PUBLIC HEALTH

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FIELDS OF STUDY
Programs of study are offered in the areas of Biostatistics, Chronic Disease Epidemiology, Environmental Health Sciences, Epidemiology of Infectious Diseases, Epidemiology of Microbial Diseases, Health Informatics, Health Policy and Management, and Social and Behavioral Sciences.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE
Generally the first two years of the Ph.D. program are devoted primarily to course work and rotations for students in some areas. All doctoral students are required to successfully complete a minimum of ten graduate-level courses and must satisfy the individual departmental requirements, detailed below. Courses such as Dissertation Research, Preparing for Qualifying Exams, Research Ethics and Responsibility, and Seminar do not count toward the course requirements. However, students must register for these courses in order for them to appear on the transcript.

All first-year students must enroll in and complete training in Research Ethics and Responsibility (EPH 600). This course will introduce and prepare students for responsible conduct in research, including data acquisition and management, mentor/trainee responsibilities, publication practices and authorship standards, scientific misconduct, and conflict of interest. Research Ethics and Responsibility is offered annually and is graded Satisfactory/Unsatisfactory.
The Graduate School uses grades of Honors, High Pass, Pass, or Fail. Students are required to earn a grade of Honors in at least two full-term courses and must achieve a High Pass average. (This applies to courses taken after matriculation in the Graduate School and during the nine-month academic year.)

Teaching and research experiences are regarded as an integral aspect of the graduate training program. All students are required to serve as teaching fellows for a minimum of two terms at the TF level 10 or 20, typically during years two and three. Depending on their funding sources, students may be expected to teach additional terms after they have fulfilled the academic teaching requirement but would not be required to teach more than four terms over the first five years. With the permission of the director of graduate studies (DGS), the total teaching requirement beyond two terms may be reduced for students who are awarded fellowships supported by outside funding or who serve as graduate research assistants in year three. Other exceptions may be granted after two terms of teaching are completed, with the approval of the DGS. During the first term of teaching, students must attend a training session conducted by the Poorvu Center for Teaching and Learning. First-year students are encouraged to focus their efforts on course work and are not permitted to serve as teaching fellows. A Ph.D. student who has fulfilled the teaching requirement is not permitted to serve as a teaching fellow without special permission from the DGS. In the rare instances this exception is approved, the student will only be allowed to serve at the TF-10 level.

At the end of years one and two, advisers will be asked to complete a progress report for each student evaluating the student’s academic progress and describing the student’s readiness for teaching and/or conducting research. This is then discussed with the student and reviewed by the DGS. Students who have not progressed adequately will be asked to meet with the DGS to address the situation.

The qualifying exam is typically taken by the end of the second full academic year. With the assistance of the faculty adviser, generally after qualifying exams, each student requests appropriate faculty members to join a dissertation advisory committee (DAC). The DAC reviews and approves the prospectus as developed by the student and submits it to the DGS and the Graduate Studies Executive Committee (GSEC) for approval. The dissertation prospectus must be approved by the end of the third year.

To be admitted to candidacy, students must: (1) satisfactorily complete the course requirements for their department as outlined below, achieve grades of Honors in at least two full-term courses, and achieve an overall High Pass average; (2) obtain an average grade of High Pass on the qualifying exam; and (3) have the dissertation prospectus approved by the GSEC. Students who have been admitted to candidacy are required by the Graduate School to complete an annual Dissertation Progress Report.

Each DAC is expected to meet as a group at least twice each year, and more frequently if necessary. The student schedules meetings of the DAC. The chair/adviser of the DAC produces a summary evaluation of progress and plans for the next six months. This document is to be distributed to each committee member for comments, and the student and the DGS are to receive a copy of the final document. The DAC reviews the progress of the dissertation research and decides when the dissertation is ready to be submitted to the readers. This decision is based on a closed defense of the dissertation, which involves a formal oral presentation by the student to the DAC. (At the adviser’s discretion, other invited faculty may be present.) Upon completion of the closed defense, the chair/adviser of the DAC submits the recommendation to the DGS along with the names of three appropriate readers.

Doctoral dissertations originating in Public Health must also be presented in a public seminar. This presentation is scheduled after the submission of the dissertation to the readers and preferably prior to the receipt and consideration of the readers’ reports. At least one member of the DAC supervising the dissertation and at least one member of the GSEC are required to attend the presentation.

**Required Course Work**

**BIOSTATISTICS**

Ph.D. students in Biostatistics (BIS) have the choice of two pathways: the Biostatistics Standard Pathway and the Biostatistics Implementation and Prevention Science Methods Pathway. In each pathway students must complete a minimum of sixteen courses (not including BIS 525, BIS 526, BIS 695, and EPH 600). Course waivers must be recommended by the academic adviser and approved by the DGS.

Required courses (or their equivalents) for both pathways are: BIS 525 and BIS 526, Seminar in Biostatistics and Journal Club; BIS 610, Applied Area Readings for Qualifying Exams; BIS 623, Advanced Regression Models (or S&DS 612, Linear Models); BIS 628, Longitudinal and Multilevel Data Analysis; BIS 643, Theory of Survival Analysis; BIS 678, Statistical Practice I; BIS 691, Theory of Generalized Linear Models; BIS 699, Summer Internship in Biostatistical Research; EPH 508, Foundations of Epidemiology and Public Health; EPH 600, Research Ethics and Responsibility; EPH 608, Frontiers of Public Health; and S&DS 610, Statistical Inference. Students entering the doctoral program with an M.P.H. are exempt from EPH 608. Students with prior graduate-level epidemiology courses may be exempt from EPH 508.

Students in the Biostatistics Standard Pathway will be required to complete BIS 681, Statistical Practice II. In consultation with their academic adviser, students also choose a minimum of six additional electives that will best prepare them for dissertation work.

Students in the Biostatistics Implementation and Prevention Science Methods Pathway will be required to complete BIS 557, Statistical Methods for Causal Inference; BIS 629, Advanced Methods for Implementation and Prevention Science; BIS 631, Advanced Topics in Causal Inference Methods; and EMD 533, Implementation Science. In consultation with their adviser, students also choose a minimum of three additional electives. Strongly recommended electives are: BIS 536, Measurement Error and Missing Data; BIS 537, Computational Statistics; BIS 567, Bayesian Statistics; BIS 646, Nonparametric Statistical Methods and Their Applications; CDE 516,
Students funded by specific fellowships may be subject to additional requirements and should discuss this with their adviser.

**CHRONIC DISEASE EPIDEMIOLOGY**

Ph.D. students in Chronic Disease Epidemiology (CDE) must complete a minimum of seventeen courses (not including EPH 600). Course waivers must be recommended by the academic adviser and approved by the DGS.

Required courses (or their equivalents) are: CDE 516, Principles of Epidemiology II; CDE 534, Applied Analytic Methods in Epidemiology; CDE 610, Applied Area Readings for Qualifying Exams; CDE 617, Developing a Research Proposal*; CDE 619, Advanced Epidemiologic Research Methods; CDE 650, Introduction to Evidence-Based Medicine and Health Care; EHS 502/CDE 502, Physiology for Public Health; EPH 508, Foundations of Epidemiology and Public Health; and EPH 600, Research Ethics and Responsibility. Students must also complete course work that introduces them to the breadth of public health (EPH 608, Frontiers of Public Health).

Students entering the doctoral program with an M.P.H. may be exempt from EPH 608. In addition, in consultation with their dissertation adviser, students choose three 600-level course units in Biostatistics† (or equivalent as approved by the adviser and the DGS), as well as five additional electives that will best prepare them for their dissertation research.

* CDE 617 is not required of students funded by the Yale AIDS Prevention Training Program. Those students must take an additional elective in order to meet the seventeen-course requirement.

† S&DS 563, Multivariate Statistical Methods for the Social Sciences, is an option to fulfill the statistics course requirement.

**ENVIRONMENTAL HEALTH SCIENCES**

Ph.D. students in Environmental Health Sciences (EHS) must take a minimum of thirteen courses (not including EHS 525, EHS 526, and EPH 600). However, more courses may be required by a student’s adviser. Students have a choice of two areas of specialization: Environmental Epidemiology and Exposure Science, and Environmental and Molecular Toxicology. For both areas of specialization, required courses (or approved substitutions) are: EHS 503, Public Health Toxicology; EHS 507, Environmental Epidemiology; EHS 508, Environmental and Occupational Exposure Science; EHS 525 and EHS 526, Seminar and Journal Club in Environmental Health; EHS 545, Molecular Epidemiology; EPH 505, Biostatistics in Public Health; EPH 508, Foundations of Epidemiology and Public Health; and EPH 600, Research Ethics and Responsibility. Students must also complete course work that introduces them to the breadth of public health (EPH 608, Frontiers of Public Health). Students entering the doctoral program with an M.P.H. may be exempt from EPH 608. Ph.D. students enrolled in EHS 503, EHS 525, and EHS 526 may be assigned additional readings.

In addition, all students are required to complete two research rotations during the first year: EHS 619 and EHS 620. At the end of the research rotation students give a presentation and are graded based on their rotation work and presentation.

Students specializing in Environmental Epidemiology and Exposure Science must choose a minimum of four electives from the following suggested courses: BIS 505, Biostatistics in Public Health II; BIS 623, Advanced Regression Models; BIS 628, Longitudinal and Multilevel Data Analysis; CDE 516, Principles of Epidemiology II; CDE 520, Case-Based Learning for Genetic and Environmental Diseases; CDE 534, Applied Analytic Methods in Epidemiology; CDE 617, Developing a Research Proposal; EHS 502, Physiology for Public Health; EHS 511, Principles of Risk Assessment; EHS 530, Air Pollution and Public Health; EHS 531, Meta-research: Evaluating and Improving Research; EHS 547, Climate Change and Public Health; EHS 560, Methods in Climate Change and Health Research; EHS 563, Biomarkers of Exposure, Effect, and Susceptibility in the Epidemiology of Noncommunicable Disease; and EHS 566, Causal Inference Methods in Public Health Research; EHS 568, Introduction to GIS for Public Health; ENV 755, Modeling Geographic Space; and ENV 756, Modeling Geographic Objects.

Students specializing in Environmental and Molecular Toxicology must choose a minimum of four electives from the following suggested courses: BIS 505, Biostatistics in Public Health II; CDE 520, Case-Based Learning for Genetic and Environmental Diseases; CDE 617, Developing a Research Proposal; EHS 502, Physiology for Public Health; EHS 511, Principles of Risk Assessment; EHS 530, Air Pollution and Public Health; EHS 531, Meta-research: Evaluating and Synthesizing Research; EHS 537, Water, Sanitation, and Global Health; EHS 547, Climate Change and Public Health; EHS 560, Methods in Climate Change and Health Research; EHS 563, Biomarkers of Exposure, Effect, and Susceptibility in the Epidemiology of Noncommunicable Disease; and EHS 567, Fundamentals of Green Engineering and Green Chemistry.

**EPIDEMIOLOGY OF MICROBIAL DISEASES**

Ph.D. students in Epidemiology of Microbial Diseases (EMD) must complete a minimum of ten courses (not including EPH 600). Course waivers must be recommended by the academic adviser and approved by the DGS.

Courses in biostatistics, epidemiology, and microbiology are strongly recommended. The specific courses recommended depend on the background of individual students and their stated research interests. An individual program that includes courses, seminars, and
In substituted.

ECON 680 Industrial Organization I; and Foundations of Behavioral Economics; and field courses in a concentration area in which they plan to develop expertise. In Students in HPM must complete a minimum of four courses, all with Ph.D. readings, in their chosen area of specialization.

Areas of Specialization

Ph.D. students in Health Policy and Management (HPM) are required to develop expertise in one of three areas of specialization: Economics; Organizational Theory and Management; or Political and Policy Analysis. Students are required to complete the course work detailed below, or the equivalent of the topic areas covered in these courses. The course listing represents a suggested program of study. The standard number of courses taken is sixteen, with the option of obtaining credits for previous courses. With the approval of the academic adviser and DGS, alternative courses that better suit the needs of the student may satisfy the course work requirement. The departmental representative to the Graduate Studies Executive Committee, in conjunction with the student's adviser, is responsible for determining if core course requirements have been satisfied by previous course work or alternative courses. If so, the student should apply for a course waiver through the Graduate School. HPM students can only waive up to three of the sixteen courses.

Courses required of all students are: EPH 508, Foundations of Epidemiology and Public Health; EPH 600, Research Ethics and Responsibility; EPH 608, Frontiers of Public Health; and HPM 617 and HPM 618, Colloquium in Health Services Research. Students entering the program with an M.P.H. degree may be exempt from EPH 608. (EPH 600, HPM 617, and HPM 618 do not count toward the total number of required courses).

HPM 610, Applied Area Readings, is required of all second-year students. Additionally, all HPM students are expected to attend the departmental research seminar for faculty and the doctoral research seminar.


A minimum of four courses in Health Policy and Management, all with Ph.D. readings, are required. Suggested courses are: EPH 510, Health Policy and Health Care Systems; HPM 514, Health Politics, Governance, and Policy; HPM 560, Health Economics and U.S. Health Policy; HPM 570, Cost-Effectiveness Analysis and Decision-Making; HPM 573, Advanced Topics in Modeling Health Care Decisions; HPM 587, Advanced Health Economics; HPM 590, Economics, Addiction, and Policy; HPM 597, Capstone Course in Health Policy; and HPM 688, Managing Health Care in Complex Systems.

Areas of Specialization

Students in HPM must complete a minimum of four courses, all with Ph.D. readings, in their chosen area of specialization.

In Economics, required courses (or their equivalents) are: ECON 545, Microeconomics; and ECON 548, Econometrics (which may count as a Methods and Statistics class or as an area of specialization class, but not both). In addition, students are required to take two field courses in a concentration area in which they plan to develop expertise. In Behavioral Economics, two courses such as: MGMT 758, Foundations of Behavioral Economics; and PSYC 553, Behavioral Decision-Making I: Choice. In Industrial Organization: ECON 600, Industrial Organization I; and ECON 601, Industrial Organization II. In Labor Economics, ECON 630, Labor Economics I; and ECON 631, Labor Economics II. In Public Finance, two courses from: ECON 556, Topics in Empirical Economics and Public Policy; ECON 680, Public Finance I; and ECON 681, Public Finance II. In consultation with the student's adviser, other courses may be substituted.

In Organizational Theory and Management, four courses are required, selected in consultation with the student's adviser.
In *Political and Policy Analysis*, four courses are required, selected in consultation with the student’s adviser. Suggested courses are: PLSC 800, Introduction to American Politics; PLSC 801, Political Preferences and American Political Behavior; and PLSC 803, American Politics III: Institutions.

HPM students take qualifying exams in each of three areas: (1) health policy and management; (2) empirical analysis and/or statistics; and (3) the student’s area of specialization. Typically these are taken in the summer after two years of course work.

**SOCIAL AND BEHAVIORAL SCIENCES**

Ph.D. students in Social and Behavioral Sciences (SBS) must complete a minimum of fifteen courses (not including EPH 600) from the following courses or their equivalents. Course waivers must be recommended by the academic adviser and approved by the DGS.

Required courses (or their equivalents) are: CDE 534, Applied Analytic Methods in Epidemiology; CDE 617, Developing a Research Proposal*; EPH 508, Foundations of Epidemiology and Public Health; EPH 600, Research Ethics and Responsibility; SBS 580, Qualitative Research Methods in Public Health; SBS 610, Applied Area Readings for Qualifying Exams; and SBS 699, Advanced Topics in Social and Behavioral Sciences. Students must also complete course work that introduces them to the breadth of public health (EPH 608, Frontiers of Public Health). Students entering the doctoral program with an M.P.H. may be exempt from EPH 608. In addition, in consultation with their dissertation adviser, students choose five advanced-level (600 or above) statistics or methods courses (from Biostatistics, Psychology, Political Science, Sociology, Anthropology, or Statistics and Data Science†) as well as three additional electives that will best prepare them for their dissertation research.

Students supported by training grants may be subject to additional requirements and should discuss with the principal investigator of the grant whether there are training-specific requirements.

* CDE 617 is not required of students funded by the Yale AIDS Prevention Training Program. Those students must take an additional elective in order to meet the fifteen-course requirement.

† S&DS 563, Multivariate Statistical Methods for the Social Sciences, is an option to fulfill the statistics course requirement.

**M.D./PH.D. PROGRAM REQUIREMENTS FOR PUBLIC HEALTH**

All M.D./Ph.D. students must meet with the director of graduate studies (DGS) in Public Health, if they are considering affiliating with Public Health. Students in this program are expected to meet the guidelines listed below in the time frame outlined. The DGS must approve any variations to these requirements.

**Teaching**

One term of teaching is required. If students teach beyond this requirement, they can be compensated. If a student has served as a teaching fellow elsewhere on campus, this experience may be counted toward the requirement. DGS approval is required to waive the teaching requirement on the basis of previous Yale teaching experience.

**Rotations/Internships**

Students should do two rotations/internships with potential advisers in Public Health. The purpose of these rotations/internships is to learn research approaches and methodologies and/or to allow the student time to determine if the faculty’s research interests are compatible with the student’s research interests. These rotations/internships are usually done during the summer between the first and second years of medical school. In some cases, students may need to defer this requirement until the summer after the second year after taking certain courses and/or completing readings in order to possess the background necessary for a successful rotation/internship.

**Required Course Work**

M.D./Ph.D. students are generally expected to take the same courses as traditional Ph.D. students. Departmental requirements vary; therefore, students should confer with the DGS and their Ph.D. adviser.

**Timeline for Qualifying Exam**

Students generally will take medical school courses in years one and two. Students can take Public Health courses or other appropriate courses during this time, if scheduling allows. Once affiliated with the Public Health program, students will complete all course requirements for the department. This generally takes a minimum of two terms but can take up to four terms after affiliating with Public Health. The qualifying exam is commonly completed after the fourth term of affiliation with the Ph.D. program in Public Health, but it can be done earlier with approval of the Ph.D. adviser and the DGS.

**Prospectus Timeline**

Following completion of the qualifying exam, students should focus on the prospectus, which must be approved by the Public Health Graduate Studies Executive Committee (GSEC) before the end of the student’s sixth term as an affiliated Ph.D. student in Public Health.
Admission to Candidacy

To be admitted to candidacy, students must: (1) satisfactorily complete the course requirements for their department as outlined above, achieve grades of Honors in at least two full-term courses, and achieve an overall High Pass average; (2) obtain an average grade of High Pass on the qualifying exam; and (3) have the dissertation prospectus approved by the GSEC. All M.D./Ph.D. students must be admitted to candidacy before the start of their fourth year in the Ph.D. program (i.e., before the start of the seventh term).

MASTER’S DEGREES

M.Phil. The M.Phil. is awarded to doctoral students who have advanced to candidacy. When students advance to candidacy, the registrar’s office automatically submits a petition for the awarding of the M.Phil. degree.

Terminal Master’s Degree Program The School offers a terminal master’s degree program leading to an M.S. in Public Health in four concentrations: Biostatistics (a two-year program), Chronic Disease Epidemiology (a one-year program), Epidemiology of Infectious Diseases (a one-year program), and Health Informatics (a two-year program). All students must fulfill both the departmental and Graduate School requirements for a terminal M.S. degree.

Students must have an overall grade average of High Pass, including a grade of Honors in at least one full-term graduate course (for students enrolled in the one-year programs in Chronic Disease Epidemiology and Epidemiology of Infectious Diseases) or in at least two full-term graduate courses (for students enrolled in the two-year programs in Biostatistics and Health Informatics). In order to maintain the minimum average of High Pass, each grade of Pass must be balanced by one grade of Honors. For more details, please see Course and Honors Requirements under Policies and Regulations.

A Biostatistics, Chronic Disease Epidemiology, or Epidemiology of Microbial Diseases student who is withdrawing from the Ph.D. program, and has successfully completed all required course work for the terminal M.S. degree (described below), may apply and be recommended for the M.S. in Public Health. In the other departments, students must have successfully completed (prior to withdrawal) at least ten courses in the doctoral program and a capstone experience, achieving a minimum of two Honors grades and an overall High Pass average. Students who withdraw after qualifying for or receiving the M.Phil. are not eligible for an M.S. degree.

Fields of Study

TERMINAL M.S. WITH CONCENTRATION IN BIOSTATISTICS

This two-year program provides training in clinical trials, epidemiologic methodology, implementation science, statistical genetics, and mathematical models for infectious diseases. Students have a choice of two pathways: the Biostatistics Standard Pathway and the Biostatistics Implementation and Prevention Science Methods Pathway. Part-time enrollment is permitted.

Course Requirements

The Biostatistics concentration requires the completion of fifteen required courses (not including BIS 525, BIS 526, BIS 695, EPH 100, and EPH 600). Required courses (or approved substitutions) for both pathways are: BIS 525 and BIS 526, Seminar in Biostatistics and Journal Club; BIS 623, Advanced Regression Models (or S&DS 612, Linear Models); BIS 628, Longitudinal and Multilevel Data Analysis; BIS 630, Applied Survival Analysis (or BIS 643, Theory of Survival Analysis); BIS 678, Statistical Practice I; BIS 679, Advanced Statistical Programming in SAS and R; BIS 681, Statistical Practice II; BIS 693, Summer Internship in Biostatistical Research; EPH 508, Foundations of Epidemiology and Public Health; EPH 600, Research Ethics and Responsibility; EPH 608, Frontiers of Public Health; S&DS 541, Probability Theory (or S&DS 600, Advanced Probability, or S&DS 551, Stochastic Process); and S&DS 542, Theory of Statistics (or S&DS 610, Statistical Inference). Students entering the program with an M.P.H. may be exempt from EPH 508.

Students in the Biostatistics Standard Pathway must complete three electives in Statistics and Data Science. Suggested electives are: S&DS 555, Introductory Machine Learning; S&DS 563, Multivariate Statistical Methods for the Social Sciences; S&DS 565, Applied Data Mining and Machine Learning; S&DS 612, Linear Models (cannot fulfill elective requirement if used to substitute for BIS 623); or any other S&DS 600-level course. Students must also select two electives in Biostatistics. Suggested electives are: BIS 557, Computational Statistics; BIS 567; Bayesian Statistics; BIS 643, Theory of Survival Analysis (cannot fulfill elective requirement if used to substitute for BIS 630); BIS 646, Nonparametric Statistical Methods and their Applications; and BIS 691, Theory of Generalized Linear Models.

Students wishing to complete a thesis may enroll in BIS 649 and BIS 650, Master’s Thesis Research. This would be an additional requirement and cannot replace any of the required courses noted above. All students who complete a thesis will be required to present their research during a public seminar organized by the Biostatistics department.

Students in the Biostatistics Implementation and Prevention Science Methods Pathway must complete the ten required courses listed above in addition to: BIS 629, Advanced Methods for Implementation and Prevention Science; and EMD 533, Implementation Science. Students will also be required to take one elective from the following: BIS 536, Measurement Error and Missing Data; BIS 537, Statistical Methods for Causal Inference; and BIS 631, Advanced Topics in Causal Inference Methods. Students will be also be required to take two electives from the following: CDE 516, Principles in Epidemiology II; CDE 534, Applied Analytic Methods in Epidemiology; EMD 538, Quantitative Methods for Infectious Disease Epidemiology; HPM 570, Cost-Effectiveness Analysis and Decision-Making; HPM 586, Microeconomics for Health Policy and Health Management; HPM 587, Advanced Health Economics; HPM 611, Policy Modeling; SBS 541, Community Health Program Evaluation; SBS 574, Developing a Health Promotion and Disease Prevention Intervention;
SBS 580, Qualitative Research Methods in Public Health; SBS 676, Questionnaire Development; and S&DS 565, Applied Data Mining and Machine Learning.

A master's thesis is strongly recommended in place of BIS 681 and one elective.

Students in both pathways will also be required to attend a Professional Skills Seminar, EPH 100 (details provided in the first term).

TERM M.S. WITH CONCENTRATION IN CHRONIC DISEASE EPIDEMIOLOGY
This one-year program is designed for medical and health care professionals (e.g., M.D., Ph.D., D.V.M., D.D.S., D.M.D.) who seek the skills necessary to conduct epidemiological research in their professional practice. Part-time enrollment is permitted.

Course Requirements
The Chronic Disease Epidemiology concentration requires the completion of ten courses (not including CDE 525, CDE 526, and EPH 600), including a capstone course.* Required courses (or approved substitutions) are: CDE 516, Principles of Epidemiology II; CDE 525 and CDE 526, Seminar in Chronic Disease Epidemiology; CDE 617, Developing a Research Proposal (or CDE 600, Independent Study or Directed Readings); EPH 508, Foundations of Epidemiology and Public Health; EPH 600, Research Ethics and Responsibility; and EPH 608, Frontiers of Public Health. Students must also complete three quantitative courses from the following list (in consultation with the student's adviser, other courses may be approved): BIS 536, Measurement Error and Missing Data; BIS 537, Statistical Methods for Causal Inference; BIS 621, Regression Models for Public Health; BIS 628, Longitudinal and Multilevel Data Analysis; BIS 630, Applied Survival Analysis; and S&DS 563, Multivariate Statistical Methods for the Social Sciences.

In addition, students must complete two electives in Chronic Disease Epidemiology and one additional elective chosen in consultation with the student's adviser. Suggested CDE electives are: CDE 502, Physiology for Public Health; CDE 532, Epidemiology of Cancer; CDE 534, Applied Analytic Methods in Epidemiology; CDE 535, Epidemiology of Heart Disease and Stroke; CDE 545, Health Disparities by Race and Social Class: Application to Chronic Disease Epidemiology; CDE 551, Global Communicable Disease; CDE 562, Nutrition and Chronic Disease; CDE 572, Obesity Prevention and Lifestyle Interventions; CDE 597, Genetic Concepts in Public Health; and CDE 650, Introduction to Evidence-Based Medicine and Health Care.

* In the capstone course CDE 617, the student is required to develop a grant application that is deemed reasonably competitive by the instructor. An alternative to this capstone course is an individualized tutorial (CDE 600) in which the student completes a manuscript that is suitable for submission for publication in a relevant journal.

TERM M.S. WITH CONCENTRATION IN EPIDEMIOLOGY OF INFECTIOUS DISEASES
This one-year program offers two areas of specialization: a quantitative area aims to provide quantitatively focused research training in the epidemiology of infectious diseases, focusing on the analysis of communicable disease data as well as modeling and simulation; and a clinical area aims to provide research training for clinicians and clinical trainees interested in furthering their research expertise. Part-time enrollment is permitted.

Course Requirements
The Epidemiology of Infectious Diseases concentration consists of ten courses (not including EPH 600, Research Ethics and Responsibility, and EMD 535/EMD 526, a yearlong seminar in Infectious Disease Epidemiology).

The required courses (or approved substitutions) for the quantitative area of specialization include: BIS 623, Advanced Regression Models; BIS 630, Applied Survival Analysis; EMD 517 and EMD 518, Principles of Infectious Diseases I and II; EMD 525 and EMD 526, Seminar in Epidemiology of Microbial Diseases; EMD 533, Implementation Science (or EMD 530, Introduction to Public Health Surveillance); EMD 538, Quantitative Methods for Infectious Disease Epidemiology; EMD 600, Independent Study or Directed Readings (or EMD 563, Laboratory and Field Studies in Infectious Diseases); EPH 508, Foundations of Epidemiology and Public Health; EPH 600, Research Ethics and Responsibility; EPH 608, Frontiers of Public Health; one elective; and a capstone project.

The required courses for the clinical area of specialization include: EPH 505, Biostatistics in Public Health; BIS 505, Biostatistics in Public Health II (or CDE 534, Applied Analytic Methods in Epidemiology); EMD 517 and EMD 518, Principles of Infectious Diseases I and II; EMD 567, Tackling the Big 3: Malaria, TB, and HIV in Resource-Limited Settings (or EMD 533, Implementation Science); EMD 530, Health Care Epidemiology: Improving Health Care Quality through Infection Prevention (or EMD 536, Investigation of Disease Outbreaks); EMD 525 and EMD 526, Seminar in Epidemiology of Microbial Diseases; EMD 600, Independent Study or Directed Readings (or EMD 563, Laboratory and Field Studies in Infectious Diseases); EPH 508, Foundations of Epidemiology and Public Health; EPH 600, Research Ethics and Responsibility; EPH 608, Frontiers of Public Health; one elective; and a capstone project.

There are two capstone course options: (1) students will develop an NIH-style research proposal focusing on a topic related to infectious disease epidemiology (EMD 625, How to Develop, Write, and Evaluate an NIH Proposal); or (2) students may elect to enroll in EMD 563, Laboratory and Field Studies in Infectious Diseases, which will provide students with hands-on training in laboratory or epidemiological research techniques.

TERM M.S. WITH CONCENTRATION IN HEALTH INFORMATICS
This two-year program provides well-rounded training in health informatics, with a balance of core courses from such areas as information sciences, clinical informatics, clinical research informatics, consumer health and population health informatics, and data
science, and more broadly health policy, social and behavioral science, biostatistics, and epidemiology. First-year courses survey the field; the typical second-year courses are more technical and put greater emphasis on mastering the skills in health informatics. Part-time enrollment is not permitted.

Course Requirements

The Health Informatics concentration consists of a total of fourteen courses (excluding EPH 600, Research Ethics and Responsibility): eight required courses, four electives, and satisfactory completion of a yearlong capstone project.

Six of the eight required courses are: BIS 633, Population and Public Health Informatics; BIS 634, Computational Methods for Informatics; CB&B 740, Introduction to Health Informatics; CB&B 750, Core Topics in Biomedical Informatics; EPH 508, Foundations of Epidemiology and Public Health; and EPH 608, Frontiers of Public Health. Other courses for this program are in development; as they are approved, the DGS will inform students of the additional required course. Students who have demonstrated a mastery of topics covered by the required courses may substitute more advanced courses. Students must receive written permission from the DGS and their adviser prior to enrolling in the substitute courses.


Ph.D. or terminal M.S. degree program materials are available upon request to the Office of the Director of Graduate Studies (c/o M. Elliot), School of Public Health, Yale University, PO Box 208034, New Haven CT 06520-8034; 203.785.6383; e-mail, melanie.elliot@yale.edu.

REQUIRED COURSES

For a complete list of Public Health courses, see the School of Public Health bulletin, available online at https://bulletin.yale.edu; and Yale Course Search at https://courses.yale.edu.

All Ph.D. students are required to take the following courses. Students entering the program with an M.P.H. may be exempt from EPH 608.

EPH 600a, Research Ethics and Responsibility  Christian Tschudi

This course seeks to introduce major concepts in the ethical conduct of research and some of the personal and professional issues that researchers encounter in their work. Sessions are run in a seminar/discussion format. Prerequisite: doctoral student or postdoctoral status only. 0 Course cr

EPH 608a or b, Frontiers of Public Health  Staff

This course is designed to expose students to the breadth of public health and is required of M.S. and Ph.D. students who do not have prior degrees in public health. It explores the major public health achievements in the last century in order to provide students with a conceptual interdisciplinary framework by which effective interventions are developed and implemented. Case studies and discussions examine the advances across public health disciplines including epidemiology and biostatistics, environmental and behavioral sciences, and health policy and management services that led to these major public health achievements. The course examines global and national trends in the burden of disease and underlying determinants of disease, which pose new challenges; and it covers new approaches that are on the forefront of addressing current and future public health needs.