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Elderly Population Projection and Their Health Expenditure Prospects in Japan

Tetsuo Fukawa[1,2,3]

[1]Co-Representative, Institution for Future Welfare, Tokyo, Japan
[2]Musashino University, Tokyo, Japan
[3]Hitotsubashi University, Tokyo, Japan
Email: fukawa@ifwj.org

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Abstract

By using a dynamic micro-simulation model named INAHSIM-II, we conducted a population-household projection in Japan (INAHSIM 2017) for the period of 2015-2065. Due to rapid aging of the population, the distribution of the elderly (65 years old or older) by dependency level has a profound impact on health expenditure (namely medical expenditure and long-term care expenditure) of the elderly. In this paper, we estimated health expenditure of the elderly in 2025-2065, using the results of the projection of the elderly by dependency level.

Keywords

Population-Household Projection, Dependency Level of the Elderly, Medical Expenditure, LTC Expenditure

1. Introduction

Most medical services in Japan are provided through the public medical insurance system. The entire population has been covered by the public medical system since 1961. Japan has three categories of medical insurance: employment-based Health Insurance, region-based National Health Insurance, and Health Insurance for the Elderly aged 75 or over (since April 2008). The average contribution rate of employment-based Health Insurance is 10.0 percent of annual wages today, shared evenly by employers and employees. Patient's cost-sharing has been unified to 30 percent of medical costs for non-elderly patients and 10 or 20 percent for elderly patients. However, there is an upper ceiling on patients' cost-sharing, and the cap is lower for low-income persons. In order to reduce the demand for medical services by preventing lifestyle-related diseases, patient-

oriented healthcare has been pursued recently. In accordance with higher patient expectations, the measurement and assurance of quality of medical services has become an important policy area in Japan [1].

Table 1 shows long trends of population and medical expenditure in Japan. Aging of the population has been quite rapid due to low fertility and steady extension of life expectancy, and aging rate (the proportion of those who are 65 years old or over to the total population) has increased from 7.1% in 1970 to 26.6% in 2015. On the other hand, National Medical Expenditure as percent of GDP has increased from 3.3% to 7.9% during the same period. National Medical Expenditure is a common data source to analyze medical expenditure in Japan. As seen in Table 1, National Medical Expenditure as percent of GDP has been in line with Public financing part of OECD health expenditure until 2010. However, the latter has been departing from the former recently, because more elements of long-term care expenditure were to be included in the latter.

In many developed countries, expenditure on long-term care for the elderly is especially a matter of great concern due to the aging of the population. In view of aging of the population and rising consumer expectations about the quality and quantity of LTC services, it is a common concern among developed countries how to increase incentives for efficiency and consumer direction in the LTC system as well as how to finance LTC expenditure [1].

Japanese LTC Insurance has been implemented since April 2000. Japan followed the German model, but there are many important differences between the two systems (Table 2).

The main beneficiaries of the Japanese LTC Insurance are the elderly aged 65 or over. One of the main reasons to introduce the LTC Insurance in Japan was to reduce the number of so-called socially induced hospitalization (Note 1) cases especially among elderly patients. Benefits are available after care need assessment, which is done by each municipal committee according to their physical

Table 1. Long trends of population, medical expenditure and LTC expenditure in Japan.

Year	Population		TFR	Life expectancy at birth (year)		National Medical Expenditure (trillion Yen)			LTC Expenditure		OECD Health Expenditure	
						Total		65+				
	Total million	65+ (%)		Males	Females	trillion	% GDP	trillion	trillion Yen	% GDP	Total % GDP	Public % GDP
1970	103.7	7.1	2.13	69.3	74.7	2.5	3.3	…	…	…	4.4	3.1
1980	117.1	9.1	1.75	73.4	78.8	12.0	4.8	…	…	…	6.3	4.5
1990	123.6	12.1	1.54	75.9	81.9	20.6	4.6	…	…	…	5.7	4.5
2000	126.9	17.4	1.36	77.7	84.6	30.1	5.9	14.6	3.6	0.7	7.2	5.8
2010	128.1	23.0	1.39	79.6	86.3	37.4	7.8	20.7	7.6	1.6	9.2	7.5
2015	127.1	26.6	1.46	80.8	87.0	42.3	7.9	24.8	9.5	1.8	10.9	9.2

Sources: Ministry of Health, Labour and Welfare, OECD Health Statistics 2017.

Table 2. Long-term Care Insurance in Japan and Germany.

	Japan (since 2000)	Germany (since 1996)
Insurer	Municipality	Care Funds
Insured	Persons aged 65 or older (Category 1), and persons aged 40 to 64 years old and subscribers of health insurance (Category 2)	All subscribers of health insurance
Contribution (rate)	Category 1: about 5000 yen per month on average Category 2 Health Insurance Association: 1.55%	2.55% (+0.25% if childless)
Financial source	User charge: 10 (20)% Government subsidy: 50% of LTC benefits Contribution: 50% of LTC benefits	Contribution: 100%
Beneficiaries	All Category 1 after care assessment + those Category 2 who suffer from age-induced illness (exceptional), both after care assessment.	All insured and their family who need long-term care of middle level or above.
Care assessment	Municipal committee	MDK (Medizinische Dienst der Krankenversicherung)
Care management	since April 2000	since July 2008
Insurance benefits	Benefit in kind only.	Benefit in kind or in cash or in combination.
	Home care services: Frail 1 - 2 Level 1 - 5	Home care services: Level 1 - 5 (since 2017)
	Facility-based services: Skilled nursing facilities Health service facilities for the elderly Skilled nursing wings of geriatric hospitals	Facility-based services: Level 1 - 5 (since 2017)
Expenditure	1.8% of GDP in 2015	0.9% of GDP in 2015
Responsible authority	Municipality	Provincial Government

Source: IHEP (2017). Health-related System and Data in Germany-2016 (in Japanese) for Germany.

and mental functioning. The income and family situation of the elderly are not considered in determining the level of care needs. Cash options are not available.

Elderly assessed with the lowest care needs have been moved to a preventive scheme since 2006. Facility-based services are provided at skilled nursing facilities, health service facilities for the elderly (primarily for rehabilitation), and skilled nursing wings of geriatric hospitals. So-called "hotel costs" (eating and accommodation) were eliminated from the benefit catalogue of the LTC Insurance since April 2006. The program is financed through a combination of contributions from the insured, government subsidies, and user charges. Service users must pay 10 percent of expenses, although there is an upper ceiling for this user charge. Regional differences are allowed to leave the management of the system to each municipality's discretion [1].

In this paper, projection of the elderly by dependency level is described in Sec-

tion 2. Using the simulation results, future health expenditure is estimated in Section 3. In Section 4, based on an international comparison on health expenditure, we discussed the challenge Japan is facing with its population ageing. Japan is already the most aged country and will be more serious in future, and Japan must deal with issues related to aging societies as a front runner among developed countries.

2. Projection of the Elderly by Dependency Level

1) Dependency level

The dependency of the elderly aged 65 or over is classified into 5 levels as follows [2]:

Level 0: No disability and completely independent;

Level 1: Some disability but basically independent;

Level 2: Slightly or moderately dependent; and

Level 3: Heavily dependent.

Level 4: Death

Levels 2 and 3 correspond to persons eligible for the Japanese LTC Insurance, and Level 3 corresponds to care need assessments 4 and 5 in particular.

2) INAHSIM 2017 Simulation

Detailed explanation about the INAHSIM model (Note 2) is found in Fukawa (2010) [2]. Events contained in the simulation model include not only such vital events as birth, death, marriage, divorce, and changes of household situations generated by them, but also merger of aged parent(s) with the child's household and other movements of households. The death rate is given by age and sex for those who are less than 65 years old, but it is determined by transition probability of dependency for those who are 65 years old or over. The number of deaths is the sum of all transitions from Levels 0 - 3 to Level 4 within one year. Therefore, the death rate for those who are 65 years old or over is determined by dependency transition which is given by age group and sex.

The total fertility rate (TFR) was assumed to remain the same throughout the simulation period, and we assumed two levels (TFR = 1.4 and 1.7). The death rate was assumed to decline gradually, and resulting life expectancy at birth will be 85 years for males and 91 years for females in 2065. The other transition probabilities remain the same throughout the simulation period. Explanation about the INAHSIM 2017 Simulation is found in Fukawa (2017a) [3].

3) Projection of the elderly by dependency level

The total number of population will decrease from 127.1 million in 2015 to 88 million in 2065, and the aging rate (proportion of those who are 65 years old or over to the total population) will increase from 26.6% in 2015 to 39% in 2065, if future TFR is assumed as 1.4. **Table 3** shows the distribution of the elderly (65+) by dependency level. The proportion of dependency level 2 was 8.2% (6.1% for males and 9.8% for females), and dependency level 3 was 3.6% (2.2% for males and 4.7% for females) in 2015 [4]. The proportion of those elderly who are com-

Table 3. Distribution of the elderly (65+) by dependency level: 2015-2065.

Year	Total				Males				Females			
	Dependency level				Dependency level				Dependency level			
	0	1	2	3	0	1	2	3	0	1	2	3
2015	53.9	34.3	8.2	3.6	52.0	39.7	6.1	2.2	55.4	30.2	9.8	4.7
2015	53.1	34.8	9.0	3.2	51.7	36.7	8.9	2.7	54.3	33.2	9.0	3.6
2025	50.7	35.0	10.5	3.8	49.5	36.2	10.8	3.5	51.6	34.1	10.3	4.0
2035	48.8	35.2	11.5	4.5	47.5	36.7	11.7	4.1	49.9	33.9	11.4	4.8
2045	48.1	35.3	11.5	5.1	47.1	36.8	11.5	4.5	49.0	34.0	11.4	5.6
2055	45.4	35.6	12.9	6.2	43.9	37.2	13.4	5.6	46.6	34.2	12.5	6.7
2065	42.9	34.5	14.6	8.0	41.9	36.3	14.7	7.2	43.8	33.1	14.5	8.6

(Note) Values in 2015 above the dotted line are based on Fukawa (2017b).

pletely independent decreases gradually, and that of those elderly with dependency levels 2 and 3 will steadily increase, and about 9% of female elderly (65+) will become dependency level 3 in 2065. The share of dependency level 3 is always higher for females than males at each age group. Those elderly in levels 2 and 3 are supposed to use the LTC services.

The incidence of dependency level 3 increased from 0.5% at age group 65 - 69 through 9.8% at age group 85 - 89 to 41.9% at age group 100+ in 2015 (both sexes) [4]. Future incidence was slightly modified according to the assumption of longevity extension, and the number of dependency level 3 continues to increase in the future. The number increases remarkably after age 85 for both males and females, and the number is higher in later years. The tendency is especially remarkable for females as shown in **Figure 1**.

3. Future Health Expenditure in Japan

1) Method

Japanese medical expenditure was 42.3 trillion yen, or 7.9 percent of GDP, in FY2015.Medical expenditure used by the elderly aged 65 or over was 24.8 trillion yen, or 59 percent of the total. Japanese LTC expenditure in FY2015 was 9.5 trillion yen, or 1.8 percent of GDP, and elderly LTC expenditure was 98 percent of the total.

Figure 2 shows Japanese age-related expenditure profiles (namely per capita expenditure) for medical expenditure and elderly LTC expenditure as percentage of per capita GDP in 2015. For those aged 65 or over, LTC expenditure is about one-third of medical expenditure. However, for those aged 90 or over, LTC expenditure is greater than medical expenditure.

By applying future age-group population to the age-related expenditure profiles for medical expenditure in **Figure 2**, future medical expenditures can be estimated (Case 1 in **Table 4**). We also used more desirable age-related expenditure profiles which once appeared in 2009 and disappeared afterwards. This

Table 4. Per capita medical and LTC expenditure of the elderly by age group: 2015 (total expenditure in billion yen, per capita expenditure in thousand yen).

	Population (1000)			Medical expenditure				LTC expenditure				
	Total	L2	L3	Total	Per capita			L2		L3		L3/L2
					Case 1	index	Case 2	Total	Per capita	Total	Per capita	
65 - 69	9750.7	116.8	48.2	4847.6	497		497	205.8	1762	144.3	2994	1.7
70 - 74	7781.0	198.0	77.8	5079.7	653	1.00	653	349.5	1765	234.8	3019	1.7
75 - 79	6346.4	353.0	134.8	5120.0	807	1.25	816	644.0	1824	416.3	3088	1.7
80 - 84	5016.4	627.9	234.0	4775.4	952	1.40	914	1208.4	1925	750.5	3207	1.7
85 - 89	3151.8	756.4	305.9	3301.9	1048	1.50	979	1530.9	2024	998.8	3265	1.6
90 - 94	1364.1	500.0	259.1	1519.9	1114	1.35	881	1056.3	2113	852.8	3291	1.6
95+	425.8	180.1	151.6	501.2	1177	1.20	783	400.0	2221	500.7	3303	1.5

Source: Ministry of Health, Labour and Welfare. National Medical Expenditure for FY 2015, and LTC.

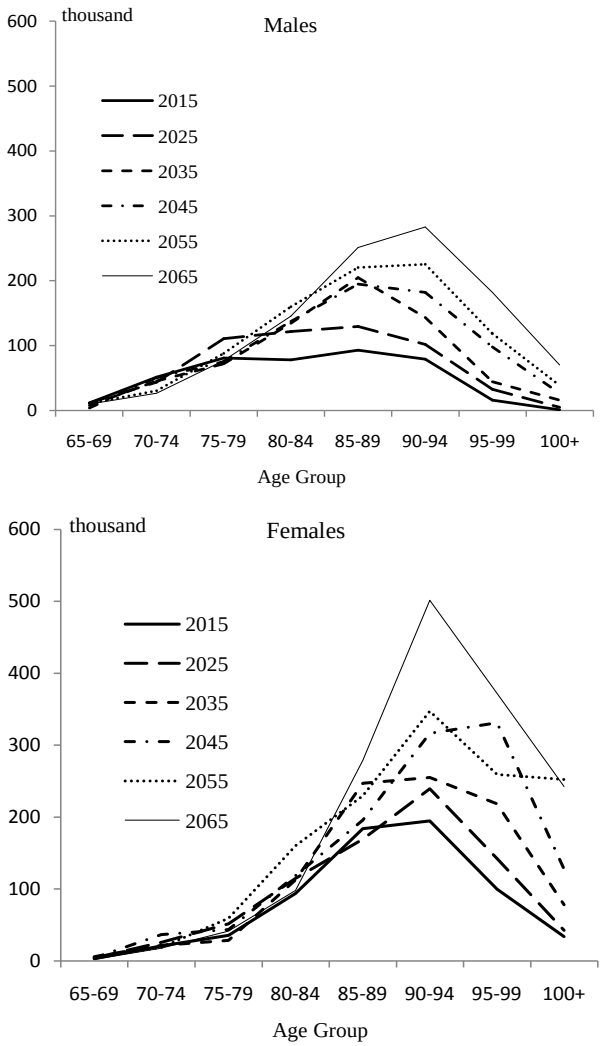

Figure 1. Number of dependency level 3 according to age group and sex: 2015-2065.

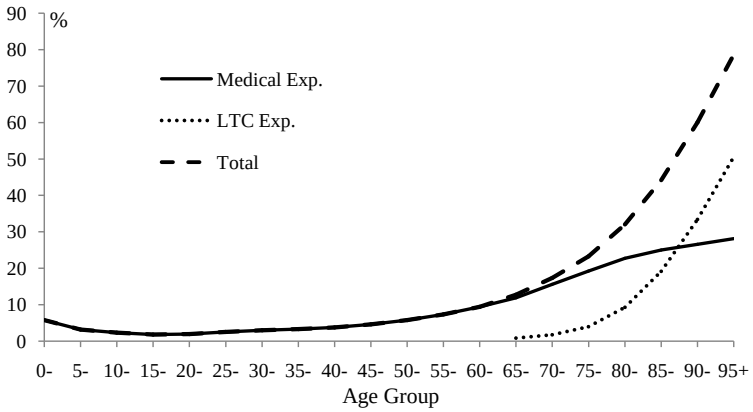

Figure 2. Per capita medical expenditure and per capita LTC expenditure by age group: As percent of per capita GDP, 2015. Source: Ministry of Health, Labour and Welfare. National Medical Expenditure for FY 2015, and LTC Expenditure Report for FY 2015.

second age-related expenditure profiles are shown as Case 2 in **Table 4**. Estimated future medical expenditure in this manner is based on 2015 prices, and no future developments such as technology advance and price increase are considered.

Elderly LTC expenditure occurs only from those whose dependency levels are 2 or 3 by definition. Age-related expenditure profiles of LTC expenditure in 2015 for those whose dependency levels are 2 or 3 are shown in **Table 4**. Future elderly LTC expenditure was calculated by applying future age-group population by dependency level to the age-related expenditure profiles by dependency level in **Table 4** (Case 1). We also assumed another case, where age-related expenditure profiles for dependency level 2 reduced by half due to a lesser prevalence rate through prevention or some kind of cost-saving (Case 2). Again, future elderly LTC expenditure is based on 2015 prices, and no future developments such as technology advance and price increase are considered.

Figure 3 shows per capita medical expenditure age profiles for Case 1 and Case 2, and per capita LTC expenditure age profiles for the elderly with dependency levels 2 and 3 in **Table 4**. It is quite clear from **Figure 3** that LTC services for the elderly with dependency level 3 are expensive, regardless of age group.

2) Results

Table 5 shows the results of future medical and elderly LTC expenditures in Japan. It is interesting to notice from this table that medical expenditure of the elderly (65+) will be peaked around 2045 and will decline afterwards, and the expenditure level in 2065 will be lower than the level in 2025, if we consider only demographic factors (namely without assuming inflation, technology advance, etc.). On the other hand, elderly LTC expenditure will continue increasing until 2065. Consequently, the sum of medical and LTC expenditures of the elderly (65+) will increase until 2055, and decline afterwards. If we focus on the elderly aged 80 or over, the sum of medical and LTC expenditures will increase until 2065.

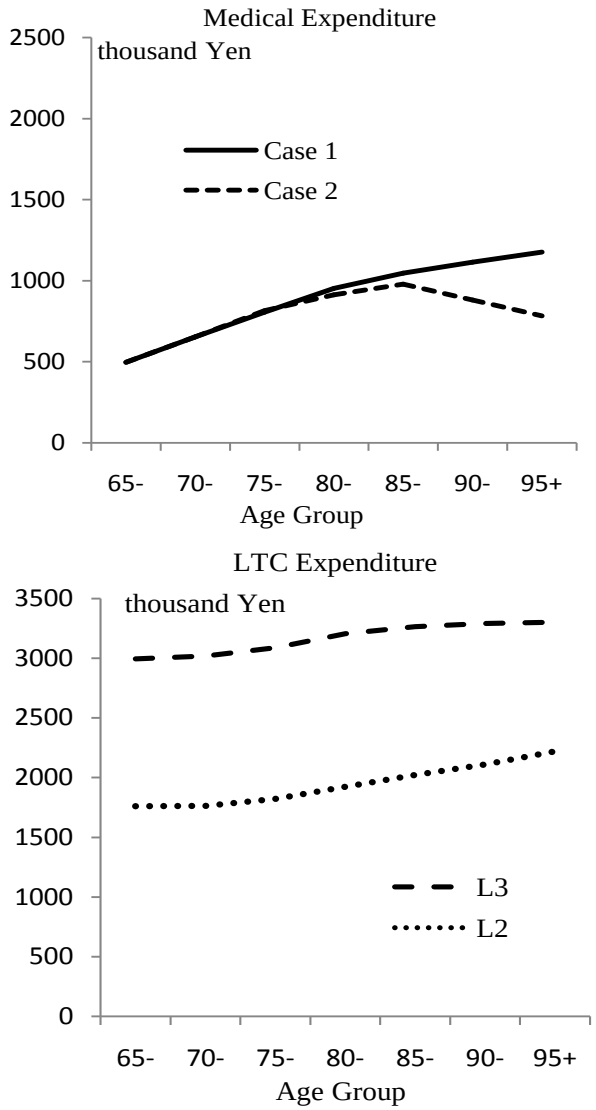

Figure 3. Per capita medical expenditure and LTC expenditure of the elderly by age group: 2015.

Table 5. Health expenditure of the elderly in 2015-2065 in Japan (in trillion Yen).

Year	65+						80+					
	Medical exp.		LTC exp.		Total		Medical exp.		LTC exp.		Total	
	Case 1	Case 2	Case 1	Case 2	Case 1	Case 2	Case 1	Case 2	Case 1	Case 2	Case 1	Case 2
2015	24.8		9.3		34.1		9.9		7.3		17.2	
(% GDP)	(4.7)		(1.7)		(6.4)		(1.9)		(1.4)		(3.2)	
2025	28.1	26.9	11.7	8.0	39.8	34.9	12.6	11.4	8.6	6.1	21.2	17.5
2035	29.2	27.6	13.6	9.4	42.8	37.0	15.5	13.9	10.9	7.8	26.4	21.7
2045	30.1	28.4	14.9	10.6	45.0	39.0	14.7	12.9	12.0	8.8	26.7	21.7
2055	29.7	27.9	16.4	11.8	46.1	39.7	16.9	15.0	13.7	10.2	30.6	25.2
2065	27.7	25.5	18.1	13.3	45.8	38.8	16.9	14.6	15.8	11.9	32.7	26.5

Compared to Case 1, Case 2 is more sustainable. Total expenditure will be reduced by 13 - 15% for the elderly aged 65 or over, and by 18 - 19% for the elderly aged 80 or over in Case 2.

Concerning the elderly aged 80 or over, the size of LTC expenditure relative to medical expenditure in Case 1 will increase from 68% in 2015 to 93% in 2065. This means that LTC expenditure will be almost parallel with medical expenditure for those who are aged 80 or over in 2065.

4. Discussions

Japanese medical expenditure may not be so high taking a high aging rate into consideration. According to OECD Health Statistics 2017, Japanese current expenditure on health was 10.8% of GDP in 2014. If we calculate "public medical expenditure" as current public expenditure on health minus public LTC (health) expenditure, then Japanese public medical expenditure was 7.3% of GDP in 2014, which was lower than that in Germany or France (Table 6).

Figure 4 shows aging rate (X axis) and health expenditure/GDP of 15 countries in 2016. As mentioned before, OECD health expenditure includes not only medical expenditure but also some portion (which differ country by country) of LTC expenditure. Nevertheless, it is quite clear from Figure 4 than Japan is exceptional on aging rate and the USA is exceptional on health expenditure as percent of GDP. As population is aging, how to provide medical and LTC services to the elderly within an affordable burden to the working population is a mounting concern in the developed countries. Japanese current expenditure on health in Table 6 is not so high taking a high aging rate into consideration. However, age profiles of medical expenditure and LTC expenditure show signs of increase with further aging.

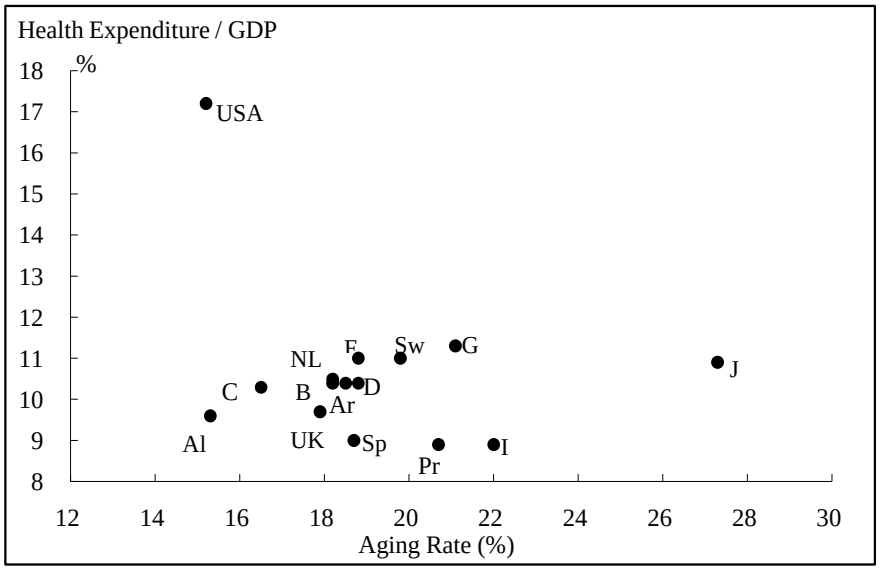

Figure 4. Aging rate and health expenditure as % of GDP in 15 countries: 2016. Source: OECD Health Statistics 2017.

Table 6. Comparison among 7 countries: 2014 (in % of GDP).

		France	Germany	Japan	NL	Sweden	UK	USA
Current expenditure on health a	Total	11.1	11.1	10.8	10.9	11.1	9.8	16.5
	Public A	8.7	9.3	9.1	8.8	9.3	7.8	8.2
LTC (health) a	Total	1.2	1.8	2.0	2.9	2.9	1.8	0.9
	Public B	1.2	1.2	1.8	2.6	2.7	1.2	0.5
Public medical expenditure	A-B	7.5	8.1	7.3	6.2	6.6	6.6	7.7
Public spending on LTC b		1.9	1.1	2.1	4.3	3.2	1.2	0.5

Note: a OECD Health Statistics 2017. b Public spending on LTC (health and social components) from OECD Health at a Glance 2016.

The dependency of the elderly aged 65 or over was classified into 4 levels, and we observed a sharp increase in the proportion of heavily dependent elderly between 2015 and 2065. This finding suggests that aging of the population will be severe, unless future improvement in the dependency of the elderly is not assumed.

According to our estimation, medical expenditure will reach its peak and decline afterwards in Japan, if we consider only demographic factors. The LTC expenditure is larger than medical expenditure for very advanced age population, and simulation results clearly show that it is the elderly LTC expenditure which should be controlled vigorously in future years. Comparing Case 1 and Case 2 of future elderly LTC expenditures, a policy package to reduce the cost occurring from those elderly with dependency level 2 through lower incidence rate or smaller benefit catalogue will be feasible and quite effective to increase the sustainability of LTC insurance in Japan.

Medical expenditure will grow under the strong pressures of medical technology advances and people's expectation for better medical services [1]. Medical spending of the US elderly is very concentrated, the poor consume more medical goods and services than the rich, and those currently experiencing either very low or very high medical expenses are likely to find themselves in the same position in the future [5]. The same situation may be found also in Japan. Among the main spending drivers for health care (demographics, income effects, low productivity and technological advances), over half of productivity gains in the overall economy has been translated to wages in the health care sector on average, but technology has also been shown to have, on aggregate, a positive impact on health spending with estimates of its exact effect varying widely [6].

Although many of health improvements will allow people to live longer, in better health, and with greater productivity, new technologies will increase health care expenditures because the reduction in spending resulting from better

health will be outweighed by the costs of the technologies themselves and by health expenditures during the additional years of life that the technologies may make possible [7]. In addition, technologies with a low per-patient cost may turn out to be very expensive as they are applied to a broader population [7]. Different policy and institutional factors (such as financing mechanisms, decentralization, organization of health provision, etc.) can have a substantial impact on the growth in public spending on health care [8]. Therefore, it is quite relevant for reform discussion in Japan to increase incentives for efficiency and consumer direction in medical and LTC systems.

Japanese LTC Insurance is a universal program financed by contribution, public subsidy, and user charge, and has relieved considerably the financial pressures on the medical expenditure of the elderly, because long-term stays of the elderly patients in hospitals had been included in the medical expenditure [1]. The Japanese approach is to convert a vertically divided welfare and health care system for the elderly to a coherent system in terms of institutional and domiciliary services and to separate the LTC from the medical care insurance [9]. Japanese LTC system belongs to the same group as German or Dutch system, namely universal coverage within a single program, but Japanese system applies primarily to the old population, compared to German and Dutch systems which apply to all people with assessed care-need regardless of the age-group [10].

The need for LTC is quite common among the very old, and the provision of LTC has been changed from welfare and rationing services to needs-based insurance benefits in Japan. Age profile of medical expenditure may become convex (namely show peak and decrease afterwards), but age profile of LTC expenditure in **Figure 2** is a steep increasing curve and very sensitive to the aging of the population. Even taking into account only the demographic impact of an ageing population, public expenditure on LTC over 2010-2060 for the EU-27 would increase from 1.8% to 3.6% of GDP, and the issue of public spending on long-term care will become an increasingly important part of the debate on how to ensure the long-term sustainability of public finances [11]. Similarly, **Table 5** shows that elderly LTC expenditure would double over 2015-2065 based on 2015 prices in Japan. Therefore, it is indispensable to prevent and reduce the incidence of LTC need as much as possible.

In our estimation on LTC expenditure, we did not distinguish between home care and institutional care. Long-term care (LTC) policies in many OECD countries aim to help people to live independently in the community for as long as possible and rates of home care have increased in recent years [12]. Moreover, home care is often a more expensive way of managing severe needs than institutional care, but some older people prefer to remain in the community even with relatively severe needs, leading to a trade-off between controlling public expenditure and offering choice and independence to LTC users [12].

The future expenditure on elderly LTC is very sensitive to the exact growth of

the number of elderly, changes in real prices of long-term care, and trends in dependency among the elderly [9]. While previous studies have shown that Time-To-Death (TTD) explains LTC expenditure over and above the effect of age, age and informal care availability are found to remain important determinants of LTC expenditure after controlling for disability, and LTC spending is driven more by disability than by survival trends unlike in the case of medical care spending [13]. The effects of aging on LTC consumption might be mitigated by a "healthy aging" process if longevity gains are fully or partially translated in additional years in good health. The correlation across countries between LTC spending and aging is rather weak [14], therefore the way of organizing and financing LTC plays an important role [1].

For medical and LTC services, it is especially important to incorporate the right incentives in the system, and new forms of solidarity, including fair share of burden among generations, are indispensable in order to make Japanese social security system sustainable. The health care cost borne by retirees is projected to rise substantially, and current workers will have to consider staying in the workforce longer or save and invest more money while working, to prepare for the higher expected health care costs waiting for them in retirement [15]. Further work is needed to better understand the social, medical, and long-term care needs of older Americans and how best to address those needs, and focusing on ways to improve the management and coordination of care for high-need, high-cost patients will be essential to meet the needs of an aging population [16]. In terms of aging rate, Japan is the front runner among developed countries. Therefore, future Japanese picture of the elderly society shall provide implications for new forms of solidarity.

Financing of the social expenditure such as LTC benefit, family benefit, benefit for low income families and benefit for handicapped is still one of the key issues in Japan. Pressure for an increased public budget on formal care services need to be seen in conjunction with the projected impact of aging on other expenditure items, notably pensions and health care, and it is worth exploring the possible impact of investing in LTC on the future level of health care expenditure, as better prevention and better follow-up (including rehabilitation and general long-term care) can avoid the recourse to more acute (often more expensive) types of care [11].

Future spending levels and the sources of spending are therefore not primarily technical matters but need to involve public debate and deliberation: this debate should draw on evidence from both the United Kingdom and other countries about the consequences of different decisions on people with different incomes and the impact on the use of the NHS and long-term care [17]. In Japan, new options have been discussed, including broadening the financial bases of social benefits, more desirable mix of public system and private arrangements, and redefinition of the elderly. Concerning a redefinition of the elderly, we calculated a threshold age. If we define the elderly as the oldest 20 percent of the population

based on the stable population in the Life Tables, then the threshold age for the elderly was 59 years old in 1960, 69 in 2015 and will be 72 years old in 2065.

5. Conclusions

By using a dynamic micro-simulation model named INAHSIM-II, we conducted a population-household projection in Japan for the period of 2015-2065. We estimated health expenditure (medical expenditure and long-term care expenditure) of the elderly (65+) in 2025-2065, using the results of the projection of the elderly by dependency level. Medical expenditure will be peaked around 2045 and will decline afterwards, if we consider only demographic factors. However, elderly LTC expenditure will continue increasing until 2065. Consequently, the sum of medical and elderly LTC expenditures will increase until 2055, and decline afterwards. The LTC expenditure will be almost parallel with medical expenditure for those who are aged 80 or over in 50 years. It is indispensable to alter age profiles of medical and LTC expenditures of the elderly in order to make the health system sustainable in future years in Japan.

(Note 1) There had been frequent use of hospitals instead of long-term care facilities because the accessibility to the latter is limited, and the medically oriented services are readily accessible to the elderly in Japan. Those elderly who stay in hospitals much longer than medically appropriate are called "social hospitalization", an induced stay in hospitals caused by social reasons.

(Note 2) INAHSIM is a dynamic micro simulation model, which is written using programming language C++. The occurrence of each event is based on the Monte-Carlo method: that is if and only if a random number generated by the computer for each event is equal to or smaller than the probability given, the event is allowed to occur. When an event is determined to occur, all the necessary procedures will be carried out step by step to simulate the changing of the actual society.

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