Abstract

An important area of statistical applications is the estimation of mortality. The study of mortality in a population is essential for the knowledge of the evolution of its main indicators (life expectancy, infant mortality, etc.) as well as to make demographic projections. Mortality is an indicator of the situations involving health as well as the living conditions and the aging process of a population. The study of mortality is useful for analysing current demographic conditions and for determining the prospects of potential changes in mortality conditions of the future. The investigation of mortality which is the oldest subject in demography is first brought under systematic and rigorous analysis through the idea of a life table. A more entire picture of mortality is given by a life table which demonstrates the death rate independently for each age. Complete life tables for the districts of Assam are not available in sample registration system (SRS). In this thesis, an attempt has been made to construct complete life tables for 23 districts of Assam namely Kokrajhar, Dhubri, Goalpara, Bongaigaon, Barpeta, Kamrup, Nalbari, Darang, Marigaon, Nagaon, Sonitpur, Lakhimpur, Dhemaji, Tinsukia, Dibrugarh, Sibsagar, Jorhat, Golaghat, Karbi angling, North Cachar, Cachar, Karimganj, Hailakandi for both male and female. The following models namely Gompertz, Makeham, Logistic, Beard, Kannisto, Coale Kisker (Quadratic) have been considered in our investigation that to find a suitable mortality model Assam human population. The feasibility of the Lee Carter model for projecting the mortality for the Assam population for total, male and female has also examined.

The thesis comprised of six chapters including the introductory chapter. The first introductory chapter gives the fundamental definition and introduces the mortality models which are used in this thesis. The death registration system of India is not satisfactory and thus by utilizing the conventional method life tables cannot be constructed [9], [6]. In Chapter 2, an indirect method of constructing abridged life tables covering 23 districts of Assam for both male and female is introduced. For this, first the model life tables of Assam have been generated by estimating life table functions $e^0{}_x$ and ${}_nq_x$ for both male and female. The regression method of curve estimation [12] has been used to estimate $e^0{}_x$ and ${}_nq_x$. The SRS data covering a time period of 15 years from 1995-99 to 2009-13 (Census of India, Sample Registration

System) for Assam have been used. The generated model life tables of Assam serve as model life tables for districts of Assam with ${e^0}_0$ [51] as the only input.

In Chapter 3, a comparison has been made to select the best fit model between Gompertz and Makeham model for extrapolating survivors in a life table past beyond the last age for Assam for total, rural and urban population for both the genders. The parameters of these two models are estimated using two methods of estimation. The best-fit mortality model has been selected on the premise RMSE and R^2 value. Based on our results, it may be concluded that Makeham model is the suitable model for projecting the survivors for Assam for total, rural and urban population for both male and female.

In Chapter 4, the most commonly used parametric mortality models namely Gompertz, Makeham, Logistic and Beard have been analysed for describing the mortality pattern of districts in Assam. The mortality pattern is divided by two age groups 20-60 and 60-100 for the purpose of separating working years and retirement so that separate laws of mortality can apply to these groups. The main objective of the chapter 4 is to find a suitable mortality model for people of mortality of districts in Assam. Ten districts have a sufficiently reliable data to be useful for the specialized purpose of the present analysis: five high population growth rate districts: Darang, Dhubri, Goalpara, Morigaon and Nagaon and five low population growth rate districts: Golghat, Jorhat, Sibsagar, Dibrugarh, and Tinsukia.

In Chapter 5, the best-fit mortality model has been selected for the oldest-old force of mortality rates for Assam. For extending the force of mortality for ages 100 and over, six mortality models: Gompertz, Makeham, Logistic, Kannisto, Beard and Coale-Kisker models have been considered.

In Chapter 6, the Lee Carter model has been examined for projecting the mortality for total, male and female Assam population. The model has been fitted to the matrix of Assam death rates based on 15 years data separately for total, male and female for the Assam populations in the form of life tables for the period 1995-99 to 2009-13. The Singular Value Decomposition (SVD) methodology has been applied to estimate the parameters of the model. A time-varying index of mortality has been forecasted up to 2025 year using random walk drift (RWD) model and has been used to generate projected life tables.