Chapter 9

SUMMARY AND CONCLUSIONS

An understanding of the mortality pattern in the country particularly by age and sex is crucial for the purpose of developmental planning to be able to meet the varied needs of all groups of the population. In addition, it would also help to assess the impact of the established health programmes which are geared to improving the quality of life of people by reduction in mortality and morbidity. In the absence of reliable civil registration data and limited use of census data, demographers largely rely on survey data to provide the estimates of fertility and mortality at various levels in order to understand population dynamics and the impact of the on-going health and family welfare programme. Apart from SRS, other special surveys like NSS and NFHS are carried out in the country from time to time with the aim to provide highly precise information about the marriage pattern, fertility, mortality, health and other aspects of the population. However, such surveys with moderate sample size may not be able to provide reliable demographic parameters, particularly estimates of mortality by age and sex at the state or lower levels because of the large sampling error involved in such estimation, apart from the error due to incompleteness of reporting of births and deaths in retrospective surveys. The purpose of the present research was to maximise the use of such surveys to study age-sex mortality pattern across state, region and communities in the country and provide alternative life tables to draw conclusive evidence on the pattern of mortality.

At the first place, while studying the feasibility of use of repeat surveys in the same population to maximize precision of the mortality estimates compared to those derived from one time survey, the

mathematical results derived under the present study suggest that given the data from a series of samples drawn from the same population, the variance of the average over all occasions is always expected to be lower than that of the mean observed on any occasion, in all the situations except one wherein a part of the sample is retained in drawing sample from the same population on each occasion. Thus, for obtaining average over all occasions, minimum variance is obtained either by keeping the same sample or by changing it on every occasion. In other words, if we wish to maximize precision and provide the best combined estimate, by averaging over all occasions, it is best to draw a new sample on each occasion, although the total size of the sample in the repeat surveys need not be the same on each occasion. Similarly, one can retain the same sample throughout all occasions to maximize precision in estimating average over all occasions, although this procedure is equally efficient in estimating the change in the mean from one occasion to the next. Since SRS follows the latter sampling frame, that is, keeping the same sampling units on every occasion in providing yearly estimates of vital rates, an average taken over a few years for a population in which time changes are slow during that period, appears to be adequate in most instances. Similarly, since national/state level surveys like NFHS follow basically the former design that is, by changing the sample on each occasion, an average taken over all occasions may provide a better estimate, particularly in the study of mortality.

In this regard, the two rounds of National Family Health Survey (NFHS) conducted during 1992-93 (NFHS-1) and 1998-99 (NFHS-2) provide an opportunity to study in more detail the mortality pattern by age and sex during the last decade across all the states, regions and communities in the country. In view of the small samples covered in the various states, age specific death rates (ASDRs) in broad age groups and annual crude death rate were published in the state reports of NFHS. Though the NFHS subject reports include a more

detailed study of infant and child mortality in the states as well as in the country as a whole, the detailed study of mortality across all ages, even by region has so far not been undertaken. While SRS data do provide information on age-sex mortality pattern at the state level, they do not provide precise information like NFHS to study mortality pattern by various socio-economic groups and communities. Therefore, the present study has made an attempt to analyse the age-specific death rate pattern for various regions and communities of the country, based on the combined estimate of the two rounds of NFHS conducted during the last decade (to minimize sampling errors arising out of small samples covered on each occasion of NFHS), and has finally constructed life tables, based on the combined estimate of ASDRs, to conclude on the mortality pattern in the country. An attempt has also been made to compare the present results with the SRS based life tables by state for the corresponding period to validate the estimates based on data obtained from the two rounds of NFHS. The SRS which is relatively a large sample based demographic survey based on the mechanism of dual record system and which has over time improved its operations in the country, provide reliable estimates of fertility and mortality. Moreover, since SRS based life tables take into account mortality pattern (ASDRs) of five years period to construct life tables, this practice is expected to maximize precision, as noted earlier from our mathematical derivation.

The results clearly reveal that ASDRs are lower in NFHS-2 than NFHS-1 for the younger age groups (<20 years) while a reverse trend is noted at ages 20 years and above, and as a result overall mortality level in India remained almost the same during the interim period of six years between NFHS-1 (1992-93) and NFHS-2 (1998-99). The effect of a large sampling error in the estimates of ASDRs is further seen when they are compared by sex in the data of NFHS-1 and NFHS-2, although the corresponding sample size and SEs are more or less same in the two sets of data. The trend of ASDRs by sex matches

reasonably well with the pattern observed in the recent SRS data, which indicates that male death rates exceed female death rates at age 30 years and above, while female death rates exceed male death rates at ages below 30 years, except at age less than one year where rates for males exceed those of females. This trend, as expected, is clearly evident in the combined estimates of NFHS-1 and NFHS-2, where sampling errors in all age groups have substantially reduced, compared to that observed in the independent estimates of NFHS-1 or NFHS-2. The pattern of ASDRs by sex is however unlike the pattern observed in other countries where ASDRs are higher at all ages in case of males than females. This is typically the pattern in other south Asian countries where death rate for females are higher particularly at ages 1-4 years, probably indicative of neglect of girls in India.

Similarly, the trend of mortality in the rural and urban areas by age and sex was examined based on NFHS-1 and NFHS-2 as well as based on combined estimates of the two surveys. As expected, the trend of ASDRs by sex for rural and urban areas is more stable in the combined estimates of NFHS-1 and NFHS-2, where SEs in all age and sex groups have substantially reduced compared to that in NFHS-1 or NFHS-2. In-fact, the trend of ASDRs by sex in the rural and urban areas is almost the same and matches well with that in the total population, although level of mortality is much higher in rural areas than in urban areas at all ages. The level of infant and child mortality is still very high and the excess female morality at younger ages particularly at ages 1-4 years, in the rural areas of India is a great cause for concern. A study of age specific mortality rates by region and state, based on the combined estimates of NFHS-1 and NFHS-2, also reveals a similar trend by sex and matches well with that observed at the all-India level, although the overall level of mortality varies widely across the regions and states. The levels of CDR and IMR are still high in the eastern and central regions followed by that in the northeast India, while the corresponding levels are relatively lower in

the northern, southern and western regions of the country. This pattern holds true for the majority of the states in their respective regions.

The combined estimates of ASDRs, derived from the two rounds of NFHS, which provide more or less a smooth trend by age and sex as a result of reduction of standard errors in the estimate of pooled ASDRs, were used here as input to construct the abridged life tables for various regions and states as well as for the country as a whole by the method suggested by T.N.E. Greville (1943), the details of which are given in the methodology. Also, the methods outlined by Chiang (1978; 1984) were used here to calculate the standard error of the life expectancy at different ages. The current abridged life table for various states, regions and communities as well as for all India in 5-year age intervals for 1992-98, along with calculation of various columns are shown and discussed in this report. A life expectation at birth of 61.6 years for males, and 63.4 years for females is noted during 1992-98, while it is 62.4 years for both sexes. As expected, life expectation on an average increases for both males and females by more than three years after crossing the crucial period of infancy, and thereafter it reduces with age. However, the life expectation at all ages is relatively higher for females than for males, indicating the better survival chances of females, particularly at older ages.

The current life tables constructed for the rural and urban areas also reveal a similar trend by age and sex, although life expectancies of both males and females are relatively much higher at all ages in the urban areas than in the rural areas. For example, a life expectation at birth of 66.6 years was noted for both sexes together in the urban areas as against 61.4 years in the rural areas. As expected, sex differential in the average expectation of life is relatively much higher in urban areas than in rural areas. For example, an e_o^o of 64.7 years was noted for males as against 68.9 years for females-a gap of 4.2

years-in urban areas, while it was 60.8 years for males as against 62.3 years for females - a gap of 1.5 years in rural areas.

As mentioned earlier, the study has also made an attempt to provide current life tables for various regions of India, based on two rounds of NFHS data, which once again clearly shows that there is a wide variation in the level of mortality across the country. The level of mortality is very high in the northeast, east and central regions, as compared to north, south and western regions. For example, e_o^o for both sexes (combined) was found to be highest in the northern region (67.2 years), followed by the western and southern regions (64.7 years each), while it is lowest in the eastern region (59.9 years), followed by that in the central (60.2) and northeast (60.3) regions. Nevertheless, regional life tables by age and sex follow the pattern observed at the national level.

Each of the major states in a region basically follow their respective regional pattern in terms of average expectation of life at different ages, with the exception of the state of West Bengal in the east, Goa in the West and Kerala in the south region, where the average expectation of life at birth is particularly much higher than that observed at the respective region. Similarly, Assam in the northeastern and Andhra Pradesh in the southern region have relatively much lower life expectancy at different ages than that observed at their respective region. When the average expectation of life at different ages by sex are examined across the states, irrespective of the region they fall in, the study reveals that life expectancy at birth is highest in the state of Kerala (73 years), followed by that in the states of Punjab (69 years) and Goa (68 years), while it is least in the state of Orissa (57 years), indicating that there is a large variation in the level of infant and child mortality as well as in the overall mortality level, which could largely attributed to the

large differential in the socio-economic condition across the states/regions.

It is in this context that current life tables were constructed for various religious, class and caste groups in the country in order to understand the vulnerability of marginalised groups for incorporation in developmental planning including targeted intervention to improve health conditions. The current life tables constructed for each of the subgroups of the population reveal at the first place the advantage of urban residents over their rural counterparts in survival. In fact, there is a distinct rural-urban gap in life expectancy at different ages, even after consideration of 95 percent confidence interval of the estimates. Similarly, religious groups other than Hindus and Muslims have a relatively higher life expectancy. For example, e_o^o for Hindus is 62 years (95 percent Confidence Interval ranging between 62 to 63 years) and for Muslims is 61 years (95 % CI ranging between 60-63 years), while the e_o^o for other religious groups is 66 years (95 % CI ranging between 64-68 years). The advantageous position of these other religious groups may be attributed to their relatively better socio-economic conditions. The caste differentials in life expectancy also confirm the social advantage of castes other than scheduled castes and scheduled tribes. The e_o^o for Scheduled Castes (SCs)/Scheduled Tribes (STs), irrespective of sex, is 61 years (with 95 % CI ranging between 60 to 62 years), which increases to 64 years (with 95 % CI ranging between 63 to 64 years) for castes other than SCs/STs. The impact of the socio-economic condition is further reiterated by the higher life expectancy among people belonging to households with a high standard of living followed by those in the medium and low standard of living. For example, e_o^o for both sexes is as high as 70 years (with 95 % CI ranging between 68 to 71 years) among households belonging to a high SLI, as against an e_o^o of 66 years (with

95 % CI ranging between 65 to 67 years) among households with a medium SLI and an e_o^o of 58 years (with 95 % CI ranging between 58 to 59 years) among households with a low SLI. Thus, the present study also confirms the findings of the earlier studies that life expectancy at birth of a population is largely a function of their socio-economic conditions. The observed large differentials in life expectancy across state or region as well as in the rural and urban areas may therefore largely be attributed to the socio-economic condition of the population in a state or region.

In an attempt to validate our results, a comparison made of the estimates of expectation of life at birth (e_o^o) derived from the two rounds of NFHS (1992-98) with that based on SRS (1993-97) by sex, according to state, revealed that the NFHS based life table estimates match well with those based on SRS for males, females and for the combined estimate of both sexes in case of majority of states (except Madhya Pradesh) as well as for the country as a whole. In fact, the SRS estimates are within 95 percent confidence interval of NFHS based estimates for all the states for which SRS life tables are available. Uttar Pradesh (in case of females) and Madhya Pradesh (in case of both males and females) are the only two states where SRS-based e_o^o is much lower than that based on NFHS data. In fact, SRS estimates appear to be slightly lower in majority of the states as well as in the country as a whole. This is mainly due to the fact that the level of infant and child mortality is reported to be lower in the NFHS data than that in the SRS data for the same period. While it is difficult to establish the correctness of data of the two sources, the current life tables constructed based on two rounds of NFHS data, by the method developed in the present study, reveal consistent results, not only at the state and national level, but also for specific regions and communities, which even SRS with its large sample base, is unable to provide information to enable the study of community specific

mortality pattern. Therefore, such national or state level surveys, like NFHS, if repeated periodically, can become an alternate reliable source (apart from SRS) of studying the mortality pattern in the country, although this does not undermine the role of SRS. In fact, in view of its large sample base and repeat of the survey at regular intervals, SRS is a major source of mortality and fertility data in the country and has also been used here to study the trend in mortality and its likely pattern in the future.

This trend analysis is essentially done using SRS data based life tables, as the estimate of the present study derived from the two rounds of NFHS data, matches well with that of the SRS for the recent period. A study of the trend on the average expectation of life of a person at different ages by sex for India during 1970 to 2005, reveals that life expectancy at different ages has improved substantially for both males and females during the last three decades. Such an increase is, however, relatively more in case of females than males. For example, a life expectation at birth of 50.5 years for males and 49.0 years for females during 1970-75, increased to 62.3 years for males and 63.9 years for females during 2001-05, indicating thereby that the increase in e_o^o is relatively higher for females (14.9 years) compared to that for males (11.8 years). As a result, the sex differential in e_o^o which was almost non-existent or rather in favour of males during the early seventies or before increased over time in favour of females. Similarly, the life expectation at ages 1, 5, 50 and 70+ is higher for females than for males, particularly at ages 5 and above during the recent period. The projection of life expectancy which is done by fitting appropriate curve to the observed time series data, reveals that e_o^o for males and females which is expected to be about 63.6 and 65.5 years in 2008 is likely to increase further to about 65.4 and 67.6 years respectively by 2015, if the present rate of decline in mortality continues in the future.

With the rise in e_o^o, the differential between the sexes is likely to increase further in the country to about 2.2 years (from 1.7 years during 2001-05) by 2015 in favour of women which is similar to the pattern observed in developed and some other developing countries like China. Considering the current level of e_o^o and its differentials by sex in developed countries as well as in other developing countries, India is far behind as e_o^o for males and females is 74 and 81 years in more developed countries (with a male-female differential of 5 years) and 72 and 76 years in East Asia, including Japan and China (with a sex differential of 4 years in favour of females). Thus, India may not achieve the desired level of mortality in terms of e_o^o even by 2015 given its present pace of decline in mortality. Therefore, there is a need for greater programme inputs and commitments to improve the survival of men and women across the life cycle, particularly during infancy and childhood. Our results further suggest that there is a need for region and community specific programmatic interventions as envisaged under the national health programme such as targeted focus in the rural areas and for families below the poverty line, throughout the country and particularly in the eighteen EAG states under the National Rural Health Mission and for the urban poor under the Urban Health Mission.