

Ageing and Healthy Life Expectancy: Will the Extended Years be Spent in Good or Poor Health?

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Abstract

Globally, a significant increase in the life expectancy has been observed. Improvement in life expectancy at all ages has allowed more elderly people to survive thus intensifying the ageing process. In India, the life expectancy at birth has doubled in last 50 years. While extended life expectancy is a great achievement, it does not mean that extra years will be healthy. The present review highlights the concept of healthy life expectancy, which can be considered a family of summary measures of population health, and provides a detailed review of the procedure used to calculate this health indicator. The health expectancy reflects the current health of a real population adjusted for mortality levels and independent of age structure. It also measures the number of remaining years, at a particular age, that an individual can expect to live in healthy state. This technique is a powerful tool for estimating the remaining years of life that a group of individuals can expect to live once they reach a certain age. In India, the second most populous country in the world with a rapidly growing population of older adults, there is an urgent need to estimate healthy life expectancy.

Globally, a significant increase in the life expectancy has been observed. The combination of low fertility and declining mortality rates has resulted in large and rapid increases in the elderly population, as successively larger cohorts step into old age. The transition from high to low fertility is beginning to narrow the age structure at its base and broaden the same at the top, contributing to the expected shift from a population pyramid to a population tower. In addition, improvement in life expectancy at all ages has allowed more elderly people to survive thus intensifying the ageing process. The resulting higher growth in the proportion of the elderly within the population has been referred to as the population ageing phenomenon.¹ The proportion of the elderly in the world population is expected to increase rapidly from 10.0% in 2000, 15.0% in 2025 and 21.1% in 2050.²

It has been estimated that 70% of the world's elderly population are and will be in developing countries.³ In India, the second most populous country in the world,

there is a rapidly growing population of older adults. The absolute number of the elderly in India is projected to reach 137 million by the year 2021 a drastic increase from 81 million in 2002. The growth in the ageing population in India has been faster than in other developing countries. In 1947, when India became independent of British rule, life expectancy wavered around 32 years. The life expectancy has nearly doubled to 63 years in 2000 with the projected increase to 74 years by 2045-2050.¹ While countries like France experienced the shift over a period of 125 years, India has seen this change in a greatly condensed time-span of approximately 35 years. While extended life expectancy is a great achievement, it does not mean that extra years will be healthy.

Health Challenges in India: Disability among the elderly

Ageing is said to put an increased burden on the social, economic, and health care demands of all countries.¹ A challenge to ensuring the quality of life of the ageing population is the double burden of diseases and disability, especially in developing countries. These countries still struggle with infectious diseases and malnutrition along with the recent, rapid growth of non-communicable diseases such as diabetes,

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cardiovascular diseases, and hypertension, as well as disability caused by age-related changes in physical health, including mobility and ability to perform activities of daily living.^{3,4}

Indian Census for the first time collected data on disability in 1872. However, concerns related to under-reporting lead to the intermittent discontinuation of the gathering of this information through the national Census. It was resumed again in the 2001 Census. In India, 75% of the elderly individuals are afflicted by physical disabilities such as vision and hearing problems, locomotor and speech difficulties and mental health issues.⁵ Gender differentials can be observed with a higher percentage of females reporting vision and hearing disabilities. Males have reported higher movement and mental disabilities. Of these individuals, about 75% of disabled live in rural areas and only 25% reside in urban areas. Similarly, vision and mental disabilities have been higher in urban areas as compared with rural areas. On the other hand, hearing and movement disabilities are higher in rural areas. In mapping chronic disease patterns, similar trends are observed for the prevalence of chronic diseases. Sixty percent of old age population above 70 years in India are reported to be having at least one chronic ailment, and 40% of rural elderly women and 36% of rural men suffer from joint pains.⁶ In urban India, 25% of female and 20% of male elderly have high blood pressure.⁷ However, the pattern of diseases between males and females differed and problems related to blood pressure, heart disease, urinary problems and diabetes were dominant in the urban areas.

Considering Active Ageing and Healthy Life Expectancy

Given that people are living longer and the proportion of older adults in our society is higher, meeting these challenges requires a clear understanding of the health needs of older adults, innovative planning to develop programs, systems and structures which will support the health and welfare of the ageing population, and substantial reforms and policies at global, national, and local levels. The World Health Organization (WHO) discussion paper on health and ageing indicated that "we can afford to get old if countries, regions and international organizations enact 'active ageing' policies and programmes that enhance the health, independence, and productivity of older women and men."³ The time to plan and to act is now.³ Active ageing is the process of optimizing opportunities

for physical, social and mental well-being *throughout the life course in order to extend healthy life expectancy*. Here active refers to continuing involvement in social, economic, spiritual, cultural and civic affairs, not just the ability to be physically active; active ageing refers to the process of extending healthy life expectancy, productivity, and quality of life in old age. Similar sentiments have been conveyed in the 2002 International Strategy for Action on Ageing and other national strategies on aging such as the Indian National Policy on Older Persons (1999) and the Older Persons (Maintenance, Care, and Protection) Bill (2005).¹

Healthy life expectancy can be considered a family of summary measures of population health. It is also understood that life expectancy alone does not serve the purpose of measuring health status any more for the ageing population with increasing prevalence of disability and chronic diseases. Increased longevity without quality of life is an empty prize. Healthy life expectancy combines information on mortality and morbidity to indicate the health of a particular population. This summary measure or index also provides meaningful health indicators at the population level of a particular country over time, allows for comparisons between and within countries or regions of the world, helps to identify and quantify overall health inequalities among subpopulations based on age, gender, socioeconomic status, living situations (rural versus urban) and other factors, and helps identify and quantify effects of morbidity on overall population health. It is very important to monitor the level of and change in physical and/or mental well being of a population.

The concept of healthy life expectancy was introduced in the 1960s and was developed by Sullivan in 1970s. Recently, there has been great interest in the estimation of health expectancy between both policy makers and members of the research community. Within the last five years, there have been a number of studies examining healthy life expectancy in the OECD countries (such as Canada, United States of America, & Australia), Brazil, Japan, Netherlands, Lithuania, Russian Federation, China and other parts of the world.⁸⁻¹⁵ These studies have shown differentials in healthy life expectancy based on factors such as age, gender, socioeconomic status, regional variation, and lifestyle practices such as smoking. Given the availability of healthy life expectancy data, national health plan goals in developed countries such as Japan, UK and USA, for example, have identified action plans and goals to prolong healthy life expectancy. In India,

there is a paucity of studies examining healthy life expectancy, with the exception of work done by Mathers and co workers in 2001 and 2004.¹² While this evidence is very useful, more in-depth country specific analysis is needed to provide directions for national health plans.

Healthy life expectancy is commonly analysed using Sullivan method.^{16,17} In this method, a life table is constructed from mortality data as the first step. A life table starts with a hypothetical cohort of 100,000 persons, and uses the mortality data to calculate how many of these are still alive at each age, and how many years will be lived in each age range. From this life table, life expectancy can be calculated by dividing the total number of years lived by the entire cohort of 100,000.⁷ To calculate healthy life expectancy, the Sullivan method allows for differentiation of the number of years lived in good health versus ill health. This method consists of subtracting the years lived in an "unhealthy" state from the years lived by a theoretical cohort of 100,000 people under their current conditions. For estimating health expectancy by the Sullivan method, information on the age specific proportions of the population in unhealthy or disability states gathered in cross-sectional surveys is required. These proportions are prevalence measures of the actual current health status of a real population, so for the disability it would be a measure of the health composition of the observed population measured by disability status. The healthy life expectancy or expectancy of a life free of disability, proposed by Sullivan, can be calculated using an adaptation of the traditional life table. The expectancy of healthy life will then reflect the state of health of a determined population adjusted by the level of mortality and, as in a life table, it is not affected by the age structure of a population. The procedure for calculating the Sullivan's method is outlined below:

1. For each age/gender group obtain the life table schedules and the expectation of life for the year of interest. Then, calculate: ${}_nL_x = e_x^x - e_x^{x+n} + I_{x+n}$,

where ${}_nL_x$ is the conventional life table measure of the average number of person years lived in the age interval x and $x + n$

2. Obtain the ill-health rate d_x in each age-group observed in a survey or census. Calculate the average number of persons aged x to $x + n$ living without ill-health in each age/gender group as: ${}_nL_x(\text{Healthy}) = {}_nL_x(1 - d_x)$,

3. Calculate life expectancy without ill-health as $\text{Healthy Life Expectancy} = (\sum_n L_x(\text{Healthy}) / I_x^x$

Where the summation is from age x upwards. Hence the last equation presents the proportion of years lived in a healthy state.

In summary,

Healthy Life expectancy, $e^x = T_x(\text{healthy}) / I_x^x$,
Un-healthy Life expectancy, $e^x = T_x(\text{un-healthy}) / I_x^x$,

Total Life expectancy, $e^x = e^x(\text{healthy}) + e^x(\text{unhealthy})$

Hence, Life Expectancy = Healthy Life Expectancy + Unhealthy Life Expectancy, for example, 77 Years of Life = 75 Years of Healthy Years + 2 Years of Unhealthy Years (2 years of unhealthy years do not mean the last 2 consecutive years of life).

Since the Sullivan method depends on the measures of healthiness, many different dimensions of morbidity such as self-rated health, presence of long-term disease or disability, and functional limitations could be used. The responses from self-rated health could be dichotomized into poor health and good health. One could also include information related to long-term disease or disability that limits one's activities of daily living. In the third estimate, researchers could take into consideration the continuum of the severity of functional limitation such as the approach proposed by the WHO in the *International Classification of Functionality, Disability and Health* (ICF), in which the limitations of activities and functionality are not only viewed as a consequence of illnesses, but principally as important components of an individual's health. The final method for measuring state of health is a proposed extension of the Sullivan method, which allows more than one healthy life-defining event to be used simultaneously.¹⁸ In addition, a weight is attributed to each event, establishing the degree of its severity. To illustrate the method, three criteria should be considered: (1) individuals do not have long-term disease or disability; (2) individuals have a long-term disease or disability that does not limit daily activities; and (3) individuals have a long-term disease or disability that limit daily activities. The weights which characterize the degree of severity in each situation will be calculated by age group, as the arithmetic mean of the scores of functional limitations in a scale varying from 0 to 1, will be obtained from factor analysis. Given that many different indicators of health can be used based on the

data availability in different countries, Sullivan method of calculating healthy expectancy is not only possible but it is extremely important for program policy changes to address the health needs of the elderly population. The health expectancy reflects the current health of a real population adjusted for mortality levels and independent of age structure. It also measures the number of remaining years, at a particular age, that an individual can expect to live in healthy state. This technique is a powerful tool for estimating the remaining years of life that a group of individuals can expect to live once they reach a certain age. There is an urgent need to estimate healthy life expectancy (HLE) in India. Specifically, how is the life expectancy distributed nationally and regionally within India? What is the relationship between life expectancy and healthy life expectancy within the Indian context? How does healthy life expectancy relate to factors such as age, gender and living situation (urban vs. rural)? Several of the East Asian countries are dealing with similar ageing phenomenon with a similar cultural context and financial constraints of the people and the health care system. Also, there is a need to carry out cross-cultural comparison with other areas within South East Asia or other developing countries. This will be a very useful indicator for population level health planning useful for the Government of India Planning Commission, as well as the Ministry of Health at national and state level. Calculation of healthy life expectancy at the national and regional levels could lead to policy recommendations for the elderly in support of improved health practices and access to quality health care. It is hoped that the present article will promote research and dialogue in this area of healthy life expectancy.

References

1. United Nations Population Division, Department of Economic and Social Affairs, United Nations Secretariat. The Ageing of the World's Population, 2002.
2. United Nations Statistics Division. Demographic Yearbook 1999. United Nations, New York or Geneva [cited 2008 Mar 23]. Available from: <http://www.un.org/depts/unsd>. <http://www.un.org/News/Press/docs/2001/dev2342.doc.htm>
3. World Health Organization. Healthy Ageing. A WHO publication, Geneva, 2001.
4. Manton KG, Stallard E, Corder LS. The dynamics of dimensions of age-related disability 1982 to 1994 in the US elderly population. *J Gerontol A Biol Sci Med Sci* 1998; 53: 59-70.
5. National Sample Survey Organisation. The aged in India: a socio-economic profile. A Socio-Economic Profile Report No.446 (52/25.0/3) http://mospi.nic.in/rept%20_%20pubn/446_final.pdf
6. Gupta I, Sankar D. Health of the elderly in India: a multivariate analysis. *Journal of Health & Population in Developing Countries* / URL: <http://www.jhpd.unc.edu/> Date Published 24 June, 2003 p1-11. http://www.iegindia.org/dis_ind_46.pdf
7. Goyal RS. Disease and disability burden of elderly women in India. *Bold* 2004; 15(1):19.
8. Andreev, E.M., McKee M., Shkolnikov, V.M. Health expectancy in the Russian Federation: a new perspective on the health divide in Europe. *Bulletin of the World Health Organization*, 81:11 ;778-788.
9. Fukuda Y, Nakamura K, Takano T. Municipal health expectancy in Japan: decreased healthy longevity of older people in socioeconomically disadvantage areas. *BMC Public Health* 2005; 5:65.
10. Groenewegan PP, Westert GP, Boshuizen HC. Regional differences in healthy life expectancy in the Netherlands. *Public health* 2003; 17,424-429.
11. Kalediene R, Petrauskienė J. Healthy life expectancy—an important indicator for health policy development in Lithuania. *Medicina (Kaunas)* 2004; 40 : 582-588.
12. Mathers CD, Sadana R, Salomon JA, et al. Healthy life expectancy in 191 countries, 1999. *Lancet* 2001; 357:1685-1691.
13. Mathers CD, Iburg KM, Salomon JA, et al. Global patterns of healthy life expectancy in the year 2002. *BMC Public Health* 2004; 4:66.
14. Matthews JR, Jagger C, Hancock RM. Does socio-economic advantage lead to a longer, healthier old age? *Soc Sci Med* 2006; 62:2489-2499.
15. Romero DE, Leite IC, Szwarcwald CL. Healthy life expectancy in Brazil: applying the Sullivan method. *Cad Saude Publica* 2005; 21:7-18.
16. Sullivan DF. A single index of mortality and morbidity. *HSMHA Health Rep* 1971; 86:347-354.
17. Sullivan DF. Disability components for an index of health. Vital and health statistics. Series 2(42) Rockville, MD. National Centre for Health Statistics. 1971.
18. Rajan SI, Mishra US. In: Agnihotri V, editor. Socio-economic profile of rural India. New Delhi: Concept Publishing House; 2002.