

Chapter 15

Cancer survival in Karunagappally, India, 1991–1997

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Abstract

The rural cancer registry of Karunagappally was established in 1990 to study cancer occurrence due to high natural background radiation in the coastal area of Kerala state. Cancer registration was done by active methods. The registry contributed data on survival for 22 cancer sites or types registered during 1991–1997. Follow-up has been carried out predominantly by active methods, with median follow-up time ranging between 3–57 months for various cancers. The proportion of histologically verified diagnosis for different cancers ranged between 39–100%; death certificates only (DCOs) comprised 0–25%; 75–100% of total registered cases were included for survival analysis. The 5-year age-standardized relative survival rates for common cancers were lung (6%), breast (45%), cervix (55%), mouth (42%), oesophagus (14%) and tongue (31%). Five-year relative survival by age group showed no distinct pattern or trend for most cancers. A majority of cases are diagnosed with a regional spread of disease among cancers of the tongue (48%), oral cavity (66%), hypopharynx (54%), larynx (46%), cervix (61%) and breast (53%); survival decreases with increasing extent of disease.

Rural cancer registry

The rural cancer registry of Karunagappally was established in 1990 as a special purpose registry by the regional cancer centre of Trivandrum, with funding support from the Department of Atomic Energy, Government of India to study cancer occurrence in relation to the high natural background radiation present in the coastal area of Kerala state, which has monazite-rich sands that emit gamma radiation. The registry covers an area of 212 km² and caters to a mixed rural (96%) and urban (4%) population of 0.4 million with a sex ratio of 1025 females to 1000 males. It has been contributing data to the quinquennial IARC publication *Cancer Incidence in Five Continents* since volume VII [1]. The method of cancer registration is entirely done by active methods. There are no dedicated cancer hospitals or laboratories for tissue diagnosis within the registry area. Over 50 sources of registration, comprising hospitals in the government and private sectors, nursing homes, pathology laboratories, imaging centres and hospices, are visited for data collection. In addition, the enumerators undertake field visits to trace new cancer cases. The average annual age-standardized incidence rate is 112 per 100 000 among males and 81 per 100 000 among females with a lifetime cumulative risk of one in 8 for males and one in 11 for females of developing cancer in 1993–2001. The top-ranking cancers among males are lung,

followed by oral cavity and oesophagus. Among females, the order is breast, cervix and oral cavity [2].

The registry has contributed data on survival from 22 cancer sites or types for this second volume of the IARC publication on *Cancer Survival in Africa, Asia, the Caribbean and Central America*.

Data quality indices (Table 1)

The proportion of cases with a histological confirmation of cancer diagnosis in this series is 71%, varying between 39–100%. The proportion of cases registered as death certificates only (DCOs) is 11%, ranging between 0–25%. The exclusion of cases from the survival analysis was the greatest in cancer of the brain and nervous system (25%); it was none for many cancers. Thus, 75–100% of the total cases registered are included in the estimation of the survival probability.

Outcome of follow-up (Table 2)

Follow-up has been carried out predominantly by active methods. These included abstraction of cancer mortality information from the vital statistics division records. The abstracted data are first matched with the incident cancer database. The follow-up information for the unmatched incident cases is then

obtained through repeated scrutiny of records in the respective sources of registration, postal/telephone enquiries and house visits. Further, the monthly cancer follow-up clinics held by oncologists from the Regional Cancer Centre in the field office and the pain and palliative care clinics held bi-weekly have helped to obtain maximal follow-up information.

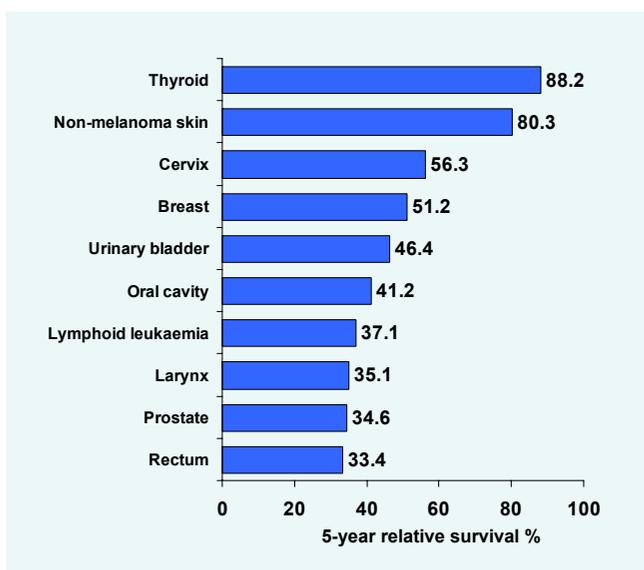
The closing date of follow-up was 31st December 1999. The median follow-up (in months) ranged between 3 for myeloid leukaemia to 59 for cancer of the thyroid. Complete follow-up at five years from the incidence date ranged from 91% (prostate cancer) to 100%. The losses to follow-up occurred in the first year of follow-up for a majority of cancers.

Survival statistics

All ages and both sexes together (Table 3)

The 5-year relative survival is the highest for thyroid cancer (88%) and the lowest for cancer of the liver (3%) among the cancers studied. The survival figures for other head and neck cancers are oral cavity (41%), larynx (35%), tongue (32%) and hypopharynx (15%). Survival rates from gastrointestinal cancers were rectum (33%) and oesophagus, stomach and pancreas (3%). The survival figures for Non-Hodgkin lymphoma was 30%, lymphoid leukaemia was 37% and myeloid leukaemia 8%.

Figure 1a. Top ten cancers (ranked by survival), Kurunagappally, India, 1991–1997



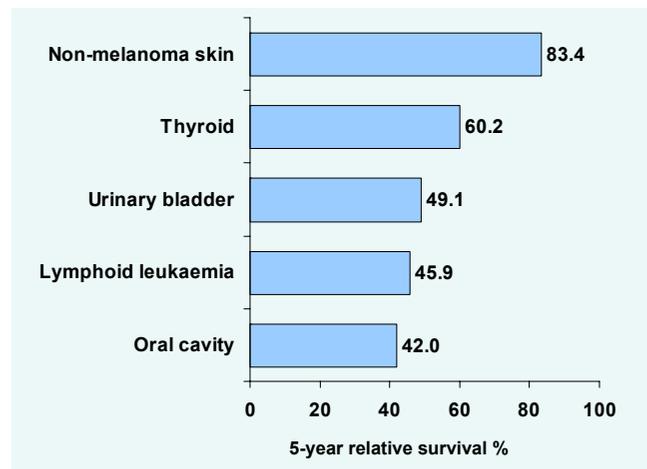
The 5-year age-standardized relative survival (ASRS) probability for all ages together is either less than or very similar to the corresponding unadjusted one for most cancers. The 5-year ASRS (0–74 years of age) is observed to be higher than the corresponding ASRS (all ages) for the majority.

Sex

Male (Table 4a)

The 5-year relative survival is the highest for non-melanoma skin cancer (83%) followed in order by thyroid (60%) and urinary bladder (49%). Survival from lymphoid and myeloid leukaemias is noticeably higher among males than females.

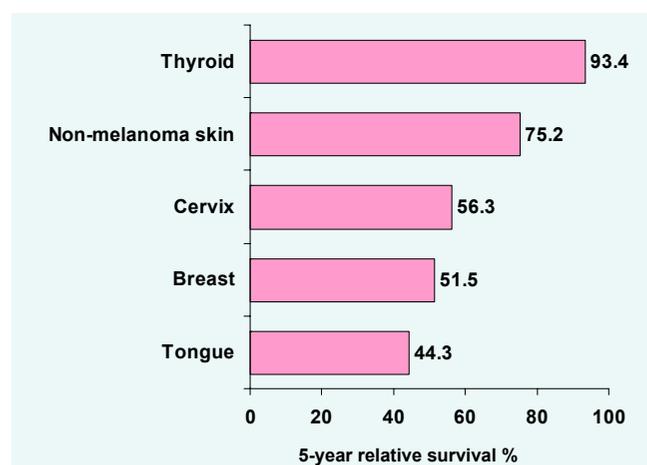
Figure 1b. Top five cancers (ranked by survival), Male, Kurunagappally, India, 1991–1997



Female (Table 4a)

The top ranking cancers on 5-year relative survival probabilities are thyroid (93%), non-melanoma skin (75%), cervix (56%) and breast (51%). Survival is markedly higher among females than males for cancers of the tongue, hypopharynx and thyroid.

Figure 1c. Top five cancers (ranked by survival), Female, Kurunagappally, India, 1991–1997



Age group (Table 4b)

The 5-year relative survival probabilities by age group do not show any distinct pattern or trend for most cancers.

Extent of disease (Table 5; Figure 2)

A majority of cases have been diagnosed with a regional spread of disease among cancers of the tongue (48%), oral cavity (66%), hypopharynx (54%), larynx (46%), cervix (61%) and breast (53%). For ovarian cancer, there are more cases in the distant metastasis category (54%) than others. The extent of disease was unknown in 7–17%. The 5-year absolute survival by extent of disease followed the expected pattern: highest for localized disease followed by regional and distant metastasis among known categories of extent of disease for most cancers.

References

1. Parkin DM, Whelan SL, Ferlay J and Storm H. *Cancer Incidence in Five Continents, Vol I to VIII: IARC Cancerbase No. 7*. IARC Press, Lyon, 2005.
2. *Rural Cancer Registry of Karunagappally. Cancer morbidity and mortality in Karunagappally: 1993–2001*. Regional Cancer Centre, Thiruvananthapuram, 2004.

Figure 2. Absolute survival (%) from selected cancers by extent of disease, Karunagappally, India

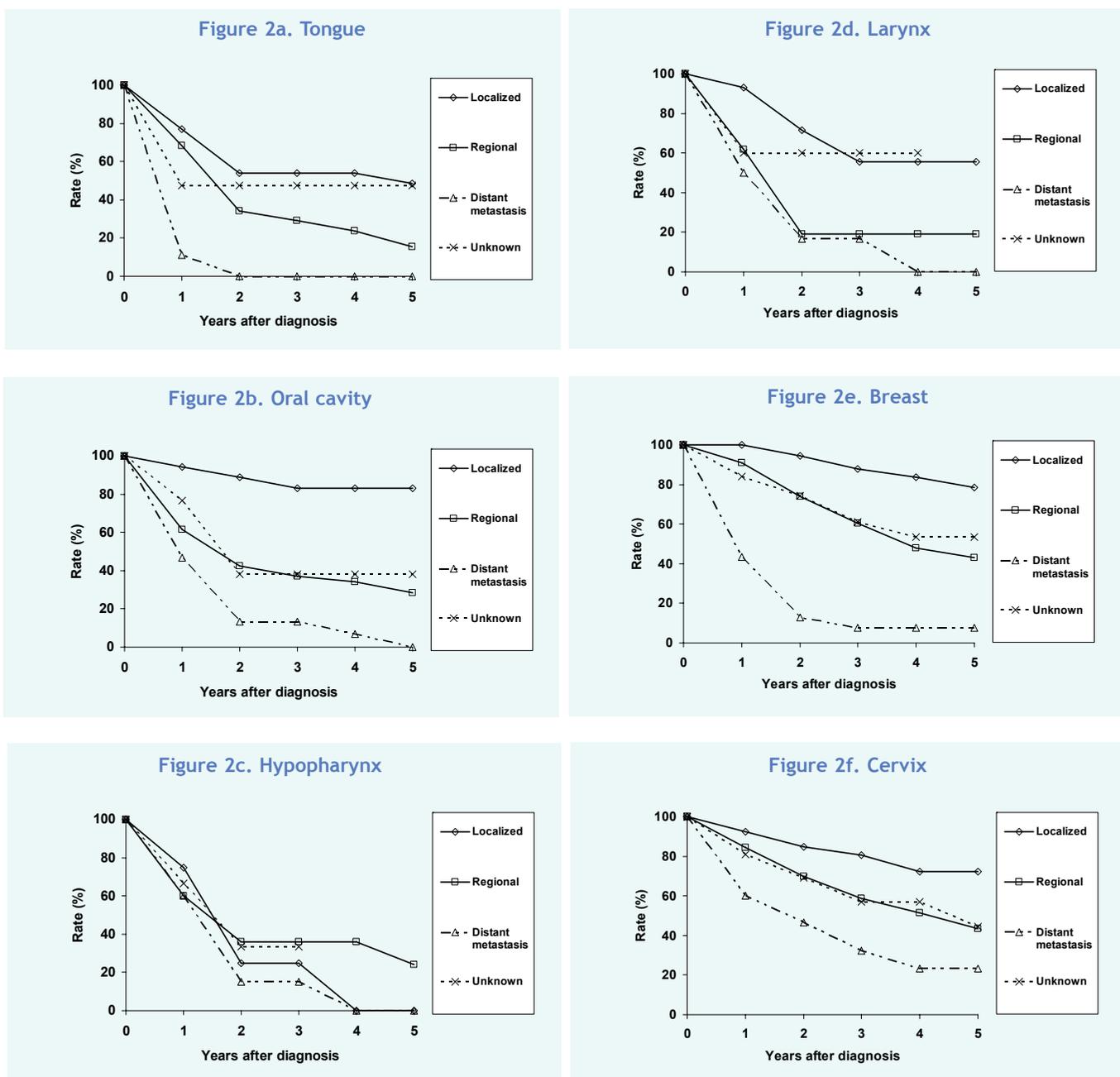


Table 1. Data quality indices - Proportion of histologically verified and death certificate only cases, number and proportion of included and excluded cases by site: Karunagappally, India, 1991–1997 cases followed-up until 1999

Site	ICD-10	Total registered	%		Excluded cases					Included cases	
			HV	DCO	DCO	Follow-up	Others	Total	%	No.	%
Tongue	C01-02	88	83.0	1.1	1	1	0	2	2.3	86	97.7
Oral cavity	C03-06	130	82.3	3.1	4	2	1	7	5.4	123	94.6
Hypopharynx	C12-13	33	93.9	0.0	0	0	0	0	0.0	33	100.0
Oesophagus	C15	111	70.3	1.8	2	2	1	5	4.5	106	95.5
Stomach	C16	86	50.0	8.1	7	2	0	9	10.5	77	89.5
Rectum	C19-20	39	76.9	2.6	1	0	0	1	2.6	38	97.4
Liver	C22	55	76.4	1.8	1	0	0	1	1.8	54	98.2
Pancreas	C25	41	39.0	0.0	0	0	0	0	0.0	41	100.0
Larynx	C32	48	87.5	2.1	1	1	0	2	4.2	46	95.8
Lung	C33-34	248	56.9	7.7	19	5	4	28	11.3	220	88.7
Other skin	C44	28	100.0	0.0	0	1	0	1	3.6	27	96.4
Breast	C50	193	93.8	1.0	2	1	0	3	1.6	190	98.4
Cervix	C53	180	85.0	3.9	7	3	0	10	5.6	170	94.4
Ovary	C56	35	88.6	0.0	0	0	0	0	0.0	35	100.0
Prostate	C61	34	67.6	0.0	0	2	0	2	5.9	32	94.1
Urinary bladder	C67	39	79.5	0.0	0	0	1	1	2.6	38	97.4
Brain & nervous system	C70-72	61	50.8	24.6	15	0	0	15	24.6	46	75.4
Thyroid	C73	75	92.0	1.3	1	0	0	1	1.3	74	98.7
Non-Hodgkin lymphoma	C82-85+C96	69	100.0	0.0	0	0	0	0	0.0	69	100.0
Multiple myeloma	C90	28	89.3	0.0	0	0	0	0	0.0	28	100.0
Lymphoid leukaemia	C91	38	100.0	0.0	0	0	0	0	0.0	38	100.0
Myeloid leukaemia	C92-94	30	100.0	0.0	0	0	0	0	0.0	30	100.0

HV: histologically verified; DCO: death certificate only

Table 2. Number and proportion of cases with complete/incomplete follow-up (in years) and median follow-up (in months) by site: Karunagappally, India, 1991–1997 cases followed-up until 1999

Site	ICD-10	Cases included	Complete FU		Incomplete FU: lost to FU						% with complete FU at 5 years	Median FU (in months)
			Alive/dead at end of FU		% lost to FU: years from diagnosis							
			No.	%	No.	%	< 1	1-3	3-5	> 5		
Tongue	C01-02	86	84	97.7	2	2.3	1.2	0.0	1.2	0.0	97.7	15.6
Oral cavity	C03-06	123	119	96.7	4	3.3	1.6	0.8	0.8	0.0	96.7	18.7
Hypopharynx	C12-13	33	31	93.9	2	6.1	6.1	0.0	0.0	0.0	93.9	12.6
Oesophagus	C15	106	105	99.1	1	0.9	0.9	0.0	0.0	0.0	99.1	6.5
Stomach	C16	77	77	100.0	0	0.0	0.0	0.0	0.0	0.0	100.0	5.1
Rectum	C19-20	38	38	100.0	0	0.0	0.0	0.0	0.0	0.0	100.0	32.0
Liver	C22	54	53	98.1	1	1.9	1.9	0.0	0.0	0.0	98.1	3.5
Pancreas	C25	41	41	100.0	0	0.0	0.0	0.0	0.0	0.0	100.0	4.0
Larynx	C32	46	45	97.8	1	2.2	0.0	2.2	0.0	0.0	97.8	17.6
Lung	C33-34	220	217	98.6	3	1.4	1.4	0.0	0.0	0.0	98.6	5.2
Other skin	C44	27	25	92.6	2	7.4	3.7	0.0	3.7	0.0	92.6	59.0
Breast	C50	190	188	98.9	2	1.1	0.5	0.0	0.0	0.5	99.5	36.1
Cervix	C53	170	169	99.4	1	0.6	0.0	0.6	0.0	0.0	99.4	38.5
Ovary	C56	35	35	100.0	0	0.0	0.0	0.0	0.0	0.0	100.0	20.3
Prostate	C61	32	29	90.6	3	9.4	6.3	3.1	0.0	0.0	90.6	34.1
Urinary bladder	C67	38	37	97.4	1	2.6	2.6	0.0	0.0	0.0	97.4	18.6
Brain & nervous system	C70-72	46	45	97.8	1	2.2	0.0	2.2	0.0	0.0	97.8	19.9
Thyroid	C73	74	73	98.6	1	1.4	1.4	0.0	0.0	0.0	98.6	57.0
Non-Hodgkin lymphoma	C82-85+C96	69	69	100.0	0	0.0	0.0	0.0	0.0	0.0	100.0	12.1
Multiple myeloma	C90	28	27	96.4	1	3.6	3.6	0.0	0.0	0.0	96.4	17.4
Lymphoid leukaemia	C91	38	38	100.0	0	0.0	0.0	0.0	0.0	0.0	100.0	20.3
Myeloid leukaemia	C92-94	30	30	100.0	0	0.0	0.0	0.0	0.0	0.0	100.0	2.9

FU: follow-up

Table 3. Comparison of 1-, 3- and 5-year absolute and relative survival and 5-year age-standardized relative survival by site: Karunagappally, India, 1991–1997 cases followed-up until 1999

Site	ICD-10	Cases included	% Absolute survival			% Relative survival			% ASRS at 5-years	
			1-year	3-year	5-year	1-year	3-year	5-year	all ages	0-74 years
Tongue	C01-02	86	62.6	35.3	25.9	65.1	39.4	31.9	31.1	29.6
Oral cavity	C03-06	123	65.6	41.1	33.1	68.3	46.5	41.2	42.3	45.3
Hypopharynx	C12-13	33	62.5	29.6	12.6	64.3	32.0	14.6	18.4	15.5
Oesophagus	C15	106	27.0	3.9	2.9	28.3	4.4	3.5	14.1	18.5
Stomach	C16	77	22.1	5.2	2.6	23.1	5.9	3.3	3.0	4.1
Rectum	C19-20	38	76.3	49.4	26.5	79.2	55.7	33.4	43.6	32.6
Liver	C22	54	34.6	9.2	2.3	35.7	10.3	2.8	4.3	4.5
Pancreas	C25	41	12.2	2.4	2.4	12.6	2.7	3.0	2.8	4.3
Larynx	C32	46	69.6	33.3	29.6	72.5	37.2	35.1	32.3	28.3
Lung	C33-34	220	22.2	7.0	5.3	23.1	7.8	6.4	5.6	7.8
Other skin	C44	27	84.9	69.5	65.3	88.3	78.3	80.3	88.0	83.7
Breast	C50	190	85.8	59.0	46.8	87.2	62.2	51.2	44.8	54.4
Cervix	C53	170	82.9	59.4	46.7	85.7	66.0	56.3	54.8	57.8
Ovary	C56	35	62.9	36.4	26.0	64.1	38.3	28.1	24.1	27.8
Prostate	C61	32	93.5	49.0	22.1	101.2	63.3	34.6	41.1	32.6
Urinary bladder	C67	38	65.3	37.9	34.6	69.0	45.0	46.4	44.5	48.4
Brain & nervous system	C70-72	46	65.2	36.3	19.2	65.9	37.1	19.8	15.1	16.2
Thyroid	C73	74	91.8	84.7	81.2	93.6	89.5	88.2	86.0	90.0
Non-Hodgkin lymphoma	C82-85+C96	69	52.2	34.6	25.5	54.4	38.8	30.4	36.0	39.8
Multiple myeloma	C90	28	63.6	25.4	10.2	66.3	28.3	12.3	12.4	13.4
Lymphoid leukaemia	C91	38	60.5	36.3	36.3	61.1	37.0	37.1	36.3	45.6
Myeloid leukaemia	C92-94	30	30.0	16.0	8.0	30.5	16.4	8.3	6.7	8.2

ASRS: age-standardized relative survival

Table 4a. Site-wise number of cases, 5-year absolute and relative survival by sex: Karunagappally, India, 1991–1997 cases followed-up until 1999

Site	ICD-10	Cases included	Male			Female		
			% 5-year survival			% 5-year survival		
			No.	Abs	Rel	No.	Abs	Rel
Tongue	C01-02	86	57	21.8	26.4	31	34.5	44.3
Oral cavity	C03-06	123	77	34.0	42.0	53	31.7	39.7
Hypopharynx	C12-13	33	28	7.7	9.1	5	40.0	44.1
Oesophagus	C15	106	74	1.5	2.0	37	5.7	6.3
Stomach	C16	77	65	1.6	1.9	21	6.3	8.5
Rectum	C19-20	38	23	26.5	34.7	16	26.7	31.7
Liver	C22	54	49	2.2	2.6	6		
Pancreas	C25	41	29	3.4	4.3	12	0.0	0.0
Larynx	C32	46	48	29.6	35.1	0		
Lung	C33-34	220	216	5.0	6.1	32	7.6	8.7
Other skin	C44	27	17	68.5	83.4	11	60.0	75.2
Breast	C50	190	1	0.0	0.0	192	47.1	51.5
Cervix	C53	170				180	46.7	56.3
Ovary	C56	35				35	26.0	28.1
Prostate	C61	32	34	22.1	34.6			
Urinary bladder	C67	38	37	36.7	49.1	2	0.0	0.0
Brain & nervous system	C70-72	46	35	21.9	22.6	26	16.5	17.1
Thyroid	C73	74	14	48.2	60.2	61	88.0	93.4
Non-Hodgkin lymphoma	C82-85+C96	69	53	25.6	30.6	16	22.7	26.8
Multiple myeloma	C90	28	16			12	18.8	22.4
Lymphoid leukaemia	C91	38	24	44.8	45.9	14	21.4	21.8
Myeloid leukaemia	C92-94	30	19	21.1	21.8	11	0.0	0.0

Abs: absolute survival; Rel: relative survival

Table 4b. Site-wise number of cases and relative survival by age group: Karunagappally, India, 1991–1997 cases followed-up until 1999

Site	ICD-10	Cases included	Number of cases by age group					Relative survival by age group				
			< 45	45-54	55-64	65-74	> 75	% 5-year survival				
								< 45	45-54	55-64	65-74	> 75
Tongue	C01-02	86	6	22	26	24	8	24.5	32.4	22.5	40.3	48.6
Oral cavity	C03-06	123	13	23	39	35	13	52.9	50.1	38.5	43.3	0.0
Hypopharynx	C12-13	33	6	3	17	6	1	0.0		11.4	21.9	
Oesophagus	C15	106	1	17	39	40	9	102.4	6.3	0.0	3.8	0.0
Stomach	C16	77	5	11	29	23	9	0.0	9.7	0.0	6.2	0.0
Rectum	C19-20	38	6	6	11	13	2	24.2	31.6	26.9	42.1	
Liver	C22	54	16	13	9	13	3	0.0	0.0	13.9	0.0	0.0
Pancreas	C25	41	4	15	10	10	2	0.0	0.0	0.0	13.0	0.0
Larynx	C32	46	2	14	12	16	2	0.0	46.7	44.2	23.2	
Lung	C33-34	220	13	38	89	66	14	31.6	5.8	6.8	2.2	0.0
Other skin	C44	27	4	4	5	12	2	102.8	79.4	89.1	66.2	96.5
Breast	C50	190	78	41	42	22	7	53.0	51.2	44.7	75.8	0.0
Cervix	C53	170	19	36	55	47	13	55.1	60.4	56.3	60.8	26.8
Ovary	C56	35	13	6	10	5	1	29.8	26.1	33.6	25.1	0.0
Prostate	C61	32	0	3	6	13	10		0.0	0.0	46.9	45.3
Urinary bladder	C67	38	1	7	12	13	5		28.2	60.2	47.1	38.9
Brain & nervous system	C70-72	46	30	9	4	2	1	23.4	21.2	0.0	0.0	0.0
Thyroid	C73	74	43	7	12	8	4	99.0	88.8	75.5	79.0	0.0
Non-Hodgkin lymphoma	C82-85+C96	69	17	11	14	19	8	48.0	48.8	41.0	8.5	0.0
Multiple myeloma	C90	28	3	5	8	9	3	0.0			14.2	0.0
Lymphoid leukaemia	C91	38	33	1	3	0	1	36.6				0.0
Myeloid leukaemia	C92-94	30	17	4	5	3	1	11.9		0.0	0.0	

Table 5. Proportion of cases and 5-year absolute survival by extent of disease and site: Karunagappally, India, 1991–1997

Site	ICD-10	Cases included	% of cases by extent of disease				% 5-year absolute survival			
			Localized	Regional	Dist. met.	Unknown	Localized	Regional	Dist. met.	Unknown
Tongue	C01-02	86	30.2	47.7	10.5	11.6	48.7	15.4	0.0	47.4
Oral cavity	C03-06	123	14.6	65.9	12.2	7.3	83.0	28.5	0.0	38.2
Hypopharynx	C12-13	33	12.1	54.5	24.2	9.1	0.0	24.0	0.0	38.2
Larynx	C32	46	30.4	45.7	13.0	10.9	55.6	19.0	0.0	
Breast	C50	190	18.4	53.2	12.1	16.3	78.6	43.1	7.8	53.4
Cervix	C53	170	15.3	60.6	8.8	15.3	72.1	43.5	23.1	44.3
Ovary	C56	35	17.1	11.4	54.3	17.1	100.0	0.0	8.8	44.4

Dis. met.: distant metastasis