

THE 2016 CANADIAN NATIONAL POSTDOCTORAL SURVEY REPORT



Canadian Association of Postdoctoral Scholars / l'Association Canadienne des
Stagiaires Postdoctoraux

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List of Abbreviations

ANOVA: Analysis of Variance
BEST: Broadening Experiences in Scientific Training
CAPS-ACSP: Canadian Association of Postdoctoral Scholars-Association-
L'Association Canadienne de Stagiaires Post-doctoraux
CAD: Canadian Dollar
CAUT: Canadian Association of University Teachers
CIHR: Canadian Institutes of Health Research
COPS: Canadian Occupation Projective System
CPP: Canada Pension Plan
CROS: Careers in Research Online Survey
CUPU: Carleton University Postdoctoral Union
EUI: European University Institute
HQP: Highly Qualified Personnel
IDP: Individual Development Plan
MIND: Motivating Informed Decisions
MITACS: Mathematics of Information Technology and Complex Systems
NEADS: National Educational Association of Disabled Students
NGO: Non-governmental Organization
NPA: National Postdoctoral Association (U.S)
NSERC: Natural Sciences and Engineering Research Council
NSF: National Science Foundation
NIH: National Institutes of Health
OECD: Organisation for Economic Co-operation and Development
PI: Principal Investigator
PDO: Postdoctoral Office
PDA: Postdoctoral Association
RES-1: Research Scientist Level 1
R&D: Research and Development
SSH: Social Sciences and Humanities
SSHRC: Social Sciences and Humanities Research Council
STEM: Science, Technology, Engineering, and Mathematics
S-PDF: SSHRC Postdoctoral Fellowships
TA and T4A: Canadian Tax Form A and Tax Form 4A
USD: United States Dollar

1. INTRODUCTION

1.1. The 2016 Canadian National Postdoctoral Survey Overview

The 2016 Canadian National Postdoctoral Survey (the 2016 Survey) is an outcome of the collaboration between Canadian Association of Postdoctoral Scholars (CAPS-ACSP) and the Tri-Council granting agencies (Canadian Institutes of Health Research; Natural Sciences and Engineering Research Council and Social Sciences and Humanities Research Council). The content of the 2016 survey leverages the results from two earlier National Postdoctoral Surveys (Mitchell et al., 2013; Stanford et al., 2009) and a CAPS-ACSP report developed in collaboration with SSHRC, which highlighted the professional development needs of postdocs in the Social Sciences and Humanities (CAPS-ACSP, 2014). The 2016 Survey expands upon themes and trends identified in 2009 and 2013, and presents new information about time-use, professional development, mental health, and career trajectory data from past Canadian postdocs. **The 2016 Survey Report compares data from the 2009 (when available), 2013, and 2016 Surveys and highlights relevant trends on the Canadian postdoctoral landscape.**

A postdoc is an individual holding a completed research doctoral degree (e.g., PhD) or medical professional equivalent (e.g., MD) and is in a temporary period of mentored research and advanced training, linked to a university or an affiliated institution, to industry or government research labs. The value of postdocs is evident in the demand for their research expertise in academic, industry, and public service sectors. Despite their public role in authoring papers, speaking to media, and routinely presenting research findings to the public and to industry (Vogel, 1999), postdocs have been called a “shadow workforce” (Harris, 2014). Postdoctoral issues, such as earnings and career development, are not unique to Canada and are found in the United States (Ahmed, 2016), Europe (Weijden, Teelken, Boer, & Drost, 2016), and Australia (White, 2004). In response, Canadian stakeholders are collaborating to identify and address the challenges faced by Canadian postdocs (CAPS-ACSP, 2014; Mitchell et al., 2013; Stanford et al., 2009).

1.2. Major Findings from the 2016 Survey Results

The 2016 Survey was an opportunity for postdocs to share their perspectives regarding supports and obstacles to desired outcomes of their postdoctoral position¹. Three major themes emerged from the data.

1. Canada's Performance on the Global Postdoctoral Stage

Attracting highly qualified postdocs may be influenced by Canada's performance on the global postdoctoral stage. The unique experiences of Canadian postdocs are compared with the postdoctoral experience reported in other countries. The 2016 Survey findings indicate a need for better support for international postdocs, improvements to postdocs' everyday well-being, such as compensation, benefits, and employment status, and new strategies to address satisfaction with postdoctoral training.

2. Positioning Postdocs as Drivers of Innovation and Discovery

Positioning postdocs for careers that drive innovation and discovery in Canada is integral to our knowledge-driven economy. Postdocs need more information on the range of career options and more support for career development. Significant numbers of postdocs leave Canada for employment after their tenure. To retain highly qualified postdocs for research careers in Canada, strategies are needed to transition postdocs into a broad range of careers options.

3. The Changing Profile of Canadian Postdocs

The trend towards more years spent in postdoctoral appointments has changed the profile of Canadian postdocs. In particular, a shift in the age distribution illustrates larger numbers of postdocs in their mid to late thirties, and fewer in their late twenties and early thirties. The older cohort of postdocs experience significant workplace stress due to life/work balance issues, few family-oriented benefits, and low salaries. Measures to address compensation and workplace mental health are needed in the short and long term to ensure the well-being of Canadian postdocs.

¹ Throughout this report, the term "Canadian postdocs" refers to all postdoctoral scholars completing postdoctoral appointments in Canada, as well as Canadian citizens completing postdoctoral appointments in countries other than Canada. "Past postdocs" refer to respondents who completed a postdoctoral appointment in the last four years.

1.3. The Canadian Association of Postdoctoral Scholars (CAPS-ACSP)

Since 2007, CAPS-ACSP has been the national organization representing Canadian postdocs. CAPS-ACSP works towards clarifying the role of postdocs in Canada, advocates for equitable treatment of postdocs, and represents the interests of postdocs at federal and provincial levels.

To advance the status of postdocs, CAPS-ACSP has developed relationships with postdoctoral offices (PDOs) and associations (PDAs), and postdoctoral administrators across Canada. Important ties have been forged with the Tri-Council granting agencies, which include Canadian Institutes of Health Research (CIHR), Natural Sciences and Engineering Research Council of Canada (NSERC), and Social Sciences and Humanities Research Council (SSHRC), as well as Mitacs (the granting agency for many industrial postdoctoral appointments in Canada).

As a central feature of the CAPS-ACSP agenda, conducting and reporting on national surveys is a mechanism for galvanizing stakeholders and cultivating strategies to improve the position of Canadian postdocs. The results of the 2016 Survey illustrate the profile of Canadian postdocs and features of the postdoctoral landscape in Canada². **By identifying both the challenges and affirming aspects of postdoctoral appointments, a major objective of the 2016 Survey is to move Canadian postdocs out of the shadows, and strengthen their position as drivers of innovation and discovery in Canada.**

A key goal of postdoctoral work is to acquire competencies for undertaking intensive independent research. Postdocs are major contributors to research, innovation, arts, culture, and policymaking (Edge & Munro, 2015; Igami, Nagaoka, & Walsh, 2015).

² Throughout this report the 2009 Survey, 2013 Survey, and the 2016 Survey refer to the Stanford et al. (2009), Mitchell et al. (2013), and the 2016 Canadian National Postdoctoral Surveys.

1.4 Who are the Stakeholders?

A wide variety of stakeholders, particularly those with the agency to influence policy and take action, will be interested in the 2016 National Postdoctoral Survey results and recommendations.

- **Postdocs**, with the support of **postdoctoral offices and associations**, can foster an agenda of change to address issues with postdoc salary structures, everyday working conditions, and career prospects. Each postdoc demographic (e.g., gender, location) has different needs and experiences, which together comprise the unique Canadian postdoctoral landscape.
- **Universities, along with postdoctoral administrators and research institutions**, shape policies and levels of support that directly affect postdocs, making them relevant stakeholders in postdoc concerns.
- The **federal and provincial governments** are influential stakeholders as they are the primary source of funding for many Canadian postdocs. Governments also have the agency to develop incentives that can improve the transition of postdocs into research positions in a broad range of sectors.
- The **granting agencies and foundations** determine policies regarding dispersal of funds (e.g., value of funding packages and responsibilities of postdocs and supervisors). Therefore, as decision-makers, the granting agencies have the opportunity to play important roles in advancing recommendations in this report, and improving the postdoctoral landscape in Canada.

In light of the contributions that postdocs make to science and society, there is more stakeholder breadth than one might consider. When innovation is held back, the population may well suffer: from missing new treatments for pain and disease, to unfulfilled appreciation for art and music. This forfeiture is critical, although difficult to measure. **Therefore, this report and its outcomes will be of relevance to all Canadians.**

1.5 2016 National Survey Methodology

The 2016 Survey is a follow-up to the 2009 and 2013 Surveys. The 2016 Survey provides an updated profile of current and recent Canadian postdocs, and was conducted in partnership with the Tri-Council granting agencies: CIHR, NSERC, and SSHRC.

Data Collection

The 2016 Survey was conducted online from March 21, 2016 to May 8, 2016 by Academica Group³. The target population was postdocs currently working in Canada, Canadian citizens completing a postdoctoral position outside of Canada, and former postdocs who completed their most recent postdoctoral position in the last four years. In an effort to reach a wide range of postdocs, the survey was deployed via direct email invitations, as well as posts on the CAPS-ACSP website and social media sites. A number of individuals and organizations assisted with the distribution, including institutional postdoctoral administrators, the Tri-Council granting agencies, institutional postdoctoral associations, Mitacs, and CAPS-ACSP.

After removal of ineligible responses and duplicate entries, 2,109 cases were retained for analysis. The response was slightly greater than the 2013 Survey where 1,830 postdocs responded; however, 479 respondents in 2016 are past postdocs.

³Academica Group is a professional research and consulting company.

Survey Response and Analysis Methods

Throughout this report, subgroup analysis using respondent characteristics was conducted where applicable. The primary variables used to conduct subgroup analysis were Field of Research, Postdoc Location; and Region of Residence. Differences between groups were tested for statistical significance using *Chi-Squared* for distributions, and *Analysis of Variance (ANOVA)* or *t-test* for mean score differences. An analysis of respondent verbatim comments was conducted to examine the prevalence of themes discussed by respondents. Thematic analysis was undertaken with the QDA Miner Lite software program (Version 1.4.3, Provalis Research, 2014).

“I hope the government can really help to make the working status of postdoctoral fellows clear - so that we could have employment insurance --something very important for female researchers.”

–*Survey respondent*

1.6 Respondent Profile

Citizenship, Age, and Gender

Most of the respondents currently completing postdocs are located in Canada (Figure 1.6.1). About one-quarter of the respondents are “past postdocs” who recently finished a postdoc in Canada (Canadian citizen, 16%, non-Canadian, 7%).

Twelve percent of respondents are Canadian citizens who are completing postdocs out-of-country (Figure 1.6.1)⁴. The average age of respondents was 34 years. Figure 1.6.2 shows the age distribution of all respondents. Gender was closely split with 51% male and 48% female. Since 2009, the gap in the ratio of female to male postdocs has decreased from 12 to 3 percentage points.

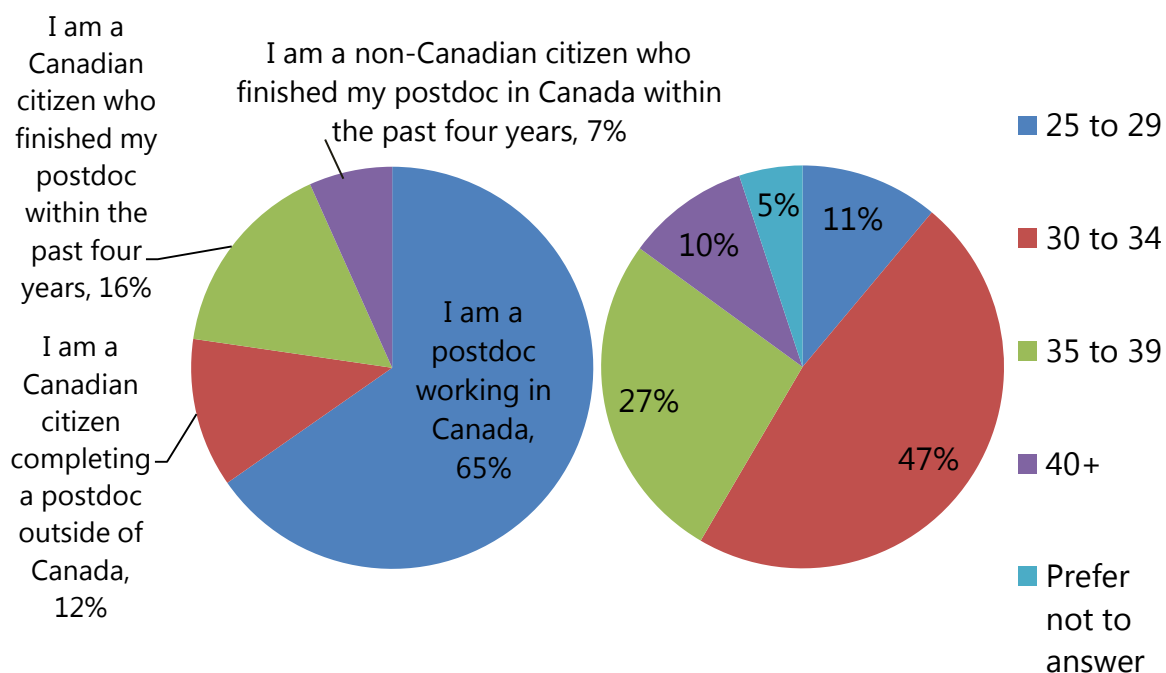


Figure 1.6.1. Location and current status.

Figure 1.6.2. Age distribution.

⁴ In light of the Canadian-centric distribution methods used for the 2016 Survey it is possible that the ratio of those completing postdocs outside of Canada to those in Canada is higher than 12%.

Representation of Canadian Universities

The profile of current postdocs suggests that the large majority in this country are working in universities (Table 1.6.1). Other than universities, respondents commonly work in government laboratories, industry, and in health services.

Table 1.6.1: Respondents by Canadian University

	# of Respondents
University of British Columbia	136
University of Toronto	132
University of Alberta	127
McGill University	123
Université de Montréal	98
University of Calgary	91
Western University	70
University of Ottawa	61
Simon Fraser University	40
University of Saskatchewan	36
University of Manitoba	33
McMaster University	31
Dalhousie University	28
Harvard University	28
Institut national de la recherche scientifique	26
Université de Sherbrooke	26
University of California	25
Concordia University	24
University of Guelph	23
University of Waterloo	21
York University	21
Other	423
Prefer not to answer	7
Total	1630

Note: "Other" refers to postdocs from universities with less than 20 respondents, and postdocs working in government laboratories, industry, and in health services.

Cultural Diversity

Postdocs in Canada originate from around the globe. Thus, meeting the needs and expectations of all postdocs will not be an easy task. As shown in Figure 1.6.3, while the majority of postdocs identify as Caucasian, the 2016 Survey respondents represent a broad range of ethnicity.

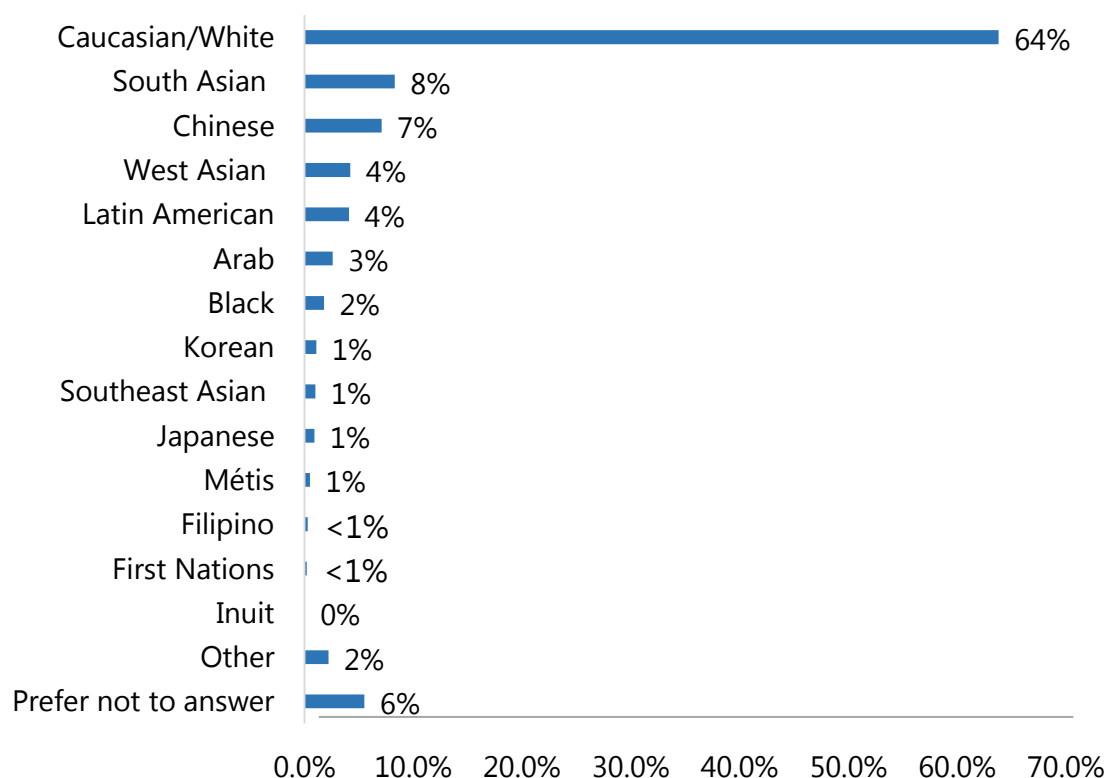


Figure 1.6.3. Ethnicity.

One-quarter of all respondents hold a work permit, and 13% are permanent residents/landed immigrants. Respondent country of origin is shown in Figure 1.6.4, **where a broad range of nations is represented**. One-third of respondents born outside of Canada originate from three countries: France (14%), India (11%), and China (10%). Many of these postdocs will be adjusting to life in a new country, as over two-fifths moved to Canada between 2014 and 2016, while equal proportions arrived during 2011-2013 or before 2010.

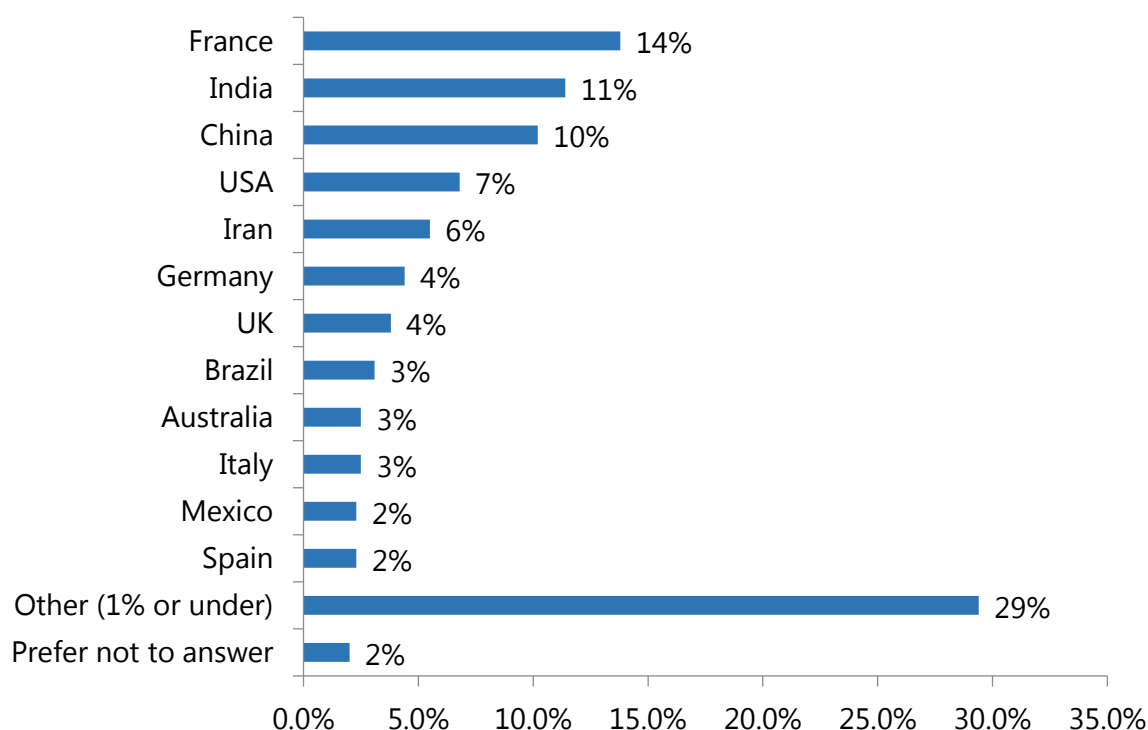


Figure 1.6.4. Country of origin.

Age and Family Status Trends

The profile of current postdocs shows that they are at the stage of life where Canadians have typically settled into relationships and a career, and are looking to start a family and buy their first home. Similar to the distribution of all respondents (previously shown in figure 1.6.2), 51% of current

postdocs are between the ages of 30 to 34 years (mean age is 34 years), with 31% aged 35 or older. **The size of the older category of postdocs (age 35+) increased in 2016 as compared to 2009, where the oldest category represented just 23% of postdocs.** Two-thirds of respondents are married, and one-third of current postdocs have dependents (almost half of these with

"There appears to be no balance between work and family. Just work. I cannot do that with my family's needs" –Survey Respondent

multiple dependent children). Postdocs indicating a divorced/separated/widowed status showed a small increase from 2% in 2013 to 3% in 2016. In open-ended comments, postdocs report frequent concerns over family and work-life balance.

Field of Research

The most common fields of research among postdocs are Biological Sciences (32%) and Health Sciences/Medicine (27%), followed by Physical Sciences and Engineering (14%). There were 19 different fields reported in the survey that were collapsed into the four categories (Appendix A). As shown in Figure 1.6.5, close to half of the 2016 respondents are conducting Life Sciences research and just over one-quarter, are conducting Physical Sciences and Engineering research. The remaining respondents are conducting Social Sciences and Humanities (16%) or Interdisciplinary research (12%). Since 2013, there has been a trend towards a decrease in the proportion of postdocs in the Life Sciences domain and increases in all other fields (after 2009, some Life Sciences postdocs may have been reclassified as “interdisciplinary”).

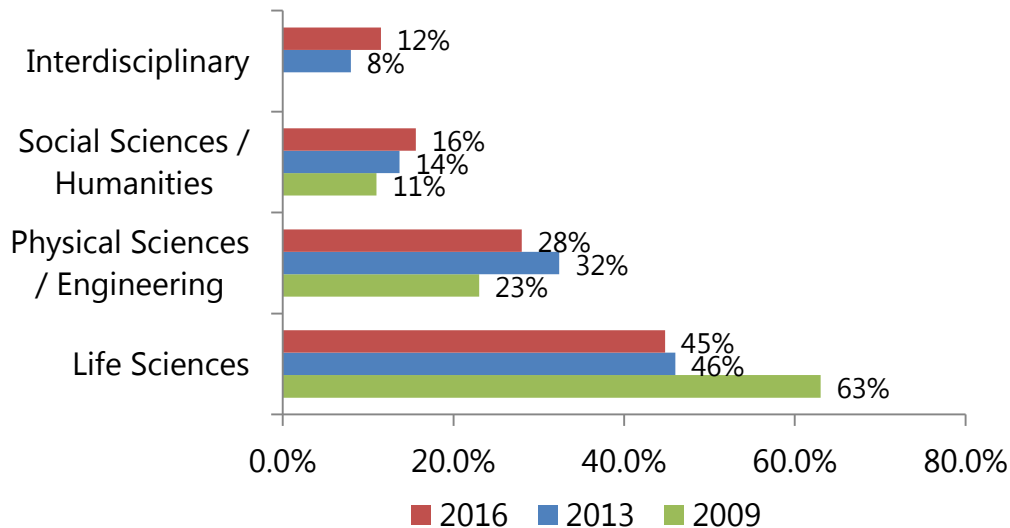


Figure 1.6.5. Trend in four main fields of research. Life Sciences include Health Sciences. See Appendix A for a description of the four main research domains. Data Sources: The 2009, 2013, and 2016 CAPS-ACSP Canadian National Postdoctoral Surveys.

Workweek

"I worked many long, tiring hours as a postdoc for a boss with very high expectations and demands. But I still felt it was worth it."

–Survey Respondent

The majority of respondents estimate that they work more than 40 hours per week, with the highest proportion working 40-49 hours, followed by those working 50-59 hours. About one in seven postdocs work more than 60 hours per week (Figure 1.6.6). The trend towards long workweeks is stable across the four

main research fields. Social Sciences and Humanities postdocs report working fewer hours per week compared to postdocs in other research fields, with fewer postdocs working more than 50 hours per week (21% versus 30% for Physical Sciences/Engineering, 41% for Interdisciplinary, and 45% for Life Sciences). Postdocs working outside of Canada report working significantly longer hours, with over one-quarter (29%) working over 60 hours.

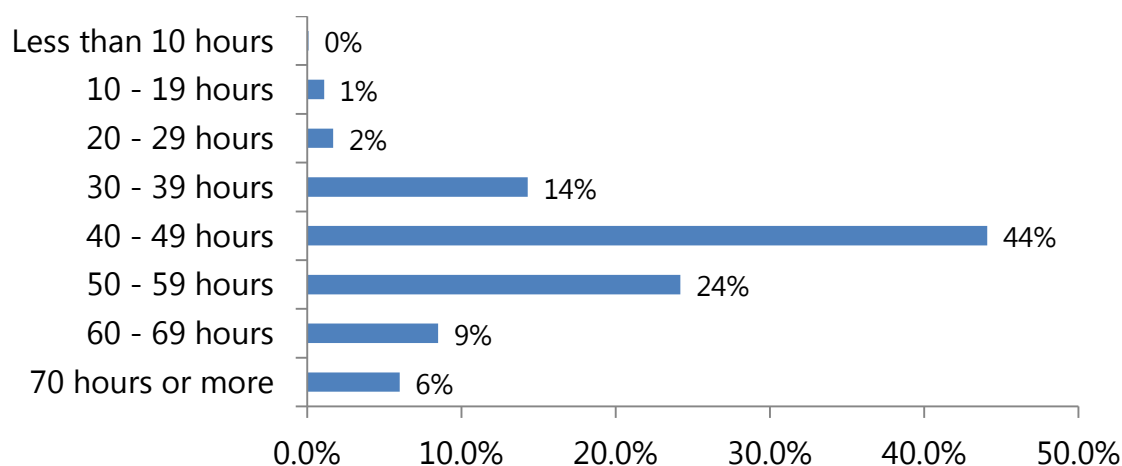


Figure 1.6.6. Average hours worked per week (postdoc-related).

For most postdocs, the workweek is usually spent conducting their own research. Other postdoc-related work includes supervision of others' research, administrative work, job search, professional development, teaching, and service (Figure 1.6.7). Life Sciences postdocs typically spend significantly more time on their own research, as compared to those in the Social Sciences and Humanities

field. Social Sciences and Humanities postdocs spend significantly more of their time searching for jobs than other program groups (Figure 1.6.7).

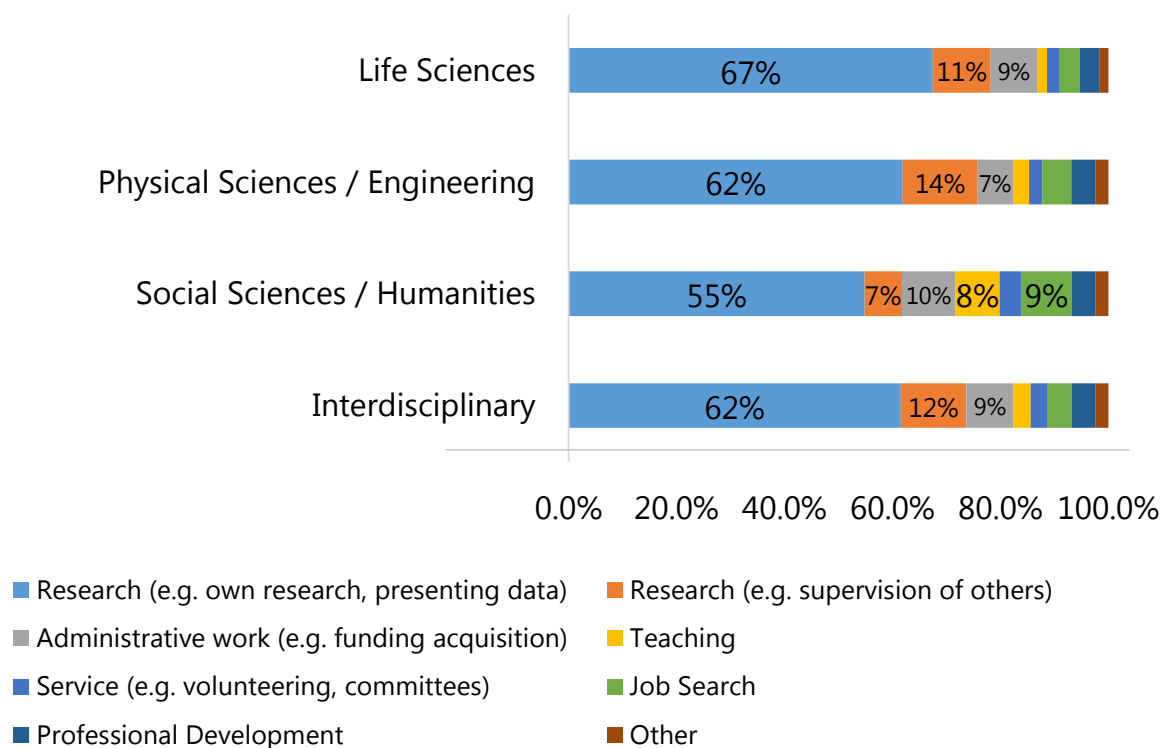


Figure 1.6.7. Time allocation by field of research. Empty cells contain values < 7%.

Compensation, Expenses, and Debt

Nearly half of all postdocs earn an annual income of less than CAD 45 000.

The overall mean annual gross salary is CAD 47 798. The trend in postdoc earnings from 2013 to 2016 indicates incremental improvements, where fewer respondents are classified in the lower income brackets (below CAD 35 000), and more respondents are earning salaries of CAD 45 000 or greater (Figure 1.6.8).

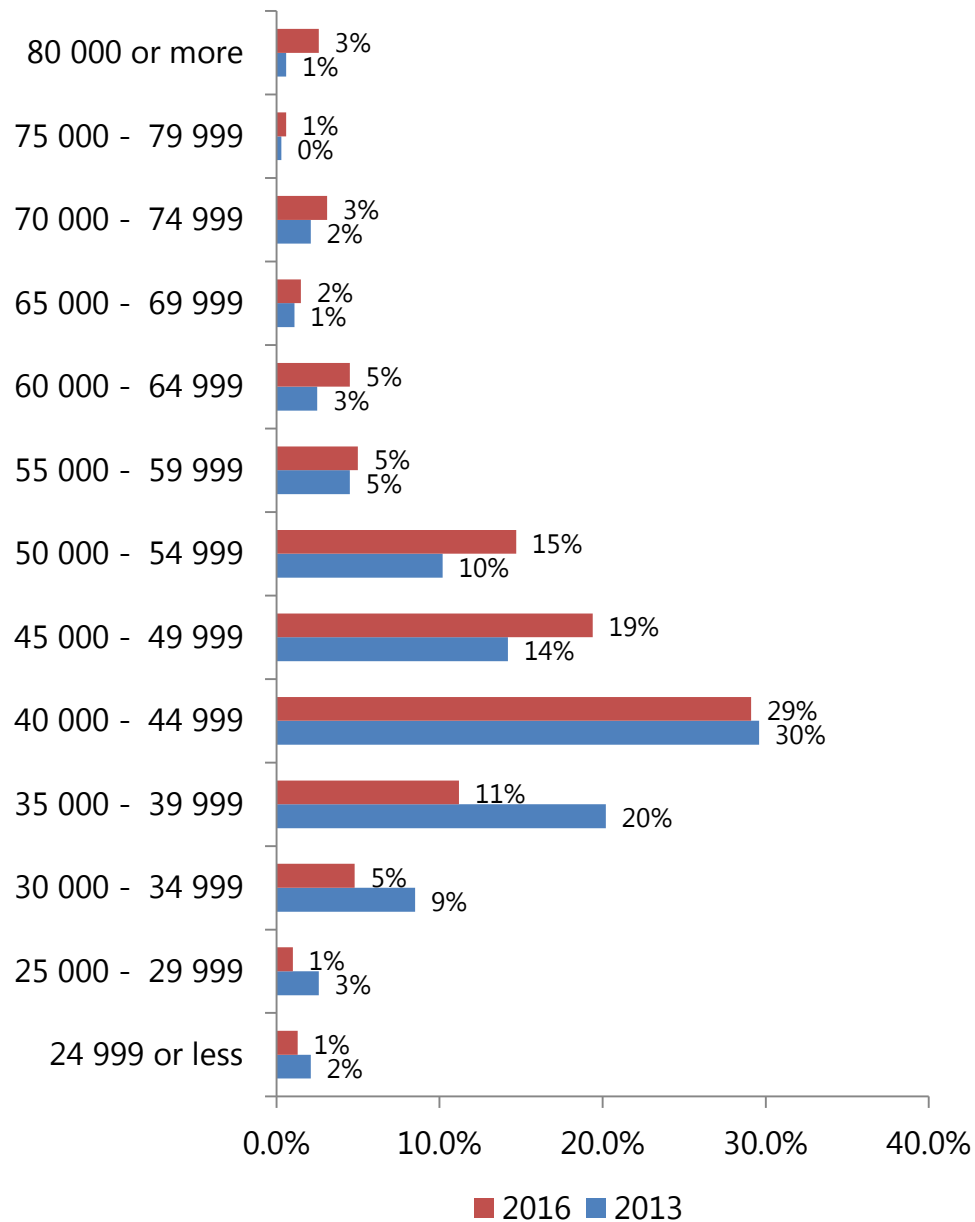


Figure 1.6.8. Comparison of income groups from 2013 to 2016. Data Sources: The 2013 and 2016 CAPS-ACSP Canadian National Postdoctoral Surveys.

As shown in Table 1.6.2, **there is no significant gender gap in earnings.** The primary source of funding for about one-third of postdocs is their supervisor’s research grant. CIHR/NSERC/SSHRC fellowships are the second most commonly reported sources of funding.

Table 1.6.2: Mean Gross Annual Salary by Postdoc Characteristics

<i>Characteristics</i>		<i>n</i>	CAD
Number of Postdoc Appointments	One	1,101	47 279.27
	Two	405	49 129.15
	Three	86	49 098.35
	Four or more	23	44 347.35
Gender	Female	783	47 751.76
	Male	805	47 847.34
Location of Postdoctoral Appointment	Canada	1,350	46 582.84
	Out-of-country	265	53 990.13
Region of Residence	Atlantic	42	46 487.61
	Quebec	371	42 337.79
	Ontario	479	47 901.39
	Prairies	306	47 940.69
	British Columbia	200	49 687.01
	Outside Canada	217	55 218.47
Field of Research	Life Sciences	723	48 208.37
	Physical Sciences / Engineering	452	48 699.74
	Social Sciences / Humanities	254	45 068.42
	Interdisciplinary	186	47 741.45
	Supervisor's grant	573	44 938.44
Primary Source of Funding	CIHR/NSERC/SSHRC	493	48 468.07
	Private foundation / association	80	50 312.01
	Mitacs fellowship	151	47 582.28
	Provincial government or provincial research council	96	46 223.47
	Institutional/depart mental training grant	88	49 346.12
	Foreign entity	47	55 478.35
	Other	71	59 577.03

Postdocs completing their appointment outside of Canada report notably higher salary ranges, with an average yearly income of CAD 53 990. A potential cause for the gap in earnings seen for Canadian versus out-of-country postdocs may reside with greater union representation in the United States. For example, the union representing more than 6 000 postdocs at the University of California reported that stipend minima have been established that are commensurate with experience: ranging from about USD 43 000 to USD 52 000 base salary (UAW Local 5810, © 2011-2016 UAW Local 5810, see uaw5810.org).

In the 2016 Survey, differences in average salaries were observed according to field of research and source of primary funding. Postdocs in the Social Sciences and Humanities, the lowest earning postdocs, show a different pattern of primary source funding as compared to other postdocs. Postdocs in the Social Sciences and Humanities are more likely to receive their primary source of income from SSHRC, rather than supervisor research grants, Mitacs, “other sources”, or the other Tri-Council fellowships. In comparison to other fields, Social Sciences and Humanities postdocs are twice as likely to have received the Banting Postdoctoral fellowship, 4% versus 2% (all other fields). About half of all respondents do not have a secondary source of funding. When available, the highest proportion of secondary funding is a supervisor’s research grant (21%).

Average monthly living expenses have increased since the 2013 Survey Report. As shown in Figure 1.6.9, there are significantly fewer postdocs with an average monthly expense below CAD 2 000 when compared to the 2013 results. Similarly, there are more postdocs with average monthly expenses that exceed CAD 3 500 in 2016 as compared to 2013.

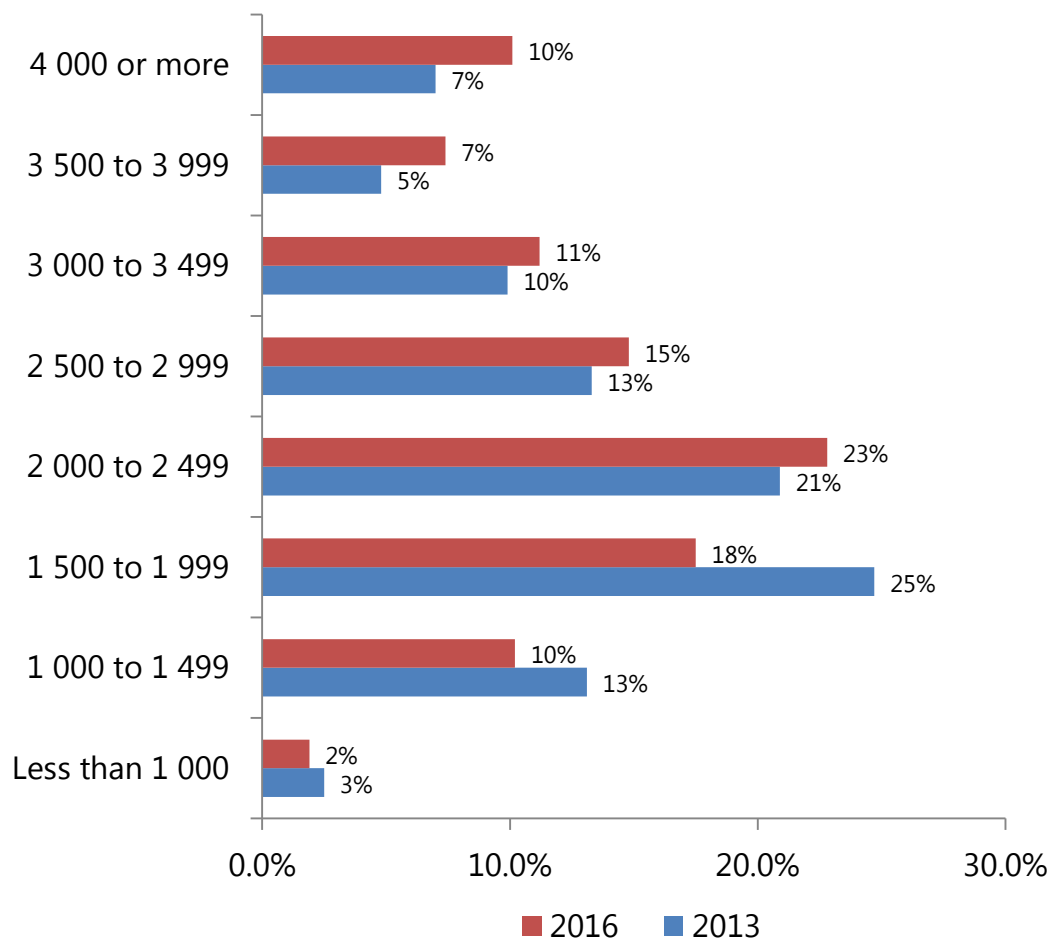


Figure 1.6.9. Comparison of average monthly expenses from 2013 to 2016. Data Sources: The 2013 and 2016 CAPS-ACSP Canadian National Postdoctoral Surveys.

Most postdocs (72%) indicate having no educational debt. In 2013 and 2016, fewer than 10% report having education-related debt exceeding CAD 50 000 (Figure 1.6.10). **Since 2013, there has been an increase in the proportion of postdocs without education-related debt.**

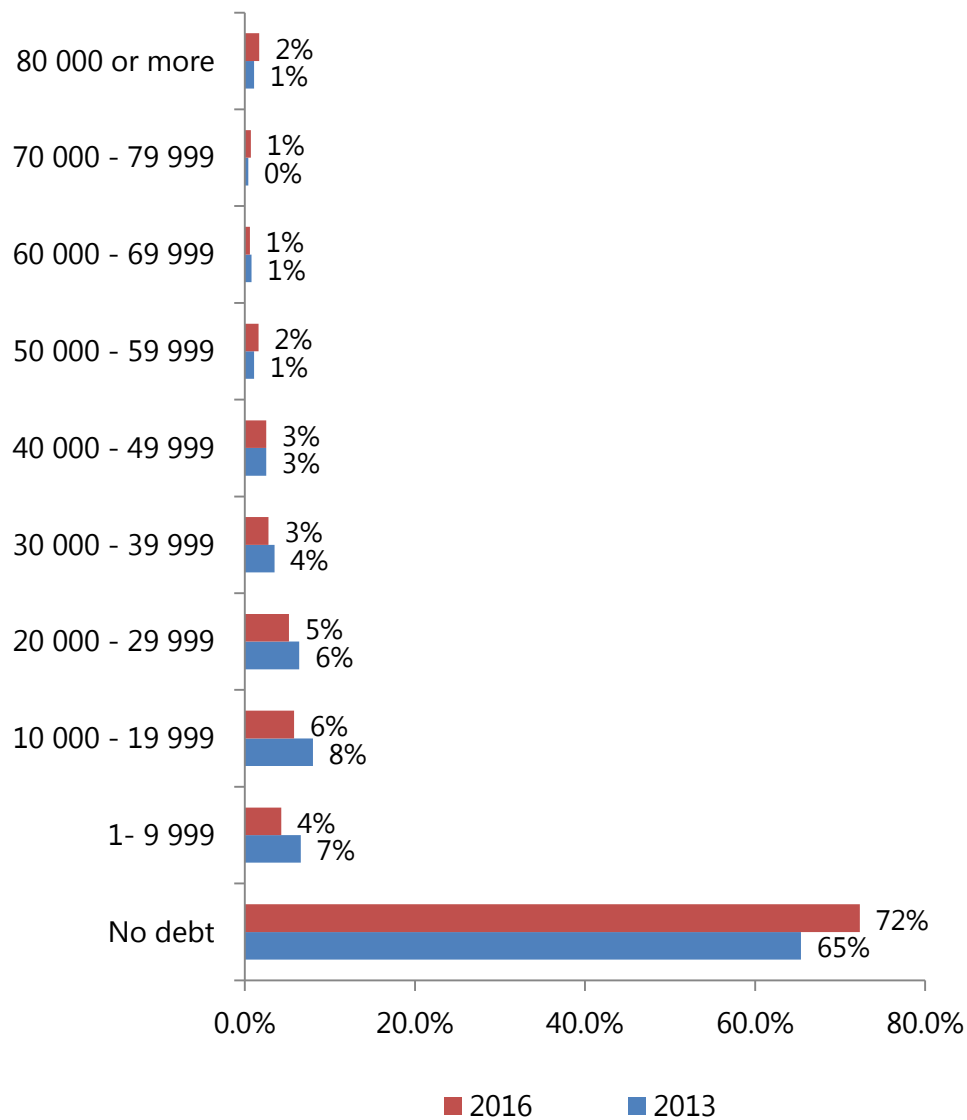


Figure 1.6.10. Trend in postdoc education-related debt. Data Sources: The 2013 and 2016 CAPS-ACSP Canadian National Postdoctoral Surveys.

Highlights of the Respondent Profile

- 12% of respondents are Canadian citizens who left Canada to complete a postdoc in a foreign country.
- The average postdoc is 34 years old and likely to be married.
- About one-third of postdocs have dependents.
- There is a shift in the age distribution of postdocs in 2016 as compared to 2009. 31% of current postdocs are 35+ years old, which represents an increase of 8 percentage points for this age group from the 2009 survey.
- There is a general trend towards fewer postdocs entering the Life Sciences field, while all other fields are increasing.
- The majority of postdocs work more than 40 hours per week, with the highest proportion working 40-49 hours, followed by those working 50-59 hours. About one in seven postdocs work 60+ hours per week.
- The largest proportion of postdocs earn CAD 40 000 to 44 999 annually. 74% of all postdocs earn between CAD 35 000 and CAD 54 999.
- Average monthly living expenses have increased from 2013. In 2016, more postdocs have expenses that exceed CAD 3 500 and fewer postdocs have expenses below CAD 2 000 each month.
- Similar to the 2013 Survey results, most postdocs have no, or very little, education-related debt.

2. CANADA'S PERFORMANCE ON THE GLOBAL POSTDOCTORAL STAGE

Attracting highly qualified postdocs may be influenced by Canada's performance on the global postdoctoral stage. The unique experiences of Canadian postdocs are compared with the postdoctoral experience reported in other countries, which reveals the following challenges:

- The barriers faced by international postdocs and their families.
- The challenges to everyday well-being, such as low income (and inconsistent taxation schemes), low levels of workplace benefits, and ill-defined status in the workplace.
- The satisfaction with postdoctoral training in Canada, and the trend for Canadians completing postdocs outside of Canada to have higher satisfaction with most aspects of their training and with their career development opportunities.

2.1 The International Postdoc Experience

The 2016 Survey revealed that 477 current and past postdocs identify as international postdocs working in Canada with a Visa or work permit. Slightly more than half of foreign postdocs in Canada are male (55%), and the majority are 30 to 34 years of age (53%). Figure 2.1.1 illustrates the trend in the percentage of postdocs originating from outside of Canada. **In 2016, 13% of postdocs hold permanent resident or landed immigrant status and 29% hold a work permit.** These figures are less than those seen in the 2009 and 2013 Surveys, and are lower than figures from the United States, where 56% of postdocs are considered "international" (Davis, 2005). Other countries may host fewer international postdocs, as does Holland (35%, van der Weijden et al., 2016), the United Kingdom (14%, Vitae, 2013), and Germany (10%, Fitzenberger & Schulze, 2014). As was illustrated in Figure 1.6.4, among respondents born outside of Canada, the highest proportion are from France (14%), India (11%), and China (10%). Over two-fifths (43%) of international postdocs had moved to

Canada between 2014 and 2016, while equal proportions arriving between 2011-2013 or prior to 2011 (29% and 29%).

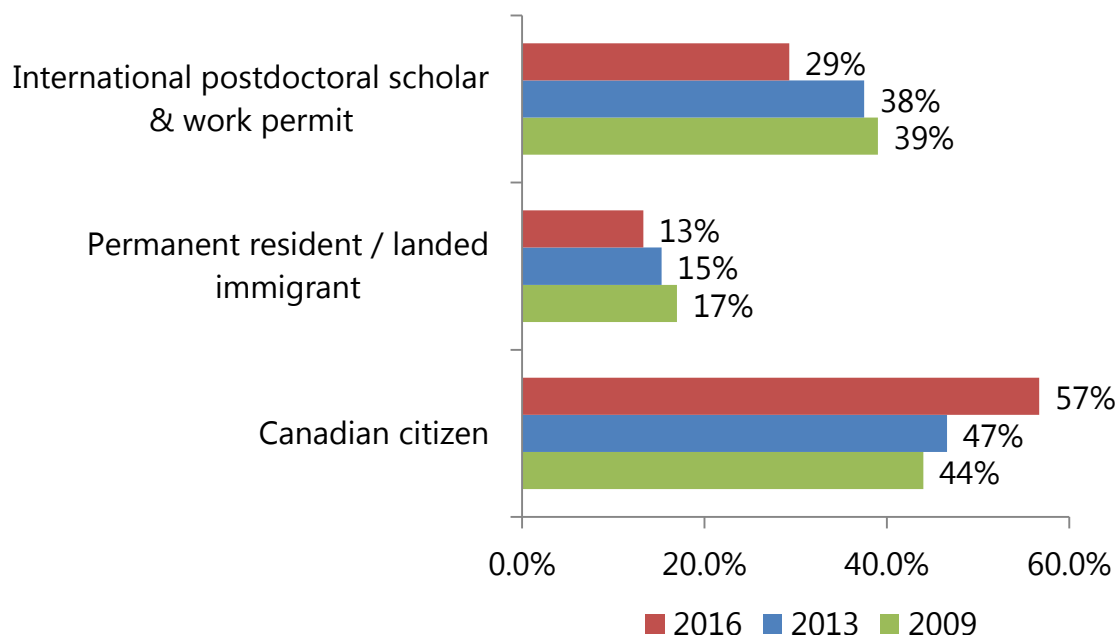


Figure 2.1.1. Trend in citizenship status of current postdocs. Data Sources: The 2009, 2013, and 2016 CAPS-ACSP Canadian National Postdoctoral Surveys.

The 2016 survey explored the issues facing international postdocs. Many PDAs and PDOs in Canada provide additional information on their websites for international postdocs. However, special services and information packages for foreign postdocs are not consistent across academic institutions, with some universities offering no online resources for foreign postdocs. With respect to recruitment, national and provincial funding programs support international postdocs in Canada. For example, in 2010-2011 about 30% of the Banting fellowships (prestigious postdoc awards worth CAD 70 000 annually for two years) were awarded to international researchers (Chakma et al., 2012). While the number of applicants from foreign sources is down in 2016, compared to 2012, the Banting awards given to foreign postdocs remain at 31% (CIHR, 2016). To compete on the international stage, and attract top scholars, it was recommended that Canada rebrand its granting services and align all

opportunities available to international postdoctoral under one streamlined delivery system (Chakma et al., 2012). In May 2016 the new *EduCanada* brand was released (www.educanada.ca), with the website hosting scholarship information for Canadian and international researchers. From the *EduCanada* website, scholars can determine what awards are available to them in accord with their home country. Promoting Canada as a country that welcomes international scholars and fosters innovation and ground- breaking research is projected to have both social and economic benefits (Cheung, Guillemette, & Mobasher-Fard, 2012).

In Canada, international postdocs come from many countries, and they do so for a variety of reasons (Figure 2.1.2). **The most common reasons for international postdocs to select Canada for a postdoctoral location are to take advantage of greater research opportunities, to learn new approaches, and to further career options.** One-quarter to one-fifth of respondents indicate that collaboration with Canadian researchers and the reputation of the learning institutions were extremely important reasons for choosing Canada as their postdoctoral location. Canada may not be fully tapping into the global market for postdocs. For example, OECD data shows that Canada is home to 5% of the global market for international students. **This 5% share of the global market for students falls below figures for the United States (18%), the United Kingdom (10%) and Australia (7%) (Cheung et al., 2012).**

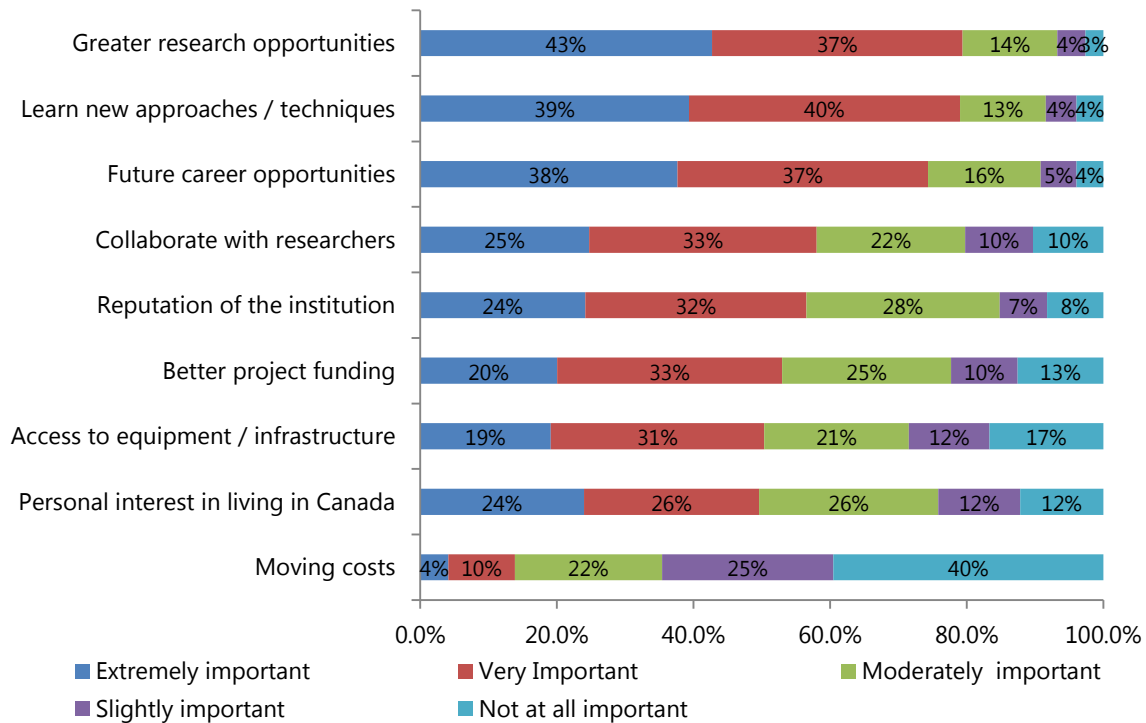


Figure 2.1.2. Reasons for pursuing a postdoctoral appointment in Canada.

"I am a US citizen and I would like to go back to the US where I don't have to deal with Immigration anymore."
 –Survey Respondent

The 2016 Survey results show that international postdocs encounter problems during their tenure in Canada. A number of concerns facing international postdocs are similar to those experienced by any newcomer to Canada, such as transitioning to a new

country and learning either English or French. The 2016 Survey results suggest that over time, these challenges associated with adapting to a new country diminish. However, obtaining postdoc funding, and Visa or work permits are complex procedures that international postdocs report as challenges years into their postdoctoral appointment. **There is a trend that Visa and work permit problems are impacting an increasingly large number of international postdocs in Canada.** The observation that international postdocs from the 2016

Survey continue to experience problems in obtaining funding after three to five years in Canada may be reflective of the postdoc pile-up phenomenon where postdocs now routinely complete multiple postdocs before finding employment (Powell, 2015).

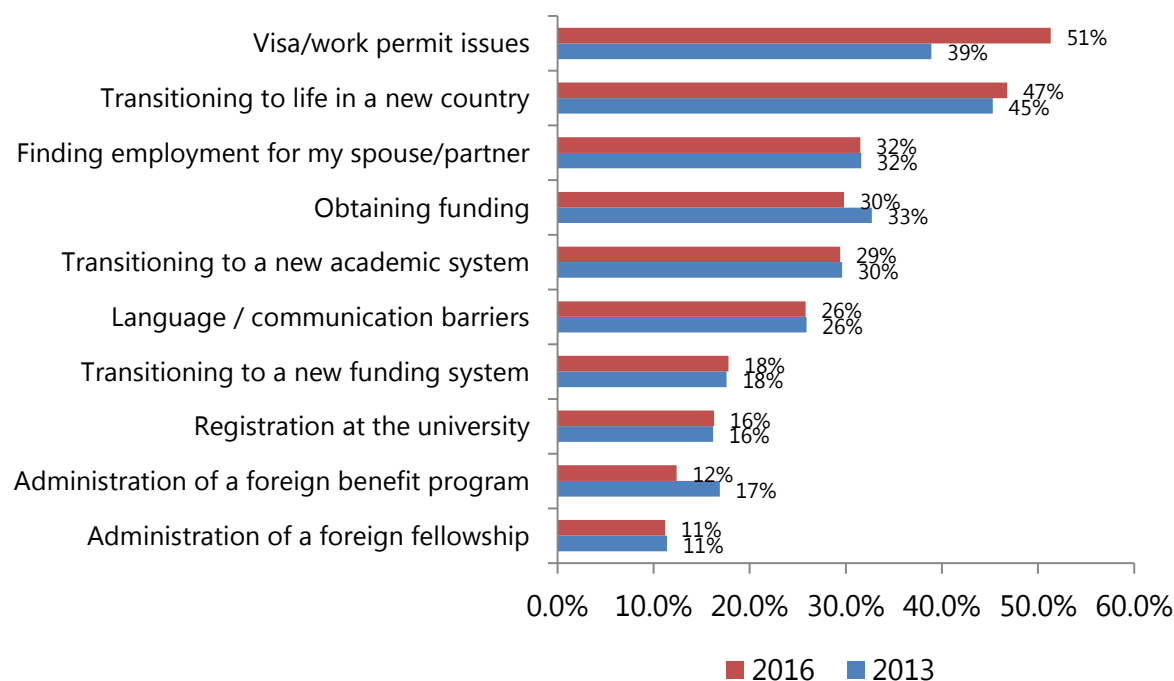


Figure 2.1.3. Trend in challenges encountered by international postdocs. Data Sources: The 2009, 2013, and 2016 CAPS-ACSP Canadian National Postdoctoral Surveys.

Despite Canada's well known cultural mosaic and anti-discrimination workplace policies, there are also a small number of open-ended comments by 2016 Survey respondents suggesting that unfair treatment of international postdocs, based on race, may not be isolated incidents in the workplace. Cantwell and Lee (2010) explored the issue of neo racism and international postdocs in the United States. They

"As an international postdoc I feel I have experienced racism, marginalization, and discrimination..."
 –Survey Respondent

suggest that international postdocs may be experiencing exploitation in the workplace because they are willing to work much longer hours and stay in lower paying jobs. The willingness to accept these working conditions may stem from high levels of gratitude for the opportunity to leave a home country for work in North America (Cantwell & Lee, 2010). Expressing concerns about working conditions can be difficult for postdocs from Canada, who have a good command of the culture and language; therefore, speaking up about unfair workplace practices may be amplified for foreign postdocs who are unfamiliar with Canadian workplace cultures and are without a full command of either official language.

2.2 Challenges to Postdoc Well-being

Earnings

The 2016 Survey results show that most postdocs earn a gross annual salary of CAD 45 000 or less. This corresponds to an annual take-home income of about CAD 35 000 (< CAD 3 000 per month). In practical terms, about 30% of postdocs may not have sufficient income to cover monthly expenses. For example, the average monthly rent for a two-bedroom apartment in Ottawa (a large Canadian city with numerous government research laboratories and two universities) is approximately CAD 1 200 (Canada Housing and Mortgage Corporation, 2016) and childcare for one infant at a licensed daycare is close to CAD 1 400 per month (City of Ottawa, 2015)⁵.

⁵ Average monthly household expenditures information found at <http://www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/famil130a-eng.htm>

That most postdocs have a net income of less than CAD 3 000 per month suggests that after paying for rent and childcare, inadequate funds remain for other basic costs of living (e.g., food, transportation, health care). Moreover, there may be inadequate funds for other costs resulting from illnesses or emergencies (e.g., trips back home). Out-of-country postdocs paid in Canadian dollars report additional financial stress, and problems with predicting and covering expenses because of fluctuating exchange rates.

Figure 2.2.1 compares Canadian postdoc earnings to those of the United Kingdom and the United States. Since 2009, there has been a trend in Canada toward comparable salaries with respect to U.S. postdocs; however, both the United States and Canada continue to lag behind the United Kingdom. Postdocs in Canada also earn relatively less in comparison to postdocs in Norway and Sweden (European University Institute (EUI), 2016).

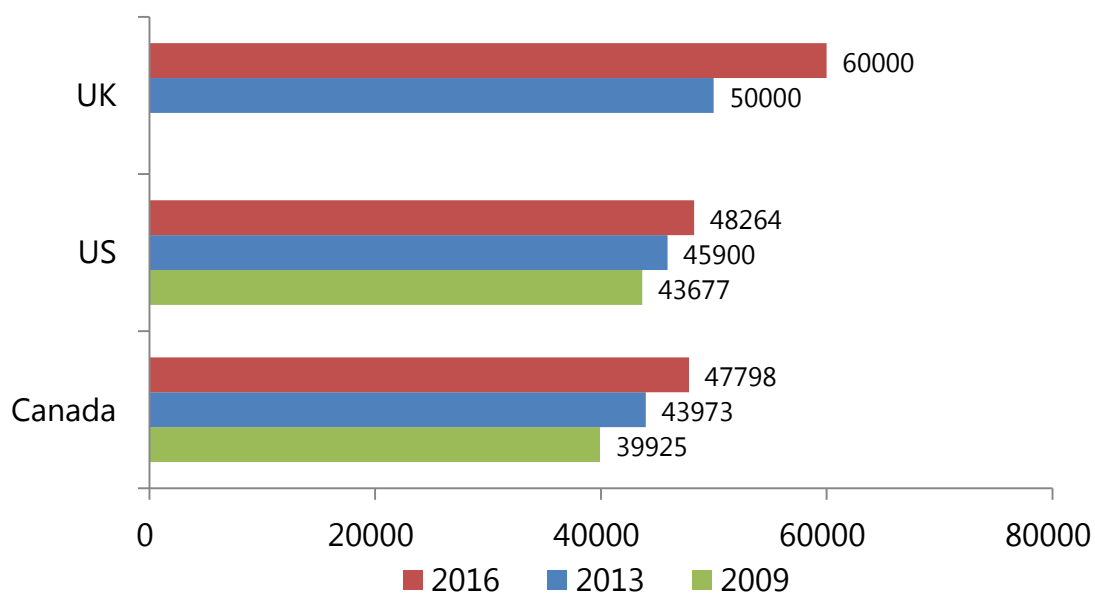


Figure 2.2.1. Average Canadian postdoc salary trend in comparison to the United States and United Kingdom. Funds converted to CAD. U.K. Sources: <http://www.birmingham.ac.uk/Documents/staff/salary-clinical.pdf>, and https://www.glassdoor.co.uk/Salaries/postdoctoral-researcher-salary-SRCH_KO0,23.htm (2009 salary data not available). U.S. Sources: <http://www.nationalpostdoc.org/page/stipends>.

A contributing factor to the gap in pay between Canadian and out-of-country postdocs is the lack of incremental increases that accompany years of experience for Canadian postdocs. For example, it is increasingly common for postdoc salaries in the United States to be adjusted in accord with years of experience (National Institutes of Health, 2014). A postdoc with five years' experience could be earning 25% more than a first-year postdoc. Salaries that are commensurate with experience are also common in the United Kingdom. For example, the NC3R^s (2016) handbook for U.K. postdocs suggests that applicants arrange experience-related salaries with their host location.

Other income factors, such as location, gender, and field of research were investigated in the 2016 Survey. Regional differences within Canada are noted, with Quebec earning the lowest and British Columbia and the Prairies earning the highest incomes (Table 1.6.2). **There is no difference in earnings of Canadian postdocs with respect to gender.** The field of research has a modest effect, whereby those in the Social Sciences and Humanities are the lowest earners. As was shown in Table 1.6.2, funding sources also influence yearly earnings, suggesting that supervisor research funds, and the Canadian national and provincial granting agencies deliver less income than private or international sources.

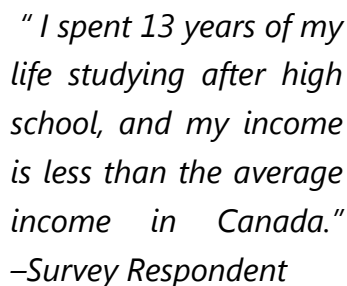
How research funding is deployed in Canada accounts for the diverse ways that postdocs are employed or contracted to work, and consequently how they are compensated. There is currently no standard postdoc salary in Canada. Postdocs might also be compensated by multiple funding sources. Each granting agency has set its own funding amount and dispersal method. Often, the university administers the granting agency funds and disperses some or all of the income to the postdoc. Postdocs can also receive funds directly from their funder.

- In academic institutions, postdocs might be hired by principal investigators (PIs) for a defined period. Responsibilities might include supervising students, providing oversight in the lab, publishing research and conducting research in their own field. Often postdocs are paid from the PIs' grants at an amount agreed upon by the PI and postdoc. Canada Pension Plan, income tax, and other standard deductions are typically

deducted when institutions have clearly indicated that postdocs are employees.

- In other labs, postdocs may have the same responsibilities as listed above, but hold external funding from one of the Tri-Council granting agencies in Canada (e.g., NSERC, SSHRC, and CIHR).
- A postdoc may be funded by the Mitacs *Elevate* program (formerly the NSERC industrial fellowship) and work part of their time in the university lab, and partly in the host company location.
- Postdocs in industry or government laboratories often have employee status, and therefore deductions may be very clearly delineated. As a result, industry and government funded postdocs may have salaries and benefits closer to private industry standards⁶.

The challenge of earning a living as highly-educated individuals is not made easier with the knowledge that the same cohort of individuals who obtained employment right after an undergraduate degree earns a median yearly salary of CAD 53 000; those with a master's degree, CAD 70 000; and, those working directly after a PhD, CAD 75 000 (Ferguson & Wang, 2014).

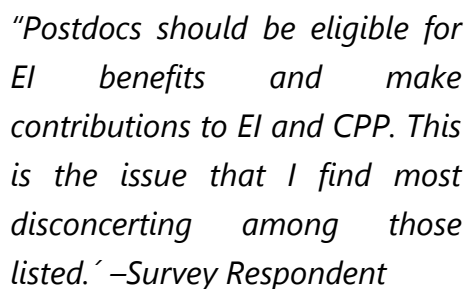


"I spent 13 years of my life studying after high school, and my income is less than the average income in Canada."
–Survey Respondent

⁶ According to a recent Public Service of Canada collective agreement for government employees, Postdocs classified at the lowest level of research scientist (RES-1) would earn a starting annually salary of about CAD 53 000, to a maximum of about CAD 70 000 (See http://www.tbs-sct.gc.ca/pubs_pol/hrpubs/coll_agre/re/re06-eng.asp).

Canadian labour market research suggests that there is a wage-premium for attainment of higher levels of education. However, the premium does not extend to Canadian postdocs who earned CAD 50 000 (gross annual income), while those PhDs who obtained non-postdoctoral employment earned CAD 75 000 (Ferguson & Wang, 2014). After five years as a postdoc, lost earnings may total CAD 125 000. Premiums for postdocs, as compared to earnings of PhDs without a postdoc, may not even exist; therefore recouping this lost income may not be possible. Most postdocs want tenure track jobs and are taking a ‘financial hit’ (CAD 125 000) in order to do so, in turn this affects the ability of Canada to recruit HQP. The discrepancy in earnings between postdocs and comparable industry-employed PhDs is a phenomenon also noted for postdocs in the United States, where salary disparities range from 40% to 200% (Committee to Review the State of Postdoctoral Experience in Scientists and Engineers et al., 2014).

Statutory and Workplace Benefits



“Postdocs should be eligible for EI benefits and make contributions to EI and CPP. This is the issue that I find most disconcerting among those listed.” –Survey Respondent

The problems associated with low incomes are compounded by the unavailability of workplace benefits for many Canadian postdocs. To assist with expenses, medical and drug costs are normally supplemented by employee benefit packages. While the majority of postdocs report having

basic provincial health care, just half of the 2016 Survey respondents have dental insurance, a drug plan, or vacation leave (Figure 2.2.2).

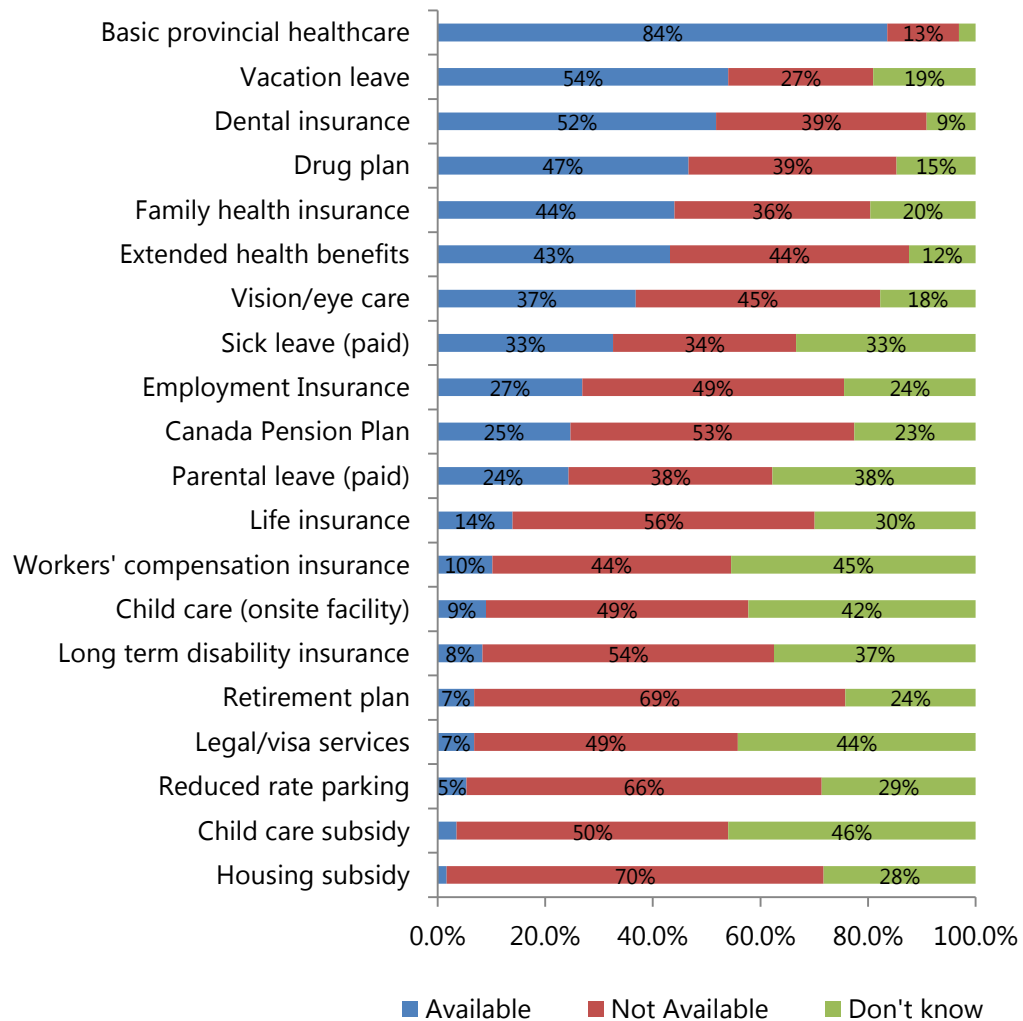


Figure 2.2.2. Benefits available through postdoctoral position. Empty cells contain values <5%.

Postdocs indicated the desirability of benefits not currently available to them (Figure 2.2.3). Concern over future financial stability is evidenced by the **high priority placed on employment insurance, pension plans, and Canada Pension Plan (CPP). Medical benefits, such as dental and drug plans, are other top concerns for respondents.**

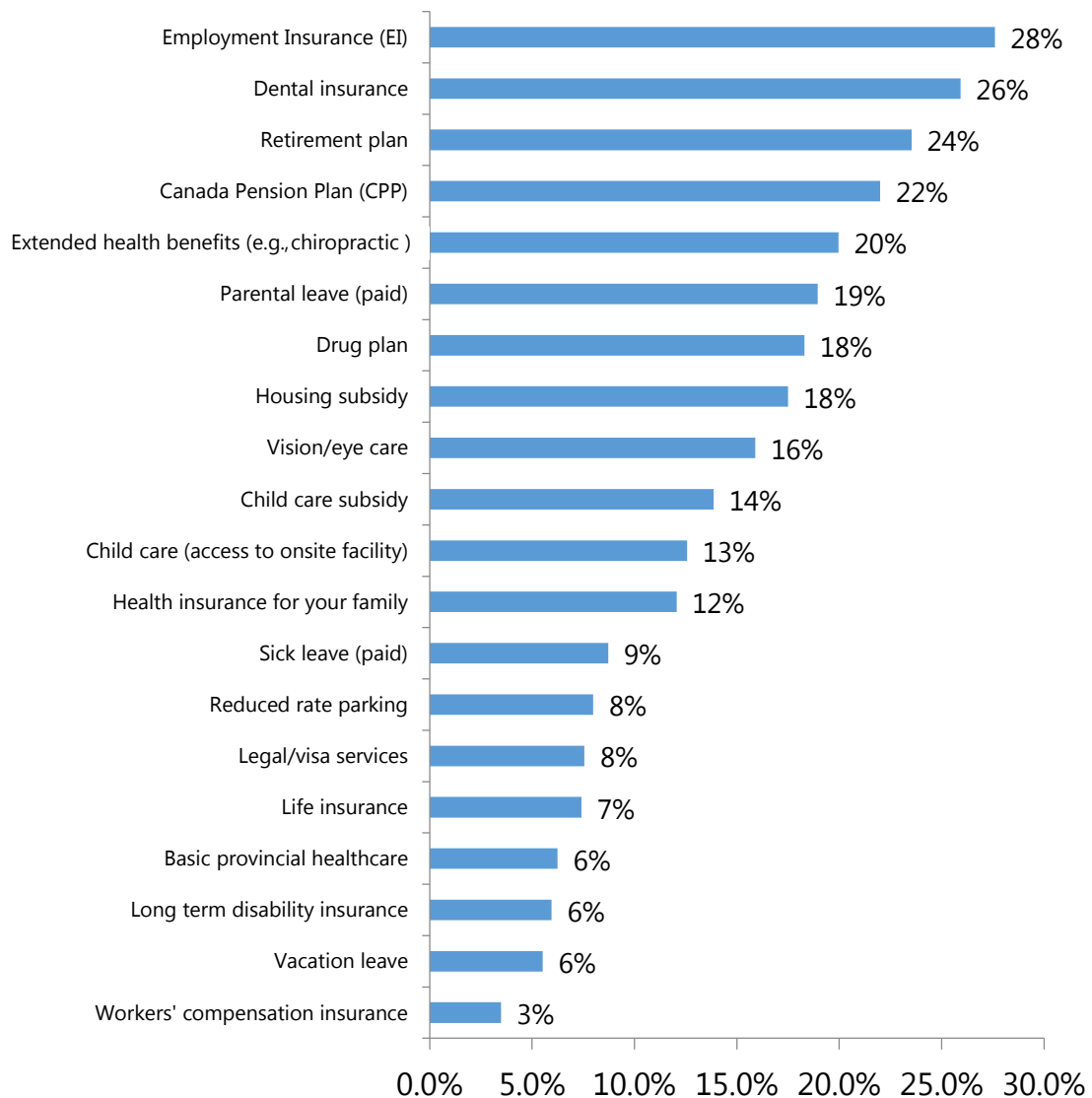


Figure 2.2.3. Top benefits desired (among those who do not have access or do not know if they had access).

The issue of benefits takes on added relevance to postdocs with disabilities and mental health issues. Critical services, previously available to individuals as graduate students, are often unavailable to postdocs (National Educational Association of Disabled Students (NEADS, 2016). For example, mental health services, such as counselling, may be unavailable for those in academic postdoc positions. Diversity with respect to citizens with disabilities appears to be very narrow among postdocs in Canada. About 2% of respondents self-identify as

having a disability. While the overall representation of individuals with disabilities is low, this figure does represent an increase from 2013 (1%) to 2016 (2%). The workplace supports required for individuals with disabilities are often complex and may be costly (e.g., technology to support augmented communication). Currently there are no formal assurances for individuals with disabilities that supports can be implemented in postdoc work environments. A workplace that does not offer a comprehensive benefits plan may not attract talent that require services to cover costs of health care needs. HQPs might forego postdocs in favour of permanent positions in public service or industry that typically offer benefit plans more aligned with their needs. Due to limited information about postdocs with disabilities, there are consequently few resources available for postdocs or employers.

Postdoc Status

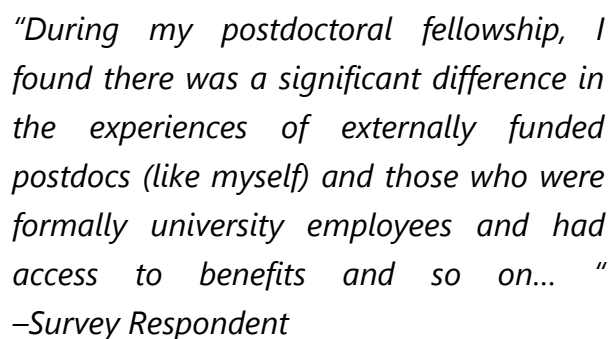
The diverse nature of postdoc compensation is more reminiscent of graduate student life than it is of most employees in Canada. Because the postdoctoral tenure is meant as a limited term training opportunity, many postdocs are not considered employees. Instead, postdoc status is a combination of researcher-trainee. Yet for postdocs, attitudes towards employee status have polarized. Seventy-six percent of postdocs from the 2013 Survey indicated a preference for employee classification. This represents an increase from the 2009 Survey where 62% of respondents indicated that postdocs should have employee status (the 2016 Survey did not contain this employee classification item). In practice, just 40% of the 2013 and the 2016 Survey respondents reported receiving employee (T4) tax forms. In Ontario, internally funded postdocs were ruled as employees of the university by the Ontario Labour Relations Board in 2012; however, externally funded postdocs were not part of this ruling. **Despite employee tax status for 40% of respondents, less than one-third to a quarter of postdocs report having employment insurance, CPP, retirement, or dental benefits** (the 2013 and 2016 Surveys indicate no change in these figures over the past three years). An informal poll of postdocs conducted by CAPS-ACSP (September 2016) found that Quebec, British Columbia, and Alberta officially recognize postdocs as trainees, and not as employees. Employee status is important as it clarifies how

postdocs should be taxed and opens the door to unionization, where negotiations can lead to increased minimum salaries and access to desired benefits.

The taxation issue was addressed in 2010 when the Federal Government ruled that postdoc compensation was taxable income. However, commensurate with the broad hiring schemes applied to postdocs, there are varying arrangements regarding postdoc taxation in Canada, with some respondents of the 2016 Survey receiving multiple tax forms (e.g., T4, T4A, T2202A).

In 2012, the ruling that internally funded postdocs in Ontario were employees and not trainees, paved the way for the introduction of postdoc unionization in some locations and, with this, increases to minimum salaries (CUPU, 2016, personal communication July 19, 2016). Despite the unionization of postdocs in some universities, there is little evidence to suggest adequate compensation of postdocs has resulted. While mean gross annual income increased from CAD 40 000 in 2009 to CAD 47 798 in 2016, this figure still falls below industry standards, where non-postdoc PhDs earn about CAD 30 000 more per year than a Canadian postdoc earns (Ferguson & Wang, 2014). Moreover, low postdoc salaries are disappointing considering that the Canadian professoriate ranks number one in a list of 28 countries with respect to earnings, with an average monthly salary of more than CAD 9 000 (Altbach, Reisberg, Yudkevich, Androushchak, & Pacheco, 2012).

The struggle to classify postdocs consistently across a broad spectrum of hiring practices and funding structures is also seen in the United States. The *Overview of Tax Issues for Postdocs* webpage provided by the National Postdoctoral



"During my postdoctoral fellowship, I found there was a significant difference in the experiences of externally funded postdocs (like myself) and those who were formally university employees and had access to benefits and so on... "
—Survey Respondent

Association (U.S.) contains a long list of taxation classifications, and acknowledges that across institutions there will be differences in the withholding

of taxes (National Postdoctoral Association, n.d.). The result in Canada is that, for the most part, postdocs are usually not considered employees, and their income is not tax-free. A postdoc in Canada who is a sole provider with dependents may be living below the Canadian *Low Income Cut-Off* (calculated using Statistics Canada [2015a] data, Ontario taxation rates, and a mean income of CAD 45000)⁷.

2.3 Satisfaction with the Postdoctoral training

Understanding what contributes to postdoc satisfaction with training promotes the identification of postdocs at risk of leaving their appointment prematurely, and can inform strategies designed to improve their experience. Current and past postdocs rated their overall level of satisfaction with training, the value of their postdoctoral training, and features of the workplace that contributed to their level of satisfaction. **Overall, the majority are at minimum somewhat satisfied with their postdoctoral training.** The general satisfaction with the postdoctoral training has been improving since the 2009 Survey.

⁷ According to Statistics Canada (2015a), the 2014 Low Income Measurement for a family of four living in a metropolitan area in Ontario was CAD 38 117.00 net annual income. A sole-provider postdoc, working in an urban area, earning a gross wage of CAD 45 000 annually has a net income of about CAD 34 000, which equates to living below the *Canadian Low Income Cut-Off*.

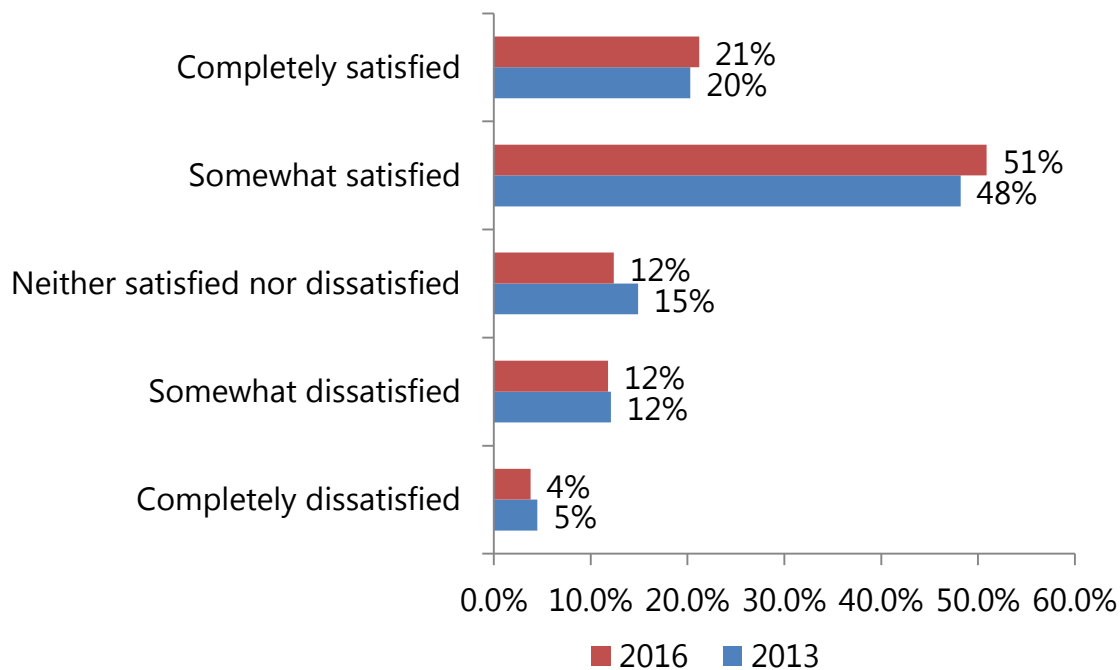


Figure 2.3.1. Trend in overall satisfaction with postdoctoral training. Data Sources: The 2009, 2013, and 2016 CAPS-ACSP Canadian National Postdoctoral Surveys.

Satisfaction with the value of postdoctoral training was analyzed according to respondent characteristics (Table 2.3.1). **Out-of-country postdocs rate their overall satisfaction with training higher than those in a postdoctoral position in Canada.** Within Canada, those in the Atlantic region show a trend to be more satisfied overall when compared to those in the rest of Canada. With respect to citizenship, postdocs with

permanent residency or landed immigrant status show the lowest level of satisfaction. Respondents completing their first postdoc are significantly more satisfied than those who are completing subsequent appointments (two,

three, or four). The gradual erosion of satisfaction with the training across multiple postdoctoral appointments was also noted in a study of postdocs in

"Overall, I am satisfied [with] the training that my university has provided during my tenure there and I would recommend it for others seeking postdoc employment."
 –Survey Respondent

Holland, where greater numbers of appointments were associated with less satisfaction (van der Weijden et al., 2016).

Table 2.3.1: Satisfaction with Value of Postdoctoral Training by Respondent Characteristics

Characteristics	<i>n</i>	<i>Mean</i>
Region of residence	Atlantic	60 3.82 _{a,b}
	Quebec	466 3.53 _a
	Ontario	621 3.55 _a
	Prairies	365 3.57 _a
	British Columbia	244 3.62 _{a,b}
	Outside Canada	353 3.87 _b
Location of postdoc appointment	Canada	1,360 3.54 _a
	Out-of-country	270 3.84 _b
Field of research	Life Sciences	731 3.54 _a
	Physical Sciences / Engineering	457 3.65 _a
	Social Sciences / Humanities	254 3.57 _a
	Interdisciplinary	188 3.64 _a
Citizenship status	Canadian citizen	1,264 3.64 _a
	Permanent resident or landed immigrant	279 3.38 _b
	International postdoc holding a work permit	534 3.69 _a
Number of appointments held	One	1,109 3.66 _a
	Two	411 3.49 _{a,b}
	Three	87 3.23 _b
	Four or more	23 3.22 _{a,b}

Notes: 1. Values in the same column and subtable not sharing the same subscript are significantly different at $p < .05$ in the two-sided test of equality for column means. Tests assume equal variances. 2. Mean scores are calculated using a 5-point scale in which 1=Completely dissatisfied and 5=Completely satisfied.

The 2016 Survey respondents express typical rates of job satisfaction. For example, in a study of 18 Canadian universities, 74% of academic faculty rated their job satisfaction at *high* or *very high* levels (Weinrib et al., 2013). Results of the 2016 Survey mirror those found in a survey of U.S. postdocs (Davis, 2005) where 70% of respondents indicated overall satisfaction with the postdoctoral

training. Davis (2005) also suggests that job satisfaction of postdocs follows that of the general working public.

Davis (2005) noted that job satisfaction is built on several elements in the workplace. These elements can be tangible, such as salaries or research resources, or intangible, such as supportive leadership and opportunities for professional development. Respondents to the 2016 Survey rated their satisfaction with specific aspects of their training (Figure 2.3.2). Benefits, salary, and training opportunities are sources of dissatisfaction. Respondents are most satisfied with the level of supervision/independence, as well as the resources and facilities available to them.

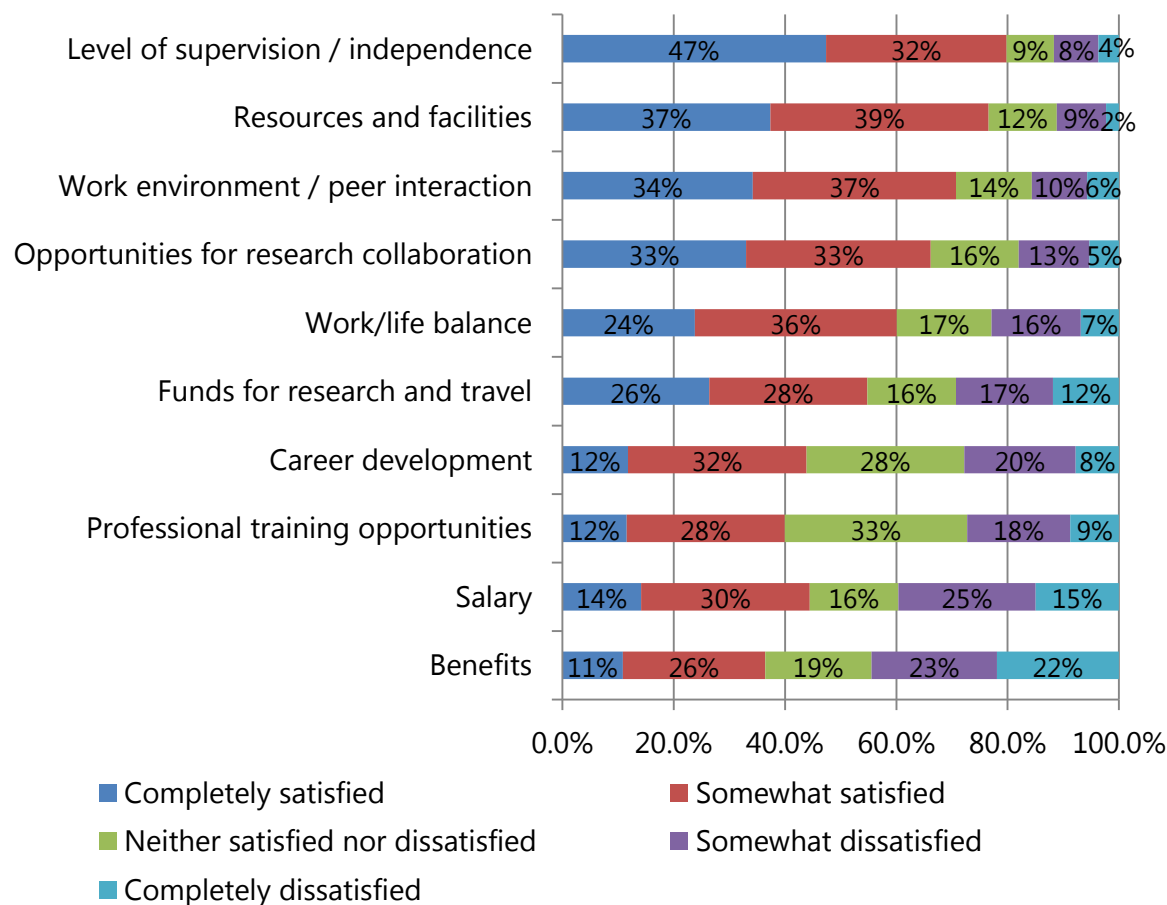


Figure 2.3.2. Satisfaction with elements of postdoctoral training.

A marked difference in satisfaction with training is found for two characteristics of postdocs in Canada. First, there is disparity along the lines of research domains, with Social Sciences and Humanities postdocs demonstrating more areas of dissatisfaction than postdocs in other fields of research. Other than the elements of work/life balance, and level of supervision and autonomy, the Social Sciences and Humanities respondents are generally less satisfied with all other aspects of the postdoctoral training (Figure 2.3.2). Social Sciences and Humanities postdocs report the lowest levels of satisfaction for benefits, opportunities for collaboration, resources and facilities, funds for research and travel, and professional training opportunities. The Social Sciences and Humanities segment of postdocs in Canada is smaller than the STEM groups, has proportionately more females, and is older than the average age of postdocs in other fields (CAPS-ACSP, 2014). Postdoctoral positions in the Social Sciences and Humanities are relatively new to the postdoctoral landscape, where the original proliferation of postdocs from the Engineering and Science domains began in earnest in the 1950s (Ferguson, Huang, Beckman et al., 2014). While both NSERC and SSHRC were instituted by acts of Parliament in the late 1970s, it is most likely that formal and informal structures in universities that supported STEM postdoctoral, or similar positions, predated such structures for the Social Sciences and Humanities. In 2013, CAPS-ACSP and the Research Training Portfolio division of SSHRC collaborated (including a workshop meeting and literature review) to investigate the issues surrounding the postdoctoral experience for Social Sciences and Humanities PhDs. At that time it was recommended, among other suggestions, that inequities arising from high proportions of female postdocs be addressed, and training plans designed to identify and support clear career trajectories be implemented.

Lower postdoctoral training satisfaction rates for the Social Sciences and Humanities researcher is not only a Canadian phenomenon, and has been reported in the United Kingdom (Vitae, 2013) and in Holland (van der Weijden et al., 2016). In the United Kingdom, 30% of female researchers in the Arts and Humanities disagreed that promotions, involvement in decision-making, and career development occur with gender neutrality. The Vitae (2013) report suggests that unrealistic career goals (vying for non-existent academic jobs) by

researchers is particularly problematic for the Social Sciences and Humanities researcher.

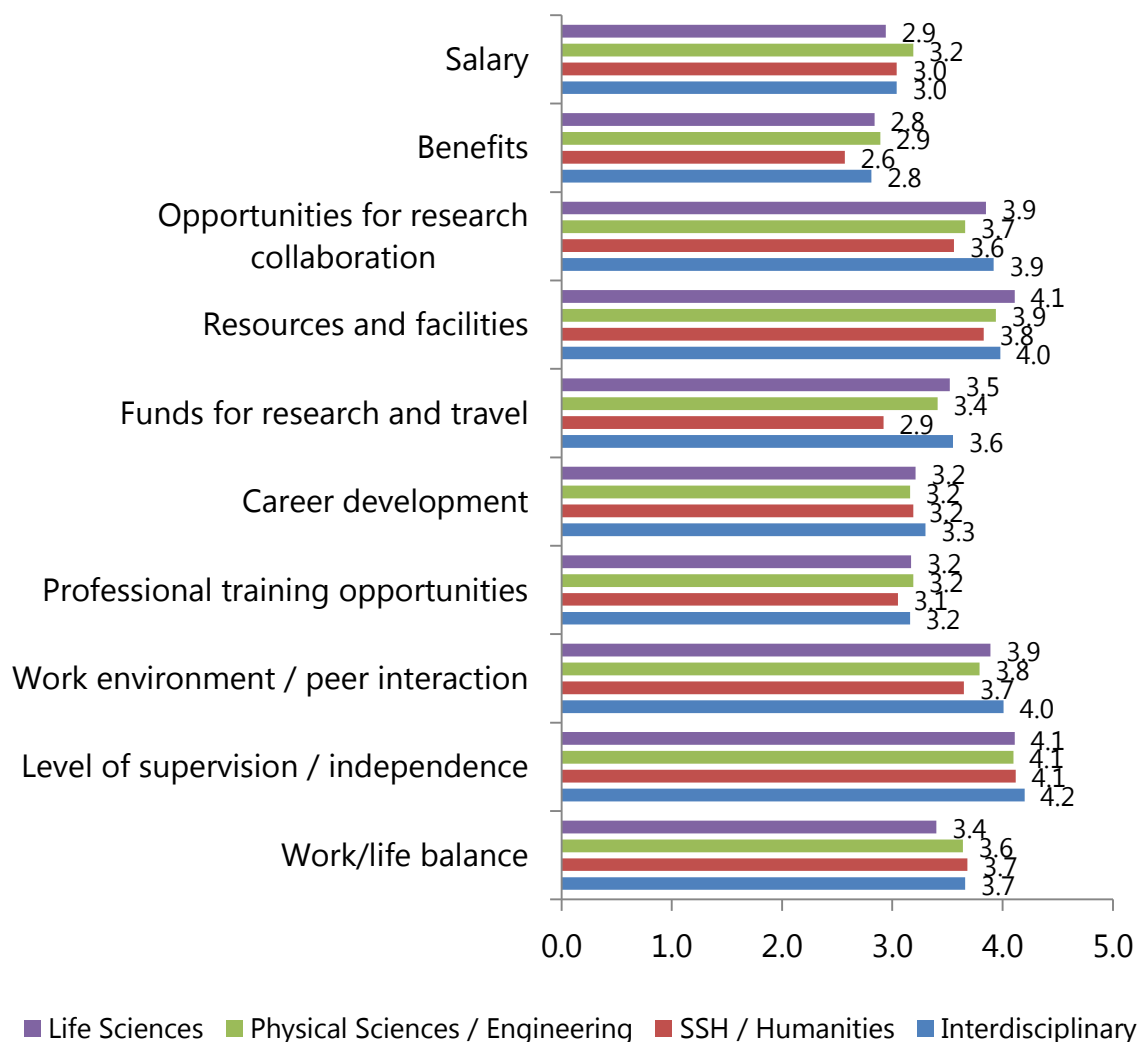


Figure 2.3.2. Levels of satisfaction with elements of postdoctoral training by research domain. Mean scores are calculated using a 5-point scale in which 1=Completely dissatisfied and 5=Completely satisfied.

The second characteristic that influences satisfaction with postdoctoral training is *location*. **Postdocs completing their appointment outside of Canada are typically more satisfied in all areas, aside from work life balance, than those working in Canada** (Table 2.3.2). The most notable differences in satisfaction with elements of the postdoctoral training, for Canadian and out-of-country

postdocs, are observed for collaboration, resources, career development, and professional training opportunities.

Table 2.3.2: Comparison of Canadian versus Out-of-Country Postdoc Satisfaction with Training

Element of Satisfaction	Canadian	Out-of-Country
Collaboration	3.7	4.1
Resources and Equipment	4	4.3
Career Development	3.1	3.5
Professional Training	3.1	3.4

Note: Mean scores are calculated using a 5-point scale.

1=Completely dissatisfied and 5=Completely satisfied.

"In this day and age it often takes more than one postdoctoral appointment to get a good research job - both in the public and private sphere. So you essentially have to leave Canada."
–Survey Respondent

Canadians are leaving for international postdoctoral appointments at a modest rate. For example, about 3% of postdocs in the United States are Canadians (Davis, 2005), which corresponds to roughly 1400 Canadian citizen postdocs

in the United States. The 2016 Survey results suggest that one reason why postdocs choose foreign postdoctoral positions is related to the opportunities for collaboration, career development and professional training, and greater availability of resources. The dissatisfaction with aspects of the postdoctoral training, and the pessimism expressed regarding career outcomes may be a symptom of a lacklustre attitude towards advanced degrees in Canada. For example, a study of tertiary education suggests that advances in innovation and discovery in Canada will require investment in a mix of education levels, including the advanced degree level (Cheung et al., 2012). Yet, in practice, Canada has low average overall rates of PhD attainment compared to other

OECD countries (The Conference Board of Canada, 2016). **In addition, Canada falls behind the United States (and other countries) in hiring practices for those with master's and doctoral degrees (Cheung et al., 2012).** These attitudes may explain some of the movement of Canadian PhDs to international locales for completion of postdoctoral training—where industry and business are traditionally more receptive to hiring individuals with advanced degrees. The attractiveness of settings, where postdocs are well supported and more likely to be recruited for employment, speaks to a need for a system-wide change in attitudes towards the value of postdoctoral training.

To promote Canada on the international stage, investments aimed at increasing postdoctoral appointments in industrial and academic arenas have been integrated into strategic funding initiatives (Government of Canada, 2014). Specifically, the Mitacs fellowship for industrial postdoctoral appointments has doubled in recent years. Such efforts may address wage disparities and career prospects for postdocs, and improve Canada's status internationally, where the unemployment of doctorate holders (4%) ranks the highest in comparison to the United States (3%), Australia (2%), Germany (3%), and Portugal (3%) (Auriol, 2007).

Highlights of Canada's Performance on the Postdoctoral Stage

International postdocs encounter obstacles not faced by Canadian postdocs.

- There is a trend towards fewer international postdocs working in Canada.
- Visa and work permit challenges impede international postdocs from coming to work in Canada.
- International postdocs encounter racism in the workplace.

Everyday life can be challenging for postdocs.

- Postdocs in Canada earn relatively less in comparison to those postdocs working internationally.
- No difference in mean gross annual income was noted for male and female postdocs.
- Canadian postdocs value both statutory and workplace benefits such as extended health plans (which many postdocs still lack).
- Striking disparities exist between postdocs in Canada with respect to employee status and taxation schemes.

Satisfaction with postdoctoral training is typically good.

- Reflecting a global trend, postdocs in the Social Sciences and Humanities are less satisfied with most aspects of the training experience.
- Out-of-country postdocs report slightly higher amounts of satisfaction with most elements of the training experience, in particular with collaboration opportunities and research facilities.

3. POSITIONING POSTDOCS AS DRIVERS OF INNOVATION AND DISCOVERY

Positioning postdocs as drivers of innovation and discovery is an important strategy for the Canadian knowledge-based economy. Three challenges identified from the 2016 Survey results inform strategies for launching postdocs into productive research careers in Canada.

- PhDs are a mobile labour force. One-third of the 2016 Survey respondents who had recently completed their postdoctoral appointments left Canada for job opportunities.
- Postdocs are training primarily for careers in academia, a trend that is not supported by the labour market.
- Postdocs are concerned about their future research careers. The gap in the ratio of female to male postdocs is closing. However, female postdocs may be at risk regarding their career options.

3.1 Global Mobility of PhDs

PhDs are a mobile labour force. One-third of the 2016 Survey respondents who had recently completed their postdoctoral appointments left Canada for job opportunities. **Ten percent of current postdocs indicate plans to leave Canada upon completion of their current postdoctoral appointment, while 28% are unsure.** Sixty percent plan to stay in Canada upon completion of their current postdoctoral appointment. The 2016 Survey examined contributing factors to past postdocs' decisions to leave Canada for employment.

Why Past Postdocs Leave Canada for Employment

The 2016 Survey contains valuable tracking information about past postdocs, n=479. Past postdoc are respondents who completed their postdoctoral appointment(s) in the last four years. Two-thirds of employed past postdocs are working in Canada. Among past postdocs who left Canada for employment

(n=141), nearly half did so for job opportunities while one-fifth did so for personal reasons (Figure 3.1.1).

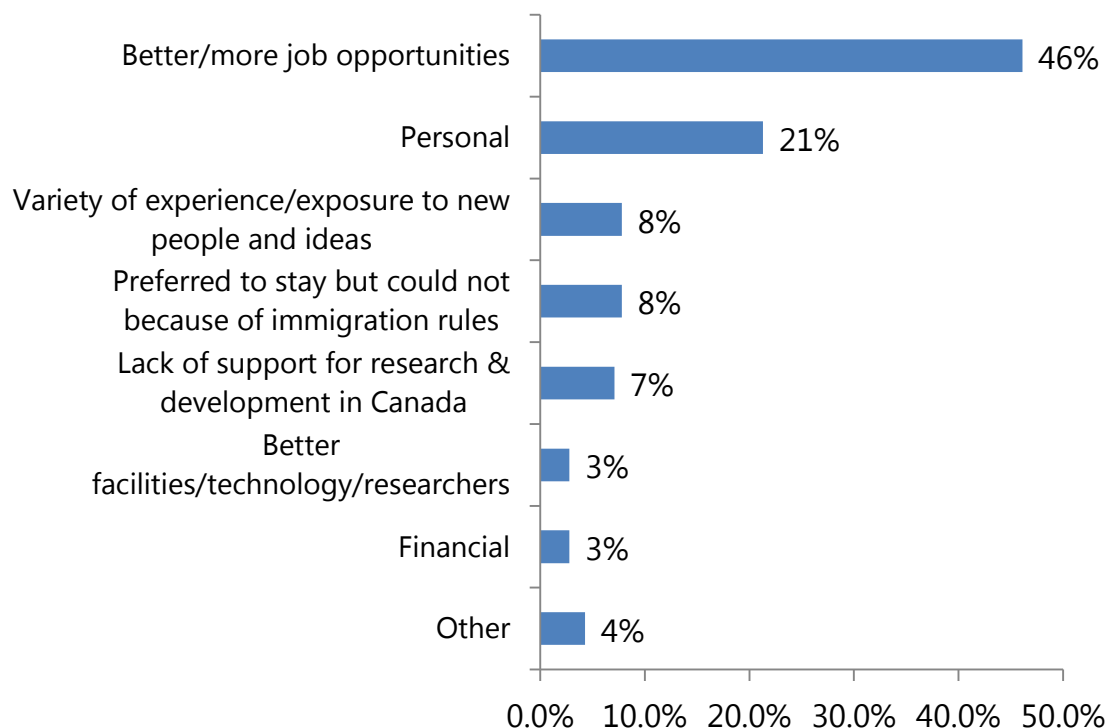


Figure 3.1.1. Why past postdocs left Canada for employment.

Half of all PhD holders in Canada are foreign-trained (Edge and Monroe, 2015), and reciprocally, Canadian PhDs are known to leave Canada for further training and research positions (Desjardins, 2012). Forty percent of the 2016 Survey respondents did not earn their PhD in Canada (Figure 3.1.2), indicating a high degree of mobility of PhDs globally. For example,

*"I am completing another postdoc in Europe, so I'm not returning to Canada after this postdoc."
–Survey Respondent*

Canada has seen its share of foreign-born doctorate holders increase by 30% from 2000 to 2009 (Auriol, Misu, & Freeman, 2013). Yet, the 2016 Survey found that **Canada has seen a relative decrease in the ratio of international to Canadian-born postdocs**. Attracting skilled researchers for careers in Canada is central to a strategy designed to foster innovation and discovery, and maintain

Canada as an important force on the international stage (Cheung et al., 2012). In one survey, doctorate holders from 14 different countries in Europe ranked their top most desirable countries in which to practice research. In only four instances did a country's PhDs collectively rank Canada in their top ten best countries for conducting research (Auriol et al., 2013).

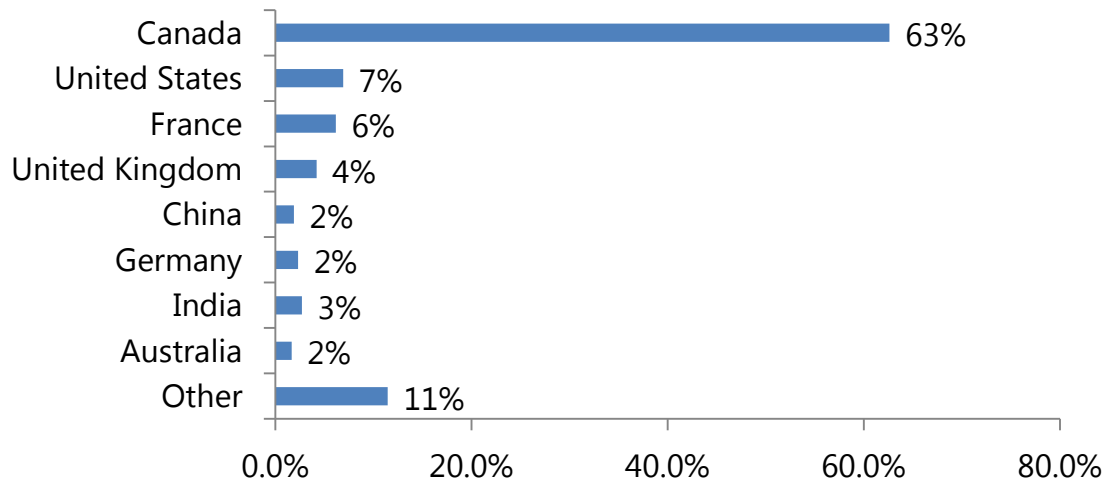


Figure 3.1.2. Country where highest level degree was completed.

A comparison of 2013 and 2016 Survey data show that there is an 8 percentage point increase across the three years in the number of postdocs who either plan to stay in Canada, or return to Canada (if they are completing a postdoctoral position out of the country)⁸. On the other hand, the number of international postdocs holding a work permit dropped from 38% in 2013 to 29% in 2016. Addressing the relatively high unemployment rate of PhDs in Canada, in comparison to PhDs in other OECD countries (Auriol, 2007), could attract foreign-born PhDs to conduct research here, and improve the ratio of international to Canadian-born postdocs.

⁸ The 2016 figure may be inflated in comparison to the 2013 Survey as there were proportionately fewer respondents who were Canadians completing postdocs outside of Canada in 2013 (4%) in comparison to 2016 (12%). Furthermore, the 2016 Survey methodology may have increased access to postdocs outside of Canada in comparison to the 2013 Survey.

3.2 Postdoc Career Planning

The 2016 Survey looked in detail at the career development activities of Canadian postdocs. A sign of career planning is participation in formal training activities. As shown in Figure 3.2.1, it is clear that the majority of postdocs do not participate in external training activities. However, there is a trend towards greater interest, where 2016 Survey respondents have better participation rates for external training than the 2013 respondents (Figure 3.2.1). The trends in professional development and career planning provide an indication of the effects of current strategies by stakeholders to encourage a broader selection of career goals by postdocs.

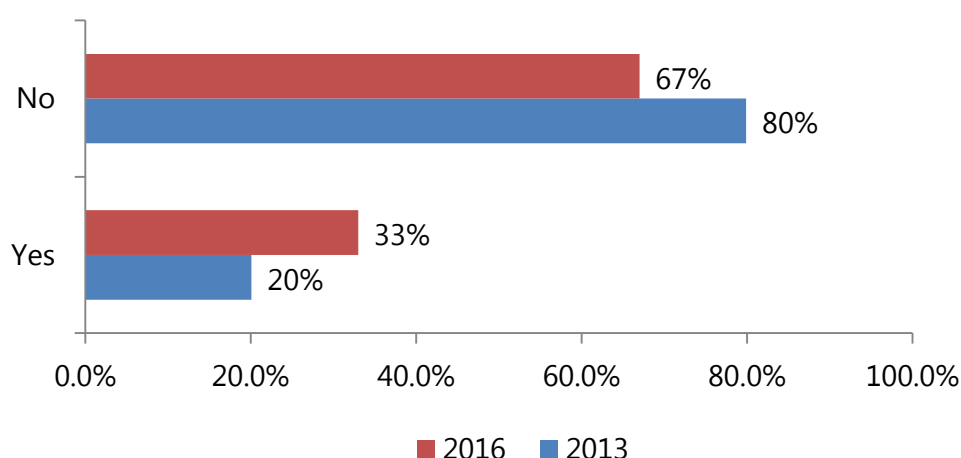


Figure 3.2.1. Trend in participation in external training. Data Sources: The 2013 and 2016 CAPS-ACSP Canadian National Postdoctoral Surveys.

Postdoctoral Training and Career Preparation

Table 3.2.1 shows the trend in postdoc interest in types of formal professional development training. Training that would be of interest to international postdocs, such as English language training and writing skills, is significantly lower in 2016: perhaps reflecting the decreased numbers of international postdocs. Project management, grant writing, and career development remain

the top areas of interest for more than 40% of postdocs. However, interest in teaching and grant writing skills is also lower in 2016 as compared to 2013.

Table 3.2.1: Trend in Interest in Formal Professional Development

	2013	2016
Research ethics	7.9% _a	6.6% _a
English language skills	14.0% _a	10.2% _b
French language skills	12.6% _a	13.3% _a
Conflict resolution skills	16.2% _a	17.1% _a
Presentation skills	16.6% _a	17.2% _a
Intellectual property	20.1% _a	19.3% _a
Writing skills	25.6% _a	19.9% _b
Negotiating skills	28.4% _a	30.9% _a
Group or lab management	37.0% _a	37.5% _a
Teaching skills	40.9% _a	34.7% _b
Project management	48.4% _a	45.3% _a
Career development	47.3% _a	48.3% _a
Grant or proposal writing	67.3% _a	61.3% _b
None	4.3% _a	4.1% _a

Notes: 1. Values in the same row not sharing the same subscript are significantly different at $p < .05$ in the two-sided test of equality for column proportions. Tests assume equal variances. 2. Data Sources: The 2013 and 2016 CAPS-ACSP Canadian National Postdoctoral Surveys.

Interest in formal professional development was examined by field of research. Life Sciences postdocs show more interest in both project management and conflict resolution training than do Social Sciences and Humanities postdocs. Social Sciences and Humanities postdocs are also less interested in intellectual property training as compared to postdocs from other disciplines.

Twenty percent of supervisors are reported as offering encouragement for postdocs to pursue training and career preparation (Figure 3.2.2). That

supervisors rarely encourage professional development training may contribute to the finding that the majority of postdocs had not participated in externally funded career training activities. In both the 2013 and 2016 Surveys, postdocs had little knowledge of, or access to, professional career counselling (13% and 16%).

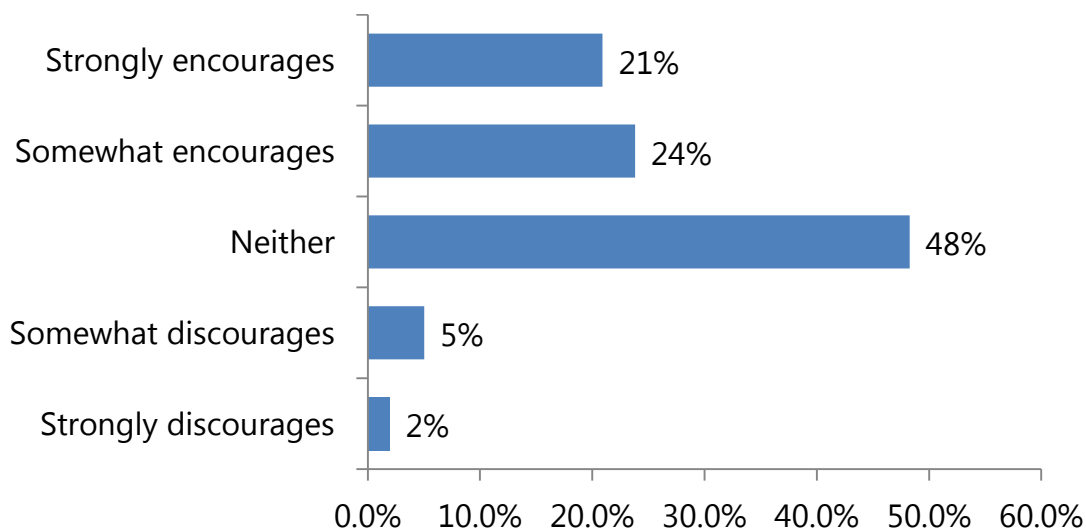


Figure 3.2.2. Level of encouragement from postdoctoral advisor to pursue professional development training

Respondents rated the quality of their postdoctoral training. Across the four main disciplines, research and communication skills have the highest quality ratings (Table 3.2.2). Considering that postdocs spend time conducting research, and preparing and giving talks related to their expertise, research and communication

skill preparation were more likely to be rated highly. Respondents rate management, networking, and teaching skills lower in terms of career preparation quality. The development of teaching, and management and networking competencies would typically require that specialized curriculum be available to postdocs. For example, the Mitacs *Step* program (provided through the Mitacs *Elevate* postdoctoral fellowship) routinely offer “Bootcamp”

“[I am] incredibly discouraged at the state of career development and skill development for postdocs with my PI/mentor and institution.”

–Survey Respondent

workshops that facilitate project management and networking skills (Mitacs, 2016). However, the lack of time and resources to attend specialized training sessions may limit postdoc opportunities for developing these important competencies.

Table 3.2.2: Quality of Postdoctoral Training in Preparing for Career by Field of Research

	All	Life Sciences	Physical Sciences / Engineering	Social Sciences / Humanities	Inter-disciplinary
n	2109	731	457	254	188
Research skills	4.41	4.48 _a	4.36 _{a,b}	4.23 _b	4.49 _a
Teaching skills	2.73	2.60 _a	2.71 _{a,b}	2.94 _b	2.70 _{a,b}
Management skills	3.42	3.38 _a	3.38 _a	3.31 _a	3.52 _a
Communication skills	3.81	3.76 _a	3.70 _a	3.74 _a	3.89 _a
Networking skills	3.40	3.31 _a	3.26 _a	3.44 _a	3.45 _a

Notes: 1. Values in the same row not sharing the same subscript are significantly different at $p < .05$ in the two-sided test of equality for column means (tests assume equal variances). 2. Mean scores are calculated using a 5-point rating scale in which 1=Very poor and 5=Excellent.

Poor prospects for tenure-track positions (Desjardins, 2012) suggest that training opportunities, with a focus on non-academic roles, should be expanded throughout the postdoctoral experience. Figure 3.2.1 indicates that there is already a trend towards greater interest in external training opportunities. Participation rates for formal training activities, in particular for career development skills and research ethics, show broad increases in 2016, as compared to 2013 (Figure 3.2.3).

*"Professional development, particularly for non-academic careers is REALLY lacking."
–Survey Respondent*

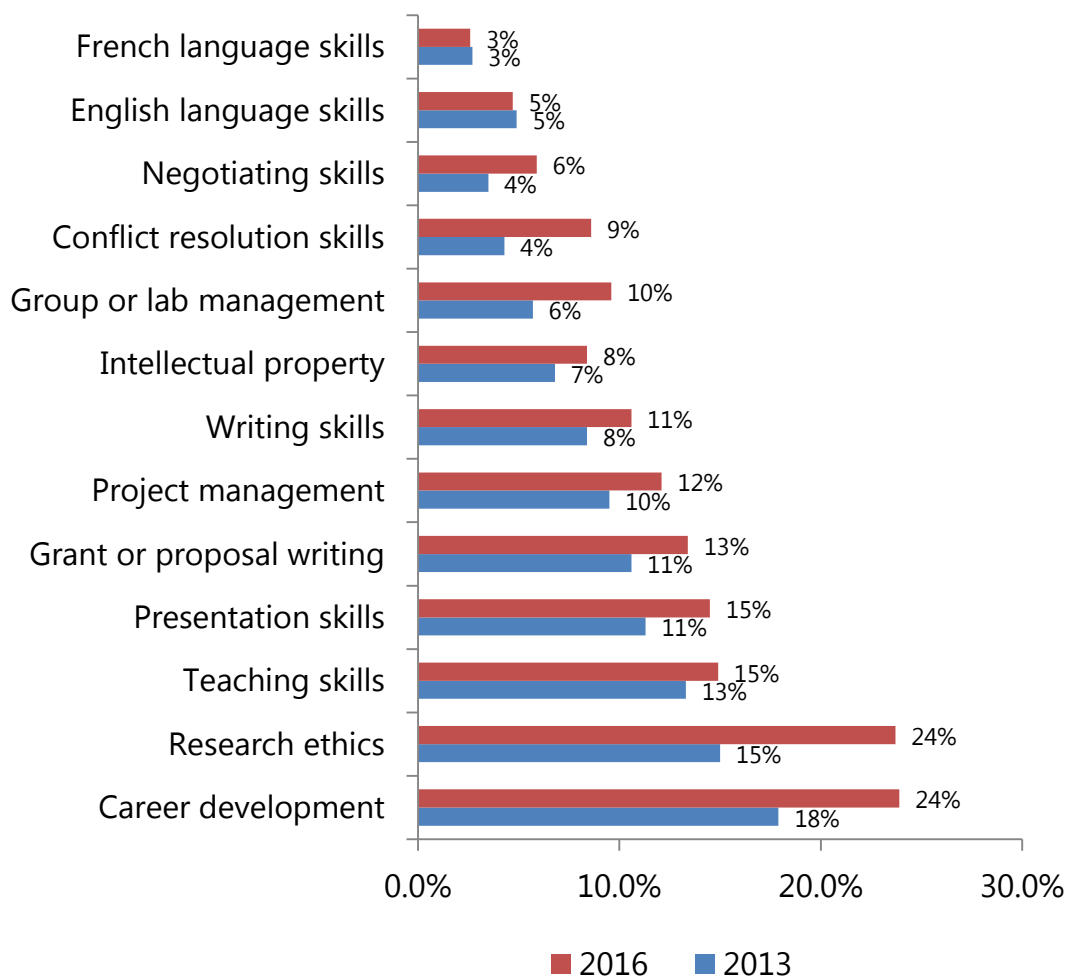


Figure 3.2.3. Trend in postdocs who have received formal training. Data Sources: The 2013 and 2016 CAPS-ACSP Canadian National Postdoctoral Surveys.

Non-academic Career Options

The majority of current postdocs are interested in non-academic career opportunities (84%). Less than half of the respondents have not been exposed to non-academic career opportunities during their postdoctoral tenure (Figure 3.2.4). Nearly half had been somewhat exposed, while one in ten had a lot of exposure to non-academic careers. Those in Life Sciences (45%) and Social Sciences and Humanities (53%) are more likely to have had a lot of exposure to non-academic career opportunities, as compared to postdocs in the Physical Sciences/Engineering (35%).

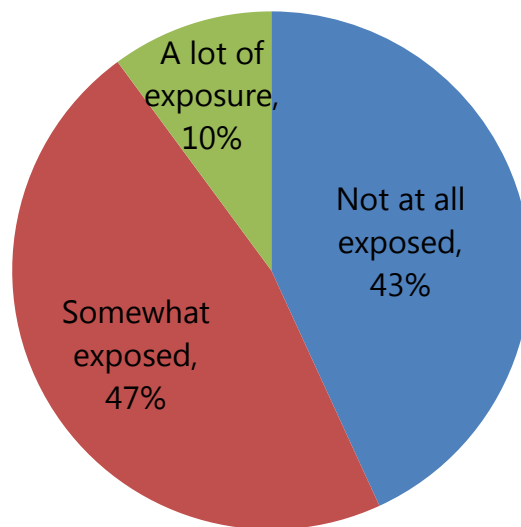


Figure 3.2.4. Extent of exposure to non-academic career opportunities.

Resources and activities developed for non-academic career development for postdocs are available at some universities. For example, large research-intensive universities in Canada are more likely to have career development resources for postdocs (in part due to larger numbers of postdocs at these institutions). For example, both the University of British Columbia (<https://blogs.ubc.ca/ubcpda/>) and McGill University (<https://pgss.mcgill.ca/en/postdocs>) have links to professional development resources from their postdoctoral office, and postdoc association web pages. At Western University, the *Competitive Edge Program* for postdocs was designed to foster skill development and broader career options by providing regular professional development opportunities. A mentorship program was also established to link postdocs with leaders in academia, industry, and the community, thereby encouraging the exploration of careers in non-academic settings

(http://grad.uwo.ca/postdoctoral_scholars/competitive_edge/index.html). The University of Calgary Postdoctoral Association hosts professional development days that include activities for competency development and career management. Resources for postdocs at the University of Calgary (<http://www.ucalgary.ca/research/postdoc>) include a link to an Individual

Development Plan (IDP) by Fuhrmann, Hobin, Lindstaedt, and Clifford (2015). The IDP includes a written action plan for goals and career of choice. The IDP is increasingly seen as an integral part of postdoctoral training. In some cases, for example at Stanford University in the United States, the IDP is mandatory and must be completed with a supervisor (<http://postdocs.stanford.edu/idp/>). Other universities in Canada have well-developed websites for postdocs regarding policies and health plans, but do not provide resources dedicated to career management. For example, at Carleton University there is a link for postdocs called "News and Opportunities"; however, the links provided are for other postdoctoral opportunities.

Resources to promote non-academic career options are being developed by SSHRC. *The Guidelines for Effective Research Training* are available via the SSHRC website at http://www.sshrc-crsh.gc.ca/funding-financement/policies-politiques/effective_research_training-formation_en_recherche_efficace-eng.aspx). These guidelines recommend training that includes competencies in project management, teaching to diverse audiences using various technologies, and consultation and community engagement. SSHRC suggests that alongside the mentoring provided by supervisors, the host institutions be prepared to provide postdocs with a broad array of training opportunities.

The U.S. National Postdoctoral Association (NPA) has an online Clearinghouse with career development resources available to members

(<http://www.nationalpostdoc.org/>).

There are specialized resources for female postdocs that include material on developing negotiation skills and

how to optimize the job search. The NPA has a focus on career networking, and hosts networking *Career Connections* events as part of their Annual Meeting where non-academic career networking is emphasized.

"Training for postdoc in the Humanities should involve more workshops on how to prepare the postdoc to careers outside of academia as there are very few jobs in academia at the moment."
–Survey Respondent

In the United States, the National Institutes of Health (NIH) launched the Broadening Experiences in Scientific Training (BEST) program in 2013. This USD 3.7-million initiative was developed for postdocs and biomedical doctoral students. The program was a result of reports from employers indicating that PhDs did not have the requisite skills (outside of research expertise) for careers in industry. Typically, BEST students spend nine months developing skills for management, teamwork, interviewing, and networking. The Motivating Informed Decisions (MIND) program at the University of California, San Francisco, is an example of the BEST program for biomedical postdocs with the objective of providing resources for those who wish to explore career opportunities *beyond* the walls of the university.

Respondents in the 2016 Survey rated how prepared they are for non-academic career opportunities. **About one-in-ten postdocs are very prepared, half are somewhat prepared, and over one-third feel that they are not at all prepared for non-academic positions.** Life Sciences, and Social Sciences and Humanities postdocs feel significantly less prepared than Physical Sciences and Engineering and Interdisciplinary postdocs (Table 3.2.3). Life Sciences, and Social Sciences and Humanities postdocs are evenly split between those who are at least somewhat prepared and those who are not prepared at all.

Postdocs need increased exposure to non-academic careers and opportunities to develop competencies for private sector research careers. Such strategies would bolster preparedness and launch more postdocs into non-academic careers.

Table 3.2.3: Level of Preparedness for Non-academic Career Opportunities by Field of Research

	Life Sciences	Physical Sciences / Engineering	Social Sciences / Humanities	Inter-disciplinary
n	731	457	254	188
A lot	7.3% _a	16.0% _b	7.9% _{a,c}	14.9% _{b,c}
Somewhat	51.3% _a	54.9% _a	45.3% _a	53.2% _a
Not at all	41.5% _{a,c}	29.1% _b	46.9% _a	31.9% _{b,c}

Note: Values in the same column not sharing the same subscript are significantly different at $p < .05$ in the two-sided test of equality for column means. Tests assume equal variances.

3.3 Career Trajectory of Canadian Postdocs

The 2016 Survey examined the career goals of Canadian postdocs before and after beginning their postdoctoral appointment. As shown in Figure 3.3.1, the tenure-track position was, and is, the primary initial career goal for more than 70% of postdocs. However, there is a trend from 2013 to 2016 for fewer postdocs to begin with a tenure-track career goal. For example, when compared to the 2013 Survey results, in 2016 more postdocs selected other career options, such as industry and private sector research, Public Service, and consulting or non-government organization (NGO) as their primary career goal.

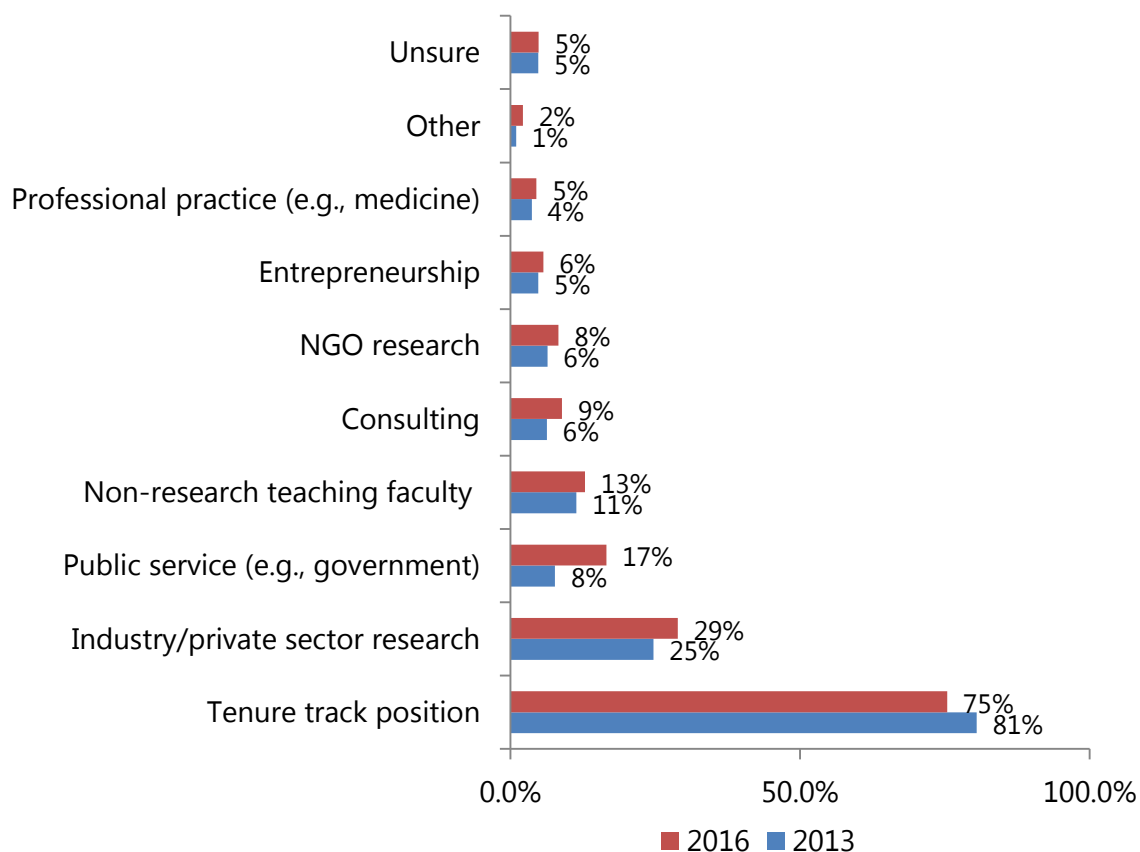


Figure 3.3.1. Career goals before taking postdoctoral position. Data Sources: The 2013 and 2016 CAPS-ACSP Canadian National Postdoctoral Surveys.

Regardless of the large numbers of postdocs interested in tenure-track jobs, the reality persists that few faculty positions are available to postdocs in Canada. If the recent past can be taken as evidence of the future, then less than 20% of current postdocs are likely to obtain tenure-track positions (Edge & Munro, 2015). Why are university positions so difficult to come by? One reason may be the increased length of time that faculty are remaining at their posts. A report by the Canadian Association of University Teachers indicated that in Canada there were 700 teachers aged 70 years or older, and this group included teachers aged 85 and older (Canadian Association of University Teachers [CAUT], 2010). The trend is a reversal from previous decades, where the balance has now shifted so that fewer teachers are in the younger age categories. It was expected that for occupations requiring tertiary education levels 70% of available jobs would arise

from the retiring cohort of baby boomers (Cheung et al., 2012). While this may be occurring for jobs associated with college and undergraduate degrees, the projection does not appear to be holding for tenure-track positions within universities. Financial constraints at the institutional level might be causing changes to service delivery models, with subsequent reductions in full-time tenured university positions (CAUT, 2010). A switch to part-time sessional teachers to cover the teaching needs at universities might be reducing the need for higher-level permanent faculty.

In addition, the large numbers of postdocs who aspire to faculty positions may be explained by the misinformation available since the early 2010s indicating that there would be a shortage of PhDs to fill faculty positions from 2013 to 2020 in Canadian universities. According to Edge and Munroe (2015), a prediction model formulated by the federal government's Canadian Occupation Projective System (COPS) overestimated the need for postdocs and PhDs transitioning to academic careers (originally calculated at about 44 000 jobs to be filled by 39 000 jobseekers). This assessment by COPS has since been revised, and the number of academic jobs available is currently expected to equal to the anticipated number of jobseekers (about 32 000 each). Despite the paucity of university faculty positions available, the 2013 and 2016 Surveys show that they are the coveted end-goal for the majority of postdocs.

Changing Career Goals

As shown in Table 3.3.1, the largest percentage of postdocs, ranging from about 71% to 87%, indicate a tenure-track position as the primary career goal. As just discussed, these results represent a decrease from the 2013 Survey, where about 80% of respondents favoured a tenure-track career goal. Industry/private and public service are the next two most common career goals. Interest in industry/private and public service careers increased significantly for postdocs across all fields of research from 2013 (increasing by 3 and 9 percentage points, respectively from 2013).

Table 3.3.1: Career Goals before Beginning Postdoctoral Position by Field of Research

	Life Sciences	Physical Sciences / Engineering	Social Sciences / Humanities	Interdisciplinary
Industry/private	26.1% _a	41.6% _b	14.2% _c	32.4% _{a,b}
Tenure-track	71.4% _a	70.7% _a	86.6% _b	78.7% _{a,b}
Public service	16.1% _a	14.9% _a	20.1% _{a,b}	27.7% _b
Non-research teaching faculty	11.1% _a	11.4% _a	20.9% _b	14.9% _{a,b}
NGO	6.6% _a	7.4% _a	13.8% _b	14.4% _b
Professional practice	4.7% _a	3.5% _a	3.1% _a	4.3% _a
Entrepreneurship	3.4% _a	9.0% _b	3.1% _a	10.1% _b
Consulting	7.0% _a	10.9% _a	11.8% _a	10.6% _a
Unsure	6.3% _a	3.7% _a	3.9% _a	7.4% _a
Other	1.8% _a	2.0% _a	2.8% _a	3.2% _a

Note: Values in the same column not sharing the same subscript are significantly different at $p < .05$ in the two-sided test of equality for column means. Tests assume equal variances.

The 2016 Survey respondents reported if their career goals had changed over the course of the postdoctoral term. Table 3.3.2 shows that, compared to the 2013 Survey, an increased number of respondents across all research domains changed their primary career goals after beginning their postdoctoral appointment. On average, 27% of postdocs from the 2016 Survey changed career goals.

Table 3.3.2: Percentage of Respondents who Changed Career Goals by Field of Research after Starting the Postdoctoral Appointment

		Life Sciences	Physical Sciences / Engineering	Social Sciences / Humanities	Interdisciplinary
Yes Changed Goals	2016	28.60%	22.10%	25.60%	28.20%
	2013	26.2%	20.2%	18.0%	25.3%
No Did Not Change Goals	2016	71.40%	77.90%	74.40%	71.80%
	2013	73.8%	79.8%	82.0%	74.7%

Note: Data Sources: The 2013 and 2016 CAPS-ACSP Canadian National Postdoctoral Surveys.

Of the 27% of postdocs who changed career goals, 75% initially desired tenure track positions, but this dropped to 30% when asked about their *current career goals* (Figure 3.3.2). For those postdocs who changed their career goals, there is a corresponding rise in interest for industry and private sector research, non-research teaching positions, consulting, public service, NGO research, professional practice, and entrepreneurship.

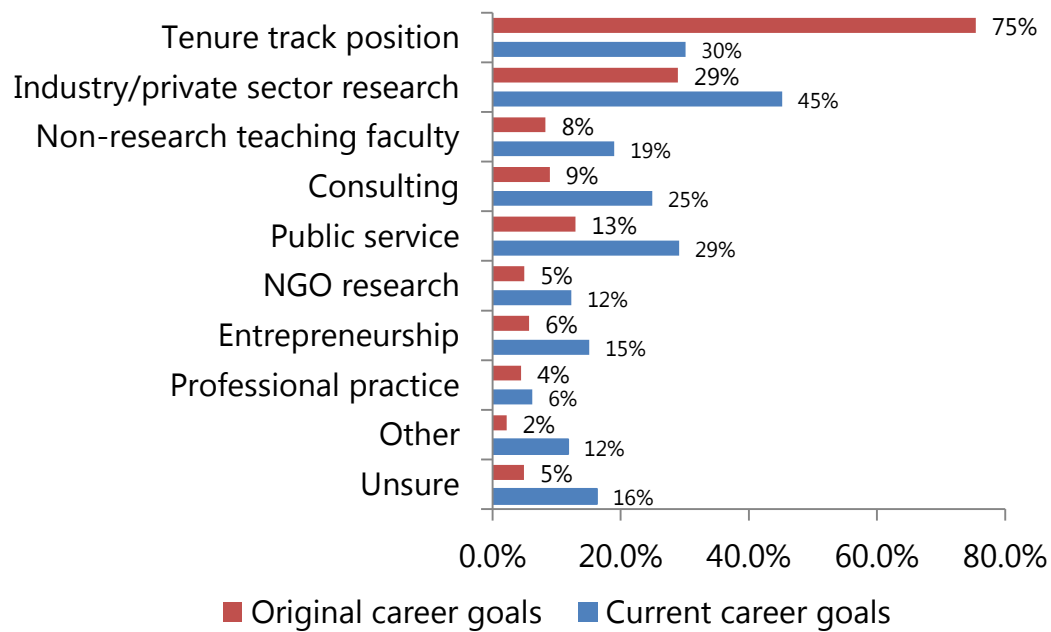


Figure 3.3.2. Original career goal before beginning postdoc and current career goals after starting postdoc.

The most common reason for changing career goals was the unfavourable job market (Figure 3.3.3). Over time, career expectations may change as postdocs experience academic socialization at their institution. In addition to explicit skill transmission, academic socialization implicitly conveys information about faculty culture (Austin, Kruger, Gardner, & Mendoza, 2012). Postdocs might modify their career goals according to the undercurrent of pessimism expressed by faculty and other postdoctoral scholars over the limited opportunities for tenure-track positions. Sauermann and Roach (2016) have examined this phenomenon, that postdocs initiate career paths with little chance of success, and suggest that difficult labour markets might actually challenge and encourage postdocs to pursue the elusive academic career. Strategies that encourage students to articulate the need for advanced degrees, *before* entering programs, are suggested as one mechanism for balancing the supply and demand for researchers in the academic domain (Sauermann and Roach, 2016).

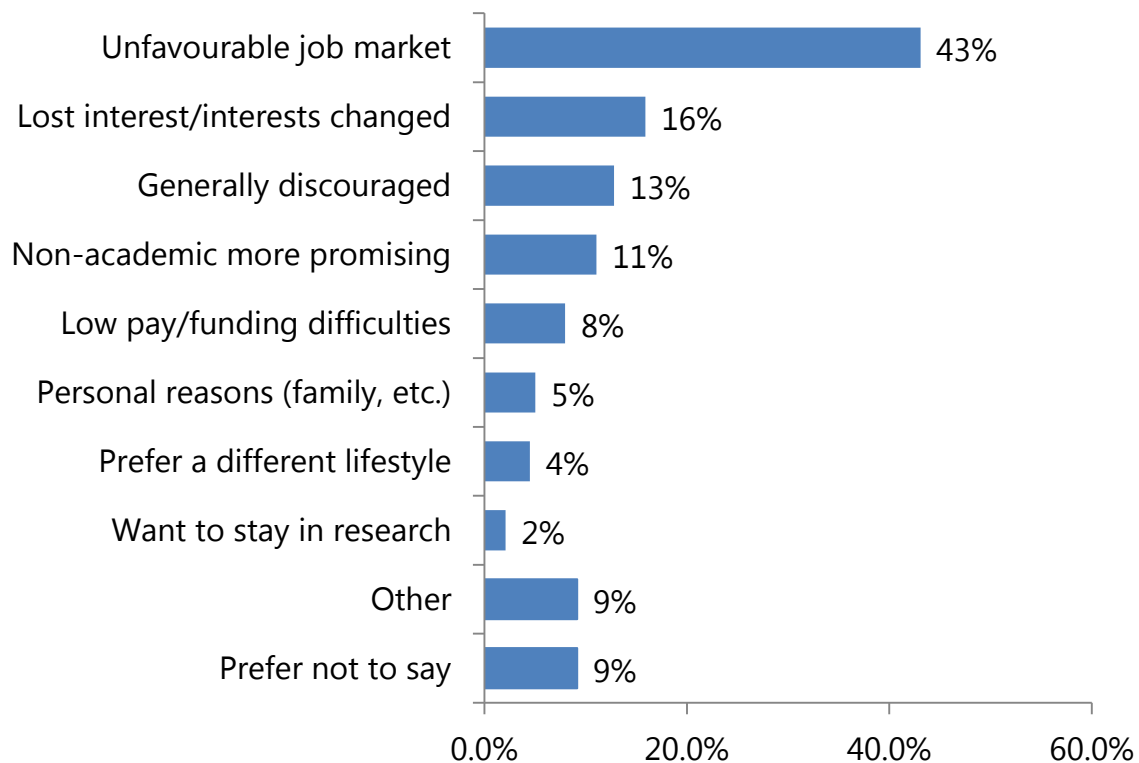


Figure 3.3.3. Reasons postdocs changed their career goals (from open-ended responses).

Postdocs rated their certainty in reaching their career goals (on a scale of 1 to 5). **Out-of-country postdocs (3.1/5) are significantly more certain of reaching their goals than postdocs in Canada (2.9/5). The Social Sciences and Humanities postdocs are the least certain of reaching their career goals (2.7/5).**

"...there are not enough faculty positions for the number of postdocs either....it is a serious problem and is directly related to me leaving Canada for an academic position in the United States." –Survey Respondent

Satisfaction with Career Options

Fifty percent of all respondents indicate they are not satisfied with their career options, and this response is most notable among the Social Sciences and Humanities postdocs who indicate a 34% satisfaction rate (Table 3.3.3).

Out-of-country (53%) postdocs are more likely to report satisfaction with their career options. Within Canada, postdocs in the Atlantic Provinces report the highest levels of satisfaction (58%). **There is also a significant difference between male and female respondents for satisfaction with career options, 55% versus 45%.**

Table 3.3.3: Satisfaction with Career Options by Respondent Characteristics

		n	% Satisfied
Field of research	Life Sciences	731	45.8% _a
	Physical Sciences / Engineering	457	55.4% _b
	Social Sciences / Humanities	254	33.9% _c
	Interdisciplinary	188	45.2% _{a,b,c}
Region	Atlantic	60	58.3% _{a,b}
	Quebec	466	50.0% _{a,b}
	Ontario	621	49.6% _{a,b}
	Prairies	365	46.3% _a
	British Columbia	244	43.9% _a
	Outside Canada	353	58.4% _b
Location	Canada	1360	45.2% _a
	Out-of-country	270	53.3% _b
Gender	Female	1007	45.3% _a
	Male	1064	55.2% _b
Citizenship Status	Canadian citizen	1264	48.9% _a
	Permanent res. / landed immigrant	279	49.5% _a
	Work permit	534	52.4% _a

Note: Values in the same column and subtable not sharing the same subscript are significantly different at $p < .05$ in the two-sided test of equality for column means. Tests assume equal variances.

Female Postdocs and Risks in the “Leaky Pipeline”

A clear trend across the 2009, 2013, and 2016 Surveys are the increasing numbers of female postdocs. While there remain slightly more males than females, this gap is closing (Figure 3.3.4).

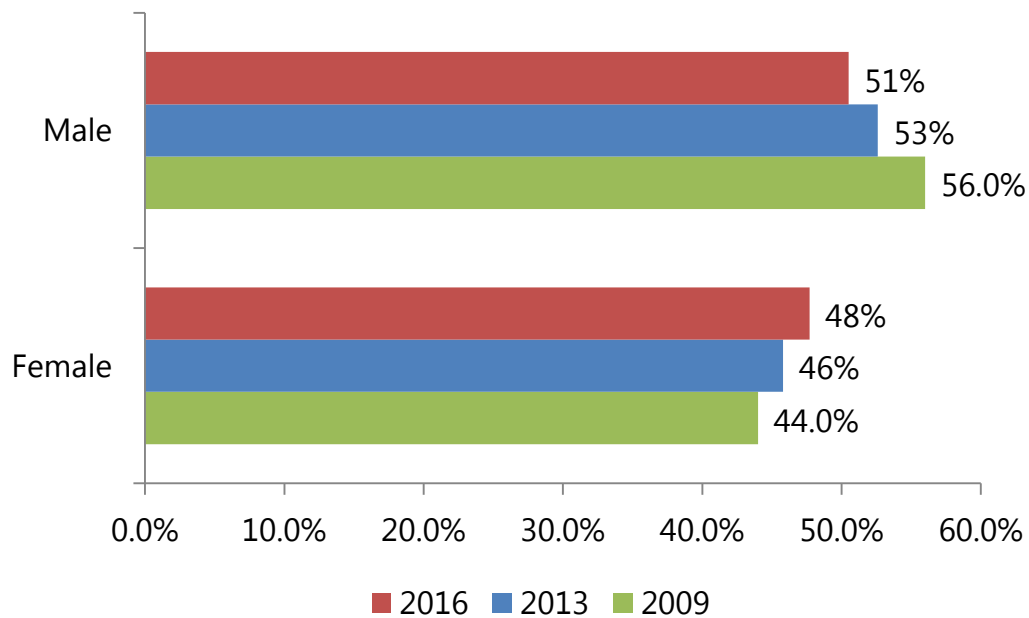


Figure 3.3.4. Trend in ratio of female to male postdocs. Data Sources: The 2009, 2013, and 2016 CAPS-ACSP Canadian National Postdoctoral Surveys.

Gender inequalities in features of the Canadian postdoctoral landscape warrant concern. **The pattern of lower satisfaction with career options for women has persisted from the 2013 Survey**, where satisfaction with career options was lower for females and males, 38% versus 49% (Figure 3.3.5).

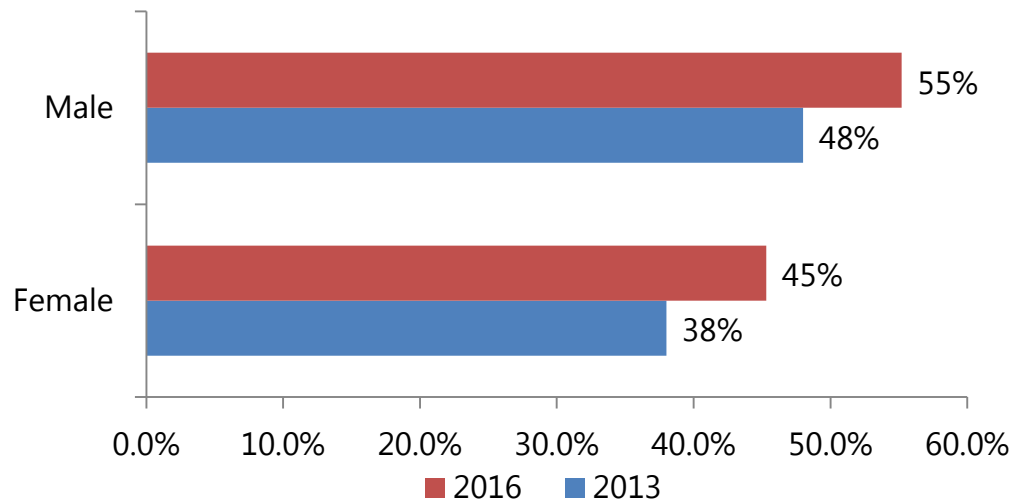


Figure 3.3.5. Trend in satisfaction with career options by gender. Data Sources: The 2013 and 2016 CAPS-ACSP Canadian National Postdoctoral Surveys.

"...I constantly feel that I have to choose between having a family and having my career...." –Survey Respondent

Female postdocs may have an elevated risk of not meeting career expectations. Explanations of the disparities in the research careers of women use the *pipeline theory*, which posits two reasons as to why women are

underrepresented in higher-paying academic posts. First, the pipeline theory predicts that fewer women enter the pipeline (spanning from undergraduates to tenure-track faculty at the far end). On this notion, affirmative action programs designed to increase the number of women entering higher education will eventually improve outcomes for women at the end of the pipeline. Schweitzer et al. (2011) dispel this idea, as over the past 20 years the numbers of Canadian women entering the pipeline has grown to similar levels as males (for some, not all research domains); yet, outcome disparities continue to exist. The second facet of pipeline theory suggests that women are disproportionately siphoned out of the pipeline between the doctorate and junior faculty level (White, 2004). For some, this leaky segment of the pipeline represents the postdoctoral years. A summary by White (2004) suggests that

female researchers were discouraged in their postdoctoral years by isolation, long work hours, lack of mentorship, and inflexible workplace policies regarding leave and childcare. Schweitzer et al. (2011) propose that females had lower expectations for salary and career advancement than males at the start of their academic preparation. The theory by Schweitzer et al. (2011) is supported by the 2016 Survey, where female postdocs show a consistent trend towards lower levels of satisfaction with career options, as compared to male postdocs (Figure 3.3.5). The tendency to begin academic careers with lower expectations can be influenced by field of study; for example, women in male-dominated fields indicated higher expectations for earnings and advancements in comparison to women in female-dominated fields (Schweitzer et al., 2011). These results suggest that fostering higher expectations from the outset could benefit female postdocs from any field.

"I am very grateful for the four months of maternity leave from the Tri-Council, glad to see it has been raised to 6 months, and hoping NSERC will see the value in raising it even further to the one year that my non-academic friends got." –Survey Respondent

More recently, an improved picture of women's outcomes in higher education was noted by Ceci, Ginther, Kahn, and Williams (2014) who found that in some fields, females obtained tenure-track positions at rates similar to men. However, a persistent trend, for women but not men, was the negative effect on career outcomes

associated with having children (Williams, 2014). Similar observations in wage disparities are noted in Canada, where female university teachers have lower lifetime earnings (CAUT, 2010). Parental leaves result in slower progress up the salary grids for female university teachers (CAUT, 2010).

The Postdoc Job Search

Understanding the postdoc job search process can inform career development resources. Nearly one-third of the 2016 Survey respondents had not applied for jobs in 2015. The highest proportion had applied to between five and nine jobs (14%). The mean number of jobs applied to was approximately nine. Physical Sciences and Engineering postdocs applied to more jobs in 2015 than Life Science postdocs (13 compared to 6 jobs). Respondents who applied for jobs in 2015 reported that 73% of the positions were related to their research. This proportion was higher among out-of-country postdocs. The majority of positions applied to were within a university (85%). Nearly one-third were within the private sector, one-quarter in government, and 7% in not-for-profit sectors. Almost all Social Sciences and Humanities postdocs (who applied for jobs) applied within the university sector (98%).

Past Postdocs Career Outcomes

Twenty-three percent of the 2016 Survey respondents have completed their postdoctoral appointments. Most past postdocs are working full-time (80%). **The majority of past postdocs who are employed are working in university settings (including affiliated research institutes and hospitals) (71%).** The percentage of past postdocs who found tenure-track positions is not known. Therefore, the university jobs are assumed to include (but are not limited to) research associate, teaching, and tenure-track positions. Eleven percent of past postdocs are working part-time, half with multiple jobs, and another 9% are unemployed. Figure 3.3.6 shows the sector of employment among this group.

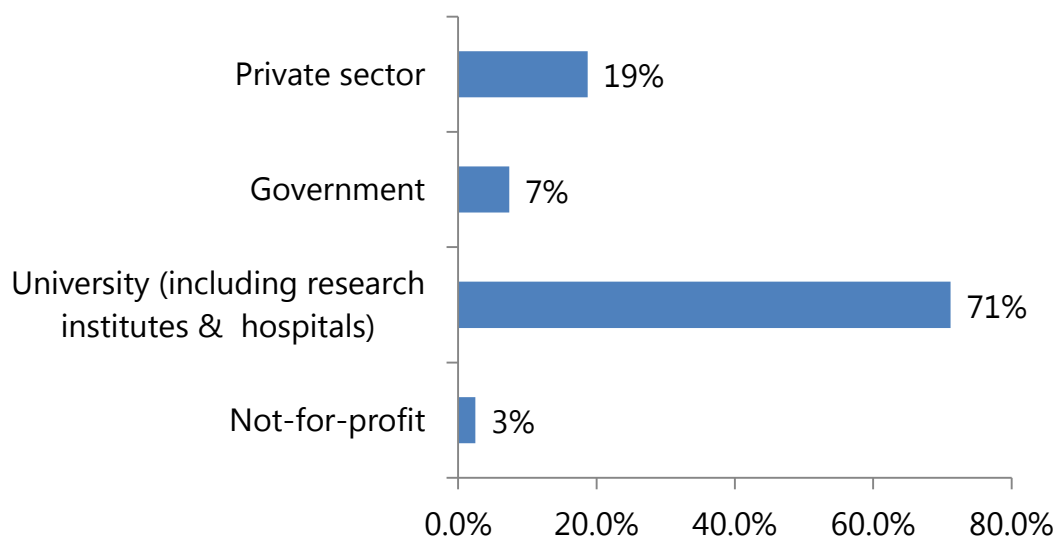


Figure 3.3.6. Past postdoc sector of employment.

Respondents who recently completed their postdocs rated the importance of their postdoctoral training in relation to their career: **two-thirds indicate their training was “very” or “extremely” important (32% and 33%).**

Those past postdocs employed in the university sector are more likely to report that their postdoctoral training was extremely important than respondents from other sectors of employment (Table 3.3.4).

Table 3.3.4: Importance of Postdoctoral Training by Sector of Employment

	Sector of employment			
	Private sector	Government	University	Not-for-profit
Extremely important	9.9% _a	25.0% _{a,b}	40.8% _b	18.2% _{a,b}
Very important	33.3% _a	28.1% _a	33.0% _a	18.2% _a
Moderately important	29.6% _a	18.8% _{a,b}	13.9% _b	36.4% _{a,b}
Slightly important	12.3% _a	21.9% _a	9.4% _a	18.2% _a
Not at all important	14.8% _a	6.3% _{a,b}	2.9% _b	9.1% _{a,b}

Notes: 1. Values in the same row not sharing the same subscript are significantly different at $p < .05$ in the two-sided test of equality for column proportions. Tests assume equal variances. 2. Responses from past postdocs only.

One-third of employed past postdocs earn between CAD 75 000 and CAD 99 999 annually. About one-quarter of past postdocs earn an annual gross salary of less than CAD 55 000, including 12% earning less than CSD 35 000. Salaries tend to be higher in the private sector, with 58% earning CAD 75 000 or above, compared to 47% earning this level of income in the government, 46% in the university sector, and 36% in the not-for-profit sector.

There is concern by stakeholders, including the granting agencies, with regard to postdocs who might leave Canada, leave their field of research, or leave the research domain completely, over disillusionment with career options (CAPS-ACSP, 2014). Some in the

"I'm not sure I can get a job that I want here. I would LOVE to stay here. My whole family would LOVE to stay here."
–Survey Respondent

community have undertaken longitudinal studies to track the career trajectory of postdocs once they have left the institution (Collins, Gilliam, Peddada, & Xu, 2016; Silva, Jarlais, Lindstaedt, Rotman, & Watkins, 2016; Webber & Yang, 2015;

Yachnin, 2016). The typical finding is that a small proportion of postdocs obtain tenure-track positions (about 20%). Canadian statistics consistently show that about 40% of all PhDs work in post-secondary education, while less than half of these are full-time tenured faculty (Edge & Munroe, 2015). Following the career paths of postdocs, specifically, is a new field of research in Canada. McAlpine and Emmioğlu (2015) followed nine Canadian postdocs over two years and found that one-third found “pre-tenure” positions. The TRaCE Project initiated at McGill University (Yachnin, 2016) plans to gather data on career trajectories for PhDs in the Humanities, Social Sciences, and Fine Arts. The TRaCE initiative does not follow researchers in the STEM branch, which represents the largest proportion of postdocs in Canada.

Highlights of Positioning Postdocs as Drivers of Innovation and Discovery

PhDs are an internationally mobile workforce

- Attracting skilled researchers for careers in Canada is central to a strategy designed to foster innovation and discovery.
- The number of current international postdocs holding a work permit dropped from 38% (2013) to 29% (2016).

Career planning is a challenge for postdocs

- Current training mainly prepares postdocs for academic positions.
- Many postdocs change their career goals due to the lack of tenure-track positions.
- Postdocs rarely engage in career development opportunities and are not encouraged to do so by their supervisors.

Career trajectories are uncertain

- 50% of current and past respondents indicate they are not satisfied with their career options.
- Female postdocs report significantly lower levels of satisfaction with career options as compared to male postdocs.
- The literature suggests that female postdocs are at higher risk of not achieving desired academic positions.
- Two-thirds of past postdocs are working in Canada, suggesting that many international postdocs also decide not to remain in Canada for employment.
- Past postdocs who left Canada did so mostly because of job opportunities abroad.
- Most past postdocs work in the academic sector and earn more than CAD 75 000 annually.

4. THE CHANGING PROFILE OF THE CANADIAN POSTDOC

The changing profile of postdocs in Canada is explored via a closer look at 2016 data, respondent comments, and from data trends across the 2009, 2013, and 2016 Surveys. Three issues stemming from the changing profile of postdocs in Canada are identified from this analysis:

- Postdocs complete multiple postdoctoral appointments before finding employment in academia, industry, public service, or other careers. This postdoc “pile-up” reflects the role postdocs play in research productivity.
- There appears to be a shift towards older postdocs in 2016 when compared to 2009 Survey findings. Thirty-one percent of current postdocs are 35+ years old, and the proportion of postdocs in this age group increased 8 percentage points when compared to the 2009 survey results.
- Stress levels are high amongst the 2016 Survey respondents. Measures to address poor compensation and workplace mental health are needed in the short and long term to ensure the well-being of Canadian Postdocs. Relationships with supervisors and mentors are central to the postdoctoral experience and either contribute to, or alleviate a lot of postdoc stress.

4.1 The Postdoc “Pile-Up”

Perhaps reflective of both the scarcity of academic jobs and a need for further training, about one-quarter of the 2016 Survey respondents indicate that they expect to complete one or more additional postdocs. As shown in Table 4.1.1, **almost 35% of all postdocs estimate their postdoctoral training will last three to five years, and 13% expect to be a postdoc for five to seven years.** Forty percent of current postdocs aspiring to an academic career expect their training to last three to five years, and 16% of these postdocs expect their postdoctoral training to last five to seven years. About 30% of postdocs and

industry career goal expect to be a postdoc for three to five years, with about 10% expecting their postdoctoral appointments to last five to seven years.

Table 4.1.1: Number of Expected Additional Postdocs and Total Length of Postdoctoral Career

		2016
Expected additional postdocs	None	51.7% _b
	One	23.6% _a
	Two	6.4% _a
	Three	0.6% _a
	Four	0.1% _a
	Five or more	0.2% _a
	Don't know	17.5% _b
Total expected length of postdoctoral career	Less than 1 year	6.8% _a
	1 to 3 years	42.7% _a
	3 to 5 years	35.1% _a
	5 to 7 years	13.3% _a
	8 or more years	2.1% _a

Note: Values in the column and subtable not sharing the same subscript are significantly different at $p < .05$ in the two-sided test of equality for column proportions. Tests assume equal variances.

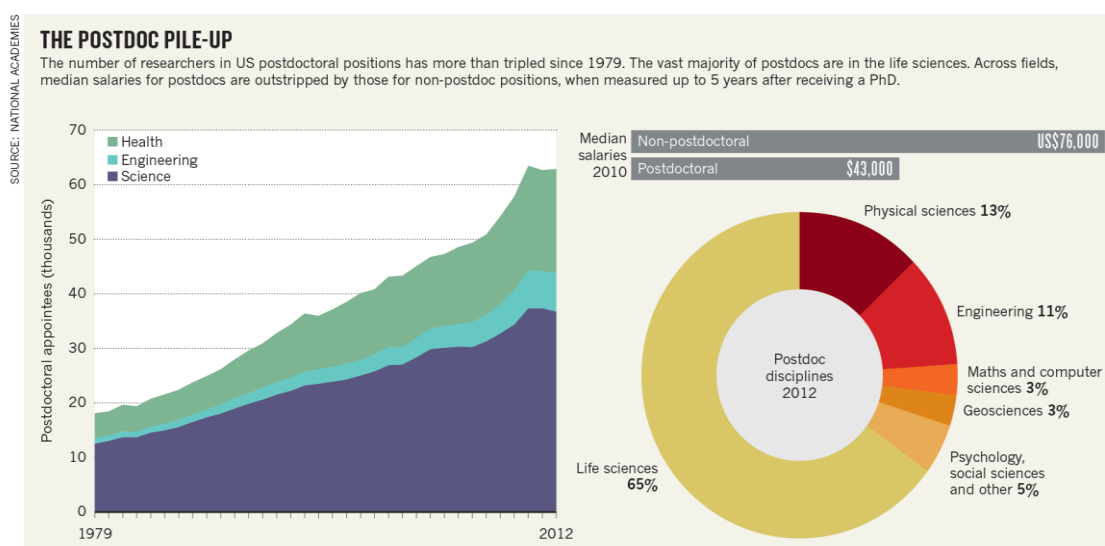
"Limited opportunity for tenure track positions- competition is too fierce, and you need to have multiple postdocs to even be considered." –Survey Respondent

As discussed, about 73% (of the 2016 survey respondents indicate a tenure-track position as a career goal. Of these academic track postdocs, about half expected to have one or more additional appointments. This preparation for

finding a faculty position has led to a phenomenon referred to as the postdoc "pile-up" or "permadoc" (Powell, 2015). Figure 4.1.1 illustrates the tripling of the number of postdocs in the United States over the past 30 years. The postdoc pile-up is observed in other knowledge-based economies such as China

(Ahmed et al., 2015), Britain (Pain, 2013), Holland (van der Weijden et al., 2016), and Germany (Fitzenberger & Schulze, 2014). Postdocs who remain in postdoctoral positions for long periods are traditionally known as long-term postdocs (National Academies, 1969). The phenomenon of the long-term postdoc is not new, and disparities by gender and national versus foreign-born PhDs were observed almost 50 years ago. In 1969, the long-term postdoc was three times more likely to be female and one and a half times more likely to be foreign-born (National Academies, 1969). The pile-up of PhDs in postdoc positions is not helped by the underuse of doctoral graduates in Canada, particularly in business and private sectors (Cheung et al., 2012).

Figure 4.1.1. The Postdoc pile-up. Reprinted by permission from Macmillan



Publishers Ltd: [Nature] (From Powell (2015).The Future of the postdoc. Nature, 520, 144-147), copyright (2015).

Postdocs and Productivity

A contributing cause of the postdoc pile-up may be the need to develop expertise *and* a publication record to obtain academic positions. While it may appear that there is an oversupply of postdocs, this is true mostly in the context of the demand for tenure-track positions. The real demand for postdocs is evident in the number of appointments filled each year. Postdocs have been called the cornerstone of innovation and discovery (Igami et al.,

2015; Mervis, 1999). One indicator of research productivity is a publication record. Postdocs publish frequently when compared to PhD students and faculty (Ahmed et al., 2015). A study of postdocs in Quebec, Canada from 2004 to 2008 found that, for Health Sciences and Natural Sciences and Engineering fields, **postdocs had higher publication rates than PhDs and academic faculty**. In the Social Sciences and Humanities field, postdocs published as frequently as faculty. In terms of research impact, **postdoc publications from all fields were cited more frequently than either faculty or PhD publications** (L'Association francophone pour le savoir, 2014). Similarly, in the Humanities and Arts field in Norway, postdocs are more productive in comparison to associate professors (Rørstad & Aksnes, 2015). It is likely that university productivity rates will rely heavily on postdoc publications in the future. As Figure 4.1.2 shows, in the United States the demand for postdocs in Science and Engineering has increased. At the same time, full-time faculty numbers have declined over the past 25 years (Figure 4.1.2) (National Science Foundation, 2011). Postdocs are important, not only in regards to institutional productivity, but to national research productivity rates (Åkerlind et al., 2005). Postdocs also fill important academy roles as teachers and supervisors of graduate students.

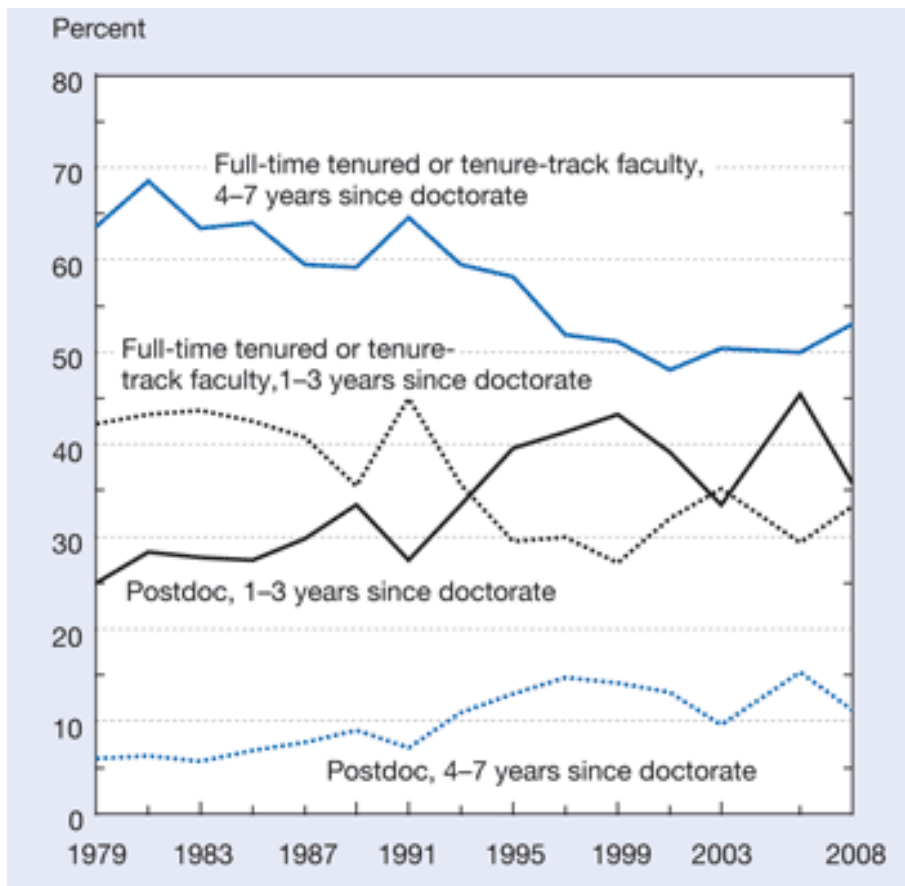


Figure 4.1.2. The rise of science and engineering postdoctoral appointments in the US versus full-time faculty. Source: National Science Foundation, National Center for Science and Engineering Statistics, special tabulations (2011) of 1973-2008 Surveys of Doctorate Recipients. Retrieved from <https://www.nsf.gov/statistics/seind12/c5/fig05-20.gif>.

As highlighted in Section 3.3.1, postdocs in 2016 are somewhat less interested in a tenure-track career, when compared to the 2013 Survey. For most postdocs, however, the tenure-track position remains their primary career goal. The “tournament” style hiring practices for university positions means that jobs go to the most successful postdocs after a lengthy competitive process. For

postdocs determined to obtain the rank of professor there is considerable pressure to complete multiple postdocs and devote much time and resources to publishing new and innovative research. As postdocs spend years in multiple appointments, honing their expertise, publishing in their field of research, and mentoring graduate students, they progress into middle age with the same life events and concerns that anyone would experience in this age category. The impact of the maturing postdoc is explored further in the following discussion.

4.2 The Age Trend of Postdocs in Canada

As shown in Figure 4.2.1, the percentage of postdocs in the two youngest categories age 25 to 29 and age 30 to 34 years has diminished since 2009. Meanwhile, 31% of current postdocs are 35+ years old, and the proportion of postdocs in this age group increased 8 percentage points when compared to the 2009 survey results. The results from 2009, 2013, and 2016 suggest a stable shift in the age distribution of Canadian postdocs.

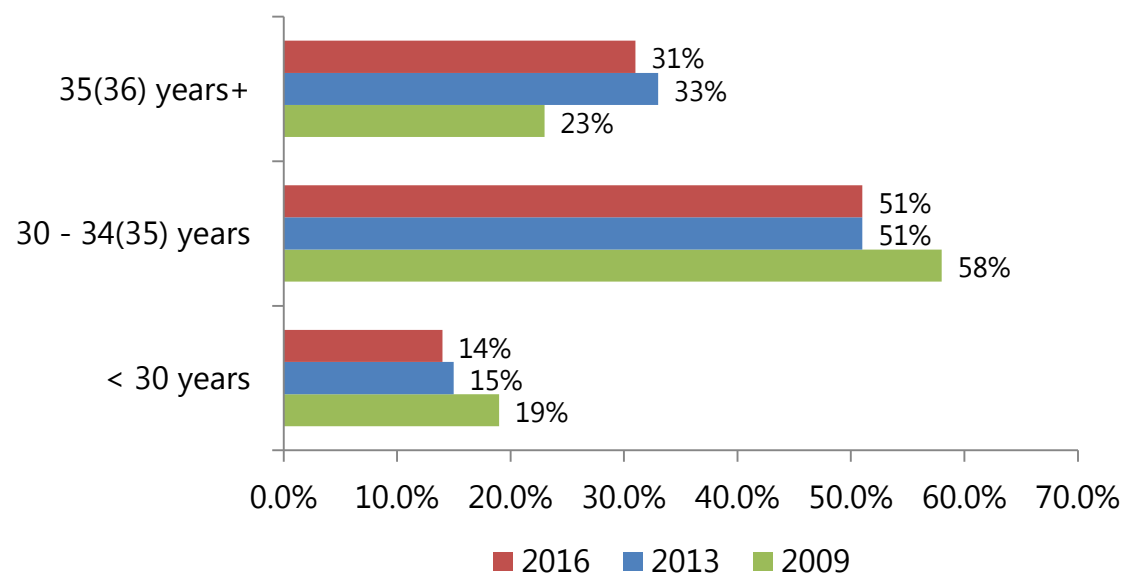


Figure 4.2.1. Age trend of postdocs in Canada. In 2009 the two middle age categories were 30 to 35 years, and 36 to 40 years (values in brackets). The oldest age category 40+ was combined with the 35 to 39 age category. Data Sources: The 2009, 2013, and 2016 CAPS-ACSP Canadian National Postdoctoral Surveys.

"The tenure-track job search proves more and more difficult and depressing as time goes on so the postdoc has been a good opportunity for me to seek new opportunities and investigate other possible careers."
–Survey Respondent

A salient feature in the trend towards a maturing cohort of postdocs is the dwindling size of the youngest age category (Figure 4.2.1). Three potential causes could contribute to the reduction of postdocs in the 25 to 29 year-old range. First, there may be a new trend for recent

doctoral graduates to take time before entering a postdoc, perhaps working in industry first before accepting a postdoc position. Second, there may be an increase in the number of years that current graduate students are using to complete a PhD. Third, fewer PhDs may be choosing postdoctoral training. Future research can investigate the youngest postdocs to determine their activity before beginning their postdoctoral appointment, and the *zeitgeist* regarding the appeal of postdoctoral positions.

Meeting the Needs of Postdocs in their Mid- to Late-Thirties and Beyond

The cohort of postdocs appears to experience the typical life events and concerns of any group in their mid to late thirties in Canada. It is likely that some begin their postdoctoral position with children and spouses, while others get married and have children during their appointment(s). As shown in Figure 4.2.2, fewer postdocs in 2016 are single or have never been married. The number of married postdocs in 2016 has increased from 2009, but the figure remains similar to that of 2013. **The divorce/separated/widowed rate shows an increase from 2013 to 2016 and another increase for past postdocs.**

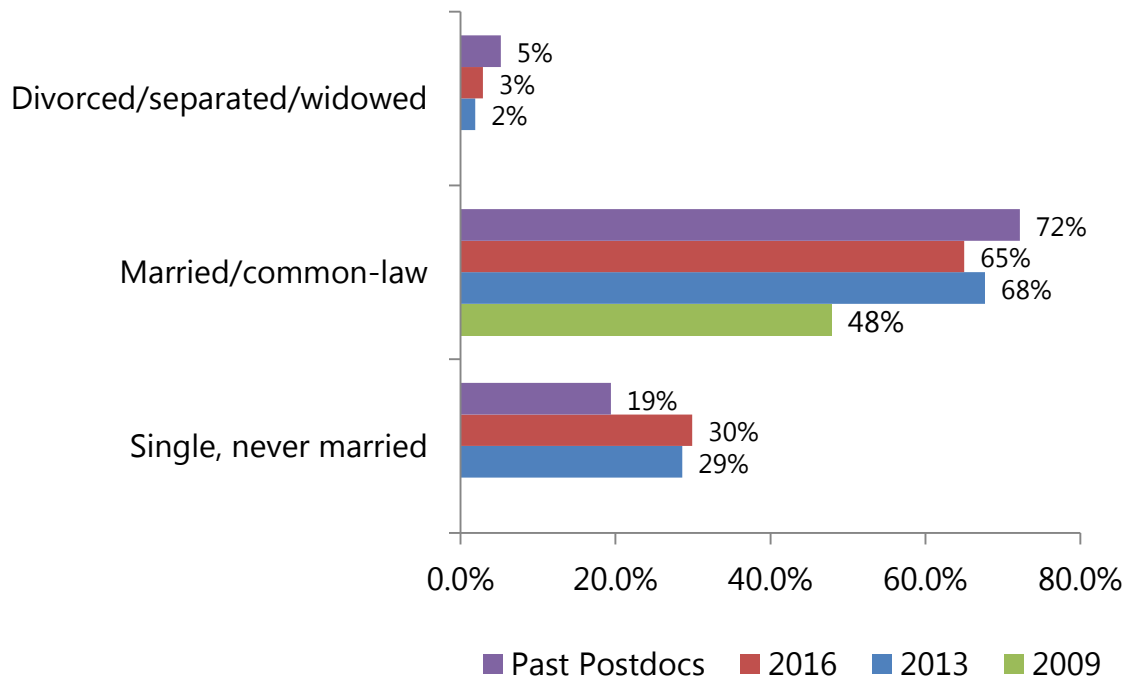


Figure 4.2.2 Trend in marital status. In 2009, only data on married/common-law status was available. Data Sources: The 2009, 2013, and 2016 CAPS-ACSP Canadian National Postdoctoral Surveys.

As shown in Figure 4.2.3, there are fewer postdocs without children in 2016 as compared to 2009. The average age for the birth of a first child in Canada is about 28 years old (Statistics Canada, 2015b). However, at 28 years of age, most respondents would have been completing their graduate studies, and may have postponed starting a family until an age somewhat older than the average Canadian. Therefore, for Canadian postdocs, the co-occurrence of shifts in the distribution of postdoc age *and* more respondents with children is a logical phenomenon. **The percentage of past postdocs with dependents (47%), as compared to current postdocs in 2016 (31%), shows that postdocs are clearly interested in starting families but are waiting until later in their 30s.** Delaying childbearing impacts fertility for women, where the odds of infertility increase three-fold for women aged 35 to 44 versus those aged 18 to 34 years (Bushnik, Cook, Yuzpe, Tough, & Collins, 2012). Bearing a

child beyond the age of 35 years is also associated with significantly increased maternal mortality rates (for a review of maternal and infant risks see Sauer, 2015). Provision of parental benefits will permit postdocs to start having children during more optimal childbearing years.

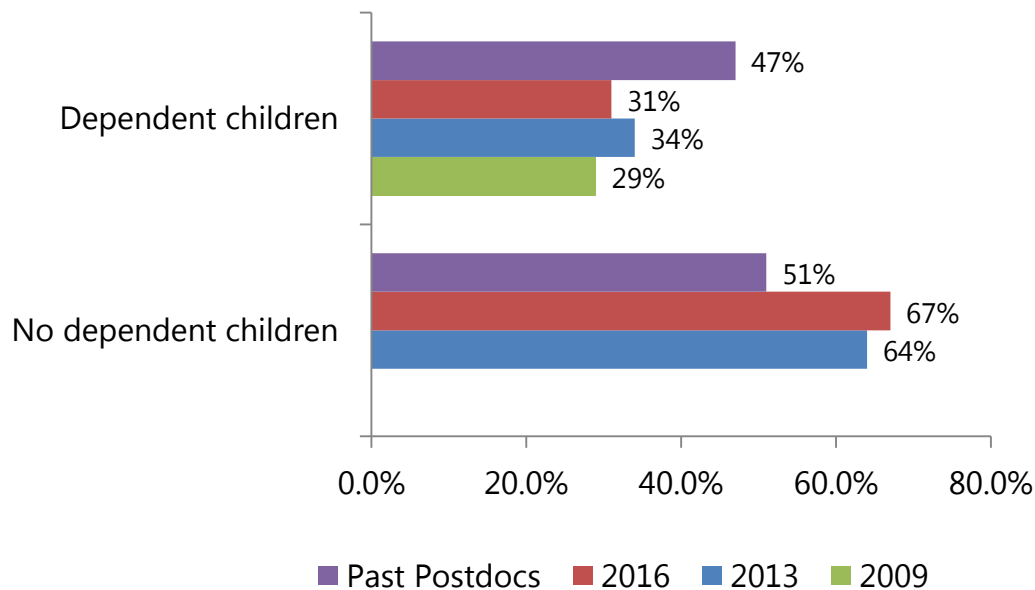


Figure 4.2.3. Trend in number of dependents. Data Sources: The 2009, 2013, and 2016 CAPS-ACSP Canadian National Postdoctoral Surveys.

A comparison of desired benefits (among those not already available) from the 2013 and the 2016 Surveys suggests a maturing cohort, with needs that reflect typical family-related concerns. For example, there is a significant increase in desire for paid parental leave. As shown in Table 4.2.1, **interest in paid parental leave increased from 16% (2013) to 19% (2016)**. In contrast, the desire for housing subsidies, and family health and life insurance decreased from 2013 to 2016.

Changes in the need for benefits may reflect the following scenarios:

- An increased desire i.e., a postdoc didn't need paid parental leave in 2013 and now they do need it in 2016; or
- The desired benefit was one they had previously, and has since been removed from a benefit package.

Table 4.2.1: Trend in Comparison of Desired Benefits.

Desired Benefit	2013	2016
Employment Insurance (EI)	30.2% _a	27.6% _a
Retirement plan	26.6% _a	23.5% _a
Dental insurance	24.6% _a	25.9% _a
Canada Pension Plan (CPP)	22.6% _a	22.0% _a
Housing subsidy	22.3% _a	17.5% _b
Parental leave (paid)	15.6% _a	19.0% _b
Vision/eye care	16.3% _a	15.9% _a
Child care subsidy	15.7% _a	13.9% _a
Health insurance for your family	16.9% _a	12.1% _b
Child care (access to onsite facility)	13.5% _a	12.6% _a
Life insurance	11.0% _a	7.4% _b
Sick leave (paid)	9.6% _a	8.7% _a
Extended health benefits (e.g., chiropractic, massage, vision)	-	20.0% _a
Legal/visa services	9.1% _a	7.6% _a
Reduced rate parking	8.0% _a	8.0% _a
Drug plan	-	18.3% _a

Notes: 1. Values in the same row not sharing the same subscript are significantly different at $p < .05$ in the two-sided test of equality for column proportions. Tests assume equal variances. 2. Data Sources: The 2013 and 2016 CAPS-ACSP Canadian National Postdoctoral Surveys.

Regardless of why an unavailable benefit shows increased desirability, it is clear that postdocs without paid parental leave indicate a greater need for this benefit. The reduced need for housing subsidies, family health insurance, and life insurance suggests that postdocs might be obtaining these benefits via

their partners, i.e. it is unlikely that postdocs, most in their mid-thirties, would have reduced needs for family health and life insurance. The need for housing subsidies may be similarly reduced by the pooled income of postdocs with partners.

Issues relating to family are represented in the 2016 Survey comments. Although, two-thirds of postdocs have partners and one-third have dependents, the frequency of comments pertaining to *family* is similar to that of *funding* (a topic that would be of interest to all postdocs) (Figure 4.2.4). Understanding that family needs are important to postdocs in Canada provides impetus for structuring family friendly workplace policies, and comprehensive benefit packages.

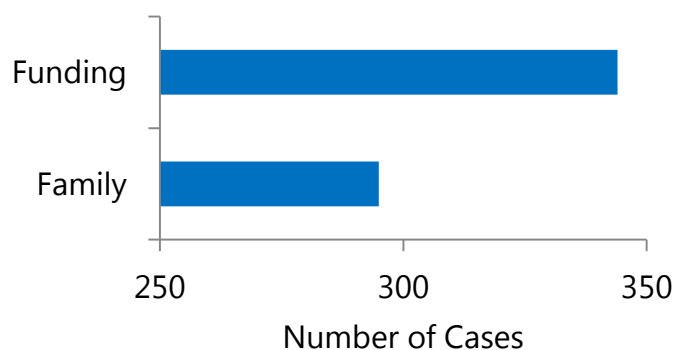


Figure 4.2.4. Frequency of “family” and “funding” coded cases from respondent open-ended responses. Discourse analysis conducted using QDA Miner 4 Lite software (Provalis Research, 2014).

The 2016 Survey open-ended comments about family are centred on providing for children, finding quality daycare, the problems associated with uprooting families, family benefits to cover health costs, and the stress of long work hours away from family. The stress noted by respondents over family issues heightens concern for female postdocs, who are likely in the midst of starting and raising families. For example, despite the large majority of women now employed outside of the home, on average, women spend twice the number of hours in

unpaid childcare activities as their male counterparts (about 50 hours versus 24 hours per week, Statistics Canada, 2016).

4.3 Life and Workplace Stress

About 75% of respondents indicated experiencing thoughts, feelings, or conditions related to their mental health during their postdoctoral appointment. As shown in Figure 4.3.1, the most commonly reported experiences (lasting for a month or more) were feeling overwhelmed by tasks, feelings of

hopelessness and loneliness, and anxiety or panic attacks. About one-quarter reported experiencing depression and insomnia, and one-fifth reporting feeling extreme sadness. Of imminent concern are the 7% of postdocs who report thoughts of self-harm or self-loathing. To better understand the depth of this problem one can examine the prevalence of these symptoms in the 30-something population. As reported by Statistics Canada (2016), the rate of suicide for this age group is 11.6 out of 100 000 individuals.

*"It's a lonely academic experience...more so than the PhD. No cohort, no association, in "no man's land" between faculty and students."
–Survey Respondent*

Only two-fifths of postdocs have access to extended health benefits, where access to services for mental health and well-being are typically found. In light of Statistics Canada data suggesting that sixty percent of suicides in the Canada are associated with depression (Statistics Canada, 2015c), it is critical that postdocs have access to extended health benefits to permit access to mental health services when needed.

Over half of the 2016 Survey respondents indicate that they expect to be a postdoc for three years or more, making persistent (chronic) stress a possibility. Chronic stress is known to have ill effects on physical and mental well-being. In a twenty-year review, Ganster and Rosen, (2013) discuss critical end points of workplace stress that include diabetes, cardiovascular disease, and depression, which result from the cortisol dysregulation brought about by sustained

stressful environments. Long-term postdocs in stressful environments may be vulnerable to compromised health.

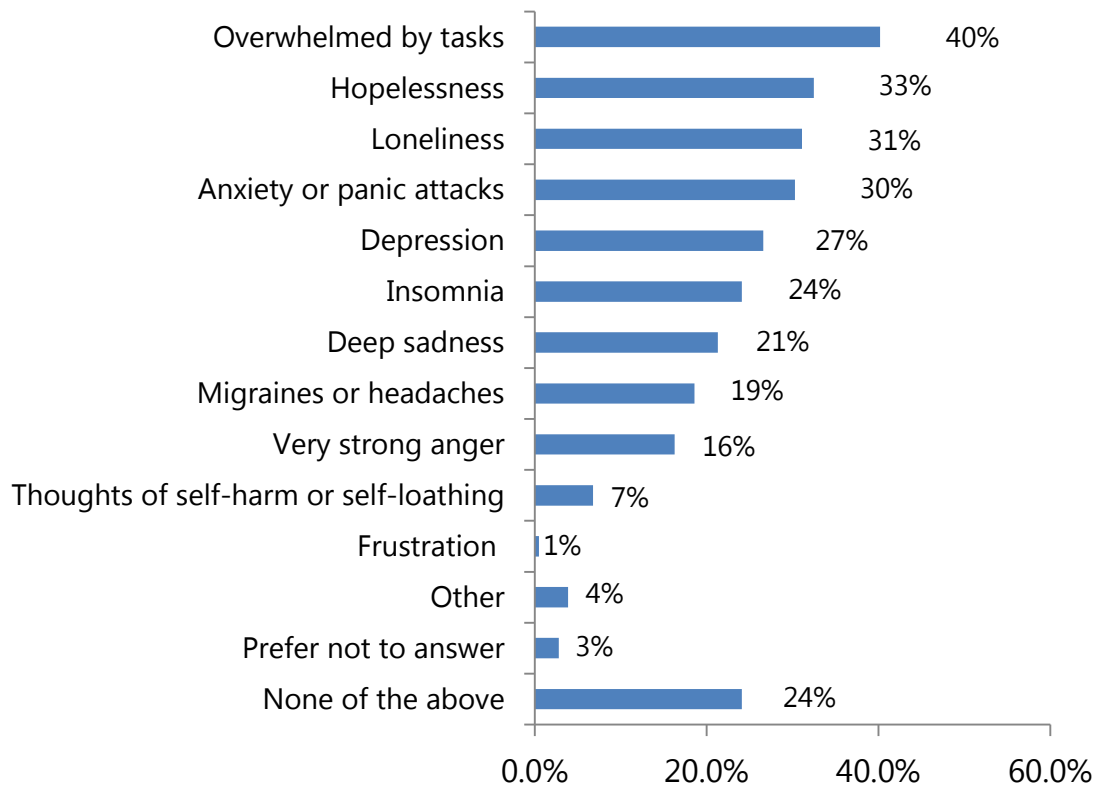


Figure 4.3.1. Mental health experience of all respondents during their postdoctoral training. Symptoms experienced for more than a month at a time.

"I think the supervisor's role is crucial in providing the work conditions and a professional-personal relationship, which will ensure postdocs feel cared for and heard during their tenure."
 –Survey Respondent

Comments from the 2016 Survey point to **relationships with supervisors as a pivotal factor in postdoc stress**. Some postdocs report having excellent relationships with their supervisor; this giving way to overall better postdoc experiences. In other

cases, troublesome interactions with supervisors are described using terms that

reflect harassment, bullying, and lack of support. Some postdocs report feeling as though they are “at the mercy” of their supervisor. Overt mentorship of postdocs by supervisors is generally constrained to core research competencies and academic professionalism. Yet, a “hidden curriculum” (a term introduced by Philip W. Jackson [1968]) was detected from the open-ended responses in the 2016 survey. The hidden curriculum transmitted the perception that postdocs do not feel valued and could easily be replaced, their well-being is of little interest to supervisors or institutional authorities, and most debilitating, their career goals are unattainable. Comments from respondents also indicate that postdocs are cognizant of what qualities *are* required of supervisors to ensure a positive and worthwhile experience, such as trust, support, and encouragement.

The issues of value and respect in the workplace have consistently been voiced by postdocs in Canada (Stanford et al., 2009; Mitchell et al., 2013). Common themes centre on low levels of support and status (Mitchell et al., 2013) and the lack of respect and recognition by institutions and granting agencies (Stanford et al., 2009). Addressing respect and value should improve the postdoc experience, as respect in the workplace is considered the top contributor to employee satisfaction (Society for Human Resource Management, 2016). An analysis of the U.S. postdoc experience found that two factors best explain satisfaction with the postdoc tenure: structured oversight and formal professional development. Structured oversight, implemented at the onset of the term, demonstrated the most potential for improving postdoc satisfaction (Davis, 2009).

“The postdoctoral experience appears to be at its best when the rules of the game are well defined and spelled out in advance. That is, the responsibilities of both the postdoc and the advisor should be clear; There should

“Generally, I really like being a post-doc and getting a chance to conduct research on my own. I have a very relaxed supervisor who supports my academic and career development and does not micromanage me.” –Survey Respondent

be checkpoints in the form of performance evaluation so that the postdoc

knows how he or she is doing; Boundaries of acceptable behavior need to be documented; and an escape route should be available should problems arise (Davis, 2009, p. 12)."

Concerns over postdoc respect and value in the workplace are observed across the globe. In Holland, the literature reports a lack of attention to postdoc day-to-day and career needs (van der Weijden et al., 2016). In U.S. research laboratories, poor acknowledgement of caregiver/family needs (Lodish, 2015), and a lack of guidance and mentoring with respect to career prospects (Scaffidi & Berman, 2011) has been reported. Some German postdocs were classified by researchers as "frustrated pessimists" when their status at the university was lower, and research motivation and career prospects were weak (Fitzenberger & Schulze, 2014, p.14). The CROS report of early career researchers in the United Kingdom noted that, while recognition for publications was common, an appreciation for work in supervising, managing, and teaching was lacking in the workplace (Vitae, 2013).

Approximately one-quarter of respondents to the 2016 Survey provide additional comments regarding prominent issues with their postdoctoral experience; of these, the majority (60%) are negative, about one-quarter are positive, and the remaining 15% are either mixed or neutral. General themes were distilled from the respondent comments and presented in Figure 4.3.2. A lack of support (e.g., funding and infrastructure), poor job prospects, unclear status, low pay, and problems with supervisors are among the top five problems cited by respondents.

Respondents indicate that they are happy with several facets of the postdoctoral experience. For example, collaborating with other experts in their field, mentorship by excellent supervisors, opportunities for conducting independent research and publishing are some of the positive sentiments expressed by respondents.

*"As a social scientist, I appreciate that the SSHRC postdoc process allowed me to design my own research...which allows for independent scholarship."
–Survey Respondent*

Respondents are appreciative of the academic freedom offered by the Tri-Council granting agencies, which permit postdocs to conduct independent research. Accompanying this gratitude towards the granting agencies are requests for larger funding packages, assured benefits, and less restrictions on activities (such as teaching) during the postdoctoral tenure.

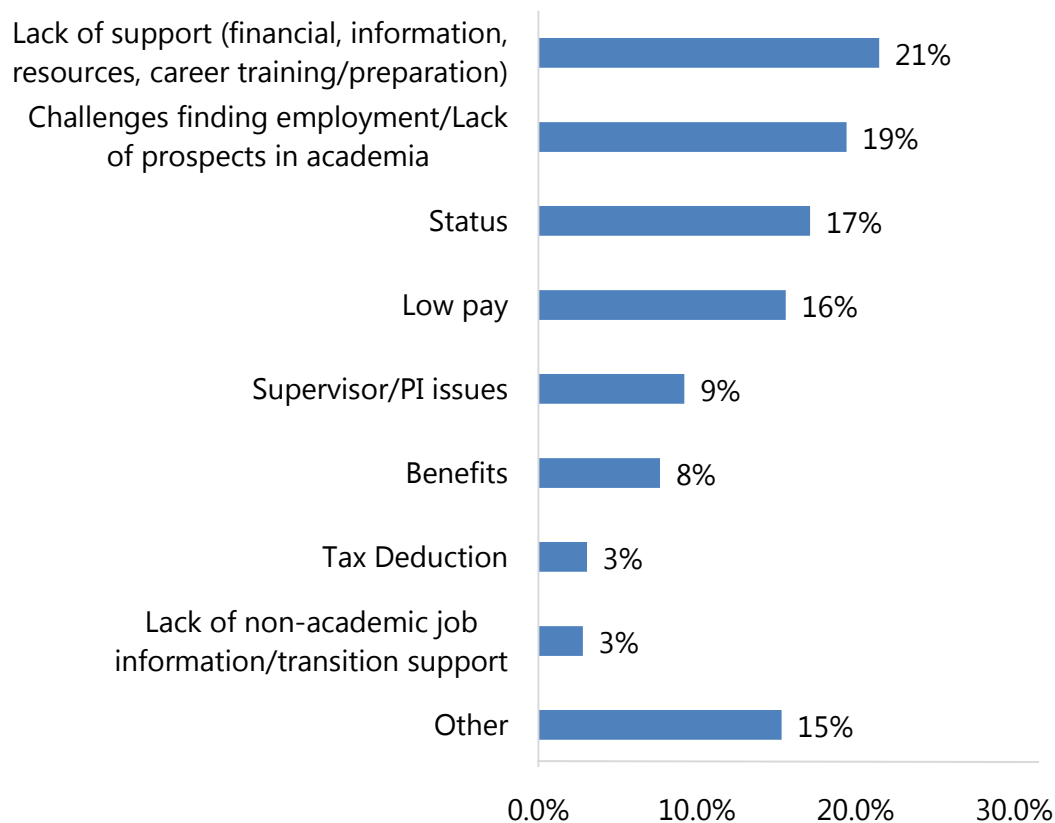


Figure 4.3.2. Open-ended comments from the 2016 Survey

Highlights from the Changing Profile of Postdocs in Canada

The postdoc pile-up phenomenon is occurring in Canada.

- 30% of postdocs expect to complete at least one additional postdoctoral appointment before finding employment in academia, industry, public service, or other careers.
- The literature suggests that postdocs are filling critical research and innovation roles as the number of full-time academic staff is decreasing.

There is a stable shift in the age distribution of current postdocs.

- Fewer postdocs make up the youngest age groups, suggesting new trends in when postdocs begin their first appointment.
- More postdocs in the older age categories indicate a shift in needs, such as paid parental leave and higher salaries.

There are indicators that stress levels are high among the 2016 Survey respondents.

- Loneliness and depressive symptoms top the list of persistent stress behaviours.
- Relationships with supervisors and mentors are singled out as central to the postdoctoral experience, and either contribute to, or alleviate, a lot of postdoc stress.

The 2016 Survey respondents are clear about positive aspects of the postdoctoral experience

- Freedom to conduct independent research and collaborate.
- Support for family needs from the granting agencies and workplaces.

5. RECOMMENDATIONS

It is our hope to transform the survey results into opportunities for stakeholders to work together towards the goal of bringing postdocs out of the shadows. The recommendations by CAPS-ACSP are organized into a 4-stage trajectory that clarifies how postdocs can support Canada's role as a global leader in innovation and discovery. A summary of the recommendations is outlined in Figure 5.1.

Attract

- Recruit postdocs for careers that are supported by market demands. For example, expand the concept of industrial postdocs to include a broad range of employers, such as NGOs, public service, consulting, and non-tenure track academic positions.
- Improve Canada's attractiveness as a destination for top researchers by reducing/removing visa and work permit barriers for international postdocs who wish to come to Canada.

Support

- Address the needs of the aging postdoc population by defining employment status to provides access to basic social support programs (EI and CPP), as well as the standard 12-month parental leave.
- Adopt a globally competitive postdoc salary scale comparable to those in the United Kingdom and the United States.
- Introduce a salary structure that includes yearly salary increases to accommodate inflation, and experience.
- All stakeholders should convey information to the larger research community about postdoc publication, teaching, and mentoring contributions: this will promote greater respect and value of the postdoc workforce.

- Foster communication within the postdoc community, and between postdocs and employers to alleviate the sense of isolation reported by many postdocs.
- Provide postdocs grievance processes that are supportive of postdocs and do not have negative impacts on their career advancement (e.g. mentoring committee or ombudsman).
- Postdocs that have obtained external funding (e.g. fellowships from the Tri-Councils, provincial funding or Foundations/Societies) should not be excluded from employment status at Universities/Institutions.

Train

- Implement Individual Development Plans (IDPs) to clarify the responsibilities of supervisors and postdocs. These should be integrated into the postdoctoral experience at all institutions.
- Encourage postdocs to pursue careers outside of academia through increased exposure to these career options during training. All stakeholders need to support these careers and disseminate comprehensive information about these career options to postdocs e.g., via professional career counsellors and increase funding for postdocs to pursue other careers.
- Increase postdocs' readiness for non-academic careers through increased non-academic training and professional development opportunities.

Launch

- Increase Canada's competitiveness in the knowledge-based economy by focusing on retaining postdocs in Canada, through the creation of more and improved employment opportunities.

- Facilitate the rapid transition of postdocs to the Canadian labour force through government investment and incentives; incentivize the transition to non-academic sectors.

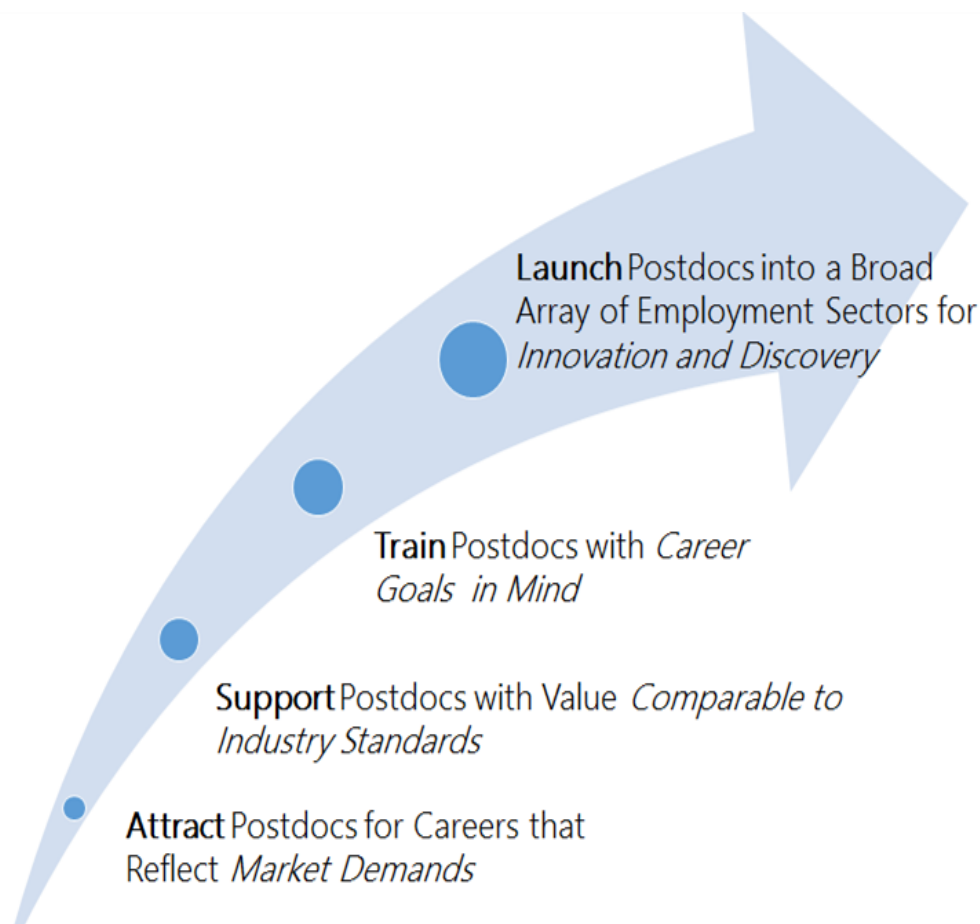


Figure 5.1. Four-Stage trajectory to enable postdocs to drive innovation and discovery.

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APPENDIX

Below is the complete list of Field of Research represented by the 2016 Survey respondents and their corresponding classification into the four main fields used in this report. Statistics Canada's Major Field of Study was used to code the fields of research and the four broad categories were based on the U.S. Sigma Xi Postdoc Survey report (Davis, 2005). While the U.S. Sigma Xi Postdoc Survey report had only three broad categories, "Interdisciplinary" was added to capture respondents who indicated fields of research that crossed over two or more of the three categories.

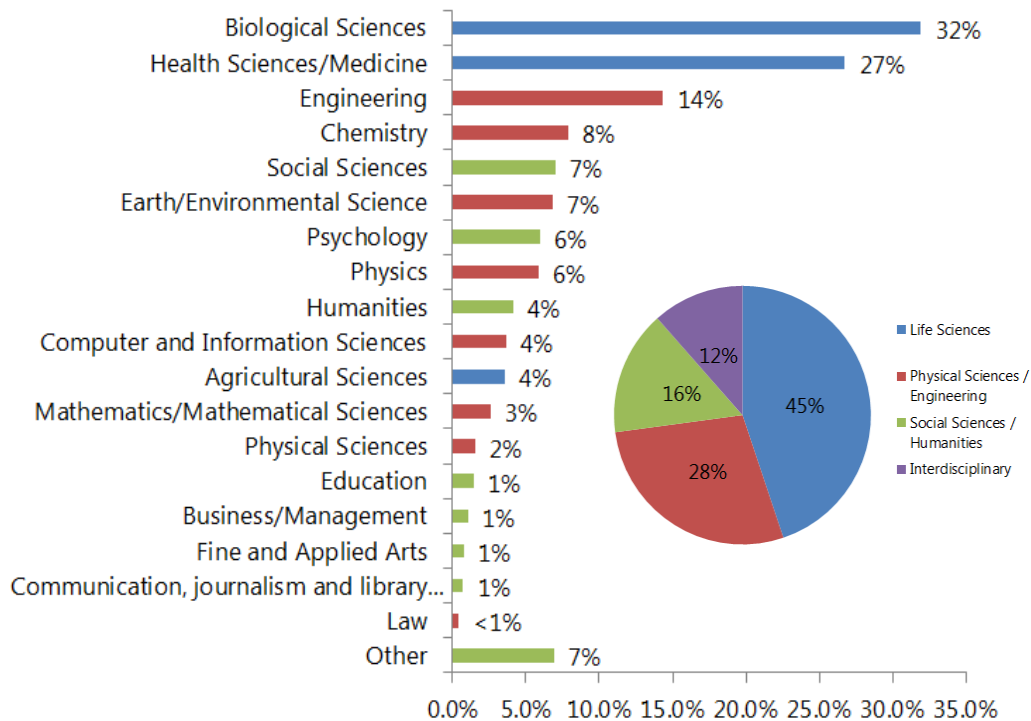


Figure A-1. Breakdown of four main domains by fields of research.