Active Aging Index and Healthy Life Expectancy in Bangladesh

Md. Ismail Tareque, M. Sc.
Department of Population Science and Human Resource Development
University of Rajshahi, Rajshahi-6205, Bangladesh
and
Department of Health Care Management and Planning
Graduate School of Medical and Dental Science
Tokyo Medical and Dental University
1-5-45 Yushima, Bunkyo-ku, Tokyo 113-8519, Japan
Phone: +81-3-5803-4700
Fax: +81-3-5803-0358
Email: tareque_pshd@yahoo.com

Nazrul Hoque, Ph. D.
Department of Demography and
Institute for Demographic and Socioeconomic Research
University of Texas at San Antonio
501 West Durango Blvd.
San Antonio, TX 78207-4415
Phone: (210) 458-6533
Email: nazrul.hoque@utsa.edu

Towfiqua Mahfuza Islam, M. Sc., M. Phil.
Department of Health Care Management and Planning
Graduate School of Medical and Dental Science
Tokyo Medical and Dental University
1-5-45 Yushima, Bunkyo-ku, Tokyo 113-8519, Japan
Phone: +81-3-5803-4700
Fax: +81-3-5803-0358
Email: tmisathee@yahoo.com

Kazuo Kawahara, M. D., Ph. D.
Department of Health Care Management and Planning
Graduate School of Medical and Dental Science
Tokyo Medical and Dental University
1-5-45 Yushima, Bunkyo-ku, Tokyo 113-8519, Japan
Phone: +81-3-5803-4030
Fax: +81-3-5803-0358
Email: kk.hcm@tmd.ac.jp

Makiko Sugawa, MMA.
Department of Health Care Management and Planning
Graduate School of Medical and Dental Science
Tokyo Medical and Dental University
1-5-45 Yushima, Bunkyo-ku, Tokyo 113-8519, Japan
Phone: +81-3-5803-4031
Fax: +81-3-5803-0358
Email: sugawa.hcm@tmd.ac.jp

Abstract

This paper examines the relationships between increased life expectancy and healthy life expectancy (HLE) in Bangladesh by examining the relationships between active aging index (AAI) and HLE. The AAI was constructed using 2009 survey data from the Rajshahi District of Bangladesh, which was collected using Probability Proportion to Size sampling technique. The Sullivan method was used to compute HLE, followed by Pearson's correlation analysis. The results suggest that urban, more educated male elderly are more active in all aspects of life and have longer HLE. The mean difference of 6.62 years for urban male elderly reveals that male elderly could expect more disability free life in comparison with other cohorts in all areas. Females are found to outlive males but are more likely to live a greater part of their remaining life in disability. As expected, we found very strong and significantly positive correlation between AAI and HLE.

Key words: Active aging index, healthy life expectancy, correlation, Bangladesh.

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Introduction

The increase in life expectancy in Bangladesh during the 20th century has been a remarkable achievement. The average life expectancy at birth has increased from about 40 years in 1960 to 66 years in 2010. However, we do not know whether the increase in life expectancy is keeping pace with the healthy life expectancy in Bangladesh. Advancing age may be associated with a higher likelihood of disability but the processes leading to a decline in health is not irreversible. Studies on health dynamics cite significant evidence of recovery from disability among older people in developed countries but there is no clear picture of recovery in developing countries. In Japan approximately 30 percent of older people who were in a state of disability in 1987 regained their functional ability during the following three years (Liu, Liang, Muramatsu, & Sugisawa, 1995). Among older Americans, 20 percent reported recovery from a disability during a two year period (Rogers, Rogers, & Belanger, 1990) although these levels should not be compared given the differences in measures and time frames. A host of socioeconomic and environmental factors were found to explain health recovery including age, participation in organizational activities, social support and self-rated health. In particular, younger age and better self-rated health may influence health status by reducing the risk of becoming disabled or dying and by facilitating recovery (Liu, Liang, Muramatsu, & Sugisawa, 1995). The same study showed lower education, not being married and smoking may increase the risk of disability,

but they do not have a negative effect on recovery. Health transition analysis (Cruz, Saito, & Natividad, 2007) indicated a significant proportion of Filipino older people experiencing recovery while age, sex, place of residence and health status/behavior indicators (self-assessed health, drinking and exercise) displayed a significant influence on future health and mortality trajectories although surprisingly, education did not show any significant effect. In some Latin American and Caribbean countries aging is associated with disability or poor quality of health, particularly diabetes and obesity (Palloni and McEniry, 2007; Wong and Palloni, 2009). Moreover, the cost of medical care for a disabled older person averages 3 times higher than that of a non-disabled senior (Trupin, Rice, & Max, 1995). According to Ruffing-Rahal (1991), a fundamental goal of health promotion is to facilitate the well-being of older adults on an ongoing basis. Although older adults may suffer from chronic diseases, cognitive impairment, and functional limitations, the choice of a health promoting lifestyle can minimize health problems and lead to enhanced health outcomes (Ruffing-Rahal, 1991). Self-care has been described as a strategy for coping with life events and stressors (McLaughlin and Zeeberg, 1993; Chen, Chang, & Li, 2002), and for enhancing quality of life during the aging process (Boyle and Counts, 1988), thereby promoting independence and healthy aging. In addition, compared with developed countries, developing countries' pace of aging is much faster, therefore, they will have less time to adjust to the consequences of aging which takes place at much lower socioeconomic levels compared with developed countries. The current and emerging effects of population aging will impact all aspects of life: social, economic, and political (UNPD, 2008). Thus, the authors are trying to introduce the concept of active aging in connection with healthy

life expectancy (HLE) which is a relatively new concept in Bangladesh. This might be a good step toward suppressing morbidity while allowing individuals to enjoy more disability free life; efforts will additionally help individuals as well as the nation to reduce medical costs for the elderly. Little is known on the levels of active aging, as its differentials vary across socioeconomic levels, demographic settings and the functional health transition patterns among older people in Bangladesh. Active aging can be applied to both individuals and population groups. It allows people to realize their potential for physical, social, and mental well being throughout their lives and to participate in society according to their needs, desires and capacities, while providing them with adequate protection, security and care when they require assistance (WHO, 2002). According to WHO (2002), if aging is to be a positive experience, longer life must be accompanied by continuing opportunities for health, participation and security. Older people who retire from work and those who are ill or live with disabilities can remain active contributors to their families, peers, communities and nations. Active aging aims to extend healthy life expectancy and quality of life for all people as they age, including those who are frail, disabled and in need of care (WHO, 2002) but there are no statistics about the relationship between active aging and healthy life expectancy, which is a critical enquiry. It is also therefore said that individuals should be aware and should prepare themselves in order to maintain health, independence, security and produce some benefits for society (WHO, 2002; Thanakwang & Soonthorndhada, 2006).

Health expectancy is increasingly emphasized as an indicator for population health that takes into accounts both mortality and morbidity or disability. It can be used to watch

the way the health of a population is evolving, to show how it compares with that of other populations, and to suggest, once the trend becomes clear, whether a healthy life expectancy is disability free. The use of health expectancy as a measure of a population's health has become an increasingly popular phenomenon and estimates have been published for about 191 countries (Robine and Ritchie, 1991; Robine, Mathers, Bone, & Romieu, 1993; Mathers, McCallum & Robine, 1994; Mathers et al., 2001). Unfortunately, healthy life expectancy cannot be measured for every year in Bangladesh due to the lack of available relevant data. In addition health policies that focus on health expectancy have increased, particularly in countries characterized by an aging population because a longer life and a healthier life do not necessarily go together (Brønnum-Hansen, Andersen, Kjøller, & Rasmussen, 2004).

According to the World Population Prospectus, there were 164.4 million people living in Bangladesh in 2010 (UN, 2008), and 6.2 percent or 10.1 million of them are 60 years of age or older. It is projected that in 2050, 21.2 percent or 47.2 million will be 60 years of age or older. At present, Bangladesh has not entered into the aging society but it will enter very soon and contains the world’s third largest number of poor elderly people preceded by India and China (HAI, 2006). Life expectancy is projected to increase from 66 years in 2010 to 76.2 years in 2050. Very soon Bangladesh is going to face enormous problems associated with aging, particularly for health facilities. We use a new data set on elderly people from the district of Rajshahi in Bangladesh to measure activeness using the active aging index (AAI) and to compute healthy life expectancy by documenting the health status of elderly people and thus measure the relationship between AAI and HLE.

At present, Bangladesh with 164.4 million people is the seventh most populous country in the world and the district of Rajshahi is the third largest city in the country.

To the best of our knowledge, there has not been a similar study examining the relationship between active aging and healthy life expectancy in Bangladesh. This paper is thus unique because it represents the first attempt to examine the relationships between an active aging index and healthy life expectancy in Bangladesh. Although older people are expected to be treated with respect and reverence in Bangladesh, they are facing increased social isolation. The health conditions for older people have not improved, and for older women conditions may have worsened. The infrastructure of Bangladesh is insufficient to help their disabled and older populations. It is therefore, important to examine the difference between life expectancy and healthy life expectancy as well as the relationship between active aging and healthy life expectancy to minimize years of disability in Bangladesh.

Data and Methods

A number of research methods and sources were used to obtain the data necessary for this study. The primary data used for the present study, collected during April 2009, comes from a research project entitled "Socio-Demographic Status of the Aged Population and Elderly Abuse: A Study on Rural-Urban Differentials in Rajshahi District, Bangladesh". The research project was funded by the Social Science Research Council (SSRC), of the Government of Bangladesh. For the relevance of the project title and due to limited funding, the Rajshahi district had been selected as the study area. For those of us

who are not familiar with the geo-political divisions in Bangladesh, the country is divided administratively (from large to small) into divisions, districts (zilas), upazilas, and thanas. In rural areas, each thana is divided into several union councils and each union council consist of multiple villages. In metropolitan areas, thanas are divided into several wards and each ward further divided into multiple mahallas. From the selected district one Union Council, named Yusufpur Union, has been selected at random. From the selected Union, two villages (smallest administrative unit in rural areas) namely, Baduria and Sahapur have been selected using the probability proportional to size (PPS) technique with random number pairs (01, 0131) and (10, 1003) respectively. All persons 60 years of age and older residing in the households of the two villages have been interviewed.

The urban sample of households and the elderly were selected in a similar way. The Ward number 05, consisting of several Mahallas (smallest administrative unit in urban areas) was selected as urban sample with random number pairs (05, 0554). All elderly residing in the households of the selected Ward were interviewed. The total number of the selected population sample was 896, with 477 rural and 419 urban residents.

To reach the desired goals of the project, a questionnaire was prepared and pre-tested by a pilot survey. Corrections were made following an evaluation of the pilot survey and a final version of the questionnaire was completed. Finally, field investigators went to the houses of selected areas where they identified eligible persons, asked the questions to the respondents and recorded answers on questionnaires. To reach the desired response rate, repeated visits were made. The structured survey instrument containing closed questions, with the exception of income information, was designed to collect information on the

following: (i) identification of respondents, (ii) details about family members, (iii) health conditions, (iv) daily activities, (v) economic activities, (vi) living conditions, (vii) abuse etc. For more accurate data collection a Bengali version of the questionnaire was prepared for the interviewees and field investigators. Responses were then converted to English for data entry and analysis with SPSS for Windows, version 15 (SPSS, Inc., Chicago, IL).

Active Aging Index Construction

Active aging depends on a variety of "influences" or "determinants" that surround individuals, families and nations (WHO, 2002). Though WHO tried to accumulate the determinants of active aging under three pillars (see figure 1), at the same time they confirmed that more research is very much needed to clarify and specify the role of each determinant, as well as the interaction between determinants, in the active aging process (WHO, 2002).

"Figure 1 about here"

Thus we tried to include the indicators for constructing an active aging index as recommended by the Active Aging Taskforce of the Western Australian Government (Active Aging Taskforce, 2003). We included 15 indicators, used by Thanakwang and Soonthorndhada (2006), which also fall among the determinants of active aging by WHO, under three core or primary dimensions: six indicators for health (three indicators for health and wellness and three indicators for physical activities), three indicators for community participation, and six indicators for security dimension (three indicators for physical

security and three indicators for financial security). The composite indices of health, community participation and security were constructed first. Then the active aging index was constructed by combining these three indices. These indicators are illustrated in the active aging framework in figure 2.

"Figure 2 about here"

In this study an attempt has been made to measure active aging in the Rajshahi district of Bangladesh by constructing active aging indices for three major dimensions, namely, (a) health, (b) community participation and (c) security. The detailed description of these three dimensions with their relevant indicators is given in Table 2. In each dimension, a weighted score for each of the indicators has been calculated. Each composite score is the sum of answers to several indicators within each dimension. However, since there was variability in the range of possible answers to the questions within each composite, a simple summation of answers would not have insured equal contribution of all questions, and there would have been an obvious inequality in the significance of the total variability of the composite score. In order to correct this issue, we applied a method to adjust each composite for the range of answers to each indicator and for the total number of indicators in the composite (McGahan, Griffith, Parente, & McLellan, 1986; Thanakwang and Soonthorndhada, 2006; Haque, Tareque, & Mostofa, 2010). For example, the composite score on the health dimension is composed of six indicators ($H_1 - H_6$). The actual score of each dimension is calculated by summing the positive responses of the respondents in favor of their activeness. This is done mathematically as shown in the equation below:

Composite score = $H_1/M_1 \times T + H_2/M_2 \times T + H_3/M_3 \times T + H_4/M_4 \times T + H_5/M_5 \times T + H_6/M_6 \times T$

Where, H = the score of each indicator

M = the maximum answer value of each indicator

T = the total number of indicators of a dimension

Then an index of each dimension was constructed following the Human Development Index (HDI) constructed by the United Nations Development Programme (UNDP, 2006) using the following equation:

$$Dimension\ Index = \frac{Actual\ score - Minimum\ score}{Maximum\ score - Minimum\ score}$$

The maximum and minimum score of each dimension is measured by the performance in each dimension, expressed by 1 or 0 in accordance with the construction method of the HDI, and one minus the indices value measures the gap of activeness.

According to the WHO's concept of active aging, health, community participation and security are inextricably linked. Therefore, the active aging index (AAI) is computed in a straightforward manner as a simple average of these three indices according to the formula below:

AAI = (health index + community participation index + security index)/3.

Each index was classified into three levels based on the UNDP criteria for levels of human development, which constitutes an indicator of the quality of life, as follows: (1) Index value less than 0.5 is low level; (2) Index value between 0.5 and 0.79 is moderate level; and (3) Index value equal or higher than 0.8 is high level.

Computation of Healthy Life Expectancy

To compute healthy life expectancy, we used the method devised by Sullivan (1971). This method partitions total life expectancy into the different health states based on the prevalence of self-rated health within a representative sample at a single point in time. Using the UN (2008) projected population for 2005 and 2010 we first estimated the 2008 and 2009 age- and sex- specific population for Bangladesh based on the exponential growth rate from 2005 and 2010. These estimates for Bangladesh were then proportioned for the Rajshahi district using the 2001 Bangladesh Population Census data to produce 2008 and 2009 population estimates for the district by age and sex for the total as well as for rural-urban areas. Preston and Bennett's (1983) method was then applied to those age distributions to compute five life tables for total and rural-urban areas by sex as well for 2009. By combining the computed life expectancies with age- and sex- specific self-rated health prevalence rates obtained from the survey, we calculated healthy life expectancy for our study population. Healthy life expectancy values were obtained by dividing total healthy person-years at each age by the survivors at that age from the computed life table which reflects the current health status of the sample population adjusted for age and

mortality levels. For more details on computation of health expectancy using the Sullivan method, see Jagger et al. (2006).

In this study, active aging index (AAI) was constructed using the framework of figure number 2 and HLE using the Sullivan method. Univariate classification analysis has been performed in order to find the percentage of active aging attributes of the elderly population. Mean distribution has been presented to show the differences among study participants for AAI and HLE. Finally, cross-tabulation analyses as well as Pearson's correlation analysis were done to uncover the correlation between AAI and HLE including tests of differences between the correlations.

Results

Table 1 provides the distribution of the characteristics of the respondents of the present study. As can be seen from Table 1, overall the average age of the respondents is 68.37 years, 57.9 percent are young-old (i.e., 60-69 years) and 42.0 percent are old (70 years and above). Overall, 59 percent of the respondents do not have any education. In rural areas 93.0 percent women do not have any education compare with 63.6 percent for men. In urban areas almost 51 percent of women do not have any education compare with 18.0 percent for men. In rural areas, only 1.8 percent of the female respondents have secondary or above education while almost 19 percent of the male respondents have secondary and above education. In urban areas 17.3 percent of the female respondents have secondary or above education while 66.3 percent of the male respondents have secondary and above education. In rural Bangladesh, the female literacy rate is very low, as is a well-known

phenomenon (Rahman, Tareque, Rahman, & Islam, 2007). About 97 percent of the respondents are Muslim and about 60 percent are married. Also of interest, more than 70 percent of urban elderly live in joint families while a little over 20 percent live in nuclear families.

"Table 1 about here"

Self-assessments of health are common components of population-based surveys. According to Fillenbaum (1984) self-perceived health status may be a better indicator than actual medical reports. In population studies, self-rated health is probably the most feasible, most inclusive and most informative measure of human health status as well as a unique and valuable indicator of human health status (Jylhä, 2009) and has been used as the first indicator under health dimension for the active aging index. Table 2 provides the measurements of indicators and dimensions of constructing active aging index. As can be seen from the Health Index on Table 2, almost 96 percent of elderly respondents reported no disability and about 59 percent reported either poor or very poor health status. About 85 percent of elderly indicate psychologically well-being. In rural areas 74.3 percent of males and 62.0 percent of females have no functional limitation. In urban areas 55.6 percent of males and 36.9 percent of females have no functional limitations. This suggests that urban elderly are in better health condition than their rural counterparts, both males and females. Almost all respondents (97.3 percent) can perform their activities of daily living (ADL) successfully. About 43 percent of elderly have some functional limitations. The urban females have more limitation than rural females or urban or rural males. About 6 out of 10

elderly participated in some exercise during the last six months prior to the survey and male elderly are more active over female elderly in both rural and urban areas.

"Table 2 about here"

An overwhelming majority of the elderly supported their family. About 97.8 percent did not participate in any clubs or any elderly group activities. Particularly in rural areas, no one participated in any groups or clubs; it may be that such facilities are not be available in rural areas. About 78 percent rural female and about 61 percent urban female elderly have no income; most strikingly 99 percent rural elderly were not satisfied with their income. Comparatively urban elderly have more income than their rural counterparts. About 93 percent elderly live with their spouse, children or others while 16.2 percent of rural female elderly were reported living alone. The most striking finding is that about 35.1 percent of rural female elderly have no safety facilities and toilet at all.

From the indices, in the health dimension about 40 percent of elderly are highly active and in good health, with male elderly being more active both in rural and urban areas. In community participation and security dimensions, most of the elderly are moderately active while females are found to be more active in community participation and males are found to be more secured. From the active aging index, we can see that about 79 percent of elderly are moderately active while male respondents are more active than the female respondents both in rural and urban areas.

Levels of Active Aging Index and Healthy Life Expectancy

Table 3 shows the mean values for healthy life expectancy and active aging index which indicates the level of activeness and disability free life expected for 60-, 65-, 70-, 80-,

and 85-year old by sex with rural-urban differentials. As expected, the results showing mean values of AAI and HLE decrease with the increase of age of the respondents. Comparatively, 60- and 65-year old persons are highly active as well as have more HLE than older aged. Male elderly are found to be more active and could expect longer HLE than female elderly in both rural and urban areas. Urban elderly could expect more HLE compared with rural elderly though some urban age ranges are found to be less active than the respective rural aged. In addition if we compare the AAI of urban 60-year old females to rural females of 60- and 65- years of age, it could be easily mentioned that the same level of activeness cannot ensure the same HLE for all. These AAI effects might reflect the effects of morbidity, health declining as age increases, environment, lifestyle and health facilities.

"Table 3 about here"

Differences between Life Expectancy (LE) and HLE

Life expectancy has frequently been used as an indicator of public health; another indicator, health expectancy, was introduced in the 1970s. Both indicators help us to measure the life expectancy with disability that one would experience in later life. Figure 3 shows the LE and HLE by sex and residence.

From Figure 3, it is observed that rural females are expected to live longer than all other elderly with little exception in 70-74 age groups. However, rural female elderly could expect less HLE than all other counterparts except the last age groups. Figure 3 also reveals that there is a huge gap between the LE and HLE, i.e. life expectancy with disability that one would experience in later life. For overall areas there is a mean difference of 8.20 years

(with 95% confidence interval [CI], 8.06-8.34; $t_{895} = 112.08$; $p < 0.0001$) between LE and HLE. For rural areas there is a mean difference of 8.40 years (95% CI, 8.13-8.67; $t_{205} = 60.99$; $p < 0.0001$) for male elderly, and 9.55 years (95% CI, 9.26-9.84; $t_{270} = 64.16$; $p < 0.0001$) for female elderly. For urban areas there is a mean difference of 6.62 years (95% CI, 6.48-6.76; $t_{204} = 93.35$; $p < 0.0001$) for male elderly and 7.81 years (95% CI, 7.58-8.04; $t_{213} = 67.43$; $p < 0.0001$) for female elderly between LE and HLE. So, male elderly could expect less disabled life in comparison with female in both the areas. These results might be an indication of the positive effect of active participation in every sector of life for male elderly. This may also indicate lack of comparable facilities for the female elderly both in urban and rural areas.

"Figure 3 about here"

Relationship between HLE and AAI

It is observed from Table 3 that the study participants, who have more HLE, also have high mean values of AAI. Thus Pearson's correlation coefficient between AAI and HLE has been measured, assuming age ranges' AAI and HLE are each value by sex and residence, showing very strong positively significant, almost perfect correlation between the variables in both the geographic areas and for both the male and female elderly. The overall correlation between AAI and HLE is 0.979 ($p<0.001$), for rural males the correlation is 0.978 ($p<0.001$), and for rural female is 0.977 ($p<0.001$). The correlation between AAI and HLE for urban males is 0.969 ($p<0.001$), and female is 0.939 ($p<0.001$)). At issue is whether the correlations for males are significantly higher than those are for females in both rural and urban areas. Thus tests of differences between correlations were

done that revealed Z is 0.25 and 0.43 in rural and urban areas respectively, are not significant at the 0.05 level. So, from observing the overall correlation as well as correlation differences, one can conclude that if one wants to lead more disability free years of life, he/she should be more active in every aspect of life or vice-versa.

Discussions

Traditionally and religiously the elderly people of Bangladesh are very much respected both within their family and community. They are considered as the key to family ties and symbols of family identity. They are treated as guardians of ancestral values since time immemorial as well as venerable counselors. For these reasons they are always respected and the younger generations try to take the best care of their elderly relatives in the family. However, due to various socio-economic changes over the years, traditional values and customs are eroding and breaking down traditional joint family living arrangements into nuclear family systems (UNESCO, 1992). Increased landlessness and poverty are assumed to weaken the relationship between elder members and other members of the family (Hassan, 2007) as well. Due to rural poverty many adults move in search of employment to urban areas. Women are also joining the urban work force in increasing numbers and they have less time to take care of elderly family members than they did in the past. It is unclear how long the society will be able to hold the tradition of young family members taking care of the elderly in their family. Thus this paper has tried to introduce self-care (i.e. active aging) by examining the socio-demographic status of the elderly through the dimensions of AAI and the relationship between HLE and AAI as well.

The analysis of 15 indicators of AAI showed that the urban elderly have more income, more education and lead better lives than rural counterparts. At the same time almost all elderly are dissatisfied with their income regardless of whether the financial support comes from the family or other sources. About 93 percent of elderly are found to live with family members but of the family types observed in rural areas, 45.9 percent are nuclear and 54.1 percent are joint families; while in urban areas, 23.4 percent are nuclear and 76.6 percent are joint families. The financial support from the family might be reduced due to declination in family size. Most of the elderly were not found to be active in any clubs or groups. Therefore, the elderly were asked a multiple choice question, "How do you pass leisure time?" The study found that most of the rural elderly pass leisure time by gossiping, caring for children and religious work, while urban elderly pass time by gossiping, caring for children, religious work and reading books or newspapers. In rural areas, almost 99 percent of the male respondents passed their leisure time by gossiping, 88.3 percent caring for children, 68.9 percent with religious work and 3.9 percent with reading a newspaper. Almost 99 percent of the rural female respondents spent their leisure time by gossiping, 87.1 percent taking care of children, 83 percent doing religious activities, and 0.4 percent reading books and or newspapers. In urban areas, 97.6 percent of the male respondents passed their leisure time by gossiping, 93.2 percent caring for children, 89.3 percent with religious work and 54.6 percent with reading books and or newspapers. Almost 96 percent of the urban female respondents spent their leisure time by gossiping, 94.4 percent taking care of children, 92.5 percent doing religious activities, and 9.8 percent reading books and or newspapers. So, most respondents participate in gossiping, whether it

is indeed negative or positive, because in Bangladeshi culture the elderly usually have few responsibilities or obligations except taking care of grandchildren. The elderly often hand over their business or properties to their children. This culture should be changed to encourage active aging in every aspect of life. Daily activities can be successfully performed by 97.3 percent of respondents and this also could motivate them to remain active in every sector of daily life. Male elderly are also found to be more active than the female elderly. Our study supports studies by Barford and others (2006), "Life expectancy: women now on top everywhere", which found that even in the poorest countries, women can expect to outlive men. We found increased levels of disability with advancing age as well as clear gender differences in Bangladesh which showed that while females outlive males, they are more likely to live a greater part of their remaining life in disability. Still, the very strong positive correlation between AAI and HLE could be a turning point for female elderly as well as for all elderly to be more active for an improved quality of life.

This study is cross-sectional and no direct conclusions can be drawn regarding time trends in healthy life expectancy. The analysis also has a few limitations. First, only the 15 indicators suggested by the Active Aging Taskforce of the Western Australian Government (Active Aging Taskforce, 2003) under three pillars have been utilized for constructing the AAI, following the parameters established by Thanakwang and Soonthorndhada (2006). Since the study is based on the WHO concept, more indicators such as no intoxication habit, or coping style might have been included to construct AAI. Further analysis is also needed to better understand the pathways that explain how these broad aging and lifestyle determinants actually affect health and wellbeing. Second, this study utilized the Preston

and Bennett (1983) estimation method for a post-childhood life table where we assumed $l_{85+} = ({}_5L_{80} + {}_{15}L_{85})/20$ i.e. the maximum year as 100 years for ${}_{15}L_{85}$ to compute age- and sex-specific life tables since we did not have any persons in 100+ years of age for 2005 and 2010. Usually the Sullivan (1971) method is used with same period mortality, but this data is unavailable for the study area, i.e. for Bangladesh. The Preston and Bennett (1983) method is innovative and yielded estimates which are not as sensitive to certain types of age-misreporting, particularly heaping (UN, 1983).

Conclusions

Though Bangladesh will face population aging after 2025, it is much more notable that this elderly population suffers challenges in respect to health and socio-economic issues. The primary objective of this study was to examine the relationships between increased life expectancy and healthy life expectancy in Bangladesh by examining the relationships between AAI and HLE.

People with more education and/or higher incomes live longer and experience fewer adverse health events (Crimmins & Saito, 2001). Our study also showed that urban as well as male elderly are more educated, active in all aspects of life and have longer HLE. These findings indicate that steps should be taken to provide life long learning as well as pragmatic education with motivation to be active in every aspect of life. The opportunity for positive community participation as well as health and security should also be ensured in later life. Urban amenities should be provided to the rural areas such as parks and recreational facilities. Strengthening family support systems through advocacy and

counseling could encourage the responsibility of family members towards elderly members. Many elderly can take care of themselves if physical exercise and income sources are available. These opportunities should be promoted through mass media (i.e. Newspaper, Television, Radio etc.) in a comprehensible manner. Indeed, physical activity plays a central role in the prevention and management of chronic disease (Cyarto, Moorhead, & Brown, 2004) and physical inactivity is identified as a leading cause of disability among older adults (Buchner, 1997).

We should bear in mind that the future health of the elderly will be influenced by a range of factors, so it cannot be assumed that healthy life expectancy will remain at current levels. Yong and Saito (2009) concluded that improvements in medical technologies could contribute to longer Japanese healthy life expectancy in the future. Since the Alma Alta Declaration in 1978, Bangladesh has made important gains in providing primary health care. All health indicators show steady gain, and the health status of the population has improved (WHO, 2010). As a result, Bangladeshi healthy life expectancy could be increased. At the same time, positive correlations between AAI and HLE suggest that the elderly could enjoy more HLE involving them in all dimensions of AAI. Thus the active aging concept should be properly introduced to the elderly as well as to all people to change their life style to enjoy more disability free years in later life. Finally, more research on this emerging issue should be done with close monitoring and this information needs to be scientifically utilized in developing suitable programs to address the needs of poor elderly residents of the Rajshahi district as well as for all the elderly people of Bangladesh and developing countries.

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Table 1: Elderly characteristics by percent of respondents

Variables	Rural		Urban		Overall
	Male	Female	Male	Female	
Age Groups					
60-64	35.0	36.9	36.1	38.3	36.6
65-69	21.4	21.4	21.0	21.5	21.3
70-74	24.8	23.6	19.5	17.8	21.5
75-79	4.9	4.4	8.8	10.3	6.9
80-84	5.3	6.6	4.9	5.6	5.7
85+	8.7	7.0	9.8	6.5	7.9
Average Age*	69.02	67.68	68.96	68.07	68.37
Religion					
Islam	97.1	96.7	97.6	96.3	96.9
Hindu	2.9	3.3	0.5	1.9	2.2
Others	-	-	2.0	1.9	0.9
Educational Level					
No Education	63.6	93.0	18.0	50.9	59.0
Primary	17.5	5.2	15.6	31.8	16.7
Secondary and Above	18.9	1.8	66.3	17.3	24.2
Marital Status					
Married	89.8	31.4	89.8	37.9	59.7
Others	10.2	68.6	10.2	62.1	40.3
Types of Family					
Nuclear	54.4	39.5	26.8	20.1	35.4
Joint	45.6	60.5	73.2	79.9	64.6

Notes: * indicates average age is calculated for the total population by sex and residence; 45.9 and 54.1 percent elderly are male and female respectively.

Table 2: Elderly responses to indicators in the active aging index by dimension types

Dimensions	No.	Indicators	Description	Measurements	Percentage				
					Rural		Urban		Overall
					Male	Female	Male	Female	
Health Index	1	Self-assessed health status	Self-assessed health status is an individual's own assessment of his or her health	5 = very good	-	-	1.0	0.5	0.3
				4 = good	8.7	3.7	16.1	5.6	8.1
				3 = Fair	31.6	25.8	41.0	36.0	33.0
				2 = poor	35.0	48.0	30.7	48.1	41.1
				1 = very poor	24.8	22.5	11.2	9.8	17.4
	2	Psychological well-being	The perception of sense of mental wellness in term of self-esteem	3 = high	91.3	80.8	89.3	81.8	85.4
				2 = moderate	6.8	18.5	10.2	16.8	13.5
				1 = low	1.0	0.7	0.5	1.4	0.9
				0 = no	1.0	-	-	-	0.2
	3	Disabilities	The number of handicaps such as paralysis, blindness and deafness	1 = no	95.6	95.2	95.6	95.8	95.5
				0 = 1 or more	4.4	4.8	4.4	4.2	4.5
	4	Activity of daily living (ADL) limitations	ADL limitations consider inability in performing usual daily activities like eating, dressing, bathing etc.	1 = no	97.1	98.5	96.1	97.2	97.3
				0 = 1 or more	2.9	1.5	3.9	2.8	2.7
	5	Functional limitations	Physical limitation, such as squatting, lifting up object weighing 5 kg, walking about 1 km, and climbing stairs (2-3 steps)	1 = no	74.3	62.0	55.6	36.9	57.4
				0 = 1 or more	25.7	38.0	44.4	63.1	42.6
	6	Exercise behavior	Having performed any exercise during last 6 months prior to the interview	1 = yes	63.6	55.0	72.7	43.9	58.4
				0 = no	36.4	45.0	27.3	56.1	41.6
Community Participation Index	1	Participation in work force	Still participates in paid and unpaid work	1 = yes	69.9	77.5	42.0	56.1	62.5
				0 = no	30.1	22.5	58.0	43.9	37.5

Table 2: Elderly responses to indicators in the active aging index by dimension types

Community Participation Index	2	Interaction with family members	The elderly's support to family members, e.g. food supply, house keeping and child care	1 = 1 or more	96.6	97.8	95.1	94.9	96.2
				0 = no	3.4	2.2	4.9	5.1	3.8
	3	Participation in clubs/groups	The elderly takes part in activity proposed by various groups, i.e. elderly group, funeral group, vocational group, house wife group, cooperatives group, and volunteer scout group	1 = 1 or more	-	-	9.3	0.5	2.2
				0 = no	100	100	90.7	99.5	97.8
Security Index	1	Income*	The income is categorized just to show the percentage, not for constructing AAI	4 = 3001+	13.6	0.7	59.0	15.4	20.5
				3 = 501 – 3000	61.7	12.5	22.4	22.9	28.6
				2 = 100 – 500	1.0	8.9	-	0.9	3.9
				1 = 0	23.8	77.9	18.5	60.7	47.0
	2	Sufficiency of income	The self-assessment by the older persons on whether his/her income is sufficient for a living	2 = sufficient	1.0	0.4	23.4	11.4	8.4
				1 = not sufficient	75.2	21.7	58.0	27.9	44.6
				0 = no income	23.8	77.9	18.5	60.7	47.0
	3	Sources of income	The number of sources of income that the elderly receives, i.e. work, pension, government living allowance, saving/interest, spouse, children, relatives, or others	2 = 2 or more	16.0	7.7	33.2	18.7	18.1
				1 = 1 source	83.5	91.9	66.3	81.3	81.6
				0 = no	0.5	0.4	0.5	-	0.3
	4	House ownership	The ownership of the dwelling in which older person is living	1 = yes	85.4	31.4	77.1	35.0	55.1
				0 = no	14.6	68.6	22.9	65.0	44.9
	5	Living arrangement	The co-residence of the elderly with family members or others in their household	1 = with spouse, children or others	97.6	83.8	99.5	93.5	92.9
				0 = living alone	2.4	16.2	0.5	6.5	7.1
	6	Safety facilities	Safety facility denotes to the safe material facilitating in a toilet	1 = yes	73.8	64.9	97.1	96.3	81.8
				0 = no	26.2	35.1	2.9	3.7	18.2

Continued…

Table 2: Elderly responses to indicators in the active aging index by dimension types

Health Index	A composite index constructed from 6 components		3 = high	52.4	35.1	51.7	24.3	40.3
			2= moderate	42.2	60.9	42.4	70.6	54.7
			1 = low	5.3	4.1	5.9	5.1	5.0
Community Participation Index	A composite index constructed from 3 components		3 = high	-	-	4.9	0.5	1.2
			2= moderate	69.4	77.5	41.5	55.6	62.2
			1 = low	30.6	22.5	53.7	43.9	36.6
Security Index	A composite index constructed from 6 components		3 = high	0.5	-	16.1	3.7	4.7
			2= moderate	85.9	25.8	77.6	53.7	58.1
			1 = low	13.6	74.2	6.3	42.5	37.2
Active Aging Index	A composite index constructed from 3 dimensions	The positive or active living of the elderly based on the WHO concept (a combination of health, community participation and security indices)	3 = high	1.0	-	11.7	1.4	3.2
			2= moderate	88.3	78.2	76.6	72.0	78.7
			1 = low	10.7	21.8	11.7	26.6	18.1

Note: * Bangladeshi currency – BDT; For indicator number 6 under security index the respondents were asked whether or not they have sanitary toilets and safe materials such as hand rails, no water on the toilet floor, toilet slippers etc. as well?

Table 3: Mean values of HLE and AAI by sex and residence

Age	HLE (AAI)				
	Rural		Urban		Overall
	Male	Female	Male	Female	
60-	5.88 (0.647)	3.81 (0.580)	8.30 (0.651)	5.58 (0.574)	**5.72 (0.609)**
65-	4.63 (0.628)	2.59 (0.561)	5.10 (0.620)	3.50 (0.554)	**3.85 (0.589)**
70-	3.26 (0.605)	2.15 (0.540)	3.61 (0.589)	3.41 (0.518)	**2.99 (0.562)**
75-	1.29 (0.511)	1.05 (0.496)	1.29 (0.526)	2.22 (0.491)	**1.57 (0.506)**
80-	0.93 (0.508)	0.64 (0.487)	0.41 (0.496)	0.98 (0.434)	**0.74 (0.483)**
85-	0.00 (0.496)	0.99 (0.487)	0.29 (0.481)	0.45 (0.369)	**0.44 (0.464)**

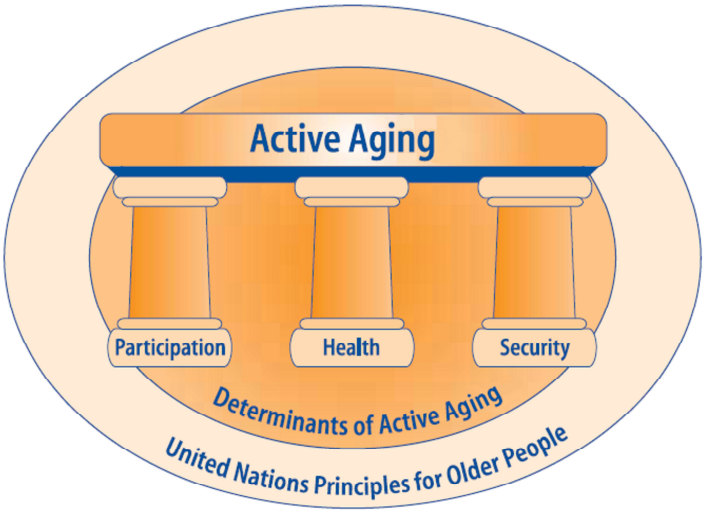

Figure 1: The determinants of active aging according to WHO, 2002: 45

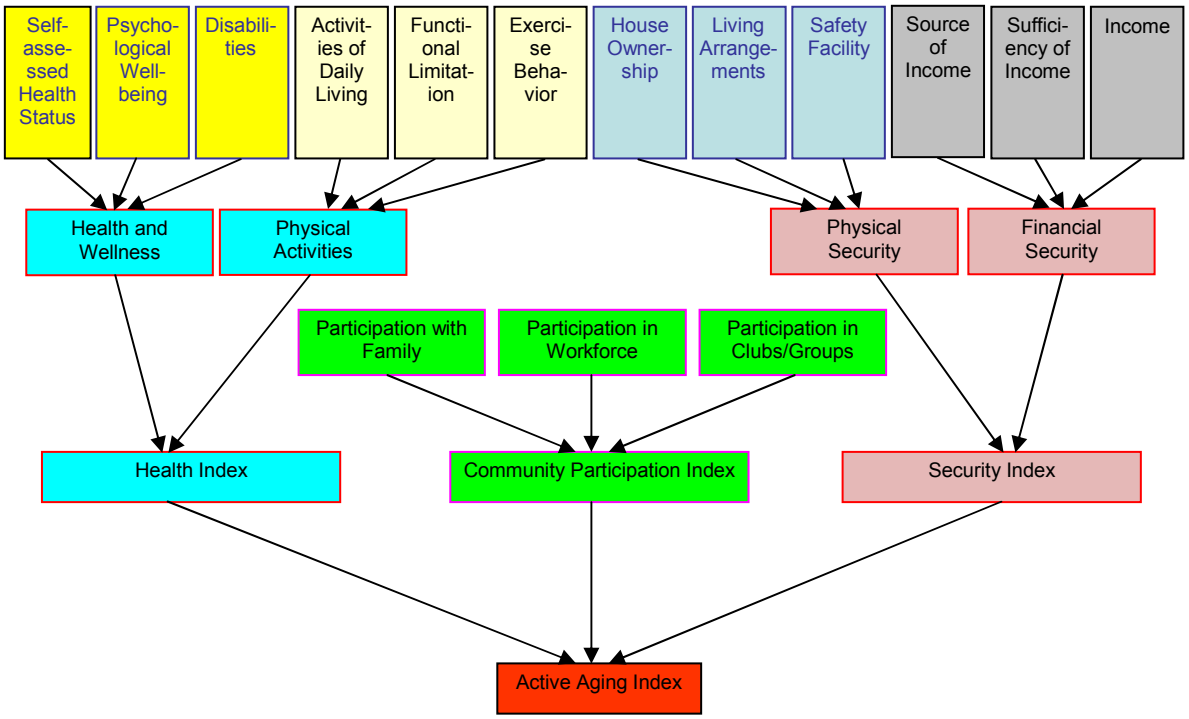

Figure 2: Framework of Active Aging Index

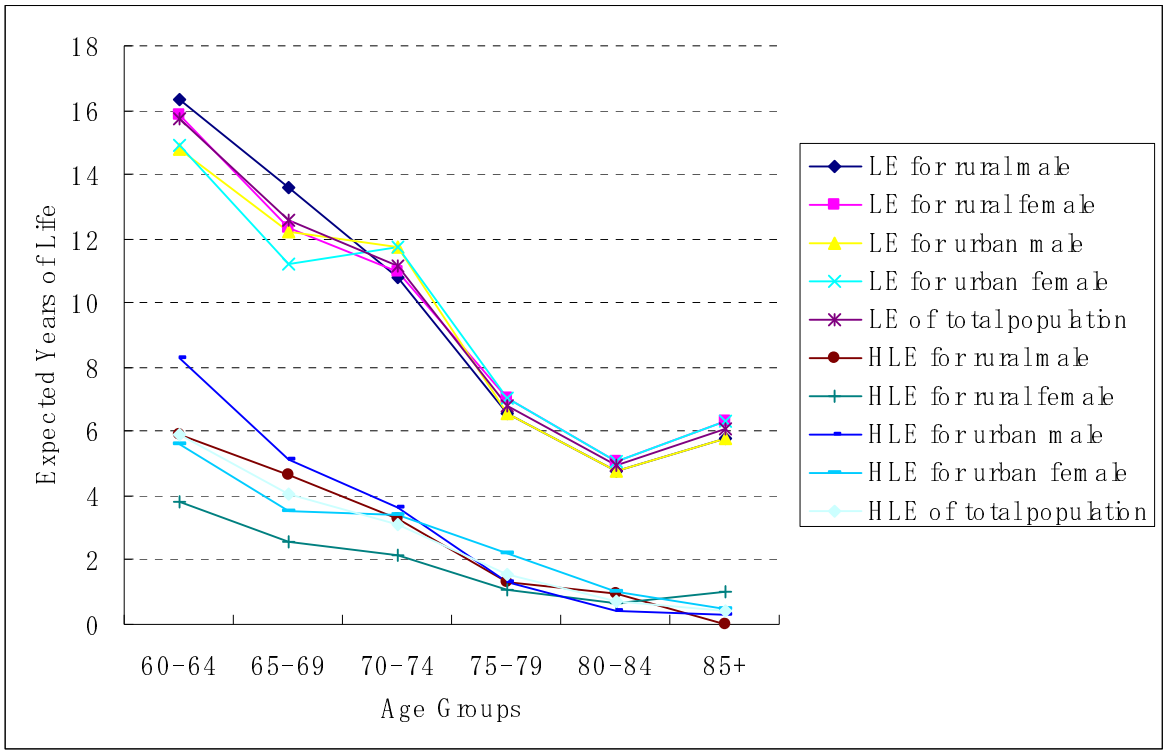

Figure 3: Difference between LE and HLE