A guide to compute Healthy Life Expectancy

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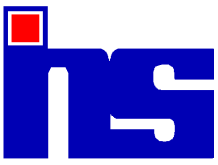

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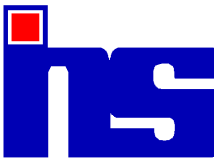

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A guide to compute Healthy Life Expectancy

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I. Introduction

Healthy life expectancy is a modification of conventional life expectancy, to account for time lived with disability. It adjusts the expectation of years of life for the loss on account of disability using explicit weights for different health states. The weights are used to quantify time spent in states of health less than perfect health. Computation of healthy life expectancy involves a number of steps and require data inputs which can be from different sources. In the following sections, the method of computations is described, as well as some of the variations in availability of data inputs. As an example, we shall calculate the Healthy Life Expectancy for Indian females, 1996.

II. Data inputs

A. Age specific death rates (ASDR):

We need ASDRs for computation of abridged life table which is usually built by five year age intervals. For India, the Sample Registration System, which functions under the Registrar General of India, publishes annually such age specific death rates for the country as a whole as well as individual states. Table-1 shows an extract from one such report, for India in 1996.

Note that these rates are per 1000 population. Hence we divide them by 1000 to obtain respective nMx values.

Table 1: Age specific death rates (per 1000 persons) for India, 1996

Age group	Total	Male	Female
<1 yr	77.5	76.9	78.1
1-4	8.5	6.5	10.6
5-9	2.3	2	2.7
10-14	1.3	1.2	1.4
15-19	1.6	1.4	1.9
20-24	2.3	2	2.7
25-29	2.5	2.5	2.5
30-34	2.9	2.9	2.8
35-39	3.4	3.9	2.8
40-44	4.9	5.7	3.9
45-49	6.7	7.9	5.3
50-54	10.9	12.7	9
55-59	15.7	17.9	13.6
60-64	26.7	29.7	23.8
65-69	36.9	41.5	32.4
70-74	61.5	67.2	55.9
75-79	87.5	94.5	80.5
80-84	120.4	129.3	111.8
85-w	182.2	189.5	175.6

[1] Source : SRS Annual Report 1996. pg 171, tbl 8

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B. Estimates of disability prevalence: There are two ways of obtaining estimates of disability prevalence.

1. Estimate National Burden of Disease by all causes. This process will give an estimate of YLDs and YLLs for each age group. We use the YLD estimates by age group and population in that age group to compute disability prevalence in respective age groups.
2. Conduct a cross-sectional survey in the population. Ask each person if (s)he lived in perfect health during the previous year. If a person reports to have lived with some chronic disease and/or experienced illness episodes, ask for a health state valuation of the chronic condition / illness episode, along with the duration. This will allow for computation of YLD for that person. Like this add up for all persons. This basic approach can be operationalised using sampling techniques along with additional simplifying assumptions. For this exercise, we use the YLD estimates from the GBD 96 publication (Murray & Lopez, 1996). The Global Burden of Disease Study in 1996 used descriptive epidemiological inputs and disability weights to arrive at the YLDs for different age and sex groups by cause. The YLD estimates for India have been taken as an estimate of disability prevalence, and are shown in Table-2. Note that these YLD estimates are available only for five broad age groups.

Table 2 :YLDs for females: India, 1996

Age groups	Pop '000s	YLDs '000s
0-4	57000	9625
5-14	95000	6371
15-44	183000	21457
45-59	46000	4653
60+	29000	2949

[1] Source : GBD1996 pg 513, table 8c

III. Calculation of YLD fraction

The total YLDs for all causes should be divided by the population for each age group to arrive at the YLD fraction, as shown in the last column in Table-3.

Table 3 : YLD fractions for different age groups

Age groups	Pop '000s	YLDs '000s	YLD Fraction
0-4	57,000	9625	0.169
5-14	95000	6,371	0.067
15-44	183000	21457	0.117
45-59	46000	4653	0.101
60	29000	2949	0.102

[1] Source : GBD1996 pg 513, table 8c

IV. Computation of abridged life table

We compute the abridged life table function using the ${}_nM_x$ (ASDR/1000) values obtained from Table-1. The method described by (Newell,1988) is used, and the results are shown in Table-4.

Table 4 : Abridged life table for females from India, 1996

x	n	${}_nM_x$	a	${}_nq_x$	${}_np_x$	l_x	${}_nd_x$	${}_nL_x$	T_x	e_x
0	1	0.0781	0.3	0.074	0.926	100,000	7,405	94,816	6,181,797	61.82
1	4	0.0106	0.4	0.041	0.959	92,595	3,829	361,191	6,086,981	65.74
5	5	0.0027	0.5	0.013	0.987	88,766	1,190	440,855	5,725,790	64.50
10	5	0.0014	0.5	0.007	0.993	87,576	611	436,352	5,284,935	60.35
15	5	0.0019	0.5	0.009	0.991	86,965	822	432,769	4,848,583	55.75
20	5	0.0027	0.5	0.013	0.987	86,143	1,155	427,826	4,415,813	51.26
25	5	0.0025	0.5	0.012	0.988	84,988	1,056	422,299	3,987,987	46.92
30	5	0.0028	0.5	0.014	0.986	83,932	1,167	416,742	3,565,688	42.48
35	5	0.0028	0.5	0.014	0.986	82,765	1,151	410,948	3,148,946	38.05
40	5	0.0039	0.5	0.019	0.981	81,614	1,576	404,131	2,737,998	33.55
45	5	0.0053	0.5	0.026	0.974	80,038	2,093	394,958	2,333,866	29.16
50	5	0.0090	0.5	0.044	0.956	77,945	3,430	381,149	1,938,909	24.88
55	5	0.0136	0.5	0.066	0.934	74,515	4,900	360,322	1,557,760	20.91
60	5	0.0238	0.5	0.112	0.888	69,614	7,819	328,524	1,197,437	17.20
65	5	0.0324	0.5	0.150	0.850	61,795	9,261	285,825	868,913	14.06
70	5	0.0559	0.5	0.245	0.755	52,535	12,883	230,466	583,089	11.10
75	5	0.0805	0.5	0.335	0.665	39,652	13,286	165,043	352,623	8.89
80	5	0.1118	0.5	0.437	0.563	26,366	11,519	103,031	187,580	7.11
85	5	0.1756		1.000		14,847	14,847	84,549	84,549	5.69

[1] Data source: ${}_nM_x$ values are based on ASDR estimates reported by SRS 1996, in Table - 1.

V. Building the Disability Adjusted Life Table

Table-5 shows the final computations for estimation of Healthy Life Expectancy. We start with the nLx column of the conventional abridged life table. This was computed in the previous step. Thus column 2 of Table-5 is the same as column 9 of Table-4. In the next column we enter YLD fractions (nYLDx), which were computed earlier in Table-3. Note that we have YLD fractions for five broad age groups. We use the same fractions for all age groups in Table-5 that fall within respective broad age group in Table-3. In the absence of information about distribution of the disability within each broad age group, we have assumed that the distribution is uniform. In column 4, we compute the equivalent time lived in perfect health (1-nYLDx). We then compute health status adjusted nLx (nLx^{HA}). This is arrived at by multiplying the conventional nLx value with (1- nYLDx) computed in column 4. The next two steps are similar to the steps for a conventional life table, only difference being we use the health status adjusted Lx value (nLx^{HA}) instead of conventional Lx. So T_x^{HA} is computed from nLx^{HA}, and finally e_x^{HA} is computed from T_x^{HA}.

Table 5 : Healthy life expectancy for females in India, 1996.

x	${}_nL_x$	${}_nYLD_x$	$1-{}_nYLD_x$	${}_nL_x^{HA}$	T_x^{HA}	e_x^{HA}
0	94816	0.169	0.831	78806	5514395	55.14
1	361191	0.169	0.831	300200	5435589	58.70
5	440855	0.067	0.933	411290	5135389	57.85
10	436352	0.067	0.933	407089	4724099	53.94
15	432769	0.117	0.883	382027	4317009	49.64
20	427826	0.117	0.883	377663	3934983	45.68
25	422299	0.117	0.883	372784	3557320	41.86
30	416742	0.117	0.883	367879	3184536	37.94
35	410948	0.117	0.883	362764	2816658	34.03
40	404131	0.117	0.883	356746	2453894	30.07
45	394958	0.101	0.899	355007	2097147	26.20
50	381149	0.101	0.899	342595	1742140	22.35
55	360322	0.101	0.899	323875	1399545	18.78
60	328524	0.102	0.898	295116	1075670	15.45
65	285825	0.102	0.898	256760	780554	12.63
70	230466	0.102	0.898	207030	523794	9.97
75	165043	0.102	0.898	148260	316765	7.99
80	103031	0.102	0.898	92554	168505	6.39
85+	84549	0.102	0.898	75951	75951	5.12

VI. Results:

A comparison of results of conventional life expectancy (e_x) and healthy life expectancy (e_x^{HA}) at different ages is shown in Table-6.

Table-6: Conventional life expectancy and HLE for females; India, 1996.

Age	e_x	e_x^{HA}
0	61.82	55.14
15	55.75	49.64
30	42.48	37.94
45	29.16	26.2
60	17.2	15.45
75	8.89	7.99

VII. References

1. Christopher J.L. Murray and Alan D. Lopez. The Global Burden of Disease - Summary A Comprehensive assessment of mortality and disability from diseases, injuries, and risk factors in 1990 and projected to 2020. Geneva: The Harvard School of Public Health on behalf of the World Health Organization and the World Bank; 1996; ISBN: 0-9655466-0-8.
2. Newell C. Methods and Models in Demography. The Guildford Press. New York.1988: 63-81
3. The Registrar General, India. Sample Registration System , Annual statistical report - 1996. New Delhi: Office of the Registrar General, India; Fertility and Mortality (SRS) Survey Division : Ministry of Home Affairs, New Delhi.