Singapore Cancer Registry

Cancer Survival in Singapore

1973-2012

Deputy Director
National Registry of Diseases Office
Health Promotion Board
Level 5, 3 Second Hospital Avenue
Singapore 168937

Fax: (65) 6536-6072
Email: HPB_FEEDBACKNRDO@hpb.gov.sg

Previous Publications

1. K Shanmugaratnam, HP Lee, NE Day: Cancer Incidence in Singapore 1968-1977. IARC Scientific Publications No. 47, 1983.

2. HP Lee, NE Day, K Shanmugaratnam: Trends in Cancer Incidence in Singapore 1968-1982. IARC Scientific Publications No. 91, 1988.

3. HP Lee, KS Chia, K Shanmugaratnam: Cancer Incidence in Singapore 1983-1987. Singapore Cancer Registry, Report No. 3, 1992.

4. KS Chia, HP Lee, A Seow, K Shanmugaratnam: Trends in Cancer Incidence in Singapore 1968-1992. Singapore Cancer Registry, Report No. 4, 1996.

5. KS Chia, A Seow, HP Lee, K Shanmugaratnam: Cancer Incidence in Singapore 1993-1997. Singapore Cancer Registry, Report No. 5, 2000.

6. A Seow, WP Koh, KS Chia, LM Shi, HP Lee, K Shanmugaratnam: Trends in Cancer Incidence in Singapore 1968-2002. Singapore Cancer Registry, Report No. 6, 2004.

7. CS Wong, KY Chow, GH Lim, V Bhalla, HP Lee, KS Chia: Cancer Survival in Singapore 1968-2002. Singapore Cancer Registry, 2008.

8. Trends in Cancer Incidence in Singapore 1968-2007. Singapore Cancer Registry, Report No. 7, 2010.

9. Cancer Survival in Singapore 1968-2007. Singapore Cancer Registry, 2011.

SINGAPORE CANCER REGISTRY

Deputy Director, NRDO Health Promotion Board	Dr Chow Khuan Yew
Manager, Epidemiology	Ms Loy En Yun
Senior Resident, Public Health	Dr Raymond Lim
Manager, Data Management	Mr William Ho
Registry Coordinators	Ms Lee Bee Guat
	Ms Moe Sandar
	Ms Ling Sing Nang
	Ms Sarjit Kaur
	Ms Tin Tin Khaing
	Ms Yun Sou Har

ACKNOWLEDGEMENTS

We wish to express our grateful thanks to Dr Foo Ling Li, Ms Lim Gek Hsiang and Ms Zheng Huili of NRDO; and Dr Stefan Ma and Dr Jeannie Tey of the Epidemiology and Disease Control Division, Ministry of Health for vetting the monograph.

Our thanks also to Prof Lee Hin Peng of the Saw Swee Hock School of Public Health, National University of Singapore for his invaluable comments and suggestions.

We would also like to acknowledge the following doctors who have provided valuable inputs to this monograph.

Nasopharyngeal, Lung Cancers:	A/Prof Tan Eng Huat
Nasopharyngeal Cancer:	Dr Soong Yoke Lim
Stomach Cancer:	A/Prof Yeo Khay Guan
	Dr Yong Wei Peng
	Dr Zhu Feng
	A/Prof Jimmy So Bok Yan
Colon, Rectal Cancer:	Dr Koh Poh Koon
	A/Prof Simon Ong
Liver Cancer:	A/Prof Tan Chee Kiat
	Dr Choo Su Pin
	A/Prof Dan Yock Young
	Prof London Lucien Ooi Peng Jin
Prostate:	Dr Terence Tan Wee Kiat
	Dr Sim Hong Gee
	Dr Tan Min-Han
Cervix, Uterine, Ovarian Cancers:	Dr Chay Wen-Yee
	Dr Lim Sheow Lei
	Dr Timothy Lim
Breast Cancer:	Dr Benita Tan

CONTENTS

EXECUTIVE SUMMARY

Survival statistics have long been recognised as important for monitoring and quantifying the effectiveness of cancer control activities at the population level, complementing the information on incidence and mortality. Together, these statistics provide a more complete picture of the cancer burden at the population level.[1] Incidence statistics can be found in previous monographs of the Singapore Cancer Registry (SCR).[2]

Between 1973 and 2012, improvement in age-standardised relative survival rates was seen for all cancer sites overall among both males and females. Continuous improvement was observed for six cancer sites (nasopharynx in males; colon, rectum, lung, prostate and liver in males and females). In particular for liver, a significant survival increase was observed after 1993 – 1997. For breast, uterus and ovary, there was increased survival followed by plateauing after 1993 – 1997. For nasopharynx and cervix in females; as well as bladder in males and females, plateauing occurred after 1998 – 2002.

When compared internationally, five cancer sites: rectum, cervix, uterus, ovary and bladder, were leading in relative survival among the countries compared. Nasopharyngeal, stomach, colon and liver cancers had survival rates that were better than many of the countries compared while more progress could be made for lung, breast and prostate cancers.

Risk factors such as tobacco smoking and obesity not only increase the incidence of cancers, but they can also lower survival among cancer patients. For instance, current smoking among cancer patients has been shown to increase the hazards of death by 38% compared to non-smokers. [3] On the other hand, obesity is associated with breast cancers of worse prognosis that were less sensitive to treatment. [4] Cancer survival is also influenced by trends in screening and treatment.

Survival trends are influenced by changes in diagnosis, treatment or early detection techniques such as screening or advances in imaging technology. Some of these changes will be described, but should not be construed as the underlying cause of survival trends. Recent treatment advances are touched upon for several cancer sites though they do not impact current survival. These updates are presented in anticipation of future trends.

INTRODUCTION

The SCR started comprehensive population-based cancer registration since January 1968. The aim of the Registry was to obtain information on cancer incidence and trends in Singapore. In April 2001, the Registry came under the auspices of the National Registry of Diseases Office at the Health Promotion Board.

The SCR receives notifications from multiple sources: (a) medical practitioners, (b) pathology records and (c) hospital records (d) death certificates. Cancer notification has been made mandatory in 2009 since the sub-legislation of cancer as a reportable disease of the National Registry of Diseases Act (Chapter 201B) in 2007. Doctors can notify cancers diagnosed histologically or clinically to the SCR through hand delivery (including courier), registered mail or electronic notification. The Registry ensures that notifications are as complete as possible by checking all pathology reports from restructured hospitals and private laboratories, and death certificates issued in Singapore as well as discharge records of all restructured hospitals. Cancer cases identified from these sources are checked against registered cases and reminders are sent to doctors in charge of cases that have not been notified to the Registry. Clinically diagnosed cancer cases are also registered by the Registry staff. Cancer registration is generally comprehensive since all cases diagnosed histologically and with mention of cancer in hospital discharge forms and death certificates are included. There is no personal contact with cases or patient follow-up by the Registry.

The cancer notification forms and a register of cases are maintained on a current chronological basis. All relevant information is coded and the Registry maintains a computerised file of all cases. Duplication of cases is avoided by checking all new cases against the master index using the unique National Registration Identification Number (NRIC). Personal identifiers such as name and NRIC are encrypted.

Certification of death is virtually complete in Singapore. In 2012, 86.0% of all deaths were certified by qualified medical officers and practitioners and 14.0% by Coroners.[5]

METHODOLOGY

PATIENT SELECTION

The study population was made up of a total of 270,786 single and multiple primary invasive cancer cases aged 15 years and above. Childhood cancer cases are not included in this analysis because of their differences in biological characteristics, treatment protocols and survival outcomes.

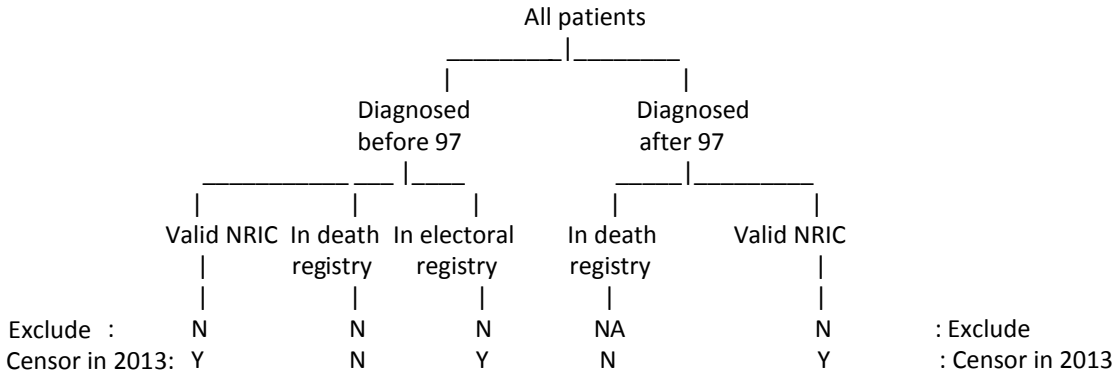
The patients were diagnosed in Singapore within the period from 1 January 1968 to 31 December 2012 and passively followed up to 31 December 2013 by matching with the death register. Patients who were not in the death register could either be still alive or lost to follow-up.

When two or more primary malignant diseases occurred at the same site, only the first cancer would be included (81 cases). Only one record per patient with synchronous primary cancers in the same organ was retained (867 cases).

Of the study population, 6,657 cases that were notified at the time of death (Death Certificates Only, DCO) were excluded. The 1997 Electoral Register***** was used to confirm the vital status of the unmatched subjects diagnosed prior to 1997. A total of 5,659 (2.1%) of all invasive cases, who were not in the death register or 1997 Electoral Register, were excluded. Additionally, 168 cases diagnosed on or after 1997 with invalid identification documents, were excluded. This criterion did not have to be applied to the pre-1997 cases as the invalid cases were already filtered out during a one-time match on death status with the Ministry of Home Affairs in 2004. A total of 13,478 (5.0%) of the patients (who were not in the death register but in the 1997 Electoral Register) were censored at 31 December 2013. One can refer to Figure 1 below for a pictorial understanding.

***** Subsequent electoral registers were not available for matching due to changes in the Parliamentary Elections Act

Figure 1. Exclusion and censoring of patients diagnosed before and after 1997



STATISTICAL METHODS

Relative survival is commonly used to describe the survival experience of the patients in a population-based study.[6] When large numbers of patients are involved in a population-based study, it becomes very difficult to follow them up over time. The cause of death may also be unreliable. When such a situation occurs, cause-specific survival which relies heavily on an accurate cause of death becomes less useful. In order to circumvent the inaccuracy of death certificates, relative survival is often used and has grown in popularity as a method to estimate net survival (or excess mortality) when registry data are analysed.[7] It has been widely used by many registries, such as EUROCARE[8], SEER[9] and those in the developing countries[10] to report on cancer survival.

Relative survival is defined as the ratio of observed survival of the patients with the expected survival of a comparable group in the general population, matched with respect to factors believed to be associated with survival at baseline (usually gender, age and calendar year of diagnosis). In other words, it reflects the chances of surviving assuming that cancer is the only possible cause of death.

The Relative Survival Ratio can be expressed in the following form:

$$RSR_i = \frac{S_i}{S_i^*}$$

where

RSR_i is the relative survival in the i^{th} sub-interval (e.g. i^{th} year)

S_i is the observed survival in the i^{th} sub-interval obtained from the patients

S_i^* is the expected survival in the i^{th} sub-interval obtained from the general population used to compare with the patient population

In this study, the expected survival ratio was estimated from the Singapore general population which included deaths from all causes.[11] The Ederer II method was used to estimate expected survival, which assumes that the matched individuals are at risk until the corresponding patient dies or is censored. Details of the computation are shown in Appendix B. Other methods used to estimate expected survival include Hakulinen and Ederer I.[12] The more popular Hakulinen's method was not used because it required the potential follow-up time of the patients, which remained unascertained in this study. Cumulative survival ratios were computed by taking the product of interval-specific ratios where the follow-up time was set to be one year. Greenwood's formula[6] was used to obtain the standard errors for the corresponding survival ratios.

The Period approach was used to calculate the estimates[13-15] so as to highlight the temporal change in patient survival in a timelier fashion. In contrast to the conventional Cohort method, which describes the survival experience for a certain cohort of patients diagnosed within a time period, the Period method describes the survival experience of the patients during a certain time frame. This is done by restricting the analysis to some recent time period through left truncation of all observations at the beginning of that period in addition to right censoring at its end. Figure 2 illustrates how both Period and Cohort methods capture 5-year survival information.

Figure 2: Differences between Period and Cohort Approaches

Period

Year of Diagnosis	Period of Follow-up									
	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
1993	0-1	1-2	2-3	3-4	4-5	5				
1994		0-1	1-2	2-3	3-4	4-5	5			
1995			0-1	1-2	2-3	3-4	4-5	5		
1996				0-1	1-2	2-3	3-4	4-5	5	
1997					0-1	1-2	2-3	3-4	4-5	5
1998						0-1	1-2	2-3	3-4	4-5
1999							0-1	1-2	2-3	3-4
2000								0-1	1-2	2-3
2001									0-1	1-2
2002										0-1

Cohort

Year of Diagnosis	Period of Follow-up									
	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
1993	0-1	1-2	2-3	3-4	4-5	5				
1994		0-1	1-2	2-3	3-4	4-5	5			
1995			0-1	1-2	2-3	3-4	4-5	5		
1996				0-1	1-2	2-3	3-4	4-5	5	
1997					0-1	1-2	2-3	3-4	4-5	5
1998										
1999										
2000										
2001										
2002										

*Each coloured cell denotes the year of follow-up. For example, 0-1 means the first year of follow-up

STATA Packages (STRS) developed by Paul Dickman were used to obtain the relative survival estimates.[16]

Population Denominators

Prior to 1983, population denominators that were required for the calculation of expected survival were generated through the intra- and extrapolation of previous population censuses. After 1983, mid-year resident population estimates from the Department of Statistics (DOS) were used.

The software Mortpak was used to unabridge population life tables from 1968 – 2002 but from 2003 onwards, complete life tables from DOS were utilized [17, 18].

Age-Standardisation

In order to compare patient survival over time and with other countries, direct standardisation on the age-specific survival estimates using the Brenner method[19] was performed to adjust for the different age structures (Appendix B). This method was used so that age-standardised survival could still be obtained even if none of the patients within one or more age strata was followed up over the entire period of interest. Furthermore, this method also assures that age-adjustment using the

study's own population age-distribution yields exactly the same result as obtained in the crude analysis. The International Cancer Survival Standards developed in 2004 were used for age-standardisation[20]. These standards were constructed with the aim of defining the smallest possible number of standards that were simple to use and provided survival values close to the raw ones by constrained cluster analysis. The standards and age classes applied to the various cancer sites can be found in table A3 of Angelis 2009[21].

Multiple Primaries

Multiple primary cases were included in accordance with the Eurocare-5[22] and Concord-2[23] study protocols. It has been argued that other comorbidities that are even more lethal than subsequent tumours may be present in the cancer patient population. Furthermore, patients who died in the general population, whether from single or multiple primary cancer(s), were included in the estimation of expected survival. Finally, as newer registries tend to identify less multiple primary cases, purportedly leading to better survival rates, this bias is compounded when rates are compared across registries of different ages.

Cancer Staging

The National Cancer Registry started to capture cancer staging information in 1968. Principles from the Extent of Disease / End Results Group 1967 Code Manual[24] were adopted for this purpose, although broad rules were constructed to encompass multiple cancer sites, rather than being applied to specific cancer sites. The registry adopted stage grouping guidelines from the American Joint Committee on Cancer (AJCC) Cancer Staging Manual 6th edition[25] for cases diagnosed between 2003 to 2009 while the 7th edition was used for cases diagnosed from 2010 onwards. Consequently, stage distribution was tabulated in groups of 3 years instead of 5 years.

Stage distribution and age-standardised 5-year stage-specific survival has been presented for all cancer sites except for liver, cervix and bladder, from 2007 onwards. The calendar period was chosen as registry coordinators started to review medical

records at hospitals and clinics, leading to more complete staging data. Cervix and bladder were excluded due to their small number of cases and liver was excluded because of the small number of cases surviving up to 5 years.

International Comparisons

Data for international comparisons were taken from:

- Surveillance Epidemiology and End Results (SEER) Cancer Query System, 2004 – 2010[9]
- EUROCARE-5, 2000 – 2007[8]
- Monitoring of Cancer Incidence in Japan - Survival 2003 – 2005 Report[26]
- Cancer Survival in China, 2003 – 2005: A Population-based Study[27]
- Cancer in Australia: An Overview, 2012, 2006 – 2010[28]
- Singapore Cancer Registry, 2003 – 2007

Relative survival for Singapore patients was calculated using the Cohort method for comparison purposes to maintain consistency with the method adopted by most of the other populations such as Eurocare-5, with the exception of the Australian registry, which used the Period approach and the SEER registries, where the estimates were calculated using the modified Period approach.[29]

When benchmarking Singapore's survival statistics on an international platform, one should bear in mind the complexity of factors affecting survival, including incidence-related factors such as specific cancer definitions, patient demographics and risk factor distribution, cancer-related factors such as stage and sub-site and health-system factors such as screening, diagnosis, treatment and supportive care.[30]

INTERPRETATION

To understand whether improved survival represents true progress, it needs to be interpreted in the context of cancer burden, i.e. whether fewer people are diagnosed or dying from cancer. True progress against cancer arises from effective primary

prevention strategies, earlier detection or better treatment, leading to the postponement of death.

Apart from relative survival, observed survival figures have also been presented in this report as they take into account the patients' probability of not only dying from cancer, but also from other competing causes.

In recent years, there has been an increase in the number of randomized controlled trials (RCTs) of new agents in metastatic solid tumours using progression-free survival (PFS) or disease-free survival (DFS) as the primary end-point, rather than the gold standard overall survival. Several of these measures will be mentioned in the commentaries below. Overall survival (OS), along with quality of life (QoL) measures, assesses direct patient benefit. QoL is a multidimensional concept taking into account physical, mental, social and patient satisfaction with treatment as well as treatment outcome. [31]

PFS and DFS are tumour-centered endpoints that act as surrogates for patient-centered endpoints and might not directly reflect patient benefit. Researchers prefer tumour-centered endpoints as studies can be smaller and shorter. Additionally, they are less influenced by competing causes of death and post-progression treatment compared to OS.

PFS is generally the time between random treatment assignment and tumour progression or death resulting from any cause in the metastatic stage. Tumour progression is variably defined in different trials (clinical or radiological progression or laboratory measures of progression). The time interval chosen for measuring progression can affect PFS values and discrepancies in time interval can result in biased PFS among different arms of a clinical trial. DFS is generally defined as the time from randomization until tumour recurrence or any-cause death after treatments given with curative intent.

Advanced colorectal and advanced ovarian cancers seem to be the only two tumour types whereby the surrogacy of PFS for OS has been demonstrated. There are several reasons why many trials have demonstrated improved PFS with no

improvement of OS. [32] First, the change in tumour size required for progression may be so small that it does not have an overall impact on time to death. Second, it is possible that the absolute degree of statistically significant improvement in PFS is insufficient to be translated into detectable OS differences due to insufficient study power. Lastly, PFS might delay progression but produce a more aggressive phenotype after treatment.

CANCER SURVIVAL IN SINGAPORE: AN OVERVIEW

Overall Incidence and Mortality Trends

The interpretation of cancer survival estimates has to be done within the context of cancer incidence and mortality figures. A total of 163,331 cases of cancer were diagnosed among all Singapore residents during the period 1973 – 2012. Of these, 110,899 died. Table 1 shows the trends in incidence and cancer specific mortality rates by gender in 5-year calendar periods.

Table 1: Trends in cancer incidence and mortality by gender, 1973 – 2012*

		Incidence			Mortality		
Period	**Gender**	**Number**	**CR**	**ASR**	**Number**	**CR**	**ASR**
1973-1977	Male	8563	158.1	246.3	5337	98.6	155.4
	Female	6187	118.9	161.1	3226	62.0	86.5
1978-1982	Male	10136	175.1	250.3	6545	113.0	164.9
	Female	7997	142.6	175.8	4280	76.3	96.5
1983-1987	Male	11681	185.8	243.3	7433	119.1	157.4
	Female	10051	164.3	183.5	5101	84.1	94.9
1988-1992	Male	13635	197.7	236.2	9036	132.3	159.9
	Female	12739	189.3	191.5	6367	95.5	96.6
1993-1997	Male	16191	213.8	236.7	9601	129.4	142.4
	Female	15704	209.5	195.6	7056	96.1	88.4
1998-2002	Male	18949	231.5	233.3	11540	141.4	143.6
	Female	19727	240.3	203.0	8624	105.5	88.8
2003-2007	Male	21940	254.7	230.0	11694	135.8	123,2
	Female	23200	265.3	203.4	9191	105.1	78.2
2008-2012	Male	27693	299.2	232.6	13339	144.1	111.0
	Female	29080	306.1	212.3	11053	116.4	74.7

CR: Crude rate (per 100,000 per year).
ASR: Age-standardised rate (per 100,000 per year).
* Source: Trends in Cancer Incidence in Singapore, 1973 – 2012 (Unpublished)

A breakdown of the ten most frequent cancers in males and females for the period 2008 – 2012 is given in Figures 3 and 4 below.

Figure 3: Ten most frequent cancers in males, 2008 – 2012

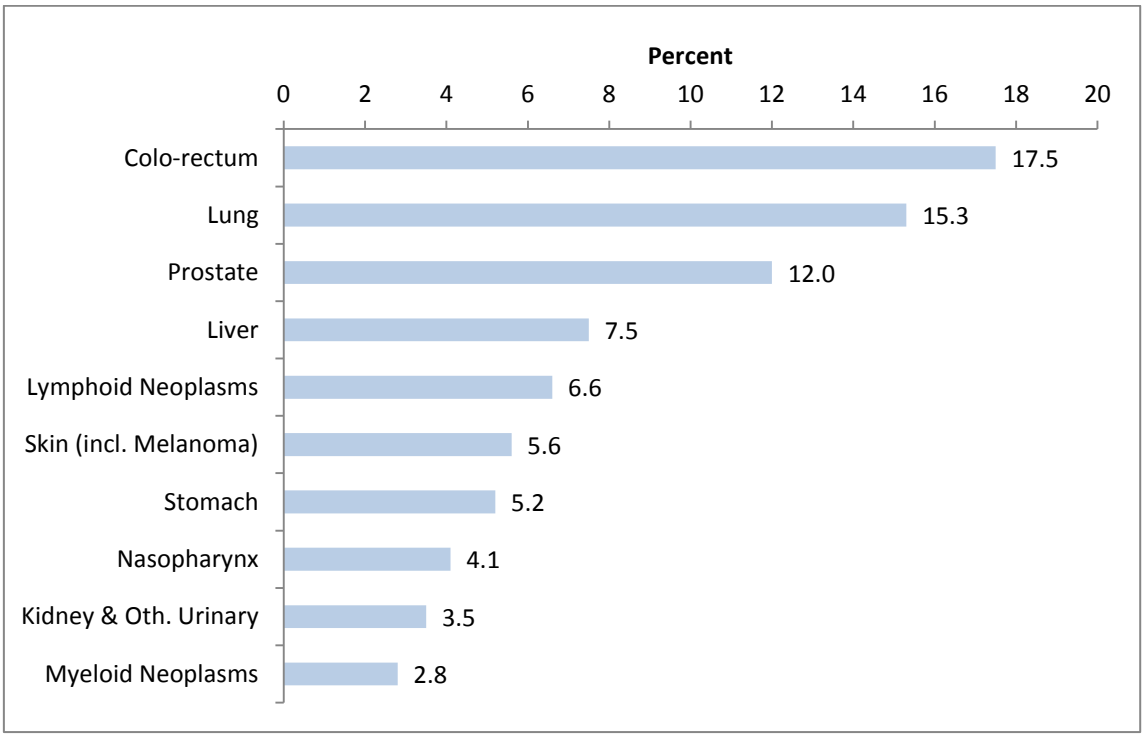
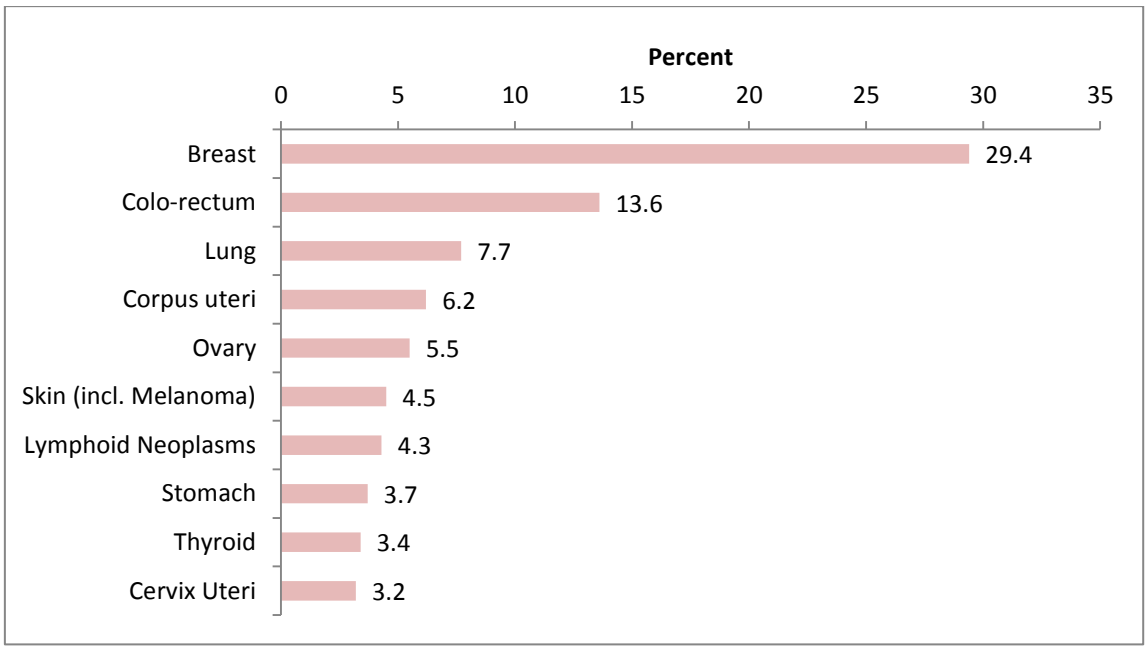


Figure 4: Ten most frequent cancers in females, 2008 – 2012



Overall Survival Trends

There was an overall improvement in the relative survival for both the males and females from 1973 to 2012. For the males, the 5-year age-standardised relative survival ratio (ASRS) improved from 13.2% in 1973 – 1977 to 48.5% in 2008 – 2012. The 10-year ASRS improved from 10.6% in 1973 – 1977 to 43.3% in 2008 – 2012. Similarly for the females, the 5-year ASRS increased from 28.0% to 57.1% and the 10-year ASRS increased from 24.8% to 51.6% during the same period of analysis. These trends are represented in Figures 5 and 6 below.

Figure 5: Trends in 5-year ASRS of all cancers by gender

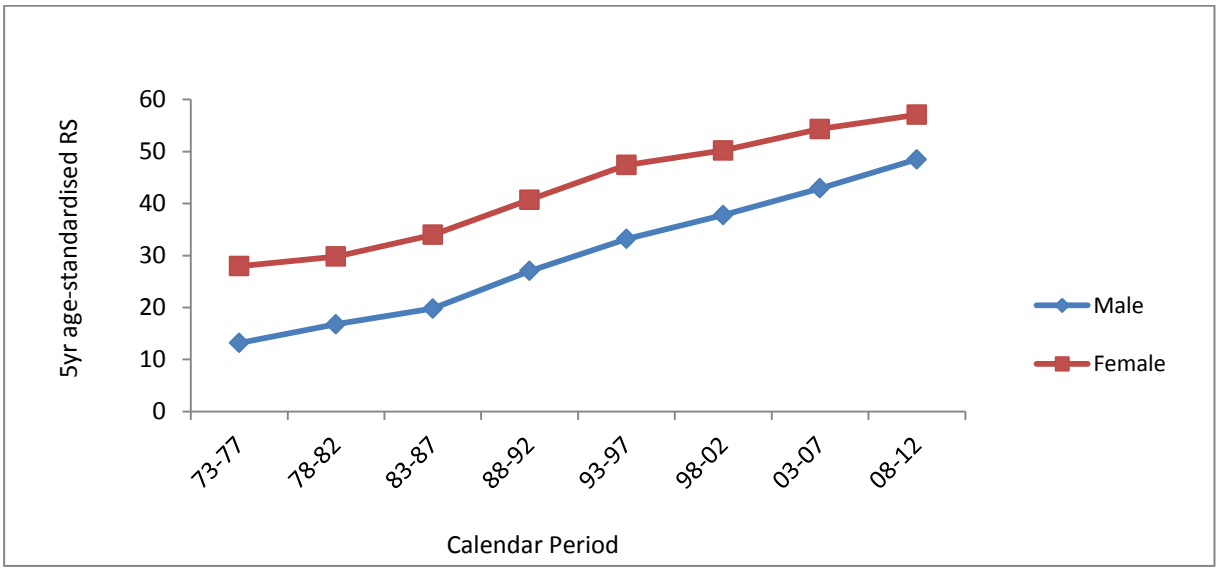
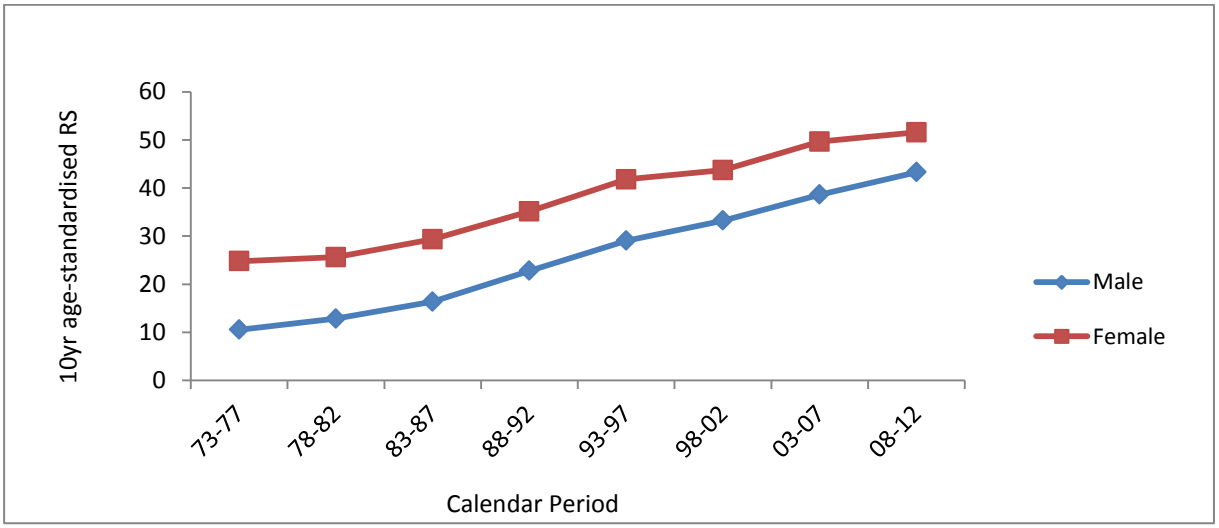


Figure 6: Trends in 10-year ASRS of all cancers by gender



Limitations

The calculation of relative survival assumes that the cancer group for whom observed survival is calculated and the general population group for whom expected survival is calculated, is comparable in terms of the distribution of factors that influence mortality from other causes.[33] For instance, patients with smoking-related cancers (e.g. lung cancer) will have a higher exposure to tobacco compared to the general population, thus their risk of death from other tobacco-related conditions are also considerably greater. This means that the relative survival estimate will be biased downwards.

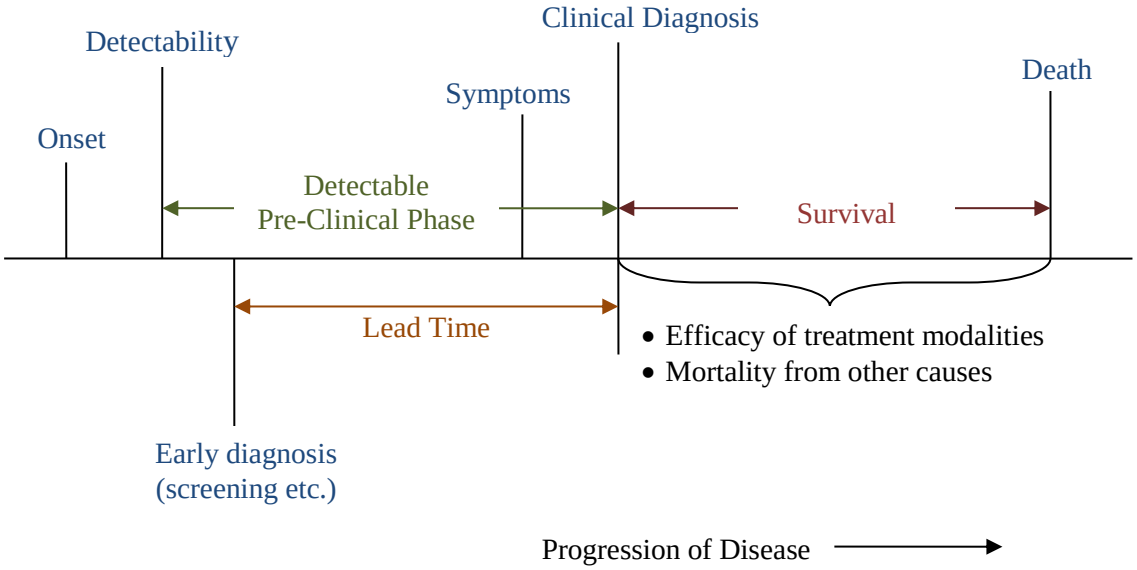
Additionally, it is assumed that the group from the general population used for comparison with the patients is free of the disease of interest. Independent competing risks is assumed.[34]

Apart from that, an increasing survival trend might not necessarily imply advancement in treatment modalities but might instead be due to (i) early detection of the cancer resulting in lead-time bias or (ii) a difference in the tools used to classify cancer stage resulting in a stage migration phenomenon.[6, 35]

Lead-time Bias

Since survival time is the duration between the dates of diagnosis and death, an earlier detection of a cancer will “prolong” a patient’s survival time. Therefore, survival time can still increase even if there is no postponement of death. This is known as a lead-time bias when the cancer is detected even before the symptoms of the disease begin. This is generally introduced by screening programmes and improved diagnostic tools, and greater general public awareness. A schematic diagram for lead-time bias is shown below in Figure 7.

Figure 7: Schematic representation of lead time bias



Stage Migration

The availability and accessibility of diagnostic instruments may bring about a stage migration phenomenon. This phenomenon occurs when there is a re-classification in cancer staging which is normally a result of advancement in technology. For example, a patient who had been clinically diagnosed with cancer at a regional stage in the 1970s, with improvement in diagnostic tools over the years, will today be diagnosed to have metastatic disease. Thus, this artifact will only make the survival rates appear to be more optimistic at each cancer stage[36] but it will not have an implication on the survival rates obtained from a non-stage-specific analysis.

In view of the above limitations, an analysis looking at relative survival, incidence and mortality trends is preferred to evaluate therapeutic progress more precisely.[1] Despite the relative lag in cancer survival compared to international counterparts, one should note that the RSR comparison is for all stages of survival. If stage-specific survival were to be compared, Singapore may be doing just as well as, if not better than other countries, suggesting that our treatment and cancer management is comparable to the international counterparts. Cases in Singapore tend to be diagnosed at a later stage compared to other developed countries. Indeed, this was found to be the case when Swedish and Singapore breast cancer cases were

compared.[37] Similarly, cancer stage and number of axillary nodes examined were factors significantly affecting 5 year relative survival in multiple regression models using data from 6 European countries (combined into 9 regional groups based on survival similarities).[38]

COMMENTARIES ON SELECTED SITES

This section contains commentaries on common cancer sites for males and females. Time trends of the 5-year Age-standardised relative survival ratio (ASRS) were plotted together with those of Age-standardised incidence and cancer-specific mortality rates for these cancers.

Stage-specific ASRS are also presented for some of the sites. Finally, 1-year and 5-year ASRS are compared with other international cancer registries.

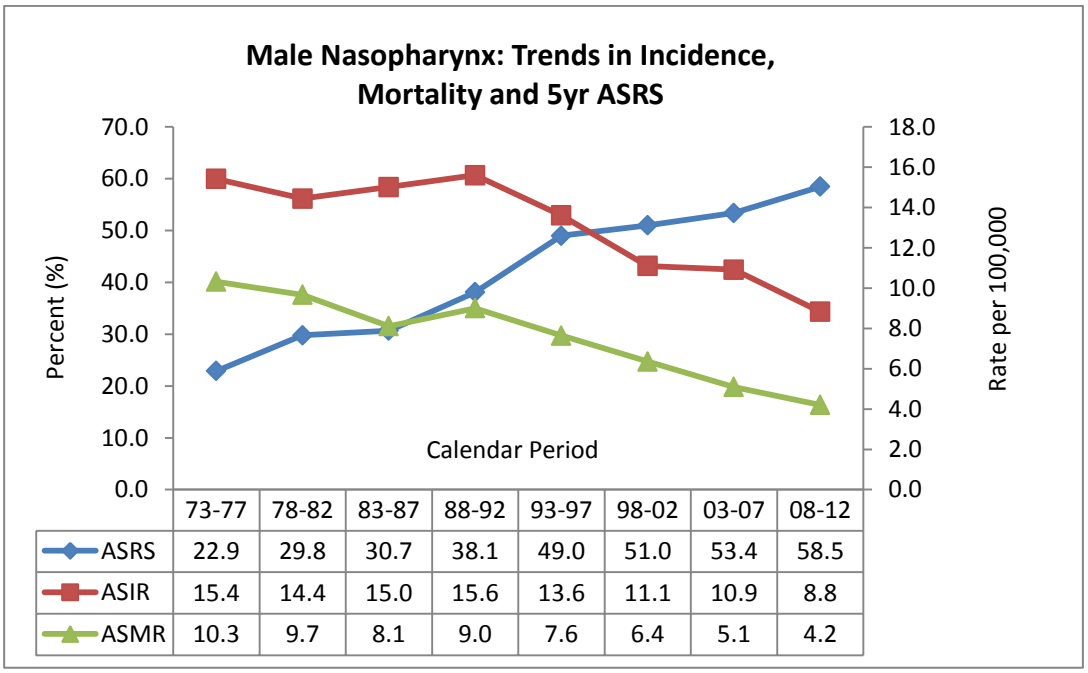
Nasopharynx (ICD-9 147)

The 5-year ASRS of nasopharyngeal cancer (NPC) improved in both genders over the study period. The continuous uptrend in females appeared to have plateaued after 1998 – 2002 while the increase in survival in males occurred mainly between the third and fifth calendar periods. The 1- and 5-year relative survivals for nasopharyngeal cancer were higher than most European countries and the 5-year relative survival for males was surpassed only by Switzerland among the countries compared.

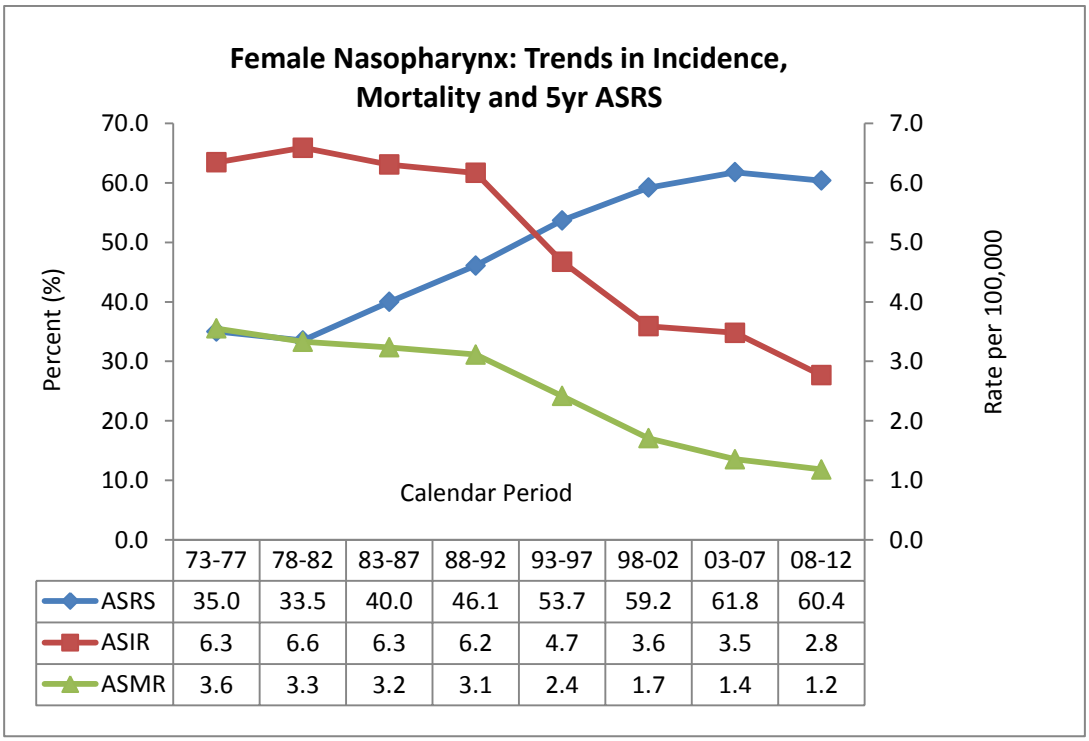
There were steady declines in the incidence and mortality of NPC, particularly after 1988 – 1992. The incidence of NPC decreased from 15.4 per 100,000 in 1973 – 1977 to 8.8 per 100,000 in 2008 – 2012 in males. The incidence in females, which was approximately one-third of what was observed in males, fell from 6.3 per 100,000 in 1973 – 1977 to 2.8 per 100,000 in 2008 – 2012. More than half of the cases were diagnosed at stages III/IV. Similarly, the mortality also declined over the study period as the mortality of NPC shrank by 60% in males and 67% in females respectively between 1973 and 2012.

Concomitant chemoradiotherapy is the standard treatment for patients with non-metastatic stage III/IV NPC. [39] A meta-analysis of eight randomized trials found a significant absolute benefit of 6% and 10% for 5 year OS and 5 year DFS, respectively, when chemotherapy was added concomitantly to radiotherapy in the treatment of locally advanced NPC. Cisplatin is typically used in concurrent chemotherapy-RT and adjuvant cisplatin and fluorouracil combined with concurrent cisplatin-RT may be beneficial. [40] Nevertheless, regardless of its timing, chemotherapy lowered the risk of locoregional and distant failure. [41]

Radiotherapy has evolved from 2-dimensional conformal technique (2DRT) to 3DRT, then to intensity-modulated radiation technique (IMRT), leading to better tumour coverage with better sparing of normal structure.[42] Three randomized trials comparing 2DRT with IMRT significantly improved overall survival. However, studies on 3DRT showed no major benefit and there were inconclusive results for IMRT.

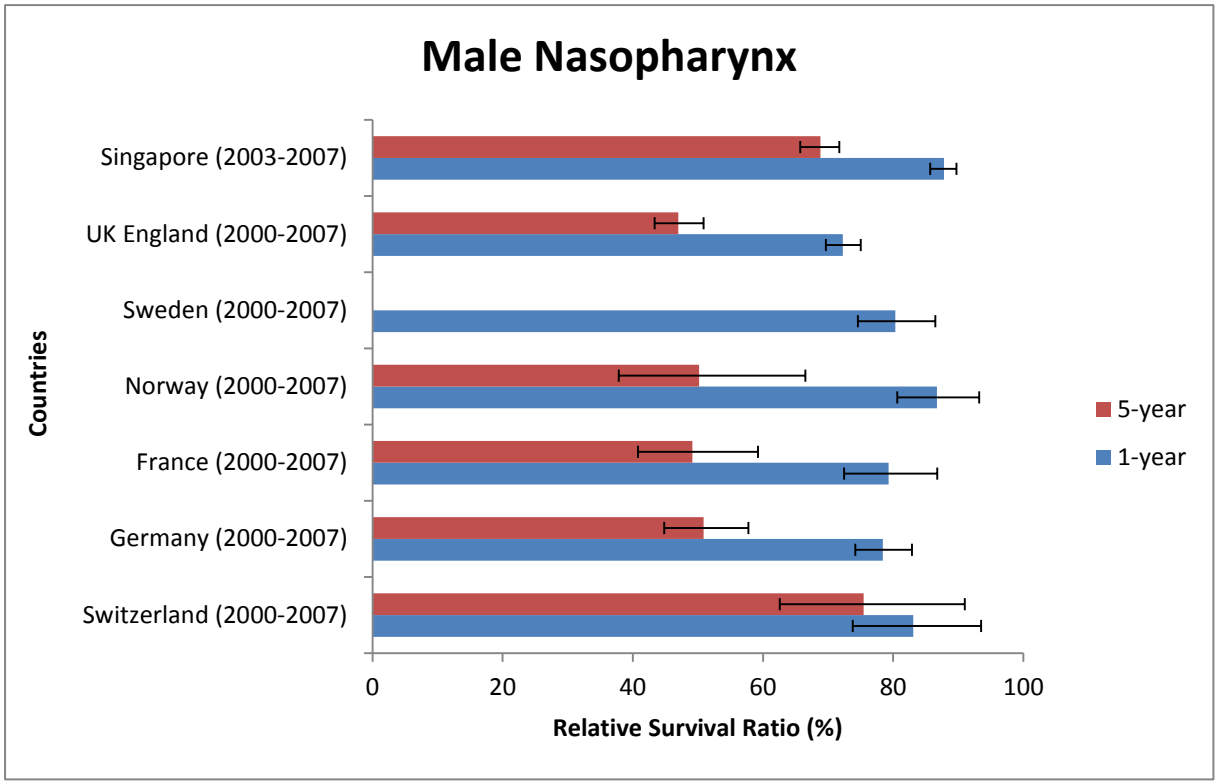


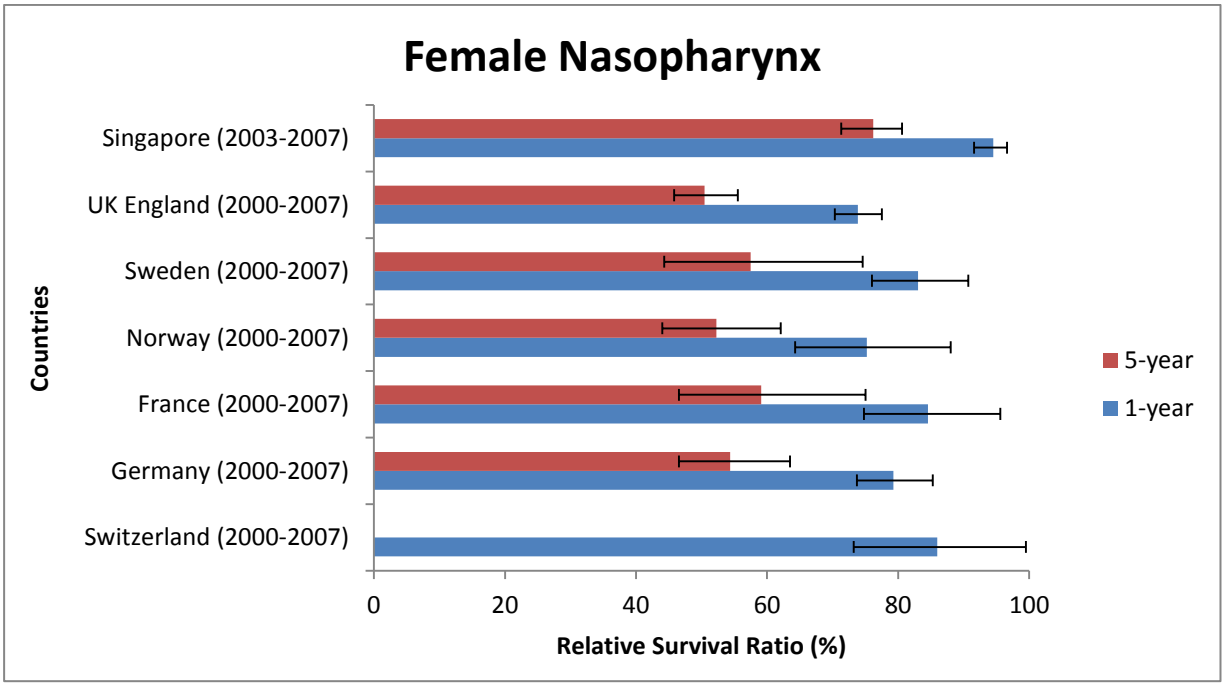
	73-77	78-82	83-87	88-92	93-97	98-02	03-07	08-12
ASRS	22.9	29.8	30.7	38.1	49.0	51.0	53.4	58.5
ASIR	15.4	14.4	15.0	15.6	13.6	11.1	10.9	8.8
ASMR	10.3	9.7	8.1	9.0	7.6	6.4	5.1	4.2



	73-77	78-82	83-87	88-92	93-97	98-02	03-07	08-12
ASRS	35.0	33.5	40.0	46.1	53.7	59.2	61.8	60.4
ASIR	6.3	6.6	6.3	6.2	4.7	3.6	3.5	2.8
ASMR	3.6	3.3	3.2	3.1	2.4	1.7	1.4	1.2

1- and 5-year age-standardised relative survival in selected countries





Age-standardised observed survival and relative survival of nasopharyngeal cancer by calendar period and gender

Calendar Period	Males							
	ASOS (%)				ASRS (%)			
	1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr
1973-1977	55.8 (51.8-59.6)	28.0 (24.5-31.6)	20.0 (16.8-23.3)	15.2 (11.8-19.0)	58.0 (53.9-62.0)	30.9 (27.0-34.8)	22.9 (19.3-26.8)	19.0 (14.8-23.8)
1978-1982	65.9 (62.4-69.2)	35.2 (31.5-38.8)	26.0 (22.6-29.5)	13.7 (11.0-16.7)	68.5 (64.8-71.9)	38.6 (34.6-42.7)	29.8 (25.9-33.8)	17.6 (14.1-21.5)
1983-1987	67.9 (64.6-70.9)	37.9 (34.6-41.2)	26.9 (23.8-30.0)	16.1 (13.5-19.0)	70.1 (66.8-73.2)	41.2 (37.6-44.8)	30.7 (27.2-34.3)	20.3 (16.9-23.9)
1988-1992	69.0 (66.3-71.6)	43.7 (40.8-46.6)	33.2 (30.3-36.1)	19.7 (17.0-22.6)	71.3 (68.5-74.0)	47.6 (44.4-50.7)	38.1 (34.8-41.4)	24.9 (21.4-28.5)
1993-1997	75.6 (73.1-77.8)	52.5 (49.7-55.3)	42.8 (40.0-45.7)	27.0 (24.2-29.9)	78.2 (75.6-80.5)	57.2 (54.1-60.2)	49.0 (45.7-52.3)	36.2 (32.4-40.0)
1998-2002	78.3 (76.0-80.5)	56.3 (53.5-59.0)	45.3 (42.6-48.1)	27.7 (25.2-30.3)	80.7 (78.3-82.9)	60.9 (57.9-63.7)	51.0 (47.9-54.0)	35.0 (31.7-38.3)
2003-2007	79.4 (77.2-81.4)	61.4 (58.8-63.9)	48.3 (45.6-51.0)	34.5 (31.8-37.2)	81.3 (79.1-83.4)	65.4 (62.6-68.0)	53.4 (50.4-56.3)	41.6 (38.4-44.8)
2008-2012	81.9 (79.8-83.8)	62.0 (59.4-64.5)	53.4 (50.8-56.0)	39.8 (37.1-42.4)	83.6 (81.5-85.6)	65.7 (62.9-68.3)	58.5 (55.6-61.3)	47.4 (44.2-50.5)
Calendar Period	Females							
	ASOS (%)				ASRS (%)			
	1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr
1973-1977	70.4 (64.3-75.7)	41.0 (34.6-47.4)	31.1 (24.7-37.7)	14.5 (7.8-23.1)	72.4 (66.1-77.8)	44.4 (37.4-51.3)	35.0 (27.8-42.4)	17.3 (9.4-27.7)
1978-1982	77.3 (72.1-81.6)	43.6 (37.9-49.2)	30.3 (25.0-35.7)	18.0 (13.3-23.1)	79.2 (73.9-83.6)	46.5 (40.4-52.4)	33.5 (27.6-39.6)	21.7 (16.2-28.0)
1983-1987	77.2 (72.7-81.0)	52.3 (47.0-57.4)	35.7 (30.5-41.0)	20.8 (16.1-26.1)	79.5 (74.9-83.5)	56.1 (50.3-61.5)	40.0 (34.2-45.8)	24.8 (19.1-31.0)
1988-1992	82.1 (78.3-85.3)	58.5 (53.7-62.9)	42.1 (37.3-46.9)	27.8 (23.1-32.7)	84.9 (71.5-93.1)	62.3 (57.2-67.0)	46.1 (40.8-51.3)	32.4 (26.9-38.1)
1993-1997	83.6 (79.9-86.7)	62.4 (57.8-66.7)	49.0 (44.3-53.5)	37.3 (32.7-41.9)	85.6 (81.8-88.8)	66.3 (61.4-70.8)	53.7 (48.6-58.6)	44.0 (38.6-49.4)
1998-2002	85.2 (81.6-88.1)	66.4 (61.9-70.4)	55.3 (50.7-59.6)	39.7 (35.2-44.2)	86.4 (82.8-89.4)	69.2 (64.6-73.4)	59.2 (54.3-63.8)	45.7 (40.5-50.8)
2003-2007	89.1 (86.1-91.5)	68.5 (64.0-72.5)	57.2 (52.5-61.6)	40.6 (36.1-45.2)	90.9 (87.8-93.3)	72.1 (67.4-76.3)	61.8 (56.7-66.5)	46.9 (41.6-52.1)
2008-2012	84.4 (80.9-87.4)	68.9 (64.7-72.8)	56.3 (52.0-60.5)	39.6 (35.3-44.0)	85.8 (82.2-88.8)	71.9 (67.5-75.9)	60.4 (55.7-64.8)	45.5 (40.4-50.4)

ASOS: Age-standardised observed survival
ASRS: Age-standardised relative survival

Stage distribution of nasopharyngeal cancer by gender

Males

Stage/Period	2004-2006		2007-2009		2010-2012	
	Number	Percent*	Number	Percent*	Number	Percent*
I	78	9.04	69	7.71	52	5.67
II	191	22.13	200	22.35	147	16.03
III	277	32.10	274	30.61	309	33.70
IV	317	36.73	352	39.33	409	44.60

Females

Stage/Period	2004-2006		2007-2009		2010-2012	
	Number	Percent*	Number	Percent*	Number	Percent*
I	27	9.41	18	6.14	13	5.20
II	81	28.22	63	21.50	57	22.80
III	95	33.10	103	35.15	74	29.60
IV	84	29.27	109	37.20	106	42.40

*Based on cancer cases with known stage

Age-standardised observed survival and relative survival of nasopharyngeal cancer by calendar period, gender and stage[1]

Males

Stage I

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	87.9 (76.2, 94.1)	81.1 (68.3-89.1)	77.4 (64.3-86.2)	89.2 (77.2, 95.4)	84.3 (71.0, 92.6)	83.4 (69.3-92.9)
2010-2012[Ω]	98.4 (79.9-99.9)	96.6 (82.8-99.4)	94.2 (81.0-98.3)	99.9 (81.1-101.3)	101.1 (86.7-104.0)	101.8 (87.6-106.2)

Stage II

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	90.5 (84.7-94.1)	75.6 (68.2-81.4)	68.7 (60.9-75.3)	92.1 (86.2-95.9)	79.1 (71.5-85.3)	73.9 (65.4-80.9)
2010-2012	92.4 (85.6-96.1)	75.7 (66.9-82.5)	68.3 (59.5-75.6)	94.6 (87.6-98.4)	80.8 (71.4-88.0)	75.0 (65.3-83.0)

Stage III

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	89.2 (83.8-92.9)	74.1 (67.1-79.8)	62.0 (54.7-68.5)	90.8 (85.3-94.6)	77.4 (70.2-83.4)	66.8 (58.9-73.8)
2010-2012	87.0 (81.9-90.7)	76.7 (70.7-81.6)	68.0 (61.3-73.8)	88.7 (83.5-92.5)	80.6 (74.3-85.8)	74.0 (66.7-80.3)

Stage IV

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	77.4 (72.0-81.9)	49.1 (43.0-54.9)	32.3 (26.6-38.1)	78.9 (73.4-83.5)	51.4 (45.0-57.5)	34.4 (28.4-40.7)
2010-2012	73.8 (68.8-78.2)	48.0 (42.2-53.5)	39.3 (33.6-44.9)	75.3 (70.1-79.7)	50.2 (44.1-56.0)	41.7 (35.7-47.7)

[1] Relative survival for early stage cancer can be more than 100% if the early stage cancer population is healthier than the general population

Females[†]

Stage I

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009[Ω]	100.0 (100.0-100.0)	100.0 (100.0-100.0)	96.0 (48.0-99.8)	100.5 (100.5-100.5)	101.5 (101.5-101.5)	98.8 (49.4-102.7)
2010-2012[Ω]	100.0 (100.0-100.0)	100.0 (100.0-100.0)	100.0 (100.0-100.0)	100.5 (100.5-100.5)	101.6 (101.6-101.6)	102.9 (102.9-102.9)

Stage II

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	100.0 (100.0-100.0)	92.1 (80.0-97.0)	71.7 (58.5-81.4)	100.5 (100.5-100.5)	94.0 (81.7-99.0)	77.2 (63.0-87.7)
2010-2012	100.0 (100.0-100.0)	95.2 (81.3-98.9)	83.0 (68.1-91.4)	101.6 (101.6-101.6)	98.9 (84.4-102.6)	87.1 (71.4-95.8)

Stage III

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	93.4 (85.1-97.2)	83.6 (73.9-89.9)	73.3 (62.0-81.7)	94.6 (86.2-98.4)	86.5 (76.5-93.0)	77.4 (65.4-86.3)
2010-2012	100.0 (100.0-100.0)	89.5 (78.7-95.0)	61.1 (49.9-70.5)	100.4 (100.4-100.4)	90.9 (79.9-96.5)	63.6 (52.0-73.4)

Stage IV

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	83.9 (74.6-90.0)	56.3 (44.0-66.8)	48.4 (36.1-59.6)	85.0 (75.6-91.2)	58.2 (45.5-69.1)	50.8 (37.9-62.6)
2010-2012	76.5 (65.4-84.4)	65.9 (54.4-75.1)	51.4 (39.9-61.8)	77.4 (66.2-85.4)	68.0 (56.2-77.6)	53.9 (41.8-64.7)

† There is no confidence interval as no patients died within 1, 3 or 5 years during the calendar period.
Ω Increasing relative survival due to late entry, where more patients diagnosed in preceding years are entering the study after time 0.

Stomach (ICD-9 151)

The survival of stomach cancer showed good improvement, though plateauing was observed after 1998 – 2002. The 5-year ASRS more than doubled in both males and females over the study period. The 5-year ASRS in 2008 – 2012 were 26.8% in males and 25.6% in females. This compared favourably with the 5-year ASRS of less than 10% in both genders in 1973 – 1977. The 5-year relative survival in Singapore was lower than that in Japan and Switzerland (among females) but better than that in US, Australia and most European registries.

The incidence of stomach cancer declined steadily in both genders. In males, the incidence dropped from 36.4 per 100,000 in 1973 – 1977 to 11.2 per 100,000 in 2008 – 2012. Similarly, in females, the incidence decreased from 16.6 per 100,000 in 1973 – 1977 to 6.4 per 100,000 in 2008 – 2012. These downward trends are similar to what have been documented in other populations as the incidence of stomach cancer has declined sharply over the latter half of this century in many countries around the world.[43]

Following the incidence trend, the mortality of stomach cancer also decreased. Comparing the mortality between the first and most recent calendar periods, the mortality has fallen by three-quarters and two-thirds for males and females respectively. The trends of stomach cancer incidence and mortality followed each other closely throughout the study period in both genders, a pattern that was seen in other cancers such as liver and lung cancer.

Histology is important in the prognosis of stomach cancer. Studies have shown that patients with diffuse type histology present with poorer survival compared to intestinal subtypes [44, 45], even after stratification by stage and adjustment for factors such as subsite, degree of differentiation and treatment [44]. There has been an increase in the percentage of diffuse type carcinoma in the Singapore registry from 2.9% in 1998 – 2002 to 4.7% in 2008 – 2012.

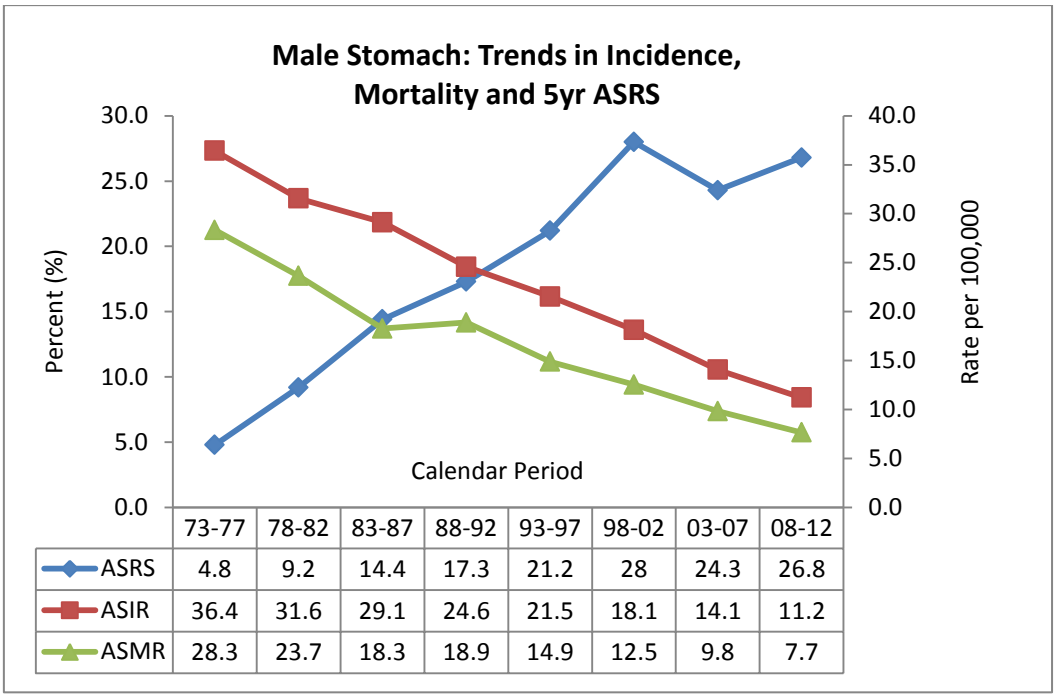
Recent trials have shown a gain of 15% in survival rate for perioperative, adjuvant chemotherapy, or chemoradiation after curative resection compared with surgery alone.[46] No one strategy has been found to be superior. Unfortunately, more than half of radically resected gastric cancer patients relapse and 5-year survival is less than 10%.

Cisplatin and fluoropyrimidine-based chemotherapy, with the addition of trastuzumab in human epidermal growth factor receptor 2 (HER2) positive patients, is the widely used treatment in stage IV patients fit for chemotherapy. Recent evidence supports the use of second-line chemotherapy after progression in patients with good performance status. Performance status is a wellness scale used by oncologists to determine if a patient is fit for a given type of treatment. Increased survival with biologic therapies such as trastuzumab in patients with HER2-positive and with ramucirumab in second line have been observed. [46]

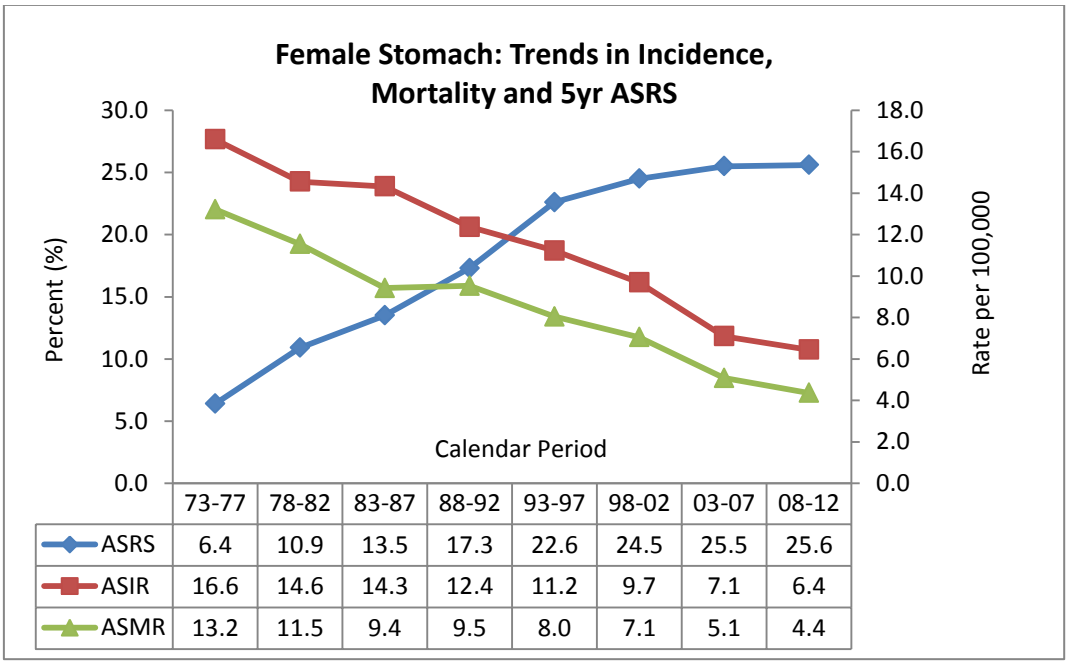
The prognosis of patients with metastatic gastric cancer remains poor and responses to first-line chemotherapy are modest and variable. [47] The addition of trastuzumab to cisplatin/fluoropyrimidine-based chemotherapy significantly improved survival among patients with HER2-positive metastatic gastric cancer, which comprised approximately 20% of all the metastatic study patients (from 24 countries). This proportion is about 10 – 20% in Singapore.

More than half of the stomach cancer cases were diagnosed at stage IV. Upstaging has been observed among stage I and II patients and downstaging among stage IV patients between 2007 – 2009 and 2010 – 2012. This was similarly observed in a cohort of surgically treated German patients, as the updated AJCC staging classification modified T categories and reduced the number of metastasized lymph nodes in the N categories. [48]

There has been a significant decrease in ASRS among stage I and IV male patients and a significant increase in ASRS among stage II and III female patients.

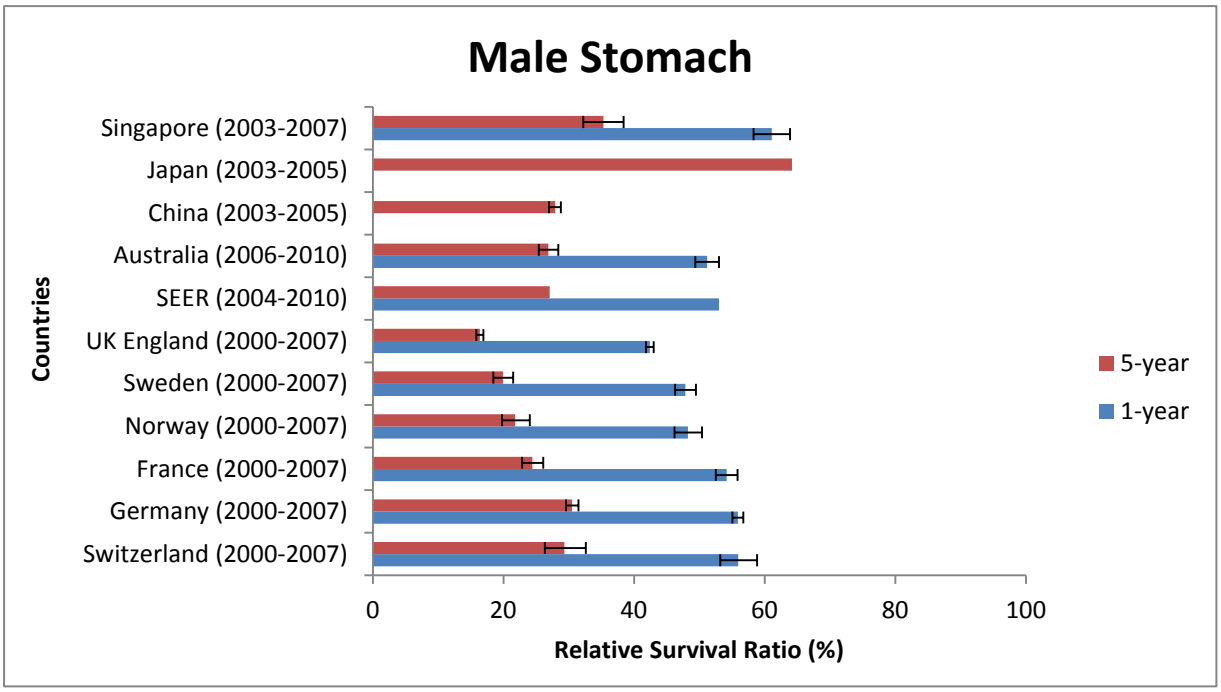


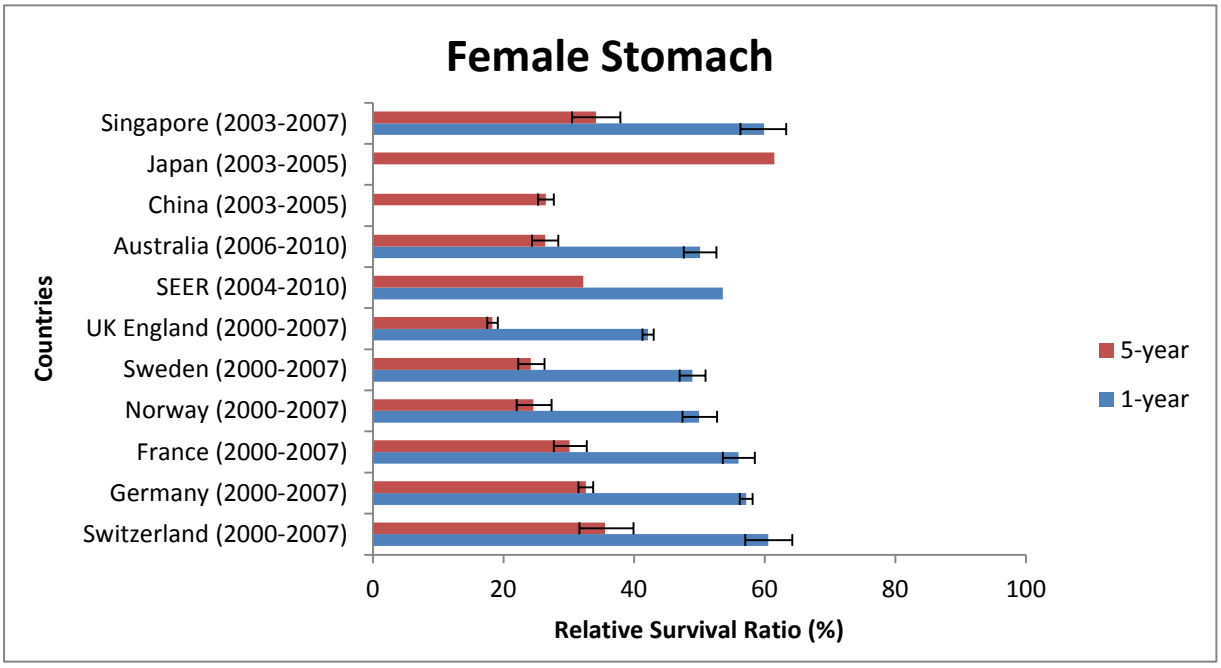
	73-77	78-82	83-87	88-92	93-97	98-02	03-07	08-12
ASRS	4.8	9.2	14.4	17.3	21.2	28	24.3	26.8
ASIR	36.4	31.6	29.1	24.6	21.5	18.1	14.1	11.2
ASMR	28.3	23.7	18.3	18.9	14.9	12.5	9.8	7.7



	73-77	78-82	83-87	88-92	93-97	98-02	03-07	08-12
ASRS	6.4	10.9	13.5	17.3	22.6	24.5	25.5	25.6
ASIR	16.6	14.6	14.3	12.4	11.2	9.7	7.1	6.4
ASMR	13.2	11.5	9.4	9.5	8.0	7.1	5.1	4.4

1- and 5-year age-standardised relative survival in selected countries





Age-standardised observed survival and relative survival of stomach cancer by calendar period and gender

Calendar Period	Males							
	ASOS (%)				ASRS (%)			
	1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr
1973-1977	15.8 (13.8-18.0)	5.2 (4.1-6.6)	3.6 (2.6-4.7)	1.5 (0.8-2.6)	17.0 (14.8-19.3)	6.3 (4.9-7.9)	4.8 (3.5-6.4)	2.6 (1.4-4.6)
1978-1982	23.1 (20.8-25.6)	9.3 (7.7-11.0)	7.0 (5.7-8.6)	3.6 (2.5-5.0)	24.6 (22.1-27.2)	11.1 (9.3-13.2)	9.2 (7.4-11.3)	6.2 (4.3-8.7)
1983-1987	31.0 (28.5-33.6)	14.5 (12.7-16.5)	11.2 (9.5-13.1)	6.8 (5.3-8.4)	33.0 (30.3-35.7)	17.1 (14.9-19.5)	14.4 (12.3-16.8)	10.8 (8.5-13.5)
1988-1992	34.2 (31.7-36.7)	18.5 (16.5-20.6)	13.3 (11.5-15.2)	8.5 (7.0-10.2)	36.2 (33.6-38.9)	21.7 (19.3-24.1)	17.3 (15.0-19.8)	14.5 (11.9-17.4)
1993-1997	39.1 (36.5-41.6)	21.1 (19.0-23.3)	16.4 (14.5-18.5)	10.6 (8.9-12.4)	41.5 (38.7-44.2)	24.7 (22.2-27.3)	21.2 (18.7-23.9)	18.1 (15.2-21.1)
1998-2002	44.8 (42.2-47.3)	26.7 (24.5-29.0)	22.5 (20.4-24.6)	15.8 (13.8-17.9)	47.1 (44.4-49.8)	30.6 (28.0-33.2)	28.0 (25.4-30.7)	24.9 (21.8-28.2)
2003-2007	48.9 (46.2-51.6)	26.5 (24.2-28.9)	20.1 (18.0-22.3)	15.0 (13.2-16.9)	51.1 (48.2-53.8)	29.8 (27.2-32.5)	24.3 (21.7-26.9)	22.4 (19.7-25.2)
2008-2012	52.8 (50.1-55.5)	29.3 (26.9-31.7)	22.4 (20.2-24.6)	16.3 (14.4-18.4)	54.9 (52.1-57.6)	32.6 (29.9-35.3)	26.8 (24.1-29.5)	23.5 (20.6-26.4)
Calendar Period	Females							
	ASOS (%)				ASRS (%)			
	1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr
1973-1977	20.2 (17.0-23.6)	8.4 (6.3-10.9)	5.2 (3.5-7.4)	3.9 (2.4-6.0)	21.2 (17.8-24.7)	9.6 (7.2-12.4)	6.4 (4.3-9.1)	5.8 (3.6-8.9)
1978-1982	26.6 (23.1-30.1)	12.5 (10.0-15.2)	8.6 (6.6-11.0)	4.1 (2.5-6.3)	28.0 (24.4-31.7)	14.4 (11.6-17.5)	10.9 (8.3-14.0)	6.6 (4.0-10.1)
1983-1987	29.5 (26.2-32.9)	15.6 (13.0-18.4)	11.5 (9.2-14.1)	7.3 (5.3-9.7)	30.8 (27.3-34.3)	17.2 (14.3-20.3)	13.5 (10.8-16.6)	10.6 (7.7-14.2)
1988-1992	37.1 (33.7-40.5)	19.3 (16.6-22.1)	14.9 (12.5-17.5)	11.9 (9.6-14.5)	38.5 (35.0-42.1)	21.3 (18.3-24.4)	17.3 (14.5-20.4)	16.0 (12.9-19.5)
1993-1997	41.8 (38.5-45.1)	24.5 (21.7-27.5)	18.8 (16.1-21.6)	12.1 (9.9-14.6)	43.6 (40.1-47.0)	27.3 (24.2-30.6)	22.6 (19.4-25.9)	17.5 (14.2-21.0)
1998-2002	43.8 (40.6-47.0)	26.9 (24.1-29.7)	21.5 (19.0-24.2)	14.4 (12.1-16.9)	45.2 (41.9-48.4)	29.1 (26.1-32.2)	24.5 (21.6-27.5)	19.2 (16.2-22.5)
2003-2007	51.9 (48.5-55.2)	28.1 (25.0-31.1)	22.1 (19.4-25.0)	16.3 (14.0-18.8)	53.5 (50.0-57.0)	30.6 (27.3-33.9)	25.5 (22.4-28.8)	22.0 (18.8-25.4)
2008-2012	48.8 (45.6-51.9)	27.7 (24.9-30.6)	22.6 (20.0-25.4)	16.8 (14.4-19.3)	50.3 (47.0-53.5)	30.0 (26.9-33.1)	25.6 (22.6-28.8)	21.8 (18.8-25.1)

ASOS: Age-standardised observed survival
ASRS: Age-standardised relative survival

Stage distribution of stomach cancer by gender

Males

Stage/Period	2004-2006		2007-2009		2010-2012	
	Number	Percent*	Number	Percent*	Number	Percent*
I	134	18.41	146	18.32	149	17.93
II	88	12.09	82	10.29	95	11.43
III	138	18.96	162	20.33	228	27.44
IV	368	50.55	407	51.07	359	43.20

Females

Stage/Period	2004-2006		2007-2009		2010-2012	
	Number	Percent*	Number	Percent*	Number	Percent*
I	72	15.62	105	20.47	105	17.74
II	52	11.28	46	8.97	71	11.99
III	96	20.82	95	18.52	143	24.16
IV	241	52.28	267	52.05	273	46.11

*Based on cancer cases with known stage

Age-standardised observed survival and relative survival of stomach cancer by calendar period, gender and stage

Males

Stage I

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	94.0 (87.5-97.2)	81.1 (72.1-87.4)	73.6 (63.8-81.2)	97.0 (90.3-100.3)	89.2 (79.3-96.1)	87.1 (75.5-96.1)
2010-2012	93.7 (87.2-97.0)	75.6 (66.3-82.6)	62.8 (52.9-71.1)	96.9 (90.1-100.2)	83.4 (73.2-91.2)	74.3 (62.6-84.1)

Stage II

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	84.9 (73.3-91.7)	65.5 (52.6-75.6)	50.9 (38.1-62.3)	87.9 (75.9-94.9)	71.8 (57.7-83.0)	59.0 (44.2-72.3)
2010-2012	81.0 (70.4-88.1)	61.4 (49.5-71.3)	39.7 (28.6-50.6)	83.9 (72.9-91.2)	68.1 (54.9-79.1)	47.1 (33.9-60.1)

Stage III

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	75.5 (67.1-82.1)	29.7 (21.4-38.4)	16.2 (10.1-23.7)	77.9 (69.1-84.7)	32.3 (23.3-41.8)	18.9 (11.7-27.6)
2010-2012	69.9 (62.8-75.9)	32.7 (25.7-39.9)	21.6 (15.1-28.8)	71.9 (64.6-78.1)	36.0 (28.3-43.9)	25.2 (17.6-33.6)

Stage IV

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	30.6 (26.0-35.3)	7.8 (5.4-10.9)	7.1 (4.7-10.1)	31.6 (26.8-36.4)	8.5 (5.8-11.8)	7.9 (5.3-11.3)
2010-2012	23.8 (19.3-28.5)	7.0 (4.8-9.9)	4.6 (2.9-6.9)	24.5 (20.0-29.4)	7.6 (5.1-10.6)	5.2 (3.3-7.8)

Females

Stage I

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	93.9 (86.1-97.4)	79.0 (67.7-86.8)	71.2 (58.4-80.7)	95.9 (87.8-99.4)	83.9 (71.8-92.1)	79.6 (65.3-90.2)
2010-2012	89.1 (79.8-94.3)	79.1 (68.5-86.5)	73.6 (62.3-81.9)	91.2 (81.6-96.5)	84.4 (73.1-92.3)	82.1 (69.6-91.5)

Stage II

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	71.0 (53.2-83.0)	43.1 (27.7-57.7)	39.7 (24.9-54.1)	72.8 (54.6-85.2)	45.7 (29.3-61.2)	43.4 (27.2-59.1)
2010-2012	87.8 (76.5-93.9)	64.6 (48.2-77.0)	39.2 (22.4-55.6)	89.9 (78.4-96.1)	69.0 (51.4-82.2)	44.4 (25.4-63.0)

Stage III

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	69.9 (58.2-78.9)	34.3 (23.9-45.0)	20.0 (10.9-31.2)	71.4 (59.4-80.6)	36.3 (25.2-47.6)	21.7 (11.8-33.7)
2010-2012	69.8 (60.8-77.2)	41.3 (31.2-51.1)	34.6 (24.5-44.9)	71.4 (62.1-78.9)	43.5 (32.9-53.9)	37.9 (26.9-49.2)

Stage IV

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	26.3 (21.1-31.8)	6.5 (3.8-10.3)	4.3 (2.0-7.8)	26.9 (21.5-32.6)	6.9 (4.0-11.0)	4.8 (2.3-8.7)
2010-2012	23.0 (18.2-28.2)	5.7 (3.4-8.9)	3.1 (1.6-5.6)	23.6 (18.7-28.8)	6.1 (3.6-9.4)	3.5 (1.7-6.2)

Colon (ICD-9 153)

The survival of colon cancer patients has made good progress. The 5-year ASRS has almost doubled among females and more than doubled among males. Notably, the proportion of cancers diagnosed at stage I had increased by more than 3% between 2004 and 2009. The relative survival for colon cancer in Singapore was comparable to that in Europe and was only slightly lower than Japan among males.

The incidence of colon cancer increased over the study period in both genders, though plateauing was seen after 1988 – 1992 among females and after 1998 – 2002 among males. The mortality of colon cancer increased initially, then decreased in both genders after 1998 – 2002. There was a significant increase in ASRS among stage I and III male patients.

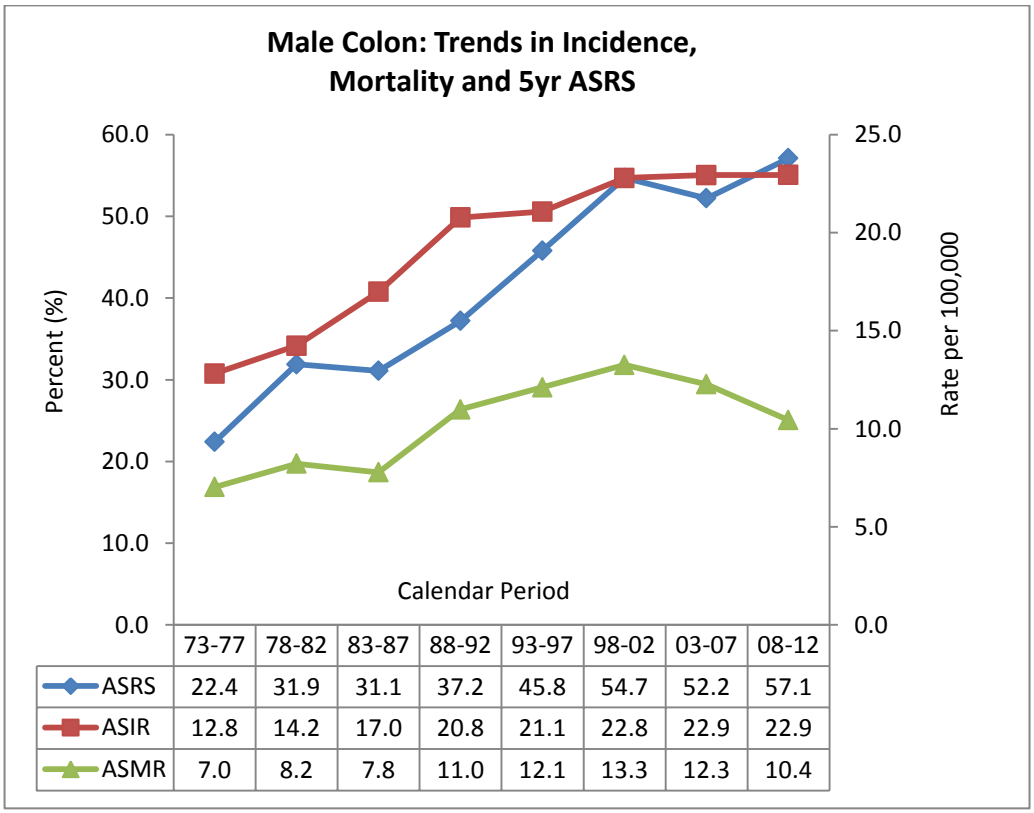
There is evidence that physical activity lowers the risk of colon, breast and endometrial cancers. [49] The National Health Surveillance Survey 2013 showed that only 23.4% of Singaporeans engaged in regular exercise (i.e. at least 20 minutes of exercise for 3 or more times a week) while 26% of Singaporeans was physically inactive. [50] The percentage of physically active Singaporeans has not changed much over time.

In the Health Behaviour Surveillance of Singapore 2012 [51], more than 37% and about 18% of Singaporeans aged 50 to 69 years reported having had a fecal occult blood test and colonoscopy / sigmoidoscopy at least once respectively. This is an improvement from less than 20% and 11.2% respectively, from the National Health Surveillance Survey in 2004. [52] This may have contributed to the increase in percentage of stage I colon cancers between 2004 – 2006 and 2007 – 2009. The national colorectal carcinoma screening programme was started in 2010.

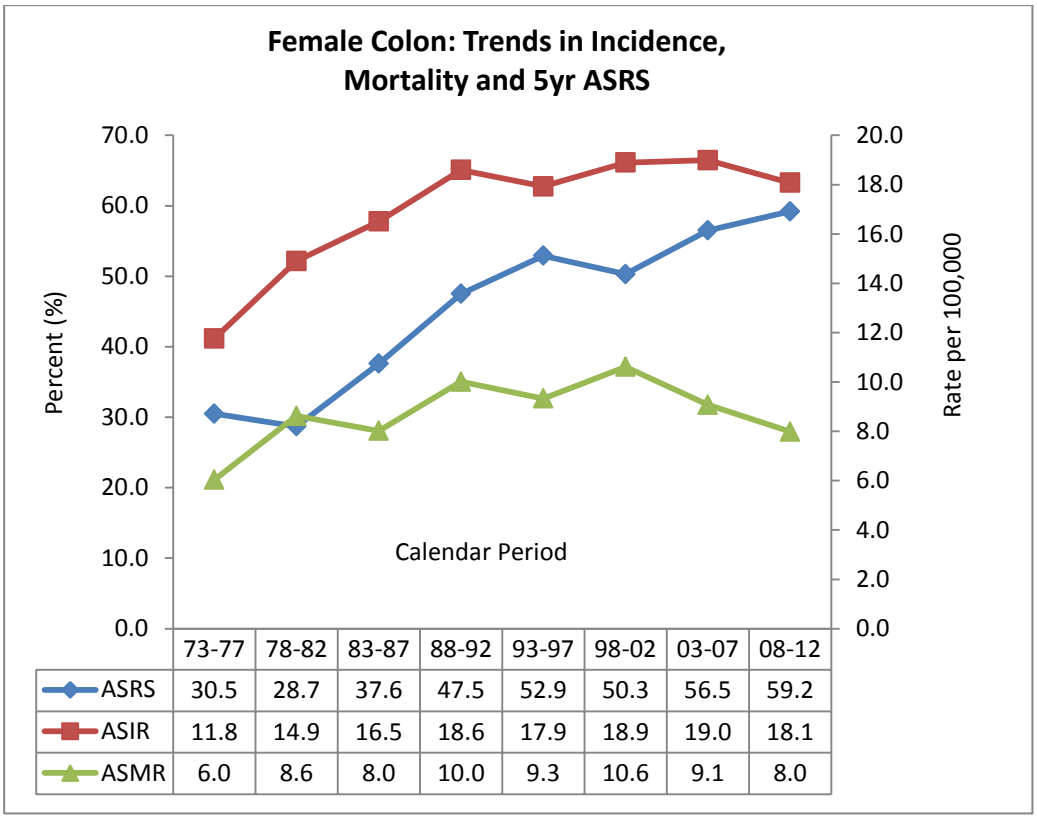
Historically, single-agent 5-Fluorouracil (5FU) was the standard adjuvant chemotherapy for resected colorectal cancer. It was also the standard palliative chemotherapy for metastatic colorectal cancer with an improvement in median survival among 7 trials by 3.7 months. [53]

Combination chemotherapy (Oxaliplatin + 5FU) replaced single agent 5FU as standard post-operative treatment in stage III cancer from 2004. [54] Combination chemotherapy was found to reduce the risk of death by 16% compared to single agent 5FU after a median follow-up time of 81.9 months. [55] The addition of oxaliplatin or irinotecan to 5FU was also more effective than single agent 5FU and became standard treatment for metastatic colorectal cancer. When patients received both combination regimens regardless of treatment sequence, the median survival in a phase III study reached 20 months. [56]

Treatment using biologics such as Bevacizumab and Cetuximab in conjunction with combination chemotherapy increased overall survival by 4.7 months and 3.5 months, respectively[57, 58] Nevertheless, its use remains limited due to high cost. Resection of liver mestastases has been regarded as a potentially curative approach since 2001, with median survival reaching 3.6 years in a meta-analysis of 60 studies. [59]

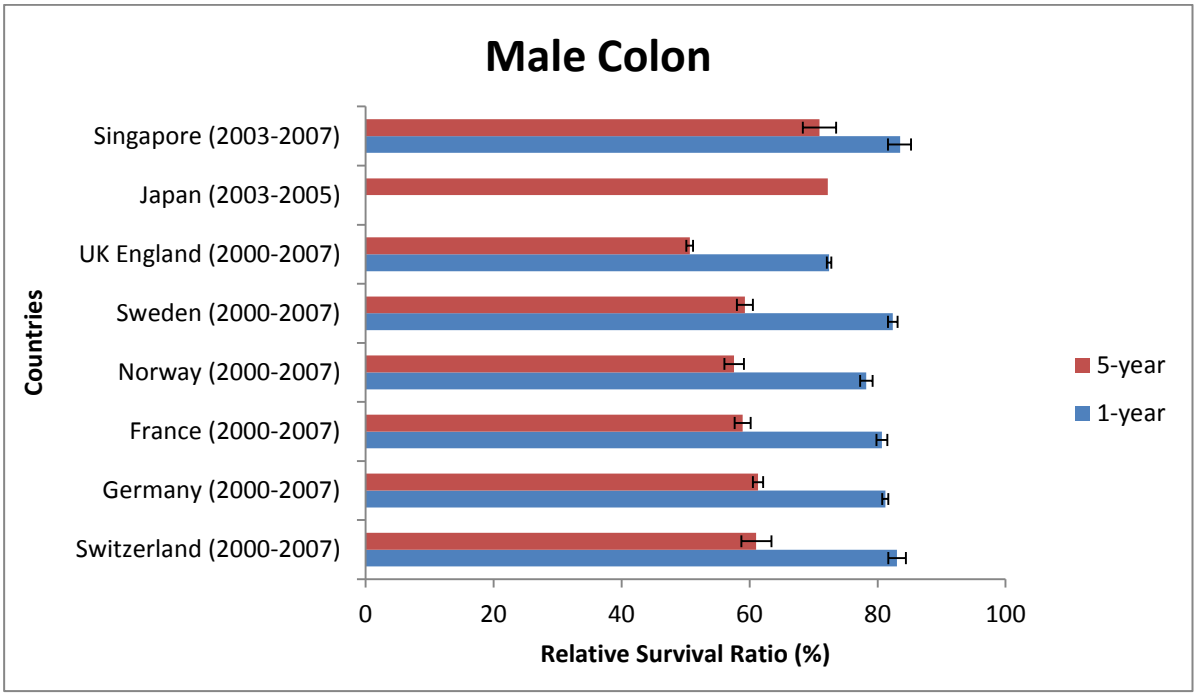


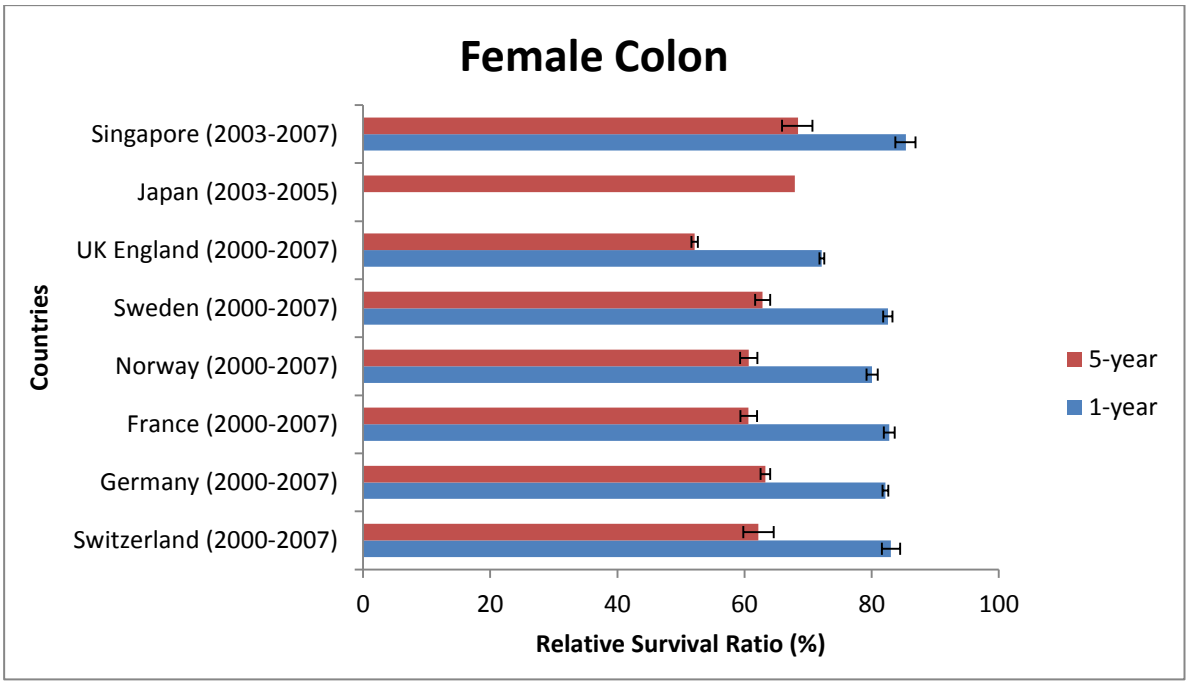
	73-77	78-82	83-87	88-92	93-97	98-02	03-07	08-12
ASRS	22.4	31.9	31.1	37.2	45.8	54.7	52.2	57.1
ASIR	12.8	14.2	17.0	20.8	21.1	22.8	22.9	22.9
ASMR	7.0	8.2	7.8	11.0	12.1	13.3	12.3	10.4



	73-77	78-82	83-87	88-92	93-97	98-02	03-07	08-12
ASRS	30.5	28.7	37.6	47.5	52.9	50.3	56.5	59.2
ASIR	11.8	14.9	16.5	18.6	17.9	18.9	19.0	18.1
ASMR	6.0	8.6	8.0	10.0	9.3	10.6	9.1	8.0

1- and 5-year age-standardised relative survival in selected countries




Female Colon
Countries
Singapore (2003-2007)
Japan (2003-2005)
UK England (2000-2007)
Sweden (2000-2007)
Norway (2000-2007)
France (2000-2007)
Germany (2000-2007)
Switzerland (2000-2007)
0
20
40
60
80
100
Relative Survival Ratio (%)
5-year
1-year

Age-standardised observed survival and relative survival of colon cancer by calendar period and gender

Calendar Period	Males							
	ASOS (%)				ASRS (%)			
	1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr
1973-1977	39.5 (34.4-44.5)	24.6 (20.2-29.2)	19.5 (15.4-24.0)	14.1 (9.6-19.4)	42.6 (37.1-48.1)	29.4 (24.1-34.9)	25.4 (20.0-31.3)	22.5 (15.3-31.0)
1978-1982	44.6 (40.1-48.9)	28.2 (24.3-32.2)	19.8 (16.3-23.5)	12.7 (9.5-16.3)	47.4 (42.7-52.0)	33.5 (28.9-38.2)	26.1 (21.5-31.0)	22.2 (16.6-28.6)
1983-1987	59.3 (55.6-62.9)	37.7 (33.9-41.4)	29.3 (25.6-33.0)	22.2 (18.6-26.0)	63.1 (59.2-66.9)	44.7 (40.2-49.2)	38.4 (33.6-43.4)	38.1 (32.0-44.6)
1988-1992	65.1 (62.2-67.8)	45.4 (42.3-48.4)	35.3 (32.2-38.4)	27.0 (23.8-30.3)	69.0 (66.0-72.0)	53.9 (50.3-57.5)	47.3 (43.2-51.5)	50.1 (44.1-56.2)
1993-1997	69.1 (66.6-71.5)	48.9 (46.2-51.6)	39.8 (37.0-42.4)	27.4 (24.7-30.2)	73.2 (70.5-75.7)	58.0 (54.7-61.1)	53.4 (49.7-57.0)	52.3 (47.1-57.5)
1998-2002	68.7 (66.5-70.8)	52.4 (50.0-54.7)	41.5 (39.1-43.9)	28.4 (26.1-30.8)	72.2 (69.8-74.4)	60.4 (57.7-63.1)	53.3 (50.2-56.3)	49.4 (45.4-53.5)
2003-2007	72.7 (70.8-74.5)	54.5 (52.4-56.6)	45.8 (43.6-47.9)	33.1 (31.0-35.3)	75.8 (73.8-77.7)	61.6 (59.1-63.9)	56.4 (53.7-59.1)	52.3 (48.9-55.8)
2008-2012	76.6 (75.0-78.2)	59.7 (57.8-61.5)	50.1 (48.2-52.1)	36.1 (34.1-38.2)	79.5 (77.8-81.1)	66.4 (64.3-68.5)	60.3 (57.9-62.6)	54.3 (51.2-57.3)
Calendar Period	Females							
	ASOS (%)				ASRS (%)			
	1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr
1973-1977	42.4 (37.0-47.7)	29.3 (24.3-34.4)	24.5 (19.7-29.6)	16.4 (11.1-22.6)	44.7 (39.0-50.2)	33.5 (27.8-39.3)	30.5 (24.5-36.9)	27.9 (18.9-38.4)
1978-1982	47.9 (43.6-52.0)	29.6 (25.8-33.5)	22.8 (19.3-26.5)	17.8 (14.3-21.7)	50.5 (46.0-54.8)	34.4 (30.0-38.8)	28.7 (24.3-33.4)	29.5 (23.6-35.9)
1983-1987	57.9 (54.2-61.3)	37.5 (33.8-41.1)	31.2 (27.7-34.8)	24.5 (20.9-28.3)	60.4 (56.6-64.0)	41.9 (37.9-46.0)	37.6 (33.3-42.0)	36.9 (31.5-42.5)
1988-1992	67.9 (65.0-70.5)	49.5 (46.4-52.5)	39.1 (36.0-42.3)	29.5 (26.2-32.9)	70.5 (67.6-73.3)	55.5 (52.0-58.8)	47.5 (43.7-51.3)	43.6 (38.7-48.6)
1993-1997	69.9 (67.4-72.3)	53.0 (50.3-55.7)	43.5 (40.8-46.2)	32.3 (29.6-35.2)	72.7 (70.0-75.2)	59.3 (56.2-62.3)	52.9 (49.6-56.2)	50.1 (45.8-54.5)
1998-2002	70.8 (68.6-72.9)	52.6 (50.2-54.9)	43.3 (40.9-45.7)	31.9 (29.6-34.3)	72.9 (70.7-75.1)	57.3 (54.7-59.8)	50.3 (47.5-53.0)	44.1 (40.8-47.4)
2003-2007	76.4 (74.5-78.1)	58.1 (55.9-60.2)	48.5 (46.2-50.7)	37.9 (35.6-40.2)	78.7 (76.8-80.6)	63.6 (61.2-65.9)	56.5 (53.9-59.1)	53.5 (50.3-56.7)
2008-2012	78.2 (76.6-79.8)	61.3 (59.4-63.2)	51.9 (49.8-53.8)	40.3 (38.2-42.3)	80.3 (78.6-81.9)	66.1 (64.0-68.1)	59.2 (56.9-61.4)	54.7 (51.9-57.5)

ASOS: Age-standardised observed survival
ASRS: Age-standardised relative survival

Stage distribution of colon cancer by gender

Males

Stage/Period	2004-2006		2007-2009		2010-2012	
	Number	Percent*	Number	Percent*	Number	Percent*
I	147	10.27	251	14.01	304	15.03
II	448	31.31	537	29.98	611	30.20
III	504	35.22	613	34.23	629	31.09
IV	332	23.20	390	21.78	479	23.68

Females

Stage/Period	2004-2006		2007-2009		2010-2012	
	Number	Percent*	Number	Percent*	Number	Percent*
I	128	8.70	194	11.24	236	12.62
II	487	33.08	513	29.72	550	29.41
III	520	35.33	615	35.63	619	33.10
IV	337	22.89	404	23.41	465	24.87

*Based on cancer cases with known stage

Age-standardised observed survival and relative survival of colon cancer by calendar period, gender and stage

Males

Stage I

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	95.2 (91.0-97.5)	85.8 (79.5-90.3)	73.1 (64.0-80.3)	98.2 (93.8-100.5)	95.0 (88.0-99.9)	87.8 (76.9-96.4)
2010-2012	97.4 (94.3-98.8)	92.8 (88.5-95.6)	84.3 (78.1-88.8)	100.2 (97.0-101.7)	101.8 (97.0-104.8)	98.9 (91.7-104.2)

Stage II

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	91.6 (88.5-94.0)	82.9 (78.8-86.4)	74.8 (69.9-79.1)	94.8 (91.5-97.2)	91.9 (87.3-95.7)	88.8 (82.9-93.9)
2010-2012	93.3 (90.6-95.3)	82.0 (78.1-85.3)	71.0 (66.4-75.1)	96.4 (93.7-98.4)	90.6 (86.2-94.3)	84.6 (79.1-89.5)

Stage III

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	85.8 (82.4-88.7)	64.2 (59.5-68.5)	50.0 (44.8-54.9)	88.7 (85.1-91.6)	70.9 (65.7-75.7)	59.3 (53.2-65.1)
2010-2012	91.2 (88.3-93.5)	73.1 (68.9-76.9)	60.1 (55.4-64.5)	94.0 (90.9-96.3)	80.3 (75.6-84.4)	71.0 (65.4-76.1)

Stage IV

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	36.4 (31.4-41.4)	12.3 (9.0-16.1)	7.9 (5.1-11.4)	37.6 (32.5-42.8)	13.5 (9.9-17.6)	9.1 (5.9-13.2)
2010-2012	42.5 (37.6-47.3)	13.4 (10.1-17.3)	9.2 (6.3-12.8)	43.9 (38.8-48.8)	14.5 (10.9-18.7)	10.3 (7.1-14.4)

Females

Stage I

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	96.2 (91.6-98.3)	92.1 (86.1-95.6)	81.7 (72.6-88.1)	98.4 (93.6-100.5)	99.2 (92.7-102.9)	93.5 (83.1-100.7)
2010-2012	95.7 (91.3-97.8)	89.8 (84.2-93.5)	83.5 (76.6-88.5)	97.4 (93.0-99.6)	95.5 (89.5-99.4)	94.1 (86.3-99.7)

Stage II

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	93.2 (90.2-95.3)	84.5 (80.5-87.8)	74.7 (69.9-78.9)	95.5 (92.4-97.6)	91.0 (86.6-94.5)	84.8 (79.4-89.6)
2010-2012	94.7 (92.1-96.5)	87.1 (83.5-90.1)	79.0 (74.6-82.7)	96.7 (94.0-98.5)	93.1 (89.1-96.2)	89.2 (84.2-93.4)

Stage III

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	87.7 (84.3-90.3)	68.9 (64.3-73.0)	59.3 (54.2-63.9)	89.7 (86.2-92.4)	73.7 (68.8-78.1)	66.9 (61.2-72.1)
2010-2012	89.5 (86.3-91.9)	71.8 (67.5-75.5)	57.7 (53.0-62.0)	91.4 (88.2-94.0)	76.5 (72.0-80.5)	64.5 (59.3-69.4)

Stage IV

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	44.5 (39.1-49.7)	14.3 (10.6-18.4)	7.4 (4.7-10.9)	45.5 (40.0-50.9)	15.1 (11.3-19.5)	8.1 (5.1-12.0)
2010-2012	46.3 (41.2-51.2)	17.2 (13.5-21.3)	9.0 (6.2-12.3)	47.4 (42.2-52.4)	18.2 (14.2-22.5)	9.9 (6.9-13.7)

Rectum (ICD-9 154)

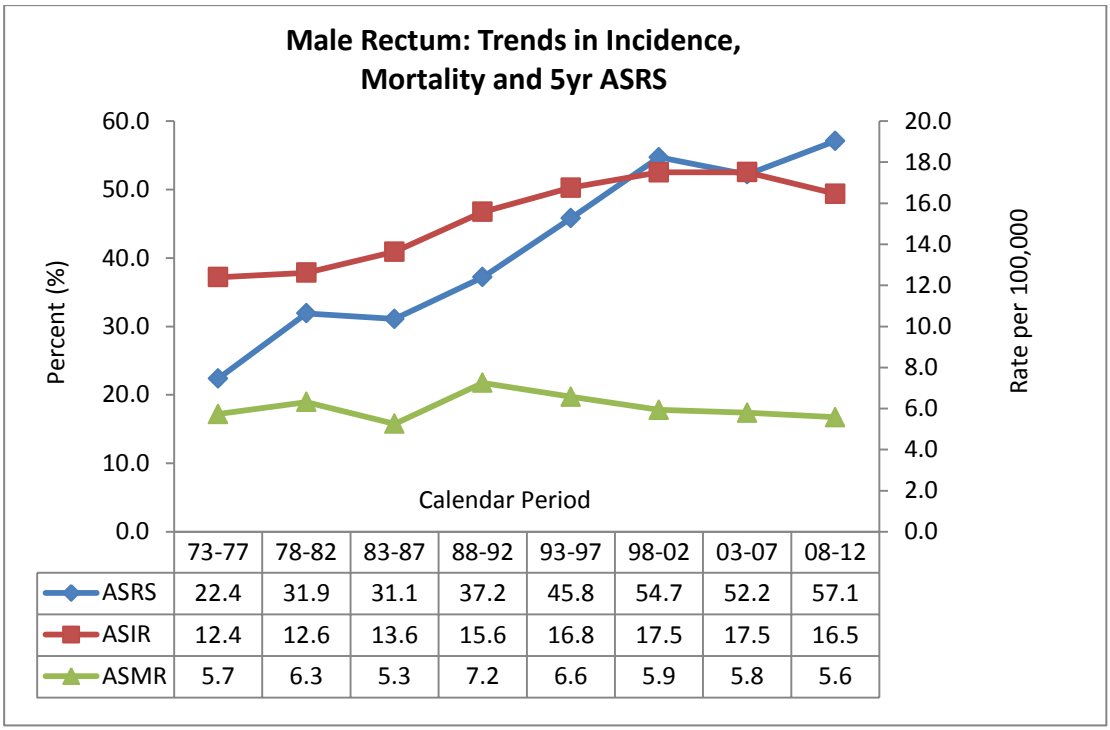
Similar to colon cancer, the 5-year ASRS has more than doubled among males and tripled among females. The proportion of cancers diagnosed at stage I had also increased by more than 3% between 2004 and 2009 in both genders. Among the countries compared, Singapore is leading in the relative survival of rectal cancer.

There were gender differences in the change of incidence of rectal cancer. The incidence in males had increased consistently over the study period, from 12.4 per 100,000 in 1973 – 1977 to 16.5 per 100,000 in 2008 – 2012 while the incidence in females, started to decline from 1993 – 1997 onwards. The mortality of rectal cancer for both genders remained fairly stable throughout the period of interest. No significant trend was observed for stage-specific ASRS.

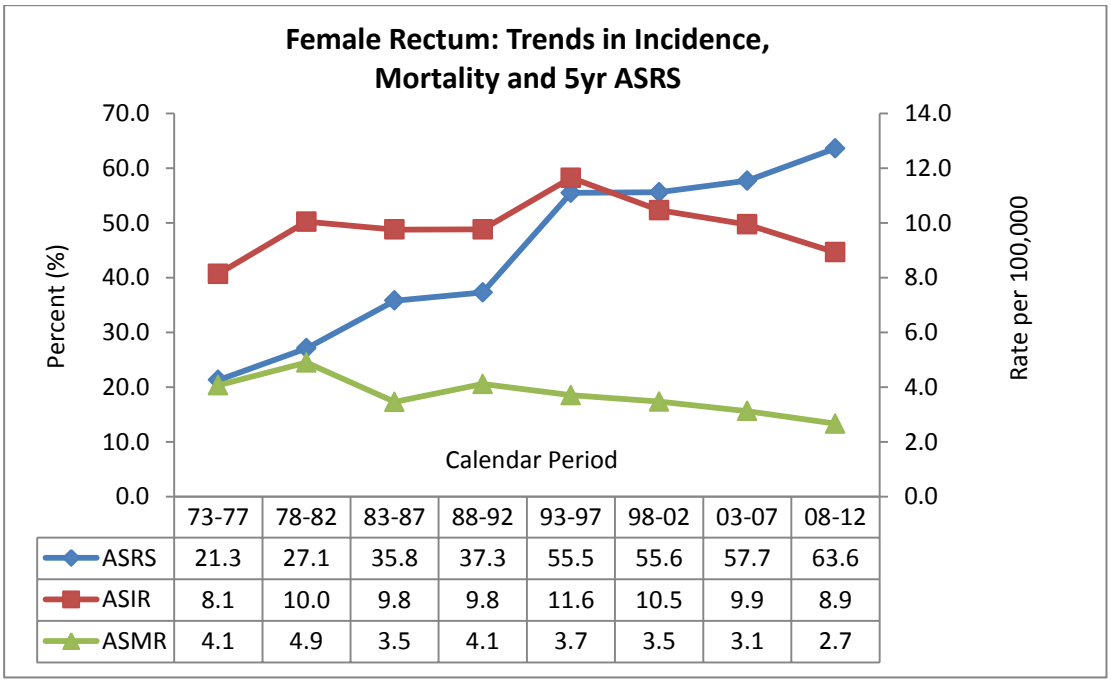
The treatment trends for colon cancer also apply to rectal cancer with the exception that neoadjuvant chemo-radiotherapy may be given to T3 and any node positive rectal cancer patients prior to surgery, whereas it is usually only given to stage III colon cancer patients.

A retrospective analysis of 658 patients from a single institution in Wuezerberg, Germany found that survival improvement can be attributed to improved surgery, adjuvant therapy and neoadjuvant chemotherapy, as well as new chemotherapeutic agents such as oxaliplatin and biological agents [60]. Total mesorectal excision has not only been shown to reduce local recurrence but could also improve 5 year survival rate. The Holm procedure for abdomino-rectal extirpation with extended resection margins has also improved outcomes. The resection of liver metastasis has also increased 5 year survival about 10-fold.

Resection of liver and pulmonary metastases, multimodal chemotherapy with targeted therapeutics and hyperthermic interaperitoneal chemotherapy (HIPEC) has been found to contribute significantly to survival of stage IV patients.

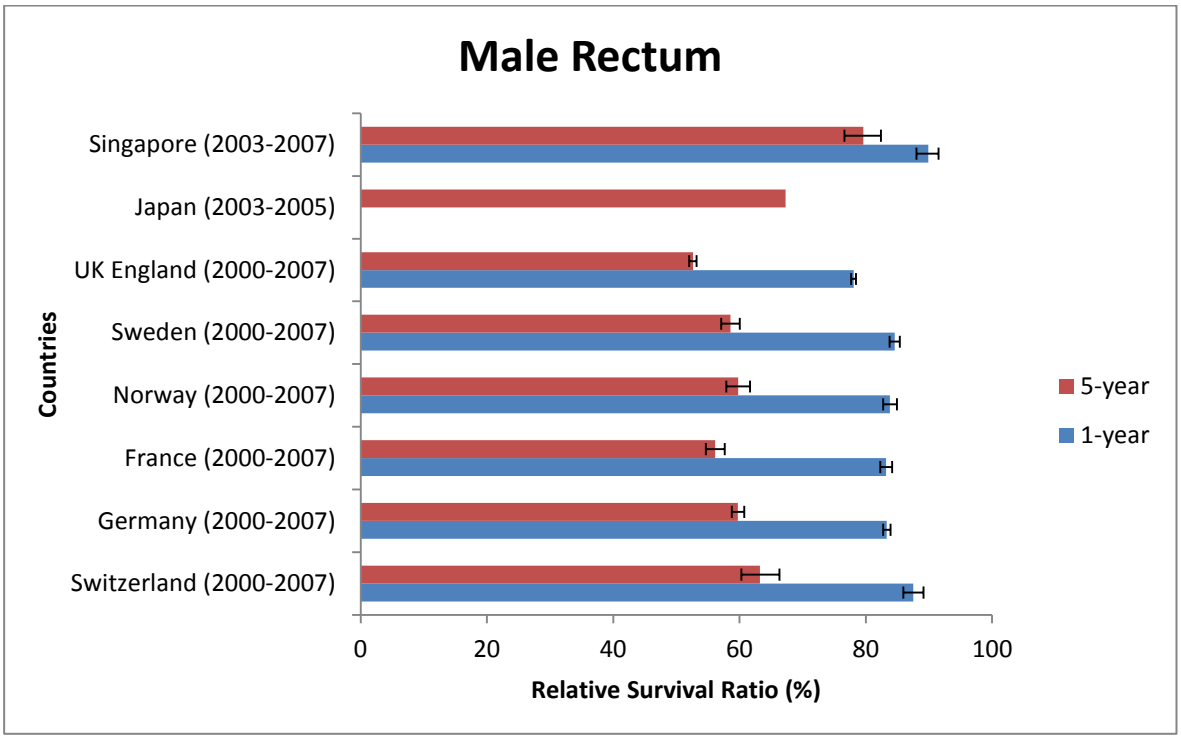


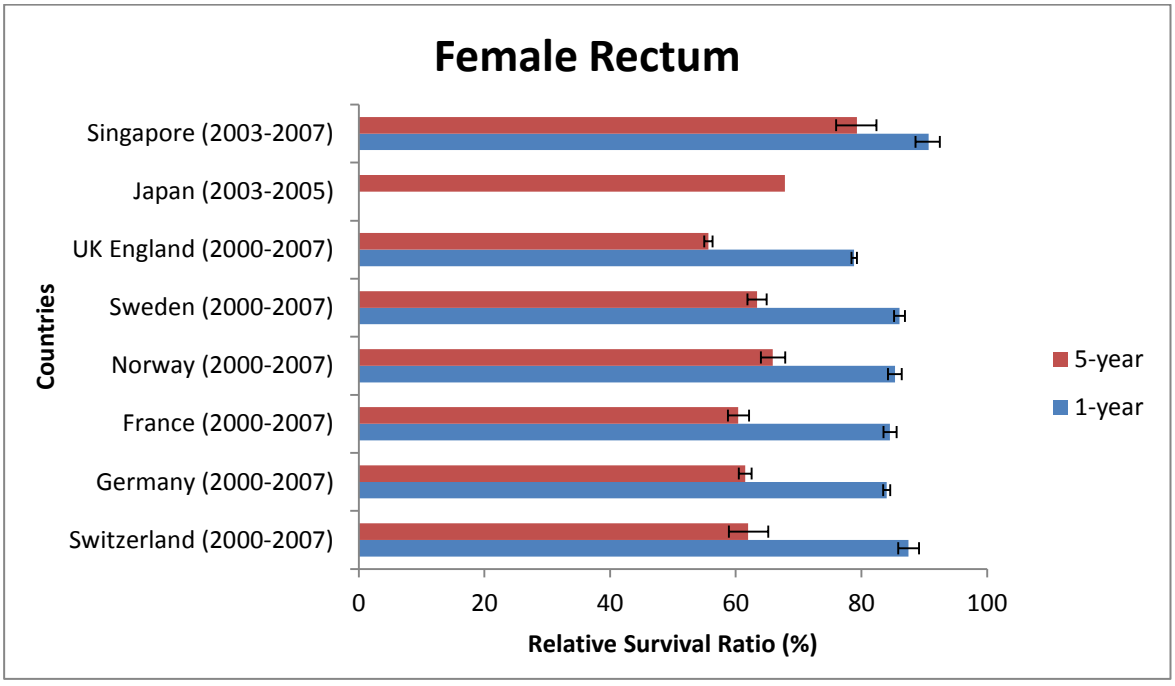
	73-77	78-82	83-87	88-92	93-97	98-02	03-07	08-12
ASRS	22.4	31.9	31.1	37.2	45.8	54.7	52.2	57.1
ASIR	12.4	12.6	13.6	15.6	16.8	17.5	17.5	16.5
ASMR	5.7	6.3	5.3	7.2	6.6	5.9	5.8	5.6



	73-77	78-82	83-87	88-92	93-97	98-02	03-07	08-12
ASRS	21.3	27.1	35.8	37.3	55.5	55.6	57.7	63.6
ASIR	8.1	10.0	9.8	9.8	11.6	10.5	9.9	8.9
ASMR	4.1	4.9	3.5	4.1	3.7	3.5	3.1	2.7

1- and 5-year age-standardised relative survival in selected countries





Age-standardised observed survival and relative survival of rectal cancer by calendar period and gender

Calendar Period	Males							
	ASOS (%)				ASRS (%)			
	1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr
1973-1977	43.7 (38.4-48.9)	21.8 (17.3-26.6)	14.9 (10.8-19.5)	10.9 (7.0-15.7)	47.1 (41.4-52.7)	26.9 (21.3-32.8)	22.4 (16.3-29.4)	27.4 (17.6-39.6)
1978-1982	59.4 (54.7-63.8)	31.4 (27.0-35.9)	22.9 (18.8-27.3)	12.7 (8.8-17.3)	63.3 (58.3-68.0)	38.2 (32.8-43.6)	31.9 (26.2-37.9)	25.8 (17.9-35.1)
1983-1987	61.1 (57.0-65.0)	35.3 (31.3-39.3)	22.9 (19.4-26.7)	13.0 (10.0-16.4)	64.8 (60.5-68.9)	41.8 (37.0-46.6)	31.1 (26.3-36.2)	25.6 (19.6-32.3)
1988-1992	67.6 (64.2-70.7)	39.0 (35.5-42.5)	28.2 (24.9-31.6)	18.3 (15.1-21.7)	71.4 (67.9-74.6)	45.8 (41.7-49.9)	37.2 (32.8-41.6)	33.7 (27.8-40.0)
1993-1997	67.6 (64.7-70.3)	45.4 (42.4-48.4)	34.0 (31.0-37.0)	21.7 (18.9-24.8)	71.8 (68.8-74.7)	53.9 (50.4-57.5)	45.8 (41.8-49.8)	41.0 (35.6-46.7)
1998-2002	75.0 (72.7-77.2)	53.4 (50.6-56.0)	43.1 (40.3-45.8)	28.3 (25.5-31.2)	78.7 (76.3-81.0)	61.2 (58.1-64.3)	54.7 (51.1-58.1)	48.3 (43.5-53.2)
2003-2007	75.4 (73.3-77.3)	53.6 (51.2-56.0)	42.6 (40.2-45.0)	30.9 (28.6-33.4)	78.5 (76.3-80.5)	60.5 (57.8-63.1)	52.2 (49.2-55.1)	48.4 (44.7-52.2)
2008-2012	79.9 (78.1-81.6)	58.6 (56.4-60.8)	47.7 (45.5-50.0)	34.7 (32.4-36.9)	82.7 (80.8-84.4)	65.0 (62.5-67.3)	57.1 (54.3-59.7)	52.3 (48.9-55.7)
Calendar Period	Females							
	ASOS (%)				ASRS (%)			
	1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr
1973-1977	44.9 (38.7-51.0)	20.8 (15.9-26.2)	16.7 (12.2-21.9)	13.4 (9.2-18.5)	47.3 (40.7-53.7)	24.1 (18.4-30.4)	21.3 (15.5-27.8)	23.7 (16.2-32.6)
1978-1982	57.8 (52.7-62.4)	31.6 (26.8-36.5)	21.3 (16.9-26.1)	13.3 (9.3-18.1)	60.8 (55.5-65.7)	36.6 (31.1-42.2)	27.1 (21.4-33.1)	21.7 (15.1-29.4)
1983-1987	65.3 (60.9-69.4)	38.6 (34.1-43.1)	29.0 (24.8-33.4)	17.3 (13.3-21.8)	68.4 (63.7-72.6)	43.8 (38.7-48.9)	35.8 (30.6-41.1)	26.7 (20.5-33.7)
1988-1992	69.6 (65.6-73.1)	43.2 (39.1-47.2)	30.7 (26.8-34.6)	21.1 (17.5-24.9)	72.3 (68.3-76.1)	48.4 (43.8-52.9)	37.3 (32.6-42.1)	32.0 (26.5-37.8)
1993-1997	73.9 (70.8-76.8)	55.8 (52.3-59.2)	46.3 (42.6-49.9)	32.0 (27.9-36.1)	76.6 (73.4-79.6)	62.2 (58.2-66.0)	55.5 (51.1-59.9)	48.8 (42.6-552)
1998-2002	76.2 (73.4-78.8)	57.6 (54.4-60.6)	47.9 (44.6-51.0)	33.9 (30.6-37.2)	78.5 (75.6-81.1)	62.8 (59.3-66.1)	55.6 (51.9-59.3)	46.8 (42.2-51.3)
2003-2007	78.6 (76.0-80.9)	58.8 (55.8-61.7)	49.8 (46.8-52.7)	39.2 (36.2-42.2)	80.8 (78.2-83.2)	64.0 (60.8-67.1)	57.7 (54.2-61.1)	55.4 (51.1-59.6)
2008-2012	81.4 (79.1-83.4)	63.1 (60.4-65.7)	55.8 (53.0-58.5)	43.6 (40.7-46.5)	83.6 (81.3-85.7)	68.2 (65.3-71.1)	63.6 (60.4-66.7)	58.8 (54.8-62.7)

ASOS: Age-standardised observed survival
ASRS: Age-standardised relative survival

Stage distribution of rectal cancer by gender

Males

Stage/Period	2004-2006		2007-2009		2010-2012	
	Number	Percent*	Number	Percent*	Number	Percent*
I	139	12.38	190	14.87	274	15.03
II	299	26.63	322	25.20	332	30.20
III	449	39.98	498	38.97	525	31.09
IV	236	21.02	268	20.97	297	23.68

Females

Stage/Period	2004-2006		2007-2009		2010-2012	
	Number	Percent*	Number	Percent*	Number	Percent*
I	111	15.77	156	19.12	172	12.62
II	184	26.14	170	20.83	182	29.41
III	287	40.77	338	41.42	353	33.10
IV	122	17.33	152	18.63	200	24.87

*Based on cancer cases with known stage

Age-standardised observed survival and relative survival of rectal cancer by calendar period, gender and stage

Males

Stage I

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	94.3 (88.9-97.1)	85.9 (78.5-90.9)	82.0 (73.7-87.8)	97.6 (91.9-100.5)	95.5 (87.2-101.0)	98.4 (88.5-105.4)
2010-2012	96.3 (92.6-98.1)	91.4 (86.2-94.7)	87.0 (80.6-91.3)	99.2 (95.5-101.2)	100.8 (95.1-104.4)	104.0 (96.4-109.2)

Stage II

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	88.4 (83.7-91.8)	71.7 (65.5-77.0)	62.2 (55.6-68.1)	91.4 (86.6-94.9)	79.8 (73.0-85.7)	74.4 (66.5-81.4)
2010-2012	90.4 (86.1-93.5)	75.8 (70.1-80.6)	62.9 (56.4-68.6)	93.3 (88.8-96.4)	83.3 (77.0-88.6)	74.2 (66.6-80.9)

Stage III

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	86.3 (82.4-89.3)	61.8 (56.7-66.5)	43.7 (38.3-48.9)	88.9 (84.9-92.1)	67.8 (62.2-73.0)	51.6 (45.2-57.7)
2010-2012	87.4 (83.7-90.3)	60.5 (55.5-65.2)	45.2 (40.1-50.1)	89.9 (86.1-92.9)	66.0 (60.5-71.1)	52.4 (46.6-58.1)

Stage IV

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	50.4 (43.8-56.6)	12.5 (8.2-17.7)	6.3 (3.4-10.6)	51.9 (45.2-58.3)	13.6 (9.0-19.3)	7.4 (4.0-12.4)
2010-2012	52.3 (45.8-58.4)	18.5 (13.7-23.8)	10.5 (6.4-15.7)	53.9 (47.1-60.2)	20.0 (14.8-25.8)	11.8 (7.2-17.8)

Females

Stage I

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	94.9 (89.1-97.6)	89.9 (82.6-94.3)	81.3 (71.3-88.2)	96.9 (91.0-99.7)	96.4 (88.5-101.0)	92.4 (81.0-100.2)
2010-2012	98.2 (93.6-99.5)	95.4 (90.1-97.9)	91.7 (85.0-95.4)	100.0 (95.3-101.4)	101.6 (95.9-104.2)	103.3 (95.8-107.5)

Stage II

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	95.3 (89.9-97.9)	81.9 (74.2-87.5)	67.4 (58.6-74.7)	97.7 (92.2-100.3)	88.5 (80.1-94.5)	76.6 (66.6-84.9)
2010-2012	96.1 (91.0-98.3)	80.9 (73.2-86.6)	75.2 (66.9-81.6)	98.4 (93.2-100.6)	86.8 (78.5-92.9)	85.2 (75.9-92.5)

Stage III

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	89.1 (84.6-92.3)	62.2 (55.8-68.0)	53.8 47.1-60.1)	91.0 (86.5-94.3)	66.5 (59.6-72.7)	60.3 (52.8-67.3)
2010-2012	91.6 (87.6-94.4)	75.3 (69.7-80.0)	64.5 (58.3-70.1)	93.8 (89.6-96.6)	80.5 (74.5-85.6)	71.9 (64.9-78.1)

Stage IV

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	46.9 (38.0-55.2)	15.3 (9.4-22.6)	9.9 (5.1-16.5)	48.2 (39.1-56.7)	16.4 (10.0-24.2)	11.0 (5.7-18.3)
2010-2012	50.0 (42.3-57.2)	18.4 (12.4-25.4)	14.3 (8.8-21.1)	51.3 (43.4-58.7)	19.7 (13.2-27.1)	15.9 (9.8-23.4)

Liver (ICD-9 155)

Between 1973 and 2012, the incidence of liver cancer in Singapore declined steadily. The incidence in males dropped from 27.4 per 100,000 in 1973 – 1977 to 17.2 per 100,000 in 2008 – 2012 while the incidence in females decreased from 6.9 per 100,000 in 1973 – 1977 to 4.8 per 100,000 in 2008 – 2012. The time trends of mortality followed that of incidence very closely in both genders and this reflects the poor prognosis of liver cancer where patients typically succumb to the disease in months after diagnosis if treatment is not possible.

There has been a dramatic rise in survival since 1993 – 1997 and 5-year ASRS of liver cancer is now greater than 20%. Internationally, our 5-year relative survival for liver cancers is now second only to Japan. This increased survival is due to a combination of higher resection rates, increased therapeutic options and earlier detection from screening.

Chronic hepatitis B infection is an important risk factor for hepatocellular carcinoma in Singapore. [61, 62] In order to prevent and control hepatitis B in Singapore, hepatitis B vaccination was introduced as an integral part of National Childhood Immunisation Programme in 1987. [63] As a result, the incidence rate of acute hepatitis B decreased from 9.5 per 100,000 population in 1985 to 1.7 per 100,000 population in 2007. [64] The herd immunity (anti-HBs >10mIU/mL) induced by the immunisation programme was 90% in children below 5 years of age in 1999. The 'catch-up' hepatitis B immunization programme implemented from 2001 to 2004 significantly raised the herd immunity of young adults aged 18 to 29 years from 27.9% in 1998 to 41.7% in 2004 ($p < 0.001$).

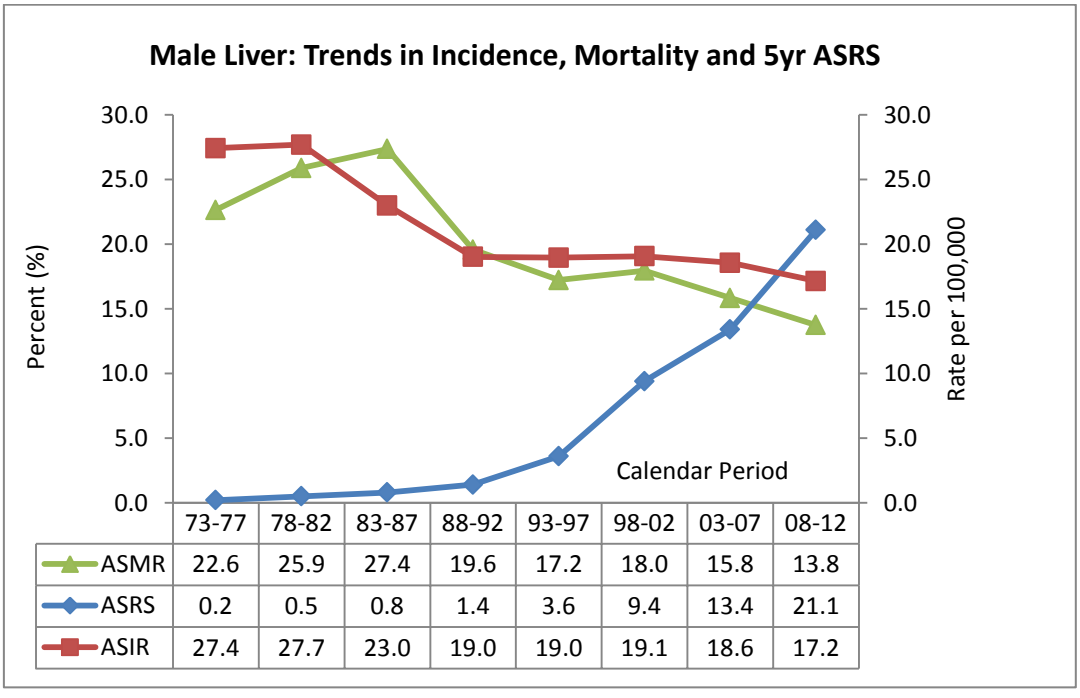
HCC surveillance among HBV patients is supported by a large randomized control trial. Among patients with liver cirrhosis, a meta-analysis including 47 cohort and case-control studies conducted between 1990 and 2014 found that 41.4% of them had HCC detected by surveillance. HCC surveillance was associated with improved early stage detection, curative treatment rates and significantly prolonged survival (OR 1.90, 95% CI 1.67 – 2.17).[65] Similarly, a retrospective study on 1,131 local patients with chronic liver disease seen at the Singapore General Hospital between

1988 – 2009 found that those on surveillance had significantly higher median overall survival (36.5 months) compared to those that were not (8.5 months). [66] Furthermore, there has been a more than 2-fold and nearly 3-fold increase in proportion of liver cancer patients with stage I disease among males and females, respectively, from 2004 – 2006 to 2010 – 2012, signifying earlier detection.

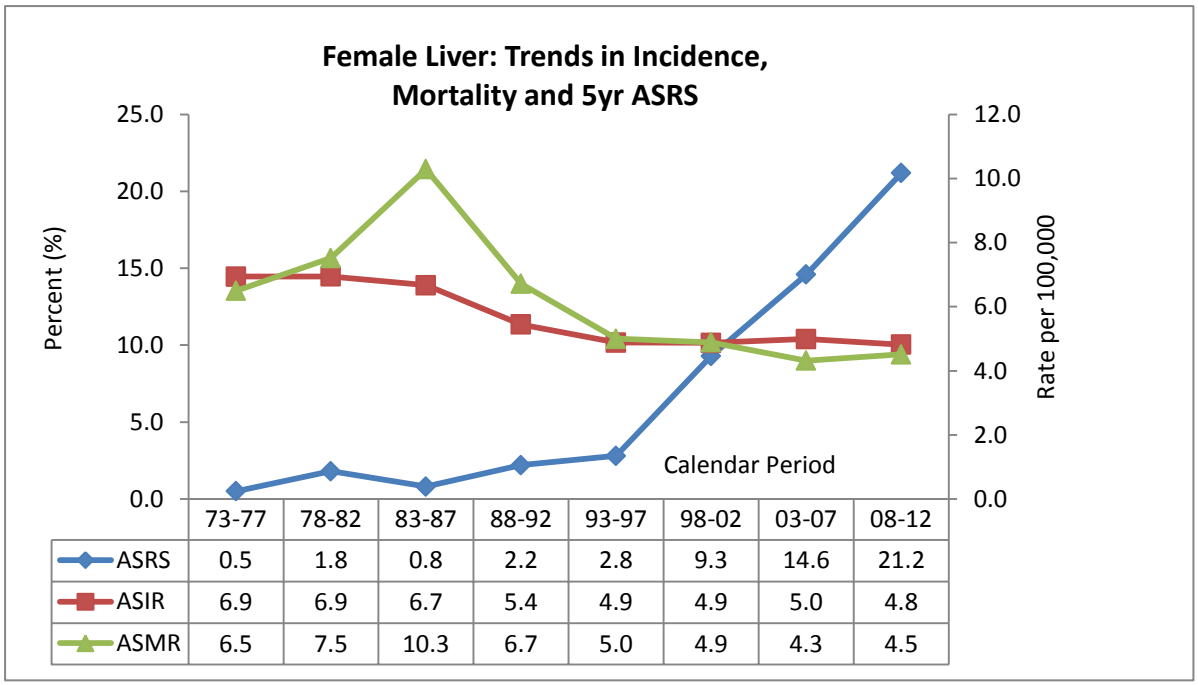
Liver cancer patients who are not eligible for surgical resection or liver transplant now have the choices of locoregional ablation (including radiofrequency ablation that may be curative in some patients, cryotherapy, and microwave ablation), transarterial chemoembolization or radioembolization. Recently, the multikinase inhibitor sorafenib has been validated to treat patients with advanced liver cancer, for whom no therapy was previously available. [67-69]

However, the survival benefit conferred by sorafenib seems modest. In a phase III clinical trial conducted in the Asia Pacific region, median overall survival in patients treated with sorafenib improved from 4 months to just 6.5 months compared to placebo. [70]

Finally, there are numerous promising ongoing clinical trials in liver cancer including trials testing immune checkpoint inhibitors.

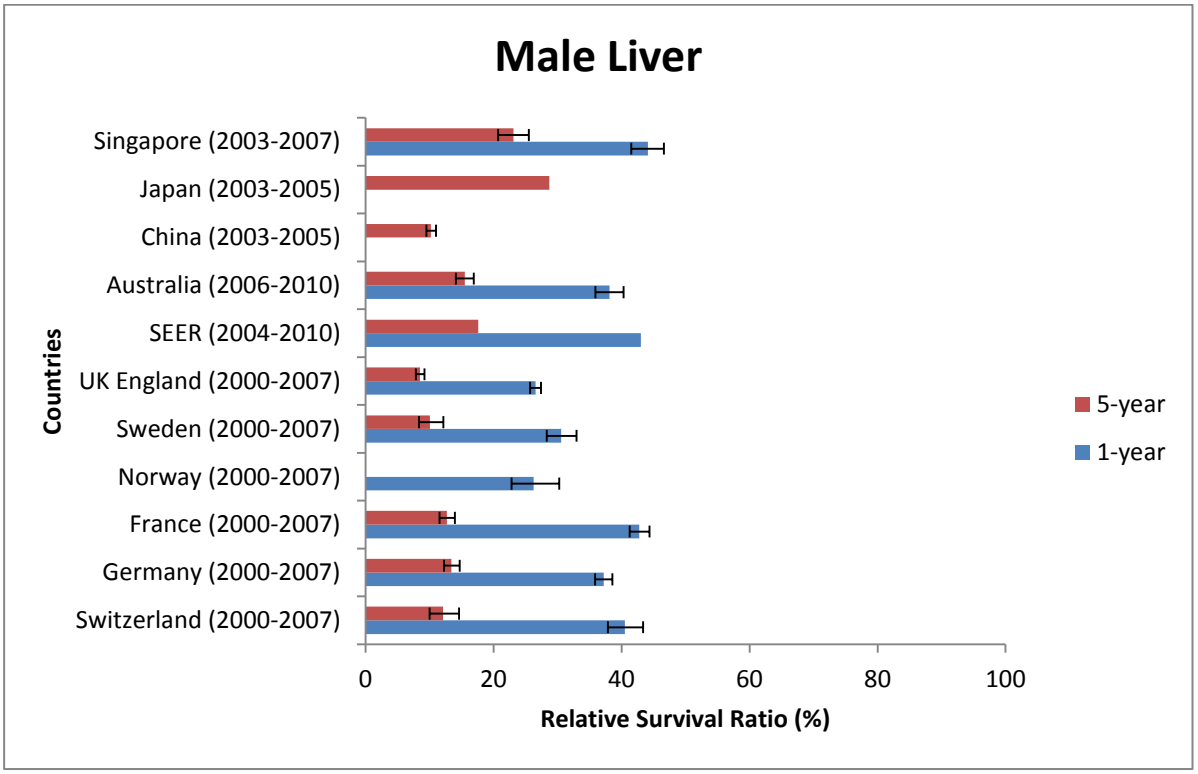


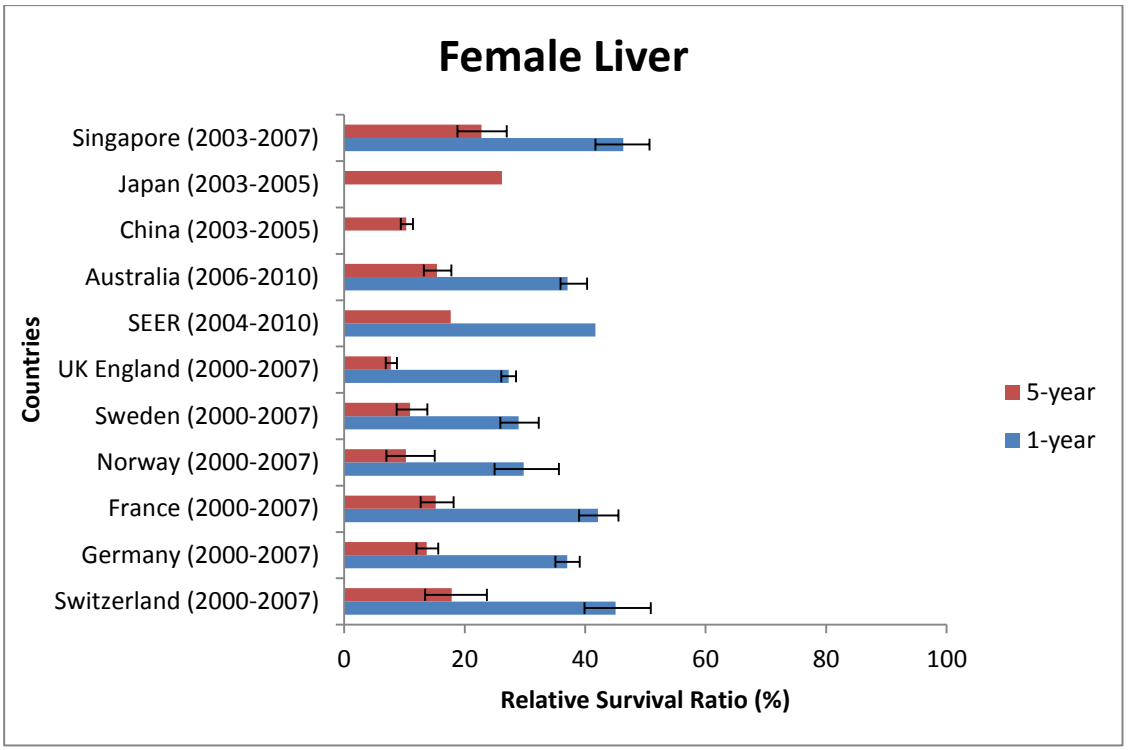
	73-77	78-82	83-87	88-92	93-97	98-02	03-07	08-12
ASMR	22.6	25.9	27.4	19.6	17.2	18.0	15.8	13.8
ASRS	0.2	0.5	0.8	1.4	3.6	9.4	13.4	21.1
ASIR	27.4	27.7	23.0	19.0	19.0	19.1	18.6	17.2



	73-77	78-82	83-87	88-92	93-97	98-02	03-07	08-12
ASRS	0.5	1.8	0.8	2.2	2.8	9.3	14.6	21.2
ASIR	6.9	6.9	6.7	5.4	4.9	4.9	5.0	4.8
ASMR	6.5	7.5	10.3	6.7	5.0	4.9	4.3	4.5

1- and 5-year age-standardised relative survival in selected countries




Female Liver
Singapore (2003-2007)
Japan (2003-2005)
China (2003-2005)
Australia (2006-2010)
SEER (2004-2010)
UK England (2000-2007)
Sweden (2000-2007)
Norway (2000-2007)
France (2000-2007)
Germany (2000-2007)
Switzerland (2000-2007)
Countries
0
20
40
60
80
100
Relative Survival Ratio (%)
5-year
1-year

Age-standardised observed survival and relative survival of liver cancer by calendar period and gender

Calendar Period	Males							
	ASOS (%)				ASRS (%)			
	1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr
1973-1977	0.5 (0.4-0.8)	0.3 (0.1-0.4)	0.2 (0.1-0.3)	0.0 (0.0-1.8)	0.6 (0.4-0.9)	0.3 (0.2-0.5)	0.2 (0.1-0.4)	0.0 (0.0-3.0)
1978-1982	1.7 (1.3-2.3)	0.6 (0.4-0.9)	0.4 (0.2-0.7)	0.2 (0.1-0.5)	1.8 (1.4-2.4)	0.7 (0.4-1.1)	0.5 (0.3-1.0)	0.4 (0.2-0.8)
1983-1987	3.1 (2.3-4.0)	1.1 (0.7-1.6)	0.5 (0.3-0.9)	0.2 (0.1-0.6)	3.2 (2.5-4.2)	1.2 (0.8-1.9)	0.8 (0.4-1.3)	0.5 (0.1-1.2)
1988-1992	8.1 (6.5-10.0)	2.0 (1.3-3.0)	1.0 (0.6-1.8)	0.3 (0.1-0.7)	8.6 (6.9-10.5)	2.3 (1.5-3.4)	1.4 (0.7-2.3)	0.5 (0.2-1.2)
1993-1997	11.5 (10.0-13.3)	4.2 (3.1-5.4)	3.0 (2.1-4.2)	1.4 (0.6-2.7)	12.1 (10.5-13.9)	4.8 (3.6-6.2)	3.6 (2.5-5.0)	1.9 (0.9-3.6)
1998-2002	21.9 (19.9-24.0)	11.2 (9.7-12.8)	7.7 (6.4-9.1)	5.6 (4.3-7.2)	22.9 (20.7-25.1)	12.6 (10.9-14.4)	9.4 (7.8-11.1)	8.1 (6.2-10.4)
2003-2007	31.9 (29.6-34.1)	17.1 (15.3-19.0)	11.4 (9.8-13.1)	7.9 (6.5-9.5)	33.0 (30.7-35.3)	18.8 (16.9-20.9)	13.4 (11.5-15.3)	11.3 (9.3-13.5)
2008-2012	43.5 (41.3-45.7)	25.7 (23.8-27.7)	18.2 (16.4-20.0)	10.9 (9.3-12.7)	44.9 (42.6-47.2)	28.2 (26.1-30.4)	21.1 (19.1-23.3)	14.8 (12.6-17.1)
Calendar Period	Females							
	ASOS (%)				ASRS (%)			
	1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr
1973-1977	1.3 (0.6-2.3)	0.8 (0.3-1.5)	0.5 (0.2-1.1)	-	1.3 (0.7-2.4)	0.8 (0.4-1.7)	0.5 (0.2-1.2)	-
1978-1982	3.8 (2.2-5.9)	2.0 (1.0-3.6)	1.6 (0.8-3.0)	0.5 (0.1-1.7)	3.9 (2.3-6.2)	2.2 (1.1-3.9)	1.8 (0.9-3.4)	0.7 (0.2-2.2)
1983-1987	2.4 (1.4-3.9)	0.8 (0.3-1.6)	0.7 (0.3-1.5)	0.4 (0.1-1.0)	2.5 (1.5-4.1)	0.9 (0.4-1.8)	0.8 (0.3-1.7)	0.5 (0.2-1.2)
1988-1992	7.6 (5.0-10.9)	1.9 (0.7-4.3)	1.9 (0.7-4.3)	1.6 (0.5-3.8)	7.9 (5.2-11.3)	2.1 (0.7-4.8)	2.2 (0.8-5.0)	2.2 (0.7-5.2)
1993-1997	9.8 (7.3-12.8)	4.2 (2.6-6.5)	2.4 (1.1-4.4)	1.7 (0.6-4.0)	10.2 (7.6-13.3)	4.7 (2.9-7.3)	2.8 (1.3-5.2)	2.2 (0.7-5.2)
1998-2002	23.2 (19.3-27.3)	11.0 (8.3-14.2)	8.5 (6.0-11.5)	2.6 (0.9-6.1)	23.8 (19.9-28.0)	11.7 (8.8-15.1)	9.3 (6.6-12.7)	3.2 (1.0-7.5)
2003-2007	34.0 (29.9-38.1)	18.5 (15.2-22.0)	13.2 (10.3-16.6)	10.0 (7.2-13.4)	34.9 (30.7-39.1)	19.7 (16.2-23.4)	14.6 (11.4-18.3)	12.2 (8.8-16.4)
2008-2012	44.4 (40.4-48.3)	25.7 (22.3-29.2)	19.3 (16.1-22.7)	10.9 (8.1-14.2)	45.5 (41.4-49.5)	27.3 (23.7-31.0)	21.2 (17.8-24.9)	13.1 (9.7-17.1)

ASOS: Age-standardised observed survival
ASRS: Age-standardised relative survival
-: the estimates were not computed due to the absence of cases in one or more age groups.

Stage distribution of liver cancer by gender

Males

Stage/Period	2004-2006		2007-2009		2010-2012	
	Number	*Percent	Number	Percent*	Number	Percent*
I	45	11.25	130	19.52	288	24.18
II	46	11.50	108	16.22	253	21.24
III	120	30.00	234	35.14	356	29.89
IV	189	47.25	194	29.13	294	24.69

Females

Stage/Period	2004-2006		2007-2009		2010-2012	
	Number	*Percent	Number	Percent*	Number	Percent*
I	9	9.89	37	18.78	90	25.14
II	7	7.69	30	15.23	60	16.76
III	24	26.37	65	32.99	97	27.09
IV	51	56.04	65	32.99	111	31.01

*Based on cancer cases with known stage

Lung (ICD-9 162)

Lung cancer is one of the most frequent cancers in Singapore. The incidence of lung cancer was ranked second highest among all cancers in males and third highest in females in 2008 – 2012.[71] Thus, it is noteworthy that during the study period, the incidence of lung cancer declined from 58.0 per 100,000 in 1973 – 1977 to 35.3 per 100,000 in 2008 – 2012 among males, and from 18.5 per 100,000 in 1973 – 1977 to 15.3 per 100,000 in 2008 – 2012 among females.

The mortality of lung cancer in each period was very close to that of the incidence across the entire period, suggesting that case fatality was very high for this condition. The modest improvement in survival of lung cancer patients over the last three decades should not distract us from the overall poor survival of this condition. The 5-year ASRS stood at 11% for males in the most recent period in this study, i.e. 2008 – 2012, the poorest survival in the analysis. Internationally, apart from the 1-year ASRS for females, the relative survival for lung cancers in Singapore was lower than most countries and only higher than UK.

The population attributable risk of smoking for lung cancer was found to be 75% in a Chinese study. [72] In other words, it is the fraction of total disease burden in a population that would not have occurred if the effects of smoking were eliminated. Efforts at smoking cessation and prevention of smoking initiation in the population would help to bring down the lung cancer rates.

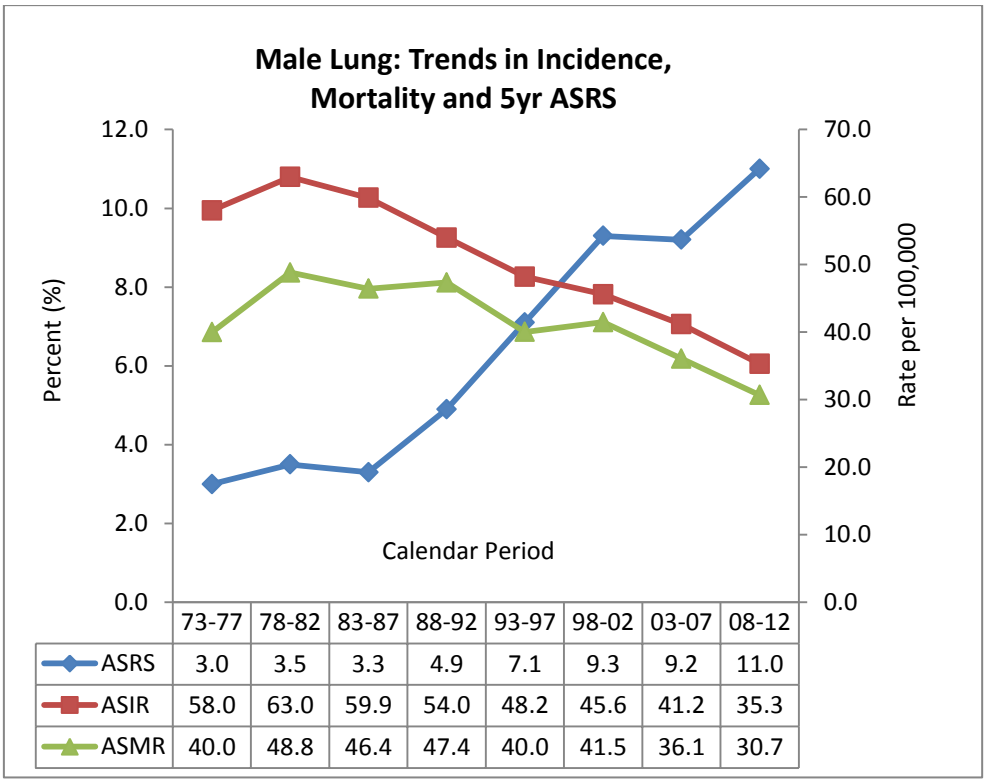
Close to 90% of all lung cancer cases in Singapore are non-small cell lung cancer (NSCLC) and most cases are diagnosed at advanced stage. Additionally, it has been estimated that less than 30% of patients with advanced-stage NSCLC have a response to platinum-based chemotherapy, the current treatment standard. [73]

A study based on lung cancer cases diagnosed among SEER registries in the US between 1977 and 1987 found that survival was lowest among cases of stage I and II small cell lung cancer (SCC) while for stages III and IV there was no significant difference by histology type. [74] The percentage of SCC in the Singapore registry has

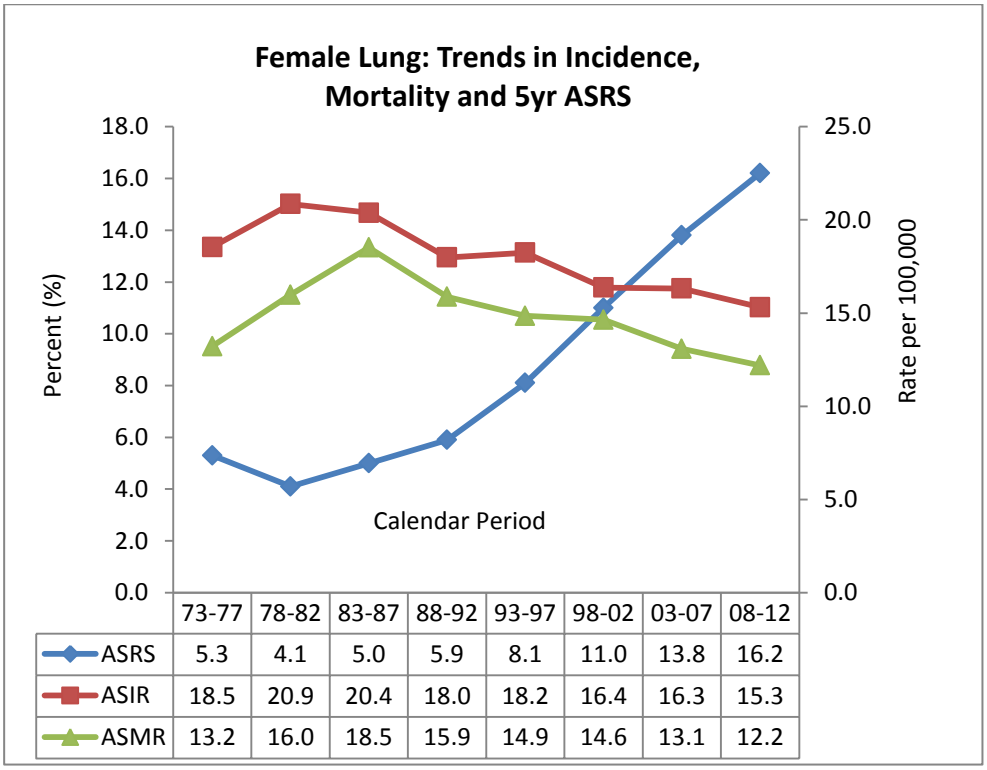
decreased from 10.7% in 1998 – 2002 to 8.1% in 2008 – 2012 and probably contributed to improvements in survival.

Docetaxel is the first drug approved as a second-line treatment for advanced NSCLC. Pemetrexed is a multi-targeted inhibitor of three key enzymes in the folate metabolic pathway, which is responsible for DNA synthesis and repair. It was previously approved for advanced non-squamous NSCLC but the US Food and Drug Administration has recently approved it as a second-line treatment for advanced NSCLC. [75] Of six phase II trials investigating the use of pemetrexed with radiation therapy among patients with stage III NSCLC, median overall survival ranged from 18.7 to 34 months. Esophagitis and pneumonitis occurred in less than 17% and 23% of patients, respectively. [76]

There was a decrease in proportion of stage III lung cancers and a corresponding increase in stage IV lung cancers from 2007 – 2009 to 2010 – 2012. The update in AJCC staging classification for non-small cell lung cancer has seen upstaging (for broad stage grouping) in 7 TNM (Tumour, Node, Metastasis) subsets and downstaging in 5 TNM subsets. [77] As expected, this resulted in a significant increase in the ASRS of stage III lung cancer among both males and females.

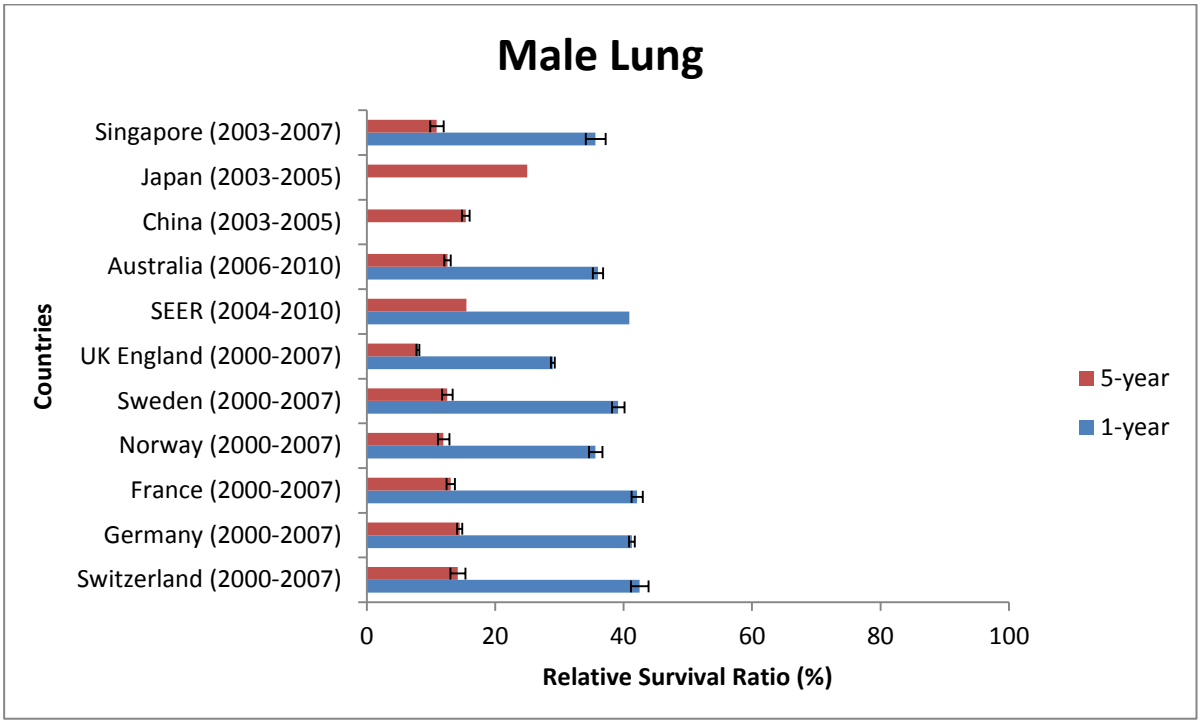


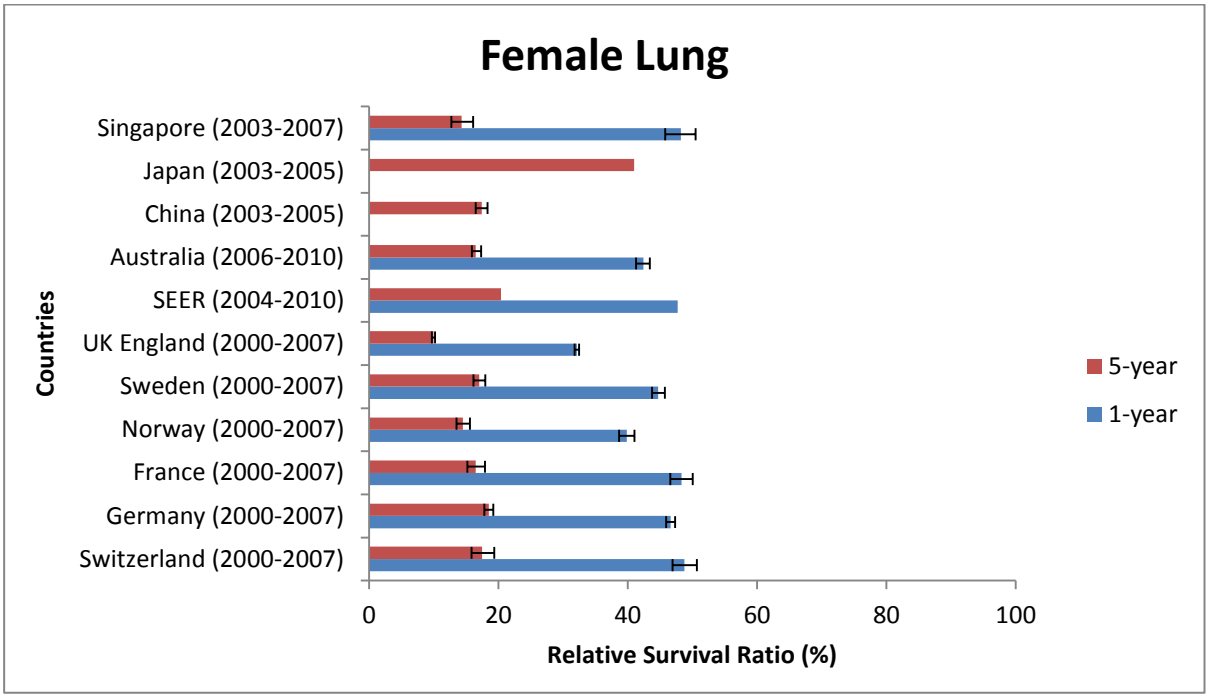
	73-77	78-82	83-87	88-92	93-97	98-02	03-07	08-12
ASRS	3.0	3.5	3.3	4.9	7.1	9.3	9.2	11.0
ASIR	58.0	63.0	59.9	54.0	48.2	45.6	41.2	35.3
ASMR	40.0	48.8	46.4	47.4	40.0	41.5	36.1	30.7



	73-77	78-82	83-87	88-92	93-97	98-02	03-07	08-12
ASRS	5.3	4.1	5.0	5.9	8.1	11.0	13.8	16.2
ASIR	18.5	20.9	20.4	18.0	18.2	16.4	16.3	15.3
ASMR	13.2	16.0	18.5	15.9	14.9	14.6	13.1	12.2

1- and 5-year age-standardised relative survival in selected countries





Age-standardised observed survival and relative survival of lung cancer by calendar period and gender

Calendar Period	Males							
	ASOS (%)				ASRS (%)			
	1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr
1973-1977	11.8 (10.4-13.2)	3.1 (2.4-3.9)	2.1 (1.6-2.9)	1.7 (1.2-2.5)	12.6 (11.2-14.1)	3.8 (3.0-4.8)	3.0 (2.1-4.0)	3.5 (2.4-4.9)
1978-1982	13.1 (11.9-14.5)	4.1 (3.4-5.0)	2.7 (2.1-3.4)	1.4 (0.9-2.0)	14.0 (12.6-15.4)	4.9 (4.0-5.8)	3.5 (2.7-4.4)	2.3 (1.5-3.4)
1983-1987	15.6 (14.4-17.0)	3.9 (3.3-4.6)	2.7 (2.1-3.3)	1.7 (1.3-2.3)	16.6 (15.2-18.0)	4.5 (3.8-5.4)	3.3 (2.7-4.1)	2.6 (2.0-3.5)
1988-1992	17.5 (16.2-18.9)	5.8 (5.0-6.6)	3.9 (3.3-4.7)	2.4 (1.8-3.1)	18.6 (17.2-20.0)	6.6 (5.7-7.6)	4.9 (4.0-5.8)	3.7 (2.9-4.8)
1993-1997	25.8 (24.3-27.3)	8.6 (7.6-9.7)	5.6 (4.8-6.5)	3.5 (2.8-4.2)	27.2 (25.6-28.8)	9.9 (8.8-11.2)	7.1 (6.0-8.2)	5.4 (4.3-6.6)
1998-2002	27.5 (26.1-28.9)	10.5 (9.6-11.5)	7.6 (6.8-8.5)	4.7 (3.9-5.5)	28.8 (27.3-30.3)	11.8 (10.8-12.9)	9.3 (8.4-10.4)	7.2 (6.1-8.5)
2003-2007	31.0 (29.6-32.5)	11.7 (10.7-12.8)	7.9 (7.1-8.8)	5.3 (4.6-6.0)	32.2 (30.7-33.7)	12.9 (11.8-14.0)	9.2 (8.2-10.3)	7.5 (6.6-8.6)
2008-2012	35.0 (33.6-36.5)	13.9 (12.9-15.0)	9.7 (8.8-10.6)	6.1 (5.3-6.9)	36.2 (34.7-37.7)	15.1 (14.0-16.3)	11.0 (10.0-12.1)	8.0 (7.0-9.1)
Calendar Period	Females							
	ASOS (%)				ASRS (%)			
	1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr
1973-1977	13.6 (11.2-16.3)	5.2 (3.7-7.0)	4.4 (3.0-6.1)	3.2 (2.0-4.9)	14.3 (11.7-17.0)	5.9 (4.2-8.0)	5.3 (3.6-7.4)	4.6 (2.8-7.1)
1978-1982	14.9 (12.7-17.2)	5.0 (3.7-6.6)	3.2 (2.1-4.5)	1.7 (1.0-2.8)	15.7 (13.3-18.2)	5.8 (4.3-7.6)	4.1 (2.7-5.8)	2.7 (1.5-4.4)
1983-1987	16.7 (14.5-18.9)	6.1 (4.7-7.7)	4.2 (3.1-5.6)	2.4 (1.5-3.6)	17.4 (15.1-19.7)	6.8 (5.2-8.6)	5.0 (3.7-6.7)	3.4 (2.1-5.2)
1988-1992	20.4 (18.1-22.8)	6.6 (5.2-8.2)	5.1 (3.9-6.5)	2.7 (1.8-3.8)	21.2 (18.8-23.6)	7.2 (5.7-9.0)	5.9 (4.5-7.6)	3.5 (2.3-5.0)
1993-1997	29.3 (27.0-31.7)	10.1 (8.5-11.9)	7.1 (5.7-8.7)	3.6 (2.5-4.9)	30.4 (28.0-32.9)	11.0 (9.3-12.9)	8.1 (6.5-10.0)	4.6 (3.2-6.4)
1998-2002	32.0 (29.7-34.3)	13.6 (12.0-15.3)	9.8 (8.4-11.3)	6.2 (4.9-7.7)	32.9 (30.6-35.3)	14.5 (12.8-16.4)	11.0 (9.4-12.7)	7.9 (6.2-9.7)
2003-2007	42.3 (40.0-44.6)	18.4 (16.6-20.3)	12.4 (10.8-14.1)	8.5 (7.1-10.0)	43.5 (41.2-45.9)	19.8 (17.8-21.8)	13.8 (12.1-15.7)	11.2 (9.4-13.2)
2008-2012	51.8 (49.7-53.9)	23.9 (22.0-25.7)	14.8 (13.2-16.4)	8.3 (7.0-9.8)	53.1 (50.9-55.3)	25.3 (23.3-27.3)	16.2 (14.5-18.0)	10.2 (8.6-12.0)

ASOS: Age-standardised observed survival
ASRS: Age-standardised relative survival

Stage distribution of lung cancer by gender

Males

Stage/Period	2004-2006		2007-2009		2010-2012	
	Number	*Percent	Number	Percent*	Number	Percent*
I	227	10.52	271	11.60	272	9.82
II	119	5.52	107	4.58	151	5.45
III	627	29.07	675	28.88	652	23.55
IV	1184	54.89	1284	54.94	1694	61.18

Females

Stage/Period	2004-2006		2007-2009		2010-2012	
	Number	*Percent	Number	Percent*	Number	Percent*
I	106	10.35	161	13.16	214	14.11
II	37	3.61	26	2.13	48	3.16
III	242	23.63	279	22.81	211	13.91
IV	639	62.40	757	61.90	1044	68.82

*Based on cancer cases with known stage

Age-standardised observed survival and relative survival of lung cancer by calendar period, gender and stage

Males

Stage I

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	83.2 (77.4-87.6)	58.7 (51.4-65.3)	43.8 (36.4-51.0)	85.9 (79.9-90.5)	64.7 (56.7-71.9)	50.9 (42.2-59.3)
2010-2012	86.5 (80.9-90.6)	65.0 (58.0-71.2)	50.4 (43.0-57.2)	89.2 (83.4-93.4)	70.9 (63.3-77.6)	58.1 (49.7-66.0)

Stage II

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	52.2 (40.5-62.6)	27.9 (19.5-37.0)	22.3 (14.2-31.5)	53.8 (41.8-64.6)	30.1 (21.0-39.9)	25.5 (16.3-36.1)
2010-2012	68.6 (59.6-75.9)	40.4 (30.1-50.5)	30.2 (20.4-40.6)	70.7 (61.4-78.3)	43.4 (32.3-54.2)	33.7 (22.8-45.2)

Stage III

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	45.2 (41.1-49.2)	17.6 (14.4-21.1)	12.8 (9.9-16.1)	46.7 (42.4-50.8)	19.2 (15.7-23.0)	14.5 (11.2-18.3)
2010-2012	48.4 (44.0-52.5)	17.4 (14.3-20.7)	10.6 (8.2-13.5)	49.8 (45.4-54.1)	18.7 (15.5-22.3)	12.0 (9.2-15.1)

Stage IV

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	18.8 (16.8-21.0)	3.4 (2.6-4.5)	1.4 (0.8-2.1)	19.5 (17.3-21.7)	3.7 (2.7-4.9)	1.5 (0.9-2.4)
2010-2012	24.0 (22.0-26.1)	5.2 (4.1-6.5)	3.1 (2.1-4.2)	24.7 (22.6-26.9)	5.6 (4.4-7.0)	3.4 (2.4-4.7)

Females

Stage I

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	95.1 (89.6-97.7)	77.0 (67.4-84.1)	64.3 (53.0-73.5)	97.2 (91.6-99.9)	82.1 (71.8-89.7)	71.7 (59.1-82.0)
2010-2012	96.3 (92.0-98.3)	79.7 (72.2-85.3)	69.4 (60.7-76.6)	98.5 (94.0-100.5)	85.1 (77.1-91.1)	76.8 (67.2-84.8)

Stage II

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	88.9 (66.6-96.6)	56.9 (35.7-73.5)	41.1 (23.2-58.3)	90.1 (67.6-98.0)	60.6 (38.0-78.3)	46.9 (26.4-66.4)
2010-2012	90.3 (75.5-96.4)	78.9 (58.6-90.0)	52.9 (30.1-71.3)	92.5 (77.3-98.7)	83.4 (61.9-95.1)	57.4 (32.7-77.5)

Stage III

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	57.7 (51.1-63.7)	23.7 (18.1-29.7)	10.7 (6.5-16.1)	59.0 (52.3-65.2)	25.0 (19.1-31.4)	11.7 (7.1-17.6)
2010-2012	64.7 (57.0-71.4)	31.7 (25.0-38.6)	17.9 (12.7-23.8)	66.4 (58.4-73.2)	33.5 (26.5-40.8)	19.5 (13.8-25.9)

Stage IV

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	35.8 (32.1-39.5)	9.6 (7.5-12.1)	3.3 (2.0-5.2)	36.6 (32.9-40.4)	10.1 (7.9-12.8)	3.6 (2.2-5.6)
2010-2012	41.7 (38.5-45.0)	11.7 (9.5-14.1)	3.5 (2.2-5.1)	42.7 (39.4-46.0)	12.3 (10.0-14.9)	3.7 (2.4-5.5)

Female Breast (ICD-9 174)

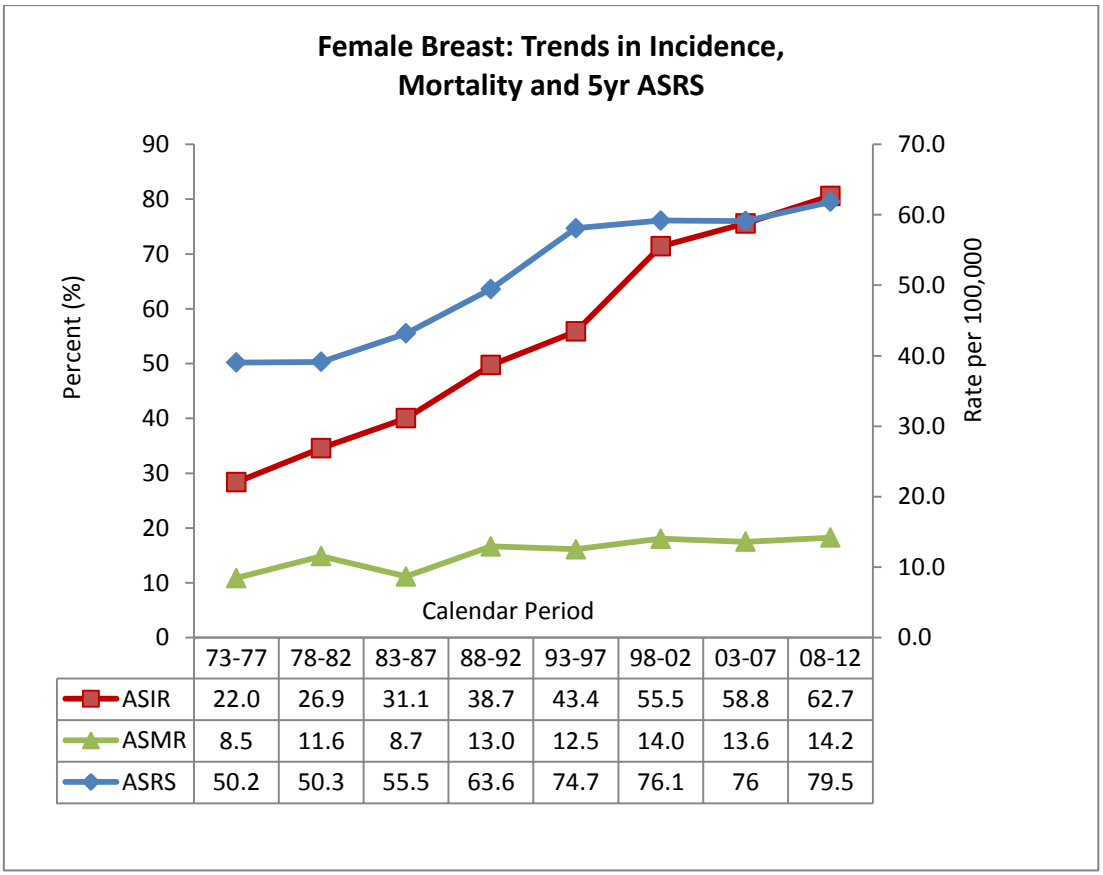
The survival of female breast cancer increased steadily over the study period. The 5-year ASRS were 50.2% and 79.5% in 1973 – 1977 and 2008 – 2012 respectively. Relative survival for breast cancer in Singapore was higher than that in Europe and China but lower than that in the SEER registries, Japan and Australia.

Breast cancer is the most frequent cancer among females in Singapore. The incidence of breast cancer has increased steadily from 22.0 per 100,000 in 1973 – 1977 to 62.7 per 100,000 in 2008 – 2012, though the rate of increase seemed to have slowed after 1998 – 2002. There was no significant trend in stage-specific survival.

Singapore started the first population-based mammographic breast screening programme in Asia (BreastScreen Singapore) in 2002.[78] While the study of breast cancer trends might be influenced by the local screening practices, the overall impact of breast cancer screening on the trends of breast cancer in Singapore was likely to be small because the utilisation of breast cancer screening during the study period was limited. The National Health Surveillance Survey 2013 reported that more than 90% of Singaporean women aged 50 to 69 years were aware of mammography [50] while the Health Behaviour Surveillance of Singapore 2012 reported that 70.8% had ever attended screening, with only 36.2% having underwent mammography in the past 2 years.[79] This was in contrast to 72.4% in women aged 50 to 74 years old from the United States [80] and 73.4% in women aged 50 to 69 years old from the United Kingdom who had underwent mammography in the past 2 years. [81]

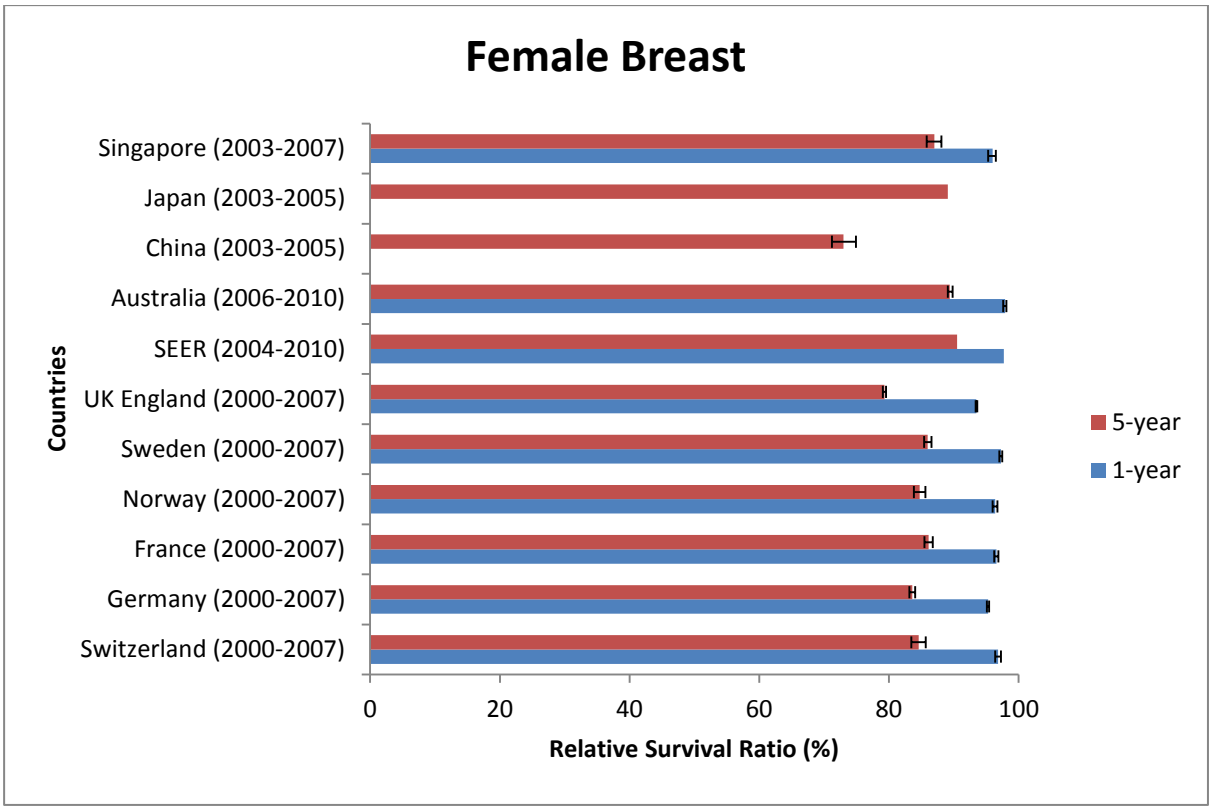
The difference between the incidence and mortality patterns was striking as the incidence almost tripled over the study period while mortality remained fairly stable since the 1980s. The divergence of incidence and mortality, together with a rise in survival, suggests that there was progress in the effectiveness of breast cancer treatment. The increase in survival, especially in the 90s, was likely due to the introduction of tamoxifen treatment and improvement in chemotherapy regimens.

Among human epidermal growth-factor receptor type 2 (HER-2) positive breast cancer patients (approximately 20% of all breast cancer patients), 10 years of adjuvant tamoxifen treatment seems to confer lower recurrence and mortality compared to ceasing treatment at 5 years. [82]



	73-77	78-82	83-87	88-92	93-97	98-02	03-07	08-12
ASIR	22.0	26.9	31.1	38.7	43.4	55.5	58.8	62.7
ASMR	8.5	11.6	8.7	13.0	12.5	14.0	13.6	14.2
ASRS	50.2	50.3	55.5	63.6	74.7	76.1	76	79.5

1- and 5-year age-standardised relative survival in selected countries



Age-standardised observed survival and relative survival of female breast cancer by calendar period

Calendar Period	Females							
	ASOS (%)				ASRS (%)			
	1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr
1973-1977	78.1 (74.9-80.9)	51.2 (47.4-54.8)	40.3 (36.5-44.1)	25.8 (20.9-30.9)	81.9 (78.6-84.8)	58.6 (54.3-62.7)	50.2 (45.5-55.0)	42.2 (34.2-50.6)
1978-1982	78.6 (76.1-80.8)	51.0 (47.9-54.0)	37.7 (34.7-40.8)	24.1 (21.2-27.0)	83.2 (80.6-85.6)	60.6 (56.9-64.2)	50.3 (46.3-54.4)	41.9 (36.9-47.0)
1983-1987	79.8 (77.7-81.7)	59.4 (56.8-61.9)	43.8 (41.1-46.5)	28.0 (25.3-30.7)	83.4 (81.2-85.4)	68.1 (65.1-70.9)	55.5 (52.1-58.9)	46.1 (41.7-50.6)
1988-1992	84.5 (83.1-85.9)	65.8 (63.8-67.6)	52.9 (50.7-55.0)	34.9 (32.4-37.4)	87.7 (86.2-89.1)	73.3 (71.1-75.4)	63.6 (61.0-66.2)	53.4 (49.6-57.2)
1993-1997	86.3 (85.2-87.4)	71.0 (69.4-72.5)	61.5 (59.8-63.2)	41.3 (39.3-43.3)	89.6 (88.4-90.7)	79.2 (77.5-80.9)	74.7 (72.6-76.7)	63.7 (60.6-66.8)
1998-2002	91.4 (90.7-92.1)	76.2 (75.0-77.3)	66.0 (64.6-67.3)	45.8 (44.1-47.5)	93.9 (93.1-94.6)	82.8 (81.5-84.0)	76.1 (74.5-77.7)	63.4 (61.1-65.7)
2003-2007	91.0 (90.3-91.6)	77.2 (76.2-78.1)	66.0 (64.9-67.1)	49.9 (48.6-51.2)	93.4 (92.8-94.1)	83.8 (82.7-84.8)	76.0 (74.7-77.3)	68.1 (66.2-69.9)
2008-2012	91.7 (91.1-92.2)	80.1 (79.3-80.9)	70.3 (69.3-71.2)	54.8 (53.6-55.9)	93.8 (93.2-94.3)	86.0 (85.1-86.8)	79.5 (78.4-80.6)	72.0 (70.5-73.5)

ASOS: Age-standardised observed survival
ASRS: Age-standardised relative survival

Stage distribution of breast cancer

Stage/Period	2004-2006		2007-2009		2010-2012	
	Number	Percent*	Number	Percent*	Number	Percent*
I	1610	33.12	1961	33.60	2365	33.57
II	1851	38.08	2236	38.31	2707	38.42
III	1005	20.67	1119	19.17	1348	19.13
IV	395	8.13	520	8.91	625	8.87

*Based on cancer cases with known stage

Age-standardised observed survival and relative survival of breast cancer by calendar period, gender and stage

Stage I

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	98.4 (97.6-98.9)	93.9 (92.5-95.0)	89.7 (87.8-91.4)	100.2 (99.4-100.8)	99.5 (98.1-100.8)	99.6 (97.4-101.4)
2010-2012	98.9 (98.3-99.3)	94.9 (93.7-95.8)	90.5 (88.9-91.9)	100.7 (100.0-101.1)	100.5 (99.2-101.5)	100.2 (98.4-101.7)

Stage II

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	97.1 (96.2-97.8)	88.8 (87.1-90.2)	80.7 (78.5-82.7)	99.1 (98.2-99.9)	94.7 (92.9-96.2)	90.1 (87.6-92.3)
2010-2012	96.7 (95.8-97.4)	89.1 (87.6-90.4)	82.1 (80.2-83.8)	98.7 (97.8-99.4)	94.9 (93.3-96.4)	91.7 (89.6-93.6)

Stage III

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	90.8 (88.7-92.5)	73.5 (70.4-76.4)	58.0 (54.3-61.4)	93.0 (90.8-94.7)	78.9 (75.5-82.0)	65.3 (61.2-69.2)
2010-2012	92.1 (90.2-93.6)	75.7 (72.8-78.3)	60.6 (57.2-63.8)	94.1 (92.3-95.7)	81.0 (77.9-83.8)	68.0 (64.2-71.5)

Stage IV

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	60.2 (55.3-64.8)	35.5 (30.6-40.3)	18.7 (14.6-23.3)	61.4 (56.4-66.1)	37.7 (32.5-42.8)	20.9 (16.2-25.9)
2010-2012	65.7 (61.2-69.8)	34.8 (30.5-39.1)	18.2 (14.7-22.0)	67.0 (62.5-71.2)	36.8 (32.3-41.3)	20.2 (16.3-24.4)

Cervix (ICD-9 180)

Survival of cervical cancer patients has markedly improved with the 5-year ASRS having increased over the study period, from 47.5% in 1973 – 1977 to 60.9% in 2008 – 2012. Although the survival rate started to plateau after 1998 – 2002, this rate is still the highest among the countries compared.

The better survival rate was accompanied by progressive declines in both the incidence and mortality rates of cervical cancer over the same study period. The incidence of cervical cancer dropped from 17.5 per 100,000 in 1973 – 1977 to 6.8 per 100,000 in 2008 – 2012. The mortality of cervical cancer decreased from 7.0 per 100,000 in 1973 – 1977 to 2.5 per 100,000 in 2008 – 2012. Several reasons could explain these observations.

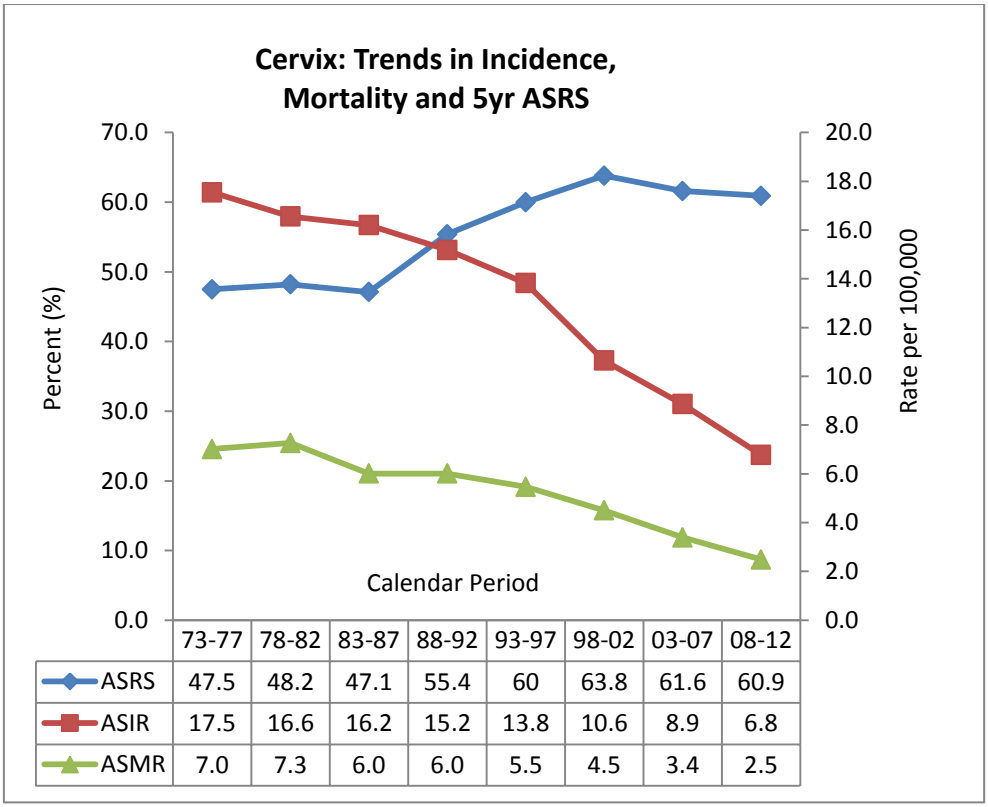
The 1998 National Health Survey[83] found that although 81.9% of women aged 25 to 69 years in Singapore acknowledged the importance of Pap smears, only 64.2% of women had undergone a Pap smear. The national cervical cancer screening programme “CervicalScreen Singapore”, launched in 2004, aims to encourage women aged 25 – 69 who ever had sex to go for Pap smears once every 3 years. In 2012, it was found that 70.8% of women had ever had Pap smear, and 50.7% had Pap smear in the past 2 years.[51]

The improvement in survival from cervical cancer is related to the detection of abnormal growths, or cervix dysplasias, before they turn cancerous, as well as the detection of cancer at earlier stages through screening. It is also due to the efficacious modality of cancer treatment in recent years.

The availability of multidisciplinary centralized cancer care in the specialist cancer centres in the various institutions where women's cancers are treated has probably contributed to the overall improvement of gynaecological cancer survival over the past 15 years.

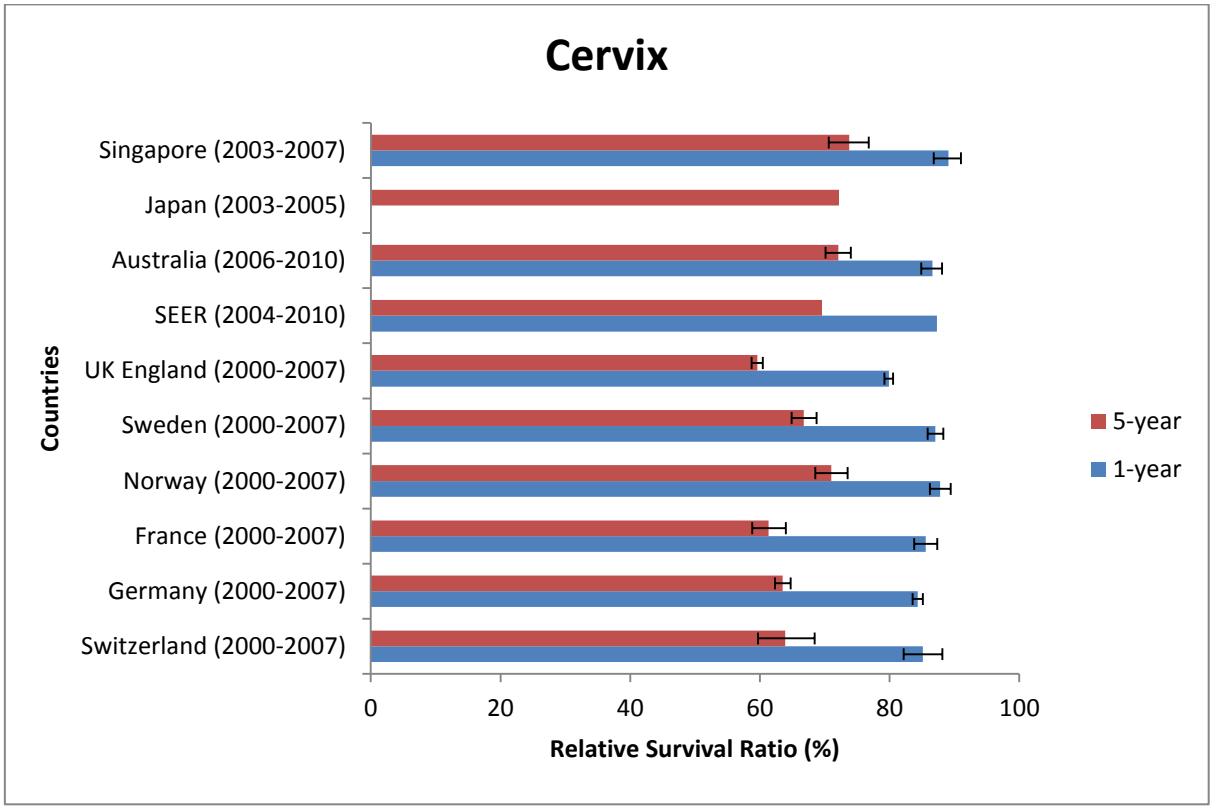
Since the late 1990s, women with locally advanced cervix had been treated with concurrent cisplatin chemotherapy with radiotherapy which reduced the risk of death by 30-50% compared with radiotherapy alone. [84]

Bevacizumab, a humanized anti-vascular endothelial growth factor (anti-VEGF) monoclonal antibody has recently been found to confer significant survival benefit for patients with recurrent and metastatic cervical cancers, [85] though it is currently not in widespread use due to high cost.



	73-77	78-82	83-87	88-92	93-97	98-02	03-07	08-12
ASRS	47.5	48.2	47.1	55.4	60	63.8	61.6	60.9
ASIR	17.5	16.6	16.2	15.2	13.8	10.6	8.9	6.8
ASMR	7.0	7.3	6.0	6.0	5.5	4.5	3.4	2.5

1- and 5-year age-standardised relative survival in selected countries



Age-standardised observed survival and relative survival of cervical cancer by calendar period

Calendar Period	Females							
	ASOS (%)				ASRS (%)			
	1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr
1973-1977	73.3 (69.5-76.7)	49.8 (45.6-53.7)	42.0 (37.9-45.9)	34.7 (30.5-39.0)	75.3 (71.4-78.7)	53.8 (49.3-58.1)	47.5 (42.9-52.0)	45.7 (40.1-51.2)
1978-1982	75.2 (71.8-78.2)	50.8 (47.0-54.4)	42.4 (38.7-46.1)	31.9 (28.3-35.5)	77.3 (73.9-80.4)	55.0 (50.9-59.0)	48.2 (43.9-52.4)	42.1 (37.4-46.9)
1983-1987	79.2 (76.4-81.8)	52.5 (49.0-55.9)	42.0 (38.5-45.5)	34.8 (31.4-38.3)	81.3 (78.3-83.9)	56.3 (52.5-60.0)	47.1 (43.1-51.1)	43.6 (39.2-48.0)
1988-1992	81.2 (78.6-83.4)	57.1 (54.0-60.0)	50.0 (46.8-53.1)	37.5 (34.2-40.8)	83.0 (80.4-85.3)	60.8 (57.5-63.9)	55.4 (51.9-58.8)	46.3 (42.2-50.4)
1993-1997	81.3 (78.9-83.3)	62.0 (59.1-64.7)	53.9 (51.0-56.8)	41.9 (38.9-44.9)	83.2 (80.8-85.3)	66.2 (63.2-69.1)	60.0 (56.7-63.2)	52.5 (48.7-56.3)
1998-2002	81.2 (78.9-83.3)	64.7 (62.0-67.4)	58.2 (55.3-60.9)	49.0 (46.1-51.9)	82.7 (80.3-84.9)	68.4 (65.4-71.1)	63.8 (60.7-66.8)	59.3 (55.7-62.8)
2003-2007	80.3 (77.9-82.5)	61.8 (58.9-64.5)	56.6 (53.7-59.4)	45.9 (43.0-48.7)	82.0 (79.5-84.2)	65.1 (62.1-68.0)	61.6 (58.4-64.6)	55.3 (51.8-58.7)
2008-2012	81.8 (79.4-83.9)	62.7 (59.8-65.5)	55.7 (52.7-58.5)	45.4 (42.5-48.2)	83.5 (81.0-85.7)	66.3 (63.3-69.2)	60.9 (57.6-63.9)	54.0 (50.6-57.4)

ASOS: Age-standardised observed survival
ASRS: Age-standardised relative survival

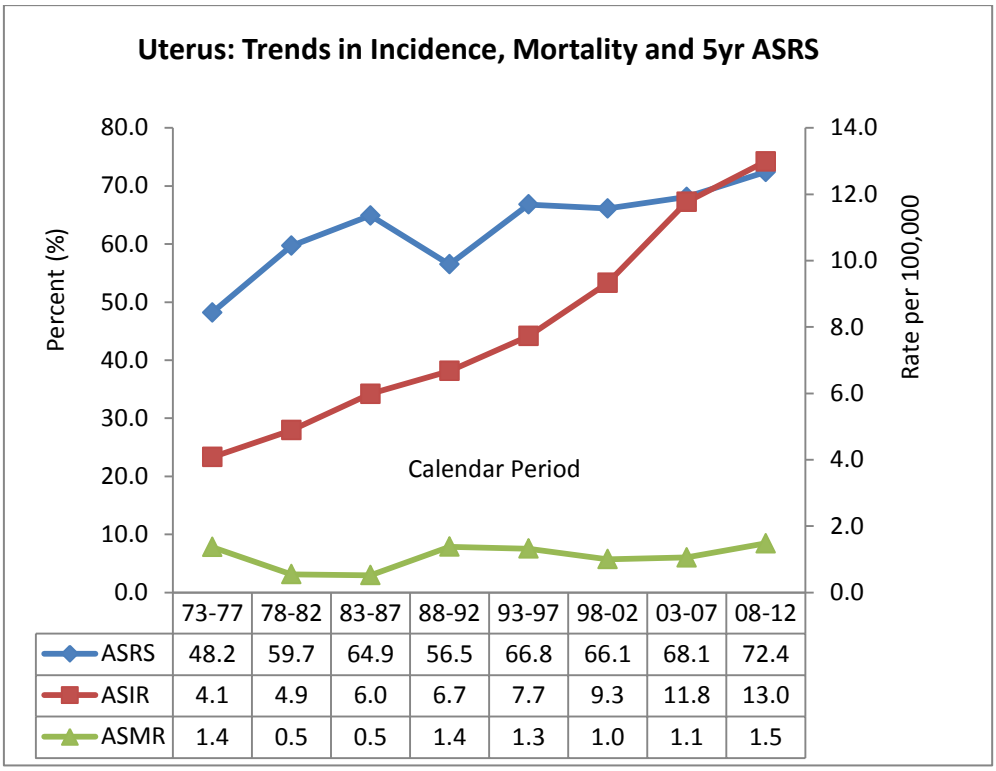
Corpus Uteri (ICD-9 182)

Uterine cancer was the fourth most common cancer in Singaporean women in 2008 – 2012. The highest age specific incidence was observed in postmenopausal women. The majority of uterine cancers originated from the endometrium; among the histologic subtypes, endometrioid carcinoma was the most common.

Uterine cancer had one of the highest 5-year ASRS among the various cancers at the start of the study period and it had shown improvement in survival over the past two decades. Between 1973 and 2007, the 5-year ASRS increased by 19.7%, from 50.7% in 1973 – 1977 to 70.4% in 2008 – 2012. The 5-year relative survival for cancer of the uterus in Singapore was highest amongst the registries compared and the 1-year relative survival was second only to Sweden.

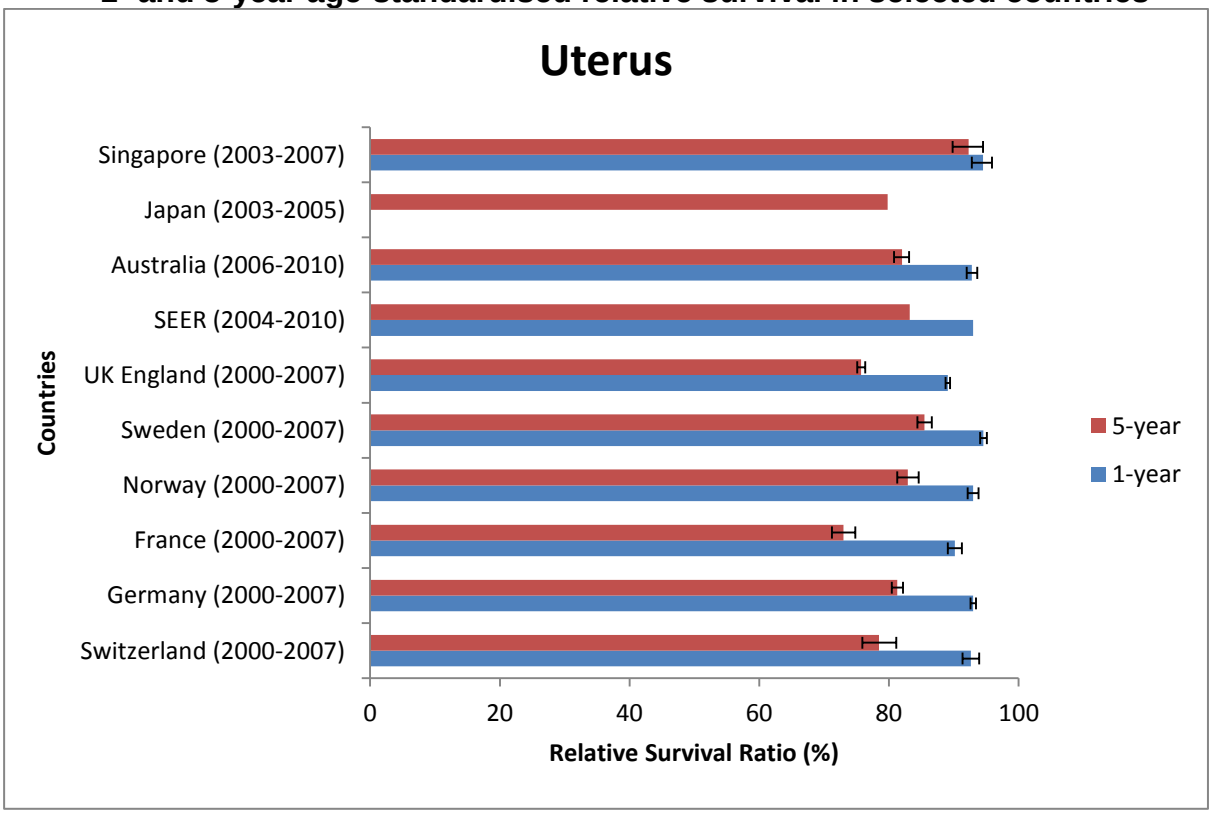
The improvement in survival took place against a background of an increasing incidence and a stable low mortality rate during the study period. The incidence of uterine cancer increased steadily over the last three decades, from 4.1 per 100,000 in 1973 – 1977 to 13.1 per 100,000 in 2008 – 2012, whereas the mortality of this disease remained at around 1.0 per 100,000 throughout the study period. This increase in incidence can be partly attributed to increasing obesity, as seen from the past National Health Surveys, [50, 52, 86] and decreasing parity [87]. There was a significant decrease in ASRS among Stage I patients.

Our good survival can be attributed to the relatively high proportion of patients diagnosed with low grade endometroid adenocarcinomas in early stages where surgery alone sometimes is sufficient to cure the patients. Notably, the percentage of endometrioid adenocarcinomas and unspecified adenocarcinomas combined (out of those with histology samples) has increased from 71.5% in 1998 – 2002 to 75.8% in 2008 – 2012.



	73-77	78-82	83-87	88-92	93-97	98-02	03-07	08-12
ASRS	48.2	59.7	64.9	56.5	66.8	66.1	68.1	72.4
ASIR	4.1	4.9	6.0	6.7	7.7	9.3	11.8	13.0
ASMR	1.4	0.5	0.5	1.4	1.3	1.0	1.1	1.5

1- and 5-year age-standardised relative survival in selected countries



Age-standardised observed survival and relative survival of uterine cancer by calendar period

Calendar Period	Females							
	ASOS (%)				ASRS (%)			
	1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr
1973-1977	68.7 (60.1-75.7)	40.2 (32.1-48.2)	37.2 (29.1-45.3)	31.2 (22.6-40.2)	72.0 (63.0-79.4)	48.3 (38.6-58.0)	48.2 (37.8-58.7)	49.2 (35.6-63.3)
1978-1982	72.7 (66.1-78.3)	49.9 (42.3-57.0)	47.3 (39.7-54.5)	35.5 (27.8-43.3)	76.1 (69.2-81.9)	56.8 (48.2-64.9)	59.7 (50.1-68.8)	60.8 (47.6-74.1)
1983-1987	77.2 (71.9-81.7)	61.1 (54.8-66.8)	54.4 (47.9-60.5)	41.4 (34.1-48.6)	80.5 (75.0-85.2)	67.7 (60.7-74.0)	64.9 (57.1-72.1)	64.2 (52.9-75.4)
1988-1992	69.1 (64.5-73.2)	53.5 (48.7-58.1)	48.3 (43.5-53.0)	40.0 (34.9-45.0)	71.7 (67.0-76.0)	58.9 (53.6-63.9)	56.5 (50.9-62.0)	57.3 (50.0-64.5)
1993-1997	81.7 (78.5-84.5)	64.8 (60.8-68.6)	58.1 (53.7-62.2)	42.1 (37.2-46.8)	84.2 (80.9-87.0)	70.8 (66.4-74.9)	66.8 (61.7-71.5)	58.4 (51.7-65.0)
1998-2002	80.0 (77.3-82.4)	67.4 (64.2-70.3)	59.0 (55.6-62.2)	48.5 (44.7-52.3)	81.9 (79.2-84.4)	71.9 (68.5-75.1)	66.1 (62.3-69.8)	62.1 (57.2-66.9)
2003-2007	83.1 (81.1-84.9)	65.2 (62.6-67.7)	60.3 (57.6-62.9)	51.7 (48.6-54.7)	85.5 (83.4-87.3)	70.5 (67.7-73.1)	68.1 (65.0-71.1)	67.4 (63.4-71.3)
2008-2012	83.7 (81.9-85.2)	71.4 (69.3-73.4)	64.8 (62.6-67.0)	53.2 (50.7-55.8)	85.5 (83.8-87.1)	76.2 (73.9-78.3)	72.4 (69.9-74.8)	67.5 (64.2-70.6)

ASOS: Age-standardised observed survival
ASRS: Age-standardised relative survival

Stage distribution of uterine cancer

Stage/Period	2004-2006		2007-2009		2010-2012	
	Number	Percent*	Number	Percent*	Number	Percent*
I	594	67.27	683	64.56	864	67.61
II	80	9.06	94	8.88	105	8.22
III	141	15.97	183	17.30	186	14.55
IV	68	7.70	98	9.26	123	9.62

*Based on cancer cases with known stage

Age-standardised observed survival and relative survival of uterine cancer by calendar period and stage

Stage I

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	98.4 (96.9-99.2)	95.5 (93.3-97.0)	90.4 (87.2-92.8)	100.2 (98.7-101.0)	101.6 (99.3-103.2)	100.4 (96.9-103.1)
2010-2012	96.0 (94.1-97.2)	92.1 (89.6-94.1)	86.8 (83.7-89.3)	97.7 (95.8-98.9)	97.4 (94.7-99.4)	96.1 (92.6-98.9)

Stage II

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	96.1 (88.7-98.7)	79.2 (67.5-87.1)	72.1 (59.0-81.6)	98.0 (90.4-100.6)	84.4 (71.9-92.8)	79.8 (65.3-90.4)
2010-2012	94.9 (87.1-98.0)	79.2 (68.4-86.6)	76.1 (64.9-84.2)	96.8 (88.9-100.0)	84.4 (72.9-92.4)	84.8 (72.3-93.8)

Stage III

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	82.7 (75.8-87.8)	59.0 (50.0-67.0)	49.2 (39.8-57.8)	84.3 (77.3-89.5)	62.2 (52.6-70.5)	53.2 (43.1-62.5)
2010-2012	94.3 (88.6-97.2)	61.7 (53.1-69.2)	48.9 (40.2-57.0)	95.9 (90.0-98.8)	65.4 (56.2-73.3)	53.6 (44.1-62.5)

Stage IV

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	32.0 (22.3-42.1)	17.7 (10.6-26.4)	14.4 (7.8-23.0)	32.7 (22.8-43.0)	18.8 (11.2-28.0)	15.5 (8.3-24.7)
2010-2012	43.3 (34.0-52.2)	20.8 (12.6-30.3)	16.0 (8.8-25.1)	44.0 (34.5-53.1)	21.6 (13.1-31.5)	16.9 (9.3-26.5)

Ovary (ICD-9 183)

Ovarian cancer has been dubbed “the silent killer” in women.[88] Presenting symptoms are often nonspecific and many patients frequently present at a late stage when the disease is already locally advanced or metastatic. By this time, the treatment options are limited and less efficacious. The stage of disease is highly prognostic. When ovarian cancer is diagnosed at early stage, the 5-year age-standardised relative survival is greater than 80%. However, this figure drops to less than 15% when the disease is diagnosed at stage IV.

Ovarian cancer was the fifth most frequent cancer among females in Singapore. It accounted for 5.5% of all female cancers diagnosed in 2008 – 2012.[71] The incidence of ovarian cancer had increased steadily from 6.2 per 100,000 in 1973 – 1977 to 12.5 per 100,000 in 2008 – 2012. The mortality of this disease remained at around 4.0 per 100,000 throughout the study period. In terms of survival, the 5-year ASRS increased from 29.2% in 1983 – 1987 to 44.6% in 1993 – 1997 and stabilised at that level until the present calendar period. Internationally, the relative survival for ovarian cancer in Singapore was highest among the countries compared and the 1-year ASRS was only slightly lower than Sweden and France.

In Singapore, a lower proportion of tumours were detected at stage III or IV compared with western countries. [89] According to an electronic database set up to capture the histology types of epithelial ovarian cancer (EOC) from cancer registries, controlled clinical trials, cohort studies, or studies of archives of surgical samples, the distribution of histology types appears to be heterogeneous worldwide. [90] Histology type plays a crucial role in survival, where countries that have higher distributions of endometriosis-associated endometrioid and clear cell subtypes are expected to present with better overall survival. This is because these tumours tend to be of lower stage and grade.

Among the countries compared in the study, Singapore has higher percentages of endometrioid, clear cell and mucinous subtypes and lower percentage of serous subtype compared to the median. This may explain our comparatively high survival.

There was a significant decrease in survival among stage I and stage III patients.

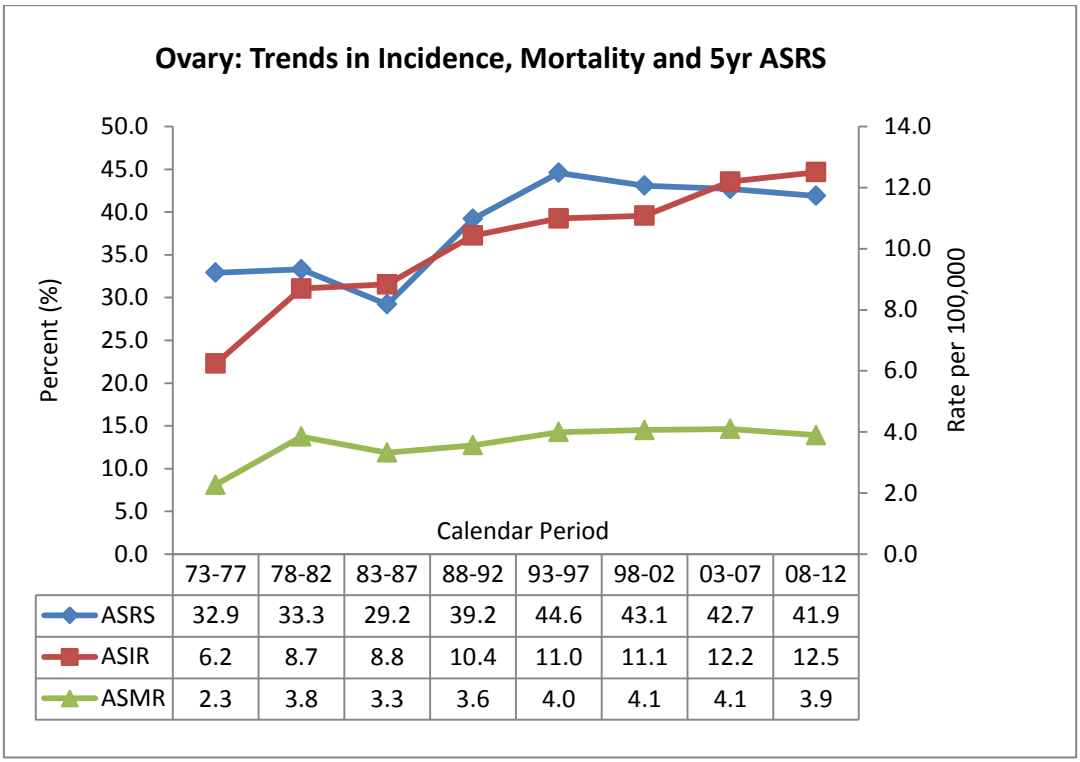
Platinum-paclitaxel chemotherapy has been the standard of care since the 1990s and this has improved absolute survival by 11% in two independent randomized clinical trials. [91] In recent years, dose-dense paclitaxel and carboplatin emerged as an alternative treatment option for first-line chemotherapy in patients with advanced EOC due to improvements in overall survival from a randomised phase III clinical trial. [92, 93]

In the 1990s, the surgical management of advanced ovary cancer had moved towards aggressive cytoreductive debulking surgery which is likely to have improved the survival as the amount of residual disease post-surgery inversely correlates with survival. [94] In 2009, Du Bois et al. reported a 12-year overall survival rate of 40% for patients with no residual disease after primary debulking surgery, compared to 15% for patients with any residual disease. [95] These treatment advances have contributed to survival improvements in the earlier years.

Despite significant survival benefits, the use of intraperitoneal (IP) chemotherapy has not been widely adopted locally in place of intravenous (IV) chemotherapy. This is primarily because of the uncertain optimal dosage with tolerable toxicity. [85]

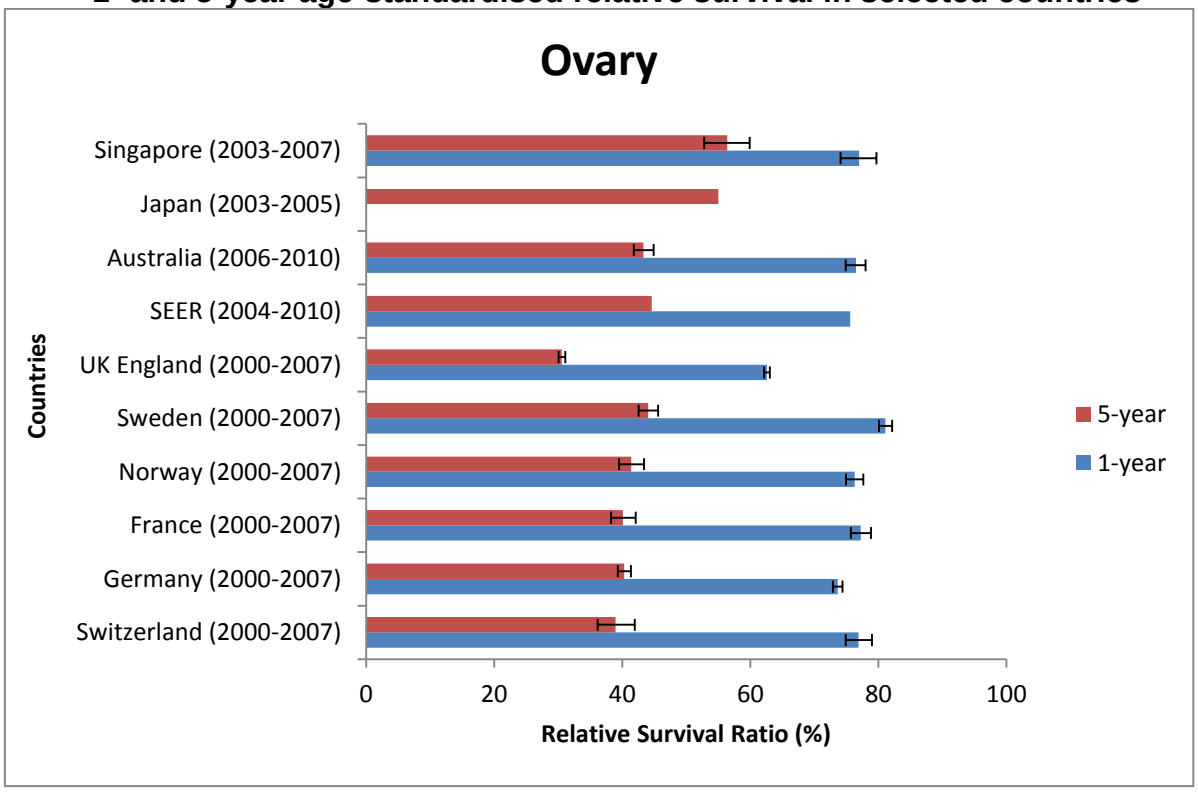
Four randomized trials adding bevacizumab to chemotherapy have been reported:
i, ii) Front-line EOC (GOG 218, ICON7)
iii) platinum-resistant recurrent EOC (AUERLIA)
iv) platinum-sensitive recurrent EOC (OCEANS)

Although all four studies significantly prolonged PFS, only two studies significantly improved OS among stage IV patients (GOG 218) and patients at high risk of progress (ICON7). However, the addition of bevacizumab to chemotherapy prolongs disease control both in front-line and recurrent EOC. [96]



	73-77	78-82	83-87	88-92	93-97	98-02	03-07	08-12
ASRS	32.9	33.3	29.2	39.2	44.6	43.1	42.7	41.9
ASIR	6.2	8.7	8.8	10.4	11.0	11.1	12.2	12.5
ASMR	2.3	3.8	3.3	3.6	4.0	4.1	4.1	3.9

1- and 5-year age-standardised relative survival in selected countries



Age-standardised observed survival and relative survival of ovarian cancer by calendar period

Calendar Period	Females							
	ASOS (%)				ASRS (%)			
	1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr
1973-1977	46.8 (40.0-53.3)	31.4 (25.2-37.8)	28.4 (22.3-34.7)	21.0 (14.3-28.7)	48.7 (41.6-55.5)	34.7 (27.8-41.7)	32.9 (25.9-40.3)	28.6 (19.4-39.0)
1978-1982	52.5 (47.4-57.4)	30.7 (26.1-35.4)	25.8 (21.3-30.4)	16.3 (12.2-20.9)	55.7 (50.3-60.9)	35.7 (30.4-41.2)	33.3 (27.5-39.2)	25.2 (18.9-32.4)
1983-1987	47.7 (42.8-52.5)	27.6 (23.3-32.0)	23.7 (19.7-27.9)	15.2 (11.8-19.0)	49.9 (44.8-54.9)	31.4 (26.5-36.4)	29.2 (24.3-34.4)	21.9 (17.0-27.3)
1988-1992	56.4 (52.4-60.2)	40.1 (36.2-44.0)	33.5 (29.6-37.5)	24.4 (20.4-28.7)	58.4 (54.3-62.3)	44.1 (39.8-48.4)	39.2 (34.6-43.9)	33.3 (27.8-39.1)
1993-1997	60.8 (57.6-63.9)	45.6 (42.3-48.9)	37.5 (34.1-40.8)	22.8 (19.6-26.1)	63.3 (59.9-66.4)	50.3 (46.7-53.9)	44.6 (40.6-48.6)	32.8 (28.2-37.6)
1998-2002	71.4 (68.7-73.9)	48.0 (45.0-50.9)	38.4 (35.5-41.2)	30.3 (27.3-33.3)	73.2 (70.4-75.8)	51.3 (48.1-54.4)	43.1 (39.8-46.3)	39.3 (35.4-43.2)
2003-2007	67.3 (64.7-69.7)	46.5 (43.8-49.1)	38.0 (35.4-40.5)	29.1 (26.6-31.6)	69.3 (66.6-71.8)	50.0 (47.2-52.8)	42.7 (39.8-45.6)	37.8 (34.6-41.1)
2008-2012	61.2 (58.8-63.5)	45.9 (43.5-48.3)	37.8 (35.5-40.2)	27.6 (25.3-29.8)	62.7 (60.2-65.0)	48.8 (46.2-51.3)	41.9 (39.3-44.6)	34.5 (31.7-37.3)

ASOS: Age-standardised observed survival
ASRS: Age-standardised relative survival

Stage distribution of ovarian cancer

Stage/Period	2004-2006		2007-2009		2010-2012	
	Number	Percent*	Number	Percent*	Number	Percent*
I	281	42.00	315	39.77	864	36.78
II	60	8.97	86	10.86	105	7.01
III	219	32.74	271	34.22	186	37.36
IV	109	16.29	120	15.15	123	18.85

*Based on cancer cases with known stage

Age-standardised observed survival and relative survival of ovarian cancer by calendar period and stage

Stage I

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	99.3 (96.7-99.8)	92.3 (87.8-95.2)	86.2 (80.8-90.2)	101.2 (98.5-101.8)	98.2 (93.4-101.3)	96.3 (90.2-100.8)
2010-2012	89.5 (85.0-92.8)	81.9 (76.6-86.2)	72.1 (66.2-77.2)	90.7 (86.1-94.0)	85.9 (80.3-90.3)	79.6 (73.0-85.1)

Stage II

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	79.2 (68.3-86.7)	77.0 (65.7-85.1)	66.1 (50.7-77.7)	80.9 (69.8-88.6)	81.5 (69.4-90.0)	72.3 (55.5-85.0)
2010-2012	75.0 (60.6-84.7)	70.6 (56.2-81.0)	53.1 (40.8-64.0)	76.6 (62.0-86.6)	74.7 (59.5-85.7)	58.8 (45.1-70.8)

Stage III

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	78.6 (72.4-83.6)	53.2 (45.7-60.1)	38.7 (31.2-46.1)	80.0 (73.7-85.0)	56.1 (48.2-63.4)	42.6 (34.3-50.8)
2010-2012	62.9 (56.6-68.6)	41.3 (35.2-47.3)	30.1 (24.5-35.9)	64.2 (57.7-70.0)	43.4 (37.0-49.7)	32.8 (26.7-39.0)

Stage IV

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	36.0 (26.3-45.8)	19.1 (12.3-27.0)	12.0 (6.7-19.1)	36.9 (27.0-46.9)	20.2 (13.0-28.6)	13.2 (7.4-21.0)
2010-2012	37.6 (29.6-45.5)	17.9 (11.8-25.1)	10.5 (5.6-17.1)	38.4 (30.2-46.5)	18.6 (12.2-26.1)	11.2 (6.0-18.4)

Prostate (ICD-9 185)

Prostate cancer is the third most frequent cancer among Singapore males[71] and the incidence had more than quadrupled during the study period. The incidence increased from 5.2 per 100,000 in 1973 – 1977 to 9.7 per 100,000 in 1988 – 1992 before accelerating to reach 28.4 per 100,000 in 2008 – 2012. The mortality of prostate cancer increased from 1.4 per 100,000 in 1973 – 1977 to 5.6 per 100,000 in 2008 – 2012. There was improvement in the survival of prostate cancer across the period of interest. The 5-year ASRS rose from 47.3% in 1973 – 1977 to 88.5% in 2008 – 2012. Internationally, the relative survival for prostate cancer in Singapore was lower than that in the SEER registries but higher than that in England and Japan.

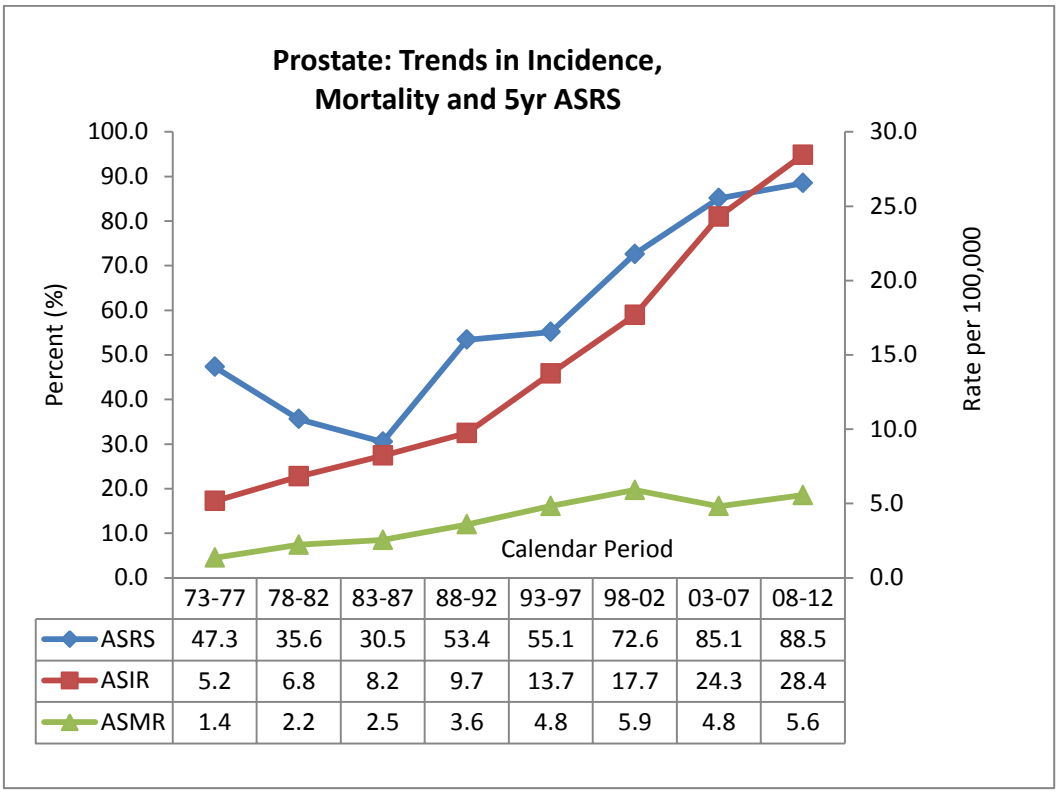
According to the National Health Surveillance Survey 2013, approximately 10.6% of Singaporean men above 50 years of age had ever undergone prostate cancer screening. [50] The actual percentage is likely to be higher, given that prostate-specific antigen (PSA) testing is commonly done as part of general health and opportunistic screening.

Most countries do not advocate screening though overdiagnosis has been reported in a variety of studies from Europe and US. [97] Overdiagnosis occurs when a condition is diagnosed that would otherwise not go on to cause symptoms or death. Prostate cancer screening did not significantly decrease prostate cancer-specific mortality in a combined meta-analysis of five randomized control trials. [98] Only one European study reported an 11% absolute risk reduction of prostate cancer-specific mortality with 13 years of follow-up among men aged 55 – 69 years.

Radical prostatectomy was the first treatment with curative intent that was introduced in the late 1980s. Compared to watchful waiting for early prostate cancer, radical prostatectomy was shown to reduce overall mortality by 11 percentage points and the risk of distant metastases by 12.2 percentage points over 23.2 years of follow-up among men 75 years of age or younger with early prostate cancer. [99]

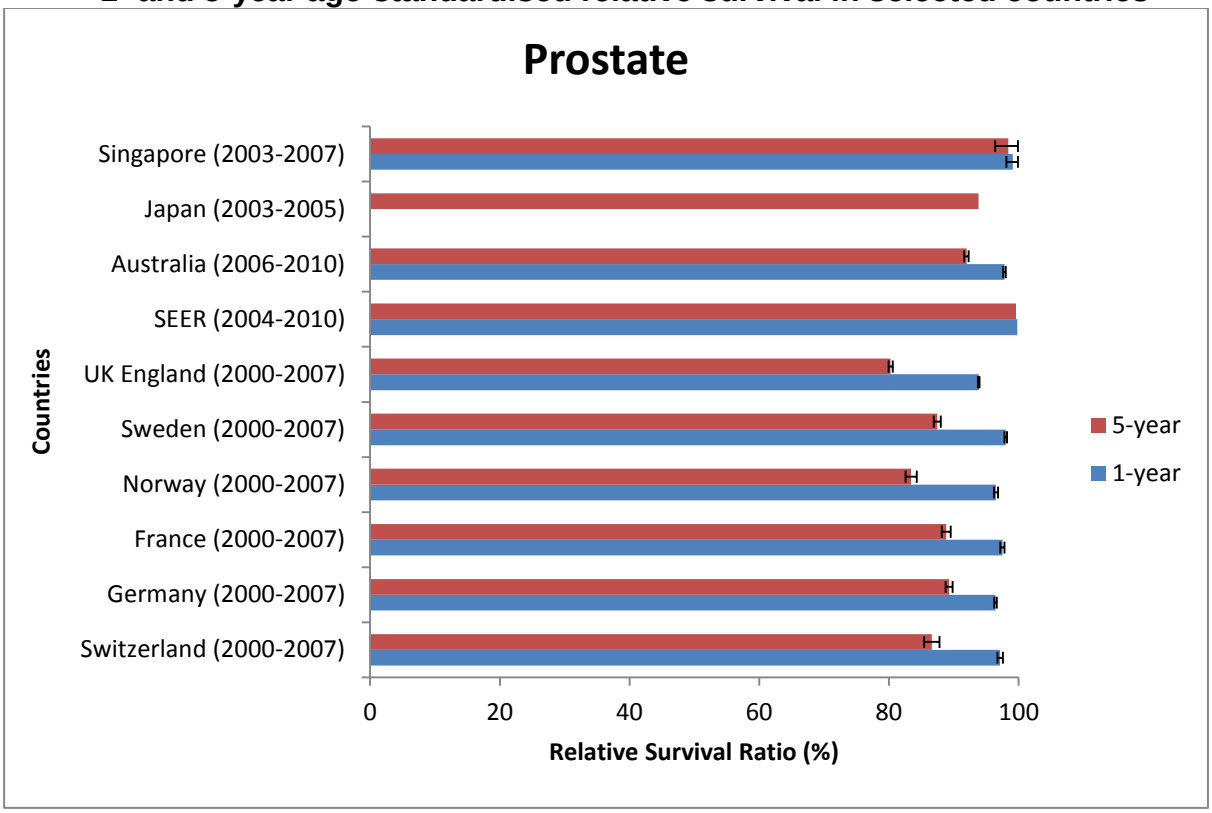
A significant increase in ASRS was also seen among stage II cancer patients between 2007- 2009 and 2010 – 2012.

The significant downstaging of prostate cancer cases from stage II to stage I in 2003 – 2007 was probably due to the change in the new edition of stage classification. Broadly, stage I now encompasses cases with Gleason score less than 6 and up to T2a whereas previously stage I cases only consisted of those with Gleason score 2-4 and T1a. In addition, increased PSA screening leading to prostate cancer overdiagnosis probably contributed to this observation as well.



	73-77	78-82	83-87	88-92	93-97	98-02	03-07	08-12
ASRS	47.3	35.6	30.5	53.4	55.1	72.6	85.1	88.5
ASIR	5.2	6.8	8.2	9.7	13.7	17.7	24.3	28.4
ASMR	1.4	2.2	2.5	3.6	4.8	5.9	4.8	5.6

1- and 5-year age-standardised relative survival in selected countries



Age-standardised observed survival and relative survival of prostate cancer by calendar period

Calendar Period	Males							
	ASOS (%)				ASRS (%)			
	1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr
1973-1977	65.6 (56.0-73.7)	42.2 (32.9-51.2)	31.0 (22.0-40.3)	13.5 (6.1-23.7)	71.2 (60.7-79.9)	54.6 (42.5-66.2)	47.3 (33.6-61.6)	27.6 (12.6-48.6)
1978-1982	68.4 (61.2-74.5)	38.9 (31.4-46.5)	23.6 (17.1-30.9)	8.7 (4.5-14.6)	73.1 (65.5-79.7)	48.7 (39.2-58.1)	35.6 (25.7-46.5)	20.5 (10.7-34.3)
1983-1987	66.8 (61.1-71.8)	38.4 (32.8-43.9)	21.2 (16.6-26.3)	10.2 (6.2-15.4)	71.3 (65.2-76.7)	46.8 (40.0-53.6)	30.5 (23.8-37.8)	23.5 (14.3-35.3)
1988-1992	79.9 (75.9-83.3)	54.4 (49.3-59.2)	37.9 (32.7-43.1)	11.7 (7.8-16.4)	85.0 (80.8-88.6)	66.0 (59.8-71.9)	53.4 (46.0-60.7)	24.6 (16.5-34.5)
1993-1997	83.9 (73.7-89.0)	55.6 (51.9-59.1)	39.8 (35.9-43.6)	18.0 (14.5-21.9)	88.8 (85.9-91.3)	66.5 (62.1-70.7)	55.1 (49.7-60.5)	39.0 (31.3-47.3)
1998-2002	90.0 (88.2-91.5)	70.4 (67.7-73.0)	56.4 (53.2-59.5)	32.8 (28.7-37.0)	93.9 (92.1-95.5)	80.9 (77.7-83.8)	72.6 (68.5-76.6)	63.7 (55.7-71.8)
2003-2007	93.6 (92.4-94.5)	80.1 (78.2-81.8)	69.9 (67.6-72.1)	46.1 (42.8-49.4)	97.0 (95.8-98.0)	89.3 (87.2-91.3)	85.1 (82.2-87.8)	75.3 (69.9-80.7)
2008-2012	95.1 (94.3-95.8)	82.5 (81.1-83.8)	74.9 (73.2-76.4)	56.8 (54.4-59.0)	98.1 (97.3-98.8)	90.9 (89.3-92.3)	88.5 (86.5-90.3)	83.8 (80.4-87.2)

ASOS: Age-standardised observed survival
ASRS: Age-standardised relative survival

Stage distribution of prostate cancer

Stage/Period	2004-2006		2007-2009		2010-2012	
	Number	Percent*	Number	Percent*	Number	Percent*
I	14	0.99	9	0.45	303	11.82
II	893	63.11	1280	64.61	1326	51.74
III	170	12.01	201	10.15	271	10.57
IV	338	23.89	491	24.79	663	25.87

*Based on cancer cases with known stage

Age-standardised observed survival and relative survival of prostate cancer by calendar period and stage

Stage I

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009[Ω]	100.0 (100.0-100.0)	100.0 (100.0-100.0)	100.0 (100.0-100.0)	104.8 (104.8-104.8)	114.8 (114.8-114.8)	122.6 (122.6-122.6)
2010-2012[Ω]	99.1 (96.7-99.8)	95.4 (87.5-98.3)	87.1 (48.7-97.4)	101.7 (99.2-102.3)	104.0 (95.5-107.3)	110.7 (61.9-123.8)

Stage II

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009[†]	98.4 (97.4-99.0)	92.2 (90.2-93.8)	84.2 (81.2-86.7)	101.5 (100.4-102.1)	101.7 (99.5-103.4)	99.8 (96.3-102.8)
2010-2012[Ω]	99.1 (98.3-99.5)	95.0 (93.5-96.2)	91.0 (88.9-92.6)	102.0 (101.1-102.4)	104.1 (102.4-105.4)	106.8 (104.4-108.7)

Stage III

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	97.1 (92.5-98.9)	86.7 (79.7-91.4)	80.1 (71.9-86.1)	100.1 (95.4-102.0)	95.5 (87.8-100.7)	94.0 (84.4-101.1)
2010-2012	98.2 (95.2-99.3)	89.4 (83.6-93.3)	81.7 (74.5-87.1)	100.9 (97.8-102.1)	97.9 (91.5-102.1)	96.4 (87.8-102.7)

Stage IV

Period	ASOS (%)			ASRS (%)		
	1yr	3yr	5yr	1yr	3yr	5yr
2007-2009	85.5 (81.5-88.6)	50.0 (44.5-55.3)	35.0 (29.4-40.7)	88.5 (84.4-91.8)	55.8 (49.6-61.7)	41.9 (35.2-48.7)
2010-2012	87.6 (84.4-90.2)	52.7 (47.8-57.4)	36.9 (31.9-41.8)	90.4 (87.1-93.1)	58.0 (52.6-63.2)	43.3 (37.5-49.1)

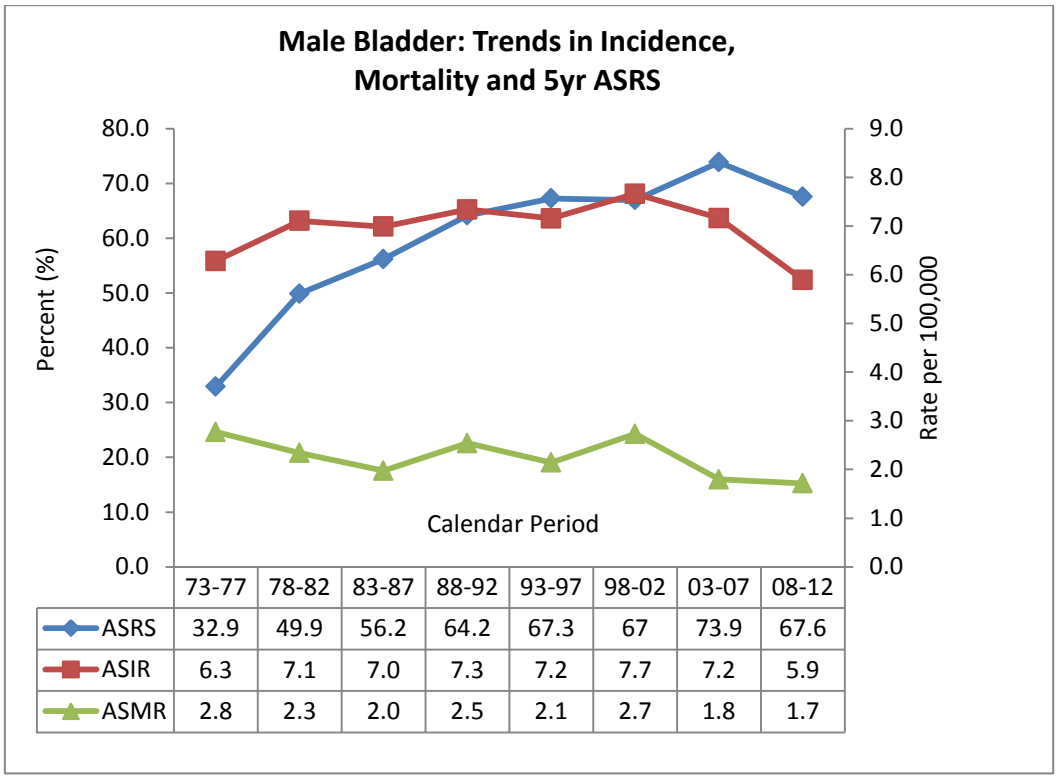
[†] There is no confidence interval as no patients died within 5 years during the calendar period.
[Ω] Increasing relative survival due to late entry, where more patients diagnosed in preceding years are entering the study after time 0.

Bladder (ICD-9 188)

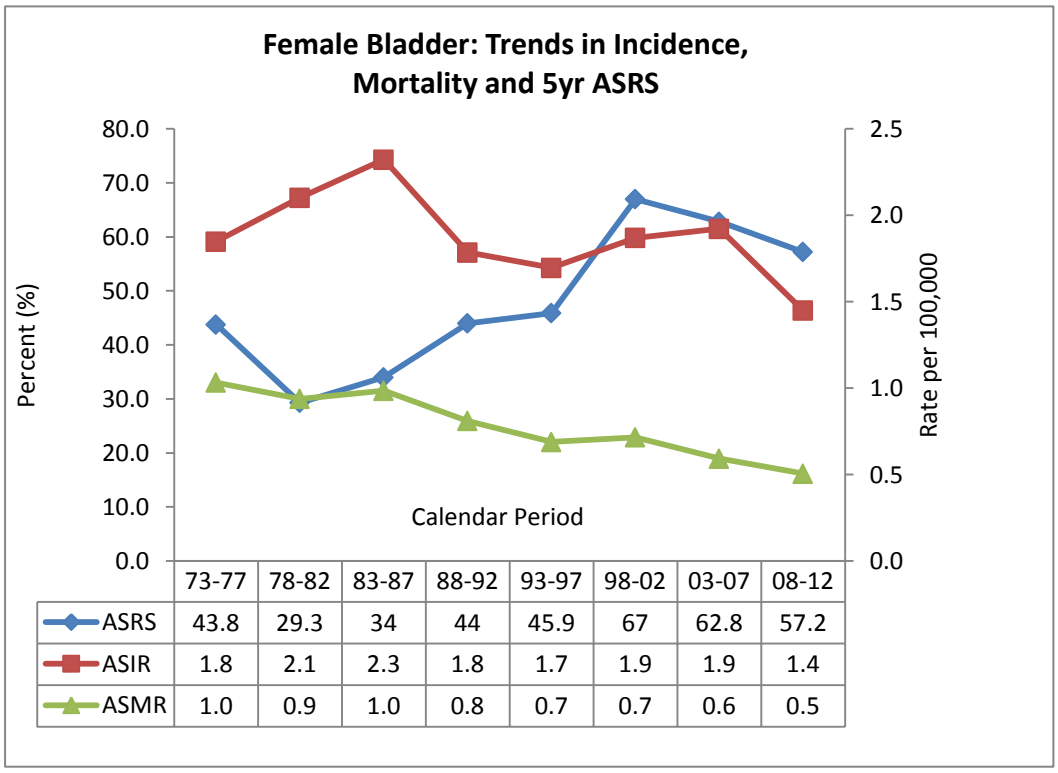
Bladder cancer has dropped from the ninth to the twelfth most frequent cancer among males in Singapore in 2008 – 2012. It was less frequent among females, where the male-to-female ratio was 4:1 during 2008 – 2012.[71]

The incidence and mortality of bladder cancer remained fairly stable over the study period. Among females, the mortality of bladder cancer dipped from 1.0 per 100,000 in 1973 – 1977 to 0.5 per 100,000 in 2008 – 2012 while its incidence fluctuated between 1.8 and 2.3 per 100,000. On the other hand, the incidence and mortality of bladder cancer in males ranged from 5.9 to 7.7 per 100,000 and 1.7 to 2.8 per 100,000 respectively during the study period. In terms of survival, both genders showed improvement. The 5-year ASRS had increased by 34.7 and 13.4 percentage points in males and females respectively over the study period, though there appears to be plateauing among males and females after 2003 – 2007 and 1998 – 2002, respectively. The relative survival for male bladder cancer was highest while for females it was comparable, among countries compared.

Technical advances in cystoscopy such as blue light cystoscopy, has increased the detection of bladder tumours and improved the quality of tumour resection. Open radical cystectomy remains the gold standard treatment for minimally invasive bladder cancer while benefits of minimally invasive radical cystectomy from randomized trials are awaited. [100]

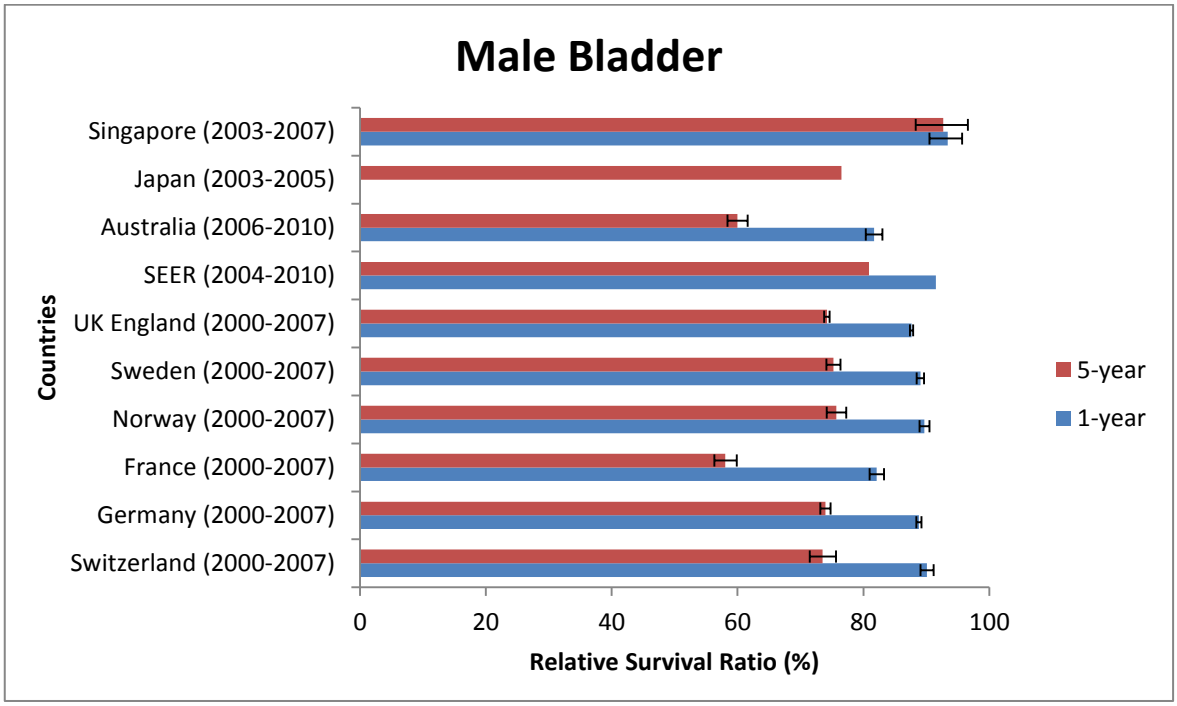


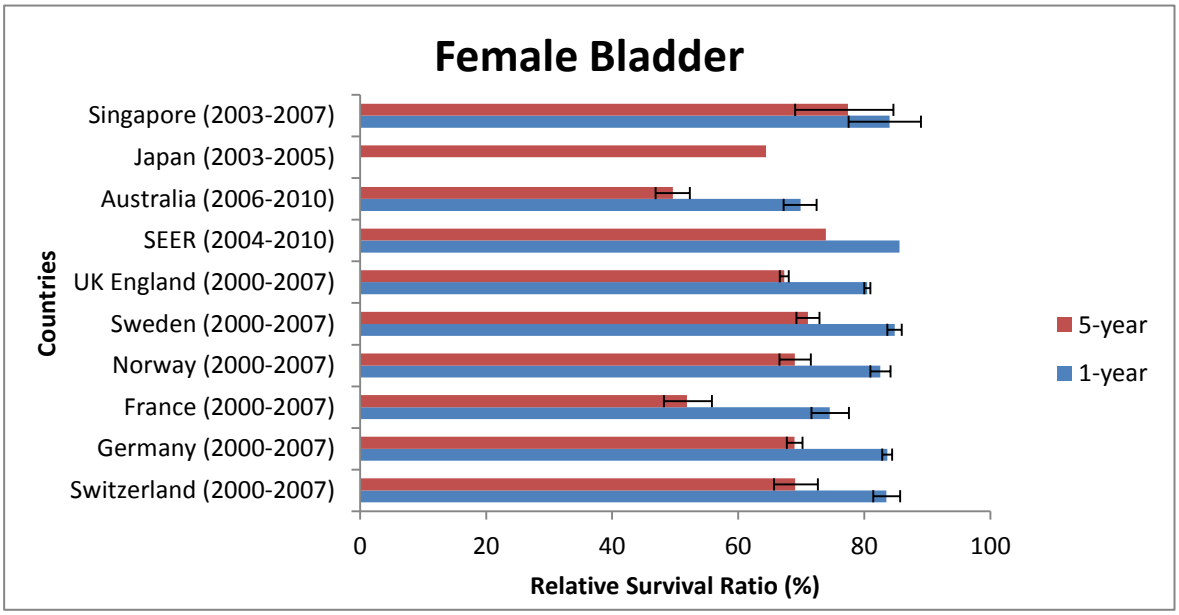
	73-77	78-82	83-87	88-92	93-97	98-02	03-07	08-12
ASRS	32.9	49.9	56.2	64.2	67.3	67	73.9	67.6
ASIR	6.3	7.1	7.0	7.3	7.2	7.7	7.2	5.9
ASMR	2.8	2.3	2.0	2.5	2.1	2.7	1.8	1.7



	73-77	78-82	83-87	88-92	93-97	98-02	03-07	08-12
ASRS	43.8	29.3	34	44	45.9	67	62.8	57.2
ASIR	1.8	2.1	2.3	1.8	1.7	1.9	1.9	1.4
ASMR	1.0	0.9	1.0	0.8	0.7	0.7	0.6	0.5

1- and 5-year age-standardised relative survival in selected countries





Age-standardised observed survival and relative survival of bladder cancer by calendar period and gender

Calendar Period	Males							
	ASOS (%)				ASRS (%)			
	1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr
1973-1977	47.2 (39.4-54.5)	31.8 (24.8-39.0)	23.7 (17.3-30.6)	16.5 (9.5-25.1)	51.1 (42.7-59.0)	39.1 (30.5-47.9)	32.9 (24.0-42.6)	27.8 (16.1-42.4)
1978-1982	62.9 (56.3-68.8)	44.0 (37.2-50.5)	35.0 (28.3-41.8)	25.0 (18.2-32.3)	67.5 (60.4-73.9)	54.3 (46.0-62.3)	49.9 (40.3-59.6)	48.5 (35.3-62.8)
1983-1987	72.2 (66.5-77.0)	52.5 (46.2-58.3)	41.2 (35.0-47.3)	24.9 (19.1-31.1)	77.4 (71.4-82.7)	64.1 (56.5-71.2)	56.2 (47.8-64.5)	45.5 (34.9-56.9)
1988-1992	79.1 (74.6-82.8)	57.3 (52.1-62.1)	46.5 (41.2-51.7)	34.1 (28.5-39.7)	84.5 (79.8-88.5)	69.6 (63.4-75.5)	64.2 (56.8-71.3)	64.3 (53.8-74.9)
1993-1997	77.2 (73.1-80.7)	59.3 (54.5-63.7)	49.0 (44.2-53.6)	35.1 (30.3-39.9)	82.2 (77.8-86.0)	71.3 (65.6-76.6)	67.3 (60.7-73.7)	69.5 (60.0-79.1)
1998-2002	77.9 (74.3-81.0)	59.7 (55.6-63.6)	52.3 (48.0-56.3)	36.3 (31.9-40.6)	82.2 (78.4-85.5)	69.3 (64.5-73.8)	67.0 (61.6-72.2)	63.5 (55.9-71.1)
2003-2007	82.2 (78.9-85.1)	66.7 (62.7-70.3)	58.6 (54.5-62.4)	41.9 (37.7-46.0)	86.3 (82.8-89.3)	76.5 (72.0-80.7)	73.9 (68.8-78.8)	67.8 (61.1-74.5)
2008-2012	80.0 (76.7-83.0)	62.8 (58.9-66.5)	55.8 (51.8-59.5)	40.5 (36.6-44.3)	83.3 (79.8-86.4)	70.3 (65.9-74.4)	67.6 (62.8-72.2)	63.2 (57.2-69.1)
Calendar Period	Females							
	ASOS (%)				ASRS (%)			
	1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr
1973-1977	49.1 (35.5-61.3)	40.0 (27.3-52.3)	35.7 (23.4-48.2)	0.1 (0.0-19.2)	51.4 (37.1-64.2)	45.7 (31.3-59.8)	43.8 (28.7-59.1)	0.1 (0.0-33.4)
1978-1982	54.2 (42.4-64.6)	34.0 (23.1-45.1)	22.1 (13.1-32.7)	10.1 (4.3-18.9)	57.2 (44.7-68.1)	39.6 (26.9-52.6)	29.3 (17.3-43.3)	18.7 (7.9-35.1)
1983-1987	51.3 (41.4-60.4)	37.7 (28.6-46.9)	26.7 (18.4-35.7)	16.1 (8.6-25.7)	53.7 (43.3-63.2)	43.3 (32.7-53.7)	34.0 (23.5-45.5)	26.9 (14.3-43.0)
1988-1992	67.0 (57.4-75.0)	44.7 (35.3-53.7)	36.5 (27.6-45.5)	26.2 (18.0-35.1)	69.8 (59.7-78.0)	49.9 (39.4-59.9)	44.0 (33.3-54.8)	38.9 (26.8-52.2)
1993-1997	71.6 (62.5-78.8)	48.8 (39.4-57.5)	37.1 (28.1-46.1)	28.4 (20.2-37.1)	74.9 (65.4-82.4)	55.5 (44.8-65.4)	45.9 (34.7-57.0)	41.3 (29.4-54.0)
1998-2002	73.0 (65.7-79.0)	61.5 (53.7-68.4)	56.9 (48.8-64.2)	41.3 (32.0-50.4)	75.4 (67.8-81.6)	67.6 (59.0-75.2)	67.0 (57.5-75.6)	57.1 (44.3-69.6)
2003-2007	75.0 (68.2-80.6)	62.7 (55.4-69.2)	53.8 (46.4-60.6)	41.0 (33.5-48.4)	77.7 (70.6-83.4)	69.0 (61.0-76.1)	62.8 (54.2-70.8)	57.6 (47.1-67.9)
2008-2012	76.1 (68.8-81.9)	56.5 (48.6-63.7)	48.7 (41.0-56.0)	40.5 (33.2-47.6)	78.7 (71.2-84.7)	62.2 (53.4-70.1)	57.2 (48.1-65.7)	55.5 (45.6-65.3)

ASOS: Age-standardised observed survival
ASRS: Age-standardised relative survival

REFERENCES

1. Dickman PW, Adami HO. Interpreting trends in cancer patient survival. *J Intern Med* 2006; **260**(2): 103-17.
2. Registry SC. Trends in Cancer Incidence in Singapore 1968-2007, 2010.
3. Warren GW, Kasza KA, Reid ME, Cummings KM, Marshall JR. Smoking at diagnosis and survival in cancer patients. *International journal of cancer Journal international du cancer* 2013; **132**(2): 401-10.
4. Ewertz M, Jensen MB, Gunnarsdottir KA, et al. Effect of obesity on prognosis after early-stage breast cancer. *Journal of clinical oncology : official journal of the American Society of Clinical Oncology* 2011; **29**(1): 25-31.
5. Registry of Births and Deaths IaCA, Singapore. Report on registration of births and deaths 2013, 2014.
6. Dickman PW. Population-based Cancer Survival Analysis (School of Public Health, University of Tampere, Finland 3-7 May 2004) 2004.
7. Dickman PW, Sloggett A, Hills M, Hakulinen T. Regression models for relative survival. *Stat Med* 2004; **23**(1): 51-64.
8. Sant M, Allemani C, Santaquilani M, Knijn A, Marchesi F, Capocaccia R. EUROCARE-4. Survival of cancer patients diagnosed in 1995-1999. Results and commentary. *Eur J Cancer* 2009; **45**(6): 931-91.
9. SEER Cancer Query Systems (CanQues).
10. Sankaranarayanan R, Swaminathan R, Brenner H, et al. Cancer survival in Africa, Asia, and Central America: a population-based study. *Lancet Oncol* 2010; **11**(2): 165-73.
11. Registrar-General of Births and Deaths. Report on the Registration of Births and Deaths, 1968-2004.
12. Dickman PW, Coviello E. Estimating and modeling relative survival. The Stata Journal; ii: 1-23.
13. Brenner H, Gefeller O. An alternative approach to monitoring cancer patient survival. *Cancer* 1996; **78**(9): 2004-10.
14. Brenner H, Soderman B, Hakulinen T. Use of period analysis for providing more up-to-date estimates of long-term survival rates: empirical evaluation among 370,000 cancer patients in Finland. *Int J Epidemiol* 2002; **31**: 456-62.
15. Brenner H, Hakulinen T. Period estimates of cancer patient survival are more up-to-date than complete estimates even at comparable levels of precision. *J Clin Epidemiol* 2006; **59**(6): 570-5.
16. Dickman PW, Coviello E, Hills M. Estimating and modelling relative survival using Stata. www.pauldickman.com2006).
17. Singapore DoS. Complete Life Tables 2003-2006 for Singapore Resident Population. 2008. http://www.singstat.gov.sg/publications/publications-and-papers/population.
18. Singapore DoS. Complete Life Tables 2008-2013 for Singapore Resident Population. 2014.
19. Corazziari I, Quinn M, Capocaccia R. Standard cancer patient population for age standardising survival ratios. *Eur J Cancer* 2004; **40**(15): 2307-16.
20. De Angelis R, Francisci S, Baili P, et al. The EUROCARE-4 database on cancer survival in Europe: data standardisation, quality control and methods of statistical analysis. *Eur J Cancer* 2009; **45**(6): 909-30.

21. Eurocare-5 protocol for updating population-based cancer survival in Europe. 2010. http://www.eurocare.it/LinkClick.aspx?fileticket=IMKSZ_5wpFU%3d&tabid=63 (accessed 22 February 2011).
22. Cancer survival in Europe and North America. The CONCORD study protocol. 2001. http://www.lshtm.ac.uk/eph/ncde/cancersurvival/research/concord/concord_study_protocol.pdf (accessed 22 February 2011).
23. SEER Historical Staging and Coding Manuals. http://seer.cancer.gov/tools/codingmanuals/historical.html (accessed 19/5/2015.
24. Greene FL, Page DL, Fleming ID, Fritz AG, Balch CM, Haller DG. AJCC Cancer Staging Manual Springer, NY: American Joint Committee on Cancer, 2002.
25. Tsukuma H, Ajiki W, Ioka A, Oshima A, Japan. RGoP-bCRo. Survival of Cancer Patients Diagnosed between 1993 and 1996: A Collaborative Study of Population-Based Cancer Regiistries in Japan. *Jpn J Clin Oncol* 2006; **36**: 602-7.
26. Zeng H, Zheng R, Guo Y, et al. Cancer survival in China, 2003-2005: a population-based study. *International journal of cancer Journal international du cancer* 2015; **136**(8): 1921-30.
27. Coleman MP, Forman D, Bryant H, et al. Cancer survival in Australia, Canada, Denmark, Norway, Sweden, and the UK, 1995-2007 (the International Cancer Benchmarking Partnership): an analysis of population-based cancer registry data. *Lancet* 2011; **377**(9760): 127-38.
28. Cronin KA, Mariotto A, Scoppa S, Green D, Clegg L. Differences Between Brenner et. al and NCI Methods for Calculating Period Survival. Statistical Research and Applications Branch, NCI; 2003.
29. Autier P, Boniol M. Caution needed for country-specific cancer survival. *Lancet* 2011; **377**(9760): 99-101.
30. Fiteni F, Westeel V, Pivot X, Borg C, Vernerey D, Bonnetain F. Endpoints in cancer clinical trials. *Journal of visceral surgery* 2014; **151**(1): 17-22.
31. Booth CM, Eisenhauer EA. Progression-free survival: meaningful or simply measurable? *Journal of clinical oncology : official journal of the American Society of Clinical Oncology* 2012; **30**(10): 1030-3.
32. Sarfati D, Blakely T, Pearce N. Measuring cancer survival in populations: relative survival vs cancer-specific survival. *Int J Epidemiol* 2010; **39**(2): 598-610.
33. Cronin KA, Feuer EJ. Cumulative cause-specific mortality for cancer patients in the presence of other causes: a crude analogue of relative survival. *Stat Med* 2000; **19**(13): 1729-40.
34. Berrino F, Sant M, Verdecchia A, Capocaccia R, Hakulinen T, Esteve J. Survival of cancer patients in Europe: the Eurocare study: Lyon; 1995.
35. Feinstein AR, Sosin DM, Wells CK. The Will Rogers phenomenon. Stage migration and new diagnostic techniques as a source of misleading statistics for survival in cancer. *N Engl J Med* 1985; **312**(25): 1604-8.
36. Tan BK, Lim GH, Czene K, Hall P, Chia KS. Do Asian breast cancer patients have poorer survival than their western counterparts? A comparison between Singapore and Stockholm. *Breast Cancer Res* 2009; **11**(1): R4.
37. Sant M, Allemani C, Capocaccia R, et al. Stage at diagnosis is a key explanation of differences in breast cancer survival across Europe. *Int J Cancer* 2003; **106**(3): 416-22.

38. Guigay J. Advances in nasopharyngeal carcinoma. *Current opinion in oncology* 2008; **20**(3): 264-9.
39. Chan AT, Gregoire V, Lefebvre JL, Licitra L, Felip E, Group E-E-EGW. Nasopharyngeal cancer: EHNS-ESMO-ESTRO Clinical Practice Guidelines for diagnosis, treatment and follow-up. *Annals of oncology : official journal of the European Society for Medical Oncology / ESMO* 2010; **21 Suppl 5**: v187-9.
40. Baujat B, Audry H, Bourhis J, et al. Chemotherapy as an adjunct to radiotherapy in locally advanced nasopharyngeal carcinoma. *The Cochrane database of systematic reviews* 2006; (4): CD004329.
41. Lee AW, Ng WT, Chan LL, et al. Evolution of treatment for nasopharyngeal cancer--success and setback in the intensity-modulated radiotherapy era. *Radiotherapy and oncology : journal of the European Society for Therapeutic Radiology and Oncology* 2014; **110**(3): 377-84.
42. Howson CP, Hiyama T, Wynder EL. The decline in gastric cancer: epidemiology of an unplanned triumph. *Epidemiol Rev* 1986; **8**: 1-27.
43. Kunz PL, Gubens M, Fisher GA, Ford JM, Lichtensztajn DY, Clarke CA. Long-term survivors of gastric cancer: a California population-based study. *Journal of clinical oncology : official journal of the American Society of Clinical Oncology* 2012; **30**(28): 3507-15.
44. Salvon-Harman JC, Cady B, Nikulasson S, Khettry U, Stone MD, Lavin P. Shifting proportions of gastric adenocarcinomas. *Archives of surgery* 1994; **129**(4): 381-8; discussion 8-9.
45. Orditura M, Galizia G, Sforza V, et al. Treatment of gastric cancer. *World journal of gastroenterology : WJG* 2014; **20**(7): 1635-49.
46. Bilici A. Treatment options in patients with metastatic gastric cancer: current status and future perspectives. *World journal of gastroenterology : WJG* 2014; **20**(14): 3905-15.
47. Reim D, Loos M, Vogl F, et al. Prognostic implications of the seventh edition of the international union against cancer classification for patients with gastric cancer: the Western experience of patients treated in a single-center European institution. *Journal of clinical oncology : official journal of the American Society of Clinical Oncology* 2013; **31**(2): 263-71.
48. Friedenreich CM, Neilson HK, Lynch BM. State of the epidemiological evidence on physical activity and cancer prevention. *European journal of cancer* 2010; **46**(14): 2593-604.
49. Epidemiology & Disease Control Department MoHS. National Health Surveillance Survey 2012.
50. Epidemiology and Disease Control Department MoH. National Health Survey 2010 Singapore.
51. Epidemiology & Disease Control Department MoHS. National Health Surveillance Survey, 2004.
52. Simmonds PC. Palliative chemotherapy for advanced colorectal cancer: systematic review and meta-analysis. Colorectal Cancer Collaborative Group. *Bmj* 2000; **321**(7260): 531-5.
53. Andre T, Boni C, Mounedji-Boudiaf L, et al. Oxaliplatin, fluorouracil, and leucovorin as adjuvant treatment for colon cancer. *The New England journal of medicine* 2004; **350**(23): 2343-51.

54. Andre T, Boni C, Navarro M, et al. Improved overall survival with oxaliplatin, fluorouracil, and leucovorin as adjuvant treatment in stage II or III colon cancer in the MOSAIC trial. *Journal of clinical oncology : official journal of the American Society of Clinical Oncology* 2009; **27**(19): 3109-16.
55. Tournigand C, Andre T, Achille E, et al. FOLFIRI followed by FOLFOX6 or the reverse sequence in advanced colorectal cancer: a randomized GERCOR study. *Journal of clinical oncology : official journal of the American Society of Clinical Oncology* 2004; **22**(2): 229-37.
56. Hurwitz H, Fehrenbacher L, Novotny W, et al. Bevacizumab plus irinotecan, fluorouracil, and leucovorin for metastatic colorectal cancer. *The New England journal of medicine* 2004; **350**(23): 2335-42.
57. Van Cutsem E, Kohne CH, Lang I, et al. Cetuximab plus irinotecan, fluorouracil, and leucovorin as first-line treatment for metastatic colorectal cancer: updated analysis of overall survival according to tumor KRAS and BRAF mutation status. *Journal of clinical oncology : official journal of the American Society of Clinical Oncology* 2011; **29**(15): 2011-9.
58. Kanas GP, Taylor A, Primrose JN, et al. Survival after liver resection in metastatic colorectal cancer: review and meta-analysis of prognostic factors. *Clinical epidemiology* 2012; **4**: 283-301.
59. Wiegering A, Isbert C, Dietz UA, et al. Multimodal therapy in treatment of rectal cancer is associated with improved survival and reduced local recurrence - a retrospective analysis over two decades. *BMC cancer* 2014; **14**: 816.
60. Khin LW, Teo CJ, Guan R. Seroprevalence of hepatitis B and C viral markers in patients with primary hepatocellular carcinoma in Singapore. *Singapore medical journal* 1996; **37**(5): 492-6.
61. Wang TL, Yap IL, Tan YO. Hepatocellular carcinoma--a case series of 104 patients. *Annals of the Academy of Medicine, Singapore* 1991; **20**(2): 215-8.
62. Goh KT, Doraisingham S, Tan KL, et al. The hepatitis B immunization programme in Singapore. *Bulletin of the World Health Organization* 1989; **67**(1): 65-70.
63. Liew F, Ang LW, Cutter J, James L, Goh KT. Evaluation on the effectiveness of the national childhood immunisation programme in Singapore, 1982-2007. *Annals of the Academy of Medicine, Singapore* 2010; **39**(7): 532-10.
64. Singal AG, Pillai A, Tiro J. Early detection, curative treatment, and survival rates for hepatocellular carcinoma surveillance in patients with cirrhosis: a meta-analysis. *PLoS medicine* 2014; **11**(4): e1001624.
65. BBG Goh JC, WC Ong, CK Tan. The 64th Annual Meeting of the American Association for the Study of Liver Diseases; 2010: Hepatology; 2010. p. 1136A-7A.
66. Colombo M, Sangiovanni A. Treatment of hepatocellular carcinoma: beyond international guidelines. *Liver international : official journal of the International Association for the Study of the Liver* 2015; **35 Suppl 1**: 129-38.
67. Cheng AL, Kang YK, Chen Z, et al. Efficacy and safety of sorafenib in patients in the Asia-Pacific region with advanced hepatocellular carcinoma: a phase III randomised, double-blind, placebo-controlled trial. *The Lancet Oncology* 2009; **10**(1): 25-34.
68. Llovet JM, Ricci S, Mazzaferro V, et al. Sorafenib in advanced hepatocellular carcinoma. *The New England journal of medicine* 2008; **359**(4): 378-90.

69. Abdel-Rahman O, Fouad M. Sorafenib-based combination as a first line treatment for advanced hepatocellular carcinoma: a systematic review of the literature. *Critical reviews in oncology/hematology* 2014; **91**(1): 1-8.
70. Seow A, Koh WP, Chia KS, Shi LM, Lee HP, Shanmugaratnam K. Trends in Cancer Incidence in Singapore, 1968-2002, 2004.
71. Wang JB, Jiang Y, Wei WQ, Yang GH, Qiao YL, Boffetta P. Estimation of cancer incidence and mortality attributable to smoking in China. *Cancer causes & control : CCC* 2010; **21**(6): 959-65.
72. Heuvers ME, Muskens F, Bezemer K, et al. Arginase-1 mRNA expression correlates with myeloid-derived suppressor cell levels in peripheral blood of NSCLC patients. *Lung cancer* 2013; **81**(3): 468-74.
73. Ries LA. Influence of extent of disease, histology, and demographic factors on lung cancer survival in the SEER population-based data. *Seminars in surgical oncology* 1994; **10**(1): 21-30.
74. Di BS, Wei KP, Tian JH, et al. Effectiveness and safety of pemetrexed versus docetaxel as a treatment for advanced non-small cell lung cancer: a systematic review and meta-analysis. *Asian Pacific journal of cancer prevention : APJCP* 2014; **15**(8): 3419-24.
75. Choy H, Gerber DE, Bradley JD, et al. Concurrent pemetrexed and radiation therapy in the treatment of patients with inoperable stage III non-small cell lung cancer: a systematic review of completed and ongoing studies. *Lung cancer* 2015; **87**(3): 232-40.
76. Nair A, Klusmann MJ, Jogeesvaran KH, Grubnic S, Green SJ, Vlahos I. Revisions to the TNM staging of non-small cell lung cancer: rationale, clinicoradiologic implications, and persistent limitations. *Radiographics : a review publication of the Radiological Society of North America, Inc* 2011; **31**(1): 215-38.
77. Wang SC. The Singapore National Breast Screening Programme: principles and implementation. *Ann Acad Med Singapore* 2003; **32**(4): 466-76.
78. Health Surveillance & Informatics Department HPB. Health Behaviour Surveillance of Singapore 2012.
79. Prevention. CfDCa. Cancer Screening- United States, 2010. Morbidity and Mortality Weekly Report. . http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6103a1.htm.
80. Publishing. O. Screening, survival and mortality for breast cancer in Health at a Glance: Europe 2012. .
81. Davies C, Pan H, Godwin J, et al. Long-term effects of continuing adjuvant tamoxifen to 10 years versus stopping at 5 years after diagnosis of oestrogen receptor-positive breast cancer: ATLAS, a randomised trial. *Lancet* 2013; **381**(9869): 805-16.
82. Epidemiology and Disease Control Department MoH. National Health Survey 1998 Singapore.
83. National Cancer Institute: NCI Clinical Announcement. Feb 1999.
84. Suh DH, Kim JW, Kang S, Kim HJ, Lee KH. Major clinical research advances in gynecologic cancer in 2013. *Journal of gynecologic oncology* 2014; **25**(3): 236-48.
85. Department EaDC. National Health Survey 2010. Singapore.
86. Statistics Do. Yearbook of Statistics. 2014. http://www.singstat.gov.sg/statistics/browse-by-theme/births-and-deaths.
87. Fader AN, Rose PG. Role of surgery in ovarian carcinoma. *J Clin Oncol* 2007; **25**(20): 2873-83.

88. Maringe C, Walters S, Butler J, et al. Stage at diagnosis and ovarian cancer survival: evidence from the International Cancer Benchmarking Partnership. *Gynecologic oncology* 2012; **127**(1): 75-82.
89. Sung PL, Chang YH, Chao KC, Chuang CM, Task Force on Systematic R, Meta-analysis of Ovarian C. Global distribution pattern of histological subtypes of epithelial ovarian cancer: a database analysis and systematic review. *Gynecologic oncology* 2014; **133**(2): 147-54.
90. Piccart MJ, Bertelsen K, Stuart G, et al. Long-term follow-up confirms a survival advantage of the paclitaxel-cisplatin regimen over the cyclophosphamide-cisplatin combination in advanced ovarian cancer. *International journal of gynecological cancer : official journal of the International Gynecological Cancer Society* 2003; **13 Suppl 2**: 144-8.
91. Katsumata N, Yasuda M, Isonishi S, et al. Long-term results of dose-dense paclitaxel and carboplatin versus conventional paclitaxel and carboplatin for treatment of advanced epithelial ovarian, fallopian tube, or primary peritoneal cancer (JGOG 3016): a randomised, controlled, open-label trial. *The Lancet Oncology* 2013; **14**(10): 1020-6.
92. Pignata S, Scambia G, Katsaros D, et al. Carboplatin plus paclitaxel once a week versus every 3 weeks in patients with advanced ovarian cancer (MITO-7): a randomised, multicentre, open-label, phase 3 trial. *The Lancet Oncology* 2014; **15**(4): 396-405.
93. Hoskins WJ, McGuire WP, Brady MF, et al. The effect of diameter of largest residual disease on survival after primary cytoreductive surgery in patients with suboptimal residual epithelial ovarian carcinoma. *American journal of obstetrics and gynecology* 1994; **170**(4): 974-9; discussion 9-80.
94. du Bois A, Reuss A, Pujade-Lauraine E, Harter P, Ray-Coquard I, Pfisterer J. Role of surgical outcome as prognostic factor in advanced epithelial ovarian cancer: a combined exploratory analysis of 3 prospectively randomized phase 3 multicenter trials: by the Arbeitsgemeinschaft Gynaekologische Onkologie Studiengruppe Ovarialkarzinom (AGO-OVAR) and the Groupe d'Investigateurs Nationaux Pour les Etudes des Cancers de l'Ovaire (GINECO). *Cancer* 2009; **115**(6): 1234-44.
95. Monk BJ, Pujade-Lauraine E, Burger RA. Integrating bevacizumab into the management of epithelial ovarian cancer: the controversy of front-line versus recurrent disease. *Annals of oncology : official journal of the European Society for Medical Oncology / ESMO* 2013; **24 Suppl 10**: x53-x8.
96. Loeb S, Bjurlin MA, Nicholson J, et al. Overdiagnosis and overtreatment of prostate cancer. *European urology* 2014; **65**(6): 1046-55.
97. Ilic D, Neuberger MM, Djulbegovic M, Dahm P. Screening for prostate cancer. *The Cochrane database of systematic reviews* 2013; **1**: CD004720.
98. Bill-Axelson A, Holmberg L, Garmo H, et al. Radical prostatectomy or watchful waiting in early prostate cancer. *The New England journal of medicine* 2014; **370**(10): 932-42.
99. Cheung G, Sahai A, Billia M, Dasgupta P, Khan MS. Recent advances in the diagnosis and treatment of bladder cancer. *BMC medicine* 2013; **11**: 13.

APPENDIX A

Relative Survival and Observed Survival by Period, Site and Age Group

RELATIVE SURVIVAL BY PERIOD, SITE AND AGE GROUP, SINGAPORE MALES, 1973-1992

SITE	Age group	Relative survival (%)															
		1973-1977				1978-1982				1983-1987				1988-1992			
		1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr
Tongue	15-44	100.3	74.0	74.6	75.9	75.7	56.9	57.4	49.1	38.8	39.1	39.4	31.1	72.8	63.5	50.5	51.8
	45-54	66.0	21.9	*	*	69.3	41.4	42.4	*	51.0	52.1	30.3	23.9	51.2	27.5	20.3	15.5
	55-64	45.9	10.5	11.1	13.0	51.5	36.7	19.8	7.0	56.7	22.6	8.0	0.5	74.9	37.1	38.8	36.2
	65-74	49.3	31.4	35.6	*	73.4	22.0	24.8	15.3	49.9	21.5	24.6	*	46.0	29.4	20.2	7.9
	75+	47.4	30.0	*	*	47.3	45.6	17.5	*	56.3	15.1	20.2	*	25.8	6.9	9.3	*
	All ages	53.1	27.3	28.7	33.2	60.1	37.5	26.1	17.2	53.5	25.6	23.7	12.4	47.8	26.5	22.5	14.4
Salivary gland	15-44	100.1	74.5	75.1	75.8	100.2	100.6	101.0	102.7	100.2	100.6	86.1	87.2	91.9	92.2	92.5	61.1
	45-54	80.8	51.5	52.3	*	100.7	71.0	49.1	52.7	100.8	82.6	84.0	91.4	100.6	62.8	63.9	44.1
	55-64	77.7	50.9	53.0	*	74.7	*	4.7	2.9	68.0	58.6	60.6	28.7	101.8	56.1	38.5	43.2
	65-74	39.6	*	*	*	80.8	*	*	*	105.0	*	*	*	42.1	47.4	55.8	*
	75+	69.1	57.8	*	*	72.2	12.0	*	*	118.5	*	*	*	69.9	17.9	22.7	*
	All ages	65.9	44.9	32.2	32.5	78.2	18.6	16.0	12.8	99.5	61.3	60.7	45.2	64.2	33.1	33.7	24.5
Nasopharynx	15-44	81.5	50.5	40.5	35.9	81.7	51.2	42.5	31.6	87.3	55.9	44.6	37.2	91.0	68.2	57.3	44.4
	45-54	70.6	37.0	29.1	19.1	80.4	47.2	32.8	19.6	76.0	49.0	32.1	18.6	84.2	58.0	45.6	35.6
	55-64	54.7	25.1	17.2	18.1	70.6	43.2	23.5	12.6	65.3	39.2	31.4	23.1	78.0	50.8	40.0	20.9
	65-74	45.3	14.1	8.7	*	64.6	28.1	31.5	*	68.3	40.2	24.2	10.5	60.1	34.0	22.7	4.4
	75+	22.3	29.5	*	*	40.9	11.2	15.6	*	46.7	9.7	12.9	*	42.6	26.7	27.2	*
	All ages	58.0	30.9	22.9	19.0	68.5	38.6	29.8	17.6	70.1	41.2	30.7	20.3	71.3	47.6	38.1	24.9
Oesophagus	15-44	8.6	8.6	*	*	34.4	3.4	3.4	*	68.8	20.8	*	20.9	38.8	3.0	3.0	*
	45-54	29.3	8.3	8.5	*	19.8	5.3	5.5	6.0	38.0	12.7	12.9	13.9	17.2	4.1	2.0	1.2
	55-64	14.9	2.0	2.1	*	19.8	6.6	2.2	0.5	22.3	7.9	3.5	*	22.5	7.2	3.7	4.2
	65-74	10.4	1.0	1.2	*	16.3	4.3	2.0	2.9	17.4	7.0	4.4	4.4	24.9	7.2	4.1	2.4
	75+	7.6	1.1	1.7	*	10.2	6.5	6.1	16.1	14.8	4.3	2.4	7.2	15.3	5.2	4.2	0.4
	All ages	12.2	2.6	2.9	*	17.0	5.5	4.3	4.3	22.5	7.4	4.4	4.1	21.0	5.4	3.5	2.7
Stomach	15-44	34.7	14.0	9.1	*	47.6	28.4	22.8	23.3	44.8	19.7	14.1	12.8	38.9	29.8	19.6	14.4
	45-54	27.2	9.1	5.2	4.5	37.9	16.0	12.9	6.7	44.5	29.0	24.3	13.1	51.6	34.9	23.7	19.1
	55-64	21.3	8.9	7.3	1.8	31.7	14.4	11.5	8.8	39.8	22.8	19.9	13.5	44.2	24.8	21.9	15.9
	65-74	14.2	6.7	6.3	4.9	18.5	8.0	7.3	3.0	34.3	15.3	12.8	11.5	31.9	17.9	13.3	13.3
	75+	8.8	1.8	1.4	*	16.3	5.3	3.9	*	20.3	9.6	8.6	*	28.8	17.1	17.1	20.5
	All ages	17.0	6.3	4.8	2.6	24.6	11.1	9.2	6.2	33.0	17.1	14.4	10.9	36.2	21.7	17.3	14.5
Colon	15-44	77.0	48.3	43.3	35.2	57.3	36.6	34.9	27.6	79.2	57.5	43.1	44.1	73.2	57.7	48.4	44.0
	45-54	60.5	47.0	42.0	43.4	76.7	53.9	41.4	33.5	67.5	43.3	38.2	33.4	76.6	54.7	50.7	46.4
	55-64	52.0	32.7	29.8	14.1	62.1	49.2	36.6	26.4	76.3	53.5	42.9	41.9	71.5	55.2	48.6	44.9
	65-74	40.6	28.3	24.5	29.8	57.5	38.4	31.2	41.8	58.6	41.8	38.7	36.0	69.4	54.6	45.5	52.7
	75+	23.2	19.5	11.7	*	17.0	11.0	9.5	3.7	53.1	39.2	32.9	153.2	63.9	52.0	48.2	61.3
	All ages	42.6	29.4	25.4	22.5	47.4	33.5	26.1	22.2	63.1	44.7	38.4	38.1	69.0	53.9	47.3	50.1
Rectum	15-44	59.7	24.1	13.5	*	71.0	31.8	27.7	15.5	68.7	39.3	20.2	14.6	76.1	50.4	44.0	36.7
	45-54	59.6	41.9	31.8	*	68.4	42.8	35.9	21.0	66.7	36.1	27.5	18.0	74.8	43.5	35.2	27.9
	55-64	51.3	24.0	18.5	9.4	65.2	35.5	27.9	27.4	73.5	51.6	36.8	32.7	75.3	50.4	40.5	34.8
	65-74	42.2	16.9	17.6	*	60.0	34.9	24.2	9.6	68.8	44.7	32.1	16.7	66.1	44.6	38.8	29.4
	75+	38.8	36.9	34.0	*	60.9	44.7	48.0	154.3	53.1	34.7	31.1	40.3	71.3	43.4	30.5	69.5
	All ages	47.1	26.9	22.4	27.4	63.3	38.2	31.9	25.8	64.8	41.8	31.1	25.6	71.4	45.8	37.2	33.7
Colorectal	15-44	68.7	36.6	30.3	25.7	63.1	34.7	31.9	23.7	75.7	50.8	33.8	31.5	74.5	55.0	46.7	41.4
	45-54	60.1	45.1	38.2	38.4	72.3	48.0	38.3	27.5	67.1	39.5	32.7	25.7	75.8	49.3	42.8	36.5
	55-64	51.6	28.3	24.2	11.7	63.6	42.5	32.4	26.5	75.0	52.6	40.1	37.4	73.4	53.1	45.0	40.4
	65-74	41.4	22.3	20.8	23.5	58.7	36.9	28.2	24.3	63.1	43.1	35.8	28.8	68.0	50.3	42.7	42.8
	75+	30.7	27.7	23.5	*	40.2	28.5	28.3	42.6	53.1	37.4	32.4	56.0	66.6	48.9	41.2	72.0
	All ages	45.0	28.5	24.4	24.5	56.2	36.8	29.9	25.3	63.9	43.4	35.0	32.1	69.9	50.5	43.0	42.9
Liver	15-44	1.7	0.7	0.3	*	1.7	0.6	0.6	0.6	5.0	2.4	2.4	2.5	14.6	2.9	0.2	0.2
	45-54	1.4	0.5	0.4	0.0	1.6	0.8	0.5	0.5	4.3	1.5	0.7	0.3	12.5	4.6	3.7	3.0
	55-64	0.9	0.7	0.5	*	2.6	0.6	0.5	0.2	5.3	1.5	0.5	0.3	11.1	2.8	2.5	*
	65-74	0.5	0.3	0.3	*	1.7	0.6	0.3	0.3	2.3	1.1	0.7	0.0	7.4	1.1	0.4	0.3
	75+	0.2	*	0.1	*	1.6	0.9	*	*	2.1	0.9	0.7	*	5.2	1.9	0.9	0.0
	All ages	0.6	0.3	0.2	0.0	1.8	0.7	0.5	0.4	3.2	1.3	0.8	0.5	8.6	2	1.4	0.5

* refers to cells where estimates are not computed due to insufficient sample size
Estimates for “all ages” are age standardised
Sites which have insufficient sample size for all cells are excluded from this appendix

RELATIVE SURVIVAL BY PERIOD, SITE AND AGE GROUP, SINGAPORE MALES, 1993-2012																
SITE	Relative survival (%)															
	Age group	1993-1997				1998-2002				2003-2007				2008-2012			
		1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr
Tongue	15-44	69.4	46.8	47.0	28.7	91.0	44.3	34.2	21.1	76.5	67.0	67.2	68.0	84.6	65.7	65.9	66.4
	45-54	54.3	47.6	40.7	43.2	77.8	57.7	58.5	61.4	85.9	50.9	41.6	24.8	82.5	70.0	70.6	68.5
	55-64	51.2	19.1	15.3	5.9	69.9	41.1	34.5	23.9	73.4	55.6	48.7	38.7	83.5	52.5	46.8	34.9
	65-74	62.3	38.4	24.0	15.4	64.9	42.7	47.4	68.2	59.8	37.6	40.5	20.1	61.7	41.9	34.2	35.2
	75+	26.2	15.9	4.0	*	71.5	42.9	50.4	*	42.6	20.0	20.1	26.1	54.1	52.0	63.4	59.3
	All ages	47.2	27.0	17.7	12.0	71.0	43.7	43.8	43.2	60.8	38.5	37.2	28.6	67.4	51.4	49.7	45.6
Salivary gland	15-44	100.2	94.4	94.8	84.5	100.1	95.7	85.2	86.1	100.1	100.4	100.6	86.0	92.4	83.9	84.0	66.6
	45-54	93.6	78.4	66.5	51.9	100.4	82.6	75.8	78.8	92.3	78.8	56.6	44.7	100.3	95.4	96.3	99.3
	55-64	101.5	72.5	75.9	49.5	101.3	104.4	72.5	81.6	93.2	73.2	61.2	40.9	89.5	57.6	53.6	26.6
	65-74	51.5	40.6	44.5	72.5	70.4	49.8	55.6	45.7	84.7	80.2	76.6	59.8	94.8	76.5	70.6	43.0
	75+	51.3	46.8	*	*	95.4	119.6	87.5	*	86.5	67.8	50.3	70.4	50.7	43.6	36.4	66.0
	All ages	66.1	54.0	48.9	46.2	88.9	87.4	73.8	86.8	88.4	75.4	63.8	54.2	81.0	64.2	58.1	50.2
Nasopharynx	15-44	91.0	73.2	61.9	50.7	92.4	77.5	67.9	54.1	95.8	83.2	73.0	59.5	95.1	84.2	77.3	68.7
	45-54	85.7	67.5	56.4	37.2	88.2	71.5	60.8	46.3	91.7	76.9	69.1	53.0	93.6	81.4	73.5	62.3
	55-64	86.5	63.9	51.2	31.5	82.7	62.1	51.2	39.3	85.5	70.1	58.5	41.6	90.7	78.0	68.0	51.6
	65-74	73.9	56.4	47.6	28.3	74.8	51.0	41.3	16.3	76.6	62.9	43.4	32.7	87.3	63.7	59.2	48.7
	75+	51.8	20.5	26.5	34.2	67.7	42.1	34.1	8.8	63.0	38.0	25.5	30.4	57.1	30.2	21.9	6.6
	All ages	78.2	57.2	49.0	36.2	80.7	60.9	51.0	35.0	81.3	65.4	53.4	41.6	83.6	65.7	58.5	47.4
Oesophagus	15-44	56.5	16.5	16.6	*	86.3	42.7	42.9	43.5	58.8	24.3	24.4	24.7	29.1	2.3	2.3	1.0
	45-54	29.2	20.4	*	0.9	44.8	25.5	20.8	*	36.8	22.1	14.7	8.4	37.6	10.9	11.0	7.7
	55-64	27.4	11.9	7.5	4.9	44.9	15.0	7.8	4.7	34.9	13.1	8.8	7.4	37.8	13.2	10.1	9.6
	65-74	26.9	9.5	6.5	5.0	32.8	11.1	6.5	5.8	29.9	7.5	3.4	2.2	39.9	9.4	4.8	6.2
	75+	7.4	1.1	1.4	1.6	27.0	12.0	15.3	25.3	18.8	7.7	9.1	10.2	31.4	6.3	6.0	5.7
	All ages	22.3	8.5	6.3	4.1	39.0	15.7	11.8	10.9	30.0	11.2	8.7	7.0	36.1	9.7	7.4	6.2
Stomach	15-44	55.7	31.2	25.1	17.3	60.2	45.2	45.4	41.1	59.1	36.4	29.6	27.7	68.3	50.5	44.0	38.6
	45-54	59.7	40.7	34.3	29.3	56.1	38.1	31.7	28.7	55.7	33.7	31.3	25.8	71.1	38.6	30.1	26.4
	55-64	47.6	29.8	26.5	25.1	59.7	38.6	35.7	25.1	65.3	39.5	34.3	30.7	63.8	37.5	33.2	30.7
	65-74	43.1	24.3	20.3	16.5	48.9	30.8	27.9	27.0	55.0	32.1	25.5	23.8	54.2	34.5	26.7	22.3
	75+	27.4	15.3	13.5	10.6	32.6	20.9	19.8	26.0	38.5	21.1	14.3	16.2	44.4	24.5	20.1	16.7
	All ages	41.5	24.7	21.2	18.1	47.1	30.6	28.0	24.9	51.1	29.8	24.3	22.4	54.9	32.6	26.8	23.5
Colon	15-44	84.3	71.8	60.8	54.9	83.5	67.4	64.3	60.1	81.3	68.1	62.2	59.5	84.5	75.2	68.6	64.2
	45-54	79.4	62.9	57.2	54.6	85.9	73.5	58.0	52.1	80.8	66.8	61.5	58.0	89.1	73.4	69.9	65.4
	55-64	80.7	63.2	53.8	48.9	80.8	64.5	55.1	49.3	84.7	68.9	61.7	57.1	85.9	71.9	64.9	56.5
	65-74	75.2	56.3	49.7	50.3	72.5	59.0	50.4	44.5	77.4	60.9	54.4	50.6	81.9	68.5	60.0	52.0
	75+	61.5	51.8	56.3	67.6	59.3	53.7	52.9	59.1	66.6	55.1	53.3	48.7	70.0	58.0	54.1	51.7
	All ages	73.2	58.0	53.4	52.3	72.2	60.4	53.3	49.4	75.8	61.6	56.4	52.3	79.5	66.4	60.3	54.3
Rectum	15-44	85.8	60.0	49.0	40.8	90.1	69.8	61.9	53.7	88.5	71.4	59.6	58.6	83.6	61.7	51.6	46.4
	45-54	81.2	55.7	43.7	34.3	88.4	69.0	54.8	50.0	85.3	69.8	59.8	54.2	88.8	72.4	64.4	55.3
	55-64	80.8	62.5	47.8	40.8	88.6	69.8	61.9	51.1	85.2	64.2	56.9	52.4	87.6	72.7	63.0	54.2
	65-74	68.2	51.1	44.0	37.2	78.2	57.6	48.1	38.9	79.5	61.4	52.3	47.3	85.1	65.0	58.8	56.1
	75+	62.1	49.0	49.2	61.3	66.8	54.9	57.8	64.5	69.3	52.1	45.2	42.6	75.2	57.8	50.0	48.5
	All ages	71.8	54.0	45.8	41.0	78.7	61.2	54.7	48.3	78.5	60.5	52.2	48.4	82.7	65.0	57.1	52.3
Colorectal	15-44	85.0	66.6	55.6	48.9	86.6	68.5	63.0	57.1	85.1	69.9	61.2	59.2	84.1	69.1	60.6	55.6
	45-54	80.2	59.6	51.2	45.2	87.1	71.3	56.4	50.8	83.3	68.4	60.9	56.4	88.9	72.9	66.9	59.8
	55-64	80.8	62.8	50.8	45.1	84.6	67.1	58.3	50.2	84.9	66.6	59.3	54.8	86.7	72.3	64.0	55.5
	65-74	72.2	54.1	47.3	44.7	74.9	58.5	49.5	42.3	78.2	61.1	53.4	49.2	83.3	67.1	59.6	53.8
	75+	61.7	50.7	53.6	65.2	62.1	54.3	54.8	61.1	67.6	53.9	50.1	46.3	71.7	57.9	52.7	50.7
	All ages	72.6	56.3	50.1	47.4	75.0	60.9	53.9	49.1	77.0	61.1	54.6	50.6	80.7	65.8	58.9	53.4
Liver	15-44	18.3	6.7	3.2	*	32.2	19.8	13.3	10.5	42.4	26.7	23.9	20.2	45.7	34.0	30.3	26.3
	45-54	20.5	10.2	7.6	3.5	25.3	17.0	12.6	10.6	39.2	26.1	19.3	17.6	47.4	33.9	26.8	17.5
	55-64	12.2	5.5	5.8	3.2	32.2	15.9	11.2	11.1	37.3	21.1	16.2	13.7	48.9	29.5	21.4	13.5
	65-74	11.0	3.3	1.8	0.2	22.5	11.1	7.3	6.0	34.0	18.0	11.0	7.3	45.1	29.2	22.1	20.6
	75+	9.0	3.0	*	*	13.8	8.5	8.1	*	24.8	13.8	8.6	8.9	40.6	22.8	15.0	4.6
	All ages	12.1	4.8	3.6	1.9	22.9	12.6	9.4	8.1	33.0	18.8	13.4	11.3	44.9	28.2	21.1	14.8

* refers to cells where estimates are not computed due to insufficient sample size
Estimates for “all ages” are age standardised
Sites which have insufficient sample size for all cells are excluded from this appendix

RELATIVE SURVIVAL BY PERIOD, SITE AND AGE GROUP, SINGAPORE MALES, 1973-1992

SITE	Age group	Relative survival (%)															
		1973-1977				1978-1982				1983-1987				1988-1992			
		1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr
Pancreas	15-44	18.4	0.0	*	*	30.7	7.3	7.4	*	18.5	18.7	18.8	*	10.1	0.6	0.1	0.1
	45-54	2.8	2.9	3.0	*	6.5	*	2.7	3.0	15.9	6.4	2.4	2.4	9.1	4.5	4.6	5.0
	55-64	2.3	2.6	*	*	8.8	*	*	*	11.8	3.9	*	*	13.4	4.3	1.0	*
	65-74	4.6	5.5	6.5	9.7	3.1	0.4	0.2	0.3	4.6	*	*	0.8	13.7	8.3	9.3	*
	75+	3.5	5.1	*	*	0.2	0.3	0.2	*	4.9	6.5	0.2	*	8.8	4.4	3.0	*
	All ages	4.1	4.1	3.3	4.6	3.9	1.3	0.8	1.1	8.0	4.5	2.8	1.4	11.5	5.2	2.9	2.7
Larynx	15-44	60.2	35.2	6.5	*	72.8	48.2	48.6	50.4	74.7	32.5	28.1	28.8	93.3	69.5	40.9	42.0
	45-54	80.6	55.8	45.1	49.6	73.4	43.6	33.6	14.3	75.6	50.5	36.0	24.7	79.0	39.9	32.4	29.3
	55-64	73.1	45.5	38.2	32.0	72.1	39.8	32.3	19.8	75.7	43.0	40.1	40.4	81.4	56.5	47.2	36.1
	65-74	55.1	28.6	22.8	*	59.4	35.1	28.4	28.5	66.9	42.5	33.5	22.5	79.9	63.6	57.4	32.2
	75+	65.9	34.7	21.8	*	48.9	44.6	35.9	*	50.5	24.6	33.4	*	50.8	51.0	38.2	17.4
	All ages	65.8	38.7	28.0	20.8	60.8	39.4	32.1	18.6	64.3	36.5	33.0	27.7	70.9	55.5	45.8	33.9
Lung	15-44	26.9	15.7	8.7	8.8	29.9	11.1	6.2	6.3	37.1	13.5	11.4	8.8	25.5	12.6	9.1	6.3
	45-54	16.2	4.7	3.5	2.8	20.6	8.8	7.8	7.6	23.4	7.9	5.8	5.2	29.0	9.1	7.5	5.7
	55-64	13.8	4.0	2.5	2.7	16.7	6.1	3.9	1.2	19.4	4.9	3.5	2.7	23.0	9.1	6.0	4.1
	65-74	12.3	3.5	2.7	*	12.5	3.4	2.5	1.9	16.6	4.4	3.7	2.6	17.6	6.7	5.0	3.8
	75+	7.0	1.7	2.7	*	8.1	2.9	1.7	1.6	8.4	1.7	0.7	*	11.3	2.6	2.2	5.7
	All ages	12.6	3.8	3.0	3.5	14.0	4.9	3.5	2.3	16.6	4.5	3.3	2.6	18.6	6.6	4.9	3.7
Bone	20-44	83.9	65	52.3	52.9	93.3	70	70.3	61.6	72.4	50.1	46	46.6	84.5	67.3	53.3	47.4
	45-54	50	50.7	51.5	*	100.8	102.8	46.3	48.7	100.9	41.1	22.5	1.7	84.3	85.4	86.7	*
	55-64	103	61.3	67.1	*	102.4	108.8	69.2	42.5	*	103.9	72	*	101.2	*	*	122.1
	65-74	23.5	27.6	*	*	105.2	14.4	*	*	36	1.6	*	*	44.3	25.3	*	*
	75+	*	*	*	*	*	*	*	*	*	*	*	*	17.8	*	*	*
	All ages	62.6	49.1	28.4	29.6	102.8	57	33.9	26.2	51.5	19.6	13.4	4.3	50.1	35.3	33.7	34.2
Connective tissue	15-44	78.9	64.4	64.7	*	60.0	50.7	41.8	35.9	76.9	61.5	61.8	62.7	62.1	44.6	38.3	34.1
	45-54	100.9	33.9	*	*	52.0	31.2	31.9	*	76.2	47.9	49.2	53.2	80.4	72.9	59.3	63.5
	55-64	65.6	54.8	58.2	*	75.2	50.3	53.3	32.4	73.6	45.6	10.0	5.7	87.7	81.7	84.8	*
	65-74	82.8	70.5	83.9	*	42.4	34.6	23.1	5.7	39.7	33.5	39.5	*	47.0	27.3	30.6	12.1
	75+	61.4	85.0	122.2	*	112.6	157.0	51.3	154.1	38.4	*	*	*	60.6	84.4	*	*
	All ages	76.8	58.0	57.9	*	61.9	49.9	38.9	36.0	61.7	39.3	35.0	31.9	67.6	57.1	49.9	35.9
Skin (inc. melanoma)	15-44	42.1	42.2	42.3	*	77.8	57.5	57.8	58.3	82.5	51.9	52.2	53.0	24.4	24.5	24.5	15.8
	45-54	0.0	*	*	*	28.7	*	*	*	*	102.7	106.0	*	100.6	*	*	7.2
	55-64	102.1	*	*	*	48.7	23.4	25.2	*	77.8	26.4	0.0	0.0	101.4	86.4	52.9	*
	65-74	64.4	40.7	*	*	75.3	10.9	*	*	105.6	73.6	85.7	*	93.3	27.5	31.4	14.0
	75+	115.3	*	*	*	41.0	*	*	*	0.1	*	*	*	39.8	47.3	*	*
	All ages	75.8	15.3	15.4	*	52.4	15.7	9.4	9.7	51.3	34.3	34.8	40.3	68.7	40.5	28.5	18.7
Prostate	15-54	60.7	18.7	19.2	*	59.9	23.3	*	0.0	55.5	23.4	5.2	*	85.9	53.9	55.0	*
	55-64	56.9	53.2	52.7	33.7	70.2	47.3	41.3	10.0	76.2	46.8	33.5	31.5	83.2	63.5	47.5	22.1
	65-74	82.3	65.7	44.5	*	72.6	49.9	38.9	33.9	77.1	58.8	44.0	27.9	85.1	68.0	49.3	27.2
	75+	76.2	63.9	39.2	*	86.0	65.7	58.6	4.7	71.9	58.3	53.8	48.9	85.6	71.2	64.7	54.0
	All ages	71.2	54.6	47.3	27.6	73.1	48.7	35.6	20.5	71.3	46.8	30.5	23.5	85.0	66.0	53.4	24.6
Testis	15-44	45.9	46.1	46.4	47.2	75.0	54.2	54.4	55.4	93.8	79.1	64.9	65.7	92.4	89.8	87.0	74.2
	45-54	100.7	*	102.8	109.3	100.7	102.3	104.6	108.9	78.1	79.3	80.6	86.3	100.6	102.1	88.8	93.4
	55-64	9.0	9.2	9.8	12.1	102.0	*	*	0.0	76.0	40.1	42.9	*	62.5	64.6	45.1	55.6
	65-74	104.7	*	*	*	17.5	*	*	*	104.1	113.7	125.2	*	60.1	65.6	25.7	36.0
	75+	0.0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	All ages	38.6	39.0	39.8	43.4	71.3	48.1	48.4	50.9	91.0	82.0	75.4	77.5	84.5	83.9	69.4	67.5

* refers to cells where estimates are not computed due to insufficient sample size
Estimates for "all ages" are age standardised
Sites which have insufficient sample size for all cells are excluded from this appendix

RELATIVE SURVIVAL BY PERIOD, SITE AND AGE GROUP, SINGAPORE MALES, 1993-2012

SITE	Age group	Relative survival (%)															
		1993-1997				1998-2002				2003-2007				2008-2012			
		1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr
Pancreas	15-44	27.9	3.4	*	3.4	25.2	14.2	14.3	*	35.6	12.2	7.8	4.8	60.4	33.6	33.7	34.0
	45-54	22.7	9.4	4.9	5.3	14.2	7.4	3.8	4.0	30.4	8.6	8.7	9.1	38.1	13.6	12.1	10.4
	55-64	14.2	3.4	3.6	4.4	25.1	11.3	7.6	*	21.3	4.1	3.6	2.9	30.6	8.7	6.8	4.4
	65-74	8.9	4.7	3.9	*	9.9	5.2	3.5	2.2	15.7	3.9	2.0	2.5	17.7	3.7	2.2	2.7
	75+	6.9	2.9	3.6	9.2	6.0	3.1	2.4	4.7	9.2	5.2	6.4	6.9	10.6	2.8	1.5	2.1
	All ages	12.3	4.3	3.8	4.7	13.3	6.7	4.6	3.8	17.8	5.7	5.0	4.7	23.1	7.2	5.4	5.5
Larynx	15-44	90.1	80.3	74.5	61.0	91.8	78.5	78.9	71.1	100.2	68.4	68.7	63.5	100.1	100.5	100.8	79.4
	45-54	94.0	80.4	74.3	71.7	86.4	79.1	80.0	66.8	93.6	77.3	69.2	55.1	94.2	79.4	74.7	75.1
	55-64	84.6	62.7	52.6	47.4	84.4	71.1	64.9	57.1	81.2	64.8	58.3	50.8	92.9	84.1	77.7	64.3
	65-74	80.5	60.8	46.2	45.7	87.0	63.6	55.7	38.1	88.4	71.0	68.1	54.7	76.8	63.1	48.2	35.0
	75+	63.3	44.8	48.3	39.4	74.0	51.2	42.7	50.4	77.8	63.2	56.9	55.9	68.8	49.1	53.2	36.5
	All ages	77.5	59.6	52.0	46.1	82.1	63.4	57.3	48.8	84.1	67.1	61.9	52.4	79.1	64.4	58.9	46.3
Lung	15-44	43.2	13.0	8.0	6.5	44.5	15.7	14.9	12.0	54.8	26.2	18.3	16.1	52.0	29.0	25.4	21.2
	45-54	39.1	12.5	9.7	8.1	47.4	21.9	18.0	14.0	48.2	19.6	13.5	8.7	50.7	22.1	16.8	13.2
	55-64	34.6	13.6	9.6	6.4	36.5	15.1	11.8	7.2	41.6	18.0	13.3	10.3	49.8	22.4	16.1	11.6
	65-74	24.6	9.0	6.5	4.1	26.3	9.6	6.7	5.0	29.9	10.8	7.5	6.2	35.3	13.8	9.8	6.4
	75+	17.0	6.9	4.5	6.9	16.1	7.4	6.3	8.7	18.8	6.7	5.1	5.7	20.3	6.9	4.3	2.8
	All ages	27.2	9.9	7.1	5.4	28.8	11.8	9.4	7.2	32.2	12.9	9.2	7.6	36.2	15.1	11.0	8.0
Bone	20-44	87.3	52.4	48.1	43.7	76.6	64.1	59	59.6	100.1	74.5	74.7	75.3	100.1	60.8	60.9	51.1
	45-54	75.4	37.3	22	16.2	78.9	79.7	80.4	82.5	84.8	68.9	69.7	72.1	69.1	60.8	61.4	30.5
	55-64	12.2	1.3	1.4	*	32.6	33.1	*	*	44.2	44.9	45.8	*	71	43.3	44.3	47
	65-74	1.4	1.5	1.7	*	67.7	*	*	56.5	102.7	84.4	59.3	*	72.6	48.1	29.9	38.2
	75+	*	*	*	*	114.2	*	*	*	35.5	*	*	*	88.2	98.3	56.9	
	All ages	18	5.7	5.9	5.3	64.6	52.1	51.5	41.5	57	50.2	44.7	47.9	78.6	67	46.8	35.8
Connective tissue	15-44	89.0	71.0	71.3	68.7	86.6	59.8	60.0	52.9	87.3	63.1	56.2	49.3	86.9	69.9	61.0	58.9
	45-54	86.5	41.4	37.1	15.0	82.2	71.0	71.7	74.9	86.6	75.3	69.2	58.9	85.7	72.6	60.9	60.2
	55-64	73.3	56.2	41.0	46.9	73.0	62.6	64.5	67.1	80.6	74.4	76.4	66.1	75.9	65.2	57.8	47.0
	65-74	50.6	26.9	29.5	39.5	55.1	43.0	37.4	11.2	79.7	58.9	48.2	*	79.2	56.5	49.4	30.9
	75+	39.3	51.6	20.6	*	88.5	54.3	29.4	60.0	72.4	57.8	74.3	94.2	58.7	53.7	48.8	32.6
	All ages	67.6	50.9	41.2	38.7	77.1	57.5	55.7	51.7	81.1	65.2	61.1	55.2	76.5	62.5	54.7	45.6
Skin (inc. melanoma)	15-44	45.5	31.3	*	0.0	100.2	100.6	101.0	*	75.7	75.9	56.5	46.2	100.1	100.3	92.3	92.9
	45-54	73.6	24.1	0.0	*	100.4	43.0	43.4	*	90.2	91.0	67.5	69.2	86.8	87.5	68.8	70.9
	55-64	101.3	4.1	*	4.7	84.8	40.6	*	*	87.7	80.8	63.6	*	94.1	59.0	60.2	45.0
	65-74	103.8	51.8	38.2	0.0	83.7	34.0	37.0	*	77.5	45.8	50.3	67.6	82.9	70.8	64.7	85.6
	75+	28.2	36.2	20.1	*	116.0	140.8	91.3	204.7	108.8	100.4	76.9	95.0	92.0	49.4	40.0	6.8
	All ages	65.4	32.4	18.7	13.7	95.5	67.3	61.5	61.9	88.9	74.3	60.1	70.1	88.4	64.8	56.8	44.2
Prostate	15-54	86.5	42.5	20.4	0.5	93.6	82.8	72.3	*	99.3	92.2	87.0	66.3	99.7	92.4	92.3	91.2
	55-64	90.6	65.1	57.0	41.8	94.5	82.9	74.1	73.6	99.1	91.7	89.5	80.7	99.0	95.5	92.5	88.7
	65-74	90.9	75.0	65.2	54.8	95.5	81.8	75.0	58.1	97.6	91.7	87.6	77.9	98.6	94.3	92.5	90.0
	75+	86.9	79.4	73.9	71.7	91.9	76.5	68.8	62.1	92.5	82.5	76.9	75.1	95.9	82.7	78.6	66.9
	All ages	88.8	66.5	55.1	39.0	93.9	80.9	72.6	63.7	97.0	89.4	85.1	75.3	98.1	90.9	88.5	83.8
Testis	15-44	96.1	94.2	91.8	90.1	98.5	95.4	92.3	87.8	96.7	96.9	97.1	97.9	97.5	96.8	97.0	97.6
	45-54	100.5	88.5	89.8	94.9	91.5	76.1	76.9	79.9	92.4	93.2	94.1	81.8	100.3	94.4	95.2	98.0
	55-64	72.8	52.7	54.2	35.3	83.1	72.7	61.0	67.1	83.3	84.9	87.2	98.2	87.3	78.5	79.9	85.9
	65-74	39.1	41.2	43.6	61.8	101.9	106.8	113.3	135.3	*	104.5	109.8	*	0.0	*	*	0.0
	75+	*	*	*	*	109.4	*	*	*	1.4	*	*	*	80.6	61.5	*	
	All ages	85.7	81.2	80.4	80.5	98.7	66.4	63.7	64.1	67.2	67.8	68.6	59.2	79.5	73.8	74.4	77.6

* refers to cells where estimates are not computed due to insufficient sample size
Estimates for “all ages” are age standardised
Sites which have insufficient sample size for all cells are excluded from this appendix

RELATIVE SURVIVAL BY PERIOD, SITE AND AGE GROUP, SINGAPORE MALES, 1973-1992

SITE	Age group	Relative survival (%)															
		1973-1977				1978-1982				1983-1987				1988-1992			
		1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr
Bladder	15-44	64.3	54.8	46.8	47.9	92.8	84.9	85.5	88.2	80.6	81.0	67.8	57.2	95.8	85.6	86.2	80.8
	45-54	73.6	56.3	50.1	36.5	82.6	66.2	60.8	41.5	92.0	82.4	75.8	66.8	90.1	85.4	81.8	72.7
	55-64	70.5	53.9	48.2	59.4	67.0	46.1	40.0	27.9	79.7	72.0	65.1	44.0	81.9	66.0	62.4	52.6
	65-74	38.3	27.5	22.4	*	66.0	51.5	51.2	66.5	82.2	63.8	54.4	46.9	84.0	69.8	61.8	60.8
	75+	36.7	26.8	19.7	*	59.0	53.9	45.7	*	68.1	50.5	43.4	19.5	83.1	62.9	57.2	112.6
	All ages	51.1	39.1	32.9	27.8	67.5	54.3	49.9	48.5	77.4	64.1	56.2	45.5	84.5	69.6	64.2	64.3
Kidney	15-44	56.4	46.4	37.2	*	86.5	65.9	66.4	67.8	54.4	45.9	35.1	8.4	61.6	61.8	62.1	63.3
	45-54	64	45.4	46.5	*	75.5	51.2	40.1	38.3	65.4	62.6	55.4	52.6	83.5	63	60.1	58.5
	55-64	49.4	33.3	31.7	*	47.5	46.4	27.9	26.8	55.1	35.4	23.9	13.7	61.4	52.7	39.4	33.9
	65-74	16.3	9.9	9.9	19.1	40	35	30.8	25.4	47.5	29.1	23	21.3	54.6	46.7	43.8	36.1
	75+	39.1	*	*	*	95.2	128.7	117.5	*	56.1	41.1	40	61.6	48.9	24.9	27.3	18.3
	All ages	38	27.2	25.7	38	63.7	64	49.6	54.4	54.2	39.6	32.1	24.7	57.8	44.4	41.1	34.6
Thyroid	15-44	94.4	94.9	95.4	97.3	90.7	81.3	81.7	83.1	100.2	97.3	97.7	93.5	94.8	95.2	95.5	96.6
	45-54	40.0	40.8	41.8	44.8	49.9	36.9	28.4	0.0	94.6	88.4	90.4	77.2	88.6	78.6	79.8	78.6
	55-64	51.5	54.7	58.1	*	72.8	51.8	55.2	*	78.0	81.5	73.5	47.3	72.4	70.7	65.0	56.7
	65-74	49.0	53.8	*	*	20.1	22.6	15.9	*	69.0	78.8	*	15.9	66.3	64.2	63.3	*
	75+	60.5	*	*	*	34.5	26.6	14.3	*	19.6	25.3	*	*	62.7	59.9	78.3	*
	All ages	60.2	63.4	65.3	68.8	54.1	44.9	40.3	18.9	72.5	75.0	59.5	55.3	75.0	72.3	72.2	68.7
Gallbladder	15-44	42.5	42.9	43.3	*	100.5	*	101.4	105	45.3	45.5	45.9	46.9	38.4	23.9	24	24.5
	45-54	19.2	10.9	11.2	*	38.4	*	*	7.3	49.7	30.3	21.8	*	0.2	0.2	0.2	0.2
	55-64	17.1	8.1	8.6	*	4.2	4.4	4.7	*	28.3	3	0	0	20.6	21.5	16.9	*
	65-74	17.8	13.4	15.3	*	31.6	10.2	7.1	*	14.7	3.9	3.4	*	36.6	17.7	11.5	18.2
	75+	0	*	*	*	4.5	*	*	*	16.8	*	*	*	11.7	2.5	3.3	*
	All ages	6.6	3.9	4.2	*	18	7	6.7	5.3	24	9.5	4.8	3.1	19.6	10.9	9.4	9.2
Brain	15-44	71.3	54.5	35.1	*	63.9	51.0	36.2	28.6	65.6	35.1	23.8	14.1	58.7	41.6	29.5	24.4
	45-54	29.3	9.0	2.0	*	43.9	6.7	*	*	65.5	15.4	15.6	*	69.5	58.5	59.4	*
	55-64	0.2	*	*	*	15.3	*	*	*	18.0	6.3	6.6	*	32.8	20.0	20.8	*
	65-74	0.8	*	*	*	0.7	*	*	*	9.4	*	*	*	27.8	31.1	*	*
	75+	*	*	*	*	10.0	*	*	*	21.7	*	*	*	2.4	*	*	*
	All ages	19.4	12.0	6.5	*	21.7	13.0	8.0	6.3	35.4	12.8	10.4	6.3	36.8	28.8	20.7	10.9
Non-Hodgkin's Lymphoma	15-44	74.0	62.9	57.8	*	78.2	44.7	44.9	36.7	81.2	65.2	65.5	53.8	86.3	70.1	48.9	38.3
	45-54	67.9	69.3	70.9	0.0	1.5	*	1.5	*	40.4	0.0	*	*	86.8	41.3	41.7	*
	55-64	11.3	11.7	*	*	46.7	28.5	29.9	*	58.0	34.2	11.3	0.7	82.8	68.3	71.2	*
	65-74	42.0	24.5	*	*	47.9	10.5	*	*	38.2	41.7	23.0	*	64.8	42.2	*	0.4
	75+	3.2	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	All ages	22.9	17.2	16.9	0.0	42.5	13.7	14.0	4.2	45.9	34.6	18.4	15.3	77.1	53.2	37.9	23.7
Hodgkin's Lymphoma	15-44	39.5	25.4	25.5	*	53.9	40.9	38.4	39.2	56.7	44.7	40.9	26.4	63.4	49.9	46.3	44.8
	45-54	35.5	26.8	21.6	11.0	37.3	23.8	16.7	3.8	61.8	41.9	20.6	21.8	54.0	37.2	36.1	24.0
	55-64	57.7	27.5	21.7	*	25.8	20.1	14.3	7.5	58.3	27.5	20.3	14.7	62.2	46.6	46.7	19.7
	65-74	16.6	4.9	*	*	46.4	27.4	18.7	*	42.7	28.1	24.0	21.6	37.0	26.1	18.2	15.4
	75+	8.4	10.8	4.3	*	24.5	16.9	24.5	*	30.4	13.2	9.3	3.3	23.2	12.0	11.4	12.1
	All ages	26.2	16.4	10.8	8.3	35.0	23.2	19.1	10.9	45.7	25.1	18.9	12.0	41.2	29.1	25.3	17.6
Leukaemia	15-44	32.1	11.8	1.5	*	41.7	16.1	6.8	5.1	56.5	26.7	12.0	1.4	58.0	28.4	11.6	3.8
	45-54	27.8	14.6	12.0	*	38.3	8.1	8.3	8.9	37.4	20.9	15.1	15.9	43.0	18.6	12.7	7.2
	55-64	18.3	4.6	2.7	*	28.2	13.3	5.5	7.1	37.6	6.3	*	0.5	32.3	14.9	6.2	*
	65-74	18.0	9.6	4.1	*	34.3	21.7	17.8	25.9	19.3	13.6	6.5	4.2	26.3	17.2	10.4	*
	75+	0.4	*	*	*	7.2	*	*	*	22.9	15.2	18.8	*	7.4	5.1	1.0	*
	All ages	10.4	4.4	2.4	*	24.4	10.0	6.7	8.2	29.7	15.1	9.4	6.2	25.7	13.4	6.4	1.1

* refers to cells where estimates are not computed due to insufficient sample size
Estimates for “all ages” are age standardised
Sites which have insufficient sample size for all cells are excluded from this appendix

RELATIVE SURVIVAL BY PERIOD, SITE AND AGE GROUP, SINGAPORE MALES, 1993-2012

SITE	Age group	Relative survival (%)															
		1993-1997				1998-2002				2003-2007				2008-2012			
		1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr
Bladder	15-44	97.6	82.9	83.3	84.8	84.0	81.3	81.7	80.1	100.1	96.0	96.3	90.4	96.1	92.3	87.9	84.4
	45-54	90.7	86.7	85.3	87.7	94.5	89.4	88.1	80.6	89.4	84.0	83.6	75.0	95.0	79.4	76.8	73.1
	55-64	91.9	79.2	73.2	64.4	90.0	78.4	71.3	57.3	92.2	85.7	82.5	73.3	90.0	80.1	76.5	71.8
	65-74	78.2	63.5	54.7	49.2	79.7	65.0	62.8	62.9	86.9	76.8	71.2	65.6	84.5	73.9	72.7	62.6
	75+	73.9	67.3	68.8	118.5	75.6	59.9	62.0	69.5	82.0	70.2	68.9	65.3	80.0	67.2	62.1	62.4
	All ages	82.2	71.3	67.3	69.5	82.2	69.3	67.0	63.5	86.3	76.5	73.9	67.8	83.3	70.3	67.6	63.2
Kidney	15-44	87.4	73.7	68.6	57.5	81.5	67.9	54.6	46.3	87.7	80.6	77.1	62.6	90.7	79.1	74.4	73.5
	45-54	77.4	65.3	55.9	49.1	84	67.7	66.9	57.6	80.8	68.7	64	59.3	85.8	75.6	71.6	68.1
	55-64	61.5	38.4	40.1	30.4	74.8	66.3	59.4	58.9	75	67.2	59.5	57.6	82.3	71.2	63.3	56.1
	65-74	67.3	56.4	42.3	34.9	71.2	59.2	61.9	69.8	77.8	67	62.3	50.3	78.8	73.1	65.7	55.1
	75+	43.2	24.8	15	10.1	54.5	50.2	44.2	36.8	62.2	56	51.3	39.8	70.9	57.7	47.2	47.2
	All ages	60.3	43.2	35.4	29.2	68	58.5	55.3	53.3	73.1	64.5	59.3	50.5	78.4	68.4	61	55.7
Thyroid	15-44	98.3	96.7	92.5	93.6	100.2	100.5	100.9	102.0	95.7	94.6	93.7	93.0	100.1	98.7	98.9	96.8
	45-54	92.6	89.2	85.4	90.3	97.7	98.6	99.7	99.1	98.4	99.2	100.2	103.9	98.9	97.8	96.8	95.7
	55-64	94.4	93.9	92.3	108.6	92.6	84.1	74.2	64.7	92.9	95.2	94.7	83.2	92.4	90.9	87.6	82.2
	65-74	62.4	47.3	53.3	30.6	67.7	64.8	70.8	59.1	74.1	68.3	54.3	34.0	94.0	91.9	87.2	102.1
	75+	41.0	36.2	29.7	*	79.3	76.4	99.1	97.0	60.1	44.1	39.0	32.8	71.6	67.5	68.3	34.7
	All ages	77.8	72.9	72.0	72.4	85.9	83.0	85.0	81.3	83.5	78.6	74.5	67.2	90.9	88.5	86.8	85.0
Gallbladder	15-44	53.5	12.8	12.8	13.1	40.3	24.1	16.7	1.5	68.6	23.9	24	12.3	51.9	29.2	*	29.6
	45-54	39.8	28.6	28.9	30.9	48.1	27.1	16.4	17	65	39.5	34.7	36	70.2	41.9	26.5	18.1
	55-64	36.5	21.3	22.3	26.4	31.7	17.9	18.6	18.2	36	17.6	15.7	11.3	47.5	21.6	16.2	14.7
	65-74	23.2	16.4	15.1	12	45.6	15.9	15.5	4.1	47.2	15.7	12.7	11.9	48.2	31.1	20.2	26.3
	75+	13.5	19.1	0	*	27.1	5.1	4.7	25.2	17.8	8.2	9.8	22.9	34.6	13.1	7.2	11.5
	All ages	27.2	19.4	15.6	15.8	36.5	14.9	13.3	13.6	36.7	15.9	14.7	13.4	46.5	24.1	15.6	16
Brain	15-44	74.1	47.5	40.9	31.5	66.3	40.2	32.1	20.4	76.0	60.9	49.9	44.9	90.5	58.0	42.1	26.1
	45-54	52.9	26.3	18.6	10.1	57.1	34.5	30.9	22.2	60.0	20.8	16.8	11.7	67.6	46.2	46.6	35.3
	55-64	28.0	16.8	12.4	14.4	48.3	21.7	4.7	5.2	55.2	27.1	19.2	10.9	51.7	26.5	24.4	13.5
	65-74	28.6	19.2	4.9	*	22.2	6.4	5.2	*	31.5	22.7	24.0	12.8	45.4	16.9	11.8	14.1
	75+	14.8	*	*	*	9.9	5.2	7.3	*	18.2	2.3	*	*	19.8	15.4	*	
	All ages	40.7	23.6	17.4	12.4	39.7	20.8	15.5	11.2	48.0	26.4	21.5	15.3	52.6	29.6	23.5	15.5
Non-Hodgkin's Lymphoma	15-44	92.0	77.5	71.9	58.2	97.7	89.3	89.5	65.4	93.3	91.1	89.1	80.8	97.7	95.3	93.4	93.8
	45-54	82.3	61.8	62.6	65.5	71.0	47.7	40.3	41.8	100.3	85.9	86.8	89.8	88.3	88.9	89.7	55.7
	55-64	83.3	86.1	89.6	104.4	70.9	64.8	55.5	49.4	100.8	89.7	92.0	78.3	69.3	70.6	64.2	42.2
	65-74	53.5	57.2	0.5	*	104.2	113.3	91.4	*	47.3	37.1	40.4	34.5	48.3	41.4	44.0	1.5
	75+	108.9	134.9	*	*	0.5	*	*	*	56.5	67.6	*	*	67.8	47.3	30.1	
	All ages	84.9	92.5	17.2	19.0	34.4	33.9	28.0	28.4	64.7	59.2	60.8	53.6	65.6	57.0	49.6	32.6
Hodgkin's Lymphoma	15-44	65.0	51.3	48.5	44.4	78.2	71.3	67.3	64.7	84.2	76.7	73.5	68.7	90.1	85.9	85.4	85.3
	45-54	75.3	66.4	62.3	55.5	72.2	54.8	52.7	39.2	75.2	70.6	67.3	66.1	81.1	69.5	66.9	59.0
	55-64	55.7	40.9	38.2	33.9	46.7	38.8	36.2	26.3	77.1	60.3	57.9	47.0	76.8	68.4	65.0	55.0
	65-74	46.7	32.6	29.1	25.2	62.8	44.2	40.4	29.3	57.5	44.0	39.9	30.4	69.6	59.6	57.4	49.1
	75+	44.9	31.9	43.2	31.1	29.0	22.3	21.6	18.2	41.7	33.1	34.1	23.0	45.5	38.0	37.9	29.2
	All ages	52.1	38.8	37.8	33.9	50.8	39.1	37.0	29.4	59.5	48.0	45.7	37.1	64.8	56.1	54.3	47.5
Leukaemia	15-44	63.4	33.7	28.6	18.2	69.2	42.6	33.2	33.6	79.2	69.4	64.0	56.5	86.3	76.2	75.2	68.8
	45-54	42.9	21.4	21.6	15.2	54.7	29.0	29.3	23.0	79.0	59.8	54.6	56.8	77.5	66.9	64.2	57.9
	55-64	48.0	24.0	25.3	17.0	58.6	44.3	24.0	12.7	70.3	63.5	58.3	60.7	74.9	59.4	55.0	44.5
	65-74	22.8	15.4	10.3	4.2	46.0	29.4	20.3	5.3	52.6	45.0	37.7	47.7	58.1	42.7	40.5	32.8
	75+	8.1	2.6	*	*	20.1	14.5	10.0	*	46.4	36.3	30.3	*	57.5	42.1	37.8	29.7
	All ages	27.9	14.2	11.2	6.5	42.4	28.3	18.8	10.4	58.9	49.6	43.9	47.3	65.2	50.8	47.5	39.2

* refers to cells where estimates are not computed due to insufficient sample size
Estimates for “all ages” are age standardised
Sites which have insufficient sample size for all cells are excluded from this appendix

RELATIVE SURVIVAL BY PERIOD, SITE AND AGE GROUP, SINGAPORE FEMALES, 1973-1992

SITE	Age group	Relative survival (%)															
		1973-1977				1978-1982				1983-1987				1988-1992			
		1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr
Tongue	15-44	100.2	19.4	*	*	89.1	72.6	73.0	*	100.1	47.0	37.1	37.7	46.2	34.6	23.0	23.2
	45-54	100.7	101.6	102.3	110.1	82.5	62.8	63.7	66.6	38.6	24.9	25.2	26.3	87.7	42.0	42.3	6.0
	55-64	32.4	*	8.8	10.8	72.6	49.3	4.7	4.9	64.7	66.5	51.4	*	65.4	27.7	28.4	31.4
	65-74	104.0	56.2	34.5	*	87.1	36.9	*	*	51.5	41.6	46.0	*	52.3	55.7	29.7	38.0
	75+	106.1	52.7	*	*	1.7	1.8	2.2	*	14.1	*	*	*	60.1	44.2	*	*
	All ages	90.7	44.1	32.6	38.8	57.7	36.1	28.9	3.5	36.6	24.4	21.1	23.7	61.4	42.4	24.0	23.3
Salivary gland	15-44	79.6	79.9	80.2	81.0	100.1	88.8	77.0	30.0	100.1	78.1	78.3	62.9	100.1	91.0	91.2	75.7
	45-54	100.7	53.9	54.5	*	100.5	101.9	103.7	108.1	100.4	87.3	88.4	44.6	72.3	46.2	46.8	48.7
	55-64	81.1	83.8	87.7	*	101.8	104.8	35.5	25.8	101.3	65.4	68.2	78.6	84.5	72.1	40.0	44.5
	65-74	103.2	110.9	73.4	*	104.3	81.3	25.7	3.3	79.3	55.7	60.3	50.9	75.7	42.8	18.5	23.9
	75+	*	*	*	*	117.4	*	*	*	68.5	83.6	117.9	*	65.0	50.2	37.7	94.3
	All ages	90.0	86.6	73.6	83.4	107.9	95.9	45.9	25.6	80.6	66.5	72.8	61.3	77.0	54.7	34.4	45.7
Nasopharynx	15-44	82.0	59.5	44.6	39.8	89.0	62.2	48.1	35.9	87.0	65.8	55.9	47.1	91.0	75.3	66.0	55.5
	45-54	72.1	30.9	20.3	17.3	85.8	64.6	52.1	30.6	87.1	62.7	42.6	20.9	87.1	60.1	49.5	42.6
	55-64	72.7	45.2	32.5	5.8	77.6	45.6	37.3	21.2	87.7	57.3	37.2	17.1	87.7	72.1	48.2	34.4
	65-74	69.1	22.1	23.9	*	83.7	33.4	17.8	24.2	85.4	59.2	49.4	12.0	86.7	63.4	40.5	12.9
	75+	59.1	79.8	*	*	37.4	1.8	0.8	*	53.4	42.0	12.1	*	63.6	28.6	*	*
	All ages	72.4	44.4	35.0	17.3	79.2	46.5	33.5	21.7	79.5	56.1	40.0	24.8	84.0	62.3	46.1	32.4
Oesophagus	15-44	6.1	6.1	6.1	*	30.2	30.4	*	0.2	27.7	*	*	*	65.8	66	*	*
	45-54	15.3	2	*	*	33.6	11.8	12	*	30.3	*	0.1	0.1	41.6	28.4	28.7	0
	55-64	28.9	11.4	8.9	10.6	27.3	10.5	6.1	7	32.7	18.5	19	21.3	36.1	10.7	11.1	5.4
	65-74	14.8	8.1	8.9	*	20.1	7.5	4.1	0.7	30.1	12	8.3	*	30.9	9.4	8.2	2.3
	75+	4.7	*	*	*	23	6.7	*	*	22.8	11.5	11.1	*	22.1	4.4	5.2	9.7
	All ages	13.6	4.7	4.5	5.6	25	9.8	5.3	4.8	28.3	11.4	10.6	10.4	32.4	13	12.9	6.7
Stomach	15-44	35.2	9.3	5.9	*	24.3	11.4	7.2	6.3	47.9	28.4	26.8	13.9	43.5	24.1	21.5	20.6
	45-54	34.5	23	16.4	11	36.9	21.3	18.7	9.6	48.9	27.5	21.4	18.7	61.2	38.5	32	31.2
	55-64	23.3	8.9	6.1	5.3	34.4	17.1	14.7	9.6	42.7	24	20	13.5	42	21.5	18.3	13
	65-74	21.1	9.8	7.8	9.4	28.6	13.3	9.5	5.5	35.1	21.9	15.1	14.3	43.7	23.4	17.1	18.1
	75+	11.3	5.1	0.7	*	20.3	11.8	6.8	0.8	9.9	3.2	2.3	2.3	24.3	13.9	12.8	14.9
	All ages	21.2	9.6	6.4	5.8	28	14.4	10.9	6.6	30.8	17.2	13.5	10.6	38.5	21.3	17.3	16
Colon	15-44	63.5	35.2	35.3	*	60.3	45	36.5	33.6	73.9	42.4	37.9	36.7	72.8	57.6	42.2	36.6
	45-54	60.6	46.1	38.6	25.3	76	54.2	41.2	31.3	73.2	52.5	47.9	43.5	86.2	62.8	53.5	50.9
	55-64	53.3	37.6	34.6	40	65.4	43.4	34.4	38.7	69	44.3	42	38.6	75.1	57.5	51.5	44.2
	65-74	46.6	37.6	32.4	15.9	49	33.4	32.6	28.2	64.4	46.2	35.4	34.5	72.4	54.1	43.6	39.5
	75+	24	20.2	21	*	28.2	18.7	13.6	25.3	43.3	33.8	34	46.1	60.8	53.2	48.1	50.2
	All ages	44.7	33.5	30.5	27.9	50.5	34.4	28.7	29.5	60.4	41.9	37.6	36.9	70.5	55.5	47.5	43.6
Rectum	15-44	59.8	28.9	20.7	21.2	60.9	27.4	21.6	16.4	69.7	27.2	25.3	23	78.6	59.3	47.1	42.9
	45-54	51.7	19	19.3	18	69.2	45	34.8	26.8	75	45	36.2	28.5	84.9	61.5	43.7	32.6
	55-64	55.6	32.7	30.3	30.6	68.1	39.9	26	19.3	78.5	57.9	46.8	35	81.6	54.3	42.1	34.5
	65-74	45.2	19.8	19.1	*	62.5	39.4	32.7	22.2	72.4	45.1	33.4	28.3	77.7	48.4	35.8	30
	75+	38.8	22.2	14.5	24.5	50	30.2	19.7	38.2	55.2	36.6	33.9	10.1	56.8	38.7	32.6	34.4
	All ages	47.3	24.1	21.3	23.7	60.8	36.6	27.1	21.7	68.4	43.8	35.8	26.7	72.4	48.4	37.3	32
Colorectal	15-44	62.2	33.0	29.5	22.8	60.6	35.9	28.8	25.3	72.3	36.4	32.9	30.9	74.6	58.1	43.7	38.4
	45-54	57.1	35.5	32.0	25.2	73.3	50.7	38.7	30.3	73.9	49.9	43.8	38.5	85.7	62.3	50.2	44.6
	55-64	54.3	35.4	32.6	35.1	66.5	42.0	30.8	30.1	72.8	49.6	44.1	37.8	77.2	56.1	47.5	40.2
	65-74	46.0	29.7	26.5	21.6	54.9	36.1	33.3	26.7	67.4	45.4	34.2	31.5	74.3	52.2	40.8	35.7
	75+	30.8	21.1	18.4	35.0	37.3	23.6	16.9	29.8	48.6	35.1	33.9	28.3	59.4	48.0	42.5	44.5
	All ages	46.0	29.5	26.5	27.2	54.9	35.5	28.4	26.9	63.7	42.8	36.9	32.8	71.2	52.9	43.7	39.1
Liver	15-44	15.6	6.6	0.3	*	27.5	11.6	11.6	*	12	5.2	5.2	3.2	16.5	0.1	*	0.1
	45-54	4.8	3.2	1.6	*	6.8	2.2	2.3	*	5	*	0.6	0.6	16.7	6.6	*	6.8
	55-64	4.4	3	2.1	*	13.2	13.6	9.3	4.4	2.7	0.7	0.7	0.1	4.2	0.3	0.3	0.3
	65-74	1.3	0.8	0.7	*	2.1	0.6	0.7	0.5	2.9	1.8	1.5	2	7.2	3.2	3.4	3.5
	75+	0	*	*	*	0.4	*	*	*	0.7	*	*	*	6.8	1	*	*
	All ages	1.3	0.8	0.5	*	3.9	2.2	1.8	0.7	2.5	0.9	0.8	0.5	7.9	2.1	2.2	2.2

* refers to cells where estimates are not computed due to insufficient sample size
Estimates for “all ages” are age standardised
Sites which have insufficient sample size for all cells are excluded from this appendix

RELATIVE SURVIVAL BY PERIOD, SITE AND AGE GROUP, SINGAPORE FEMALES, 1993-2012

SITE	Age group	Relative survival (%)															
		1993-1997				1998-2002				2003-2007				2008-2012			
		1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr
Tongue	15-44	87.8	32.2	32.3	32.5	80.1	80.2	80.4	80.8	89.7	67.0	67.1	49.5	91.5	75.6	61.8	62.2
	45-54	61.6	62.0	62.5	44.7	68.4	54.4	54.7	30.0	100.2	69.6	61.0	53.7	91.2	76.6	77.0	78.3
	55-64	45.1	45.9	46.7	34.8	100.6	90.2	91.5	96.7	83.7	45.7	46.4	48.9	87.1	73.3	65.0	39.2
	65-74	89.9	78.3	84.0	106.1	88.9	23.5	24.9	16.1	89.6	72.1	75.2	45.2	74.7	66.4	58.6	60.7
	75+	66.5	76.5	66.1	*	77.7	49.6	46.6	33.9	38.1	33.9	32.0	22.2	75.2	70.9	68.8	50.8
	All ages	70.7	65.0	64.5	52.5	84.0	59.3	59.8	46.5	71.6	54.9	53.3	44.9	80.8	71.4	65.9	57.7
Salivary gland	15-44	100.1	91.2	83.2	83.7	100.1	100.2	93.8	94.3	100.1	95.3	95.5	96.1	100.1	100.2	100.3	100.9
	45-54	91.1	80.2	63.3	65.6	76.5	76.8	66.4	46.9	100.2	100.7	101.2	103.1	100.2	95.3	95.7	82.2
	55-64	88.6	89.9	91.8	98.8	91.5	92.7	94.1	82.2	85.9	65.4	66.4	70.3	100.4	90.5	91.5	86.3
	65-74	63.6	66.7	70.7	8.8	90.8	61.6	49.9	59.4	82.9	72.7	75.3	88.6	90.6	93.6	77.3	63.2
	75+	45.8	*	*	7.7	104.8	118.4	148.2	*	105.7	98.2	111.2	142.3	97.6	66.1	77.2	18.9
	All ages	67.8	53.7	53.2	30.3	95.5	91.5	89.8	92.7	94.9	84.5	89.4	98.1	96.6	83.3	84.4	61.1
Nasopharynx	15-44	95.6	76.4	64.8	48.9	95.3	88.5	79.2	70.2	97.6	91.2	77.8	64.4	97.0	91.6	84.4	74.5
	45-54	96.5	84.4	67.2	55.3	94.1	79.1	70.8	60.4	97.9	87.9	81.3	71.8	97.5	92.2	85.3	68.2
	55-64	89.3	71.8	66.9	58.8	95.0	87.8	82.3	66.8	96.6	85.6	74.4	54.8	94.4	85.8	75.5	61.2
	65-74	86.9	76.7	56.8	51.7	84.8	67.6	43.8	27.7	90.5	58.1	47.2	24.4	86.5	70.9	61.6	39.3
	75+	62.1	25.9	12.7	*	68.6	30.3	29.0	*	77.7	46.2	38.6	28.4	58.9	32.9	19.0	5.2
	All ages	85.6	66.3	53.7	44.0	86.5	69.2	59.2	45.7	90.9	72.1	61.8	46.9	85.8	71.9	60.4	45.5
Oesophagus	15-44	*	100.5	53	*	16.5	*	*	16.5	84.6	37.5	*	*	100.1	57.5	57.6	*
	45-54	37.7	*	12.1	*	75.2	41.8	42.1	*	100.2	100.6	27.6	28.3	63.4	51.6	51.8	52.5
	55-64	33.5	20.8	0.9	0	38.4	22.5	16.6	*	48.4	24.1	24.6	26.4	71.6	43.7	44.2	47.1
	65-74	41.9	16.2	17.4	3	45.3	24.2	18.5	10.4	43.5	15.3	10.5	9.5	41.7	29.9	18.7	14.7
	75+	16.5	*	2.1	1.8	20.4	10.3	12.3	*	24.4	11.4	7.8	11.4	35.7	13.2	3.9	7
	All ages	31.4	15	7.1	3.8	36.2	20.1	17.7	12.7	45.9	24	16.8	17.3	49.2	29.7	25.2	25.8
Stomach	15-44	46.1	27.4	19.7	17.4	45.2	29.6	26.5	21.7	49.6	26.7	25.6	19.4	56.3	37.4	37.5	37.7
	45-54	56.6	33.8	25.6	17.9	57.2	35.3	28.6	20.3	55	37.7	29.6	25.8	65.2	35.2	31.6	29
	55-64	60.5	39.9	30.1	23.1	53.8	37.4	33.1	29.1	59.8	30.7	27	20.8	61.2	31.8	26.4	21.9
	65-74	41.7	24.5	21	13.8	54	32.3	26.6	20.9	61.2	36.4	33.3	27.7	54	37.1	31.2	26.6
	75+	30.2	20.1	19.8	25.2	29.7	19.6	15.7	9.3	44.7	24.8	16.8	20.8	37	20.8	17.5	12.8
	All ages	43.6	27.4	22.6	17.5	45.2	29.1	24.5	19.2	53.5	30.6	25.5	22	50.3	30	25.6	21.8
Colon	15-44	77	54.1	46.1	42.4	90.6	67.5	57.4	56.5	88.4	65.6	55	51.4	88	61.9	55.8	51.5
	45-54	77.5	65.1	55.5	51.4	80.9	64	58.1	55.5	87.3	70.9	62.8	60.1	92.3	71.8	61.2	56.6
	55-64	78.4	66.1	58.8	52.8	79.1	60.1	50.4	43.7	85	70.3	62.9	56.7	88	71.9	65.1	57.5
	65-74	76.4	58.8	53.9	51.2	75.2	59.1	51	45.3	82.7	66.4	59.1	55	82	70.1	62	56.5
	75+	62.9	54.4	48.6	52.5	62.1	50.4	46.7	34.4	68	55	49.3	51.7	69.3	58	53.3	52.1
	All ages	72.7	59.3	52.9	50.1	72.9	57.3	50.3	44.1	78.7	63.6	56.5	53.5	80.3	66.1	59.2	54.7
Rectum	15-44	88.6	69	54	49.8	82.2	59.4	51.9	44.4	84	64.7	61.4	54.6	95.2	82.7	78.3	73
	45-54	77.6	61	58.4	50.3	85.7	70.7	67.4	52.3	87.9	74.4	64.5	54.7	90.6	77.9	69.6	63
	55-64	82.7	63.2	53.6	48.9	86	68.6	57.7	46.4	84.7	68.5	61.5	56.6	88.6	74.8	67.6	61.9
	65-74	79.9	67	61.6	54.2	79.8	63.4	55.7	52.2	83.8	68.4	64.3	62.3	85.3	71.3	65.9	62.9
	75+	66.5	56.4	50.7	40.7	69.6	56.7	51.6	40.1	73	53.6	46.3	50.4	75.5	56.6	56.1	50.2
	All ages	76.6	62.2	55.5	48.9	78.5	62.8	55.6	46.8	80.8	64	57.7	55.4	83.6	68.3	63.6	58.8
Colorectal	15-44	81.8	60.2	49.6	45.6	87.2	64.2	55.2	51.4	86.8	65.3	57.9	53.1	90.8	70.3	64.6	59.8
	45-54	77.6	63.5	56.6	51.0	82.7	66.6	61.7	54.5	87.5	72.2	63.4	57.9	91.7	74.1	64.3	59.0
	55-64	80.2	65.1	57.1	51.6	81.8	63.3	53.2	45.2	84.9	69.5	62.3	56.7	88.2	72.9	66.0	59.2
	65-74	77.7	61.8	56.7	52.6	76.8	60.6	52.6	47.8	83.1	67.1	61.0	57.7	83.1	70.4	63.3	58.7
	75+	64.3	55.2	49.4	49.3	64.5	52.4	48.3	35.4	69.5	54.5	48.3	51.3	71.1	57.7	54.1	51.6
	All ages	74.2	60.4	53.9	49.9	74.9	59.2	52.2	45.0	79.4	63.7	57.0	54.2	81.3	66.9	60.7	56.2
Liver	15-44	25.6	8.3	*	*	55.9	29.7	29.7	*	66	34.2	29	23.8	67.9	59.3	59.4	59.8
	45-54	10.8	7.2	7.2	*	37.8	20.1	14.3	4.6	41.3	23	23.1	23.5	59.2	30.3	18.8	12.4
	55-64	11.8	5.8	2.5	2.7	35.6	18.1	15.9	*	36.5	26.8	17.6	12.1	54.2	39.2	33.9	20.1
	65-74	7.9	3.6	1.9	2.3	22.8	11.2	7.7	4.6	38.4	21.8	14.7	12.8	43.9	24.2	17	8
	75+	8.5	3.1	1.4	*	7.5	3.2	2.4	*	23.6	10	5.7	4.9	32.2	15.6	9.8	4.9
	All ages	10.2	4.7	2.8	2.2	23.8	11.7	9.3	3.2	34.9	19.7	14.6	12.2	45.5	27.3	21.2	13.1

* refers to cells where estimates are not computed due to insufficient sample size
Estimates for “all ages” are age standardised
Sites which have insufficient sample size for all cells are excluded from this appendix

RELATIVE SURVIVAL BY PERIOD, SITE AND AGE GROUP, SINGAPORE FEMALES, 1973-1992

SITE	Age group	Relative survival (%)															
		1973-1977				1978-1982				1983-1987				1988-1992			
		1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr
Pancreas	15-44	44.4	10.4	10.5	10.5	0.7	0.7	0.7	0.7	21.0	21.0	21.1	21.2	25.5	9.9	9.9	10.0
	45-54	4.2	*	0.1	0.1	1.6	1.6	*	1.7	35.7	13.6	13.8	*	24.4	16.7	12.9	13.6
	55-64	10.1	*	*	*	9.3	4.7	4.8	*	15.7	3.4	3.6	1.3	8.3	1.7	0.5	*
	65-74	2.6	1.0	1.1	*	18.2	11.6	13.0	*	15.6	4.9	5.5	7.7	8.5	1.4	1.0	1.4
	75+	0.8	0.0	*	*	1.2	*	*	*	2.3	0.3	*	*	13.6	2.5	*	*
	All ages	5.1	0.7	0.7	0.4	6.4	4.2	4.4	4.6	12.9	4.3	4.5	4.4	12.3	3.5	2.1	1.7
Larynx	15-44	100.2	41.9	*	*	28.2	28.3	28.5	*	100.2	100.4	100.7	102.7	100.2	*	*	31.0
	45-54	100.5	77.0	59.2	*	52.9	12.2	12.4	7.9	59.3	60.2	38.4	*	100.3	101.0	102.3	107.9
	55-64	72.5	37.3	27.0	20.9	64.9	41.6	33.7	39.8	101.3	68.3	47.6	39.9	89.6	78.7	61.1	56.2
	65-74	82.3	90.4	101.4	*	103.0	110.5	76.7	12.0	67.3	55.7	37.6	30.0	84.4	50.8	36.2	14.8
	75+	0.0	*	*	*	59.0	19.8	*	*	81.3	56.9	40.5	*	53.6	32.9	32.7	*
	All ages	46.0	37.6	36.1	27.5	68.9	46.5	36.9	26.9	79.8	60.8	43.2	30.9	75.0	51.3	44.0	31.0
Lung	15-44	32.9	18.1	18.2	*	28.4	12.5	12.5	12.8	33.1	15.0	15.0	8.5	46.1	19.3	15.0	5.2
	45-54	25.1	11.7	10.3	7.9	21.4	5.0	2.4	1.0	29.5	14.0	10.7	11.2	30.9	7.6	6.9	4.7
	55-64	14.5	5.7	5.4	5.7	19.0	8.9	6.6	4.9	19.1	10.9	6.0	4.1	29.4	12.0	11.7	7.9
	65-74	10.5	2.8	2.6	3.0	16.6	5.7	3.4	1.2	18.9	4.2	3.7	3.2	21.4	7.4	5.0	2.7
	75+	10.5	5.1	3.0	*	7.9	2.8	2.0	*	7.8	2.0	2.2	0.1	8.0	2.2	1.3	*
	All ages	14.3	5.9	5.3	4.6	15.7	5.8	4.1	2.7	17.4	6.8	5.0	3.4	21.2	7.2	5.9	3.5
Bone	20-44	66.0	34.8	34.8	*	84.0	84.2	71.0	71.4	100.1	92.6	92.8	93.5	79.7	65.6	65.7	50.4
	45-54	39.4	*	*	*	*	*	*	*	100.5	59.1	*	*	24.3	13.4	6.1	*
	55-64	*	*	*	*	21.5	22.1	*	*	*	101.6	104.0	*	45.2	46.0	46.7	48.9
	65-74	*	*	*	*	77.9	29.9	*	*	102.0	*	*	*	6.7	*	*	*
	75+	*	*	*	*	*	*	*	*	*	*	*	*	116.6	*	*	*
	All ages	47.0	5.1	5.1	*	56.4	27.2	2.8	2.9	101.4	11.3	11.6	12.1	32.3	25.8	20.5	20.4
Connective tissue	15-44	79.0	79.1	79.2	46.4	79.8	55.3	49.1	39.8	85.1	64.2	64.3	64.7	87.7	70.7	65.0	53.3
	45-54	86.1	70.6	71.6	*	51.1	51.7	39.6	41.6	75.7	62.5	63.2	66.3	81.1	43.1	43.5	33.8
	55-64	58.2	44.0	45.3	*	73.0	61.3	41.6	28.7	71.5	73.2	74.9	53.8	100.9	80.0	82.3	73.7
	65-74	44.1	50.7	54.0	*	26.5	29.0	33.2	*	103.3	84.1	97.0	54.4	94.5	73.4	23.5	36.0
	75+	0.0	*	0.0	*	118.8	79.0	*	165.5	59.2	77.4	116.4	*	26.5	29.7	25.0	*
	All ages	59.3	52.3	55.8	55.0	67.9	55.7	52.2	55.5	79.6	70.5	75.9	58.8	78.2	60.6	52.5	36.3
Skin (inc. melanoma)	15-44	100.2	51.8	52.0	*	100.2	100.6	101.2	*	100.2	68.9	69.0	70.2	43.0	27.3	27.4	17.0
	45-54	100.5	68.6	0.0	*	100.6	101.9	16.7	*	32.9	33.3	33.9	*	34.3	9.5	*	9.8
	55-64	85.2	19.5	0.0	*	9.1	*	*	*	101.8	104.6	108.2	*	78.7	10.5	*	11.5
	65-74	69.2	*	*	*	31.9	*	*	*	55.5	58.4	*	*	73.8	43.0	17.2	*
	75+	106.8	128.9	0.1	*	75.9	93.4	125.6	*	90.9	57.6	*	*	84.2	49.4	59.0	*
	All ages	87.9	46.7	0.3	*	51.9	41.6	37.0	*	76.9	66.8	46.0	33.7	73.3	31.5	26.4	23.6
Female breast	15-44	84.5	68.5	57.6	48.9	90.5	67.5	58.4	44.6	91.4	69.2	60.6	49	95.4	79.3	66.9	57.1
	45-54	83.8	54.4	48.8	43	83.1	61.6	51.3	44.8	89.3	71.6	58.7	46.6	94.1	80.2	71.4	58.4
	55-64	80.4	58	46.1	28.2	81.8	49.9	39.8	30.9	86.4	67.1	57.6	47.3	90.3	73.2	62.2	43.5
	65-74	79.5	67.7	60.3	66	81	62.1	52.1	45.9	85.8	70.1	59.5	46.6	91.5	76.3	67.8	60.7
	75+	84	47.4	39.4	26.3	84.5	65.7	56.4	79.5	75.4	66.1	46.9	47	79.3	67.8	57.8	55.2
	All ages	81.9	58.6	50.2	42.2	83.2	60.6	50.3	41.9	83.4	68.1	55.5	46.1	87.7	73.3	63.6	53.4
Cervix	15-44	86.6	69.8	61.8	56.6	84.3	65	60.5	55.4	90.7	73.5	65.1	62.1	90.6	72.9	66.2	63.1
	45-54	79.7	56.3	52.1	49.6	80.6	62.1	53.4	45.8	81.8	58.2	49.9	44.3	89.3	73.6	65.3	57.2
	55-64	75.6	51.5	42	38.2	75.6	52.8	44.6	36.8	84.8	61.2	51.6	46.2	87.4	68.4	59.3	42.5
	65-74	63.9	42	36.9	41.1	75.5	52.3	47.8	41.2	76.9	39.6	27.8	25.5	79.9	52.3	50.6	40
	75+	60.9	37.3	38.9	36.6	66.8	34.8	24.4	17.5	69.6	43.4	37.4	53.7	66.9	38.4	37.6	23
	All ages	75.3	53.8	47.5	45.7	77.3	55	48.2	42.1	81.3	56.3	47.1	43.6	83	60.8	55.4	46.3
Corpus uteri	15-44	83.5	64.5	58	59.4	93.8	84	84.4	79.6	91.9	78.3	75.7	67	93.1	90.6	90.9	87.4
	45-54	77	65.2	63.3	67.2	86.3	76	70.8	66.9	90.1	84.5	83.6	79.6	94.9	89.4	87.8	85.7
	55-64	69	50.5	43.8	49.6	76.7	62.4	54.8	50.9	82.3	69.7	70.1	64.8	84.3	73.3	70	63.3
	65-74	47.1	26.6	28.9	20.2	77.6	76.6	84.9	22.9	85.1	65.7	62.7	58.5	82.6	70.3	61.8	55.2
	75+	92.1	57.2	70.8	*	68.4	23	30.3	66.7	69.6	66.3	57.3	75.6	45.8	28.1	29.1	51
	All ages	72	48.4	48.2	49.2	76.1	56.8	59.7	60.8	80.5	67.7	64.9	64.2	71.7	58.9	56.5	57.3

* refers to cells where estimates are not computed due to insufficient sample size
Estimates for "all ages" are age standardised
Sites which have insufficient sample size for all cells are excluded from this appendix

RELATIVE SURVIVAL BY PERIOD, SITE AND AGE GROUP, SINGAPORE FEMALES, 1993-2012

SITE	Age group	Relative survival (%)															
		1993-1997				1998-2002				2003-2007				2008-2012			
		1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr
Pancreas	15-44	3.9	3.9	3.9	4.0	56.5	19.7	19.7	19.8	52.8	39.9	39.9	40.2	46.1	26.0	21.6	21.7
	45-54	10.6	1.4	1.4	1.2	23.8	14.1	*	6.7	43.8	16.6	16.7	*	49.2	15.1	4.6	3.4
	55-64	19.1	8.4	8.6	*	24.9	9.1	5.1	*	26.4	9.6	6.4	4.7	37.1	14.5	9.7	10.2
	65-74	5.2	2.6	2.8	*	12.3	5.3	4.0	*	21.3	6.8	7.1	5.6	21.8	11.4	7.8	6.7
	75+	5.9	2.5	3.0	*	3.1	1.2	1.5	2.8	10.3	2.7	1.3	2.6	13.7	4.7	3.1	1.0
	All ages	8.8	3.9	4.1	2.1	14.5	5.8	4.4	3.4	22.6	8.4	7.2	6.9	26.5	11.0	7.0	6.1
Larynx	15-44	52.4	52.5	52.7	*	*	*	100.2	101.1	100.1	100.3	*	100.6	100.0	100.2	100.4	*
	45-54	100.3	101.0	55.7	57.8	100.2	100.6	101.0	102.5	100.2	100.6	101.1	102.9	100.2	100.5	101.0	102.6
	55-64	101.1	88.0	77.9	63.6	58.6	59.5	60.8	54.7	100.5	101.9	104.1	111.8	100.5	101.5	83.4	88.5
	65-74	79.2	60.4	38.5	19.5	81.5	84.3	78.0	45.0	91.0	85.6	67.8	34.9	64.3	43.1	45.4	32.1
	75+	81.6	37.9	10.1	0.3	68.5	53.4	42.6	60.2	56.9	45.1	36.8	66.9	39.0	24.0	21.9	29.4
	All ages	84.0	67.4	45.9	23.1	73.6	65.8	60.2	51.5	79.0	73.8	62.7	56.3	69.2	57.4	55.4	53.3
Lung	15-44	41.2	17.9	15.6	10.2	56.5	19.0	15.7	11.7	63.4	29.7	13.1	11.0	71.1	37.1	27.9	25.0
	45-54	46.1	21.0	11.2	7.8	59.0	31.7	26.7	19.6	58.4	25.5	16.4	11.1	72.5	37.9	26.6	16.4
	55-64	42.1	13.2	10.3	7.0	42.7	18.0	12.4	7.0	57.6	27.9	20.0	13.7	72.7	38.6	23.1	12.2
	65-74	31.4	11.3	9.3	4.0	30.2	13.2	8.9	6.4	44.1	21.5	17.5	14.1	54.2	25.1	16.8	11.6
	75+	14.5	4.7	2.1	0.6	15.7	7.2	6.4	6.0	24.6	8.9	5.6	7.5	29.1	10.3	5.4	2.4
	All ages	30.4	11.0	8.2	4.6	32.9	14.6	11.0	7.9	43.5	19.8	13.8	11.2	53.1	25.3	16.2	10.2
Bone	20-44	81.1	69.8	69.9	54.5	80.0	62.7	55.1	49.8	86.6	69.8	69.9	55.2	93.1	83.7	83.8	84.2
	45-54	58.7	59.0	*	59.8	79.8	57.7	4.7	*	88.5	76.2	76.7	*	100.2	67.9	55.8	56.8
	55-64	65.6	66.4	67.1	71.0	100.4	101.6	73.1	75.3	75.5	30.7	31.3	32.9	100.5	101.5	102.7	107.7
	65-74	102.7	109.0	*	*	*	102.5	108.6	*	101.9	*	*	10.9	26.8	*	*	*
	75+	49.5	69.9	97.3	*	85.8	7.6	*	19.9	70.0	0.0	*	*	46.9	35.3	41.6	*
	All ages	78.4	86.3	103.9	116.6	88.4	43.7	40.2	54.1	81.9	19.0	19.2	20.8	50.1	41.2	43.3	45.4
Connective tissue	15-44	80.5	65.5	61.4	56.7	91.7	76.9	67.3	63.3	90.0	78.4	71.1	71.5	86.8	79.0	79.1	70.7
	45-54	71.5	52.9	53.3	55.1	69.9	60.6	61.0	50.7	60.5	56.8	57.1	51.5	83.9	75.7	76.1	71.4
	55-64	80.9	82.4	84.7	82.8	66.5	67.3	68.3	62.3	70.8	58.8	59.8	51.8	84.6	55.9	56.6	59.9
	65-74	69.0	43.7	36.3	39.4	52.2	40.6	42.4	40.2	72.4	48.3	50.5	59.4	74.5	61.4	53.9	44.7
	75+	60.2	4.0	*	*	48.1	35.7	26.9	*	61.0	65.7	60.3	63.8	49.6	35.2	35.9	9.0
	All ages	72.3	53.8	49.5	47.9	66.6	55.9	51.6	47.9	71.1	59.6	57.0	56.4	75.5	60.5	59.5	51.6
Skin (inc. melanoma)	15-44	91.9	61.4	45.3	*	89.3	78.5	60.6	45.8	100.1	91.6	91.8	92.1	87.5	72.8	66.6	57.7
	45-54	100.3	57.8	*	*	85.9	86.4	60.1	*	66.6	32.0	23.9	24.5	100.2	90.6	79.6	44.5
	55-64	86.8	62.3	63.7	*	100.4	70.2	61.5	44.9	82.4	68.9	69.7	42.3	54.2	19.6	16.4	17.0
	65-74	68.5	72.4	77.1	*	101.6	88.8	93.0	110.0	66.3	68.8	56.1	46.3	85.7	42.6	44.7	43.6
	75+	65.5	21.8	26.8	34.9	87.5	39.4	48.3	80.3	80.7	51.3	26.6	53.3	80.2	49.1	47.9	33.6
	All ages	78.3	57.3	54.9	47.8	94.7	66.4	62.2	67.3	77.4	64.6	52.0	47.8	78.4	46.1	42.8	38.9
Female breast	15-44	95.1	85.2	75.3	63.9	97.5	89	80	70	98.5	92.1	87.3	79.5	98.6	92.8	88.6	79.6
	45-54	96	86.1	79.1	69.9	96.6	88	81.7	71.2	97.5	91.3	85.8	78.6	97.1	91	86.1	80
	55-64	95.4	82.4	74.4	60.7	95.4	85.5	79.7	65.7	96	87.9	80.8	73.3	96.4	88.9	82.9	75.1
	65-74	92.2	81.5	73.6	61.1	94	85.2	77.5	64.7	94.9	85.9	78	69.6	94.6	86.1	80.2	73.4
	75+	79.2	71	75.6	68.7	91.1	75.4	69.7	56.7	88.4	74.8	64.4	55.6	90	81.6	73.1	63.7
	All ages	89.6	79.2	74.7	63.7	93.9	82.8	76.1	63.4	93.4	83.8	76	68.1	93.8	86	79.5	72
Cervix	15-44	89.7	78.8	73.8	70.1	94.8	84.6	81.7	77.5	92.8	83.1	83.3	81.4	96.8	81.1	78.5	76.6
	45-54	88	71.8	66.1	60.7	89.6	76.1	66.8	61.2	93.6	79.2	74.5	68.7	88.1	73.5	68.3	62.5
	55-64	85.3	66	59.7	49	83.2	67.2	61.4	56	87.3	70.2	66.9	56.9	89.9	71.6	65.9	57.4
	65-74	77.8	61.4	52.9	44	81.7	61.8	56.4	48	78.9	64.2	60	49	84.9	66.2	59.6	51.4
	75+	77.1	54.4	48	31.8	67.5	56.1	55.8	56.7	65.7	39.6	32.9	29.7	67.7	51.2	44.9	31.4
	All ages	83.2	66.3	60	52.5	82.7	68.4	63.8	59.3	82	65.1	61.6	55.3	83.5	66.3	60.9	54
Corpus uteri	15-44	96.4	92.5	89.2	87.3	95.7	90.5	86.5	83.1	99.1	97.2	95.7	93.8	97.6	92.4	91.2	89.7
	45-54	95.7	89.1	84.8	81.8	96	90.2	86	82.2	94.9	90.2	88.4	87.5	95.1	90.1	87.4	86.3
	55-64	90	77	72.4	74.6	90.8	78.9	77.1	73.3	92.7	84.1	79.6	76.7	91.3	83.5	82.2	78.1
	65-74	81.5	62.8	65.1	65.5	79.9	67.7	61.3	60.8	89.4	74.6	70.7	66.3	86.6	76	71.7	68.8
	75+	79	67.4	34.4	17.4	72.3	63.2	54.8	30.3	72.7	48.5	48.3	54.5	77.3	65.4	59.5	47.2
	All ages	84.2	70.8	66.8	58.4	81.9	71.9	66.2	62.1	85.5	70.5	68.1	67.4	85.5	76.2	72.4	67.5

* refers to cells where estimates are not computed due to insufficient sample size
Estimates for "all ages" are age standardised
Sites which have insufficient sample size for all cells are excluded from this appendix

RELATIVE SURVIVAL BY PERIOD, SITE AND AGE GROUP, SINGAPORE FEMALES, 1973-1992

SITE	Age group	Relative survival (%)															
		1973-1977				1978-1982				1983-1987				1988-1992			
		1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr
Ovary	15-44	83.8	67.4	64.4	57.4	83.2	66.6	64.5	59.4	86.1	66.3	65.8	62.3	90.4	76.8	70	67.9
	45-54	73.9	50.9	41.9	*	65.8	47.9	42.1	38.1	70	52	50.5	44.9	78.3	56.6	49.8	39.3
	55-64	64.2	46.6	41	28.9	56.6	35.6	32.9	31.9	70.3	43.4	37.8	34.9	77.9	56	47.3	41.7
	65-74	44	37.6	41.9	*	52.4	33.1	32.5	14.3	43.9	30.3	23.6	18.7	56.9	49.1	37.8	32.9
	75+	26.9	*	*	*	49.3	29.3	27.3	*	27.5	8.8	11.5	*	39.9	26.3	32.8	0.1
	All ages	48.7	34.7	32.9	28.6	55.7	35.7	33.3	25.2	49.9	31.4	29.2	21.9	58.4	44.1	39.2	33.3
Bladder	15-44	100.1	100.6	101.3	*	100.2	*	*	*	73.5	45.7	45.8	*	100.1	82.9	83.2	84.1
	45-54	52.6	53.4	54.3	*	27.8	3.6	0.1	*	72.3	29.8	30.3	*	64.4	47.8	48.3	50.6
	55-64	41.4	33.3	35.0	*	59.0	44.3	46.0	38.6	54.2	50.7	52.5	59.1	86.3	63.8	47.8	46.5
	65-74	52.0	44.8	33.9	0.1	52.1	39.4	30.2	20.9	58.6	54.9	42.5	30.5	56.4	35.2	33.9	22.4
	75+	57.0	47.1	59.8	*	57.9	54.9	43.8	66.5	33.1	28.0	13.7	0.0	69.3	50.7	42.2	45.7
	All ages	51.4	45.7	43.8	0.1	57.2	39.6	29.3	18.7	53.7	43.3	34.0	26.9	69.8	49.9	44.0	38.9
Kidney	15-44	24.4	24.5	24.6	24.8	71.1	71.3	71.7	72.7	81.2	81.4	81.7	27.5	68.9	54.2	41.5	41.9
	45-54	82.6	44.0	44.7	*	51.8	44.0	34.6	36.5	67.5	58.7	59.4	61.9	93.6	46.3	39.3	25.7
	55-64	26.7	17.0	17.6	*	45.4	47.2	27.5	31.1	43.5	44.9	39.0	20.6	90.0	85.2	87.7	73.2
	65-74	57.0	41.3	2.9	*	33.8	3.9	4.7	*	59.0	29.0	24.6	*	67.7	52.0	43.0	46.1
	75+	57.5	35.8	44.4	*	5.7	8.3	10.8	23.8	57.9	38.6	58.3	167.6	65.7	57.9	63.3	200.5
	All ages	49.3	32.8	28.0	14.3	30.0	21.8	18.0	20.4	57.4	39.9	38.0	35.6	74.4	60.9	57.0	60.4
Thyroid	15-44	95.9	93.3	86.0	83.6	98.1	96.1	96.4	95.7	99.5	99.8	100.0	100.8	99.6	99.8	99.5	99.3
	45-54	84.2	76.1	77.1	80.9	79.0	79.9	80.9	70.5	95.0	95.9	96.9	101.2	95.7	92.2	90.1	93.0
	55-64	75.9	67.4	55.5	49.8	70.0	72.5	60.1	39.7	72.6	69.7	67.5	64.5	89.7	89.1	87.3	83.7
	65-74	41.0	36.7	41.5	*	58.9	32.7	27.8	14.1	65.0	52.2	55.8	*	67.6	54.7	53.8	29.0
	75+	106.9	127.1	0.4	*	31.3	27.7	*	*	30.4	27.8	33.4	*	23.3	17.2	20.2	16.9
	All ages	76.8	72.4	56.4	55.1	67.4	60.2	53.8	43.4	73.1	68.9	71.0	67.1	73.0	68.3	67.9	59.6
Gallbladder	15-44	100.2	*	0.0	*	19.1	19.2	*	19.4	40.2	28.0	28.1	*	35.2	20.7	12.6	12.7
	45-54	33.5	*	*	*	27.8	0.9	*	*	23.4	12.1	*	*	54.2	22.5	12.3	*
	55-64	13.7	14.1	5.1	*	18.4	4.6	*	*	28.2	12.4	12.8	*	30.8	10.0	4.3	*
	65-74	12.9	5.0	*	*	2.7	0.3	0.3	*	9.8	*	*	1.2	38.1	18.7	*	*
	75+	3.3	*	*	*	17.6	*	*	*	12.1	4.2	*	*	45.1	35.4	40.3	*
	All ages	14.5	4.1	1.9	*	13.7	2.3	2.5	3.0	17.7	7.4	5.5	2.7	40.5	20.8	12.1	9.2
Brain	15-44	53.3	6.0	6.1	*	64.5	50.6	50.8	36.9	76.6	41.4	26.3	10.2	81.3	48.1	44.6	21.5
	45-54	45.7	28.2	28.6	*	66.3	26.1	26.5	*	10.4	0.0	0.0	0.0	59.5	*	*	0.0
	55-64	101.2	104.6	*	*	3.4	3.5	3.6	*	30.8	*	*	11.5	58.0	35.1	17.4	*
	65-74	44.2	*	*	*	30.8	2.2	*	*	26.8	*	*	*	35.9	9.8	6.1	*
	75+	*	*	*	*	0.0	*	*	*	28.1	*	*	*	1.0	*	*	*
	All ages	63.3	33.6	33.9	*	27.7	17.0	17.4	11.6	35.9	11.9	8.8	3.9	48.8	19.6	15.0	9.5
Non-Hodgkin's Lymphoma	15-44	76.1	50.8	*	*	100.1	83.9	67.8	*	41.9	42.0	42.1	42.3	92.2	92.4	92.6	49.4
	45-54	100.5	*	*	*	20.4	8.7	*	*	19.1	*	19.3	*	34.4	*	*	34.8
	55-64	101.5	*	*	*	45.0	29.1	0.3	*	1.2	1.2	1.2	*	101.4	45.4	*	48.5
	65-74	0.0	*	*	*	43.8	1.7	*	*	104.3	115.7	61.4	*	3.6	*	3.8	5.8
	75+	27.4	32.3	41.6	*	*	*	111.6	*	0.0	*	*	*	31.4	9.9	*	*
	All ages	37.2	38.0	48.4	*	44.3	18.0	13.4	*	27.2	29.7	21.3	22.0	42.1	17.3	18.4	24.2
Hodgkin's Lymphoma	15-44	44.3	32.3	32.3	32.6	23.0	19.5	19.6	13.5	70.7	54.2	39.3	18.5	68.9	54.2	54.4	54.7
	45-54	45.6	30.3	18.2	*	69.4	54.5	55.4	*	65.4	49.7	45.8	42.1	86.9	59.7	56.3	42.1
	55-64	16.8	17.7	*	*	58.2	35.6	13.8	*	56.3	33.7	34.7	38.0	64.7	49.2	39.0	33.5
	65-74	36.1	39.1	43.6	*	26.3	25.2	19.5	15.9	56.2	41.5	38.7	33.4	48.3	35.9	28.0	14.0
	75+	82.8	1.7	*	*	14.1	18.1	5.1	*	26.9	25.1	29.3	*	12.2	7.2	6.5	7.2
	All ages	41.2	23.2	20.3	22.7	35.9	32.5	18.8	10.1	48.0	35.3	34.7	31.4	43.8	31.5	27.1	21.1
Leukaemia	15-44	36.1	14.2	12.0	*	38.5	11.8	2.4	0.1	45.5	24.8	12.3	*	54.5	22.7	19.0	19.2
	45-54	20.4	16.5	16.7	*	33.6	14.7	7.4	*	25.5	14.6	14.8	15.4	58.8	40.3	14.6	6.7
	55-64	22.5	14.7	15.3	*	21.4	9.4	6.4	*	24.2	5.5	*	6.2	40.4	8.8	9.0	*
	65-74	8.4	3.6	*	*	17.2	7.3	4.0	*	12.2	4.9	3.2	4.8	21.9	*	*	2.4
	75+	17.1	2.0	*	*	0.5	*	*	*	7.8	5.9	*	*	11.9	5.2	*	*
	All ages	17.3	5.7	5.6	*	12.1	5.2	2.9	0.3	16.7	7.7	5.3	6.2	28.8	9.6	5.8	2.8

* refers to cells where estimates are not computed due to insufficient sample size
Estimates for “all ages” are age standardised
Sites which have insufficient sample size for all cells are excluded from this appendix

RELATIVE SURVIVAL BY PERIOD, SITE AND AGE GROUP, SINGAPORE FEMALES, 1993-2012

SITE	Age group	Relative survival (%)															
		1993-1997				1998-2002				2003-2007				2008-2012			
		1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr	1yr	3yr	5yr	10yr
Ovary	15-44	92.8	85.8	82.1	75.9	95.5	86.3	83.7	78.8	93.1	84.6	78	74	93.3	85.6	79.7	74.8
	45-54	85.3	70	60.4	52.5	86	70.6	63.2	51	88.8	71.1	61.5	56.7	89.6	78.3	70.4	60.1
	55-64	82.2	52.2	43.8	32.5	83.3	66.4	53.8	49.3	85.9	61.9	54.4	45.4	84.7	63.4	56.5	49
	65-74	72.4	56.8	47.8	41.4	81	51.1	42.5	35.7	69.5	45.8	36.2	28.4	74.4	59.4	49.9	42.7
	75+	33.2	32.4	32.4	20	52.3	29	23.3	22.9	52.3	38.3	33.6	37.3	30	21.7	17.7	12.6
	All ages	63.3	50.3	44.6	32.8	73.2	51.3	43.1	39.3	69.3	50	42.7	37.8	62.7	48.8	41.9	34.5
Bladder	15-44	84.9	69.9	70.1	70.7	83.4	61.0	61.1	61.4	88.4	88.5	88.7	89.1	69.0	69.1	69.3	61.0
	45-54	78.2	66.4	67.1	55.0	93.9	82.4	82.8	69.8	74.4	68.4	64.0	65.3	86.7	79.3	79.7	81.3
	55-64	83.4	59.9	61.2	60.5	78.1	65.7	66.8	64.6	80.9	74.7	66.6	66.3	85.2	64.5	62.9	63.6
	65-74	75.6	53.5	42.0	33.6	87.4	80.3	80.9	72.0	76.2	66.8	59.9	51.4	89.4	80.9	73.1	61.1
	75+	67.9	49.4	26.4	19.6	56.7	54.2	51.9	21.7	79.5	67.5	61.7	48.9	71.6	55.0	49.5	57.3
	All ages	74.9	55.5	45.9	41.3	75.4	67.6	67.0	57.1	77.7	69.0	62.8	57.6	78.7	62.2	57.2	55.5
Kidney	15-44	77.8	66.7	51.4	51.8	80.9	74.0	74.1	69.1	86.6	83.7	80.9	66.0	94.6	89.3	82.6	77.2
	45-54	84.0	84.6	79.6	82.3	70.4	62.3	54.1	48.7	87.3	79.9	75.7	69.5	93.0	89.5	83.1	81.8
	55-64	70.6	57.7	52.2	44.6	85.7	67.6	63.8	60.3	86.8	75.1	69.8	66.1	87.0	81.0	74.2	53.5
	65-74	78.0	57.3	53.8	42.8	69.8	52.9	47.6	20.2	72.2	60.2	46.4	44.6	87.0	74.3	68.6	56.4
	75+	42.0	19.8	18.6	15.0	54.0	30.8	28.9	15.0	52.9	42.0	41.0	5.6	69.8	50.7	38.2	44.6
	All ages	67.0	50.3	45.6	38.5	68.1	51.1	47.3	35.9	71.2	60.3	54.1	42.5	81.7	69.5	61.6	54.9
Thyroid	15-44	99.3	98.6	98.4	98.5	100.1	99.9	99.6	98.3	100.1	99.6	99.7	98.3	99.8	99.6	99.7	99.1
	45-54	95.4	94.6	93.8	90.2	98.0	98.4	94.6	90.4	98.3	98.1	95.1	95.2	99.3	99.6	99.6	94.1
	55-64	95.2	97.1	90.3	81.4	90.8	84.7	81.3	78.1	97.4	93.8	93.7	89.9	96.9	94.2	93.7	88.3
	65-74	82.0	84.2	82.8	49.5	81.6	73.6	65.6	59.6	82.9	74.2	67.8	52.0	97.0	93.3	91.5	93.4
	75+	40.9	39.8	49.5	92.6	70.7	64.0	45.4	20.0	50.7	41.8	41.5	25.7	51.5	40.7	40.2	31.4
	All ages	82.2	82.6	82.2	79.0	87.6	83.1	76.5	69.2	85.1	80.1	78.1	70.3	88.4	84.3	83.7	80.3
Gallbladder	15-44	58.6	27.8	18.5	18.6	44.8	33.8	33.9	34.1	62.6	44.4	35.1	35.4	71.8	43.4	43.5	31.6
	45-54	52.3	35.3	35.6	36.6	50.8	39.8	36.3	22.4	47.4	21.7	19.3	17.8	68.0	46.0	36.3	26.9
	55-64	28.8	17.6	11.8	0.2	46.5	30.3	18.0	7.8	44.5	25.3	18.6	20.0	53.9	24.4	24.7	19.5
	65-74	43.6	11.2	6.6	*	36.9	25.8	17.0	20.0	54.1	32.8	18.1	18.4	45.2	19.3	12.5	7.3
	75+	23.6	16.1	18.1	11.2	30.2	14.6	7.7	3.2	22.4	13.4	15.1	5.0	21.7	5.9	5.7	4.1
	All ages	35.7	17.1	13.9	5.3	38.8	24.4	17.3	11.8	40.7	23.6	18.2	16.1	42.4	19.1	16.3	11.5
Brain	15-44	79.5	54.5	42.5	26.9	90.1	53.8	44.9	38.0	80.4	58.6	43.3	32.0	81.9	66.7	54.6	32.4
	45-54	73.0	50.1	50.3	*	45.3	22.2	22.3	2.0	77.4	49.2	49.5	42.8	78.9	56.4	43.2	37.6
	55-64	29.2	5.7	2.5	2.9	43.2	0.5	0.5	0.5	87.8	50.8	51.4	53.3	55.3	24.5	15.8	12.0
	65-74	23.6	0.0	0.0	0.0	25.1	13.2	2.5	2.8	36.2	20.2	21.3	12.2	50.4	20.1	14.5	*
	75+	11.1	12.2	*	*	2.5	2.6	2.9	*	15.1	17.1	*	0.2	26.7	17.1	10.7	*
	All ages	41.2	21.5	17.1	13.5	39.9	18.3	14.3	11.6	58.8	37.3	32.2	25.1	58.2	36.1	27.3	19.4
Non-Hodgkin's Lymphoma	15-44	100.1	100.2	93.1	84.6	97.2	91.1	87.0	81.7	100.0	87.8	87.8	83.9	100.0	98.2	96.3	96.5
	45-54	100.2	66.1	*	*	54.3	54.5	54.7	*	100.2	100.7	101.3	103.0	100.2	100.5	101.0	102.8
	55-64	101.0	*	105.0	*	77.4	78.8	60.9	*	100.4	80.4	4.3	2.9	72.4	64.4	65.0	67.9
	65-74	102.7	*	*	115.0	76.3	60.0	62.5	*	55.5	17.3	18.3	13.7	68.9	71.2	73.1	83.7
	75+	35.2	*	*	*	70.5	80.2	90.8	*	7.0	7.7	8.8	*	60.5	*	*	22.8
	All ages	59.4	45.0	44.9	8.3	73.4	71.0	68.7	69.3	58.9	44.5	43.2	28.1	69.6	58.6	59.1	67.3
Hodgkin's Lymphoma	15-44	70.5	55.9	54.2	52.3	84.7	78.5	77.5	68.5	86.5	82.6	80.9	78.2	92.5	82.7	82.9	80.6
	45-54	80.9	71.3	68.9	51.5	81.0	71.2	66.4	62.1	83.9	75.7	72.9	69.2	92.2	89.4	86.4	83.1
	55-64	71.1	57.7	52.7	44.8	69.3	65.3	59.1	45.4	84.2	76.5	73.4	62.7	84.8	77.2	76.8	66.5
	65-74	69.9	56.7	53.2	43.1	66.9	55.8	52.3	54.0	67.0	51.1	43.8	33.8	69.2	60.6	61.0	52.1
	75+	31.3	25.6	17.7	35.5	41.7	33.8	25.1	22.6	52.2	34.0	36.9	16.0	49.4	39.8	37.7	39.6
	All ages	56.6	46.3	42.1	37.8	60.7	52.6	47.1	42.2	68.0	54.8	52.1	41.4	68.1	59.6	58.6	53.4
Leukaemia	15-44	60.0	41.6	30.2	20.0	69.8	52.1	43.9	44.1	85.1	71.3	68.8	59.3	88.0	76.8	73.6	70.3
	45-54	59.6	24.1	24.3	24.9	61.9	41.4	35.9	28.4	80.7	72.9	70.8	72.1	75.4	72.9	69.2	62.8
	55-64	31.6	26.8	20.5	22.3	48.2	34.1	25.2	14.5	61.2	45.7	41.8	44.3	72.6	59.0	53.2	53.7
	65-74	25.3	11.3	12.2	*	34.8	22.4	21.3	*	44.0	34.8	27.9	14.6	59.1	42.5	34.5	25.3
	75+	3.6	2.4	1.9	*	19.3	11.8	8.8	5.8	47.9	48.9	39.7	47.7	52.4	40.1	30.8	17.4
	All ages	23.4	13.8	11.7	10.1	37.1	25.0	20.5	11.4	55.4	47.1	41.6	35.3	63.0	50.1	43.2	36.4

* refers to cells where estimates are not computed due to insufficient sample size
Estimates for "all ages" are age standardised
Sites which have insufficient sample size for all cells are excluded from this appendix

APPENDIX B

5-year ASRS Ranking of selected cancers by gender: 2008-2012

5yr ASRS Ranking of selected cancers by gender: 2008-2012

Males

Rank	Site	5yr ASRS
1	Prostate	88.5
2	Thyroid	86.8
3	Testis	74.4
4	Bladder	67.6
5	Kidney	61.0
6	Colon	60.3
7	Larynx	58.9
8	Nasopharynx	58.5
9	Salivary Gland	58.1
10	Rectum	57.1
11	Skin	56.8
12	Connective Tissue	54.7
13	Hodgkin's Lymphoma	54.3
14	Tongue	49.7
15	Non-Hodgkin's Lymphoma	49.6
16	Leukaemia	47.5
17	Bone	46.8
18	Stomach	26.8
19	Brain/Central Nervous System	23.5
20	Liver	21.1
21	Gallbladder	15.6
22	Lung	11.0
23	Oesophagus	7.4
24	Pancreas	5.4

Females

Rank	Site	5yr ASRS
1	Salivary Gland	84.4
2	Thyroid	83.7
3	Breast	79.5
4	Uterus	72.4
5	Tongue	65.9
6	Rectum	63.6
7	Kidney	61.6
8	Cervix	60.9
9	Nasopharynx	60.4
10	Connective Tissue	59.5
11	Colon	59.2
12	Non-Hodgkin's Lymphoma	59.1
13	Hodgkin's Lymphoma	58.6
14	Bladder	57.2
15	Larynx	55.4
16	Bone	43.3
17	Leukaemia	43.2
18	Skin	42.8
19	Ovary	41.9
20	Brain/Central Nervous System	27.3
21	Stomach	25.6
22	Oesophagus	25.2
23	Liver	21.2
24	Gallbladder	16.3
25	Lung	16.2
26	Pancreas	7.0

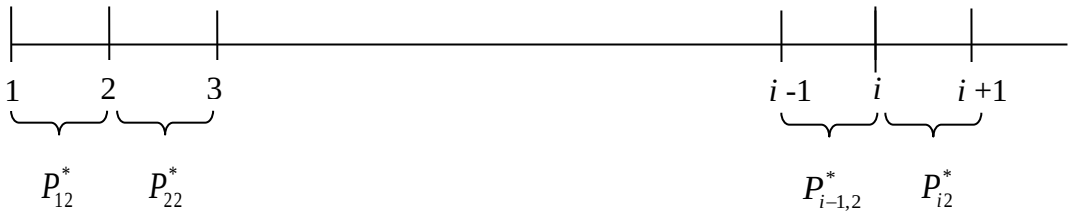
APPENDIX C

Computation of the Expected Survival Rate, Confidence Interval, and Age-standardised Estimate

(A) Computation of the Expected Survival Rate

The Ederer II method is outlined below:

Suppose that we want to estimate the cumulative expected survival from the start of follow-up to the end of the i^{th} sub-interval (in our case, one interval length is one year). Then, we calculate ${}_1P_i^* = \prod_{j=1}^{i} P_{j2}^*$,which is the i^{th} year cumulative survival proportion, where $P_{j2} = \sum_{h=1}^{l_j} \frac{P_j^*(h)}{l_j}$ is the average of the one-year expected survival probabilities of the patients alive at the start of the j^{th} interval. $P_j^*(h)$ is the expected survival probability of the h^{th} patient in the j^{th} interval; and l_j is the number of patients in the j^{th} interval.



The *i*-year cumulative expected survival is then = P_{12}^* x P_{22}^* x … x $P_{i-1,2}^*$ x P_{i2}^*

(B) Computation of the Confidence Interval

(i) Working on the assumption that the estimated survival rate is normally distributed, the 2-sided 100(1-α)% confidence interval for cumulative relative survival can be computed as

$$\hat{CSR} \pm z_{\alpha/2} SE(\hat{CSR})$$

SE($\hat{CSR}$) is the standard error for cumulative relative survival using Greenwood's formula

Note: This computation method can also be applied to interval-specific relative survival or the cumulative observed survival.

(ii) In the event that the upper and lower bounds are out-of-range (i.e. exceed the range of 0 and 1), the complementary log-log transformation is used.

Then, the 2-sided 100(1-α)% confidence interval for cumulative relative survival can be written as

$$\frac{1}{Expected\ \ Survival\ Rate}\log(-\log(\text{Cumulative OSR})) \pm z_{\alpha/2}SE(\log(-\log(\text{Cumulative OSR})))$$

Using Taylor series, the standard error of the complementary log-log transformed observed survival rate can be approximated by $\frac{SE(OSR)}{OSR * \log(OSR)}$ [1]

(C) Computation of the Age-standardised Estimate

The procedure to obtain age-standardised survival estimates is shown below.

Suppose there are *J* age classes and *K* population strata.

Cumulative *i*-year age-standardised relative survival estimates for the k^{th} population stratum are formulated as:

$$ASRS_{ik} = \sum_{j=1}^{J} \frac{M_j}{M} R_{ijk},$$

where R_{ijk} is the cumulative relative survival estimate at the end of the i^{th} year of follow-up for age class *j* and k^{th} population stratum;

$M_j = \sum_j m_{jk}$ is the number of patients in age class *j*;

$M = \sum_j M_j$ is the total number of patients, summed across all age classes.

M_j and *M* are independent of population strata.[2]

REFERENCES:

1. Voutilainen ET, Dickman PW, Hakulinen T. Surv 2: Relative Survival Analysis Program. In: Software Manual Program Version 202b (Oct 30, 1998); Aug 9, 2000.
2. Sankaranarayanan R, Black RJ, Swaminathan R, Parkin DM. Cancer Survival in Developing Countries; 1998.