



TOPIC: University of Maryland, College Park: Ph.D. and M.S. in Environmental Health Sciences

COMMITTEE: Education Policy and Student Life

DATE OF COMMITTEE MEETING: Tuesday, January 17, 2017

SUMMARY: The School of Public Health proposes to offer a new doctoral program in Environmental Health Sciences that would be overseen by the faculty of the Maryland Institute for Applied Environmental Health (MIAEH). The degree will have foci that are consistent with the areas of expertise of the MIAEH faculty, i.e., human health, environmental epidemiology, risk assessment, environmental justice, and occupational health.

The proposed curriculum would prepare students to become experts in areas including exposure assessment, environmental epidemiology, environmental microbiology, children's environmental health, environmental justice, occupational health, and risk assessment.

This proposal includes the creation of a M.S. in Environmental Health Sciences. Students will not be actively recruited or admitted into the M.S. program; it will be offered as an exit path for doctoral candidates who cannot or choose not to complete the Ph.D., or to those students who successfully complete the requirements and opt to obtain the additional credential. Program requirements for the M.S. degree include a minimum of 31 course credits, including completion of either a non-thesis project or M.S. thesis.

The only Ph.D. program in Environmental Health Sciences within the State is offered by Johns Hopkins University. The UMD School of Public Health's unique focus areas in environmental justice, cumulative burden of exposure, water re-use innovations (USDA-funded CONSERVE Center of Excellence), and climate change consequences on health will continue to distinguish UMD from peer schools to ensure strong recruitment of top-quality students.

ALTERNATIVE(S): The Regents may not approve the program or may request further information.

FISCAL IMPACT: No additional funds are required. The program can be supported by the projected tuition and fees revenue.

CHANCELLOR'S RECOMMENDATION: That the Committee on Education Policy and Student Life recommend that the Board of Regents approve the proposal from University of Maryland, College Park to offer the Ph.D. and M.S. in Environmental Health Sciences.

COMMITTEE RECOMMENDATION: Approval

DATE: January 17, 2017

BOARD ACTION:

DATE:

SUBMITTED BY: Joann A. Boughman

301-445-1992

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UNIVERSITY SYSTEM OF MARYLAND INSTITUTION PROPOSAL FOR

- New Instructional Program
- Substantial Expansion/Major Modification
- Cooperative Degree Program
- Within Existing Resources, or
- Requiring New Resources

University of Maryland College Park

Institution Submitting Proposal

Environmental Health Sciences

Title of Proposed Program

Ph.D. and M.S.

Award to be Offered

Fall 2017

Projected Implementation Date

Proposed HEGIS Code

School of Public Health

Department in which program will be located

44.0501

Proposed CIP Code

Stephen M. Roth

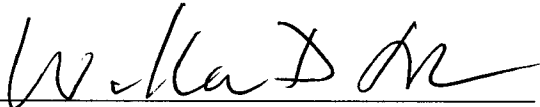
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Signature of President or Designee

December 19, 2016

Date

A. Centrality to the University's Mission and Planning Priorities;

As the flagship campus of the University System of Maryland, and the original 1862 land-grant institution in the State, the University of Maryland, College Park (UMD) has a mission to provide excellent teaching, research, and service to nourish a climate of intellectual growth and provide outstanding instruction in a broad range of academic disciplines and interdisciplinary fields. UMD has as a primary goal to provide knowledge-based programs and services that are responsive to the needs of the citizens across the state and throughout the nation. Education and training of doctoral students who can become the next generation of educators and research leaders is central to this mission. In response to this call, the UMD School of Public Health proposes to offer a new doctoral program in Environmental Health Sciences, overseen by the faculty of the Maryland Institute for Applied Environmental Health (MIAEH). The degree will focus on human health, environmental epidemiology, risk assessment, environmental justice, and occupational health, consistent with the areas of expertise of the MIAEH faculty.

MIAEH was established in 2006 with a mission to carry out research on a broad range of environmental factors and their effects on human health. Faculty members in MIAEH collaborate with state, federal, international and private agencies to develop research solutions that address pressing environmental and occupational health problems. Students will become experts in areas including exposure assessment, environmental epidemiology, environmental microbiology, children's environmental health, environmental justice, occupational health, and risk assessment. They will also obtain a broad appreciation of public health as required for students graduating from a School of Public Health accredited by the Council on Education in Public Health.

MIAEH currently offers students flexible and individualized programs of study that lead to the Master of Public Health in Environmental Health Sciences. In 2010, MIAEH also became the UMD home of the USM-wide doctoral program in Toxicology. Because toxicology is the focus area of only a small minority of our faculty, student recruitment has been challenging: students are reluctant to be perceived as toxicologists when they are training and developing research foci within other areas of environmental health science. Thus, in order to better support the training of doctoral students and provide a better alignment of career aspirations with faculty expertise, we are proposing a new Ph.D. program better matched to the full range of research within MIAEH. As a result of the existing MPH program, and the anticipated transition of doctoral students from the Toxicology Ph.D. to this new program, MIAEH's existing resources are sufficient to launch the Ph.D. in Environmental Health Sciences.

B. Adequacy of Curriculum Design and Delivery;

The degree requirements are in Appendix A. The doctoral program consists of a minimum of 46 credit hours of graduate courses, depending on the incoming student's previous coursework. Elective courses and rotations with faculty field studies and laboratories will offer students the knowledge and skills needed to specialize within the broader area of environmental health and become independent researchers. Students who enter the program without an MPH degree will require additional coursework as required by the public health accrediting body (CEPH). Graduate courses include (1) core courses within environmental health, epidemiology and biostatistics; (2) supporting courses in environmental health research, ethics, public health, and grant writing; (3) specialized courses selected within the research foci; and (4) dissertation credits. Program requirements for a Ph.D. degree also include successful completion of a written and oral comprehensive exam, oral defense of a written dissertation research proposal, and a minimum of 12 credits of Ph.D. dissertation research, written dissertation, and a final dissertation defense. The program can be completed on either a full- or part time basis. Students will be able to customize their selection of courses and lab rotations based on their

specific career objectives. They will file a preliminary program of study with the graduate program director before registering for their first semester of classes, and then submit an amended, final plan of study before the start of their second semester, approved by a program committee.

All students will complete comprehensive written and oral qualifying examinations overseen by a committee of graduate faculty, of whom the majority of members will be from within MIAEH. After passing the qualifying examinations, the student will be advanced to candidacy. Generally, the examining committee will serve as the dissertation committee. The candidate will then write a dissertation research proposal in consultation with the committee, submit the written proposal to the committee at least two weeks prior to a scheduled oral defense of the proposal, and finalize the proposal following the oral defense. The procedures for the dissertation defense and examining committee are as specified in the University of Maryland Graduate School Catalog.

Course descriptions, both existing courses and the one additional course that will be developed specifically for this degree program, are included in Appendix B.

This proposal includes the creation of an M.S. in Environmental Health Sciences. Students will not be actively recruited or admitted into the M.S. program; it will be offered as an exit path for doctoral candidates who cannot or choose not to complete the Ph.D., or to those students who successfully complete the requirements and opt to obtain the additional credential. Program requirements for the M.S. degree include a minimum of 31 course credits, including completion of either a non-thesis project or M.S. thesis. The curriculum for the M.S. program is also included in Appendix A.

Educational Objectives

Students in the doctoral program in Environmental Health Sciences will master an essential core of knowledge in environmental and occupational health, epidemiology and biostatistics. Program objectives are characterized by the following learning outcomes, with assessments tied to benchmarks along students' path through to completion. Outcomes will be evaluated as part of the campus-wide Graduate Outcomes Assessment process and will be used for continuous improvement of the curriculum.

Successful students will be able to:

1. Synthesize environmental health knowledge, including explaining and analyzing key theories, principles, methods and controversies, and identify opportunities to advance the field of environmental health.
2. Develop testable hypotheses that will advance the field of environmental health.
3. Design and conduct research studies, analyze data and test hypotheses that advance the science of environmental health.
4. Effectively communicate results of environmental health research to the scientific community.

C. Critical and Compelling Statewide Need;

Nearly every top 40 School of Public Health in the U.S. offers a doctoral program in Environmental Health Sciences, and the UMD School of Public Health will be strengthened with such a degree. Our

unique focus areas in environmental justice, cumulative burden of exposure, water re-use innovations (USDA-funded CONSERVE Center of Excellence), and climate change consequences on health will continue to distinguish UMD from peer schools to ensure strong recruitment of top-quality students.

Development of the environmental health workforce has been a key concern of the U.S. Department of Health and Human Services for many years. For example, the *Healthy People 2010* publication articulated the concern that public health infrastructure in several areas, including environmental health, was lacking and that workforce development opportunities need to be expanded. In particular for the present proposal, the Centers for Disease Control and Prevention (CDC) has noted the paucity of leaders in environmental health and raised the concern that impending retirements and vacancies will leave the environmental health leadership ranks severely understaffed (supporting documents and statements can be found at <http://www.cdc.gov/nceh/ehs/activities/training.htm>). As such, the development of a doctoral program in environmental health sciences at a public land-grant university will help support the workforce development needs of the field.

D. Market Supply and Demand;

See section C.

E. Reasonableness of Program Duplication, if any;

The only Ph.D. program in Environmental Health Sciences within the state of Maryland is offered by Johns Hopkins University, a private institution, with one of the largest programs in the U.S. (15-20 doctoral enrollments per year). The only other Environmental Health Sciences doctoral programs near the mid-Atlantic region are at the following locations (with enrollment data as determined from accreditation reports): West Virginia University (enrolled 2 students per year AY2013 and 2014); University of Pittsburgh (program size of 11 students in 2014); University of North Carolina (reports 5-10 enrolled students per year); and Rutgers University (enrolled 1-4 students per year in AY2013-15).

This degree program is also quite distinct from other environmental science-related Ph.D. programs offered by UMD and jointly with other USM institutions (e.g., graduate programs in Environmental Science and Technology and the system program in Marine, Estuarine and Environmental Sciences), which focus primarily on ecosystem health and environmental science.

Clarifying the differences between toxicology and environmental health sciences is important to understanding the basis for the present proposal. Environmental health is a branch of public health centered on all aspects of the natural and built environment that may affect human health. In contrast, toxicology is the study of the effect of chemicals and physical agents on living organisms. While there is overlap between the two fields (e.g., the study of chemical agents on human health), the research foci are quite different. Environmental health research includes environmental epidemiology, risk assessment, environmental justice, occupational health, among others, while toxicology has a stronger linkage with chemistry and pharmacology. As an example, the USM-administered Ph.D. in Toxicology has its largest student base from the UMB Schools of Pharmacy and Medicine with research primarily aligned with pharmacology faculty. Revising the Ph.D. in Toxicology would not serve the needs of environmental health students or faculty, nor would it serve UMB's needs; the fields are different, and students will anticipate different career options.

F. Relevance to Historically Black Institutions;

We do not believe the proposed program will impact the uniqueness, institutional identities, or missions of Maryland's Historically Black Institutions (HBI's).

G. Distance Education Program;

N/A

H. Adequacy of Faculty Resources;

Faculty will be drawn from throughout the School of Public Health but most specifically from the Maryland Institute for Applied Environmental Health, who will provide academic direction and program oversight, and who will serve as the primary research mentors for students in the program. Brief biographies of the MAIEH core faculty are included in Appendix D.

I. Adequacy of Library Resources;

The University of Maryland Libraries has conducted an assessment of library resources required for this program. The assessment concluded that the University Libraries are able to meet, with its current resources, the curricular and research needs of the program.

J. Adequacy of Physical Facilities, Infrastructure, and Instructional Resources;

Delivery of this program will require modest classroom utilization in existing buildings and laboratory research space that is already assigned to MAIEH faculty. Classes will be folded into our regular scheduling process.

K. Adequacy of financial resources;

See the resources and expenditures tables. MIAEH has sufficient faculty to teach the required courses and advise doctoral candidates, and students are expected to transition from the existing Toxicology program into this new program over time. Thus, no new resources are requested. There is only one new course, MIEH 700, in the proposed curriculum. MIEH 700 will be offered every 2-3 semesters as needed to ensure student progress to degree completion. Any member of the MIAEH graduate faculty would be able to teach this course, and a rotation of instructors is anticipated. The other required courses are part of the existing curriculum for the Master of Public Health degree. Because the overall enrollment in the Ph.D. program is expected to be small (a maximum of 15 students per year), no significant changes in enrollments in the remaining courses is anticipated.

L. Adequacy of Program evaluation;

Program Review is monitored following the guidelines of the campus-wide cycle of Graduate Outcomes Assessment (<https://www.irpa.umd.edu/Assessment/LOA.html>). As syllabi and details of the curriculum are developed, this program will be integrated into UMD's GOA cycle of review. Formal program review is also carried out according to the University of Maryland's policy for Periodic Review of Academic Units, which includes a review of the academic programs offered by, and the research and administration of, the academic unit (<http://www.president.umd.edu/policies/2014-i-600a.html>). Faculty within the department are reviewed according to the University's Policy on Periodic Evaluation of Faculty Performance (<http://www.president.umd.edu/policies/2014-ii-120a.html>). Since 2005, the University has used an online course evaluation instrument that standardizes course evaluations across campus. The course evaluation has standard, university-wide questions and also allows for supplemental, specialized questions from the academic unit offering the course.

Finally, the University of Maryland School of Public Health programs are evaluated through its professional accreditation body, the Council on Education for Public Health (CEPH). The School was recently re-accredited for a seven year term, extending to December 31, 2022.

M. Consistency with Minority Student Achievement goals;

As stated in the University of Maryland’s Strategic Plan for Diversity and Inclusion, “the University of Maryland has embraced diversity as a central driver in all its activities and has supported and promoted pioneering scholarship of diversity in academic programs.” The Strategic Plan further states, “Our diversity is fundamental to our excellence and has enriched our intellectual community. The University’s capacity to educate students for work and life in the 21st century and to be a leader in research and scholarship is greatly enhanced by a community that reflects the nation and world.”

The MIAEH faculty are a diverse group (e.g., 50% women; 50% underrepresented minorities) committed to recruiting, retaining, and graduating a diverse student body. Many of the faculty focus their research efforts on issues that impact health disparities among minority groups. The faculty will use their networks of colleagues and professional organizations to ensure a diverse pool of applicants from which to recruit, retain, and graduate a diverse and excellent student body.

N. Relationship to Low Productivity Programs;

N/A

Estimated Resources and Expenditures

TABLE 1: RESOURCES	Year 1	Year 2	Year 3	Year 4	Year 5
1.Reallocated Funds	\$736,820	\$906,874	\$934,080	\$962,102	\$990,965
2. Tuition/Fee Revenue (c+g below)	\$121,115	\$124,748	\$128,491	\$132,346	\$136,316
a. #FT Students	13	13	13	13	13
b. Annual Tuition/Fee Rate	\$8,315	\$8,564	\$8,821	\$9,086	\$9,359
c. Annual FT Revenue (a x b)	\$108,095	\$111,338	\$114,678	\$118,118	\$121,662
d. # PT Students	2	2	2	2	2
e. Credit Hour Rate	\$651	\$671	\$691	\$711	\$733
f. Annual Credit Hours	10	10	10	10	10
g. Total Part Time Revenue (d x e x f)	\$13,020	\$13,411	\$13,813	\$14,227	\$14,654
3. Grants, Contracts, & Other External Sources	\$698,750	\$606,591	\$624,788	\$643,532	\$662,838
4. Other Sources	\$0	\$0	\$0	\$0	\$0
TOTAL (Add 1 - 4)	\$1,556,685	\$1,638,213	\$1,687,359	\$1,737,980	\$1,790,120

TABLE 2: EXPENDITURES	Year 1	Year 2	Year 3	Year 4	Year 5
1. Faculty (b+c below)	\$585,200	\$753,445	\$776,048	\$799,330	\$823,310
a. #FTE	4.0	5.0	5.0	5.0	5.0
b. Total Salary	\$440,000	\$566,500	\$583,495	\$601,000	\$619,030
c. Total Benefits	\$145,200	\$186,945	\$192,553	\$198,330	\$204,280
2. Admin. Staff (b+c below)	\$75,810	\$75,345	\$77,605	\$79,933	\$82,331
a. #FTE	1.0	1.0	1.0	1.0	1.0
b. Total Salary	\$57,000	\$56,650	\$58,350	\$60,100	\$61,903
c. Total Benefits	\$18,810	\$18,695	\$19,255	\$19,833	\$20,428
3.Total Support Staff (b+c below)	\$75,810	\$78,084	\$80,427	\$82,840	\$85,325
a. #FTE	1.0	1.0	1.0	1.0	1.0
b. Total Salary	\$57,000	\$58,710	\$60,471	\$62,285	\$64,154
c. Total Benefits	\$18,810	\$19,374	\$19,956	\$20,554	\$21,171
4. GA stipends	\$442,635	\$342,792	\$353,076	\$363,668	\$374,578
5. GA health benefits	\$135,000	\$139,050	\$143,222	\$147,518	\$151,944
5. Tuition Remission	\$121,115	\$124,748	\$128,491	\$132,346	\$136,316
6. Equipment	\$0	\$0	\$0	\$0	\$0
7. Library	\$0	\$0	\$0	\$0	\$0
8. New or Renovated Space	\$0	\$0	\$0	\$0	\$0
9. Other Expenses: Operational Expenses	\$0	\$0	\$0	\$0	\$0
TOTAL (Add 1 - 9)	\$1,435,570	\$1,513,464	\$1,558,868	\$1,605,634	\$1,653,804

Appendix A: Degree Requirements for the Ph.D. and M.S. in Environmental Health Sciences

Ph.D. Program in Environmental Health Sciences		
	Course Title	Credits
Core Courses <i>(24 Required Credits)*</i>	MIEH 600 Foundations of Environmental Health	3
	MIEH 700 Applied Environmental Health	3
	MIEH 720 Principles of Toxicology	3
	MIEH 740 Risk Assessment	3
	MIEH 771 Exposure Assessment of Environmental Hazards	3
	EPIB 610 Epidemiology I	3
	EPIB 650 Biostatistics I	3
	EPIB 651 Biostatistics II	3
Supporting Courses <i>(11 to 19 Required Credits)*</i>	MIEH 609 Methods in Toxicology and Environmental Health (1 or 2 rotations)**	3 to 6
	EPIB 641 Ethics in Public Health	1
	MIEH 688 Environmental Health Seminar**	3
	Course(s) that will expose the student to concepts in health behavior and health services administration (This could include HLTH 665, HLSA 601 or a survey course that covers all five foundation areas of public health.)	1 to 6
	KNES 771 Grant Writing or Equivalent	3
Specialization Area <i>(12 to 15 Credits)***</i>	<i>The specialization area would be created by and tailored to each student. If the student takes 2 lab rotations, s/he would take 12 credits of specialization. If s/he takes 1 lab rotation, s/he would take 15 credits of specialization.</i>	12 to 15
Dissertation <i>(12 Required Credits)</i>	MIEH 899 Doctoral Dissertation Research	12
* Students could waive out of some of these courses with coursework taken at UMD or in previous master's programs.		
** Students would not be able to waive out of all rotations or the seminar requirements. Rotations can be in physical labs or with faculty conducting non-laboratory based research. At least 1 rotation must be outside of the students focus area.		
***Students would not be able to waive out of any of the 12 to 15 credits required for the specialization area. No more than 6 credits of MIEH 898 could be taken as part of the specialization area.		

M.S. Program in Environmental Health Sciences		
	Course Title	Credits
Core Courses (18 Required Credits)	MIEH 600 Foundations of Environmental Health	3
	MIEH 720 Principles of Toxicology	3
	MIEH 740 Risk Assessment	3
	MIEH 771 Exposure Assessment of Environmental Hazards	3
	EPIB 610 Epidemiology I	3
	EPIB 650 Biostatistics I	3
	Supporting Courses (7 to 12 Required Credits)	MIEH 609 Methods in Toxicology and Environmental Health (1 rotation)*
EPIB 641 Ethics in Public Health		1
MIEH 688 Environmental Health Seminar		2
Course(s) that will expose the student to concepts in health behavior and health services administration (This could include HLTH 665, HLSA 601 or a survey course that covers all five foundation areas of public health.)		1 to 6
Students must select the Thesis or Non-Thesis Option:		
Non-Thesis Option (6 Required Credits)	MIEH 789 Independent Study (completion of a scholarly project)	3
	Elective course	3
OR		
Thesis (6 Required Credits)	MIEH 799 Masters Thesis Research	6
Total number of required credits		31

* Rotations can be in physical labs or with faculty conducting non-laboratory based research.

Appendix B: Ph.D. in Environmental Health Sciences -- Course Descriptions

Existing Courses

MIEH 720 Principles of Toxicology (3): Overview of toxicology, including exposure pathways, toxico-kinetics, dermal toxicants, carcinogens, and genetic, reproductive, immuno-, neuro-, target organs, complex mixtures, structure-activity analysis, and determinants of hypo- and hyper-susceptibility. Case studies of global national and regional interest.

MIEH 740 Environmental Health Risk Assessment (3): Review of the major methods of human and ecological risk assessment conducted by the U.S. Environment Protection Agency. Emphasis on sources of uncertainty.

MIEH 771 Exposure Assessment of Environmental Hazards (3): Approaches and methods for determining exposure to environmental contaminants. Biomonitoring and genetic methods to detect recent exposures. Optimizing exposure assessment.

EPIB 610 Foundations of Epidemiology (3): Introduction to the discipline of epidemiology and its applications to health issues and practices. Basic epidemiologic concepts and methods will be covered.

EPIB 650 Biostatistics I (3): Basic statistical concepts and procedures for Public Health. Focuses on applications, hands-on-experience, and interpretations of statistical findings.

EPIB 651 Biostatistics II (3): Introduction to a variety of statistical tools with applications in public health, including one- and two-sample inference, nonparametric methods, categorical data, ANOVA, simple and multiple regression.

MIEH 609 Methods in Toxicology and Environmental Health (3 to 6): This research-based rotation in toxicology and environmental health will provide doctoral students with the opportunity to work closely with one of the faculty researchers in the Maryland Institute for Applied Environmental Health (MIAEH) within the School of Public Health. Our research covers multiple fields within the environmental health sciences (e.g. environmental epidemiology, exposure science, risk assessment, environmental microbiology, environmental microbiology, environmental microbial genomics, food toxicology, airborne infection transmission, environmental justice, and children's environmental health) that involve either laboratory-based research or non-laboratory based studies. Students will not only gain invaluable research experience and interpersonal skills but also contribute to MIAEH's ongoing environmental health research programs.

EPIB 641 Ethics in Public Health (1): Overview and discussion of ethical issues that face public health practitioners and researchers.

MIEH 688 Environmental Health Seminar (3): Repeatable to 3 credits. Invited and in-house research presentations from guest scientists, faculty members, and students, and critical analysis of journal articles on current topics in environmental and occupational health.

KNES 771 Grant Writing (or equivalent) (3): Enhance continued professional development through an exploration of culture, climate, expectations, and mentoring in research I universities. Generate a grant application including the hypothesis, structure, specific aims, background and significance, and submission of a total grant. Grant process and product will be emphasized.

New Courses

MIEH 700 Applied Environmental Health (3): Advanced analysis of the chemical, physical and biological hazards present in our living and working environment and their effects on human health. A focus on analysis of recent research and development of new hypotheses. Topics include: exposure assessment, environmental justice, occupational health and safety, children's environmental health, ambient and indoor air pollution, food-borne diseases, solid and hazardous wastes, water resources, risk assessment, ecological issues and environmental laws.

Appendix C: Ph.D. in Environmental Health Sciences – Review of comparable programs

The proposed Ph.D. in Environmental Health Sciences offered through the University of Maryland, College Park and the Maryland Institute for Applied Environmental Health (MIAEH) is structured similarly to comparable degrees at similar institutions. For example:

Johns Hopkins University: The closest comparable degree at JHU is the Exposure Sciences Ph.D. program, which requires environmental health courses, a toxicology course, coursework in epidemiology and biostatistics, seminar, research-related and grant writing courses, and an ethics course. Beyond these required courses, students take electives in environmental health and exposure sciences. This structure is similar to the UMD proposed program, which also includes environmental health courses, courses in toxicology and risk assessment, coursework in epidemiology and biostatistics, seminar, laboratory rotation, and grant writing courses, and an ethics course. Beyond formal coursework, both degree programs require students to successfully complete written and oral comprehensive examinations and a scholarly doctoral dissertation.

West Virginia University: The closest comparable degree at WVU is the Occupational and Environmental Sciences Ph.D. program, which requires 54 credits, including environmental and occupational health courses, a health and policy course, coursework in epidemiology and biostatistics, seminar and research-related courses, and a scientific integrity course. Beyond these required courses, students take electives in environmental and occupational health. This structure is similar to the UMD proposed program, but UMD differs by not requiring a dedicated emphasis on occupational health, though some students may pursue that research direction with specific faculty. Beyond formal coursework, both degree programs require students to successfully complete written and oral comprehensive examinations and a scholarly doctoral dissertation.

University of Pittsburgh: The closest comparable degree at Pitt is the Environmental and Occupational Health Ph.D. program, which requires environmental health courses, a toxicology course, coursework in epidemiology and biostatistics, seminar and research rotation courses, and a molecular fundamentals course. Beyond these required courses, students take electives in environmental and occupational health. This structure is similar to the UMD proposed program. Beyond formal coursework, both degree programs require students to successfully complete written and oral comprehensive examinations and a scholarly doctoral dissertation.

Rutgers University: The closest comparable degree at Rutgers is the Public Health Ph.D. program, within which students select the Environmental & Occupational Health concentration, which requires 9-15 credits of core public health courses, 33 credits of concentration-specific courses within environmental and occupational health (including environmental health courses, epidemiology and biostatistics, and environmental health electives), and 24 credits of doctoral research. This structure is not as similar to the UMD proposed program, in that the program is more focused on general public health courses and the concentration courses are more flexible, being individually approved for each student. This is due to the nature of a single Ph.D. program in Public Health with multiple concentrations in a wide range of areas.

Appendix D: Faculty Credentials

Don Milton, MD, Professor, is board certified in internal and occupational medicine and has 20 years of experience in occupational medicine referral practice. He teaches courses on environmental and occupational hygiene, aerobiology, toxicology, indoor air quality, respiratory epidemiology, physiology, pathology, pathophysiology. He is actively pursuing multidisciplinary investigations of the health effects of bio-aerosols with three major themes: 1) investigation and prevention of airborne infection transmission and applications to biodefense, 2) exhaled breath analysis, and 3) the relationship of asthma onset and exacerbation to exposure to allergens and microbial products. Currently, his research on mechanisms and prevention of airborne infection transmission is focused on influenza.

Amy Sapkota, PhD, Associate Professor, has research interests in the areas of environmental microbiology, environmental microbial genomics, exposure assessment and environmental epidemiology. Her projects focus on evaluating the complex relationships between environmental exposures and human infectious diseases. Her work seeks to 1) characterize the microbiome of environmental samples relevant to human health, including water, food, tobacco and air, and 2) understand how exposures to these media can impact the human microbiome and infectious disease risk.

Robin Puett, PhD, Associate Professor, is an environmental, spatial, and chronic disease epidemiologist with degrees in environmental health sciences and in epidemiology. Much of her NIH-funded research and publications have focused on chronic disease health outcomes related to ambient air pollution exposures and the pathophysiology underlying these outcomes. Additionally, she has begun exploring the impact of integrative health modalities as protective factors for chronic disease and stress.

Amir Sapkota, PhD, Associate Professor, focuses his research on development and application of novel exposure metrics for the study of the impact of climate change on human health. He is currently leading an NIH funded study to investigate the relationship between frequency of extreme events, changes in plant phenology and increased risk of respiratory diseases in the contiguous United States. In a separate study funded through the CDC's Climate Ready City and States program for the Maryland Department of Health and Mental Hygiene (DHMH), his team is collaborating with investigators at DHMH to develop public health strategies against climate change effects for the State of Maryland.

Paul C Turner, PhD, Assistant Professor, has research interests focused on exposure assessment and molecular epidemiology of chronic disease. His specific focus is on better understanding the role of naturally occurring toxins, especially fungal toxins in cereals, on human disease. An estimated 25% of crops are contaminated with such toxins. He has been funded by the Gates Foundation for his work. He teaches *Food Toxicology* and *Toxicology* for the program.

Sacoby Wilson, PhD, Assistant Professor, is an environmental health scientist with over ten years of experience working in community-university partnerships on environmental health and justice issues. He has expertise in exposure science and applied environmental health including community-based exposure assessment, environmental justice science, social epidemiology, environmental health disparities, built environment, air pollution monitoring, and community-based participatory research (CBPR). For the past two years, he has been building a program on community engagement, environmental justice, and health (CEEJH) to engage impacted communities, advocacy groups, and policymakers in Maryland and the Washington, DC region on environmental justice issues and environmental health disparities.

Lesliam Quiros-Alcala, PhD, Assistant Professor, has research focused on children's environmental health and, more broadly, environmental exposures and their potential health effects in highly vulnerable populations including mothers, children, low-income/underserved communities, and occupational populations. She is interested in assessing the impact of environmental exposures in homes and at schools/early childhood education (ECE) facilities; and the health impacts of pesticides, chemicals in consumer products, and

unconventional gas development on vulnerable populations. She has experience working in children's environmental health research, occupational health, science communication, working with Latino communities, and conducting exposure and epidemiologic pesticide research.

Devon Payne-Sturges, PhD, Assistant Professor, focuses her research on racial and economic disparities in exposures to environmental contaminants and associated health risks with the aim of improving the science our society uses to make decisions about environmental policies that impact the health of communities and populations, especially vulnerable, low income and minority populations.

Stephen M. Roth, PhD, Professor and MIAEH Interim Director, has extensive training in human genetics and has researched the genetic aspects of health in the context of aging. He has been funded by the NIH (R21, K01, R01) to perform a variety of genetic investigations.