

OVERVIEW

Overview of the Japan Collaborative Cohort Study for Evaluation of Cancer (JACC)

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Abstract

Starting in the late 1980s a major collaborative effort has been carried out in Japan to increase knowledge about factors contributing to mortality from cancer and circulatory disease. This Japan Collaborative Cohort Study (JACC Study) is sponsored by the Ministry of Education, Science, Sports and Culture of Japan (Monbukagakusho) and has contributions from 45 areas of the country. With Drs Kunio Aoki and Yoshiyuki Ohno as leading figures in this endeavour, the cohort now covers more than 100,000 participants enrolled at various centers located from Hokkaido in the North to Kyushu in the South. To collect epidemiological information at baseline, a self-administered questionnaire was used. Follow-up up was to 2003 in the majority of cases and a total of 17,404 deaths were registered, the five commonest sites of cancer development being the lung, stomach, liver, pancreas and colon in men, and the stomach, lung, liver, colon and pancreas in women.

Keywords: Japan Collaborative Cohort Study - cancer - circulatory disease - questionnaire

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Introduction

To enlarge our knowledge about life-style factors and mortality from total causes and major cancers systematically, with additional attention to coronary heart disease and stroke in Japan, we have completed this supplement publication based on the Japan Collaborative Cohort Study (JACC Study) for Evaluation of Cancer Risk sponsored by the Ministry of Education, Science, Sports and Culture of Japan (Monbusho).

The JACC Study is a large-scale population-based study started in the late 1980s (Aoki, 1996, Ohno et al, 2001, Tamakoshi et al, 2005) to reveal risk factors and to provide cancer prevention strategies. It includes 45 areas in Japan: 3 towns in Hokkaido district, 5 towns in Tohoku, 5 towns in Kanto, 1 city, 3 towns and 2 villages in the Chubu, 8 towns and 2 villages in Kinki, 1 city and 1 town in Chugoku, and 4 cities, and 9 towns and 1 village in Kyushu (none in the Shikoku district, see Figure 1). Follow-up has already been carried out until 2003 except in 3 areas.

Because the JACC Study is based on more than 100,000 subjects recruited from almost the whole of Japan with a reasonably long follow-up period, the matrix data we provide in the present special supplement should greatly help us to clarify our knowledge about life-style factors and death from cancer and circulatory diseases, like coronary heart disease and stroke in Japan.

Subjects and Methods

Study Participants

From 1988 through 1990, we established the JACC study in 45 areas in Japan. This was a multicenter-collaborative study, in which 24 institutions voluntarily participated. The recruitment of the study subjects was dependant on each investigator, who had the responsibility

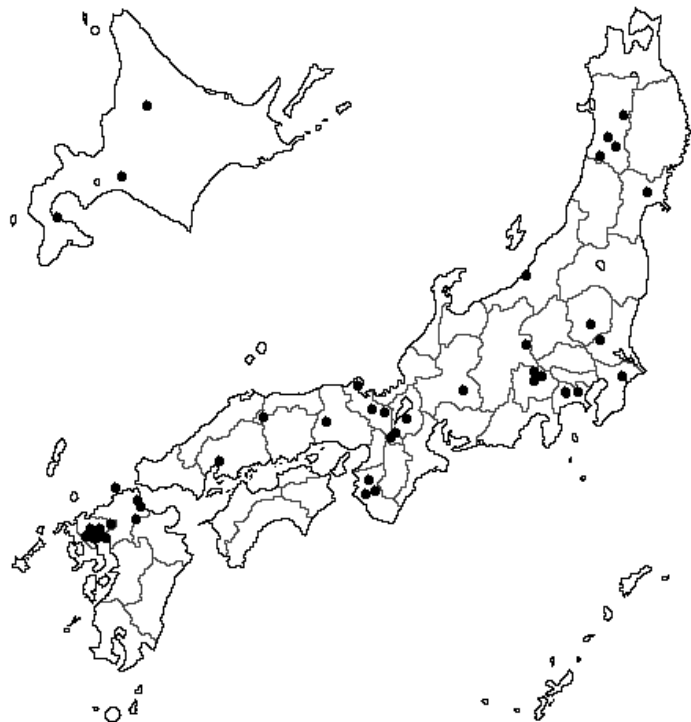


Figure 1. Locations of the JACC Study Sites in Japan

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Table 1. Characteristics of the Study Population

		Age at baseline								Total
		40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	
Men	Number at baseline	5,995	5,797	6,310	7,655	8,362	5,468	3,965	2,626	46,178
	Number of deaths	233	350	665	1,201	1,977	1,935	2,079	1,790	10,230
	Number of move-outs	407	300	230	219	204	181	145	90	1,776
	Person-years	81,805	78,976	84,932	99,543	103,068	63,840	40,415	22,898	575,477
	Mortality rate*	2.8	4.4	7.8	12.1	19.2	30.3	51.4	78.2	17.8
Women	Number at baseline	7,530	7,870	9,039	10,700	10,948	8,461	5,459	3,593	63,600
	Number of deaths	137	219	344	644	1,085	1,402	1,595	1,748	7,174
	Number of move-outs	477	365	367	373	397	410	353	237	2,979
	Person-years	102,613	106,831	122,636	142,301	140,083	103,791	62,590	36,824	817,669
	Mortality rate	1.3	2.0	2.8	4.5	7.7	13.5	25.5	47.5	8.8
Total	Number at baseline	13,525	13,667	15,349	18,355	19,310	13,929	9,424	6,219	109,778
	Number of deaths	370	569	1,009	1,845	3,062	3,337	3,674	3,538	17,404
	Number of move-outs	884	665	597	592	601	591	498	327	4,755
	Person-years	184,418	185,807	207,568	241,845	243,151	167,632	103,005	59,721	1,393,146
	Mortality rate	2.0	3.1	4.9	7.6	12.6	19.9	35.7	59.2	12.5

* Per 1,000 person years.

to construct a cohort in each area. In 22 out of 45 areas, all residents living in the target area (not always equal to the whole area, but usually somewhat smaller and readily describable included districts) were regarded as study subjects, and questionnaires were supplied. In 20 areas, those who had undertaken a basic health examination that was conducted under the Health and Medical Service Law for the Aged were invited to participate in the study. In 2 areas, the study subjects were those examinees of health examination plus volunteers. In 1 area, subjects were defined based on the health checkup for atomic bomb survivors. To participate in the study, individual informed consent was obtained in 36 out of 45 areas (written consent in 35 areas and oral consent in 1 area), and in the remaining 9 areas, group consent from the head of the area was obtained.

Questionnaire

To collect epidemiological information at baseline, a self-administered questionnaire was used to collect demographic information: past medical history; family medical history; health condition one year prior to entry; exercise/sports activities engaged in; frequency of food intake and preference for salty and fatty foods; smoking and alcohol drinking status; health check-up history; occupation; residential area; education; behavioral attitude/stress; and reproductive history for women. All information was entered into a computer using the same format, under the responsibility of each investigator, and then sent to the central secretariat of the JACC study restricting face-sheet information so that anyone outside would not be able to identify the subjects.

In this supplement, we focus on risks of mortality from all causes, cancers and circulatory diseases with all main questionnaire items.

Follow-up

The date and cause of death were annually or biannually confirmed, with the permission of the director-general of the Prime Minister's Office (Ministry of Public Management, Home Affairs, Post and

Telecommunications). The date of move-outs from the study area was also annually verified by the investigator in each area by reviewing population-register sheets of the cohort members. We executed follow-up until the end of 2003, except in 3 areas, in which follow-up was stopped at the end of 1999.

Ethical Review

Our entire study design, which comprised singular and collective use of epidemiologic data and biological materials (serum only), was approved in 2000 by the Ethical Board at Nagoya University School of Medicine.

Data Analysis

There were 110,792 subjects (46,465 men and 64,327 women), aged 40 to 79 years at the baseline. From those, we excluded 1,014 participants with previous history of cancer at any site at the baseline, thus 109,778 were a basic target of the analysis. We also excluded subjects who did not answer the target question item from each analysis. Therefore, the numbers of subjects, observed person-years and total and cause-specific deaths in each table were different.

For each participant, the person years of follow-up were calculated from the date of filling out the baseline questionnaire to death, moving out of the community, or the end of 2003 (1999 in 3 areas), whichever came first. The sex-specific relative risks and 95% confidence intervals of total mortality, total cancer mortality (C00-C97 by ICD-10), cause-specific cancer mortality, death from ischemic heart disease (I20-I25) and cerebrovascular disease (I60-I69) were calculated by using the Cox proportional hazard model adjusted for age group and areas. We picked up cancer sites with more than 100 events, thus we dealt with cancers of esophagus (C15), stomach (C16), colon (C18), rectum (C19-C20), liver (C22), gall bladder/duct (C23), pancreas (C25), lung (C33-C34), breast (C50), cervix uteri (C53), prostate (C61), kidney (C64), urothelial tract (C65-C67), non-Hodgkin lymphoma (C82-C85), multiple myeloma (C90) and myeloid leukemia (C92) for the purpose of this

Table 2. Mortality Overall

Cause of death	ICD Code	Age at Baseline								Total	%	%*
		40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79			
Men												
All causes		233	350	665	1,201	1,977	1,935	2,079	1,790	10,230		100.0
All cancers	C00-97	85	152	309	561	958	731	622	476	3,894	100.0	38.1
Esophagus	C15	5	7	21	30	40	26	15	9	153	3.9	
Stomach	C16	19	34	54	118	184	141	129	98	777	20.0	
Colon	C18	11	6	24	28	49	34	34	33	219	5.6	
Rectum	C19-20	6	14	14	38	25	26	23	18	164	4.2	
Liver	C22	11	25	58	80	132	63	58	36	463	11.9	
Gall bladder	C23	0	1	5	7	12	26	10	11	72	1.8	
Pancreas	C25	6	10	12	32	46	44	38	36	224	5.8	
Lung	C33-34	13	19	59	114	249	200	149	101	904	23.2	
Prostate	C61	1	1	7	9	34	30	44	43	169	4.3	
Kidney	C64	0	3	2	9	11	6	11	4	46	1.2	
Urothelial tract	C65-67	0	3	3	6	22	21	25	14	94	2.4	
Non-Hodgkin's lymphoma	C82-85	0	4	10	13	26	16	12	12	93	2.4	
Multiple myeloma	C90	1	3	3	6	13	10	8	5	49	1.3	
Myeloid leukemia	C92	3	6	4	8	10	4	7	2	44	1.1	
Ischemic heart disease	I20-25	18	27	39	77	107	126	143	129	666		6.5
Cerebrovascular disease	I60-69	17	29	73	129	220	267	327	260	1,322		12.9
Women												
All causes		137	219	344	644	1,085	1,402	1,595	1,748	7,174		100.0
All cancers	C00-97	70	109	182	318	451	440	423	332	2,325	100.0	32.4
Esophagus	C15	0	1	3	2	3	6	6	6	27	1.2	
Stomach	C16	10	15	18	59	63	78	77	66	386	16.6	
Colon	C18	0	10	19	29	37	46	36	43	220	9.5	
Rectum	C19-20	5	4	8	12	23	11	17	9	89	3.8	
Liver	C22	3	7	15	38	53	55	25	31	227	9.8	
Gall bladder	C23	2	7	8	12	12	16	26	12	95	4.1	
Pancreas	C25	2	8	12	27	53	43	45	27	217	9.3	
Lung	C33-34	8	8	22	32	65	49	51	33	268	11.5	
Breast	C50	14	15	18	17	14	12	7	6	103	4.4	
Cervix uteri	C53	5	2	8	2	5	4	5	5	36	1.5	
Kidney	C64	0	0	0	4	2	9	3	1	19	0.8	
Urothelial tract	C65-67	1	0	3	3	7	8	9	10	41	1.8	
Non-Hodgkin's lymphoma	C82-85	1	3	4	14	18	10	10	5	65	2.8	
Multiple myeloma	C90	2	2	3	6	11	8	9	8	49	2.1	
Myeloid leukemia	C92	1	3	2	4	8	6	6	3	33	1.4	
Ischemic heart disease	I20-25	7	3	18	18	48	97	115	152	458		6.4
Cerebrovascular disease	I60-69	17	24	35	69	129	232	313	332	1,151		16.0

*Percentage of deaths per all causes

supplement.

Results

The mean follow-up periods were 12.5 years for men and 12.9 years for women. There were 17,404 deaths (10,230 men and 7,174 women) occurred during follow-up period. As shown in Table 1, mortality rates of men were higher than those of women in any age group. Among men's cancer mortality, the five commonest sites were lung, stomach, liver, pancreas and colon, and among women, those were stomach, lung, liver, colon and pancreas (Table 2).

Discussion

With more than 12 years of follow-up, almost 15% of subjects in our cohort died, and one-third of mortality was caused by cancer. The follow-up condition of mortality with cancer site shown here was almost the same

as that of the end of 1999 (Watanabe et al, 2005a). It must be useful for understanding risk factors of cancer with the matrix shown in this supplement and for constructing a comprehensive cancer prevention strategy.

Member List of the JACC Study Group

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