THE IMPACT OF CHRONICALLY ILL ELDERLY ON HOUSEHOLD ECONOMIC STATUS: EVIDENCE FROM THAILAND

Kanjana Tisayaticom[1, 2, *], Kusol Soonthorndhada [1], Chalermpol Chamchan[1], Supon Limwattannanon[2, 3], Viroj Tangcharoensathien[2]

[1] Institute for Population and Social research Mahidol University, Nakhonpathom 73170, Thailand
[2] International Health Policy Program Thailand, Ministry of Public Health, Nonthaburi 11000, Thailand
[3] Faculty of Pharmaceutical Sciences, Khon Kaen University, Khon Kaen 40002, Thailand

ABSTRACT:

Background: In accordance with the epidemiologic transition due to an ageing population, the disease burden of the Thai population has been shifting from a predominance of infectious diseases to non-communicable diseases (NCD), especially chronic diseases. Households with chronically ill elderly experience a variety of deleterious impacts.

Methods: This study aims to assess the economic consequences of chronic disease among elderly members in households, specifically regarding household income and wealth depletion. The third (2007) and the fourth (2010) waves of the household socio-economic panel survey, which is a nationally representative panel of approximately 6,000 households conducted by the National Statistical Office of Thailand (NSO), were employed to study the impact of chronic disease among the elderly with respect to the economic status of households by using regression model. The model of impact of health on wealth depletion is formulated as $\Delta W = f(\Delta H, X)$ where Δw is wealth change(as a dependent variable), ΔH is a change in health condition(independent variables), and X are control variables including age, sex, education, area of residence, occupation of household, health insurance coverage, and wealth quintile.

Results: The percentage of households with elderly members who suffered from a chronic disease were more than that of households without elderly members. The percentage of households with members who had a chronic disease in 2010 was higher than in 2007. Over one-tenth (13.0%) of households had elderly members who had onset of cardiovascular disease in 2007, and this rate increased to 20.3% in 2010. The regression model suggests that the total wealth depletion of households had a positive significant effect with respect to households with at least one elderly member having cancer (0.736 $p<0.05$). Health insurance buffers the impact of chronic disease on wealth or income depletion of households. Increases in the proportion covered by universal health insurance coverage (UC) or social security system (SSS) would result in a reduction of household wealth depletion by 49% ($p<0.01$) and 56% ($p<0.01$), and reduction on income depletion by 34% ($p< 0.05$) and 67% ($p<0.01$).

Conclusions: It is recommended to promote healthy ageing through active health promotion, changes in life style and maintaining pre-elderly population health.

Keywords: Wealth depletion, Income depletion, Chronic disease, Thailand

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INTRODUCTION

Currently, the world population faces the ageing of societies which precludes a larger share of the population that are elderly and older age groups that increase in number faster than younger groups. The current global annual growth rate of the older population is 1.9% compared to 1.2% of the total population. Moreover, by 2025-2030, projections indicate that the population over 60 will be growing 3.5 times as rapidly as the total population [1].The population in Asia has also been ageing since the 1970s

* *Correspondence to: Kanjana Tisayaticom*
E-mail: kanjana@ihpp.thaigov.net

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due to the continuing decline in fertility and mortality in that region. From the 1970s to 2000, the proportion of older adults in the Asian population increased gradually and will continue to rise significantly in the future. Population change in Asia is being driven by three interrelated demographic phenomena: the baby boom, declining fertility rates, and low mortality rates leading to increased life expectancies at birth. Thailand, Taiwan and Singapore have been experiencing below replacement-level fertility a total average lifetime fertility of slightly less than 2 births per woman since 1995 [2]. Thailand has now reached a new demographic turning point with the advent of an ageing society. The number of people aged 60 or over has risen dramatically during the three previous decades, increasing from 5.2% in 1960 to 7.3% in 1990 and 10.3% in 2000, and is projected to be 18.3% in 2020 [3]. The transition toward an aged population in Thailand is faster than was the case of developed countries, with a doubling of the proportion of elderly within only 30 years compared to more than 100 years in developed countries [4]. Between 1970 and 1995, the Thai population age 60 or over doubled from 1,715,000 in 1970 to 4,456,000 in 1995 [2]. Given the ageing population, Thailand has also been in an epidemiologic transition from the past few decades. The disease burden of the Thai population has shifted from a predominance of infectious diseases to NCD, especially chronic diseases. The proportion of Disability Adjusted Life Years (DALYs) lost due to NCD increased from 58.9% in 1999 to 65.6% in 2004 [5]. The demand for health care services rises with age and the utilization of almost all health services increases as age increases. Thus, the most common consequence of chronic disease among elderly members in the household is household impoverishment. Recently in developing countries, the consequences of the financial burden caused by health payments are of increased interest. Many unpublished data reflect the burden of catastrophic illness [6-9]. The economic consequences and investment in health in rich countries may differ from those in low-income countries. Many households in developing countries face both high expenditures for medical treatment and reduced income as they lose capacity to work. As a consequence of the aging of the population, the considerable increases in the demand for health care, and limitations of previous studies on the impact of ill-health on households, it is crucial to assess the economic consequences of ill-health on households or individuals, and to know how health changes with age result in income and wealth depletion of the elderly.

METHODS

This study applies a model derived from Life Cycle Theory [10] using the Panel Socio-Economic Survey (PSES), initiated by the NSO since 2005. The first three waves were conducted in 2005, 2006 and 2007. This study uses the 2007 and 2010 PSES dataset for analysis. Note that in 2010, the NSO, in collaboration with the International Health Policy Program, conducted the most recent round of the PSES to assess the impact of health shocks on households. Based on the Life Cycle Theory, a function can be written as follows:

$$\Delta W_i = \alpha + \gamma \Delta H_i + \sum_k \lambda_k X_{ik} + \mu$$

Where ΔH_i is the onset of a chronic disease between time t and time t-n, X_{ik} is a series of control variables, and μ is a random error term.

Considering the impact of health on the income depletion of the household, the function is as follows:

$$\Delta income_i = \alpha + \gamma \Delta H_i + \sum_k \lambda_k X_{ik} + \mu$$

Where ΔH_i is the onset of a chronic disease between time t and time t-n, X_{ik} is a series of control variables, and μ is a random error term.

The regression models have been used to estimate the effect of the onset of chronic disease among the elderly on the amount of wealth, and on income depletion of the household. Wealth and income of households are measured on an equivalence scale. Each dependent variable was measured as the difference in the amount of wealth or income in each household between 2007 and 2010. These dependent variables have to be transformed, using a log scale to reduce their skewed distributions. The results of the econometric model in terms of beta were changed using exponential conversion. The independent variables are the four main chronic diseases of the elderly, which were measured as the incidence of disease in the household. For example, 1 refers to households having at least one elderly member with onset of disease, and 0 refers to households without. The control variables were standardized by using the proportions of members by gender, educational attainment, occupation, health insurance coverage, and asset quintile in 2007. Area of residence and region in 2007 are also control variables.

Data sources

This study used the PSES, a longitudinal data set, produced by the NSO. The PSES is a nationally representative panel of approximately 6,000 households, selected by two-stage stratified sampling, where provinces constituted strata. Each

Table 1 Household characteristics in 2007 and 2010

Variables	2007		2010	
	mean	SD	mean	SD
Area of residence				
Urban	0.30	0.46	0.30	0.46
Rural	0.70	0.46	0.70	0.46
Demographics				
Household size	3.52	1.78	3.49	1.78
Number of males	1.68	1.12	1.66	1.11
Number of adult males	1.04	0.80	1.04	0.82
Number of children (< 15 years old)	0.87	0.97	0.78	0.93
Number of adults	2.20	1.27	2.20	1.32
Number of elderly (> 59 years old)	0.45	0.70	0.50	0.72
Occupation*				
Agriculture	0.44	0.50	0.45	0.50
Number of members having salary/wage/businesses	1.34	1.06	1.34	1.09
Number of agriculture workers	0.88	1.14	0.87	1.13
Education**				
Number of members with primary school	1.43	1.13	1.41	1.13
Number of members with secondary school	0.66	0.85	0.70	0.89
Number of members with post-secondary school	0.45	0.81	0.49	0.84
No education	0.02	0.13	0.01	0.12
Highest level of education is primary school	0.34	0.47	0.33	0.47
Highest level of education is secondary school	0.34	0.47	0.34	0.47
Highest level of education is post-secondary school	0.30	0.46	0.32	0.46
Health insurance				
Number of members covered by UC	2.60	2.02	2.59	1.93
Number of members covered by SSS	0.36	0.73	0.38	0.75
Number of members covered by CSMBS	0.40	1.01	0.38	0.97

Note: * interviewed only household (HH) members age 15 years or over
** interviewed only HH members age 6 years or over
Sampling weights applied (N = 14,646,141 households)

stratum was divided into two parts by the type of local administration: Municipal or non-municipal area. The primary sampling units were blocks for municipal areas and villages for non-municipal areas. The secondary sampling units were households. This study employs data from the two most recent waves, which are the third (2007) and the fourth (2010), conducted three years apart. The between-wave duration is long enough to demonstrate changes in both health and economic consequences. Inclusion criteria are the households that were present in both waves (three and four), and excluding new separated households (those who created a separate household from the primary household).

Ethical considerations

As this study used secondary data from the NSO, the Institute for Population and Social Research Institutional Review Board (IPSR-IRB) of Mahidol University approved it on February 24th, 2012 (Ref 2012/2_1_03).

RESULTS

Descriptive statistics on characteristic of households in Table 1 show that the majority of households were in rural areas: 30% of households were in urban areas and 70 % were in rural areas. The average household size was 3.52 in 2007 with a slight drop to 3.49 in 2010. The number of children, adults and elderly in 2007 was 0.87, 2.20 and 0.45 persons per household, respectively. The average number of children per household in 2010 noticeably declined to 0.78, while the average number of elderly increased to 0.50 persons per household. Fully 44 and 45% were agricultural households in 2007 and 2010, respectively. The levels of completed education of household members were divided into three main categories: Post-secondary, secondary, and primary school. The average number of household members with primary school was 1.43 and 1.41 persons in 2007 and 2010, respectively. The average numbers of household members completing secondary and post-secondary school were 0.66 and 0.45 persons in 2007, increasing to 0.70 and 0.49 persons in 2010. The level of education of households improved as of 2010. Only 1 to 2% of all households had members with no education. The percentage of households

Table 2 Number and percentage of households (HH) with and without elderly having chronic diseases in 2007 and 2010

Household with a chronic disease	2007		2010	
	HH with elderly	HH without elderly	HH with elderly	HH without elderly
Musculoskeletal disease (MSD)				
No	73.2	87.9	82.9	94.2
At least one elderly	26.8	12.1	17.1	5.8
1	20.6	9.8	15.2	5.3
2	5.8	2.1	1.8	0.4
3	0.5	0.1	0.1	0.0
Cardiovascular disease (CVD)				
No	67.0	87.6	55.4	83.4
At least one elderly	33.0	12.4	44.6	16.6
1	27.2	11.0	36.1	14.7
2	5.4	1.4	7.5	1.8
3	0.4	0.0	1.0	0.1
Diabetes mellitus (DM)				
No	84.8	94.5	78.4	90.3
At least one elderly	15.2	5.5	21.6	9.7
1	13.8	5.3	18.8	9.2
2	1.3	0.2	2.6	0.4
3	0.1	0.0	0.2	0.0
Cancer (CA)				
No	99.0	99.3	97.6	98.9
At least one elderly	1.1	0.7	2.4	1.1
1	1.1	0.7	2.3	1.1
2	0.0	0.0	0.1	0.0
	N=2096	N=3373	N=2322	N=3147

Note: N is the number of households with elderly and the percentage is measured by using this number as denominator

Table 3 Number and percentage of households with elderly having onset of chronic diseases by PSES wave (W)

Onset of chronic diseases	W3		W4	
	household	%	household	%
Musculoskeletal disease (MSD)				
Absence	1,790	85.65	2,106	90.85
Presence	300	14.35	212	9.15
Cardiovascular disease (CVD)				
Absence	1,818	86.99	1,848	79.72
Presence	272	13.01	470	20.28
Diabetes mellitus (DM)				
Absence	2,018	96.56	2,128	91.8
Presence	72	3.44	190	8.2
Cancer (CA)				
Absence	2,080	99.52	2,282	98.45
Presence	10	0.48	36	1.55
	(N=2090)		(N=2318)	

having the highest level of education as primary school or secondary-school was approximately 34% in both waves, while households with members with post-secondary school education stood at 30% in 2007 and then improved to 32% in 2010. The UC plays a major role in providing health insurance for most of the population in Thailand. The average number of household members covered by the UC scheme was 2.60 and 2.59 persons per household in 2007 and 2010, respectively. The average number of household members covered by the SSS stood at 0.36 in 2007 and increased to 0.38 persons per household in 2010, whereas the average number of household members covered by Civil Servant Medical Benefit Scheme (CSMBS) declined from 0.40 in 2007 to 0.38 persons in 2010.

Table 2 shows that the highest percentage was the households having an elderly member with cardiovascular disease (CVD) at 33.0 in 2007 and 44.6 % in 2010. When comparing 2007 and 2010,

Table 4 Effect of elderly having onset of a chronic disease on the amount of wealth depletion among households with wealth depletion

Predictors	HH wealth depletion per equivalence scale		*p-value*
	coef	percent change	
Household with elderly having onset of MSD	0.013	1.34	0.92
Household with elderly having onset of CVD	0.090	9.47	0.35
Household with elderly having onset of DM	0.038	3.82	0.77
Household with elderly having onset of CA	0.736**	108.75	0.03
Proportion male of household members	-0.039	-3.85	0.77
Proportion children	-0.145	-13.46	0.63
Proportion elderly	0.288**	33.38	0.05
Proportion wage earners/business occupation	0.101	10.61	0.42
Proportion agriculture occupation	-0.005	-0.51	0.97
Proportion primary education only	0.284	32.82	0.24
Proportion Secondary education only	0.288	33.41	0.29
Proportion post-secondary education	0.902***	146.38	<.01
Proportion of households with UC	-0.676***	-49.12	0.00
Proportion of households with SSS	-0.823***	-56.10	>.01
Proportion of households with CSMBS	-0.411*	-33.69	0.06
asset quintile 2	0.295**	34.37	0.02
asset quintile 3	0.520***	68.19	0.00
asset quintile 4	0.868***	138.25	0.00
asset quintile 5	1.269***	255.65	0.00
Rural	-0.169**	-15.55	0.04
Central	-0.249**	-22.05	0.02
North	-0.267**	-23.43	0.02
Northeast	-0.309***	-26.58	0.01
South	-0.090	-8.63	0.46
_cons	8.892***		0.00
Number of observation	2243		
R-squared	0.1927		

Note: *** Significant *** p<0.01, ** p<0.05,* p<0.1; p is proportion of the value of variables in each household

this study found that there was an increasing trend on the percentage of households both with and without elderly members having chronic disease, with the exception of musculoskeletal disease (MSD). The percentage of households that had at least one elderly member who had MSD, for example, stood at 26.8% in 2007 and declined to 17.1% in 2010. Cancer (CA) was a rare disease in this study: Only 1.1% of households in 2007 reported this condition, increasing to 2.4% in 2010.

Table 3 summarizes the onset of chronic disease of the elderly in households by who initially reported the disease. For example, the person who reported chronic disease in 2007 but did not in 2006, or the person who had chronic disease in 2010 but did not have it in 2007 were identified as a new onset case. It is clear that the percentage of households that had elderly with onset of chronic disease in 2010 is higher than in 2007, except for MSD. Thirteen percent of households with elderly had CVD onset in 2007, increasing to 20.3% in 2010. CA onset was rare as there were only 0.5 and 1.6% of the elderly households in 2007 and 2010 reporting this condition, respectively.

The results shown in Table 4 suggest that chronic disease of elderly in a household had a positive effect on wealth depletion of the household. However, this association did not reach statistical significance except for households with an elderly member with onset of CA. Among households with wealth depletion, this study found that health insurance could protect them from the impact of illness with associated wealth depletion. It indicated that increased proportions of household members with UC, SSS, and CSMBS is associated with decreased wealth depletion of the household, other things being equal. Increase by one percentage point change of members with UC, SSS, or CSMBS beneficiaries would result in a decline in the household wealth by 68 (p<0.01), 82 (p<0.01), and 41 (p<0.1) %, respectively, ceteris paribus. It is noteworthy that the richer the household, the greater the wealth depletion, and this statistically significant association increase monotonously by wealth quintile. On the other hand, living in a rural area or outside Bangkok had a significantly negative effect

Table 5 Effect of elderly onset of a chronic disease on the amount of household income depletion in terms of percentage change

Predictors	Income depletion per equivalence scale		*p-value*
	coef	percent change	
Household with elderly having onset of MSD	0.156	16.91	0.22
Household with elderly having onset of CVD	-0.169*	-15.55	0.07
Household with elderly having onset of DM	0.164	17.77	0.20
Household with elderly having onset of CA	0.582*	78.97	0.07
Proportion male of household members	-0.065	-6.32	0.62
Proportion children	0.134	14.34	0.64
Proportion elderly	-0.088	-8.44	0.53
Proportion wage earners/business occupation	0.303**	35.43	0.01
Proportion agriculture occupation	0.220*	24.64	0.07
Proportion primary education only	0.105	11.11	0.64
Proportion secondary education only	0.251	28.52	0.33
Proportion post-secondary education	0.531*	70.06	0.06
Proportion of households with UC	-0.421**	-34.38	0.04
Proportion of households with SSS	-1.104***	-66.86	0.00
Proportion of households with CSMBS	-0.858***	-57.60	0.00
asset quintile 2	0.113	11.91	0.34
asset quintile 3	0.299***	34.83	0.01
asset quintile 4	0.719***	105.28	0.00
asset quintile 5	1.099***	200.24	0.00
Rural	-0.265***	-23.27	0.00
Central	-0.155	-14.32	0.14
North	-0.467***	-37.32	0.00
Northeast	-0.430***	-34.98	0.00
South	0.013	1.30	0.92
_cons	8.024***		0.00
Number of observation	2264		
R-squared	0.1488		

Note : *** Significant *** p<0.01, ** p<0.05,* p<0.1; p is proportion of the value of variables in each household

on the amount of wealth depletion.

Table 5 shows the impact of the onset of chronic diseases among the elderly in households associated with total income per equivalent scale depletion. Households with elderly members with onset of CA had the highest positive effect on income depletion, and this is statistically significant. By contrast, households with elderly having CVD had a negative and significant effect with respect to total income depletion. For households with elderly members with CA, the total income depletion increased by 79.0% (p <0.1).

For health insurance coverage, it is obvious that there are negative effects on total income depletion with respect to all three kinds of health insurance. For example, given an increase in one percentage point of UC coverage, the total income depletion would be likely to decrease by 34.4% (p<0.1). Similarly, given an increase in one percentage point of SSS and CSMBS coverage, the total income depletion would be likely to be 66.9 (p<0.01) and 58.0 (p<0.01) percent, respectively.

With regard to wealth quintiles, the results show that income depletion was more likely as wealth increased. For example, households in the 3rd, 4th and 5th quintile were more likely to have total income depletion by 34.8, 105.3 and 200.2%, respectively (p<0.01) compared to households in the 1st quintile.

For the area of residence, the results show negative and significant effects on total income depletion with respect to households in a rural area compared to households in an urban area by 23.3% (p < 0.01). Similarly, there are negative and statistically significant effects on total income depletion with respect to households in the north and northeast region compared to those in Bangkok and vicinity by 37.3 and 35.0% (p<0.01), respectively.

DISCUSSION AND CONCLUSION

NCD is a major burden of diseases in both developed and developing countries, the World Health Organization has launched global strategies, including global targets and indicators to curb mortalities and control risk among the four major chronic conditions: cancer, diabetes, cardiovascular

diseases and chronic lung diseases through primary and secondary prevention. This study found that CVD has a major impact on Thai households. One out of five (20.3%) households had at least one member with CVD in 2007, and this increased to 28.5% in 2010. This result also corresponds with a study of low-income and middle-income countries, which found that CVD is one of the most common chronic diseases and was responsible for 50% of the total disease burden in 2005 [11]. Although CA played only a minor role in this study, in 2010, 2.4% of households still at least one elderly member still CA, which is more than in households without elderly members, which had a CA prevalence of only 1.1%. This result confirms the findings of the situation of the Thai elderly in 2008 that chronic disease was the major problem among the elderly in Thailand [12]. Moreover, this study found that the percentage of households with at least one elderly member having CVD, DM, or CA increased from 2007 to 2010. These results agree with the findings from a study of elderly in the US which found that the prevalence of chronic disease with co-morbidity of elderly people increased overtime [13]. Moreover, the study on multi morbidity among the rural elderly in Bargarh district of Odisha (India) found that multi-morbidity was higher for the elderly, especially for male elderly, and recommended that there was an urgent need to develop geriatric health care services in that developing country [14].

Findings from this study indicate that the total wealth depletion of the household had a positive association with respect to households with at least one elderly member who had a chronic disease, especially households with elderly members who had CA. Health insurance could protect against the impact of chronic disease with respect to wealth depletion of the household. Both UC and SSS had a negative and significant association with wealth depletion, while CSMBS had no significant negative effect. This is because more members of CSMBS belong to wealthy quintiles, while a majority of UC members belong to the poorest and poor quintiles with limited resilient capacity, and therefore experience higher wealth depletion [15].

This result is contradictory with a study in China which found that health insurance increases the risk of high and catastrophic spending as insurance encourages people to seek more care when sick and to seek expensive care from higher-level hospitals [9]. It is important to note that health insurance systems in China did not provide a comprehensive benefit package and substantial copayment. Moreover, a study in Russia also found that health insurance of household members was associated with increased health care. Russia is similar to China is that the insurance does not provide full coverage and substantial co-payment [16].

This study found that having at least one elderly member with CA had the highest positive and significant effect on total income. This might be because of high health care costs and reduction in income due to inability to work. Using data from the USA, Smith [17] found that a severe health event resulted in reduction in time at work by about four hours per week. Using the same data, Levy [18] found that health problems reduced household income and reduced the probability of working by approximately ten percentage points. A study using Indonesian data found significant economic costs associated with illness and reduction in labor supply [19]. Wagstaff [20] studied data from Vietnam and also found that "health shock may precipitate increase in unearned income that partially offsets reductions in earned income and large increases in medical spending".

RECOMMENDATION

This study confirms that the chronic disease burden of household members increases with age. Therefore, promoting healthy ageing is important. Government and non-government agencies should focus on the prevention of NCD and promote exercise in the community in order to enhance healthy behavior before people develop preventable chronic diseases. Health insurance could protect households from wealth and income depletion. Thus, adding more health benefit packages in health insurance for the elderly might be one strategy to deal with increased risk of elderly morbidity. For example, health insurance should cover the cost of traveling to/from the hospital. In addition, there should be more social support such as providing more financial subsidies for caregivers.

On limitation of this study, as PSES is a face to face interview survey, the respondents may suffer from recall bias and can over or under report changes in their assets and incomes, as well as a lack of clear definitions of having chronic conditions. This is an unavoidable limitation commonly faced by any interview surveys. Future study may focus on effective interventions preventing NCD in the pre-elderly population through primary and secondary preventions; as well as effective coverage of treatment of NCD in elderly to prevent complications such as diabetic foot [21], retinopathy and mortality from cancers.

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CONFLICT OF INTEREST

None declared by all authors.

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