Program Progress Report
Institutional Quality Assurance Program (IQAP) Review
STATISTICS M.SC. PROGRAM

Date of Site Visit: February 12-13, 2018
Progress Report Prepared by: Matheus Grasselli, Chair, Mathematics and Statistics

Please outline below how recommendations from the initial program review have been addressed. [Please fill in one table for each recommendation from the original Final Assessment Report]

Recommendation: **1. Developing regular rotation of graduate courses**
Responsibility for Implementation: Chair and Associate Chair (Statistics)
Anticipated Timeline for Completion: Next three years
Additional Notes/Commentary: The Statistics group plans to return to the practice of holding regular meetings and recommending a slate of courses to the Department.
Progress (check one) ☐ Completed X In Progress ☐ Other (please explain)
Department's Comments: The Chair and Associate Chairs (Graduate and Statistics) conducted an extensive review of graduate courses offered by the Department and established that there will be 5 core 700-level MATH courses offered each year plus 4 pairs of 700-level MATH courses offered in alternating years. Similarly, for the time being, there will be 7 core 700-level STATS courses offered each year, namely 743(1), 743(2), 752, 771, 790 and two sections of 780, plus one 700-level STATS course chosen on the basis of a survey of graduate students and availability of instructors. In 2021-22 this course is STATS 756. A review of the course structure and content for the Statistics MSc is currently underway with the view to modernize the curriculum and is expected to be completed this year (see Recommendation 2 below). This will include a revised list of core and rotating courses.
Dean's Comments: The department has taken several steps to implement the recommendation. We are supportive of their efforts.
QAC Comments (to be filled in by Quality Assurance Committee): QAC reviewed this report and had no further comments or concerns.

Recommendation: **2. Modernize the curriculum**
Responsibility for Implementation: Chair and Associate Chair (Statistics)
Anticipated Timeline for Completion: 2018-2019
Additional Notes/Commentary: This recommendation included a proposal for a new course STATS 790 (Statistical Learning), as well as rotation between STATS 6CI03 (Computational Inference) and STATS 6I03 (Inference) starting in Winter 2019.
Progress (check one) ☐ Completed X In Progress ☐ Other (please explain)
Department's Comments: In addition to the 700-level STATS courses mentioned in Recommendation 1, the Department implemented the recommended rotation between STATS 4I03/6I03 (Inference) and STATS 4CI3/6CI3. The recommended new course STATS 790 (Statistical Learning) has been created and offered every year beginning 2019-20. As mentioned in Recommendation 1, a review of the course structure and content for the Statistics M.Sc. is currently underway with the view to modernizing the curriculum. One focus of this review, which is being led by the Associate Chair (Statistics), is to modernize the core courses for the Statistics M.Sc.; e.g., to ensure that there is substantial Bayesian statistics contents within the core courses. Because the Ph.D. in Statistics allows students to fulfill their course requirements by taking any two 700-level STATS courses, modernization of the courses for the M.Sc. in Statistics will *ipso facto* modernize courses for the Ph.D. in Statistics.
Dean's Comments: As mentioned above, the department has made progress on this front. The plan to revise M.Sc. level curriculum is proposed. The changes will require the approval of the Faculty of Science Graduate Curriculum, Policy, And Study Committee (GCPASC).
QAC Comments (to be filled in by Quality Assurance Committee): See above.

Recommendation: **3. Maintain list of available courses from outside the program**
Responsibility for Implementation: Chair and Associate Chair (Statistics)
Anticipated Timeline for Completion: 2019-2020
Additional Notes/Commentary: Regrettably, relatively few students in the Stats MSc program take courses from outside the Department. Having an up-to-date list of available courses might serve to increase the participation rate in such courses, and we will consult with other departments to help prepare and maintain such a list.
Progress (check one) ☐ Completed X In Progress ☐ Other (please explain)
Department's Comments: The Department website was upgraded on 2019 and now features a "Graduate Courses" page that lists all MATH and STATS courses offered in the current academic year, together with the corresponding outline, the instructor assigned to each and the next term in which the course is scheduled to be taught. This is preceded by a link to a "Graduate Course Outline Archive" with a list of courses offered in previous academic years (beginning 2019-20) and their corresponding course outlines, as well another link to the full list of "Program and Course Offerings" in the current Graduate Calendar. The next step in the revamping of the website will be to add an up-to-date list of recommended courses offered by other departments as per the recommendation above.
Dean's Comments: The department is in the process of identifying suitable externally offered courses. We await further details. In addition to other McMaster units, students may utilize the Ontario Visiting Graduate Student program to take courses elsewhere in the province. Both these options should be explored.
QAC Comments (to be filled in by Quality Assurance Committee): See above.

Recommendation: **4. Ensure the size of the Statistics group does not decrease**
Responsibility for Implementation: Chair
Anticipated Timeline for Completion: Next five years
Additional Notes/Commentary: One new tenure-track faculty hire in Statistics has been approved, with an anticipated start date of July 1, 2019. In addition, candidates in the current search for a teaching-track faculty member in Actuarial Science are expected to be able to contribute through the teaching of undergraduate courses in statistics. Nevertheless, the Stats group is concerned, with the pending retirement of Dr. Roman Viveros, the new hire will only maintain the current supervisory capacity in statistics; additional faculty hires in statistics will be needed to increase that capacity.
Progress (check one) ☐ Completed X In Progress ☐ Other (please explain)
Department's Comments: Since the site visit, the Department successfully completed 9 new hires, including the following three related to statistics, the last two of which are now part of the Statistics group: Dr. Anas Abdallah (Assistant Professor, teaching stream, Actuarial Sciences), January 2019 Dr. Noah Forman (Assistant Professor, tenure track, Probability and Statistics), July 2019 Dr. Pratheepa Jeganathan (Assistant Professor, tenure track, Statistics and Data Science), January 2021 In addition, the Faculty of Science approved a tenure-track Assistant Professor position in Data Science in Actuarial and Financial Mathematics and a teaching-stream Assistant Professor position in Statistics, both to start in July 2022. Going forward, the Chair is supportive of proposals for new hires in Statistics to be submitted to the Faculty of Science within the framework of the Department next strategic plan and considers the long term sustainability of the Stats MSc and PhD programs to be of high priority.
Dean's Comments: The Faculty of Science has a centralized process for the submission and consideration of requests for new faculty positions that takes into account many factors including undergraduate and graduate teaching, research, alignment with the strategic plan, equity diversity and inclusion, performance benchmarks and resources available. These will all be considered in any future submissions.

QAC Comments (to be filled in by Quality Assurance Committee): See above.

Recommendation: **5. Hire in modern areas of statistics**
Responsibility for Implementation: Chair, Associate Chair (Statistics), and Appointments Committee
Anticipated Timeline for Completion: Next two years
Additional Notes/Commentary: The Department is optimistic that it will be able to recruit a strong candidate working in an area of statistics that will help modernize the program
Progress (check one) ☐ Completed X In Progress ☐ Other (please explain)
Department's Comments: From the new hires mentioned in Recommendation 4 above, Dr. Pratheepa Jeganathan works in the modern area of data science and biostatistics, and Dr. Noah Forman's research has applications to statistical learning, in particular hierarchical classification. As mentioned in Recommendation 4 above, the Chair is supportive of other proposals for future hires in modern areas of Statistics, especially those that strengthen the ties with other research areas inside and outside the Department.
Dean's Comments: As indicated in the response to item 4, departments have the capacity to submit faculty hiring requests with detailed justification in a range of areas.
QAC Comments (to be filled in by Quality Assurance Committee): See above.

Recommendation: **6. Improve quality of student office space**
Responsibility for Implementation: Chair
Anticipated Timeline for Completion: Next five years

Additional Notes/Commentary: The Chair is ultimately responsible for the allocation of all space within the Department, including graduate offices. Right now, the Department is experiencing a severe shortage of graduate desk space, and the situation will unfortunately get worse before it gets better, since next year a new class of M-Phimac students will all require office space as well. With the Faculty of Science in an improved financial situation, we are hopeful that new space in Hamilton Hall or in a nearby building will be allocated for use by our graduate students.

Progress (check one)

☐ Completed

X In Progress

☐ Other (please explain)

Department's Comments:

The shortage of graduate desk space has not been entirely resolved, but did not get worse either: the new M-Phimac students were allocated space in the original
Phimac lab, which was completely renovated to accommodate the increased numbers without affecting the desk allocation to students in any other program.

Currently, all PhD students in the Department (including in the newly created Stats PhD program) are allocated individual desks in purpose-made graduate student offices, whereas Master students, as a rule, are allocated shared desk space at the approximate ratio of X students per desk, with overflow students encouraged to use common study spaces in the university libraries.

We are hopeful that more space will be made available in the near future on the ground floor of Hamilton Hall in order to be able to offer individual desk space to all graduate students in the Department.

Dean's Comments:

The Faculty of Science continues to evaluate space utilization and operational needs across all units. The remote work and study environments required during the pandemic have stimulated us to engage with some external consultants to consider our central office space utilization in concert with our anticipation that many individuals will want to retain some form of hybrid work and study arrangements in the future. The outcomes of this consultation will also be translated to departments like Math and Stats.

QAC Comments (to be filled in by Quality Assurance Committee):

See above.

Recommendation: **7. More engagement with students**
Responsibility for Implementation: Chair and Associate Chair (Statistics)
Anticipated Timeline for Completion: 2018-2019
Additional Notes/Commentary: Towards the end of each Fall term, an electronic survey will be administered to solicit student feedback.
Progress (check one) ☐ Completed X In Progress ☐ Other (please explain)
Department's Comments: The Math and Stats Grad Student Association (MS-GS) was created in 2019 as an official McMaster Graduate Student Association (GSA) Club. The President of the MS-GS is now a regular member of the Graduate Committee. One of the tasks of the Association is to poll graduate students in the Fall term and ask which courses they intend to take the following academic year, including both core and optional courses, which is now taken into account when deciding graduate course offerings in combination with the selection of core and rotating courses recommended by the Statistics group (see Recommendation 1 above). The next step in this recommendation will be to add questions to the Fall survey administered by the MS-GS targeted specifically to graduate students in Statistics to gather feedback about other aspects of the programs (i.e., non-course related).
Dean's Comments: The department is proposing to solicit feedback from students on various aspects of the program. We will await the details of the feedback and follow up plans.
QAC Comments (to be filled in by Quality Assurance Committee): See above.

Recommendation: **8. Provide Coursework students more experiential learning opportunities**
Responsibility for Implementation: Associate Chair (Statistics)
Anticipated Timeline for Completion: 2019-2020

Additional Notes/Commentary: We plan to investigate potential experiential learning opportunities. Some concrete steps are addressed in response to points 9, 10, 12 below.
Progress (check one) ☐ Completed X In Progress ☐ Other (please explain)
Department's Comments: In addition to the comments in Recommendations 9, 10, and 12 below, we are considering making 780 a core course for the M.Sc. thereby ensuring a substantial element of experiential learning.
Dean's Comments: We are supportive of the department's proposal.
QAC Comments (to be filled in by Quality Assurance Committee): See above.

Recommendation: **9. Introduce more co-op/internship opportunities**
Responsibility for Implementation: Chair and Associate Chair (Statistics)
Anticipated Timeline for Completion: Next three years
Additional Notes/Commentary: We will continue to make students aware of MITACS, and similar, internships that they may wish to take advantage of. We will also investigate co-op options.
Progress (check one) ☐ Completed X In Progress ☐ Other (please explain)
Department's Comments: The major barrier to the integration of internships within the Statistics M.Sc. program is the presence of multiple two-term core courses (STATS 743, STATS 770, and STATS 771). While it should be relatively easy to "split" STATS 770 and STATS 771 into one-term courses, the situation with STATS 743 is more complicated. The separation of STATS 743 into two one-term courses is inextricably tied to the introduction of more modern contents, e.g., Bayesian statistics, and so will be handled as part of the review of the course structure and content for the Statistics M.Sc.

Dean's Comments: The department has identified some of the barriers to experiential learning that are due to the delivery format of core courses. A solution will require careful consideration of options, curriculum changes, and experiential opportunities for students. We support the plan to review program courses before taking any further steps.
QAC Comments (to be filled in by Quality Assurance Committee): See above.

Recommendation: **10. Modify Stats 770**
Responsibility for Implementation: Associate Chair (Statistics)
Anticipated Timeline for Completion: 2019-2020
Additional Notes/Commentary: The new course Stats 771 was created (in 2019-20 as expected) to address the issues raised. Stats 770 continues to be offered.
Progress (check one) X Completed ☐ In Progress ☐ Other (please explain)
Department's Comments: The new 3-units course STATS 771 (Statistics Research Project) was created in order to strengthen the research component for course-based Masters students (for whom it is required) and more flexibility for thesis-based Master students (for whom it is optional). The description for this course is as follows: *Students will conduct and present an independent research project under the supervision of a faculty member in statistics. The topic can be in any area of theoretical or applied statistics or probability and should be chosen in consultation with the supervising faculty member. The work may be a comprehensive literature review on a broad topic, a detailed review of one recent advance in the literature, an application of methodology to a real dataset. Students are required to write a report (5000-10000 words) and to deliver an oral presentation (20 minutes) of their work immediately after the end of the winter term. This course is a requirement for graduation for the course option of the statistics MSc program.* STATS 770 (Statistics Seminar) continues to be offered in the form of a regular seminar for the Statistics group, with mandatory attendance by Master's students, but no credit towards degree requirements.

Dean's Comments: The department has acted on the recommendation by creating a new course STATS 771.
QAC Comments (to be filled in by Quality Assurance Committee): See above.

Recommendation: **11. Increase number of student awards**
Responsibility for Implementation: Chair and Associate Chair (Statistics)
Anticipated Timeline for Completion: 2018-2019
Additional Notes/Commentary: At present, the extent to which students are aware of award deadlines depends on who happens to be teaching 400 level courses in the Fall term. Starting in Fall 2018, we will take a more strategic approach and include this information at the start of the third seminar of the Fall semester. Happily, one of our incoming Statistics M.Sc. students received an NSERC-CGS scholarship. Because she is also a graduate of our undergraduate program, this is especially good news.
Progress (check one) ☐ Completed X In Progress ☐ Other (please explain)
Department's Comments: Information about available awards and scholarships is now systematically disseminated to upper level undergraduate students and incoming graduate students, including the application process and important deadlines. The increased Graduate Admin support mentioned in Recommendation 14 below will allow the Department to provide enhanced help and guidance to students and supervisors during the application process. Recent successes in the Statistics graduate programs include a Vanier Scholarship (Michael Gallaugher), a Banting Fellowship (Michael Gallaugher), an NSERC CGS-D award (Kat Clark), several OGS awards, and a Governor General's Gold Medal.
Dean's Comments: In response to this recommendation, the department is making efforts to communicate scholarship information to students more broadly and systematically. While this is a good practice, scholarship success depends on multiple factors including strong letters of support

and feedback on applications before final submission. We encourage the program to establish an internal process to increase the support for quality applications.

QAC Comments (to be filled in by Quality Assurance Committee):

See above.

Recommendation: **12. Add experiential learning opportunities to graduate courses**

Responsibility for Implementation: Associate Chair (Statistics)

Anticipated Timeline for Completion: Implemented

Additional Notes/Commentary: This already happens in part of STATS 780: Data Science and STATS 752: Linear Models and Experiment Designs, where students must complete and present a detailed project on non-trivial data for their final project. A similar approach will be taken with the new course STATS 790: Statistical Learning.

Progress (check one)
X Completed
☐ In Progress
☐ Other (please explain)

Department's Comments:
As mentioned, the comments above, this was already implemented in STATS 780 and STATS 752 by the time of the site visit, and is currently being implemented in the new course STATS 790 as well.

Dean's Comments:
This issue has been addressed appropriately.

QAC Comments (to be filled in by Quality Assurance Committee):

See above.

Recommendation: **13. Renewal of external faculty involved in supervision within the program**

Responsibility for Implementation: Associate Chair (Statistics)

Anticipated Timeline for Completion: Next three years
Additional Notes/Commentary: We intend to actively recruit potential supervisors from other disciplines. Three recent hires from other departments have expressed interests in becoming associate members of the Master's program in statistics. Their names and home departments are: Dr. Youngki Shin (Economics), Dr. Sarmeer Parpia (Oncology), and Dr. Guillaume Paré (Pathology and Molecular Medicine).
Progress (check one) ☐ Completed X In Progress ☐ Other (please explain)
Department's Comments: Some progress has already been made on this front. For example, two of the six current M.Sc. in Statistics (thesis) students are being supervised by faculty members outside the Department. Further progress is expected as part of the review of the course structure and content for the Statistics M.Sc.
Dean's Comments: We acknowledge the efforts made to engage with supervisors external to the department and encourage the program to continue to foster collaborative connections across campus and in coordination with the MacData Institute.
QAC Comments (to be filled in by Quality Assurance Committee): See above.

Recommendation: **14. Review workload of the graduate secretary**
Responsibility for Implementation: Chair
Anticipated Timeline for Completion: 2018-2019
Additional Notes/Commentary: Submit a proposal for a new graduate staff position dedicated to the Departmental graduate programs. Note that we currently have less than one staff person to handle four separate graduate programs.
Progress (check one) X Completed ☐ In Progress

☐ Other (please explain)
Department's Comments: Soon after the site visit, we obtained approval for an additional half-time Graduate Admin Assistant position, which was filled in September 2018 by Hanadi Attar-Elbard. After the retirement of Diana Holmes -- the long-time staff member mentioned in the Final Assessment Report as the sole Graduate Admin Assistant at the time of the site visit – in July 2021, the position of Hanadi Attar-Elbard was converted to full time and we also obtained approval to hire another full time Graduate Admin Assistant, Hania Zahid, starting September 2021. These two positions now provide support to all graduate programs in the Department (math, stats, financial math), as well as the Computational Science and Engineer (CSE) program.
Dean's Comments: This resourcing issue has been addressed through the departmental budget submission and resourcing request process which is an annual activity.
QAC Comments (to be filled in by Quality Assurance Committee): See above.

Recommendation: **15. Governance issues:** (a) Recognize research supervision outside one's home department. (b) Devise equitable ways for faculty to teach courses outside their home departments. (c) Provide teaching credit for research supervision. (d) Add more Statistics representatives on Appointments Committee.
Responsibility for Implementation: Chair and Associate Chair (Statistics)
Anticipated Timeline for Completion: Next five years
Additional Notes/Commentary: (a) This is a good point, and ultimately addressed at the decanal and university level. (b) Another good point, one that again requires a solution at the decanal and university level. (c) This suggestion has much merit, but presently our faculty resources are stretched thin simply mounting the courses for the program. Additional faculty members in Statistics would make it possible to implement a course-reduction scheme for rewarding graduate supervision. (d) The Appointments Committee is an elected committee with one-year terms and a two-year term limit. There is a constitutional provision that guarantees representation from at least one member of the Stats group, but there can be (and often are) additional members from the Stats

group on the committee. This can occur through the election process, and it also occurs automatically whenever there is a targeted hire in statistics through the following mechanism.

In a faculty search, a "hiring subcommittee" is struck, typically consisting of three members appointed by the Chair and working in the area. Such members, if not already elected, are added to the appointments committee for the given search ("add-ons"). The subcommittee is charged with proposing an initial slate of candidates, participating in skype interviews, recommending a short list for on-campus interviews, etc. For example, in a targeted search in statistics, additional members from the Stats group would be selected for the hiring committee.

As well, all decisions made by the appointments committee are discussed in an open meeting with all Department members invited to participate. Consensus is taken by means of a departmental straw vote, which (if supported) is moved by the appointments committee and formally voted upon. No system is perfect, but ours has the virtue of allowing direct input from all members of the Department while also recognizing the expertise of members in the field (e.g. the Stats group), who are better equipped in making decisions on hires in their area.

Progress (check one)
☐ Completed
X In Progress
☐ Other (please explain)

Department's Comments:
(a) All research supervision activities by faculty members, including in home department, other departments in the university, and outside the university, are already recognized in the annual career, progress and merit (CP/M) and tenure and promotion (T&P) processes.

(b) There exist well-defined mechanisms in place for cross-Department and cross-Faculty teaching, with corresponding costs allocated according to the current budget model adopted by the University. The Department and the Faculty are supportive of proposals for new interdisciplinary programs involving faculty members from different units across the University.

(c) The current scheme for allocation of CP/M scores in the Department combines classroom teaching with HQP training, so that the contributions to both types of activities can be balanced and suited to individual faculty members.

Whereas there is no formal mechanism in place for automatic course load reduction for graduate supervision, this can be (and sometimes has been) achieved in practice through several internal and external awards (e.g. Canada Research Chairs, Science Research Chairs, Killam Fellowships, Steacie Fellowships) that recognize research excellence and provide teaching release.

Going forward, the Chair is supportive of exploring the idea of an automatic course load reduction in recognition of sustained (i.e. over a well defined length of time) graduate

supervision that is significantly above the departmental average, provided the necessary teaching capacity is in place.

(d) The procedures described in the Department response at the time of the site visit have been formalized in the Department Bylaws that are currently being expanded to include other governance aspects in the Department.

Dean's Comments:
The Office of the Dean of Science supports the efforts that have been made to communicate clearly the governance and operations policy and process. Internal communications is an effective tool to address concerns about equity and fairness and the Department Chair has done an excellent job of addressing these.

QAC Comments (to be filled in by Quality Assurance Committee):