



EVALUATION OF THE UNIVERSITY FACULTY AWARDS PROGRAM

FINAL REPORT

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Natural Sciences and Engineering Research Council
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EXECUTIVE SUMMARY

INTRODUCTION

Launched in 1999 by the Natural Sciences and Engineering Research Council (NSERC), the University Faculty Awards (UFA) Program provides funding to promising researchers with a view to increasing the representation of women and Aboriginal people in faculty positions in natural sciences and engineering.

The objective of the UFA program is to encourage Canadian universities to appoint talented female and Aboriginal researchers to tenure-track or tenured positions in the natural sciences and engineering disciplines. The award consists of a salary contribution and a research grant. Several committees adjudicate the award: the University Faculty Awards Selection committee is responsible for assessing the need for women or Aboriginal people in the discipline and/or the institution, as well as institutional commitment; and the Grant Selection Committee from the Discovery Grant Program determines the merit of the candidates and their research program, and the value allotted for the grant.

PURPOSE OF THIS EVALUATION

The evaluation of the University Faculty Awards Program examined issues related to the Program's relevance/rationale, success/outcomes, cost-effectiveness, and design and delivery. The specific evaluation questions addressed are presented in Appendix A to the report.

METHODOLOGY

The methodology to evaluate the University Faculty Awards Programs was comprised of a number of qualitative and quantitative lines of evidence. The use of multiple methodologies in an evaluation has the advantage of providing the opportunity for triangulation of evaluation findings from different perspectives. The lines of evidence used to collect data for this evaluation included:

- Document and file review
- Analysis of data from Statistics Canada, NSERC and Indian and Northern Affairs (INAC)
- Survey of UFA holders (n=83)
- Survey of non-recipient UFA nominees (n=60)
- Survey of doctoral and post-doctoral fellows (n=191)

- Interviews with university decision-makers (n=21)
- Interviews with key informants (n=22)
- Case studies (n=9).

PROGRAM RELEVANCE

CONTINUED RATIONALE FOR THE PROGRAM

Based on statistical data on academic staff and enrolment in the natural sciences and engineering, women continue to be under-represented in general in the natural sciences and engineering. The data clearly show that Canada is facing a “leaky pipeline”. More and more female students are enrolling and graduating in sciences and engineering, but few of them reach the top levels of the academic profession. In fact, the proportion of women declines markedly at each step of the academic ladder. Given the current turnover rate in faculty members, waiting for a gender balance among academia does not seem to be a particularly effective strategy. The data indicate that there is attrition at the undergraduate, graduate and doctorate levels and at the associate and full professor levels. The Program is directed at the point where there is the least attrition, i.e. the pipeline is the least leaky. However, the extent of under-representation of women in the natural sciences and engineering is such that the program is unlikely to have a significant impact given that approximately 25 women per year benefit from the Program. There is a clear need to increase the representation of women in the natural sciences and engineering and thus for a Program with this objective. However, the Program as currently designed and resourced, is unlikely to impact the representation of women significantly.

Data on the number of Aboriginal academics do not exist as such; however, there is quantitative and qualitative evidence to suggest that Aboriginal people are under-represented in academia. Data on the proportion of Aboriginal people with a university degree or certificate in the natural sciences and engineering further indicate that Aboriginal people are under-represented in these fields. Few, if any, Aboriginal people are pursuing higher education in natural sciences and engineering so there are rarely any candidates available for academic positions. The Program is thus unlikely to influence the number of Aboriginal academics hired by Canadian universities because the pool of candidates is extremely limited.

The vast majority of those interviewed for this evaluation feel there is a need to increase the representation of women and Aboriginal people. However, many feel that the Program is not directed at the appropriate stage in the academic careers of women and Aboriginal people. There is evidence that the

Program, as currently designed, is not adequately responding to the barriers faced by women or Aboriginal people seeking to pursue academic careers.

Some researchers have suggested that for full integration of a minority group to occur the minority group must make up 30 per cent of the population. For women to reach what some consider to be the critical mass where there is full integration of a group, the proportion of women in the natural sciences and engineering would have to approximately double from the current level.

There is generally support for the Program however there are indications that some universities may be less supportive of the Program than others. This does not necessarily imply they are less willing to hire women or Aboriginal people. According to university decision-makers some of the reasons they are less willing to participate in the UFA are: reduced teaching and administrative loads of UFA recipients; the effort required to nominate a candidate; and difficulty finding suitable candidates.

This evaluation found little support for the view that women are less interested than men in an academic career. In fact, the leaky pipeline is evidenced between the Masters and Doctoral levels and then after the Assistant Professor level. The proportion of women remains constant from the Doctoral to the Assistant Professor level, precisely where the UFA Program is directed. This provides some indication that women are interested in pursuing an academic career but their numbers decrease relative to men after the Assistant Professor level. This implies that the Program is not directed at the point in the academic ladder where it will have the most impact, i.e. result in the most retention of female academics.

BARRIERS FACED BY WOMEN AND ABORIGINAL PEOPLE IN CANADIAN UNIVERSITIES

There is clear evidence that the balancing of work and family is the most significant barrier for women pursuing an academic career in the natural sciences and engineering. In fact, there is some evidence that the balancing of work and family presents a barrier to men as well. However, it should be noted that this barrier is not specific to academia. Other important barriers identified for women include: the different treatment of men and women; the attitudes of colleagues; the lack of female role models; the need for geographic mobility; and the differences in networking styles of men and women. Some academic studies have also noted bias in the hiring process, however this evaluation found no evidence of such barriers.

There is strong evidence that the barriers for Aboriginal people start long before they enter university. Barriers impacting Aboriginal people are largely social and cultural including: different learning and teaching styles; stereotypes; lack of understanding on the part of universities of the different career

paths of Aboriginal students; and the high school education system which does not provide adequate, culturally relevant science and math education.

There is some evidence that universities experience some barriers to hiring women and Aboriginal people. These barriers include: an insufficient number of qualified candidates; lack of appeal of department/university/town; lack of appeal of academic life; and difficulty identifying potential Aboriginal candidates.

With respect to women, the Program is not responding to the leaky pipeline issue noted in the previous section nor to the barriers noted in this section. To respond to the leaky pipeline, a Program would need to be directed at increasing the proportion of women who stay in the academic stream at each stage in the academic stream at each point in the academic ladder. The social barriers faced by women in pursuing academic careers are such that UFA, as currently designed, cannot reasonably be expected to solve them. These social barriers or realities relate to women's role in society and within the family. Women continue to be the primary caregivers in most families and so face competing demands with respect to work and family.

With respect to Aboriginal people, this evaluation found clear evidence that the Program as currently designed, does not respond to the lack of representation of Aboriginals in academia. The very low number of people pursuing degrees in the natural sciences and engineering means that the pool of candidates that constitute the potential hires for academic positions is too small to have a measurable impact. In order to increase the number of Aboriginal people hired, the pool of potential candidates must first be increased, i.e. the number of Aboriginal people who pursue degrees in natural sciences and engineering must be increased.

POTENTIAL FOR INTER-RELATIONSHIP BETWEEN CRC AND UFA PROGRAMS

This evaluation found no evidence of the CRC Program adversely impacting the UFA Program. There was little evidence found that the UFA and CRC Programs are competing for the same candidates. In fact, there was evidence of only one candidate who had been nominated for both the CRC and UFA simultaneously and six who were nominated for CRCs within three years of receiving the UFA award. Analysis conducted by NSERC found that the mean number of years of experience, as measured by years since receipt of PhD, was 3.93 years for UFA nominees and 8.91 years for CRC Tier 2 nominees. This is a strong indication that there is little overlap between the pools of candidates for the two Programs.

This evaluation found no evidence of universities using the UFA and CRC Programs strategically. The decision to nominate a candidate for the UFA Program is usually made at the level of the department, and the department chair then seeks approval to nominate a candidate for UFA from the university. In the case of CRCs, the decision to nominate a candidate is made at the level of the university and is linked to the overall strategic plan for the university. Although the departments who obtain a CRC

benefit, and are active in developing the nomination, they generally do not initiate the process as they would with a UFA.

SUCCESS AND OUTCOMES

IMPACT OF UFA ON RECIPIENTS' CAREER PATHS

Roughly equal proportions of recipients and non-recipients anticipate staying in academia over the next five years. As well, the majority of non-recipients are currently in tenured or tenure-track positions indicating that recipients would likely have been hired regardless of UFA for a tenured or tenure-track position. This is supported by the views of university decision-makers and those interviewed for case studies. This provides an indication that the Program is not having a significant incremental impact on the number of women hired for tenured or tenure-track positions or the number of women who choose to pursue a career in academia.

There is evidence that the Program is having an impact on the early career progression of UFA recipients. This evaluation found evidence that recipients may have been able to make faster early progress on their research and to publish more papers than non-recipients. The UFA Program has not been in place long enough to assess the longer term impacts of the increased number of publications of recipients, however the increased number of publications may serve to increase the early career momentum of recipients. Why recipients were able to publish more research papers cannot be assessed given the existing data, however recipients have a decreased teaching and administrative load so they are better able to focus on their research and publishing papers early in their career. As well, there is evidence that they are able to start their research sooner after having been hired because they have their Discovery Grant in hand as soon as they are awarded the UFA. Non-recipients, if granted a Discovery Grant in the first round, are permitted to keep their Discovery Grant providing they obtain a position within a specified period of time. Otherwise they must apply for a Discovery Grant after being hired by the university.

The majority of UFA recipients and non-recipients feel that holding an UFA is an important factor in university hiring and promotion decisions. However, few non-recipients report that not having received an UFA has been detrimental to their academic career.

This evaluation found little distinction between UFA recipients and the salary and benefits of other faculty. However, with respect to funding, this evaluation found that UFA recipients have been slightly less successful than non-recipients at securing research funding. Similarly, recipients tend to support fewer highly qualified personnel than non-recipients. However, UFA recipients tend to fare better with respect to Discovery Grants, receiving on average \$24,379 versus \$19,667 for non-recipients in 2003. In addition, a

higher proportion of recipients continue to hold Discovery Grants over time (92 per cent of recipients versus 48 per cent of non-recipients).

There is some evidence that the retention rate for UFA recipients is higher than that of non-recipients. A higher proportion of UFA recipients continue to hold a Discovery Grant for a longer period of time. As well, according to survey results, recipients tend to obtain a tenured or tenure-track position sooner after receipt of their PhD.

Overall, university decision-makers feel that UFA has had a positive impact on hiring practices and that the quality of UFA candidates is comparable, or better than average, relative to non-recipients. There is also some evidence, based on comments from university decision-makers, that UFA has had a positive impact in terms of increased awareness and culture change in their departments that have become more open.

There is little evidence that the UFA is impacting on the decision of UFA recipients to pursue an academic career. In general, recipients were already clearly on the path to an academic career with 51 per cent of recipients being post-doctoral fellows at the time of their nomination. An additional 28 per cent were lecturers and 14 per cent were doctoral students.

According to university decision-makers, only rarely are UFA positions new academic positions. However, the majority of recipients believe that their UFA position is a new one.

EXTENT TO WHICH UFA REDUCES BARRIERS

We note that NSERC management report they did not intend the UFA Program to directly result in a significant increase in the number of women hired for tenured or tenure track positions but rather the Program is intended to work to increase the opportunities for a small number of women and Aboriginal people to develop research capacity early in their career and to serve as mentors for subsequent generations of female and Aboriginal students. The Program resources are insufficient to have a direct impact on the number of women hired for academic positions in Canada. The expectation is that the increased mentoring will encourage more women and Aboriginal people to develop and interest in the science and mathematics and to pursue studies and careers in the natural sciences and engineering. Despite this, there is no strong evidence that UFA recipients are fulfilling their role as mentors any better than non-recipients. If anything, the reduced teaching load of recipients implies they have less contact with students to whom they may serve as role models or mentors. There is evidence from case studies that most students and colleagues are unaware of who holds a UFA. This differs from the situation for CRCs, which tend to be very well publicized.

For the most part, the barriers faced by women in pursuing an academic career in the natural sciences and engineering are societal rather than discriminatory. Societal barriers experienced by women in academia, or other careers, relate largely to family-career balance. The UFA Program is not addressing these social barriers directly. However, some feel that the Program, although not addressing the barriers faced by women directly, is serving to increase the number of women in academia and increasing awareness within academia of the need to increase the representation of women in academia.

Given that the number of nominations for identified Aboriginal people has, to date, been very low with only three nominees to date, including two who were awarded UFAs, nominees being awarded an UFA Award, one cannot expect that the Program will have had a measurable incremental impact on the number of Aboriginal faculty in the natural sciences and engineering. A related issue is the lack of data on the number of Aboriginal faculty without which the extent of the problem, nor the level of success, can be assessed. However, there is consensus among key informant interviewees and case study participants that the Program is not responding to the barriers identified for Aboriginal people, because these arise long before the hiring stage targeted by the Program. This evaluation has found that the barriers for Aboriginal people arise at the elementary and high school level. This results in the pool of Aboriginal candidates who could potentially be nominated for UFA being too small to have a measurable impact. The Program is not directed at the appropriate stage in the education of Aboriginal people so as to result in increased representation of Aboriginal people in academia within the natural sciences and engineering. Despite the lack of incremental impact, the Program is important symbolically in attracting attention to the issue of under-representation of Aboriginal people in academia.

QUALITY AND APPROPRIATENESS OF PROGRAM INFORMATION

Based on evidence collected for this evaluation, academic supervisors and to some extent site visits stand out as being the most effective and successful sources of information about UFA for potential nominees. However, there is a need for the Program to communicate directly with academic staff and university decision-makers about the Program.

This evaluation found that there is a gap in communication about the accomplishments of UFA recipients. Such communication could serve to increase the visibility of recipients and allow them to better serve as role models and mentors, fulfilling a key goal of the Program.

COST-EFFICIENCY AND ALTERNATIVES

APPROPRIATENESS OF THE PROGRAM

Most of those interviewed as part of this evaluation feel that it is appropriate for NSERC to be attempting to redress the under-representation of women and Aboriginal people in academia in the natural sciences and engineering. Most feel this is appropriate because the issue and the domain fit within the mandate of NSERC. There is also some sense that despite its limited ability to influence the proportion of women and Aboriginal people in academia, the Program is symbolic in terms of focusing attention on the issue.

Overall, UFA recipients are well-perceived by their peers. However, this evaluation found possible evidence that a small proportion of recipients may have had some negative experiences with respect to the perceived status of the UFA. This is evidenced by the fact that although they have directly benefited from the Program, recipients generally have the most negative view of employment equity programs with respect to prestige and the perception of others.

Although most of those interviewed indicated that they feel the UFA Program is appropriate in a university setting, many expressed some misgivings. There is strong evidence that nominees for UFA would obtain tenured or tenure-track positions without the UFA. The Program is intended to provide awards to the most talented researchers, however the most talented researchers would have little difficulty in securing a tenured or tenure-track position at a Canadian university regardless of UFA. Thus those who may be talented, but perhaps not outstanding, and thus have more challenges in securing a tenured or tenure-track position, are unlikely to be nominated or awarded a UFA.

ALTERNATIVE DELIVERY STRUCTURES

Alternative structures or delivery modes for increasing the representation of women in academia suggested by interviewees generally focus on the ability of women to better balance work and family, fixing the leaky pipeline, and increasing the appeal of math and science among girls and young women. Alternative structures for increasing the proportion of Aboriginal people in academia focus on the early stages of education, specifically grade school and high school. This responds to barriers identified for Aboriginal people, which arise long before university.

Changes to the design and delivery of the program include: changing nomination deadlines; desynchronizing the UFA and Discovery grant processes; improving communication about the Program; and more partnering with other organizations with similar goals or clientele.

RECOMMENDATIONS

There is considerable evidence that the needs that gave rise to the UFA Program continue to exist. The data clearly indicate that women and Aboriginal people continue to be under-represented in general in the natural sciences and engineering. The evaluation also shows, however, that the Program may not be addressing this under-representation at its core. While the evidence suggests that the UFA Program is having a positive impact on the early career progression of UFA recipients by enabling them to make faster early progress on their research and to publish more papers, it also appears that recipients would likely have been hired regardless of UFA for a tenured or tenure-track position. Therefore, the Program does not seem to be having a significant incremental impact on the number of women hired for tenured or tenure-track positions or the number of women who choose to pursue a career in academia. No significant impacts on salary and benefits were observed either, although some positive impacts on retention rates and hiring practices were noted.

The evaluation evidence also revealed that most feel it is appropriate for NSERC to be attempting to redress the issues around under-representation of women and Aboriginals. However, a number of key concerns characterize the operation of this Program. Therefore, the following recommendations have been developed from the evaluation findings.

Recommendation 1: Discontinue the UFA Program as currently designed

Women—This evaluation found evidence that the Program, as currently designed, is not directed at the stages in the academic ladder where the leaky pipeline occurs for women. The Program is directed at the stage where women are moving from the PhD or post-doctoral level to the assistant professor level, when the data indicate that the level of attrition is smallest at this stage.

Aboriginal people—Based on findings from this evaluation, the barriers faced by Aboriginal people in pursuing studies or careers in the natural sciences and engineering, start at the elementary and high school levels. The Program is not directed at the appropriate stage in the education or academic career of Aboriginal people.

Recommendation 2: Continue to have a program directed at increasing the representation of women in academia within the natural sciences and engineering

This evaluation found considerable evidence that the need for increasing the representation of women in the natural sciences and engineering continues to exist. In addition, NSERC plays an important role within this research community. Although the UFA program is small and so cannot be expected to have large and immediate impacts, the existence of such a program within NSERC is symbolically important in conveying the importance of increasing the representation of women in the natural sciences and engineering. The UFA Program also communicates the federal government's and NSERC's commitment to the issue of female representation in these fields within academia. Nevertheless, NSERC should assess how resources could

be better allocated to respond to the challenge of increasing the representation of women. Attention should be focused on academic levels where there is the greatest degree of attrition. NSERC has two options in this regard, that is, at earlier stages prior to the doctoral level or at later stages at the associate and full professor levels.

Thus, NSERC could examine methods for decreasing the attrition of female students at the undergraduate, graduate and PhD levels. Focusing on the undergraduate, graduate and PhD levels could increase the potential size of the pool of female candidates for academic positions in the natural sciences and engineering. The most meritorious candidates would continue to be hired into tenured or tenure-track positions at the assistant professor level. It should be noted that there was no evidence found in either the literature or the evaluation data that money is an issue in the decision on whether or not to pursue further academic studies and, ultimately an academic career, nor whether to continue in an academic career. The evaluation did find a significant need for increased mentoring for both female students as well as young female professors just beginning their career in academia.

Alternatively, attention could be focused on continuing to have a program directed at young female academics. NSERC should conduct research or analysis to determine the best response to the needs of young female academics. The evaluation found that there is a slight stigma associated with employment equity programs, including the UFA, which may be affecting some UFA recipients. There is also a need to maintain women in academia once they have chosen to pursue an academic career. Such a program could provide young female academics with assistance, for example providing mentoring facilitating return to work after maternity leave, that would make staying in academia more appealing and feasible. This would increase the prestige of the Program since it would then be seen as an award for women faculty rather than an employment equity program.

Recommendation 3: Continue to address the issue of under-representation of Aboriginal people in the academia within the natural sciences and engineering

Given the considerable evidence that the needs that gave rise to the UFA Program continue to exist, NSERC should assess how to better direct a program at the appropriate education levels for Aboriginal people. Despite the limited data available on the issue, there is evidence that Aboriginal people are under-represented in these academic areas. The inclusion of Aboriginal people within the UFA Program is important symbolically because it demonstrates the federal government's and NSERC's commitment to increasing the proportion of Aboriginal academics within the natural sciences and engineering. The existence of such a program sends a symbolic message that it is an important issue. NSERC is the best-suited federal government body to undertake such a program.

Efforts should be directed at increasing the level of interest in math and science among Aboriginal youth. That should result in an increased number of Aboriginal people pursuing university studies in the natural sciences and engineering and ultimately pursuing careers in these fields. This could be a particularly useful strategy, given the demographic profile of Aboriginal people in Canada. The large number of Aboriginal

youth is a significant potential source of future academics in the natural sciences and engineering for the future.

Enlisting the help of existing Aboriginal academics in the natural sciences and engineering would be an effective means of communicating the benefits and appeal of a career in these fields to Aboriginal youth. Aboriginal youth rarely come into contact with those in the natural sciences and engineering, so these disciplines tend to be given little attention when making academic or career choices. These efforts could take the form of presentations, summer camps, a website directed at Aboriginal youth and university students, among others. Special attention should be paid to youth in remote/northern communities where schools may have limited resources for teaching math and science and where opportunities for coming into contact with math and science are rare.

Recommendation 4: Communicate information about the Program

Whatever program NSERC develops to replace the UFA program, NSERC should communicate information about the program, including the rules for nomination and eligibility as well as the achievements of recipients. This evaluation found that few are aware of the UFA Program or the award recipients; even colleagues and students are often unaware. This differs considerably from the CRC Program where the identities and achievements of CRCs are well publicized. Better communications should serve to increase the prestige of recipients as well as improve their visibility, and thus their ability to serve as role models for other women and Aboriginal people. This could be done through similar means to the CRC Program with short biographies of recipients on the NSERC website. Communication efforts should target university decision-makers and academic advisors since these have been found to be the key sources of information about the Program for potential nominees. Additionally, NSERC staff should continue to conduct site-visits in a targeted manner, focusing on events that are likely to be well-attended by university decision-makers, academic advisors and potential nominees since these have been found to be very effective.

1. INTRODUCTION

The Natural Sciences and Engineering Research Council (NSERC) implemented the University Faculty Awards (UFA) Program in 1999. The primary objective of the Program is to decrease the under-representation of women and Aboriginal people in faculty positions in the natural sciences and engineering by encouraging Canadian universities to appoint promising researchers in those groups to tenure-track or tenured positions.

The UFA Program is based on the former Women's Faculty Awards (WFA) program created in 1991. The WFA program was designed to expand career opportunities in an academic setting for a selected number of promising women researchers in the natural sciences and engineering. By 1995, when WFA was terminated, 80 women had received WFA awards. In 1996, NSERC Council requested an evaluation of the WFA program to respond to a recommendation in the report of the Task Force on Women in Science and Engineering.¹ In particular, the evaluation was to determine to what extent the WFA program was the driving force for the hiring of women faculty in the natural sciences and engineering. Given the positive conclusion of the evaluation, it was decided to resume the program, in a new form, in 1999. The new program's mandate was extended in 2001-02 to include not only promising and excellent women, but also Aboriginal people.

Besides the UFA Program, NSERC has other programs that are intended to increase the participation of women in the Natural Sciences and Engineering. These programs include: the Chairs for Women in Science and Engineering, the goal of which is to increase the participation of women in science and engineering and to provide role models for women active in and considering careers in these fields; and PromoScience, the goal of which is to encourage organizations that help young Canadians in elementary school, high school or their first year of college in Quebec, develop science and engineering skills and interests.

1.1 UNIVERSITY FACULTY AWARDS

The objective of the UFA program is to encourage Canadian universities to appoint talented female and Aboriginal researchers to tenure track or tenured positions in the natural sciences and engineering disciplines. The award consists of a salary contribution and a research grant. Several committees adjudicate the award: the University Faculty Awards Selection committee is responsible for assessing the need for women or Aboriginal people in the discipline and/or the institution, as well as

¹ Frize, M. Report of the Task Force on Women in Science and Engineering to the Natural Sciences and Engineering Research Council, NSERC, June, 1996.

institutional commitment; and the Grant Selection Committee from the Discovery Grant Program determines the merit of the candidates and their research program, and the value allotted for the grant.

Total NSERC expenditures for 2003-04 on programs relating to NSERC's Strategic outcome "Investing in People", of which UFA is a component, were \$200.449 million. Expenditures for UFA were \$3.806 million in 2003-04.

a) Eligibility Criteria

Applicants must meet the following criteria:

- Be a Canadian citizen or permanent resident of Canada as of the nomination deadline;
- Be a woman or an Aboriginal person;²
- Hold a doctorate in one of the fields of research that NSERC supports; and
- Be offered, at the time of nomination, a tenured or tenure-track appointment at an NSERC eligible institution effective only after the proposed start of the award.

In addition, all applicants must:

- Have relevant experience following receipt of the doctorate degree, as required by the university for an appointment at the rank of at least assistant professor in their discipline; and
- Be nominated by a Canadian university that is eligible for NSERC awards. Nominations submitted directly to NSERC by individuals are not accepted.

b) Review procedures and selection criteria

Since the UFA Award consists of both a salary contribution and a research grant, the input of two committees is required: a Grant Selection Committee (GSC) and the University Faculty Award Selection Committee (UFASC). The Grant Selection Committee, which judges the applications to the Discovery Grants Program, are also responsible for assessing the excellence of the nominees and the merit of their research programs. Only those nominations endorsed by the relevant GSCs are reviewed by the UFASC.

The review by the UFASC follows the GSC review process. The UFASC is responsible for assessing each nomination in terms of the demonstrated need for female and/or Aboriginal representation in the discipline/institution and the institutional commitment. Each UFA nomination is assigned to two internal reviewers. The first internal reviewer is assigned a nomination that falls within the reviewer's area of expertise or area of research. The second reviewer is randomly assigned a spectrum of nominations in different disciplines from the reviewer's area of expertise in order to broaden the basis for comparison

² For the purposes of the UFA, Aboriginal peoples are defined as Indians, Inuit, or Métis.

between the various disciplines. The rationale for the nomination is assessed for each nomination, in terms of the demonstrated need for female and/or Aboriginal representation in the discipline/institution and the institutional commitment. The Selection Committee evaluates and selects candidates according to the following criteria and weighting:

- Excellence of the individual and merit of the research program (40 per cent);
- Need for female or Aboriginal representation in the discipline (40 per cent); and
- Institutional commitment (20 per cent).

c) Duration of Award

Successful applicants are awarded salary funding for a maximum of 60 months. After the initial 36 months appointment, they must renew for the additional 24 months. The renewal of the award is dependent on a satisfactory evaluation by the applicant's university and by NSERC. Recipients are evaluated on:

- Their continuing ability to meet eligibility criteria and objectives;
- The university submitting a report to NSERC at the end of the third year of funding;
- A satisfactory review by the UFA Selection Committee; and
- The availability of funds.

d) Terms and conditions

Recipients of the UFA remain employees of the university for the duration of their award. Their activities are therefore governed by the same terms and conditions of their employment as regular faculty employees who are engaged in similar work. One exception is that award holders may teach no more than one full course per year and accept no more than a half service or administrative load.

e) Nature of appointment

UFA holders are expected to devote the majority of their time to research and supervision of undergraduate and graduate students. Award holders are also encouraged to interact with others in the university community and industrial sectors.

f) University obligations

The following is expected of the university:

- Provision of tenured or tenure-track positions with the same opportunities and benefits as other academic faculty with equivalent qualifications, experience, and responsibilities;
- Application of the university's normal probationary period should apply even though teaching and service loads have been reduced; and
- Provision of teaching assistants where required.

g) Salary

The university should determine the salary of UFA holders based on employees with similar qualifications, experience, and responsibilities. In addition:

- Award holders should be paid in accordance with the university's normal practices.
- Fringe benefits should be comparable to those of other university faculty.
- Award holders should receive comparable salary increments and merit increases.
- NSERC will not approve the award if it determines the salary contribution from the university to be inadequate.

h) Competition Results

Since the UFA program began in 1999, the annual number of recipients has fluctuated between 21 and 26. The success rate for the competition in 2004 was 46 per cent, with 26 UFA grants being awarded³. We present a summary of competition results for 1999 to 2004 in Table 1.1. The number of awards has generally been below the 25 awards available except in 2004 when 26 awards were presented. An issue of concern for the NSERC committee was the decline in the number of nominees in 2002, however the number of nominees has since increased, with 53 nominees being presented in 2004.

The first Aboriginal nominee was presented in the 2002 competition. This particular candidate was not accepted for a Discovery Grant and so was ineligible for consideration for a UFA Award. Two Aboriginal candidates were nominated in 2004 and both were granted a UFA Award.

The number of recipients who decline the UFA Award has remained low, the largest number of declined awards was in 2004 with four. An analysis of the reasons for declining the award conducted by NSERC revealed that, among the 26 files reviewed, the most frequently cited reasons for declining the UFA

³ Statistical profile of the University Faculty Awards (UFA) Program, NSERC, Winter 2004.

Award were: family reasons/constraints; family mobility; and other offers from industry, the public sector or other universities.

A review of Program data revealed nine interruptions of the UFA. This means that UFA recipients put their UFA on hold for a period of time. All but two interruptions were related to maternity leave; one to accept an offer at another university and one for a sabbatical. In addition there were three terminations of the UFA; two of which were related to other offers of employment (one from another university and from industry) and one was related to deciding to stay home to raise a family.

Table 1.1: Competition Results, 1999-2004

	1999 (number)	2000 (number)	2001 (number)	2002 (number)	2003 (number)	2004 (number)	Total (number)	Total (%)
Nominees	58	63	46	30	39	53	289	100
Awards offered	22	23	25	21	21	26	138	47.7
Awards accepted	19	21	24	19	18	22	123	42.6
Awards declined	3	2	1	2	3	4	15	5.2

Source: Statistical Profile of the University Faculty Awards (UFA) Program, NSERC, Winter 2004.

Table 1.2 summarizes the rank of the positions at which nominees who were awarded the UFA were offered a position. The majority, 95.5 per cent, were at the Assistant professor level. According to NSERC data, 98 per cent of the positions were tenure track and the remaining 2 per cent were tenured.

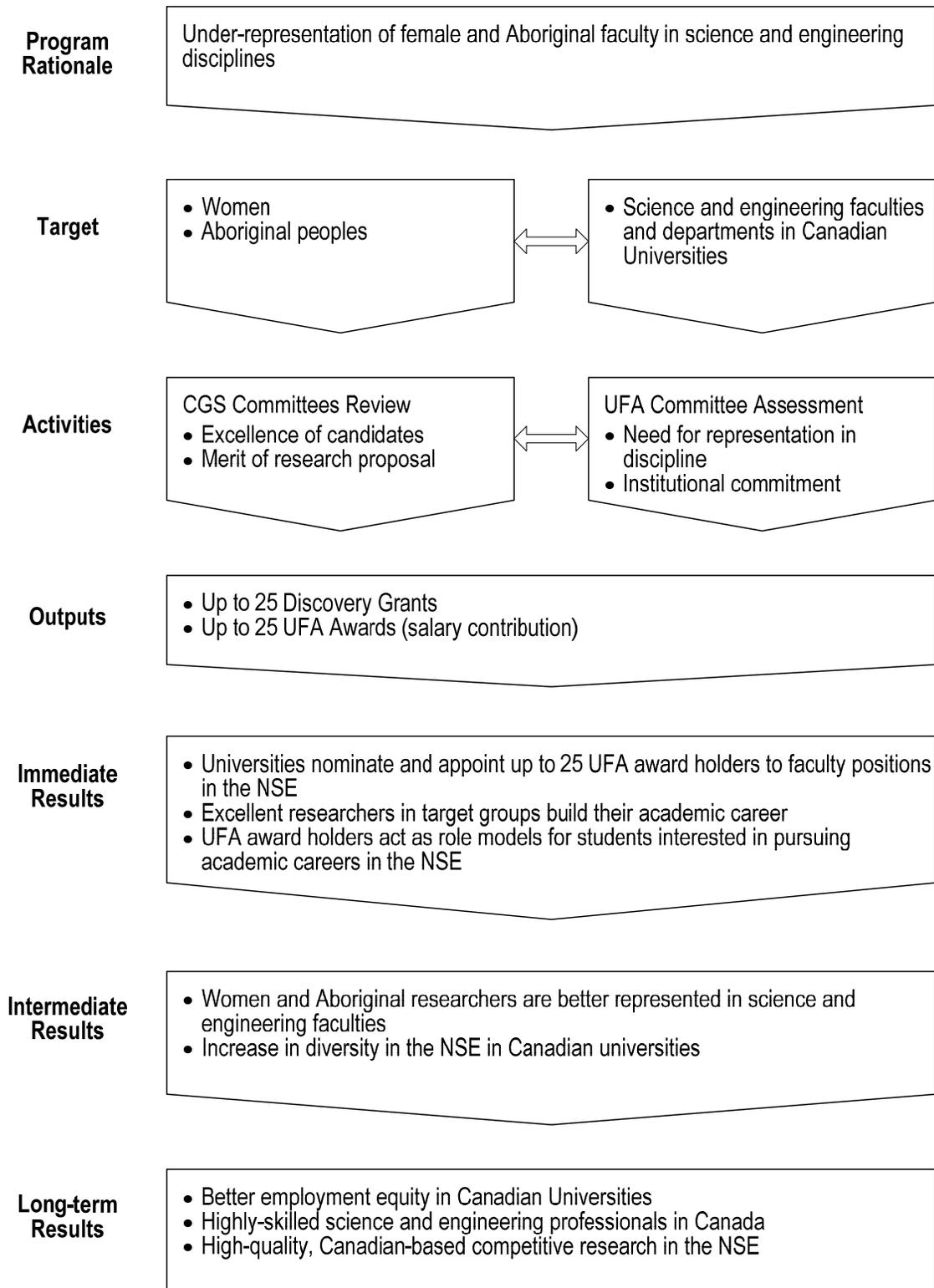
Table 1.2: Rank of Positions Offered to nominees, 1999-2004

Rank	1999	2000	2001	2002	2003	2004	Total
Assistant (number)	20	21	25	19	21	24	130
%	90.9	91.3	100.0	90.5	100.0	92.0	95.5
Associate (number)	1	2	0	1	0	2	6
%	4.5	8.7	0	4.8	0	8.0	3.6
Full professor (number)	1	0	0	1	0	0	2
%	4.5	0	0	4.8	0	0	1.8
Total (number)	22	23	25	21	21	26	138

Source: Statistical Profile of the University Faculty Awards (UFA) Program, NSERC, Winter 2004.

According to NSERC's Statistical Profile of the UFA Program, approximately 40 per cent of UFA recipients were working or studying abroad at the time of their nomination. This illustrates the significance of the UFA Program in repatriating researchers to Canadian universities. Figure 1.1 illustrates the program logic model developed by NSERC.

Figure 1.1 UFA Program logic model



1.2 PURPOSE AND SCOPE OF THIS EVALUATION

As a summative evaluation, this evaluation is intended to provide NSERC and its Governing Council with information on the outcomes of the UFA Program. The results of the evaluation are intended to guide NSERC and the Governing Council in making decisions about the future of the UFA Program.

The evaluation of the University Faculty Awards Program examined issues related to the Program's relevance/rationale, success/outcomes, cost-effectiveness, and design and delivery. The specific evaluation questions addressed are presented in Appendix A

1.3 PURPOSE AND ORGANIZATION OF THIS REPORT

The purpose of this document is to present the details of the results of the summative evaluation of the University Faculty Awards Program. Chapter Two provides a brief summary of the data collection methodologies implemented in the conduct of this evaluation. Chapter Three addresses evaluation issues related to relevance of the UFA Program. We present results related to success and outcomes of the UFA Program in Chapter Four and cost-efficiency and alternatives in Chapter Five. Finally, recommendations stemming from this summative evaluation are presented in Chapter Six.

2. METHODOLOGY

This chapter briefly describes the methodological approach for this summative evaluation. The methodology to evaluate the University Faculty Awards Programs is comprised of a number of qualitative and quantitative lines of evidence. The use of multiple methodologies in an evaluation has the advantage of providing the opportunity for triangulation of evaluation findings from different perspectives. The lines of evidence used in this evaluation are listed below and briefly described in the following sections of this chapter.

- Document and file review
- Analysis of data from Statistics Canada, NSERC and Indian and Northern Affairs (INAC)
- Survey of UFA holders (n=83)
- Survey of non-recipient UFA nominees (n=60)
- Survey of doctoral and post-doctoral fellows (n=191)
- Interviews with university decision-makers (n=21)
- Interviews with key informants (n=22)
- Case studies (n=9)

2.1 DOCUMENTATION AND LITERATURE REVIEW

A main source of documents for this review was NSERC, as well as information available in the public domain. The two key types of information for this component include:

- *Documents pertaining directly to the development and implementation of the UFA program* — These include the Terms of Reference for the program, policy guidelines and procedures, materials related to candidate application, selection and assessment, and budgets and financial statements. These documents were important to understanding the stated rationale for the program and its operation. The review also examined promotional activities related to the UFA (e.g., content, reach, timing).
- *Literature from other jurisdictions/programs* — The evaluation question related to cost-effectiveness requires that the UFA program be situated in a broader landscape. Documents were consulted relating to any other university award programs in other jurisdictions or other

disciplines that are aimed at encouraging the participation of women and/or Aboriginal people. A bibliography of documents reviewed for this study may be found in Appendix B.

2.2 REVIEW OF QUANTITATIVE DATA

Analysis of existing data was used to contribute to addressing issues related to program relevance. Data available through NSERC and from Statistics Canada and Indian and Northern Affairs Canada (INAC) were used to compile a profile of participation of women and Aboriginal people in the disciplines encompassed by NSERC. We note that relatively limited information was available on Aboriginal people due to their relatively small numbers in academia and in the population as a whole (i.e. they represent approximately 3 per cent of the Canadian population). As well, data on Aboriginal ancestry is usually dependent on individuals self-identifying as being Aboriginal.

2.3 KEY INFORMANT INTERVIEWS

We conducted a total of 43 interviews with knowledgeable UFA staff, partners, stakeholders and university decision-makers in order to solicit their opinions and observations on the evaluation issues. University decision-makers were identified by NSERC and include university department heads. The list of university decision-makers provided by NSERC included those who had been involved in nominating candidates as well as those who had not. The names and contact information for the remaining categories of interviewees were also provided by NSERC. The categories of interviewees and the number per category are summarized in Table 2.1.

Table 2.1: Distribution of Interviews by Interviewee Category

Category of Interviewee	Number of Interviewees
NSERC senior management and members of the NSERC Council and Standing Committees	6
UFA program management and staff	2
Outside experts/associations	8
Aboriginal experts and associations	6
University decision-makers	21
Total interviews	43

We developed interview questions for the five categories of key informants: Program staff; NSERC senior management; external experts with expertise in Aboriginal issues; external experts with expertise in women's issues; and university decision-makers.

A database of university decision-makers was provided by NSERC staff. The database is a compilation of all of the departments that have nominated a candidate, successful or not, to the UFA program since 1999. In addition, some universities that have never applied to the UFA were added. These

are all small universities. This database included all the necessary contact information as well as the size of the university (small, medium, large), as determined by NSERC. Attempts were made to include university decision-makers from all three categories of universities, however the majority of those in the database were from large universities. The distribution of interviews with university decision-makers, based on size of university, is as follows:

- Small (n=5)
- Medium (n=3)
- Large (n=13)

Of the 21 interviews completed, 18 were with men and 3 with women. The proportion of women in the list of university decision-makers was approximately 10 per cent, itself a possible indication of the lack of representation of women in academia in the natural sciences and engineering. Attempts were made to ensure that female university decision-makers were included in the interviews. Most university decision-makers interviewed had been involved in the nomination of at least one UFA candidate. However, of the 21 university decision-makers interviewed, five had never submitted a nomination and of these five, four are from small universities and one from a medium-sized university.

We conducted all interviews in person, whenever possible (within the National Capital Region), and all other interviews were conducted by telephone. Interviews were carried out in the official language of the respondent's choice. Potential respondents were advised (by way of a letter sent by email or fax) by NSERC of the impending evaluation and that they may be contacted by EKOS in the near future to obtain their input. This letter explained the purpose of the interview, that participation is voluntary and that all comments will be treated as strictly confidential. All interviewees were sent the finalized guide by either email or facsimile, depending on their preference, prior to their appointment to allow them to prepare for the interview. Interviews averaged about 60 minutes in duration.

Once all interviews were completed, thorough analysis was employed to synthesize and summarize the findings from the stakeholder interviews, in order to produce a concise set of findings and conclusions. Findings by evaluation question were analyzed qualitatively, noting where views converge as well as differences of opinion across respondents. A technical report on the key informant interviews was submitted to the NSERC Project Authority.

2.4 SURVEYS

Three different telephone surveys were conducted for this evaluation. The survey respondent groupings as well as the number of completions are summarized below in Table 2.2.

Table 2.2: Overview of Surveys

Respondent Group	Number of Completions	Length of interview
UFA Holders	n=83	20 minutes
UFA Non-Recipients	n=60	10 minutes
Doctoral and Post-doctoral Fellows	n=191	10 minutes

A technical report on the surveys conducted for this study was submitted to the Project Authority. This technical report included a detailed description of the methodology for each of the three surveys as well as frequency distributions.

a) Survey of UFA Recipients

The population for the survey of recipients was potentially all those who have received a UFA Award since the inception of the Program. In a database provided by Program staff at NSERC, the total population of Award holders who were awarded and accepted their UFA nomination between fiscal years 1999-2000 and 2003-2004 was 108. Those who were offered the UFA Award conditionally were also included in the sample, for a total population of UFA Award recipients of 115. Of these 115 UFA Award recipients, two were Aboriginal. In consultation with the Project Authority, it was decided to exclude the two Aboriginal UFA holders because it was felt that a meaningful analysis could not be carried out with this small number. It was decided that their contribution would be more valuable for the case studies conducted as part of this evaluation.

All 113 female UFA Award holders were emailed a pre-notification letter by the Project Authority. In many cases recipients had provided NSERC with more than one email contact and so pre-notifications were sent to all available email addresses.

b) Survey of UFA Non-Recipients

The population for the survey of non-recipients was all those who were nominated for a UFA Award since the inception of the Program but were unsuccessful. In a list provided by Program staff at NSERC, the total population of non-recipients between fiscal years 1999-2000 and 2003-2004 was 150. Of these 150 non-recipients, one was Aboriginal. In consultation with the Project Authority, it was decided to exclude the Aboriginal non-recipient because it was felt that a meaningful analysis could not be carried out with this small number.

All 149 female UFA non-recipients were emailed a pre-notification letter by the Project Authority. A number of UFA non-recipients had provide NSERC with more than one email contact. We note that all non-recipients were contacted, including those to whom the pre-notification letter could not be sent. Those who did not receive the pre-notification were sent a copy at their request by EKOS at initial contact by our interviewers.

c) Survey of Doctoral and Post-Doctoral Fellows

The population for the survey of Doctoral and Post-Doctoral Fellows was all those who had applied for NSERC funding for Doctoral or Post-doctoral studies in the natural sciences and engineering. The database was provided by the Project Authority and contained a total of 1,094 names. It was decided that because of the difficulty in contacting individuals living overseas (i.e. outside North America) the survey would focus on those who had contact numbers within North America. Of the contacts provided 44 were outside Canada or the United States. As well, there were five individuals identified as Aboriginal in the sample file. These individuals were not contacted so that they would be available for participation in the case studies. Thus the effective population for the survey of Doctoral and Post-Doctoral Fellows was 1,045 (i.e. excluding those with contact numbers outside Canada and the United States and Aboriginal people). This population included 251 Post-doctoral Fellows and 794 Doctoral Fellows.

All Doctoral and Post-Doctoral Fellows in the database were emailed a pre-notification letter by the Project Authority. A number of doctoral and post-doctoral fellows in the sample had more than one email address and so the pre-notification letter was sent to all available email addresses.

Upon reaching the quota of 160 completions for the survey of Doctoral and Post-Doctoral Fellows, it was discovered that there was an insufficient number of completions from women to allow for meaningful analysis of survey results based on gender. As a result it was decided, under consultation with the Project Authority, to re-start the survey with the goal of attaining additional responses from female Doctoral and Post-Doctoral Fellows. The number of completions from women is now sufficient to permit an analysis of survey results by gender. However the relatively small number of female post-doctoral fellows (n=22) means that the number of completions obtained from this category of respondent may limit the robustness of results for female post-doctoral fellows.

2.5 CASE STUDIES

We conducted nine case studies of UFA holders, mid-career academics and an Aboriginal student in order to obtain in-depth knowledge of the experience of women and Aboriginal people in academia in general and, in particular, the impact of the UFA on career paths – research activities, faculty position, salary, other awards and funding. The case studies represent a key source of data on Aboriginal people.

The distribution of case studies were as follows:

- Female UFA holders (n=2)
- Mid-career women faculty (n=2)
- Aboriginal UFA holders (n=1)

- Aboriginal post-doctoral fellow (n=1)
- Aboriginal graduate student (n=1)
- Aboriginal mid-career faculty (n=2)

For case studies of UFA holders, interviews were conducted with both the recipient of the Award as well as the university decision-maker responsible for submitting the nomination to NSERC where possible. For case studies of mid-career academics and students, interviews were conducted with only the subject of the case study.

Interviews were conducted using the same approach outlined for key informant and university decision-maker interviews.

Once the case studies were completed, a Technical Report on the case studies was prepared. For each of the case studies, a point-form summary based on the interviews and review of files was prepared.

3. PROGRAM RELEVANCE

This chapter addresses evaluation issues and questions related to the relevance of the UFA Program.

3.1 CONTINUED RATIONALE FOR THE PROGRAM

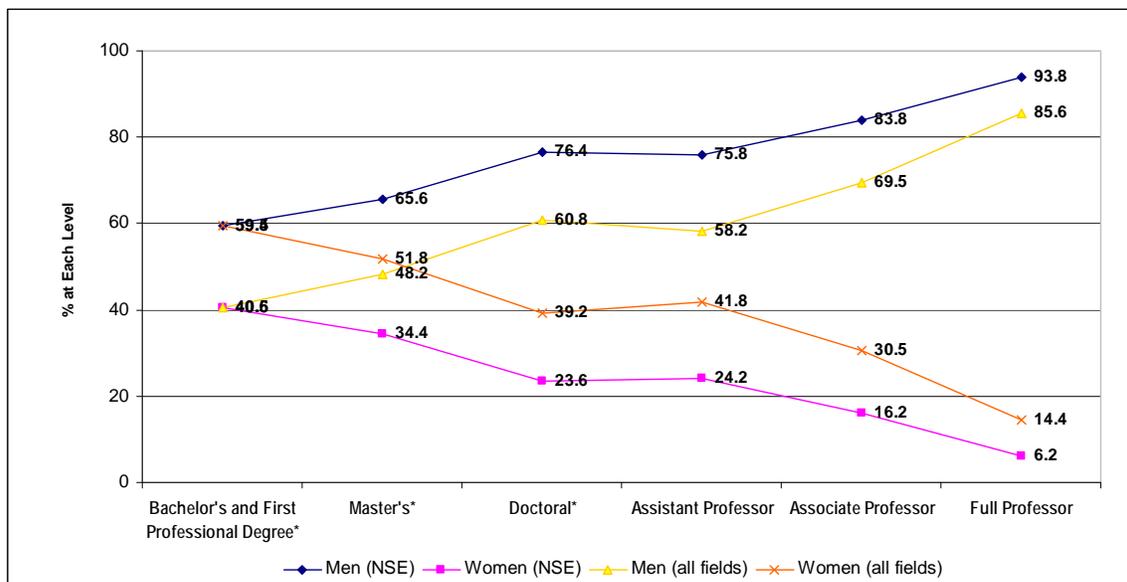
It is well recognized internationally that women are under-represented in most disciplines within the natural sciences and engineering. In fact, NSERC is not alone among international science and engineering agencies in attempting to redress this issue, including the United States, Sweden, Germany and Finland.⁴ The UFA Program is the main tool used by NSERC to encourage employment equity in Canadian universities. The Program is intended to give young women or Aboriginal academics a 'jump start' on their career by providing them with the opportunity to focus on their research for a period of up to five years. The goal is to provide UFA holders with the best possible conditions to start their academic career and ultimately to serve as mentors.

a) State of Women and Aboriginal People in Academia

Women and Aboriginal people have been under-represented in many aspects of academia, including tenured positions and in the engineering and science disciplines. Based on data from Statistics Canada, women make up 28 per cent of all full-time university teachers in Canadian universities. In the natural sciences and engineering, women represent 14.0 per cent of all faculty members. The proportion of women in the natural science and engineering disciplines is low and clearly indicates under-representation; at 14 per cent it is half the proportion of all women faculty in all fields and one-third of the national workforce. Figure 3.1 shows the proportion of women and men at each stage of the academic career in 1999. It clearly illustrates the impact of gender on the outcomes of scientific careers; the proportion of women steadily declines as one moves up the academic ladder and the corresponding proportion of men increases. An interesting issue to note is that the proportion of women declines drastically between the Masters and Doctoral levels, remains relatively steady between the Doctoral level and the Assistant Professor levels and then decreases between the Assistant Professor level and Associate Professor. The proportion of women further decreases significantly between the Associate Professor and Full Professor levels. Similar patterns are evident in all disciplines, but the proportion of women in the natural sciences and engineering is lower at all levels.

⁴ International Context Study for the Evaluation of the Research Grants Program, NSERC, January 2002.

Figure 3.1: Canadian Women and Men in Natural Sciences and Engineering versus all fields, 1999-2000



Source: Statistical Profile of the University Faculty Awards Program (UFA), NSERC, Winter 2004.

Data from 2002-03 further demonstrate the inequity, where women fill 26 per cent of tenured, 38 per cent of tenure track and 43 per cent of non-tenure track positions.⁵ In the engineering and applied sciences, only nine per cent of full-time university teachers in 2000-2001 were female. This proportion is slightly higher in the mathematics and physical sciences area (12 per cent) and higher still in the agricultural and biological sciences (24 per cent)⁶. These data also show substantial variation across the various sub-disciplines; for example, 24 per cent of university teachers in biology in 2000-2001 were women compared to five per cent in electrical engineering. The inequity is also reflected in student enrolment statistics, although the discrepancy is narrower; women represent only 30 per cent of full-time equivalent graduate enrolment in mathematics and the physical sciences, and just 23 per cent of engineering and applied sciences.⁷

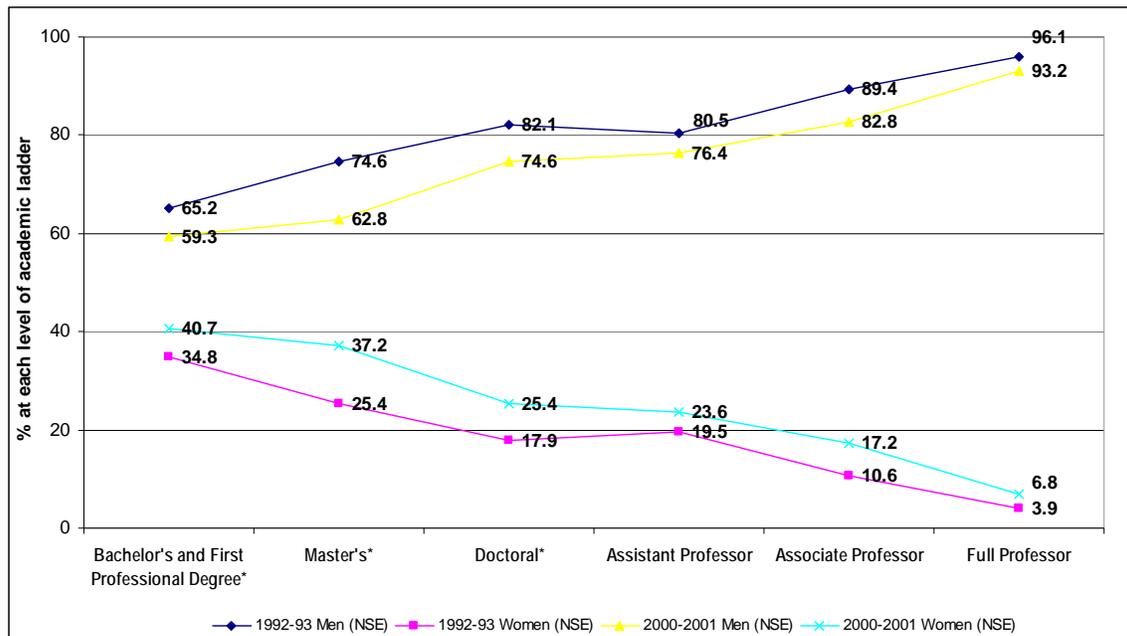
Exhibit 3.2 illustrates the “leaky pipeline” issue for women in the natural sciences and engineering over time; data is presented for 1992-93 and 2000-01. Although the proportion of women has increased for each level of the academic ladder since 1992, the graph is downward sloping.

⁵ Canadian Association of University Teachers. (2004). Post-Secondary Almanac. www.caut.ca/english/publications/cautalmanac/default.asp

⁶ Statistics Canada.

⁷ Canadian Association of University Teachers. (2004). Post-Secondary Almanac. www.caut.ca/english/publications/cautalmanac/default.asp.

Figure 3.2: Canadian Women and Men in Natural Sciences and Engineering 1992-2001



It should be noted when interpreting the “pipeline”, that although each level of the academic ladder is the precursor for the next level, there is in fact a time lag between levels that is not reflected in the graph. For example, women who received their Masters in 2000 do not represent the available pool of women for those who received their PhD in 2000 – this cohort would have received their Master’s at least four years earlier. To address this, a cohort simulation is used to illustrate the “leaky pipeline” in the NSE. A cohort of undergraduates is followed, two years later, by a cohort of graduates, and five years later by a cohort of granted PhDs.⁸The cohort of PhDs is followed by assistant professors, where a three-year postdoctoral period is used, based on an NSERC survey of scholarships and fellowships.⁹The time to gain a tenure position at the associate professor level is estimated at six years. This academic progression of four simulated cohorts between 1980 and 1990 is illustrated in Figure 3.3.

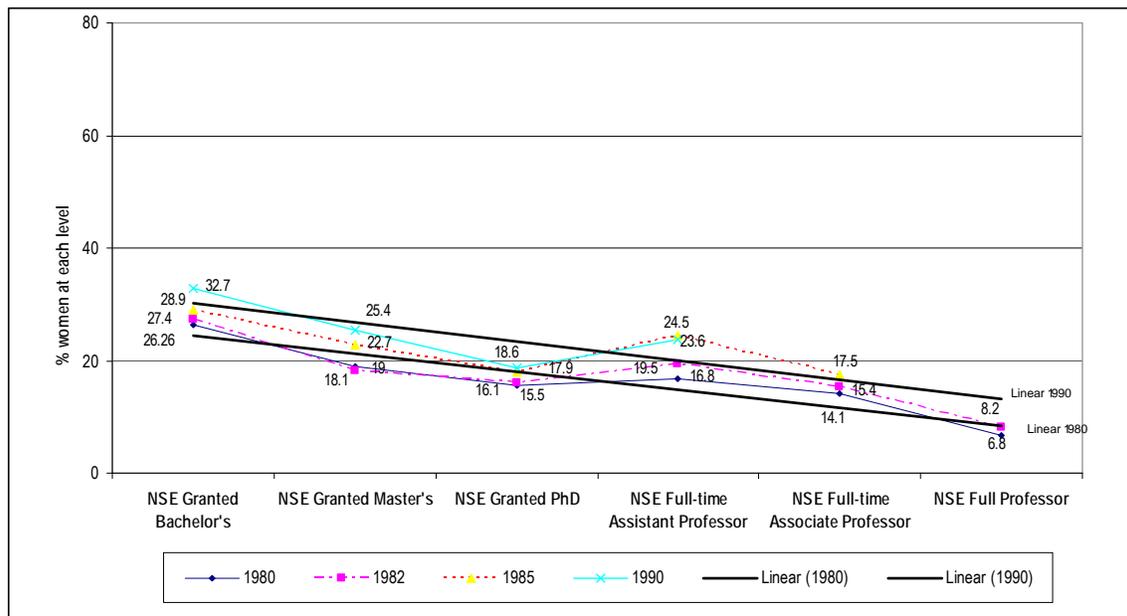
Linear trends are added to summarize the information for the cohorts starting in 1980 and 1990 respectively. Trends are similar for both these cohorts, suggesting that patterns have not changed since the implementation of the UFA’s precursor program (the WFA program) in 1990. The proportion of women has increased for each level of the academic ladder; however, the trend is still downward sloping. As with the previous graph (Figure 3.2), the simulation suggests that the least attrition occurs between the PhD level and assistant professor (i.e., the pipeline is the least leaky at this stage). In fact, in the simulation, the proportion of assistant professors exceeds the pool of PhDs; this may be accounted for by women PhDs

⁸ The median year to completion in science and engineering was 2.0 for students entering Master’s study on a full time basis at Mc Master University during the period September 1996 – August 2001. The median year to completion in science and engineering for the national cohort entering the PhD in 1992 was 4.7. Source: Mc Master University.

⁹ NSERC, Scholarship and Fellowship Surveys, May 2001 p. 39.

coming from abroad. It is important to note that the cohorts are estimated and do not represent the progression of a real cohort of students from undergraduate to academe, nor do they include immigrant women who have studied abroad.

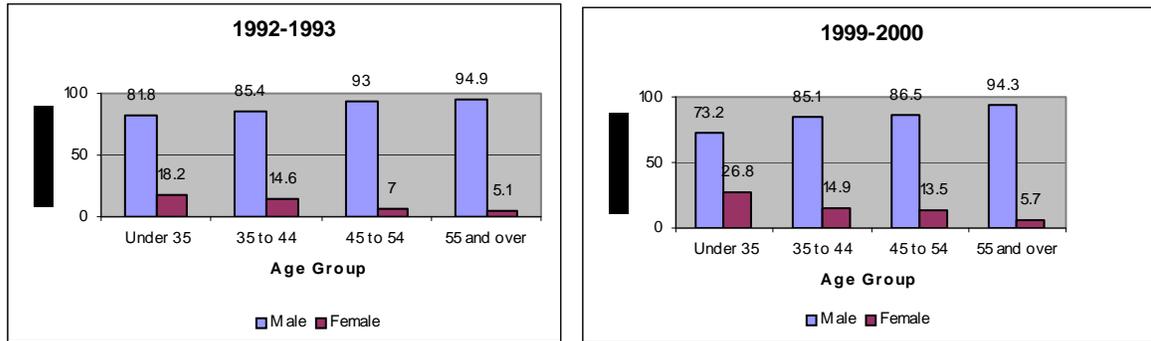
Figure 3.3: Simulated Trends for Women in Natural Sciences and Engineering, 1980-2000



As depicted in the three preceding figures, the distribution of women in academic positions is skewed towards the lower ranks. Some have suggested that the gender imbalance among academics in the natural sciences and engineering is the result of women having entered academia relatively recently. If this is true, then female faculty should be younger than male faculty. Statistics Canada data does not support this theory.¹⁰ As Figure 3.4 below illustrates, women continue to be a minority, whatever their age. Although the situation has improved to a greater extent among younger faculty, there are still significant differences across gender, which have not changed significantly since 1992.

¹⁰ Statistical Profile of the University Faculty Awards (UFA) Program, NSERC, Winter 2004.

Figure 3.4 Faculty Members in NSE by Gender, 1992-93 and 1999-2000



Source: Statistics Canada, special tabulations

The data related to Aboriginal ancestry are not as extensive. According to the 2001 Census, the total identified Aboriginal population represented approximately 3.3 per cent of the total population in Canada. In 2001, Aboriginal peoples represented 6.7 per cent of university professors and assistant professors, roughly equally distributed between women and men.¹¹ As illustrated in Table 3.1, a smaller proportion of Aboriginal people and women obtain post-secondary certificates, diplomas or degrees in the natural sciences and engineering. In fact the lowest proportion of those with degrees in the natural sciences and engineering fields are Aboriginal women with 14.8 per cent and registered Indian women at 11.2 per cent. The corresponding percentage for non-Aboriginal women is 24.6 per cent.

Table 3.1: Proportion of Population with Post-Secondary Certificates, Diplomas, Degrees by Major Field of Study

Field of study in Post-secondary Certificate, Diploma or Degree	Registered Indians (proportion of total)			Others with Aboriginal Identity (proportion of total)			Other Canadians (proportion of total)		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Agricultural and biological sciences/technologies	2.7	2.0	2.0	2.6	2.9	2.8	4.8	4.8	4.8
Engineering and Applied Sciences	6.4	0.7	2.6	8.7	1.5	4.7	17.4	2.4	10.1
Engineering and Applied Science Technologies and Trades	0.3	0.2	0.2	0.7	0.0	0.3	0.3	0.1	0.2
Health Professions, Sciences and Technologies	3.1	6.5	5.4	3.6	8.6	6.7	6.8	13.0	9.8
Mathematics and Physical Sciences	4.0	1.8	2.5	7.0	1.8	4.0	9.9	4.3	7.2
Total	16.5	11.2	12.7	22.6	14.8	18.5	39.2	24.6	32.1

Source: INAC, Aboriginal Post-Secondary Education and Labour Market Outcomes, 2000; based on Statistics Canada Census Data from 1996.

¹¹ Ivory Towers: Feminist Audits. (2004). www.fedcan.ca/english/policyandadvocacy/win/publications.cfm I

b) Interest in an Academic Career

An argument frequently made to explain the lack of representation of women in academic positions within the natural sciences and engineering is that women are simply not as interested in pursuing careers in the natural sciences and engineering as men; that it is largely a matter of self-selection on the basis of interests and talent. Those who make this argument note that women achieve outstanding scores in mathematics and science less frequently than men. Even women who have a very strong aptitude for math often show strong preferences for more people-oriented occupations so do not gravitate to the physical sciences.¹²

Post-doctoral fellows were asked their main reason for undertaking a post-doctoral fellowship. The most frequently cited response was “planned an academic career”, with 52 per cent of post-doctoral fellows citing this reason. A similar proportion, approximately 50 per cent, of men and women cited this reason. The second most frequently cited reason for pursuing post-doctoral studies cited by post-doctoral fellows was “planned a research career”. Thus there is no clear evidence from the survey of doctoral and post-doctoral fellows that women are generally not interested in an academic career in the natural sciences and engineering. In fact, women are as interested as men in an academic career.

Of the 19 PhD candidates who indicated they were unlikely to pursue a post-doctoral fellowship, the following were the main reasons cited¹³:

- No academic interest (n=10)
- Financial reasons (n=2)
- Family reasons (n=2)
- Employment opportunity (n=2)

In the same vein, doctoral and post-doctoral fellows were asked the likelihood that they will pursue a career in academia. Overall, 58 per cent of doctoral and post-doctoral fellows indicated that it was likely they would pursue a career in academia. The proportion was higher for post-doctoral fellows, 76 per cent versus doctoral fellows at 50 per cent and men 61 per cent versus 54 per cent for women. Again, women are somewhat less likely to be interested in an academic career than men but there is no clear indication that they are not at all interested. In addition the pursuit of post-doctoral studies is in itself a strong indication of a desire to pursue an academic career since it is usually the first step in an academic career. Doctoral and post-doctoral fellows who indicated they were unlikely to pursue an academic career were asked to cite the reason why, the following are the most frequently cited responses:

- Not interested (n=6)

¹² National Post, January 8, 2000, Open letter from Doreen Kimura, President of the Society for Academic Freedom and Scholarship.

¹³ Of 19 PhD candidates who indicated that they were unlikely to pursue a post-doctoral fellowship, 16 indicated why.

- Academia too demanding (n=3)
- Salary(n=3)
- Difficult to get grants (n=3)
- Would like a more flexible career (n=2)
- Lack of job security (n=1)

c) Rationale for the Program

According to interviewees who were involved in the implementation of the Program, the Program was implemented to respond to the under-representation of women in the natural sciences and engineering in academia. There was, from the start, an intention to incorporate Aboriginal people, visible minorities and the disabled into the Program at a later date. In the second year of the Program, the issue of opening up the Program to these other groups was addressed by NSERC Council. Aboriginal people were incorporated however visible minorities and the disabled were not included. Visible minorities were not represented because not enough data to demonstrate under-representation were available. The disabled were not incorporated into the Program because of difficulties associated with defining 'disabled'. One member of the NSERC Council who had been involved in these discussions noted that it is an aberration that women and Aboriginal people are considered under the same program since their challenges and issues are very different.

The majority of university decision-makers feel there is a continued need for the Program for both women and Aboriginal people, however, close to half noted that the need is greater in some disciplines. A small minority of university decision-makers feel there is little or no need for the Program in most disciplines. For example, some noted that there was less need for the program in psychology and more need in engineering. In fact, Statistics Canada data on the number of faculty support the view that the need is greater in engineering and applied sciences and in mathematics and physical sciences. Similarly there is a consensus among key informant interviewees that there continues to be a need for the UFA Program because women and Aboriginal people continue to be under-represented in academia.

Women

Many key informants and university decision-makers noted the issue of a 'leaky pipeline' whereby women make up an increasingly higher proportion of students at the undergraduate level but their numbers proportionately decrease further up the academic ladder and so slightly increased enrolment at the undergraduate and graduate level is not translating into more female academics.

The idea of the 'leaky pipeline' is, for the most part, supported by the data on university enrolment and the proportion of university teaching staff that indicates that a smaller proportion of women move up the academic ladder, this is illustrated in Exhibit 3.1. There is thus an indication that there is a need

for increasing the representation of women in engineering and applied science and mathematics and physical sciences and less of a need within some disciplines within the agricultural and biological sciences and health profession fields.

Overall, a little over half of university decision-makers interviewed indicated that the proportion of women in their department was less than one quarter and all indicated that the proportion of women in their department was less than half. The estimates of recipients and non-recipients and doctoral and post-doctoral fellows were consistent with those of university decision-makers and Statistics Canada data. Recipients and non-recipients reported that the number of female faculty hired in the past three years, including themselves, averaged two in recipients' departments and four in non-recipients' departments.

One would expect that departments that have successfully nominated a candidate for UFA would be the most interested in hiring women since; in general, successful nominations are dependent on both the quality of the candidate as well as the quality of the nomination presented by the university. Universities must also explain or justify the need to hire a women in their department. Thus it is possible that some non-recipients' nominations were not accepted because there was no demonstrated need to hire more women in their department since there already was a significant proportion relative to other departments. In fact, this is one of the things that the UFA committee look at and it is more likely to be the case for disciplines in the life sciences. Their success rate is particularly low because there are proportionately more women in the life sciences than in other disciplines within the natural sciences and engineering. The success rate for nominations in the life sciences is 33.3 per cent versus an overall success rate of 47.4 per cent across all disciplines within the natural sciences and engineering. Table 3.2 summarizes the success rate of nominations by discipline.

Table 3.2: UFA Awards by Discipline, 1999-2004

	1999 (number)	2000 (number)	2001 (number)	2002 (number)	2003 (number)	2004 (number)	Total Awards (number)	Success Rate (%)	Total Awards (%)
Life Sciences	9	5	6	3	7	8	38	33.3	27.5
Physical Sciences	7	7	8	7	4	7	40	61.5	29.0
Math Sciences	2	3	3	7	6	5	26	65.0	18.8
Engineering	3	4	6	3	3	4	23	39.6	16.7
Computing Sciences	1	4	2	1	1	2	11	78.6	8.0
Total	22	23	25	21	21	26	138	47.4	100.0

Source: Statistical Profile of the University Faculty Awards Program (UFA), NSERC, Winter 2004

A small number of interviewees commented that women have yet to reach the point where they make up at least 30 per cent of the population of university teaching staff in all disciplines, a threshold

many consider to be the critical mass necessary for integration of groups of people. As a result, these interviewees feel there is a continued need for the UFA Program. Statistics Canada data on the proportion of university professors by rank support this view in that women continue to make up less than 30 per cent of academic staff at Canadian universities in fields related to the natural sciences and engineering. For women to reach the point where there was sufficient critical mass to allow for their full integration, the proportion of women in academia in the natural sciences and engineering would have to approximately double.

Some interviewees believe that the numbers for women in academia are slowly improving, while others feel that women continue to be greatly under-represented in academia. Overall interviewees agree that there continues to be an under-representation of women in academia. A number of interviewees noted that although the number of women as a proportion of academic staff has not changed, the number of female academic staff has actually increased as a result of increased hiring by universities in response to an increased number of students and impending retirements. Statistics Canada data support the view that the number and proportion of women is slowly increasing in the natural sciences and engineering, however women continue to be significantly under-represented.

Doctoral and post-doctoral fellows tend to agree with recipients with 63 per cent believing that women face barriers to some extent in pursuing academic careers in the natural sciences and engineering, with more women than men holding this view. Notably 28 per cent of men and 16 per cent of women feel that women face barriers to little extent.

Aboriginal People

A small number of university decision-makers noted that the issue of under-representation for Aboriginal people is much more serious because few Aboriginal people are pursuing higher education in natural sciences and engineering so there are rarely any candidates available for academic positions. This perspective is supported by the data presented in Table 3.1 above which indicates that 12.7 per cent of registered Indians with post-secondary degrees have those degrees in the natural sciences or engineering, this compares to 32.1 per cent for other Canadians and 18.5 per cent for others (non-registered) of Aboriginal identity. However Aboriginal experts interviewed believe that there are an increasing number of Aboriginal youth pursuing post-secondary education and this, combined with the demographic profile of Aboriginal people in Canada, will eventually result in more Aboriginal academics. However, data from Indian and Northern Affairs (INAC) do not support this view. According to data from INAC's Post Secondary Education Database, in 1996-97 the total number of Aboriginal students enrolled and funded by INAC was 10,379 at the undergraduate level and 849 at the graduate level; by 2000-01 these numbers had dropped to 8,329 at the undergraduate level and 668 at the graduate level. It is important to note, however, that these figures must be treated with caution since they do not reflect the total number of Aboriginal students enrolled in university but rather the number of Aboriginal students enrolled in university and receiving funding from INAC. As well, these data do not include Métis, who are eligible for the UFA Program. No other data on Aboriginal enrolment in university are currently available. Aboriginal academics interviewed for case studies indicated that they knew of few, if any, other Aboriginal academics in Canada. As said by one Aboriginal

academic, “I wonder how many Aboriginal people in Canada are being called as part of this evaluation. Less than six? Clearly it’s a problem. I don’t know any other faculty members who are Aboriginal.”

Table 3.3 summarizes the number and proportion of Aboriginal students enrolled in the natural sciences and engineering and funded by INAC. The data do not indicate that there were more Aboriginal students enrolled in post-secondary studies in 2000-01 than in 1996-97, the data do indicate that there are a slightly greater proportion studying natural sciences and engineering at both the undergraduate and graduate level. Thus there is some indication that a slightly higher proportion of Aboriginal students are enrolling in the natural sciences and engineering, however, there is insufficient data to establish this as a clear trend.

Table 3.3: Aboriginal Post-Secondary Enrolment, 1996-97 and 2000-01

	Undergraduate % (number)		Graduate % (number)	
	1996-97	2000-01	1996-97	2000-01
Agricultural and Biological Sciences	1.4 (144)	1.5 (127)	1.4 (12)	2.4 (16)
Engineering and Applied Sciences	2.1 (214)	2.6 (220)	1.8 (15)	1.3 (9)
Health Professions	Unavailable	Unavailable	Unavailable	unavailable
Mathematics and Physical Sciences	1.1 (115)	1.4 (118)	1.1 (9)	1.3 (9)
Total Natural Sciences and Engineering	4.6 (473)	5.6 (465)	4.2 (36)	5.1 (34)
Total all fields	10,379	8,329	849	668

Source: INAC Post-Secondary Education Database, Information Management Branch, INAC

d) Support for the Program

According to data from the surveys of recipients and non-recipients, the level of support for the UFA program is higher in recipients’ departments than non-recipients’ departments, with 88 per cent of recipients indicating that their department is extremely supportive of the Program versus 49 per cent for non-recipients. This is not surprising since the most supportive departments will tend to make the most effort in preparing the nomination for the Program and so will have a greater proportion of successful nominations or recipients. Overall, key informant interviewees feel there is a sufficient level of interest in UFA among university decision-makers. However many noted that the level of interest varies by university or department with some universities tending to participate more actively in UFA by nominating more candidates. Interviewees hypothesize that this may be the result of having a champion of the Program within these universities or within particular departments of some universities. Some key informants reported that nominations from some universities are of poor quality and reflect the lack of support for the nominee and the Program. In fact, this issue was noted in a 1999 Report to the Committee of Research Grants that the GSC members were generally impressed by the quality of the candidates however, the UFA committee

members were disappointed that the quality of some nomination applications was weak relative to the quality of the candidate.¹⁴

A small number of interviewees noted that some universities may be apprehensive about participating in UFA because of the reduced workload for UFA holders (reduced teaching and administrative responsibilities) and because of the timing of the application process which does not match the university hiring/recruitment process. This was confirmed by university decision-makers. NSERC has assessed the possibility of changing the timing of UFA nominations. However, no consensus on the most appropriate dates could be reached with universities. There is no consistent date for recruitment across universities. Further, some universities in Quebec may have difficulty identifying potential nominees because of language requirements. In fact, Francophone universities have requested that they be allowed to recruit internationally for UFA due to the difficulty in finding French-speaking nominees for UFA. Despite this, Francophone universities have presented nominations to UFA and been successful with approximately 15 UFA Awards going to Francophone universities in Quebec.

There is strong support on the part of Program recipients for continuing the Program with 86 per cent agreeing that there is a need for NSERC to take steps to increase the representation of women in natural sciences and engineering disciplines in academia. Doctoral and post-doctoral fellows were asked to what extent they feel there is a need to increase the representation of women in the natural sciences and engineering disciplines in academia. The strongest support for the Program is among women with 63 per cent of female doctoral and post-doctoral fellows feeling there is a large need to increase the representation of women in the natural sciences and engineering. This is in contrast to men where 35 per cent feel there is a significant need. A higher proportion of post-doctoral fellows feel there is a significant need to increase the representation of women, 53 per cent versus 44 per cent for doctoral fellows. This may be the result of the decreasing proportion of women at the post-doctoral level relative to the doctoral level and post-doctoral fellows may be more familiar with this reality than doctoral fellows.

e) Conclusions

Based on statistical data on academic staff and enrolment in the natural sciences and engineering, women continue to be under-represented in general in the natural sciences and engineering. The data clearly show that Canada is facing a “leaky pipeline”. More and more female students are enrolling and graduating in sciences and engineering, but few of them reach the top levels of the academic profession. In fact, the proportion of women declines markedly at each step of the academic ladder. Given the current turnover rate in faculty members, waiting for a gender balance among academia does not seem to be a particularly effective strategy. The data indicate that there is attrition at the undergraduate, graduate and doctorate levels and at the associate and full professor levels. The Program is directed at the point where there is the least attrition, i.e. the pipeline is the least leaky. However, the extent of under-representation of women in the natural sciences and engineering is such that the program is unlikely to have a significant impact given that approximately 25 women per year benefit from the Program. There is a clear

¹⁴ Statistical Profile of the University Faculty Awards (UFA) Program, NSERC, Winter 2004.

need to increase the representation of women in the natural sciences and engineering and thus for a Program with this objective. However, the Program, as currently designed and resourced, is unlikely to impact the representation of women significantly.

Some researchers have suggested that for full integration of a minority group to occur the minority group must make up 30 per cent of the population. For women to reach what some consider to be the critical mass where there is full integration of a group, the proportion of women in the natural sciences and engineering would have to approximately double from the current level.

Data on the number of Aboriginal academics do not exist as such, however there is quantitative and qualitative evidence to suggest that Aboriginal people are under-represented in academia. Data on the proportion of Aboriginal people with a university degree or certificate in the natural sciences and engineering further indicate that Aboriginal people are under-represented in these fields. Few, if any, Aboriginal people are pursuing higher education in natural sciences and engineering so there are rarely any candidates available for academic positions. The Program is thus unlikely to influence the number of Aboriginal academics hired by Canadian universities because the pool of candidates is extremely limited.

The vast majority of those interviewed for this evaluation feel there is a need to increase the representation of women and Aboriginal people. However, many feel that the Program is not directed at the appropriate stage in the academic careers of women and Aboriginal people. There is evidence that the Program, as currently designed, is not adequately responding to the barriers faced by women or Aboriginal people seeking to pursue academic careers.

There is generally support for the Program; however, there are indications that some universities may be less supportive of the Program than others. This does not necessarily imply they are any less willing to hire women or Aboriginal people. However, for some, the challenges of participating in the Program outweigh the potential benefits of UFA funding for the hiring of women or Aboriginal people. According to university decision-makers some of the reasons they are less willing to participate in the UFA are: reduced teaching and administrative loads of UFA recipients; the effort required to nominate a candidate; and difficulty finding suitable candidates.

This evaluation found little support for the view that women are less interested than men in an academic career. In fact, the leaky pipeline is evidenced between the Masters and Doctoral levels and then after the Assistant Professor level. The proportion of women remains constant from the Doctoral to the Assistant Professor level, precisely where the UFA Program is directed. This implies that the Program is not directed at the point in the academic ladder where it will have the most impact, i.e. result in the most retention of female academics. This provides some indication that women are interested in pursuing an academic career but their numbers decrease relative to men after the Assistant Professor level. This implies that efforts should be directed during or after the Assistant Professor level to increase the proportion of female professors who stay in academia.

3.2 BARRIERS FACED BY WOMEN AND ABORIGINAL PEOPLE IN CANADIAN UNIVERSITIES

a) Barriers Faced by Women

There is a general consensus that despite the increasing number of women that pursue academic studies in the sciences and engineering at the undergraduate and graduate levels, the proportion of women declines markedly at the doctoral and post-doctoral level. For each step in the academic ladder past the graduate level, the proportion of women declines further. There are thus fewer women in senior management positions in universities and research institutes. In fact, women represented approximately ten per cent of university decision-makers in the database of university decision-makers provided to the consultant by NSERC.

The Statistics Canada data indicate significant differences across disciplines with respect to the representation of women among teaching staff. In 2000-01, women made up only four per cent of full professors in engineering and applied sciences and six per cent in mathematics and physical sciences. So the data clearly indicate that women are under-represented among teaching staff in the natural sciences and engineering and that the extent of under-representation gets worse among higher ranking professors and is especially marked within some disciplines of the natural sciences and engineering. These data are summarized in Table 3.4 below.

Table 3.4: Proportion of Full-time University Teachers Who Are Women by Field, Highest Degree Earned and Rank – 1995-96, 1997-98 and 2000-2001.

Field	Full Professor %			Associate Professor %			Assistant Professor %		
	1995-1996	1997-1998	2000-2001	1995-1996	1997-1998	2000-2001	1995-1996	1997-1998	2000-2001
Agricultural and biological sciences	10	11	13	25	26	28	36	40	38
Engineering and applied sciences	2	3	4	7	9	11	17	17	15
Health professions and occupations	16	17	19	31	32	37	43	46	48
Mathematics and physical sciences	3	4	6	10	12	14	22	23	22
Total natural sciences and engineering	8	9	11	20	22	25	34	36	35
Total all fields	11	13	15	25	28	32	40	42	41

Source: Statistics Canada

A number of studies have been undertaken to explain why women drop out of the academic track in science and engineering. In general, explanations relate to family influences, hiring processes, peer reviews, and political structures within universities. Studies have found that there are definite differences in the career paths of female and male scientists and engineers. These differences have been found to relate to differences in the influence of family.¹⁵ The job of raising children and caring for elderly family members tends to fall to women rather than men. These studies indicate that this results in women's careers being more frequently interrupted or delayed and that top academic or research positions are not accepted because of the long working hours required. Some have also noted that women's geographic mobility is limited relative to men because of family responsibilities.¹⁶ In fact, case studies conducted as part of this evaluation confirm geographic mobility is an issue and illustrate some of the issues faced by academics. In the words of one case study participant; "...my husband is also an academic but the university wasn't able to offer him employment. He's made some arrangements with our former employer so he can work while in Canada, but it's a temporary solution and when he gets a position somewhere else, I may have to move."

A study conducted in the United States that was based on the Survey of Doctorate Recipients, a national database tracking 160,000 PhD recipients across all disciplines, illustrates many of the barriers faced by women in academia with respect to balancing family and career. The study found that only one in three women who take a fast-track university job without children ever become mothers. However men who are married with children tend to thrive at work. The study also found that women with young children are 29 per cent less likely than their colleagues without children to enter a tenure-track position. They are also 25 per cent less likely than men to become a full professor within 16 years. Women who take a few years off to raise a family before they reach tenure are unlikely to return to academia.¹⁷ Case studies reinforce the point that the balancing of work and family tends to present greater challenges for women, particularly with respect to the timing of starting a family. As one case study participant noted, it was not looked upon favourably when she got pregnant during the final stages of her PhD. In fact, it caused some to doubt her commitment to an academic career. The number of UFA awards that were awarded by NSERC but subsequently declined by nominees, despite being relatively low, reflects some of the issues faced by women pursuing careers in academia, specifically; family constraints; family mobility; and offers from industry.

Finally, some studies have noted the systemic bias in the academic hiring process, particularly in the peer review process. A study conducted by the European Union noted that there tends to be a reliance on the "old boys network" and personal invitations to fill posts.¹⁸ These studies have shown that

¹⁵ Swiss National Science Foundation. (May 2003). Major Challenges for Research Funding Agencies.; Massachusetts Institute of Technology. 1999. A Study on the Status of Women Faculty in Science at MIT.; National Science Foundation. (June 2004). Gender Differences in the Careers of Academic Scientists and Engineers; Rosser, Sue V and Eliesh O'Neil Lane, *Journal of Women and Minorities in Science and Engineering*, vol 8, pp. 161-189, 2002.

¹⁶ Swiss National Science Foundation. (May 2003). Major Challenges for Research Funding Agencies.

¹⁷ Mason, Mary Ann and Marc Goulden, "Marriage and Baby Blue: Redefining Gender Equity", University of California, Berkely.

¹⁸ European Commission (2002), *Science Policies in the European Union: Promoting Excellence through Mainstreaming Gender Equality*.

many aspects of the culture of engineering and science are defined by male attributes.¹⁹ However, some have argued that the lower representation of women in the sciences and engineers is largely a matter of self-selection on the basis of interests and talents.²⁰ Based on data collected through interviews, surveys, and case studies, this study did not find evidence of systemic bias in hiring. However, we note that this evaluation was not intended to research hiring practices at Canadian universities nor the issue of self-selection.

A majority of recipients tend to agree that academia presents more challenges to women than other work environments with 63 per cent of recipients believing that academia presents more challenges for women versus 48 per cent for non-recipients. In fact 25 per cent of non-recipients feel that academia does *not* present more challenges to women than other work environments. Despite both groups being women, this difference in perception with respect to the extent to which women face challenges in pursuing academic careers, is difficult to explain given the information available. A possible explanation for why fewer non-recipients feel that academia presents more challenges to academia than other environments is that non-recipients have, for the most part, obtained a tenured or tenure track position without UFA and have faced fewer barriers than they anticipated. These results are summarized in Table 3.5.

Doctoral and post-doctoral fellows tend to agree with recipients with 63 per cent believing that women face barriers to some extent in pursuing academic careers in the natural sciences and engineering, with more women than men holding this view. Notably, 28 per cent of men and 16 per cent of women feel that women face barriers to little extent.

Table 3.5: Extent to Which Women Face Challenges in Pursuing Academic Careers

Academia presents more challenges for women than other work environments.	Agree % (number)	Neither agree nor disagree % (number)	Disagree % (number)	Don't know/no answer % (number)
Recipients	63 (n=52)	17 (n=4)	17 (n=17)	4 (n=3)
Non-Recipients	48 (n=29)	23 (n=14)	25 (n=15)	3 (n=2)
It is more difficult for women to succeed in academia than men.	Agree % (number)	Neither agree nor disagree % (number)	Disagree % (number)	Don't know/no answer % (number)
Recipients	88 (n=73)	2 (n=2)	10 (n=8)	0
Non-Recipients	71 (n=43)	10 (n=6)	19 (n=11)	0
To what extent do women face challenges in pursuing academic careers in the natural sciences and engineering	Large extent % (number)	Some extent % (number)	Little extent % (number)	Don't know/no answer % (number)
Male doctoral and post-doctoral fellows	6 (n=7)	58 (n=63)	28 (n=31)	7 (n=8)

¹⁹ Natural Sciences and Engineering Research Council of Canada. (1996). Report of the Taskforce on Women in Science and Engineering to the Natural Sciences and Engineering Research Council.

²⁰ For some examples see: The Ottawa Citizen, January 18, 2000, "I Am Woman, You're Not"; National Post, January 8, 2000, "Don't Discriminate with Grants"; Letter posted on Society for Academic Freedom and Scholarship web-site from Professor Lorraine Allan, August 9, 2000; The Ottawa Citizen, January 25, 2005, "The Summers of Our Discontent."

Female doctoral and post-doctoral fellows	12 (n=10)	71 (n=58)	16(n=13)	1 (n=1)
Doctoral fellows (male and female)	5 (n=7)	62 (n=83)	27 (n=36)	5 (n=7)
Post-doctoral fellows (male and female)	17 (n=10)	66 (n=38)	14 (n=8)	3 (n=2)
Total	9 (n=17)	63 (n=120)	23 (n=44)	5 (n=10)

Source: Surveys of Recipients, Non-recipients and Doctoral and Post-doctoral Fellows, EKOS, 2004.

The majority, 88 per cent, of UFA Award recipients agree that it is more difficult for women to have a successful career in academia than men. The corresponding percentage for non-recipients is 71 per cent. Recipients who feel it is more difficult for women were asked to explain why they felt this way. Table 3.6 summarizes the responses of the 73 recipients and 43 non-recipients who responded. We note that up to three reasons from each respondent were accepted.

Table 3.6: Reasons Why More Difficult for Women to Have an Academic Career

Reasons why it is more difficult for women to have a career in academia	Recipients % (number)	Non-Recipients % (number)
Women's family responsibilities	59 (n=43)	70 (n=30)
Men and women treated differently/not judged on the same basis	18 (n=13)	2 (n=1)
'old boys' network/attitudes of colleagues	16 (n=12)	14 (n=6)
Lack of female role models/mentors	5 (n=4)	9 (n=4)

Source: Survey of Recipients and Non-recipients, EKOS, 2004.

Note: 72 of 73 recipients and 41 of 43 non-recipients cited a reason why it is more difficult for women to have a career in academia.

According to UFA Award recipients, non-recipients and doctoral and post-doctoral fellows, the most important barriers to women in pursuing and obtaining an academic position in science and engineering include: the difficulty balancing work and family; the 'old boys' network in many departments; and the lack of role models. Among those who indicated that men and/or women faced barriers, generally a greater proportion of female doctoral and post-doctoral fellows cited this than did males. Men tended to cite other barriers such as the lack of encouragement for women in these fields and that these fields were male-dominated. A very high proportion, 91 per cent, of doctoral fellows cited the difficulty of balancing work and family as a barrier, indicating that many, both male and female, have experienced this barrier directly or indirectly by the time they reach the doctoral level. Among female doctoral and post-doctoral fellows who indicated that women faced barriers, they generally indicated that the barriers they cited have personally affected them. Notably, when doctoral and post-doctoral fellows were asked whether men faced barriers in pursuing academic careers in the natural sciences and engineering and what those barriers were, the most frequently cited was the difficulty in balancing work and family. Table 3.7 summarizes these data.

Table 3.7: Comparison of Proportions of Those Who Believe Work Family Balance is a Major Barrier to Academic Career *

Lack of flexibility/difficulty balancing work and family	Total %	Male %	Female %	PhD %	Post-doctoral fellows %
Major barrier faced by women in pursuing an academic career	73 (n=36 of 49)	64 (n=14 of 22)	81 (n=22 of 27)	59 (n=16 of 27)	91 (n=20 of 22)
Major barrier faced by men in pursuing an academic career	59 (n=10 of 17)	42 (n=5 of 12)	100 (n=5 of 5)	57 (n=5 of 9)	50 (n=4 of 8)

Source: Survey of Doctoral and Post-doctoral Fellows, EKOS, 2004.

* Note that only those who indicated that they believe men and/or women face barriers to pursuing an academic career were asked what barriers were faced by men and/or women. A total of 49 respondents indicated that women faced barriers and 17 indicated that men faced barriers.

Key informants representing the NSERC Council and staff, UFA Program staff and external experts (non-Aboriginal) agreed that much of the issue of under-representation of women is related to universities being perceived as being not friendly to a family-work balance. Many explained that women continue to be largely responsible for family care. However some noted that this perception is slowly changing. Two interviewees (one male and one female) noted that this is an issue for both men and women. Other barriers noted by key informants included:

- *Inherent/institutional sexism* – According to interviewees, many university departments continue to be an ‘old boys club’ and not particularly welcoming to women. As well, standards for men and women are not seen to be the same, with women being expected to meet higher standards for advancement. Data on the proportion of female professors supports the view that many university departments continue to be dominated by men with women making up approximately 14 per cent of full-time faculty in Canada for all science and engineering. However, it is important to note that this differs greatly by department with some university decision-makers and key informants reporting that some departments, specifically psychology, are dominated by women. However, we note that psychology is also a social science and so cannot be seen as representative of the natural sciences and engineering. As well, the proportion of female professors at all levels has been slowly increasing, thereby implying that there is a general willingness, or recognition of the need, to hire more women.
- *Biological clock* – by the time women complete their post-doctoral studies and are embarking on an academic career they tend to be in their early 30’s which is often the time they decide to start a family. This view is reinforced by data from the survey of doctoral and post-doctoral fellows, with a much higher proportion of post-doctoral fellows citing the difficulty of balancing work and family as a barrier than doctoral fellows who tend to be younger. Evidence from case studies and academic research suggests that female academics tend to wait until they have completed, or are nearing completion of, their doctoral studies to start a family.
- *Difference in networking styles between men and women* – Interviewees and case studies indicate that men tend to be more at ease with self-promotion than are women.

- *Geographic mobility* – women tend to be less willing and able to move for their careers due to family obligations. This is supported by the survey of doctoral and post-doctoral fellows where the majority, 76 per cent of doctoral and post-doctoral fellows would be willing to relocate to advance their career. However, the proportion is smaller among women with 66 per cent indicating that they would be willing to relocate. We note however that the survey of doctoral and post-doctoral fellows did not ask whether they were married or had children, important factors in willingness to relocate.
- *Lack of mentorship* – According to interviewees, the lack of female professors makes university life and planning an academic career more challenging because there are few sources of advice. The very low proportion of women in some fields, engineering and applied sciences for example, where women make up 3 per cent of full professors, supports the view that there is a lack of female mentors. Interviewees and case studies indicate that there are certain topics that female students are not comfortable discussing with male academic advisors, particularly issues related to the work/family balance and starting a family. The lack of mentorship is not an issue with respect to being inspired academically but rather the ability to recognize that someone in a similar situation can pursue an academic career and have a family.

b) Barriers Faced by Aboriginal People

The majority of Aboriginal experts interviewed noted the lack of adequate educational tools and instruction in math and science in most Aboriginal schools, particularly those in Northern or remote communities as the most significant barrier. This tends to result in little awareness of, or interest in, math and science and so few of those who go on to university study math or science. Other barriers noted by Aboriginal experts relate to the university system and how Aboriginal students experience university. These barriers relate to teaching style, negative stereotypes and the lack of understanding on the part of universities of the different career and educational patterns of Aboriginal people. As one Aboriginal UFA holder noted, “I didn’t take the usual route. I went to university right out of high school but hated it, so I quit. It took me ten years to get my undergraduate degree because I found a night job that paid well, so I took my time.”

Some Aboriginal experts interviewed noted that Aboriginal people tend to be older than average and have young families by the time they get to university. Again, one Aboriginal student noted, “I’m older and have a family. It’s a lot easier to live as a student when you’re 20 and have no family. I have three children and a wife who works full-time.” The university system does not adapt to this reality and so Aboriginal people with young families to support are faced with competing with those who are usually much younger and without responsibilities. Case studies conducted as part of this evaluation provide strong evidence in support of this view. Two case study participants either interrupted their studies to work or worked full-time while pursuing their studies.

Aboriginal experts interviewed agreed that the issue of under-representation of Aboriginal people in academia is related to the lack of relevant educational tools, lack of role models, and other factors related to culture. One Aboriginal UFA holder noted, “ It’s a social thing as well. I personally know so many Aboriginals who did not finish high school, that got into drugs and were in and out of reform school.” Some noted that universities are mostly in urban areas but ties to communities tend to be very strong making it difficult for many Aboriginal people to leave. One key informant cited statistics from the United States that indicate that the most significant reasons for Aboriginal students to leave university are homesickness and pregnancy. Aboriginal experts interviewed and evidence from case studies indicates that programs for Aboriginal students in the natural sciences and engineering that are geared to easing the transition to university are particularly successful at making the transition easier and more successful.

Aboriginal experts were asked to comment on whether the barriers for women and Aboriginal people are different and at what stage in the educational system or process the barriers manifest themselves for Aboriginal people. Interviewees and Aboriginal case study participants agreed that the barriers for Aboriginal people tend to manifest themselves long before students enter university. For example:

- The curriculum in grade school is not taught in an attractive and culturally relevant way to get youth interested in science and mathematics and so few Aboriginal youth develop an interest in science and math. According to Statistics Canada 1996 Census data, 8 per cent of registered Indians with university certificates or degrees had them in fields within the natural sciences and engineering. This is much lower than the corresponding percentage for Canadians which is 22 per cent.
- Lack of role models for Aboriginal youth. There are very few identified Aboriginal academics and still fewer in the natural sciences and engineering. The result is that Aboriginal youth are not aware of what the employment and career opportunities are for those with a university degree in math or science. In addition, Aboriginal youth living on-reserve or in remote communities will have little opportunity to be exposed to university professors. They are much more likely to be exposed to lawyers, social workers and others with social science degrees.
- University life and the way science and math are taught are not culturally relevant. Some Aboriginal experts and case study participants interviewed noted that projects that have sought to teach science to Aboriginal youth in a culturally relevant way have been particularly successful at developing an interest in science among youth as well as an appreciation of the achievements of Aboriginal peoples. Specific examples include relating canoes and igloos to physics, chemistry and engineering.
- Aboriginal women are doubly disadvantaged since they face barriers associated with being a woman as well as those faced by Aboriginal people.
- Aboriginal people often don’t make it to university. Statistics Canada data support this view with 14 per cent of Aboriginal people having some university as their highest level of schooling. The corresponding percentage for other non-Aboriginal Canadian is 23 per cent.

Further, of Aboriginal people who attend university, 39 per cent obtain a university degree. Of non-Aboriginal Canadians who attend university, 58 per cent obtain university degrees. So fewer people of Aboriginal descent attend university and a smaller proportion of those who do attend obtain a university degree relative to non-Aboriginal Canadians.

As one Aboriginal case study participant commented, “ I feel I’m somewhat atypical. I’ve rarely met Aboriginal students with higher degrees. The first time was when I was going through interviews for medical school.”

c) Barriers to Hiring

University decision-makers were asked whether there were any barriers to hiring women and Aboriginal people by their department. About half indicated that there were barriers and the most frequently cited barriers include:

- *For women:* small pool of candidates with the necessary qualifications; region/town/department is not appealing to potential candidates; academic life is not appealing to women.
- *For Aboriginal people:* social and cultural issues or barriers; small pool of candidates with the necessary qualifications; Aboriginal people are not encouraged to pursue science and math; identifying candidates who are Aboriginal. University decision-makers noted that it is usually not possible to tell whether a given candidate is Aboriginal unless he or she identifies themselves as such.

A small number of university decision-makers noted that the timing of deadlines for applications does not coincide well with the timing of university hiring/recruitment. This results in universities offering unconditional nominations, which some departments cannot afford financially, or risk losing the candidate to another university.

The vast majority of university decision-makers and key informants feel that universities have a responsibility to increase the representation of women and Aboriginal people. A number noted that it is important to have role models/mentors for students and to reflect the needs of students. However some key informants noted that many universities have yet to recognize this responsibility or the business case for doing so. Many key informants noted that universities are businesses and any good business should be encouraging diversity so as to attract the best faculty and students. Some also noted that without diversity universities are excluding a significant proportion of the population.

d) Conclusions

There is clear evidence that the balancing of work and family is the most significant barrier for women pursuing an academic career in the natural sciences and engineering. In fact, there is some

evidence that the balancing of work and family presents a barrier to men as well. However, it should be noted that this barrier is not specific to academia. Other important barriers identified for women include: the different treatment of men and women; the attitudes of colleagues; the lack of female role models; the need for geographic mobility; and the differences in networking styles of men and women. Some academic studies have also noted bias in the hiring process, however this evaluation found no evidence of such barriers.

There is some evidence that universities experience barriers to hiring women and Aboriginal people. These barriers include: an insufficient number of qualified candidates; lack of appeal of department/university/town; lack of appeal of academic life; and difficulty identifying potential Aboriginal candidates.

With respect to women, the Program is not responding to the leaky pipeline issue noted in the previous section nor to the barriers noted in this section. To respond to the leaky pipeline, a program would need to be directed at increasing the proportion of women who stay in the academic stream at each stage in the academic stream at each point in the academic ladder. The social barriers faced by women in pursuing academic careers are such that UFA, as currently designed cannot reasonably be expected to solve them. These social barriers or realities relate to women's role in society and within the family. Women continue to be the primary caregivers in most families and so face competing demands with respect to work and family.

There is strong evidence that the barriers for Aboriginal people start long before they enter university. Barriers impacting Aboriginal people are largely social and cultural including: different learning and teaching styles; stereotypes; lack of understanding on the part of universities of the different career paths of Aboriginal students; and the high school education system which does not provide adequate, culturally relevant science and math education.

With respect to Aboriginal people, this evaluation found clear evidence that the Program as currently designed, does not respond to the lack of representation of Aboriginals in academia. The very low number of people pursuing degrees in the natural sciences and engineering means that the pool of candidates that constitute the potential hires for academic positions is too small to have a measurable impact. In order to increase the number of Aboriginal people hired, the pool of potential candidates must first be increased, i.e. the number of Aboriginal people who pursue degrees in natural sciences and engineering must be increased.

3.3 POTENTIAL INTER-RELATIONSHIP BETWEEN CRC AND UFA PROGRAMS

There have been concerns expressed by some in recent years that the Canada Research Chairs Program is adversely impacting the University Faculty Awards Program. Two specific issues have been noted. First, there is a concern that the two Programs partly target the same population of outstanding young women at the beginning of their academic career. As a result, some argue that universities would

rather nominate excellent candidates to the more lucrative and prestigious CRC. Thus nominations to the CRC would explain the decrease in the number of UFA nominations in 2002-03. Second, young women who have the most experience would be selected for the prestigious CRC, and candidates with the least experience would be selected for the UFA. As some noted, nominees to the UFA might have included a few researchers that are more experienced prior to the inception of the CRC, but that since the inception of the CRC, UFA nominees are more likely to consist of only entry level researchers. If true, this would result in a decrease in the UFA nominees' level of experience over time.

a) Impact of CRC Program on UFA Program

The Canada Research Chairs Program

The Canada Research Chairs Program was created in 2000 to respond to concerns that many of the country's top researchers were leaving for the United States and other foreign countries. The CRC Program is meant to stem the brain drain and help universities recruit professors from abroad and retain those in Canada. The CRC Program is expected to fund 2,000 CRCs by 2005-06. Industry Canada, the department responsible for the CRC Program, allocated the CRCs across disciplines based on the share of federal research funds that goes to each of the three granting agencies. This meant that about 45 per cent of the Chairs went to disciplines covered by NSERC, 35 per cent for the Canadian Institutes of Health Research and 20 per cent for Social Science and Humanities Research Council disciplines.

Nominations are assessed based on the quality of the nominee and of his or her proposed program of research and the integration of the nominee's research with the university's research plan. The university is required to demonstrate the importance of the CRC to the strategic development of research at the institution and, as applicable, at its affiliated hospitals, research institutes, and so forth. Reviewers assess the fit of the proposed CRC with the university's Strategic Research Plan and gauge how the proposed CRC will contribute to the attainment of the university's objective. So the CRC must fit with the university's overall strategy whereas the UFA Program is more focussed at the level of individual university departments and their teaching and research needs.

There are two types of CRCs:

- *Tier 1 Chairs* – are tenable for seven years and renewable. They are intended for outstanding researchers acknowledged by their peers as world leaders in their fields. For each Tier 1 CRC, the university received \$200,000 annually for seven years. Nominees must be full professors or associate professors who are expected to be promoted to the full professor level within one or two years of the nomination.
- *Tier 2 Chairs* – are tenable for five years and renewable once. They are intended for exceptional emerging researchers, acknowledged by their peers as having the potential to lead in their field. For each Tier 2 CRC, the university receives \$100,000 annually for five years. Nominees must be assistant or associate professors or possess the necessary qualifications to be appointed to these levels.

It is possible for an individual to be nominated and hold both the CRC and the UFA. CRC holders are also eligible for infrastructure support from the Canada Foundation for Innovation (CFI) to help acquire state-of-the-art equipment essential to their work.

The CRC Program has recently been accused of gender bias with only 17 per cent of the 1,035 CRCs awarded to women as of December 2003.²¹ According to some, universities were nominating experienced professors to Tier 2 positions which are intended for junior academics. The CRC Secretariat has recently changed the rules to discourage this. Since the nomination cycle 2002-2 the CRC Program has been requesting universities to provide a letter of justification if they are nominating a researcher for a Tier 2 Chair who has more than ten years past their highest degree. There are legitimate situations where researchers have more than ten years past the highest degree and are appropriately nominated for a Tier 2 Chair, for example, some women with different career paths and researchers coming from industry or government labs. The onus is on the nominating institution to make their case in this letter of justification for nominating the candidate to a CRC. Early in the CRC Program, some universities were, according to CRC Program managers, mismanaging their Chair allocations, especially smaller universities. If they did not have a Tier 1 Chair for a relatively-senior and well-recognized researcher, they tended to nominate the person for a Tier 2 Chair. In addition to the letter of justification, subsequent to the Third Year Review of the Chairs Program, the CRC Program provided to all institutions something called a corridor of flexibility, which allows them to combine two Tier 2 Chairs to make one Tier 1, and to split one Tier 1 Chair into two Tier 2 Chairs. Therefore, universities have more freedom to manage their Chair allocations and of course to avoid not nominating a researcher for a Chair at the appropriate level

As of November 2004, 1348 Canada Research Chairs have been awarded, 20 per cent (n=270) of which have gone to women. Twenty-five per cent (n=169) of the Tier 2 Chairs (n=667) have gone to female researchers. Although parity has not yet been achieved between female and male Chair holders, universities are keenly aware of the importance to better their performance in the area of female Chair representation. And as more young women are being attracted to careers in academia, it is expected that the number of female Chair holders at both ranks will rise in the future.

Overlap of Nominees for UFA and CRC

NSERC conducted an analysis of the CRC and UFA databases to assess whether there existed any overlap of nominees for the two programs. The analysis found that there was only one nominee who had been nominated for both programs within the same year. This candidate was not awarded a UFA.

Besides the one candidate that had been nominated for both programs simultaneously, there were an additional six nominees who had received UFA Awards and then, within three years, were nominated for a Tier 2 CRC. Table 3.8 summarizes the overlap between nominees for UFA and CRC. We

²¹ The Chronicle of Higher Education, January 9, 2004.

note that this table includes the one candidate who was nominated for both CRC and UFA within the same year.

Table 3.8: Number of UFA Nominees Who Were Also Nominated for CRC, 1999-2004

	UFA awarded but declined (number)	UFA awarded and active/interrupted (number)	UFA not awarded (number)	Total (number)
CRC awarded	2	2	1	5
CRC not awarded	0	0	2	2
Total	2	2	3	7

Source: UFA and CRC Program Database, NSERC, 2005.

Impact of CRC on UFA

If the CRC and the UFA Programs share the same target population of young female academics, awardees should have a similar level of experience.

An analysis of UFA and CRC recipients conducted by NSERC found that successful UFA nominees had on average 3.93 years of experience (as measured by years since award of PhD) versus 8.61 years for successful CRC nominees. Thus CRCs tend to have more than twice the experience of UFA award holders. NSERC also conducted an analysis of the years of experience of Women's Faculty Award (WFA) holders. The WFA is the pre-cursor to the UFA Program. The analysis found that in the period following inception of the CRC Program, UFA nominees had approximately the same number of years of experience as the UFA and WFA nominees that had applied prior to 2001 when CRC was implemented. Simply put, those receiving UFA and WFA awards have approximately half the years of experience of those in the CRC Program, which can be expected given the flow from the WFA to UFA Programs.

Table 3.9 summarizes the number of years UFA award holders received their PhD.

Table 3.9: Experience of UFA Award Holders versus CRCs, 1999-2003

Years Since PhD ¹	UFA Recipients ² % (number)	Canada Research Chairs Recipients ³ % (number)	New Women Grantees to Discovery Grants ⁴ % (number)
0 to 5	78 (73)	25 (11)	66 (246)
6 to 10	19 (18)	48 (21)	24 (89)
Over 11	3 (3)	27 (12)	10 (38)

1. Years since PhD at time of award.

2. UFA recipients from 2001 to 2004.

3. Tier 2 CRC recipients from 2001 to 2004.

4. New women grantees to Discovery Grants from 2001 to 2004, excluding UFA and female CRC recipients

Source: Comparison Between CRC and UFA Populations, NSERC, February 2005.

The issue of the CRC impacting on the UFA arose when the number of nominations to UFA declined in 2002 to 30 from a high of 63 in 2000. The number of nominations increased to 41 in 2003. Some managers at NSERC expressed concern over the decreased number of applications and hypothesized that universities were shifting their focus from UFA to CRCs. Given the small number of women and Aboriginal people competing for faculty positions in the natural sciences and engineering, it was felt by NSERC managers that there was the potential for the two programs to work against each other.

Slightly over half of the university decision-makers interviewed feel that UFA award holders are *potential* CRC candidates. However, some university decision-makers noted that CRC candidates are already established researchers, whereas UFA candidates are most often beginning their career. Others noted that UFA and CRC have different agendas/play different roles within the university setting with CRCs being seen to play a longer term, strategic role with respect to developing research and teaching expertise within the university. We note that UFA candidates cannot have held a tenured or tenure track position within a Canadian university prior to taking up the award. There are thus few areas where there is potential for the CRC Program to adversely impact the UFA Program through an overlap of nominees. .

According to one interviewee, it is possible that there is a perceived difference in prestige between UFA and CRC and that this has impacted the willingness of universities to participate in UFA since the rules have recently been changed to allow for a candidate to be nominated for both. However, there should be no negative impact for universities with either award. Another interviewee noted that candidates and universities themselves would much prefer the CRC since there is more money attached to the CRC.

There was little consensus among key informants interviewed with respect to the relative prestige of the UFA and CRC Programs. The perception of UFA being less prestigious arises from the fact that it is viewed as an employment equity program and so some may view recipients as having been given their position because they are women (or Aboriginal). One interviewee commented that she suspects that since the CRC was implemented the UFA is getting the 'left over' candidates from CRC. She noted that Tier 2 CRCs may have some similarities with UFA holders in terms of where they are in their career. However this interviewee noted that she was unable to substantiate this view. Another key informant notes that the CRC is more prestigious but there is little comparison between CRC and UFA since the two groups are at different stages in their careers.

Overall, there is little consensus among university decision-makers with respect to the relative costs and benefits of UFA and CRC. Some noted that the CRC is more beneficial because it is more prestigious and linked to more funding. Others noted that the UFA is more beneficial because it is less costly for the department in terms of start-up lab and staff costs. Finally, others noted that there is no difference in terms of the costs and benefits since both are beneficial and the choice to apply to either will depend on the priorities of the university.

b) Extent to Which Participation in UFA is Strategic and Links with CRC

According to university decision-makers the decision to nominate a candidate for UFA is dependent on factors such as: area of expertise; qualifications; desire to have a woman in a tenure track or tenured position; and long-term potential of the candidate. The CRC was not mentioned by any university decision-makers as a deciding factor or a consideration in deciding to nominate a candidate for UFA. However, of the seven nominees who were nominated for both CRC and UFA, three were nominated from within the same university, three from different Canadian universities and one was nominated for a CRC while affiliated with a university outside Canada. All seven of these nominees were nominated for a CRC within three years of being nominated, but not necessarily receiving, the UFA. Thus there is some support for the view that in a small number of cases, university decision-makers have nominated a candidate for a UFA and then subsequently nominated them for a CRC Tier 2. This does not imply competition for candidates for CRC and UFA but rather reflects the career progression of talented researchers who have received UFA Awards. This is illustrated in the situation of one of our case studies where the UFA holder has subsequently received a Tier 2 CRC.

A further review of CRC and WFA (Women's Faculty Awards Program), which was the precursor to UFA, found that there were sixteen WFA recipients that have gone on to be awarded Tier 2 CRCs. This lends further support to the hypothesis that the link between UFA and CRC is the result of career progression on the part of UFA award holders who are able to develop their research with the aid of UFA.

University decision-makers were asked to comment on the factors that are taken into consideration when seeking funding through CRC and whether this was linked to UFA. Most indicated that there was little link between the two programs. According to some university decision-makers:

- CRCs are nominated by senior university administrators rather than department heads, as is the case for UFAs, and are linked to the strategic plan of the university with the goal of building research capacity within the university.
- CRCs are higher quality candidates (i.e. further along in their career). We note however, that university decision-makers did not distinguish between Tier 1 and Tier 2 CRC in their comparisons to UFA holders.
- UFA candidates are usually starting their career as opposed to CRC candidates who are more established. This is consistent with the selection criteria for Tier 2 CRCs, who are defined to be assistant or associate professors or possess the necessary qualifications to be appointed to these levels. A UFA nominee cannot hold or have held a tenured or tenure track position within a Canadian university prior to taking up UFA.
- CRCs are seen by universities as a much larger commitment requiring more resources (research space, equipment, and staff) than UFAs.

c) Conclusions

This evaluation found no evidence of the CRC Program adversely impacting the UFA Program. There was little evidence found that the UFA and CRC Programs are competing for the same candidates. In fact, there was evidence of only one candidate who had been nominated for both the CRC and UFA simultaneously, and six who were nominated for CRCs within three years of receiving the UFA award. Analysis conducted by NSERC found that the mean number of years of experience, as measured by years since receipt of PhD, was 3.93 years for UFA nominees and 8.91 years for CRC Tier 2 nominees. This is a strong indication that there is little overlap between the pools of candidates for the two Programs.

This evaluation found no evidence of universities using the UFA and CRC Programs strategically. The decision to nominate a candidate for the UFA Program is usually made at the level of the department and the department chair then seeks approval to nominate a candidate for UFA from the university. In the case of CRCs, the decision to nominate a candidate is made at the level of the university and is linked to the overall strategic plan for the university. Although the departments who obtain a CRC benefit and are active in developing the nomination, they generally do not initiate the process as they would with a UFA.

4. SUCCESS AND OUTCOMES

This chapter responds to evaluation issues related to success and outcomes of the UFA Program. Each of the evaluation issues is addressed in a separate section.

4.1 IMPACT OF UFA ON RECIPIENTS' CAREER PATHS

a) Impacts on Career Progression

Overall, recipients reported the impact of the UFA award with respect to their career or position within their department as either positive or neutral. They reported a positive impact with respect to recognition by the peers, their ability to establish a research infrastructure and their choosing a Canadian university. The impacts were reported to be somewhat neutral with respect to their salary level and the extent of their collaboration with other university researchers or other sectors. University decision-makers interviewed reported that the salaries of UFA recipients are unaffected by the Award since salaries are negotiated independently of the UFA. There is thus evidence that departments are respecting their agreement with NSERC and treating awardees fairly.

According to UFA holders interviewed for the case studies conducted for this evaluation, the UFA Award allowed them to get a faster start on their research. In the words of one recipient, "Because of the UFA I was able to start my research earlier. I entered the university with my research grant in hand, unlike most starting professors who write their funding applications in their first year. I hit the ground running. The reduced teaching load also helped to start my research right away." Another commented, "The UFA Award freed up a lot of time for research. Becoming a new professor requires a lot of adjustment and having to teach fewer courses freed up time to adjust and get my footing in research." This early career acceleration may result in a decrease in the attrition of female professors beyond the assistant professor level. However, the data available do not allow further assessment of this possibility.

The majority, 89 per cent, of recipients indicated that it is likely that they will remain in academia over the next five years. Similarly, 85 per cent of non-recipients expect they will remain in academia. Only a small number (n=4) of recipients and non-recipients (n=7) indicated that they may leave academia sometime in the next five years. The reasons cited by these four recipients included family reasons and lack of tenure. Reasons cited by the seven non-recipients were lack of funding/finances, other job, work environment, and the demanding workload. This indicates that, despite the barriers faced by women in pursuing an academic career, the majority of recipients and non-recipients intend to stay in academia. Notably, the proportion of non-recipients who expect to stay in academia is not much lower than for recipients, implying that the UFA Program may be having little or no incremental impact on keeping

women in academia, particularly since the large majority of non-recipients have found tenured or tenure-track employment and expect to stay in academia.

NSERC conducted an analysis of the proportion of recipients and non-recipients for UFA and WFA who continue to hold a Discovery Grant in 2005. The analysis found that a much larger proportion, 92.2 per cent of recipients in the 1999-01 cohort, held a Discovery Grant in 2004-05 when compared to non-recipients of whom 47.8 per cent held a Discovery Grant in 2004-05. NSERC has not conducted a formal analysis of these results, but the hypothesis is that those who no longer hold a Discovery Grant are neither working in academia nor conducting formal research in science and engineering in Canada. These results imply that UFA/WFA recipients tend to continue to conduct academic research, i.e., pursue an academic career, further into the future than their non-recipient cohorts.

The publication of research papers in refereed journals is an important measure of success and an important criterion for promotions. Recipients and non-recipients were asked how many papers they have had accepted for publication in refereed journals in the last three years. The average number among recipients was eight and the average for non-recipients was six, indicating that recipients were generally more successful at getting papers published. A possible explanation for this is that recipients, being able to get a faster start on their research due to having a research grant in hand when starting their position and having a lighter teaching and administrative load, are able to find time to conduct more research and publish more papers. In fact this is the intent of the reduced teaching and administrative load in UFA. We note that the number of publication is discipline-dependant. Table 4.1 provides a breakdown of the number of publications for recipients and non-recipients by discipline.

Table 4.1: Average Number of Articles Published in Refereed Journals in Previous Three Years

	Recipients (number)					Non-recipients (number)				
	Total	Eng and Comp Science	Math and Physical Sc.	Earth and Life Sc.	Other	Total	Eng and Comp Science	Math and Physical Sc.	Earth and Life Sc.	Other
	7.69	7.43	7.71	7.19	26.00	5.77	4.76	4.22	6.58	10.00

Source: Survey of Recipients and Non-recipients, EKOS, 2004.

A potential measure of success of the UFA Program is the time between the awarding of PhD and award of a tenured or tenure-track position. Overall, 90 per cent of respondents received their PhD within the same year of accepting their current tenured or tenure-track position. The time between receipt of their PhD and accepting their current position tends to be longer for non-recipients with 77 per cent receiving both within the same year. Thus recipients tend to obtain a tenured or tenure-track position sooner after receiving their PhD.

A majority, 69 per cent of recipients feel that holding a UFA Award is an important factor in university hiring and promotion decisions. Similarly, 64 per cent of non-recipients believe it is important. In fact, the majority (97 per cent) of recipients feel that the UFA Award has had a positive impact on their career. Non-recipients were asked the extent to which they felt that not receiving a UFA has had a negative impact on their career, 32 per cent feel that not receiving a UFA has had a negative impact on their career and 47 per cent feel it has had no impact. This is a counter-intuitive result in that both recipients and non-recipients feel that UFA is an important factor in university hiring and promotion decisions yet only one third of non-recipients report that not having received a UFA had a negative impact on their career. One possible explanation is that it is too early in the careers of non-recipients for them to fairly assess the impacts of not having received the UFA. Another possible explanation is that UFA is not that important in terms of career advancement in that maybe it is viewed as a “plus”, but that they would not be penalized by not holding a UFA.

The majority, 88 per cent of UFA Award holders surveyed still hold a UFA Award. Of those who still hold a UFA Award, 14 per cent are in a tenured position. Of those who no longer hold a UFA Award, half are in tenured positions and half are in tenure track positions, that is, all are employed in academia. The majority of non-recipients, 92 per cent are currently working at a university and 80 per cent are in tenured or tenure track positions. Of non-recipients who are not currently in tenured or tenure track positions (n=14), approximately half expect to obtain a tenured or tenure track position and half do not. Notably the proportion of non-recipients who are in tenured or tenure track positions is significant, indicating that the incremental impact of UFA in helping women obtain tenured or tenure track positions may not be large. A possible explanation is that these non-recipients were hired because of their successful discovery grant. An analysis of the program output shows that between 60 per cent and 70 per cent of unsuccessful UFA candidates who were offered a Discovery grant in the first round took up their grants within a year after the UFA competition. It is possible that holding a Discovery Grant may have been an asset for these unsuccessful candidates and influenced whether they were hired even without the UFA award. This could be an unintended effect of the program. Another plausible explanation is that UFA candidates are all excellent researchers. Indeed, most candidates for UFA positions go through a hiring selection process at the department level and only the best candidates are nominated. Again, this could be an unintended effect due to the program emphasis on excellence. Table 4.2 summarizes the proportion of recipients and non-recipients in tenured and non-tenured positions.

Table 4.2: Tenure status for Recipients and Non-recipients

	Recipients % (number)	Non-recipients % (number)
Tenure-track	82 (n=68)	52 (n=31)
Tenured	18 (n=15)	25 (n=15)
Neither		15 (n=9)
Not in university		8 (n=5)
Total	100% (n=83)	100% (n=60)

Source: Survey of Recipients and Non-recipients, EKOS, 2004.

The majority of university decision-makers feel that the median grants of UFA holders are similar to those of non-UFA faculty. According to one NSERC Council member, grants are ruled by seniority issues, with new applicants often getting smaller grants than applicants who have been in the academic world for some time. Discovery Grants tend to be quite comparable for all. Some key informants interviewed noted that UFA recipients tend to do quite well with respect to Discovery Grants. (UFA recipients are guaranteed a minimum grant.) The majority of recipients, 89 per cent, report having been able to secure research funding beyond the Discovery Grant they received with the UFA Award. Non-recipients appear to be generally more successful at obtaining grants with 78 per cent reporting having other NSERC grants versus 53 per cent of recipients. Eighty-three per cent of non-recipients reported having been able to secure alternate research funding from multiple sources since applying for a UFA. So, although a slightly higher proportion of recipients have been able to secure additional research funding, both recipients and non-recipients can be seen as successful in this regard. Sources of funding cited by recipients and non-recipients are summarized in Table 4.3.

Table 4.3: Sources of Research Funding

Sources of funding	Recipients % (number)	Non-recipients % (number)
Other NSERC grant	53 (n=39)	78 (n=39)
University	53 (n=39)	30 (n=15)
Canada Foundation for Innovation	50 (n=37)	42 (n=21)
Provincial funding sources	49 (n=36)	42 (n=21)
Industry	20 (n=15)	20 (n=10)
International	16 (n=12)	8 (n=4)
CIHR/SSHRC	14 (n=10)	26 (n=13)
Non-profit research organizations	7 (n=5)	6 (n=3)
Other federal government funding	3 (n=2)	...

Source: Survey of Recipients and Non-recipients, EKOS, 2004.

Data provided by NSERC indicate that the average value of Discovery Grants for UFA recipients is consistently higher for the years 1999-2003. In 2003 the average Discovery Grant for UFA recipients was \$24,379 and \$19,667 for non-recipients. The average Discovery Grant for successful new female Discovery Grant applicants was \$22,758. Table 4.4 summarizes these data.

Table 4.4: Average Discovery Grants, 1999-2003

Competition Year	Female Successful New Applicant (\$)	UFA Recipient (\$)	UFA Non-recipient (\$)
1999	23,599	29,887	21,470
2000	20,707	24,107	20,684
2001	22,535	27,691	20,957
2002	24,231	25,209	21,750
2003	22,758	24,373	19,667

Source: NSERC Discovery Grants database.

Recipients were asked to estimate the total amount of research funding they had secured to date aside from the Discovery Grant. Survey data indicate that non-recipients have been able to secure, on average, more funding than recipients. It is not immediately obvious from Table 4.5 that non-recipients reported more funding. This is somewhat contradictory since one would expect recipients to be able to more easily secure additional research funding through leveraging their UFA Award since they are considered to be ‘the best and brightest’. As well, given that recipients have a reduced teaching and administrative load one would expect they have more time to pursue sources of research funding. The amount of funding secured by the 74 recipients and 50 non-recipients is summarized in Table 4.5. We note that funding is discipline dependent with some disciplines requiring less funding.

Table 4.5: Amount of Research Funding Secured

Amount of research funding secured to date	Recipients % (number)					Non-recipients % (number)				
	Total	Eng and Comp Science	Math and Physical Sc.	Earth and Life Sc.	Other	Total	Eng and Comp Science	Math and Physical Sc.	Earth and Life Sc.	Other
Less than \$100,000	27 (n=20)	8 (n=6)	15 (n=11)	4 (n=3)		16 (n=8)	2 (n=1)	8 (n=4)	6 (n=3)	
\$100,000 to \$249,000	20 (n=15)	3 (n=2)	8 (n=6)	9 (n=7)		32 (n=16)	16 (n=8)	2 (n=1)	14 (n=7)	
\$250,000 to \$499,999	20 (n=15)	7 (n=5)	7 (n=5)	5 (n=4)	(n=1)	16 (n=8)	4 (n=2)	2 (n=1)	10 (n=5)	
\$500,000 to \$999,999	19 (n=14)	3 (n=2)	7 (n=5)	9 (n=7)		22 (n=11)	4 (n=2)	2 (n=1)	16 (n=8)	
More than \$1,000,000	14 (n=8)	4 (n=3)	3 (n=2)	7 (n=5)		12 (n=6)	2 (n=1)		10 (n=5)	
Don't know	3 (n=2)			3 (n=2)		2 (n=1)				2 (n=1)

Source: Survey of Recipients and Non-recipients, EKOS, 2004.

The average number of graduate or senior undergraduate students supported by the current research funding of UFA recipients responding to the survey is four, of which half are female. Similarly, for non-recipients, the number of students supported is five, of which half are female.

b) Impacts on Hiring

According to university decision-makers, the deciding factors in choosing to nominate a candidate for UFA include: need for hiring; level of effort versus likelihood of success; lab/research space available; support of the Dean; and quality of the candidate.

The majority of recipients of UFA Awards reported no negative impacts related to receiving the UFA. Some negative impacts mentioned by a small number of recipients included: negative stigma associated with equity program awards (n=6); time constraints of the application process (n=3,) and unfair treatment by the university (n=3). Some of the positive impacts noted by recipients included: prestige/respect from peers (n=3); positive research opportunities (n=3,); and positive mentoring opportunities (n=2).

University decision-makers report that universities identify potential UFA nominees through a variety of means, including: personal contact and candidates presenting themselves. The hiring of UFA nominees has been, according to university decision-makers, conditional on receipt of the UFA award. This is largely linked to university budget issues. Departments must receive final approval for hiring new staff and are often able to convince university administrators to allow them to hire staff by saying the position will be partly subsidized by UFA for a period of up to five years. University decision-makers indicated that their department rarely incorporates UFA requirements into their job search advertisements with about one quarter indicating that if an appropriate candidate presents herself then she is nominated for an UFA.

Almost half of university decision-makers interviewed feel that the salary and benefits provided to UFA recipients are comparable to those of other faculty. A small number indicated that the median salaries and benefits of UFA holders are higher while an additional small number of university decision-makers indicated that they were lower. Some of those who indicated that the median salary and benefits were lower noted that the university must top-up the salary provided by UFA. It appears that a small number of university decision-makers do not understand that the UFA is not intended to cover the full cost of salaries. According to one interviewee, UFA only provides partial funding for salaries and benefits and in many universities the union rules indicate that all new faculty must have similar salaries, so the university would be required to supply the rest, as well as any start-up funds necessary. We note that the \$40,000 provided to the university by UFA is not intended to represent the full salary of UFA holders but rather an incentive to universities. This indicates a misinterpretation on the part of some university decision-makers of what the \$40,000 in funding to the universities is intended for.

Fifty-one per cent of recipients were post-doctoral fellows when they were nominated for the UFA. Twenty eight per cent were lecturers and 14 per cent were doctoral students. Based on survey results, in general, those who pursue post-doctoral studies intend to pursue an academic career or a research

career. Those who are lecturers are, in effect, already in an academic career but not in a tenured or tenure-track position. This implies that, in general, recipients had already decided or were seriously considering an academic career prior to receiving the UFA Award and so receiving the UFA Award did not directly impact on their decision to pursue an academic career.

A majority of recipients, 69 per cent reported that at the time they were nominated for the UFA, they were also applying for other opportunities such as employment or other research grant or fellowship opportunities. A similar proportion of non-recipients, 68 per cent reported that they were also applying for other opportunities. Of non-recipients seeking other positions, 49 per cent were offered other positions within academia not including grants or fellowships. Recipients seeking other opportunities reported receiving on average one additional offer within academia not including grants or scholarships. Further, recipients reported having, on average, less than one other position outside academia offered to them (excluding grants and fellowships) and an average of one grant and fellowship offered to them. Overall, non-recipients were offered two positions within academia, two positions outside academia and two research grant or fellowship opportunities. This indicates that non-recipients have not necessarily fared worse in terms of career opportunities than recipients and is consistent with non-recipients' view that not having received the UFA was not detrimental to their career. In terms of opportunities, non-recipients have, in general, been more successful than recipients.

Recipients were asked for reasons why they had decided to accept the UFA Award. The reasons cited were generally consistent with the goals of the UFA Program. The reasons cited by recipients include:

- Good research opportunity/desire to do research (n=36, 43 per cent)
- University/city is in a desired location (n=24, 29 per cent)
- Desire to enter academia (n=23, 28 per cent)
- Prestige of the award (n=23, 28 per cent)
- Reduced teaching/administrative load (n=23, 28 per cent)
- Prestige of the institution (n=21, 25 per cent)
- Desire to return/stay in Canada (n=21, 25 per cent)
- Tenured/tenure-track position (n=20, 24 per cent)

Overall, university decision-makers feel that UFA has had a positive impact on the hiring practices of their department and that the quality of UFA candidates is comparable, or slightly above average relative to non-UFA candidates. Two linked the hiring of a UFA candidate by their department to impending retirements, suggesting that UFA candidates and the UFA is being used as a bridge to the retirement of department staff. Some university decision-makers noted that the impact of UFA has also been positive in terms of increased awareness and culture change in their departments that have become more

open. However, according to university decision-makers, there remain some issues preventing universities from hiring more women including: a lack of available positions; lack of research facilities/lab space; time and effort required; and competition from the private sector/lack of interest in an academic career. One university decision-maker, representing a department in the applied sciences, noted that there is no real need for UFA in his department since they are willing and able to hire women without UFA.

Key informants interviewed are split on whether the Program has been successful in decreasing the under-representation of women in tenure-track or tenured positions in Canadian universities. Those who feel the Program has increased the number of women in tenure-track or tenured positions noted the number of UFA Award holders. However those who feel the Program has not had an impact note that in some cases the UFA holders would have been hired regardless of the UFA Award. Other interviewees who feel the Program has not had an impact commented that the proportion of female faculty has remained the same, even if the actual numbers have increased. Statistics Canada data support this view to some extent. The proportion of female teaching staff in tenured or tenure track positions has been increasing slightly however, this increase was evident before the UFA Program was implemented and so increases, however slight, cannot be attributed to the UFA Program.

The vast majority of recipients, 96 per cent, agree that the UFA is a good way to increase the representation of women in academia. However, the majority, 67 per cent, also indicated that they would still be in academia if they had not received the UFA. Despite not receiving the UFA, the majority of non-recipients feel that the UFA Program has been successful in encouraging universities to hire women in the natural sciences and engineering.

University decision-makers indicated that only rarely is the UFA position a new one; the positions offered to UFA award holders are largely pre-existing positions. This contradicts UFA recipients, as 64 per cent believed that their position was new to their department, however, 24 per cent believed that it was an existing position.

In 2001-02 NSERC awarded 25 UFA Awards, 18 of which were conditional and 7 were unconditional. Conditional awards are nominations that are conditional on the receipt of the UFA and so can be seen as the incremental impact attributable to the UFA Program. In other words, without the UFA Program, the university that nominated them would not have hired these 18 women. According to Statistics Canada, the number of female assistant professors hired, the level at which 95 per cent of UFA nominees are hired, in the natural sciences and engineering in 2001-02 was 298. This figure includes UFA Award holders. So the incremental impact of the UFA Program is relatively small, even when we assume none of the 18 conditional nominees would have been hired by another university, which is unlikely since all UFA holders are reported to be of the highest calibre and the majority of non-recipients have tenured or tenure-track positions in Canadian universities.

c) Conclusions

In spite of some positive effects of the program, the incremental effect of the program is not significant. Roughly equal proportions of recipients and non-recipients anticipate staying in academia over the next five years. As well, the majority of non-recipients are currently in tenured or tenure-track positions indicating that recipients would likely have been hired regardless of UFA for a tenured or tenure-track position. This is supported by the views of university decision-makers and those interviewed for case studies. This provides an indication that the Program is not having a significant incremental impact on the number of women hired for tenured or tenure-track positions or the number of women who choose to pursue a career in academia.

There is evidence that the Program is having an impact on the early career progression of UFA recipients. This evaluation found evidence that recipients may have been able to make faster early progress on their research and to publish more papers than non-recipients. The UFA Program has not been in place long enough to assess the longer-term impacts of the increased number of publications of recipients, however the increased number of publications may serve to increase the early career momentum of recipients. Why recipients were able to publish more research papers cannot be assessed given the existing data. However, recipients have a decreased teaching and administrative load so they are better able to focus on their research and publishing papers early in their career. As well, there is evidence that they are able to start their research sooner after having been hired because they have their Discovery Grant in hand as soon as they are awarded the UFA, non-recipients must apply for a Discovery Grant after being hired by the university. Non-recipients, if granted a Discovery Grant in the first round, are permitted to keep their Discovery Grant provide they obtain a position within a specified period of time. Otherwise they must apply for a Discovery Grant after being hired by the university.

The majority of UFA recipients and non-recipients feel that holding an UFA is an important factor in university hiring and promotion decisions. However, few non-recipients report that not having received an UFA has been detrimental to their academic career.

This evaluation found little distinction between UFA recipients and the salary and benefits of other faculty. However, with respect to funding, this evaluation found that UFA recipients have been slightly less successful than non-recipients at securing research funding. Similarly recipients tend to support fewer highly qualified personnel than non-recipients. However, UFA recipients tend to fare better with respect to Discovery Grants, receiving on average \$24,379 versus \$19,667 for non-recipients in 2003. In addition, a higher proportion of recipients continue to hold Discovery Grants, 92 per cent of recipients versus 48 per cent of non-recipients.

There is some evidence that the retention rate for UFA recipients is higher than that of non-recipients. A higher proportion of UFA recipients continue to hold a Discovery Grant for a longer period of time. As well, according to survey results, recipients tend to obtain a tenured or tenure-track position sooner after receipt of their PhD. There is little evidence that the UFA is impacting on the decision of UFA recipients to pursue an academic career. In general, recipients were already clearly on the path to an academic career

with 51 per cent of recipients being post-doctoral fellows at the time of their nomination. An additional 28 per cent were lecturers and 14 per cent were doctoral students.

Overall, university decision-makers feel that UFA has had a positive impact on hiring practices and that the quality of UFA candidates is comparable, or better than average, relative to non-recipients. There is also some evidence, based on comments from university decision-makers, that UFA has had a positive impact in terms of increased awareness and culture change in their departments that have become more open.

According to university decision-makers, only rarely are UFA positions new academic positions. However, the majority of recipients believe that their UFA position is a new one.

4.2 EXTENT TO WHICH UFA REDUCES BARRIERS

According to NSERC management, the Program is not intended to have an impact on the number of women and Aboriginal people in academia directly through increasing the hiring of women and Aboriginal people but rather, it is hoped that women and Aboriginal people hired through the Program will serve as mentors to students and thus encourage more to pursue academic careers. The intended impacts of the Program are thus expected to appear over the longer term. However, we note that this does not fit with the logic model for the program. Also, as stated on NSERC's web site, the objective of the program is to "decrease the under-representation" of women and Aboriginal researchers. The objectives of the WISE CWSE (NSERC Chairs for women in science and engineering) Program are to increase representation of women and to provide role models. Currently, mentoring is a medium to long-term impact of the UFA program. However, if mentoring is the real objective of the program then it should be stated clearly and the program modified accordingly.

a) Research Space and Other Resources

Studies have found that there are inequities between male and female academic staff in the distribution of research space and other resources, salaries and the distribution of awards and other forms of recognition.²² In fact, one review in the United Kingdom found that women received less pay than men at every single grade throughout the university hierarchy. As well, women were found to be more likely to be on short-term contracts than men.

Recipients and non-recipients of UFA were asked to rate how they would compare their situation with that of their colleagues with respect to lab space, office space, access to technical help, opportunities for networking and opportunities for mentoring. In all respects, both recipients and non-

²² Massachusetts Institute of Technology. 1999. A Study on the Status of Women Faculty in Science at MIT. ; European Commission (2002), Science Policies in the European Union: Promoting Excellence through Mainstreaming Gender Equality.

recipients rated their situation as about the same as that of their colleagues. This implies that both recipients and non-recipients do not see their day-to-day work situation as significantly different from that of their colleagues and so there is no indication of discrimination against, or in favour of, UFA recipients.

b) Impacts on Mentoring and Networking

One of the major barriers to more women and Aboriginal people pursuing careers in academia cited by university decision-makers, recipients, non-recipients and doctoral and post-doctoral fellows is the lack of female and Aboriginal mentors. The UFA Program, in encouraging the hiring of tenured or tenure track female staff, is seeking to address this barrier. In fact, the UFA program is seeking to address informally this lack of mentorship by increasing the total number of women available to be mentors in academe.

The majority, 94 per cent of UFA recipients report that they supervise students. On average, those who supervise students report supervising seven students, of which three are, on average, women. A small proportion of recipients who supervise students, 8 per cent, reported not supervising any women. Similarly, 88 per cent of non-recipients supervise students with an average of seven students of which three are women (and six per cent report not supervising any students). Of these seven students, recipients are supporting four from their research funding whereas non-recipients are supporting five.

Based on these survey results, the UFA program does not appear to be having an incremental impact on the number of students that recipients supervise or mentor since there is little difference in the number of students or female students supervised between recipients and non-recipients. In fact, recipients do not come into contact with as many students through teaching due to their reduced teaching load though, according to recipients, their decreased teaching load has little negative impact on their ability to supervise and mentor students. We note that the Evaluation of WFA conducted in 1997 also concluded no impact on mentoring. The lack of incremental impact is not an issue with respect to expected program performance but rather the capacity of the program design not to hinder possible outcomes.

Recipients generally reported no negative impact on their ability to network with others in their institution resulting from their reduced teaching and administrative load. This implies that recipients feel well integrated into the university department despite having fewer teaching and administrative responsibilities.

c) Barriers Impacting Women

The majority of key informant interviewees feel the Program is not responding to the barriers faced by women. Most noted that the barriers faced by women wanting to pursue an academic career are societal and the Program cannot address the social changes required to decrease these barriers. However, some external experts disagree, saying that the Program is inciting change by increasing the number of women being hired, who according to these interviewees, may not otherwise be hired by universities. They also noted, however, that the number is so small that their overall impact is not significant.

Some key informants feel that the Program is not responding to the 'leaky pipeline' issue for women. These interviewees commented that the Program may be encouraging women to stay in academia but is doing very little to encourage women to pursue studies beyond the undergraduate or graduate levels.

Almost half of the university decision-makers interviewed feel the Program has been of some assistance in responding to these barriers. Ways in which the Program has proved useful include funding for the hiring of women and increasing awareness of the issue of under-representation. One interviewee noted that the Program has not been, nor can it be helpful, in increasing the hiring of women or Aboriginal people since there are too few qualified candidates available to hire. Although the data support this view for Aboriginal people, the data do not entirely support this view for women. University decision-makers noted that the impacts of UFA were largely, to their knowledge, limited to their department and had not moved to other departments in their university.

d) Barriers Impacting Aboriginal People

There is consensus among key informant interviewees that the Program is not responding to the barriers identified for Aboriginal people. Interviewees noted that the Program cannot, as currently designed, respond to these barriers because there are very few potential candidates for hire for academic positions. In fact, there have been only three Aboriginal nominees to the UFA Program since 1999, including the latest competition in 2005. These interviewees noted that the barriers for Aboriginal people arise long before the hiring stage targeted by the Program. Case study participants interviewed for this evaluation agree, with most noting that the challenges start long before university.

A related issue is the lack of data on the number of Aboriginal faculty without which the extent of the problem, nor the level of success can be assessed. However, there is consensus among key informant interviewees and case study participants that the Program is not responding to the barriers identified for Aboriginal people, because these arise long before the hiring stage targeted by the Program. This evaluation has found that the barriers for Aboriginal people arise at the elementary and high school level. This results in the pool of Aboriginal candidates who could potentially be nominated for UFA being too small to have a measurable impact. The Program is not directed at the appropriate stage in the education of Aboriginal people so as to result in increased representation of Aboriginal people in academia within the natural sciences and engineering. Despite the lack of incremental impact, the Program is important symbolically in attracting attention to the issue of under-representation of Aboriginal people in academia.

Further key informants agree that the Program has not had any impact on the number of Aboriginal people in tenure-track or tenured positions in Canadian universities. Aboriginal experts interviewed note that NSERC should assess why there are so few Aboriginal people being nominated for UFA and direct efforts to addressing this. Aboriginal experts suggest that the Program should be targeting Aboriginal people earlier in the academic or educational process and that effort should be directed at the grade school level and should be part of a larger effort to expand educational opportunities for Aboriginal people.

e) Conclusions

We note that NSERC management report they did not intend the UFA Program to directly result in a significant increase in the number of women hired for tenured or tenure track positions but rather the Program is intended to work to increase the opportunities for a small number of women and Aboriginal people to develop research capacity early in their career and to serve as mentors for subsequent generations of female and Aboriginal students. The Program resources are insufficient to have a direct impact on the number of women hired for academic positions in Canada. The expectation is that the increased mentoring will encourage more women and Aboriginal people to develop an interest in science and mathematics and to pursue studies and careers in the natural sciences and engineering.

Despite this, there is no strong evidence that UFA recipients are fulfilling their role as mentors any better than non-recipients. If anything, the reduced teaching load of recipients implies they have less contact with students to whom they may serve as role models or mentors. There is evidence from case studies that most students and colleagues are unaware of who holds a UFA. This differs from the situation for CRCs, which tend to be very well publicized.

UFA recipients experience a comparable work environment to that of non-recipients with respect to research space and resources and other resources.

For the most part, the barriers faced by women in pursuing an academic career in the natural sciences and engineering are societal rather than discriminatory. Societal barriers experienced by women in academia, or other careers, relate largely to family-career balance. The UFA Program is not addressing these social barriers directly. However, some feel that the Program, although not addressing the barriers faced by women directly, is serving to increase the number of women in academia and increasing awareness within academia of the need to increase the representation of women in academia.

Given that the number of nominations for identified Aboriginal people has, to date, been very low with only three nominees to date, including two who were awarded UFAs, one cannot expect that the Program will have had a measurable incremental impact on the number of Aboriginal faculty in the natural sciences and engineering. A related issue is the lack of data on the number of Aboriginal faculty without which the extent of the problem, nor the level of success, can be assessed. However, there is consensus among key informant interviewees and case study participants that the Program is not responding to the barriers identified for Aboriginal people, because these arise long before the hiring stage targeted by the Program. This evaluation has found that the barriers for Aboriginal people arise at the elementary and high school level. This results in the pool of Aboriginal candidates who could potentially be nominated for UFA being too small to have a measurable impact. The Program is not directed at the appropriate stage in the education of Aboriginal people so as to result in increased representation of Aboriginal people in academia within the natural sciences and engineering. Despite the lack of incremental impact, the Program is important symbolically in attracting attention to the issue of under-representation of Aboriginal people in academia.

4.3 QUALITY AND APPROPRIATENESS OF PROGRAM INFORMATION

a) Information about the Program

According to UFA Program management, the communication strategy for sharing information about the Program has, to date, consisted of posting information on the NSERC web-site, pamphlets that are available at universities and site visits made by UFA Program staff. Program staff sometimes visit universities to make presentations as part of basic NSERC scholarship and bursary presentations. They have also been making UFA-specific site visits since 2001 but these are sometimes very poorly attended. They have also produced a pamphlet on UFA specific to Aboriginal people. UFA Program staff also occasionally attends and makes presentations at conferences where there may be a significant number of potential nominees. Interviewees representing UFA Program staff generally feel that the program should be making more site visits and presenting at conferences. However they feel that the necessary information is reaching potential candidates and departmental chairs. In general, these interviewees feel the Program needs to be more proactive in its communications strategy.

University decision-makers reported finding out about the UFA Program through a variety of means, including: information provided by university administration to the department; NSERC web-site; word of mouth; NSERC literature; the UFA candidate; the current evaluation.

The most frequently cited source through which recipients and non-recipients first heard about the UFA Program is faculty members or academic supervisors. Other sources through which recipients and non-recipients reported first hearing about the UFA Program include: word of mouth; NSERC web-site; a university administrator; and a job advertisement. Among female doctoral and post-doctoral fellows who were aware of UFA, site visits were a frequently cited method through which respondents first heard about UFA.

Approximately half of all doctoral and post-doctoral fellows were aware of the UFA Program. Interestingly a slightly higher proportion of men were aware of the Program than women. There is no indication in the data collected why this could be. Awareness was greatest among post-doctoral fellows with 60 per cent reporting that they were aware of UFA. Doctoral and post-doctoral fellows were asked to rate the effectiveness of various communications methods. Table 4.6 summarizes these responses.

Table 4.6: Effectiveness of Communication Tools Used by UFA

	Total % (number)	Men % (number)	Women % (number)	PhD % (number)	Post-doctoral Fellows % (number)
University student paper					
Not effective	25 (n=47)	26 (n=28)	23 (n=19)	22 (n=29)	31 (n=18)
Somewhat effective	68 (n=130)	66 (n=72)	70 (n=57)	70 (n=93)	62 (n=36)
Effective	6 (n=11)	6 (n=7)	6 (n=5)	7 (n=9)	5 (n=3)
Don't know/no answer	2 (n=3)	2 (n=2)	1 (n=1)	2 (n=2)	2 (n=1)
Pamphlets or posters in university departments					
Not effective	9 (n=17)	11 (n=12)	7 (n=6)	9 (n=12)	10 (n=6)
Somewhat effective	68 (n=130)	72 (n=78)	62 (n=51)	69 (n=92)	64 (n=37)
Effective	23 (n=44)	17 (n=18)	30 (n=25)	21 (n=28)	26 (n=15)
Don't know/no answer	1 (n=2)	1 (n=1)		1 (n=1)	
Internet					
Not effective	6 (n=11)	7 (n=8)	5 (n=4)	8 (n=11)	2 (n=1)
Somewhat effective	56 (n=107)	59 (n=64)	52 (n=43)	52 (n=69)	66 (n=38)
Effective	37 (n=71)	32 (n=35)	43 (n=35)	38 (n=51)	33 (n=19)
Don't know/no answer	1 (n=2)	2 (n=2)		2 (n=3)	
Academic Supervisors					
Not effective	4 (n=8)	6 (n=6)	2 (n=2)	5 (n=7)	2 (n=1)
Somewhat effective	34 (n=65)	38 (n=41)	28 (n=23)	38 (n=51)	24 (n=14)
Effective	60 (n=115)	53 (n=58)	68 (n=56)	53 (n=70)	74 (n=43)
Don't know/no answer	3 (n=6)	4 (n=4)	1 (n=1)	4 (n=5)	
Site visits by NSERC					
Not effective	5 (n=10)	6 (n=7)	5 (n=4)	5 (n=7)	5 (n=3)
Somewhat effective	48 (n=92)	50 (n=55)	44 (n=36)	48 (n=64)	47 (n=27)
Effective	45 (n=86)	40 (n=44)	50 (n=41)	43 (n=57)	48 (n=28)
Don't know/no answer	3 (n=6)	4 (n=4)	1 (n=1)	4 (n=5)	

Source: Survey of Doctoral and Post-doctoral Fellows, EKOS, 2004

- University student paper – The majority 68 per cent rated it as somewhat effective. Post-doctoral fellows rated this method somewhat less favourable than PhD fellows 62 per cent rated it as somewhat effective and 31 per cent as ineffective. Thus implying that the university student paper is not the most effective means through which to communicate with post-doctoral fellows.
- Pamphlets or posters in university departments – The majority, 68 per cent, rated this mechanism as somewhat effective. Women tended to rate this mechanism more favourably than men with 30 per cent of female respondents rating it as effective.
- Internet – The majority of respondents, 56 per cent rated it as somewhat effective. However, 43 per cent of women rated it as effective, a higher proportion than men.
- Academic supervisors – This was rated as effective by 60 per cent doctoral and post doctoral fellows. It was rated highly by a larger proportion of women, 68 per cent, and post-doctoral

fellows, 74 per cent. This indicates that this is generally an effective method of communicating information about UFA.

- Site visits by people from NSERC – this method was rated as somewhat effective by 48 per cent and effective by 45 per cent of doctoral and post-doctoral fellows.

Given the size of the Program, this evaluation did not find evidence of significant gaps in communication of Program information. The only potential gap is the lack of a communication strategy targeted at university decision-makers and academic supervisors. Directing communication strategies at these two groups could encourage more departments to nominate candidates and to provide information about the Program to students in their departments. Academic supervisors are important because they are an important source of information for doctoral and post-doctoral fellows. In addition to site visits, NSERC could send information letters to faculty and thus reach more than 80 per cent of potential academic supervisor in science and engineering in Canadian university. We note that attendance to site visits is often low as reported by UFA staff.

b) Information about UFA Recipients

Interviewees and case study participants suggested that NSERC should be better communicating information about UFA recipients and their accomplishments. It is felt that such communication would serve to better inform students, universities, peers and others of recipients accomplishments and thus the prestige of the Award. As well, communicating information about the recipients would allow them to better serve as role models and mentors for women and Aboriginal people. The Program currently does not consistently communicate information about recipients.

c) Conclusions

Based on evidence collected for this evaluation, academic supervisors and to some extent site visits stand out as being the most effective and successful sources of information about UFA for potential nominees. However, there is a need for the Program to communicate directly with academic staff and university decision-makers about the Program.

This evaluation found that there is a gap in communication about the accomplishments of UFA recipients. Such communication could serve to increase the visibility of recipients and allow them to better serve as role models and mentors, fulfilling a key goal of the Program.

5. COST-EFFICIENCY AND ALTERNATIVES

This chapter addresses evaluation issues related to cost-efficiency and alternatives. We address cost-efficiency and alternatives in separate sections of this chapter.

5.1 APPROPRIATENESS OF PROGRAM

a) Appropriateness of NSERC Involvement

Overall, there is a consensus among key informants that it is appropriate for NSERC to be attempting to redress the issue of under-representation of women and Aboriginal people in the natural sciences and engineering because the issue and the domain (natural sciences and engineering) fits within the mandate of NSERC. Some key informants commented that NSERC should be taking the lead on this issue largely because universities have respect for NSERC and so NSERC serves as an example and provides symbolic support for increasing the representation of women and Aboriginal people. These key informants feel that if NSERC eliminates UFA then this will send a negative message. Many key informants also commented that other organizations, specifically universities and provincial governments, have an important role to play. The majority of university decision-makers feel that it is appropriate for NSERC to be attempting to redress the issue of under-representation of women and Aboriginal people in the natural sciences and engineering. A small number feel strongly that NSERC should not be involved noting that NSERC should focus on funding research and that the responsibility for employment equity issues rests with the provinces and territories.

A small number of university decision-makers suggested that NSERC should partner or collaborate more with other bodies such as Indian and Northern Affairs Canada and the provinces and territories on the issue of under-representation of women and Aboriginal people. A small number of key informants noted that the National Science Advisor of Canada is now interested in this issue, and that NSERC should look to collaborating with the National Science Advisor.

b) Perceptions of the UFA Program and Recipients

All university decision-makers interviewed indicated that the perception of UFA holders is positive within their department. According to university decision-makers, there are few unintended negative impacts resulting from UFA. A number noted that there are issues related to the decreased teaching load for

UFA holders. The decreased teaching load has a tendency to create some resentment as well as administrative difficulties related to ensuring that there is sufficient staff to teach courses. Other university decision-makers noted that there are currently a number of awards, including the CRC, that incorporate a reduced teaching load and so UFA holders are not so unusual in that regard.

The majority of recipients, 61 per cent, feel that awards that are designated for particular types of faculty such as women or Aboriginal people do not have the same status as other awards. The corresponding percentage for non-recipients is 38 per cent. This provides some indication that UFA recipients may have had some negative experiences with respect to the perceived status of the UFA. Further, 61 per cent of recipients feel that such awards can be considered discriminatory, while thirty-six per cent of non-recipients feel such awards can be considered discriminatory. Thus although recipients have benefited from the UFA program, which is an employment equity program, they generally have the most negative view of such programs with respect to prestige and the perceptions of others. This may be an indication of some backlash experienced by recipients, however, few other specific indications of negative experience related to the Program is evident in data from the survey of recipients.

Forty per cent of doctoral and post-doctoral fellows feel such programs can be considered discriminatory with a higher proportion of post-doctoral fellows believing this to be true. Doctoral and post-doctoral fellows generally agree (52 per cent) that awards that are designated for particular groups such as women and Aboriginal people can generate resentment from colleagues; a higher proportion (60 per cent) of post-doctoral fellows agreed. Forty five per cent of doctoral and post-doctoral fellows disagree that awards that are designated for particular groups such as women and Aboriginal people are discriminatory.

The above contrasts with the perception of the majority of recipients (59 per cent) who believe that UFA holders are recognized as the best and brightest in their field. Similarly, 47 per cent of doctoral and post-doctoral fellows who are aware of UFA agree that UFA holders are the best and brightest in their field. This may be because UFA awards are peer reviewed. There was no difference across gender among those who feel that UFA holders are the best and brightest in their field, however, there was a difference between doctoral and post-doctoral fellows with a higher proportion of doctoral fellows believing that UFA holders were the best and brightest. So, despite almost 2/3 believing that UFA are recognized as best and brightest, almost 2/3 believe that the award does not have the same status and is discriminatory. That these latter views are held by so many UFAs and so few non-recipients, doctoral and post-doctoral fellows (just over 1/3) lends credence to the hypothesis that they may have had negative experiences.

c) Appropriateness of Employment Equity Programs in Universities

Most key informants interviewed feel that the impacts of participating in programs such as UFA are positive. A small number of those who feel the impacts are positive noted that the peer review process in hiring ensures that those hired and awarded a UFA are recognized as qualified by their peers. As well, some key informants commented that UFA needs to be marketed better to improve the perception of the Award and Award winners. There was no negative impact on UFA holders in terms of respect and

recognition by peers reported by university decision-makers. In general, university decision-makers noted that UFA candidates are well respected by their peers and recognized as having good qualifications. One university decision-maker noted that UFA candidates undergo the same peer review process as other job candidates so all their peers are aware of their qualifications.

University decision-makers were asked to comment on the potential for success in a university setting of programs such as UFA which seek to increase the representation of certain groups. The majority feel that this type of program, and UFA in particular, have the potential for success. Only one interviewee expressed disfavour stating that any hiring should be based solely on merit. However, it should be noted that UFA competition is based on merit because nominations are peer-reviewed. A number of university decision-makers admitted to having mixed feelings about these types of programs saying that they feel the program is justified in seeking to increase the representation of certain groups. Yet these university decision-makers were uncomfortable with respect to candidate qualifications, explaining that if the candidate was the most suitable then they would be hired without the UFA so thus there may be no need for the Program. Another noted that the emphasis on the 'best of the best' on the part of NSERC may be undermining the goals of the Program since such candidates would be hired without the help of an UFA. In fact, this was a recurring theme with university decision-makers.

In general, key informants representing NSERC and governing council feel that programs such as UFA can be successful in a university setting. However some interviewees also noted that such programs need to maintain focus on excellence otherwise they risk backlash against the program and/or award holders. One interviewee noted that in general such programs can be successful but UFA is so small that it cannot have a significant impact. A small number of interviewees feel this type of program cannot work because of the backlash against beneficiaries. The majority, 87 per cent of doctoral and post-doctoral fellows who are aware of UFA feel it is a good way to increase the representation of women and Aboriginal people in academia.

External experts were asked whether awards that seek to increase the representation of certain groups are perceived as being less prestigious. Interviewees were almost evenly split with some feeling that these programs serve to level the playing field. For example, one interviewee stated that he had some negative views towards UFA when it first started; however, now that he is directly involved in hiring and with the UFA Program itself, he sees its merits. He now views the UFA as just as, or more prestigious than other awards. He goes on to mention that the UFA Award is based on peer review that is more rigorous than many search committees. In contrast, another interviewee noted that in her experience many women are reluctant to apply for such programs and it is usually their supervisor who encourages them to do so because women tend not to want to be singled out or treated differently.

d) Conclusions

Most of those interviewed as part of this evaluation feel that it is appropriate for NSERC to be attempting to redress the under-representation of women and Aboriginal people in academia in the natural sciences and engineering. Most feel this is appropriate because the issue and the domain fit within the

mandate of NSERC. There is also some sense that despite its limited ability to influence the proportion of women and Aboriginal people in academia, the Program is symbolic in terms of focusing attention on the issue.

Overall, UFA recipients are well-perceived by their peers. However, this evaluation found possible evidence that a small proportion of recipients may have had some negative experiences with respect to the perceived status of the UFA. This is evidenced by the fact that although they have directly benefited from the Program, recipients generally have the most negative view of employment equity programs with respect to prestige and the perception of others.

Although most of those interviewed indicated that they feel the UFA Program is appropriate in a university setting, many expressed some misgivings. There is strong evidence that nominees for UFA would obtain tenured or tenure-track positions without the UFA. The Program is intended to provide awards to the most talented researchers. However, the most talented researchers would have little difficulty in securing a tenured or tenure-track position at a Canadian university regardless of UFA. Thus, those who may be talented, but perhaps not outstanding, and thus have more challenges in securing a tenured or tenure-track position are unlikely to be nominated or awarded a UFA.

5.2 ALTERNATIVE STRUCTURES AND DELIVERY MODES

a) More Effective Strategies

In seeking to elicit suggestions for alternative structures and delivery modes that would provide the same or better results more efficiently for the UFA Program, university decision-makers and key informants were asked to suggest how the approximately \$5 million in UFA funding allocations could be better spent to achieve more representation for women in Canadian universities. Suggestions included:

- More focus on fixing the leaky pipeline i.e. keeping women in the academic stream to the post-doctoral level and into the academic career stream. This could be done through more funding for Master, Doctoral and Post-doctoral awards and scholarships aimed at women. However, this evaluation found that those who go on to Post-doctoral fellowships and do so because they are committed to a career in science and do so even without funding.
- Improved childcare facilities at universities which would make it easier for women to balance work and family. As one key informant noted, having daycare on campus allows women to spend time with their children over the course of the day even with busy research and teaching schedules.
- Program for mothers returning to academia. Such a program would ease the transition back into the workforce and facilitate the return to or implementation of research after an absence

from the workforce. This would also ensure that more women return to academia after being absent for maternity leave or to raise a family.

- Organize mentoring opportunities/coordinate mentoring. This responds to the perspective that the lack of female mentors is one of the critical barriers keeping more women from pursuing higher level studies in the natural sciences and engineering and careers in academia. Having better mentoring opportunities and more sharing of experiences would educate women on the realities of academic life and encourage more to pursue academic careers.
- More targeting of young girls to get them interested in science. In a study conducted at the University of Alberta involving a survey of 1,400 students, it was concluded that if girls are to be encouraged to pursue careers in mathematics and science, they need to be influenced early.²³ Other studies have found that those who pursue science and math at university have a high level of preparation and performance in high school.²⁴

Recipients, doctoral and post-doctoral fellows suggested that NSERC could pursue the following strategies for ensuring that more women studying natural sciences or engineering are encouraged to pursue a career in academia:

- More role models/mentoring: There is evidence that women feel a need to have a female mentor to guide them through their decision on whether or not to pursue an academic career. Examples of women who have successfully balanced family life with an academic career are particularly important.
- More scholarships for women/more programs like UFA/continue UFA : Many feel that there continues to be a need for equity programs such as UFA in order to encourage more women to consider a career in academia.
- Early math and science exposure/encourage interest in science sooner : There is a general sense that women and girls tend to be less interested in math and science. Fostering an interest in math and science before university, i.e. in high school, could encourage more women to become interested in math and science at the university level.
- Improve maternity benefits/policies: Improving maternity benefits/policies at universities would provide women with the assurance that the university environment is family friendly and would thus encourage more women to consider a career in academia.
- Improve access to childcare: Improved access to childcare at universities would reassure women considering a career in academia that should they decide to have a family, they will have easy access to childcare on the university campus.

²³ Lupart, Judy, University of Alberta.

²⁴ Cannon, Elizabeth, Jean E. Wallace, Valerie A Haines, "Academic Choices of Engineering Undergraduates", University of Calgary.

- Better recognition of the importance of family life: There is a sense that university life and family life do not mix well and that universities need to work to allow academics to better balance work and family life.

Recipients suggested that the following strategies could be effective for ensuring that more women studying natural sciences or engineering are encouraged to stay in a career in academia:

- Make universities more 'family friendly': Women are often starting families and academic careers at the same point in their lives. This study has found that there are challenges associated with this and that universities, in making their policies with respect to promotion as well as the general work environment, more family friendly, could encourage more women to stay in academia after starting families.
- More role models/mentoring: There is a sense that younger female academics sometimes feel overwhelmed by the male dominated work environment and the lack of role models and mentoring. Some have suggested a network of female academics be set up so that more senior female academics can serve as mentors or resources for younger female academics.
- More/better childcare: The availability of good quality childcare would encourage more women with families to stay in academia.
- More awards for women /more programs like UFA/more support from NSERC: Additional sources of funding would encourage more women to stay in academia. There is a sense that competition for funding is greater than ever before and having additional sources of funding available to women would encourage more women to stay in academia.

Case study participants, despite having directly benefited from the Program and reporting positive impacts on their career, also provided strong evidence that the Program was not appropriately targeted. All female case study participants, including UFA recipients and mid-career faculty, suggested that women need to be targeted earlier in their career, that is, prior to applying for their first university faculty position. Case study participants suggested that efforts should be targeted at increasing the number of women who continue on to do a PhD or post-doctoral studies.

Key informants were also asked to suggest how the approximately \$5 million in UFA funding allocations could be better spent to address under-representation of Aboriginal people. The following suggestions were made:

- More funding for MA, Doctoral and Post-doctoral awards and scholarships targeted at Aboriginal people.
- Separate program similar to UFA for Aboriginal people that is better targeted to Aboriginal people and reflective of the barriers faced.

- Increased partnering with national Aboriginal organizations to communicate the importance and usefulness of a science education. Currently, few Aboriginal youth choose to pursue studies in the natural sciences and engineering. The majority seek degrees in the social sciences with the aim of contributing to their community through that avenue. There needs to be more effort put into showing Aboriginal youth and their communities the benefits of degrees in the natural sciences and engineering.
- Organize mentoring opportunities/coordinate mentoring. As with women, there is a sense that there is a great need for mentoring. Unfortunately there are few identified Aboriginal academics in the natural sciences and engineering.
- Target Aboriginal youth to get them interested in science. The education system in most First Nation communities is limited in its ability to provide stimulating and culturally relevant courses in math and sciences. Targeting Aboriginal youth would require increased resources that are culturally relevant for the teaching of math and science in First Nation communities.

The majority of university decision-makers interviewed feel that the issue of under-representation of Aboriginal people arises early in the academic life of Aboriginal students. Overall, university decision-makers feel that NSERC should implement more efforts at the high school, undergraduate and graduate levels to get and keep Aboriginal youth interested in the natural sciences and engineering. Many noted that programs such as the Summer Internship Program could be very beneficial.

b) Design Changes to the Existing UFA Program

Key informants were asked whether there are any changes necessary to the design or delivery of the UFA Program. The following are the suggestions made:

- Changing application deadlines to make them more in line with hiring timelines at universities. A small number of key informants and university decision-makers noted this as a challenge in nominating candidates for the UFA. Besides the timing of the nomination being out of synch with the hiring practices, the process itself is quite long meaning that universities risk losing very good candidates to other universities that are willing to offer nominees more immediate employment.
- Improve communication about the Program to send the message that UFA awards are extremely competitive and difficult to get.
- Partner with other organizations with similar goals such as the Institute of Aboriginal Peoples' Health (Canadian Institutes of Health Research), the Aboriginal Women's Research Network in Saskatchewan, Aboriginal Achievement Foundation, and Status of Women Canada.
- Disconnect the Discovery Grant process from the UFA Award process after the initial application. Currently the link between the Grant and the Award creates difficulties in cases of

maternity leave. This de-linking would facilitate and speed up the renewal process. This change would have no adverse impact on Program delivery.

The majority of recipients were pleased with the way the Program was delivered. The majority had not encountered any difficulties. Those who had encountered difficulties noted difficulty in securing an offer of a tenured/tenure-track position, lack of clarity in the nomination process, length of the nomination and approval process, and difficulty in accessing information about the Program.

c) Conclusions

Alternative structures or delivery modes for increasing the representation of women in academia suggested by interviewees generally focus on the ability of women to better balance work and family, fixing the leaky pipeline, and increasing the appeal of math and science among girls and young women. Alternative structures for increasing the proportion of Aboriginal people in academia focus on the early stages of education, specifically grade school and high school. This responds to barriers identified for Aboriginal people, which arise long before university.

Changes to the design and delivery of the program include: changing nomination deadlines; desynchronizing the UFA and Discovery grant processes; improving communication about the Program; and more partnering with other organizations with similar goals or clientele.

6. CONCLUSIONS AND RECOMMENDATIONS

There is considerable evidence that the needs that gave rise to the UFA Program continue to exist. The data clearly indicate that women and Aboriginal people continue to be under-represented in general in the natural sciences and engineering. The evaluation also shows, however, that the Program may not be addressing this under-representation at its core. While the evidence suggests that the UFA Program is having a positive impact on the early career progression of UFA recipients by enabling them to make faster early progress on their research and to publish more papers, it also appears that recipients would likely have been hired regardless of UFA for a tenured or tenure-track position. Therefore, the Program does not seem to be having a significant incremental impact on the number of women hired for tenured or tenure-track positions or the number of women who choose to pursue a career in academia. No significant impacts on salary and benefits were observed either, although some positive impacts on retention rates and hiring practices were noted.

The evaluation evidence also revealed that most feel it is appropriate for NSERC to be attempting to redress the issues around under-representation of women and Aboriginals. However, a number of key concerns characterize the operation of this Program. Therefore, the following recommendations have been developed from the evaluation findings.

Recommendation 1: Discontinue the UFA Program as currently designed

Women—This evaluation found evidence that the program, as currently designed, is not directed at the stages in the academic ladder where the leaky pipeline occurs for women. The Program is directed at the stage where women are moving from the PhD or post-doctoral level to the assistant professor level, when the data indicate that the level of attrition is smallest at this stage.

Aboriginal people—Based on findings from this evaluation, the barriers faced by Aboriginal people in pursuing studies or careers in the natural sciences and engineering, start at the elementary and high school levels. The Program is not directed at the appropriate stage in the education or academic career of Aboriginal people.

Recommendation 2: Continue to have a program directed at increasing the representation of women in academia within the natural sciences and engineering

This evaluation found considerable evidence that the need for increasing the representation of women in the natural sciences and engineering continues to exist. In addition, NSERC plays an important role within this research community. Although the UFA program is small and so cannot be expected to have large and

immediate impacts, the existence of such a program within NSERC is symbolically important in conveying the importance of increasing the representation of women in the natural sciences and engineering. The UFA Program also communicates the federal government's and NSERC's commitment to the issue of female representation in these fields within academia. Nevertheless, NSERC should assess how resources could be better allocated to respond to the challenge of increasing the representation of women. Attention should be focused on academic levels where there is the greatest degree of attrition. NSERC has two options in this regard, that is, at earlier stages prior to the doctoral level or at later stages at the associate and full professor levels.

Thus, NSERC could examine methods for decreasing the attrition of female students at the undergraduate, graduate and PhD levels. Focusing on the undergraduate, graduate and PhD levels could increase the potential size of the pool of female candidates for academic positions in the natural sciences and engineering. The most meritorious candidates would continue to be hired into tenured or tenure-track positions at the assistant professor level. It should be noted that there was no evidence found in either the literature or the evaluation data that money is an issue in the decision on whether or not to pursue further academic studies and, ultimately an academic career, nor whether to continue in an academic career. The evaluation did find a significant need for increased mentoring for both female students as well as young female professors just beginning their career in academia.

Alternatively, attention could be focused on continuing to have a program directed at young female academics. NSERC should conduct research or analysis to determine the best response to the needs of young female academics. The evaluation found that there is a slight stigma associated with employment equity programs, including the UFA, which may be affecting some UFA recipients. There is also a need to maintain women in academia once they have chosen to pursue an academic career. Such a program could provide young female academics with assistance, for example providing mentoring facilitating return to work after maternity leave, that would make staying in academia more appealing and feasible. This would increase the prestige of the Program since it would then be seen as an award for women faculty rather than an employment equity program.

Recommendation 3: Continue to address the issue of under-representation of Aboriginal people in the academia within the natural sciences and engineering

Given the considerable evidence that the needs that gave rise to the UFA Program continue to exist, NSERC should assess how to better direct a program at the appropriate education levels for Aboriginal people. Despite the limited data available on the issue, there is evidence that Aboriginal people are under-represented in these academic areas. The inclusion of Aboriginal people within the UFA Program is important symbolically because it demonstrates the federal government's and NSERC's commitment to increasing the proportion of Aboriginal academics within the natural sciences and engineering. The existence of such a program sends a symbolic message that it is an important issue. NSERC is the best-suited federal government body to undertake such a program.

Efforts should be directed at increasing the level of interest in math and science among Aboriginal youth. That should result in an increased number of Aboriginal people pursuing university studies in the natural sciences and engineering and ultimately pursuing careers in these fields. This could be a particularly useful strategy, given the demographic profile of Aboriginal people in Canada. The large number of Aboriginal youth is a significant potential source of future academics in the natural sciences and engineering for the future.

Enlisting the help of existing Aboriginal academics in the natural sciences and engineering would be an effective means of communicating the benefits and appeal of a career in these fields to Aboriginal youth. Aboriginal youth rarely come into contact with those in the natural sciences and engineering, so these disciplines tend to be given little attention when making academic or career choices. These efforts could take the form of presentations, summer camps, a website directed at Aboriginal youth and university students, among others. Special attention should be paid to youth in remote/northern communities where schools may have limited resources for teaching math and science and where opportunities for coming into contact with math and science are rare.

Recommendation 4: Communicate information about the Program

Whatever program NSERC develops to replace the UFA program, NSERC should communicate information about the program, including the rules for nomination and eligibility as well as the achievements of recipients. This evaluation found that few are aware of the UFA Program or the award recipients; even colleagues and students are often unaware. This differs considerably from the CRC Program where the identities and achievements of CRCs are well publicized. Better communications should serve to increase the prestige of recipients as well as improve their visibility, and thus their ability to serve as role models for other women and Aboriginal people. This could be done through similar means to the CRC Program with short biographies of recipients on the NSERC website. Communication efforts should target university decision-makers and academic advisors since these have been found to be the key sources of information about the Program for potential nominees. Additionally, NSERC staff should continue to conduct site-visits in a targeted manner, focusing on events that are likely to be well-attended by university decision-makers, academic advisors and potential nominees since these have been found to be very effective.

APPENDIX A
EVALUATION ISSUES
AND QUESTIONS

Table A.1: Evaluation Issues and Questions

Evaluation Issues/Questions	Indicators	Data Sources
Relevance		
<p>1. Is there still a need to decrease the under-representation of women and Aboriginal people through the program?</p>	<ul style="list-style-type: none"> › Statistics on earned PhD degrees and enrolments › Percentage of women full-time university teachers by discipline › Extent of support for the program in universities › Records on universities' participation rate › Interest of eligible candidates in academic career 	<ul style="list-style-type: none"> › Literature/document review › Data analysis/Statistics Canada › Data analysis/NSERC data › Survey of UFA holders › Survey of non-recipient UFA nominees › Interviews with university decision-makers › Interviews with key informants › Survey of doctoral students and postdoctoral fellows
<p>2. What are the barriers to the hiring of women and Aboriginal peoples in Canadian universities?</p>	<ul style="list-style-type: none"> › Perception of key informants on main barriers › Analysis of faculty ranks by gender to assess possible discrimination › Attitudes of decision-makers 	<ul style="list-style-type: none"> › Interviews with key informants › Statistical analysis/Statistics Canada data › Interviews with university decision-makers › Survey of UFA holders › Survey of non-recipient UFA nominees › Case studies of social and family context for women and Aboriginal potential candidates
<p>3. What is the impact of the Canada Research Chairs program on the UFA program?</p>	<ul style="list-style-type: none"> › Perception of university decision-makers on competition from CRC › Perceived prestige of UFA holders in comparison to CRC holders › Perceived prestige of UFA program in comparison to CRC program › Perception of cost-benefit of UFA award versus Canadian Research Chairs 	<ul style="list-style-type: none"> › Interviews with university decision-makers › Interviews with key informants
<p>4. To what extent is participation in UFA a strategic decision on the part of universities? Is the strategy linked to the Canada Research Chairs Program?</p>	<ul style="list-style-type: none"> › Indication of links between programs › Use of UFA and Canada Research Chairs Programs 	<ul style="list-style-type: none"> › Interviews with university decision-makers › Interviews with key informants

Evaluation Issues/Questions	Indicators	Data Sources
Success/Program Outcomes		
5. What impact does the award have on UFA holders' career path?	<ul style="list-style-type: none"> › Funding and research outputs/comparison with non-recipients › Opinion of UFA holders on whether award was a help or a hindrance to the establishment of career › Analysis of NSERC funding/comparison with non-recipients › Employment milestones (e.g. time to get a faculty position, tenured/comparison with non-recipients) › Lab space, office space/comparison with non-recipients › Awards, Referee tasks/comparison with non-recipients › Access and support for graduate and senior undergraduate students/comparison with non-recipients › Technical help and other support/comparison with non-recipients 	<ul style="list-style-type: none"> › Survey of UFA holders › Survey of non-recipient UFA nominees › Data analysis/NSERC data › Case studies of social and family context for women and Aboriginal potential candidates › Interviews with key informants › Interviews with university decision-makers › Survey of doctoral and post-doctoral fellows
6. To what extent does the UFA program reduce the barriers for women and Aboriginal people considering a career in Academe?	<ul style="list-style-type: none"> › Perceptions of university decision-makers › Trends in the hiring of female and Aboriginal faculty in NSE › Number of new faculty positions created for the UFA program in participating universities › Retention rate for UFA positions › Opinion of UFA holders on barriers and how to improve retention › Ratio of UFA appointments to new female faculty appointments in NSE, 1999-2001 	<ul style="list-style-type: none"> › Interviews with key informants › Interviews with university decision-makers › Survey of UFA holders › Survey of non-recipient UFA nominees › Data analysis/Statistics Canada
7. Is the program information and documentation distributed or shared with the appropriate stakeholders and in an appropriate format?	<ul style="list-style-type: none"> › Level of awareness of the program among target groups › Methods used to reach audiences › Type of audiences reached › Perception of audiences on preferred methods of communication › Opinion of target groups on preferred methods of dissemination › Content of promotional information 	<ul style="list-style-type: none"> › Interviews with university decision-makers › Interviews with key informants › File review/reports of promotion activities › Survey of UFA holders › Survey of non-recipient UFA nominees › Surveys of PhD and post-doctoral students

Evaluation Issues/Questions	Indicators	Data Sources
<p>8. How is the UFA package competitive with the Canadian Research Chairs?</p>	<ul style="list-style-type: none"> › Comparison of median grants of UFA holders and similar full-time faculty members › Comparison of median salaries of UFA holders and similar full-time faculties › Opinion of UFA holders 	<ul style="list-style-type: none"> › Data analysis/NSERC data › Survey of UFA holders › Survey of non-recipient UFA nominees › Data analysis/Statistics Canada › Interviews with university decision-makers › Interviews with key informants
Cost-efficiency and Alternatives		
<p>9. Is there scope for considering more effective program structure and service delivery?</p> <ul style="list-style-type: none"> › Are programs such as UFA, which seeks to increase the representation of certain groups perceived to be beneficial by participants and stakeholders? 	<ul style="list-style-type: none"> › Alternative delivery designs › Perception of prestige and excellence by post-doctoral fellows and post-graduate students › Excellence of UFA nominees 	<ul style="list-style-type: none"> › Literature review/International benchmarking › Interviews with university decision-makers › Survey of UFA holders › Survey of non-recipient UFA nominees › Survey of doctoral students and post-doctoral fellows › Interviews with key informants

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