Associations of income with symptoms, morbidities and healthcare usage in Japanese adults

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Key words

Health inequality, socioeconomic factors, income, morbidity, health care usage

ABSTRACT

Objectives: Socioeconomic inequalities in health are major public health and health policy concerns. We examined the associations of income with symptoms, morbidities and healthcare usage in a national sample of the Japanese population.

Methods: We used the data of 21,929 men and 24,620 women from the Comprehensive Survey of the Living Conditions of People on Health and Welfare in 2007. The prevalences of symptoms, treatments, and those who received treatments among survey respondents with symptoms, for 16 groups of symptoms and disorders, were compared according to household income from the highest to the lowest, using the relative index of inequalities (RII). The RIIs were computed by age-groups (25-59 years [young group] and 60+ years [senior group]).

Results: People with lower incomes had higher prevalences of symptoms and treatments for most of the disorders examined. The RIIs of symptoms and treatments were, in total, 1.19 (95%CI: 1.09-1.31) and 1.04 (0.93-1.16) for the young and 1.69 (1.53-1.87) and 1.51 (1.36-1.67) for the senior groups, respectively. For the treatment among those with symptoms, the RII significantly lower than 1.0 was not found except a few disorders in the young group.

Conclusions: Income inequalities in various symptoms and morbidities were evident in the Japanese population, and these inequalities were greater in the senior than in the young. Our results suggest that lower income is not a substantial barrier to healthcare usage for the senior, while it is related to lower healthcare usage for the working age.

Introduction

Health inequalities and social determinants of health have recently been recognized as important public health and health policy concerns [1, 2]. Since the 1990s especially, numerous studies have demonstrated evidence of socioeconomic inequalities in health [3, 4]. Mortalities, morbidities, self-rated health and health-related behaviors are related to the socioeconomic status (SES) of individuals, measured by factors such as income, educational attainment and occupational class [3, 4]. Moreover, the association SES and various health issues such as skin morbidity, allergic diseases, vision problems, and low back pain was reported from outside of Japan [5-8].

Studies of the Japanese population have also demonstrated socioeconomic inequalities in health [9]. Similar to other countries, lower SES is associated with poor health and health risk behaviors [10-12]. Fujino et al compared mortalities between populations with lower and higher levels of education in a cohort study, and demonstrated that mortalities from cancers and external causes were significantly higher among those with less education, while the risk of ischemic heart disease was marginally reduced in men with lower education [13]. Nishi et al, using a cross-sectional study design,

57 demonstrated that gradients in prevalence according to educational level were found
58 for diabetes among men and for hypercholesterolemia among women, but not
59 hypertension [14]. However, findings on the relationships of mortalities and
60 morbidities with SES in Japan are limited, to only a few diseases. Concrete evidence
61 of the effects of socioeconomic inequalities on mortalities and morbidities is thus
62 lacking.

63 Health inequalities are critically related to health system factors including health
64 insurance [2]. Japan has one of the fairest health care systems in the world [15]. The
65 Japanese population has been universally and comprehensively covered with health
66 insurance since 1960's [16, 17]. In countries without universal health insurance
67 coverage, such as the US, there are barriers to healthcare access for particular
68 populations [18]. In addition to health insurance, the use of health care services
69 depends on co-payments, regional access to health facilities, and individual
70 characteristics including SES and race [18, 19]. Considering the recent debates on
71 increased social disparities [20, 21], it is worthwhile to discuss whether socioeconomic
72 inequalities exist in healthcare usage in Japan.

73 The aim of this study was to elucidate the associations of income with morbidities and
74 healthcare usage in Japan. For this purpose, we used data from a survey conducted on

a national sample of the Japanese population. This survey included household income, and symptoms and treatments for various physical disorders and conditions.

Methods

Data from the 2007 Comprehensive Survey of the Living Conditions of People on Health and Welfare conducted by the Ministry of Health, Labour and Welfare [22] was used for these analyses. This survey began in 1986, and a large survey is conducted every three years (demographic, health, long-term care, income and savings). In the 2007 survey, 5440 Enumeration Districts (EDs) from among approximately one million EDs were randomly selected for demography and health questionnaires. Interviewers visited all households within the selected areas using lists of households and approached all household members. The questionnaires included household and individual basic information regarding demographics, health, illness profiles, lifestyle and other items. Moreover, 2000 unit areas were randomly selected from the 5400 EDs, and all households and household members were approached regarding the questionnaire items on income and savings. Microdata files from this survey were used with permission from the Ministry of Health, Labour and Welfare.

The total number of households sampled for basic information was 287,807, of which 36,285 were interviewed with regard to income and savings. The response rates were 80.1% (N = 230,596) for the basic information survey and 67.7% (N = 24,578) for the income survey. The number of the household members ranged 1 to 13, with a mean (SD) of 2.7 (2.2).

The data for 21,926 men and 24,620 women over 25 years of age, whose basic and income data were surveyed and contained no missing data for variables, were used in this study. The detailed numbers and basic characteristics of the study subjects were shown in Table 1. Their mean (SD) age and household income was 55.3 (16.9) years and 6.5 (5.1) million yen, respectively.

Outcomes

As health outcomes, we used symptoms and treatments according to the 16 groups shown in Table 2.

The survey asked whether the subjects had symptoms represented by 41 items, and whether they had received outpatient treatment for 39 diseases and physical conditions. The treatments included not only those in medical facilities (hospitals and clinics) but also acupuncture and osteopathy. Cardiovascular disease (CVD) and related disorders

(diabetes, dyslipidemia, hypertension, stroke and ischemic heart diseases) were not included among the symptoms.

In addition to symptoms and treatments, we also examined the prevalences of treatments received by those with symptoms. For example, we determined the percentage of those with ophthalmological symptoms who had and received ophthalmological treatments. This was considered to reflect access to and usage of healthcare services.

Analyses

We examined the relationships between income and outcomes using the relative index of inequality (RII) [23, 24]. The following analyses were conducted by age-groups; 25 to 59 years (young group) and 60 years of age or over (senior group). Since we assumed that the association of income with symptoms, morbidities, and healthcare usage are influenced by socioeconomic conditions such as employment and co-payment in healthcare usage in addition to health status, this study focused on comparisons of the association between age groups. As the boundary, 65 years old is used in general demographic statistics and 70 years old might be suitable because the co-payment of healthcare decreases from 20% to 10% for people over 70 years in

126 Japan. In this study, however, we used 60 years as provisional boundary, considering
127 the decrease of employment rate over 60 years.

128 RII is a commonly used measure of the extent to which the health outcome such as
129 disease and death varies with socioeconomic status or some other background variable
130 [23, 24]. Construction of RII, first, requires hierarchical order in a given variable, from
131 high to low. Second, in order to apply regression analyses, each category must be
132 quantified by assigning a relative position in the hierarchy with values between 0 and
133 1. RII estimated from the regression analysis is interpreted as the risk, including the
134 relative risk and the odd ratio, of the notional highest (=1) compared with the notional
135 lowest (=0) across the population.

136 According to the RII concept, we first divided the subjects into ten equal groups
137 according to annual household income, the mean (SD) of which was 6.5 (5.1) million
138 yen. The highest 10% of the population was given the relative income variable of 0.05,
139 and the next highest 10% was assigned 0.15, while the lowest 10% was designated
140 0.95. Then, we estimated the odd ratios using logistic regression analysis with health
141 outcomes (symptoms, treatments, and treatments received by those with symptoms) as
142 the dependent variables, the relative income variable (0.05 to 0.95) as the independent
143 variable, and adjustment for age (years) and sex. Fitness and significance of the

models were examined by the Hosmer-Lemeshow test and the score test, respectively. The statistical package PASW Statistics 18 (SPSS Inc.) was used to perform the analyses.

Results

Table 3 shows the prevalences of symptoms, treatments and the treatments received by those with symptoms. For most of the symptoms and treatments, prevalences were higher in the senior than in the young group. Unlike symptoms and treatments, the prevalences of treatments received by those with symptoms differed minimally between the young and senior groups.

RIIs for symptoms are shown in Table 4. With the exceptions of rhinopathy in both age groups and dermopathy in the young group, significant relationships were recognized between income and symptoms. Compared with the young group, the senior group had higher RIIs for all symptom categories. Total RIIs were 1.19 (95%CI: 1.09-1.31) for those less than 60 years of age and 1.69 (1.53-1.87) for those age 60 and older. Most of the models showed the good fitness ($p>=0.05$) and the significance ($p<0.05$).

RIIs for treatment prevalences are shown in Table 5. For the young group, ophthalmopathy, respiratory diseases and depression had significantly higher RIIs, with depression showing the highest RII (4.67). Dermopathy had the RII significantly lower than 1.0 (0.71). For the senior group, with the exceptions of rhinopathy, dental diseases and dermopathy, significant relationships were recognized between income and treatments. The senior group had higher RIIs than the young group for most of the treatment categories. In total, the RIIs were 1.04 (0.93-1.16) those less than 60 years of age and 1.51 (1.36-1.67) for those age 60 and older. Some of the models did not show the goodness of fit and the model of rhinopathy did not show the significance.

Table 6 shows RIIs for treatments received by those with symptoms. For the young group, there were significant negative relationships (RII<1.0) for dental diseases and dermopathy, while a significant positive relationship (RII>1.0) was recognized for depression. For the senior group, rhinopathy, respiratory diseases, neck stiffness and lumbago showed significant positive relationships, and there were no negative relationships, with treatment. Most of the model showed the goodness of fit, while some did not show the significance.

Table 7 shows the prevalences and RIIs of CVD-related diseases. With the exceptions of dyslipidemia, which showed a significant negative association (RII=0.69), and

hypertension, relationships between income and treatments were positive in the young group. For the senior group, all of these diseases showed significant positive associations with RII. Fit of these models was not generally good, but all of the models were significant.

Discussion

The main finding of this study is higher prevalences of morbidities and symptoms in lower the income population, which is in line with the results of previous studies. As in studies conducted in other countries [25, 26], several investigations of the Japanese population showed that those with lower SES, as measured by income, education and occupational class, had higher prevalences of disorders such as diabetes and dyslipidemia [14, 27]. Compared with previous studies, we have presented herein more detailed information as well as some interesting findings on relationships between income and disease prevalences in Japanese adults.

This study focuses on differences in health inequalities by age-groups, since previous studies in Japan demonstrated substantial age-group differences in the associations between SES and health issues [11, 28, 29]. In this study, the senior group showed

196 stronger relationships between lower income and higher disease prevalences. This
197 raises two possibilities. The health effects of socioeconomic disadvantages may be
198 cumulative, increasing with age. Unfavorable lifestyle factors and hazardous
199 environments including occupational conditions affect health cumulatively with aging.
200 In addition, a so-called vicious cycle might result in ever broader health inequalities in
201 the elderly population, since poor health causes lower income, and lower income
202 causes poor health [30].

203 We examined inequalities in healthcare usage by the prevalences of treatments among
204 those who had symptoms. The results suggested minimal access barriers for the elderly
205 population. Since the entire Japanese population is covered by comprehensive public
206 health insurance, anyone can obtain healthcare with a small co-payment. However, this
207 study demonstrated that a few disorders showed treatment prevalences in those with
208 symptoms to be lower in the young group with lower incomes, and that RIIs in the
209 young group were generally lower than those in the senior group. We can thus
210 speculate that the working age with lower incomes may hesitate to seek healthcare
211 services, even if they have symptoms and worsening physical conditions. In addition
212 to differences in healthcare seeking behavior according to SES [31], the healthcare
213 co-payment for the working age higher than that for the elderly: 30% versus 10%.

214 These differences might be influenced by healthcare access and generate barriers to
215 health services for the lower income population. In fact, a previous study demonstrated
216 that people with lower incomes hesitate to seek healthcare services [32].

217 Income differences in healthcare usage in this study might not solely attributed by the
218 economic barrier. The differences in health behaviors possibly result from severities of
219 the symptoms and diseases, socioeconomic and demographic factors, health
220 knowledge and literacy, and others, and these factors are interactively related with
221 each other [5-8, 33, 34]. Further studies are required to examine intermediating and
222 moderating factors between income and health, in order to consider practical
223 measurements to reduce socioeconomic inequalities.

224 The results for CVD-related diseases, including diabetes, hypertension and stroke,
225 support limited access to healthcare for lower income younger members of the
226 population. For the young group in this study, stroke and ischemic disease prevalences
227 were higher but those of dyslipidemia and hypertension were not. These findings
228 suggest that for asymptomatic disorders morbidity is higher for the lower income
229 population, though they may be reluctant to see healthcare, even when these disorders
230 become increasingly severe and obvious, compelling them to receive treatment. It is
231 possible that small chances of health checkups in young or lower income populations

[10] lead to underestimation of income inequalities in especially asymptomatic diseases such as hypertension, diabetes, and dyslipidemia that are mainly detected by health checkups. Along with preventive measures for CVD, appropriate healthcare services, especially early detection and treatment, are required.

Depression showed a unique pattern. The relationships of lower income with symptoms and treatments were the strongest for depression. Moreover, the prevalence of treatment in those with symptoms had very high RII (=3.82) for the young group. We assessed this relationship between income and depression in a previous study [35]; in addition to vulnerability to psychological distress in the socially disadvantaged population, we speculate that those with high SES might be reluctant to receive health care even if they are experiencing psychological discomfort.

This study offers two main advantages for examining the relationships between income and morbidities in the Japanese population. First, we used a large national sample, allowing detailed analyses of various disorders, by age-group. Second, we examined not only symptoms and morbidities, but also access to healthcare combining data on symptoms and treatments. Since social disparities remain a major concern in Japanese society [20, 21], the results of this study provide important evidence of inequalities in healthcare in Japan.

This study also has several limitations. First, the morbidities and treatments were self-reported. In general, lower SES populations are more likely to report their sickness [36]. Self-reporting bias and overestimation of the relationships between income and morbidities might have occurred in this study. Second, treatment includes not only medical treatments but also other forms of care such as acupuncture and osteopathy. Third, there were other boundaries of age groups such as 65 and 70, and the different boundaries might draw different results. Although the data did not shown, the higher the age of boundary were, the stronger the associations of income with symptom and morbidities were in the older group by our supplemental analyses. Fourth, several logistic regression models did not show the good fitness and the significance. The meaning of goodness-of-fit has been debated [37] and most of the regressions with significant RII showed the significance of model. However, reconsideration of models such as by adding other explanatory variables might improve the goodness of fit and thus result in more accurate estimate of the RII. Fifth, this study has a cross-sectional design, such that no conclusions can be drawn regarding causal relationships. Finally, since RII of the association of income adjusted for only sex and age, possible confounding factors remained not adjusted. The residual confounding might result in overestimate or underestimate of the influence of income

on symptoms, morbidities and healthcare usage.

Socioeconomic inequalities in health, which have been receiving more attention in Japan, as social disparities related to income and education, are discussed herein [20, 21]. It is important to explore these factors, accumulate more evidence on health inequalities and also to monitor the relevant trends. The survey used in this study is conducted every three years, and is useful for monitoring health inequalities in the Japanese population.

In conclusion, we have demonstrated lower income to be associated with higher prevalences of physical symptoms and morbidities, and this association was stronger in the senior than in younger members of the population. Although for the elderly population there were few inequalities in access to healthcare, the working age might have a certain difficulty in receiving healthcare services due to socioeconomic disadvantages including lower income.

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Table 1 Basic characteristics of study subjects: sex, age and household income

		Men	Women	Total
Number of subjects	Age < 60	13,303 (60.7%)	13,843 (56.2%)	27,146 (58.3%)
	Age >= 60	8,623 (39.3%)	10,777 (43.8%)	19,400 (41.7%)
	Total	21,926 (100.0%)	24,620 (100.0%)	46,546 (100.0%)
Age (years, mean±S.D.)		54.3±16.4	56.2±17.3	55.3±16.9
Annual household income (million, mean±S.D.)		6.6±5.1	6.3±5.1	6.5±5.1

Table 2 Classification of symptoms and disorders

Groups	Symptoms	Disorders
Ophthalmopathy	Dim vision, visual difficulty	Ophthalmopathy
Otopathy	Dizziness, buzzing, hearing difficulty	Otopathy
Rhinopathy	Nasal obstruction, nasal discharge	Cold, allergic rhinitis
Respiratory diseases	Cough and sputum, wheezing	Asthma, other respiratory diseases
Digestive diseases	Gastric heaviness and heartburn, appetite loss, abdominal and stomach	Diseases of stomach and duodenum
Dental diseases	Toothache, swelling and bleeding of gums, chewing difficulty	Dental diseases
Dermopathy	Eruption, itch	Atopic dermatitis, other skin diseases
Neck stiffness	Neck stiffness	Neck stiffness
Lumbago	Back pain	Lumbago
Arthropathy	Pain in limb joints	Arthritis, rheumatoid arthritis
Depression	General fatigue, sleeplessness, irritation	Depression
Diabetes	(not available)	Diabetes
Dyslipidemia	(not available)	Dyslipidemia
Hypertension	(not available)	Hypertension
Stroke	(not available)	Stroke
Ischemic heart diseases	(not available)	Ischemic heart diseases

Table 3 Prevalences of having symptoms and recieving treatment by age group (<60 years vs >=60 years)

	Symptoms			Treatment			Treatment / symptoms [a)]		
	<60	>=60		<60	>=60		<60	>=60	
Ophthalmopathy	5.8%	14.1%	*	2.6%	10.9%	*	18.8%	34.4%	*
Otopathy	5.6%	14.5%	*	0.7%	2.2%	*	6.5%	10.6%	*
Rhinopathy	5.3%	5.0%		2.2%	2.3%		21.4%	20.9%	
Respiratory diseases	5.7%	8.2%	*	1.6%	3.3%	*	14.8%	21.6%	*
Digestive diseases	5.2%	7.8%	*	1.2%	3.6%	*	12.1%	20.2%	*
Dental diseases	5.0%	9.4%	*	4.0%	6.6%	*	27.2%	29.5%	
Dermopathy	5.5%	7.5%	*	2.9%	3.1%		28.2%	26.4%	
Neck stiffness	10.6%	13.4%	*	2.8%	5.6%	*	17.7%	29.7%	*
Lumbago	10.2%	18.1%	*	3.9%	10.1%	*	26.7%	42.0%	*
Arthropathy	5.2%	13.1%	*	1.8%	6.3%	*	22.2%	30.9%	*
Depression	9.2%	12.0%	*	1.6%	1.7%		9.0%	8.4%	
Total	29.2%	42.6%	*	18.7%	35.5%	*	41.0%	57.5%	*

[a)] prevalence of people receiving treatment among those with symptoms

* $p<0.05$ on chi-square test for comparison beteween <60 and >=60

Table 4 Relative index of inequality (RII) for symptoms according to household income by age groups: results of logistic regression analysis with adjustment for age and sex

	<60 years				>=60 years			
	RII	(95%CI)	fit	model	RII	(95%CI)	fit	model
Ophthalmopathy	1.51	(1.27 - 1.80)		*	2.45	(2.12 - 2.82)	†	*
Otopathy	1.68	(1.40 - 2.01)	†	*	2.02	(1.75 - 2.32)	†	*
Rhinopathy	1.19	(0.99 - 1.43)	†	*	1.19	(0.95 - 1.50)	†	*
Respiratory diseases	1.34	(1.12 - 1.60)	†	*	1.58	(1.32 - 1.89)	†	*
Digestive diseases	1.67	(1.38 - 2.02)	†	*	1.86	(1.55 - 2.23)	†	*
Dental diseases	1.65	(1.36 - 1.99)	†	*	1.65	(1.39 - 1.95)		*
Dermopathy	1.12	(0.93 - 1.34)	†	*	1.31	(1.09 - 1.58)	†	*
Neck stiffness	1.20	(1.05 - 1.37)	†	*	1.71	(1.48 - 1.98)	†	*
Lumbago	1.39	(1.21 - 1.59)	†	*	1.77	(1.56 - 2.01)	†	*
Arthropathy	1.76	(1.46 - 2.12)		*	1.95	(1.68 - 2.26)	†	*
Depression	1.59	(1.38 - 1.84)		*	2.03	(1.74 - 2.36)	†	*
Total	1.19	(1.09 - 1.31)	†	*	1.69	(1.53 - 1.87)	†	*

† p>=0.05 on Hosmer-Lemeshow test for goodness of fit

* p<0.05 on score test for significant of model

Table 5 Relative index of inequality (RII) for treatments according to household income by age groups: results of logistic regression analysis with adjustment for age and sex

	<60 years				>=60 years			
	RII	(95%CI)	fit	model	RII	(95%CI)	fit	model
Ophthalmopathy	1.34	(1.03 - 1.73)		*	1.85	(1.58 - 2.17)		*
Otopathy	1.18	(0.71 - 1.97)	†	*	2.33	(1.67 - 3.27)	†	*
Rhinopathy	0.77	(0.58 - 1.01)	†	*	1.19	(0.85 - 1.66)	†	
Respiratory diseases	1.43	(1.03 - 1.99)	†	*	1.77	(1.34 - 2.34)	†	*
Digestive diseases	1.36	(0.93 - 1.99)	†	*	1.94	(1.49 - 2.53)	†	*
Dental diseases	0.94	(0.76 - 1.16)	†	*	0.87	(0.71 - 1.06)		*
Dermopathy	0.71	(0.56 - 0.92)	†	*	0.80	(0.61 - 1.06)	†	*
Neck stiffness	0.92	(0.72 - 1.18)	†	*	1.94	(1.56 - 2.41)	†	*
Lumbago	1.09	(0.88 - 1.34)		*	1.78	(1.51 - 2.10)	†	*
Arthropathy	1.20	(0.88 - 1.64)	†	*	1.97	(1.61 - 2.41)	†	*
Depression	4.67	(3.29 - 6.61)		*	1.79	(1.23 - 2.62)	†	*
Total	1.04	(0.93 - 1.16)		*	1.51	(1.36 - 1.67)		*

† p>=0.05 on Hosmer-Lemeshow test for goodness of fit

* p<0.05 on score test for significant of model

Table 6 Relative index of inequality (RII) for treatments in those with symptoms according to household income by age groups: results of logistic regression analysis with adjustment for age and sex

	<60 years				>=60 years			
	RII	(95%CI)	fit	model	RII	(95%CI)	fit	model
Ophthalmopathy	1.14	(0.75 - 1.73)	†		0.93	(0.70 - 1.23)		*
Otopathy	0.67	(0.34 - 1.32)	†		1.72	(1.12 - 2.66)	†	*
Rhinopathy	0.72	(0.45 - 1.13)	†		0.88	(0.51 - 1.52)	†	
Respiratory diseases	1.54	(0.95 - 2.50)	†	*	1.65	(1.08 - 2.50)	†	*
Digestive diseases	0.85	(0.50 - 1.46)	†		1.27	(0.81 - 2.00)	†	
Dental diseases	0.65	(0.43 - 0.98)	†		0.76	(0.53 - 1.09)	†	*
Dermopathy	0.55	(0.37 - 0.81)	†	*	0.81	(0.53 - 1.23)	†	
Neck stiffness	0.92	(0.67 - 1.28)	†	*	1.43	(1.06 - 1.93)	†	*
Lumbago	0.92	(0.69 - 1.23)	†	*	1.28	(1.01 - 1.63)		*
Arthropathy	0.77	(0.50 - 1.17)	†	*	1.07	(0.79 - 1.44)	†	
Depression	3.82	(2.32 - 6.29)	†	*	1.05	(0.63 - 1.77)	†	
Total	1.02	(0.87 - 1.19)	†	*	1.32	(1.13 - 1.54)		*

† p>=0.05 on Hosmer-Lemeshow test for goodness of fit

* p<0.05 on score test for significant of model

Table 7 Prevalences of treatment and relative index of inequalities (RII) for cardiovascular-related diseases by age group: results of logistic regression analysis with adjustment for age and sex

	<60 years					>=60 years				
	Prevalence	RII	(95%CI)	fit	model	Prevalence	RII	(95%CI)	fit	model
Diabetes	2.6%	1.62	(1.25 - 2.10)		*	7.4%	1.38	(1.14 - 1.67)	†	*
Dyslipidemia	2.8%	0.69	(0.54 - 0.89)		*	7.7%	1.25	(1.04 - 1.50)		*
Hypertension	6.6%	1.03	(0.87 - 1.22)		*	23.4%	1.43	(1.27 - 1.61)		*
Stroke	0.7%	2.23	(1.36 - 3.66)	†	*	3.2%	2.20	(1.65 - 2.92)	†	*
Ischemic heart diseases	0.8%	2.39	(1.50 - 3.81)	†	*	4.4%	1.64	(1.29 - 2.08)		*
Total	10.6%	1.08	(0.95 - 1.24)		*	35.1%	1.56	(1.40 - 1.73)		*

† p>=0.05 on Hosmer-Lemeshow test for goodness of fit

* p<0.05 on score test for significant of model