



Statistics and Actuarial Science
Simon Fraser University
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Director Serge Villemure
Director, Chemistry, Engineering and Mathematical Sciences
Natural Sciences and Engineering Research Council of Canada
350 Albert Street
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Dear Director Villemure,

Thank you for your presentation at the annual meeting of the Statistical Society of Canada held recently in St. John's and your information on the changes at NSERC, especially with regard to the operation of GSC 14.

The current system has been based on many years of careful construction and evolution and has worked exceptionally well. Because the changes being implemented are not in response to specific problems which have arisen with the current system, caution in implementing drastic changes seems advisable. As a community, we are grateful for NSERC's efforts to ensure it does the best for our discipline, that it seeks our responses to changes implemented, and that it is willing to adapt itself based on such responses. This letter discusses approaches which we view as important. We put them forward in the spirit of cooperative discussion and evaluation. You can be assured that we understand that both our community and NSERC have the same goal in mind: that of making Canada renowned for innovation and excellence in statistical sciences and of developing statistical tools and methods to make our Canadian and global community flourish.

Innovation and Growth of the Discipline:

The considerable increase of applications to NSERC in the discipline of statistics has certainly caused tremendous burdens on the statistical sciences GSC. However, it is also a reflection of a remarkable amount of growth in the discipline in Canada in response to the many areas in science and technology which depend critically on statistical reasoning and methodology. NSERC has clearly helped to encourage and support the growth of our discipline, but because of this growth and the fact that we are a relatively young discipline without large current numbers of retirements and with a substantial proportion of active senior researchers, we struggle to provide adequate funding to the large numbers of deserving applicants that we consider.

Research in statistics is fundamental to advances in many other disciplines. Many research areas require complex statistical methodologies which are actively being developed by our community. Monitoring for the effects of climate change, for example, requires new statistically rigorous



techniques because standard methodology lacks the power to detect small but steadily increasing effects; efficient and accurate disease surveillance depends critically on statistical contributions for monitoring incidence and modeling spread of disease; health informatics and health economics rely on statistical analysis of huge data bases on diagnosis and treatment. All of these areas require statistical innovation to meet new challenges. As a community we view the growth in the discipline very positively – much hard work has gone into putting forward cases at universities in Canada that a re-shaping of the scientific enterprise is required which increases the size of the statistics faculty complement in our universities. It would be very unfortunate if the effects of changing policies at NSERC were to compromise the advances our community has striven so hard to achieve. Substantial growth of the discipline in Canada is crucial for attaining critical mass for this young discipline and fundamental to the breakthroughs in many scientific fields through our collaborative involvements.

Support for Young Researchers and Researchers Working in Isolation:

The support for young researchers in Canada has been an important distinguishing feature of NSERC especially in comparison with the UK, the USA and Australia. It gives new faculty the opportunity to establish a research career and to demonstrate their potential. In statistics particularly, current demand means researchers are hired soon after they complete their doctorate degree; new statistical researchers do not typically have the protective environment of postdoctoral fellowships to start building their research careers. After about 6 years from the completion of the doctorate degree, we would want to see an emphasis on training of HQP and on the impact of research, as well as international recognition.

Support for researchers at smaller universities plays an important role in the education of MSc students and in the recruitment of undergraduates into graduate programs, through the provision of research assistantships. There is a very strong demand for both Masters and PhDs in statistics and it is imperative that we attract more qualified applicants, especially at a time when many universities have the expansion of graduate programs as a key objective.

In the last few decades, our system has been the envy of other jurisdictions, giving grant-holders creative freedom to choose and change direction in response to new challenges and emerging areas; the ability to award grants to new researchers partly on the basis of potential; the possibility of awarding small grants to those whose main funding comes from elsewhere. Canada has historically had a strong commitment to supporting isolated regions, and the support of researchers at smaller universities is an important part of this commitment.

Measuring Success: Excellence and Training of HQP

Trying to measure success is important but difficult. Using application success rates may not be particularly meaningful for a small discipline. Many Canadian statistical researchers have international reputations; excellence in the Canadian statistical context should be measured in different terms. Measures should reflect the high rankings of Canadian researchers in many areas of the statistical sciences, and their powerful impact on both statistical theory and, perhaps more significantly, on statistical practice. The latter is also seen in the collaborative work that many statistical scientists undertake.



Importantly, such measurements should emphasize our success at training of HQP. At some institutions, undergraduates are active in research as well. Many of these undergraduates go on to graduate work and research careers, so the contribution of undergraduate research should not be overlooked. Most of our graduates (both MSc and PhD) work in fields associated with the discipline of statistics. There is extremely strong demand for all our graduates, not only those who become academics, with most students being recruited before they complete their theses. Their high employment rate also indicates that they do have the training employers need. NSERC has data from each researcher on training which could be used for assessment. Success could also be measured by talking to major employers such as Statistics Canada. The excellence of Official Statistics in Canada is additionally, another measure of success. Statistics Canada has long been recognized as being among the best statistical agencies in the world. The selection of Montreal, in 2001, as the new site for UNESCO's Institute of Statistics is a tribute to Canada's excellence in this area. Most of the 150 statisticians working at Statistics Canada have obtained a graduate degree in a Canadian university. Many of our graduates also emerge as leaders in a huge variety of fields. Finally, success in collaborative work could also be measured by additional grants held by statisticians and their collaborators.

The primary goal of NSERC is to foster research excellence. We believe that the current system already does this to a great extent.

The Utility of some Small Grants and the Impact of Reducing the Success Rate:

Because statistics is often collaborative, small grants have an impact in our GSC beyond that in other GSCs. A grant of \$10,000, for example, could very effectively provide training with allocations of \$7,000 for partial student support and the remainder for travel or equipment. Collaborative research with other disciplines often requires the development of new methodologies. The research program of some collaborators may not allow the development or investigation of statistical properties of such new methodologies, but small grants to statisticians allow them to combine with funds with other holders to properly develop and assess these new tools. Similarly, small grants allow researchers to "top-up" other funds from programs such as MITACS, to more fully develop new methodologies. Small grants are also often sufficient to purchase equipment needed by individuals at smaller institutions to support their research and that of their students.

Note that there is a triage process that occurs well before applications are received at the national level. Only those researchers with well-developed proposals apply to the GSC. Unlike other disciplines (such as in health research), there are a limited number of other funding sources so most researchers in our GSC do not apply to several granting agencies hoping to be funded by one. We believe this lends further strength to the desirability of permitting small grants to deserving applicants – those with significant research and HQP training programs. Researchers in statistics do not have a cadre of post-doctoral fellows in laboratories that can help train additional students – most of our training is done directly by senior supervisors. As a result reducing the success rate may have the unintended consequence of reducing the flow of HQP, as most statisticians are "time poor". With the high demand for HQP in the statistical sciences, we need to enlist as many qualified researchers as possible in the training enterprise. We also need to encourage collaboration on pressing scientific and public affairs issues by providing researchers with funding to support the statistical innovation that is often needed. It would be a lost



opportunity not to engage as many good scientists as possible in these activities. Indeed, we emphasize that the *big science* model is not equally applicable to all disciplines.

Here are some additional brief comments on other aspects of your presentation.

The current GSC structure and how well it serves our community or discipline

The statistics community is well served by the current GSC structure. The statistical sciences GSC is the home of most research statisticians in Canada. The evaluations made by this GSC are respected and meet with a general acceptance in the community. Other granting agencies with multidisciplinary programs, such as CIHR and Quebec's FQRNT, use NSERC evaluations as an input for their own assessment. These multidisciplinary GSCs do not have the expertise for an in-depth evaluation for individual applicants as NSERC's GSC structure allows. In fact, NSERC evaluations are often looked at as a gold standard which some other granting agencies use in their own selection procedures.

Are there specific current research areas that aren't handled well by the current system – e.g. interdisciplinary work, or inter-Council proposals?

Statistics is an important methodological tool for many sciences and several research proposals in application areas have important statistical components. Many applications in biostatistics and in economics are, for instance, handled by the statistical sciences GSC. These applications could also fall within CIHR's or SSHRC's mandate. Typically the statistical sciences GSC has managed to maintain good expertise in these areas and to feel relatively comfortable when evaluating these applications, though there have been some occasions where difficulties have arisen. Some recent efforts to promote interdisciplinarity, for example, the Collaborative Research Grant Program and NPCDS may well be important avenues for collaborative ventures in the future.

Do you see emerging research areas that will stretch the current system, either in terms of workload or because the areas will be outside the mainstream of the existing GSCs?

Current advances in some fields will pose challenges; for example, those in the life sciences, especially in genomics, are overwhelming. This research is carried out at the intersection of biostatistics, computer science, probability and the biological sciences. With some adjustment the current GSC structure should be able to adapt to new challenges.

What are the areas of intersection, overlap or complementarity with other disciplines or GSCs?

Industrial engineering, experimental psychology, computer science, population biology, various other engineering fields, probability are examples of areas of intersection. Some statistical science researchers can and do apply to other committees. However, interdisciplinarity is the nature of the discipline and it does not mean that the current discipline-oriented committees should be replaced by multidisciplinary committees. This would make it harder to develop



methodology that cuts across the needs of various areas, and would also hinder the highly valuable cross-fertilization that occurs now. For example, consider that important methods developed for reporting delays in industrial warranties are also now used in connection with disease surveillance.

How important is the sense of “home” for your discipline within the GSC structure, and could this be provided by another kind of structure?

The statistical sciences GSC was formed more than 30 years ago. It has substantial connections to many areas with much of the motivation for innovations in theory and methods arising from emerging problems in a huge variety of fields. In fact, the creation of the statistical sciences GSC at NSERC came at about the same time as the creation of the Statistical Society of Canada. NSERC has worked well with the SSC to make the statistical sciences GSC the home of the discipline in Canada. The GSC’s procedures have not been stagnant, but have evolved to suit the needs of the discipline in Canada. The quality evaluations produced by the current GSC structure are highly valuable. Multidisciplinary committees with a broad base could not achieve the same level of detail in their assessments of research proposals. Those of us with experience on international grant selection panels believe that the current structures suit our field extremely well.

What is your vision of the ideal system for the Discovery Grants program?

The Discovery Grant program should serve as the premier program for the discipline of statistical science. That is, it should support innovation in theory and methods, and the training of HQP (and their recruitment) in statistical science. One of the first tasks of the NSERC Liaison committee will be to articulate a vision for the Discovery Grants program. The current system is close to ideal.

Yours sincerely,

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SSC President

cc

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