SECTION 6

Smoking and Mortality in the Japan Collaborative Cohort Study for Evaluation of Cancer (JACC)

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Abstract

In the JACC study, risk of death with all cancers and all causes was found to be increased with active smoking,with and without dose-dependence, respectively. Death from both of the circulatory diseases was also adversely affected. The younger the age at commencing the habit, the greater the effect, with diminution after cessation. Regarding particular cancers, strong evidence was noted for the esophagus, liver, pancreas, lung and urothelium. Also links were apparent with gastric and gallbladder cancers and the breast in female ex-smokers. With passive smoking, the data were equivocal.

Keywords: Smoking - active - passive - mortality - cancer

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Introduction

Smoking habits were surveyed in all areas of the Japan Collaborative Cohort Study for Evaluation of Cancer (JACC) for their influence on mortality.

Materials and Methods

Each participant was asked about smoking habits and classified as a smoker, ex-smoker, or nonsmoker. Smokers were further classified according to a level-of-smoking index (pack-years), number of cigarettes consumed per day, duration of smoking habit, and age at which the smoking habit commenced. Ex-smokers were classified according to the number of years since smoking ceased. Participants were also asked about passive smoking during childhood, currently at home and at places other than home. The sex-specific and age and study area-adjusted hazard ratios and 95% confidence intervals for major causes of death were calculated.

Results

Active smoking

Risk of death from all causes

Table 1 reveals that compared with nonsmokers, risk of death from all causes was increased in male (HR = 1.62, $P < 0.01$) and female smokers (HR = 1.60, $P < 0.01$), as well as in ex-smokers (HR = 1.24, $P<0.01$ for men, and HR = 1.48, $P< 0.01$ for women). Dose-dependence, as indicated by the smoking index, number of cigarettes consumed per day, and duration of smoking habit was not observed (Tables 2-4). For male (HR = 1.92, $P < 0.01$) and female (HR = 2.16, $P < 0.01$) smokers who commenced smoking before 20 years of age, risk of death from all causes was increased (Table 5). The increased mortality risk associated with smoking in both men and women gradually lessened after cessation of smoking (Table 6).

Risk of death from all cancers

Compared with nonsmokers, the risk of death from all cancers was increased in both male (HR = 2.01, $P < 0.01$) and female smokers (HR = 1.48, $P < 0.01$), as well as ex-smokers (HR = 1.45, $P < 0.01$, for men and HR = 1.62, $P < 0.01$, for women) (Table 1). Dose-dependence, as indicated by the smoking index, number of cigarettes consumed per day, and duration of smoking habit was observed (Tables 2-4). In both male and female smokers, a younger age at which smoking commenced increased the risk of mortality (Table 5). This increased risk gradually decreased in both sexes after cessation of smoking (Table 6).

Risk of death from esophageal cancer

The risk of death from esophageal cancer was increased in male smokers and male ex-smokers (HR = 3.72, $P < 0.01$, and HR = 2.49, $P < 0.01$, respectively) (Table 1). There appeared to be some dose-dependence, as indicated by the smoking index, number of cigarettes consumed per day, and duration of smoking habit (Tables 2-4). A younger age at which smoking commenced increased the risk (Table 5). The increased risk appeared to gradually diminish after smoking ceased (Table 6).

Risk of death from liver cancer

The risk of death from liver cancer was increased in male smokers, male ex-smokers (HR = 1.59, $P < 0.01$,

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Table 1. Hazard ratios (HRs)[#] and 95% Confidence Intervals (95% CI) for Selected Causes of Death from Cigarette Smoking

Observed person- /Male years / Female		Nonsmoker 116,086 659,899		Current smoker 291,944 38,182		Ex-smoker 140,717 11,146	
	ICD10	No	HR	No	HR (95%CI)	No	HR (95%CI)
Male							
All causes		1,497	1.00	5259	1.62 (1.53, 1.72)**	2737	1.24 (1.16, 1.32)**
All cancers	C00-97	476	1.00	2175	2.03 (1.84, 2.25)**	1021	1.45 (1.30, 1.61)**
Esophagus	C15	12	1.00	99	3.72 (2.04, 6.79)**	39	2.49 (1.30, 4.78)**
Stomach	C16	118	1.00	397	1.47 (1.19, 1.80)**	211	1.22 (0.97, 1.53)+
Colon	C18	37	1.00	95	1.18 (0.80, 1.72)	68	1.27 (0.85, 1.91)
Rectum	C19-20	28	1.00	86	1.31 (0.85, 2.01)	38	0.95 (0.58, 1.56)
Liver	C22	61	1.00	237	1.59 (1.20, 2.12)**	141	1.48 (1.09, 2.00)*
Gall bladder	C23	8	1.00	36	2.25 (1.04, 4.87)*	23	1.96 (0.87, 4.40)
Pancreas	C25	30	1.00	119	1.79 (1.20, 2.68)**	63	1.47 (0.94, 2.27)+
Lung	C33-34	58	1.00	623	4.94 (3.77, 6.47)**	186	2.20 (1.63, 2.96)**
Prostate	C61	29	1.00	76	1.35 (0.88, 2.09)	48	1.06 (0.66, 1.68)
Kidney	C64	6	1.00	27	1.91 (0.78, 4.67)	10	1.09 (0.39, 3.03)
Urothelial tract	C65-67	7	1.00	56	3.79 (1.72, 8.37)**	23	2.11 (0.90, 4.94)+
Non-Hodgkin's lymphoma	C82-85	20	1.00	45	1.01 (0.60, 1.73)	23	0.82 (0.45, 1.50)
Multiple myeloma	C90	9	1.00	20	0.99 (0.44, 2.19)	14	1.11 (0.48, 2.59)
Myeloid leukemia	C92	5	1.00	20	1.59 (0.59, 4.27)	18	2.71 (0.99, 7.36)+
Ischemic heart disease	I20-25	83	1.00	350	1.92 (1.51, 2.44)**	184	1.46 (1.13, 1.90)**
Cerebrovascular disease	I60-69	234	1.00	630	1.30 (1.12, 1.52)**	346	1.01 (0.86, 1.20)
Female							
All causes		5,246	1.00	462	1.60 (1.45, 1.76)**	179	1.48 (1.27, 1.72)**
All cancers	C00-97	1,737	1.00	142	1.48 (1.25, 1.76)**	60	1.62 (1.25, 2.11)**
Esophagus	C15	30	1.00	2	1.76 (0.40, 7.62)	1	2.50 (0.32, 19.0)
Stomach	C16	301	1.00	14	0.86 (0.50, 1.48)	7	1.07 (0.50, 2.28)
Colon	C18	168	1.00	6	0.67 (0.29, 1.53)	7	2.05 (0.95, 4.41)+
Rectum	C19-20	68	1.00	5	1.31 (0.52, 3.29)	1	0.68 (0.09, 4.95)
Liver	C22	160	1.00	18	1.95 (1.19, 3.19)**	3	0.76 (0.24, 2.39)
Gall bladder	C23	65	1.00	7	1.92 (0.87, 4.22)	2	1.51 (0.36, 6.21)
Pancreas	C25	169	1.00	13	1.41 (0.80, 2.48)	9	2.73 (1.39, 5.38)**
Lung	C33-34	173	1.00	39	4.25 (2.98, 6.05)**	8	2.19 (1.07, 4.48)*
Breast	C50	79	1.00	7	1.43 (0.65, 3.11)	7	4.79 (2.18, 10.5)**
Cervix uteri	C53	30	1.00	3	1.58 (0.47, 5.21)	0	NA
Kidney	C64	12	1.00	1	1.63 (0.21, 12.66)	0	NA
Urothelial tract	C65-67	33	1.00	3	1.55 (0.47, 5.08)	1	1.22 (0.16, 9.03)
Non-Hodgkin's lymphoma	C82-85	47	1.00	2	0.85 (0.20, 3.54)	3	3.56 (1.09, 11.6)*
Multiple myeloma	C90	41	1.00	2	0.86 (0.20, 3.60)	1	1.08 (0.14, 7.96)
Myeloid leukemia	C92	22	1.00	3	2.22 (0.66, 7.47)	1	2.01 (0.26, 15.1)
Ischemic heart disease	I20-25	310	1.00	47	2.65 (1.95, 3.62)**	13	1.63 (0.93, 2.85)+
Cerebrovascular disease	I60-69	850	1.00	71	1.53 (1.20, 1.96)**	20	1.03 (0.66, 1.61)

[#]Adjusted for age, area of study. Significance level: ** p<0.01, * p<0.05, + p<0.1 NA: not applicable

and HR = 1.48, P < 0.05, respectively), and in female smokers (HR = 1.95, P < 0.01) (Table 1). Dose-dependency, as indicated by smoking index, number of consumed cigarettes a day, and duration of smoking habit was not clearly observed, although younger age at which smoking commenced increased the risk of death from liver cancer (Tables 2-5). In ex-smokers, the time interval in years since smoking ceased was not associated with altered risk of death from liver cancer (Table 6).

Risk of death from pancreatic cancer

The risk of death from pancreatic cancer was increased in male smokers (HR = 1.79, P < 0.01) and in female ex-smokers (HR = 2.73, P < 0.01) (Table 1). There was a trend to dose-dependency, as indicated by smoking index and number of cigarettes consumed per day (Tables 2, 3).

Risk of death from lung cancer

The risk of death from lung cancer was increased in both male and female smokers (HR = 4.94, P < 0.01, and HR = 2.20, P < 0.01, respectively), compared with nonsmokers, and also in ex-smokers (HR = 2.20, P < 0.01, for men and HR = 2.19, P < 0.01, for women) (Table 1). In males, a clear dose-dependency was observed, as indicated by the smoking index (HR = 7.85, P < 0.01, for 60+ pack-year), number of cigarettes consumed per day (HR = 7.37, P < 0.01, for 25+ cigarettes), and duration of smoking habit (HR = 5.62, P <0.01, for 40+ years) (Tables 2-4). Increased risk of death from lung cancer was observed for men (HR = 6.09, P < 0.01) and women (HR = 14.48, P < 0.01) who commenced smoking before 20 years of age (Table 5). However, the increased risk gradually diminished after smoking ceased (Table 6).

Table 2. Hazard Ratios (HRs)[#] and 95% Confidence Intervals (95% CI) for Smoking Index in Smokers, Compared to Nonsmokers

				Smoking index (pack-years) in smokers							
Observed		Nonsmokers		<20		20-39		40-59		60+	
person /Male		116,086		42,329		138,699		70,423		23,069	
-years /Female		659,899		23,338		8,656		1,756		692	
Site	ICD10	No	HR	No	HR (95% CI)	No	HR (95% CI)	No	HR (95% CI)	No	HR (95% CI)
Male											
All causes		1,497	1.00	545	1.55 (1.40, 1.77)**	2101	1.58 (1.47, 1.69)**	1707	1.61 (1.50, 1.72)**	582	1.85 (1.68, 2.04)**
All cancers	C00-97	476	1.00	192	1.59 (1.34, 1.89)**	865	1.93 (1.72, 2.19)**	727	2.15 (1.92, 2.42)**	253	2.48 (2.13, 2.90)**
Esophagus	C15	12	1.00	7	2.01 (0.78, 5.13)	53	4.42 (2.35, 8.31)**	24	3.05 (1.52, 6.12)**	10	4.38 (1.88, 10.2)**
Stomach	C16	118	1.00	45	1.52 (1.07, 2.14)*	164	1.47 (1.16, 1.87)**	120	1.41 (1.09, 1.82)**	40	1.57 (1.09, 2.25)*
Colon	C18	37	1.00	11	1.08 (0.55, 2.14)	41	1.14 (0.73, 1.79)	28	1.12 (0.68, 1.84)	7	0.89 (0.39, 2.01)
Rectum	C19-20	28	1.00	10	1.28 (0.61, 2.65)	32	1.12 (0.67, 1.87)	34	1.81 (1.09, 2.99)*	6	1.03 (0.42, 2.51)
Liver	C22	61	1.00	29	1.66 (1.06, 2.59)*	105	1.62 (1.18, 2.23)**	53	1.18 (0.81, 1.72)	26	1.81 (1.14, 2.87)*
Gall bladder	C23	8	1.00	2	1.07 (0.22, 5.08)	11	1.60 (0.64, 4.01)	16	2.89 (1.23, 6.79)*	3	1.88 (0.49, 7.18)
Pancreas	C25	30	1.00	13	1.73 (0.90, 3.35)$^{+}$	47	1.69 (1.06, 2.70)*	43	2.01 (1.26, 3.23)**	13	2.01 (1.04, 3.87)*
Lung	C33-34	58	1.00	34	2.43 (1.59, 3.73)**	209	3.97 (2.96, 5.32)**	249	6.10 (4.58, 8.13)**	95	7.85 (5.65, 10.9)**
Prostate	C61	29	1.00	4	0.71 (0.25, 2.04)	33	1.58 (0.95, 2.62)$^{+}$	27	1.41 (0.83, 2.40)	7	1.32 (0.57, 3.05)
Kidney	C64	6	1.00	1	0.68 (0.08, 5.70)	12	2.10 (0.78, 5.69)	8	1.84 (0.63, 5.33)	5	3.69 (1.11, 12.2)*
Urothelium	C65-67	7	1.00	5	3.16 (0.99, 10.1)$^{+}$	18	2.97 (1.23, 7.19)*	26	5.04 (2.17, 11.7)**	5	3.23 (1.01, 10.3)*
Non-Hodgkin's lymphoma	C82-85	20	1.00	5	1.04 (0.38, 2.82)	22	1.23 (0.66, 2.30)	12	0.94 (0.45, 1.93)	4	1.04 (0.35, 3.07)
Myeloma	C90	9	1.00	1	0.42 (0.05, 3.34)	11	1.25 (0.51, 3.05)	4	0.66 (0.20, 2.16)	4	2.09 (0.63, 6.89)
Leukemia	C92	5	1.00	0	N.A	11	2.42 (0.76, 7.68)	5	1.99 (0.53, 7.50)	4	5.18 (1.27, 21.0)*
Ischemic heart disease	I20-25	83	1.00	37	1.93 (1.30, 2.86)**	138	1.90 (1.44, 2.51)**	117	1.96 (0.47, 2.60)**	39	2.16 (1.47, 3.17)**
Cerebrovascular disease	I60-69	234	1.00	69	1.35 (1.03, 1.77)*	275	1.40 (1.18, 1.68)**	179	1.40 (1.18, 1.68)**	62	1.35 (1.02, 1.79)*
Female											
All causes		5,246	1.00	205	1.39 (1.21, 1.60)**	151	2.00 (1.70, 2.36)**	44	1.75 (1.30, 2.36)**	19	2.21 (1.40, 3.46)**
All cancers	C00-97	1,737	1.00	69	1.32 (1.04, 1.68)*	48	1.96 (1.47, 2.62)**	14	2.02 (1.19, 3.44)**	2	0.83 (0.20, 3.35)
Esophagus	C15	30	1.00	1	1.66 (0.22, 12.6)	1	3.39 (0.44, 25.7)	0	NA	0	NA
Stomach	C16	301	1.00	6	0.71 (0.31, 1.59)	6	1.42 (0.63, 3.20)	1	0.79 (0.29, 2.13)	0	NA
Colon	C18	168	1.00	3	0.61 (0.19, 1.91)	3	1.35 (0.43, 4.27)	0	NA	0	NA
Rectum	C19-20	68	1.00	2	0.95 (0.23, 3.91)	2	2.05 (0.49, 8.45)	1	3.57 (0.48, 26.2)	0	NA
Liver	C22	160	1.00	5	1.00 (0.41, 2.44)	6	2.47 (1.09, 5.62)*	3	4.28 (1.35, 13.6)*	1	4.62 (0.64, 33.2)
Gall bladder	C23	65	1.00	4	1.99 (0.72, 5.49)	1	1.08 (0.15, 7.82)	0	NA	0	NA
Pancreas	C25	169	1.00	10	1.97 (1.04, 3.75)*	2	0.87 (0.21, 3.55)	0	NA	0	NA
Lung	C33-34	173	1.00	16	3.18 (1.90, 5.33)**	18	7.84 (4.78, 12.9)**	2	3.06 (0.75, 12.4)	1	4.52 (0.63, 32.4)
Breast	C50	79	1.00	5	1.69 (0.68, 4.21)	2	1.72 (0.42, 7.02)	0	NA	0	NA
Cervix uteri	C53	30	1.00	1	0.93 (0.12, 6.90)	2	4.17 (0.98, 17.6)$^{+}$	0	NA	0	NA
Kidney	C64	12	1.00	1	2.93 (0.37, 22.9)	0	N.A	0	NA	0	NA
Urothelium	C65-67	33	1.00	2	2.13 (0.50, 8.92)	1	1.78 (0.24, 13.2)	0	NA	0	NA
Non-Hodgkin's lymphoma	C82-85	47	1.00	1	0.71 (0.09, 5.20)	1	1.82 (0.24, 13.3)	0	NA	0	NA
Myeloma	C90	41	1.00	1	0.83 (0.11, 6.09)	0	N.A	1	5.79 (0.78, 42.9)$^{+}$	0	NA
Leukemia	C92	22	1.00	2	2.62 (0.61, 11.3)	1	3.03 (0.40, 22.7)	0	NA	0	NA
Ischemic heart disease	I20-25	310	1.00	19	2.28 (1.43, 3.63)**	16	3.56 (2.14, 5.91)**	6	3.30 (1.46, 7.45)**	2	3.15 (0.78, 12.7)
Cerebrovascular disease	I60-69	850	1.00	29	1.27 (0.88, 1.85)	24	2.00 (1.33, 3.01)**	6	1.39 (0.62, 3.11)	4	2.55 (0.95, 6.85)$^{+}$

[#]Adjusted for age and area of study. Significance level: ** p<0.01, * p<0.05, $^{+}$ p<0.1 NA: not applicable

Risk of death from urothelial cancer

The risk of death from urothelial cancer was increased in male smokers (HR = 3.79, P < 0.01), compared with nonsmokers (Table1). A trend to dose-dependency, as indicated by smoking index, number of cigarettes consumed per day, and duration of smoking habit was observed (Tables 2-4). Commencing smoking earlier than 20 years of age also resulted in increased risk of death from urothelial cancer (HR = 5.45, P < 0.01) (Table 5).

Risk of death from cancers at other sites

In male smokers, there was an increased risk of death from stomach cancer (HR = 1.47, P < 0.01,) and gall bladder cancer (HR = 2.25, P < 0.05) (Table 1). Female ex-smokers had increased risk of death from breast cancer (HR = 4.79, P < 0.01) and non-Hodgkin's lymphoma (HR = 3.56, P < 0.05). For these cancers, there was a trend to dose-dependency, as indicated by smoking index and number of cigarettes consumed per day (Tables 2, 3).

Risk of death from circulatory diseases

The risk of death from ischemic heart disease was increased in both male smokers and ex-smokers (HR = 1.92, P < 0.05, and HR = 1.46, P < 0.01, respectively), and in female smokers (HR = 2.65, P < 0.01) (Table 1). In male (HR = 1.30, P < 0.01) and female (HR = 1.53, P < 0.01) smokers, risk of death from cerebrovascular disease was increased. Dose-dependence, as indicated by number of cigarettes consumed per day, was observed for both ischemic heart and cerebrovascular disease, but was not clearly observed using the smoking index and duration of smoking as an indicator of dose (Tables 2-4).

Table 3. Hazard ratios (HRs)[#] and 95% Confidence Intervals (95% CI) for Smoking Amount in Smokers, Compared to Nonsmokers

				Number of cigarettes consumed per day in smokers					
Observed		Nonsmokers		<15		15-24		25+	
person- /Male		116,086		51,774		157,164		78,968	
years / Female		659,899		20,199		13,662		2,679	
	ICD10	No	HR	No	HR (95%CI)	No	HR (95%CI)	No	HR (95%CI)
Male									
All causes		1,497	1.00	1267	1.58 (1.46, 1.70)**	2913	1.61 (1.51, 1.72)**	998	1.71 (1.57, 1.85)**
All cancers	C00-97	476	1.00	422	1.68 (1.47, 1.92)**	1260	2.12 (1.91, 2.36)**	457	2.23 (1.96, 2.55)**
Esophagus	C15	12	1.00	20	3.43 (1.67, 7.03)**	61	4.05 (2.17, 7.54)**	16	2.80 (1.31, 6.01)**
Stomach	C16	118	1.00	87	1.38 (1.05, 1.83)*	235	1.56 (1.25, 1.95)**	66	1.26 (0.92, 1.71)
Colon	C18	37	1.00	25	1.29 (0.77, 2.15)	49	1.08 (0.70, 1.66)	19	1.13 (0.64, 1.99)
Rectum	C19-20	28	1.00	16	1.14 (0.61, 2.11)	53	1.49 (0.94, 2.37)$^{+}$	16	1.16 (0.62, 2.18)
Liver	C22	61	1.00	50	1.61 (1.10, 2.34)*	134	1.62 (1.20, 2.20)**	46	1.35 (0.91, 1.99)
Gall bladder	C23	8	1.00	6	1.38 (0.48, 4.00)	21	2.30 (1.01, 5.24)*	8	3.07 (1.11, 8.48)*
Pancreas	C25	30	1.00	22	1.34 (0.77, 2.34)	70	1.87 (1.21, 2.88)**	26	2.04 (1.19, 3.50)**
Lung	C33-34	58	1.00	96	3.12 (2.25, 4.33)**	356	5.12 (3.87, 6.76)**	164	7.37 (5.43, 10.0)**
Prostate	C61	29	1.00	17	1.06 (0.58, 1.94)	47	1.59 (0.99, 2.55)$^{+}$	12	1.56 (0.78, 3.13)
Kidney	C64	6	1.00	6	1.86 (0.59, 5.78)	14	1.88 (0.71, 4.93)	6	2.31 (0.72, 7.44)
Urothelium	C65-67	7	1.00	8	2.01 (0.73, 5.57)	40	4.67 (2.08, 10.5)**	7	2.70 (0.93, 7.89)$^{+}$
Non-Hodgkin's lymphoma	C82-85	20	1.00	6	0.59 (0.24, 1.49)	30	1.25 (0.70, 2.21)	9	1.06 (0.47, 2.39)
Myeloma	C90	9	1.00	3	0.66 (0.18, 2.47)	10	0.91 (0.36, 2.26)	7	1.70 (0.61, 4.75)
Leukemia	C92	5	1.00	3	1.22 (0.29, 5.13)	10	1.53 (0.52, 4.51)	7	2.59 (0.79, 8.42)
Ischemic heart disease	I20-25	83	1.00	79	1.75 (1.28, 2.38)	197	1.95 (1.51, 2.53)**	70	2.12 (1.53, 2.94)**
Cerebrovascular disease	I60-69	234	1.00	187	1.48 (1.22, 1.79) **	339	1.25 (1.06, 1.48)**	97	1.20 (0.94, 1.53)
Female									
All causes		5,246	1.00	254	1.50 (1.32, 1.70)**	157	1.81 (1.54, 2.13)**	34	2.14 (1.52, 3.00)**
All cancers	C00-97	1,737	1.00	84	1.54 (1.23, 1.92)**	47	1.52 (1.13, 2.03)**	7	1.28 (0.61, 2.70)
Esophagus	C15	30	1.00	1	1.41 (0.18, 10.6)	1	3.03 (0.40, 22.95)	0	NA
Stomach	C16	301	1.00	9	0.96 (0.49, 1.87)	4	0.79 (0.29, 2.13)	0	NA
Colon	C18	168	1.00	2	0.38 (0.09, 1.54)	4	1.46 (0.54, 3.97)	0	NA
Rectum	C19-20	68	1.00	2	0.96 (0.23, 3.95)	2	1.51 (0.36, 6.23)	1	4.27 (0.58, 31.0)
Liver	C22	160	1.00	8	1.54 (0.75, 3.15)	8	2.59 (1.26, 5.31)**	1	1.94 (0.27, 13.9)
Gall bladder	C23	65	1.00	3	1.44 (0.45, 4.60)	3	2.61 (0.81, 8.37)	0	NA
Pancreas	C25	169	1.00	9	1.64 (0.84, 3.22)	3	1.09 (0.34, 3.44)	0	NA
Lung	C33-34	173	1.00	25	4.79 (3.13, 7.31)**	12	4.03 (2.23, 7.28)**	2	3.95 (0.97, 16.0)$^{+}$
Breast	C50	79	1.00	6	2.39 (1.04, 5.51)*	1	0.54 (0.07, 3.92)	0	NA
Cervix uteri	C53	30	1.00	3	3.02 (0.91, 9.96)$^{+}$	0	NA	0	NA
Kidney	C64	12	1.00	1	2.72 (0.35, 21.0)	0	NA	0	NA
Urothelium	C65-67	33	1.00	3	2.76 (0.84, 9.04)$^{+}$	0	NA	0	NA
Non-Hodgkin's lymphoma	C82-85	47	1.00	1	0.75 (0.10, 5.49)	1	1.29 (0.17, 9.43)	0	NA
Myeloma	C90	41	1.00	1	0.76 (0.10, 5.54)	1	1.41 (0.19, 10.41)	0	NA
Leukemia	C92	22	1.00	2	2.64 (0.61, 11.3)	1	2.36 (0.31, 17.73)	0	NA
Ischemic heart disease	I20-25	310	1.00	25	2.36 (1.56, 3.55)**	15	3.14 (1.86, 5.31)**	6	5.79 (2.57, 13.0)**
Cerebrovascular disease	I60-69	850	1.00	32	1.15 (0.81, 1.64)	27	2.08 (1.42, 3.07)**	8	3.07 (1.53, 6.18)**

[#]Adjusted for age, area of study. Significance level: ** p<0.01, * p<0.05, $^{+}$ p<0.1 NA: not applicable

Risk of death from passive smoking

Influence of passive smoking on risk of death from lung cancer was evaluated in nonsmokers (Table 7). A total of 58 male and 173 female nonsmokers died from lung cancer before the end of 2003. Although passive smoking at home, for 3 hours or longer, every day, may increase the risk of lung cancer deaths amongst men (RR = 5.29, 95% CI; 1.03–27.1 for two cases), all indices of passive smoking demonstrated non-significant relative risk around unity.

Discussion

Smoking is the leading cause of cancer worldwide. In most developed countries, tobacco use is linked etiologically with the development of 30% of all malignant tumors; in addition to lung cancer, tobacco consumption causes tumors of the larynx, pancreas, kidney and bladder (IARC, 2003). Smoking, in conjunction with alcohol consumption, is linked with a higher incidence of carcinoma of the oral cavity and the esophagus (IARC,

Table 4. Hazard ratios (HRs)[#] and 95% Confidence Intervals (95% CI) for Duration of Smoking Habit in Smokers, Compared to Nonsmokers

				Duration of smoking habit in smokers (years)					
Observed		Nonsmokers		<25		25-39		40+	
person- /Male		116,086		56,568		132,623		87,170	
years / Female		659,899		19,545		11,535		3,884	
	ICD10	No	HR	No	HR (95%CI)	No	HR (95%CI)	No	HR (95%CI)
Male									
All causes		1,497	1.00	240	1.55 (1.33, 1.79)**	1524	1.62 (1.50, 1.75)**	3207	1.61 (1.51, 1.72)**
All cancers	C00-97	476	1.00	82	1.13 (0.88, 1.45)	717	1.98 (1.75, 2.24)**	1251	2.01 (1.90, 2.36)**
Esophagus	C15	12	1.00	5	1.63 (0.52, 5.08)	44	4.07 (2.10, 7.88)**	46	3.76 (1.94, 7.29)**
Stomach	C16	118	1.00	18	1.09 (0.64, 1.88)	137	1.60 (1.22, 2.09)**	219	1.45 (1.15, 1.83)**
Colon	C18	37	1.00	7	1.07 (0.44, 2.63)	30	1.00 (0.60, 1.67)	50	1.16 (0.74, 1.79)
Rectum	C19-20	28	1.00	4	0.67 (0.22, 2.08)	36	1.43 (0.84, 2.41)	42	1.38 (0.83, 2.27)
Liver	C22	61	1.00	11	0.76 (0.38, 1.52)	101	1.74 (1.24, 2.43)**	105	1.47 (1.06, 2.05)*
Gall bladder	C23	8	1.00	0	NA	13	3.20 (1.21, 8.48)*	19	1.73 (0.75, 3.98)
Pancreas	C25	30	1.00	7	1.87 (0.75, 4.70)	39	1.89 (1.13, 3.18)*	70	1.79 (1.15, 2.78)**
Lung	C33-34	58	1.00	14	1.60 (0.86, 2.97)	174	4.01 (2.94, 5.48)**	402	5.62 (4.25, 7.45)**
Prostate	C61	29	1.00	1	0.83 (0.10, 6.42)	12	1.10 (0.52, 2.30)	58	1.45 (0.92, 2.27)
Kidney	C64	6	1.00	1	1.10 (0.11, 10.9)	8	1.71 (0.55, 5.33)	17	2.21 (0.85, 5.73)
Urothelium	C65-67	7	1.00	0	NA	10	1.99 (0.71, 5.54)	44	4.73 (2.09, 10.7)**
Non-Hodgkin's lymphoma	C82-85	20	1.00	2	0.74 (0.15, 3.55)	19	1.37 (0.69, 2.73)	22	0.96 (0.51, 1.80)
Myeloma	C90	9	1.00	1	0.58 (0.06, 5.27)	8	1.00 (0.36, 2.75)	11	1.11 (0.44, 2.80)
Leukemia	C92	5	1.00	2	0.79 (0.12, 4.98)	6	1.21 (0.34, 4.35)	12	5.26 (1.37, 20.2)*
Ischemic heart disease	I20-25	83	1.00	23	3.48 (2.07, 5.84) **	108	2.40 (1.75, 3.29) **	203	1.77 (1.36, 2.29)**
Cerebrovascular disease	I60-69	234	1.00	20	1.10 (0.68, 1.79)	169	1.35 (1.09, 1.68) **	397	1.26 (1.07, 1.48)**
Female									
All causes		5,246	1.00	104	1.34 (1.10, 1.63) **	161	1.69 (1.44, 1.97) **	157	1.81 (1.54, 2.12)**
All cancers	C00-97	1,737	1.00	39	1.19 (0.86, 1.64)	48	1.47 (1.10, 1.97) **	47	2.14 (1.59, 2.87)**
Esophagus	C15	30	1.00	0	NA	1	2.60 (0.34, 19.7)	1	2.79 (0.35, 21.7)
Stomach	C16	301	1.00	2	0.41 (0.10, 1.67)	8	1.45 (0.72, 2.94)	4	0.94 (0.35, 2.55)
Colon	C18	168	1.00	4	1.39 (0.51, 3.78)	2	0.67 (0.16, 2.72)	0	NA
Rectum	C19-20	68	1.00	2	1.36 (0.32, 5.63)	0	NA	3	3.92 (1.19, 12.9)*
Liver	C22	160	1.00	2	0.64 (0.15, 2.59)	8	2.53 (1.24, 5.18)*	5	2.28 (0.92, 5.65)$^{+}$
Gall bladder	C23	65	1.00	3	2.35 (0.72, 7.59)	2	1.62 (0.39, 6.63)	0	N.A
Pancreas	C25	169	1.00	5	1.66 (0.67, 4.07)	4	1.31 (0.48, 3.55)	3	1.31 (0.41, 4.16)
Lung	C33-34	173	1.00	7	2.16 (1.01, 4.65)*	11	3.50 (1.89, 6.46)**	19	9.78 (5.93, 16.1)**
Breast	C50	79	1.00	4	1.55 (0.56, 4.29)	1	0.67 (0.09, 4.87)	2	4.28 (1.01, 18.0)*
Cervix uteri	C53	30	1.00	0	NA	1	1.59 (0.21, 11.79)	2	7.20 (1.61, 32.2)**
Kidney	C64	12	1.00	1	4.93 (0.60, 40.0)	0	NA	0	NA
Urothelium	C65-67	33	1.00	1	1.96 (0.26, 14.7)	0	NA	2	3.23 (0.75, 13.9)
Non-Hodgkin's lymphoma	C82-85	47	1.00	1	1.00 (0.13, 7.40)	1	1.28 (0.17, 9.36)	0	NA
Myeloma	C90	41	1.00	1	1.38 (0.18, 10.3)	0	NA	1	1.67 (0.22, 12.4)
Leukemia	C92	22	1.00	1	1.88 (0.24, 14.3)	1	2.24 (0.30, 16.74)	1	4.09 (0.53, 31.7)
Ischemic heart disease	I20-25	310	1.00	10	2.78 (1.47, 5.27)**	15	2.73 (1.62, 4.59) **	19	2.98 (1.86, 4.78)**
Cerebrovascular disease	I60-69	850	1.00	15	1.41 (0.84, 2.35)	29	1.96 (1.35, 2.84) **	19	1.20 (0.76, 1.90)

[#]Adjusted for age, area of study. Significance level: ** p<0.01, * p<0.05, $^{+}$ p<0.1 NA: not applicable

2003). In the JACC study, smoking was one of the strongest risk factors for mortality of major cancers as well as for death overall. Some statistically nonsignificant hazard ratios calculated for other cancers may be due to the small numbers of deaths in those sub-groups. Low prevalence of smoking in women may also have contributed to the finding of few significant hazard ratios for the risks of increased mortality of cancers and other causes in women. The association of smoking with various site-specific cancers has been examined for esophageal (Sakata et al, 2005), stomach (Fujino et al, 2005a), pancreatic (Lin et al, 2002a), colon and rectal (Wakai et al, 2003), ovarian cancers (Niwa et al, 2005a), hepatocellular carcinoma (Ogimoto et al, 2004b), as well as oral and pharyngeal cancer (Ide et al, 2007). Attributable and absolute risk of death due to lung cancer according to smoking status was recently evaluated (Ando et al, 2003).

Risks associated with smoking depend both on the amount of tobacco products consumed and the duration of smoking habit. The integrated effect of these factors

Table 5. Hazard ratios (HRs)[#] and 95% Confidence Intervals (95% CI) for Age at Which the Smoking Habit Commenced in Smokers, Compared to Nonsmokers

				Age at which the smoking habit commenced (years)					
Observed		Nonsmokers		<20		20-24		25+	
person- /Male		116,086		55,727		173,352		48,060	
years / Female		659,899		1,780		8,056		25,284	
	ICD10	No	HR	No	HR (95%CI)	No	HR (95%CI)	No	HR (95%CI)
Male									
All causes		1,497	1.00	881	1.92 (1.76, 2.09)**	3071	1.62 (1.52, 1.72)**	1022	1.42 (1.31, 1.54)**
All cancers	C00-97	476	1.00	378	2.36 (2.06, 2.71)**	1267	2.02 (1.81, 2.24)**	409	1.82 (1.60, 2.08)**
Esophagus	C15	12	1.00	18	4.36 (2.08, 9.17)**	58	3.62 (1.93, 6.76)**	19	3.38 (1.64, 6.97)**
Stomach	C16	118	1.00	72	1.79 (1.32, 2.42)**	210	1.34 (1.06, 1.68)*	92	1.65 (1.25, 2.17)**
Colon	C18	37	1.00	11	0.84 (0.42, 1.67)	54	1.08 (0.71, 1.65)	22	1.30 (0.76, 2.21)
Rectum	C19-20	28	1.00	16	1.54 (0.82, 2.89)	47	1.24 (0.77, 1.98)	19	1.48 (0.82, 2.65)
Liver	C22	61	1.00	57	2.12 (1.46, 3.06)**	127	1.43 (1.05, 1.95)*	34	1.25 (0.82, 1.91)
Gall bladder	C23	8	1.00	7	3.10 (1.09, 8.81)*	21	2.19 (0.96, 4.99)$^{+}$	4	1.04 (0.31, 3.46)
Pancreas	C25	30	1.00	18	1.84 (1.01, 3.35)*	71	1.79 (1.16, 2.76)**	27	1.96 (1.12, 3.21)*
Lung	C33-34	58	1.00	107	6.09 (4.40, 8.43)**	395	5.36 (4.06, 7.07)**	89	3.23 (2.32, 4.50)**
Prostate	C61	29	1.00	13	2.11 (1.07, 4.15)*	44	1.46 (0.90, 2.36)	14	0.96 (0.50, 1.83)
Kidney	C64	6	1.00	3	1.35 (0.33, 5.55)	17	2.09 (0.82, 5.37)	6	2.16 (0.69, 6.74)
Urothelium	C65-67	7	1.00	11	5.45 (2.06, 14.4)**	37	4.21 (1.86, 9.54)**	6	1.76 (0.59, 5.27)
Non-Hodgkin's lymphoma	C82-85	20	1.00	6	0.89 (0.35, 2.26)	26	1.05 (0.58, 1.90)	11	1.29 (0.61, 2.71)
Myeloma	C90	9	1.00	4	1.07 (0.32, 3.61)	12	1.01 (0.42, 2.43)	4	1.03 (0.31, 3.38)
Leukemia	C92	5	1.00	4	2.51 (0.61, 10.3)	14	2.47 (0.80, 7.55)	2	1.07 (0.19, 5.89)
Ischemic heart disease	I20-25	83	1.00	65	2.60 (1.86, 3.63)**	209	2.00 (1.54, 2.59)**	60	1.51 (1.08, 2.12)*
Cerebrovascular disease	I60-69	234	1.00	94	1.48 (1.16, 1.89)**	350	1.25 (1.05, 1.48)**	142	1.23 (1.00, 1.52)*
Female									
All causes		5,246	1.00	32	2.16 (1.52, 3.06)**	85	1.97 (1.58, 2.44)**	306	1.52 (1.35, 1.70)**
All cancers	C00-97	1,737	1.00	14	3.14 (1.85, 5.32)**	21	1.33 (0.86, 2.05)	99	1.47 (1.20, 1.81)**
Esophagus	C15	30	1.00	0	NA	1	6.06 (0.80, 45.9)	1	1.24 (0.16, 9.36)
Stomach	C16	301	1.00	0	NA	3	1.19 (0.38, 3.73)	11	0.97 (0.53, 1.78)
Colon	C18	168	1.00	0	NA	0	NA	6	0.94 (0.41, 2.13)
Rectum	C19-20	68	1.00	1	5.54 (0.76, 40.17)	0	NA	4	1.52 (0.55, 4.19)
Liver	C22	160	1.00	6	14.8 (6.50, 33.7)**	2	1.28 (0.31, 5.22)	7	1.07 (0.50, 2.29)
Gall bladder	C23	65	1.00	0	NA	1	1.70 (0.23, 12.4)	4	1.57 (0.57, 4.34)
Pancreas	C25	169	1.00	0	NA	0	NA	12	1.85 (1.02, 3.35)*
Lung	C33-34	173	1.00	6	14.5 (6.36, 32.9)**	6	4.00 (1.76, 9.10)**	25	3.89 (2.54, 5.94)**
Breast	C50	79	1.00	0	NA	2	1.87 (0.45, 7.68)	5	1.55 (0.62, 3.85)
Cervix uteri	C53	30	1.00	1	10.4 (1.39, 76.7)*	1	2.72 (20.25)	1	0.78 (0.10, 5.79)
Kidney	C64	12	1.00	0	NA	0	NA	1	2.40 (0.31, 18.7)
Urothelium	C65-67	33	1.00	0	NA	0	NA	3	2.18 (0.66, 7.14)
Non-Hodgkin's lymphoma	C82-85	47	1.00	0	NA	0	NA	2	1.21 (0.29, 5.03)
Myeloma	C90	41	1.00	0	NA	1	2.81 (0.38, 20.6)	1	0.63 (0.08, 4.60)
Leukemia	C92	22	1.00	0	NA	0	NA	3	3.20 (0.95, 10.8)$^{+}$
Ischemic heart disease	I20-25	310	1.00	4	3.97 (1.47, 10.7)**	10	4.07 (2.16, 7.67)**	30	2.51 (1.72, 3.66)**
Cerebrovascular disease	I60-69	850	1.00	2	0.76 (0.19, 3.05)	13	2.00 (1.16, 3.48)*	48	1.50 (1.12, 2.01)**

[#]Adjusted for age, area of study. Significance level: ** p<0.01, * p<0.05, $^{+}$ p<0.1 NA: not applicable

can be represented as their mathematical product such as the smoking index expressed as pack-years. Almost all tobacco smokers in Japan consume cigarettes. The risk of most cancers depends on these three indicators. In contrast, the risk of ischemic heart and cerebrovascular disease showed dose-dependency with the number of cigarettes consumed per day, but not with duration of smoking habit.

Reproducibility of the baseline questionnaire for smoking was examined by comparing it with responses in the interim survey, which was conducted in selected areas, in 1993–1995, approximately 5 years after the baseline survey. Prevalence of smoking had diminished by 5% to 11% from the original level of smoking measured in the baseline survey (Kawado et al, 2005). Comparison of smoking with serum biomarkers has also been examined (Suzuki et al, 2003b).

Ex-smokers had a higher risk of various cancers, but their risk was lower than that for smokers. This was in contrast to the cancer mortality risks for ex-drinkers, associated with alcohol consumption. The risk of various

Table 6. Hazard ratios (HRs)[#] and 95% Confidence Intervals (95% CI) of Period Since Smoking Ceased in Ex-smokers, Compared to Nonsmokers

				Years since smoking ceased					
Observed		Nonsmokers		<5		5-14		15+	
person- /Male		116,086		35,875		58,192		40,138	
years / Female		659,899		3,368		3,908		2,540	
	ICD10	No	HR	No	HR (95%CI)	No	HR (95%CI)	No	HR (95%CI)
Male									
All causes		1,497	1.00	717	1.42 (1.30, 1.55)**	1020	1.27 (1.17, 1.37)**	825	1.03 (0.95, 1.13)
All cancers	C00-97	476	1.00	263	1.61 (1.38, 1.88)**	392	1.52 (1.32, 1.73)**	305	1.28 (1.10, 1.48)**
Esophagus	C15	12	1.00	11	3.01 (1.32, 6.87)**	14	2.44 (1.12, 5.32)*	8	1.58 (0.63, 3.93)
Stomach	C16	118	1.00	47	1.19 (0.84, 1.67)	80	1.25 (0.94, 1.67)	67	1.14 (0.84, 1.55)
Colon	C18	37	1.00	25	2.05 (1.23, 3.42)**	19	0.96 (0.55, 1.68)	22	1.27 (0.74, 2.17)
Rectum	C19-20	28	1.00	5	0.50 (0.19, 1.31)	18	1.16 (0.64, 2.10)	13	1.00 (0.51, 1.96)
Liver	C22	61	1.00	29	1.27 (0.81, 1.98)	54	1.54 (1.06, 2.23)*	48	1.54 (1.05, 2.27)*
Gall bladder	C23	8	1.00	7	2.89 (1.04, 8.03)	9	2.18 (0.83, 5.69)	7	1.60 (0.57, 4.47)
Pancreas	C25	30	1.00	15	1.56 (0.83, 2.91)	25	1.66 (0.97, 2.83)$^{+}$	20	1.43 (0.80, 2.55)
Lung	C33-34	58	1.00	72	3.66 (2.58, 5.19)**	69	2.19 (1.54, 3.12)**	36	1.17 (0.77, 1.79)
Prostate	C61	29	1.00	8	0.74 (0.33, 1.63)	21	1.29 (0.73, 2.28)	15	0.82 (0.43, 1.54)
Kidney	C64	6	1.00	3	1.35 (0.33, 5.43)	4	1.19 (0.33, 4.26)	3	1.07 (0.26, 4.42)
Urothelium	C65-67	7	1.00	3	1.35 (0.34, 5.27)	12	3.21 (1.25, 8.23)*	8	2.07 (0.74, 5.77)
Non-Hodgkin's lymphoma	C82-85	20	1.00	7	1.07 (0.45, 2.56)	10	0.98 (0.45, 2.11)	6	0.61 (0.24, 1.54)
Myeloma	C90	9	1.00	1	0.34 (0.04, 2.72)	5	1.06 (0.35, 3.18)	8	1.95 (0.73, 5.18)
Leukemia	C92	5	1.00	4	2.48 (0.65, 9.35)	6	2.24 (0.67, 7.43)	8	4.04 (1.27, 12.8)*
Ischemic heart disease	I20-25	83	1.00	47	1.63 (1.14, 2.34)**	83	1.79 (1.32, 2.43)**	41	0.87 (0.60, 1.27)
Cerebrovascular disease	I60-69	234	1.00	91	1.20 (0.94, 1.53)	114	0.93 (0.74, 1.16)	115	0.90 (0.72, 1.13)
Female									
All causes		5,246	1.00	45	1.57 (1.17, 2.11)**	63	1.51 (1.18, 1.94)**	44	1.26 (0.93, 1.69)
All cancers	C00-97	1,737	1.00	19	2.05 (1.30, 3.23)**	23	1.79 (1.18, 2.71)**	11	1.11 (0.61, 2.02)
Esophagus	C15	30	1.00	0	NA	1	8.09 (1.05, 62.0)*	0	NA
Stomach	C16	301	1.00	1	0.61 (0.08, 4.37)	3	1.35 (0.43, 4.23)	1	0.56 (0.07, 4.02)
Colon	C18	168	1.00	3	3.74 (1.19, 11.8)*	1	0.77 (0.10, 5.56)	2	2.14 (0.52, 8.68)
Rectum	C19-20	68	1.00	1	2.93 (0.40, 21.3)	0	NA	0	NA
Liver	C22	160	1.00	1	1.05 (0.14, 7.51)	2	1.40 (0.34, 5.69)	0	NA
Gall bladder	C23	65	1.00	1	2.78 (0.38, 20.2)	0	NA	0	NA
Pancreas	C25	169	1.00	2	2.40 (0.59, 9.71)	4	3.34 (1.23, 9.06)*	2	2.16 (0.53, 8.76)
Lung	C33-34	173	1.00	2	2.10 (0.52, 8.50)	4	3.13 (1.15, 8.50)*	2	2.15 (0.53, 8.73)
Breast	C50	79	1.00	3	6.90 (2.16, 22.0)**	0	NA	3	9.74 (3.04, 31.2)**
Cervix uteri	C53	30	1.00	0	NA	0	NA	0	NA
Kidney	C64	12	1.00	0	NA	0	NA	0	NA
Urothelium	C65-67	33	1.00	1	6.10 (0.82, 45.3)$^{+}$	0	NA	0	NA
Non-Hodgkin's lymphoma	C82-85	47	1.00	1	4.50 (0.61, 32.9)	1	3.37 (0.45, 24.7)	0	NA
Myeloma	C90	41	1.00	0	NA	1	3.19 (0.43, 23.5)	0	NA
Leukemia	C92	22	1.00	0	NA	1	5.35 (0.71, 40.4)	0	NA
Ischemic heart disease	I20-25	310	1.00	7	3.53 (1.66, 7.50)	6	2.25 (1.00, 5.07)	0	NA
Cerebrovascular disease	I60-69	850	1.00	1	0.22 (0.03, 1.58)	11	1.64 (0.90, 2.98)	7	1.7 (0.55, 2.47)

[#]Adjusted for age, area of study. Significance level: ** p<0.01, * p<0.05, $^{+}$ p<0.1 NA: not applicable

cancers decreased in proportion to the time interval following cessation of smoking. It appeared to require 15 years or longer, after quitting smoking, to reduce the cancer risk to levels similar to that in nonsmokers. Detailed analysis has been carried out for risk associations between smoking and lung cancer (Wakai et al, 2001) and cardiovascular disease (Iso et al, 2005a).

Based on various epidemiological and experimental studies, environmental tobacco smoke (ETS) has been identified as the definitive carcinogen. The risk of exposure to ETS is less than that for exposure through active smoking. For example, the estimated relative risk for lung cancer from exposure to ETS is 1.15–1.2 (IARC, 2003). In the JACC study, we failed to identify any significant risk associated with passive smoking for mortality of various cancers and other diseases in nonsmokers. Exposure to ETS at home and in other locations was evaluated separately in the baseline questionnaire. The validity of this finding was thought to be robust in the context of results obtained in a study

Table 7. Passive Smoking and Lung Cancer in Nonsmokers

	Males			Females		
	Observed person-years	N	HR (95% CI)	Observed person-years	N	HR (95% CI)
Passive smoking at home						
Almost every day	12,377	2	0.45 (0.09, 2.22)	178,809	46	1.06 (0.68, 1.64)
3 hours or longer a day	1,653	2	5.29 (1.03, 27.2)*	42,962	10	1.12 (0.55, 2.28)
Sometimes, 1-4/week,	16,201	10	1.48 (0.57, 3.84)	98,999	21	0.84 (0.49, 1.46)
None	39,419	12	1.00	142,393	42	1.00
Passive smoking at places other than home						
Almost every day	17,008	5	0.97 (0.31, 3.00)	50,335	7	0.77 (0.35, 1.72)
Sometimes, 1-4/week	30,556	11	0.94 (0.41, 2.17)	115,269	26	0.86 (0.54, 1.37)
None	25,075	12	1.00	232,178	70	1.00
Passive smoking in childhood						
From household members	50,913	20	0.76 (0.34, 1.43)	314,167	38	0.93 (0.64, 1.40)
None	25,887	13	1.00	133,045	96	1.00

Significance level * $p<0.05$

comparing passive smoking with plasma fibrinogen levels (Iso et al., 1996), and comparison of survey responses about passive and active smoking within the same household (Ozasa et al, 1997).

Exposure to ETS probably changed during the study period as a result of public tobacco control activities. At the time of the interim survey, changes in prevalence of passive smoking were greater than those in active smoking as the followings. Status of passive smoking on the same subjects was compared between the baseline and interim surveys. Twenty-three percent of female and 40% of male nonsmokers, who declared in the baseline survey that they were exposed to ETS in their home, subsequently reported that they were no longer exposed. In contrast, 31% of female and 29% of male nonsmokers, who reported no exposure previously, reported in the interim survey that they were presently exposed to ETS. Amongst female nonsmokers, who at baseline survey reported that they were exposed to ETS outside the home almost every day, 34% subsequently reported that they were exposed to ETS only 3–4 days per week or less. Another 28% subsequently reported that they were not exposed to ETS any longer. Amongst those who answered at the time of baseline survey that they were exposed to ETS 3–4 days per week or less, 7% subsequently reported that they were exposed to ETS almost every day and 43% reported that they were not. Amongst those who reported in the baseline survey that they were not, 4% subsequently reported that they were exposed to ETS almost every day and 28% had the potential to be exposed to ETS for 3-4 days per week or less. Consequently, the estimated effect of passive smoking on mortality of various cancers may be affected by discrepancies between exposure to ETS reported in the baseline and interim surveys. These might reflect either true changes in circumstances due to tobacco control activities or misclassification between the two surveys.

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