

CHAPTER 53

STATISTICS

Doctoral Theses

01. KAGDIYAL (Puja)
Some Contributions to Trend Free Designs.
Supervisor : Dr. Poonam Singh
Th 22920

Contents

1. Introduction 2. Construction of linear trend-free fractional factorial design through finite field. 3. Construction of linear trend-free fractional factorial designs using linear codes 4. Construction of trend free orthogonal arrays using some linear codes 5. Minimum level change trend free factorial designs using projective geometry 6. Restricted randomized two level fractional designs using gray code. Appendix. References

02. MITTAL (Juhi)
Parametric Models for Estimating Onset Time of Nephropathy in Type 2 Diabetic Patients.
Supervisor : Dr. Guprit Grover
Th 22921

Contents

1. Introduction 2. A Bayesian approach for estimating onset time of nephropathy for type 2 diabetic patients under various health conditions 3. Estimation of survival function of diabetic nephropathy patients using gamma generalized linear model 4. Application of multivariate and bivariate normal distributions to estimate duration of diabetes 5. Estimation of survival function and probability of onset of diabetic nephropathy using path analysis and analysis of covariance 6. Conclusion and future studies. Bibliography.

03. PATHAK (Anupam)
Contributions to Estimation Procedures for Some Exponentiated Distributions.
Supervisor : Dr. Ajit Chaturvedi
Th 23069

Abstract (Not Verified)

The three-parameter exponentiated Weibull distribution is considered. The uniformly minimum variance unbiased estimators (UMVUES) of the reliability function $R(t)=P(X>t)$ and $P=P(Y<X)$ under stress-strength set-up are derived for the family under complete sample. The maximum likelihood estimators (MLES) for $R(t)$ and 'P' are also developed and extended for the case when all the parameters are unknown. Bayes estimators are derived for the reliability function $R(t)$ and 'P' both under squared error loss function (SELF) and general entropy loss function (GELF). In order to obtain these estimators, the major role is played by the UMVUES, MLES and Bayes estimators of the powers of parameter(s) and the functional forms of the parametric functions to be estimated are not needed. Next, we have

considered two-parameter exponentiated inverted Weibull distribution, two-parameter exponentiated Pareto distribution, two-parameter exponentiated Rayleigh distribution. The UMVUES and MLES of the reliability function $R(t)$ and 'P' are derived under complete sample. We have proposed four-parameter exponentiated exponential-Weibull distribution and four-parameter exponentiated generalized Lomax distribution. We have plotted probability density function (pdf) as well as hazard rate function with respect to different values of the parameters. The UMVUES and MLES of the reliability function $R(t)$ and 'P' are derived under complete sample. In order to examine the performance of MLES and UMVUES of power of the parameters, reliability function $R(t)$ and 'P' in all the chapters of the thesis, we have conducted a simulation experiment using Monte Carlo technique over different sample sizes. For the case when all the parameters are unknown, estimates of the MLES of reliability function $R(t)$ and 'P' are also derived. All the necessary computer programs are developed in R software.

Contents

1. The Conception, growth and development of reliability inference 2. Classical and Bayesian estimation procedures for three-parameter exponentiated Weibull distribution 3. Estimation of the reliability function for two-parameter exponentiated inverted weibull distribution 4. Estimation of the reliability function for two-parameter exponentiated pareto distribution 5. Estimation of the reliability function for two-parameter exponentiated rayleigh or burr type x distribution 6. Estimation of the reliability function for four-parameter exponentiated exponential-Weibull distribution 7. Estimation of the reliability function for four-parameter exponentiated generalized lomax distribution. References.

04. SWAIN (Prafulla Kumar)

Estimation of Survival of HIV/AIDS Patients on Antiretroviral Therapy in the Presence of Covariates using Accelerated Failure Time Models with Frailty Effects.

Supervisor : Dr. Gurprit Grover
Th 22922

Abstract (Verified)

The HIV/AIDS epidemic is one of the most notorious infectious diseases in the twenty first century. Its morbidity and mortality rates are staggering, currently an estimated 35.3 million people living with HIV/AIDS worldwide. Statistical modeling can be a vital tool for understanding the epidemiology of HIV/AIDS, and thus contribute towards the prevention of new infections as well as providing greater care, support and treatment to people living with HIV/AIDS. In this thesis, we have made an attempt to study the disease progression using Multistate Markov model and survival patterns of HIV/AIDS patients undergoing Antiretroviral Therapy (ART), and determine significant biological and socio-demographic factors while controlling the unobserved heterogeneity in the population. Also, a joint model have been developed to simultaneously study the longitudinal repeated measures on CD4 cell counts and the time to event (event being defined as lost to follow-up) process of HIV/AIDS patients undergoing ART. Moreover, we have also estimated the probability of death of AIDS patients due to the opportunistic infection Tuberculosis (TB), in the presence of other competing risks viz. Diarrhea, Other infection and Unknown causes. The data have been collected from the ART centre at Ram Manohar Lohia Hospital, New Delhi, India. The data comprises of a cohort of patients who had reported to the ART centre at various points of time during April, 2004 to December, 2010.

Contents

1. Introduction 2. A Multistate markov model based on CD4 cell counts for disease progression of HIV/AIDS patients on antiretroviral therapy 3. On the estimation of survival of HIV/AIDS patients on antiretroviral therapy using NPMLE method: An application to interval censored data 4. Accelerated failure time shared frailty model approach: To study the prognostic factors affecting survival of HIV/AIDS patients on anti-retroviral therapy 5. A joint modeling approach to assess the impact of CD4 cell

count on the risk of loss to follow up in HIV/AIDS patients on antiretroviral therapy
 6. A competing risk approach with censoring to estimate the probability of death of HIV/AIDS patients on antiretroviral therapy in the presence of covariates
 7. Conclusion and future studies. Bibliography. Appendix

05. TIWARI (Rashmi)

Some Aspects of Moments of Ordered Statistics.

Supervisor : Prof: Jagdish Saran and Dr. Narinder Pushkarna

Th 22923

Abstract
(Not Verified)

The thesis comprises seven chapters. Chapter I is an introductory one which introduces the concepts/definitions needed to grasp the contents of the subsequent chapters. In Chapter II, we have established some recurrence relations for single and product moments of order statistics from doubly truncated Bass diffusion model. Further, in this chapter, for exponentiated inverted Weibull distribution, we have established explicit expressions and recurrence relations for single and product moments of order statistics, L-moments and TL-moments, L-moment and TL-moment estimators of unknown parameters and compared their efficiencies with MLEs of parameters involved in terms of their MSE's. Chapter III deals with recurrence relations for higher moments of order statistics from doubly truncated exponential, doubly truncated Burr and two parameter Lindley distribution. Further, for Lindley distribution, we have also done parameter estimation based on L-moments and TL-moments and compared their efficiencies in terms of MSE's. In Chapter IV, we have derived explicit expressions for Bonferroni Curve, Bonferroni index, Lorenz Curve and Gini index for Marshall-Olkin exponential distribution. Also, for this distribution, we have derived recurrence relations for single and product moments of progressive type-II right censored order statistics. Further, we have also considered Frechet distribution and obtained recurrence relations for single and product moments of progressive type-II right censored order statistics, L-moment and TL-moment estimators of parameters involved and compared their efficiencies with MLEs in terms of their MSE's. Chapter V deals with recurrence relations for single and product moments of generalized order statistics from Lindley distribution and also from a general class of distributions. Chapter VI deals with certain recurrence relations for single and product moments of dual generalized order statistics from a general class of distributions. The last Chapter VII is conclusion chapter, which highlights the findings given in different chapters of this thesis.

Contents

1. Introduction 2. Relationships for single and product moments of order statistics 3. Relationships for higher moments of order statistics 4. Bonferroni and gini indices and relationships for moments of progressively censored order statistics 5. Relationships for moments of generalized order statistics 6. Relationships for moments of dual generalized order statistics 7. Conclusion.

06. GUPTA (Vinay Kumar)

Some Contributions to Multiple Imputation for Missing Data in Survival Analysis

Supervisor : Dr. Gurprit Grover

Th 23141

Abstract
(Not Verified)

An overview of missing data analysis is provided in the first chapter with the focus on the brief description of Multiple Imputation (MI). Two popular multiple imputation techniques, namely Markov Chain Monte Carlo (MCMC) and Multiple Imputation by Chained Equations (MICE) are used for this purpose. Five chapters for five distinct missing data problems in survival analysis are included in this thesis. In chapter two, a two level growth curve model in the form of linear mixed effects regression model is used for multiple imputation. of missing BMI z-score of students from an unbalanced

longitudinal data. In chapter three, an MI technique was proposed using generalized linear model to impute the missing values of an outcome variable that follows gamma distribution. In chapter four, performance of MICE technique was assessed for the analysis of right censored data using restricted survival time when some of the covariates are missing. In chapter five, performance of multiple imputation technique for interval censored data with competing risks is assessed to impute the exact survival time in the presence of loss to follow up as a competing risk. In this chapter six, an extension of the technique used in chapter five was proposed to impute the interval censored data along with the missing covariate values. In this thesis, new algorithms are provided for the computational strategies of MI which were previously not available in literature. In all the analyses, it is shown that the results of MI technique are better in terms of lower standard errors. However, the performance of MI technique is also assessed through simulation studies and through cross validation analysis. Finally, it can be re-iterated that if the proportion of missing data is large enough that is more than 10%, MI technique can be used instead of using only observed data analysis.

Contents

1. Introduction 2. Multiple imputation for growth curve model 3. Multiple imputation for gamma outcome variable using generalized linear model 4. Multiple imputation of censored survival data with missing covariates 5. Multiple imputation of interval censored data of HIV/AIDS patients with loss to follow up as a competing risk 6. Multiple imputation of interval censored data with competing risk and missing covariates. Conclusion and idea of future research. List of published research work. Bibliography.