

## SECTION 7

# Occupational Factors and Mortality in the Japan Collaborative Cohort Study for Evaluation of Cancer (JACC)

Yoshihisa Fujino

## Abstract

Occupational factors and mortality were assessed in the Japan Collaborative Cohort Study for evaluation of cancer. Overall an elevated risk of death from all causes, all cancers and circulatory disease, particularly in males, was found for those who were unemployed or to a lesser extent, self-employed. Certain cancers also showed links. There was no difference in the risk of total death or death due to cancers between office workers and manual workers. However, manual workers of both sexes have a decreased risk of death due to colon cancer and of breast in females. In males, rotating shift work increased risk of total death and ischemic heart diseases. Slight increase overall with dusty and noisy environments, perceived stress linked with IHD and CVD.

**Keywords:** Occupation - self-employed - unemployed - mortality - cancer - circulatory disease

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## Introduction

Occupation and its related factors are recognized as major determinants of various health outcomes. These relationships are traditionally considered to be underpinned by hazardous environment including occupational exposure to noise, dust, and toxic chemical substances. These findings have contributed to improvement in occupational safety and hygiene. In addition, recently, attention has focused on the workplace as a potential source of stress that might contribute not only to mental disturbances but also to physical health problems, such as cardiovascular and cerebrovascular disease. Furthermore, associations between occupational factors and health outcomes are seen with differences in socioeconomic status, which is of relevance to the design of prevention strategies and health policies.

## Materials and Methods

In this section, we examine the association between occupational related factors and several health outcomes using the JACC study data in order to show the brief sketch of the impact of occupational factors on health.

## Results

### *Type of employment* (Table 1)

In the present analyses, compared with employed workers, people in other categories including part-time workers, self-employed workers, unemployed people, and full-time homemakers, generally have higher risk of total

death and death due to cancers. For total death, the HR was 1.08 in part-time male, 1.14 in self-employed male, 1.59 in unemployed male, 1.18 in self-employed female, 1.15 in housewife female, and 1.49 in unemployed female. For all cancers, HR was 1.13 in self-employed males, 1.29 in unemployed males, 1.25 in self-employed females, and 1.24 in housewife females. In addition, death due to ischemic heart disease (HR=1.64 in males), cerebrovascular disease (HR=1.58 in males), and several sites of cancers, including the esophagus (HR=1.98 in males), stomach (HR=1.35 in males), liver (HR=1.84 in males), pancreas (HR=3.08 in females), and lung (HR=2.13 in females) were more likely to have occurred among the unemployed people.

### *Type of job*

There was no difference in the risk of total death or death due to cancers between office workers and manual workers. However, manual workers of both sexes have a decreased risk of death due to colon cancer (HR=0.59 in males and HR=0.57 in females), and manual female workers also showed decreased risk of death due to breast cancer (HR=0.41). In contrast, manual male workers demonstrated an increased risk of death due to stomach cancer (HR=1.49).

### *Shift work*

In this analysis, rotating shift work increased risk of total death in males (HR=1.12) but fixed-night work did not. Rotating shift work particularly increased the risk of death due to ischemic heart diseases in males (HR=1.76, 95% CI: 1.34, 2.33). No association was detected between

Department of Preventive Medicine and Community Health, University of Occupational and Environmental Health, 1-1, Iseigaoka, Yahata-nishi-ku, Kitakyushu, 807-8555, Japan, Fax +81-93-603-4307, E-mail: zenq@med.uoeh-u.ac.jp

**Table 1. Age-adjusted Hazard Ratios\* and 95% Confidence Intervals(95% CI) According to Occupational Factors in Males**

Type of employment	All causes		All cancers		Esophageal cancer		Stomach cancer		Colon cancer		Rectal cancer		Liver cancer		
	No	HR(95%CI)	No	HR(95%CI)	No	HR(95%CI)	No	HR(95%CI)	No	HR(95%CI)	No	HR(95%CI)	No	HR(95%CI)	
employed	1,439	1.00	663	1.00	30	1.00	115	1.00	45	1.00	38	1.00	87	1.00	
part time	166	1.08 (0.92, 1.27)**	75	1.18 (0.93, 1.50)	3	1.45 (0.43, 4.84)	16	1.45 (0.85, 2.47)	2	0.50 (0.12, 2.10)	4	1.26 (0.44, 3.61)	11	1.86 (0.98, 3.54)*	
self-employed	2,842	1.14 (1.07, 1.22)**	1,172	1.13 (1.02, 1.26)*	49	1.33 (0.82, 2.17)	260	1.40 (1.10, 1.77)**	64	1.01 (0.67, 1.53)	48	0.94 (0.59, 1.49)	118	1.22 (0.91, 1.65)	
housewife	485	1.25 (0.69, 2.28)	7	2.03 (0.96, 4.29)*	0	N.A.	1	1.53 (0.21, 11.0)	1	4.95 (0.67, 36.3)	1	6.36 (0.86, 47.1)*	0	NA	
unemployed	3,033	1.59 (1.47, 1.71)**	959	1.29 (1.15, 1.46)**	41	1.98 (1.12, 3.51)*	180	1.35 (1.02, 1.79)*	66	1.59 (0.99, 2.55)*	39	1.29 (0.74, 2.24)	115	1.84 (1.31, 2.61)**	
others	610	1.26 (1.14, 1.40)**	246	1.26 (1.07, 1.47)**	13	1.94 (0.96, 3.93)*	57	1.63 (1.15, 2.30)**	8	0.72 (0.33, 1.60)	10	1.20 (0.56, 2.55)	20	1.39 (0.83, 2.34)	
Type of job (1)															
office work	83,528	1.00	361	1.00	16	1.00	51	1.00	30	1.00	18	1.00	39	1.00	
manual work	255,472	1.03 (0.95, 1.11)	1,369	1.00 (0.89, 1.13)	50	0.87 (0.49, 1.56)	298	1.49 (1.10, 2.01)**	65	0.59 (0.38, 0.92)*	63	0.96 (0.56, 1.63)	124	0.98 (0.67, 1.41)	
others	30,181	1.04 (0.93, 1.18)	201	0.93 (0.77, 1.13)	7	0.87 (0.33, 2.29)	38	1.09 (0.69, 1.73)	8	0.50 (0.21, 1.19)	8	0.87 (0.35, 2.16)	23	1.33 (0.76, 2.35)	
Type of job (2)															
sedentary work	112,511	1.673	638	1.00	29	1.00	127	1.00	41	1.00	30	1.00	67	1.00	
sedentary and standing	1,065	0.98 (0.90, 1.06)	430	0.98 (0.87, 1.12)	10	0.46 (0.22, 0.96)*	81	0.94 (0.70, 1.25)	27	1.16 (0.70, 1.92)	19	1.06 (0.58, 1.93)	50	1.00 (0.69, 1.47)	
standing position	25,166	1.15 (1.04, 1.28)**	159	1.04 (0.87, 1.24)	6	0.83 (0.34, 2.03)	29	0.92 (0.61, 1.38)	16	1.81 (1.01, 3.25)*	6	0.88 (0.36, 2.14)	26	1.61 (1.02, 2.55)*	
moving	214,361	0.94 (0.88, 1.00)*	1,438	0.97 (0.88, 1.08)	70	0.91 (0.56, 1.47)	301	0.98 (0.78, 1.24)	76	1.00 (0.66, 1.52)	61	1.04 (0.64, 1.69)	114	0.13 (0.56, 1.08)	
Shift work															
mainly daytime	353,693	1.00	2,284	1.00	101	1.00	460	1.00	131	1.00	98	1.00	224	1.00	
mainly night	21,986	1.10 (0.99, 1.23)*	121	0.88 (0.73, 1.07)	3	0.59 (0.18, 1.94)	27	0.99 (0.65, 1.49)	6	0.56 (0.24, 1.30)	5	0.68 (0.26, 1.74)	14	1.23 (0.69, 2.19)	
alternate night/day	43,874	1.12 (1.03, 1.22)**	227	0.96 (0.83, 1.10)	9	0.93 (0.46, 1.86)	44	0.96 (0.70, 1.32)	18	1.16 (0.70, 1.92)	13	1.11 (0.62, 2.01)	22	0.87 (0.55, 1.35)	
Working settings															
mainly indoor	160,778	2.428	978	1.00	35	1.00	178	1.00	66	1.00	37	1.00	128	1.00	
mainly outdoor	202,561	0.98 (0.93, 1.04)	1,383	0.97 (0.89, 1.05)	61	1.17 (0.76, 1.79)	292	1.07 (0.88, 1.30)	71	0.77 (0.54, 1.08)	66	1.28 (0.84, 1.94)	108	0.68 (0.52, 0.89)**	
alternate	83,468	1.276	0.97 (0.91, 1.04)	495	0.93 (0.84, 1.04)	25	1.27 (0.75, 2.13)	91	0.92 (0.71, 1.19)	25	0.74 (0.46, 1.18)	21	1.09 (0.64, 1.88)	69	1.03 (0.77, 1.39)
Dust at workplace															
no	206,074	3.013	1,242	1.00	68	1.00	234	1.00	77	1.00	48	1.00	109	1.00	
yes	114,344	1.657	1.12 (1.05, 1.18)**	643	1.04 (0.94, 1.14)	25	0.76 (0.48, 1.21)	136	1.17 (0.95, 1.45)	29	0.72 (0.47, 1.11)	37	1.52 (0.98, 2.34)*	77	1.29 (0.96, 1.73)*
perceived noise exposure at workplace															
no	205,421	3.063	1,267	1.00	65	1.00	251	1.00	76	1.00	48	1.00	110	1.00	
yes	111,177	1.496	1.07 (1.01, 1.14)*	611	1.01 (0.92, 1.12)	28	0.91 (0.58, 1.43)	117	1.01 (0.80, 1.26)	35	0.92 (0.61, 1.38)	36	1.55 (1.00, 2.41)*	73	1.23 (0.91, 1.66)
Stress for human relationships															
no	209,040	3.076	1,287	1.00	69	1.00	262	1.00	76	1.00	62	1.00	110	1.00	
yes	112,005	1.590	1.06 (0.99, 1.13)*	604	0.99 (0.89, 1.09)	25	0.90 (0.55, 1.46)	113	0.91 (0.72, 1.15)	36	0.87 (0.57, 1.33)	21	0.66 (0.39, 1.12)	74	1.29 (0.95, 1.77)*
Job control															
no	65,037	857	1.00	343	1.00	17	1.00	52	1.00	18	1.00	17	1.00	43	1.00
yes	284,267	4.496	0.94 (0.87, 1.01)	1,799	1.00 (0.89, 1.12)	84	1.03 (0.61, 1.75)	368	1.34 (1.00, 1.80)*	111	1.11 (0.67, 1.85)	76	0.82 (0.48, 1.41)	171	0.84 (0.60, 1.18)

\*Adjusted for age and area of study. \*\* p<0.01; \* p<0.05; + p<0.10 NA: not applicable

**Table 1. Continued. Age-adjusted Hazard Ratios and 95% Confidence Intervals(95% CI) According to Occupational Factors in Males**

	Person -years	Gall bladder cancer No HR(95%CI)	Pancreas cancer No HR(95%CI)	Lung cancer No HR(95%CI)	Prostate cancer No HR(95%CI)
<b>Type of employment</b>					
employed	190,821	9 1.00	35 1.00	139 1.00	19 1.00
part time	9,657	3 3.06 (0.80, 11.6) <sup>+</sup>	0 NA	22 1.44 (0.91, 2.28)	2 0.71 (0.16, 3.11)
self-employed	181,935	17 0.91 (0.38, 2.17)	73 1.28 (0.82, 1.97)	277 1.13 (0.91, 1.41)	45 0.90 (0.50, 1.62)
housewife	485	0 NA	1 5.43 (0.73, 40.1) <sup>*</sup>	1 1.25 (0.17, 8.97)	1 4.82 (0.63, 36.6)
unemployed	73,648	30 2.05 (0.84, 5.02)	38 0.86 (0.50, 1.48)	208 1.12 (0.87, 1.45)	57 1.15 (0.62, 2.12)
others	25,593	3 0.83 (0.21, 3.29)	20 1.63 (0.89, 2.99)	58 1.17 (0.84, 1.62)	10 0.99 (0.43, 2.26)
<b>Type of jobs(1)</b>					
office work	83,528	7 1.00	21 1.00	82 1.00	12 1.00
manual work	255,472	17 0.56 (0.23, 1.37)	83 1.01 (0.62, 1.64)	338 1.07 (0.83, 1.36)	46 0.97 (0.51, 1.85)
others	30,181	2 0.31 (0.05, 1.72)	11 0.74 (0.33, 1.63)	61 1.18 (0.82, 1.70)	9 1.00 (0.38, 2.65)
<b>Type of jobs(2)</b>					
sedentary work	112,511	12 1.00	37 1.00	141 1.00	28 1.00
sedentary and standing	73,055	9 0.91 (0.37, 2.23)	25 0.99 (0.58, 1.68)	100 0.96 (0.74, 1.26)	15 0.95 (0.50, 1.83)
standing position	25,166	3 0.85 (0.23, 3.08)	4 0.45 (0.16, 1.27)	30 0.86 (0.58, 1.29)	8 1.34 (0.61, 2.97)
moving	214,361	25 0.66 (0.31, 1.39)	79 0.90 (0.58, 1.38)	372 1.06 (0.86, 1.31)	59 1.19 (0.72, 1.94)
<b>Shift work</b>					
mainly daytime	353,693	42 1.00	122 1.00	560 1.00	91 1.00
mainly night	21,986	2 1.06 (0.23, 4.86)	7 0.96 (0.43, 2.16)	27 0.88 (0.59, 1.33)	7 0.90 (0.39, 2.04)
alternate night day	43,874	3 0.83 (0.25, 2.73)	16 1.29 (0.76, 2.19)	47 0.84 (0.62, 1.14)	10 1.01 (0.52, 1.97)
<b>Working settings</b>					
mainly indoor	160,778	15 1.00	53 1.00	236 1.00	34 1.00
mainly outdoor	202,561	31 1.24 (0.65, 2.36)	76 0.95 (0.66, 1.37)	339 0.95 (0.80, 1.13)	60 1.26 (0.82, 1.96)
alternate	83,468	3 0.34 (0.09, 1.18) <sup>+</sup>	36 1.24 (0.81, 1.90)	108 0.82 (0.65, 1.04)	25 1.52 (0.90, 2.56)
<b>Dust at workplace</b>					
no	206,074	20 1.00	67 1.00	294 1.00	50 1.00
yes	114,344	12 1.31 (0.63, 2.69)	37 1.09 (0.72, 1.63)	154 1.09 (0.90, 1.33)	24 1.03 (0.63, 1.69)
<b>Perceived noise exposure at workplace</b>					
no	205,421	20 1.00	61 1.00	295 1.00	56 1.00
yes	111,177	12 1.46 (0.70, 3.04)	39 1.31 (0.87, 1.98)	144 1.07 (0.87, 1.32)	21 0.89 (0.53, 1.49)
<b>Stress for human relationships</b>					
no	209,040	22 1.00	69 1.00	305 1.00	53 1.00
yes	112,005	9 1.12 (0.49, 2.55)	32 0.93 (0.60, 1.46)	140 1.06 (0.86, 1.31)	26 0.84 (0.51, 1.38)
<b>Job control</b>					
no	65,037	3 1.00	20 1.00	94 1.00	11 1.00
yes	284,267	32 1.93 (0.58, 6.35)	99 0.94 (0.58, 1.53)	412 0.84 (0.67, 1.05)	81 1.18 (0.62, 2.23)

<sup>\*</sup>, p<0.05; <sup>+</sup>p<0.10 NA: not applicable

shift work and any site of cancer.

### Working settings

Working setting, that means mainly indoor, mainly outdoor, or alternate both, is similar in nature to "type of jobs" in this questionnaire, and showed similar results. There was no difference in the risk of total death or cancers between the groups of working settings. Men who worked mainly outdoor had decreased risk of death due to ischemic heart disease than those who worked mainly indoor (HR=0.74, 95% CI: 0.60, 0.92). In contrast, indoor workers showed lower risk of death due to liver cancer in male (HR=0.68, 95% CI: 0.52, 0.89).

### Dust and noise at work place

The slightly higher risks of total death were observed among the men who indicated their workplace is dusty or noise than those who did not. The HR of total death was 1.12 among the male who indicated their workplace was dusty and 1.07 among the male who indicated their workplace was noisy. No association was observed between dust and noise in occupational environment and cancers. Unacquainted association between noisy workplace and rectum cancer was observed in males (HR=1.55). It is supposed that respiratory diseases are

linked to occupational dust, women only who indicated their work place was dusty had marginally increased risk of death due to lung cancer (HR=1.47). There was no association between dusty and noisy workplace and ischemic heart disease and cerebrovascular disease.

### Stress for human relationships and job control

In the present analyses showed that the men who reported their perceived stress related to human relationships is high had a higher risk of death due to ischemic heart disease (HR=1.32, 95% CI: 1.03, 1.69) and cerebrovascular diseases (HR=1.25, 95% CI: 1.04, 1.49) than those who did not. In addition, in the present analyses, women who reported their perceived stress for human relationships is high had a higher risk of death due to multiple myeloma and malignant plasma cell neoplasms (HR=3.98), men who reported their job control was high had a higher risk of death due to stomach cancer (HR=1.34), and women who reported their job control high had lower risk of death due to liver cancer (HR=0.56).

## Discussion

### Type of employment

A number of previous studies reported inequalities in

**Table 1. Continued. Age-adjusted Hazard Ratios<sup>#</sup> and 95% Confidence Intervals(95% CI) for Selected Cancers According to Occupational Factors in Males**

Type of employment	Person years	Kidney		Urothelial tract		Non-Hodgkin's		Multiple myeloma		Myeloid leukemia		Ischemic heart		Cerebrovascular	
		No	HR(95%CI)	No	HR(95%CI)	No	HR(95%CI)	No	HR(95%CI)	No	HR(95%CI)	No	HR(95%CI)	No	HR(95%CI)
employed	190,821	11	1.00	13	1.00	20	1.00	9	1.00	12	1.00	90	1.00	161	1.00
part time	9,657	0	NA	3	1.88 (0.52, 6.74)	0	NA	0	NA	1	1.07 (0.13, 8.48)	7	0.71 (0.33, 1.56)	21	1.06 (0.67, 1.69)
self-employed	181,935	11	0.77 (0.31, 1.91)	25	0.93 (0.45, 1.92)	25	0.80 (0.42, 1.52)	19	1.43 (0.60, 3.39)	18	1.22 (0.55, 2.69)	179	1.11 (0.84, 1.46)	347	1.08 (0.88, 1.32)
housewife	485	0	NA	0	NA	0	NA	0	NA	0	NA	0	NA	1	0.84 (0.11, 6.04)
unemployed	73,648	10	0.90 (0.31, 2.59)	26	1.05 (0.47, 2.35)	24	1.07 (0.51, 2.24)	13	1.54 (0.55, 4.25)	9	1.04 (0.36, 2.96)	206	1.64 (1.21, 2.21)**	424	1.58 (1.27, 1.96)**
others	25,593	3	0.91 (0.22, 3.65)	5	0.89 (0.29, 2.67)	4	0.69 (0.22, 2.18)	2	0.88 (0.17, 4.43)	1	0.42 (0.05, 3.42)	43	1.39 (0.94, 2.05) <sup>+</sup>	81	1.24 (0.93, 1.65)
Type of job (1)															
office work	83,528	11	1.00	9	1.00	11	1.00	7	1.00	8	1.00	63	1.00	82	1.00
manual work	255,472	15	0.40 (0.18, 0.89)*	27	0.77 (0.36, 1.68)	28	0.70 (0.34, 1.42)	16	0.64 (0.26, 1.59)	21	0.76 (0.33, 1.76)	194	0.80 (0.59, 1.06)	406	1.26 (0.99, 1.60) <sup>+</sup>
others	30,181	0	NA	4	0.52 (0.15, 1.86)	6	1.05 (0.35, 3.12)	3	0.78 (0.17, 3.48)	1	0.27 (0.03, 2.42)	33	0.80 (0.50, 1.28)	65	1.12 (0.79, 1.60)
Type of job (2)															
sedentary work	112,511	12	1.00	14	1.00	15	1.00	8	1.00	10	1.00	117	1.00	218	1.00
sedentary and standing	73,055	7	0.92 (0.34, 2.43)	14	1.42 (0.66, 3.07)	12	1.15 (0.52, 2.54)	4	0.96 (0.27, 3.34)	7	1.14 (0.41, 3.15)	79	1.01 (0.75, 1.36)	130	0.97 (0.77, 1.21)
standing position	25,166	0	NA	7	2.08 (0.83, 5.23)	4	1.11 (0.36, 3.38)	0	NA	0	N.A.	30	1.06 (0.71, 1.60)	66	1.29 (0.98, 1.71) <sup>+</sup>
moving	214,361	16	0.62 (0.27, 1.43)	28	0.82 (0.41, 1.63)	28	0.76 (0.38, 1.52)	22	1.59 (0.64, 3.90)	20	1.05 (0.45, 2.45)	217	0.81 (0.63, 1.03) <sup>+</sup>	442	0.89 (0.74, 1.06)
Shift work															
mainly daytime	353,693	32	1.00	53	1.00	49	1.00	30	1.00	32	1.00	349	1.00	716	1.00
mainly night	21,986	0	NA	4	1.41 (0.46, 4.29)	2	0.63 (0.14, 2.76)	1	0.39 (0.05, 3.05)	3	1.36 (0.38, 4.85)	24	1.07 (0.69, 1.67)	56	1.08 (0.81, 1.45)
alternate	43,874	3	0.78 (0.23, 2.59)	2	0.40 (0.09, 1.65)	6	1.15 (0.48, 2.73)	2	0.56 (0.13, 2.42)	1	0.25 (0.03, 1.89)	62	1.76 (1.34, 2.33)**	85	1.19 (0.95, 1.50)
Working setting															
mainly indoor	160,778	11	1.00	26	1.00	27	1.00	12	1.00	12	1.00	179	1.00	281	1.00
mainly outdoor	202,561	16	1.13 (0.51, 2.48)	34	0.84 (0.49, 1.43)	27	0.66 (0.38, 1.16)	17	0.89 (0.42, 1.91)	21	1.36 (0.65, 2.83)	201	0.74 (0.60, 0.92)**	487	1.12 (0.96, 1.30)
alternate	83,468	9	1.59 (0.65, 3.87)	9	0.62 (0.29, 1.34)	8	0.52 (0.23, 1.15)	8	1.27 (0.51, 3.14)	4	0.64 (0.20, 2.01)	96	1.00 (0.78, 1.29)	162	1.06 (0.87, 1.29)
Dust at workplace															
no	206,074	18	1.00	28	1.00	30	1.00	17	1.00	21	1.00	189	1.00	377	1.00
yes	114,344	9	0.96 (0.43, 2.15)	11	0.82 (0.40, 1.65)	10	0.61 (0.30, 1.26)	8	0.92 (0.39, 2.14)	7	0.64 (0.27, 1.51)	113	1.21 (0.96, 1.54)	213	1.17 (0.99, 1.39) <sup>+</sup>
Perceived noise exposure at workplace															
no	205,421	17	1.00	30	1.00	31	1.00	18	1.00	22	1.00	199	1.00	386	1.00
yes	111,177	8	0.97 (0.41, 2.27)	11	0.82 (0.40, 1.65)	10	0.61 (0.29, 1.26)	6	0.67 (0.26, 1.70)	7	0.64 (0.27, 1.52)	94	1.02 (0.79, 1.31)	181	1.10 (0.92, 1.32)
Stress for human relationships															
no	209,040	17	1.00	29	1.00	24	1.00	13	1.00	17	1.00	187	1.00	377	1.00
yes	112,005	8	0.78 (0.32, 1.90)	12	0.83 (0.41, 1.69)	17	1.37 (0.71, 2.66)	11	1.52 (0.64, 3.60)	11	1.24 (0.55, 2.80)	118	1.32 (1.03, 1.69)*	225	1.25 (1.04, 1.49)*
Job control															
no	65,037	4	1.00	8	1.00	7	1.00	8	1.00	6	1.00	63	1.00	112	1.00
yes	284,267	24	1.15 (0.39, 3.38)	36	0.83 (0.38, 1.80)	40	1.08 (0.48, 2.44)	20	0.40 (0.17, 0.92)*	26	0.87 (0.35, 2.15)	286	0.81 (0.61, 1.07)	573	0.84 (0.68, 1.03) <sup>+</sup>

<sup>#</sup>Adjusted for age and area of study. \*\*; p<0.01; \* p<0.05; + p<0.10 NA: not applicable

Table 1. Continued. Age-adjusted Hazard Ratios\* and 95% Confidence Intervals(95% CI) According to Occupational Factors in Females

Type of employment	Person years	All causes		All cancers		Esophageal cancer		Stomach cancer		Colon cancer		Rectal cancer		Liver cancer	
		No	HR(95%CI)	No	HR(95%CI)	No	HR(95%CI)	No	HR(95%CI)	No	HR(95%CI)	No	HR(95%CI)	No	HR(95%CI)
Type of employment															
employed															
part time	102,974	272	1.00	125	1.00	2	1.00	21	1.00	15	1.00	8	1.00	8	1.00
self-employed	69,289	220	1.09 (0.91, 1.30)	111	1.23 (0.95, 1.59)	0	N.A.	20	1.27 (0.68, 2.36)	7	0.60 (0.24, 1.47)	6	1.14 (0.39, 3.31)	11	1.91 (0.76, 4.76)
housewife	128,425	713	1.18 (1.03, 1.37)*	286	1.25 (1.01, 1.56)*	3	0.40 (0.06, 2.59)	41	0.92 (0.53, 1.59)	29	0.88 (0.46, 1.69)	12	1.04 (0.41, 2.62)	23	1.49 (0.65, 3.40)
unemployed	210,309	1,426	1.15 (1.00, 1.31)*	549	1.24 (1.01, 1.52)*	7	0.41 (0.08, 2.19)	88	1.03 (0.63, 1.70)	49	0.70 (0.38, 1.29)	16	0.70 (0.28, 1.72)	62	2.01 (0.94, 4.30)*
others	138,843	2,840	1.49 (1.30, 1.71)**	725	1.43 (1.15, 1.77)	11	0.24 (0.04, 1.42)	128	1.13 (0.67, 1.91)	69	0.72 (0.37, 1.37)	27	1.14 (0.44, 2.91)	69	1.95 (0.87, 4.36)*
Type of jobs(1)	36,079	295	1.18 (0.99, 1.40)*	114	1.40 (1.07, 1.83)*	0	N.A.	20	1.18 (0.62, 2.25)	12	0.88 (0.39, 1.95)	7	1.79 (0.61, 5.24)	7	1.24 (0.43, 3.53)
office work	62,722	215	1.00	107	1.00	1	1.00	13	1.00	14	1.00	5	1.00	8	1.00
manual work	217,407	904	0.86 (0.74, 1.00)*	391	0.83 (0.67, 1.04)	4	0.94 (0.09, 8.96)	64	1.09 (0.59, 2.00)	36	0.57 (0.30, 1.07)*	20	0.82 (0.30, 2.24)	34	0.96 (0.43, 2.10)
others	97,844	649	0.97 (0.83, 1.15)	230	0.82 (0.64, 1.05)	6	2.91 (0.29, 28.6)	37	1.02 (0.52, 2.00)	19	0.48 (0.22, 1.02)*	9	0.87 (0.27, 2.84)	17	0.75 (0.30, 1.85)
Type of jobs(2)															
sedentary work	150,155	901	1.00	340	1.00	2	1.00	44	1.00	31	1.00	18	1.00	32	1.00
sedentary/standing	103,939	767	1.01 (0.91, 1.12)	258	0.90 (0.76, 1.07)	2	1.10 (0.14, 8.48)	35	0.89 (0.55, 1.41)	27	0.99 (0.57, 1.72)	4	0.23 (0.07, 0.72)*	22	0.74 (0.41, 1.31)
standing position	33,561	239	1.00 (0.87, 1.16)	82	0.91 (0.71, 1.17)	1	1.88 (0.16, 21.4)	11	0.91 (0.46, 1.78)	4	0.48 (0.17, 1.39)	2	0.38 (0.08, 1.69)	14	1.51 (0.79, 2.88)
moving	242,629	1,906	0.94 (0.86, 1.03)	647	0.89 (0.77, 1.03)	13	2.35 (0.46, 12.0)	118	1.16 (0.79, 1.70)	68	0.95 (0.59, 1.54)	26	0.53 (0.26, 1.06)*	49	0.63 (0.38, 1.03)*
Shift work															
mainly daytime	465,765	3,237	1.00	1,144	1.00	16	1.00	183	1.00	114	1.00	49	1.00	101	1.00
mainly night	14,107	142	0.98 (0.82, 1.17)	39	0.89 (0.64, 1.23)	1	1.90 (0.21, 17.1)	8	1.31 (0.62, 2.76)	0	N.A.	0	NA	1	0.26 (0.03, 1.93)
alternate	36,077	328	1.08 (0.96, 1.21)	107	1.07 (0.87, 1.30)	1	0.72 (0.09, 5.52)	16	1.04 (0.62, 1.74)	13	1.24 (0.69, 2.22)	0	NA	10	1.11 (0.57, 2.13)
Working settings															
mainly indoor	299,571	1,743	1.00	664	1.00	6	1.00	100	1.00	70	1.00	24	1.00	62	1.00
mainly outdoor	168,749	1,488	0.97 (0.90, 1.04)	491	0.96 (0.85, 1.08)	11	1.85 (0.65, 5.23)	83	1.03 (0.76, 1.40)	43	0.74 (0.50, 1.10)	21	1.11 (0.60, 2.07)	33	0.70 (0.45, 1.10)
alternate	80,944	703	0.91 (0.84, 1.00)*	224	0.88 (0.75, 1.03)	1	0.37 (0.04, 3.15)	37	0.95 (0.64, 1.40)	21	0.70 (0.42, 1.16)	4	0.38 (0.13, 1.13)*	28	1.12 (0.70, 1.78)
Dust at workplace															
no	287,478	1,959	1.00	693	1.00	11	1.00	144	1.00	73	1.00	28	1.00	50	1.00
yes	102,649	635	1.01 (0.93, 1.11)	234	1.02 (0.88, 1.19)	5	1.77 (0.61, 5.16)	42	1.14 (0.79, 1.63)	20	0.86 (0.52, 1.42)	8	0.88 (0.39, 1.96)	20	1.29 (0.76, 2.19)
Perceived noise exposure at workplace															
no	289,537	1,998	1.00	700	1.00	9	1.00	124	1.00	71	1.00	27	1.00	53	1.00
yes	94,142	532	1.06 (0.96, 1.17)	201	1.05 (0.90, 1.24)	5	3.12 (1.00, 9.77)*	31	0.94 (0.63, 1.41)	15	0.83 (0.47, 1.47)	9	1.22 (0.56, 2.65)	16	1.18 (0.66, 2.10)
Stress for human relationships															
no	276,365	1,919	1.00	668	1.00	7	1.00	118	1.00	61	1.00	30	1.00	50	1.00
yes	120,062	707	0.95 (0.87, 1.05)	263	0.98 (0.84, 1.15)	5	3.20 (0.88, 11.7)*	40	0.94 (0.64, 1.39)	34	1.49 (0.94, 2.36)*	10	0.79 (0.36, 1.71)	20	1.13 (0.64, 1.97)
Job control															
no	77,508	477	1.00	177	1.00	4	1.00	22	1.00	19	1.00	3	1.00	23	1.00
yes	367,168	2,720	1.00 (0.91, 1.11)	940	0.97 (0.83, 1.15)	9	0.42 (0.13, 1.41)	170	1.44 (0.92, 2.25)	92	0.89 (0.54, 1.46)	43	2.73 (0.84, 8.85)*	68	0.56 (0.34, 0.91)*

#Adjusted for age and area of study. \*\* p&lt;0.01; \* p&lt;0.05; + p&lt;0.10 NA: not applicable

**Table 1. Continued. Age-adjusted Hazard Ratios and 95% Confidence Intervals(95% CI) According to Occupational Factors in Females**

	Person -years	Gall bladder cancer No HR(95%CI)	Pancreas cancer No HR(95%CI)	Lung cancer No HR(95%CI)	Breast cancer No HR(95%CI)	Cervical cancer No HR(95%CI)
Type of employment						
employed	102,974	5 1.00	6 1.00	10 1.00	10 1.00	5 1.00
part time	69,289	6 1.55 (0.47, 5.12)	7 1.56 (0.52, 4.67)	8 1.11 (0.43, 2.82)	10 1.60 (0.66, 3.87)	1 0.26 (0.03, 2.27)
self-employed	128,425	10 1.09 (0.36, 3.31)	21 1.95 (0.77, 4.92)	35 1.83 (0.89, 3.76) <sup>+</sup>	17 1.84 (0.83, 4.10)	4 0.60 (0.15, 2.36)
housewife	210,309	15 0.93 (0.32, 2.66)	57 2.69 (1.13, 6.37)*	73 2.09 (1.05, 4.13)*	26 1.60 (0.75, 3.43)	8 0.63 (0.19, 2.07)
unemployed	138,843	34 1.96 (0.67, 5.70)	75 3.08 (1.25, 7.55)*	83 2.13 (1.04, 4.38)*	20 2.17 (0.90, 5.21) <sup>+</sup>	8 0.75 (0.19, 2.97)
others	36,079	5 1.74 (0.47, 6.33)	13 3.51 (1.29, 9.55)*	14 2.18 (0.94, 5.06) <sup>+</sup>	2 0.77 (0.16, 3.59)	2 0.85 (0.15, 4.77)
Type of jobs(1)						
office work	62,722	3 1.00	10 1.00	16 1.00	11 1.00	1 1.00
manual work	217,407	17 1.37 (0.39, 4.81)	31 0.70 (0.34, 1.46)	40 0.58 (0.32, 1.06) <sup>+</sup>	16 0.41 (0.19, 0.92)*	8 2.52 (0.31, 20.5)
others	97,844	14 1.94 (0.51, 7.39)	25 0.79 (0.35, 1.76)	29 0.72 (0.36, 1.40)	7 0.46 (0.16, 1.31)	5 3.19 (0.34, 29.7)
Type of jobs(2)						
sedentary work	150,155	17 1.00	32 1.00	38 1.00	10 1.00	10 1.00
sedentary/standing	103,939	13 0.86 (0.40, 1.87)	29 1.22 (0.71, 2.09)	31 0.95 (0.57, 1.57)	15 2.77 (1.19, 6.41)*	2 0.23 (0.05, 1.13) <sup>+</sup>
standing position	33,561	2 0.43 (0.09, 1.89)	9 1.22 (0.57, 2.59)	4 0.39 (0.13, 1.11) <sup>+</sup>	6 3.00 (1.06, 8.42)*	2 0.73 (0.15, 3.43)
moving	242,629	25 0.69 (0.34, 1.37)	65 1.18 (0.73, 1.89)	81 0.96 (0.62, 1.47)	25 1.99 (0.89, 4.42) <sup>+</sup>	9 0.41 (0.15, 1.11) <sup>+</sup>
Shift work						
mainly daytime	465,765	49 1.00	111 1.00	137 1.00	51 1.00	18 1.00
mainly night	14,107	2 1.15 (0.26, 5.01)	7 1.34 (0.60, 2.98)	3 0.67 (0.20, 2.17)	1 0.58 (0.07, 4.28)	0 NA
alternate	36,077	6 1.41 (0.60, 3.33)	10 0.94 (0.48, 1.80)	7 0.60 (0.28, 1.30)	4 1.02 (0.36, 2.84)	3 2.05 (0.60, 7.06)
Working settings						
mainly indoor	299,571	32 1.00	58 1.00	74 1.00	37 1.00	13 1.00
mainly outdoor	168,749	17 0.70 (0.38, 1.31)	63 1.38 (0.95, 2.01) <sup>+</sup>	58 1.03 (0.71, 1.48)	20 0.88 (0.49, 1.56)	7 0.85 (0.32, 2.23)
alternate	80,944	13 1.18 (0.60, 2.30)	20 0.94 (0.56, 1.59)	21 0.77 (0.47, 1.28)	7 0.66 (0.28, 1.51)	5 1.31 (0.45, 3.80)
Dust at workplace						
no	287,478	28 1.00	74 1.00	70 1.00	39 1.00	14 1.00
yes	102,649	13 1.30 (0.66, 2.54)	22 0.93 (0.58, 1.51)	34 1.47 (0.97, 2.23) <sup>+</sup>	3 0.21 (0.06, 0.68)**	3 0.58 (0.16, 2.04)
Perceived noise exposure at workplace						
no	289,537	28 1.00	78 1.00	77 1.00	28 1.00	16 1.00
yes	94,142	13 1.67 (0.84, 3.30)	13 0.61 (0.33, 1.11)	25 1.22 (0.76, 1.94)	13 1.38 (0.71, 2.71)	2 0.39 (0.08, 1.71)
Stress for human relationships						
no	276,365	35 1.00	72 1.00	74 1.00	32 1.00	11 1.00
yes	120,062	7 0.51 (0.21, 1.19)	21 0.63 (0.37, 1.05) <sup>+</sup>	24 0.90 (0.55, 1.48)	10 0.56 (0.27, 1.19)	8 1.77 (0.66, 4.70)
Job control						
no	77,508	7 1.00	16 1.00	26 1.00	5 1.00	6 1.00
yes	367,168	43 1.18 (0.52, 2.65)	100 1.09 (0.64, 1.87)	97 0.68 (0.44, 1.06) <sup>+</sup>	44 1.83 (0.72, 4.66)	13 0.44 (0.16, 1.18)

\*\*<sub>p</sub><0.01; \*<sub>p</sub><0.05; <sup>+</sup><sub>p</sub><0.10 NA: not applicable

morality and morbidity between social and occupational classes. However, differences in mortality and morbidity between employment statuses have not received much attention. In the present analyses, employed worker were generally healthier than people in other categories including part-time workers, self-employed workers, unemployed people, and full-time homemakers. This is often described in epidemiological studies in which workers are more likely to be healthy than general population, known as "healthy worker effect". This is supported by the fact that total death, death due to ischemic heart disease, cerebrovascular disease, and several sites of cancers, including esophagus, stomach, liver, pancreas, and lung are more likely to be occurred among the unemployed people. Although the present results showed no difference in the risk of death due to cerebrovascular disease between employed and self-employed workers, the detail of the association between self-employed worker and a lower risk of cerebrovascular disease is previously reported elsewhere (Fujino et al., 2005).

#### Type of job

The risk of colon cancer in both sexes and that of breast cancer in females were decreased among the manual workers compared with the office workers. Probably, physical activity partly explain these links, since manual

workers should be physically active than office workers (Larsson et al., 2006). The increased risk of death due to stomach cancer in manual male workers is partly due to the fact that stomach cancer is more prevalent in those with a low-socioeconomic status (Fujino et al., 2002).

#### Shift work

Shift work is one of the major concerns for public health in respect to occupational health policy. Previous studies reported that some type of shift work increase the risk of several diseases, particularly, cardiovascular diseases, and cancers in breast (O'Leary et al., 2006, Schernhammer et al., 2006) and colon (Schernhammer et al., 2003). The present analysis showed that rotating shift work increased the risk of total death in males. In addition, rotating shift work increased the risk of death due to ischemic heart diseases in males, which is fully described elsewhere (Fujino et al., 2006). Although the present analysis showed no increased risk of death due to prostate cancer, the detail analyses accounting for several confounding factors reported the increased risk of prostate cancer (Kubo et al., 2006).

#### Working settings

Outdoor workers had the decreased risk of death due to ischemic heart disease than indoor workers, which is

Table 1. Continued. Age-adjusted Hazard Ratios\* for Selected Cancers According to Occupational Factors in Females

Type of employment	Person years	Kidney cancer		Urothelial tract cancer		Non-Hodgkin's		Multiple myeloma		Myeloid leukemia		Ischemic heart disease		Cerebrovascular	
		No	HR(95%CI)	No	HR(95%CI)	No	HR(95%CI)	No	HR(95%CI)	No	HR(95%CI)	No	HR(95%CI)	No	HR(95%CI)
employed	102,974	2	1.00	3	1.00	4	1.00	3	1.00	0	1.00	17	1.00	42	1.00
part time	69,289	0	N.A.	2	0.85 (0.14, 5.20)	3	0.93 (0.20, 4.19)	1	0.51 (0.05, 4.99)	1	NA	15	1.11 (0.55, 2.24)	29	0.86 (0.53, 1.38)
self-employed	128,425	1	0.31 (0.02, 3.69)	3	0.38 (0.07, 1.99)	8	0.93 (0.27, 3.21)	3	0.68 (0.13, 3.51)	9	NA	29	0.59 (0.32, 1.10)	100	0.90 (0.62, 1.31)
housewife	210,309	4	0.53 (0.08, 3.30)	8	0.48 (0.12, 1.95)	22	1.52 (0.49, 4.69)	13	1.59 (0.42, 5.94)	8	NA	72	0.69 (0.40, 1.20)	204	0.86 (0.61, 1.21)
unemployed	138,843	7	0.69 (0.10, 4.86)	16	0.51 (0.12, 2.17)	12	0.79 (0.22, 2.88)	17	2.22 (0.53, 9.22)	10	NA	206	0.95 (0.55, 1.64)	496	1.08 (0.76, 1.53)
others	36,079	2	1.39 (0.16, 11.6)	2	0.75 (0.11, 4.93)	0	NA	1	0.77 (0.07, 7.90)	2	NA	14	0.61 (0.29, 1.27)	45	0.87 (0.56, 1.35)
Type of jobs(1)															
office work	62,722	0	1.00	0	1.00	3	1.00	0	1.00	0	1.00	10	1.00	33	1.00
manual work	217,407	2	NA	5	NA	10	0.84 (0.22, 3.18)	10	NA	8	NA	44	0.82 (0.40, 1.64)	140	0.79 (0.54, 1.16)
others	97,844	3	NA	1	NA	13	2.26 (0.57, 9.02)	5	NA	4	NA	28	0.85 (0.39, 1.83)	11	0.99 (0.65, 1.50)
Type of jobs(2)															
sedentary work	150,155	2	1.00	5	1.00	13	1.00	9	1.00	4	1.00	55	1.00	143	1.00
sedentary/standing	103,939	3	2.11 (0.31, 14.2)	4	1.06 (0.26, 4.34)	13	0.92 (0.41, 2.09)	4	0.52 (0.14, 1.82)	9	3.01 (0.85, 10.7) <sup>+</sup>	41	0.90 (0.59, 1.39)	115	0.97 (0.75, 1.26)
standing position	33,561	1	1.98 (0.16, 23.3)	2	1.53 (0.28, 8.27)	2	0.46 (0.10, 2.09)	1	0.43 (0.05, 3.48)	1	1.00 (0.10, 9.30)	16	1.19 (0.68, 2.10)	31	0.81 (0.55, 1.21)
moving	242,629	5	1.48 (0.24, 9.17)	8	0.89 (0.25, 3.13)	14	0.37 (0.16, 0.84) <sup>*</sup>	11	0.56 (0.20, 1.53)	8	1.19 (0.32, 4.40)	115	0.93 (0.65, 1.33)	323	1.01 (0.81, 1.26)
Shift work															
mainly daytime	465,765	8	1.00	13	1.00	37	1.00	19	1.00	17	1.00	188	1.00	525	1.00
mainly night	14,107	2	5.17 (0.88, 30.15) <sup>+</sup>	1	1.24 (0.14, 10.4)	2	1.94 (0.43, 8.63)	2	2.64 (0.55, 12.5)	0	NA	9	0.97 (0.48, 1.97)	27	0.99 (0.66, 1.48)
alternate	36,077	1	1.34 (0.16, 11.02)	3	2.28 (0.63, 8.25)	2	0.66 (0.16, 2.77)	3	1.78 (0.52, 6.09)	4	2.45 (0.81, 7.40)	21	1.10 (0.69, 1.73)	52	0.99 (0.74, 1.32)
Working settings															
mainly indoor	299,571	3	1.00	6	1.00	24	1.00	10	1.00	8	1.00	96	1.00	253	1.00
mainly outdoor	168,749	6	2.06 (0.51, 8.37)	9	1.80 (0.61, 5.28)	11	0.68 (0.32, 1.43)	8	0.89 (0.33, 2.35)	8	1.28 (0.46, 3.55)	100	1.05 (0.78, 1.40)	264	1.08 (0.90, 1.30)
alternate	80,944	1	0.62 (0.06, 6.24)	4	1.69 (0.46, 6.20)	7	0.74 (0.31, 1.77)	6	1.47 (0.51, 4.19)	6	2.19 (0.73, 6.61)	38	0.82 (0.56, 1.21)	126	1.03 (0.83, 1.29)
Dust at workplace															
no	287,478	5	1.00	7	1.00	23	1.00	11	1.00	12	1.00	125	1.00	309	1.00
yes	102,649	2	1.49 (0.28, 7.72)	3	1.26 (0.31, 5.00)	7	0.81 (0.34, 1.92)	6	1.63 (0.59, 4.49)	0	NA	32	0.80 (0.54, 1.19)	107	1.12 (0.90, 1.40)
Perceived noise exposure at workplace															
no	289,537	6	1.00	8	1.00	23	1.00	12	1.00	10	1.00	120	1.00	325	1.00
yes	94,142	1	0.78 (0.09, 6.66)	3	1.31 (0.34, 5.06)	5	0.69 (0.26, 1.84)	6	1.91 (0.69, 5.29)	2	0.81 (0.17, 3.86)	35	1.27 (0.86, 1.87)	82	1.06 (0.82, 1.36)
Stress for human relationships															
no	276,365	5	1.00	5	1.00	22	1.00	8	1.00	10	1.00	120	1.00	305	1.00
yes	120,062	2	0.71 (0.12, 4.14)	6	2.55 (0.71, 9.12)	7	0.82 (0.33, 2.01)	11	3.98 (1.46, 10.9) <sup>**</sup>	2	0.39 (0.08, 1.95)	36	0.81 (0.54, 1.21)	114	0.98 (0.77, 1.23)
Job control															
no	77,508	0	1.00	2	1.00	2	1.00	6	1.00	1	1.00	39	1.00	68	1.00
yes	367,168	8	NA	10	0.77 (0.16, 3.62)	30	3.05 (0.72, 12.82)	20	0.53 (0.21, 1.35)	16	2.87 (0.37, 21.88)	169	0.75 (0.53, 1.07)	449	1.12 (0.87, 1.46)

\*Adjusted for age and area of study. \*\* p&lt;0.01; \* p&lt;0.05; + p&lt;0.10 NA: not applicable

similar to the result of type of jobs, as people who are physically active have lower risk of ischemic heart disease than those who are sedentary (Noda et al., 2005). The risk of death due to liver cancer in males was lower among the indoor workers than the outdoor workers, which is supposed to be due to some sort of biases. For example, sources of bias might be the hiring procedure of the workplace or the worker's estimate of their own ability to tolerate outdoor working. Another source of selection bias might be the workers' giving up outdoor working because of health problems.

#### *Dust and noise at work place*

Dust and noise may be a proxy of occupational environmental conditions at work places. Men who indicated their work place is noisy or dusty had slightly higher risks of total death than men who did not. It is supposed that respiratory diseases are linked to occupational dust, and only women who indicated their work place was dusty had marginally increased risk of death due to lung cancer (HR=1.47). Although the present analyses did not show the association between noise exposure at work and cerebrovascular disease, we previously reported that perceived noise exposure at work increased the risk of death due to intracerebral haemorrhage, but not subarachnoid haemorrhage, or cerebral infarction (Fujino et al., 2007).

#### *Stress for human relationships and job control*

Recent studies reported individual's perceived stress may affect human health in various ways via hormonal secretion, immune system, and autonomic nervous regulation. It has been reported circulatory disorders are particularly affected by perceived stress, which is consistent with the present analyses that showed the association between stress related to human relationships and death due to ischemic heart disease and cerebrovascular disease in men. The detail analyses of the link between perceived mental stress and cardiovascular diseases were previously reported elsewhere (Iso et al., 2002).

## **Conclusion**

The present analyses confirmed that occupational related factors associated with various health outcomes, which is basically consistent with most of the results of the many previous reports. Exploration of the association between occupational factors and health outcomes may be useful not only for investigation the biomechanical cause of diseases but also for improvement in policies related to occupational safety and health.

## **References** \*(other than JACC study)

- Fujino Y, Iso H, Tamakoshi A (2007). A prospective cohort study of perceived noise exposure at work and cerebrovascular diseases among male workers in Japan. *J Occup Health*, **49**, 382-388.
- Fujino Y, Iso H, Tamakoshi A, et al (2005). A prospective cohort study of employment status and mortality from circulatory

disorders among Japanese workers. *J Occup Health*, **47**, 510-7.

- Fujino Y, Iso H, Tamakoshi A, et al (2006). A prospective cohort study of shift work and risk of ischemic heart disease in Japanese male workers. *Am J Epidemiol*, **164**, 128-35.
- Fujino Y, Tamakoshi A, Ohno Y, et al (2002) Prospective study of educational background and stomach cancer in Japan. *Prev Med*, **35**, 121-7.
- Iso H, Date C, Yamamoto A, et al (2002) Perceived mental stress and mortality from cardiovascular disease among Japanese men and women: the Japan Collaborative Cohort Study for Evaluation of Cancer Risk Sponsored by Monbusho (JACC Study). *Circulation*, **106**, 1229-36.
- Kubo T, Ozasa K, Mikami K, et al (2006) Prospective cohort study of the risk of prostate cancer among rotating-shift workers: findings from the Japan Collaborative Cohort Study. *Am J Epidemiol*, **42**, 2590-7.
- Larsson SC, Rutegard J, Bergkvist L, Wolk A\* (2006). Physical activity, obesity, and risk of colon and rectal cancer in a cohort of Swedish men. *Eur J Cancer*,
- Noda H, Iso H, Toyoshima H, et al (2005) Walking and sports participation and mortality from coronary heart disease and stroke. *J Am Coll Cardiol*, **46**, 1761-7.
- O'Leary ES, Schoenfeld ER, Stevens RG, et al\* (2006) Shift work, light at night, and breast cancer on Long Island, New York. *Am J Epidemiol*, **164**, 358-66.
- Schernhammer ES, Kroenke CH, Laden F, Hankinson SE\* (2006), Night work and risk of breast cancer. *Epidemiology*, **17**, 108-11.
- Schernhammer ES, Laden F, Speizer FE, et al\* (2003). Night-shift work and risk of colorectal cancer in the nurses' health study. *J Natl Cancer Inst*, **95**, 825-8