

WINTER SCHOOL ON  
**Epidemiological and Genomic Methods for the  
Study of Human Diseases**

Sponsored by:

*Sun Pharma Science Foundation*

Organized jointly by:

National Institute of Biomedical Genomics (NIBMG), Kalyani,  
Society for Applied Studies (CHRD SAS), Delhi, and  
Indian Statistical Institute (ISI), Kolkata

**Dates:** November 28 to December 3, 2022

**Venue:** NIBMG, Kalyani, West Bengal

**Purpose:** This Winter School is being organized for clinical researchers and basic scientists engaged in research on biomedical sciences involving humans.

**Who Can Apply:** If you are currently engaged in clinical or biomedical research, and are involved in or interested to learn methods of genetic epidemiology and human microbiome research, you can apply. You need to provide evidence of your engagement in such research, through publications, research summary or outline of funded projects.

**How to Apply:** Applications must be sent to [workshop@nibmg.ac.in](mailto:workshop@nibmg.ac.in) with the following information:

- (a) *Short bio-data*, with current designation and affiliation, email address and cellphone number (one page); (b) *Evidence of engagement in relevant research* (half-page; may include list of publications, description of funded research, etc.); and (c) *Description of current research and reasons for intending to participate* (one page)

**Applications will be accepted until 6 pm, Saturday, November 12th 2022.**

**Nature of the Winter School:** This Winter School will be held in person at the NIBMG, Kalyani, West Bengal. ***Classes will not be webcast live.***

**Number of Participants:** Total number of participants will be limited to 50. A committee constituted by the organisers will select participants. Criteria for selection will be: Nature of research contribution/engagement, familiarity with genetic and epidemiological methods, academic career plan, etc.

**Support for selected participants:** This Winter School is residential. There is no fee to participate. Board and lodging will be provided free-of-cost to all selected participants in the Guest House of the NIBMG. **Participants are expected to travel to NIBMG at their own cost.** Travel support may be provided under exceptional circumstances.

### **Tentative List of Topics to be Covered in the Winter School:**

1. Epidemiological Study Designs – Overview of study designs (Prospective/Retrospective, Observational, Interventional Studies, Sources of Bias)
2. Measures of Occurrence - Incidence, Prevalence, Exposures and Outcomes
3. Study population; Selection, Sampling, Randomization (Simple, Blocked, Stratified) and Concealment
4. Ethical Issues in interventional and genetic epidemiological studies
5. Study designs often used in genetic epidemiology
6. Statistics refresher:
  - (a) Probability distributions - Types of probability distributions and how do these arise in practice (Idea of probability distribution, Binomial, Poisson, Negative Binomial, Normal, Chi-squares, t, F motivated by real life examples)
  - (b) Sampling - Concept of population, Sampling frame and representativeness of a sample
  - (c) Sampling methods and sampling errors
  - (d) Measurement in research - Qualitative and Quantitative; pros and cons of qualitative vs quantitative measurement; validity and reliability; levels of measurement nominal, ordinal, interval, ratio; association; measures of risk; causality; replication; generalization
  - (e) Testing of hypothesis, power, and sample size - Simple tests of hypothesis; Type 1 error and Type 2 error; power; Sample size calculation for observational studies
7. Analyses of qualitative and quantitative data (I) – Data summarization; simple methods of association analysis and measures (Correlation, Linear and Logistic Regression, measures of association for categorical variables)
8. Analyses of qualitative and quantitative data (II) – Concept of bias, confounding and interaction; adjustment for covariates
9. Genetic basis of disease (including genetic relative risks, modes of disease inheritance and identification from pedigrees)
10. Association analysis: Genome-wide association study (GWAS)
11. Linkage Disequilibrium and Haplotypes
12. Haplotype relative risk
13. Multiple testing correction with special reference to GWAS
14. Microbiome in human health and disease – Methods of identifying microbial taxa in various types of human biospecimens, assessment of microbial diversity and perturbations.
15. Introduction to whole exome and whole genome sequencing methods.

### **Special Sessions**

Demonstration and Hands-on Sessions: Most talks will be exemplified by actual data on diseases, demonstration of analytical methods and interpretation of results. Walk-through sessions in the experimental laboratories will be held to familiarize participants. A limited number of actual hands-on (particularly of association analysis of genome-wide marker data) sessions will be held, in which participants will carry out analyses of real data sets.

Invited Lectures: We will invite prominent clinicians and researchers in human biomedical genetics to deliver special invited lectures.

Discussion of Landmark Publications: Participants will be provided copies of some landmark papers to read and discuss during the Winter School.