

INSTITUTE FOR PUBLIC HEALTH GENETICS, UNIVERSITY OF WASHINGTON

**SELF-STUDY FOR PH.D. PROGRAM IN PUBLIC HEALTH GENETICS
OCTOBER, 2008**

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SECTION I: EXECUTIVE SUMMARY

Public Health Genetics (PHG) is an emerging, interdisciplinary field that applies the rapid advances in human genetics, genomics, and bioinformatics to improve public health and prevent disease on a population basis.

The Ph.D. program in Public Health Genetics is offered by the interdisciplinary UW Institute for Public Health Genetics (IPHG). The mission of the IPHG is to provide broad, interdisciplinary training for future public health professionals, to facilitate research in public health genetics, and to serve as a resource for continuing professional education. The IPHG exemplifies values expressed by both the UW Vision statement (“We foster creativity, the boundaries of knowledge, and cultivate independence of mind through unique interdisciplinary partnerships”) and the School of Public Health (“Creativity and interdisciplinary approaches in solving local, national, and global public health problems”).

The IPHG was funded in 1997 through the “University Initiatives Fund” after a competitive application process. The IPHG was formally reviewed by the Provost’s office in 2001, and was then provided permanent state funding. There are 13 members of the IPHG core faculty from 9 different UW departments, 5 auxiliary faculty, and more than 35 UW faculty and non-UW health professionals affiliated with the IPHG.

Establishing the IPHG (initially denoted Public Health Genetics in the Context of Law, Ethics and Policy) included the creation of four new graduate programs: a master of public health (MPH) track in Public Health Genetics, a graduate certificate in Public Health Genetics, a master of science (M.S.) degree in Genetic Epidemiology and a Ph.D. in Public Health Genetics. All of these degrees have been successfully implemented, and there are a total of 91 graduates from all of the programs to date. A formal concurrent JD/MPH program was also implemented in 2006. Creating curricula for these innovative, interdisciplinary, degree programs included developing 17 new courses, crafting a unique preliminary examination for the Ph.D. program based on a case study approach, and the formation of highly interdisciplinary dissertation supervisory committees. In the process, the IPHG core faculty have become a cohesive, stable, and highly interactive interdisciplinary group that has leveraged the IPHG resources into several large research grants during the last 10 years.

The Ph.D. program in PHG was approved in 2002. The *overall goals* of this program are:

- 1) To train highly-qualified individuals for careers and leadership roles in academic institutions, health care delivery systems, public health departments, government agencies and the private sector; and
- 2) To provide interdisciplinary education in the core knowledge areas of public health genetics (genetic & molecular epidemiology; ecogenetics & pharmacogenomics; clinical aspects of genomics; ethics & social science; law & policy; health economics & outcomes research), based on the fundamental areas of study (human genetics & genomics and public health), so that graduates can address scientific and policy questions from a variety of perspectives.

This second goal reflects the organization of the program around two “Core Knowledge Areas” as shown below. Core faculty members contribute their expertise in one or more of these areas in training the doctoral students.

Table 1. Public Health Genetics Core Knowledge Areas

<i>A: Genomics in Public Health</i>	<i>B: Implications of Genetics for Society</i>
Genetic and Molecular Epidemiology	Ethics & Social Science
Ecogenetics & Pharmacogenetics	Law & Policy
Clinical Aspects of Genomics	Health Economics & Outcomes Research

The first students were admitted into the Ph.D. program in 2003, and a total of 20 students have enrolled to date. Of these, 14 have passed the preliminary examination, 10 have been advanced to candidacy, and 8 students have graduated. Each graduate of the program completed an interdisciplinary dissertation project that included research in both of the IPHG core knowledge areas with an interdisciplinary dissertation supervisory committee. (Two students who did not pass the preliminary examination were awarded an MS in Public Health Genetics upon completion of a capstone project.) All of the Ph.D. graduates have obtained excellent positions, several as post-doctoral fellows, one as a faculty member, and others with national and state agencies.

The IPHG faculty strongly believes that we have been very successful in establishing the Ph.D. program. However, we recognize that now, at the 10-year anniversary of the IPHG, is the time to be looking forward with the development of a strategic plan for the Institute. We plan to develop a strategy that ensures not just the viability and long-term success of the program, but its preeminence as the top Public Health Genetics program in the nation. Components of this plan will include: ongoing improvement of the Ph.D. program curriculum; establishment of an alumni advisory board; sustaining enrollment at its current level and continuing to seek the highest quality applicants to the program; initiating a targeted outreach to potential applicants from diverse backgrounds; building on our interdisciplinary faculty areas of expertise; continuing to seek grant funding for the UW to leverage the training investment being made by the University; and developing a strategy to ensure the retention of IPHG faculty and their involvement in the program. Finally, we would like to establish a fundraising plan to garner support from extramural donors focused initially on graduate student fellowships, and to increase the visibility of the program within the University and the local community, as well as both nationally and internationally. These goals and challenges were endorsed by the IPHG Advisory Board meeting in October 2008, all in the context of the administrative challenges faced by interdisciplinary programs such as the IPHG that are not traditional academic departments. During the next few months, the IPHG faculty and students will be discussing each of the strategic goals in detail, will set priorities, and will then develop a specific plan for their implementation.

The growing importance of the interdisciplinary field of public health genetics, and urgent need for public health professionals trained in this area, has been illustrated by many recent developments. These 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, an increasing number of private companies offering direct-to-consumer genetic testing, and the passage of the Genetic Information Nondiscrimination Act by congress. A recent 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 IPHG provides precisely this training, and thus is instrumental in addressing these important national, Washington State, and UW educational needs.

SECTION II: ORGANIZATION AND GOVERNANCE

IIA. Organization

Background

The Ph.D. program in Public Health Genetics was proposed in April 2001 (see documents in **Appendix H**), following the successful implementation of the MPH program in Public Health Genetics by the Interdisciplinary Group in Public Health Genetics. The review committee completed its report on the proposed program in September, 2001, and the IPHG responded in October, 2001. The degree was approved by the UW Graduate School Council on March 7, 2002, by the Higher Education Coordinating Board on June 11, 2002, and by the UW Regents on July 19, 2002. Applications for the degree program were solicited during the 2002-2003 academic year, and the first entering class began the program in the Autumn Quarter, 2003.

Organization, Faculty, and Advisory Board

As shown in **Figure A1, in Appendix A**, the IPHG has dual oversight by the School of Public Health and Community Medicine (SPHCM) and the UW Graduate School. It is administratively housed in the Department of Epidemiology within the SPHCM, although it maintains its own budget and staff, and academic oversight is provided by the Graduate School through the Interdisciplinary Public Health Genetics Group of faculty. Dr. Melissa Austin (Epidemiology) serves as the Director of the IPHG, and Dr. Ken Thummel (Pharmaceutics) is the Deputy Director. There are four staff members: Kevin Schuda, IPHG Manager; Barbara Snyder, Student Services Advisor; Brian Fish, IT specialist; and a part-time Student Assistant, Justin Jocson.

There are three groups of interdisciplinary IPHG faculty, with each faculty member having expertise in one or both of the “core knowledge areas” of the program (See **Table 1** in Section I above).

1) The Academic Program Committee (APC) consists of the core faculty and oversees all academic aspects of the MPH, Ph.D. and Graduate Certificate programs. There are currently 13 members of this committee (**Table A1 in Appendix A; See Appendix E for Faculty CVs**) that meets bi-weekly during the academic year and is chaired by Dr. Austin. In addition, there are two student representatives on the committee, one for the MPH program and a second for the Ph.D. program. Meeting topics include curriculum matters, student admissions for the MPH and Ph.D. programs, student advising and mentoring, reviewing MPH thesis topics, writing and grading the Ph.D. preliminary exam, and identifying new interdisciplinary research opportunities for IPHG faculty and trainees. The student representatives have the opportunity to bring student issues and concerns to faculty at each of the APC meetings.

2) Due to the continued growth of the IPHG graduate programs and the need for additional faculty members to serve on MPH thesis and doctoral dissertation committees, a new category of IPHG “Auxiliary Faculty” was created this summer. (Note that these appointments are equivalent to adjunct appointments in academic departments.) These faculty members can chair thesis and dissertation committees, but are not required to participate in APC meetings or assume other academic responsibilities. Through their thesis and dissertation projects, and their unique broad training, IPHG students can make important contributions to research projects of these faculty members. Similar to qualifications for the APC, IPHG Auxiliary Faculty must have expertise in one or more of the “core knowledge areas” of the IPHG and they must be a member

of the UW Graduate Faculty. If an Auxiliary Faculty member wishes to chair a dissertation supervisory committee, he/she must also be endorsed to chair dissertation committees by the Graduate School. Although not required, Auxiliary Faculty members are encouraged to support IPHG students on their grants. Five IPHG Auxiliary Faculty members have been approved by the APC to date, and they are listed in **Table A2 (See Appendix E for Faculty CVs)**.

3) In addition to APC members and Auxiliary Faculty, the IPHG continually seeks to identify researchers and health professionals who are interested in public health genetics, and then offer affiliation with the IPHG as “Associated Faculty Members.” (Note that these appointments are equivalent to affiliate appointments in academic departments.) Those who accept may become involved in a variety of IPHG academic activities, including mentoring students, serving on thesis and dissertation committees (not as chair), providing practicum sites, giving an occasional guest lecture or seminar, and/or participating in outreach activities and conferences. At present there are 37 such IPHG faculty members from both within the UW and other local institutions. This year, three new IPHG faculty members were added (**Table A3**).

The Advisory Board for the IPHG consists of deans of the UW schools and colleges and chairs of the departments involved with the Institute (**Table A4**). The chair of this board rotates, and is currently Patricia Wahl, Dean of the SPHCM. 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. The most recent meeting was held on October 15, 2008, and focused on developing future directions of the Institute and a strategic plan for the next 5 to 10 years.

IIB. Budget

Appendix B 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, and the Ph.D. in Public Health Genetics, as well as the MS in Genetic Epidemiology; See **Table 5 in Section IIID**). Since most faculty and staff are involved in all of the programs (See **Section IIA**, Organization), 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, more than 85% of the IPHG budget is devoted to faculty and staff salaries. As described in **Section IIC** 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 (again for students in all degree programs) constitutes approximately 7% of the IPHG budget, while about 5% of the budget is for program operation funds.

Note that because IPHG is not an academic department, grant and contract support, and the indirect costs associated with these research projects, are not returned to the IPHG. Thus, “Faculty Grant and Contract Support” is zero. As shown in **Section IV**, the IPHG faculty is extremely productive and collaborations among IPHG faculty members have resulted in several large grants to their home departments. Further, because of the interdisciplinary nature of the program, initiatives for Gifts and Endowments have been difficult to initiate.

II.C. Resources

Financial Resources

Faculty and Staff Support

The financial resources available to the IPHG are continually evaluated to insure they are being used to the maximum benefit of the graduate program. The highest priority is to provide limited salary support to APC members to secure their continued participation in the program. Each APC 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 APC 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. As described in **Section IID**, staff salary support essential for the operation of the IPHG is funded on a continuing basis.

Student Support

The second highest priority for financial resources is student support. Each year, the IPHG strives to provide as much financial support as possible to students in the form of fellowships, training grant support, research assistant (RA) positions, and teaching assistant (TA) positions. The Director, Program Manager, and the Student Services Advisor maintain contacts with the Graduate School and with many faculty members who have opportunities that can support IPHG students. These are summarized below:

- Graduate School: Several IPHG Ph.D. students have received fellowships from the UW Graduate School. Two Achievement Rewards for College Scientist (ARCS) Foundation Fellowships have been awarded to IPHG Ph.D. students. One of these was for a continuing student, and the second will be awarded to an incoming Ph.D. student this autumn. A total of 6 Ph.D. students have received Top Scholar RA Awards from the Graduate School, at least one in each academic year since the beginning of the program. A continuing Ph.D. student was awarded the Graduate School Gatzert Child Welfare Fellowship this year.
- NIH Training Grants: Many IPHG Ph.D. students have been, and continue to be, supported by faculty members with access to NIH Training Grants. The grants include:
 - UW Multidisciplinary Predoctoral Research Training Program - a Roadmap Initiative from the N.I.H./National Center for Research Resources (P. Mitchell (Nursing) & S. Marshall (Medicine), Program Directors)
 - Biobehavioral Cancer Prevention Training Program (Donald Patrick, Health Services, PI, funded by NIH)
 - Cancer Prevention Training – Nutrition, Exercise and Genetics (Emily White, Epidemiology, PI, funded by NCI)
 - Center for Genomics and Healthcare Equality (W. Burke, Medical History and Ethics, PI, funded by NHGRI)
 - Center for Genomics and Public Health (K. Edwards, Epidemiology, PI, funded by CDC)
 - Ethical, Legal and Social Implications (ELSI) Core (K. Fryer-Edwards, Director) of the Center for Ecogenetics and Environmental Health (D. Eaton, PI, funded by NIEHS)
- RA positions: Each year, the IPHG provides funding for 2-3 RA positions with IPHG faculty. Incoming and continuing students are matched with the research interests of the APC and Auxiliary Faculty for these positions. This year, two incoming MPH students, and

one Ph.D. student are receiving this support. A wide variety of other research and training programs at the UW also provide support for IPHG students. These include:

- Center for Genomics and Healthcare Equality (W. Burke, Medical History and Ethics, PI, funded by NHGRI)
 - Center for Genomics and Public Health (K. Edwards, Epidemiology, PI, funded by CDC)
 - Ethical, Legal and Social Implications (ELSI) Core (K. Fryer-Edwards, Director) of the Center for Ecogenetics and Environmental Health (D. Eaton, PI, funded by NIEHS)
 - Genome Outreach for Minorities Program (School of Engineering)
 - Alzheimer's Disease Research Center (Department of Epidemiology)
 - The Drug Metabolism, Transport and Pharmacogenomics Research Program (funded by gifts from the pharmaceutical industry, K. Thummel, Director)
- TA positions: TA positions are funded by the IPHG for at least three of the PHG core courses each year. (See **Section IIIB** for details on selection of TAs for these courses). Part-time (10 hour/week) TA positions are funded for other courses on an as needed basis, and when funding is available.

During the Spring of 2008, the IPHG collaborated with the Department of Biostatistics, the Division of Medical Genetics, the Department of Genome Sciences, and the Department of Statistics to submit a training grant entitled "Interdisciplinary Training in Public Health Genetics, Statistical Genetics, Medical Genetics, and Genome Sciences," in response to the 2009 Burroughs Wellcome "Institutional Program Unifying Population and Laboratory Based Sciences." This program could potentially support 1-2 Ph.D. students in the IPHG program. Although we were not funded (only 3 of 140 applications were funded), we plan to resubmit the proposal.

Small travel grants are provided to students who are present posters or oral presentations at national meetings. These grants are often augmented by funding from the Graduate School. Examples of student presentations this year are:

- Anne-Marie Laberge, MD, MPH: The standard of care for genetic tests: what role do clinical practice guidelines play? Oral presentation, Translating "ELSI": International Congress on Ethical, Legal and Social Implications of Genomics, Cleveland, Ohio, May, 2008.
- Joon-Ho Yu, MPH: 1) Population specificity may not be enough: as case-based investigator of racial generalization in gene-disease association research. Poster presentation, 57th annual Meeting of the American Society of Human Genetics, San Diego, California, October, 2007; 2) Race-based medicine and justice as recognition: exploring the phenomenon of BiDiL. Poster Presentation, Annual Meeting of the Society for Social Studies of Science (4S), Montreal, Canada, October, 2007.
- Grace Wang, MPH: Risk of losing insurance during the transition into adulthood among young adults with disabilities. Oral presentation, Academy Health Annual Research Meeting, Washington, D.C., June, 2008.
- Catharine Riley, MPH: Public health follow-up of abnormal newborn screening results. Oral Presentation, Translating "ELSI": International Congress on Ethical, Legal and Social Implications of Genomics, Cleveland, Ohio, May, 2008.
- Brandon Pierce, M.S., Can patents on genetic tests inhibit the development of genomic diagnostics? Poster Presentation, American Society of Human Genetics 57th Annual Meeting, San Diego, California, October, 2007.

- Nora Henrikson, MPH, Willingness to pay for melanoma risk reduction: How does it compare with risk reduction behavior and expenditure? Oral Presentation, American Society of Health Economists, Durham, North Carolina, June, 2008.

Space

The Department of Epidemiology provides 6 offices to the IPHG in the F-Wing of the Health Sciences Building: 3 faculty offices (Austin, Mastroianni, and Edwards), and 3 staff offices. It also provides administrative support for payroll matters, three student cubicles, and a shared computer lab for Epidemiology and IPHG students. In addition, space within the home departments of the IPHG faculty is occasionally provided to our students while they are conducting their RA or 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, for faculty, and for staff. It is continually updated, but a major review and revision was conducted during the summer of 2008. The improvements included an update of the Ph.D. guidelines and faculty affiliations, announcements of upcoming seminars, and the latest IPHG news on the home page. In 2007, a new brochure was developed, focused on highlighting the unique interdisciplinary nature of the program, and including student profiles (See **Appendix I**).

Seminar Refreshments

The School of Pharmacy has funded the costs of refreshments for the biweekly multi-disciplinary seminar series throughout its 10-year history. This support comes from the Drug Metabolism, Transport and Pharmacogenomics Research Program and is intended to provide a broader perspective of genetics and public health to School of Pharmacy trainees. It has also enhanced interactions between graduate students, fellows and faculty of the IPHG and School of Pharmacy, leading to formal collaborations such as the Obstetrics and Fetal Pharmacology Unit (Mary Hebert, School of Pharmacy, PI; Kelly Fryer Edwards, IPHG and Ken Thummel, School of Pharmacy and IPHG, co-investigators)

IID. Staffing

Staff

There are three professional staff members of the IPHG: Kevin Schuda, IPHG Manager; Barbara Snyder, Student Services Advisor; Brian Fish, IT Specialist. A part-time Student Assistant, Justin Jocson, provides additional support for the professional staff. Based on 10 years of experience, the IPHG staff needs have been determined, and the current staff provides the level of services needed by the program. These staff members are evaluated by their supervisors each year, and professional development opportunities, including workshops and courses, are discussed for the upcoming year.

Faculty

As described above, there are three types of IPHG faculty members: APC (core faculty), Auxiliary Faculty and Associated Faculty Members. Although the IPHG is not an academic department, and therefore is not directly involved in promotion and tenure decisions, several IPHG core faculty have been promoted in recent years (McGrath, Mastroianni, Edwards, Rose, Fryer-Edwards), and the IPHG director is often asked to contribute to the evaluation of these

faculty members in their home departments. Salary increases are also controlled by home departments, but the percentage of salary support provided by the IPHG is related to the time commitment made by each faculty member for any given year.

SECTION III: FACULTY, TEACHING, AND DEGREE PROGRAMS

III.A. Teaching Responsibilities

Classroom Teaching

Each APC 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, including teaching PHG courses, and the salary support that the IPHG will provide for this service. Once finalized, these memos are forwarded to each faculty member’s department chair, and to appropriate administrators to insure that there are mutual understandings about the involvement of each faculty member in the program.

Beginning in the Autumn of 2009, Dr. Timothy Thornton will join the Department of Biostatistics to each PHG 519 (Statistical Methods in Genetic Epidemiology). It is our hope that Dr. Thornton will also participate on the APC when he arrives at the UW. Similar to that for the APC, a “memo of understanding” has been developed for each Auxiliary Faculty member to document his/her commitment to the IPHG.

As shown in **Table 2** below, each IPHG faculty member teaches, or co-teaches, courses in his or her area of expertise. Each course was developed by the participating faculty members specifically for the MPH and/or Ph.D. program in Public Health Genetics. Many courses are cross-listed in the faculty member’s home department, and are often attended by students from these departments. For each of the 5 years of the Ph.D. program, the number of courses taught and the number of credits for each faculty member are listed in **Tables C1 and C2 in Appendix C**. These tables illustrate that APC members teach at least one course nearly every academic year, and most Auxiliary faculty members also do classroom teaching.

Course Enrollment

Table C3 (Appendix C) summarizes IPHG course enrollment for the 2007-2008 academic year and shows that IPHG courses are in high demand from students outside the program. For the academic year combined, 324 students were enrolled in IPHG courses, 212 of whom were in IPHG degree programs (65.4%), 16 (4.9%) of whom are in the Graduate Certificate in Public Health Genetics, and 96 (29.6%) of whom were from other UW graduate degree programs. Of those in other degree programs, 31 (14.6%) were from other degree programs in the SPHCM, 19 (5.9%) were from the Law School, and the remaining enrollees were from 14 other UW degree programs. Thus, with one third of enrollees in IPHG courses from outside the institute, our courses are clearly of broad interest across the campus.

Public Health Genetics Journal Club

During the 2007-2008 academic year, the IPHG formalized a student-led journal club that met on a bi-weekly basis. This club has been coordinated by Lilda Barata, a Ph.D. student, with assistance from Malia Fullerton, a member of the APC. The purpose of journal club is to create an interdisciplinary forum to foster community within the IPHG program and to promote the development of critical analytical and communication skills for students in all of the IPHG degree programs. Throughout the academic year, students analyze and appraise recent research relevant to public health genetics, and their discussions focus on key methodologies and research findings, with the goal of integrating concepts across the diverse disciplines encompassed by public health genetics. The journal club has been well attended, and will continue with new student leaders.

Table 2. IPHG Courses (Classroom Teaching)

<i>IPHG Course</i>	<i>Units</i>	<i>Quarter offered</i>	<i>Current Instructors (former)</i>
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 513/ENVH 513/PCEUT 513: Basic Concepts in Pharmacogenetics and Toxicogenomics	3	Winter	Eaton & Thummel
PHG 518/EPI 518: Computer Applications in Genetic Epidemiology	4 or 2	Spring	Edwards
PHG 519/BIOSTAT 516/EPI 516: Statistical Methods in Genetic Epidemiology	3	Autumn	Thornton (Monks, Kerr)
PHG 521/ANTH 574/NURS 582: Culture, Society, and Genomics	3	Spring	McGrath
PHG 522/MHE 516: Ethical Frameworks of Public Health Genetics	2	Winter	Mastroianni
PHG 523/LAW H520: Genetics and the Law	32	Winter	Kuszler (Miller)
PHG 525: Public Commentary on Ethical Issues in Public Health Genetics	3	Spring	Fryer-Edwards
PHG 536/PABIO 536/MEBI 536: Bioinformatics and Gene Sequence Analysis	3	Spring	Rose
PHG 537/PHARM 436: Pharmacoeconomics, Genetics and Healthcare	2	Autumn	Veenstra (Ramsey)
PHG 541: Economic and Policy Issues for Genetic Technologies and Services	3	Autumn	Watts (Ramsey)
PHG 542/MHE 530: Genetic Discovery in Medicine and Public Health	3	Winter	Burke
PHG 543: Social and Behavioral Research Methods in Public Health Research	3	Spring	McGrath (Bowen)
PHG 551: Human Genomics: Science, Ethics, Society	4	Spring	Fullerton
PHG 580: Interactive Seminar	1	Autumn, Winter, Spring	Austin & Fullerton (Thummel, Veenstra, McGrath, Mastroianni, Fryer-Edwards, Kuszler)
PHG 581: Introduction to Genetic Services and Bioinformatics	1	Winter	Lochner Doyle & Rose

Interactive Seminar Series

The IPHG seminar series, PHG 580, continues to feature a variety of speakers from different disciplines, reflecting the interdisciplinary nature of the program. 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 these seminar sessions and other relevant tapes is maintained in the IPHG office.

The coordination of the seminar rotates among IPHG faculty members (See **Table 2**). This past year, the seminar was coordinated by Melissa Austin and Malia Fullerton. To illustrate the types of seminars that presented, a summary of the seminars for the 2007-2008 academic year is provided below.

Once each quarter, the seminar speakers are students in the IPHG program or recent alumni. This year, sessions included two students who recently completed the Ph.D. program in Public Health Genetics (See Section IIIC):

- Nora Henrikson, MPH, Ph.D., presented work from her dissertation project, “Willingness to Pay for Cancer Risk Reduction In People with Melanoma and Their Families.”
- John Thompson, MPH, MPA, Ph.D., who is currently a Health Services Consultant with the Washington State Department of Health, presented a seminar entitled “Putting Knowledge, Surveillance and Evaluation Together to Improve Public Health: True Stories from Newborn Screening.”

In addition, four 2nd year MPH students coordinated the annual “MPH Thesis” panel during which they presented their thesis topics and described the process for developing their projects and thesis committees. The goals of this session are to assist 1st year students with their thesis projects, and to provide the 2nd year students with an opportunity to present their work.

The seminar series also focuses on research being conducted by UW faculty from many departments on campus, as well as IPHG faculty. This year, these sessions included:

- Michael Bamshad, M.D., Professor of Pediatrics, Division of Genetics and Development, UW School of Medicine, presented a first seminar on “Genetics Influences on Health: Does Race Matter?”
- Nick Anderson, Deputy Director, Biomedical Informatics Core, Institute for Translational Health Science, UW, spoke on “Experimental Information Management Issues and Barriers in Biomedical Research.”
- Josh Akey, Ph.D., Assistant Professor, Department of Genome Sciences, UW School of Medicine, presented a seminar entitled, “Human Genetic and Gene Expression Variation.”
- Phillip Thurtle, MA, Ph.D., Assistant Professor, Comparative History of Ideas Program and Department of History, discussed “Information Processing and Genetics, an Early History.”
- Sarah Goering, Ph.D., Assistant Professor of Philosophy, presented a seminar on “Rethinking Researcher Responsibility in Genetic Research with Marginalized Populations.”
- Kelly Fryer-Edwards, Ph.D., Associate Professor, Department of Medical History and Ethics, UW School of Medicine, and IPHG APC member, discussed her work related to the Center for Ecogenetics and Environmental Health (see Section IV) on “Ethics and Exposures: Workplace Safety and Emerging Technologies.”

- Several IPHG APC members, including Melissa Austin, Karen Edwards, Dave Eaton, Wylie Burke, Carolyn Watts, Barbara McGrath, and Pat Kuszler, discussed the case study used for the 2007 Ph.D. preliminary examination (see Section IIIC) based on the Nup'ik Eskimos in Alaska.

The IPHG has co-sponsored several Danz lecturers and a UW Walker-Ames lecturer. During the 2007-2008 academic year, Dr. Malia Fullerton, an APC member, facilitated the visits of the following lecturers:

- Walker Ames Lecturer: Dr. Irving Gottesman, Professor of Psychiatry from the University of Minnesota School of Medicine spoke on “The Risky Business of Risk Prediction for the Offspring of the Mentally Ill.”
- Jesse and John Danz Lecturer: Dr. Richard Lewontin, Alexander Agassiz Research Professor at the Museum of Comparative Zoology, Harvard University presented a seminar on “Frequency and Population Context Dependent Fitness.”

Each of these speakers also had informal breakfast or lunch meetings with IPHG students, and individual discussions with IPHG faculty members.

Finally, the IPHG co-sponsored a seminar by Dr. Julie Johnson, Professor and Chair, Pharmacy Practice, Professor of Pharmaceutics and Medicine, Cardiology Director, UF Center for Pharmacogenomics, University of Florida, entitled “Pharmacogenetics of antihypertensive drugs: From BP response to outcomes.” Dr. Thummel and the School of Pharmacy facilitated the visit.

IIIB. Instructional Effectiveness

The IPHG uses several approaches to continually evaluate and improve the quality of instruction for the Ph.D. program in Public Health Genetics. These are briefly summarized below. (See Data Summary in Appendix D.)

Student Evaluations of Courses

All IPHG 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 whole”, the “course content”, the “instructor’s contribution”, and the “instructor’s effectiveness”, based on a scale of 0 (very poor) to 5 (excellent), for each course is listed below in **Table 3**. IPHG courses continue to be highly rated by the students. In particular, two courses were rated especially high (4.6 or above) this year, including PHG 543 taught by Barbara McGrath and PHG 551 taught by S. Malia Fullerton.

Annual Student Feedback Session and Ph.D. Curriculum Review, June, 2008

The IPHG continues to seek feedback from students about the curriculum on a regular basis. Two students, one MPH and one Ph.D., attend APC meetings, and are encouraged to raise student issues at any meeting during the year. The annual IPHG student-faculty feedback session was held in April 2008, followed by a pizza lunch.

Since there are now 8 graduates of the Ph.D. program, a second session focused specifically on the Ph.D. curriculum was held in June 2008. This interactive session was facilitated by two IPHG APC members, Barbara McGrath and Kelly Fryer-Edwards, and was well attended by both students and faculty. The discussion focused on the learning objectives of the Ph.D. program (listed below in **Section IIID**), and resulted in some useful revisions.

Table 3. Student Evaluations of IPHG Courses, 2007-2008 Academic Year

<i>IPHG 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 513/ENVH 513/PCEUT 513: Basic Concepts in Pharmacogenetics and Toxicogenomics	3	Winter, 2008	4.3
PHG 518/EPI 518: Computer Applications in Genetic Epidemiology	4 or 2	Spring, 2008	4.2
PHG 519/BIOSTAT 516/EPI 516: Statistical Methods in Genetic Epidemiology	3	Will be offered Autumn, 2009	N/A
PHG 521/ANTH 574/NURS 582: Culture, Society, and Genomics	3	Spring, 2008	4.3
PHG 522/MHE 516: Ethical Frameworks of Public Health Genetics	2	Will be offered Autumn, 2009	N/A
PHG 523/LAW H520: Genetics and the Law	2	Winter, 2008	3.5
PHG 525/MHE 515: Public Commentary on Ethical Issues in Public Health Genetics	3	Spring, 2008	4.4
PHG 536/PABIO 536/MEBI 536: Bioinformatics and Gene Sequence Analysis	3	Spring	3.6
PHG 537/PHARM 436: Pharmacoeconomics, Genetics and Healthcare	2	Autumn, 2007	4.3
PHG 541: Economic and Policy Issues for Genetic Technologies and Services	3	Autumn, 2007	3.8
PHG 542/MHE 530: Genetic Discovery in Medicine and Public Health	3	Winter, 2007	4.4
PHG 543: Social and Behavioral Research Methods in Public Health Research	3	Spring, 2008	4.7
PHG 551: Human Genomics: Science, Ethics, Society	4	Spring, 2008	4.9
PHG 580: Interactive Seminar	1	Autumn, Winter, Spring, 2008	3.7,4.1,4.2
PHG 581: Introduction to Genetic Services and Bioinformatics	1	Winter, 2008	3.5

* Median Score ranging from 0 for “poor” to 5 for “excellent”

TA Opportunities

All students in the Ph.D. program in Public Health Genetics are encouraged to obtain teaching experience during their training. For most students, this involves serving as TA for one or more of the PHG core courses. Many of these TA positions are funded by the IPHG. Each

year, TA opportunities are advertised to all students in the IPHG degree programs (including both masters and PhD levels). Interested students submit applications that are then reviewed by the instructor(s). Often based on interviews with qualified students, instructors then select the TA for the upcoming academic year in their courses.

Exit Interviews and Placement of Graduates

The IPHG has two sources of exit interviews that provide data to inform the APC about the instructional effectiveness of the Ph.D. program. First, 6 graduates to date have completed the Exit Questionnaire in MyGradProgram. The average ratings from 2006-2007 and 2007-2008 are summarized below. In general, these data demonstrate that the graduates are very satisfied with the program. The high scores for “response to recent development or trends” is particularly important for an emerging field such as public health genetics. The relatively low scores for “adequacy of space, facilities and equipment” most likely reflect the fact that all such facilities, including the student computer lab and faculty offices, are provided by the Department of Epidemiology.

Table 4. MyGradProgram Exit Questionnaire for Ph.D. Graduates

	<i>Average Score (1 to 5 with 5 highest)</i>	
	<i>2006-2007 (N=2)</i>	<i>2007-2008 (N=4)</i>
Rating of departmental academic standards	5.0	4.0
Response of recent developments or trends	4.5	4.5
Adequacy of research and professional training	4.0	3.75
Adequacy of space, facilities, and equipment	3.0	3.0
Satisfaction with supervision and/or guidance	4.5	4.0
Confidence in preparation for teaching	4.0	3.0
Adequacy of teaching preparation for students	5.0	3.33
Quality of faculty	5.0	4.5
Satisfaction with career mentoring	4.0	4.0
Confidence as an independent scholar/researcher	4.0	4.0
Overall quality of the program	4.5	4.0

Second, the IPHG manager and student services advisor have completed in-person exit interviews with 6 of the graduates to date. A summary of comments and suggestions from these interviews, by topic, include:

- *Overall:* The writing, critical thinking, theory, emphasis on the big picture, and interdisciplinary model make this degree marketable; This a unique program with lots of breadth compared to other programs...I’ve made many contacts that will help me in getting a post-doc position; The program prepares students to think in multi-disciplinary ways, but also gives depth in the separate disciplines; The biggest strength is the interdisciplinary nature of the program....allows us to cross boundaries.
- *Faculty and research:* The program needs to include more preparation to do independent research, not just learning research methods while writing the dissertation; The faculty are willing to work with students and are the strength of the program; My mentor was very

accessible; Another strength is the faculty, their general availability and their belief in the program.

- *Preliminary Exam*: Preliminary exam was very challenging, especially having enough time to answer all of the questions; students who don't pass the preliminary exam should not have to wait an entire year before taking the exam again. The preliminary exam was scary.
- *Dissertation*: Identifying a GSR was difficult due to the interdisciplinary faculty; regarding my dissertation, I had to search for data to use; I wish I had gotten involved in writing a grant.
- *General Exam*: I enjoyed taking the general exam; I learned a lot from the process of writing the [general] exam and the feedback I received from my advisors. However, the IPHG should be clear on the purpose of the general exam and state the purpose on the website; The general exam was a good learning experience; Communication is key; suggest that students be required to develop a program of study with their committee.
- *Teaching and Curriculum*: I did get some teaching experience, but for other grads who want to teach, more opportunities would be helpful; My interdisciplinary training will definitely help when teaching; [Student – faculty] feedback sessions [on curriculum] are great.
- *Career*: PHG is very applicable to different consulting jobs; I would like to find a job requiring a broad range of knowledge; An earlier job focus would have helped.
- *Funding*: International students may need different procedures to help them get funding since they are not eligible for most training grants.
- *Future of program*: Students and alumni should be involved in how the program unfolds from here; Since PHG is a new program, there needs to be an avenue to stay connected and form a sense of community.

IIIC. Teaching and Mentoring Outside the Classroom

IPHG Core and Auxiliary faculty are actively involved in teaching and mentoring outside of the classroom.

When students enter the Ph.D. program, they are assigned two co-mentors, one from each of the core knowledge areas of the program (See **Table 1**). Due to the interdisciplinary nature of the program, this ensures that each student receives the guidance he/she needs in each of the areas from the beginning of his/her training. These co-mentors are assigned based on matching interests expressed by the student in his/her application with those of the faculty, while also distributing mentoring responsibilities as equitably as possible within the program.

Next, each student completes an annual progress report during the autumn quarter of each academic year. This report includes all courses taken, and those planned, as well as research progress. Before students take the preliminary examination, this form must be signed by both of the student's co-mentors. Generally, this means that the student meets in person with these mentors, providing an opportunity to discuss any concerns and to provide guidance for the upcoming year. Once the student has passed the preliminary examination, this form is signed by his/her dissertation supervisory committee chair.

In addition to this formal mentoring, all students work with IPHG faculty as RAs and/or as TAs. This often serves to focus the student's research and teaching interests in this interdisciplinary context, and often leads to the development of his/her dissertation project.

Importantly, all IPHG APC members, and most Auxiliary Faculty members serve on MPH thesis and Ph.D. dissertation committees. This service is documented in **Tables C1 and C2** in **Appendix C**, and constitutes a major commitment of these faculty members to the IPHG. The

high graduation rates, and timely completion of degrees in the IPHG 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 all Ph.D. graduates from the program have published papers from their dissertation work is another indication of the quality of service provided by the faculty.

IIID. Degree/Certificate Programs

List of Programs

Although this self-study is for the review of the Ph.D. in Public Health Genetics, all of the educational programs offered by the IPHG are listed below. Note that the IPHG does not offer undergraduate degrees. Each of the degree programs in Public Health Genetics (MPH, M.S., Ph.D. and Graduate Certificate) is academically overseen by the faculty group as listed in **Section IIA**, but the M.S. in Genetic Epidemiology has a different core faculty group. That program is directed by Dr. Karen Edwards, and is undergoing a separate review by the Graduate School.

Table 5. Educational Programs Offered by the Institute for Public Health Genetics

<i>Degree / Certificate Program</i>	<i>Administrative Notes</i>
Master of Public Health (MPH) in Public Health Genetics	Degree conferred by the SPHCM 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 SPHCM
M.S. in Public Health Genetics	Option for students who do not complete the Ph.D. in Public Health Genetics
Graduate Certificate in Public Health Genetics	Interdisciplinary Program housed in the Graduate School and administratively housed in the Department of Epidemiology in the SPHCM
M.S. in Genetic Epidemiology	Joint program offered by the IPHG, the Department of Epidemiology and the Department of Biostatistics in the SPHCM

Because the faculty who participate in the Ph.D. program in Public Health Genetics also mentor and teach the core courses for the MPH and Graduate Certificate programs, a brief summary of each is provided below. Details about these programs can also be found in our 10th Annual Progress Report (**Appendix F**)

MPH Program in Public Health Genetics

The UW offers the only accredited MPH in Public Health Genetics in the U.S. Many of our MPH students have undergraduate degrees in biology, biochemistry, genetics or molecular biology, but others have backgrounds ranging from nursing and medicine to law and philosophy. A total of

196 prospective students have applied to the MPH track in Public Health Genetics during the last 10 years. Of these, a total of 104 (53%) were admitted into the program, with admission rates varying from 40% to 73%. Of the applicants admitted, approximately two-thirds enrolled in the program, with some variation across years.

Overall, 48 (nearly 90%) of the students enrolled in the program have graduated. In general, more than half of IPHG MPH graduates have undertaken more advanced training in a variety of disciplines, while the remainder work in either state or local health departments or in research settings. MPH graduates have gone on to law school, to M.S. degrees in genetic counseling, to medical school and to nursing degree programs. Several have gone on to Ph.D. programs in the UW IPHG program, in Science Education (UW), Public Policy (Johns Hopkins), and Sociology (UC San Francisco). At the present time, other MPH graduates are working in either Washington or Oregon State Health Departments, or are working in research related positions. One graduate is a staff member at the National Human Genome Research Institute at NIH, and another is an Epidemiologist at Amgen Inc. in Seattle.

Graduate Certificate in Public Health Genetics

The Graduate Certificate Program in Public Health Genetics is designed for students currently enrolled in another graduate degree program at the UW who wish to learn about public health genetics. Certificate students are required to take IPHG core courses and 3 quarters of the interactive seminar. Upon completion of these requirements, students receive a paper certificate and an acknowledgment of this training on their UW transcript. A total of 35 students from 11 different departments have been accepted into the certificate program, and 28 have completed the requirements to date.

Peer Institutions

The UW is the only institution to offer a Ph.D. degree in Public Health Genetics. As described briefly below, other universities offer graduate programs in Public Health Genetics, although none are as comprehensive as the UW IPHG program.

- University of Michigan School of Public Health: Interdisciplinary Concentration in Public Health Genetics
- University of Pittsburgh School of Public Health, Department of Human Genetics: MPH in Public Health Genetics
- Sarah Lawrence College: Public Health Genetics/Genomics Certificate Program
- University of Iowa College of Public Health: Ph.D. and Certificate in Statistical Genetics

Goals and Learning Objectives for the Ph.D. Program in Public Health Genetics

The *overall goals* of the interdisciplinary Ph.D. program in Public Health Genetics are:

- To train highly-qualified individuals for careers and leadership roles in academic institutions, health care delivery systems, public health departments, government agencies and the private sector; and
- To provide interdisciplinary education in the core knowledge areas of public health genetics (genetic & molecular epidemiology; ecogenetics & pharmacogenomics; clinical aspects of genomics; ethics & social science; law & policy; health economics & outcomes research), based on the fundamental areas of study (human genetics & genomics and public health), so that graduates can address scientific and policy questions from a variety of perspectives.

Learning Objectives

There are two sets of learning objectives for the Ph.D. program in Public Health Genetics.

Set I. General set of objectives for all Ph.D. programs in the School of Public Health and Community Medicine at the University of Washington:

- 1) Describe major research study designs and their advantages and limitations;
- 2) Critically review the scientific literature, synthesize the findings across studies, and make appropriate recommendations based on current knowledge;
- 3) Organize data and information, prepare technical reports, and give oral presentations appropriate to the scientific community and/or the general public;
- 4) Function as a professional within a management structure (academic, governmental, or other), including working with professionals from other disciplines;
- 5) Collect, analyze, interpret, and use data for solving problems in an area of research interest;
- 6) Formulate a hypothesis, design an experiment to test that hypothesis, conduct a study, and complete a research-based thesis;
- 7) Display comprehensive understanding and in-depth knowledge of a methodology or subject area;
- 8) Display knowledge of the discipline within the context of the field of public health; and
- 9) Conceive and conduct independent research.

Set II. Learning objectives specific for the Ph.D. program in Public Health Genetics were first developed based on competencies recommended by the Public Health Genetics Training Collaboration. This collaboration consists of five universities that provide training related to Public Health Genetics, the Washington State Department of Health, and liaisons to the Centers for Disease Control and Prevention and the Genetics Services Branch of the Health Resources and Human Services Administration in 2001 (Austin MA, Arnett D, Beaty T, Durfy S, Fineman R, Gettig E, Lochner Doyle D, Peyser P, Sorenson J, Thompson JD, Watts C. Opportunities for public health genetics trainees: Results from an employer/workplace survey. *Community Genetics* 4:143-147, 2001.)

Following an interactive internal review of the Ph.D. program by students active in the program during the 2007-2008 academic year, alumni of the program, and faculty, the following, updated objectives were developed:

- 1) Display competency in “Genomics in Public Health” (Core Knowledge Area A):
 - a. Apply knowledge of inheritance and genomic advances, including cellular and molecular mechanisms and technical developments, to understanding the etiology of a variety of rare and common, complex diseases and health conditions;
 - b. Apply epidemiological and statistical approaches to the study of risk factors and diseases with a genetic component;
 - c. Identify interactions among genes, environmental factors, and behaviors, and their roles in health and disease;
 - d. Understand how genetic principles and genomic technologies apply to diagnosis, screening, and interventions for disease prevention and health promotion programs.
- 2) Display competency in “Implications of Genetics for Society” (Core Knowledge Area B):
 - a. Identify the impact of genomics on the public health activities of assessment, policy development and assurance;

- b. Apply methods to address ethical implications of the use of genetic information and technologies in public health;
 - c. Understand legal concepts and the role of the law in the development of policies relating to genetics and genomics; and identify legal implications of the application of genetics and genomic technologies in public health;
 - d. Apply knowledge of key social science concepts in analysis of the political, social and cultural forces that influence the research and clinical application of genetics and genomic technology in public health;
 - e. Analyze the interaction and impact of market forces and public policy on the development and delivery of genetic services.
- 3) Acquire advanced knowledge in one of these core knowledge areas through coursework and dissertation project research.
 - 4) Demonstrate effective integration of the two core knowledge areas while conducting independent, interdisciplinary, research in public health genetics.
 - 5) Acquire skills needed to stay current with the rapid advances in genomics, public health genetics, and clinical genetics, and their application in public health settings.
 - 6) Communicate effectively about public health genetics to audiences from diverse backgrounds, including writing at a professional level and giving oral presentations.

Admissions and Enrollment

As shown in **Table 6** below, the Ph.D. program in Public Health Genetics is entering its 6th academic year. During this time, there have been a total of 74 applicants, 27 of whom were admitted into the program (36.5%). Thus, although there has been variation from year-to-year, approximately one-third of the applicants to the program are admitted overall. Among those who were admitted, 71% enrolled in the program, or 20 students total.

Table 6. Ph.D. Program: Number of Applicants, Number Offered Admission, 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	13	18	8	13	10	12	74
# Admitted (% Of Applicants)	7 (53.8)	8 (44.4)	3 (37.5)	3 (23.1)	1 (10.0)	5 (41.7)	27 (36.5)
# Enrolled (% Of Admitted)	6 (85.7)	6 (75.0)	2 (66.7)	2 (66.7)	0 (0.0)	4 (80.0)	20 (71.4)

The four incoming Ph.D. students for this academic year are listed below. Each of these students has earned a previous master's degree, two from the UW, and two from other universities. Note that each student has two IPHG faculty co-mentors, one in each of the Core Knowledge Areas (See **Table 1**). One student is supported by a UW Graduate School Top Scholar RA Award and an ARCS Fellowship, and three students are funded by research and training grants that involve IPHG core faculty.

Table 7. Incoming Ph.D. students, 2008-2009 Academic Year

<i>Name</i>	<i>Previous Training</i>	<i>Co-Mentors</i>	<i>Funding, Research Assistantship (RA) and Teaching Assistant (TA) Positions for 2008-2009 Academic Year</i>
Kristin Beima	MPH, UW Public Health Genetics, 2008	M. Austin (IPHG, Epidemiology); M. Fullerton (IPHG, Medical History and Ethics)	Graduate School Top Scholar Award, Achievement Rewards for College Scientists (ARCS) Fellowship; RA, The role of genetic and immunologic factors on mother-to-child transmission of HIV and on clinical outcomes and mortality in HIV infected mothers and infants (Grace John-Stewart, Medicine, PI)
Greg Guzauskas	MSPH, Health Policy, University of North Carolina, Chapel Hill	K. Thummel (IPHG, Pharmaceutics); A. Mastroianni (IPHG, Law)	RA, Ethical, Legal, and Social Implications (ELSI) Core (Kelly Fryer-Edwards, Medical History and Ethics, Director) of the NIEHS-funded Center for Ecogenetics and Environmental Health (David Eaton, Environmental and Occupational Health, PI)
Jonathan Kocarnik	MPH, Biostatistics & Epidemiology, Oregon Health Sciences University, 2008	B. McGrath (IPHG, Nursing); K. Edwards (IPHG, Epidemiology)	Trainee, NCI-funded Cancer Prevention Training Grant – Nutrition, Exercise and Genetics (Emily White, Epidemiology, PI)
Krysta Shutske	MPH, UW Public Health Genetics, 2008	W. Burke (IPHG, Medical History and Ethics); P. Kuszler (IPHG, Law)	RA, NHGRI-funded Center for Genomics and Healthcare Equality (W. Burke, Medical History and Ethics, PI) TA, PHG 512

Revisions to Admissions Policy

During the 2007-2008 academic year, the Graduate School approved a major revision to the admission policy of the Ph.D. program. Specifically, the APC can now offer applicants for the Ph.D. program admission directly into the M.S. in PHG degree program. That is, candidates who apply to enter the Ph.D. program, but who need additional training to be successful Ph.D. students, have the option of being admitted directly into the M.S. in PHG degree program. The APC believes that many of these M.S. in PHG students would eventually be able to qualify for admission to the Ph.D. program by completing the required coursework, by passing the Ph.D.

preliminary examination, and by completing an abbreviated application process to the Ph.D. program.

Graduation and Placement

As of summer, 2008, there have been a total of 8 students who have earned the Ph.D. degree in Public Health Genetics, one in 2006, one in 2007, and 6 in 2008. As illustrated by the dissertation titles in **Table 8** below, all of the Ph.D. graduates had both Core Knowledge Areas (Genomics in Public Health and Implications of Genetics for Society, See **Table 1**) strongly represented in their work. To complete these ambitious projects, Ph.D. students are required to have an interdisciplinary dissertation supervisory committee, including two APC members, one with expertise in Area A and another with expertise in Area B. Dissertation supervisory committee members are from a variety of departments and disciplines and serve on these committees to provide appropriate expertise to the student’s project. The involvement of these faculty members from outside the IPHG also illustrates that students make important contributions to research projects of non-IPHG faculty members as well.

All of the graduates of the Ph.D. program have obtained excellent positions after receiving the degree, several as post-doctoral fellows, and others with national and state agencies. Of particular note, Brandon Pierce is a post-doctoral fellow at the University of Chicago and Julie Harris has been accepted into the Robert Wood Johnson Health and Society Scholars Program at UC San Francisco and UC Berkeley. Erin Ramos continues as an epidemiologist in Population Genomics at the National Human Genome Research Institute, and John Thompson is with the Newborn Screening Program at the Washington State Department of Health. The most recent graduate, Anne-Marie LaBerge will join the faculty at Hospital Sainte-Justine in Montreal, Canada, this fall. All of the graduates have publications resulting from their IPHG training (See **Appendix L**).

Table 8. Ph.D. Graduates, Dissertation Titles, Committee Members and Current Positions

<i>Name (Graduation Year)</i>	<i>Dissertation Title</i>	<i>Dissertation Supervisory Committee Members</i>	<i>Current Position and Organization</i>
Erin Ramos, MPH, Ph.D. (Winter, 2006)	Public Health Genetics of Alzheimer’s Disease: From the Identification of Genetic Risk Factors to Public Policies Surrounding Long-Term Care Insurance	K. Edwards (Chair, IPHG and Epidemiology), W. Kukull (Epidemiology), C. Watts (IPHG and Health Services), T. Montine (GSR, Pathology)	Epidemiologist, Population Genomics, National Human Genome Research Institute, Bethesda, MD
Megan Fesinmeyer, MPH, Ph.D. (Spring, 2007)	Pancreatic Cancer Risk and Prevention: Association with PPARG Gene and Policy Analysis of Tobacco-Related Pancreatic Cancer	M. Austin (IPHG, Epidemiology, Chair), D. Nickerson (GSR, Genome Sciences), T. Brentnall (Medicine), M. Mandelson (Epidemiology), J. Stanford (Epidemiology), C. Watts (IPHG, Health Services)	Postdoctoral Research Associate, Translational Outcomes Research Group and Cancer Technology Assessment Group, Public Health Sciences, Fred Hutchinson Cancer Research Center, Seattle, WA

Table 8. (Continued) Ph.D. Graduates, Dissertation Titles, Committee Members and Current Positions

<i>Name (Graduation Year)</i>	<i>Dissertation Title</i>	<i>Dissertation Supervisory Committee Members</i>	<i>Current Position and Organization</i>
John Thompson, MPH, MPA, Ph.D. (Winter, 2008)	Implications of Newborn Screening Strategy for Cystic Fibrosis	C. Watts (Chair, IPHG and Health Services), T. Rose (IPHG and Pathobiology), W. Burke (IPHG and Medical History and Ethics), L. Garrison (GSR, Pharmacy)	Health Services Consultant, Newborn Screening Program, WA State Department of Health, Shoreline, WA
Josh Carlson, MPH, Ph.D. (Winter, 2008)	Pharmacogenomic Drug Targeting in Non-Small Cell Lung Cancer: Evaluating the Evidence, Cost-effectiveness, and Policy Options	D. Veenstra (Chair, IPHG and Pharmacy), S. Ramsey (IPHG and Medicine, B. Kopjar (GSR, Health Services), L. Garrison (Pharmacy)	Senior Post Doctoral Fellow, Pharmaceutical Outcomes Research and Policy Program, School of Pharmacy, University of Washington, Seattle, WA
Brandon Pierce, MS, Ph.D. (Winter, 2008)	Searching for Prostate Cancer Susceptibility Variants and Exploring Intellectual Property Implications for Future Clinical Applications	M. Austin (Chair, IPHG and Epidemiology), P. Kuszler (IPHG and Law), J. Stanford (Epidemiology), C. Carlson (Epidemiology), S. O'Connor (GSR, Law)	Postdoctoral Scholar, Department of Health Studies, The University of Chicago, Chicago, IL
Nora Henrikson, MPH, Ph.D. (Spring, 2008)	Genetic Testing for Risk of Common Cancers: Decision Timing, Preference for Risk Reduction, and Clinical Utility	S. Ramsey (Chair, IPHG and Medicine), W. Burke (IPHG and Medical History and Ethics), D. Bowen (IPHG and Health Services), T. Lumley (GSR, Biostatistics)	Visiting Lecturer, Center for Genomics and Health Care Equality, School of Medicine, University of Washington and Postdoctoral Fellow, Group Health Center for Health Studies, Seattle, WA

Table 8. (Continued) Ph.D. Graduates, Dissertation Titles, Committee Members and Current Positions

<i>Name (Graduation Year)</i>	<i>Dissertation Title</i>	<i>Dissertation Supervisory Committee Members</i>	<i>Current Position and Organization</i>
Julie Harris, MPH, Ph.D. (Summer, 2008)	Communicating Genetic Risk Information: Understanding the Role of Different Communication Channels (Family and Clinic) on the Use of Genetic and Hereditary Health Information	D. Bowen (Chair, IPHG and Health Services), W. Burke (IPHG and Medical History and Ethics), K. Fryer- Edwards (IPHG and Medical History and Ethics), Diane Magyary (GSR, School of Nursing)	Scholar, Robert Wood Johnson Health & Society Scholars Program, UC San Francisco / UC Berkeley, CA
Anne-Marie Laberge, MD, MPH, Ph.D. (Summer, 2008)	Clinical Practice Guidelines and Their Impact on the Use of Genetic Tests in Practice and on the Definition of the Standard of Care	W. Burke (Chair, IPHG and Medical History and Ethics), P. Kuszler (IPHG and Law), B. Psaty (Epidemiology and Medicine), H. Starks (Medical History & Ethics), T. Lumley (GSR, Biostatistics)	Medical Geneticist, Department of Pediatrics, Centre Hospitalier Universitaire Sainte-Justine, affiliated with Université de Montréal, Canada

Ph.D. Program Milestones

Detailed guidelines for the Ph.D. program in Public Health Genetics are provided on our program website and are given in **Appendix J**. They are described briefly below.

Completion of Required Core Courses and Preliminary Examination

The first major milestone of the Ph.D. program is the preliminary examination. The preliminary examination is developed collaboratively by the IPHG APC faculty during the Spring Quarter of each year, and is designed to be taken after students have completed the required core courses, usually at the end of the second year of study. The purpose of the exam is for students to demonstrate competency in the two fundamental areas of study (human genetics & genomics and public health) and in each of the six components of the core knowledge areas (genetic epidemiology; ecogenetics & pharmacogenetics; ethics & social science; law & policy; health economics & outcomes research, **Table 1**) based on IPHG coursework, and specifically addresses learning objectives I1) to I9) and II1) and II2) listed above. The exam is comprehensive and integrative, and uses a case study approach with questions relating to each of the core knowledge areas. (See **Appendix K** for the 2008 Preliminary Examination.) The preliminary examination is administered each June, and students have two opportunities to pass it. Each question of the exam is graded by a group of appropriate core faculty members. Of the possible 100 points, a total score of at least 70 points is required to pass the exam, regardless of how the points are distributed among the individual questions.

The preliminary examination has been administered each year from 2004-2008, and the distribution of points earned by students is shown in **Figure K1 in Appendix K**. This figure

shows that the examination has been taken 18 times. One student who failed the examination (score less than 70 points) re-took it the following year, and passed. Two students who failed the examination twice completed capstone projects and received an M.S. degree in Public Health Genetics.

In addition to the Ph.D. graduates listed above, four additional Ph.D. students enrolled in the program have passed this examination, and are currently developing their dissertation projects (**Table 9**).

Table 9. Ph.D. Students Who Passed the Preliminary Examination

<i>Name</i>	<i>Status</i>	<i>IPHG Co-Mentors</i>	<i>Funding, Research Assistantship (RA) and Teaching Assistant (TA) Positions for 2008-2009 academic year</i>
Llilda Barata, MPH	Passed preliminary examination, June, 2007; preparing for general examination	D. Eaton (IPHG, Environmental and Occupational Health Sciences), K. Fryer-Edwards (IPHG and Medical History and Ethics)	RA, NHGRI-funded Center for Genomics and Healthcare Equality (W. Burke, Medical History and Ethics, PI)
Sierra Hansen	Passed preliminary examination, June, 2008; preparing for general examination	S. Fullerton (IPHG, Medical History and Ethics), S. Ramsey (IPHG, Medicine)	Trainee, UW Multidisciplinary Predoctoral Research Training Program - a Roadmap Initiative from the N.I.H./National Center for Research Resources, P. Mitchell (Nursing) & S. Marshall (Medicine), Program Directors
Catharine Riley, MPH	Passed preliminary examination, June, 2008; preparing for general examination	A. Mastroianni (IPHG, Law), B. McGrath (IPHG, Nursing)	Trainee, UW Multidisciplinary Predoctoral Research Training Program - a Roadmap Initiative from the N.I.H./National Center for Research Resources, P. Mitchell (Nursing) & S. Marshall (Medicine), Program Directors
Krysta Shutske, MPH	Passed preliminary examination, June, 2008; completing MPH in Public Health Genetics	W. Burke (IPHG, Medical History and Ethics) P. Kuszler (IPHG, Law)	RA, NHGRI-funded Center for Genomics and Healthcare Equality (W. Burke, Medical History and Ethics, PI) TA, PHG 512

General Examination

The second major milestone in the Ph.D. program is the general examination. This examination is taken after the student's dissertation proposal has been completed, and before data collection for the dissertation research has begun. The general examination, administered by

the dissertation supervisory committee, deals primarily with the general topic of the student's dissertation and consists of written and oral components. It is designed to:

- a. Measure the student's ability to analyze and synthesize information.
- b. Determine whether the student has sufficient depth and breadth of knowledge in the general areas of the topic of his/her dissertation to complete the project.
- c. Evaluate whether the student has adequate knowledge of recent advances and important concepts relevant to the student's research project.

The general examination addresses learning objectives II3), II4), II5) and II6) listed above. Upon passing the general examination, students are advanced to candidacy. In addition to the graduates of the program, two of our current students have been advanced to candidacy. As **Table 10** below again illustrates that interdisciplinary dissertation projects being undertaken by these students, and that their dissertation committees consist of faculty members from several different academic units.

Table 10. Ph.D. Students Advanced to Candidacy

<i>Name</i>	<i>Dissertation Title</i>	<i>Dissertation Committee Members</i>	<i>Funding, Research Assistantship (RA) and Teaching Assistantship (TA) Positions for 2008-20009 Academic Year</i>
Grace Wang, MPH	Medical Care Transitions by Youth with Special Needs and Disabilities Aging into Adulthood	C. Watts (Chair, IPHG and Health Services), B. McGrath (IPHG and Nursing), D. Grembowski (Health Services), B. Dudgeon (GSR, Rehab. Medicine)	Trainee, UW Multidisciplinary Predoctoral Research Training Program - a Roadmap Initiative from the N.I.H./National Center for Research Resources, P. Mitchell (Nursing) & S. Marshall (Medicine), Program Directors; TA, Gatzert Child Welfare Fellowship
Joon-Ho Yu, MPH	What are our AIMS? Public Health Genetics and the Practice of Ancestry Informative Markers	S. Fullerton (Chair, IPHG and Medical History and Ethics), K. Edwards (IPHG and Epidemiology), K. Fryer-Edwards (IPHG and Medical History and Ethics), J. Taylor (GSR, Anthropology)	RA, Center for Genomics and Healthcare Equality (W. Burke, Medical History and Ethics, PI)

Final Examination (Dissertation Defense)

Upon completion of the dissertation research project, and with approval by the student's dissertation supervisory committee, the student schedules the final examination or oral defense of the dissertation. The Final Examination consists of a public presentation of his/her dissertation project followed by questions, and a second set of questions in a closed session before the student's dissertation supervisory committee. The Examination is facilitated by the chair of the Supervisory Committee, and must include the GSR. Passing the final examination confirms that the student has met all of the learning objectives of the program. After successful

completion of the final examination, the student incorporates changes into the dissertation as recommended by the committee. Upon filing the dissertation with the Graduate School, the student is awarded the Ph.D. degree.

Summary of Student Progress and Graduation Timeline

Table 11 below summarizes cumulative student progress in the Ph.D. program during the 5 years of the program to date. A total of 14 students have passed the preliminary exam, 10 have been advanced to candidacy, and 8 have been awarded Ph.D. degrees. As noted above, two students admitted in the 2003-2004 academic year did not pass the preliminary examination. They were awarded M.S. degrees in Public Health Genetics upon completion of capstone projects. One of these students is currently in the Master of Nursing Program at the UW, and the other is a Project Manager for United Science Corporation.

Table 11. Summary of Ph.D. Student Progress by Academic 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	6	6	2	2	0	4	20
# Passed Preliminary Exam	4	5	2	2	0	1	14
# M.S. Graduates*	2	0	0	0	0	0	2
# Advanced to Candidacy	4	5	1	0	0	0	10
# Ph.D. Graduates	4	3	1	0	0	0	8

* Did not pass preliminary examination

Table 12 below documents the time to degree for the eight Ph.D. graduates of the program to date. Note that five of these graduates obtained an MPH in Public Health Genetics before entering the Ph.D. programs, resulting in 3.4 years enrolled versus 4.1 years, on average, to graduate from the program. Taken together, it is clear from these data that students are completing the Ph.D. degree in a timely way in this interdisciplinary program.

Table 12. Ph.D. Program Average (Range) of: Number of Quarters Students Were Enrolled to Pass Preliminary Examination, to Pass General Examination, to Pass Final Examination, and Average Years to Graduation

<i>Ph.D Graduates</i>	<i># Quarters enrolled to pass Prelim Exam</i>	<i># Quarters enrolled to pass General Exam*</i>	<i># Quarters enrolled to pass Final Exam **</i>	<i>Total # Quarters to Graduation</i>	<i>Average Total time to degree (years)</i>
All Graduates (N=8)	4.4 (2-7)	5.0 (3-8)	3.6 (7-15)	11.2 (7-15)	3.6
Previous UW MPH in Public Health Genetics (N=5)	3.6 (2-7)	4.6 (3-7)	3.0 (1-6)	16.0 (14-19)	3.4
Previous non-IPHG master's degree (N=3)	5.7 (4-8)	5.7 (3-8)	4.7 (3-7)	13.0 (7-19)	4.1

* after passing preliminary examination

** after passing general examination

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

Rapid progress in biotechnology, in the sequencing of the human genome, in the publication of large scale genetic association studies of common, complex diseases, and in elucidating and modifying gene expression has generated high hopes of finding new ways to prevent and treat human diseases. However, this scientific revolution has also raised fears about the premature application of such technologies and the level of knowledge about genetics in public health and clinical settings. Some genetic innovations – for example, BRCA testing to identify women at increased risk for inherited breast and ovarian cancer – have been introduced effectively into the healthcare system, with an appropriate evidence base and practice guidelines. Other innovations are being promoted, at times without robust evidence to support their use; examples include the screening of patients at risk for type 2 diabetes by testing for variants in the TCF7L2 gene, and the use of gene chips (microarrays) in pharmacogenetics (e.g. Warfarin dosing). In addition, we are seeing the rise of direct to consumer genetic testing for conditions ranging from obesity to Alzheimer's disease, often with marketing messages that imply health benefits that are as yet unproven. Not only have many expressed concerns about the inappropriate use of genetic technologies, there is also growing concern that results from these or other tests may be mishandled or misused. Enactment of the Genetic Information Nondiscrimination Act of 2008 (GINA), which aims to protect the privacy of personal genetic information and to prevent its misuse by health insurance companies and employers, demonstrates the national recognition of the potential misuse of genomic information.

However, many scientific and social 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 public health genetics. Ethical issues, health care economics and policy priorities, risks of discrimination in employment and insurance, and complex psychological aspects with families are crucial dimensions in this new field of study.

The aim of the IPHG program is to bring together the public health sciences (epidemiology, environmental health, biostatistics, health services, outcomes, and cost-effectiveness research) and the basic sciences (including human genetics, molecular genetics, genomics, and biotechnology), with ethics and law, and social sciences, to train individuals with the necessary knowledge and skills to examine genetic advances in the context of public health.

The graduate degrees offered by the IPHG address the need for professionals to be trained to contribute to research in public health genetics in both public institutions and the private sector, to participate in public and professional education, and lead in the development of public health policies and infrastructure related to public health genetics. Evidence of this national need is found in:

- Public funding research initiatives relevant to PHG: Examples include the development of cancer family registries and a Cancer Genetics Network (National Cancer Institute); recent “requests for applications” (RFAs) for study of the gene/environment interaction (including the Genes and Environment Initiative (GEI) sponsored by several NIH institutes), pharmacogenetics (National Institute for General Medical Sciences and other NIH agencies), and assessment of genetic tests (Centers for Disease Control and Prevention); the Ethical, Legal and Social Implications (ELSI) research program within the Human Genome Project (National Human Genome Research Institute (NHGRI)), including the initiative to establish NIH-funded Centers of Excellence in ELSI Research (one of the six funded Centers is at the University of Washington and has close ties to the IPHG).
- Establishment of a national office of public health genetics at the Center for Disease Control and Prevention (CDC) in Atlanta, now designated the National Office of Public Health Genomics (NOPHG). 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.
- Availability of a new fellowship in “Public Health Research and Practice,” co-sponsored by the American Society of Human Genetics” and NOPHG to “enhance current activities and develop new approaches in integrating genetics and genomics into public health policy and program at the national, state, and local levels.”
- A growing biotechnology industry and increasing importance in other industries of genetics research and social and policy questions related to genetics, particularly in the pharmaceutical industry.

Genetics is of increasing importance to the residents of 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:

- 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 health economics and epidemiology.

- Public health genetics is of concern to Washington State health professionals, as evidenced by sold out attendance at both the Summer Institute sponsored by the IPHG in Seattle in July 2000 and the “Learning to Live with the Human Genome,” a January 2001 conference co-sponsored by IPHG and several others, including the Office of the Insurance Commissioner, the State Supreme Court, the State Board of Health, the State Department of Health, the Department of Social and Health Services Division of Developmental Disabilities, and the UW Center for Ecogenetics and Environmental Health.
- 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.
- Washington State is home to several major research institutions and a growing biotechnology industry, with increasing commitments to genetic research.
- Washington State’s recent health insurance crisis, with the near collapse of the individual private health insurance market, is evidence of the fragility of this system. Genetic testing and screening could create another vulnerable population that would strain the state’s health insurance safety net, requiring thoughtful policy approaches.

Many students in the Public Health Genetics track of the UW MPH program participate directly in Washington State DOH programs through their practicum requirement, and several have taken positions at agencies within the DOH upon graduation. One of the Ph.D. graduates also currently works at the Newborn Screening Program of the DOH (See **Table 8**).

The IPHG at the University of Washington is in a unique position to provide trained professionals to address the research, teaching, and program management needs generated by growing genetics knowledge. Thus, the IPHG exemplifies one of the important values expressed by the UW Vision statement, “We foster creativity, challenge the boundaries of knowledge, and cultivate independence of mind through unique interdisciplinary partnerships.” Indeed, most of our graduates have taken positions that allow them to participate directly in research, educational, and policy initiatives that address scientific and public concerns related to genomic innovation. No other program in the US provides graduate degrees in public health genetics, although others are under development at other universities. These degrees contribute to the development of a public health workforce with genetics expertise, but do not provide sufficient education to prepare students for independent academic or research careers, or high level managerial positions within a public health infrastructure. The additional training provided by the Ph.D. program offers students substantive research skills as well as knowledge of genetics and its implications for public health practice and policy. An important component of the Ph.D. training program is its interdisciplinary nature, providing graduates with excellent preparation for participation in programs that must address both the social and the scientific implications of new genetic information. This dual expertise is particularly important because of the changes in clinical and public health practice that will follow the rapid growth in genetic knowledge and the resulting need for rational, theory-based evaluations. Although our experience is still relatively limited, our graduates have been successful in competitive searches for fellowship and other positions, indicating the value of the training they receive.

The IPHG is also important to the UW School of Public Health, and reflects the current values of the school, “Creativity and interdisciplinary approaches in solving local, national, and global public health problems.” A recent 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 IPHG provides precisely this training, and is the national leader among schools of public health in developing such a curriculum. In addition to the graduate degrees offered by the IPHG, the courses developed by the IPHG faculty to meet this educational goal are well attended by graduate students from many different UW graduate programs. As shown in **Table C3 in Appendix C**, nearly 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 IPHG educational programs provide a unique and valuable resource to the School of Public Health.

Finally, the growing importance of Public Health Genetics from an international perspective is reflected in the following developments:

- 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. This initiative includes the GE³LS (Genomics and Ethical, Environmental, Economic, Legal and Social Issues) section, and several IPHG faculty members have been involved in these projects.
- Launching of the Public Health Genomics European Network (PHGEN) by the European Union, a new project to ensure that as public health systems integrate advance in genetics, that the rights of individuals are protected.
- Creation of GrAPH-Int (Genome-based Research and Population Health International Network), a global collaboration of individuals and organization with an interest in public health genomics that supports dialogue, research, education and training, communication, and stakeholder engagement.
- 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 Center for Public Health Genomics at Erasmus University Medical Center in Rotterdam, the Netherlands, including plans to create and MPH track in Public Health Genomics.

SECTION IV: DIVERSITY

Of the 20 students who have enrolled in the Ph.D. program, 1 is African American, 1 is Hispanic and 3 are Asian American, for a total of 5 students who are non-white (25%), (**Table 13**). Of the 20 enrollees, 14 (70%) are female. Because the Ph.D. program is small, we also present diversity data for the MPH and Ph.D. programs combined (**Table 14**). Approximately 9% of these students are non-white and the majority of students are female.

Table 13. Ethnic Group and Gender of Ph.D. 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	6	6	2	2	0	4	20 (100.0)
<i>Ethnic Group</i>							
White	4	4	1	2	0	4	15 (75.0)
African American	1	0	0	0	0	0	1 (5.0)
Hispanic	0	0	1	0	0	0	1 (5.0)
Asian American	1	2	0	0	0	0	3 (15.0)
<i>Gender</i>							
Female	5	3	2	2	0	2	14 (70.0)
Male	1	3	0	0	0	2	6 (30.0)

Table 14. Ethnic Group and Gender of MPH and Ph.D. 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	13	11	4	12	5	11	56 (100.0)
<i>Ethnic Group</i>							
White	11	8	2	11	5	8	45 (80.4)
African American	1	1	0	1	0	0	3 (5.4)
Hispanic	0	0	1	0	0	1	2 (3.4)
Asian American	1	2	1	0	0	2	6 (10.7)
<i>Gender</i>							
Female	10	7	4	11	5	8	45 (80.4)
Male	3	4	0	1	0	3	11 (19.6)

Whenever an underrepresented minority applicant is admitted the program, the faculty and staff of the IPHG make personal contact with the student, and the IPHG often assists in funding a visit to the UW. These prospective students are encouraged to attend GO-MAP events, and meet continuing IPHG students during their visits. These efforts have resulted in recruiting have resulted in one Hispanic and one African American student into the program. However, an important component of our strategic plan will be to initiate a targeted outreach to potential applicants from diverse backgrounds, with the goal of expanding diversity in the trainee pool beyond our current levels (see **Section VII**).

Each year, the IPHG submits a diversity plan to GO-MAP in the Graduate School. During the 2006-2007 academic year, the IPHG was awarded a GO-MAP RA position that was given to an African American student in the MPH program. The second year of her training was funded by the IPHG and she graduated from the program in the summer of 2008. The Hispanic student in the Ph.D. program is supported by a RA position in the UW Center for Genomics and Health Care Equality (Wylie Burke, PI, funded by NHGRI). She has passed the preliminary examination and is currently forming her dissertation supervisory committee.

SECTION V: RESEARCH AND CREATIVITY

An important component of the IPHG is leveraging the resources provided to the institute by facilitating research and policy development in the emerging field of public health genetics. The following programs and faculty accomplishments illustrate that the IPHG continues to be highly successful in fulfilling this goal.

Secretary's Advisory Committee on Genetics, Health and Society (SACGHS)

Dr. Barbara Burns McGrath, APC member, is currently serving on this committee and is chair of the task force, "Genetics Education and Training." SACGHS was chartered in 2002 by the Secretary of the U.S. Department of Health and Human Services as a public forum for deliberation on the broad range of policy issues raised by the development and use of genetic tests and to provide advice on these issues. SACGHS consists of 17 members from around the country who have expertise in the disciplines relevant to genetics and genetic technologies. Dr. McGrath's membership on the committee illustrates the active involvement of IPHG faculty in national policy development, as well as providing a means for informing the students and faculty of the IPHG about the latest developments and issues under debate.

UW Center for Genomics & Healthcare Equality (CGHE)

Dr. Wylie Burke (Medical History and Ethics) is principal investigator and Dr. Patricia Kuszler (School of Law), is co-principal investigator of this center. Both are IPHG core faculty members. The center is funded by the National Human Genome Research Institute (NHGRI) and the National Institute for Child Health and Human Development, and is one of six Centers of Excellence in Ethical, Legal, and Social Implications (ELSI) Research nationwide. The Center is dedicated to addressing two overarching themes accompanying the clinical integration of genomics: the need to define criteria that lead to clinically and socially appropriate applications of genomic health care; and the need for a translational pathway that incorporates the goal of reducing health and health care disparities among the medically underserved. The specific aims of the Center are to:

1. Identify strategies for assessing the clinical utility of a range of different genomic applications to health care.
2. Assess the implications of different genomic health care applications for medically underserved populations.
3. Based on these efforts, describe policy options for the clinical integration of genomics into health care, and their implications for addressing health and health care disparities.
4. Engage ELSI researchers and genetic scientists in on-going conversations about the interacting contributions of the environment, social structural factors, and genetics to health outcomes.
5. Provide training opportunities to encourage the participation of researchers from underrepresented minorities in the Center's research agenda and other ELSI research.
6. Stimulate collaborative partnerships that result in additional funded research addressing these and related questions.

In addition to Drs. Burke and Kuszler, key personnel on the project include several other IPHG faculty members: Deborah Bowen, David Eaton, Karen Edwards, Kelly Fryer-Edwards, Malia Fullerton, Ken Thummel, Carolyn Watts. Importantly, this Center also supports three pre-doctoral IPHG students.

Ethical, Legal and Social Implication (ELSI) Core of the 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”, and 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.

This past year, the Ethical, Legal and Social Implications (ELSI) Core within the Center merged with the Outreach and Education Core. This expanded service and research core is directed by IPHG core faculty member Kelly Fryer-Edwards, and involves several other IPHG faculty members. The merger has brought more resources to the ethics education and research activities of the Core, and has embedded the Core more directly into the day-to-day missions of the Center. In addition, two IPHG graduate students are supported by RA-ships from the Core and participate as full team members by contributing to and leading specific outreach and research efforts. The goals of the ELSI Core are to:

- 1) Facilitate the development of research projects to identify and study the ethical, legal, social and policy implications of scientific advances in ecogenetics and environmental genomics, especially in relation to high frequency, low penetrance genetic polymorphisms.
- 2) Develop and implement education strategies and materials that address the ethical, legal, social and policy implications of ecogenetic research for several target audiences, including graduate students, CEEH Investigators and trainees, health professionals and community groups.
- 3) Provide a service to other Center Investigators by maintaining the existing CEEH "Registry for the Study of Genetic and Environmental Risk Factors" and provide consultation to Center Investigators on ethical, legal and policy issues, including informed consent, for genetic studies involving human subjects.

The ELSI/Outreach Core is continuing its focus on issues regarding decision-making under uncertainty, as this is a common theme within several ecogenetic studies. We are also working to build our education portfolio by adding more case studies and teaching modules, including providing introductory materials that could be used by a number of Center investigators.

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 Dr. Karen Edwards serving as PI. 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, 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 additional funding as part of a competitive renewal process in 2004. These two Centers are currently funded through 2009.

In addition to Dr. Edwards, several IPHG faculty members actively participate in the Center. Many IPHG students have been involved in the Center and several have completed their MPH practicum and/or thesis in affiliation with the Center.

American Society of Human Genetics

Dr. Wylie Burke, IPHG core faculty member, served as the President of this national society during 2007-2008. Her Presidential address to the society at its annual meeting in October 2007 was entitled, “Who is Under the Umbrella – and Why Are We Here?” As noted in section IIIC above, two IPHG students also presented posters at this meeting. In addition, Dr. Burke was elected to the Institute of Medicine in 2008.

Institute of Medicine

Dr. Burke, IPHG core faculty member, was elected to the Institute of Medicine (IOM) in 2008, and recently chaired the IOM Roundtable on Translating Genomic-Based Research for Health. Dr. Austin has served on two IOM committees related to public health genetics: Committee on Genomics and Public Health in the 21st Century (2004 –2005) and the Committee on Assessing Interactions Among Social, Behavioral, and Genetic Factors on Health (2005-2006).

The Greenwall Foundation

Anna Mastroianni, IPHG core faculty member, was a Faculty Scholar in Bioethics from 2002-2006. Her project was entitled “Ethics and Policy in the Genomic Era: Policy Gaps and Conflicts in the Use of Stem Cells, Embryos and Related Technologies.” Professor Mastroianni was on sabbatical during the 2007-2008 academic year and was a Visiting Scholar at the Treuman Katz Center for Pediatric Bioethics of Seattle Children’s Hospital during that time.

Charles I. Stone Professor of Law

In February, 2008, Dr. Patricia Kuszler, member of the APC and founding member of the IPHG, was installed as the Charles I. Stone Professor of Law at the UW. Dr. Kuszler is recognized internationally for her work on global health, human rights, bioethics, and health law. At her installation ceremony, she presented a lecture entitled “Genomic and Global Health: Promise or Peril?”

UW Graduate School

Dr. Melissa Austin served as Associate Dean for Academic Programs in the Graduate School from 2005 to 2007. During this time, she was responsible for the academic program review process for all graduate program at the UW; facilitating approvals of new graduate degrees, including working with the Washington State Higher Education Coordinating Board; coordinating the 13 interdisciplinary academic programs administered in the Graduate School; as well as assisting with graduate school policy development and coordinating meetings of the Graduate School Council.

UW Department of Pharmaceutics

Dr. Kenneth Thummel, Deputy Director of the IPHG, was named Chair of the Department of Pharmaceutics in the School of Pharmacy in 2006. Working with IPHG faculty member Karen Edwards, Dr. Thummel received NIH funding for a grant to identify genetic risk factors for drug-

induced renal toxicity in liver transplant patients. This project, with significant input from Wylie Burke and the CGHE as well as the University of Washington ITHS, will form the foundation of a larger multi-disciplinary UO1 grant proposal to investigate genetics and drug safety in rural and underserved communities of the Northwest.

Risk Benefit Framework for Genetics Tests Grant

In collaboration with other IPHG faculty members, Dr. David Veenstra, IPHG Auxiliary Faculty Member, recently received this research grant from Centers for Disease Control (CDC) Office Genomics and Disease Prevention. The overall goal of this project is to develop a formal clinical risk-benefit framework to facilitate the translational pathway for genomic technologies using three case studies.

Media Coverage of Genetics: Impact on Public Attitudes and Behaviors

In collaboration with Dr. Patricia Moy from the UW School of Communication, Dr. Carolyn Watts has submitted this grant proposal to the Ford Foundation to study the way in which the media frames genetics issues, and the impact of media coverage on peoples' interest in participating genetics research and in having clinical genetic tests.

Genome Canada

Genome Canada is a non-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. Several IPHG faculty members have been involved in the GE³LS (Genomics and Ethical, Environmental, Economic, Legal and Social Issues) section of Genome Canada. Dr. Melissa Austin chairs the Scientific Advisory Board for the Genome Quebec Project, Genomics and Public Health: Building Public "Goods" and Drs. Carolyn Watts and Malia Fullerton served as reviewers for the 2007 grant competition for GE³LS. Most recently, Drs. Austin and Burke met with representatives from the Public Health Agency of Canada, the University of Ottawa and the University of British Columbia to discuss a potential cross-border education collaboration in public health genomics.

SECTION VI: COLLABORATIONS AND INTERDISCIPLINARITY

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

As described in **Section IIA**, the faculty of the IPHG is 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 Ph.D. program in Public Health Genetics (**Section IIID**). Overall, the IPHG faculty has remained involved in the program during the past 10 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 Ph.D. student themselves, and their dissertation projects and publications (**Tables 8 and 10 and Appendix L**), illustrate the success of this rigorous, interdisciplinary graduate program, and the contributions the students make to a wide range of research projects across the UW.

SECTION VII: FUTURE DIRECTIONS AND STRATEGIC PLANNING

Although the IPHG faculty strongly believes that we have been very successful in establishing the Ph.D. program, we recognize that now, at the 10-year anniversary of the IPHG, is the time to be looking forward with the development of a strategic plan for the Institute. In particular, we plan to develop a strategy that ensures not just the viability and long-term success of the program, but its preeminence as the top Public Health Genetics 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, and the ongoing challenges facing interdisciplinary programs at the UW (See **Appendix M**). Nonetheless, we have identified a number of programmatic changes that could form the framework of a strategic plan. These include:

- Improve the Ph.D. curriculum, beginning with an update of learning objectives. This is already in progress, including linking learning objectives with degree milestones, but plans need to be developed that permit continuous assessment of our academic outcomes with input from the various stakeholders, including the faculty, the current student body, alumni, employers of our graduates, and health professionals likely to be impacted by the contributions of the program.
- Sustain enrollment in the Ph.D. program at current levels by ensuring its relevance and expanding RA funding opportunities for the trainees. With regard to the latter objective, one effort currently underway is to establish a multi-disciplinary Training Grant from the Burroughs-Wellcome Foundation through collaborations with the departments of Biostatistics, Medical Genetics, and Genome Sciences at the UW. A more long-term goal would be to establish a NIH-funded Training Grant in Public Health Genetics that is led and administered by the IPHG.
- Sustain enrollment in the MPH program, and maximize integration of its curriculum with the doctoral program, such that it can continue to serve as a feeder of high quality doctoral candidates and permit leveraging of limited IPHG educational resources.
- Initiate a targeted outreach to potential applicants from diverse backgrounds, with the goal of expanding diversity in the trainee pool beyond our current level (10% under-represented minorities), which is similar to the University average (8.3% for graduate and professional programs).
- Establish an alumni advisory board that would provide critical guidance as to the relevance and quality of the training we provide in preparing graduates for their ultimate careers. Input from such a board would also contribute to the overall internal program assessment process. In addition, creation of a special website alumni link could permit broader input from the entire alumni pool on a continuing basis and also serve as a place for advertising IPHG events that the alumni would be welcomed to attend.
- Develop a plan to ensure the retention of IPHG faculty and their involvement in the program. This plan would consider the allocation of and compensation for faculty effort, faculty promotion (particularly tenure review) and peer recognition for IPHG contributions.
- Expand IPHG faculty development opportunities related to the mission of the IPHG program, with emphasis on those areas outside of an individual's core expertise. This could include faculty attending conferences outside his/her own area of expertise, but within the "core knowledge areas" of the program. Again, creating an independent financial resource to

support such activities may be critical to its success. Another possibility is to systematically perform peer review of courses by faculty with expertise in a different area than the course content.

- Continue to leverage extramural resources that can benefit the University and the IPHG program. This includes facilitating the development and funding of extra-mural interdisciplinary grants that can provide support for IPHG trainees and educational innovation, in addition to the primary research objectives.
- Establish a development staff and fundraising plan to garner support from extramural donors for our training and research programs. Such an effort would likely focus on seeking funds for student fellowships first. Enabling this effort should be a plan to increase the visibility of the program, as discussed below.
- Raising program visibility in the university, local community, nationally, and internationally. This could be achieved in part by ensuring that the interdisciplinary faculty and trainees have opportunities to present IPHG-relevant research at what might be for them “non-traditional” meetings. Such an effort could be created with a special travel fund supported by external donations. In addition, we should develop a continuing education program for the broader public health and lay communities that disseminates our unique but critical perspective of ethical, legal, social, scientific and economic issues that will impact the uptake and integration of genetic research in health care. This effort could also include expansion of courses and a certificate program that targets faculty, fellows and visiting scientists at the University.

These general goals were endorsed by the IPHG Advisory Board meeting in October 2008. During the next few months, the IPHG faculty will be discussing each of them in detail, will set priorities, and will then develop a specific plan for their implementation. As with curriculum revisions to date, IPHG students will also be actively involved in this process, and will provide important perspectives on the goals for the next 5 to 10 years of the program. Most importantly, the IPHG will continue to “foster creativity, challenge the boundaries of knowledge, and cultivate independence of mind through unique interdisciplinary partnerships,” as expressed in the UW vision statement.