GRADUATE PROGRAMS IN BIOSTATISTICS

Student Handbook

Division of Biostatistics
Medical College of Wisconsin
8701 Watertown Plank Road
Milwaukee, WI 53226
Phone: (414) 955-8280
Fax: (414) 955-6513
Email: **phdbiostatistics@mcw.edu**

MEDICAL COLLEGE OF WISCONSIN
Institute for Health & Equity
Division of Biostatistics

Bridging the sciences
BIOSTATISTICS

Updated Aug 2021

Table of Contents

Introduction

This handbook is intended for students entering the graduate programs in the Division of Biostatistics in the Institute for Health and Society at the Medical College of Wisconsin. It describes the programs, including detailed course requirements and related academic processes throughout the student's pursuit of a graduate degree in the Division.

The College

The Medical College of Wisconsin is a private, national, freestanding educational institution that offers MD, PhD, MS, MA and MPH degrees. The Medical College was founded on May 20, 1893, as the Wisconsin College of Physicians and Surgeons. In 1913, the Wisconsin College of Physicians and Surgeons and the Milwaukee Medical College merged to become the Marquette University School of Medicine.

In 1967, Marquette University, due to financial constraints, terminated its sponsorship of the medical school. The school then continued as a private, freestanding institution. Its name was changed in 1970 to the Medical College of Wisconsin. The Medical College has more than 15,000 alumni.

In 1978, the College moved to its present location in suburban Milwaukee, on the 240 acre campus of the Milwaukee Regional Medical Center. Other institutions on the campus include Froedtert Memorial Lutheran Hospital, Children's Hospital of Wisconsin, Milwaukee County Mental Health Complex, Curative Rehabilitation Center and the Blood Research Center of Wisconsin. The College benefits from a close working relationship with these institutions, as well as other Milwaukee institutions including the Zablocki Veterans Affairs Medical Center, Marquette University, the University of Wisconsin at Milwaukee, and the Milwaukee School of Engineering.

The Medical College of Wisconsin is internationally known for its research programs. These programs offer opportunities for students to study with funded investigators at the cutting edge of biomedical research. In addition to the traditional biomedical departments, several interdisciplinary research opportunities are available in areas such as cancer biology, functional imaging, molecular biology and genetics, neuroscience and cardiovascular physiology. Special research centers and facilities at the College include the Human and Molecular Genetics Center, Nuclear Magnetic Resonance Laboratories, Electron Microscope Laboratory, NIEHS Aquatic Biomedical Research Center, Protein and Nucleic Acid Laboratory, Center for International Blood and Marrow Transplant Research, Center for AIDS Intervention Research, Cardiovascular Research Center, Clinical Research Center, Injury Research Center, Cancer Center and Center for Patient Care and Outcomes Research. The research effort at the Medical College has grown remarkably over the past 20 years. Today, the college is among the upper half of academic medical institutions in terms of research support from the National Institutes of Health, and in the upper third of all medical institutions nationally in overall research and training support.

In 2007, the Higher Learning Commission of the North Central Association of Colleges and Schools (HLC-NCA) granted reaccreditation to the Medical College for the longest term possible (10 years). The NCA is the accrediting body for all institutions of higher education in the Medical College's geographic region. (HLC - www.ncahlc.org)

In 2011, the Liaison Committee on Medical Education (LCME) awarded full, eight-year accreditation to the -Medical College, the maximum period of accreditation. The LCME is the -accrediting body of all U.S. medical schools.

The Graduate School of Biomedical Sciences

Programs of graduate study in biomedical sciences have been an integral part of the Medical College since early in the past century. The Graduate School of Biomedical Sciences at the Medical College of Wisconsin has as its primary mission the provision of graduate study and research training opportunities for degree-seeking students who wish to study in an interdisciplinary environment and desiring to achieve intellectually stimulating careers as productive biomedical scientists.

The Graduate School has programs leading to PhD degrees in basic and translational research; biochemistry; biophysics; biostatistics; cell biology, neurobiology and anatomy; microbiology, immunology and molecular genetics; pharmacology and toxicology; physiology; public and community health; and functional imaging (joint PhD program with Marquette University).

Master's degrees are offered in: bioethics (MA), biostatistics and data science (MA), clinical and translational science (MS), and public health (MPH). Joint degree programs are offered in: bioinformatics (MS) and healthcare technologies management (MS) with Marquette University, and medical informatics (MS) with the Milwaukee School of Engineering. In addition, Graduate Certificate programs are offered in clinical bioethics, public health, research ethics, and a joint Bioethics Certificate with the American Medical Association. All programs emphasize biomedical research, and students are expected to make original contributions to knowledge in their chosen field.

Currently, there are more than 1,265 students enrolled in educational programs at the Medical College. This includes 816 medical students and more than 450 graduate students. Class sizes are small and the overall student-to-faculty ratio is better than 1:1. A low student-to-faculty ratio fosters individual attention and a close working relationship between student and faculty mentor.

The Division of Biostatistics

The Division of Biostatistics is a part of the Institute for Health and Society at the Medical College of Wisconsin. Other divisions in the Institute include Center for Bioethics and Medical Humanities, Community Engagement, Education, Global Health, and Health Equity and Urban Clinical Care Partnerships. The Biostatistics Division has 17 full time faculty members and several adjunct faculty members whose primary appointments are in the Mathematical Sciences Department at the University of Wisconsin-Milwaukee.

The Biostatistics faculty are engaged in a number of collaborative research projects:

- Center for International Blood and Marrow Transplant Research
- General Clinical Research Center
- Center for Advancing Population Science
- Medical College of Wisconsin- Clinical Cancer Center
- Functional Imaging Research Center
- Center for Human and Molecular Genetics
- Specific projects in genetics, medical imaging, clinical trials, and pharmacologic modeling

Students participate in these projects under faculty supervision. Dissertation research topics in statistical methodology often evolve from such participation, and students usually become co-authors on papers arising from these projects. Faculty is also engaged in research aimed at development of new statistical methodologies, evaluating recently developed methods and investigating their theoretical properties. The research areas of the faculty include survival analysis, statistical genetics, bioinformatics, clinical trials, statistical/machine learning, Bayesian statistics, missing data problems, functional magnetic resonance imaging, high dimensional data analysis, variable selection, and personalized medicine.

The Division of Biostatistics maintains a computing system composed of Linux client-server environment with networked workstations and PC's. All biostatistics graduate students are provided SUN workstations. Available software includes C, C++, FORTRAN, R, SAS, BUGS, JAGS, STAN, MATHEMATICA, and MATLAB.

For up-to-date information on the Division of Biostatistics, see the page: www.mcw.edu/biostatistics

Contact Us:
The Division of Biostatistics
Medical College of Wisconsin
8701 Watertown Plank Road
Milwaukee WI 53226
Phone: 414-955-8280
Fax: 414-955-6513
Email: **phdbiostatistics@mcw.edu**

PhD PROGRAM IN BIOSTATISTICS

The program leading to PhD degree in Biostatistics is offered through the Graduate School of Biomedical Sciences at the Medical College of Wisconsin. It is designed for students with strong undergraduate preparation in Mathematics. The curriculum includes a sound foundation in statistical theory and applications, and training in statistical consulting. In addition, students gain substantial training and experience in statistical computing and software packages. The degree requirements, including dissertation research, are typically completed in at most five years for a well-prepared student entering the program with a BS degree. The program is in collaboration with the faculty of the Department of Mathematics at the University of Wisconsin-Milwaukee. Courses in the program are offered in collaboration with the Department of Mathematics at the University of Wisconsin-Milwaukee with several required courses taught on the UWM campus.

Admission Requirements

The minimum admission requirements are:

- Undergraduate degree in mathematics or closely related fields from an accredited college or university.
- Overall grade point average of B or better.
- B average or better in mathematics and science.

- An average of 80% or greater on the scores of the Quantitative and Verbal components, of the Graduate Record Examination (GRE): http://www.ets.org/gre. Tests must have been taken within five years from the date of application.
- All applicants who did not receive a bachelor's or master's degree from a U.S.-based, non-online degree granting program are required to take either an International English Language Testing System (IELTS) or a Test of English as a Foreign Language (TOEFL): http://www.ets.org/toefl. For TOEFL, our Institution Code is 1519, Department code is 0000 (or leave the department code blank). A score of 100 or higher on the internet-based version of the TOEFL or a score of 6.0 or higher on the IELTS is recommended for competitive consideration.

Applicants are also expected to have completed courses in advanced calculus, linear/matrix algebra and scientific programming with minimum grade of B in each of these courses. Those who have not done so may be considered for admission to the program upon approval of the biostatistics admission committee, and if admitted, these requirements must be completed during the first year of study. In addition to the above requirements, the applicant must have strong interest in pursuing research in biomedical sciences.

Financial Support

Every entering full time student is supported year round by a Fellowship for the first four semesters (fall and spring of the first year, summer and fall of the second year), followed by a Research Assistantship or a Teaching Assistantship for the remaining part of the program, for a maximum of 5 total years of support. The research assistantships provide students with the opportunity to gain experience in statistical consulting and collaborative research. Both types of support include the cost of tuition and fees, a stipend to cover living expenses, and an allowance toward health insurance. The stipend for the academic year 2021-2022 is $31,683. The college provides the health insurance to all stipend students, with additional benefits for dental and vision coverage requiring a nominal cost for dental and vision coverage.

During the fellowship period the student is expected to give full time effort to graduate studies, taking minimum 9 credit hours of coursework per semester in the Fall and Spring, and 6 credit hours in the Summer. As a Research Assistant, the student works 20 hours per week on research projects under faculty supervision.

General participation in the activities of the Division and the Graduate Student Association via committee memberships and volunteering is greatly encouraged.

Student Advising

Upon entering the program, the Director of Graduate Studies serves as the student's academic advisor until the student identifies a dissertation advisor with mutual agreement – usually at the beginning of the third academic year. The student's choice of dissertation advisor must be approved by the Director of Graduate Studies and the Division Director. Dissertation advisors are typically chosen from the senior faculty. A junior faculty member who has not previously served as dissertation advisor may do so, provided a more experienced faculty member is chosen as co-advisor. Students are required to spend time reading with two faculty members prior to selecting a dissertation advisor.

Course Curriculum

A. Required Courses

BIOE 10222 Ethics and Integrity in Science	1 credit
BIOE 10444 Research Ethics Discussion Series	1 credit
BIOS 04214 Design and Analysis of Clinical Trials	3 credits
BIOS 04220 Research Seminar	1 credit
BIOS 04221 Biomedical Applications and Consulting	3 credits
BIOS 04222 Statistical Consulting	3 credits
BIOS 04224 Biostatistical Computing	3 credits
BIOS 04231 Statistical Models and Methods I	3 credits
BIOS 04232 Statistical Models and Methods II	3 credits
BIOS 04233 Introduction to Statistical and Machine Learning	3 credits
BIOS 04275 Applied Survival Analysis	3 credits
BIOS 04285 Introduction to Bayesian Analysis	3 credits
BIOS 04295 Reading and Research	1-9 credit(s)
BIOS 04313 Advanced Statistical Computing	3 credits
BIOS 04363 Advanced Statistics I	3 credits
BIOS 04365 Linear Models I	3 credits
BIOS 04384 Statistical Genetics	3 credits
BIOS 04385 Advanced Bayesian Analysis	3 credits
BIOS 04386 Theory of Survival Analysis	3 credits
BIOS 04399 Doctoral Dissertation	1-9 credits
BIOS 04231/MTHSTAT 761* Mathematical Statistics I	3 credits
BIOS 04232/MTHSTAT 762* Mathematical Statistics II	3 credits
BIOS 24150 Bioinformatics in Omics Analysis	3 credits

*courses taken at UW-Milwaukee

B. Reading and Research

Beginning with the summer after the first academic year students take Readings & Research (04295) hours with various faculty members. The purpose of this is to become familiar with faculty interests and engage in independent preparatory work in possible areas of dissertation research to begin later in the program. Over the first two years students are required to read with at least two different faculty members before making a choice of dissertation topic and advisor. During the third academic year students continue to take Readings & Research hours, now with one faculty member, concentrating in an area of research that will lead to a dissertation proposal. After passing the Qualifying Examination and presenting a dissertation proposal, research is carried out under Readings & Research hours until the final semester in which the student defends the dissertation and graduates.

C. Writing Requirement

Students are required to prepare written reports on two consulting/collaborative research projects during the first two years of study. These reports should include a description of the biological problem, a discussion of the statistical methods used in the analysis and a presentation of results. The reports must be written for presentation to the clinical investigator

and not be focused solely on statistical techniques. A guide to writing consulting reports can be found in The Statistical Consultant in Action by DJ Hand & BS Everitt, Cambridge University Press, 1987.

Reports can be based either on projects from the student's consulting classes or from the student's work assignment. The papers should be 5-10 pages in length as a guide. The documents must be approved by a faculty member (typically the instructor of the consulting class or the supervising faculty member for a collaborative project).

D. Elective Courses

A minimum of 6 credit hours of graduate-level electives in a non-statistical field such as biological/medical science are required. Students may take appropriate courses from MCW, UWM or Marquette to satisfy the elective requirements. Electives must be approved by the student's advisor and the Graduate Committee of the Division. Examples of courses meeting this requirement are:

BIOE 201 Medical Ethics	2 credits
BIOE 222 Ethics and Integrity in Science	2 credits
BIOE 232 Ethics, Policy and Genetic Technology	2 credits
BIOP 215 Medical Physics	1 credit
CDBI 31150 Introductory Cell Biology	1 credit
CDBI 31152 Human Development	1 credit
CDBI 31207 Introduction to Neuroscience	2 credits
PUCH 19210 Health and Medical Geography	3 credits
PUCH 19229 Survey Research Methods	3 credits
PUCH 19150 Introduction to Epidemiology	3 credits
CTSI 20151 Introduction to Epidemiology	3 credits
PUBH 18201 Principles of Epidemiology (online)	3 credits

E. Research Seminar

Each semester, students are required to participate in the Division's two seminar series – the weekly seminar at lunch and the biweekly series of Special Talks. Credit for this activity is obtained by registering for 1 hour of 04220 Research Seminar.

Examination Process

A. Preliminary Examinations. Upon completion of the necessary courses, the student is given two written preliminary examinations. One addresses Theory of Statistics, covering the subject matter from Statistical Inference I & II. The other, on Applied Statistics, covers Statistical Models and Methods I, II and III, Design and Analysis of Clinical Trials, Applied Survival Analysis, Introduction to Bayesian Analysis, and Biostatistical Consulting. Both examinations are organized and administered by the Division's Graduate Studies Committee. Evaluation is done by the entire faculty. The criteria for evaluation are the student's understanding and competency in basic principles and foundations of biostatistics, and his/her potential for conducting independent research in statistical methods and applications. To continue in the PhD program, both examinations must be successfully completed by the end of August in the student's second

year. The examinations are offered every August. If a student does not pass an exam, he/she is given a second opportunity to take it in January.

B. Choosing an Advisor and forming a Dissertation Committee. By the beginning of the Fall semester in the student's third year in the program, the student chooses a member of the Division's faculty as his/her advisor with mutual agreement. It is expected that this choice will grow out of the student's coursework, two research and readings courses, seminar participation and general immersion in the Division's academic activities. The two readings courses are taken in the first summer and the second spring or summer semesters. The student's choice of advisor must be approved by the Director of Graduate Studies and the Division Director. Advisors are typically chosen from the senior faculty. A junior faculty member who has not previously served as dissertation advisor may do so provided a more experienced faculty member is chosen as co-advisor.

In close consultation with the advisor, the student forms the Dissertation Committee in full accordance with the requirements of the Graduate School. The committee consists of five graduate faculty members including the advisor. Four of the five must be from the Division of Biostatistics (including Joint and Adjunct faculty) and one must be from outside the Division of Biostatistics. The committee must be approved by the Director of Graduate Studies and the Division Director. The process of committee formation, including submission of the appropriate form to the Graduate School, must be completed by the end of September in the student's third year. From this date forward the student's progress is monitored by the advisor and the Dissertation Committee.

C. Qualifying Examination. Upon successful completion of the preliminary exam and at a time determined by the Dissertation Committee, the student is given a qualifying examination. This examination is individualized for each student, and it is organized, administered and evaluated by his/her Dissertation Committee. The evaluations are based on student's in-depth understanding and competency in advanced topics in biostatistics, and his/her ability and maturity to apply the knowledge earned from the coursework in conducting meaningful research. The exam consists of two parts. One part is an oral examination testing the student's general statistical knowledge at the advanced level. The other part consists of writing a dissertation proposal and presenting it to the Division. This proposal must be approved by his/her Dissertation Committee. A student not passing either part of the exam may be given another chance to retake that part within three months of the first attempt. Students passing this exam will be admitted to Ph.D. candidacy.

D. Paper submission. The student is required to submit at least one methodology paper to peer reviewed journals. The paper must address statistical methodology and be from the thesis. The student must provide a proof of paper submission for the thesis committee before the final examination.

E. Final Examination. The PhD candidate must submit a dissertation representing an original research contribution. It must show high attainment and clear ability to carry out independent biostatistics research of publishable quality. The final oral examination, including a public defense of the dissertation, is administered by his/her Dissertation Committee after the student has completed all other formal requirements for the PhD degree. The student is expected to

demonstrate a good understanding of the general field in which the dissertation is written. The student's Dissertation Committee will evaluate the performance of the student in the dissertation defense.

Sample Program Plans

Typical sequence for the completion of required courses (starting in even year)

Fall 1: 04214: Clinical Trials 04224: Biostat Computing 04231: Models & Methods I *04261: Mathematical Statistics I** Elective or Bioethics	**Spring 1:** 04232: Models & Methods II *04262: Mathematical Statistics II** 04285: Intro. Bayesian Analysis 04221: Biomedical Applications and Consulting	**Summer 1:** 04222: Statistical Consulting 04295: Readings & Research
Fall 2: 04233: Statistical/Machine Learning 04385: Advanced Bayesian Analysis 04313: Adv. Statistical Computing 24150: Bioinformatics in Omics Analysis 04295: Readings & Research	**Spring 2:** 04275: Applied Survival 04363: Advanced Statistics 04295: Readings & Research Elective or Bioethics	**Summer 2:** 04295: Readings & Research Elective
Fall 3: 04386: Theory of Survival Analysis 04295: Readings & Research Elective	**Spring 3:** 04365: Linear Models 04384: Statistical Genetics 04295: Readings & Research Elective	**Summer 3:** 04295: Readings & Research Elective

Typical sequence for the completion of required courses (starting in odd year)

Fall 1: 04224: Biostat Computing 04231: Models & Methods I *04261: Mathematical Statistics I** Elective or Bioethics	**Spring 1:** 04232: Models & Methods II *04262: Mathematical Statistics II** 04275: Applied Survival 04221: Biomedical Applications and Consulting	**Summer 1:** 04222: Statistical Consulting 04295: Readings & Research
Fall 2: 04214: Clinical Trials 04233: Statistical/Machine Learning 04386: Theory of Survival Analysis 24150: Bioinformatics in Omics Analysis 04295: Readings & Research	**Spring 2:** 04285: Intro. Bayesian Analysis 04365: Linear Models 04384: Statistical Genetics 04295: Readings & Research Elective or Bioethics	**Summer 2:** 04295: Readings & Research Elective
Fall 3: 04313: Adv. Statistical Computing	**Spring 3:** 04363: Advanced Statistics	**Summer 3:**

04385: Advanced Bayesian Analysis 04295: Readings & Research Elective	04295: Readings & Research Elective	04295: Readings & Research Elective

* Italicized courses are taught at the UWM.

Dissertation Research Requirements

The student begins his/her dissertation research during the third year. The initial step consists of identifying a topic that is of mutual interest to the student and a member of the faculty who serves as the dissertation advisor. Courses, talks and presentations by the faculty assist the student in this process. After a literature survey and a clearer definition of the scope of the research under the direction of the advisor, the student submits a written proposal and presents it orally to the advisory committee. During the conduct of dissertation research the advisory committee meets periodically to monitor the student's progress. Upon completion of the proposed research the student submits the dissertation and defends it in a public presentation. The dissertation must be an original contribution to scientific knowledge. It can involve development of new statistical methodologies, evaluation of existing methodologies and study of their properties, innovative application of existing methodologies, or any combination of the above. The dissertation should be of publishable quality in peer reviewed journals in biostatistics or statistics.

Academic Life/Activities

The Division's academic activities include regular Biostatistics Seminar Series and consulting meetings. Students are expected to participate actively in both. The faculty, staff and students in the Division work together in an informal environment. There are regular social gatherings to facilitate and enhance interaction among the faculty, staff and students. In addition, students are urged to participate in the activities of the Graduate Student Association, including its fundraising efforts.

MS PROGRAM IN BIOSTATISTICS

The Division of Biostatistics offers a Master's degree in Biostatistics. The MS degree is only occasionally awarded to those who must discontinue the PhD program, but have met the MS requirements.

A. Required Courses

All of the following courses:

BIOS 04214 Design and Analysis of Clinical Trials	3 credits
BIOS 04221 Biomedical Applications and Consulting	3 credits
BIOS 04224 Biostatistical Computing	3 credits
BIOS 04231 Statistical Models and Methods I	3 credits
BIOS 04232 Statistical Models and Methods II	3 credits
BIOS 04275 Applied Survival Analysis	3 credits
BIOS 04285 Introduction to Bayesian Analysis	3 credits
BIOS 04221 Biomedical Applications and Consulting	3 credits

BIOS 04222 Statistical Consulting	3 credits
BIOE 1022a Ethics and Integrity in Science	1 credit
BIOS 04231/MTHSTAT 761* Mathematical Statistics I	3 credits
BIOS 04232/MTHSTAT 762* Mathematical Statistics II	3 credits

Any three of the following courses:

BIOS 04264* Time Series Analysis	3 credits
BIOS 04280* Applied Probability	3 credits
BIOS 04232 Introduction to Statistical and Machine Learning	3 credits
BIOS 04313 Advanced Statistical Computing	3 credits
BIOS 04363 Advanced Statistics I	3 credits
BIOS 04365 Linear Models I	3 credits
BIOS 04384 Statistical Genetics	3 credits
BIOS 04385 Advanced Bayesian Analysis	3 credits
BIOS 04386 Theory of Survival Analysis	3 credits
BIOS 24150 Bioinformatics in Omics Analysis	3 credits

*Courses taught at UWM Mathematics Department

B. Writing Requirement. Students are required to prepare written reports on two consulting/collaborative research projects. These reports should include a description of the biological problem, a discussion of the statistical methods used in the analysis and a presentation of results. The reports must be written for presentation to the clinical investigator and not be focused solely on statistical techniques. A guide to writing consulting reports can be found in The Statistical Consultant in Action by DJ Hand & BS Everitt, Cambridge University Press, 1987. Reports can be based either on projects from the student's consulting classes or from the student's work assignment. The papers should be 5-10 pages in length as a guide. The documents must be approved by a faculty member (typically the instructor of the consulting class or a member of the student's examination committee).

MASTER OF ARTS PROGRAM IN BIOSTATISTICS AND DATA SCIENCE

Program Description

The Master of Arts program in Biostatistics and Data Science provides a learning experience focused on solid theoretical foundation and practical experience. Robust course offerings, active engagement in statistical consulting, and a capstone project create ample opportunities to develop essential analytical skills. Consulting projects ranging from the simplest statistical summaries to the most complex protocols and data collection schemes allow students to get experience of working with real data analysis projects from start to finish. This hands-on experience will enable students to synthesize the acquired knowledge and integrate various courses they have taken. In the process, students will create a portfolio which demonstrates competency in data analysis, statistical programming, consulting experience with non-statisticians, oral and written communication skills.

Admission Requirements

Any graduate of an accredited college or university with an undergraduate degree in mathematics or related field with strong preparation in mathematics is eligible for admission. Applicants must have the following:

- Baccalaureate degree - official transcripts required
- Prior coursework in calculus (including integrals, such as Calculus II), probability and/or statistics, linear/matrix algebra, and computer programming experience
- An overall grade point average of 3.0 or better
- Three letters of recommendation
- Applicants who studied overseas or via an online U.S.-based institution are required to submit their Test of English as a Foreign Language (TOEFL) or International English Language Testing System (IELTS) results.

Credit Requirements

Students must complete at least 31 credit hours of coursework. The curriculum consists of 8 core, required biostatistics courses which have been identified as an essential knowledge base for all students in the program. Also required, is an Ethics and Integrity in Science course. The capstone project course can be taken throughout multiple semesters but at least 3 credit hours are required for graduation. The program allows for students to choose two or more elective courses which best reflect their personal interests. Students may pursue the degree on a full-time or part-time basis.

Required Courses (25 credits)

BIOE 10222 Ethics and Integrity in Science	1 credit
BIOS 04224 Biostatistical Computing	3 credits
BIOS 04221 Biomedical Applications and Consulting	3 credits
BIOS 04231 Statistical Models and Methods I	3 credits
BIOS 04232 Statistical Models and Methods II	3 credits
BIOS 04233 Introduction to Statistical and Machine Learning	3 credits
BIOS 24160 Concepts in Probability and Statistics	3 credits
BIOS 24150 Bioinformatics in Omics Analysis	3 credits
BIOS 24297 Capstone Project	3 credits

Elective Courses (at least 6 credits)

BIOS 04214* Design and Analysis of Clinical Trials	3 credits
BIOS 04285* Introduction to Bayesian Analysis	3 credits
BIOS 04275* Applied Survival Analysis	3 credits
BIOS 04222 Statistical Consulting	3 credits
PUCH 19210 Health and Medical Geography	3 credits
PUCH 19229 Survey Research Methods	3 credits
PUCH 19150 Introduction to Epidemiology	3 credits
CTSI 20151 Introduction to Epidemiology	3 credits
PUBH 18201 Principles of Epidemiology (online)	3 credits

*NOTE: One of the three elective courses - either BIOST 04214, or 04285, or 04275 - is required.

Description of Courses

04200 Biostatistics I. *3 credits.*
This is an introductory course in biostatistical methods for non-biostatistics majors. Topics include elementary probability, sampling, point and interval estimation and hypothesis testing.

04201 Biostatistics II. *3 credits.*
A continuation of Biostatistics I. Topics include statistical methods for categorical data, regression and correlation, and analysis of variance.

04202 Principles of Biostatistics. *1 credit.*
This course provides an introduction to statistical concepts used in medical research at a non-mathematical level. Topics include introduction to study designs, descriptive statistics, probability, estimation, test of hypothesis, regression and correlation.

04214 Design and Analysis of Clinical Trials. *3 credits.*
Prerequisites: Statistical Models and Methods I or concurrent registration
This course covers issues in clinical trials including the clinical trial protocol, sources of bias in clinical trials, blinding, randomization, sample size calculation; phase I, phase II, phase III and hybrid trials; interim analysis, stochastic curtailment, Bayesian designs, and administrative issues in study design.

04220 Research Seminar. *1 credit.*
Prerequisites: Concurrent registration
Students present plans for an analysis of research projects and research data. Projects and examples from classical and current literature are discussed by students and faculty.

04221 Biomedical Applications and Consulting. *3 credits*.
Prerequisites: Statistical Models and Methods I
Theory of consulting, communication and statistical techniques most often used in consulting and biomedical applications, practical experience in the real consulting setting and writing statistical reports.

04222 Statistical Consulting. *1-3 credit(s).*
Prerequisites: Statistical Models and Methods I & II
This course is designed for students to gain experience in statistical consulting by working with the biostatistics faculty members on various consulting projects.

04224 Biostatistical Computing. *3 credits.*
Prerequisites: Statistical Models and Methods I or concurrent registration
This course will cover the details of manipulating and transforming data required for statistical analysis. Topics include reshaping the data from a per-case to a per-event within a case and vice-versa. It will also cover the techniques necessary to write functions and macros in both SAS and R for developing new/modified data analysis methods. How to use R packages and C/C++ codes in R will also be covered. The LaTeX document production system is also introduced.

04231 Statistical Models and Methods I. *3 credits.*
Prerequisite: Three semesters of calculus and one semester of linear algebra
This course will cover statistical techniques for basic statistics. Topics include one-sample/two-sample

tests, analyses for count data and contingency tables, basic nonparametric methods including sign, rank-sum and signed-rank tests, simple linear regression model and inference, checking model assumptions, model diagnostics, correlation analysis, one-way analysis of variance, Kruskal-Wallis one-way ANOVA, simple logistic regression, and weighted linear regression. SAS/R will be used throughout the course.

04232 Statistical Models and Methods II. *3 credits.*
Prerequisite: Statistical Models and Methods I
This course will cover various regression models for independent and correlated data. Topics include multiple linear regression, model diagnostics, variable selection, influence/leverage, outliers, collinearity, transformation, GLM including logistic and Poisson regression, overdispersion, GEE, mixed models, and GLMM. SAS/R will be used throughout the course.

04233 Introduction to Statistical and Machine Learning. *3 credits.*
Prerequisite: Statistical Models and Methods II
This course will provide an introduction to statistical learning. Core topics include variable selection, penalized linear regression such as lasso, dimension reduction including principal component analysis, flexible regression techniques including kernel smoothing/smoothing splines/generalized additive models/regression trees, support vector machine, clustering, and random forests. Other topics that can be covered include but are not limited to ridge regression, group lasso, fused lasso, adaptive lasso, SCAD, Bayesian lasso, Bayesian group lasso, Bayesian CART, BART, neural network, feature screening, graphical models, and quantile regression.

MTHSTAT 761 * Mathematical Statistics I. *3 credits.* (UWM registration)
Fundamentals of probability, independence, distribution and density functions, random variables, moments and moment-generating functions, discrete and continuous distributions, exponential families, location and scale families, marginal and conditional distributions, transformation and change of variables, multivariate distributions, random samples, convergence concepts, sampling from normal distributions, order statistics.

MTHSTAT 762 * Mathematical Statistics II. *3 credits.* (UWM registration)
Point estimation, interval estimation, hypothesis testing, minimal sufficiency and completeness, ancillary statistics, likelihood and invariance principle, asymptotic properties of estimators and likelihood ratio tests, LMP tests, union-intersection tests, pivotal quantities, coverage probability, large-sample estimation and testing.

PH721 * Introduction to Translational Bioinformatics. *3 credits.* (UWM registration)
Bioinformatics has become one of the major disciplines in modern biomedical research. Knowledge and analytic skills to retrieve the most relevant information imbedded in the large omic data are key to the discovery for translational research. This course will review high-throughput technologies that produce various omic data, along with the methodologies and tools to analyze and interpret these different layers of information. Topics will cover a variety of data mining techniques and the use of several widely-used bioinformatics software and programming tools with emphasis on guiding students through the process of translating genomics data into biological knowledge, towards the discovery of novel therapeutic targets, biomarkers and the dissection of gene networks and pathways.

04275 Applied Survival Analysis. *3 credits.*
Prerequisites: Statistical Models and Methods I
The following topics will be covered in this course: Basic parameters in survival studies; Censoring and

truncation, Competing risks; Univariate estimation including the Kaplan-Meier and Nelson-Aalen estimator; tests comparing two or more populations, the log rank test; Semi-parametric regression, the Cox model; Aalen's Additive hazards regression model; regression diagnostics.

04285 Introduction to Bayesian Analysis. *3 credits.*
Prerequisites: Statistical Models and Methods I
This course introduces basic concepts and computational tools for Bayesian statistical methods. Topics covered include one and two sample inference, regression models and comparison of several populations with normal, dichotomous and count data.

04295 Reading and Research. *1-9 credit(s).*
Prerequisites: Concurrent registration
Readings in recent literature and supervised research project.

04313 Advanced Statistical Computing. *3 credits.*
Prerequisites: Statistical Models and Methods II, Statistical Inference II, Biostatical Computing
This course will focus on numerical computing of statistics and algorithm programming. Topics include: numerical random number generation, likelihood maximization, numerical integration using quadrature and Monte-Carlo methods, the EM algorithm, Monte Carlo simulation, resampling (Bootstrap, permutation, Jackknife), optimization for penalized regression, parallel computing, and creating R packages.

04363 Advanced Statistics I. *3 credits.*
Prerequisites: Statistical Models and Methods II, Statistical Inference II
This course covers both the theoretical framework and practical aspects of statistical models. The course will cover likelihood inference, properties of likelihood, exponential families and GLM, large sample properties of likelihood-based inference, likelihood based regression models, GEE, conditional and marginal likelihood, asymptotics of penalized regression.

04365 Linear Models I. *3 credits.*
Prerequisites: Statistical Inference II
This course will cover review of matrix algebra and vector spaces, multivariate normal distribution, quadratic forms, least squares estimation, ANOVA, testing contrasts, multiple comparison, lack-of-fit test, multiple regression models, and mixed models. Emphasis is on theory.

04384 Statistical Genetics. *3 credits.*
Prerequisites: Linear Models I, Statistical Inference II
This course will cover the fundamental concepts in population genetics and statistical models and methods on genetic linkage and association mapping studies. Topics include Mendelian inheritance, Hardy-Weinberg equilibrium, linkage disequilibrium, allele identity by descent (IBD), inbreeding and coancestry coefficients, genetic models, heritability, genetic variance components, linkage analysis, haplotype analysis, case-control association analysis, association analysis using family data, adjust for population admixture, analysis of rare variants, microarray data analysis, eQTL analysis, copy number variants (CNV), RNA-seq data, proteomic and methylation data analysis.

04385 Advanced Bayesian Analysis. *3 credits.*
Prerequisites: Introduction to Bayesian Analysis
A combination of Bayesian principles, tools and methods; emphasis is on models, computations and

analysis. Likelihood function, prior, posterior and predictive distributions, Bayes factors, HPD regions, conjugate and non-informative priors in the exponential family, Markov chain Monte Carlo methods for the generalized linear model, hierarchical models, restricted parameter spaces and censored data, examples of Bayesian analyses of complex biomedical models.

04386 Theory of Survival Analysis. *3 credits.*
Prerequisites: Applied Survival Analysis, Statistical Inference II
Analysis of survival data using counting process techniques. Topics include the mathematical theory of counting process, martingales, asymptotic properties for estimation of the survival and cumulative hazard functions, proportional hazards and additive hazards regression models, multivariate survival data, and empirical process.

04391 Special Topics in Statistics. *1-3 credit(s).*
Prerequisites: Concurrent registration
This course is designed to cover special topics in biostatistics that are not covered in regular courses. The topics will depend on the research interests of the instructor and the students.

04399 Doctoral Dissertation. *1-9 credit(s).*
Prerequisites: Concurrent registration

24160 Concepts in Probability and Statistics. *3 credits.*
Prerequisites: Calculus I and II
The course is designed for graduate students who have a background in statistics but would benefit from a review of the basic concepts in probability and statistics. It focuses on the properties of random variables including distributions, expectations, and variability measures. Topics in inferential statistics covered in this course include estimation, hypotheses testing, methods for categorical data tabulation and analysis. It also includes an overview of statistical techniques based on simulations and resampling. Key features of Bayesian analysis will be covered as well. After completion of the course, students should be well prepared for taking more advanced courses in statistics, both theoretical and applied.

24150 Bioinformatics in Omics Analysis. *3 credits*
Prerequisites: Statistical Models and Methods I and Biostatistical Computing, or consent of instructor
The course aims to introduce modern statistical and computational methods in high-throughput omics data analysis. The first half of the course focuses on fundamental statistical and computational methods applicable in different types of high-throughput omics data. The second half covers selected important topics in bioinformatics and aims to give students a systematic view of the omics data analysis. The goals of the course include: (1) to motivate students from quantitative fields into omics research (2) to familiarize students from biological fields with a deeper understanding of statistical methods (3) to promote inter-disciplinary collaboration atmosphere in class. Students are required to have a basic statistical training (i.e. elementary statistics courses, basic calculus, and linear algebra) and basic programming proficiency (R programming is required for homework and the final project).

24297 Capstone Project. *3 credits*
Prerequisites: Statistical Models and Methods II
The course is the culmination of the MA program in Biostatistics. Students will complete a project integrating their statistical analysis, data science, and application domain knowledge. A large and complex dataset will be provided to learners, and the analysis will require the application of a variety of methods and techniques introduced in the previous courses, including exploratory data analysis through

data visualization and numerical summaries, statistical inference, and modeling as well as interpretations of these results in the context of the data and the research question. The project results in a written report and presentation which will improve student's ability to communicate effectively about statistics and data science in written and oral form using both technical and nontechnical language. In addition, the project will enable students to expand their professional portfolio of coding samples, written reports and presentations.

Faculty & Their Research Interest:

The Division of Biostatistics currently has 17 full-time faculty members all dedicated to specific areas of statistical methodology. Please visit their personal faculty pages on the Biostatistics webpage here: https://www.mcw.edu/departments/biostatistics/people/faculty

Kwang Woo Ahn, PhD, Associate Professor
The University of Iowa (Statistics) 2008
Professor Kwang Woo Ahn joined the Division of Biostatistics in August 2008. His research interests include survival/competing risks data analysis, missing data, high dimensional data analysis, and statistical/machine learning. For collaborative research, he has been collaborating with CIBMTR. Dr. Ahn published more than 100 methodology and collaborative papers.

Paul L. Auer, PhD, Professor
Purdue University (Statistics) 2010
Dr. Paul Auer is a Professor in the Division of Biostatistics at the Medical College of Wisconsin and the Director of the Biostatistics Shared Resource at the Froedtert and Medical College of Wisconsin Cancer Center. He joined the division in the Summer of 2021. Dr. Auer's research expertise is in statistical genetics and the analysis of complex genomic data. His work has focused on the analysis of rare genetic variation and its influence on complex traits, large-scale meta-analyses, multi-omic data analysis, imputation of genetic data in multi-ancestry settings, and the detection of somatic copy number alterations. Dr. Auer is also interested in methods for using genetic data to inform causal inferences. Dr. Auer collaborates with research groups at the MCW Cancer Center, the Center for International Blood and Marrow Transplant Research (CIBMTR), and numerous external institutions such as the University of Washington, Columbia University, and the MD Anderson Cancer Center.

Anjishnu Banerjee, PhD, Associate Professor
Duke University (Statistics) 2013
Professor Anjishnu Banerjee joined the Division of Biostatistics in July 2014 coming from Amazon Inc. where he was employed as a Research Scientist. His research involves statistical modeling for large, complex and high dimensional data.

Ruta Brazauskas, PhD, Associate Professor
Medical College of Wisconsin (Biostatistics) 2003
Professor Ruta Brazauskas joined the Division of Biostatistics in June 2008 coming from the Marquette University where she served as Assistant Professor. Her research interests include survival analysis and competing risks. Most recent methodological work on the issues of paired studies in survival analysis was funded by the CTSA supplemental grant awarded to a group of faculty members at the Division.

Raphael Fraser, PhD, Assistant Professor

Florida State University (Statistics) 2015
Dr. Raphael Fraser works as a Statistician for Bone Marrow Transplant Clinical Trials Network and the Center for International Blood and Marrow Transplant Research. His work includes plasma cell disorders, mainly multiple myeloma. He joined the Division of Biostatistics in the fall of 2015 and is also an adjunct professor in the Department of Mathematical Sciences at the University of Wisconsin, Milwaukee. Before joining the Division of Biostatics, Dr. Fraser worked at the Tropical Medicine Research Institute in Kingston, Jamaica where he focused primarily on sickle cell disease. His research interests are survival analysis, clinical trials, Bayesian biostatistics, survey methods and empirical process theory.

Yan Gao, PhD, Assistant Professor
University of Illinois at Chicago (Biostatistics) 2021
Dr. Yan Gao is an Assistant Professor in the Division of Biostatistics at the Medical College of Wisconsin. She joined the division in the fall of 2021. Her major research interests in statistics include Bayesian survival analysis and experimental design in clinical trials. She is particularly interested in developing statistical methodologies and computational tools in survival joint models, multiple testing procedures for multiple endpoints in clinical trials, nonparametric regression, and accelerating MCMC algorithms. She is also interested in both applied mathematics and medicine. Research interests in mathematics include stochastic process, numerical integration and algorithm design. Her interests in medicine include oncology, immunology, genomic medicine and precision medicine. Her major collaboration research groups at MCW include the Center for Advancing Population Science and Division of General Internal Medicine.

Soyoung Kim, PhD, Associate Professor
University of North Carolina at Chapel Hill (Biostatistics) 2013
Professor Soyoung Kim joined the Division of Biostatistics in September 2015, coming from Fred Hutchinson Cancer Research Center where she served as Postdoctoral research fellow. Her research interests include survival analysis, case-cohort studies, casual inference, biomarker evaluation, variable selection, and missing data.

Purushottam W. (Prakash) Laud, PhD, Professor
University of Missouri-Columbia (Statistics) 1977
Professor Laud joined the Division of Biostatistics in the spring of 1994. He was previously in the Department of Mathematical Sciences at Northern Illinois University. His methodological research has spanned many areas of Bayesian statistics: nonparametric models for survival analysis, model selection in linear and generalized linear models, computational methods, semi-parametric models for instrumental variables regression with binary and time-to-event outcomes.

He has several collaborative relationships with researchers at the College, particularly with those in the College's Comprehensive Injury Center (CIC), the Center for Advancing Population Science, and the Cardiovascular Research Center. Projects include falls injury prevention, relationship of obesity and motor vehicle crash fatalities, breast cancer screening and surveillance, genetic mechanisms of hypertension development in salt sensitive rats, and many others. The projects involve both experimental and observational studies.

Chien-Wei (Masaki) Lin, PhD, Assistant Professor
University of Pittsburgh (Biostatistics) 2017
Dr. Chien-Wei (Masaki) Lin is an Assistant Professor in the Division of Biostatistics at the Medical College of Wisconsin. He joined the division in the Summer of 2017. His research expertise is statistical data

analysis using different types of omics data, including single nucleotide polymorphism (SNP), copy number variation (CNV), DNA methylation, gene expression, proteomics (peptide), and metabolomics. He is particularly interested in developing statistical methodologies/tools in the fields of statistical genetics, bioinformatics, power and sample size calculation, integrative/meta-analysis and supervised/unsupervised machine learning problems. His major collaboration research groups at MCW include the Department of Pediatrics and Department of Biomedical Engineering.

Brent R. Logan, PhD, Professor
Northwestern University (Statistics) 2001
Professor Logan joined the Division of Biostatistics in the summer of 2001. Dr. Logan is a biostatistician for the Blood and Marrow Transplant Clinical Trials Network of the Center for International Blood and Marrow Transplant Research, and a statistical consultant for the National Marrow Donor Program. He has research interests in personalized medicine, survival analysis, clinical trials, multiple testing, dose-response analysis, and neuroimaging studies. Professor Logan has published over 120 papers, including more than 20 statistical methodology publications.

Michael Martens, PhD, Assistant Professor
Medical College of Wisconsin (Biostatistics) 2017
Dr. Michael Martens is an Assistant Professor in the Division of Biostatistics at the Medical College of Wisconsin. He joined the division in the Fall of 2020 after working as a Senior Biostatistician at The Emmes Company. His research interests include sequential and adaptive designs for clinical trials, time-to-event analysis, Bayesian nonparametric models for supervised and unsupervised learning, and sample size/power determination for nonlinear regression models. He serves as a biostatistician for the Center for International Blood and Marrow Transplant Research, the Blood and Marrow Transplant Clinical Trials Network, and the Department of Radiation Oncology

Rodney Sparapani, PhD, Associate Professor
Medical College of Wisconsin (Biostatistics) 2011
Dr. Sparapani joined the Division of Biostatistics in December 2013 coming from the Center for Patient Care and Outcomes Research (currently Center for Advancing Population Science) at MCW where he served as the Sr. Biostatistician. His research focuses on applying Bayesian methodology to modern biostatistical problems such as survival analysis, health services research, causal inference, comparative effectiveness research and big data/omics.

Aniko Szabo, PhD, Professor
The University of Memphis (Applied Statistics) 1998
Aniko Szabo is Associate Professor and Director of the Biostatistics Consulting Service. She joined the Division of Biostatistics in the summer of 2007. Prior to joining the Medical College of Wisconsin, she was an Assistant Professor at the Huntsman Cancer Institute and Department of Oncological Sciences at University of Utah. Dr. Szabo's research interests are in statistical modeling of biomedical data. She has worked on developing tree models of oncogenesis, nonparametric models of clustered discrete data, and population level models of the effect of screening on prostate cancer incidence.

Sergey Tarima, PhD, Associate Professor
University of Kentucky (Statistics) 2005
Professor Tarima joined the Division of Biostatistics in the fall of 2005. In a pre-doctoral position he worked on missing data problems in the Injury Research Center at the University of Kentucky. Professor

Tarima's current research interests include methods for using additional information in statistical estimation, estimation with missing, censored and partially grouped data, and survey data analysis.

Kai Yang, PhD, Assistant Professor
University of Florida (Biostatistics) 2021
Dr. Yang is an Assistant Professor in the Division of Biostatistics at the Medical College of Wisconsin. He joined the division in the Summer of 2021. His research interests lie in the intersection between statistical methodologies and their applications to biomedical science, environmental science and engineering. He is particularly interested in developing nonparametric methodologies for modeling and monitoring spatio-temporal data with covariates, which has broad applications in disease surveillance, environmental monitoring and streaming image processing. In addition, Dr. Yang loves collaboration with colleagues. He has many years of experience on collaborating with epidemiologists, environmental health scientists, cancer researchers, physicians, engineers, radiologists and more.

Tao Wang, PhD, Associate Professor
North Carolina State University (Statistics) 2001
Professor Wang joined the Division of Biostatistics in January 2002, coming from North Carolina State University where he was a PhD student in the Bioinformatics Research Center. He also holds a joint appointment at the Human Molecular Genetic Center (HMGC) here at MCW.
Dr. Wang's research interest focuses on statistical genetics. His current researches include theoretical modeling and analysis of quantitative trait loci (QTL), and statistical methods for association mapping of disease genes using polymorphic genetic markers such as single nucleotide polymorphisms (SNPs).

Mei-Jie Zhang, PhD, Professor
Florida State University (Statistics) 1991
Professor Zhang came to the Medical College of Wisconsin to serve as an assistant professor and a biostatistician for the Center for International Blood and Marrow Transplant Research (CIBMTR) in 1992. Professor Zhang joined the Division of Biostatistics in 1994.

Professor Zhang's major research areas are survival analysis, inference from stochastic processes, non-linear models and diagnostic testing. As a biostatistician for the CIBMTR he is interested in developing statistical model and methodology for analyzing complex transplant data. His research is funded by the National Institute of Health and the National Cancer Institute. Professor Zhang has published more than 180 original articles in peer-reviewed journals. Dr. Zhang is an Associate Editor for the *Lifetime Data Analysis.*

Adjunct Faculty

- Pippa Simpson, PhD, Professor, Medical College of Wisconsin, Quantitative Health Sciences
- Vytaras Brazauskas, PhD, Professor, Department of Mathematical Sciences, University of Wisconsin-Milwaukee
- Daniel Gervini, PhD, Professor, Department of Mathematical Sciences, University of Wisconsin-Milwaukee
- Daniel Rowe, PhD, Professor, Marquette University, Department of Mathematical and Statistical Sciences

Collaborative Research Opportunities

Faculty and students in the Division of Biostatistics play important roles in a number of centers and program projects at the Medical College of Wisconsin. The types of problems encountered in these projects often motivate dissertation topics for students.

Biostatistics Consulting Service

https://www.mcw.edu/departments/biostatistics/biostatistics-consulting-service

The consulting service in the Division of Biostatistics at the Medical College of Wisconsin offers comprehensive statistical consulting, computing and data entry services for clients within and outside the Medical College. A full time statistician serves as the manager of the statistical consulting services, and a Biostatistics faculty member is in charge of overseeing the operation. Each consulting project is supervised by a faculty member, and the consulting is provided by the faculty member and/or the manager of the services. Biostatistics graduate students also become involved in consulting under the supervision of the faculty. Specific services offered include assistance in grant proposal preparation, design of clinical trials, experimental design, survey design, determination of sample size requirements, randomization, data management, modeling, data analysis and interpretation. The Biostatistics Division has state of the art statistical software packages and computing facilities. For more information about the Biostatistics Consulting Service please visit their website

Cancer Center at MCW

https://www.mcw.edu/departments/cancer-center

The Cancer Center at the Medical College of Wisconsin is actively involved in clinical and basic science research in the areas of bone marrow transplantation, biological response modifiers, gene regulation experimental radiotherapy, cell biology and experimental therapeutics. MCW participates in multi-institutional cooperative group studies as well as serves as coordinating center for some clinical trials. Today, the statistician is recognized as an integral partner in the design of cancer clinical trials from concept to execution. Survival outcomes are frequently the principal measurement of effect of therapy in clinical trials. Statistical research in the area of survival (time of event) analysis has become a major area of research in biostatistics. Cancer research at the Medical College of Wisconsin offers biostatistics students the opportunity to gain familiarity and experience in the design and conduct of clinical trials. Dr. Paul Auer is the Director of the Biostatistics Shared Resource at the MCW Cancer Center.

Center for Advancing Population Science (CAPS)

https://www.mcw.edu/departments/center-for-advancing-population-science-caps

Re-introduced in July 2018, the Center for Advancing Population Science (CAPS), formerly the Center for Patient Care and Outcomes Research (PCOR), develops, tests and implements innovative strategies for transforming healthcare that optimizes quality, value and cost. Through innovative research, analysis, implementation and impact, CAPS is set to become a global leader in healthcare transformation. With a focus on population science and global health, enhanced faculty and collaborator recruitment, and a desire to improve community engagement, CAPS conducts research on patient care services and related health outcomes, facilitates a supportive environment for new MCW investigators, determines the need for and recruit new faculty in targeted methodologic areas, and sponsors a health services research seminar series for the exchange of ideas. Drs. Prakash Laud and Yan Gao from the Division of Biostatistics work with physicians and other medical researchers in CAPS. Most of the projects here are funded by government agencies such as the National Institutes of Health and the Department of Defense or by private foundations.

The Clinical and Translational Science Institute
https://ctsi.mcw.edu/
The CTSI, which was founded in 2010, comprises the BloodCenter of Wisconsin, Children's Hospital of Wisconsin, Clement Zablocki VA Medical Center, Froedtert Hospital, Marquette University, MCW, Milwaukee School of Engineering, and the University of Wisconsin – Milwaukee. The composition of the CTSI is unique nationally because of the engagement of academic institutions not affiliated with MCW. Using innovative mechanisms, CTSI members work to translate research discoveries more quickly into preventive, diagnostic and therapeutic interventions for patients. Consortium members share resources, technology, knowledge and expertise to work towards those goals. The CTSI research portfolio includes more than 185 studies, with more than 47 collaborative research studies underway.

The CTSI is a borderless, synergistic biomedical research enterprise that is accelerating the translation of research discoveries into new and improved medical treatments.

The Genomic Sciences and Precision Medicine Center
https://www.mcw.edu/departments/genomic-sciences-and-precision-medicine-center-gspmc
The Genomic Sciences and Precision Medicine Center at the Medical College of Wisconsin provides academic support for researchers at MCW who use the genomic sequence to understand disease and translate this information from the laboratory to the patient. Most of the research projects in the Center are funded by government agencies such as the National Institutes of Health. The research areas include various directions in genomics, high throughput sequencing and the development and use of single nucleotide polymorphisms (SNP's), microarray analysis and bioinformatics. Dr. Tao Wang is associated with this Center.

Statistical Center of the Center for International Blood and Marrow Transplant Research (CIBMTR)
http://www.cibmtr.org/pages/index.aspx
CIBMTR collaborates with the global scientific community to advance hematopoietic cell transplantation and cellular therapy research worldwide. A combined research program of the National Marrow Donor Program and the Medical College of Wisconsin, CIBMTR facilitates critical research that has led to increased survival and an enriched quality of life for thousands of patients. Our prospective and observational research is accomplished through scientific and statistical expertise, a large network of transplant centers and a clinical database of 350,000 transplant recipients.

The Statistical Center is the core component of the registries and is located at the Medical College of Wisconsin in Milwaukee. The Statistical Center provides the biostatistical expertise for designs, conduct, analysis and interpretation of scientific studies. Dr. Zhang serves as the Statistical Director and Drs. Logan, Wang, Brazauskas, Ahn, Kim, Martens, and Fraser serve as the biostatisticians of the Statistical Center which brings the close relationship between the Division of Biostatistics and the Center, and provides the biostatistical students with a broader range of opportunity to analyzing complex transplant data.

The Blood and Marrow Transplant Clinical Trials Network
https://web.emmes.com/study/bmt2/
The Blood and Marrow Transplant Clinical Trials Network (BMT CTN) is a multi-center network funded by the NIH and NCI to implement clinical trials in the field of hematopoietic stem cell transplantation. It was established to conduct large multi-institutional clinical trials. Trials address important issues in hematopoietic stem cell transplantation (HSCT), thereby furthering understanding of the best possible treatment approaches. Participating BMT CTN investigators collaborate through an organization

designed to maintain continuity of operations, to facilitate effective communication and cooperation among participating transplant centers and with collaborators at the National Institutes of Health, and to offer trials participation to patients in all regions of the U.S. Corporation. MCW Biostatisticians support the clinical trials network through the Data Coordinating Center (DCC) in terms of designing the clinical trials and analyzing the trial results. Drs. Logan, Fraser, and Martens serve as the Ph.D. statisticians for BMT CTN.

The National Marrow Donor Program

https://network.bethematchclinical.org/

Dr. Brent Logan serves as the biostatistician for the corporate activities of the National Marrow Donor Program® (NMDP)/Be The Match® National Marrow Donor Program (NMDP) in Minneapolis. The NMDP is NMDP/Be The Match is a global leader in bone marrow transplantation. They conduct research to improve transplant outcomes, provide support and resources for patients, and partner with a global network. All centers in their network must meet quality standards. These standards are put in place to make sure that donors and patients receive high quality care and government standards are met.

Projects of statistical interest include projections of the optimal registry size and composition and development of some means of grading performance of NMDP centers in terms of patient survival.

MCW Comprehensive Injury Center

https://www.mcw.edu/departments/comprehensive-injury-center

The CIC at MCW conducts research in wide ranging aspects of injury and its treatment. Ongoing projects include quality of life after trauma, biomechanics of penetrating brain injury, violence related fatalities and injuries, and psychological factors in adjustment after traumatic injury. Drs. Laud and Tarima from the Biostatistics Division collaborate with various researchers in the Center.

Life in Milwaukee

Milwaukee, a Great Place on a Great Lake!

Milwaukee is located in southeastern Wisconsin, about 90 minutes from Chicago, IL and Madison, WI. Milwaukee is on the shores of Lake Michigan, the fifth largest lake in the world where Summerfest, the world's largest music festival and many ethnic festivals take place throughout the summer. There is something for everyone in Milwaukee; you can experience old world charm, diverse cultures, historic neighborhoods and it's a great place to raise a family.

Like sports? Milwaukee is home to several professional sports teams which include the Bucks (NBA), Brewers (MLB\NL), Packers (NFL), Wave (MISL), Admirals (AHL) or Milwaukee Iron (AFL). Visit one of our many culture centers to include the Pabst Mansion, the Marcus Center for the Performing Arts and the Milwaukee Art Museum which includes the first Santiago Calatrava-designed building in the United States. Visit the MCW "About Milwaukee" webpage for more useful links and resources: https://www.mcw.edu/departments/human-resources/living-working-milwaukee.