

ORIGINAL ARTICLE

RISK FACTORS AND CHANGES IN SUCCESSFUL AGING AMONG OLDER INDIVIDUALS IN INDONESIA

*Laila Ulfa¹ and Ratu Ayu Dewi Sartika¹¹Department of Public Health Nutrition, Faculty of Public Health, Universitas Indonesia, Depok, 16424, Jawa Barat, Indonesia.

*Correspondence author: Laila Ulfa

Email: ulfanns@gmail.com

ABSTRACT

Successful aging is a universal goal, but it is a challenge owing to declining physical, psychological, and social conditions that occur with increasing age. The aim of this study was to analyze risk factors and changes in successful aging among older individuals (≥ 60) in Indonesia. This longitudinal study (2000 to 2014) used data from the Indonesia Life Survey (IFLS). Successful aging was defined with physical, mental and social health based on the available questionnaire. The univariate analysis and chi-square test was used in this study. Of the 801 individuals followed up, 588 (93.2%) were found to have unsuccessful aging and 43 (6.8%) older person showed a change from unsuccessful to successful aging. The proportion of older persons mental and social unhealthy were higher than physical. Factors significantly relating to unsuccessful aging included female sex ($p < 0.001$), living in rural areas ($p < 0.05$) or movement from rural to urban areas ($p < 0.05$), unemployed ($p < 0.001$), movement from employed to unemployed ($p < 0.001$), unmarried ($p < 0.001$) and underweight ($p < 0.05$). Older individuals who are not categorized as successful aging at the age of ≥ 60 years can still change for better success in aging at ≥ 74 years of age. Maintaining mental and social health of older individuals can be achieved through their empowerment by providing opportunities for social activity and work productivity in the community.

Keywords: Older individual, Successful aging, Changes in aging, Physical, Mental, and Social Health.

INTRODUCTION

Advances in public health and health care, have increased life expectancy, which consequently rapidly increases the proportion of older person population increases rapidly¹. The proportion of individuals around the globe over the age of 65 years is currently 10% and is expected to increase by 22% by 2050². Indonesia has the fifth largest elderly population in the world. Based on the Indonesian population census in 2010, there are 18.1 million individuals aged over 65 years, representing 7.6% of the total population of Indonesia. In 2014, the number of older individuals in Indonesia increased to 18.781 million and is estimated to reach 36 million in 2025³, suggesting that Indonesia has entered a period called the aging population.

Increase in the population of older individuals can raise the burden of dependence on families, communities, and government. Amount of dependency burden is assessed with the dependency ratio of older individuals in Indonesia. To reduce the dependency ratio, older individuals need to be physically, mentally and socially healthy, i.e., undergo successful aging. The concept of successful aging was introduced by Rowe and Khan. (1997) who outlined it with three components: 1) avoidance of disease and risk factors for disease; 2) preserved physical and cognitive function; and 3) physically active life. This concept has been used by previous researchers⁴⁻⁷. Other studies have

also employed other term such as terms such as physically healthy, emotionally healthy, life engagement and life satisfaction⁸, physical, mental and social health⁹, self-esteem, self-efficacy interpersonal relationships, and self-achievement¹⁰.

Successful aging is a universal goal, but it is a challenge owing to declining physical, psychological, and social conditions that occur with increasing age. To age successfully, physical, mental, and social health must be maintained. Unfortunately, the prevalence of unsuccessful aging is more often found with increasing age^{8,9,11}. Although many studies⁴⁻⁹, are available regarding successful aging, changes in successful aging are difficult to obtain. This study aimed to analyze risk factors and changes in successful aging in older Indonesian individuals for 14 years. Successful aging can be grouped into three (3) criteria: physical, mental, and social health¹⁰.

METHODS

Study Design

This study was a longitudinal study using data from Indonesian Family Life Survey (IFLS) from the 2000 (round 3) until 2014 (round 5). The IFLS survey is a panel household survey conducted in Indonesia in five rounds: 1993, 1997/1998, 2000, 2007, and 2014. We used data from 2000 until 2014 to see changes over 14 years in which the

minimum age of respondents in 2014 was 74 years (at risk).

Population and Sample

In this study, the target populations were aged ≥ 60 years and surveyed in 2000. Totaling 3,067 individuals. Inclusion criteria for this study included the following: age ≥ 60 years in 2000 who could be followed until 2014 and complete data set ($n = 801$). Individuals who died ($n = 1571$), physically move addresses and were not tracked ($n = 551$) and proxy ($n = 142$) were excluded.

Variable Measurement

Successful aging

The successful aging definition is measured by three criteria: physical, mental, and social health. The physical health is measured by medical drugs being consumed (hypertension, anemia and diabetes). Respondents who reported did not consume drugs met the physical health criteria, while respondents who reported no problem with mental health (could not sleep, anxiety, difficulty concentrating, need an effort to carry out normal tasks and feel bother) in the past week met the mental health criteria. The last one, respondents who involved in community participation in the last 12 months met the social health criteria of successful aging. Overall, older individuals were categorized as a "success" if they met and "not successful" if they did not meet the three criteria.

Independent Variables

Socio-demographic variables comprised sex (female/male), length of education ($< 12/\geq 12$ years), employment status (employed/unemployed), marital status (married/unmarried), and area of residence (rural/urban). Behavioral variables comprised smoking habits (smoking/not smoking), habitual intake (carbohydrates: seldom (< 4 days per week)/often (≥ 4 days per week), protein: seldom (< 4 days per week)/often (≥ 4 days per week), fat: seldom (< 4 days per week)/often (≥ 4 days per week), and nutritional status measured with body mass index (BMI); normal (18.5-25.0 kg/m²), underweight (< 18.5 kg/m²), overweight (> 25.0 kg/m²).

Statistical Analysis

Chi-square test was used to analyze the relationship between successful aging (dependent) and all independent variables. Variables with more than two categories were treated as dummy variables. Fisher's exact test was used if the variables did not qualify on chi-square test, because there were some cells with expected value < 5 . Statistical analyses were performed with SPSS 16.0.

RESULTS

This study has 801 participants, which represent the Indonesian population. The average age of the respondents in the base-line data (2000) was 65.8 ± 5.4 years (min-max: 60-101 years). Table 1 shows characteristic of representative population. Most of older individuals in our study were females (57.7%), with an educational experience of < 12 years (94.4%), living in rural areas (52.7%), and employment status that changed from employed to unemployed (39%). One important aspect in this study was that more than 90% of older persons had education < 12 years. The respondents living without their spouse (unmarried) accounted for 40.3% of the total respondents. The proportion of those who continued smoking or not smoking was almost the same (40.3% and 40.6%). Regarding nutrition, most respondents often consumed carbohydrates (98.3%) and seldom consumed protein (52.5%) and fat (74.6%), but 40% of the respondents had a normal BMI. The number of respondents who changed from normal nutritional status to underweight (14.9%) were higher than to overweight (5%), it concluded that old person tends to lose their body weight.

In 2000 at base line data, the proportion of elderly who were successful aging was higher than 2014 (12% vs 5%). On the contrary, older people who were unsuccessful aging in 2000 was less compared 2014 (88.8% vs 95%). Of the 801 individuals followed up, 588 (93.2%) were found to have unsuccessful aging and 131 (77.06%) older person showed a change from successful to unsuccessful aging (Table 2). Over the-14 years observation, the proportion of older person who are still successful aging (22.94%). Even though the proportion is not much, some of them did not succeed and became successful after 14 years later as much as 6.8% ($Pv < 0.001$). It indicated that older person (60 years) still has the possibility of becoming successful aging at the age of 74.

Distribution of successful aging proportions based on the 2000 and 2014 criteria for physical, mental, and social health is shown in figures 1 and 2. Figure 1 describes the percentage of older individuals' physical, mental and social health in 2014 to be less than that in 2000. While in Figure 2, the proportion of older individuals' physical, mental and social unhealthy in 2014 were higher number than it in 2000. Figure 2 also shows that the proportion of older individuals who are not mentally and socially healthy was greater than those who were not physically healthy.

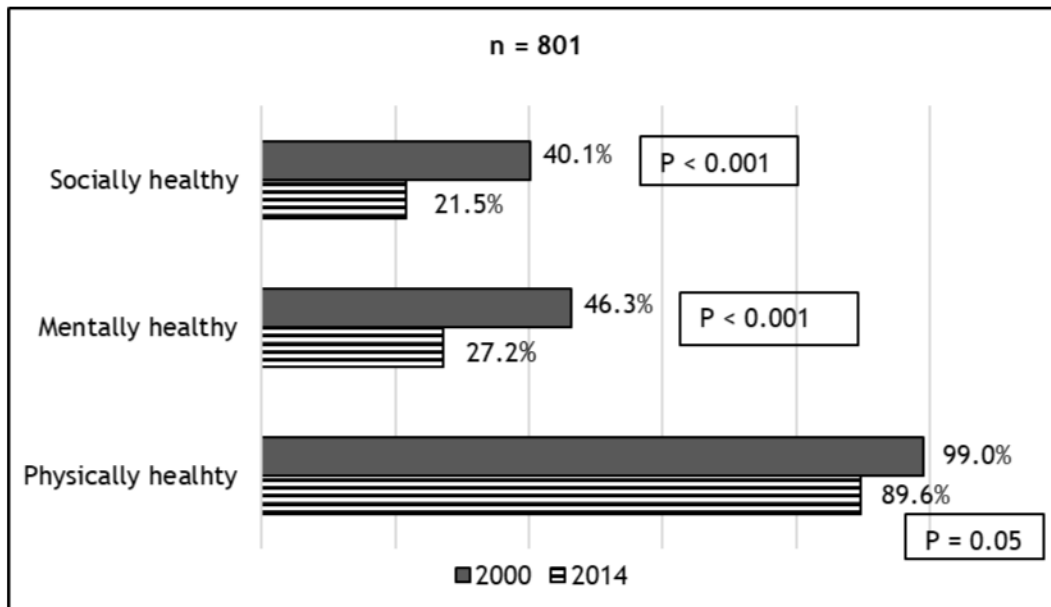


Figure 1. Proportion of Older Person who are Physically, Mentally and Socially Healthy In 2000 and 2014

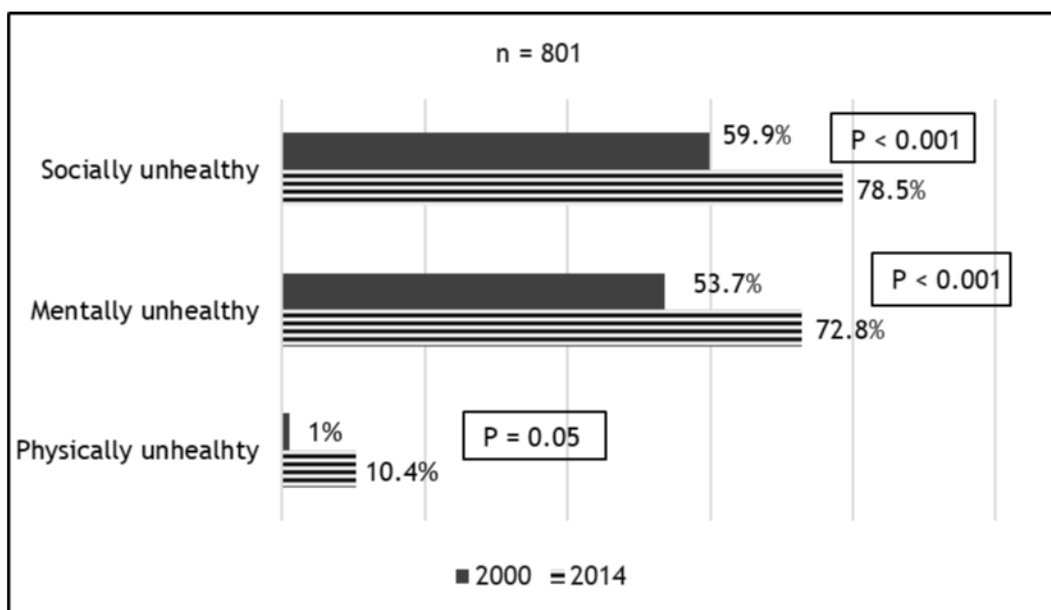


Figure 2. Proportion of Older Person who are Physically, Mentally and Socially Unhealthy in 2000 and 2014

Table 3 shows that female sex, living in a rural area or who moved from rural to urban areas, who were unemployed or changed from being employed to unemployed, and were unmarried significantly associated with unsuccessful aging ($p < 0.001$). Older individuals who were unemployed generally showed unsuccessful aging (96.6%) compared with those who were employed (79.2%) and were 7.5-times more likely to have unsuccessful aging. The result also found a significant relationship between being

underweight and unsuccessful aging ($p = 0.047$). An older individual who remained underweight had twice the risk of having unsuccessful aging compared with someone with a normal nutritional status. Based on eating behavior, there was no significant relationship between successful aging and consumption of carbohydrates, proteins, or fats. However, 81% of the older individuals who seldom consumed fat were found to have unsuccessful aging.

Table 1: Characteristics of respondents by socio-demographic, behavior and nutritional status in 2000-2014

Category Variable	n	%
Sex (n = 801)		
Female	462	57.7
Male	339	42.3
Length of education (n = 801)		
< 12 years	756	94.4
≥ 12 years	45	5.6
Changes in residence area (n = 801)		
Still in rural	422	52.7
Still in urban	243	30.3
Rural → urban	130	16.2
Urban → rural	6	0.8
Changes in Employment status (n = 801)		
Still unemployed	206	25.7
Still employed	260	32.5
Employed → unemployed	312	39.0
Unemployed → employed	23	2.9
Changes in Marital status (n = 801)		
Still married	255	31.8
Still unmarried	323	40.3
Married → unmarried	221	27.6
Unmarried → married	2	0.3
Changes in Smoking habit (n = 801)		
Still smoking	323	40.3
Still no smoking	325	40.6
Smoke → not smoking	92	11.5
Not smoking → smoking	61	7.6
Changes in Habitual intake		
Carbohydrate intake (n = 409)		
Often → seldom	7	1.7
Still seldom	2	5.0
Still often	402	98.3
Protein intake (n = 354)		
Still seldom	186	52.5
Still often	168	47.5
Fat intake (n = 389)		
Still seldom	288	74.0
Still often	22	5.7
Often → seldom	22	5.7
Seldom → often	57	14.6
Changes in Nutritional status/BMI (n = 787)		
Overweight → underweight	13	1.7
Normal → underweight	117	14.9
Underweight → underweight	185	23.5
Overweight → normal	27	3.4
Normal → normal	315	40.0
Underweight → normal	60	7.6
Overweight → overweight	29	3.7
Normal → overweight	39	5.0
Underweight → overweight	2	0.2

Table 2: Distribution of proportions of successful aging in 2000-2014 (n=801)

Variable	2014		RR (95% CI)	P value
	Unsuccessful aging	Successful aging		
2000	588 (93.2%)	43 (6.8%)	1,20 (1,11 - 1,32)	< 0.001*
	131 (77.1%)	39 (22.9%)		

Note: RR, Relative Risk, * significant statistic $p < 0.05$

Table 3: Result of association between respondents characteristics and succesfull aging of older individuals aged ≥ 60 years in 2000-2014

Variable	Unsuccessful aging n (%)	Successful aging n (%)	RR (95% CI)	P value
Sex				
Male (ref)	288 (85.0)	51 (15.0)	1	0.000*
Female	431 (93.3)	31 (6.7)	1,09 (1,04-1,15)	
Length of education				
≥ 12 years (ref)	37 (82.2)	8 (17.8)	1	0.122
< 12 years	682 (90.2)	74 (9.8)	1.09 (0.9 - 1,26)	
Residence area				
Still in urban (ref)	228 (93.8)	15 (6.2)	1	
Still in rural	373 (88.4)	49 (11.6)	0.94 (0.89 - 0.99)	0.031*
Rural → urban	113 (86.9)	17 (13.1)	0.93 (0.86 - 0.99)	0.038*
Urban → rural	5 (83.3)	1 (16.7)	0.89 (0.62 - 1,27)	0.331
Working status				
Still employed (ref)	206 (79.2)	54 (20.8)	1	
Still unemployed	199 (96.6)	7 (3.4)	1,22 (1,14 - 1,30)	0.000*
Employed → unemployed	292 (93.6)	20 (6.4)	1,18 (1,10-1,26)	0.000*
Unemployed → employed	22 (95.7)	1 (4.3)	1,20 (1,08 - 1,34)	0.058
Marital Status				
Still married (ref)	275 (84.6)	50 (15.4)	1	
Still unmarried	245 (96.1)	10 (3.9)	1,13 (1,08 - 1,19)	0.000*
married → unmarried	199 (90.0)	22 (10.0)	1.06 (0.99 - 1,14)	0.082
unmarried → married	2 (100%)	0 (0)	1.18 (1.23 - 1.24)	1.000
Smoking habit				
Still not smoking (ref)	296 (91.1)	29 (8.9)	1	
Still smoking	280 (86.7)	43 (13.3)	0.95 (0.90 - 1.00)	0.098
Smoking → not smoking	86 (93.5)	4 (6.6)	1.03 (0.96 - 1,09)	0.603
Not smoking → smoking	57 (93.4)	4 (6.6)	1.03 (0.95 - 1,10)	0.721
Carbohydrate intake				
Still often (ref)	319 (79.8)	81 (20.1)	1	
Still seldom	2 (100)	0 (0)	1.25 (1.19 - 1.32)	1.000
Often → seldom	6 (85.7)	1 (14.33)	1.07 (0.79-1,5)	1.000
Fat intake				
Still often (ref)	17 (77.3)	5 (22.7)	1	
Still seldom	233 (80.9)	55 (19.1)	1.05 (0.83 - 1,32)	0.89
Often → seldom	16 (72.2)	6 (27.3)	0.94 (0.67- 1,32)	1.000
Seldom → Often	44 (77.2)	13 (22.8)	1,00 (0,77-1,30)	1.000
Nutritional status/BMI				
Normal → normal (ref)	280 (88.9)	35 (11.1)	1	
Overweight → underweight	13 (100)	0 (0)	1.13 (1.08 - 1.17)	0.375
Normal → underweight	106 (90.6)	11 (9.4)	1.02 (0.95 - 1,09)	0.74
Underweight → underweight	175 (94.6)	10 (5.4)	1,06 (1.01 - 1,12)	0.047*
Overweight → normal	24 (89.9)	3 (11.1)	1.00 (0.87 - 1,15)	1.00
Underweight → normal	50 (83.3)	10 (16.7)	0.94 (0.83 - 1.05)	0.32
Overweight → overweight	31 (91.2)	3 (8.8)	1.03 (0.92 - 1,15)	1.00
Normal → overweight	34 (81.0)	8 (19.0)	0.91 (0.78 - 1.06)	0.22
Underweight → overweight	1 (50.0)	1 (50.0)	0.56 (0.14-2.25)	0.22

Note: RR, Relative Risk, * significant statistic $p < 0.05$

DISCUSSION

The results of this study indicate a change in the proportion of successful aging among the 801 older individuals followed up for 14 years. Prevalence of successful aging was 12% in 2000 and 5% in 2014 (data not shown). The same result showed that prevalence of successful aging (≥ 51 years) decline from 11.9 % to 10.9 % (1998-2004)³. The causative mechanism of improving successful aging is elusive, but the current study

provides data supporting that successful aging relies on physical, mental, and social health of older individuals. Approximately 22.94% of the older individuals did not experience a decrease in successful aging, which differs from the proportion of those who remained unsuccessful (93.18%). These data indicate that the ability to reach the level of successful aging reduces with increasing age. The older an individual is, the greater is the tendency to develop chronic diseases such as heart disease, hypertension,

stroke, diabetes, and osteoporosis. Most older individuals have 1-4 comorbidities¹², and the decline in one's health status results in reduced overall bodily function. Therefore, physical health appears to be the main determinant of successful aging⁸. After 14 years of follow-up, there were 6.8% older person who have successful aging (2014) from unsuccessful aging (2000). For this reason, it is possible that maintaining health status in older person by doing regular medical check-up, health behaviors such as doing exercise, physical activity, healthy diet and not smoking can improve their successful aging. Supported by other study, the sedentary behavior was significantly associated with lower odds of successful aging¹³.

Health changes with the aging process can be monitored through changes in physical, psychological, and social variables¹⁴. We determined a decrease in the proportion of older individuals aged ≥ 74 years who were mentally and socially healthy, more than a decrease in those who were physically health. The decline in mental health in an older individual can be caused by stressful conditions and problems experienced due to life dissatisfaction. Studies conducted in Canada in individuals aged > 65 years showed that good life satisfaction was associated with successful aging⁴. The results of this study indicate that older individuals in Indonesia had a greater incidence of mental and social health problems than of physical health, as evidenced by a significant relationship between mental and social health ($p < 0.001$) (data not shown). A previous study showed that social participation has the potential to reduce loneliness in older people¹⁵, and significantly related to mental health¹⁶. In addition, reduced social participation in older individuals can be attributed to their deteriorating functional health¹⁷.

We found that 87% of the older individuals who moved from rural to urban areas were in the unsuccessful aging group, with a significant associated of movement to unsuccessful aging ($p < 0.05$). This finding differs from those of other studies⁶ that show the proportion of successful aging to be higher in those living in urban areas than in those living in rural areas. Supported by other study, worse depression, worse physical health and lower life satisfaction are more experienced by people who live in the rural areas¹⁸. One of the efforts to improve mental health is by improving housing for older individuals living in rural areas¹⁹. Supported by another study showed that elderly who lives on islands have a higher success index compared to their counterparts in Mani region and it can occur due to differences in lifestyle²⁰. The regional differences with unequal values and cultural systems tend to have differences in understanding successful aging²¹.

After 14 years of follow-up, 39% of the older individuals whose employment status changed from being employed to unemployed, as well as those who were unemployed, were more likely be have less successful aging than those who continued to be employed. This differs from the finding of a study in older Mexicans that those who retired were not at a risk for unsuccessful aging²². Through gainful employment, older individuals continue to earn enough income to meet their daily needs, which include perpetually increasing medical expenses and health care¹². This is consistent with the other reports in the literature that show a relationship between high income and successful aging⁵⁻⁷. Adequate finance allows elderly people to take medication and visits to regular health services, because they play an important role in better health.

Regarding marital status variables, an older individual without a spouse had a greater risk of having an unsuccessful aging compared with those with a spouse. Presence of a spouse provides support for social participation¹⁶ and higher self-esteem. Spouses are the most important figure in providing support as a decreased life satisfaction is noted following the loss of a spouse, especially among males¹⁰. Existence of a spouse influences longevity and healthy aging as they have improved companionship and partner support²³.

We focus on eating behavior and nutritional status, most of the older individuals who had unsuccessful aging were seldom consuming carbohydrates and fats but were often consuming protein. Poor consumption of carbohydrates and fats results in weight loss. The results of this study show a significant relationship ($p = 0.031$) between fat consumption and BMI (data not shown). Absence of significant differences between the habit of consuming carbohydrates and BMI is likely caused by the trend that most Indonesians consume carbohydrates as their main food source. Further, in older individuals, diet quality correlates with cardiometabolic risk factors, all-cause mortality, low physical function, and degradations in brain and mental function. However, A systematic review found that there were several inconsistencies in cross-sectional studies that resulted in inverse relationships (depression led to poor eating habits)²⁴. Differences in results can occur due to differences in research methods.

The mean BMI also decreases with age in both sexes ($p < 0.01$) and tends to decrease with age (Table not shown). Although the results of this study showed that the most respondents had normal nutritional status, the proportion of underweight individuals (23.5%) was higher than that of overweight individuals (7.6%). Those who were underweight or overweight had less successful aging than those having a normal

nutritional status. A different result from a cross-sectional showed a positive relationship between successful aging in older individuals aged 65-75 years who were underweight (BMI < 18 kg / m²) and was negatively correlated with being overweight (BMI > 25 kg/m²)⁹. Another study found that an older individual aged 51.9 years with a BMI of > 30 kg/m² had a lower chance of success at the age of > 60 years compared with individuals with BMIs of 18.5 and 25.0 kg/m²²⁵. However, generally there is a significant relationship between nutritional status and successful aging.

Several other findings indicate that malnutrition plays an important role in health²⁴, increased risk of infectious and non-communicable diseases and mortality¹⁴. Furthermore, malnutrition can affect on mental health in aging, thereby reducing quality of life²⁶, but these results are not supported by other study²⁷. Differences in results may occur due to differences in measurement of outcome indicators.

The limitation of using secondary data are incomplete information and not specific to our research needs. A limitation of this study is that the physical health assessment, as an indicator of successful aging, did not involve age-related chronic diseases, because of data of chronic diseases were incomplete from 2000 until 2014. Further, the independent variable was only valid in describing the nutritional status of older individuals, because the relationship between successful aging and nutritional status is rarely found. Further studies are needed to better understand mental and social changes in older individuals.

CONCLUSIONS

The results of our study suggest that older individuals who have unsuccessful aging at the age of ≥ 60 years still have an opportunity for meeting success over the age of 74 years. Sex, area of residence, employment status, marital status, and nutritional status play an important role in successful aging. Further, underweight was higher risk to be unsuccessful aging than normal nutritional status. In addition, the proportion of older individuals who are not mentally and socially healthy was greater than those who were not physically healthy. Therefore, this study can help increase the attention given to mental and social health of older individuals through empowerment to remain active and productive in the community.

ACKNOWLEDGEMENTS

Authors would like to thank Faculty of Public Health Universitas Indonesia as the funder through PITTA grant (a grant for internationally-indexed publications for the student's final assignments). Authors also thank Lembaga survey

meter Indonesia for the assistance in data set compilation for this study.

REFERENCES

1. Dipietro L, Singh MF, Fielding R, et al. Successful aging. *Aging Res.* 2012;2012:2-4.
2. World Economic Forum. Global Agenda Council on Ageing 2012-2014 [Internet]. 2015 [cited 2018 Jan 7]. p. 6. Available from: http://www3.weforum.org/docs/GAC/2013/connect/WEF_GAC_Ageing_2012-2014_connect.pdf
3. UNFPA. Indonesia on the threshold of population ageing. In: Posselt H, editor. UNFPA Indonesia Monograph [Internet]. 1st ed. UNFPA Indonesia Monograph; 2014. p. 1-90. Available from: https://indonesia.unfpa.org/sites/default/files/pub-pdf/BUKU_Monograph_No1_Ageing_03_Low-res.pdf
4. McLaughlin SJ, Connell CM, Heeringa SG, et al. Successful aging in the United States: Prevalence estimates from a national sample of older adults. *Gerontology.* 2010;65B(2):216-26.
5. Meng X, Arcy D. Successful aging in Canada: Prevalence and predictors from a population-based sample of older adults. *Gerontology.* 2014;8(60):65-72.
6. Jang SN, Choi YJ, Kim DH. Association of socioeconomic status with successful ageing: Differences in the components of successful ageing. *Biosoc Sci.* 2009;41(2):207-19.
7. Hamid TA, Momtaz YA, Ibrahim R. Predictors and prevalence of successful aging among older Malaysians. *Gerontology.* 2012;58(4):366-70.
8. Ng TP, Broekman BF, Niti M, et al. Determinants of successful aging using a multidimensional definition among Chinese elderly in Singapore. *The American Journal of Geriatric Psychiatry.* 2009;17(5):407-16.
9. Dahany MM, Drame M, Mahmoedi R, et al. Factors associated with successful aging in persons aged 65 to 75 years. *Eur Geriatr Med.* 2014;5(6):365-70.
10. Hyun Cha, Jun Seo E, R Sok S. Factors influencing the successful aging of older Korean adults. *Contemp Nurse.* 2012;41(1):78-87.
11. Li C, Lin CH, Lin WY, et al. Successful aging defined by health-related quality of life and

- its determinants in community- dwelling elders. *BMC Public Health*. 2014;14(1):1-8.
12. de Matos Nascimento C, Ribeiro AQ, Cotta RMM, et al. Factors associated with functional ability in Brazilian elderly. *Arch Gerontol Geriatr*. 2012;54:e89-94.
 13. Dogra S, Stathokostas L. Sedentary behavior and physical activity are independent predictors of successful aging in middle-aged and older adults. *Journal of Aging Research*. 2012;2012:1-8.
 14. Lopez PM, Fernandez-Ballesteros R, Zamarron MD, et al. Anthropometric, body composition and health determinants of active ageing: a gender approach. *Biosoc Sci*. 2011;43(5):597-610.
 15. Ballantyne A, Trenwith L, Zubrinich S, et al. ' I feel less lonely ': what older people say about participating in a social networking website. *Qual Ageing Older Adults*. 2010;11(10):25-35.
 16. Tomioka K, Kurumatani N, Hosoi H. Positive and negative influences of social participation on physical and mental health among community-dwelling elderly aged 65-70 years: a cross-sectional study in Japan. *BMC Geriatr*. 2017;17(1):1-13.
 17. Ahmad K, Hafeez M. Factors affecting social participation of elderly people: A study in Lahore. *J Anim Plant Sci*. 2011;21(2):283-9.
 18. Williams L, Zhang R, Packard KC. Factors affecting the physical and mental health of older adults in China: The importance of marital status, child availability, and gender. *SSM - Population Health* [Internet]. 2017;3:20-36. Available from: <http://dx.doi.org/10.1016/j.ssmph.2016.11.005>.
 19. Illario M, Vollenbroek-Hutten MM, Molloy DW, et al. Active and healthy ageing and independent living 2016. *Aging Res*. 2016;2016:3-6.
 20. Mariolis A, Foscolou A, Tyrovolas S, Piscopo S, et al. Successful aging among elders living in the Mani continental region vs . Insular Areas of the Mediterranean: the MEDIS Study. *Aging Dis*. 2016;7(3):285-95
 21. Galiana L, Gutiérrez M, Sancho P, et al. Socio-demographic variables and successful aging of the Angolan elderly. *Scientifica (Cairo)*. 2016;2016:1-10.
 22. Arias-Merino ED, Mendoza-Ruvalcoba NM, Arias-merino MJ, et al. Prevalence of successful aging in the elderly in Western Mexico. *Curr Gerontol Geriatr Res*. 2012;2012:3.
 23. Rattanapun S, Fongkeaw W, Chontawan R, et al. Characteristics healthy ageing among the elderly in Southern Thailand. *Chiang Mai Univ J Nat Sci*. 2009;8(2):143-60.
 24. Milte CM, Mcnaughton SA. Dietary patterns and successful ageing : a systematic review. *Eur J Nutr*. 2016;55:423-50.
 25. Singh-Manoux, Sabia S, Bouillon K, et al. Association of body mass index and waist circumference with successful aging. *Obesity*. 2014;22(4):1172-8.
 26. Kvamme JM, Olsen JA, Florholmen J, et al. Risk of malnutrition and health-related quality of life in community-living elderly men and women : The Tromsø study. *Qual Life Res*. 2011;20:575-82.
 27. Greenlund KJ, Giles WH, Keenan NL, et.al. Physician advice, patient actions, and health-related quality of life in secondary prevention of stroke through diet and exercise. *Stroke*. 2002;33(2):565-70.