Capacity Building for a Better Future

RULES, REGULATIONS AND SYLLABUS
M.Sc. IN BIOSTATISTICS AND DEMOGRAPHY

International Institute for Population Sciences
(DEEMED UNIVERSITY)
Deonar, Mumbai 400 088.
Website: http://www.iipsindia.org

About the Institute

The Institute was established in 1956 as the regional centre for training and research in Population Studies for the country of Asia and Pacific region. The International Institute for Population Sciences embraced the present name and was declared a "Deemed University" in 1985 by the Ministry of Human Resource Development, Government of India. The Institute is an autonomous body under the administrative control of the Ministry of Health and Family Welfare, Government of India. This is the only Institute of its kind in the world exclusively devoted to teaching and research in population sciences. Over the last fifty years, the Institute has helped in building a nucleus of professionals in the field of population in various countries in the ESCAP region. Many who were trained at the Institute now occupy key positions in reputed national and international organizations.

Learning Objectives

The Master of Science in Biostatistics and Demography will provide students knowledge and understanding of modern statistical demographic and epidemiological methods. The students will learn about their application in all areas of public health, health, demography, and social sciences aimed at understanding and improving human wellbeing. The course offers a thorough grounding in modern epidemiological research and the application of statistical methods to epidemiological investigation and practice. Students will be given the opportunity to apply research techniques to a variety of challenging epidemiological and biomedical problems. The course also aim at providing students scope for professional development in understanding and use of statistical software packages including SPSS, STATA, SAS, MLWin, GIS and R. In the second year of the course students shall write a dissertation on the basis of contemporary applications of epidemiological and statistical methods and statistical softwares in public health, health and demography. Opportunities are given to develop presentation and consultancy skills which are much valued by employers.

In India, there is a serious shortage of biostatisticians, demographers and epidemiologists trained to Master's level, which is the entry level to a broad range of employment sectors including the pharmaceutical industry, medical research and health services. The aim of this Master's course is to equip students with the required knowledge to follow careers in these areas. The Master of Science in Biostatistics and Demography shall also be gateway to further pursue Ph.D.

Expected Outcomes of M.Sc. Biostatistics and Demography

On completion of two years Master of Science in Biostatistics and Demography the passing out students shall be able to:

- design, analyse, interpret and criticise demographic, epidemiological, health and public health research
- demonstrate an understanding of the essential principles of modern bio-statistical methods and statistical softwares and how to apply them
- employ basic mathematical and computational skills used in the analysis of population, disease pathogenesis, transmission and control
- undertake original research projects that makes a contribution to the body of knowledge for human wellbeing
- exhibit the ability to disseminate research findings to the scientific community and the

general public
- prepare Statistical Analysis Plan (SAP)
- undertake analysis of clinical trials

Eligibility for admission and selection procedure

Candidates with a Bachelor's degree from recognized universities in India or abroad in core subject of Mathematics or Statistics or with atleast two full papers of Mathematics or Statistics with a minimum of 55% marks or equivalent grade will be eligible for admission to the above programme. Candidates awaiting results of qualifying examination latest by 30th September of the admission year can also apply for consideration. The upper age limit is 25 years as on 30th June of the admission year. Marks and age are relaxable for candidates belonging to reserved categories as per GOI rules.

Selection Criteria for the M.Sc. in Biostatistics and Demography Program

The selection will be made on the basis of a written test and personal interview. Only shortlisted candidates will be called for the test and interview. Shortlisted candidates appearing for admission test are entitled to claim sleeper class train fare by the shortest route on production of original tickets and in case of road journey normal fare will be paid only for travel by public transport run by a Government body.

Number of Seats and Award of Degrees

There are 50 seats available with the Government of India fellowship.

Fellowships

There are 50 Government of India Awards (Fellowships of Rs. 5000/- per month) available for M.Sc. in Biostatistics and Demography programme. There are no other allowances.

Duration of the Course

The M.Sc. in Biostatistics and Demography programme, which is of two academic years comprises four semesters, begins from the second week of July. The first semester ends in the month of November. The second semester starts in the last week of November and ends in month of May next year. The third semester begins again in the month of July and ends in the month of May next year completing of fourth semester.

Conditions for the Award

a) M.Sc. in Biostatistics and Demography programme is a full time course. The student shall not accept or hold any appointment paid or otherwise or receive any emoluments, salary, stipend, etc., from any other source during the tenure of the award.
b) The student should also obtain prior permission of the Director in writing for appearing at any examination conducted by any other University/Institution.
c) The fellowship will be available from the onset of the course till the end of the course.
d) The fellowship may be terminated at any time if the Institute is not satisfied with the progress or conduct of the student.

e) The student will have to execute a bond requiring him/her to refund the fellowship received by him/her, if the fellow discontinues before the end of the prescribed period. The condition of the bond cannot be waived or relaxed except by the Director with the consent of the Executive Council of the Institute.

f) If a student's performance in the first semester is not found satisfactory, or his/her conduct is found unsatisfactory on the basis of indiscipline of any act as is likely to undermine the prestige of the Institute, or endanger harmony of academic life of the Institute or is likely to violate the rules of the institute, his/her admission and fellowship will be terminated without any further notice. In case the fellowship is terminated, he/she will be required to refund the whole of the fellowship money drawn till that date provided the action against him/her has not been contemplated on the ground of unsatisfactory performance as stated above.

g) <u>Fees</u>: The candidates admitted to the programme will have to pay the fees as per schedule of the Institute on 1st January and 1st July every year regularly. For payment of fees, a grace period of 30 days shall be given without late fee. Thereafter, 5% on all dues will be charged extra as late fee, every month.

Hostel Accommodation

Accommodation in the hostel of the Institute will be provided to the students at the applicable rate, subject to availability.

Medical Facilities

The students of the Institute will have access to free medical advice from the medical officers of the Institute.

Leave

A student can take leave for a maximum of four working days in a semester on the recommendation of Course Co-ordinator and granted by the Director.

Attendance

(1) Minimum of 95 percent of attendance in classes is compulsory to receive full fellowship.

(2) Minimum of 75 percent of attendance in classes is compulsory to appear in exams.

Dissertation

A student is required to write a dissertation on some demographic or related problems under the guidance of a faculty member. The topics of the dissertation have to be submitted at the beginning of the Forth Semesters. The dissertation will be presented in formal seminar of the students and faculty members of the Institute. The content and presentation and participation in the seminar shall be subjected to assessment by a committee comprising of faculty members.

Evaluation

Grades obtained in all the subjects counted for determining the overall grade for M.Sc. in Biostatistics and Epidemiology programme. Minimum Grade required for passing is "B Minus" in each unit.

Grading System

The following ten points grading system is followed in the Institute:

Letter Grade	Numerical Value	Equivalent Marks/ Qualitative Level
A+	9	85 and above / Excellent
A	8	75-84 / Very Good
A-	7	65-74 / Good
B+	6	55-64 / Above Average
B	5	45-54 / Average
B-	4	35-44 / Below Average
C+	3	25-34 ⎱
C	2	15-24 ⎰ Poor/Fail
C-	1	1-14
D	0	0

1. The teacher concerned will set the question paper and also evaluate the answer books as per grading pattern.
2. A final grade for each paper will be arrived by taking weighted average of grades given in different sections of the paper in case of questions of unequal weights. The weights can be given in proportion to the credit (i.e. number of hours) assigned for each section of the paper.
3. Overall Grade will be arrived on the basis of the number of credit hours and grade points for each subject.
4. A student securing a overall average grade points (OAGP) of less than B Minus, i.e. grade C Plus will not be eligible for the award of the degree.

Written Examination

Written examination will be conducted for all courses.

Re-evaluation of Answer Sheets

A student can have access to his/her examination papers in the form of xerox copies at a cost of Rs. 200/- per paper with prior approval of the Director.

A student can apply for re-evaluation of his/her answer sheet at a cost of Rs. 500/- per paper. The candidate must apply for re-evaluation within 15 days of declaration of the results.

Re-Examination

(1) Re-examination will not be conducted during the course period.
(2) Those students who fail or could not appear in any examination will be allowed to re-appear in a paper in the next semester examinations.
(3) Those failing in any exam of final semester will not be awarded the degree in the same academic year. They can appear in the re-examination along with first semester of the next batch.
(4) Maximum of three attempts will be allowed including the first appearance in each paper.
(5) There will not be any down grading in re-examinations.
(6) 50 Percent of clearance of the total papers in each semester is compulsory to continue the study in next semester.

M.Sc. in Biostatistics and Demography

S. No.	Course title	No. of credits
SEMESTER I		
MBD-1	Basics of Human Biology	2*
MBD-2	Introduction to Demography	2
MBD-3	Demographic Methods I	4
MBD-4	Introduction to Biostatistics & Epidemiology	4
MBD-5	Healthcare Systems and Policies	4
		16
SEMESTER II		
MBD-6	Demographic Methods II	4
MBD-7	Epidemiological Methods	4
MBD-8	Sampling Techniques in Health & Demographic Surveys	4
MBD-9	Application of Statistical and Demographic Packages I	2
MBD-10	Research Methodology I	2
Viva-1	Viva-voce	2
		18
SEMESTER III		
MBD-11	Research Methodology II	2
MBD-12	Applied Multivariate Analysis	4
MBD-13	Concepts and Measures of Global Health	4
MBD-14	Application of Statistical and Demographic Packages II	4
MBD-15	Demographic Models and Indirect Methods of Estimation	2
		16
SEMESTER IV		
MBD-16	Survival Analysis	4
MBD-17	Methods in Clinical Trials	4
MBD-18	Optional Paper	4
DISS	Dissertation	8$
Viva-2	Viva-voce	2
		22
	Total credits	**72**

*Not counted for calculating the final grade

$ Evaluation procedure for dissertation: Guide - 0.25, Presentation & Defense – 0.25, Content – 0.50. The grade for 'presentation & defense must also be given independently by each member, and submitted to the controller of examinations independently. For content, the director may appoint a two member committee for each dissertation. The two members should independently evaluate the dissertation and independently submit the grades to the controller of examinations.

OPTIONAL COURSE - One of the following:
1. Operations Research
2. Health Economics & Health Financing
3. Database Theory and Management of Biological Data

A one-unit course involves 48 hours of classroom lecture while a half-unit course is composed of 24 hours of lecture. A student is expected to take all the preparatory and main courses and one of the optional courses. The performance of a student is evaluated through a combination of assignments, written examination and comprehensive viva-voce.

M.Sc. Biostatistics and Demography
Schedule of Fees

Particulars	Indian Students (Rs.)	Foreign Students (US $)
A: Non Refundable		
Admission Fee	500	200
Tuition Fee (Per Year)	8000	7000
Computer Fee (Per Year)	2500	--
Examination Fee (Per Sem)	500	--
Re-examination Fee (Per Paper)	500	--
Re-evaluation Fee (Per Paper)	500	--
Thesis Submission Fee	500	50
Thesis re-submission Fee	500	--
Provisional Certificate Fee	100	--
Degree Certificate Fee	200	--
Library Fee (Per Year)	800	--
Medical Examination Fee	200	--
Sport/Cultural Fee (Per Year)	1000	--
Duplicate Certificate Fee	800	--
Migration Certificate Fee	100	--
Transcript Fee (For Two Sets)	500	50
Duplicate I-card Fee	100	--
Hostel Accommodation Charges (Per Month	400	300
Refundable Deposits		
Library	2000	100
Dining Hall	2000	--
B: Processing Fee (Non-Refundable)	500	--
Convocation Charges	500	50

Note: 50% Concession on Tuition Fees to students from SAARC Countries.

MBD-1: Human Biology

Introduction to human Biology; Human life cycle; Definition & structure of cell, tissue structure & type

Anatomy and physiology of human organ and organ related diseases - Digestive system; Respiratory system; Cardiovascular System; Lymphoid & haemopoiteic system (circulatory); Nervous & the special senses; Muscular and Skeletal system; Excretory System; Urinary system; Reproductive System (Female and Male)

Essential Reading List
1. Guyton Arthur C., 1991, Textbook of Medical Physiology, A Prism Book Pvt. Ltd. Bangalore
2. Horton Casey, 1994, Atlas of Anatomy, Marshall Cavendish Books, London
3. W.Gordon Sears, Robert S. Winwood and J.L. Smith, 1985, Anatomy and Physiology for Nurses and Students of Human Biology, Education Academic and Medicinal Publishing Division of Hodder and Stoughton, London.
4. Keele, Neil et.al, 1991, Samson Wright's Applied Physiology, Oxford University Press, Delhi.

MBD-2: Introduction to Demography

1. **Introduction to Demography**
    Definition and Scope: Demography as a scientific discipline; Development of demography as a discipline; Basic demographic concepts; Components of population change

    Historical trends in population situation in the world; Present population situation and past and future trends in the world and in developed and developing countries

    Brief description of demographic transition theory

2. **Sources of Demographic Data**
    Population census; Uses and limitations; Indian Censuses; Vital registration system

    National Sample Survey; Sample Registration System; Demographic Health Surveys (DHS), and other sample surveys.

3. **Dynamics of Age-Sex Structure**
    Present levels and past trends in the sex and age structure of the population of world and developed and developing countries

    Present levels and past trends in the sex and age structure of India's population

    Importance of age-sex structure in population dynamics and factors affecting sex ratio of the population

    Sex ratio of India's population and role of different factors in changing sex ratio

    Factors affecting age structure of the population: dynamics of age structure along with demographic transition

    Ageing of the population and relative roles of low fertility and low mortality in population ageing

4. Population growth rates – Arithmetic, geometric and exponential

Essential Reading List
1. Jacob S. Siegel and David a. Swanson (2004): *The Methods and Materials of Demography*, Second Edition, Chapters 1, 2, 3, 7, 9,10, Elsevier Science, USA.
2. John Weeks (2005): Population: An Introduction to Concepts and Issues, Wordsworth Learning. Singapore 9th edition.
3. United Nations, (1973): *The Determinants and Consequences of Population Trends*, Vol. I, *Population Studies*, No. 50, Chapter VII, New York.
4. Bhende, A., (1996): *Principles of Population Studies* (Seventh Edition), Himalaya Publishing House, Bombay.

Suggested Reading List
1. World Population Prospects 2006, Vol I and II, United Nation
2. Bogue, D., (1969): *Principles of Demography*, John Wiley and Sons, New York.

MBD-3: Demographic Methods I

1. **Fertility**
   Importance of the fertility study in population dynamics; Basic terms and concepts used in the study of fertility

   Basic concepts; Problems in fertility analysis; period and cohort approaches; Period measures of fertility - basic fertility measures, order-specific fertility rates, Coale's fertility indices; Cohort measures; Birth interval analysis; Reproduction measures

   Determinants of natural fertility; Davis intermediate variables framework of fertility; Socio-economic determinants of proximate variables; Lee and Bulatao framework of fertility determinants; Bongaarts proximate determinants

2. **Mortality**
   Need and Importance of the study of Mortality; Some basic measures: - crude death rate (CDR) and Age-Specific Death Rates (ASDRs) - their relatives merits and demerits

   Need and importance of standardization: direct and indirect technique of standardization of rates and ratios in the light of mortality rates; Decomposition

   Infant mortality rate and its sub-divisions; Maternal Mortality Rate, Ratios, Life time risk; Issues related to estimation of maternal mortality measures

   Basic concept of a life table; Types and forms of life table; Anatomy of life table; uses of life table in demographic analysis; Construction of life tables; model life tables

3. **Migration**
   Concept of mobility and migration, sources and quality of data, types of migration, census definition of migrants, limitations

   Internal migration patterns and characteristics in developing countries with a special focus on India; Determinants of internal migration: Causes of migration at the place of origin and at the place of destination; Patterns of international migration: Historical and recent trends; causes and consequences of international migration

   Direct estimation of lifetime and inter-censal migration rates from census data; Indirect measures of net internal migration: Vital Statistics Method, National Growth Rate Method and Census and Life Table Survival Ratio methods; Methods of estimating international migration; Migration surveys

Essential Reading List
1. Shryock, Henry S. Jacob S. Siegel and Associate, (1980): The Methods and Materials of Demography Vol.1 & 2, U.S. Bureau of the Census, Washington D.C.
2. John R. Weeks, (2005), *Population: An Introduction to Concepts and Issues,* Nineth Edition, Wadsworth Publishing Company, Belmont, California.
3. Pathak, K.B. and F.Ram, (1998) Techniques of Demographic Analysis, Mumbai: Himalaya Publishing House, Chapter 4, Pp.108-153.

4. Asha A. Bhende and Tara Kanitkar, (2003), *Principles of Population Studies,* Sixteenth Revised Edition, Himalaya Publishing House, Mumbai.
5. Hinde, Andrew (1998) *Demographic Methods.* London: Arnold.
6. United Nations, (1974): *Methods of Measuring Internal Migration,* Manual VI, UN, New York.

Suggested Reading List

1. Rowland, Donald T. (2006), *Demographic Methods and* Concepts. New York: Oxford University Press.
2. Yaukey, David. 1985. Demography: The study of Human population. St. Martins, New York.
3. Coale, Ansley J. and Paul, Demney (1983): *Regional Model Life Tables and Stable Populations*, Academic Press, New York.
4. United Nations (1982): *Model Life Tables for Developing Countries*, United Nations, NewYork.
5. United Nations, (1979): "Trends and Characteristics of International Migration Since 1950" *Demographic Studies* No. 64, UN, New York.

MBD-4: Introduction to Biostatistics & Epidemiology

1. Biostatistics

Measuring the occurrence of disease: Measures of morbidity - prevalence and incidence rate, association between prevalence and incidence, uses of prevalence and incidence, problems with incidence and prevalence measurements; Clinical agreement: kappa statistics, intra-class correlation; Surveillance

Assessing the validity and reliability of diagnostic and screening test: Validity of screening test – sensitivity, specificity, positive predictive value and negative predictive value; Reliability; Relationship between validity and reliability; ROC curve and its applications; Overall accuracy

Issues in epidemiology: Association; causation; causal inference; Errors and bias; Confounding; Controlling confounding; Measurement of interactions; Generalizability

Estimating risk: Estimating association – absolute risk, relative risk, odds ratio; Estimating potential for prevention – attributable risk; comparison of relative risk and attributable risk; Odds ratios for retrospective studies; Odds ratios approximating the prospective RR; Exact inference for odds ratio analysis of matched case-control data

Statistical process control: special and common causes of variation, Shewhart, CUSUM and EWMA charts

2. Epidemiology

Introduction: Definition and objectives of epidemiology; Epidemiology and clinical practice; The epidemiologic approach; Infectious disease epidemiology, occupational epidemiology, disaster epidemiology

The dynamics of disease transmission: Modes of transmission; epidemic, endemic and pandemic; Disease outbreak; Determinants of disease outbreak; Herd immunity; incubation period; outbreak investigation; epidemiological modeling

Identifying the roles of genetic and environmental factors in disease causation*:* Association with known genetic diseases; Age at onset; Family studies; Interaction of genetic and environmental factors

Epidemiology and public policy: Epidemiology and prevention; Population versus high-risk approaches to prevention; epidemiology and clinical medicine; Risk assessment; Meta Analysis

Context of environmental epidemiological studies, impetus of study, multi-sectoral interaction: social, economic legal and policy aspects. Risk perception and communication; Biological basis of environmental epidemiology, exposure and response ,exposure assessment, exposure pathways: air, water, soil, food; physical factors- noise, radiation, exposure measurement, exposure modeling.

Essential Reading List

1. *Altman D G*: Practical Statistics for Medical Research, London: Chapman and Hall, 2006.
2. *Rosner B*: Fundamentals of Biostatistics, ed. 6, 2006.
3. *Bonita R, Beaglehole R, Kjellstrom T:* Basic Epidemiology, ed. 2. World Health Organization, 2006.
4. *Gordis L*: Epidemiology, ed. 3. Philadelphia, 2004.
5. Baker, D. et al.: Environmental Epidemiology: A Text Book on Study Methods and Public Health Applications, WHO/SDE/99.7, 1999.
6. *Dunn G, Everitt B*: Clinical Biostatistics: An Introduction to Evidence-based Medicine. Edward Arnold, 1995.

MBD-5: Healthcare Systems and Policies

1. Identify the structure, components and characteristics of global health care system

2. Understanding the needs and goals for various policies related to public health, policy environment, frameworks for policy analysis

3. Basic models and functions of health services, health care systems, international experience

4. Health infrastructure and health delivery system in India- public, private, NGOs, Indigenous health systems

5. National health programmes- Public health preparedness

6. Public health system- A re-appraisal and SWOT analysis, a critique on the health delivery system- problems related to structural, functional and management of public health care services

7. Health care system- stakeholders in health care system, human capital and health, role of government in providing health care, improving access to health care with quality

8. Health care legislations in India: Legal aspect of health care, MTP Act, biomedical waste Rules, COPRA Act, PNDT Act, Transplantation of human organs Act,etc

9. Principles of planning and management of health programmes- monitoring and evaluation- quality assurance- health impact assessment- five year plans

10. Heath services- Community needs assessment, Decentralization of health facilities

11. Sustainability of public health intervention- Concept and mechanism of sustainability, models and examples of sustainability, community ownership, Public-private mix

12. Introduction to health services and research policies - Perspectives- methodological approach

13. Major National Health Policies and Missions- NHP-2002, NRHM (2005-12)

14. Major public health problems – A critical review and analysis, identification of major areas of public health requiring interventions, ongoing public health interventions in India. Health system reforms and their impact

Essential Reading List
1. Lassey M, Lassey W, and Jinks, M. (1997). Health Care Systems around the World: Characteristics, Issues and Reforms. Prentice-Hall, Inc.
2. Graig, Laurene A. (1999) Health of Nations: An International Perspective on US Healthcare Reform. 3rd Edition, Congressional Quarterly, Inc.
3. Bodenheimer, Thomas S., Kevin Grumbach. *Understanding Health Policy*

4. Fort, Meredith, Mary Anne Mercer and Oscar Gish (Editors). *Sickness and Wealth: The Corporate Assault on Global Health*
5. Govt. of India (2002)-National Health Policy-2002, Ministry of Health and Family Welfare, New Delhi.
6. Govt. of India (2005) Report of the National Commission on Macroeconomics and Health, Ministry of Health and Family Welfare, New Delhi.
7. Peters, et.al (2002), Better Health System for India's poor: Findings, Analysis and Options: The World bank, New Delhi
8. Reddy, K.S. et.al (2011)" Towards achievement of universal health care in India by 2020 : A Call of Action", www.thelancet.com
9. Banerjee, D. (1982), Poverty, class and Health Culture in India, Vol. 1 Parchi Prakashan, New Delhi.
10. Indian Council of Social Science Research and Indian Council of Medical Research (1981), Health for All by 2000 A. D., ICSSR, Delhi.
    Madan, T.N. (1969), "Who Chooses Modern Medicine and Why", Economic and Political Weekly, pp. 1475-84.