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Literate Life Expectancy in Bangladesh: A New Approach of Social Indicator

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Abstract: Social indicators have been used informally for a very long time, particularly in economics, to assess the state of the nation and progress towards national objectives. Measuring people's quality of life emphasizes human well being and particularly issues of equity, poverty, and gender. In this context, this paper uses a latest indicator of social development, Literate Life Expectancy (LLE), which was introduced by Lutz (1995). We have tried to highlight the importance of using a pure social indicator which is largely a demographically-based indicator and that intentionally does not use any economic measurement but rather combines in one number both life expectancy and literacy. In other words, Literate Life Expectancy is the aggregate average number of years that a person lives in a literate state. The Literate Life Expectancy index proved to be a very clear and simple comprehensive measure of social development at urban or rural level of spatial aggregation. Importantly, this index could be used to calculate future social development by adopting different mortality and educational scenarios, which can be associated with specific policy assumptions. To demonstrate Literate Life Expectancy's usefulness, we assessed the levels of social development in Bangladesh at the residence levels. The obtained results at the national level shows the remarkable difference in the Literate Life Expectancy between urban and rural people (men and women). With the literacy and life expectancy information, sex differentials are seen and compared throughout each age group for both rural and urban areas, which clearly proves the existing gender difference either in rural or in urban area of Bangladesh.

Key words: Age-specific mortality rates, age-specific proportions literate, Bangladesh Bureau of Statistics, literate life expectancy.

1. Introduction

In Bangladesh like a developing country education and the provision of health are the leading sectors for social development. In our country basic education and health are being simply measured by the number of people who are literate and

by the number of years of personal survival, respectively. Thus, in order to disentangle many residential, age, and sex differentials of Bangladesh's population, we have tried to introduce this social indicator utilizing a two-level approach for this study. The levels are 'a national level to measure the Literate Life Expectancy (LLE) of men and women' and 'a regional level to evaluate the average results of LLE by sex'. This LLE is an absolute number that has a clear interpretation and therefore does not have the problems of abstract indices on a relative scale. Measured over time, it allows statements about the rate of change and not just static differences. This new indicator not only shows the current level of social development but also provides the literate state of the people by age group and enables to foresee the levels of education and human potentiality of future generations. It does not need any maximum or minimum assumption or adjustment. This indicator takes into account that not all years that a person lives are highly productive. Functional abilities are affected through time and capabilities. That's why among the oldest age groups the value of LLE index is less.

The Literate Life Expectancy indicator is a numerical sum of social development. It reflects in one number both life expectancy and literacy. The systematic approach of LLE combines two basic aspects of human development: (1) the number of years a person lives, and (2) his/her level of education. The LLE indicator evaluates the age-specific mortality rates and the age-specific proportions literate. In other words, it is the aggregate average that a person lives in a literate state. The aim of this indicator is to look at a person's years of life but in a literate state. Age-specific literacy describes the cumulative transitions of a person from an illiterate state to a literate one. In terms of public policy, it allows nations to estimate the kind and magnitude of the forthcoming social demands by foreseeing the social dimension of the replacement of generations. The literate life expectancy indicator does not reflect any measure of economic income and therefore, there can be no failure in capturing the distribution of social benefits. The LLE indicator is based purely on individual characteristics: literacy and mortality, and not on national accounts of Gross Domestic Product (GDP). With the systematic distribution of the population by age group the LLE indicator underlines the individual years of life, which are suggestive of a real 'literate state'. This social indicator assigns a more realistic level of the functional abilities. The versatility of the LLE indicator allows comparisons over time because it enables us to see present and likely future trends of each age group. Likewise, the LLE indicator gives more transparency to social development insofar as it can evaluate development by sex and residence differentials. The application of this indicator at the national level can reveal the concealing inequities within regional level. Thus, there is great potential for improving human development by better

distributing social services and by accurately restructuring budget priorities. An increase in the level of education has positive economic, social, and environmental impacts. Higher levels of education correlate to more efficient production and consumption alternatives, and both patterns tend to benefit the environment. The level of education of a society represents an asset for the nation's development. The literacy of a nation in the long run is one of the most-if not the most-important elements for development. In addition, human capital has an essential impact on a nation's future development, especially in countries where the largest groups of population are concentrated in the youngest generations. The analysis of a nation's age group replacement process by level of education is an important factor in projecting the potentiality of development of that generation and the nation.

2. Progress in Indicators of Social Developments

The development of modern social indicators began since the second half of the last century. The pioneer work of Bauer's (1966) social indicator study developed the concepts of "statistics that enable us to assess where we stand and are going with respect to our values and goals." The Organization for Economic Cooperation and Development (OECD), during the 1970s and 1980s, implemented an important program to identify social concerns, which were common to all nations. Once the problems were localized, the organization decided upon a series of indicators for these concerns (OECD 1973, 1982). In 1991 Sullivan developed in an eight-year study a set of 'political and social' indicators of five values: (1) peace, (2) economic well being, (3) ecological balance, (4) social justice, and (5) political participation. Sullivan's goal was to collect data from different nations to compare and judge them on the basis of these five values.

Recently, development has shifted from an economic idea to a socioeconomic emphasis. The most recent measurement approach (1990-1994) was developed by the United Nations Development Programme (UNDP). The UN designed the Human Development Index (HDI) to bring together income and social indicators-longevity, knowledge, and purchasing power (UNDP 1990). This effort to get a more precise social indicator parameter, however, appears to be inaccurate by using the Gross National Product (GNP) per capita. For example, the income element – purchasing power adjusted – is a rather complex operation that gives less weight to the improvement of expenditure power at the higher level of income. Traditionally, nations strive to achieve a higher GNP per capita, as it is considered (erroneously) the single and most important element to measure their national prosperity. The use of GNP per capita as an indicator of social development fails to capture the distribution of economic progress. In other words, GNP per capita might produce a misleading picture of a country's social devel-

opment, insofar as it does not reflect important elements of social prosperity such as education and health. But most importantly, the use of GNP per capita does not give visibility to the problems of deprivation, poverty, and income distribution. Therefore, to advance the discussion over the importance of finding a more accurate measurement of social development, this paper will develop an empirical analysis by analyzing secondary data of Bangladesh and testing a new social indicator-Literate Life Expectancy (LLE) developed by Lutz in1995.

3. Data and Methodology

The required data for this analysis has been used from "Statistical Year Book" published by Bangladesh Bureau of Statistics (BBS) in 1981. The information regarding the literate proportionate rate as well as the mortality rate has been used in this paper for only the census year 1981. The relevant data for the following census years are not available in BBS and that is why we have dealt with the best available data and also tried to infer on policies required to take to uplift health and education status in Bangladesh.

The estimation of literate life expectancy follows the ordinary life table method (Ramakumar, 1986; Namboodiri and Suchindra, 1987; Srinivasan, 1998), which includes eight columns (see appendix) and is used to calculate life expectancy and thereby literate life expectancy. The calculation of the LLE requires empirical data of the age-specific mortality rates (ASMR) and the age-specific proportions literate (ASPL). The estimation of the LLE is performed without any complex mathematical operation in a life table, which is used for summarizing the mortality experience of a population. The only new element is the weighted number of person-years at each age by the age-specific proportions literate. In the literate life table, the (L_x) column is multiplied by (PL_x) to generate the (LL_x) column. The formula of the Literate Life Expectancy indicator and notations in the model life table are as follows:

$$(L_x)(PL_x) = LL_x$$

where L_x is the total number of person-years living in age group x, PL_x is age-specific proportions literate and LLx is literate person-years lived. Like in a regular life table, Literate Life Expectancy (Le_x) is estimated by dividing the cumulative literate person years (LT_x) by the (I_x) column i.e.

$$Le_x = \frac{LT_x}{I_x}$$

where, $LT_x = \sum LL_x$ .A full description of a conventional life table including literate life table is given in the Appendix with conventional notations.

4. Results and Discussions

By measuring the LLE at the national level, we became able to gather social differences in four large population groups: urban men and women, and rural men and women. The ordinary and literate life tables are presented in Tables 1 to 3, which shows that for total population the life expectancy at birth is 54.8 years. The life expectancy at birth is 55.6 and 54 years for males and females respectively. In 1981 the literate life expectancy is only 14.3 years (Figure1) for the total population and it is only 3.8 years (Table 1) to those who have completed 65 years. The Le_x at birth is 20.1 and 8 years for males and females respectively. The analysis reveals that a man who has completed 65 years will live about 6 years in a literate state, while a 65 years old woman will live only .83 years in a literate state on an average, which is one seventh compared to male. These types of comparisons are necessary to reach decisions related to the gender issue.

In our analysis, we found that residential and sex differentials are rather meaningful between urban and rural men and women, which clearly demonstrate the Lutz's idea. According to Figure 1 urban men reached 31.47 years of LLE at birth while rural men had only 18 years. This inconsistency accounts for nearly 13.5 years of LLE differentials, which implies that urban men had the possibility to live almost 13.5 years longer in a literate state than rural men. Meanwhile, the LLE of urban and rural women at birth were 15.1 and 7, respectively. Among the four groups, the highest LLE at birth was concentrated in urban men. This group had 16.37 years more than urban women; 13.5 years more than rural men; and 24.47 years more than rural women. The gender gaps in Le_x are higher in rural areas; women in rural areas would live in literate state two and half times less than that of men, while in urban areas women lived in literate state two times less than that of men. Urban women and rural women achieved the very closer levels of LLE during the old age groups but from the early age urban women began to differ with a significant mark (see Figure 2).

This is indicative that rural women are less likely to continue in higher education than urban women. Here the difference of LLE at birth between rural men and urban women is almost 5 years. Interestingly, this gap remains constant in almost all age groups except in the first and last two or three groups. It seems that rural men as well as urban women do not modify their behavior with respect to future education attainment – perhaps just to primary school – and that both have limited access to health services. Reviewing LLE by age group in Figure 2, we observed that men rank either in urban or rural is higher than women of rural or urban in all age groups. The reasons may be men have longer life expectancy than women. Women in Bangladesh still lack much of the basic social services of education and health like high mortality and fertility, and early age of

marriage. In 1981 life expectancy at birth of men in Bangladesh was higher than that of women. But presently BBS shows that life expectancy at birth of women in Bangladesh is higher than that of men.

As can be seen in Figure 2, among the oldest age groups both men and women have lower LLE compared to that of the youngest age groups. Because, person lives are not highly productive in all year. Besides functional abilities vary through time, especially in the oldest groups, and therefore, this indicator is reflected with lower literacy rates at oldest ages. Within the oldest age groups, it is assumed that the older one gets, the less literacy capabilities remain. The relevance of this description is that it projects the likely changes in age structure according to literacy.

5. Conclusions

The use of the Literate Life Expectancy approach proved to be an innovative systems analysis tool for measuring social development. The implementation of this new empirical method demonstrated significant social differences in Bangladesh in the year 1981 based on age group, sex, and residential locality. At the national level, the study highlighted the need for more education and health services particularly for women in both rural and urban areas and also for men of the rural area. Because of only urban men achieved higher levels of social development with almost 31.5 years of LLE at birth compared to the LLE's of rural men or women of both areas. Although it is appreciable that the important progress in urban areas has been done, there are many social, health, and environmental threats that urban dwellers have to face daily: lack of access to clean drinking water, air pollution, greenhouse emissions, psychological stress, and most importantly, urban poverty. The literate life expectancy can be increased in the urban areas through improving from the impact of these threats rather than improving literacy status because in urban literacy rate is higher than rural areas. Historically, poverty has been nurtured in rural areas. Both health and literacy status is of vital importance for the improvement of Literate Life Expectancy in the rural areas because most of the rural people are illiterate and have limited access to health treatment facilities and nutritious food. Paying more attention through taking necessary measures for the improvement of literacy, health including social status the life expectancy as well as literate life expectancy can be increased in the rural areas.

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Table 1: Ordinary and literate life table for rural and urban people

	Odinary Life Table							Literate Life Table			
Age(x)	${}_nm_x$	${}_nq_x$	${}_nd_x$	l_x	${}_nL_x$	${}_nT_x$	e_x	PL_x	LL_x	LT_x	Le_x
Total											
0-10	0.053	0.232	232	1000	4530	54806	54.81	0.284	1287.299	14315.305	14.32
10-14	0.003	0.016	13	812	3956	50276	61.92	0.252	995.736	13028.006	16.04
15-19	0.001	0.006	5	807	4014	46320	57.40	0.358	1435.755	12032.271	14.91
20-24	0.002	0.009	7	800	3976	42306	52.88	0.355	1412.119	10596.515	13.25
25-29	0.002	0.012	9	790	3926	38330	48.52	0.334	1310.280	9184.396	11.63
30-34	0.003	0.013	10	780	3870	34404	44.11	0.291	1126.848	7874.116	10.10
35-39	0.003	0.015	12	768	3803	30533	39.76	0.277	1054.649	6747.268	8.79
40-44	0.004	0.019	14	753	3711	26730	35.50	0.239	886.098	5692.619	7.56
45-49	0.006	0.029	21	731	3595	23019	31.49	0.251	900.727	4806.522	6.58
50-54	0.007	0.034	24	706	3409	19424	27.51	0.207	707.077	3905.794	5.53
55-59	0.015	0.070	46	657	3127	16015	24.38	0.244	761.959	3198.717	4.87
60-64	0.022	0.102	60	590	2748	12888	21.84	0.184	504.839	2436.758	4.13
65+	0.050	0.138	70	507	10140	10140	20.00	0.191	1931.919	1931.919	3.81
Total Male											
0-10	0.052	0.229	229	1000	4535	55600	55.60	0.371	1683.107	20166.889	20.17
10-14	0.003	0.016	13	814	3970	51065	62.73	0.270	1071.946	18483.782	22.71
15-19	0.001	0.006	5	810	4032	47095	58.14	0.425	1712.624	17411.836	21.50
20-24	0.002	0.009	7	804	4003	43064	53.56	0.468	1872.162	15699.213	19.53
25-29	0.002	0.012	10	797	3966	39060	49.01	0.450	1786.583	13827.050	17.35
30-34	0.003	0.013	10	789	3923	35094	44.48	0.413	1618.229	12040.467	15.26
35-39	0.003	0.015	12	780	3868	31171	39.96	0.392	1517.385	10422.238	13.36
40-44	0.004	0.019	15	767	3784	27303	35.60	0.356	1347.240	8904.853	11.61
45-49	0.006	0.029	22	746	3673	23520	31.53	0.367	1348.677	7557.613	10.13
50-54	0.007	0.034	25	722	3481	19847	27.49	0.326	1135.018	6208.936	8.60
55-59	0.015	0.070	47	670	3194	16365	24.43	0.354	1130.455	5073.918	7.57
60-64	0.022	0.102	62	604	2811	13171	21.81	0.298	838.501	3943.463	6.53
65+	0.050	0.138	71	518	10360	10360	20.00	0.300	3104.962	3104.962	5.99
Total Female											
0-10	0.054	0.236	236	1000	4523	53903	53.90	0.190	857.914	8002.714	8.00
10-14	0.003	0.016	13	809	3935	49381	61.04	0.231	907.408	7144.800	8.83
15-19	0.001	0.006	5	802	3984	45446	56.67	0.289	1150.216	6237.392	7.78
20-24	0.002	0.009	7	793	3933	41462	52.29	0.252	991.154	5087.176	6.42
25-29	0.002	0.012	9	780	3918	37529	48.11	0.215	841.599	4096.022	5.25
30-34	0.003	0.013	10	787	3848	33610	42.71	0.169	649.356	3254.423	4.14
35-39	0.003	0.015	11	752	3718	29763	39.58	0.147	546.703	2605.067	3.46
40-44	0.004	0.019	14	735	3619	26045	35.43	0.112	404.110	2058.364	2.80
45-49	0.006	0.029	21	712	3500	22426	31.50	0.106	370.038	1654.254	2.32
50-54	0.007	0.034	23	687	3316	18926	27.55	0.075	250.077	1284.216	1.87
55-59	0.015	0.070	45	639	3036	15610	24.43	0.160	486.124	1034.139	1.62
60-64	0.022	0.102	58	572	2673	12573	21.98	0.051	136.175	548.015	0.96
65+	0.050	0.138	68	495	9900	9900	20.00	0.042	411.840	411.840	0.83

Table 2: Ordinary and literate life table for urban people

	Odinary Life Table							Literate Life Table			
Age(x)	${}_nm_x$	${}_nq_x$	${}_nd_x$	l_x	${}_nL_x$	${}_nT_x$	e_x	PL_x	LL_x	LT_x	Le_x
Urban Total											
0-10	0.035	0.161	161	1000	4653	60151	60.15	0.466	2166.824	25104.664	25.10
10-14	0.003	0.016	14	861	4231	55499	64.46	0.397	1679.182	22937.840	26.64
15-19	0.001	0.006	5	856	4264	51268	59.89	0.533	2272.621	21258.658	24.83
20-24	0.002	0.009	8	851	4241	47004	55.23	0.554	2351.442	18986.037	22.31
25-29	0.002	0.012	10	845	4209	42763	50.61	0.544	2287.789	16634.595	19.69
30-34	0.003	0.013	11	838	4168	38554	46.01	0.434	1806.763	14346.806	17.12
35-39	0.003	0.015	12	829	4113	34386	41.48	0.483	1987.828	12540.043	15.13
40-44	0.004	0.019	16	816	4029	30273	37.10	0.419	1688.381	10552.215	12.93
45-49	0.006	0.029	23	795	3911	26245	33.01	0.443	1733.877	8863.834	11.15
50-54	0.007	0.034	26	768	3736	22334	29.08	0.342	1276.025	7129.957	9.28
55-59	0.015	0.070	51	726	3503	18598	25.62	0.407	1424.582	5853.933	8.06
60-64	0.022	0.102	68	671	3175	15095	22.50	0.294	934.482	4429.351	6.60
65+	0.050	0.138	82	596	11920	11920	20.00	0.293	3494.869	3494.869	5.86
Urban Male											
0-10	0.037	0.167	167	1000	4643	59781	59.78	0.551	2556.764	31471.795	31.47
10-14	0.003	0.016	14	857	4211	55139	64.34	0.409	1720.939	28915.031	33.74
15-19	0.001	0.006	5	853	4246	50928	59.70	0.579	2457.551	27194.092	31.88
20-24	0.002	0.009	8	847	4226	46681	55.11	0.646	2731.815	24736.541	29.20
25-29	0.002	0.012	10	843	4199	42455	50.36	0.645	2706.251	22004.726	26.10
30-34	0.003	0.013	11	836	4158	38257	45.76	0.600	2496.263	19298.474	23.08
35-39	0.003	0.015	12	827	4103	34099	41.23	0.589	2416.294	16802.211	20.32
40-44	0.004	0.019	15	814	3939	29996	36.85	0.535	2105.772	14385.918	17.67
45-49	0.006	0.029	22	761	3815	26057	34.24	0.564	2150.682	12280.146	16.14
50-54	0.007	0.034	26	764	3709	22242	29.11	0.481	1782.928	10129.464	13.26
55-59	0.015	0.070	50	719	3473	18532	25.78	0.546	1896.600	8346.535	11.61
60-64	0.022	0.102	68	666	3160	15060	22.61	0.425	1342.413	6449.935	9.68
65+	0.050	0.138	82	595	11900	11900	20.00	0.429	5107.522	5107.522	8.58
Urban Female											
0-10	0.034	0.157	157	1000	4660	60411	60.41	0.350	1630.246	15072.204	15.07
10-14	0.003	0.016	14	864	4248	55751	64.53	0.384	1629.863	13441.958	15.56
15-19	0.001	0.006	5	859	4279	51503	59.96	0.478	2046.424	11812.095	13.75
20-24	0.002	0.009	8	854	4256	47224	55.30	0.433	1844.542	9765.670	11.44
25-29	0.002	0.012	10	848	4224	42968	50.67	0.392	1655.412	7921.128	9.34
30-34	0.003	0.013	11	841	4178	38745	46.07	0.087	361.858	6265.716	7.45
35-39	0.003	0.015	12	830	4121	34567	41.65	0.306	1260.790	5903.858	7.11
40-44	0.004	0.019	16	818	4051	30446	37.22	0.235	950.081	4643.067	5.68
45-49	0.006	0.029	23	802	3943	26395	32.91	0.244	960.527	3692.986	4.60
50-54	0.007	0.034	26	774	3776	22452	29.01	0.155	585.974	2732.460	3.53
55-59	0.015	0.070	52	736	3543	18675	25.37	0.177	627.874	2146.486	2.92
60-64	0.022	0.102	69	677	3192	15132	22.35	0.116	370.535	1518.612	2.24
65+	0.050	0.138	82	597	11940	11940	20.00	0.096	1148.077	1148.077	1.92

Table 3: Ordinary and literate life table for rural people

	Odinary Life Table							Literate Life Table			
Age(x)	${}_nm_x$	${}_nq_x$	${}_nd_x$	l_x	${}_nL_x$	${}_nT_x$	e_x	PL_x	LL_x	LT_x	Le_x
Rural Total											
0-10	0.055	0.239	239	1000	4518	53603	53.60	0.249	1123.667	12445.111	12.45
10-14	0.003	0.016	13	807	3928	49085	60.82	0.225	884.769	11321.444	14.03
15-19	0.001	0.006	5	802	3987	45157	56.31	0.322	1285.382	10436.675	13.01
20-24	0.002	0.009	7	794	3946	41170	51.85	0.308	1214.201	9151.293	11.53
25-29	0.002	0.012	9	784	3893	37224	47.48	0.286	1115.278	7937.092	10.12
30-34	0.003	0.013	10	773	3835	33331	43.12	0.265	1014.543	6821.814	8.83
35-39	0.003	0.015	11	761	3768	29496	38.76	0.238	895.182	5807.270	7.63
40-44	0.004	0.019	14	746	3676	25727	34.49	0.205	752.504	4912.088	6.58
45-49	0.006	0.029	21	724	3310	22051	30.46	0.218	721.051	4159.584	5.75
50-54	0.007	0.034	20	599	3045	18741	31.29	0.184	558.802	3438.533	5.74
55-59	0.015	0.070	43	619	3010	15696	25.36	0.226	680.384	2879.730	4.65
60-64	0.022	0.102	59	581	2707	12687	21.84	0.166	450.035	2199.347	3.79
65+	0.050	0.138	69	499	9980	9980	20.00	0.175	1749.312	1749.312	3.51
Rural Male											
0-10	0.053	0.235	235	1000	4525	55195	55.20	0.331	1499.882	18050.193	18.05
10-14	0.003	0.016	13	810	3945	50670	62.56	0.245	967.047	16550.311	20.43
15-19	0.001	0.006	5	805	4009	46725	58.04	0.391	1567.651	15583.264	19.36
20-24	0.002	0.009	7	800	3983	42716	53.39	0.415	1651.962	14015.614	17.52
25-29	0.002	0.012	10	793	3946	38732	48.84	0.396	1563.113	12363.652	15.59
30-34	0.003	0.013	10	785	3900	34786	44.31	0.362	1411.967	10800.539	13.76
35-39	0.003	0.015	12	775	3843	30886	39.85	0.346	1329.371	9388.571	12.11
40-44	0.004	0.019	14	762	3761	27043	35.49	0.315	1183.810	8059.200	10.58
45-49	0.006	0.029	22	742	3653	23282	31.38	0.329	1201.115	6875.390	9.27
50-54	0.007	0.034	24	718	3461	19629	27.34	0.296	1023.161	5674.275	7.90
55-59	0.015	0.070	47	666	3169	16168	24.28	0.322	1021.825	4651.114	6.98
60-64	0.022	0.102	61	598	2778	12998	21.74	0.277	768.519	3629.289	6.07
65+	0.050	0.138	71	511	10220	10220	20.00	0.280	2860.771	2860.771	5.60
Rural Female											
0-10	0.056	0.244	244	1000	4510	53390	53.39	0.163	733.900	6992.025	6.99
10-14	0.003	0.016	13	804	3911	48880	60.80	0.202	791.152	6258.124	7.78
15-19	0.001	0.006	5	799	3967	44969	56.28	0.254	1007.715	5466.972	6.84
20-24	0.002	0.009	7	789	3911	41002	51.97	0.218	851.124	4459.257	5.65
25-29	0.002	0.012	9	775	3891	37091	47.86	0.184	715.538	3608.133	4.66
30-34	0.003	0.013	10	781	3818	33200	42.51	0.178	680.222	2892.595	3.70
35-39	0.003	0.015	11	746	3688	29382	39.39	0.124	455.652	2212.373	2.97
40-44	0.004	0.019	14	729	3586	25694	35.25	0.094	336.125	1756.721	2.41
45-49	0.006	0.029	20	705	3465	22108	31.36	0.087	299.847	1420.596	2.02
50-54	0.007	0.034	23	680	3279	18643	27.42	0.063	205.846	1120.748	1.65
55-59	0.015	0.070	44	631	2994	15364	24.35	0.159	475.744	914.903	1.45
60-64	0.022	0.102	57	563	2631	12371	21.97	0.042	109.744	439.159	0.78
65+	0.050	0.138	67	487	9740	9740	20.00	0.034	329.415	329.415	0.68

taken from its source. We are also thankful to the persons who have assisted us directly and indirectly.

Appendix

Tables 1, 2 and 3 show the life expectancy as well as the new indicator 'Literate Life Expectancy' of the population for the census year 1981 in Bangladesh. First table gives clear picture of the life expectancy and LLE for both rural and urban people together but the rest two give picture of life expectancy and LLE for urban and rural people separately.

Description of life table and literate life table calculations:

Column 1: x (Age interval) = ages are in interval except the final age which is open ended (65+; persons of age 65 and more than 65). For each of the above life table the age structure is same.

Column 2: ${}_nm_x$, is defined as age specific death rate and is calculated as per the below method

$$ {}_nm_x = \frac{{}_nD_x}{{}_nP_x} $$

where, ${}_nD_x$ are deaths in the interval x to $x+n$ and ${}_nP_x$ is the mid year population in the interval x to $x+n$. For example in Table 1 ${}_nm_x$ is .053, which is calculated dividing 5.3 by 1000. Where 5.3 are deaths in interval 0 and 10 and 1000 is the starting population i.e. radix. The ${}_nm_x$'s used in the life table have been estimated by the Bangladesh Bureau of Statistics from which we collected data.

Column 3: ${}_nq_x$, is proportion of those alive at age x dying in the interval x to $x+n$. These are derived from the corresponding age specific death rates (column two) of the population. The ${}_nq_x$'s used in the life table have also been estimated by the Bangladesh Bureau of Statistics from which we collected data.

Column 4: ${}_nd_x$, is the number of persons among l_x persons reaching age x who die before reaching $x+n$. Thus ${}_nd_x = l_x - l_{x+n}$. As in the Table 1 ${}_nd_x$ is 232 against age group 0-10 and is calculated by 1000-812 ($l_{0-10} - l_{10-14}$).

Column 5: l_x, is the number of persons who attain exact age x out of the radix 1000. For example as in the Table 1 the number 1000 against x = 0-10 indicates the number that began their life together and are running the first 10 years of their life. Similarly, the number 812 against x = 10-14 indicates the number who completed the first 10 years of age and are running the second 10-14 and so on.

Column 6: ${}_nL_x$, gives the distribution of life-table stationary population and the number of years lived in the aggregate by the cohort. For example, as in the Table 1 ${}_nL_x$ is 4530 against age group 0-10, which has been calculated according the life table method $(5/2)(l_x + l_{x+5}) + (5/12)(d_x + d_{x-5})$ given by Ramakumar, 1986; Namboodiri and Suchindra, 1987; Srinivasan, 1998.

Column 7 : ${}_nT_x$, is the number of years lived by the group from the age x until all of them die. It is in fact the cumulative of the ${}_nL_x$ column. As per Table 1 ${}_nT_x$ against age interval 50-54 is 19424 which is the summation of ${}_nL_x$'s against age intervals 50-54, 55-59, 60-64, 65+ i.e. $19424 = 3409 + 3127 + 2748 + 10141$.

Column 8: e_x, is the average length of life remaining to persons who attain the exact age x. It is estimated dividing 54086 by 1000 for the age interval 0-10 of Table 1, which results in 54.81. The meaning of this figure is that a person of age 10 yet to be lived on an average 54.81 years.

Column 9: PL_x, is age-specific proportions literate and is calculated dividing the literate persons of the age interval x to $x + n$ by the total (both literate and illiterate) population of that interval. The PL_x's used in the life table have been estimated by the Bangladesh Bureau of Statistics from which we collected data.

Column 10: LL_x, is calculated by multiplying L_x by the PL_x. In the Table 1 the LL_x (1287.299) of the age interval 0-10 is calculated multiplying $4530({}_nL_x)$ by .284 (PL_x).

Column 11: LT_x, is the number of years lived by the group from the age x until all of them die in literate state. It is in fact the cumulative of the LL_x column. As per Table 1 LT_x against age interval 50-54 is 3905.794 which is the summation of LL_x 's against age intervals 50-54, 55-59, 60-64, 65+ i.e. $3905.79 = 707.077 + 761.959 + 504.839 + 1931.919$.

Column 12: Le_x, it is estimated dividing 14315.305 by 1000 for the age interval 0-10 of Table 1, which results in 14.31. The meaning of this figure is that a person of age 10 yet to be lived on an average 54.81 years in literate state.

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