Master’s of Science (MS) in Biostatistics

Program Director: K.B. Kulasekera, Ph.D.
Administrative Assistant: Lynne C. Dosker
Department: Bioinformatics and Biostatistics
Website: MS in Biostatistics

Introduction

Biostatistics involves the development and application of statistical techniques to scientific research in health-related fields including medicine, nursing, and public health. Students in the MS program receive state-of-the-art training in the latest statistical methodologies with focus on the design of research studies, modern statistical data analysis in health sciences research, and research in Biostatistical methodology. In addition, students are provided with tools with which to develop evidence-based clinical and healthcare policies and guidelines.

Competencies

To graduate, a student must be able to demonstrate mastery of the following competencies:

<table>
<thead>
<tr>
<th>Competency*</th>
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</thead>
<tbody>
<tr>
<td>Evaluate the biostatistics content of scientific and biomedical journal articles. [C6]</td>
</tr>
<tr>
<td>Analyze moderately complex research data using statistical methods involving common linear statistical models. [C4]</td>
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<tr>
<td>Manage data using spreadsheet and database software. [C3]</td>
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<tr>
<td>Demonstrate use of standard statistical and graphics computer packages, including SAS, R, Microsoft Excel, and SPSS. [C3]</td>
</tr>
<tr>
<td>Evaluate new statistical methods presented in the literature. [C6]</td>
</tr>
<tr>
<td>Investigate the history, theoretic underpinnings, current applications, and active areas of inquiry of biostatistics. [C4]</td>
</tr>
<tr>
<td>Apply principles and theorems of advanced biostatistical operations. [C3]</td>
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</tbody>
</table>

* Bracketed codes represent cognitive domain levels from Bloom’s Taxonomy

Demonstration of the competencies is accomplished by successful completion of all MS curriculum activities.
Admission

The MS program is available to students who have completed an undergraduate degree in biostatistics, statistics, mathematics, or a related discipline and possess competency in college-level calculus, linear algebra, and statistics, as evidenced by transcripts from postsecondary institutions attended. The following are required for admission:

- [Graduate application](#) submitted to the School of Interdisciplinary and Graduate Studies (SIGS).
- Non-refundable application fee.
- At least two letters of recommendation written within past twelve months, submitted as part of the [graduate application](#).
- Submission of GRE scores to SIGS. Students admitted to our MS program in past years had a median \([Q_1, Q_3]\) GRE Quantitative score at the 80th percentile \([63, 91]\).
- All postsecondary transcripts. Transcripts from institutions outside of the U.S.A. require a foreign credential evaluation.
- A statement of purpose submitted to the department office, which must include desired degree program.
- If an applicant’s primary language is not English, one of the following:
  - Test of English as a Foreign Language (TOEFL) exam with a minimum score of 250 (after conversion for test type)
  - Passing the exit examination for the advanced level of the Intensive English as a Second Language Program at the University of Louisville
  - Degree from an accredited university in the U.S.A.

Curriculum

Faculty Advisor

Upon admission to the MS program, the program director serves as the student’s faculty advisor until a mentor for the student’s project or thesis is identified. At this milestone, the mentor becomes the student’s faculty advisor.

Program of Study

Upon admission to the MS program, the program director, working with the student as faculty advisor, develops a program of study for the student, which requires agreement by the student and the academic dean. Changes to a student's program of study, including coursework, milestones, and their anticipated timings, are made by the student’s faculty advisor, working with the student, and formally signed by the student, the faculty advisor, the program director, and, for selected changes, the
academic dean. This flexibility allows adapting programs of study to differing student capabilities and interests.

Degree Requirements

The MS program in biostatistics is 30 credit hours over three semesters for full-time students. Additional credit hours may be needed for remediation of missing or lacking student capabilities encountered following matriculation or for capabilities outside the standard coursework required for an identified project or thesis.

A student may apply to continue beyond the required coursework to pursue the preparation and defense of a six credit-hour master’s thesis in an additional semester. The optional thesis requires permission of the program director and is available for those students intending to pursue a Ph.D. degree or wanting to pursue a research project that interests them. However, a master’s thesis is not a requirement for the degree. A student who pursues a thesis and subsequently does not successfully complete the thesis remains eligible for award of degree.

Award of degree from an accredited school of public health requires successful completion of the equivalent of three credit hours in:

- Instruction that introduces the students to the breadth of public health
- Instruction in epidemiology

Either or both of these requirements may be determined to have been met prior to matriculation by approval of the academic dean of a variance request submitted by the program director. The request for a variance in one or both requirements must be justified by (1) previous degrees received, such as an MPH or Dr.P.H., (2) previous coursework successfully completed, or (3) extensive experience in the public health workforce. In the absence of a variance for a requirement, the student’s program of study must include successfully completed coursework that satisfies the requirement.

For the MS in Biostatistics, the epidemiology requirement is met by the epidemiology elective included in the required coursework. However, the public health foundation requirement is not included in the required coursework and, in the absence of a variance, is met by including PHMS-523 Public Health in the U.S. on a co-curricular basis prior to graduation.

Coursework

<table>
<thead>
<tr>
<th>Semester</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall 1</td>
<td>PHST 661</td>
<td>Probability</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>PHST 680</td>
<td>Biostatistical Methods I</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>PHST 624</td>
<td>Clinical Trials I</td>
<td>2</td>
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<tr>
<td></td>
<td>PHPH 523</td>
<td>Public Health in the U.S.¹</td>
<td>(2)</td>
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<tr>
<td>Semester</td>
<td>Course Code</td>
<td>Course Title</td>
<td>Credits</td>
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<td>----------------------------------------</td>
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</tr>
<tr>
<td>Spring 1</td>
<td>PHST 662</td>
<td>Mathematical Statistics</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>PHST 681</td>
<td>Biostatistical Methods II</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>PHST 684</td>
<td>Categorical Data Analysis</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>PHST 625</td>
<td>Clinical Trials II</td>
<td>2</td>
</tr>
<tr>
<td></td>
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<td><strong>Semester Total</strong></td>
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</tr>
<tr>
<td>Fall 2</td>
<td>PHST 683</td>
<td>Survival Analysis</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>PHST xxx</td>
<td>Biostatistics Elective$^2$</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>PHEP xxx</td>
<td>Epidemiology Elective$^3$</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>PHST 675</td>
<td>Independent Study in Biostatistics</td>
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<td><strong>Semester Total</strong></td>
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<td></td>
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<td><strong>Degree Total</strong></td>
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**Spring 2**

<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>PHST 666</td>
<td>Master’s Thesis Research (optional)</td>
<td>6</td>
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<td></td>
<td><strong>Total</strong></td>
<td>6</td>
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<tr>
<td></td>
<td><strong>Degree Total with Optional Thesis</strong></td>
<td>36</td>
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</table>

1. PHPH 523 fulfills the accreditation requirement that all graduates from the School of Public Health and Information Science receive foundational instruction in public health.

2. The biostatistics elective is chosen with the approval of a faculty advisor, typically from courses offered by the Department of Bioinformatics and Biostatistics (PHST courses).

3. The epidemiology elective is chosen with the approval of a faculty advisor from courses offered by the Department of Epidemiology and Population Health (PHEP courses).

Students in the 3-semester, non-thesis M.S. fulfill their degree requirements after the Fall semester of the second year of study.

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**Optional Thesis**

A student may apply to pursue preparation and defense of a master’s thesis following completion of the required coursework. Pursuing an optional thesis requires permission of the program director. The thesis topic is approved by the major professor and thesis committee, chaired by the major professor. The student identifies a desired mentor to become his or her major professor, who is recommended by the program director and appointed by the academic dean. The major professor (or at least one when there are co-major professors) must be from the Department of Bioinformatics and Biostatistics. Following appointment, the major
professor becomes the student’s faculty advisor. Procedures for the thesis are given below.

**Thesis Committee**

Working with the major professor, the student identifies at least two desired committee members. Including the major professor, at least two members of the committee must be faculty in the Department of Bioinformatics and Biostatistics and at least one member must be from outside the department. The committee members are then recommended by the program director and appointed by the academic dean.

**Thesis Preparation**

The thesis is prepared in format according to the guidelines established by the School of Interdisciplinary and Graduate Studies. It is the responsibility of each student to ensure that the readability and quality of writing in his/her thesis meets professional standards. Students are strongly encouraged to take advantage of the services offered by the University Writing Center when writing their theses. The services offered by the Writing Center are free to the student.

**Thesis Approval**

Final approval of the thesis is voted upon by the thesis committee after an oral defense of the thesis by the student. Students submit their theses to members of their committee two or more weeks prior to the date of the oral defense. Approval of the thesis is by majority vote of the committee after the oral defense.

Students are required by SIGS to provide two weeks’ notice when scheduling oral defenses (http://louisville.edu/graduate/forms/request-to-schedule-thesis-dissertation-final-oral-examination). This requirement permits those wanting to attend the oral defense adequate time to make arrangements for attending. Students must follow the below procedure for scheduling oral defenses:

1. Identify a date and time for the oral defense in consultation with the thesis advisor and members of the committee.
2. Request a room reservation for the oral defense through the Department’s Administrative Assistant.
3. Notify the Department’s Administrative Assistant of the date, time, and location of the oral defense as well as the title of the thesis. The Department’s Administrative Assistant will circulate an announcement of the defense as well as notify the SPHIS Office of Student Services of the defense, who in turn notify SIGS.
4. Distribute technically and grammatically error-free copies of the thesis to all committee members two weeks prior to the defense date.
There are no exceptions to these requirements and students will not be permitted by
the Department to schedule defenses with less than 2 weeks’ notice. Students are
expected to be aware of university deadlines for theses
(http://louisville.edu/graduate/current-students/thesis-dissertation-information) and
to ensure that the 2 weeks’ notice requirement is fulfilled within these university
deadlines. Students are strongly encouraged to allow for even greater than two
weeks’ notice to ensure that all deadlines and requirements are fulfilled.

Thesis Submission

The following steps must be taken to submit the final copy of the thesis electronically
after oral defense and approval of the committee:
1. Final document must be converted to a PDF (following the guidelines as noted
above) and sent to SIGS and the department’s administrative assistant.
2. Submit as advised by the School of Interdisciplinary and Graduate Studies
through the ThinkIR repository. Click here to download instructions on this process.
3. The signature page within the electronic version must have the names of your
committee members typed under the signature line; the signatures cannot be scanned
into the document.
4. Submit a signed signature page on white paper, with original signatures, to the
School of Interdisciplinary and Graduate Studies, attention Courtney Kerr.

An electronic copy of the thesis must be provided to the Department’s Administrative
Assistant.

Accreditation

The School of Public Health and Information Sciences is accredited by the Council on
Education for Public Health (CEPH).

The University of Louisville is accredited by the Southern Association of Colleges and
Schools Commission on Colleges (SACSCOC).

For more information, see the School’s accreditation webpage.
# Program History

<table>
<thead>
<tr>
<th>Version</th>
<th>Submitted</th>
<th>Approved</th>
<th>Change Summary</th>
<th>Author(s)</th>
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<tr>
<td>0</td>
<td>unknown</td>
<td>unknown</td>
<td>- Initial version</td>
<td></td>
</tr>
</tbody>
</table>
| 2006.09.12 | 09/27/06 | 10/24/06 | - Thesis required, not optional  
- Courses revised  
- Practicum added as required |          |
| 2007.04.16 | 04/24/07 | 06/26/07 | - Required course PHEH-600 replaced with elective  
- Elective list revised |          |
| 2007.04.16-1 | 08/03/07 | 08/03/07 | - Reformatted to match template |          |
| 2007.04.16-2 | 08/11/09 | 08/11/09 | - Program director and administrative assistant updated  
- Graduate coordinator and concentration coordinators removed  
- Editorial changes for SIGS replacing Graduate School  
- PHEP-601 renumbered as PHEP-501 |          |
| 2007.04.16-3 | 05/07/10 | 05/07/10 | - Administrative assistant updated  
- Elective list revised |          |
| 2010.08.09 | 08/11/10 | 08/18/10 | - Required course PHEH-618 replaces PHEH-501 |          |
| 2010.08.09-1 | 06/04/13 | 06/04/13 | - Program Director changed to Susmita Datta  
- PHST and PHDA courses changed to PHST | Ms. Tammi Thomas |
| 2013.02.13 | 02/13/13 | 08/23/13 | - Removed “Decision Science” from name of program  
- Removed concentrations in biostatistics and in decision science  
- Revised competencies  
- Revised admission criteria  
- Reduced required credit hours to 30 from 36  
- Revised required coursework  
- Revised electives  
- Added optional thesis beyond degree requirements  
- Added statement of requirements for epidemiology and public health foundation | Susmita Datta  
Karunarathna Kulasekera  
Peter L. Walton |
| 2013.02.13-01 | 06/15/15 | 06/15/15 | - Added accreditation section | Peter L. Walton, M.D. |
| 2015.08.19 | unknown | 08/19/2015 | - PHCI courses changed to PHST  
- Minor revision to coursework and elective options | Karunarathna Kulasekera  
Jack Barnette |
| 2015.08.19-01 | 2/11/16 | 2/11/16 | - Updated thesis submission information | C. Winton Reynolds |
| 2015.08.19-02 | 5/20/16 | 5/20/16 | - Added "linear algebra" to admissions requirements | KB Kulasekera |
| 2015.08.19-03 | 08/12/16 | 8/12/16 | - Thesis Committee: Added requirement that two committee members (including major professor) are Biostats faculty  
- Clarified procedures for Thesis approval and Oral Defense scheduling.  
- Changed departmental thesis submission format to “electronic.” | Karunarathna Kulasekera |
| 2015.08.19-04 | 02/03/17 | 02/03/17 | - Changed prefix from PHMS-523 to PHPH-523 | Jack Barnette |
| 2015.08.19-05 | 03/10/2017 | 06/23/2017 | - Admissions: Change of minimum score requirement for GRE  
- Thesis Preparation: Added statement on utilizing University Writing Center  
- 4/10/17: Recommended by Curriculum Committee  
- 4/11/17: Approved by Faculty Forum  
- 6/23/17: Approved by provost’s office | Doug Lorenz |