

Institute for Public Health Genetics
An Interdisciplinary Unit in the Department of Epidemiology,
School of Public Health,
and the Graduate School
University of Washington

**SELF-STUDY GUIDE FOR
MASTER OF SCIENCE DEGREE IN GENETIC EPIDEMIOLOGY**

Participating Programs and Departments:
Institute for Public Health Genetics
Department of Epidemiology
Department of Biostatistics

Name of Unit: **Master of Science in Genetic Epidemiology Program**
Institute for Public Health Genetics
Housed in the Department of Epidemiology
School of Public Health
University of Washington

Official Title(s) of Degrees/Certificates Offered by Unit:
M.S. in Genetic Epidemiology
Ph.D. in Public Health Genetics
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J.D./M.P.H. in Public Health Genetics
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INSTITUTE FOR PUBLIC HEALTH GENETICS, UNIVERSITY OF WASHINGTON

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TABLE OF CONTENTS

SECTION I: EXECUTIVE SUMMARY

SECTION II: ORGANIZATION AND GOVERNANCE

A. Organization

Background
Faculty for M.S. in Genetic Epidemiology
MSGE Faculty Committee
IPHG Advisory Board

B. Budget

C. Resources

Financial Resources
Work Space
Website and Brochure
Development Plan

D. Staffing

Faculty
Staff

SECTION III: FACULTY, TEACHING, AND DEGREE PROGRAMS

A. Teaching Responsibilities

Classroom Teaching

Table 1. IPHG and Epidemiology MSGE Courses (Classroom Teaching)

Interactive Seminar Series

B. Instructional Effectiveness

Student Evaluations of MSGE Courses

Table 2. Student Evaluations of Required MSGE Courses, 2007-2008 Academic Year

Exit Interviews and Placement of Graduates

Annual Student Feedback Session

C. Teaching and Mentoring Outside the Classroom

RA Opportunities

D. Degree/Certificate Programs

List of Programs

Table 3. Educational Programs Offered by the Institute for Public Health Genetics

Admissions and Enrollment

Table 4. MSGE Program: Number of Applicants, Number Offered Admissions, and Number of Students Enrolled by Academic Year

Table 5. Continuing MSGE Students, 2008-2009 Academic Year

Graduation and Placement

Table 6. MSGE Graduates, Thesis Titles, Committee Members and Current Positions

Summary of Student Progress and Graduation Timeline

Program Need: National, Washington State, University of Washington, School of Public Health, and International

Peer Institutions

Goals and Learning Objectives for the MSGE Program

SECTION IV: DIVERSITY

Table 7. Ethnic Group and Gender of MSGE Students By Year Of Enrollment

SECTION V: RESEARCH AND CREATIVITY

Northwest Center for Genomics and Public Health (NWCGPH)

Ethical, Legal and Social Implication (ELSI) Core of the Center for Ecogenetics and Environmental Health (CEEH)

Genes and Environment Initiative, Genome-Wide Associations Coordinating Center

Predocutorial Training Grant 5T32GM081062-02

SECTION VI: COLLABORATIONS AND INTERDISCIPLINARITY

SECTION VII: FUTURE DIRECTIONS AND STRATEGIC PLANNING

APPENDICES

A. Organization Chart

B. Budget Summary

C. Faculty

D. OAP Summary Data

E. Abbreviated Faculty Curricula Vitae

F. Strategic Planning

G. HEC Board Summary

H. MSGE Course Information

MSGE Brochure

MSGE Student Checklist

MSGE Required and Elective Courses

I. MSGE Student Bios

J. Additional Support Materials

Summer Institute in Public Health Genomics Brochure

Summer Institute in Statistical Genetics Brochure

Interview with Cecile Janssens

SECTION I: EXECUTIVE SUMMARY

The overall mission of the Master of Science in Genetic Epidemiology program is to contribute to the understanding of the etiology and prevention of disease by focusing on genetic influences and their interactions with the environment, and using this information to improve the health of the public.

Genetic epidemiology is a unique and emerging field that focuses on discovering and characterizing genetic susceptibility to health and disease in human populations and identifying interactions with environmental factors. Genetic epidemiologists use population and family-based studies to assess the impact of genes on the occurrence of a wide range of human diseases and conditions. Increasingly, genetic epidemiologists also participate in evaluating a broad range of issues related to these discoveries, such as developing and evaluating tailored interventions based on genetic susceptibility, disease prediction based on genetic information and emerging areas such as pharmacogenomics and nutrigenomics. Finally, results from genetic epidemiologic studies will play an increasingly important role in personalized medicine. Thus, results from genetic epidemiologic studies have broad application in clinical and public health settings. The MSGE program was designed to meet the increasing demand for individuals trained in this area. It was developed as one of four degree programs in the Institute for Public Health Genomics, funded in 1997 through the University Initiatives Fund.

Genetic epidemiology is a relatively new field that differs from existing programs in epidemiology and genetics, and requires specific training that is sufficiently different from each of these programs to warrant a separate degree track. Traditional epidemiology tends to focus on the environmental causes and risk factors of disease, while traditional genetics tends to focus on the relationship between genes and traits, and often ignores the environmental factors. Genetic epidemiology focuses on both genetics and environmental factors in order to explain how genes are expressed in the presence of different environmental contexts, to come to a fuller understanding of the etiology of complex traits in human populations.

Because most diseases and conditions have both genetic and non-genetic influences, understanding how these factors interact to cause disease is becoming increasingly important. Understanding these factors will help scientists and clinicians implement better preventive measures and lead to improved diagnosis and treatment of disease. Further, with the rapid advances in understanding the genome, genetic epidemiology has expanded to include a broader scope of investigation beyond the traditional family based designs and more than ever before requires specialized training. Training in genetic epidemiology at the University of Washington focuses on fundamental concepts and methods used to identify the genetic factors involved in disease susceptibility and to understand their interactions with each other and environmental exposures in human populations, while at the same time preparing students to be lifelong learners so they can keep abreast of advances in this rapidly evolving field.

The Master of Science degree in Genetic Epidemiology at the UW was one of the first such programs in the US, and continues to serve as a model for other programs. The UW MSGE program is unique in several ways. First, the program builds upon a strong foundation in epidemiology and biostatistics that is coupled with bioinformatics, genome science and public health genetics to form the unique core curriculum. Secondly, it emphasizes applied research skills so that graduates are prepared to enter the workforce and participate in the design and analysis of data covering a broad range of genetic epidemiologic study designs, thus increasing employment opportunities for our graduates. Further, the MSGE can serve as an important stepping stone for a variety of advanced and professional degree programs, or for clinician

scientists, who often use this additional training to launch their research career in this new area. The UW MSGE program is unique in that students are also exposed to the ethical, legal, and social implications (ELSI) relevant to the conduct of genetic epidemiologic studies as part of their core curriculum. Finally, due to the outstanding strengths of the UW in many areas related to genetics and public health, students have a great deal of flexibility in selecting electives from a broad range of existing courses to round out their educational experience and training.

This specialized training is a result of the involvement and support of the Departments of Epidemiology and Biostatistics, and the Institute for Public Health Genetics (IPHG), as well as dedicated faculty from other related UW programs. Although the MSGE program is offered through the interdisciplinary Institute for Public Health Genetics (IPHG), it is enhanced by the collaboration and support from the Departments of Epidemiology and Biostatistics, and the program in Statistical Genetics. These relationships also afford opportunities for expansion of training and collaboration between these units.

The importance of training in this emerging field can be demonstrated in a number of ways. First, with the completion of the Human Genome Project, the demand for professionals trained in genetic epidemiology has become substantial and is expected to increase in the coming years. In fact, participants at a National Institutes of Health (NIH) Leadership Forum in 2008 noted "that there are increasing numbers of genome-wide association studies being supported, and as the technology moves from genotyping to sequencing the community will be deluged with data that will require scientists who can: (1) develop new methods of analyses and (2) perform the analyses. There is a concern that there is not a sufficiently trained cadre of scientists to participate in these research projects." The need for training in this area can also be seen by the number of projects requiring genetic epidemiologic expertise in the new Challenge Areas recently released by NIH. Secondly, there is increasing demand for individuals with knowledge in genetic epidemiology who can translate these findings into practice, both public health and clinical; our program provides many unique opportunities for students to gain these skills. The MSGE program was created in anticipation of this increasing demand, and our experience over the past five years positions us to continue to take the lead in this area and to consider new ways to deliver training to meet the state, national and international needs for individuals trained in genetic epidemiology.

Further, training in genetic epidemiology is a key element in several other degree programs, including the multidisciplinary IPHG program as noted in Table 1. Several of the MSGE core courses such as PHG511 and PHG518 are also important for students in other programs, including epidemiology, biostatistics, genome sciences, global health, environmental health, nursing, and fellows in a number of programs within the School of Medicine.

In summary, genetic epidemiology will continue to be a growth area and UW is in a unique position to continue to offer high quality training in this area. Genetic epidemiological methods can be applied to a variety of national and international settings, as well as to the study of both infectious and chronic diseases. This program has direct relevance to public health and the mission of the UW School of Public Health. It is also consistent with the goals and mission of several national initiatives and supports several statewide initiatives.

The highlight of this program lies in the unprecedented strength of the faculty and resources at UW. No other institution matches UW for emphasis in genomics, epidemiology, biostatistics, and public health genetics, the core knowledge areas for genetic epidemiology. While our small program is strong in all of these key knowledge areas and meets an important need, we have identified several areas where improvements can be made.

Summary of Strengths and Weaknesses

We have noted a number of strengths to our program as well as opportunities to improve specific aspects. These are detailed in the following sections of this document. Briefly, the MSGE program is remarkable in its success given the very small number of faculty involved in the program and the limited resources available. The small but dedicated MSGE core faculty members have become a cohesive and stable interdisciplinary group with research funding that has been used to support our students over the past five years. Further, we have identified a number of ways to efficiently administer the program and reduce the burden on the faculty who are participating in the MSGE, including conducting many tasks by email and phone. This is particularly important given that the MSGE faculty come from several different departments, several of which have primary offices located off campus. We will continue to look for opportunities to increase the efficiency of the program, including moving to electronic files for the 2009-10 admissions meeting.

The graduates of our program have also been very successful. In particular, our students have an impressive track record of NIH grant funding and peer-reviewed publications. In conducting the self-study, we have also identified several opportunities for improvement, including the following: reviewing the curriculum with specific attention to the content of required core courses, holding additional faculty meetings to focus on longer term planning for the program, adding additional MSGE faculty, and, as with all programs at the UW, continuing to find opportunities to provide support for our students. We are also looking for ways to increase visibility and to market the program.

SECTION II: ORGANIZATION AND GOVERNANCE

II-A. Organization

Background

The MSGE is administered by the Institute for Public Health Genetics (IPHG), in collaboration with the Departments of Epidemiology and Biostatistics. As shown in Appendix A, the IPHG has dual oversight by the School of Public Health (SPH) and the UW Graduate School. The IPHG is housed in the Department of Epidemiology within the SPH, although it maintains its own budget and staff, and the Graduate School provides academic oversight through the Interdisciplinary Public Health Genetics Group of faculty. Dr. Melissa Austin (Epidemiology) serves as the Director of the IPHG, Dr. Kenneth Thummel (Pharmaceutics) is the Deputy Director, and Dr. Karen Edwards (Epidemiology) directs the MS in Genetic Epidemiology program. Dr. Scott Davis is the Chair of the Department of Epidemiology. The Department of Biostatistics, chaired by Dr. Bruce Weir, is a collaborating unit that also contributes to the MSGE program. The MSGE program does not have a separate budget, but is one component of the overall IPHG budget.

Faculty for M.S. in Genetic Epidemiology

Faculty from related departments serve as core faculty for the MSGE program (Appendix A):

- Melissa Austin, PhD, Professor (Epidemiology; Director, IPHG)
- Karen Edwards, PhD, Associate Professor (Epidemiology; IPHG; Core Faculty in the Statistical Genetics Group; Director, MSGE program)
- Timothy Rose, PhD, Professor (Pediatrics, UW; Seattle Children's Research Institute)
- Michael Rosenfeld, PhD, Professor (Environmental & Occupational Health Sciences)
- Steven Schwartz, PhD, Professor (Epidemiology)
- Timothy Thornton, PhD, Assistant Professor (Biostatistics) (arriving Autumn 2009)

Dr. Edwards coordinated the effort to develop this degree program and continues to serve as the Director for the MSGE program. Drs. Austin, Schwartz, and Rosenfeld have served as MSGE core faculty since the program started in 2003. Dr. Rose was added as MSGE faculty in the 2008-09 academic year. The MSGE faculty were selected based on the following criteria:

- a. Faculty level appointment in the School of Public Health at UW
- b. Willingness to provide a substantial teaching/mentoring and/or research responsibility for genetic epidemiology students
- c. Willingness to accept the responsibilities of being a core faculty member

Responsibilities:

- a. Serve on the Genetic Epidemiology admissions and curriculum committee, and agree to serve on masters thesis committee(s) as appropriate
- b. Attend meetings as required to administer the program
- c. Assist with peer-review of teaching and course evaluations for core courses in genetic epidemiology as needed

MSGE Faculty Committee

The MSGE faculty members oversee all academic aspects of the MSGE program. Because the number of faculty involved in the program is small, and the faculty are physically located throughout Seattle, we have utilized email and phone calls to handle the majority of MSGE

business and as a way to reduce the burden on the faculty. However, we recognize that it would be beneficial to meet in person for discussion of topics such as longer range planning and review of the curriculum. We now plan to hold quarterly in-person meetings of the MSGE faculty during each academic year.

In 2007, a student representative was added to the MSGE faculty committee as liaison between the faculty and the students. The student representative communicates concerns or issues to the faculty and also sits on the admissions committee. The student representative is elected each year by the MSGE students and serves a one-year term.

IPHG Advisory Board

The Advisory Board for the IPHG consists of deans of the UW schools and colleges and chairs of the departments involved with the Institute. The current chair is Dr. Patricia Wahl, Dean of the SPH. There are also representatives from the Fred Hutchinson Cancer Research Center (FHCRC), the Washington State Department of Health (DOH) and Seattle Children's Hospital. The board generally meets annually, and more often as needed, to provide guidance to the IPHG program. The most recent meeting was held on October 15, 2008, and focused the review of the Ph.D. program in Public Health Genetics that has just been completed by the Graduate School. The MSGE program utilized this board during the initial planning and development of the program and has updated the board on progress of the program through the annual IPHG report written by Dr. Austin each summer. We plan to utilize this board in the future for advice on broad issues such as marketing and advancement, and possible expansion of the program to include distance learning and expanding collaborations with other existing programs.

We have also considered forming a small committee composed of the Chairs of Epidemiology, Biostatistics, IPHG and the Statistical Genetics program (Drs. Davis, Weir, Austin and Thompson, respectively) to assist in providing more immediate guidance to the program and with regard to issues that would involve or impact these Departments.

II-B. Budget

Appendix B provides a summary of the IPHG budget for the current biennium. It is important to note that this is the budget for all IPHG graduate programs (MS in Genetic Epidemiology, MPH, JD/MPH, Graduate Certificate, and PhD in Public Health Genetics; see Table 3 in Section III-D). Because IPHG faculty and staff are involved in all five programs (see Section II-D), and RA and TA appointments are made for students in all of the programs, it would be artificial to separate budget items for each of the degree programs.

As shown in the budget summary in Appendix B, approximately 88% of the IPHG budget is devoted to faculty and staff salaries. As described in Section II-C below, salary support for each faculty member varies, and is directly related to his/her time commitment to the IPHG. Student support in the form of RA and TA positions constitutes approximately 10% of the IPHG budget, while about 2% of the budget is for program operation funds. The MSGE program generally receives support for one RA position per year. The following faculty receive a portion of their salary support from the IPHG for their contribution to the MSGE program, either by serving as MSGE faculty or by teaching an IPHG course that is required for the MSGE: Karen Edwards (Director, PHG 518), Melissa Austin (PHG 511), Tim Rose (PHG 536), Anna Mastroianni (PHG 512), PHG 519 instructor (Tim Thornton, beginning in the 2009-10 academic year).

Note that because the IPHG is not an academic department, grant and contract support, and the indirect costs associated with research projects, are not returned to the IPHG. Thus, “Faculty Grant and Contract Support” from indirect costs is zero. As shown in Section V, the IPHG faculty is extremely productive, and collaborations among IPHG faculty members have resulted in several large grants to their home departments.

II-C. Resources

As indicated above, resources for all IPHG programs are shared, so it would be artificial to separate resources for the MSGE program; the following is based on the overall IPHG, and where appropriate, we describe the MSGE program separately.

Financial Resources

IPHG Faculty and Staff Support

The financial resources available to the IPHG are continually evaluated to ensure they are being used for maximum benefit. The highest priority is to provide limited salary support to the IPHG faculty members to secure their continued participation in the graduate programs. Each faculty member meets with the IPHG Director during the summer to develop a “memo of understanding” that details the faculty member’s commitment to the IPHG during the upcoming academic year, and the support that the IPHG will provide for this service. The level of salary support is directly related to the number of courses taught, participation in faculty meetings and related academic activities, and student mentoring. Although the level of salary support available is minimal, the IPHG Director strives to provide as much support as possible since faculty participation is critical to the success of the program. The MSGE faculty members supported in part by IPHG are Drs. Austin, Edwards, Rose, and Thornton. Additional IPHG faculty members contribute to the program by teaching IPHG courses that are also required by the MSGE program (Mastroianni and Kuszler).

Student Support

The second highest priority for financial resources from IPHG is student support. Each year, we strive to provide as much financial support as possible to students in the form of fellowships, research assistant (RA) positions, and teaching assistant (TA) positions. As noted above, the IPHG generally provides one RA position for the MSGE program each year. In addition, the Director of the MSGE program, the IPHG Program Manager, and the Student Services Advisor maintain contacts with the Graduate School and with many faculty members who have opportunities that can support MSGE students. The Director of the MSGE and the IPHG program staff work directly with MSGE students to assist them in finding RA or hourly positions.

Work Space

The IPHG is able to allocate the majority of its funding to faculty and student support because workspace is largely provided at no cost. The Department of Epidemiology provides 6 offices to the IPHG: 3 faculty offices, including Drs. Austin and Edwards), and 3 staff offices. It also provides two student cubicles, a shared computer lab for Epidemiology, IPHG, and MSGE students, and administrative support for personnel matters, including RA and TA appointments. In addition, the home departments of the MSGE faculty generally provide space within their office space to the MSGE students while they are conducting their thesis research.

Website and Brochure

The IPHG website (<http://depts.washington.edu/phgen>) serves as a major source of information for prospective and continuing students, and includes a specific section for the MSGE program. The MS in Genetic Epidemiology page on the IPHG website is located at: http://depts.washington.edu/phgen/degreeprograms/MSGE_degree.shtml. It is updated regularly. In 2008, a new brochure was developed (see Appendix H).

Development Plan

The MSGE program itself does not have a development plan, but rather is part of the IPHG plan. The MSGE program will work to integrate itself more explicitly into the development plans for existing programs within the SPH and IPHG and will utilize the IPHG Advisory Board to advise the program on this issue.

II-D. Staffing

Faculty

As described above, IPHG faculty are identified from appropriate departments and asked to serve as IPHG core faculty. Home departments control salary increases, but the percentage of salary that the IPHG provides for MSGE faculty is related to the time commitment each faculty member makes for any given year. The IPHG provides at least some support for the following faculty as part of their involvement in the MSGE program: Edwards, Austin, Rose, and Thornton.

Although the IPHG is not an academic department, and therefore is not directly involved in promotion and tenure decisions, two IPHG core faculty participating in the MSGE program have been promoted in recent years (Drs. Edwards and Rose).

Staff

The IPHG has four staff members that provide services needed by all IPHG programs, including the MSGE program. They assist in consulting with students and provide computer and admissions support. The IPHG supervisors evaluate the staff members annually and discuss professional development opportunities, including workshops and courses, for the upcoming year.

SECTION III: FACULTY, TEACHING, AND DEGREE PROGRAMS

III-A. Teaching Responsibilities

Classroom Teaching

All IPHG faculty members meet with the IPHG Director every summer to develop a “memo of understanding” that details the faculty member’s commitment to the IPHG during the upcoming academic year, including the participation in the MSGE program, and the support that the IPHG will provide for this service. Once finalized, these memos are forwarded to the faculty member’s department chair and to appropriate administrators to insure that there is mutual understanding about the involvement of each faculty member in the program.

Beginning in Autumn 2009, Dr. Timothy Thornton will join the Department of Biostatistics and will teach PHG 519 (Statistical Methods in Genetic Epidemiology), a required core course, and will participate as a core MSGE faculty member. This position has been vacant for several years and we are very excited that Dr. Thornton will join the program. Successful recruitment of Dr. Thornton was due in part to the existence of the MSGE program and efforts by Drs. Edwards, Weir and Austin in his recruitment.

As shown in Table 1 below, MSGE faculty members teach courses in their own area of expertise. Participating faculty members have developed courses specifically for the MSGE program (PHG 518 and PHG 519). These two core courses are cross-listed in the faculty member’s home department; students from these and other departments attend. The MSGE program also efficiently utilizes existing courses to augment the core curriculum and to provide a broad range of elective courses. For example, EPI 573 (Instructor: S. Schwartz) was developed as an epidemiology course, but it also contributes to the MSGE program as a required core course.

Table 1. IPHG and Epidemiology MSGE Courses (Classroom Teaching)

COURSE TITLE	Units	Quarter offered	Current Instructors (former)
PHG 511/EPI 517: Genetic Epidemiology	3	Spring	Austin
PHG 512/LAW H504/MHE 514/HSERV 590D: Legal, Ethical and Social Issues in Public Health Genetics	3	Autumn	Kuszler or Mastroianni
PHG 518/EPI 518: Computer Applications in Genetic Epidemiology	4	Spring	Edwards
PHG 519/BIOSTAT 516/EPI 516: Statistical Methods in Genetic Epidemiology	3	Autumn	Thornton (Monks, Kerr, Weir)
PHG 536/PABIO 536/MEBI 536: Bioinformatics and Gene Sequence Analysis	3	Spring	Rose
EPI 573 Methods and Issues in Using Biological Measurements in Epidemiologic Research	3	Autumn	Schwartz

Interactive Seminar Series

The IPHG seminar series, PHG 580, is a popular course for the MSGE students that features a variety of speakers from different disciplines, providing students a broad perspective of issues relevant to genetic epidemiology. These bi-weekly seminars provide an opportunity for students from all of the degree programs and the IPHG faculty from many parts of campus to discuss

topics of mutual interest. They are designed to be highly interactive. A video library of the seminar sessions and other relevant tapes is maintained in the IPHG office.

III-B. Instructional Effectiveness

The MSGE program uses several approaches to continually evaluate and improve the quality of instruction for the program. These are summarized below.

Student Evaluations of MSGE Courses

All MSGE courses continue to be evaluated by students using the Instructional Assessment System of the Office of Educational Assessment. The average combined score for “the course as a whole,” the “course content,” the “instructor’s contribution,” and the “instructor’s effectiveness,” based on a scale of 0 (very poor) to 5 (excellent), is listed below in Table 2. MSGE required core courses continue to be very highly rated by the students.

Table 2. Student Evaluations of Required MSGE Courses, 2007-2008 Academic Year

<i>MSGE Course</i>	<i>Units</i>	<i>Quarter, Year</i>	<i>Combined Score*</i>
PHG 511/EPI 517: Genetic Epidemiology	3	Spring, 2008	4.0
PHG 512/LAW H504/MHE 514/HSERV 590D: Legal, Ethical and Social Issues in Public Health Genetics	3	Autumn, 2007	4.1
PHG 518/EPI 518: Computer Applications in Genetic Epidemiology	4	Spring, 2008	4.2
PHG 519/BIOSTAT 516/EPI 516: Statistical Methods in Genetic Epidemiology	3	Will be offered Autumn, 2009	N/A
PHG 536/PABIO 536/MEBI 536: Bioinformatics and Gene Sequence Analysis	3	Spring	3.6
EPI 573: Methods and Issues in Using Biological Measurements in Epidemiologic Research	3	Autumn, 2007	3.4
GENOME 552: Technologies for Genome Analysis	1.5	Autumn, 2007	4.5
GENOME 553: Advanced Genetic Analysis	1.5	Winter, 2008	4.6
* Median Score ranging from 0 for “poor” to 5 for “excellent”			

Exit Interviews and Placement of Graduates

The MSGE also utilizes the data generated by the UW Exit Questionnaire administered in the MyGradProgram to inform the faculty about the instructional effectiveness of the MSGE program. To date, four graduates have completed the Exit Questionnaire in MyGradProgram. In general, these data demonstrate that the graduates are very satisfied with the program. The short survey includes questions on 11 areas and scores ranging from 1 to 5, with 5 being the highest. In 2007-2008, the high scores for “Response to recent developments or trends” (score of 4.5), “Rating of departmental academic standards” (score of 4.5), and “Quality of faculty” (score of 4.5) is particularly important for an emerging field such as genetic epidemiology. The 2007-08 average ratings for the MSGE program in the following three areas were notably higher than the average ratings for the University as a whole and reflect the quality of the program: rating of departmental academic standards (4.5 vs. 3.95), response to recent developments or trends (4.5 vs. 4.12), and quality of faculty (4.5 vs. 4.12). In 2005-06, confidence as an independent

scholar/researcher was much higher than for the University average (4.5 vs. 3.63). The modest rating (score of 3.0) for “adequacy of space, facilities and equipment” most likely reflects the fact that there are no dedicated facilities for MSGE students. All such facilities, including the student computer lab and faculty offices, are provided by the Department of Epidemiology and are shared among MSGE, IPHG and Epidemiology students.

Annual MSGE Student Feedback Session

The MSGE program continues to seek feedback from students about the curriculum and other matters on a regular basis. Prior to 2007, the mechanism for gathering feedback was through conversations between the MSGE program director and individual students. In 2007, we began a more formal mechanism to obtain feedback from the students that we will continue on an annual basis. The process is as follows: each year, students meet without the faculty to discuss the positive aspects of the program, areas for improvement, and suggestions. The student representative gathers this information, summarizes the student comments, and presents a written summary to the MSGE Director. We moved the process up this year in preparation for the review of the program. Through this process we have identified one course that may no longer meet the needs of our students. We will also take this opportunity to review the entire curriculum and make appropriate changes. The comments from our students and potential solutions (many suggested by the students) are summarized below.

- 1) Thanks from the students for the opportunity to comment honestly on the program
- 2) Curriculum issues
 - a. Request for earlier introduction to coursework in genetic epidemiology (before spring quarter)
 - i. *Potential action item:* Initially, the two core genetic epidemiology courses were offered in winter (PHG 517) and spring quarter (PHG 518). However, due to changes in requirements for the IPHG program, PHG 517 was moved to spring quarter. The students suggested a monthly genetic epidemiology journal club; however, there is some concern about additional workload for the students in these first quarters, as well as faculty burden. This request will be considered as part of the curriculum review.
 - b. Concerns regarding the relevance of course content of Genome Sciences 553
 - i. *Action item:* We will review the curriculum and consider changes in required course work, including a replacement for Genome Sciences 553.
 - c. Statistical Genetics (PHG 519) was not offered.
 - i. *Action item:* New hire of Dr. Tim Thornton will resolve this issue. A substitute course was developed and offered by Dr. Bruce Weir for two academic years to fulfill this requirement.
- 3) Communication of program requirements and procedures
 - a. Improve documentation of degree requirements on website.
 - i. *Potential action item:* Consider separate sections for prospective vs. current students
 - ii. *Potential action item:* Create .pdf files that can be easily downloaded and printed
 - b. Promptly communicate to students when required courses will be offered. If required courses will not be offered in the degree term, communicate which courses will substitute and when these will be offered. This concern relates primarily to PHG 519, which has now been resolved.
 - c. Provide more details about “landmarks,” including forming thesis committees, choosing a thesis project, and expected timeframes

- i. *Potential action item*: Provide new students with a “welcome packet” that lists all requirements clearly, courses to be taken, when those courses are offered, brief details about thesis, and contact information of other students and faculty.
- 4) Advisors: the students requested that we clarify the advisor/advisee relationship and provide an earlier introduction of thesis requirements and information on forming a committee.
 - i. *Potential action item*: This information is on the website; however, we will update the website to highlight this information and will also provide information in the “welcome packet” as part of item 3.c.i above.
- 5) The students requested that we continue the annual feedback session.
 - i. *Action item*: This will be continued as described above.
- 6) Career planning and assistance in finding employment after graduation
 - i. *Potential action item*: Include profiles of alumni and current students with their current position and employer on the website or through some other mechanism
 - ii. *Potential action item*: Develop a student-run quarterly IPHG newsletter (possibly sent via e-mail as a .pdf) for all IPHG students, including the MSGE students.
 - iii. *Potential action item*: Suggest that MSGE students attend the practicum fair since many potential employers participate.
- 7) The students noted several important strengths of the program.
 - a. Strong mentoring relationships
 - b. Flexibility within elective requirements
 - c. Unique training opportunity

In response to student suggestions, the MSGE website will be updated to include a section for prospective students; lists of required and elective courses that include links to the catalog descriptions, as well as links to the course website and syllabi when available; a document outlining satisfactory performance and progress requirements; and an updated sample schedule based on a two-year full-time course load. We have also already implemented a “checklist” that the students complete each year and review with their faculty advisor (Appendix H). This helps to ensure that the students meet all requirements for a timely graduation.

The MSGE program utilizes all of the above sources to evaluate the quality of the teaching program. At this time in our development, it may also be beneficial to consider implementing additional faculty peer-review for the core MSGE courses. This process is already implemented for courses that are cross-listed the Epidemiology program; we may be able to utilize those results for some of our core courses (such as PHG 518). If this process is implemented for all MSGE core courses, we will need to balance the burden on the MSGE faculty with the potential benefits of this process.

III-C. Teaching and Mentoring Outside the Classroom

MSGE faculty are actively involved in teaching and mentoring outside of the classroom. When students enter the MSGE program, they are assigned a mentor who ensures that each student receives the guidance he/she needs in the beginning of his/her training.

Next, each student completes an annual progress report during the winter quarter of each academic year and reviews this checklist with his/her advisor. This report includes all courses taken, and those planned, as well as research progress. In addition to this formal mentoring, most MSGE student work with faculty primarily as RAs. This serves to focus the student’s research, and often leads to the development of his/her thesis project. The nature of our program

allows for close connections between the students and faculty. The high graduation rates and timely completion of degrees in the MSGE graduate program is attributable to extensive time and effort that these faculty members contribute, beyond the requirements of their academic home departments. The fact that nearly all the MSGE graduates have published papers from their thesis work is another indication of the quality of the service provided by the faculty, the quality of the students and the focus on applied research skills. This points to the quality of our students and the mentoring they receive (see Appendix I for student bios). Graduation rates, time to degree completion, and titles of thesis projects for MSGE graduates are shown in Section III-D.

RA Opportunities

All students in the MSGE program are encouraged to obtain research experience during their training. For most students, this involves serving as an RA for research projects and involves significant mentoring. There are limited opportunities for the MS level students to obtain TA positions and to gain teaching experience. This problem is not unique to our MSGE students, but is common to most Master’s level students in the SPH. However, we do encourage our students who are interested in gaining teaching skills to seek opportunities for TA or tutoring positions in undergraduate courses, such as genetics and biology.

III-D. Degree/Certificate Programs

List of Programs

All of the educational programs offered by the IPHG are listed in Table 3 below. This self-study focuses on the M.S. in Genetic Epidemiology. The review of the Ph.D. program in Public Health Genetics was reviewed in early 2009 and was given continuing status with the next review in 10 years (the self-study for that program and the review committee reports are available on the IPHG website). The graduate certificate program will be reviewed during the 2009-2010 academic year.

Table 3. Educational programs offered by the Institute for Public Health Genetics

Degree / Certificate Program	Administrative Notes
Master of Public Health (M.P.H.) in Public Health Genetics	Degree conferred by the SPH as one of many tracks of the MPH Graduate Program
Ph.D. in Public Health Genetics	Interdisciplinary Program (IPHG) housed in the Graduate School and administratively housed in the Department of Epidemiology in the SPH.
M.S. in Public Health Genetics	Option for students who do not complete the Ph.D. in Public Health Genetics
J.D./M.P.H.	Requires separate admission into the Law School and into the MPH program in Public Health Genetics; allows students to complete both degrees in 4 years, instead of the usual 5 years
Graduate Certificate in Public Health Genetics	Interdisciplinary Program housed in the Graduate School and administratively housed in the Department of Epidemiology in the SPH

M.S. in Genetic Epidemiology

Joint program administered by the IPHG, with the Department of Epidemiology and the Department of Biostatistics in the SPH

The MSGE is a rigorous program of study that emphasizes applied research skills. Students must earn a minimum of 68 course credits. Of these, 33 must be graded credits (not including 1-credit seminars, independent study, and thesis research credits). Substitutions or waivers based on prior coursework or extensive work experience may be made with the approval of the course instructor, the student's academic advisor, the MSGE Graduate Program Coordinator and the MSGE Director. The program includes basic courses in epidemiology and biostatistics, core courses in genetic epidemiology, a bioinformatics course, and an Ethical, Legal and Social Implications course. MSGE students must take at least two elective courses and may choose from a variety of offerings in biotechnology, genomics, socio-cultural and legal perspectives on genetics, and biostatistics. A list of required and elective courses is available in Appendix H.

MSGE students must also complete a research-based thesis. By the end of the first year of the program, each student will focus on a research project for his or her Master's thesis under the guidance of a supervisory committee. The thesis project may be based on research involving primary data collection, or may be a secondary analysis of data from a completed genetic epidemiologic study by investigating a research question not yet considered in that study.

The thesis committee chair is chosen by the student and must be a member of the MSGE Core Faculty. This is to ensure consistency in level of work expected for the completion of the thesis project for all MSGE students. The full Master's thesis committee will consist of at least two members of the Graduate Faculty. The second member need not be from the Genetic Epidemiology core faculty. No more than four members can serve on a master's committee. Each MSGE student must write a thesis proposal, obtain approval of the proposal by his or her thesis chair, and complete human subjects training before beginning research.

The MSGE website lists information on required and elective courses, sample schedules, satisfactory performance and progress, and thesis requirements:

http://depts.washington.edu/phgen/degreeprograms/MSGE_degree.shtml.

Admissions and Enrollment

As shown in Table 4 below, the MSGE program is in its 6th academic year. During this time (through 2008-09), there have been a total of 52 applicants, 22 of whom were admitted into the program (42%). Of those who were admitted, 55% enrolled in the program, or 12 students total. Applications to the program increased for the 2009-10 academic year, with 17 completed applications received, 8 accepted and 3 confirmed as planning to enroll in Autumn 2009. We have found that because we are one of the few programs in Genetic Epidemiology, many of the applicants admitted to our program have also been admitted to PhD programs in other disciplines and institutions. These students are frequently offered funding as part of their admission package to PhD programs and we find it difficult to compete with these offers. However, the reputation and uniqueness of our program has allowed us to attract very strong students, despite not being able to offer a guarantee of funding at admission. Dr. Edwards personally contacts all applicants who are accepted into the program to answer any questions they may have. This has also contributed to our ability to attract students.

Table 4. MSGE Program: Number of Applicants, Number Offered Admissions, and Number of Students Enrolled by Academic Year

<i>Academic Year</i>	<i>2003-2004</i>	<i>2004-2005</i>	<i>2005-2006</i>	<i>2006-2007</i>	<i>2007-2008</i>	<i>2008-2009</i>	<i>Total</i>
# of Applicants	11	5	3	11	13	9	52
# Offered Admission (% Of Applicants)	4 (36%)	3 (60%)	1 (33.3%)	4 (36%)	6 (46%)	4 (44%)	22 (42%)
# Enrolled (% Of Admitted)	3 (75%)	0 (0%)	1 (100%)	4 (100%)	3 (50%)	1 (25%)	12 (55%)

Table 5 lists the names, quarters of entry, mentors, and funding positions for MSGE students who are continuing in the 2008-09 academic year.

Table 5. Continuing MSGE Students, 2008-2009 Academic Year

<i>Name</i>	<i>Entry Quarter</i>	<i>Mentor</i>	<i>Funding, Research Assistantship (RA) and Teaching Assistant (TA) Positions for 2008-2009 academic year</i>
Pui Yee Fong	Autumn, 2006	M. Austin	RA, funded by IPHG and Edwards grant support
Nathaniel Watson, MD	Autumn, 2006	K. Edwards	Funded by NIH award
Saeed Hamine	Autumn, 2007	K. Edwards	RA, funded by IPHG and Edwards grant support
Nora Kozloff	Autumn, 2007	K. Edwards	Enrolled part time
Katherine Snapinn	Autumn, 2007	K. Edwards	RA, funded by IPHG and Edwards grant support
Marc Horton	Autumn, 2008	K. Edwards	RA, funded by FHCRC / N. Ulrich

Graduation and Placement

As of Summer 2008, there have been a total of five students who have earned the M.S. degree in Genetic Epidemiology. A sixth student is on track to graduate Winter 2009. Thesis titles for all five MSGE graduates are listed in Table 6 below. Thesis committee members are from a variety of departments and disciplines and serve on these committees to provide appropriate expertise to the student's project.

All of the graduates of the MSGE program have obtained excellent positions after receiving the degree. Of particular note, Drs. Chien, Heike, and McKone have each already received multi-year NIH grants. Dr. Chien received a 5-year grant from the National Heart, Lung, and Blood Institute, entitled: Genetic epidemiology of TLR4 alleles and bacteremia. Dr. McKone received a 4-year grant from the National Heart, Lung, and Blood Institute, entitled: Genetic epidemiology of glutathione and CF lung disease. Dr. Heike received a 5-year grant from the National Institute of Dental and Craniofacial Research, entitled: Craniofacial and Genetic Variation in 22Q11.2 Deletion Syndrome. A current student, Dr. Watson, has received a Mentored Patient-Oriented Research Career Development Award. In addition, Ms. Elizabeth Webber works as a Research Associate at the Kaiser Center in Oregon and Ms. Margaret

Ragland is an epidemiologist in King County’s Tuberculosis Control program. Ms. Ragland was also recently admitted to the UW School of Medicine and will be part of the 2009 entering class.

Table 6. MSGE Graduates, Thesis Titles, Committee Members and Current Positions

<i>Name (Year of Graduation)</i>	<i>Thesis Title</i>	<i>Thesis Committee Members</i>	<i>Current Position and Organization</i>
Margaret Ragland (2008)	EIF and Parkinson's Disease: A Case-Control Association Study	K. Edwards (Chair), C. Zabetian	Epidemiologist, Tuberculosis Control Program, King County, Seattle, WA
Elizabeth Webber (2008)	Predictors of Prenatal Genetic Screening in Oregon: A PRAMS analysis	K. Edwards (Chair), B. McGrath	Research Associate, Kaiser Center, Portland, OR
Jason Chien, MD (2005)	The Genetic Epidemiology of Rapid Airflow Decline after Hematopoietic Cell Transplant	M. Austin (Chair), D. Nickerson	Assistant Professor, Pulmonary and Critical Care, UW School of Medicine; Assistant Member, Clinical Research, Fred Hutchinson Cancer Research Center, Seattle, WA
Carrie Heike, MD (2006)	Craniofacial Features and TBXI in 22q11.2 Deletion Syndrome	K. Edwards (Chair), J. Starr, M. Cunningham	Attending Physician, Seattle Children's; Acting Assistant Professor of Pediatrics, UW School of Medicine, Seattle, WA
Edward McKone, MD (2005)	The Influence of CFTR Genotype on Phenotype and Mortality	K. Edwards (Chair), M. Aitken	National Adult Cystic Fibrosis Unit, Department of Respiratory Medicine, St. Vincent's University Hospital, Dublin, Ireland.

Summary of Student Progress and Graduation Timeline

Out of the total of 12 students, 5 students have graduated and 6 are currently enrolled. Only one student has had to leave the program for personal reasons unrelated to the program. The average number of quarters to graduation is 6.2, with a range of 4-8 quarters, and an average total time to degree of 2.7 years. These data indicate that students are completing the MSGE degree in a timely fashion.

Program Need: National, Washington State, University of Washington, School of Public Health, and International

Genetic epidemiologists play a critical role in research (academic, government, and private) and increasingly in public health practice. For example, recent developments in biotechnology have illustrated the growing importance of the interdisciplinary field of public health genetics and the urgent need for public health professionals trained in genetic epidemiology. Examples of recent innovations include the publication of numerous genome-wide association studies identifying susceptibility alleles for common diseases, the establishment of large-scale biobanks to be used in such studies, the number of private companies offering direct-to-consumer genetic testing, and increasing consumer demand for and clinical adoption of genetic tests.

Rapid progress in biotechnology has generated high hopes of finding new ways to prevent and treat human diseases. However, many scientific implications of such capabilities remain to be urgently addressed. Relating each mutation and genetic variant to its observable effects (genotype/phenotype relationships) in human populations, and relating genetic predisposition to hormonal, behavioral, dietary and environmental factors that influence disease risk, are important aspects in the study of genetic epidemiology.

An Institute of Medicine report, “Who Will Keep the Public Healthy? Educating Public Health Professionals in the 21st Century” (National Academies Press, 2003), stated that public health education programs must provide students with a framework for understanding the importance of genomics to public health and with the ability to apply genomics to basic public health sciences. The MSGE program provides precisely this training, and thus is instrumental in addressing these important needs on a national, state, and university level.

The aim of the MSGE program is to train individuals with the knowledge and skills in epidemiology, genetics, and biostatistics necessary to examine genetic advances in the context of public health with an awareness of the ethical, legal and social implications. The MSGE addresses the need for professionals to be trained to contribute to research in genetic epidemiology in both public institutions and the private sector, to participate in public and professional education, and to lead in the development of public health policies and infrastructure related to genetic epidemiology. Evidence of this national need is found in the following examples:

- During and following a lecture on genetic epidemiology with the Seattle VA, Dr. Edwards received questions from across the country, illustrating national interest.
- Public funding research initiatives relevant to MSGE: Examples include the development of cancer family registries and a Cancer Genetics Network (National Cancer Institute), as well as recent “requests for applications” for study of the gene-environment interaction (including the Genes and Environment Initiative sponsored by several NIH institutes), pharmacogenetics (National Institute for General Medical Sciences and other NIH agencies), assessment of genetic tests (Centers for Disease Control and Prevention), and the need for translational research involving genomics (Centers for Disease Control and Prevention).
- Establishment of the National Office of Public Health Genomics (NOPHG) at the Center for Disease Control and Prevention (CDC) in Atlanta. The NOPHG “promotes the integration of genomics into public health research, policy, and practice in order to improve the lives and health of all people.”
- Creation of the Genetics Forum within the American Public Health Association. The forum is meant to engage public health and health care communities in projects and activities that increase the awareness, knowledge, and skills of genetics services as they relate to: 1) The ethical, legal, and social issues surrounding genetics, genomics, and epigenetics; 2) The relationships and relevance of genomics to public health, health care, and health disparities; and 3) Professional and public education.
- A growing biotechnology industry and increasing importance in other industries of genetics research, particularly in the pharmaceutical industry.
- The first annual Summer Institute in Public Health Genetics (SIPHG), directed by Dr. Edwards, will feature numerous intensive courses, including a session on genetic epidemiology. Similar summer institutes offered by the Department of Biostatistics for the past 14 years have been well attended and highly rated. The SIPHG features 17 U.S. and 2 international experts from state and federal agencies and academic research institutions. This

program was recently featured as part of a European focus on genetic epidemiology and public health genomics (see Appendix J).

Genetic epidemiology is of increasing importance to Washington State. Issues that affect state residents include access to high quality clinical and laboratory services, the medical and social implications of genetic testing and technology, privacy of genetic information, protection of research subjects participating in genetic research, and economic implications of genetic applications in industry. For example:

- Washington State is home to several major research institutions and a growing biotechnology industry, with increasing commitments to genetic research. The Washington Life Sciences directory lists 500 biotechnology, medical device, research, economic development, and supporting service companies located in the state. More than 150 of the organizations are specific to biotechnology, 15 of which are in the genomics and informatics sector. The state government has also indicated a clear interest in bioscience development through the Life Sciences Discovery Fund, which provides \$35 million per year for 10 years to fund biomedical research and development.
- The MSGE program began during the 2003-2004 academic year and 5 students have graduated to date. Two of these students now hold faculty positions in the UW School of Medicine, and a third is a research fellow. Another graduate, Dr. Carrie Heike, has received an NIH K-award, focusing on the genetic epidemiology of craniofacial features. Two graduates now hold positions within Public Health – Seattle & King County (Washington) and the Kaiser Center (Oregon). Thus, graduates of this program are utilizing their training, and are already becoming established as independent investigators in their respective fields and in public health practice.
- The Department of Health (DOH) subsidizes several facilities across the state to promote improved access to genetic services and continuously strives to assess service delivery gaps and quality of existing services, requiring public health professionals knowledgeable in genetics and epidemiology. There have been several requests from WA DOH to assist in analyzing data with a genetic component.
- Genetic epidemiology is of concern to Washington State health professionals, as evidenced by the high participation in the course in Genetic Epidemiology Dr. Edwards offered as part of the VA Summer Epidemiologic Research and Information Center (ERIC) Institute in 2005 and 2006. Further, due to the popularity of this course, it was recorded for broadcast on UWTV and is now available online. The UWTV office has received inquiries from people (general public and researchers alike from the US and abroad) asking for copies of slides and handouts, or simply saying how much they enjoyed the series. This series can be viewed at: <http://www.uwv.org/programs/displayseries.aspx?fid=4237>
- Requests for assistance in analyzing large datasets from local, state, and national public health surveys, including the Washington State BRFSS. Most recently, faculty in the UW Business School requested assistance in evaluating evidence of genetic influences on the propensity to save money, using data from the Swedish Twin Registry. Students in the MSGE program, under faculty supervision, have worked on these special projects, providing benefits to both the students and the organization making the request.
- As new genetic tests become available, there are calls for new or expanded genetic screening programs in the state, requiring careful evaluation to ensure both protection of the public and appropriate use of public resources.

The MSGE program at the University of Washington is in a unique position to provide training to address the research and program management needs generated by growing genetics knowledge. Indeed, most of our graduates have taken positions that allow them to participate directly in clinical practice and research that addresses scientific and public concerns related to genetic epidemiology. As one of only five universities in the country to offer a degree in Genetic Epidemiology, the program helps to distinguish the University of Washington on the national stage and contributes to its strong reputation as a leader in genetics and genomics.

The MSGE program is also important to the UW School of Public Health. The Institute of Medicine report, “Who Will Keep the Public Healthy? Educating Public Health Professionals in the 21st Century” (National Academies Press, 2003), stated: “Public Health education programs must provide their students with a framework for understanding the importance of genomics to public health and with the ability to apply genomics to basic public health sciences.” The MSGE program addresses this need by training both our own students and those from other programs. About 30% of enrollees in these courses are from programs other than those administered by the IPHG, and approximately half of these are from other School of Public Health degree programs. Thus, the MSGE educational program provides a unique and valuable resource to the School of Public Health, including the IPHG program.

Finally, the growing importance of Genetic Epidemiology from an international perspective is reflected in the following developments and activities:

- Creation of Genome Canada, a not-for-profit organization established in 2000 to develop and implement a national strategy for supporting large-scale genomics and proteomics research for the benefit of all Canadians.
- Launching of the Public Health Genomics European Network (PHGEN) by the European Union, a new project to ensure that the rights of individuals are protected as public health systems integrate advances in genetics.
- Development of the *Public Health Genomics Journal*, the first peer-reviewed international journal to focus on the translation of genome-based knowledge and technologies into public policy, disease prevention and the improvement of population health.
- Establishment of the Clinical and Public Health Genomics program at Erasmus University Medical Center in Rotterdam, the Netherlands, including an academic program in genetic epidemiology and a summer institute.
- The continuing presence of the International Genetic Epidemiologic Society, and its journal, *Genetic Epidemiology*.
- Requests to consider developing a summer program in Genetic Epidemiology at the University of Zagreb in Croatia.
- The MSGE program has received several international applications, which illustrates both interest in genetic epidemiology internationally and the unique capacity of the University of Washington to fulfill that training.

Peer Institutions

The University of Washington is one of only five major universities to offer a Master of Science in Genetic Epidemiology. The other four are:

- Case Western Reserve University
- Johns Hopkins University
- University of Southern California
- Washington University

Goals and Learning Objectives for the MSGE Program

The overall mission of the Master of Science in Genetic Epidemiology program is to contribute to the understanding of the etiology and prevention of disease by focusing on genetic influences and their interactions with the environment, and using this information to improve the health of the public.

The general objective of the program in genetic epidemiology is to train students in the principles and methods that will enable them to design, conduct, analyze, and interpret genetic epidemiologic research. Upon completion of the MS degree, students should have acquired an understanding of the following broad topics:

- a) contribution of genetic epidemiology, epidemiology and biostatistics to health research
- b) design, conduct, and analysis of genetic epidemiologic studies
- c) critical appraisal of genetic epidemiologic studies, synthesis and integration of genetic epidemiologic research, and
- d) communication of scientific results

In addition, students should have acquired a basic knowledge of the ELSI issues relevant to genetic epidemiologic research and a basic understanding of the laboratory techniques used in genomic research.

Upon satisfactory completion of the MS program in Genetic Epidemiology, students should be able to display competency in genetic epidemiology as demonstrated by the following specific learning objectives:

- Communicate effectively and persuasively, both orally and in writing, with colleagues from other disciplines and with lay audiences;
- Advocate for appropriate integration of genetic information into public health programs;
- Interact sensitively, effectively, and professionally with persons from diverse cultural, socioeconomic, educational, and professional backgrounds, and with persons of all ages and lifestyle preferences;
- Understand the role of cultural, social, and behavioral factors in determining disease, disease prevention, health promoting behavior, and medical service organization and delivery;
- Critically read and evaluate quantitative research findings contained in medical and public health journals;
- Apply knowledge of inheritance and genomic advances, including cellular and molecular mechanisms and technical developments, to understanding the etiology of a variety of diseases and health conditions;
- Apply epidemiological and statistical approaches to the study of risk factors and diseases with a genetic component;
- Describe the major genetic epidemiologic research study designs and their advantages and limitations;
- Evaluate interactions among genes, environmental factors, and behaviors, and understand their roles in health and disease;
- Be aware of the legal, ethical and social issues that may be associated with the application of genetics and genomic technologies in public and private health care delivery;

- Be aware of the latest laboratory techniques used to investigate the role of genes in disease and normal variation of traits;
- Design an genetic epidemiologic study to address a question of interest;
- Use appropriate statistical methods for analysis of genetic epidemiological data;
- Use a variety of standard statistical software packages for genetic epidemiological research;
- Interpret results of a genetic epidemiologic study, including the relation to findings from other genetic epidemiologic studies, the potential biological and/or social mechanisms, the limitations of the study, and the public health implications; and
- Write a clear description of the rationale, methods, results and interpretation of a genetic epidemiologic investigation.

After five years of experience in developing and administering the program, we welcome this opportunity to evaluate the program and to reflect on its successes and challenges. We are a small, interdisciplinary program, which creates both benefits and challenges for our students and faculty. Overall, we feel that we have provided a high quality and unique educational experience in an important and growing field. We are one of the few programs in the country to offer this training and have been very selective in the applicants that we have admitted to the program to ensure their success. We anticipate growing interest in this program. We also recognize the need to involve additional faculty in mentoring students and are considering ways to accomplish this, including adding a small number of faculty to the MSGE core faculty.

In fact, we have recently added Dr. Tim Rose, who teaches the required bioinformatics course (PHG 536), to the core MSGE faculty. Dr. Thornton, a new faculty member in biostatistics, will also join the MSGE faculty in September 2009. Together, the MSGE faculty will be available to share the mentoring and to assist in providing or identifying financial support for the students and in administering the program.

Finally, it may still be necessary to find ways to involve additional faculty who can also make important contributions to mentoring and supporting MSGE students, but who may not be able to make the commitment to serving as a core MSGE faculty member. For example, many faculty members have genetic epidemiologic projects and need assistance in analyzing these datasets. Thus, we will also consider creating a category of affiliate faculty if needed in the future.

As described in Section VII below, we also have plans to review our curriculum and have already identified one core course through student feedback that will likely need to be replaced. We have already begun working to identify an appropriate replacement.

SECTION IV: DIVERSITY

The MSGE program has been successful in recruiting a diverse student body. The program has enrolled one African American, one Asian American, and three international or “other” students in the program. The MSGE program is pleased to have enrolled a total of 42% of its students who are non-white, and will continue to focus on recruiting a diverse pool of applicants (see Section VII).

Each year, the IPHG submits a diversity plan to GO-MAP in the Graduate School for all of the degree programs. Whenever an underrepresented minority applicant is admitted to the program, the MSGE Director makes personal contact with the student, and the IPHG Staff assist in arranging a visit to the UW. These prospective students are encouraged to attend GO-MAP events, and meet other MSGE and IPHG students during their visits. We have also utilized the SPH Student Services Office as needed to assist our students of color.

In addition, the MSGE program was also involved in the recruitment of a new faculty member who is African American and who will be participating in our program next year as a core faculty MSGE faculty member.

Table 7. Ethnic Group and Gender of MSGE Students by Year of Enrollment

<i>Academic Year</i>	<i>2003-2004</i>	<i>2004-2005</i>	<i>2005-2006</i>	<i>2006-2007</i>	<i>2007-2008</i>	<i>2008-2009</i>	<i>Total (%)</i>
# Enrolled	3	0	1	4	3	1	12 (100.0)
<i>Ethnic Group</i>							
White	2	0	0	3	1	1	7 (58.3)
African American	0	0	1	0	0	0	1 (8.3)
Hispanic	0	0	0	0	0	0	0
Asian American	1	0	0	0	0	0	1 (8.3)
International/Other	0	0	0	1	2	0	3 (25.0)
<i>Gender</i>							
Female	1	0	1	3	3	0	8 (66.7)
Male	2	0	0	1	0	1	4 (33.3)

SECTION V: RESEARCH AND CREATIVITY

An important component of the MSGE program is leveraging the resources by facilitating research development in genetic epidemiology. The following programs and faculty accomplishments illustrate that the MSGE faculty continue to be highly successful in fulfilling this goal.

Northwest Center for Genomics and Public Health (NWCGPH)

The Northwest Center for Genomics and Public Health was established in 2001 at the UW as a hub of expertise in genomics and population health, with a strong focus on translation of genetic epidemiologic findings into public health practice. Dr. Karen Edwards, director of the MSGE program, serves as PI of this Center. The NWCGPH was one of three such centers originally funded by the Centers for Disease Control and Prevention (CDC) Office of Genomics and Disease Prevention in 2001, with the others located in Schools of Public Health at the University of Michigan and the University of North Carolina. Center activities have included (1) increasing the knowledge base in genomics and public health; (2) providing technical assistance to local, state and regional public health organizations; and (3) developing and providing genomics training materials. Two of the original Centers, located at the University of Washington and at the University of Michigan, received continued funding as part of a competitive renewal process in 2004. These two Centers are currently funded through 2009. Further, due to the strong program in genetic epidemiology, biostatistics and public health genomics at the UW, Dr. Edwards was asked to initiate the first Summer Institute in Public Health Genomics at the University of Washington, which will include a course in genetic epidemiology led by Dr. Edwards and including Dr. Cecile Janssens from Erasmus University in the Netherlands (see Appendix J for brochure). This institute will be held in conjunction with the well-established Summer Institute in Statistical Genetics, directed by Dr. Bruce Weir (Chair, UW Department of Biostatistics). This joint endeavor demonstrates the strong and collaborative ties between the MSGE program and the Dept of Biostatistics and in developing stronger ties with other genetic epidemiology programs, including the program at Erasmus University in the Netherlands.

Many of the MSGE students have been supported by funds from the Center and several have completed thesis projects in affiliation with the Center.

Genes and Environment Initiative, Genome-Wide Associations Coordinating Center

The NIH-wide Genes and Environment Initiative (GEI), developed to support efforts for identification of major genetic susceptibility factors for high impact diseases and potential causative environmental exposures, recently launched the Genome-Wide Associations (GWA) component to support genome-wide association studies in both the initial discovery or replication phases. To support the complexities of such an ambitious effort, the Department of Biostatistics at the University of Washington has convened a team of experts to serve as the Coordinating Center (GWA CC) to provide the necessary organizational and statistical expertise for integration of data, development of methodologies and tools for both data harmonization and analyses, and for the administration of those tasks needed for a large multi-site scientific study of this nature. Coordination of the GEI-GWA Study will be done in a spirit of collaboration using creative and flexible approaches while providing leadership in statistical methodology and approaches to project management. This proposal brings together a strong team of statistical geneticists, biostatisticians, epidemiologists, programmers, analysts and project management

staff with many years of related experience to successfully accomplish the goals of the GEI-GWA. The project is funded by NIH and headed by Dr. Bruce Weir (5U01HG004446-02).

Predocutorial Training Grant 5T32GM081062-02

The statistical genetics faculty at the University of Washington were recently awarded a new predoctoral training program in biostatistics that emphasizes applications to genetics from the NIGMS (Weir B; 5T32GM081062-02). The faculty members belong to the very strong departments of Biostatistics, Genome Sciences or Statistics at the University of Washington and some of them also have appointments at the Fred Hutchinson Cancer Research Center. The trainees will pursue PhD degrees in one of the three departments. The training program will include the current PhD tracks in statistical genetics offered by the Departments of Biostatistics and Statistics but it will have the additional feature of rotations in experimental laboratories and opportunities for internships in local companies. In addition to formal courses taught by international experts in statistical genetics, the training program features journal clubs, seminars and retreats. Trainees will also be able to attend modules in the annual Summer Institute in Statistical Genetics held at the University of Washington. Dr. Bruce Weir directs the program and Dr. Edwards is participating in this program, again demonstrating the strong collaborations between the MSGE, Department of Biostatistics and the Statistical Genetics faculty.

Center for Ecogenetics and Environmental Health (CEEH)

Dr. David Eaton, an IPHG core faculty member, is the PI of the CEEH, funded by the National Institute of Environmental Health Sciences (NIEHS). The theme of this center is “Biochemical and Molecular Mechanisms Underlying Human Variability in Response to Environmental Exposures.” The overall purpose is to provide an administrative infrastructure and technical support to foster the multidisciplinary collaborations necessary to extend basic mechanistic studies on environmental health problems to direct application in human populations.

The CEEH functional genomics core resource provides a service to Center Investigators and has been utilized for genotyping work related to several thesis projects and in providing opportunities for students to gain a better understanding of the laboratory methods required for sample preparation and genotyping.

SECTION VI: COLLABORATIONS AND INTERDISCIPLINARITY

As reflected throughout this self-study document, the MSGE program is part of a highly interdisciplinary IPHG academic program.

As described in Section II-A, the faculty of the IPHG are from many different departments and several different schools at the UW, and there are strong collaborative ties with the Washington State Department of Health, the Fred Hutchinson Cancer Research Center, and Seattle Children's Hospital. These faculty members bring a wide array of expertise to the program and have developed an effective interdisciplinary curriculum for the M.S. in Genetic Epidemiology program (Section III). Overall, the IPHG faculty has remained involved in the program during the past 6 years, providing continuity for the students and a sense of community and common purpose to the program. The scholarly and research activities of the IPHG faculty further demonstrate the broad range of disciplines represented in the Institute and the ability of the faculty to collaborate and leverage the resources provided to the IPHG (Section VI).

The MSGE students themselves, and their thesis projects and publications (Table 6 and Appendix I), illustrate the success of this rigorous graduate program, and the contributions the students make to a wide range of research projects across the UW, state, nation, and globe.

SECTION VII: FUTURE DIRECTIONS AND STRATEGIC PLANNING

Although the MSGE faculty strongly believe that we have been very successful in establishing the MSGE program, we recognize that now is the time to be looking forward with the development of a strategic plan for the degree program and to consider ways to strengthen this program. In particular, we plan to develop a strategy that ensures not only the viability and long-term success of the program, but its preeminence as the top Genetic Epidemiology program in the nation. This critical introspection has not occurred to a significant degree to date simply because of the demands placed on the faculty to implement the program. Nonetheless, we have identified a number of programmatic changes that could form the framework of a strategic plan. These include the following:

- In addition to the IPHG advisory board, the program may also benefit from a committee composed of Chairs or Directors of those programs with direct relevance to the MSGE, including:
 - Bruce Weir, PhD (Chair, Biostatistics)
 - Scott Davis, PhD (Chair, Epidemiology)
 - Melissa Austin, PhD (Director, IPHG)
 - Elizabeth Thompson, PhD (Director, Statistical Genetics Program)
- Improve the MSGE curriculum, beginning with an update of learning objectives and review of the curriculum. We plan to begin this activity in the Summer of 2009, including evaluating the content of all required courses to determine relevance for the MSGE degree, and linking learning objectives with degree milestones. Plans need to be developed that permit continuous assessment of our academic outcomes with input from a wider stakeholder group that includes alumni, employers of our graduates, and health professionals and researchers likely to be impacted by the contributions of the program.
- Sustain enrollment in the MSGE program at current levels by increasing visibility of the program and expanding RA funding opportunities for the students.
- Maximize integration of the MSGE curriculum with related UW doctoral programs, such that it can continue to serve as a feeder of high quality doctoral candidates.
- Maintain efforts to sustain diversity among MSGE enrollees (more than 40 percent of the MSGE enrollees are non-white, compared to the University average of 8.3% for graduate and professional programs).
- Develop a plan to ensure the retention of MSGE faculty and their involvement in the program. This plan will need to consider the allocation of and compensation for faculty effort, faculty promotion (particularly tenure review) and peer recognition for MSGE contributions.
- Consider adding additional faculty to serve as part of the MSGE core faculty, as well as involving additional UW faculty in the program by establishing a group of affiliate faculty to provide a broader range of opportunities for research experience in genetic epidemiology.
- Continue to leverage extramural resources that can benefit the University and the MSGE program.
- Work with development staff for the SPH and the IPHG Advisory Board to identify potential sources of support from extramural donors.
- Utilize the IPHG Advisory Board to assist in broad program planning, including approaches to increase visibility and marketing of the program.

- Consider creating a network to link current students with alumni to address the need for additional career counseling. As the number of alumni grows, this will become a more feasible component.
- Raising program visibility at the University, community, national, and international level. This could be achieved in part by pursuing discussions of an exchange program initiated by Erasmus University in the Netherlands, as well as with the University of Zagreb in Croatia (see Appendix J for interview with Dr. Cecile Janssens).
- Develop a continuing education program for the broader public health and research communities that disseminate our unique but critical perspective of genetic epidemiological issues that will impact the uptake and integration of genetic research in health care. This activity is already underway with the new Summer Institute in Public Health Genomics under the direction of Dr. Edwards and in collaboration with the well-established Summer Institute in Statistical Genetics directed by Dr. Bruce Weir (see Appendix J for brochures).

During the next few months, the MSGE faculty will discuss each of these in detail, set priorities, and develop a specific plan for their implementation. In closing, there is clearly a need for training in genetic epidemiology, and the UW is well-positioned to continue providing this training, as well as to consider opportunities for expansion of this program in the future.

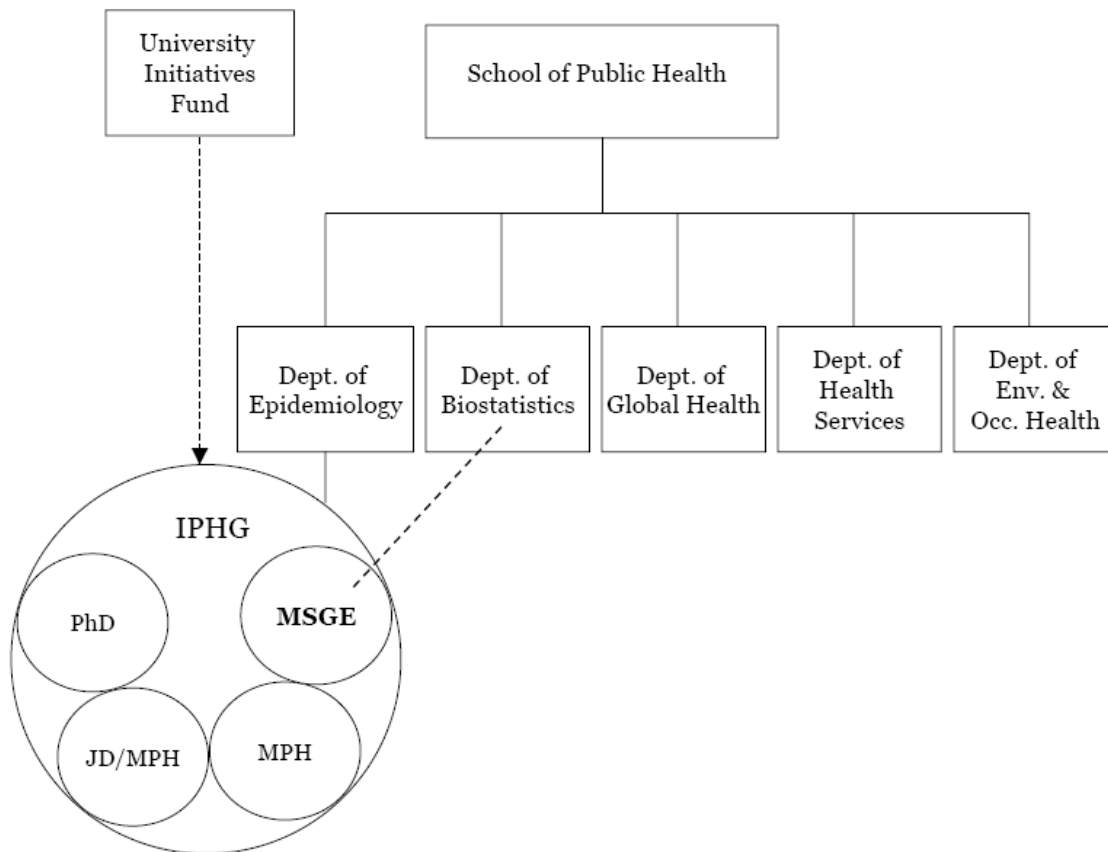
Appendix A – Organization Chart

The Master of Science in Genetic Epidemiology program is administered by the Institute for Public Health Genetics, which is administratively housed in the Department of Epidemiology, School of Public Health. The Departments of Epidemiology and Biostatistics as well as the IPHG contribute to the MSGE.

Karen Edwards, PhD, is the director of the MSGE. Melissa Austin, PhD, is the chair of the IPHG. The members of the MSGE core faculty are:

- Melissa Austin, PhD, Professor
- Karen Edwards, PhD, Associate Professor
- Timothy Rose, PhD, Professor
- Michael Rosenfeld, PhD, Professor
- Steven Schwartz, PhD, Professor
- Timothy Thornton, PhD, Assistant Professor

The MSGE program benefits from the advisory committee and staff support of the IPHG.



Appendix B – Budget Summary

Institute for Public Health Genetics Biennium Period July 1, 2007 to June 30, 2009

This Appendix provides a summary of the IPHG budget for the current biennium. It is important to note that this is the overall budget for all IPHG graduate programs (the MPH, the Graduate Certificate, the JD/MPH, and the PhD in Public Health Genetics, as well as the MS in Genetic Epidemiology; see Table 3 in Section III-D). Because most faculty and staff are involved in all of the programs, and RA and TA appointments are made for students in all of the programs, it would be artificial to separate budget items for each of the degree programs.

	Year 1 Total	Year 2 Total	Biennium Total
State Permanent GOF & DOF Funding:			
Faculty and Staff Salaries:			
Faculty Salaries	322,483	335,594	658,077
Staff Salaries	153,282	147,848	301,130
Total Faculty and Staff Salaries	475,765	483,442	959,207
Graduate Student (ASE) Salaries:			
Teaching Assistant Salaries	13,059	13,392	26,451
Research Assistant Salaries	40,158	41,175	81,333
Total Graduate Student (ASE) Salaries	53,217	54,567	107,784
Program Operation Funds:			
Other Services	3,447	11,796	15,243
Student Travel	0	0	0
Supplies	3,000	3,000	6,000
Equipment	0	0	0
Total Program Operation Funds	6,447	14,796	21,243
Total State Permanent GOF & DOF Funding	535,429	552,805	1,088,234
Faculty Grant & Contract Support	0	0	0
Significant Gifts or Endowments	0	0	0
Grand Totals	535,429	552,805	1,088,234