

# University of Michigan Medical School

## Prerequisites & Core Competencies\*

\*Published publicly at <https://medicine.umich.edu/medschool/education/md-program/md-admissions/requirements>

### OVERVIEW

The University of Michigan Medical School will look positively upon individuals who have discovered personal areas of academic interest through their curricular and extracurricular activities and have worked to independently develop, refine and distinguish their experiences to improve and advance health care.

Since the many fields of medicine offer opportunities for those talented in both humanities and the sciences, students should allow personal interests and their passion to dictate their choice of an undergraduate major. We prefer you think of our prerequisites as competencies to develop and not as specific course requirements.

The purpose of our listed prerequisites is to identify individuals that can exhibit our core competencies. These involve demonstrated academic strength and rigor in the following areas:

- Biomedical and Social Sciences (including skills in Written and Verbal Communication)
- Statistical Analysis and Epidemiology
- Hypothesis Development and Investigation
- Analytical Thought and Problem-Solving Skills

Keep in mind that your choices to fulfill our prerequisites should demonstrate pursuit of these core competencies. More information about each competency can be found in the following four sections. These descriptions include real-world examples from admitted Michigan medical students.

The AAMC Core Competencies for Entering Medical Students also offers additional information.

### BIOMEDICAL & SOCIAL SCIENCES

Intellectual engagement in the humanities (which may include coursework or research, for example) that emphasizes the written and verbal communication of ideas and concepts with an understanding of their historical and societal background and relevance. Understanding of ethical and analytical decision-making can be helpful. Courses offering a social science or philosophical context (such as philosophy, history, anthropology or psychology) can provide future doctors with insights that are crucial to the discharge of their professional responsibilities.

Intellectual engagement in the field of biology (which will include coursework and laboratory experience) that encompasses the core concepts of cell and developmental biology, molecular biology and genetics. These core concepts include:

- Nucleic acid/nucleosome structure and function including epigenetics (histone modification and DNA methylation)
- Cell structure, cell cycle, meiosis, and mitosis
- Genetic mutations, repair and recombination
- Regulation of gene expression in eukaryotic and prokaryotic cells (transcription factors & mechanisms)
- RNA processing
- Protein translation
- DNA and RNA viruses - properties and generation, and use of viral vectors
- Foundations of signal transduction

Intellectual engagement in the field of chemistry (which will include coursework and laboratory experience) that encompasses core concepts of biochemistry and biologically applicable elements of inorganic and organic chemistry. These core concepts include:

- Acid/base chemistry
- Thermodynamics and chemical equilibrium
- Protein structure and function
- Enzymes: mechanisms, kinetics, inhibition, binding constants
- Bioenergetics and oxidative metabolism
- Carbohydrate metabolism
- Lipid metabolism
- Membranes and transport

Clear evidence of the ability to demonstrate knowledge of basic physical principles and their applications to the study and understanding of living systems is required. These core concepts include:

- Newtonian mechanics
- Fluid dynamics
- Basic thermodynamics
- Basic concepts of electrical circuits and electrostatics
- Diffusion and transport of mass and energy

The University of Michigan will not require dedicated coursework in physics.

Here are some examples of how our admitted students fulfilled these competencies outside of the classroom:

- Research experience at an institute and co-authored a paper with the findings
- Postbaccalaureate program
- Lab work in oncology

- Self-taught and created biochemistry curriculum
- Thesis work
- Designed and performed experiments in stem cell laboratories
- Founded a start-up that worked with a grassroots development organization
- Poster sessions and journal clubs
- Independent study and CLEP exams

## **STATISTICAL ANALYSIS & EPIDEMIOLOGY**

Intellectual engagement in the field of statistics that encompasses the following core concepts:

- Descriptive statistics and inference
- Probability, populations and samples
- Statistical distributions
- Hypothesis testing
- Regressions and correlations
- Analysis of variance
- Types of observational and experimental studies

Here are some examples of how our admitted students fulfilled these competencies outside of the classroom:

- Collaborated on CDC-funded national project with frequent literature reviews
- Developed measures to track practice-based improvement in immunization rates
- Research assistant
- Supplemental education during gap year
- Studied global health care systems
- Summer internship with physician-led medical research organization
- Anthropological and social research projects
- Performed basic chi-squared tests on large volumes of health data at a leading university

## **HYPOTHESIS DEVELOPMENT & INVESTIGATION**

A distinct experience in intellectual inquiry and participation in the independent discovery of new knowledge is strongly recommended but not required. We are looking for the ability to understand hypothesis development and to apply problem-solving techniques.

We believe that research is not simply limited to bench research, but can also include inquiry in the fields of translational, clinical, laboratory and humanities research. It can be quantitative or qualitative, and not limited to the natural sciences.

Here are some examples of how our admitted students fulfilled these competencies outside of the classroom:

- Internship at an institute biology lab to conduct small research project that resulted in an improved protocol
- Submitted an abstract to a national foundation
- Collaborated with PhD and postdoctoral students
- Developed parameters for simulations as part of summer research project
- Designed experiments to examine drug resistance
- Conducted original research work for a capstone class
- Research technician in an Alzheimer's disease lab
- Literary research project

### **ANALYTICAL THOUGHT & PROBLEM-SOLVING SKILLS**

Analytical thought and problem-solving skills should be an integral and pervasive part of the majority of the curricular and extracurricular experiences.

Here are some examples of how our admitted students fulfilled these competencies outside of the classroom:

- Internship with public health non-profit organization in another country
- Developed an app
- Wrote computer code to analyze research data
- Research fellowship
- Global health experience
- Volunteered with Child Life
- Staged trial runs with standards to perfect research techniques
- Language instructor and program administrator