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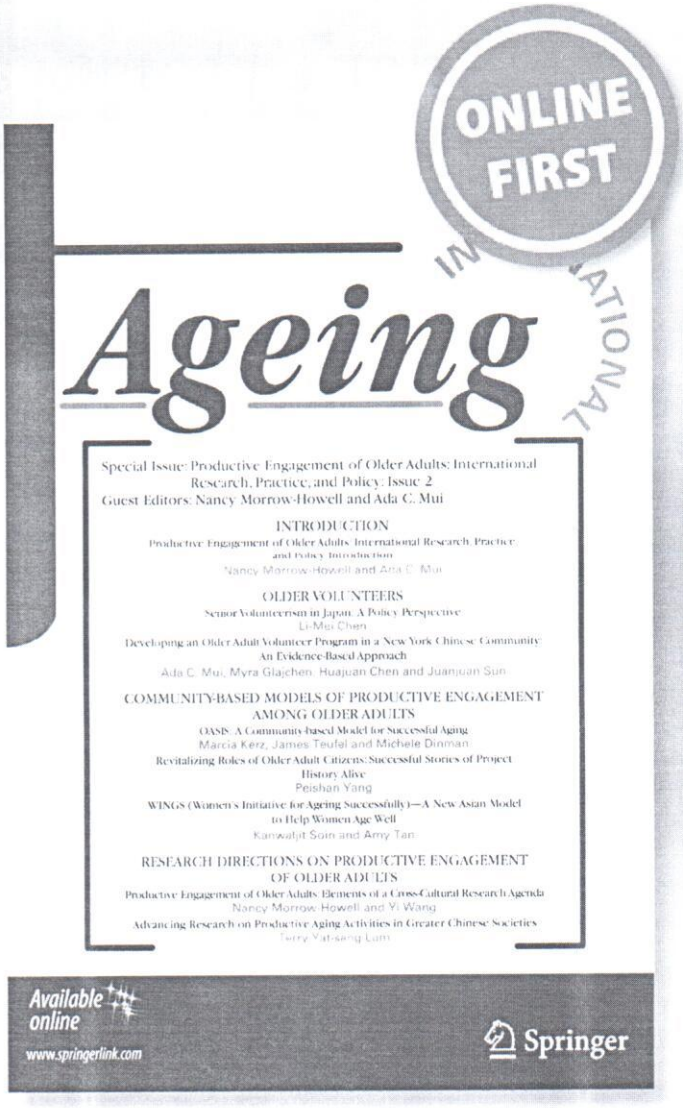

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Abstract The Thai population structure is changing, with the growing number of elderly people leading to a higher dependency ratio. Particularly, the dependency resulted from aging related disability becomes a critical problem in rural Thailand. This study was designed to determine the prevalence and factors associated with severe disability among community dwelling elderly people in rural Thailand. The findings imply that the prevalence of severe disability in the elderly was 11.9 % (95 % CI, 9.23–15.07). The factors associated with severe disability were, according to strength of association, co-morbidity (AOR 3.63; 95 % CI 1.78–7.41), fall (AOR 3.21; 95 % CI. 1.53–6.73), age (over 75 years) (AOR 2.78; 95 % CI 1.33–5.80), and dementia (AOR 2.29; 95 % CI 1.01–5.20), while participation in social activities was a protective factor for severe disability (AOR 0.13; 95 % CI 0.06–0.27). Therefore, to improve care for the community dwelling elderly people in Thailand, the government should focus on health promotion, enhancing the elderly people's social participation in the society activities for the risk group, and providing long-term care for the elderly with severe disability.

Keywords Severe disability · Elderly · Rural

Introduction

The structure of Thailand's population is rapidly ageing and reaching an aging society, as the elderly population grows in size and proportion rising from 10.5 % in 2005, to 11.2 % in 2009, and to 29.8 % in 2050 (United Nations 2007; Institute for Population

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and Social Research 2006; United Nations 2009). Moreover, the elderly population tends to live longer; the life expectancy at birth increased from 70.6 years in 2005 and 2010 to 71.7 in 2010–2015. It is projected that the life expectancy will increase to 78.1 years between 2045 and 2050 (United Nations 2007).

Aging society is typically associated with dependency in terms of economy, health, and self-care activity. One-fourth of Thai elderly people are vulnerable and 21.2 % earn only meager income (National Statistical Office 2008). Dependency ratio of the elderly in Thailand rises sharply. Besides, health problems and chronic diseases are caused by the dependence on health, with increasing age. It was found that had 31.7 % hypertension and 13.3 % diabetes (National Statistical Office 2008).

Furthermore, chronic diseases increased the difficulty to perform activities of daily living, leading to disability (Jagger et al. 2007; Spiers et al. 2005). Particularly, comorbidity and dementia were the cause of disability (Spiers et al. 2005; Tas et al. 2007). It was found that 15.5 % of elderly people had a disability (Aekplakorn et al. 2009). The higher age, the more disability-related changes were found (Marengoni et al. 2009; Spiers et al. 2005).

Thus, disability is an important indicator of the health status in the elderly and a major cause of low quality of life of the elderly (WHO 2003; Bowling et al. 2007). In 2003, the life expectancy and the disability-free life expectancy at age 60 for Thai men were 20.3 years and 16.4 years, and for Thai women were 23.9 years and 18.2 years (Jitapunkul et al. 2003) Particularly, severe disability that typically requires long-term care has significant impact on economy (Lafortune and Balestat 2007). In 2009, it was projected that there were about 60,000 Thai elderly men and 100,000 women with severe disability who need long-term care. Approximately, in the next 20 years, the figures will increase to approximately 100,000 people in men and 140,000 people in women. Also, costs of treating people with severe disability will increase from 908 and 11,354 millions in 2009, to 2,766 and 34,573 millions in 2024 (Srithamrongsawat et al. 2009).

Severe disability is a major problem among the elderly in any society. However, the study of severe disability is often limited due to variations in measurement tools, local contexts, and characteristics of the population which typically confounds interpretation of findings (Lafortune and Balestat 2007). In Thailand, studies of severe disability in rural areas are rare, and factors related to severe disability in rural Thai elderly people have not been adequately studied. Therefore, this study is aimed to investigate the prevalence and related factors of severe disability among older people living in rural areas of Thailand.

Methodology

A descriptive study was conducted, using data gathered through interviews with the elderly at home, during the period from December 2010 to April 2011. The rural areas results higher proportion of older persons than in urban areas (Institute for Population and Social Research 2006). This study purposely selected rural area in the northeastern part of Thailand, where was Ku Kum sub-district in Khon Kaen province including eight villages.

The population was the elderly people aged 60 years and above in these eight villages. The inclusion criteria were living in the community for more than 6 months, and being registered at the local government. Exclusion criteria include being confused and unable to provided information, and hospitalization more than 6 months. The final data set had 515 persons. The response rate of participants was 98.25 %.

Measures

Severe disability refers to limitations or difficulties in performing activities of daily living (ADL) assessed by the Barthel ADL index (Collin et al. 1988), which has been translated into Thai (Jitapunkul 1994). The 10 ADL items was comprised of feeding, transferring, toilet use, grooming, bathing, walking on level surface, ascending and descending stairs, dressing, controlling of both bowels and bladder. The cut off point for severe disability was 12 points or below (Challis et al. 2000; Jitapunkul et al. 2003).

Factors associated with severe disability were identified from systematic reviews of previous studies and in-depth interviews with subjects in the study areas. The initial analysis included factors in three domains. First of all, psychological factors included depression, assessed by using Geriatric Depression Scale (Yesavage et al. 1982), which had been translated into Thai, with the cutoff point of 6 or more (Jitapunkul et al. 1994). Dementia was determined by Mini-Mental State Examination (MMSE) (Folstein et al. 1975), with three groups at the educational level of illiterate (≤14 score), elementary school (≤17 score), and high school and higher (≤22 score), using the three cut off points to indicate the level of completed education (Kuha et al. 2009). Second, with regard to physiological factors, co-morbid diseases, i.e., one or more chronic diseases in the same person diagnosed by a physician were assessed based on self-report with cross-checking of the information from primary care units. Obesity was assessed by body mass index (BMI) over 30 (Tas et al. 2007). Fall was defined by more than one fall in the past 6 months (Aekplakorn et al. 2009). Physical activity was defined as any bodily movement produced by skeleton muscles that results in energy expenditure, which can be categorized into occupational, sports, conditioning, household, and other activities (Caspersen et al. 1985) that last for 30 min or longer per week for at least 3 days. Finally, social factors included social participation in visits to others and participating in social activities outside the home (Avlund et al. 2004), which can be dichotomized into with participation groups and non-participation groups. Age includes two groups, young elderly (60–74 years) and old elderly (75 years and above). Living alone was also a dichotomous variable.

These assessment tools were pre-tested with 30 elderly people who lived in areas close to research areas and were similar to the target population. The reliability as measured by Cronbach's alpha coefficient was 0.8458, 0.8773 and 0.7606 for ADL, GDS and MMSE, respectively. Data collection was performed by interviewers who were trained and examined by agreement test of GDS and MMSE by a psychiatrist and ADL by a geriatric nurse. The agreement test for MMSE and ADL was in the good range (Kappa=0.81–1.00). The agreement test of GDS was good (Kappa=0.81–1.00) for 8 items, and satisfactory (Kappa=0.61–0.80) for the other 7 items. Furthermore, the study was approved by the Ethic Committee of the Khon Kaen University with approval number HE531298.

Statistical Analysis

The demographic characteristics, such as socio-economic, health status, physical activities, and falls, were illustrated by percentages, means (with standard deviations), and median (with inter quartile ranges), and were compared between groups using Mann–Whitney *U* test and Chi square test. The prevalence of severe disability was reported using the overall prevalence (percentage), level of severe disability, and the prevalence by demographic characteristics. Bivariate analysis and Chi square test were used to analyze the initial factors. Multivariate logistic regression was used to investigate the relationship between various factors and severe disability in odds ratio and 95 % confidence interval.

Results

The response rate of participants was 98.25 %. About two in three participants were female, with median age of 66 years (IQR±62.8, 72.0), almost all primary schools graduates, and more than half married. Nearly three fifth of the elderly participants had a chronic disease. One in four elders had co-morbidity, mostly chronic diseases such as hypertension, diabetes and osteoarthritis. Besides, those having severe disability were less likely to be in couple-hood and have social activities than older people without severe disability. Also, elders with severe disability showed more chronic diseases, hospitalization, dementia, depression, fall, and regular exercise, while obesity and osteoarthritis were not difference. (Table 1)

Prevalence of Severe Disability

The prevalence of severe disability at baseline was 11.9 % (95 % CI=9.23–15.07) of the study population, which is classified as moderately severe dependence (7.7 %), severe dependence (3.0 %), and total dependence (1.2 %). Also, the earliest onset of disability in engaging activities of daily living in the elderly was controlling bladder, followed by ascending and descending stairs, transferring, walking on level surface, toilet use, and grooming being the latest. (Table 2)

Factors Associated with Severe Disability in Elderly

All nine initial factors were analyzed using bivariate analysis. A total of 7 of 9 variables were associated with prevalent severe disability, living alone, and obesity. Also, multivariate logistic analysis, while controlling the 7 factors, revealed 4 factors associated with severe disability in the elderly, which was related, by hierarchy, to co-morbidity, falling, age, and dementia, while depression and exercise were found to have no correlation with the occurrence of severe disability in the elderly. Participation in social activity was a protective factor for severe disability. (Table 3)

Table 1 Baseline demographic characteristics stratified by severe disability

Baseline characteristic	Severe disability			
	Total sample (n=506)	Severe disability (n=60)	Non severe disability (n=446)	P value
1. Age median (years) ± (25th %tile–75th %tile)[a]	66±(62.8,72.0)	73.5±(66.3,80.0)	66±(62.0,72.0)	<0.001*
2. Female	305(60.3)	41(59.2)	264(68.3)	0.174
3. Couple	298(58.9)	24(40.0)	274(61.4)	0.002
4. Education level				0.045
Illiterate	28 (5.5)	7(11.7)	21(4.7)	
Elementary school	467 (92.3)	53(88.3)	414(92.8)	
High school and higher	11(2.2)	0(0.0)	11(2.5)	
5. Living alone	50(7.5)	6(10.0)	44(9.9)	0.974
6. Social participation	431(85.2)	21(35.0)	410(91.9)	<0.001
7. Chronic disease	324(60.0)	49(81.7)	275(61.7)	0.002
7.1 Co morbidity	128(25.3)	34(56.7)	94(21.1)	0.033
7.2 Hypertension	116(22.9)	35(58.3)	81(18.2)	<0.001
7.3 Diabetes	99(19.6)	14(23.3)	85(19.1)	0.433
7.4 Osteoarthritis	52(10.3)	6(10.0)	47(10.5)	0.898
8. Hospitalization	106(20.9)	30(50.0)	76(17.0)	<0.001
9. Obesity (BMI >30) median ± (25 thtile–75thtile)[a]	22.6(20.1,25.6)	21.5(18.4,26.0)	22.8(20.3,25.6)	0.067*
10. Physical activities	328(64.8)	26(43.3)	302(67.7)	<0.001
11. Dementia (MMSE score ≤17)	64(12.6)	24(40.0)	40(9.0)	<0.001
12. Depression (GDS score ≥6)	147(29.1)	37(61.7)	110(21.7)	<0.001
13. Fall	77(15.2)	26(15.2)	51(11.4)	<0.001

Comparison between groups used *Mann–Whitney U test for continuous variables if the distribution was not normal, and the Chi-square test if the variable was categorical variables

[a] Age and Obesity (BMI) were represented by median (inter quartile range); all other baseline characteristic, by frequency (percentages)

Discussion

Prevalence of Severe Disability

The results showed that the prevalence of severe disability among elderly people living in rural areas of Thailand was approximately 12 %. Moreover, the prevalence of having at least one chronic disease was 82 %, and more than half of the elderly suffered from co-morbidity. The pattern of disability as revealed in this study is consistent with the mainstream view of the disability process (Verbrugge and Jette 1994; WHO 2001b). Also, the hierarchy of difficulty in performing daily activities of the elderly began from activities associated with mobility, including controlling bladder, ascending and descending stairs, transferring, walking on level surface, to

toilet use, which is similar to findings from the survey of activities of daily living in Thailand (Aekplakorn et al. 2009). This difficulty in performing daily living is a significant issue for long term care for its associated burden of elderly care (Lafortune and Balestat 2007).

Although it is difficult to compare severity of disability, given the differences in measurement and participants, the comparative trends of severe disability shown in this study and those from other countries were diverse. The United States, for instance, had trends of reduction in severe disability, but Japan had increases, while Australia was overall in stable in term of severe disability (Lafortune and Balestat 2007). There are differences also in population characteristics, including life expectancy and chronic disease of the elderly people, with developed countries having relatively has higher rates of chronic diseases (Lafortune and Balestat 2007; United Nations, D. o. E. a. S. A., Population Division 2009)

However, the prevalence of severe disability was lower than in Bangkok, where 19 % of severe disability was found using similar tools (Jitapunkul et al. 2003). The differences may be a result of two major policies, i.e., national health care reform and The Act on Older Persons 2003 that had been issued for a decade (Jitapunkul and Wivatvanit 2009; McManus 2010), that improved health of the elderly and controlled severe disability through three pathways. Firstly, the elderly in the health care system might have more access to health services and health promotion. Secondly, health services is improved the quality of health services was improved and the care for the elderly was required. Finally, the elderly were protected the rights of health and social activities by central and local government (Jitapunkul and Wivatvanit 2009; McManus 2010). According to the World Health Organization (WHO), active ageing requires developed health and social service systems that emphasize health promotion, disease prevention, and provision of cost-effective, equitable, and dignified long-term care (WHO 2001a). Thus, severe disability prevention is needed for the elderly in general, while the long term care is necessary for the elderly with severe disability.

Table 2 Prevalence of disability in activities of daily living

Activities of daily living	Total (n=506)	Disability (n=60)	Non disability (n=446)
1) Feeding	50(9.9)	42(70.0)	8(1.8)
2) Grooming	13(2.6)	8(2.0)	5(5.2)
3) Transferring	76(15.0)	60(100.0)	1(0.2)
4) Toilet use	68(13.4)	60(100.0)	8(1.8)
5) Walking on level surface	75(14.8)	60(100.0)	15(3.4)
6) Dressing	62(12.3)	59(98.3)	3(0.7)
7) Ascending and descending stairs	82(16.2)	60(100.0)	22(4.9)
8) Bathing	38(7.5)	37(61.7)	1(0.2)
9) Controlling bowels	45(8.9)	27(45.0)	18(4.0)
10) Controlling bladder	116(22.9)	59(98.3)	57(12.8)

Table 3 Associated factors with severe disability: multivariate logistic regression with unadjusted and adjusted odds ratio (95 % CI)

Independent variable	No of subject (%)		Unadjusted OR	95 % (CI)	*P* value	Adjusted OR	95 % (CI)	*P* value
	Severe disability	Non severe disability						
1. Oldest older								
75 years and above	28(46.7)	68(15.2)	4.86	2.75–8.59	<0.001	2.78	1.33–5.80	<0.001
60–74 years	32(53.3)	378(84.8)						
2. Living alone								
Yes	7(11.7)	31(7.0)	1.02	0.41–2.49	0.974	–	–	–
No	53(88.3)	415(93.0)						
3. Social activities								
Participation	21(35.0)	410(91.9)	0.05	0.03–0.09	<0.001	0.13	0.06–0.27	<0.001
Non participation	39(65.0)	36(8.1)						
4. Co morbidity								
Yes	34(56.7)	94(21.1)	4.90	2.80–8.56	<0.001	3.63	1.78–7.41	<0.001
No	26(43.3)	352(78.9)						
5. Physical activity								
Yes	26(43.3)	302(67.7)	0.33	0.19–0.57	<0.001	0.71	0.34–1.49	0.360
No	34(56.7)	144(32.3)						
6. Obesity								
BMI ≥30	5(8.3)	26(5.8)	1.47	0.54–3.98	0.450	–	–	–
BMI <30	55(91.7)	420(94.2)						
7. Dementia								
Yes	24(40.0)	40(9.0)	6.77	3.68–12.46	<0.001	2.29	1.01–5.20	0.047
No	36(60.0)	406(91.0)						
8. Depression								
GDS ≥6 score	37(61.7)	110(24.7)	4.91	2.80–8.63	<0.001	1.93	0.93–4.00	0.077
GDS <6 score	23(38.3)	336(75.3)						
9. Falling								
>1 time	26(43.3)	51(11.4)	5.92	1.90–7.64	<0.001	3.21	1.53–6.73	0.002
≤1 time	34(56.7)	395(88.6)						

Severe Disability and the Associated Factors

Severe disability was associated with four factors. First, co-morbidity has high strength of association. Similar associations were found in Sweden, Germany, and England (Jacobzone et al. 2000). This study found that one in four elderly suffered from co-morbidity, with the most common co-morbidity being hypertension. Moreover, open-

ended question revealed that some elderly with hypertension were not treated and unable to control the disease. According to the national surveys, only 6–9 % of the health elderly with hypertension were not treated, and 23–25 % were unable to control hypertension (Aekplakorn et al. 2009). Thereby, prevention of severe disability in the elderly is through control of disease, particularly, co-morbidity such as hypertension.

Fall was another important factor causing severe disability resulting from injury. Similarly, in the findings of Thailand was found that 5.1 % of elderly people fell and needed hospitalization, and 1–2 % had fracture arm and hip bones (Aekplakorn et al. 2009). Also, in the findings of WHO and the study in developing countries showed that fall was a risk factor for disability (Tas et al. 2007; WHO 2003). Besides, the problem of falls in this study showed lack of safety in bathroom, where the highest falls among the elderly occurred and more than half was caused by slip and stumble in the bathroom. More than 90 % of all participants were concerned of environment factors which were the bathrooms with no handrails, seat stool, and a closet squatting. Alike, the national survey found the cause of falls, that more than 65 % was smooth and slippery surface, and more than half happened in the bathroom (National Statistical Office 2008). Thus, improving the safety of environments for older persons is important for reducing falls and prevention severe disability.

Also, dementia was found in correlation with severe disability among the elderly. Similarly, a study in England and Wales, and Germany found that dementia were powerful predictors of incident disability (Spiers et al. 2005; Tas et al. 2007), because dementia strongly contribute to both the development of long term functional dependence and decline in functioning (Spiers et al. 2005). In this study we found that nearly one in eight elderly people were suspected of dementia, very similar to 12.4 % as shown in the Thai national survey (Aekplakorn et al. 2009). Therefore, the controlling of dementia is necessary for prevention of severe disability in Thai elderly.

Finally, the oldest elderly was associated with a severe disability. Consistently, concept of disability concluded that the level of disabilities increases with age (Spiers et al. 2005; Tas et al. 2007; WHO 2003). Aging processes not only structurally change the function of the body, it also reduces the effectiveness of sensory and nervous systems and worsens musculoskeletion system. (WHO 2003). In addition, chronic diseases cause pathology, loss of organ function, and lead to the loss of the ability to perform activities in daily living (Verbrugge and Jette 1994; WHO 2001a, b).

On the other hand, participation in social activity was found as a protective factor of severe disability in the elderly. The recent study showed that diversity in high social participation was an important factor for maintaining functional ability (Avlund et al. 2004). According, the study of neighbourhood deprivation and incident mobility disability in older adults found the incident reports of difficulties in mobility to a risk for disability (Lang et al. 2008). Therefore, participation in social and cultural activities (e.g., religious ceremony observation, teaching the children, and promotion of traditions) helps maintain one's role and activity in the community, improve self reliance, and prevent the occurrence of severe disability among Thai elderly in rural areas. Moreover, in this study, depression was not significantly associated with disability, but the finding indicated that 62 % of elderly people with disability also suffered from depression, which considered a risk factor for the occurrence of disability (WHO 2003; Tas et al. 2007)

Summary

This study found more than one in ten elderly patients with severe disability. The factors associated with severe disability were co-morbidity, fall, dementia, and age. This study had shown factors associated with a severe disability among elderly, which were not only health factors and bodily functions. Severe disability was also associated with personal factors and environmental factors on health, which was closely related to activities of the elderly. While, participation in social activity was found to be a key factor that was related to the prevention of severe disability in the elderly. Therefore, the results of this study offer recommendations to policy makers and other important stakeholders in Thailand, who should be to maintain proactive service, focus on health promotion, reducing the factors associated, and enhance the roles of the elderly in the society. Also, the long term care is necessary for the elderly with severe disability. This will prevent and delay, as long as possible, the occurrence of severe disability among the elderly in rural areas of Thailand. However, this study was a descriptive study; in order to acquire more accurate understanding of the risk factors of severe disability, more longitudinal research is required.

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References

Aekplakorn, W., Porapakkham, Y., Taneepanichskul, S., Thaikla, K. (2009). *The report of Thailand population health examination survey IV.* Bangkok.

Avlund, K., Lund, R., Holstein, B. E., & Due, P. (2004). Social relations as determinant of onset of disability in aging. *Archives of Gerontology and Geriatrics, 38*(1), 85–99.

Bowling, A., Seetai, S., Morris, R., & Ebrahim, S. (2007). Quality of life among older people with poor functioning. The influence of perceived control over life. *Age and Ageing, 36*(3), 310–315. doi:10.1093/ageing/afm023.

Caspersen, C. J., Powell, K. E., & Christenson, G. M. (1985). Physical activity, exercise, and physical fitness: definitions and distinctions for health-related research. *Public Health Reports, 100*(2), 126–131.

Challis, D., Mozley, C. G., Sutcliffe, C., Bagley, H., Price, L., Burns, A., et al. (2000). Dependency in older people recently admitted to care homes. *Age and Ageing, 29*(3), 255–260.

Collin, C., Wade, D. T., Davies, S., & Horne, V. (1988). The Barthel ADL index: a reliability study. *Disability and Rehabilitation, 10*(2), 61–63. doi:10.3109/09638288809164103.

Folstein, M. F., Folstein, S. E., & McHugh, P. R. (1975). "Mini-mental state". A practical method for grading the cognitive state of patients for the clinician. *Journal of Psychiatric Research, 12*(3), 189–198.

Institute for Population and Social Research (2006). *Population projections for Thailand, 2005–2025. (Vol. March 2006 revision).* Institute for Population and Social Research, Mahidol University.

Jacobzone, S., Cambois, E., & Robine, J. M. (2000). *Is the health of older persons in OECD countries improving fast enough to compensate for population ageing? (vol. OECD Economic studies No.30,2000/1).* Mimeo: OECD.

Jagger, C., Matthews, R. J., Matthews, F. E., Spiers, N. A., Nickson, J., Paykel, E. S., et al. (2007). Cohort differences in disease and disability in the young-old: findings from the MRC Cognitive Function and Ageing Study (MRC-CFAS). *BMC Public Health, 7*, 156. doi:10.1186/1471-2458-7-156.

Jitapunkul, S. (1994). Disability: a problem of the elderly. *Chulalongkorn Medical Journal, 38*(2), 67–75.

Jitapunkul, S., & Wivatvanit, S. (2009). National policies and programs for the aging population in Thailand. *Ageing International, 33*, 62–74. doi:10.1007/s12126-009-9027-6.

Jitapunkul, S., Nivataphan, R., Worakul, P., Atulayasak, C., & Hanvivadhanaku, P. (1994). The validity and factor analysis of the geriatric depression scale using in Thai elderly. *Chulalongkorn medical journal, 38*(7), 383–389.

Jitapunkul, S., Kunanusont, C., Phoolcharoen, W., Suriyawongpaisal, P., & Ebrahim, S. (2003). Disability-free life expectancy of elderly people in a population undergoing demographic and epidemiologic transition. *Age and Ageing, 32*(4), 401–405.

Kuha, O., Bunmeepipit, B., Vanichvarotm, C., & Thamanavat, N. (2009). Comparative Study of Mini-Mental State Examination Thai 2002 (MMSE-Thai 2002) and Thai Mini-mental State Examination (TMSE) in elderly screening test for cognitive impairment. *Journal of Gerontology and Geriatric Medicine, 10*(1), 19–24.

Lafortune, G., & Balestat, G. (2007). *Trends in severe disability among elderly people: Assessing the evidence in 12 OECD countries and the future implications.* OECD Employment, Labour and Social Affairs Committee. Health Working Papers, 0_1.

Lang, I. A., Llewellyn, D. J., Langa, K. M., Wallace, R. B., & Melzer, D. (2008). Neighbourhood deprivation and incident mobility disability in older adults. *Age and Ageing, 37*(4), 403–410. doi:10.1093/ageing/afn092.

Marengoni, A., von Strauss, E., Rizzuto, D., Winblad, B., & Fratiglioni, L. (2009). The impact of chronic multimorbidity and disability on functional decline and survival in elderly persons. A community-based, longitudinal study. *Journal of Internal Medicine, 265*(2), 288–295. doi:10.1111/j.1365-2796.2008.02017.x.

McManus, J. (2010). *Thailand's universal coverage scheme: Achievements and challenges an independent assessment of the first 10 years (2001–2010) synthesis report* (p. 120). Nonthaburi: Health Insurance System Research Office.

National Statistical Office. (2008). *Report on the 2007 survey of the older persons in Thailand.* Bangkok: National Statistical Office, Thailand.

Spiers, N. A., Matthews, R. J., Jagger, C., Matthews, F. E., Boult, C., Robinson, T. G., et al. (2005). Diseases and impairments as risk factors for onset of disability in the older population in England and Wales: findings from the Medical Research Council Cognitive Function and Ageing Study. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences, 60*(2), 248–254. doi:10.1093/gerona/60.2.248.

Srithamrongsawat, S., Bundhamcharoen, K., Sasat, S., Odton, P., Ratkjaroenkhajorn, S. (2009). *Projection of demand and expenditure for institutional long term care in Thailand.* Nonthaburi Health Insurance System Research Office.

Tas, U., Verhagen, A. P., Bierma-Zeinstra, S. M., Hofman, A., Odding, E., Pols, H. A., et al. (2007). Incidence and risk factors of disability in the elderly: the Rotterdam Study. *Preventive Medicine, 44*(3), 272–278. doi:10.1016/j.ypmed.2006.11.007.

United Nations. (2007). *World population prospects the 2006 revision, highlights. (Vol. Working Paper No. ESA/P/WP.202).* New York: Department of Economic and Social Affairs, Population Division.

United Nations. (2009). *World population ageing 2009.* New York: United Nations Department of Economic and Social Affairs/Population Division.

Verbrugge, L. M., & Jette, A. M. (1994). The disablement process. *Social Science & Medicine, 38*(1), 1–14.

WHO. (2001a). *Health and ageing a discussion paper.* Geneva: Department of Health Promotion, Non-Communicable Disease Prevention and Surveillance.

WHO. (2001b). *International classification of functioning, disability and health.* Geneva: WHO.

WHO. (2003). *What are the main risk factors for disability in old age and how can disability be prevented?* Denmark: WHO.

Yesavage, J. A., Brink, T. L., Rose, T. L., Lum, O., Huang, V., Adey, M., et al. (1982). Development and validation of a geriatric depression screening scale: a preliminary report. *Journal of Psychiatric Research, 17*(1), 37–49.

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