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Participation in health check-ups and mortality using propensity score matched cohort analyses

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ABSTRACT

Objective. All Japanese aged ≥40 years are eligible for free annual health check-ups including blood pressure and cholesterol measurements. It is well known that health check-up screenees are more likely to have healthy lifestyles and better health conditions than non-screenees. Therefore, controlling these factors is required to investigate whether screenees have a lower mortality risk than non-screenees independent of their lifestyles or health conditions.

Methods. We followed 48,775 Japanese National Health Insurance beneficiaries aged 40–79 years since 1994 for 11 years. We used Cox proportional hazard models adjusted for possible confounding factors. We also performed propensity for use of the health check-up matched cohort analyses.

Results. Compared to non-screenees, multiple-adjusted hazard ratios (95% confidence intervals) for all-cause and cardiovascular disease mortality among screenees were 0.74 (0.62–0.88) and 0.65 (0.44–0.95) for men and 0.69 (0.52–0.91) and 0.61 (0.36–1.04) for women, respectively. These relations were also observed when we used propensity matched cohort analyses.

Conclusion. This is the first study to show that mortality rates are lower among screenees than non-screenees in Japanese health check-ups when propensity matched cohort analyses were used for adjusting confounding factors. Further prospective studies, including randomized controlled trials, are required to confirm whether screening lowers mortality.

Introduction

Japanese have the longest life span in the world, and this has increased remarkably (Statistics and Information Department, Minister's Secretariat, Ministry of Health, Labour and Welfare, 2007). The reduction of stroke mortality in Japan is one explanation for the current status of Japanese longevity (Statistics and Information Department, Minister's Secretariat, Ministry of Health, Labour and Welfare, 2008).

One strategy to reduce stroke in Japan has been the national health check-up system. The Health Services for the Elderly Act 1982 provides for six health services including general health checks (Tatara et al., 1991). These services are inexpensive or free for all who reside anywhere in Japan and hold a resident card, who are aged ≥40 years, and who do not have access to other health examinations in the workplace. Thus, all Japanese adults aged ≥40 years can attend annual health check-ups. Height, weight, blood pressure (BP), lipids, glucose, liver function, and renal function are measured during these health check-ups (Tatara et al., 1991). Specific cancer screenings are not included in the health check-up examination. After the check-ups, depending on the results, the screenees can receive health education in a group setting or ask for individual health counseling (Tatara et al., 1991).

The U.S. Preventive Task Force (USPSTF) recommends regular monitoring for high BP, lipid disorders, and obesity in adults (U.S. Preventive Services Task Force, 2009), and these risk factors are included in the national health check system. Thus, this Japanese system of health check-up coupled with follow-up treatment of abnormalities should contribute to lowering stroke mortality among Japanese.

However, estimating the effect of health check-ups on mortality is difficult because no randomized trial exists, and participants who attend annual health check-ups are more likely to have healthy lifestyles or health conditions than those who do not.

Although previous studies did not adjust for these lifestyles or health conditions (Iwasaki et al., 2006; Lannerstad et al., 1997;

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Wilhelmsen et al., 1986), recent Japanese studies reported the relationship between health check-up and risk of mortality adjusted for possible confounding factors (Khan et al., 2004; Ikeda et al., 2005). Khan et al. (2004) investigated 3185 men and women for about 15 years and found an inverse relationship between screening and all-cause mortality. Ikeda et al. (2005) also investigated 68,825 men and women for 10 years and reported an inverse relationship between participation in screening and all-cause and cause-specific mortality only in women. However, neither of the studies adjusted for information on diet, self-rated health, nor physical function, which should also be different between participants who used health check-up (screenees) and those who did not (non-screenees).

The Ohsaki National Health Insurance (NHI) Cohort Study investigated lifestyles of the general population with very high response rate and determined whether participants used the annual health check system in 1995 (Hozawa et al., 2009; Kuriyama et al., 2006; Ohmori-Matsuda et al., 2007; Sone et al., 2008. Tsuji et al., 1998). Because the Ohsaki study had several detailed lifestyle information than the previous report, such as diet, physical function, or self-rated health, we could control for these important confounding factors.

Recently, propensity scores have been widely used in cardiovascular research (D'Agostino, 2007). This approach was used to reduce bias in observational studies. Therefore, in this study, we also used this approach to investigate the relationship between health check-up and mortality.

The present study compares general and specific mortality rates among screenees and non-screenees, after 11 years of follow-up, controlling lifestyle, and other risk factors.

Methods

Study cohort

Details of the Ohsaki NHI Cohort Study have been described elsewhere (Hozawa et al., 2009; Kuriyama et al., 2006; Ohmori-Matsuda et al., 2007; Sone et al., 2008; Tsuji et al., 1998). In brief, we sent a self-administered questionnaire between October and December 1994 to all NHI beneficiaries aged 40–79 years living in the catchment area of the Ohsaki Public Health Center. The NHI in Japan is used by farmers, self-employed individuals, pensioners, and their dependents. Because these populations usually do not have access to any other health examinations, they could all be considered targets of health check-ups. Of the 54,996 eligible individuals mailed the questionnaire, 52,029 (95%) responded. To ascertain the date of and reason for withdrawal from the NHI, we started the prospective collection of NHI withdrawal history files on January 1, 1995. We excluded 774 participants who had withdrawn from the NHI before the baseline questionnaire survey. Thus, 51,255 participants ultimately formed the study cohort. Among the participants of the Ohsaki NHI Cohort Study, 16,515 (32.2%) had undergone an annual health check between April and December 1995. In Japan, calendar year started in April, and health check-ups were usually carried out from April to December. To exclude bias from participants who died before being able to attend a health check, we further excluded 2480 participants who died or moved from the area before the health check ended on December 6, 1995 (Fig. 1). Thus, our study participants comprised of 48,775 men and women (men, 23,451; women, 25,324). We defined 15,985 of them as screenees and 32,790 as non-screenees of the health check in 1995.

The ethics committee of Tohoku University School of Medicine reviewed and approved the study protocol. We considered that returning signed, self-administered questionnaires implied written consent to participate in this study.

Exposure data

The questionnaire included items about cigarette smoking, alcohol consumption, self-reported weight and height, histories of diseases, participation in sports or exercise, time spent walking, sense that life is worth living (*ikigai*) (Sone et al., 2008), self-rated health, physical function, the frequency of recent average consumption of 4 beverages (green tea, oolong tea, black tea, and coffee) and 36 food items, and cancer screening within the previous 5 years. Validation of the questionnaire for time spent walking (Tsubono et al., 2002) or the food frequency questionnaire (Ogawa et al., 2003) has already been reported. The physical function status was assessed using the six-item measure of the Medical Outcomes Study (MOS) Short-form General Health Survey (Stewart et al., 1988): able to perform vigorous activity (MOS scores of 5 or 6); capable of moderate but not vigorous activity (MOS scores of 2–4); and capable of only low physical activity (MOS scores of 0 or 1). We defined MOS 0 or 1 as limited physical function.

Follow-up

The end points among the cohort of 48,775 were all-cause mortality and cause-specific mortality from December 6, 1995, to December 31, 2006. The

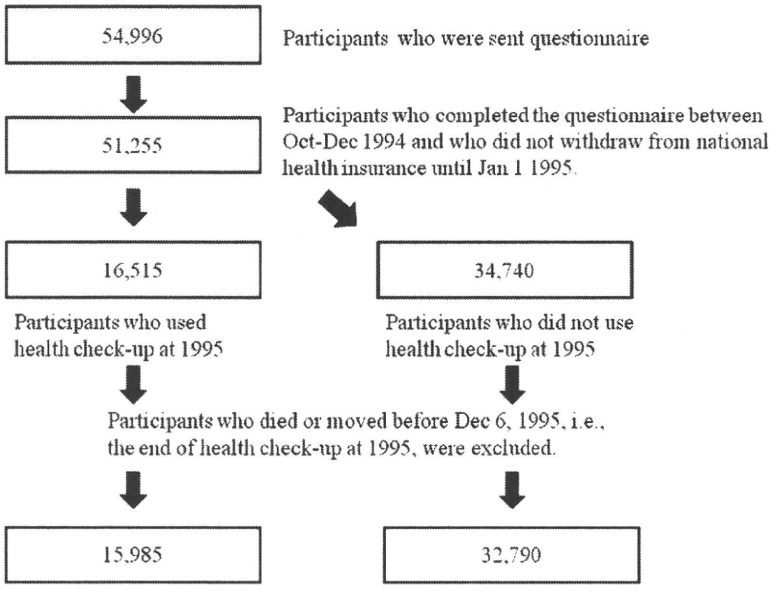

Fig. 1. Flowchart of the study participants.

details of follow-up and certification of death causes have been described in previous reports (Hozawa et al., 2009; Kuriyama et al., 2006; Ohmori-Matsuda et al., 2007, Sone et al., 2008).

Statistical analysis

To compare the baseline characteristics, we used the Student's *t*-test and the chi-squared test for continuous and categorical variables, respectively. We used the Cox proportional hazards regression analysis with age as the time scale, using left and right censoring, to calculate the hazard ratios (HRs) and 95% confidence intervals (CIs) of all-cause and cause-specific mortality (Korn et al., 1997). All data were analyzed using the SAS statistical software, version 9.1 (SAS Institute Inc., Cary, NC, USA). Non-screenees were considered as the reference category. Because smoking habit or alcohol consumption is largely different between men and women in Japan, we separately analyzed men and women in all analyses. One exception was the propensity score matched cohort analysis. Because the pairs were matched both by sex and propensity score, we showed men only, women only, and men and women combined information in this analysis.

We used two models to estimate the difference in mortality between screenees and non-screenees. Model 1 used the following lifestyles and conditions as potential confounders: body mass index (BMI); participation in sports or exercise; time spent walking; sense of life worth living (*ikigai*); self-rated health; physical function; history of any extant diseases; smoking status; alcohol consumption; daily consumption of meat, fish, green and yellow vegetables, and green tea; job status; education; residential area; and history of screening for lung, gastric, colon, breast, and uterine cancer. To minimize the possibility that participants did not attend health check-ups because of illness or moving restriction, we used Model 2: excluding participants with any extant diseases, those with limited physical function, and those who died within the first 3 years of follow-up.

For the propensity score matched cohort analyses, we used participants who did not have any extant diseases, those without limited physical function, and those who did not die within the first 3 years of follow-up ($N=7732$ for men and $N=7435$ for women). Among the participants, we calculated the propensity score, which was determined without regard to outcome, using multivariable logistic regression analysis using possible confounding factors in Model 2 together with age categories at baseline (40–49, 50–59, 60–69, and 70–79). *C* statistics of these models were 0.79 for men and 0.78 for women. Then, we made propensity score categories for every 5% (Table 1). The number of pairs was defined as the minimum of the number of screenees and non-screenees in each propensity score category. We randomly selected the participants from each category. Finally, we sorted screenees and non-screenees according to the propensity score. As a result, 1800 and 2087 propensity matched pairs (1:1) for men and women were selected. The relation between the use of the health check-up and all-cause and cause-specific mortality was calculated using the Cox proportional hazard model stratified on the propensity score matched pairs. All reported *p* values are 2-tailed.

Table 1
Selection of pair for propensity matched cohort analyses. The Ohsaki Cohort Study.

Men				Women		
Propensity score	Non-screenees	Screenees	Pair selected	Non-screenees	Screenees	Pair selected
0–0.049	423	17	17	74	3	3
0.05–0.099	1093	83	83	445	37	37
0.1–0.149	994	148	148	492	76	76
0.15–0.199	759	154	154	508	117	117
0.2–0.249	508	157	157	555	155	155
0.25–0.299	348	125	125	465	152	152
0.3–0.349	264	108	108	391	166	166
0.35–0.399	192	143	143	270	146	146
0.4–0.449	177	136	136	211	197	197
0.45–0.499	175	149	149	199	203	199
0.5–0.549	152	163	152	176	213	176
0.55–0.599	129	181	129	178	199	178
0.6–0.649	108	183	108	126	235	126
0.65–0.699	84	187	84	120	217	120
0.7–0.749	69	161	69	89	267	89
0.75–0.799	29	94	29	78	298	78
0.8–0.849	9	26	9	57	233	57
0.85–0.899	0	2	0	15	70	15
0.9–	0	2	0	0	2	0
Total	5513	2219	1800	4449	2986	2087

We used participants who did not have any extant diseases, those without limited physical function, and those who did not die within the first 3 years of follow-up ($N=7732$ for men and $N=7435$ for women).
Number of pair was defined as the minimum of the number of screenees and non-screenees in each propensity score category.

Results

Mean ages (standard deviation, SD) of screenees and non-screenees were 61.7 (10.0) and 59.6 (10.7) years for men and 61.4 (8.9) and 62.0 (10.5) years for women, respectively. Mean BMIs (SD) of screenees and non-screenees were 23.4 (2.9) and 23.3 (3.2) kg/m^2 for men and 23.8 (3.2) and 23.8 (3.7) kg/m^2 for women, respectively. The proportions who never smoked, who often consumed green and yellow vegetables, and who had been screened for cancer were much higher among screenees than non-screenees (Table 2). The proportions of participants who considered that life was worth living, who had unlimited physical functions, or who had good/excellent self-rated health were also higher among screenees than non-screenees. Table 2 also shows the proportion with a history of severe diseases such as stroke, myocardial infarction, or cancer was higher among non-screenees than screenees. Thus, screenees were in better health than non-screenees, probably because, as we have been able to check using other analyses, they tended to have healthier lifestyles.

During 11 years of follow-up, the all-cause mortality rate (per 1000 person-years) was lower among screenees (men, 15.8; women, 5.7) than that among non-screenees (men, 23.8; women, 14.0). This tendency was similar for cause-specific mortality. Both male and female screenees had a reduced multiple-adjusted HR of death due to all-causes, CVD, cancer, and other causes (Model 1) (Table 3). For men, if we used more detailed categories of current smoking (≥20 cigarettes/day and <20 cigarettes/day) and current drinking (≥69 g of ethanol/day, 46–68.9 g of ethanol /day, 23–45.9 g of ethanol/day, and 0–22.9 g of ethanol/day), the HRs were unchanged (data not shown).

When we excluded participants with any extant diseases, those with restricted movement, and those who died during the first 3 years of follow-up (Model 2), this approach did not alter the point estimate of the relative risk substantially.

For the propensity matched cohort analyses, significant differences were not found in the characteristics between screenees and non-screenees at baseline when the propensity matched cohort analyses were made (data not shown). Screenees consistently showed a reduced HR of all-cause and cause-specific mortality when we used propensity matched cohort analysis (Table 4). When we combined men and women in the same model, screenees had a significantly reduced HR of death due to all-cause and cause-specific mortality, except for cancer mortality.

Discussion

We found that screenees of a health check-up in 1995 had healthier lifestyles than non-screenees. We also found that all-cause and cause-specific mortality risks were lower among screenees than non-screenees. The difference in mortality between screenees and non-screenees persisted, despite attenuation when adjusted for lifestyle or when participants with extant diseases were excluded. Furthermore, except for cancer mortality, propensity matched analyses also showed significantly lower all-cause and cause-specific mortality risks among screenees than non-screenees, even though propensity matched screenees and non-screenees had identical baseline characteristics.

The strengths of this study are the large sample cohort and the high (95%) response rate to the questionnaire. Thus, we considered our screenees and non-screenees to be representatives of the target

Table 2
Baseline characteristics of participants who used health check-up in 1995 and those who did not. The Ohsaki Cohort Study, 1994.

		Men			Women		
		Screenees	Non-screenees	*P*	Screenees	Non-screenees	*P*
N		6814	16,637		9171	16,153	
Age category	40–49 years (%)	16.9	24.4	<0.001	12.9	17.3	<0.001
	50–59 years (%)	20.1	22.1		26.3	21.6	
	60–69 years (%)	42.3	36.0		45.2	36.1	
	70–79 years (%)	20.8	17.5		15.7	25.1	
Body mass index	<18.5 kg/m^2 (%)	2.9	4.1	<0.001	2.9	5.0	<0.001
	18.5–21.9 kg/m^2 (%)	28.4	30.1		25.7	26.6	
	22–24.9 kg/m^2 (%)	43.5	40.4		40.0	36.1	
	25–29.9 kg/m^2 (%)	23.7	23.2		28.8	27.9	
	≥30 kg/m^2 (%)	1.6	2.2		2.5	4.4	
Smoking	Current (%)	48.2	57.8	<0.001	4.9	10.5	<0.001
	Former (%)	30.5	24.8		1.7	3.2	
	Never (%)	21.3	17.4		93.4	86.3	
Alcohol drinking	Current (%)	76.1	70.3	<0.001	22.0	22.7	<0.001
	Former (%)	8.3	12.8		3.1	5.4	
	Never (%)	15.6	17.0		75.0	71.9	
Engaging in sports or exercise	≥1 hour/week (%)	29.9	35.3	<0.001	30.2	25.5	<0.001
Time spent walking	≥1 hour/day (%)	48.0	48.4	<0.001	44.2	41.4	<0.001
Sense of life worth living	Yes (%)	68.1	58.4	<0.001	60.3	53.7	<0.001
Self-rated health	Excellent (%)	9.2	10.7	<0.001	7.9	7.5	<0.001
	Good (%)	64.2	53.4		60.0	49.7	
	Fair (%)	13.6	14.9		14.1	15.8	
	Poor (%)	10.5	14.3		14.8	18.9	
	Bad (%)	2.5	6.7		3.4	8.1	
Physical function	Unlimited (%)	93.6	86.6	<0.001	92.3	85.4	<0.001
Meat consumption	≥3–4 times/week (%)	26.1	27.3	<0.001	29.9	26.0	<0.001
Fish	Almost everyday (%)	39.1	35.3	<0.001	41.9	35.3	<0.001
Green and yellow vegetables	Almost everyday (%)	36.3	28.9	<0.001	48.3	39.2	<0.001
Green tea	≥5 cups/day (%)	30.5	25.5	<0.001	34.3	33.4	<0.001
Education	Until 15 years of age (%)	59.6	63.5	<0.001	55.1	60.2	<0.001
	Until 16–18 years of age (%)	32.1	29.3		36.5	32.2	
	Until ≥19 years of age (%)	8.3	7.2		8.3	7.6	
Job status	Working (%)	57.2	56.4	<0.001	35.1	30.8	<0.001
Living area	City (%)	14.8	27.3	<0.001	15.5	30.2	<0.001
Cancer screening/lung	≥1/5 years (%)	92.5	77.6	<0.001	90.8	77.0	<0.001
Cancer screening/gastric	≥1/5 years (%)	80.6	49.8	<0.001	77.3	48.6	<0.001
Cancer screening/colon	≥1/5 years (%)	57.3	28.6	<0.001	53.3	27.4	<0.001
Cancer screening/uterus	≥1/5 years (%)	–	–		71.4	43.4	<0.001
Cancer screening/breast	≥1/5 years (%)	–	–		62.3	34.9	<0.001
History of diseases	Stroke (%)	1.7	3.4	<0.001	0.7	2.3	<0.001
	Hypertension (%)	24.4	24.6	0.73	24.6	31.0	<0.001
	Myocardial infarction (%)	2.7	3.6	<0.001	1.8	2.8	<0.001
	Kidney diseases (%)	3.7	3.8	0.64	3.6	4.6	<0.001
	Liver diseases (%)	7.0	7.0	0.85	4.1	4.6	0.08
	Cholecystitis or cholelithiasis (%)	5.8	4.9	0.003	6.6	7.6	0.004
	Diabetes (%)	6.4	7.9	<0.001	3.5	7.1	<0.001
	Gastric ulcer (%)	23.5	18.6	<0.001	12.3	10.2	<0.001
	Tuberculosis (%)	5.7	4.3	<0.001	3.1	3.0	0.60
	Hearing problem (%)	5.6	4.7	0.003	3.1	4.1	<0.001
	Cataract (%)	5.7	4.7	0.002	11.2	11.8	0.14
	Arthritis (%)	6.6	6.1	0.13	12.0	13.0	0.02
	Osteoporosis (%)	1.1	1.2	0.55	6.9	7.0	0.71
	Cancer (%)	2.5	3.1	0.01	3.3	4.0	<0.01
	Blood transfusion (%)	10.8	11.6	0.09	11.8	13.5	<0.01

population in this area. Although it is unknown whether this information could be directly applicable for participants who had other insurance for employees and their dependents or who lived in other countries or other areas in Japan, our information might be important for other settings.

Several important confounding factors should be considered when comparing mortality rates between screenees and non-screenees of health check-ups. Firstly, screenees had healthier habits on important lifestyle factors such as smoking or green and yellow vegetable consumption. Secondly, we found that participants with a history of diseases were less likely to undergo the health check-up. This may be because they were feeling too bad to attend or they often visited a physician anyway. Thirdly, screenees were more active, had better self-rated health, and had a greater sense that life is worth living. These characteristics are associated with lower mortality (Sone et al., 2008; Idler and Benyamini, 1997). However, although we considered them as confounding factors, these factors could not fully account for the difference in mortality. Finally, our result did not change substantially when we used propensity matched cohort analyses to minimize the self-selection bias. Therefore, we concluded that the difference in mortality rates between screenees and non-screenees was observed, even though we used detailed lifestyle information, extant diseases, or propensity for participating in health check-up. However, as with all prospective cohort studies, unknown confounding factors might exist. Although the effect of unknown and unmeasured confounding factors on mortality might be reduced by using propensity matched cohort analyses, only randomized controlled trials can provide an unbiased estimate of the effect.

A beneficial effect of health checks on mortality rates might be attributable to early detection of risk factors and early intervention

Table 3
Relation between using a health check-up in 1995 and cause-specific mortality. The Ohsaki Cohort Study, 1995–2006.

		All-cause mortality		CVD mortality		Cancer mortality		Mortality due to other causes	
		Screenees	Non-screenees	Screenees	Non-screenees	Screenees	Non-screenees	Screenees	Non-screenees
Men	*n*	6814	16,637	6814	16,637	6814	16,637	6814	16,637
	Number of deaths	1052	3589	261	1043	418	1219	373	1327
	Mortality rate (per 1000 person-years)	15.8	23.8	3.9	6.9	6.3	8.1	5.6	8.8
	Hazard ratio (95% CI) Model 1	0.72 (0.67–0.77)	1	0.68 (0.58–0.79)	1	0.75 (0.66–0.84)	1	0.71 (0.63–0.81)	1
	Hazard ratio (95% CI) Model 2	0.73 (0.61–0.87)	1	0.64 (0.43–0.94)	1	0.76 (0.58–0.997)	1	0.77 (0.57–1.04)	1
Women	*n*	9171	16,153	9171	16,153	9171	16,153	9171	16,153
	Number of deaths	519	2125	174	758	179	574	166	793
	Mortality rate (per 1000 person-years)	5.7	14.0	1.9	5.0	2.0	3.8	1.8	5.2
	Hazard ratio (95% CI) Model 1	0.66 (0.59–0.73)	1	0.70 (0.58–0.84)	1	0.66 (0.55–0.79)	1	0.62 (0.51–0.74)	1
	Hazard ratio (95% CI) Model 2	0.66 (0.50–0.86)	1	0.60 (0.36–1.006)	1	0.64 (0.41–0.98)	1	0.70 (0.43–1.14)	1

n: number of participants; CVD: cardiovascular diseases; CI: confidence interval; Model 1: we used Cox proportional hazards model with age as the time scale. In the model, we adjusted for body mass index (calculated as weight in kilograms divided by height in meters squared; <18.5, 18.5–21.9, 22.0–24.9, 25.0–29.9, and ≥30); participation in sports or exercise (<1 hour/week and ≥1 hour/week); time spent walking (<1 or ≥1 hour/day); sense of life worth living (*ikigai*); self-rated health; physical function; history of any extant diseases; smoking status (never, former, and current); alcohol consumption (never, former, and current); daily consumption of meat, fish, green and yellow vegetables, and green tea; job status; education (until 15 years of age, between 16 and 18 years of age, and ≥19 years of age); residential area; and history of screening for lung, gastric, colon, breast, and uterine cancer. Model 2: excluding participants with any extant diseases, those with limited physical function, and those who died within the first 3 years of follow-up.

including treatment. Risk factors such as high BP, abnormal liver function, and excessive alcohol consumption can be identified earlier among screenees of health check-ups. When risk factors are identified, participants are advised to visit a physician or to alter their lifestyle. If participants follow such advice, risk factors might be better controlled and lead to a reduction in future mortality rates. Although the health check-ups mainly screen risk factors for CVD, this process is also applicable to non-CVD mortality. Changes in smoking status or alcohol consumption could reduce rates of not only CVD diseases but also of cancer, liver, and respiratory diseases. Education about decreasing salt intake to lower BP might contribute to reducing salt-related diseases such as gastric cancer and kidney disease. However, our study did not collect detailed information about whether screenees with abnormal findings determined through health check-ups actually visited clinicians, changed their lifestyles, or controlled their risk factors appropriately through medication or lifestyle modification. This is a study limitation.

We had another limitation in this study. Except for several questionnaires, we generally relied on the self-reported questionnaire. We also rely on the data from secondary sources, such as death certificate. Usage of this information might yield uncontrolled errors and imprecision (Doria-Rose et al., 2010).

In conclusion, we found that the mortality risk was lower among screenees than non-screenees when we adjusted for possible confounding factors, such as lifestyle and extant diseases. This is also true when we used propensity matched cohort analyses. However, this study could not clarify whether the health check processes actually lead to a decreased risk of mortality. Further studies including randomized controlled trials are required to confirm our findings, but such trials could not be performed in Japan, since the national health check-up service is available to all. Therefore, we believe that the present findings represent the best available information regarding the relationship between the Japanese health check system and mortality.

Conflict of interest statement
The authors declare that there are no conflicts of interest.

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This study is not related with any industry.

Table 4
Relation between using health check-up in 1995 and all-cause and cause-specific mortality using propensity for undergoing health check-up matched cohort. The Ohsaki Cohort Study, 1995–2006.

		All-cause mortality		CVD mortality		Cancer mortality		Mortality due to other causes	
		Screenees	Non-screenees	Screenees	Non-screenees	Screenees	Non-screenees	Screenees	Non-screenees
Men	*n* of participants	1800	1800	1800	1800	1800	1800	1800	1800
	Number of deaths	137	189	26	43	59	76	52	70
	HR (95% CI)	0.70 (0.56–0.88)	1	0.63 (0.38–1.03)	1	0.79 (0.55–1.12)	1	0.67 (0.46–0.97)	1
Women	*n* of participants	2087	2087	2087	2087	2087	2087	2087	2089
	Number of deaths	72	99	18	27	29	40	25	32
	HR (95% CI)	0.73 (0.53–0.99)	1	0.68 (0.37–1.26)	1	0.73 (0.45–1.17)	1	0.77 (0.45–1.32)	1
Men and women combined	*n* of participants	3887	3887	3887	3887	3887	3887	3887	3887
	Number of deaths	209	288	44	70	88	116	77	102
	HR (95% CI)	0.71 (0.59–0.86)	1	0.65 (0.44–0.95)	1	0.76 (0.58–1.01)	1	0.70 (0.51–0.95)	1

n: number; HR: hazard ratio; CI: confidence interval.

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岩手県花巻市における特定健診未受診者の未受診理由と健康意識

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目的　基本健康診査の地域における受診率は40％程度に過ぎなかった。特定健診受診率の最終目標は市町村国保で65％とされており，今までよりかなり高い数値を求められている。本研究では市町村国保加入者における特定健診未受診者を対象に，未受診理由と健康意識についての調査を行った。

方法　岩手県花巻市における平成20年度の特定健診対象国保加入者20,519人のうち，10,043人が特定健診を受診した（受診率49％）。未受診者のうち施設入所者・人間ドック受診者等397名を除いた10,079人を対象に，平成21年1月に郵送で未受診理由・健康意識等に関するアンケート調査を実施した。

結果　特定健診未受診者10,079人のうち，4,840人より回答が得られた（回収率48％）。健診未受診の理由としては，他機関での受診や医療機関での受療などを除くと，「自分は健康だから」「時間の都合がつかない」と回答した者が多かった。また健診所要時間に対する許容範囲は非常に短く，「待ち時間を含めて1時間未満」と答えた者が7割に達していた。メタボリックシンドロームについての認知度はかなり高く，名前だけ知っている人まで勘案するとほぼ90％が「知っている」と回答していた。しかし「内容も知っている」と答えた人は3分の2程度であった。回答者の5割強程度が保健指導への参加を希望していた。しかし希望者においても費用負担をする概念はほとんどなく，5割は「無料」を希望し，「有料でも参加」と回答した場合であっても，その希望単価の平均は男性で1,700円，女性では1,200円程度であった。

考察　特定健診未受診理由としては「自分は健康だから」および「時間の都合がつかない」と回答した者が多かった。それぞれ地域啓発と柔軟性の高い受診機会の提供が主な対策となる。未受診者の健診所要時間への要望は現実とはかけ離れており，健診の効率化など行政側の工夫と住民の意識啓発が重要であると考えられた。

キーワード　特定健診受診率，健診未受診理由，医療機関受療，健康意識，メタボリックシンドローム認知度

Ⅰ　はじめに

花巻市における基本健康診査の受診率は55％を超え，全国平均に比較すると高いとはいえ，「健診は必ず受けるもの」と言う意識の定着には至っていなかった。

メタボリックシンドローム対策に着目した新しい健診・指導方法である特定健診・特定保健指導が平成20年度に開始された。しかし新しい健診制度が疾病予防の目的を果たすためには十分な受診率が必須である。

特定健診受診率の最終目標は市町村国保で

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65％とされており[1]，今までよりかなり高い数値を求められている。そこで国保加入者における特定健診未受診者を対象に，未受診理由と健康意識についての調査を行った。

Ⅱ 方　法

（1） 対象者

本研究は岩手県花巻市において実施された。花巻市は，平成18年1月に1市3町が合併し，人口10万人の新市としてスタートを切った，岩手県中央部に位置する農業と観光のいで湯のまちであり，銀河鉄道の夜などの作家として世界的に著名な宮沢賢治の生誕の地でもある。

花巻市における平成20年度の特定健診対象国保加入者20,519人のうち，10,043人が特定健診を受診した（受診率49％）。未受診者のうち施設入所者・人間ドック受診者等397人を除いた10,079人を対象に，郵送で未受診理由・健康意識等に関するアンケート調査を実施した。

（2） 調査項目

主な調査項目は性，年齢，服薬状況，喫煙状況，飲酒状況，食習慣，運動量，健診未受診理由，健診への要望，メタボリックシンドローム認知度，健康教室への参加の有無などである。

（3） 統計解析

健康教室参加の関連因子について，単変量解析で有意な差があった項目を説明変数としてモデルに入れ，多重ロジスティック回帰分析を実施し，調整オッズ比および95％信頼区間を算出した。検定は両側検定とし，P値が0.05未満を統計的に有意差ありとした。

統計解析には，SAS version9.1を用いた。

（4） 倫理面への配慮

本研究は，無記名自記式アンケート調査である。また郵送に関わるすべての作業は花巻市健康こども部健康づくり課において行い，個人情報は厳重に管理している。

表1　市の健診受診，服薬状況，生活習慣の状況

（単位　人，（　）内％）

	総数	男性	女性
健診受診状況			
ほぼ毎年受診していた	1 382 (28.6)	571 (24.8)	776 (32.4)
時々受けていた	1 230 (25.4)	543 (23.5)	652 (27.2)
ほとんど受けていなかった	2 131 (44.0)	1 153 (50.0)	930 (38.8)
不明（無回答）	97 (2.0)	39 (1.7)	40 (1.7)
服薬状況（複数回答）			
血圧を下げる薬	1 645 (34.0)	827 (35.9)	777 (32.4)
インスリン注射又は血糖を下げる薬	355 (7.3)	230 (10.0)	117 (4.9)
コレステロールを下げる薬	712 (14.7)	247 (10.7)	445 (18.6)
現在，タバコを習慣的に吸っていますか			
はい	1 196 (24.7)	938 (40.7)	233 (9.7)
いいえ	3 593 (74.2)	1 350 (58.5)	2 145 (89.5)
不明（わからない，無回答）	51 (1.1)	18 (0.8)	19 (0.8)
お酒を飲む頻度はどのくらいですか			
毎日	1 328 (27.4)	1 081 (46.9)	215 (9.0)
時々	1 367 (28.2)	660 (28.6)	674 (28.1)
飲まない（飲めない）	2 033 (42.0)	529 (22.9)	1 447 (60.3)
不明（わからない，無回答）	112 (2.3)	36 (1.6)	62 (2.6)
生活習慣の改善を勧められたこと			
ある	2 228 (46.0)	1 137 (49.3)	1 033 (43.1)
ない	2 237 (46.2)	995 (43.1)	1 190 (49.6)
覚えていない	114 (2.4)	58 (2.5)	54 (2.3)
不明（無回答）	261 (5.4)	116 (5.0)	121 (5.0)
どこで勧められた（複数回答）			
医院や病院（健診以外での受診）	1 547 (32.0)	809 (35.1)	701 (29.2)
市の健診・保健センター	335 (6.9)	125 (5.4)	204 (8.5)
職場の健診	257 (5.3)	162 (7.0)	90 (3.8)
人間ドック	257 (5.3)	132 (5.7)	117 (4.9)
知人・家族	201 (4.2)	109 (4.7)	86 (3.6)
その他	64 (1.3)	36 (1.6)	26 (1.1)
健康教室に参加したことがあるか			
ある	618 (12.8)	236 (10.2)	365 (15.2)
ない	3 917 (80.9)	1 935 (83.9)	1 885 (78.6)
覚えていない	45 (0.9)	24 (1.0)	19 (0.8)
不明（無回答）	260 (5.4)	111 (4.8)	129 (5.4)

注　不詳を除く

Ⅲ 結　果

特定健診未受診者10,079人のうち，4,840人より回答が得られた。回収率は48％であった。

（1） 基本属性・服薬状況・生活習慣（表1）

男女比はほぼ等しく（男性47.6％，女性49.5％），平均年齢は62歳であった。男性では無職が，女性では主婦・家事手伝いが最多であった。

健診受診状況は男女とも，「ほとんど受けていなかった」との回答が最多であり，特に男性では半数を占めていた。

高血圧・糖尿病・脂質異常症につい

図1　特定健診を受けない理由（複数回答）

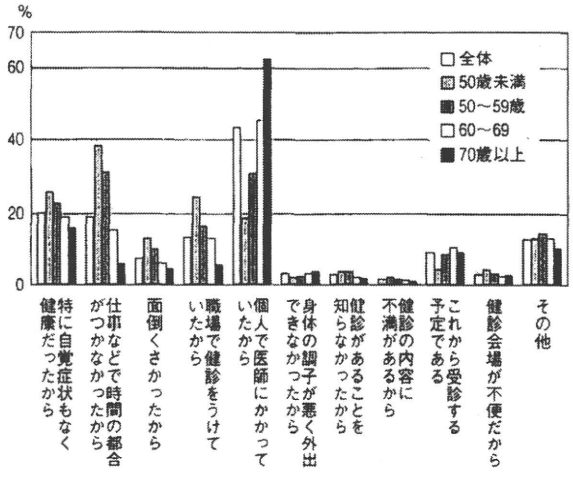
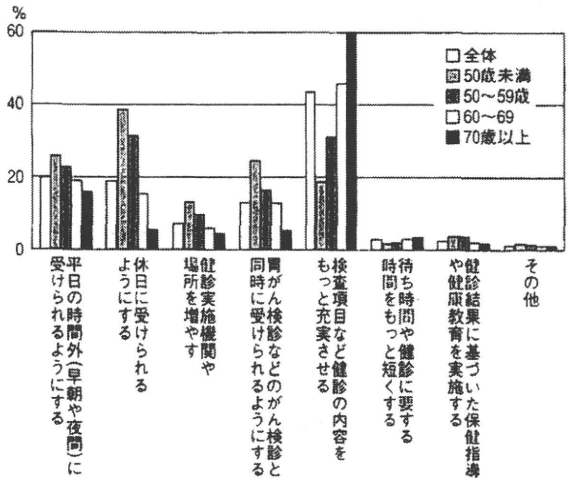


図2　特定健診を積極的に受けるには（複数回答）



ての服薬状況については，全体の34％が高血圧の，７％が糖尿病の，15％が脂質異常症の既往を有すると回答していた。

喫煙状況は男性の41％，女性の10％が現在喫煙習慣を有すると回答していた。

飲酒状況は男性の47％，女性の９％が毎日飲酒すると回答していた。

過去の保健指導状況については，生活習慣改善を勧められたことがあるものは全体の46％であり，そのほとんどは医療機関受診時であった。過去の健康教室参加者は男性10％，女性15％と低率であった。

（2）　未受診理由

特定健診未受診理由に関する結果を図１に示す。健診未受診の理由を他機関での受診とした者は，職場健診・医療機関受療を併せると全体で56％と半数を超えており，年代が上がるほど受療者が増加していた。また若年者ほど「自分は健康だから」「時間の都合がつかない」「面倒くさい」と回答するものの割合が高かった。

（3）　健診への要望とメタボリックシンドローム認知度

特定健診への要望に関する結果を図２に示す。健診への要望としては，若年者ほど「受診時間の短縮」「休日健診や平日の時間外健診の実施」と回答する者の割合が高かった。とりわけ

表2　「費用が高くなければ参加する」の方が参加しようと思う費用

（単位　円）

	人数	平均	標準偏差	最少	最高
全体	607	1 426	2 065	1	40 000
50歳未満	46	1 430	1 633	300	10 000
50～59歳	120	1 786	3 705	300	40 000
60～69	332	1 347	1 297	1	10 000
70歳以上	99	1 333	1 582	200	10 000
男性	251	1 715	2 761	200	40 000
50歳未満	17	2 309	2 420	500	10 000
50～59歳	37	2 865	6 406	500	40 000
60～69	142	1 612	1 256	300	5 000
70歳以上	48	1 054	398	200	4 000
女性	343	1 214	1 336	1	10 000
50歳未満	29	916	447	300	2 000
50～59歳	78	1 231	920	500	5 000
60～69	185	1 159	1 309	1	10 000
70歳以上	48	1 633	2 113	200	10 000

注　不詳を除く

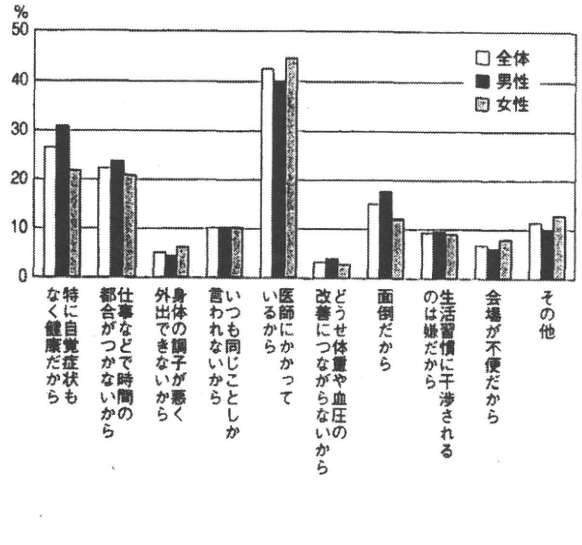
所要時間への要望は「待ち時間を含めて１時間未満」と答えた者が７割に達していた。

メタボリックシンドロームに関する認知度は高く，名前だけ知っている者まで入れると，ほぼ９割が「知っている」と回答した。しかしながら「内容も知っている」と答えた者は３分の２程度であった。

（4）　健康教室への参加

健康教室への参加については，回答者の５割以上が健康教室への参加を希望しており，その割合は女性・高齢者において高率であった。しかし希望者であっても費用負担に関する意識は低く，半数は「無料」を希望していた。また

図3　健康教室への参加を希望しない理由（複数回答）



「有料でも参加したい」と回答した者でも，希望単価の平均は1,400円にすぎなかった。40歳から59歳までの希望単価は男性において高いが，70歳代になると女性のほうが高かった（表2）。

健康教室への参加を希望しない理由としては，医療機関受療が40%程度で最多であり，特に高齢になるほどその割合は高かった。また年齢が若いほど「自分は健康だから」「時間の都合がつかない」「面倒くさい」と回答するものの割合が高かった（図3）。

（5）　高血圧・糖尿病・脂質異常症服薬者を除外した対象者における分析

医療機関受療が，特定健診未受診および保健指導不参加の最大の関連要因であった。そこで，特定保健指導の対象に含まれない，高血圧・糖尿病・脂質異常症のいずれかのために服薬している者を除外した対象において，特定健診未受診および保健指導不参加の理由について分析を行った（図4，5）。

医療機関受療を理由としたものの割合は除外前45%から除外後は25%に低下した。また「特に自覚症状もなく健康だから」「時間の都合がつかない」を理由としたものの割合が20%から30%程度に上昇した。

健康教室への参加を希望しない理由としては，医療機関受療の割合が除外前45%から除外後20%に低下した。また「特に自覚症状もなく健康だから」「時間の都合がつかない」の割合が20%から30%程度に上昇した。

保健指導不参加と関連する独立した有意な対象者特性は，「男性」「若め」「メタボリックシンドロームを認知していない」「毎日飲酒する，または飲酒しない」であった（有意差の認めら

図4　特定健診を受けない理由（複数回答，3疾患服薬者除外後）

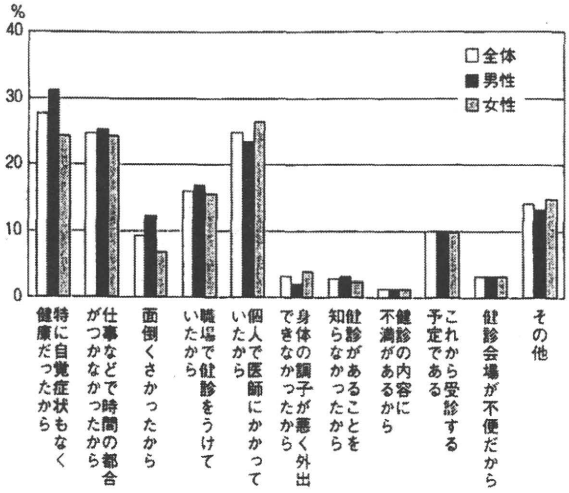


図5　健康教室への参加を希望しない理由（複数回答，3疾患服薬者除外後）

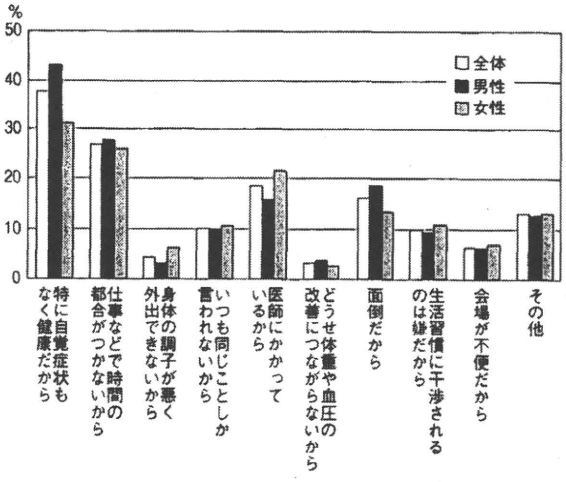


表3　健康教室参加の関連因子（3疾患服薬者除外後）

	オッズ比	P値
女性（vs男性）	1.56	<0.0001
年齢（1歳ごと）	1.03	<0.001
メタボ認知（vs 聞いたことない）		
名前だけ	1.34	0.004
内容も	1.42	0.000
飲酒（vs 非飲酒）		
毎日飲む	1.01	0.9
時々飲む	1.34	0.004

れなかった要因は表に示さず）（表3）。

Ⅳ 考　　察

岩手県花巻市において，特定健診未受診理由を調査した。健診未受診の理由としては，全体の4割以上，高齢者の6割以上が受療を理由としていた。これより，とりわけ生活習慣病以外での受療に対しては，医師会等との連携を図り，受療中であっても，特定健診の受診・特定健診に該当する検査の必要性の啓発に努めることが重要と考えられた。

また他機関での受診や医療機関での受療などを除くと，健診未受診の理由として「特に自覚症状もなく健康だから」「時間の都合がつかない」と回答した者の割合が高かった。また健診所要時間に対する許容範囲は非常に短く，「待ち時間を含めて1時間未満」と答えた者が7割に達していた。

特に40～59歳は自覚症状がない，時間がないと回答する者が多く，また，休日実施やがん検診との並行実施などの要望が高かった。これより，健康に自信があり多忙な40～59歳に対しては，疾病予防のための健診受診の啓発と，柔軟な健診の工夫が必要と考えられた。

具体的な取り組みとして，今年度より特定健診の日曜日実施を開始した。また，健診所要時間短縮のため，健診の導線の見直しを行い，待ち時間に問診票の自己記入を行う形式とした。加えて，番号札を配布し受診者に自分の順番が明確となるように工夫した。こうした取り組みが，受診率改善にどのような効果を及ぼすかについて，今後継続的な追跡が必要と考えられる。

メタボリックシンドロームについての認知度はかなり高く，名前だけ知っている人まで勘案するとほぼ90％が「知っている」と回答していた。しかし「内容も知っている」と答えた人は3分の2程度であった。一部の住民は「メタボ」という言葉には敏感でも，メタボリックシンドロームの正確な内容を知らず，健診受診の意義や生活習慣改善の必要性を認識していないため，健診未受診や保健指導の不参加につながっている可能性が示唆された。

このため，メタボリックシンドロームを自分の問題として受け止めてもらうことを目的とし，特定健診当日，特定保健指導の対象となる可能性が高いと考えられる受診者（肥満者，血圧高値者，等）に対し，オリジナルパンフレットを使った個別指導を開始した。加えて，その際に希望者に対し家庭血圧計を貸し出している。このような早い段階での働きかけが対象者の意識付けにつながり，保健指導参加者の増加につながることが期待される。実際，使用者から定期的な測定により自分の本当の血圧が分かった，生活習慣しだいで血圧が上下することが分かったなどの反響があり，家庭血圧測定を通じたセルフケア意識の向上が得られているものと考えられる。

本調査において，回答者の5割強程度が保健指導への参加を希望していた。しかし希望者においても費用負担をする概念はほとんどなく，5割は「無料」を希望し，「有料でも参加」と回答した場合であっても，その希望単価の平均は男性で1,700円，女性では1,200円程度であった。年齢別にみた場合40～59歳の希望単価は男性において高いが，70歳代になると女性のほうが高いなど，健康管理に対する男女間での意識の相違が興味深い結果であった。

特定保健指導の対象に含まれない，高血圧・糖尿病・脂質異常症のいずれかのために服薬している者を除外した対象において分析を行ったところ，保健指導不参加と関連する独立した有意な対象者特性は，「男性」「若め」「メタボリックシンドローム認知していない」「毎日飲酒する，または飲酒しない」であった。これらの要因は，真に保健指導が必要である対象者において，特に積極的に指導参加を募るべきターゲットを考える上で重要と考えられた。

本研究の結果，未受診理由として「特に自覚症状もなく健康だから」および「時間の都合がつかない」と回答した者が多かった。それぞれ地域啓発と柔軟性の高い受診機会の提供が主な対策となる。

未受診の健診所要時間への要望は現実とは乖

離しており，サービス提供側と受益者側の要求のすり合わせが必要と考えられた。その前提としても健診についての地域啓発が重要であると考えられた。こうした特定健診受診に向けた啓発の積み重ねは，特定健診の受診率向上につながるのみならず，積極的に健康管理に取り組む住民が増加し，その結果として地域全体の健康に対する意識を高め，地域における将来の健康寿命の延長につながることが期待される。

平成21年度も特定健診対象国保加入者のうち未受診者10,064人を対象に同様の調査を実施し，3,625人の回答を得た（回答率36%）。そのデータに関しても詳細に分析を行い，受診率に関わる要因，およびその変化について，引き続き検討を続けるとともに，受診率向上のための方策を導入していく予定である。

本研究は平成20・21年度厚生労働省科学研究費補助金循環器疾患等生活習慣病対策総合研究事業「未受診者対策を含めた健診・保健指導を用いた循環器疾患予防のための地域保健クリティカルパスの開発と実践に関する研究」（研究代表者：岡村智教．分担研究者：大久保孝義）により実施された。

文　献

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