

# POSTGRADUATE INSTITUTE OF SCIENCE UNIVERSITY OF PERADENIYA



## Certificate Course on Applied Epidemiology

### BACKGROUND

Epidemiology is the key scientific discipline underlying some of the most important areas of medicine, including public health, clinical research and clinical trials, and health services research. Epidemiological studies and research has become an important tool in the study of the aetiology and natural history of infectious and non-infectious diseases, and in assessing health effects in populations. Epidemiological information is used to plan and evaluate strategies to prevent illness and as a guide to the management of patients and in animals in whom disease has already developed.

The certificate course in **Applied Epidemiology** is designed to provide excellence in teaching of epidemiological and bio statistical concepts and methods, with an emphasis on the practical application of epidemiological methods in public health and clinical settings.

The course will be taught by staff who have teaching and research experience extending across the major diseases of Asian region. The teachers of the course will be those who have been teaching epidemiology and related subjects both theory and practical in medical, veterinary and basic science fields in University of Peradeniya. Teaching will be through lectures, seminars and practical sessions. Seminar discussions will focus on current issues and controversy in epidemiology. The practical sessions will involve the analysis, interpretation and discussion in small groups of a variety of epidemiological studies, and participants will make use of the computer facilities available in the PGIS. Critical reading of published scientific literature of national wide study designs will be stressed.

### PROGRAMME ELIGIBILITY

Applicants for admission to the programme must have successfully completed a MBBS/BVSc BSc degree in Science or any other equivalent qualification acceptable to the Postgraduate Institute of Science, University of Peradeniya. The medium of instruction and examinations of the programme will be English.

### AIMS AND OBJECTIVES

The course will provide students with an understanding of the epidemiological concepts, with training in essential methodological skills for the conduct of epidemiological studies in human and animal populations.

## EXPECTED LEARNING OUTCOME

On completion of the course, students will be able to:

- demonstrate an understanding of the key concepts in the discipline of epidemiology;
- apply epidemiological principles to surveillance and infection and disease control within animal and human populations;
- communicate effectively with researchers from different disciplinary backgrounds;
- select an appropriate study design when confronted with an epidemiological research question;
- question and develop a detailed study protocol capable of answering the research question;
- analyzes and interpret epidemiological data derived from cross-sectional, case-control and follow-up studies ;
- find appropriate solutions, control and mitigatory measures of epidemic conditions.

## PROGRAMME STRUCTURE AND DURATION

This is a part -time programme consisting of course work. Course work will be conducted over a period of four months (16 weeks) during weekends and/or week days.

Continuous attendance is compulsory during the period of each course. Assessment methods vary and include:

- written assignments
- analyses of data sets and reports on analyses
- timed examinations
- Critical reading and comments of published scientific literature
- Certificates will be awarded to the participants who have obtained average 80 percent of all the courses

### Programme Summary

Course	Lecture hours	Practical hours	No. of Credits
Introduction to Epidemiology	15		1
Methods of Epidemiology	20	20	2
Environmental Epidemiology	20	20	2
Overview of Public Health	15		1
Zoonoses and public health	30	30	3
Public Health Policy and Law	15		1
Infectious disease surveillance and outbreak investigation	20	20	2
Bioinvasions, bioterrorism biosecurity, and public health	15		1
Introduction to Biostatistics and statistical applications in health sector	30		2
Health Care Systems: Management & Evaluation Techniques	15		1
Sociology of Health and Illness & Health Promotion	15		1
Research Methodology, Scientific Writing, and Seminar	15		1
Independent Study			2
Total			20
Total hours			~300
No. of weeks			~20

## **PROGRAMME DETAILS**

### **Introduction to Epidemiology (1 Credit)**

**Course Objectives:** At the completion of this course, the student will be able to:

- Assess major epidemiologic events and studies in the context of the historical evolution, landmark studies and applications of epidemiology;
- Assess disease concepts using basic epidemiologic concepts, including the natural history of disease, measurement of risk, models of disease transmission, levels of prevention, and causality, including environmental and genetic causes of disease;
- Assess current epidemiologic studies based on the strengths and weaknesses of the major study designs used in epidemiology; cross-sectional, case-control, cohort and clinical trials;
- Assess the effects of bias, confounding, power of studies, and attrition on validity, reliability and generalizability in epidemiologic studies, and apply standard approaches for handling them through study design and analysis;
- Evaluate and synthesize the scientific literature on an epidemiologic problem of the student's choice, using the concepts provided during this course, in a term paper and an oral report the classmates and faculty.

**Description:** The course introduces the basic principles and methods of epidemiology and demonstrates their applicability in the field of public health. Topics to be covered include the historical perspective of epidemiology, measures of disease occurrence and of association, clinical epidemiology, disease screening, causal inference, and study design.

### **Methods of Epidemiology (2 Credits)**

**Course Objectives:** At the completion of this course, the student will be able to:

- Analyze the scientific foundation for the establishment of causation;
- Analyze the strengths and weaknesses of the following study designs: case-control, cohort, randomized clinical trial, and community intervention trial;
- Evaluate the role of clinical epidemiology in public health; analyze the scientific foundations of surveillance and screening in public health;
- Identify the methods and strategies for conducting infectious disease epidemiology

**Description:** This course will introduce the student to the most common analytic methods in epidemiology. Students will learn how to design epidemiologic studies, to choose appropriate research designs, and to utilize common statistical tests. Emphasis will be placed on case control studies, cohort studies, clinical epidemiology, community intervention trials, and infectious disease epidemiology.

### **Environmental Epidemiology (2 Credits)**

**Course Objectives:** At the completion of this course, the student will be able to:

- Identify some of the major chemical, physical, and biological agents as risk factors for environmentally-related diseases.
- Describe hazardous effects of some major environmental exposures on human physical health, including disease induction, physiological impairment, and genetic susceptibility to risk.

- Describe pathways of exposure to hazardous agents in the workplace and general environment.
- Describe methods for assessing human exposures to hazardous agents for epidemiological research purposes.
- Describe the influences of genetic susceptibility on risks related to environmental agents.

**Contents:** This course focuses on methods to study relations between exposure to environmental agents (for example air pollutants and metals) or conditions (heat waves) and effect markers, symptoms, morbidity and mortality in population and subgroups. It also describes how to use the information from epidemiological and toxicological studies in risk assessment and environmental health impact assessment.

### **Overview of Public Health (1 Credit)**

**Course Objectives:** At the completion of this course, the student will be able to:

- Achieve familiarity with the various components of the public health system;
- Understand interrelationships among the system's components;
- Acquire the ability to apply this knowledge and understanding to important health issues and problems;
- Acquire an awareness of the importance of independent reading and study;
- Develop basic computer skills for accessing information and communicating with peers;
- Appreciate the unique characteristics of public health practice as a social enterprise;
- Appreciation of the importance of disease prevention and health promotion in our society.

**Description:** This course provides an introduction to public health concepts and practice by examining the philosophy, purpose, history, organization, functions, tools, activities and results of public health practice at the national, state, and community levels. The course also addresses important health issues and problems facing the public health system. Case studies and a variety of practice-related exercises serve as a basis for learner participation in real world public health problem-solving simulations.

### **Zoonoses and public health (3 Credits)**

**Course Objectives:** At the completion of this course, the student will be able to:

- Define zoonotic disease and become familiar with the most common routes of transmission from animals to humans
- Understand that zoonotic diseases account for five of the six bioterrorism Category A agents and become familiar with these agents
- Understand what outbreaks are commonly caused by zoonotic agents
- Explain the difference between bioterrorism and agroterrorism, realizing that animal populations as well as human populations may be targets for terrorists
- Compare animal disease surveillance systems to human disease surveillance systems
- Demonstrate mastery of fundamentals of zoonotic diseases and outbreak investigation by working through case studies and outbreak scenarios
- Describe the public health competencies for environmental health staff

**Description:** This course will introduce zoonotic disease basics, and explore zoonotic diseases as potential bioterrorism agents with emphasis on the Category A zoonotic agents. The topics of food security and agroterrorism, framework for disease surveillance. A case study of zoonotic disease outbreak investigations and details, the role of environmental health professionals.

## **Public Health Policy and Law (1 Credit)**

**Course Objectives:** At the completion of this course, the student will be able to:

- Identify the basic characteristics of public policy, the steps in policymaking, and the nature and role of politics in policy making;
- Understand the different roles of various governmental branches and organizations, the media, the courts, interest groups and the public in formulating and implementing public policies that impact public health practice;
- Describe the basic legal framework which underlies public health practices;
- Interpret the development and evolution of major public health policy topics in the context of the forces that determine policy making;
- Apply these models to proposals for new policies that address significant health concerns.

**Description:** This course is designed to explore the major governmental and legal forces that shape public health policy in Sri Lanka. governments, the media, the public and courts in placing issues on the policy agenda and in developing, implementing and assessing public policy related to the design, delivery and financing of public health services.

## **Infectious disease surveillance and outbreak investigation (2 Credits)**

**Course Objectives:** At the completion of this course, the student will be able to:

- Develop skills related to the investigation of communicable disease outbreak affecting their country.
- Plan and conduct a descriptive analysis of an outbreak: create epidemic curves, line-listing and summary tables of person characteristics and maps with distribution of cases (spot maps or incidence maps)
- Choose between different designs to conduct an analytical epidemiological investigation of an outbreak
- Communicate the results of an outbreak investigation

**Description:** Introduction to outbreak investigation, cohort and case-control studies: creation of a questionnaire, data entry and validation, descriptive epidemiology, analysis of time characteristics (epidemic curve), analysis of place characteristics (mapping of cases using GIS), analytical epidemiology, bivariate analysis, analytical epidemiology, stratified analysis, analytical epidemiology, multivariate analysis.

## **Bioinvasions, bioterrorism biosecurity, and public health (1 Credit)**

**Course Objectives:** At the completion of this course, the student will be able to

- Understand emerging public health and safety issues
- analysis, evaluation, and solutions for homeland security health threats that imperil our citizens and those who must respond to preserve their health
- translation of new ideas into effective solutions that address country-based health security needs
- expertise for planning, training, executive leadership, public health, and hospital preparedness in domestic and international settings.

**Description:** This course is designed to explore the significance of biological invasions: high profile and potentially devastating consequences. Impacts of bioinvasions on human health: agriculture, infrastructure, and the environment. Comprehensive approach to biosecurity that

addresses to bioterrorism, and invasive alien species. Prevention, early detection, and rapid response to species incursions as central mission themes. The role of scientific community, industry, and the public to ensure environmental and community safety.

### **Introduction to Biostatistics and statistical applications in health sector (2 Credits)**

**Course Objectives:** At the completion of this course, the student will be able to:

- Recognize research questions which are appropriate for statistical analysis;
- Define the research question with the statement of the null and research hypotheses;
- Distinguish between parametric and non-parametric data;
- Determine which statistical procedure is appropriate for a specific research question;
- Apply the selected statistical procedure to the data available;
- Analyze the statistical results;
- Determine if the results are statistically significant in order to accept or reject the research hypothesis

**Description:** This is an elementary course in statistical methods, applied to health-related problems. The statistical issues encountered by public health professionals will generally be health-related. For public health professionals, knowledge of statistical procedures and terminology is essential for understanding research articles that present new information in areas of expertise and for conducting research studies.

### **Health Care Systems: Management & Evaluation Techniques (1 credit)**

**Course objectives:** At the completion of the course, the student will be able to identify strengths and weaknesses of health monitoring and evaluation systems and make positive constructive remarks for potential upgrading of such systems.

**Description:** Performance monitoring and management of health care systems, effectiveness evaluation of health management systems to improve its efficiency while enhancing staff satisfaction. The content of the course includes motivation, knowledge management, managing diversity, leadership, recruitment and organizational culture, the design of evaluations, information on the theoretical underpinnings of evaluation strategies and examples from practice.

### **Sociology of Health and Illness & Health Promotion (1 Credit)**

**Course objectives:** At the end of the course, the student will be able to identify sociological aspects of current health monitoring systems so that they could possibly be improved for the best ability of the staff and the patient/client.

**Description:** An introduction to sociological perspectives on health and illness, social patterns of health and illness and possible explanations; responses to health and illness by individuals, families, lay contacts and professionals; and the social processes by which some experience come to be defined and treated as illness while others do not; an approach to health promotion encompassing social and political action to address inequalities in health as well as health education, major issues in health promotion planning, implementation and evaluation from a number of perspectives including psychology, education, epidemiology and sociology

## **Research Methodology, Scientific Writing, and Seminar (1 credits)**

**Course objectives:** At the end of the course, the student will be able to apply appropriate data collection and analytical methods in epidemiological and public health related research. In addition, they should also be able to present the problem to a statistician, if and when required. Furthermore, they will also acquire the ability to properly document the findings and also the present it both in writing and verbally.

**Description:** In this course, the nature and concepts of research, types of research and tools of research, research design and conceptualization, causality, survey research and data collection techniques, strategies for data analysis and their applications, scientific writing and writing research reports, scientific papers and dissertations, preparing presentations, preparation of bibliography; information gathering through internet and use of electronic resources will be highlighted.

Each student is required to present a seminar based on review of literature on a current development in the area of epidemiology.

## **Independent Study (1 Credit)**

The aim of this study is to provide students with an opportunity to apply knowledge and skills gained during the course to carry out an individual and an independent, reasonably small scale project. The project will include two components, one being a literature review and the other, a scientific report. Each student will be guided by an expert in the relevant field of study.

## **TEACHING PANEL**

- Dr. A. Dangolla, Department of Veterinary Clinical Studies, Faculty of Veterinary Medicine & Animal Sciences, University of Peradeniya.  
*BVSc (Sri Lanka), Dip. Vet. Epid. (Finland), Ph.D. (Denmark)*
- Dr. S. Dharmaratne, Department of Community Medicine, Faculty of Medicine, University of Peradeniya. *MBBS (Sri Lanka), M.Sc. (Sri Lanka), MD (Sri Lanka)*
- Dr. W.G. A Dissanayake, Regional Director /Health Services, Matale  
*MBBS (Sri Lanka), M.Sc. (Sri Lanka)*
- Dr. S. A. K. Gamage, Regional Director/Health Services, Kandy  
*MBBS (Sri Lanka), M.Sc. (Sri Lanka)*
- Prof. O. A. Ileperuma, Department of Chemistry, Faculty of Science, University of Peradeniya  
*B.Sc. (Cey.), Ph.D. (Arizona)*
- Mrs. S Ileperuma, Senior Assistant Librarian, Science Library, University of Peradeniya  
*B.Sc. (Cey.), MLS (Colombo)*
- Dr. G. Jayakody, Provincial Director/Health Services, Kandy  
*MD (Russia), M.Sc. (Sri Lanka), MD (Sri Lanka)*
- Dr. A. Jayasinghe, Department of Community Medicine, Faculty of Medicine, University of Peradeniya  
*MBBS (Sri Lanka), MSc (London), DCH (London), FRCPH (UK), FRCP (London)*
- Dr. R. Kalupahana, Department of Veterinary Clinical Studies, Faculty of Veterinary Medicine & Animal Sciences, University of Peradeniya  
*BVSc (Sri Lanka), Ph.D. (Cantab)*
- Dr. P. V. R. Kumarasiri, Department of Community Medicine, Faculty of Medicine, University of Peradeniya. *MBBS (Sri Lanka), MD (Sri Lanka)*

- Dr. A. Siribaddana, Consultant Chest Physician, General Hospital, Kandy  
*MBBS (Sri Lanka), MD (Sri Lanka), MRCP (UK)*
- Dr. T. Wijayathilake, Department of Animal Production & Health, Gannoruwa  
*BVSc (Sri Lanka), MTAP (Netherlands)*
- Dr. P. R. Wijesinghe, Consultant in Community Medicine, Epidemiology Unit  
Ministry of Healthcare and Nutrition, Colombo. *MBBS (Sri Lanka), MSc (Community  
Medicine), MD (General Medicine), MD (Community Medicine)*
- Dr. S. K. Yatigammana, Department of Zoology, Faculty of Science, University of Peradeniya  
*B.Sc. (Perad.), M.Sc. (Perad.), Ph.D. (Canada).*

## **PROGRAMME COORDINATORS**

Dr. Sudharma Yatigammana  
Department of Zoology  
University of Peradeniya  
Peradeniya  
E-mail: [sudharmay@pdn.ac.lk](mailto:sudharmay@pdn.ac.lk)  
Phone: 081 2394479  
077 6444201

Dr. Ashoka Dangolla  
Department of Veterinary Clinical Sciences  
University of Peradeniya  
Peradeniya.  
E-mail: [adangolla@yahoo.com](mailto:adangolla@yahoo.com)  
Phone: 081 2395879  
077 7810591

