MEDICINE, DOCTOR OF (M.D.)/ EPIDEMIOLOGY, DOCTOR OF PHILOSOPHY (PH.D.) [DUAL DEGREE]

The Ph.D. program in the Department of Epidemiology in the School of Public Health, is highly individualized, with students working closely with faculty mentors to develop and execute research. The mission of the program in epidemiology is to train students to become independent research scientists and leaders who can develop epidemiological methods and conduct outstanding population-based research.

Required course work represents only one component of study toward the degree. Each student is closely matched to a faculty adviser with shared research interests. Training with the primary adviser is tailored to meet the advisee's particular interests. The primary emphasis of the training is to provide the student with multiple opportunities to develop research skills and the capacity to apply epidemiological methods as an independent research scientist and leader in the field. Through its tailored training approach, the program recognizes that career goals for many M.D.-Ph.D. physician-scientists are distinct from those of most Ph.D. trainees.

Program goals

Students in the M.D.-Ph.D. program in epidemiology will acquire the foundational skills to allow them, after further clinical specialty and postdoctoral research training, to become independent physician-scientists. Program graduates ultimately pursue careers in academic medicine, biotechnology and pharmaceutical industry, research institutes and government agencies as clinicians, scientists, educators and administrators. The goals of the M.D.-Ph.D. program in epidemiology are to provide students with the following skills.

- Critical foundation skills: The program is designed to provide students with the critical skills required to advance to positions as epidemiological physician-scientists in a broad spectrum of positions.
- Mastery and application of science: The structure of the program provides a framework for the progressive development of a mastery of the current state of the subject matter of epidemiology and ability to synthesize this information and apply this foundation to the identification of key areas of investigation/experimentation in population medicine.
- Communication skills: Students will develop skills in the various means of communicating both the core of epidemiological knowledge and the expression of epidemiological methodology, population medicine, research design, results and interpretation to a variety of potential clinical and non-clinical audiences.

Among the many benefits offered by participation in the dual-degree program are the following:

- Students will have the foundation and training in epidemiology and in medicine to conduct basic and translational research to advance both the underlying science and patient health. Training received in this program will enable students to take bedside observations to research initiatives and to translate results of population-based, epidemiological research to patient populations and the broader community, as appropriate.
- Students have the opportunity to participate in clinical research during the M4 year.
- Students with M.D.-Ph.D. training are highly competitive for positions in leading physician-scientist clinical training programs as well as faculty positions in academic medical centers, and are well-positioned to ultimately take on leadership roles in academic medicine, industry and government.
- Tuition, fees and a stipend are provided throughout both the medical and graduate phases of training.

The diplomas for this dual degree program are awarded simultaneously upon completion of the requirements for both degrees.

Student learning outcomes

The student learning outcomes described in the epidemiology Ph.D. program page (https://bulletin.vcu.edu/graduate/p-health/epidemiology/epidemiology-phd/) also apply to M.D.-Ph.D. students.

Admission requirements

To be considered for the VCU M.D.-Ph.D. program, prospective students must apply to the medical school through the American Medical College Application Service (https://students-residents.aamc.org/applying-medical-school/applying-medical-school-process/applying-medical-school-amcas/). Please designate "Combined Graduate/Medical Degree" on your AMCAS application. The deadline for application to the program for admission in the fall semester is listed on the AMCAS web site.

In rare situations when resources allow, students matriculated in the medical school class may be considered for admission to the M.D.-Ph.D. program, usually near the start of the M1 academic year. For additional details, see the M.D.-Ph.D. dual degree opportunities page (https://bulletin.vcu.edu/professional-studies/medicine/md-phd-opportunities/).

Degree requirements

The dual-degree program is designed to allow students to complete the first two years of medical school and the USMLE Step 1 examination (M1, M2) before undertaking graduate training (G1 and subsequent two years). After successfully defending the Ph.D. dissertation, students complete the remaining clinical years (M3, M4) of medical training. Nevertheless, important aspects of dual-degree training are integrated across the program. These include M.D.-Ph.D.-specific graduate courses during M1 and M2 that supplement the medical curriculum and emphasize research and translational aspects of M.D. course topics and required M3 clinical rotations integrated into the graduate phase. Opportunities for research experience begin prior to entering the graduate phase (pre-matriculation and summers after M1 and M2), when students spend time working with Ph.D. faculty epidemiological research programs of their choice. These research rotations enable students to experience faculty research projects, approaches and research environments, and to select an area for specialization.

After completing M2, students are required to take the USMLE Step 1 exam, followed by one or two required M3 clinical rotations lasting six to eight weeks. They then transition into graduate studies. During the first one-and-one-half years of graduate training (G1 and fall semester of G2), students take graduate courses selected to optimize their training and devote time to independent research under the guidance of a faculty

adviser. During the spring semester of G2 and the subsequent year, G3, the student's effort is devoted to independent research focused on developing the dissertation proposal and full dissertation.

Upon satisfactory completion of course work, students must pass written and oral comprehensive examinations to qualify for degree candidacy. The written comprehensive examination and oral defense for the dual M.D.-Ph.D. are normally completed during G2. Each student must develop their dissertation proposal including three original research projects and defend the proposal before entering G3. During G3, each student must complete the proposed three original research projects, prepare a written dissertation, present their work in a seminar and defend it successfully between the end of G3 and G4. Department-sponsored seminars and other activities give students opportunities to discuss their research interests with visiting scientists and to present their research both internally and at national professional meetings.

The Ph.D. component of training in epidemiology for M.D.-Ph.D. students normally takes a minimum of three to four years to complete. Courses taken during the M1 and M2 years of medical school satisfy a number of core and elective course requirements, and additional program courses are completed in the G1 and G2 years. M.D.-Ph.D. students, if eligible under NIH rules, are required to prepare and submit an NIH F30 predoctoral training grant application by the end of G2, which is usually based on the dissertation proposal defended during the comprehensive oral examination. Students also are encouraged to submit predoctoral training grant applications to other funding sources. Acceptance of a peer-reviewed first-author (or co-first-author) manuscript in a scientific journal indexed in PubMed or Web of Science that is based on research conducted during Ph.D. training (rather than a review, commentary, case note or similar publication) is required of all M.D.-Ph.D. students prior to returning to the M3 phase of medical school.

In addition to completing VCU School of Medicine requirements for the M.D. degree and the general VCU Graduate School graduation requirements (https://bulletin.vcu.edu/academic-regs/grad/graduation-info/), students must complete a minimum of 61 credit hours for the Ph.D., including directed research.

Curriculum requirements for the M.D.

Based on the equivalent knowledge acquired by successfully completing MEDI 100, MEDI 150, MEDI 200 and MEDI 250 and IBMS 651 (https://bulletin.vcu.edu/search/?P=IBMS%20651) during the M1 and M2 years, 14 credits are satisfied (for EPID 650, practical research skills and substantive electives). Courses taken to satisfy Ph.D. requirements do not satisfy M.D. requirements.

Course	Title	Hours
M1 year		
Fall semester (MEDI 100)		
Transition to Medical School		
Practice of Clinical Medical Bootcamp		
Molecular Basis of Health and Disease		
Principles of Physiology		
Principles of Autonomics and Pharmacology		
Immunity and Infection		
Foundations of Disease		
Practice of Clinical Medicine		
Patient, Physician and Society		
Population Health and Evidence Based Medicine		
Ultrasound		
Diagnostic Reasoning		
Geriatrics		
Spring semester (MEDI 150)		
Marrow (Hematology / Oncology)		
Movement (Musculoskeletal)		
Gastrointestinal		
Endocrine		
Reproduction		
Practice of Clinical Medicine		
Patient, Physician and Society		
Population Health and Evidence Based Medicine		
Ultrasound		
Diagnostic Reasoning		
Geriatrics		
IPEC 502	Interprofessional Quality Improvement and Patient Safety	1
M2 year		
Fall semester (MEDI 200)		
Cardiovascular		
Pulmonary		
Renal		
Neuroscience		
Practice of Clinical Medicine		
Patient, Physician and Society		
Population Health and Evidence Based Medicine		
Ultrasound		
Diagnostic Reasoning		
Geriatrics		
Spring semester (MEDI 250)		
Behavioral Sciences		
Practice of Clinical Medicine		
Step 1 Study		
M3 year		
Fall and spring semesters (MEDI 300)		
M3 Transition to Clerkships		
Internal Medicine Clerkship		
Surgery Clerkship		
OB/GYN Clerkship		
Pediatrics Clerkship		
Family Medicine Clerkship		
Neurology Clerkship		
Psychiatry Clerkship		
Ambulatory Clerkship		
Foundational Career Exploratory electives		
Patient, Physician and Society		
Population Health		
Telehealth		
M4 year		
Fall and spring semesters (MEDI 400)		
Transition to M4 - Clinical Concentrations		

Two acting internships, one ward and one critical care (four weeks each)		
Step 2 Clinical Knowledge exam		
28 weeks of clinical electives		
Up to 20 weeks of non-clinical electives		
Patient, Physician and Society		
Interprofessional Critical Care Simulations		
IPEC 561	IPE Virtual Geriatric Case	2
Transition to Residency		

Curriculum requirements for the Ph.D.

Based on the equivalent knowledge acquired by successfully completing MEDI 100, MEDI 150, MEDI 200 and MEDI 250 during the M1 and M2 years, 14 credits are satisfied. These credits consist of three credits for EPID 650; two for practical research skills; and nine credits of substantive electives. M.D.-Ph.D. students also complete six credits of IBMS 697 in the summers after M1 and M2 to satisfy the six credits of methodological elective course work required for the Ph.D. degree. Students are required to take additional credits of M.D.-Ph.D.-specific courses listed below.

Course	Title	Hours
Required core courses		
BIOS 602	Analysis of Biomedical Data II	3
EPID 649	Analysis of Health Datasets	3
EPID 650	Epidemiologic Methods for Research (satisfied by M1/M2 study)	3
EPID 651	Intermediate Epidemiologic Methods for Research	3
EPID 652	Advanced Epidemiologic Methods and Data Analysis	3
EPID 690	Journal Club (taken four semesters during G1/G2)	4
STAT 643	Applied Linear Regression	3
Additional required courses		
IBMS 624	Research Reproducibility and Transparency (satisfies one credit of practical research skills development)	1
IBMS 651	M.D.-Ph.D. Journal Club (one-credit course required fall and spring semester of M1; satisfies one credit of practical research skills development)	2
IBMS 652	M.D.-Ph.D. Science and Disease	1
IBMS 653	M.D.-Ph.D. Research Seminar (0.5-credit course; required fall and spring of M1, fall of M2 and during G phase except in semester of defense)	2
IBMS 697	M.D.-Ph.D. Directed Research (six credits satisfy methodological electives required in Ph.D.)	12
OVPR 601	Scientific Integrity	1
or OVPR 602	Responsible Scientific Conduct	
or OVPR 603	Responsible Conduct of Research	
Practical research skills development (satisfied by M1/M2 study)		2
Elective courses		
Methodological electives: six credits satisfied by summer research rotations in M1/M2; select additional three credits from the following.		9
BIOS 549	Spatial Data Analysis	
BIOS 632	Multivariate Analysis	
BIOS 635	Structural Equation Modeling	
BIOS 668	Statistical Methods for High-throughput Genomic Data II	
BIOS 671	Nonlinear Models	
BNFO 601	Integrated Bioinformatics	
CCTR 630	Design Implications in Clinical Trials	
CCTR 631	Adaptive Clinical Trials	
CCTR 692	Special Topics in Translational Research	
EPID 620	Cancer Epidemiology	
EPID 622	Maternal and Child Health	
EPID 623	Injury and Violence Epidemiology	
EPID 646	Epidemiology of Psychiatric and Substance Use Disorders	
EPID 692	Independent Study	
HADM 763	Applied Health Services Research	
HCPR 730	Survey Research Methods and Analysis for Health Policy	
HGEN 603	Mathematical and Statistical Genetics	
HGEN 617	Genetic Analysis of Complex Traits	
HGEN 619	Quantitative Genetics	
PHAR 688	Applied Pharmacoepidemiology Research Methods	
PPAD 723	Survey Research Methods	
PSYC 655	Community Interventions: Development, Implementation and Evaluation	
SBHD 610	Behavioral Measurement	
SBHD 631	Disseminating, Adopting and Adapting Evidence-based Prevention Programs	
SBHD 633	Structural Equation Modeling	
SBHD 636	Community-based Participatory Research	
SBHD 637	Program Evaluation	
SBHD 638	Applications in Qualitative Research Methods	
SOCY 656	Social Network Analysis	
URSP 621	Introduction to Geographic Information Systems	
URSP 622	Community Socioeconomic Analysis Using GIS	
URSP 625	Spatial Database Management and GIS Modeling	
URSP 627	GIS Applications in Urban Design	
Substantive area electives: Satisfied by M1/M2 study		9
Dissertation research		
EPID 697	Directed Research in Epidemiology	18
Total Hours		**61**

The minimum number of graduate credit hours required for this degree is 61.

Plan of study timeline

The dual-degree program blends medical and graduate training supplemented with M.D.-Ph.D.-specific course work and opportunities during the medical (M) and graduate (G) phases of the curriculum that culminates in the simultaneous awarding of the M.D. and Ph.D. degrees. The timeline of medical and graduate training is as follows:

Year 1 (M1): Mostly preclinical medical course work, some research

- Preclinical medical courses
- M.D.-Ph.D. Journal Club (two semesters)
- M.D.-Ph.D. Seminar (two semesters)
- Research rotations (and pre-matriculation research opportunity)

Year 2 (M2): Mostly preclinical medical course work, some research and clinical rotation

- Preclinical medical courses
- M.D.-Ph.D. Science and Disease (one semester)
- M.D.-Ph.D. Seminar (one semester)
- Research rotations
- Preparation for USMLE Step 1
- Required M3 clinical rotation(s) (one or two, lasting six to eight weeks total)

Year 3 (G1): Graduate course work and research, some clinical experiences

- Graduate program course work
- M.D.-Ph.D. Seminar (two semesters)
- Directed research (begin dissertation research)
- Opportunities for clinical experience

Years 4-5 (G2-G3) and additional year if needed: Primarily research, some clinical experiences

- Ph.D. Qualifying Examination, admission to candidacy
- Submit NIH F30 fellowship application
- Directed research (completion of dissertation research)
- Graduate program course work
- M.D.-Ph.D. Seminar
- Required M3 ambulatory care rotation
- Publication of peer-reviewed first-author paper
- Dissertation defense

Years 6-7: M3-M4: Completion of clinical training, clinical research experience

- Clinical rotations
- Clinical and non-clinical elective
- Preparation for USMLE Step 2
- M4 Clinical research capstone project

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