THE EFFECTS OF USING DIFFERENT NUMBERS OF FIVE YEARLY AGE GROUPS ON VARIOUS AGE AND SEX RATIO SCORES FOR 1981 CENSUS OF PAKISTAN

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ABSTRACT

This study has been taken to evaluate the differences (if any) between sex ratio scores, male and female age ratio scores and joint scores for urban and rural areas of divisions of Sindh and provinces of Pakistan, using different numbers of 5-yearly age sex groups, taken from 1981 census.

It has been observed that the effects of using different numbers of five yearly age groups are larger on urban areas and females than on rural areas and males. Different scores do not always give similar results and the data are highly inaccurate such that we can not rely on the data of any region.

1. INTRODUCTION

Age ratio scores (ARS) and sex ratio scores (SRS) give only a rough indication of smoothness of the data. These scores are affected by a number of items such as digital preference, age variations, sex under-reporting etc. The columns of the differences between sex ratios of various age groups and the percentage differences between their actual and average populations indicate those effects.

Gulnawaz and Rizwana [1] had evaluated Joint Score (JS) for Punjab using 16 five year groups from 1981 census, taking 75 years and above as the last group. Farhat and Pollard [7] had calculated JS for West Malaysia using

13 five yearly groups, i.e. data up to 65 years age.

Manzoor, et al [6] had used 14 groups from 1981 census of Pakistan, taking 65-70 years as the last group.

Noting the differences between the JS obtained by using data sets up to different age limits, it was decided to conduct this study with the following objectives:

(i) To evaluate the differences between various scores using 13, 14 and 15 groups, i.e. using data up to 65, 70 and 75 years. In other words, can we rely on the data of any region up to some sex-age group?

(ii) To evaluate the differences between various scores rural - urban wise, region-wise and sex-wise. In other words, we want to answer the question: do the different scores give similar results in various areas and regions?

2. DATA AND METHODOLOGY

2.1 DATA

The data have been taken from Pakistan Statistical Year Book, 1984. The results for data up to 70 years are already known [6] and are reproduced here for comparison.

2.2 METHODOLOGY

MARS, FARS, SRS and JS are calculated for various areas and regions, as in [6], by the following formulas:

$$\text{Age Ratio: } AR = \frac{P_i}{(P_{i+1} + P_{i-1})/2} \times 100.$$

where P=male or female population in its group

$$\text{Sex Ratio: } SR = \frac{\text{No.of males}}{\text{No.of females}} \times 100$$

Age Ratio Score: ARS = (AR - 100) /(N-2), for males and females,separately

Sex Ratio Score: SRS= $(SR_i - SR_{i-1})/(N-1)$

Joint Score: JS=3 (Sex Ratio Score) + Male Age-Ratio Score + Female Age Ratio Score.

i.e. JS= 3SRS+MARS+FARS

Note:

(i) i varies from 1 to N in each of the above formula and N denotes the total number of groups.

(ii) if JS < 20.0, population is accurate.
if JS > 40.0, population is highly inaccurate.

3. TABLES AND GRAPHS

3.1 TABLES

Tables 1.1, . . ., 1.8 give data and values for various ratios and scores for "Urban areas" of Pakistan's provinces and Sindh's divisions, using 15 and 13 groups. Tables 2.1, . . . 2.8 give similar ratios and scores for rural areas.

Tables 3.1 (U) and 3.2 (R) give SRS, MARS, FARS and JS for different groups. Tables 4.1 and 4.2 give % JS and SRS, in the form of 13/14 U, 14/15 U, 13/14 R, 14/15 R and U/R.

Tables 5.1(U) and 5.2(R) give % ARS in the form of 13/14 M, 14/15 M, 13/14 F, 14/15 F; and M/F.

Tables 6.1 (U) and 6.2 (R) give U/R% ARS.

3.2 GRAPHS

Graphs 1.1(U) and 1.2(R) each represent three curves of JS, for Pakistan and provinces, Sindh and divisions. Simly Graphs 2.1(U) and 2.2(R) each represent 3 curves of SRS.

Graphs 3.1(U) and 3.2(R) each represent 4 curves of % ARS, for 13/14 M, 14/15 M, 13/14 F and 14/15 F. Graphs 4.1(U) and 4.2(R) are for % M/F ARS.

4. DISCUSSION

4.1 Comparision Using JS (Tables 3.1, 3..2; Graphs 1.1, 1. .2)

(i) $JS_U < JS_R$, for all provinces, divisions and N

(ii) $JS_{13} < JS_{14} < JS_{15}$, for all Areas and regions

(iii) Diff (JS_{13}, JS_{14}) > Diff (JS_{14}, JS_{15}) for all Areas and regions, i.e. figures for urban areas are "more accurate" than for rural areas and the "level of accuracy" (AL) decreases as N increases for all regions.

(iv) The figures for urban areas of Karachi, Hyderabad, Sindh and Punjab are 'inaccurate' for N=13 (because JS<40) but are "highly inaccurate" for other areas, regions, and for N=14,15.

(v)

Provinces		Divisions	
Max	Min.	Max.	Min
U Bal (NWFP)	Sindh (Punjab)	Sukkur	Kar(Hyd)
R Bal	Punjab	Karachi	Hyd(Suk)

Infact, the figures for Baluchistan, urban NWFP and rural Karachi are worst of all (JS>40).

(vi) JS_U (Bal)=1.5 JS_U(Sindh), JS_U (Sukkur)=1.2 JS_U(Kar), JS_R (Bal)= 1.6 JS_R (Punjab), JS_R (Kar)= 1.12 JS_R (Hyd)

i.e. $AL_R < AL_U$ and Inter-divisional variations <Inter-provincial variations.

4.2 Comparison Using U/R % JS (Table 4.1)

(i) AL of urban areas varies but is greater than that of rural areas.

Inter-divisional differences <Inter-provincial differences.

(ii) $Perc_{13} < Perc_{14} < Perc_{15}$ for all regions, except Karachi, at N=13, i.e. the effects of decreasing N are larger in urban areas than in rural areas and are not

uniform over areas and regions.

(iii)

	Provinces	Divisions
Max.	NWFP	Sukkur
Min.	Sindh	Karachi

In fact, Diff (JS_R, JS_U) for N=15 is minimum for NWFP and maximum for Karachi for all N.
The figures for urban and rural areas of Punjab and Karachi are almost equally affected by N.

4.3 Comparison using 13/14 and 14/15 % JS (Table 4.1)

(i) The effects of changes in N on urban areas and for 14 to 13 are larger than on rural areas and for 15 to 14, or AL_U improves rapidly than AL_R.

(ii) $Perc_U$ (13/14) < $Perc_R$ (13/14), for all regions, except Karachi,
$Perc_U$ (14/15) < $Perc_R$ (14/15), for all regions.
The effects of changing N on urban areas are larger than on the corresponding rural areas.

(iii) Diff (per 13/14, perc 14/15) varies over areas and regions.
In fact, rural Baluchistan and rural Karachi seem to be least affected by the changes in N.

4.4 Comparison Using SRS (Tables 3.1, 3.2, Graphs 2.1, 2.2)

(i) $SRS_U < SRS_R$, for all regions (except NWFP) for all N

(ii) $SRS_{13} < SRS_{14} < SRS_{15}$, for all Areas and regions (except Sindh)

(iii) Diff (SRS_{13}, SRS_{14}) > Diff (SRS_{14}, SRS_{15}) for all Areas and regions

(iv)

Provinces		Divisions	
Max.	Min.	Max.	Min
U Bal (NWFP)	Sindh	Sukkur (Kar)	Hyd
R Bal	(NWFP)Punjab	Kar(Sukkur)	Hyd

Thus the results by SRS differ from those by JS in some places.

(v) SRS_U (Bal) = 1.8 SRS_U (Sindh)

SRS_U (Sukkur) = 1.1 SRS_U (Hyd),

SRS_R (Bal) = 2.0 SRS_R (NWFP),

SRS_R (Kar) = 1.21 SRS_R (Hyd).

i.e. Inter-divisional variations < Inter-provincial variation (as by JS) and $AL_R < AL_R$ (as by JS).

4.5 Comparison Using U/R % SRS (Table 4.2)

(i) Inter-divisional differences < inter-provincial differences and $ALR_U > AL_R$.

(ii) $Perc_{13} < Perc_{14} < Perc_{15}$ for all regions.
i.e the effects of changes in N on U/R % SRS are not always similar to those on JS.

(iii)

	PROVINCES	DIVISIONS
Max.	NWFP	Sukkur(Exc.N=13)
Min.	Sindh	Karachi(Exc.N=13)

This result is similar to that by JS, except for divisions when N=13. Here Diff (U/R % SRC) is negligible for N=13 and 14 for NWFP only.

4.6 Comparison Using 13/14 and 14/15 % SRS (Table 4.2)

(i) AL_R does not improve in case of reduction of N from 15 to 14 (exc. for Punjab and NWFP). Moreover, the changes in urban areas for N from 15 to 14 are larger than in the other three cases (contrary to JS).

(ii) Diff (Perc 13/14, Perc 14/15) varies over areas and regions (as by JS)

(iii)

		PROVINCES		DIVISIONS	
		Max.	Min.	Max.	Min.
(13/14)	U	Sindh	NWFP	Karachi	Sukkur
(13/14)	R	NWFP	Sindh	Karachi	Sukkur
(14/15)	U	NWFP	Punjab	Hyd	Sukkur
(14/15)	R	NWFP	Bal	Kar	Sukkur

In fact, Sukkur seems to be least affected in each case and rural NWFP and Karachi are most affected areas in majority of the cases (not as by JS).

4.7 Comparison Using U/R % ARS (Tables 6.1 & 6.2)

(i) Inter-divisional differences > inter-provincial differences. for all N, and $AL_U > AL_R$, for all N and Regions (as by JS and SRS)

(ii) Perc 13 < Perc 14 < Perc 15 for all regions (as by JS) except Sukkur at N=15

The effects of decreasing N from 14 to 13 are greater than those of decreasing N from 15 to 14.

(iii)		Provinces	Divisions
Max.	M	NWFP (Pun'b) (exc. N=13)	Sukkur
	F	Bal(Exc. N=13)	Karachi
	M	Sindh	Karachi
Min.	F	Punjab(exc. N=13)	Hyd (Exc.N=13)

The results for NWFP by MARS are similar to those for other provinces, contrary to the results by JS and SRS. (Different from those by FARS).

4.8 Comparison Using 13/14 % and 14/15 % ARS (Tables 5.1, 5.2, Graphs: 3.1, 3.2)

(i) The effects of changes in N on urban areas and for 14 to 13 are larger than those on rural areas and for 15 to 14, respectively (as by JS).

(ii) $Perc_U$ (13/14) < $Perc_R$ (14/15), for all regions and sexes (as by JS).

$Perc_U$ (14/15) < $Perc_R$ (14/15), for all regions and sexes (as by JS).

(iii)		Provinces		Divisions	
		Max.	Min.	Max.	Min.
(13/14)	U	Bal	Sindh	Sukkur	Karachi
(13/14)	R	NWFP	Punjab	Sukkur	Karachi
(14/15)	U	Punjab	NWFP	Sukkur	Karachi
(14/15)	R	Balochistan	Sindh	Hyd	Sukkur

The percentages are nearly uniform over all regions. However, Sukkur seems to be least affected and Karachi is most effected for both sexes.

4.9 Comparison Using M/F % ARS

(a) For Urban Areas:

(i) Inter-divisional differences > inter-Provincial differnces, between MARS and FARS, for all N. Male ARS under go larger changes than Female ARS for all N and regions, except Punjab and NWFP. $AL_M > AL_F$ by ARS, for all N.

(ii) $Perc_{13} < Perc_{14} < Perc\ 15$, only for Sindh and Sukkur (opposite to by JS)

(iii) Diff ($Perc_{13}$, $Perc_{14}$) > Diff ($Perc_{14}$, $Perc_{15}$), except for Sindh and Sukkur.

b) For Rural Areas:

(i) Inter-divisional differences < Inter-provincial differences, between MARS and FARS, for all N. MARS undergo smaller changes than FARS, for all N and regions
$AL_R < AL_F$ by ARS, for all N (opposite to urban areas)

(ii) $Perc_{13} < Perc_{14} < Perc_{15}$, by ARS, for all N

(iii)

	Provinces	Divisions
U	Punjab	Sukkur
Max.		
R	Bal(exc.N=13,Punjab)	Karachi (exc.N=13, Hyd)
U	NWFP (exc.N=14, Sindh)	Hyd (exc.N=13,Karachi)
Min.		
R	NWFP	Sukkur

Here Baluchistan and Karachi show large differences between the MARS and FARS, due to the changes in N (contrary to urban areas).

5. MAIN FINDING

(i) Results for urban areas are more accurate than for rural areas by JS, SRS, MARS and FARS for three numbers of groups; i.e. $AL_U > AL_R$.

(ii) Variations among divisions < variations among provinces, by each criteria and for all N.

(iii) JS and ARS depend on the number of age groups. They increase with N, more for urban than for rural areas, such that U/R % for 13 groups < for 14 groups < for 15 groups.

(iv) Males undergo greater changes than females, specially in rural areas.

(v) MARS < FARS for most of the urban areas, where as MARS > FARS for all rural areas and all N.
Thus results by MARS are not always similar to those by FARS

(vi) Diff (ARS) < Diff (JS) < Diff (SRS), for all regions, areas and N, except NWFP.

(vii) Differences between JS of urban and rural areas are maximum for Sindh and Karachi, and minimum for NWFP and Sukkur, for all N.
In general, the effects of decreasing N from 14 to 13 are greater than but opposite to those by changing from 14 to 15, more for urban areas and females than for rural areas and males.
Moreover, different scores give similar results in most of the cases but we can not rely on the data of any region being highly inaccurate.

Note: Due to the voluminous nature of the data, we are providing Tables 1.1 and 2.1 only. The remaining tables can be supplied to the interested reader on request.

TABLE 1.1

SHOWING COMPUTATION OF AGE AND SEX RATIO SCORES FOR PAKISTAN URBAN, 1981 CENSUS

AGE GROUP	ACTUAL POPULATION (1000's)		SEX RATIO	DIFFERENCE OF SEX RATIO	AVERAGE POPULATION		AGE RATIO		DEVIATION OF AGE RATIO	
	MALE	FEMALE			MALE	FEMALE	MALE	FEMALE	MALE	FEMALE
01	1813	1766	102.66	-	-	-	-	-	-	-
02	1838	1713	107.30	04.64	1733.0	1616.0	106.00	106.06	06.06	06.00
03	1653	1466	112.76	05.46	1601.5	1444.0	103.22	101.52	03.22	01.52
04	1365	1175	116.17	03.41	1406.0	1208.0	097.08	097.27	02.92	02.73
05	1159	0950	122.00	05.83	1154.5	0975.0	100.39	097.44	00.39	02.56
06	0944	0775	121.81	00.19	0958.0	0792.0	098.54	097.85	01.46	02.15
07	0757	0634	119.40	02.41	0806.0	0691.0	093.92	091.75	06.08	08.25
08	0668	0607	110.05	09.35	0681.5	0580.0	098.02	104.66	01.98	04.66
09	0606	0526	115.21	05.16	0579.0	0499.5	104.66	105.31	04.66	05.31
10	0490	0392	125.00	09.79	0532.5	0431.5	092.02	090.85	07.98	09.15
11	0459	0337	136.20	11.20	0366.0	0287.0	125.41	117.42	25.41	17.42
12	0242	0182	132.97	03.23	0392.5	0279.5	061.66	065.12	38.34	34.88
13	0326	0222	146.85	13.88	0188.5	0139.5	172.94	159.14	72.94	59.14
14	0135	0097	139.18	07.67	0239.0	0166.0	056.49	058.43	43.51	41.57
15	0152	0110	138.18	00.99	-	-	-	-	-	-
1) Total of 15 Age Groups =				83.21					214.95	195.34
2) Total of 13 Age Groups =				74.55	-	-	-	-	098.50	094.63
1,2) Sex Ratio Score =(5.94,6.21)					-	-	-	-		

1,2) Age Ratio Score: Male = (16.535, 8.955), Female= (15.026, 8.603)

1,2) Joint Score = (49.39, 36.20)

TABLE 2.1

SHOWING COMPUTATION OF AGE SEX RATIO SCORES FOR PAKISTAN RURAL, 1981 CENSUS

AGE GROUP	ACTUAL (1000's) POPULATION		SEX RATIO	DIFFERENCE OF SEX RATIO	AVERAGE POPULATION		AGE RATIO		DEVIATION OF AGE RATIO	
	MALE	FEMALE			MALE	FEMALE	MALE	FEMALE	MALE	FEMALE
01	4387	4608	095.20	-	-	-	-	-	-	-
02	4973	4618	107.69	12.48	4295.5	4044.0	115.77	114.19	15.77	14.19
03	4204	3480	120.80	13.12	3900.5	3506.5	107.78	099.24	07.78	00.76
04	2828	2395	118.08	02.73	3157.5	2744.0	089.56	087.28	10.44	12.72
05	2111	2008	105.13	12.95	2388.0	2103.5	088.40	095.46	11.60	04.54
06	1948	1812	107.51	02.38	1871.0	1801.5	104.12	100.58	04.12	00.58
07	1631	1595	102.26	05.25	1700.0	1638.5	095.94	097.35	04.06	02.65
08	1452	1465	099.11	03.14	1481.5	1498.5	098.01	097.76	01.99	02.24
09	1332	1402	095.01	04.11	1286.5	1269.5	103.54	110.44	03.54	10.44
10	1121	1074	104.38	09.37	1255.5	1196.5	089.29	089.76	10.71	10.24
11	1179	0991	118.97	14.59	0869.5	0831.5	135.60	119.18	35.60	19.18
12	0618	0589	104.92	14.05	1076.0	0843.0	057.43	069.87	42.57	30.13
13	0973	0695	140.00	35.08	0519.0	0461.5	187.48	150.60	87.48	50.60
14	0420	0334	125.75	14.25	0749,5	0534.5	056.04	062.49	43.96	37.51
15	0526	0374	140.64	14.89	-	-	-	-	-	-
(1) Total of 15 Age Groups =			-	158.39					279.62	195.78
(2) Total of 13 Age Groups =				129.25	-	-	-	-	148.18	107.67
(1,2) Sex Ratio Score=(11.31, 10.77)					-	-	-	-		

(1,2) Age Ratio Score: Male = (21.508, 13.469), Female = (15.06, 9.788)

(1,2) Joint Score = (70.51, 55.57)

TABLES 3.1 & 3.2
SHOWING SRS, MARS, & JS FOR URBAN & RURAL AREAS

REGION		SRS			MARS			JS		
		13	14	15	13	14	15	13	14	15
PAK	U	06.2	0.3	05.9	08.9	14.3	16.6	36.2	46.1	49.4
	R	10.8	11.0	11.3	13.5	19.6	21.5	55.6	65.9	70.5
PUNJAB	U	07.2	07.4	07.3	09.3	14.8	16.9	38.7	48.6	52.7
	R	09.7	1.00	10.4	12.3	18.2	20.1	50.4	60.7	65.6
NWFP	U	09.2	09.3	10.9	13.0	20.3	22.7	53.6	66.6	76.2
	R	09.1	09.1	09.5	17.7	24.7	26.6	60.8	72.4	77.5
BAL:	U	10.5	10.9	11.3	11.4	16.9	19.5	53.9	68.3	74.0
	R	18.6	18.7	18.7	16.6	23.3	24.9	84.8	95.0	97.4
SINDH	U	06.3	05.9	06.4	08.2	13.1	15.5	36.2	44.8	50.9
	R	13.6	14.2	13.9	13.7	19.9	22.0	66.3	77.6	80.9
KAR:	U	07.5	07.1	08.2	07.8	12.2	14.6	38.6	46.6	54.8
	R	13.9	16.7	15.5	14.8	21.9	24.1	70.5	87.5	87.5
HYD:	U	06.2	06.0	07.4	09.1	14.1	16.4	37.9	47.0	55.9
	R	12.1	13.0	12.8	14.8	21.5	23.6	63.0	76.2	79.5
SUKK	U	07.9	08.2	08.5	10.1	15.2	17.8	45.8	57.1	62.4
	R	15.0	15.1	14.9	12.8	18.4	20.6	70.0	79.1	82.3

TABLES 4.1 & 4.2
SHOWING % JS AND SRS (RATIOS)

REGION	13/14U	14/15U	13/14R	14/15R	U/R 13	U/R 14	U/R 15
%JS	078.6	093.3	084.3	093.5	065.1	069.9	070.0
PAK							
%SRS	098.1	106.6	097.6	097.6	057.7	057.3	052.5
%JS	079.6	092.2	083.0	092.5	076.8	080.1	080.3
PUNJAB							
%SRS	097.2	100.8	097.2	095.9	073.9	073.9	070.3
%JS	080.6	087.4	084.0	093.4	088.2	091.9	098.3
NWFP							
%SRS	099.0	084.3	100.1	095.4	101.1	102.2	115.6
%JS	078.9	091.2	089.3	097.5	063.5	071.9	076.9
BAL:							
%SRS	095.7	096.4	097.8	100.0	056.2	057.5	060.6
%JS	081.0	088.0	085.4	095.9	054.7	057.7	062.9
SINDH							
%SRS	105.4	093.3	096.0	101.7	046.3	042.2	046.0
%JS	082.8	085.0	080.5	100.0	054.7	053.2	062.7
KAR:							
%SRS	105.2	086.2	083.3	107.7	053.7	042.5	053.0
%JS	080.7	084.1	082.7	095.9	060.3	061.7	070.3
HYD:							
%SRS	103.7	081.6	093.1	101.9	051.3	046.1	057.6
%JS	080.2	091.5	088.4	096.1	065.5	072.2	075.8
SUKK:							
%SRS	096.4	097.0	099.1	101.8	052.9	054.5	057.2

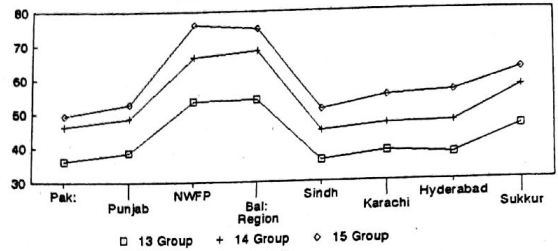
TABLES 5.1 & 5. 2
SHOWING % ARS FOR URBAN & RURAL AREAS (RATIOS)

REGION	13/14M	14/15M	13/14F	14/15F	M/F 13	M/F 14	M/F 15
U	062.7	086.4	067.1	080.0	104.6	111.5	103.2
PAK: R	068.6	091.3	074.2	087.6	137.6	148.9	142.8
U	062.9	087.4	067.4	084.8	118.2	126.5	122.8
PUNJAB R	067.4	091.0	071.8	087.6	137.2	146.2	140.9
U	064.2	089.4	071.0	090.0	098.6	109.1	109.8
NWFP R	071.7	092.8	077.3	091.6	111.1	119.7	118.2
U	067.3	086.9	059.6	086.7	102.0	091.1	090.9
BAL: R	071.5	093.5	084.4	091.2	133.6	157.7	152.5
U	062.3	084.5	066.4	085.1	090.2	095.1	095.7
SINDH R	068.8	090.3	077.5	089.1	115.8	130.5	128.6
U	063.4	084.0	064.6	083.8	092.0	093.7	093.5
KAR: R	067.6	091.0	089.7	091.9	106.0	140.6	142.0
U	064.5	086.1	068.3	085.4	089.7	095.0	094.3
HYD: R	068.7	091.1	075.7	089.0	124.6	137.4	134.3
U	066.5	085.8	069.2	089.6	085.6	089.1	093.1
SUKK: R	069.3	089.5	079.7	089.1	105.2	120.8	120.2

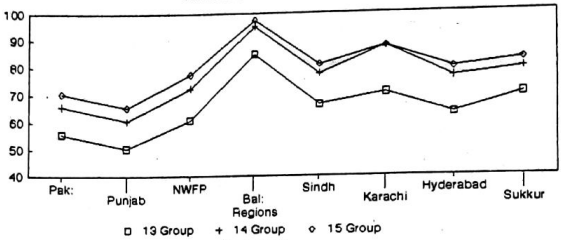
TABLES 6.1 AND 6. 2
SHOWING U/R % ARS FOR MALES AND FEMALES

REGION/ GROUP		13	14	15
PAKISTAN	M	066.5	072.8	076.9
	F	087.9	097.2	106.4
PUNJAB	M	075.6	080.9	084.3
	F	087.8	093.6	096.6
NWFP	M	073.5	082.1	085.2
	F	082.8	090.1	091.7
BALOCHISTAN	M	068.5	072.8	077.9
	F	0.89.7	125.9	130.8
SINDH	M	060.1	065.7	070.2
	F	077.2	090.2	094.4
KARACHI	M	052.4	055.9	060.5
	F	060.4	083.8	091.9
HYDERABAD	M	061.8	065.8	069.6
	F	085.8	095.1	099.2
SUKKUR	M	079.4	082.8	086.4
	F	097.6	112.3	111.6

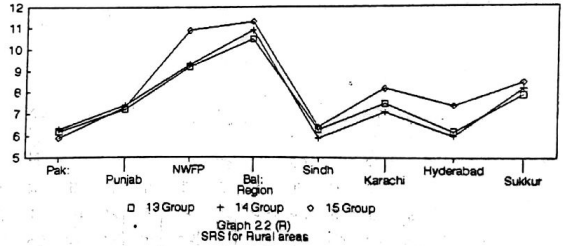
Graph 1.1 (U)
Joint Scores for Urban areas



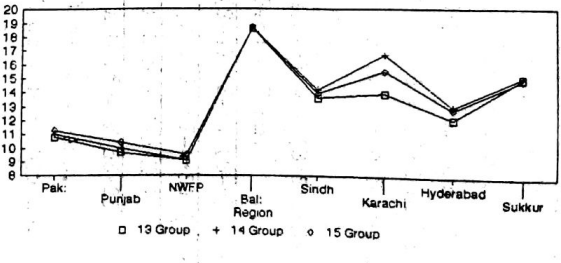
Graph 1.2 (R)
Joint Scores for Rural areas



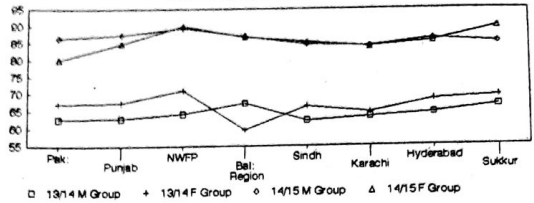
Graph 2.1 (U)
SRS for Urban areas



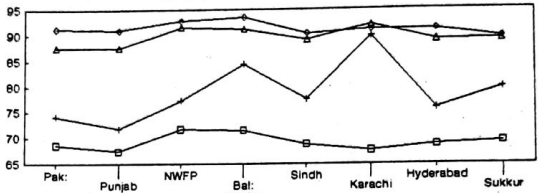
Graph 2.2 (R)
SRS for Rural areas



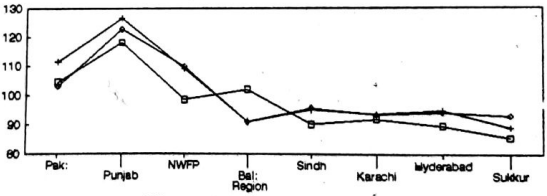
Graph 3.1 (U)
13/14,14/15 %ARS for Urban area



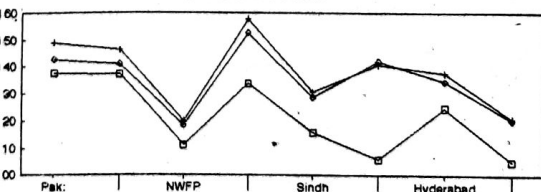
Graph 3.2 (R)
13/14,14/15 %ARS for Rural area



Graph 4.1 (U)
M/F % ARS for Urban areas



Graph 4.2 (R)
M/F % ARS for Rural areas



REFERENCES

1. Gul Nawaz Khan & Rizwana Raza: Evaluation of Census, Sex-Age Data, Punjab, 1981; Journal of Pure and Applied Sciences, 4, 1, 1985, 85-90.

2. Munir Ahmed: Evaluation of Census, Sex-Age Data, Pakistan, 1972 Proceedings of Statistical Conference, Faisalabad,1976.

3. Statistics Division, Pakistan Statistical Year-Book, Federal Bureau of Statistics, Government of Pakistan, Islamabad, 1984.

4. Statistics Division, District-Wise Population Census Reports Population Census Organization, Government of Pakistan, Islamabad, 1984.

5. United Nations: "Accuracy Tests for Census Age Distribution Tabulated in Five-Year and Ten-Year Groups", Population Bulletin No.2, 1952, pp.59-79.

6. Manzoor Ahmed; Dr.N.M.Shaikh & Muhammad Aslam Memon: Comparison of Accuracy Levels of Grouped Sex-Age Data for Rural and Urban Areas of Sindh and Pakistan, 1981 Population Census; Research Journal, Shah Abdul Latif University, Khairpur, 1992, pp.132-142.

7. Pollard & Farhat Yousuf: Demographic Techniques, Pergamon Press, Sydney.