

PROFILE

Censtat has been established in May 1998, thanks to the growth of the statistics research group, which already exist since the foundation of the university in 1973. Ten years after its foundation and based on strong collaborative links, CenStat decided to join forces with L-BioStat.

| Category | Biostatistics | Statistical Bioinformatics & Statistical Genetics | Mathematical Statistics |
|---------------------------------|---|---|---|
| Professors | Geert Molenberghs Marc Aerts Christel Faes Helena Geys | Tomasz Burzykowski Ziv Shkedy | Noël Veraverbeke Paul Janssen Roel Braekers |
| Part-time Professors | Ariel Alonso Abad, Luc Bijmens, Marc Buyse, Luc Duchateau, Niel Hens, Emanuele Lesaffre, Herbert Thijs, Emmy Van Kerkhove, Geert Verbeke, Joost Weyler | | |
| Postdoctoral Researchers | José Cortiñas Abrahantes, Annuschka Laenen, Dan Lin, Saskia Litière, Cristina Sotto, Suzy Van Sanden | | |
| Consultants | Full-time: Liesbeth Bruckers, Herbert Thijs; Part-time: : all CenStat members Administration: Kris Callaert | | |
| Predoctoral Researchers | Amparo Castro Sanchez, Jurgen Claesen, An Creemers, Emanuele Del Fava, Auguste Gadhah, Candida Geerdens, Arthur Gitome, Nele Goeyvaerts, Yves Grouwels, Akililu Habteab Ghebretinsae, Philippe Haldermans, Adetayo Kasim, Tatsiana Khamiakova, Elasma Milanzi, Girma Minalu Ayele, Thomas Neyens, Edmund Njagi, Ruth Nysen, Setia Pramana, Leen Prenen, Birhanu Teshome Ayele, Qi Zhu | | |

Key Figures 2009

Research budget: € 1.660.000
Researchers: 68
Publications: 95
PhD theses: 6

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Useful links

<http://www.censtat.be/> - <http://www.ibiostat.be/>
<http://www.censtat.be/reports/> - <http://www.censtat.be/phd/>



Center for Statistics, a division of I-BioStat HIGHLIGHTS 2009

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PREFACE

In 2009 CenStat had to confront many challenges and initiatives that were initiated in 2008. There was the foundation of I-BioStat, the new Interuniversity Institute for Biostatistics and statistical Bioinformatics, joining forces of CenStat and L-BioStat, the Biostatistical Center of the Katholieke Universiteit Leuven (KUL).



CenStat and I-BioStat are dedicated to the integration of three pillars: research, education and scientific collaboration and consultancy. Successes of the pillars are transferred to each other. For example, the trajectory 'Epidemiology & Public Health Methodology' is implemented since 2009-2010 and received a formal accreditation for the next eight years.

CenStat also has a scientific collaboration with the VAXINFECTIO Institute of the University of Antwerp (UA), in the field of epidemiology and infectious diseases. This resulted in a Methusalem research project. Its annual report confirms that the first year of the consortium has been a success.

2009 has also been a good year for our consultancy unit, with projects from industry and governmental institutes and from the European Community. Several consultancy projects and contacts started from a standard project and grew further into research grants or found their way into our master program.

Further on in this brochure, you will find more information on CenStat's realizations in 2009, centred around the three pillars.

Professor Marc Aerts
Director of the Center for Statistics

Professor Geert Molenberghs
Director of the International Institute for Biostatistics and statistical Bioinformatics



SCIENTIFIC HIGHLIGHTS 2009

SCIENTIFIC AWARDS and HONORS

In August **Geert Molenberghs** received an 'Excellence in Continuing Education Award of the American Statistical Association' for his course on discrete longitudinal data. He also received 'the Belgian Francqui Chair 2008-2009' at Antwerp University.

The scientific chair 'Evidence-based Vaccinology' at the UA, was appointed to **Niel Hens**, with promoters Philippe Beutels and Pierre Van Damme of the UA.

Emanuele Del Fava won the first prize for student paper competition at the 'IBS Channel Network Conference' in Ghent.

Christel Faes won the 'prize of the Flemish Society for Veterinary Epidemiology and Economy (VEE) 2009', to honor and stimulate a contribution to the fields of fundamental or applied research in veterinary epidemiology.

I-BIOSTAT

In the second year after its foundation, we can say that I-BioStat completed its first critical year of life with success. Six PhD students are active on the project 'A powerful modeling framework for efficient design and analysis of life science studies'. Three of whom are located in Leuven, the other three in Hasselt.

METHUSALEM research project

Together with the VAXINFECTIO Institute, CenStat obtained a Methusalem research project in 2008. The first annual report 2008-2009 proves that the first year of the consortium has been very successful (<http://www.censtat.be/reports/>).

CenStat accredited for their Master of Statistics

The Visiting Committee concluded that our Master of Statistics reaches its objectives and stands as a recognized reference for an international statistics

program. It is focused on training students from all over the globe. Because of the favorable evaluation by the Flemish Interuniversity Council, our Master of Statistics received the formal accreditation in September 2009, valid for the next 8 years.

RESEARCH TOPICS

Topic 1: Mathematical statistics

In statistics, one develops methods and techniques for the analysis of data. To make conclusions, one needs appropriate probability models to underpin the uncertainty.

Methodology

Our principal investigators use probabilistic tools to develop models for analysis of specific data types. Important are the analysis of survival data. They are often censored, not fully observed, which complicates statistical analysis.

Results

To evaluate methods, researchers rely on asymptotic properties. The distribution of the statistical quantity of interest can be approximated by a normal distribution. Showing the validity of such results requires probability theorems. These asymptotic results are the key for the construction of approximate confidence intervals. To answer practical questions for finite sample sizes, one relies on approximation methods. The use of such methods is based on asymptotic arguments.

Topic 2: Surrogate endpoints: hopes and perils

The cost of drug development has increased the demands on efficiency in the selection of suitable drug candidates. Surrogate endpoints have emerged to improve this process, hoping they help reducing duration and cost of clinical trials.

Methodology and results

Owing to historical events and in spite of potential advantages, the use of surrogate endpoints is a controversy. A well-known case is the approval by



the Food and Drug Administration of three antiarrhythmic drugs. They were approved because of their capacity to suppress arrhythmias and they would reduce the death rate. However, a trial showed that the active-treatment death rate was double the placebo rate.

Research CenStat

A key problem was the lack of a formal statistical framework for the evaluation of surrogates. In 1989 the University of Washington proposed a definition of surrogate endpoints. CenStat has strongly contributed to the literature on surrogate markers, with papers in refereed journals and a Springer book. Numerous presentations and short courses have been given by CenStat members on this topic.

Topic 3: Statistics in toxicology

Toxicology is the study of the adverse effects of chemicals on animals and humans. Adverse events could occur when practically any substance is given in excessive doses.

Methodology

Testing the safety of a compound is complex. One is interested in any dose dependencies, in relationship among parameters and gradients in toxic effects in time. Controlled animal experiments are needed to guarantee the safety of tests on humans. But one wants to refine testing procedures so that animals experience less pain and to replace animals with non-animal testing systems. It is essential that the most appropriate and efficient statistical models are used to determine whether there is a possible adverse effect.

Research CenStat

CenStat has experience with the development of statistical methods to more efficiently characterize the dose-response relationship and estimate a safe dose level. CenStat has contributed to the literature in the area of toxicology with respect to the use of all sorts of data.

Topic 4: Measuring the mind

Psychometrics is the scientific field concerned with the theory of educational and psychological measurement. The field focuses on the construction and validation of measurement instruments like rating scales, educational tests, etc. It is also necessary for the development of tools to appraise the presence of mental problems like depression and anxiety.

Research CenStat

CenStat has mainly focused on the validation of rating scales used in psychology, psychiatry and cancer research. Important extensions of fundamental concepts have been proposed by our researchers. The recent advances in fields like neurosciences, statistics, etc. give us confidence that profound contributions will take place in the next ten or fifteen years in psychometrics.

VALORISATION

Researchers from I-Biostat and **Janssen Pharmaceutica** collaborate in the area of functional genetics in the phase of early drug development.

Flemish Government initiates projects to study the relationship between pollution and public health. The program studies the impact of living in the vicinity of a point source on the internal exposure of the inhabitants.

In most clinical trials safety is a very important feature. For this reason an **Independent Data Monitoring Committee (IDMC)** is composed, to monitor the evolution of the trial with respect to safety of the drug.

CenStat has an intensive collaboration with **Eli Lilly**. Most projects fit within the context of missing data, one of the key I-BioStat research topics. The collaboration with Eli Lilly is a two-way interaction, it also encompasses a strong research component.

Drug development involves three key players: the biopharmaceutical industry, industry itself and the regulatory authority. I-BioStat interacts with **Drug Development Regulatory Authorities** in the US and Europe.

Over the last five years, CenStat has completed several consultancy projects for the **European Food Safety Agency**, within a multiple framework contract.

Projects Modelling Infectious Diseases focuses on the estimation of epidemiological parameters. CenStat collaborates intensively with VAXINFECTIO.

StatCom Hasselt was founded to increase engagement between the university and the surrounding community. It is a student run organization providing statistical support to governmental and non-profit organizations at a pro bono basis.

