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A COMPARATIVE STUDY OF AGE REPORTING IN
SELECTED CENSUSES AND SURVEYS IN PAKISTAN

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INTRODUCTION

It is well recognized phenomena that the statistical information on population characteristics in developing countries suffer from inaccuracy. It is also recognized that the age data presented in Censuses and Surveys are subject to errors. In a society where literacy rate is very low and not much importance is attached to the exact age the problem is further aggravated. Inadequate vital registration is often accompanied by poor reporting of age in censuses and surveys. This is the situation prevailing in Pakistan.

In every census or survey the question on age is asked by the respondent or head of the household; who reports this information by recalling his or her memory for each member of the household. In other cases it is estimated by the enumerator. It is never recorded on the basis of a birth certificate or some other reliable document. However, in the presence of inadequate vital registration system, majority of people do not possess birth certificates. Therefore, the errors are expected to be present in the censuses or surveys. Other factors which contribute to the errors in age data and which are common to most investigations of age and to most countries are given below: [Shryock and Seigel, 1975, and United Nations, 1967].

- a) Coverage errors,
- b) Failure to record ages,
- c) Misreporting of ages,
- d) Ignorance of correct ages,
- e) A general tendency to report ages, ending on certain "preferred" digits,
- f) A tendency to exaggerate length of life at advanced ages,
- g) Misreporting of ages for economic, social, political or purely personal reasons.

Van de Walle remarked for African countries that all African demographic surveys share the problem of trying to record the ages of people who do not know their exact ages and are not fundamentally interested in knowing them [Brass, 1968: 13]. It may be that the errors in age data in Pakistani Censuses and Surveys arise from this factor. The types of errors may vary from census to census and from country to country.

IMPORTANCE OF AGE DATA

Age is the most important variable in the study of mortality, fertility, nuptiality and other factors of population change. The importance of census data by age group in the studies of population growth is even greater when adequate vital registration systems are lacking.

Social scientists have a special interest in the age structure of a population since social relationships within a community are considerably affected by the relative numbers at each age. It is also important for planning purposes, for demographic purposes and for the evaluation of the quality of census counts of population. Accordingly age was recommended with higher priority by the United Nations for inclusion in the 1960 and 1970 censuses [United Nations, 1957]. The presence of errors in the age data may vitiate any projections, demographic estimates or judgements based on these data. This has already been pointed out in an earlier attempt by one of the authors on the analysis of age structure in Pakistan [Zaki, 1981 a].

THE PURPOSE OF THE PRESENT STUDY

The purpose of the present study is to explore the nature and extent of errors in age data in Pakistan and its provinces. The analysis will be

based on comparisons of several censuses and surveys conducted in Pakistan since 1951. The findings will also be compared with other developing countries i.e., India and Bangladesh.

The quality of data from surveys is considered to be better than that of censuses as it is argued that surveys in general, utilize the services of trained and well paid enumerators. Since census is a gigantic activity; it does not enjoy as good supervision and commitment from its staff than do surveys. The relative judgements about the quality of data from censuses and surveys will also be made on the basis of the above comparisons.

Furthermore, there exists a difference in the relative quality of demographic information for males and females. Perhaps males tend to report their ages more correctly than females. Due to cultural reason, their ages may be wrongly reported by the respondent or head of the household (who is usually a male) or inaccurately estimated by the enumerator. The pattern of age reporting for males and females will be compared to study the levels, trends and differentials in reporting ages.

CENSUS TAKING IN PAKISTAN

The first population census of Pakistan was conducted in 1951, the second in 1961 and the third in 1972. The latest census was undertaken in March 1981. The figures from 1981 census are not yet available.

The de jure method of enumeration was adopted for the census taking purposes in all the three censuses. Under this method, an individual was counted at the place of his normal residence, no matter where he was located at the time of census date. The enumerators were given special instructions

in this regard e.g., the individuals who stayed away from their normal residence for the entire census enumeration period were counted where they were found by enumerators.

All the censuses adopted a uniform question on age. The age was recorded in completed years and for infants in completed months. The question on age was simple, for example, in 1961 census it was phrased as "what is your age on 31st of January 1961?" and the answers were recorded in completed years. The explanation of completed years was given as follows: If a person was 20 years and 10 months on 31st January 1961, was entered as 20 years not 21 years. In cases where ages were not known, were estimated by the enumerators by referring to any past events. It generally helps in the estimation of ages to enumerate the children in a household starting from the youngest child.

There were a number of improvements made in census taking procedures in 1972, over that of 1961 and 1951. Enumerators and their supervisors were very thoroughly trained and special manuals of instructions for enumerators and supervisors were issued. The simple questionnaire was used in 1972. The 1961 census suffered from lack of technical staff, inadequate maps, insufficient tabulation equipment. Manual procedures were involved in 1961 whereas in 1972 the processing of data and tabulations were carried out by the use of computer. Therefore, with the use of modern and scientific methods of collecting and presenting data it is expected to improve the quality and reliability of data.

One would also be interested to analyse the differences in the accuracy of age reporting on the basis of the question on age, whether the question

on age was based on completed years or on the year of birth. Since all the surveys and censuses included in this study recorded age in completed years except the Pakistan Fertility Survey (PFS) where the question on age was based on year of birth, hence, the possibility to make such a comparison is limited.

THE DATA AND ITS LIMITATIONS

The current study is based on the censuses of population undertaken in Pakistan in 1951, 1961 and 1972. The data from Population Growth Estimation projects (1962 through 1965), Population Growth Surveys (1968, 1969 and 1970), Housing, Economic and Demographic Survey (1973) and Pakistan Fertility Survey of 1975 have also been utilized for the comparisons of age distributions with censuses. The current study utilizes the tabulations by 5 years of age groups by sex which are available from all the above sources.¹

To facilitate the comparisons among various censuses and surveys, certain adjustments to the data have been made i.e., the age groups less than 1 and 1-4 have been combined as 0-4; and the highest age group has been limited to age 60 and above. Moreover, to maintain the geographic identity between censuses and several surveys, the population of the Provincially Administered Tribal Areas (PATA) of North West Frontier Province, Central Administered Tribal Areas (CATA) and Federal Capital Territory of Islamabad (FCTI) have not been included in this analysis.

¹ The tabulations by single year of age are also available except in 1961 census and an analysis of those is underway by the present authors. The age reporting errors due to digital preference are reduced when data are tabulated by 5-years or 10-years of age groups.

However, the population of Tribal Areas adjoining Hazara district have been included in the censuses of 1961 and 1972. The given age data for 1951 also excluded 2,666,378 persons of Agencies and Special Added Areas under the Deputy Commissioners in the districts of Peshawar and Dera Ismail Khan in the Frontier Regions.² Therefore, this study represents Pakistan comprising of its four major provinces i.e., NWFP (excluding Malakand division), Punjab, Sind and Baluchistan. The four major provinces of Pakistan constitute about 93 percent of the total population of Pakistan. The population total for Pakistan in 1961 and 1972 were obtained by summing up each age group and sex group from the available District Census Reports (DCRs). This was necessitated due to the unavailability of the 1972 census age distribution corresponding to the 1961 age distribution at the national and at provincial levels.³

DESCRIPTION OF SURVEYS

Population Growth Estimation Projects (PGE) of 1962 to 1965 were sample the surveys and presented / data for population of all geographic areas of Pakistan except the Frontier Regions, Quetta and Kalat divisions. These areas were excluded because of their difficult terrain, very low density of population and certain other field problems [Farooqui and Farooq, 1971]. PGE experiment involved two systems of data collection: (i) Longitudinal Registration (LR) and (ii) Cross-Sectional Survey (CS). CS provided data on age composition and other characteristics of population.

² See explanatory notes for Table 11 in census of Pakistan West Pakistan, Vol. 3 population, 1961.

³ However, 1951 census data are analysed at the national level only, because, it becomes a job too cumbersome to adjust for geographic boundary changes to bring it up in line with 1961 and 1972 provincial figures by 5 years of age group.

Population Growth Survey (PGS) collected information on age, sex, births, deaths and marital status etc. on a calendar-year basis for the years 1968, 1969 and 1971. Initially the survey was conducted in 32 electoral units but later the sample areas constituted 64 electoral units. The sample design excluded the Tribal Agencies and special areas of Peshawar and D. I. Khan districts as defined in the 1961 population census of Pakistan.⁴

The 1972 census was conducted in two phases, namely Big count and Housing, Economic and Demographic (HED) survey. HED was conducted during August-November 1973. It presented the data for Pakistan and its four provinces, separately. The sample consisted of approximately 255,000 households. The survey covered the whole of Pakistan, except the Federally Administered Tribal Areas (FATA) and Malakand Division of Northwest Frontier Province (NWFP). Thus, this survey excluded approximately six and half percent of the total population of Pakistan.

The Pakistan Fertility Survey (PFS) as a part of the World Fertility Survey (WFS) programme, was conducted in Pakistan during 1975, to yield information on fertility patterns. The survey covered all the areas of four major provinces except Malakand Division and Provincially Administered Tribal Areas (PATA) of NWFP because of the unsettled nomadic population which are highly inaccessible. The survey also excluded the rural population of Kalat, Mekran, Loralai, Zhob and Khairpur districts of Baluchistan province and restricted cantonment areas. However, the population covered in the survey represented about 93 percent of the total population of the country.

⁴ For details see Pakistan Statistical Division [31].

TECHNIQUES OF ANALYSIS OF AGE DATA

A number of techniques of demographic analysis can be employed in the evaluation of census and survey data for age groups,⁵ for example, intercensal cohort analysis based on age data from earlier census, derivation of estimates based on birth and death statistics, use of expected sex ratios and age ratios, mathematical graduation of census data, comparison with various types of population models and other more elaborate techniques involving data from several censuses [Shryock and Seigel, 1975].

The best known technique to analyse the age data by age groups is the United Nations Age-Sex-Accuracy Index (U.N. Index). U.N. Index takes into account the sex ratios and age ratios, both.

One method of testing the accuracy of age groups is to compare the sex ratios for successive age groups. An age-specific sex ratio is defined as the number of males per 100 females in that age group. Normally, sex ratios change very gradually from one age group to another, accounting for the sex differences in mortality and in-migration etc. They do not fluctuate abruptly and violently. The sex ratios fall gradually throughout life, not dipping below 100 under age 40 or later. They decline slowly in the younger ages but steeply at older ages. This pattern results from the usual small excess of males among births and usual excess of male over female mortality. This shape of sex ratios is assumed only when data are free from errors in male and female reporting and when errors are in the same direction and are of same kind. The marked fluctuations in sex ratios indicate the presence of

⁵ For details of the techniques of analysis of single year-age data i.e., Myers Index, Whipples Index etc. and for further references see Shryock and Seigel [1975: 204-211].

errors in data for males and females, both. For Pakistan we expect a somewhat different picture which is presented in a following section along with other findings of the current study.

Another method to identify errors is to examine the age ratios. An age ratio, according to U.N. method, is defined as the ratio of population in the preceding and following age groups, symbolically, it can be written as follows:

$$\text{An age ratio is} = \frac{5P_a}{1/2(5P_{a-5} + 5P_{a+5})} \times 100$$

Age ratios are computed separately for males and females because the data for males and females may be subjected to different types of errors. The computed age ratio is compared to an expected value of 100 which implies that coverage errors are about the same from one age group to another and that age misreporting errors for a given age groups are offset by complementary errors in adjacent age groups. The three age groups should form a linear series. The considerable fluctuations in age ratios are indicative of presence of inaccuracies due to age misreporting or incomplete enumeration. Extreme cases of past births, deaths and migration should be considered also while analysing the age ratio. The age-specific mortality is usually neglected because year to year changes in mortality are gradual and systematic.

SUMMARY MEASURES

Summary measures i.e., sex ratio scores and age ratio scores are derived on the basis of sex ratios and age ratios which facilitate comparisons among several areas i.e., districts, provinces and countries. These summary

measures are also used to compute U.N. Index. The sex ratio score is the mean difference between sex ratios for the successive age groups averaged irrespective of sign and an age ratio score is the mean deviation of age ratios from 100 also irrespective of sign separately for males and females. U.N. Index is then equal to three times the sex ratio score to the sum of age ratio scores for males and females. The higher the index the higher the inaccuracy in the reported age-sex data. United Nations described it as follows:

<i>U.N. Index</i>	<i>Accuracy</i>
<20	"accurate"
20-40	"inaccurate"
40+	"highly inaccurate"

Age sex ratios, age ratios and the summary measures described above are used in the current analysis. However, U.N. Index fails to take account of the expected decline in the sex ratio with increasing age and the irregularities in age distribution due to migration, war, and epidemic as well as normal fluctuations in births and deaths. The use of definition of an age ratio which omits the central age group also introduces an upward bias by giving considerable weight to the sex ratio component in the formula. In addition, the index is primarily a measure of net age misreporting and, for the most part, does not measure net underenumeration by age. In spite of its limitations, the U.N. Index appears to be a useful measure for making comparisons between countries or geographic subdivision of a country with respect to the accuracy of age reporting by sex and have been extensively used to test the quality of age data. The age-sex ratio technique is commonly used in illustrative text book examples [Barclay, 1958, United Nations, 1967, and Shryock and Selgel, 1975]. Brass

[1968] has used thi;- technique for African census data, The above techniques have been applied to populationsat different levels of economic development and with divergent cultural settings.

AGE STRUCTURE OP PAKISTAN

The reported percentages in 5-years age groups by sex for Pakistan are given in Table 1 and are also shown in Figure 1, Table 2 presents the population below age 15 in several censuses and surveys for Pakistan and provinces for 1951 to 1975 period.

Figure 1 (the population pyramid for Pakistan for the years 1961 and 1972) presents a usual shape of population of a less developed country. The broad base of a pyramid indicates a high birth rate in the country. It is seen from Table 2 that about 40 to 47 percent of males and females are below age 15.

A comparison of reported age distributions with stable age distributions demonstrated deviations by age in Pakistani data [Zaki, 1981a],

FINDINGS FOR PAKISTAN AND PROVINCES

The following section presents results for the years 1951 to 1975 based on the sex ratios, age ratios and United Nations Age-Sex Accuracy Index (U.N. Index). The graphic illustrations of these indices are based on figures from .1961 and 1972 censuses, only.

Sex Ration

A sex ratio is defined here as number of males per 100 females. The sex ratios by age for several Pakistani Censuses and surveys for / period

Table 1

*Percentage Age Distribution for Pakistan *
By Sex in Censuses of 1951, 1961 And 1972*

Age Groups	Males			Females		
	1951	1961	1972	1951	1961	1972
0-4	7.1	8.4	7.6	6.7	8.0	7.5
5-9	7.0	8.8	8.5	6.2	7.7	7.7
10-14	8.7	5.3	7.0	7.6	4.3	5.5
15-19	6.2	4.9	4.7	5.9	4.1	3.9
20-24	4.4	4.1	3.8	3.7	3.7	3.6
25-29	3.7	4.0	3.9	2.8	3.7	3.5
30-34	3.3	3.3	3.3	2.4	3.1	3.0
35-39	2.6	2.9	2.9	2.0	2.4	2.5
40-44	2.6	2.6	2.6	2.0	2.2	2.3
45-49	2.0	2.1	2.1	1.6	1.7	1.7
50-54	2.1	2.1	2.1	1.6	1.6	1.6
55-59	1.2	1.1	1.0	1.1	0.9	0.9,
60+	3.1	4.0	4.0	2.6	3.0	3.0
All ages	53.9	53.7	53.4	46.1	46.4	46.5
	(16733352)	(21289400)	(32500765)	(14327437)	(18393103)	(28273690)

* Percentages are based on the total of both sexes in all ages; which is equal to 31060789 persons and 39682503 persons in 1951 and 1961 respectively, and 60774455 in 1972.

Table 2

*Percent Below age 15, in Pakistan for Males
And Females, 1951-1975**

Year	Males	Females
Census 1951	42.2	44.5
Census 1961	41.9	43.2
Census 1972	43.1	43.4
PGE 1962	43.9	43.4
PGE 1963	43.2	44.5
PGE 1964	41.8	43.3
PGE 1965	42.9	43.3
PGS 1968	43.3	43.6
PGS 1969	44.4	44.2
PGS 1971	45.6	45.7
HED 1973	42.4	44.2
PGS 1975	44.3	44.3

* Percentages are based on the total of males and females separately.

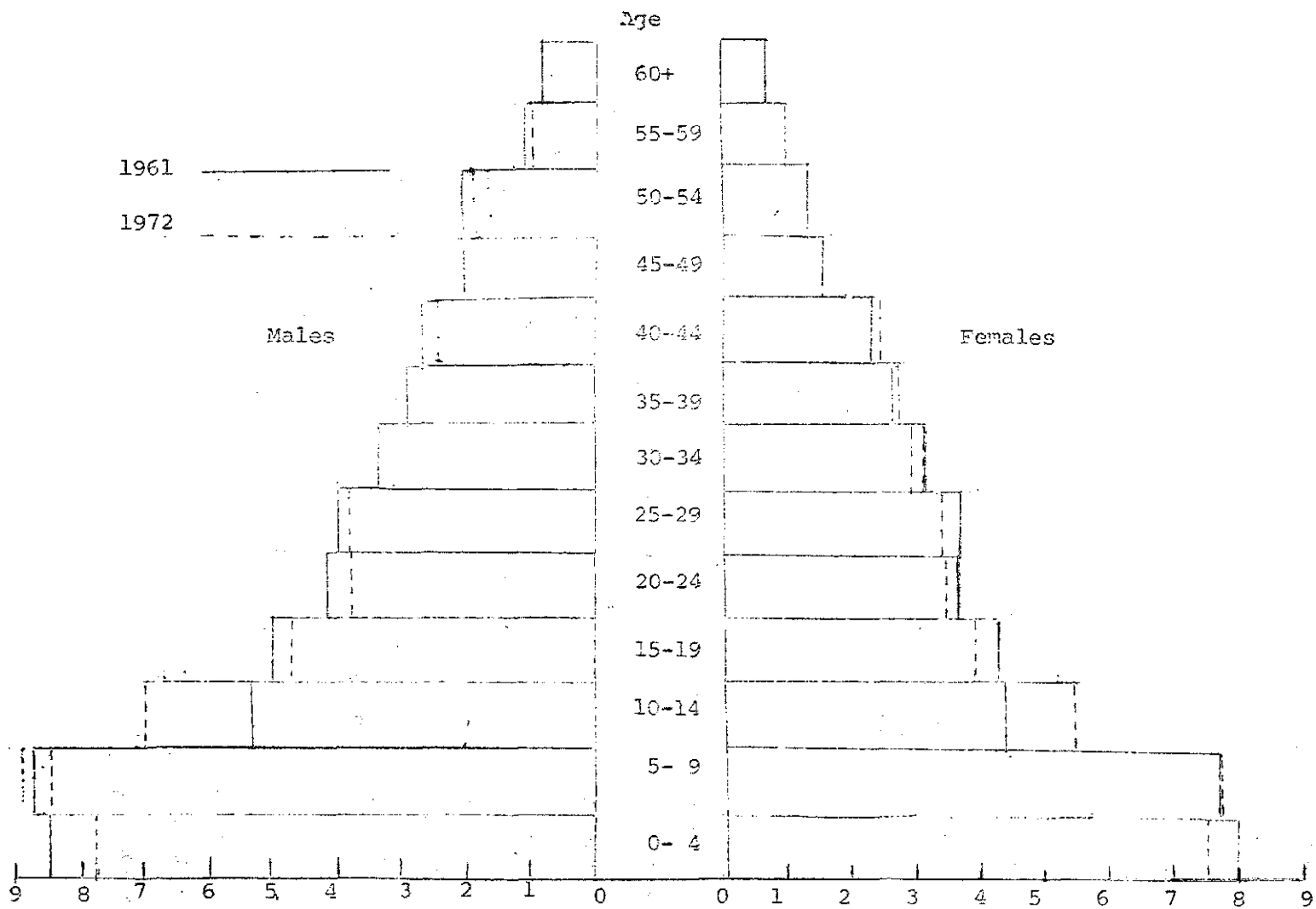
Table 2-a

*Percent Below Age 15, in Pakistan and Provinces
For Males and Females in 1961 and 1972**

	Males		Females	
	1961	1972	1961	1972
Pakistan	41.9	43.1	43.2	44.5
NWFP	45.6	44.3	45.2	45.2
Punjab	41.9	43.2	43.0	43.8
Sind	39.6	42.5	43.4	45.5
Baluchistan	42.8	43.0	45.0	46.6

* Percentages are based on the total of males and females separately.

Figure 1: Percentage of Total Population in Age Groups



Source: Table 1

are shown in Tables 3, and 3.a. Tables 4, 4.a and 4.b give sex ratios at the provincial level for the censuses of 1961 and 1972 and HED Survey of 1973, respectively.

Table 3 indicates that for Pakistan in general, sex ratios remained high (excess of males). In censuses, from age group 0-4 the sex ratios (101) rose to the peak (127) in age groups 10-14; whereas in surveys this peak (136) was attained in age-group 15-19. In PFS sex ratios appeared consistent from age group 0-4 (109) and a deficit of males emerged (sex ratios below 100) in ages 20-34. Beyond the peak age groups, for censuses and surveys both, the sex ratios exhibited extreme fluctuations ranging between 103 to 150. For illustration purposes the sex ratios for Pakistani censuses of 1961 and 1972 are shown in Figure 2. However, the 1951 census demonstrated

/ very high sex ratios ranging between 130 to 135 for the ages 25 to 54.

Sex ratios for provinces in Tables 4, 4.a and 4.b show that NWFP and Punjab behaved quite similar to Pakistan's sex ratios except the age groups 25-39 in NWFP, in 1961 and 1973 (sex ratios below 100). For Baluchistan in all the three years, sex ratios for age group 0-4 ranged between 69-96. For the same age groups they ^{were} below 100 for NWFP, Sind and Baluchistan in 1972 census and 1973 HED Survey also.

However, age to age fluctuations in sex ratios existed in all the the censuses and surveys, at the national and provincial levels. In 1972 for most age groups sex ratios ^{were} below the level/ ^{of} 1961. Among younger age groups, the crucial ages ^{were} 10-24. The overall decline in sex ratios in 1972 is observed due to the lowering down of sex ratios in Sind and Baluchistan, which may be an indication of better enumeration or reporting

Table 3
Sex Ratios by Age in Pakistan Censuses, 1951-1972

Age Groups	1951	1961	1972
0- 4	105	105	101
5- 9	112	115	111
10-14	114	123	127
15-19	106	118	120
20-24	117	113	107
25-29	135	109	112
30-34	134	110	108
35-39	135	117	116
40-44	132	119	116
45-49	130	125	122
50-54	131	129	133
55-59	108	126	118
60+	117	133	137
All Ages	117	116	115
Sex Ratio Scores:	5.5	5.3	8.0

Table 3-a
Sex Ratios by Age in Several Pakistani Surveys, 1962-1975

Age Groups	PGE 1962	PCL 1963	PCE 1964	PGE 1965	PGS 1968	PGS 1969	PGS 1971	HED 1973	PFS 1975
0- 4	105	107	108	109	109	110	110	98	108
5- 9	111	110	105	113	112	114	114	112	109
10-14	127	127	127	125	120	123	124	126	109
15-19	123	131	136	135	118	115	121	130	97
20-24	97	93	105	104	105	108	101	116	97
25-29	98	103	106	104	110	103	104	107	99
30-34	105	96	112	106	109	109	106	108	103
35-39	122	121	118	119	118	111	118	105	128
40-44	116	107	118	113	109	122	131	118	104
45-49	137	133	120	118	121	119	141	112	101
50-54	119	125	137	140	116	133	135	139	133*
55-59	151	131	122	121	122	102	73	101	-
60+	134	137	130	123	128	133	140	150	-
All Ages	114	114	115	115	114	115	115	116	109
Sex Ratio Scores:	12.1	15.1	9.5	10.7	6.6	6.9	8.3	10.4	8.4

*For age 50+

Table 4

Sex Ratios for Pakistan and Provinces in 1961-1973

1961

Age Groups	Pakistan	N-WFP	Punjab	Sind	Baluchistan
0- 4	105	101	106	104	96
5- 9	115	112	113	119	122
10-14	123	123	120	128	142
15-19	118	113	116	128	129
20-24	113	106	110	123	121
25-29	109	97	105	125	119
30-34	110	96	107	129	118
35-39	117	102	113	140	124
40-44	119	109	117	130	129
45-49	125	114	123	135	141
50-54	129	115	129	139	144
55-59	126	118	122	138	146
60+	133	127	137	124	134
All Ages	116	109	114	123	122

Sex Ratio Scores	5.3	7.0	5.3	6.3	9.2
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1972

Table 4-a

0- 4	101	94	109	90	80
5- 9	111	107	111	111	106
10-14	127	121	126	130	137
15-19	120	117	118	124	145
20-24	107	100	106	109	115
25-29	112	104	111	118	117
30-34	108	103	107	113	105
35-39	116	107	115	126	114
40-44	116	106	115	124	119
45-49	122	114	119	136	125
50-54	133	117	135	137	128
55-59	118	116	116	126	115
60+	137	130	141	127	125
All Ages	115	109	116	115	113

Sex Ratio Scores	8.0	6.7	7.3	10.2	13.2
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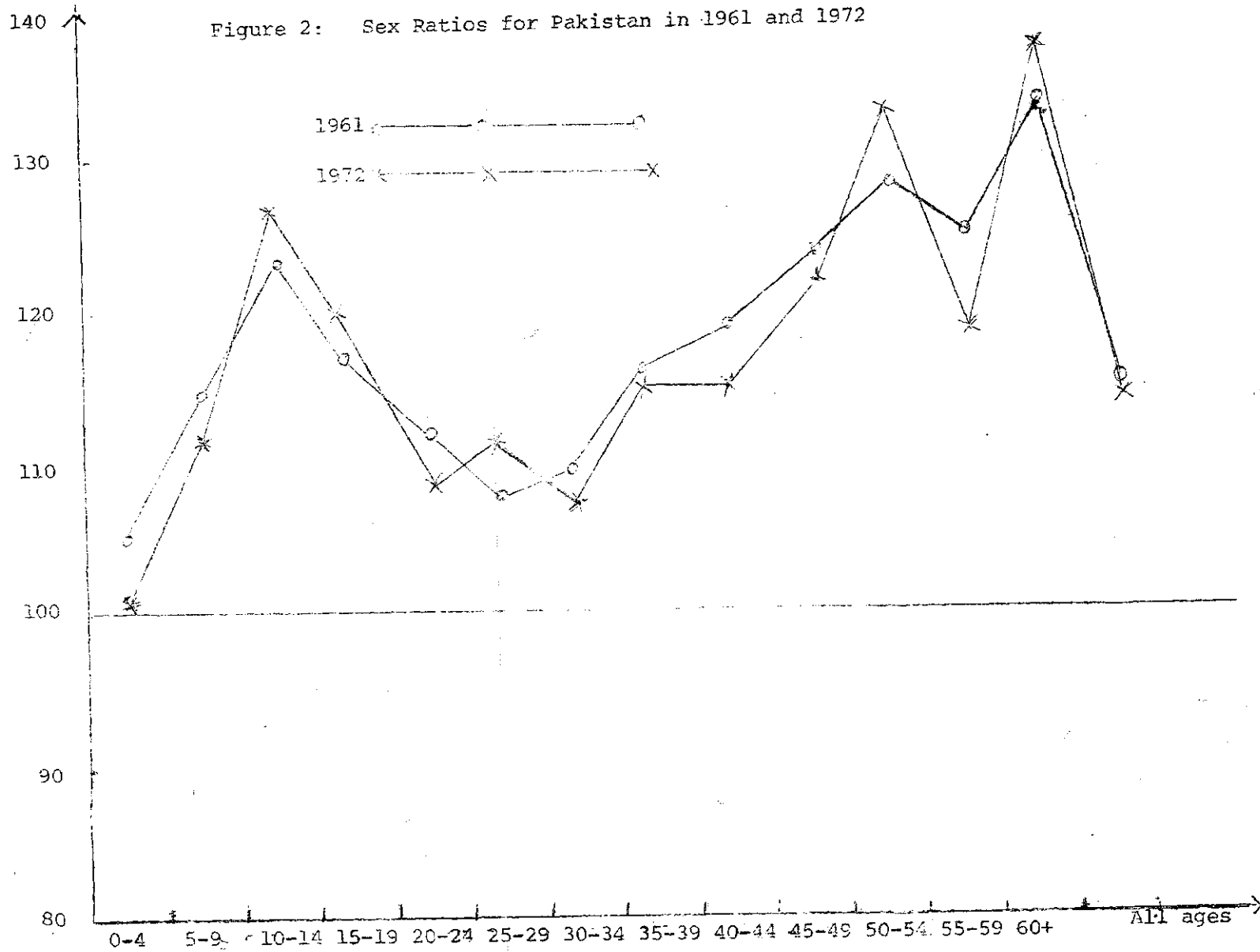
Table 4-b

1973

Age Groups	Pakistan	NWFP	Punjab	Sind	Baluchistan
0- 4	98	97	102	95	69
5- 9	112	110	113	113	89
10-14	126	124	125	132	128
15-19	130	117	131	133	145
20-24	116	103	119	114	109
25-29	107	93	107	111	108
30-34	108	103	105	114	116
35-39	105	97	105	112	102
40-44	118	110	112	131	164
45-49	112	111	107	124	117
50-54	139	120	136	153	159
55-59	101	105	99	104	111
60+	150	154	176	153	149
All Ages	116	111	118	118	111
Sex Ratio Scores	10.4	8.8	9.5	11.9	24.8

Sex Ratios

Figure 2: Sex Ratios for Pakistan in 1961 and 1972



of females in the said provinces in 1972. The 1951 figures must have been resulted by the migration at the time of partition of the Indo-Pakistan sub-continent and due to violent killings also. WFP had made no contribution and for Punjab they have gone slightly higher. Hence, the marked fluctuations in sex ratios point to the errors in the data and these errors are not the same for the two sexes. The peak at 10-24 can partly be explained in terms of general understatement of the ages of older boys and young men resulting in an inflation of this age group or female mortality in the earlier child-bearing ages. The peaks at the older ages also witness the errors in reporting and is completely against the phenomena of male/female selective mortality. Also, persons in their late forties tend to report their ages higher because socially and culturally greater respect is attached to older people. Migration could also be another possible factor which could contribute to fluctuations in sex ratios.

According to Shryock and Siegel, if a sex ratio deviates extremely from the range of 95 to 105, it must be accounted for in terms of migration and both volume and sex composition of migrants are relevant. A sex ratio deviating even further say above 110 or below 85 may be created by the special features of the area which select certain classes of "migrant", i.e., military installation, a college for men and women, some factories or industries in the area [Shryock and Siegel, 1975: 199].

Generally speaking for Pakistan, the areas where sex ratios were higher in 1961, they have declined in 1972 and for the areas where sex ratios were lower in 1961 they have increased in 1972. The areas which showed a decline in sex ratios have experienced out-migration. The indirect

migration estimates⁶ were computed by the present authors which supported the above contention and consequently the sharp decline in sex ratios for Sind and Baluchistan between 1961 and 1972, (see Tables 3 and 4) seems to be created by lot of female in-migration in these provinces. The female in-migrants out numbered male in-migrants in the two provinces. The overall picture of sex ratio pattern at the provincial level seems to be an artifact of female migration. This phenomena of female mobility unaccompanied by male does not seem to satisfy the reality in the case of Pakistan. Therefore, in the absence of extreme mortality change during the last decade, we could expect the overreporting of female population in the said provinces.

Burki [6] also, presented inter provincial (indirect) migration estimates between 1961 and 1972, which showed that NWFP and Punjab lost people while Sind and Baluchistan gained. We found the same phenomena/study in our which is consistent with high sex ratios and is alarming us of defects in data. Many demographers [Afzal, 1973 and Krotki, 1963] agreed that 1961 census suffered from underenumeration, therefore, the inconsistencies of 1972 census data seem to be overenumeration.

Bean [4] argued on the basis of language riots in Sind which coincided with the 1972 census time and resulted in an over enumeration of language groups in order to provide the strong political representation. He presented similar argument for the provinces of NWFP and Baluchistan for over reporting by political parties. He felt it might have been the case because it happened in 1931 census of India due to Hindu-Muslim conflicts. Nigeria census of 1953 also suffered from over counts for the similar reasons given above.

⁶ "A study of sex-ratios and internal migration in Pakistan, 1961-1972" (Study underway).

Sex Ratio Scores

For Pakistan the range of sex ratio scores is 5.3-10.7 which identifies the 1961 census (5.3) the better quality data set relative to the 1972 census and other surveys of this study. However, according to these scores PGS of 1968 and 1969 can be classified as moderately better than PGE (1962-65), HED (1973) and PFS (1975).

The sex ratio scores analysis at the provincial level (see Tables 4, 4.a and 4.b) demonstrated that these scores are lower in 1961 for all the provinces than 1972 and 1973 (highest in 1973). The sex ratio scores for Punjab were 5.3, 7.3 and 9.5 in the years 1961, 1972 and 1973, respectively. The sex ratio scores for the province of Sind were 6.3, 10.2 and 11.9 for the years 1961, 1972 and 1973 respectively and Baluchistan province experienced marked increases (9.2 in 1961 to 13.2 in 1972 and 28.8 in 1973). The marked increase in sex ratio scores in the province of Baluchistan in 1973 might have been due to the lower sex ratios at ages 0-4 and 5-9 relative to the successive age groups. The lower sex ratio for an age group relative to the neighbouring age groups contributes to a greater successive difference leading towards an overall higher average.

Age Ratios

The age ratios are presented in Table 5 for censuses and Tables 5.a and 5.b for surveys in Pakistan. These ratios are presented by sex and they are also shown graphically in Figures 3 and 4, for males and females respectively, in the censuses of 1961 and 1972.

Table 5

*Age Ratios for Males and Females in Pakistan
Censuses, 1951-1972*

Age Group	Males			Females		
	1951	1961	1972	1951	1961	1972
0-4	-	-	-	-	-	-
5-9	88.0	128.1	116.4	86.4	124.0	118.0
10-14	132.6	78.1	106.8	128.7	73.8	95.7
15-19	94.9	102.6	86.4	102.9	102.3	85.6
20-24	87.7	93.3	87.9	86.9	94.2	95.9
25-29	98.3	107.0	111.3	89.6	109.9	106.7
30-34	102.1	98.2	96.5	103.0	99.6	101.5
35-39	90.0	94.9	97.3	88.9	92.4	93.3
40-44	111.8	105.8	106.4	112.2	106.9	108.9
45-49	85.9	90.1	87.1	87.1	88.9	87.4
50-54	131.7	128.3	136.2	121.4	124.3	124.2
55-59	-	-	-	-	-	-
60+	-	-	-	-	-	-
Age Ratio	13.3	11.7	12.2	12.73	11.8	10.1
Scores:						

Table 5-a

*Age Ratios for Males in Several
Pakistan Surveys 1962-75*

Age Groups	PGE 1962	PGE 1963	PGE 1964	PGE 1965	PGS 1968	PGS 1969	PGS 1971	HED 1973	PFS 1975
0- 4	-	-	-	-	-	-	-	-	-
5- 9	109.0	110.1	114.6	117.7	117.6	117.4	117.5	119.3	107.4
10-14	95.0	94.0	95.5	96.0	96.3	99.7	102.9	108.6	108.6
15-19	96.2	99.3	95.6	91.5	83.1	81.0	81.0	91.4	90.8
20-24	86.1	83.9	83.9	83.6	100.5	96.3	90.5	87.7	88.3
25-29	113.6	116.0	121.0	120.1	107.7	105.3	108.6	104.8	101.4
30-34	97.4	92.7	92.7	88.4	97.3	103.1	97.3	36.1	102.0
35-39	95.2	103.6	100.3	111.7	97.2	93.4	100.2	97.1	99.6
40-44	107.1	94.7	100.0	87.1	103.8	111.9	107.6	107.7	103.2
45-49	87.6	91.4	90.8	101.3	85.6	79.6	86.7	87.1	-
50-54	130.8	132.1	131.1	124.0	136.3	146.0	116.0	140.3	-
55-59	-	-	-	-	-	-	-	-	-
60+	-	-	-	-	-	-	-	-	-
Age Ratio Scores:	10.4	10.2	10.8	12.5	10.7	13.4	9.7	12.1	5.5

Table 5-b

*Age Ratios for Females in Several
Pakistan Surveys 1962-75*

Age Group	PGE 1962	PGE 1963	PGE 1964	PGE 1965	PGS 1968	PGS 1969	PGS 1971	JED 1973	PFS 1975
0-4	-	-	-	-	-	-	-	-	-
5-9	110.8	114.2	125.7	120.2	119.5	118.8	119.9	118.9	106.7
10-14	86.4	86.8	86.4	92.1	91.2	92.4	96.4	101.4	104.5
15-19	88.7	84.5	82.7	78.7	80.2	81.6	76.4	85.9	97.3
20-24	97.9	105.2	95.3	98.7	108.9	100.0	101.1	90.7	89.1
25-29	116.6	106.5	124.3	120.7	104.0	108.9	107.2	109.4	102.1
30-34	98.9	105.7	90.8	91.7	100.7	100.9	101.7	95.0	108.8
35-39	85.5	86.3	97.6	101.8	89.7	96.1	98.5	103.4	80.7
40-44	117.9	111.4	100.5	91.9	113.4	104.7	103.2	98.4	114.6
45-49	74.6	82.3	95.3	106.3	79.3	84.5	81.6	99.0	-
50-54	155.1	139.4	115.7	105.4	143.2	123.5	89.2	109.0	-
55-59	-	-	-	-	-	-	-	-	-
60+	-	-	-	-	-	-	-	-	-
Age Ratio Scores:	16.8	14.2	11.8	10.1	15.0	10.2	9.1	7.3	8.7

Age Ratios

Figure 3: Age Ratios for Males in Pakistan in 1961 and 1972

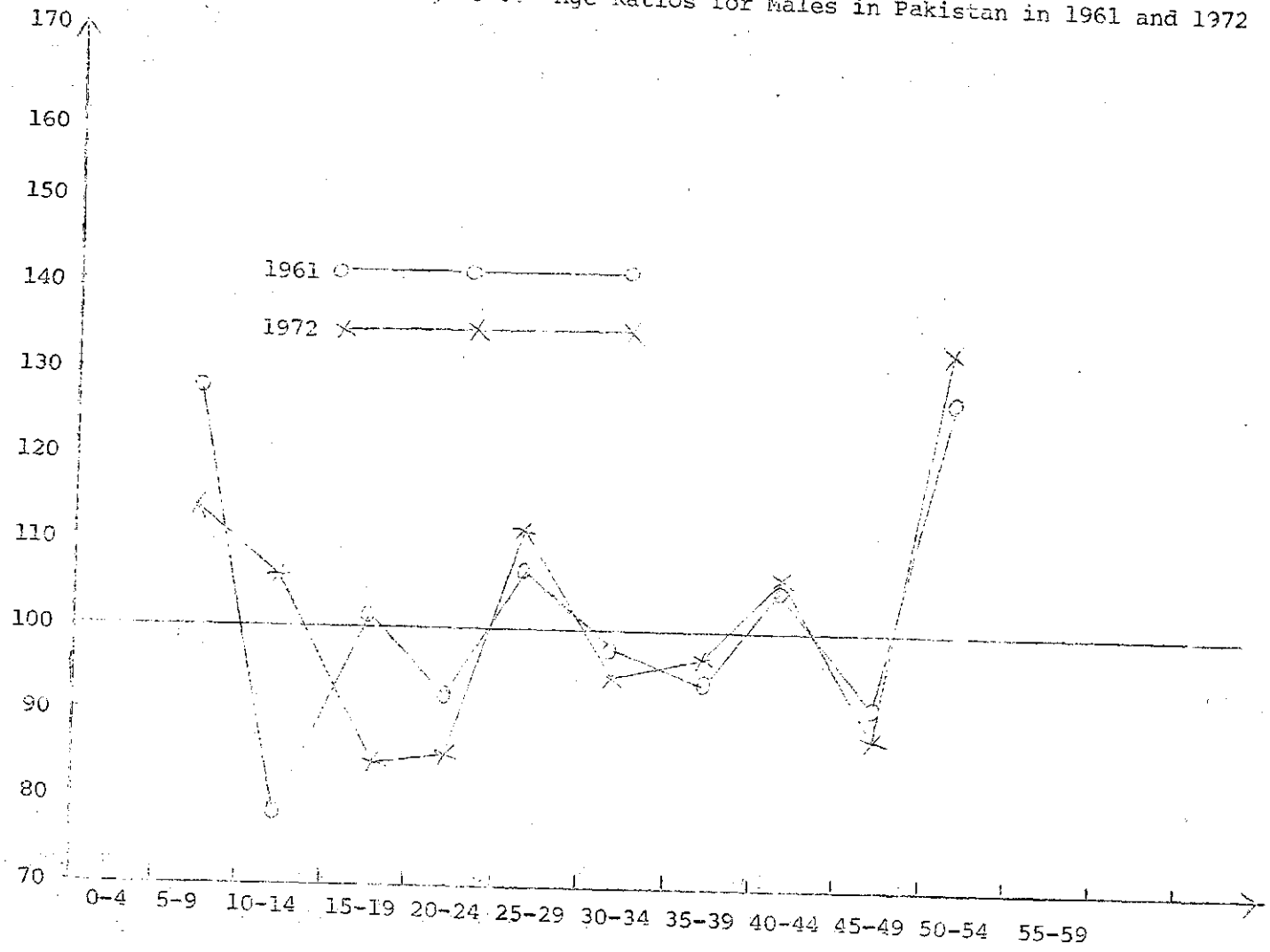
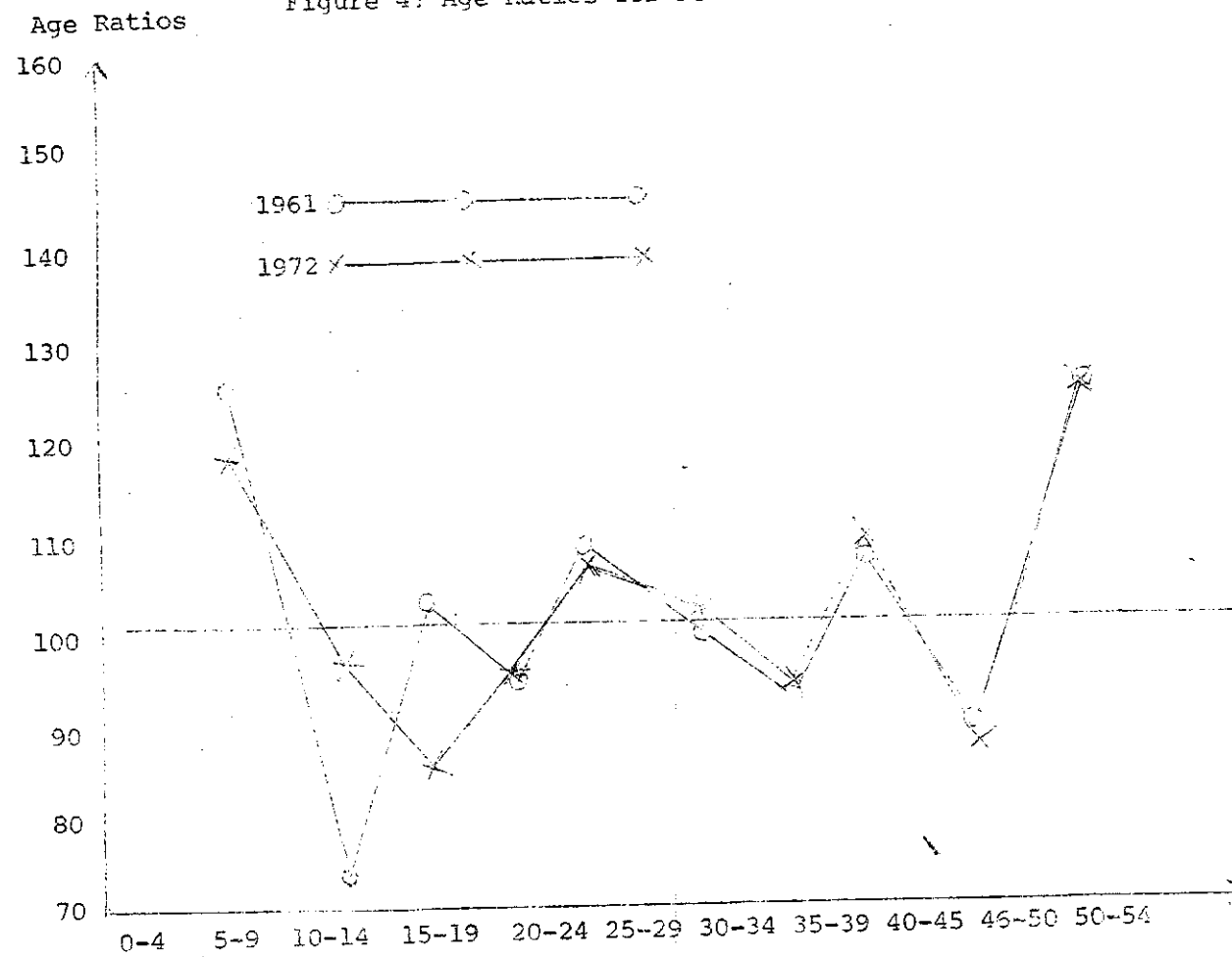


Figure 4: Age Ratios for Females in Pakistan in 1961 and 1972



These ratios in 1951 for males ^{were} higher at ages 10-14, 30-34, 40-44 and 50-54 relative to the neighbouring age groups where age ratios were less than 100. The over reporting seems to have occurred in age group 10-14 where age ratio is 132 at risk of ages 15-29. Females also showed deviations similar to males except age group 15-19.

For males and females, the age ratios gave a characteristic fluctuation in censuses and surveys both. These ratios were high at ages 5-9, 25-29, 40-44 and 50-54 for males and females, both. For female these ratios were high at ages 20-24, 30-34 in PGS and they were consistent in all the three survey years i.e., 1968, 1969 and 1971 (high at ages 5-9, 20-24, 25-29, 30-34, 40-44 and 50-54). The high age ratios mean that excessive numbers of persons were reported in the age groups mentioned above by comparison with the numbers in the groups just higher or lower. In a population in the absence of past violent experience of births, deaths and migration and with perfect age reporting, an age ratio for a given age group should approximate to 100.

In 1972, the age ratios are high for the age group 10-14 also, for males. For females, a pattern similar to that of 1961 existed except the age group 15-19 (see Figures 3 & 4). The provinces do not differ much from Pakistan. Above age 20 the misreporting of ages ^{was} almost identical in both the censuses. PGE projects for the years 1962-1965, for both the sexes, reflected that the age ratios are consistent except the age 35-49 for males. They showed fluctuations by age in all the four years of survey. The similar pattern existed for ^{to} females during 1962/1965. The over reporting for males and females was also

indicated in HED (1973) and PGS (1975) for age groups 5-9, 10-14, 25-29 and 40-44 and under reporting (age ratio below 100) at the neighbouring ages. The smaller deviations in age ratios of males and females were found in PGS relative to the censuses and other surveys which^{was} also supported by the age ratio scores for males (5.5) and for females (8.7).

Age Ratio Scores

The age ratio scores are average of the deviations of age ratios from 100 for all age groups therefore are affected by the very high age ratios hence, could be misleading index; it must not be presented independent of age ratios. Over reporting^{was} observed in age groups mostly beginning with fives and under reporting in the neighbouring age groups in all the censuses and surveys for both the sexes. No improvement is observed at province level and Pakistan level for males on the basis of age ratio scores. The age reporting appeared better for females in 1972 in all the provinces except the province of Sind (the age ratio score rose to 12.6 in 1972 from 10.8 in 1961). HED 1973 shows increased over reporting for males and these scores are quite low for females in HED compared to the census of 1972 except in the province of Baluchistan. HED survey gave worse results than the censuses.

OVERALL QUALITY OF PAKISTANI DATA

The summary measures for Pakistani censuses and surveys are shown in Table 6 and for the provinces of Pakistan in Table 7. The summary measures i.e., sex ratio scores and age ratio scores have been discussed in the above section. The following discussion will focus on U.N. Index (which is 3 times the sex ratio scores to the sum of age ratio scores for males and females).

Table 6

*Summary Measures of Age Reporting for Pakistani
Censuses and Surveys, 1951-1975*

		Sex Ratio Score	Age Ratio Scores		U.N. Index
			Males	Females	
<u>Censuses</u>	1951	5.5	13.3	12.7	42.4
	1961	5.3	11.7	11.8	39.4 ^a
	1972	8.0	12.2	10.1	46.4
<u>Surveys</u>					
PGE	1962	12.1	10.4	16.8	63.6
PGE	1963	15.1	10.2	14.2	69.8
PGE	1964	9.5	10.8	11.8	51.3
PGE	1965	10.7	12.5	10.1	54.7
PGS	1968	6.6	10.7	15.0	45.5
PGS	1969	6.9	13.4	10.2	44.2
PGS	1971	8.3	9.7	9.1	43.6
HED	1973	10.4	12.1	7.3	50.6
PFS	1975	8.4	5.5	8.7	39.3

Table 7

*Summary Measures of Age Reporting for Pakistan and its Provinces
In 1961 and 1972 Censuses and HED Survey 1973*

	Pakistan	NWFP	Punjab	Sind	Baluchistan
<i>Sex Ratio Scores</i>					
1961 census	5.3	7.0	5.3	6.3	9.2
1972 census	8.0	6.7	7.3	10.2	13.2
1973 HED	10.4	8.8	9.5	11.9	28.8
<i>Age Ratio Scores</i>					
Males: 1961 census	11.7	15.5	11.9	10.3	14.7
1972 census	12.2	15.8	11.9	11.4	14.7
1973 HED	12.1	16.7	11.1	12.8	15.6
Females: 1961 census	11.8	16.6	11.8	10.8	14.3
1972 census	10.1	15.2	8.6	12.6	12.1
1973 HED	7.3	11.8	7.8	6.7	16.6
<i>U.N. Age Sex Accuracy Index</i>					
1961 census	39.4	52.9	39.7	40.2	56.6
1972 census	46.4	51.0	42.4	54.4	66.4
1973 HED	50.6	55.0	47.6	55.2	118.5

United Nations described census age-sex data as "highly inaccurate", depending on whether the U.N. Index is under 20, 20-40 or above 40, respectively. By this classification the Pakistani data appears to be "inaccurate" in 1961 census and 1975 PFS and "highly inaccurate" in 1951 and 1972 censuses and other surveys of this study⁷. At the national level, the overall range of U.N. Index is 39.3-69.8 (for censuses and surveys). U.N. Index ranges between 39.7-118.5 at the provincial level. The range (excluding the province of Baluchistan) is 39.7-55.2.

The U.N. Index categorises the census of 1961 and the PFS of 1975 as of better quality, relative to the 1951 and 1972 censuses and PGE, PGS and HED surveys. This index amounted to 39.4 and 39.3 in the 1961 census and PFS 1975, respectively. For PGE (1962-1965) it ranged between 51.3 and 69.8, whereas for PGS it ranged from 43.6 to 45.5. The U.N. Index for HED was 50.6 (see Table 6).

At the province level (Table 7), the U.N. Index revealed that data were "highly inaccurate", in both censuses and in HED also. For the Punjab in 1961 this index^{was} (39.7), the lowest of all areas, but it still was very close to the (40) lower limit of "highly inaccurate" category. The percentage changes, between 1961 and 1972, in the U.N. Index are given in Table 8. For Pakistan, the U.N. Index has increased by 17.9 percent. For NWFP it has declined by 3.5 percent, which^{was} an indication of improvement of reporting ages. For the provinces of Punjab, Sind and Baluchistan the percentage increases^{were} 6.9, 35.5 and 17.3, respectively, the increase

⁷ It must be noted that the highest age in PFS was recorded as 50 and above, whereas, all other data sources were analysed upto age 60 and above, hence the results must be compared with caution.

Table 8

*Percentage Change in United Nations Age-Sex Accuracy Index
For Pakistan and Its Provinces Censuses, 1961-1972*

	Censuses			Percentage Change	
	1951	1961	1972	1951-1961	1961-1972
Pakistan	42.4	39.4	46.4	-7.1	17.9*
N-WFP	-	52.9	51.0	-	-3.6
Punjab	-	39.7	42.4	-	6.9
Sind	-	40.2	54.3	-	35.5
Baluchistan	-	56.6	66.4	-	17.3

* A negative sign denotes an improvement in index in 1972.

were the greatest in Sind and the lowest in the Punjab. However, the worse picture appeared / in 1972. The "highly inaccurate" data⁸ were found in all the districts of Sind province in 1972.⁸ The similar kind of situation existed at the district level of Baluchistan province in both the censuses. Therefore, it is concluded that the age distributions of Pakistan / "inaccurate" and/or "highly inaccurate", and no improvement in the pattern of age reporting has been made over 1961-1972. However, a decline of 7.1 percent in U.N. Index in 1961 over 1951 demonstrated an improvement in the quality of age data. So far the data for the province of Punjab can be classified as inaccurate to a lesser extent (U.N. Index being the lowest) compared to NWFP, Sind and Baluchistan provinces.

COMPARISON WITH OTHER COUNTRIES

U.N. Index for Pakistan and a few other developed and developing countries based on census/survey data are shown in Table 9. According to the U.N. Index the United States (12.2) and Sweden (15.1) have accurate data sets on age. For these two countries, at such an advanced stage of economic, social and scientific development alongwith high literacy, one would expect the accuracy in statistical reporting to this extent; they are also not 100 percent correct either. The comparisons made in Table 9 revealed that Pakistani data (census, 1961 and PFS, 1975) are of the same quality as of the Philippine (census, 1960) and Greece (census, 1961). Furthermore, it is observed that the inaccuracy of data is not only inherited by Pakistani Censuses and Surveys, the worse are data for other countries also, namely: Nigeria, Ivory Coast, Taiwan, Java and Bangladesh. Therefore, it is concluded

⁸ It is revealed by a district level analysis, which is underway by the present authors.

Table 9

*United Nations Age-Sex Accuracy Index for Pakistan and
A Few Other Developed and Developing Countries*

Country	Census/Survey Year	U.N. Index
United States ¹	1960	12.2
Sweden ¹	1963	15.1
India (unadj) ²	1971	27.5
Philippines	1960	32.8
Greece ¹	1961	35.5
Pakistan (PFS) ²	1975	39.3
Census	1951	42.4
Census	1961	39.4
Census	1972	46.4
Taiwan ¹	1964	49.3
Pakistan (HED) ²	1973	50.6
Java (LFS) ³	1958	68.5
Bangladesh ²	1951	68.8
Turkey ¹	1960	70.6
Java ³	1960	75.6
Nigeria ⁴	1963	84.8
Ivory Coast ⁴	1958	92.7

Source:

1. Shryock and Seigel [35: 222].
2. Computed by the present authors.
3. Iskandar, N. "Some Monographic Studies on the Population In Indonesia", (No date): 45.
4. Ogum, [20].

that accuracy of data is expected to improve in the long run alongwith socio-economic and educational development and after the significance attached to age or to any type of statistical reporting is well understood.

SUMMARY AND CONCLUSION

The purpose of the present analysis was to identify the pattern and extent of age mis-reporting for males and females in several Pakistani censuses and surveys, rather than correcting and adjusting these errors. It has been common practice to compare the reported age distribution with model age distribution. A set of these model stable populations are available by Coale and Demeny [7]. A stable population assumes constant mortality and constant fertility schedules over time. This method has its own limitations with regard to the selection of appropriate model age distributions. In cases where age data are very poor, normally they are dis-regarded and replaced by stable age distribution. However, a comparison of reported age distribution of 1961 and 1972 censuses with stable age distribution was presented earlier by Zaki [41 and 42] which pointed age to age deviations in reported age data relative to the fitted stable model.

In order to identify the errors in age data sex ratios by age and age ratios were analysed and the current study used the United Nations method to compute the age-sex accuracy index.

The analysis of Pakistani data by using above method indicated that the three censuses of 1951, 1961 and 1972 and surveys namely: PGE, PGS, HED and PFS suffer^{ed} from age misreporting and the data were inaccurate or highly inaccurate for Pakistan as a whole and at the province level, also. The data for Punjab province appear^{ed} to be relatively of better quality than the

province of NWFP, Sind and Baluchistan. In general, overall quality of census data has not improved from one census to another, although for surveys since 1962 to 1975 the U.N. Index has been gradually declining except HED of 1973.

The age data obtained from censuses and surveys suffered from the same irregularities. However, the quality of age data was expected to be better in surveys due to better trained and better paid enumerators who had better supervision in the field, also. The present study compared the age data from four sample surveys such as PGE, PGS, HED and PFS. In general survey data suffer from varying levels of sampling and non-sampling errors.⁹ Data biases and sample coverage are important factors which might have affected our results. The PGS sample design provided substantially more sample areas and household coverage than was the case for PGE. Thus from this standpoint PGS, HED and PFS should have given better results. However, our findings^{did} not support the consensus that survey data are less erroneous than data from census.

Furthermore, it has also been observed that the pattern of age reporting^{was} the same for both the sexes in the censuses of 1961 and 1972. We can further conclude on the basis of age ratio scores that age data for males suffer^{ed} from misreporting of ages to a greater extent compared to females age misreporting. Though age data for females also show^{ed} irregularities, but some improvement^{was} observed overtime, in censuses and surveys of this study.

⁹ Another type of errors such as systematic errors and random errors might contribute to errors in age data. Census/Survey takers might do something about systematic errors but it is very difficult to check random errors.

SUGGESTIONS

Age is of the fundamental significance in demographic statistics. Information on demographic statistics are mostly tabulated and presented by age groups of population. Age plays an important role in the studies of population change and its component factors i.e., fertility, mortality migration and nuptiality. Economic growth of a country is directly related to the population structure of the country as it determines the level of labour supply and on the basis of these, projections for future can also be made. The whole planning framework for better standard of living of masses, public facilities and health programs, labour force participation, economic dependency ratios, school enrolments etc. involve population statistics by age. Therefore, the economic planners and policy makers are cautioned that all the estimates based on the erroneous data would be misleading and hence hamper the process of economic growth. In the absence of adequate vital registration system, it is emphatically suggested that the efforts towards the evaluation of existing data sources with regard to its validity and reliability in terms of its accuracy must be encouraged.

Some improvements in age data can be expected by improving the format of question on age; whether the question is based on "year of birth" or age "in completed years" has been asked. In the censuses and surveys of this research the age was asked "in completed years" except the PFS, where the question was based on "year of birth"¹⁰. If the question on age is a combination of "year of birth" with reference to historical events and age "in completed years" might give better results. In some cases "year of birth"

¹⁰The current analysis concluded that the PGS data are of better quality relative to other surveys.

may be a better way to ask question on age because the age "in completed years" changes every year and people may not be keeping up the counting of age correctly, and may be able to recall the "year of birth" because it is one point of time reference. However, the question on age should be very simple so that a layman would be able to understand and respond without getting confused. Any carelessness on behalf of the respondents and enumerators would produce errors in data.

The long run solution to the problems of age misreporting are expected along with the socio-economic development and improvements in the literacy level.¹¹ There should be compulsory registration system with emphasis on numerical age. In a developing country like Pakistan these changes are not likely to come in the near future. In the meantime, there must be continuous effort from the government to improve the quality of data to encourage the concerned agencies, to keep the birth records through political representatives, religious leaders, hospitals and health clinics, police stations and post offices etc.

¹¹An analysis of age reporting by literacy at the district level has shown a positive correlation between the two variables.

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