

## Appendix V-1 Program and Track Learning Objectives

### ***Master of Public Health Program***

#### **MPH, Biostatistics Track**

This track combines broad training in public health with specific training in Biostatistics. The track includes core courses in biostatistics, environmental health, epidemiology, health services, and social and behavioral sciences. In addition, successful candidates are required to complete a public health practicum and write a research-based master's thesis. The degree is designed for individuals who anticipate careers as data analysts in public health research or practice and for individuals who plan doctoral work in a biomedical field, but who want more methodological training than those PhD programs offer. (Note: this is a new option. We expect to enroll the first student in Fall 1998.)

#### **Learning objectives:**

Upon satisfactory completion of the MPH track in Biostatistics, students should be able to:

- ◆ Meet the learning objectives of the MPH core curriculum (see Criterion V.C.1.);
- ◆ Describe major research study designs and their advantages and limitations;
- ◆ Plot graphs and compute summary statistics to display important features of a set of data;
- ◆ Explain the logic of statistical hypothesis tests and confidence intervals;
- ◆ Perform appropriate hypothesis tests to compare one group to a standard, or two or more groups to each other;
- ◆ Use appropriate statistical techniques to adjust two- or K-group comparisons for confounding factors;
- ◆ Use appropriate regression analysis techniques for continuous, binary, count and censored-survival outcomes to analyze independent data from medical and public health studies;
- ◆ Explain different modeling strategies employed in regression analysis, depending on whether the purpose of the analysis is to develop a predictive model or to make adjusted comparisons;
- ◆ Set up hypotheses to be tested based on data from a biomedical research study and the major research question of the study; and
- ◆ Determine the sample size needed for a study to have a given power and significance level.

#### **MPH, Occupational and Environmental Health Track**

This program is designed to provide professionals in the field of occupational and environmental health with a broad base of knowledge of the field of occupational and environmental medicine and public health. Understanding the public health, clinical, and scientific principles that underlie occupational and environmental health is emphasized.

#### **Learning objectives:**

Upon satisfactory completion of the MPH program in Occupational and Environmental Health, students should be able to:

- ◆ Meet the learning objectives of the MPH core curriculum (see Criterion V.C.1);
- ◆ Use epidemiology and biostatistics to identify occupational health hazards and evaluate the effectiveness of interventions to reduce hazards and improve health outcomes
- ◆ Describe the organization and administration of health services and its relationship to primary, secondary, and tertiary prevention in occupational and environmental health;
- ◆ Describe the impact of social and behavioral influences on health and the interaction of these influences with occupational and environmental agents;
- ◆ Define the major sources of contamination — chemical, microbial, and radiation — in water, air, soil, and food;
- ◆ Describe how these contaminating agents interact with biological systems and the mechanisms by which they exert adverse effects on humans and other exposed organisms;
- ◆ Predict the nature of adverse effects that a novel occupational or environmental agent may be expected to exert on public or environmental health;
- ◆ Describe and use models for predicting the magnitude of a novel occupational or environmental agent's adverse effect on biological systems;

- ◆ Identify significant gaps in current knowledge concerning health effects of environmental agents, and identify areas of uncertainty in the risk assessment process;
- ◆ Describe current legislation and regulation regarding environmental issues; and
- ◆ Organize data and information, prepare written reports, and give oral presentations on occupational and environmental contaminants, biological systems, and health effects of occupational and environmental agents.

### **MPH, Epidemiology, General Track**

The general Epidemiology track combines broad training in public health with specific training in the principles and methods of epidemiology. The degree requirements include course work in epidemiology, biostatistics, health services, environmental health, and social and behavioral sciences; a practicum; and completion of a research-based master's thesis.

#### **Learning objectives:**

Upon satisfactory completion of the MPH program in Epidemiology, students should be able to:

- ◆ Meet the learning objectives for the MPH core curriculum (see Criterion V.C.1);
- ◆ Define and calculate measures of disease frequency and measures of association between risk factors and disease;
- ◆ Describe the major epidemiologic research study designs and their advantages and limitations;
- ◆ Describe the major sources of bias in epidemiologic research (confounding, selection bias and measurement error) and the ways to evaluate and reduce the bias;
- ◆ Evaluate effect modification;
- ◆ Apply criteria to support whether an association is causal;
- ◆ Understand the basic terms and methods used in outbreak investigation, infectious disease epidemiology, chronic disease epidemiology, disease prevention trials and evaluation of screening tests;
- ◆ Critically review the scientific literature, synthesize the findings across studies, and make appropriate public health recommendations based on current knowledge;
- ◆ Design an epidemiologic study to address a question of interest;
- ◆ Interpret results of an epidemiologic study, including the relation to findings from other epidemiologic studies, the potential biological and/or social mechanisms, the limitations of the study, and the public health implications;
- ◆ Write a clear description of the rationale, methods, results and interpretation of an epidemiologic investigation; and
- ◆ Apply epidemiologic skills in a public health setting, specifically in the formulation or application of public health programs or policies.

### **MPH, Epidemiology, International Health Track**

See Health Services, International Health Track

### **MPH, Epidemiology, Maternal and Child Health Track**

See Health Services, Maternal and Child Health Track

### **MPH, Epidemiology, Nutritional Sciences Track**

The Master of Public Health program in Nutritional Sciences is a professional degree program currently offered only to students who have their registered dietician (RD) certification, or are RD-eligible. Graduates

of the MPH-nutrition program participate in policy analysis and program development and design and manage population-based community-wide nutrition interventions as part of a large-scale public health program.

**Learning objectives:**

Upon satisfactory completion of the MPH program in Nutritional Science, students should be able to:

- ◆ Meet the learning objectives of the MPH core curriculum (see Criterion V.C.1.);
- ◆ Provide a broad overview of the public health system and the environment in which the public health recommendations are interpreted and implemented;
- ◆ Provide basic analytical and administrative skills to integrate nutrition into public health core functions of assessment, policy development and assurance; and
- ◆ Conduct advanced study of a particular topic in public health nutrition.

**MPH, Epidemiology, Public Health Genetics Track**

The Public Health Genetics MPH track provides broad training in this emerging, multidisciplinary field that encompasses genetic epidemiology, statistical genetics, biotechnology, bioinformatics, and ecogenetics, all in the context of law, ethics and policy.

Degree requirements include coursework in epidemiology, biostatistics, health services, environmental health, pathobiology, biotechnology, bioinformatics, law, ethics and anthropology; a seminar series; a practicum; and a research-based master's thesis.

**Learning objectives:**

Upon satisfactory completion of the MPH program in Public Health Genetics, students should be able to:

- ◆ Meet the learning objectives for the MPH core curriculum (see Criterion V.C.1.);
- ◆ Explain study designs and analysis approaches for studying genetic influences on disease in families and populations, and critically review the scientific literature using these approaches;
- ◆ Describe the methods used to address ethical and policy issues associated with the application of genetics to population-based research and public health practice, and apply these methods to specific controversies;
- ◆ Evaluate the legal consequences of genetic technologies and information, including the ramifications accompanying dispersal and use of new genetic discoveries;
- ◆ Critically examine the social implications and cultural responses of human genome sequencing and the potential for controlling gene expression;
- ◆ Describe the laboratory methods currently employed in the identification of genetic polymorphisms, and the importance of transgenic animal models in elucidating the functional impact of these polymorphisms;
- ◆ Use large databases of genetic information, including biological sequence information and data from the human genome project;
- ◆ Describe the relevance of gene-environment interactions to understanding disease susceptibility, including single and multi-gene variability, drug therapy and environmental exposures;
- ◆ Explain the importance of genetic host-pathogen interactions for understanding susceptibility to infectious diseases; and
- ◆ Apply skills listed above in a public health setting, such as contributing to the development of a program or implementing public policy related to public health genetics.

## **Health Services**

The mission of the Master of Public Health program in health services is to promote public health and the effectiveness, efficiency and equity of health services through the education of public health professionals. To fulfill this mission, we have defined the following goals:

- ◆ To convey knowledge based on the history and values of public health;
- ◆ To develop the future leaders of public health in health services;
- ◆ To prepare future professionals to assess the health problems and needs of defined communities, to develop health policy to address these needs, and to assure that necessary, high quality and effective services are available to meet them;
- ◆ To produce future professionals with basic competencies in public health and health services research to perform these functions and to evaluate the performance of health services in improving community health;
- ◆ To increase the diversity of faculty, students and staff; and
- ◆ To offer opportunities for students to learn through community service.

### **Learning Objectives:**

Students in the Health Services MPH program acquire knowledge and skills in the following areas: determinants of health and disease; external and internal factors shaping health care and public health systems; structure functioning, and performance of health systems; policy analysis and development; management; strategies for improving health; evaluation and methods; and individual skills. Upon satisfactory completion of the MPH program in Health Services, students should be able to:

- ◆ Explain and apply an understanding of the socioeconomic, behavioral, biological, and societal determinants of health and disease. Understand the factors affecting the etiology, incidence, and prevalence of major health problems in populations;
- ◆ Explain the sociocultural and health sector responses to health conditions in society. Understand the factors affecting the need, demand, and utilization of health care and public health services;
- ◆ Explain and apply an understanding of the economic, social, technological, political, and regulatory factors shaping the financing and organization of health services;
- ◆ Explain how the availability, financing, and organization of health services affects access, costs, quality, and outcomes;
- ◆ Explain the context, structure, functioning, and effectiveness of public health systems and other programs aimed at protecting and promoting the health of the public;
- ◆ Explain and apply an understanding of the economic, social, and political factors that influence health policy;
- ◆ Understand the importance of and be able to balance science and values in the development and advocacy of policy positions;
- ◆ Plan, implement, manage, evaluate, and continuously improve health programs and services;
- ◆ Collaborate with the community in assessing health problems, designing and implementing programs to address these problems, and mobilizing action;
- ◆ Design and conduct assessments of the health status and health needs of communities and populations;
- ◆ Describe and be able to apply principles and strategies for improving access to and delivery of health services and for addressing community health problems, drawing on health sector and non-health sector resources;
- ◆ Describe and be able to apply strategies for health promotion at the individual and community levels;
- ◆ Design and conduct evaluation studies of the effectiveness, efficiency, and outcomes of programs, interventions, and policies aimed at improving the health of individuals, populations, and/or communities;
- ◆ Critically read and apply quantitative and qualitative research findings contained in medical, public health and social science journals;
- ◆ Describe and be able to apply epidemiologic principles and techniques to the measurement of health and disease;
- ◆ Evaluate the validity and weaknesses of data, information, and study designs;
- ◆ Describe and be able to apply appropriate quantitative and qualitative methods in the design and conduct of scholarly studies to answer meaningful questions;
- ◆ Promote creativity, inquisitiveness, and lifelong learning;
- ◆ Develop the competencies to work in and with diverse cultures and communities;
- ◆ Develop change agent skills;

- ◆ Strengthen analytic and problem-solving skills; and
- ◆ Strengthen the ability to communicate effectively and persuasively, both orally and in writing.

### **MPH, Health Services, Community Medicine Track**

This track provides a generalist approach to public health and is designed for students interested in the core MPH courses and the opportunity to tailor their electives to their own career goals.

#### **Learning objectives:**

Upon satisfactory completion of the MPH program in Community Medicine, students should be able to:

- ◆ Meet the learning objectives of the MPH core curriculum and the MPH Program in Health Services (see Criterion V.C.1 and above); and
- ◆ Carry out assessments and formal investigations in a variety of disciplinary and programmatic settings on questions relevant to public health.

### **MPH, Health Services, International Health Track (joint with Epidemiology)**

This interdisciplinary graduate program, offered through Health Services or Epidemiology, is designed for health professionals, administrators, and policy analysts who intend to devote a significant part of their careers to improving health in developing countries. Our goal is to balance teaching, research, and service to contribute to improvements in health at home and abroad.

The program focuses on community health and primary health care systems, bringing epidemiological and qualitative research skills to bear. The curriculum addresses understanding the social, political, economic, environmental, geographic, and health systems factors that have an impact on health. Courses emphasize public health skills and their application to strengthening communities' capacity to determine their own health outcomes. Our basic approaches to identifying and solving problems are multidisciplinary and intersectoral, based on collaboration and solidarity.

#### **Learning objectives:**

Upon satisfactory completion of the MPH program in International Health, graduates will be able to:

- ◆ Meet the learning objectives of the MPH core curriculum and the MPH in Health Services (see Criterion V.C.1. and above);
- ◆ Describe the major factors that determine poverty, inequality, and health in developing countries;
- ◆ Describe the epidemiology of diseases in developing countries and determine how social and economic developments influence these patterns;
- ◆ Outline the roles of equity, education, population pressures, environment, gender, land reform and other socioeconomic factors on health and health services;
- ◆ Trace the development of sociocultural and health sector responses to health conditions in different national settings;
- ◆ Use quantitative and qualitative skills to assess the availability, access, utilization and cost effectiveness of health sector interventions;
- ◆ Identify political, economic, and social factors that influence the development, implementation, financing, and advocacy for policies and programs relevant to international health;
- ◆ Describe local and population-based strategies for solving community health problems, addressing the responsibility of government and the contributions of scientific investigation and the interdisciplinary approach; and
- ◆ Apply the elements of program planning, implementation, research, and evaluation to address issues related to international health.

### **MPH, Health Services, Maternal and Child Health Track (joint with Epidemiology)**

**Learning objectives:**

Students in the MCH program acquire knowledge and skills in the following areas: the scientific basis of maternal and child health issues; methodological and analytical skills; management and communication skills; policy and advocacy skills; ethical conduct; and skills in oral and written communication. Upon satisfactory completion of the MPH program in Maternal and Child Health, students should be able to:

- ◆ Meet the learning objectives of the MPH core curriculum and the MPH in Health Services (see Criterion V.C.1. and above);
- ◆ Describe MCH problems in terms of time epidemiologically and historically;
- ◆ Apply knowledge of demographic, health, social and community factors in designing MCH programs;
- ◆ Understand the organization and financing of health services in the U.S., the position of MCH within the system, and the utilization of specific manpower to provide such services;
- ◆ Discuss the historical development of federal, state, and local agencies and programs serving families, women, and children and their current structure and mission; the relationship of programs to the problems being addressed; and
- ◆ Demonstrate ethical conduct in community practice and research.

**MPH, Health Services, Social and Behavioral Sciences Track**

The mission of the Social and Behavioral Sciences track is to shape the study, thought, and practice of public health professionals on the cultural, social, political, economic, and behavioral determinants of the health status of populations; of disease, injury, and illness; barriers to effective health care and their removal; public health policy and practice; organizational relationships in public health and health services; and community organization and empowerment.

**Learning objectives:**

Upon satisfactory completion of the MPH program in Social and Behavioral Sciences, students should be able to:

- ◆ Meet the learning objectives of the MPH core curriculum and the MPH in Health Services (see Criteria V.C.1 and above);
- ◆ Identify and evaluate the relative contribution of social and behavioral determinants — including race, class, ethnicity, gender, level of economy, attitudes and beliefs, and health and illness behaviors — to the health status of populations;
- ◆ Describe how social and behavioral processes affect the etiology, incidence, and prevalence of the major diseases in the population;
- ◆ Identify and discuss possible ways to remove barriers to self-care and the use of effective health care services, including those outside the health sector;
- ◆ Identify political, economic, and social processes that influence the development, evaluation, implementation, financing, and advocacy for policies and programs that improve the public's health;
- ◆ Analyze the organizational relationships among community and health-promoting agencies in order to plan and implement effective health services;
- ◆ Collaborate with community representatives and agencies on the assessment of health problems, setting of priorities, and the planning, implementation, and evaluation of health services;
- ◆ Apply both quantitative and qualitative methodologies in the study of problems in health status, health care, and population health in order to identify effective policies, programs, services, and behaviors; and
- ◆ Read and apply quantitative and qualitative research findings contained in medical, public health and social science journals to professional activities.

### **Extended MPH Degree Program**

The mission of the Extended Degree Program (EDP) is to serve the educational needs of mid-career practitioners who must acquire knowledge, skills, and credentials in public health, community health services, and public health administration in order to advance their careers.

#### **Learning Objectives:**

Upon satisfactory completion of the EDP, graduates will be able to:

- ◆ Meet the learning objectives of the MPH core curriculum and the MPH in Health Services (see Criterion V.C.1 and above);
- ◆ Describe the organization, financing and delivery of health services in the US;
- ◆ Describe the economic, political, organizational and behavioral factors that influence access to and utilization of health services by various populations;
- ◆ Apply the skills of program planning, management and evaluation to problems in practice settings; and
- ◆ Apply appropriate research methods to conduct a project culminating in an acceptable thesis or project.

### **Extended MPH Degree Program, Health Education Pathway**

Graduates of the Master of Public Health Extended Degree Program's Health Education Pathway will be prepared to engage in teaching/learning, research, and service activities that enhance the quality of their health education practice in a variety of community settings, including schools. This will improve the health and quality of life for all people they serve. The professional health educator helps individuals, families, communities and organizations, including health professionals, apply knowledge and skills to planning interventions for the prevention of, or effective coping with, illness, disability and premature death. Health educators promote optimal health through their own independent actions and actions in collaboration with others.

#### **Learning objectives:**

Upon satisfactory completion of the MPH Extended Degree program in Health Education, students should be able to:

- ◆ Meet the learning objectives of the MPH Extended Degree Program;
- ◆ Conduct community and individual needs assessment and plan, deliver, and evaluate targeted health education interventions to meet identified needs;
- ◆ Pose research questions for health education and construct a theoretical framework and vigorous study design to support inquiry; and
- ◆ Communicate the purposes and practices of health education and its relevance to a multicultural society.

### **Extended MPH Degree Program, Maternal and Child Health Pathway**

Students in the MCH program acquire knowledge and skills in the following areas: the scientific basis of maternal and child health issues; methodological and analytical skills; management and communication skills; policy and advocacy skills; ethical conduct; and skills in oral and written communication.

#### **Learning Objectives:**

Upon satisfactory completion of the MPH Extended Degree program in MCH, students should be able to:

- ◆ Meet the learning objectives of the MPH Extended Degree program (see above);
- ◆ Meet the learning objectives of the in-residence MCH pathway.

## ***Concurrent MPH Degree Programs***

### **MAIS/MPH, Master of Arts in International Studies/Master of Public Health, International Health Track**

The SPHCM and the Jackson School of International Studies offer an interdisciplinary concurrent graduate program in international health and international studies leading to a Master of Public Health and a Master of Arts in International Studies degree. Concurrent degree students matriculate in the International Health Program within the department of Health Services or Epidemiology and also participate in a year-long International Studies core curriculum which studies the ways in which political, economic social and cultural issues effect institutional development in different countries/regions of the world. The concurrent degree program prepares professionals to function at the interface of both fields in administration, practice, research, planning, and development and implementation of policy.

#### **Learning objectives:**

Upon satisfactory completion of the MPH/MAIS program, students should be able to:

- ◆ Meet the learning objectives of the MPH core curriculum and the MPH Program in Health Services (see Criterion V.C.1. and above);
- ◆ Meet the learning objectives of the MPH in the International Health track (see above);
- ◆ Describe interdisciplinary approaches to the working of the international order;
- ◆ Understand the institutions, patterns of interaction, and issues at work in international affairs;
- ◆ Describe the interrelationship of politics and economics, and differentiate international political economy from contextual, institutional and historical perspectives; and
- ◆ Gain an institutional and historical perspective on the international political economy.

### **MN/MPH, Master of Nursing/Master of Public Health**

The Master of Nursing/Master of Public Health concurrent degree program offers interdisciplinary preparation in the fields of public health and nursing, leading to the Master of Public Health and Master of Nursing degrees. Public health and nursing share an interest in a population-based preventive approach to health and social problems. Both fields recognize the influence of the social environment and human behavior on contemporary health problems.

The objective of the concurrent degree program is to prepare professionals who will function at the interface of both fields in practice, research, planning, administration, and policy development.

#### **Learning objectives:**

Upon satisfactory completion of the MN/MPH program, students should be able to:

- ◆ Meet the learning objectives of the MPH core curriculum and the MPH program in Health Services (see Criterion V.C.1. and above);
- ◆ Meet the learning objectives of the MN curriculum;
- ◆ Demonstrate competence in advanced nursing practice in community health; and
- ◆ Understand the organization and functioning of the health care delivery system.

### **MSW/MPH, Master of Social Work/Master of Public Health**

The mission of the Master of Public Health/Master of Social Work Concurrent Degree program is to prepare professionals who will function at the interface of social work and public health in practice, research, planning, administration and policy development.

#### **Learning objectives:**

Upon satisfactory completion of the MSW/MPH program, students should be able to:

- ◆ Meet the learning objectives of the MPH core curriculum and the MPH program in Health Services (see Criterion V.C.1. and above);
- ◆ Meet the learning objectives of their Social Work concentrations and public health tracks;
- ◆ Demonstrate competent social work practice in a community health setting (measured by successful completion of social work/PH practicum);

- ◆ Describe the organization and functioning of the health and social service delivery systems and their interrelationships (measured by the successful completion of SW and PH courses); and
- ◆ Apply appropriate research methods to conduct a project culminating in an acceptable thesis (measured by completion of a public health thesis).

### ***Master of Health Administration Program***

In addition to the in-residence MHA program, the SPHCM offers an Evening Degree program for Medical Executives and a concurrent MBA/MHA.

#### **Master of Health Administration Evening Degree Program for Medical Executives**

The Master of Health Administration Evening Degree program for medical executives is designed to provide a broad exposure to health care policies and practices for those physicians and clinicians who have elected to pursue a ñlater in lifeñ change in professional direction.

Students in this track are typically experienced clinicians who wish to learn how organizations operate and how such organizations can best respond to broader population and health care needs.

#### **Learning objectives:**

Upon satisfactory completion of the MHA Evening Degree program, graduates will be able to:

- ◆ Meet the learning objectives of the MHA In-Residence program (see Criteria V.C.1).

### ***Concurrent MHA Degree Program***

#### **MBA/MHA, Master of Business Administration/Master of Health Administration**

The concurrent Master in Health Administration/Master of Business Administration program is for those students who wish to pursue a career primarily in the private sector of health care. These individuals meet the requirements for each of the two degrees in approximately two years and two quarters.

#### **Learning objectives:**

Upon satisfactory completion of the MHA/MBA program, students should be able to:

- ◆ Meet the learning objectives of the MHA In-Residence program (see Criterion V.C.1);
- ◆ Meet the learning objectives of the MBA program.

## ***Master of Science Programs***

### **MS, Biostatistics**

The Master of Science program offers advanced training in Biostatistics. The program includes coursework in biostatistics, statistics and one or more biomedical fields. In addition, successful candidates are required to pass a master's theory exam and write a research-based master's thesis. The degree is designed for individuals who anticipate a career as a data analyst in biomedical or public health research or practice and for individuals who plan doctoral work in a biomedical field, but want more methodological training than those PhD programs offer.

#### **Learning objectives:**

Upon satisfactory completion of the MS program in Biostatistics, students should be able to:

- ◆ Meet the learning objectives of the Master of Science program (see Criteria V.C.1);
- ◆ Describe major research study designs and their advantages and limitations;
- ◆ Plot graphs and compute summary statistics to display important features of a set of data;
- ◆ Explain the logic of statistical hypothesis tests and confidence intervals;
- ◆ Describe desirable properties of statistical tests and estimators;
- ◆ Compare the properties of commonly used statistical tests and estimators;
- ◆ Perform appropriate hypothesis tests to compare one group to a standard, or two or more groups to each other;
- ◆ Use appropriate statistical techniques to adjust two- or K-group comparisons for confounding factors;
- ◆ Use appropriate regression analysis techniques for continuous, binary, count and censored-survival outcomes to analyze independent data from medical and other public health studies;
- ◆ Explain different modeling strategies employed in regression analysis, depending on whether the purpose of the analysis is to develop a predictive model or to make adjusted comparisons;
- ◆ Set up hypotheses to be tested in a biomedical research study based on the collected data and the major research question of the study; and
- ◆ Determine the sample size needed for a study to have a given power and level of significance.

### **MS, Environmental Health, Technology Track**

#### **Learning objectives:**

Upon satisfactory completion of the MS program in the Technology track, students should be able to:

- ◆ Meet the learning objectives of the Master of Science program (see Criterion V.C.1);
- ◆ Define the major sources of contamination —chemical, microbial and radiation — identified in water, air, soil, and food;
- ◆ Identify current regulatory programs and legislative authorities directed at managing contamination in water, air, soil and food;
- ◆ Define major processes in human and natural environments that transport, disperse, transfer, transform or accumulate hazardous agents. Identify characteristics of the agent, the environment and the conditions of release that influence environmental fate and distinguish key factors for a given scenario;
- ◆ Describe the mechanisms and processes by which toxic or infectious hazards reach target populations and predict most significant exposure pathways in a given scenario;
- ◆ Describe and apply means by which exposures of target populations to toxic or infectious hazards may be measured and/or modeled. Indicate how these approaches would reflect a specific contaminant, including novel contaminants. Identify sources and magnitudes of uncertainties associated with these characterizations;
- ◆ Describe and apply means of preventing or controlling adverse effects on human health or environmental quality, emphasizing management of drinking water, food, wastewater, and solid and hazardous wastes or discharges;
- ◆ Develop and be able to take part in management programs conducted by local, state, and federal regulatory agencies or within the private sector, to accomplish the prevention or control of adverse effects on human health or environmental quality; and

- ◆ Communicate effectively with the public and professionals regarding impacts, mitigation, potential health effects and associated uncertainties regarding chemical, microbial or radiation contamination of water, air, soil or food.

### **MS, Environmental Health, Toxicology Track**

#### **Learning objectives:**

Upon satisfactory completion of the MS program in the Toxicology track, students should be able to:

- ◆ Meet the learning objectives of the Master of Science program (see Criterion V.C.1);
- ◆ Define the major classes of toxicants present in the environment and the workplace;
- ◆ Understand how toxicants interact with biological systems and the mechanisms by which they elicit adverse effects in humans and other organisms;
- ◆ Recognize sources and modes of exposure to toxic agents;
- ◆ Understand the process by which the risk of adverse effects is assessed;
- ◆ Find and interpret information on toxicological issues in the literature;
- ◆ Analyze toxicological issues and identify significant data gaps concerning health effect of environmental chemicals;
- ◆ Formulate hypotheses and design experiments to test such hypotheses aimed at advancing knowledge on toxicological issues;
- ◆ Organize data and information, prepare written reports and give oral presentations on toxicological aspects of environmental health; and
- ◆ Use toxicological knowledge to solve issues related to the assessment of risk related to environmental or occupational exposures.

### **MS, Environmental Health, Industrial Hygiene and Safety Track**

#### **Learning objectives:**

Upon satisfactory completion of the MS program in the Industrial Hygiene and Safety track, students should be able to:

- ◆ Meet the learning objectives of the Master of Science program (see Criterion V.C.1);
- ◆ Find and interpret information on industrial hygiene and safety in the literature;
- ◆ Describe important legislation and regulation regarding industrial hygiene and safety issues;
- ◆ Recognize safety and health hazards in the workplace;
- ◆ Characterize exposures to airborne chemicals, noise and other occupational hazards;
- ◆ Understand the interaction, metabolism and effects of chemicals on the human body;
- ◆ Analyze potential seriousness of exposures using exposure data, recommended standards of exposure and published industrial hygiene literature;
- ◆ Function as a safety and health professional within a management structure, including working with managers, labor representatives, occupational health physicians and nurses, ergonomists and industrial engineers;
- ◆ Recommend personal protective equipment, engineering controls and management controls for safety and health hazards;
- ◆ Outline and explain the issues (scientific, health-related, and social) pertinent to an area of research interest;
- ◆ Organize data and information, prepare technical reports, and give oral presentations on recognition, evaluation, management and control of occupational health and safety exposures;
- ◆ Identify significant gaps in the current knowledge base concerning health effects of environmental agents; and
- ◆ Use the scientific method to design, conduct and report on a study of a question concerning occupational health or safety.

### **MS, Epidemiology, General Track**

The Master of Science program offers research training in Epidemiology. The program includes coursework in epidemiology and biostatistics, and a research-based master's thesis is required. This degree is appropriate for physicians or other health professionals who prefer a more focused program than the MPH to prepare for research and teaching careers. We also accept exceptional individuals with a Bachelor's degree who wish to prepare for master's-level research careers, such as research project coordinator, or as preparation for the PhD program in Epidemiology after completion of the MS degree.

**Learning objectives:**

Upon satisfactory completion of the MS program in Epidemiology, students should be able to:

- ◆ Meet the learning objectives of the Master of Science program (see Criterion V.C.1);
- ◆ Define and calculate measures of disease frequency and measures of association between risk factors and disease;
- ◆ Describe the major epidemiologic research study designs and their advantages and limitations;
- ◆ Describe the major sources of bias in epidemiologic research (confounding, selection bias and measurement error) and the ways to evaluate and reduce the bias;
- ◆ Evaluate effect modification;
- ◆ Apply criteria to support whether an association is causal;
- ◆ Understand the basic terms and methods used in outbreak investigation, infectious disease epidemiology, chronic disease epidemiology, disease prevention trials and evaluation of screening tests;
- ◆ Critically review the scientific literature, synthesize the findings across studies, and make appropriate public health recommendations based on current knowledge;
- ◆ Design an epidemiologic study to address a question of interest;
- ◆ Apply regression, classical methods of analysis of categorical data, and other appropriate statistical approaches to analyze epidemiologic data.
- ◆ Interpret results of an epidemiologic study, including the relation to findings from other epidemiologic studies, the potential biological and/or social mechanisms, the limitations of the study, and the public health implications; and
- ◆ Write a clear description of the rationale, methods, results and interpretation of an epidemiologic investigation.

**MS, Epidemiology, Nutritional Science Track**

The Master of Science program in Nutritional Science is an interdisciplinary program of graduate studies designed to provide the student with the understanding and basic knowledge of human nutrition and the opportunity to focus advanced study in one of three principal areas of study: experimental, clinical and public health. The curriculum also provides appropriate research experience to enable the graduate to actively participate in nutritional science in an experimental setting as well as its application in public health and clinical health care settings. Qualified students in the MS program also have the opportunity to apply for the dietetic internship.

**Learning objectives:**

Upon satisfactory completion of the MS program in Nutritional Science, students should be able to:

- ◆ Meet the learning objectives of the Master of Science program (see Criterion V.C.1);
- ◆ Describe human nutrient requirements and their relationship to metabolism and physiological function;
- ◆ Determine the nutritional status of individuals and groups;
- ◆ Relate pathophysiological changes to alterations in nutritional status;
- ◆ Participate in scientific investigation of topics related to nutritional sciences;
- ◆ Provide leadership and management in the provision of nutritional care services for individuals and groups;
- ◆ Assist in policy development and evaluation; and
- ◆ Design effective and appropriate nutritional education programs for individuals and groups.

**MS, Health Services**

The Master of Science program in Health Services offers training in the research methods of health services. The program emphasizes coursework in biostatistics, epidemiology, and the special methods of health services research (outcomes assessment, cost effectiveness research, quality of life management, program evaluation and community assessment) and requires a research-based masters thesis. The degree is designed for physicians and other health professionals who wish to obtain advanced research training in health services but do not aspire to a professional public health degree (the MPH) and for bachelor's-trained individuals who seek to pursue a masters-level research career. (The Department of Health Services does not currently offer a PhD degree.)

**Learning objectives:**

Upon satisfactory completion of the MS program in Health Services, students should be able to:

- ◆ Meet the learning objectives of the Master of Science program (see Criterion V.C.1);
- ◆ Describe the current structure of the health services system in the U.S. and the trends and major issues confronting that system;
- ◆ Develop a meaningful hypothesis regarding selected elements of the health care system and design a study which is feasible and which would test that hypothesis;
- ◆ Apply classical univariate and multivariate statistical techniques to the analysis of health services studies;
- ◆ Access and manipulate large secondary data sets for the purpose of descriptive data presentation and research; and
- ◆ Write a clear description of the rationale, methods, results and interpretation of a health services research investigation.

**MS, Pathobiology**

The Master of Science program in Pathobiology is designed to prepare the student for a senior technical position in a research, government or biotechnology laboratory. While many of the courses required for the MS are also required for the PhD, the MS program differs in that more of the courses emphasize the concepts underlying methodological approaches rather than the ability to design a major research program in the field of pathobiology. Thus, our MS program combines an emphasis on public health with coursework that provides an understanding of the concepts underlying the approaches used in biomedical research laboratories.

**Learning objectives:**

Upon satisfactory completion of the MS program in Pathobiology, students should be able to:

- ◆ Meet the learning objectives of the Master of Science program (see Criterion V.C.1);
- ◆ Apply basic biomedical research to diseases of public health interest;
- ◆ Collect, analyze, interpret, and use data for solving problems in pathobiology; and
- ◆ Demonstrate basic research skills and understanding of the scientific method by completing a research-based thesis.

## ***Doctoral Programs***

### **PhD, Biostatistics**

The doctoral program in Biostatistics trains future academicians, highly qualified as independent investigators and teachers, and well-trained practitioners of biostatistics. The program includes coursework in biostatistics, statistics, and one or more biomedical fields. In addition, successful candidates are required to pass PhD applied and theory exams, complete a biology project and write a dissertation that reports the results of new biostatistical research undertaken by the candidate.

#### **Learning objectives:**

Upon satisfactory completion of the PhD program in Biostatistics, graduates will be able to:

- ◆ Meet the learning objectives of the MS program in Biostatistics (see Criteria V.C.1.);
- ◆ Meet the learning objectives of the PhD program (see Criteria V.C.1);
- ◆ Use appropriate statistical techniques to analyze longitudinal, clustered and other non-independent outcome data;
- ◆ Provide rigorous proofs characterizing the properties of standard statistical methods;
- ◆ Develop expertise in an area of biostatistical methodology, read and understand statistical methodological papers in that area, provide an explanation of their strengths and weaknesses and describe how the papers in that area are related to each other;
- ◆ Read and provide a critical summary of biomedical literature pertaining to a question of interest; and
- ◆ Design and carry out a biostatistical research study that will propose a new biostatistical method or provide new information about the properties of existing methods.

### **PhD, Environmental Health, Toxicology Track**

#### **Learning objectives:**

Upon satisfactory completion of the PhD program in Toxicology, students should be able to:

- ◆ Meet the learning objectives of the MS program in Toxicology (see Criterion V.C.1);
- ◆ Meet the learning objectives of the PhD program (see Criterion V.C.1);
- ◆ Conceive, develop and conduct original research leading to significant advances in the knowledge of mechanisms of toxic action or in the assessment of risk deriving from exposure to toxicants;
- ◆ Apply advanced methodology to research projects in environmental health and develop new research methods to address environmental or occupational problems; and
- ◆ Demonstrate written and oral skills by preparing papers and presentations for peer scientists and the community at large.

### **PhD, Environmental Health, Industrial Hygiene and Safety Track**

#### **Learning objectives:**

Upon satisfactory completion of the PhD program in Industrial Hygiene and Safety, students should be able to:

- ◆ Meet the learning objectives of the MS program in Industrial Hygiene and Safety (see Criterion V.C.1.);
- ◆ Meet the learning objectives of the PhD program (see Criterion V.C.1);
- ◆ Conceive, develop, and conduct original research leading to significant advances in the knowledge of mechanisms important to recognition, evaluation, or control of industrial hygiene or safety problems;
- ◆ Apply advanced methodology to research projects in industrial hygiene and develop new research methods to address occupation hazard problems; and
- ◆ Demonstrate written and oral skills by preparing papers and presentations for peer scientists and the community at large.

### **PhD, Epidemiology, General Track**

The doctoral program in Epidemiology is intended to produce future academicians, highly qualified as independent investigators and teachers, and well-trained practitioners of epidemiology. The program includes course work in epidemiology and biostatistics and also requires the development and execution of an independent dissertation research project. Most candidates have completed prior graduate training to the master's (or doctoral) degree level in a health-related field.

**Learning objectives:**

Upon satisfactory completion of the PhD program in Epidemiology, students should be able to:

- ◆ Meet the learning objectives for the MS program in Epidemiology (see Criterion V.C.1);
- ◆ Meet the learning objectives of the PhD program (see Criterion V.C.1);
- ◆ Formulate study questions that will advance scientific knowledge about a topic of public health importance;
- ◆ Develop a research proposal that presents the study aims, scientific background, public health significance and the detailed methods for carrying out the epidemiologic study;
- ◆ Design and implement data collection, quality control and data management procedures for an epidemiologic study;
- ◆ Develop study procedures for protection of rights of human subjects;
- ◆ Apply regression, classical methods of analysis of categorical data, logistic regression, survival analysis and other appropriate statistical approaches to analyze epidemiologic data;
- ◆ Present a clear oral presentation on the design and/or results of an epidemiologic study;
- ◆ Write a clear description of the rationale, methods, results and interpretation of an epidemiologic investigation that would be acceptable for publication in a scientific journal; and
- ◆ Demonstrate expertise in a substantive area of disease etiology, disease prevention or clinical epidemiology.

**PhD, Epidemiology, Nutritional Sciences Track**

A student receiving a Doctor of Philosophy degree from the Interdisciplinary Graduate Program in Nutritional Sciences at the University of Washington will be prepared for the acquisition and dissemination of new knowledge and for professional practice in academics and research in the multidisciplinary science of nutrition.

The objectives of the PhD in Nutritional Science are to prepare students to meet the needs for expanding the base of new knowledge in nutritional sciences and to apply this knowledge in public health and clinical health care settings. The PhD program is designed to assist students in gaining an advanced understanding of nutrition and metabolism, and of related biological, biochemical, molecular, and behavioral sciences, in acquiring skills in research methods, and in developing timely and original hypotheses in nutritional sciences.

**Learning objectives:**

Upon satisfactory completion of the PhD program in Nutritional Science, students should be able to:

- ◆ Meet the learning objectives of the MS program in Nutritional Science (see Criterion V.C.1);
- ◆ Meet the learning objectives of the PhD program (see Criterion V.C.1);
- ◆ Translate sophisticated, multidisciplinary concepts of modern nutrition to the needs of individuals in the society;
- ◆ Relate normal physiology, anatomy, biochemistry and molecular biology to nutrition status and nutritional requirements;
- ◆ Relate pathophysiologic changes to alterations in nutrition status and nutritional requirements;
- ◆ Construct testable hypotheses, develop appropriate study designs, and conduct and publish the results of research, which will significantly expand knowledge of nutritional sciences;
- ◆ Be proficient in the use of modern technology for the acquisition and dissemination of information and to be knowledgeable of the process, sources and means of procuring research funding;
- ◆ Determine the nutritional status of individuals and groups;
- ◆ Formulate nutrition care plans appropriate for individuals and integrate these plans with total medical management;
- ◆ Design nutrition counseling and educational programs for patients, health care professionals and the general community; and
- ◆ Provide leadership and management for nutrition care programs and to give expert advice in the formulation of nutrition policy at the community, state and national levels.

### **PhD, Pathobiology**

The doctoral program in Pathobiology is designed to train students for careers as program heads in biomedical research and development and in the applications of biotechnology to public health. We envisage these careers to take a variety of forms, ranging from traditional academic careers to careers in the biotechnology industry or in government laboratories. Thus, with its emphasis on training students for leadership positions, the doctorate program is distinct from the Master of Science program, which emphasizes technological excellence.

#### **Learning objectives:**

Upon satisfactory completion of the PhD program in Pathobiology, students should be able to:

- ◆ Meet the learning objectives of the MS program in Pathobiology (see Criterion V.C.1.);
- ◆ Meet the learning objectives of the PhD program (see Criterion V.C.1);
- ◆ Demonstrate expertise in the area of basic cellular and molecular processes and techniques important in the application of basic biomedical research to diseases of public health interest;
- ◆ Collect, analyze, interpret, and use data for solving problems in pathobiology;
- ◆ Apply advanced research skills and expertise in the area of his/her research concentration;
- ◆ Apply these skills to approach an unfamiliar experimental system and identify and explore important questions concerning pathogenesis and infection;
- ◆ Demonstrate skills in oral and written communication of scientific information; and
- ◆ Conduct and publish independent research leading to the expansion of knowledge of pathobiology.