Munich Cancer Registry

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ICD-10 C37: Thymus cancer

Incidence and Mortality

Year of diagnosis	1998-2014
Patients	205
Diseases	206
Creation date	04/13/2016
Export date	12/23/2015
Population	4.64 m

Munich Cancer Registry at Munich Cancer Center
Marchioninistr. 15
Munich, 81377
Germany

http://www.tumorregister-muenchen.de/en

http://www.tumorregister-muenchen.de/en/facts/base/bC37__E-ICD-10-C37-Thymus-cancer-incidence-and-mortality.pdf

Global Statements about the statistics on the Internet −
Baseline Statistics (grey button), **Survival** (red button)

In these analyses, the clinics and physicians of Upper Bavaria and the city and county of Landshut[#], with a total of 4.64 million inhabitants, account for the frequency of cancer diseases[##] and the achieved long term results. Additionally, the long term survival evaluated by the Munich Cancer Registry (MCR) is compared with the results of the population-based registry in the USA (SEER), which is useful for checking the consistency of the data on an international level.

In comparing several tables, inconsistent figures may be detected. This is based on the fact that different patient cohorts are included in the base calculation, for example when proportions of multiple tumors or DCO-cases[###] are concerned. In other cases the individual tumor diagnosis is the basis for calculation, for example with incidence.

The foot notes describe the currentness of the data. The baseline statistics and survival data are updated annually. This yearly analysis comprises the Annual Report of the MCR.

Clinics and physicians have access to essentially more detailed data, with which they can check, compare and in the best case optimize their own data and results.

We would be pleased to receive corrections, critique and useful suggestions. Just send an e-mail to tumor@ibe.med.uni-muenchen.de.

Munich Cancer Registry, April 2016

[#] Base data has been collected since 1998. An increase in new diseases is apparent, which is an effect of two extensions in the MCR catchment area (from a base population of 2.51 million to 3.96 in 2002, and to 4.52 million in 2007).

[##] Due to the high frequency and good prognosis of non-malignant skin cancer (C44), no systematic ascertainment is performed for this diagnosis. C44 is not designated as a primary, but rather as a secondary tumor.

[###] DCO (death certificate only) identifies a cancer case that first becomes available to the MCR through the death certificate.

ICD-10 codes (ICD-10 2015) used for specifying cancer site

Code	Description
C37	Malignant neoplasm of thymus

INCIDENCE

Table 1

All patients with invasive cancer by year of diagnosis, proportions of DCO, multiple primaries, deaths, and active follow-up (incl. DCO)

Year of diagnosis	Cases n	DCO cases n	Prop. DCO %	Prop. mult. primaries %	Prop. deaths %	Prop. actively followed %	
1998	6			33.3	50.0	100.0	
1999	4			25.0	50.0	100.0	
2000	3			33.3	100.0	100.0	
2001	4	1	25.0	25.0	75.0	100.0	
2002	13			23.1	76.9	92.3	#
2003	5			20.0	80.0	100.0	
2004	12	1	8.3	25.0	66.7	91.7	
2005	8	1	12.5	12.5	50.0	87.5	
2006	13	1	7.7	15.4	53.8	76.9	
2007	17	1	5.9	23.5	52.9	70.6	#
2008	20	2	10.0	30.0	30.0	65.0	
2009	25	1	4.0	20.0	44.0	80.0	
2010	14			21.4	57.1	71.4	
2011	15	1	6.7	13.3	26.7	60.0	
2012	20			15.0	20.0	70.0	
2013	13	1	7.7	7.7	30.8	100.0	
2014	14	1	7.1	28.6	7.1	100.0	##
1998-2014	206	11	5.3	20.9	44.2	81.1	

The increases of incident cases in 2002 and 2007 reflect the expansion to additional registry areas.

Please be aware that data of recent annual patient cohorts may not yet be fully processed. The years under evaluation can be found in the respective headings.

Table 1a

All patients with invasive cancer
by year of diagnosis and gender
(incl. DCO)

Year of diagnosis	All n	Males n	Females n	Prop. males %
1998	6	4	2	66.7
1999	4	3	1	75.0
2000	3	2	1	66.7
2001	4	1	3	25.0
2002	13	9	4	69.2
2003	5	4	1	80.0
2004	12	5	7	41.7
2005	8	5	3	62.5
2006	13	9	4	69.2
2007	17	7	10	41.2
2008	20	11	9	55.0
2009	25	12	13	48.0
2010	14	5	9	35.7
2011	15	7	8	46.7
2012	20	12	8	60.0
2013	13	8	5	61.5
2014	14	11	3	78.6
1998-2014	206	115	91	55.8

Table 2

Incidence measures by year of diagnosis including DCO cases
(with respect to registry area expansion from 2.51 to 3.96 m as of 2002,
and from 3.96 to 4.64 m as of 2007, respectively)

Year of diagnosis	Males n	Females n	Males Inc. raw	Fem. Inc. raw	Males Inc. WS	Fem. Inc. WS	Males Inc. ES	Fem. Inc. ES	Males Inc. BRD-S	Fem. Inc. BRD-S
1998	4	2	0.4	0.2	0.2	0.1	0.3	0.1	0.4	0.2
1999	3	1	0.3	0.1	0.3	0.0	0.3	0.1	0.3	0.1
2000	2	1	0.2	0.1	0.2	0.0	0.2	0.0	0.2	0.1
2001	1	3	0.1	0.2	0.0	0.1	0.1	0.2	0.1	0.2
2002	9	4	0.5	0.2	0.4	0.1	0.4	0.1	0.5	0.1
2003	4	1	0.2	0.1	0.1	0.0	0.2	0.0	0.2	0.0
2004	5	7	0.3	0.4	0.2	0.2	0.2	0.3	0.3	0.3
2005	5	3	0.3	0.2	0.2	0.1	0.2	0.2	0.3	0.2
2006	9	4	0.5	0.2	0.3	0.1	0.4	0.1	0.5	0.1
2007	7	10	0.3	0.4	0.2	0.3	0.3	0.4	0.3	0.4
2008	11	9	0.5	0.4	0.3	0.2	0.4	0.3	0.5	0.3
2009	12	13	0.5	0.6	0.3	0.3	0.4	0.4	0.5	0.5
2010	5	9	0.2	0.4	0.1	0.2	0.1	0.3	0.2	0.3
2011	7	8	0.3	0.3	0.2	0.2	0.3	0.2	0.3	0.3
2012	12	8	0.5	0.3	0.4	0.2	0.5	0.3	0.5	0.3
2013	8	5	0.4	0.2	0.2	0.1	0.3	0.1	0.3	0.2
2014	11	3	0.5	0.1	0.3	0.1	0.4	0.1	0.5	0.1
1998-2014	115	91	0.4	0.3	0.2	0.1	0.3	0.2	0.4	0.2

The computation of the incidence measures includes all primaries, irrespective of first or subsequent malignancy.

Table 3

Age distribution parameters by year of diagnosis (All patients)
(incl. DCO)

Year of diagnosis	Cases n	Mean	Std. dev.	Min.	Max.	10%	25%	Median 50%	75%	90%
1998	6	58.9	17.1	31.0	80.7	31.0	50.5	60.9	69.3	80.7
1999	4	52.9	26.9	14.7	72.5	14.7	34.1	62.2	71.7	72.5
2000	3	54.4	30.6	20.0	78.7	20.0	20.0	64.4	78.7	78.7
2001	4	69.4	5.0	63.2	75.3	63.2	65.8	69.6	73.1	75.3
2002	13	61.4	18.4	28.0	92.7	43.6	45.2	67.3	73.3	81.4
2003	5	56.7	13.5	40.7	72.7	40.7	46.0	57.1	66.9	72.7
2004	12	55.2	19.2	20.2	82.1	33.3	36.3	62.3	65.2	78.1
2005	8	56.3	20.9	18.1	82.4	18.1	43.3	62.6	69.1	82.4
2006	13	59.8	15.3	30.8	83.0	44.7	46.6	61.1	71.8	76.5
2007	17	57.0	14.1	33.5	86.4	40.6	45.5	55.3	62.8	78.9
2008	20	62.0	18.3	29.4	87.6	35.0	42.9	65.6	77.7	82.0
2009	25	62.4	15.7	19.5	89.9	45.9	51.9	64.7	74.1	78.5
2010	14	61.3	16.8	39.1	86.2	39.2	42.2	65.8	72.9	84.0
2011	15	63.3	14.7	42.3	84.7	43.1	50.5	62.3	80.4	83.5
2012	20	57.8	17.2	22.4	82.8	37.4	40.2	62.2	67.6	80.8
2013	13	67.1	9.7	49.7	83.5	57.4	59.8	67.4	76.1	76.8
2014	14	63.6	10.4	48.3	79.1	48.4	56.9	66.1	71.2	78.3
1998-2014	206	60.6	16.1	14.7	92.7	39.1	49.7	63.0	72.7	80.2

Table 3a

Age distribution parameters by year of diagnosis (MALES)
(incl. DCO)

Year of diagnosis	Cases n	Mean	Std. dev.	Min.	Max.	10%	25%	Median 50%	75%	90%
1998	4	55.1	20.6	31.0	80.7	31.0	40.8	54.3	69.4	80.7
1999	3	46.9	29.5	14.7	72.5	14.7	14.7	53.6	72.5	72.5
2000	2	42.2	31.3	20.0	64.4	20.0	20.0	42.2	64.4	64.4
2001	1	75.3		75.3	75.3	75.3	75.3	75.3	75.3	75.3
2002	9	56.8	16.2	28.0	74.3	28.0	45.2	55.2	72.9	74.3
2003	4	52.6	11.7	40.7	66.9	40.7	43.3	51.5	62.0	66.9
2004	5	55.8	19.9	20.2	65.8	20.2	64.1	64.4	64.5	65.8
2005	5	59.9	24.7	18.1	82.4	18.1	60.9	65.8	72.5	82.4
2006	9	56.6	14.7	30.8	76.5	30.8	46.6	55.7	69.0	76.5
2007	7	61.4	15.3	33.5	78.9	33.5	52.5	62.8	76.9	78.9
2008	11	62.6	17.8	29.4	84.7	41.9	43.8	66.5	78.8	79.4
2009	12	62.8	18.9	19.5	89.9	45.9	50.7	68.3	75.1	78.1
2010	5	69.3	15.3	44.6	86.2	44.6	70.2	70.8	74.9	86.2
2011	7	57.1	13.8	42.3	82.4	42.3	43.9	55.0	64.7	82.4
2012	12	59.6	16.8	22.4	82.8	37.1	53.2	63.4	66.5	80.2
2013	8	64.6	8.8	49.7	76.8	49.7	59.1	65.0	71.0	76.8
2014	11	61.9	11.2	48.3	79.1	48.4	49.7	59.2	71.4	78.3
1998-2014	115	59.7	16.4	14.7	89.9	37.1	49.7	62.7	72.5	78.8

Table 3b

Age distribution parameters by year of diagnosis (FEMALES)
(incl. DCO)

Year of diagnosis	Cases n	Mean	Std. dev.	Min.	Max.	10%	25%	Median 50%	75%	90%
1998	2	66.5	3.9	63.8	69.3	63.8	63.8	66.5	69.3	69.3
1999	1	70.9		70.9	70.9	70.9	70.9	70.9	70.9	70.9
2000	1	78.7		78.7	78.7	78.7	78.7	78.7	78.7	78.7
2001	3	67.5	3.9	63.2	71.0	63.2	63.2	68.3	71.0	71.0
2002	4	71.6	21.1	43.6	92.7	43.6	56.2	75.1	87.0	92.7
2003	1	72.7		72.7	72.7	72.7	72.7	72.7	72.7	72.7
2004	7	54.8	20.3	33.3	82.1	33.3	34.5	56.9	78.1	82.1
2005	3	50.3	15.0	34.5	64.3	34.5	34.5	52.2	64.3	64.3
2006	4	67.1	16.1	44.7	83.0	44.7	56.7	70.3	77.4	83.0
2007	10	53.9	13.1	40.6	86.4	42.5	45.3	52.2	55.4	74.1
2008	9	61.3	19.8	31.9	87.6	31.9	41.2	64.7	77.6	87.6
2009	13	62.1	12.7	41.4	81.9	47.9	53.4	59.9	72.9	78.5
2010	9	56.9	16.7	39.1	84.0	39.1	42.2	60.9	65.8	84.0
2011	8	68.7	14.0	43.1	84.7	43.1	61.5	67.7	81.9	84.7
2012	8	55.1	18.5	37.6	81.5	37.6	38.9	50.0	72.1	81.5
2013	5	71.0	10.8	59.5	83.5	59.5	59.8	76.1	76.2	83.5
2014	3	69.8	1.7	68.0	71.2	68.0	68.0	70.3	71.2	71.2
1998-2014	91	61.7	15.7	31.9	92.7	39.2	45.5	63.8	72.9	81.9

Table 4

Age distribution by 5-year age group and gender for period 2007-2014
(incl. DCO)

Age at diagnosis Years	Cases n	%	Cum.%	Males n	%	Cum.%	Females n	%	Cum.%
15-19	1	0.7	0.7	1	1.4	1.4			0.0
20-24	1	0.7	1.4	1	1.4	2.7			0.0
25-29	1	0.7	2.2	1	1.4	4.1			0.0
30-34	2	1.4	3.6	1	1.4	5.5	1	1.5	1.5
35-39	7	5.1	8.7	1	1.4	6.8	6	9.2	10.8
40-44	13	9.4	18.1	5	6.8	13.7	8	12.3	23.1
45-49	9	6.5	24.6	6	8.2	21.9	3	4.6	27.7
50-54	10	7.2	31.9	5	6.8	28.8	5	7.7	35.4
55-59	15	10.9	42.8	8	11.0	39.7	7	10.8	46.2
60-64	18	13.0	55.8	12	16.4	56.2	6	9.2	55.4
65-69	16	11.6	67.4	8	11.0	67.1	8	12.3	67.7
70-74	13	9.4	76.8	8	11.0	78.1	5	7.7	75.4
75-79	17	12.3	89.1	10	13.7	91.8	7	10.8	86.2
80-84	11	8.0	97.1	4	5.5	97.3	7	10.8	96.9
85+	4	2.9	100.0	2	2.7	100.0	2	3.1	100.0
All ages	138	100.0		73	100.0		65	100.0	

Included in the statistics are 31.9% multiple primaries in males and 18.5% in females.

Table 5

Age-specific incidence, DCO rate and proportion of all cancers
for period 2007-2014

Age at diagnosis Years	Males n	Females n	Males Age-spec. incid.	Females Age-spec. incid.	Males DCO rate n=2 %	Females DCO rate n=4 %	Males Prop.all cancers n=91183 %	Females Prop.all cancers n=89596 %
0- 4			0.0	0.0				
5- 9			0.0	0.0				
10-14			0.0	0.0				
15-19	1		0.1	0.0			0.5	
20-24	1		0.1	0.0			0.3	
25-29	1		0.1	0.0			0.2	
30-34	1	1	0.1	0.1			0.1	0.1
35-39	1	6	0.1	0.5			0.1	0.3
40-44	5	8	0.3	0.5			0.3	0.2
45-49	6	3	0.4	0.2			0.2	0.1
50-54	5	5	0.4	0.4			0.1	0.1
55-59	8	7	0.8	0.6			0.1	0.1
60-64	12	6	1.2	0.6			0.1	0.1
65-69	8	8	0.8	0.8			0.1	0.1
70-74	8	5	0.9	0.5	12.5		0.0	0.0
75-79	9	7	1.6	1.0	11.1	14.3	0.1	0.1
80-84	4	7	1.1	1.2		14.3	0.0	0.1
85+	2	2	0.9	0.3		100.0	0.0	0.0
All ages	72	65			2.8	6.2	0.1	0.1
Incidence								
Raw			0.4	0.3				
WS			0.2	0.2				
ES			0.3	0.3				
BRD-S			0.4	0.3				

The age-specific incidence characterizes the disease risk in a particular age group. The age distribution depends on the patient population frequency in each age group and reflects the tangible clinical picture of everyday patients care (see following chart).

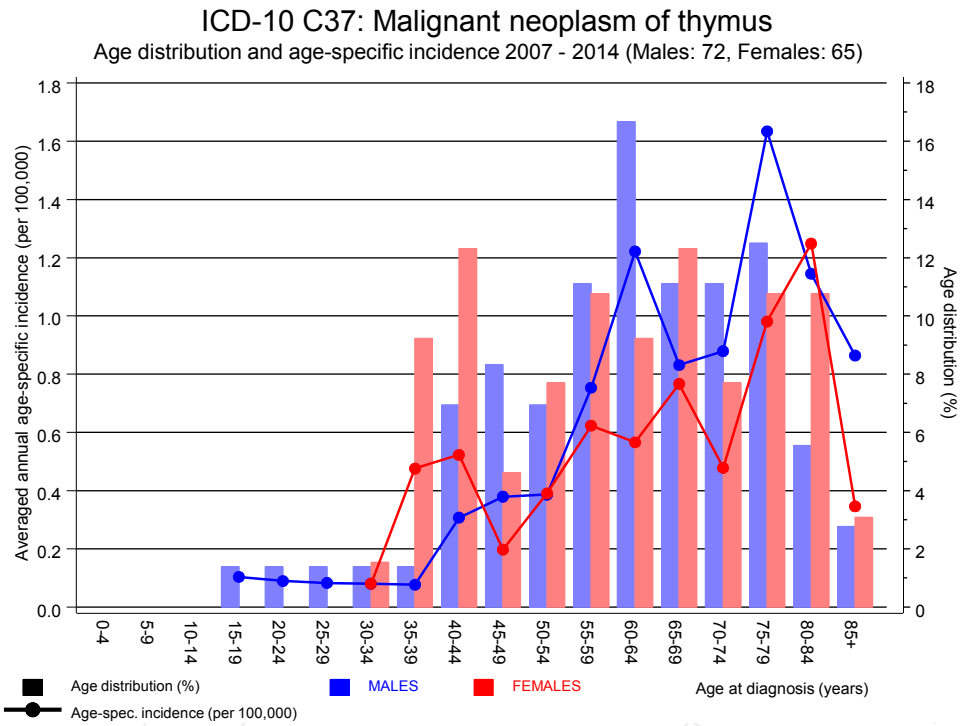


Figure 6. Age distribution and age-specific incidence

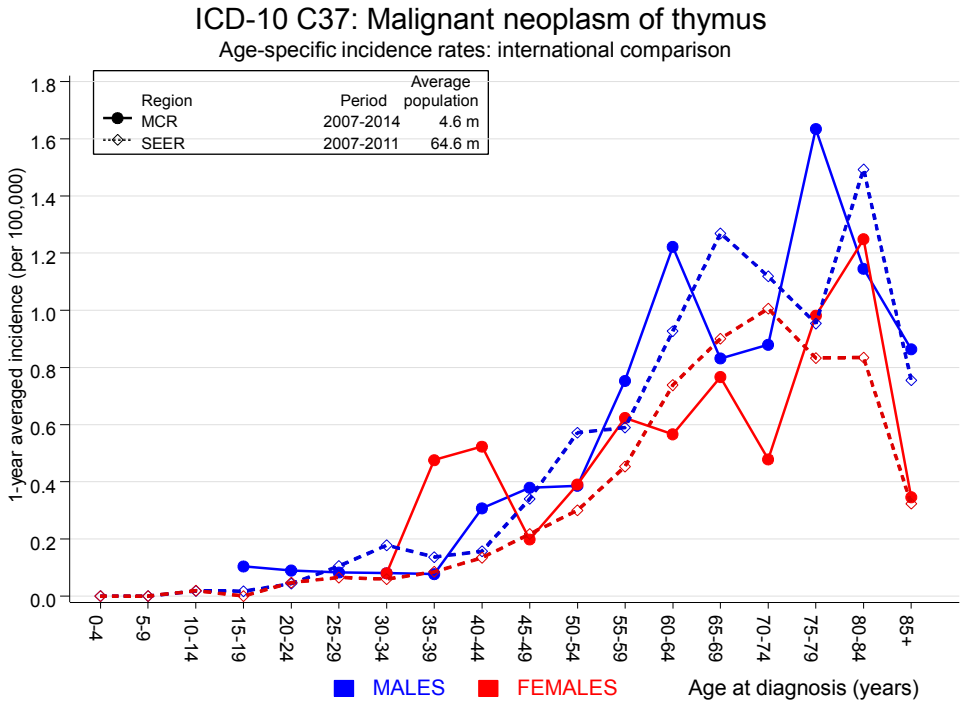


Figure 6a. Age-specific incidence in MCR registry areas compared to SEER (Surveillance, Epidemiology, and End Results, USA).

Reference:

Surveillance, Epidemiology, and End Results (SEER) Program SEER*Stat Database: Incidence - SEER 18 Regs Research Data, released April 2014, based on the November 2013 submission. http://www.seer.cancer.gov.

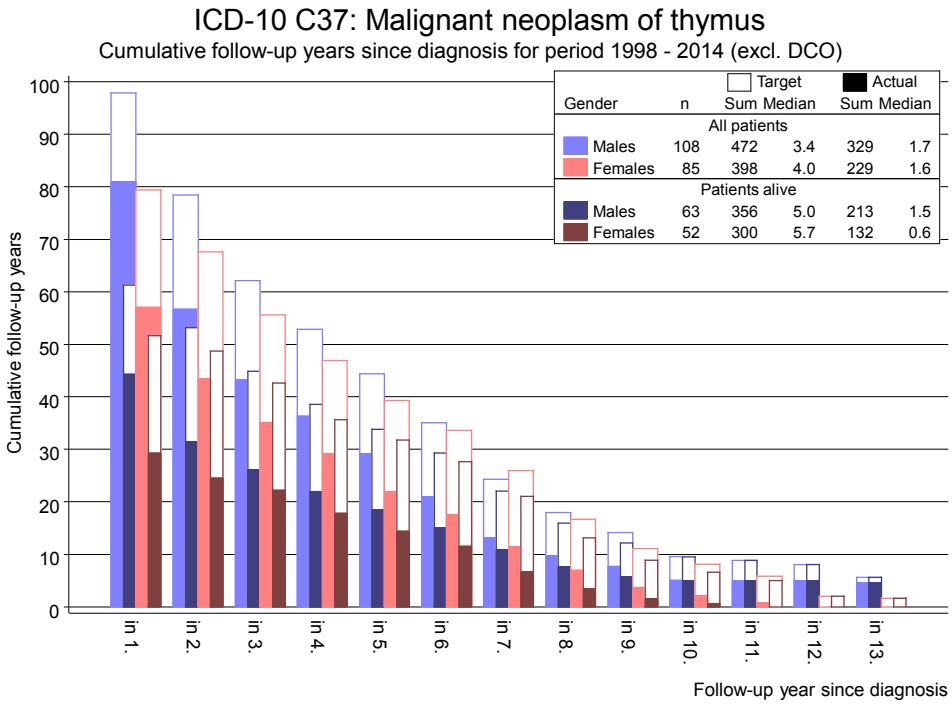


Figure 7. Cumulative follow-up years depending on time since diagnosis

The increase of the lost to follow-up rate can be interpreted as a consequence of a declining number of survivors over time.

Table 8a

Standardized incidence ratio (SIR, with 95% confidence limits), excess absolute risk (EAR) and DCO rate of second primaries for period 1998–2014
MALES

Diagnosis	Observed n	Expected n	SIR	LCL 95%	UCL 95%		EAR	DCO %
C43 Malign. melanoma	2	0.2	11.2	1.4	40.6	#	55.8	
C61 Prostate	5	1.2	4.3	1.4	10.1	#	117.8	
Other primaries	6	0.5	12.0	4.4	26.0	#	168.4	16.7
Not observed	0	2.2	0.0	0.0	1.7		-67.9	
All mult. primaries	13	4.1	3.2	1.7	5.5	#	274.1	7.7

Patients	110
Median age at second malignancy (years)	62.5
Person-years	326
Mean observation time (years)	3.0
Median observation time (years)	1.6

The occurrence of second malignancy is statistically significant.

Observed second primaries with count 1 are pooled in category “Other primaries”

Table 8b

Standardized incidence ratio (SIR, with 95% confidence limits), excess absolute risk (EAR) and DCO rate of second primaries for period 1998–2014
FEMALES

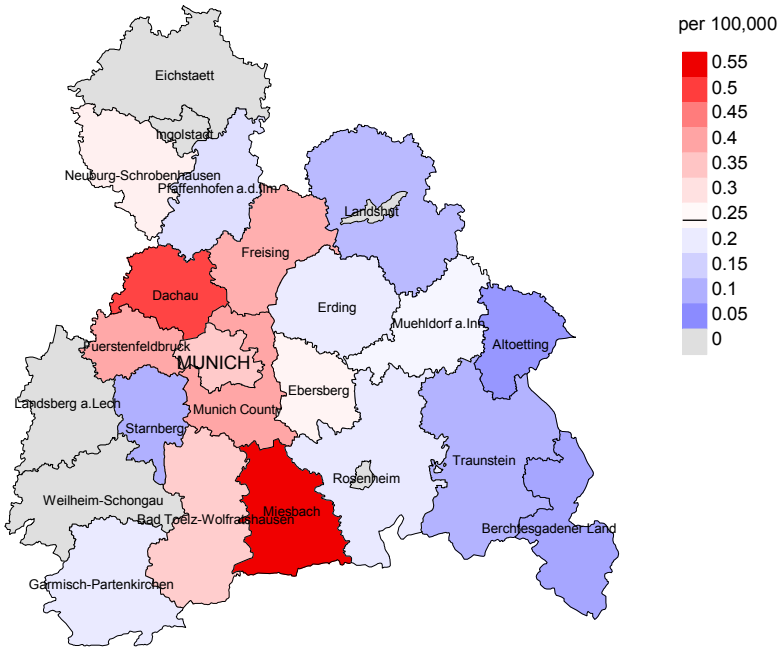
Diagnosis	Observed n	Expected n	SIR	LCL 95%	UCL 95%		EAR	DCO %
C33–C34 Lung	2	0.2	11.7	1.4	42.1	#	78.4	
C50 Breast	2	0.7	2.8	0.3	10.2		55.4	
Other primaries	3	0.3	9.4	1.9	27.3	#	114.8	
Not observed	0	1.1	0.0	0.0	3.4		-47.2	
All mult. primaries	7	2.3	3.0	1.2	6.3	#	201.5	

Patients	84
Median age at second malignancy (years)	64.9
Person-years	233
Mean observation time (years)	2.8
Median observation time (years)	1.6

The occurrence of second malignancy is statistically significant.

Observed second primaries with count 1 are pooled in category “Other primaries”

Average incidence (world standard population) 2007 - 2014: Males



Average incidence (world standard population) 2007 - 2014: Females

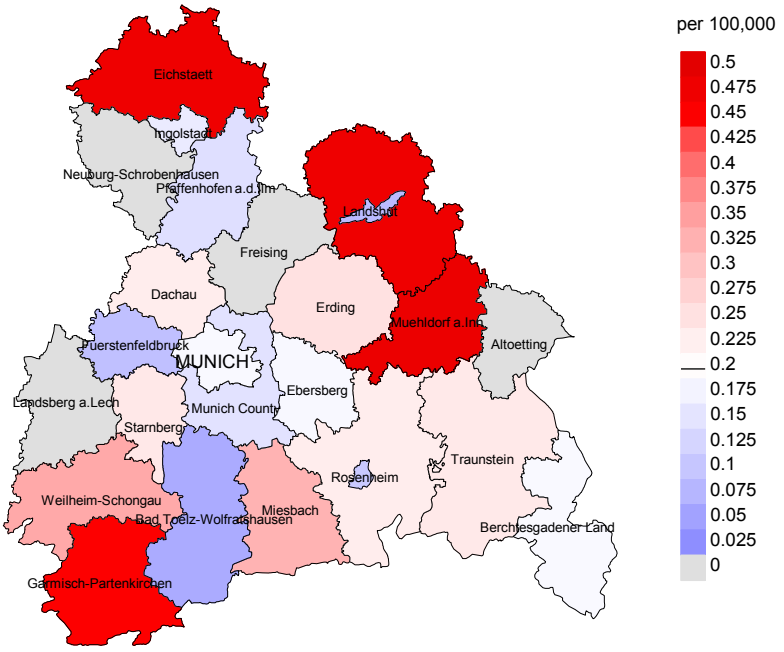
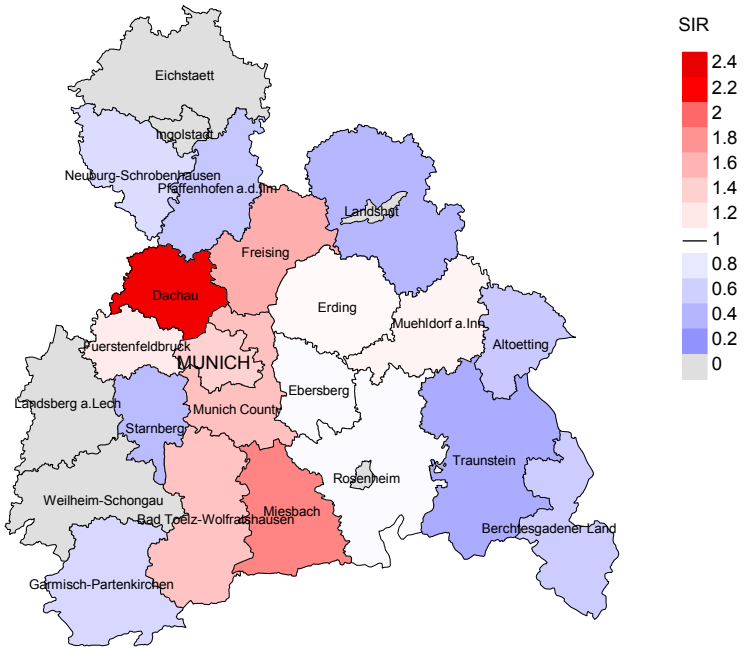


Figure 9a. Map of cancer incidence (world standard population, incl. DCO cases) by county averaged for period 2007 to 2014. According to their individual incidence rates, the counties are displayed in different red and blue color temperatures where the fine white color indicates the population mean (males 0.2/100,000 WS N=72, females 0.2/100,000 WS N=65).

The results should be interpreted with caution! E.g., in county Ebersberg with a population of 65,347 female residents (averaged) in the period from 2007 to 2014 a total of 2 women were identified with newly diagnosed thymus cancer. Therefore, the mean incidence rate for this cancer type in this area can be calculated at 0.2/100,000 (world standard population). Though, the value of this parameter may vary with an underlying probability of 99% between 0.0 and 1.2/100,000.

Standardized incidence ratio (SIR) 2007 - 2014: Males



Standardized incidence ratio (SIR) 2007 - 2014: Females

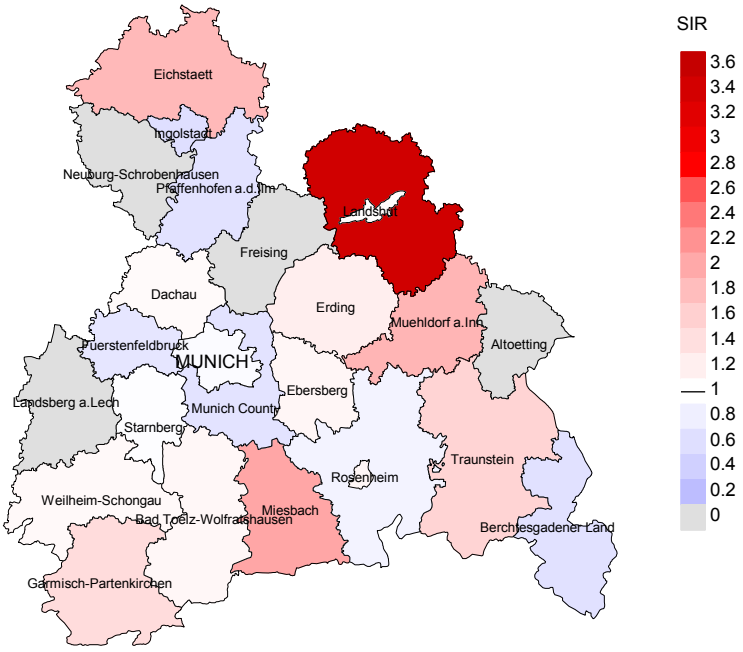


Figure 9b. Map of standardized incidence ratio (SIR, incl. DCO cases) by county averaged for period 2007 to 2014. According to their individual SIR values, the counties are displayed in different red and blue color temperatures where the fine white color indicates the population overall of 1.0 (males N=72, females N=65).

The results should be interpreted with caution! E.g., in county Ebersberg with a population of 64,924 female residents (averaged) in the period from 2007 to 2014 a total of 2 women were identified with newly diagnosed thymus cancer. Therefore, the mean standardized incidence ratio (SIR) for this cancer type in this area can be calculated at 1.11. Though, the value of this parameter may vary with an underlying probability of 99% between 0.06 and 5.16, and is therefore not statistically striking.

MORTALITY

Table 10a

Patient cohorts of incident cancers by year of diagnosis, follow-up status, proportion of DCO, deaths among the annual cohorts and proportion of available death certificates (with respect to registry area expansion from 2.51 to 3.96 m as of 2002, and from 3.96 to 4.64 m as of 2007, respectively)

Year of diagnosis	Incident cases n	Prop. actively followed %	Prop. DCO %	Deaths n	Prop. deaths %	Prop. deaths with death certific. %
1998	6	100.0		3	50.0	100.0
1999	4	100.0		2	50.0	100.0
2000	3	100.0		3	100.0	100.0
2001	4	100.0	25.0	3	75.0	100.0
2002	13	92.3		10	76.9	100.0
2003	5	100.0		4	80.0	100.0
2004	12	91.7	8.3	8	66.7	100.0
2005	8	87.5	12.5	4	50.0	100.0
2006	13	76.9	7.7	7	53.8	100.0
2007	17	70.6	5.9	9	52.9	100.0
2008	20	65.0	10.0	6	30.0	100.0
2009	25	80.0	4.0	11	44.0	90.9
2010	14	71.4		8	57.1	100.0
2011	15	60.0	6.7	4	26.7	100.0
2012	20	70.0		4	20.0	100.0
2013	13	100.0	7.7	4	30.8	100.0
2014	14	100.0	7.1	1	7.1	100.0
1998-2014	206	81.1	5.3	91	44.2	98.9

Table 10b

Annual cohorts of incident cancers and deaths, proportion of death certificates and cases deceased the same year of cancer diagnosis
(incl. DCO)
(with respect to registry area expansion from 2.51 to 3.96 m as of 2002, and from 3.96 to 4.64 m as of 2007, respectively)

Year of diagnosis/ death	Incident cases n	Deaths n	Prop. deaths with death certific. %	Deaths in same year n	Prop. deaths in same year %
1998	6	1	100.0		
1999	4	1	100.0		
2000	3	2	100.0		
2001	4	3	66.7	1	25.0
2002	13	6	100.0	2	15.4
2003	5	8	100.0		
2004	12	6	100.0	1	8.3
2005	8	2	100.0	1	12.5
2006	13	13	100.0	2	15.4
2007	17	7	100.0	2	11.8
2008	20	7	100.0	3	15.0
2009	25	13	100.0	4	16.0
2010	14	13	100.0	2	14.3
2011	15	11	100.0	2	13.3
2012	20	12	100.0	1	5.0
2013	13	4	100.0	3	23.1
2014	14	14	100.0	1	7.1
1998-2014	206	123	99.2	25	12.1

Table 10c

Annual cohorts of deaths, proportion of cancer-related and non-cancer-related deaths, and cancer recorded on death certificates (incl. DCO)
(with respect to registry area expansion from 2.51 to 3.96 m as of 2002, and from 3.96 to 4.64 m as of 2007, respectively)

Year of death	Deaths n	Prop. cancer-related %	Prop. non-cancer-related %	Prop. cancer recorded on death certificate %
1998	1	100.0		100.0
1999	1		100.0	
2000	2	50.0	50.0	100.0
2001	3	100.0		100.0
2002	6	50.0	50.0	83.3
2003	8	62.5	37.5	62.5
2004	6	100.0		100.0
2005	2	50.0	50.0	50.0
2006	13	69.2	30.8	76.9
2007	7	85.7	14.3	100.0
2008	7	85.7	14.3	100.0
2009	13	76.9	23.1	76.9
2010	13	53.8	46.2	69.2
2011	11	81.8	18.2	72.7
2012	12	75.0	25.0	83.3
2013	4	75.0	25.0	75.0
2014	14	71.4	28.6	71.4
1998-2014	123	72.4	27.6	78.7

Table 11a

Medians of age at death according to the grouping in Table 10
MALES

Year of death	Deaths n	Age at death (all causes) Years	Age at death (cancer-related) Years	Age at death (non-cancer-related) Years	Age at death (according to death certificate) Years
1998	1	66.5	66.5		66.5
1999	1	46.4		46.4	
2000	1	35.1		35.1	35.1
2001	3	61.9	61.9		68.6
2002	3	55.2	21.7	66.0	55.2
2003	4	66.2	55.8	86.0	55.8
2004	6	68.7	68.7		68.7
2005	1	69.2		69.2	
2006	9	62.9	54.4	66.1	60.7
2007	6	69.9	66.4	73.4	69.9
2008	4	78.7	78.7		78.7
2009	7	76.2	69.9	81.5	69.9
2010	7	77.0	76.0	79.5	75.1
2011	5	79.9	66.9	81.3	66.9
2012	6	68.1	68.1	67.5	67.8
2013	3	68.5	68.5		68.5
2014	8	73.8	70.0	78.7	73.5
1998-2014	75	69.2	68.3	73.8	68.4

Deaths of patients are considered to be cancer-related, in case that fact was recorded on the death certificate, or patients had suffered from metastasis or recurrence.

Table 11b

Medians of age at death according to the grouping in Table 10
FEMALES

Year of death	Deaths n	Age at death (all causes) Years	Age at death (cancer-related) Years	Age at death (non-cancer-related) Years	Age at death (according to death certificate) Years
1998					
1999					
2000	1	71.7	71.7		71.7
2001					
2002	3	66.1	73.8	64.3	73.8
2003	4	73.2	63.2	83.8	63.2
2004					
2005	1	79.0	79.0		79.0
2006	4	77.3	74.4	82.0	74.4
2007	1	75.1	75.1		75.1
2008	3	60.1	58.7	60.1	60.1
2009	6	69.1	65.1	74.0	65.1
2010	6	78.4	66.2	87.1	74.9
2011	6	43.7	43.7		43.6
2012	6	68.7	67.7	69.7	67.7
2013	1	92.3		92.3	
2014	6	79.9	73.0	90.7	69.8
1998-2014	48	72.0	66.9	82.0	66.5

By 2010, life expectancy at birth was 77.5 years for boys and 82.6 years for girls.

Deaths of patients are considered to be cancer-related, in case that fact was recorded on the death certificate, or patients had suffered from metastasis or recurrence.

Table 12a

Mortality measures (cancer-related death) and mortality-incidence-index
by year of death
MALES

Year of death	Deaths n	Mort. raw	MI-Index raw	Mort. WS	MI-Index WS	Mort. ES	MI-Index ES	Mort. BRD-S	MI-Index BRD-S
1998	1	0.1	0.25	0.1	0.32	0.1	0.29	0.1	0.23
1999									
2000									
2001	3	0.3	3.00	0.2	3.89	0.2	2.93	0.3	2.07
2002	1	0.1	0.11	0.1	0.21	0.1	0.14	0.1	0.16
2003	3	0.2	0.75	0.1	0.69	0.1	0.78	0.2	0.98
2004	6	0.3	1.20	0.2	0.86	0.2	1.12	0.3	1.28
2005									
2006	7	0.4	0.78	0.3	0.90	0.3	0.78	0.4	0.79
2007	5	0.2	0.71	0.1	0.56	0.2	0.58	0.2	0.70
2008	4	0.2	0.40	0.1	0.29	0.1	0.36	0.2	0.49
2009	5	0.2	0.42	0.1	0.33	0.2	0.37	0.2	0.39
2010	4	0.2	0.80	0.1	0.81	0.1	0.87	0.2	1.18
2011	3	0.1	0.43	0.1	0.33	0.1	0.37	0.1	0.46
2012	4	0.2	0.33	0.1	0.27	0.1	0.32	0.2	0.32
2013	3	0.1	0.38	0.1	0.36	0.1	0.36	0.1	0.35
2014	6	0.3	0.55	0.1	0.48	0.2	0.52	0.2	0.52
1998-2014	55	0.2	0.48	0.1	0.42	0.1	0.46	0.2	0.51

Table 12b

Mortality measures (cancer-related death) and mortality-incidence-index
by year of death
FEMALES

Year of death	Deaths n	Mort. raw	MI-Index raw	Mort. WS	MI-Index WS	Mort. ES	MI-Index ES	Mort. BRD-S	MI-Index BRD-S
1998									
1999									
2000	1	0.1	1.00	0.0	1.97	0.1	1.48	0.1	1.03
2001									
2002	2	0.1	0.50	0.0	0.43	0.1	0.46	0.1	0.55
2003	2	0.1	2.00	0.1	2.58	0.1	2.47	0.1	2.11
2004									
2005	1	0.1	0.33	0.0	0.11	0.0	0.18	0.0	0.32
2006	2	0.1	0.50	0.0	0.41	0.1	0.50	0.1	0.63
2007	1	0.0	0.10	0.0	0.04	0.0	0.06	0.0	0.11
2008	2	0.1	0.22	0.1	0.30	0.1	0.30	0.1	0.25
2009	5	0.2	0.38	0.1	0.37	0.2	0.36	0.2	0.38
2010	3	0.1	0.33	0.1	0.25	0.1	0.30	0.1	0.34
2011	6	0.3	0.75	0.2	1.10	0.2	0.98	0.2	0.72
2012	5	0.2	0.63	0.1	0.44	0.1	0.50	0.2	0.52
2013									
2014	4	0.2	1.33	0.1	1.26	0.1	1.34	0.1	1.58
1998-2014	34	0.1	0.37	0.1	0.34	0.1	0.35	0.1	0.37

Table 13

Age distribution of age at death (cancer-related) for period 2007-2014
(**incl. multiple primaries**)

Age at death Years	Cases n	%	Cum.%	Males n	%	Cum.%	Females n	%	Cum.%
30-34	1	1.6	1.6	1	2.9	2.9			0.0
35-39	0	0.0	1.6			2.9			0.0
40-44	4	6.6	8.2			2.9	4	15.4	15.4
45-49	3	4.9	13.1	2	5.7	8.6	1	3.8	19.2
50-54	3	4.9	18.0			8.6	3	11.5	30.8
55-59	5	8.2	26.2	3	8.6	17.1	2	7.7	38.5
60-64	4	6.6	32.8	3	8.6	25.7	1	3.8	42.3
65-69	16	26.2	59.0	9	25.7	51.4	7	26.9	69.2
70-74	4	6.6	65.6	3	8.6	60.0	1	3.8	73.1
75-79	11	18.0	83.6	8	22.9	82.9	3	11.5	84.6
80-84	8	13.1	96.7	5	14.3	97.1	3	11.5	96.2
85+	2	3.3	100.0	1	2.9	100.0	1	3.8	100.0
All ages	61	100.0		35	100.0		26	100.0	

Included in the statistics are 31.9% multiple primaries in males and 18.5% in females.

Table 14

Age-specific mortality (cancer-related) and proportion of all cancers
for period 2007-2014
(**incl. multiple primaries**)

Age at death Years	Males n	Females n	Males Age-spec. mortal.	Males MI-index	Females Age-spec. mortal.	Females MI-index	Males Prop.all cancers %	Females Prop.all cancers %
0- 4			0.0		0.0			
5- 9			0.0		0.0			
10-14			0.0		0.0			
15-19			0.0		0.0			
20-24			0.0		0.0			
25-29			0.0		0.0			
30-34	1		0.1	1.00	0.0		1.1	
35-39			0.0		0.0			
40-44		4	0.0		0.3	0.50		0.6
45-49	2	1	0.1	0.33	0.1	0.33	0.2	0.1
50-54		3	0.0		0.2	0.60		0.2
55-59	3	2	0.3	0.38	0.2	0.29	0.1	0.1
60-64	3	1	0.3	0.25	0.1	0.17	0.1	0.0
65-69	9	7	0.9	1.13	0.7	0.88	0.1	0.1
70-74	3	1	0.3	0.38	0.1	0.20	0.0	0.0
75-79	8	3	1.5	0.80	0.4	0.43	0.1	0.0
80-84	5	3	1.4	1.25	0.5	0.43	0.1	0.0
85+	1	1	0.4	0.50	0.2	0.50	0.0	0.0
All ages	35	26					0.1	0.1
Mortality								
Raw			0.2	0.48	0.1	0.40		
WS			0.1	0.39	0.1	0.37		
ES			0.1	0.43	0.1	0.38		
BRD-S			0.2	0.49	0.1	0.38		
PYLL-70								
per 100,000			1.0		1.5			
ES			0.9		1.2			
AYLL-70			9.2		13.1			

The rates underestimate the prognosis if other synchronous cancers are prognostic unfavorable.

Table 15a

Multiple primaries in deaths in period 1998–2014
MALES

Diagnosis		Total n	Total %↓	Pre n	Pre ←%	Syn-chron ±30d n	Syn-chron ±30d ←%	Post n	Post ←%
C09–C10	Oropharynx	1	3.3					1	100.0
C15	Oesophagus	1	3.3					1	100.0
C16	Stomach	1	3.3					1	100.0
C18	Colon	2	6.7	2	100.0				
C19–C20	Rectum	1	3.3					1	100.0
C32	Larynx	1	3.3					1	100.0
C33–C34	Lung	3	10.0					3	100.0
C37	Thymus	1	3.3					1	100.0
C43	Malign. melanoma	2	6.7	1	50.0			1	50.0
C44	Skin others	2	6.7			1	50.0	1	50.0
C61	Prostate	6	20.0	4	66.7			2	33.3
C64	Kidney	2	6.7	1	50.0			1	50.0
C67	Bladder	2	6.7					2	100.0
C70–C72	CNS cancer	1	3.3					1	100.0
C73	Thyroid	1	3.3					1	100.0
C82–C85	NHL	2	6.7			1	50.0	1	50.0
C90	Mult. myeloma	1	3.3	1	100.0				
All mult. primaries		30	100.0	9	30.0	2	6.7	19	63.3

ICD-10 C44 (Other malignant neoplasms of skin) is not systematically recorded by MCR and therefore not considered for evaluation as a particular primary but at least as a multiple malignancy.

Table 15b

Multiple primaries in deaths in period 1998-2014
FEMALES

Diagnosis		Total n	Total %↓	Pre n	Pre ←%	Syn-chron ±30d n	Syn-chron ±30d ←%	Post n	Post ←%
C18	Colon	1	14.3	1	100.0				
C25	Pancreas	2	28.6					2	100.0
C33-C34	Lung	2	28.6					2	100.0
C73	Thyroid	1	14.3	1	100.0				
C91-C96	Leukaemia	1	14.3			1	100.0		
All mult. primaries		7	100.0	2	28.6	1	14.3	4	57.1

ICD-10 C44 (Other malignant neoplasms of skin) is not systematically recorded by MCR and therefore not considered for evaluation as a particular primary but at least as a multiple malignancy.

Table 16

Age-specific mortality (cancer-related) and proportion of all cancers
for period 2007-2014
(**First primaries only** *)

Age at death Years	Males n	Females n	Males Age-spec. mortal.	Males MI-index	Females Age-spec. mortal.	Females MI-index	Males Prop.all cancers %	Females Prop.all cancers %
0- 4			0.0		0.0			
5- 9			0.0		0.0			
10-14			0.0		0.0			
15-19			0.0		0.0			
20-24			0.0		0.0			
25-29			0.0		0.0			
30-34	1		0.1	1.00	0.0		1.2	
35-39			0.0		0.0			
40-44		4	0.0		0.3	0.57		0.7
45-49	2	1	0.1	0.40	0.1	0.33	0.2	0.1
50-54		3	0.0		0.2	0.60		0.2
55-59	3	2	0.3	0.38	0.2	0.33	0.1	0.1
60-64	2	1	0.2	0.18	0.1	0.20	0.1	0.0
65-69	9	6	0.9	1.29	0.6	1.00	0.2	0.1
70-74	3		0.3	0.43	0.0		0.0	
75-79	5	3	0.9	1.00	0.4	0.43	0.1	0.1
80-84	3	3	0.9	3.00	0.5	0.43	0.1	0.1
85+	1	1	0.4	0.50	0.2	0.50	0.0	0.0
All ages	29	24					0.1	0.1
Mortality								
Raw			0.2	0.50	0.1	0.41		
WS			0.1	0.41	0.1	0.39		
ES			0.1	0.45	0.1	0.40		
BRD-S			0.2	0.51	0.1	0.40		
PYLL-70								
per 100,000			1.0		1.5			
ES			0.9		1.2			
AYLL-70			9.3		13.7			

* See corresponding tables with multiple primaries.

Table 17

Age-specific mortality (cancer-related) and proportion of all cancers
for period 2007-2014
(**Single primaries only** *)

Age at death Years	Males n	Females n	Males Age-spec. mortal.	Males MI-index	Females Age-spec. mortal.	Females MI-index	Males Prop.all cancers %	Females Prop.all cancers %
0- 4			0.0		0.0			
5- 9			0.0		0.0			
10-14			0.0		0.0			
15-19			0.0		0.0			
20-24			0.0		0.0			
25-29			0.0		0.0			
30-34	1		0.1	1.00	0.0		1.2	
35-39			0.0		0.0			
40-44		4	0.0		0.3	0.57		0.8
45-49	1	1	0.1	0.20	0.1	0.33	0.1	0.1
50-54		3	0.0		0.2	0.60		0.2
55-59	3	2	0.3	0.38	0.2	0.40	0.1	0.1
60-64	1	1	0.1	0.10	0.1	0.20	0.0	0.0
65-69	7	4	0.7	1.00	0.4	0.80	0.1	0.1
70-74	2		0.2	0.33	0.0		0.0	
75-79	4	2	0.7	1.00	0.3	0.29	0.1	0.1
80-84	1	2	0.3	1.00	0.4	0.29	0.0	0.0
85+	1	1	0.4	1.00	0.2	0.50	0.0	0.0
All ages	21	20					0.1	0.1
Mortality								
Raw			0.1	0.39	0.1	0.36		
WS			0.1	0.32	0.1	0.35		
ES			0.1	0.35	0.1	0.36		
BRD-S			0.1	0.39	0.1	0.34		
PYLL-70								
per 100,000			0.8		1.4			
ES			0.7		1.2			
AYLL-70			9.4		15.2			

* See corresponding tables with multiple primaries.

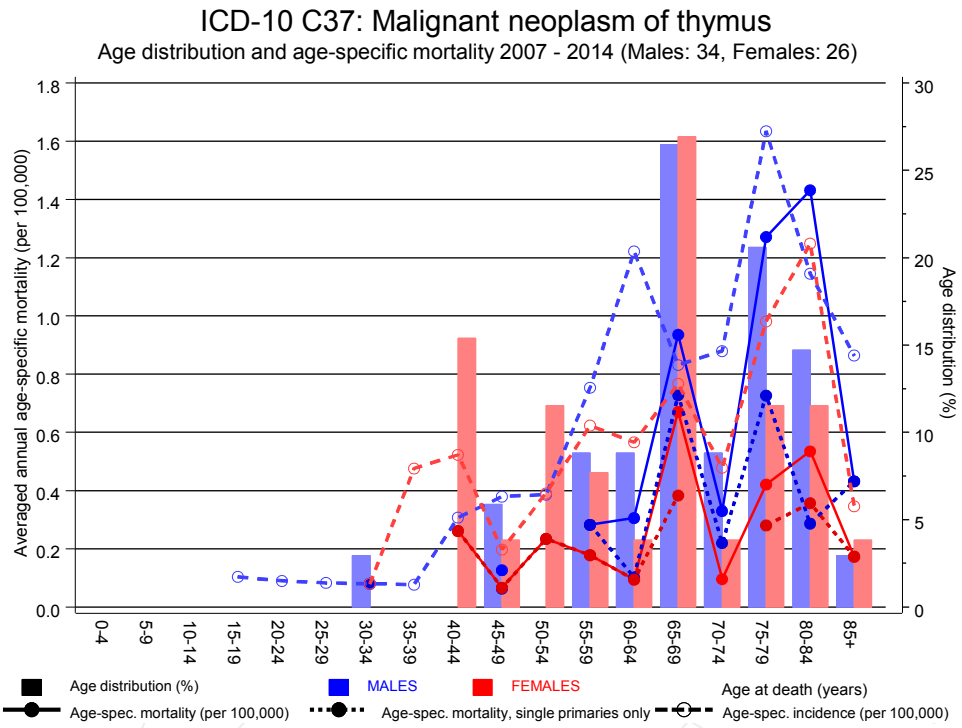
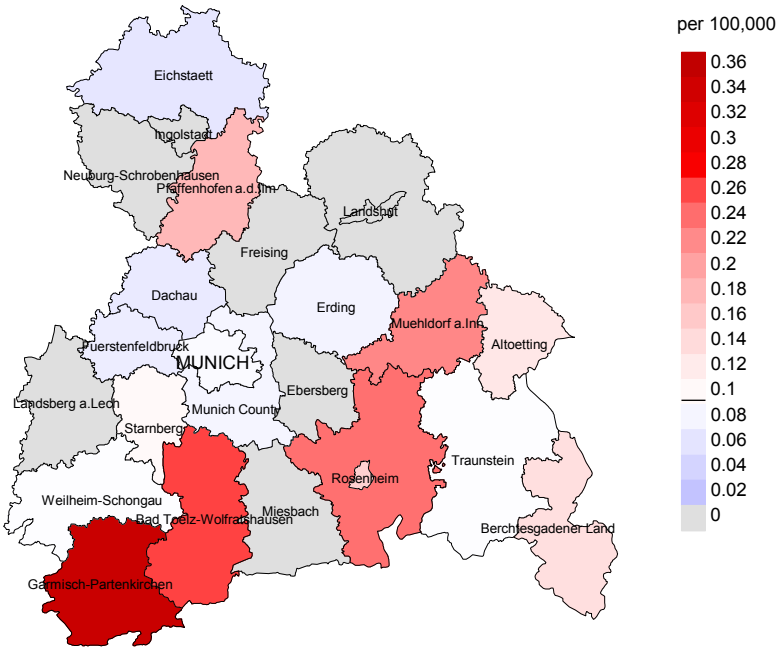


Figure 18. Distribution of age at death (bars) and age-specific mortality (all patients: solid line, patients with single primaries: dotted line). The age-specific incidence is additionally plotted for comparison (dashed line).

The difference between age at diagnosis (Table 3) and age at thymus cancer-related death (see Table 10) should be considered.

Average mortality (world standard population) 2007 - 2014: Males



Average mortality (world standard population) 2007 - 2014: Females

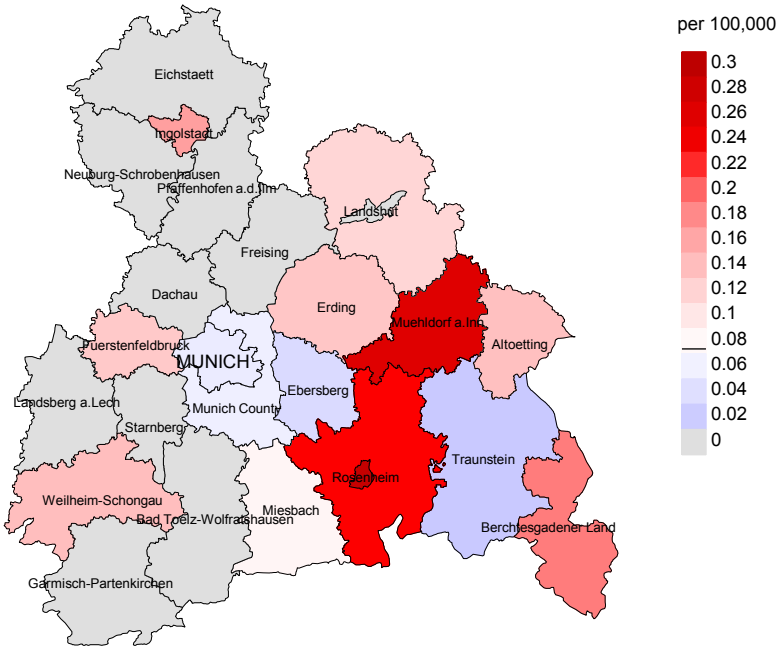
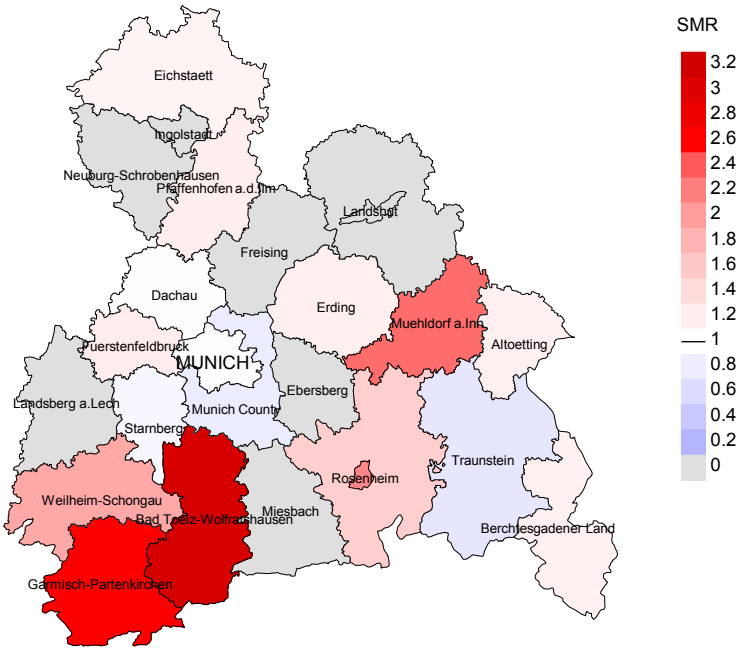


Figure 19a. Map of cancer mortality (world standard population) by county averaged for period 2007 to 2014. According to their individual mortality rates, the counties are displayed in different red and blue color temperatures where the fine white color indicates the population mean (males 0.1/100,000 WS N=34, females 0.1/100,000 WS N=26).

The results should be interpreted with caution! E.g., in county Ebersberg with a population of 65,347 female residents (averaged) in the period from 2007 to 2014 a total of 1 women died from thymus cancer. Therefore, the mean mortality rate for this cancer type in this area can be calculated at 0.0/100,000 (world standard population). Though, the value of this parameter may vary with an underlying probability of 99% between 0.0 and 0.3/100,000.

Standardized mortality ratio (SMR) 2007 - 2014: Males



Standardized mortality ratio (SMR) 2007 - 2014: Females

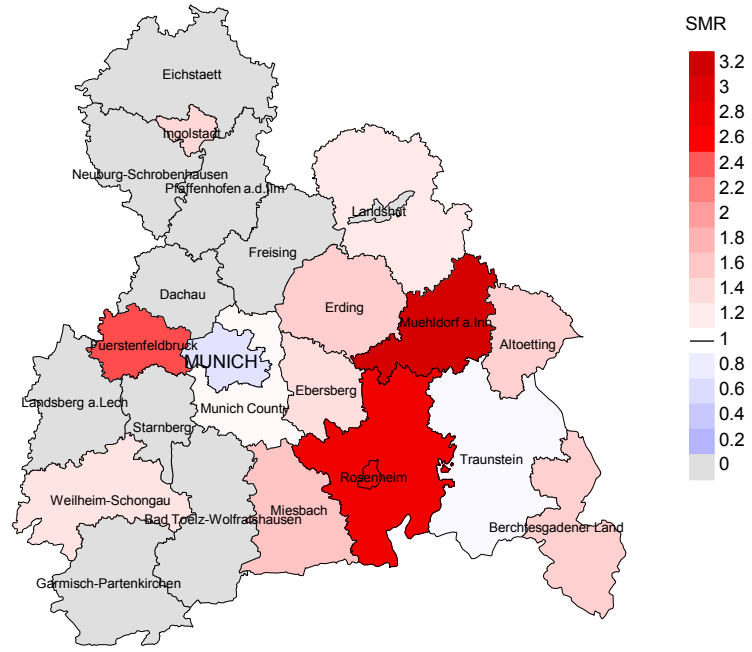


Figure 19b. Map of standardized mortality ratio (SMR, incl. DCO cases) by county averaged for period 2007 to 2014. According to their individual SMR values, the counties are displayed in different red and blue color temperatures where the fine white color indicates the population overall of 1.0 (males N=34, females N=26).

The results should be interpreted with caution! E.g., in county Ebersberg with a population of 64,924 female residents (averaged) in the period from 2007 to 2014 a total of 1 women died from thymus cancer. Therefore, the mean standardized mortality ratio (SMR) for this cancer type in this area can be calculated at 1.39. Though, the value of this parameter may vary with an underlying probability of 99% between 0.01 and 10.29, and is therefore not statistically striking.

Statistical Notes

In all tables and figures the respective reference values should be carefully considered. The incidence rates include diagnoses (with multiple primary), and death certificate only (DCO) cases, where applicable. For mortality statistics patients, diagnoses and progressive course of disease are presented. In the calculations, all courses of disease are considered whereby progressions occurred and/or death certificate identified progressive cancers were ascertained. Additionally there are three groups of disease course to consider:

1. **All multiple primaries included**

   The mortality statistic describes the tumor-specific death, independent of any malignancy. The patient perspective, induced secondary malignancies, and the problem of multiple malignancies from the same primary tumor all have reasons for their inclusion.

2. **First singular primary** (no information about other prior or synchronous malignancy)

   The mortality statistic describes the cancer-related death for patients who have no therapeutic restrictions due to a previous or synchronous cancer. These statistics are comparable to studies that have exclusion criteria based on a second malignancy.

3. **Single primary** (no information about other prior, syn- or metachronous malignancy)

   The mortality statistic describes the tumor-specific death that occurs without any impact through secondary primaries, earlier, synchronous, later or induced. Precisely the difference between disease group 1 and 2 highlight the magnitude of the problem of secondary malignancies.

For this reason differences appear concerning official mono-causal mortality statistics. To judge the maximum deviation, 2 further tables are presented. In the first table the distribution of secondary malignancies before, at or after the described cancer are shown, that could be an alternative cause of death. In the second table, the age-specific mortality rates for all courses of disease, without designation of secondary malignancies are shown.

A previously minimally acknowledged statistic is the **age at death**, which allows for a good assessment of the quality of classification of the apparent tumor-specific death. For assumed tumor-independent deaths, the age of death should be estimated from the age of diagnosis and the normal life expectancy, whereas tumor-dependent deaths can be estimated from the age of diagnosis plus the average tumor-specific life expectancy. The comparison of different tumors demonstrates this association, if the causes of cancer and the competing cause of death are independent of each other (e.g. breast and colon versus head/neck and lung).

The index from mortality and incidence (Mortality-Incidence ratio, **MI-index**) is a statistic that allows for the evaluation of the quality of data. For diseases with poor prognoses, comparable values are obtained from all age groups, because to a large extent, the numerator and denominator contain the same cases. For tumors with a good prognosis, increasing and decreasing incidence and age-specific differences in prognosis can more strongly alter the MI- index. Additionally, attention should be paid to the confidence intervals where fewer cases are reported.

The complexity of problems identified here emphasizes the importance of relative survival data for the appropriate analysis of long term results.

As a measurement of the burden of disease, the number of potential life years loss due to premature deaths in a cohort can be calculated (**PYLL**, potential years of life lost, standardized per 100,000 persons or per European standard) as well as the average loss of life years per individual (**AYLL**, average years of life lost). Depending upon the analytic aim (health economy, prevention, health care research) different methods exist for the generation of these measurements. In the results presented here, the age for a premature death is considered to be before 70 years, according to the guidelines of the OECD and the WHO (as seen in the abbreviation PYLL-70 or AYLL-70).

Shortcuts

FRG	Federal Republic of Germany
GEKID	Association of Population-based Cancer Registries in Germany (Gesellschaft der epidemiologischen Krebsregister in Deutschland e.V.)
MCR	Munich Cancer Registry (Tumorregister München)
SEER	Surveillance, Epidemiology, and End Results (USA)
AYLL-70	Average years of life lost prior to age 70 given a person dies before that age
BRD-S	German standard population
DCO	Death certificate only
EAR	Excess absolute risk = excess cancer cases (O - E) per 10,000 person-years
ES	European standard population (old)
LCL	Lower confidence limit
MI-index	Ratio between mortality and incidence
PYLL-70	Potential years of life lost prior to age 70 given a person dies before that age
SIR	Standardized incidence ratio
SMR	Standardized mortality ratio
UCL	Upper confidence limit
WS	World standard population

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