Provisional Estimates of Length of Working life in Pakistan

by

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Life table techniques have been used fairly widely to determine the working life of the labour force or work-life expectancy [6; 7; 8; 18; 23]. The length of working life in developing countries, however, is often unknown or estimates are based upon very rigid assumptions which are not realistic given the conditions of labour in such countries. For example, Mortara's international comparisons are based upon the assumption that the activity ages are always 15 to 60 years only [6]. Such an assumption leads to a low estimate of work-life expectancy in countries such as Pakistan where the lower age of large scale labour force participation is, at a minimum, age 10 as officially defined in the labour force statistics and where individuals apparently maintain some connection with the labour force during latter years of life.

Specific estimates of the length of working life depend upon fairly refined data including age specific activity rates and a life table. The 1961 Census of Pakistan and the Population Growth Estimation project make such data now available for Pakistan. It is therefore the purpose of this paper to utilize these data to generate and evaluate work-life tables for the male population of East and West Pakistan. This study is restricted to males since female labour force participation in Pakistan is low and the movement of women in and out of the labour force presents many unique problems which have only recently been solved in countries where extensive statistical data are available. Furthermore the analysis presented here deals with the two provinces separately because of mortality [4] and labour differences.

The Working Life Table

For demographers interested in labour force analysis, the work-life table holds a special interest. It provides a simple and direct means of dealing with the relationship between one demographic variable, mortality, and labour force dynamics [8]. Life table methodology can be expanded to deal with accessions to the labour force and separations due to death and all other causes which are generally lumped together under the rubric of "retirements". Such data provide

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detailed information on one aspect of labour mobility [8], and information necessary for certain aspects of manpower planning [15].

Standard work-life tables such as the two presented here refer to individuals in the labour force. Work-life expectancy (e^{o}_{wx}) in the table refers to the number of years an individual already in the labour force and age x may expect to remain in the labour force. In addition to the e^{o}_{wx} function, the work-life tables provides additional functions of interest: *i)* ${}_nA_x$, the accession rate; *ii)* ${}_nQ^{s}_{x}$, total separations; *iii)* ${}_nQ^{d}_{x}$ separations due to death; *iv)* ${}_nQ^{r}_{x}$, separations due to all causes other than death (retirement); and *v)* $e^{o}_{x} - e^{o}_{wx}$ the period of time an individual may expect to remain alive after leaving the abour force (retirement).

The Data and Methodology

The starting point for the abridged work-life table is a set of ${}_nL_x$ values[1] from an abridged life table for males and a set of labour force participation rates by age. In this paper the ${}_nL_x$ values were taken from a previously constructed abridged life table generated from 1962-63 mortality data [4]. The mortality data and base population figures were collected in the Population Growth Estimation project which has been described by Ahmed [1], Aslam [2] and others [9;20].

To relate the participation rates (${}_nW_x$) to the stationary population (${}_nL_x$) rates for quinquennial age groups are minimal requirements, and at early ages where accession rates are high, greater accuracy is secured if participation rates and the stationary population are available by single years. Such data are not available, and both mathematical and graphic interpolation provided no major improvement in the results. Use of quinquennial groups at the early ages may produce some bias in the data but certainly no more than what might be generated by the use of single year age groups in a country where many errors in age reporting occur [16].

There is, of course, the question of whether the labour force participation rates are valid. In age group 10-14 the East Pakistan labour force participation rate appears to be unusually high: 581 per 1000. One likely source of error arises from the 1961 Census which required economic questions to be completed for all individuals age 10 and over. To reduce recording time, it appears that enumerators listed children age 10 and over (say 10, 11 and 12) as age 7-9. One may hypothesize that the enumerators were more likely to shift children who were not actually

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[1] The notations used here follow traditional life table form. For a detailed explanation of the life table notation and functions the reader may wish to consult Barclay [3]. The specific notation used in the work-life table is described in detail along with the computational techniques by Sadie [18]. Briefly the ${}_nL_x$ function is the stationary population or the number of person years lived between age x and x + n.

working. This would reduce the denominator of the participation index and inflate the rate of participation. There are good reasons, however, for believing that the activity rates are not unrealistic. Early entrance of males to the labour force may be expected under conditions of limited educational facilities, low retention ratios, concentration of workers in agriculture, and high levels of widowhood. Such conditions are more common in East Pakistan with its high age 10-14 activity rate than in West Pakistan. Participation rates similar to East Pakistan's are found also in other developing countries. The following are reported in the *1964 UN Demographic Yearbook* [22], and demonstrate that the high activity rates in early ages for East Pakistan are not unique.

Country	*Year*	*Age 10—14*	*Age 15—19*
Pakistan	1961	.493	.767
East Pakistan	1961	.581	.811
West Pakistan	1961	.334	.723
India	1953/54	.392	.745
Taiwan	1956	.492	.775
Iran	1956	.297	.807
Iraq	1957(5—14)	.659	.690
Thailand	1960(11—14)	.504	.769

Between age 15 and 59 the activity rates [10] are reasonable and consistent with those found in developed and developing countries [22], but a methodological problem is presented by activity rates of age groups 25-54. For these age groups labour force data are reported for 10 rather than 5-year age groups. Quinquennial participation rates were estimated by linear interpolation. For East Pakistan certain fluctuations in participation rates made it necessary to smooth the rates for the groups between 25 and 49 since the activity rates were not monotonically increasing. It is necessary [18] and realistic to assume that actual participation rates increase regularly to a peak and then decrease regularly. To meet this assumption the participation rates were smoothed by a simple moving average. The shift in participation rates is minimal ranging from .018 (age 25-29) to .001 (age 35-39). No adjustment was necessary for West Pakistan.

It was originally decided to extend the work-life table to age groups beyond 60 to provide results comparable to those available for other countries [18; 23]. For these age groups, however, there is a methodological problem as well as the question of validity. Above age 60 participation rates are lumped together. The participation rates were estimated for age groups 60-64, 65-69, 70-74 and

75 and over by graphic extrapolation. The estimated rates were checked by applying them to the 1961 Census population age 60 and over as adjusted by the demographic section of the Pakistan Institute of Development Economics[2]. The sum of the age specific estimated rates produce a figure slightly lower than the actual number of labour force participants above 60 as reported in the census and thus should be viewed as slightly conservative. The figures for the age groups 60 and over should be regarded as approximations not only because of the estimates used here but also because of the errors which arise in age reporting in older ages in Pakistan [13].

The errors in age reporting in older years of life present special problems. Exaggeration of age may result in some upward bias in both the life expectancy and work-life expectancy. It is difficult to determine precisely the degree of error involved and it may be years before the problem can be resolved in Pakistan for not only are ages exaggerated by part of the population but in many cases the exact age or even approximate age is not known. Nevertheless, the data do appear to be consistent with certain model life tables to be discussed below.

Work Life Tables for East and West Pakistan Males

The abridged work-life tables for East and West Pakistan males are presented in Tables I and II. The computational techniques follow Sadie [18] and Wolfbein [23] for each function reported.

Accession Rates

The accession rate—Tables I and II, Col. (4), (1000 ${}_nA_x$)—refers to the number of individuals in a cohort not in the labour force at age x + n who will enter before they are five years older. Thus in East Pakistan, of the males in the stationary population (${}_nL_x$) age 5-9, 570.5 per thousand may expect to be in the labour force by age 10-14, and in West Pakistan 377.7 per thousand. While more than 50 per cent of the males in East Pakistan enter the labour force during this initial age slightly more than one-third in West Pakistan enter during the same age period[3]. Entry to the labour force in West Pakistan, however, is concentrated in a shorter period of time; few individuals not in the labour force by age 25-29 in West Pakistan can expect to enter during the next five-year period while individuals up to age 35-39 in East Pakistan may expect to enter before they are five years older. The majority in each province, however, are in the labour force by age 20-24. In industrialized nations the number entering

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[2] These adjustments were made in the process of computing a new population projection for Pakistan.

[3] Because of the lack of single year age and participation data for peak years of accession it is difficult to compare these data with those of developed countries. It is possible, of course, to interpolate and break down these data into single years of age. This requires, however, interpolation of ${}_nL_x$ values, activity rates, and ${}_nQ_x$ values (see [20]) and the finally computation is, therefore, subject to sufficient methodological bias to render comparisons questionable.

the labour force after age 20-24 is also small, but such individuals are usually those who postpone entry to the labour force because of extended education. Postponement of entry into the labour force for higher education is probably not the most important reason for more prolonged period of accessions[4] in East Pakistan.

The more prolonged period of entry into the labour force for East Pakistan males is probably due to two factors. First, the low level of urban and industrial development in East Pakistan relative to West Pakistan means that relatively fewer employment opportunities are available outside of agriculture in East Pakistan where the population is larger, more densely settled, and farms already small in relation to the available manpower. Second the degree of reporting error for participation rates may be greater in East Pakistan. An indication of this problem is that in the case of East Pakistan data it was necessary to smooth activity rates since they did not increase monotonically to a given age and then decrease monotonically thereafter as we find in West Pakistan and, in general, in other countries.

Regardless of the differences in the accession rates between the two provinces at the older ages, there is one point about which there should be no argument. The average age of entry to the labour force in East Pakistan is roughly five years earlier than in West Pakistan, and this difference may in part reflect the higher educational retainment ratio in West Pakistan relative to East Pakistan.

Separations from the Labour Force

Separation rates for East and West Pakistan males appear in Columns (5), (6) and (7) of Tables I and II. The total separation rate ($1000\ {}_nQ_x^s$) is broken down into separations due to death ($1000\ {}_nQ_x^d$—Col. (6)) and separations due to all other reasons ($1000\ {}_nQ_x^r$—(Col. 7)). In East Pakistan, the probability of separations due to death at any age exceeds the probability of retirement even at age 75 and over. These data indicate that those reported to be still in the labour force are more likely to die than to retire at any age. In West Pakistan, on the other hand, the probability of separation for reasons other than death (retirement) is not only consistently higher than in East Pakistan, but retirements also exceed separations due to death in the last two age groups.

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[4] It is, of course, true that in many developing countries, particularly those with a history of English education, the many liberal arts and law graduates often find it difficult to find the appropriate job. An appropriate analogy here is with individuals who have some formal education but who may be classified as functionally illiterate. For a number of reasons, it appears that many individuals with higher education in developing countries are functionally incompetent. Often individuals are trained in skills which are in limited demand or at least trained in skills for which their is a surfeit of supply. Moreover given the status problems faced by the highly educated, they may refuse to accept a job not commensurate with the perceived status to which they feel their college or higher education entitles them. In some cases the "appropriate" position may be obtained eventually, but often, after years of unemployment, a lower prestige position is finally accepted.

TABLE I

ABRIDGED WORK-LIFE TABLE FOR MALES, EAST PAKISTAN, 1962/63

Age	Stationary population	Activity rate	Stationary population activity rate	Accession rate	Separation rates			Work-life expectancy	Life expectancy	Retirement period
					Total	Death	Retirement			
	$_nL_x$	$_nW_x$	$_nLW_x$	$1000\ _nA_x$	$1000\ _nQ_x^s$	$1000\ _nQ_x^d$	$1000\ _nQ_x^r$	e_{wx}^o	e_x^o	$e_x^o - e_{wx}^o$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
5- 9	381,745	.0000		570.5						
10-14	374,620	.5814	362,557	225.5	7.97	7.97		53.25	54.82	1.57
15-19	371,635	.8112	359,668	103.3	9.57	9.57		48.95	50.23	1.28
20-24	368,080	.9155	356,228	34.5	12.74	12.74		44.36	45.63	1.27
25-29	363,390	.9505	351,689	10.3	17.41	17.41		39.83	41.10	1.27
30-34	351,062	.9610	345,565	3.6	23.04	23.04		35.39	36.67	1.28
35-39	348,835	.9647	337,603	3.0	34.36	34.36		31.06	32.38	1.32
40-44	336,848	.9678	326,001		51.90	50.08	1.82	26.89	28.17	1.28
45-49	319,962	.9660	309,083		70.04	63.53	6.51	22.97	24.33	1.36
50-54	299,568	.9595	287,435		102.30	91.29	11.01	19.27	20.66	1.39
55-59	272,068	.9484	258,029		164.59	136.88	27.71	15.82	17.04	1.22
60-64	234,305	.9200	215,561		241.03	198.36	51.67	12.76	13.92	1.16
65-69	188,052	.8700	163,605		313.95	251.99	61.96	10.25	11.20	.95
70 74	136,880	.8200	112,242		427.67	328.01	99.66	8.16	8.87	.71
75 and over	152,295	.7400	112,698		770.03	451.06	318.97	5.01	5.86	.85

Source: For Col. (1), *see* [4].
For Col. (2), *see* [12].

TABLE II

ABRIDGED WORK-LIFE TABLE FOR MALES, WEST PAKISTAN, 1962/63

Age	Stationary population	Activity rate	Stationary population activity rate	Accession rate	Separation rates			Work-life expectancy	Life expectancy	Retirement period
					Total	Death	Retirement			
	$_nL_x$	$_nW_x$	$_nLW_x$	$1000\ _nA_x$	$1000\ _nQ_x^s$	$1000\ _nQ_x^d$	$1000\ _nQ_x^r$	e_{wx}^o	e_x^o	$e_x^o - e_{wx}^o$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
5-9	379,808	.0000		377.7						
10-14	373,665	.3839	352,927	334.1	15.64	15.64		53.95	57.40	3.45
15-19	367,420	.7233	347,406	153.2	18.89	18.89		49.78	53.16	3.38
20-24	360,872	.8789	340,844	56.4	20.97	20.97		45.61	49.07	3.46
25-29	353,305	.9370	333,697	3.7	22.71	22.71		41.48	45.03	3.55
30-34	345,282	.9408	326,119	...	25.20	25.20		37.35	40.98	3.63
35-39	336,582	.9445	317,902		29.06	29.06		33.20	36.91	3.71
40-44	326,865	.9437	308,463		37.07	37.07		29.06	32.86	3.80
45-49	315,050	.9428	297,029		66.99	49.94	17.05	24.97	28.83	3.86
50-54	299,182	.9263	277,132		79.90	62.53	17.37	21.16	24.97	3.81
55-59	280,300	.9097	254,989		127.97	75.57	52.40	17.62	21.39	3.77
60-64	258,555	.8600	222,357		169.01	111.60	57.41	13.57	17.75	4.18
65-69	228,362	.7900	180,406		271.56	160.16	111.40	10.74	14.24	3.50
70-74	187,735	.7000	131,415		448.43	213.68	234.75	8.98	11.26	2.28
75 and over	285,781	.5200	148,606		938.02	221.98	716.04	5.31	7.81	2.50

Source: For Col. (1), *see* [4].
For Col. (2), *see* [12].

The low separation rates which prevail until the oldest age groups and the low separation rates due to "retirement" are, of course, subject to two sources of bias. Exaggeration of age above 60 for example would increase the separation rates for the older age groups and decrease them for younger age groups.

Low separations for retirement purposes are likely to reflect the prolonged identification of males with the labour force despite a non-existent or weak actual attachment. Particularly in the agricultural sector older males may indicate that they are members of the working force when in fact their work activities are minimal or non-existent. In part the structure of the 1961 Census economic activity questions induces such error for the agricultural population since the "gainful worker" rather than the "labour force" [18] concept was used for agricultural workers. Thus, older males who viewed themselves as "usually tillers of the soil" were enumerated as members of the labour force. In Pakistan where seasonal unemployment, and underemployment in agriculture is widespread a prolonged period of inactivity for older males is easy to reconcile with their identification with the labour force. Moreover since control of the land remains in the hands of the older male, he may have further reason for reporting himself as a "tiller" of the soil.

The argument that in Pakistan older agricultural males are unlikely to dis-associate themselves from the labour force is consistent with the observed separation rates. In East Pakistan where a much larger proportion of the male population is in agriculture, the "retirement" separation rate is consistently lower than in West Pakistan with its strikingly larger non-agricultural labour force.

Length of Working Life in Pakistan

Tables I and II (Cols. (8), (9) and (10)) present the life expectancy and work life values for East and West Pakistan separately. There are three points of interest in these tables: *i*) the relatively high values for life expectancy in Pakistan; *ii*) the small differences between e^{o}_{x} (life expectancy) and e^{o}_{wx} (work-life expectancy); *iii*) the East and West Pakistan differences.

Males in Pakistan in the labour force at age 10 may expect to live on the average an additional 54.8 years in East Pakistan and 57.40 years in West Pakistan under mortality condition of 1962-63. These values compare favourably with developed Western countries in 1940-51 (*see*, Table III), and seem to reflect the rapidly improving mortality conditions noted in many developing countries. These life table values, however, appear to be somewhat high. These high values may be due to two mortality differentials: male mortality conditions are better than female mortality conditions and apparently major mortality improvements have been made for males above age 5. Males who survive early childhood are likely to receive, disproportionately, the limited medical aid available [17]. Moreover the data used in the construction of the life tables are

subject to sampling and non-sampling errors. The quality of the fieldwork for collecting mortality data may have been better in East Pakistan so that a greater number of deaths were missed in West Pakistan [20]. As a result, the e_x^o values for East Pakistan are consistent with Coale and Demeny model life table South, level 14 [5], while West Pakistan e_x^o value appear to be roughly 2.5 years too high on the basis of model life table South, level 15 which otherwise provides the best fit [5]. Nevertheless such values appear consistently in life tables constructed on the basis of one [2] two [4] and three [20] year PGE data.

Under the labour force participation rates for 1961, males in East and West Pakistan in the labour force at age 10-14 may expect to remain in the labour force for 53.25 and 53.95 years respectively. Thus few years are available to the males (*see* Col. (10), Tables I and II) when they are not regarded as active participants of the labour force. The small differences between e_x^o and e_{wx}^o reflect the low retirement rates discussed above. While retirement programmes are widely discussed in Pakistan and the retirement age has been lowered for governmental workers, the majority of the labour force remains in agriculture where older men continue to identify themselves as part of the labour force. Indeed the East-West Pakistan differences in $e_x^o - e_{wx}^o$ are consistent with the much greater concentration of East Pakistan males in agriculture.

The East-West differences in length of working life are best illustrated by contrasting selected values with those found in other countries. Some comparative data are presented in Table III for the United States, 1940 and 1947 and white males, South Africa, 1951.

TABLE III

SELECTED WORKING LIFE VALUES: PAKISTAN, UNITED STATES AND SOUTH AFRICA

Age	e_x^o	e_{wx}^o	$e_x^o - e_{wx}^o$	e_x^o	e_{wx}^o	$e_x^o - e_{wx}^o$
			Pakistan			
	East Pakistan (1962/63)				West Pakistan (1962/63)	
15-19	50.2	49.0	1.2	53.2	50.0	3.2
20-24	45.6	44.4	1.2	49.1	45.6	3.5
60-64	13.9	12.8	1.1	17.8	13.6	4.2
			United States			
	1940				1947	
15-19	51.3	45.8	5.5	52.6	47.4	5.2
20-24	46.8	41.3	5.5	48.0	42.8	5.2
60-64	15.1	9.2	5.9	15.3	9.7	5.6
			South Africa (White males) (1951)			
15-19	53.3	47.6	5.7			
20-24	48.7	42.9	5.8			
60-64	15.6	9.7	5.9			

The data presented in Table III suggest major differences between the two provinces of Pakistan: for West Pakistan males life expectancy is higher, males remain in the labour force longer, and *after* retirement will live approximately three times as long as males in East Pakistan.

In comparison with the United States 1940 and 1947 data and 1951 South African data, the East Pakistan results are plausible. It is difficult to accept the West Pakistan results, however, primarily with respect to the life expectancy. While there are social, economic, and medical differences between East and West Pakistan it is unlikely that such conditions in West Pakistan are so good that mortality conditions in West Pakistan above age 15 are better than those in the United States in 1940-47, comparable to South Africa at age 15 and superior at age 20 and 60. These comparisons again suggest that the recording of male deaths in East Pakistan may have been more complete than in West Pakistan. The work-life expectancies in the two wings are higher than those from the three "Western" tables, but this reflects not only the life expectancy but also the low retirement levels in Pakistan.

Conclusions

In this initial effort to construct a work-life table for males in Pakistan, data have been drawn from the 1961 Pakistan Census and the 1962-63 Population Growth Estimation project. While the results are plausible, the tables should be viewed as a first approximation because of the limitations of the data. Several sources of bias have an unmeasurable effect on the results.

The accuracy of work-life tables depends upon the validity of age specific death rates and age specific labour force participation data. In Pakistan where errors in age reporting are normal rather than infrequent, such data must be carefully analyzed. Aggregating the data as we have done in the construction of abridged tables provides some reduction of error, and smoothing techniques eliminates some obvious disparities. Nevertheless a highly reliable work-life table for Pakistan must await the time when more accurate age reporting by single years can be linked to accurate and more refined reporting of mortality and economic activity.

It should be further pointed out that the basic life table from which the initial stationary population values were taken, is based on the PGE data which are subject to sampling as well as non-sampling errors, yet a series of three life tables based on one, two and three years' data indicate very consistent results. It is, of course, possible for the same types of error to systematically bias each life table, but no evidence of such error has been found.

Labour force participation rates as used here are based on the 1961 Census, and their limitations should also be recognized. Three problems are encountered in the use of such data. First, rates are not available by five or even ten-year age groups beyond age 60 and quinquennial rates were therefore estimated. Second, at early ages where high accession rates occur, greater accuracy would be introduced if single year rates were available. Finally the use of the "gainful worker" concept for agricultural (tillers) workers may have inflated participation rates for the very young and very old, and therefore deflated the retirement rates. While the actual economic contribution of many young men and older men may be marginal, in Pakistan such workers are legitimately viewed as part of the labour force and therefore in part this may account for the low levels of agricultural productivity and the high estimated rate of underemployment.

Despite the limitations of the data, the work-life tables are instructive. The data clearly reflect past improvements in mortality which are apparent in both the long life and work-life expectancy. The long period of work life corroborates the finding for other predominantly agricultural societies that men enter the labour force early and remain active to some degree for long periods of time. Retirement rates appear to be a function of the level of urbanization and industrialization elsewhere in the world [6] and the East-West Pakistan differences confirm this.

In summary it should be pointed out that the long work life expectancy found in Pakistan has the advantage of offsetting the dependency burden created by the broad based age structure of Pakistan [6]. In the future, however, one should expect to find a decrease in the length of working life arising from a rising age of entry into the labour force and increased rates of retirement in the older ages; hopefully increased labour productivity will then offset the dependency load placed on the smaller proportion of the population in the labour force.

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