Table 4
Overview of relationship between responses and socio-economic background (%).

	Q2			Q3			Q4			Q5			Q6			Q7		
	Yes	No	I don't know	Yes	No	I don't know	Yes	No	I don't know	Yes	No	I don't know	Yes	No	I don't know	Yes	No	I don't know
Sex																		
Male	4.3	93.0	2.8	80.3	3.3	16.4	62.1	12.7	25.2	40.2	47.0	12.8	25.4	62.4	12.2	25.4	62.4	12.2
Female	4.2	92.6	3.2	73.4	2.9	23.7	55.4	8.7	35.9	44.8	38.1	17.2	23.6	60.1	16.3	23.6	60.1	16.3
		Pr = 0.829			Pr < 0.001			Pr < 0.001			Pr < 0.001			Pr = 0.001			Pr < 0.001	
Age																		
20–29	2.9	93.8	3.4	76.3	3.7	20.1	57.6	10.2	32.3	48.4	38.0	13.5	27.3	55.7	16.9	54.4	26.3	19.3
30–39	3.6	93.1	3.2	77.4	2.8	19.8	57.2	9.7	33.1	46.7	35.6	17.8	30.1	55.8	14.1	60.2	23.5	16.2
40–49	2.4	96.6	1.1	75.9	2.4	21.7	57.0	10.1	32.9	43.7	40.4	15.9	23.9	60.4	15.7	60.0	23.9	16.1
50–59	4.3	92.8	2.9	75.1	3.6	21.3	57.4	10.9	31.7	41.7	43.8	14.5	22.8	63.4	13.8	55.0	27.6	17.4
60–69	7.6	88.2	4.3	79.0	3.1	18.0	63.7	11.8	24.5	33.5	53.2	13.3	18.8	69.1	12.1	57.3	28.6	14.1
Others	16.7	83.3	0.0	100.0	0.0	0.0	83.3	16.7	0.0	50.0	16.7	33.3	33.3	66.7	0.0	83.3	0.0	16.7
		Pr < 0.001			Pr = 0.790			Pr = 0.130			Pr < 0.001			Pr = 0.051			Pr = 0.264	
Marital status																		
Spouse	3.8	93.6	2.6	76.5	3.3	20.2	58.8	10.6	30.6	41.4	43.2	15.4	23.2	62.3	14.6	58.3	25.8	16.0
No spouse	5.5	90.5	4.0	77.3	2.6	20.1	58.1	10.6	31.2	45.9	39.9	14.2	28.1	58.2	13.7	55.1	26.7	18.3
		Pr = 0.037			Pr = 0.687			Pr = 0.949			Pr = 0.153			Pr = 0.367			Pr = 0.296	
No spouse																		
Unmarried	4.2	91.6	4.2	76.9	4.2	18.9	56.6	11.9	31.5	45.5	44.1	10.5	23.8	63.6	12.6	56.6	25.2	18.2
Divorced	7.7	87.2	5.1	89.7	0.0	10.3	71.8	5.1	23.1	30.8	53.9	15.4	18.0	61.5	20.5	50.0	29.0	21.1
Widowed	25.0	63.9	11.1	66.7	2.8	30.6	55.6	8.3	36.1	33.3	41.7	25.0	11.4	68.6	20.0	44.4	36.1	19.4
		Pr < 0.001			Pr = 0.133			Pr = 0.418			Pr = 0.112			Pr = 0.023			Pr = 0.678	
Children																		
Yes	4.1	93.1	2.8	77.0	2.9	20.1	59.4	10.1	30.6	40.5	44.0	15.5	22.9	62.8	14.3	58.1	25.6	16.3
No	4.3	92.5	3.2	77.0	3.4	19.6	57.8	11.1	31.1	47.8	38.7	13.6	28.2	57.6	14.2	55.8	27.1	17.2
		Pr = 0.845			Pr = 0.820			Pr = 0.691			Pr = 0.006			Pr = 0.011			Pr = 0.589	
Profession																		
Company worker/ executive	3.0	94.8	2.2	77.0	2.8	20.2	59.3	12.4	28.4	45.3	41.2	13.5	27.4	59.8	12.8	57.2	26.5	16.3
Public officer	6.3	90.9	2.8	85.3	2.8	11.9	56.6	11.9	31.5	42.7	41.3	16.1	25.9	62.9	11.2	60.8	28.0	11.2
House husband/ wife	4.4	91.8	3.8	73.9	4.2	21.9	54.4	9.1	36.5	46.2	35.4	18.4	20.4	60.4	19.3	58.6	23.5	17.9
Self-employed	3.3	94.1	2.6	79.7	3.9	16.3	67.3	11.1	21.6	36	54.9	9.2	25.7	64.5	9.9	54.9	28.1	17.0
Freelance professional MD, lawyer, etc.	15.6	84.4	0.0	77.8	4.4	17.8	51.1	11.1	37.8	51.1	31.1	17.8	28.9	57.8	13.3	62.2	33.3	4.4
Part-time worker	2.6	93.4	4.0	70.0	3.5	26.5	52.2	7.8	40.1	44.1	37.5	18.4	25.4	59.1	15.6	58.4	23.1	18.5
Pensioner, unemployed	7.6	88.0	4.4	80.8	1.2	18.0	64.4	11.6	24	28.8	57.6	13.6	17.2	68.8	14.0	55.2	28.0	16.8
Others	4.1	94.3	1.6	82.8	3.3	13.9	67.2	7.4	25.4	40.2	47.5	12.3	26.2	59.8	13.9	54.9	27.9	17.2
		Pr = 0.001			Pr = 0.016			Pr < 0.001			Pr < 0.001			Pr = 0.011			Pr = 0.500	
Region																		
Hokkaido/Tohoku	5.6	89.8	4.6	78.7	3.9	17.4	59.7	10.8	29.5	41.3	45.9	12.8	24.6	63.3	12.1	57.1	26.2	16.7
Kanto	4.0	93.4	2.6	77.0	2.6	20.3	57.9	11.8	30.3	45.9	37.9	16.2	27.8	57.8	14.4	56.8	26.2	17.0
Chubu	3.3	93.9	2.8	73.3	3.6	23.1	58.4	11.0	30.6	44.2	41.4	14.4	25.3	62.3	12.4	56.8	26.2	17.1
Kinki	3.6	93.7	2.7	74.5	3.4	22.2	56.9	10.4	32.8	42.7	41.2	16.1	21.7	63.0	15.2	58.1	23.4	18.6
Chugoku/Shikoku	4.6	92.4	3.0	76.8	4.2	19.0	60.3	10.1	29.5	39.7	49.0	11.4	20.2	62.2	17.7	59.7	28.2	12.2
Kyushu/Okinawa	5.5	91.6	2.9	81.4	1.5	17.2	61.0	7.3	31.8	33.9	49.6	16.4	21.2	63.9	15.0	57.9	27.1	15.0
		Pr = 0.699			Pr = 0.303			Pr = 0.838			Pr = 0.009.			Pr = 0.147			Pr = 0.788	
Educational background																		
Junior high school	5.4	89.1	5.4	76.1	3.3	20.7	56.5	17.4	26.1	31.5	48.9	19.6	27.2	55.4	17.4	43.5	35.9	20.7
High school	4.6	91.2	4.2	73.0	4.2	22.8	56.4	13.0	30.6	38.5	45.8	15.6	22.6	63.4	14.1	56.4	27.2	16.4
College	4.0	92.1	3.9	74.8	2.3	22.9	55.0	7.7	37.3	45.0	38.7	16.4	23.3	58.8	17.9	58.9	22.7	18.5
University, Graduate school	4.0	94.7	1.4	80.6	2.6	16.8	62.3	9.7	28.0	45.5	40.9	13.6	26.3	61.2	12.5	58.7	26.0	15.4
		Pr = 0.006			Pr = 0.004			Pr < 0.001			Pr = 0.009			Pr = 0.055			Pr = 0.047	

Table 4 (*Continued*)

	Q2			Q3			Q4			Q5			Q6			Q7		
	Yes	No	I don't know	Yes	No	I don't know	Yes	No	I don't know	Yes	No	I don't know	Yes	No	I don't know	Yes	No	I don't know
Family ever had cancer?																		
Yes	6.0	91.0	3.0	77.3	3.4	19.3	59.0	9.9	31.2	40.1	45.2	14.7	21.7	65.5	12.8	58.0	26.8	15.2
No	3.0	94.2	2.8	76.9	2.8	20.3	58.6	11.1	30.3	44.1	40.6	15.3	26.3	58.5	15.2	57.1	25.6	17.3
I don't know	0.0	91.7	8.3	54.2	0.0	45.8	45.8	20.8	33.3	62.5	25.0	12.5	37.5	37.5	25.0	58.3	16.7	25.0
		Pr = 0.003			Pr = 0.024			Pr = 0.387			Pr = 0.052			Pr = 0.001			Pr = 0.431	
Ever had cancer?																		
Yes	8.3	90.6	1.0	80.2	2.1	17.7	57.3	13.5	29.2	37.9	42.1	20.0	20.8	69.8	9.4	57.3	30.2	12.5
No	4.0	93.1	2.9	76.8	3.1	20.1	59.0	10.2	30.9	42.6	42.6	14.8	24.4	61.2	14.4	57.6	25.7	16.7
I don't know	8.2	81.6	10.2	71.4	4.1	24.5	49.0	24.5	26.5	44.9	36.7	18.4	32.7	53.1	14.3	54.2	33.3	12.5
		Pr = 0.003			Pr = 0.819			Pr = 0.023			Pr = 0.566			Pr = 0.268			Pr = 0.517	
Income																		
≤4 million yen	6.0	88.2	5.8	75.1	4.6	20.3	55.6	12.7	31.8	39.7	43.6	16.8	22.2	62.4	15.3	53.9	29.0	17.1
4–8 million yen	3.3	94.2	2.5	77.0	2.5	20.5	61.4	9.7	28.9	42.2	43.2	14.6	24.3	60.7	15.0	58.5	25.6	15.8
>8 million yen	4.1	94.3	1.6	78.1	2.9	19.0	58.5	10.4	31.1	44.5	41.3	14.2	25.8	61.6	12.6	59.2	24.7	16.1
Others	0.0	95.2	4.8	61.9	0.0	38.1	38.1	9.5	52.4	57.1	19.1	23.8	42.9	38.1	19.1	38.1	14.3	47.6
		Pr < 0.001			Pr = 0.095			Pr = 0.078			Pr = 0.183			Pr = 0.147			Pr = 0.003	

N.B. Pr values are calculated according to chi^2 test.

background for the answer. The answer on the five-grade Likert scale was employed as the dependent variable. Sex, age, region of residence, family experience of cancer, personal experience of cancer, and awareness of cancer registration, which were all significantly correlated with response to Q8, were used as independent variables. The results are shown in Table 5. Male sex (OR 1.25), older age (OR 1.33), and living in the southern region (OR 1.31) were factors significantly associated with support for cancer registration. Cut-off points were arranged almost linearly, and no clear affinity between the answer categories was observed.

4. Discussion

4.1. Study results

This study clarified the current general opinion on cancer registration in Japan. The questionnaire alone could not fully inform respondents about cancer registration. However, the present results should be more reliable than those of previous surveys because the explanation was given in neutral terms rather than being phrased in a way that creates unrest about privacy.

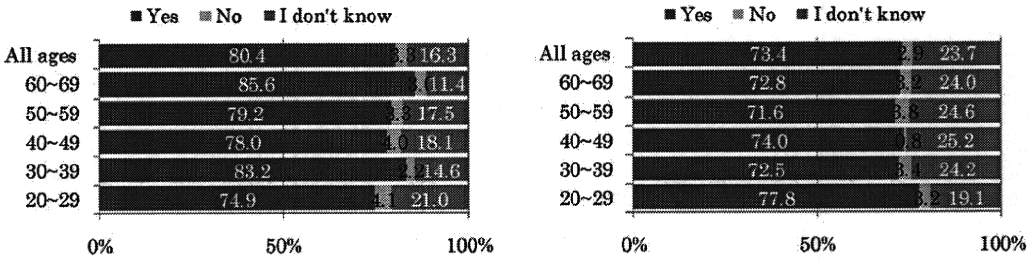
Awareness of the cancer registry system was remarkably low; most Japanese people were unaware of the system, despite increasing media coverage. In the UK study, the awareness was a little higher than in Japan. This is probably because British cancer registries or GPs provide more information on cancer registration to the public. The difference may also be related to frequency to see epidemiological study results based on cancer registration. Nonetheless, nearly 80% of the Japanese respondents answered "cancer registry is useful" when a short explanation on the system was provided.

Compared with the British, Japanese people seemed to be more suspicious about cancer registration according to their responses to Q4 and 5. We speculate that these two questions are correlated in terms of the trade-off that we see in Q8. Japanese respondents appear to believe that they should be informed which contents are transmitted to cancer registries and how this is done. Only when these requirements are satisfied would they agree with legislation of cancer registration. In a general survey on national character in Japan, 41% of the 1001 respondents answered "I am very worried about abuse of my own personal information by someone" [8]. In another international comparative study on information, 55.4% of UK respondents felt assured about the confidentiality of their information, while Japan was positioned at the bottom of the 7 countries surveyed, with only 34.3% of Japanese stating that they felt assured in this regard [9].

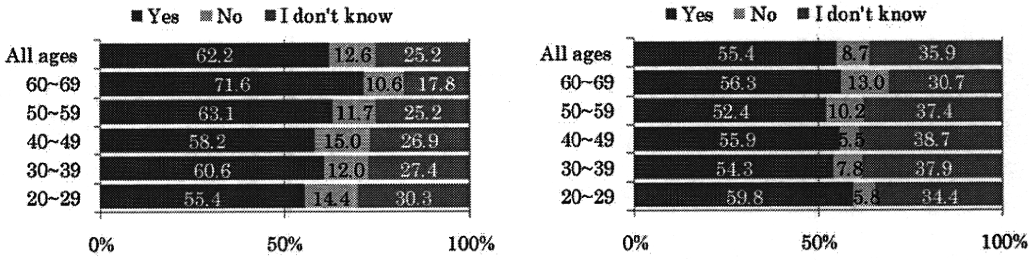
However, it should be noted that Japanese respondents did not show active opposition to cancer registration, as they tended to choose "I don't know" instead of "no". This probably stems from insufficient knowledge of cancer registration in Japan, or to the Japanese tendency to avoid a definitive "yes" or "no" answer. The information in the questionnaire allowed the respondents to consider cancer registration in detail, and to understand its utility. We believe, however, that the general population should receive more education in the long term, in order to form their opinion according to their social position or circumstances.

The tendency to think that cancer registration is an invasion of privacy in Japan may be related to the mass media coverage of the Act for Protection of Computer Processed Personal Data in 2003. Another possibility is the recent prevalence of crime that misuses or leaks personal information. Moreover, differences between the two countries in their attitudes to and understanding of public health and epidemiology and public interest might be another contributing factor.

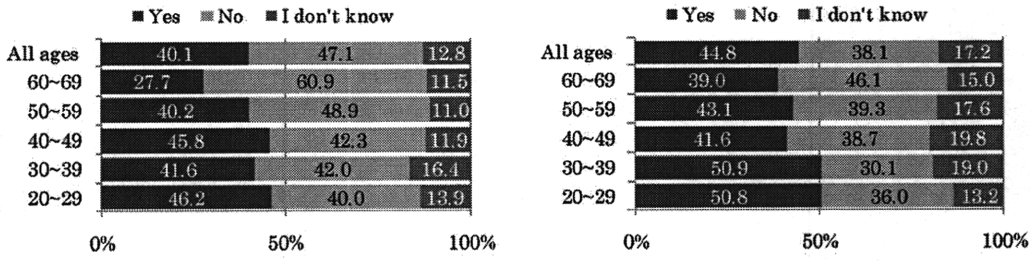
It is interesting that a large difference was seen in the responses to Q1, 5, and 6, although these three questions all covered privacy.



Q3. The cancer registry is the only reliable source of information for monitoring trends in the risk of getting cancer and trends in cancer survival. The information is used to compare the effectiveness of cancer treatment around the country, and to evaluate the success of cancer screening programs. Do you think this is useful information for us to have in this country?



Q4. In the USA, Denmark, Sweden, South Korea and many other countries, all cases of cancer have to be notified to the cancer registry by law. In future, there may need to be a similar law in Japan, to ensure that the cancer registries continue to have the information needed for monitoring cancer in Japan. Would you support a new law that meant all cases of cancer have to be notified to the cancer registries?



Q5. Currently, survival rates from cancer can only be compared between regions of the country by knowing cancer patients' names and addresses. If you had cancer and your name and address was included automatically in the cancer registries, to be held confidentially and under strict security, do you think this would be an invasion of your privacy?

Fig. 2. Sex and age differences in the answers to Q3, 4, and 5.

It is already well known that personal information is manipulated by the local administration in the course of civil registration; hence, people may not care about this issue. In both countries, for example, breast and cervical cancer screening are managed by the government, and the population has already received announcements about their health from city halls or health authorities. Even Japanese people are used to receiving such information with a nominative cover letter. On the other hand, cancer registration is an unknown system and people may still be suspicious about it, compared with medical research participation requested through

Table 5
Results of the ordered logit model for the association between response to Q8 and respondents' background factors.

Variables		Odds ratio	S.E.	Pr
$n = 2406$ log likelihood $= -3762.2065$ LR chi^2(6) $= 47.26$				
Male		1.245467	0.090686	0.003
Age >49		1.333289	0.104200	0.000
Resident of southern regions		1.313561	0.118063	0.002
Own experience of cancer (Q17)		1.155135	0.090001	0.064
Experience of cancer in the family (Q16)		1.137620	0.220123	0.505
Aware of cancer registry (Q2)		1.346390	0.245652	0.103
	Cut-off point 1	−1.566630	0.080296	
	Cut-off point 2	−0.257750	0.069048	
	Cut-off point 3	0.678866	0.070283	
	Cut-off point 4	2.124766	0.083575	

their treating doctors. Cancer registration requires information about sensitive medical records in addition to personal identifiers. This may increase feelings of resistance. Moreover, cancer screening brings people a direct advantage; however, cancer registration seems not to provide any immediate merit.

The logit modeling showed us that only general background factors (age, sex, and residence region) affected opinions on the cancer registration. Cancer experience slightly increased respondents' knowledge of the cancer registry system, but it had no significant effect on their opinion of it. Such differences of opinion concerning privacy probably result from age and sex differences, rather than from the tendency for young women to be more concerned about conditions such as breast, ovarian or cervical cancer. For example, the "Public opinion poll concerning protection of individual information" in September 2006 showed more uneasiness regarding information leakage among female respondents [10]. In that poll, young respondents and city residents felt uneasiness regarding the misuse of personally identifiable information. We consider that the results of our study do not reflect a specific tendency about "cancer" or "cancer registration".

4.2. Research limitations

The research subjects were recruited from those designated "research monitors" by Nikkei Research Ltd. Strictly speaking, this may introduce bias if we consider them to represent the general population, since the monitors are willing to be registered in Nikkei Research Ltd., and this motivation might lead to such people having similar characteristics. However, nowadays in Japan, it is not at all feasible to achieve a high response rate in social science research by selecting subjects from the telephone directory or electoral roll, although such methods were satisfactory a few decades ago. Research with low response rates, for example 30%, is much less reliable than the present survey. We believe strongly that using a database of a research and marketing company was the most efficient way to obtain answers as close as possible to the "real" opinion of the general population.

The difference in methodology between the two studies, i.e., telephone interview in the British study versus mailed questionnaires in the present study, might impede comparability. However, it is extremely difficult to maintain a high response rate with the telephone investigation method in Japan. We considered it more important to have a high response rate than to achieve methodological commonality between the two studies.

4.3. The future of cancer registration in Japan

A decade ago, researchers were encouraged to achieve social recognition for cancer registration throughout the world. At that time, there remained criticism against the epidemiological research based on cancer registration without individual consent of the patients, based on the principles of the Helsinki Declaration [11,12]. Times have changed, in particular after the enactment of the European Commission directive in 1995, and we now have consensus that cancer registration is exempt from the basis of individual informed consent because it can only benefit society. The alternative of making the data anonymous by replacing all the identifiers with codes would impede cancer surveillance [13] and is not realistic. The unfortunate example in Estonia warns against the overzealous implementation of data protection, even under a favorable situation [14]. What we need is to achieve a proper balance between protection of patient privacy and public health interests by setting appropriate policies, regulations, and use of technology [15], while avoiding overly restrictive policies and an exaggerated reaction [16].

As for the anxiety regarding the treatment of personal information in Japan, we think that feelings will soften if transparency in data processing is improved, specifically regarding what information is accumulated by which route, and what it is used for. The public are then more likely to feel, "we are taking advantage of our predecessors' contributions now, and are proud to do the same for the following generation's health", which seems to be the prevailing sentiment in the UK. We also have to enhance the opinion of cancer registration in the general population by describing the rigor of the registries' safety management measures, which treat personal information according to strict international standards [17].

It is worth noting that the Japanese public thought that they would be disadvantaged if their region had no cancer registry system (Q7). Unlike countries with a national registry (e.g., Nordic countries) or those where the cancer registries have no plan to cover the whole country (e.g., England, France, Italy), the Japanese cancer registry system aims to create independent regional cancer registries to cover the whole country. Considering the National Cancer Control Act in 2006, pertaining to the standardization and the equalization of cancer information based on cancer registration, the results of the present study support the continuation of our project [16].

In the "Administrative divisions cancer measures" questionnaire which the Nikkei Newspaper sent to the cancer registries, the registries answered that legislation and financial support were of course important, and "understanding of society" was one of the most important factor considered to enhance the position of cancer registration. We need a long-term strategy to ensure that the public is well informed on cancer registration [18]. In the USA, 64.3% of registries had educational materials to explain the system and to describe the possibility that researchers may contact patients about participating in a study [16]. Japanese cancer registries should emulate the American example, and promote passive educational approaches (web sites, pamphlets, brochures, etc.).

After 50 years of cancer registration in Japan, we are at a crossroads. Compared with other developed countries, we have not yet completed a system that can provide sufficient cancer registry data for means of cancer control or to evaluate cancer screening. Nor have we been able to use cancer registry data in a large-scale cohort study. To obtain the "understanding of society," we need to actively utilize information from the cancer registry and to educate the public about examples of actual use that have wide appeal. The future of cancer control therefore depends on our efforts and on public cooperation.

Conflict of interest statement

There is no conflict of interest concerning this study.

References

[1] Okamoto N. A history of the cancer registration system in Japan. Int J Clin Oncol 2008;13(April (2)):90–6.

[2] Sobue T. Current activities and future directions of the cancer registration system in Japan. Int J Clin Oncol 2008;13(April (2)):97–101.

[3] Curado MP, Edwards B, Shin HR, Storm H, Ferlay J, Heanue M, et al., eds. Cancer incidence in five continents, vol. IX. Lyon: IARC, 2007.

[4] Tanaka H. Features of the USA Cancer Registries Amendment Act viewed from the status quo in Japan. Nippon Koshu Eisei Zasshi 2006;53(January (1)):8–19.

[5] Barrett G, Cassell JA, Peacock JL, Coleman MP. National survey of British public's views on use of identifiable medical data by the National Cancer Registry. Brit Med J 2006;332(May (7549)):1068–72.

[6] Cabinet Office Government of Japan. Public opinion polls on cancer control. Tokyo; 2007 [contract no. document number].

[7] Suda M. Expectation for cancer control measures progress. Mainichi Newspaper; 2007.10.19.

[8] Social Survey Information Research Group. A study of the Japanese national character: the twelfth nationwide survey. Tokyo: Research Innovation

Center, The Institute of Statistical Mathematics; 2008 [contract no. document number].
[9] White Paper on Information and Communications in Japan. Tokyo: Ministry of Internal Affairs and Communications; 2009 [contract no. document number].
[10] Cabinet Office Government of Japan. Public opinion polls on personal information protection. Tokyo; 2006 [contract no. document number].
[11] Sankila R, Martinez C, Parkin DM, Storm H, Teppo L. Informed consent in cancer registries. Lancet 2001;357(May (9267)):1536.
[12] Illman J. Cancer registries: should informed consent be required? J Natl Cancer Inst 2002;94(September (17)):1269–70.
[13] Verity C, Nicoll A. Consent, confidentiality, and the threat to public health surveillance. Brit Med J 2002;324(May (7347)):1210–3.
[14] Rahu M, McKee M. Epidemiological research labelled as a violation of privacy: the case of Estonia. Int J Epidemiol 2008;37(June (3)):678–82.
[15] Deapen D. Cancer surveillance and information: balancing public health with privacy and confidentiality concerns (United States). Cancer Causes Control 2006;17(June (5)):633–7.
[16] Beskow LM, Sandler RS, Weinberger M. Research recruitment through US central cancer registries: balancing privacy and scientific issues. Am J Public Health 2006;96(November (11)):1920–6.
[17] Storm H, Brewster DH, Coleman MP, Deapen D, Oshima A, Threlfall T, et al. Guidelines for confidentiality and cancer registration. Br J Cancer 2005;92(June (11)):2095–6.
[18] Saul H. Privacy and cancer registries in Europe. Eur J Cancer 2002;38(January (1)):3.

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Epidemiology Note

Cancer Incidence and Incidence Rates in Japan in 2004: Based on Data from 14 Population-based Cancer Registries in the Monitoring of Cancer Incidence in Japan (MCIJ) Project

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The Japan Cancer Surveillance Research Group estimated the cancer incidence in 2004 as part of the Monitoring of Cancer Incidence in Japan (MCIJ) project, on the basis of data collected from 14 of 31 population-based cancer registries. The total number of incidences in Japan for 2004 was estimated as 623 275 (C00–C96). The leading cancer site according to the crude and age-standardized incidence rates was the stomach for men and breast for women. The apparent increase in age-standardized incidence rates in 2003 was calmed down in 2004.

Key words: cancer incidence – incidence estimates – cancer registry – Japan

The Japan Cancer Surveillance Research Group is involved in cancer monitoring in Japan since 2000 (1–4). This group estimated the cancer incidence in 2004 as part of the Monitoring of Cancer Incidence in Japan (MCIJ) project, on the basis of data collected from 14 of 31 population-based cancer registries: Miyagi, Yamagata, Chiba, Kanagawa, Niigata, Fukui, Shiga, Osaka, Tottori, Okayama, Hiroshima, Saga, Kumamoto and Nagasaki. If data from all 31 registries were used, this would have led to a large underestimation of national cancer incidence because of under-registration. The methods of registry selection, estimation of incidence and the limitations of these methods have been explained in previous studies (5–7). As is mentioned in the last article, there were two major methodological changes in the MCIJ2003, and we maintained these changes in the present study: (i) we invited all 31 population-based cancer registries in Japan to participate, and from these, we selected the 14 cancer registries with high-quality data in order to estimate the national incidence, and (ii) we used 2004 data alone for the national estimation. For this year, Kumamoto prefecture was newly selected as one of the registries with high-quality data for the national estimation, but the other registries remained since the previous estimations.

The number of incidences, crude rates, age-standardized rates and completeness of registration in 2004 are shown in Table 1, and the age-specific number of incidences and the rates according to sex and primary site are shown in Tables 2 and 3. The total number of incidences in Japan for 2004 was estimated as 623 275 (C00–C96). The time trends of age-standardized incidence rates for the five major sites and male- and female-specific sites in 1975–2004 are shown in Fig. 1 (standard population: the world population) and in Fig. 2 (standard population: the 1985 Japanese model population). The leading cancer site according to the crude and age-standardized incidence rates was the stomach for men and the breast for women, as shown in Figs 1 and 2. The apparent increase in age-standardized incidence rates in 2003 because of development of hospital-based cancer registry in designated cancer care hospitals was calmed down in 2004. The estimated cancer incidence data in Japan by sex, site, 5-year age group and calendar year during the period 1975–2004 are available as a booklet and as an electronic database on the website (only available in Japanese, http://ganjoho.jp/professional/statistics/monita.html).

Table 1. Incidence, completeness of reporting and accuracy of diagnosis in Japan according to sex and primary site, 2004

Primary sites	ICD-10th	Number of incidence	Crude rate[a]	Age-standardized rate[a]		Completeness of reporting		Accuracy of diagnosis
				World population	Japanese 1985 model population	DCO/I (%)	I/M	MV/I (%)
Male								
All sites (incl. CIS)	C00–C96, D00–D09	372 913	598.6	282.3	400.4	17.1	1.93	73.8
All sites	C00–C96	362 149	581.3	273.9	388.6	17.6	1.88	73.2
Lip, oral cavity and pharynx	C00–C14	7136	11.5	6.0	8.1	14.1	1.77	79.7
Esophagus	C15	15 215	24.4	11.8	16.4	15.4	1.62	78.8
Stomach	C16	73 950	118.7	56.4	79.6	14.1	2.25	82.1
Colon	C18	35 657	57.2	26.7	38.1	12.4	2.68	82.4
Rectum	C19–C20	20 954	33.6	16.7	23.1	10.9	2.46	83.8
Liver	C22	28 172	45.2	21.5	30.2	25.6	1.20	33.7
Gallbladder etc.	C23–C24	9234	14.8	6.3	9.4	27.7	1.24	48.3
Pancreas	C25	13 128	21.1	9.6	13.9	31.3	1.10	33.8
Larynx	C32	3210	5.2	2.5	3.4	9.4	3.33	86.2
Trachea, bronchus and lung	C33–C34	55 984	89.9	38.9	58.1	24.3	1.27	70.2
Melanoma of skin etc.	C43–C44	4298	6.9	3.2	4.6	6.2	7.61	92.7
Prostate	C61	39 321	63.1	26.6	39.7	10.9	4.45	83.6
Bladder	C67	12 012	19.3	8.6	12.6	10.9	3.15	83.5
Kidney, renal pelvis, ureter etc.	C64–C66, C68	9358	15.0	7.5	10.5	15.4	2.43	76.1
Brain and nervous system	C70–C72	2352	3.8	2.6	3.1	29.4	2.58	63.4
Thyroid	C73	1933	3.1	1.8	2.4	8.3	4.53	86.9
Malignant lymphoma	C81–C85, C96	9436	15.1	8.0	10.8	17.4	1.96	82.0
Multiple myeloma	C88, C90	2723	4.4	1.9	2.8	29.4	1.37	64.9
All leukemias	C91–C95	5282	8.5	5.3	6.5	25.3	1.28	85.6
Female								
All sites (incl. CIS)	C00–C96, D00–D09	275 578	421.4	198.7	266.2	17.1	2.17	73.6
All site	C00–C96	261 126	399.3	183.5	247.2	18.0	2.05	72.4
Lip, oral cavity and pharynx	C00–C14	2980	4.6	2.1	2.8	14.7	1.94	78.1
Esophagus	C15	2600	4.0	1.6	2.2	22.4	1.47	70.2

Continued

Table 1. *Continued*

Primary sites	ICD-10th	Number of incidence	Crude rate^a	Age-standardized rate^a		Completeness of reporting		Accuracy of diagnosis
				World population	Japanese 1985 model population	DCO/I (%)	I/M	MV/I (%)
Stomach	C16	35 822	54.8	21.5	30.2	17.8	2.02	78.2
Colon	C18	29 070	44.5	16.9	23.8	16.6	2.21	76.5
Rectum	C19–C20	11 585	17.7	7.7	10.5	14.4	2.30	80.6
Liver	C22	13 343	20.4	7.1	10.3	30.4	1.20	29.7
Gallbladder etc.	C23–C24	10 457	16.0	4.7	7.0	33.3	1.18	40.2
Pancreas	C25	11 314	17.3	5.7	8.4	33.8	1.10	30.3
Larynx	C32	224	0.3	0.1	0.2	13.4	2.87	71.6
Trachea, bronchus and lung	C33–C34	24 122	36.9	13.7	19.5	25.3	1.51	67.3
Melanoma of skin etc.	C43–C44	4326	6.6	2.2	3.2	8.5	7.55	90.7
Breast (incl. CIS)	C50, D05	50 549	77.3	48.1	62.0	5.4	4.80	91.1
Uterus (incl. CIS)	C53–C55, D06	24 422	37.3	26.0	32.6	7.2	4.42	89.7
Uterus (only invasive)	C53–C55	17 603	26.9	16.6	21.4	9.5	3.19	86.9
Cervix uteri	C53	9252	14.1	9.5	12.2	6.8	3.71	89.6
Corpus uteri	C54	7253	11.1	6.5	8.4	5.2	5.05	91.8
Ovary	C56	8655	13.2	8.1	10.3	13.5	1.96	79.3
Bladder	C67	4039	6.2	2.0	2.9	16.9	2.32	74.7
Kidney, renal pelvis, ureter etc.	C64–C66, C68	4374	6.7	2.8	3.8	19.5	2.11	70.2
Brain and nervous system	C70–C72	2220	3.4	2.1	2.4	29.5	3.23	56.5
Thyroid	C73	7062	10.8	6.8	8.5	6.6	7.03	87.7
Malignant lymphoma	C81–C85, C96	8063	12.3	5.8	7.6	17.2	2.22	80.4
Multiple myeloma	C88, C90	2247	3.4	1.2	1.7	31.8	1.17	62.5
All leukemias	C91–C95	3726	5.7	3.3	3.9	25.7	1.28	85.0

ICD-10th, International Classification of Disease, 10th Revision; DCO/I, proportion of cases with the death certificate only to incident cases; I/M, number of incidence/number of deaths; MV/I, proportion of microscopically verified cases to incident cases; CIS, carcinoma *in situ*.

[a] Per 100 000 population.

Table 2. Age-specific incidence in Japan according to sex and primary site, 2004

Primary sites	ICD-10	All ages	Age group (years)																	
			0–4	5–9	10–14	15–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	65–69	70–74	75–79	80–84	85+
Male																				
All sites (incl. CIS)	C00–C96, D00–D09	372 913	388	171	210	282	535	1073	1727	2567	3891	8273	18 354	31 956	44 998	57 595	70 712	64 723	36 908	28 550
All sites	C00–C96	362 149	388	171	210	271	527	1056	1674	2438	3752	7980	17 771	30 896	43 301	55 799	68 663	63 034	36 053	28 165
Lip, oral cavity and pharynx	C00–C14	7136	0	0	0	16	15	33	63	58	124	290	602	812	1174	1176	1211	745	460	357
Esophagus	C15	15 215	0	0	0	0	0	1	5	8	65	328	863	1789	2633	2856	2744	2123	1198	602
Stomach	C16	73 950	0	0	5	6	10	154	243	369	739	2004	4117	7271	9433	11 844	14 072	12 063	6418	5202
Colon	C18	35 657	0	0	11	5	25	66	90	260	444	643	1762	2987	4635	5565	6765	6133	3462	2804
Rectum	C19–C20	20 954	0	0	0	0	1	31	61	235	305	558	1480	2740	3137	3508	3543	2808	1388	1159
Liver	C22	28 172	14	5	0	0	1	5	52	150	195	598	1450	2843	3811	5205	6061	4464	1952	1366
Gallbladder etc.	C23–C24	9234	0	0	4	0	0	3	28	39	32	122	292	446	733	1279	1668	1736	1447	1405
Pancreas	C25	13 128	0	1	0	0	0	9	16	31	133	274	765	1129	1555	1845	2340	2276	1535	1219
Larynx	C32	3210	0	0	0	0	0	0	0	8	11	80	166	348	548	555	630	474	228	162
Trachea, bronchus and lung	C33–C34	55 984	0	0	0	6	29	22	77	139	383	857	1952	3779	5646	7304	11 128	12 366	7287	5009
Melanoma of skin etc.	C43–C44	4298	10	0	0	7	20	35	33	51	77	108	179	270	336	520	739	820	522	571
Prostate	C61	39 321	0	0	0	0	0	0	0	21	19	96	549	1533	3952	7200	9284	8525	4534	3608
Bladder	C67	12 012	0	0	1	3	2	20	25	48	97	255	628	884	1171	1341	2224	2293	1668	1352
Kidney, renal pelvis, ureter etc.	C64–C66, C68	9358	20	2	0	0	22	21	53	82	151	442	715	1044	1039	1298	1736	1400	794	539
Brain and nervous system	C70–C72	2352	64	45	44	30	45	67	46	137	144	79	168	186	181	262	320	264	132	138
Thyroid	C73	1933	0	1	4	10	23	36	92	59	102	110	199	233	172	320	189	232	97	54
Malignant lymphoma	C81–C85, C96	9436	22	32	56	49	114	135	96	139	206	335	660	887	902	1296	1361	1392	1010	744
Multiple myeloma	C88, C90	2723	0	0	0	1	0	0	2	17	30	20	119	190	305	348	531	547	324	289
All leukemias	C91–C95	5282	127	71	41	53	67	131	119	165	187	140	334	504	562	611	611	775	462	322
Female																				
All sites (incl. CIS)	C00–C96, D00–D09	275 578	269	147	185	363	741	2395	4846	7321	10 069	13 866	20 044	24 791	27 244	29 778	34 370	34 462	29 140	35 547
All site	C00–C96	261 126	269	147	185	349	493	1514	3227	5874	8633	12 798	19 073	23 745	26 090	28 541	33 221	33 528	28 422	35 017

Continued

Table 2. *Continued*

Primary sites	ICD-10	All ages	Age group (years)																	
			0–4	5–9	10–14	15–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	65–69	70–74	75–79	80–84	85+
Lip, oral cavity and pharynx	C00–C14	2980	0	8	0	4	18	57	42	47	80	127	172	269	314	272	450	438	294	388
Esophagus	C15	2600	0	0	0	0	0	12	10	8	9	40	167	261	336	341	375	299	320	422
Stomach	C16	35 822	0	0	1	0	52	40	204	411	568	1161	1940	2747	3156	4000	5368	5409	4764	6001
Colon	C18	29 070	0	0	0	5	15	28	124	216	310	591	1507	2040	3161	3338	4365	4558	3966	4846
Rectum	C19–C20	11 585	0	0	0	0	4	10	75	206	194	483	813	1003	1363	1565	1602	1491	1273	1503
Liver	C22	13 343	14	1	0	3	0	4	30	10	45	80	353	624	1049	2066	2710	2558	1924	1872
Gallbladder etc.	C23–C24	10 457	0	0	0	0	0	0	6	15	31	87	247	380	625	967	1286	1796	2070	2947
Pancreas	C25	11 314	0	0	0	0	0	1	12	30	83	131	310	617	804	1350	1725	1936	1990	2325
Larynx	C32	224	0	0	0	0	0	0	0	0	1	0	5	22	21	17	53	55	28	22
Trachea, bronchus and lung	C33–C34	24 122	0	0	1	1	6	27	50	92	300	499	1080	1779	2288	2912	3811	3902	3156	4218
Melanoma of skin etc.	C43–C44	4326	0	2	2	4	7	31	55	55	30	61	126	215	307	340	535	673	659	1224
Breast (incl. CIS)	C50, D05	50 549	1	0	1	0	19	253	1039	2397	4204	6181	6635	6965	6556	5073	4060	3338	2104	1723
Uterus (incl. CIS)	C53–C55, D06	24 422	0	0	2	23	251	1168	2430	2605	2465	1909	2752	2636	1973	1737	1355	1256	788	1072
Uterus (only invasive)	C53–C55	17 603	0	0	2	12	32	334	900	1334	1433	1269	2397	2319	1738	1531	1267	1196	773	1066
Cervix uteri	C53	9252	0	0	0	8	27	297	759	1139	1094	673	994	878	753	645	528	592	385	480
Corpus uteri	C54	7253	0	0	2	4	5	37	134	172	321	560	1323	1371	927	827	657	478	209	226
Ovary	C56	8655	1	1	28	53	91	199	150	404	519	792	1202	1202	917	773	734	697	446	446
Bladder	C67	4039	0	0	0	1	4	0	0	30	22	72	101	248	298	366	628	579	683	1007
Kidney, renal pelvis, ureter etc.	C64–C66, C68	4374	25	6	3	4	2	5	35	29	71	141	244	303	445	508	676	701	560	616
Brain and nervous system	C70–C72	2220	43	22	58	58	11	57	48	68	67	76	180	177	122	265	231	307	197	233
Thyroid	C73	7062	0	0	8	43	130	191	297	327	402	562	761	1155	762	815	602	459	277	271
Malignant lymphoma	C81–C85, C96	8063	8	30	21	40	29	117	101	107	247	292	540	720	889	930	1042	1020	929	1001
Multiple myeloma	C88, C90	2247	0	0	0	0	0	0	3	6	10	19	60	183	163	235	375	522	346	325
All leukemias	C91–C95	3726	91	34	36	74	35	83	60	113	104	162	163	251	364	456	367	515	385	433

Table 3. Age-specific incidence rate per 100 000 population in Japan according to sex and primary site, 2004

Primary sites	ICD-10	All ages	Age group (years)																	
			0–4	5–9	10–14	15–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	65–69	70–74	75–79	80–84	85+
Male																				
All sites (incl. CIS)	C00–C96, D00–D09	598.6	13.2	5.6	6.8	8.1	13.5	24.1	34.8	58.9	97.9	210.2	396.2	671.1	1073.2	1653.1	2396.2	2985.4	3266.2	3693.4
All sites	C00–C96	581.3	13.2	5.6	6.8	7.8	13.3	23.7	33.8	55.9	94.4	202.7	383.6	648.8	1032.7	1601.6	2326.8	2907.5	3190.5	3643.6
Lip, oral cavity and pharynx	C00–C14	11.5	0.0	0.0	0.0	0.5	0.4	0.7	1.3	1.3	3.1	7.4	13.0	17.1	28.0	33.8	41.0	34.4	40.7	46.2
Esophagus	C15	24.4	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	1.6	8.3	18.6	37.6	62.8	82.0	93.0	97.9	106.0	77.9
Stomach	C16	118.7	0.0	0.0	0.2	0.2	0.3	3.5	4.9	8.5	18.6	50.9	88.9	152.7	225.0	340.0	476.9	556.4	568.0	673.0
Colon	C18	57.2	0.0	0.0	0.4	0.1	0.6	1.5	1.8	6.0	11.2	16.3	38.0	62.7	110.5	159.7	229.2	282.9	306.4	362.7
Rectum	C19–C20	33.6	0.0	0.0	0.0	0.0	0.0	0.7	1.2	5.4	7.7	14.2	31.9	57.5	74.8	100.7	120.1	129.5	122.8	149.9
Liver	C22	45.2	0.5	0.2	0.0	0.0	0.0	0.1	1.0	3.4	4.9	15.2	31.3	59.7	90.9	149.4	205.4	205.9	172.7	176.7
Gallbladder etc.	C23–C24	14.8	0.0	0.0	0.1	0.0	0.0	0.1	0.6	0.9	0.8	3.1	6.3	9.4	17.5	36.7	56.5	80.1	128.1	181.8
Pancreas	C25	21.1	0.0	0.0	0.0	0.0	0.0	0.2	0.3	0.7	3.3	7.0	16.5	23.7	37.1	53.0	79.3	105.0	135.8	157.7
Larynx	C32	5.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.3	2.0	3.6	7.3	13.1	15.9	21.3	21.9	20.2	21.0
Trachea, bronchus and lung	C33–C34	89.9	0.0	0.0	0.0	0.2	0.7	0.5	1.6	3.2	9.6	21.8	42.1	79.4	134.7	209.6	377.1	570.4	644.9	648.0
Melanoma of skin etc.	C43–C44	6.9	0.3	0.0	0.0	0.2	0.5	0.8	0.7	1.2	1.9	2.7	3.9	5.7	8.0	14.9	25.0	37.8	46.2	73.9
Prostate	C61	63.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5	2.4	11.8	32.2	94.3	206.7	314.6	393.2	401.2	466.8
Bladder	C67	19.3	0.0	0.0	0.0	0.1	0.1	0.4	0.5	1.1	2.4	6.5	13.6	18.6	27.9	38.5	75.4	105.8	147.6	174.9
Kidney, renal pelvis, ureter etc.	C64–C66, C68	15.0	0.7	0.1	0.0	0.0	0.6	0.5	1.1	1.9	3.8	11.2	15.4	21.9	24.8	37.3	58.8	64.6	70.3	69.7
Brain and nervous system	C70–C72	3.8	2.2	1.5	1.4	0.9	1.1	1.5	0.9	3.1	3.6	2.0	3.6	3.9	4.3	7.5	10.8	12.2	11.7	17.9
Thyroid	C73	3.1	0.0	0.0	0.1	0.3	0.6	0.8	1.9	1.4	2.6	2.8	4.3	4.9	4.1	9.2	6.4	10.7	8.6	7.0
Malignant lymphoma	C81–C85, C96	15.1	0.7	1.1	1.8	1.4	2.9	3.0	1.9	3.2	5.2	8.5	14.2	18.6	21.5	37.2	46.1	64.2	89.4	96.2
Multiple myeloma	C88 C90	4.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.8	0.5	2.6	4.0	7.3	10.0	18.0	25.2	28.7	37.4
All leukemias	C91–C95	8.5	4.3	2.3	1.3	1.5	1.7	2.9	2.4	3.8	4.7	3.6	7.2	10.6	13.4	17.5	20.7	35.7	40.9	41.7
Female																				
All sites (incl. CIS)	C00–C96, D00–D09	421.4	9.6	5.1	6.3	11.0	19.7	55.8	99.7	170.1	256.0	353.9	429.5	508.2	611.0	771.7	977.8	1176.2	1384.3	1811.8
All site	C00–C96	399.3	9.6	5.1	6.3	10.6	13.1	35.3	66.4	136.5	219.5	326.6	408.7	486.8	585.1	739.6	945.1	1144.3	1350.2	1784.8

Continued

Table 3. *Continued*

Primary sites	ICD-10	All ages	Age group (years)																	
			0–4	5–9	10–14	15–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	65–69	70–74	75–79	80–84	85+
Lip, oral cavity and pharynx	C00–C14	4.6	0.0	0.3	0.0	0.1	0.5	1.3	0.9	1.1	2.0	3.2	3.7	5.5	7.0	7.0	12.8	14.9	14.0	19.8
Esophagus	C15	4.0	0.0	0.0	0.0	0.0	0.0	0.3	0.2	0.2	0.2	1.0	3.6	5.4	7.5	8.8	10.7	10.2	15.2	21.5
Stomach	C16	54.8	0.0	0.0	0.0	0.0	1.4	0.9	4.2	9.6	14.4	29.6	41.6	56.3	70.8	103.7	152.7	184.6	226.3	305.9
Colon	C18	44.5	0.0	0.0	0.0	0.2	0.4	0.7	2.6	5.0	7.9	15.1	32.3	41.8	70.9	86.5	124.2	155.6	188.4	247.0
Rectum	C19–C20	17.7	0.0	0.0	0.0	0.0	0.1	0.2	1.5	4.8	4.9	12.3	17.4	20.6	30.6	40.6	45.6	50.9	60.5	76.6
Liver	C22	20.4	0.5	0.0	0.0	0.1	0.0	0.1	0.6	0.2	1.1	2.0	7.6	12.8	23.5	53.5	77.1	87.3	91.4	95.4
Gallbladder etc.	C23–C24	16.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.8	2.2	5.3	7.8	14.0	25.1	36.6	61.3	98.3	150.2
Pancreas	C25	17.3	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.7	2.1	3.3	6.6	12.6	18.0	35.0	49.1	66.1	94.5	118.5
Larynx	C32	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.5	0.5	0.4	1.5	1.9	1.3	1.1
Trachea, bronchus and lung	C33–C34	36.9	0.0	0.0	0.0	0.0	0.2	0.6	1.0	2.1	7.6	12.7	23.1	36.5	51.3	75.5	108.4	133.2	149.9	215.0
Melanoma of skin etc.	C43–C44	6.6	0.0	0.1	0.1	0.1	0.2	0.7	1.1	1.3	0.8	1.6	2.7	4.4	6.9	8.8	15.2	23.0	31.3	62.4
Breast (incl. CIS)	C50, D05	77.3	0.0	0.0	0.0	0.0	0.5	5.9	21.4	55.7	106.9	157.8	142.2	142.8	147.0	131.5	115.5	113.9	100.0	87.8
Uterus (incl. CIS)	C53–C55, D06	37.3	0.0	0.0	0.1	0.7	6.7	27.2	50.0	60.5	62.7	48.7	59.0	54.0	44.2	45.0	38.5	42.9	37.4	54.6
Uterus (only invasive)	C53–C55	26.9	0.0	0.0	0.1	0.4	0.8	7.8	18.5	31.0	36.4	32.4	51.4	47.5	39.0	39.7	36.0	40.8	36.7	54.3
Cervix uteri	C53	14.1	0.0	0.0	0.0	0.2	0.7	6.9	15.6	26.5	27.8	17.2	21.3	18.0	16.9	16.7	15.0	20.2	18.3	24.5
Corpus uteri	C54	11.1	0.0	0.0	0.1	0.1	0.1	0.9	2.8	4.0	8.2	14.3	28.3	28.1	20.8	21.4	18.7	16.3	9.9	11.5
Ovary	C56	13.2	0.0	0.0	0.9	1.6	2.4	4.6	3.1	9.4	13.2	20.2	25.8	24.6	20.6	20.0	20.9	23.8	21.2	22.7
Bladder	C67	6.2	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.7	0.6	1.8	2.2	5.1	6.7	9.5	17.9	19.8	32.4	51.3
Kidney, renal pelvis, ureter etc.	C64–C66, C68	6.7	0.9	0.2	0.1	0.1	0.1	0.1	0.7	0.7	1.8	3.6	5.2	6.2	10.0	13.2	19.2	23.9	26.6	31.4
Brain and nervous system	C70–C72	3.4	1.5	0.8	2.0	1.8	0.3	1.3	1.0	1.6	1.7	1.9	3.9	3.6	2.7	6.9	6.6	10.5	9.4	11.9
Thyroid	C73	10.8	0.0	0.0	0.3	1.3	3.4	4.4	6.1	7.6	10.2	14.3	16.3	23.7	17.1	21.1	17.1	15.7	13.2	13.8
Malignant lymphoma	C81–C85, C96	12.3	0.3	1.0	0.7	1.2	0.8	2.7	2.1	2.5	6.3	7.5	11.6	14.8	19.9	24.1	29.6	34.8	44.1	51.0
Multiple myeloma	C88 C90	3.4	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.3	0.5	1.3	3.8	3.7	6.1	10.7	17.8	16.4	16.6
All leukemias	C91–C95	5.7	3.3	1.2	1.2	2.2	0.9	1.9	1.2	2.6	2.6	4.1	3.5	5.1	8.2	11.8	10.4	17.6	18.3	22.1

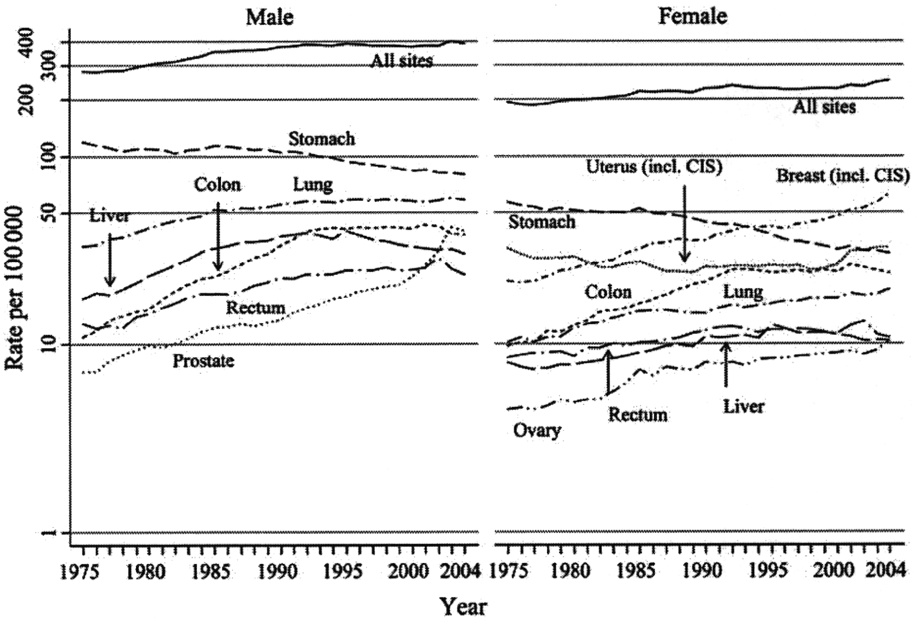

Figure 1. Trends of age-standardized cancer incidence rates for five major sites and specific sites for each sex (standard population: world population). CIS, carcinoma *in situ*.

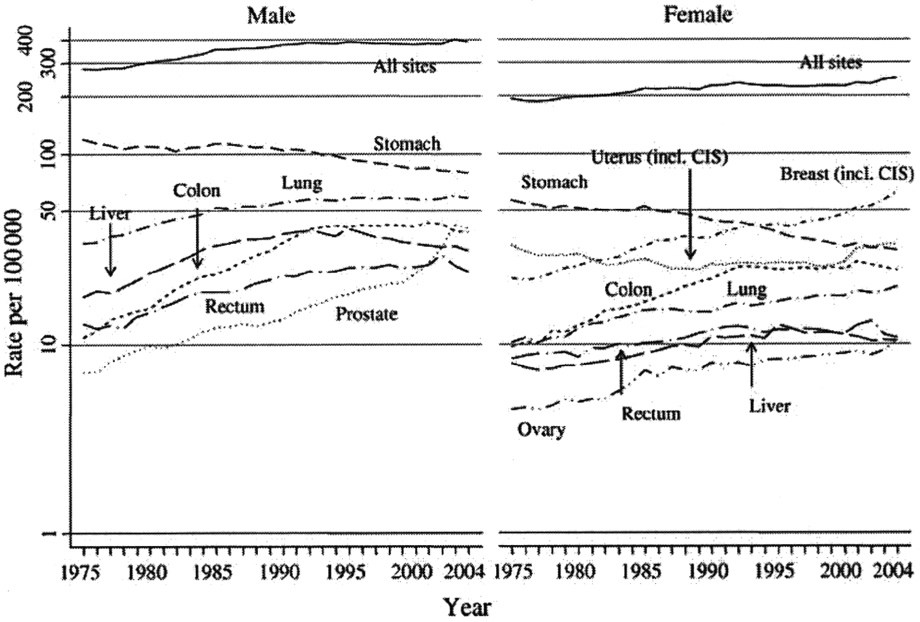

Figure 2. Trends of age-standardized cancer incidence rates for five major sites and specific sites for each sex (standard population: 1985 Japanese model population).

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Conflict of interest statement

None declared.

References

1. Marugame T, Kamo K, Katanoda K, Ajiki W, Sobue T. Cancer incidence and incidence rates in Japan in 2000: estimates based on data from 11 population-based cancer registries. *Jpn J Clin Oncol* 2006;36:668–75.
2. Marugame T, Matsuda T, Kamo K, Katanoda K, Ajiki W, Sobue T. Cancer incidence and incidence rates in Japan in 2001 based on the data from 10 population-based cancer registries. *Jpn J Clin Oncol* 2007;37:884–91.
3. Matsuda T, Marugame T, Kamo K, Katanoda K, Ajiki W, Sobue T. Cancer incidence and incidence rates in Japan in 2002: based on data from 11 population-based cancer registries. *Jpn J Clin Oncol* 2008;38:641–8.
4. Matsuda T, Marugame T, Kamo K, Katanoda K, Ajiki W, Sobue T. Cancer incidence and incidence rates in Japan in 2003: based on data from 13 population-based cancer registries in the Monitoring of Cancer Incidence in Japan (MCIJ) Project. *Jpn J Clin Oncol* 2009;39:850–8.
5. The Research Group for Population-based Cancer Registration in Japan. Cancer incidence and incidence rates in Japan in 1988: estimates based on data from ten population-based Cancer Registries. *Jpn J Clin Oncol* 1994;24:299–304.
6. The Research Group for Population-based Cancer Registration in Japan. Cancer incidence in Japan, 1985–89: re-estimation based on data from eight population-based cancer registries. *Jpn J Clin Oncol* 1998;28:54–67.
7. The Research Group for Population-based Cancer Registration in Japan. Cancer incidence in Japan. In: Tajima K, Kuroishi T, Oshima A, editors. *Cancer Mortality and Morbidity Statistics—Japan and the World.* Tokyo: Japanese Scientific Societies Press 2004; 95–130.

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Population-based Survival of Cancer Patients Diagnosed Between 1993 and 1999 in Japan: A Chronological and International Comparative Study

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Objective: The purpose of the present study was to collect data from population-based cancer registries and to calculate relative 5-year survival of cancer patients in Japan. We also sought to determine time trends and to compare the results with international studies.
Methods: We asked 11 population-based cancer registries to submit individual data for patients diagnosed from 1993 to 1999, together with data on outcome after 5 years. Although all these registries submitted data (491 772 cases), only six met the required standards for the quality of registration data and follow-up investigation. The relative 5-year survival calculated by pooling data from 151 061 cases from six registries was taken as the survival for cancer patients in Japan.
Results: Relative 5-year survival (1997–99) was 54.3% for all cancers (males: 50.0%, females: 59.8%). Survival figures for all sites changed slightly over the 7-year period, from 53.2% for the first 4 years of the study (1993–96) to 54.3% for the last 3 years (1997–99), however, a major improvement was observed in several primary sites. Some overall survival was lower in Japan than in the USA, but similar to that in European countries. Specifically, survival for uterine cancer, prostate cancer, testis cancer, lymphoma and leukemia was much lower in Japan than in other countries. However, survival was better in Japan mainly for cancers of the esophagus, stomach, colon, liver and gallbladder.
Conclusion: The study suggests an improvement in cancer survival in several primary sites in Japan, which is consistent with the development of treatments and early detection.

Key words: epidemiology/public health – prognostic factors – epidemiol-prevention

INTRODUCTION

Cancer survival, as assessed based on population-based cancer registries, is a valuable medical indicator to evaluate the progress of cancer control in a country or region. Precise population-based cancer survival is a comprehensive, practical and timely index for cancer control in a country. Use of relative 5-year survival statistics is useful to evaluate therapeutic effect in cancer incidence/mortality trends in real time. Cancer survival has also been shown to be powerful when comparing survival between sex, age groups and socioeconomic groups or between geographic areas where incidence or death due to other causes may differ.

However, this information is not often available because of legislative, financial and technical difficulties in following-up patients, even in population-based cancer registries in developed nations.

Clinical research groups frequently publish hospital-based survival rates for cancer patients at specific medical facilities (1–3); however, these data do not provide useful information to political planners because of inevitable recruitment bias. Population-based survival is a thus prerequisite for designing public health projects and evaluating the efficacy of cancer prevention, screening and treatment.

In 1998, we proposed standard methods which required checking of vital status of patients by inquiring to the resident registration 5 years after diagnosis (4). We reported relative 5-year survival based on these methods for stomach, lung and breast cancer diagnosed from 1985 to 1989, using data from cancer registries of Yamagata, Fukui and Osaka Prefectures (5), which had collected data satisfying the methodological criteria. In 2001, we collected, from 12 registries belonging to the study group, individual data from all cancer patients (for all sites) diagnosed in 1993 for whom outcome information after 5 years was available. From this data we attempted to produce a nationwide relative 5-year survival according to standard methods (6). This nationwide survival, however, could not be completed because there were differences in the quality of registration and assessment methods of outcome among the 12 registries. A population-based survival was therefore not published in Japan until 2006 (7). This first population-based study reported that relative 5-year survival calculated by pooling 279 000 data from 7 registries was 49.2% for males and 59.4% for females.

The aims of the study were first to calculate the most recent relative 5-year survival of cancer patients in Japan, and second to observe changes in survival by comparing the data between two observation periods, 1993–96 and 1997–99, and by comparison with the results of international studies.

PATIENTS AND METHODS

Eleven among 15 registries (Miyagi, Yamagata, Niigata, Chiba, Kanagawa, Fukui, Aichi, Shiga, Osaka, Tottori, Okayama, Saga, Nagasaki, Kumamoto and Okinawa) submitted individual data (a total of 491 772 cases) to the survival study. These 15 registries were selected because they had relatively high-quality data tracing the 5-year outcome of patients diagnosed from 1993 to 1999. They had also participated in the Monitoring of Cancer Incidence in Japan (MCIJ) project for 2002 incident cases (8). We requested 11 population-based cancer registries to submit patient data for cancers at all sites, diagnosed from 1993 to 1999, including information on outcome after 5 years. We pooled cancer registry data that met standards of data quality in terms of both registration and outcome assessment.

QUALITY CRITERIA FOR AREA SELECTION

The quality criteria were based on the standards adopted in the above-mentioned MCIJ project: DCO% (death certificate only: proportion of patients for whom the death certificate provides the only notification to the registry) <25% or DCN% (death certificate notification: proportion of patients for whom the death certificate provides the first notification to the registry) <30%, and IM ratio (incidence to mortality ratio) less than 1.5 (8). Among the 11 registries, six (Miyagi, Yamagata, Niigata, Fukui, Osaka and Nagasaki) met the required standards for the quality of registration and outcome assessment. According to the data provided by these registries, we calculated survival rates and considered them to be a nationwide index.

As far as the quality of outcome assessment was concerned, we set two criteria relating to follow-up methods. For registries checking survival of patients by referring to resident registries (active follow-up; Yamagata, Fukui and Osaka), we specified that the proportion of outcome-unknown cases 5 years after diagnosis should be <5%. For registries having no confirmation of survival 5 years after diagnosis (passive follow-up; Miyagi, Niigata and Nagasaki), we specified that information on personal identification including names would be computerized in order to collate the registered patients with death information with high accuracy. Registries that met these criteria were therefore guaranteed to have sufficiently accurate information about death.

SURVIVAL CALCULATION

Referring to other studies, since 1996 the research group has set standardized methods of calculating survival in Japan through the collaborative study of population-based cancer registries. The method of calculating survival is mainly based on the EUROCARE study (9). In concrete terms, we excluded DCO cases, cancers *in situ* and mucosal cancers of the large bowel from the analysis. In the case of multiple cancers, only the first-diagnosed tumor was analyzed.

This study calculated the survival for cancers including followed-back cases from DCN (Subjects 1) and excluding these cases (Subjects 2). The former method was that used in the EUROCARE study, and is suitable for international comparison of survival based on population-based cancer registries. The latter should instead be utilized for domestic comparison of survival in Japan where some registries do not conduct follow-back inquiries to medical institutions for DCN cases, according to death certificate information.

Survival for Subjects 2 is generally better than that for Subjects 1 because the latter include cases regarded as incident according to death information. Given the high proportion of incident cases not reported by medical facilities but registered on the basis of death certificates, the survival calculated for Subjects 1 may be underestimated. In contrast, it is also possible for survival to be overestimated in Subjects 2. In Japan, each population-based registry decides whether to apply active follow-up; consequently, the survival of Subjects 2 would be better than that of Subjects 1. In this study, we will regard the survival calculated for Subjects 2 as that of cancer patients in Japan.

Cumulative 5-year survivals were calculated starting from the date of diagnosis. Expected survivals were calculated using the cohort survival table based on life tables of the Japanese population and then using the survival probability in the general population similar to the patients in sex, birth year and age. The former were divided by the latter to obtain relative 5-year survivals.

If vital status was unknown at 5 years after diagnosis, cases were dealt with as alive at the last contact date (5). However, for the three registries that had not checked the survival of patients by referring to the resident registry, we regarded all cases whose death was not confirmed as being alive until 5 years, and survival was calculated on this basis.

RESULTS

SURVIVAL DATA QUALITY

Table 1 shows the number of incident cases, validity indices of registration, and the number of study subjects for survival analysis, for each registry in the two studies. In 1997–99 there were 221 080 incident cases, and the following cases were excluded from the survival analysis: DCO (36 939 cases, 16.7% of the total), subsequent primary tumors (17 814 cases, 8.1% of the total), non-malignant tumors (565 cases, 0.3% of the total), and *in situ* cancers (3 264 cases, 1.5% of the total). In addition, after excluding patients with unknown age at diagnosis and those over 100 years old, we considered the rest (164 738 cases, 74.5% of the total) as Subjects 1. Moreover, for DCN cases, additional cancer reports were requested in Yamagata, Fukui and Osaka Prefectures, and the registry records of cases originating from death information were distinguished in Miyagi Prefecture. The number of cases in which we traced the death information to incidence was 13 677, 8.3% of the total. The number of final analysis subjects (Subjects 2) excluding these cases was 151 061, corresponding to 68.3% of the total.

Table 2 shows the vital status at 5 years from diagnosis. In the Miyagi, Yamagata and Niigata Cancer Registries, in which the vital status of patients was checked after 5 years by referring to resident registries, the proportion of cases with unknown vital status was 2.0% among these three registries. Survival rate varied from 38.0 to 45.8%.

SURVIVAL BY AGE AND SEX

Table 3 shows 5-year relative survival rate and standard error according to the primary site and sex, excluding the follow-back cases (i.e. in Subjects 2). The 5-year relative survival was 53.2% for all cancers diagnosed in 1993–96 (M: 48.9%, F: 59.0%), while that for 1997–99 was 54.3% (M: 50.0%, F: 59.8%).

When all sites were considered together, females had a higher survival than males (M: 50.0%, F: 59.8%). This tendency was evident for lip, oral cavity and pharynx (M:

Table 1. Number of incident cases, validity indices of registration and number of study subjects for survival calculations, according to registry—cases diagnosed in 1993–96 (the previous study) and in 1997–99

Observation period	Registry	*n*	DCO		Subsequent primary		Non-malignant tumors		CIS		Subjects 1		Follow-back cases		Subjects 2	
			n	%[a]	*n*	%[a]	*n*	%[a]	*n*	%[a]	*n*	%[a]	*n*	%[b]	*n*	%[a]
1993–96	Miyagi	37 194	5709	15.3	4359	11.7	127	0.3	919	2.5	26 832	72.1	183	0.7	26 649	71.6
	Yamagata	24 416	2546	10.4	1211	5.0	0	0.0	285	1.2	20 406	83.6	2531	12.4	17 875	73.2
	Niigata	44 818	10 843	24.2	1621	3.6	5	0.0	495	1.1	31 867	71.1	–	–	31 867	71.1
	Fukui	13 886	575	4.1	797	5.7	3	0.0	153	1.1	12 395	89.3	1586	12.8	10 809	77.8
	Osaka	120 040	23 386	19.5	7488	6.2	360	0.3	1507	1.3	88 551	73.8	13 411	15.1	75 140	62.6
	Nagasaki	30 338	2790	9.2	2663	8.8	0	0.0	601	2.0	24 576	81.0	–	–	24 576	81.0
	Total	270 692	45 849	16.9	18 139	6.7	495	0.2	3960	1.5	204 627	75.6	17 711	8.7	186 916	69.1
1997–99	Miyagi	32 439	4232	13.0	4015	12.4	181	0.6	767	2.4	23 741	73.2	844	3.6	22 897	70.6
	Yamagata	19 248	1949	10.1	1202	6.2	1	0.0	195	1.0	15 953	82.9	1709	10.7	14 244	74.0
	Niigata	35 908	8737	24.3	1958	5.5	18	0.1	387	1.1	24 824	69.1	–	–	24 824	69.1
	Fukui	11 559	562	4.9	922	8.0	14	0.1	132	1.1	9974	86.3	1016	10.2	8958	77.5
	Osaka	97 641	19 268	19.7	7050	7.2	351	0.4	1223	1.3	71 093	72.8	10 108	14.2	60 985	62.5
	Nagasaki	24 285	2191	9.0	2667	11.0	0	0.0	560	2.3	19 153	78.9	–	–	19 153	78.9
	Total	221 080	36 939	16.7	17 814	8.1	565	0.3	3264	1.5	164 738	74.5	13 677	8.3	151 061	68.3
Total		491 772	82 788	16.8	35 953	7.3	1060	0.2	7224	1.5	369 365	75.1	31 388	8.5	337 977	68.7

DCO, Death certificate only cases; Follow-back cases: cases notified by death certificates require follow-back to obtain their clinical information.
Subjects 1: including followed-back cases from DCN; Subject 2: excluding followed-back cases.
[a] Proportion of total cases.
[b] Proportion of Subject 1 cases.

Table 2. Vital status at 5 years from diagnosis

Registry	Subjects 1	Dead		Alive		Unknown		Survival proportion (excl. unknown cases), %
		n	%[a]	*n*	%[a]	*n*	%[a]	
1993–96								
Active follow-up								
Yamagata	20 406	11 041	54.1	9219	45.2	146	0.7	45.5
Fukui	12 395	6905	55.7	5111	41.2	379	3.1	42.5
Osaka	88 551	54 229	61.2	32 447	36.6	1875	2.1	37.4
Total	121 352	72 175	59.5	46 777	38.5	2400	2.0	43.9
Passive follow-up								
Niigata	31 867	15 183	47.6	16 684	52.4	–	–	–
Miyagi	26 832	12 811	47.7	14 021	52.3	–	–	–
Nagasaki	24 576	13 180	53.6	11 396	46.4	–	–	–
Total	204 627	113 349	55.4	88 878	43.4	–	–	–
1997–99								
Active follow-up								
Yamagata	15 953	8563	53.7	7231	45.3	159	1.0	45.8
Fukui	9974	5377	53.9	4238	42.5	359	3.6	44.1
Osaka	71 093	43 135	60.7	26 399	37.1	1559	2.2	38.0
Total	97 020	57 075	58.8	37 868	39.0	2077	2.1	44.8
Passive follow-up								
Niigata	24 824	11 541	46.5	13 283	53.5	–	–	–
Miyagi	23 741	11 256	47.4	12 485	52.6	–	–	–
Nagasaki	19 153	9885	51.6	9268	48.4	–	–	–
Total	164 738	89 757	54.5	72 904	44.3	–	–	–
Total	369 365	203 106	55.0	161 782	43.8	–	–	–

[a]Proportion of total cases.

48.3% vs. F: 63.0%) and lung cancer (M: 22.4% vs. F: 33.5%). In contrast, females had a lower survival than males in for cancers of the larynx (M: 77.0% vs. F: 64.4%) and bladder (M: 78.6% vs. F: 69.8%).

The relative 5-year survivals for all sites decreased markedly in the elderly. In males, this difference was pronounced for cancers of the lip, oral cavity and pharynx, bladder and thyroid, as well as in malignant lymphoma and all leukemias. For women, there was a marked age-related decrease in survival for cancers of the lip, oral cavity and pharynx and uterus (cervix and corpus), as well as malignant lymphoma, multiple myeloma and all leukemias (Fig. 1).

SURVIVAL AND TIME TRENDS FOR SURVIVAL BY PRIMARY SITE

Survival probabilities for cancers of the cervix, prostate, larynx, bladder, corpus uteri, female breast, testis and thyroid ranged from 71.5 to 92.4%; those for ovary, mouth, oral cavity and pharynx, stomach, rectum and anus, and colon ranged from 52.0 to 68.9%; those for pancreas, gallbladder, liver, lung, multiple myeloma, esophagus, all leukemias and malignant lymphoma ranged from 6.7 to 49.9% (Table 3).

Survival figures for all sites improved significantly over the 7-year period, increasing from 53.2% for the first observation period (1993–96) to 54.3% in the second (1997–99) (Table 3). Proportion of localized tumor at diagnosis increased; 43.0–52.0% for prostate, 5.4–10.1% for multiple myeloma, 25.0–28.6% for lung, 26.7–29.3 for malignant lymphoma, 43.3–45.5% for lip, oral cavity and pharynx, 31.6–33.5% for esophagus, 34.5–36.4% for ovary, 70.1–71.7% for liver and 55.6–57.2% for female breast. Accordingly survival also improved significantly for cancers of the prostate (by 8.7 points), esophagus (by 4.7 points), lung (by 3.1 points) and liver (by 1.9 points).

SURVIVAL AND TIME TRENDS FOR SURVIVAL BY EXTENT OF DISEASE

Table 4 shows observed and relative 5-year survival by extent of disease at diagnosis. Relative survival for all sites

Table 3. Relative 5-year survival by sex for selected sites of cancer diagnosed in 1993–96 and in 1997–99 (Subjects 2)

Primary sites	Male			Female			Total		
	n	Relative survival rate		*n*	Relative survival rate		*n*	Relative survival rate	
		%	SE		%	SE		%	SE
1993–96									
All sites (C00–C96)	106 022	48.9	0.2	77 473	59.0	0.2	183 495	53.2	0.1
Lip, oral cavity and pharynx (C00–C14)	2535	48.6	1.1	1022	64.7	1.7	3557	53.2	0.9
Esophagus (C15)	4401	25.7	0.7	843	33.1	1.7	5244	26.9	0.7
Stomach (C16)	29 318	62.1	0.3	14 817	60.4	0.5	44 135	61.6	0.3
Colon (C18)	10 542	71.3	0.6	8609	66.1	0.6	19 151	68.9	0.4
Rectum and anus (C19–C21)	7089	65.0	0.7	4316	63.9	0.8	11 405	64.6	0.5
Liver (C22)	9958	21.0	0.4	3619	21.8	0.7	13 577	21.2	0.4
Gallbladder etc. (C23–C24)	2475	19.0	0.9	2962	20.1	0.8	5437	19.6	0.6
Pancreas (C25)	2855	7.0	0.5	2205	5.9	0.5	5060	6.5	0.4
Larynx (C32)	1570	78.2	1.4	90	75.9	6.3	1660	78.1	1.4
Trachea, bronchus and lung (C33–C34)	15 124	20.8	0.4	5618	27.1	0.6	20 742	22.5	0.3
Female breast (C50)				14 094	84.4	0.4	14 094	84.4	0.4
Uterus (C53–C55)				5332	74.4	0.7	5332	74.4	0.7
Cervix uteri (C53)				3472	73.4	0.8	3472	73.4	0.8
Corpus uteri (C54)				1688	79.5	1.1	1688	79.5	1.1
Ovary (C56)				2116	49.4	1.1	2116	49.4	1.1
Prostate (C61)	4220	66.8	1.0				4220	66.8	1.0
Testis (C63)	505	89.6	1.6				505	89.6	1.6
Bladder (C67)	3481	80.0	1.0	1049	70.6	1.8	4530	77.8	0.9
Thyroid (C73)	541	86.3	2.1	2483	93.2	0.7	3024	92.0	0.7
Malignant lymphoma (C81–85, C96)	2349	46.3	1.1	1800	51.4	1.3	4149	48.5	0.9
Multiple myeloma (C88, C90)	508	29.3	2.2	446	30.9	2.3	954	30.0	1.6
All leukemias (C91–C95)	1686	31.7	1.2	1234	33.2	1.4	2920	32.3	0.9
1997–99									
All sites (C00–C96)	84 851	50.0	0.2↑**	62 860	59.8	0.2↑**	147 711	54.3	0.1↑**
Lip, oral cavity and pharynx (C00–C14)	1853	48.3	1.3	854	63.0	1.9	2707	52.9	1.1
Esophagus (C15)	3834	30.7	0.8↑**	643	37.3	2.0	4477	31.6	0.8↑**
Stomach (C16)	2190	62.6	0.4	10 485	61.2	0.5	32 375	62.1	0.3
Colon (C18)	8370	71.0	0.6	7106	66.4	0.7	15 476	68.9	0.5
Rectum and anus (C19–C21)	5797	65.7	0.8	3475	64.5	0.9	9272	65.2	0.6
Liver (C22)	7689	23.7	0.5↑**	3118	21.8	0.8	10 807	23.1	0.4↑**
Gallbladder etc. (C23–C24)	1884	21.8	1.1↑*	2430	18.9	0.8	4314	20.2	0.7
Pancreas (C25)	2386	6.2	0.5	1900	7.3	0.6	4286	6.7	0.4
Larynx (C32)	1130	77.0	1.7	78	64.4	6.6	1208	76.1	1.6
Trachea, bronchus and lung (C33–C34)	12 737	22.4	0.4↑**	4963	33.5	0.7↑**	17 700	25.6	0.4↑**
Female breast (C50)				12 334	85.5	0.4	12 334	85.5	0.4
Uterus (C53–C55)				3995	72.5	0.8	3995	72.5	0.8
Cervix uteri (C53)				2244	71.5	1.1	2244	71.5	1.1

Continued

Table 3. *Continued*

Primary sites	Male			Female			Total		
	n	Relative survival rate		*n*	Relative survival rate		*n*	Relative survival rate	
		%	SE		%	SE		%	SE
Corpus uteri (C54)				1571	76.8	1.2	1571	76.8	1.2
Ovary (C56)				1800	52.0	1.2	1800	52.0	1.2
Prostate (C61)	4508	75.5	1.0↑**				4508	75.5	1.0↑**
Testis (C63)	369	92.0	1.9				369	92.0	1.9
Bladder (C67)	2824	78.6	1.1	870	69.8	2.0	3694	76.5	1.0
Thyroid (C73)	437	87.6	2.3	1986	93.5	0.8	2423	92.4	0.7
Malignant lymphoma (C81–85, C96)	1949	46.6	1.3	1473	54.2	1.4	3422	49.9	0.9
Multiple myeloma (C88, C90)	422	31.5	2.5	403	28.1	2.4	825	29.8	1.7
All leukemias (C91–C95)	1242	32.2	1.4	986	33.8	1.6	2228	32.9	1.0

↑Improved significantly between the two observation periods $^{**}P < 0.01$, $^{*}P < 0.05$.

(C00–C96) was 85.2% for localized tumors, 43.7% for those with regional lymph node or direct invasion to the adjacent tissue/organ and 10.1% for those with distant metastasis. When all sites were considered together, improvement in survival was found only for localized tumors; survival rate increased from 84.6 to 85.2% ($P <$ 0.05).

Among localized tumors, survival improvement between the two periods was observed for the esophagus, liver, lung and female breast; among tumors with regional lymph node or direct invasion to the adjacent tissue/organ, improvement was seen for the pancreas, lung, prostate and testis. No improvement was observed in distant metastatic tumor cases.

In contrast, survival deteriorated significantly between the two observation periods for localized bladder cancer, laryngeal cancer with regional lymph node or adjacent organ metastasis, and gallbladder cancer with distant metastasis.

COMPARISON WITH INTERNATIONAL DATA

Table 5 shows relative 5-year survivals in the current study, SEER study (10) and EUROCARE4 study (11). Compared with the American data (SEER study), overall all-age survival was lower in Japan (64.9–54.3%); however, age-standardized survival in Japan was similar to that in European countries (53.3–51.9%). In particular, the survivals for Japanese patients with uterine cancer, prostate cancer, testicular cancer, lymphoma and leukemia were much lower than for their American counterparts. Survival in Japan was better than in Europe or the USA mainly for cancers of the digestive and hepatobiliary organs, such as the esophagus, stomach, colon, liver and gallbladder.

DISCUSSION

SURVIVAL IN JAPAN

On the basis of the data from six population-based cancer registries in Japan that met standards for data quality in terms of both registration and outcome assessment, we calculated the latest relative 5-year survival for major cancers.

Age differences were observed in survival when all sites were considered together and in some specific primary sites. Ioka et al. (12) found that advanced cervical cancers leading to poor survival are common in older people. Otherwise, this may be explained by histological differences or simply physical decline in older patients. Farley et al. (13) reported a similar decreasing survival with age in their study of uterine cancer. Studies of leukemia (14) and bladder cancer (15) also show similar effects of age.

Sex differences in survival for cancers at two primary sites, the larynx and lung, might be caused by biological differences between the two sexes and diagnostic circumstances. These differences could relate to smoking behavior in the two sexes, even for cancers of the same histology. Nordquist et al. (16) found differences in survival according to the smoking status of patients with adenocarcinoma of the lung. Another study showed that the survival of bladder cancer patients varies according to current smoking, age and gender, in addition to a latent promoter hypermethylation (17). Bladder cancer is often at a more advanced tumor stage at diagnosis in women than in men.

COMPARISON BETWEEN THE TWO PERIODS AND WITH THE RESULTS OF INTERNATIONAL STUDIES

Overall chronological improvement of survival in several primary sites was observed, confirming the findings of a