

CRAC

Royal Society Research Fellowships: Career Pathway Tracker

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Royal Society Research Fellowships: Career Pathway Tracker

An independent report commissioned by The Royal Society

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1. Executive summary

2018 marks the 35th anniversary of the first Royal Society University Research Fellowship (URF) appointments, while the Dorothy Hodgkin Fellowship (DHF) programme was launched in 1995. These fellowship schemes have been positioned specifically to provide long-term funding and support to talented early career researchers with the aim of facilitating their progression to independent research leaders.

- The URF has provided up to 10 years of funding and support, for outstanding postdoctoral researchers with the potential to become leaders in their chosen field, to enable them to build an independent research career.
- The DHF has offered 4 years of funding and support (and 5 years from 2012) for outstanding postdoctoral researchers who specifically needed flexibility due to personal circumstances such as caring responsibilities or health issues. Candidates for this scheme were normally at an earlier stage in their career than URFs, ranging from recently qualified postdoctoral scientists to those with up to six years of postdoctoral research experience. It enables such early career researchers to take the first recognised step towards an independent research career. Whilst the programme has been and remains open to all researchers that meet these criteria, most of those funded through the DHF to date have been women with young families.

To date the two fellowships have supported over 1600 individuals in their careers, 1400 individuals receiving a URF and over 200 individuals a DHF. In recent years around 50-60 new fellowships are being awarded annually; 370 individuals are currently being supported by the two schemes.

The Royal Society is setting up a programme of activity to engage and track the careers of the early career Research Fellows it has funded in this way. The Royal Society Research Fellows' Career Pathway Tracker has been set up to understand the long-term impact of the funding support and protected time to focus on research provided by these fellowships on these early career researchers, considering their careers over time. It should complement both past and future evaluations of these fellowship programmes. The Society also wishes to investigate the potential to establish an alumni network which will provide opportunities to engage with the Society's work and with each other. Insights gained from the programme will inform the Society's future early career research programmes.

This report presents the findings from the first survey within this career tracking project. It is not a formal evaluation of the two research fellowship programmes as there is no control group against which to compare outcomes. The research objectives included to:

- Indicate the long-term impact that the fellowships have made to the Research Fellows' careers and to their scientific research endeavour;
- Determine more broadly the contributions these fellowship alumni have made or are making to the wider scientific landscape, through leadership roles and societal impact including influencing science policy, commercialisation and public engagement;
- Identify the career choices and pathways made by the early career researchers funded through research fellowships, and understand better the factors and trends influencing research careers across the natural sciences;

- Provide evidence to improve the provision of support and opportunities offered to current and future Royal Society Research Fellows;
- Identify challenges and opportunities facing researchers and different groups amongst them (e.g. particular disciplines or under-represented groups);
- Provide additional insights and inputs into the Society's policy work on research careers, research culture and diversity and inclusion.

An online survey was conducted between mid-November 2017 and mid-January 2018. It targeted those who had completed a research fellowship (i.e. 'alumni', not current Research Fellows). A total of 897 completed responses was obtained, reflecting an extremely high overall response rate of 82%, highest amongst the earliest alumni. 799 responses were from those who had been awarded a URF (or another named Society fellowship that was similar, including some who had had both a DHF and a subsequent URF) and 98 responses from those who had (solely) had a DHF. Based on the response rate and close match between the profile of research disciplines of respondents and the awards made over the period, these responses should be highly representative of the alumni population.

Profile

The survey results confirm that the proportion of women amongst URF participants has risen slowly, from around 20% to 25%. Following changes to eligibility for the fellowships in the 1990s,¹ relating to European Union legislation, the proportion of respondents from outside the UK rose markedly from 5% early in the URF scheme to 30%, and from 20% to nearly 50% in the DHF scheme (that growth exclusively from other EU countries). Amongst URF participants, the proportion of UK domiciles with an ethnic minority background has grown from a very low level to around 5%, which is typical for research in UK higher education but strongly under-representative when compared with the current proportion of people of ethnic minority background in UK society as a whole.

Current employment

At the time of survey, 95% of working URF alumni were employed in academia. Amongst the working DHF alumni, 88% were in academia. Most of them were working in the UK (84% of URF alumni; 75% of DHF alumni). Although there was evidence for some 'drain' of UK domiciles away from the UK over time, especially to the USA and Australia, this was essentially compensated by the fact that two-thirds of the non-UK domiciles funded have remained in the UK after their fellowship – so there has arguably been a slight net 'gain' in research talent for the UK through the fellowship schemes.

Career progression and research leadership

- Following completion of their fellowship, URF alumni overwhelmingly entered academic positions (94%) including 27% at the level of Professor (and 8% at a higher level). The proportion obtaining a Professor-level position was higher amongst men (31%) than women (21%). Higher proportions of more recent alumni (40%) had obtained a Professor-level position by or at this point than amongst those who completed their fellowship over 20 years ago (<20%).

¹ Eligibility requirements for the fellowship schemes are outlined in Appendix 2

- Most alumni have experienced substantial career progression. Over two thirds of URF alumni who have pursued an academic career have attained the level of Professor, the most senior level of research occupation, some of whom have gone on to influential academic roles of greater seniority. Although there was not a significant difference in this proportion by gender, there was a difference in the mean length of time taken to reach this level of seniority (4.6 years for men, 5.8 years for women).
- Over 90% of the alumni in academic careers currently have a permanent or tenured position. Three quarters of the URF alumni had achieved this by or in the year that they completed their fellowship; this was higher amongst men (84%) than women (69%).
- The vast majority of fellowship alumni have supervised at least one doctoral research student to successful completion and trained or managed research staff at postdoctoral level. Cumulatively, the alumni have supervised a large number of successful doctoral students and trained many postdoctoral researchers – there is some evidence that URF alumni on average supervise more doctoral students and manage more research staff than other research leaders in similar subjects with a comparable length of experience.²
- Around 80% of fellowship alumni currently in academic posts are undertaking international collaborations, and over half have spent some time abroad during their career (most commonly a period of 2-3 years). Over 90% are undertaking public engagement activity at least once per year and around half conduct knowledge exchange or commercialisation activity. As many as half of the most experienced URF alumni are contributing to policy-making at a national or international level regularly. Through these activities, and their supervisory and management roles, they are making major contributions to science through academic research and leadership.
- Around 5% of the URF alumni have pursued a career outside academia. 3-4% elected to work outside academia immediately after their fellowship but around half of these subsequently re-entered academia. Overall, this flow back 'in' has been more than offset by a somewhat larger flow 'out' from academia from amongst those who initially pursued an academic career.
- 85% of DHF alumni obtained jobs in academia after completion of their fellowship, 6% at the level of Professor. Results for DHF and URF alumni are generally not comparable due to the different durations of the two fellowship types and different entry requirements.
- 52% of DHF alumni had obtained a permanent position by or on completion of their fellowship.
- Amongst the DHF alumni, 41% had Professor-level positions at the time of the survey.
- 12% of the DHF alumni have pursued a career outside academia, almost all leaving academia immediately after their fellowship.
- Most of the (URF and DHF) alumni working outside academia are in senior research or leadership roles in the commercial or third sectors or working in research-related policy or funding bodies, while around 1 in 5 are self-employed. As for those in academic careers, most are undertaking public engagement, commercialisation or policy-making activity.

² Based on comparison with data from the Principal Investigators & Research Leaders Survey (PIRLS): <https://www.vitae.ac.uk/impact-and-evaluation/pirls>

Impact of the Fellowships

- Although these are not formal measures of the 'success' of a research fellowship, a number of indicators were used that are consistent with establishment of independent research leadership. By the time they completed their fellowship (or at least in that year), amongst the URF alumni in academic careers:
 - 96% had published a key paper as a principal investigator;
 - Over 80% had secured a significant research grant as a principal investigator;
 - 78% had supervised at least one doctoral student to successful completion;
 - 80% had hired at least one postdoctoral researcher;
 - 78% had obtained a permanent academic position.
- Substantial proportions of the DHF alumni had achieved each of these measures, indicating that most were progressing along a similar research trajectory to the URF alumni. By or during their year of completion, 72% of DHF alumni in academic careers had published a key paper, 44% had secured a research grant, 83% successfully supervised doctoral student/s, 56% hired research staff and 52% had a permanent position.
- On the basis of these indicators, the survey provides substantial evidence that the majority of those participating in both the URF and DHF schemes are achieving the sorts of outcomes consistent with the aims of these schemes, i.e. establishment as an independent research leader in a research career.
- More specifically in relation to the impact of the research fellowship, the overwhelming majority of alumni (95%) believed it had helped them to secure a permanent position, while nearly as many felt it had accelerated their career progression and made a substantial difference to their career.

Benefits and value of the fellowships

- The key benefits of a URF or DHF were reported to be, overwhelmingly:
 - The freedom it gave them as independent researchers to pursue new and more novel lines of research (than they could otherwise have pursued);
 - The relatively long duration of the funding and stability that ensued, especially for URF participants;
 - The flexibility in terms of location – freedom to select or move institution but also enabling support for family responsibilities in parallel to research;
 - An increase in self-confidence.
- The aspects of the fellowship that were deemed to be of greatest value were the time and freedom that allowed a focus on research without other commitments, together with the flexibility to make this progress in research while accommodating personal aspirations or commitments, and the prestige associated with the fellowship programme.
- More specifically, over 95% of URF respondents felt the freedom to explore innovative approaches and new lines of research was highly valuable or valuable, and similar proportions saw value in the boost to their self-confidence. 95% also considered the flexibility of the funding and the prestige to be valuable. Amongst those who had completed their fellowship within the last 10 years, and women participants more generally, the

opportunity to interact with peer researchers in the scheme and the benefit of the training and networks provided by the Society were valued by over half of respondents.

- The DHF provided participants with many similar outcomes to their URF counterparts and, for most, enabled progression in that same direction. Direct comparison of the extent of impact in terms of that progression between URF and DHF participants is inappropriate given the different experience requirements and durations of the schemes.
- 70% of DHF alumni had taken at least one career break for maternity or paternity (at some point, not necessarily during the fellowship) and one third of all URF alumni (61% amongst women but only 26% of men). 40% of the DHF alumni who had taken maternity leave had done so for more 12 months duration in total, which was longer than amongst women URF alumni (for whom this was 27% of those who had taken maternity leave). Although the right to flexibility is common to both schemes, these differences suggest that more of the DHF participants knew they wanted flexibility from the outset and took advantage of it through the scheme. In contrast, 90% of the men who had taken any paternity leave had done so for less than 3 months.

2. Aims, scope and methodology

2.1. Context

The number of early career researchers in higher education has increased considerably over the last 15 years, both in the UK and worldwide. The majority of these researchers aspire to an academic career³ but there are insufficient opportunities for them all to succeed in this aspiration. The transition from a position as a postdoctoral researcher on a research grant to independent research leader is arguably the most difficult step. Supporting outstanding scientists and, in particular, the next generation of research leaders is one of the priority areas for The Royal Society, as articulated in its Strategic Plan and Grants Strategy. The Society supports excellence in science through its research fellowship schemes which offer funding to aspiring research leaders at this critical stage of their career, underpinned by a government grant (currently from BEIS) and some funding from philanthropy.

2018 marks the 35th anniversary of the first awards made through The Royal Society's prestigious University Research Fellowship (URF) scheme. The scheme was positioned specifically to provide long-term support to talented early career researchers and facilitate their progression to become independent research leaders, offering them protected time and freedom to focus on developing their research. The URF initially provided up to 10 years of funding and support⁴ to talented early career researchers, incorporating grant funding and an associated suite of training and development support for participants.

Since launch in 1995, the Dorothy Hodgkin Fellowship (DHF) offered 4 years of funding and support (5 years from 2012) for talented early career researchers who needed flexibility to conduct their fellowship due to personal circumstances such as caring responsibilities or health issues. As such, the DHF was particularly aimed at encouraging talented researchers who had a non-standard career path. Whilst the programme was and remains open to all researchers that meet these criteria, a significant majority of those funded have been female early career scientists with young families. The scheme aimed to provide them with a recognised first step into an independent research career, giving them time to consolidate their postdoctoral training and/or use the fellowship to transition to independence. The eligibility requirements for both schemes, which have evolved with policy changes, are outlined in Appendix 2.

Together these two fellowships have supported over 1600 individuals in their careers, with about 1400 individuals receiving the URF to date, and over 200 individuals receiving the DHF. In recent years around 50-60 new fellowships are being awarded annually. At present, 370 individuals are being supported by the two schemes.

2.2. Project aims and scope

The Royal Society aims to set up a programme of activity engaging and tracking the careers of the early career Research Fellows it has funded. The Royal Society Research Fellows Career Pathway Tracker will help to evaluate the impact of the long-term funding support and protected time to focus on research at this important career stage provided by these fellowships, considering the impact on the careers of recipients over time. It will also identify an alumni network with which the Society can continue to engage. The insights gained will help

³ CROS – Careers in Research Online Survey: <https://www.vitae.ac.uk/impact-and-evaluation/cros>

⁴ Maximum 8 years since 2008

inform the Society's early career research fellowship programmes, contribute to the health of the research environment and promote the value of research.

The work described in this report represents the first phase of this activity, which aims to lay the ground for the proposed Research Fellows Career Pathway Tracker including implementation of the first of a series of periodic surveys with alumni. This report focuses on the results of the initial survey, but other project outputs include recommendations on how to implement future waves of survey research with the Career Pathway Tracker. The Royal Society is publishing, in parallel, a commentary and narrative in response, which includes case studies of those who have been Research Fellows and their achievements in science.⁵

A key aim of this project was to explore the impact of Royal Society Research Fellowships on funded researchers' careers, research excellence and wider contributions to the scientific environment. The study is not a formal impact evaluation of these two Research Fellowship programmes as there are no control groups against which to compare outcomes. Its scope is somewhat more limited in being a detailed study of successful applicants to the URF and DHF schemes who have completed their fellowship (and responded to the survey). Interpretations of impact also need to take into account some changes to the schemes in relation to eligibility and duration of funding,⁶ as well as to the research landscape, during the period considered.

Nonetheless, with the backdrop of a changing research landscape, it seemed particularly timely to try to identify and understand some of the challenges and opportunities facing early- and mid-career researchers as they establish and maintain independent research careers in the UK or overseas or choose alternative career pathways. The Society was interested in understanding the career progression and destinations of these scientists, as well as depicting their leadership roles in terms of training the next generation of scientists and participating in knowledge exchange, public engagement and/or policy-making.

The Career Pathway Tracker is thought to be the first of its kind to monitor, long-term, the career pathways of researchers across the natural sciences. UK research funders continue to express a need to develop ways to track the career pathways of their researchers. In the UK, existing surveys gather data on the early career destinations of graduates including those with doctoral degrees,⁷ as reported in Vitae's *What do researchers do?* publications,⁸ but not over the long term. The Wellcome Trust tracks longitudinally the career destinations for a number of its funded research cohorts.⁹ Internationally, the National Science Foundation launched the Early Career Doctorates Survey (ECDS) to learn about the career paths of doctorates earned in the US in the last 10 years¹⁰ and Science Europe a similar project in Europe since 2010.¹¹

Through this survey and subsequent Career Pathway Tracker activities, the Society will also more generally develop potentially rich and useful knowledge about the long-term diverse

⁵ *Royal Society Career Pathway Tracker: 35 years of supporting early career research fellows*, The Royal Society, 2018. <http://royalsociety.org/career-tracker>

⁶ See Appendix 2

⁷ Higher Education Statistics Agency: Destinations of Leavers from Higher Education (DLHE) survey and longitudinal survey: <https://www.hesa.ac.uk/data-and-analysis/graduates>

⁸ What do researchers do? Vitae: <https://www.vitae.ac.uk/WDRD>

⁹ <https://wellcome.ac.uk/funding/managing-grant/wellcome-trust-career-trackers>

¹⁰ <https://www.nsf.gov/statistics/srvyecd/>

¹¹ <http://www.esf.org/scientific-support/career-tracking-of-doctorate-holders/2017-career-tracking-survey-of-doctorate-holders/>

career pathways and motivations of scientists and engineers across the natural sciences, which will benefit the wider research community.

More specific research objectives included to:

- Indicate the long-term impact that the fellowships have made to the Research Fellows' careers and to their scientific research endeavour;
- Determine more broadly the contributions these fellowship alumni have made or are making to the wider scientific landscape, through leadership roles and societal impact including influencing science policy, commercialisation and public engagement;
- Identify the career choices and pathways made by the early career researchers funded through research fellowships, and understand better the factors and trends influencing research careers across the natural sciences;
- Provide evidence to improve the provision of support and opportunities offered to current and future Royal Society Research Fellows;
- Identify challenges and opportunities facing researchers and different groups amongst them (e.g. particular disciplines or under-represented groups);
- Provide additional insights and inputs into the Society's policy work on research careers, research culture and diversity and inclusion.

2.3. Survey methodology and sample achieved

The focus of this report is on results obtained from implementation of the first major online survey within the proposed Career Pathway Tracker project. More details about its implementation can be found in Appendix 1. The survey was live for a period of two months between mid-November 2017 and mid-January 2018. It was targeted only to those who had completed a URF, DHF or an equivalent early career research fellowship through one of the other named Royal Society schemes operating in the early years of the URF (referred to here as 'alumni')¹² and not to current research fellows.

An extremely high overall response rate of 82% was obtained (84% amongst URF respondents and 76% amongst DHF respondents), resulting in a final sample of 897 valid, complete responses for analysis in two groups: 799 'URF' responses (comprising those who had had a URF or another named similar Society research fellowship and those who had had both a DHF and a subsequent URF) and 98 'DHF' responses. From the individuals (whose contact details were available) originally invited to participate, approximately 150 URF and 30 DHF alumni did not respond; analysis of what is known by the Society about these individuals is outside the scope of this report.

Comparative analysis of response numbers against fellowship dates held in the Society's management information suggested that the highest response rates were from the earliest alumni (well over 80%) while rates from those who had completed their fellowships in the last five years were somewhat lower (but in all cases over 60%). These response rates (illustrated in Appendix 1) are considered exceptionally high for an online survey of this kind, presumably indicating the strong engagement of alumni with the Society.

¹² A very small number who had not completed their Fellowship but resigned it early were also in the sample

The data gathered represent alumni over a 35-year period, including respondents who were at very different career stages. The approach taken during analysis was to provide some results for all alumni of a fellowship type, but for some analyses URF respondents were split into three cohorts (and DHF respondents into two cohorts) each representing ten years of completion dates of fellowship. Where results were substantively different by gender or with broad disciplinary area, such differences were highlighted.

As shown in Table 2.1, the profile of the URF response sample by research discipline closely resembled the profile of specialisms based on the Society's management information. The gender profile also seemed to be a good match based on the Society's fellowship records. For a 95% confidence limit, the confidence interval (effectively the 'error bar' on a data point) for a sample of this size based on the known alumni populations would be around 1.5% for URF results but larger at up to 5% for DHF results, depending on the specific result. However, taking these considerations together, we have confidence that the results are representative of the population of these Research Fellowship alumni and therefore will be robust and meaningful.

Research discipline		Target %	% of responses
A side	1 - Maths and Computing	8%	8%
	2 - Physics	20%	20%
	3 - Chemistry	15%	14%
	4 - Engineering and Materials	9%	7%
	5 - Earth and Physical Environmental Sciences	7%	7%
B side	8 - Anatomy, Physiology, Neurological and Health Sciences	11%	8%
	6 - Biochemistry, Structural and Cell Biology	13%	35%
	7 - Developmental biology, Genetics etc	8%	
	9 - Evolutionary and Ecological Sciences	11%	
	Other		1%

Table 2.1 Profile of URF responses achieved by reported current research discipline (N=821, coded to Royal Society groups) compared with profile of disciplines of awarded research fellowships (Target %)

3. Profile and current circumstances of alumni

3.1. Profile of respondents

Table 3.1 summarises the gender profile of respondents. As anticipated, a very high proportion of DHF respondents were female (95%). The DHF scheme has always been open to men and women applicants although in its early years there was a particular focus on encouraging women to apply. Based on survey responses, the small proportion of men participants has risen somewhat with time.

Amongst the URF respondents, 76% were male and 24% female.¹³ As Table 3.1 shows, the proportion of women who completed their fellowship in the last 10 years (26%) was slightly higher than amongst those who completed between 1998 and 2007 (20%). The 24% figure for the earliest group (completion before 1998) is thought to be an artefact of a particularly high response rate amongst the (relatively few) early women URFs, as management information suggests that around 20% of awards were at that time to women. The Society has since 2014 published diversity statistics for these schemes back to 2010, in terms of applicants and awards; around 25% of URF awards were made to women in recent years.¹⁴

A possible comparison is available from the PIRLS survey which indicates that around 27% of research leaders, in these broad subject areas and of comparable experience, are women.¹⁵ UK higher education statistics suggest that 22% of Professors in science, engineering and technology subjects are women, although this represents only a subset of research leaders.¹⁶

It should be remembered that the survey provides a retrospective view of fellowship participation. Many of the URF alumni in the most recent group analysed (who completed their fellowship in the last ten years) will have commenced their Research Fellowships in the late 1990s and all of them prior to 2010.

Gender		URF				DHF		
		All	<1998	1998-2007	>2007	All	1998-2007	>2007
	Male	76%	76%	80%	74%	5%	4%	7%
	Female	24%	24%	20%	26%	95%	96%	93%

Table 3.1 Gender of respondents (where declared), by fellowship completion date (URF: N=747; DHF: N=94)

The under-representation of UK researchers of black, Asian and minority ethnic (BAME) background has prompted recent interest in this aspect of the diversity profile of those working in science and academia. Ethnicity was captured in the survey only for those of UK domicile, as the conventional classification adopted was designed for the UK population. Table 3.2 shows that the proportion of UK respondents known to be of ethnic minority origin was just

¹³ Proportions of the 99% of respondents who indicated their sex

¹⁴ *Diversity data report 2017*, The Royal Society. <https://royalsociety.org/topics-policy/diversity-in-science/diversity-data/>

¹⁵ PIRLS – Principal Investigators and Research Leaders Survey: Vitae: <https://www.vitae.ac.uk/impact-and-evaluation/pirls>

¹⁶ Equality in higher education: statistical report Part 1: staff, Equality Challenge Unit: <https://www.ecu.ac.uk/guidance-resources/using-data-and-evidence/statistics-report/>

under 5% for both URF and DHF alumni, with a small percentage preferring not to declare their ethnicity. The proportion amongst the earliest group of URFs was lower still. The actual numbers of respondents are also given in Table 3.2 to highlight the limited number of BAME researchers in the sample. More detailed analysis revealed that there were no black respondents at all amongst the 97% who declared their ethnicity.

Ethnicity		URF				DHF
		All	<1998	1998-2007	>2007	All
URF	BAME	5%	2%	5%	5%	5%
	White	92%	96%	92%	93%	95%
	Undeclared	3%	2%	3%	2%	-
DHF	BAME	31	3	13	9	3
	White	575	151	239	185	55
	Undeclared	17	3	9	5	-

Table 3.2 Ethnicity of UK-domiciled respondents, by scheme and by date of fellowship completion (URF: N=623; DHF: N=55), by proportion and number

These proportions of BAME respondents are very low in comparison with the proportion in the current overall UK population which is around 13% (and over 1 in 5 amongst UK HE students). However, in 1991, when the Census first captured ethnicity, the proportion of the overall UK population of BAME background was under 6%, which places these results in a different context. Some other comparative figures are available about UK higher education. HESA statistics¹⁷ suggest that 15% of current academic staff are of ethnic minority background, which has grown from around 7% in the mid-1990s, but only 6% of current Professors. The proportion of principal investigators and research leaders of ethnic minority background (in broadly comparable subject areas and with an appropriate age profile) has been around 5% since 2011, while for research staff it has been around 7%, according to recent PIRLS and CROS surveys, respectively. These comparisons suggest that the under-representation of BAME individuals in the Royal Society Research Fellowships across the period studied is broadly reflective of their overall under-representation in senior HE research roles rather than particular to these fellowship schemes.

As Table 3.3 summarises, overall, 84% of URF respondents were of UK domicile, with 14% from other EU countries and 3% from outside the EU (although they had to have spent three years in the UK to be eligible for the schemes). These proportions mask significant differences in the profile at different periods of the scheme, reflecting adjustments to eligibility criteria.¹⁸ Most notable has been the rise of participants from other EU countries, reaching one quarter of those who completed their fellowship in the last ten years, which reflects the widening of eligibility in 1997 to applicants from EEA countries. For the DHF scheme, the proportion from other EU nations has been higher still, reaching 40% in the most recent period reported; only just over half of DHF alumni from that period were of UK domicile (although the size of that DHF sub-sample is limited).

¹⁷ *Higher Education Staff Statistics 2016/17*, Statistical First Release 248, Higher Education Statistics Agency 2018

¹⁸ Appendix 2 contains more detail on eligibility criteria for the Research Fellowships

Country of domicile		URF				DHF		
		All	<1998	1998-2007	>2007	All	1998-2007	>2007
	UK	84%	94%	87%	71%	62%	70%	53%
	Other EU	14%	2%	10%	25%	30%	22%	40%
	RoW	3%	4%	3%	4%	8%	8%	7%

Table 3.3 Domicile of survey respondents, by scheme and by date of completion (URF: N=754; DHF: N=95)

Information on certain other aspects of the demographic profile of respondents is given in Appendix 1. In section 2.3 it was shown that the reported research disciplines of respondents closely matched the profile of those awarded fellowships. Amongst the URF alumni, 56% reported research disciplines that were broadly physical science-based (Royal Society A-side subjects) and 43% biological and related sciences (B-side subjects).¹⁹

3.2. Current circumstances

3.2.1. Employment situation

The vast majority of survey respondents were in employment or self-employment at the time of the survey (98%, Table 3.4) with just 2% reporting that they were retired or not working although that proportion was higher amongst the earliest URF alumni. Of the 98% who were working, only a small proportion (under 2%) were self-employed.

Amongst those who were working, overall, 95% of URF alumni and 88% of DHF alumni respondents reported that they were employed in academia.²⁰ The proportion working in academia was highest amongst those who had completed their fellowship most recently.

Sector		URF				DHF		
		All	<1998	1998-2007	>2007	All	1998-2007	>2007
Working		98%	92%	99%	100%	98%	100%	96%
	Academia	95%	93%	93%	98%	88%	86%	89%
	Other	5%	7%	7%	2%	10%	14%	7%
Retired/not working		2%	8%	1%	0%	2%	0%	4%

Table 3.4 Employment circumstances of respondents, by scheme and by date of completion (URF: N=777; DHF: N=98)

Respondents were invited to identify the occupational sector in which they currently worked and name their employer and job title. The number working outside academia was very modest so it was possible to analyse job titles individually to ascertain their current occupations. Amongst URF alumni employed outside academia, roughly half appeared to be in leadership or senior research roles in science-related private sector companies (which ranged from large

¹⁹ The remaining 1% identified their discipline as outside these two groups

²⁰ This included public research institutes

corporations to spin-outs they had founded), and there were also small clusters in science policy or funding and in science communication or publishing. In only a very few cases did the occupation have little or no connection with research-level science – two alumni now worked for large banks, one was a schoolteacher and one a member of the clergy. Some more detailed analysis of the careers of the individuals working outside academia, including the timing of when they changed sector, can be found in section 4.7 on career progression.

3.2.2. Location of employment

Table 3.5 illustrates the country of employment for those who were in work when surveyed. Overall, 84% of URF alumni were employed in the UK and 75% of DHF alumni, but this varied significantly with respondent domicile. For example, 88% of UK-domiciled URF alumni were employed in the UK, but this proportion was 66% of those not of UK domicile. A similar trend existed for DHF alumni, amongst whom 85% of the UK domiciles but only 60% of others were working in the UK when surveyed.

Current location		URF			DHF		
		All	UK-dom	Non-UK	All	UK-dom	Non-UK
	UK	84%	88%	66%	75%	85%	60%
	Other EU	6%	3%	17%	12%	7%	20%
	RoW	10%	9%	17%	13%	9%	20%

Table 3.5 Location of current employment of respondents, by scheme and domicile (URF: N=827; DHF: N=96)

Further analysis revealed trends in the location of respondents with domicile and time since completion of fellowship for URF alumni (there was an insufficient number of DHF alumni for this analysis). Table 3.6 shows the current locations by number of URF respondents of different domiciles within the three broad periods of fellowship completion. Amongst those who completed their fellowship less than ten years ago, 91% of the UK domiciles were in the UK when surveyed, whereas this was the case for 86% of UK domiciles who completed 10-20 years ago but higher at 90% for those who completed over 20 years ago.

Completion year	URF											
	<1998				1998-2007				>2007			
Domicile	All	UK	Other EU	RoW	All	UK	Other EU	RoW	All	UK	Other EU	RoW
Current location												
UK	154	152	2	0	258	239	18	1	262	197	58	7
Other EU	3	2	1	0	19	10	9	0	14	3	9	2
RoW	22	15	0	7	39	30	3	6	18	13	3	2

Table 3.6 Location of current employment of URF alumni respondents, by number, by domicile and period of completion (N=789)

Higher proportions of alumni of non-UK domicile have re-located outside the UK with time, including all the alumni originally from outside the EU in the earliest group (although this was admittedly a very small number of individuals). On the other hand, a high proportion of the alumni from other EU countries remained in the UK for at least ten years after completion. These patterns are somewhat masked by the varying proportions by domicile at different times.

Around two thirds of the UK domiciles now working overseas were in either the USA or Australia, while the non-UK domiciles now abroad were working either in the country of their original domicile or one of these major destination countries.

One interesting observation when these results are taken together is that the total number of URF alumni working in the UK at the point of survey was very slightly higher than the total number of UK domiciles who have been funded through the URF scheme, although this difference was very small. However, this means the overall 'brain drain' of UK domiciles who have left the UK has been at least compensated by a 'brain gain' in terms of the number of overseas researchers funded by the scheme who have remained in the UK after their fellowship. Figure 3.1 illustrates this rather simplistic analysis by showing the relationship between the domiciles of respondents and their location when surveyed, albeit based purely on a single cumulative snapshot at the time of the survey.

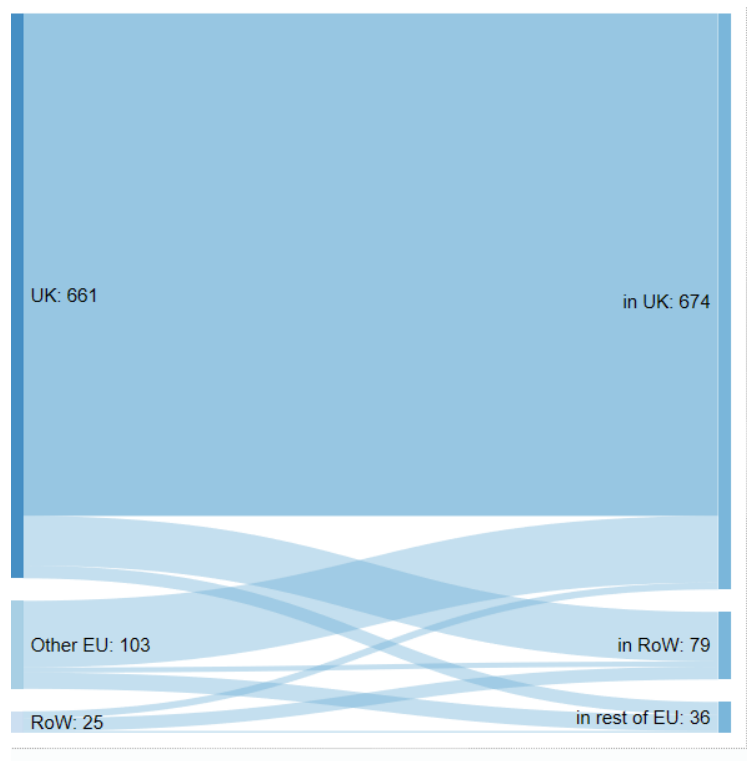


Figure 3.1 Sankey diagram showing domicile of URF respondents (left-hand axis) with their current location of employment (right-hand axis)

3.2.3. Level of academic employment

The job titles provided by respondents were coded to the occupational stratification developed by the Universities and Colleges Employers Association (UCEA) which is used by the Higher Education Statistics Agency (HESA) when recording data about academic staff.²¹ For academic staff, the stratification runs from Level L (which includes junior lectureship positions and post-doctoral researchers/assistants) through to Level A which is Vice-Chancellors (Table 3.7). Levels G and H are not currently used. Several of the Levels are of particular interest in this study, especially F (Professor), I (Reader, also Associate Professor and Principal Research Fellow) and J (Assistant Professor, Senior Lecturer, Senior Research Fellow). UCEA explicitly allocates a Royal Society Research Fellow to Level J. Lectureship positions are classified either as Level K (subject lecturer) or L (junior lecturer), depending on the seniority of the post.

Level	Description	Example job title or descriptor
A	Head of institution	Vice-Chancellor
B	Highest level of manager reporting to Head of institution	Deputy/Pro Vice-Chancellor
C	Head/Director of major academic area; Director of function/s	Executive Dean; Dean, Head of College; Finance Director; Director of Research
D	Head of an academic centre	Head of Department; Associate Dean; Director
E	Head of small centre; senior function head	Director; Division Leader; Head of Human Resources
F	Professor; function head	Professor; Functional Manager
I	Senior academic lead	Associate Professor; Reader; Principal Lecturer; Principal Research Fellow
J	Senior academic staff	Assistant Professor; Senior Lecturer; Senior Research Fellow; Royal Society Research Fellow
K	Academic staff	Subject Lecturer; Postdoctoral Research Fellow; Research Fellow; Research Associate
L	Academic staff	Lecturer; Researcher; Postdoctoral Research Fellow/Associate/Assistant; Research Officer

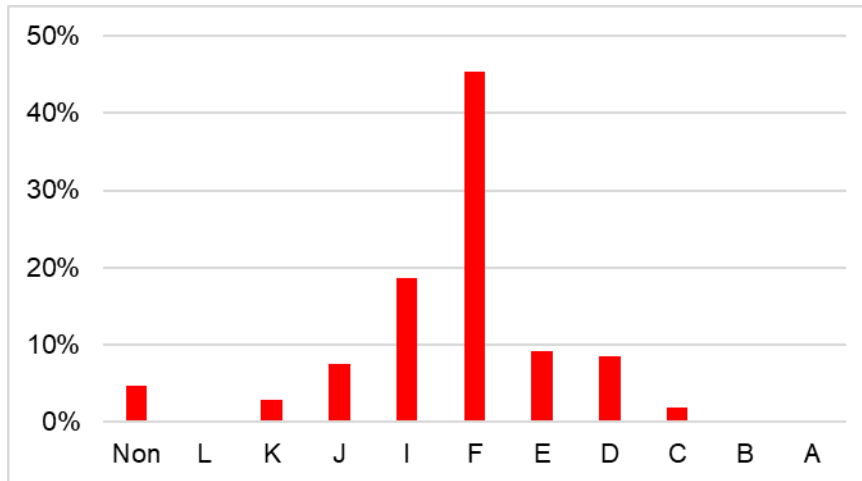
Table 3.7 Extract from UCEA higher education occupational classification

Using this classification scheme, as shown in Figure 3.2(a), at the time of survey the highest proportion of URF alumni were currently working at Level F (Professor) and 65% were at this level or above (which was 68% of those in an academic career when surveyed), while a further

²¹ https://www.hesa.ac.uk/collection/c16025/combined_levels

5% were working outside academia. Amongst the DHF alumni, illustrated in Figure 3.2(b), the largest proportions were at Level I (Associate Professor, Reader, or Principal Research Fellow) and Level F (Professor). 33% of all those currently working were at Level F or above – which was 41% of those currently working in academia – while 15% were working outside academia.

(a)



(b)

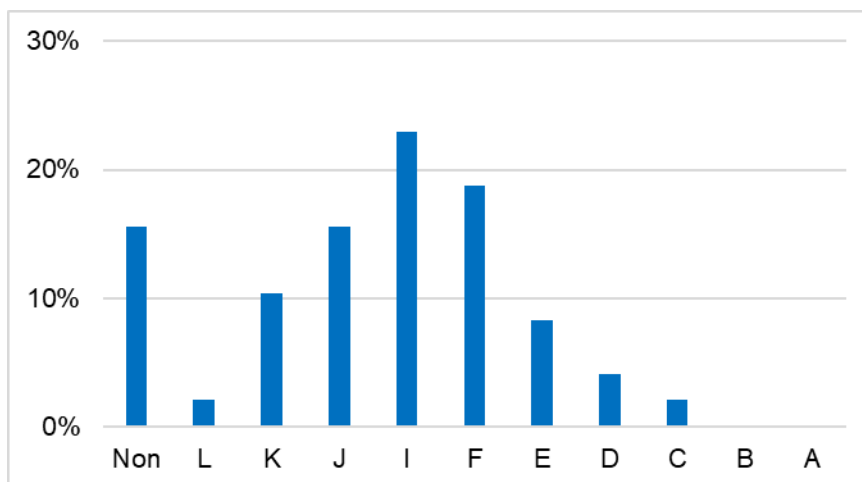


Figure 3.2 Classification of level of current employment position, by fellowship scheme: (a) URF (N=780); and (b) DHF (N=96). 'Non' indicates positions outside academia

Since these results include respondents who completed their fellowships at very different times, the overall results need to be treated with some caution. Results for the two schemes are not directly comparable as a higher proportion of DHF scheme respondents, by definition, were at an earlier stage of their career than of URF alumni, as the DHF scheme was launched 12 years later. Furthermore, a higher proportion of DHF alumni held their fellowship part-time and thereby for a longer period before any subsequent progression.

A more sophisticated analysis of these data follows in section 4.3, including data on the first positions obtained after the fellowship and subsequent career progression.

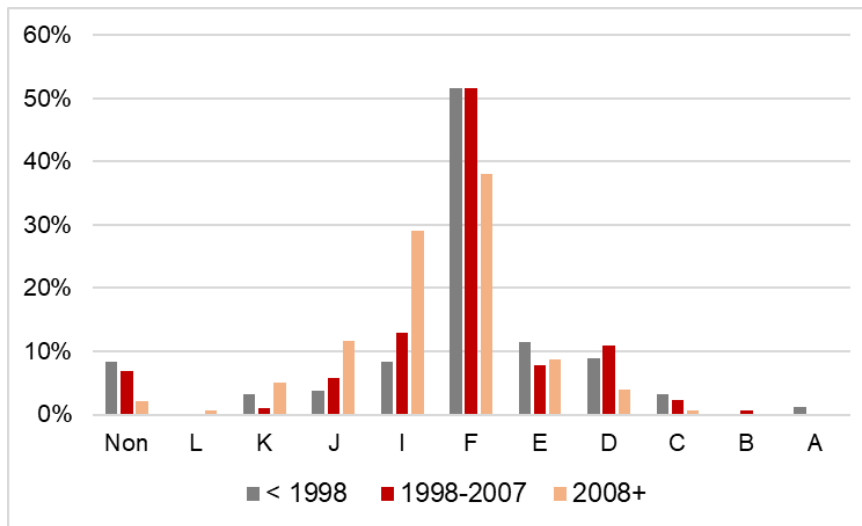


Figure 3.3 Classification of level of current employment position for URF respondents, by period of completion of fellowship (<1998: N=157; 1998-2007: N=294; 2008+: N=276). 'Non' indicates positions outside academia

In Figure 3.3, URF respondents' current level of employment is illustrated for each of the three main periods of fellowship completion used. Higher proportions of the most recent group were working at Levels K (e.g. Research Fellow), J (e.g. Senior Research Fellow) and I (including Principal Research Fellow), while the proportion at Level F (Professor) was lower, as would be expected. However, the proportions working at the 'higher' levels above F did not seem to relate closely to the time elapsed since completion of the fellowship.

When the current positions of URF alumni were considered by gender, overall, some variance was seen between the proportions of men and women respondents working at Level F (Professor), as seen in Figure 3.4. However, this overall difference in the proportion of male URF alumni currently employed at Level F or higher (68%) and female URFs (59%) was not statistically significant ($p > 0.05$).

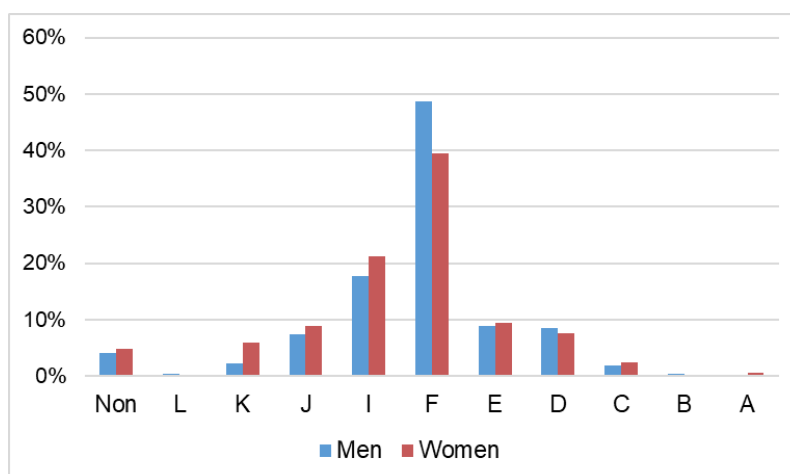


Figure 3.4 Level of current position of URF alumni, by gender (Men: N=554; Women: N=170)

As the gender profile of fellowship holders has changed over time, Figure 3.5 shows the proportions by gender of URF alumni working at Level F (Professor) or higher within each of the three broad periods of completion of fellowship. This shows the similarity in the proportion of women and men now working at these levels in each sub-group, suggesting that any difference is temporary and resulting in no significant difference overall.

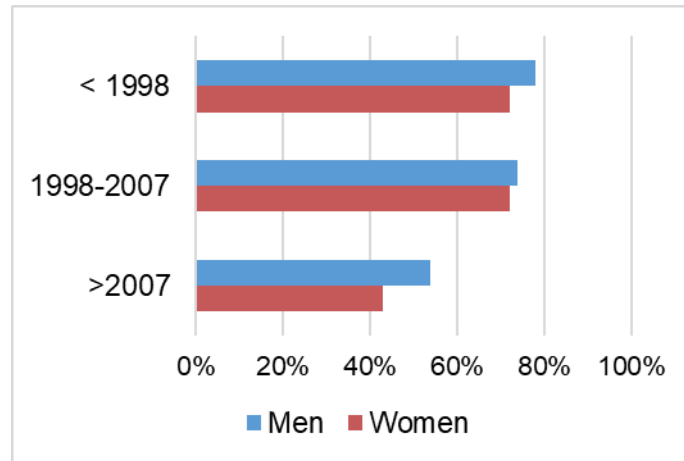


Figure 3.5 Proportion of URF alumni currently working at Level F (Professor) or higher, by gender and period of completion of fellowship (Men: N=554; Women: N=170)

There was no significant difference in the current employment level results by broad disciplinary group (Royal Society A-side disciplines vs. B-side disciplines) overall. When that analysis was combined with the broad period of completion of the fellowship, amongst the earliest group (fellowship completion prior to 1998) a slightly higher proportion of the A-side respondents had reached Professor level or higher than of B-side respondents, but the sample size from this period was limited.

3.3. Summary

Results described in this chapter reveal some aspects of the demographic profile and current working circumstances for alumni of the Royal Society's Research Fellowship schemes. The under-representation of women and those of ethnic minority background in the URF scheme has lessened slightly with time but largely reflects the diversity profile and trends seen more widely in UK HE in relation to progression to senior research roles. The vast majority of alumni of the URF and DHF schemes continue to work in academia, and mostly in the UK. Overall, most URF alumni in academia are working at the level of Professor or higher. The career progression of both URF and DHF alumni is explored in more detail in the next chapter.

4. Tracking the career progression of Research Fellows

Survey respondents were asked to state the year in which they first undertook certain key activities, and/or achieved particular career positions, selected as potential indicators of establishment of independent research leadership. These dates were compared with the year in which they had completed their fellowship, in order to assess rates of progression. Year of completion was used as the most reliable reference point as individual fellowships were known to be of different lengths (including some extension periods and breaks). Comparisons between these key dates (i.e. the number of years between that key activity and completion of fellowship) provided numerical results for each respondent which underpin the analyses in much of this section, and thereby indications of rates and extents of progression in career and research. It should be noted that these analyses do not take into account any career breaks, or other factors such as age on completion, but are based on 'raw' periods of time in years.

4.1. Impact of evolving fellowship eligibility criteria

A number of factors complicate analysis of progression of the alumni with time, including the changes to some eligibility requirements for fellowships outlined in Appendix 2. While the purpose of the schemes has remained the same and they are targeted at broadly the same career stage – postdoctoral researchers ready to establish and lead independent research careers – certain eligibility criteria have changed in detail such as EEA country applicants being eligible from 1997 onwards.

The impact of any change in eligibility does not feed through into these results immediately but is delayed by up to 10 years or more in the case of URF alumni (whose fellowship duration was 8-10 years), and up to 5 years or more for DHF alumni (duration 4 years, but in many cases longer as the fellowship was taken up on a part-time basis). The increased duration of the DHF of 5 years since 2012 applied to very few of the alumni in this study.

Another aspect of eligibility that has changed relates to the age and experience of applicants for the URF. Prior to 1994, applicants were required to be aged 26 to 33 but from 1994 onwards the upper age limit was increased to 40 (along with an expectation of at least 2 and up to 7 years of post-doctoral experience).²² This relatively greater length of research experience prior to their fellowship for more recent URF alumni impacts upon some of the issues investigated in this section. More detail on these differences is shown in Appendix 2, where there is an analysis of the period between respondents obtaining their PhD and completing their fellowship. It shows that many of the URF alumni who completed their fellowships since 2003 (which broadly corresponds to fellowships starting since 1994) had 3 to 5 years more research experience when they commenced their fellowship, compared with those who completed their fellowship prior to 2003. This seems to correlate well with the change to eligibility in relation to experience for the URF that took place in 1994.

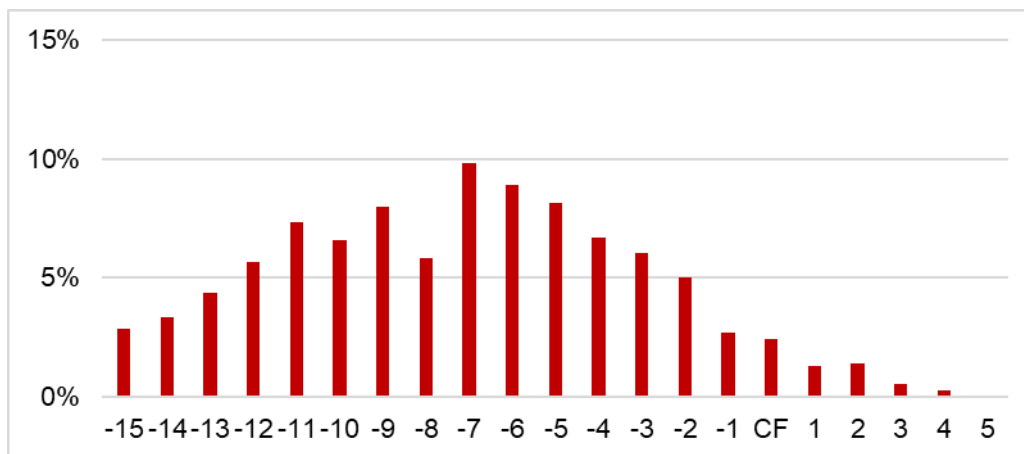
²² Subsequent further adjustments to this criterion (up to 8 years of experience post-PhD, and an expectation of up to three prior post-doctoral positions) have not yet filtered through to results for alumni

4.2. Key research career achievements

4.2.1. First significant paper as a principal investigator

One of the potential indicators of establishment of an independent research position relates to publication of papers. The survey questionnaire sought the year in which the respondent published their first significant paper as a principal investigator.²³ Figure 4.1(a) illustrates the period between the year in which URF respondents reported their first such publication and year of completion of their fellowship. For URF respondents, there was a broad distribution of timing of such a first paper, with the median around 7 years prior to completion, i.e. early in their fellowship. 96% of URF alumni had published such a paper by the year they completed their fellowship, although around one third of these appeared to have done so before they started (assuming a fellowship duration of 8-10 years).

(a)



(b)

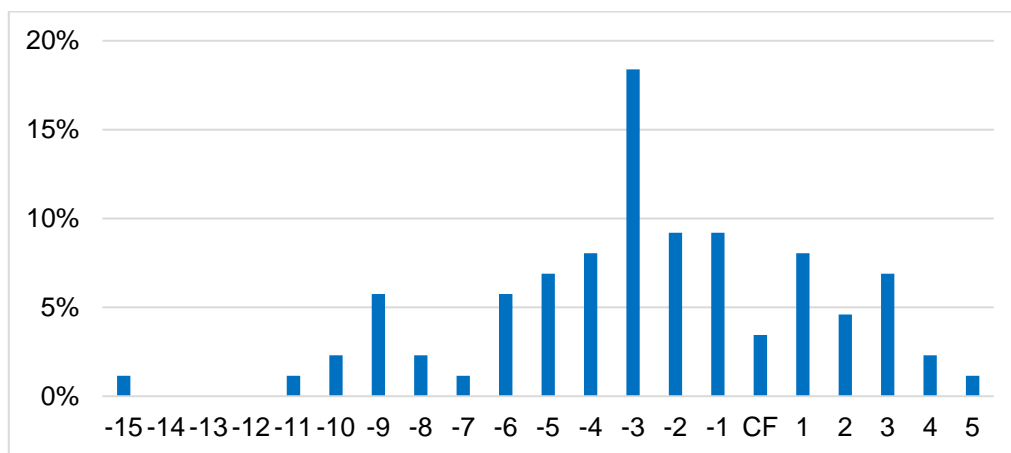


Figure 4.1 Period in years between publication of first significant paper as a principal investigator and fellowship completion date: (a) URF alumni (N=780); and (b) DHF alumni (N=87). CF denotes year of completion

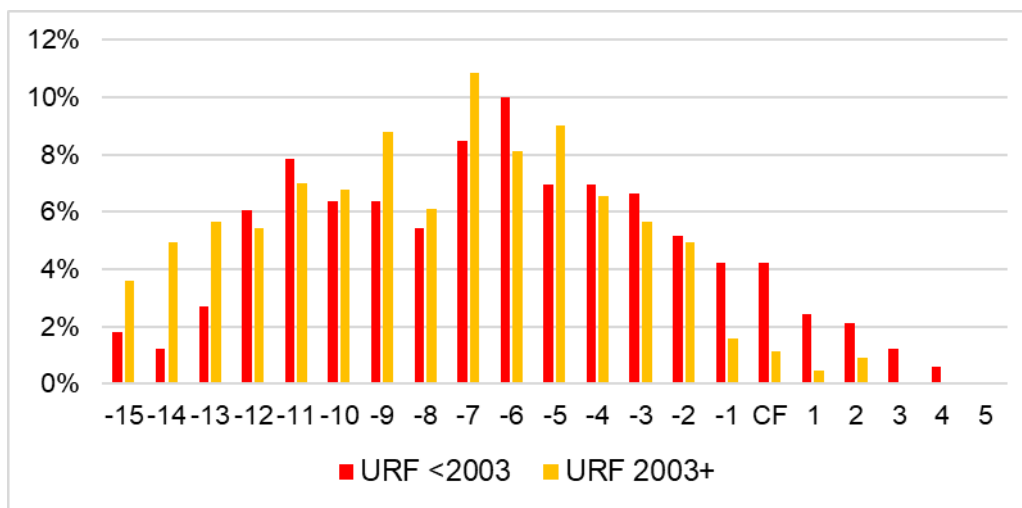
²³ The term principal investigator was not defined in the survey questionnaire and it is acknowledged that there may be some disciplinary differences in how this was interpreted, but responses were received across all disciplines

For DHF alumni respondents, again, around one third had published a key paper before starting the fellowship and there was a particular peak at 3 years prior to completion. In total, 72% had published a key paper by or in the year of completion.

For both the DHF and the URF respondents, the peak in the distribution occurred quite early in the fellowship, based on (full-time basis) fellowship lengths of 4 years and 8-10 years, respectively.

In Figure 4.2(a) this analysis is applied to 'earlier' and 'later' URF alumni respondents, corresponding to the two broad periods of eligibility highlighted in the previous section. Amongst those completing their fellowship prior to 2003, 93% had a key paper by the time they completed, while this was 99% for those completing after 2003. This difference could largely be explained by the proportion who had published a key paper before they started the fellowship, which was 30% of the earlier group and 36% of the more recent.

(a)



(b)

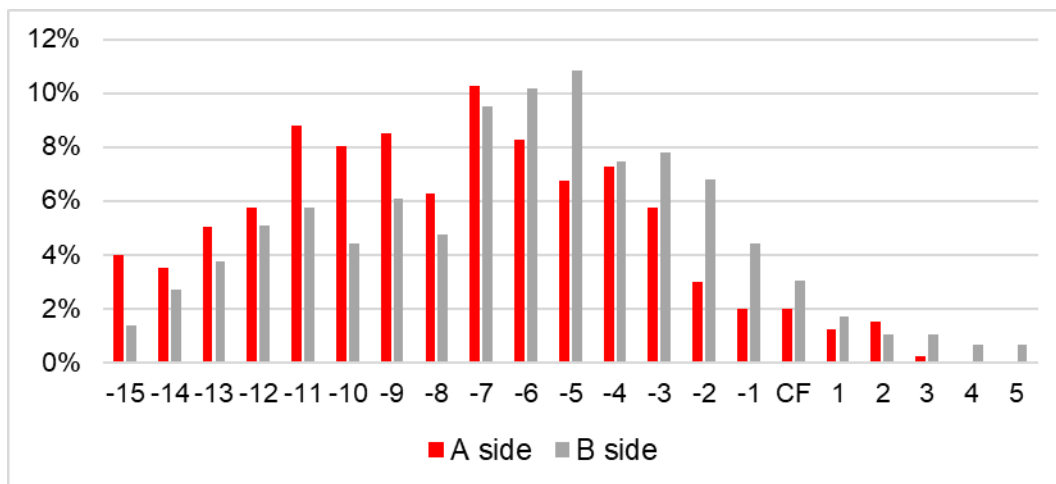


Figure 4.2 Period in years between publication of first significant paper as a principal investigator and fellowship completion (CF) for URF alumni: (a) by period of fellowship completion (<2003: N=432; 2003+: N=320); and (b) by broad disciplinary area (A: N=392; B: N=292).

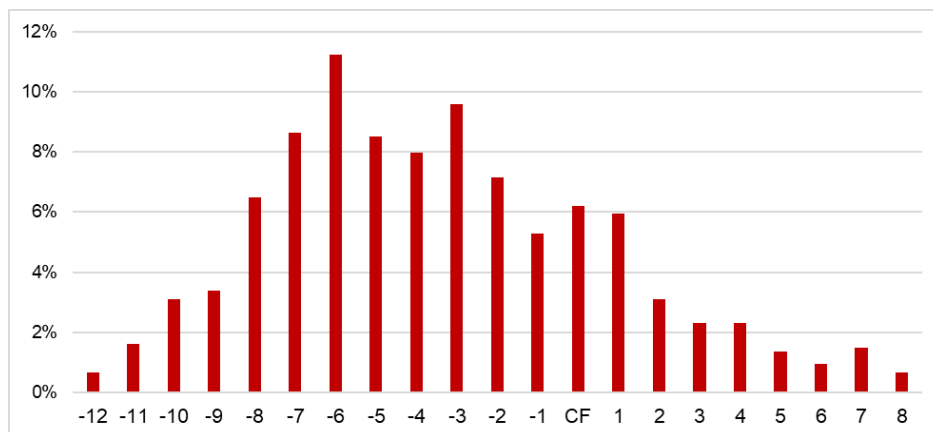
The extensive ‘tail’ of results many years before a fellowship could also be because some respondents indicated the date of their earliest first-author paper, rather than the first while they were in the position of a principal investigator (which was the year specifically sought in the survey).

Figure 4.2(b) is a similar analysis by broad disciplinary area, across all the URF alumni. This shows that (very broadly) somewhat higher proportions of respondents in A-side subjects tended to have published their first paper earlier than those in B-side subjects. This could relate to disciplinary differences within these broad areas, such as the extent to which the research was theoretical or experimental, the lead times in to experimental work, or a variety of other reasons. An analysis of these results for URF respondents by gender did not show any systematic differences.

4.2.2. First significant research grant as a principal investigator

The timing of survey respondents’ reported year of first success in securing a significant research grant as a principal investigator was investigated as another indicator. 80% of URF alumni had secured a grant by or in the year they completed their fellowship.

(a)



(b)

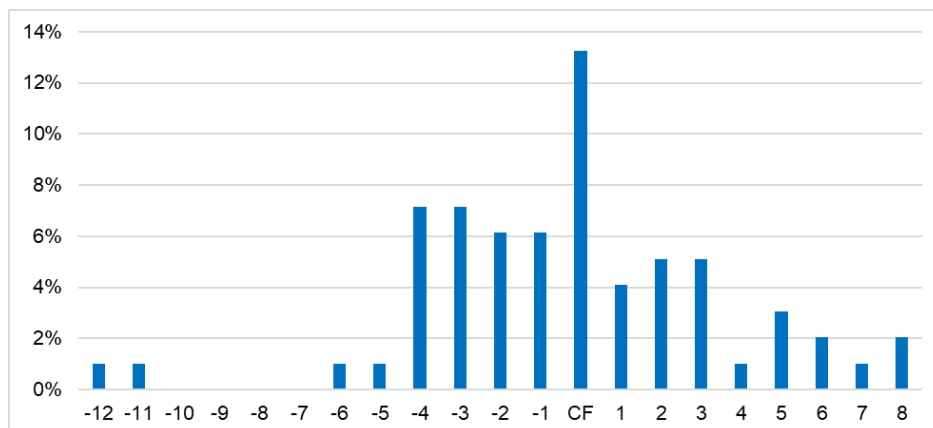
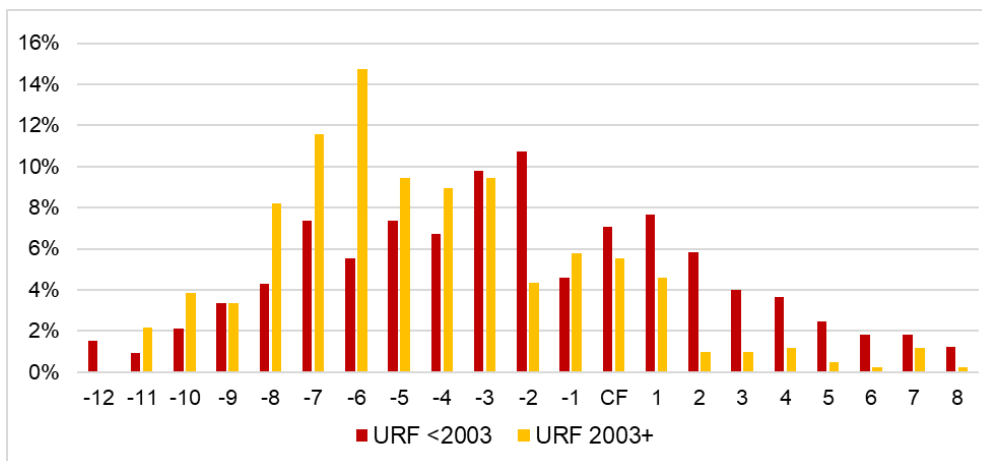


Figure 4.3 Period in years between securing first significant research grant as a Principal Investigator and fellowship completion (CF): (a) URF alumni (N=740); and (b) DHF alumni (N=67)

As Figure 4.3(a) shows, the distribution was quite broad in terms of the period between first grant and completion of fellowship, but with a peak at around six years prior to completion, corresponding to 2-4 years after commencement of the URF. For DHF alumni, the most common timing was to secure a grant in the year of completion, but 44% had secured their first research grant by or in the year they completed their fellowship (Figure 4.3(b)), which would be 4-5 years after commencement in many cases. The rather uneven distribution of results for DHF alumni reflects the modest sample size.

More detailed analysis showed no significant differences by gender amongst the URF respondents. When analysed broadly by when the fellowship took place, the greater prior research experience of some more recent URF participants was again evident. Higher proportions of those completing their fellowship since 2003 secured a grant early in their fellowship (6-8 years prior to completion) compared with alumni before that time, Figure 4.4(a). By the year of completion, over 80% of the former group (completing since 2003) had secured a grant, whereas this was 71% amongst the earlier alumni. These differences could also relate to changes in the external environment such as availability of research funding.

(a)



(b)

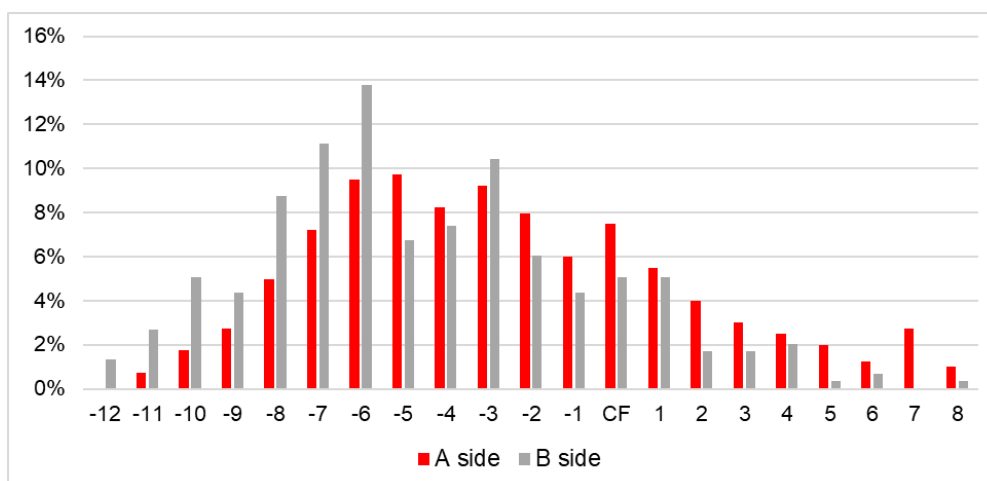


Figure 4.4 Years between securing first significant research grant as a Principal Investigator and fellowship completion (CF) for URF alumni: (a) by period (<2003: N=403; 2003+: N=326); and (b) by broad disciplinary area (A: N=391; B: N=294)

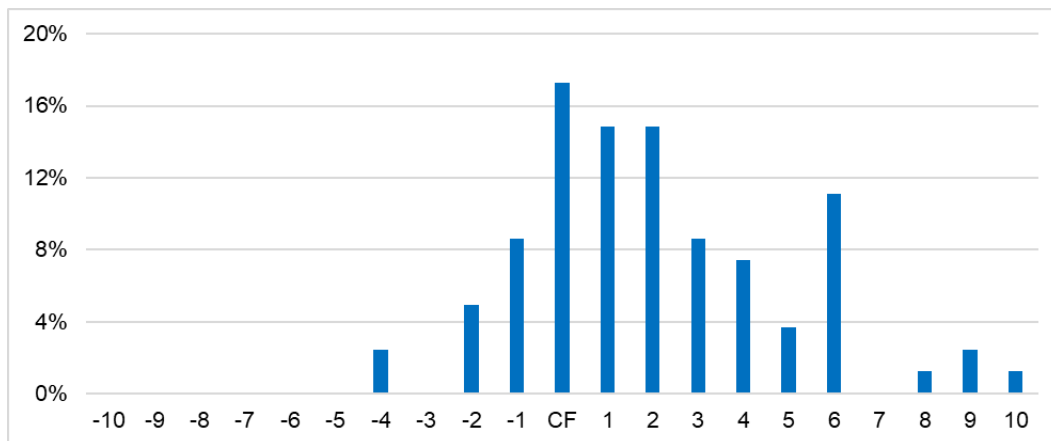
Analysis by broad disciplinary area, shown in Figure 4.4(b), indicates that a significantly higher proportion of URF respondents in B-side subjects (48%) had secured a grant 6 years prior to completion of their fellowship compared with their A-side counterparts (27%). However, by the year of completion, this difference was much less pronounced. Again, this could relate to changes in the availability of research funding schemes in different broad disciplinary areas.

4.2.3. Supervision of a successful doctoral researcher

One of the yardsticks considered in tracking the development of the alumni as research leaders was the year in which the first doctoral researcher that they had supervised had successfully completed their doctorate.

Of the 98 DHF alumni respondents, 83% (81 individuals) reported that they had supervised at least one doctoral researcher to successful completion. Most of the remaining respondents, who had not achieved this, were now working outside academia. The timing of that first successful completion relative to completion of their own fellowship is shown in Figure 4.5(a).

(a)



(b)

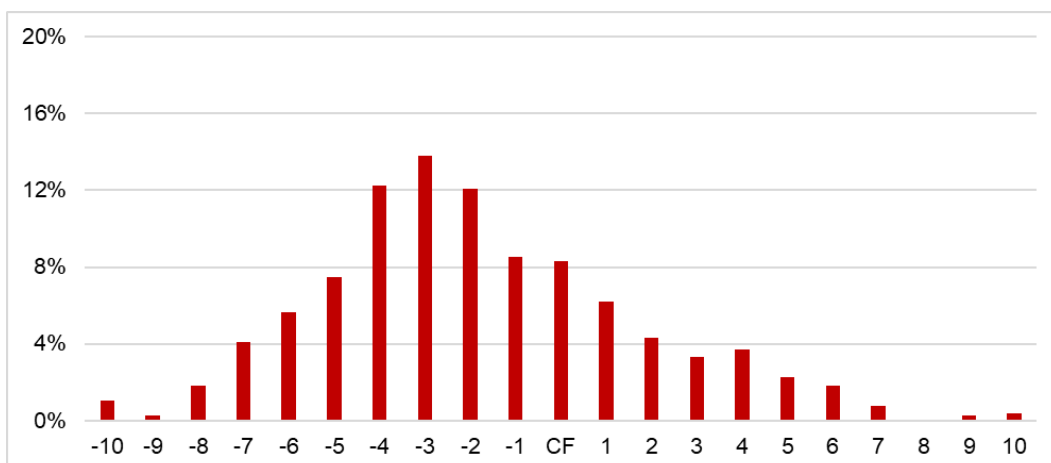


Figure 4.5 Years between first successful completion of supervised doctorate and completion of fellowship (CF), for (a) DHF alumni (N=81); and (b) URF alumni (N=748)

The most common timing of their first successful doctoral completion was the year they concluded their own fellowship (31%) or up to two years following this. It is worth noting that many of these DHF alumni, in keeping with the aims of the scheme, will have held their fellowship part-time, so the duration of their fellowship will have been longer than 4 years, enabling sufficient time for a doctoral student to undertake and complete a PhD. This also underlines that research leaders who work part-time are able to supervise doctoral researchers successfully.

The proportion of URF alumni who had supervised a doctoral researcher to successful completion was very high (almost 98%) amongst the URF respondents. Again, the few that had not done so were either working outside academia or in occupations that did not involve research. Amongst the URF alumni, the distribution of periods between first successful doctoral supervision and completion of their own fellowship was quite broad but with a peak around 2-4 years prior to fellowship completion, Figure 4.5(b). Based on a fellowship duration of 8-10 years, this would indicate that they had started supervising doctoral researchers a few years into their fellowship. The proportion of URF alumni who had supervised a doctoral researcher to successful completion by or in the year that finished their fellowship was 78%.

There was a very small number of URF respondents who reported they had supervised a doctoral researcher to completion prior to the start of their own research fellowship, giving further evidence that among some of the more recent URF alumni there were some relatively experienced and established researchers when they took up their fellowship.

Within the URF alumni, no significant difference was seen with gender in terms of these timings, nor with broad disciplinary areas (A side vs. B side).

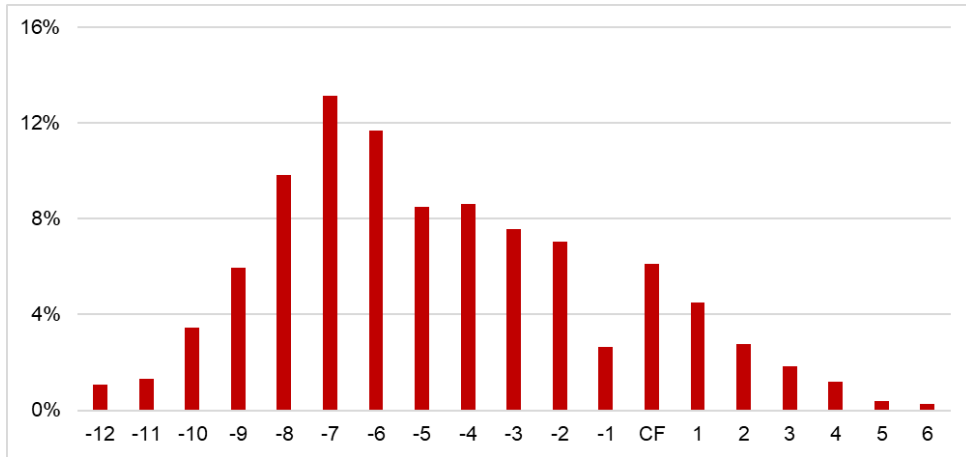
4.2.4. Managing research group members

A similar investigation was made of the year in which fellowship alumni had recruited their first research group member and/or gained line management responsibility, as this is a practical indication of research leadership. Figure 4.6(a) shows the timing of that first recruitment relative to reported completion of the fellowship for URF alumni, illustrating a broad distribution of results but a peak around 7 years prior to completion, which would equate to 1-3 years into most fellowships. Over 80% of URF alumni had hired or line-managed at least one research group member by or in the year they completed their fellowship.

For DHF alumni, Figure 4.6(b), the most common timing was 3 years prior to completion, which could equate to 1-2 years into fellowship on a full-time basis but later than this for those who were part-time. Some caution is needed as the sample of DHF alumni was quite small (N=75). 56% of DHF alumni had hired at least one research staff member by or the year of completion. Around 20% of the DHF alumni had never hired a research group member; this group again largely comprised those working outside academia (but also a few in academia).

There were no significant differences with gender for the URF alumni in relation to this yardstick. The existence of a small number of URF alumni reporting that they had hired research group members as early as 12 years prior to commencing their fellowship could relate either to experience prior to the fellowship or extended duration of the fellowship due to a period working part-time or a career break.

(a)



(b)

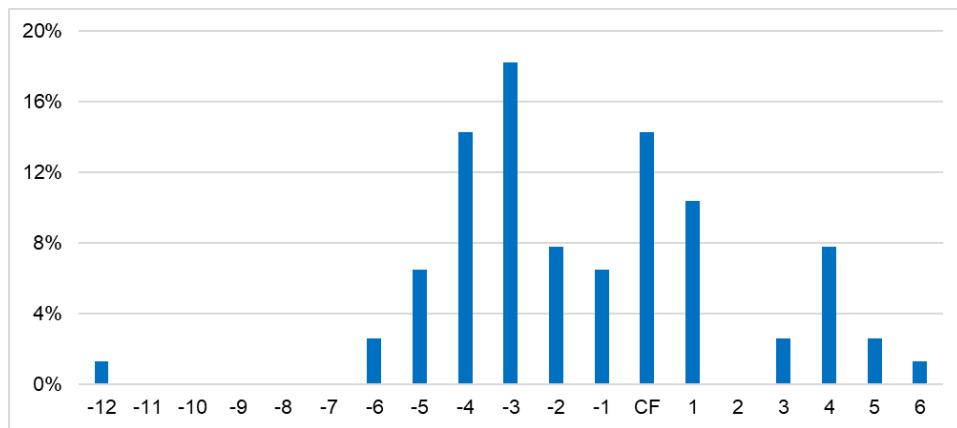


Figure 4.6 Number of years between recruitment of first research group member (or first line management) and completion of fellowship (CF): (a) URF alumni (N=738); (b) DHF alumni (N=75)

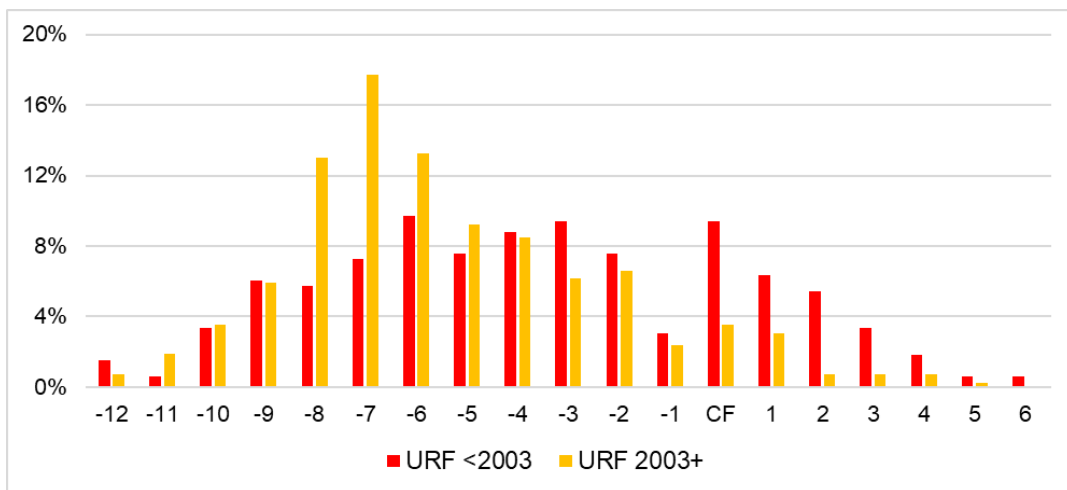


Figure 4.7 Number of years between recruitment of first research group member (or first line management) and completion of URF (CF) by broad period of fellowship completion (<2003: N=414; 2003+: N=324)

Analysis showed a higher proportion of more recent alumni to have first hired researchers 6-8 years prior to completion, than of earlier alumni (Figure 4.7). It is unclear whether this relates to awards being made to more experienced candidates or whether it reflects an overall increase in the pace and demand for results from research over time. Analysis by broad disciplinary area showed no significant differences.

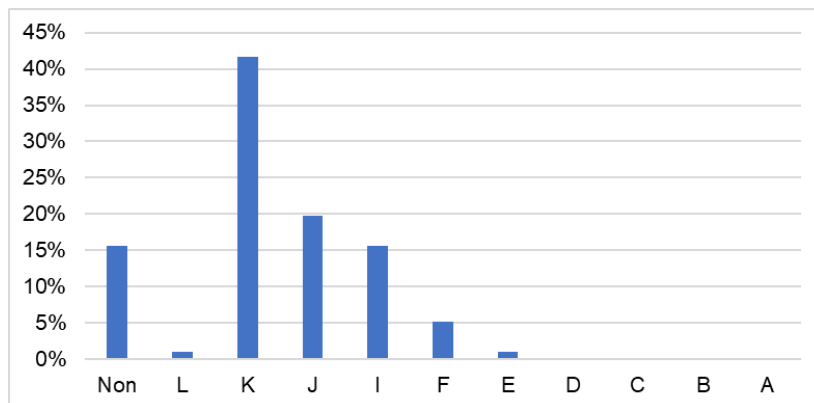
More attention is given to respondents' management of research staff in section 5.

4.3. First position after fellowship

The main aim of the Royal Society's Research Fellowship schemes is to provide talented early career researchers with protected research time and facilitate their progression to become independent research leaders. An important insight into the potential success of the schemes is therefore to understand the positions that those holding fellowships secured immediately following their fellowship.

Figure 4.8(a) illustrates the first positions that DHF alumni secured following their fellowship, by level within academia or outside academia (indicated as 'Non' in the chart). This shows that DHF alumni most commonly progressed to a role at academic level K (equivalent to Research Fellow or a Subject Lecturer, 41%), and only 6% at Level F (Professor) or higher. For many of those who progressed to a Level J position, this was actually in the form of a URF. 15% of the DHF alumni progressed to a non-academic role at this point.

(a)



(b)

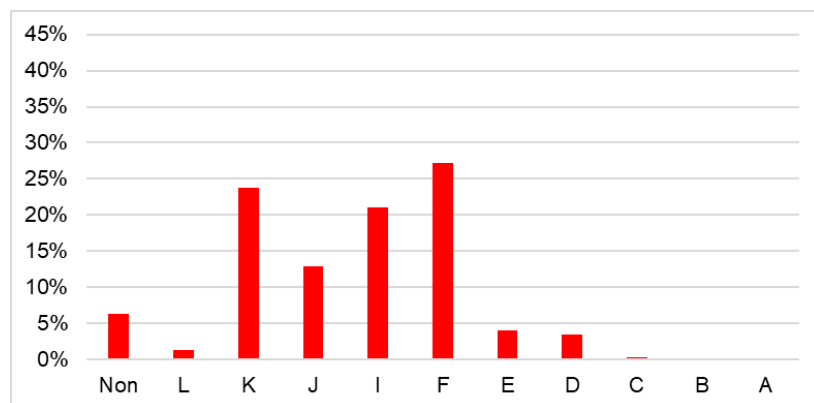


Figure 4.8 Level of first significant position secured after completion of fellowship (CF): (a) DHF alumni (N=96); (b) URF alumni (N=780). 'Non' indicates a position outside academia

Figure 4.8(b) shows that the largest proportion of URF alumni entered Level F (Professor, 27%) roles after completion, and a further 8% at a higher level. Only 6% immediately entered a job outside academia.

Amongst the URF alumni, Figure 4.9 shows there was some difference by gender in the first positions secured after fellowship. A higher proportion of the men (31%) secured a Level F (Professor) position than the women (21%), which was a statistically significant difference ($P < 0.001$). Conversely, a higher proportion of the women (29%) secured a Level K (Lecturer or Research Fellow) post than of the men (22%), also a significant difference.

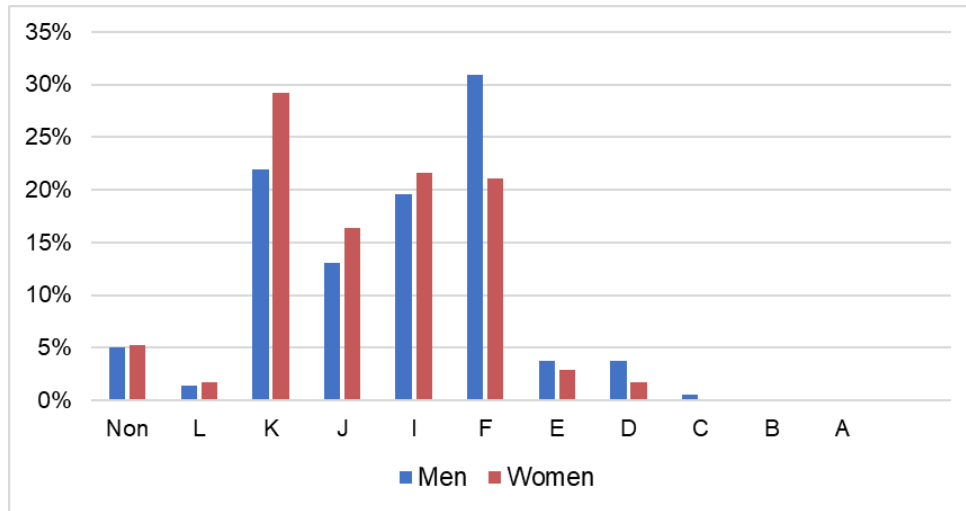


Figure 4.9 Level of first significant position secured after completion of URF, by gender (Men: N=588; Women: N=171)

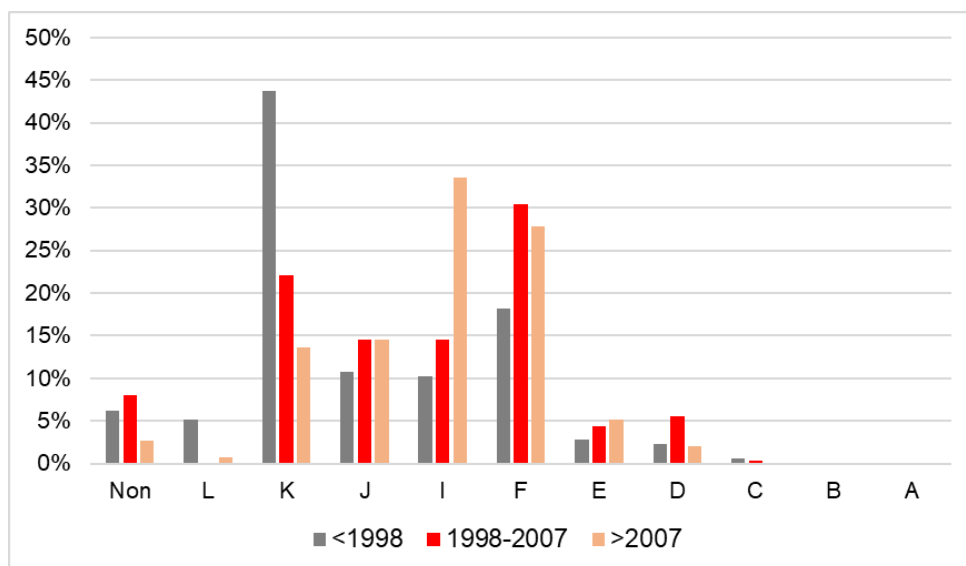


Figure 4.10 Level of first significant position secured after completion of URF, by completion date of fellowship (<1998: N=176; 1998-2007: N=322; >2007: N=295)

On the other hand, analysis by broad disciplinary area did not reveal systematic differences, so differences by gender did not arise due to differing gender profiles of disciplinary areas.

Analysis of these results with the broad timing of the fellowship appeared to reveal some differences, although some of the differences arose from the earliest group of alumni which was the smallest of the groups. As Figure 4.10 demonstrates, a higher proportion of URF alumni who completed their fellowship over twenty years ago entered a Level K (Lecturer or Research Fellow) post initially, than has been the case for those completing more recently. Relatively few of those earliest alumni entered posts at Professor (Level F) or higher after completion (around 20%) whereas this has been relatively common for more recent alumni (around 40%). It is not immediately clear what underlies these differences, but they could relate to changes in universities' policies on appointing staff with the title of Professor. Sector data do suggest that the proportion of UK academic staff who are Professors has increased from 6.7% in 1994 to 9.6% recently.²⁴ It is unclear why such a high proportion of the most recent group entered Level I (Senior Academic Lead, Reader, Principal Research Fellow) posts.

4.4. Progression since first position

Comparison of the current occupational level profile of the alumni with the profile of their first positions confirms that, overall, there has been progression for many since the first role they secured after their fellowship. For the DHF alumni, a substantial difference can be seen between the profile of their first positions and their current positions when surveyed. Figure 4.11 shows the strong peak at Level K that was seen in section 4.3 for their first positions secured, whereas the most common position when surveyed was Level I (Senior Academic Lead, Principal Research Fellow, as shown in section 3.2.3). When the profile of only those who have changed role ('not 1st job') is highlighted, the most common current role was at Level F (Professor). This is clear demonstration of progression overall and that amongst those who have changed role many have attained a Level F (Professor) position.

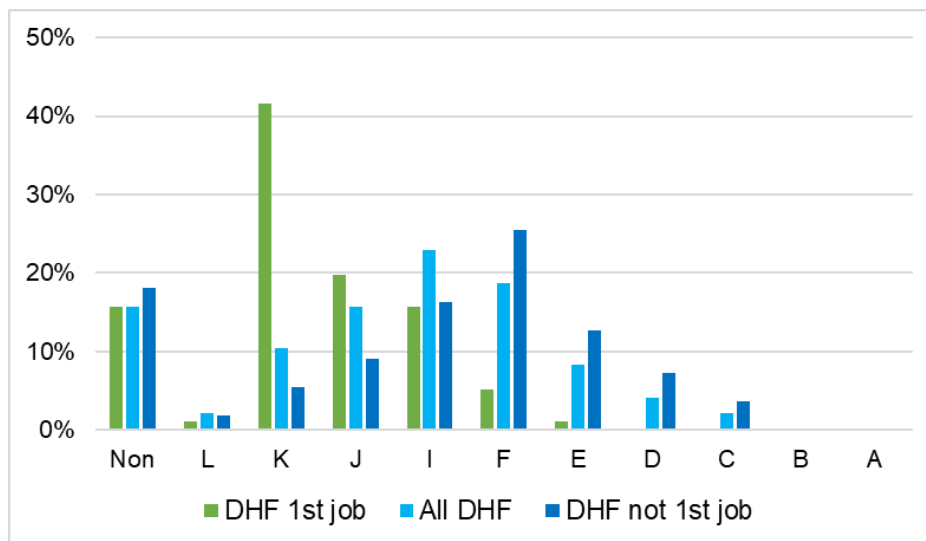


Figure 4.11 Level of post of DHF alumni: first job after completion of fellowship (N=96); all current positions (N=96); current positions of those who have changed role (N=55). 'Non' indicates positions outside academia

²⁴ Higher Education Statistics Agency: <https://www.hesa.ac.uk/data-and-analysis/staff>

Similar analysis of the levels of positions of URF alumni also shows some progression towards more senior roles (Figure 4.12). Given that a substantial proportion of URF alumni obtained a Professor-level role on completion of their fellowship, which is the most senior research post available in most circumstances, the potential for progression for URF alumni is mostly limited to those who did not achieve such a post immediately. In many cases, the ‘highest’ level roles (beyond Professor) tend to incorporate managerial functions and may not be seen as attractive to some at Professor level, while some other roles such as Head of Department may only be temporary positions. Examination of the data in detail confirms that the proportion of URF alumni who have changed role since obtaining their first position following their Fellowship was much higher amongst those whose first role was not at the level of Professor.

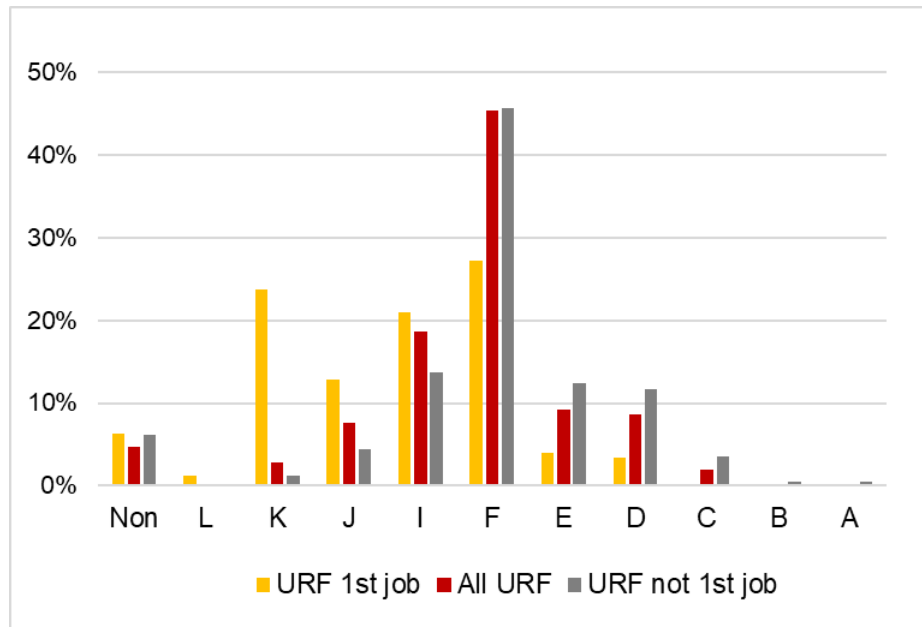


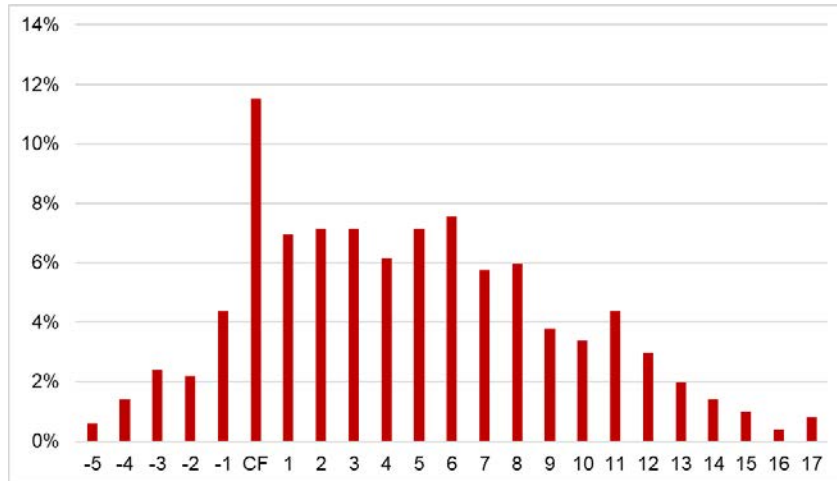
Figure 4.12 Level of post of URF alumni: first job after completion of fellowship (N=780); all current positions (N=780); and current positions for those who have changed role (N=401). ‘Non’ indicates a post outside academia

If one of the key objectives of a Research Fellowship is to facilitate progress as a recognised leader in research, such as to obtain a Professor-level research position in academia, these analyses suggest that the fellowship did provide that progression for many of the URF alumni, while many others have subsequently also progressed to such a post later. In the majority of cases, a DHF provided the first step in progression for DHF alumni towards such an outcome, which is consistent with the aim of the scheme to enable talented early career researchers to make the first recognised step towards independence.

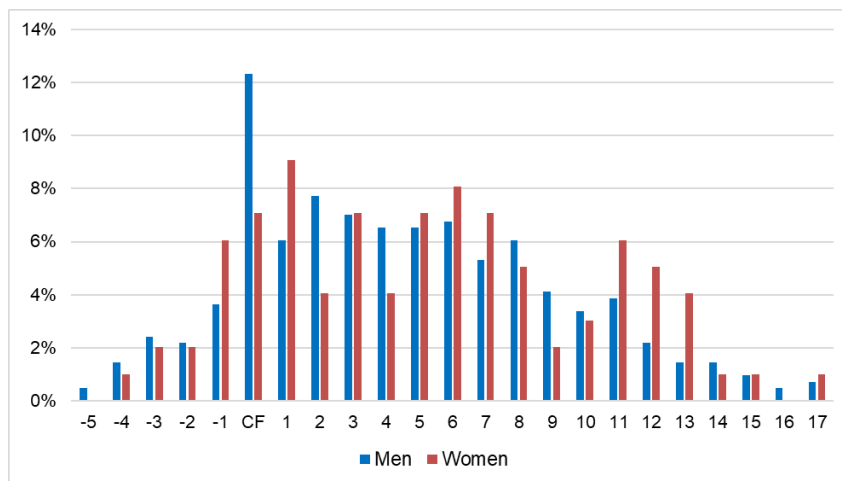
4.5. Time taken to reach a senior position

Analysis of the time taken to reach a senior position – which was defined in the questionnaire as obtaining a ‘Chair or position of equivalent seniority’ (which we took to mean Level F, Professor, in the UCEA/HESA classification) – is shown in Figure 4.13.

(a)



(b)



(c)

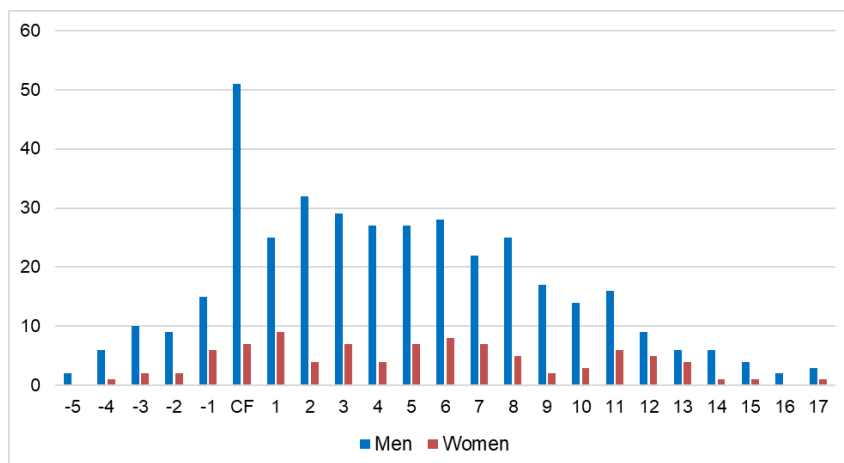


Figure 4.13 Time taken in years by URF alumni to obtain a Chair or equivalent senior level post from fellowship completion (CF): (a) all URF obtaining such a position (N=495); (b) by gender, shown as proportion; (c) by gender, shown as number (Men: N=390; Women: N=95)

Almost 70% of all URF alumni respondents reported that they had achieved such a position when surveyed, which was 71% of those in an academic career. As shown in Figure 4.13(a), amongst URF respondents, the most common time at which they obtained a Chair or equivalent senior position was immediately after the fellowship. 80% of the URF alumni who had such a position when surveyed had achieved it within 8 years of completion of their fellowship.

These data were analysed by gender, for the 73% of men and 58% of women URF alumni who had obtained a position at this level by the time of survey. Figure 4.13(b) shows prominently that the most common year for men to obtain this level of position was the year they completed their fellowship. The profile was similar for women other than that there was no such prominent spike at fellowship completion, and the most common time was a year later. These differences in timing are more clearly shown in Figure 4.13(c), which presents the same data as Figure 4.13(b) but using number of respondents rather than proportion.

When the average time taken to obtain this level of position was compared for men and women, there was a statistically significant difference, with the women taking on average 5.8 years and the men 4.6 years ($p=0.048$). 80% of the men (who had achieved this level of position when surveyed) achieved it within 8 years of completion, whereas this was the case for 75% of the women.

This analysis reflects quite well the higher proportion of men URF alumni who reported that their first position after the fellowship was at Level F (Professor) in section 4.3, than of the women URF alumni. However, the proportions who reported reaching this level of position based on this specific question (i.e. in relation to its timing) and based on analysis of job titles (that underpinned the analysis of first positions achieved in section 4.3) did not match. This could be due to some inconsistency in interpretation of the wording 'Chair or equivalent senior position' by respondents or the difference could relate to (recollections of) the specific year in which a position was obtained. For example, an individual who completed a fellowship towards the end of one calendar year and obtained a post early in the following year could record those events as a year apart. It is notable that 24% of the URF alumni reported that they secured a Chair or equivalent senior post within a year either side of the year of fellowship completion, which is quite close to the 27% who reported a Level F (Professor) post as their first position after fellowship.

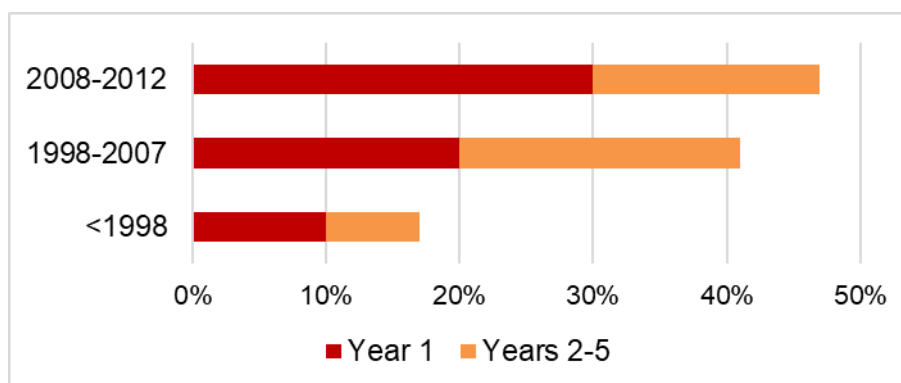


Figure 4.14 Proportion of URF alumni respondents who had achieved a Chair- or equivalent senior-level post within one year or 2-5 years after fellowship completion, by period of fellowship (<1998: N=179; 1998-2007: N=317; 2008-2012: N=155)

The relatively high proportion of more recent URF alumni securing a Level F (Professor) position as their first job after the fellowship, reported in section 4.3, was also evident in the results to this question. It was clearly not possible to record the periods between fellowship completion and obtaining a senior-level position for alumni who have only completed fellowships relatively recently, as insufficient time will have elapsed for some of them. Instead, a simpler analysis of the proportion of all URF alumni who obtained a Chair or equivalent senior-level position within 5 years of completion was undertaken, for all those who had completed their fellowship more than 5 years ago, using data from this question. This showed that while only 17% of the earliest group of URF alumni achieved such a position within 5 years of completion, this was 42% amongst those who completed between 1998 and 2007, and 47% of those completing most recently (2008-2012). On deeper investigation this appeared to result from a higher proportion (of more recent alumni) securing such a position during the last few years of their fellowship as well as a somewhat higher proportion doing so immediately afterwards. Part of this difference could relate to the relatively greater experience levels of some alumni when they had been awarded a fellowship, but presumably it also reflects changes in the employment landscape (and/or between different countries). Broadly, around 30% of URF alumni completing in the past 10 years acquired a Chair or equivalent senior position within a year of completion, whereas this proportion was 20% amongst those completing in the previous decade and less than 10% of the earliest group of alumni.

An analysis of the length taken to obtain a Chair- or equivalent senior-level position by DHF alumni is shown in Figure 4.15, but caution needs to be applied as the number of individuals who have reached this level of post is very limited (hence the chart uses the number of respondents not proportions). Only a single DHF alumna had achieved this level of position on this basis immediately at the end of the fellowship, to date, and although half who had achieved this level had done so within 8 years of completion of the fellowship, this constituted only 13 individuals.

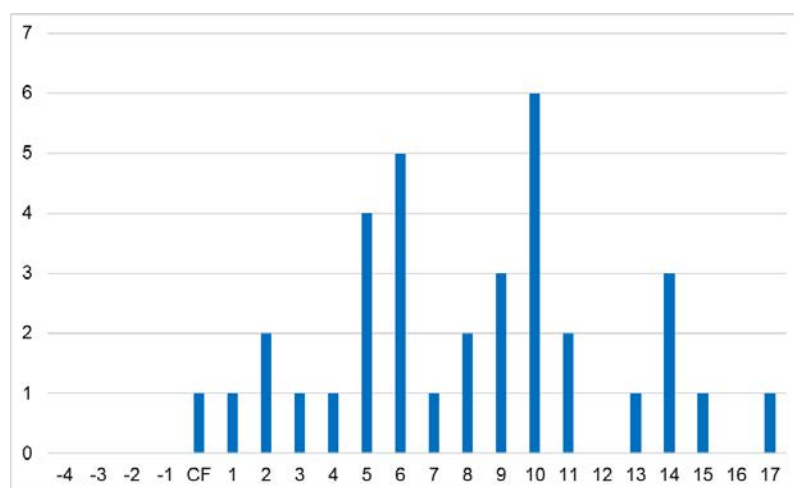


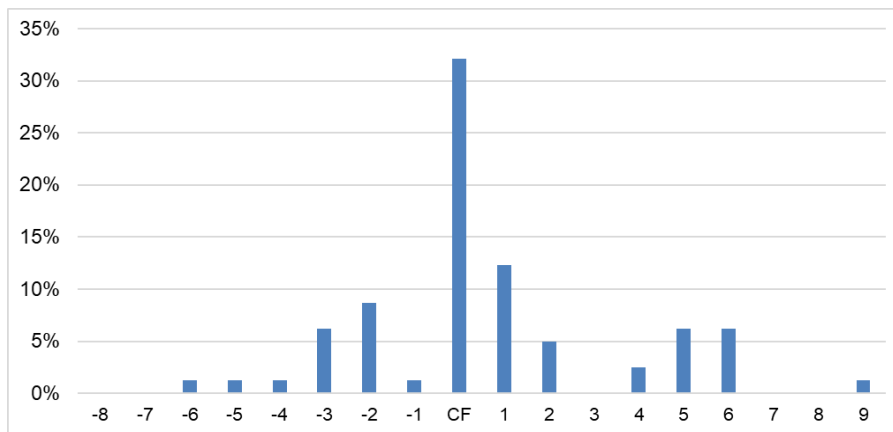
Figure 4.15 Time taken in years by DHF alumni to obtain Chair or equivalent senior position from fellowship completion (CF), shown as number of respondents (N=35)

Collectively these results show that the time taken to reach a senior level research position, for those pursuing an academic career, could vary considerably, and these results take no account of whether an individual had any career breaks or interruptions. Nonetheless, they show that a significant minority of URF alumni in particular did obtain such a position either immediately or within a few years after the Fellowship. There is also evidence to suggest that the time taken by women to reach this level of position was longer than for men. However, the results are made more complex by the greater proportion of alumni who completed within the last 10-15 years who achieved such a senior post at an earlier stage than their counterparts during the first 20 years or so of the URF scheme. Differences in employment policies and other potential variables such as the country where a post may have been secured could be contributory factors to these differences in the time taken to obtain a senior position between the earlier and more recent alumni cohorts.

4.6. Obtaining a permanent position

By the time of survey, 96% of URF alumni and almost 90% of DHF alumni in academic careers had secured a permanent or tenured job. Figure 4.16 illustrates the year in which they did so.²⁵

(a)



(b)

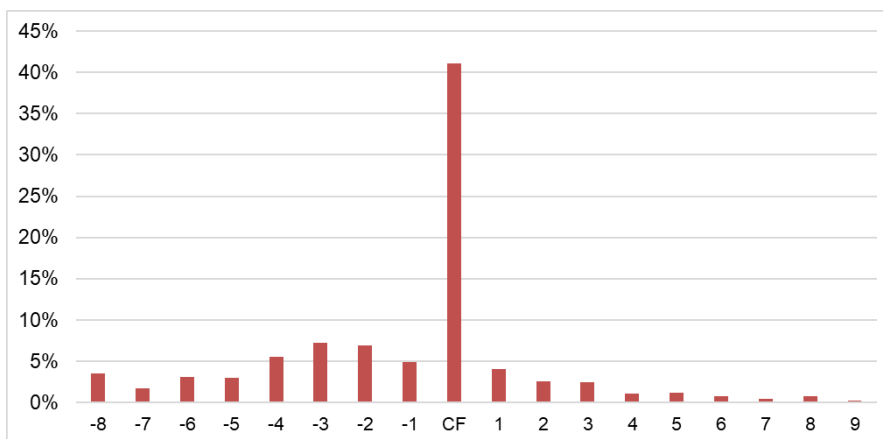
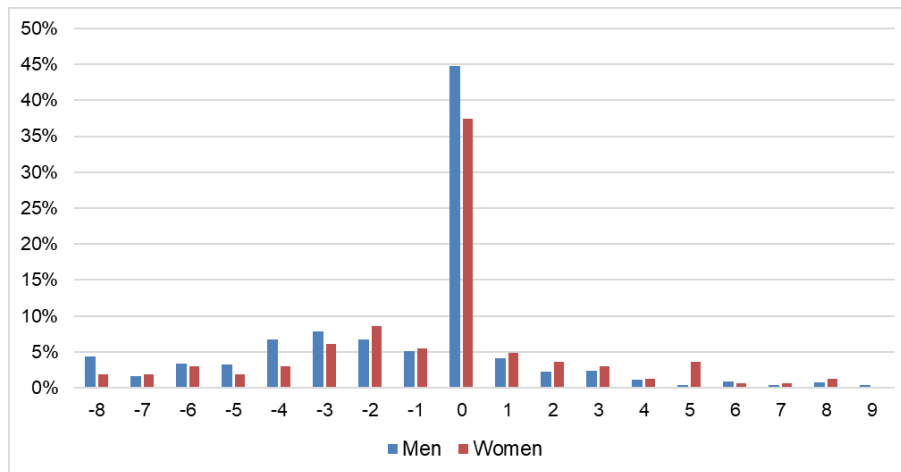


Figure 4.16 Years between first permanent or tenured position and completion of fellowship for respondents in an academic career: (a) DHF (N=69); (b) URF (N=678)

²⁵ Analyses excludes those in non-academic careers and those yet to obtain a permanent position

Figure 4.16(a) illustrates the timings for DHF alumni in academic careers who have obtained a permanent position, showing a prominent peak in the year of completion with 32% of DHF alumni obtaining a permanent post that year. A total of 52% of DHF alumni in academic careers had obtained such an employment position by or in the year they completed the fellowship. For URF alumni in academic careers, over 40% obtained a permanent or tenured position in the year of completion, Figure 4.16(b), and a total of 78% had achieved this by that time. In comparison, alumni of broadly equivalent fellowship schemes such as the BBSRC David Phillips Fellowship have reported that 65%²⁶ (and more recently 83%²⁷) secured permanent roles after their fellowship and 23% of MRC Career Development Award holders said that they had secured a subsequent job or promotion.²⁸

(a)



(b)

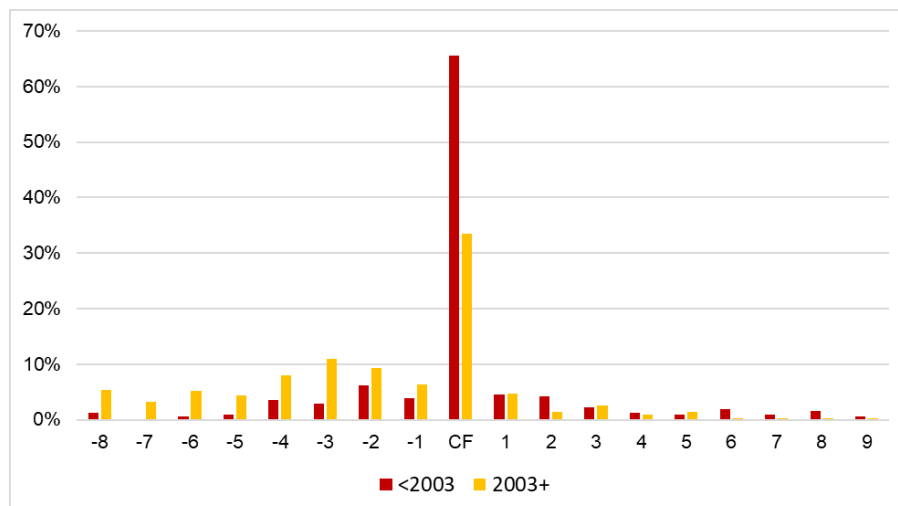


Figure 4.17 Years between first permanent or tenured position and completion of fellowship (CF) for URF respondents in an academic career: (a) by gender (men: N=518; women: N=149); (b) by period of completion of fellowship (<2003: N=326; 2003+: N=423)

²⁶ Review Of BBSRC Strategy For Investing In Fellowships, BBSRC, 2015, <https://bbsrc.ukri.org/documents/1503-review-fellowship-investment/>

²⁷ Direct communication from BBSRC

²⁸ Based on sample of 57 CDA holders: *Bringing Research Careers into Focus: An MRC Review of Next Destinations*, IFF Research, 2015 <https://mrc.ukri.org/publications/browse/mrc-review-of-next-destinations/>

As shown in Figure 4.17(a), amongst the URF alumni respondents, 84% of men had obtained their first permanent position by or in the year of completion (39% prior to and 45% in the year of completion), while this was 69% of women (32% prior to and 37% in that year). This was a significant difference statistically ($p=0.004$). By the time of the survey a total of 97% of the men and 88% of the women URF alumni respondents were in permanent positions.

Analysis of these data by when the URF was completed, using the two broad periods relating to the change in eligibility of applicants in 1994,²⁹ showed some differences. Interestingly, for both groups, 87% had achieved a permanent position by the time they completed their fellowship or in that same year. However, amongst those completing prior to 2003, 22% had achieved a permanent position before they had completed their fellowship (and 65% at or in the same year as completion). Amongst those completing their fellowship since 2003, a much higher proportion (53%) had obtained a permanent position during their fellowship and the remaining 34% at completion or shortly afterwards. This presumably reflects changes in university employment policies as well as, perhaps, the relatively greater prior experience of the more recent fellowship awardees when appointed; it will be interesting to see in investigations with future cohorts of alumni if this trend continues.

As the proportion of women has been somewhat higher amongst more recent URF alumni, and higher proportions of recent URF alumni overall have obtained a permanent post more quickly, the intersection of these trends would tend to increase the overall proportion of women obtaining permanency early when viewed as a total sample. However, the observed difference in results between men and women URFs persists in spite of this (and cannot be explained away as an artefact of the lower proportion of women in the earlier period of the scheme when permanency was slower to acquire).

4.7. Careers outside academia

As stated in section 3.2 on current circumstances, the number of respondents working outside academia was very modest, being just over 12% of DHF alumni (12 individuals) and 5% of URF alumni (37 individuals) who were in employment. Amongst URF alumni, this proportion was only around 2% for those who had completed their fellowship within the last 10 years, but 7% for earlier groups, indicating that there was some progressive shift 'outwards' from academia over time.

Given the relatively small number of alumni now working outside academia, it was possible to look at each respondent's job title and organisation individually to ascertain their current occupations. Roughly half of these alumni appeared to be in leadership and/or senior research roles in science-related private companies or public or third sector organisations. The private sector organisations ranged from large multinational corporations to spin-outs the alumni had founded. There were also small alumni clusters in science policy, funding and communication or publishing. 10 of the URF alumni were self-employed. In very few cases did the occupation have little or no connection with research-level science – two alumni now worked for large banks, one was a schoolteacher and one a member of the clergy. There was no evidence of any correlation between broad research discipline and a non-academic career choice.

Although this study did not attempt to track in detail the career trajectories of individual alumni, analysis of their first jobs after completion of fellowship and current positions does offer some

²⁹ See Appendix 2

insights into their career pathways. Amongst the DHF alumni, all but one of those now working outside academia had 'left' academia immediately after their fellowship (although a number of them had subsequently changed organisation and/or role). Based on analysis of the first positions secured, only one alumna had initially been employed outside academia and subsequently moved back 'in' to academia (at least on the basis on these two career points).

In contrast, nearly half of the URF alumni now working outside academia had started their post-fellowship career in an academic position and moved 'out' at a later stage. About the same number had initially taken a position in scientific industry or a public sector organisation and at a later date re-entered an academic career. In this respect, there appeared to be more balanced flows in and out of academia amongst the URF alumni, than amongst the DHF alumni, although the overwhelming majority entered an academic career immediately after their career and remained in it for the long term (based on this analysis).

As reported in chapter 7, those currently in non-academic careers tended to rate the impact and value of their fellowship somewhat more modestly than those in academic careers, although many still cited the experience and impact as significant. The fellowship's value in helping them to commercialise their work was viewed highly by around a quarter of those now working outside academia, higher than amongst those currently working in academia (15%).

A number of quotations attesting to the value and impact of the fellowship in section 7.3 are from alumni who elected to pursue a non-academic career direction, although some of them had forged a first career within academia and related some of the impacts on that first career stage rather than on their non-academic career. While a number of those who 'left' academia relatively early felt that much of the potential impact of the fellowship was of less relevance to them in their new career direction, a significant proportion made positive comments about their fellowship, which in a variety of ways had assisted them in their chosen career although it was not transformative for them in the way that it had been for many of their academic counterparts.

4.8. Summary

This chapter has focused in some detail on a variety of issues relating to the career progression of the URF and DHF alumni, principally through analysis of the reported timings of a series of events within an academic career associated with development of independent research leadership (which is ultimately a key desired outcome for individuals funded). Overwhelmingly it shows that most of the alumni have achieved these potential benchmarks including publishing key papers and securing research grants as a lead investigator, hiring research staff and supervising doctoral researchers, and themselves securing senior research positions and permanency as academic staff. The speed with which they did so cannot be compared with others as there was no control group that could be accessed within the practical constraints of this study. Within the results, there is some evidence for differences in timing and extent of achievement of certain factors, particularly over time as eligibility criteria for an award and the research employment landscape have changed, but also some suggestions of difference in relation to gender (but rarely with discipline, at least on a very broad level). A number of those differences, observed as trends in results and charts, are not statistically significant as the size of the key sub-samples, particularly in respect of women alumni, are relatively limited. However, the time for women URF alumni to achieve a Chair or equivalent senior position (if they have done so) is longer than for men. Meanwhile, other alumni have progressed to senior research and leadership roles in commercial or other sectors outside academia, which are also valid outcomes of the scheme. The next chapter uses the survey results to reveal more about the research and science leadership activities of the alumni.

5. Evidence for scientific leadership

5.1. Science- and research-related achievements

Respondents to the survey were invited to identify any significant national or international prizes or awards that they had achieved, during or since their fellowship, and to specify the two research outputs or impacts of which they were most proud. Analysis of those responses is beyond the scope of this report but being undertaken by The Royal Society itself. A number of case studies are published in its publication in parallel with this report.³⁰

Respondents were also invited to describe briefly up to two other achievements of which they were particularly proud, which could include key career milestones. Thematic analysis of the 1340 open-ended responses they provided reveals the most prominent types of achievement to be those in Table 5.1. The threshold for inclusion in this list was for citation by more than 50 different URF respondents, and more than 10 DHF respondents, respectively. They are listed, for each fellowship type, broadly in order of how frequently they were cited.

URF	DHF
Progression (in career)	Progression (in career)
External recognition	Training researchers (and their subsequent achievements)
Training researchers (and their subsequent achievements)	Securing grant funding
Public engagement and outreach	External recognition
Securing grant funding	Equality and inclusion activity
Establishing a research group or unit	Public engagement and outreach

Table 5.1 Most common themes and issues cited by respondents when reporting the two other achievements of which they were most proud

Many of the achievements reported were very individual and recording them here verbatim as examples could enable identification of the respondent, which would contravene the assurances of confidentiality given to respondents. Nonetheless, the following brief quotations and extracts provide some broader examples of the types of achievement cited by both DHF and URF alumni. The deliberate focus here is on broader leadership or science-related activity rather than directly on either scientific/research achievements or career- and progression-related achievements (considered in chapter 7 on Fellowship impact).

³⁰ *Royal Society Career Pathway Tracker: 35 years of supporting early career research fellows*, The Royal Society, 2018. <http://royalsociety.org/career-tracker>

It was notable that these 'broader' leadership and science-related achievements tended to be reported more commonly by women than men, proportionally, as was the case for a number of diversity-related issues, whereas a higher proportion of the men responding tended to cite more achievements that were more directly research-, progression- or recognition-related.³¹

"Training many PhD students and post-docs and seeing their careers flourish. Many now hold established positions in the UK and worldwide, and many have won prizes for their research" [URF, female, 1990]

"Establishing a unique, world-renowned interdisciplinary laboratory..." [URF, female, 1996]

"Mentoring a cohort of younger scientists who worked in my laboratory as graduate students or postdocs and have progressed to positions of leadership for biomedical research worldwide... several hold senior leadership posts in Biotech and Big Pharma" [URF, female, 2001]

"I founded a biotech company which has been active for ten years focused on developing new drugs... We have raised more than \$350 million to finance this research" [URF, female, 1992]

"I have worked with policy makers to contribute the results of my research to policy development and serving as a technical adviser to the House of Commons Science and Technology Committee" [URF, male, 2016]

"First female professor appointed in my department" [URF, female, 1997]

"First female Head of Department (since the first one was appointed in 1828)" [DHF, female, 2001]

"First female director of my research group (after 13 years as the only woman in the group, I am now one of four) with a healthy complement of female MSc students and PhD students" [DHF, female, 2004]

"I am proud to have successfully supervised many PhD students (7 completed and 7 ongoing). Many have continued in academia whilst others have undertaken careers in public engagement or civil service. I am honoured to continue to mentor all of them" [DHF, female, 2012]

"I am very pleased that so many of my PhD students and Postdocs have gone on to be very successful scientists. 3 are Professors in UK Universities, 1 in a European University, and another was the youngest ever Chinese academician and rose to be the Vice Chancellor of one of the top Universities in Shanghai" [URF, male, 1995]

"Over 35 former members of my group now hold independent positions in academia across the world - the support of people is more important than the research" [URF, male, 1998]

"Mentoring a cohort of younger scientists who worked in my laboratory as graduate students or postdocs and have progressed to positions of leadership for biomedical research worldwide. These include Professors, Associate Professors and Lecturers as well as several alumni who now hold senior leadership posts in biotech and big pharma" [URF, female, 2001]

³¹ Fellowship type, gender and year of completion are given for each respondent quoted

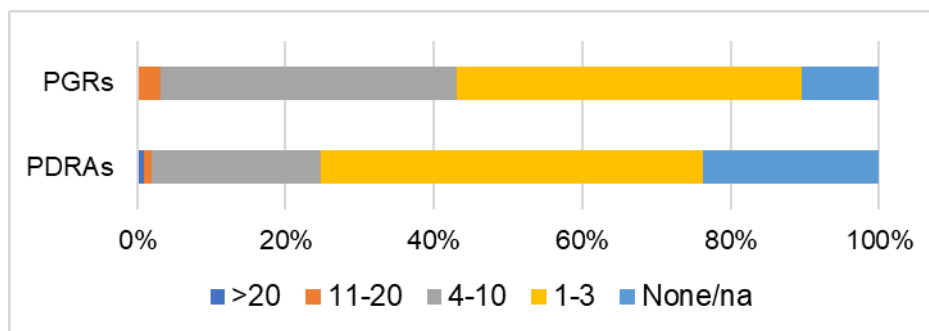
5.2. Current leadership and management of researchers

The numbers of postgraduate doctoral researchers (PGRs) currently supervised and postdoctoral researchers (PDRAs) currently managed by alumni working in the academic sector were reported by respondents. Figure 5.1(a) shows that around 90% of URF alumni respondents were currently supervising at least one PGR, with the vast majority supervising between 1 and 10.

Around three quarters of URF alumni were managing postdoctoral researchers and, again, in most cases between 1 and 10 of them. A similar high proportion of the DHF alumni working in academia were supervising at least one PGR and around two thirds managing at least one PDRA, Figure 5.1(b).

The relatively small proportions who were not currently supervising PGRs comprised roughly half who had completed their fellowship within the last five years and half who were experienced alumni. Analysis of their occupations revealed that they were either employed at levels below that of Professor or else working in managerial or administrative positions.

(a)



(b)

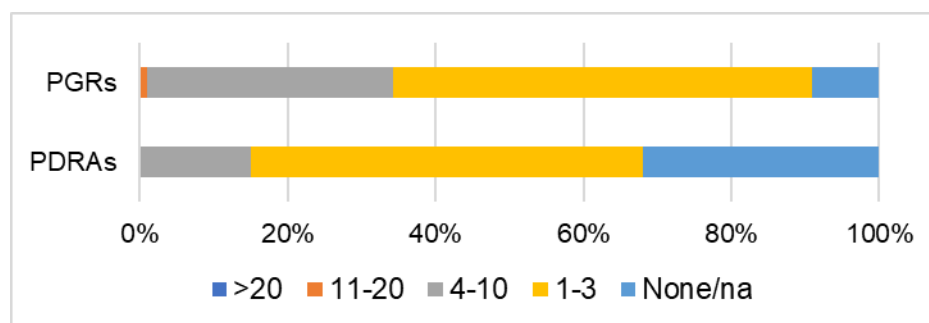


Figure 5.1 Number of doctoral researchers (PGRs) currently supervised and postdoctoral researchers (PDRAs) currently managed, by respondents employed in the academic sector: (a) URF alumni (N=689); (b) DHF alumni (N=76).

In order to provide a possible comparison with similar data for other research leaders, further analysis was undertaken for URF alumni who had completed their fellowship within the last 10 years. Figure 5.2 illustrates results for URF alumni working in academia from this period along with results from the PIRLS survey in 2017 for respondents in comparable subjects with a

roughly similar level of experience.³² This suggests that this subset of URF alumni, at least, were currently supervising more PGRs than ‘average’ research leaders in the UK with similar seniority/experience. A similar difference could be seen in relation to the number of PDRAs that they currently supervised. Comparisons between DHF alumni and PIRLS respondents are not reliable as the size of the appropriate subset of DHF respondents is very small.

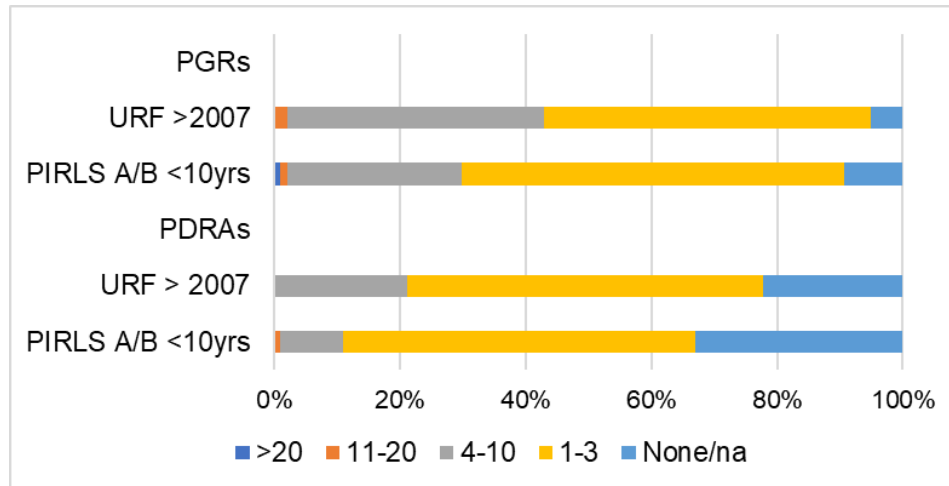


Figure 5.2 Number of PGRs (doctoral researchers) supervised and PDRAs (postdoctoral researchers) managed currently by URF alumni in the academic sector who completed their fellowship within the last 10 years, compared with PIRLS results (URF: N=271)

5.3. Cumulative leadership and management to date

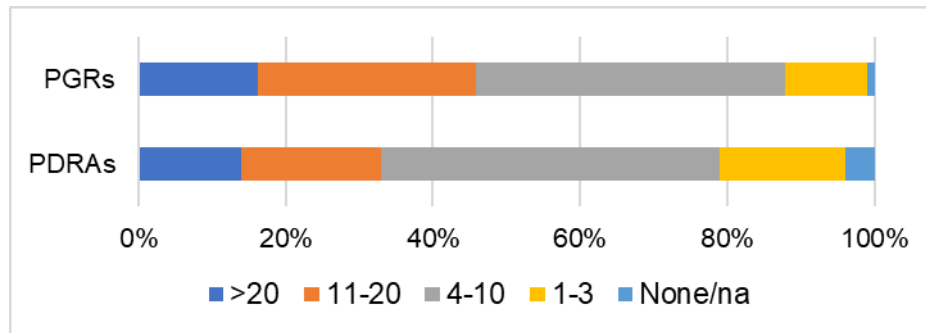
Figure 5.3 presents a similar analysis but for the cumulative numbers of doctoral researchers (PGRs) supervised to successful completion and postdoctoral researchers (PDRAs) or research staff) trained to date, by alumni in the academic sector.

This shows that almost half of URF alumni respondents had supervised more than 10 PGRs to successful completion. As seen in section 4.2.3, 98% had supervised at least one. Nearly one third of URF alumni had trained more than 10 PDRAs. Amongst DHF respondents, 83% had supervised one or more PGRs and around 20% had supervised more than 10 PGRs, while 60% had trained more than 3 PDRAs. The cumulative numbers of researchers managed by DHF alumni will inevitably be smaller on average (than for URF alumni) as the scheme started more recently.

Unfortunately, there was no readily available external benchmark with which the cumulative leadership or training achievement of fellowship alumni could be compared.

³² PIRLS – Principal Investigators and Research Leaders Survey: <https://www.vitae.ac.uk/impact-and-evaluation/pirls>

(a)



(b)

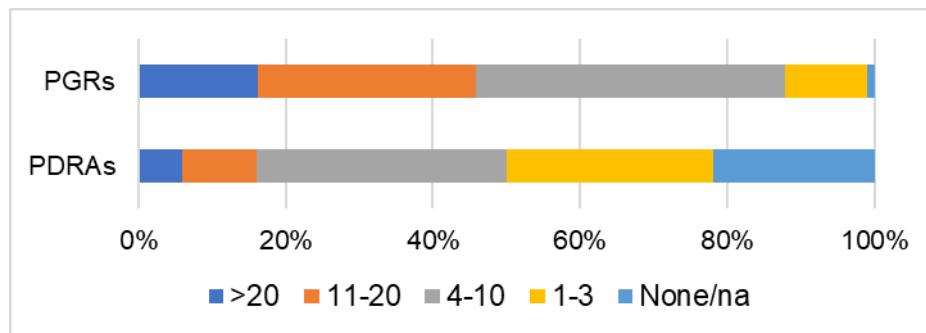


Figure 5.3 Total number of PGRs (doctoral researchers) supervised and PDRAs (postdoctoral researchers) managed by respondents in the academic sector: (a) URF alumni (N=686); (b) DHF alumni (N=72)

5.4. Other contributions to science

Respondents were asked the frequency with which they undertook public engagement with science, knowledge exchange or commercialisation activity, and policy-making at national level. Figure 5.4 summarises results by fellowship type and for various sub-groups of URF alumni working in the academic sector.

This suggests that almost 90% of both URF and DHF alumni who were academics were active in public engagement at least once per year. A higher proportion of the women amongst URF respondents undertook public engagement activity more frequently than amongst men, and more of those working on B-side disciplines were more active than those in A-side disciplines. Using this broad measure, the frequency levels were relatively similar for the most and least experienced URF alumni. Amongst the small sample of alumni who were working outside academia when surveyed, the majority (two thirds) also reported that they were active in public engagement on this basis.

The results for knowledge exchange or commercialisation varied much less across these sub-groups, with just under two-thirds of those in both academic and other careers participating in this type of activity at least once per year. Amongst the former, the proportions who were active once or more per year was slightly higher amongst those who had completed their fellowship over 20 years ago and amongst those undertaking research within the B-side disciplines (e.g. biological sciences and related subjects). There were no clear gender differences.

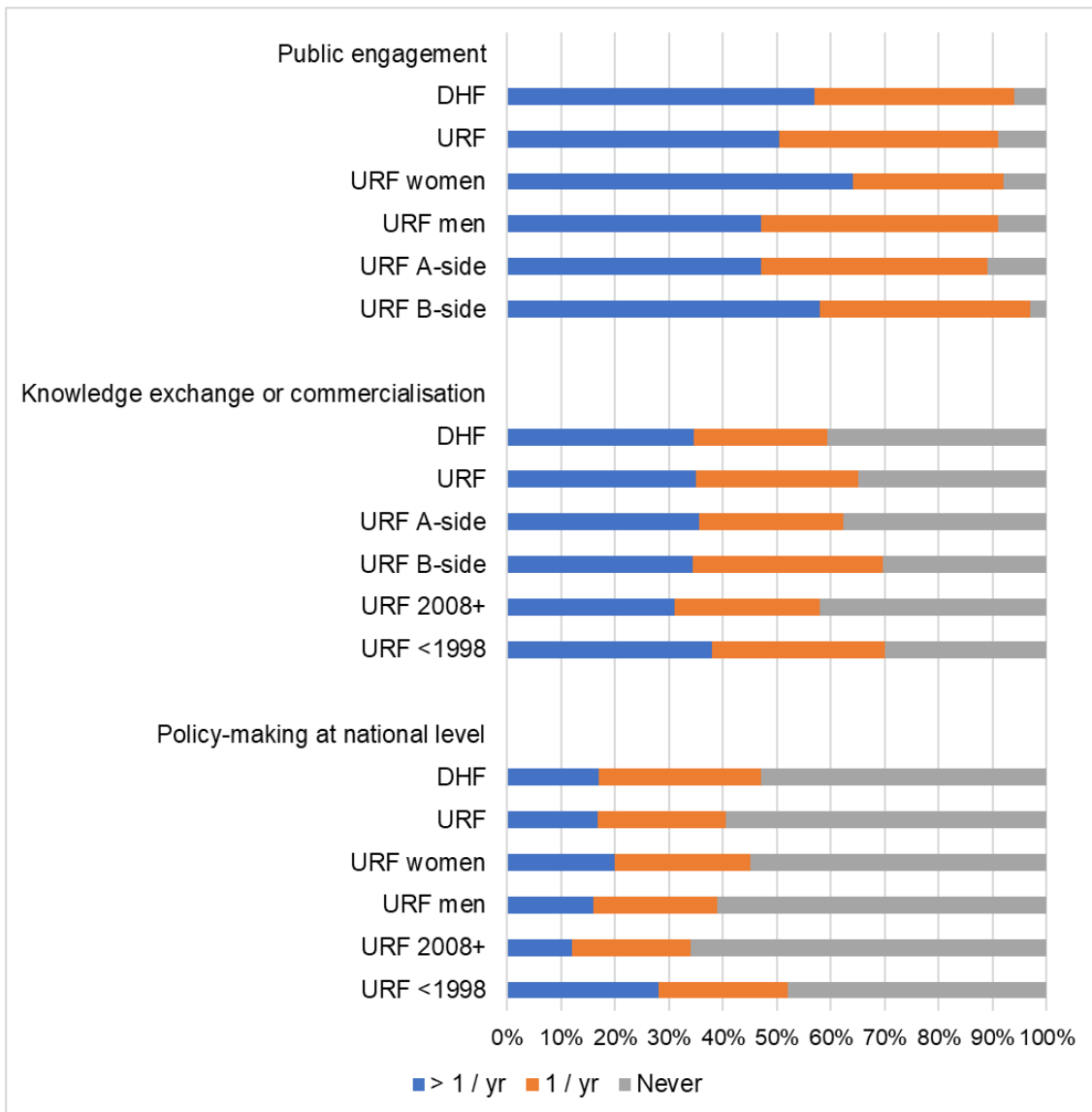


Figure 5.4 Proportions of respondents participating in public engagement, knowledge exchange or commercialisation and policy-making, by fellowship type, and by gender, broad disciplinary area and period for URF respondents (URF: N=735; DHF: N=81)

The proportion of URF alumni respondents in academia who indicated that they were involved in senior-level policy-making – which was worded in the questionnaire as “policy-making activity (e.g. at national level)” – at least once per year was just over 40%. This was slightly higher amongst DHF alumni. A slightly higher proportion of women amongst the URF alumni were active than of the men, but there was no difference in relation to broad discipline. Perhaps unsurprisingly, policy-making at this level was more common amongst the most experienced group of URF alumni, of whom over half reported that they were engaged in this activity at least once per year. A similar proportion of URF alumni working outside academia reported that they were active in policy-making, of whom more were active more than once per year. These would seem to be very high and welcome proportions, in relation to potential science impact, and would be worthy of deeper exploration in any future surveys of the alumni.

It is possible to provide some contextual comparison with levels of engagement in some of these activities from other research. A study for research funders in 2015 found that 82% of

researchers in the UK had been active to some extent in public engagement within the past year, and that 18% had not (the latter was the case for over 20% for researchers in comparable subject areas to the present study).³³ This would suggest that the level of public engagement activity is higher amongst these Research Fellowship alumni than amongst all researchers, although the latter group encompasses a wide range of levels of seniority (and did find that frequencies of activity were higher amongst more senior and older staff).

Another potential comparison is with results from the PIRLS survey which is of UK research leaders and therefore more directly comparable with the alumni in this study.³⁴ PIRLS does not obtain information directly about frequency of participation in public engagement or knowledge exchange but records the extent to which research leaders feel recognised by their institution for undertaking these activities. The proportion of PIRLS respondents indicating that this is not applicable to them could be a proxy for (non-) participation in these activities. Around 6% of PIRLS respondents in comparable subjects indicated that public engagement was not applicable to them, which is broadly similar to the proportion of research fellowship alumni here who indicated that they did not participate. This would suggest that these alumni are at least as active as other research leaders in these broad subject areas, on average, in terms of public engagement.

On the other hand, the proportion of alumni who reported here that they did not participate in knowledge exchange or commercialisation was much higher (at around a third) than the 10% of PIRLS respondents indicating that the question on that theme was not applicable to them. It would be valuable to investigate other measures to understand whether such a difference is genuine.

5.5. International collaborations

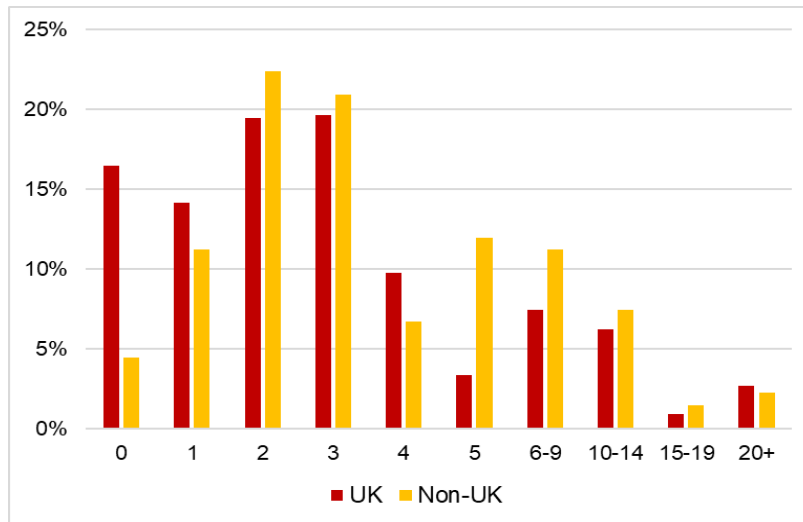
Another aspect of research endeavour that the Society was keen to understand amongst the scientists it has supported was the extent to which they collaborate with other researchers internationally. The survey sought an indication from respondents of the number of significant research collaborations in which they were currently involved, at co-investigator level. Analysis of responses from alumni in academic positions suggested that over 90% of URF alumni were currently engaged in at least one such collaboration. Amongst DHF alumni the proportion was over 85%, although there was some indication that somewhat fewer of them had a large number of current collaborations and most had fewer than three such collaborations.

A very wide range of numbers of collaborations was reported, although the mean figure for both fellowship types was around 4 current collaborations. A few respondents indicated very large numbers of collaborations – in a few cases in excess of 100. We assume that such a large number of concurrent collaborations indicates that these respondents had included all the different collaborators on one or more large international grants, whereas others may have reported only more substantive individual collaborations (and/or counted a multi-collaborator grant as a single collaboration). As a result, we suggest that in future a tighter definition of collaboration would be needed to provide data that are robust as a measure of the number of collaborations.

³³ *Factors affecting public engagement by researchers*, TNS BNRB, 2015

³⁴ PIRLS – Principal Investigators and Research Leaders Survey: <https://www.vitae.ac.uk/impact-and-evaluation/pirls>

(a)



(b)

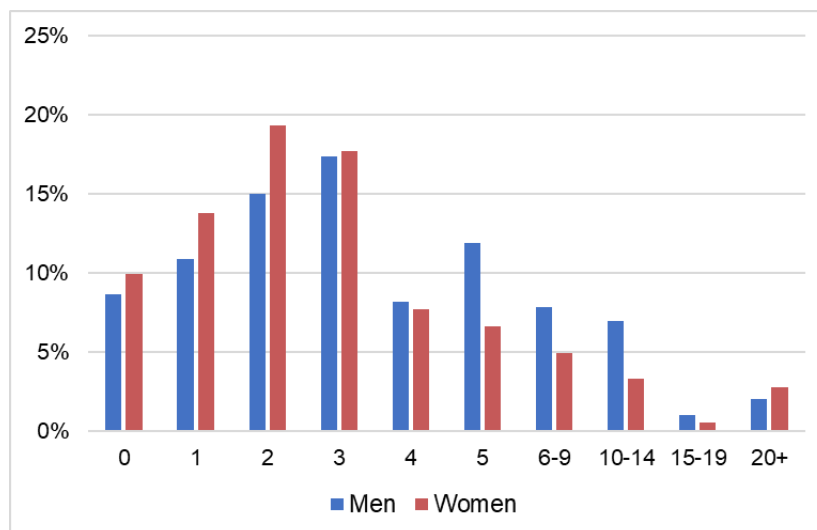


Figure 5.5 Number of current international collaborations reported by URF respondents working in the academic sector: (a) by domicile (UK: N=565; non-UK: N=134); and (b) by gender (Men: N=528; Women: N=157)

With that caveat, the results suggest that URF alumni from outside the UK tended to have somewhat more international collaborations than UK domiciles, Figure 5.5(a). The evidence also suggested that slightly higher proportions of men amongst the URF alumni had 5 or more collaborations than women, Figure 5.5(b). On the other hand, there was no substantive difference in the profile with the broad field of study, at least at the level of The Royal Society's A-side (Physical Sciences) and B-side (Biological Sciences) disciplinary areas. As the measure sought was the current number of international collaborations, not a cumulative number, it was perhaps not surprising that there was little variation with time since completion of the fellowship.

These issues would be valuably explored in future surveys with alumni using a more tightly defined measure of level and type of international collaboration.

5.6. Mobility

There has been long interest, heightened since the UK's 2016 referendum vote to leave the European Union, in the value of the international mobility of researchers. More recently, there is increasing interest also in intersectoral mobility, which in the context of academic research is generally defined as movement between work in the academic and other employment sectors. The survey was a good opportunity to assess the extent to which these research fellowship alumni had taken advantage of opportunities for both these forms of mobility, although the formulation of the questions meant that any mobility reported could have taken place at any point in their career, not purely during their fellowship.

Respondents were invited to indicate whether they had spent a significant period (defined as at least 3 months duration) working in another country that was not their normal place of residence, at some point in their career to date. Overall, 57% of URF and 48% of DHF alumni respondents reported that they had done so (Table 5.2).

		All			UK			Other EU
		All	Men	Women	All	Men	Women	
International mobility								
	URF	57%	58%	53%	56%	59%	48%	65%
	DHF	48%		47%	41%		43%	55%

Table 5.2 Proportion of respondents reporting that they had experienced at least one significant period of international mobility, by fellowship type, gender and domicile³⁵ (URF: N=737; DHF: N=81).

Amongst the URF alumni, a slightly higher proportion of men (58%) reported such international mobility than women (53%). There was no significant variation, however, with period since completion of the fellowship, which could indicate that much of the mobility had taken place either before or during the fellowship. As the question wording was broad (mobility at any time during career to date), that timing could not be investigated.

The level of international mobility reported was somewhat higher amongst alumni who were from other EU nations (65% for such URF alumni, and 55% for DHF alumni) than amongst UK nationals (amongst whom it was 56% and 41%, respectively). However, it should be remembered that the numbers of alumni from outside the UK were relatively limited, and there were too few from outside the EU to analyse. Analysis of the UK-domiciled URF alumni suggested that a higher proportion of men alumni (59%) had experienced international mobility than of women (48%). There was little difference in the results for those in the two broad disciplinary areas. It would be valuable to investigate these variances further in future surveys provided that it was possible to constrain more tightly when the international mobility took place.

Amongst the UK-domiciled URF alumni, the cumulative time spent in another country ranged from three months to (in a few cases) 25 years, with a mean duration of 3 years and median 2 years. Results for UK domiciles who were working in the UK when surveyed may be the most meaningful given that some of the mobility reported could have related to full emigration.

³⁵ Absence of a result in Table 5.2 indicates that a sub-group was too small to analyse

Analysis of this sub-group (UK domiciles who currently worked in the UK) showed that very few respondents had spent more than 5 years overseas, with a mean duration of around 2.5 years and median again 2 years. Amongst this sub-group of URF alumni, 55% reported that they had been mobile, and this was somewhat higher for men (58%) than women (46%), although there was no significant difference by gender in either the mean or median duration.

Respondents were also asked to indicate whether they had worked outside academia (referred to as intersectoral mobility) for a period of at least three months and, if so, for what duration in total. The wording of the question again did not specify when such intersectoral mobility took place and, for simplicity, the analysis was restricted only to those currently working in the academic sector. As shown in Table 5.3, overall 12% of URF alumni reported that they had worked in another sector. Amongst the URF alumni, there appeared to be no significant difference in relation to gender, but some suggestion that a higher proportion (14%) of those in A-side disciplines had spent time in another sector than of alumni in B-side disciplines (8%). Fewer of those who completed their fellowship within the last 10 years (8%) had spent time in another sector than those who had completed in the previous decade (16%). Only 10% of the DHF alumni, which constituted just 8 individuals, reported having been intersectorally mobile. It is hard to determine underpinning trends from these results, but they could be consistent with an increasing occurrence of intersectoral mobility generally with time (and that some of it was taking place in mid-career). However, revisiting this issue in more detail in future surveys would be valuable.

		All	A-side	B-side	>2008	1998-2008	<1998
Intersectoral mobility							
	URF	12%	14%	8%	8%	16%	12%
	DHF	10%					

Table 5.3 Proportion of respondents reporting that they had experienced at least one significant period of intersectoral mobility, by fellowship type, broad disciplinary area and period of completion of fellowship.³⁶ URF: N=737; DHF: N=81.

Analysis of responses from the URF alumni currently working in academia who had been mobile intersectorally revealed that the mean length of time spent in another sector was just over 2 years, although the median duration was a single year. These durations appeared to be similar for those working in both A- and B-side disciplines. A handful of respondents had spent 8 years or more in another sector but it was not possible to determine from the survey data whether this had been a single period or multiple periods in those sectors.

5.7. Summary

Results reported in this chapter confirm that the URF and DHF alumni are playing their part in scientific leadership in a range of respects. There is some evidence to suggest that on average they are supervising more doctoral researchers and managing more research staff than typical UK research leaders of comparable experience across a similar subject range. Together they

³⁶ Absence of a result indicates that sub-group was too small to analyse

have made a very substantial contribution in terms of the cumulative number of researchers they have supervised, trained and managed, and personal evidence attests to the scientific success that some of those researchers have in turn achieved.

Almost all the alumni, including those working outside academia, are contributing to public engagement efforts and significant minorities are active in knowledge exchange, commercialisation and/or policy-making at senior level.

Although it would be beneficial to probe these issues in more specific detail in any future surveys, there is some evidence to suggest that most of the alumni are active in international research collaborations and many have themselves undertaken some extent of international mobility, although the extent of intersectoral mobility (for those currently working in academic positions) appears to remain relatively low.

6. Career breaks

One of the aspirations of this research study was to investigate the career progression of those who have benefited from a Royal Society Research Fellowship, including some of the challenges and issues that they have faced in their careers. The survey explored the extent to which alumni had taken a range of types of break in their careers. It should be noted that the number and duration of any such breaks were reported on the basis of breaks at any point during their career, and not specifically during the fellowship or after it.

70% of DHF alumni respondents had at some point in their career taken maternity or paternity leave, and 34% of the URF respondents. These results were based on a single question asking if a respondent had taken maternity or paternity leave, rather than through separate questions for each type. Table 6.1 shows that there were some significant variations in these proportions amongst different sub-populations.

		All			>2008			<1998		
		All	Men	Women	All	Men	Women	All	Men	Women
Maternity/paternity leave										
	URF	34%	26%	61%	46%	41%	63%	22%	9%	60%
	DHF	70%		72%	83%			na	na	na
Looking after children/caring										
	URF	6%	5%	11%	6%	5%	7%	5%	2%	12%
	DHF	19%		19%	27%			na	na	na

Table 6.1 Proportion of respondents who reported they had experienced at least one period of leave, by fellowship type, completion date and gender³⁷ (DHF: N=81; URF: N=737)

A much higher proportion of women amongst URF respondents (61%) had taken maternity leave than men had taken paternity leave (26%), although that 61% was still lower than the 70% reported by DHF respondents (of whom all but four were female). Unsurprisingly, given the evolving culture in the workplace, paternity leave was much more common amongst men who had completed their URF in the last 10 years (41%) than earlier alumni (9% of men who completed it over 20 years ago). On the other hand, the proportion of women URF alumni reporting that they had taken maternity leave was similar irrespective of the period in which they had their fellowship. It will be interesting to monitor whether this changes in future as there have recently been major legislative changes on rights to paternity leave in the UK that will not (or not yet) impacted on the careers of most of the alumni studied here. There was also some evidence to suggest that maternity leave was somewhat more common amongst women who had left academia, compared with those who had remained in academia, although the sample size for the former group was very small.

A third of the URF alumni who had experienced maternity or paternity leave reported that they had taken only one such period of leave, while a half had taken two such periods and a much smaller proportion three or more. These proportions were broadly similar for both women and men. However, the cumulative duration of this type of leave was quite different by fellowship type and gender (Figure 6.1). Even though these results were for all such leave during a career (not just during a fellowship), it is notable that higher proportions of DHF alumni took greater

³⁷ Absence of a result indicates that sub-group was too small to report; na – not applicable

durations of maternity leave than women URF alumni. As proportions of those who took such leave, 40% of DHFs spent more than a year on maternity leave and 58% between 3 and 12 months. In comparison, 27% of women URFs reported a cumulative duration of their maternity leave of over a year and 63% 3-12 months. In contrast, over 90% of the men URF alumni who had taken paternity leave had taken less than 3 months, and none more than 12 months. It will be interesting to see in future whether a greater right to paternity leave for men will shift these patterns at all, or whether women will continue to take much more maternity leave (in terms of cumulative duration) than men take paternity leave.

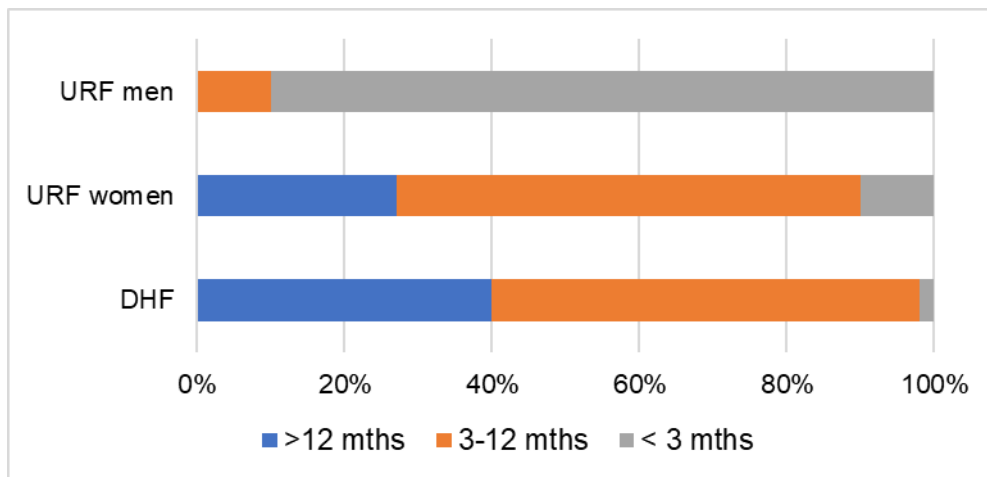


Figure 6.1 Cumulative duration of period/s of maternity or paternity leave, by fellowship type and gender (URF men: N=145; URF women: N=108; DHF: N=69)

The frequency and duration of certain other types of leave from work were also investigated. Also shown in Table 6.1, 19% of DHF alumni but just 6% of URF alumni (11% of the women and 5% of the men) had taken at least one period of leave to look after children or for other caring responsibilities. It was also notable that amongst the DHF alumni, this type of leave was more commonly taken by those who have completed their fellowship within the last 10 years (27%) than the previous decade (12%).

Of those who had taken leave to undertake caring responsibilities or look after children, two thirds had taken a single period of such leave and the cumulative duration of such periods of leave was in most cases less than 12 months (70%).

Around 8% of both URF and DHF alumni had experienced one or more periods of absence from work due to ill health (and 4% for other personal reasons), although the majority of these (around two thirds) had only taken one such period of leave and, in most cases, it was for less than 3 months in total duration. It would be useful to benchmark this against appropriate types of workers in other sectors, but no relevant sub-group was found with which a direct comparison could easily be made. It was noted, however, that recent research suggests that around 0.1% of the UK workforce goes on long-term sick leave in any single year.³⁸ Simple extrapolation from 0.1% per year would produce an extent which falls short of the cumulative total of 8% which was the average amongst the alumni within their careers to date, which would suggest that these alumni take more periods of long-term sick leave than average UK workers.

³⁸ *Working well: A plan to reduce long-term sickness absence*, Institute for Public Policy Research 2017

However, this cannot be considered a direct comparison, as long-term sick leave is defined as 20 weeks or longer nationally, whereas in the survey of alumni the period questioned was 3 months duration or longer.

Overall, just under 10% of URF alumni and 11% of DHF alumni reported that they had experienced being unemployed or in a position of looking for work in their career to date. The proportion was somewhat lower (6%) amongst URF alumni who had completed their fellowship over 20 years ago. Of those who had experienced unemployment, its cumulative duration had been between 3 and 6 months, and for only a handful of respondents had its duration been more than 12 months. Very few had experienced more than one such period of unemployment.

Due to the small numbers involved, it was not possible to undertake any analysis for sub-groups of those taking leave for this reason or for other types of leave other than for maternity/paternity leave.

Some preliminary analysis was conducted to ascertain whether there were differences in the extent or rate of career progression to senior roles for alumni who reported having had one or more maternity/paternity breaks compared with those who had not. On the basis of that preliminary analysis, clear or systematic trends did not emerge in relation to the time taken to reach a senior position or the level reached. Larger samples would be required for sound comparisons to be made and these would be more robust with tighter establishment of when the breaks took place.

7. Impact of the Research Fellowship

7.1. Impact upon career progression

Respondents to the survey were asked the extent to which they believed having a Royal Society Research Fellowship had impacted upon their career, in a number of respects. Over 80% of URF alumni now in an academic career strongly agreed (and a further 15% agreed) that the fellowship had made it easier for them to obtain their first permanent position (Figure 7.1). The corresponding proportions for DHF alumni were 70% and 15% respectively, so also very high.

Over 90% of all those in an academic career agreed (two thirds of whom strongly agreed) that the fellowship had made a significant difference to their career path, while almost the same proportions agreed that it had facilitated faster career progression, although this was felt slightly more strongly by URF than DHF alumni.

Although around two thirds of alumni of fellowships of both types believed it had enhanced the way senior colleagues perceived them, and similarly impacted on the level of seniority they had reached, the proportions strongly reporting these impacts were lower at 20-25%.

Results from those who were not in academic positions were also positive, for all these options, although they tended to be expressed with somewhat lower levels of strong agreement.

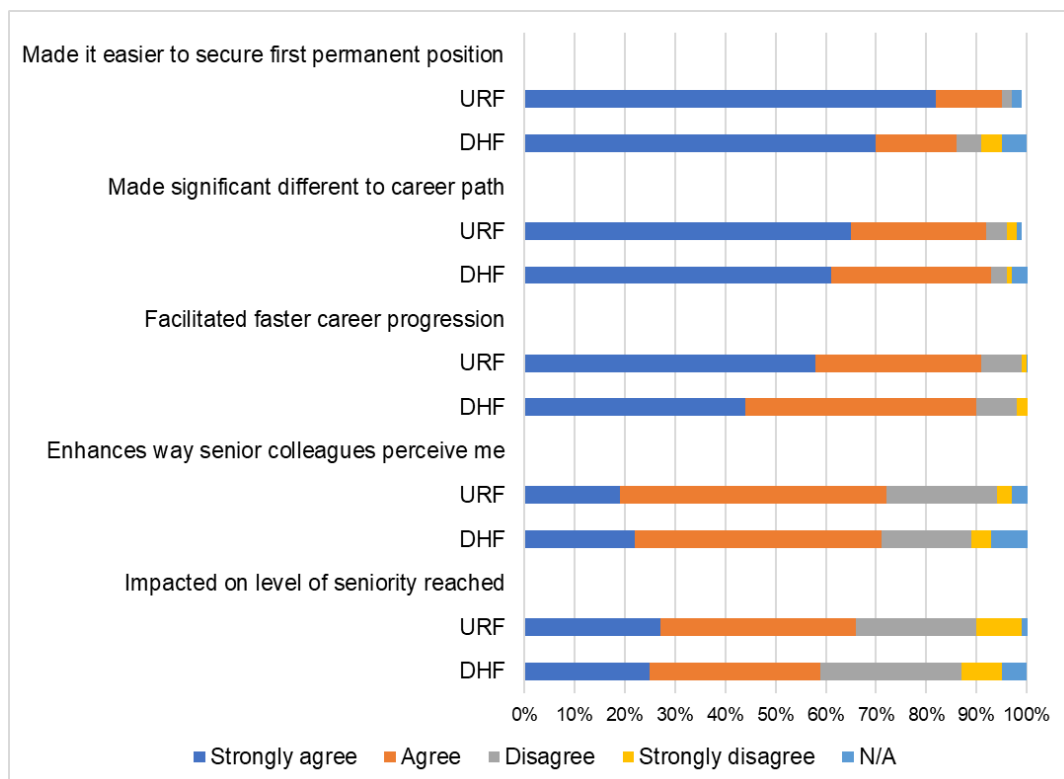


Figure 7.1 Respondents' extent of agreement with a range of statements about the impact of their research fellowship on their career, by fellowship type³⁹ (URF: N=736; DHF: N=79)

³⁹ The items relating to level of seniority and difference to career path were both styled as counterfactual options (i.e. extent of agreement that this was not the case) but results have been adjusted prior to inclusion in Figure 7.1

Results from the URF alumni did not differ significantly by gender, with one exception. 77% of women amongst the URF alumni either strongly agreed (29%) or agreed (48%) that the fellowship enhanced the way senior colleagues perceived them. This was more strongly felt than amongst men (of whom 16% were in strong agreement and 54% agreement with this).

URF alumni who had completed their fellowship within the last 10 years rated the impact of the fellowship somewhat more highly than those who had completed it earlier, in relation to perceptions of the level of seniority reached and the rate of career progression. On the other hand there was no difference in their views in relation to securing their first permanent position or impact on their overall career path. The strongest difference with period of fellowship completion was seen in relation to perceptions of how the respondent was viewed by senior colleagues; this was highest (over 80% agreeing that it made a difference) amongst those who completed in the last 10 years and lower, although still over half (53%), amongst those who completed their fellowship over 20 years ago.

7.2. Value of fellowship in becoming a research leader

Figure 7.2 presents respondents' perceptions of how valuable different aspects of their research fellowship had been in becoming a research leader. Very high proportions reported high value in the freedom to explore innovative approaches and opportunity to pursue new lines of research, as well as high value in the increase in self-confidence that winning the fellowship brought them. The stronger publication record, collaborations and multi- or cross-disciplinary work enabled by the fellowship, and also the opportunity to obtain subsequent grant funding, were also valued by over two thirds of respondents (although with lower proportions rating these aspects as very valuable). As many of these results were very similar for both URF and DHF respondents, Figure 7.2 illustrates the results for URF respondents and only shows a result for DHF alumni where this appeared to be substantively different.

Women in particular rated very highly the value of the fellowship in relation to improving their self-confidence. Three quarters of the DHF respondents, almost all of whom were women, felt that their fellowship was very valuable in this respect (and over 90% either very valuable or valuable). This was higher than the two thirds of all URF respondents who rated it as very valuable. When the URF results were analysed by gender, the proportion of women respondents attributing high value to improved self-confidence was similar to the level amongst DHF respondents, although it should be borne in mind that very high proportions of both men and women felt that the boost to self-confidence was either valuable or very valuable.

Perceptions of the value of the other potential benefits of the fellowship were similar for men and women amongst URF respondents, with the exception of development of leadership qualities. 85% of the women felt that the fellowship was valuable in this respect, which was higher than the corresponding 75% of men. Within these groups, the proportion of women who felt that the fellowship was very valuable, rather than valuable, was also higher than the corresponding proportion amongst men.

When the results were analysed by time since completion of the fellowship, one relatively consistent variance was observed. Those who had completed their fellowship within the last 5 years tended to rate the value of almost all aspects of the fellowship more highly than those who were more established in their careers. Amongst all those who had completed more than 5 years ago, the results varied relatively little with the period since completion.

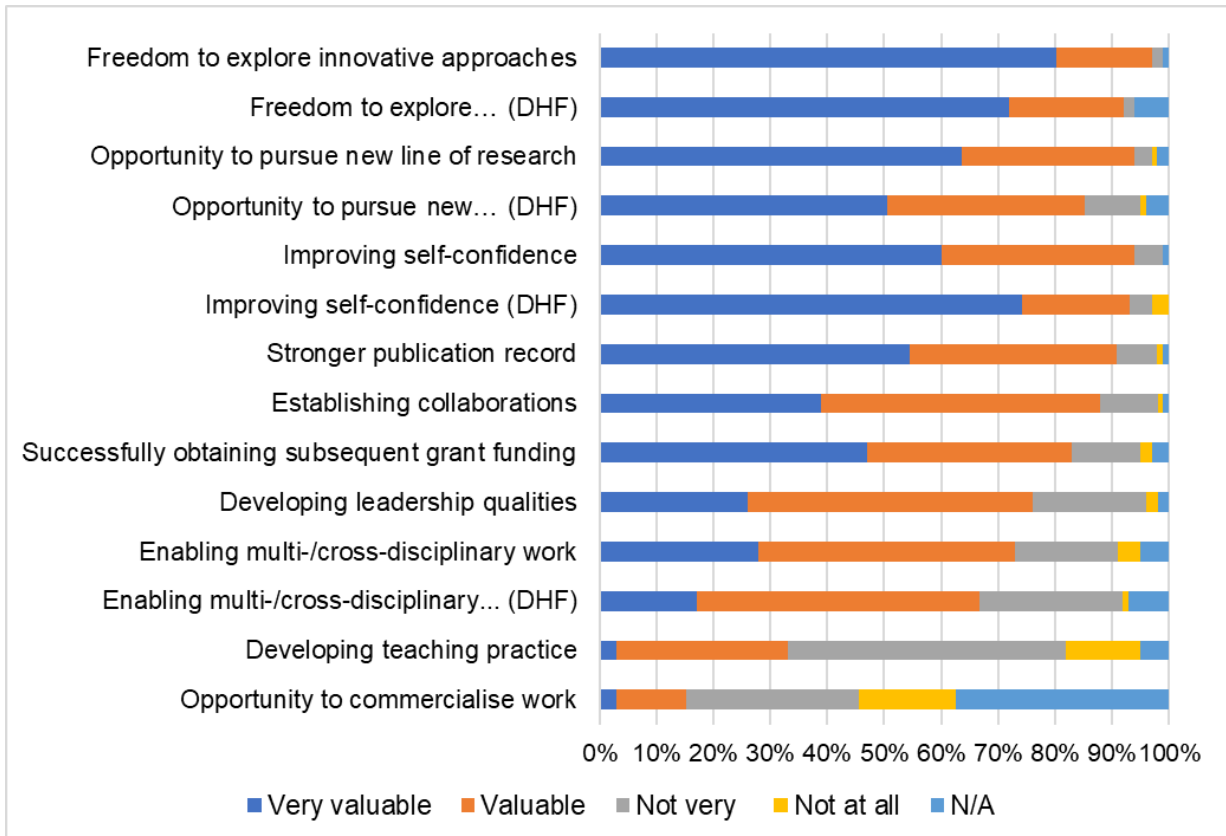


Figure 7.2 URF alumni respondents' perceptions of the value of their fellowship on a range of aspects of development of research leadership; results given for DHF respondents only presented where different from URF (URF: N=735; DHF: N=81)

Those who had not followed academic careers tended to rate the value of these benefits of the fellowship somewhat more modestly. The only exception to this was the fellowship's value in terms of commercialising work, which was viewed as valuable by around a quarter of those now working outside academia, higher than amongst those working in academia (15%).

Respondents were also asked about the value of a range of potential benefits of the fellowship and accompanying support from the Society in relation to their development as a research leader. The overwhelming majority felt that the highest value was in the additional time that the fellowship afforded them to focus on their research, although the flexibility of the funding and the prestige associated were also very highly rated. Figure 7.3 summarises these results. Many results were similar for URF and DHF alumni so the results are presented for URF alumni (in academic career positions) and only shown for DHF alumni where those results were different.

A significantly higher proportion of DHF alumni (than URF alumni) considered that the opportunity to access the Society's training and networks was very valuable, and more of them rated the opportunity to interact with their peers as valuable too. Similar results were seen amongst women URF respondents, suggesting that these benefits were considered of higher value by women than men. This difference echoes results of the PIRLS survey which have consistently shown that amongst research leaders women tend to be more receptive and

enthusiastic about opportunities for training than men in similar positions.⁴⁰ Otherwise the results were broadly similar by gender.

In line with results in the previous section, a number of the benefits of the fellowship were much more highly valued by the most recent alumni. In particular, over 80% of URF alumni who completed within the last 5 years valued the training and networks of the Society, whereas this proportion was around half for those further into their career. This could relate partly to an expansion in the extent of training activities around 10 years ago.

In parallel with this finding, over 60% of the most recent alumni valued interactions with their peers highly, whereas this was considered valuable by just under half of those who completed more than 10 years ago.

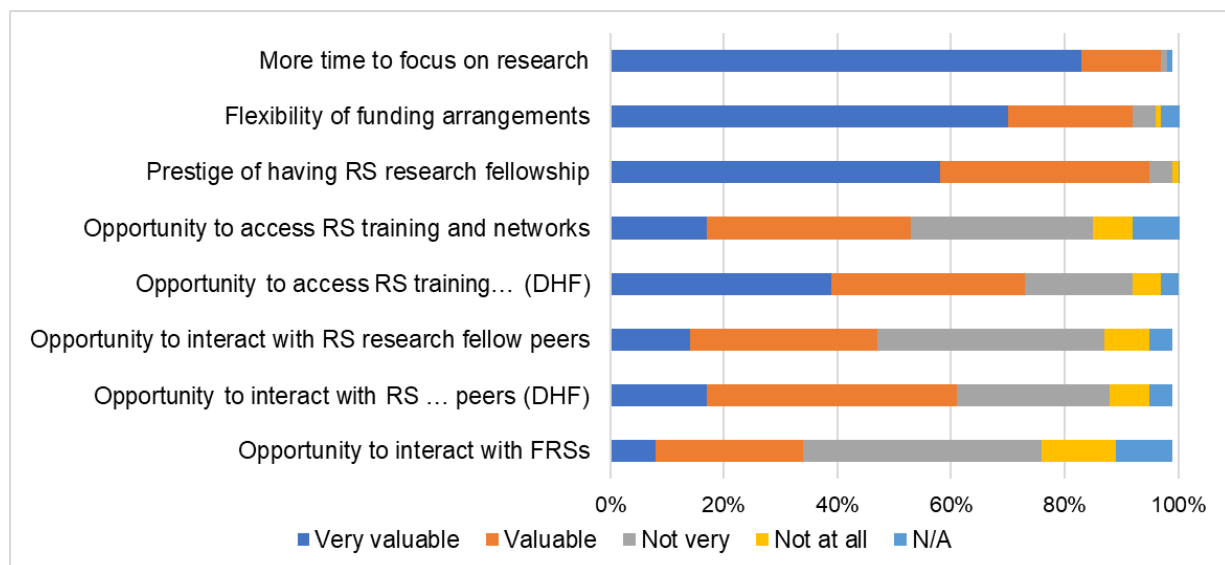


Figure 7.3 URF alumni respondents' perceptions of the value of different potential benefits of their fellowship towards development of research leadership; results given for DHF respondents only where different from URF (URF: N=735; DHF: N=81)

7.3. Impact on career – in their own words

In addition to providing responses to the closed questions about impact, respondents were invited to use open text to summarise the difference that they felt the Royal Society Research Fellowship had made to their career. The c.750 responses they inputted provide a very rich strand of qualitative evidence about personal perceptions of the impact of the fellowship. In the limited space available in this report, it is hard to do justice to this very large number of overwhelmingly positive comments, some of which were very effusive, made by the alumni, but The Royal Society has highlighted some of them using case studies.⁴¹

Thematic analysis of these comments revealed that the most commonly raised aspects within the experiences and perceptions of the URF alumni, and to a somewhat lesser extent the DHF

⁴⁰ Principal Investigators & Research Leaders Survey, Vitae 2017

⁴¹ *Royal Society Career Pathway Tracker: 35 years of supporting early career research fellows*, The Royal Society, 2018. <http://royalsociety.org/career-tracker>

alumni, were the following. All these themes were cited by very significant numbers of respondents:

- The independence afforded by the research fellowship;
- The opportunity (freedom) to pursue one's own research interests (which many also identified as pursuit of more innovative or 'risky' research than otherwise possible);
- The long duration of the URF, in particular, which enabled impact to ensue from that extended period of independent research freedom;
- The stability afforded by the long duration of the fellowship yet also its flexibility in terms of freedom to choose location, especially, but also (for some respondents) in relation to mode of working (which could be crucial alongside parenthood or in a dual career);
- In relation to location, the ability to choose an institution and/or research group within which to work;
- The freedom from other commitments in academic work, notably teaching and administration, which enabled much greater focus on research;
- The fellowship had enabled them to remain in academia, which otherwise they would have left for an alternative career direction.

Amongst the DHF alumni there were some additional themes cited:

- How the fellowship enabled them to remain and progress in a research career alongside motherhood;
- How the fellowship had bolstered their (perceived) reputation and increased their self-confidence.

The following is a small selection of their contributions, with an indication for each respondent of the year of completion of their fellowship – which shows that impacts have been seen throughout the operation of the schemes as well as throughout careers. The gender of the respondent is also shown and the fellowship type in each case.

"It offered me the flexibility and freedom to engage in creative research that is otherwise not permissible, especially in the current academic environment in the UK. The work carried out as a URF formed the basis for the subsequent research directions" [URF, male, 2007]

"[It] had an enormous impact in terms of prestige, flexibility, not having to teach unless I wanted to, generously funded without too much paperwork. All this made me feel valued and gave me true freedom and confidence to explore my research wherever it took me without worrying about the short term" [URF, male, 2003]

"My Royal Society fellowship has been absolutely crucial to my career. It allowed me the freedom to properly establish my own independent research systems (in the field in Africa) which I had begun during an earlier junior research fellowship, and to focus almost completely on research for long enough to do things properly: both to start new projects and to see them through to completion (and to think and to write...). This in turn made it relatively straightforward to be granted subsequent research funding and grow these projects further. I've no doubt that the freedom and medium term security that this gave me was pivotal to my development as a scientist" (DHF, female, 2013)

“... it was really the freedom that made it so magical” [URF, female, 2014]

“It gave me the freedom to take and run with new unexpected findings and start to commercialise them - forming a spin out company and developing a new drug which is now in clinical trials” [URF, male, 2002]

“The award of my URF is the reason that I have been able to explore an exciting multidisciplinary research career. Without the URF, I would have been much more likely to have been trapped in a silo. I realise that without the timing, duration and scientific freedom of the URF, the alternative of a series of short PDRA posts would not have been compatible with family life and I would have been another woman who left science for purely pragmatic reasons.” [URF, female, 1999]

“It provided the opportunity to establish my own research lab in a top institution with freedom from unwanted teaching and admin. The 5 to 10 year tenure gave me stability and the chance to take risks while positioning me favourably to take advantage of tenured job opportunities when they came along” [URF, male, 1989]

“The URF gave me the time and flexibility to truly innovate. The discoveries made at that time have set the course for much of my subsequent research. I believe that my work changed the field I work in, not just my own career. It would have been much harder to be achieve that while being a regular lecturer with full teaching and administrative responsibilities” [URF, male, 2003]

“It was the step that took me from essentially being an early career researcher into an independent, critical and more original scientist. For the first time in my life I had the time to really step back and think about what I was doing, to always try to find better ways of doing it, and to not be afraid to take risk” [URF, female, 2007]

“The fellowship gave me the time and independence to pursue big questions and to develop know-how at the interfaces of disciplinary boundaries which would have been very difficult at that time within the then existing structures of university departments” [URF, male, 1998]

“The major impact was an opportunity to focus wholeheartedly on research, which fueled a period of substantive productivity that I have never been able to replicate because of necessary time commitments to teaching and administrative responsibilities in my subsequent academic positions” [URF, male, 1987]

“My URF gave me the flexibility to focus and develop research interests and establish an independent research group. The period of time was particularly successful in generating a large number of high impact publications. These outputs combined with the prestige of the fellowship allowed me to secure my first lectureship position” [URF, male, 2000]

“To put it simply, it allowed me to establish my independent career, recruit my first students, and obtain my first significant research grant” (DHF, female, 2006)

“I cannot overestimate the impact the RS URF made to my career. As an early career researcher it gave me the mark of prestige and credibility that was irreplaceable as a 27 year old female in a male-dominated area. It gave me the confidence to pursue my research ambitions. Without it, I would never have been a full (tenured) professor at age 31” [URF, female, 2001]

“My Dorothy Hodgkin Fellowship enabled me to combine an academic career with starting a family (I had two periods of maternity leave during my Fellowship and changed to part-time employment) - without this flexibility I would probably have left academia at that stage” [DHF, female, 1999].

“The Dorothy Hodgkin Fellowship was absolutely critical in my career. I believe that I would not be a scientist now without it. It allowed me to stay in research and have independence at the end of my postdoc, but before I was competitive for applying for a tenure-track academic position, or indeed was ready because of my young family. The ability to work part-time during when my son was an infant was simply fantastic. I treasure that time in my career; it was instrumental in my success” [DHF, female, 2011]

“I was abroad when I applied for my fellowship - the award allowed me to return to the UK as an independent scientist with funds to support my research for several years, giving me opportunities to build on my research findings to generate further income to support a productive research programme. I was subsequently able to use my fellowship to secure a 'tenured' position and launch my academic career.” [URF, male, 1993]

“I was one of the first generation of URFs and it enabled me to stay in the UK when otherwise I would have moved to the US where I held a faculty position. Otherwise my career would have been very different and not UK-based” [URF, male, 1985]

“It enabled me to focus on launching my independent research career without heavy teaching and administrative loads. It also allowed me to choose where I started my independent research career - I elected to hold the URF in a department where I knew senior colleagues would share research interests and support my career development. This level of choice is a benefit that other academic career paths (e.g. direct appointment to a lectureship) generally do not offer because of the limited number of open positions each year in a specific discipline” [URF, male, 1998]

“Absolutely pivotal to my development as a confident independent research scientist” [URF, male, 1998]

“I owe my career to the RS URF. The URF allowed me to develop my research independence and it provided a bridge into a permanent post (via a proleptic appointment), initially as a lecturer, but rapidly as Reader and later as Professor in the UK. The modest annual funding that came with the URF was extremely valuable for the exploration of new ideas” [URF, male, 1998]

“It was simply the most important career defining moment of my professional life” [URF, male, 2003]

“My fellowship was crucial in enabling me to establish myself as a research leader in my field. It gave me the confidence and freedom to help build a new research group. My time as a Royal Society URF was the most productive and innovative time in my research career” [URF, male, 2004]

“The main benefit was boosting my confidence and self-belief” [DHF, female, 2007]

“Royal Society Fellowship was the most valuable and defining opportunity in my career. It is the best scheme of its kind I have ever seen in any country. It was the most productive time in my career and in this respect I wish I could have remained a URF for life” [URF, male, 2007]

These contributions provide substantive evidence that the great majority of those who were funded by a Royal Society Research Fellowship found it a positive experience and a significant positive step towards establishment of an academic career as an independent research leader. In this respect the open-ended comments strongly affirm many of the quantitative insights described elsewhere in this report. It is also clear that these positive perceptions were held by alumni of both the URF and DHF schemes.

This bank of quotations also attests to some profound impacts on some who elected to pursue another career direction. Many of those now working in another sector had forged a first career in academia and related the typical impacts on that career phase as described above. While a number of those who 'left' academia relatively early felt that much of the potential impact of the fellowship was of less relevance to them in their new career direction, a significant proportion made positive comments about their fellowship, which in varying ways had assisted them in their chosen career (although admittedly not to the transformative extent related by many of their academic counterparts):

"It gave me an important and significant "kick start" in my research career. Longer term as I moved from academia into the pharmaceutical industry it earned respect. Now I have left research and am establishing my own company I can see that the early boost to my confidence the fellowship gave me was also valuable" [URF, male, 2002]

"I only had the fellowship for one year before moving into industry. It is now - much later in my career - that I am deploying many of my research skills to full effect" [URF, male, 1984]

"The second fellowship was a URF at [...], which enabled me to firmly establish [new area] and to begin putting [it] on a firmer footing. The work supported by the URF led directly to my first Professorship, and was the fundamental basis of everything academic and commercial that I have done since" [URF, male, 1984]

"The fellowship made it possible for me to switch career directions and explore my interests in how science can be applied to address pressing issues in international development, specifically related to [...]. The fellowship gave me the independence I needed as a young post-doc scientist... It equipped me with communication skills and the confidence that I could grow and contribute as part of a global network of scientists focused on alleviating global poverty" [URF, male, 2003]

"For me, the most important thing was to be able to work as an independent researcher and explore my own avenues of interest. This develops skills relevant to future leaders that would not be gained by working in a more directed capacity as a PDRA. The prestige of holding such a fellowship also immediately gives credibility to you which is very important" [DHF, female, 2004]

"... the life experience of being a URF, and the prestige it holds, is something I am extremely proud of... It has also given me the confidence to believe I can do anything I wish to, as I have a strong skill-set, with many transferable skills, that the URF and the Royal Society helped develop in my time as a researcher. Even over 10 years after moving away from research I still hold my URF in high regard as being a key part of my professional development and something which holds real, indirect, value in my current role" [URF, male, 2005]

7.4. Summary

Through both quantitative analysis of a range of closed questions relating to its perceived value and impact, and the powerful open-ended narratives provided by individuals when invited to describe personal impacts, the benefits and value of a Royal Society Research Fellowship clearly emerge. The transformative impact of a URF, in particular, on researchers is clearly articulated; the fellowship has clearly been delivering the intended opportunities for researchers to develop and become established as independent research leaders. That impact is founded upon the combination of an extended duration of stability and independence with which to pursue new lines of research, which other funding might not enable, together with sufficient flexibility to benefit from this support in a personal career context. Alumni attest to substantial value in terms of increased research outputs and enhanced career progression but increases in self-confidence and other 'softer' benefits from activities such as peer-to-peer contact are also evident.

Within the open-ended responses to the questionnaire, The Royal Society has an extensive and deep collection of personal perceptions of the value of the experience of a research fellowship to individual careers and circumstances, which are worthy of considerable further investigation, in parallel to the reporting of academic research outputs and prizes awarded to the alumni, analysis of which has been beyond the scope of this study.

8. Overall findings, issues and recommendations

8.1. Overall findings

A highly representative sample of survey responses was received from those who undertook University Research Fellowships and Dorothy Hodgkin Fellowships since the inception of these schemes which are designed to establish independent research leaders (although the number of DHF scheme alumni is relatively modest). Overall, the large number and tenor of these responses indicate that the vast majority of respondents remain very engaged with the Society and wish to continue to do so as alumni of these fellowship schemes.

The survey results present a current snapshot of contemporary research leaders, of whom 95% are in academia, and a retrospective view of the impact of these particular Research Fellowships on their careers and progression. This is because participants were exclusively those who had completed⁴² their fellowships (i.e. 'alumni') – some of whom did so several decades ago. The most recent respondents commenced their URF around 2005 (or 2010 in the case of a DHF), so the majority of results reflect the experiences and careers of alumni whose fellowships started in the 1980s and 1990s.

The online survey was conducted between mid-November 2017 and mid-January 2018. It targeted those who had completed a research fellowship (i.e. 'alumni', not current Research Fellows). A total of 897 completed responses was obtained, reflecting an extremely high overall response rate of 82%, highest amongst the earliest alumni. A total of 799 responses were received from those who had been awarded a URF (or another named Society fellowship that was similar, including some who had had both a DHF and a subsequent URF) and 98 responses from those who had (solely) had a DHF. Based on the response rate and close match between the profile of research disciplines of respondents and the awards made over the period, the responses should be highly representative of the alumni population.

Profile

The survey results confirm that the proportion of women amongst URF participants has risen slowly, from around 20% to 25%. Following changes to eligibility for the fellowships in the 1990s,⁴³ relating to European Union legislation, the proportion of respondents from outside the UK rose markedly from 5% early in the URF scheme to 30%, and from 20% to nearly 50% in the DHF scheme (that growth exclusively from other EU countries). Amongst UK-domiciled URF participants, the proportion of respondents with an ethnic minority background has grown from a very low level to around 5%, which is typical for research in UK higher education but strongly under-representative when compared with UK society as a whole.

Current employment

At the time of survey, 95% of working URF alumni were employed in academia. Amongst the working DHF alumni, this was 88%. Most were working in the UK (84% of URF alumni; 75% of DHF alumni). Although there was some evidence for 'drain' of UK domiciles away from the UK over time, especially to the USA and Australia, this was slightly more than compensated by the fact that two-thirds of the non-UK domiciles funded through the schemes have remained in the UK after their fellowship – so there has arguably been a slight net 'gain' in research talent for the UK through these fellowship schemes.

⁴² A handful of cases where the respondent had resigned their Fellowship early were also in the sample

⁴³ Eligibility requirements for the fellowship schemes are outlined in Appendix 2

Career progression and research leadership

- Following completion of their fellowship, URF alumni overwhelmingly entered academic positions (94%) including 27% at the level of Professor (and 8% at a higher level). The proportion obtaining a Professor-level position was higher amongst men (31%) than women (21%). Higher proportions of more recent alumni (40%) had obtained a Professor-level position by or at this point than amongst those who completed their fellowship over 20 years ago (<20%).
- Most alumni have experienced substantial career progression. Over two thirds of URF alumni who have pursued an academic career have attained the level of Professor, the most senior level of research occupation, some of whom have gone on to influential academic roles of greater seniority. Although there was not a significant difference in this proportion by gender, there was a difference in the mean length of time taken to reach this level of seniority (4.6 years for men, 5.8 years for women).
- Over 90% of the alumni in academic careers currently have a permanent or tenured position. Three quarters of the URF alumni had achieved this by or in the year that they completed their fellowship; this was higher amongst men (84%) than women (69%).
- The vast majority of fellowship alumni have supervised at least one doctoral research student to successful completion and trained or managed research staff at postdoctoral level. Cumulatively, the alumni have supervised a large number of successful doctoral students and trained many postdoctoral researchers – there is some evidence that URF alumni on average supervise more doctoral students and manage more research staff than other research leaders in similar subjects with a comparable length of experience.⁴⁴
- Around 80% of fellowship alumni currently in academic posts are undertaking international collaborations, and over half have spent some time abroad during their career (most commonly a period of 2-3 years). Over 90% are undertaking public engagement activity at least once per year and around half conduct knowledge exchange or commercialisation activity. As many as half of the most experienced URF alumni are contributing to policy-making at a national or international level regularly. Through these activities, and their supervisory and management roles, they are making major contributions to science through academic research and leadership.
- Around 5% of the URF alumni have pursued a career outside academia. 3-4% elected to work outside academia immediately after their fellowship but around half of these subsequently re-entered academia. Overall, this flow back 'in' has been more than offset by a somewhat larger flow 'out' from academia from amongst those who initially pursued an academic career.
- 85% of DHF alumni obtained jobs in academia after completion of their fellowship, 6% at the level of Professor. Results for DHF and URF alumni are generally not comparable due to the different durations of the two fellowship types and different entry requirements.
- 52% of DHF alumni had obtained a permanent position by or on completion of their fellowship.
- Amongst the DHF alumni, 41% had Professor-level positions at the time of the survey.

⁴⁴ Based on comparison with data from the Principal Investigators & Research Leaders Survey (PIRLS): <https://www.vitae.ac.uk/impact-and-evaluation/pirls>

- 12% of the DHF alumni have pursued a career outside academia, almost all leaving academia immediately after their fellowship.
- Most of the alumni working outside academia are in senior research or leadership roles in the commercial or third sectors or are working in research-related policy or funding bodies, while around 1 in 5 of them are self-employed. As for those in academic careers, most are undertaking public engagement, commercialisation or policy-making activity.

Impact of the fellowships

- Although these are not formal measures of the 'success' of a research fellowship, a number of indicators were used that are consistent with establishment of independent research leadership. By the time they completed their fellowship (or at least in that year), amongst the URF alumni in academic careers:
 - 96% had published a key paper as a principal investigator;
 - Over 80% had secured a significant research grant as a principal investigator;
 - 78% had supervised at least one doctoral student to successful completion;
 - 80% had hired at least one postdoctoral researcher;
 - 78% had obtained a permanent academic position.
- Substantial proportions of the DHF alumni had achieved each of these measures, indicating that most were progressing along a similar research trajectory to the URF alumni. By or during their year of completion, 72% of DHF alumni in academic careers had published a key paper, 44% had secured a research grant, 83% successfully supervised doctoral student/s, 56% hired research staff and 52% had a permanent position.
- On the basis of these indicators, the survey provides substantial evidence that the majority of those participating in both the URF and DHF schemes are achieving the sorts of outcomes consistent with the aims of these schemes, i.e. establishment as an independent research leader in a research career.
- More specifically in relation to the impact of the research fellowship, the overwhelming majority of alumni (95%) believed it had helped them to secure a permanent position, while nearly as many felt it had accelerated their career progression and made a substantial difference to their career.

Benefits and value of the fellowships

- The key benefits of a URF or DHF were reported to be, overwhelmingly:
 - The freedom it gave them as independent researchers to pursue new and more novel lines of research (than they could otherwise have pursued);
 - The relatively long duration of the funding and stability that ensued, especially for URF participants;
 - The flexibility in terms of location – freedom to select or move institution but also enabling support for family responsibilities in parallel to research;
 - An increase in self-confidence.
- The aspects of the fellowship that were deemed to be of greatest value were the time and freedom that allowed a focus on research without other commitments, together with the

flexibility to make this progress in research while accommodating personal aspirations or commitments, and the prestige associated with the fellowship programme.

- More specifically, over 95% of URF respondents felt the freedom to explore innovative approaches and new lines of research was highly valuable or valuable, and similar proportions saw value in the boost to their self-confidence. 95% also considered the flexibility of the funding and the prestige to be valuable. Amongst those who had completed their fellowship within the last 10 years, and women participants more generally, the opportunity to interact with peer researchers in the scheme and the benefit of the training and networks provided by the Society were valued by over half of respondents.
- The DHF provided participants with many similar outcomes to their URF counterparts and, for most, enabled progression in that same direction. Direct comparison of the extent of impact in terms of that progression between URF and DHF participants is inappropriate given the different experience requirements and durations of the schemes.
- 70% of DHF alumni had taken at least one career break for maternity or paternity (at some point, not necessarily during the fellowship) and one third of all URF alumni (61% amongst women but only 26% of men). 40% of the DHF alumni who had taken maternity leave had done so for more 12 months duration in total, which was longer than amongst women URF alumni (for whom this was 27% of those who had taken maternity leave). Although the right to flexibility is common to both schemes, these differences suggest that more of the DHF participants knew they wanted flexibility from the outset and took advantage of it through the scheme. In contrast, 90% of the men who had taken any paternity leave had done so for less than 3 months.

8.2. Differences with gender and other aspects of profile

The level of participation by women in the URF scheme is seen to have risen somewhat over the period analysed through these survey results, although this is a retrospective view. There is some evidence of differences in the rate of progression and career outcomes between men and women, and in some other aspects of research endeavour, amongst the URF alumni. Lower proportions of women URF alumni than men secured a Professor-level position during or in the year they completed their fellowship. Proportionally fewer of the women had obtained a permanent or tenured position by or at that point. In terms of their current position, there was no significant difference in the proportion reaching a Chair-level or more senior position, but evidence that, on average, it has taken them longer to achieve it where they have done so.

There was no evidence that the women were different from the men in terms of the proportions who, or when they first, published a key paper as a principal investigator, successfully applied for a major grant, hired a postdoctoral researcher or supervised a doctoral student to successful completion, in relation to the completion of their own fellowship. On the other hand, women did value more highly than men some of the benefits of their fellowship, including the access to training and peer support and the boost in self-confidence that it gave them.

In relation to these indicators of career progression, there was very little if any difference between most results for respondents whose broad disciplinary area was in A-side subjects (physical sciences) or B-side (biological and related sciences). A higher proportion of B-side URF alumni secured a major research grant earlier than A-side alumni, but the difference evened out over time.

On the other hand, there were considerable differences in some results between those who had completed their URF over 20 years ago and more recently. Amongst the latter, significantly higher proportions obtained a permanent academic position by or in the year that they completed their fellowship, compared with earlier cohorts, and the proportion who obtained a Professor-level post or higher by or at that point was more than double the proportion amongst those completing their fellowship over 20 years ago. This difference is thought to relate both to changes in employment policies around appointment of staff at Professor level (there are now more Professors, in total) but also, to some extent, to a change to eligibility for the URF in the 1990s through which somewhat more experienced researchers became eligible for an award.

As established academics, there was some suggestion that women alumni on average tend to have slightly fewer international collaborations and may have been slightly less internationally mobile than men, but more sophisticated measures would be required to verify these differences robustly. On the other hand, there was some evidence that women may undertake public engagement activities somewhat more frequently than men.

Clear and expected differences were observed, however, in relation to career breaks: much higher proportions of women took maternity leave than men took paternity leave, and the cumulative duration of such breaks was radically different. No evidence emerged from this study in relation to whether the extent or rate of progression of those who had taken such career breaks was different to those who had not, but larger samples and more specific data on the timing of breaks could allow for more sophisticated analysis in future.

While it would be valuable, in principle, to identify any differences in outcomes and circumstances for other groups, such as those of ethnic minority background, or non-UK domicile, or those reporting a disability, at this stage of the schemes these sub-populations are too small to analyse.

In relation to gender differences, the total number of women in the response sample is relatively modest, although women are gradually increasing as a proportion of the total alumni population over time. Further analyses of these kinds should be undertaken as the total population of alumni, including women, rises with time. However, even on the basis of the limited evidence to date, it would be valuable to consider whether selective additional support could be offered to help women alumni with some aspects of progression given the differences identified. It was evident in these responses that women tend to value more highly the training and network opportunities – and peer support – afforded by their fellowship, so potentially there could be scope to develop these aspects of support further to enhance their career progression.

8.3. Questions for further study

In parallel with this report, The Royal Society is publishing a commentary on the findings recorded here and some analysis of other information collected in this survey.⁴⁵ We outline here some potential specific themes and issues that could be addressed, or could be investigated in more detail, in future iterations of surveys within the Research Fellows Career Pathway Tracker with the alumni.

⁴⁵ *Royal Society Career Pathway Tracker: 35 years of supporting early career research fellows*, The Royal Society, 2018. <http://royalsociety.org/career-tracker>

In designing this first online survey, we tried to strike a balance between ease of response and extent and granularity of information sought. For example, information was sought about respondents' first position after completing their fellowship and also their current circumstances. Potential information about roles and positions held during their progression, i.e. detail between these two points in their career, was considered too onerous for respondents to provide. However, this does mean that it is not possible to investigate career trajectories in depth. It would be especially interesting to understand in more detail the transitions of those who have moved between the academic and other sectors.

Related to this, the questions in the survey about mobility – international and intersectoral – were posed in a very general way, simply based on whether it had taken place (and its total duration) at some point within the respondent's career. In future surveys it would be useful to determine when such mobility took place (for example, whether it was before, during or since the fellowship).

In parallel, the questions about career breaks for maternity, paternity, caring responsibilities or other reasons were also very general. The information gathered would be more useful – particularly in relation to any impact of such breaks – if the timing of when these breaks occurred was more specifically established; for example, whether a maternity break was taken during or after the fellowship.

In a small number of questions, it would be valuable to provide a fuller definition of certain terminology or wording used, in order to remove any potential subjectivity in terms of respondents' interpretations of the information they should provide. For example, we obtained some feedback from the Society that the term 'Principal Investigator' – although one that CRAC/Vitae uses regularly in our policy work – could be interpreted in differing ways in different disciplines. A tight definition of its meaning, or an alternative term which would leave nothing to interpretation, could be useful in future, although there is no evidence from the survey results that it hindered respondents. The same applies to the terms 'Co-investigator' (used when investigating international collaborations) and 'Chair' (used when identifying the time to reach a senior level position).

The analyses of times taken to reach certain activities or positions, which were chosen as potential indicators of establishment of independent research leadership, were all made with reference to respondents' identification of the year they completed their fellowship. In some ways this was preferential to using a fellowship start date, as it avoided potential complicating factors such as some fellowships being of longer duration (due to an agreed extension or being undertaken part-time, especially common for DHF alumni), in the cases where the activity being recorded took place after completion. However, for activities that took place prior to completion of a fellowship, the fellowship start date could be a useful alternative point of reference for analysis. While start dates are, in principle, available from the Society's management information, meaningful analysis would also require knowledge of whether the fellowship was extended and/or undertaken part-time as opposed to full-time.

It should also be noted that a number of respondents commented that they felt the survey questionnaire was long and required a lot of attention to detail and, as a result, they would appreciate any future surveys being as short as possible and making use of information that was collected in this first survey. Several commented that they had given some of the same information in a previous impact survey. A strategy to minimise survey length, and to avoid asking respondents to re-supply information they have given before, is likely to increase the likelihood of participation by alumni in future surveys.

Appendix 1. Methodology and sample achieved

Research approach

The focus of this report is results obtained from implementation of the first major survey within the proposed Career Pathway Tracker project. An online survey methodology was selected as this represented the most cost-effective means to obtain systematic information about a wide variety of issues relating to the Royal Society Research Fellowship alumni and their career progression, for what was hoped to be a statistically representative sample of alumni of the schemes. An online survey questionnaire was developed with input from key Royal Society staff and tested with the help of a small number of alumni. It was hosted online by the Institute for Employment Studies using the SNAP Surveys platform. Fully personalised invitations to respond to the survey were issued from the platform on behalf of the Society. The platform also enabled respondents to save incomplete responses and return to them at a later date for completion before submission. Through close monitoring of incoming responses, a series of personalised reminders were issued to those who had not responded or were yet to complete their responses.

Following a circular to alumni from the current President of the Society, encouraging them to participate, the survey was launched on 7 November 2017. It remained open for responses for a period of two months, closing in mid-January 2018.

Research themes

The online survey questionnaire was structured as a series of thematic sections. Following questions to verify eligibility and ascertain current circumstances, question routing (based on responses) was used to provide appropriate questions to different groups of respondents. The main sections were designed to obtain detailed information about respondents':

- Current employment and/or first employment after completion of their fellowship;
- Perceptions of impact of the Royal Society Research Fellowship;
- Timing of key developmental stages within progression to become a research leader;
- Career progression including career breaks;
- Contributions to science, including training and leadership of researchers;
- Main academic and/or career achievements;
- Personal characteristics;
- Willingness and consent to engage and participate in the tracking project.

The majority of questions were closed, in order to provide responses that could be analysed quantitatively with statistical robustness, but a significant number of open-ended questions were also included through which respondents could describe their achievements and expand upon their perceptions of the impact of their fellowship. Many respondents also took the opportunity to provide additional or explanatory commentary upon their closed responses on a number of issues and topics.

Survey targeting, engagement and sample achieved

It was agreed from the outset that the survey should be targeted only to those who had completed a Royal Society Research Fellowship (referred to here as ‘alumni’) and not to current Research Fellows. The Society provided the contact details it currently held for these alumni, along with certain management information on the individual fellowships. Current contact data was not available for 15-20% of individuals and an exercise was carried out by CRAC to identify those contact details using web searching. This was successful for around half of those whose contact details had been ‘missing’ in the database. This resulted in a total of 1105 viable email addresses being available, which were believed to represent eligible respondents – i.e. alumni who had been awarded a University Research Fellowship (URF), a Dorothy Hodgkin Fellowship (DHF) or an early career research fellowship through one of the other named Royal Society schemes that were operating in the early years of the URF. Survey invitations were sent on a personalised basis to these 1105 recipients. 15 ‘bouncebacks’ were received indicating that these contacts were incorrect or not useable.

From the 1090 useable email contacts, a total of 897 responses were obtained, representing an extremely high overall response rate of 82%. The headline response rate was as high as 84% amongst URF respondents but a little lower at 74% amongst DHF respondents. Table A.1 illustrates that the 897 completed responses available for analysis were then split into two groups: ‘URF alumni’ (799 responses, comprising those who had had a URF or another named similar Society fellowship, including those who had had both a DHF and a subsequent URF) and ‘DHF alumni’ (98 responses).

Responses and rates	Total	URF	Other	DHF
Unique addresses available	1105	930	43	132
Final failed/bouncebacks	15			
Total responses achieved	897	765	34	98
Response rate	82%	84%	79%	74%
Proportion of total responses		85%	4%	11%
Totals for analysis	897	799		98

Table A.1 Numbers of responses and response rates

One critical aspect of the data analysis, particularly in relation to evolving impact or career progression, is the period since completion of the fellowship. In order to provide results for respondents who would be comparable in terms of time elapsed since the completion of their fellowship, responses were initially coded into five-year groups (Table A.2). These groupings offered a reasonably even distribution of responses. Although an exact analysis was not possible, a comparative analysis of response numbers against fellowship dates held in the Society’s management information suggested that there were very respectable response rates across all these different periods/groups of respondents. Somewhat unexpectedly, the highest rates were from the earliest alumni (at well over 80%) while response rates from those who had completed their fellowships in the past five years were somewhat lower (but still up around 65%). Nonetheless, it should be stated that these response rates are exceptionally high for an online survey and far higher than achieved in most socio-economic or education research surveys.

Date of completion	Responses	Estimated response rate	% of responses	
			URF	DHF
2013-2017	154	65%	19%	14%
2008-2012	189	65%	20%	35%
2003-2007	179	80%	19%	29%
1998-2002	188	80%	21%	22%
1993-1997	94	85%	12%	
Before 1992	85	85%	9%	
Total known completion date	889	82%	100%	100%

Table A.2 Response numbers and estimated response rates by fellowship completion date

Representativeness of results

The very high response rate in the survey immediately lends confidence to the likelihood of its results being representative of the total Research Fellowship alumni population. This reliability can also be considered in two further ways. One is to compare the profile of the response sample in terms of certain characteristics (such as particular respondent demographics) with those of the total population being surveyed, where those characteristics are known for the total population. The other approach is to calculate the theoretical confidence interval for a randomly distributed sample of the size achieved.

For the former approach, few characteristics were systematically available within the management information across such a long period. One feasible characteristic was research discipline, although this was not a perfect comparison because the survey captured respondents' reported current research specialism (on the basis of REF Units of Assessment) whereas the management information contained the Society's own subject grouping for the discipline of the fellowship itself. Not only will there be some imprecision in terms of matching the two subject breakdowns, but there is also scope for change to have occurred in the alumni's field of interest. Despite those two caveats, on the basis of the available information there was an excellent match between the subject profile of URF respondents and the disciplines of the original research fellowships (Table A.3). This suggests that the achieved sample does not suffer any particular over- or under-representation of responses in different disciplinary areas.

With some caveats, it was also possible to compare the gender profile reported by respondents with an assessment of the gender profile of the total URF alumni population based on the first names of alumni within the fellowship management information. The gender profile of the response sample, which is reported in section 3.1, appears to be a good match overall with the estimated total profile on this basis. This suggests that the achieved response sample is broadly representative in terms of gender, despite the well-established finding from many surveys that females are likely to be over-represented (as females tend to be more willing to respond to surveys than males).

Research discipline		Target %	% of responses
A side	1 - Maths and Computing	8%	8%
	2 - Physics	20%	20%
	3 - Chemistry	15%	14%
	4 - Engineering and Materials	9%	7%
	5 - Earth and Physical Environmental Sciences	7%	7%
B side	8 - Anatomy, Physiology, Neurological and Health Sciences	11%	8%
	6 - Biochemistry, Structural and Cell Biology	13%	35%
	7 - Developmental biology, Genetics etc	8%	
	9 - Evolutionary and Ecological Sciences	11%	
	Other		1%

Table A.3 Profile of URF responses achieved (N=821) by reported current research discipline (coded to Royal Society groups) compared with profile of disciplines of awarded Research Fellowships (Target %)

Finally, the confidence interval can be calculated for a randomly distributed sample of a certain size based on an original population of known size. For a 95% confidence limit, the confidence interval (effectively the 'error bar' on a data point) for the total response sample (URF and DHF combined) would be just over 1%. However, in this study it was more meaningful to report results for either URFs or DHFs, or for sub-groups of either of them, not for the entire response sample. In the case of results for all URF responses, the confidence interval at a 95% confidence level is better than 1.5%. Where results are given for particular sub-groups within the URF respondents, for example by gender, the confidence interval is a little larger at 2-3%. Practically, this means, for example, that if results for male and female URF respondents differ by more than that magnitude, statistically they could be expected with 95% confidence to be different (but any differences of less than that magnitude are not reliable). Within the much smaller DHF response sample, the confidence interval at a 95% confidence limit is somewhat larger at up to 5%, depending on the specific result.

Taking these considerations together, the excellent response rate to the survey underpins a high level of confidence that the results reported here are robust and meaningful. Around 150 URF and 30 DHF alumni who were eligible and invited to participate in the survey did not respond. On the basis of discipline and gender, it is likely that their profile was similar to that of the response samples, but any other particular characteristics of this group are unknown and only limited management information is available for them.

Personal profile of respondents

In addition to the information presented in section 3.1, this section provides some further information about the personal profile of respondents.

The age of respondents was captured in the survey but that overall profile has relatively little value in itself, given the long timespan of fellowship activity being reported here. However, these data would provide the Society with an opportunity to analyse the ages of research fellows at appointment, if the responses are matched with management records, should that information not have been captured at the point of application or retained. It would also enable establishment of ages at completion of fellowships, which could be another angle in future investigations of career progression.

Just over 3% of URF respondents reported that they considered they had a disability, while 2% preferred not to say whether they did or not. These are broadly similar to levels reported in other studies of the academic population, and for recent URF awards based on Royal Society diversity reporting. Only one DHF respondent reported that they had a disability. As the question captured current disability, rather than any disability at the time of appointment to a fellowship, it is also not a reliable indicator of the extent to which disabled people were applying to these schemes and/or awards being made to them, as research fellows may have experienced a disability either during their fellowship or in their subsequent career. The Society's diversity reporting suggests that higher proportions of DHF awards have been made to applicants reporting a disability in some recent years.

Appendix 2. Policy changes to Research Fellowships and their impact on results

A number of factors complicate the analysis of the career progression of the alumni based on the survey results, including changes to eligibility requirements for the fellowships over time. In addition, the duration of the fellowships has changed. The duration of a DHF (full-time basis) was extended from 4 to 5 years in 2012 but this will only have applied to very few of the alumni in this study, as almost all DHF respondents will have commenced their fellowship prior to 2012. The restriction in duration of a URF to 8 years since 2008 (as opposed to potentially being extendable to 10 years prior to that time) is not yet seen in these results.

Caution is also needed as the results are reported in terms of the period of fellowship completion and not the start of the fellowship. Therefore, changes in results that reflect eligibility adjustments only emerge several years after that adjustment (i.e. typically 8-10 years later in the case of URF alumni, and 4-5 years later for DHF alumni, later still for those who took it up on a part-time basis). Due to this retrospective nature of the results, some of the changes in eligibility have yet to filter through.

Whilst the URF has always been targeted at early career postdoctoral researchers ready to establish themselves as independent research leaders, how this has been defined in the eligibility criteria for this scheme has changed over time. One aspect of eligibility that is visible in the results relates to the level of research experience of applicants for the URF (Table A2.1). Prior to 1994, applicants were required to be aged 26 to 33 but from 1994 onwards the upper age limit was increased to 40 years of age (along with an expectation of at least 2 and up to 7 years of post-doctoral experience). The eligibility requirements for the DHF are shown in Table A2.2.

Year of appointment	Eligibility / experience	Nationality
1984-1993	Outstanding young scientists aged between 26 and 33, to work for up to 10 years in departments of science, mathematics, engineering and technology in universities in the UK. Those appointed were expected to be strong candidates for permanent university posts when vacancies arose. Salaries were on the university lecturers' scale for non-clinical academic and related staff.	
1994-2004	Outstanding young scientists aged between 26 and 40 and should have between 2 and 7 years postdoctoral experience. Applicants over 40 may be considered under very exceptional circumstances. Otherwise similar to above, but (from 1988) institutions to include polytechnics as well as universities in the UK;	
1997-2004	Additionally mention: "Career breaks such as maternity leave, EU national service and voluntary service overseas can be discounted but teaching experience and/or time spent in industry since the award of a PhD should be included in the total amount of postdoctoral experience."	URFs open to European Union citizens who are either currently employed in the UK or, if not employed, have at some time been resident in the UK for a continuous period of three years other than for the sole purpose of receiving full-time education. Citizens of Norway, Israel and Switzerland may also apply for the Olga Kennard Research Fellowship and there are no residency requirements. No nationality restrictions on applicants for the Robert and Joan Case Research Fellowship or the Pickering Research Fellowship. Those holding a permanent post in a EU university will not be considered for either appointment.
2005-2011	Applicants must have a PhD or equivalent research experience by the time they apply (but not those who have just submitted their PhD). Applicants are expected to be at an early to mid-stage of their career; as an example, having had between one and three post doc positions.	
2012-2017	Applicants must have a PhD by the time they apply (but not those who have just submitted). Applicants must be at an early stage of their research career (between three to eight years of research experience since their PhD).	
2018		No nationality restriction

Table A2.1 URF eligibility criteria

Year of appointment	Eligibility / experience	Nationality
1995-2011	<p>Targeted at those in the first few years after their PhD (at minimum must have a PhD at time of appointment). The scheme seeks to target early-career stage scientists; for example, applicants could have had one or two post-doctoral positions.</p> <p>The scheme is open to both women and men.</p> <p>The scheme enables outstanding young scientists to work for up to 4 years in UK universities.</p>	As per URF
2012-2017	Applicants should be at an early stage of their career (have completed their PhD but have no more than 6 years of research experience post-PhD by the closing date of the round)	Applicants required to be a citizen of the European Economic Area (EEA), i.e. European Union, Iceland, Norway or Liechtenstein; or a Swiss citizen, or have a relevant connection to the EEA or Switzerland (established if an individual has a PhD from a university in the EEA, or has worked as a research scientist in a university or research institute in the EEA for at least the past two years, or has done so before taking up an appointment outside the EEA).
2018		No nationality restriction

Table A2.2 DHF eligibility criteria

Analysis of the period between respondents obtaining their PhD and completing their fellowship, i.e. the profile of URF respondents in terms of length of post-PhD experience, reflects the 1994 change in eligibility. As shown in Figure A2.1, URF respondents who completed their fellowships prior to 2003 (which broadly corresponds to fellowships starting around 1994) most commonly completed their fellowship between 9 and 11 years after obtaining their PhD. On the other hand, for those completing their fellowship in 2003 or later, it was most commonly between 11 and 14 years after obtaining their PhD. The difference in profile between these two broad groups seems to reflect quite well the widening of eligibility to include more experienced researchers since 1994.

Figure A2.1 also contains similar data for DHF alumni, most of whom completed their fellowship 5 to 8 years after PhD completion, suggesting that, unlike URF alumni, most had only a few years of research experience prior to fellowship.

It should also be noted that these analyses do not take any account of career breaks (which, incidentally, were more common for DHF alumni than URF) or other factors but are based on 'raw' periods of time in years, nor of whether they took up their fellowship part-time.

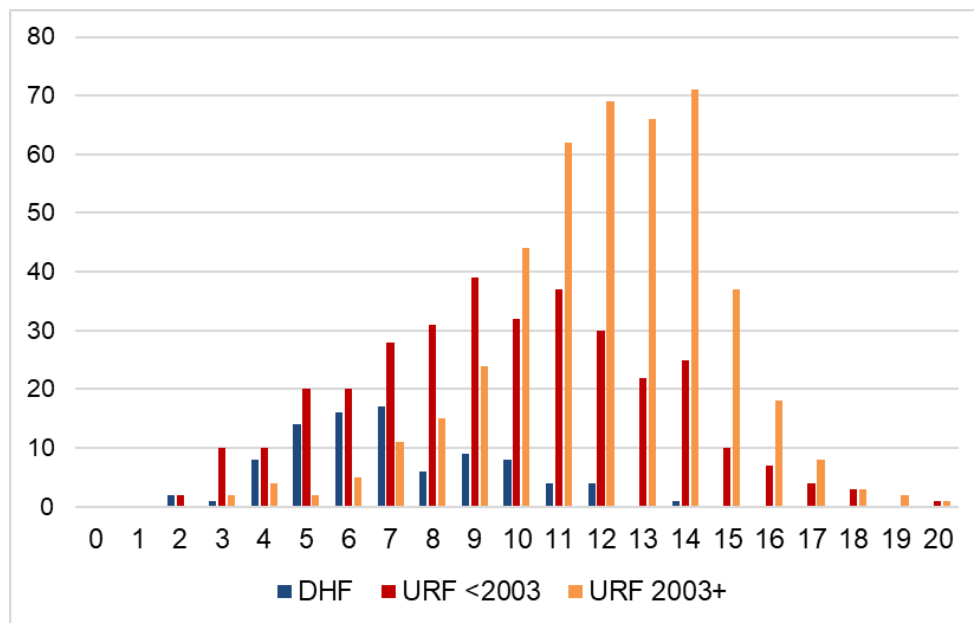


Figure A2.1 Length in years between completion of PhD and completion of fellowship, by fellowship type and period of completion. Vertical axis is number of respondents (URF <2003: N=331; URF 2003+: N=444; DHF: N=98)