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LITERATE LIFE EXPECTANCY AND ITS GENDER DIFFERENTIALS IN OMAN

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Abstract

Measuring human quality and well-being by the human development index (HDI) is very challenging as it is a composite index of many socio-economic variables. However, a simple index called literate life expectancy (LLE) by combining life expectancy and literacy only can be used as an alternative measure, which is less data intensive than HDI. LLE is the average life expectancy that a person lives under literate state. Length of life in literate state has many positive implications on social, economic and political aspects of life. In this paper an attempt has been made to construct LLE for Omani population with its gender differentials. The data for the study were extracted from the 2015 Statistical Year Book and the 2010 Population and Census report of Oman published by the National Centre for Statistics & Information. Despite socio-economic progress, levels of education among women in Oman are not the same as men. The analysis shows the remarkable differences in the LLE between men and women for almost all age groups. The Omani female population is much lag behind in literate life expectancy than the Omani male population. The results underscore the need to take necessary steps for reducing gender gap in LLE in Oman.

Key Words: Life expectancy, Literate Life Expectancy, Oman.

1. Introduction

Education along with health is generally considered as the most important elements of the aggregate human capital development and well-being for any community. A large body of empirical research demonstrated that education and health plays vital role in promoting quality, skill and well-being of the population (UN, 2003; Wolfe and Zuvekas, 1997; Groot and van den Brink, 2006). Those who having higher levels of education tend to live longer, protective, healthier and their productivity increased enormously than the people with less education (Wong et al., 2002; Lleras-Muney, 2005; Desjardins, 2008; Frank and Nason, 2009).

The achieving education and learning of the population has been considered as a key factor of economic, institutional, and social development (Benavot, 1989) since many years. Educational development help minimize all kinds of societal inequities from the nation. Since the literacy of any nation is the most important instrumental factors, therefore, the level of education has a positive impact on gross national product and quality of life. Thus it would not be an exaggeration to say that education is the best

medicine for human health and well-being. However, measuring human quality and well-being by a single indicator is very challenging. In this respect the HDI can be used but the HDI is a composite index of many socio-economic variables including health and education, and is thus more data intensive. Moreover, HDI put more emphasis on the aggregate social aspects of development, and thus present an abstract that lacks any clear real life interpretation (Lutz and Striessnig, 2012). Wolfgang Lutz (1995) developed an alternative simple index, called literate life expectancy (LLE), by combining mortality and literacy through use of well-known life table technique.

The LLE indicator can be treated as the "average number of years a person lives in a literate state," under the given two components-- age specific mortality rates and age specific proportions literate (Lutz, 1995; Medina, 1996). A higher value of LLE indicates the higher level of quality of life of the people and higher level of social development. LLE is less data intensive and can be applied for sub-national level. This index could be useful in finding and measuring future social development that are directly related to mortality and educational attainments under any specific policy assumption (Khan and Asaduzzaman, 2007). Most strikingly, this indicator does not consider the fact that person lives always in highly productive state.

Sultanate of Oman, an oil reach traditional Muslim country in the Arabian Peninsula, sees rapid improvement in health and education in recent time due to massive economic and social development. The economy of the country is heavily dependent on oil and gas export revenue which accounts for more than 80% of the total revenue. The living standard and health status have improved to a great extent over the period. The country is now considered as high income country with per capita income of 45,500 Us dollar. The total population of the country was estimated to be 4.2 million in 2014. Out of the estimated total, 2.4 million (57%) was Omani native and remaining 1.8 million (43%) was foreigner (National Centre for Statistical Information (NCSI), 2015). The population density was estimated to be 14 people per square kilometer. The improvement in health status of the people in the country is reflected in the significant reduction of childhood mortality. As for example, the under-five child mortality rate has declined to 10 from 317 (per 1000) live birth in 2015 from 1960 (NCSI, 2015). As a result, the life expectancy has increased from less than 50 years in late 1960s to over 75 years in recent time. The level of education of both male and female have also expanded. Oman starts its educational journey from only three primary schools for the boys only in 1970 with less than 1000 students (Al Shmeli, 2009; Baporikar and Shah, 2012). Over the period, the net enrollment rate in primary school has increased from 5% to almost 100% between 1970 and recent time and the general literacy rate reached over 90%. The gender gap in literacy rates has almost disappeared and females are already better represented than males at higher level of education (Islam, 2014). With this backdrop, it is important to examine how much the quality of life and well-being has developed in Oman through application of LLE index. Thus the objective of this study is to measure the LLE indicator for Oman including its differentials by gender.

2. Methods and Materials

The LLE index is estimated following the ordinary life table technique used for presenting the results of mortality experience of a population. The detailed description of the theory of life table is available in many demographic text books (e.g., Chiang, 1984; Namboodiri and Suchindra, 1987). The vital ingredients needed

for estimating LLE are the age-specific mortality rates known as ASMR and the age-specific proportions of literate known as ASPL. A person having ability to read, write, speak and understand written information is generally considered as literate. The indicator calculates the weighted number of person-years at each age by the age-specific proportions literate of the population under study.

To estimate LLE, we first construct ordinary life table which has the following functions defined as follows:

x indicates ages in interval with width n except the final age which is open ended and usually denoted by ω.

${}_nm_x$, the death rate in age interval (x, x+n), and is calculated by

$${}_nm_x = \frac{{}_nD_x}{{}_np_x},$$

where ${}_nD_x$ are deaths in the interval x to $x + n$ and ${}_np_x$ is the midyear population in the interval x to $x + n$.

${}_n\hat{q}_x$ is the probability of dying in the interval (x, x+n), and is calculated using Greville's (1943) method:

$${}_nq_x = \frac{{}_nm_x}{\frac{1}{n} + {}_nm_x[.5 + \frac{n}{12}({}_nm_x - .096)]}$$

l_x, the number of persons who attain exact age x out of the cohort of 100,000 births called radix of life table.

${}_nd_x$, the number dying in interval (x, x+n).

The interrelationships between l_x, ${}_nd_x$ and ${}_nq_x$ are as follows:

$${}_nd_x = l_x \times {}_nq_x, \qquad x=0,1,\ldots\ldots\ldots,\omega$$

and $l_{x+n} = l_x - {}_nd_x, \qquad x=0,1,\ldots\ldots\ldots, \omega\text{-}1.$

Also $\quad {}_nd_x = l_{x+n} - l_x, \qquad x=0,1,\ldots\ldots\ldots, \omega\text{-}1,$ where ${}_nL_x$, the number of person-years lived by the total cohort in interval (x, x+n), and ${}_nL_x = \frac{n}{2}(l_x + l_{x+n}),$ for x $\geq$1, and L_0 is calculated as $L_0 = 0.3l_0 + 0.7l_1$.

T_x, the total number of years lived beyond age x. Thus,

$$T_x = {}_nL_x + {}_nL_{x+n} + \ldots\ldots\ldots + L_\omega = \sum_{y=x}^{\omega} L_y, \qquad x=0,1,\ldots\ldots\ldots,\omega$$

Clearly, $\quad T_x = {}_nL_x + {}_nT_{x+n}.$

and e_x, the average duration of life remaining to persons who already attained the exact age x. It is estimated by $e_x = \frac{T_x}{l_x}$.

We then estimate the literate person-years lived denoted by LL_x, which is obtained by multiplying the ${}_nL_x$ values of the ordinary life table by the age-specific proportions literate denoted by PL_x.

Like in an ordinary life table, literate life expectancy (Le_x) is then calculated by dividing the cumulative literate person years LT_x by the lx column, i.e.,

$Le_x = LT_x/l_x$, where $LT_x = \sum LL_x$.

Age (x)	All (Omani + Expatriate)			Omani population		
	Total	Male	Female	Total	Male	Female
0-9	650,086	331,404	318,682	585,018	298,119	286,899
10-14	234,579	119,744	114,856	208,889	106,249	102,640
15-19	239,220	122,675	116,545	221,376	113,228	108,148
20-24	391,869	244,236	147,633	250,536	127,283	123,253
25-29	691,916	506,642	185,274	238,542	120,811	117,731
30-34	552,009	404,263	147,746	198,533	100,108	98,425
35-39	386,620	273,648	112,972	147,017	73,742	73,305
40-44	269,982	197,869	72,113	91,426	48,724	45,702
45-49	186,619	135,911	50,707	69,582	34,546	35,036
50-54	136,173	93,478	42,695	63,603	31,049	32,554
55-59	98,169	66,267	31,902	49,223	22,866	26,357
60+	155,633	83,677	71,957	95,672	46,328	49,344
Total	3,992,893	2,579,811	1,413,082	2,222,447	1,123,053	1,099,394

Table 1: Midyear Population of Oman in 2014

The data for the study were extracted from the 2015 Statistical Year Book and the 2010 Population and Housing Census report of Oman, published by the National Centre for Statistics & Information (NCSI, 2015). The age specific registered midyear population for 2014 was obtained from 2015 Statistical Year Book, while the age specific number of deaths for 2010 were obtained directly from 2010 Oman Population and Housing Census report (see Table 1). The deaths were then projected for the year 2014. Only Omani population is considered for estimating the LLE. Table 2 shows the age specific number of deaths for Omani population for the census year 2010 and the projected number of deaths for the target year 2014.

Age x	Census 2010			Projected deaths for 2014		
	Total	Male	Female	Total	Male	Female
0-9	1007	610	397	957	580	377
10-14	57	33	24	54	31	23
15-19	157	113	44	149	107	42
20-24	218	163	55	207	155	52
25-29	163	121	42	155	115	40
30-34	131	91	40	125	87	38
35-39	109	74	35	104	70	33
40-44	132	92	40	126	87	38
45-49	172	108	64	164	103	61
50-54	242	142	100	230	135	95
55-59	213	141	72	203	134	68
60+	2,798	1,597	1,201	2,660	1,518	1,142
Total	5,339	3,825	2,114	5,133	3,123	2,010

Table 2: Age specific Deaths for Omani Population in 2014

Age (x)	Census 2010			Projected literate proportion for 2014		
	Total	Male	Female	Total	Male	Female
0-9	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
10-14	0.9948	0.9947	0.9949	0.9999	0.9998	0.9999
15-19	0.9913	0.9920	0.9906	0.9948	0.9947	0.9949
20-24	0.9871	0.9901	0.9840	0.9913	0.9920	0.9906
25-29	0.9815	0.9882	0.9748	0.9871	0.9901	0.9840
30-34	0.9663	0.9839	0.9488	0.9815	0.9882	0.9748
35-39	0.9203	0.9721	0.8665	0.9663	0.9839	0.9488
40-44	0.8098	0.9381	0.6808	0.9203	0.9721	0.8665
45-49	0.6776	0.8757	0.4837	0.8098	0.9381	0.6808
50-54	0.5149	0.7412	0.3080	0.6776	0.8757	0.4837
55-59	0.4139	0.6301	0.2107	0.5149	0.7412	0.3080
60+	0.1463	0.2414	0.0496	0.1902	0.3138	0.0645

Table 3: Age specific literacy proportions of Omani Population in 2014

The midyear population and deaths were used to calculate age-specific mortality rates as found later in all the literate life expectancy tables. The information on age-specific proportion of literate have been obtained from the 2010 population and housing census of Oman and then projected for 2014 using linear projection under some assumptions. The assumptions included that the literacy rates were fixed within the 5 year groups and no extra intervention was given during the four years to any age group for promoting literacy rates by the Sultanate of Oman. The persons who can read, write and understand the written document were defined as literate. The children of the age group 0-9 have been considered as illiterate as they were not fully able to read, write and understand. Table 3 presents the age-specific proportion of literate of Omani population as well as Omani male and Omani female population.

3. Results and Discussion

Table 4 resents the ordinary and literate life tables constructed by the methods as described above. The Table 4 shows the LLE's including life expectancies for Omani population for 2014. Overall, the life expectancy at birth for Omani population was found to be 72.9 years, and the LLE at birth was found to be 46.9 years, indicating that an Omani person of the age group 0–9 years yet to be lived on an average 46.9 years in literate state. Similarly, LLE = 3.9 years for Omani people of age 60+ years implies that an Omani older person of age 60+ years yet to live on an average 3.9 years in literate state.

Age x	Ordinary Life Table						
	${}_nm_x$	${}_n\hat{q}_x$	${}_nd_x$	l_x	${}_nL_x$	T_x	e_x
0-9	0.0016	0.0082	816	100000	497960	7292428	72.92
10-14	0.0003	0.0013	129	99184	495598	6794468	68.5
15-19	0.0007	0.0034	334	99055	494749	6298870	63.59
20-24	0.0008	0.0041	408	98721	492888	5804121	58.79
25-29	0.0006	0.0032	319	98313	491028	5311233	54.02
30-34	0.0006	0.0031	307	97994	489474	4820205	49.19
35-39	0.0007	0.0035	344	97687	487987	4330731	44.33
40-44	0.0013	0.0066	645	97343	485843	3842744	39.48
45-49	0.0024	0.0117	1131	96698	481848	3356901	34.72
50-54	0.0036	0.0179	1716	95567	475059	2875053	30.08
55-59	0.0041	0.0204	1913	93852	503583	2399994	25.57
60+	0.0278	1	91939	91939	1896411	1896411	20.63

Age x	Literate Life table			
	PL_x.	LL_x	LT_x	Le_x
0-9	0.0000	0	4692193	46.92
10-14	0.9999	495548	4692193	47.31
15-19	0.9948	492176	4196644	42.37
20-24	0.9913	488600	3704468	37.52
25-29	0.9871	484694	3215868	32.71
30-34	0.9815	480419	2731174	27.87
35-39	0.9663	471542	2250756	23.04
40-44	0.9203	447121	1779214	18.28
45-49	0.8098	390201	1332092	13.78
50-54	0.6776	321900	941892	9.86
55-59	0.5149	259295	619992	6.61
60+	0.1902	360697	360697	3.92

Table 4: Ordinary life table and literate life table for Omani population in 2014

Table 5 shows the LLE and the life expectancy at birth for Omani male population for 2014. The life expectancy at birth and the LLE for Omani male are found to be 70.8 and 51.4 years respectively in 2014. The results indicate that both the life expectancy at birth and the LLE are slightly better for Omani male than the total Omani population as shown in Table 4. The LLE = 51.4 (0-9) implies that an Omani male person of the age group 0–9 yet to be lived on an average 51.4 years in literate state.

Age x	Ordinary Life Table						
	${}_nm_x$	${}_n\hat{q}_x$	${}_nd_x$	l_x	${}_nL_x$	T_x	e_x
0-9	0.0019	0.0097	969	100000	497578	7077285	70.77
10-14	0.0003	0.0015	147	99031	494788	6579707	66.44
15-19	0.0009	0.0047	469	98884	493248	6084920	61.54
20-24	0.0012	0.0061	598	98415	490580	5591672	56.82
25-29	0.0010	0.0048	465	97817	487923	5101092	52.15
30-34	0.0009	0.0043	420	97352	485710	4613170	47.39
35-39	0.0010	0.0048	462	96932	483505	4127460	42.58
40-44	0.0018	0.0089	863	96470	480193	3643955	37.77
45-49	0.0030	0.0148	1412	95607	474505	3163762	33.09
50-54	0.0043	0.0215	2028	94195	465905	2689257	28.55
55-59	0.0059	0.0289	2666	92167	492573	2223352	24.12
60+	0.0328	1	89501	89501	1730779	1730779	19.34

Age x	Literate Life table			
	PL_x.	LL_x	LT_x	Le_x
0-9	0	0	5138911	51.39
10-14	0.9998	494689	5138911	51.89
15-19	0.9947	490633	4644222	46.97
20-24	0.992	486655	4153589	42.20
25-29	0.9901	483092	3666934	37.49
30-34	0.9882	479979	3183841	32.70
35-39	0.9839	475721	2703863	27.89
40-44	0.9721	466795	2228142	23.10
45-49	0.9381	445133	1761347	18.42
50-54	0.8757	407993	1316214	13.97
55-59	0.7412	365083	908221	9.85
60+	0.3138	543118	543138	6.07

Table 5: Ordinary and literate life table for Omani male population in 2014

The life expectancy at birth and literate life expectancy for Omani female population for 2014 are given Table 6. The LLE and life expectancy are found 42.0 and 76.1 years respectively for Omani females in 2014. The Table 6 shows the age specific LLE's including life expectancies for Omani female population for 2014. The results depict that for Omani female population the life expectancies for each of the age groups are much higher than the Omani male population but the literate life expectancies are lower than the Omani male population as shown in Table 5. Our finding on gender gap in LLE is consistent with the findings in Bangladesh and India (Khan et al.,2016; Chattopadhyay and Sinha, 2010).

Age x	Ordinary Life Table						
	${}_nm_x$	${}_n\hat{q}_x$	${}_nd_x$	l_x	${}_nL_x$	T_x	e_x
0-9	0.0013	0.0066	656	100000	498360	7614106	76.14
10-14	0.0002	0.0011	111	99344	496443	7115746	71.63
15-19	0.0004	0.0019	192	99233	495685	6619303	66.70
20-24	0.0004	0.0021	210	99041	494680	6123618	61.83
25-29	0.0003	0.0017	168	98831	493735	5628938	56.96
30-34	0.0004	0.0019	191	98663	492838	5135203	52.05
35-39	0.0005	0.0023	224	98472	491800	4642366	47.14
40-44	0.0008	0.0042	409	98248	490218	4150566	42.25
45-49	0.0017	0.0086	847	97839	487078	3660348	37.41
50-54	0.0029	0.0145	1407	96992	481443	3173271	32.72
55-59	0.0026	0.0129	1234	95585	514667	2691828	28.16
60+	0.0231	1.0000	94351	94351	2177161	2177161	23.08

Age x	Literate Life table			
	$PL_{x.}$	LL_x	LT_x	Le_x
0-9	0	0	4200547	42.03
10-14	0.9999	496393	4200547	42.31
15-19	0.9949	493157	3704154	37.35
20-24	0.9906	490030	3210997	32.44
25-29	0.984	485835	2720967	27.55
30-34	0.9748	480418	2235132	22.67
35-39	0.9488	466620	1754714	17.84
40-44	0.8665	424773	1288094	13.13
45-49	0.6808	331602	863321	8.84
50-54	0.4837	232874	531718	5.49
55-59	0.308	158517	298844	3.13
60+	0.0645	140327	140327	1.49

Table 6: Ordinary and literate life table for Omani female population in 2014

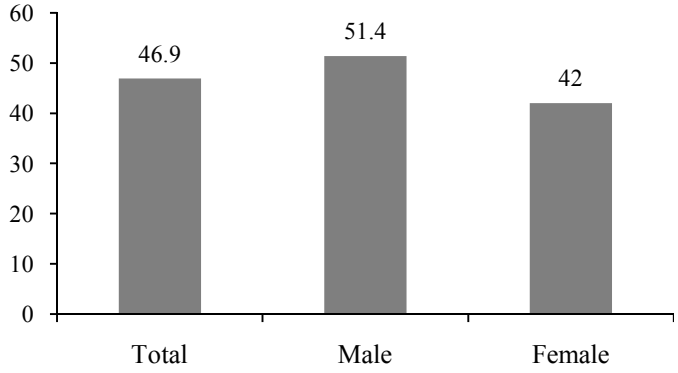

Figure1: Literate life expectancy at birth for Omani population

The LLE at birth in 2014 for Omani's differs considerably by gender. The difference in LLE at initial age between Omani male and female is notably higher (9.4 years; Figure 1). The LLE at birth of Omani female is only 42 years (Table 6 and Figure 2) but it is 9.4 years higher for Omani male (Figure 3). On the other hand, very contrast results are seen in the expectancy of life at birth between Omani women and men. Thelife expectancy at birth for women is more than 76 years but for men it is about 70 years. The notable difference in LLE between Omani men and women also reflects that the literacy rates among women are significantly lower than the Omani men.

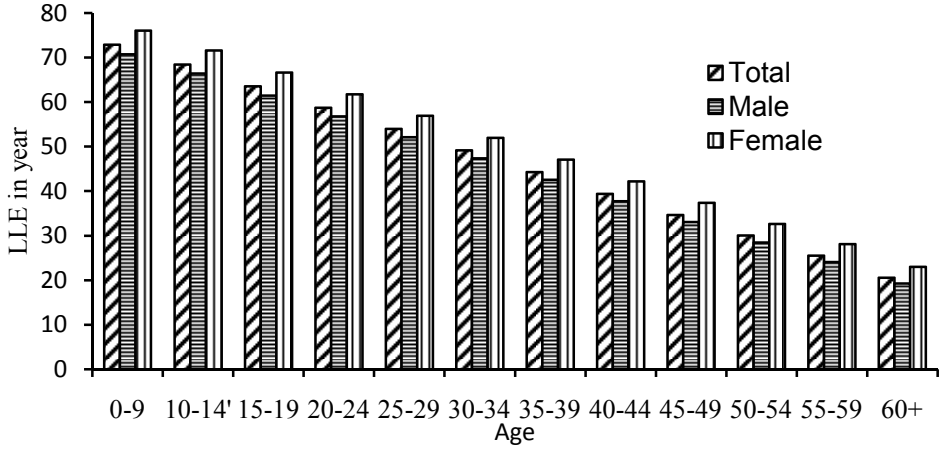

Figure 2: Age-specific literate life expectancy by gender differentials

This type of comparisons may lead to reach decisions related to gender issues why females are lack behind. For Oman as a high income country, the measurements of LLE at birth give the indication about Oman's quality of public health and health care system for both men and women including mothers as well as children.

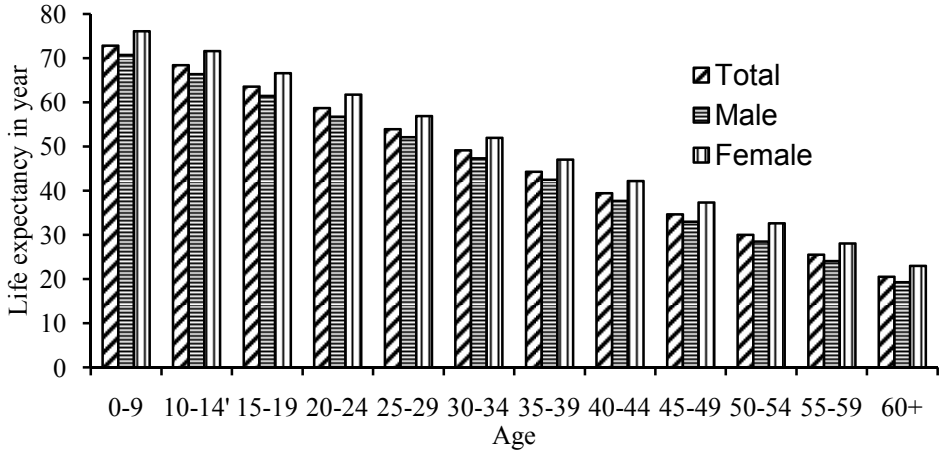

Figure 2: Age-specific life expectancy at birth by gender differentials

4. Conclusions

In 2014, the LLE at birth was found to be 46.9, 51.4, and 42.0 years for Omani total, male and female, respectively. The LLE at birth for men is higher than women. This indicates that the social development has been taken place reasonably higher among men than women. In order to promote the LLE among the Omani, the study suggests the need for more improvement in level of education and health, particularly for females. There are many threats regarding social, occupational, health, and environmental that women face more than men. These treats may include lack of access to education for older population, psychological stress, and probably the lack of autonomy. The LLE can be increased among women population by eradicating the effects of these threats rather than from improving health care facilities since the study shows that among women the life expectancy is always higher than men. Gender gap in LLE should be the basis of delivering more educational, health care facilities, and human capital skills to the affected group but equal opportunity for all other human activities. To increase the LLE, it is important to educate people and enhance their economic status and health.

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