23%) and benefits (42%).

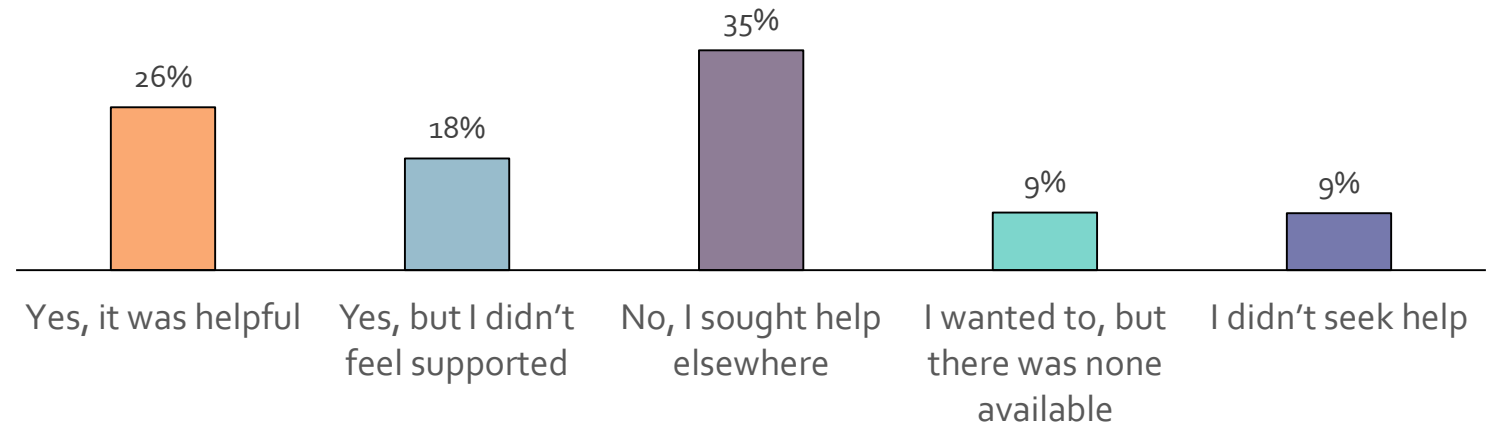
MENTAL HEALTH AND DISCRIMINATION

36% OF RESPONDENTS HAVE SOUGHT HELP FOR ANXIETY OR DEPRESSION

Q: Have you ever sought help for anxiety or depression caused by PhD study?



Q: Did you seek help for anxiety or depression within your institution?

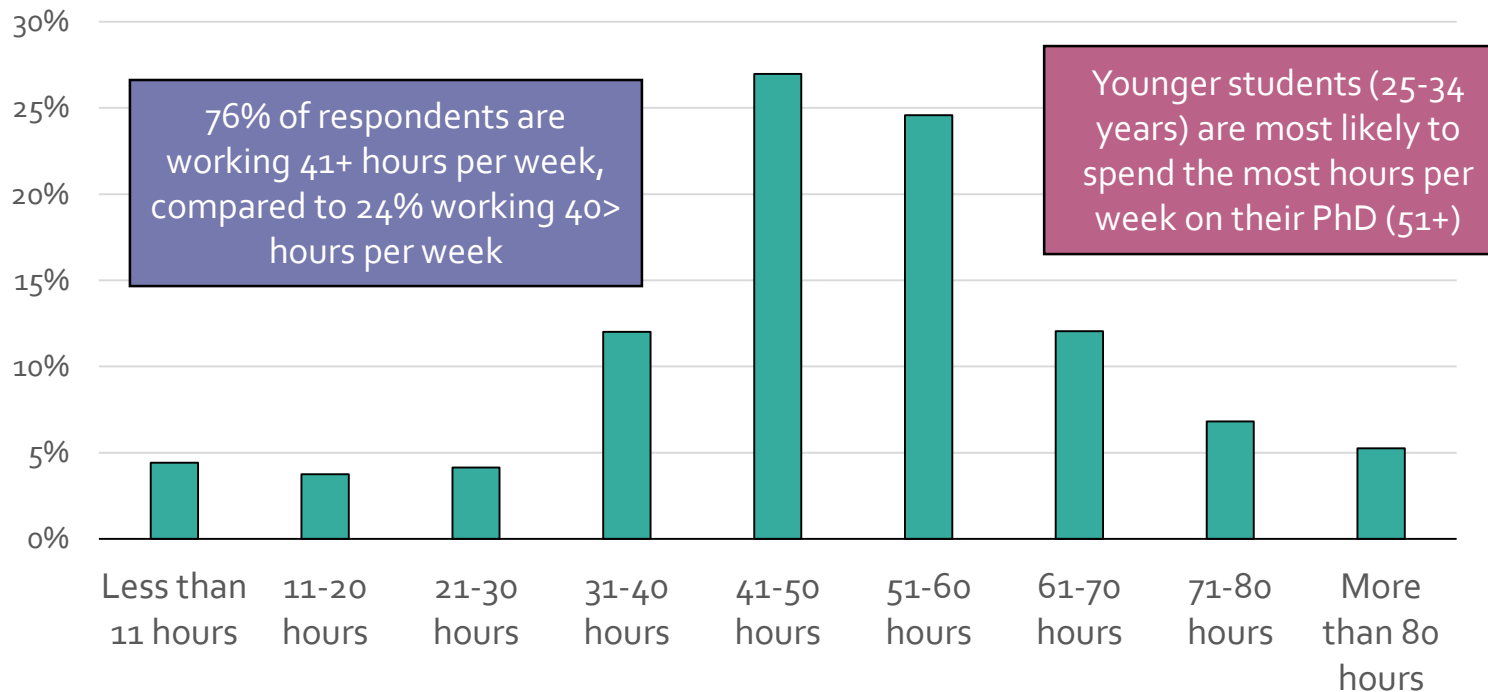


- Of the respondents who had sought help for anxiety and depression caused by PhD study, 43% done so via their institution. However, only 26% found this helpful. 9% indicate they sought help but none was available.
- Qualitative interviews indicated that mental health support within the universities was usually available, but interviewees often mentioned having to seek it out themselves – it wasn't promoted around campus and supervisors seemed unlikely to advise accessing mental health support. If support was available, there were often long waiting times, a lack of counsellors and few hours given for free or at an affordable price.

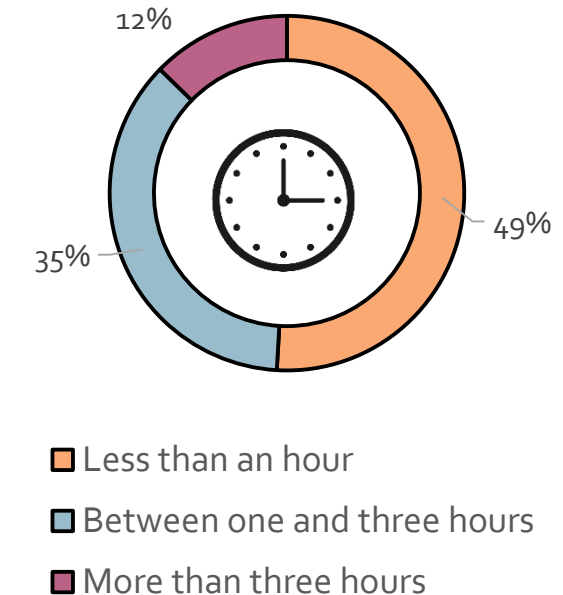
76% OF RESPONDENTS ARE WORKING 41+ HOURS PER WEEK

27% of respondents report that they spend 41-50 hours on their PhD programme per week, and 25% report that they spend 51-60 hours. 85% of respondents who spend 41+ hours a week on their PhD are dissatisfied with their hours worked. Almost half of respondents (51%) suggest they receive less than an hour 1-2-1 contact time with their supervisor per week.

Q: On average, how many hours a week do you typically spend on your PhD programme?



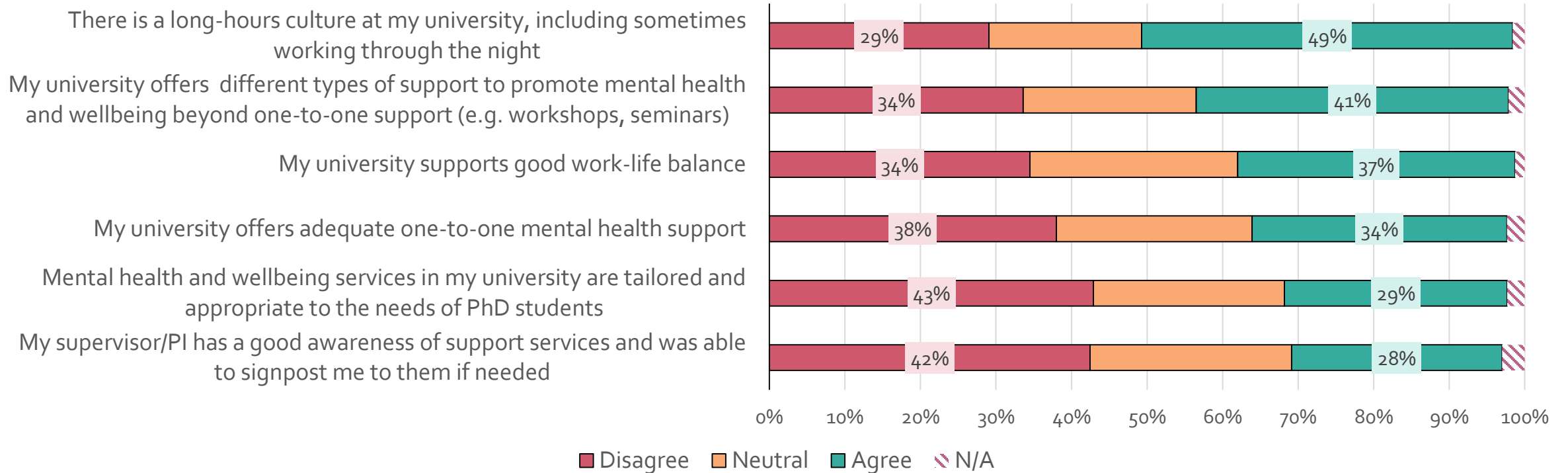
Q: On average, how much one-on-one contact time do you spend with your supervisor each week?



NEARLY HALF OF RESPONDENTS REPORT A LONG-HOURS CULTURE AT THEIR UNIVERSITY, ALTHOUGH 37% STILL SUGGEST A GOOD WORK-LIFE BALANCE

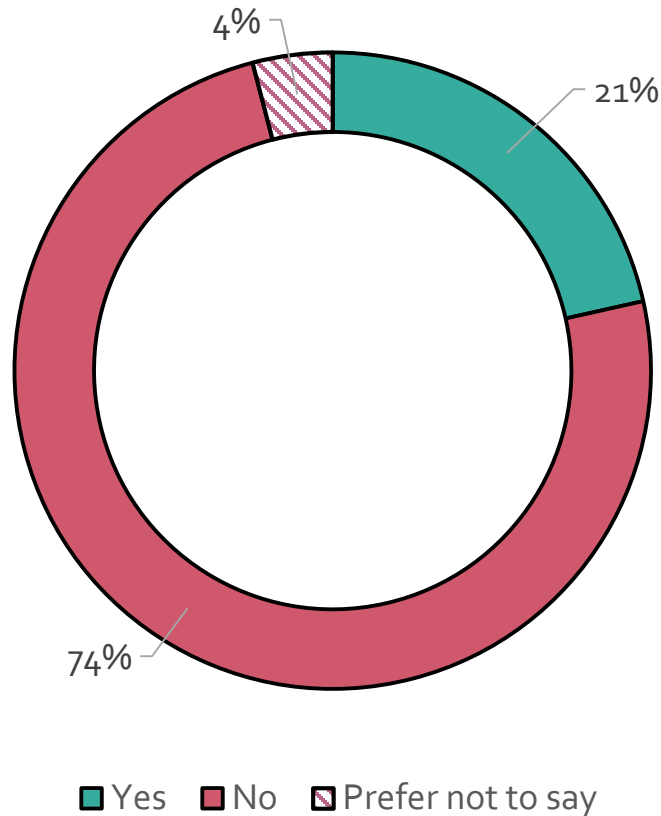
Qualitative findings suggested there were issues of upholding the reputation of universities – some interviewees felt that discrimination and mental health incidents were played down to protect the university’s reputation. These results suggest more could be done by universities to promote available support students.

Q: To what extent do you agree or disagree with the following statements?

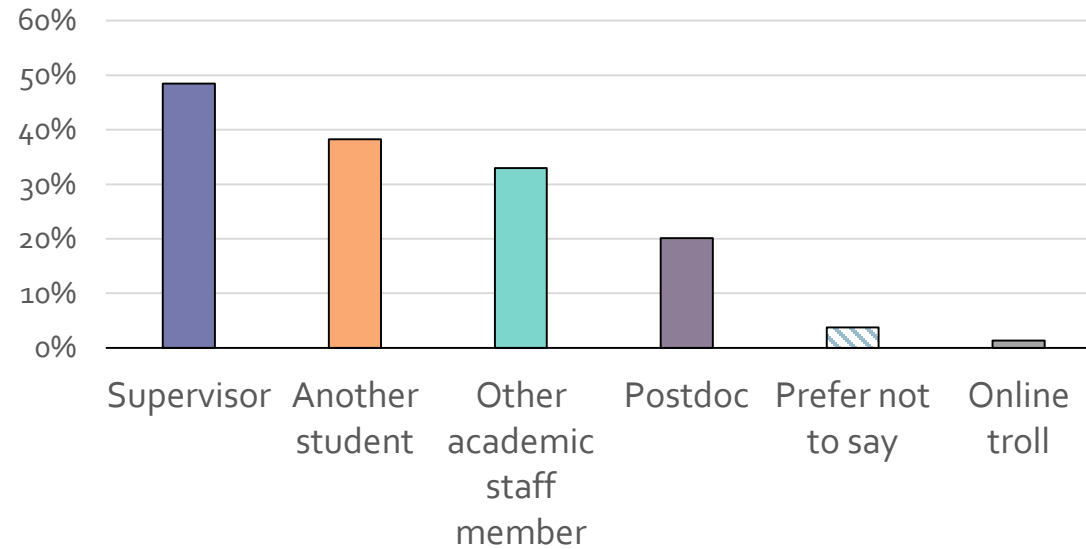


OVER A FIFTH OF RESPONDENTS HAVE EXPERIENCED BULLYING AND 57% OF THESE STUDENTS FEEL UNABLE TO SPEAK OUT ABOUT THEIR EXPERIENCES

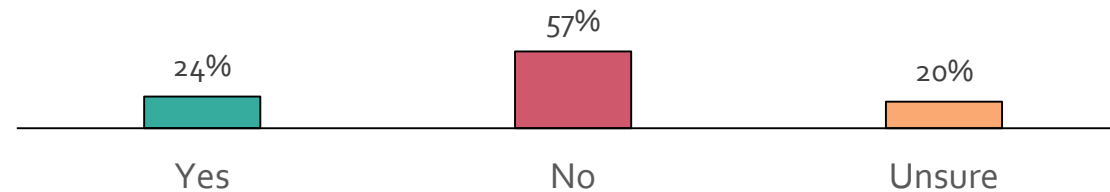
Q: Do you feel that you have experienced bullying in your PhD program?



Q: Who was the perpetrator(s)?



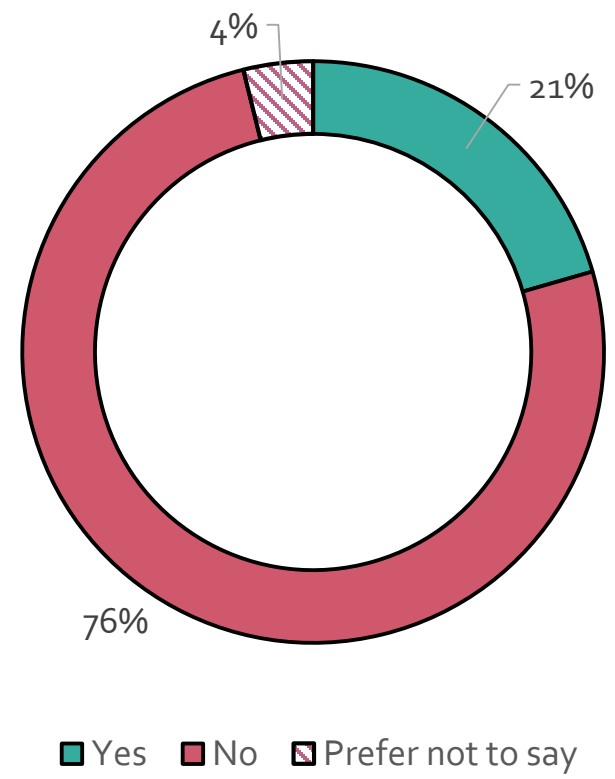
Q: Do you feel able to speak out about your experiences of bullying without personal repercussions?



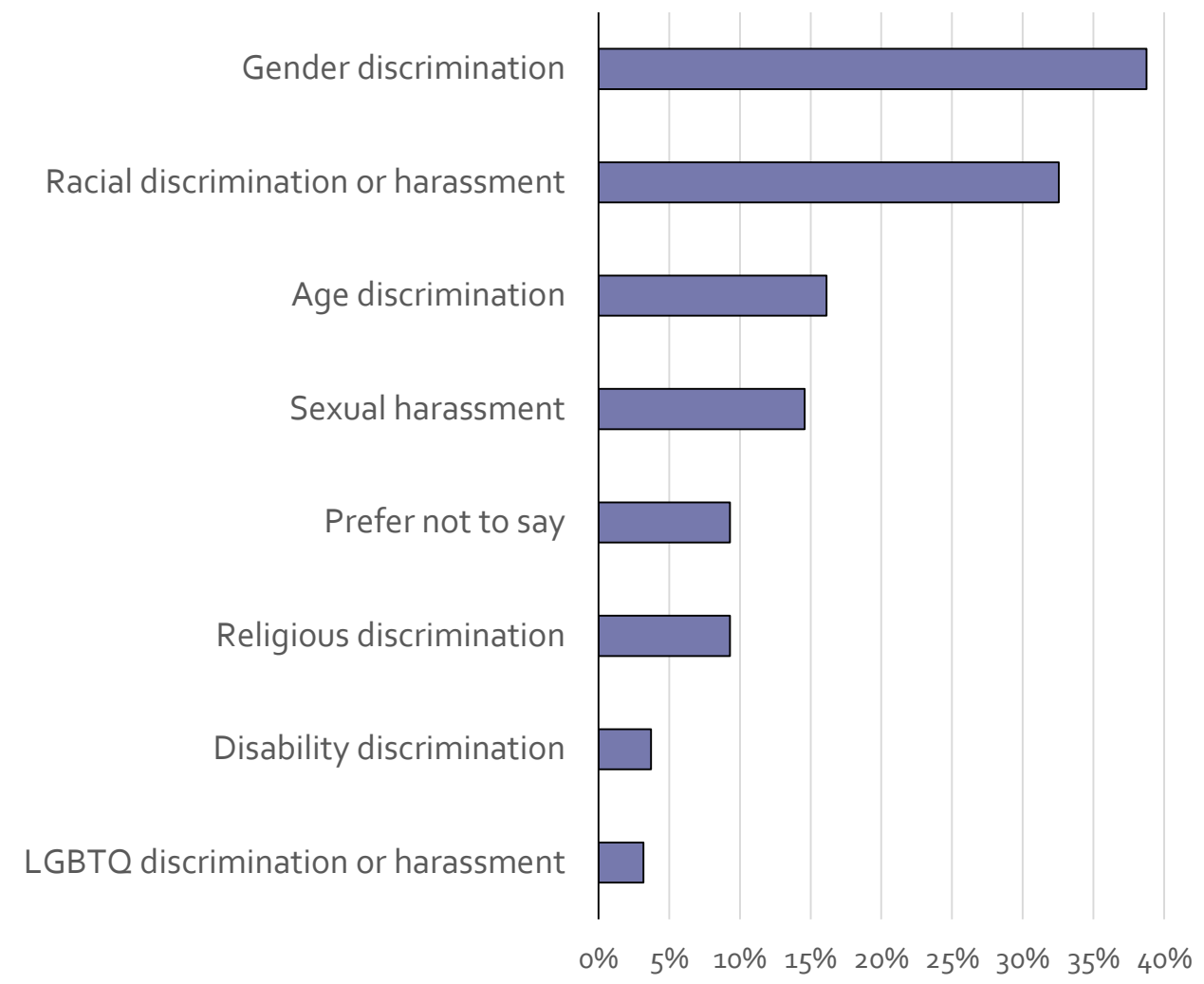
- 21% of respondents have experienced bullying in their PhD programme.
- Supervisors (48%) and other students (38%) were the most common perpetrators.
- Qualitative findings suggested bullying from supervisors took different forms, such as acting aggressively towards students, asking them to work outside of their remit, or being overly critical.
- Over half of those who had experienced bullying felt unable to speak out about their experiences (57%).
- Qualitative interviews suggested fear of repercussions due to not being able to speak up anonymously.

OVER A FIFTH OF RESPONDENTS HAVE EXPERIENCED DISCRIMINATION OR HARASSMENT

Q: Do you feel that you have experienced discrimination or harassment in your PhD program?



Q: Which of the following have you experienced?

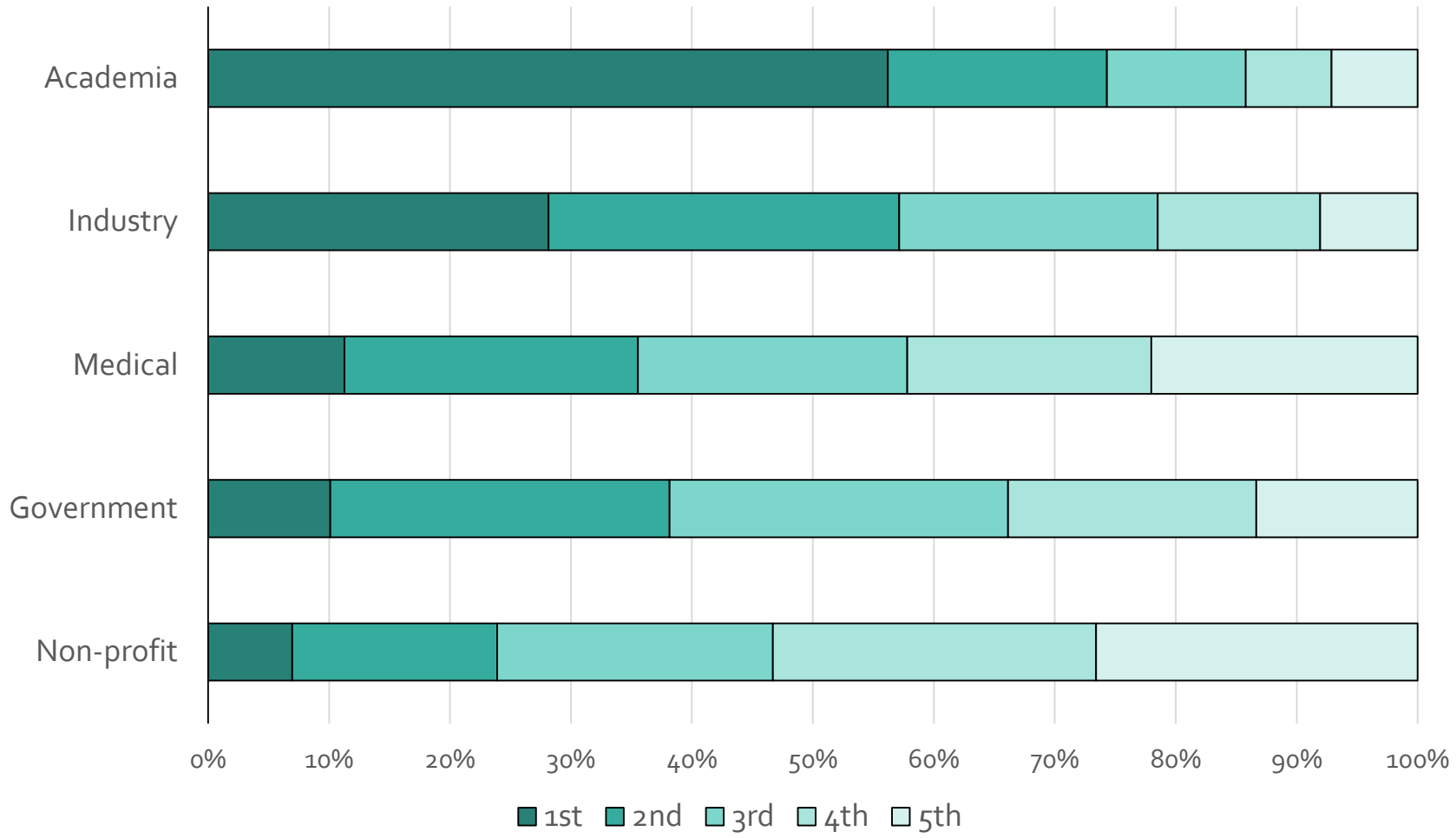


- 21% of respondents had experienced discrimination or harassment in their PhD programme.
- Gender (39%) and racial (33%) discrimination were the most common forms.
- 85% of those who had experienced gender discrimination were women. 88% who had experienced sexual harassment were women.
- Sexual harassment was most prevalent in North & Central America.
- Other forms of discrimination or harassment mentioned by survey respondents included xenophobia, socio-economic, cronyism, cultural and political.

FUTURE CAREER PLANS

OVER HALF OF RESPONDENTS SUGGEST ACADEMIA IS THEIR #1 CAREER DESTINATION

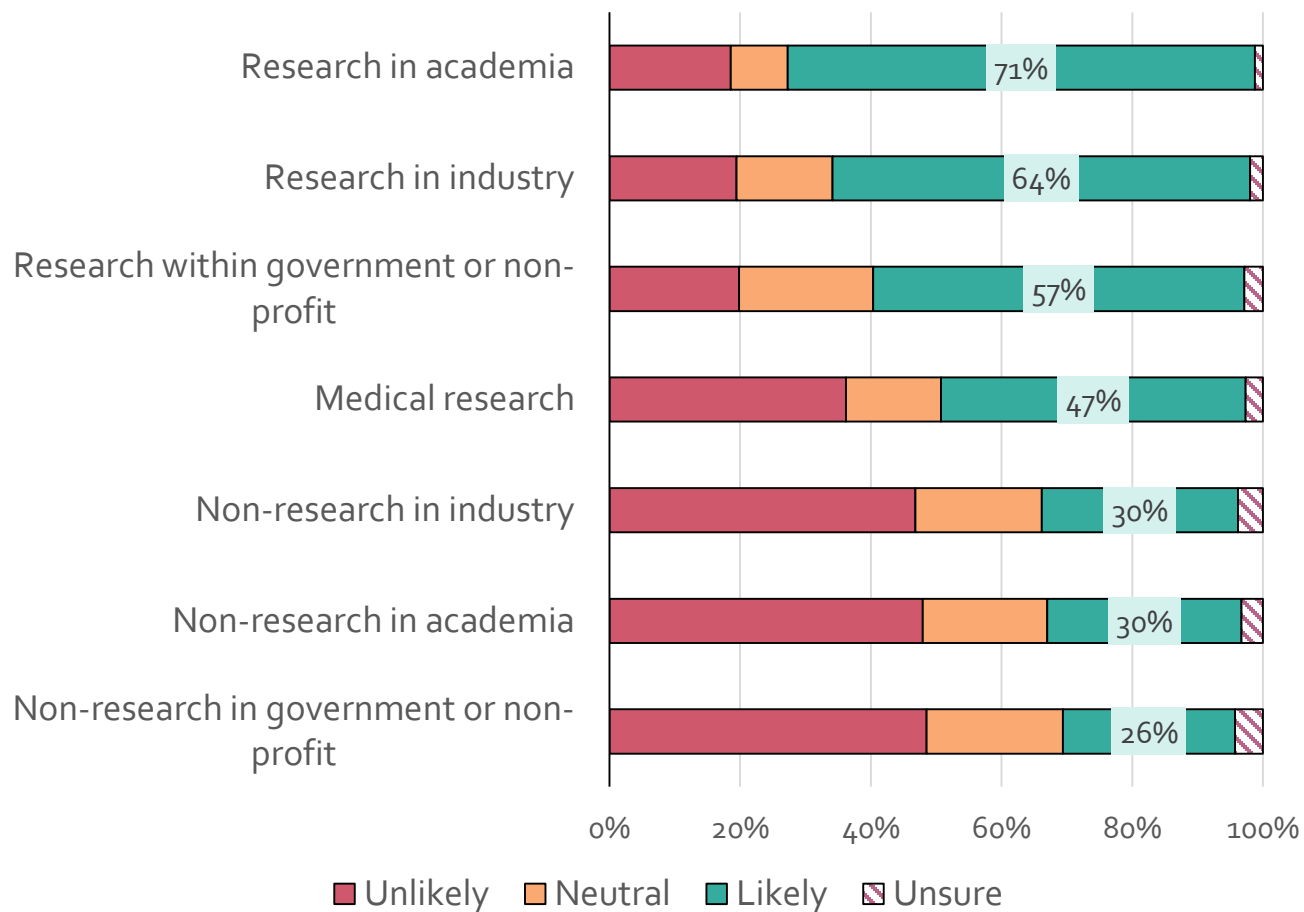
Q: Which of the following sectors would you most like to work in (beyond a postdoc) when you complete your degree? (Ranked 1st – 5th)



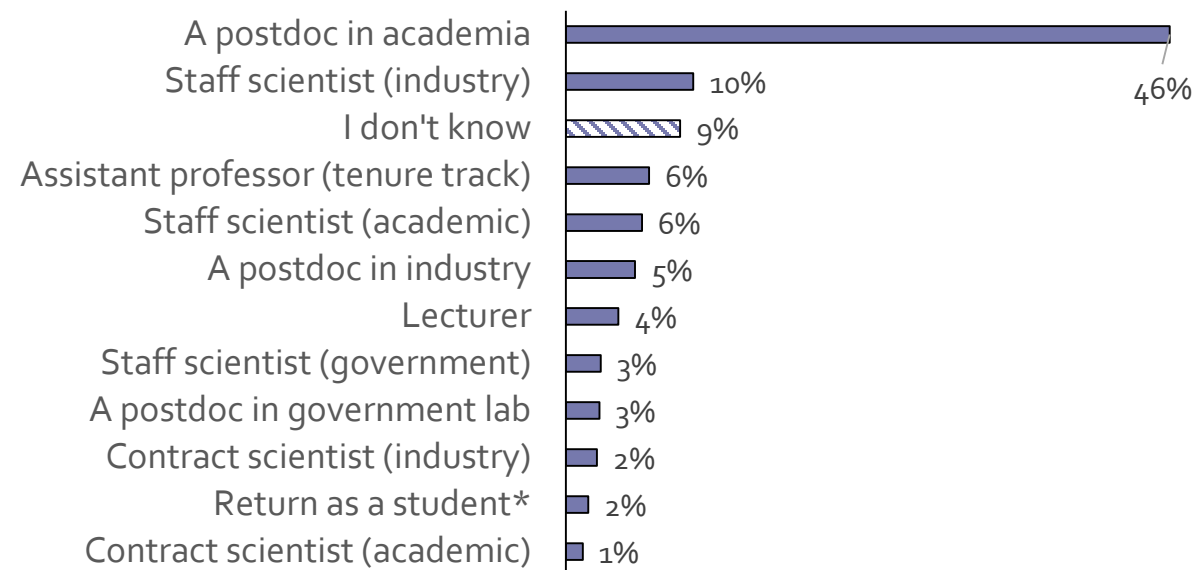
- 56% of respondents ranked academia as the sector they would most likely work in on completion of their PhD.
- Industry appears to be the 2nd most popular option, with 28% of respondents ranking this #1.
- Respondents were significantly likely to rank medical and non-profit sectors as the least appealing career paths.
- Those based in Asia and South America were most likely to rank academia #1. European and US respondents were most likely to be open to industry.
- Men were significantly more interested in academia than women.

RESPONDENTS ARE MOST LIKELY TO PURSUE A RESEARCH IN ACADEMIA PATH

Q: Please use the scale below to indicate how likely you are to pursue one of these career paths upon completion of your programme.



Q: What position do you most expect to occupy immediately after you complete your degree?



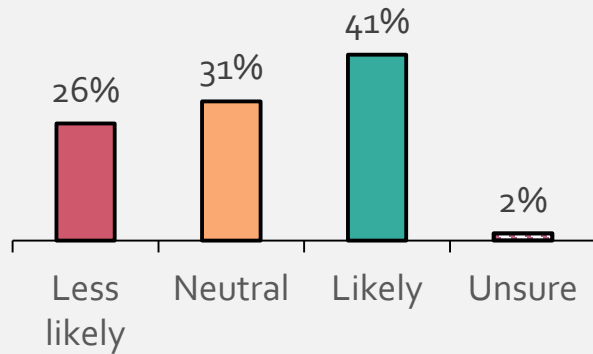
- The most popular career path is research in academia, followed by research in industry. Male respondents are significantly more likely to pursue research in academia and industry than female students.
- Least popular paths appear to be non-research related roles.
- Those interested in a research career are likely to expect to move into a postdoc in academia role.

Base n = 6320; Position base n = 5934 (only asked if interested in a research career)

*To undertake another degree

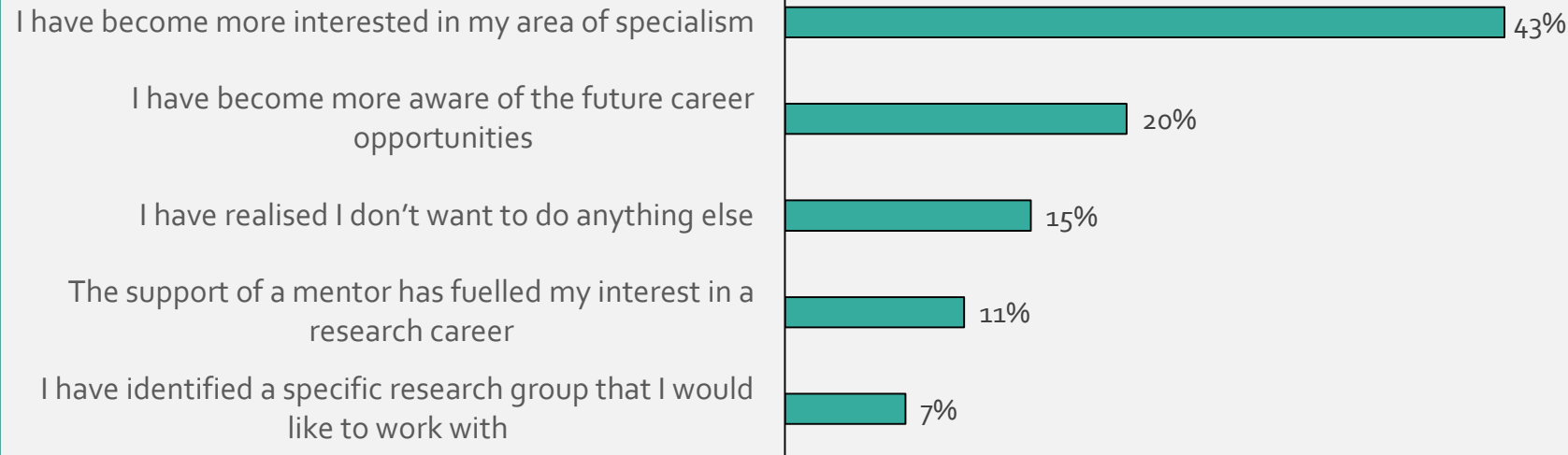
FUNDING AND WORK-LIFE BALANCE ARE BARRIERS TO PURSUING AN ACADEMIC RESEARCH CAREER

Q: How much more likely are you now to pursue a research career than when you launched your PhD programme?

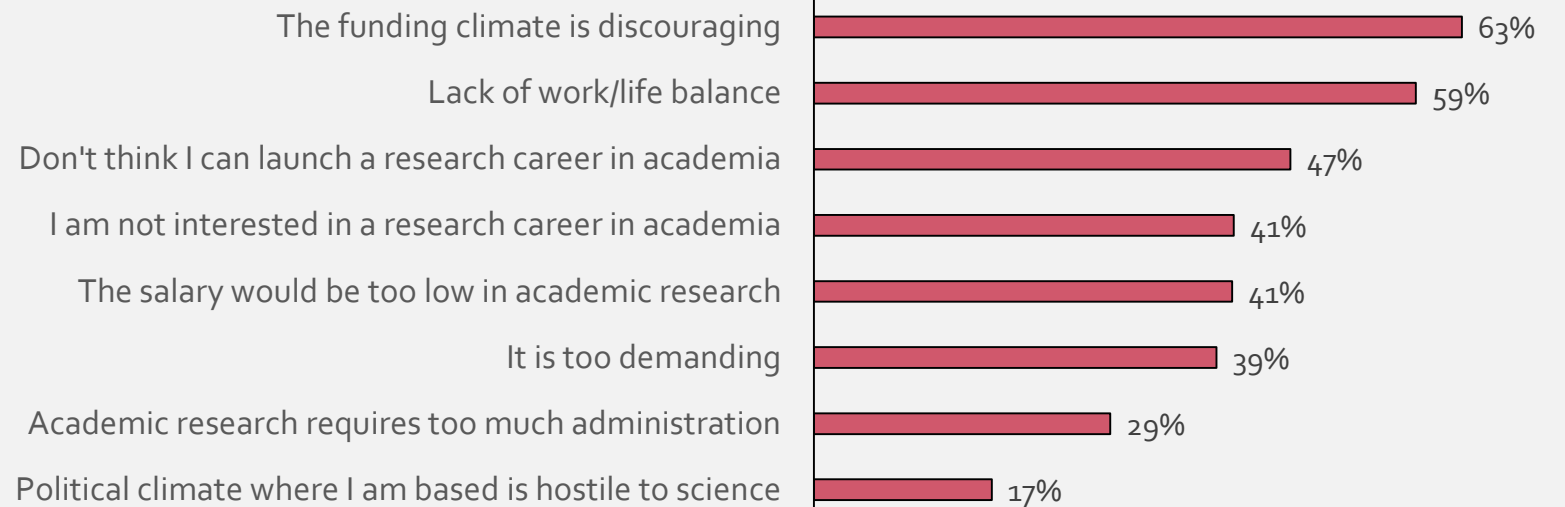


- 41% of respondents suggest they are more likely to pursue a research career since commencing their PhD, compared to 26% who are less likely.
- Drivers include specialism interest and awareness of career opportunities.
- Female respondents are significantly likely to cite work-life balance as a barrier, whereas men are more likely to suggest the low salary as off-putting.

Q: What is the main reason why you are more likely to pursue a research career?

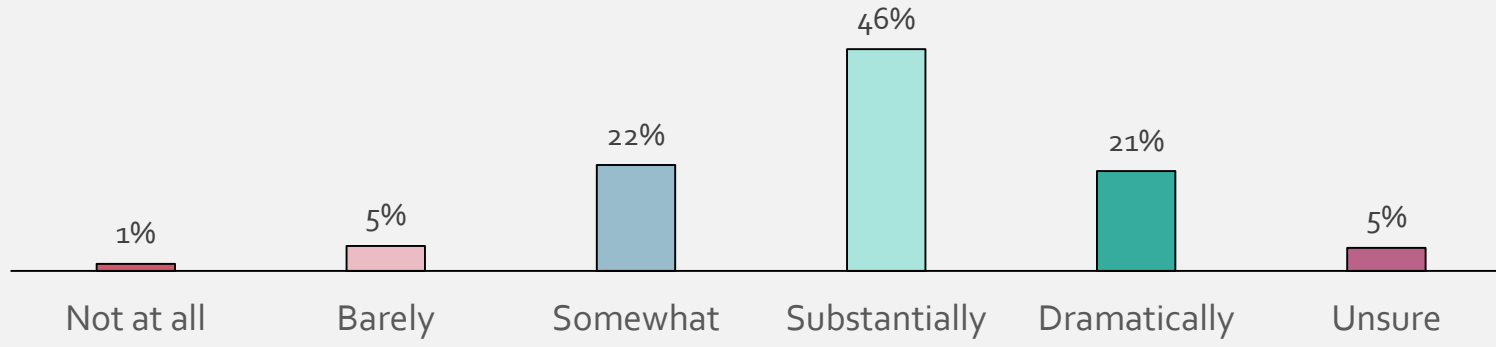


Q: If you're unlikely to pursue an academic research career, what are the main reasons?



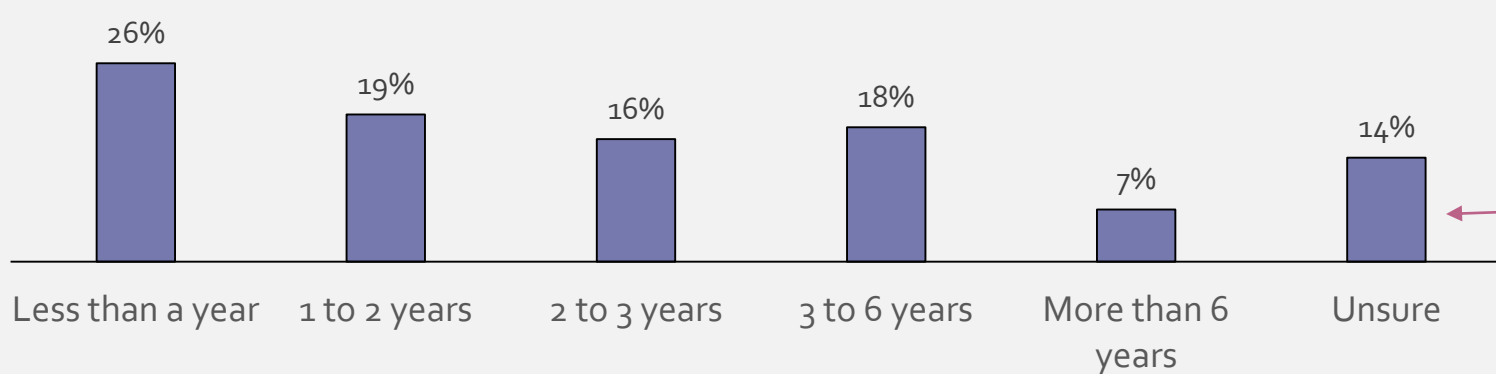
OVER A QUARTER OF RESPONDENTS BELIEVE IT WILL TAKE <1 YEAR TO FIND A JOB

Q: How much do you expect your PhD to improve your job prospects?



- 67% of respondents believe their PhD will improve their job prospects either substantially or dramatically. This increased to 78% when exploring results from African respondents specifically.
- 7% of respondents believe it would have barely any impact, or no impact at all. This was significantly likely to be the case for European respondents (8%).
- A majority of respondents (46%) believe they will find a permanent position within the first 2 years of completing their PhD.

Q: After completing your PhD, how long do you think it will take you to find a permanent (non-trainee) position?

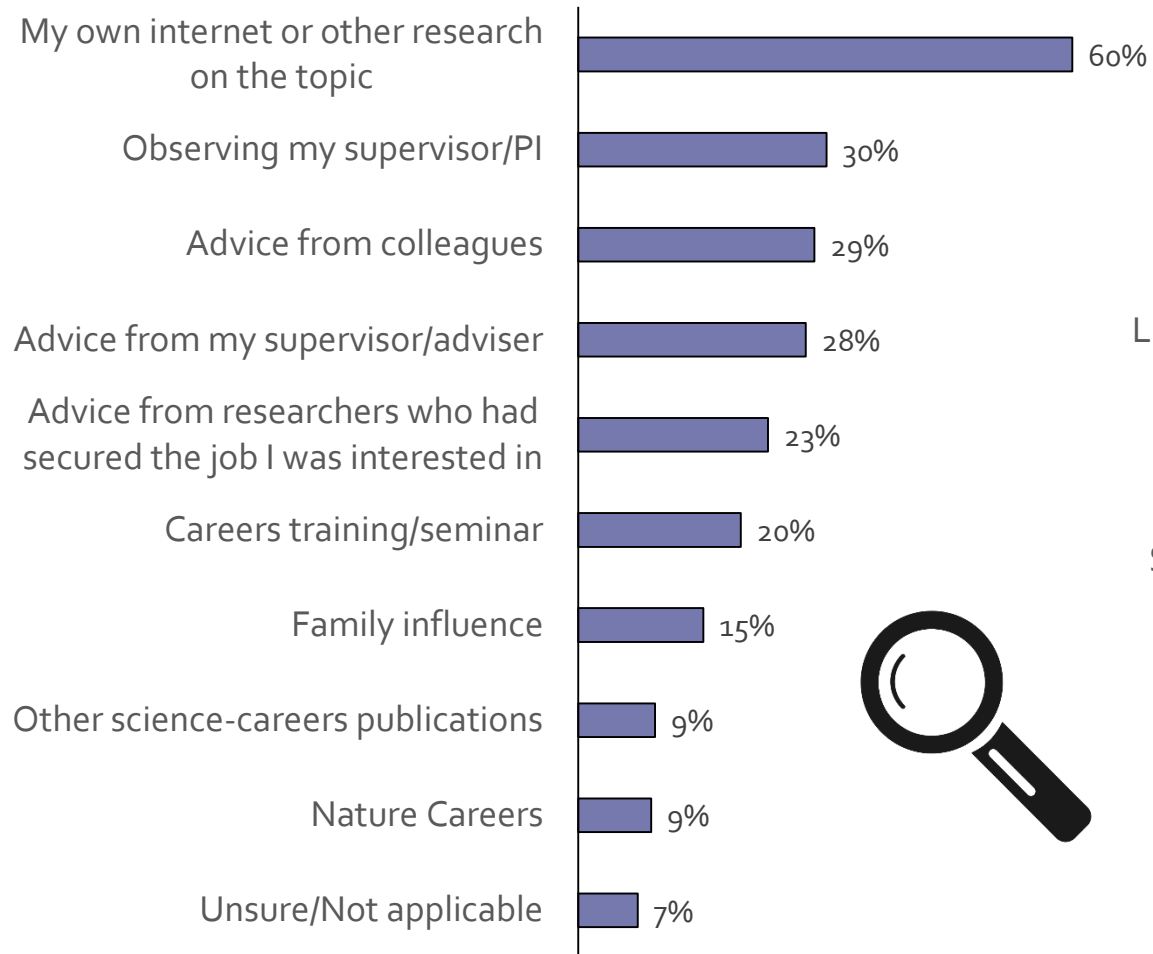


A quarter of African respondents (25%) were unsure of how long it would take to find a permanent position.

CAREERS SUPPORT

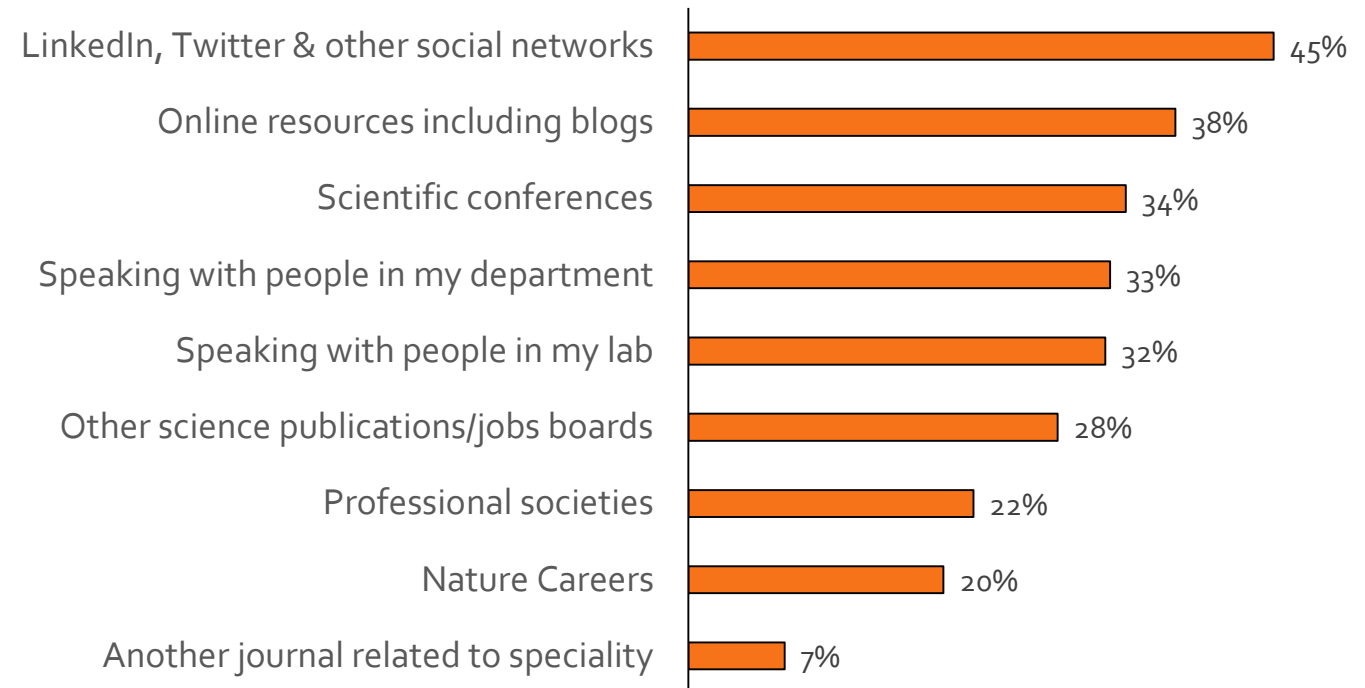
SOCIAL NETWORKS AND ONLINE RESOURCES ARE THE MAIN SOURCE FOR INFO ON CAREERS OUTSIDE OF ACADEMIA

Q: How did you arrive at your current career decision?



- Personal research is the main source of knowledge for students to base their current career decisions (60%). Observations and advice from supervisors and colleagues follows.
- A third (33%) of respondents learn about non-academic opportunities from people in their department.

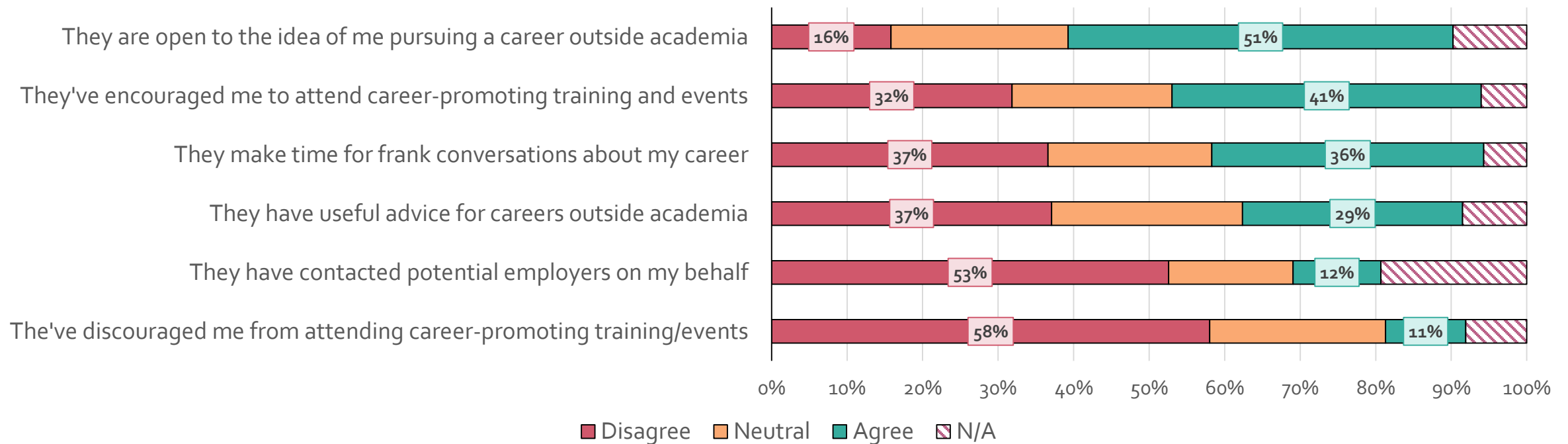
Q: How do you learn about available career opportunities that are beyond academia?



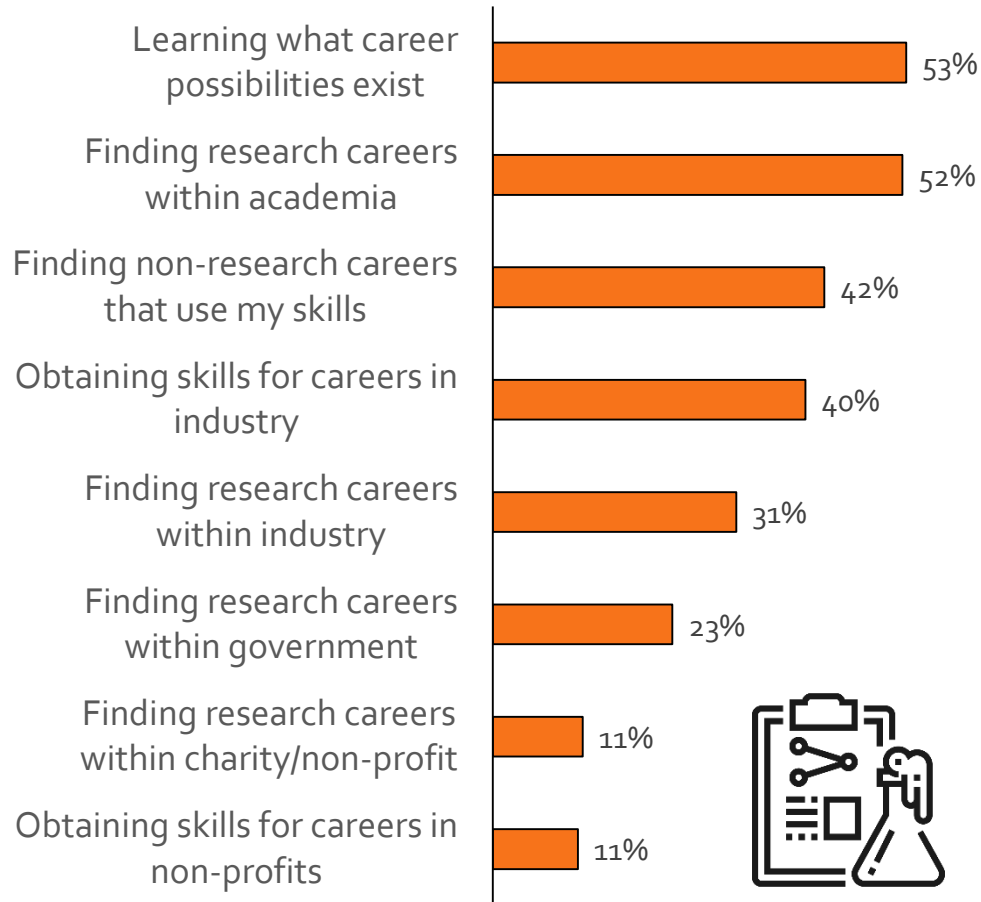
ONLY 29% AGREED THAT STAFF HAVE USEFUL ADVICE ON CAREERS OUTSIDE ACADEMIA

Over half of respondents (51%) agree that department staff are open to them pursuing a career outside academia, however only 29% agree that they have been given useful advice on this.

Q: To what extent do you agree or disagree with the following statements regarding other faculty members or scientists in your department?

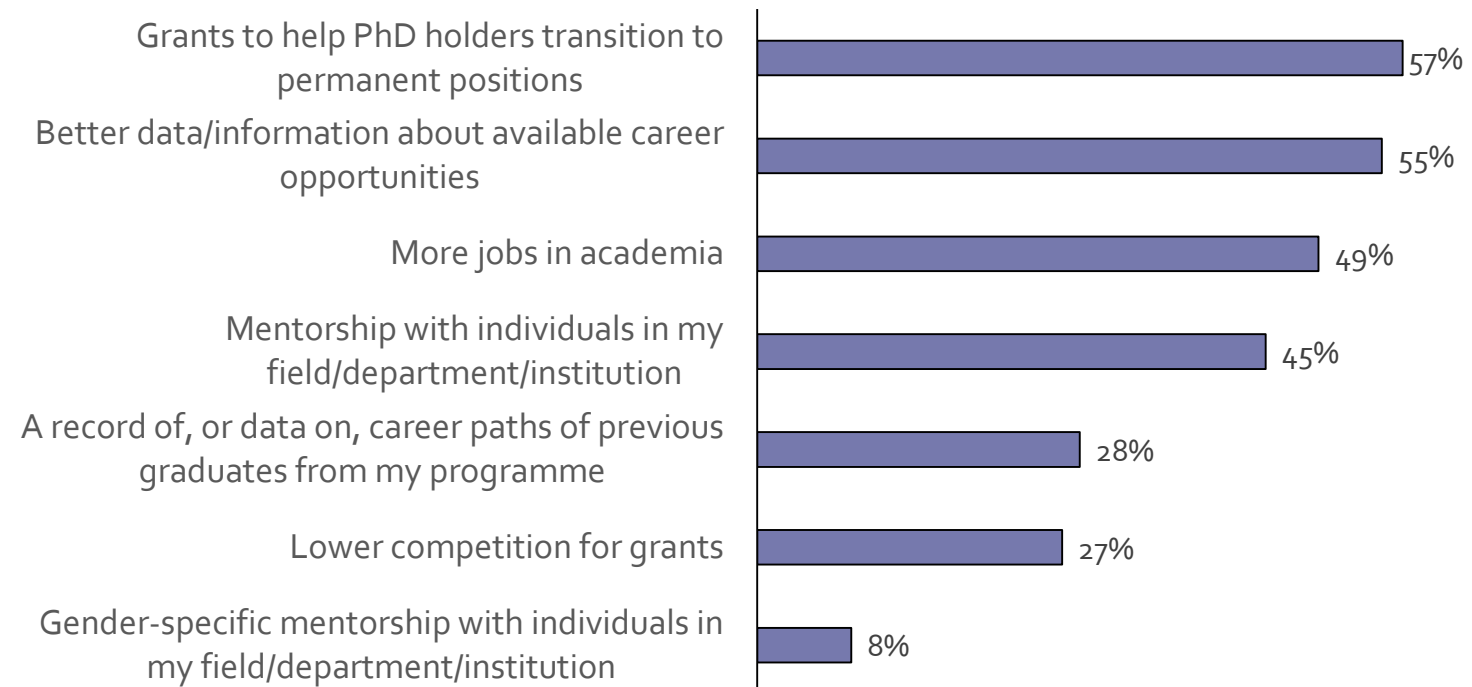


Q: Which of the following 3 things would you say are the most difficult for PhD students in your discipline? (Max 3)



- 53% of students believe finding out what career possibilities exist is difficult for students within their discipline.
- 12% of women believe gender-specific mentorship would help them establish a satisfying career.

Q: Which of the following resources do you think PhD students need the most in order to establish a satisfying career? (Max 3)

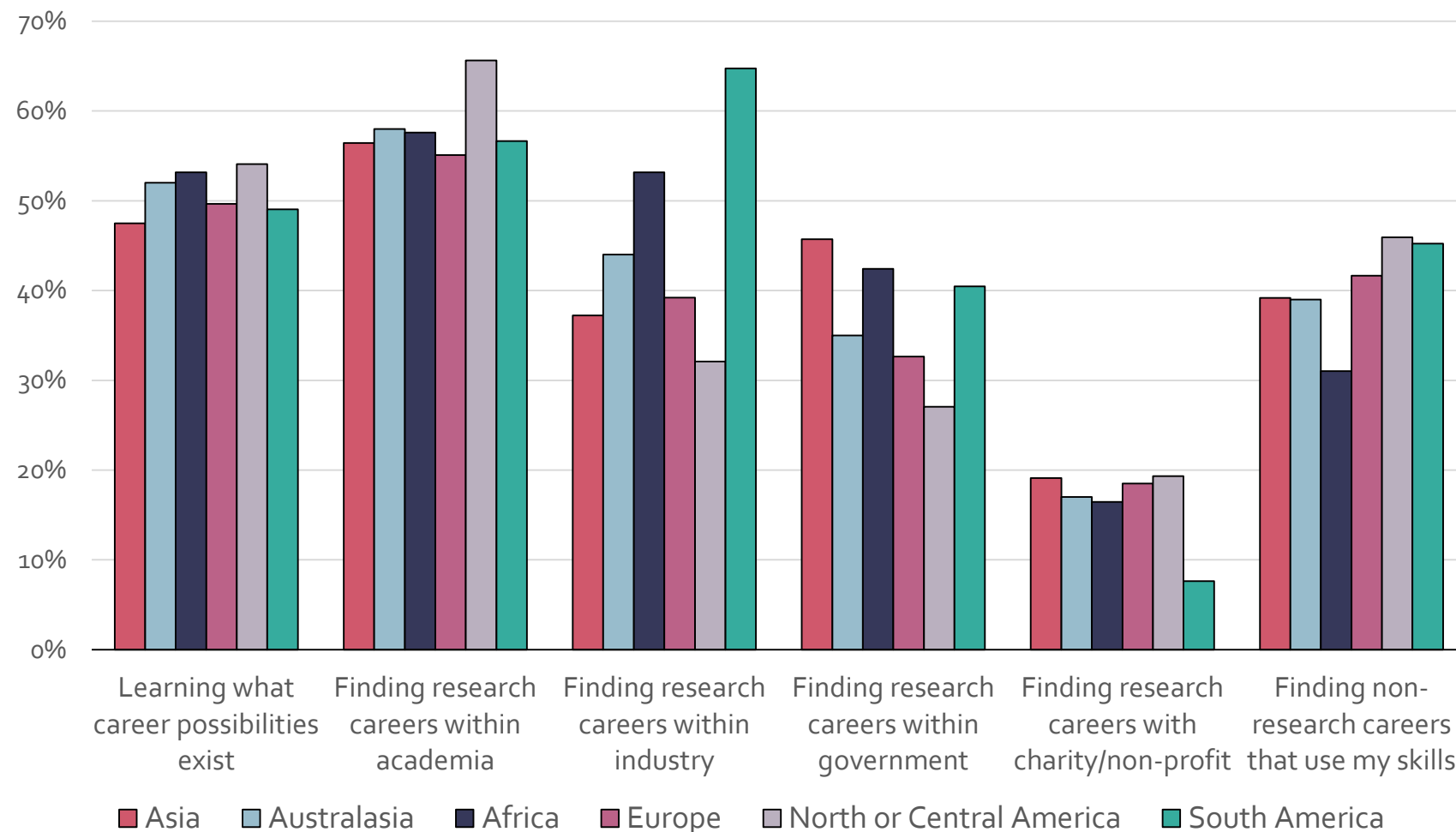


FINDING RESEARCH CAREERS IN ACADEMIA IS A CHALLENGE ACROSS THE GLOBE

- For the majority of respondents, finding research careers within academia is the biggest challenge.
- Learning what career possibilities exist is also a challenge across the board.
- South American respondents were significantly likely to suggest finding research careers within industry is difficult.
- During the qualitative stage, several interviewees based in Africa talked about going abroad for work after their PhDs because job prospects where they were studying were poor.



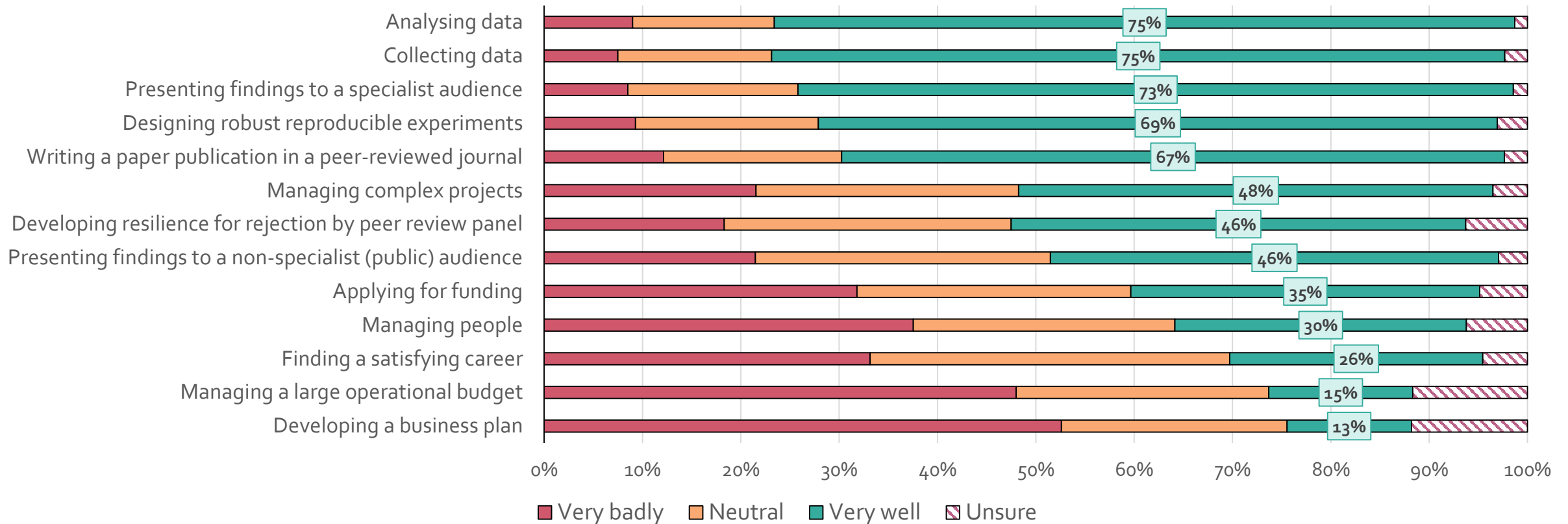
Q: Which of the following would you say are the most difficult for PhD students in the country where you are studying? (Max 3)



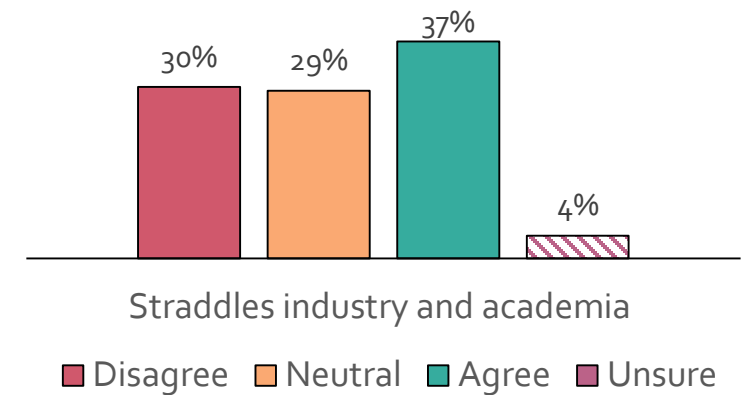
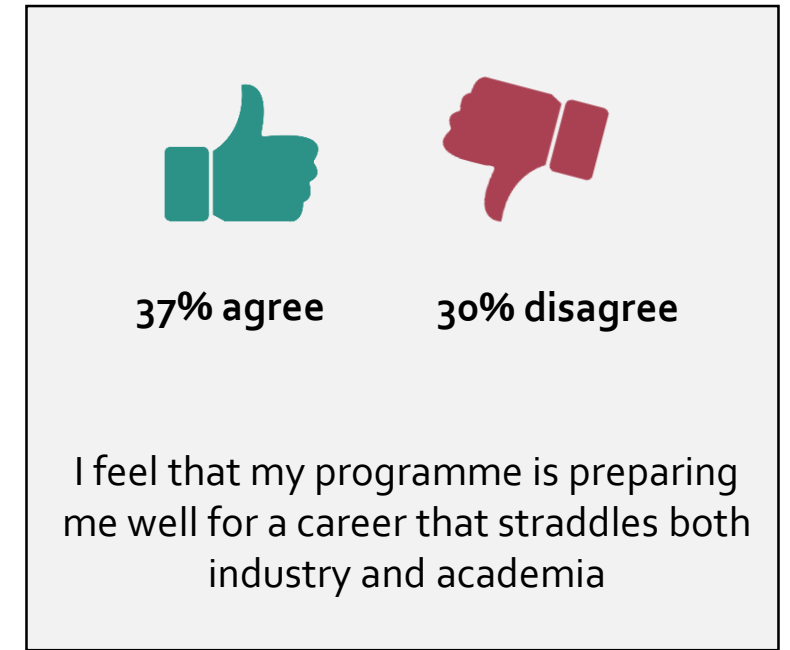
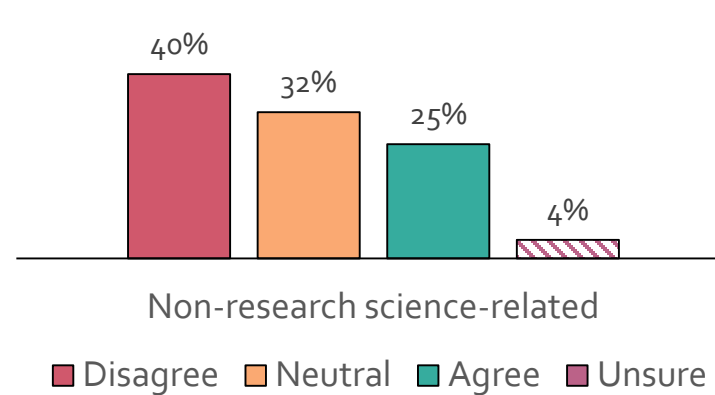
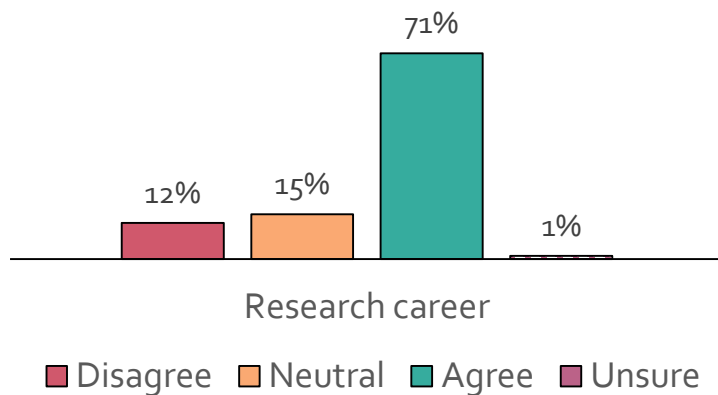
STUDENTS FEEL WELL-PREPARED FOR DATA ANALYSIS AND COLLECTION, BUT UNPREPARED FOR MANAGING PEOPLE AND APPLYING FOR FUNDING

These findings suggest that PhD students feel prepared for a career in academia, but perhaps less prepared for industry skill requirements.

Q: How well is your programme preparing you to carry out each of the following activities?

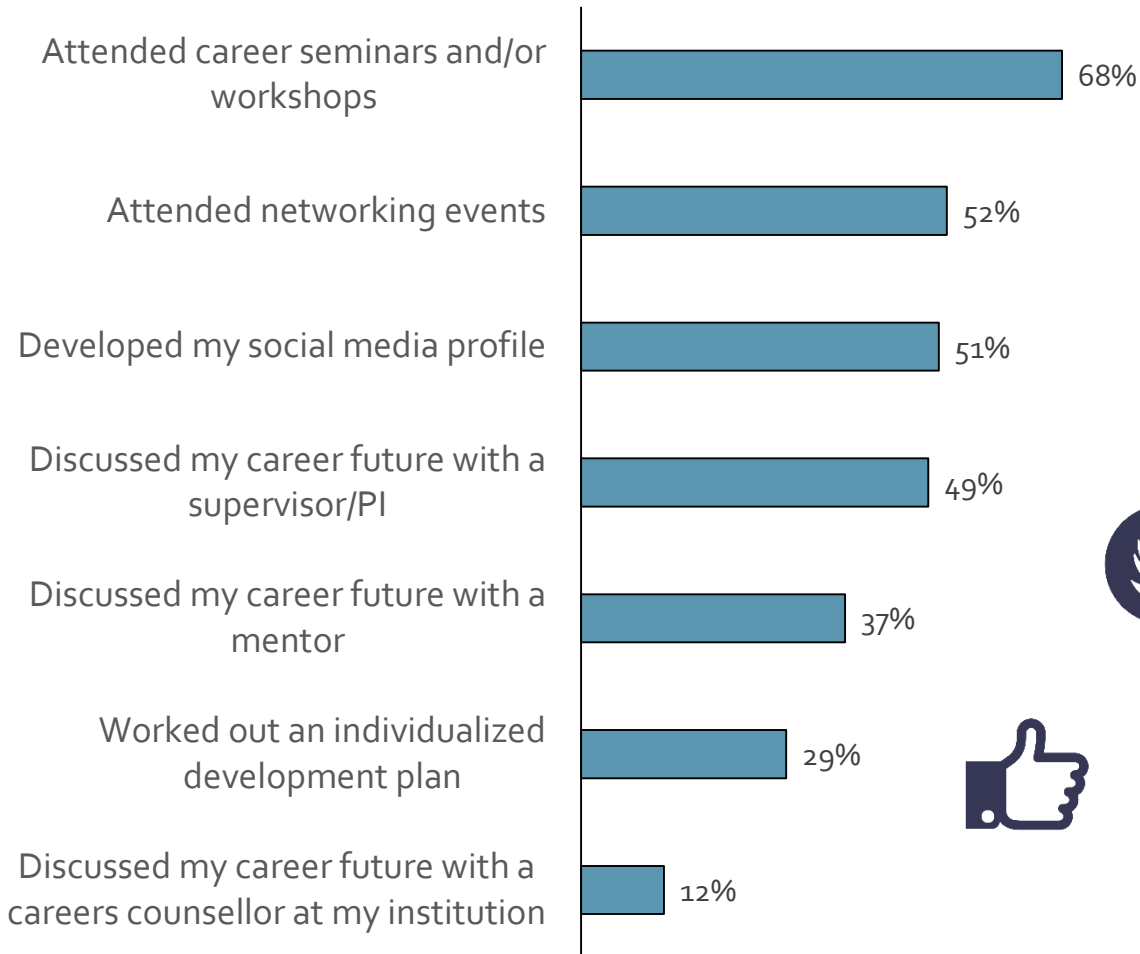


ONLY A QUARTER AGREE THAT THEIR PROGRAMME IS PREPARING THEM WELL FOR A NON-RESEARCH SCIENCE-RELATED CAREER



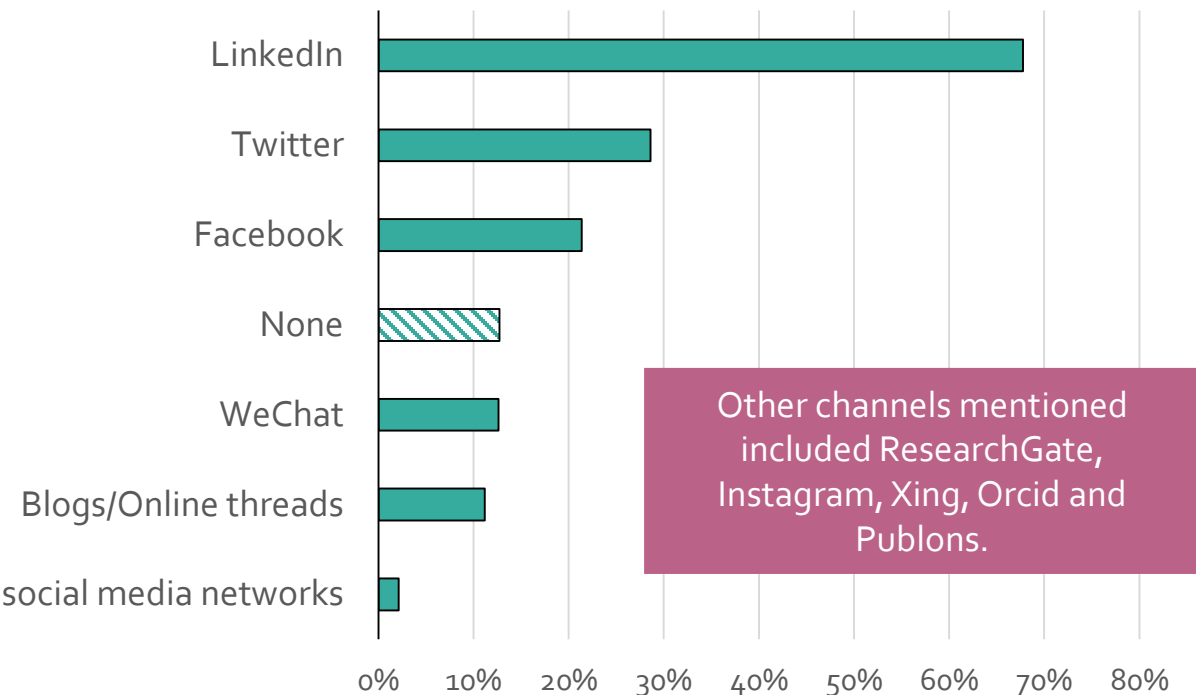
LINKEDIN IS MOST THE COMMONLY USED SOCIAL CHANNEL FOR NETWORKING

Q: Which, if any, of the following activities have you done to advance your career?



- Students were most likely to have attended career seminars and networking events to advance their career.
- Other career-advancing activities mentioned by respondents included internships, part-time jobs, speaking to recruiters and discussions with peers.

Q: Which of the following social media networks have you used to build your professional network?



Other channels mentioned included ResearchGate, Instagram, Xing, Orcid and Publons.

REFLECTION

STUDENTS' DESCRIPTIONS OF THE ACADEMIC SYSTEM WERE OVERWHELMINGLY NEGATIVE

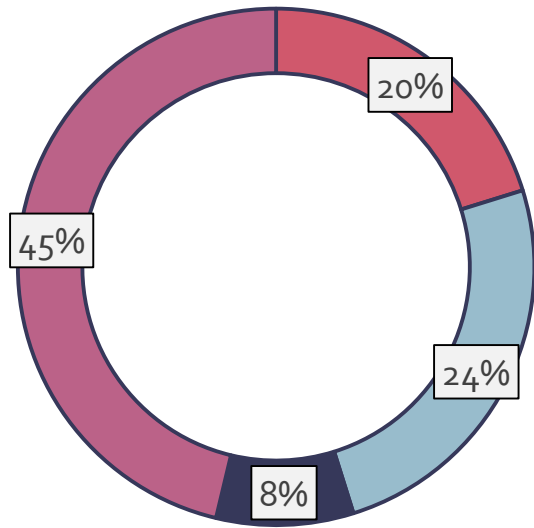
| Q: Overall, how would you describe the academic system, based on your PhD experience so far? | % |
|--|-----|
| Good / fair | 23% |
| Broken / flawed / corrupt | 11% |
| Competitive | 10% |
| Influenced by relationship with PI / supervisor | 9% |
| Publish or perish mentality | 7% |
| Unfair / unequal / biased | 5% |
| Underfunded / PhDs paid poorly | 5% |
| Abusive / toxic / exploitative | 5% |
| Political / bureaucratic | 5% |
| Stressful / demanding / high pressure | 5% |
| Long-hours culture / poor work-life balance | 5% |
| Hierarchical | 4% |
| Out-dated / old-fashioned | 4% |
| Needs improvement | 4% |

- *"The academic system is stressful because of the "publish or perish" mentality. I fear that some academics lose sight of scientific integrity in order to publish a high impact story."*
- *"The academic system doesn't always help the position of the PhD student. The PhD student is very dependent on their supervisor(s) and this means that a good relationship with your supervisor is a necessity for an enjoyable PhD experience. I'm lucky that I have a good relationship, however I've seen plenty examples where this isn't the case."*
- *"It highly depends on lab/supervisor. A good supervisor can either make you happy during your PhD journey or destroy your life/career."*
- *"The academic system needs a drastic overhaul. It has become a corrupt and abusive system. I would like to see major reforms at every single level."*
- *"Negative and toxic. People are stressed and many seem on the edge of a mental break down. There is huge pressure to work long hours and to overachieve. The pressure to publish seems to result in rushed science and papers, which could jeopardise their quality."*
- *"Broken from the top down. The pressure to publish to get grants and tenure has filtered down to the PhD student. Faculty push to publish all work rather than support good work that may take more time. There is too much pride associated with the number of publications. That number determines which grants you will get and which positions you will get. For those students who do not have successful results in their first 2-3 years, they are seriously hurt by this."*



24% REPORT THAT THEY WOULD CHANGE THEIR PI AND 8% WOULD NOT PURSUE A PhD AT ALL, GIVEN THE CHANCE TO START OVER

Q: What would you do differently right now if you were starting your programme?



- Change area of study
- Change supervisor/PI
- Not pursue a PhD at all
- Nothing



| Q: With the benefit of hindsight, what one thing do you know now which you wish you'd known about when you started your PhD? | % |
|--|-----|
| Financial / funding knowledge | 19% |
| Career options outside of academia | 13% |
| The nature of research culture | 13% |
| Impact on mental health and wellbeing | 9% |
| Work-life balance expectations | 8% |
| Time management / likely length of studies | 6% |
| More information about supervisor / lab | 4% |
| Impact of bad relationship with supervisor / staff | 4% |

- *"That the alternative funding would not materialise, that there is no financial support beyond a government loan. That academia is now so much about profit, that working class students are completely priced out of reaching their full potential without a full stipend."*
- *"That there are very limited amount of academic positions, so I would focus during my PhD also on other career paths and try to work towards them."*
- *"I knew that PhD programs can affect your mental health and I knew that graduate students often have mental health difficulties. However, there was really no way to understand how it would feel to worry about research 24/7 for several years. It has certainly been difficult."*

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