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Original Research Article

Gender Differentials in Health Expectancy in Rural Areas of Nagaland

Seikh Faruk Ahmed

Assistant Professor, Department of Statistics, Kohima Science College (Autonomous), Jotsoma, Kohima, Nagaland-797002.

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ABSTRACT

Health status is an important determinant of economic and social development of a population. Life expectancy, an indicator of measuring health status of a population, has been increasing worldwide over the years. Longer life does not necessarily mean healthier life. Health expectancy, an important indicator of measuring the quality of life lived by a population. The objective of this study is to examine whether gender differentials in health expectancy exists in the rural areas of Nagaland- a hilly state in the north east India. Age specific proportions of persons afflicted by disease were collected from 5404 individuals belonging to 1150 households using a cross sectional survey conducted in May- July, 2011 in 23 villages of Kohima and Dimapur districts of Nagaland. Sullivan's method was used to estimate the health expectancies for both sexes in the rural areas of Nagaland. The health expectancies at birth for males (females) in the rural areas of Nagaland were found to be 50.64 (52.27) years. A clear gender differential has been observed with females having an advantage in health expectancies compared to males in all ages in the rural areas of Nagaland.

Keywords: Gender differentials, Health expectancy, Sullivan's Method, Rural, and Nagaland.

INTRODUCTION

Health status, an important determinant of economic and social development of a population, is generally measured in terms of life expectancy. Life expectancy at birth has become double from 40 years to nearly 80 years since 1800. [1] Although the life expectancy has been increasing worldwide but in living these additional years, one must remember that increased longevity without quality of life is an empty prize. [2] Many studies indicated that longer life expectancy does not necessarily mean healthier life though the success stories in improving human life expectancies are quite impressive. [3-5] There are many people who are sick but escaped early deaths and continue to live to older ages with an increased risk of acquiring chronic non communicable diseases over their remaining lifetime and ending up with multiple diseases, some with disability. [6] It is observed that the decrease in mortality has not been accompanied by a decrease in morbidity but a consequence of increased life expectancy with poor health. [7] Therefore, life expectancy alone should not be viewed as the determinant of the health status of a population. The gain in longevity may contribute to an increase in number of years of survival in poor health or an increase in percentage of older people with disease and disability.

Health expectancy or life expectancy in healthy state combines mortality and healthy state (i.e., disease-free state) into a single indicator and is defined as the number of remaining years at a particular age that an individual can expect to live in a healthy state (howsoever way health may be defined) if current mortality and morbidity prevails. [8,9] Health expectancy at birth is

generally interpreted as the average number of years a new born baby can expect to live without (serious) diseases. Life expectancy with disease (or disability) and without disease (or, disability) adds up to the total life expectancy. During second half of twentieth century, WHO noted that the fundamental objective of human activity should include both long life as well as good health. [10] Life expectancies in good health, life expectancies free from disability, life expectancies free from a specific disease are some of the different ways of measuring health expectancies. [11] Health expectancy has become an increasingly used and preferred indicator of population health status as it comprises both mortality and morbidity into a single indicator.

Health expectancies are important indicators for several reasons. Firstly, they allow us to monitor health of a population with a greater understanding compared to traditional life expectancies. [11] As most of the countries, all over the world are passing through the epidemiological transition and experience an increase in proportion of deaths due to degenerative diseases, the comparisons of life expectancy alone may hide important differences in levels of morbidity and disability. The World Health Organization has also recognized the importance of health expectancies as population health indicators and has estimated it for 192 member states. [12]

Secondly, the trends in health expectancies are useful indicators for addressing the question of whether current increases in life expectancy are being matched by similar increases in health expectancy. As health expectancy is adjusted for the size and age structure of populations, it allows direct comparison of health status of different population. The usefulness of health expectancy indicators has been recognised in the Jakarta declaration on leading health promotion into the 21st century. [13]

However, it has been observed that, in this part of the world, people usually talk of life expectancy as an indicator of population health status rather than using health expectancy. So far, no analytical study on health expectancy has been done related to the morbidity due to any disease in the rural areas of Nagaland. Therefore, it is an urgent need to explore the health expectancies for rural people of Nagaland in terms of morbidity due to any disease.

Objective

To examine whether gender differentials exists in terms of health expectancy in the rural areas of Nagaland. For this purpose, we estimate the health expectancies free from morbidity due to any disease in the rural areas of Nagaland in 2011 for both sexes.

MATERIALS AND METHODS

Data

As discussed earlier, Sullivan's method is applied to estimate the health expectancy free from morbidity due to disease in the rural areas of Nagaland. To estimate health expectancy, the data requires is the proportion of persons with any disease and age-specific mortality information. The age-specific proportions of persons with disease (Figure-1) were obtained using cross sectional data collected through a household survey conducted in 23 villages of Kohima and Dimapur districts of Nagaland during May-July, 2011. [14]

Multistage sampling procedure was adopted in the survey. Data on the prevalence of disease was collected from 5404 individuals belonging to 1150 households using a well prepared pretested schedule. The age-specific mortality information for both males and females of rural areas of Nagaland is taken from the life table constructed for both sexes for rural Nagaland, 2001-05. [15]

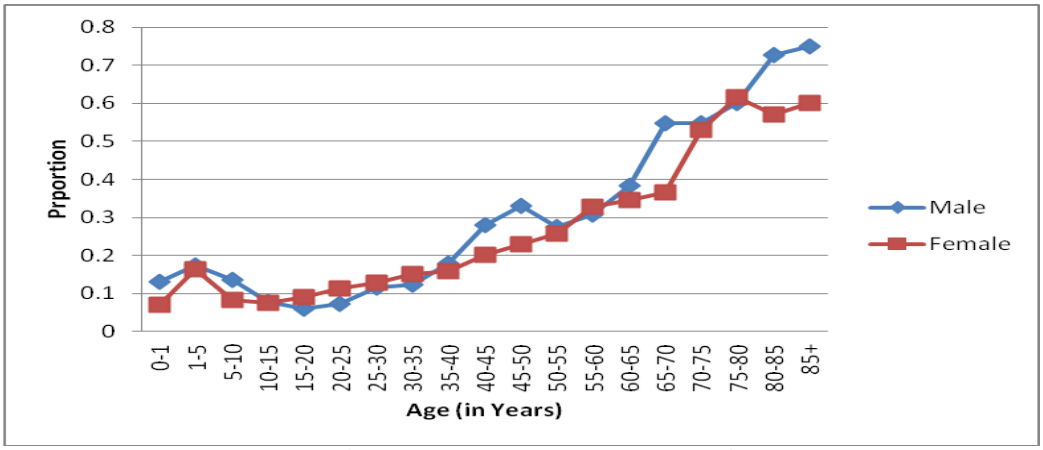

Figure1: Proportion of persons with any disease in rural areas of Nagaland in 2011

Methodology

Estimation of Health Expectancy (HE)

For the analysis of the data, measures of descriptive statistics such as standard error, confidence interval, life table technique and Sullivan's methods have been used.

Sullivan's method is described in terms of life expectancies with disease and without (i.e., free of) disease.

In the usual notation of the life table, the life expectancy at age x (e_x^0) is given by

$$e_x^0 = \frac{1}{l_x}\sum_{x=0}^{w} L_x$$

Where, L_x is the total numbers of years lived by the cohort in the interval $[x, x+1)$ and w is the value of the last age interval.

The calculation of health expectancy also follows similar lines. If we assume two states such as with disease (WD) and without disease (WOD) then the life expectancy with disease at age x ($WDLE_x$) and life expectancy without (i.e., free of) disease at age x ($WODLE_x$) or, health expectancy at age x (he_x^0) are defined by

$$WDLE_x = \frac{1}{l_x}\sum_{x=0}^{w} L_x(WD) \text{ and}$$

$$WODLE_x = he_x^0 = \frac{1}{l_x}\sum_{x=0}^{w} L_x(WOD)$$

(Jagger, 1999)

Where, $L_x(WD)$ and $L_x(WOD)$ are the numbers of person years lived from age x onwards in the states WD and WOD respectively. Using the Sullivan method as an approximation of health expectancy, we have

$L_x(WD) = \pi_x \times L_x$ and

$L_x(WOD) = (1-\pi_x) \times L_x$; $x = 0, ..., w$

Where π_x is the prevalence of disease at age x or, morbidity proportion at age x.

i.e., $\pi_x = PM_x$ = Age-specific proportions of morbidity at age x.

Thus, $WDLE_x = \frac{1}{l_x}\sum_{x=0}^{w} \pi_x \times L_x$ and

$WODLE_x = he_x^0 = \frac{1}{l_x}\sum_{x=0}^{w} (1-\pi_x) \times L_x$; where,

l_x is the number of survivors at age x in the hypothetical life table cohort; L_x is the numbers of years of life lived by the life table cohort in the age interval $[x, x+1)$ and π_x is the proportion of persons with disease in the age interval $[x, x+1)$ in the population and he_x^0 denotes the health expectancy or life expectancy free of diseases at age x.

But, $WDLE_x = \frac{1}{l_x}\sum_{x=0}^{w} {}_n\pi_x \times {}_nL_x$ and

$WODLE_x = he_x^0 = \frac{1}{l_x}\sum_{x=0}^{w} (1-{}_n\pi_x) \times {}_nL_x$;

where, l_x is the number of survivors at age x in the hypothetical life table cohort; ${}_nL_x$ is the number of years of life lived by the life table cohort in the age interval $[x, x+n)$ and ${}_n\pi_x$ is the proportion of persons with disease in the age interval $[x, x+n)$ in the

population and he_x^0 denotes the health expectancy or life expectancy free of diseases at age x.

Estimation of Standard Error of Health Expectancy

The standard error of estimated health expectancy can be calculated by approximating the variance formula provided by Mathers (1991) [17] as follows

$$S^2({}_n\pi_x) = \frac{{}_n\pi_x(1-{}_n\pi_x)}{{}_nN_x};$$

[In general $S^2({}_n\pi_x) = S^2(1-{}_n\pi_x)$]

Here, ${}_nN_x$ is the number of persons in the age interval $[x, x+n)$ participating in the prevalence survey. A simple approximation in the case of complex sampling (e.g., stratified or cluster) design is to use the weighted ${}_n\pi_x$ and un-weighted ${}_nN_x$. The variance of $WDLE_x$ and $WODLE_x$ (or, he_x^0) provided by Mathers (1991) [17] can be approximated as

$$S^2(WDLE_x) = \frac{1}{l_x^2}\sum_{x=0}^{w} {}_nL_x^2 S^2({}_n\pi_x)$$

$$\approx \frac{1}{l_x^2}\sum_{x=0}^{w} {}_nL_x^2 \frac{{}_n\pi_x(1-{}_n\pi_x)}{{}_nN_x}$$

and

$$S^2(he_x^0) = \frac{1}{l_x^2}\sum_{x=0}^{w} {}_nL_x^2 S^2(1-{}_n\pi_x)$$

$$\approx \frac{1}{l_x^2}\sum_{x=0}^{w} {}_nL_x^2 \frac{{}_n\pi_x(1-{}_n\pi_x)}{{}_nN_x}$$

The Standard Error (SE) of Health Expectancy (HE) is given by $SE = \sqrt{S^2(he_x^0)}$ and finally, 95% confidence intervals (CI) for HE are obtained by $95\%\ CI = HE \pm 1.96\ SE$

RESULTS AND DISCUSSION

The health expectancies at birth for males (females) for disease in the rural areas of Nagaland were found to be 50.64 (52.27) years. That is, at birth a male (female) is expected to live 50.64 (52.27) years of life without (i.e., free of) disease (Table-1). This indicates that females live on an average more years without disease than their male counterpart.

Table1: Health expectancies (HEs) and life expectancies (LEs) and their percentage difference for both sexes in rural areas of Nagaland, 2011

Age	Male			Female		
	HE	LE	% of (LE-HE)	HE	LE	% of (LE-HE)
0	50.64	67.48	24.96	52.27	67.07	22.07
5	50.55	67.93	25.59	53.17	68.72	22.63
15	41.98	58.42	28.14	44.39	59.28	25.12
30	28.62	43.99	34.94	31.51	44.93	29.87
45	17.12	29.98	42.9	19.75	30.93	36.15
55	10.97	21.5	48.98	12.96	22.2	41.62
60	8.11	17.74	54.28	10.2	18.25	44.11
65	5.76	14.44	60.11	7.72	14.7	47.48
70	4.33	11.57	62.58	4.96	11.58	57.17

The health expectancies for females were more than males in all ages (Figure-2). Since the total life expectancy is the sum of life expectancy with disease and without disease, therefore, the life expectancy with disease can be obtained by subtracting the life expectancy without disease (i.e., health expectancies) from the life expectancies in each corresponding age groups and are expressed in percentage (Table-1).

The percent difference between life expectancies and health expectancies indicate the risk of living the number of remaining years of life with disease or in ill health. From Table-1, we observed a clear gender differential with the females exhibiting an advantage in the total number of remaining years with lower risk of morbidity from any disease compared to males. For example, a fifty years old female has a risk of living 10.22 years (or 38.64%) of remaining life with disease compared to 11.47 years (or 44.82%) for a male of same age. The number of remaining years lived without disease and with disease declines with ages. They reach a convergence at about 60 years of age for males and 70 years of age for females (Table-1) where a crossover is noted with more years expected to be spent in an unhealthy state with

respect to any disease. It is also found that the health expectancies for females in each age group are more than the males for any disease (Figure-2). The higher health expectancies for females than males were possibly because of the fact that males were more susceptible to risk health behaviours such as habit of smoking, use of tobacco, drinking alcohol, etc., than females. [18-22]

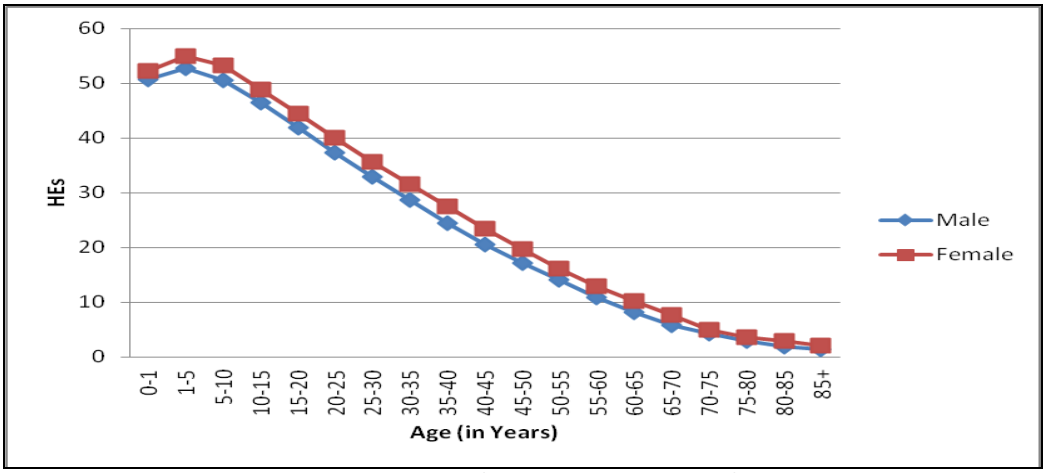

Figure2: Health Expectancies (HEs) for diseases in rural areas of Nagaland in 2011

The prevalence of disease by age may exhibit considerable amount of variation due to sampling. Mortality rates are also subject to random variation. Since the Sullivan method of calculating health expectancy combines such mortality and morbidity rates, it too is subject to random variation.

Table 2: Standard Errors (SEs) and 95% Confidence Intervals (CIs) of Health Expectancies (HEs) for both sexes in rural areas of Nagaland in 2011

Age	Male			Female		
	SE of HE	95% CI of HE		SE of HE	95% CI of HE	
0	0.66463	49.34	51.94	0.776126	50.75	53.79
5	0.70507	49.17	51.93	0.841551	51.52	54.82
15	0.69643	40.61	43.35	0.839605	42.74	46.04
30	0.68903	27.27	29.97	0.837447	29.87	33.15
45	0.65907	15.83	18.41	0.82333	18.14	21.36
55	0.64397	9.71	12.23	0.820869	11.35	14.57
60	0.64502	6.85	9.37	0.812921	8.61	11.79
65	0.66182	4.46	7.06	0.818192	6.12	9.32
70	0.66177	3.03	5.63	0.838776	3.32	6.6

It is evident from Table-2 that the estimated values of health expectancies were quite satisfactory as the standard errors for age-specific health expectancies were very small as well as the corresponding length of the 95% confidence intervals were also very small. For example, the standard error (SE) for health expectancy (HE) at birth for males (females) for any disease was 0.664 (0.776). The 95% CI for HE at birth for any disease were (49.34, 51.94) for males and (50.75, 53.79) for females respectively.

CONCLUSION

Gender differentials in health expectancies existed with females having higher health expectancies than males in all ages.

DRAWBACK

The possible drawback of this study might be in the reference period of the estimates. For estimating the health expectancy, the primary data on age-and-sex specific proportion of population with disease, were collected from the household survey done in 2011, whereas the age-and-sex specific mortality information were taken from the life table for rural people of Nagaland for the period 2001-05. But, it is believed that the demographic measures do not change drastically over short time period and hence the estimates produced are assumed to be reliable.

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