

# Evaluation of the Banting Postdoctoral Fellowships Program



Final Report 2015

## **Acknowledgements**

Special thanks to all the participants in this evaluation – survey respondents, interview and focus group participants, the Vanier-Banting Secretariat, CIHR Financial Planning Unit, and CIHR Planning, Reporting, Measurement and Data Unit. Additional thanks to Jean-Christian Maillet and Adnan Al Wahid (CIHR Evaluation Unit) and members of the Evaluation Working Group – Shannon Clarke-Larkin (NSERC/SSHRC), Tony Damiani (Industry Canada), Christopher Manuel and François Zegers (CIHR).

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# Executive Summary

## Program Description

The Banting Postdoctoral Fellowships (PDF) program was launched by the federal government in 2010 as part of a broader strategy to increase Canadian capacity for research excellence. It was designed as a prestigious postdoctoral fellowship program that would attract top-level talent to Canada. The program's specific objectives are to:

- Attract and retain top-tier postdoctoral talent, both nationally and internationally;
- Develop their leadership potential; and
- Position them for success as research leaders of tomorrow.

The value of the Banting Postdoctoral Fellowship is \$70,000 per year for a two-year period. The program awards 70 fellowships annually which are distributed equally among the Canadian Institutes of Health Research (CIHR), the Natural Sciences and Engineering Research Council (NSERC), and the Social Sciences and Humanities Research Council (SSHRC). The Banting PDF program is unique in its emphasis on the synergy between the applicant and the host institution, with applicants required to complete their applications in full collaboration with the proposed host institution. The program is administered jointly by the CIHR, NSERC and SSHRC.

## Evaluation Purpose, Scope and Methodology

The purpose of this first evaluation of the Banting program is to assess the program's continued relevance and performance (effectiveness and efficiency), and how it can be improved. The evaluation was led by CIHR in collaboration with NSERC and SSHRC and covers the first four competitions of the program from fiscal year 2010-11 to fiscal year 2013-14.

In line with best practice in evaluation, multiple lines of evidence were used to triangulate the findings, including: review of program documents and administrative data; key informant interviews; focus groups with Banting recipients and applicants; online surveys of Banting recipients, unsuccessful applicants and selection committee members; and bibliometric analysis of Banting applicants' research productivity and impact. The evaluation compared Banting fellows with two different groups of unsuccessful applicants: those who obtained a postdoctoral fellowship from CIHR, NSERC or SSHRC (referred to throughout this report as "Agency PDFs") and those who did not obtain a postdoctoral fellowship from any of the tri-agencies (referred to as "Unfunded" applicants.)

## Key Findings: Performance

### Attracting and Selecting Top-tier Candidates

The Banting PDF program is attracting and selecting top-tier candidates.





- Selection committee members ranked Banting applications among the best they had reviewed in comparison to similar programs and strongly believed in the ability of the Banting PDF selection process to pick the best candidates.
- Bibliometric analysis of the impact of publications showed that applicants in the health sciences and natural sciences and engineering domains had higher average of relative citation (ARC) scores and higher average of relative impact factor (ARIF) scores than the average for Canadian and World researchers. This evidence supports the view that the program is attracting some of the best researchers in the world.
- This evaluation has highlighted a potential tension between the program objective of attracting top-tier talent and that of retaining it. The design of the program results in both an 'inflow' into Canada of top-tier foreign citizens coming to Canadian institutions and an 'outflow' of Canadians and permanent residents who take up their awards abroad. In simple terms, this can be viewed as a 'net gain' or 'net loss' of top-tier talent, although there are many further nuances to consider (e.g. Canadians who later return to this country). To prevent a 'net loss' of talent, the program stipulates a 25% annual cap on awards held by Canadians outside of Canada.
- The annual cap has resulted in a small proportion of top-tier talent not being selected for awards. During the period under review, ten Canadian applicants proposing to take up awards abroad (4%) were passed over as a result of this annual cap, with an additional eight being passed over in the most recent (2014-15) competition.
- The program has resulted in a greater number of foreign citizens coming into Canada than Canadians leaving to go abroad; 31% of those taking up awards were foreign citizens coming to Canada (87 awards) compared with 25% who were Canadians or permanent residents hosted abroad (71 awards).
- There is a lack of consensus regarding the need for the cap among supervisors, host institution representatives, federal agency representatives, and selection committee members. Some stakeholders do not want to limit the take-up of the award internationally while others see a need for limits to retain postdoctoral fellows in Canada.
- There are signs of a decline in the proportion of foreign applications; after initially holding steady at 40%, this fell to 34% in the last year under study, and further to 26% of applications in the most recent competition (2014-15). One possible explanation is that the requirement to demonstrate synergy between an applicant's research program and the proposed host institution's strategic priorities may be posing a barrier to foreign applicants.





### **Training and Support**

Banting fellows rate their training environments very highly and are receiving appropriate training and support to carry out their research programs. Some Banting fellows seemed to be accessing additional supports, usually resulting from institutional commitments made as part of their application. There is wide variation in the additional supports provided by host institutions; examples include being given the opportunity to apply for research grants as an independent investigator and being appointed into a senior trainee position. This variation in types of support may have an impact on the ability of Banting fellows to conduct independent research.

### **Research Excellence and Leadership**

Available evaluation evidence suggests that Banting fellows are demonstrating research excellence as well as leadership after receiving the award. Bibliometric analysis indicates that after receiving the award, Banting fellows in the health sciences and natural sciences and engineering had higher ARC and ARIF scores than their respective cohorts of Agency PDFs and Unfunded applicants.

- Fellows' supervisors and senior representatives of host institutions saw the Banting fellows as strong research leaders and change agents.
- Banting fellows spent over two-thirds of their time on research and less on teaching, supervision, administrative tasks and other activities; these proportions were however, similar to those of Agency PDFs and Unfunded applicants.
- Almost all Banting fellows, Agency PDFs and Unfunded applicants believed that their research leadership abilities had developed to a great extent or some extent as a result of their postdoctoral training. However, only half of each of these three groups held a similar perception about the extent to which their teaching and service leadership abilities had developed during their training.
- As compared to research leadership development activities, Banting fellows were less likely to engage in teaching leadership development activities and least likely to engage in service leadership development activities.

### **Establishing Collaborations**

Banting fellows are establishing collaborations, most frequently within their own institutions and internationally, which are ongoing and resulting in the production and dissemination of knowledge.

### **Awareness of Banting Fellowships**

Evaluation evidence indicates that awareness of the Banting fellowship is increasing both nationally and internationally; however, the program is currently better known in academia and





in Canada. The fellowship is highly regarded by applicants, particularly for its award amount, prestige and opportunities to develop their research leadership potential.

### **Retention of Banting Fellows**

Although the evaluation covers only the first four years of the program, there is evidence that the program has made progress towards meeting its intermediate objective of retaining top-tier postdoctoral talent in Canada.

- Banting fellows are more likely to be: employed (91%), conducting research (88%) and working in Canada (58%) than Agency PDFs (72%, 72% and 54% respectively) and Unfunded applicants (87%, 76% and 35% respectively).
- A greater proportion (92%) of Banting fellows work in academia compared to Agency PDFs (73%) and Unfunded applicants (73%).
- Among those working outside Canada, the most common reason for pursuing research-related positions outside the country was for better or more job opportunities; this finding is also consistent with the views of key informants.

### **Program Efficiency**

Available evidence indicates that the Banting program is being delivered by the federal research funding agencies in a cost-efficient manner.

- For fiscal year 2013-14, the administrative expenditure (\$434,340) as a percentage of total expenditure (\$10,234,340) was 4.2% which translates into an administrative cost of \$1,000.78 per eligible application and \$6,204.85 per award.

### **Key Findings: Relevance**

The evaluation confirms the continued need for the Banting program to support and develop Canada's postdoctoral talent pool. The program is attracting top-tier postdoctoral talent and serving as stepping stone or pathway to an academic career.

The Banting program aligns with federal roles and responsibilities to support the attraction, development and retention of researchers and is consistent with the federal government's approach to supporting research capacity as outlined in the 2014 Science, Technology and Innovation Strategy. The program also aligns closely with the strategic outcomes and priorities of CIHR, NSERC and SSHRC to build research capacity by attracting, supporting and training top-tier postdoctoral fellows to carry out research.

### **Conclusions**

Overall, the Banting PDF program is meeting or has made good progress towards meeting its immediate outcomes. There is evidence that top-tier postdoctoral trainees are being attracted, recruited and provided with some enhanced training and support, although this support varies across host institutions. There is awareness of the program particularly within academia and





nationally. Banting fellows are devoting majority of their time to research and are establishing national and international collaborations that are resulting in the creation and dissemination of knowledge.

The program has only just completed its fourth year but has already made progress towards achieving its intermediate outcomes of demonstrating research excellence and retaining top talent in Canada. Banting fellows are beginning to show development in leadership particularly in the research domain and are more likely than comparator groups (Agency PDFs and Unfunded applicants) to be employed and conduct research in Canada. Banting fellows are being recognized by both senior representatives of host institutions and fellows' supervisors as exceptional, outstanding, and driven. There is also evidence that the program is being delivered in a cost efficient manner.

The evaluation evidence attests to the continued need for the Banting PDF program and the program's alignment with federal roles and responsibilities and with the strategic outcomes and priorities of the federal government, and CIHR, NSERC and SSHRC.

### **Recommendations**

The Banting PDF program has made good progress towards achieving its intended outcomes and based on the evidence of this evaluation should be continued. The following recommendations address issues that could affect the performance of the program going forward, with supporting evidence provided for each of these.

- 1. The Banting program should take steps to address the decline in international applicants to ensure the program can attract and retain top-tier postdoctoral talent, both nationally and internationally.**

The proportion of foreign applications fell from 40% in the program's first two years to 34% in the last year under study, and declined further to 26% of applications in the most recent competition (2014-15). Additionally, in the 2014-15 competition, 146 foreign citizens (not permanent residents) applied for the fellowship, approximately half (56%) of the 260 foreign citizens who applied in the first-year of the program (2010-11). Key informants suggested the program might be too Canada-centric and that Canadian professors would be unlikely to nominate a candidate with whom they had not previously worked. This could potentially put international applicants at a disadvantage. Banting program management should explore any potential link between the decline and program design issues such as the requirement to demonstrate synergy between an applicant's research program and the proposed host institution's strategic priorities. Program management should also review current processes used by universities to determine if factors exist that inhibit international applications and, if warranted, take action to address the factors.







**2. The Banting program should monitor the ongoing impact of and need for the 25% cap on Banting fellowships awarded to individuals who apply in collaboration with a foreign institution.**

The issue of the 25% cap relates to the tensions identified in the program between the attraction and retention of top-tier talent. Decisions taken on the cap will reflect whether program management views it as more important to attract the best candidates regardless of where they intend to take up the award or whether ensuring retention and a 'net gain' of talent is the primary consideration. While the cap contributes to the retention of top-tier postdoctoral talent in Canada it limits the selection of the best candidates from among those who wish to hold their fellowship abroad.

There is currently a lack of consensus among key program stakeholders on the need for the cap and diverse opinions on the benefit to Canada of retaining Banting fellows to conduct their training in Canada in contrast with the international nature of research and ability to attract top-tier postdoctoral fellows. As a result, it is important to monitor the attraction and retention of Banting fellows after their fellowship to assess the need for the cap based on its longer-term impact on the retention of Banting fellows.

**3. The Banting program should develop guidance regarding leading practices for the support of Banting fellows to develop their leadership potential and position them for success as research leaders of tomorrow.**

Currently, the nature and extent of support provided to Banting fellows varies widely across institutions, which could impact the ability of fellows to conduct independent research. Some supports such as office space, computers and access to library facilities seem to be always available but others such as a guaranteed fund for independent research or the ability to independently apply for research grants are not. Similarly, mentoring by fellows' supervisors or informal interactions with other experienced faculty appear to be always available whereas formally structured mentorship programs with specified milestones are rare. The Banting program should identify leading practices regarding the level and types of support to develop and position Banting fellows as research leaders.





# 1. Introduction

## About the Program

The Banting Postdoctoral Fellowship (PDF) program supports the development of Canada's research capacity by awarding fellowships in equal numbers in the areas of health sciences, natural sciences and engineering, and social sciences and humanities. The program was announced in the 2010 federal budget as part of a broader strategy to increase Canadian capacity for research excellence and has the following specific objectives:

- Attract and retain top-tier postdoctoral talent, both nationally and internationally;
- Develop their leadership potential; and
- Position them for success as research leaders of tomorrow.

The fellowship program is expected to attract the very best applicants, both nationally and internationally, and candidates are required to apply in full collaboration with their proposed host institution showing the host's commitment to their research program and its alignment with their strategic priorities. This requirement for institutional commitment and demonstrated synergy between applicant and institutional strategic priorities is unique to the Banting PDF.

Further details about the program including its target audience, delivery and budgetary resources are presented later in this report in Appendix A: Program Profile.

## Evaluation Purpose and Scope

This is the first evaluation of the program and is designed to provide tri-council senior management with valid and practical findings about the performance and continued relevance of the Banting PDF program and meet the requirements of the *Financial Administration Act* and Treasury Board's *Policy on Evaluation*.<sup>1</sup> The evaluation was led by CIHR in collaboration with NSERC and SSHRC.

The evaluation's scope is limited to the first four years of the program, 2010-2011 to 2013-2014 and assessment of program performance focuses on the extent to which immediate outcomes have been achieved, what early progress has been made towards achieving intermediate outcomes (expected to occur in one to five years post award) and how the program can be improved.<sup>2</sup>

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<sup>1</sup> For further details on the TBS policy suite see: <http://www.tbs-sct.gc.ca/cee/pol-eng.asp>

<sup>2</sup> The program's logic model is presented in Appendix B.





In accordance with the Treasury Board Secretariat's (TBS) requirements under the 2009 *Policy on Evaluation* and *Directive on the Evaluation Function*,<sup>3</sup> the evaluation addresses the core issues identified by TBS:

- Continued need for the program;
- Alignment with government priorities;
- Alignment with federal roles and responsibilities;
- Achievement of expected outcomes; and
- Demonstration of efficiency and economy.

### **Evaluation Questions**

The evaluation addresses the following questions:

#### **Relevance**

1. To what extent does the Banting program continue to address a demonstrated need?
2. To what extent is the Banting program aligned with federal roles and responsibilities?
3. To what extent is the Banting program aligned with federal government and agency priorities?

#### **Performance: Effectiveness**

4. Is the Banting program's selection process able to attract and select top-tier post-doctoral candidates?
5. To what extent have Banting fellows received appropriate training and support to carry out their research programs?
6. To what extent have Banting fellows demonstrated research excellence and leadership?
7. To what extent have Banting fellows established national and international collaborations?
8. To what extent have national and international awareness of Banting fellowships as an attractive and competitive award increased since program launch?
9. To what extent have Banting fellows remained in Canada and pursued research careers?

#### **Performance: Efficiency and Economy**

10. Are the most appropriate and efficient means being used to achieve the outcomes, relative to alternative design and delivery approaches?

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<sup>3</sup> For further details on the TBS policy suite see: <http://www.tbs-sct.gc.ca/cee/pol-eng.asp>





## Evaluation Methodology

### *Data Collection*

In line with TBS guidance and recognized best practice in evaluation (e.g., McDavid, Huse & Hawthorn, 2013), several lines of evidence were utilized to triangulate the evaluation findings and ensure that conclusions drawn would be valid.<sup>4</sup> The data collection methods included the following:

- Key informant interviews (n=46) with Banting host institution representatives, Banting fellows' supervisors; senior executives of the tri-agencies, Vanier-Banting secretariat and relevant federal government departments;
- Focus groups (n=5) with current Banting fellows and corresponding cohorts of unsuccessful applicants;
- Online survey of Banting selection committee members (n=60);
- Online survey of the first two cohorts of Banting fellows (using the Banting End of Award Report, BEAR) (n=119);
- Online survey of corresponding cohorts of unsuccessful applicants (n=189);
- Bibliometric analysis of the research productivity and impact of Banting PDF applicants from the first four competitions; and
- Analysis of administrative data and review of program documents.

### *Analysis Approach*

The analysis compared Banting fellows with two groups of unsuccessful applicants: those who had received an Agency-specific postdoctoral fellowship from one of the tri-agencies in the three year period before or after their Banting application (referred to throughout this report as "Agency PDF") and those without any Agency-specific postdoctoral fellowship (referred to as "Unfunded").

Analysis of the Agency PDF and Unfunded applicants revealed that they were far from unsuccessful. Indeed after their unsuccessful Banting application, almost all secured alternative funding for postdoctoral training while a few obtained faculty tenure track positions. This has implications for any *a priori* expectations about the comparison of the two groups with the Banting fellows in relation to immediate and intermediate program outcomes. It seems to suggest that one should not expect much of a difference between successful and unsuccessful applicants in terms of their research productivity and other indicators and therefore if any difference is observed in favour of Banting fellows, it should be interpreted as giving even more credence to the effectiveness of the Banting postdoctoral fellowship.

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<sup>4</sup> The evaluation matrix guiding the evaluation is presented in Appendix C.





### *Limitations*

As with most evaluations, limitations were encountered during the data collection and are highlighted below. Further details about the methodology and limitations are presented in Appendix D.

- The bibliometric data presented in this evaluation are drawn from the Canadian Bibliometric Database (CBD™) built by the *Observatoire des sciences et des technologies* (OST) using Thomson Reuters' Web of Science (WoS). However, the bibliometric analyses presented in this report do not include all documents published by the studied researchers, since some works are disseminated through scientific media not indexed by the WoS (e.g., highly specialized journals, national journals, grey literature and particularly conference proceedings not published in journals). What these statistics do measure, however, is the share of researchers' scientific output that is the most visible for Canadian and worldwide scientific communities, and therefore that is most likely to be cited.
- The WoS offers a good coverage of the publication output for the research fields of health sciences and natural sciences and engineering (NSE) including the content of international journals. By contrast, a large proportion of research results in the social sciences and humanities (SSH) is published in books and national journals not indexed in WoS and thus its coverage is far less complete for the social sciences, and even less so for humanities. While the results are therefore considered reliable for CIHR and NSERC applicants, they could not be considered to be representative of the publication outputs of applicants in the SSH domain. Therefore the bibliometrics findings for the SSHRC applicants are not presented in this report.
- The surveys of Banting fellows and unsuccessful applicants were administered at two different points in time: the Banting End of Award Report (BEAR) was completed by the Banting fellows between late 2012 and March 2015 while the unsuccessful applicant survey was administered from March 26, 2015 to April 20, 2015. Although most of the survey questions were taken from the BEAR, it is possible that respondents answered questions relating, for example, to research productivity, with reference to different time points: Banting fellows with reference to the two-year tenure of the Banting fellowship; and the unsuccessful, with reference to their postdoctoral training which could be longer than two years. As a result, only the bibliometric analyses results and not the survey results are used to compare the research productivity of Banting fellows, Agency PDF and Unfunded applicants.
- Although the initial invitations to host institutions targeted senior executives (e.g. Vice President or Vice-Provost) some chose to nominate alternatives with varying levels of involvement in the Banting program.





- The majority of Banting fellows' supervisors who participated in the key informant interviews had only limited experience with the Banting program.
- The numbers of participants in the focus groups for unsuccessful applicants were small, fewer than four, limiting the data collected and potentially the diversity of perspectives.






## 2. Performance

### 2.1 ATTRACTING AND SELECTING TOP-TIER CANDIDATES

Evaluation Question: Is the Banting program's selection process able to attract and select top-tier postdoctoral candidates?

#### Key Findings

- **The Banting PDF program is attracting and selecting top-tier candidates.** The bibliometric analysis of the impact of publications showed that applicants in the health sciences and natural sciences and engineering domains, irrespective of success status had higher average of relative citation (ARC) scores and higher average of relative impact factor (ARIF) scores than the average for Canadian and world researchers. This evidence supports the view that the program is attracting some of the best researchers in the world.
- **Selection committee members ranked Banting applications among the best they had reviewed in comparison to similar programs** and strongly believed in the ability of the Banting PDF selection process to pick the best candidates.
- **Senior representatives of host institutions and fellows' supervisors considered Banting PDF applicants to be of a high quality** describing them in such terms as "exceptional," "outstanding" and "driven."
- **Half (52%) of successful applicants had also been successful in other postdoctoral fellowship competitions** and had received offers for other fellowships.
- **The program stipulates a 25% annual cap on awards held outside of Canada.** Of the 283 fellowships awarded between 2010 and 2014, 125 (44%) were Canadians/permanent residents hosted in Canadian institutions, 71 (25%) were hosted abroad while 87 (31%) were foreign citizens who came to Canadian institutions. The cap has contributed to a net "inflow" or gain of 16 (87-71) fellows taking up the award in Canada with more international fellows hosted in Canadian institutions than Canadians/permanent residents hosted abroad.
- **The cap highlights a tension within the program's objective to attract and retain top-tier postdoctoral talent in Canada whereby the retention of top-tier postdoctoral talent in Canada limits the selection of the best applicants from among those who wish to hold their fellowship abroad.** The cap has contributed to the net gain of 16 fellows taking up awards in Canada; however, it has resulted in some higher ranked applicants who intend to take-up the award abroad being passed over because the cap has been filled. During the period under review, 10 applicants (4%) were passed over as a result of the cap, with additional eight being passed over in the most recent (2014-15) competition. There is a lack of consensus regarding the need for the cap among



supervisors, host institution representatives, federal agency representatives, and selection committee members with views split between not limiting the take up of the award internationally versus the need for a limit to retain postdoctoral fellows in Canada.

- **There are signs of a decline in the proportion of foreign applications.** After initially holding steady at 40%, the proportion of foreign applications fell to 34% in the last year under study, and further to 26% of applications in the most recent competition (2014-15). One possible explanation is that the requirement to demonstrate synergy between an applicant's research program and the proposed host institution's strategic priorities may be posing a barrier to foreign applicants.

In order to understand the ability of the Banting PDF program to attract and select the best candidates in terms of both research excellence and leadership, the evaluation assessed the research excellence of applicants in the three year period immediately preceding their Banting application and also canvassed expert opinion on the quality of applicants. Evidence from bibliometrics, the survey of Banting PDF selection committee members, key informant interviews with fellows' supervisors and host institution representatives, and analyses of the BEAR data and program administrative data were used for this assessment.

The bibliometric indicators used to assess research productivity were average annual number of papers, average of relative citations (ARC) and average of relative impact factors (ARIF). The average annual number of papers for a group of researchers refers to the total number of distinct publications assigned to that group divided by the number of researchers in the group and the number of years considered in the observation window.

The ARC relates to the number of citations received by a published paper over the period covered by the database following the publication year. An ARC value greater than 1 means that a paper or a group of papers scores higher than the world average of its specialty; while a value below 1, shows that those publications are not cited as often as the world average.

The ARIF provides a measure of the scientific impact of the journals in which a group of researchers publishes. When the ARIF is greater than 1, it means that the group of researchers publishes in journals that are cited more often than the world average and when it is below 1, it implies that the group publishes in journals that are not cited as often as the world average. Further details about the definition and computation of the bibliometric indicators are presented in the Methodology Section (Appendix D).

### **Health Sciences**

Findings from the bibliometric analysis for the health research domain reveal that candidates selected for the Banting fellowship were more productive in terms of the average annual



number of peer reviewed publications in the three year period prior to applying for the Banting fellowship than those who were not selected (Table 2.1-1).<sup>5</sup> Also, the publications of the selected candidates had higher scientific impact in terms of the ARC than the Agency PDF (p<.05) and Unfunded (p<.001) applicants. Although there was no difference between the selected candidates and the Agency PDF applicants in relation to the ARIF scores, both groups published in journals with higher impact than the Unfunded applicants (Banting PDFs p<.01; Agency PDFs p<.05).

Both the ARC and ARIF scores also confirm that there was no significant difference in the quality of applicants over the years based on this measure as the scores were consistently well above the World average score of 1.0.

**Table 2.1-1: Bibliometric scores prior to Banting PDF application, by type, funding status and competition year (Health research domain)**

	Banting PDF	Agency PDF	Unfunded
<b>Average Number of Papers</b>			
2010	1.70	1.40	0.92
2011	2.10	1.35	1.04
2012	1.48	1.36	1.00
2013	1.57	1.28	0.98
2010-2013	<b>1.71</b>	<b>1.35</b>	<b>0.98</b>
<b>Average of Relative Citations (ARC)</b>			
2010	1.67	1.29	1.28
2011	2.26	1.49	1.19
2012	1.57	1.44	1.27
2013	1.54	1.36	1.42
2010-2013	<b>1.79</b>	<b>1.37</b>	<b>1.28</b>
<b>Average of Relative Impact Factors (ARIF)</b>			
2010	1.52	1.30	1.24
2011	1.45	1.25	1.21
2012	1.36	1.33	1.33
2013	1.46	1.24	1.34
2010-2013	<b>1.45</b>	<b>1.29</b>	<b>1.27</b>

Source: Observatoire des sciences et des technologies (Thomson Reuters Web of Science) – Canadian Bibliometric Database current as of July 2014.

### Natural Sciences and Engineering

The bibliometric analysis for the natural sciences and engineering (NSE) domain also showed that the selected candidates published more papers in the three year period leading to their

<sup>5</sup> Note that the “average annual number of publications” as computed in the report cannot be used for statistical tests because it is not simply the sum of the number of publications produced by each researcher divided by the number of researchers, but instead, as stated in the methodology section in Appendix D, the number of distinct publications produced by the group, divided by the number of researchers in the group and the number of years considered. A key strength of this method is that it avoids the double counting of publications and is therefore robust.

application for a Banting PDF than the Agency PDF and Unfunded applicants (Table 2.1-2). Similarly, the selected candidates outperformed the Agency PDF ( $p < .05$ ) and Unfunded ( $p < .01$ ) applicants in terms of the impact of their publications as measured by their ARC scores. However, there were no statistically significant differences across the groups in terms of the impact of the journals in which they published as measured by the ARIF scores.

**Table 2.1-2: Bibliometric scores prior to Banting PDF application, by type, funding status and competition year (NSE domain)**

	Banting PDF	Agency PDF	Unfunded
<b>Average Number of Papers</b>			
2010	1.88	1.35	1.14
2011	1.90	1.06	1.18
2012	2.15	1.90	1.81
2013	2.31	2.38	1.91
2010-2013	<b>2.06</b>	<b>1.70</b>	<b>1.43</b>
<b>Average of Relative Citations (ARC)</b>			
2010	2.36	1.55	1.51
2011	2.16	1.42	1.39
2012	2.14	1.66	1.66
2013	1.52	1.51	2.29
2010-2013	<b>2.03</b>	<b>1.56</b>	<b>1.74</b>
<b>Average of Relative Impact Factors (ARIF)</b>			
2010	1.39	1.23	1.38
2011	1.42	1.08	1.26
2012	1.63	1.42	1.38
2013	1.24	1.20	1.39
2010-2013	<b>1.42</b>	<b>1.27</b>	<b>1.36</b>

Source: Observatoire des sciences et des technologies (Thomson Reuters Web of Science) – Canadian Bibliometric Database current as of July 2014.

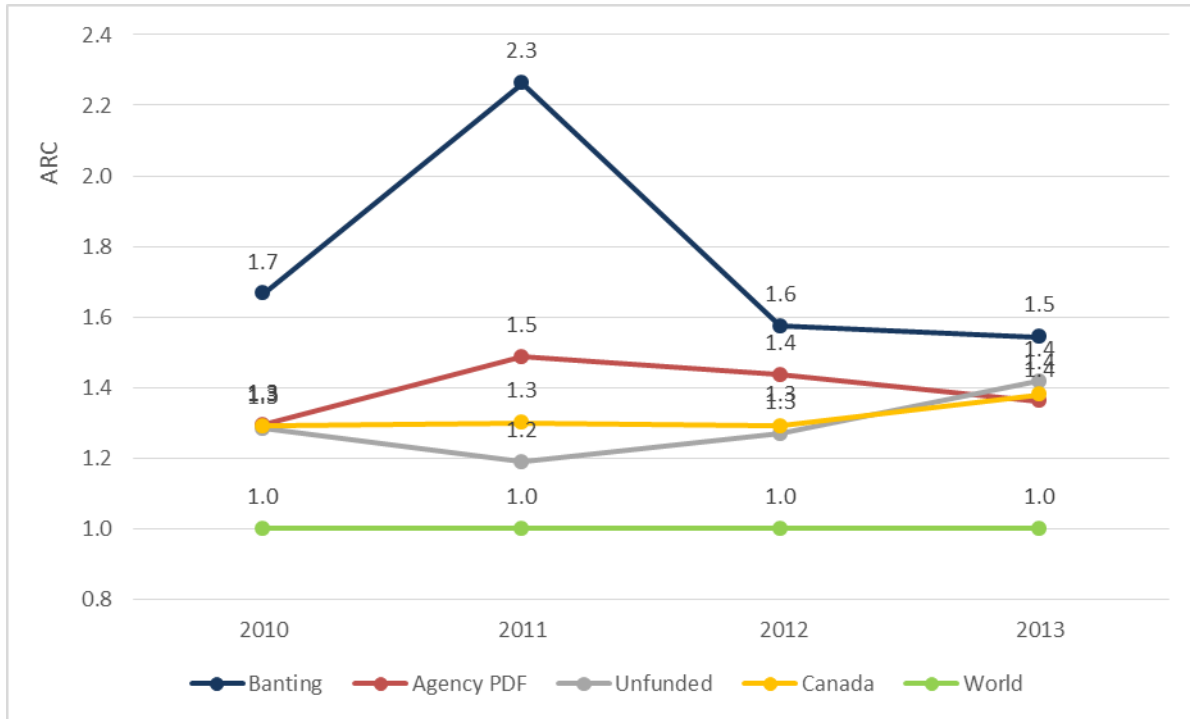
It should be noted that the results for the 2013 cohort are not consistent with what we see in the findings for other years. The funded applicants for 2013 are slightly less productive than the Agency PDF applicants (2.31 against 2.38) and more surprisingly, their ARC and ARIF scores are lower than those of Unfunded applicants. It is unclear why this is so however, overall, across the four cohorts, it is clear that the selected candidates performed better.

Beyond the differences between successful and unsuccessful candidates, the bibliometric analysis for the health sciences and natural sciences and engineering domains also indicate that the Banting program was attracting top-tier candidates. Their ARC scores irrespective of their funding status (except for Unfunded applicants in the health sciences domain) were higher than the ARC scores for Canadian and World researchers (Fig. 2.1-1).

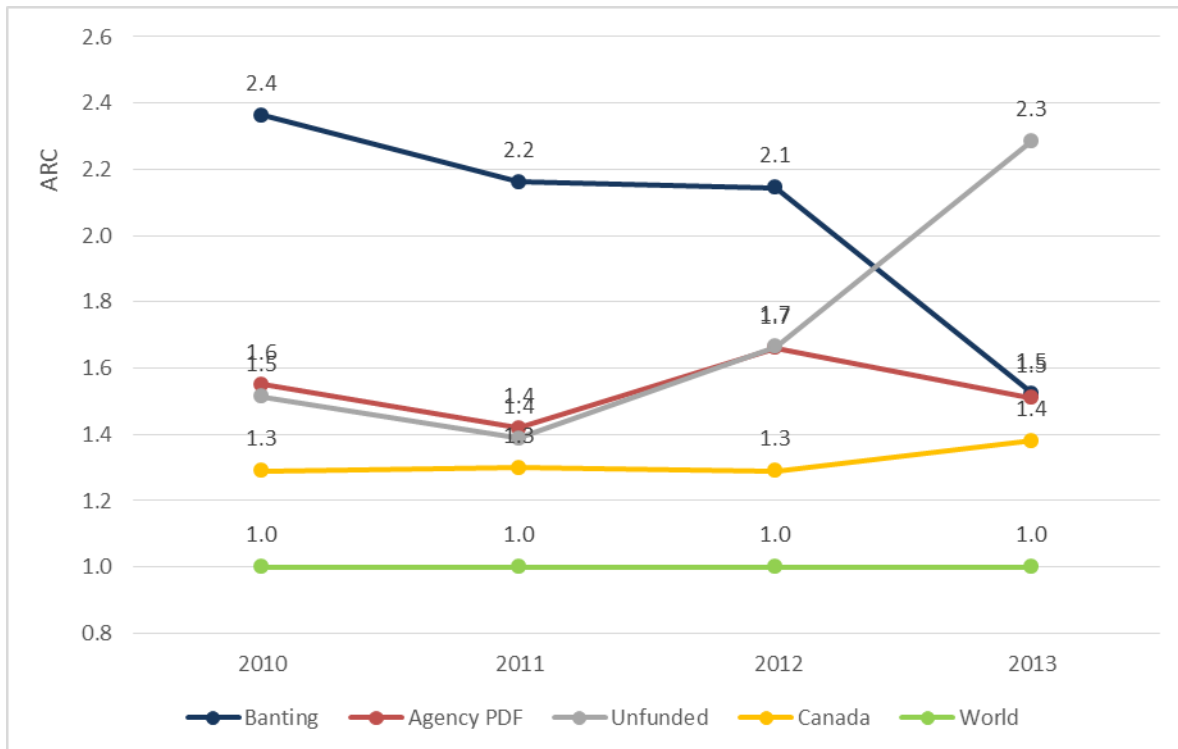


**Fig. 2.1-1: ARCs – Banting Applicants vs. Canadian and World Researchers in Health and NSE**

Health



NSE



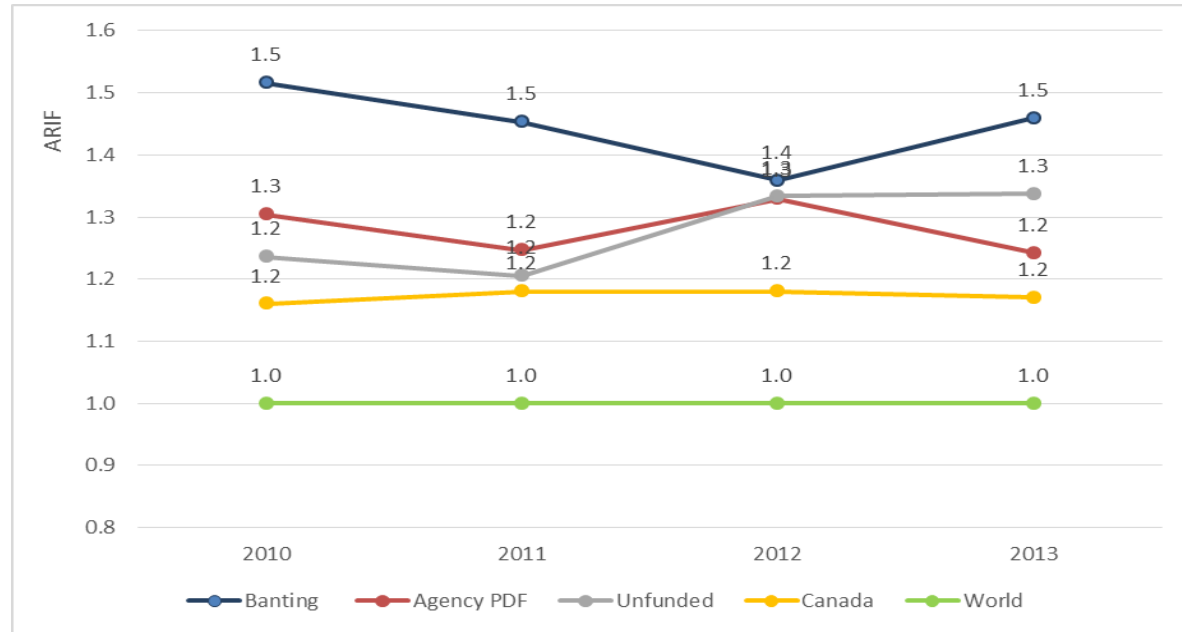
Source: Observatoire des sciences et des technologies (Thomson Reuters Web of Science) – Canadian Bibliometric Database current as of July 2014.



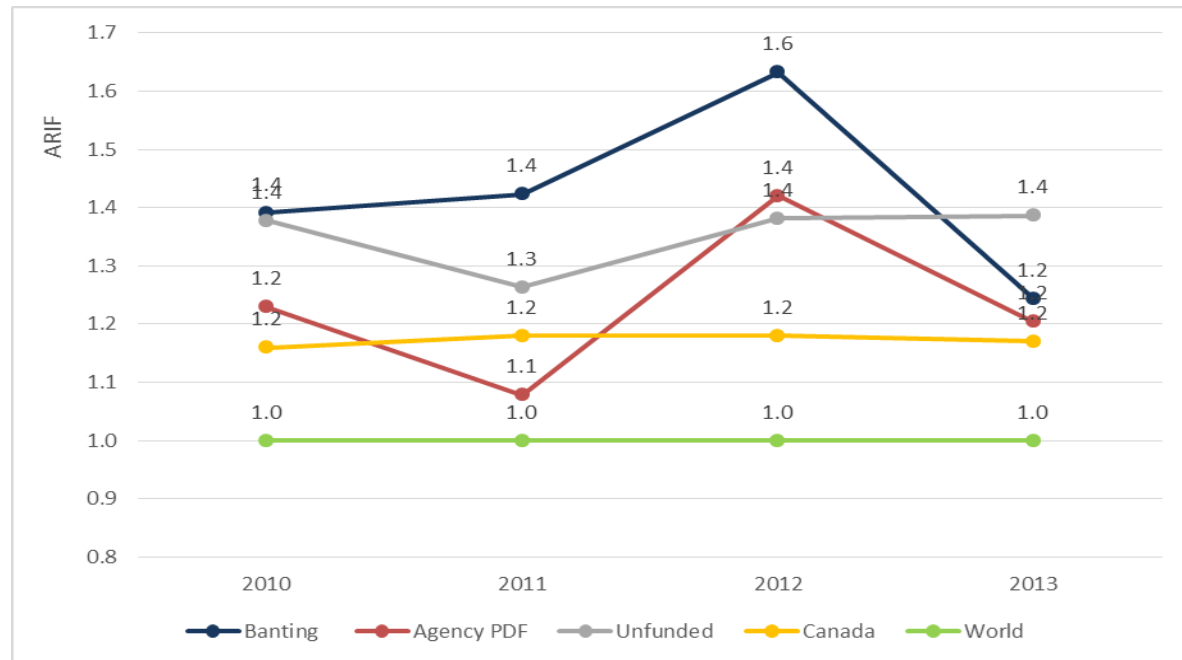


Second, the Banting applicants irrespective of funding status (except for 2011 with the Agency PDFs in the NSE domain) published in journals with higher impact (as measured by ARIF scores) than Canadian and World researchers (Fig. 2.1-2).

**Fig. 2.1-2: ARIFs – Banting Applicants vs. Canadian and World Researchers in Health and NSE**



NSE



Source: Observatoire des sciences et des technologies (Thomson Reuters Web of Science) – Canadian Bibliometric Database current as of July 2014.





Findings from the key informant interviews showed that supervisors of Banting fellows and senior representatives in fellows' host institutions considered Banting PDF applicants to be of a high quality, describing them in such terms as "exceptional," "outstanding" and "driven."

*"He is absolutely exceptionally outstanding!"* Fellow's supervisor.

*"These are very highly dynamic, highly focused, highly successful, highly driven people who are aiming to be very successful and they're probably very driven around their research."*

Host institution representative.

Findings from analysis of the BEAR data corroborate the high quality of applicants. The findings showed that selected applicants are in very high demand:

- 52% (55/106) of former fellows (from the first two cohorts) who completed the BEAR had been offered other fellowships at time of notification of the Banting award.
- The fellowships were usually from CIHR, NSERC, SSHRC, the Ontario provincial government, voluntary organizations (e.g., Heart & Stroke Foundation) and international sources (e.g., US, Brazil and Japan).
- One had been offered a visiting assistant professorship at a US university and another had a fellowship from Harvard University.
- One-third (32%; 34/106) of responding former fellows left Banting before the full term. Of these, 88% (30/34) said they obtained another position with only 12% citing personal or other reasons.

Findings from the survey of Banting PDF selection committee members showed that over one-half (56%) of the members ranked Banting applicants in the top 10% and 86% ranked them in the top 20% of all fellowships they had reviewed in comparison to other programs. Also, when asked to assess the ability of the selection process to pick the best applicants, using a 7-point extent scale (where 1 meant "no extent" and 7 meant "great extent"), three-quarters (73%) of the selection committee members responded with a 6 or 7, confirming their strong belief in the efficacy of the Banting PDF selection process.

### **Attraction and Retention Versus 25% Cap on Training Outside Canada**

The Banting program has a requirement that 25% of the 70 annual awards can be held outside Canada and this raises the potential that a better candidate could be skipped over if they proposed a foreign host institution and the 25% cap had been reached.

Analysis of program administrative data revealed that the proportion of applicants proposing to take the Banting fellowship to a foreign institution increased steadily from 16.4% in the 2010-11 competition year to 29% in 2013-14 (Table 2.1-3). Over the same period, the number of otherwise successful applicants who were passed over in favour of lower ranked applicants



because of the cap ranged from zero in the first year to five in 2012-13. As a proportion of the 70 annual awards, the proportion of applicants passed over for the four year period being examined in this evaluation averaged 4%.

In the absence of any benchmark data, it is difficult to give an interpretation to the 4% except to say that 4% of the best and brightest top-tier candidates were not selected. It should be noted that eight applicants (or 11% of the 70 awards) were passed over in the most recent competition (2014-15, outside the scope of this evaluation). Thus it seems that the cap has resulted in a tension whereby the program's objective to attract and retain top-tier postdoctoral talent in Canada is limiting the selection of the best applicants from among those who wish to hold their fellowship abroad.

**Table 2.1-3: Banting Applicants by Citizenship and Proposed Location of Training (Canada vs. Abroad) 2010-2014<sup>6</sup>**

	Canadian/Permanent Resident in Canada		Canadian/Permanent Resident Abroad		International Trainee in Canada		Annual Total		Applicants Skipped	
	N	%	N	%	N	%	N	%	N	% (of 70)
<b>2010-11</b>	290	44.1%	108	16.4%	260	39.5%	658	100%	0	0.0
<b>2011-12</b>	196	39.1%	107	21.4%	198	39.5%	501	100%	2	2.7
<b>2012-13</b>	158	35.7%	122	27.6%	162	36.7%	442	100%	5	7.1
<b>2013-14</b>	159	36.7%	126	29.0%	149	34.3%	434	100%	3	4.3
<b>Total</b>	<b>803</b>	<b>39.5%</b>	<b>463</b>	<b>22.8%</b>	<b>769</b>	<b>37.8%</b>	<b>2035</b>	<b>100%</b>	<b>10</b>	<b>3.5</b>

Source: Administrative data from Vanier-Banting Secretariat.

The implications of the 25% cap can also be examined from the perspective of the number and proportion of Banting fellows who were foreign citizens and came to Canada versus Canadians and permanent residents who went abroad and those who remained in Canada for their training (Table 2.1-4). Of the 283 Banting fellowships awarded over the period 2010-2014, about one third of fellows (31% or 87) were foreign citizens who were hosted at an institution in Canada while one quarter (25% or 71), as stipulated by the cap, were Canadian citizens or permanent residents who travelled outside Canada for their training and about two-fifths (44% or 125) were also Canadian citizens or permanent residents who remained in Canada for their training. The difference of 16 (87-71) between international fellows hosted in Canadian institutions and Canadians and permanent residents hosted abroad could be interpreted as a net gain in terms of having fellows being physically present in Canada. However, it should be

<sup>6</sup> Note that in the first year of the program each selection committee was given a quota of five applications to be hosted outside Canada and the Board made the final recommendations. The process was changed in subsequent years with applications now being awarded based on their relative rankings until all the awards (25% - 18 awards) are used up.

noted that there is no guarantee that the international fellows will remain in Canada or that Canadians abroad would return home after their postdoctoral training. For example, if it is assumed that the 10 higher ranked applicants who were passed over because of the cap (see Table 2.1-3) would have displaced 10 foreign citizens taking up the award in Canada, that would have led to a net outflow or loss (i.e. awards being taken up abroad) of 4 fellows,<sup>7</sup> a rather small number relative to the total of 283 fellows. It would be useful to monitor the numbers of Canadians/permanent residents taking up their Banting fellowship in Canadian institutions in relation to those going abroad as well as international fellows coming to Canada paying particular attention to longer term outcomes such as where they end up five and ten years after their training.

**Table 2.1-4: Banting Fellows by Citizenship and Location of Training (Canada vs Abroad), 2010-2014**

	Canadian/Permanent Resident in Canada		Canadian/Permanent Resident Abroad		International Trainee in Canada		Annual Total <sup>8</sup>	
	N	%	N	%	N	%	N	%
<b>2010-11</b>	30	42.9%	18	25.7%	22	31.4%	70	100%
<b>2011-12</b>	31	42.5%	18	24.7%	24	32.9%	73	100%
<b>2012-13</b>	31	44.3%	17	24.3%	22	31.4%	70	100%
<b>2013-14</b>	33	47.1%	18	25.7%	19	27.1%	70	100%
<b>Total</b>	125	44.2%	71	25.1%	87	30.7%	283	100%


Source: Administrative data from Vanier-Banting Secretariat.

Opinions were split among key informant interview participants as to whether the 25% cap was necessary. The issue was not particularly salient among the key informants as it was not usually brought up spontaneously until prompted by the interviewer. Opinions were diverse including: removing the 25% cap and allowing the exchange of knowledge across international boundaries; restricting the fellowship only to Canadian host institutions; and deferring any action until the proportion of foreign-hosted Banting PDFs who eventually returned to Canada was known.

*“International utilization is fundamental to academic research. All of us studied in other countries. We work with researchers in other countries, being international and certainly in today’s global economy, the strongest researchers are part of international networks. And I think we should be doing everything we can to facilitate and see Canada as a player in those international networks. And I think we should open it up....So let the high flier postdoc go with their money and go where they want to go.”* Host institution representative.

<sup>7</sup> Canadians/permanent residents going abroad (71+10=81) and internationals coming to Canada (87-10=77) and therefore 81-77=4.

<sup>8</sup> Note that in 2011-12, a total of 73 fellowships were awarded.



*“That is a pipeline that is kind of open; but we are losing equal numbers of good people to other institutions in United States and elsewhere. So Banting has to really make it very clear that we will, if it’s retention, it’s attraction, we only allow postdocs coming into the country and working here - not allowing them to go overseas because they ... then disappear. They will never come back.”* Host institution representative.

*“But I'd want to know, for the people who do get it, what the percentages that come back are and if there's a good percentage that do come back, then it might be worth raising the 25% limit.”* Fellow’s supervisor.

Opinion among Banting selection committee members was also diverse. While 48% (25/52) of respondents to the survey were satisfied or very satisfied with the 25% cap, just over one-third (36%) were dissatisfied or very dissatisfied. An additional 10% of the committee members were neither satisfied nor dissatisfied with the cap and 6% did not know.

### **Attracting Foreign Citizens Versus Canadians and Permanent Residents**

Analysis of the Banting program application data shows that the proportion of foreign applicants was fairly steady for the first three years but fell to just over one-third in the last year under study (see Table 2.1-3), and declined further , to just over one quarter of applications (26%) in the most recent competition (2014-15). Also, the number of Canadians and permanent residents applying to the program fell for two years after program launch but has subsequently reached 564 in 2014-15, surpassing first-year levels.

The program is focused on attracting top class talent both nationally and internationally and therefore the recent decline in the proportion of applications from abroad may warrant further examination as other lines of evidence raise similar concerns.

There were indications from analysis of the key informant interviews that the program appeared to be too centered on Canada and might not be attracting enough international candidates.

*“I think it's probably still kind of Canada-centric.”* Fellow’s supervisor.

*“In terms of bringing in international researchers through the program, the results have been to my mind less than stellar... Canadian professors are only going to nominate someone who they know. And they only know students and researchers with whom they have worked. So for an international researcher who may be crème de le crème of researchers, if they haven't had direct and ongoing relations with a Canadian professor, they can't even apply.”* Federal agency representative.





The program requires the demonstration of synergy between an applicant's research program and the strategic priorities of the proposed host institution. It is possible that international candidates with little or no connection to Canadian researchers or host institutions might be encountering problems developing such relationships which might put them at a disadvantage. Further examination of the factors underlying the decline in foreign applications might therefore be warranted.

Apart from attracting top talent, there were further indications from the qualitative analysis results that the Banting program was already being used to retain some of that top talent in academia although not necessarily only in Canada.<sup>9</sup> It was noted in the key informant interviews that host institutions were leveraging the Banting fellowship to retain high quality researchers who had already been attracted through the institutions' other funding mechanisms.

*"The candidate arrived without any scholarship right after finishing her doctorate in 2013, but she wasn't eligible to apply for the Banting because she hadn't received it in that fiscal year, something like that, and so, she was awarded the PBEEE [Programme de bourses d'excellence pour les étudiants étrangers - Merit Scholarship Program for Foreign Students], and then we applied for the Banting, so she was [already] here when we applied for the Banting."* Fellow's supervisor.

*"Because I was aware of his talent, I had brought him to Canada with an exchange program for a year."* Fellow's supervisor.

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<sup>9</sup> Retention of talent in Canada is presented in detail in Section 2.6 of this report.





## 2.2 TRAINING AND SUPPORT

Evaluation Question: To what extent have Banting fellows received appropriate training and support to carry out their research programs?

### Key Findings

- **Banting fellows, Agency PDFs and Unfunded applicants rated their training environments very highly**, including: quality of supervision and mentorship, research resources, and office space. This was consistent with the claims of supervisors and host institution representatives that they provided all postdoctoral trainees regardless of type of fellowship, with a wide range of training and mentorship opportunities.
- **Banting fellows were more likely than Agency PDFs and Unfunded applicants to report that they had received guidance and encouragement from their supervisors to pursue a research career**, and that the postdoctoral experience had increased their desire to pursue such a career and improved their prospects of securing permanent employment.
- **Banting fellows were accessing extra supports usually reflecting the institutional commitments that had been made at the application stage** to support their candidature, including: seniority status in relation to other trainees; appointment into positions that allowed them to apply independently for grant funds; enrollment in faculty development programs and other customized professional development programs; extra research funds; office space, and conference travel.
- **There was wide variation in the additional supports provided by host institutions** such as being given the opportunity to independently apply for research grants or being paid a preferential rate for teaching and this variation could impact the ability of Banting fellows to conduct independent research.

Candidates apply for the Banting PDF in collaboration with their proposed host institutions who are expected to demonstrate synergy between their institutions' priorities and the candidates' proposed research. The institutions are also required to commit to providing the necessary training and support to the candidates to ensure a successful tenure. Surveys of applicants and key informant interviews with fellows' supervisors and senior representatives of host institutions provided evidence on the extent to which the Banting fellows received appropriate training and support to carry out their research programs.

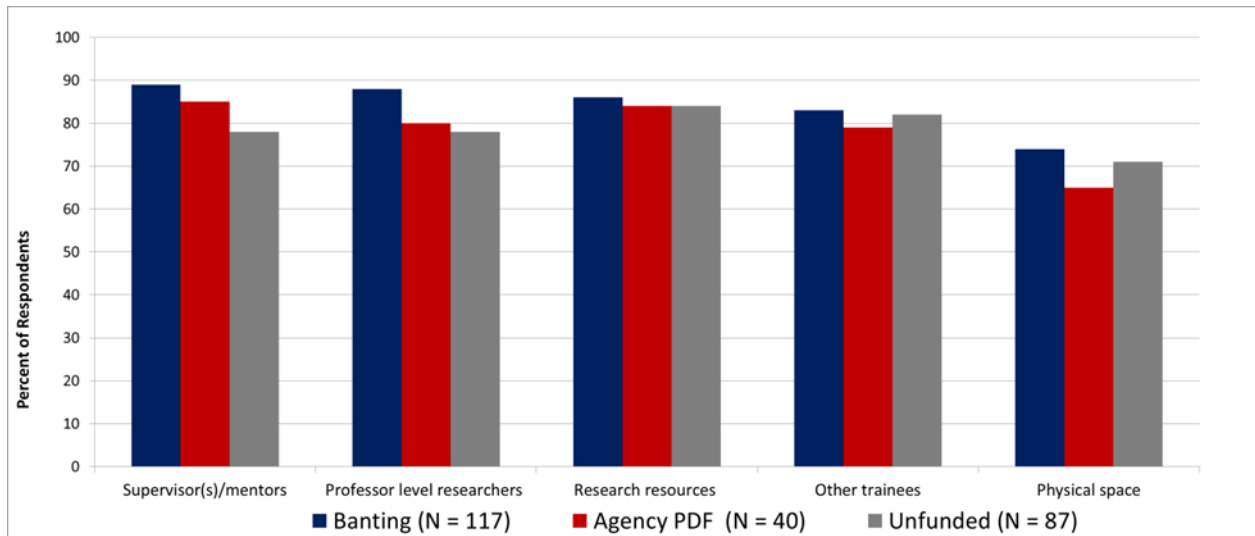
### Research Environment

Survey findings showed that Banting fellows were just as likely as comparison groups to rate their research environment very highly (Fig. 2.2-1). The research environment included the



quality of the supervisors, mentors, and other professor-level researchers with whom they worked and also the quality of other trainees such as colleague postdoctoral fellows, graduate, and undergraduate students. It also included research infrastructure and resources such as equipment, databases, and physical space, for example, building, laboratory, and office space. This finding is consistent with that of a nationwide survey of postdoctoral trainees that reflected a similarly favourable perception of the Canadian research environment (Mitchell et al., 2013).

**Fig 2.2-1: Percentage Reporting Research Environment to be Good or Excellent**



Source: Survey of Banting Applicant 2015 and Banting End of Award Report 2010–2011 and 2011–2012.

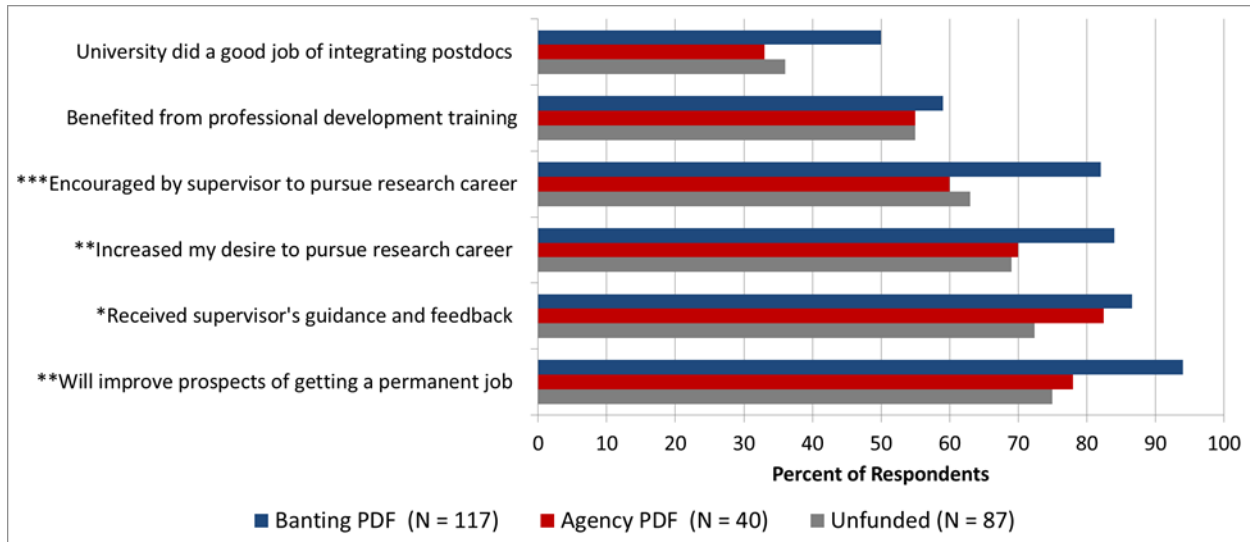
### Support Received

The Banting PDFs were more likely than the Agency PDFs and the Unfunded applicants to report that the postdoctoral experience had increased their desire to pursue a research career, that it would improve their prospects of getting a permanent job, that they received guidance and feedback from their supervisor, and that they were encouraged by their supervisor to pursue a research career (Fig. 2.2-2). These differences were statistically significant.





**Fig. 2.2-2: Support Received by Funding Status – Percent Saying Agree or Strongly Agree**

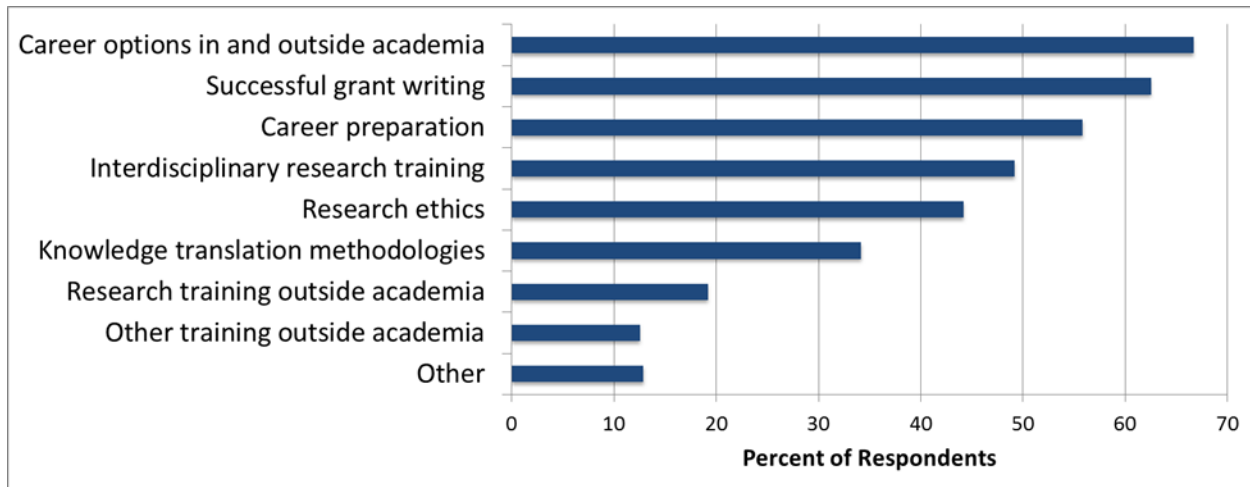


Source: Survey of Banting Applicant 2015 and Banting End of Award Report 2010–2011 and 2011–2012.

\* p<0.05; \*\* p<0.01; \*\*\* p<0.001.

When presented with a list of types of training they had received, Banting fellows often selected receiving advice on career options within and outside academia, training in grant writing, and career preparation skills such as interview skills and preparing curriculum vitae (Fig.2.2-3). Only a few selected training outside academia such as industry, laboratory, policy, and patent law or business.

**Fig. 2.2-3: Types of Training Received by Banting Fellows (%)**



Source: Banting End of Award Report 2010–2011 and 2011–2012.

Findings from the key informant interviews corroborated the support and training reported by the Banting fellows. Host institutions and supervisors provided Banting fellows with a wide range of training opportunities and mentorship (both formalized programs and informal) although these were usually the same as those provided to other graduate and postdoctoral





trainees. The professional development opportunities included: grant writing, CV preparation, interview skills, negotiating job offers, supervising doctoral students and building a research group, effective collaborations and effective networking, knowledge translation and mobilization, communication skills, project management, intellectual property regulation, and entrepreneurship.

Some Banting fellows however, received additional opportunities and supports such as being appointed as adjunct professors which enabled them to apply independently for research funds like other faculty members, seniority status over other trainees at initial appointment, cash or in-kind support for research, enrollment in faculty development programs, and customized professional development programs. These supports were usually what the institutions had committed to in the candidate's application.

*“When the [application] form says what additional commitment, financial and otherwise, well we know it would be competitive, you’ve got to step up.”* Host institution representative.

*“And that's part of the actual application and that's highlighted in the institutional letter [of support].”* Host institution representative.

Analysis of the qualitative data on supports for Banting fellows suggests that there are some supports that are usually in place, others are sometimes in place and others are rarely in place. Some supports such as provision of office space, computers and access to library facilities appear to be taken as given. Professional development or training workshops were always provided to postdoctoral trainees, however, not all topics were necessarily available at one institution. At the same time, professional development programs specially customized for top-tier talent, for example, being enrolled in a faculty development initiative, appeared to be rare (Table 2.2-1).



**Table 2.2-1: Type and availability of supports provided by host institutions to Banting Fellows**

Type of Support	Usually in place	Sometimes in place	Rarely in place
Dedicated office space /cubicle/Postdoctoral office	√ Basic space with desk and chair; sometimes shared with others	√ Bigger space, not shared	
Computers	√		
Laboratory and other equipment	√ Trainees typically apply to a particular institution because certain facilities already exist there.	√ Extra equipment specific to fellow's line of research –e.g., transcription equipment for qualitative researcher	
Access to library	√		
Status/level of appointment	√ Regular postdoctoral trainee		√ Advanced trainee status; Adjunct professor, junior faculty or similar status with ability to apply independently for grant funds and manage own research account; Banting fellowship attached to tenure track position.
Research grant		√ Some funds may be available through institution-wide competition or from supervisor's grant	√ Guaranteed amount per annum (e.g., \$15,000) for duration of fellowship, to be used independently by fellow for their own research.
Publication grant			√ Funds to help with journal publication costs
Mentorship	√ Mentoring by supervisor; informal interactions with other experienced faculty.	√ Formalized, structured mentorship program; may not necessarily be with supervisor but other faculty mentor.	√ Formalized, structured mentorship program with specific requirements such as participating in selected workshops, having an individualized development plan.
Networking opportunities	√ Occasional guest lectures, conference presentations		√ Presenting at formalized guest lecture series, e.g., Banting Fellowship Seminar Series; running an already established seminar series
Conference travel	√ Postdoctoral travel awards, Institution-wide competition open to all postdoctoral trainees		√ Several conferences per annum



Type of Support	Usually in place	Sometimes in place	Rarely in place
Funds for travel to work or study tour of other laboratories			√ Stipend for travel to work in other laboratories
Management skills and other such opportunities		√ Informal supervision and/or mentoring of students	√ Managing a laboratory, supervising doctoral students and other postdoctoral trainees, managing and reporting on status of laboratory account and budget
Teaching opportunities	√ Access to teaching and learning centre or equivalent, teaching undergraduate classes		√ Graduate certificate program in university teaching; being paid at a preferential rate for teaching
Professional development/training workshops		√ Available to all fellows although offerings may differ across institutions	√ Enrollment in customized professional development programs for top-tier talent, e.g., faculty development initiative
Benefits package	√ Access to gymnasium/fitness facilities; health/dental insurance especially for fellows in Canadian host institutions		√ Health/dental insurance especially for fellows in US; healthcare and other benefits are treated as separate payment in addition to Banting award; priority access to campus day care and social events.

NB: The checked symbol (√) indicates availability of that type of support.

In a similar vein, while one Banting fellow was guaranteed a fixed amount for research for the duration of the fellowship, another received only a modest amount for travel while a third received nothing beyond the Banting stipend thus further confirming the variation in availability of training opportunities and supports across institutions.

*“They gave me a pretty big research fund for each year, \$15,000 each year to use as a research fund and for travel.”* Focus group participant.

*“I received a little bit of travel money at least from the department.”* Focus group participant.

*“For me, I don't have any money...So nothing else, not any other financial support or services or something in that manner.”* Focus group participant.





## 2.3 DEMONSTRATION OF RESEARCH EXCELLENCE AND LEADERSHIP

Evaluation Question: To what extent have Banting fellows demonstrated research excellence and leadership?

### Key Findings

- **Bibliometric analysis indicates that after receiving the award, Banting fellows in the health sciences and natural sciences and engineering had higher ARC and ARIF scores than their respective cohorts of Agency PDFs and Unfunded applicants.**
- **Fellows' supervisors and representatives of host institutions saw Banting fellows as strong research leaders and change agents.**
- **Banting fellows spent over two-thirds of their time on research** and less on teaching, supervision, administrative tasks and other activities; these proportions were however, similar to those of Agency PDFs and Unfunded applicants.
- **Almost all Banting fellows, Agency PDFs and Unfunded applicants believed that their research leadership abilities had developed to a great extent or some extent** as a result of their postdoctoral training. However, only half of these three groups held a similar perception about the extent to which their teaching and service leadership abilities had developed during their training.
- **As compared to research leadership development activities,** Banting fellows were less likely to engage in teaching leadership development activities and least likely to engage in service leadership development activities.

A key expected outcome of the Banting fellowship is the demonstration of research excellence and leadership by fellows about two to four years after receiving their Banting PDF training. The first aspect of this outcome, the demonstration of research excellence, was assessed by examining Banting fellows' research productivity and impact (as measured by bibliometrics) in the two to three year period following the award of the fellowship.<sup>10</sup> This was then triangulated with findings from key informant interviews with fellows' supervisors and host institution representatives.

Research productivity was measured by the average annual number of papers produced by Banting fellows from the first two competitions and their corresponding cohort of unsuccessful applicants while research impact was measured by their ARC and ARIF scores. This use of only the first two competitions allowed for at least a two-year observation window for each cohort - publications of the 2010 applicants were examined for the years 2011, 2012, and 2013 while

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<sup>10</sup> Note that as stated earlier in this report, bibliometrics findings are presented only for the health sciences and natural science and engineering domains.





those of 2011 applicants were examined for 2012 and 2013. The bibliometrics method annualizes the data to account for variations in the widths of the observation windows.

Banting fellows' demonstration of leadership was examined by assessing the proportion of time spent on research activities versus other activities such as teaching, supervision and administrative tasks. Other measures of demonstration of leadership were Banting fellows' perceptions of the extent to which their leadership skills had developed as a result of the fellowship and the extent of their involvement in leadership development activities in the three domains of research, teaching and service.

### **Research Excellence: Health Sciences**

The bibliometric analyses for the period following the award of the fellowship showed that in the health sciences domain, the Banting fellows produced on average, slightly more papers (1.6) than the Agency-PDFs (1.5) and 60% more than Unfunded applicants (1.0) (Table 2.3-1).<sup>11</sup> Also, the papers of Banting fellows were significantly more cited (ARC=2.46;  $p<.05$ ) than those of Unfunded applicants (ARC=1.41). They were more cited than the Agency PDFs (2.01), but this difference was not statistically significant (Table 2.3-1).

The ARIF scores showed that the Banting fellows also published their papers in journals with higher impact (1.70) than Agency-PDFs (1.46,  $p<.01$ ) and Unfunded applicants (1.26,  $p<.001$ ) (Table 2.3-1). It should be noted however, that the higher overall ARIF score for the Banting fellows is largely due to the 2010 cohort since the analysis showed lower bibliometric indices for the Banting fellows in 2011. The results seem to suggest that two years may not be enough time to show a predictable trend in the ARC and ARIF indices in any particular direction and therefore caution needs to be exercised in interpreting the findings.

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<sup>11</sup> As previously noted (see Footnote 5) the "average annual number of papers" as computed in the report cannot be used for statistical tests because it is not simply the sum of the number of papers published by each researcher divided by the number of researchers, but instead, the number of distinct papers produced by the group, divided by the number of researchers in the group and the number of years considered. A key strength of this method is that it avoids the double counting of papers and is therefore robust. Further details of the evaluation methodology are provided in Appendix D.



**Table 2.3-1: Bibliometric scores after Banting PDF application, by type, funding status and competition year. (Health)**

	Banting PDF	Agency PDF	Unfunded
<b>Average Number of Papers</b>			
2010	1.81	1.41	0.92
2011	1.44	1.56	1.02
2010-2011	<b>1.64</b>	<b>1.46</b>	<b>0.97</b>
<b>Average of Relative Citations (ARC)</b>			
2010	3.06	2.03	1.26
2011	1.20	2.18	1.67
2010-2011	<b>2.46</b>	<b>2.01</b>	<b>1.41</b>
<b>Average of Relative Impact Factors (ARIF)</b>			
2010	1.86	1.51	1.23
2011	1.36	1.37	1.32
2010-2011	<b>1.70</b>	<b>1.46</b>	<b>1.26</b>

Source: Observatoire des sciences et des technologies (Thomson Reuters Web of Science) – Canadian Bibliometric Database current as of July 2014.

#### Research Excellence: NSE

The bibliometrics findings for the natural sciences and engineering (NSE) applicants showed that the Banting fellows produced on average more papers (1.8) than the Agency-PDFs (1.5), and the Unfunded applicants (1.4) (Table 2.3-2). The findings also showed that the papers of Banting fellows were significantly more cited (ARC=2.19,  $p < .01$ ) than those of Unfunded applicants (1.96). The ARIF scores showed that Banting PDFs published their papers in journals with similar impact (ARIF=1.34) as the Agency PDFs (1.33) and slightly higher impact than the Unfunded applicants (1.29) although these differences were not statistically significant (Table 2.3-2). As with the bibliometric results for the health sciences domain, the results for the NSE domain also need to be interpreted with caution due to the small number of data points.

**Table 2.3-2: Bibliometric scores after Banting PDF application by type, funding status and competition year. (NSE)**

	Banting PDF	Agency PDF	Unfunded
<b>Average Number of Papers</b>			
2010	1.72	1.41	1.50
2011	1.80	1.72	1.29
2010-2011	<b>1.76</b>	<b>1.52</b>	<b>1.41</b>
<b>Average of Relative Citations (ARC)</b>			
2010	2.62	1.37	2.06
2011	1.60	3.71	1.73
2010-2011	<b>2.19</b>	<b>2.13</b>	<b>1.96</b>
<b>Average of Relative Impact Factors (ARIF)</b>			
2010	1.33	1.24	1.31
2011	1.37	1.50	1.24
2010-2011	<b>1.34</b>	<b>1.33</b>	<b>1.29</b>

Source: Observatoire des sciences et des technologies (Thomson Reuters Web of Science) – Canadian Bibliometric Database current as of July 2014.



Overall, in the two to three year period after receiving the award, the Banting fellows in the health domain appeared to be showing higher levels of research productivity and impact than the Agency PDF and Unfunded applicants. Similarly, Banting fellows in the natural sciences and engineering domain appeared to be showing higher levels of research productivity than the Agency PDF and Unfunded applicants. They also appeared to be showing higher impact as measured by ARC scores than Unfunded applicants but they were broadly similar to the two comparator groups in terms of their ARIF scores. However, as has already been noted, the results for both the health and NSE domains need to be interpreted with caution as the only two data points in this time series do not show a predictable trend in the ARC and ARIF indices to warrant any definitive conclusions. These analyses should be revisited in future evaluations of the program at which point more data will become available.

Findings from the key informant interviews also confirmed the Banting fellows' demonstration of research excellence. They were seen as exceptional individuals who had established strong research credentials through their publications.

*"All our Bantings secured a tenure-track position... They were exceptional individuals."* Host institution representative.

*"We've got -- I should think about two or three papers out now. The last one went viral ... We had a lot of media attention. So it was in the New York Times...and here locally; so all of that was great."* Fellow's supervisor.

### **Demonstration of Leadership**

The Banting program is aimed at developing the leadership potential of recipients in three domains - research, teaching and service - and positioning them for success as the research leaders of tomorrow. The demonstration of leadership was assessed for each of the three domains.

To assess the extent to which postdoctoral fellows were provided with support to develop their leadership skills, all survey respondents were asked about how much time they spent on research, teaching versus other tasks; the extent to which their research, teaching and service leadership skills had developed as a result of their postdoctoral training; and for the Banting fellows specifically, the extent of their involvement in leadership development activities in each of the three leadership domains. This was then triangulated with key informants' perceptions of Banting fellows as demonstrators of excellence and leadership.

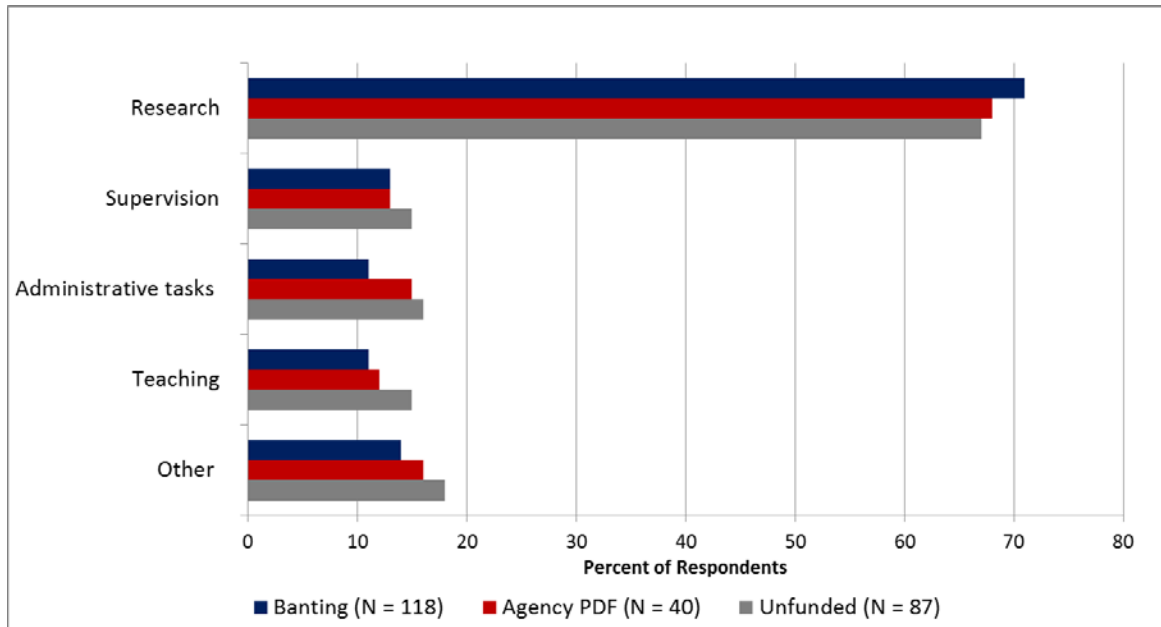
Broadly, the applicant survey and BEAR analysis findings showed no significant differences among Banting fellows, Agency PDFs and Unfunded applicants in terms of time spent on various activities (Fig. 2.3-1). All respondents irrespective of funding status spent the largest proportion





of their time, over two-thirds, on research activities and much less time on supervision, teaching and administrative tasks. However, the proportion of time spent on administrative activities by Banting fellows (11%) was found to be statistically different from those of Agency PDFs (15%) and Unfunded applicants (16%) ( $p < .05$ ).

**Fig. 2.3-1: Mean Percent Time Spent on Various Activities by Funding Status**



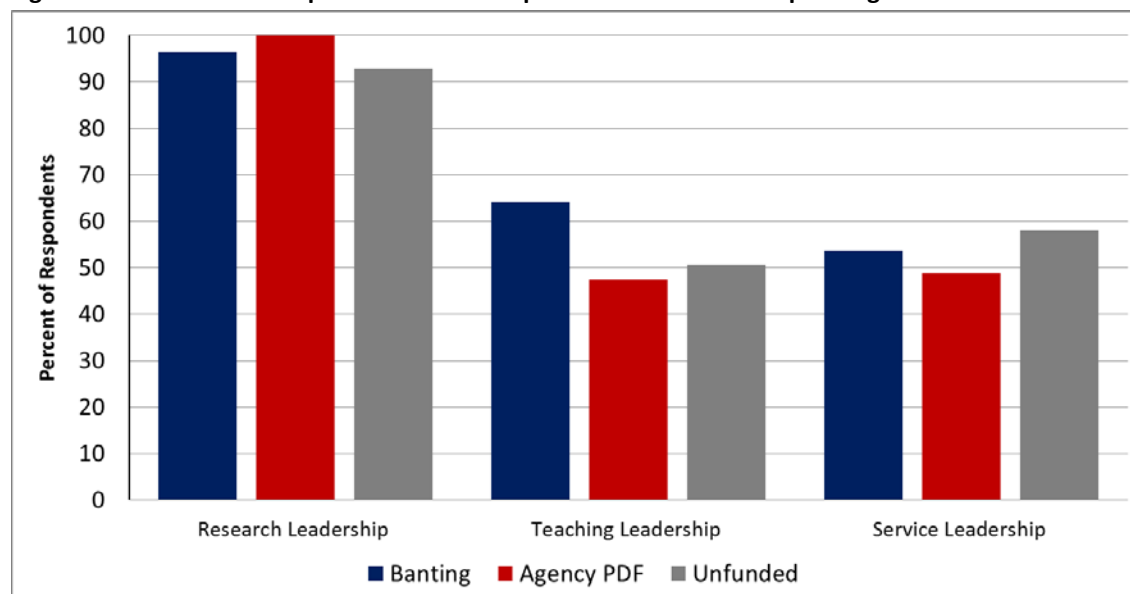
Source: Survey of Banting Applicants 2015 and Banting End of Award Report 2010–2011 and 2011–2012.

Perceptions of development of leadership abilities showed similar patterns as involvement in various activities, reflecting more emphasis on the research domain. Almost all Banting fellows, Agency PDFs and Unfunded applicants believed that their research leadership abilities had developed to some or a great extent as a result of the postdoctoral training (Fig. 2.3-2). In contrast, roughly one-half of each of the three groups indicated that their teaching and service leadership abilities had developed; Banting fellows were somewhat more likely to have identified teaching leadership (i.e., mentioned by almost two-thirds).





Fig. 2.3-2: Extent of Development of Leadership Abilities – Percent Responding to Some or Great Extent



Source: Survey of Banting Applicants 2015 and Banting End of Award Report 2010–2011 and 2011–2012.

Note: Ns for research leadership: Unfunded - 83, Agency PDF -36 and Banting fellows -112; for teaching leadership, Ns are 85, 38 and 109 respectively; and for service leadership Ns are 86, 39 and 110 respectively.

### Research Leadership

Apart from Banting fellows’ perceptions of their leadership abilities, findings from the key informant interviews and focus groups indicated that the fellows had strong skills in leadership in general and strong research leadership skills in particular. The Banting fellows were seen as candidates who had already established strong research leadership in their respective research fields and as change agents. The Banting fellows also saw the program as helping them to develop their leadership skills.

*“We put in five [candidates] this year but two or three of them scored so high internally on leadership that we really see them as change agents. It’s amazing what they’ve done in their short term.”* Host institution representative.

*“Le programme Banting nous aide à recruter des gens qui ont déjà un leadership scientifique et qui ont déjà beaucoup de succès.”* Host institution representative.

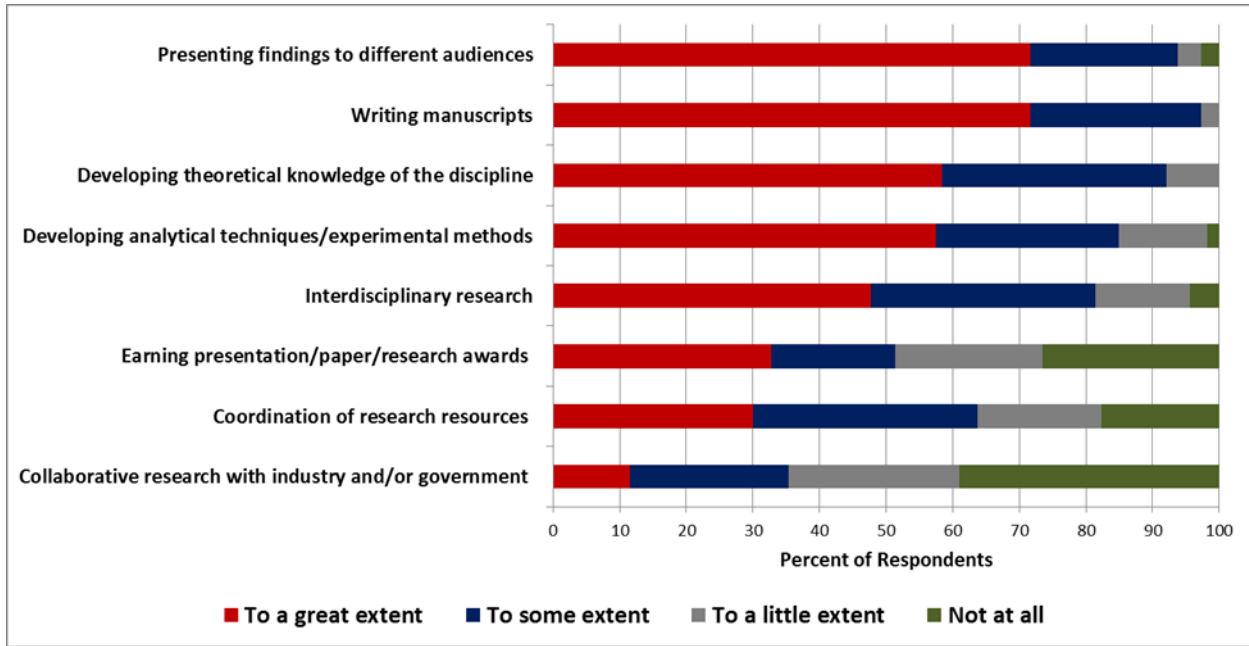
*“There are several ways in which this program has already helped me build leadership or I guess a bit of leadership skills and to develop my career. [It] allowed me funding to move in at a relatively senior position in a lab that was even a relatively different area from what I have done in the past.”* Focus group participant.





A majority of the Banting fellows were involved to a great extent in research leadership development activities; in particular, presenting findings to different audiences, writing manuscripts, developing theoretical knowledge of their discipline and developing analytical techniques and experimental methods (Fig. 2.3-3).

**Fig. 2.3-3: Extent of Banting PDFs' Involvement in Research Leadership Development Activities**



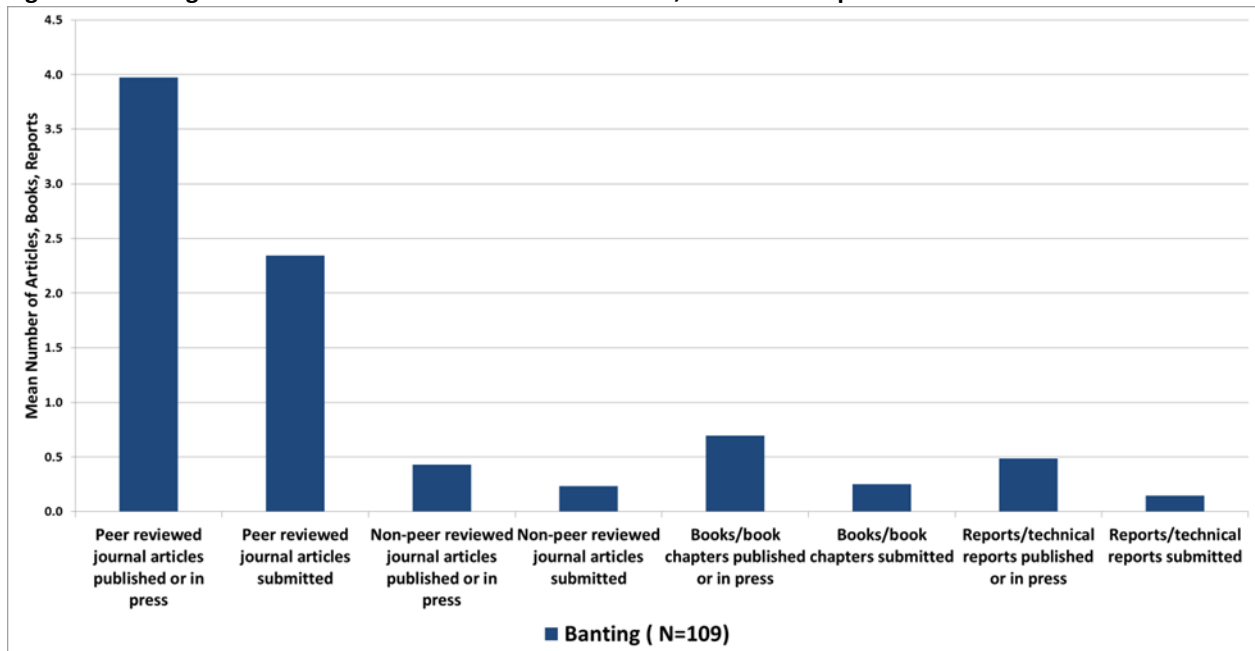
Source: Banting End of Award Report 2010–2011 and 2011–2012.

Banting fellows' involvement in research leadership development activities was further corroborated by other data that confirmed that they were submitting articles and getting published in peer-reviewed and non-peer reviewed journals, writing books, book chapters, technical reports and other reports (Fig. 2.3-4).





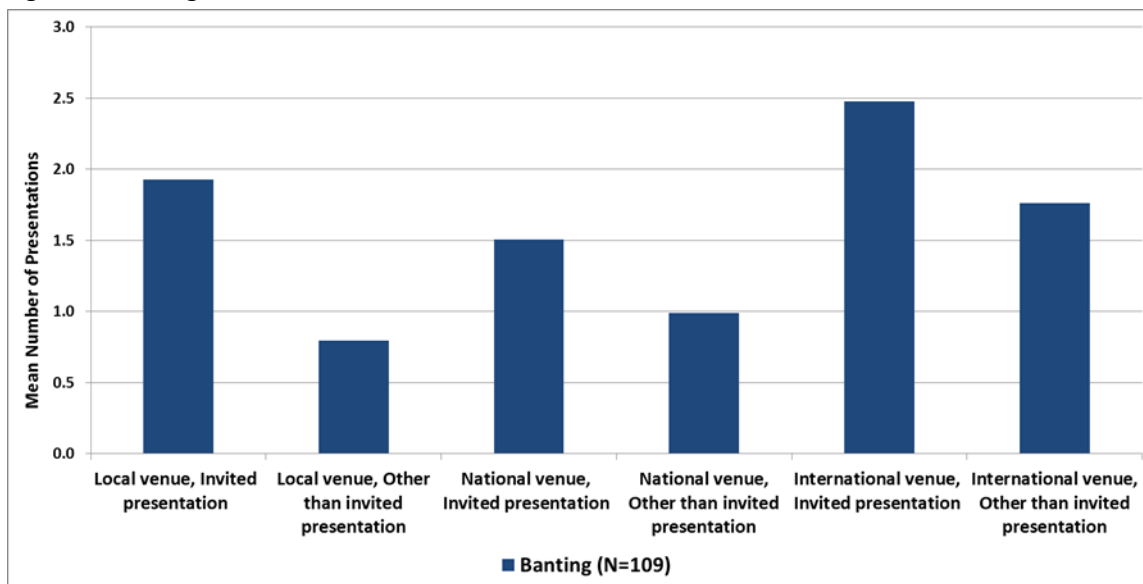
**Fig 2.3-4: Banting Fellows - Mean Number of Journal Articles, Books and Reports**



Source: Banting End of Award Report 2010–2011 and 2011–2012.

Additionally, Banting fellows were making invited presentations and other forms of presentations at local, national and international venues with invited presentations at international venues being the most common (Fig. 2.3-5).

**Fig 2.3-5: Banting Fellows - Mean Number of Local, National and International Presentations**



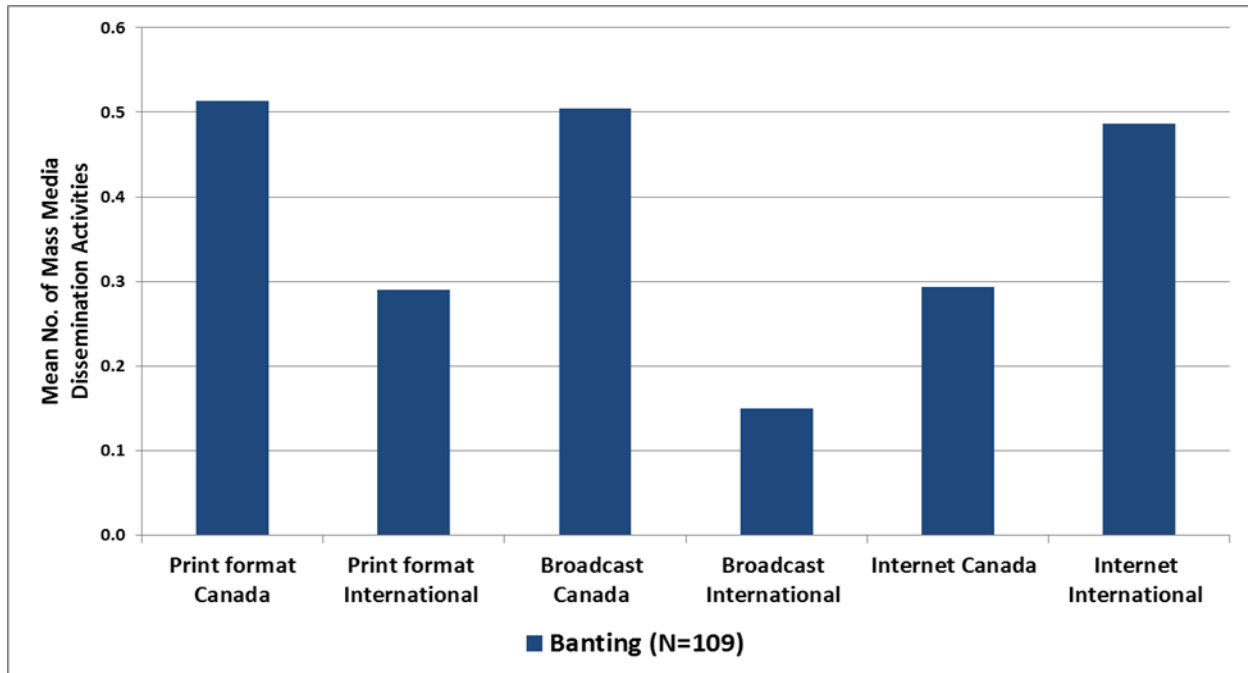
Source: Banting End of Award Report 2010–2011 and 2011–2012.





Banting fellows also engaged in knowledge dissemination activities through the Canadian print and broadcast media and the internet (Fig. 2.3-6).

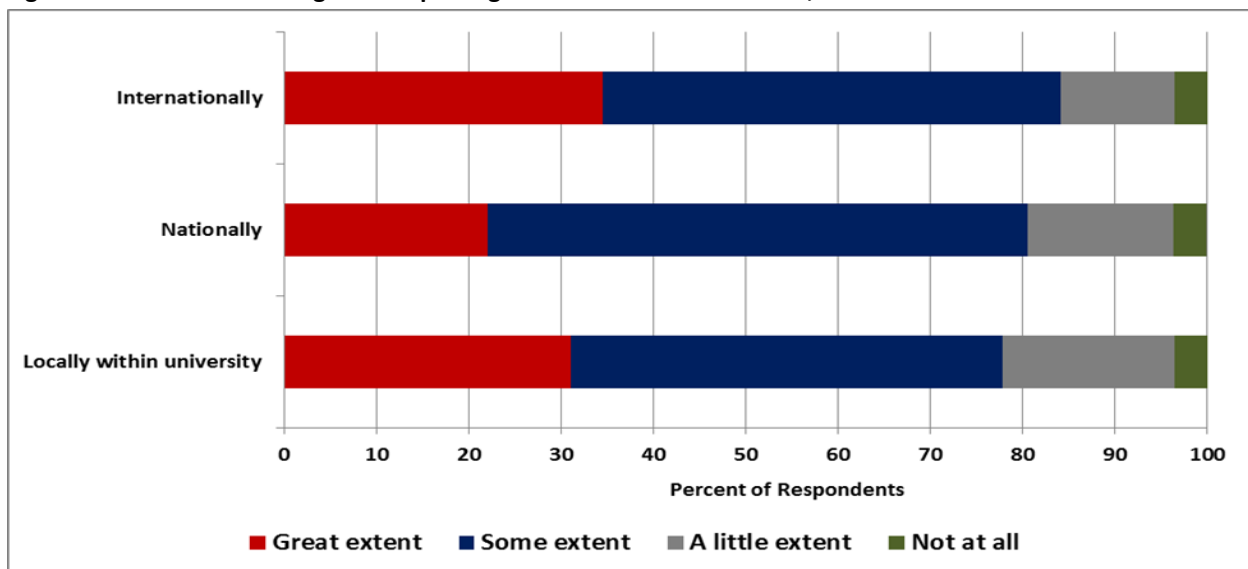
**Fig. 2.3-6: Banting Fellows - Mean Number of Mass Media Dissemination Activities**



Source: Banting End of Award Report 2010–2011 and 2011–2012.

When asked about the extent of influence of their research, over three-quarters of the Banting fellows expressed the belief that their research had influence to some extent or a great extent at each of three levels - locally within the university, nationally and internationally (Fig. 2.3-7).

**Fig. 2.3-7: Percent of Banting PDFs Reporting Research Influence at Local, National and International Levels**



Source: Banting End of Award Report 2010–2011 and 2011–2012



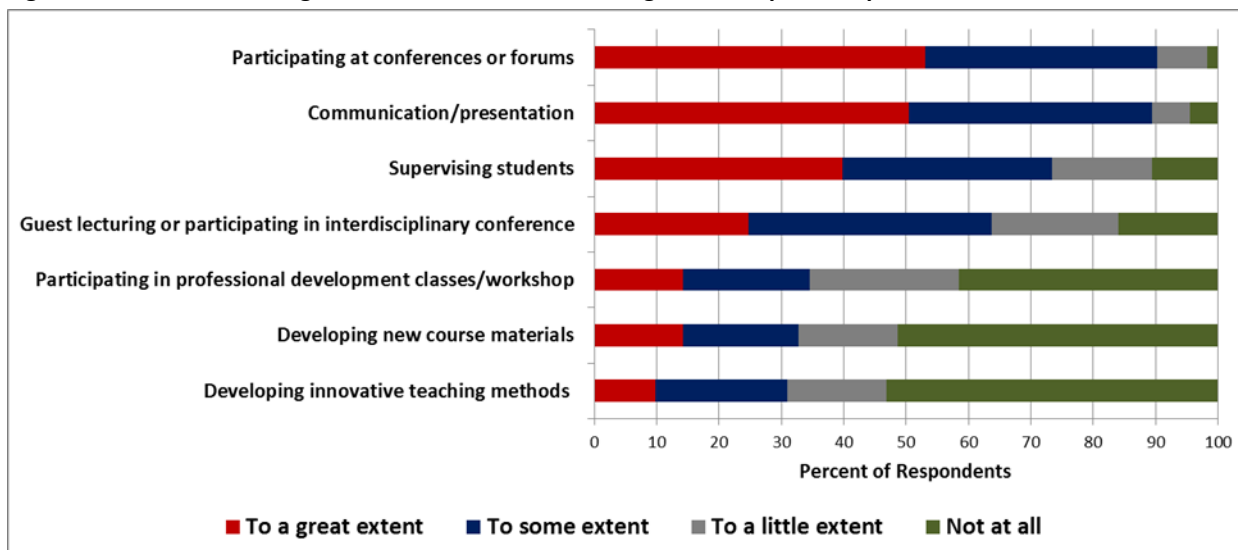




### Teaching Leadership

Findings from analysis of the BEAR data showed that majority of the Banting fellows were involved to a great extent or some extent in teaching leadership development activities, in particular, participating in conferences or forums, communication/presentation, supervising students, and guest lecturing or participating in interdisciplinary conferences (Fig. 2.3-8).

Fig. 2.3-8: Extent of Banting PDFs’ Involvement in Teaching Leadership Development Activities



Source: Banting End of Award Report 2010–2011 and 2011–2012.

The Banting fellows were not as involved in participating in professional development classes/workshops or developing new course materials or innovative teaching methods. Their lower levels of involvement in teaching as compared to research (as observed in Fig. 2.3-1) are not surprising. Findings from the key informant interviews also seemed to suggest that institutions were giving higher priority to research than teaching.

*“Well what the Banting tries to do and what we actually do with it, I think are two different things. Most universities, ours included, probably would make sure that the Banting fellow does -- research is the highest priority and give some opportunities to develop leadership skills and teach a little bit; positioning for doing research under very positive conditions.”* Host institution representative.

### Service Leadership

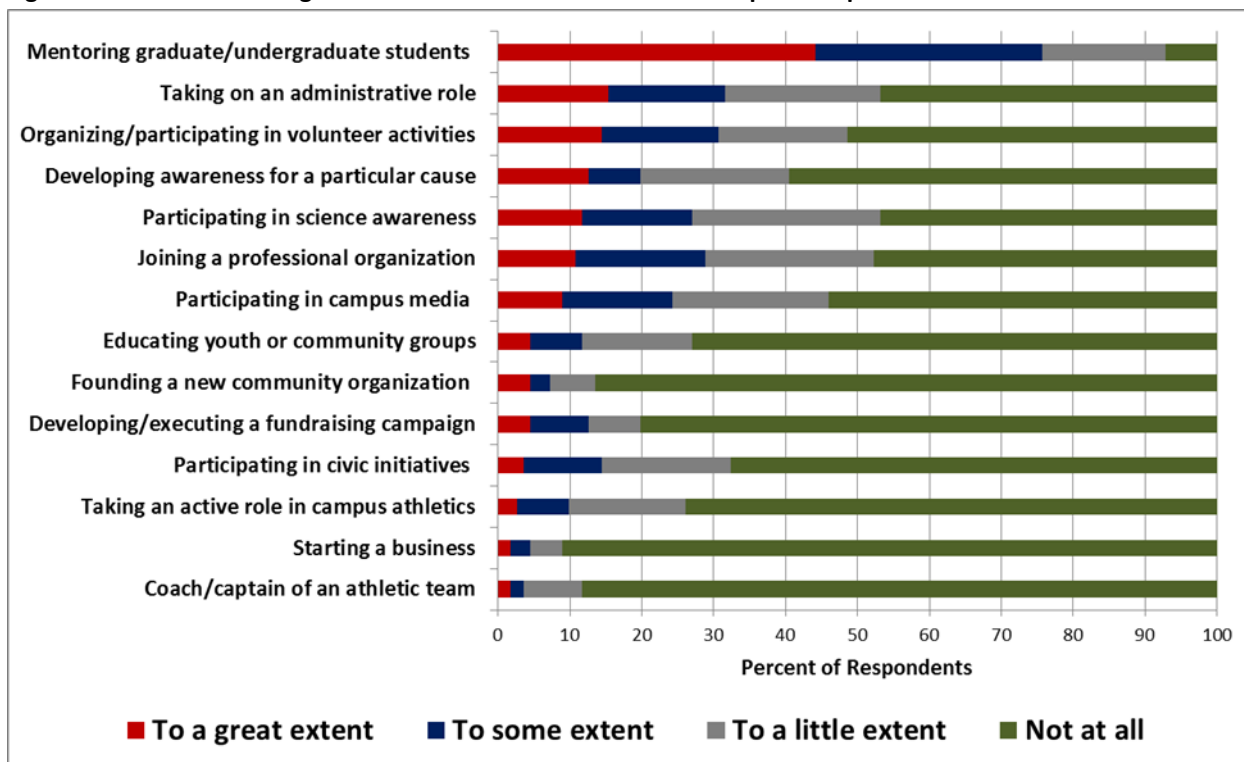
The results of the BEAR data analysis showed that there were only a few service leadership activities in which the Banting fellows engaged to a great extent or some extent (Fig. 2.3-9). Over 70% indicated being involved in mentoring graduate or undergraduate students. Banting fellows had limited involvement in other service leadership development activities such as starting a new business, founding a new community organization, developing and executing a





fundraising campaign, educating youth or community groups and coaching or being captain of an athletic team.

**Fig. 2.3-9: Extent of Banting PDFs' Involvement in Service Leadership Development Activities**



Source: Banting End of Award Report 2010–2011 and 2011–2012.

However, a few Banting fellows are participating in some service leadership activities. For example, one Banting fellow noted:

*“[I am] trying to do something that I have done before [student committees], so I've continued with that because I think Banting sort of made me realize that it was very important to be all rounded and not just focus on one thing.”* Focus group participant.





## 2.4 ESTABLISHING COLLABORATIONS

Evaluation Question: To what extent have Banting fellows established national and international collaborations?

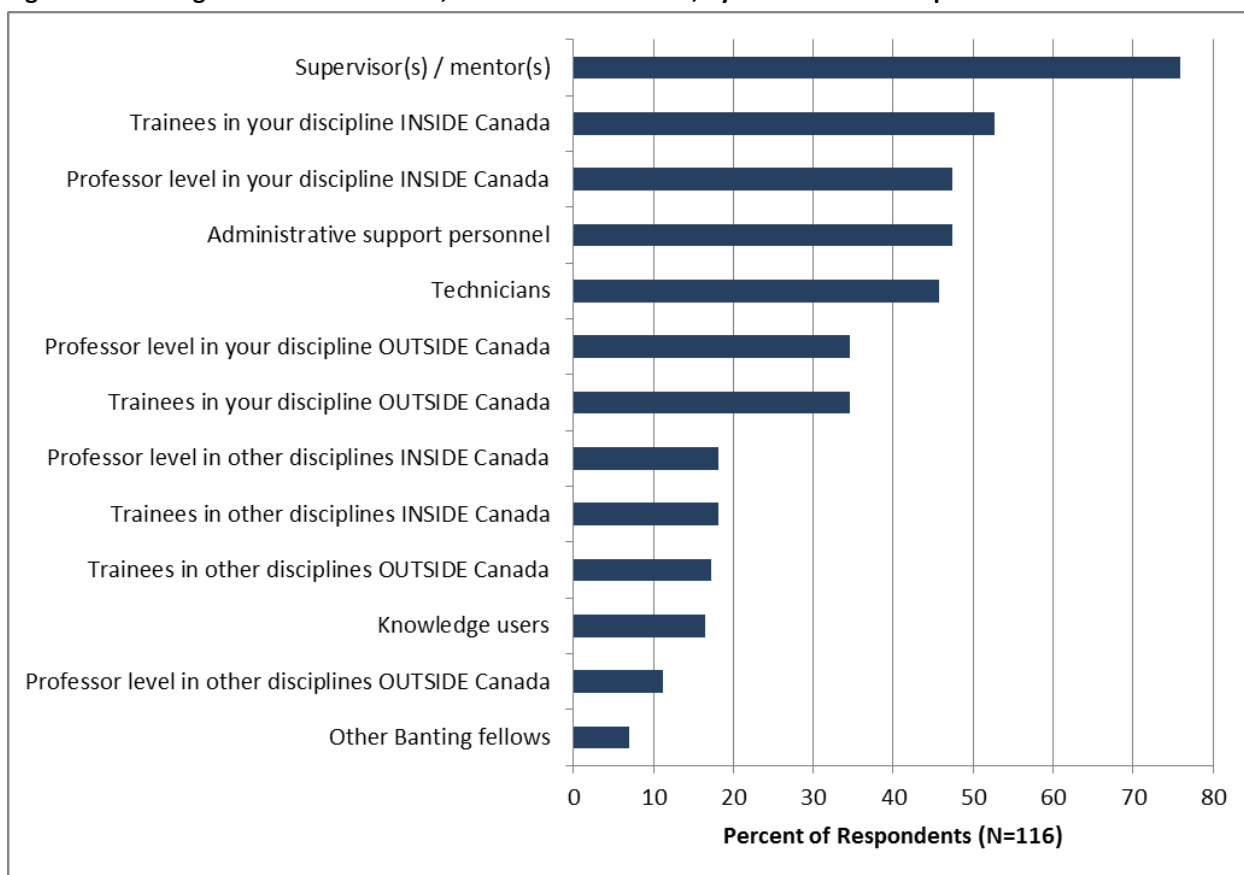
### Key Findings

- **Banting fellows interacted most often with their supervisors/mentors, other trainees and researchers within their own disciplines inside Canada.** They reported less frequent interaction with researchers outside their discipline, knowledge users and other Banting fellows.
- **Banting fellows are establishing collaborations, most frequently within their own institutions and internationally,** which are ongoing and resulting in the production and dissemination of knowledge.
- **The bibliometric data on co-authorship rates indicate that in the health sciences, Banting fellows were more likely than Agency PDFs and Unfunded applicants, to author papers in which there was at least one co-author with a foreign (international) address.** In contrast, in the natural sciences and engineering, Unfunded applicants had the highest international collaboration rate followed by Banting fellows and Agency PDFs.

Evidence from the BEAR analysis results showed that Banting fellows tended to interact more often with researchers within their own discipline inside Canada (Fig. 2.4-1). Their most frequent interactions were with their supervisors/mentors and trainees in their discipline inside Canada. Less than one in five interacted with researchers in other disciplines and interactions with knowledge users and other Banting fellows were rare.



**Fig. 2.4-1: Banting Fellows’ Interactions, at Least Once a Week, by Stakeholder Group**



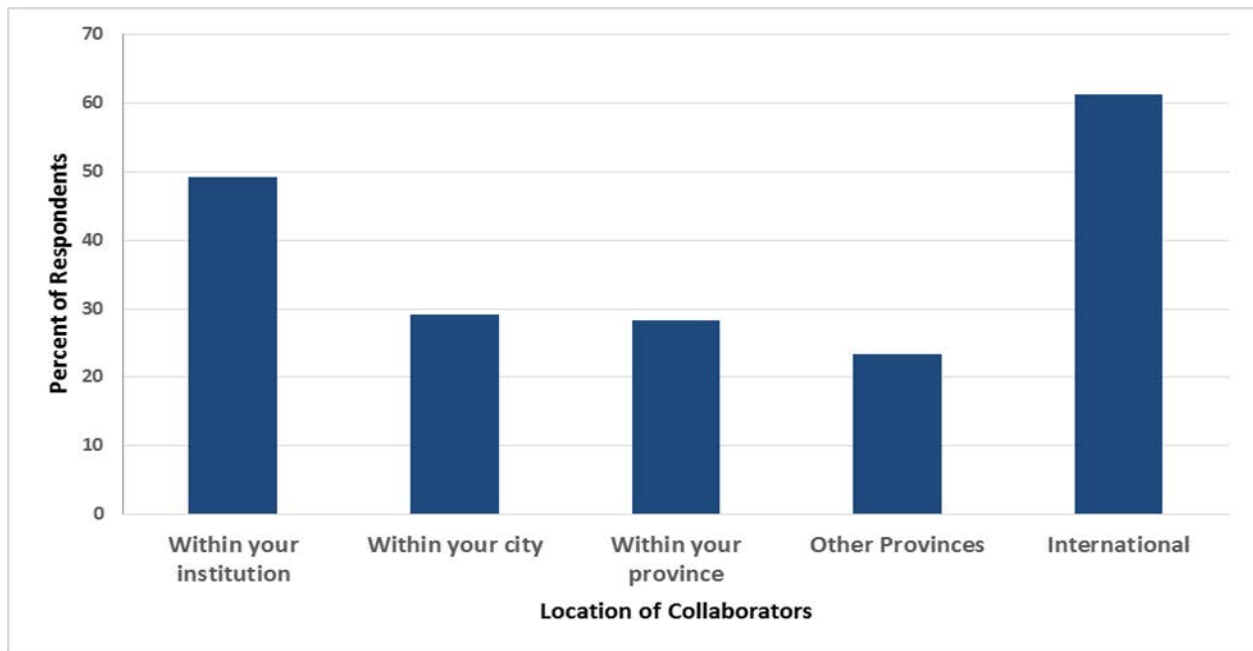
Source: Banting End of Award Report 2010–2011 and 2011–2012.

Over four in five Banting fellows (82%) reported that their interactions developed into collaborations with a mean of three collaborations (SD=1.6). Only 10% reported collaborations with other Banting fellows. Although interactions with researchers outside Canada were infrequent, they were the most likely to lead to collaborations: international collaborations (61% of 119) were the most frequently reported followed by collaborations within one’s own institution (49%) (Fig. 2.4-2).

Almost all Banting fellows involved in collaboration believed the collaboration had resulted to a great extent or some extent in both knowledge creation (96%) and the dissemination of that knowledge (91%) and 96% planned to continue collaborating with those individuals.



**Fig. 2.4-2: Geographic Dispersion of Collaborations**



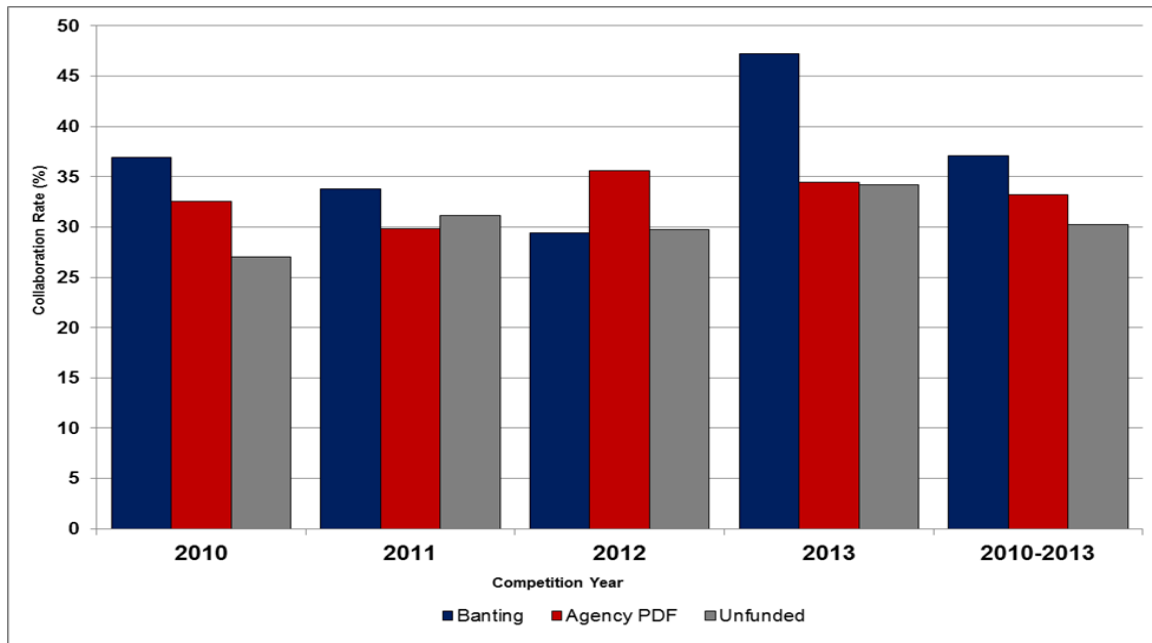
Source: Banting End of Award Report 2010–2011 and 2011–2012.

Evidence from the bibliometric analysis corroborated the BEAR analysis results. It showed that in the health sciences domain the Banting fellows tended to have higher rates of international collaboration – an indicator of the relative intensity of scientific collaboration between countries - in their publications than Agency PDFs and Unfunded applicants (Fig. 2.4-3). The difference between Banting fellows and Unfunded applicants was statistically significant ( $p < .01$ ).

The *Observatoire des sciences et des technologies* (OST) of the University of Quebec in Montreal defines a paper as written in international collaboration when it bears addresses from at least, two different countries; for example, a Canadian researcher co-authoring a paper with a researcher from a foreign institution with a foreign address.<sup>12</sup> The rate is calculated by dividing the number of international collaborations by the total number of papers.

<sup>12</sup> See Methodology section, Appendix D for the definition of international collaboration used in this report.

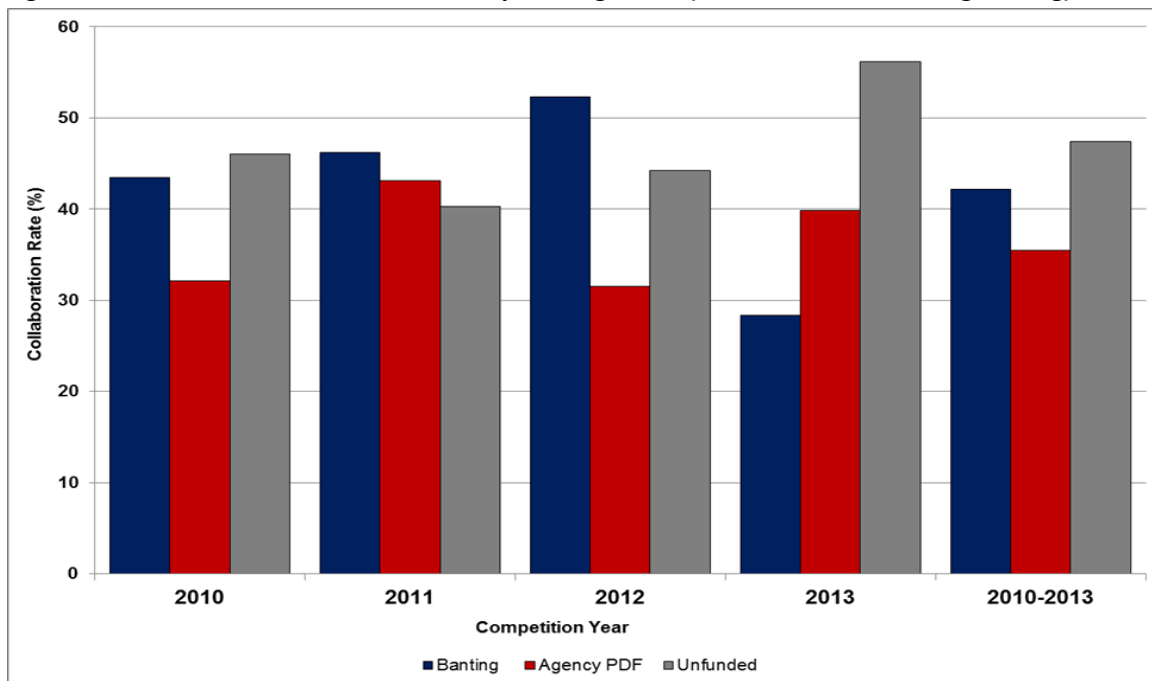
**Fig. 2.4-3: International Collaboration Rate by Funding Status (Health Sciences)**



Source: Observatoire des sciences et des technologies (Thomson Reuters Web of Science) – Canadian Bibliometric Database current as of July 2014.

It should be noted though that for the natural sciences and engineering domain, the Banting fellows had a higher rate of international collaboration than the Agency PDFs ( $p < 0.01$ ) but less than Unfunded applicants ( $p < 0.05$ ) (Fig. 2.4-4).

**Fig. 2.4-4: International Collaboration Rate by Funding Status (Natural Sciences and Engineering)**



Source: Observatoire des sciences et des technologies (Thomson Reuters Web of Science) – Canadian Bibliometric Database current as of July 2014.



## 2.5 AWARENESS OF BANTING FELLOWSHIPS

Evaluation Question: To what extent has national and international awareness of Banting fellowships as an attractive and competitive award increased since program launch?

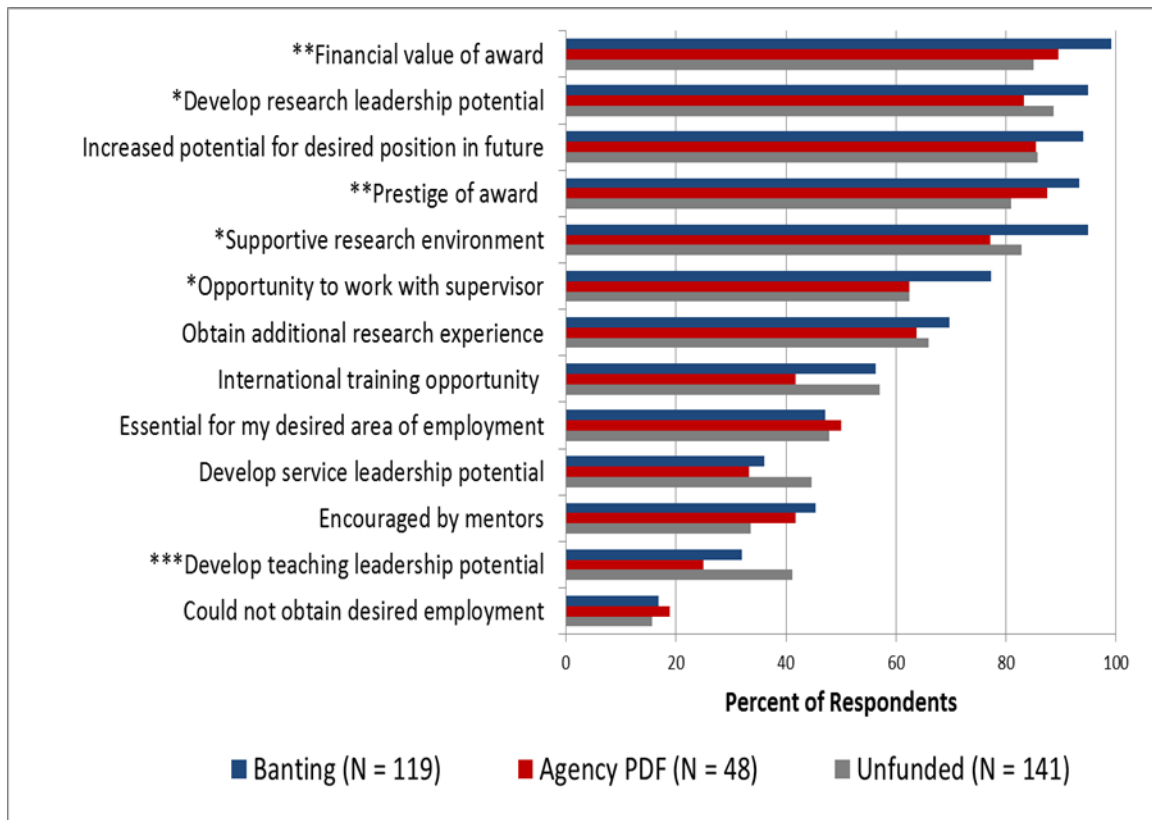
### Key Findings

- **The Banting fellowship is highly regarded by applicants for its award amount, prestige, and opportunities to develop their research leadership potential.**
- **Awareness of the Banting fellowship is increasing both nationally and internationally; however, currently the program is better known in academia and in Canada.**
- **The number of visits to the Banting website has increased steadily since 2011 and more than doubled after 2013 with international traffic (56%) accounting for a higher proportion than Canadian (46%).**

Survey findings confirm that the Banting fellowship is highly regarded by applicants irrespective of whether they received an award, chiefly for: the award amount offered; the opportunity to develop their leadership potential; the prestige of the award; to have a supportive research or work environment; or opportunity to work with a particular supervisor (Fig. 2.5-1). Banting fellows considered these reasons more important than Agency PDFs and Unfunded applicants.

By contrast, Unfunded applicants considered the opportunity offered by the Banting fellowship to develop their teaching leadership potential to be more important than the Agency PDFs and Banting fellows.

**Fig. 2.5-1: Reasons for Applying for the Banting Fellowship by Funding Status**



Source: Survey of Banting Applicants 2015 and Banting End of Award Report 2010–2011 and 2011–2012.  
 \*p<.05; \*\*p<.01; \*\*\*p<.001.

Evidence from the key informant interviews and focus groups suggest that the Banting fellowship is better known in academic circles and also better known in Canada than in the USA or elsewhere. Key informants believe that awareness levels will increase with time and that reputation and prestige can only come once the program is more established.

*“I’m originally from Germany and I know that a lot of Germans who’re in that stage are aware of the program and have decided on applying to it. And I know also in China ... it’s the same thing, it’s quite well known. It’s been very prestigious and there’s a huge interest in applying for that.”* Fellow’s supervisor.

*“Prestige takes time. Reputation, reputation takes years and years and years. So some of these programs that we now speak of that just roll off our tongue, we’re all familiar with it. People didn’t know about them for the first 10, 15 years. So I think in terms of prestige, it will just take some time.”* Fellow’s supervisor.





## Web Metrics

Results from an analysis of administrative data on Internet traffic to the Banting program's website indicate that the program has maintained an Internet presence since program launch with increasing volume of traffic. The number of visits to the Banting program website, redesigned in 2013 to align with federal government standards, has increased steadily since 2011 and more than doubled after 2013 (Table 2.5-1).

**Table 2.5-1: Web Metrics for the Banting PDF Website, 2011-2014**

	2011	2012	2013	2014
<b>Number of visits</b>	79,345	89,571	90,150	190,045
<b>Facebook as referral website</b>	10%	20%	Data unavailable	Data unavailable
<b>Banting Facebook fans - English</b>	18,371	30,234	31,069	35,185
<b>Banting Facebook fans - French</b>	6,071	7,050	7,374	7,421
<b>Canadian vs International traffic</b>	Data unavailable	46% vs. 54%	45% vs. 55%	40% vs. 60%

**Source: Banting PDF Communication Update; Program document available from Vanier Program Secretariat.**

Further, the web metrics indicate that there is more international versus Canadian traffic to the Banting PDF program's website. The program has a Facebook page and it was found that that page was the leading referral website for the main Banting PDF program website accounting for 10% and 20% of all referrals in 2011 and 2012 respectively, the only periods for which data are available. The numbers of Facebook friends for both the English and French Facebook accounts have increased steadily since 2011.



## 2.6 RETENTION OF BANTING FELLOWS

Evaluation Question: To what extent have Banting fellows remained in Canada and pursued research careers?

### Key Findings

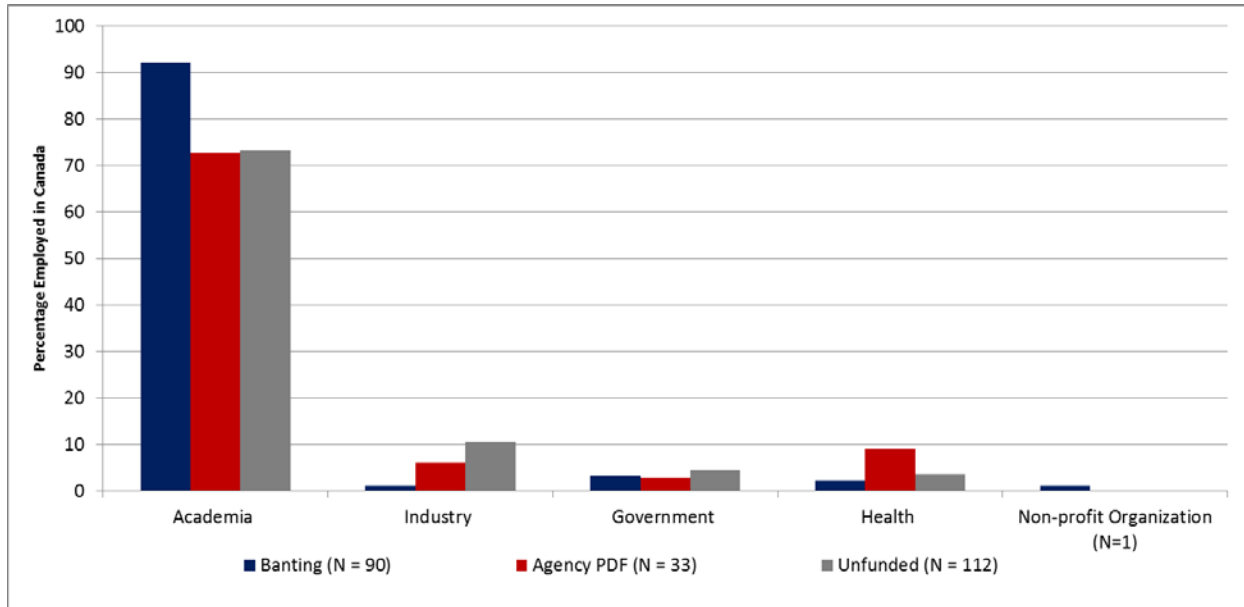
- **Banting fellows are more likely to be employed (91%), conducting research (88%) and working in Canada (58%)** than Agency PDFs (72%, 72% and 54% respectively) and Unfunded applicants (87%, 76% and 35% respectively).
- **A greater proportion (92%) of Banting fellows work in academia compared to Agency PDFs (73%) and Unfunded applicants (73%).**
- **Among those working outside Canada, the most common reason for pursuing research-related positions outside the country was for better or more job opportunities, this finding is also consistent with the views of key informants.**

Progress made towards intermediate outcomes such as retention of Banting fellows in Canada was addressed by measuring the proportions of former Banting fellows working in research-related positions and whose main job activities and job titles are research-related. Other perspectives on retention were assessed through key informant interviews and focus groups.

The survey findings showed that 92% of Banting fellows as compared to 73% of Agency PDFs and 73% of Unfunded applicants work in the academic sector in Canada (Fig. 2.6-1). Also, 11% of Unfunded applicants worked in the industry sector while 9% of Agency PDFs worked in the health sector. The sector differences across the three groups were statistically significant ( $p < .05$ ).



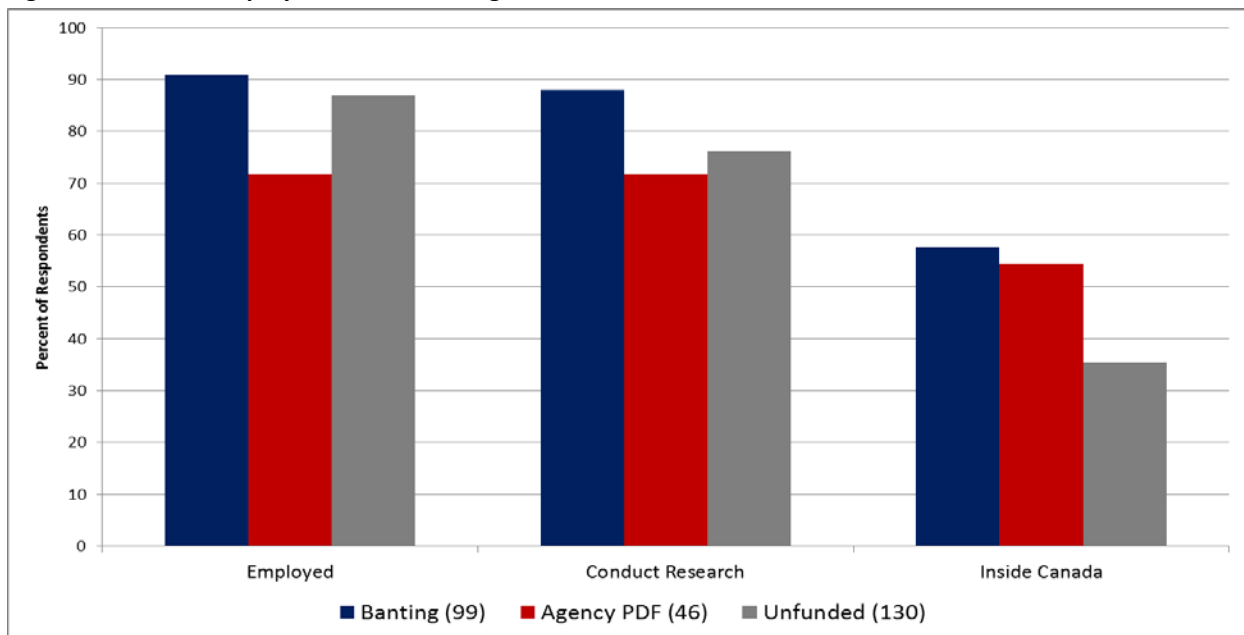
**Fig. 2.6-1: Current Employment Sector by Funding Status**



Source: Survey of Banting Applicants 2015 and Banting End of Award Report 2010–2011 and 2011–2012.

Additionally, the survey findings indicated that Banting fellows were more likely than the Agency PDFs and Unfunded applicants to be employed, conduct research and reside in Canada. As many as 91% of the Banting fellows were employed, 88% conducted research and 58% worked in Canada (Fig. 2.6-2). This contrasted with 72%, 72% and 54% respectively of the Agency PDFs and 87%, 76% and 35% of Unfunded applicants.

**Fig. 2.6-2: Percent Employed and Conducting Research in Canada**



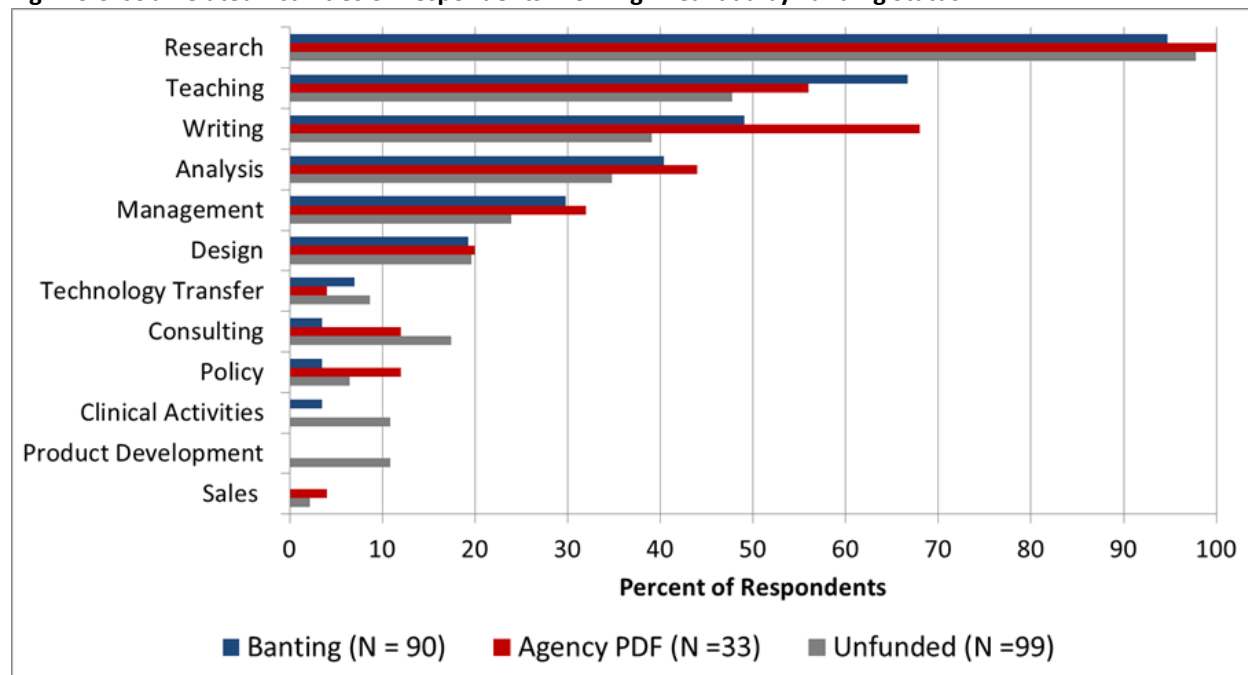
Source: Survey of Banting Applicants 2015 and Banting End of Award Report 2010–2011 and 2011–2012.





In terms of activities they do as part of their jobs, 95% of Banting fellows, 100% of Agency PDFs and 98% of Unfunded applicants identified research as a job-related activity while 67%, 56% and 48% respectively mentioned teaching and slightly lower proportions mentioned writing and analysis (Fig. 2.6-3). Policy and clinical activities were relatively rare. None of the differences was statistically significant

**Fig. 2.6-3: Job-Related Activities of Respondents Working in Canada by Funding Status**



Source: Survey of Banting Applicants 2015 and Banting End of Award Report 2010–2011 and 2011–2012.

Findings from the key informant interviews and focus groups suggest that some of the Banting fellows working outside Canada might not have pursued research-related positions in Canada due to: a lack of positions, especially tenure track ones; a lack of opportunities, such as a fellow being a principal investigator on a grant; and, the fellows being in high demand elsewhere because of their high quality.

*“I think that the difficulty is the retention; a tenure track position to immediately follow the postdoc - that would have been ideal.”* Host institution representative.

*“But unfortunately, we still have no more jobs to keep them in Canada. I mean they wanted to stay in Canada but they could not find a position in Canada, a tenure track position.”* Host institution representative.

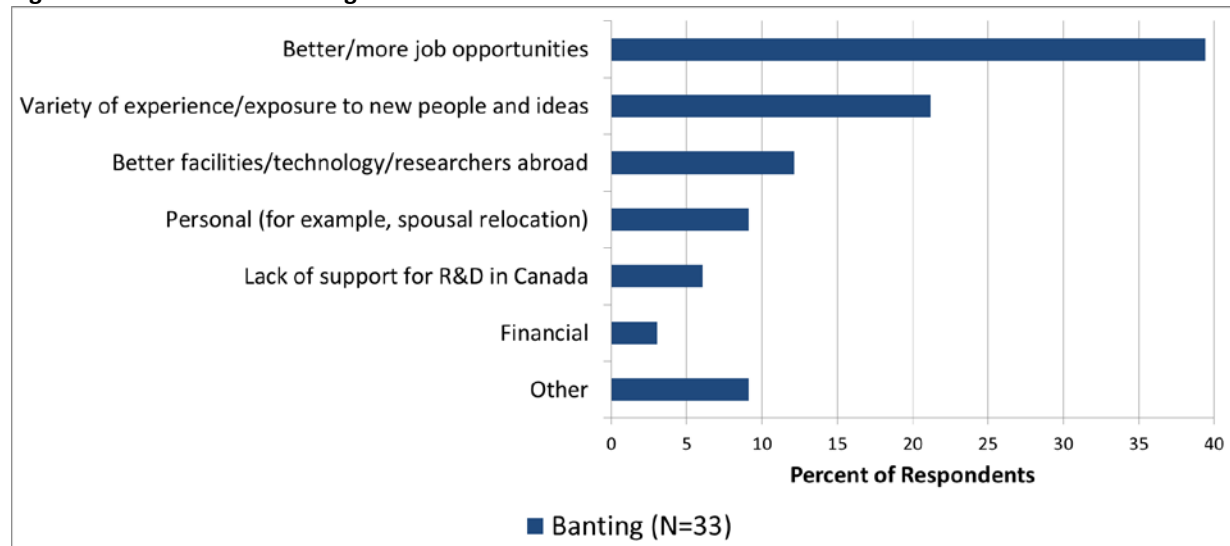
*“Within my own discipline, there is a brain drain happening where people are having more success as Canadians with Ph.Ds. in the humanities having more success finding positions in the UK, in Singapore, in New Zealand than they are in Canada.”* Focus group participant.



These findings corroborate previous research suggesting a general lack of opportunities for academic positions, regardless of postdoctoral training (Mitchell et al., 2013; Borlee, 2011; Puljak & Sharif, 2009; Akerlind, 2005). A 2013 survey of postdoctoral trainees in Canada by Mitchell and others found that respondents were very concerned that after many years of postdoctoral training, their employment prospects remained uncertain. Borlee (2011) found that only 20% of doctoral graduates had academic tenure-track positions six years after graduation and Akerlind (2005) concluded that “*postdoctoral positions do not necessarily guarantee career advancement in the higher education sector.*”

Findings from the BEAR analysis support those of the key informant interviews and focus groups. Among Banting fellows working outside Canada, the most commonly reported reasons for pursuing research-related employment outside Canada were: better/more job opportunities and gaining a variety of experience/exposure to new people (Fig. 2.6-4).

**Fig. 2.6-4: Reasons for Pursuing Research outside Canada**



Source: Banting End of Award Report 2010–2011 and 2011–2012.

Overall, there is evidence that the Banting program is helping to retain fellows in the research enterprise whether it is in Canada or abroad: over 80% of Banting fellows reported being employed, working in the academic sector and having research as one of their job-related activities. More importantly, the program is making progress towards achieving its intermediate target of retaining top-tier talent in Canada: well over one half (58%) of Banting fellows reported conducting research in Canada. It is possible that this proportion would have been higher were it not for the lack of employment opportunities, especially tenure-track ones, in Canadian academia as reflected in the qualitative analysis findings and previous studies.

## 2.7 PROGRAM EFFICIENCY

Evaluation Question: Are the most appropriate and efficient means being used to achieve the outcomes, relative to alternative design and delivery approaches?

### Key Findings

- Available evidence indicates that the Banting program is being delivered in a cost-efficient manner.
- For fiscal year 2013-14, the administrative expenditure (\$434,340) as a percentage of total expenditure (\$10,234,340) was 4.2% which translates into an administrative cost of \$1,000.78 per eligible application and \$6,204.85 per award.
- As a comparison, the total direct costs to administer the Banting PDF program were about the same as the Vanier Canada Graduate Scholarship (CGS) program (\$434,340 and \$414,344 respectively). However, administrative costs as a percentage of total program expenditure differed (4.2% for Banting PDF and 1.6% for Vanier CGS) due to the difference in the size of the award budgets (\$9.8 million and \$24.8 million).
- Key informants' suggestions to improve the program focused on modifying aspects of the program, broadly addressing perceived challenges to the program and addressing individual level issues facing Banting fellows.

Details of the direct cost to the tri-agencies of administering the Banting PDF program for 2013-14 are presented in Table 2.7-1. These include direct salary and benefits and also the PWGSC's contribution to rental office space.<sup>13</sup> Staff time and salaries were based on estimates provided by the Vanier Banting Secretariat to the CIHR Finance Unit.

Table 2.7-1: Comparison of Banting PDF and Vanier CGS Program Expenditures, 2013-14

Item Description	Banting PDF Program Expenditures (\$)	Vanier CGS Program Expenditures (\$)
Direct Salary	262,898.08	259,830.92
Direct Operations & Maintenance	84,685.30	68,769.18
Employee Benefit Plan (20%)	52,579.62	51,966.18
Accommodation (13%)	34,176.75	33,778.02
<b>Total Admin Costs</b>	<b>434,339.74</b>	<b>414,344.30</b>
Total Awards Expenditure	9,800,000.00	24,807,499.00
<b>Grand Total Expenditures</b>	<b>10,234,339.74</b>	<b>25,221,843.30</b>
Total Admin Expenditures as a proportion of Grand Total Expenditures	4.24%	1.64%

Source: Financial and administrative data from CIHR Finance Unit and Vanier-Banting Secretariat.

<sup>13</sup> Rental costs for office space are reflected under "accommodation" costs in Table 2.7-1.



The costs do not include opportunity costs to Selection Committee members for reviewing applications or for applicants and their supporting institutions for putting the applications together. The cost of administering the Vanier CGS program is also presented for purposes of comparison.<sup>14</sup>

In 2013-14 the total direct costs to the tri-agencies to administer the Banting program was \$434,340 as compared to \$414,344 for the Vanier CGS program. Banting award expenditures for the same year (for a two-year fellowship) amounted to \$9.8 million while those of the Vanier CGS totaled \$24.8 million. Therefore total administrative expenditure as a percentage of total program expenditures was 4.2% for the Banting program as compared to 1.6% for the Vanier CGS.

It should be noted that although the operational costs of the two programs are about the same, the Vanier CGS has a larger awards budget and this may partly explain the difference in the two administrative expenditure percentages. While the difference can simply be an artefact of the method for computing the proportion by using the award budget as the denominator it may also reflect the effect of economies of scale in that there is a fixed cost for setting up the basic structures of any program administration regardless of the size of the award budget.

Other factors such as the complexity of the program delivery itself and the structures set up to do so and whether the type of research funded is a training award or research grant program may also have a bearing on this analysis.

Both the Banting and Vanier programs are managed by a single office, the Vanier-Banting Secretariat, housed at CIHR with staff from the CIHR, NSERC and SSHRC. Although the Vanier program involves a larger number of applications, the costing methodology apportioned staff time and other cost elements equally to both programs.

Based on a total of 434 eligible applications for 2013-14 (calculated after transfers between agencies were completed) the cost of administering one eligible Banting application was \$1,000.78 and that of one award was \$6,204.85 (Table 2.7-2).

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<sup>14</sup> Note that the costing approach used by the CIHR Finance Unit is different from the previous one used for the Vanier CGS program evaluation. The new approach had to be applied to the Vanier CGS costing data to allow for a valid comparison.



**Table 2.7-2: Banting PDF Program’s Administrative Costs per Application and Award**

Item Description	Number or Cost
Number of eligible applications	434
Number of awards	70
Total administrative costs	\$434,339.74
Administrative cost per eligible application	\$1,000.78
Administrative cost per award	\$6,204.85

Source: Financial and administrative data from CIHR Finance Unit and Vanier-Banting Secretariat.

### **Applicants, Host Institutions and Selection Process**

Generally, most applicants irrespective of funding status seemed to have similar perceptions of the application process. While they agreed with the requirement for institutional support at the application stage, they felt that obtaining such support was difficult particularly for those applying to institutions outside Canada where the Banting was not well known. They also saw the process of completing the Common CV to be rather arduous.

*“I applied for University [X] and the biggest barrier here is that a lot of American schools don’t know about the Banting program and so coordinating the documents that you need, for instance, the letter from the President of the university is difficult.”* Focus group participant.


*“It [completing the CCV] was just a long and arduous process for no particular reason. I feel like I could have just provided my CV for the same effect.”* Focus group participant.

Other observations made by current fellows related to the types of processes and supports available at the host institution. Focus group participants stated that the application process was lengthy and time consuming and it was important to be organized and to give lots of time to go through the process.

This issue was of particular concern for those who were applying from other countries as well as Canadians who wanted to go to a host institution outside of Canada. The lack of knowledge about the Banting PDF program and its application process within the proposed foreign host institutions created difficulties meeting deadlines, completing the requirements of the application and identifying the elements of the application that would provide applicants the best leverage (e.g. the types of professional development supports available to them; and getting strong reference letters).

Getting the right support from the proposed host institution during the application and endorsement process was a repeated theme in the focus groups. Several participants identified





that those host institutions that had a clear plan of support, had integrated into their processes the lessons learned from past applications, and that put resources to support the Banting applicants had been successful in getting more Banting fellows.

Focus group participants were concerned about the various levels of university administration that were required to provide signed letters for the application. The institutions differed in terms of the number of levels or places where the applications were reviewed. A few did not have any internal review process for Banting applications and endorsed all applicants but were planning to introduce some review mechanisms. However, others particularly the United States-based institutions indicated that due to low application volumes they had no plans to introduce any such internal review mechanisms specifically for the Banting fellowship.

At the other end of the spectrum were those institutions that had formalized internal review processes requiring applicants to first submit a letter of intent describing their area of interest and proposed program of research. This was submitted to the applicant's unit or department for review and if endorsed, forwarded to a faculty selection committee which then passed the best applications on to a central selection committee based at the university's board of graduate studies for the penultimate endorsement. A few organizations had quotas on the number of Banting applications that each faculty could put forward for the university to review.

There were other strengths of the various processes at the host institutions. At one university there was a proactive strategy being used for strategic hires or nominating postdoctoral trainees who could ultimately be hired. The application writing was primarily led by the Banting candidate but in close consultation with the supervisor. Getting support at the departmental and/or university level in the review of the proposal was helpful for several supervisors and the Banting applicants.

One of the challenges in supporting a candidates' application was the limited time the institutions had in providing advice, direction or other related supports to the supervisor and prospective candidate although many endeavored to provide support in making a strong application. The extent to which the candidates were supported varied across institutions.

*"We increased the internal review process time that we had so that ... the committee could get back to the Banting applicants or candidates [with] significant suggestions on their applications. And also, give adequate notice of the upcoming deadlines, etc. which is difficult initially just because of the timing of the competition."* Host institution representative.

*"And once we go through that process, then we work with the candidate to help them prepare for the package that they would be finalizing and sending off to Banting."* Host institution representative.



Some host institution representatives and federal agency representatives identified the application process as complex and concluded that this combined with the competitiveness of the Banting PDF, was not worth the effort.

*“It's a lot of effort on everyone's part for something that -- three times out of four does not end up working out from the institutional point [of view].”* Host institution representative.

*“Another issue is the complexity of the program....it's a very long process...this whole process seems very onerous and I've been told by some that some of the institutions just -- it's too complicated. It's too much work for the value.”* Federal agency representative.

### **Suggestions to Improve Banting PDF Program**

Suggestions for program improvement from key informant interviews and focus groups sought to modify aspects of the program, broadly address perceived challenges facing the program or tackle problems facing individual fellows. Specific examples of the suggestions are provided below.

#### *Increase number of awards*

Host institution representatives in the key informant interviews saw the Banting PDF as a new and young program that needed to grow and expand and that one valuable strategy to attract more top-tier candidates and thereby enhance Canada's research enterprise was to increase the number of awards available in each competition cycle. Although the key informants felt this may not be possible due to fiscal constraints, nevertheless they considered such an increase to be a worthwhile endeavor for the broader objectives of the country and to make the program more competitive in comparison to other programs around the world.

#### *Require institutions to show how fellows will have autonomy for their research*

The Banting PDF aims to support fellows to become independent researchers; host institution representatives and fellows' supervisors suggested that the expectation that research funding may come from the supervisor or the university can create a greater dependence of the trainee on their supervisor and hence, be counterproductive to the objective of creating independent researchers. Providing operational funds is one important strategy to ensure that the Banting fellow's research remains separate and independent from that of the supervisor.

Some universities have already addressed this by allocating such funds to the Banting fellow as part of their application. In some instances this funding is from the university and in other instances, it is a combination of both the university and the supervisor's own research programs. Either way, host institution representatives and fellows' supervisors considered it important that institutions be required to give a clear indication of how the candidate will have independence/autonomy for their research.





*Clarify expectations around types of support universities are required to provide*

Although in principle, host institution representatives and fellows' supervisors were in agreement with the requirement of synergy between the Banting applicant's research program and the host institution's strategic priorities, they sought clarity around the level of institutional commitment that could ensure a strong application. More specifically the question was: what types of support can an institution provide to increase its odds of success? A counter argument was made though about the importance of setting some limits around the extra supports so that institutions with greater resources do not "buy their way through [to] the top of the list" to the disadvantage of institutions with fewer resources.

Some key informants felt that candidates who wanted to apply internationally were at a disadvantage whether they were foreigners planning to come to Canada or Canadians planning to go abroad because of geography and a potential lack of familiarity with researchers at the host institution. One host institution representative suggested removing the requirement for synergy between the applicant and the proposed host institution and making the Banting an individual award.

*Clarify/Modify the eligibility criteria.*

Some host institution representatives sought clarification around whether they could nominate a candidate who was already undergoing postdoctoral training at their institution and some also wanted the eligibility criteria to be modified so that 'brilliant' junior faculty who did not meet the eligibility requirements could still apply for the Banting fellowship. This suggestion seems to speak to the issue of trainee retention as well since the fellowship could help junior faculty to rapidly establish themselves in their areas of research.

*"But we frankly get mixed signals from the program about whether you can recruit from within or whether -- you know what constitutes an external person. We were boy scouts on that in the early days and did not put forward postdoctoral fellows who are currently at the institution, but we have seen successful candidates elsewhere that [were from within the university]." Host institution representative.*

*"And we've had some amazing junior faculty who are incredible, who are doing fantastic research...So that was one of the insights....it's junior faculty who want to put proposals ... it would be fantastic to help build some [of them]-- instead of having another associate with the CRC." Host institution representative.*

Other suggestions to modify the program eligibility criteria were to make the duration of the Banting PDF more flexible (host institution representative and federal agency representative)





and to modify the time allowance between doctoral and postdoctoral training to allow for legitimate interruptions (host institution representative).

*Improve program visibility*

The evaluation found that the Banting PDF program is well known within academia and inside Canada. To increase awareness and improve the program's visibility outside academia and internationally, fellows' supervisors, host institution and federal agency representatives suggested creating opportunities to bring Banting fellows and alumni together to increase networking and collaboration opportunities. It was felt that keeping Banting alumni engaged with the program can reap benefits for the country through involvement as expert consultants and supporting the marketing of the program around the world. Another suggestion was to create a recognition program or event to acknowledge and celebrate Banting PDF recipients in order to increase the visibility of the program.

*Establish a target for international candidates*

Analysis of program administrative data showed that the number of applications from international candidates has been declining. A suggestion from a federal agency representative that addresses this theme is to establish a target (not a quota) for international candidates so that concerted effort is made by institutions and researchers to meet that target.

*Address trainee retention*

The evaluation found retention of top-tier postdoctoral fellows within Canada to be a challenge and key informants suggested several ways of addressing the problem including: requiring universities to offer tenure track positions to fellows before they complete their award (host institution representative); changing the discourse and the perception that success is only in getting an academic position (host institution representative; and federal agency representative) and working with institutions to enhance their capacity to track postdoctoral trainees so that career outcomes can be monitored (host institution representative).

*Address unanticipated challenges*

Suggestions from current Banting fellows revolved around unanticipated personal challenges they were facing. It was noted that fellows in the United States received their fellowship funds directly from the program and were therefore not recognized by their host institutions as employees requiring health care and other benefits. The current depreciation of the Canadian dollar relative to the American dollar had also led to a loss in the purchasing power of the fellowship funds.





## 3.Relevance

### 3.1 CONTINUED NEED FOR THE PROGRAM

Evaluation Question: To what extent does the Banting program continue to address a demonstrated need?

#### Key Findings

- **The Banting program is fulfilling an important need by positioning top-tier postdoctoral talent for success as research leaders.** Banting fellows saw the fellowship as a stepping stone or pathway to an academic career, strengthening their belief in themselves and their ability to achieve their career objectives, and were leveraging the fellowship to secure employment.
- **Eight out of ten (80%) believed that holding a Banting fellowship was considered an asset by employers** and three-quarters (77%) report it was very important or important in their decision to remain in academic research.
- **The perceived prestige, monetary value and professional development opportunities of the Banting fellowship is attracting top-tier postdoctoral talent.** Host institution representatives and fellows' supervisors confirmed the high quality of Banting fellows; whereas, Banting selection committees verified the high quality of Banting applicants.

Assessment of the continued need for the Banting postdoctoral fellowship program was approached in terms of how Banting fellows perceived the fellowship in relation to other PDFs, its role in their decision to remain in academic research and its contribution to obtaining their current employment. Trends in success rates from one competition year to another were also reviewed as part of assessing the continued need for the program.

Findings from focus groups with Banting fellows showed that the program was addressing fellows' critical needs. In particular, they saw the fellowship as providing them with a stepping stone towards an academic career and giving them a psychological boost to pursue their career objectives. Banting fellows talked about the importance of obtaining independent funding early in one's research career and saw a successful Banting application as one proof of that. The fellowship had also improved their opportunities for networking through attending more conferences and enhanced their chances of obtaining employment. Their success also motivated them to endeavour to live up to what was expected of a holder of a prestigious fellowship.

*"When I got the Banting, it made it much easier for me to look for faculty positions and ... two departments of universities contacted me, asking me if I would be interested in joining them after my Banting."* Focus group participant.

*"The Banting definitely motivated me just in terms of having a win...[the] knowledge that I'm considered one of the top-tier researchers in the country ... is really nice so it ... helped me get my research program off the ground in terms of having the resources that I need and the mentorship that I needed to make that next step."* Focus group participant.

The results of the BEAR data analysis corroborated the focus groups findings and confirmed that the Banting PDFs valued the fellowship as it gave them opportunities for professional development such as autonomy to pursue their research interests and to enhance their curriculum vitae in addition to the prestige and monetary value associated with the fellowship.

*“I had received the notification for the CIHR postdoctoral fellowship few days before the Banting. I have decided to accept the Banting fellowship over the CIHR since it is more prestigious award and gives more opportunities for professional development.”* BEAR respondent.

In today’s competitive job market, 80% of Banting fellows believe that holding a Banting PDF is an asset to employers and 77% consider their postdoctoral fellowship funding as very important or important in their decision to remain in academic research. They saw the Banting fellowship as an important leverage to securing employment.

*“Certainement ma bourse Banting et les productions scientifiques s’y découlant.”* BEAR respondent.

These findings corroborate previous findings in the literature that have highlighted the shift towards postdoctoral training as an added requirement for an academic career (Ekos Research Associates, 2013; Nerad & Cerny, 1999).

### Volume of Applications

The volume of applications can give an indication of the continued need for a program. Analysis of program administrative data shows that the number of applications has been declining year over year for the period covered by this evaluation; however, the rate of decline has been decreasing (Table 3.1-1). In fact, in the most recent competition (2014-15) the number of applications increased over the previous year. Success rates have averaged 14% over the four competitions (2010 to 2014) covered by the evaluation.

**Table 3.1-1: Banting PDF Program – Percentage Change in Volume of Applications and Success Rates, 2010-2015**

Competition Year	Number of Applications*	% Change (Year on Year)	Success Rate
2010-11	658	-	10.6%
2011-12	501	-23.9	14.6%
2012-13	442	-11.8	15.8%
2013-14	434	-1.8	16.1%
2014-15	564	30.0	-
Average for 2010 to 2014			13.9%

\*Numbers reflect eligible applications submitted, after transfers were completed.

Source: Administrative data from Vanier-Banting Secretariat.



It is possible that the initial low success rate of 10.6% had an impact on subsequent competitions. Only the most competitive top-tier candidates are applying and others are deterred from doing so because of low expectations of being successful. In addition, since the number of fellowships is fixed at 70 per year, as the number of applications declined the success rate started to rise, which may also explain the increase in applications in the most recent competition. The hypothesis that only the most competitive top-tier candidates are applying is corroborated by the findings that Banting is attracting excellent candidates.

Representatives of host institutions and fellows' supervisors confirmed in the key informant interviews the consistently high quality of Banting fellows they have hosted over the years and Banting selection committee members also confirmed the high quality of Banting fellowship applications that they have been reviewing. These together reflect the continued need for the program for talented young researchers.





## 3.2 ALIGNMENT WITH FEDERAL ROLES AND RESPONSIBILITIES

Evaluation Question: To what extent is the Banting program aligned with federal roles and responsibilities?

### Key Findings

- **The Banting program aligns with federal roles and responsibilities and the mandates of the granting agencies to support the development, attraction and retention of researchers.**
- **The role of the federal government to promote and support postdoctoral research was confirmed by key informants as very important to develop a national pool of postdoctoral talent that can contribute to Canada's economic, social and research-based growth.**


As outlined in *Seizing Canada's Moment: Moving Forward in Science, Technology and Innovation Report*, the Banting program aligns with the role of the federal government to support postgraduate training to develop, attract and retain highly-qualified and skilled researchers and that can contribute to an innovative, knowledge-based economy. Specifically, the Banting program is aligned with the mandates of CIHR, NSERC and SSHRC as outlined in the enabling legislation of each agency.

By supporting the development of Canada's research capacity and excellence, the Banting program aligns with the functions of the federal research funding agencies to promote and assist research in their respective domains (see Canadian Institutes of Health Research Act, 2000; Natural Sciences and Engineering Research Council Act 1985; and Social Sciences and Humanities Research Council Act, 1985). In the case of CIHR, the Banting program directly supports the agency's function to: "*foster the development and ongoing support of the scientific careers of women and men in health research*" (Canadian Institutes of Health Research Act, 2000).

Consistent with findings from the document review, federal research funding agency representatives, host institution representatives and fellow's supervisors believed that the Banting PDF program was aligned with the federal government's roles and responsibilities. In particular, interviewees identified three key areas in which the Banting program is aligned with the role of the federal government.

First, interviewees confirmed the importance of federal funding for postdoctoral training and research to support research and innovation in Canada.





*“The support for graduate students and postdocs is very important. On the science and technology side it speaks to the innovation agenda in which Canada is lagging badly.”*  
Fellow’s supervisor.

Second, interviewees emphasized the role of the federal government in increasing the visibility and awareness of top-tier postdoctoral training by promoting and marketing the Banting program nationally and internationally. Through these activities, the Banting program will work to build and diversify the national talent pool and research enterprise as well as support interdisciplinary research.

*“Given that there is no federal department of education, there are various agencies and departments which do play a role, for example the granting councils and ourselves in terms of the international promotion.”* Federal agency representative.

*“It’s important for the university to diversify its talent pool frankly and bringing in high quality people from outside who have been schooled in different labs and in different cultures who had different experiences, brings a fresh perspective.”* Host institution representative.

Third, the Banting program provides leadership in helping to bring attention to the importance of postdoctoral training to support innovation and a knowledge-based economy as well as providing support for the creation and uptake of common guidelines for postdoctoral training in Canada. Typically, postdoctoral training is not a large component of academic institutions’ role and the Banting program is a key means through which the federal government could help shine a light on this level of training to create visibility and bring attention to it.

*“I actually think postdocs can be very vulnerable. They are not as recognized within institutions.... sometimes they can be taken advantage of...I think we need to figure out a way to incentivize universities to track postdocs to begin with ... so we can know how many we have and how many we ideally should have.”* Host institution representative.

*“I really think we need common guidelines for all postdocs ... we need a policy ... There should be a national mandate.”* Host institution representative.



### 3.3 ALIGNMENT WITH FEDERAL GOVERNMENT AND AGENCY PRIORITIES

Evaluation Question: To what extent is the Banting program aligned with federal government and agency priorities?

#### Key Findings

- **Introduced in the federal government’s 2010 Budget, Canada’s Economic Action Plan: Leading the Way on Jobs and Growth, the Banting program has remained a priority of the federal government** and was recently highlighted in the *Seizing Canada’s Moment: Moving Forward in Science, Technology and Innovation Report* and the 2015 Budget.
- **The objectives of the Banting program directly align with the strategic priorities of the three federal research funding agencies to build research capacity through attracting, retaining and developing research talent.** The alignment is further corroborated by senior officials of the tri-agencies who note that the program supports the development of the next generation of researchers as part of a suite of programs including the Vanier Canada Graduate Scholarship and Canada Research Chair programs.

Introduced in the Federal Government’s 2010 Budget, *Canada’s Economic Action Plan: Leading the Way on Jobs and Growth*, the Banting program was designed to be a new, prestigious, and internationally competitive postdoctoral fellowship program to attract top-level talent to Canada (Finance Canada, 2010, p. 78). In addition, the program has been referenced in the 2015 Budget as one of the means to “develop promising research talent” (Economic Action Plan 2015, p.91).

The Banting program has remained a priority of the federal government and was highlighted in the recently released *Seizing Canada’s Moment: Moving Forward in Science, Technology and Innovation* as one of the tools for “strengthening the ability of the universities to attract and retain world-leading research talent and support the development of the research leaders of tomorrow” (Industry Canada, 2014, p.24).

A key priority of the tri-agencies is to build research capacity and this is consistent with the Banting program’s objectives.

- **CIHR** seeks to “invest in world-class research excellence through attracting and retaining the best international scholars and experts” (CIHR, 2009).
- **NSERC** aims to make Canada “a world leader in advancing, connecting and applying new knowledge in natural sciences and engineering” and under its People- Research Talent Program, supports the “attraction, retention and development of highly qualified people in natural sciences and engineering in Canada” (NSERC, 2014).
- **SSHRC** – “To make Canada a world leader in social sciences and humanities research and research training” (SSHRC, 2013).



The opinions of key informants further corroborate the alignment of the program and tri-agency priorities. Senior tri-agency officials in the key informant interviews observed that it was part of their remit to develop the next generation of research leaders in their respective mandate areas and they saw this to be very compatible with the Banting program's objectives.

*"They're very aligned with the Industry Canada Science and Technology Strategy. So there's a suite of programs of these identified -- to align specifically with the science and technology strategy, the Vanier is one, the Banting is one, the Canada Research Chairs ... and so, it's very aligned. I mean, these programs exist because of that strategy."* Federal agency representative.

*"One of our key areas of investment is our talent program which we see [as] being about developing the next generation of research leaders."* Federal agency representative.





## 4. Conclusions and Recommendations

### Conclusions

Overall, the Banting PDF program is meeting or has made good progress towards meeting its immediate outcomes. There is evidence that top-tier postdoctoral trainees are being attracted, recruited and provided with some enhanced training and support although the support varies across host institutions. There is awareness of the program particularly within academia and nationally. Banting fellows are devoting majority of their time to research and are establishing national and international collaborations that are resulting in the creation and dissemination of knowledge.

The program has only just completed its fourth year but has already made progress towards achieving its intermediate outcomes of demonstrating research excellence and retaining top talent in Canada. Banting fellows are beginning to show developments in leadership particularly in the research domain and are more likely than comparator groups (Agency PDFs and Unfunded applicants) to be employed and conduct research in Canada. Banting fellows are being recognized by both senior representatives of host institutions and fellows' supervisors as exceptional, outstanding, and driven. Also, there is evidence that the program is being delivered in a cost efficient manner.

The evaluation evidence attests to the continued need for the Banting PDF program and the program's alignment with federal roles and responsibilities and with the strategic outcomes and priorities of the federal government, and CIHR, NSERC and SSHRC.

### Recommendations

The Banting PDF program has made good progress towards achieving its intended outcomes and based on the evidence of this evaluation should be continued. The following recommendations address issues that could affect the performance of the program going forward, with supporting evidence provided for each of these.

- 1. The Banting program should take steps to address the decline in international applicants to ensure the program can attract and retain top-tier postdoctoral talent, both nationally and internationally.**

The proportion of foreign applications fell from 40% in the program's first two years to 34% in the last year under study, and declined further to 26% of applications in the most recent competition (2014-15). Additionally, in the 2014-15 competition, 146 foreign citizens (not permanent residents) applied for the fellowship, approximately half (56%) of the 260 foreign citizens who applied in the first-year of the program (2010-11). Key informants suggested the program might be too Canada-centric and that Canadian professors would be unlikely to nominate a candidate with whom they had not previously worked. This could potentially put international applicants at a disadvantage. Banting program management





should explore any potential link between the decline and program design issues such as the requirement to demonstrate synergy between an applicant's research program and the proposed host institution's strategic priorities. Program management should also review current processes used by universities to determine if factors exist that inhibit international applications and, if warranted, take action to address the factors.

**2. The Banting program should monitor the ongoing impact of and need for the 25% cap on Banting fellowships awarded to individuals who apply in collaboration with a foreign institution.**

The issue of the 25% cap relates to the tensions identified in the program between the attraction and retention of top-tier talent. Decisions taken on the cap will reflect whether program management views it as more important to attract the best candidates regardless of where they intend to take up the award or whether ensuring retention and a 'net gain' of talent is the primary consideration. While the cap contributes to the retention of top-tier postdoctoral talent in Canada it limits the selection of the best candidates from among those who wish to hold their fellowship abroad.

There is currently a lack of consensus among key program stakeholders on the need for the cap and diverse opinions on the benefit to Canada of retaining Banting fellows to conduct their training in Canada in contrast with the international nature of research and ability to attract top-tier postdoctoral fellows. As a result, it is important to monitor the attraction and retention of Banting fellows after their fellowship to assess the need for the cap based on its longer-term impact on the retention of Banting fellows.

**3. The Banting program should develop guidance regarding leading practices for the support of Banting fellows to develop their leadership potential and position them for success as research leaders of tomorrow.**

Currently, the nature and extent of support provided to Banting fellows varies widely across institutions, which could impact the ability of fellows to conduct independent research. Some supports such as office space, computers and access to library facilities seem to be always available but others such as a guaranteed fund for independent research or the ability to independently apply for research grants are not. Similarly, mentoring by fellows' supervisors or informal interactions with other experienced faculty appear to be always available whereas formally structured mentorship programs with specified milestones are rare. The Banting program should identify leading practices regarding the level and types of support to develop and position Banting fellows as research leaders.





# Appendices

## APPENDIX A: PROGRAM PROFILE

### Background

The Banting Postdoctoral Fellowships (PDF) program was announced in the 2010 federal budget as part of a broader strategy to increase Canadian capacity for research excellence. The three federal granting agencies (Canadian Institutes of Health Research - CIHR, Social Sciences and Humanities Research Council of Canada - SSHRC, and Natural Sciences and Engineering Research Council of Canada - NSERC) were allocated \$45 million over five years to establish a new and prestigious postdoctoral fellowships program aiming to attract top-level talent to Canada. The first program intake was in November 2010, with the first awards announced in March 2011.

### Program Objectives and Target Audience

The Banting Postdoctoral Fellowships (PDF) program aims to develop high-level research capacity in Canada, by attracting Canadian and international trainees to initiate their research careers in Canadian universities and abroad and to ultimately contribute positively to Canada's economic, social and research-based growth through a research-intensive career. The specific objectives of the program are to:<sup>15</sup>

- Attract and retain top-tier postdoctoral talent, both nationally and internationally;
- Develop their leadership potential; and
- Position them for success as research leaders of tomorrow

Areas of research supported by the fellowship are health research, natural sciences and engineering, and social sciences and humanities. The program is intended to be competitive with other prestigious international awards and the stipend level compares favorably with other international fellowships (Table A1).

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<sup>15</sup> See <http://banting.fellowships-bourses.gc.ca/app-dem/overview-apercu-eng.html>. Accessed January 7, 2014.





**Table A-1: Postdoctoral Fellowship Awards in Selected Countries vs Canada\***

Country	Award	Stipend (CDN\$/Year)
UK	Arts and Humanities Research Board Doctoral Awards	\$19,500-\$25,000
USA	National Research Service Awards for Individual Postdoctoral Fellows	\$25,800+
EU	Max Weber Fellowships	\$33,300+
Germany	Humboldt Foundation	\$37,000
Canada	SSHRC Fellowship (Agency-specific)	\$40,500
Canada	NSERC Fellowship (Agency-specific)	\$40,000
Canada	CIHR Fellowship (Agency-specific)	\$40,000-50,000+
USA	National Institutes of Health Postdoctoral Award	\$43,000-\$68,000
USA	NSF Postdoctoral Research Fellowships in Biology	\$45,000 +
Japan	Postdoctoral Research Fellowships	\$50,000
Australia	Australian Research Council Postdoctoral Fellowships	\$59,500
Japan	Elite Postdoctoral Research Fellowships	\$61,000
UK	Economic and Social Research Council Fellowship	\$65,000-\$71,000
Multiple	Human Frontier Science Program - Long Term Fellowships	\$69,000
Canada	<b>Banting Postdoctoral Fellowship (Tri-agency)</b>	\$70,000
UK	Biotechnology and Biological Sciences Research Council Fellowship	\$73,500
UK	Newton International Fellowships	\$81,500+

\*Awards are ranked by stipend value. CIHR and SSHRC give out \$5000 extra as annual research allowance while CIHR adds \$5000 for awards held outside Canada. For internationals: Not including research allowance. Source: Banting program documents.

The program is targeted at Canadian citizens, permanent residents of Canada and foreign citizens who have:

- fulfilled all degree requirements for a PhD, PhD-equivalent or health professional degree within an eligibility window of three years prior to their Banting PDF application, or within five years if they have experienced career interruptions;
- already demonstrated their potential for strong leadership in their fields; and
- shown high quality research with demonstrated potential for significant impact through an independent research-intensive career.

### Organization and delivery

Competitions are run annually with the top 70 candidates being selected and recommended for approval.<sup>16</sup> Initially, eligible applications are reviewed and ranked by agency-specific selection committees (i.e., one per granting agency) in relation to three equally weighted selection criteria with the 23 or 24 most meritorious applicants being recommended by each selection committee.<sup>17</sup> The criteria are:

1. Research excellence and leadership in the research domain;

<sup>16</sup> <http://banting.fellowships-bourses.gc.ca/rev-eval/overview-apercu-eng.html>. Accessed Jan 27, 2014.

<sup>17</sup> The three agencies take turns selecting the 24<sup>th</sup> applicant to make up the annual total of 70 new Banting recipients.





2. Quality of the applicant's proposed research program; and
3. Institutional commitment and demonstrated synergy between applicant and institutional strategic priorities.

Subsequently, the list of 70 recommended applicants is submitted to the Vanier-Banting Steering Committee, composed of the Presidents of the tri-agencies and Deputy Ministers of Health Canada and Industry Canada, for final approval. The committee also approves the fundable cutoff for use in the event that an applicant within the first 70 declines the award.

### Budget and Other resources

The Banting PDF awards are of two years duration, with a taxable value of \$70,000 per year. The program supports 70 new fellows per year, with a total of 140 active awards after the selection of the second cohort. From program launch in 2010-11 to 2013-14, a total of 283 fellowships<sup>18</sup> have been awarded and this number is expected to reach 350 by the fifth year. From an initial amount of \$100,000 in 2010-11, the program's operational budget increased to \$5.1million in 2011-12 and to \$10 million in 2012-13 and is projected to stay at that level through 2014-15 (Table A-2).

**Table A-2: Banting PDF program operational budget, 2010-2011 – 2014-2015 (000\$)**

Operation	2010-2011 (000\$)	2011-2012 (000\$)	2012-2013 (000\$)	2013-2014 (000\$)	2014-2015 (000\$)
<b>Operations</b>	100				
<b>CIHR</b>		100	100	100	100
<b>NSERC</b>		50	50	50	50
<b>SSHRC</b>		50	50	50	50
<b>Awards</b>	---	4,900	9,800	9,800	9,800
<b>Total</b>	\$100	\$5,100	\$10,000	\$10,000	\$10,000

Source: Treasury Board program documents and Banting PMS document.

The operational budget amounts exclude the financial resources used by institutions to promote the Banting PDF program, as well as their financial and in-kind support to fellows. The overall program resources may thus be higher than the direct support from the granting agencies.

<sup>18</sup> Note that in 2011-12, a total of 73 fellowships were awarded.







## APPENDIX B: BANTING POSTDOCTORAL FELLOWSHIPS PROGRAM LOGIC MODEL

**Vision:** *“To attract and retain top—tier postdoctoral talent, both nationally and internationally, to develop their leadership potential and to position them for success as research leaders of tomorrow, positively contributing to Canada’s economic, social and research-based growth through a research-intensive career.”*

Activities	Outputs	Immediate Outcomes	Intermediate Outcomes	Ultimate Outcomes
Program management and administration  Development and dissemination of program branding, communications and marketing strategies	Top-tier applicants are attracted and recruited  Banting fellowships awarded  Communication/promotion materials produced  Communication/promotion materials disseminated  Client services delivered, program management reports produced, delivered and disseminated	Banting fellows receive enhanced research training  Banting fellows devote the majority of their time to conduct research  Banting fellows establish national and international collaborations  Increased national and international awareness of Banting PDFs as an attractive and competitive award	Banting fellows are retained and undertake research careers in Canada*  Banting fellows attain leadership positions in organizations  Banting fellows demonstrate leadership**  Banting fellows are recognized as representatives of Canadian research excellence	Canada’s research enterprise has a reliable supply of highly qualified/trained researchers  Canada is a destination of choice for quality research training

Assumptions	External Influences
<ul style="list-style-type: none"> <li>• Research institutions are aware of objectives and nature of B-PDF program.</li> <li>• Research institutions engage and participate as intended.</li> <li>• Attraction and retention are important to all activities and outcomes.</li> </ul>	<ul style="list-style-type: none"> <li>• Government of Canada budget &amp; priorities</li> <li>• Budget and priorities of research institutions.</li> <li>• Canadian &amp; global economic climate</li> <li>• Priorities and need in research communities</li> </ul>

\* Research careers can be undertaken in a variety of sectors such as Industry, Government, Academia, Non-profit organizations and Health.

\*\*The program’s performance measurement strategy separates leadership into three broad categories, each with its own characteristics and activities: Research Leadership; Academic Leadership; and, Service Leadership (see Mazutis, Morris and Olsen, 2011). While the first two categories are relatively straightforward, Service Leadership is not. For university faculty, “service” primarily means participating in departmental or institutional committees. However, the performance measurement strategy also includes activities such as advising students, mentoring junior colleagues, or becoming involved in community civic groups, agencies and organizations.





## APPENDIX C: BANTING POSTDOCTORAL FELLOWSHIPS PROGRAM EVALUATION MATRIX

Evaluation Questions	Indicators	Data sources and collection methods
<b>Relevance</b>		
<p>1. To what extent does the Banting program continue to address a demonstrated need?</p>	<p>1.1 Assessment of demand for the program (application pressure - number of applications, % fundable but not funded)</p> <p>1.2 Percentage of Banting recipients who completed their award and took up research-related positions (whether in Canada or outside). (BEAR)</p> <p>1.3 Perceptions of Banting PDF recipients regarding PDF experience without Banting funding and in the context of other funding opportunities (BEAR)</p> <p>1.4 Perceived role of Banting in decision to remain in academic research (BEAR)</p> <p>1.5 Perceived significance of Banting to employers (BEAR)</p> <p>1.6 Percentage of Banting PDF recipients who declined award (where possible, identified reason(s) why)</p>	<ul style="list-style-type: none"> <li>• Administrative data</li> <li>• Document review</li> <li>• Banting End of Award Report (BEAR)</li> <li>• Survey of Banting PDF non-recipients</li> <li>• Focus groups with Banting recipients and non-recipients</li> </ul>
<p>2. To what extent is the Banting program aligned with federal government and agency priorities?</p>	<p>2.1 Compatibility of Banting program objectives/expected results with federal government and granting agencies' priorities</p> <p>2.2 Extent of duplication/overlap of Banting program objectives with other federal granting agency postdoctoral funding programs</p>	<ul style="list-style-type: none"> <li>• Document review</li> <li>• Key informant interviews with Banting program staff, institutional representatives and senior granting agency/government officials including Health Canada, Industry Canada, and DFATD.</li> </ul>





Evaluation Questions	Indicators	Data sources and collection methods
3. To what extent is the Banting program aligned with federal roles and responsibilities?	3.1 Identified role for the federal government in supporting top tier national and international postdoctoral trainees	<ul style="list-style-type: none"> <li>• Document review</li> <li>• Key informant interviews with Banting program staff, institutional representatives and senior granting agency/government officials including Health Canada, Industry Canada, and DFATD.</li> </ul>
<b>Performance: Effectiveness</b>		
4 Is the Banting program's selection process able to attract and select top-tier post-doctoral candidates?	<p>4.1 Identified facilitators and inhibitors to attracting and retaining top tier postdoctoral talent</p> <p>4.2 Extent to which Banting PDF recipients and non-recipients express satisfaction with the application and selection process</p> <p>4.3 Perceptions of institutional endorsement process used including identified strengths, weaknesses and suggested improvements</p> <p>4.4 Perceptions of research and leadership attributes and accomplishments of supervised Banting PDF recipients</p> <p>4.5 Perceptions of the extent to which trainees endorsed for a Banting PDF award were top tier</p> <p>4.6 Proportion of recipients vs. non-recipients from top-ranked institutions as measured by The Times rankings index<sup>19</sup></p> <p>4.7 ARCs and ARIFs, number of books, book chapters &amp; reports published, number of presentations (for 3-year period leading to application) of recipients vs. non-recipients; correlations of these productivity data with selection committee rankings</p>	<ul style="list-style-type: none"> <li>• Document/Literature review</li> <li>• Focus groups with Banting recipients and non-recipients</li> <li>• Key informant interviews with Banting program staff and institutional representatives</li> <li>• Administrative data analysis</li> <li>• Survey of Banting PDF recipient supervisors</li> <li>• Survey of selection committee members</li> <li>• Bibliometrics</li> </ul>

<sup>19</sup> See <http://www.timeshighereducation.co.uk/world-university-rankings/2013/reputation-ranking>





Evaluation Questions	Indicators	Data sources and collection methods
<p>5 To what extent have Banting fellows received appropriate training and support to carry out their research programs?</p>	<p>5.1 Banting recipients' perceptions of the quality of their training environment (BEAR)</p> <p>5.2 Perceptions of quality of supervision, professional development training and socialization into academic community received during award tenure (BEAR)</p> <p>5.3 Extent of Banting recipients' involvement in leadership development activities during award tenure (BEAR)</p> <p>5.4 Types of training opportunities received by Banting recipients' during award tenure (BEAR)</p> <p>5.5 Banting recipients' perceptions of extent of development of leadership abilities activities and opportunities provided to Banting recipients (BEAR)</p> <p>5.6 Percentage of time devoted to research activities vs. administrative, teaching, supervisory and other duties (BEAR)</p>	<ul style="list-style-type: none"> <li>• Banting End of Award Report (BEAR)</li> <li>• Key informant interviews with institutional representatives</li> <li>• Survey of Banting PDF recipient supervisors</li> <li>• Survey of Banting PDF non-recipients</li> <li>• Focus groups with Banting recipients and non-recipients</li> </ul>
<p>6 To what extent have Banting fellows demonstrated research excellence and leadership?</p>	<p>6.1 Number and type of research outputs and knowledge dissemination activities undertaken by Banting recipients and non-recipients since Banting award/application year (BEAR)</p> <p>6.2 Mean years to first peer-reviewed publication of recipients vs. non-recipients since Banting award/ application year (BEAR)</p> <p>6.3 Perceived influence of research locally, nationally and/or internationally (BEAR)</p> <p>6.4 Positive teaching reviews obtained and teaching awards earned (BEAR)</p>	<ul style="list-style-type: none"> <li>• Banting End of Award Report (BEAR)</li> <li>• Survey of Banting PDF non-recipients</li> <li>• Focus groups with Banting recipients and non-recipients</li> </ul>





Evaluation Questions	Indicators	Data sources and collection methods
	6.5 Type, number and value of grants, awards and prizes held by Banting recipients vs. non-recipients since Banting award/application year (BEAR)	
7 To what extent have Banting fellows established national and international collaborations?	<p>7.1 Percentage of Banting recipients and non-recipients who report engaging in networking and collaboration including type of collaboration (BEAR)</p> <p>7.2 Percentage of Banting recipients and non-recipients whose interactions developed into collaborations (BEAR)</p> <p>7.3 Frequency of interactions with researchers and trainees both inside and outside Canada (BEAR)</p> <p>7.4 Percentage of Banting recipients and non-recipients reporting national vs. international collaborations (BEAR)</p> <p>7.5 Percentage of Banting recipients collaborating with other Banting recipients (BEAR)</p> <p>7.6 Percentage of Banting recipients and non-recipients who were satisfied with their networking and collaborations</p>	<ul style="list-style-type: none"> <li>• Banting End of Award Report (BEAR)</li> <li>• Survey of Banting PDF non-recipients</li> <li>• Focus groups with Banting recipients and non-recipients</li> </ul>
8 To what extent have national and international awareness of Banting fellowships as an attractive and competitive award increased since program launch?	<p>8.1 Perceptions of, and evidence provided by, institutional representatives regarding the extent to which awareness of the Banting program has increased over time</p> <p>8.2 Percentage change in web metrics for Banting Fellowship website relating to number of visits, Canadian vs. international</p>	<ul style="list-style-type: none"> <li>• Key informant interviews with institutional representatives</li> <li>• Document review (Banting Communications Updates)</li> <li>• Administrative data analysis</li> <li>• Banting End of Award Report (BEAR)</li> <li>• Survey of Banting PDF recipient supervisors</li> <li>• Survey of PDF non-recipients</li> <li>• Focus groups with Banting</li> </ul>





Evaluation Questions	Indicators	Data sources and collection methods
	<p>traffic, and sources of referrals to website.</p> <p>8.3 Percentage increase in number of Banting PDF applicants from both inside and outside Canada</p> <p>8.4 Researchers' and students' perceptions of the relative prestige and competitiveness of Banting PDFs (BEAR)</p>	<p>recipients and non-recipients</p>
<p>9 To what extent have Banting fellows remained in Canada and pursued research careers?</p>	<p>9.1 Percentage of Banting PDF recipients and non-recipients who completed their postdoctoral training and are working in research-related positions in Canada (BEAR)</p> <p>9.2 Percentage of Banting PDF recipients and non-recipients who remained in Canada and have research-related job titles (BEAR)</p> <p>9.3 Percentage of Banting PDF recipients and non-recipients who remained in Canada and whose main job activities are research-related (BEAR)</p> <p>9.4 Identified factors that influenced Banting PDF recipients and non-recipients to pursue or obtain research-related positions outside of Canada (BEAR)</p>	<ul style="list-style-type: none"> <li>• Banting End of Award Report (BEAR)</li> <li>• Survey of Banting PDF non-recipients</li> <li>• Focus groups with Banting recipients and non-recipients</li> </ul>
<b>Performance: Efficiency and Economy</b>		
<p>10 Are the most appropriate and efficient means being used to achieve the outcomes, relative to alternative design and delivery approaches?</p>	<p>10.1 Ratio of operating expenditures to applications reviewed in total and by federal granting agency</p> <p>10.2 Ratio of operating expenditures to grant funds awarded in total and by federal granting agency</p> <p>10.3 Proportion of Banting program budget expended in total and per agency</p> <p>10.4 Identified best practices among national and</p>	<ul style="list-style-type: none"> <li>• Administrative data analysis</li> <li>• Document/Literature review</li> <li>• Key informant interviews with Banting program staff and institutional representatives</li> <li>• Survey of selection committee members</li> <li>• Focus groups with Banting recipients and non-recipients</li> </ul>





Evaluation Questions	Indicators	Data sources and collection methods
	international postdoctoral fellowship programs 10.5 Perceptions of comparable or alternative delivery mechanisms to the Banting program 10.6 Identified strengths of, and suggested improvements to, the design and implementation of the Banting program	





## APPENDIX D: METHODOLOGY

In line with best practice in evaluation several lines of evidence were utilized to triangulate the findings. The use of multiple methods involving both quantitative and qualitative evidence is designed to ensure that the evaluation findings are robust and credible and that valid conclusions can be drawn about the performance and relevance of the programs. The data collection methods included key informant interviews with Banting host institution representatives and Banting fellows' supervisors; focus groups with current Banting fellows and a corresponding cohort of unsuccessful applicants; analysis of online end of award reports completed by the first two cohorts of fellows; an online survey with corresponding cohorts of unsuccessful applicants; bibliometrics analysis of the research productivity and impact of Banting applicants from the first four competitions, analysis of administrative data and review of program documents.

### **Key Informant Interviews**

A total of 46 semi-structured interviews were conducted by an external contractor with host institution representatives, Banting fellows' supervisors and federal agency officials. The host institutions were selected using a stratified random sampling approach based on number of Banting fellows hosted, institution size and region. In each selected institution, the vice president or dean for research or the postdoctoral office was invited to participate.

Participants were initially sent invitation letters by the CIHR Evaluation Unit and the consultant followed up with those who responded positively. Of the 35 institutional representatives invited, 22 agreed to participate. Supervisors were either contacted directly by the CIHR Evaluation Unit or indirectly through their Banting trainees and 16 out of 60 invitees participated. Eight senior officials representing the federal granting agencies, federal departments and the Vanier-Banting secretariat were also interviewed.

All key informant interviews were conducted by telephone except one which was conducted by Skype. Each interview took between 30 to 60 minutes and was recorded after verbal consent had been received. Transcripts were generated and analyzed thematically using NVivo 8 software (QSR International, 2008) for coding. An interview guide was developed for each category of key informants (host institution representatives, supervisors and federal officials) and each was translated into French with each participant being interviewed in the official language of their choice.

In qualitative methods, there is an effort made to solicit a wide range of perspectives and opinions from a diverse set of participants. In semi-structured interviews, participants have flexibility in responding to questions and may at times elaborate on thoughts and ideas that are not necessarily inquired, or may decide to provide less emphasis on specific questions without

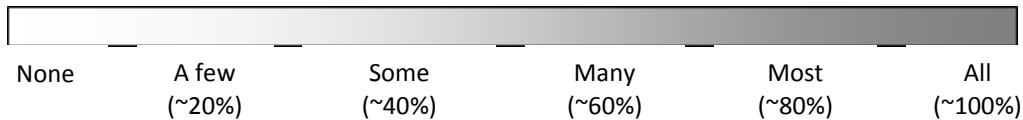






necessarily devaluing the intent of the question. It is, therefore, problematic to attach quantitative concepts such as magnitude, (e.g. the number of people or percentage of people who provided a specific response) to qualitative data analysis. The lack of specific responses from interview participants does not necessarily mean they agree/disagree or lack perspective on the topic in question. Nonetheless, it may be useful to understand if there are shared or similar opinions held across a diverse group of key informants. As such, language such as “a few participants”, or “some participants” or “one participant” have been used in the report to indicate if there were single ideas or ideas shared by more than one individual. Caution should be applied in over interpreting the magnitude on specific perspectives. A lack of voiced opinion by a participant does not imply lack of any opinion; similarly, an opinion shared by a few participants may not be shared by many more participants.

In this report, we are using a loose definition of shared opinions based on the scale below.



### Focus Groups

Separate focus groups were held with current Banting fellows and a corresponding cohort of unsuccessful applicants. The sessions were moderated by an external consultant using teleconference. Participants were selected based on simple random sampling methods and were invited for specific dates/times and those who confirmed were provided the teleconference number and passcode. Each focus group took between 60 to 90 minutes depending on the number of people who participated.

A total of five focus groups were held; an additional three sessions were organized but were cancelled as there were no confirmed participants. In order to increase participation numbers, individual telephone interviews were arranged with three non-recipients. Individual interviews were approximately 30 minutes. Each focus group session included participants from only one of the tri-agencies (CIHR, NSERC and SSHRC) and only Banting fellows or only unsuccessful applicants. Two individual interviews were conducted in French. A total of 20 successful Banting PDFs and seven unsuccessful applicants participated in these focus groups and interviews. Each focus group/interview was recorded after receiving verbal consent. Transcripts were generated and analyzed thematically using NVivo 8 software.





## Document Review/Administrative Data Analysis

Program records and administrative and financial data from the Vanier-Banting Secretariat and the tri-agencies were reviewed to help contextualize the program in terms of application trends, success rates and target audience and also to help determine the cost of the program.

## Bibliometrics

Bibliometric analysis has been used by the federal funding agencies and others to measure the scientific outputs and outcomes of the researchers they support and to assess the effectiveness of the peer review process in selecting the “best” applicants (CIHR, 2012; Larivière, 2011; SSHRC, 2010; Campbell et al., 2010, 2009; NSERC, 2007; Melin & Danell, 2006) including doctoral and postdoctoral candidates (Bornmann, Wallon & Ledin, 2008; Bornmann & Daniel, 2006, 2005 a & b).

The use of bibliometrics however, has been criticized on the grounds that estimates of publication quality based on citations can be misleading and that citation practices differ across disciplines and sometimes between sub-fields in the same discipline (Ismail et al., 2009). This is a particularly salient issue for researchers whose work (a) falls into certain NSERC or SSHRC research areas or (b) lie predominantly in CIHR’s Pillars III and IV relating to health systems and population health and include research disciplines where outputs such as books or book chapters may be a more meaningful and accurate measure. In the light of this, the bibliometric analysis was conducted separately for applicants from the different agencies.

The bibliometric analysis was conducted by an external contractor, *Observatoire des sciences et des technologies* (OST) of the University of Quebec in Montreal. The bibliometric data were drawn from the Canadian Bibliometric Database (CBD™) built by the *Observatoire des sciences et des technologies* (OST) using Thomson Reuters’ Web of Science (WoS). The WoS includes three databases (the Science Citation Index Expanded™ [SCI Expanded], the Social Sciences Citation Index™, and the Arts & Humanities Citation Index™) covering, in 2013, more than 11,700 journals in all disciplines. The WoS is the staple database for bibliometric analyses, and indexes the most important journals of each disciplinary field based on their number of citations. Also, its coverage of scientific literature is consistent over time<sup>20</sup>.

Although, PubMed offers a more comprehensive coverage of health sciences literature, unlike WOS it is not a “citation index”, and therefore does not allow for the computation of scientific impact measures, which are essential indicators in the context of the present study. Another citation index that could be used for bibliometrics is built and maintained by publisher Elsevier-Reed: the Scopus database. However, literature shows that Scopus and the WoS produce highly comparable results (Archambault et al., 2009).

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<sup>20</sup> See: [http://thomsonreuters.com/products\\_services/science/free/essays/journal\\_selection\\_process/](http://thomsonreuters.com/products_services/science/free/essays/journal_selection_process/)





The analysis involved the reconstitution of publications files (2007-2013) of postdoctoral researchers who applied to Banting or other federal postdoctoral fellowships in the period spanning 2010-11 to 2013-14. The list of Banting fellows included those who declined the award because although they did not accept the fellowship, they were flagged by the selection process as being among the best applicants. It was assumed that an assessment of the selection process that involved reviewing research productivity prior to the competition year should include them in the “successful” category. Thus, the total number of “recipients” was 318 compared to the 283 researchers who actually accepted the award.

The indicators used in the analysis are defined below:

**Number of Publications:** Each publication authored by a researcher is counted once for that researcher, regardless of the number of co-authors. However, when a group of researchers is considered as a whole (for example the 2010 cohort of Banting fellows), each publication is counted once, even if it was authored by more than one researcher belonging to that group. Although the OST database includes several types of documents, only articles, research notes and review papers were selected for the bibliometric analysis as these are the primary means of disseminating new knowledge.

**Average Annual Number of Publications:** The total number of distinct publications assigned to a group of researchers is divided by the number of researchers in the group and the number of years considered in the observation window.

**Average Relative Impact Factor (ARIF):** This indicator provides a measure of the scientific impact of the journals in which a group of researchers publishes. Each journal has an impact factor (IF), which is calculated annually based on the average number of citations received by the papers it published during the two previous years. The value of a journal’s IF is assigned to each paper it publishes. In order to account for different citation patterns across fields and subfields (e.g., there are more citations in biomedical research than mathematics), each paper’s IF is then divided by the average IF of the papers in its particular subfield in order to obtain a Relative Impact Factor (RIF). The ARIF of a given institution (or group of researchers) is computed using the average RIF of all papers belonging to it.

When the ARIF is greater than 1, it means that this institution (or group of researchers) publishes in journals that are cited more often than the *world average*; when it is below 1, it publishes in journals that are not cited as often as the *world average*. This indicator is set to non-significant (n.s.) when the number of publications involved is below 30. Also, since the distribution of the relative impact factors is skewed, Mann-Whitney U statistical tests were performed to probe the statistical significance of any observed differences.





$$ARIF = \frac{\sum_{p=1}^n \frac{X_{psy}}{\bar{X}_{sy}}}{N}$$

Where:

$X_{psy}$  = Impact factor of the paper (p) of the speciality (s) published in a given year (y);

$\bar{X}_{sy}$  = Average impact factors of papers of the speciality (s) published in the same year (y);

N = Total number of papers (of a given country or institution)

**Average of Relative Citations (ARC):** This indicator is based on the number of citations received by a published paper over the period covered by the database following the publication year. Thus, for papers published in 2007, citations received between 2008 and 2013 are counted. For papers published in 2008, citations received between 2009 and 2013 are counted, and so on. Author self-citations are included. The number of citations received by each paper is normalized by the average number of citations received by all papers published during the same year in the same subfield, hence taking into account the fact that older papers tend to have higher citations than more recent ones and that citation practices are different for each specialty.

An ARC value greater than 1 means that a paper or a group of papers scores higher than the world average of its specialty; while a value below 1, shows that those publications are not cited as often as the world average. This indicator is set to non-significant (n.s.) when the number of publications involved is below 30. Also, since the distribution of the relative citations is skewed, Mann-Whitney U statistical tests were performed to probe the statistical significance of observed differences.

$$ARC = \frac{\sum_{p=1}^n \frac{X_{psy}}{\bar{X}_{sy}}}{N}$$

Where:

$X_{psy}$  = Number of citations received by the paper (p) of the speciality (s) published in a given year (y);

$\bar{X}_{sy}$  = Average number of citations by papers of the speciality (s) published in the same year (y);

N = Total number of papers (of a given country or institution).

**International collaboration:** This is an indicator of the relative intensity of scientific collaboration between countries. A paper is considered to be written in international collaboration when it bears addresses from a least two different countries; for example, a Canadian researcher co-authoring a paper with a researcher from a foreign institution. The rate is calculated by dividing the number of international collaborations by the total number of papers.





## Surveys

Online surveys were conducted to provide information to assess several evaluation issues including achievement of outcomes, design and delivery and relevance. The survey results also helped triangulate findings from other lines of evidence.

Banting fellows are required to complete an online survey, the Banting End of Award Report (BEAR), within 18 months of completing the fellowship. The evaluation leveraged this existing data and therefore Banting fellows did not have to be re-surveyed. The BEAR was administered using Fluid Survey software. By the end of March 2015 all members of the first two cohorts of Banting fellows (2010-11 and 2011-12) were expected to have completed the BEAR and reports from some of the 2012-13 fellows had started trickling in. Only respondents from the first two cohorts were used in this analysis.

A corresponding cohort of unsuccessful applicants from the first two competitions was targeted in another online survey using a shortened version of the BEAR to reduce respondent burden and enhance response rates. All unsuccessful applicants from the first two competitions were considered eligible and the survey was administered with Fluid Survey software from March 26, 2015 to April 20, 2015. The population sizes and corresponding response rates are presented by tri-agency and respondent type in Table A4 below.

**Table A4: Applicant Surveys - Response Rate by Respondent Type**

Group	Population Size	Invitations Sent	Responses received	Response Rate
CIHR Banting	47	47	39	83.0%
NSERC Banting	47	47	43	91.5%
SSHRC Banting	49	49	38	77.6%
CIHR Agency PDF	91	91	27	29.7%
NSERC Agency PDF	45	45	14	31.1%
SSHRC Agency PDF	28	28	8	28.6%
CIHR Unfunded	289	289	43	14.9%
NSERC Unfunded	404	404	76	18.8%
SSHRC Unfunded	135	135	22	16.3%

Source: Survey of Banting Applicants 2015 and Banting End of Award Report 2010–2011 and 2011–2012.





The BEAR is obligatory for every postdoctoral trainee who has been supported with Banting program funds and therefore the high response rate is not surprising.

In terms of representativeness, the BEAR and unsuccessful applicant samples fairly reflect the population of candidates who have applied successfully and unsuccessfully as can be seen in the last two columns in Table A5.

**Table A5: Representativeness: Sample to Population Ratio**

	Population	Sample	Proportion in Population	Proportion in Sample
<i>Banting</i>				
CIHR	47	39	32.9%	32.5%
NSERC	47	43	32.9%	35.8%
SSHRC	49	38	34.3%	31.7%
<b>Sub-Total</b>	143	120	100.0%	100.0%
<i>Agency PDF</i>				
CIHR	91	27	55.5%	55.1%
NSERC	45	14	27.4%	28.6%
SSHRC	28	8	17.1%	16.3%
<b>Sub-Total</b>	164	49	100.0%	100.0%
<i>Unfunded</i>				
CIHR	289	43	34.9%	30.5%
NSERC	404	76	48.8%	53.9%
SSHRC	135	22	16.3%	15.6%
<b>Sub-Total</b>	828	141	100.0%	100.0%

Source: Survey of Banting Applicants 2015 and Banting End of Award Report 2010–2011 and 2011–2012.

Members of the Banting Selection Committees were also surveyed using Fluid Survey software and the response data are presented in Table A6.

**Table A6: Response Rate for Banting Selection Committee Member Survey**

Group	Population Size	Invitations Sent	Responses received	Response Rate
CIHR	41	41	21	51.2%
NSERC	32	32	21	65.6%
SSHRC	25	25	18	72.0%
<b>Total</b>	98	98	60	61.2%

Source: Survey of Banting Selection Committee Member 2015.

All survey data were analyzed using IBM SPSS Statistics software version 21 (IBM Corporation, 2012).





## Limitations

As with all evaluations, limitations were encountered in implementing the data collection methods and these are reviewed below.

The bibliometric data presented in this evaluation are drawn from the Canadian Bibliometric Database (CBD™) built by the Observatoire des sciences et des technologies (OST) using Thomson Reuters' Web of Science (WoS). However, the bibliometric analyses presented in this report do not include all documents published by the studied researchers, since some works are disseminated through scientific media not indexed by the WoS (e.g., highly specialized journals, national journals, grey literature and particularly conference proceedings not published in journals). What these statistics do measure, however, is the share of researchers' scientific output that is the most visible for Canadian and worldwide scientific communities, and therefore that is most likely to be cited<sup>21</sup>.

Also, the WoS offers a good coverage of the publication output for the research fields of health sciences and natural sciences and engineering (NSE) including the content of international journals. In contrast, a large proportion of research results in the social sciences and humanities (SSH) is published in books and national journals not indexed in WoS and thus its coverage is far less complete for the social sciences, and even less so for humanities. Thus, while the results are considered reliable for CIHR and NSERC applicants, they could not be considered to be representative of the publication outputs of applicants in the SSH domain. Therefore the bibliometrics findings for the SSHRC applicants are not presented in this report.

The surveys of Banting fellows and unsuccessful applicants were administered at two different points in time: the Banting End of Award Report (BEAR) was completed by the Banting fellows between late 2012 and March 2015 while the unsuccessful applicant survey was administered from March 26, 2015 to April 20, 2015. Although most of the survey questions were taken from the BEAR, it is possible that respondents answered questions relating, for example, to research productivity, with reference to different time points: Banting fellows with reference to the two-year tenure of the Banting fellowship; and the unsuccessful, with reference to their postdoctoral training which could be longer than two years. As a result, only the bibliometric

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<sup>21</sup> For more details see [http://thomsonreuters.com/products\\_services/science/free/essays/journal\\_selection\\_process](http://thomsonreuters.com/products_services/science/free/essays/journal_selection_process)





analyses results and not the survey results are used to compare the research productivity of Banting fellows, Agency PDF and Unfunded applicants.

There were two limitations with the key informant interviews. Firstly, all the initial invitations to host organizations were sent to senior executives of the universities (E.g. Vice President or Vice-Provost). Each invited individual determined if they wanted an alternative person to be interviewed. The level of involvement with the Banting PDF was therefore different among the host organization interviewees and this differentially impacted their contributions to the key informant interviews.

Secondly, majority of the Banting fellows' supervisors had limited experience with the Banting program. All had supervised only one Banting recipient; and in almost all cases had supported only one to two Banting applications thus potentially limiting the depth of their perspectives.

The limitation with the focus groups related to small sample sizes. More specifically, the number of participants in the focus groups targeting unsuccessful applicants was small, fewer than four, limiting the data collected and potentially the diversity of perspectives. The majority of those who declined did not provide a reason or stated that they were not available for the scheduled focus groups while two individuals indicated their disappointment with the outcome of their application and preferred not to participate.





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