

**Course Structure of Master of Science in Biostatistics and Demography (MBD)  
as per UGC Credit Based Choice System**

<b>Paper Code</b>	<b>SEMESTER I COURSE TITLE</b>	<b>No. of credits</b>
MBD-F1	Basics of Human Biology	2*
MBD-C1	Introduction to Demography and History of Population	4
MBD-C2	Demographic Methods I	4
MBD-C3	Introduction to Biostatistics & Epidemiology	4
MBD-E1	MBD E-1.1: Healthcare Systems and Policies	3
	MBD E-1.2: Basic concepts of Sociology, Psychology and Anthropology	3
	<b>Semester Credits</b>	<b>15</b>
	<b>SEMESTER II</b>	
MBD-C4	Demographic Methods II	4
MBD-C5	Epidemiological Methods	4
MBD-C6	Research Methodology	4
MBD-E2	MBD E-2.1: Historical Demography	3
	MBD E-2.2: Spatial Demography	3
MBD-E3	MBD E-3.1: Urbanization, Space and Planning	3
	MBD E-3.2: Large-scale Sample Surveys	3
MBD-F2	Application of Statistical and Demographic Packages I	3*
MBD-V1	Viva-voce	2
	<b>Semester Credits</b>	<b>20</b>
	<b>SEMESTER III</b>	
MBD-C7	Sampling Techniques in Health & Demographic Surveys	4
MBD-C8	Applied Multivariate Analysis	4
MBD-E4	MBD E-4.1: Concepts and Measures of Global Health	3
	MBD E-4.2: Gender, Development and Health	3
MBD-E5	MBD E-5.1: Population Ageing and Health Transition	3
	MBD R 5.2: Population and Sustainable Development	3
MBD-C9	Application of Statistical and Demographic Packages II	4
MBD-C10	Demographic Models and Indirect Methods of Estimation	3
	<b>Semester Credits</b>	<b>21</b>
	<b>SEMESTER IV</b>	
MBD-C11	Survival Analysis	4
MBD-C12	Methods in Clinical Trials	4
MBD-E6	MBD E-6.1: Health Economics and Financing	3
	MBD E-6.2: Operations Research	3
	MBD E-6.3: Monitoring and Evaluation	3
MBD-S1	Seminar Series	S*
MBD-D	Dissertation	10 <sup>\$</sup>
MBD-V2	Viva-voce	2
	<b>Semester Credits</b>	<b>23</b>
	<b>Total credits</b>	<b>79</b>

\*Not counted for calculating the final grade

F – Foundation course, C – Core course, E – Elective course, S- Skill enhancement course, V-Viva voce, D – Dissertation.

Semester I: One elective may be opted by the student

Semester II: Two electives may be opted from each shaded groups

Semester III: Two electives may be opted from each shaded groups

Semester IV: One elective may be opted

Core courses: 72%; Elective courses: 28%

Core papers cannot be changed. Elective paper can be changed if the student fails in an elective paper and submits his/her request for a change in writing.

\$ 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 evaluation, the director may appoint a three-member committee for each dissertation. The three members should independently evaluate the dissertation and independently submit the grades to the controller of examinations.

# Foundation Courses

<b>MBDF1</b>	<b>Basics of Human Biology</b>	<b>30 Hours</b>
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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 & haemopoietic 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.

<b>MBDF2</b>	<b>Application of Statistical and Demographic Packages I</b>	<b>45 Hours</b>
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Introduction to SPSS-facilities, creating database structure, data entry, specifying scales, validation of data entry, importing and exporting data.

Data manipulation using SPSS – recoding creating new variable, sorting, filtering and selection of specific data, generating simple frequencies, use of syntax editor.

Introduction to STATA -facilities, creating database structure, data entry, specifying scales, validation of data entry, importing and exporting data.

Data manipulation using STATA – recoding creating new variable, sorting, filtering and selection of specific data, generating simple frequencies, use of syntax editor.

Correlation and regression analysis – interpretation and regression diagnostic test, Survey analysis – estimation of mean, proportion

Introduction to GIS and illustration

Basics of MORTPAK4, SPECTRUM and its applications.

### **Essential Reading List**

1. SPSS 14.0 Brief Guide – SPSS Inc.
2. SPSS regression models 14.0 - SPSS Inc.
3. SPSS advanced models 14.0 - SPSS Inc.
4. Stata user's guide: Release 10., 2<sup>nd</sup> Edition. Stata Press.
5. Stata survey data reference manual: Release 8., 2<sup>nd</sup> Edition. Stata Press.
6. Cromley, Ellen K. and McLafferty, Sara L., (2002): GIS and public health. Guilford Press, New York.

# Core Courses

<b>MBDC1</b>	<b>Introduction to Demography and History of Population</b>	<b>60 Hours</b>
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**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

**2. Population History**

Contribution of fertility, mortality and migration to population change in the past; major sources of data about the population in the past; major explanations of population change in the past; relation between population change and other social and economic changes at the national and local levels; All the above in relation to India

**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 9<sup>th</sup> 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.
5. Livi-Bacci, M.,(1996): *A Concise History of World Population* (2nd edition), Oxford.

### **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.

<b>MBDC2</b>	<b>Demographic Methods I</b>	<b>60 Hours</b>
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#### **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 relative 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*, Ninth 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, New York.
5. United Nations, (1979): "Trends and Characteristics of International Migration Since 1950" *Demographic Studies* No. 64, UN, New York.

<b>MBDC3</b>	<b>Introduction to Biostatistics &amp; Epidemiology</b>	<b>60 Hours</b>
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**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, Mantel-Haenszel test; 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

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.

<b>MBDC4</b>	<b>Demographic Methods II</b>	<b>60 Hours</b>
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**1. Population Theories**

By Malthus and Marx; Optimum population

**2. Fertility Theories**

Theory of Social Capillarity, Theory of Change Response, Theory of Diffusion and Cultural Lag, Liebenstein Theory, Becker's Theory, Easterlin Framework of Fertility, Caldwell's Theory, U. N. Threshold Hypothesis and Reproductive motivations and value of children theories.

**3. Mosley & Chen Framework of Child Survival**

**4. Demographic Transition Theory**

**5. Evaluation and Adjustment of Demographic Data**

Types of errors: Coverage and content errors;

Sources of errors: Examples of data on survey and census data affected by errors;

Post-enumeration surveys, Dual record system;

Techniques of evaluation of age data using Whipple's index, Myer's index, UN Joint score;

Quality checks incorporated in survey procedures to minimize errors;

Smoothing of age data;

**6. Population Estimates and Projections**

Concepts of population projections; population estimates, forecasts and projections, uses of population projections;

Methods of interpolation, extrapolation using linear, exponential, polynomial, logistics and Gompertz curves;

Cohort component method: basic methodology; projection of mortality, fertility and migration components;

Population projections of United Nations, World Bank and Expert Committees of Government of India;

Methods of rural-urban and sub-national population projections;

Methods of related socio-economic projections: labour force, school-enrolment, health personnel and households;

**Essential Reading List**

1. Bhende, A. and Kanitkar, T. (2011). Principles of Population Studies, 21<sup>st</sup> Edition. Mumbai: Himalaya Publishing House.
2. Mosley, W.H. and Chen, L.C. (1984). An analytical framework for the study of child survival in developing countries. *Population and Development Review* 10: 25-45.
3. Shryock, H.S. and Siegel, J.S. (1976). The methods and materials of demography. California: Academic Press, Inc.
4. Srinivasan, K. (1997). Basic demographic techniques and applications. New Delhi: SAGE.
5. United Nations (1956). Manual III. Methods for population projections by age and sex. New York: United Nations.
6. Government of India (2006). *Population Projections for India and States, 2001-2026*. New Delhi: Office of the Registrar General.

<b>MBD-C5</b>	<b>Epidemiological Methods</b>	<b>60 Hours</b>
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Application of epidemiology to identify the cause of disease – Cohort Studies; case-control and cross-sectional studies; nested case-control studies; comparing cohort and case-control studies; deriving inferences from epidemiologic studies.

Analysis of unmatched case-control studies; stratified analysis; effect modification; analysis of matched case-control studies – conditional logistic regression models.

Experimental epidemiology; Randomized trials - end point; surrogate end point; multiple comparison procedures; Bonferroni correction.

Infectious disease epidemiology – introduction; basic concepts; transmission dynamics models; SI, SIS, and SIR models; Kermack- McKendrick threshold theorem; Kermack-McKendrick threshold theorem epidemiology; basic reproductive number ( $R_0$ ); what determines  $R_0$ ; endemic vs. epidemic; effective reproductive number ( $R_t$ ); eradication threshold; other considerations while vaccinating; estimating  $R_0$ .

Surveillance of infectious diseases; guiding principles behind surveillance; uses of surveillance; surveillance of HIV/AIDS and malaria surveillance in India.

Ethical and professional issues in Epidemiology.

Meta Analysis – concept, application to bio-medical research, application using real data.

Application of epidemiology to evaluate health services.

#### **Essential Reading List**

1. *MacMahon B, Pugh T F: Epidemiology: Principles and Methods*. Boston, Little Brown, 1970.
2. *Gordis L: Epidemiology*, ed. 3. Philadelphia, 2004.

3. *Everitt B S, Pickles A: Statistical Aspects of the Design and Analysis of Clinical Trials*, ed. 2. London, Imperial College Press, 2004.
4. *Leandro G: Meta-analysis in Medical Research: The Handbook for the Understanding and Practice of Meta-analysis*, BMJ Books, Blackwell Publishing, 2005.
5. *Family Health International: Behavioral Surveillance Surveys*. Family Health International, 2000.

<b>MBD-C6</b>	<b>Research Methodology</b>	<b>60 Hours</b>
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**Goal and Objectives:** The main objective of this course is to impart student's knowledge and skills on the principals and methods of social research to be used in epidemiological analysis of various disease, health and injuries. The goal of this course is to equip students with the skill to prepare a scientific research proposal with application of various bio statistical techniques and skills learnt during the course and also to conduct social science research with the help of hospital data.

This course also presents the fundamentals of quantitative and qualitative methods of data collection and preparation of research instruments for data collection. The course prepares students to design, carry out, report, and present a research projects based on the fieldwork carried out by them. Students learn how to collect data using methods including interviewing, participant observation, social mapping, focus group discussions, key informant interviews, in-depth interviews etc. in a real population. Students further learn how to process and analyze the data using computer software such as ATLAS Ti and Nvivo. The course equips students with conceptual understandings of current academic debates regarding methods of data collection with practical skills to put those methods into practice. Students submit a written report and present their practical work for assessment.

**1. Scientific Methods of Research**

Definition of Research, Assumptions, Operations and Aims of Scientific Research.  
The Research Process: conceptual, Empirical and Analytical Phases of Research,  
Essentials Criteria of Scientific methods.

**2. Research Designs**

Observational Studies: Descriptive, explanatory, and exploratory,  
Experimental Studies: Pre-test design, post-test design, Follow-up or longitudinal design, threats to internal validity  
Cohort Studies  
Case Control Studies  
Cross sectional studies  
Monitoring and evaluative studies  
Action research/Intervention studies,  
Panel Studies.

**3. Measurement**

Reliability and validity of measurement

- Face, construct, concurrent, and predictive validity
- Inter-coder reliability and stability,
- Non random and random errors,
- Reliability and validity of screening and diagnostic tests,
- Concept of Golden Test, Specificity and Sensitivity
- Predictive power of positive and negative test
- ROC Curve and its interpretation
- Scaling and composite indices,
  - Attitude Scales: Point scales, ranking scales, rating scales, limitations of attitude scales,
  - Types of Scales: Bogardus, Guttman, Likert, Semantic, Thurstone scale.
- Use of standards in measurements
- Gold standards for measuring biomarkers in field settings

#### **4. Writing research proposal and report**

- Purpose of a proposal/report
- Content of proposal/report
  - Critical review of research report and journal article
- Introductory section, methodology adopted,
  - Development of research tools
  - Protocol preparation
- Analysis and inferences,
- Summary, conclusions and recommendations.
- References/Bibliography,
- Appendices,
- Footnotes.

#### **5. Research Ethics**

- Ethics of Research,
- History of ethical guidelines and general principles
- Informed consent and human subject protection
- ICMR ethical guidelines for biomedical research on human participants
- The Biomedical research on human subjects -regulation, control and safeguards

#### **6. Sampling**

- Complete enumeration versus sampling.
- Concept of sampling unit, sampling frame and sampling design.
- Sampling methods: Simple random sampling, stratified sampling, systematic sampling, cluster sampling, and purposive sampling.
- Multistage sampling in large-scale surveys, self-weighting designs, Stratification in multistage sampling.
- Sampling and non-sampling errors, calculation of weights, sample size determination.

#### **7. Methods of Data Collection – Quantitative and qualitative**

Quantitative Methods: Questionnaire (mail method, interviews through telephone, internet and computers), interview schedule (face-to-face interviews or personal interviews).

Questionnaire/interview schedule design and construction: Principles of constructing a questionnaire/interview schedule, Types of questions, framing of questions, sequencing of sections and questions and Interview techniques

Qualitative Method: Walk through and observation (participatory and non-participatory), Social mapping, key informant interview, In-depth interviews, Focus group discussion, content analysis, free listing, pile sorting, mechanical devices (camera, tape recorder)

## **8. Data Collection - Field work**

## **9. Data processing and analysis, research report**

## **10. Presentation of research report**

### **Essential Reading List**

1. Bernard, H. Russell, (1995): *Research Methods in Anthropology: Qualitative and Quantitative Approaches*, Altamira Press, Walnut Creek.
2. Goode W J and Hatt P K. 1952. *Methods in Social Research*. McGraw Hills, New York.
3. Mukherji, P.N., (1999): *Methodologies in Social Science*, Sage Publications, New Delhi.
4. Royce A. Singleton and Bruce C. Straits, (1999): *Approaches to Social Research*, Oxford, Oxford University Press.
5. Young P V. 1994. *Scientific Social Surveys and Research*. Prentice-Hall, New York (4<sup>th</sup> Edition).
6. Bernard, H. Russell, (1995): *Research Methods in Anthropology: Qualitative and Quantitative Approaches*, Altamira Press, Walnut Creek.
7. Goode W J and Hatt P K. 1952. *Methods in Social Research*. McGraw Hills, New York.
8. Pullum W. 2006. *An Assessment of Age and Data Reporting in the DHS Surveys, 1985-2003*. DHS Methodological Report No. 5. Calverton, Maryland, Marco International Inc.
9. Royce A. Singleton and Bruce C. Straits, (1999): *Approaches to Social Research*, Oxford, Oxford University Press.
10. Young P V. 1994. *Scientific Social Surveys and Research*. Prentice-Hall, New York (4<sup>th</sup> Edition).

Concept of population and sample, need for sampling, sample survey versus census, elementary units, sampling units, assumptions of sampling from finite population, sampling frame, selection and inclusion probabilities, probability and non-probability sampling, concept of sampling mechanism and sampling design.

Simple random sampling with and without replacement, concept of unequal probability sampling with and without replacement.

Stratified random sampling, sample allocation methods, gain due to stratification, determination of strata boundaries, number of strata, allocations for multiple characteristics.

Concept of systematic sampling, comparison with simple random sampling, variance estimation, comparison with stratified random sampling, systematic sampling, selection procedure for fractional interval, circular systematic sampling.

Use of auxiliary information, ratio and regression methods of estimation under simple random sampling, bias, mean square error, and ratio and regression estimators in stratified random sampling.

Simple random cluster sampling for equal size and unequal size clusters, gain in efficiency of cluster sampling, concept of multi stage sampling, two stage equal probability sampling at both stages, comparisons with unistage unit sampling and cluster samplings, components of variance of two stage sampling and estimation, cost function and sample size determination.

Sampling weight concept and computation, sampling and sampling errors.

### **Essential Reading List**

1. Cochran, W.G. (1977). Sampling Technique, Third edition. New York: John Wiley & Sons.
2. Des Raj (1972). The design of sample surveys. McGraw Hill.
3. Sukhatme, P.V. and Sukhatme, B.V. (1970). Sampling Theory of Surveys with Applications. Asia Publishing House.
4. Murthy, M.N. (1977). Sampling Theory and Methods, 2<sup>nd</sup> Edition. Calcutta: Statistical Publishing Society.
5. Kish, L. (1995). Survey Sampling. New York: John Wiley and Sons, INC.
6. Lwanga, S.K. and Lemeshow, S. (1991). Sample size determination in health studies. Geneva: The World Health Organization.

**Rationale:** The course is intended to give an overview of statistical models commonly used in causal analyses of non-experimental data in the social and bio-medical sciences. The goal is to impart an intuitive understanding and working knowledge of these models. The strategy would be to simplify the treatment of statistical inference and to focus primarily on how to specify and interpret models in the context of testing causal relationships. All the problems/exercises will be based on real data in the social/bio sciences and will be solved through the widely used statistical computing package, namely, Stata and MLwiN. Emphasis will be given on interpreting and understanding of the results obtained from these statistical models/computer outputs. Students of statistics/mathematics wishing to upgrade their methodological skills will find this course very useful.

1. Random variables and Probability distributions, Joint, marginal and conditional distributions.
2. Basic concept of Law of large numbers and Central Limit Theorem, Normal distribution, Chi-square distribution, F- distribution and Student's t distribution. Methods for finding estimators- method of moments, maximum likelihood method. Properties of estimators- Unbiasedness, Efficiency and consistency.
3. Concept of confidence interval, confidence interval for- mean and variance. Testing of hypotheses, Relationship between confidence interval procedures and tests of hypotheses.
4. Simple linear regression and its assumptions, the method of least squares, Analysis of variance for the simple regression model, outliers, non-linearity, centring in the regression. Multiple regressions, partial correlation, relationship among simple, partial and multiple correlation coefficients, Omission of relevant variables and inclusion of irrelevant variables. R square and adjusted R square. Tests for stability. Violation of the assumptions of the basic model-heteroskedasticity, autocorrelation and multicollinearity-principal component regression. Regression with dummy explanatory variables. Interaction effect and Effect modifier.
5. Simultaneous equation models- the identification problem. Methods of estimation-the instrumental variable method and two-stage-least squares method. Diagnostic checking and model selection.
6. Generalized linear models: A general model for the response probability, the logit, the probit and the complementary log-log model, choice of link function, Estimation of the generalized model. Latent variable representation of a generalized linear model.

7. Multilevel modelling: A multilevel model for group effects, estimating group effects, random vs. fixed effects, random intercept model
8. Generalized linear random intercept model, random intercept logit model, a random slope logit model
9. Computer Applications using Stata and MLwiN softwares.

**Essential Reading List:**

1. Hogg, R.V and Craig, A.T.: Introduction to Mathematical Statistics, Fourth edition. Collier Macmillan Publisher.
2. Mood, A.M., Graybill, F.A., and Boes, D.C. : Introduction to the Theory of Statistics, Third edition. McGraw Hill.
3. Goon, A.M., Gupta, M.K., and Dasgupta, B. : An Outline of Statistical Theory, Vol 2. The World Press Publishers Pvt. Ltd., Calcutta.
4. Rao, C.R.: Linear Statistical Inference and Applications, Revised edition. Wiley Eastern.
5. Snijders, Tom A.B. and Bosker, Roel J., (1999): *Multilevel analysis: An introduction to basic and advanced multilevel modeling*. Sage Publications.
6. Retherford, R.D. and Choe, M. K., (1993): *Statistical Models for Casual Analysis*, A Wiley-Inter-Science Publications, John Wiley and Sons, INC, New York.
7. Graeme Hutcheson and Nick Sofroniou, (1999): *The Multivariate for Social Scientist*, SAGE Publications.
8. Gujarati, DN and Sangeetha (2007). *Basic Econometrics* (Fourth Edition), Tata McGraw Hill, New Delhi.
9. Jones, Andrew (2007). *Applied Econometrics for Health Economists*, Radcliffe Publishing Ltd, United Kingdom.
10. Maddala, G.S (1989). Introduction to Econometrics, Macmillan Publishing Company, New York.

<b>MBD-C9</b>	<b>Application of Statistical and Demographic Packages II</b>	<b>60 Hours</b>
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**Course Objectives:**

- To introduce SAS software.
  - To teach application of SAS for bio-statistical and epidemiological analysis.
1. Introduction to SAS programs, running SAS programs, diagnosing and correcting syntax errors. Producing List Reports using PRINT procedure; sequencing and grouping observations, using special WHERE statement operators; customizing report appearance - formatting data values, creating HTML reports.

Programming with the DATA Step - reading SAS data sets and creating variables, executing statements conditionally, dropping and keeping variables.



Assigning and Changing variable attributes, combining merging and SAS Data Sets  
Producing Summary Reports using REPORT procedure.

2. Using SAS Enterprise Guide: naming a project, working with existing code, diagnosing and correcting errors, creating SAS programs, accessing data sources with the LIBNAME statement, understanding Output Delivery System (ODS). Using Graphics in SAS Enterprise Guide.

Controlling Input and Output - controlling when a record loads, reading hierarchical raw data files; outputting multiple observations, selecting variables and observations, writing to multiple SAS data sets, writing to external files; Processing Data Iteratively using DO loop, SAS array processing.

3. Using SQL with SAS: Understanding the purpose, design, uses, and terminology of SQL; Basic Queries, using SQL procedure, summarizing data with column and row functions, grouping data, performing analyses on groups of data, subquerying, and remerging, ordering data, customizing query output.

Combining Tables - querying multiple tables using joins, using union, intersect, and other set operators to combine tables.

Creating and Modifying Tables and Views, using views to simplify queries and access changing data, creating and using indexes; maintaining tables, views, and indexes.

4. Introduction to the Macro Facility- purpose of the macro facility, program flow. Macro Variables and macro functions; defining and calling macros, macro parameters.

DATA Step and SQL Interfaces - creating macro variables in the DATA step, indirect references to macro variables, retrieving macro variables in the DATA step, creating macro variables in SQL.

5. EPI Info, HIV Surveillance

### **Essential Reading List**

1. Cody R, Smith J. *'Applied Statistics & the SAS Programming Language'*. Prentice Hall 1997. 4th edition.

<b>MBD-C10</b>	<b>Demographic Models and Indirect Methods of Estimation</b>	<b>60 ours</b>
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1. **Concepts of Demographic Models:** Stable population; Generalized Population; Momentum of Population Growth; Concept of Multiregional Model; and Micro Model

such as Birth Interval, Waiting Time (Birth Distribution etc, Estimation of fecundability);

2. **Indirect methods for estimating fertility:** Needs for Indirect methods; Concept of Reverse Survival Method, Robust Method and method based on Generalized Population Model; Rele's Method;

Concept of P/F ratio method and its modification [Hypothetical Cohort methods]

3. **Indirect Method of Estimating Mortality:**

- I. Indirect Methods of Estimating Infant and Child Mortality**

(a) Basic concepts, fundamental assumptions and underlying principles to the technique proposed by Brass based on retrospective data on children ever-born and surviving mothers classified by current age of mother; (b) Modifications proposed by Sullivan and subsequently by Trussell over Brass method; and (c) the UN revised and extended version of Trussell's method.

- II. Some Methods of Estimating Adult (including Maternal Mortality) and Old Age Mortality**

(i) Some methods of estimating adult mortality using successive census age-distributions; (ii) Methods of estimating life expectancies at older ages; and (iii) Estimation of maternal mortality through sisterhood method.

- III. Some Indirect Methods for Estimating Death Registration Completeness for Countries Having Limited and Defective Vital Registration Data**

An overview of some selected methods of estimating completeness of death registration, starting from Brass growth balance method and its subsequent development.

### **Essential Reading List**

1. Preston, Samuel H. Patrick, Heuveline and Michel Guillot, 2003, *Demography: Measuring and Modeling Population Processes*, Blackwell Publishers, 2001 (First Indian Reprint 2003).
2. Bhat P.N.M, (2002): General growth balance method: A reformulation for population open to migration, *Population Studies*, 56 (2002), 23-34, Printed in Great Britain.
3. Bhat P.N.M., (2002): Completeness of India's Sample Registration System: An assessment using the general growth balance method, *Population Studies*, 56 (2002), 119-134, Printed in Great Britain.
4. Keyfitz, Nathan (1977): *Introduction to the Mathematics of Population with Revision*, Addison-Wesley Publishing Company, Inc., Massachusetts.
5. Pathak, K.B. and F. Ram (1998): *Techniques of Demographic Analysis*, Himalaya Publishing House, Second Edition, Mumbai.
6. United Nations (1983): *Indirect Techniques for Demographic Estimations*, Manual X, Population Studies No.81, Department International Economic and Social Affairs, (ST/ESA/SER.A/81).

<b>MBD- C11</b>	<b>Survival Analysis</b>	<b>60 Hours</b>
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**Learning Objectives:** The main objective of this course is to equip students with the basic concepts and methods employed in survival analysis. At the same time, the course aims to equip the student with recent advances in the field of Survival Analysis. The idea is to emphasize concepts over details, with recent applications in public health. After going through this course, the student should be capable enough to take up responsibility and actively participate in academics, government organizations, pharmaceutical companies, health organizations, etc. The introduction of such course is especially very important in India as there is very limited capacity in India at this moment.

1. Introduction to survival analysis; motivating the need; concepts and definitions; concept of censoring and type of censoring.
2. Survival function, probability density function, hazard function; relationship between the three types of function; survival curve; estimating median survival time; estimation of these function in the absence and presence of censoring; application of these functions in survival analysis.
3. Survival distributions- Weibull distribution; exponential distribution; lognormal distribution; gamma distribution.
4. Nonparametric methods of estimating survival function- introduction; Kaplan-Meier estimates; life table estimates; clinical life tables; life table vs. Kaplan-Meier estimates; The Mantel-Haenszel test.
5. Estimating survival rates using large scale data like DHS, NFHS, DLHS, etc.
6. Comparing survival curves- Generalized Wilcoxon (Breslow, Gehan); logrank test
7. Regression methods for survival analysis- introduction to Cox-proportional hazard models; proportionality assumption in Cox-proportional hazard models; test of proportionality; interpretation of coefficients; application of Cox-proportional hazard models in Epidemiology and Public Health.
8. Discrete-time survival models: introduction.

#### **Essential Reading List**

1. *Altman D G*: Practical Statistics for Medical Research, London: Chapman and Hall, 2006
2. *Lee E T*: Statistical Methods for survival Data Analysis, ed. 2. New York, John Wiley & Sons.
3. *Armitage P, Berry G*: Statistical Methods in Medical Research, ed.4, Wiley Blackwell, 2001.

4. *Choe MK, Retherford RD: Statistical Models for Causal Analysis, Wiley-Interscience, 1993.*

<b>MBD- C12</b>	<b>Methods in Clinical Trials</b>	<b>60 Hours</b>
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**Learning Objectives:** The main objective of this course is to equip students with the basic concepts and methods employed in Clinical Trials. At the same time, the course aims to equip the students with recent advances in the field of Clinical Trials. The idea is to emphasize concepts over details, with recent applications in public health. After going through this course, the students should be capable enough to take up responsibilities and actively participate in academics, government organizations, pharmaceutical companies, health organizations, etc. The introduction of such course is especially very important in India as there is very limited capacity in India at this moment.

1. Basic concepts of clinical trials: Basic concepts; definitions; historical perspectives
2. Classification of trials by design and purpose: phases of clinical trials, concept of randomization, process of randomization, types of blinding
3. Basic concepts of design of experiments: completely randomized design, randomized block designs and factorial designs.
4. Designs of phases of clinical trials, cross over designs, hybrid designs, response variables, response surface experiments, group allocation design
5. Sample size determination for qualitative and quantitative outcomes, sample size for cluster randomization, sample size for repeated trials
6. Planning and conduct of clinical trials: Protocol development; Multicentric trials; Deviations from protocol; Stopping rules; Considerations of adverse effects and non-compliance
7. Ethical issues: Ethical issues in clinical research; ICMR guidelines on ethical issues in medical research
8. Data safety and monitoring concepts: Types of form for clinical trials- baseline assessment, evaluation form, flow sheet, layout and design, missing, range and logical checks, data transfer
9. Analysis of data from clinical trials: Describing clinical trials data-qualitative and quantitative, prognostic, adjustment for prognostic factors

**Essential Reading List**

1. *Pocock S. J.: Clinical Trials: A Practical Approach. Michigan, Wiley Medical Publication, 1983.*

2. *Everitt B.S., Pickels, A.:* Statistical Aspects of the Design and Analysis of Clinical Trials, ed. 2. London, Imperial College Press, 2004.
3. *Friedman L. M., Furberg, C.D., DeMets, D. L.:* Fundamentals of Clinical Trials. Boston, PSG, 1982.
4. Dean, A., Voss, M: Design and Analysis of Experiments.
5. Khuri, A. and Cornell, M.: Response Surface Methodology. Marcel Dekker.
6. Federer, W.T.: Experimental Designs- Theory and Methods. Oxford & IBH.
7. Goon, A.M., Gupta, M.K. and Dasgupta, B.: Fundamental of Statistics, Vol. II. World Press.
8. Das, M.N. and Giri, N.C.: Design and Analysis of Experiments. Wiley Eastern.

# Elective Courses

<b>MBD E-1.1</b>	<b>Healthcare Systems and Policies</b>	<b>45 Hours</b>
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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, PNDDT 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. Health 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 ParchiPrakashan, 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.

<b>MBD E-1.2</b>	<b>Basic concepts of Sociology, Psychology and Anthropology</b>	<b>45 Hours</b>
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1. **The Nature of Human Society:** The Study of Human Society: a) The Sociological/Anthropological point of views, b) The Value of Sociology and Anthropology, and c) Perspectives in Sociology and Anthropology.
2. **Major Groups:** a) Primary and Secondary Groups, b) Rural and Urban Communities, c) Caste, d) Class and Stratification.
3. **The Social Structure:** Major forms of Social Structure: a) Types of social group, b) Groups in social life c) The Primary group, d) The Great Association.
4. **The Family:** a) Sociological Significance of the Family, b) Early forms of the Family, c) Types and functions of Family.
5. **The Community:** a) The Communities as place. Its Physical Configuration, b) Community and Intra Communal Difference,

*Social Class and Caste: Principles of Class and Caste*

6. **Ethnic and Racial Groups:** a) Ethnic and Racial Relations in Social life, b) Ethnic and Racial groups as 'Caste'.

## **7. Society and Culture in India:**

1. Aspects of society and culture in India, and its role and importance in Population Studies.
2. Social Institutions and their role in influencing demographic situation of the Population of India - Family, Marriage, Kinship and Religion.
3. Varna and Caste System
  - i) Concept & Definition of Varna and Caste System, Scheduled Caste
  - ii) Changing Caste System in India-legislation, normative, and behavioral context and its influence on demographic characteristic of the Population

## **8. Tribes in India:** a) Definition of Tribe / Scheduled Tribe, b) Special distribution, c) Composition, d) Size and Growth

### Social Institutions:

Family, Kinship, Marriage, Religion, Statuses of women and Relevance with demographic components

### Economics Institutions:

Land tenure, Land use pattern, and Tribal Economy.

### Administrative and Political:

Traditional Panchayat and Panchayat Rai Institutions, Tribal Movements and Developments.

## **9. Social Change:** Definition and Concept of Social Change,

Process of Social Cultural Change in India and its role in influencing demographic characteristic: a) Sanskritization, b) Secularization, c) Liberalization, d) Modernization, e) Democratization

## **10. Social Psychological Concepts:**

- I. Psychology as a Discipline:
  - Branches and dominant Psychological thoughts
  - Psychoanalysis: Cognitive Behaviour,
- II. Social Psychological Concepts and its relevance to Population Studies
  - Personality Motivation, Attitude, Behaviour,
- III. Learning and Communication Processes:

Concept, Meaning, Scope, and need in the Context of Population Studies.

## **Essential Reading List**



1. Davis Kingslay, *Human Society*, Macmillen and Co., New York, (1975), Chapters 1, 3,5,6.
2. Kapadia K. M., *Marriage and Family in India*, Oxford University Press, Calcutta, (1986).
3. Ketkar S.V., *History of Caste in India*, Rawt Publication, Jaipur, (1979).
4. Kuppuswamy B., Revised by B.V. Kumar, *Social Change in India*, Konark Publication Pvt. Ltd. Delhi, (1990).
5. Mandelbaum D.G., *Society in India-Continuity and Change and Change and Continuity*, Vol.I. University of California Press, London, (1970).
6. MaCiver R.M., Charles H. Page, *Society an Introductory Analysis*, Halt Riehart Winston, New York, (1949), Chapters No.1, 3,7,11,15,22,24,25,26.
7. Srinivas M.N.,*Social Change in Modern India*, University of California Press, Berkeley, (1966)
8. Vidyarthi L.P., *The Tribal Culture of India*, Concept Publishing Co., Delhi, (1977).

### Suggested Readings

1. Hasain N., *Tribal India Today*, Harnam Publication, New Delhi, (1986).
2. Krech D.; Crutchfield R.S. and Ballachey E.L., *Individual in Society*, International Student Edition, McGraw-Hill Book Company, INC, New York, (1962).
3. Linda A. Mooney, Davis Knox & Caroline Schacht, *Understanding Social Problems*, 3rd Edition, Wadsworth / Thomson Learning, USA, (2002).
4. N.P. Chaubey, *Indian Society at the Turn of the Century*, Century Printers, New Delhi, (1988).
5. Ram Mohan, *Encyclopedia of Social Problems in Developing Countries*, Vol-1, 2,3, Sarup & Sons, New Delhi, (2003).
6. Richard T. Lapiere, *Social Change*, McGraw-Hill Book Company, New York, (1965).
7. S. Kumar and S. Gajrani, *Culture and Society in India*, Om Publications, Faridabad, (1999).
8. S.R.Maheswary, *Society and Culture*, Rajat Publications, Delhi, (2000).
9. RamKrishna Mukherjee, *Society, Culture & Development*, Sage Publications, New Delhi, (1991).
10. Feldman R.S., *Social Psychology Theories, Research and Applications*, International Student Edition, McGraw-Hill Book Company, INC, New York, (1985).
11. France N. Magill (ed.),*International Encyclopedia of Sociology*, Vol. II and I (selected readings) Fitzriy Dearborn Publishers, England, (1995).

<b>MBD E- 2.1</b>	<b>Historical Demography</b>	<b>45 Hours</b>
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#### I.Introduction to historical demography

Introduction to historical demography: Meaning, Scope, and Importance; Difference between History of Demography, Demographic History and Historical Demography;

Limitations of Research in Historical Demography. Development of historical demography (Europe and Asia).

## **II.Data Sources, Methods and Approaches**

**Data Sources:** Paris registers, Population registers, Census, Vital registration data, Bills of mortality, Fiscal documents, Military records, Inventories of properties, Genealogies, Marriage practices, Archaeological remains, Administrative geography, Colonization of new land, Cemetery data, Traveler's tales.

**Approaches:** Family reconstitution; Cross checking the information from different sources. Back Projection, and Generalised Inverse Projection, Other Methodological Developments

## **III.Evolution of human and peopling of the earth**

Evolutionary Process and Emergence of human (Darwinism, Mendel, Lamarckism); Historical trend and pattern of migration and distribution of population; Historical evolution of towns and peopling of the world, Industrial and agricultural revolution and peopling of the earth

## **IV.India's demographic history**

Historical sources of population data, Population in India from pre-historic to modern time; Peopling in India and racial classification; Peopling in India and linguistic classification; Indian great famines and its implication on mortality; family transition and status of women from historical perspective; Transition from traditional family planning methods to modern methods and health practices in India – a historical perspective

## **Essential Readings**

1. Davis, Kingsley, The Population of India and Pakistan, Princeton, Princeton University Press, 1951.
2. Tim Dyson (ed.), India's Historical Demography: Studies in Famine, Disease and Society, London, Curzon, 1989.
3. Glass D.V. & Eversley, D.E., Population in History: Essays in Historical Demography, London, Edward Arnold, 1965.
4. Hollingsworth, T.H., Historical Demography: The Sources of History, Studies in the Uses of Historical Evidence, London, 1969.
5. Maharatna, Arup, Demography of Famines: An Indian Historical Perspective, Delhi, 1996.
6. Willigan, J. Dennis, Lynch, Katherine A., Sources and Methods of Historical Demography, Academic Press, New York, 1982.

## **Reading List:**

1. Akerman, S., "History and Demography: An Evaluation of the Family Reconstitution Technique" in A.E. Andersson and I. Holmberg (eds) Demographic, Economic, and Social Interaction, Cambridge, Ballinger Publishing Company, 1977.

2. Harris, P.M.G., History of Human Populations, Vol.II (Migration Urbanization and structural change) London: Praeger, 2003.
3. John Knodel, "Two and a Half Centuries of Demographic History in a Bavarian Village". Population studies Vol.XXIV No.3, Nov. 1970, pp. 353-376.
4. Kertzer, David I., "Qualitative and Quantitative Approaches to Historical Demography", Population and Development Review, Vol.23 (4). Dec. 199--(839-84), 1997.
5. Krishnan, P., "Historical Demography Through Literature: Preliminary Report on Indian Historical Demography", Paper presented in the Session Historical Demography, IUSSP Meeting, Florence, Italy, June, 1985.
6. Paul E. Vincent, "French Demography in the Eighteenth Century" Population Studies Vol.I, 1947-48. Pp.44-71.
7. Razzell, P.E., "The evolution of Baptism as a form of Birth Registration through Cross Matching census and Parish Register Data: A study in Methodology" Population Studies Vol.26, No.1. March 1972, pp.121-146.
8. Saito, Osamu, Historical Demography: Achievements and Prospects, Population Studies, Vol.50 (3--(53), 1996.
9. Srivastava, H.C., "Registration of vital Events in Goa- A study of current system in Retrospect", Artha Vijanana, Vol. XIII, No.4, Dec. 1971.
10. Vinovskis, Maris A., Studies in American Historical Demography, Academic Press, New York, 1979.
11. William H. Howells, "Estimating Population Numbers Through Archeological and Skeletal Remains" in Robert F. Heizar and Sherburne F. cook. The application of Quantitative methods in Archeology, Viking Fund Publication in Archeology, No.28, 1960. pp. 158-159.

<b>MBD E-2.2</b>	<b>Spatial Demography</b>	<b>45 Hours</b>
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Unit	Contents	lectures
<b>A.</b>	<b>Concepts and Theories</b>	
	Demography as a spatial science; difference between spatial demography and population geography; Spatial pattern and spatial process; location, distance and area; Distance and decay relationship and spatial hierarchy; space, place and region; Type of spaces– concrete and abstract space; absolute, relative and relational spaces	( 6 ) .
	Understanding demographic process by geographical scale; nature of disaggregated data– Census and secondary sources; Linking micro and macro demography in a spatial frame	( 4 )

Application of spatial frameworks to demographic process; Space, culture and fertility; Spatial pattern of mortality and diseases; Distance as factor in access to health care and health planning; Migration and distance– gravity model; space, culture and migration; urban sprawl and sub–urbanization ( 5 )

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**B. Statistical and Geospatial Data and Software**

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**Spatial Concepts and Cartography:** Spatial parameters: Site and location; Scale; Plane and spherical coordinate, Map Projection–UTM, Types of maps: cadastral, toposheet, thematic, digital; Representation of spatial and non spatial data; ( 3 )

**Introduction to geospatial software: GIS:** discrete data: point, and polygon data, Raster and vector data, layouts preparation. Geocoding and basics of digitization in ArcGIS ( 6 )

**Introduction to Geoda:** ESDA in (Exploratory Spatial Data Analysis); Local Indicators of Spatial Association (LISA)

**Statistical Concepts:** Bar diagram, Frequency polygon, Frequency curve; Test of significance, confidence intervals, Univariate and Multivariate Statistics: Correlation and Regression, Matrix algebra; Auto–correlation; kriging, Moran’s I index ( 3 )

**Introduction to Statistical software:** SPSS, STATA, R ( 6 )

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**C. GIS and Spatial Analysis of demographic data**

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**Representation of statistical data and automated cartography (Lab based exercises):** ( 4 )

- a) Population distribution map of India using dot and sphere/circle, cubes, combined; Cartograms
- b) Density map by Choropleth and population density gradient by Isopleth;
- c) Fertility, mortality and natural growth of population by Polygraph.
- d) Measurement of population concentration by cumulative curve.
- e) Migration flow by Carogram

**Concept and application Models:** ( 8 )

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- a) Spatial Lag and Error Regression Modeling;
  - b) Multilevel modeling (hierarchical linear modeling);
  - c) Geographically Weighted Regression;
  - d) Spatial Pattern Analysis;
  - e) Urban and city level projection
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**Reading list:**

A znselin, L. (2005). Exploring Spatial Data with GeoDa: A Wookbook. UC Santa Barbara, CA: Center for Spatially Integrated Social Science. available on <http://geodacenter.asu.edu/>.

Bailey, T. and Gatrell, A. C. (1995): Interactive Spatial Data Analysis. Harlow, Longman.

Barbara E., Ronald R. R., Stephen J. W., Tom P. E. and Sara R. C. (1997). *Geographic Information Systems, Spatial Network Analysis, And Contraceptive Choice*. Demography. 34(2): 171-187.

Bonham, Carter G.F. (1995): Information Systems for Geoscientists-Modelling with GIS. Pergamon, Oxford.

Chen, X., Orum A.M., and Paulsen K.E. (2013). Introduction to Cities: How Place and Space shape Human Experience. West Sussex, Willey-Blackwell.

de Castro M. C. (2007). *Spatial Demography: An Opportunity to Improve Policy Making at Diverse Decision Levels*. Population Research and Policy Review 26: 477-509.

Dorling, D. and Fairborn, D. (1997): Mapping. Ways of Representing the World. Longman, Harlow.

ESRI (1993): Understanding GIS. Redlands, USA

Fraser Taylor, D.R. (1980): The Computer in Contemporary Cartography. New York, John Wiley and Sons,

Griffith, D. A. and Amehein (1997): Multivariate Statistical Analysis for Geographers. Englewood Cliffs, New Jersey, Prentice Hall.

Goodchild, M.F. and Janelle, D.G. (eds). (2003). Spatially Integrated Social Science: Examples in Best Practice. Oxford University Press.

- John R. Weeks. 2004. The Role of Spatial Analysis in Demographic Research. Chapter 19 (pp. 381–399) in M.F. Goodchild and D.G. Janelle (eds.) (2004) *Spatially Integrated Social Science* New York, NY, Oxford University Press.
- Kurland K. S., Gorr W. L. (2007). *GIS Tutorial for Health*. Redlands, CA, ESRI Press.
- Lo, C.P. and Yeung, A. K. W. (2002): *Concepts and Techniques of Geographic Information Systems*. New Delhi, Prentice Hall of India.
- Massey, D. (2008). *for space*. New Delhi, Sage Publications Ltd.
- Monkhouse, F.J. and Wilkinson, H. R. (1962). *Maps and Diagrams*. London, Methuen and Company Ltd.
- Parker R. N., Asencio E. K. (2008). *GIS and Spatial Analysis for the Social Sciences: Coding, Mapping, and Modeling*. New York, NY, Routledge/Taylor & Francis.
- Paul V. (2007). *Demography as a Spatial Social Science*. *Population Research and Policy Review* 26: 457–476. (plus Introduction to the special issue of PRPR on Spatial Demography) pp. 455–456).
- Editor. (2007). *Introduction to the Special Issue*. *Population Research and Policy Review* 26: 455–456).
- Reibel, Michael, (2007). *Geographic Information Systems and Spatial Data Processing in Demography: A Review*. *Population Research and Policy Review* 26: 601–608.
- Robinson, A. H. H., Sale R., Morrison J. and Muehrcke, P. C (1984) *Elements of Cartography*. New York, John Wiley and Sons.
- Shaw, G. and Wheeler, D. (1994). *Statistical Techniques in Geographical Analysis*. Englewood Cliffs, New Jersey, Prentice Hall.
- Soja, E. W. (1996). *Thirdspace: Journeys to Los Angeles and Other Real-and-Imagined Places*. Wiley-Blackwell
- Sparks Corey. (2013). *Spatial Analysis in R: Part 1. Spatial Demography* 1(1) 131–139
- Sparks Corey. (2013). *Spatial Analysis in R: Part 2. Spatial Demography* 1(2) 219–226

Zhu E. J. and Chi G. (2008). *Spatial Regression Models for Demographic Analysis*. Population Research Policy Review 27:17–42 DOI 10.1007/s11113-007-9051-8

<b>MBD E-3.1</b>	<b>Urbanization, Space and Planning</b>	<b>45 Hours</b>
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**I. Urbanization and Space**

Urbanization and space: concepts and forms (formal and informal spaces); Differences between space, place and region; urbanization and space interaction: gravity model, distance decay model, forces of concentration and dispersion, urban agglomeration and spatial economy; Access to urban and right to the city

**II. Evolution of Spaces of Settlements**

Settlement: evolution, characteristics and factors; settlement pattern and hierarchy; Urban morphology; Change in urban land use and population density; Rural-urban relationship: dichotomy or continuum; Role of urban centres in rural development.

**III. Urban and Regional Planning**

**Planning:** \_\_\_Definitions, concepts, purpose, types and levels; geography/demography and planning relationship.

**Regional development/planning:** Region: concept and definition, types (formal, functional and planning); Need for regional planning; Types of regional planning; Spatial structure of regions,

Theories of regional development: Stages of development, economic base theory, Industrial location theory, Growth Pole theory; Core-periphery interactions.

Regional planning in India; Planning regions in India; Regional disparity in development; Special area development planning (hilly area development planning, (North-Eastern regional council, Mumbai Metropolitan Regional Development Plan).

**Urban Planning:** Concepts; history and origins of urban planning; pioneers of urban planning; types of urban plans: New towns, neighborhood, garden city, green belts; healthy urban planning, WHO concept of healthy city, livable city, sustainable city.

Urban policy since independence, five year plans, important urban plans (New Delhi, Navi Mumbai, Chandigarh); Smart Cities Mission; HRIDAY, AMRUT, PURA, RURBAN mission

**IV. Challenges in Urban planning**

Recent urban policies and programmes; Urban redevelopment; Urban poverty, urban housing and real estate, Slums and slum rehabilitation, The case of SRA in Mumbai; Urban pollution, Solid waste management; Management of migrants

## V. GIS and Urban and Regional Planning

Application of GIS in urban and regional planning.

### Essential Reading List

1. Friedman, John and William Alonso (1964) *Regional Development and Planning: A Reader*, The MIT Press, Massachusetts.
2. Friedman, John (1966) *Regional Development Policy: A Case Study of Venezuela*, MIT Press, Massachusetts.
3. Chaudhuri, J. R. (2001) *An Introduction to Development and Regional Planning*, Orient Longman, Hyderabad.
4. Chand, M and V.K. Puri, (1983), *Regional Planning in India*, New Delhi, Allied.
5. Friedman, J and W. Alonso, (eds: 1969), *Regional Development and Planning: A Reader*, Cambridge, MIT Press.
6. Lefebvre, H (1991) *The Production of Space*, Blackwell, Oxford.
- 7.
8. Hall, P, (1992), *Urban and Regional Planning*, Third Editions, London, Routledge.
9. Harvey, D. (2008) 'The Right to the City', *New Left Review* 53 (September-October): 23-40.
10. Harvey, D. (2012) *Rebel Cities: From the Right to the City to the Urban Revolution*, Verso, London.
11. Husain, M, (1994), *Human Geography*, Jaipur, Rawat.
12. Leong, Goh C. and G.C. Morgan, (1982), *Human and Economic Geography*, Singapore, Oxford University Press.
13. Singh, R. Y. (1994), *Geography of settlements*, Rawat, Jaipur.
14. Ginsburg, N., Bruce Koppel and T.G. Mc Gee (1991) *The Extended Metropolis: Settlement Transition in Asia*, University of Hawaii Press, Honolulu.
15. Nath, V. (1971) Regional Development Policies “, *Economic and Political Weekly*, 6(30-32): 1601-1608.
16. Lo, C.P. and Yeung, A. K. W. (2002): *Concepts and Techniques of Geographic Information Systems*. Prentice Hall of India, New Delhi.
17. Nyerges, Timothy L. and Jankowski Piotr (2010): *Regional And Urban Gis: A Decision Support Approach*, Rawat Publication, Jaipur. ISBN: 9788131603697, 8131603695

### Suggested readings

1. Friedman, J and Clyde Weaver, (1979), *Territory and Function: The evolution of regional planning*, London, Edward Arnold.
2. Kawashima, T and P. Korcelli, (1982), *Human Settlement Systems: Spatial Patterns and Trend*, Luxemburg, IIASA.



3. Knowles, R and J. Warling, (1983), *Economic and Social geography: Made Simple*, London, Heinemann.
4. Misra, R.P, (1992), *Regional planning: Concepts, Techniques, Policies and Case studies*, New Delhi, Concept.
5. Sarin, M, (1982), *Urban Planning in the Third World: The Chandigarh Experience*, London, Manshell.
6. MMRDA(2016), *Mumbai Metroplotan Regional Development Plan 2016-2036* MMRDA, Mumbai.
7. UNEP and others (2007), *Livable Cities: The benefits of environmental planning* , The Cities Alliance, Washington. <http://www.citiesalliance.org/idex.html>.

<b>MBD E-3.2</b>	<b>Large-scale Sample Surveys</b>	<b>45 Hours</b>
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**Unit I: Scope of large scale surveys and sampling design**

Need for large scale surveys, objectives of cross-sectional, longitudinal, rotational and interpenetrating surveys. Sample size determination and sample allocations for such surveys to districts, states and regions in terms of individuals, households and primary sampling units.

**Unit II: Sampling frames**

Sources of sampling frame for cross-sectional, longitudinal, rotational and interpenetrating surveys. Explicit and implicit stratifications, domain controlled sampling by regions and social groups, merging and segmentation procedures for small and large primary sampling units. Mapping and listing for preparation of frame for last stage sampling units. Sample selection of PSUs and households.

**Unit III: Quality assurance procedures**

Revisit of sub-samples, field check tables, non-response pattern, and quality lot assurance, roles of supervisors, editors, field and nodal agencies. Third party audit.

**Unit IV: Software development**

Computer assisted personal interview (CAPI), process of data transfers, introduction to features of Census and Survey Processing System (*CSPro*), steps for development of data entry software in *CSPro*.

**Unit V: Ethical considerations in large-scale sample surveys**

**Unit VI: Estimation of sampling weights**

**Unit VII: Preparation of factsheets, reports and other deliverables**

**Reading List**

1. United Nations (2005): *Household Sample Surveys in Developing and Transition Countries*. [www.unstats.un.org/unsd/hhsurveys/](http://www.unstats.un.org/unsd/hhsurveys/)
2. *CSPro Software*. [www.census.gov/data/software/cspro.Download.htm](http://www.census.gov/data/software/cspro.Download.htm)

3. Kish, Leslie, (1995): Survey Sampling, John Wiley and Sons, Inc. New York.
4. Lohr L. Sharaon., (1999): Sampling: Design and Analysis, Duxbury Press, London
5. Ladusingh, L. (2018). Survey Sampling Methods, PHI Learning, New Delhi
6. Roy, T.K., Acharya R., Roy, A.K. (2016). Statistical survey design and evaluating impact, Cambridge University Press, New Delhi.

<b>MBD E-4.1</b>	<b>Concepts and Measures of Global Health</b>	<b>45 Hours</b>
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**Rationale:** This course introduces to the students the basic concepts of global health. This course emphasizes on understanding the global burden of disease and measuring population health. A key component of this course is to understand the determinants of health and health disparities. It will also provide student with a broad understanding of the relationship between environment and health. It also develops the understanding of the students about the health care delivery system, human resources for health, migration of human resources for health, etc. Finally, it introduces to students the issues related to policy and health. The topics that will be covered in the course are listed below:

1. **Concept and introduction:** Concept of global health; why is it important to study global health?; health and development in the global context; demographic, health and epidemiological transitions; major patterns of distribution of disease in the world; sources of data on disease and disability
2. **Global burden of disease:** Concept of burden of disease; hypotheses related to burden of diseases – compression of morbidity, expansion of morbidity and dynamic equilibrium; measures of burden of disease at the population level – health expectancy and health gap; methods for estimating DFLE, HALE and DALY; how does the burden of disease and mortality vary by geography, social class, race and gender? GBD 1990, 2010 and 2013 – changes and continuities; new and re-emerging infectious diseases; issues related to HIV/AIDS; introduction to NCDs; double burden of diseases in developing countries; impact of tobacco abuse; trends and challenges related to maternal and child health; maternal mortality
3. **Determinants of Health:** Culture, gender, race, social, political and economic determinants of health and health disparities; contribution of income, education and other factors to health; Factors responsible for variation in the global burden of disease across countries; poverty and health; income inequality and health; health risk factors
4. **Environment and health:** Role of water, sanitation, indoor and outdoor air pollution and nutrition in explaining global health disparities; climate change and health; migration, disaster (man-made, natural), conflicts and epidemics
5. **Health care delivery systems:** Introduction to health systems; how to measure performance of health system?; health systems in different countries; factors responsible for better performance of health systems in developed countries; the distribution of human resources for health; quality of human resources for health; the push and pull factors associated with the migration of health care providers

6. **Policy and health:** Human rights approach to health; national and international policies related to health; how are global health priorities set?; the role of international actors like WHO, World Bank, etc. in global health; influence of international priorities on national priorities

### **Essential Reading List**

1. Skolnik, R. (2008). *Essentials of global health*, Jones and Bartlett: Sudbury, MA.
2. Jacobsen, K.H. (2007). *Introduction to global health*, Jones and Bartlett: Sudbury, MA.
3. Markel, W.H., Fisher M., Smego R. (2007). *Understanding global health*, McGraw Hill: Columbus.
4. Merson, M.H., Black, R.E., Mills, A.J. (2001). *International public health: diseases, programs, systems and policies*, Gaithersburg, MD: Aspen Publishers.
5. Murray, C.J.L., Saloman, J.A., Mathers, C.D., Lopez, A.D. (2002). *Summary measures of population health: concepts, ethics, measurement and applications*, The World Health Organization: Geneva.
6. Murray, C.J.L., Saloman, J.A., Mathers, C. (2000). A critical examination of summary measures of population health, *Bulletin of the World Health Organization* 78(8): 981-994.
7. Cutler, D., Deaton, A., Lleras-Muney, A. (2006). The determinants of mortality, *Journal of Economic Perspectives* 20(3): 97-120.
8. Link, B.G., Phelan, J. (1995). Social conditions as fundamental cause of disease, *Journal of Health and Social Behavior* 35: 80-94.
9. Smith, J.P. (1999). Healthy bodies and thick wallets: the dual relation between health and economic status, *Journal of Economic Perspectives* 13(2): 145-166.
10. Shiffman, J. (2009). A social explanation for the rise and fall of global health issues, *Bulletin of the World Health Organization* 87(8): 608-613.
11. Gwatkin, D.R. (2000). Health inequalities and the health of the poor: what do we know? What can we do? *Bulletin of the World Health Organization* 78(1): 3-18.
12. Laxminarayanan, R. et al. (2006). Advancement of global health: key messages from the Disease Control Priorities Project, *Lancet* 367(9517): 1193-1208.
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14. Mills, A., Rasheed, F., Tollman, S. (2006). Strengthening health systems, In *Disease Control Priorities in Developing Countries (2<sup>nd</sup> Edition)*, pages 87-102, New York: Oxford University Press.
15. Hsiao, W.C. (2003). What is a health system? Why should we care? Harvard School of Public Health Working Paper.
16. Anand, S., Baernighausen, T. (2004). Human resources and health outcomes: a cross country econometric study, *Lancet* 364(9445): 1603-09.
17. Chen, L. et al. (2004). Human resources for health: overcoming the crisis, *Lancet* 364(9449): 1984-1990.
18. Pallikadavath, S., Singh, A., Ogollah, R., Dean, T., Stones, W. (2013). Human resource inequalities at the base of India's public health care system, *Health & Place* 23: 26-32.

19. Zurn, P., Dal Poz, M.R., Stilwell, B., Adams, O. (2004). Imbalance in the health workforce, *Human Resources for health* 2(13): 1-12.
20. Willis-Stattuck, M. et al. (2008). Motivation and retention of health workers in developing countries: a systematic review, *BMC Health Services Research* 8: 1-8.
21. Brown, T.M., Cueto, M., Fee, E. (2006). The World Health Organization and the transition from ‘international’ to ‘global’ public health, *American Journal of Public Health* 96(1): 62-72.
22. Ruger, J.P. (2005). The changing role of the World Bank in global health, *American Journal of Public Health* 95(1): 60-70.
23. Ravishankar, N. et al. (2009). Financing of global health: tracking development assistance for health from 1990-2007, *Lancet* 373(9681): 2113-2124.
24. London, L. (2008). What is a human-rights based approach to health and does it matter? *Health Human Rights* 10(1): 65-80.

<b>MBD E-4.2</b>	<b>Gender, Development and Health</b>	<b>45 Hours</b>
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The rationale of the course is to synthesize the issues studied in different papers and equipping the students with a number of gender sensitive indicators and analytical tools.

**Section 1: Introduction:** The purpose of this section is to explain the basic concepts of three major components of this course namely gender, health and development.

1. The Concept of gender, Evolution of gender in historical perspective
2. Patriarchy, Kinship Structure and gender roles, Feminist theories, Gender stratification in traditional and modern societies, Gender Analysis Tools, Gender Sensitive Indicators and Gender budgeting and auditing
3. Concept of health, Evolution of the concept of Reproductive Health, life cycle approach to RH and recommendations from ICPD
4. Changing concept of development, Indicators of development, gender adjusted HDI

**Section 2: Gender and Health:** This section presents the situation analysis regarding sex differentials in different aspects of health and highlights some special issues of women and men’s health.

***Situation analysis of sex differentials in morbidity and mortality***

1. Major morbidity and mortality burden in the developing world with major focus on India- sex ratio of births, major health problems experienced by women and men, reproductive health of women and men in developing world, differentials in use of male and female methods of contraception
2. Health infra-structure and health care providers
3. Nutritional status, susceptibility to infections
4. Accidents and other risk factor and health seeking behavior

5. Health and Nutrition issues of adolescent of boys and girls, abuse and maltreatment, Puberty, Sexual Debut, Adolescent Pregnancy, Abortion, women and family planning programs, Contraceptive Technology
6. Major risk factors of men's health: masculinity, alcoholism, tobacco and drug consumption, accident
7. Gender and Sexuality: Sexual health of men and women, gender dimension of HIV /AIDS. Gender and Infertility

**Section 3: Gender and Development:** The purpose of this section is to understand the sex differentials in health in terms of socio- economic and cultural context of gender and to study the gender dimensions of development.

1. Understanding social structures- role of caste, class, ethnicity and religion and gender in health inequalities and health outcomes
2. Gender dimension of social development, status and role of men and women in household and community, culture, marriage customs, dowry and bride price practices, age at marriage
3. Gender differentials in household headship and role in decision making
4. Gender differences in access to knowledge-, education, exposure to media and freedom of movements
5. Gender based violence- Domestic and community violence and gender, Legal aspects of domestic violence and rape
6. Women's role in community life and involvement in politics-as voter, political worker and leader, women in Panchayati Raj Institutions and self-help groups
7. Media representation of men and women
8. Gender dimension of economic development: women's access to economic resources, entitlements, land ownership, inheritance laws, access to credit, measurements of women's work, profiling women's work, informal sector involvement, working condition, maternity benefits, wage differentials, gender and poverty
9. Globalization, changing pattern of economic activity, issues of marginalization and vulnerability along with agency, negotiation and spaces of power, Gender Divisions in Urban Labor Markets, Gender and Migration
10. Housing, Household environment and its differential impact on men and women's life
11. Environmental degradation, changes in climate, water table and land use and their differential impact on men and women

**Section 4: Gender mainstreaming in health and development programs:** The purpose of this section is to understand the concept of mainstreaming gender in development and to review the measures taken for eliminating undesirable impact of gender inequalities and to bring women in the main stream of development

1. The concept of Gender Mainstreaming
2. Historic overview of Gender Mainstreaming- Women in development (WID)-concept and criticism by feminist; shift to Gender and Development (GAD), Gender Mainstreaming and the Millennium Development Goals (MDGs)

3. The rights approach to Health, sexual and reproductive rights, violence, human rights and health
4. Paradigm shift from the Target Based Supply Driven Fertility influencing programs to RH Approach.
5. Legal aspects – laws regarding marriage, dowry, domestic violence, ,rape PNDT act , property inheritance, maternity and other benefits of working women, sexual harassments at workplace, reservations in political institutions and
6. Gender mainstreaming in various health and development sectors- e.g. Agriculture, Health, Education, gender in work place (Public & private) etc.
7. Advocating for Gender equality
8. Gender responsive policy making and planning of health and development programs.

### **Section 5: Some case studies of Gender analysis of health and development**

**programs, budgeting and auditing:** This section aims to give necessary skills and tools to undertake the gender analysis of health and development policies and programs and to help them to develop gender sensitive indicators and measures

#### **Essential Reading List**

1. Basu, Alaka M., (1992): *Culture, The Status of Women and Demographic Behaviour*, Oxford University, New York.
2. Bhasin K. 1993. *What is patriarchy?*, Kali for Women Publishers, New Delhi.
3. Bhasin K. (2000). *Understanding Gender*, Kali for Women Publishers, New Delhi.
4. Dyson, Tim and Mick Moore, (1983). “On Kinship structure, female autonomy, and demographic behaviour in India”, *Population and Development Review* vol. 9(1), pp. 35-60.
5. Ellsberg Mary and Heise Lori L. (2005) *Researching violence against women: A practical guide for researchers and activists*. WHO and Path, Washington D.C.
6. Folbre, Nancy. (1992). Improper arts: Sex in classical political economy. *Population and Development Review*. 18(1): 105-112.
7. Gita Sen, Adreinne Germain and Lincoln C. Chen, (Eds.), (1994): *Population Policies Reconsidered: Health and Empowerment and Rights*, Harvard University Press, Harvard.
8. Jeffery Patricia and R. Jeffery. 1997. *Population Gender and Politics: Demographic change in rural north India*. Cambridge University, Cambridge.
9. Miller, Barbara, D.(ed) (1993) *Sex and Gender Hierarchies*, Cambridge University Press, New York.
10. Hess, B.B. and M.M. Ferree. (1987). *Analyzing Gender: A Handbook of Social Science Research*. Sage Publication, London.
11. United Nation. 2001. *Population, Gender and Development: A Concise Report*. UN, Economic and Social Affairs (Dept. of), New York
12. World Health Organization. (1998). *Gender and Health. Technical paper WHO/FRH/WHD/98*. (Website: [www.who.int](http://www.who.int))
13. World Bank. (1991). *Gender and Poverty in India*. World Bank, Washington.
14. World Health Organization (2003): *Comparative Evaluation of Indicators for Gender Equity and Health*, Women and Health Programme, Centre for Health Development, Kobe, Japan.

15. William Joan. 1989. Deconstructing Gender, 87 Michigan L Rev. 797. *Law Journal Article*

### Suggested Readings

1. Agnes, Flavia. (2000). Law and gender inequalities: the policies of women's right in India. Oxford, New Delhi.
2. Anker, R.(1997). *Gender and Jobs: Sex Segregation of Occupations in the World*, ILO, Geneva.
3. Balk, Deborah, 1997): "Defying Gender Norms in Rural Bangladesh: A Socio demographic Analysis". *Population Studies* Vol.51, pp. 153-172.
4. Bandhopadhyay, D. 2000. Gender and governance in India. *Economic and Political Weekly*. 35(3): 2696-269xxx).
5. Basu, AlakaMalwade. 2000. Gender in population research: Confusing implications for health policy. *Population Studies*. 54: 19-22.
6. Das Gupta, Monica, 1987. Selective discrimination against female children in rural Punjab, India. *Population and Development Review*, 13(1): 77-100.
7. DoyalL.(1995) What Makes Women Sick: Gender and the Political Economy of Health. London, Macmillan.
8. Dreze, Jean and Sen Amartya, (1995): *India: Economic and Social Opportunity*, Oxford University Press, New York.
9. Harriet B. Presser, (1997): Demography, Feminism and the Science-policy Nexus, *Population and Development Review* Vol. 23(2), pp. 295-331.
10. Jeffery, Roger and Basu, Alka M. (Eds.), (1996): *Girls Schooling, Women's Autonomy and Fertility Changes in South Asia*, Sage Publications, New Delhi.
11. Jejeebhoy S. 1996. *Women's Education, Autonomy and Reproductive Behavior: Assessing what we have learned*. East West Centre, Hawaii.
12. Reeves Hazel and Baden Sally (2000): *Gender and Development: Concepts and Definitions*, Report No. 55, Bridge (development- gender) Institute of Development Studies, University of Sussex, Brighton BN1 9RE, UK.
13. Sonya, Andermahr, Lovell Terry and Wolkowitz, Carol, (1997): *A Glossary of Feminist Theory*, Arnold-Hodder Headline Group, London.
14. Sopher, David, (1980). *An Exploration of India: Geographical Perspective on Society and Culture*, Cornell University New York

<b>MBD E-5.1</b>	<b>Population Ageing and Health Transition</b>	<b>45 Hours</b>
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The aims of this course are:

- 1) To impart knowledge of concepts and theoretical framework relating to demography of ageing, and health, social and economic dynamics of population ageing
- 2) To impart concepts and theories of health transition, linkage between health transition and ageing transitions
- 3) To develop skills to analyze trends, determinants and consequences of population ageing
- 4) To build capacity to understand and use theoretical and empirical advancements to develop strategies, policies and programmes to meet challenges of population

ageing and plan for health care and social and economic wellbeing of ageing population.

### **I Demography of Ageing:**

A. Concepts and measures of population ageing; components of population ageing; Inter-relationship between population ageing, fertility, mortality and migration; population ageing and momentum of population growth, age structure transition and ageing, and declining population.

B. Population ageing trends and patterns in developed and developing countries; Factors determining ageing trends and patterns; Projected trends and pattern of population ageing; global and regional perspective.

C. Population ageing trends, patterns and determinants in India; state variations; future scenario of population ageing in India and states.

### **II Life Course Perspective and Social Dynamics of Ageing:**

A. Life course perspective of population ageing; Age and Ageism; Social Status and Roles of Elderly, Family Structure, Intergenerational relations, Kinship and family support, Social Security; Social network- Frameworks (Berkman and others) and measurement.

B. Living Arrangements of Elderly, Old Age Homes, Social Networks, and Contribution of elderly: “Feminization” of Ageing, Dependency, Gender Dimensions and Discrimination, Widows, Elderly abuse, Social and legal Vulnerability, Legislations to protect elderly in India.

**III Health Transition:** Understanding Health Transition and Ageing Transition; Critiques of “Health Transition” and “Epidemiological Transition” theory: Mortality and Morbidity Compression, Age Patterns of Mortality and Morbidity; Global burden of disease, communicable diseases, injuries and violence; Health Transition and emergent infectious diseases; social epidemiology and medical social determinants of health as fundamental causes of chronic disease; social determinants of health; the relative income hypothesis and the social gradients of health for ageing population: Healthy Ageing; WHO Framework for Healthy Ageing.

### **IV Ageing and Health:**

A. Ageing and Life Expectancy: ageing and life expectancy; changing age pattern of mortality, oldest old mortality; ageing and epidemiological transition in disease prevalence and patterns; Measuring population health; life expectancy and disability free life expectancy, health adjusted life expectancy.

B. Ageing and Burden of Disease: Measurement issues in assessing burden of chronic and multiple diseases in ageing populations; Self-Reported Prevalence, Symptom based prevalence; Measured Prevalence; burden of non-communicable diseases, dual burden of communicable and non-communicable in developed and developing countries; injuries and violence Indian scenario; Ageing, Intrinsic Capacity and Biomarkers of Ageing.

C. Ageing and Functional Health: Ageing and disabilities; trends and prevalence; ageing and injuries, ageing and functional health on various domains- mobility, self-care, pain, vision, interpersonal activities, sleep and energy; Ageing and Quality of Life, WHOQoL Ageing and Disability; WHODAS; Ageing and wellbeing and Life satisfaction.



D. Ageing and mental health problems; cognition, memory loss, dementia and depression; Alzheimer's and Parkinson.

E. Ageing and health risk factors: nutrition, diet and food practices; health risk behaviour-tobacco, alcohol; physical activities; Access to minimum living conditions (sanitation, water).

### **V Health Care System for Geriatric Care and Health Financing:**

A. Availability and accessibility to geriatric care, Geriatric Health Care Institutions; Human Resource Development for Geriatric Care; institutional care; Long-term Care; Health Systems Inequalities for Addressing NCDs.

B. Ageing, health care and health financing: health care utilization, public and private health services utilization; outpatient and inpatient health care utilization; sources of health spending; out of pocket health expenditure; lack of health care options for elderly; Health induced impoverishment among elderly.

### **VI Population Ageing and Economic Conditions:**

A. Population Ageing and Labour Force: Implications of population ageing on labor force, Retirement and work participation among elderly; occupational distribution among the elderly.

B. Ageing and Public Finance: Ageing, savings and investment; pressures on public finance - government health expenditure; implications for health insurance and health financing for elderly, Implications for Government expenditure for social security – pension, social support and housing; The Solow model with an ageing population, Becker's family model; Bloom and Williamson's model; ageing and poverty; Ageing, health and development.

### **VII Ageing Policies and Programmes:**

A. Social and Economic Support Policies and Programmes for the Elderly- Retirement, Pensions and Social care Policies in developed and developing countries. Social security and welfare policies and programmes for elderly in India. National Programmes for Health Care of Elderly (NPHCE); National Policy for Senior Citizens.

B. Organizations Engaged in Wellbeing of Ageing Populations: Helpage International, Dignity Foundation, Age in Action, Age International, [Alliance for Aging Research](#), Alzheimer's Disease International (ADI), [The Parkinson Alliance](#), Geriatrics Societies and Gerontological Associations; Age –friendly world: environment, security and health care.

C. Worldwide Longitudinal Ageing Studies in 40 countries: LASI, SAGE, SHARE, HRS, CHARLS, JSTAR, ELAS, KLoSHA

### **Reading List**

7. World Health Organization (2015), *WHO Report on Ageing and Health*, WHO, Geneva.
8. United Nations (1994), *Ageing and the Family*, United Nations, New York
9. United Nations (1998), *Economic and Social Implications of Population Ageing*, Department of International Economic and Social Affairs, UN, New York.

10. United Nations (2001): *Living Arrangements of Older Persons: Critical Issues and Policy Responses*. Population Division, Department of Economic and Social Affairs, Special Issue Nos. 42/43, 2001, New York.
11. UNFPA, 2001, *Population Ageing and Development: Social, Health and Gender Issues*, United Nations, Malta.
12. Bloom, D.E., D. Canning, et.al. (2002): *The Demographic Dividend: A New Perspective on the Economic Consequences of Population Change*. Santa Monica, CA, RAND.
13. Bose, A.B. (2006). *Social Security for the Old*. New Delhi: Concept Publishing Company.
14. Linda J. Waite (ed.) (2004) *Aging, Health, and Public Policy: Demographic and Economic Perspectives*, Supplement to *Population and Development Review*
15. Irudaya Rajan, (2007) *Social Security for the Elderly Experiences from South Asia*, Routledge, New Delhi.
16. Prskawetz, Bloom, and Lutz, eds., 2008 *Population Aging, Human Capital Accumulation, and Productivity Growth*, A Supplement to *Population and Development Review*.
17. Sandra Gruescu, (2006), *Population ageing and economic growth*. Physica-Verlag
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20. Pool, Ian, Laura R. Wong and Eric Vilquin (ed) (2006), *Age-structural transitions: challenges for development*. Paris: CIRCRED.
15. Berman, Lisa (2000) “Social Support, Social Networks, Social Cohesion and Health” *Social Work in Health Care* [http://dx.doi.org/10.1300/J010v31n02\\_02](http://dx.doi.org/10.1300/J010v31n02_02)

<b>MBD E-5.2</b>	<b>Population and Sustainable Development</b>	<b>45 Hours</b>
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### **Objectives:**

After the successful completion of this paper, students will be able to:

- 1) Define the concept of sustainable development and explain how the idea of sustainability and development has changed over time.
- 2) Understand how the policies have evolved in line with the concept of sustainable development and population trends.
- 3) Critically examine the recent trends in sustainable development with specific focus on population changes.
- 4) Apply sustainable development concepts and policies to current population, environmental and developmental issues.

### **Modules**

#### **1. Sustainable development: Conceptual and Theoretical issues**

Importance of Studying Sustainable development; Meaning, Concepts and Definitions; Inter-linkages between ecology and development; Economic growth and ecological degradation; Indicators and processes involved in its achievement; Brundtland Report on Environment and development and agenda.

## **2. Innovations for Sustainable Development**

Conventional perspectives on development; Critics of Conventional Development perspectives; Case studies based on experiences from developed and developing countries; How the concept of sustainability has influenced the policy, programme practice in development sectors

## **3. Population-environment linkages**

Ecological and environmental dimensions of sustainable development; Approaches to environment; Gandhian approach, Marxian/Socialist approach, Neo-classical approach, Market approach; Population growth and climate change; Population matters to sustainable development and environment (growth, age structure, spatial distribution)

## **4. Population and Quality of Life**

Quality of life: definition and measurement; Resource creation, management and distribution of water, air, housing, etc; Land, Cattle and open Space linkages; Sanitation, Health and health care; Education and Information.

## **5. Environmental Degradation and Poverty**

Sustainable livelihoods; Population and common property resources; Population, poverty and vulnerability; gender dimensions; Grass-root perspectives – Environment-Development struggle; Development and displacement; Alienation of tribal; Tribal land encroachment; Forest Depletion; Case studies – Narmada and Vedanta (Orissa) Projects.

## **6. Environmental issues in the context of migration and displacement**

Regional Development; Green Movements; Chipko movement; Silent valley movements etc; Natural Calamities – Flood, Droughts, Landslide, Earth Quakes, Tsunami etc; Urbanization-new challenges- environmental health hazards (water or air pollution); Solid Waste Management; Rain Harvesting; Mobility and Patterns of settlement; Development and urban ecology; Slums, Urban Poverty and Rehabilitation.

## **7. Governance for Sustainable Development**

Issues related to natural resources management; Forest management; Mining of natural resources, Ground Water, River and Ocean Pollution; Different institutional arrangements for environmental protection and their limitations; Creating and managing emission related norms; Some success models of efficient environmental management – CNG, Smokeless Choolah, and other successful green models; The Challenges for International Environmental Governance; Emerging new institutions of environmental protection; Capacity Building, Technology Transfer for Sustainable Development.

## **8. Population, Society and Sustainable development**

Population and resources; Human versus land ‘carrying capacity’; ‘Population stabilization’ to ‘Population balance’; Critiques of sustainable development perspectives; Role of social institutions; Individual behavior in the context of social costs and benefits; Gender and environment; Indigenous population and traditional methods of environmental sustainability; Sociological approaches to sustainable development; Vulnerability of Indigenous population; Case Studies – Sacred forests, Anti-Eucalyptus movement

## **9. Contemporary issues**

Affluence and environment: How rich countries are also responsible for the sad state of affairs?; NGOs and Development issues; Civil society initiatives and involvement; International Agencies; Population and Biodiversity; Research Methods to examine Population, sustainable development and environment nexus.

### **Essential Reading List**

1. Bongaarts, John. (1992). Population growth and global warming. *Population and Development Review*, 18: 299-319.
2. Bründtland , G.H. (1987). *Our Common Future: The World Commission on Environment and Development*, Oxford, Oxford University Press.
3. Clarke, John I. (1996): “The Impact of Population Change on Environment: An Overview.” in Bernardo Colombo, Paul Demeny, and Max F. Perutz, (Eds.), *Resources and Population: Natural, Institutional, and Demographic Dimensions of Development*. Clarendon Press, Oxford, pp. 254-268.
4. Davis , Kingsley and Mikhail S. Bernstam (eds.) (1991), *Resources, Environment, and Population: Present Knowledge, Future Options*. New York: Oxford University Press.
5. Dawson, P. J, and R. Piffin, (1998), Is there a long run relationship between Population growth and living standards? The case of India, *Journal of Development Studies*, 34. 149-156.

6. Demeny, Paul. (1989). Demography and the limits to growth. In Michael S. Teitelbaum and Jay M. Winter (eds), *Population and Resources in Western Intellectual Traditions*. Supplement to *Population Development Review*. New York: Population Council.
7. Diana Liverman, Emilio F. Moran, Ronald R. Rindfuss, and Paul C. Stern, (Eds). (1998): *People and Pixels: Linking Remote Sensing and Social Science*. Committee on the Human Dimensions of Global Change, Commission on Behavioral and Social Sciences and Education, National Research Council, National Academy Press: Washington DC.
8. Dietz, Thomas and Eugene A. Rosa. (1997): "Effects of population and affluence on CO2 emissions." *Proceedings of the National Academy of Sciences*. Vol. 94 pp. 175-179.
9. Government of India (1999): *Silent Revolution for Environmental Conservation*, Ministry of Environment and Forests, New Delhi.
10. Guha, Ramachandra and Martinez-Alier, J (1998): *Varieties of Environmentalism*, Oxford University Press, New Delhi.
11. Hardin, Garrett. (1968): "The Tragedy of the Commons." *Science*. Vol. 162, No. 13, reprinted in Rex R. Campbell and Jerry L. Wade, (Eds), *Society and Environment: The Coming Collision*. Allyn and Bacon, Inc: Boston, MA, pp. 1243-1248.
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23. UNFPA (2009): *State of World Population- 2009: Facing a changing world: Women, Population and Climate*, UNFPA, New York.
24. Zelezny, Lynnette C., Poh-Pheng Chua, and Christina Aldrich (2000): "Elaborating on Gender Differences in Environmentalism." *Journal of Social Issues*. Vol. 56, N. 3; pp. 443-457.

**Objectives:**

1. To familiarize the students with basic concepts, theories and models in health economics and how to apply the economic tools in analyzing the structure and performance of health care sector.
2. To provide an understanding on the functioning of health care markets and health care industry.
3. To orient and encourage the students to understand main economics of health and micro financing of health care.
  1. Basic concepts in health economics-relationship between economics, economic development and economic aspects of health care- demand and supply in health care, health care market, market failure and public goods.
  2. Production function, laws of production, production in health care, externalities in health care markets, resource allocation in health care- both in private and public sector.
  3. Supply and demand for health care personnel, hospitals, technology. The trade-offs between quality and quantity- demand for health care services.
  4. Health output and input indicators- and their correlation with the level of economic development and with public expenditure on health.
  5. Application of cost-benefit analysis and cost-effectiveness - the role of health in economic development- value of output lost due to number of sick days- a review of per capita private and public expenditure on health. Cost concept- short term and long -term costs, economies of scale, various types of economic evaluation used in health care, consumer impact assessment,
  6. Measuring health outcomes-human life and quality adjusted years of life, cost-utility analysis, Quality adjusted life years(QALYs) and Health year equivalents (HYEs).Economics of prevention and public health, understand the principles of economic evaluation as applied to health care, quality of life and statistics in health economic evaluation(including QALY and DALY).
  7. Efficiency and equity in health: health care and welfare state, private versus public health care, public-private partnerships in health care, equity in healthcare delivery, efficiency and effectiveness in health care, case studies.
  8. Health care financing- national health accounting, sources and use of funds, health budgeting, interrelationship between epidemiological transition and health expenditure, sources of health care spending.

9. Health insurance- private health insurance, regulation of health insurance, government as health insurer in India, recent developments in developed and developing countries, Case studies - RSBY, Aarogyasree, etc.
10. Health sector reforms- International and Indian experiences, regulation of health sector including pharmaceutical industry, access to health care with quality, health care utilization.

### **Essential Reading List**

1. Banerjee, D. (1982), Poverty, class and Health Culture in India, Vol. 1 PanchiPrakashan, New Delhi.
2. Indian Council of Social Science Research and Indian Council of Medical Research (1981), Health for All by 2000 A. D., ICSSR, Delhi.
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5. Cutler and Zeckhauser (1999) The Anatomy of Health Insurance, NBER Working Paper # 7176.
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7. Schoen and DesRoches (2000) “Uninsured and Unstably Insured: The Importance of Continuous Insurance Coverage,” Health Service Research, 35 (1, Part II): 187-206.
8. Manning *et al.* (1987) “Health Insurance and the Demand for Medical Care: Evidence from a Randomized Experiment,” American Economic Review, 77(3): 251-277.
9. Grossman (1972) “On the Concept of Health Capital and the Demand for Health,” Journal of Political Economy, 80(2): 223-255.
10. Philipson (1999) “ Economic Epidemiology and Infectious Diseases,” NBER Working Paper # 7037.
11. Cuyler,Anthony J. and Joseph P. Newhouse (2000) Handbook of Health Economics, Volumes 1A and 1B, North- Holland, Elsevier Science.
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13. Wagstaff, Adam ( 1986). “The Demand for Health: Theory and Applications,” Journal of Epidemiology and Community Health, 40(1), 1-11.
14. Deaton, Angus. (2003).”Health, Inequality, and Economic Development,” Journal of Economic Literature 41(1), 113-158.
15. Bloom, David, David Canning and JaypeeSevilla. (2001). The Effect of Health on Economic Growth: Theory and Evidence, NBER Working paper 8587.
16. Phelps, Charles E.(1997), Health Economics , Addison- Wesley Educational Publishers Inc., Reading, Mass.
17. Govt. of India (2005) Report of the National Commission on Macroeconomics and Health, Ministry of Health and Family Welfare, New Delhi.

18. Rexford E. Sntre and Stephen P. Neun (2007), Health Economics: Theories, Insights and Industry Studies, Thompson South – Western, 3<sup>rd</sup> Edition (614, San/Hea, 073226).
19. Zweifel and Breyer,( 1997), Health Economics, Oxford University Press.
20. Drummond MF, Sculpher MJ, Torrence GW, O'Brien B, Stoddart GL, eds.( 2005) Methods for economic Evaluation of Health Care Programmes, , Oxford University Press.
21. Reddy, K.S. et.al (2011)” Towards achievement of universal health care in India by 2020 : A Call of Action”, [www.thelancet.com](http://www.thelancet.com).
22. Peters, et.al (2002), Better Health System for India’s poor: Findings, Analysis and Options: The World Bank, New Delhi.
23. Jack, William (1999). Principles of Health Economics for Developing Countries, The World Bank, Washington, DC.

<b>MBD E-6.2</b>	<b>Operations Research</b>	<b>45 Hours</b>
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1. Definition of OR
  - (a) What is Operations Research
  - (b) Focus and Objective of Operations Research
  - (c) Types and Examples of Operations Research
2. Role of Researchers and Managers
3. Components of OR proposal
4. Identification of Problem and Solution
  - (a) Identification and Definition
  - (b) Justification
  - (c) Alternative Solution
  - (d) Indicators- Outputs, Outcomes and Impacts
5. Causality (Randomize Experimental Design)
  - (a) Pretest-Post test Control Group Design
  - (b) Post test –only Control Group Design
  - (c) Multiple Treatment Design
6. Quasi/Non-Experimental Design
  - (a) Non-Experimental Control Design
  - (b) Time Series, and Before and After Design
7. Inferential Statistics in Operations Research
  - (a) ( $X^2$ , t, F)-tests
  - (b) Deciding Sample Size in case of Different Experimental Design
  - (c) Linking Different Design and Statistical Test
8. Study Design Exercises
  9. Ethics in Operations Research
    - (a) ICMR Guidelines
    - (b) International Perspectives
    - (c) Case Studies
10. Utilization and Dissemination, and Process Documentation
11. Critiques to OR proposal



## Essential Reading List

1. Fisher, Andrew A., James R. Foreit, J. Laing, J. Stoeckel and J. Townsend 2002: Designing HIV/AIDS Intervention Studies-An Operations Research Handbook, Population Council, New York.
2. Foreit, James R. and Tomas Frejka 1998: Family Planning Operations Research-A Book of Reading, Population Council, New York
3. Kish, Leslie 1965: Survey Sampling, New York, John Wiley and Sons.

<b>MBD E-6.3</b>	<b>Monitoring and Evaluation</b>	<b>45 Hours</b>
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1. **Introduction to Monitoring and Evaluation:** Basic concepts, Difference between Monitoring and Evaluation; Linkage between Planning, Monitoring and Evaluation; Importance of Monitoring and Evaluation
2. **Monitoring and Evaluation Framework:** Resources for monitoring and evaluation, Engagement of stakeholders in monitoring and evaluation; Meaning of Indicators, Ideal requirement, process of developing indicator, illustration of indicators developed from large scale surveys, measurement, need & levels of indicator; Challenges in developing indicators from Large-Scale Surveys; Types of Indicators – Input, Process, Output, Outcome, Impact; Capacity building for monitoring and evaluation
3. **Monitoring of Policy Implementation:** Components of policy and programme, budget, staff, process of evaluation, developing tangible indicators for policy monitoring in terms of Input, Process, Output, Outcome, Impact; Result based inference
4. **Evaluation Design:** Determination of sample size under different approaches and design including measurement of change due to certain interventions; Quasi Experiment design, Case control design, Evaluation Terms of Reference-Formative and Summative Evaluations, Managing Evaluations; Evaluation at different points: Baseline, Mid-point, Concurrent and End line evaluation; Evaluating for results: Need and Uses of evaluation, Principles, norms and standards for evaluation; Roles and responsibilities in evaluation; Randomization, Statistical design of Randomization; Randomized control trials, time dependant cluster design, interrupted time series analysis.
5. **Assuring the Quality of Evaluation Design and Methodology:** Overview; Defining the context; The evaluation purpose; Focusing the evaluation; Evaluation methodology; Mandatory requirements for programme; SWOT analysis of NHM, ICDS and National Livelihood Mission; Social audit – meaning, objectives, advantage, case study of social audit

6. **Statistical Approaches of Evaluation of Intervention Programme:** Statistical inferences used in different intervention design – z, t, F and paired ‘t’ tests, two stage LSM, instrument variable method; Propensity score matching; Difference in Difference Method: Theory and application, advantage and disadvantage, regression implementation
7. **Management Information System and Use of Technology:** MIS – Monitoring information system; Role of programmers; HMIS system; Global Positioning System and use of other technology

**References:**

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- FHI (2004). *Introduction to Monitoring and Evaluation Monitoring and Evaluation, monitoring hiv/aids programs: A facilitator’s training guide*. Family Health International
- GoI & UNDP (2012). *Guiding Framework for Monitoring and Impact Evaluation of Capacity Building & Training of Panchayati Raj Institutions in States/UTs*. Government of India and United Nation’s Development Programme
- IFRC and RCS (2002). *Handbook for Monitoring and Evaluation*. International Federation of Red Cross and Red Crescent Societies –Geneva
- NIRD&PR; MoRD and TISS (2016). *Social Audit: A manual for Trainers*. National Institute of Rural Development & Panchayati Raj; Ministry of Rural Development and Tata Institute of Social Sciences
- Rossi, Peter H.; Mark W. Lipsey and Howard E. Freeman (2004). *Evaluation, A Systematic Approach*. Seventh Edition. Sage Publications – New Delhi.
- Sullivan, T.M., Strachan, M., and Timmons, B.K. (2007). *Guide to Monitoring and Evaluating Health Information Products and Services*. Baltimore, Maryland: Center for Communication Programs, Johns Hopkins Bloomberg School of Public Health; Washington, D.C.: Constella Futures; Cambridge, Massachusetts: Management Sciences for Health, 2007
- UNDP (2009). *Handbook on planning, monitoring and evaluating for development results*. United Nations Development Programme - New York
- UNESCO (2014). *Monitoring and Evaluation Guidance for School Health Programs: Thematic Indicators*. United National Educational, Scientific and Cultural Organization.

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