The unprecedented high rates of population growth have stimulated the researchers from various fields to strive to understand the change in population dynamics with respect to it’s composition and vital rates. Fertility, mortality and migration are three of the main demographic factors which govern the pace of population dynamics. Fertility being the most crucial factor in determining the demographic profile of any country has gained the attention of social scientists and demographers to study the complex phenomenon of human reproduction. Precise estimates of human fertility are very important for formulation, implementation and execution of various development plans as well as family welfare programmes. The researchers have intelligibly studied the interrelationships among fertility and it’s social, economic, psychological and physiological determinants.

Owing to inevitable presence of a number of uncontrollable variables, analysing the well defined populations with respect to existing variations in the vital events is a difficult task. The non-experimental nature of the changes taking place in the population dynamics makes this endeavour even more complicated and this accounts for adopting mathematical models based approach to investigate the population dynamics and related aspects. These models can broadly be classified into two categories viz. deterministic and stochastic, depending upon the problem under investigation. The deterministic models take care of the situation
where the outcome is certain but in case of a random phenomenon where the outcome is uncertain, stochastic models pave ways in a better fashion. Under the varying sets of assumptions, the demographers and the social scientists have already developed several such models, which explain the different aspects of fertility. The present research embodies applications of existing demographic models and development of some new models, which are useful in estimating some fertility parameters of interest.

The present piece of work consists of six chapters. A brief description of work done within each chapter is as given below:

**Chapter 1** gives a brief introduction to the topic of study, literature review along with the objectives and major contribution of the present work.

**Chapter 2** explores the levels and trends of contraceptive use before first pregnancy by Indian women and factors affecting this pioneering behaviour. This analysis has been done utilizing the data of National Family Health Survey-3 (2005-2006), India.

**Chapter 3-I** is a modest attempt to estimate the effect of sex selective induced abortion on sex ratio at birth. Assuming the possibility of induced abortion, this chapter proposes a probability model for the expected number of births, expected family size and sex ratio at birth under three sex preferred stopping rules followed by couples and investigates its behaviour under various realistic scenarios.

**Chapter 3-II** proposes a model to estimate the underlying heterogeneity in probability of having a male birth to women and illustrates its application using data from National Family Health Survey-3(2005-2006), India.

**Chapter 4** attempts to show one of the important uses of stochastic modelling by estimating the distribution of women’s age at last conception. These distributions have been obtained for various hypothetical plans characterising couple’s contraceptive use be-
haviours as well as stopping behaviours assuming the possibility of incomplete con-
ceptions.

Chapter 5 essays to apply stochastic modelling for estimating fertility parameters under consid-
eration of varying stopping behaviours of couples. Policy planners and researchers
are often interested to know the behaviour of different fertility measures under cou-
ples’ varying demeanour regarding birth spacing and stopping rules. But it may not
be possible to collect empirical information regarding every possible stopping be-
avour of couples in the society and in this case modelling techniques can be really
helpful.

Chapter 6 is an attempt to explore the nexus among expected family size associated with sex
preferred desired family size and socio-demographic characteristics in Uttar Pradesh.
Furthermore, this chapter addresses the gap in the expected and actual family sizes
for the women who have completed their family and gauges the extent to which the
fertility desires have been realised. This chapter utilised URHI-MLE data.

Some results of the chapter 2 were presented at XXXVI Annual Conference of Indian
Association for the Study of Population held at University of Kerala, Thiruvananthapuram
and was conferred 'Prof. S. N. Singh poster award'. This complete chapter was pre-
sented at International Conference on Family Planning held at Bali, Indonesia and has been
published in BMC: Public Health, 15:1316. Chapter 3-I has been presented at National
Seminar on use of Statistics in Industry and Corporate World held at Banaras Hindu Univer-
sity, Varanasi and also has been accepted for publication in journal Janasamkhya, 32(1 &
2). Chapter 3-II has been accepted to be presented at TIMC-AMS conference being held
at DST, CIMS Banaras Hindu University. Chapter 4 has been selected for participation in
Dr. C. Chandrasekharan young scientist award session in XXXVII Annual Conference
of Indian Association for the Study of Population. The last chapter, chapter 6 has been
presented at ISPS Conference held at University of Lucknow, Lucknow.