Content:

All research lines at the LMU have a strong methodological focus

1. Research Line 1:
Genetic Epidemiology and Statistical Genetics in Complex Diseases
2. General Description of the Research Line:
This research line focuses on association and linkage analysis aiming at the genetic mapping of complex traits as well as at the integration of 'omics data.
3. Specific Subtopics within the Research Line:
Genetic epidemiology deals with the identification and characterization of genes responsible for diseases in humans. The two paradigms of statistical analysis in genetic epidemiology are linkage and association analysis. Linkage analysis investigates co-segregation between genetic markers (with known position in the genome) and an unknown disease locus within families, and association analysis looks at the correlation between alleles at marker and disease locus on the population level. Whereas linkage analysis has led to the successful mapping of many Mendelian diseases, genome-wide association studies (GWAS) with chip-based genotyping using common genetic variants have resulted in the identification of numerous genes that are responsible for a variety of common complex traits. The advancement of molecular genetic technology has made genome-wide sequencing possible, at least for small to moderate sample sizes, which allows for analyzing rare genetic variants. Furthermore, it has recently become possible to measure other molecular markers such as DNA methylation, gene expression, and metabolites in human serum, so-called 'omics data, on a large scale. These developments give rise to a variety of research questions and topics regarding the application and further development of statistical methods in genetic epidemiology: • Combination of population-based and family information with the goal to identify previously unknown disease genes with moderate effects • Modeling gene-gene and gene-environment interactions and the effect of mitochondrial DNA in the context of complex traits • Integration of genetic, epigenetic, and metabolomic data and their joint analysis for disease risk • Development and implementation of new statistical methods to adequately model complex modes of inheritance (e.g. imprinting, sex-specific effects, overdominance) • Optimization of algorithms for linkage and association analysis • Establishment and validation of prediction models with genetic and other molecular markers as a prerequisite for an individualized prevention
4. Contact Person for Interested Students/Teaching Staff:
Prof. Dr. Konstantin Strauch (strauch@helmholtz-muenchen.de)
5. Field of Research (for Example: Epidemiology, Public Health, Statistics, Medicine):
Epidemiology, Statistics, Informatics, Mathematics
6. For which Levels the Research Line is Applicable (Undergraduate, Master, Doctorate, Post-Doctorate/Teaching Staff)
Master, Doctorate, Post-Doctorate

1. Research Line 2:
Clinical Trials and Translational Medicine
2. General Description of the Research Line:
This research line covers a wide spectrum of problems in clinical epidemiology with a strong link to molecular medicine. Recent results concern methodology for diagnostic and

prognostic research. The focus of this line is on clinical trials and their use in translational medicine. The group takes part in many clinical research studies and is partner in the Munich cluster for development of personalized treatment strategies.

3. Specific Subtopics within the Research Line:

- prognostic studies
- diagnostic studies
- instruments and strategies of quality assurance in the clinic
- …

4. Contact Person for Interested Students/Teaching Staff:

Prof. Dr. Ulrich Mansmann (mansmann@ibe.med.uni-muenchen.de)

5. Field of Research (for Example: Epidemiology, Public Health, Statistics, Medicine):

Epidemiology, Statistics

6. For which Levels the Research Line is Applicable (Undergraduate, Master, Doctorate, Post-Doctorate/Teaching Staff)

Master, Doctorate, Post-Doctorate

1. Research Line 3

Cancer health care: Outcomes Research, Health Economics and Health Technology Assessment

2. General Description of the Research Line

Focus of this research line is to initiate outcomes research projects, health economic analyses in cancer care based on real world data from primary retrospective/prospective data collection and secondary data (e.g. cancer registries). Systematic literature assessments will complement the before mentioned studies. Due to demographic changes predicted cancer cases will range between increase between 17% and 28% compared to 2014. In Germany, total costs for cancer care reached are expected to reach EUR 17.2 billion in 2020. In the last two decades innovative treatments moving from classical cytotoxic cancer therapy to new so-called 'targeted therapies' have been developed, marketed and changed treatment paradigms. In this context the question how to generate appropriate data to optimize cancer health care from in times of a growing number of patients, innovative cancer therapies and limited resources is central from different perspectives.
Overall focus will be the development of innovative study designs, development of appropriate methods (including definition of prerequisite variables / data and tools to answer appropriately questions associated with the above mentioned research question.
Multiple myeloma will use as an example.

3. Specific Subtopics within Research Line

- Observational studies (retrospective and prospective) to determine treatment patterns, patient flows and associated outcomes, to identify unmet medical and patient-relevant needs and to collect data on resource consumption and respective costs
- Evaluation of guideline adherence, development of quality criteria to develop a pragmatic quality management programme for usage in routine clinical care
- Systematic literature research according HTA requirements: to evaluate published literature regarding methods and Outcomes
- Model calculations

4. Contact Person for Interested Students/Teaching Staff

Prof. Dr. Helmut Ostermann Helmut.Ostermann@med.uni-muenchen.de
Karin Berger Karin.Berger@med.uni-muenchen.de

5. Field of Research (for Example: Epidemiology, Public Health, Statistics, Medicine)
Outcomes Research, Health Economics, Statistics, Medicine
6. For which levels the Research Line is Applicable (undergraduate, Master, Doctorate, Post Doctorate / Teaching Staff)
Master, Doctorate, Post-Doctorate

1. Research Line 4:
Analysis and Modelling of Complex Systems in Biology and Molecular Medicine
2. General Description of the Research Line:
The general aim is to develop novel methodology emerging from challenging substantive problems in such complex systems and to apply it in collaboration with colleagues from biology and medicine. The centre will constitute the computational, mathematical and statistical backbone for interdisciplinary research in biology and medicine, in particular in molecular life sciences at the LMU. It provides high-performance resources from computer science, statistics, mathematics and physics to collaborators in natural sciences, initiating a core facility for a Centre of Quantitative Methods in a School of Science. In close interaction with experimental life sciences this will contribute to novel concepts for investigating complex biological and medical systems with a high potential to revolutionise our view and practice of biomedical research and its applications.
3. Specific Subtopics within the Research Line:
Investigation of complex biological and cellular systems
4. Contact Person for Interested Students/Teaching Staff:
Prof. Dr. Ulrich Mansmann (mansmann@ibe.med.uni-muenchen.de)
5. Field of Research (for Example: Epidemiology, Public Health, Statistics, Medicine):
(Biology, Medicine, Bio-Informatics, Mathematics, Biostatistics)
6. For which Levels the Research Line is Applicable (Undergraduate, Master, Doctorate, Post-Doctorate/Teaching Staff)
Master, Doctorate, Post-Doctorate

1. Research Line 5:
Evidence-Based Prevention and Modelling of Chronic Diseases
2. General Description of the Research Line:
The project addresses the modelling and analysis of complex chronic diseases. Various diseases will be analysed, but the main focus is on the application-oriented, interdisciplinary development of methods. Using the example of colorectal cancer, it will be shown how relevant information may be merged. There are extensive data collections concerning this disease (Munich Cancer Registry, cohort studies in process, data from health insurance and hospital data). The course of the disease, the effects of colonoscopy, the disease's impact on functional health and the implementation of the programme will be studied, modelled and evaluated based on data collected. From this arises a methodological framework that enables the description of typical health biographies and the balancing of alternatives in disease management. A standardized body of tools is then extracted, which permits precise and realistic modelling of chronic disease under the specific conditions of the German health care system. In the analysis of the course of the disease, further aspects should be taken into account, such as differences in the functioning of patients and the acceptance of prevention programmes resulting from adequate risk communication and perception.
3. Specific Subtopics within the Research Line:

• modelling and analysis of the history of complex chronic diseases • differences in the functioning of patients • acceptance of prevention programmes resulting from adequate risk communication and perception
4. Contact Person for Interested Students/Teaching Staff:
Prof. Dr. Ulrich Mansmann (mansmann@ibe.med.uni-muenchen.de)
5. Field of Research (for Example: Epidemiology, Public Health, Statistics, Medicine):
(Statistics, Mathematics)
6. For which Levels the Research Line is Applicable (Undergraduate, Master, Doctorate, Post-Doctorate/Teaching Staff)
Master, Doctorate, Post-Doctorate

1. Research Line 6:
Methods for and Analysis of Clinical Trials and Registry Studies
2. General Description of the Research Line:
In our working group, we deal with a couple of clinical trials, predominantly in the field of chronic myeloid leukemia. We also collect registry data. Research covers the comparison of treatment strategies, in dependence on the trial, aiming at improvement of overall survival, the achievement of molecular remission, reduction of adverse events, or survival without molecular relapse. A particular focus of our scientific interest is prognostic research.
3. Specific Subtopics within the Research Line:
• Methods in planning and analyzing clinical trials • Prognostic research • Survival analyses • Analysis of competing events
4. Contact Person for Interested Students/Teaching Staff:
PD Dr. rer. biol. hum. Markus Pfirrmann (pfi@ibe.med.uni-muenchen.de)
5. Field of Research (for Example: Epidemiology, Public Health, Statistics, Medicine):
Biometry, Epidemiology
6. For which Levels the Research Line is Applicable (Undergraduate, Master, Doctorate, Post-Doctorate/Teaching Staff)
Master, Doctorate, Post-Doctorate

Further Information
A list of the professors of the medical faculty of the LMU can be found here:
http://www.en.uni-muenchen.de/about_lmu/introducing-lmu/people/professors_list/index.html
Scroll down to “Faculty of Medicine”.