

# Munich Cancer Registry



- ▶ Survival
- ▶ Selection Matrix
- ▶ Homepage
- ▶ *Deutsch*

## ICD-10 C46: Kaposi sarcoma

### Incidence and Mortality

Year of diagnosis	1998-2019
Patients	99
Diseases	99
Creation date	01/25/2021
Database export	01/07/2021
Population	4.92 m





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<https://www.tumorregister-muenchen.de/en>

[https://www.tumorregister-muenchen.de/en/facts/base/bC46\\_\\_E-ICD-10-C46-Kaposi-sarcoma-incidence-and-mortality.pdf](https://www.tumorregister-muenchen.de/en/facts/base/bC46__E-ICD-10-C46-Kaposi-sarcoma-incidence-and-mortality.pdf)

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**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<sup>#</sup>, with a total of 4.69 million inhabitants, account for the frequency of cancer diseases<sup>##</sup> 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<sup>###</sup> 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](mailto:tumor@ibe.med.uni-muenchen.de).

Munich Cancer Registry, January 2021

<sup>#</sup> 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 2.65 million to 4.10 in 2002, and to 4.69 million in 2007).

<sup>##</sup> 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.

<sup>###</sup> DCO (death certificate only) identifies a cancer case that first becomes available to the MCR through the death certificate.

### **Some remarks regarding this cancer type**

Kaposi's sarcoma was once a rare disease. With an increased occurrence of HIV and AIDS the incidence of Kaposi's sarcoma also increased particularly in men. Incidence and prognosis of Kaposi's sarcoma as an HIV-associated disease are highly dependent on the therapeutic success of the infection itself. Progress in this field is reflected in a change of global epidemiological parameters such as incidence, mortality or survival.

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

Code	Description
C46.-	Kaposi sarcoma
C46.0	Skin
C46.1	Soft tissue
C46.2	Palate
C46.3	Lymph nodes
C46.7	Other sites
C46.8	Multiple organs
C46.9	Kaposi sarcoma, unspecified

## INCIDENCE

Table 1

##

Cases with invasive cancer by year of diagnosis, proportions of DCO, further malignancies, deaths, and active follow-up (ALL PATIENTS) (incl. DCO)

Year of diagnosis	All cases n	DCO cases n	Prop. DCO %	Prop. at least 1 further malign. prior + synchron. %	Prop. at least 1 further malign. after %	Prop. deaths %	Prop. actively followed %
1998	8	4	50.0	12.5	17.7	87.5	100.0
1999	1			22.2	18.2	100.0	100.0
2000	11	2	18.2	15.0	18.4	45.5	72.7
2001	3	1	33.3	13.0	17.1	33.3	33.3
2002	4	2	50.0	18.5	17.8	100.0	100.0 #
2003	2			17.2	15.9	100.0	100.0
2004	3	1	33.3	18.8	16.4	33.3	100.0
2005	4			16.7	16.9	50.0	100.0
2006	7			16.3	17.7	28.6	85.7
2007	6	2	33.3	14.3	16.4	33.3	83.3 #
2008	7	1	14.3	14.3	16.3	71.4	100.0
2009	6			14.5	14.3	33.3	100.0
2010	4			13.6	13.5		50.0
2011	7			12.3	15.2	57.1	71.4
2012	7			11.3	15.4	42.9	100.0
2013	4			10.7	15.8		100.0
2014	7	1	14.3	12.1	13.3	42.9	85.7
2015	4			11.6	25.0	25.0	100.0
2016	1			11.5	50.0		100.0
2017	3			12.1	33.3		100.0
1998-2017	99	14	14.1	12.1	17.7	45.5	87.9

99 cases diagnosed 1998-2017 are related to a total of 99 patients. Currently, in 30 (30.3 %) of these 99 patients more than one malignancy of any cancer type has been registered. Hereby, groups of 23 / 4 / 3 (23.2 % / 4.0 % / 3.0 %) patients exist having 2 / 3 / 4+ malignancies.

# 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 retrieved from the respective headings.

How to interpret:

In 2015, a subgroup of 4 cases has been diagnosed, of which 11.6 % previously and/or concurrently (synchronously) had at least one other malignancy of any cancer type. In 25.0 % of cases, at least one new malignancy has occurred during the follow-up period (all numbers refer to the date of the database export, see cover sheet).

Table 1a

##

Cases with invasive cancer by year of diagnosis, proportions of DCO, further malignancies, deaths, and active follow-up (MALES) (incl. DCO)

Year of diagnosis	Males n	Males %	DCO cases n	Prop. DCO %	Prop. at least 1 further malign. prior + synchron. %	Prop. at least 1 further malign. after %	Prop. deaths %	Prop. actively followed %
1998	8	100.0	4	50.0	12.5	19.0	87.5	100.0
1999	1	100.0			22.2	19.7	100.0	100.0
2000	9	81.8	1	11.1	11.1	20.0	44.4	66.7
2001	3	100.0	1	33.3	9.5	18.2	33.3	33.3
2002	3	75.0	2	66.7	12.5	19.0	100.0	100.0 #
2003	2	100.0			11.5	18.3	100.0	100.0
2004	2	66.7	1	50.0	10.7	19.0	50.0	100.0
2005	4	100.0			9.4	19.3	50.0	100.0
2006	5	71.4			10.8	20.4	20.0	100.0
2007	5	83.3	1	20.0	9.5	18.4	20.0	80.0 #
2008	7	100.0	1	14.3	10.2	18.2	71.4	100.0
2009	6	100.0			10.9	16.2	33.3	100.0
2010	3	75.0			10.3	15.6		66.7
2011	5	71.4			9.5	17.2	60.0	80.0
2012	6	85.7			8.7	16.7	33.3	100.0
2013	4	100.0			8.2	16.7		100.0
2014	7	100.0	1	14.3	10.0	14.3	42.9	85.7
2015	3	75.0			9.6	28.6	33.3	100.0
2016	1	100.0			9.5	50.0		100.0
2017	3	100.0			10.3	33.3		100.0
1998-2017	87	87.9	12	13.8	10.3	19.0	44.8	89.7

87 cases diagnosed 1998-2017 are related to a total of 87 patients. Currently, in 27 (31.0 %) of these 87 patients more than one malignancy of any cancer type has been registered. Hereby, groups of 21 / 3 / 3 (24.1 % / 3.4 % / 3.4 %) patients exist having 2 / 3 / 4+ malignancies.

# 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 retrieved from the respective headings.

How to interpret:

In 2015, a subgroup of 3 cases has been diagnosed, of which 9.6 % previously and/or concurrently (synchronously) had at least one other malignancy of any cancer type. In 28.6 % of cases, at least one new malignancy has occurred during the follow-up period (all numbers refer to the date of the database export, see cover sheet).

Table 1b

##

Cases with invasive cancer by year of diagnosis, proportions of DCO, further malignancies, deaths, and active follow-up (FEMALES) (incl. DCO)

Year of diagnosis	Females n	Females %	DCO cases n	Prop. DCO %	Prop. at least 1 further malign. prior + synchron. %	Prop. at least 1 further malign. after %	Prop. deaths %	Prop. actively followed %
1998	0							
1999	0							
2000	2	18.2	1	50.0	50.0	8.3	50.0	100.0
2001	0							
2002	1	25.0			66.7	10.0	100.0	100.0 #
2003	0							
2004	1	33.3			75.0	0.0		100.0
2005	0							
2006	2	28.6			50.0	0.0	50.0	50.0
2007	1	16.7	1	100.0	42.9	0.0	100.0	100.0 #
2008	0							
2009	0							
2010	1	25.0			37.5	0.0		
2011	2	28.6			30.0	0.0	50.0	50.0
2012	1	14.3			27.3	0.0	100.0	100.0
2013	0							
2014	0							
2015	1	25.0			25.0	0.0		100.0
2016	0							
2017	0							
1998-2017	12	12.1	2	16.7	25.0	8.3	50.0	75.0

12 cases diagnosed 1998-2017 are related to a total of 12 patients. Currently, in 3 (25.0 %) of these 12 patients more than one malignancy of any cancer type has been registered. Hereby, groups of 2 / 1 / 0 (16.7 % / 8.3 % / 0.0 %) patients exist having 2 / 3 / 4+ malignancies.

# 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 retrieved from the respective headings.

How to interpret:

In 2015, a subgroup of 1 cases has been diagnosed, of which 25.0 % previously and/or concurrently (synchronously) had at least one other malignancy of any cancer type. In 0.0 % of cases, at least one new malignancy has occurred during the follow-up period (all numbers refer to the date of the database export, see cover sheet).

Table 2

Incidence measures by year of diagnosis including DCO cases  
(with respect to registry area expansion from 2.65 to 4.10 m as of 2002,  
and from 4.10 to 4.92 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	8		0.7		0.5		0.6		0.6	
1999	1		0.1		0.1		0.1		0.1	
2000	9	2	0.8	0.2	0.5	0.1	0.7	0.1	0.7	0.1
2001	3		0.3		0.2		0.2		0.2	
2002	3	1	0.2	0.1	0.1	0.0	0.2	0.0	0.1	0.0
2003	2		0.1		0.1		0.1		0.1	
2004	2	1	0.1	0.1	0.1	0.0	0.1	0.0	0.1	0.0
2005	4		0.2		0.1		0.2		0.2	
2006	5	2	0.3	0.1	0.2	0.1	0.2	0.1	0.2	0.1
2007	5	1	0.2	0.0	0.1	0.0	0.2	0.0	0.2	0.0
2008	7		0.3		0.2		0.3		0.3	
2009	6		0.3		0.2		0.2		0.3	
2010	3	1	0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.0
2011	5	2	0.2	0.1	0.1	0.0	0.2	0.1	0.2	0.1
2012	6	1	0.3	0.0	0.1	0.0	0.2	0.0	0.2	0.0
2013	4		0.2		0.1		0.1		0.2	
2014	7		0.3		0.2		0.2		0.3	
2015	3	1	0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.0
2016	1		0.0		0.0		0.0		0.0	
2017	3		0.1		0.1		0.1		0.1	
1998-2017	87	12	0.2	0.0	0.1	0.0	0.2	0.0	0.2	0.0

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



Table 3

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

Year of diagnosis	Cases n	Std.		Median						
		Mean	dev.	Min.	Max.	10%	25%	50%	75%	90%
1998	8	49.5	10.7	36.2	60.4	36.2	37.4	53.1	59.2	60.4
1999	1	70.2		70.2	70.2	70.2	70.2	70.2	70.2	70.2
2000	11	58.3	22.1	31.2	92.9	37.4	37.8	53.4	85.3	91.6
2001	3	52.8	20.1	31.6	71.5	31.6	31.6	55.1	71.5	71.5
2002	4	57.3	11.1	44.5	71.4	44.5	49.6	56.7	65.0	71.4
2003	2	57.9	35.7	32.6	83.1	32.6	32.6	57.9	83.1	83.1
2004	3	61.4	23.6	47.1	88.6	47.1	47.1	48.3	88.6	88.6
2005	4	44.6	11.1	35.1	58.9	35.1	35.8	42.2	53.4	58.9
2006	7	50.6	19.4	29.8	84.6	29.8	32.5	44.1	65.8	84.6
2007	6	46.6	12.1	36.1	70.3	36.1	41.5	43.1	45.4	70.3
2008	7	68.8	17.2	37.8	88.1	37.8	60.4	73.2	85.1	88.1
2009	6	59.3	20.2	35.8	83.7	35.8	42.1	55.8	82.7	83.7
2010	4	58.8	12.3	46.1	70.8	46.1	48.3	59.1	69.2	70.8
2011	7	66.1	21.8	29.6	95.3	29.6	47.6	68.6	80.7	95.3
2012	7	69.5	18.3	43.0	87.7	43.0	44.8	74.8	85.3	87.7
2013	4	51.0	19.2	28.2	75.1	28.2	38.6	50.4	63.4	75.1
2014	7	62.0	19.9	37.5	87.8	37.5	38.0	69.1	77.0	87.8
2015	4	47.0	16.3	25.5	64.5	25.5	35.6	49.1	58.5	64.5
2016	1	69.5		69.5	69.5	69.5	69.5	69.5	69.5	69.5
2017	3	61.4	28.5	28.6	79.3	28.6	28.6	76.4	79.3	79.3
1998-2017	99	57.7	18.5	25.5	95.3	35.1	43.0	54.2	73.7	85.1

Table 3a

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

Year of diagnosis	Cases n	Std.		Median						
		Mean	dev.	Min.	Max.	10%	25%	50%	75%	90%
1998	8	49.5	10.7	36.2	60.4	36.2	37.4	53.1	59.2	60.4
1999	1	70.2		70.2	70.2	70.2	70.2	70.2	70.2	70.2
2000	9	56.9	20.5	31.2	92.9	31.2	44.4	53.4	60.6	92.9
2001	3	52.8	20.1	31.6	71.5	31.6	31.6	55.1	71.5	71.5
2002	3	52.6	7.3	44.5	58.6	44.5	44.5	54.8	58.6	58.6
2003	2	57.9	35.7	32.6	83.1	32.6	32.6	57.9	83.1	83.1
2004	2	47.7	0.8	47.1	48.3	47.1	47.1	47.7	48.3	48.3
2005	4	44.6	11.1	35.1	58.9	35.1	35.8	42.2	53.4	58.9
2006	5	47.5	13.4	29.8	65.8	29.8	43.9	44.1	53.9	65.8
2007	5	47.5	13.3	36.1	70.3	36.1	41.5	44.1	45.4	70.3
2008	7	68.8	17.2	37.8	88.1	37.8	60.4	73.2	85.1	88.1
2009	6	59.3	20.2	35.8	83.7	35.8	42.1	55.8	82.7	83.7
2010	3	54.7	11.4	46.1	67.6	46.1	46.1	50.5	67.6	67.6
2011	5	63.5	25.5	29.6	95.3	29.6	47.6	68.6	76.2	95.3
2012	6	66.5	17.9	43.0	85.3	43.0	44.8	74.6	76.5	85.3
2013	4	51.0	19.2	28.2	75.1	28.2	38.6	50.4	63.4	75.1
2014	7	62.0	19.9	37.5	87.8	37.5	38.0	69.1	77.0	87.8
2015	3	54.2	9.5	45.6	64.5	45.6	45.6	52.5	64.5	64.5
2016	1	69.5		69.5	69.5	69.5	69.5	69.5	69.5	69.5
2017	3	61.4	28.5	28.6	79.3	28.6	28.6	76.4	79.3	79.3
1998-2017	87	56.7	17.5	28.2	95.3	35.8	43.9	53.9	71.5	83.1

Table 3b

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

Year of diagnosis	Cases n	Mean	Std. dev.	Min.	Max.	Median				
						10%	25%	50%	75%	90%
2000	2	64.7	38.0	37.8	91.6	37.8	37.8	64.7	91.6	91.6
2002	1	71.4		71.4	71.4	71.4	71.4	71.4	71.4	71.4
2004	1	88.6		88.6	88.6	88.6	88.6	88.6	88.6	88.6
2006	2	58.6	36.9	32.5	84.6	32.5	32.5	58.6	84.6	84.6
2007	1	42.1		42.1	42.1	42.1	42.1	42.1	42.1	42.1
2010	1	70.8		70.8	70.8	70.8	70.8	70.8	70.8	70.8
2011	2	72.7	11.3	64.7	80.7	64.7	64.7	72.7	80.7	80.7
2012	1	87.7		87.7	87.7	87.7	87.7	87.7	87.7	87.7
2015	1	25.5		25.5	25.5	25.5	25.5	25.5	25.5	25.5
1998-2017	12	64.8	24.1	25.5	91.6	32.5	40.0	71.1	86.2	88.6

Table 4

Age distribution by 5-year age group and sex for period 2007-2017  
(incl. DCO)

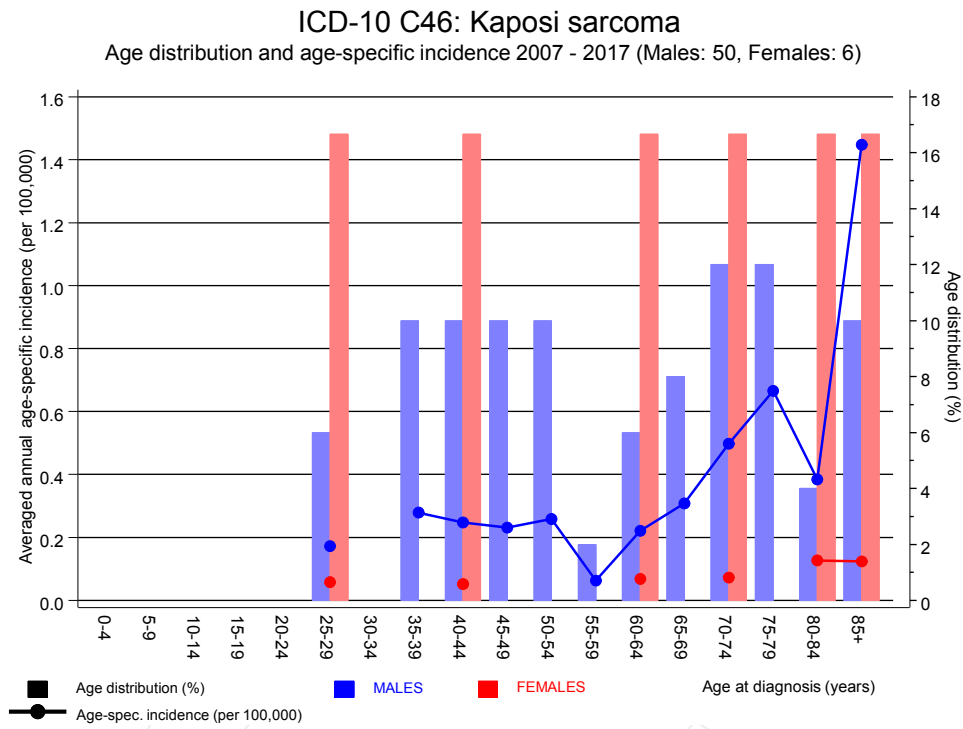
Age at diagnosis Years	Cases n	Males			Females				
		%	Cum.%	n	%	Cum.%	n	%	Cum.%
0-4									
5-9									
10-14									
15-19									
20-24									
25-29	4	7.1	7.1	3	6.0	6.0	1	16.7	16.7
30-34	0	0.0	7.1			6.0			16.7
35-39	5	8.9	16.1	5	10.0	16.0			16.7
40-44	6	10.7	26.8	5	10.0	26.0	1	16.7	33.3
45-49	5	8.9	35.7	5	10.0	36.0			33.3
50-54	5	8.9	44.6	5	10.0	46.0			33.3
55-59	1	1.8	46.4	1	2.0	48.0			33.3
60-64	4	7.1	53.6	3	6.0	54.0	1	16.7	50.0
65-69	4	7.1	60.7	4	8.0	62.0			50.0
70-74	7	12.5	73.2	6	12.0	74.0	1	16.7	66.7
75-79	6	10.7	83.9	6	12.0	86.0			66.7
80-84	3	5.4	89.3	2	4.0	90.0	1	16.7	83.3
85+	6	10.7	100.0	5	10.0	100.0	1	16.7	100.0
All ages	56	100.0		50	100.0		6	100.0	

Table 5

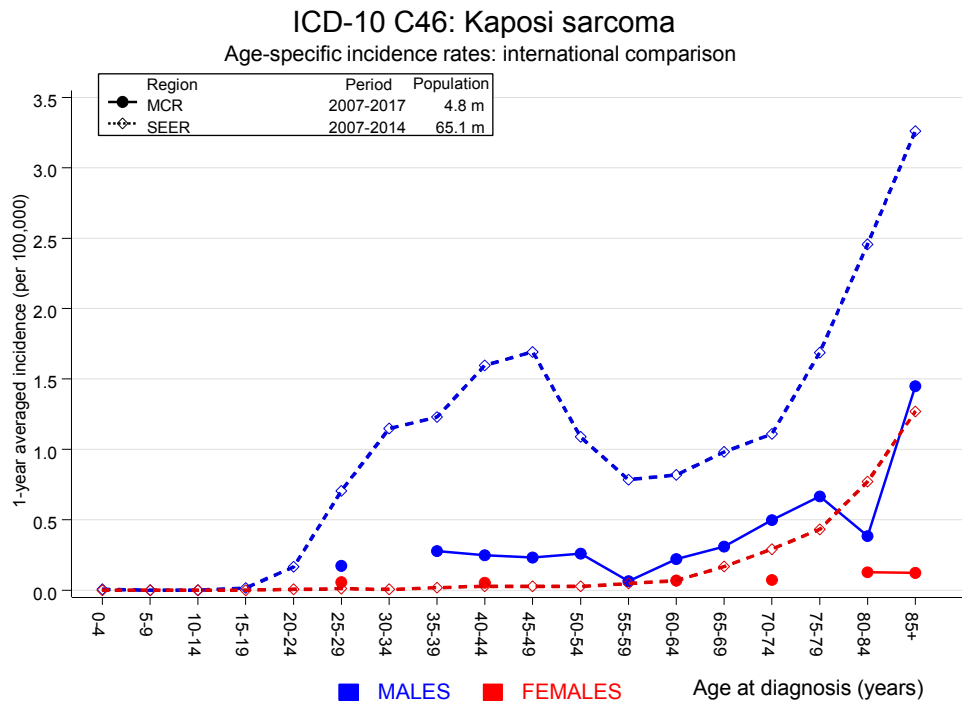
Age-specific incidence, DCO rate and proportion of all cancers for period 2007-2017

Age at diagnosis Years	Males n	Females n	Males Age- spec. incid.	Females Age- spec. incid.	Males DCO rate n=3 %	Females DCO rate n=1 %	Males	Females
							Prop.all cancers n=143063 %	Prop.all cancers n=144724 %
0- 4								
5- 9								
10-14								
15-19								
20-24								
25-29	3	1	0.2	0.1			0.3	0.1
30-34								
35-39	5		0.3		20.0		0.3	
40-44	5	1	0.2	0.1		100.0	0.2	0.0
45-49	5		0.2		20.0		0.1	
50-54	5		0.3				0.1	
55-59	1		0.1				0.0	
60-64	3	1	0.2	0.1			0.0	0.0
65-69	4		0.3				0.0	
70-74	6	1	0.5	0.1			0.0	0.0
75-79	6		0.7				0.0	
80-84	2	1	0.4	0.1			0.0	0.0
85+	5	1	1.4	0.1	20.0		0.1	0.0
All ages	50	6			6.0	16.7	0.0	0.0
Incidence								
Raw			0.2	0.0				
WS			0.1	0.0				
ES			0.2	0.0				
BRD-S			0.2	0.0				

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 (males: mean=60.2 yrs, median=61.4 yrs; females: mean=61.9 yrs, median=67.7 yrs) 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 2019, based on the November 2018 submission. <http://www.seer.cancer.gov>.

Table 7a

Standardized incidence ratio (SIR, with 95% confidence limits),  
excess absolute risk (EAR) and DCO rate of further malignancies  
for period 1998–2017

## MALES

Diagnosis	Observed n	Expected n	SIR	CI 95%	CI 95%	EAR	DCO %
C03–C06 Oral cavity	1	0.0	28.1	0.7	156.3	27.8	
C16 Stomach	1	0.2	6.2	0.2	34.5	24.2	
C18 Colon	1	0.4	2.7	0.1	14.8	18.0	
C19–C20 Rectum	1	0.2	5.1	0.1	28.3	23.2	
C21 Anus/canal	1	0.0	96.6	2.4	538.2 #	28.6	
C33–C34 Lung	2	0.4	4.8	0.6	17.2	45.6	
C43 Malign. melanoma	1	0.2	5.4	0.1	30.1	23.5	
C60 Penis	1	0.0	95.5	2.4	532.3 #	28.6	
C61 Prostate	2	1.0	2.0	0.2	7.3	29.2	
C73 Thyroid	1	0.0	32.0	0.8	178.2	28.0	
C81 Hodgkin lymphoma	1	0.0	84.6	2.1	471.4 #	28.5	
C82–C85 NHL	2	0.2	11.7	1.4	42.1 #	52.8	
Not observed	0	1.2	0.0	0.0	3.0	–36.0	
All further malignancies	15	3.8	3.9	2.2	6.4 #	322.1	
Patients		69					
Median age at next malignancy (years)		66.6					
Person-years		346					
Mean observation time (years)		5.0					
Median observation time (years)		3.4					

# The occurrence of further specified malignancy is statistically significant.

Table 7b

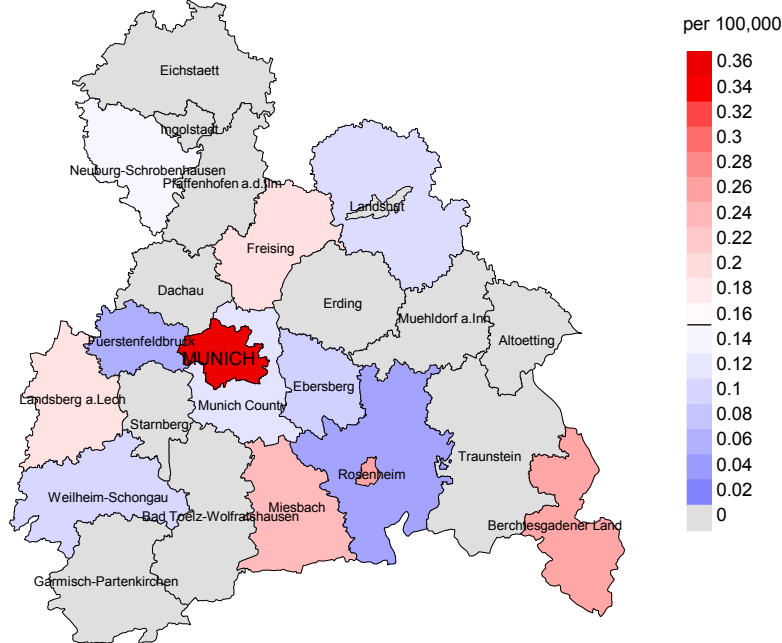
Standardized incidence ratio (SIR, with 95% confidence limits), excess absolute risk (EAR) and DCO rate of further malignancies for period 1998-2017

FEMALES

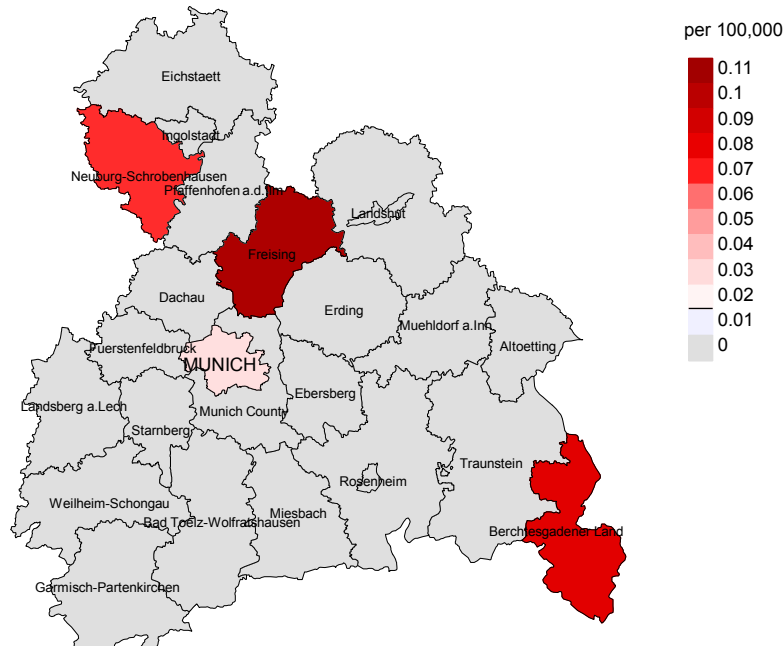
Diagnosis	Observed n	Expected n	SIR	CI 95%	CI 95%	EAR	DCO %
Not observed	0	0.4	0.0	0.0	10.1	-104	
All further malignancies	0	0.4	0.0	0.0	10.1	-104	
Patients		9					
Person-years		35					
Mean observation time (years)		3.9					
Median observation time (years)		1.8					

# The occurrence of further specified malignancy is statistically significant.

Average incidence (Germany 1987 standard population) 2007 - 2019: Males



Average incidence (Germany 1987 standard population) 2007 - 2019: Females

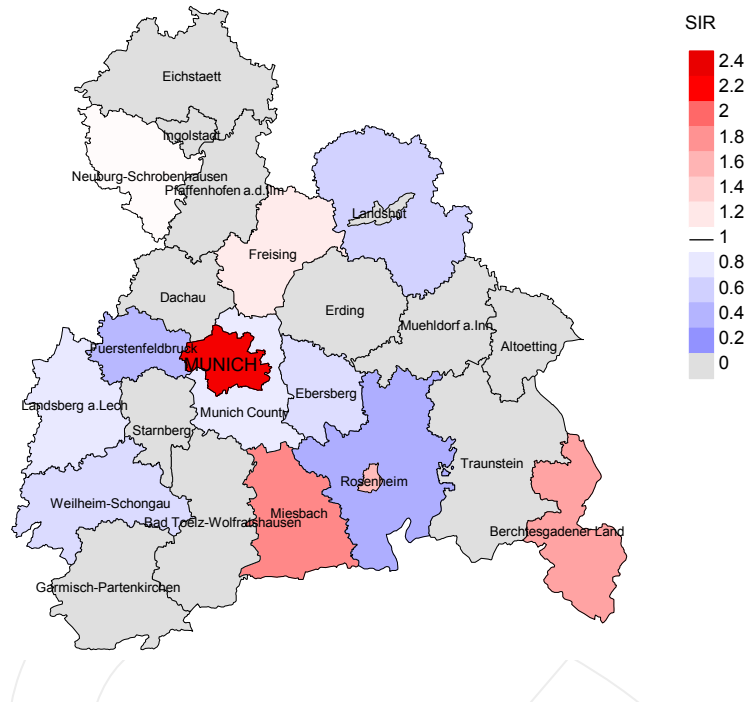


**Figure 8a.** Map of cancer incidence (german standard population, incl. DCO cases) by county averaged for period 2007 to 2019. According to their individual incidence rates, the counties are displayed in different red and blue hues, being the fine white color attributed to the population mean (males 0.2/100,000 WS N=50, females 0.0/100,000 WS N=6).

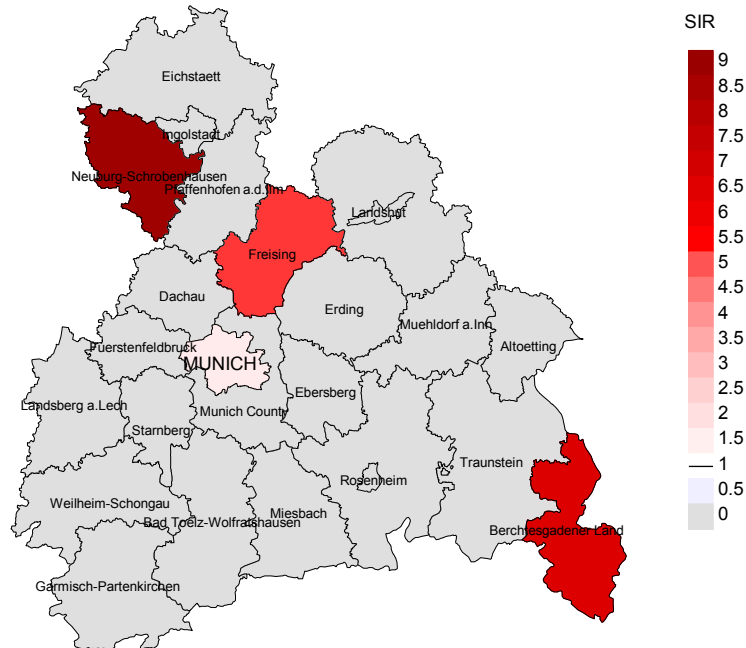
The results should be interpreted with caution! E.g., in county Ebersberg with a population of 67,462 female residents (averaged) in the period from 2007 to 2019 a total of 0 women were identified with newly diagnosed kaposi sarcoma. Therefore, the mean incidence rate for this cancer type in this area can be calculated at 0.0/100,000 (german standard population). Though, the value of this parameter may vary with an underlying probability of 99% between 0.0 and 0.0/100,000.



Standardized incidence ratio (SIR) 2007 - 2019: Males



Standardized incidence ratio (SIR) 2007 - 2019: Females



**Figure 8b.** Map of standardized incidence ratio (SIR, incl. DCO cases) by county averaged for period 2007 to 2019. According to their individual SIR values, the counties are displayed in different red and blue hues, being the fine white color attributed to the population overall of 1.0 (males N=50, females N=6).

The results should be interpreted with caution! E.g., in county Ebersberg with a population of 67,153 female residents (averaged) in the period from 2007 to 2019 a total of 0 women were identified with newly diagnosed kaposi sarcoma. Therefore, the mean standardized incidence ratio (SIR) for this cancer type in this area can be calculated at 0.00. Though, the value of this parameter may vary with an underlying probability of 99% between 0.00 and 33.52, and is therefore not statistically striking.

## MORTALITY

Table 9a

Annual cohorts: Incident cancers, follow-up status, proportion of DCO, deaths among the annual cohorts and proportion of available death certificates (with respect to registry area expansion from 2.65 to 4.10 m as of 2002, and from 4.10 to 4.92 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	8	100.0	50.0	7	87.5	100.0
1999	1	100.0		1	100.0	
2000	11	72.7	18.2	5	45.5	100.0
2001	3	33.3	33.3	1	33.3	100.0
2002	4	100.0	50.0	4	100.0	100.0
2003	2	100.0		2	100.0	100.0
2004	3	100.0	33.3	1	33.3	100.0
2005	4	100.0		2	50.0	100.0
2006	7	85.7		2	28.6	50.0
2007	6	83.3	33.3	2	33.3	100.0
2008	7	100.0	14.3	5	71.4	80.0
2009	6	100.0		2	33.3	100.0
2010	4	50.0				
2011	7	71.4		4	57.1	75.0
2012	7	100.0		3	42.9	66.7
2013	4	100.0				
2014	7	85.7	14.3	3	42.9	100.0
2015	4	100.0		1	25.0	100.0
2016	1	100.0				
2017	3	100.0				
1998-2017	99	87.9	14.1	45	45.5	88.9

Table 9b

Annual cohorts of incident cancers and deaths, proportion of death certificates and cases deceased within the same year of being diagnosed with cancer (incl. DCO)

(with respect to registry area expansion from 2.65 to 4.10 m as of 2002, and from 4.10 to 4.92 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	8	5	100.0	4	50.0
1999	1	2	50.0	1	100.0
2000	11	3	100.0	2	18.2
2001	3	1	100.0		
2002	4	4	100.0	3	75.0
2003	2	1	100.0		
2004	3	3	100.0	1	33.3
2005	4				
2006	7				
2007	6	5	80.0	2	33.3
2008	7	2	100.0	1	14.3
2009	6	3	100.0	1	16.7
2010	4	2	100.0		
2011	7	2	100.0		
2012	7	4	75.0		
2013	4	4	100.0		
2014	7	4	100.0	2	28.6
2015	4	1	100.0		
2016	1	2	100.0		
2017	3				
1998-2017	99	48	93.8	17	17.2

Table 9c

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 2.65 to 4.10 m as of 2002,  
and from 4.10 to 4.92 m as of 2007, respectively)

Year of death	Deaths n	Prop. cancer- related %	Prop. non-cancer- related %	Prop. cancer recorded on death certificate %
1998	5	40.0	60.0	100.0
1999	2	100.0		100.0
2000	3	66.7	33.3	100.0
2001	1	100.0		100.0
2002	4	50.0	50.0	100.0
2003	1		100.0	
2004	3	100.0		66.7
2005				
2006				
2007	5	40.0	60.0	75.0
2008	2		100.0	50.0
2009	3	66.7	33.3	66.7
2010	2		100.0	
2011	2	100.0		100.0
2012	4		100.0	33.3
2013	4	100.0		100.0
2014	4	50.0	50.0	75.0
2015	1	100.0		100.0
2016	2	50.0	50.0	50.0
2017				
2018	1		100.0	
2019	1		100.0	
1998–2019	50	52.0	48.0	75.6

Table 10a

Medians of age at death according to the grouping in Table 9  
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	5	53.2	52.7	54.2	53.2
1999	2	53.3	53.3		36.1
2000	2	57.9	61.8	54.1	57.9
2001	1	93.6	93.6		93.6
2002	4	56.8	63.3	51.6	56.8
2003	1	88.3		88.3	
2004	2	68.8	68.8		47.1
2005					
2006					
2007	4	45.4	47.5	41.0	47.5
2008	2	54.2		54.2	37.8
2009	3	68.8	71.8	52.6	71.8
2010	1	89.7		89.7	
2011	2	56.0	56.0		56.0
2012	4	63.9		63.9	91.4
2013	2	86.4	86.4		86.4
2014	4	77.0	58.1	89.7	65.1
2015	1	59.3	59.3		59.3
2016	2	61.4	47.2	75.5	47.2
2017					
2018	1	70.5		70.5	
2019	1	92.1		92.1	
1998-2019	44	59.0	60.6	58.5	54.8

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 10b

Medians of age at death according to the grouping in Table 9  
 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	91.6	91.6		91.6
2001					
2002					
2003					
2004	1	73.0	73.0		73.0
2005					
2006					
2007	1	42.1		42.1	42.1
2008					
2009					
2010	1	89.5		89.5	
2011					
2012					
2013	2	85.5	85.5		85.5
2014					
2015					
2016					
2017					
2018					
2019					
1998-2019	6	85.5	85.5	65.8	82.4

By 2018, Bavarians' life expectancy at birth is estimated at 79.3 years for boys and 83.8 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 11a

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	2	0.2	0.25	0.1	0.28	0.2	0.30	0.2	0.29
1999	2	0.2	2.00	0.1	2.03	0.1	1.80	0.2	1.62
2000	1	0.1	0.11	0.1	0.10	0.1	0.09	0.1	0.09
2001	1	0.1	0.33	0.0	0.29	0.1	0.41	0.1	0.48
2002	2	0.1	0.67	0.1	0.63	0.1	0.67	0.1	0.78
2003									
2004	2	0.1	1.00	0.1	0.81	0.1	1.04	0.1	1.09
2005									
2006									
2007	2	0.1	0.40	0.1	0.46	0.1	0.44	0.1	0.49
2008									
2009	2	0.1	0.33	0.0	0.27	0.1	0.27	0.1	0.26
2010									
2011	2	0.1	0.40	0.1	0.44	0.1	0.41	0.1	0.37
2012									
2013	2	0.1	0.50	0.0	0.23	0.1	0.39	0.1	0.49
2014	2	0.1	0.29	0.1	0.31	0.1	0.31	0.1	0.28
2015	1	0.0	0.33	0.0	0.29	0.0	0.34	0.0	0.32
2016	1	0.0	1.00	0.0	1.17	0.0	1.02	0.0	1.08
1998-2016	22	0.1	0.27	0.0	0.26	0.1	0.27	0.1	0.27

Table 11b

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	0.50	0.0	0.21	0.0	0.31	0.0	0.37
2001									
2002									
2003									
2004	1	0.1	1.00	0.0	2.47	0.0	1.85	0.0	1.85
2005									
2006									
2007									
2008									
2009									
2010									
2011									
2012									
2013	2	0.1		0.0		0.0		0.1	
2014									
2015									
2016									
1998-2016	4	0.0	0.35	0.0	0.16	0.0	0.23	0.0	0.28

Table 12

Age distribution of age at death (cancer-related) for period 2007-2016  
 (incl. multiple malignancies)

Age at death Years	Cases			Males			Females		
	n	%	Cum.%	n	%	Cum.%	n	%	Cum.%
0-4									
5-9									
10-14									
15-19									
20-24									
25-29									
30-34									
35-39									
40-44									
45-49	4	28.6	28.6	4	33.3	33.3			0.0
50-54	1	7.1	35.7	1	8.3	41.7			0.0
55-59	1	7.1	42.9	1	8.3	50.0			0.0
60-64	1	7.1	50.0	1	8.3	58.3			0.0
65-69	2	14.3	64.3	2	16.7	75.0			0.0
70-74	1	7.1	71.4	1	8.3	83.3			0.0
75-79	1	7.1	78.6	1	8.3	91.7			0.0
80-84	1	7.1	85.7			91.7	1	50.0	50.0
85+	2	14.3	100.0	1	8.3	100.0	1	50.0	100.0
All ages	14	100.0		12	100.0		2	100.0	



Table 13

Age-specific mortality (cancer-related) and proportion of all cancers  
for period 2007-2016  
(incl. multiple malignancies)

Age at death Years	Males		Females		Males		Females	
	n	n	Age- spec. mortal.	MI-index	Age- spec. mortal.	MI-index	Prop.all cancers %	Prop.all cancers %
0- 4								
5- 9								
10-14								
15-19								
20-24								
25-29								
30-34								
35-39								
40-44								
45-49	4		0.2	0.88			0.3	
50-54	1		0.1	0.22			0.0	
55-59	1		0.1	1.12			0.0	
60-64	1		0.1	0.37			0.0	
65-69	2		0.2	0.55			0.0	
70-74	1		0.1	0.18			0.0	
75-79	1		0.1	0.19			0.0	
80-84		1			0.1	1.12		0.0
85+	1	1	0.3	0.23	0.1	1.10	0.0	0.0
All ages	12	2					0.0	0.0
Mortality								
Raw			0.1	0.27	0.0	0.37		
WS			0.0	0.26	0.0	0.11		
ES			0.0	0.27	0.0	0.18		
BRD-S			0.0	0.26	0.0	0.26		
PYLL-70								
per 100,000			0.7					
ES			0.5					
AYLL-70			14.7					

Table 14a

Further malignancies in deaths in period 1998-2016  
MALES

Diagnosis	Total n	Total %↓	Pre n	Pre ←%	Syn- chron ±30d n	Syn- chron ±30d ←%	Post n	Post ←%
C16 Stomach	1	7.7					1	100.0
C19-C20 Rectum	1	7.7					1	100.0
C25 Pancreas	1	7.7			1	100.0		
C33-C34 Lung	1	7.7					1	100.0
C44 Skin others	1	7.7	1	100.0				
C82-C85 NHL	6	46.2	2	33.3	1	16.7	3	50.0
C91-C96 Leukaemia	2	15.4	1	50.0			1	50.0
All further malignancies	13	100.0	4	30.8	2	15.4	7	53.8

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 further malignancy.

Table 14b

Further malignancies in deaths in period 1998-2016  
FEMALES

N=3 further malignancies in deaths were registered. Therefore, the table was not created.

Table 15

Age-specific mortality (cancer-related) and proportion of all cancers  
for period 2007-2016  
(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								
5- 9								
10-14								
15-19								
20-24								
25-29								
30-34								
35-39								
40-44								
45-49	4		0.2	0.88			0.3	
50-54								
55-59	1		0.1	1.12			0.0	
60-64								
65-69	2		0.2	0.55			0.0	
70-74	1		0.1	0.18			0.0	
75-79	1		0.1	0.23			0.0	
80-84		1			0.1	1.12		0.0
85+	1	1	0.3	0.23	0.1	1.10	0.0	0.0
All ages	10	2					0.0	0.0
Mortality								
Raw			0.0	0.25	0.0	0.37		
WS			0.0	0.23	0.0	0.11		
ES			0.0	0.24	0.0	0.18		
BRD-S			0.0	0.25	0.0	0.26		
PYLL-70								
per 100,000			0.5					
ES			0.4					
AYLL-70			15.4					

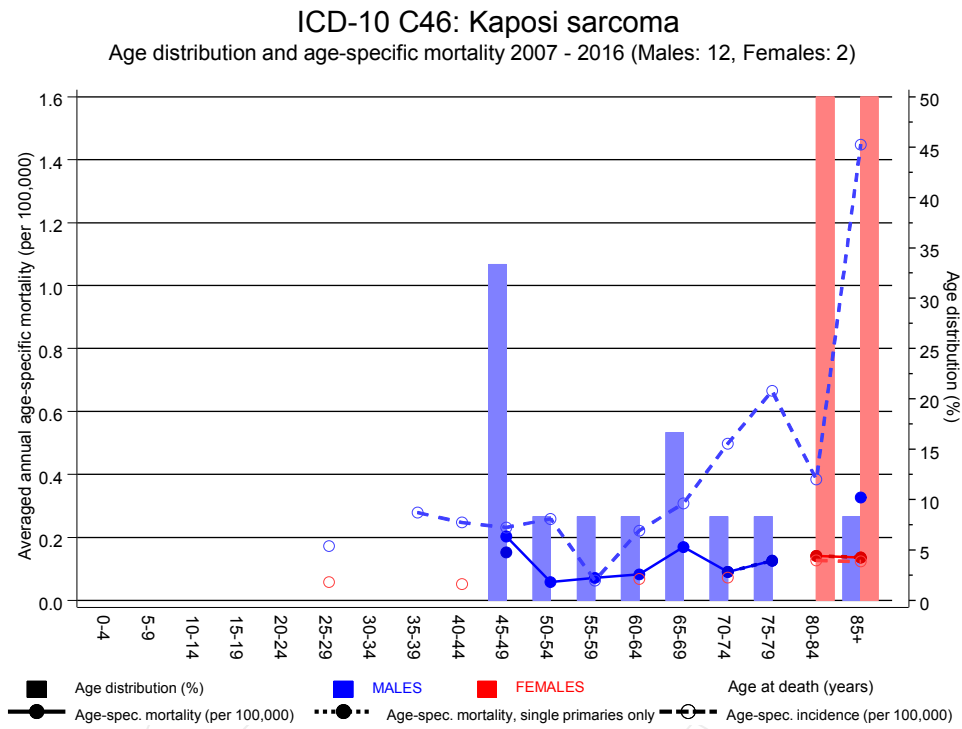
\* See corresponding tables with multiple malignancies.

Table 16

Age-specific mortality (cancer-related) and proportion of all cancers for period 2007-2016 (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								
5- 9								
10-14								
15-19								
20-24								
25-29								
30-34								
35-39								
40-44								
45-49	3		0.2	0.82			0.2	
50-54								
55-59								
60-64								
65-69								
70-74	1		0.1	0.22			0.0	
75-79	1		0.1	0.28			0.0	
80-84		1			0.1	1.12		0.0
85+		1			0.1	1.10		0.0
All ages	5	2					0.0	0.0
Mortality								
Raw			0.0	0.15	0.0	0.37		
WS			0.0	0.14	0.0	0.11		
ES			0.0	0.14	0.0	0.18		
BRD-S			0.0	0.16	0.0	0.26		
PYLL-70								
per 100,000			0.3					
ES			0.3					
AYLL-70			22.5					

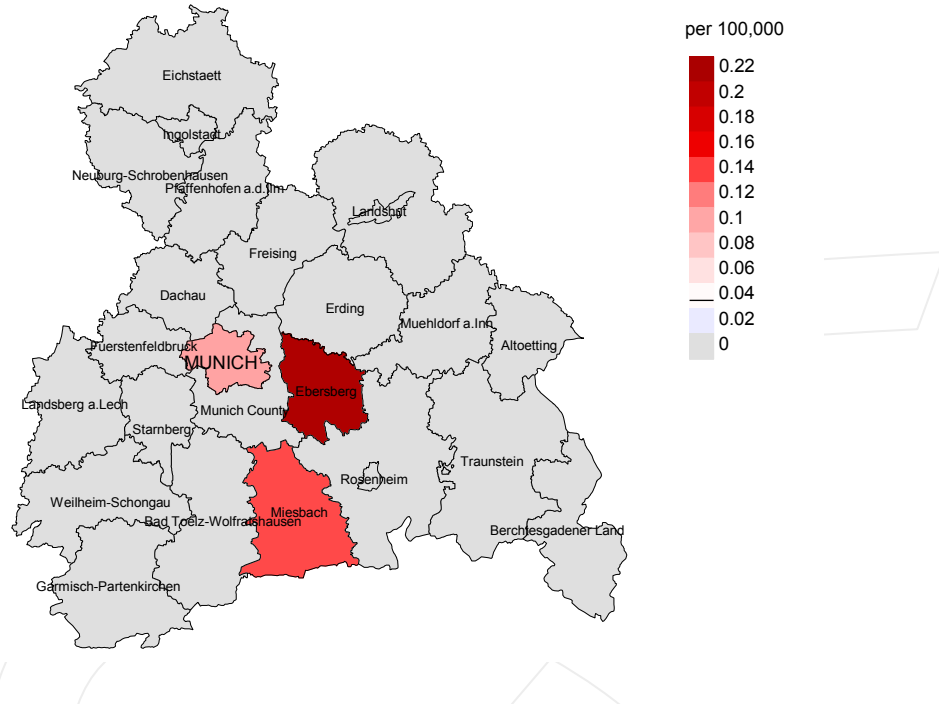
\* See corresponding tables with multiple malignancies.



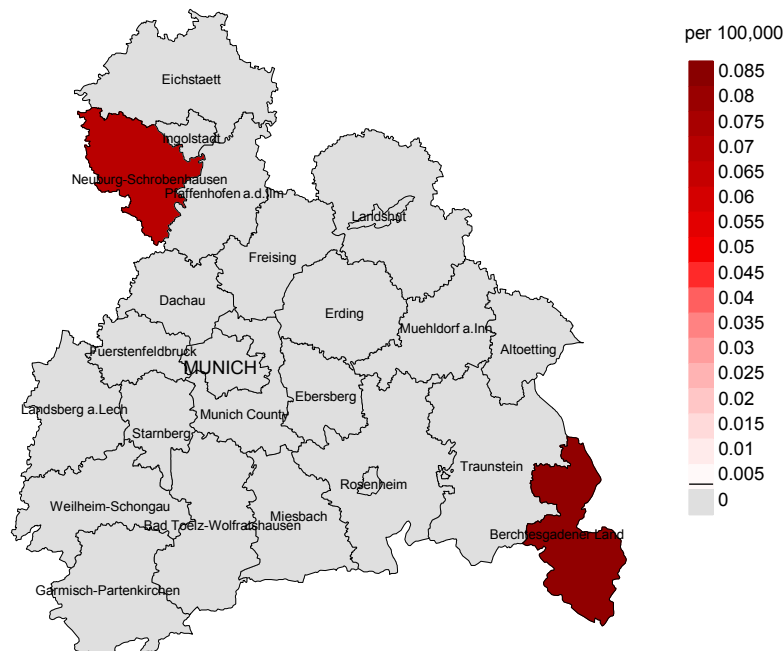
**Figure 17.** Distribution of age at death (bars; males: mean=55.3 yrs, median=49.4 yrs; females: mean=84.2 yrs, median=84.2 yrs) and age-specific mortality (all patients: solid line, patients with single primaries: dotted line). The age-specific incidence is additionally plotted for comparison (dashed line).

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

Average mortality (Germany 1987 standard population) 2007 - 2019: Males



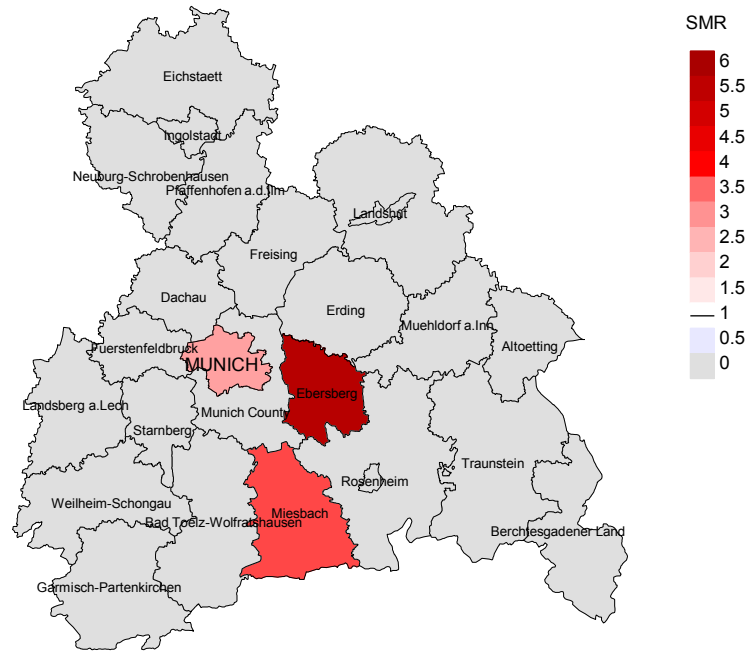
Average mortality (Germany 1987 standard population) 2007 - 2019: Females



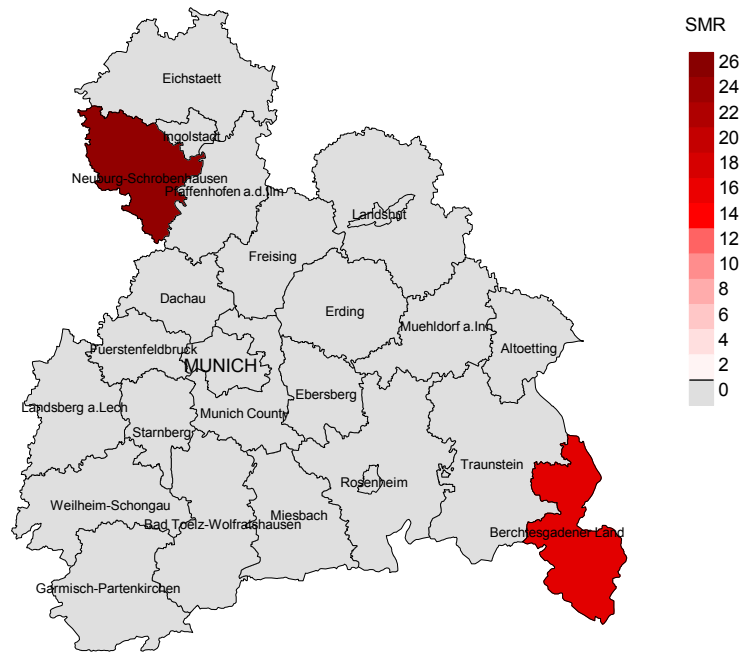
**Figure 18a.** Map of cancer mortality (german standard population) by county averaged for period 2007 to 2019. According to their individual mortality rates, the counties are displayed in different red and blue hues, being the fine white color attributed to the population mean (males 0.0/100,000 WS N=12, females 0.0/100,000 WS N=2).

The results should be interpreted with caution! E.g., in county Ebersberg with a population of 67,462 female residents (averaged) in the period from 2007 to 2019 a total of 0 women died from kaposi sarcoma. Therefore, the mean mortality rate for this cancer type in this area can be calculated at 0.0/100,000 (german standard population). Though, the value of this parameter may vary with an underlying probability of 99% between 0.0 and 0.0/100,000.

Standardized mortality ratio (SMR) 2007 - 2019: Males



Standardized mortality ratio (SMR) 2007 - 2019: Females



**Figure 18b.** Map of standardized mortality ratio (SMR, incl. DCO cases) by county averaged for period 2007 to 2019. According to their individual SMR values, the counties are displayed in different red and blue hues, being the fine white color attributed to the population overall of 1.0 (males N=12, females N=2).

The results should be interpreted with caution! E.g., in county Ebersberg with a population of 67,153 female residents (averaged) in the period from 2007 to 2019 a total of 0 women died from kaposi sarcoma. Therefore, the mean standardized mortality ratio (SMR) for this cancer type in this area can be calculated at 0.00. Though, the value of this parameter may vary with an underlying probability of 99% between 0.00 and 103.95, 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 ratio of mortality and incidence (mortality-to-incidence ratio, **MIR, MI-Index**) is a statistical index 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 MIR. 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**

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

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