Berkeley School of Public Health ENVIRONMENTAL HEALTH SCIENCES DIVISION

Academic Year: 2016-17

STUDENT HANDBOOK

Academic Degrees: MPH

This Handbook is for students enrolled in the School of Public Health, Division of Environmental Health Sciences. It addresses the policies and procedures related to the professional degree (MPH) programs. Students enrolled in the academic degree (MS, Ph.D.) programs in the Graduate Group of Environmental Health Sciences should refer to the Graduate Group handbook for relevant information

Berkeley School of Public Health ENVIRONMENTAL HEALTH SCIENCES DIVISION

Division of Environmental Health Sciences
50 University Hall, Berkeley, CA 94720-7360

August 22, 2016

Dear Environmental Health Sciences Incoming Class,

Welcome to the Environmental Health Sciences (EHS) Program at the School of Public Health at the University of California at Berkeley!

We are pleased that you decided to pursue your graduate studies here and look forward to interacting with you both in the classroom and through the many field studies and extracurricular activities that await you.

The EHS program has dedicated faculty and staff who we encourage you to get to know so that you fully benefit from your time at Berkeley. Each of you has been assigned an academic advisor who will help to guide you during your time in the program. You are also encouraged to reach out to consult with other faculty or staff members who you think may have insight.

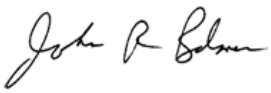
There are many resources at your disposal, including the EHS, School of Public Health (SPH) and UC Berkeley websites, SPH Student Services and Admissions staff, and the Center for Occupational and Environmental Health (COEH), which is housed within the Division of EHS. Within the EHS MPH Program Handbook you will find information on:

- EHS mission & competencies
- MPH curriculum
- EHS courses
- Program, school, and campus resources

Please read your program handbook and ask faculty or staff any questions that you may have about the program. Norma Firestone is the Student affairs Officer for EHS. Her email is nstone@berkeley.edu and her office phone no. is 510 643-5160.

We look forward to getting to know each of you and understanding how we can help you achieve your educational and professional goals in the field of EHS.
With best wishes,

Ellen A. Eisen, ScD
Professor and Head,
Division of Environmental
Health Sciences



John R. Balmes, MD
Professor and Vice Head,
Division of Environmental
Health Sciences

Table of Contents

Competencies in EHS

Upon completion of the MPH program, graduates will be able to:

•Identify the sources and health effects of major environmental and occupational hazards.

•Describe general mechanisms of toxicity relevant for these hazards and interpret data to assess hazards.

•Describe how environmental and occupational exposures are measured.

•Interpret epidemiologic data to assess evidence for health effects caused by environmental and occupational exposures.

•Identify factors that affect susceptibility and vulnerability of sub-populations to health effects of environmental and occupational exposures.

•Use risk assessment and other methods to assess hazards and identify ways to reduce them.

•Describe healthy policy and regulatory institutions in the US and worldwide and develop approaches to improve health.

•Define environmental justice and how it relates to environmental health

•Understand the health risks posed by the built environment and how to improve community environments.

•Explain climate change and potential impacts on health, as well as major mitigation and adaptation strategies.

•Organize written and oral material for EHS presentations and communicate to diverse audiences.

EHS Mission

The mission of the Environmental Health Sciences (EHS) program is to prepare students to assess the health impacts of physical, chemical, and biological agents in the environment and workplace and to explore means for their measurement and control. EHS integrates several disciplines with emphasis in assessment of exposures to environmental contaminants, toxicology, environmental and occupational epidemiology, risk assessment, and policy analysis. Students learn to apply tools in these disciplines to problems in the United States and other parts of the world.

1. INTRODUCTION TO THIS HANDBOOK

Welcome to the School of Public Health and the Environmental Health Sciences Division.

We have prepared this handbook to explain the Environmental Health Sciences (EHS) program for the MPH degree. This professional degree is offered by the School of Public Health. (There are also academic degrees such as the Ph.D. and the M.S. degrees, and some of your colleagues will be pursuing these degrees. They are not, however, covered in this handbook)

This handbook focuses primarily on the elements of the MPH degree that are required by and managed through the Environmental Health Sciences Division. There are also elements that are required by or managed through the School of Public Health as a whole. You will want to also refer to online and written resources provided by the School. The Student Affairs Office on the fourth floor of University Hall is a key resource for you.

The EHS Division is affiliated with the Center for Occupational and Environmental Health (COEH). The COEH links environmental health and medicine programs at the Berkeley, Davis and San Francisco campuses. The COEH is also an Educational Resource Center of the National Institute for Occupational Safety and Health (NIOSH), which provides student support at Berkeley in the areas of industrial hygiene and ergonomics. Additionally, the COEH sponsors community outreach through the Labor Occupational Health Program.

1.1 Disciplines of Environmental Health Sciences

Environmental Health Sciences is a multi-disciplinary field that brings together knowledge and tools from several areas to build capacity to understand and address environmental health issues. As you are probably aware, environmental factors are estimated to be responsible for 25-40% of the burden of disease. There also issues of equality as some groups are most affected and most susceptible including infants and children, pregnant women, and people with less money and power.

The EHS curriculum prepares students to assess the health impacts of physical, chemical, and biological agents in the environment and workplace, and the means for their measurement and control. EHS integrates several disciplines with emphasis on assessment of exposures to environmental contaminants, toxicology, environmental and occupational epidemiology, risk assessment, control strategies, and policy solutions. Students learn to apply tools in these disciplines to problems in both the U.S. and other parts of the world. Some of the disciplines are discussed below.

> ***Toxicology*** - Measurement of dose-response relationships for various environmental chemicals; investigations on mechanisms of toxicity; application of bioassays for evaluating chemical toxicity; development of biological markers of chemical exposure and effect.
>
> ***Exposure Assessment*** - Evaluation of exposures including the design and development of measurement techniques or strategies; air and water pollution studies including design of control strategies; studies of sources of pollution and their relationship to human health.
>
> ***Environmental Health Policy*** – Draws upon assessment methods including risk assessment, to focus on strategies to prevent exposures to environmental and occupational hazards and

conditions, with an emphasis on communication strategies for diverse audiences and consideration of equity.

Occupational and Environmental Epidemiology - Involves human population studies that address the health effects caused by exposure to chemical and physical agents. Although Occupational and Environmental Epidemiology is one of the core areas in EHS, students whose primary interest is epidemiology would usually apply for admission to the Division of Epidemiology. While based in that Division, students may enroll in EHS courses and work with faculty in both divisions.

Industrial Hygiene - Recognition of health risk caused by exposure to toxic chemicals, harmful physical or infectious biological agents and ergonomic factors, evaluation of exposures by various measurement techniques or strategies involving worksite air sampling and biological monitoring, formulation of controls for exposures by administrative, engineering, or personal protective measures.

Ergonomics – Recognition and amelioration of work-related risk factors for chronic musculoskeletal disorders through knowledge of pathophysiology, biomechanics, anthropometry, and engineering. The goal of Ergonomics is to improve design of workstations to prevent injury.

1.2 Professional Degree

The Master of Public Health (MPH)

The MPH degree is recommended for students who wish to work as environmental or occupational health professionals in settings such as community-based or non-governmental organizations, health departments, other government agencies, industry, and so on.

The School of Public Health offers a Doctor of Public Health (DrPH) degree program, but this is not administered by the Environmental Health Division. If you are interested in a DrPH degree, please refer to, http://sph.berkeley.edu/areas-study/doctor-public-health.

Students who are primarily interested in research may wish to consider the M.S or Ph.D. academic degrees.

1.3 Administrative Structure

The Environmental Health Sciences (EHS) academic program consists of a Division, which administers the professional degrees, and a Graduate Group administering the academic degrees.

Environmental Health Sciences is one of several divisions within the School of Public Health. These Divisions have independent identities only within the School, which is the home department. The professional degree, MPH is under the jurisdiction of the Dean of the School of Public Health, Dr. Stefano Bertozzi. Those students who have selected the Environmental Health Sciences program and who are seeking the MPH degree, are advised, and were initially recommended for admission, by the EHS program faculty acting under authority delegated by the Dean.

Dr. Ellen Eisen serves as Head, and Dr. John Balmes serves as the Vice Head of the Environmental Health Sciences Division and they represent EHS faculty within the School. Professional degree students also have academic advisors based on their specialty areas within EHS. Students are encouraged to meet with their academic advisors regularly regarding academic planning and advising.

The EHS Division faculty members are noted below, and their research interests are described in Appendix 1.

Dr. John Balmes

Dr. Michael Bates

Dr. Asa Bradman

Dr. Ellen Eisen

Dr. Katharine Hammond

Dr. Carisa Harris-Adamson

Dr. Nina Holland

Dr. Catherine Koshland

Dr. Thomas McKone (emeritus)

Dr. Stephen Rappaport

Dr. David Rempel (emeritus)

Dr. James Seward

Dr. Allan Smith (emeritus)

Dr. Kirk Smith

Dr. Martyn Smith

Dr. Robert Spear (emeritus)

Dr. Luoping Zhang

Dr. Charlotte D. Smith

1.4 Faculty Affiliates:

Robert Harrison, Lecturer, UCSF Clinical Professor

Amy Kyle, Retired Adjunct Professor

Mark Nicas, Retired Adjunct Professor

James Seward, Clinical Professor

2. COMPETENCIES FOR EHS STUDENTS

Each student is expected to achieve competencies by the time that they finish their degree. Some of these are set by the School of Public Health for all MPH students. Some of these are set by the Environmental

Health Sciences Division for MPH students who are specializing in EHS. Both sets of competencies are explained in this section.

2.1 School of Public Health Competencies

Upon successful completion of the degree, students will possess core understanding of the fundamental areas of knowledge in public health, develop a professional specialization, and an ability to integrate and apply this knowledge in addressing public health problems. The School of Public Health competencies listed below will be met through the entire program of study, including the SPH breadth courses.

A. Identify and define parameters of public health problems.

B. Collect data relevant to a public health problem.

C. Demonstrate critical thinking in determining effective use and analysis of data and statistical methods for public health problems as applied, for example, in epidemiology, health management, program planning, program evaluation, and policy analysis.

D. Describe the interrelationships of scientific, economic, political, social, ethical, and personal interplay with public health problems and issues.

E. Demonstrate leadership and communicate public health information, policy, positions, and program justifications effectively in writing and orally.

F. Advocate for public health issues and resources.

G. Demonstrate cultural competence with persons and groups from diverse backgrounds.

H. Demonstrate ethical standards in practice, research, data collection and storage and program management.

3. MPH CURRICULUM

The curriculum for MPH students is a combination of elements developed by the School of Public Health for all students and those develop by the Environmental Health sciences Division for its students. Please refer to the table on the following page, which lays out the basic elements of the curriculum.

Major Elements of the EHS MPH Curriculum

School of Public Health – Basic Knowledge of the Field: "Breadth"

Courses

Health Policy & Management	PH 200J (Fall)
Environmental Health	EHS Students do not take
Health and Social Behavior	*PH 200L (Fall)

School of Public Health – Essential Methods for all Students

Epidemiologic Methods I or II	PH 250A & PH 250B

Biostatistics – Probability and Statistics	PH 142 (Fall and Spring)
Biostatistics – Continuous Outcome Data	PH 145 (Fall)

Environmental Health Sciences -- Core Courses

Introduction to Environmental Health Sciences	PH 270 (Fall)
Toxicology	PH 270B (Fall)
Exposure Assessment and Control I	PH 270A (Spring)
Risk Assessment, Regulation, and Policy	PH 220C (Spring)
Science and Policy for Environmental Health	PH 271E (Spring)

Environmental Health Sciences – "Selectives"

(Students must take at least one of these)

Human Genome, Environment and Health	PH 256A (Spring)
Genetic Analysis Methods	PH 256B (Spring)
Case Studies in Environmental and Occupational Epidemiology	PH 272B (Fall)
Environmental Determinants of Infectious Disease	PH 290 (Fall)
Introduction to GIS and City Planning (City & Regional Planning)	204C (Spring)

Environmental Health Sciences – Seminar and Field Placement

MPH Seminar (EHS MPH Capstone Seminar 3rd and 4th semester)	PH 292
Summer Field Placement	PH 297

Notes: Additional elective units are required. There are additional requirements for industrial hygiene students

Advanced EHS Courses – Electives

PH 267B	Characterization of Airborne Chemicals (3) (Sp, alt.Odd yrs)
PH 290	Exposure Assessment & Control II (Sp. alt. even year)

PH 269C	Occupational Biomechanics (3) (Sp)
PH 269D	Ergonomics Seminar (2) (F)
PH 269E	Current Topics in Environmental Medicine (3) (F)
PH 270C	Practical Toxicology (2) (Sp)
PH 271C	Drinking Water and Health (3) (Sp)
PH 271D	Global Burden of Disease (3) (Sp)
PH 271G	Global Environmental Change for Health Scientists (2) (Sp)

3.1 Understanding Requirements for the MPH Degree in EHS

1. The **first element of the curriculum** is about understanding the overall parameters of public health. This is referred to as the "breadth" requirement. The School has established courses to provide this foundation, and all MPH students take these.

   PH 200J Introduction to Health Policy & Management (2 units)

   PH 200L Introduction to Health and Social Behavior (2 units)

   PH 200K is not required for EHS students.

Please refer to your School of Public Health Orientation Packet for more information regarding exemption exams and alternatives to the breadth requirements.

2. The second element of the curriculum is about skills and knowledge that are important for all MPH students. These are biostatistics and epidemiology. The School requires all MPH students to take courses in these two disciplines.

All MPH students are required to take at least one epidemiology course and may choose from PH 250A or 250B

PH 250A Epidemiologic Methods I (3 units)

PH 250B Epidemiologic Methods II (4 units)

EHS Students are encouraged to take PH 250B if possible.

3. The third element of the curriculum are core courses in environmental health require for all EHS MPH students These are noted in the diagram and will be explained further later in this handbook. The EHS core courses represent the main intellectual aspects of Environmental Health Sciences and constitute the basis for the competencies established for EHS students. These are described in the appendix to this document.

3.2 Other Requirements for the EHS Degree

The EHS course descriptions are noted in Appendix 2.

In addition to the EHS Core and other required courses listed above, MPH students must fulfill the following degree requirements:

4. Advanced Courses (200 series) - 9 units, minimum. At least 4 units in EHS beyond the core courses, with the remainder relating to the individual's program either in the School of Public Health or outside the department. Students should check with their advisor about which courses count as advanced courses. This includes the "selectives."

5. Electives, including seminars - 6 units, minimum

6. A minimum of 12 units must be taken in the graduate series (Courses numbered in the 200's).

7. At least 12 units must be taken in the School of Public Health.

8. Public Health Practice - 3 units. Every MPH student is expected to complete field training or a project-based public health practice activity for a minimum of 12 weeks. Students presenting evidence of previous qualifying experience may meet this requirement. A request for waiver is initiated with the student's advisor during Fall 2016 Semester. This requirement may be waived for students admitted in advanced standing.

9. Students must register for course PH 297 after undertaking public health practice training in the summer during the Fall 2016 Semester. The Center for Public Health Practice, in conjunction with the EHS Program Coordinator, assists MPH students in locating potential internship placements.

10. MPH students specializing in industrial hygiene are required to complete a three-month, full-time internship in industry or government during the program, regardless of previous work experience. The Center for Public Health Practice coordinates all MPH summer internships to assist IH students with their internships.

11. At least a B (3.0 grade-point) average in all work completed in graduate standing.

12. Final Project– Students will be evaluated at the end of their second year based on a Final Project. There are two options for the project: (A) **Thesis** option requires approval of a faculty member who commits to mentoring the student through completion of the thesis. (B) **Capstone** option requires the Capstone seminar PH292 (1 unit) in Yr 02. Third semester focuses on capstone project development and the fourth semester focuses on capstone project completion, presentation and final report). If a student opts for the thesis option, they must submit a proposal for the thesis by the end of Yr 1. The thesis must be completed by the end of Yr 2. The thesis proposal must be approved by the faculty mentor, otherwise the capstone project is the default.

13. A minimum of four semesters of academic residence (exception: a minimum of two semesters for Occupational Medicine Residents).

Except for students admitted with advanced standing, a minimum of 48 units is required for the MPH degree. Students admitted with advanced standing are required to complete a minimum of 24 units. Only one-third of the total units completed are allowed on an S/U grading basis (Courses numbered Public Health 291, 297, 299, and 300 through 600 series are discounted from the one-third limit). Additionally, no more than 6 units for the degree may be research units (PH 299).

Students who enroll full time each semester and successfully complete the EHS core courses, SPH breadth courses, and specialty area requirements generally have no problem meeting the degree requirements. Please refer to the appropriate course requirement check sheet in the appendix to use as a guide in planning your courses. If you have questions about the requirements, contact your faculty advisor or the EHS Program Coordinator.

4. PROFESSIONAL DEGREE PROGRAMS AND REQUIREMENTS

4.1 Sample Curriculum for MPH Students

First-Year Program (2016-2017)

Fall:	PH 142 Probability & Statistics	4 units
	PH 200J Health Policy & Management	2 units
	PH 200L Health and Social Behavior	2 units
	PH 250A or B Epidemiologic Methods	3 or 4 units
	PH 270 Introduction to Environmental Health Sciences	3 units
	PH 270B Toxicology	3 units
Spring:		
	PH 270A Exposure Assessment & Control I	3 units
	PH292 MPH Seminar	1 unit
	Selective(s)	3 or 4 units
	Elective(s)	2-7 units
Summer:	Internship, full time (Register Fall 2016)	3 units

Second-Year Program (2016-2017)

Fall:	PH 145 Statistical Analysis of Continuous-Outcome Data or another Biostatistics Course	4 units
	PH292 MPH Capstone Seminar	1 unit

	Selective(s)	3 or 4 units
	Elective(s)	2-7 units
Spring:	PH 220C Health Risk Assessment, Policy & Regulation	3 units
	PH 271E Science and Policy for Env. & Hlth.	3 units
	[or, PH 220 Health Policy Decision Making (Fall)]	
	PH292 MPH Capstone Seminar	1 unit
	Selective(s)	3 or 4 units
	Elective(s)	5-8 units

4.2 Sample Curriculum for IH Students

The curriculum for the Industrial Hygiene specialization is less flexible. The suggested order of the required coursework is shown below. However, the student with her/his advisor should plan a program that best meets the student's needs and interests. For example, a student might wish to change the order of some of the required courses.

First-Year Program (2016-2017)

Fall:	PH 142 Probability & Statistics	4 units
	PH 200J Health Policy & Management	2 units
	PH 200L Intro. To Health and Social Behavior	2 units
	PH 250A Epidemiologic Methods*	3 units
	PH 270 Introduction to Environmental Health	3 units
	PH 270B Toxicology	3 units
Spring:		
	PH 234 Green Chemistry: An Interdisciplinary Approach	3 units
	PH 270A Exposure Assessment & Control I	3 units
	PH 290-05 Exposure Assessment & Control II (offered every even year)	3 units
	PH 269C Occupational Biomechanics	4 units
	PH 292 MPH Seminar	1 unit
Summer:	*PH 297 Internship, full time (Register Fall 2015)*	*3 units* ***(S/U only)***
	Fundamentals of Workplace Safety (2-day course)	No units

Second-Year Program (2016-2017)

Fall:	PH 145 Statistical Analysis of Continuous-Outcome Data	4 units
	Or another Biostatistics Course	
	PH 298-00 Occupational Health Clinic[1]	1 unit **(S/U only)**
	PH 299-00 Occupational Fatality Case Analysis	2 units
	PH 260A Principles of Infectious Disease [Elective]	3 units
	CE 265 Traffic Safety and Injury Prevention [Elective]	3 units
	PH 269E Current Topics in Environmental Medicine	3 units
	PH 272B Case Studies in Occupational and Environmental Epidemiology [Elective]	2 units
	PH292 MPH Capstone Seminar	1 unit
Spring:	PH 220C Health Risk Assessment, Policy & Regulation	3 units
	PH 267B Characterization of Airborne Chemicals (offered every odd year)	3 units
	PH 271E Science and Policy for Env. & Hlth.**	3 units
	PH 256A Human Genome, Environment and Health	2 units (spring)
	PH 256B Genetic Analysis Methods	2 units (spring)
	PH292 MPH Capstone Seminar	1 unit

Note: *The alternative course is PH 250B. In addition, one of these courses could be taken in the 2nd year.

**The alternative course is PH 220 Health Policy Decision Making, which taught in the Fall Semester.

4.3 Additional Information for MPH IH Students

MPH IH students are required to take two electives in courses related to occupational health.

Examples of suitable courses are:

Environmental Engineering (CE 111)	3 units (fall, Lab offered in spring)
Public Health Microbiology (PH 162A)	3 units (fall)
Principles of Infectious Disease (PH 260A)	3 units (fall)
Human Genome, Environment, and Health (PH 256A)	2 units (spring)
Genetic Analysis Methods (PH 256B)	2 units (spring)
Traffic Safety and Injury Prevention (CE 265)	3 units (fall)
Current Topics in Environmental Medicine (PH 269E)	3 units (fall)

[1] Students can enroll in the Occupational Health Clinic either fall or spring semester, depending on the needs of their schedules and those of the Clinic.

Case Studies in Occupational Environmental Epidemiology (PH 272B) 2 units (fall)

Social Justice and Worker Health (PH 290) 2-3 unit (fall, spring)

5. CURRICULUM PLANNING, POLICIES, AND PROCEDURES

The administration of coursework and degree requirements and enrollments are handled by the School of Public Health and the Office of the Registrar. These matters are not handled by the Environmental Health Sconces Division.

As noted before, students should carefully review information from these entities to make sure that they are being properly enrolled in courses and meet degree requirements.

Most paperwork required for EHS students is handled through the School of Public Health's Office of Student Affairs which is located on the fourth floor of University Hall. This would include the filing of schedule request forms, petitioning to add/drop courses, and applying to change degree goal, or withdraw.

The appropriate Graduate Advisor should be consulted about taking any such actions. Darlene Francis PhD. is the Associate Dean of Education, Equity, and Inclusion.

This section includes some examples of policies and procedures of interest to MPH students.

5.1 University Policy on "Incompletes" for Graduate Students

Graduate students are considered to be in good academic standing if they have a 3.0 GPA and no more than two incompletes. Three incomplete grades can put students on academic probation and make them ineligible for GSI or GSR appointments. If special circumstances pertain, such as illness, steps can be taken to request continued enrollment and/or eligibility for student appointments.

5.2 Course Loads

Environmental Health Sciences students are required each semester to carry a full-time course load, which is equivalent to 12 units. Lower division courses (under 100) are not counted at all in the calculation of course loads. The Dean's Office, upon the recommendation of the faculty advisor, may grant other exceptions to this policy.

5.3 Satisfactory/Unsatisfactory Grade Option

The campus Graduate Division prefers that students enroll in courses for letter grades. However, graduate students in good standing may take courses on a Satisfactory/Unsatisfactory (S/U) basis with the consent of their academic advisers. A Satisfactory grade for graduate students implies work of B- quality or better. Courses graded as S/U are not included in the calculation of the GPA. Credit for courses taken on an S/U basis is limited to one-third of the total units taken and passed at Berkeley (excluding courses Public Health 291, 297, 299, and 300 through 600 series). The EHS faculties recommend that all of the

EHS core courses, except for the EHS Masters and Doctoral Seminars (PH 292/293), are taken for letter grades.

5.4 Applying to Ph.D. Program

If a current Masters student wishes to apply for the Ph.D. program in Environmental Health Sciences, the following items must be submitted to 417 University Hall by December 1:

1. New SPH application
2. Updated statement of purpose
3. At least one new letter of recommendation (although three new letters are preferred)
4. Petition to Add or Change Degree Goal

6. FINANCIAL SUPPORT

6.1 General Information

In addition to the campus Financial Aid Office, both the SPH Student Services Office and the EHS Program Coordinator are knowledgeable about the sources of funding available to School of Public Health students. Students may also check the Graduate Fellowship Office website for financial resources, http://www.grad.berkeley.edu/financial/fellowships_resources.shtml.

Several EHS students receive funding through specific programs related to their academic interests (e.g., the National Institute of Occupational Safety and Health). Additionally, EHS receives funding from the Graduate Division and faculty extramural sources, which are divided among new and continuing students as determined by the EHS faculty. Because the sources vary each year, funding cannot be guaranteed for all students. For more information regarding financial support, you may contact the EHS Program Coordinator.

Please note that stipends available to graduate students, not loans, are taxable under the terms of the Tax Reform Act of 1986. Fellowships and grant funds used to pay tuition, fees, and other course-related expenses are excluded from taxation, but funds used for living expenses are taxable. It is up to students to claim the taxable portion of awards, because the University does not distribute W-2 forms for student awards. Additionally, the University does not withhold taxes from stipends nor does it report such stipends to the Internal Revenue Service for US citizens and permanent residents.

The University does, however, report awards made to international students. Federal income tax is withheld from student fellowship, scholarship, and grant payments at the rate of 14% unless the student is exempt under a tax treaty. California State income tax will not be withheld from student payments; however, the student is responsible for filing a California State income tax return. Any further questions regarding fellowship payments or GLACIER can be directed to the Foreign Tax Analyst by emailing glacieradmin@berkeley.edu.

All foreign individuals receiving funds from the University must have a GLACIER record. GLACIER determines residency status and tax treaty eligibility for the foreign individual. Please refer to this website for instructions: http://internationaloffice.berkeley.edu/tax-prep.

All F-1 students receiving cash-in-hand awards from the University, separate from GSI or GSR stipends, must have a Social Security Number or Individual Taxpayer Identification Number (ITIN) in order to complete the GLACIER process and for Payroll to release their award payments. Berkeley International Office can assist F-1 students in applying for the ITIN once they have completed a GLACIER record. The latest ITIN information is available at: http://internationaloffice.berkeley.edu/itin_faqs

6.2 Fee Remission

Students appointed as a Graduate Student Instructor (GSI) or Graduate Student Researcher (GSR) on campus may have some or all of their educational and health insurance fees paid as a benefit of employment. There are occasional GSI opportunities in Environmental Health Sciences. However, the majority of the students employed by EHS are appointed as GSRs. Students interested in locating a GSI position should look at listings on the EHS and School of Public Health bulletin boards, contact departments of interest. Although the specifics of a graduate student appointment vary, the following fee remissions generally apply for students appointed the full semester:

- GSI: partial fee remission ($8,220.00) including Student Health Insurance--SHIP--remission
- GSR (25-44%): partial fee remission ($8,220.00) including SHIP
- GSR (45% or greater): full fee remission ($8,827.25)

6.3 Filing Fee

This permits eligible graduate students to pay one-half of the University Registration Fee (approximately $268.50) in lieu of full registration fees when filing a thesis or dissertation or completing a comprehensive exam. Filing fee status is approved only for students who have met the University's continuous registration requirement and whose research requires no use of University facilities or faculty consultation time. Filing Fee status is not equivalent to registration; if students want to use University services that are supported by registration fees, they must pay additional fees.

7. DEPARTMENTAL RESOURCES

There are no funds available to cover photo copying, faxing, or purchasing supplies for students. All supplies, photo copying, mailing costs, and so on must be charged to a specific university account and university funds are becoming increasingly scarce. For example, if a faculty member wishes to photocopy an article, he or she must specify the class for which it is required or a research grant charge number. The same is true of University vehicles and virtually everything else.

8. MISCELLANEOUS NOTES

8.1 Mailboxes

All EHS students have a mailbox located in Suite 760, University Hall. Mailboxes should be checked regularly (at least once a week) for messages and announcements. All SPH students also have a mailbox in the University Hall Student Lounge B (room 56). Although the EHS program distributes mail only to the mailboxes in the University Hall Suite 760, students should check their SPH University mailboxes for all-school announcements.

8.2 EHS Bulletin Board

The EHS program has bulletin boards specifically for announcements relevant to EHS students: seminar notices, course changes and additions, job announcements and examinations, and campus services. They are located outside of Environmental Health Sciences office, Suite 760 University Hall.

8.3 E-mail Directory

All students are encouraged to obtain e-mail accounts as soon as possible. Go to https://bconnected.berkeley.edu/ to learn about the online services offered for Berkeley students. This includes file storage and calendar as well as email.

EHS faculty, staff, and students rely heavily on e-mail for on-going communication throughout the Division and several School groups use e-mail distribution as their main method of information dissemination. A list of the EHS student, faculty and staff email addresses is distributed at the beginning of each semester.

There are several e-mail lists utilized in the School of Public Health. Some of the addresses that may be of use to you are:

All EHS Students:	all_ehs_students@lists.berkeley.edu
EHS MPH Students:	ehs_mph_students@lists.berkeley.edu
EHS MS Students:	ehs_ms_students@lists.berkeley.edu
EHS Doctoral Students:	ehs_phd_students@lists.berkeley.edu
All SPH Students:	sphinfo@berkeley.edu
Multicultural Student Organization:	mcso_berkeley@googlegroups.com
SPH Student Government:	http://sph.berkeley.edu/students/government.php
All SPH faculty:	sph_faculty_open@berkeley.edu
GSI Teaching & Resource Center:	gsi.berkeley.edu

By sending one email message to an address listed above, you will be sending your message to everyone on the list, for whom email addresses have been recorded.

8.4 bCourses

bCourses is the name of the campus' learning management systems where many course materials and communications will take place and be archived for later retrieval. Students are automatically added to the bCourses site for any course they are enrolled in. Students are advised to explore bCourses and resources available about it. See https://bcourses.berkeley.edu/

It is ***highly recommended*** that students enroll in the SPH Student site called *SPH Grads*. That site is where SPH administration and Student Services staff posts course enrollment information, deadline information, fellowship and employment (GSR/GSI positions) opportunities, announcements, etc.

Note: there are methods for filtering mail from your various bCourses sites; beware of turning off email notification for one site housed on bCourses site as notifications for all other sites will be affected. All email communications are archived in each site so if you do miss a message you can catch up there.

The eGrad website is produced by Graduate Communications & Events, distributed by email, and archived on the Web (http://grad.berkeley.edu/category/news/). Graduate students, alumni, faculty, and staff are invited to send news and other announcements to Richard Corten, editor, at gradpub@calmail.berkeley.edu.

8.5 Updated Course Information

Current schedules for Environmental Health and other Public Health courses are available with the EHS Program Coordinator's Office, University Hall room 761. The Berkeley Bulletin/ Public Health at, http://bulletin.berkeley.edu/courses/pb_hlth/, are generally accurate, but check in the EHS Division for the most up-to-date information.

8.6 Student Participation in Committees

Students are encouraged to participate in Standing Committees governing student matters. Students who have an interest in these matters should contact Darlene Francis, Associate Dean of Education, Equity, and Inclusion, darlenefrancis@berkeley.edu, regarding School Committees on the Berkeley Campus, or the EHS Program Coordinator for EHS committees.

8.7 Advisors

All EHS students have been assigned a faculty advisor according to their intended course of study and expressed areas of interest. Advisors may be changed by mutual consent. Students are encouraged to meet with their advisors on a regular basis.

Group advising sessions will be held occasionally during the academic year. Students are encouraged to attend these sessions to learn more about general academic policies, recommended courses, and other developments in EHS.

8.8 California Residency

Because of the high cost of out-of-state tuition, students who intend to reside in California are highly recommended to take the steps necessary to establish legal residency in California. Some of these criteria should be fulfilled immediately after your arrival in Berkeley (August or early September) because it takes one year to establish intent to reside in California. This is especially important for students receiving funding from extramural grants (i.e., NIOSH training grants) because these sources often do not have adequate funds to pay for non-resident tuition. Contact the Residency Office at 642-7209 for specific information on establishing residency.

8.9 Informational Websites

The websites listed below can provide useful information on the EHS program, the School of Public Health, UC Berkeley and professional associations related to environmental health. Some associations offer scholarships and maintain a list of job postings.

COEH	http://coeh.berkeley.edu/
UCB Resources & Services for Graduate Students	http://grad.berkeley.edu/students/
UCB Environmental Health Sciences	http://ehs.sph.berkeley.edu/
UCB EHS Faculty	http://ehs.sph.berkeley.edu/faculty/
UCB School of Public Health	http://sph.berkeley.edu/
SPH Student Government:	http://sph.berkeley.edu/current-students/student-government
UC Housing Mailing List	http://www.housing.berkeley.edu/
UC Berkeley Home Page	http://www.berkeley.edu/index.html
American Public Health Association	http://www.apha.org/
Bay Area Environmental Safety Group	http://www.baesg.org/
National Toxicology Program	http://ntp-server.niehs.nih.gov/
Society for Environmental Toxicology & Chemistry	http://www.setac.org/
Society of Toxicology	http://www.toxicology.org/
Society for Risk Analysis	http://www.sra.org/
Air & Waste Management Association	http://www.awma.org/home
American Conference of Gov't Industrial Hygienists	http://www.acgih.org/
American Industrial Hygiene Association	http://www.aiha.org/Pages/default.aspx
American Society of Safety Engineers	http://www.asse.org/
Semiconductor Safety Association	http://www.semiconductorsafety.org/

Disabled Students Program (DSP) --

The Disabled Students' Program offers a wide range of services for students with disabilities. These services are individually designed, and based on the specific needs of each student as identified by Disability Specialists. Students are entitled to a fully accessible learning experience. Contact the Disabled Students' Program through the website at http://dsp.berkeley.edu or by phone to (510) 642-0518 if you have any questions or concerns or think that you may need accommodation.

Appendix A: EHS Faculty Bios and Research Interests

A.1 Environmental Health Sciences Division Faculty

John Balmes, M.D.

Professor and Vice Head of the EHS Division; Director, Northern California COEH, (Academic Senate). Dr. Balmes is a pulmonary physician, Professor of Medicine at UCSF, and Professor of Environmental Health, SPH. His research is principally in the area of occupational and environmental respiratory disease. He studies the acute effects of inhalational exposures to ambient air pollutants in his Human Exposure Laboratory at San Francisco General Hospital and the chronic effects of such exposures in epidemiological studies with collaborators at both UCSF and UC Berkeley. Two examples of his current UCB-based work are a study of the effects of air pollution on risks of obesity and diabetes in a cohort of children from Fresno and a study of the effects of exposure to biomass smoke in Malawi on risks of early childhood pneumonia and decreased lung function in adults. He is also interested in genetic and epigenetic determinants of responses to air pollutants.

Michael N. Bates, Ph.D.

Professor of Environmental Epidemiology (Non-Academic Senate). Dr. Bates is an occupational and environmental epidemiologist with a background in toxicology. Current research includes a large cross-sectional study in New Zealand investigating whether chronic exposure to hydrogen sulfide gas from geothermal sources is associated with health effects, a study of the health effects of solvent exposures in San Francisco Bay Area automotive mechanics, and investigations in India and Nepal into whether indoor smoke from cooking fires increases risks for tuberculosis and cataract of the eye. Other recent research projects have included epidemiologic studies in Argentina and Chile investigating cancer risks from arsenic in drinking water, studies of cancer risks for firefighters and possible health effects of dental amalgam fillings, and studies of organochlorine contaminants in breast milk and serum. Dr. Bates is also Associate Director of the Global Health and Environment (GHE) Program within the Division of EHS and he teaches the summer class Epidemiologic Methods I (PH 250A).

Asa Bradman, PhD MS

(Lecturer, Division of EHS, SPH). Dr. Bradman is an environmental health scientist who focuses on exposures to pregnant women and children. He worked with Dr. Eskenazi to co-found CERCH in 1997 and helps direct biomonitoring and exposure studies as part of the CHAMACOS partnership in the Salinas Valley, California. He is co-Principal Investigator of the National Children's study in Kern County, CA, and also leads an initiative to improve environmental health in California child care facilities. He was appointed by Governor Schwarzenegger to the Scientific Guidance Panel for the California Environmental Contaminant Biomonitoring Program and is a member of the Scientific Advisory Committee of the National Center for Healthy Homes and the California Child Care Health Program Advisory Panel.

Ellen A. Eisen, Sc.D.

Professor of Environmental Epidemiology, Head of EHS Division (Non-Academic Senate). Dr. Eisen does research at the interface of epidemiologic methods and applied public health, and bridges the fields of occupational and environmental health, statistics and epidemiology. A long-term interest in selection bias due to the healthy worker survivor effect has motivated much of her work. In early studies of the

physiologic significance of poorly reproducible pulmonary function tests, she identified excess FEV1 test variability (poor reproducibility) as a biomarker of impaired respiratory health and a source of selection bias in epidemiologic studies. In later studies of health effects of metalworking fluids in the automobile industry, she developed a strategy for reducing healthy worker survivor bias due to job transfer in cross-sectional studies, leading to an association between adult onset asthma and exposure to water-based fluids. Her ongoing studies of cancer in a large cohort of autoworkers have identified new associations between exposure to oil based fluids and cancers of the larynx, rectum, and bladder, as well as malignant melanoma. She is interested in nonparametric models of relative risk as a smoothed function of exposure because these methods can capture nonlinearities that frequently arise in occupational studies due to depletion of more susceptible subjects or healthy worker survivor bias. She is currently applying causal models to address healthy worker survivor bias as a problem related to the treatment of a time varying confounder (underlying health status) that is affected by previous exposure. In addition to the cancer incidence and mortality studies of autoworkers, Dr. Eisen is involved in exposure-response models of pulmonary function and cancer in longitudinal studies of cotton textile workers, cardiovascular disease in aluminum workers, and carpel tunnel in manufacturing workers.

S. Katharine Hammond, Ph.D.

Professor (Academic Senate). Dr. Hammond's early work focused on the pulmonary effects of exposures to silicon carbide in manufacturing, the carcinogenic potential of diesel exhaust exposures in railroad workers, the effects of exposure to solvents among boat builders, and the effect of exposure to machining fluids in the automobile industry. One of her continuing interests has been quantifying exposures to environmental tobacco smoke (ETS). She developed one of the first methods for measuring such exposure quantitatively as well as the first passive monitor for ETS exposure. Her work on two major studies of ETS exposure on commercial airlines led to the banning of cigarette smoking on domestic flights. The measuring techniques she developed have been adapted by the U.S. Environmental Protection Agency for its nationwide study of exposures. Dr. Hammond directed the exposure assessment strategy for the large and complex study of spontaneous abortion among women in the semiconductor industry. The study sought to learn if there was an excess risk of miscarriages among women working in fabrication facilities and, if so, what the cause might be. Ultimately, the study showed that fabrication employees did have an increased incidence of spontaneous abortion, and Dr. Hammond's exposure assessment procedures enabled the team to identify positive photo resists and a product called "buffered oxide etch" as being associated with particularly elevated risks. Dr. Hammond plans to continue developing innovative methods of exposure assessment for environmental and occupational health.

Carisa Harris-Adamson, PhD, CPE

Dr. Harris is Assistant Professor of Environmental Health in the School of Public Health at UC Berkeley and Assistant Professor in the Department of Medicine at UC San Francisco. Additionally, she is the Director of the Ergonomics Research & Graduate Training Program. Her research is primarily focused on the prevention of musculoskeletal disorders such as carpal tunnel syndrome and hand/wrist tendinosis. She is engaged in epidemiological research to identify the biomechanical and psychosocial exposures associated with upper extremity MSDs and subsequent work disability. Additionally, Dr. Harris collaborates with other EHS Faculty and students to study the health impacts of heavy load carrying (water, firewood, etc) on women in third world countries. She is engaged in prevention through design research that aims to reduce workplace biomechanical exposure through equipment and work design modifications. Currently, Dr. Harris is also researching the physiological impact of heavy and sedentary workloads on workers' health.

Nina T. Holland, Ph.D.

Professor, (Non-Academic Senate). Director of Children's Environmental Health Laboratory, and SPH Biorepository at UC Berkeley). Dr. Holland's scientific interests include human genetics, molecular epidemiology and reproductive toxicology. Currently, Dr. Holland conducts several projects focused on effects of air pollution, pesticides and other environmental agents on growth, neurodevelopment, cytogenetic and immunological abnormalities in fetuses, young children and adolescents, and on genetic and epigenetic mechanisms. She participates in several collaborative projects including CERCH, FACES, CRECE (http://cerch.org/research-programs) at UC Berkeley, and with Stanford University, Children's Hospital Oakland Research Institute, Kaiser Research Center and University of California, San Francisco. She has organized scientific sessions on Molecular Epidemiology of Children's Environmental Health and has been an invited speaker at numerous national and international meetings. She is a principal instructor on the graduate courses "Molecular and Genetic Epidemiology" at UC Berkeley. She has also taught and provided research assistance at the University of Hawaii, and the National Universities of Australia, Mexico, Thailand and India.

Catherine P. Koshland, Ph.D.

Professor of EHS, SPH; Professor, Energy and Resources Group; Wood-Calvert Professor in Engineering (Academic Senate). Vice Chancellor for Undergraduate Education. Dr. Koshland's research and teaching are at the intersection of air pollution, combustion, energy and public health. She works with graduate students in Mechanical Engineering and Civil Engineering as well as in Public Health and Energy and Resources. Her primary research has been focused on the analysis of pollutant formation in combustion processes including the study of fundamental chemical kinetic mechanisms for chlorinated hydrocarbons, and the development of advanced diagnostic tools for non-intrusive monitoring of combustion species including CHCs and metals. Recent work has focused on nano-particles including their formation, chemical characteristics and health impacts, and on their use in sensors for detection of toxic substances. In addition, she has worked with a number of students in energy (combustion), air pollution and environmental (human) health assessing the impacts of changes in technologies or the built environment, or environmental or technology policies on the health and well-being of communities in the US and China.

Thomas E. McKone, Ph.D.

Professor (Non-Academic Senate). Dr. McKone's research interests include the use of multimedia compartment models in health-risk assessments; chemical transport and transformation in the environment; and measuring and modeling the biophysics of contaminant transport from the environment into the microenvironments with which humans have contact and across the human/environment exchange boundaries--skin, lungs, and gut. His most recent achievement in the area of exposure assessment involves the development of the CalTOX model for the California Department of Toxic Substances Control. This model addresses clean-up goals for contaminated soils and the contamination of adjacent air, surface water, sediments, and ground water. The modeling effort includes multimedia transport and transformation models, exposure-scenario models, and efforts to quantify and reduce uncertainty in multimedia, multiple-pathway exposure models. The model is now being distributed by Cal-EPA and has attracted much attention both in the academic and regulatory communities. Dr. McKone is now working with the U.S. EPA to develop exposure models for regional air pollution and to develop exposure models for use with industrial ecology studies. He is also working with the U.S. EPA, the National Academy of Science, and the Environmental Defense Fund to evaluate health impacts of

industrial releases to the air, water, and soil, and to assess the reliability of models used as indicators of health and environmental impact.

Stephen M. Rappaport, Ph.D.

Professor (Academic Senate). Dr. Rappaport is a prominent advocate for the concept of the 'exposome', which represents all potentially important exposures from both exogenous and endogenous sources received by a person during life. Much of his current research involves exposome-wide association studies that compare profiles of chemicals in blood from diseased and healthy persons to discover exposures that cause cancers and other chronic diseases. He is also a pioneer in the field of exposure biology, which employs a combination of environmental and biological measurements - along with statistical models - to investigate the uptake, elimination, metabolism and mechanisms of damage caused by toxic chemicals. He has long-term interests in areas related to the assessment of long-term chemical exposures for purposes of controlling workplace hazards and investigating exposure-response relationships.

Justin Remais, Ph.D., M.S.

Associate Professor (Academic Senate). Dr. Remais' research advances methods for estimating the distribution and spread of environmentally-mediated infectious diseases in rapidly changing environments. His work has examined the public health implications of a wide range of major environmental changes, such as those resulting from urbanization, industrialization, changes in water resources, and a changing and more variable climate. Dr. Remais' NIH- and NSF-funded research in China has involved the analysis of high-dimensional disease surveillance, climate and geospatial data to characterize the dynamics of waterborne and vector-borne infections—including diarrheal diseases, malaria, dengue, Japanese encephalitis and schistosomiasis—as the country has experienced significant societal and environmental changes. He currently serves as a Principal Investigator of projects working in Ecuador and Senegal to address fundamental questions regarding how infectious diseases spread along environmental pathways, and what can be done to interrupt their transmission. His research in these settings focuses on diarrheal and parasitic diseases, combining field research, epidemiological analysis and simulation modeling to identify the optimal timing and targeting of control and surveillance activities. Prior to joining the UC Berkeley faculty, Dr. Remais served on the faculty of Emory University and the Georgia Institute of Technology.

Kirk R. Smith, Ph.D., MPH

(Professor of Global Environmental Health, SPH; Coordinator of Global Health and Environment MS Program). Dr. Smith's research focuses on environmental and health issues in developing countries, particularly those related to health-damaging and climate-changing air pollution from household energy use, and includes field measurement and health-effects studies in India, China, Nepal, Mexico, and Guatemala as well as development and application of tools for international policy assessments. He also develops and deploys small, smart, and cheap microchip-based monitors for use in these settings. He is working with groups in Guatemala and India to conduct large-scale epidemiological studies of the health impacts in women and children of smoke from household use of solid fuels, a large source of exposure on a global scale. In the course of this work, he has developed new conceptual approaches to total exposure assessment and its use in regulatory policy. He also conducts research on greenhouse gas emissions in developing countries, again both at the level of field monitoring and new concept development. He explores the potential co-benefits that can be attained by choosing international greenhouse-gas control efforts according to their potential to reduce health-damaging pollutants. He sits on several international

policy bodies, including the Global Energy Assessment, the Global Comparative Risk Assessment, the Intergovernmental Panel on Climate Change, and WHO's Indoor and Outdoor Air Quality Guidelines. He is a member of the US National Academy of Sciences.

Martyn T. Smith, Ph.D.

Professor of Toxicology, Chair and Head Graduate Adviser for the EHS Graduate Group. Program Director, Superfund Basic Research Program (Academic Senate). Research in Dr. Smith's laboratory aims to find the causes of blood cancers (leukemia & lymphoma) in adults and children and to develop new therapies for their treatment. To achieve this goal his research group is developing biomarkers that will allow identification of persons at risk of leukemia and lymphoma and are examining the effects of chemicals linked with these diseases, such as benzene, formaldehyde and chlorinated solvents, in molecular epidemiology studies of exposed human populations. Studies on the basic biology of these diseases in cell culture aim to understand the role of stem cells, chromosome abnormalities, epigenetic changes, and immunological dysfunction in the development of these diseases.

Charlotte D. Smith, Ph.D.

(Lecturer, Division of EHS, SPH). Dr. Smith is an environmental health scientist with a background in microbiology. She has worked in the drinking water sector for 30 years. Her research primarily focuses on maintenance of drinking water quality in distribution systems. She is also involved with developing water quality regulations at the national level in the US. Dr. Smith was a member of a committee of the National Academy of Sciences that addressed assessing and reducing risk of post-treatment water contamination. She researches factors that contribute to long-term sustainability of rural water systems globally. Currently she involved with a multi-department project exploring California AB 685 and the United Nation's declaration of the human right to water. Dr. Smith teaches Drinking Water and Health (PH170/271C) and the undergraduate course Introduction to Environmental Health Science (PH150B/270).

Robert C. Spear, Ph.D.

Professor, Emeritus. Dr. Spear is an engineer by training. His research is principally in the area of exposure assessment and in the modeling and analysis of environmental and occupational health problems. From his early work on pesticide exposure in farm workers to more recent work in the analysis of risk arising from exposure to water contaminated with pathogenic micro-organisms, his focus has been on the understanding of the impact of uncertainty and variability in these processes and how they affect intervention and control strategies. In recent years his work has been focused on understanding the local determinants of the transmission intensity of the parasitic disease, schistosomiasis, and in developing local control strategies. This work is currently being extended to a related parasitic disease in Thailand involving human exposure and infection via consumption of uncooked fish. This new area is also being tackled using geographical information system technology, satellite imaging, and dynamic systems approaches developed in his former work.

Luoping Zhang, Ph.D.

Professor (Non-Academic Senate). Most of Dr. Zhang's research projects are focused on the biological consequences of chemical exposures in humans and understanding the molecular mechanisms involved. For the past two decades, Dr. Zhang, in collaboration with many national and international scientists, has lead and conducted numerous molecular epidemiological studies that used biomarkers of

occupational and/or environmental exposures to toxic chemicals, including benzene, butadiene, formaldehyde, and trichloroethylene in China; dioxin in Italy; and arsenic in Chile and Bangladesh. Dr. Zhang has been a co-leader and co-principle investigator in the Superfund Research Program and the Center for Exposure Biology at Berkeley. Her group employs and develops many high-throughput novel technologies, such as, molecular cytogenetics (OctoChrome FISH, fluorescence *in situ* hybridization), single-cell genetic analysis, and omic-based technologies, such as toxicogenomics (the toxicity testing in 21st Century) to further understand the causes and mechanisms of leukemia and lymphoma associated with exposure to environmental pollutants. Most recently, her research interest has turned to functional genomics by applying RNAi (RNA interference) and novel CRISPR (Clustered Regularly Interspaced Short Palindromic Repeats) techniques in human cell culture studies of toxic chemical exposure. Additionally, Dr. Zhang has been appointed as a member of *Carcinogen Identification Committee* by California Governor Brown since 2012. She also served as a member on various committees for Institute of Medicine at the National Academies. Dr. Zhang teaches "*Practical Toxicology*" (PH 270C), a unique and real-world toxicology course.

A. 2 Other Members of the EHS Graduate Group

John Casida, Ph.D.

(Professor of the Graduate School and of Molecular Toxicology, College of Natural Resources). Dr. Casida's overall research goal is to provide information pertinent to the safer and more efficient use of existing agrochemicals and the development of new materials with better selectivity characteristics and environmental compatibility. Two general approaches are used in this research: 1) evaluate the chemistry, metabolism, and mode of action of insecticides, herbicides, fungicides, related toxicants, and environmental chemicals; 2) consider structure-activity relationships, photo alteration and persistence characteristics, metabolic fate and biodegradability, primary modes of action and secondary toxicological lesions.

Brenda Eskenazi, Ph.D.

(Jennifer and Brian Maxwell Professor of Maternal and Child Health and Epidemiology, Division of Epidemiology, SPH). Dr. Eskenazi's research is focused on effects of chemical exposure on reproductive and developmental health. She is the Director of the Center of Children's Environmental Health Research (CHAMACOS) funded by the NIH and EPA and also leads CERCH (Center for Environmental Research & Children's Health) at UC Berkeley. This Center investigates the exposure and potential health effects of pesticides and other environmental agents on pregnant women and children living in the agricultural community of the Salinas Valley and other parts of the world. She has written extensively about the reproductive and developmental effects of passive and active exposure to cigarette smoke on fetal and child growth and neurodevelopment as well as the reproductive and developmental effects of caffeine exposure. She has used the alpha fetal protein as a biomarker of exposure in analyzing the reproductive health effects of caffeine. She has studied the reproductive health of women employed in the semiconductor industry and plans to continue studying the reproductive health effects of women in the maquiladora industries on the U.S. Mexico border. She has also been interested in the epidemiology of preeclampsia, a hypertensive disease of pregnancy, and has demonstrated an association of solvent exposure and hypertension and preeclampsia. Recently, Dr. Eskenazi has been examining the reproductive health of a population of women heavily exposed to dioxin from an explosion in 1976. Specifically, she is determining whether dioxin exposure causes higher rates of endometriosis. She is also interested in the hazards of chemical exposure on male reproduction. As one of the Superfund project investigators, she is using genetic biomarkers of human sperm to assess the effects of paternal exposure to environmental toxicants on the fetus.

Rachel Morello-Frosch, Ph.D.

(Professor, Dept. of Environmental Science Policy and Management, and SPH). Dr. Morello-Frosch's research examines race and class determinants of environmental health among diverse communities in the United States. Specifically, she is assessing the relationship between social inequality, psychosocial stress and how these factors may interact with chemical exposures to amplify pollution/health outcome relationships and produce environmental health inequalities. Much of her work has examined this question in the context of ambient air pollution and indoor chemical exposures and children's health, often using community-based participatory research approaches for data collection and risk communication. As part of this work she also explores the scientific challenges and bioethical considerations associated with exposure assessment and chemical biomonitoring research in economically and racially marginalized communities. Dr. Morello-Frosch has also examined ways in which measures of material deprivation (e.g. poverty) and social inequality (e.g. racial residential segregation) may modify observed relationships between pollution exposures and poor perinatal outcomes such as low birth weight and risk of preterm delivery. She is also exploring issues related to community health vulnerability to climate change. In collaboration with scientific colleagues and regulatory scientists, she has worked to develop scientifically valid and transparent tools for assessing the cumulative impacts of chemical and non-chemical stressors to inform regulatory decision-making and environmental policy in ways that advance environmental justice goals and that address the disparate impacts of environmental hazards in vulnerable communities.

William Nazaroff, Ph.D.

(Daniel Tellep Distinguished Professor, Department of Civil and Environmental Engineering, College of Engineering). Dr. Nazaroff's research group studies air quality engineering, primarily emphasizing two themes: (1) pollutant dynamics in indoor air and (2) exposure science. On (1), the primary interest is to better understand the physics and chemistry that control the concentrations, fates, and effects of pollutants in indoor environments. On (2), we develop and apply basic knowledge about air pollutants to build a quantitative and mechanistic understanding of the relationship between emissions from sources and consequent human exposures. The group pursues research through a combination of laboratory and field experiments, modeling, and data analysis. In recent years, in addition to maintaining vigorous activities in these two primary areas, Dr. Nazaroff's group has begun to pursue research opportunities on the themes of sustainability, climate change, and energy-use efficiency, especially when opportunities arise that intersect with the primary research emphases.

Appendix B: Descriptions of SPH Biostatistics and Epidemiology Courses

PH 142. INTRODUCTION TO PROBABILITY AND STATISTICS IN BIOLOGY AND PUBLIC HEALTH (4)

Three hours of lecture and one hour of discussion per week. Descriptive statistics, probability distributions, point and interval estimation, hypothesis testing, chi-square, correlation and regression with biomedical applications. Selvin/Lahiff (F/Sp)

PH 145. STATISTICAL ANALYSIS OF CONTINUOUS-OUTCOME DATA (4)

Three hours of lecture and two hours of laboratory/discussion per week. Regression models for continuous outcome data; least squares estimates and their properties, interpreting coefficients, prediction, comparing models, checking model assumptions, transformations, outliers and influential points. Categorical explanatory variables: interaction and analysis of covariance, correlation and partial correlation. Appropriate graphical methods and statistical computing. Analysis of variance for one and two factor models: F tests, checking model assumptions, and multiple comparisons. Random affects models and variance components. Introduction to repeated measures models. Marshall (F)

PH 250A. EPIDEMIOLOGIC METHODS I (3)

Three hours of lecture and one hour of discussion per week. Prerequisites: 142A (may be taken concurrently). Principles and methods of epidemiology: study design, selection, and definition of cases and controls; sampling, data collection, analysis, and inference. Discussion session provides an opportunity to apply methods to problem sets and to discuss issues presented in lectures. Reingold (F)

PH 250B. EPIDEMIOLOGIC METHODS II (4)

Four hours of lecture and two hours of laboratory per week. Prerequisites: 250A or an equivalent introductory course in epidemiology or consent of instructor. This course is intended as an intermediate level course in the field of epidemiology. Topics include causal inference; measurement of disease rates; inferential reasoning; and research study designs including ecologic, case-control, cohort, intervention trials, and meta-analytic designs (potential sources of bias, confounding and effect modification in each research design are explored in depth); topics in clinical epidemiology including the use of likelihood ratios, receiver operator curves, and sensitivity, specificity and predictive value of a test; as well as brief introductions to logistic regression, survival analysis, and decision analysis. The readings from this course are drawn primarily from advanced epidemiology textbooks. The course is intended to provide a firm foundation for students who will subsequently enroll in 250C. Colford (F)

B.1: Descriptions of EHS Core Courses

PH 270. INTRODUCTION TO ENVIRONMENTAL HEALTH SCIENCES (2)

This seminar course covers the breadth of hazards to chemical, biological, and physical agents of concern to environmental health professionals. Students will meet weekly with the instructor to discuss readings and assignments related to the lecture topics. Lectures are presented by experts on particular topics that emphasize the activities involved in professional practice. The full two-semester course is designed to prepare EHS MPH and MS students to conduct the capstone project or thesis, respectively, required for graduation on a topic of current interest in some aspect of environmental health. The Fall semester course is also designed for other graduate-level students interested in an overview course on environmental health. The Spring semester course is primarily designed for EHS master's students. Balmes (F and Sp)

PH 270A. EXPOSURE ASSESSMENT AND CONTROL I. (3)

Two 1 1/2 hour lectures per week. Direct and indirect methods and procedures for the estimation and control of human exposure to chemical, physical and biological agents of concern to health in the community and in occupational settings. Includes review of measurement technologies, exposure assessment strategies, and multi-pathway analyses. Also covers exposure control options and strategies including administrative procedures, personal protective equipment and various engineering control approaches. S. Rappaport (Sp)

PH 270B. TOXICOLOGY (3)

Covering case studies, dose-response, toxicity testing, chemical metabolism, mechanisms of toxicity, carcinogenesis, and interpretations of toxicological data for risk assessment and target organ toxicity. M. Smith (F)

PH 220C. HEALTH RISKS ASSESSMENT, REGULATION, AND POLICY (4)

Two 1 1/2 hour lectures per week. Prerequisite: PH 250A, PH 270A, and PH 270B recommended. This course introduces the basic scientific principles of environmental health risk assessment, develops the understanding necessary to carry out and interpret quantitative risk assessments, and describes the context in which decisions to manage environmental health risks are made. The course presents the quantitative methods used to assess the human health risks associated with exposure to microbial and chemical agents, focusing on the four major components of risk assessment -- hazard identification, dose-response assessment, exposure assessment, and risk characterization. The course examines the application of environmental health risk assessment to contemporary issues, including the associated complexities, challenges, and controversies. Remais (Sp)

PH 271E. SCIENCE AND POLICY FOR ENVIRONMENT AND HEALTH (3)

Two 1 1/2 hour lectures discussion per week. Scientific knowledge and analyses are important to the development of public policies that address impact of the environment on health. The limits of existing knowledge and uncertainties in research result create significant challenges in applying science to answer critical questions. This course critically examines how scientific information is used in policy decisions. Case studies of current issues address characterization of scientific knowledge, interpretation of science in policy contexts, scientific integrity, and factors in addition to science that influence decisions. Assignments prepare students to effectively translate technical knowledge for multi-disciplinary and lay audiences and to participate in public policy proceedings. Core materials addresses differences between regulatory and market-based approaches, emerging paradigms including the precautionary principle and environmental justice; and key elements of risk assessment and cost-benefit analysis. Kyle (Sp)

Alternate:

PH 220. HEALTH POLICY DECISION-MAKING (3)

Three hours lectures per week. Introduction to federal-level health policy and analysis of government capacity in addressing major issues in health policy. The course explores structural impediments to reform in the US regulatory decision-making – particularly decision-making under conditions of uncertainty, and basic tools of policy analysis. Students will apply these tools in a seminar paper that analyzes a proposed or existing health policy or program. Keller (F)

EHS SELECTIVES (one required)

PH 256A HUMAN GENOME, ENVIRONMENT AND HUMAN HEALTH (2)

This introductory course will cover basic principles of human/population genetics and molecular biology relevant to understanding how data from the human genome are being used to study disease and other health outcomes. The latest designs and methods for genome-wide association studies and other approaches to identify genetic variants, environmental risk factors and the combined effects of gene and environment important to disease and health will be presented. The application of biomarkers to define exposures and outcomes will be explored. The course will cover recent developments in genomics, epigenomics and other 'omics', including applications of the latest sequencing technology and characterization of the human microbiome. The current role of genomics in personalized medicine and health will be presented. Ethical, legal and social issues will be discussed. Examples from public health will be emphasized, including the application of these important fields to studies of chronic and infectious diseases. Barcellos, Holland (Sp)

PH 256B. GENETIC ANALYSIS METHODS (2)

Preqs: PH256A (may be taken concurrently)

This introductory course will provide hands-on experience with modern wet laboratory techniques and computer analysis tools for studies in molecular and genetic epidemiology and other areas of genomics in human health. Students will also participate in critical review of journal articles. Students are expected to understand basic principles of human/population genetics and molecular biology, latest designs and methods for genome-wide association studies and other approaches to identify genetic variants, environmental risk factors and the combined effects of gene and environment important to human health. Students will learn how to perform DNA extraction, polymerase chain reaction and methods for genotyping, sequencing, and cytogenetics. Students will also learn how to utilize tools implemented in PLINK and R packages for analysis of genetic and genomic data. The course will introduce the use of many bioinformatics tools and public resources, including methods for pathway analysis, and both ENCODE and UCSC Genome Browser tools. Students will complete a final analysis project and a research proposal. Barcellos, Holland (Sp)

PH272B. CASE-STUDIES IN OCCUPATIONAL AND ENVIRONMENTAL EPIDEMIOLOGY (2)

Prereqs: PH250C or PH150, PH142.

This seminar course uses a case-based approach to teach key epidemiologic concepts and methods as they arise in the study of environmental health hazards in the workplace and general community. Within the context of studies of health effects of specific hazards (e.g. air pollution, diesel exhaust, and shift work) we will cover a variety of analytical methods. At the end of the course students will understand the basic ideas underlying exposure assessment methods, directed acyclic graphs (DAGs) to clarify data structure and identify confounders, healthy worker survivor bias and exposure-response models. Following completion of this course, students should be able to critically evaluate epidemiologic studies and understand potential strengths and the limitations of epidemiology in driving improved worker and community health protection. Eisen, Costello (F)

PH290. ENVIRONMENTAL DETERMINANTS OF INFECTIUS DESEASES. (2)

This seminar will take a global perspective, exploring the diverse environmental phenomena that influence the transmission of infectious diseases. Complex dynamics, feedbacks and spatial flows inherent in the transmission of environmentally driven infectious diseases are examined, focusing on vector-borne diseases, tropical parasites and waterborne pathogens. The epidemiological significance of

environmental and socio-environmental forcings are explored, including weather, climate extremes, rapid urbanization, hydrology, development projects, and land use change. Anthroponotic and zoonotic diseases of global significance are examined and respect to how environmental factors shape their distribution, intensify environmental fate, transport, and persistence. The specific epidemiological consequences of climate change, dams, irrigation, agricultural intensification and de/reforestation are emphasized, and analytical tools for their study presented and critiqued, including methods coupled environmental-epidemiological systems. Remais (F)

PH 290. EXPOSURE ASSESSMENT & CONTROL II (3)

One 3-hr lecture/laboratory per week, two field trips per semester. PREREQUISITES: Exposure Assessment & Control I (PH270A); Graduate standing or consent of instructor. This course explores specific topics of physical agents including noise, ionizing/non-ionizing radiation and thermal stress, and ventilation as a major component of engineering control for indoor air quality. The course focuses on how these agents impact health, methods most commonly used to evaluate exposure to these physical agents, and methods used to control exposure to both physical and chemical agents. The course integrates lab components & field trips with lectures, and provides hands on experience of using survey monitoring and control instruments to enrich students learning experience. Hammond/Liu (Sp) (every even yr)

CITY & REGIONAL PLANNING 204C. INTRODUCTION TO GIS AND CITY PLANNING (4)

The principles and practical uses of Geographic Information Systems (GIS). This course is intended for graduate students with exposure to using spreadsheets and database programs for urban and natural resource analysis, and who wish to expand their knowledge to include basic GIS concepts and applications. Prior GIS or desktop mapping experience not required. Radke (Sp)

B.2 EHS Elective Courses

PH 267B. CHARACTERIZATION OF AIRBORNE CHEMICALS (3)

Two 1 1/2 hour lectures per week. Prerequisites: Graduate standing in Environmental Health Sciences or consent of instructor. Principles underlying the use of air monitoring methods in industry. Topics include behavior of gases, vapors and aerosols; mechanisms of absorption and elimination of inhaled toxicants; and methods for measuring airborne chemicals. Intended primarily for students specializing in industrial hygiene. Hammond (Sp odd-number years)

PH 269C. OCCUPATIONAL BIOMECHANICS (3)

One 3-hour lecture per week. Introductory course covering pathophysiology and work-related risk factors of chronic musculoskeletal disorders, biomechanics of material handling, anthropometry applied to workstation design and seating, and structure of ergonomics programs. Students will conduct a job analysis. Harris-Adamson (Sp)

PH 269D. ERGONOMICS SEMINAR (2)

One 2-hour lecture per week. Prerequisites: PH 269C or consent of instructor. Readings and lectures in occupational biomechanics. Topics to be covered are: muscle, tendon, and joint biomechanics, material

handling models, mechanisms of injury, hand tool design, and instrumentation issues. Students will prepare critical reviews of recent publications and design an engineering intervention to reduce work-related risk factors. Harris-Adamson (F)

PH 269E. CURRENT TOPICS IN ENVIRONMENTAL MEDICINE (3)

Two hours of lecture per week. Will provide students with an overview of the health impacts, disease mechanisms, and public controversies related to selected environmental exposures. The course will cover established environmental diseases as well as impacts of some emerging exposures of concern. The focus will be primarily on disease pathophysiology, issues related to exposure pathways, and the susceptibilities of specific human populations. No prior medical knowledge required. Seward, Harrison (F)

PH 270C. PRACTICAL TOXICOLOGY (2)

One hour of lecture, and one hour of group discussion. This course will focus on cutting-edge issues involving real-world toxicology in drug discovery, pesticide regulation, and stem cell research etc. Many well-known toxicologists, regulators and consultants from pharmaceutical companies, petroleum industry, private consulting firms, non-profit institutes, federal and state regulatory agencies in Bay Area will be invited to talk to our participating students. Some of the speakers are our school's alumni who understand exactly what our students need to know before entering the real world. Zhang (Sp)

PH 271C. DRINKING WATER AND HEALTH (3)

Three hours Lectures and one hour of discussion per week. The course covers monitoring, control and regulatory policy of microbial, chemical and radiological drinking water contaminants. Additional subjects include history and iconography of safe water, communicating risks to water consumers and bottled water versus tap water taste test as part of the discussion on aesthetic water quality parameters. A field trip to a local water treatment plant in included. C. Smith (Sp)

PH 271D. GLOBAL BURDEN OF DISEASE (3)

Two hours of lecture, discussion, presentation per week. Prerequisite: Graduate standing or consent of instructor. The Global Burden of Disease (GBD) database utilized by WHO provides estimates of illness, injury, and death by disease type, age, sex and world region in a consistent and coherent manner. The course will explore the ways such a detailed database makes possible a wide range of new types of analysis of health priorities and the relationships of database will also be introduced. This seminar will also provide an opportunity for reading and discussion of the basic assumptions, data limitations, critiques, and methodological difficulties of the GBD. It is intended to be a true seminar relying heavy on class participation. The homework assignments will be greatly facilitated by use of computer spreadsheets. K. Smith (Sp)

PH 271G. HEALTH IMPLICATIONS OF CLIMATE CHANGE (2)

Three hours of lecture per week. Prerequisites: The material will be presented with minimal expectation of a background in physical science, although some additional reading may be needed for students with no university science courses. A background in epidemiology is also helpful, but not necessary. The course will provide a basic foundation in the physical mechanisms of, responses to, and health implications of climate change. We will explore the variety of epidemiologic, risk assessment, and

statistical methods used to understand the impacts of climate change on health across diverse demographic groups. The public health implications, positive and negative, of efforts to mitigate and adapt to climate change will be elaborated, including discussions of ethical, political, and economic aspects of these efforts. Students will be responsible for leading class discussions and presenting a poster on their choice of a topic related to climate change and health. Also listed as Environ Sci, Policy, and Management C282. K. Smith (Sp)

PH 290. SOCIAL JUSTICE AND WORKER HEALTH (2-3)

One three hours lecture per week. This course will help public health practitioners build a framework for understanding the role that work and workplace conditions play in health, introduce strategies that address work-related health inequities, and facilitate the development of concrete skills. The course emphasizes worker and community organization and participation in effecting social justice and building skills essential to community-based practice, such as popular education, training for action, and partnership building. Chang (F)

PH 297. FIELD STUDY IN ERGONOMICS. (1-12)

Students will be placed in an off-campus site and supervised by an ergonomics specialist and the instructor. Regular meeting with faculty sponsor and written reports required. Rempel (F/Sp)

PH 298. CLINICAL ERGONOMICS. (2)

Students will observe clinical practices of an occupational medicine physician and nurse, orthopedist, neurologist and physical therapist to understand methods of managing musculoskeletal disorders and the role of ergonomics. Students will perform job analysis of patients' work tasks. Rempel (F/ Sp)