



College of HUMAN MEDICINE

Norman Beauchamp,
DEAN

MISSION

The College of Human Medicine was founded in 1964 to develop and implement programs in medical education, research, and service designed to improve the system of health care within the State of Michigan, both directly and through its students and graduates. In the tradition of Michigan State University, the land grant university for the State of Michigan, the college is an educational institution and a social resource in service to the health of the people of the State. As part of this mission, the college seeks opportunities and mechanisms to integrate its academic work with major community health organizations and systems throughout the State, creating a network of education, research, and health services.

The primary mission of the college is the education of physicians who will bring the most sophisticated scientific knowledge to bear on medical problems and health status in a humane and compassionate way, and who will take leadership roles in bringing about changes directed toward achieving equal opportunities for health care for all.

A commitment to this mission is part of the education of all graduates of the college, for it is with these individuals that the responsibility rests to pass this commitment to future generations. Corollaries of this mission are (1) to recruit a diversified student body, faculty, and staff to reflect a changing society and (2) to develop and participate in systems of health care directed toward unmet needs.

The college has been organized to accomplish its mission in undergraduate, graduate, and postgraduate education by:

1. Educating physicians who can serve the needs of the State of Michigan in an exemplary fashion as characterized by: continued learning and professional renewal throughout their lives; concern for the biological, social, and emotional elements in all health problems; readiness to identify and respond to health care needs and problems in their communities; and use of the knowledge, skills, and concepts essential to quality health care and medical problem solving.
2. Generating new knowledge and assisting in its dissemination and application for the benefit of the people of the State of Michigan through education and support of faculty, students, and graduates who critically assess and contribute to the humanistic and scientific studies that are essential to the evolving basis of medical practice.
3. Helping to provide, to evaluate, and, where needed, to improve appropriate health care services and their associated delivery systems.

The College of Human Medicine provides several programs of study leading to health careers. In addition to the professional program that leads to the Doctor of Medicine degree, the College offers a Master in Public Health (M.P.H.) degree as well as Master of Science and Doctor of Philosophy programs through its basic science departments and interdepartmental programs. These departments are Biochemistry and Molecular Biology, Cell and Molecular Biology, Epidemiology and Biostatistics, Genetics, Microbiology and Molecular Genetics, Neuroscience, Pharmacology and Toxicology, Physiology, and Translational Science and Molecular Medicine.

HUMAN MEDICINE

Mission

The clinical departments of the college are Emergency Medicine; Family Medicine; Neurology and Ophthalmology; Pediatrics and Human Development; Obstetrics, Gynecology, and Reproductive Biology; Psychiatry; Medicine; Radiology; and Surgery. The College sponsors residency and fellowship programs in cardiology, child and adolescent psychiatry, endocrinology, family medicine, geriatric psychiatry, hematology/oncology, infectious disease, internal medicine, interventional cardiology, neonatology, pediatrics, physical medicine and rehabilitation, psychiatry, surgery, surgical critical care, and vascular surgery.

Students who are enrolled in the professional program that leads to the Doctor of Medicine degree may elect specializations in Infancy and Early Childhood. For additional information, refer to the statement on *Interdepartmental Graduate Specializations in Infancy and Early Childhood* in the *College of Social Science* section of this catalog.

PROGRAM IN HUMAN MEDICINE

The professional program leading to the Doctor of Medicine degree has been accredited by the Liaison Committee on Medical Education of the American Medical Association/American Association of Medical Colleges.

To achieve its educational goals, the College will:

1. Recruit students from diverse academic, geographical, racial, and ethnic origins.
2. Enact a curriculum for medical students that:
 - (a) is strongly influenced by the focus of educating primary care physicians.
 - (b) considers the understanding of human behavior and social processes, as well as the biological sciences, as basic to medicine.
 - (c) is located, to the extent possible, in communities that closely approximate the environments in which students, as physicians, will ultimately provide health care.
 - (d) considers the needs of the population which its students will ultimately serve.
 - (e) emphasizes medicine as a helping profession as well as an applied science.
 - (f) fosters student responsibility for self-learning, peer evaluation, interactive professional discussion, and decision making in groups of health professionals.
 - (g) results in the preparation of graduates to enter and complete graduate medical education.
 - (h) can be evaluated in terms of its intended accomplishments.
 - (i) can be modified based on assessment of its effectiveness.
 - (j) emphasizes preventive and health maintenance services in clinical practice.
3. Provide oversight to integrated and affiliated community residency and fellowship programs that stress goals similar to those of the medical student curriculum.
4. Promote and support graduate student and postgraduate programs in the disciplines basic to medicine.
5. Provide programs whereby physicians and other health professionals can acquire the conceptual background and skills in instruction, educational planning, evaluation, research, and administration needed to function as effective faculty members.
6. Conduct patient care programs that encourage and foster continued clinical excellence by the faculty and that provide students with examples of quality—evaluated and cost-effective patient care.
7. Sponsor, organize, and evaluate continuing education programs in medically related fields of biological, behavioral, so-

cial, educational, and clinical sciences to assist practicing physicians and other health professionals in pursuing life-long learning objectives, often by collaborating with community organizations and physicians.

8. Collaborate with other colleges in providing educational programs and experiences that would expand the scope of health professions education in the University.

SHARED DISCOVERY CURRICULUM

The College of Human Medicine's Shared Discovery Curriculum is designed to be responsive to the health care needs of Michigan, the country, and in the educational best interests of diverse learners. The curriculum represents a significant departure from present educational models by emphasizing usefulness and experience as the motivating framework for adult medical education. It features the blending of pedagogy and action reverting back more than a century to the traditional medical education of the last 80 years.

The design of the curriculum is based on a set of guiding principles which are divided into two categories. The core principles are envisioned as the foundation to all learning within the curriculum. The critical additional principles are critical to the college's vision and mission and should be reflected in the experiences of any graduate of our program.

Core Principles

Adult learning/student centered
Competence and excellence
Rational instructional design
Humanism
Integration
Patient-centered
Faculty development link to the curriculum

Critical Additional Principles

Community medicine
Chronic disease
Compassion and empathy
Innovative use of technology
Problem-based
Cultural competence
Healthcare disparities
Future oriented
Liaison Committee on Medical Education (LCME) accreditation standards
Multidisciplinary programming
Safety science
Continuous quality improvement model
Teamwork
Leadership

Learning Societies

Students and faculty are organized in an Academy through the creation of four learning societies spanning the geographic campuses and medical student years in the curriculum. The learning societies are the site of academic coordination of student learning plans as well as the home of post clinic groups that integrate and contextualize students' experiences in clinic with the programmed content of the curriculum. The learning societies provide student mentorship, exploration of the social context of medicine and medical humanities, and peer-to-peer and near-peer support.

The college's curriculum is organized around a core group of competencies based on residency competencies adopted by the Accreditation Council for Graduate Medical Education (ACGME).

Additional competencies were added and others were reorganized to better align with the college's mission. This competency structure will be used within the shared discovery curriculum.

Major Curriculum Experiences

The curriculum will be organized around three major clinical experiences: an Early Clinical Experience, a Middle Clinical Experience, and a Late Clinical Experience. Between the clinical experiences there will be a series of intersessions which will provide an opportunity for students to focus on particular areas of strength, weakness, and interest.

Early Clinical Experience

The 24-week Early Clinical Experience begins with an 8-week lead-in Preparation for the Early Clinical Experience which emphasizes student and patient safety in clinical settings, communication and clinical skills, the social context of clinical decisions, medical humanities, and a survey of the necessary sciences underpinning common ambulatory clinical exam procedures, diagnostics tests, and clinical findings. Within the first few weeks of the Preparation for the Early Clinical Experience, students take the Progress Suite and develop a personal learning plan with their learning community faculty. During the Preparation for the Early Clinical Experience students begin orientation in their ambulatory clinic site and begin learning the clinic's processes. As the Early Clinical Experience proper begins, students sequentially function as a medical assistant and then participate in care management activities before beginning to do focused histories and examinations on patients with common presenting conditions.

The weekly template for Preparation for the Early Clinical Experience and Early Clinical Experience student workflow includes small group sessions, a Team-Based Learning Session or Integrative Clinical Correlation, Post Clinic Group, and guaranteed Guided Independent Learning time each week.

Topics in the Preparation for the Early Clinical Experience include: introductory gross anatomy and radiological correlates for the Core Physical Exam; and integrative molecular and cellular biology of common laboratory tests and host response to pathogen.

Topics for the Early Clinical Experience Chief Complaints include: immunizations and fever, upper respiratory tract infections, knee and back joint pain, blood pressure dysregulation, palpitations, health maintenance, introduction to evidence-based medicine, depression and anxiety, dyspnea, abdominal pain, dysuria, blood glucose dysregulation, dizziness, vertigo, disequilibrium, and syncope.

Intersessions

The Shared Discovery Curriculum includes a series of intersessions between the Early and Middle Clinical Experiences and again between the Middle and Late Clinical Experiences designed to help students prepare for their next level of clinical work.

There are four blocks of intersessions between the Early and Middle Clinical Experiences. Each block is four weeks long and students take two intersessions at a time creating eight total intersessions. Students take three required intersessions such as Medical Humanities, Health of Special Populations, and Evidence-based Medicine. Students also have the opportunity to take "catch-up" intersessions in basic sciences and clinical skills as well as take intersessions related to the college's certificate programs.

Between the Middle and Late Clinical Experiences there are two blocks of intersessions. Each block is four weeks long and students take two intersessions at time creating four total intersessions. Students are required to take two intersessions such as Clinical Anatomy and the United States Medical

Licensure Examination preparation. Students also have the opportunity to take "catch-up" intersessions in basic sciences and clinical skills as well as take intersessions related to the college's certificate programs.

Middle Clinical Experience

The Middle Clinical Experience in the curriculum further integrates clinical and necessary science and humanities experiences in more complex settings and to a greater depth. The learning society post clinic groups of the Early Clinical Experience continue once a week in the Middle Clinical Experience in support of the weekly programmed large group content. The clinical experiences of the Middle Clinical Experience are more varied than in the Early Clinical Experience but still have their own goals and objectives supported by a weekly rotation based small group precepted by the learning society faculty.

Late Clinical Experience

The Late Clinical Experience provides disciplinary clerkships to prepare students for residency and a career of learning in the specialty of their interest. The major disciplines will be included through four-week rotations in family medicine, internal medicine, intensive care, obstetrics and gynecology, pediatrics, psychiatry, Surgery 1 and 2, and electives. Because of the clinical intensity of the Middle Clinical Experience, many of these clerkships are at the level of a sub-internship. The learning society content and recurring progress assessment suites continue through the Late Clinical Experience.

ELECTIVES

Students are also required to complete 24 weeks of approved clinical electives as a part of meeting the college graduation requirements. At least 8 of the 24 weeks must be completed in the community to which the student is assigned. Students are encouraged to study broadly and/or to pursue intensively their special interests through elective programs. Elective programs may include any of the variety of courses offered by the college and university, research projects, or placements in hospitals other than those associated with Michigan State University. Students may also take elective courses at other medical schools.

PROGRESS ASSESSMENT

From the first days of the curriculum, and at regular intervals throughout a learner's trajectory, a suite of progress assessments enable students and their faculty to verify learners' achievement of competence and readiness to advance through the curriculum. Progress testing is a longitudinal competency assessment that facilitates adult lifelong learning. In essence, the College of Human Medicine's progress suite of assessments is the graduation test for the M.D. degree. Students take the progress suite assessment and move through the curriculum as they demonstrate competency. With some slight variation for licensure preparation, every offering of the progress suite of assessments is equivalent and students are evaluated on the assessments many times in their College of Human Medicine career.

Pragmatism as an educational philosophical stance requires assessing thought, action and their interaction. The curriculum utilizes a group of assessments that include the nationally-normed multiple choice examinations associated with a professional education but do not stop at the determination of simply what our learners "know." A core assessment is the Progress Clinical Skills Examination of actual performance with standardized patients. Other assessments in the suite include a multi-source rating by their faculty, peers, health care team members and actual patients which will indicate what our College of

HUMAN MEDICINE Curriculum

Human Medicine students “do.” Portfolios of evidence containing essays, multimedia, reflections, scholarly products and projects are regularly reviewed by faculty to assure that acquisition of the necessary knowledge, skills and attitudes is taking place, and that learners can receive anticipatory guidance to achieve not only competence, but excellence. Ongoing data flow from these multiple types of assessments assure students, faculty, staff, and administration are engaging in continuous quality improvement. Students with particular strengths, such as a strong basic science or clinical background, and weaknesses, such as a time away from formal schooling or an atypical college major, are guided to focus on particular areas of challenge and opportunity.

Progress suite assessments are offered twice a semester to students of all levels of the curriculum. Students are required to pass the progress suite of assessments in order to advance through the curriculum.

ADMISSION TO THE PROGRAM IN HUMAN MEDICINE

The College of Human Medicine Committee on Admissions strives to select qualified applicants who are academically, emotionally, motivationally, and socially competent and ready for the rigors of medical school and for a career in medicine. These competencies creates graduates who meet the bio-psycho-social needs of a diverse patient population. As a community-integrated medical school in Michigan, the college’s mission focuses on educating physicians to meet the primary health care needs of the people of Michigan, including the state’s underserved rural and inner-city areas. In preparation for serving a diverse patient population, the composition of the entering class of 190 students is representative of Michigan’s general population. Students come from a variety of cultural, geographic, and ethnic backgrounds. Historically, women have comprised more than 50 percent, underrepresented minority students 15 to 20 percent, and Michigan residents 80 percent of the entering class. Since there is no preference for academic majors, applicants with varied academic backgrounds are represented in each entering class, including those with degrees in the natural sciences, applied sciences, arts, business, engineering, humanities, and social sciences.

The College of Human Medicine uses the primary application services available through the American Medical College Application Service (AMCAS). Applicants may contact their premedical advisor, or contact AMCAS at <http://www.aamc.org> for application information. The Committee on Admissions encourages students to submit the AMCAS application in June of the year prior to anticipated enrollment, but no later than the November 1 deadline date. The Committee also requires that all applicants submit Medical College Admissions Test (MCAT) scores. The MCAT is administered multiple times throughout the year. MCAT scores are valid for three years. For more information about the MCAT, applicants should contact their premedical advisors, or the MCAT Program Office at www.aamc.org/students/applying/mcat. For further information about the College of Human Medicine, request a copy of the **CHM Handbook for Premedical Students**, by contacting the College of Human Medicine, at <http://www.chm.msu.edu/>

The admissions process will continue the college’s traditional use of holistic review, which uses a balanced assessment of academic metrics, activities, and personal characteristics, and attributes when making admissions decisions. The College of Human Medicine Committee on Admissions evaluates applicants’ AMCAS applications, including life experiences and personal statements, and letters of recommendation (personal characteristics and attributes), and academic profile (major, classes, GPA trends, MCAT scores, undergraduate institution). The Committee evaluates the applications to determine the most qualified applicants to advance to the next phase of the admissions process, the

interview. Students are invited to Interview Day to learn more about the College of Human Medicine through a series of highly-structured interviews and programs. Applicant interviews consists of a one-on-one interview with a medical students and a 100-minute, eight-station multiple mini-interview that uses faculty, staff, students, alumni, and other vested individuals. Interviewers are trained to assess applicants on the qualities the College associates with becoming exemplar physicians consistent with the mission of the college.

The Committee on Admissions makes the final admissions decisions based on the following cognitive and non-cognitive considerations:

1. Academic competence including attributes such as fulfilling the premedical requirements, grades, trend in grades, degrees earned, rigors of the degree programs, MCAT scores, research experience, and cognitive skills.
2. Experiences consistent with a commitment and success within medicine, such as clinical experiences, non-medical community service experiences, experiences with people different from self, experiences showing commitment to a community of people, mentoring experiences, leadership experiences, and teamwork experiences.
3. Personal characteristics and attributes that are consistent with a commitment and success within medicine, such as compassion, maturity, social responsibility, professional responsibility, morals and ethics, sociability, cultural competence, self-awareness calm-disposition, honesty, competence, and respect for others.

Minimum requirements which must be fulfilled prior to enrollment in the program in human medicine are:

1. Completion of the baccalaureate degree.
2. Completion of 8 semester credits or 12 term credits in each of the following areas with no final grade below 2.0:
 - General/Inorganic Chemistry Sequence including at least one laboratory
 - General Biology Sequence including at least one laboratory
 - Organic Chemistry Sequence including at least one laboratory
 - General Physics Sequence including at least one laboratory
 - English Writing courses which may include “Writing in the Major”
 - Humanities/Social Science Courses that focus on psychological and social theory, individual and/or group behaviors, and comparative cultures. Recommended Humanities/Social Science Courses include anthropology, cultural studies, economics, ethics, psychology, sociology, women’s studies, and philosophy.
3. Mathematics through college algebra or one statistics course at the college level (requirement waived with Advanced Placement credit for Calculus 1 or placement above college algebra on a mathematics placement test).
4. Completion of two upper-level (junior or senior level) biological science courses from the following list: biochemistry, cell biology, embryology, genetics, microbiology, molecular biology, neuroscience, or physiology.

Transfer Credits

For a student who is pursuing a full-time M.B.A. degree from MSU jointly with a Doctor of Medicine (M.D.) degree from Michigan State University - College of Human Medicine, a maximum of 12 credits from the MSU College of Human Medicine may be transferred to the full-time M.B.A. degree program.

Student Rights and Responsibilities

Refer to the statement on *Student Rights and Responsibilities* in the *General Information, Policies, Procedures and Regulations* section of this catalog.

GRADUATE STUDY

The graduate programs of the college provide opportunities for advanced study with emphasis in a single discipline on the departmental level. Programs leading to the degrees of Master of Public Health, Master of Science and Doctor of Philosophy are offered. Graduate Certificates in Leadership in Medicine for the Underserved, Leadership in Rural Medicine, Medical Partners in Public Health, and Public Health are available.

All graduate programs of the college are designed to develop independent effort, encourage creative thinking, and educate the student in the fundamentals of basic research. Each student's program is arranged to suit his or her individual needs within the restriction that the final program must conform to one of the general patterns approved by the faculties of the department, college and the university. The college administers master's degrees in biostatistics, epidemiology and public health. Doctor of Philosophy degrees are offered through the basic biological science departments.

Several colleges and departments within Michigan State University cooperate in offering the interdepartmental Doctor of Philosophy degree program with a major in neuroscience, which is administered by the College of Natural Science. For additional information, refer to the statement on the doctoral program in neuroscience in the *College of Natural Science* section of this catalog.

Students who are enrolled in master's or doctoral degree programs in the Department of Psychology may elect an Interdepartmental Specialization in Cognitive Science. For additional information, refer to the statement on *Interdepartmental Graduate Specializations in Cognitive Science* in the *College of Social Science* section of this catalog.

Students who are enrolled in Master of Science degree programs in the Departments of Epidemiology and Biostatistics, and Microbiology and Molecular Genetics may elect a Specialization in Food Safety. For additional information, refer to the statement on the specialization in the *College of Veterinary Medicine* section of this catalog.

Master of Arts

The Master of Arts degree is offered by the College. In addition to meeting the requirements of the University as described in the *Graduate Education* section of this catalog, students must meet the requirements specified below.

Admission

To be admitted to a Master of Arts degree in the College of Human Medicine on regular status, an applicant must have:

1. a bachelor's degree from a recognized educational institution.
2. a cumulative grade-point average of at least 3.0 in the junior and senior years of the bachelor's degree program.

Each applicant must submit a letter directly to the academic unit that administers the program to which admission is sought, giving the applicant's academic background and reasons for pursuing advanced study.

Requirements for the Master of Arts Degree

Candidates for the Master of Arts degree plan a program of study in consultation with a graduate advisor subject to the rules of the academic unit in which the degree is sought, the college, and the University. Two patterns of study are in general use: Plan A (with thesis) and Plan B (without thesis).

Master of Science

The Master of Science is the conventional degree for which programs are offered by the departments of Biochemistry and Molecular Biology, Epidemiology and Biostatistics, Microbiology and Molecular Genetics, Pharmacology and Toxicology, Physiology, and Surgery.

In addition to meeting the requirements of the University as described in the *Graduate Education* section of this catalog, students must meet the requirements specified below.

Admission

Any student who possesses a bachelor's degree may apply for admission to a master's degree program. Admission is determined by the academic unit responsible for the program into which admission is sought and by the dean, after consideration of the student's record, experience, personal qualifications, and proposed program of study.

With the exception of the departments of Epidemiology and Biostatistics, and Surgery, those units of the college which offer master's degree programs are **shared** departments responsible to the College of Human Medicine and to other colleges such as Natural Science and Veterinary Medicine. Whether a student's program is administratively associated with the College of Human Medicine depends on the character of the proposed program, the nature of the student's career aspirations, and the college of the student's mentor. A student accepted by a given department for admission to the graduate program may be identified with the College of Human Medicine upon recommendation of the chairperson of that department and the concurrence of the appropriate deans. This recommendation is contingent on the relevance of the student's program and/or career aspirations to the field of human medicine.

Requirements for the Master of Science Degree

All programs of study must include a thesis for which 4 credits in master's thesis research (course number 899) are required. A maximum of 10 credits may be authorized for thesis research. In addition, an oral examination over the thesis is required. A written examination may be required. The nature of the examination is at the discretion of the academic unit responsible for the program of study.

Academic Standards

The grades required for course credit toward the master or arts and master of science degrees are set by the academic unit responsible for the degree program. The accumulation of grades below 3.0 in more than three courses of three or more credits each removes the student from candidacy for the master of science degree. Candidates for the master of arts degree may accumulate no more than 6 credits with a grade below 3.0 in courses that are to be counted toward the degree. A student who fails to meet the standards set for any program may, on recommendation of the program director and the department chairperson, be required by the dean to withdraw at the end of any semester.

HUMAN MEDICINE Graduate Study

Time Limit

The time limit for completion of the master's degree is six years from the beginning of the first semester in which credit was earned toward the degree.

Doctor of Philosophy

The successful completion of the Doctor of Philosophy degree requires the development in the student of scholarly ability of a very high order. This degree emphasizes research in the various disciplines represented in the College of Human Medicine. The departments of the college which offer programs leading to this degree are Biochemistry and Molecular Biology, Microbiology and Molecular Genetics, Pharmacology and Toxicology, and Physiology.

In addition to meeting the requirements of the University as described in the *Graduate Education* section of this catalog, students must meet the requirements specified below.

Admission

Admission may be granted to a student who has a record acceptable to the department and to the college. A master's degree in an appropriate subject-matter field may be required, but the completion of a master's degree is not a guarantee of admission. Some of the departments require applicants to submit Graduate Record Examination scores. Normally, an average of 3.00 in all previous academic work is required for admission to regular status. Admission to provisional status may be used to indicate incomplete records, incomplete interpretation of available records, grade point average below 3.00 but with additional evidence of good capacity, or minor deficiencies in subject-matter training. Those units of the college which offer Doctor of Philosophy degree programs are *shared* departments responsible to the College of Human Medicine and to other colleges such as Natural Science and Veterinary Medicine. Whether a student's program is administratively associated with the College of Human Medicine depends on the character of the proposed program, the nature of the student's career aspirations and the college of the student's mentor. A student accepted by a given department for admission to the graduate program may be identified with the College of Human Medicine upon recommendation of the chairperson of that department and the concurrence of the appropriate deans. This recommendation is contingent on the relevance of the student's program and/or career aspirations to the field of human medicine.

Academic Standards

In the College of Human Medicine the minimum standards of academic performance for a doctoral candidate are:

1. A 3.00 average in all academic work is required for graduation.
2. Grades of 2.0 or lower in no more than three courses required for graduation.

DUAL DEGREE MEDICAL SCIENTIST TRAINING PROGRAM

The Dual Degree Medical Scientist Training Program is a special program for students who want to earn both a professional medical doctoral degree (Doctor of Medicine) and a graduate research doctoral degree (Doctor of Philosophy). The program seeks to meet a national need for physicians who are proficient in research as well as in medicine, and who will pursue careers as faculty members in medical schools and research institutions.

The program is designed to select, educate, and train highly motivated students having outstanding research and academic qualifications. Trainees pursue medical and graduate studies in parallel, meet regularly with peers in seminars, and engage in medical and graduate level courses and clerkships, as well as in research with highly qualified mentors.

A student who is interested in this program should contact the office of the associate dean for research and graduate study in the College of Human Medicine.

For additional information, refer to the statement on *Special Programs* in the *Graduate Education* section of this catalog.

MASTER OF PUBLIC HEALTH IN PUBLIC HEALTH

The Master of Public Health Degree in Public Health engages students in course work and practical training to obtain the knowledge, skills and abilities to successfully perform as a public health professional. Public health is a discipline that is distinct from clinical medicine. Public health focuses on the health status of communities and populations and emphasizes disease prevention and health promotion over treatment. Three major functions of public health include assessment, policy development and assurance. Core disciplines contributing to public health include biostatistics, epidemiology, health policy and management, social and behavioral sciences, and environmental health sciences.

In addition to meeting the requirements of the University and of the College of Human Medicine, students must meet the requirements specified below.

Admission

To be considered for admission to the Master of Public Health in Public Health, an applicant must:

1. have earned a bachelor's degree from a recognized, accredited educational institution;
2. submit Graduate Record Examination (GRE), Medical College Admission Test (MCAT), Graduate Management Admission Test (GMAT) or Law School Admission Test (LSAT) scores;
3. present evidence of competency in English, assessed with Test of English as a Foreign Language (TOEFL) or Michigan English Language Assessment Battery (MELAB) scores, if English is not the first language;
4. submit three letters of recommendation;
5. submit an essay describing interest in public health, including professional career goals, and past experience with and understanding of the public health profession;
6. submit official transcripts;
7. submit a resume or curriculum vitae.

The Admission Committee integrates the academic information, letters of recommendation, and information regarding the public health profession to make the final admissions decision based on the following considerations:

1. Academic: including attributes such as grades, trend in grades, degrees earned, rigors of the degree programs, graduate study placement scores, research experience, and cognitive skills;
2. Personal Motivation: including attributes such as public health experience and insights about public health competencies, health care reform, and other ethical, social, legal, political, and economic aspects of health;
3. Social Awareness: including attributes such as community service, experience with persons or groups unlike themselves, leadership, and mentoring experiences, as well as effective communication skills and sensitivity to community concerns.

Students may be invited to participate in on-site or telephone interviews as part of the admission process.

Requirements for the Master of Public Health in Public Health

The Master of Public Health in Public Health is available under Plan B (non-thesis). Students must complete 42 credits as specified below.

	CREDITS
1. Complete all of the following courses (18 credits):	
HM 801 Introduction to Public Health	3
HM 802 Biostatistics for Public Health	3
HM 803 Epidemiology for Public Health	3
HM 804 Public Health Administration	3
HM 805 Social and Behavioral Aspects of Public Health	3
HM 806 Environmental Factors of Health	3
2. All of the following courses (6 credits):	
HM 891 Introduction to Public Health Practicum	1
HM 892 Public Health Practicum	3
HM 893 Public Health Capstone	2
3. Complete 18 credits of elective course work from a list of approved courses available through the student's academic advisor.	
4. Successfully complete a final examination or evaluation.	

GRADUATE CERTIFICATE IN APPLIED PARASITOLOGY FOR PUBLIC HEALTH

The Graduate Certificate in Applied Parasitology for Public Health provides students the knowledge necessary for augmenting existing graduate and medical programs by contributing to the development, implementation, and maintenance of field-based health programs aimed at controlling or eliminating parasitic infections. The Graduate Certificate in Applied Parasitology for Public Health is available only online.

Requirements for the Graduate Certificate in Applied Parasitology for Public Health

	CREDITS
Students must complete the following courses (15 credits):	
HM 863 Parasitic Diseases and Public Health in Developing Countries	3
HM 881 Pathogenesis of Parasitic Infections Important to Public Health	3
HM 886 Public Health Diagnosis and Interpretation of Parasitic Infections	3
HM 887 Control and Eradication of Parasitic Infections of Public Health Importance	3
HM 888 Field Methodology for Investigating Parasitic Diseases of Public Health Importance	3

GRADUATE CERTIFICATE IN CLINICAL TRIALS RESEARCH MANAGEMENT

The Graduate Certificate in Clinical Trials Research Management is a collaborative program offered by Michigan State University and Grand Valley State University. The program is offered only online and designed for experienced clinical researchers seeking additional course work or preparation for entering a clinical research trials career.

Admission

To be considered for admission to the Graduate Certificate in Clinical Trials Research Management, students must:

1. have a bachelor's or advanced degree.
2. submit official copies of transcripts from all post-secondary institutions attended.
3. provide three letters of recommendation.
4. submit a personal essay describing interest or experience in clinical trials research and career goals.
5. provide a resume or curriculum vitae.

International students must also:

1. submit evidence of English language proficiency verified by an official Test of English as a Foreign Language (TOEFL).
2. provide proof of funding if requesting an I-20.

Students who have been admitted to a master's or doctoral degree program at either University must notify both the graduate studies office and the program coordinator if they intend to seek this certificate in addition to the program for which they have been admitted.

Requirements for the Graduate Certificate in Clinical Trials Research Management

	CREDITS
Students must complete 12 credits from the following courses:	
<i>From Michigan State University, both of the following courses:</i>	
HM 868 Integrated Research Study Design and Informatics	3
PHM 659 Regulatory Affairs and Project Management in Clinical Research	3
<i>From Grand Valley State University, the following course:</i>	
PSM 650 Ethics and Professionalism in Applied Science	3
<i>From Grand Valley State University, one of the following courses:</i>	
AHS 692 Clinical Research Trials Capstone	3
PA 535 Grant Writing	3
STA 610 Applied Statistics for Health Professionals	3

Students who do not have two or more years of professional experience related to clinical trials research are advised to select AHS 692 as part of their program of study. If selected, AHS 692 must be taken after completion of at least two of the required courses and may be taken concurrently with the third required course.

Transfer Credit

Because of the collaborative nature of this program, the courses listed above are the only courses that can be used to satisfy the requirements of this certificate. Courses from institutions other than Michigan State University and Grand Valley State University cannot be used in this certificate program. The certificate awarded to students will include the following statement: Collaborative Program of Grand Valley State University and Michigan State University.

GRADUATE CERTIFICATE IN COUNTERFEIT PHARMACEUTICALS

The Graduate Certificate in Counterfeit Pharmaceuticals embodies the principles of prevention in public health and tackles the emerging threat of fake legal drugs.

Requirements for the Graduate Certificate in Counterfeit Pharmaceuticals

	CREDITS
Students must complete all of the following courses (15 credits):	
HM 801 Introduction to Public Health	3
HM 833 Introduction to Pharmaceutical Counterfeiting and Public Health	3
HM 834 Advanced Counterfeit Pharmaceuticals Readings	3
HM 875 Applications of Open Source Information in Public Health Intelligence	3
VM 813 Special Studies in Food Safety	3

GRADUATE CERTIFICATE IN INTERNATIONAL PUBLIC HEALTH

The Graduate Certificate in International Public Health provides access to interdisciplinary study in global health issues with the opportunity to gain specific expertise in the unique challenges of international public health in the developing world, or among relevant international populations in the United States. The certificate is also designed to develop an intellectual environment that will foster the growth of research, teaching and practice in international public health.

HUMAN MEDICINE
Graduate Study

Requirements for the Graduate Certificate in International Public Health

Students must complete all of the following courses (15 credits):			CREDITS
HM	832	Global Public Health	3
HM	836	Comparative Global Healthcare Systems	3
HM	837	Poverty and Public Health	3
HM	838	Cultural Aspects of Public Health Practice	3
HM	839	Water and Public Health: A Global Perspective	3

GRADUATE CERTIFICATE IN LEADERSHIP IN MEDICINE FOR THE UNDERSERVED

The Graduate Certificate in Leadership in Medicine for the Underserved prepares physicians to address the needs of medically underserved and vulnerable populations of the United States and abroad. The graduate certificate is available to students currently pursuing the Professional Program in Human Medicine leading to the Doctor of Medicine degree.

Requirements for the Graduate Certificate in Leadership in Medicine for the Underserved

Students must successfully complete the following:			CREDITS
1.	Participation in 130 hours of didactic/experiential learning sessions during Block III of the professional program.		
2.	Participation in 88 self-directed volunteer hours during Block III and IV of the professional program.		
3.	Completion of the following courses during Block IV (12 credits):		
	HM	629 Leadership in Medicine for Underserved or Vulnerable Communities	6
	HM	631 Advanced Leadership in Medicine for Underserved or Vulnerable Communities	6

GRADUATE CERTIFICATE IN LEADERSHIP IN RURAL MEDICINE

The Graduate Certificate in Leadership in Rural Medicine trains students to possess a special set of knowledge, skills and attitudes enabling them to better understand address the medical needs and provision of healthcare to individuals living in rural and remote communities. The graduate certificate is available to students currently pursuing the Professional Program in Human Medicine leading to the Doctor of Medicine degree.

Requirements for the Graduate Certificate in Leadership in Rural Medicine

Students must successfully complete the following:			CREDITS
1.	Participation in 90% or more the additional didactic sessions during Block I and Block II years of the professional program.		
2.	Participation in the 32-hour preclinical experience in a rural community.		
3.	Completion of at least 12 weeks' clinical experience in a rural or remote education setting during Block III of the professional program.		
4.	Completion of additional clinical experience in the rural community.		
5.	One of the following rural elective options (12 credits):		
	a.	Students in the Rural Physician Program (RPP):	
		FM 608 Family Practice Clerkship	6
		HM 632 Rural Community Health	6
	b.	Students in the Rural Community Health Program (R-CHP):	
		HM 632 Rural Community Health	6
		HM 633 Advanced Rural Community Health	6
6.	Completion of a scholarly presentation or publication.		
7.	Completion of portfolio or additional assignments as assigned by the student's advisor.		

GRADUATE CERTIFICATE IN MEDICAL PARTNERS IN PUBLIC HEALTH

The Graduate Certificate in Medical Partners in Public Health is designed for College of Human Medicine medical students who are interested in complementing their clinical medicine training with a rigorous population and community-focused approach to

improving public health. The certificate helps fulfill the Center for Disease Control's vision of training physicians who do not yet have a public health degree.

Admission

Students must be in good academic standing to participate in the program. Students must apply for and be selected for the program by completing the application process which consists of essays and interviews. Students are not eligible for the certificate if they already possess master's in public health degree or certificate.

Requirements for the Graduate Certificate in Medical Partners in Public Health

Students must complete all of the following courses (18 credits):			CREDITS
HM	622	Practical Applications of Public Health Principles-Planning a Community Project	6
HM	623	Practical Applications of Public Health Principles-Implementing a Community Project	6
HM	822	Introduction to Core Disciplines of Public Health for Medical Students	3
HM	823	Medical Partners in Public Health: Special Seminars	3
Students will also participate in community service and in quarterly journal club/seminars around public health topics.			

GRADUATE CERTIFICATE IN PUBLIC HEALTH

The Graduate Certificate in Public Health is designed to provide students with an overview of the core disciplines, a basis for understanding the breadth and scope of the public health field. Public health differs from clinical medicine in its focus on populations and emphasis on health promotion and disease prevention. Public health activities such as health education, control of communicable diseases, application of sanitary measures and environmental monitoring contribute to the health status of communities. Core public health disciplines include biostatistics, epidemiology, health policy and management, social and behavioral sciences, and environmental health sciences.

Requirements for the Graduate Certificate in Public Health

1. Complete all of the following courses (18 credits):			CREDITS
HM	801	Introduction to Public Health	3
HM	802	Biostatistics for Public Health	3
HM	803	Epidemiology for Public Health	3
HM	804	Public Health Administration	3
HM	805	Social and Behavioral Aspects of Public Health	3
HM	806	Environmental Factors of Health	3

GRADUATE CERTIFICATE IN PUBLIC HEALTH ADMINISTRATION

The Graduate Certificate in Public Health Administration offers additional study in the area of public health administration which includes planning, organization, administration, management, evaluation and policy analysis of health and public health programs.

Requirements for the Graduate Certificate in Public Health Administration

Students must complete all of the following courses (18 credits):			CREDITS
HM	801	Introduction to Public Health	3
HM	804	Public Health Administration	3
HM	830	Practical Applications of Public Health Law	3
HM	840	Public Health Finance	3
HM	841	Public Health Policy	3
HM	853	Public Health Program/Intervention Evaluation	3

GRADUATE CERTIFICATE IN PUBLIC HEALTH INFORMATICS

The Graduate Certificate in Public Health Informatics provides a systematic application of information, computer science, and technology to public health practice, research and learning.

Students who successfully complete the course work will be well positioned to compete for the Public Health Informatics Fellowship program sponsored by the Centers for Disease Control and Prevention.

Requirements for the Graduate Certificate in Public Health Informatics

Students must complete all of the following courses (15 credits):			CREDITS
HM	842	Introduction to Public Health Informatics	3
HM	843	Methods in Public Health Informatics	3
HM	844	Legal/Ethical Issues in Public Health Informatics	3
HM	845	Informatics and Information Technology	3
HM	846	Advanced Topics in Public Health Informatics Management	3

DEPARTMENT of ANESTHESIA

GRADUATE STUDY

The Department of Anesthesia is administered by the College of Human Medicine with the mission of providing medical students with vital experience in airway management and the care of patients during surgery. Faculty provide hands-on training for residents from other medical specialties and for students in other health fields involving the care of surgical patients (nurse anesthetists, physician assistants, anesthesia assistants, and emergency medical technicians). Outside the surgical suites, the department collaborates with community anesthesiologists in developing continuing education programs for the benefit of physicians around the state.

DEPARTMENT of BIOCHEMISTRY and MOLECULAR BIOLOGY

Thomas D. Sharkey, Chairperson

GRADUATE STUDY

The Department of Biochemistry and Molecular Biology is administered jointly by the colleges of Human Medicine, Natural Science, and Osteopathic Medicine. These colleges offer Master of Science and Doctor of Philosophy degree programs with a major in biochemistry and molecular biology. In addition, the College of Natural Science offers a Doctor of Philosophy degree program in biochemistry and molecular biology—environmental toxicology along with options for dual majors in a variety of disciplines. For additional information about the department and its graduate degree programs, refer to the statement on the *Department of Biochemistry and Molecular Biology* in the *College of Natural Science* section of this catalog.

BIOMOLECULAR SCIENCE GATEWAY - FIRST YEAR

Students are encouraged to apply for admission to the Ph.D. program through the BioMolecular Science Gateway – First Year, where students choose a doctoral major from any of six Ph.D. programs: biochemistry and molecular biology, cell and molecular biology, genetics, microbiology and molecular genetics, pharmacology and toxicology, or physiology. For additional information refer to the *College of Natural Science* section of this catalog.

DEPARTMENT of EMERGENCY MEDICINE

Michael Brown, Chairperson

GRADUATE STUDY

The Department of Emergency Medicine is administered by the College of Human Medicine. The department's responsibilities include preclinical and clinical medical student teaching, emergency medicine residency training, and research. Areas of clinical research and education encompass the broad spectrum of acute care ranging from pediatric emergencies to geriatrics. The research program emphasizes collaboration with other clinical departments and communities in the areas of neurological emergencies, resuscitation and knowledge translation. The department is affiliated with graduate medical education programs in community hospitals where the department faculty train emergency medicine residents.

DEPARTMENT of EPIDEMIOLOGY and BIOSTATISTICS

Claudia B. Holzman, Chairperson

The Department of Epidemiology and Biostatistics offers several graduate-level educational opportunities including Master of Science and Doctor of Philosophy degree programs in epidemiology, Master of Science and Doctor of Philosophy degree programs in biostatistics, postdoctoral research training in epidemiology and biostatistics, and an epidemiology certificate program as a non-degree graduate program at the undergraduate level. The department also offers a Minor in Global Public Health and Epidemiology. The Department faculty also teach epidemiology and biostatistics to students pursuing medical or other graduate degrees.

Epidemiology and biostatistics are population-oriented quantitative disciplines for medical science and biomedical research; both are concerned with public health. Epidemiologists and biostatisticians work to gain increasingly definitive evidence about how to promote health and to prevent or reduce risk of disease, to delay disease onset, and to shorten or ameliorate disease-related suffering and disability. They also help to shape the practice of evidence-based medicine through methodological and substantive contributions needed for cost effectiveness and decision analysis. Epidemiology and biostatistics are both

HUMAN MEDICINE
Department of Epidemiology and Biostatistics

multidisciplinary endeavors involving a mastery of biological science in health, as well as an understanding of mechanisms that link population health to societal factors and to individual-level health-related behaviors.

Students who are enrolled in Master of Science degree programs in the Department of Epidemiology and Biostatistics may elect a Specialization in Food Safety. For additional information, refer to the statement on the specialization in the *College of Veterinary Medicine* section of this catalog.

UNDERGRADUATE PROGRAM

MINOR IN GLOBAL PUBLIC HEALTH AND EPIDEMIOLOGY

The Minor in Global Public Health and Epidemiology, which is administered by the Department of Epidemiology and Biostatistics, provides an opportunity for sustained study of public health and epidemiology-related topics and research. It is available as an elective to students who are enrolled in bachelor's degree programs at Michigan State University. Applications are accepted starting in January of the freshman year.

The minor focuses on public health and epidemiologic methods, rather than clinical medicine, and treats public health from a global perspective. It addresses the core principles of public health and gives students applied tools for evaluating and analyzing health data.

With the approval of the department and college that administer the student's degree program, the courses that are used to satisfy the minor may also be used to satisfy the requirements for the bachelor's degree.

Requirements for the Minor in Global Public Health and Epidemiology

1. All of the following courses (16 credits):	CREDITS
EPI 200 A Multidisciplinary Approach to Problems in Global Public Health and Epidemiology	3
EPI 280 Applied Analytic Methods in Health Studies I	3
EPI 380 Applied Analytic Methods in Health Studies II	3
EPI 390 Disease in Society: Introduction to Epidemiology and Public Health	4
HM 101 Introduction to Public Health	3

GRADUATE STUDY

BIostatISTICS

Master of Science

The master's degree program in biostatistics is designed to provide graduate students with essential quantitative training necessary for public health and medical research. Students completing the program will be well prepared to design experimental studies and analyze data in several areas of clinical and biomedical investigations. Required courses concentrate on the principles of study design and methods for analysis of the continuous, categorical and mixed types of biomedical data from clinical experiments and from observational studies. Elective courses are offered in analytic methods for inference from longitudinal data, genomic and genetic data, and censored data.

Admission

To be considered for admission applicants must:

1. Have a bachelor's degree including undergraduate or graduate level quantitative methods with at least two semesters of college-level calculus, a course in matrix or linear algebra, and an introductory course in statistics.
2. Demonstrate interest or experience in a public health field by submitting a statement of purpose.
3. Provide an official transcript.
4. Submit Graduate Record Examination (GRE) scores. Test results should not be older than five years.
5. Submit three letters of recommendation, one of which must be from an academic advisor from a previous program.
6. Provide Test of English as a Foreign Language (TOEFL) scores, if an international applicant. A minimum score of 80 on the internet-based test, 550 on the paper-based test or 237 on the computer-based test, or passing grade on the MSU English Language Test (MSUFLT). Scores must be no older than two years. International students with full native fluency in English are exempt.

Students with less preparation may be provisionally admitted. Credits earned in collateral course work will not count towards the degree requirements.

Requirements for the Master of Science Degree in Biostatistics

The program is available under either Plan A (with thesis) or Plan B (without thesis). The student's program of study must be approved by the student's academic advisor and guidance committee with the approval of the Dean of the College of Human Medicine.

In addition to meeting the requirements of the university and of the College of Human Medicine, the student must complete at least 40 credits distributed as follows:

	CREDITS
1. All of the following courses (10 credits):	
EPI 808B Advanced Biostatistics	3
EPI 826B Categorical Data Analysis	3
EPI 855 Biostatistical Modeling in Genomic Data Analysis	3
EPI 856 Statistical Consulting in Public Health	1
2. One of the following courses (3 credits):	
EPI 853B Statistical Computing	3
STT 461 Computations in Probability and Statistics	3
3. Both of the following courses (6 credits):	
EPI 810 Introductory Epidemiology	3
LCS 829 Design and Conduct of Epidemiological Studies and Clinical Trials	3
4. The following course (1 credit):	
EPI 828 Seminar in Responsible Conduct of Research	1
5. Elective courses selected from the following (Plan A 16 credits) or (Plan B 20 credits):	
a. At least 13 credits (Plan A) or 17 credits (Plan B) from the following biostatistics, statistics, and econometrics courses:	
EC 821A Cross Section and Panel Data Econometrics I	3
EC 821B Cross Section and Panel Data Econometrics II	3
EPI 851 SAS Programming I: Essentials	1
EPI 852 SAS Programming II: Data Management and Analysis	1
EPI 858 Clinical Trials	3
EPI 920 Advanced Methods in Epidemiology and Applied Statistics	3
EPI 951 Latent Variable Modeling	3
EPI 952 Duration and Severity Analysis	3
EPI 953 Analytical Strategies for Observational Studies	3
STT 801 Design of Experiments	3
STT 825 Sample Surveys	3
STT 847 Analysis of Survival Data	3
STT 850 Applied Multivariate Statistical Methods	4
STT 861 Theory of Probability and Statistics I	3
STT 862 Theory of Probability and Statistics II	3
b. At least 3 credits from the following epidemiology courses:	
EPI 812 Causal Inference in Epidemiology	3
EPI 813 Investigation of Disease Outbreaks	3
EPI 817 Epidemiology of Communicable Disease	3
Other epidemiology electives are available with approval of the student's academic advisor.	

Additional Requirements for Plan A

1. The following course (4 credits):
EPI 899 Master's Thesis Research 4

Additional Requirements for Plan B

1. Completion of a final oral examination or evaluation.

Doctor of Philosophy

The Doctor of Philosophy degree in Biostatistics provides students with the quantitative skills needed for the development, evaluation and application of novel methods for the analysis of modern biomedical data.

In addition to meeting the requirements of the university, and of the College of Human Medicine, students must meet the requirements specified below.

Admission

For admission to the doctoral degree in biostatistics on regular status, the student must:

1. have a master's degree in biostatistics, statistics, or related field;
2. submit Graduate Record Examination (GRE) scores, or MCAT scores;
3. provide TOEFL scores if their native language is other than English;
4. provide three letters of recommendation;
5. provide a statement of purpose;
6. provide official transcripts.

Applicants with strong academic records who are in the process of completing a master of science may be admitted on a provisional basis. The first 30 credits applied towards the completion of a master of science may not be counted toward the Ph.D. in Biostatistics.

Applicants who are admitted without a master's degree will be required to complete collateral course work to make up deficiencies. Collateral course work will not count towards the fulfillment of degree requirements. It is strongly recommended that applicants have taken course work in multivariate calculus, advanced undergraduate linear algebra and probability, and numerical computing.

Requirements for the Doctor of Philosophy Degree in Biostatistics

The doctoral degree program in biostatistics is selected in consultation with a faculty advisor and guidance committee. The doctoral degree program will offer three emphasis areas: design and analysis of medical studies; big data and statistical genetics; and biometry, a flexible option for students with diverse interests.

Student's must:

1. Complete 25 credits in the required courses for the chosen emphasis area, and electives.
2. Pass the comprehensive examination which contains two modules: the first (3/4 of the exam) will be based on the content covered in the required courses common to all emphasis areas; and the second (1/4 of the exam) will be based on the required courses in the chosen emphasis area. A student who fails the comprehensive examination may retake the examination within six months after the first take, usually in January of the following year.
3. Complete 24 credits of EPI 999 Doctoral Dissertation Research.
4. Successful completion of a dissertation and final oral examination in defense of the dissertation.

EPIDEMIOLOGY

Master of Science

The master's degree program in epidemiology is designed to produce individuals competent to undertake research in epidemiology and to participate in epidemiologic work as a part of public health practice. Required core courses concentrate on the population approach to disease, quantification of disease frequency, approaches to acute disease outbreaks, relevant biostatistical techniques, sources of health data, research design and analysis, and the development of skills in epidemiologic judgment. Specialized elective courses are offered in epidemiologic aspects of

heart disease, cancer, reproductive health, and communicable diseases.

Admission

A bachelor's degree is required for admission to the program.

Requirements for the Master of Science Degree in Epidemiology

The program is available only under Plan A (with thesis). The distribution of credits within the student's program is determined by the student's academic advisor and guidance committee with the approval of the Dean of the College of Human Medicine. The guidance committee determines the form, scope, and time of required examinations.

In addition to meeting the requirements of the university and of the College of Human Medicine, the student must complete at least 40 credits distributed as follows:

	CREDITS
1. All of the following courses:	31
EPI 808 Biostatistics I	3
EPI 809 Biostatistics II	3
EPI 810 Introductory Epidemiology	3
EPI 812 Causal Inference in Epidemiology	3
EPI 817 Epidemiology of Communicable Diseases	3
EPI 826 Research Methods in Epidemiology	3
EPI 828 Seminar in Responsible Conduct of Research	1
EPI 836 Practicum in Epidemiological Methods	3
EPI 851 SAS Programming I: Essentials	1
EPI 852 SAS Programming II: Data Management and Analysis	1
EPI 899 Master's Thesis Research	4
LCS 829 Design and Conduct of Epidemiological Studies and Clinical Trials	3
2. One of the following courses:	3
EPI 815 Epidemiology of Cardiovascular Disease	3
EPI 823 Cancer Epidemiology	3
3. Complete 6 credits of 800-level or above course work approved in advance by the student's guidance committee.	
4. Pass an oral examination in defense of the thesis.	

Doctor of Philosophy

The objective of the Ph.D. degree program is to provide students with the epidemiological and biostatistical skills that will enable them to undertake the highest levels of clinical and epidemiologic research. The program trains students to participate both in public health activities such as health planning, disease control, and community health education and in research into the causation of disease.

Admission

To be considered for admission to the program:

1. an applicant must have earned a master of science or a master of public health in epidemiology degree with at least 40 credits.
2. applicants who earned their master of science or master of public health in epidemiology at an institution other than Michigan State University will be evaluated individually by the department to determine if any additional collateral course work will be required. Credits earned in collateral courses will not count toward the Ph.D. in Epidemiology.
3. submit GRE (Graduate Record Examination) scores, or MCAT scores.
4. present evidence of competency in English (TOEFL or MELAB scores) with their application if their native language is not English.
5. submit three letters of recommendation.
6. submit a statement of purpose.
7. submit official transcripts.

HUMAN MEDICINE
Department of Epidemiology and Biostatistics

Applicants with strong academic records who are in the process of completing a master of science or a master of public health in epidemiology may be admitted on a provisional basis. The first 40 credits applied towards the completion of a master of science or a master of public health in epidemiology may not be counted toward the Ph.D. in Epidemiology.

In addition to meeting the requirements of the University and the College of Human Medicine, students must meet the requirements specified below.

Requirements for the Doctor of Philosophy Degree in Epidemiology

	CREDITS
1. Complete the following core courses (9 credits):	
EPI 805 Readings in the Historical Roots of Epidemiological Thought	3
EPI 910 Themes in Contemporary Epidemiology	3
EPI 920 Advanced Methods in Epidemiology and Applied Statistics	3
2. Complete one of the following courses (3 credits):	
EPI 950 Advanced Biostatistical Methods in Epidemiology	3
STT 847 Analysis of Survival Data	3
3. Complete 15 credits of 800-900 level course work approved in advance by the student's guidance committee.	
4. Attendance at 80% of all presentations in the departmental epidemiology seminar series during the period of course work.	
5. Attendance at monthly Doctoral Journal Club meetings.	
6. Pass a comprehensive written examination which will cover the field of epidemiology in general and the candidate's area of special interest and study.	
7. Successfully complete 24 credits of Epidemiology 999 doctoral dissertation research that demonstrates original research in epidemiology and public health.	
8. Successful oral defense of the dissertation.	

Academic Standards

A student who fails the comprehensive examination or the final oral defense of the dissertation may repeat either examination only once, within six months of the first examination.

DEPARTMENT of FAMILY MEDICINE

Bengt B. Arnetz, Chairperson

The Department of Family Medicine provides medical students in the College of Human Medicine (CHM) with both classroom and clinical education reflecting the depth and scope of family medicine. Our goal is to provide students with a foundation for their future practice, one that incorporates the patient-centered, value-based, and population health-centered values and skills of family medicine, regardless of their future career choice. To accomplish this goal the department is staffed by experienced family physicians and other health, health systems and environmental health professionals with interest and experience in many different aspects of medical practice and education. Interests and activities of the department faculty cover the spectrum of family medicine. The department includes a Division of Geriatrics and Gerontology.

The department participates in most of the college's interdisciplinary programs, directs a required clinical clerkship in family medicine, and offers a variety of electives including Sports Medicine and Geriatrics. The department provides leadership for many areas in the CHM curriculum.

Students in department clerkships attend active family medicine practices that are dedicated to medical education. The practices are located at clinical sites in and around CHM campuses.

The department is active in multiple family medicine residencies at community hospitals across the state. The Integrated Program (TIP) provides senior medical students an opportunity to work intensively with a College of Human Medicine affiliated family medicine residency program. Competitive scholarships are available to support TIP students.

Departmental faculty are engaged in extramurally supported research focusing on primary care, prevention, self-care, geriatrics, complex medical disorders, and long-term care. In addition, the faculty is engaged in population health and environmental health research as well as health systems research, provider well-being, and telehealth. Support for research includes grants from the National Institutes of Health (NIH), Health Resources and Services Administration (HRSA), major foundations, and insurance carriers.

DEPARTMENT of MEDICINE

Francesca Dwamena, Chairperson

The Department of Medicine has major responsibilities for providing students with clinical experience in general clinical medicine and the medical specialties including basic science correlations, patient interviewing, and physical and laboratory diagnosis and problem solving. Clinical education is conducted in affiliated community hospitals. Graduate programs in medical education have been developed in a number of affiliated hospitals where the department makes significant contributions to training medical residents and subspecialty fellows, and to continuing education for practicing physicians in the communities. Faculty members are actively involved in research and collaborate actively with faculty in other departments and affiliated institutions in communities. These programs are based in university facilities including laboratories in the Life Science Building and the Clinical Center. Clinical research is also conducted at the MSU Breslin Cancer Center. The Department of Medicine is dedicated to advancing the practice of medicine while embracing diversity, challenge and opportunity.

DEPARTMENT of MICROBIOLOGY and MOLECULAR GENETICS

Victor J. DiRita, Chairperson

GRADUATE STUDY

The Department of Microbiology and Molecular Genetics is administered jointly by the colleges of Human Medicine, Natural Science, Osteopathic Medicine, and Veterinary Medicine. All four of these colleges offer a Master of Science degree in microbiology and molecular genetics and a Doctor of Philosophy degree in microbiology and molecular genetics. In addition, the College of Veterinary Medicine offers a Doctor of Philosophy degree program with a major in microbiology—environmental toxicology. For additional information about the department and its graduate degree

programs, refer to the statement on the *Department of Microbiology and Molecular Genetics* in the *College of Natural Science* section of this catalog.

BIOMOLECULAR SCIENCE GATEWAY - FIRST YEAR

Students are encouraged to apply for admission to the Ph.D. program through the BioMolecular Science Gateway – First Year, where students choose a doctoral major from any of six Ph.D. programs: biochemistry and molecular biology, cell and molecular biology, genetics, microbiology and molecular genetics, pharmacology and toxicology, or physiology. For additional information refer to the *College of Natural Science* section of this catalog.

DEPARTMENT of NEUROLOGY and OPHTHALMOLOGY

David Kaufman, Chairperson

The Department of Neurology and Ophthalmology, established July 1, 2000, is an outgrowth of the former neuro-ophthalmology unit that has existed on campus since 1986. The department lead is through the College of Osteopathic Medicine. It offers dually accredited residency programs in neurology; fellowship programs in neuro-ophthalmology, stroke, neuro-intervention, neuro-physiology, epilepsy, and neuro-epidemiology; and clinical and research programs for medical and graduate students. The department has Accreditation Council for Graduate Medical Education (ACGME) approval for its neurology residency subspecialty fellowships. It also provides academic oversight for multiple ophthalmology residency programs statewide.

Its broad research portfolio is supported by multiple National Institutes of Health (NIH) grants and other extramural funding. Major themes of the department's research are to use the visual system as a model for brain disease. It also has major research interest in stroke, neuro-intervention, neuro-degenerative disease, epilepsy, sports concussion and demyelinating disease. The department shares research and clinical faculty with affiliated clinical and research laboratories on the MSU campus and statewide.

The clinical responsibilities of the department are fulfilled by on-campus neurologists, neuro-ophthalmologists, and ophthalmologists who have sub-specialty training in a number of different disciplines of neurology. To enrich its research, clinical and educational programs, the department also collaborates with numerous clinicians statewide, nationally and internationally. MSU's International Neurology, Psychiatry and Epidemiology Programs (INPEP) are administered through this unit and has outposts in several countries in sub-Saharan Africa.

DEPARTMENT of OBSTETRICS, GYNECOLOGY, and REPRODUCTIVE BIOLOGY

Richard E. Leach, Chairperson

The Department of Obstetrics, Gynecology, and Reproductive Biology is comprised of a diverse faculty committed to the broad, integrated medical and surgical care of women's health throughout their lifespan. The faculty participates in the educational, research and service goals of the College of Human Medicine to enhance understanding of women's health, including genetic, social cultural and environmental influences.

Within this framework, the department's responsibilities are to provide educational experiences to medical students during the pre-clinical and clinical years, develop and contribute to programs of graduate and continuing medical education, conduct research, and promote optimal women's health within the community. To accomplish its educational goals, the department participates in the college's interdisciplinary programs and directs the required and elective clinical courses across its seven community campuses. The faculty participates in graduate obstetric-gynecologic education through its four affiliate residency programs across the state. Research activities in the areas of human reproduction, gynecologic oncology, prenatal and infant health, health services delivery, and community health problems related to women's health issues comprise the breadth of the department's research.

DEPARTMENT of PEDIATRICS and HUMAN DEVELOPMENT

B. Keith English, Chairperson

The Department of Pediatrics and Human Development is comprised of a diverse faculty who share a common concern for all aspects of human growth and development, both normal and abnormal. The Department has a statewide footprint with faculty in Lansing, Grand Rapids, Flint, Southfield, Midland, Traverse City, and Marquette/Escanaba. The Department has educational responsibilities at all levels in the curriculum of the College of Human Medicine. Its faculty participate in courses which relate biological, behavioral, and clinical sciences to child health. Departmental faculty play major roles in the new College of Human Medicine Shared Discovery Curriculum and its Learning Societies. The department also has responsibility for general pediatric clerkships and pediatric subspecialty electives in the clinical medical curriculum. The department participates actively in graduate medical education with three affiliated pediatric residency programs (with Sparrow Hospital in Lansing, Helen DeVos Children's Hospital in Grand Rapids, and Hurley Children's Hospital in Flint), three affiliated pediatric subspecialty fellowship programs (Perinatal-Neonatal Medicine in Lansing; Pediatric Hematology-Oncology and Pediatric Critical Care Medicine in Grand Rapids), and in CME. In addition, faculty members work with students in other graduate programs in the University. Individual faculty members of the Department participate in patient

care and render medical consultation services in their respective subspecialty areas. The research endeavors of the departmental faculty are expanding and aim to help create a healthier, better functioning society by improving the health and wellbeing of the child and family.

DEPARTMENT of PHARMACOLOGY and TOXICOLOGY

Richard R. Neubig, Chairperson

The Department of Pharmacology and Toxicology is administered jointly by the colleges of Human Medicine, Osteopathic Medicine, and Veterinary Medicine. The College of Veterinary Medicine is the primary administrative unit. All three colleges offer a Master of Science degree program in Laboratory Research in Pharmacology and Toxicology, a Master of Science and Doctor of Philosophy degree program in Pharmacology and Toxicology, and a Graduate Certificate in Safety Pharmacology. A Master of Science degree in Integrative Pharmacology is also available for professional laboratory personnel. In addition, the College of Veterinary Medicine offers a Doctor of Philosophy degree program with a major in pharmacology and toxicology—environmental toxicology.

The department is responsible for teaching the fundamentals and applied aspects of pharmacology and toxicology and offers courses at the undergraduate, professional, and graduate levels.

A Minor in Pharmacology and Toxicology is available through the College of Veterinary Medicine.

GRADUATE STUDY

The graduate programs in Pharmacology and Toxicology are primarily designed to prepare students for careers in research, teaching, and related activities. Research interests range from the effects of drugs and chemicals on macromolecules to their actions in humans. Research strengths include neuropharmacology, neurotoxicology, cardiovascular pharmacology, cancer pharmacology and prevention, environmental toxicology, drug discovery, drug receptor pharmacology, gastrointestinal pharmacology, immunopharmacology, immunotoxicology and integrative pharmacology.

For additional information about the department and its graduate degree programs, refer to the statement on the *Department of Pharmacology and Toxicology* in the *College of Osteopathic Medicine* section of this catalog.

Students who are enrolled in Master of Science degree programs in the Department of Pharmacology and Toxicology may elect a Specialization in Food Safety. For additional information, refer to the statement on the specialization in the *College of Veterinary Medicine* section of this catalog.

BIOMOLECULAR SCIENCE GATEWAY - FIRST YEAR

Students are encouraged to apply for admission to the Ph.D. program through the BioMolecular Science Gateway – First Year, where students choose a doctoral major from any of six Ph.D. programs: biochemistry and molecular biology, cell and molecular biology, genetics, microbiology and molecular genetics, pharmacology and toxicology, or physiology. For additional information

refer to the *College of Natural Science* section of this catalog.

DEPARTMENT of PHYSIOLOGY

Charles Leroy Cox, Chairperson

GRADUATE STUDY

The Department of Physiology is administered jointly by the colleges of Human Medicine, Natural Science, Osteopathic Medicine, and Veterinary Medicine. All four of these colleges offer Master of Science and Doctor of Philosophy degree programs with majors in physiology. In addition, the College of Natural Science offers a Doctor of Philosophy degree program with a major in physiology—environmental toxicology. For additional information about the department and its graduate degree programs, refer to the statement on the *Department of Physiology* in the *College of Natural Science* section of this catalog.

PHYSIOLOGY—ENVIRONMENTAL TOXICOLOGY

Doctor of Philosophy

For information about the Doctor of Philosophy degree program in physiology—environmental toxicology, refer to the statement on *Multidepartmental Doctoral Programs in Environmental Toxicology* in the *Graduate Education* section of this catalog.

BIOMOLECULAR SCIENCE GATEWAY - FIRST YEAR

Students are encouraged to apply for admission to the Ph.D. program through the BioMolecular Science Gateway – First Year, where students choose a doctoral major from any of six Ph.D. programs: biochemistry and molecular biology, cell and molecular biology, genetics, microbiology and molecular genetics, pharmacology and toxicology, or physiology. For additional information refer to the *College of Natural Science* section of this catalog.

DEPARTMENT of PSYCHIATRY

Jed Gary Magen, Chairperson

The Department of Psychiatry is administered jointly by the colleges of Human Medicine and Osteopathic Medicine. The College of Human Medicine is the primary administrative unit. The department plays a major role in integrating the behavioral sciences with the biological sciences and with clinical science elements of the professional programs of these colleges. The department's responsibilities include: preclinical and clinical medical student teaching, psychiatry residency training, professional continuing medical education, patient care, and research. Areas of research emphasis include: geriatric psychiatry, child psychiatry, **neurocognitive dysfunctions secondary to malaria and AIDS**; trace minerals in HIV-infected individuals collab-

orating in graduate medical and psychiatric education with affiliated institutions; developing programs on continuing education for physicians and contributing to continuing education programs for other mental health care disciplines; and developing research programs including some in collaboration with other clinical departments. The department has extensive telepsychiatry services to multiple sites around the state of Michigan.

DEPARTMENT of RADIOLOGY

Suresh K. Mukherji, Chairperson

The Department of Radiology is jointly administered by the Colleges of Osteopathic Medicine and Human Medicine. The Department provides basic and clinical education in anatomy and diagnostic imaging including radiology, ultrasound, magnetic resonance, CT, women's imaging and nuclear medicine. Department faculty have special skills and interests in management, health policy, and medical decision-making. In the College of Osteopathic Medicine, faculty participate in the Systems sequence, deliver RAD 610 as a required course, and provide radiology and anatomy content for several statewide campus system residency courses. Other electives are offered in both colleges, including clerkships in radiology and nuclear medicine at affiliated hospitals. The department sponsors a visiting professor program for residents, interns and medical students. The department directs an osteopathic residency program through a hospital in Garden City, Michigan. Research interests include molecular imaging, imaging physics, bioengineering, fMRI, sports physiology and regenerative medicine. More information about the department can be found at www.rad.msu.edu.

DEPARTMENT of SURGERY

The Department of Surgery is dedicated to providing state of the art, evidence-based and cost-effective surgical care. We strive to put patients and their families first. Our updated surgical curriculum is built to provide a solid foundation for medical students in all our clinical campuses, including Flint, Grand Rapids, Lansing, Midland Region, Southeast Michigan, Traverse City, and the Upper Peninsula. Our postgraduate general surgery training programs strive to provide a broad clinical experience to our residents and launch their surgical career. The department also offers several postgraduate surgical specialty training in critical care, cardiothoracic, colorectal, plastic and reconstructive and vascular surgery. We foster a culture of scientific curiosity and seek new discoveries through clinical and basic science research. The surgical faculty is involved in all aspects of clinical care, education, simulation and research, and is committed to educate the surgeons of the future.

DEPARTMENT of TRANSLATIONAL SCIENCE and MOLECULAR MEDICINE

Jack Lipton, Chairperson

GRADUATE STUDY

The Department of Translational Science and Molecular Medicine (TSMM) is a research-intensive department focused on the study and treatment of neurodegenerative diseases. The current faculty within TSMM study Alzheimer's disease, Parkinson's disease and Traumatic Brain Injury/Neuroinflammation. For first year College of Human Medicine medical students, TSMM offers Molecular Neuropathology of Neurodegenerative Diseases which provides advanced study of the pathological hallmarks, pathological molecules, symptomatology, diagnostic criteria, genetic and environmental risk factors, and the epidemiology and socioeconomics of neurodegenerative diseases. TSMM faculty members also participate in mentor-based education for students pursuing doctoral degrees through the Neuroscience and the Biomolecular Science graduate programs. TSMM strives to provide research opportunities and resources to students in pursuing translational neuroscience research. The faculty also have a comprehensive program of community outreach and education for patients and the lay public.

DIVISION OF HUMAN PATHOLOGY

The Division of Human Pathology is administered by the colleges of Human Medicine and Osteopathic Medicine.

OFFICE of MEDICAL EDUCATION RESEARCH and DEVELOPMENT

Brian Mavis, Director

The Office of Medical Education Research and Development (OMERAD) is a multidisciplinary unit within the College of Human Medicine. The mission of OMERAD is to provide innovative educational opportunities for faculty to promote scholarship, develop curriculum, improve teaching effectiveness, lead learner assessment and program evaluation, and integrate educational technology to advance medical education. OMERAD faculty work collaboratively with educators and health care professionals in the College of Human Medicine's affiliated community campuses.

OMERAD faculty are committed to providing excellent instruction for undergraduate, graduate and postgraduate learners. OMERAD faculty develop and evaluate college educational programs, and serve as a college leader in the integration and application of digital learning technology. The unit's consultation mission involves collaborating with health care professionals to

design, evaluate and disseminate educational innovations. OMERAD's research mission is to advance knowledge in medical education. The unit's faculty serve in leadership roles in college, university, and national professional organizations.

OMERAD faculty and support staff have expertise in education, measurement, social science and computer science. Specialized research facilities include a faculty-computing laboratory and training center.

The CENTER for ETHICS and HUMANITIES in the LIFE SCIENCES

Thomas Tomlinson, Director

The Center for Ethics and Humanities in the Life Sciences is administered by the College of Human Medicine. The unit brings to-

gether a multidisciplinary team of scholars to address conceptual, theoretical, and practical aspects of the field of bioethics. The center also shares interests and holds various teaching commitments in the colleges of Arts and Letters, Natural Science, and Social Science.

Since 1977, the center has engaged in bioethics teaching, research and outreach viewed from the perspectives of the traditional liberal arts and social sciences. In addition to its on-campus activities, the center offers clinical and continuing education in bioethics at various teaching hospitals around Michigan. The center fosters study of the humanities and social sciences as they relate to bioethics practice and policy in the health professions. Through its research activities, the center engages the wider community to explore and understand compelling current bioethics issues. Faculty expertise includes neuroethics, health care resource allocation and justice, biospecimen use and trust, patient care and shared decision-making, spirituality in medicine, and the social determinants of health.