Prevalence of healthy aging and factors associated in Thai urban elderly, Bangkok, Thailand

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Received June 2018
Accepted July 2018

Abstract

Purpose - Population aging is a global phenomenon affecting many countries including Thailand. Healthy aging is the key to many challenges that come with population aging. This study aimed to estimate prevalence of healthy aging and identify factors related to healthy aging among Thai urban elderly in Bangkok, Thailand.

Design/methodology/approach - This research was a cross-sectional study. Data collection was done by face-to-face interviews using questionnaires at Lumpini Park, Bangkok. A total of 200 older persons (100 males and 100 females) aged 60 years or over were recruited non-randomly. Descriptive analysis including chi-square test, univariate and multivariate regression analyses were used to analyze the prevalence and associated factors of healthy aging. This study defined healthy aging as having totally independent physical function, normal cognitive function, good mental health status, normal nutritional status, and good quality of life.

Findings - The prevalence of healthy aging was 66.0%. There were no differences in prevalence of healthy aging between males and females. After controlling for other covariates, household income, health awareness, physical activity, and sleep were associated with factors of healthy aging.

Originality/value - About two-thirds of the older persons met the criteria of healthy aging. The findings of this study can be used as provisional data for policy makers to help Thailand overcome challenges that come with aging population.

Keywords Elderly, Healthy aging, Successful aging, Thailand

Paper type Research paper

Introduction

The world that we live in is currently going through a dramatic change particularly in population structure. It is estimated that the number of people who aged 60 or above will be double from the year of 2000 (900 million) to 2050 (2 billion) [1]. This phenomenon is driven by the success of public health policy and improvement of health care system. With better access to health care services and the improvement of the quality of services, we have seen a significant decline in mortality rate, resulting in an increase in life expectancy. These successes together with a lower fertility rate, are the reasons why the world is aging [2]. The aging trend is growing around the globe, not only in developed countries but also in developing and under developing countries and Thailand is also facing with this demographic shift. In 2015, the elderly accounted for 15.6% of total population of Thailand (10.7 million out of 68.7 million population) and the rate is predicted to be increased to 35.0% (22.9 million out of 65.4 million population) in 2050 [3].

With increasing age, there are declines in functional level of the body both physically and mentally which can lead to chronic diseases [2]. Rising numbers of older persons with these diseases would add a burden to families, communities and to the countries especially in low-income countries where they are not ready to handle this growing problem [2]. Nonetheless, a data from the world bank showed that healthy aging population need fewer resources and can reduce cost of medical care [4].

Healthy aging is defined by the world health organization as “The process of developing and maintaining the functional ability that enables well-being in older

age" [1]. One of the most accepted model of healthy aging is Rowe and Kahn's. They suggested that healthy aging consists of three components: low probability of disease and disease-related disability, high physical and cognitive function, and active engagement with life [5]. However, there are many debates on Rowe and Kahn's model over the years. With major concerns suggesting that the concept is too narrow with little role of broad structural factors, some researchers stressed the need to establish a better definition and concept of healthy aging [6-8]. A newer and broader conceptual framework of healthy aging was proposed in 2012 by Bousquet et al. [9] identified three key domains of healthy aging as: (a) physical and cognitive capability across the life course, (b) psychological and social well-being, mental health, and quality of life across the life course, and (c) functioning of underlying physiological systems across the life course, preventing or delaying onset of chronic diseases, frailty, and disability.

Previous studies have been done to find prevalence of healthy aging based on varied definitions and conceptualizations of healthy aging which resulting in a wide range of prevalence from 0.4 to 95.0% [10]. A study from The United States using Rowe and Kahn's model estimated that not more than 11.9% of older persons (aged 65 or over) were healthy agers at four time points: 1998, 2000, 2002, and 2004 [11]. A Malaysian study conducted in 2012 by defining healthy aging as the absence of major diseases including cancer, heart problem, diabetes, stroke, hypertension and chronic lung disease together with good mental health, good cognitive function and quality of life [12], found a prevalence of healthy aging at 13.8%.

Only few studies in Thailand focused on this issue. A study in Rayong province [13] showed that 27.5% of older persons (aged 60 or over) were aging healthily based on three criteria: having good family relationship, high self-esteem, and high happiness. Not only that there is no study in Thailand which based on mainstream conceptualization of healthy aging, but there is also none that study explicitly in the urban part of Thailand. Thus, in order to apprehend health status of Thai urban seniors, this study was conducted to determine the prevalence of healthy aging in Thai urban elderly based on Bouquet et al' model and to identify associated factors of healthy aging.

Materials and methods

Study design and setting

This study is a cross-sectional study conducted between April – May, 2018 at Lumpini park, Bangkok, Thailand. All participants were selected by using quota sampling technique. Face-to-face interviews were conducted by using questionnaires to obtain primary data from participants.

Study sample

The sample consists of Thai elderly aged 60 years or over both males and females who have been living in the urban part of Bangkok for at least 10 years and able to respond to questions asked. Furthermore, the participants who had psychiatric problems that may interfere with the interview were excluded from this study. Sample size calculation was done using Cochran formula with expected conversion rate = 0.138 which came from the result of similar study in Malaysia [12]. Thus, total sample size is 200 which includes 100 males and 100 females.

Dependent variables

Based on Bousquet et al. [9] conceptualization. Healthy aging in this study is defined as a multidimensional concept composed of (a) totally independent physically, (b) normal cognitive function, (c) no depression, (d) normal nutritional status, and (e) good quality of life.

Totally Independent Physically: Participants were tested by The Barthel Index to assess their basic activities of daily living (ADLs). Only when their scores reached 20 points, then they were considered to be totally independent physically [14].

Normal Cognitive Function: Mini-Mental State Examination: Thai Version 2002 (MMSE-Thai 2002) was used to assess participants' cognitive function. They had to pass the cut-points according to their education level to be classified as having normal cognitive function [14].

No Depression: Patient Health Questionnaire-9 (PHQ-9) was used on participants to screen for depressive symptoms. A score less than 7 points indicated that they had no depression [14].

Normal Nutritional Status: Participants with more than 11 points on Mini Nutritional Assessment (MNA) represented the ones with normal nutritional status [14].

Good Quality of Life: Participants' quality of life was evaluated using The World Health Organization Quality of Life Assessment, an Abbreviated Version of WHOQOL-100 Thai Version (WHOQOL-BREF-THAI). Reported scores of more than 60 points were judged to have met the criteria of good quality of life [15].

Participants who met all of five criteria above for healthy aging were categorized as healthy agers. If not, they were considered as normal agers.

Independent variables

Sociodemographic factors (gender, age, marital status, education level, household income, and underlying disease), lifestyles and health behavior factors (hobbies, health awareness, tobacco smoking, alcohol drinking, social participation, positivity and optimism, physical activity, exercise, sleep, and diet) were evaluated as independent variables. A questionnaire of these factors was validated by the experts in geriatrics and the reliability was tested by a pilot study which revealed a Cronbach's alpha at 0.77.

Data analysis

Descriptive analyses (mean, standard deviation, and percentage), Chi-square test, univariate logistic regression, and multivariate logistic regression were used to analyze the collected data.

Ethical consideration

This study was approved by the Ethical Review Committee for Research Involving Human Research Subjects, Health Science Group, Chulalongkorn University, Bangkok, Thailand on 17 April 2018 with COA NO. 091/2018.

Results

Sample characteristics

A total of 200 participants joined this study with 100 male and 100 female older persons. There were significant differences of socio-demographic characteristics among male and female older persons in marital status and education level. As more male seniors were married, whereas more females were widowed. Furthermore, male older persons had higher education level than female older persons (Table 1).

As for lifestyles and health behaviors, there were significant differences between male and female gender in hobbies, tobacco smoking, alcohol drinking, social participation, sleeping troubles and proper diet intake (Table 2).

Prevalence of healthy aging

The prevalence of healthy aging as defined in this study was calculated at 66.0% among Thai urban elderly, there were no significant differences among male and

Table 1. Socio-demographic characteristics of participants by gender with Chi-square test (n=200)

Socio-demographic characteristics	Male n (%)	Female n (%)	Total n (%)	χ^2	*p*-value
Gender	100 (50)	100 (50)	200 (100)		
Age (years)				5.11	0.078
60 - 69	37 (18.5)	51 (25.5)	88 (44)		
70 - 79	41 (20.5)	27 (13.5)	68 (34)		
≥ 80	22 (11)	22 (11)	44 (22)		
mean ± SD (min, max)	72.33 ± 7.99 (60, 92)				
Marital status**				23.43	<0.001
Single	8 (4)	20 (10)	28 (14)		
Married	67 (33.5)	33 (16.5)	100 (50)		
Divorced/separated/widowed	25 (12.5)	47 (23.5)	72 (36)		
Education level*				8.89	0.012
Elementary school or lower	46 (23)	59 (29.5)	105 (52.5)		
Middle school or high school	21 (10.5)	26 (13)	47 (23.5)		
Bachelor degree or higher	33 (16.5)	15 (7.5)	48 (24)		
Household income (baht/month)				5.87	0.118
< 30,000	30 (15)	44 (22)	74 (37)		
30,001 - 50,000	23 (11.5)	21 (10.5)	44 (22)		
50,001 - 100,000	29 (14.5)	17 (8.5)	46 (23)		
> 100,000	18 (9)	18 (9)	36 (18)		
Have underlying disease				0.03	0.874
Yes	72 (36)	73 (36.5)	145 (72.5)		
No	28 (14)	27 (13.5)	55 (27.5)		

Note: *Significant difference with *p*-value < 0.05; **Significant difference with *p*-value < 0.01

Table 2. Lifestyles and health behaviors of participants by gender with Chi-square test (n=200)

Lifestyles/health behaviors	Male n (%)	Female n (%)	Total n (%)	χ^2	*p*-value
Hobbies**				24.09	<0.001
Exercise	36 (18)	44 (22)	80 (40)		
Watching television	19 (9.5)	10 (5)	29 (14.5)		
Reading	15 (7.5)	7 (3.5)	22 (11)		
Doing housework	3 (1.5)	17 (8.5)	20 (10)		
Gardening	10 (5)	1 (0.5)	11 (5.5)		
Others	17 (8.5)	21 (10.5)	38 (19)		
Health awareness				0.80	0.370
No	37 (18.5)	31 (15.5)	68 (34)		
Yes	63 (31.5)	69 (34.5)	132 (66)		
Tobacco smoking**				72.34	<0.001
Never	45 (22.5)	99 (49.5)	144 (72)		
Yes	42 (21)	1 (0.5)	43 (21.5)		
Have quit	13 (6.5)	0 (0)	13 (6.5)		
Alcohol drinking**				89.86	<0.001
Never	38 (19)	100 (50)	138 (69)		
Yes	47 (23.5)	0 (0)	47 (23.5)		
Have quit	15 (7.5)	0 (0)	15 (7.5)		
Social participation**				13.03	<0.001
Inactive	45 (22.5)	21 (10.5)	66 (33)		
Active	55 (27.5)	79 (39.5)	134 (67)		
Positivity and optimism				1.30	0.254
No	60 (30)	52 (26)	112 (56)		
Yes	40 (20)	48 (24)	88 (44)		

(continued)

Table 2. (continued)

Lifestyles/health behaviors	Male n (%)	Female n (%)	Total n (%)	χ^2	*p*-value
Physical activity				1.50	0.220
Inactive	24 (12)	17 (8.5)	41 (20.5)		
Active	76 (38)	83 (41.5)	159 (79.5)		
Exercise				6.42	0.093
None	14 (7)	12 (6)	26 (13)		
Less than 2-3 times/week	27 (13.5)	16 (8)	43 (21.5)		
More than 2-3 times/week	40 (20)	57 (28.5)	97 (48.5)		
Everyday	19 (9.5)	15 (7.5)	34 (17)		
Sleeping troubles*				4.50	0.034
No	58 (29)	43 (21.5)	101 (50.5)		
Yes	42 (21)	57 (28.5)	99 (49.5)		
Proper diet intake*				5.85	0.016
No	24 (12)	11 (5.5)	35 (17.5)		
Yes	76 (38)	89 (44.5)	165 (82.5)		

Note: *Significant difference with *p*-value < 0.05; **Significant difference with *p*-value < 0.01

Table 3. Numbers and percentage of older persons meeting healthy aging criteria by gender with Chi-square test (n=200)

Criteria	Male n (%)	Female n (%)	Total n (%)	χ^2	*p*-value
Good physical capability	96 (48)	95 (47.5)	191 (95.5)	0.12	0.733
Normal cognitive function	97 (48.5)	96 (48)	193 (96.5)	0.15	0.700
No depression	88 (44)	87 (43.5)	175 (87.5)	0.05	0.831
Normal nutritional status	89 (44.5)	90 (45)	179 (89.5)	0.05	0.818
Good quality of life*	70 (35)	84 (42)	154 (77))	5.54	0.019
Healthy aging	**64 (32)**	**68 (34)**	**132 (66)**	**0.36**	**0.550**

Note: *Significant difference with *p*-value < 0.05

female gender. However, for the criteria of quality of life, female older persons had significantly better quality of life than their male counterparts (Table 3).

Associated factors of healthy aging

From univariate logistic regression analyses, education level, household income, and underlying disease are socio-demographic factors which were significantly associated with healthy aging. Older persons with bachelor degree or higher, the ones who earned more than 100,000 baht/month, and the elderly who had no underlying disease were more likely to be healthy agers (Table 4).

As for lifestyle and health behavior factors, all of them were related to healthy aging except for tobacco smoking. In other words, the seniors who had exercise as their hobbies, had health awareness, had never drunk alcohol, had active social participation, had positivity and optimism, had active physical activity, exercised more than 2-3 times/week, had no sleeping troubles, and had proper diet intake were significantly more probable to be healthy agers (Table 5).

All factors with a *p*-value < 0.20 in the initial univariate logistic regression were forwarded for subsequent multivariate logistic regression analyses. The final model of multivariate logistic regression analyses revealed that after adjusting for other covariates, household income, health awareness, physical activity, and sleep were positively and significantly associated with healthy aging (Table 6).

Table 4. Univariate logistic regression analyses of socio-demographic characteristics of healthy aging among Thai urban elderly

Characteristics	Healthy aging n (%)	Unadjusted OR	95% CI	*p*-value
Gender				
Male	64 (64)	1		
Female	68 (68)	1.20	0.67 - 2.15	0.551
Age (years)				
60 - 69	59 (67)	1		
70 - 79	48 (70.6)	1.18	0.59 - 2.34	0.637
80 - 89	23 (57.5)	0.67	0.31 - 1.43	0.298
≥ 90	2 (50)	0.49	0.07 - 3.67	0.489
Marital status				
Single	16 (57.1)	1		
Married	75 (75)	2.25	0.94 - 5.40	0.069
Divorced/separated/widowed	41 (56.9)	0.99	0.41 - 2.40	0.986
Education level				
Elementary school or lower	61 (58.1)	1		
Middle school or high school	34 (72.3)	1.89	0.89 - 3.98	0.096
Bachelor degree or higher*	37 (77.1)	2.43	1.12 - 5.28	0.025
Household income (baht/month)				
< 30,000	37 (50)	1		
30,001 - 50,000*	32 (72.7)	2.67	1.19 - 5.96	0.017
50,001 - 100,000*	34 (73.9)	2.83	1.27 - 6.31	0.011
> 100,000**	29 (80.6)	4.14	1.61 - 10.64	0.003
Have underlying disease*				
No	43 (78.2)	1		
Yes	89 (61.4)	0.44	0.22 - 0.91	0.027

Note: *Significant difference with *p*-value < 0.05; **Significant difference with *p*-value < 0.01

Table 5. Univariate logistic regression analyses of lifestyles and health behaviors of healthy aging among Thai urban elderly

Lifestyles/health behaviors	Healthy aging n (%)	Unadjusted OR	95% CI	*p*-value
Hobbies				
Exercise	61 (76.3)	1		
Watching television*	16 (55.2)	0.38	0.16 - 0.94	0.036
Reading	15 (68.2)	0.67	0.24 - 1.88	0.444
Doing housework*	10 (50)	0.31	0.11 - 0.86	0.025
Gardening	8 (72.7)	0.83	0.20 - 3.45	0.798
Others*	22 (57.9)	0.43	0.19 - 0.98	0.044
Health awareness**				
No	25 (36.8)	1		
Yes	107 (81.1)	7.36	3.81 - 14.21	<0.001
Tobacco smoking				
Never	101 (70.1)	1		
Yes	24 (55.8)	0.54	0.27 - 1.08	0.082
Have quit	7 (53.8)	0.50	0.16 - 1.57	0.232
Alcohol drinking				
Never	98 (71)	1		
Yes	29 (61.7)	0.66	0.33 - 1.32	0.236
Have quit**	5 (33.3)	0.20	0.07 - 0.64	0.006
Social participation**				
Inactive	28 (42.4)	1		
Active	104 (77.6)	4.71	2.49 - 8.88	<0.001

(continued)

Table 5. (continued)

Lifestyles/health behaviors	Healthy aging n (%)	Unadjusted OR	95% CI	*p*-value
Positivity and optimism**				
No	60 (53.6)	1		
Yes	72 (81.8)	3.9	2.02 - 7.52	<0.001
Physical activity**				
Inactive	11 (26.8)	1		
Active	121 (76.1)	8.68	3.98 - 18.97	<0.001
Exercise				
None	10 (38.5)	1		
≤ 2-3 times/week	18 (41.9)	1.15	0.43 - 3.12	0.781
≥ 2-3 times/week**	79 (81.4)	7.02	2.74 - 18.00	<0.001
Everyday**	25 (73.5)	4.44	1.48 - 13.32	0.008
Sleeping troubles**				
No	81 (80.2)	1		
Yes	51 (51.5)	0.26	0.14 - 0.49	<0.001
Proper diet intake*				
No	17 (48.6)	1		
Yes	115 (69.7)	2.44	1.16 - 5.11	0.019

Note: *Significant difference with *p*-value < 0.05; **Significant difference with *p*-value < 0.01

Table 6. Final multivariate logistic regression model of socio-demographic characteristics, lifestyles and health behaviors of healthy aging among Thai urban elderly

Characteristics/lifestyles/health behaviors	Adjusted OR	95% CI	*p*-value
Household income (baht/month)			
< 30,000	1		
30,001 - 50,000*	3.75	1.32 - 10.65	0.013
50,001 - 100,000*	3.5	1.15 - 10.63	0.027
> 100,000*	4.01	1.29 - 12.52	0.017
Health awareness**			
No	1		
Yes	10.04	4.40 - 22.90	<0.001
Physical activity**			
Inactive	1		
Active	9.11	3.45 - 24.09	<0.001
Sleeping troubles**			
No	1		
Yes	0.29	0.13 - 0.64	0.002

Note: *Significant difference with *p*-value < 0.05; **Significant difference with *p*-value < 0.01

Discussion

The data of socio-demographic characteristics shows that the majority of participants were the ones who aged between 60 – 69 years old, married, finished elementary school or lower, had less than 30,000 baht/month, and had underlying diseases. This demographic data is consistent with population projections of Thailand and also from the 2014 survey of the older persons in Thailand [3, 16].

This study was conducted to determine the prevalence of healthy aging based on Bousquet et al. [9] conceptualization, and examined the association of socio-demographic characteristics, lifestyles and health behavior factors in healthy aging among Thai urban elderly in Bangkok, Thailand. The prevalence of healthy aging was calculated at 66.0% in this study. It is not easy to compare this result with previous studies since the definitions of healthy aging were defined differently in each

research which resulting in a broad range of prevalence from 0.4-95.0% in previous literatures [10]. A Malaysian study conducted in 2012 by defining healthy aging as the absence of major diseases including cancer, heart problem, diabetes, stroke, hypertension and chronic lung disease together with good mental health, cognitive function and quality of life, found a prevalence of healthy aging at 13.8% [12]. Another study was done in Shanghai, China in 2006 to find prevalence of healthy aging defined as having normal cognitive function, life satisfaction and good quality of life. This study revealed a prevalence of healthy aging at 46.2% among people aged 65 years or over [17]. A population-based study [18] was conducted in Canada to find prevalence of successful aging in 2014. They defined successful aging in the study following Rowe and Kahn's model as absence of major diseases, high cognitive and physical functioning and active engagement with life. The result showed that 42.0% of Canadian adults aged 60 years or over met the criteria for successful aging [18]. The prevalence of healthy aging at 66.0% in this study is higher than previous literatures and these are four reasons why. Firstly, the conceptualization used in this study is very much different from models used in previous studies, it is broader and less rigid. Secondly, except for Chinese study, the rest of the previous researches used secondary data from national surveys to analyze the results. On the other hand, this study was conducted at only one venue that is Lumpini recreational park. Thus, the population in this study might be healthier than general population. Thirdly, difference in time period can also be a crucial factor in prevalence of healthy aging as demographic patterns, disease profiles, health care systems, access to health care, education on health and many other factors related to health can change over time. Finally, diverse structure of demographic factors in each country may impact prevalence of healthy aging.

From multivariate logistic regression analyses after adjusting for other covariates, the final model revealed that household income was significantly related to healthy aging positively, in accordance with many other pervious researches [11, 12, 19, 20]. This emphasizes the importance of economic factor towards health status of individuals as the elderly who were more well-off would have a better chance to be healthy agers. Having underlying diseases had negative influence on healthy aging which is consistent with previous study [21]. The result reflects that with less diseases, older persons would have more chance to be healthy agers. Health awareness was also found to be positively associated with healthy aging. This study is among the first ones to emphasize the positive effect of health awareness (having regular health check-ups) on healthy aging and is one of the uniqueness of this study. It is proof that health check-up plays an important role towards health even in the elderly. Moreover, active physical activity was positively related to healthy aging. It highlights the results from many of previous studies that emphasized the benefit of physical activity [18, 22-25]. Active physical activity is a positive factor since being active could reduce risks toward diseases such as obesity and cardiovascular diseases [22]. Finally, older persons who had no sleeping troubles had significantly higher chance to be healthy agers. This finding is supported by previous literatures [17, 22, 26]. Sleep is proven to be a vital factor towards health. Repairs of organs occurred when we sleep, an adequate sleep leads to a better memory, immune system, skin and so on. In other words, sleep is what keeps you healthy [22].

Conclusion

This study found that the prevalence of healthy aging among Thai urban elderly in Bangkok, Thailand was at 66.0% based on five criteria: (1) totally independent physically, (2) normal cognitive function, (3) no depression, (4) normal nutritional status, and (5) good quality of life. After adjusting for all other variables, household

income, health awareness, physical activity and sleep were significantly associated with healthy aging. Making use of a broad conceptualization of healthy aging, using primary data and utilizing standardized tests to assess for healthy aging are the strong components of this research. However, there are also several limitations. There is no universal tool to assess healthy aging which in turn makes it extremely difficult to compare the prevalence of healthy aging and factors associated among different studies. This emphasizes a great need for a standard conceptualization of healthy aging. Moreover, this study was conducted at Lumpini Park which served as a purposive area and participants were recruited by quota sampling technique. These elements may lead to selection bias, since the elderly who come to this area might be healthier than general older persons.

Finally, the findings of this study can be used as provisional data for policy makers to further develop Thailand into a healthy-aging society by implementing health promotion program focusing on the associated factors. Further studies about prevalence of healthy aging in Thailand should be done at a household level with multi-stage sampling technique using primary data collected by healthcare professionals and may include more factors within Thai context such as living arrangement or spiritual belief.

Acknowledgements

This study was supported by Chulalongkorn University Graduate School Thesis Grant.

References

1. World Health Organization [WHO]. World report on ageing and health. Geneva: WHO; 2015. [cited 2018 June]. Available from: http://apps.who.int/iris/bitstream/10665/186463/1/9789240694811_eng.pdf?ua=1
2. World Health Organization [WHO]. Global health and aging. [cited 2018 June]. Available from: http://www.who.int/entity/ageing/publications/global_health.pdf?ua=1
3. United Nations [UN]. World population prospects: the 2017 revision. [cited 2018 June]. Available from: https://www.un.org/development/desa/publications/world-population-prospects-the-2017-revision.html
4. Lee R, Mason A, Cotlear D. Some economic consequences of global aging: A Discussion note for the world bank. Washington, DC: World Bank; 2010.
5. Rowe JW, Kahn RL. Successful aging. Gerontologist. 1997 Aug; 37(4): 433-40. doi: 10.1093/geront/37.4.433
6. Holstein MB, Minkler M. Self, society, and the "New Gerontology". Gerontologist. 2003; 43(6): 787-96. doi: 10.1093/geront/43.6.787
7. Glass TA. Assessing the success of successful aging. Ann Intern Med. 2003 Sep; 139(5 Pt 1): 382-3.
8. Scheidt RJ, Humpherys DR, Yorgason JB. Successful aging: What's not to like? J Appl Gerontol. 1999 Sep; 18(3): 277-82. doi: 10.1177/073346489901800301
9. Bousquet J, Kuh D, Bewick M, Standberg T, Farrell J, Pengelly R, et al. Operational definition of Active and Healthy Ageing (AHA): A conceptual framework. J Nutr Health Aging. 2015 Nov; 19(9): 955-60. doi: 10.1007/s12603-015-0589-6
10. Depp CA, Jeste DV. Definitions and predictors of successful aging: a comprehensive review of larger quantitative studies. Am J Geriatr Psychiatry. 2006 Jan; 14(1): 6-20. doi: 10.1097/01.JGP.0000192501.03069.bc
11. McLaughlin SJ, Connell CM, Heeringa SG, Li LW, Roberts JS. Successful aging in the United States: prevalence estimates from a national sample of older adults. J Gerontol B Psychol Sci Soc Sci. 2010 Mar; 65B(2): 216-26. doi: 10.1093/geronb/gbp101
12. Hamid TA, Momtaz YA, Ibrahim R. Predictors and prevalence of successful aging among older Malaysians. Gerontology. 2012; 58(4): 366-70. doi: 10.1159/000334671
13. Nanthamongkolchai S, Tuntichaivanit C, Munsawaengsub C, Charupoonphol P. Successful ageing: A case study of Rayong province, Thailand. Asia Journal of Public Health. 2011; 2(1): 35-9.

14. Thailand, Ministry of Public Health, Department of Health. Manual of geriatric screening tools. Bangkok: Department of Health; 2014.
15. Silva PAB, Soares SM, Santos JFG, Silva LB. Cut-off point for WHOQOL-bref as a measure of quality of life of older adults. Revista De Saude Publica. 2014 Jun; 48(3): 390-7. doi: 10.1590/S0034-8910.2014048004912
16. Thailand, National Statistical Office. The 2014 survey of the older persons in Thailand. Bangkok: Ministry of Information and Communication Technology; 2014.
17. Li C, Wu W, Jin H, Zhang X, Xue H, He Y, et al. Successful aging in Shanghai, China: definition, distribution and related factors. Int Psychogeriatr. 2006 Sep; 18(3): 551-63. doi: 10.1017/S1041610205002966
18. Meng X, D'Arcy C. Successful aging in Canada: prevalence and predictors from a population-based sample of older adults. Gerontology. 2014; 60(1): 65-72. doi: 10.1159/000354538
19. Wu M, Yang Y, Zhang D, Sun Y, Xie H, Zhang J, et al. Prevalence and related factors of successful aging among Chinese rural elders living in nursing homes. Eur J Ageing. 2017 Dec; 14(4): 419-28. doi: 10.1007/s10433-017-0423-6
20. White CM, St John PD, Cheverie MR, Iraniparast M, Tyas SL. The role of income and occupation in the association of education with healthy aging: results from a population-based, prospective cohort study. BMC Public Health. 2015 Nov; 15: 1181. doi: 10.1186/s12889-015-2504-9
21. Kim SH, Park S. A Meta-Analysis of the Correlates of Successful Aging in Older Adults. Res Aging. 2017 Jun; 39(5): 657-77. doi: 10.1177/0164027516656040
22. Neeser KJ, Somrongthong R. The key to health and longevity. Bangkok: College of Public Health Science, Chulalongkorn University; 2017.
23. Viña J, Rodriguez-Mañas L, Salvador-Pascual A, Tarazona-Santabalbina FJ, Gomez-Cabrera MC. Exercise: the lifelong supplement for healthy ageing and slowing down the onset of frailty. J Physiol. 2016 Apr; 594(8): 1989-99. doi: 10.1113/JP270536
24. Pines A. Lifestyle and healthy aging. Gynecol Endocrinol. 2014 Sep; 30(9): 609-11. doi: 10.3109/09513590.2014.945905
25. Sowa A, Tobiasz-Adamczyk B, Topor-Madry R, Poscia A, la Milia DI. Predictors of healthy ageing: public health policy targets. BMC Health Serv Res. 2016 Sep; 16(Suppl 5): 289. doi: 10.1186/s12913-016-1520-5
26. Shi WH, Zhang HY, Zhang J, Lyu YB, Brasher MS, Yin ZX, et al. The status and associated factors of successful aging among older adults residing in longevity areas in China. Biomed Environ Sci. 2016 May; 29(5): 347-55. doi: 10.3967/bes2016.045

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