



Canadian Cancer Society
Société canadienne
du cancer

Innovation Grants Assessment

Summary of Findings

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Program background

In May 2010, the CCSRI underwent an in-depth evaluation and redesign of its research programs to ensure it continued to fund excellent, innovative and impactful research. The research program was evaluated and redesigned in order to:

- Align with the goals of the Canadian Cancer Society's nationwide strategic plan
- Strategically meet the needs of Canada's diverse communities of cancer researchers
- Be fiscally flexible and sustainable
- Respect the Canadian Cancer Research Alliance (CCRA) pan-Canadian cancer research strategy (allowing CCSRI to coordinate with and leverage other cancer research programs in Canada).

CCSRI's Innovation Grants were developed in consultation with the research community and the Society's Advisory Council on Research (ACOR) and formally launched in June 2011 – representing the first of the new CCSRI research programs to be initiated. They were created to support innovative, creative problem solving in cancer research. As competition for grant funding increases, peer review panels become more conservative and risk averse, emphasizing feasibility more than innovation. The goal of this program is to support unconventional concepts, approaches or methodologies to address problems in cancer research. Innovation projects should include elements of creativity, curiosity, investigation, exploration and opportunity. Successful projects may be based on "high risk" ideas, but will have the potential for "high reward" (i.e. to significantly impact our understanding of cancer and generate new approaches to combat the disease by introducing novel ideas into use or practice).

Innovation Grants are intended to accelerate the introduction of innovation into the entire cancer research system and contribute to the scientific idea pipeline. Although this grant program is primarily designed to support the biomedical, translational and clinical research communities, applications from all areas and disciplines of cancer research are considered eligible for funding and are evaluated based on a common set of criteria. Grant budgets may be up to \$100,000 per year and a maximum of \$200,000 per grant. Grant terms are typically 2 years, however may be extended over 3 years if justified. Grants are non-renewable. CCSRI's "Innovation to Impact (i2I)" Grants program was implemented in 2014 to provide a mechanism to support significant findings from ideas proposed within Innovation Grants, however successful Innovation Grants may also be supported through CCSRI's Impact Grants (if the scale and scope is appropriate), CCSRI's Prevention and Quality of Life Research Grants for relevant proposals, or grants offered by other agencies.

Multidisciplinary peer review committees are assembled to review the full applications. Peer review committees consist of scientific experts with broad expertise, along with community representatives to provide patient/survivor/caregiver perspectives. The mandatory abstract registrations inform the composition and number of panels required. Rather than pre-structuring panels, CCSRI staff uses the abstract registration step to assess the breadth of research areas represented and determine the needed panel structure. Typically, panels composed are as follows:

- Biomarkers and Genomics (Panel I1a)
- Gene Regulation and Cell Biology (Panel I1b)
- Imaging and Technology Development (Panel I2)

- Immunology, Signalling and Stem Cells (Panel I3)
- Novel Therapeutics (Panel I4)
- Prevention and Quality of Life (Panel I5)

There are two competitions per year with the anticipation that up to 25 grants will be awarded in each competition (up to 50 grants a year). Having been operational for 3 years, the Innovation Grants program is currently operating at a steady state. Note that as a result of significant donor interest and the strength of Innovation Grant proposals relative to other CCSRI funding programs, significantly more Innovation Grants than originally budgeted have been supported in several competition rounds. To date, there have been 8 competitions resulting in 286 awarded grants representing a \$54.9M funding commitment.

Assessment goals and audience

The goal of the assessment was to determine if the Innovation Grants program is beginning to meet its goals and what effect the program is having on the research community. Furthermore, it was meant to establish a performance baseline related to the Innovation Grants program that can be used to contextualize and benchmark against future outcome data.

The primary audiences of the assessment include senior staff and scientific advisory committees. Secondary audiences include the research community and other research funders. Project findings are meant to inform discussions around future program design and provide key stakeholders with messages related to program outcomes.

Assessment questions and data sources

The assessment was guided by a set of 4 general evaluation questions and related specific questions. To help answer these questions different data sources were analysed. Progress report data directly related to publications and citations, commercialization activity and leveraged funding were used to assess research performance. These indicators were chosen because they most closely align with the specific goals of the Innovation Grants program. General funding statistics were analysed to assess program goals not directly associated with research performance and to help uncover the effects of the program on the research community (both applicants and reviewers). Program budgets and records were also used to assess how the program is helping the Society meet its “charity of choice” goals. All data was cleaned and adequately prepared for analysis. The table below shows how the general evaluation questions, specific evaluation questions and data sources intersect.

General Evaluation Question	Specific Evaluation Question	Data Sources and Units of Analysis
1. Is the Innovation Grants program beginning to meet its goals? What are the main outcomes and	What are the program’s general funding statistics?	Funding statistics from all competitions (n=8)
	Is the program attracting new researchers?	

more immediate benefits achieved through the Innovation Grants program?	How is the program generally performing?	Progress report data from completed Innovation Grants ¹ (n=62); Google Scholar
2. What have been the effects of the Innovation Grants program on the research community? What are the human costs associated with administering the Innovation Grants program?	What are (human) the costs to the system in terms of reviewing these grants?	Funding statistics from all competitions (n=8)
	How many students, trainees and technical staff are being supported through these grants?	Progress report data from completed Innovation Grants (n=62)
3. What have been the effects of the Innovation Grants program on supporting the Society's mission?	How has the Innovation Grants program contributed to the Society's "charity of choice" goals?	Program records; CCSRI budget
4. How does the research performance and administrative costs of the Innovation Grants program compare to previous CCSRI research programs (i.e. the Research Grants program)?	How does the program's performance compare to the previous Research Grants program?	Progress report data from a subset of completed Innovation Grants (n=50); Progress report data from a subset of completed Research Grants (n=50); Google Scholar
	How many students, trainees and technical staff are being supported through these grants as compared to the previous Research Grants program?	
	What are the (human) costs to the system in terms of reviewing these grants as compared to the previous Research Grants program?	

¹ Innovation Grants that completed their terms and submitted all applicable annual progress reports.

Key Findings

- The number of applications has generally gone up year over year since the program's inception (with the exception of the INNOV13-2 and INNOV15-2 competitions). This suggests that the program has been well received by research community (i.e. filling a gap) and/or is a reflection of the changing cancer research funding landscape in Canada in which there are a shrinking number/amount of funding opportunities overall.
- Junior Investigators² account for 15% (n=44) of all successful applications whereas New Investigators to CCSRI³ account for 4% (n=13) of all successful applications. When compared to the previous Research Grants program, the Innovation Grants program is attracting a greater percentage of Junior Investigators (16% for Innovation Grants vs 10% for Research Grants) and a similar percentage of New Investigators to CCSRI (9% for Innovation Grants and 10% for Research Grants). This suggests that the Innovation Grants program is not disadvantaging these classes of investigators.
- 74% of completed Innovation Grants have been 'successful' – i.e. resulted in a publication and/or leveraged funding for a project's next steps. When compared to the previous Research Grants program, Innovation Grants are producing a lower rate of publications per grant (0.8 for Innovation Grants vs 1.87 for Research Grants), but they are generating a higher leveraged funding per dollar invested (\$2.05 leveraged for Innovation Grants vs \$1.53 leveraged for Research Grants).
- An average of 5.3 personnel have been directly supported⁴ through each Innovation Grant. When compared to the previous Research Grants program, Innovation Grants directly support a lower number of personnel per grant (3.1 personnel per Innovation Grant vs 4.6 personnel per Research Grant).
- The average volunteer hours per application for the Innovation Grants program has slightly decreased over time and they are substantially lower than they were for the previous Research Grants program (e.g. 11.5 hours for INNOV15 and 30.0 for RG11). This would suggest that the Innovation Grants program is not over burdening the reviewer community; however, it should be noted that the Innovation Grants program is offered twice a year and the Research Grants program was offered only once a year.
- The Innovation Grants program has played a key role in helping the Society achieve its 'charity of choice' goals. It has accounted for nearly half (45%, \$10M) of the total value of all named CCSRI grants (grants directly supported by donors or partners).

² Applicants who have been an independent PI for less than 5 years as indicated on their grant application.

³ Applicants that have not previously applied for CCSRI funding as a PI, co-PI, co-applicant or additional author.

⁴ Refers to personnel who have been paid in whole or in part.

What are the program’s general funding statistics?

Since the program’s inception, a total 1561 applications have been submitted by 941 Investigators representing an average of 1.66 applications per Investigator. 286 Innovation Grants have been awarded resulting in an 18% success rate overall. 272 Investigators have been awarded an Innovation Grant and 95% (n=259) of successful Investigators hold only one Innovation grant. Finally, 21% (n=55) of all successful applications have been re-applications.

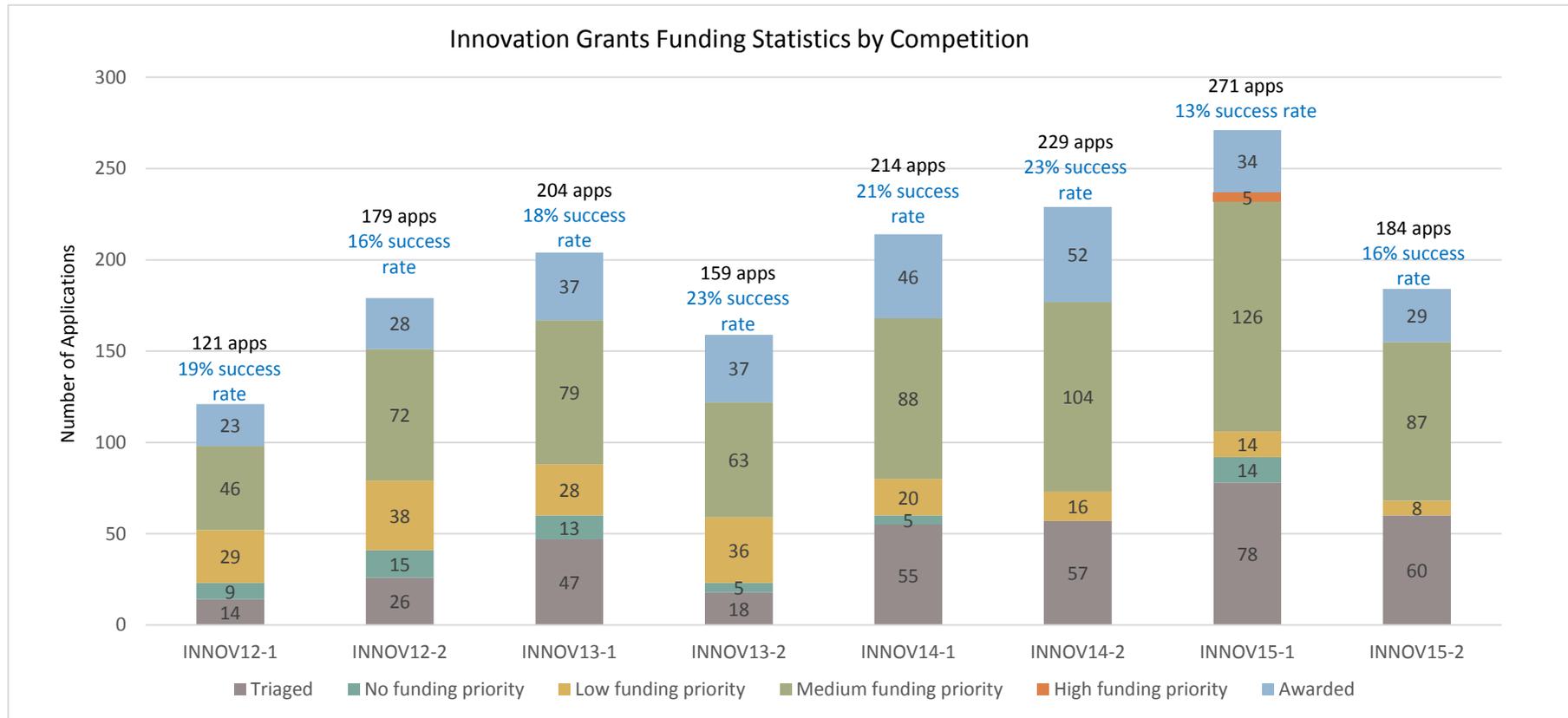


Figure 1. The total number of applications received, the number of grants awarded and the number of applications in each priority ranking based on CCSRI’s scoring scale are provided for each competition.

Is the program attracting new researchers?

Junior Investigators and New Investigators to CCSRI combine to account for 25% (n=390) of all submitted applications. Overall, Junior Investigators have an 18% success rate and account for 15% (n=44) of all successful applications. New Investigators to CCSRI have a 9% success rate overall and account for 4% (n=13) of all successful applications. All other Investigators (i.e., those who are neither a Junior Investigator nor a New Investigator to CCSRI) have a 20% success rate overall and account for 81% (n=229) of all successful applications.

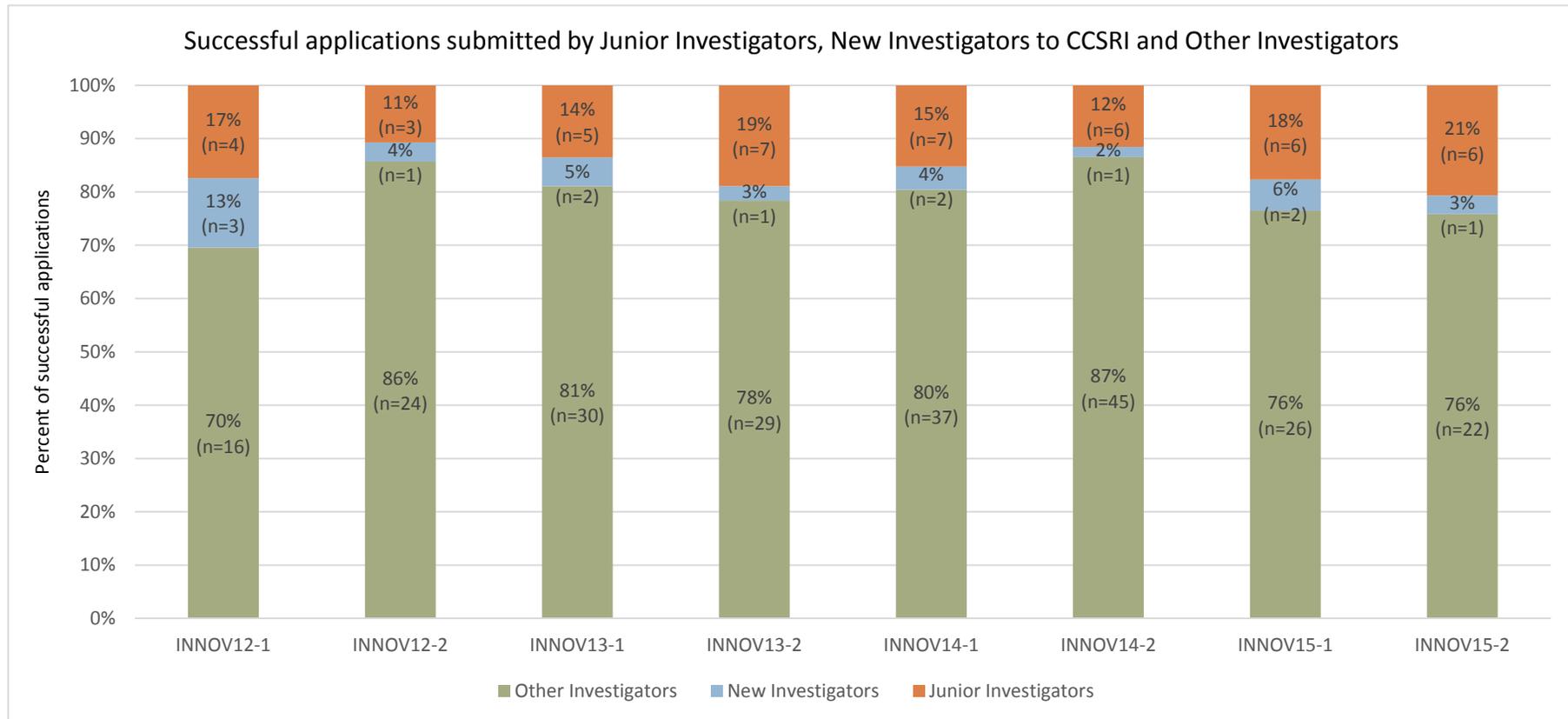


Figure 2. The proportion of successful applications in each competition submitted by Junior Investigators, New Investigators to CCSRI and all other Investigators.

How is the program performing?

The table below displays the publication and citation record of the completed Innovation Grants. It shows that 50% of the completed Innovation Grants resulted in at least one publication and that 85% of publications have been cited. A total of 54 publications have been produced resulting in an average of 0.87 publications per grant.

Grants Resulting in Publication(s)	31 (50%)
Total Publications	54
Publications per grant (average)	0.87
Cited Publications	46 (85%)
Total Citations	617
Citations per Publication (average)	13.4
Citations Per publication (median)	5

40% (n=25) of completed Innovation Grants resulted in leveraged funding to specifically develop a project's next steps. The table below provides a breakdown of the leveraged funding by source and shows that CCSRI accounts for 65% (\$6.9M) of the leverage funding for next steps.

Leveraged Funding for Next Steps	\$10,815,819 (n=25)
Innovation to Impact Grants	\$4,471,895 (n=10)
Impact Grants	\$2,499,950 (n=2)
Other Sources	\$3,843,974 (n=13)

Some form of commercialization activity was reported by 21% (n=13) of completed Innovation Grants. The table below shows commercialization activity by type.

Provisional Patents Filed	8
Invention Disclosures	4
Patent Applications Filed	3
IP Agreements	2
Patents Granted	1

How many students, trainees and technical staff are being supported through Innovation Grants?

A total of 327 personnel have been paid⁵ through the completed Innovation Grants. This represents an average of about 5.3 personnel paid per grant. Overall, a larger number of graduate students and technical staff are supported than fellows and undergraduate students.

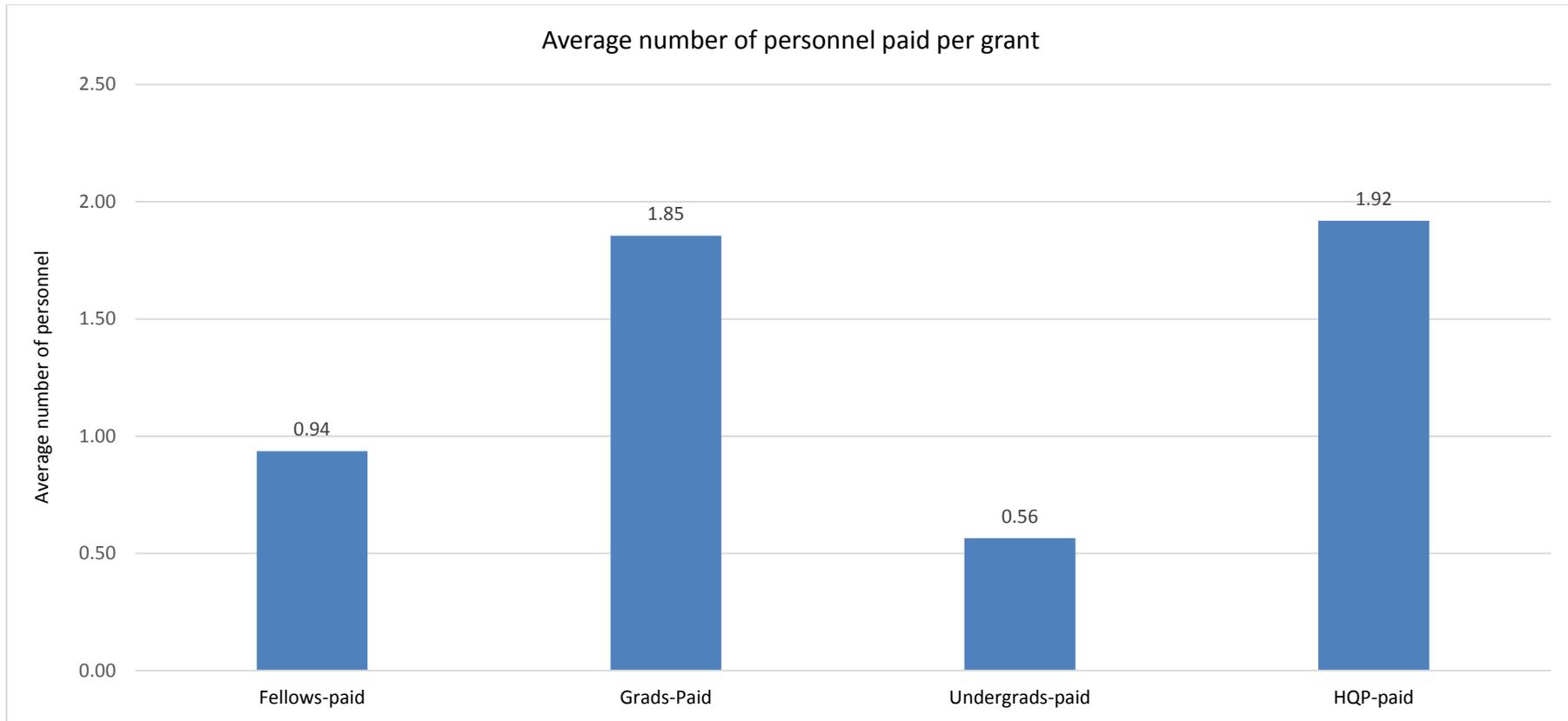


Figure 3. The average number of personnel paid per grant, per year.

⁵ Refers to personnel paid in whole or in part and, as such, these numbers do not solely reflect full time personnel.

What are the (human) costs of reviewing Innovation Grants?

Overall, the average volunteer hours per application has slightly decreased over time. The average volunteer hours per funded grant has fluctuated across competitions – generally, as the number of grants funded increases the average volunteer hours per funded grant decreases and vice versa.

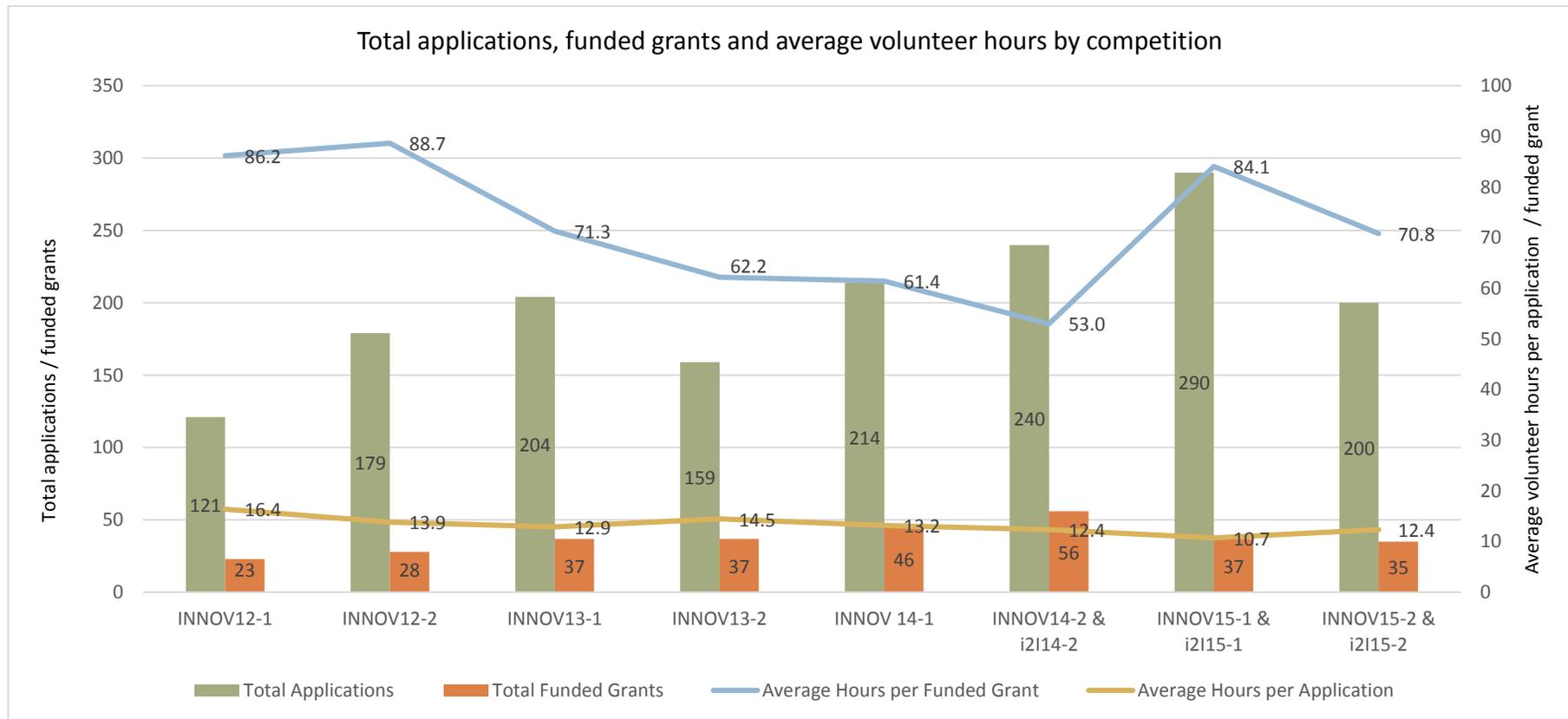


Figure 4. The total number of applications and funded grants (primary y-axis) as well as the average number of volunteer hours per application and funded grant (secondary y-axis) for each competition.

How has the Innovation Grants program contributed to the Society’s “charity of choice” goals?

A strategic focus of the Society’s Nationwide Strategic Plan 2010–15 was for the Society to position itself as the cancer charity of choice. To engage more Canadians to get involved in the fight against all cancers and have Canadians choose the Society as their cancer charity – to donate, volunteer and work. To this end, a greater focus was placed on external engagement and a new culture of philanthropy with increasing integration between the Society’s brand, mission and fundraising activities.

There have been 54 named Innovation Grants (53 supported by donors and 1 supported with a partner). The total value of named Innovation Grants is \$10M. More specifically:

- Innovation Grants account for 61% (n=54) of all named CCSRI grants
- Innovation Grants account for 45% (\$10M) of the total value of all named CCSRI grants

As a result of this significant donor interest and the strength of Innovation Grant proposals, significantly more Innovation Grants than originally budgeted have been supported.

How does the Innovation Grants program performance compare to NCIC/CCSRI's previous Research Grants program?

A subset of completed Innovation Grants from the INNOV 12-1, 12-2 and 13-1 competitions (n=50) and a subset of Research Grants from the RG10 and RG11 competitions (n=50) were compared based on publications⁶/citations, leveraged funding⁷, and supported research personnel⁸. Research Grants from the RG10 and RG11 competitions were selected because they had a 3 year funding term, which is similar to the Innovation Grants funding term. The subsets include a similar number of initial applications and reapplications – renewals were removed from the Research Grants subset. Additionally, a similar number of new investigators to CCSRI (n=4) were included in both subsets.

As the comparison summary shows below, the Research Grants program had a higher number of publications, citations and a higher number of personnel paid whereas the Innovation Grants program had more leveraged funding. When taking into consideration funding investment for each program, the publication per dollar invested and personnel paid per dollar invested was lower for the Research Grants program whereas a greater amount of leveraged funding per dollar invested was generated by the Innovation Grants program.

Program	Total Funding Investment ⁹	# of publications	Publications per grant (average)	Publications per \$ invested	Leveraged funding amount	Leveraged funding per \$ invested	# of personnel paid	Personnel paid per grant (average)	Personnel paid per \$ invested
Innovation Grants (n=50)	\$9,419,534.27	40 publications	0.8	\$235,488.36 per publication	\$19.3M	\$2.05 leveraged	154 personnel	3.1 personnel	\$61,165.81 per personnel
Research Grants (n=50)	\$12,205,102.53	99 publications	1.98	\$123,283.86 per publication	\$18.6M	\$1.53 leveraged	230 personnel	4.6 personnel	\$53,065.66 per personnel

⁶ Reported Publications from 2012, 2013, 2014, and 2015 were included for INNOV12-1, INNOV12-2 and INNOV13-1. Reported Publications from 2010, 2011, 2012, and 2013 were included for RG10 and RG11.

⁷ Only leveraged funding reported in the first two progress reports was included in the analysis.

⁸ Only paid research personnel reported in the first two progress reports was included in the analysis.

⁹ Funding investment was adjusted to include the first two years only – 1/3rd of funding was removed from each Research Grant and from the Innovation Grants that were extended to 3 years (n=7)).

How does the (human) cost of reviewing Innovation Grants compare to the cost of reviewing Research Grants?

The administrative costs of the Innovation Grants program was compared to previous Research Grants competitions¹⁰ and that comparison is displayed in the figure below. The Innovation Grants competitions were grouped by year since the program is offered twice a year as opposed to the Research Grants program, which was only offered once a year. Overall, the number of grant applications (yellow bar) has increased over time while the average volunteer hours per application (blue line) has decreased. While the average number of volunteer hours per funded grant (orange line) appears much lower for the Innovation Grants program, when normalized for the value of the grants, the average number of volunteer hours per \$100K awarded (green line) has remained relatively consistent over time.

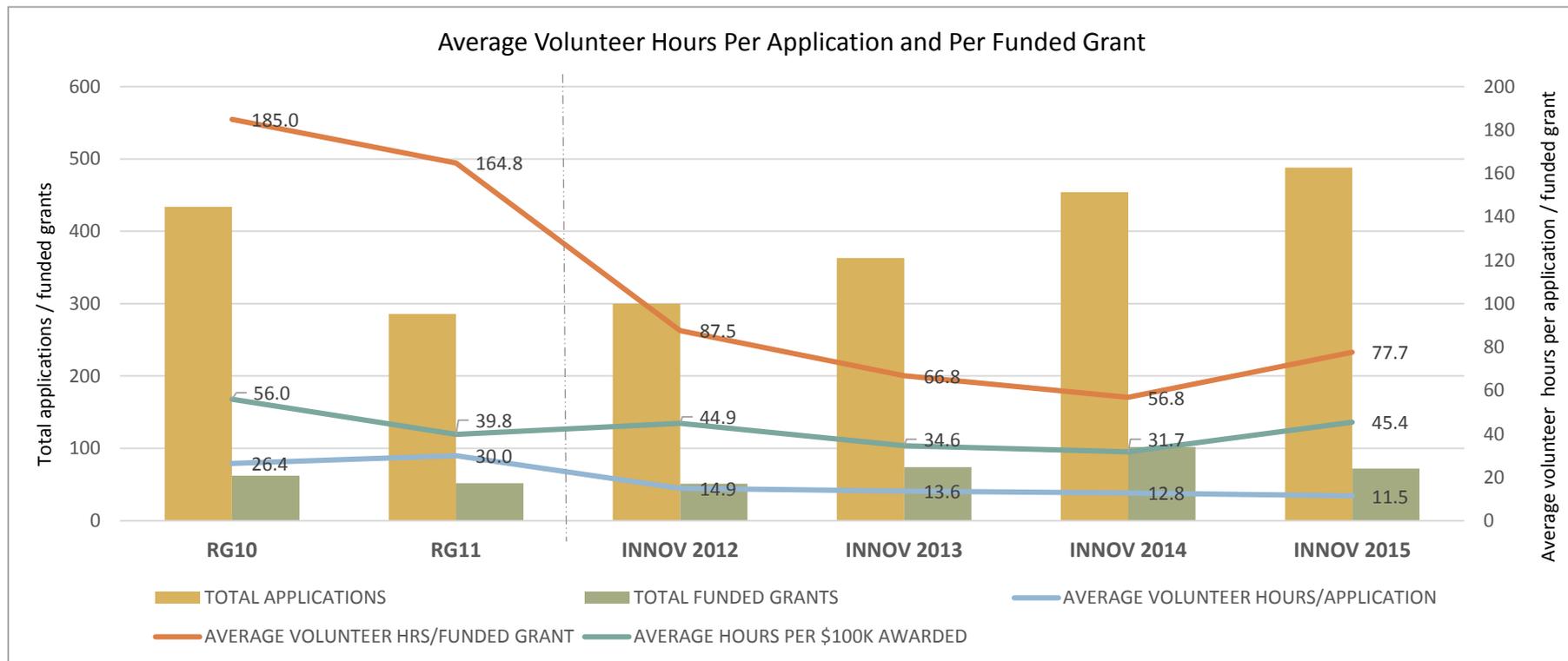


Figure 5. Total Number of Applications, Total Number of Funded grants, Average Volunteer Hours per Application, Average Volunteer hours per Funded Grant and Average Volunteer Hours per \$100K Awarded.

¹⁰ INNOV14-2, 15-1 and 15-2 competitions include i2I grants (INNOV14-2: 11 i2I apps, 4 funded, INNOV15-1: 19 i2I apps, 3 funded, INNOV15-2: 14 i2I apps, 6 funded).

Conclusion and Next Steps

Overall, the Innovation Grants program is performing relatively well – especially in the area of leveraged funding. Innovation Grants are not producing as many publications nor are they supporting as many personnel as the previous Research Grants program, but these programs did have very different purposes. The increasing number of applications over time indicates strong researcher awareness and that the program may be filling a need amongst the research community. The program also seems to be attracting a suitable number of Junior Investigators and New Investigators to CCSRI. Finally in relation to reviewer burden, fewer volunteer hours per application are required for Innovation Grants than for the previous Research Grants. Although it is important to note that the Innovation Grants program runs twice a year, whereas the Research Grants program ran only once a year.

Many of the Innovation Grants included in this analysis ended quite recently, so it will be important to track the longer term impacts of these grants over time. Additionally, it will also be important to assess the Innovation Grants program in the context of CCSRI's larger portfolio and to assess whether similar trends continue as we monitor and evaluate the other funded Innovation Grants (this analysis only represents the first subset of funded Innovation Grants) going forward.