April 21, 2021

John Karl Scholz, Ph.D.
Provost and Vice Chancellor for Academic Affairs

William Karpus, Ph.D.
Dean of the Graduate School

--Sent electronically--

Re: Five-Year Review of M.S. in Biomedical Data Science

Dear Provost Scholz and Dean Karpus:

On behalf of the School of Medicine and Public Health, I endorse the five-year review of the M.S. in Biomedical Data Science. After discussion at the April 21, 2021 meeting of the SMPH Academic Planning Council, APC members unanimously approved the report of the review committee and the response of program leadership to the review committee’s report. Those reports are attached.

The program has many strengths, including three of particular note:

1. Early on, the program took a wise course of action by adjusting its curriculum and consolidating two degree tracks into one.
2. The program has met its target enrollment goals.
3. Graduates have had outstanding success finding employment or continuing into PhD studies.

The review committee identified areas for improvement. The APC notes that the program has been responsive.

1. It has been difficult for students to enroll in high-demand Statistics and Computer Sciences courses. Program faculty and staff are working to facilitate timely enrollment in such courses.
2. Recruitment and enrollment of URM students is low. The program is making efforts to increase recruiting and retention, such as participating in national events and following up with prospective students.
3. It has been difficult to build community among students, primarily because students attend a variety of courses rather than a lock-step curriculum. The program is considering review committee recommendations to increase the sense of community.
4. While many students obtain assistantships, it has been difficult for some students to find financial support. The program is making efforts to provide more systematic support for students who seek assistantships.

Both the SMPH Academic Planning Council and I concur with the review committee’s recommendation to continue the program. We recommend that the next review occur in ten years.
Thank you for your consideration. If you require additional information, please do not hesitate to contact my office.

Sincerely,

[Signature]

Robert N. Golden, M.D.
Robert Turell Professor in Medical Leadership
Dean, School of Medicine and Public Health
Vice Chancellor for Medical Affairs

Copy:
Michael Newton, Biostatistics and Medical Informatics
Mark Craven, Biostatistics and Medical Informatics
Beth Bierman, Biostatistics and Medical Informatics
Shelley Maxted, Biostatistics and Medical Informatics
James Keck, School of Medicine and Public Health
Carrie Brinkmeier, School of Medicine and Public Health
Andrea Poehling, School of Medicine and Public Health
Jocelyn Milner, Academic Planning and Institutional Research
Karen Mittelstadt, Academic Planning and Institutional Research
Parmesh Ramanathan, Graduate School
Jenna Alsteen, Graduate School

Attachments:
1) Program response
2) Review committee report
February 9, 2021

James Keck, Ph.D.
Associate Dean for Basic Research Training
School of Medicine and Public Health
University of Wisconsin-Madison

Dear Dr. Keck,

On behalf of the Steering Committee of the MS program in Biomedical Data Science, I am writing to acknowledge the Five-Year Program Review: MS in Biomedical Data Science report and to thank the review committee members for their thoughtful and thorough review.

We concur with the program strengths, challenges, and opportunities for improvement that the committee has identified and discussed. I would like to provide an update on some recent efforts we have undertaken to address several of the specific recommendations made by the committee. First, several program representatives attended the Society for Advancement of Chicanos and Native Americans in Science (SACNAS) virtual conference in October. Student service coordinators Beth Bierman and Shelley Maxted, several graduate students and I staffed a virtual booth at the conference and reached out to conference attendees. Second, we redoubled our efforts to get feedback from current students and alumni by asking them to respond to a short, anonymous, on-line survey. We received responses from 50% of our current students and 52% of our alumni. The attachment summarizes the responses.

Again, we appreciate the effort that you and the review committee have put into providing a helpful assessment of our program.

Sincerely,

Mark W. Craven
Professor, Department of Biostatistics & Medical Informatics
Department of Computer Sciences
Responses from current students

Please reflect on your experience to date in the MS program and answer the following questions on the scale: strongly disagree (1), disagree (2), neutral (3), agree (4), strongly agree (5)

I am gaining an understanding of the theories, methods and tools in biomedical data science.

I have applied, adapted and/or validated data science methods for a specific biomedical problem.

I have given an oral or written presentation and received helpful feedback on it.

I have learned about professional, ethical and legal standards of conduct in biomedical data science.
Responses from program alumni

Please reflect on your experience while you were in the MS program and answer the following questions on the scale: strongly disagree (1), disagree (2), neutral (3), agree (4), strongly agree (5)

I gained an understanding of the theories, methods and tools in biomedical data science.
11 responses

I was able to apply, adapt and/or validate data science methods for a specific biomedical problem.
11 responses

I gave an oral or written presentation and received helpful feedback on it.
11 responses

I learned about professional, ethical and legal standards of conduct in biomedical data science.
11 responses
Summary of activities and materials reviewed:
The review committee was charged by SMPH Associate Dean Jim Keck on October 5, 2020 and provided with the following documents:

- Original proposal to the Board of Regents, dated August 22, 2014
- Program Approval Memo from UW Associate Vice President, dated September 18, 2014
- Program name change Approval Memo UW Associate Vice President, dated July 16, 2016
- Program’s self-study, dated February 21, 2020
- Letter from Program Representative and additional documents in response to query from the committee, dated November 16, 2020

The committee met on November 19, 2020 to review the documents. Consultant-Program Representative Mark Craven was present.

The overall conclusion from our review is:

After readjusting the curriculum and paring down to a single (research) track, this MS program in Biomedical Data Science has settled into a better-defined and sustainable program that fills a niche. During the initial 5-year existence of the program, the faculty and staff of the Department of Biostatistics and Medical Informatics have recruited between 2 and 12 students annually. While most graduates found appropriate employment, a few stayed on to earn a PhD degree. Through its self-evaluation in preparation of this five-year review, the program faculty and staff identified several areas of success as well as areas for potential improvement. The Review Committee commends the faculty and staff for identifying areas of improvement and strategies to address those issues. The Review Committee believes that this MS degree program in Biomedical Data Science is on a solid foundation and is making significant contributions to the field and the University of Wisconsin-Madison. The implementation of some of the strategies identified in their self-study and this review will build on this foundation. The committee recommends continuation of the program.

Summary of the program’s key features:

Biomedical data science is the interdisciplinary field that encompasses the study and pursuit of the effective uses of biomedical data for scientific inquiry, problem-solving, and decision-making, driven by efforts to improve human health. Biomedical data science investigates and supports reasoning, modeling, simulation, experimentation, and translation across the biomedicine spectrum, from molecules to individuals to populations.

Based on the need suggested by the students and market demand in this field, the program Master of Science-Biomedical Informatics started in 2015 to serve baccalaureate-prepared students in data sciences, as well as health professionals and clinicians. The 31-credit program is designed to teach core concepts in biomedical informatics, as well as allow for concentrated coursework in both methodology and application. The proposed program relates to, and contrasts with, four existing programs on campus: those in Biostatistics, in Industrial and
Systems Engineering, in Clinical Investigation, and in Computer Sciences. Enrollment of five new students per year was anticipated for a total of 20-25 in the first five years of the program. The program is distinguished from the related programs by its unique focus on both the broad spectrum of data science (spanning methodologies from statistics and computer science) and the specific applications of these methods in biology and medicine.

In 2016, it was realized that MS students would be better served by the program offering a broader range of courses that encompass the entire field of Biomedical Data Science as applied to biology and biomedical investigation. To more accurately reflect this curriculum change and maintain the consistency in both MS and PhD Degree Programs, the name of the program was changed from the “MS Degree Program in Biomedical Informatics” to the “MS Degree Program in Biomedical Data Science.”

The creation of this interdisciplinary MS Biomedical Data Science program is consistent with the broader goals of UW School of Medicine and Public Health to foster campus-wide big data initiatives. This MS degree program will enhance the School’s position in this field, especially in recruiting outstanding students.

**Program strengths:**

There is a strong commitment to the program as evidenced by the involvement of a steering committee consisting of seven members (all are program faculty and at least five are tenured BMI department faculty). The diligence of this committee in monitoring the students’ interest in the two tracks (Professional and Research) has resulted in streamlining the program from two tracks to one (Research only).

With a total enrollment of 33 students from a pool of 233 applicants (46 per year on average), the Program has met its target enrollment. The acceptance rate by the applicants offered has steadily increased. This program appears to attract more foreign applicants (approx. 3/4th of all applications) than domestic students. Women are well represented in the applicant pool (nearly 50% of total) but make up only 36% of enrolled students. More than 60% of students have completed the degree within the expected 2-year time. All graduating students have been successful at obtaining jobs or positions in PhD programs that are commensurate with their specific MS training and level of education. The program has a very strong record of its graduates going on to PhD programs in various areas of quantitative biomedical science. Overall, the program has filled the niche described as proposed.

**Program challenges:**

As with any new graduate program, the originally proposed MS program faced a few challenges. Right at the outset, there was some discordance between the proposed MS and the PhD programs. To maintain the consistency in both MS and PhD Degree Programs, the name of the program was changed to the MS Degree Program in Biomedical Data Science.

There are some ongoing challenges. These include 1) ensuring that students find spots to enroll in some high demand but required courses in Statistics and Computer Sciences, 2) attracting and recruiting applications from URMs, 3) difficulty for students to form a community because the students are not in the same physical space and because they aren’t taking the same courses and 4) finding opportunities for financial support.
The program faculty/staff are making efforts to facilitate timely enrollment in the high demand courses. The Committee made specific suggestions to overcome challenges 2 through 4 as described in the summary below.

Summary of opportunities for improvement:

The review committee commends the faculty/staff for undertaking a critical self-evaluation in preparation for this five-year review.

- The program was expected to get more clinically focused students. It is not clear why this goal has not been met. One possibility is that the course schedule is not friendly to students who work traditional weekday hours. The Department is encouraged to discuss alternate course schedule offerings to accommodate such students.

- Several strategies were suggested to improve community building among the students, including organizing weekly faculty-moderated journal club and talks by alumni and industry leaders.

- To attract URM students, consider inviting summer students to attend these above described events and sponsoring faculty visits to URM recruitment conferences.

- To improve opportunities for financial assistance, cast a campus-wide net to find faculty who may have specific, well-defined and funded projects that the students can participate in.

Considerations for the five-year review

The committee addressed the following points specific to a five-year review:

1. **Determine whether the goals and objectives as stated in the original program proposal were met and evaluate if the program is meeting standards of quality that are expected based on the original proposal.**

   This MS Degree Program in Biomedical Data Science, redefined from its original focus to better align with the PhD program by the same name, has met its standards of quality as evident by the number of students recruited, graduated and found appropriate employment.

2. **Confirm that the program is important to be delivered at UW-Madison and understand the program’s relationship to other programs at UW-Madison. Are other programs positively or negatively impacted? Are connections with other programs as planned in the original proposal developing as envisioned?**

   This program fills a unique niche in the interdisciplinary field of biomedical data science. With its research track, the program prepares individuals who can contribute in a broad range of biomedical settings. This program complements and positively impacts the more recently instituted MS in Clinical & Health Informatics that fits a different niche.

3. **Determine if the resource implications of continuing the program are appropriate.**
This is largely a self-funded graduate program. Students get support through various mechanisms such as Teaching or Research Assistantships in the department or elsewhere on campus. Additional mechanisms may also be available.

Specific Recommendations

- Find opportunities to increase applications and recruitment of URM students. Specifically, reach out and attend conferences of the Society for Advancement of Chicanos and Native Americans in Science (SACNAS) and the Annual Biomedical Research Conference for Minority Students (ABRCMS). There is also a UW-Madison SACNAS chapter that program leadership could contact to determine if there are local students who may want to join the MS program. Additionally, consider reaching out to others on campus for example of how they’re addressing these issues.

- To address the issue of financial support to students, the program needs to do a better job of helping students find projects, perhaps by sending e-mails to biomedical faculty to inquire if they would like to hire students for a defined project.

- Implement a directed and systematic effort to gather feedback from students throughout their study and when they graduate. Also, collect feedback from current PhD students who are graduates of the program, and if possible, graduates who aren’t at UW.

- In addition to the campus-wide opportunities for career guidance, there is a need to offer more directed niche-specific career guidance

- Students in the program need a sense of belonging to community. Regular participation in seminars, perhaps as a required credit, could help build community. In addition to the current mode of Zoom meetings, help students to find other communities that are aligned to their research and career interests.

Summary

In summary, our committee recommends that the program continues and that the next program review occurs in ten years.