



Cover Sheet for In-State Institutions

New Program or Substantial Modification to Existing Program

received
1/9/19

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| Institution Submitting Proposal | Johns Hopkins/University |
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Each action below requires a separate proposal and cover sheet.

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|---|---|
| <input checked="" type="radio"/> New Academic Program | <input type="radio"/> Substantial Change to a Degree Program |
| <input type="radio"/> New Area of Concentration | <input type="radio"/> Substantial Change to an Area of Concentration |
| <input type="radio"/> New Degree Level Approval | <input type="radio"/> Substantial Change to a Certificate Program |
| <input type="radio"/> New Stand-Alone Certificate | <input type="radio"/> Cooperative Degree Program |
| <input type="radio"/> Off Campus Program | <input type="radio"/> Offer Program at Regional Higher Education Center |

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|--|--|---------------|-------------------|
| Payment <input checked="" type="radio"/> Yes | Payment <input type="radio"/> R*STARS | Payment | Date |
| Submitted: <input type="radio"/> No | Type: <input checked="" type="radio"/> Check | Amount: \$850 | Submitted: 1.8.19 |

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|--|--|--------------|--|
| Department Proposing Program | JHU Bloomberg School of Public Health | | |
| Degree Level and Degree Type | Master's (Level) Master of Science (Type) | | |
| Title of Proposed Program | Toxicology for Human Risk Assessment | | |
| Total Number of Credits | 69 | | |
| Suggested Codes | HEGIS: | CIP: 21.1006 | |
| Program Modality | <input checked="" type="radio"/> On-campus <input type="radio"/> Distance Education (<i>fully online</i>) <input type="radio"/> Both | | |
| Program Resources | <input checked="" type="radio"/> Using Existing Resources <input type="radio"/> Requiring New Resources | | |
| Projected Implementation Date | <input checked="" type="radio"/> Fall <input type="radio"/> Spring <input type="radio"/> Summer Year: 2019 | | |
| Provide Link to Most Recent Academic Catalog | URL: https://www.jhsph.edu/offices-and-services/student-affairs/resources/jhsph-guidebook/2017_2018Guidebook.pdf | | |

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|-------------------------------------|--|
| Preferred Contact for this Proposal | Name: Natalie Lopez |
| | Title: Senior Academic Compliance Specialist |
| | Phone: (410) 516-6430 |
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|---------------------------|--|
| President/Chief Executive | Type Name: Sunil Kumar |
| | Signature: Date: 1.8.19 |
| | Date of Approval/Endorsement by Governing Board: |

Revised 12/2018

**The Johns Hopkins University
Bloomberg School of Public Health
Proposal for New Degree Program**

Master of Science in Toxicology for Human Risk Assessment

A. Centrality to Institutional Mission Statement and Planning Priorities

1. Provide a description of the program, including each area of concentration (if applicable), and how it relates to the institution's approved mission.

The Johns Hopkins University Bloomberg School of Public Health (JHSPH) proposes a Master of Science in Toxicology for Human Risk Assessment. The MS in Toxicology for Human Risk Assessment will address the increasing incorporation of new toxicity testing modalities and their resulting data into the risk assessment paradigm.

The mission of JHSPH is the improvement of health through discovery, dissemination, and translation of knowledge and the education of a diverse global community of research scientists and public health professionals. This new degree program enhances this mission by training future regulators to incorporate new toxicity testing modalities and their resulting data into the risk assessment paradigm. Graduates of the program will be prepared to play an essential scientific role in the evaluation of toxicity testing data and their utilization in the regulatory process at federal agencies and in the private and industrial sectors. It directly supports the strategic education goal of “preparing leaders in public health science and practice to address current and future public health challenges”.

The program is designed for full-time students and part-time working professionals who wish to pursue a career or enhance their current activities in risk assessment with emphasis on the combined use of traditional *in vivo* and emerging *in vitro* and *in silico* models. The program addresses the increasing incorporation of new toxicity testing modalities and their resulting data into the risk assessment paradigm.

The proposed program set commence in Fall, 2019 will require successful completion of a minimum of 64 credits of didactic course work in the first year followed by an internship of a minimum of two eight-week academic terms. Full-time students may complete the degree program over a minimum of six 8-week terms (1.5 years). Part-time students have up to 3 years to complete the program.

2. Explain how the proposed program supports the institution's strategic goals and provide evidence that affirms it is an institutional priority.

The proposed program advances the university's *Ten by Twenty* vision, and related strategic goals for Johns Hopkins University, in a number of significant ways. The program will support the core academic mission of the University by enhancing and enriching the impact of the University to the nation, Baltimore and the world through state of the art training of individuals who will apply the latest concepts and tools of toxicology to regulatory science.

3. Provide a narrative of how the proposed program will be adequately funded for at least the first five years of program implementation.

JHSPH sets aside a portion of its tuition revenue each year as part of its budgeting process to fund the development of new programs and new courses. In addition, the tuition revenue from enrollments in the courses in any program is used to cover the instructional costs of the program before any excess is used for other JHSPH efforts. If a new program finds that its instructional costs are greater than the tuition revenue, funds are allocated from elsewhere in the overall JHSPH budget to cover the startup program's shortfalls during the first five years. Additional information is in Appendix C.

4. Provide a description of the institution's commitment to:

a) Ongoing administrative, financial, and technical support of the proposed program.

JHSPH's ongoing administrative, financial, and technical support for this program is reflective of the 100 years this school has been supportive of public health programs that have educated many generations and individuals all over the world. JHSPH does a careful program viability study for new programs based on prospective student enrollment, in addition to addressing global health concerns. The proposed program would receive the same sort of administrative, financial, and technical support as the other academic programs in JHSPH's portfolio.

b) Continuation of the program for a period of time sufficient to allow enrolled students to complete the program.

JHSPH is committed to providing all enrolled students the opportunity to complete the degree program, including under circumstances of low demand. The departments evaluate programs and determinations are made as to whether they should continue to admit students. If a program ceases to admit new students, the school remains committed to see the current student through their program of study.

B. Critical and Compelling Regional or Statewide Need as Identified in the State Plan

1. Demonstrate demand and need for the program in terms of meeting present and future needs of the region and the State in general.

Regulatory agencies in both the United States and Europe are mobilizing to develop methods for incorporating traditional *in vivo* testing methodologies along with novel *in vitro* and *in silico* models to support human health risk assessments. Moreover, industry is now using this new paradigm to assess risk to newly developed chemicals.

Half of all products bought by consumers contain classes of chemicals regulated using toxicological assessments. Safety sciences is a multi-billion-dollar industry on its own and represents a scientific field undergoing continuous adaptation to ensure the highest safety

standards for consumers while allowing innovation. New products arising from novel nano-, bio- and other technologies are constantly challenging the way in which safety standards are set. Addressing these challenges requires specialists versed in traditional as well as innovative toxicity testing approaches. These individuals will be positioned to pursue positions in regulatory agencies and the industries they regulate.

The Master of Science in Toxicology for Human Risk Assessment is a professional degree program that provides individuals with the knowledge and tools needed to be at the forefront of this transition in human health risk assessment. It is an outgrowth of an elective track in a Master of Science in Public Health degree program.

The program will prepare current and future practitioners to assess highly complex public health and science challenges related to human exposures to environmental agents that emerge daily and to evaluate their potential impact on human health.

Graduates of the program will be equipped to drive the responsible application of new knowledge to assessing risk of exposures for causing adverse health effects to residents of Baltimore, Maryland, the country and beyond.

2. Provide evidence that the perceived need is consistent with the Maryland State Plan for Postsecondary Education.

The 2017-2021 Maryland State Plan for Postsecondary Education articulates three goals for postsecondary education: 1.) Access: Ensure equitable access to affordable and quality postsecondary education for all Maryland residents. 2.) Success: Promote and implement practices and policies that will ensure student success. 3.) Innovation: Foster innovation in all aspects of Maryland higher education to improve access and student success. The proposed program addresses each of these goals.

The Bloomberg School of Public Health aims to prepare highly trained scientists and healthcare professionals to work in organizations where they can contribute to the public health needs of society. The proposed program is intended to meet the growing need for skilled professionals trained in the integration of in vivo and in vitro tools in assessing the risk associated with environmental exposures in Baltimore, the State, across the country, and beyond. This is consistent with Goal 3 (Innovation) of the State Plan.

By allowing students to complete the program either full-time or part-time, access is provided to those who wish to enter this field as well as those currently working in it who wish additional training. The online format allows part-time students to pursue the degree even if their work schedules do not permit onsite class attendance. Additionally, students who move away from the Maryland region will still be able to complete the program, thus supporting the State Plan's innovation and completion goals (Goals 2 & 3).

Types of funding include loans, scholarships, student employment, travel awards and grants. Successful individuals often utilize more than one of the sources identified and are watchful for additional opportunities. Funding is available for students at all levels of their academic pursuits (Goal 1).

The JHSPH Student Affairs office is a resource to counsel prospective students on funding. In addition, the Financial Aid Office provides assistance with federal and private loans and federal work study (Goal 1).

JHSPH offers an array of services for the continued success of the student learner. These services include career counseling, 1:1 (student:faculty) academic advising, disability services, mentored research and mentored practicums in the areas of public health (Goal 2).

Each student receives a program plan of study and a guidebook for their program upon matriculation to the School. Each program has a program specific orientation for incoming students and faculty and staff meet with students throughout their program to insure continued progress towards their degree (Goal 2).

Typically, part-time students with full-time jobs who enroll in JHSPH degree programs represent a broader range of diversity than students in full-time degree programs. In targeting these part-time students, this program addresses the Access goal (Goal 1) in the State Plan.

Similarly, the proposed program is consistent with Goal 3, innovation, which articulates Maryland's aspiration to be "a national leader in the implementation of creative and diverse education and training opportunities that will align with State goals, increase student engagement, and improve learning outcomes..."

Additionally, the program, through the preparation of highly qualified individuals engaged in risk assessment, contributes to the economic growth and vitality goal (Goal 3) by providing life-long learning to scientists and health professionals so they can maintain the skills they need to succeed in the workforce.

C. Quantifiable and Reliable Evidence and Documentation of Market Supply and Demand in the Region and State

1. Describe potential industry or industries, employment opportunities, and expected level of entry (ex: mid-level management) for graduates of the proposed program.

In recent years the demand for individuals trained in the application of in vitro tools to complement more standard in vivo tools for use in risk assessment has been increasing. The faculty who will be directing this degree program in the Department of Environmental Health and Engineering receive frequent inquiries from individuals interested in seeking training in new methods for incorporating in vitro methods into the risk assessment process. The program will provide students with a pathway to career opportunities in government, non-profits, and the private sector. These and similar employment opportunities are available nationwide. A recent search (July 2018) for employment in the area of risk assessment/toxicology on the job site [Indeed.com](https://www.indeed.com) revealed over 400 active job postings where training in toxicology and risk assessment are required.

2. Present data and analysis projecting market demand and the availability of openings in a job market to be served by the new program.

JHSPH receives 1-2 inquiries each month from professionals interested in seeking master's level training in toxicology and risk assessment.

According to the Bureau of Labor Statistics (BLS), nation-wide employment of healthcare practitioners and technical workers is projected to grow 13.8 percent from 2014 to 2024. This is an imprecise job category, but one can expect that job opportunities for which this new degree will prepare students should grow at least as fast as the healthcare field overall. Pursuing a degree like this Master of Science in Toxicology for Human Risk Assessment is a significant way to maintain career viability. Job opportunities for the graduates of this program include positions in government and healthcare organizations.

In addition to the national employment projections made by the Bureau of Labor Statistics noted above, the State of Maryland projects that employment opportunities for healthcare practitioners and technical workers will grow 18.2 percent from 2014 to 2024.

3. Discuss and provide evidence of market surveys that clearly provide quantifiable and reliable data on the educational and training needs and the anticipated number of vacancies expected over the next 5 years.

There is a demand for detailed mechanisms in understanding toxicology and being able to predict adverse outcomes that lead to safer drugs, foods, and the environment. Such information is needed to support government at the federal, state and local level but also globally. In addition, the drug industry has need of individuals in this area for regulatory processes.

4. Provide data showing the current and projected supply of prospective graduates.

There are no Maryland schools that currently offer a graduate program in Toxicology with the CIP code 21.1006.

D. Reasonableness of Program Duplication

1. Identify similar programs in the State and/or same geographical area. Discuss similarities and differences between the proposed program and others in the same degree to be awarded.

In Maryland, there are no programs with CIP code 21.1006 approved or endorsed by MHEC.

2. Provide justification for the proposed program.

The program will provide concrete training in toxicology, epidemiology, and biostatistics with particular focus on risk assessment using data from animal, in vitro and in silico

models. This knowledge and skills will serve others as a terminal master's program that can lead students directly to private sector or government positions, or to obtain promotions in positions already held.

The program will be grounded in real-world challenges and informed by cutting edge scholarship, with a diverse faculty of the leading experts in the field and a student body bringing lived experiences to the classroom.

E. Relevance to High Demand Programs at Historically Black Institutions (HBIs)

By definition, an appropriate student for the program would apply after attending and completing a baccalaureate degree at any undergraduate institution, including any of Maryland's Historically Black Institutions. The proposed program would not directly affect the implementation, maintenance, uniqueness, identity or mission of these institutions. There are no known similar programs in any of the Historically Black Institutions in Maryland. Though Johns Hopkins Bloomberg School of Public Health is willing to collaborate with the Historically Black Institutions in Maryland.

F. Relevance to the identity of Historically Black Institutions (HBIs)

1. Discuss the program's potential impact on the uniqueness and institutional identities and missions of HBI'S.

There is no comparable degree program offered at any Historically Black Institutions in Maryland. We believe the Program would not impact on the uniqueness and institutional identities and missions of HBIs.

G. Adequacy of Curriculum Design and Delivery to Related Learning Outcomes (as outlined in COMAR 13B.02.03.10)

1. Describe how the proposed program was established and describe the faculty who will oversee the program.

As the school prepares to respond to new Council on Education in Public Health (CEPH) requirements, we recognized that this program in its original format as a track in the Master of Science in Public Health, needed to become a separate degree program to provide graduates with degree credentials appropriate for professionals in the field of regulatory toxicology. The faculty are primarily members of the Department of Environmental Health and Engineering. The faculty have produced leading Environmental health research while generating scholarship and educating the next generation of leaders in toxicology. See Appendix B for a list of faculty associated with this program.

2. Describe educational objectives and learning outcomes appropriate to the rigor, breadth and (modality) of the program.

Educational Objectives:

- a) Have an essential scientific role in the evaluation of toxicity data from new, emerging, in vitro toxicity testing systems and in vivo toxicity testing data in the risk assessment process.
- b) Utilize these data in the regulatory process at federal agencies and in the private and industrial sectors.

Student Learning Outcomes:

Upon completion of the program, students will be able to:

- Explain and interpret epidemiologic studies to support risk assessment and decision making;
- Elaborate commonly used public health measures, such as relative risk, attributable risk and relative hazards, and select appropriate statistical methods for estimating such measures in the presence of covariates;
- Interpret descriptive and inferential statistics resulting from data analysis and draw relevant conclusions;
- Interpret studies that use bioinformatic techniques;
- Evaluate and interpret traditional toxicological studies;
- Elaborate novel methodological approaches in toxicology;
- Apply and integrate epidemiological, traditional and novel toxicological studies to support risk assessment;
- Define the major environmental agents (i.e., environmental chemical, biological, and physical that cause adverse effects on human health) and their sources, natural and anthropomorphic;
- Discuss the transport and fate of major environmental agents in the environment, and identify the carriers or vectors (air, water, soil, and food) that promote the transfer of these agents from various environments (e.g. occupational setting) to the human;
- Describe the toxicokinetics of major environmental agents including routes of entry, metabolism, storage, and excretion;
- Describe the toxicodynamics of major environmental agents, including toxicological pathways and the mechanisms by which agents exert adverse health effects, and the use of in vitro models for predicting the magnitude of adverse effects;
- Describe approaches for in vitro to in vivo modeling of toxicokinetics;
- Summarize areas of emerging science for risk assessment (personalized toxicology, chemical mixture toxicology, systems toxicology, multi-natured stressor mixtures);
- Use systematic approaches for combining and evaluating toxicokinetic and toxicodynamic evidence;
- Evaluate evidence-based toxicology studies and studies conducted using other systematic approaches;

- Utilize exposure and epidemiologic and traditional and novel toxicological data to conduct a risk assessment;
- Communicate and translate science to general audiences and policymakers;
- Describe key risk management practices in the US and internationally;
- Explain the application of evidence used to make environmental health decisions, setting of standards and guidance;
- Summarize the function of federal agencies in public health practice and decision making.

3. Explain how the institution will:

a) Provide for assessment of student achievement of learning outcomes in the program

JHSPH's Center for Teaching and Learning has a staff of Instructional Designers that assist faculty in the design and delivery of their courses. These Instructional Designers assist the faculty in preparing learning assessments (projects, papers, exams) that are linked to the program and course learning outcomes. These assessments are graded by the instructors and the students' grades reflect their knowledge of the matter.

b) Document student achievement of learning outcomes in the program

Grades are kept in a gradebook in the school's CoursePlus system and grade distributions are shared with the department chairs and the Committee on Academic Standards (CAS). If learning outcomes are not met in a given year, the program is expected to address these issues for the next offering.

4. Provide a list of courses with title, semester credit hours and course descriptions, along with a description of program requirements

A full course listing, with course titles, credits and descriptions, is provided in Appendix A.

Program Requirements

Students will be required to successfully complete a minimum of 64 didactic credits plus 32 credits for an internship and 2 credits for a capstone paper. Students will enroll in a combination of required core courses and electives. The degree can be completed over a minimum of six 8-week terms. Once enrolled, students will work with an assigned faculty advisor to develop an initial plan for their program of study and this advisor will continue to guide them throughout their studies.

Program coursework will allow students to engage deeply with topics including toxicology, epidemiology, biostatistics, risk assessment, and environmental sciences. Students will complete 24 (69 credit) core courses to satisfy basic degree requirements. All students take the courses listed in Table 1.

The field experience (32 credits) involves students working in a private sector or government sector under the direction of a preceptor at the site and a faculty advisor. For the capstone experience requirement (2 credits), the students will work with faculty advisors in the preparation of their capstone papers.

Table 1: Curriculum Overview

| Course Number | Course Title | Credits | Required or Elective |
|----------------|--|-----------|----------------------|
| 550.860 | Academic & Research Ethics | 0 credits | Required |
| 550.865 | Public Health Perspectives on Research | 2 credits | Required |
| 180.609 | Principles of Environmental Health | 4 credits | Required |
| 187.610 | Public Health Toxicology | 4 credits | Required |
| 317.600 | Introduction to the Risk Sciences and Public Policy | 4 credits | Required |
| 317.610 | Risk Policy Management and Communication | 3 credits | Required |
| 317.605 | Methods In Quantitative Risk Assessment | 4 credits | Required |
| 317.515 | Topics In Risk Assessment | 2 credits | Required |
| 317.721 | Epidemiologic Inference in Public Health I | 5 credits | Required |
| 317.722 | Epidemiologic Inference in Public Health II | 4 credits | Required |
| 140.621 | Statistical Methods in Public Health 1 and Lab | 4 credits | Required |
| 140.622 | Statistical Methods in Public Health II and Lab | 4 credits | Required |
| 187.640 | Toxicology 21: Scientific Foundations | 1 credit | Required |
| 187.632 | Molecular Toxicology | 4 credits | Required |
| 187.645 | Toxicology 21:Scientific Application | 3 credits | Required |
| 180.640 | Molecular Epidemiology and Biomarkers | 4 credits | Required |
| 187.655 | Evidence-Based Toxicology | 3 credits | Required |
| 187.650 | Alternative Methods In Animal Testing | 3 credits | Required |
| 180.628 | Intro. To Environmental & Occupational Health Law | 4credits | Required |
| 410.620 | Program Planning for Health Behavioral Change | 3 credits | Required |
| 340.680 | Environmental & Occupational Epidemiology | 4 credits | Required |
| 182.845 | MS Special Studies & Research | Variable | Required |
| 182.610 | MS Field Placement | Variable | Required |
| 182.850 | MS Essay | Variable | Required |

5. Discuss how general education requirements will be met, if applicable.

Not applicable

- 6. Identify any specialized accreditation or graduate certification requirements for this program and its students.**

Not applicable

- 7. If contracting with another institution or non-collegiate organization, provide a copy of the written contract.**

Not applicable

- 8. Provide assurance and any appropriate evidence that the proposed program will provide students with clear, complete, and timely information on the curriculum, course and degree requirements, nature of faculty/student interaction, assumptions about technology competence and skills, technical equipment requirements, learning management system, availability of academic support services and financial aid resources, and cost and payment policies.**

JHSPH's CoursePlus system <https://courseplus.jhu.edu/core/index.cfm/go/home/> contains all the course offerings including a course description, requirements, nature of faculty/student interaction, assumptions about technology competence and skills, and technical equipment requirements. These details are listed on the syllabus for a course. All program related information (degree requirements, learning management systems, academic support, financial aid, records, and policies) can be found on the School's web site <https://www.jhsph.edu/> and in the Academic Prospectus https://www.jhsph.edu/admissions/how-to-apply/prospectus-request/_pdf/2019-2020_prospectus.pdf

- 9. Provide assurance and any appropriate evidence of advertising, recruiting and admissions materials will clearly and accurately represent the proposed program and the services available.**

The JHSPH web site <https://www.jhsph.edu/> contains the same marketing, recruiting and admission materials that are used in print. The Academic Prospectus https://www.jhsph.edu/admissions/how-to-apply/prospectus-request/_pdf/2019-2020_prospectus.pdf is also available in interactive PDF form. We are transparent with students on requirements, services and policy at time of admission through the life cycle of a student to alum.

H. Adequacy of Articulation

Not applicable.

I. Adequacy of Faculty Resources (as outlined in COMAR 13b.02.03.11)

- 1. Provide a brief narrative demonstrating the quality of program faculty. Include a summary list of faculty with appropriate type, terminal degree title and field, academic title/rank, status, (fulltime, part-time, adjunct) and the course(s) each faculty member will teach (in this program).**

See Appendix B for a representative list of faculty who will teach in the proposed program. Each faculty are distinguished and experienced professionals and all have advanced degrees, many with multiple doctorates. Greater than 90% of the faculty are full time. They have produced leading environmental health research while continuing to generate path-breaking scholarship, educating the next generation of leaders in toxicology, risk assessment, and epidemiology. The majority of the faculty have research programs funded by international and nongovernment agencies as well as the U.S. government. Together, hundreds of manuscripts have been published in peer reviewed journals by the faculty who are teaching in our program. Program faculty have also served on committees that are responsible for funding, regulation, and education. Overall, many are considered to be the leading experts in their field of study.

- 2. Demonstrate how the institution will provide ongoing pedagogy training for the faculty in evidenced-based best practices, including training in a. Pedagogy that meets the needs of students, b. the learning management system and c. Evidenced-based best practices for distance education, if distance education is offered:**

The School's Center for Teaching and Learning (CTL) supports faculty in the design, development and delivery of courses and supports the teaching experience. CTL offers workshops and 1:1 faculty consultations on topics such as course consultations, Faculty and TA development and using CoursePlus. Such workshop topics include: using Case Studies and Case Examples, Getting the Most Out of Your Live Talk, Using the Course Management System to Its Fullest Potential in the Education Process and Authentic Assessment.

CTL has a staff of Instructional Designers that are assigned to faculty developing or teaching a course. Instructors receive direct support and guidance from the instructional designer and the multimedia staff, which may take the form of course design, course production support, and audio and video recording support. CTL supports faculty in the refinement of the course by updating content and the quality of the students' educational experience.

J. Adequacy of Library Resources (as outlined in COMAR 13B.02.03.12)

The book collections at the Johns Hopkins University number almost two and one-half million volumes, selected to support the studies of all departments and divisions of the University. The William H. Welch Medical Library collects current scholarly information, primarily electronic, which supports the research, clinical, administrative, and educational needs of its clients. The collection covers health, the practice of medicine and related biomedical and allied health care disciplines, public health and related disciplines, nursing, research literature, methodological literature, reviews or state-of-the-art reports, and in-depth, authoritative analyses of areas influencing biomedicine and health care. The library's emphasis is on providing materials at

point of need. As a result, the collection includes more than 7,200 electronic journals, more than 400 databases, and more than 13,000 e-books. The library has staff members assigned to each department to aid in research and best practices for library services.

K. Adequacy of Physical Facilities, Infrastructure and Instructional Equipment (as outlined in COMAR 13B.02.03.13).

1. Provide an assurance that physical facilities, infrastructure and instruction equipment are adequate to initiate the program, particularly as related to spaces for classrooms, staff and faculty offices, and laboratories for studies in the technologies and sciences. If the program is to be implemented within existing institutional resources, include a supportive statement by the President for adequate equipment and facilities to meet the program's needs.

JHSPH has 26,567 square feet of classroom and student study space. Each classroom has a computer and LCD projector. The School has robust student support services, including a fully staffed information technology team and over 1000 computers located in computer labs and throughout main buildings for student use. The central computing resource for the School, the Office of Information Technology (IT), provides students with reliable computing infrastructure, location, and device independence, and critical software tools. Additionally, an enterprise service desk offers support for faculty, staff, and students. Assistance is provided over various channels, including phone, desktop, and FIPS 140-2 compliant remote-control support. Customer satisfaction is monitored and benchmarked against other higher educational institutions and industries. For this program, no additional facilities, infrastructures or laboratory or computer resources will be required.

2. Provide assurance and any appropriate evidence that the institution will ensure students enrolled in and faculty teaching in distance education will have adequate access to: a) an institutional electronic mailing system, and b) a learning management system that provides the necessary technological support for distance education.

- All JHU students receive an Office 365 account including email capabilities (built on Outlook Live), as well as 25GB of online storage, and collaboration, blogging, photo-sharing, event-planning, instant messaging, and other tools. The email account is accessible from a variety of browsers on both the PC and Mac, including full support for Internet Explorer, Firefox, and Safari.
- Courses can be taken through JHSPH's CourePlus course management system. These technologies are supported by the Center for Teaching and Learning (CTL) and the university's IT infrastructure and provide password-protected online course sites and community management systems that enable ongoing collaborative exchange and provide convenient channels for synchronous and asynchronous learning. Johns Hopkins is also outfitted with suitable technical and professional staff and a help desk to provide technical assistance to the students taking online courses. All of the student services such as application processes, course registration, bookstore, ID service, and advising are currently provided online as well.

L. Adequacy of Financial Resources with Documentation (as outlined in COMAR 13B.02.03.14)

See Appendix C for detailed financial information.

M. Adequacy of Provisions for Evaluation of program (as Outlined in COMAR 13B.02.03.15)

1. Discuss procedures for evaluating courses, faculty and student learning outcomes.

As part of the program design and approval process, student learning outcomes and assessments have been aligned with the academic goals of the School and approved by the School's Committee on Academic Standards. Student course evaluations, conducted at the end of each term, provide feedback about both courses and faculty. The evaluations include questions addressing the course overall, the instructor and the assessments of learning.

The program committee consisting of Drs. Yager, Bressler, and Nachman will meet annually to assess course evaluations and other feedback provided by students, faculty and other stakeholders in the program. Program level evaluation activities will include an annual assessment of program inputs, processes and outputs to generate a report on program applicants and admitted students, course enrollment, faculty participation, pedagogical innovations and program accomplishments/recognition.

Evaluation of student learning and achievement will focus on the early identification of students' goals/objectives and individualized learning outcomes; students' acquisition of knowledge and skills and the degree to which the program is fostering students' achievement of the degree competencies. The Educational Program Committee in the department reviews student course evaluations and will reach out to program faculty when problems arise.

The program committee also reaches out to the internship advisor for evaluations. Adjustments to the program will be made accordingly. Finally, post-degree professional and academic accomplishments of graduates will also be tracked.

2. Explain how the institution will evaluate the proposed program's educational effectiveness, including assessments of student learning outcomes, student retention, student and faculty satisfaction, and cost effectiveness

The procedures that will be used to evaluate these matters are noted in section M.1. The department Chair, working closely with administrative staff and the Associate Dean for Education, will routinely evaluate performance and initiate corrective action plans, if necessary.

N. Consistency with the State's Minority Student Achievement Goals (as outlined in COMAR13B.02.03.05).

Any student meeting the admissions requirements can apply to the program, which will work to help all accepted students improve their workplace competitiveness and reach their professional goals, an aim consistent with the State's minority student achievement goals.

O. Relationship to Low Productivity Programs Identified by the Commission:

Not applicable.

P. Adequacy of Distance Education Programs (as outlined in COMAR 13B.02.03.22)

1. Provide affirmation and any appropriate evidence that the institution is eligible to provide Distance Education.

JHSPH has decades of experience administering successful online courses and programs. This program will be supported in the same way our other programs are supported. JHSPH's Center for Teaching and Learning (CTL) has the instructional knowledge and staff to support our faculty and successful student learning.

2. Provide assurance and any appropriate evidence that the institution complies with C-RAC guidelines, particularly as it relates to the proposed program:

a) Online learning is appropriate to the institution's mission and purposes:

Refer to Section A.1 in the main body of the proposal.

b) The institution's plans for developing, sustaining, and if appropriate, expanding online offerings are integrated into its regular planning and evaluation processes.

JHSPH has a commitment to online teaching as demonstrated by the resources of its Center for Teaching and Learning, which provides course development, instructional, and technical support to new and current faculty.

c) Online learning is incorporated into the institution's systems of governance and academic oversight.

At JHSPH, any new proposed academic program is subjected to a review by the School's Committee on Academic Standards, a faculty body with representation from all departments and school-wide programs. If approved by the Committee, the proposal is then forwarded to the School's Advisory Council, comprised of the School's leadership and Department Chairs, for review and approval. Once approved at the School level, new programs must be approved by Johns Hopkins University, which reviews new online program proposals using the same systems of governance and academic oversight as for new on-site programs. Before being shared with the deans of all JHU academic divisions, all proposals must first undergo a review by internal

academic bodies, including discussions of fit with the School's mission, program viability, program rigor, instructor quality, and redundancy with existing programs. Once a program is launched, its courses will enter the course evaluation system. Students in all JHSPH courses complete a course evaluation. These evaluations ask students to reflect on the course structure, the course content, and the instructor's performance. Summary reports are reviewed by the faculty member, the program chair, and the JHSPH administration to determine whether changes are necessary.

d) Curricula for the institution's online learning offerings are coherent, cohesive, and comparable in academic rigor to programs offered in traditional instructional formats.

The courses for this program may be taken in traditional format or on-line. Both fulltime and part-time (online) students will be held to same academic standards required to complete the program, including the internship. The program is composed of courses that are appropriately sequenced to ensure students have the adequate background for courses that are required later in the program.

All online courses adhere to CTL's course development process with support from experienced instructional designers. Online coursework follows well-established curriculum development standards, tailoring delivery methods, content, and assessments to learning objectives. The electronic portfolio will be used to assess students' achievement of program competencies.

e) The institution evaluates the effectiveness of its online learning offerings, including the extent to which the online learning goals are achieved, and uses the results of its evaluations to enhance the attainment of the goals.

As part of the online course design process, course assessments are required to be aligned with stated courses learning objectives. The proposed program will incorporate authentic assessments that demonstrate students' application of learned skills. Program faculty have experience with developing individual and collaborative assessments for measuring the acquisition of relevant knowledge and skills through online learning.

f) Faculty responsible for delivering the online learning curricula and evaluating the students' success in achieving the online learning goals are appropriately qualified and effectively supported.

Online programs are supported by CTL, which offers a number of opportunities and resources for faculty instructors and teaching assistants to become more familiar with online teaching and best pedagogical practices. In addition to maintaining an extensive catalog of resources on teaching and learning via an online Teaching Toolkit, CTL regularly offers events, workshops, and one-on-one office hours to introduce and provide updates on the latest advances in teaching technology and pedagogy.

Prior to teaching their first courses, all new online instructors are required to participate in training that conveys, among other things, principles of best practices for online education.

The Bloomberg School, through CTL, maintains an innovative course management system and provides faculty support and training for online education through a staff of more than 30 individuals who specialize in instructional design, audio production, technical writing, web development, production management and quality control.

g) The institution provides effective student and academic services to support students enrolled in online learning offerings.

The Bloomberg School maintains numerous web-based resources to inform prospective students on the information they may need as an online student. These resources include the JHSPH website www.jhsph.edu and the [Course Catalog](#). These resources offer detailed programmatic information, academic support services, financial aid, costs, policies, etc. and specific information for online learning. As new online students are admitted and enrolled, they receive timely emails with important information to help them prepare to become an online student. These emails include information on technical requirements, available academic support services, and a required orientation course (IOL) for new online students.

JHSPH online students have access to the following academic support services:

Academic advising. Students are assigned an advisor when accepted. Students work individually with the advisor to develop a course of study that meets the requirements of the program and the career goals of the student. The advisor regularly contacts the students to check on progress and answer questions. Courses that deviate from the program plan and have not been approved by an adviser may not count toward degree requirements.

Library services. Students have online access to the William H. Welch Medical Library and the Milton S. Eisenhower Library on the Homewood campus. The interlibrary loan department allows students access to resources at any other university in the nation. The University's library system provides easy access to a wide selection of electronic information resources, including an online catalog, and numerous electronic abstracting and indexing tools. Many of the databases are accessible remotely. Librarians are available to assist students remotely and the library maintains an extensive web site to take visitors through all its services and materials.

Disability Support Services. The Johns Hopkins University is committed to making all academic programs, support services, and facilities accessible to qualified individuals. Students with disabilities who require reasonable accommodations can contact the JHSPH Disability Services' Senior Director.

Career Services. The Career Services Office at the Bloomberg School helps students, alumni, faculty, staff, and employers navigate the world of public health jobs.

Johns Hopkins Student Assistance Program. The Johns Hopkins Student Assistance Program (JHSAP) is a professional counseling service that can assist students with managing problems of daily living. Stress, personal problems, family conflict, and life challenges can affect the academic progress of students. JHSAP focuses on problem solving through short-

term counseling. Accessing the service is a simple matter of a phone call to arrange an appointment with a counselor. Online students contact the service by phone for consultation and are directed to the appropriate resource or office. JHSAP services are completely confidential. The program operates under State and federal confidentiality legislation and is HIPAA compliant.

Transcript Access. Students may view and print unofficial transcripts at any time. Official transcripts will be mailed to students upon completion of the program; additional official transcripts will be mailed upon request of the student at minimal charge.

Student Login IDs. The University issues each student a Johns Hopkins Enterprise ID (JHED ID) and the School issues a JHSPH ID. The JHED ID grants students a JHU email address and secure access to many online services including course registration, bill payment, official grades, library services, and the online learning platform CoursePlus. Students are also issued a JHSPH ID that provides access to the School's intranet (My JHSPH) where students can locate additional resources including research and administrative tools as well as the School's policy and procedures manual.

h) The institution provides sufficient resources to support and, if appropriate, expand its online learning offerings.

JHSPH has a commitment to online teaching as demonstrated by the resources of its Center for Teaching and Learning, which provides course development, instructional, and technical support to new and current faculty. See Appendix C for detailed financial information regarding the proposed program. If additional sections of a course are needed to support the program, the department will offer an additional section.

Each year during the budget development period, additional resources such as faculty, staffing, teaching assistants and other instructional needs are taken into consideration with program growth. In turn, the CTL will devise budgets to increase personnel for the following fiscal year if needed to support the online course growth.

i) The institution assures the integrity of its online offerings.

The Higher Education Opportunity Act (HEOA) enacted in 2008 requires that an academic institution that offers distance education opportunities to students 1) has a process established to verify that the student who registers is the same student who participates in and completes the offering and receives academic credit for it, 2) has a process established to verify that student privacy rights are protected, and 3) has a process established that notifies the student about any additional costs or charges that are associated with verification of student identity. In JHSPH programs, the following actions have been taken to satisfy these requirements: 1) students may only enter the academic website for the online courses they take by providing the unique student ID and password assigned after admission, 2) all FERPA privacy rights are preserved by limiting access very specifically in the University student information system to only those permitted by law to have access to restricted student information, and 3) there are no additional costs assessed to the student for the measures we use to verify student identity.

As referenced all new JHSPH students are enrolled in a mandatory Academic Ethics and Research course -- a zero-credit, zero-tuition course that is geared towards helping students avoid behaviors linked to plagiarism, cheating and other violations of academic integrity.

Appendix A

Course List and Descriptions

550.860 Academic & Research Ethics (0 credits)

Examines academic and research ethics at JHSPH in a series of online interactive modules. Focuses on information about the academic ethics code and responsible conduct of research at the School. Explores issues of academic integrity such as proper ethical conduct and referencing, and discusses violations such as plagiarism and cheating, relative to case studies that illustrate situations faced by students and faculty in the academic setting. Addresses topics that include responsible conduct of research, authorship, data management, data ownership, guidelines for professional conduct, research fraud or scientific misconduct, federal and institutional guidelines related to research using human and animal subjects and ethical issues involving vulnerable subjects in research.

Prerequisite: None

550.865 Public Health Perspectives on Research (2 credits)

Introduces the substantive and methodologic bases for public health research, emphasizing the critical roles of the quantitative, qualitative, biologic, social, and behavioral sciences in improvement of public health. Highlights principles of high-quality research, including the value of a population perspective, interdisciplinary cooperation, the importance of new measurement techniques, and the interface between theory and practice. Gives students information about the interactions between the public and the researcher.

Prerequisite: None

180.609 Principles of Environmental Health (4 credits)

Presents concepts, principles, and applications forming the basis of the field of environmental health. Topics include contaminant sources, fate & transport, pathways of exposure, toxicology, health effects, policy, practice and systems. Discussions and exercises focus on current environmental health issues and opportunities for prevention and intervention. Students learn how to critically evaluate current environmental health literature and how to think about environmental health from a systems perspective.

Prerequisite: None

187.610 Public Health Toxicology (4 credits)

Examines basic concepts of toxicology as they apply to the effects of environmental agents present in air, water and food (e.g. chemicals, metals) on public health. Discusses the distribution, cellular uptake, metabolism, and elimination of toxic agents, as well as the fundamental principles governing the interaction of foreign chemicals with biological systems. Considers how population data on disease incidence (various cancers, lung, kidney, heart, etc.) can suggest possible etiologies and how genetic and epigenetic factors can influence risk for adverse health effects. Focuses on the application of how these concepts provide evidence relevant to the understanding and prevention of morbidity and mortality resulting from environmental exposures to toxic substances through presentation of case studies.

317.600 Introduction to the Risk Sciences and Public Policy (4 credits)

Provides an introduction to the basic paradigm for quantitative risk assessment and illustrates its application in the public policy process using case studies. Examines risk assessment in a broad

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societal context, considering social, economic, and political factors that affect risk decision-making; evolution of risk assessment; and the use of risk assessment in regulatory processes. Students complete a risk assessment exercise.

Prerequisite: Instructor's consent

317.610 Risk Policy Management and Communication (3 credits)

Examines the role of the risk sciences in the public policy process. A case study approach presents the broad societal context of risk based decision making, including the scientific, social, economic, legal and political factors that drive the policy process. Provides an overview of risk management tools and the application of risk communication principles and strategies. The goal is to provide an understanding of how the risk sciences are applied in the formulation and implementation of public health risk policy in "the real world."

Prerequisite: Instructor's consent

317.605 Methods in Quantitative Risk Assessment (4 credits)

Introduces students to a variety of quantitative and qualitative methods used in hazard identification/characterization, exposure and dose-response assessment for chemical and microbial risk assessments. Students gain experience with selected methods through the assignments including probabilistic exposure assessment modeling, qualitative weight-of-evidence evaluation, and guided review and critique of existing risk analyses. Students learn to identify and evaluate assumptions used to bridge data gaps and to conceptualize and communicate variability and uncertainty. Guest speakers discuss current and emerging issues in chemical and microbial risk assessment and management.

317.515 Topics in Risk Assessment (2 credits)

Uses a case study approach of a selected risk-based public health issue to integrate student's application of the skills in the risk sciences (risk assessment, risk management, and risk communication).

317.721 Epidemiologic Inference in Public Health I (5 credits)

Introduces principles and methods of epidemiologic investigation of disease and other health states. Presents different types of study designs, including randomized trials, cohort and case-control studies; measurement of exposures and outcomes; risk estimation; surveillance; program evaluation; and causal inference. Links epidemiologic inferences with the development of policy. Activities provide experience in applying epidemiologic methods, interpreting findings, and drawing inferences.

317.722 Epidemiologic Inference in Public Health II (4 credits)

Expands knowledge beyond introductory level epidemiologic concepts and methods material, using examples from the published literature. Emphasizes interpretation and the ability to critically evaluate issues related to populations/study design, measurement, population comparisons and inference, including: modern cohort study designs; advanced nested designs; novel techniques for exposure assessment; interpretation and utility of measures of impact; sources of bias and methods for their prevention; descriptive and analytical goals for observational study inference; the counterfactual model for defining exchangeability, cause, and confounding; and synthesis of inferences from observational studies.

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140.621 Statistical Methods in Public Health I and Lab (4 credits)

Introduces the basic concepts and methods of statistics as applied to diverse problems in public health and medicine. Demonstrates methods of exploring, organizing, and presenting data, and introduces fundamentals of probability, including probability distributions and conditional probability, with applications to 2x2 tables. Presents the foundations of statistical inference, including concepts of population, sample parameter, and estimate; and approaches to inferences using the likelihood function, confidence intervals, and hypothesis tests. Introduces and employs the statistical computing package, STATA, to manipulate data and prepare students for remaining course work in this sequence.

140.622 Statistical Methods in Public Health II and Lab (4 credits)

Presents use of likelihood functions, confidence intervals, and hypothesis tests to draw scientific inferences from public health data. Discusses null and alternative hypotheses, Type I and II errors, and power. Develops parametric and non-parametric statistical methods for comparing multiple groups (ANOVA). Also introduces measures of association and simple linear regression. Addresses methods for planning a study, including stratification, balance, sampling strategies, and sample size.

Prerequisite: 140.621

187.640 Toxicology 21: Scientific Foundations (1 credit)

Provides students with fundamental knowledge of the emerging science driving new strategies for human risk assessment. Topics include toxicokinetics, xenobiotic activation and inactivation, systems biology, and databases for toxicity testing. Presents case studies that have used different data bases for toxicity testing. Students have hands-on experiences using the databases and other Web-based applications.

Prerequisite: Public Health Toxicology 187.10

187.632 Molecular Toxicology (4 credits)

Reviews the mechanisms by which environmental toxicants cause chronic diseases such as cancer, COPD, asthma and heart diseases that impact public health. Topics include cell signaling pathways involved in oxidative and nitrosative stress, cell growth, cell death, DNA repair, inflammation and carcinogenesis in response to exposure to air pollutants, metals and other environmental toxicants. Presents most recent technological advances in the molecular and genetic tools available to study how environmental toxicants cause diseases, which includes omics technologies (genomics, proteomics and metabolomics), next-generation sequencing for gene expression and genetic variations, transgenic animals and emerging alternative animal models.

Prerequisite: A basic course in molecular biology or consent of instructor

187.645 Toxicology 21: Scientific Application (3 credits)

Familiarizes students with the novel concepts being used to revamp regulatory toxicology in response to a breakthrough National Research Council Report "Toxicity Testing in the 21st Century: A Vision and a Strategy." Presents the latest developments in the toxicology field: moving away from animal testing toward human relevant, high content, high throughput

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integrative testing strategies. Active programs from EPA, NIH and the scientific community work-wide illustrate the dynamics of safety sciences

Prerequisite: 187.632 or Background in molecular and cell biology.

180.640 Molecular Epidemiology and Biomarkers (4 credits)

Emphasizes the scientific basis of molecular epidemiology and provides examples of the application of molecular biology, analytical chemistry, and toxicology to the study of chronic disease etiology and its public health application, including examples in human cancer, cardiovascular, immunological, and neurological diseases. Also discusses methodological and study design problems.

187.655 Evidence-Based Toxicology (3 credits)

The National Toxicology Program, the Environmental Protection Agency and authorities worldwide, increasingly embrace the concepts of systematic reviews, meta-analysis, risk-of-bias, and quality assurance. Evidence-based toxicology (EBT) is a rapidly evolving discipline that represents a way to transparently and consistently evaluate scientific evidence, which can then be applied to address critical questions in toxicology. EBT is especially useful in the fields of regulatory toxicology and risk assessment, where numerous studies must be considered, weighed and integrated to support decision-making. Provides students with fundamental knowledge about EBT approaches currently in use (or in development) that integrate and utilize diverse sources of data. These approaches include meta-analysis and systematic reviews, as used in evidence-based medicine. Introduces, explains and expands upon techniques such as risk of bias, QA/QC, good laboratory practice and validation, and the role that these tools and techniques play in assuring maximum confidence in evidence-based approaches.

Prerequisite: 187.610 Public Health Toxicology

187.650 Alternative Methods in Animal Testing (3 credits)

Discusses and evaluates strategies for reducing the number of animals utilized in basic and applied research. Addresses traditional in vitro methods, including cell culture and analytical chemistry as well as newer and evolving techniques such as informatics, genomics, proteomics, and metabolomics. Also discusses governmental regulatory processes for approving new testing methods, especially in vitro methods.

180.628 Intro. To Environmental & Occupational Health Law (4 credits)

Examines US and international environmental and occupational health laws and regulations. Covers significant US federal laws, such as the Clean Air Act, the Occupational Safety and Health Act, Superfund, the Toxic Substances Control Act, Safe Drinking Water Act, the Resource, Conservation and Recovery Act and significant international treaties and laws, such as the European Union's REACH legislation, with a particular emphasis on how they influence public health intervention strategies. Also introduces students to the agencies that administer worker health and environmental protection programs.

410.620 Program Planning for Health Behavioral Change (3 credits)

Provides an overview of the breadth of programs and diversity of settings in the field of health education in health promotion, and an opportunity to develop skills in program planning.

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Explains the importance of health behavior as a contributor to current public health problems and the role of health education and health promotion programs in addressing them, drawing examples from the literature on community-based health education, patient education, school health, and work-site health promotion. Also discusses issues of ethical standards and quality assurance in health education and health promotion.

340.680 Environmental & Occupational Epidemiology (4 credits)

Introduces the key health effects of environmental and occupational exposures and the epidemiologic methods used to identify and estimate those effects. Emphasizes the interplay of methodological issues, including the assessment of environmental exposures and the understanding of specific disease processes in identifying the health impact of environmental exposures in the population. Students learn about environmental and occupational exposures (including water and air pollution, food contamination, ionizing radiation, persistent environmental pollutants and emergent environmental exposures) and key methodological issues relevant for these exposures in population studies (including study design, exposure assessment and biomonitoring, disease clusters, dose-response relationships, susceptibility, geographic analysis, and evidence synthesis).

Prerequisite: Either 340.601 Principles of Epidemiology and 340.608 Observational Epidemiology, OR 340.751 Epidemiologic Methods 1, 340.752 Epidemiologic Methods 2, and 340.753 Epidemiologic Methods 3.

182.845 MS Special Studies & Research (variable credit)

Prepares students to identify and research the central issues in environmental health.

182.610 MS Field Placement (variable credit)

MSPH students in EHE must register for this course when completing their internship (full-time students) or independent professional project (part-time students) requirement.

182.850 MS Essay (variable credit)

Students work with their adviser to formulate, research, finalize, and gain approval of their master's essay, which is based on a required Independent Professional Project (IPP). Students write the essay as a professional report summarizing the findings of the IPP. This represents a substantive application of professional technical skills through the process of collecting and summarizing data and reviewing appropriate literature.

Appendix B

| Faculty Lead(s)* | Rank | Discipline | Status | Course/number | Degree |
|-------------------------|---------------------|--------------------------------------|---------------|--|---------------|
| Biswal, Shyam | Professor | Environmental Health and Engineering | Full-Time | Molecular Toxicology/187.632 | PHD |
| Bressler, Joseph | Associate Professor | Environmental Health and Engineering | Full-Time | Public Health Toxicology/187.610; Toxicology21: Scientific Foundations/187.640; 187.640Alternative Methods in Animal Testing/187.650 | PhD |
| Burke, Thomas | Professor | Health Policy and Management | Full time | Methods in quantitative risk assessment/317.605 | PhD |
| Celentano, David D. | Professor | Epidemiology | Full-Time | Epidemiologic Inference in Public Health I/317.621 | ScD |
| Deal, Jennifer A. | Assistant Scientist | Epidemiology | Full-Time | Epidemiologic Inference in Public Health I/317.621 | PhD |
| Diener-West, Marie | Professor | Biostatistics | Full-time | Statistical Methods in Public Health I/ 140.622 and II/140.622 | PhD |
| Fox, MA | Assistant Professor | Health Policy and Management | Full-time | Introduction to the Risk Sciences & Public Policy/317.600; Risk Policy, Management and Communication/317.610; Methods in Quantitative Risk/ 317.605Assessment; Topics in Risk Assessment/317.515 | PhD |

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| | | | | | |
|------------------------|---------------------|--------------------------------------|-----------|--|------|
| Gange, Stephen | Professor | Epidemiology | Full-Time | Epidemiologic Inference in Public Health II/317.622 | PhD |
| Golub, Elizabeth | Senior Lecturer | Epidemiology | Full-Time | Epidemiologic Inference in Public Health II/317.622 | PhD |
| Guallar, Eliseo | Professor | Epidemiology | Full-Time | Environmental and Occupational Epidemiology/180.628 | MD |
| Heaney, Christopher D. | Associate Professor | Environmental Health and Engineering | Full-Time | Environmental and Occupational Epidemiology/180.628 | PhD |
| Jones, Vanya | Assistant Professor | Health, Behavior, Society | Full-time | Program Planning for Behavior Change/410.620 | PhD |
| Locke, Paul | Associate Professor | Environmental Health and Engineering | Full-time | Introduction to Environment & Occupational Health Law/180.628 | DrPH |
| Nachman, Keeve | Assistant Professor | Environmental Health and Engineering | Full-time | Introduction to the Risk Sciences and Public Policy/317.600 | PhD |
| Smirnova, Leena | Research Associate | Environmental Health and Engineering | Full-time | Toxicology 21; Scientific Application/187.645; Evidence Based Toxicology 187.655 | PhD |
| Tang, Winnie | Associate Professor | Environmental Health and Engineering | Full-time | Molecular Toxicology/187.632 | PhD |
| Vernick, Jon | Professor | Health Policy and Management | Full-time | 550.860 Academic & Research Ethics/550.860 | JD |

APPENDIX C

| TABLE 1: RESOURCES: | | | | | |
|--|------------------|------------------|------------------|------------------|------------------|
| Resource Categories | 2019 | 2020 | 2021 | 2022 | 2023 |
| 1. Reallocated Funds | 0 | 0 | 0 | 0 | 0 |
| 2. Tuition/Fee Revenue (c + g below) | \$323,640 | \$333,348 | \$343,350 | \$353,652 | \$424,970 |
| a. Number of F/T Students | 6 | 6 | 6 | 6 | 7 |
| b. Annual Tuition/Fee Rate | \$53,940 | \$55,558 | \$57,225 | \$58,942 | \$60,710 |
| c. Total F/T Revenue (a x b) | 0 | 0 | 0 | 0 | 0 |
| d. Number of P/T Students | 0 | 0 | 0 | 0 | 0 |
| e. Credit Hour Rate | 0 | 0 | 0 | 0 | 0 |
| f. Annual Credit Hour Rate | 0 | 0 | 0 | 0 | 0 |
| g. Total P/T Revenue (d x e x f) | 0 | 0 | 0 | 0 | 0 |
| 3. Grants, Contracts & Other External Sources | 0 | 0 | 0 | 0 | 0 |
| 4. Other Sources | 0 | 0 | 0 | 0 | 0 |
| TOTAL (Add 1 – 4) | \$323,640 | \$333,348 | \$343,350 | \$353,652 | \$424,970 |

2.) Resources are full time tuition revenues. The expectation is that we will start with six students and increase to eleven students (between 10-15 students subsequent years). The cost of the tuition cost subject to a 3% increase each year. Tuition revenue will be the only resource to support this program.

APPENDIX C

| TABLE 2: EXPENDITURES: | | | | | |
|--------------------------------|------------------|------------------|------------------|------------------|------------------|
| Expenditure Categories | 2019 | 2020 | 2021 | 2022 | 2023 |
| 1. Faculty (b + c below) | \$269,340 | \$277,420 | \$380,990 | \$392,420 | \$404,193 |
| a. # FTE | 2 | 2 | 2 | 2 | 2 |
| b. Total Salary | \$201,000 | \$207,030 | \$284,321 | \$292,851 | \$301,637 |
| c. Total Benefits | \$68,340 | \$70,390 | \$96,669 | \$99,569 | \$102,556 |
| 2. Admin. Staff (b + c below) | 0 | 0 | 0 | 0 | 0 |
| a. # FTE | 0 | 0 | 0 | 0 | 0 |
| b. Total Salary | 0 | 0 | 0 | 0 | 0 |
| c. Total Benefits | 0 | 0 | 0 | 0 | 0 |
| 3. Support Staff (b + c below) | 0 | 0 | 0 | 0 | 0 |
| a. # FTE | 0 | 0 | 0 | 0 | 0 |
| b. Total Salary | 0 | 0 | 0 | 0 | 0 |
| c. Total Benefits | 0 | 0 | 0 | 0 | 0 |
| 4. Equipment | 0 | 0 | 0 | 0 | 0 |
| 5. Library | 0 | 0 | 0 | 0 | 0 |
| 6. New or Renovated Space | 0 | 0 | 0 | 0 | 0 |
| 7. Other Expenses | 0 | 0 | 0 | 0 | 0 |
| TOTAL (Add 1 – 7) | \$269,340 | \$277,420 | \$380,990 | \$392,420 | \$404,193 |

1. The equivalent of 2 full-time faculty salaries with a 3% increase in salary each year.. Faculty effort to teach and advise students in this program. Fringe benefit rate of 34%.