# Human Resource Needs and Capacity in Cancer Research in Canada

## An Online Survey of Cancer Researchers

CCRA
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Canadian Cancer Research Alliance • Alliance canadienne pour la recherche sur le cancer

CANADIAN PARTNERSHIP AGAINST CANCER
PARTENARIAT CANADIEN CONTRE LE CANCER

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December 2012

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# Executive summary

**OBJECTIVES:** Primary – To investigate the perceptions and opinions of cancer researchers in Canada on Canada's human resource needs and capacity in cancer research. Secondary – To derive an estimate of the cancer research workforce in Canada.

**DESIGN, SETTING, AND PARTICIPANTS:** An online survey conducted between December 6, 2011 and January 23, 2012 and completed by 570 researchers from a larger group of researchers who had been sent a link to the survey by email. Researchers were those who had received research grant funding from government and non-governmental organizations between the years of 2005 and 2008.

**MAIN OUTCOME MEASURES:** Researchers' opinions on: training opportunities in researchers' area of cancer research compared to other key countries; challenges experienced in recruiting qualified cancer research personnel; reasons for experiencing challenges in recruiting personnel; the sufficiency of Canada's human resources capacity in cancer research; and how insufficiencies in Canada's human resources capacity in cancer research could be addressed.

**RESULTS:** Sixty percent (339/570) of respondents were of the opinion that Canada had fewer training opportunities in their area of cancer research when compared to other key countries and two thirds (365/570) reported that they had experienced challenges recruiting qualified personnel to their research teams. Half of the respondents (288/570) felt that Canada currently had insufficient human resources capacity in cancer research. When stratified by area of research, the distribution of responses to these key questions was fairly similar. Responses to items relating to the specific positions that posed recruitment challenges, reasons for recruitment challenges, and ways to address insufficiencies in human resources research capacity in cancer research varied by research area. That being said, many respondents who indicated that Canada had insufficient cancer research capacity (350/469) felt that more funding opportunities and greater stability of funding were key ways to address the problem.

In terms of the second objective, the cancer research workforce was estimated to be between 10,000 to 15,000 FTEs, which includes principal investigators, students, and other personnel.

**CONCLUSIONS:** Despite an increase in monies allocated to cancer research over the past decade, many researchers felt that more funding opportunities/sustainable funding was needed to address Canada's human resources capacity issues. The concerns identified in the survey warrant further consideration by the cancer research funding community. Several questions raised by the survey results that are of particular interest to research funders are identified in the Discussion section of the report.

# 1. Introduction

The pan-Canadian cancer research strategy[1] was developed to identify areas of new collaboration for members of the Canadian Cancer Research Alliance (CCRA) and potential opportunities for future research investment. During consultations undertaken as part of the strategic planning process, concerns were expressed about limited research capacity in a number of areas. As well, one of the themes that emerged during the information gathering process for the strategic plan was that the amount of research funding provided through different funding mechanisms was imbalanced (i.e., insufficient project funding relative to infrastructure investment and personnel support).

**ABBREVIATIONS USED IN THIS REPORT**

| | |
|---|---|
| CCRA | Canadian Cancer Research Alliance |
| CCRS | Canadian Cancer Research Survey |
| CSO | Common Scientific Outline |
| FTE | Full-time equivalent |
| HR | Human Resources |
| PI | Principal Investigator |

To facilitate planning for new research investments, it was agreed that a comprehensive assessment of the nature and number of cancer researchers and related personnel in Canada was necessary. This was considered important on at least two fronts. First, before making substantial investments in new areas of research, an understanding of the extent of researcher capacity and availability of relevant training programs is crucial—investment will have little uptake if research capacity is low. Second, in order to address potential imbalances, there needs to be an understanding of those areas of research where capacity is growing faster than available funding.

Within Action Item 21 of the pan-Canadian research strategy, the CCRA commissioned the Executive Office to prepare a report to describe current cancer research capacity across the cancer research spectrum. This report relies on the results of an online survey of cancer researchers, which was used to gather data on the cancer research workforce and solicit opinions on perceived challenges and potential solutions to human resource issues. Little information exists on the perceptions and opinions of Canada's cancer researchers on these specific topics.

In combination with other action items within the strategy (e.g., the reports on prevention and survivorship research, the translational research workshops, etc.), it is hoped that this report will help CCRA members and other important stakeholders such as leaders at universities and colleges to better understand how they can enhance human resources capacity in cancer research in Canada through their individual and collaborative initiatives.

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1. Canadian Cancer Research Alliance. (2010). Pan-Canadian Cancer Research Strategy: *A Plan for Collaborative Action by Canada's Cancer Research Funders.* Toronto: CCRA.

# 2. Methods

## 2.1 SURVEY PARTICIPANTS

Researchers were identified using the Canadian Cancer Research Survey (CCRS) database, which at that time contained information on cancer research projects and their affiliated personnel funded by 39 organizations/initiatives for four calendar years, 2005 to 2008. All principal investigators (PIs) working at Canadian institutions who had operating grants, salary awards or equipment/infrastructure grants funded at any time between January 1, 2005 and December 31, 2008 that were at least 50% relevant to cancer were targeted for the survey. Selection was limited to researchers who were known to be currently working in Canada.

The survey population (number of targeted researchers) was 1,773. Potential survey participants were asked to exclude themselves from the survey if they:

- were retired, with no active research program
- resided outside of Canada and were not actively involved in research in Canada
- conducted research that was no longer relevant to cancer

In addition, incomplete surveys were excluded from the final data set. In total, 29 people were excluded from the survey, leaving 1,744 prospective respondents.

## 2.2 DEVELOPMENT OF THE QUESTIONNAIRE

The questionnaire was developed by the CCRA Executive Office, with input from the CCRA co-chairs. In addition, an expert group of 12 researchers representing a cross-section of regions and disciplines helped pilot test and refine the survey (these individuals are listed in the Acknowledgements).

The survey consisted of closed- and open-ended questions on respondents and their opinions of human resources in cancer research as summarized in Table 2.2.1 below. The questionnaire also included items related to respondent characteristics. These included closed-ended questions (i.e., age range and sex) and open-ended questions (i.e., name, current institutional affiliations, number of years of independent research experience, and academic qualifications/expertise).

In both the introductory message to participants and the preamble to the survey, the purpose of the survey was described. The survey was made available in both English and French. A copy of the English version is provided in Appendix A.

TABLE 2.2.1
**SURVEY ITEMS RELATING TO HUMAN RESOURCES**

| Question |
|---|
| **Information on respondent's work and research team** |
| Allocation of respondent's time across different activities |
| Proportion of respondent's research portfolio considered relevant to cancer |
| Proportion of respondent's research portfolio considered team science |
| Allocation of respondent's cancer-relevant research portfolio across six Common Scientific Outline (CSO) categories |
| Allocation of respondent's research portfolio across five phases of the research translation continuum |
| Allocation of respondent's research portfolio across 26 cancer sites |
| Composition of respondent's current research team/lab in terms of FTEs for 19 positions |
| **Respondent's opinions on human resource needs** |
| Opinions on training opportunities in researchers' area of cancer research compared to the U.S., U.K., and other key countries |
| Challenges experienced in recruiting qualified cancer research personnel – 19 choices |
| Reasons for experiencing challenges in recruiting personnel – 5 choices |
| Opinions on Canada's human resources capacity in the cancer research area – 4 choices |
| Opinions on how insufficiencies in Canada's human resources capacity in cancer research could be addressed – 11 choices |

## 2.3 SURVEY ADMINISTRATION

Links to the English and French versions of the survey were sent to researchers in an email on December 6, 2011. To enhance response rates, respondents were sent email reminders on December 28, 2011, January 12, 2012, January 19, 2012, and January 23, 2012. Some CCRA member agencies were also asked to promote the survey during this time. The survey was closed on January 23, 2012. FluidSurveys, a Canadian-based online questionnaire provider, was used to create, publish, and host the survey.

## 2.4 DATA ANALYSIS & CREATED VARIABLES

Survey data was exported from FluidSurveys and analyzed using SAS® Enterprise Guide® 5.1 (SAS Institute Inc., Cary, N.C., U.S.). Proportions were calculated on the basis of the total number of respondents for each question and expressed as a percentage. Due to rounding, percentages may not always sum to zero. Depending on the type of variable and number of groups, either Pearson chi-square test or Kruskal-Wallis one-way ANOVA were used to assess differences between groups. A $p$ value of less than 0.05 was considered statistically significant for two-group comparisons and 0.01 for multiple comparisons.

Specific numerical responses were grouped into ordinal categories to simplify reporting (i.e., years of independent research experience, cancer relevance of research, and proportion of research considered team science). In addition, six nominal categories were created from the data on academic qualifications. These were: Doctorate – medical sciences, Doctorate – other, MD, MD-Doctorate, MD-Master's, and Master's.

Responses regarding allocations of research to the categories of the CSO, phases on the translational continuum, and cancer sites were also grouped into mutually exclusive categories (nominal variables) as described below.

## CSO CATEGORY GROUPING

Respondents were assigned to one of six groups based on the way in which they allocated their research across the CSO categories. Respondents were assigned to either the CSO categories of Biology, Early detection, diagnosis & prognosis, Treatment, or Cancer control, survivorship & outcomes if more than 50% of the allocation was made to the category or if the maximum allocated to the category exceeded the allocations of any other category by at least 15%. Due to small numbers, Etiology and Prevention were combined and comprised those respondents whose allocations to Etiology and Prevention summed to more than 50% or for whom the maximum proportion allocated to these two categories exceeded the allocations of any other category by at least 15%. A final group, the "multiple areas" group, consisted of those respondents that had allocations distributed across two or more CSO codes with no dominant category selected. Of this group, 42 respondents had 50-50 allocations, a third (14/42) of whom identified Biology and Treatment.

## TRANSLATIONAL PHASE CATEGORY GROUPING

Respondents were assigned to one of five groups based on the way in which they allocated their research across the phases of the translational continuum. Respondents were assigned to either Discovery research, Early translation, or Late translation if more than 50% of the allocation was made to the phase or if the maximum allocated to the phase exceeded the allocations of any other phase by at least 15%. Due to small numbers, Dissemination and Outcomes phases were combined and comprised those respondents whose allocations to the Dissemination and Outcomes phases summed to more than 50% or whose summed allocation exceeded those of the other phases by at least 15%. The "multiple phases" group consisted of those respondents who had allocations distributed across two or more translational phases with no dominant phase selected. Of this group, 30 respondents had 50-50 allocations, approximately half of (16/30) which were for Discovery research and Early translation.

## RESEARCHER CLASSIFICATION

Survey respondents were divided into three groups on the basis of the two category groupings described above. Fundamental researchers[2] (N=335, 58.8%) were those respondents

2. Fundamental researchers participate in many areas of fundamental cancer research, including molecular, cellular, developmental and systems biology, immunology, nanotechnology, and diverse applications of biomedical engineering.

who were involved in research with a major focus on Biology (regardless of translational phase), discovery-based research in the areas of Early detection, diagnosis & prognosis and/or Treatment, and discovery-based research where no single CSO was identified as a major focus (i.e., Multiple areas). Population science researchers (N=48, 8.4%) were those respondents who were involved in research with a major focus on Etiology and/or Prevention. The remaining respondents were defined as Clinical researchers (N=187, 32.8%), which for the purposes of this report includes researchers engaged in patient-oriented research, behavioral studies, and outcomes and health services research. See Figure 2.4.1.

FIGURE 2.4.1

**RESEARCHER CLASSIFICATION – THREE GROUPS**

**CSO Category Grouping**

| **Translational Phase Category Grouping** | Biology | Etiology & Prevention | Early detection, diagnosis, prognosis | Treatment | Cancer control, survivorship, outcomes | Multiple areas |
|---|---|---|---|---|---|---|
| Discovery research | + | • | + | + | ✳ | + |
| Early translation | + | • | ✳ | ✳ | ✳ | ✳ |
| Late translation | + | • | ✳ | ✳ | ✳ | ✳ |
| Dissemination & outcomes research | + | • | ✳ | ✳ | ✳ | ✳ |
| Multiple phases | + | • | ✳ | ✳ | ✳ | ✳ |

+ Fundamental researchers (N=335)
• Population science researchers (N=48)
✳ Clinical researchers (N=187)

## CANCER SITE GROUPING

Seven categories were formed for the cancer site grouping. The All/non-site specific group consisted of respondents who allocated more than 50% of their research to this category or had an allocation to this category that exceeded the allocations of any other category by at least 15%. For the breast, colorectal, leukemia, lung and prostate groups, more than 50% of the allocations had to be for the site or the allocations had to exceed the allocations to any other site by at least 15%. The other sites group contained all the remaining respondents. Of this group, 34 respondents had 50-50 allocations and for half (17/34) of these respondents, breast along with another cancer site were identified.

# 3. Findings

## 3.1 RESPONDENTS

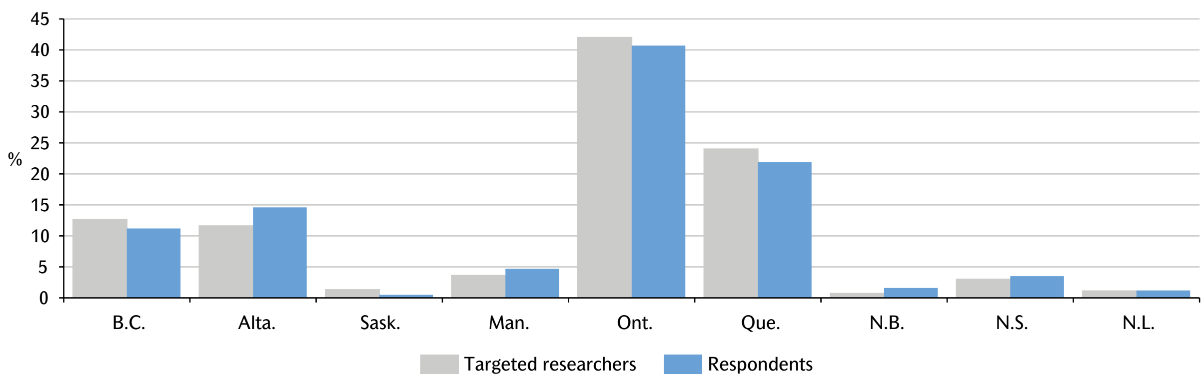
### RESPONSE RATE AND REPRESENTATIVENESS OF RESPONDENTS

The final data set contained responses from 570 researchers, representing a response rate of 32.7%. The majority (90.2%) of respondents completed the English version of the survey (514 completed the English version of the survey and 56 completed the French version of the survey).

To assess the representatives of the respondent sample, the overall provincial distributions of the targeted researchers and respondents were compared (Figure 3.1.1). Province-specific response rates are presented below the graph. Researchers from New Brunswick, Manitoba, Alberta, and Nova Scotia were slightly overrepresented, while researchers from Saskatchewan were underrepresented among survey respondents. There were no survey respondents from PEI.

FIGURE 3.1.1

**DISTRIBUTION OF RESPONDENTS AND TARGETED RESEARCHERS BY PROVINCE [1]**



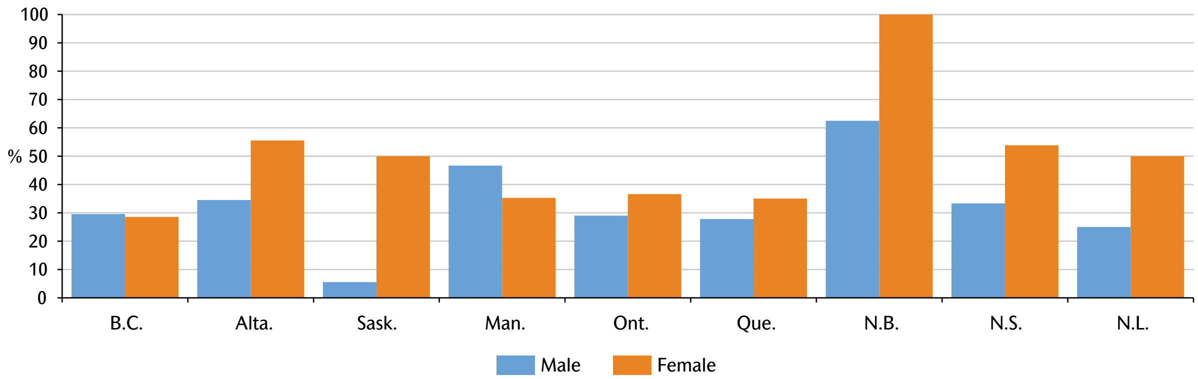

[1] There were no respondents from P.E.I.

| | B.C. | Alta. | Sask. | Man. | Ont. | Que. | N.B. | N.S. | N.L. |
|---|---|---|---|---|---|---|---|---|---|
| Response rate (% respondents per targeted researchers) | 29.2 | 41.1 | 13.6 | 43.5 | 31.7 | 29.8 | 75.0 | 38.5 | 35.0 |

Proportionately more females responded to the survey – there were 557 (31.9%) females in the target population of 1,744 and 214 (37.5%) females among the 570 survey respondents. The response rates for males and females by province are shown in Figure 3.1.2.

FIGURE 3.1.2

## RESPONSE RATES FOR MALES AND FEMALES BY PROVINCE [1]

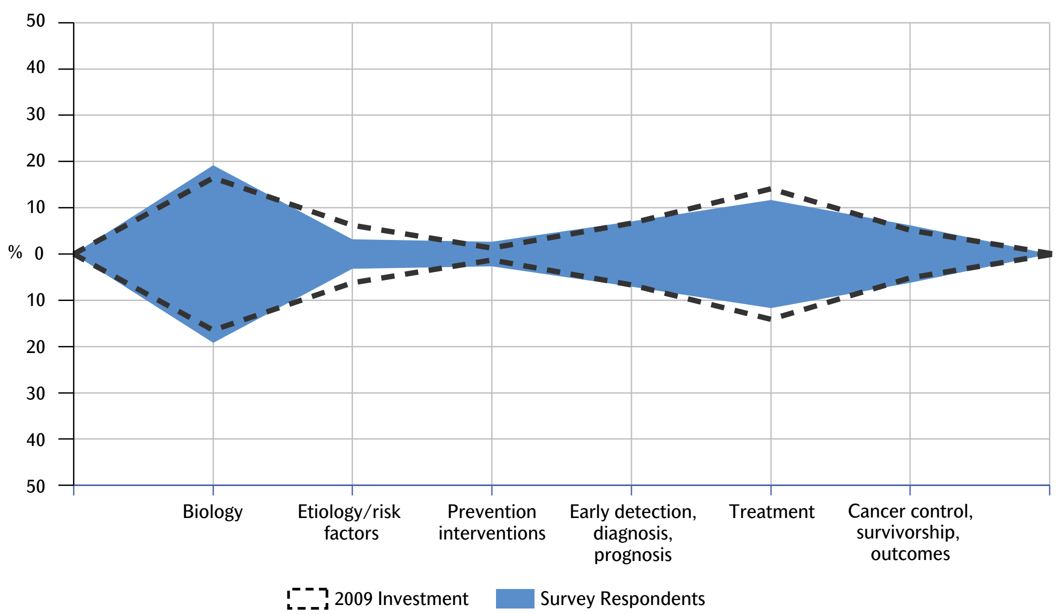



[1] There were no respondents from P.E.I.

In another assessment of respondent representativeness, respondent allocations across the CSO categories were compared to the overall distribution of 2009 cancer research investment as documented in the CCRS (Figure 3.1.3). The distributions were somewhat similar although there was an underrepresentation of Etiology and overrepresentation of Prevention and Biology research areas among survey respondents.

FIGURE 3.1.3

## COMPARISON OF RESPONDENTS' CANCER RESEARCH PORTFOLIOS AND 2009 CANCER RESEARCH INVESTMENT BY CSO CATEGORY




| | Biology | Etiology/risk factors | Prevention interventions | Early detection, diagnosis, prognosis | Treatment | Cancer control, survivorship, outcomes |
|---|---|---|---|---|---|---|
| Survey respondents | 38.4 | 6.4 | 5.2 | 14.2 | 23.4 | 12.4 |
| 2009 Investment [1] | 32.9 | 12.4 | 2.5 | 13.4 | 28.2 | 10.2 |

[1] Sums to 99.6% as the Scientific Model Systems category is not included.

## DEMOGRAPHICS

Respondent characteristics are detailed in Table 3.1.1.

Of the total 570 respondents, 214 (37.5%) were female and 356 (62.5%) were male. There were proportionately more males (statistically significantly more) among fundamental researchers when compared with population science and clinical researchers. In terms of age group, there were proportionately more population science researchers in the oldest age category and this group also had the highest proportion of people in the 'over 25 years' experience category. Most (80.1%) respondents had at least six years of experience as an independent researcher.

Two of every five respondents were from Ontario, and one of every five respondents was from Quebec. The top five institutions represented by survey respondents were: University of Toronto, University of British Columbia, University of Alberta, and McGill University. Figure 3.1.4 shows the respondents by researcher group and province. Of note, there were proportionately fewer population science researchers from Alberta and proportionately fewer clinical researchers from Quebec.

Half of respondents held doctorate degrees within the fields of medical science, while one quarter of respondents held doctorate degrees from other fields. Fundamental researchers comprised nearly 80% (235/296) of all respondents with doctorates in the medical sciences whereas 61.5% (83/135) of respondents with MDs were clinical researchers.

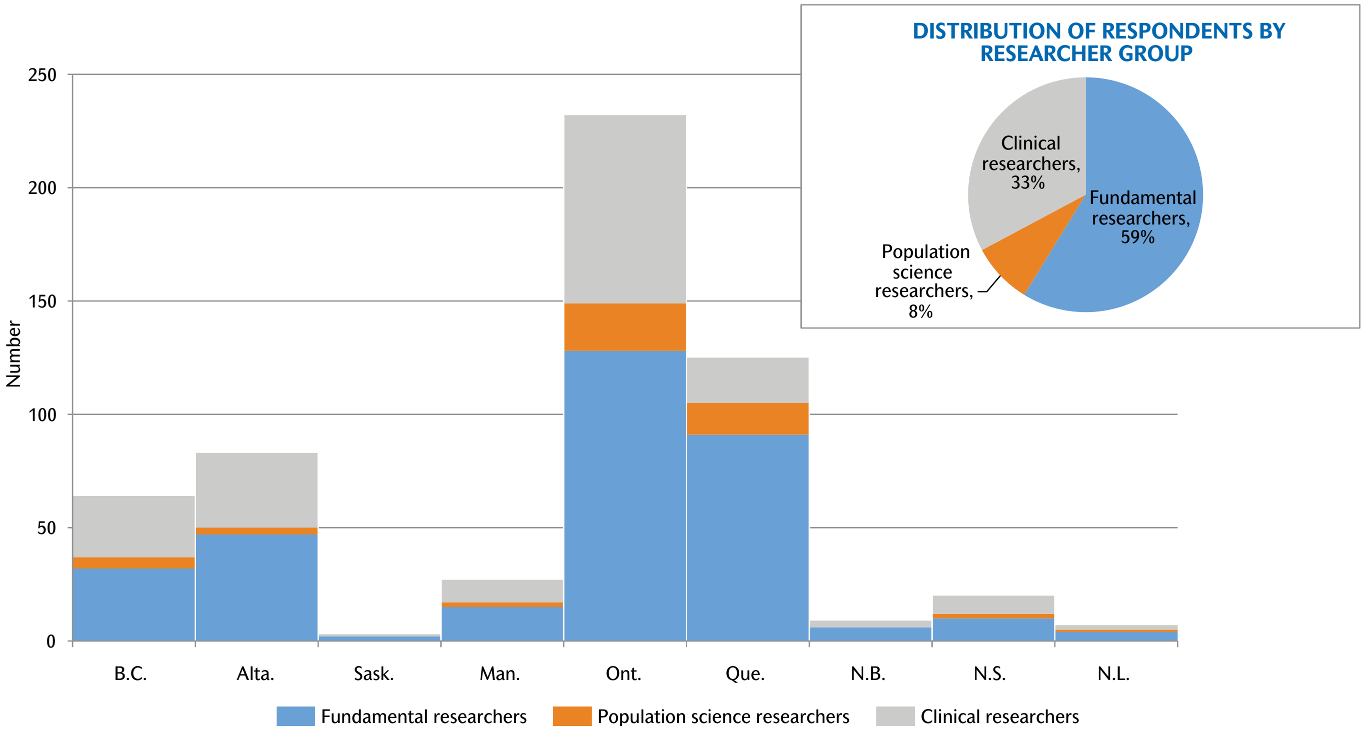
TABLE 3.1.1

## CHARACTERISTICS OF RESPONDENTS (%)

| Characteristic | | Fundamental researchers N=335 | Population science researchers N=48 | Clinical researchers N=187 | TOTAL N=570 |
|---|---|---|---|---|---|
| Sex | Female | 30.8 | 50.0 | 46.5 | 37.5 |
| | Male | 69.3 | 50.0 | 53.5 | 62.5 |
| Age Group | Under 40 years | 15.5 | 8.3 | 16.0 | 15.1 |
| | 40 to 49 years | 36.4 | 35.4 | 38.0 | 36.8 |
| | 50 to 59 years | 34.9 | 37.5 | 34.8 | 35.1 |
| | 60 or more years | 13.1 | 18.8 | 11.2 | 13.0 |
| Province | B.C. | 9.6 | 10.4 | 14.4 | 11.2 |
| | Alta. | 14.0 | 6.3 | 17.7 | 14.6 |
| | Sask. | 0.6 | 0.0 | 0.5 | 0.5 |
| | Man. | 4.5 | 4.2 | 5.4 | 4.7 |
| | Ont. | 38.2 | 43.8 | 44.4 | 40.7 |
| | Que. | 27.2 | 29.2 | 10.7 | 21.9 |
| | N.B. | 1.8 | 0.0 | 1.6 | 1.6 |
| | N.S. | 3.0 | 4.2 | 4.3 | 3.5 |
| | N.L. | 1.2 | 2.1 | 1.1 | 1.2 |
| Experience as Independent Researcher | Less than 1 year | 3.3 | 0.0 | 3.7 | 3.2 |
| | 1 to 5 years | 15.8 | 14.6 | 18.7 | 16.7 |
| | 6 to 10 years | 20.6 | 20.8 | 26.2 | 22.5 |
| | 11 to 15 years | 17.0 | 12.5 | 18.7 | 17.2 |
| | 16 to 20 years | 18.5 | 25.0 | 12.3 | 17.0 |
| | 21 to 25 years | 11.0 | 6.3 | 9.6 | 10.2 |
| | 26 or more years | 13.4 | 20.8 | 10.7 | 13.2 |
| | No response | 0.3 | 0.0 | 0.0 | 0.2 |
| Academic Qualifications | Doctorate – Medical Sciences | 70.2 | 52.1 | 19.3 | 51.9 |
| | Doctorate – Other Disciplines | 15.5 | 37.5 | 35.3 | 23.9 |
| | MD | 4.5 | 4.2 | 16.6 | 8.4 |
| | MD-Doctorate | 8.4 | 6.3 | 14.4 | 10.2 |
| | MD-Master's | 1.2 | 0.0 | 13.4 | 5.1 |
| | Master's | 0.3 | 0.0 | 1.1 | 0.5 |

FIGURE 3.1.4

## NUMBER OF RESPONDENTS BY RESEARCHER GROUP AND PROVINCE




## TIME ALLOCATION

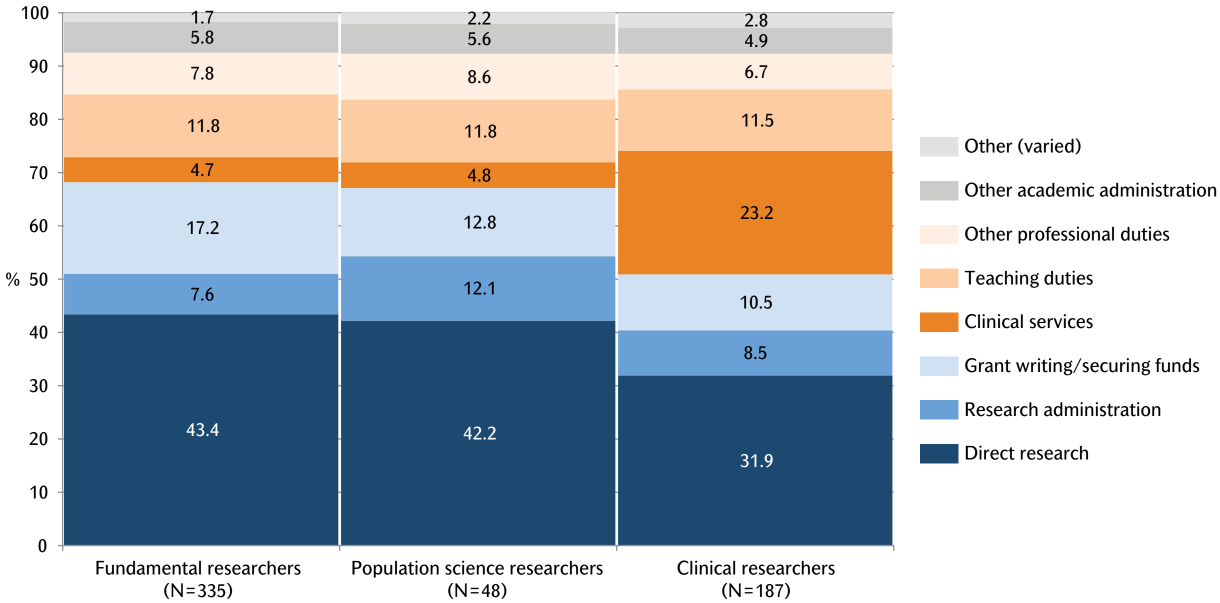
Respondents were asked to report on how their time was allocated over the most recent year. Overall, the highest mean proportion of time was for direct research, which represented, on average, 39.5% of respondents' time. Combined, grant writing/securing research funds, teaching duties, and clinical services not related to research accounted for another 37.1% for respondents as a whole.

Time allocation by researcher type is presented in Figure 3.1.5. Fundamental and population science researchers spent significantly more time on direct research than clinical researchers. Fundamental researchers also reported the highest proportion of time on grant writing/securing research funding. Time spent on research administration was highest for population science researchers whereas clinical researchers spent the highest proportion of their time engaged in clinical services.

Not surprisingly, overall lab size was related to time allocations. Fundamental researchers with no personnel spent more time on direct research and research administration than their counterparts who had personnel. The inverse was true for grant writing— Fundamental researchers with lab personnel spent more time on grant writing than those who did not have lab personnel. Clinical researchers who had no personnel on their research teams spent more time engaged in clinical services and less time on research administration and granting writing than their counterparts who had research personnel on their teams.

FIGURE 3.1.5

## RESPONDENTS' AVERAGE TIME ALLOCATIONS BY ACTIVITY




## NATURE OF CANCER RESEARCH CONDUCTED

The survey captured information about the type of cancer research conducted by survey respondents. These data are summarized in Table 3.1.2 (ordinal and nominal groupings). Figure 3.1.6 shows overall respondents by translational phase and cancer site (continuous/interval data).

Clinical researchers reported, on average, a statistically significantly higher proportion of their research relevant to cancer when compared to fundamental researchers (86.0% versus 78.3%). When responses to this question were constructed into an ordinal grouping, half of respondents (50.2%) reported that their research was entirely focused on cancer (Table 3.1.2). Another 40% of respondents reported that between 50 to 99% of their research was relevant to cancer.

Overall, two out of five respondents reported that 80% or more of their cancer research could be considered team science (defined as collaborative/multi-institutional and/or multi-, inter-, and trans-disciplinary) (Table 3.1.2). Nearly one quarter (24.0%) reported that less than 25% of their cancer research involved a team science approach. Fundamental researchers were least likely to be engaged in team science when compared with either the population science or clinical researchers – the proportion of cancer research considered team science averaged 44.1% for fundamental researchers, 76.1% for population science researchers, and 78.5% for clinical researchers.

In terms of site grouping, significantly more of the fundamental researchers were focused on leukemia research and significantly more of the population science researchers were focused on lung cancer research. The proportion of researchers focused on breast cancer was fairly similar for all three groups (in the 17% to 21% range).

TABLE 3.1.2

## NATURE OF RESPONDENTS' RESEARCH [1] (%)

| Dimension | | Fundamental researchers N=335 | Population science researchers N=48 | Clinical researchers N=187 | TOTAL N=570 |
|---|---|---|---|---|---|
| Cancer relevance | Less than 50% | 12.2 | 8.3 | 7.5 | 10.4 |
| | 50% to 99 % | 43.6 | 37.5 | 32.6 | 39.5 |
| | 100% | 44.2 | 54.2 | 59.9 | 50.2 |
| Involvement in team science | Less than 25% | 36.1 | 10.4 | 5.9 | 24.0 |
| | 25% to 69% | 38.2 | 22.9 | 22.5 | 31.8 |
| | 70% or more | 25.7 | 66.7 | 71.7 | 44.2 |
| Cancer site | All/not specific | 29.6 | 35.4 | 21.9 | 27.5 |
| | Breast | 17.3 | 20.8 | 18.7 | 18.1 |
| | Colorectal | 5.1 | 0.0 | 3.7 | 4.2 |
| | Leukemia | 7.8 | 2.1 | 2.1 | 5.4 |
| | Lung | 1.5 | 12.5 | 6.4 | 4.0 |
| | Prostate | 5.4 | 2.1 | 7.5 | 5.8 |
| | Other | 33.4 | 27.1 | 39.6 | 34.9 |

[1] Represents the distributions by response groupings (see Methodology for details on how the groups were formed).

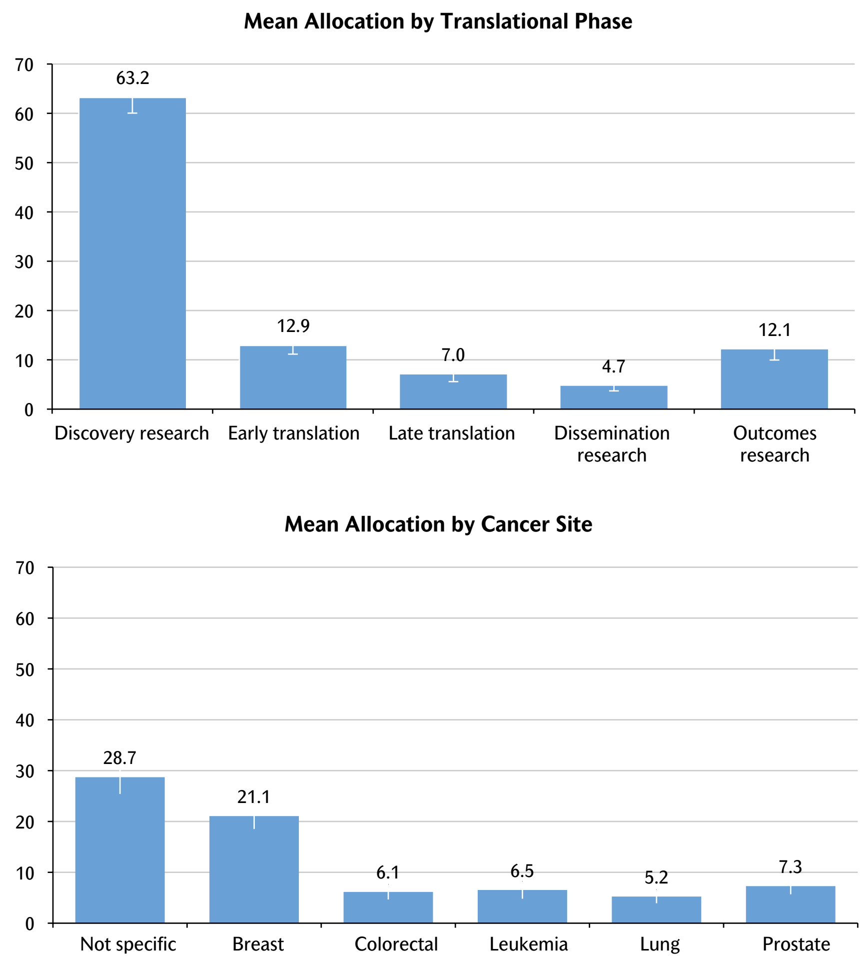
In terms of the six categories[3] of the CSO (depicted previously in Figure 3.1.3), Biology had the highest average allocation (38.3%) and Treatment research had a mean allocation of 23.4% for respondents as a whole. Categories with the lowest mean allocations were Etiology/risk factors (6.4%) and Prevention interventions (5.2%).

Mean allocations by translational phase and cancer site are shown in Figure 3.1.6. In terms of translational phase, the highest overall mean allocation was for Discovery research (63.2%). The highest mean allocation for cancer sites was for all sites/non-site specific (28.7%), followed by breast cancer (21.1%). Allocations to research on colorectal cancer, leukemia, lung cancer, and prostate cancer were similar and averaged 5 to 7% each.

3. The CSO is comprised of seven categories. In the survey, the Scientific Model Systems category was not included.

FIGURE 3.1.6

## MEAN ALLOCATIONS BY TRANSLATIONAL PHASE AND CANCER SITE – ALL RESPONDENTS



## RESEARCH TEAM/COMPOSITION

The current composition of respondents' research teams in terms of full-time equivalents (FTEs) is provided in Table 3.1.3. There was a total of 4,291 FTEs identified. Nearly one of every five FTEs was a doctoral student. Master's students represented 14.6% of the overall FTE count. Postdoctoral fellows and research associates each represented about 10% of the overall FTEs.

TABLE 3.1.3

### COMPOSITION OF RESPONDENTS' RESEARCH TEAMS

| | Fundamental researchers (N=335) | | Population science researchers (N=48) | | Clinical researchers (N=187) | | TOTAL (N=570) | |
|---|---|---|---|---|---|---|---|---|
| Position | FTEs | % | FTEs | % | FTEs | % | FTEs | % |
| Undergraduate students | 317.5 | 12.5 | 31.5 | 5.9 | 111.5 | 9.2 | 460.5 | 10.7 |
| Summer students | 199.5 | 7.9 | 23.0 | 4.3 | 96.2 | 7.9 | 318.7 | 7.4 |
| Co-op students | 48.0 | 1.9 | 8.0 | 1.5 | 27.1 | 2.2 | 83.1 | 1.9 |
| Master's level students | 405.7 | 16.0 | 69.0 | 12.9 | 150.2 | 12.4 | 624.9 | 14.6 |
| Doctoral students | 582.0 | 22.9 | 68.0 | 12.7 | 170.0 | 14.0 | 820.0 | 19.1 |
| Medical students | 27.3 | 1.1 | 5.0 | 0.9 | 39.9 | 3.3 | 72.2 | 1.7 |
| Postdoctoral fellows | 314.0 | 12.4 | 38.0 | 7.1 | 81.4 | 6.7 | 433.4 | 10.1 |
| Post-MD fellows | 72.0 | 2.8 | 2.0 | 0.4 | 71.1 | 5.8 | 145.1 | 3.4 |
| Clinican scientists | 20.1 | 0.8 | 8.0 | 1.5 | 48.1 | 4.0 | 76.2 | 1.8 |
| Research associates | 226.1 | 8.9 | 76.5 | 14.3 | 146.8 | 12.1 | 449.4 | 10.5 |
| Study nurses/research coordinators | 30.9 | 1.2 | 32.0 | 6.0 | 94.4 | 7.8 | 157.3 | 3.7 |
| Technicians | 215.6 | 8.5 | 29.0 | 5.4 | 65.1 | 5.4 | 309.7 | 7.2 |
| IT/informatics specialists | 30.2 | 1.2 | 13.0 | 2.4 | 12.0 | 1.0 | 55.2 | 1.3 |
| Statisticians | 6.3 | 0.2 | 22.0 | 4.1 | 15.3 | 1.3 | 43.6 | 1.0 |
| Pathologists | 14.8 | 0.6 | 0.0 | 0.0 | 30.0 | 2.5 | 44.8 | 1.0 |
| Health service specialists | 1.0 | 0.0 | 0.0 | 0.0 | 1.5 | 0.1 | 2.5 | 0.1 |
| Program/project managers | 10.0 | 0.4 | 49.0 | 9.2 | 23.6 | 1.9 | 82.6 | 1.9 |
| Senior managers | 11.0 | 0.4 | 11.0 | 2.1 | 7.0 | 0.6 | 29.0 | 0.7 |
| Other | 9.0 | 0.4 | 49.0 | 9.2 | 25.0 | 2.1 | 83.0 | 1.9 |
| **TOTAL** | **2,540.9** | **100** | **534.0** | **100** | **1,216.1** | **100** | **4,291.0** | **100** |

Population science researchers reported a larger overall team size (mean 11.1 FTEs) when compared to fundamental or clinical researchers (at 7.6 and 6.5, respectively). Nearly one-quarter (24.6%) of clinical researchers and 18.8% of population science researchers had no lab personnel. In contrast, only 6.0% of fundamental researchers had no lab personnel.

In terms of specific positions, additional statistically significant differences emerged. Fundamental researchers had more undergraduate, masters, doctoral, and postdoctoral trainees as well as technicians on their teams. Population science researchers reported more FTEs in the positions of research associate, IT/informatics specialist, statistician, program/project manager, and senior manager. The teams of clinical researchers had more post-MD fellows, clinician scientists, study nurses, and pathologists.

In terms of advanced trainees (i.e., medical students, doctoral students, postdoctoral and post-MD fellows), there were an average of 3.0 advanced trainee FTEs per fundamental researcher, 2.4 advanced trainee FTEs per population science researcher, and 1.9 advanced trainee FTEs per clinical researcher.

## 3.2 RECRUITING QUALIFIED PERSONNEL TO RESEARCH TEAMS

### CHALLENGES IN RECRUITING

Two thirds of survey respondents reported that they had experienced challenges recruiting qualified personnel to their research teams. Statistically significantly more fundamental researchers experienced challenges recruiting qualified personnel than either population science or clinical researchers (68.7% versus 54.2% and 58.3%, respectively).

In terms of cancer sites, nearly three-quarters of researchers (78.3%) with a predominant focus on lung cancer research and 70.8% of researchers with a predominant focus on colorectal cancer experienced challenges in recruiting personnel. This contrasted sharply with prostate cancer researchers and leukemia researchers, where fewer than half (39.4% and 45.2%, respectively) reported recruitment challenges. These differences were statistically significant.

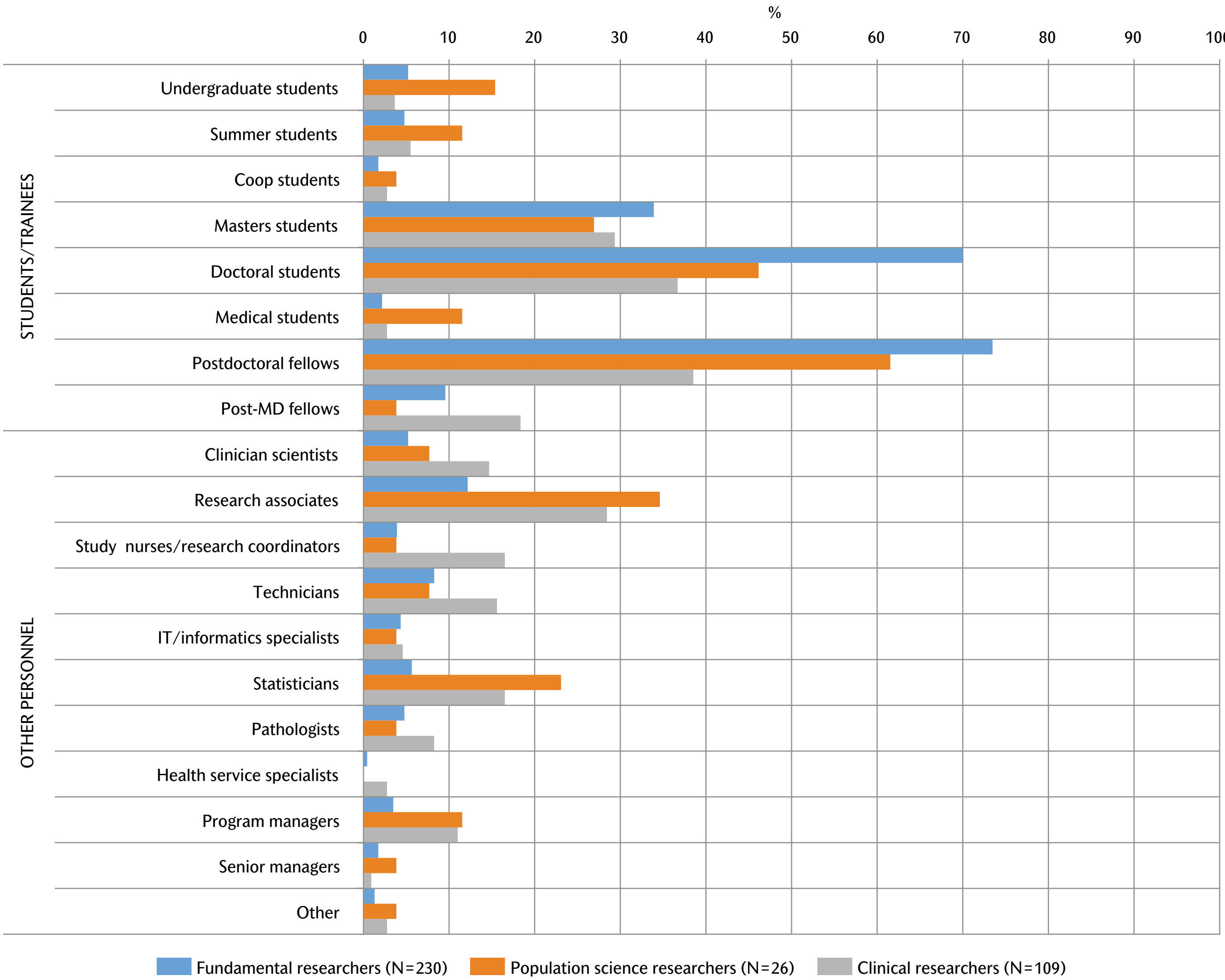
### PERSONNEL/POSITIONS MOST DIFFICULT TO RECRUIT

In conjunction with the question of whether survey participants had experienced challenges in recruiting, survey respondents were asked to identify the specific positions/cancer research personnel that they had challenges recruiting. Responses are summarized in Figure 3.2.1.

The largest proportion of respondents in all three groups reported recruitment challenges for postdoctoral students. Proportionately more fundamental researchers indicated that they had experienced challenges recruiting doctoral and postdoctoral trainees. Recruiting research associates, statisticians, and program managers posed more challenges for population science and clinical researchers. Population science researchers were more likely to report challenges recruiting undergraduate and summer students whereas clinical researchers were more likely to report challenges recruiting study nurses/research coordinators.

FIGURE 3.2.1

**PERSONNEL/POSITIONS DIFFICULT TO RECRUIT BY RESEARCHER TYPE**



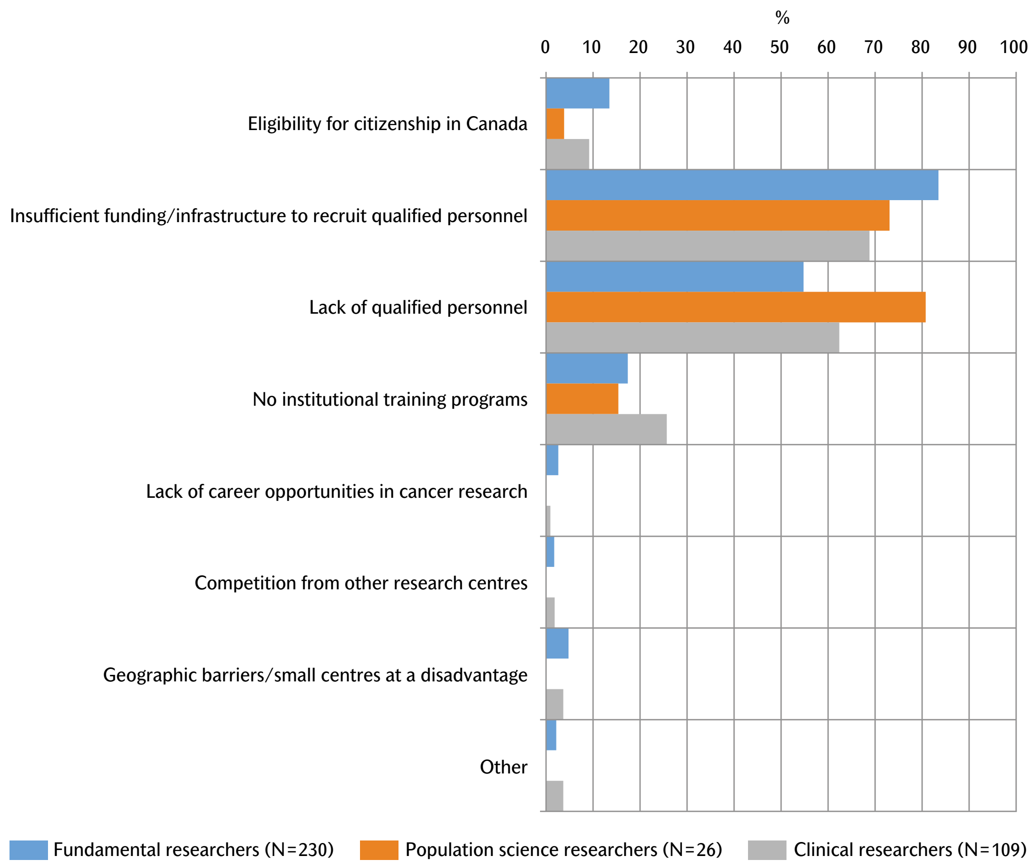

## REASONS FOR RECRUITING CHALLENGES

Survey respondents who reported that they had experienced challenges in recruiting personnel to their cancer research groups were asked to identify the reasons for their recruitment challenges from a supplied list and/or provide another reason. They could provide as many reasons as they felt was applicable. Supplied choices included eligibility for citizenship in Canada, insufficient funding/infrastructure to recruit qualified personnel, lack of qualified personnel to recruit, and lack of institutional training program(s). Other reasons identified by respondents included: lack of career opportunities in cancer research, competition from other research groups within/outside of Canada, and geographic barriers (i.e., smaller cites/small research centres had more difficulty recruiting qualified personnel).

The majority (78.4%, 286/365) of respondents felt that challenges in recruiting personnel were due to insufficient funding/infrastructure, and this was most critical for fundamental researchers. Overall, about three out of five respondents (215/365) cited lack of qualified personnel as a reason for recruitment challenges, with this being identified by many of the population science researchers. One-quarter of clinical researchers felt a lack of institutional training programs contributed to recruitment challenges. These data are summarized in Figure 3.2.2.

FIGURE 3.2.2

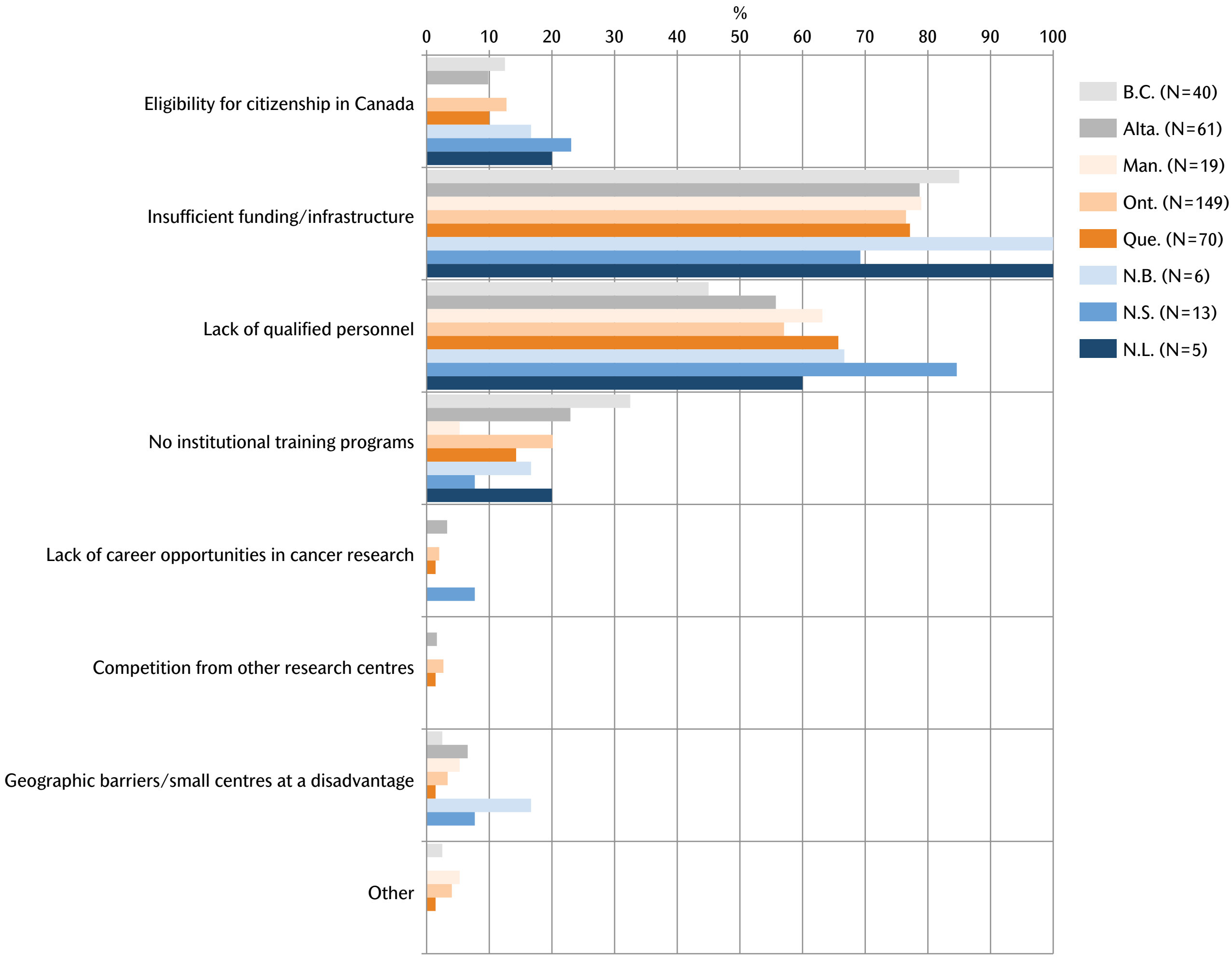
**REASONS FOR RECRUITMENT CHALLENGES BY RESEARCHER TYPE**




Responses to this question varied somewhat by province (Figure 3.2.3). While insufficient funding/infrastructure ranked first for most provinces, proportionately more respondents from Nova Scotia felt that the lack of qualified personnel contributed to recruitment challenges. Proportionately more respondents from British Columbia identified lack of institutional training programs while proportionately more respondents from New Brunswick identified geographic barriers as reasons for recruitment challenges.

FIGURE 3.2.3

## REASONS FOR RECRUITMENT CHALLENGES BY PROVINCE [1, 2]




[1] Respondents from Saskatchewan have been excluded from this figure due to small numbers.

[2] There were no respondents from P.E.I.

## 3.3 PERCEPTIONS OF TRAINING OPPORTUNITIES

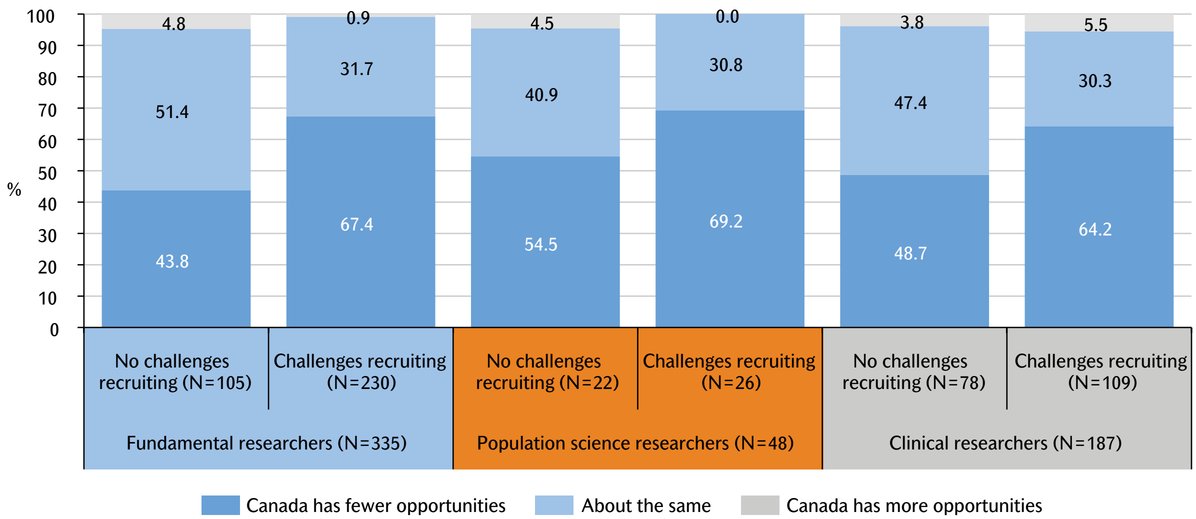
Survey respondents were asked to provide their opinions on the current state of training opportunities in Canada compared to the U.S., U.K., or other key countries. The majority (59.5%) of respondents felt that Canada had fewer opportunities, whereas only 3.0% of respondents felt that Canada had more opportunities. The balance (37.5%) of respondents felt that Canada's opportunities were about the same as other key countries.

Responses to this question did not vary by researcher type. However, respondents who had experienced challenges recruiting qualified personnel were more likely to indicate that Canada had fewer opportunities. In addition, researchers with no reported personnel on their research teams were more likely than respondents who had personnel to report that Canada had fewer training opportunities, suggesting perhaps that training opportunities or lack thereof affected the size of their research teams. (See Figure 3.3.1.)

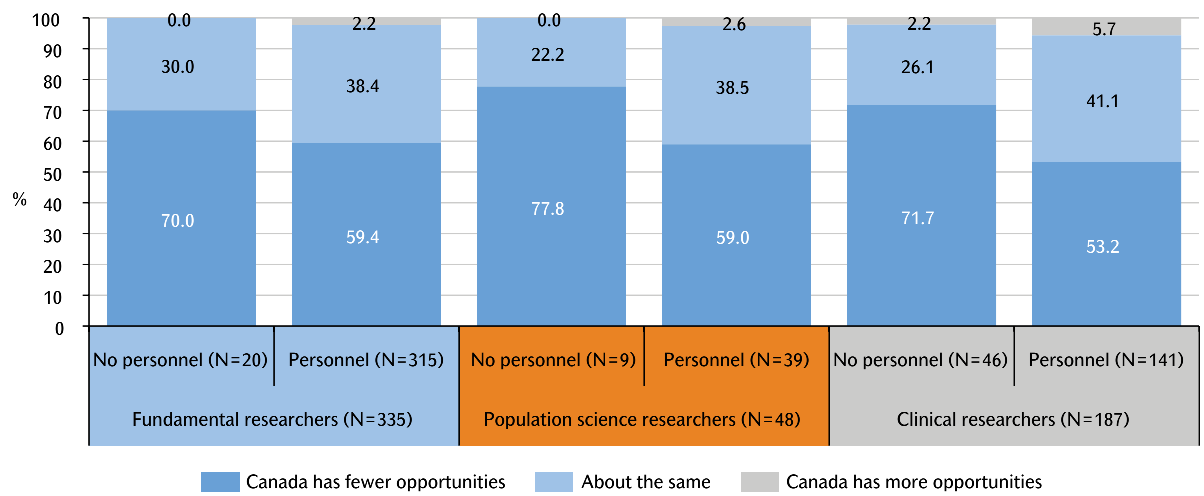
FIGURE 3.3.1

## PERCEPTIONS OF TRAINING OPPORTUNITIES IN CANCER RESEARCH IN CANADA BY RESEARCHER TYPE

**Challenges Recruiting**




**Personnel on Research Team**



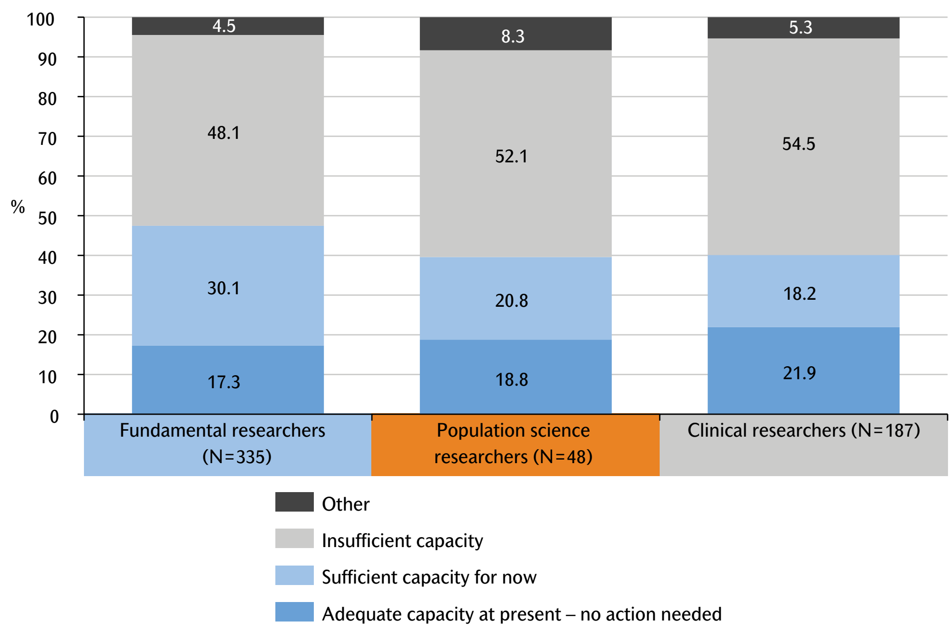
## 3.4 CANADA'S HUMAN RESOURCES CAPACITY IN CANCER RESEARCH

### SUFFICIENCY OF RESEARCH CAPACITY

Overall, half of survey respondents (50.5%) agreed with the statement, "Canada currently had insufficient human resources capacity in cancer research." Another 25.4% of respondents felt that there was sufficient human resources capacity in cancer research for now, but that a shortage could result in the longer term without specific action. Fundamental researchers were more likely than population science or clinical researchers to agree with this statement. (See Figure 3.4.1.)

FIGURE 3.4.1

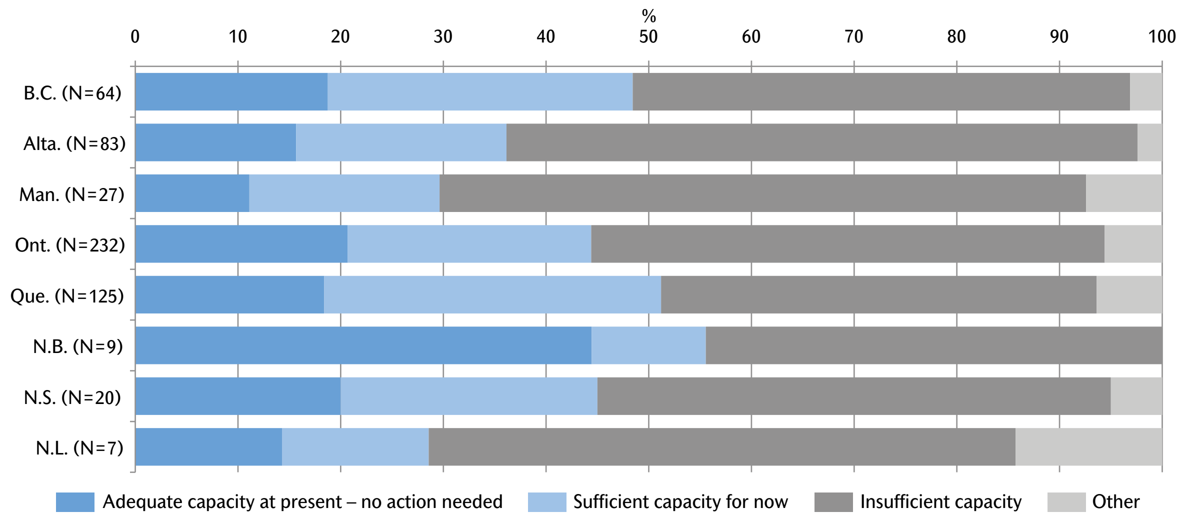
**OPINIONS ABOUT CANADA'S HUMAN RESOURCES CAPACITY IN CANCER RESEARCH BY RESEARCHER TYPE**




Responses to this question were also analyzed by respondents' location (Figure 3.4.2). Over sixty percent of respondents from Manitoba and Alberta reported that Canada had insufficient human resources capacity in cancer research. Respondents from New Brunswick were somewhat unique in that they had the highest proportion of respondents (44.4%) indicating that Canada's human resources capacity was sufficient.

FIGURE 3.4.2

**DISTRIBUTION OF OPINIONS ABOUT CANADA'S HUMAN RESOURCES CAPACITY IN CANCER RESEARCH BY RESPONDENTS' LOCATION [1, 2]**




[1] Respondents from Saskatchewan were excluded from this figure due to small numbers.

[2] There were no respondents from P.E.I.

For respondents who selected the option, "Canada had sufficient human resources capacity at present but that this could be threatened without specific action," most responses dealt with the need for stable/sustained research funding (regardless of researcher group). A higher proportion of population health researchers, however, expressed the need for improved training programs as well as greater opportunities for new scientists. Protected/designated time, fostering clinician scientists and other clinical research personnel, and enhanced institutional support were themes identified by clinical researchers.

Respondents who indicated that Canada had insufficient human resources capacity in cancer research were asked to identify the areas of insufficiency. The majority of responses identified specific areas of research; most often this was the area of research in which the respondent was involved (e.g., fundamental researchers identified basic/discovery research). Many responses related insufficient capacity to lack of research funding (this was more common among fundamental researchers) and/or lack of funded and qualified personnel. Fundamental researchers also identified insufficiencies in site-specific research capacity (i.e., lung, pancreatic, colorectal, and skin cancers). Both clinical and fundamental researchers identified translational research as an area of insufficiency.

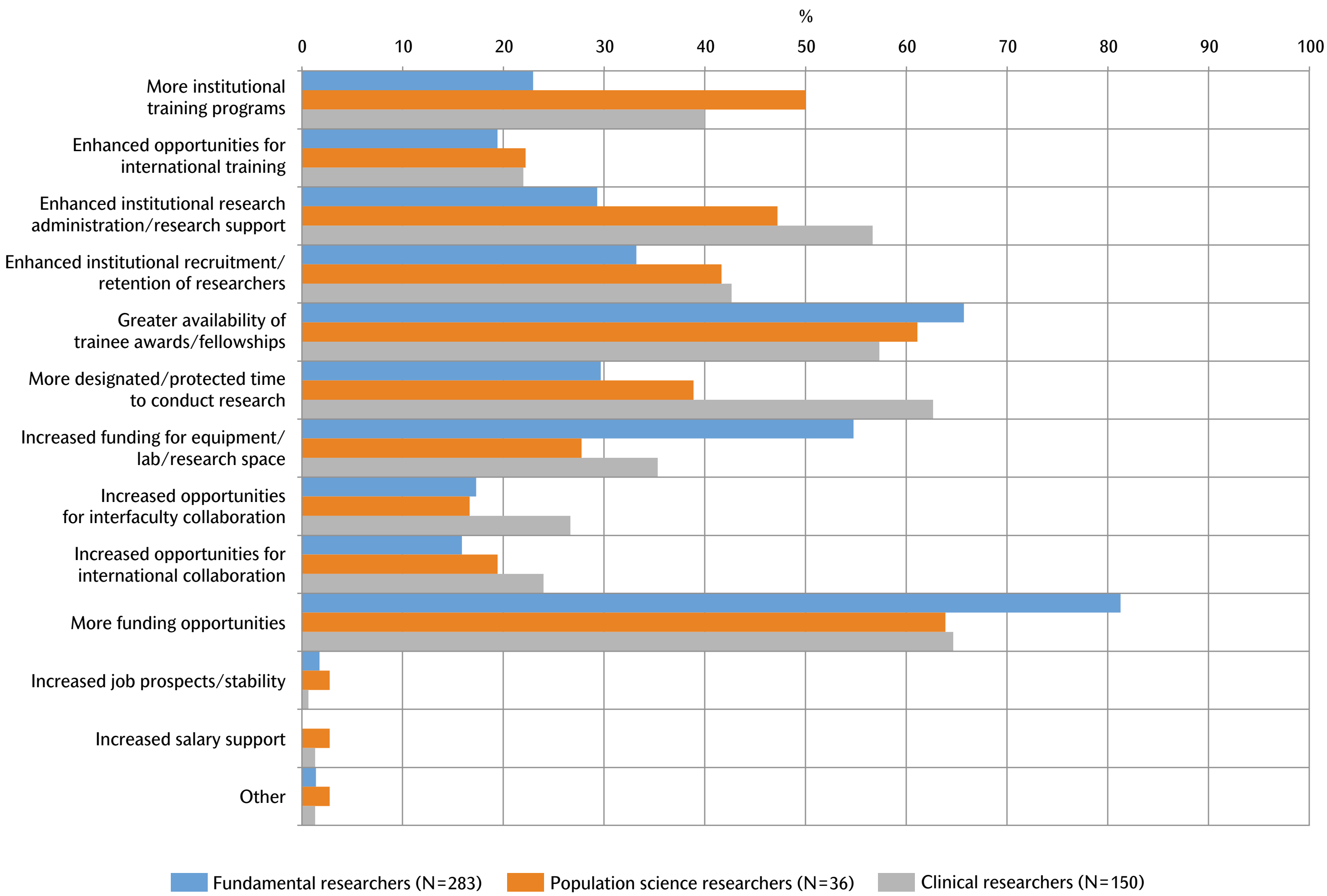
## IMPROVING CANADA'S HUMAN RESOURCE CAPACITY IN CANCER RESEARCH

The final question of the survey asked respondents to suggest ways to address insufficiencies in Canada's human resources capacity in cancer research. Survey respondents were invited to select as many responses as applicable from a supplied list of 10 choices. Surprisingly, responses were received from 469 respondents (283 fundamental researchers, 36 population science researchers, and 150 clinical researchers) and this included some respondents who had indicated that Canada had sufficient human resources capacity in cancer research and no action was needed. All responses to this question, regardless of their opinions from earlier questions, were included in the analysis.

Overall, most respondents (74.6%; 350/469) felt that more funding opportunities were needed—this was especially the case for fundamental researchers. Fundamental researchers were also much more likely than population science and clinical researchers to identify the need for increased funding for equipment/lab/research space. All three groups of researchers indicated the need for greater availability of trainee awards/fellows in similar proportions (within the 60% range). Clinical researchers were more likely to indicate the need for more designated/protected time to conduct research as well as enhanced institutional research administration/research support infrastructure (as previously shown, more than one-quarter of their time was devoted to clinical services). Both population science researchers and clinical researchers were much more likely than fundamental researchers to indicate the need for more institutional training programs. (See Figure 3.4.3.)

FIGURE 3.4.3

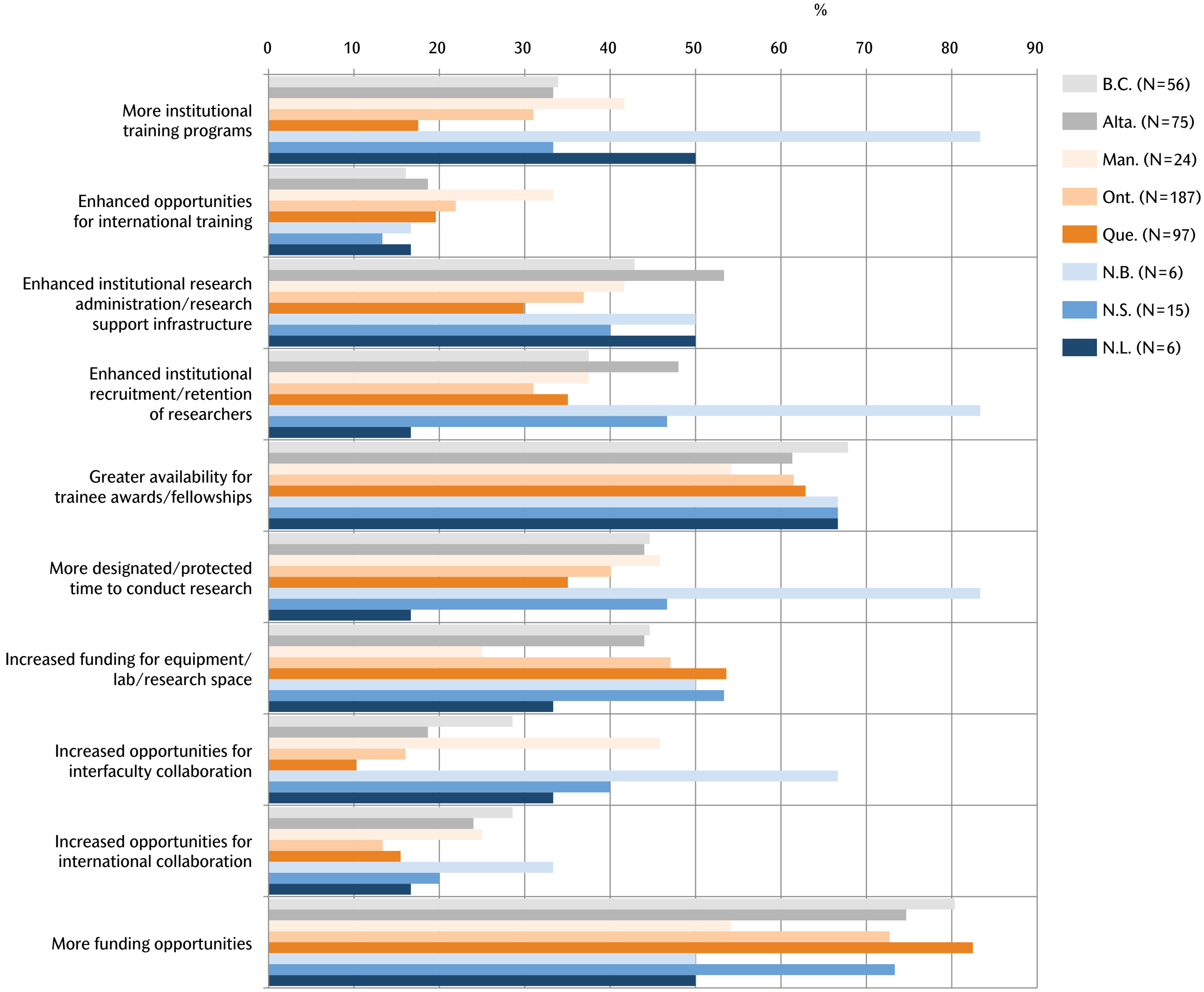
**OPINIONS ON HOW TO ADDRESS INSUFFICIENT HUMAN RESOURCES CAPACITY IN CANCER RESEARCH BY RESEARCHER TYPE**




Alternatively, responses to this question were stratified by respondents' locations (see Figure 3.4.4). New Brunswick respondents varied from respondents of the other provinces, with higher proportions of support for more institutional training programs, enhanced institutional recruitment/retention of researchers, and more designated/protected time to conduct research. More than one half of respondents from each province identified greater funding opportunities as a solution, although proportionately fewer respondents from Manitoba and proportionately more respondents from British Columbia and Quebec did so. Greater availability for trainee awards/fellowships was also widely supported as a means to address insufficiencies in Canada's human resources capacity in cancer research. This was particularly the case for respondents from Newfoundland & Labrador, New Brunswick, and British Columbia. Interfaculty collaboration was most frequently reported by respondents of New Brunswick (66.7%). In contrast, only 10.3% of respondents from Quebec identified this as a potential solution.

FIGURE 3.4.4

## OPINIONS ON HOW TO ADDRESS INSUFFICIENT HUMAN RESOURCES CAPACITY IN CANCER RESEARCH BY PROVINCE [1, 2]




[1] Respondents from Saskatchewan have been excluded from this figure due to small numbers.

[2] There were no respondents from P.E.I.

# 4. CANCER RESEARCH WORKFORCE IN CANADA - ESTIMATES

Survey responses were used to generate estimates of the total current cancer research workforce (in FTEs) in Canada. Estimate 1 is a crude calculation based on survey responses regarding lab composition for each researcher group, multiplied by a factor of 3 (based on the survey response rate of 33%). Estimate 2 is the same as estimate 1, but corrects for the bias in terms of CSO categories. In both estimates, PI FTEs were estimated by applying the mean ratings of the cancer relevance to the resulting number of PIs based on the stratification. A third estimate did not involve the online survey, but was computed using a combination of data from the CCRS and CIHR (see Appendix B for details). These estimates suggest that the cancer research workforce is comprised of 10,000 to 15,000 FTEs (Figure 4.4.1). A breakdown of the FTEs yielding from Estimate 2 is presented in Figure 4.4.2.

FIGURE 4.4.1

**ESTIMATES OF THE CANCER RESEARCH WORKFORCE IN CANADA (FTEs)**

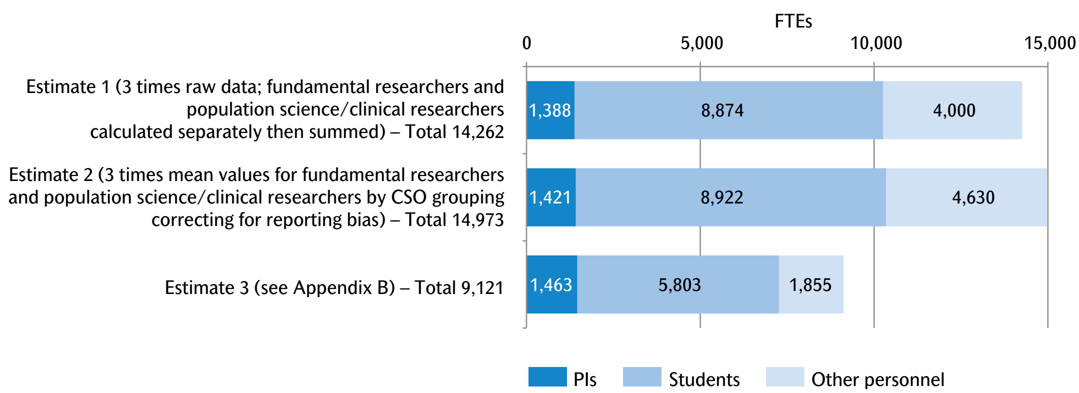
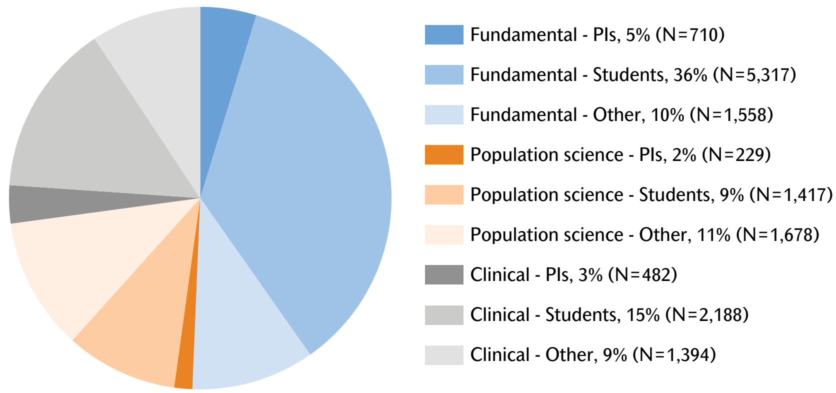


FIGURE 4.4.2

## DISTRIBUTION OF FTEs OF CURRENT CANCER RESEARCH WORKFORCE IN CANADA (ESTIMATE 2)



# 5. DISCUSSION

This survey represents the perceptions and opinions of Canadian researchers representing fundamental,[4] population science, and clinical[5] disciplines on Canada's human resources needs and capacity in cancer research. Although there may be some limitations due to the 33% response rate, there is important information to be gleaned from the opinions expressed and the survey provides a valuable snapshot of cancer researchers, the nature of their research, the composition of their research teams, and the stressors they perceive.

While half of respondents agreed with the statement that "Canada has insufficient cancer research capacity," 82% identified one or more ways to address current or future needs. Responses to key survey questions are summarized in Tables 5.1.1 and 5.1.2 below. The latter table highlights similarities and differences among the researchers in terms of the most frequent responses to what is needed to improve cancer research capacity.

TABLE 5.1.1

**DISTRIBUTION OF RESPONSES TO KEY QUESTIONS IN THE SURVEY (%)**

| Question | Option | Fundamental researchers N=335 | Population science researchers N=48 | Clinical researchers N=187 | TOTAL N=570 |
|---|---|---|---|---|---|
| How do training opportunities in your area of cancer research in Canada compare to other key countries? | - Canada has fewer opportunities | 60.0 | 62.5 | 57.8 | 59.5 |
| | - About the same | 37.9 | 35.4 | 37.4 | 37.5 |
| | - Canada has more opportunities | 2.1 | 2.1 | 4.8 | 3.0 |
| Have you experienced challenges in recruiting qualified cancer research personnel to your research teams/laboratory? | - Yes | 68.7 | 54.2 | 58.3 | 64.0 |
| | - No | 31.3 | 45.8 | 41.7 | 36.0 |
| Your opinion about Canada's human resources capacity | - Canada has insufficient cancer research capacity | 48.1 | 52.1 | 54.5 | 50.5 |
| | - Canada has sufficient cancer research capacity at present, but a shortage could result without action | 30.1 | 20.8 | 18.2 | 25.4 |
| | - Canada has adequate/sufficient cancer research capacity at present | 17.3 | 18.8 | 21.9 | 19.0 |
| | - Other | 4.5 | 8.3 | 5.4 | 5.1 |

4. Fundamental researchers participate in many areas of fundamental cancer research, including molecular, cellular, developmental and systems biology, immunology, nanotechnology, and diverse applications of biomedical engineering.

5. For the purposes of this report, clinical researchers include researchers engaged in patient-oriented research, behavioral studies, and outcomes and health services research.

TABLE 5.1.2

## SUMMARY OF TOP RESPONSES BY RESEARCHER TYPE

| Question | Fundamental researchers | Population science researchers | Clinical researchers |
|---|---|---|---|
| Personnel/positions difficult to recruit - students/trainees | 1) Doctoral students | 1) Postdoctoral fellows | 1) Postdoctoral fellows |
| | 2) Postdoctoral fellows | 2) Doctoral students | 2) Doctoral students |
| | 3) Masters students | 3) Masters students | 3) Masters students |
| Personnel/positions difficult to recruit - other personnel | 1) Research associates | 1) Research associates | 1) Research associates |
| | 2) Technicians | 2) Statisticians | 2) Study nurses/research coordinators |
| | 3) Statisticians | 3) Program managers | 3) Statisticians |
| Reasons for recruitment challenges | 1) Insufficient funding/infrastructure to recruit qualified personnel | 1) Lack of qualified personnel | 1) Insufficient funding/infrastructure to recruit qualified personnel |
| | 2) Lack of qualified personnel | 2) Insufficient funding/infrastructure to recruit qualified personnel | 2) Lack of qualified personnel |
| Ways to address insufficient HR capacity | 1) More funding opportunities | 1) More funding opportunities | 1) More funding opportunities |
| | 2) Greater availability of trainee awards/fellowships | 2) Greater availability of trainee awards/fellowships | 2) More designated/protected time to conduct research |
| | 3) Increased funding for equipment/lab/research space | 3) More institutional training programs | 3) Enhanced institutional research administration/research support infrastructure |

The need for more funding opportunities and sustained funding was identified by a majority of respondents as a critical concern. Sustained operating funding for research was seen to be critical to build on and maximize investments that had already been made in terms of infrastructure and career support. With inadequate or dwindling monies for operating grants, respondents reported that it was difficult to attract and retain students and other research personnel to their cancer research teams. The lack of adequate operating funds was also identified as a disincentive for students pursuing a career as a cancer researcher.

The imbalance between postdoctoral positions and faculty or other career positions available within academia was another area of concern identified by a number of respondents. In an often-cited article on this topic, Fuhrmann et al.[6] advocated a broader doctoral curriculum to prepare trainees for a wide range of research and non-research career paths in both the academic and non-academic sectors and proposed that research funders have a responsibility to provide funding to support mentoring, professional skills training, and career development for graduate and postdoctoral trainees. Similar themes in terms of exposing graduate students and postdoctoral trainees to multiple career path options were articulated in the actions from the 2011 NCI's National Institute of General Medicine strategic plan for biomedical and behavioural

6. Fuhrmann, CN (2011). Improving graduate education to support a branching career pipeline: recommendations based on a survey of doctoral students in the basic biomedical sciences. *CBE-Life Sciences Education*, 10(3): 239-49.

research training.[7] Sharom,[8] in a review of the question 'Are we producing too many trainees?', however, presents another perspective on what he terms the 'current biomedical science career bottleneck.' He suggests that the overproduction of trainees creates a large pool of inexpensive labour, significantly benefiting all stakeholders (i.e., individual PIs, universities, funding agencies, industry, and the society at large). In either case, this issue is a complex one and would require system-wide change.

The survey results raise a number of questions:

- What is the role of funders in attracting trainees, especially at the doctoral and postdoctoral levels, to cancer research? How does long-term career viability affect recruitment? Do funders have a role in ensuring that a broad range of career options are explored during a trainee's tenure? Given the increasing emphasis on university-industry partnerships, how do these programs affect cancer research and the nature and number of career opportunities for cancer research trainees?
- Can funding mechanisms be created or refined to attract qualified candidates to cancer research? Can domestic capacity be cultivated or should the focus be on recruitment from outside Canada?
- What additional infrastructure funding is needed to support cancer research and does this vary by cancer research area?
- Can research associates be better supported through different funding mechanisms? How does funding stability affect these positions?
- How can research funders address the dearth of statisticians involved in all areas of cancer research (identified in Table 5.1.2)? Is this a bigger issue reflecting a lack of this expertise in the country?
- What mechanisms can funders use to enhance capacity in the population science and clinical research areas? Protecting time for research and improving the research administration at institutions were key issues raised by the clinical researcher group while providing more institutional training programs was identified by population science researchers.

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7. National Institute of General Medical Sciences (2011). Investing in the Future: Strategic Plan for Biomedical and Behavioral Research Training. NIH Publication No. 11 7673. Available at http://publications.nigms.nih.gov/trainingstrategicplan/Strategic_Training_Plan.pdf.

8. Sharom, JR (2008). The scientific workforce policy debate: do we produce too many biomedical trainees? *Hypothesis,* 6(1): 17-29.

Broader and more far-reaching issues for consideration include:

- Do we have enough cancer researchers? Do we need to augment our researcher capacity in order to improve research impact and outcomes at an international level?
- If the investments made over the past decade helped to create a ~10,000+ cancer research workforce, what are the immediate, mid- and long-term impacts if funding is not provided to sustain it? What will be the economic and reputational impacts as well as the impact on national intellectual capacity?
- What is the appropriate number of trainees needed to help sustain the research enterprise and replenish retiring scientists? What can funders (and the scientific community at large) do to attract/retain students to science, specifically to disciplines critical to cancer research?
- What funding mechanisms can best support/sustain current capacity and strengthen the quality of research undertaken?
- What should the success rate of grant competitions be to ensure the optimization of scientific impact? Should there be targets?
- Is there bias in the funding system and, if so, what are the detrimental impacts and how can the system/decision-making be improved?
- How should Canada's research dollars be spent – what areas of research will yield the greatest return on investment to Canada, society, and global health?
- How can funders balance competing needs among cancer researchers from different disciplines?
- Will the increased focus on patient-oriented/outcomes research by research funders have an impact and what will the impact(s) be?

These issues are not specific to cancer research and will require a more collaborative and broad-based approach in order to be successfully addressed.

In summary, addressing human resource needs and cancer research capacity is complex and multi-faceted. The survey results identified a number of common and research area-specific concerns that require further consideration, discussion, and action by cancer research funders in their efforts to accelerate discovery and ultimately reduce the cancer burden.

# APPENDIX A. CCRA HR SURVEY

**ABOUT THE SURVEY**
This survey has a mix of open and closed-choice items and takes approximately 15 minutes to complete. It is designed to be completed in one session. Please answer all of the questions and then click on "Submit" to submit responses. Responses should reflect your current status.

**PART A.**
**About You**

**Question 1**
Your first and last name:

**Question 2**
Age range:
- Under 30 years
- 30-39 years
- 40-49 years
- 50-59 years
- 60-69 years
- 70 or more years

**Question 3**
Sex:
- Female
- Male

**Question 4**
Current institutional affiliations (please list all that apply):

**Question 5**
Number of years of independent research experience (i.e., years since starting your own research program as an Assistant Professor or equivalent):

**Question 6**
Time allocation over the most recent year (please sum up to 100%):

A. Direct research – activities related to your research program (e.g., hands-on experiments, supervising research personnel/graduate students/postdocs, outfitting/maintaining lab, presenting your research results at meetings/seminars/conferences, preparing/submitting manuscripts
B. Research administration – activities related to sustaining your research program (e.g., recruiting research personnel, budget monitoring)
C. Grant writing/securing research funds for your research program
D. Clinical services not related to your research program
E. Teaching duties and related administration (e.g., classroom teaching, course coordination, curriculum development for your institution/other institutions)
F. Other professional duties (e.g., organizing local/national/international research meetings, serving on external advisory boards and/or grant review panels, serving on journal editorial boards, serving as a journal editor, reviewing manuscripts)
G. Other academic administration duties (e.g., serving on the tenure committee/space committee, serving on examining committees for students
H. Community outreach activities (e.g., serving on advisory committees)
I. Other duties (please specify below)

**Question 7**
Your academic expertise (please complete as applicable):
Doctorate
- Accounting
- Actuarial Science (management)
- Actuarial Science (mathematical sciences)
- Administrative Computing
- Aeronautical Engineering
- Agricultural Engineering
- Agronomy
- Anatomy
- Andragogy
- Anesthesia
- Anthropology
- Applied Mathematics
- Archaeology
- Architecture and Design
- Archive and Library Sciences
- Art History
- Art Sociology
- Art Therapy
- Arts Education
- Astronomy and Astrophysics
- Biochemistry
- Biology and Related Sciences
- Biomedical and Biochemical Engineering
- Business Administration
- Cardiology
- Cell Biology
- Chemical Engineering
- Chemistry
- Chiropractic
- Civil Engineering
- Classical and Ancient Studies
- Classical Archaeology
- Climatology and Meteorology
- Communication
- Comparative Education
- Computer and Software Engineering
- Computer Science
- Counselling, Career Education
- Criminology
- Dance
- Demography
- Dentistry
- Dermatology
- Design
- Didactics
- Dietetics and Nutrition
- Drama
- Earth Science
- Economy
- Electrical and Electronic Engineering
- Endocrinology
- Epidemiology and Biostatistics
- Ergonomics
- Ethnology
- Family Medicine
- Finance
- Forest Engineering
- Forestry and Wood Science
- Gastroenterology
- Genetics
- Geriatrics-Gerontology
- Health Administration
- Hematology
- History

- Human Geography
- Immunology
- Industrial Engineering
- Industrial Relations
- Insurances
- Kinanthropology
- Kinesiology
- Language Studies
- Law
- Linguistics
- Literature
- Management
- Marketing
- Material and Metallurgic Engineering
- Mechanical Engineering
- Media and Visual Arts
- Microbiology
- Mining and Geological Engineering
- Molecular Biology
- Music
- Nephrology
- Neurosciences
- Nuclear Engineering
- Nuclear Medicine
- Nursing
- Nutrition
- Obstetrics and Gynecology
- Occupational Therapy
- Oceanography
- Oncology
- Ophthalmology
- Optometry
- Orthopedics
- Pathology
- Pediatrics
- Pharmacology
- Pharmacy
- Philosophy
- Physiatry
- Physical Education
- Physical Engineering
- Physics
- Physiology
- Physiotherapy
- Political Science
- Preventive and Community Medicine
- Psychiatry
- Psychoeducation
- Psychology
- Psycho-pedagogy
- Public Administration
- Pure Mathematics
- Radiology
- Recreology and Leisure Sciences
- Remedial Education
- Respirology
- Rheumatology
- School Administration
- Semiology
- Sexology
- Social Services and Social Work
- Sociology
- Speech-Language Pathology and Audiology
- Statistics
- Statistics and Evaluation
- Studies Literary Studies
- Studies Museology
- Studies Musicology
- Surgery
- Theology - Religious Studies
- Urban Studies
- Urology
- Veterinary Sciences
- Virology
- Water and Environment
- Women Studies

Medical degree (MD)

- Adolescent Medicine
- Anatomical Pathology
- Anesthesiology
- Cardiac Surgery
- Cardiology
- Child and Adolescent Psychiatry
- Clinical Immunology and Allergy
- Clinical Pharmacology and Toxicology
- Clinician Investigator Program
- Colorectal Surgery
- Community Medicine
- Critical Care Medicine
- Dermatology
- Developmental Pediatrics
- Diagnostic Radiology
- Emergency Medicine
- Endocrinology and Metabolism
- Family Medicine
- Forensic Pathology
- Forensic Psychiatry
- Gastroenterology
- General Internal Medicine (GIM)
- General Pathology
- General Surgery
- General Surgical Oncology
- Geriatric Medicine
- Geriatric Psychiatry
- Gynecologic Oncology
- Gynecologic Reproductive Endocrinology and Infertility
- Hematological Pathology
- Hematology
- Infectious Diseases
- Internal Medicine
- Maternal-Fetal Medicine
- Medical Biochemistry
- Medical Genetics
- Medical Microbiology
- Medical Oncology
- Neonatal-Perinatal Medicine
- Nephrology
- Neurology
- Neuropathology
- Neuroradiology
- Neurosurgery
- Nuclear Medicine
- Obstetrics and Gynecology
- Occupational Medicine
- Ophthalmology
- Orthopedic Surgery
- Otolaryngology-Head and Neck Surgery
- Pain Medicine
- Palliative Medicine
- Pediatric Emergency Medicine
- Pediatric General Surgery
- Pediatric Hematology/Oncology
- Pediatric Radiology
- Pediatrics
- Physical Medicine and Rehabilitation
- Plastic Surgery
- Psychiatry
- Public Health and Preventive Medicine
- Radiation Oncology
- Respirology

- Rheumatology
- Thoracic Surgery
- Transfusion Medicine
- Urology
- Vascular Surgery

Other (please elaborate – e.g., MSc Epidemiology)

**PART B.**
**Your Cancer Research**

**Question 8**
What proportion of your research portfolio would you consider to be relevant to cancer? Please note that we include research on behavioural or environmental risk factors associated with cancer (e.g., tobacco) as cancer-relevant.

**Question 9**
What proportion of your cancer research would be considered team science (i.e., collaborative/multi-institutional and/or cross-disciplinary (multi-, inter-, and transdisciplinary))?

**Question 10**
Please allocate the cancer relevant proportion of your research portfolio as indicated in Question 8 to the appropriate categories of the Common Scientific Outline (CSO), an international classification system of cancer research (please sum to 100%). For a detailed description of these categories, see www.cancerportfolio.org/cso.jsp.

A. Biology
B. Etiology/risk factors
C. Prevention interventions
D. Early detection, diagnosis, prognosis
E. Treatment
F. Cancer control, survivorship, outcomes

**Question 11**
Please allocate the cancer relevant proportion of your research portfolio as indicated in Question 8 to the appropriate phase(s) on the research translation continuum (please sum to 100%).

A. Discovery research (laboratory, epidemiology, behavioural, etc.)
B. Early translation (up to Phase I/II trials)
C. Late translation (Phase III trials, research commercialization)
D. Dissemination research, including education materials, training
E. Outcomes research, health services research, etc., to inform provider practice

**Question 12**
Please allocate your cancer research in terms of cancer sites/types (please sum to 100%):

- No specific site/type
- Bladder
- Bone and connective tissue
- Brain
- Breast
- Cervix
- Colorectal
- Esophagus
- Gall bladder
- Hodgkin's disease
- Kidney
- Larynx
- Leukemia
- Liver
- Lung
- Multiple myeloma
- Non-Hodgkin's lymphoma
- Oral
- Ovary
- Pancreas
- Prostate
- Skin
- Stomach
- Thyroid
- Uterus
- Other (please specify below)

**Question 13**
From this question, we would like to ascertain a count of the current cancer research workforce in Canada. To avoid double-counting, please answer this question only if you lead a cancer research program or team (e.g., lab, clinical trials group). Please indicate the current composition of your research team(s) at your institution (please indicate in full-time equivalents/FTEs).

- Undergraduate students
- Summer students
- Co-op students
- Master's level students
- Doctoral students
- Medical students
- Postdoctoral fellows
- Post-MD fellows
- Clinician scientists
- Research associates
- Study nurses/research coordinators
- Technicians
- IT/informatics specialists
- Statisticians
- Pathologists
- Health service specialists
- Program/project managers
- Senior managers
- Other (please specify below)

**PART C.**
**Cancer Research Human Resources Capacity in Canada**

**Question 14**
In your opinion, how do training opportunities in your area of cancer research in Canada compare to the U.S., U.K., or other key countries?

- About the same
- Canada has fewer opportunities
- Canada has more opportunities

**Question 15**
Have you experienced challenges in recruiting qualified cancer research personnel to your research teams/laboratory?

- Yes
- No

**Question 16**
Please indicate the research personnel that you have experienced challenges in recruiting (select all that apply):

- Undergraduate students
- Summer students
- Co-op students
- Master's level students
- Doctoral students
- Medical students
- Postdoctoral fellows
- Post-MD fellows
- Clinician scientists
- Research associates
- Study nurses/research coordinators
- Technicians
- IT/informatics specialists
- Statisticians
- Pathologists

- Health service specialists
- Program/project managers
- Senior managers
- Other (please specify below)

**Question 17**
What do you feel were the reasons you experienced challenges in recruiting qualified cancer research personnel to your research teams/laboratory? (Select all that apply).

- Eligibility for citizenship in Canada
- Insufficient funding/infrastructure to recruit qualified personnel
- Lack of qualified personnel
- No institutional training program(s)
- Other, please specify:

**Question 18**
Please select/expand on one response that best reflects your opinion about Canada's human resources capacity in the cancer research area.

- Canada has adequate/sufficient cancer research capacity at present and is not in any jeopardy in the foreseeable future. No action is needed.
- Canada has sufficient cancer research capacity at present, but a shortage could result in the longer term without the following:
- Canada has insufficient cancer research capacity, particularly in the following areas:
- Other (please specify):

If you feel that Canada has insufficient cancer research capacity, please identify how this could be addressed (select all that apply):

- More institutional training programs
- Enhanced opportunities for international training
- Enhanced institutional research administration/research support infrastructure
- Enhanced institutional recruitment/retention of researchers
- Greater availability of trainee awards/fellowships
- More designated/protected time to conduct research
- Increased funding for equipment/lab/research space
- Increased opportunities for interfaculty collaboration
- Increased opportunities for international collaboration
- More funding opportunities
- Other (please specify):

We welcome any additional comments.

**Question 19**
Would you be willing to be contacted further to elaborate on responses provided and assist us in the development of a report on the HR cancer research capacity in Canada?

- Yes
- No

# APPENDIX B. ESTIMATES OF THE CANCER RESEARCH WORKFORCE IN CANADA

Estimates were derived from information captured in the CCRS as well as additional information available from CIHR. "Direct" refers to trainees who received trainee awards in the CCRS. "Operating" refers to trainees and other personnel who were supported by operating grants as documented in the CCRS. Trainees supported through the Strategic Training Initiative in Health Research (STIHR) projects and provincial training programs are estimated from data published by CIHR. The footnotes provide further elaboration of the specific rows/columns in the table.

| Funding program sector | Funding mechanism | Level of Trainee [1] | | | | Other Personnel [2] | Total | Principal Investigators [3] |
|---|---|---|---|---|---|---|---|---|
| | | Undergraduate | Masters | Doctoral | Postdoctoral Fellows | | | |
| Federal government | Direct [4] | 52.0 | 179.3 | 309.4 | 141.9 | | 682.5 | |
| | Operating [5] | 241.2 | 263.5 | 504.7 | 682.3 | 894.1 | 2,585.7 | |
| | STIHR [6] | 155.1 | 182.8 | 328.6 | 203.1 | | 869.5 | |
| | Subtotal | 448.2 | 625.5 | 1,142.6 | 1,027.3 | 894.1 | 4,137.7 | |
| Provincial governments | Direct [4] | 12.0 | 100.4 | 147.6 | 124.4 | | 384.3 | |
| | Operating [5] | 59.2 | 64.7 | 123.9 | 167.6 | 219.6 | 635.0 | |
| | Training programs [6] | 25.2 | 29.7 | 53.4 | 33.0 | | 141.3 | |
| | Subtotal | 96.4 | 194.8 | 324.9 | 325.0 | 219.6 | 1,160.6 | |
| Charities | Direct [4] | 5.0 | 31.0 | 65.6 | 113.0 | | 214.6 | |
| | Operating [5] | 200.1 | 218.6 | 418.7 | 566.1 | 741.8 | 2,145.2 | |
| | Subtotal | 205.1 | 249.6 | 484.2 | 679.1 | 741.8 | 2,359.8 | |
| **GRAND TOTAL** | | **749.7** | **1,069.9** | **1,951.8** | **2,031.3** | **1,855.4** | **7,658.1** | **1,462.7** |

[1] This estimate excludes trainees and other personnel supported directly by institutions.

[2] Other personnel includes technicians, research associates, program managers, and other non-trainee staff.

[3] Includes the weighted number of nominated PIs with operating grants or career awards active in calendar 2009 as captured in the CCRS.

[4] Includes the weighted number of trainees with trainee awards active in calendar 2009 as captured in the CCRS.

[5] Applies mean values of personnel as submitted on a per project basis to the CCRS by Alberta Cancer Foundation, $C^{17}$ Research Network, Canadian Breast Cancer Foundation, Canadian Breast Cancer Research Alliance, CancerCare Manitoba, National Research Council, Nova Scotia Health Research Foundation, Ontario Institute for Cancer Research, Ontario Ministry of Economic Development and Innovation, Prostate Cancer Canada, and The Leukemia & Lymphoma Society of Canada to all operating grants active in calendar 2009.

[6] Estimates were derived from Table 5 in CIHR Internal Assessment - Report for the 2011 International Review and applied to the number of STIHRs and provincial training programs active in calendar 2009.

# Our Members

Alberta Cancer Foundation

Alberta Innovates Health Solutions

braintumour foundation of Canada

BC Cancer Agency Care & Research

Children's Cancer & Blood Disorders

CAPCA

CARO ACRO – Canadian Association of Radiation Oncology / Association canadienne de radio-oncologie

Canadian Breast Cancer Foundation / Fondation canadienne du cancer du sein

Canadian Cancer Society / Société canadienne du cancer

CIHR IRSC – Canadian Institutes of Health Research / Instituts de recherche en santé du Canada

Canadian Partnership Against Cancer / Partenariat canadien contre le cancer

CancerCare Manitoba – Action Cancer Manitoba

Cancer Care Nova Scotia

Ontario – Cancer Care Ontario / Action Cancer Ontario

Cancer Research Society / Société de recherche sur le cancer

Fonds de recherche Santé Québec

Genome Canada

Government of Canada / Gouvernement du Canada

The Kidney Foundation of Canada / La Fondation canadienne du rein – The foundation of kidney care. Totalement dévouée aux soins du rein.

Leukemia & Lymphoma Society Canada – fighting blood cancers

Manitoba Health Research Council

Michael Smith Foundation for Health Research – Discover. Connect. Engage.

NRC-CNRC Canada

NSERC CRSNG

New Brunswick / Nouveau Brunswick

Nova Scotia Health Research Foundation

OICR – Ontario Institute for Cancer Research

Ovarian Cancer Canada / Cancer de l'ovaire Canada

PROCURE – Halte au cancer de la prostate. The Force Against Prostate Cancer.

Prostate Cancer Canada

Fondation du cancer du sein du Québec / Quebec Breast Cancer Foundation – www.rubanrose.org

Saskatchewan Cancer Agency

A single dream. A world of hope. The Terry Fox Foundation

Canadian Cancer Research Alliance (CCRA)
1 University Avenue, Suite 300
Toronto, Ontario M5J 2P1 CANADA

http://www.ccra-acrc.ca

*Aussi offert en français.*