ABSTRACT

Demography is the science of human population. It deals with the size, territorial distribution, composition of the human population and changes therein. The interaction among the three components of population dynamics, fertility, mortality and migration, is responsible for the change in size, distribution and composition of population. Besides a substantial reduction in mortality rate around the world since the commencement of the last century, decline in fertility began much later which has caused an alarming rate of growth of the population leading to population explosion especially in developing countries. This has created a severe problem before the policy makers and researchers.

Demographers and social scientists have been much influenced by demographic models as they provide concise representations of extensive data sets and motivate to develop further work as well. A study of demographic models based on nature and fundamental demographic components helps one to understand a phenomenon more clearly and to draw inferences accordingly. However, the formulation of models in social sciences (including demography) are in scanty and are of recent origin as no controlled experiments are possible on human beings to study the real situation. Moreover, there is no unique and unified model in demography, which may satisfy all types of demographic phenomena. Population projection is an analytical tool to experiment with demographic processes for better understanding about the future size of population. It is the process of predicting population at a future date.

The main objective of this study is to develop some models and/or utilise some existing models on demographic variables viz., Migration models, population projection, ultimate population, and population momentum.
Models of this thesis are illustrated by using various sets of real and hypothetical data obtained from different sources.

There are five chapters in this thesis.

**Chapter I** is an introductory one which highlights the objective of this study. A brief literature review of the previous works concerning this study is also given. Chapters II to VI deal with different components responsible for the changes occurring in the population of any region in some way or others.

Most studies related to the family planning/contraceptive uses are based on the descriptive analysis pertaining to the levels and trends in contraceptive prevalence and unmet need for family planning and also about assessment of the diversity of contraceptive methods used. But a model based study of linkage between the population growth reduction and age dependent use of family planning methods is very rare. In **Chapter II**, the impact of various contraceptive policies on Indian population has been studied through some model based approach in stability conditions. The chapter is divided into two sections. First section deals with finding the required proportion of contraceptive users to get the desired reduction in the rate of increase. In the second section, making an abrupt change in fertility schedule through a simulated programme of population control, expressions for birth trajectory and hence the population size at any time \( t \) for \( t \leq \alpha \), where \( \alpha \) is the lower limit of the reproductive period. Also population size for longer duration has been estimated under the given fertility schedule.

Several studies have been conducted to derive various models for the size of population at some future time under stable population theory and varying path of fertility reduction. These models have been derived for closed populations as per the assumptions of stable population. But, it is difficult to keep a society closed to migration for a long time since movement in a society
is unavoidable for its development. In the first part of chapter III, some expressions for population projection under the stability condition with effect of emigration have been derived Models are illustrated by taking some numerical values of the parameters involved therein. A very simple procedure for the estimation of Total Fertility Rate (TFR) of migrated couples, based on closed birth interval has been suggested in the second section of this chapter. It explores the impact of temporary separation due to the migration of males leaving their wives at home, on fertility through a theoretical procedure proposed under reasonable assumptions. The present procedure has been applied to an observed set of data relating to migrants from a rural area.

In Chapter IV, an attempt has been made to develop some formulae to estimate for population size at longer times by making use of the reproductive value of the population concerned under the concept of stable population theory under changed fertility and mortality schedules. Both gradual and abrupt shift in fertility schedule have been considered in developing models.

As stated before, various modes have been developed to estimate population size in stability conditions but despite various progresses made in population projection under stability conditions, the analytical approaches fail to estimate the time required for a population to achieve stability with accuracy. Chapter V is an attempt to find the time that the Indian population will take to achieve the state of stability.

Migration is not only responsible for changing the size and composition of population of the area of the origin and destinations but also considered to be instrumental in bringing the social and economic change. Demographically, it is an uncertain event in an individual’s life, in common with other vital events such as marriage, divorce, etc. Its study usually covers the estimation of volume of moving population, migration differentials and trends,
determinants of migration process and other implications of migration. This is essentially an interdisciplinary topic and researchers of various fields of knowledge viz. geographers, economists, sociologists, demographers, statisticians and others have made their contributions in their own ways.

In Chapter VI, two probability models based on the concept of weighted distribution have been proposed to study the pattern of male migrants at household level. The parameters involved have been estimated using method of moments and their applicability has been checked by some real data of adult members in the household. The models have also been compared with some previous ones.

The findings of chapter V have been presented in 36th annual conference of Indian association for the study of Population held at University of Kerala, Thiruvananthpuram, during 7-9 November 2014. These are also published in Global Journal of Multidisciplinary Studies. Some of the results of chapter VI have been published in Journal of Statistics Applications and Probability and are also presented in a national conference Population and human development in Bhopal, M.P. during 21-23 January, 2015.

The author believes that the models developed in the thesis will be useful for researchers and other social scientists, which may stimulate future research in the field of population projection, migration and stable population theory. The findings of this study may be fruitful to the researchers and demographers by giving them potential opportunities for extending the models, including the possibility of using them to study other demographic events.