

Review of the University of Washington PhD Program in Public Health Genetics

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More than ten years after the creation of the Public Health Genetics program at the University of Washington (and the creation of the CDC Office of Public Health Genomics), the multidisciplinary field of public health genomics is poised to move forward with scientific rigor and new methods and approaches. The public health community owes a great deal to the UW PHG program and its unique doctoral program.

My review consists of two parts. The first is an evaluation of the program as it has evolved over the past few years and to where it is today. The second part consists of needs and next steps for the program to consider in planning for the next decade

I. Current status of the UW PhD program in PHG

a. Training in PHG is urgently needed

Only a few years after the completion of the human genome project, we are now witnessing an acceleration of gene discoveries for a wide variety of common human diseases of public health significance- from chronic diseases such as cancer and diabetes to disease causes by environmental and infectious etiologies. The implications of these discoveries for public health and disease prevention at the population level are largely unexplored. The UW PhD program is needed more than ever to develop and produce young talented individuals who can become the next generation of public health leaders that show us in science, policies and actions how to use genome-based information appropriately and ethical for the benefit of population health. While there exists dozens if not hundreds of scientific professionals specializing in basic genomic sciences, we hardly have enough qualified that can address the population aspects of gene discoveries in the context of policy, ethics and law. Certainly, at the CDC as the primary national public health agency in the US, we are constantly on the lookout for such individuals that can be placed in federal, state, local, academic as well as private sector positions.

b. The UW PhD Program in PHG is truly unique

It is no exaggeration to state that the UW program has no peer, nationally or internationally. While several public health schools have begun integrating genomics into their curricula, only a handful have special emphasis on PHG and none have PhD programs in this area. European institutions such as Erasmus University in Rotterdam have begun developing their own programs but only recently. So it is fair to say that the UW program has blazed a new trail. It has no peers. Not only it developed organically with the talent of its faculty and students but it has also helped defined what PHG is. This is exemplified by the Bellagio conference statement in 2006 (co-chaired by myself, Wylie Burke and Ron Zimmern from the UK). The statement came from a multidisciplinary international working group that defined the

scope and activities of PHG. As far as I know, this is the only international document on PHG and it shows clearly the leadership role of the UW program.

c. The UW program has superb and internationally known faculty

The calibers of the faculty involved in the PHG PhD program as well as their engagement in the program are truly outstanding. The director of the program, Dr Melissa Austin, has done an admirable job in spearheading the developmental efforts, as well as in maintaining, growing and managing its day to day operations. Other involved faculty members are impressive. Not only are they accomplished professionals and academicians in their own fields, they have worked very hard to create the bridges across the various fields and creating courses and teaching modules that are challenging and academically rigorous. The amount of recognition that the faculty has achieved both nationally and internationally is truly remarkable. The number and depths of “centers” at UW involved in genomics is impressive. It reflects the ability of faculty to obtain collaborative funding that crosses boundaries of departments. I sit on several national committees on genetics and health care. There is always one of the UW PHG faculty members at the table. For example, the HHS Secretary’s Advisory Committee on Genetics, Health and Society (SACGHS) includes Barbara McGrath on it. She has been leading the charge in reviewing and developing genomics competencies and training for public health professionals. The other example is the IOM roundtable on translating genomics for health which is chaired by Wylie Burke. Karen Edwards is part of the stakeholder group for the evaluation of genomic applications in practice and prevention (EGAPP). Internationally, the UW program including Wylie Burke, Melissa Austin and Karen Edwards all have been active in the formation and development of an international network on public health genetics, the Genome-based Research and Population Health International Network (GRAPH Int). A byproduct of GRAPHInt leadership has been the launching of a new journal (Public Health Genomics as the continuation of an old journal called Community Genetics). Again, UW faculty members have senior editorial board roles and leaderships.

d. The PhG program is truly interdisciplinary

A distinguishing feature of the PhG PhD program at UW is its interdisciplinarity. Because the PHG enterprise relies on the confluence and synergy of multiple disciplines, the program was designed at the outset to include and nurture the interdisciplinarity that many academic programs try to implement but often difficult to achieve. An example of how this interdisciplinarity has been put in action is through the dissertation topics for all PhD students in PHG. All students are co-mentored by two advisors from different disciplines. In addition, each thesis has multiple projects from different disciplines and pre-proposal forums with wide audience participation and input. The prelim exams are truly interdisciplinary in nature with questions that challenges students and faculty alike.

e. The quality of PHG training is remarkable

In my 10 years of doing PHG work at the CDC, I have not seen a richer array of course offerings (17 new courses) in public health offered to students anywhere. At UW, these courses are so popular even with students outside the PHG program. The courses seem to be very well rated and accepted by the students. They cover the gamut of the disciplines involved in PHG and also the interdisciplinary synergy that occurs.

f. The PHG PhD students are strong and academically diverse

Not unexpectedly, the high caliber and diversity of the PhD students enrolled in this program are remarkable. This is reflected in the variety of dissertation topics chosen by the students and by the

various angles of knowledge applied to the topics, almost always with an eye towards policy, ethics and societal implications.

II. Needs and opportunities for the next decade

As the UW PHG PhD program continues to evolve and mature over the next few years, I would like to offer a few comments and suggestions on points to consider. First, I applaud the program for embarking on a strategic planning effort. This is really an important time in the history of genomic medicine and its emphasis on personalized healthcare. I think the “population” aspects of all the new gene discoveries tend to be overlooked. I think the UW program is in a unique position to train the next generation of leaders in the field. These leaders will explore the policy and societal implications of genome-based information and knowledge. They will be able to show us the way of what is appropriate integration of these new tools in medical practice. The importance and timeliness of this cannot be overemphasized. With a deep economic downturn and spiraling health care costs and continued inequities in population health and health care, we need appropriately trained leaders who can not only ask the tough questions, but also develop methods and approaches to answer them.

a. From interdisciplinarity to transdisciplinarity

Recently, there has been a growing emphasis on “team science”. A recent workshop on team science sponsored by the NCI led to a series of articles published in 2008 in the American Journal of Preventive Medicine (supplement). In this supplement, the authors and workshop organizers emphasized that new knowledge can emerge from the interaction and participation of researchers from multiple scientific disciplines working together in a “trans-disciplinary” fashion. They use the example of smoking and nicotine dependence to illustrate the point. They also compare and contrast terms like interdisciplinarity, multidisciplinary and transdisciplinarity. As you all embark on strategic planning, the program is in a unique position to implement what others only talk about and recommend doing. The talent pool in the PHG faculty at UW is deep enough to allow for this evolution to occur. This could lead to breakthrough research and genomic discoveries that are in the context of gene-environment, gene-cultural, gene-behavior and gene-social interactions. These types of studies call for hybrid designs with multiple fields pitching in. The need for transdisciplinary research in genomics was also discussed in an IOM 2006 report on gene-environment interaction. An enhanced emphasis on gene-environment interaction is needed with a broad definition of genes and environment using a life span approach with multiple disciplines working together to develop new knowledge and new insights.

b. Increased emphasis on knowledge synthesis and integration

One of the most important functions of public health genomics as expanded on by the Bellagio statement (2006) is ‘knowledge synthesis or integration’ within and across disciplines as a key tool to be used for policy, research and practice. In addition to primary disciplinary and transdisciplinary research, practitioners of PHG need to be able to synthesize the knowledge base of genome-based information within their own disciplines (e.g. genetic associations) or across disciplines. I did not see much emphasis in the PhD program on knowledge synthesis and integration. Certainly, developing and applying methods for meta analysis and systematic reviews can lead to evidence based policies and recommendations. This is one of the most important needs we have at the national policy level in healthcare and population health. Namely, we need systematic quantitative and qualitative methods to assess what genome-based tools bring to the table in terms of its value, or added value, especially in the context of traditional approaches to disease prevention and healthcare, that essentially use very little if any genetic information. This is important for the fulfillment of the dreams and promise of personalize

health and healthcare. But it will not occur without a cadre of trained individuals who can not only summarize the literature in a descriptive fashion, but provides approaches to modeling and analyses that integrate disparate types of data into decision analytic frameworks for medicine and public health. This emphasis can occur both in courses and case base study learning as well as deployed as part of PhD dissertation projects.

c. Increased focus on genomic translation research

Here I use the term “translation” in a broad sense to imply the full continuum of translation, not only from the bench to the bedside but also to the development of guidelines, implementation into practice as well evaluating outcomes in practice based settings and at the population level. Although in genomics, there has been little so far to “translate”, we truly need the UW program to develop a new cadre of professionals who are versed with the full scope of translation and the necessary evidentiary, policy, ethical and legal frameworks to move from one phase of translation to another. Although recognize the non-linearity of translation, I think it is important for a training program such as UW to recognize the phases, develop methods and approaches that help transitions from research to practice. Development of approaches and methods in health services research, dissemination and implementation research as well as outcomes research and public health surveillance are sorely needed. Above all, we need a new cadre of professionals who can provide training and technical assistance to the clinical, public health and policy communities.

d. Suggestions for refinements of curriculum and mentoring

Given the ideas presented in a through c, the UW PHD program may consider integrating these concepts into existing courses and curricula or even develop new ones whenever they are needed. For example, I can see increased emphasis on statistical methods, not only for gene discovery, but also those that are needed to use genetic information for risk prediction, risk stratification and clinical prediction. One of the important unresolved issues for years to come is the evaluation of added value of genetic risk stratification and personalization of treatments and prevention strategies compared to a non-stratified approach. New methods of analyses are emerging that borrow from clinical epidemiology (modeling risk, area under the curve, reclassification etc...) that should be considered in any formal training as well as part of dissertation topics for students. In addition, decision analysis methods including cost-effectiveness, which already in use by the program, may need to be emphasized even more in the next few years. Also, formal methods of evidence-based medicine including systematic reviews and meta analyses and approaches such as used by the EGAPP working group and the US Preventive Services Task force will need to be emphasized. People trained in such methods of knowledge synthesis and integration are highly needed right now and in the years to come, especially in the context of health care reform and public health practice. I also encourage the UW program to seek more training grants and establish stronger connections with faculty from other universities. An active exchange program can foster collaboration, both national and international, not only among faculty but students as well, who are going to be the leaders of PHG in the next generation. Although formally not part of this review per se other avenues for cross fertilization can be explored like summer programs in public health genomics and a postdoctoral program in the field.

In summary, the UW PhD program in public health genetics is unique and highly successful. The suggestions above could be viewed in the context of an emerging and evolving field. Continuous refinements in the program may be needed and opportunities for additional funding explored. I have no doubt that the ultimate success of the genomics “revolution” will depend to a great extent, not only on the scientific discoveries that are made in the laboratories, but on a “population” approach to use such

discoveries for the benefits of all members of society. For that to happen, the UW program is an asset for training and producing highly qualified people that can work at the intersection of disciplines, and provide the needed tools, methods and analyses that show us the ultimate utility of genetics and genomics in population health.