3 POPULATION SIZE, STRUCTURE, DISTRIBUTION AND CHANGES

3.1 Population Size

There are two types of counts for measuring population size; one counting of population where present on census date and other count is at normal or usual residence. The former is known as de-facto count and the latter as de-jure count of population size. Each one has its own merits and demerits, the detailed of which has already provided in chapter 2. Since 1981 Pakistan is counting population both on de-jure and de-facto counts basis and prior to that population was enumerated as de-jure count only. The intent of introducing both counts is to reduce chances of misreporting. Ideally speaking both de-jure and de-facto counts should match at national level if the effect of international migration is considered as 'nil' or suitably adjusted. By definition of census aliens and Pakistanis emigrants were out of the scope of the 1998 Census. Thus, only the figure left, which is likely to cause difference between the two counts, is Pakistanis repatriated and present some where in the country on census date. Such Pakistanis are enumerated as household members present. Thus, there is no possibility of creating difference between the two censuses counts due to repatriation of Pakistanis. So any difference registered between the two censuses counts must be due to the difference in level of reporting of events in these two counts.

In the 1998 Census 129.18 million persons were enumerated under de-jure count (excluding FATA) while 126.54 million persons were counted under de-facto count. The difference of 2.63 million persons between the two counts thus can be attributed to misreporting. This misreporting can either be due to misconception about reporting of household members temporarily absent or non-reporting in case of temporarily absence of all members of the household, or counting of guests/visitors, both at their normal residence and present place of enumeration etc. In Pakistani context, where there is strong tendency of reporting members permanently absent from the household, there is relatively far less chances of omission of members temporarily absent. Therefore, de-jure count can be taken as close proxy of the actual population.

Contrary to the above, people do not bother to report guests/visitors staying with them. Thus, where slackness, negligence or lack of interest have been shown on the part of any enumerator, the respondent generally does not inform about guests/visitors present there on census date. So, the guests/visitors are most likely to be omitted from the count. In other words de-facto count is under counted. This supported by the fact that the de-facto count is less than the de-jure count as emerged from the 1998 Census. Also there is a general tendency of under reporting of children particularly under one year and females. However, such under reporting probably affect equitably both the counts. To sum up misreporting has been found in the 1998 Census data but de-jure count is more reliable than de-facto count. Moreover the formal count provides comparable data with earlier censuses than the latter count.

In the 1998 Census population was enumerated as 132,352,279 persons living in four provinces, FATA and Islamabad Federal Capital Territory, excluding Allai area of Batagram District, the missed population was estimated as 52,960 persons. The census count includes all persons present in Pakistan on the dawn of 5th March 1998 including those who were alive at that time but subsequently died, repatriated Pakistanis and aliens but excluding children born after the dawn of 5th March, Pakistanis emigrated before that date and diplomats and their families living in the country. However as per government policy the alien population was excluded from the published data.

3.2 Population Structure

3.2.1 Sex structure

Classification or grouping or division of population with respect to any of its characteristic is called as structure of population with respect to that characteristic, e.g. division of population into males and females is known as 'sex structure' of population. Similarly if population is divided into different age groups it is known as 'age structure' of population, so is the age-sex structure and so on.

Sex characteristic of population is very important for demographic studies. Separate data on males and females are important for analytical studies of many other socio- economic and demographic characteristics of population, assessment of population data with respect to their completeness and reliability. Any policy, planning and its implementation dealing with any aspect of human being can not conceive to achieve its ultimate objectives without giving due consideration to male and female composition of population. Therefore social scientists, economists, researchers and planners are very much concerned with sex structure of a population. Sex structure reveals male and female composition in the population which can be measured as sex ratio, and masculinity proportion of either sex in relation to other. Sex ratio and Masculinity proportion are defined as number of males per hundred females and number of males or females in total population. In mathematical notations these are represented as:

$$\text{Sex ratio (SR)} = \frac{\text{Males}}{\text{Females}} \times 100$$

$$\text{Masculinity proportion of males } (MP_m) = \frac{P_m}{P_t \text{ or } (P_m + P_f)} \times 100$$

Where P_m is male population, P_f is female population and P_t is total population.

$$\text{Masculinity proportion of females } (MP_f) = \frac{P_f}{P_t \text{ or } (P_m + P_f)} \times 100 \quad \text{or}$$

$$MP_f = 100 - MP_m$$

Computation procedure

According to the 1998 Census of Pakistan the total population was 132,352,279, of this 68,873,686 were males and 63,478,593 were females. The Computation procedures for SR, MR(m) and MR(f) are:

$$SR = \frac{68,873,686}{63,478,593} \times 100 = 108.50 \text{ percent or 108.5 males for every 100 females.}$$

$$MR(m) = \frac{68,873,686}{132,352,279} \times 100 = 52.04 \text{ males amongst every 100 persons.}$$

$$MR(f) = \frac{63,478,593}{132,352,279} \times 100 = 47.96 \quad \text{or } 100 - 52.04 = 47.96 \text{ females amongst every 100 persons.}$$

If any of the above three estimates is known the other two can be worked out as:

$$\text{Sex ratio (SR)} = \frac{\text{Males}}{\text{Females}} = \frac{\text{Males}}{\text{Females}} + 1 - 1 = \frac{\text{Males + Females}}{\text{Females}} - 1$$

$$= \frac{P_m + P_f}{P_f} - 1 \quad \text{or} \quad 1 / \left(\frac{P_f}{P_m + P_f}\right) - 1 = (1 / MR_f) - 1$$

$MR_f = 1/(1+SR)$ or $1+SR = 1/MR_f$ or $SR = 1/MR_f - 1 = (1-MR_f)/MR_f$ or

$SR = (1-MR_f)/MR_f$

Since $MR_m = 1 - MR_f$ therefore $MR_m = 1 - 1/(1+SR) = \frac{SR}{1+SR}$ or

$MR_m = 1 - 1/(1+SR)$ or $1/(1+SR) = 1 - MR_m$ or

$1+SR = 1/(1 - MR_m)$ or

$SR = 1/(1-MR_m) - 1$

Given SR =1.0850, then $MR_f = 1/(1+SR) = 1/(1+1.0850) \times 100 = 47.96$ percent.

$MR_m = SR/(1+SR) = 1.0850/(1+1.0850) = 52.04$ percent.

Conversely, given $MR_m = 0.5204$ then $SR = 1/(1-0.5204)-1 = 108.50$ percent.

$MR_f = 0.4796$ then $SR = (1-0.4796)/0.4796 = 108.50$ percent.

Genetically sex ratio at birth should be around 105 with average range from 104 to 106. Because of genetic factor females are more powerful than males at birth thus their chances of survival are far more than male babies resulting possibility of declining sex ratio after birth unless it is disturbed by sex selective health care and cultural values. Sex ratio beyond the above range can shed doubt about the reliability of the data.

Sex ratio in Pakistan was above 115 males per 100 females in 1951 which is gradually declining with time and it was estimated at 108.5 percent in 1998. This indicates that female coverage is improving over time though still there is a lot of room in improving their reporting. They are generally under reported at their birth, especially by mothers having age between 15 and 19 years.

3.2.2 Age Structure

The age structure is the most important demographic variable of population. Most of analytical techniques depend upon the age structure. Thus the reliability of any statistical methods largely depends upon the degree of accuracy of age data. The age structure of population is generally given by single years of age or by age groups which may be five years or ten years of age or broad age groups like under 15, 15-49, 15-60, 65 plus etc. Age can be measured as on last birth day, nearest birth day or next birth day but generally it is measured as on last birth day or in completed years.

A person who has not reached the first birth day is termed as infant, who has not attained the puberty age is known as a child, who has attained the puberty age is known as adolescent, who has reached age of maturity called as an adult and a person who has reached the age of retirement is known as old person. Age structure of a population could guide about number of infants, children, adolescents, young people and old people living in a society economically active population, potential for school going population etc. Knowledge about such groups of people is playing a vital role in any population development activities at national level as well as at sub-national level.

Change in fertility rate first affects the infant followed by gradual affect on child population, adolescents, and adults and at the end old population. Mortality equally affects all age groups but its effect varies from age group to group. Its effect is very high at early age groups particularly in infancy and more so in first week and first month, then its effect taper of to a bare minimum level at adult ages and then starts increasing with further advancing in ages. Migration also changes the age structure but its effect is always at two different geographic units that is one place of origin and other place of destination. However reasons for change in age structures of population of receiving areas and loosing areas are altogether different. The receiving areas have socio-economic pull forces attracting people from loosing areas where push forces are persuading the people to quit the areas of deprivation.

On the other hand, age structure influences the demographic, social and economic characteristics of the population. Population with high proportion of females in reproductive ages generally has high level of fertility and with low proportion of females low fertility level. If fertility starts declining even then population will continue to grow for quite some time because of future mothers already been born. This is commonly known as 'population momentum'. Population with high proportion of children usually has high level of mortality with low proportion of children low mortality level. Mortality level also increases with increased proportion of older people in a society. Thus age structure determines the momentum of growth of population.

Age structure also plays a vital rule in determining the potential school going population, children to be inoculated against seven fetal diseases, manpower, voting population, population needing National Identity Cards, women of child bearing ages, old age population etc. Because of difference in age structure of population of two or more countries or regions some demographic parameters (crude birth rates, crude death rates) can not be compared without standardization of their age structures. Age structure is very important, too, in evaluating and smoothing population data. Age is considered to be a very crucial variable in applying some statistical models and estimation of many parameters.

Age Dependency Ratio

Age dependency ratio (ADR) is one of important but crude indicator to see economic burden on bread-earners in a society. For estimating age dependency ratio population can be divided into three broad age groups, children under 15 years (P_{0-14}), persons between ages 15 and 65 years (P_{15-64})who are considered to be economically active or productive and older people 65 years and over (P_{65+}). Then age dependency ratio and its two components can be worked out as:

$$ADR = \frac{P_{0-14} + P_{65+}}{P_{15-64}} \times 100$$

$$ADR\ (\text{for children}) = \frac{P_{0-14}}{P_{15-64}} \times 100$$

$$ADR\ (\text{for older persons}) = \frac{P_{65+}}{P_{15-64}} \times 100.$$

ADR = ADR (for children) +ADR (for older persons)

Given from the 1998 Census population of children under 15 equal 56064747, population between 15 and 65 equal 68586126, and number of older people aged 65 and over equal 4525075 the age dependency ratio and its components can be computed as:

$$ADR = \frac{P_{0-14} + P_{65+}}{P_{15-64}} \times 100 = \frac{56064747 + 4525075}{68586126} \times 100 = \frac{60589822}{68586126} \times 100 = 88.34\ \%$$

ADR (for ~~children~~) older

$$= \frac{P_{0-14}}{P_{15-64}} \times 100 = \frac{4525075}{68586126} \times 100 = 6.60 \text{ percent}$$

$$P_{65+} \qquad 56064747$$

ADR (for older persons) = --------- x 100 = ------------ x 100 = 81.74 percent

P_{15-64} 68586126

Errors in Age Reporting

An error in the censuses or surveys is an outcome of interaction between two groups of people that is an enumerator or interviewer and a respondent. It could be due to negligence, incompetence, lack of art of asking questions or probing and/ or biased attitude on the part of an enumerator in recording information. Or it could be due to poor knowledge, lack of interest, time factor, reluctance in furnishing information, misunderstanding with the enumerator and/or biased attitude on part of respondent in providing information to the enumerator.

There are two types of errors; those are coverage errors and content errors. Coverage errors comprised under-reporting and over- reporting. Combine together are known as gross errors and difference of two are called as net errors. If magnitude of under-reporting exceeds the magnitude of over-reporting it is known as net under reporting other-wise net over-reporting errors. The magnitude and type of coverage errors vary with age and sex. It is very high at early ages especially for children under one and more so for female children. At adult ages it is more or less sex selective and at old age it is linked with both sexes.

Content errors creep into the process of age reporting due to digital preference and age heaping. While age reporting people generally prefer digit 0 followed digits 5, then even number and least preference goes to odd number especially two digits surrounding 0 (see application of Myer's blended population index):Content errors are of two types –one reporting true contents as false and other reporting false contents as true. The total of these two types of content errors is known as gross misreporting error and their difference as net misreporting errors and if the first type of content errors exceeds the second type of errors then net misreporting errors is called as response bias.