STUDENT HANDBOOK

GUIDELINES FOR GRADUATE STUDY

Version 2012.1 (August 2012)

Graduate Programs in Human Genetics

Department of Human Genetics

Graduate School of Public Health

University of Pittsburgh

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DEGREE PROGRAMS

The Department of Human Genetics offers the following programs:

Ph.D. in Human Genetics (including genetic counseling emphasis),
M.S. in Human Genetics,
M.S. in Genetic Counseling,
M.P.H. in Public Health Genetics,
Dual M.S. in Genetic Counseling and M.P.H. in Public Health Genetics,
M.D./Ph.D. in Human Genetics (in collaboration with the MSTP program),
Certificate (non-degree) program in Public Health Genetics.

Requirements for each program are described in detail below. This document primarily presents requirements that are specific to the Department of Human Genetics. Students should consult the Graduate and Professional Bulletin of the University of Pittsburgh and the regulations of the Graduate School of Public Health for more general requirements.

CONTACT INFORMATION

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APPLICABILITY

As there have been some adjustments in course requirements, the course requirements described here formally apply only to students starting our program after the date of this version of the Student Handbook. Older versions of the Student Handbook are available on the Human Genetics web page, and each student is governed by the course requirements of the Student Handbook in effect when they first started our program. However, where the current course requirements have added courses, we strongly encourage our students to take these additional courses if feasible.

PH.D. IN HUMAN GENETICS

Admission

Application for admission must be made through the Graduate School of Public Health Office of Student Affairs. Applications are accepted at any time, although it is preferable to start the program in the Fall semester. Applicants who wish to be considered for financial aid must apply by December to be considered for admission and aid the following Fall. For specific deadlines in any given year, refer to the Pitt Public Health Office of Student Affairs information.

Admission requires a bachelor's degree in a discipline related to the biological, behavioral, or mathematical sciences from an accredited college or university, with a grade point average of 3.0. Prerequisites to admission to the program are a first course in each of the following: genetics, general biochemistry, and calculus. Graduate Record Examination (GRE) scores must be supplied by all applicants and should be above the 70th percentile. Subject GREs are not required. Students seeking a Ph.D. may apply directly to the Ph.D. program regardless of whether they already have a Master's degree. Students in good standing in the M.S. degree program within the Department of Human Genetics may apply to the Ph.D. degree program at any time, but can only be considered for financial aid once per year along with new Ph.D. applicants. All applications are evaluated by the faculty on the basis of undergraduate academic performance, experience, personal statement, letters of recommendation, and scores on the GRE and TOEFL (for those for whom English is a second language). For foreign students, the University of Pittsburgh requires an official score report from the TOEFL or the IELTS exam. The minimum acceptable TOEFL score is either 550 on the written test or 80 on the Internet test. The minimum acceptable score on the IELTS is Band 6.5, and applicants must take the academic writing and reading modules of the test. The TOEFL or IELTS must be taken within two years prior to the application for admission.

Applicants who are graduates of an accredited college or university but who do not qualify for admission to full graduate status because of deficiencies in either their undergraduate course program or their scholastic achievement, may be considered for provisional graduate status if there is strong supporting evidence of their ability to successfully complete a graduate program. Courses taken to remove deficiencies do not count toward completion of graduate degree requirements. Transfer from provisional to full graduate status is initiated and recommended by the department, and is possible only after removal of deficiencies and other conditions noted at the time of admission and satisfactory progress in graduate course work.

A Ph.D. in human genetics with a focus on genetic counseling is available. To be considered for admission to this track, applicants need to be board certified in genetic counseling (ABGC or ABMG) and have at least 3 years of work experience as a genetic counselor.

Financial Aid

Graduate Student Researcher (GSR) positions, provide both tuition and stipend support. Most full-time students in the Ph.D. program eventually earn financial support as a GSR. Admission to the program does not guarantee financial aid, however. For students who are admitted with a

departmental financial aid offer, the department pays both tuition and stipend during the first year of the Ph.D. program. Students who are admitted but not offered departmental aid may seek GSR positions with individual faculty as an alternative. After the first year, the department continues to support tuition for all Ph.D. students with GSRs, and stipends are supported by the student's research advisor. Continuation of GSR support is based on satisfactory performance as described in the Pitt Public Health Policy for Graduate Student Researchers.

Students who have questions about the University's policy on sufficient academic progress for student loans should speak with the Assistant Dean for Student Affairs.

Overview

The Ph.D. Program is comprised of a combination of course work and original research, which usually allows attainment of the degree within 4-5 years. The University requires the minimum elapsed residence time for the Ph.D. degree to be six terms of full-time graduate study. General requirements are listed below, but the student should also consult with his/her academic advisor.

Important: Please also read the ADDITIONAL INFORMATION FOR STUDENTS IN ALL PROGRAMS section on page 30.

Program Objectives

Students successfully completing this program will be able to:

- Describe basic genetic mechanisms and how they affect proteins, chromosomes, cells, individuals, and populations of organisms in normal and disease states
- Describe mechanisms by which genes and the environment interact to affect the distribution of health and disease in human populations
- Demonstrate familiarity with a broad range of molecular, clinical, and analytical methodologies for genetic studies, and demonstrate mastery of a substantial subset of methods
- Analyze published research in human genetics at the level needed for effective research and teaching
- Use their in-depth experience with a specific research project in genetics to generate and test research hypotheses, design experiments, analyze data, and interpret research results
- Communicate their own research ideas and results, orally and in publishable written form
- Apply fundamental principles of grant-writing
- Apply fundamental principles of laboratory and research program management, and of ethical research practice

Coursework

A minimum total of 72 credits is required. The following courses are required:

BIOST 2041	Introduction to Statistical Methods 1	3 credits
BIOST 2042	Introduction to Statistical Methods 2	3 credits
EPIDEM 2110	Principles of Epidemiology	3 credits
PUBHLT 2011	Essentials of Public Health	3 credits
HUGEN 2022	Human Population Genetics	2 credits
HUGEN 2031	Chromosomes and Human Disease	3 credits
HUGEN 2034	Biochemical and Molecular Genetics of Complex Disease	3 credits
HUGEN 2040	Molecular Basis of Human Inherited Disease	3 credits
HUGEN 2025	Human Genetics Seminar (must be taken four times)	0 credits
HUGEN 2027	Human Genetics Journal Club (must be taken twice)	1 credit
HUGEN 2028	Human Genetics Journal Club and Peer Review (must be taken twice)	1 credit
INTBP 2290	Scientific Ethics	1 credit
HUGEN 3010	Research and Dissertation	
or		
HUGEN 2021	Special Studies	
PUBHLT 2022	The Dean's Public Health Grand Rounds (must be taken for the first two semesters)	0 credits

Two advanced courses in Human Genetics, at least one of which must be:

HUGEN 2080	Statistical Genetics	3 credits
or		
HUGEN 2029	Introduction to Gene Mapping	3 credits

Other advanced Human Genetics courses include:

HUGEN 2070	Bioinformatics for Human Genetics	3 credits
HUGEN 2051	Inborn Errors of Development	2 credits

Students may select another advanced course with permission of the Graduate Director.

Ph.D. students must also make at least two journal club presentations during the course of their degree program.

In the fall of the first year, most students take BIOST 2041, EPIDEM 2110, HUGEN 2040, HUGEN 2027, HUGEN 2025, PUBHLT 2022, and 5 credits of HUGEN 2021. In the spring of the first year most take HUGEN 2022, HUGEN 2034, HUGEN 2039, HUGEN 2025, HUGEN 2028, PUBHLT 2022, BIOST 2042, and additional credits of HUGEN 2021 or other courses to reach a full-time load of 15 credits. In the second year most students take HUGEN 2031 and one or two advanced courses.

In addition to the courses listed above, students are expected to select, in consultation with their advisor, additional courses appropriate for their areas of concentration. A student's committee may require that a student register for specific courses within or outside the Department of Human Genetics to gain knowledge in an area relevant to the student's area of concentration. It is strongly recommended that entering graduate students who are not fluent in English take a University course in conversational English. This course will not contribute to the student's GPA for the Graduate Program.

Upon successful completion of 72 credits and all required courses (possibly including transfer credit from previous graduate work), PhD students should register for Full-time Dissertation Study (FTDR 3999), which carries no credits or letter grade but provides full-time status. It is not necessary to have passed exams in order to register for FTDR.

First Year Research Rotations and Choice of Major Advisor

When the student enters the program, the Director of Graduate Studies is the faculty advisor and will follow the student's progress through the first year. After the first year, the faculty research advisor will oversee the student's research program (see below). However, the Director of Graduate Studies will continue to monitor the student's overall progress throughout the student's tenure in the program.

During the first year of the Ph.D. program, each student is expected to interview faculty members regarding possible research and dissertation areas. Most students participate in research rotations with 1 - 3 prospective advisors during this time. By the end of the first year, the student should choose a research advisor who will give assistance on the choice of a dissertation topic and who will remain in close consultation with the student about various aspects of the research as it progresses. This faculty member also typically provides GSR support for the student, although it is permissible for the student to be supported by a different faculty member than the primary research advisor. The student must submit to the Department written notification of the choice of a faculty research advisor. Exceptions to the procedures described above may be allowed for those students who have previously arranged to work with and be supported by a specific faculty member.

Students may select a faculty research advisor from among the entire faculty of the University of Pittsburgh, provided the advisor is a member of the Graduate Faculty of the university and his/her research involves genetics in some way. It is highly recommended that students first consider faculty within the Department of Human Genetics, then consider faculty with secondary appointments in Human Genetics, and only then go entirely outside the department. If the research advisor does not have a primary appointment in the Department of Human Genetics, the student must also select an academic advisor within the department. In this case the research advisor and the academic advisor typically both provide close guidance to the student throughout his or her tenure in the program.

Ph.D. Qualifying Examination

The purpose of the Qualifying Examination is to assess the breadth of the student's knowledge of the discipline, the student's achievement during the first year of graduate study, and the student's potential to apply research methods independently. This judgment will be based on the student's aptitude and potential for completing the program as well as on his or her mastery of the desired substantive content to date. The Qualifying Examination is an oral examination in which the student presents a critical analysis of a published paper from the contemporary peer-reviewed literature. For full-time students the examination must be taken during the second year in the Ph.D. program, preferably in the fall term or very early in the winter term.

It is the student's responsibility to initiate the appointment of a Qualifying Examination Committee and arrange a date for the examination. If the student has separate research and academic advisors, both normally serve on the qualifying exam committee. The committee must be approved by the Office of Student Affairs; this approval should be requested in a letter prepared by the Department of Human Genetics student services staff and signed by the student's program director or advisor.

Rules for Ph.D. Qualifying Examination Committee membership:

- The committee must consist of at least four University of Pittsburgh faculty members.
- The committee chair and at least one other member must be on the core faculty list of the Human Genetics Department.
- Half or more of the members must be on the core faculty list of at least one Pitt Public Health department.
- Half or more of the members must have graduate faculty status.
- One of the Pitt faculty on the committee must not be on the core list of the Human Genetics Department.

The Pitt Public Health Office of Student Affairs maintains a list of the core educational faculty of each department, which is available on the Student Affairs web site.

The student's academic advisor, in consultation with the other committee members, selects the paper on which the oral examination is based. This paper should be 'new' to the student: the student must not have presented this paper nor may others have presented it recently. The paper should also fall outside of the student's primary thesis area. One week prior to the examination date, the paper is distributed to the student and the committee. During the week in which the student is studying the assigned paper he or she may consult with committee members on background scientific issues, but should not receive direct help in interpreting the paper. He or she should not consult with anyone outside the committee on any issue relevant to the paper. At the examination, the student presents a critical review of the background and hypothesis of the paper, the methods, results and conclusions of the paper. The presentation is typically 30 - 50 minutes long. The student should be able to critically judge the methods used, the data and its analysis, and the conclusions drawn from these analyses. The student is expected to be able to identify weaknesses in the paper, judge the validity of the conclusions, and suggest alternative ways to test the hypothesis posed. The student will also be asked to answer questions on general background and course material relevant to the degree.

Passing of a candidate in the qualifying examination is by a unanimous vote of the committee. The committee's decision is reported to the department chair, who forwards it to the Office of Student Affairs. A student who fails to pass may repeat the qualifying examination one time (See Pitt Public Health Policy on Probation and Dismissal).

Comprehensive Examination and Dissertation Overview

Students enrolled in the Ph.D. program should take the Ph.D. Comprehensive Examination within two years after passing the Qualifying Examination. The Comprehensive Examination is generally administered after the student has completed his/her coursework and has decided on a dissertation topic. It is the student's responsibility to initiate the appointment of a Comprehensive Examination Committee and arrange a date for the examination. The student's advisor, with the concurrence of the department chair, recommends the committee membership for approval to the Office of Student Affairs. It is the function of this committee to administer the examination. The Comprehensive Examination committee is typically chaired by the student's research advisor, and goes on to become the student's Dissertation Committee. Note that the committee chair need not have a primary appointment in the Department of Human Genetics.

Rules for Ph.D. Comprehensive Committee membership are identical to the rules for the Ph.D. Dissertation Committee membership (see below).

For the Comprehensive Examination, the student is required to complete a dissertation research proposal. The dissertation proposal should provide the basis for an open discussion to determine whether the student has a good project and how it can be improved. Potential and/or perceived flaws or uncertainties should be clearly discussed and highlighted. The topic of the proposal is generally selected by the student in consultation with his or her research advisor. The proposal is expected to be conceptually well-founded and adequately documented. Attribution to published and unpublished sources must be comprehensive. As described in the RECOMMENDED TEMPLATE FOR THE DISSERTATION RESEARCH PROPOSAL section on page 34, the proposal is to be well-organized and should describe original and innovative experiments or analyses that will accomplish the stated aims and objectives of the research. The written proposal cannot consist of just a collection of experiments or analyses, but must include the rationale as well as the significance of the proposed experiments or analyses. The significance of the expected results should be discussed. There is no absolute limit on the length of the proposal, but it is recommended that the entire document be no more than 10 - 20 double-spaced pages of text and up to an additional 10 pages of references, appendices, tables, figures, etc. Already-written papers should be included as appendices, but should be summarized in the main body of the proposal. The final written proposal should be delivered to all members of the committee a minimum of three weeks prior to the oral examination date. The committee will then provide feedback on the proposal within two weeks. Students will then have the week before the exam to revise the proposal. The Director of Graduate Studies recommends that all students discuss the Specific Aims of their dissertation research proposal with all members of their Comprehensive Exam committee at least two to three months (or more) before their Comprehensive Exam.

At the oral examination, the student gives a 30 – 45 minute presentation of the dissertation proposal. The Comprehensive Examination committee evaluates the student's proposal and conducts an oral examination on the student's understanding of both the content of the research proposal and the basic concepts underlying the contents. The student is graded pass/fail. A unanimous vote of the panel decides the grade. The chair of the committee shall notify the department chair of the decision and submit the completed, signed evaluation form. The department chair shall notify the Pitt Public Health Office of Student Affairs of the decision. A "pass" shall be warranted when both of the following conditions are met: (i) the written proposal is considered acceptable as presented, and (ii) the student has performed knowledgeably in defense of the proposal. In the event of a failure, the student shall be given one opportunity to repeat the Comprehensive Examination provided that the modified written proposal is submitted within four months after notification of failure of the first exam. In the event of a second failure, the faculty shall recommend either dismissal of the student from the program or that the student transfer to the M.S. degree program for the completion of his/her training. See the Pitt Public Health Probation and Dismissal Policy for more information.

Ph.D. Dissertation Committee

The primary responsibility of the Ph.D. Dissertation Committee shall be to advise the student in the effective design, conduct and analysis of a research study and to approve a body of original research of sufficient quality to form the basis for the Ph.D. dissertation. The Dissertation Committee shall be proposed by the student and his or her research and academic advisors and must be approved by the Office of Student Affairs.

Rules for Ph.D. Dissertation Committee membership:

- The committee must consist of at least four University of Pittsburgh faculty members, including the student's research and academic advisor(s).
- At least two members must be on the core list of the Human Genetics Department.
- The majority of members must have graduate faculty status.
- One of the Pitt faculty on the committee must not be on the core list from the student's department.

The Dissertation Committee has the responsibility of meeting at least annually, and preferably every six months, to review the student's research progress. A simple majority of the Dissertation Committee determines actions of the committee with the exception of final approval of the doctoral thesis.

Dissertation and Final Oral Examination

The student's dissertation must provide evidence of original scholarly research of sufficient quality to be published in a peer reviewed scientific journal. The style and format of the dissertation must conform to the standards set forth in the University's Electronic Thesis and Dissertation (ETD) rules. Subject to the discretion of the Dissertation Committee, the format of the dissertation can be either a traditional single cohesive document, or individual works in the style of publishable (or published) papers can be included. If the format is that of a compendium of papers, the dissertation must also include a substantial introduction and a substantial

discussion that tie the body of work together into a cohesive whole. If the papers have numerous co-authors, it is also recommended that each chapter include a description of the student's contribution to the work. The dissertation advisor and one or more members of the Dissertation Committee may read preliminary drafts of the dissertation, suggest revisions and approve the final copy for submission to the Dissertation Committee. The defense cannot take place in the same semester as the comprehensive exam.

The final copy of the dissertation will be submitted to the Dissertation Committee at least three weeks prior to the Final Oral Examination (dissertation defense). With consent of every member of the committee, a shorter time-period may be allowed. It is highly recommended that the defense occur at least two weeks prior to the **initial** dissertation submission deadline for the semester in which the student plans to graduate. The dissertation defense will consist of a public seminar on the subject of the dissertation followed by an examination by the Dissertation Committee. Approval of the dissertation is certified by a unanimous vote of the Dissertation Committee. The degree will be granted by the University of Pittsburgh.

Students intending to graduate must file an application to graduate by the deadline specified in the University Calendar. They must notify the Department of Human Genetics approximately two months prior to the intended date of the dissertation defense, so that public notices of the defense date can be placed according to University policy.

The final copy of the dissertation must be prepared and submitted according to the University guidelines for Electronic Theses and Dissertations (ETD). Detailed information on requirements is available from the Pitt Public Health Office of Student Affairs and at http://www.pitt.edu/~graduate/etd.

M.S. IN HUMAN GENETICS

Admission

See "Ph.D. in Human Genetics" above. Admission criteria are the same for M.S. applicants.

Financial Aid

Tuition support is not normally available to students in the M.S. program, although M.S. students may be able to arrange for hourly wage/stipend support from research mentors. Students who have questions about the University's policy on sufficient academic progress for student loans should speak with the Assistant Dean for Student Affairs.

Overview

The M.S. in Human Genetics is a research-oriented degree, intended to prepare the graduate to participate in laboratory or statistical research or to go on to Ph.D. level study. The requirements for the M.S. in Human Genetics can normally be fulfilled in two years of full-time study.

Students interested in pursuing a Ph.D. are encouraged to apply directly to the Ph.D. program; an M.S. is not required for entrance to the Ph.D. program.

General requirements are listed below, but the student should also discuss requirements with his or her faculty advisor.

Important: Please also read the ADDITIONAL INFORMATION FOR STUDENTS IN ALL PROGRAMS section on page 30.

Program Objectives

Students successfully completing this program will be able to:

- Describe basic genetic mechanisms and how they affect proteins, chromosomes, cells, individuals, and populations of organisms in normal and disease states
- Describe mechanisms by which genes and the environment interact to affect the distribution of health and disease in human populations
- Demonstrate familiarity with a range of molecular, clinical, and analytical methodologies for genetic studies, and demonstrate mastery of at least a subset of methods
- Analyze published research in human genetics
- Use their in-depth experience with a specific research project in genetics to generate and test research hypotheses, design experiments, analyze data, and interpret research results
- Summarize and present a research project orally and in writing

Coursework

A minimum total of 36 credits is required for the M.S. in Human Genetics. The following courses are required.

BIOST 2041	Introduction to Statistical Methods 1	3 credits
BIOST 2042	Introduction to Statistical Methods 2	3 credits
EPIDEM 2110	Principles of Epidemiology	3 credits
PUBHLT 2011	Essentials of Public Health	3 credits
HUGEN 2022	Human Population Genetics	2 credits
HUGEN 2031	Chromosomes and Human Disease	3 credits
HUGEN 2034	Biochemical and Molecular Genetics of Complex Disease	3 credits
HUGEN 2040	Molecular Basis of Human Inherited Disease	3 credits
HUGEN 2025	Human Genetics Seminar (must be taken two times)	0 credits
HUGEN 2027	Human Genetics Journal Club (must be taken once)	1 credit

HUGEN 2028	Human Genetics Journal Club and Peer Review (must be taken once)	1 credit
INTBP 2290	Scientific Ethics	1 credit
HUGEN 2021	Special Studies (Research)	2 credits (min.)
PUBHLT 2022	The Dean's Public Health Grand Rounds (must be taken for the first two semesters)	0 credits

M.S. students must also make at least one journal club presentation during the course of their degree program.

In the fall of the first year, most students take BIOST 2041, EPIDEM 2110, HUGEN 2031, HUGEN 2040, HUGEN 2027, HUGEN 2025, PUBHLT 2022, and 2 credits of HUGEN 2021. In the spring of the first year most take HUGEN 2022, HUGEN 2034, HUGEN 2039, HUGEN 2025, HUGEN 2027, PUBHLT 2022, PUBHLT 2011, BIOST 2042, and additional credits of HUGEN 2021 or other courses to reach a full-time load of 15 credits.

In addition to the courses listed above, students are expected to select, in consultation with their advisor, additional courses appropriate for their areas of concentration. A student's committee may require that a student register for specific courses within or outside the Department of Human Genetics to gain knowledge in an area relevant to the student's area of concentration. It is strongly recommended that entering graduate students who are not fluent in English take a University course in conversational English. This course will not contribute to the student's GPA for the Graduate Program.

First Year Research Rotations and Choice of Major Advisor

The process for M.S. students is essentially the same as that described for the Ph.D. program above, except that M.S. students are encouraged to move through the process of choosing an advisor a bit more quickly so that thesis research can begin before the start of the second year.

Comprehensive Examination

All M.S. students must pass a comprehensive examination covering areas of basic knowledge relevant to human genetics. The M.S. Comprehensive Examination follows the same form as the Ph.D. Qualifying Examination (described above). The M.S. Comprehensive Examination should be taken in the fall or early in the spring of the second year for full-time students. It must be taken at least one month before the last day of the term on which the student is to graduate. Typically the Comprehensive Examination Committee is identical or almost identical to the Thesis Advisory Committee. The committee must be approved by the Office of Student Affairs; this approval should be requested in a letter prepared by the Department of Human Genetics student services staff.

Rules for M.S. Comprehensive Examination Committee membership:

- The committee must consist of at least three University of Pittsburgh faculty members.

- The committee chair must be on the core faculty list of the Human Genetics Department.
- Half or more of the members must be on the core faculty list of at least one Pitt Public Health department.
- One of the Pitt faculty on the committee must not be on the core list of the Human Genetics Department.

Note that if the M.S. student plans to apply to transfer into the Ph.D. program, then it is recommended that the Comprehensive Examination and M.S. Thesis Committees be chosen so they satisfy equivalent Ph.D. committee composition requirements.

M.S. Thesis Advisory Committee

The Thesis Advisory Committee should be selected by the student in consultation with the research advisor. The committee composition requirements are identical to those described above for the M.S. comprehensive examination, with the addition that the student's research and academic advisor(s) must be on the committee, and the advisory committee can be chaired by the student's research advisor, even if that individual does not have a primary appointment in Human Genetics. The Thesis Advisory Committee must be approved by the Office of Student Affairs. It is the responsibility of the Thesis Advisory Committee to guide the student in selecting an appropriate research topic and in the completion of a satisfactory thesis on an original problem in the area of the student's primary interest. The Committee will meet periodically with the student to give advice on the completion of the research project and preparation of the thesis. If the research advisor is not on the core faculty list of Human Genetics, the student must also select an academic advisor within the department. In this case the research advisor and the academic advisor typically both provide close guidance to the student throughout his or her tenure in the program.

M.S. Thesis

The M.S. thesis must demonstrate a mastery of knowledge in the specific topic area and demonstrate the student's ability to articulate a substantive research question and address the question through laboratory or non-laboratory research or through a comprehensive review of the literature. The style and format of the dissertation must conform to the standards set forth in the University's Electronic Thesis and Dissertation (ETD) rules. The Thesis Advisory Committee will judge the adequacy of the thesis by an open oral examination covering the subject of the thesis. Successful completion of the M.S. thesis requires unanimous agreement by the Thesis Advisory Committee.

All M.S. students must register for at least one credit during the term in which they intend to graduate.

Students intending to graduate must file an application to graduate by the deadline specified in the University Calendar.

The final copy of the M.S. thesis must be prepared and submitted according to the University guidelines for Electronic Theses and Dissertations (ETD).

M.S. IN GENETIC COUNSELING

(*A Ph.D. in Human Genetics with a focus on genetic counseling is available. Please see the Ph.D. in Human Genetics section for further information.)*

Admission

Application for admission must be made through the Graduate School of Public Health Office of Student Affairs. The admissions process is highly structured, and includes a required interview. Further information is available on the Human Genetics web site.

Admission to the Graduate Program in Genetic Counseling requires a bachelor's degree in a discipline related to the biological or behavioral sciences from an accredited college or university with a minimum quality point average (GPA) of 3.0. The General Graduate Record Examination (GRE) scores for the verbal, quantitative and analytical tests must be supplied with the application for admission and should be above the 70th percentile in each of these three areas. The preferred undergraduate background includes courses in each of the following: genetics, organic chemistry, general biochemistry, calculus, statistics, and a behavioral or social science. Prior to admission, student applicants are encouraged to volunteer at clinical genetic centers and/or at an agency that would offer opportunity to gain experience working with individuals in a crisis situation. Applicants also need to demonstrate a robust understanding of the genetic counseling profession.

Financial Aid

Tuition support is not normally available to students in the M.S. program, although M.S. students are typically able to arrange for hourly wage/stipend support from research mentors or other faculty. Students who have questions about the University's policy on sufficient academic progress for student loans should speak with the Assistant Dean for Student Affairs.

Overview

The Genetic Counseling Program in the Department of Human Genetics at the University of Pittsburgh has a long history. The Program was established in 1971 and is the second oldest program nationally. The Genetic Counseling Program received full accreditation from the American Board of Genetic Counseling in 1997. Our most recent reaccreditation occurred in 2011.

Recent discoveries concerning the genetic contribution to human diseases mean that genetic counseling has an increasingly important role in health care delivery. The genetic counselor is trained to provide patients and families with pertinent genetic information to understand their risk for disease and to make informed decisions. The Genetic Counseling Program at the University of Pittsburgh is committed to providing up-to-date training in the complex science of

human genetics, as well as in counseling skills. As a result, the Genetic Counseling Program is based on three important foundations: scientific training in human genetics, clinical experience, and understanding the psychology and social aspects of counseling.

The two-year program provides students with an in-depth background in human genetics and counseling. Training incorporates specific aspects of disease as they relate to individuals or families, including disease prognosis, consequences, treatment, risk of recurrence, and prevention. An internship in the second year requires students to integrate the science of human genetics with the social, psychological, moral, and ethical issues of genetic counseling. This program consists of prescribed courses during the first ten months, followed by an intensive rotation experience through the department's training programs at Children's Hospital of Pittsburgh, Magee-Women's Hospital, the Cancer Genetics Program, Allegheny General Hospital, and the University of Pittsburgh Health System. All rotations sites are in the Pittsburgh area with most being located within walking distance from the Graduate School of Public Health.

The program provides general content areas to support the development of practice-based competencies in genetic counseling. Most course work is completed in the first academic year. The clinical rotations begin in May and continue through March of the second year. Most students see approximately 150 cases during their clinical rotations.

The theory and application of counseling and interviewing including areas such as individual psychosocial development and dynamics; family dynamics; crisis intervention; psychosocial assessment and referral; grief/bereavement counseling; and cross cultural issues are incorporated throughout the curriculum. The social, ethical and legal issues as they pertain to the delivery of genetic services with review of health care delivery systems and principles of public health are provided in the Principles of Genetic Counseling course and the Intervention Skills for Genetic Counselors course.

The curriculum also includes principles and applications of human genetics and related sciences: cytogenetics; biochemical genetics; molecular genetics; population and quantitative genetics; human variation and disease susceptibility; embryology; and teratology.

Courses also address principles and practice of clinical/medical genetics: clinical features and natural history of a broad range of genetic diseases; indications for and methods of genetic diagnosis, including physical assessment, dysmorphology, laboratory and other diagnostic studies; indications for and methods of prenatal diagnosis including obstetric and genetic techniques; family history and pedigree analysis; risk assessment; use of the genetic literature; and case management skills.

The methods of genetic testing including indications, limitations, and methodology of tests used in cytogenetic, biochemical genetic, and molecular genetic laboratories are covered.

Teaching skills for presentations are reviewed in several classes and all students must present multiple cases at clinical case conference and at the rotation sites.

Research methods are reviewed in the biostatistics and epidemiology classes and are applied in the preparation of the Master's thesis project proposal.

Important: Please also read the ADDITIONAL INFORMATION FOR STUDENTS IN ALL PROGRAMS section on page 30.

Program Objectives

Students who receive the M.S. in genetic counseling will achieve the practice-based competencies outlined by the American Board of Genetic Counselors. These are as follows.

Domain I: Communication Skills

1. Can establish a mutually agreed upon genetic counseling agenda with the client.
The student is able to contract with a client or family throughout the relationship; explain the genetic counseling process; elicit expectations, perceptions and knowledge; and establish rapport through verbal and non-verbal interaction.

2. Can elicit an appropriate and inclusive family history.
The student is able to construct a complete pedigree; demonstrate proficiency in the use of pedigree symbols, standard notation, and nomenclature; structure questioning for the individual case and probable diagnosis; use interviewing skills; facilitate recall for symptoms and pertinent history by pursuing a relevant path of inquiry; and in the course of this interaction, identify family dynamics, emotional responses, and other relevant information.

3. Can elicit pertinent medical information including pregnancy, developmental, and medical histories.
The student is able to apply knowledge of the inheritance patterns, etiology, clinical features, and natural history of a variety of genetic disorders, birth defects, and other conditions; obtain appropriate medical histories; identify essential medical records and secure releases of medical information.

4. Can elicit a social and psychosocial history.
The student is able to conduct a client or family interview that demonstrates an appreciation of family systems theory and dynamics. The student is able to listen effectively, identify potential strengths and weaknesses, and assess individual and family support systems and coping mechanisms.

5. Can convey genetic, medical, and technical information including, but not limited to, diagnosis, etiology, natural history, prognosis, and treatment/management of genetic conditions and/or birth defects to clients with a variety of educational, socioeconomic, and ethnocultural backgrounds.
The student is able to demonstrate knowledge of clinical genetics and relevant medical topics by effectively communicating this information in a given session.

6. Can explain the technical and medical aspects of diagnostic and screening methods and reproductive options including associated risks, benefits, and limitations.
The student is able to demonstrate knowledge of diagnostic and screening procedures and clearly communicate relevant information to clients. The student is able to facilitate the informed-consent process. The student is able to determine client comprehension and adjust counseling accordingly.

7. Can understand, listen, communicate, and manage a genetic counseling case in a culturally responsive manner.
The student can care for clients using cultural self-awareness and familiarity with a variety of ethnocultural issues, traditions, health beliefs, attitudes, lifestyles, and values.

8. Can document and present case information clearly and concisely, both orally and in writing, as appropriate to the audience.
The student can present succinct and precise case-summary information to colleagues and other professionals. The student can to write at an appropriate level for clients and professionals and produce written documentation within a reasonable time frame. The student can demonstrate respect for privacy and confidentiality of medical information.

9. Can plan, organize, and conduct public and professional education programs on human genetics, patient care, and genetic counseling issues.
The student is able to identify educational needs and design programs for specific audiences, demonstrate public speaking skills, use visual aids, and identify and access supplemental educational materials.

Domain II: Critical-Thinking Skills
1. Can assess and calculate genetic and teratogenic risks.
The student is able to calculate risks based on pedigree analysis and knowledge of inheritance patterns, genetic epidemiologic data, and quantitative genetics principles.

2. Can evaluate a social and psychosocial history.
The student demonstrates understanding of family and interpersonal dynamics and can recognize the impact of emotions on cognition and retention, as well as the need for intervention and referral.

3. Can identify, synthesize, organize and summarize pertinent medical and genetic information for use in genetic counseling.
The student is able to use a variety of sources of information including client/family member(s), laboratory results, medical records, medical and genetic literature and computerized databases. The student is able to analyze and interpret information that provides the basis for differential diagnosis, risk assessment and genetic testing. The student is able to apply knowledge of the natural history and characteristics/symptoms of common genetic conditions.

4. Can demonstrate successful case management skills.
The student is able to analyze and interpret medical, genetic and family data; to design, conduct, and periodically assess the case management plan; arrange for testing; and follow up with the

client, laboratory, and other professionals. The student should demonstrate understanding of legal and ethical issues related to privacy and confidentiality in communications about clients.

5. Can assess client understanding and response to information and its implications to modify a counseling session as needed.
The student is able to respond to verbal and nonverbal cues and to structure and modify information presented to maximize comprehension by clients.

6. Can identify and access local, regional, and national resources and services.
The student is familiar with local, regional, and national support groups and other resources, and can access and make referrals to other professionals and agencies.

7. Can identify and access information resources pertinent to clinical genetics and counseling.
The student is able to demonstrate familiarity with the genetic, medical and social-science literature, and on-line databases. The student is able to review the literature and synthesize the information for a case in a critical and meaningful way.

Domain III: Interpersonal, Counseling, and Psychosocial Assessment Skills
1. Can establish rapport, identify major concerns, and respond to emerging issues of a client or family.
The student is able to display empathic listening and interviewing skills, and address clients' concerns.

2. Can elicit and interpret individual and family experiences, behaviors, emotions, perceptions, and attitudes that clarify beliefs and values.
The student is able to assess and interpret verbal and non-verbal cues and use this information in the genetic counseling session. The student is able to engage clients in an exploration of their responses to risks and options.

3. Can use a range of interviewing techniques.
The student is able to identify and select from a variety of communication approaches throughout a counseling session.

4. Can provide short-term, client-centered counseling and psychological support.
The student is able to assess clients' psychosocial needs and recognize psychopathology. The student can demonstrate knowledge of psychological defenses, family dynamics, family theory, crisis-intervention techniques, coping models, the grief process, and reactions to illness. The student can use open-ended questions; listen empathically; employ crisis intervention skills; and provide anticipatory guidance.

5. Can promote client decision-making in an unbiased, non-coercive manner.
The student understands the philosophy of non-directiveness and is able to recognize his or her values and biases as they relate to genetic counseling issues. The student is able to recognize and respond to dynamics, such as countertransference, that may affect the counseling interaction.

6. Can establish and maintain inter- and intra-disciplinary professional relationships to function as part of a health-care delivery team.
The student behaves professionally and understands the roles of other professionals with whom he or she interacts.

Domain IV: Professional Ethics and Values
1. Can act in accordance with the ethical, legal, and philosophical principles and values of the profession.
The student is able to recognize and respond to ethical and moral dilemmas arising in practice and seek assistance from experts in these areas. The student is able to identify factors that promote or hinder client autonomy. The student demonstrates an appreciation of the issues surrounding privacy, informed consent, confidentiality, real or potential discrimination, and other ethical/legal matters related to the exchange of genetic information.

2. Can serve as an advocate for clients.
The student can understand clients' needs and perceptions and represent their interests in accessing services and responses from the medical and social service systems.

3. Can introduce research options and issues to clients and families.
The student is able to critique and evaluate the risks, benefits, and limitations of client participation in research; access information on new research studies; present this information clearly and completely to clients; and promote an informed-consent process.

4. Can recognize his or her own limitations in knowledge and capabilities regarding medical, psychosocial, and ethnocultural issues and seek consultation or refer clients when needed.
The student demonstrates the ability to self-assess and to be self-critical. The student demonstrates the ability to respond to performance critique and integrates supervision feedback into his or her subsequent performance. The student is able to identify and obtain appropriate consultative assistance for self and clients.

5. Can demonstrate initiative for continued professional growth.
The student displays knowledge of current standards of practice and shows independent knowledge-seeking behavior and lifelong learning.

Coursework

The following courses are required.

Fall Term of 1st year		
BIOST 2011	Principles of Statistical Reasoning	3 credits
EPIDEM 2110	Principles of Epidemiology	3 credits
HUGEN 2031	Chromosomes and Human Disease	3 credits
HUGEN 2040	Molecular Basis of Human Inherited Disease	3 credits
HUGEN 2035	Principles of Genetic Counseling	3 credits
HUGEN 2025	Human Genetics Seminar	0 credits

HUGEN 2047	Clinical Genetics Case Conference	0 credits
HUGEN 2027	Human Genetics Journal Club	0 credits
PUBHLT 2022	The Dean's Public Health Grand Rounds	0 credits

Ethics Case Conference
Embryology (alternate years by arrangement)
Biochemistry (for those not completing prior to admission)

Spring Term of 1st year

HUGEN 2038	Intervention Skills for Genetic Counselors	3 credits
HUGEN 2022	Human Population Genetics	2 credits
HUGEN 2039	Risk Calculation in Genetic Counseling	1 credit
HUGEN 2032	Genetic Techniques	2 credits
HUGEN 2034	Biochem. and Mol. Genetics of Complex Disease	3 credits
HUGEN 2025	Human Genetics Seminar	0 credits
HUGEN 2047	Clinical Genetics Case Conference	1 credit
PUBHLT 2011	Essentials of Public Health	3 credits
PUBHLT 2022	The Dean's Public Health Grand Rounds	0 credits

Summer Term of 1st year
Begin internship in the Summer Term (May 1)

Fall Term of 2nd year

HUGEN 2036	Genetic Counseling Internship	4 credits
HUGEN 2047	Clinical Genetics Case Conference	0 credits

Ethics Case Conference

Spring Term of 2nd year

HUGEN 2036	Genetic Counseling Internship	4 credits
HUGEN 2047	Clinical Genetics Case Conference	0 credits

Comprehensive Examination

The Comprehensive Examination for M.S. (Genetic Counseling) students is a two-part examination. The written examination consists of 100 multiple choice questions in a format similar to the Certification Examination of the American Board of Genetic Counseling. The written examination is administered in the Fall term of the second year of study. A student failing a minimum score of 70% must repeat the written examination within 90 days and achieve a minimum score of 70% or undergo a series of supervised tutorial sessions to overcome areas of deficiencies. The second part of the examination, administered in the Spring term of the second year of study, consists of an oral examination based on a "fictional" clinical case presented to a panel of examiners. A student failing to achieve a passing score on the oral exam must satisfactorily complete a series of tutorial sessions under the direction of the Program Co-Directors or their designee.

Genetic Counseling Internship

The genetic counseling internship consists of a rotation through the Division of Medical Genetics at Children's Hospital of Pittsburgh, the Division of Reproductive Genetics at Magee-Womens Hospital, the UPMC Cancer Genetics Program, the Division of Maternal-Fetal Medicine and the Cancer Genetic Program at Allegheny General Hospital and Genetics Services of the University of Pittsburgh Medical Center.

Thesis Advisory Committee

The Thesis Advisory Committee should be selected by the student, in consultation with the research advisor. The committee composition rules are the same as those outlined above for the M.S. in Human Genetics. The committee must be approved by the Office of Student Affairs; this approval should be requested in a letter prepared by the Department of Human Genetics student services staff and signed by the student's program director or advisor. It is the responsibility of the Thesis Advisory Committee to guide the student in selecting an appropriate research topic and in the completion of a satisfactory thesis on an original problem in the area of the student's primary interest. The Committee will usually meet periodically with the student to give advice on the completion of the research project and preparation of the thesis.

M.S. Thesis

The M.S. thesis must demonstrate a mastery of knowledge in the specific topic area and demonstrate the student's ability to articulate a substantive research question and address the question through laboratory or non-laboratory research or through a comprehensive review of the literature. The Thesis Advisory Committee will judge the adequacy of the thesis by an open oral examination covering the subject of the thesis. Successful completion of the M.S. thesis requires unanimous agreement by the Thesis Advisory Committee.

All M.S. students must register for at least one credit during the term in which they intend to graduate.

Students intending to graduate must file an application to graduate by the deadline specified in the University Calendar.

The final copy of the M.S. thesis must be prepared and submitted according to the University guidelines for Electronic Theses and Dissertations (ETD).

M.P.H. IN PUBLIC HEALTH GENETICS

Admission

Application for admission must be made through the Graduate School of Public Health Office of Student Affairs.

Candidates for the M.P.H. program in Human Genetics must meet the general admission requirements of the University of Pittsburgh Graduate School of Public Health M.P.H. program. In addition, the following departmental requirements and guidelines apply.

- Candidates must have a degree in a discipline relevant to public health or must have substantial knowledge of a discipline relevant to public health gained through either study or experience.
- Candidates should submit a personal statement describing their interests and educational goals.
- GRE scores must be submitted and should generally be above the 70th percentile in all categories.
- Coursework in genetics, biochemistry, and calculus is helpful but is not required.

Applicants who are graduates of an accredited college or university but who do not qualify for admission to full graduate status because of deficiencies in either their undergraduate course program or their scholastic achievement, may be considered for provisional graduate status if there is strong supporting evidence of their ability to successfully complete a graduate program. Courses taken to remove deficiencies do not count toward completion of graduate degree requirements. Transfer from provisional to full graduate status is initiated and recommended by the department, and is possible only after removal of deficiencies and other conditions noted at the time of admission and satisfactory progress in graduate course work.

Financial Aid

Tuition support is not normally available to students in the M.P.H. program, although M.P.H. students may be able to arrange for hourly wage/stipend support from research/practicum mentors. Students who have questions about the University's policy on sufficient academic progress for student loans should speak with the Assistant Dean for Student Affairs.

Overview

This M.P.H. program integrates genetics and the public health science disciplines of epidemiology, pathobiology, biostatistics, environmental health and health services research, with ethics, social sciences, public affairs, economics and law. Public health genetics focuses on phenotypic disease prevention in populations, not just individual patients and their families. It addresses society's legal, ethical, financial, regulatory and organizational responsibilities in offering genetic services, and devising environmental and occupational interventions to prevent disease in populations.

The requirements for the M.P.H. in Public Health Genetics can normally be fulfilled in two years of full-time study. General requirements are listed below, but the student should also review the requirements with his or her faculty advisor.

Important: Please also read the ADDITIONAL INFORMATION FOR STUDENTS IN ALL PROGRAMS section on page 30.

Program Objectives

A student completing the MPH program in Public Health Genetics will be able to:

- Command and apply the essential competencies of public health's core content areas to complex public health issues.
- Demonstrate essential competencies of public health, disciplines, especially use of genetic principles, in a public health practice setting.
- Communicate knowledge of inheritance, including basic cellular and molecular mechanisms, and risk factors for disease to understanding a variety of rare and common health conditions.
- Identify interactions among genes, environmental factors, and behaviors and their effects on public health.
- Evaluate how genetic principles/technologies apply to diagnosis, screening, and interventions for disease prevention and health promotion programs, and how they intersect with other public health disciplines.

Coursework

A minimum of 47 credits is required for the MPH. This total is made up of school core courses, a core of required courses in the department of Human Genetics, and electives relevant to the student's program goals.

School core course requirements		
PUBHLT 2014	Public Health Overview	1 credit
PUBHLT 2015	Public Health Biology	2 credits
*BIOST 2011	Principles of Statistical Reasoning	3 credits
EPIDEM 2110	Principles of Epidemiology	3 credits
BCHS 2509	Social and Behavior Sciences and Public Health	3 credits
EOH 2013	Environmental Health and Disease	3 credits
HPM 2001	Introduction to Leadership, Management, and Policy for Public Health	3 credits
PUBHLT 2016	Capstone: Problem Solving in Public Health	2 credits
PUBHLT 2022	The Dean's Public Health Grand Rounds (must be taken for the first two semesters)	0 credits

Students in the Public Health Genetics program with adequate prior background may apply to be exempted from the requirement to take PUBHLT 2015. Most students do this.

Required human genetics courses		
HUGEN 2049	Public Health Genetics	3 credits
HUGEN 2025	Human Genetics Seminar (must be taken two times)	0 credits
HUGEN 2022	Human Population Genetics	3 credits

HUGEN 2034	Biochemical and Molecular Genetics of Complex Disease	3 credits
HUGEN 2040	Molecular Genetics of Human Inherited Disease	3 credits
HUGEN 2047	Clinical Genetics Case Conference (must be taken two times)	1 credits
HUGEN 2027	Human Genetics Journal Club (must be taken at least once)	1 credit
HUGEN 2026	Practicum	min 6 credits

* For the MPH degree, all students must take or be formally exempted from a course that addresses the core biostatistical competencies necessary for a public health professional degree. This requirement can be met by any of the following. Students should choose among these options in close consultation with their advisors.

1) Biostatistics 2011

2) Biostatistics 2041 AND 2042 (both must be taken)

3) In special circumstances and with the permission of both the student's advisor and the Department of Biostatistics, other introductory statistics courses may be substituted for the above, including Biostatistics 2014, certain PSYED courses, and certain STAT courses. However, any course or course sequence that is substituted must cover the majority of statistical methods that are used in the public health literature, and should ideally include public health application examples.

Course Progression

There is a fair amount of flexibility in the scheduling of courses for the M.P.H., depending on the interests of the student and on any other degree or certificate programs in which he or she is enrolled. The most typical schedule is to take HUGEN 2049, HUGEN 2040, PUBHLT 2014 and BIOST 2011 in the first fall semester, along with at least some journal club, seminar, or case conference credits. In the spring of the first year most students take HUGEN 2022 and HUGEN 2034, along with two or more of the core courses. Other core courses can be taken in the summer or in the second year, depending on whether the student is on campus during the summer. Some students use the summer to do a practicum in an off-campus location. Students cannot register for PUBHLT 2016 unless they have taken all of the other core courses, though it is permissible to take one other core course concurrently. The entire program can be completed in 1 1/2 years, though most students prefer to spread it out over two years.

Practicum and Masters Essay

All students are required to complete a Practicum. The Practicum is a supervised practice experience of at least 200 hours, providing students an opportunity to learn how genetics is applied in a public health setting and in the formulation and application of public health policy. It

is highly recommended that M.P.H. students discuss potential practicum plans with one of the Co-directors of the M.P.H. program in Genetics by the spring of their first year.

Students must write a master's essay, which will normally be based on the practicum experience. The essay is read and approved by an MPH Essay Committee that must consist of at least one faculty member in Human Genetics and one from outside the department. The MPH Essay Committee must be approved by the Office of Student Affairs. The essay must be approved by unanimous vote of the committee. A hard copy of the final M.P.H. essay must be provided to each member of the MPH Essay committee, one of the co-directors of the M.P.H. in Genetics program, and to the Department of Human Genetics.

DUAL M.S. IN GENETIC COUNSELING AND M.P.H. IN PUBLIC HEALTH GENETICS

Overview

Students interested in receiving both the M.S. in genetic counseling and the M.P.H. in public health genetics may enroll in the dual degree program, which awards both degrees simultaneously at the end of a 3-year program. All requirements for both programs must be fulfilled, with the exceptions noted below.

Important: Please also read the ADDITIONAL INFORMATION FOR STUDENTS IN ALL PROGRAMS section on page 30.

Admission

Application for admission must be made separately to the two programs. It is not absolutely necessary for students to be admitted to each degree program at the same time. For example, a student might enter the M.S. program initially and then be accepted into the M.P.H. program after the first term. Or a student might enter the M.P.H. program and then be accepted into the M.S. program starting in the next Fall.

Coursework

All required courses for both degrees must be taken by dual degree students, with the exception of PUBHLT 2011, Essentials of Public Health. The total number of credits required for the dual degree is 62. In general, dual degree students spend the first two years doing their M.S. work and concentrate on the core courses for the M.P.H. in the third year, but all programs are arranged individually with one of the Co-director's of the MPH in Genetics program.

M.S. Thesis and M.P.H. Essay

Usually, the student will submit both an M.S. thesis and an M.P.H. essay. The essay should focus upon elements of the practicum. The M. S. thesis should be submitted electronically and a hard

copy of the final M.P.H. essay must be provided to each member of the advisory committee, one of the co-directors of the M.P.H. in Genetics program, and to the Department of Human Genetics. Very occasionally, if the M.S. thesis topic involves substantial public health content, the student may submit a single document (in M.S. thesis form) to fulfill the requirements for both the thesis and the M.P.H. essay. This latter option needs prior approval from the co-directors of the MPH in Genetics program.

If the M.S. thesis topic involves substantial public health content, the student may submit a single document (in M.S. thesis form) to fulfill the requirements for both the thesis and the M.P.H. essay.

OTHER DEGREE COMBINATIONS

Many students choose to combine a degree in Human Genetics with a degree in another department. In addition, some students pursue more than one degree within the department. Recent examples have included:

- M.P.H. and Ph.D. in Human Genetics
- M.P.H. in Epidemiology and Ph.D. in Human Genetics
- M.S. in Biostatistics and Ph.D. in Human Genetics
- M.S. in Human Genetics and Dr.P.H. in Epidemiology

Students considering pursuing more than one degree should talk to advisors in both departments as early as possible in the process. There are strict limits on the number of credits that may be "shared" between two degrees in different departments; in general a Masters and a Ph.D. may share only 24 credits, and two Masters degrees may share only 6, but consult the Assistant Dean for Student Affairs in the Pitt Public Health Office of Student Affairs for rules specific to your situation.

CERTIFICATE PROGRAM IN PUBLIC HEALTH GENETICS

Overview

The overall goal of the program is to give public health professionals the core genetics competencies that they need to integrate genetics into any public health discipline. Students enrolled in this certificate program are trained to incorporate knowledge of how genes, together with the environment and behavior, influence health and apply this insight into their area of practice or research. The certificate program assumes that participants already have standard public health competencies, or are in the process of acquiring them through other coursework.

Important: Please also read the ADDITIONAL INFORMATION FOR STUDENTS IN ALL PROGRAMS section on page 30.

Admission

The program is open to currently matriculated Pitt Public Health students and also to non-degree students who hold at least a bachelor's degree. The standards for admission are the same as those

for the M.P.H.. Applicants who are not enrolled in degree programs in Pitt Public Health must demonstrate prior public health experience in the form of academic work or appropriate job experience.

Program Objectives

Students completing the Public Health Genetics Certificate will be able to:

• Demonstrate basic knowledge of the role that genetics plays in the development of disease

• Identify the limits of his/her genetic expertise

• Identify ethical and medical limitations to genetic testing, including uses that don't benefit the individual

• Identify the role of cultural, social, behavioral, environmental and genetic factors in development of disease, disease prevention, and health promoting behaviors; and their impact on medical service organization and delivery of services to maximize wellness and prevent disease

Curriculum

The curriculum consists of 15 credits, of which at least 12 must be traditional classroom courses. The remaining 3 credits can be seminar, project, or practicum work, as described below.

1) All students must take

HUGEN	2049	3	Public Health Genetics

2) Students must take at least two of the following four courses to achieve competency in the basic science of genetics.

HUGEN	2022	2	Human Population Genetics
HUGEN	2034	3	Intro. to Human Biochemical and Molecular Genetics
HUGEN	2040	3	Molecular Genetics of Human Inherited Disease
HUGEN	2031	3	Chromosomes and Human Diseases

3) A maximum of 3 credits may come from the following courses.

HUGEN	2047	1	Clinical Genetics Case Conference (may be taken more than once)
HUGEN	2027	1	Human Genetics Journal Club (may be taken more than once)
HUGEN	2026	1-3	Special Studies in Human Genetics – Practicum (1-3 credits)

Additional courses permitted for the certificate include the following.

All other Human Genetics courses

EPIDEM 2601	2	Molecular Epidemiology Laboratory
BCHS 2572	3	Risk Communication

Other courses must be approved by the Director of Graduate Studies for the Department of Human Genetics.

In addition, all students receiving the certificate must give one presentation at the Human Genetics Journal Club, regardless of whether they register for the journal club course for credit.

Students enrolled in Human Genetics degree programs other than the M.P.H. in Public Health Genetics may receive the certificate, with the stipulation that the certificate curriculum must include at least 6 credits of coursework that is not part of the coursework for their degree. These 6 credits will consist of the Public Health Genetics course and at least 3 additional credits of work that is specifically focused on ethics or public health genetics (as opposed to the basic science of genetics), such as a practicum, a biomedical ethics course, or the Clinical Genetics Case Conference Course.

Advising

Each student who is admitted to the certificate program is assigned a faculty advisor who is responsible for helping the student choose courses and integrate the genetics experiences with the student's regular degree program or professional goals.

ADDITIONAL INFORMATION FOR STUDENTS IN ALL PROGRAMS

Institutional Review Board Approval

All research carried out by students in the Graduate School of Public Health which involves human subjects must be approved by the institutional Review Board of the University of Pittsburgh. It is the responsibility of the student, in consultation with their advisor, to assure that requirements for the protection of human subjects are met prior to initiating a research project. Information regarding IRB requirements and procedures is available at http://www.irb.pitt.edu. Students engaged in human subjects research must complete on-line training modules appropriate to their research area.

Research Integrity

All research and degree related activities in the Department of Human Genetics must comply with the policies of the University of Pittsburgh set forth in the Guidelines for Ethical Practices in Research. These guidelines are available from the Office of Research Integrity, University of Pittsburgh. All students must complete on-line training on research ethics and integrity modules.

Academic Integrity

Students are expected to be familiar with the University of Pittsburgh Policy on Academic Integrity, and are required to complete the Pitt Public Health on-line Student Academic Integrity Module. All new students enrolled in a Pitt Public Health program (certificate, degree, or non-degree) are required to complete this module during the first month of their first semester.

Bioinformatics Training

In addition to the formal courses offered through the Department, the Health Sciences Library offers a selection of excellent workshops and short courses on different topics and tools in bioinformatics. These are highly recommended for all Human Genetics students.

Grades

University policy dictates that in order to graduate the student have a cumulative grade point average (GPA) of at least 3.0 in all courses required for the degree. The Program requires that the student maintain a GPA of 3.0. Only A through F grades in required courses are employed for the GPA computation. A Pitt Public Health student whose cumulative GPA falls below 3.00 is immediately placed on academic probation, and the student, advisor, and department chairperson are notified by the Pitt Public Health Student Performance Committee. The student may be permitted to take additional coursework over no more than two terms (part-time students: a maximum of an additional 18 credit hours) to reach a GPA/GPA of 3.00. Students are given at most two opportunities to register for and pass each required course, including departmental requirements and Pitt Public Health core courses. In some cases a low grade in a non-required course can be omitted from the GPA for the purposes of the above calculations; in this case the course cannot count towards the number of credits required for graduation.

Research Credits

Students enrolled in the M.S. program register for HUGEN 2021 for their research credits, as do students enrolled in the Ph.D. program who have not yet started dissertation research. After starting dissertation research, students enrolled in the Ph.D. program can register for HUGEN 3010 unless/until they are registered for Full Time Dissertation Study.

Transfer Credit

Transfer credits and exemption from required courses should be discussed with the student's advisor as soon as possible after starting the program. In addition to consulting with the student's advisor, students who are planning to transfer or share credits with other (current or previous) degrees should consult with Office of Student Affairs. No more than six credits may be granted toward the completion of the requirements for a master's degree for work completed at another accredited graduate institution. No more than 24 credits may be accepted for a master's degree awarded by another institution to meet the credit requirements for the Ph.D. degree. In recognition of graduate study beyond the master's degree successfully completed elsewhere, no more than 12 additional credits may be accepted at the time of admission to meet the minimum

credit requirement. Exemption from Pitt Public Health core courses or departmental required courses is entirely separate from transfer credit, and requires permission of the course instructor.

Alternative schedules for completion of academic milestones

Schedules for completion of academic milestones (preliminary examination, comprehensive examination, etc.) are described above for typical full-time students. Part-time students and Ph.D. students who already have an M.S. when they enter the program should consult with their academic advisors and/or the Director of Graduate Studies to develop individualized time-lines.

Registration in terms prior to graduation

All graduate students must register for at least 1 credit or full-time dissertation study during the 12-month period preceding graduation (that is, must be on active status) and must be registered for the term in which they plan to graduate. Waivers may be obtained by submitting a written request to the registrar from the dean of the school. The request should be based on extenuating circumstances, e.g., inability of the student's Dissertation Committee to meet during the final term when a student has given reasonable notice or the student has completed all degree requirements in a previous term. Waivers will not be granted to students who are inactive.

Statute of Limitations

The purpose of a statute of limitations is to ensure that a graduate degree from the University of Pittsburgh represents mastery of current knowledge in the field of study. All requirements for the M.S. degree must be completed within a period of four consecutive calendar years from the student's initial registration for graduate study. All requirements for the Ph.D. degree must be completed within a period of ten years if the student has received credit for a master's degree appropriate to the field of study. Programs in which candidates pursue part-time study while working full-time within their chosen discipline, may be granted a longer statute of limitations at the discretion of the Dean, Graduate School of Public Health.

Under exceptional circumstances, a candidate for an advanced degree may apply for an extension of the statute of limitations. The request must be approved by the department or departmental committee (master's or doctoral) and submitted to the dean for final action. Requests for an extension of the statute of limitations must be accompanied by a departmental assessment of the work required of the student to complete the degree as well as documented evidence of the extenuating circumstances leading to the requested extension. Students who request an extension of the statute of limitations must demonstrate proper preparation for the completion of all current degree requirements.

Students are advised to review the school-wide Probation and Dismissal Policy and Procedures.

Student Organizations

Students of the Graduate School of Public Health have a Graduate Student Organization (GSO) with elected offices. The organization holds regular meetings to discuss academic matters as

well as other items of interest to the students and the school. One elected member of the GSO sits on appropriate standing committees of the Graduate School of Public Health to represent the students at the committee meetings and provide a channel of communication between the entire faculty and the student body.

INFORMATION SPECIFIC TO MSTP (M.D./PH.D.) STUDENTS

The University of Pittsburgh School of Medicine offers an M.D./Ph.D. program that requires a minimum of six years of study. M.D./Ph.D. students who choose to pursue Ph.D. training within the Department of Human Genetics will be eligible for graduate student tuition remission and stipend support while they are enrolled in the Ph.D. program. More complete information regarding details for the M.D. requirements and additional financial aid can be obtained from the Human Genetics Director of Graduate Studies or the Director of the M.D./Ph.D. Program in the School of Medicine.

The medical student will be given credit equivalent to 16 graduate credits for completing the first two years of medical school.

INFORMATION SPECIFIC TO M.M.P.H. STUDENTS

The Department of Human Genetics welcomes students from the Multidisciplinary Master of Public Health (MMPH) program who wish to pursue coursework in genetics.

RECOMMENDED TEMPLATE FOR THE DISSERTATION RESEARCH PROPOSAL

Overall recommendations[1]

Your proposal should address the following questions:
• What do you intend to do?
• Why is this worth doing or what is the significance of the research? How is it innovative?
• What has already been done in general, and what have other researchers done in this field? Use appropriate references. What will this new work add to the field of knowledge?
• What have you (and your collaborators) done to establish the feasibility of what you are proposing to do?
• How will the research be accomplished? Who? What? When? Where? Why?

Purpose:
A dissertation proposal should be the basis for an open discussion of whether the student has a good project and how it can be improved. Potential and/or perceived flaws or uncertainties should be *highlighted*.

Suggestions:
1. Make sure that all sections are internally consistent and that they dovetail with each other. Use a numbering system, and make sections easy to find. Lead the committee members through your research plan. Revise and edit the final draft.
2. Show knowledge of recent literature and explain how the proposed research will further what is already known.
3. Emphasize how some combination of a novel hypothesis, important preliminary data, a new experimental system and/or a new experimental approach will enable important progress to be made.

Flexibility:
By providing this outline, we hope to lay out the usual questions that must be addressed in a comprehensive research proposal, as well as to provide a template for organizing the answers to those questions. However, while this is a recommended outline, it is not written in stone: the student, with the approval of their committee, may modify the outline to better fit the particulars of their research proposal.

Length:
There is no absolute limit on the length of the proposal, but it is recommended that the entire document be no more than 10 - 20 double-spaced pages of text and up to an additional 10 pages of references, appendices, tables, figures, etc. Already-written papers should be included as appendices, but should be summarized in the main body of the proposal.

A downloadable outline-only template in Word-format is available on the Human Genetics web site.

[1] These recommendations are based on the following NIH documents with some modifications:
http://deainfo.nci.nih.gov/extra/extdocs/gntapp.pdf
http://grants.nih.gov/grants/funding/424/SF424_RR_Guide_General_Adobe_VerB.pdf

Outline for a dissertation research proposal

[Title]

[Student name]

Human Genetics, Ph.D. Candidate
University of Pittsburgh
Graduate School of Public Health

[Date]

1. Hypotheses and Specific Aims

Purpose: The purpose of the specific aims is to describe concisely and realistically the goals of the proposed research and summarize the expected outcome(s), including the impact the proposed research will exert on the research fields involved.

What are the aims of your planned dissertation research?

Recommended Length: The recommended length of the specific aims is two double-spaced pages or less.

Content: The specific aims should:
- Describe the broad, long-term goals
- Describe the specific objectives and hypotheses to be tested
- Summarize expected outcomes
- Describe impact on the research field.

Suggestions:
1. Generally, the Specific Aims section should begin with a brief narrative describing the long-term goals or objectives of the research project and the hypothesis to be tested. This is followed by a numbered list of the Aims.
2. List succinctly the specific objectives of the research proposed, e.g., to test a stated hypothesis, create a novel design, solve a specific problem, challenge an existing paradigm or clinical practice, address a critical barrier to progress in the field, or develop new technology.
3. Make sure your specific objectives or hypotheses are clearly stated, are testable, and adequately supported by citations (and perhaps preliminary data). Be sure to explain how the results to be obtained will be used to test the hypothesis.
4. *Be brief and specific*. For clarity, each aim should consist of only one or two sentences. Use a brief paragraph under each aim if detail is needed.
5. Include a brief statement of the overall impact of the research studies.

2. Background and Significance

a. Background and Significance

b. Public Health Relevance

The Public Health Relevance section should be brief, no more than half a page.

Purpose: The Significance section should explain the importance of the problem or describe the critical barrier to progress in the field that is being addressed. Explain how the proposed research project will improve scientific knowledge, technical capability, and/or clinical practice in one or more broad fields. Describe how the concepts, methods, technologies, treatments, services, or preventative interventions that drive this field will be changed if the proposed aims are achieved.

What is already known about your research topics?
Why will the results of your research be important?
How will the results of your research contribute to public health?

Content: It should cover:

- the state of existing knowledge, including literature citations and highlights of relevant data
- rationale of the proposed research
- explain gaps that the project is intended to fill
- potential contribution of this research to the scientific field(s)
- include a sub-section addressing the *public health relevance* of your research

Suggestions

1. Make a compelling case for your proposed research project. Why is the topic important? Why are the specific research questions important? How are the researchers qualified to address these?
2. Establish significance through a careful review of published data in the field. Avoid outdated research. Use citations not only as support for specific statements but also to establish familiarity with all of the relevant publications and points of view.
3. Highlight awareness of potential barriers and alternative approaches.
4. Highlight why research findings are important beyond the confines of a specific project - i.e., how can the results be applied to further research in this field or related areas.
5. Clearly state the public health implications.
6. Stress any innovations in experimental methods (e.g., new strategies, research methods used, interventions proposed).

3. Preliminary Results

Purpose: The purpose of this section is to describe your progress towards the achievement of your aims.

What results have you already generated?

Content and Suggestions:
• Number the sections in this part of the application to correspond to the numbers of the Specific Aims; you may use further subheadings.
• Provide figures and tables to illustrate your key data
• Include sufficient methodological detail so that the committee members can understand how you obtained and analyzed the results
• Discuss difficulties, negative results and challenges in obtaining and analyzing your data
• Explain how the results support or refute your hypothesis and how your findings inform upcoming work
• Illustrate how your progress to date fits with your research timetable.

4. Approach

Purpose: The purpose of the approach section is to describe how the research will be carried out. This section is crucial to how favorably your proposal is viewed.

How will you accomplish your Specific Aims?
What methodology and approaches will you use and why?

Content: The research design and methods section should include the following:
• An overview of the experimental design.

• A description of methods and analyses to be used to accomplish the specific aims of the project.

• A discussion of potential difficulties and limitations and how these will be overcome or mitigated.

• Expected results, and alternative approaches that will be used if unexpected results are found.

• If the project is in the early stages of development, describe any strategy to establish feasibility, and address the management of any high risk aspects of the proposed work.

• A detailed discussion of the way in which the results will be collected, analyzed, and interpreted.

• A description of any new methodology used and why it represents an improvement over the existing ones.

Suggestions
1. Number the sections in this part of the application to correspond to the numbers of the Specific Aims.
2. Include subsections such as “Hypothesis”, “Rationale”, “Experiment 1", "Experiment 2", …, etc, “Anticipated Results", "Alternative Approaches”, etc.
3. Avoid excessive experimental detail by referring to publications that describe the methods to be employed. Publications cited should include some from your own research team, if possible. Citing someone else's publication establishes that you know what method to use, but citing your own (or that of a supervisor or collaborator) establishes that you are experienced with or have access to the necessary techniques.
4. If relevant, explain why one approach or method will be used in preference to others. This establishes that the alternatives were not simply overlooked. Give not only the "how" but the "why."
5. If employing a complex technology for the first time, take extra care to demonstrate familiarity with the experimental details and potential pitfalls. Describe collaboration with investigator(s) experienced with the technology, if necessary.
6. Explain how the research data will be collected, analyzed, and interpreted.
7. Develop alternative strategies for potential problems.
8. Point out any procedures, situations, or materials that may be hazardous to personnel and precautions to be exercised (i.e., use of Select Agents).

5. Anticipated Problems/Strategies

Purpose
A dissertation proposal should be the basis for an open discussion of whether the student has a good project and how it can be improved. Potential and/or perceived flaws or uncertainties should be *highlighted*.

What problems might you run into?
What alternative approaches might be used to achieve your goals?

Content and Suggestions:
• A discussion of potential difficulties, flaws, uncertainties, and limitations and how these might be overcome or mitigated.
• Alternative approaches that will be used if unexpected results are found.

6. Timeline

When and in what sequence will you accomplish your Aims?

Content and Suggestions:
• A projected sequence or timetable (work plan) including the entire time period of your dissertation research.

7. References

Purpose: The quality of reference section will indicate your familiarity with the relevant literature.

Content and Suggestions:
• Use of Endnote or other reference management software to make editing and formatting references easy and consistent.

8. Appendix

Content:
• Ethical and Safety Considerations section (see below for details).
• Your publications which include the results of your dissertation work.
• Large data tables or figures.

Ethical and Safety Considerations

Purpose: The purpose of this section is address any ethical issues associated with human subjects, animal subjects or hazardous materials research.

How will research risks be minimized?

Recommended length:
A few sentences per relevant subtopic.

Content and Suggestions:
• Discuss how human subjects are protected from research risks, and mention the IRB approval status of your work.

• Describe the procedures to ensure humane treatment of live animal subjects, mention the IACUC approval status of your work.

• Describe how the risks associated with the use of hazardous materials (recombinant DNA, infectious agent, chemical hazards, radioactive substances) are mitigated.