Preface

The *European Seminar on Mathematical Methods for Survival Analysis, Reliability and Quality of Life* was created in 1997 by C. HUBER, N. LIMNIOS, M. NIKULIN and M. MESBAH, and, thanks to our respective laboratories and also to the supporting universities (see list below), it ran regularly during the last 10 years. 2007 is a special year as our European Seminar celebrates its 10th birthday. This seminar aims to give a review of recent research in the field of survival analysis, reliability, quality of life, and related topics, from both statistical and probabilistic points of view. Three or four sessions take place every year at the participating universities.

Besides these regular annual sessions, the European seminar supported many international conferences and workshops in France and abroad: for instance, in 2000, GOF2000 (Goodness Of Fit) in Paris and MMR2000 (Mathematical Methods in Reliability) in Bordeaux, in 2004, an international workshop on "Semi-parametric Models" organized at Mont Saint Michel and, more recently, Biostat2006 in Cyprus. More than 14 international workshops, 26 seminar sessions and about 150 talks were organized during the last ten years (see Appendix A).

Reliability and survival analysis are important applications of stochastic mathematics (probability, statistics and stochastic processes) that were usually treated separately in spite of the similarity of the involved mathematical theory. Reliability is oriented towards technical systems studies (without excluding the human factor), while survival analysis and quality of life are oriented towards biological and medical studies (without excluding the technical factor). The lifetime T of a technical system, of a human patient or of a bacteria is a non-negative random variable, and the same function of the time t, $Prob(T > t)$, is stated as the reliability function, denoted $R(t)$ in reliability theory, and as the survival function, denoted S(t), in medical applications. Nevertheless, even if the function to investigate is the same, the objectives are not always identical. In the field of reliability, most of the time, systems are ergodic and large, which is not the case in survival analysis. Thus, techniques developed in order to evaluate or to estimate the reliability/survival function are not always based

on the same fundamental results. However they also include several common techniques: Cox models, degradation models, multi-state approaches (i.e., Markov and semi-Markov models), point processes, etc.

While it is recognized that quality of life is ultimately as important as quantity of life (survival time), efforts to implement quality of life measurements often fail. Statistical methods to analyze time of events are nowadays well established; opinions are largely agreed on between statisticians, clinicians and industrial professionals. Unfortunately, in the quality of life field, there is no standard instrument to measure it, no standard methodology to validate measurement instruments (questionnaires) and no standard statistical methodology to analyze obtained measurements. Specific development and application of modern psychometrical measurement models (latent variable models including the Rasch model) and connection with utility theory are important issues. A more recent issue is the joint analysis of the latent quality of life and external variables such as treatment, evolution (longitudinal analysis) and/or survival time.

The present book includes 21 chapters divided into four parts:

I. Survival analysis

II. Reliability

III. Quality of life

IV. Related topics

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