

The Effect of Exercise on Reducing Medical and Caregiving Costs in Residents in a Japanese Rural City

EPH214

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Objectives

The Aomori Prefecture, a typical rural area located in northern Japan (Figure 1), has the shortest life expectancy since 1975. In 2013, the Center of Healthy Aging program (CHAP) started to raise health awareness in the rural city, Hirosaki in Aomori (Figure 1). In a previous study, we found that the CHAP reduced the risk of coronary heart diseases (CHDs) and strokes. We further observed a long-term reduction in medical costs using the aggregated financial data in the governmental statistics¹. In this study, we assessed the connection between daily habits and the reduction of medical and caregiving costs, in addition to the participation of the CHAP, using individual data on health resource utilization.

Methods

We included all residents registered in Hirosaki city before July 1st, 2015 (index date) and analyzed the anonymized medical and caregiving claims data from July 2015 to March 2020 (follow-up period), which were individually linked with the result of Japan-specific health checkup (SHC) and CHAP-specific checkup. All-cause medical and caregiving costs that individuals aged 40 to 74 years acquired during the follow-up period, were compared. This index age was chosen because the SHC is only provided for that age group. We used a hurdle negative binomial regression model considering the following: (1) age, sex, CHD risk score (collected in the latest checkup); (2) baseline care level; (3) information on daily habits such as exercise and walking speed compared with others the same age group, and (4) Carlson comorbidity index (CCI) assessed within 6 months prior to the index date. To adjust the difference in characteristics between the groups, an inverse probability weight (IPW) was used. As some subjects did not report their daily habits, we applied a multiple imputation method for missing values.

1) Shoji A, Kudo K, Murashita K, Nakaji S, Igarashi A. Reduction in medical costs for cardiovascular diseases through innovative health awareness projects in a rural area in Japan. PLoS One. 2022 Nov 16;17(11):e0277600. doi: 10.1371/journal.pone.0277600.

Figure 1. Location of Hirosaki city

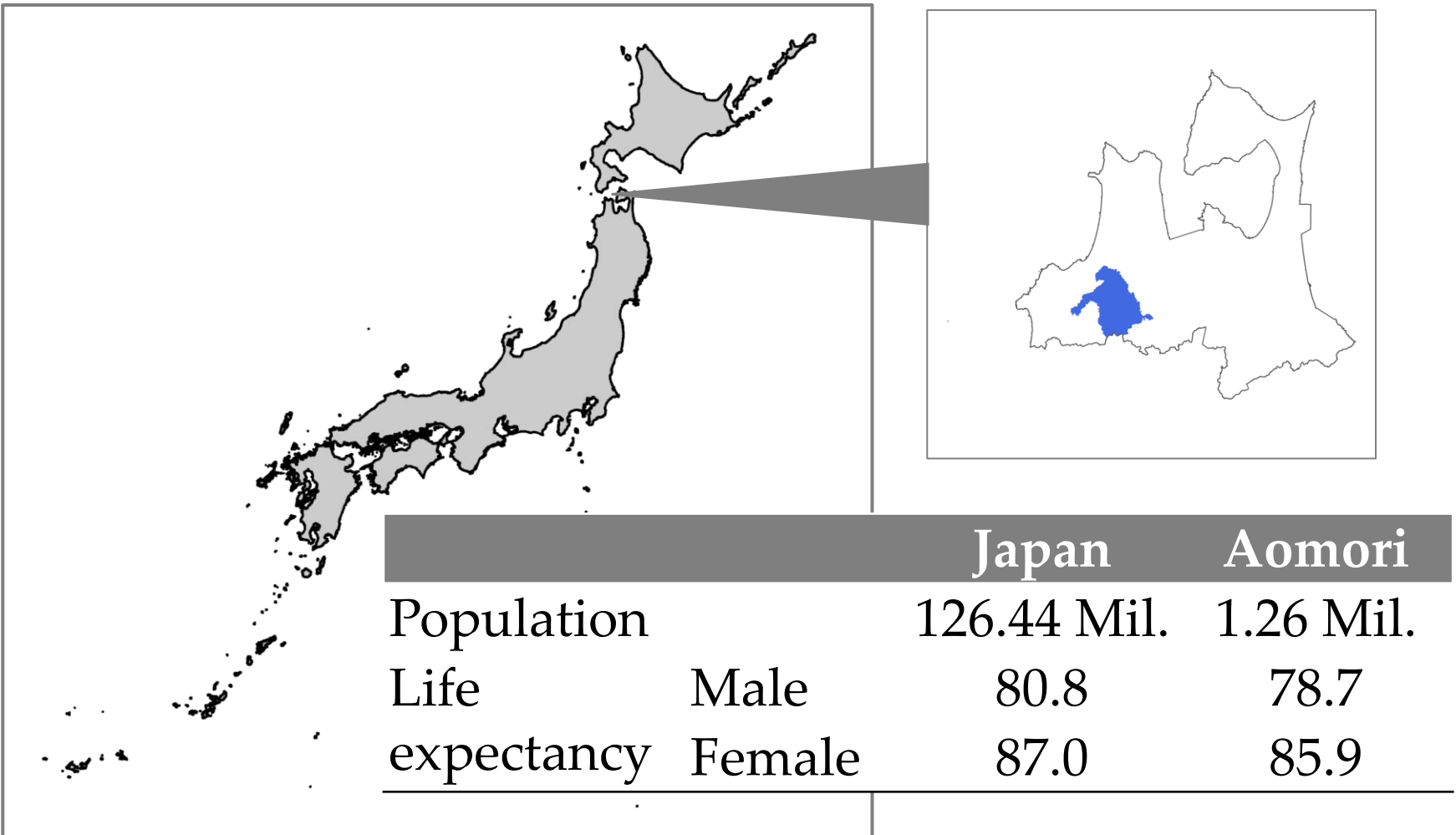


Figure 2. Flow of identifying subjects of analyses

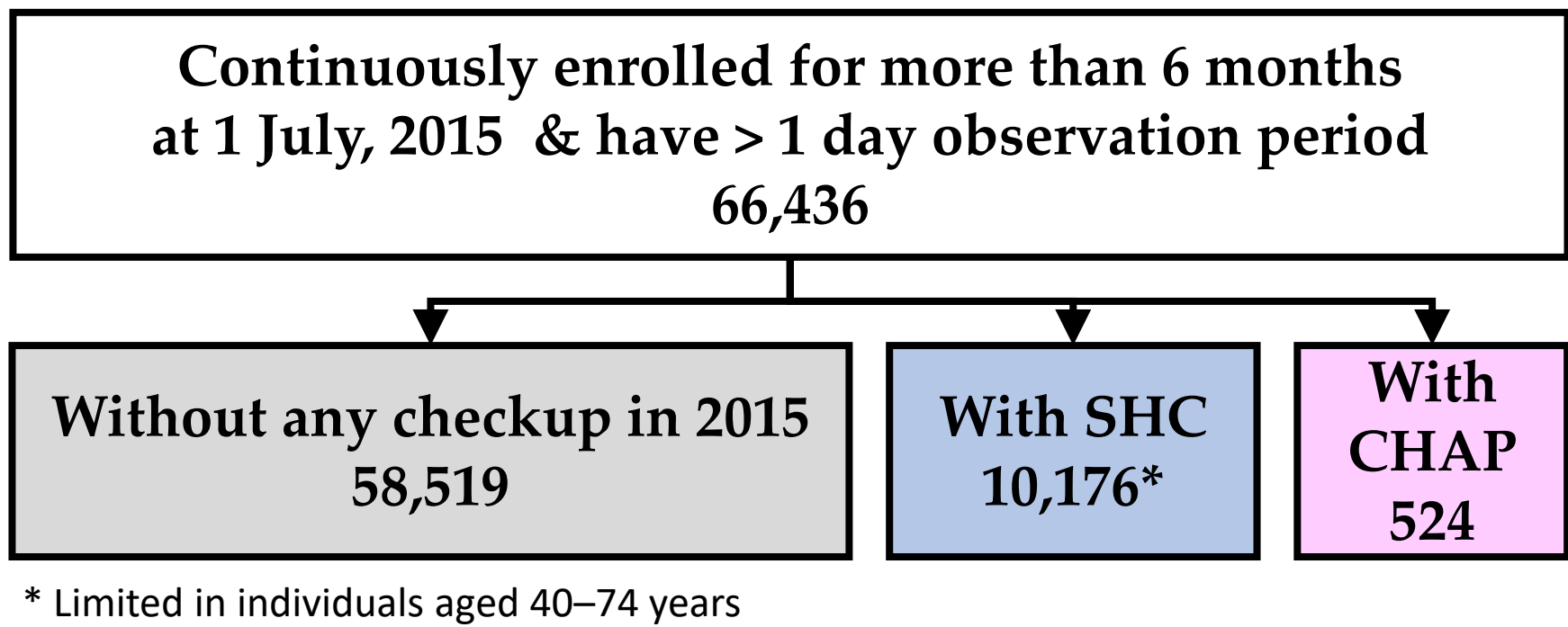


Table 1. Individual Characteristics

	No checkup		SHC		CHAP	
	n, mean	%, SD	n, mean	%, SD	n, mean	%, SD
N (40–74 years)	32,630		9,805		384	
Age (years)	60.50	9.70	64.77	7.98	61.43	8.63
Male	16,657	51.05	5,706	58.19	233	60.68
CCI	0.74	1.60	0.89	1.42	0.67	1.07
Care level	0.05	0.46	0.01	0.22	0.01	0.10
CHD Risk score	–	–	39.09	9.00	36.90	8.79
With exercise habit	–	–	1,001	33.90	72	22.15
Higher walking speed	–	–	1,271	43.04	135	41.54

CCI: Charlson comorbidity index; CHD: coronary heart disease

Results

The no checkup group showed a high baseline care level. The SHC group showed the highest age and CCI, even once subjects aged with <40 or >74 years were excluded (Table 1). No checkup group was excluded from the below analysis due to the lack of information on daily habits. After IPW-weighting, the estimate of all-cause medical and caregiving costs in the CHAP group were 0.653 higher than those in the SHC group. Subjects with exercise habit were associated with lower amount of costs. The increases in CCI by 1.0 point and CHD risk score by 1.0 point were associated with 1.318 and 1.011 times more costs, respectively (Figure 3). Using these estimated parameters, we evaluated the all-cause medical and caregiving costs per person per 5 years as follows.

Estimated 5-year costs	
A man aged 60 years with SHC	JPY 267,680
+ CHAP	JPY –42,027
+ Exercise habits	JPY –61,491
+ Higher walking speed	JPY –18,343
+ CHD risk score 5pts	JPY +15,182
+ CCI 1pt	JPY +85,147
+ Baseline care level 1pt	JPY + 159,120

Figure 4. Odds ratio of avoiding 5-year medical costs

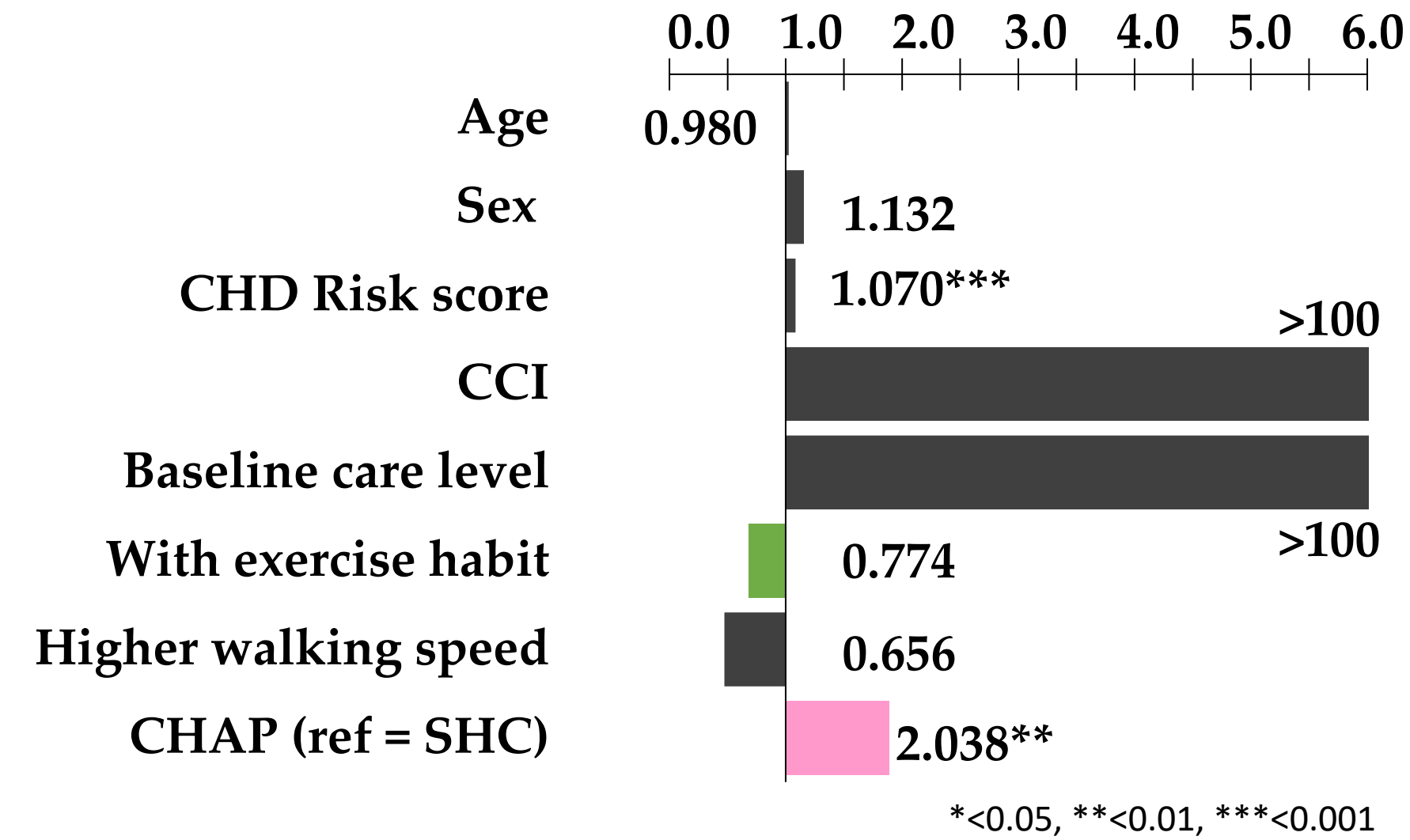
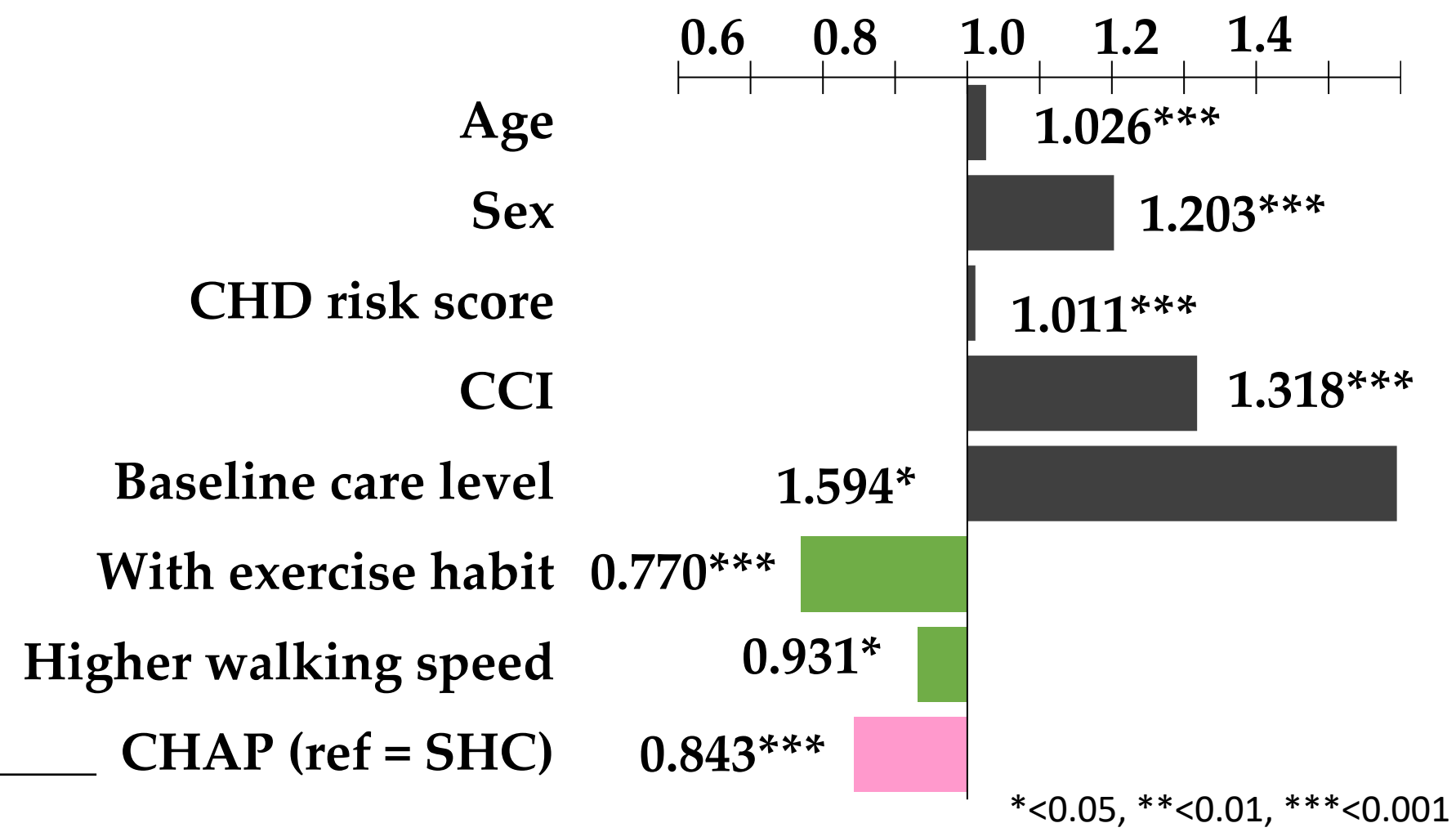


Figure 3. Risk ratio of increasing 5-year medical costs



The CHAP group showed a higher probability of incurring costs (odds ratios of 2.038). Exercise habits didn't significantly associate with all-cause medical and caregiving costs (Figure 4).

Using these estimates, we evaluated the probability of incurring medical costs per person per 5 years as follows:

Estimated 5-year probability	
A man aged 60 years with SHC	76.5%
+ CHAP	+ 8.4%
+ CHD risk score 1pt	+ 5.5%

After the multiple imputation was performed, similar results was obtained.

Conclusion

The present study was the first collaborative study between a research institute and the local government to achieve the data linkages. Using individual cost data liked with the CHAP participant information, we conclude that exercise habits, as well as participating in the CHAP, can reduce long-term medical and caregiving costs.

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