# **Munich Cancer Registry**



- Survival
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# ICD-10 C72: Spinal cord cancer

# **Incidence and Mortality**

Year of diagnosis	1998-2014
Patients	120
Diseases	120
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/bC72\_E-ICD-10-C72-Spinal-cord-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<sup>#</sup>, with a total of 4.64 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.

Munich Cancer Registry, April 2016

- <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 2.51 million to 3.96 in 2002, and to 4.52 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.
- ### 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
C72	Malignant neoplasm of spinal cord, cranial nerves and other parts of central nervous system
C72.0	Spinal cord
C72.1	Cauda equina
C72.2	Olfactory nerve
C72.3	Optic nerve
C72.4	Acoustic nerve
C72.5	Other and unspecified cranial nerves
C72.8	Overlapping lesion of brain and other parts of central nervous system
C72.9	Central nervous system, unspecified

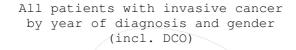
# INCIDENCE

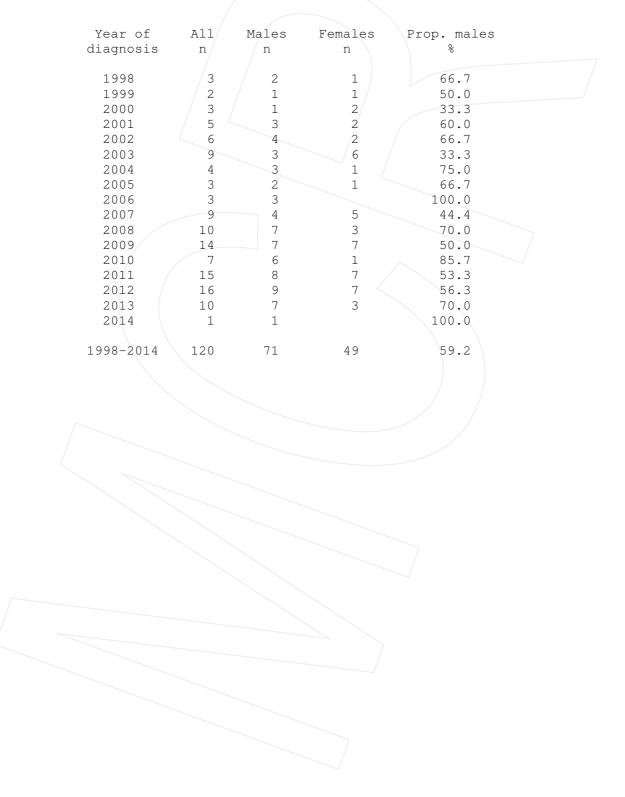
			Table	1		
All	patients	with inv	asive can	cer by year o	f diagnosi	s,
proportion	s of DCO,	multiple		s, deaths, an	d active f	ollow-up
			(incl. D	CO)		
				Prop.		Prop.
		DCO	Prop.	mult.	Prop.	actively
Year of	Cases	cases	DCO	primaries	deaths	followed
diagnosis	n	n	90	8	%	8
2						
1998	3					100.0
1999	2				50.0	100.0
2000	3				33.3	66.7
2001	5			20.0	60.0	100.0
2002	6			16.7	33.3	83.3 #
2003	9			22.2	44.4	100.0
2004	4			25.0	50.0	100.0
2005	3			33.3	33.3	100.0
2006	3					66.7
2007	9			11.1	22.2	66.7 <b>#</b>
2008	10	1	10.0	10.0	30.0	40.0
2009	14			7.1	14.3	35.7
2010	7				42.9	71.4
2011	15			20.0	20.0	53.3
2012	16			25.0	56.3	81.3
2013	10				10.0	100.0
2014	1			100.0		100.0 ##
1998-2014	120	1	0.8	14.2	30.8	72.5

- # 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 la





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)

			Males	Fem.	Males	Fem.	Males	Fem.	Males	Fem.
Year of	Males	Females	Inc.	Inc.	Inc.	Inc.	Inc.	Inc.	Inc.	Inc.
diagnosis	n	n	raw	raw	WS	WS	ES	ES	BRD-S	BRD-S
2										
1998	2	1	0.2	0.1	0.3	0.1	0.2	0.1	0.1	0.1
1999	1	1 /	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
2000	1	2 /	0.1	0.2	0.0	0.1	0.1	0.1	0.1	0.1
2001	3	2	0.3	0.2	0.2	0.1	0.2	0.2	0.3	0.2
2002	4	2	0.2	0.1	0.2	0.1	0.2	0.1	0.3	0.1
2003	3	6	0.2	0.3	0.1	0.2	0.2	0.3	0.2	0.3
2004	3	1	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.1
2005	2	1	0.1	0.1	0.1	0.0	0.1	0.0	0.1	0.0
2006	3		0.2		0.1		0.1		0.1	
2007	4	5	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.2
2008	7	3	0.3	0.1	0.3	0.1	0.3	0.1	0.3	0.1
2009	7	7	0.3	0.3	0.2	0.3	0.3	0.3	0.3	0.3
2010	6	1	0.3	0.0	0.3	0.1	0.3	0.1	0.2	0.0
2011	8	7	0.4	0.3	0.4	0.2	0.4	0.2	0.3	0.2
2012	9	7	0.4	0.3	0.3	0.2	0.3	0.3	0.4	0.3
2013	7	3	0.3	0.1	0.3	0.2	0.3	0.2	0.3	0.1
2014	1		0.0		0.0		0.0		0.0	
1998-2014	71	49	0.2	0.1	0.2	0.1	0.2	0.1	0.2	0.1

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

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

Year of	Cases		Std.					Median		
diagnosis	n	Mean	dev.	Min.	Max.	10%	25%	50%	75%	90%
a1a9110010		moun				- 0 0	200	000	100	500
1998	3	30.5	24.1	3.4	49.8	3.4	3.4	38.1	49.8	49.8
1999	2	53.4	28.9	33.0	73.8	33.0	33.0	53.4	73.8	73.8
2000	3	56.8	0.2	56.5	56.9	56.5	56.5	56.9	56.9	56.9
2001	5	55.8	21.2	37.2	87.6	37.2	39.7	47.8	66.8	87.6
2002	6	51.8	21.8	22.5	75.3	22.5	28.9	56.3	71.9	75.3
2003	9	48.8	15.3	28.8	74.6	28.8	39.2	48.9	55.1	74.6
2004	4	45.3	32.4	4.4	77.3	4.4	19.9	49.9	70.8	77.3
2005	3	55.1	27.1	25.0	77.7	25.0	25.0	62.8	77.7	77.7
2006	3	52.1	22.7	26.4	69.6	26.4	26.4	60.3	69.6	69.6
2007	9	35.4	25.0	0.8	70.6	0.8	26.8	30.0	60.6	70.6
2008	10	48.1	20.9	8.6	77.7	20.4	33.5	54.3	57.4	75.4
2009	14	40.9	15.9	3.6	71.9	21.1	35.2	42.8	49.0	53.6
2010	7	36.4	26.1	2.7	67.4	2.7	4.0	41.5	64.5	67.4
2011	15	46.8	21.0	1.7	76.5	9.2	37.8	47.4	67.1	70.1
2012	16	58.5	21.5	8.0	84.3	18.0	57.1	62.4	71.3	78.4
2013	10	34.9	20.1	2.7	57.9	4.0	20.4	39.4	54.1	56.6
2014	1	56.6		56.6	56.6	56.6	56.6	56.6	56.6	56.6
1998-2014	120	46.4	21.5	0.8	87.6	8.9	33.3	48.8	62.3	73.2

#### Table 3a

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

Year of	Cases		Std.					Median		
diagnosis	n	Mean	dev.	Min.	Max.	10%	25%	50%	75%	90%
-										
1998	2	20.8	24.5	3.4	38.1	3.4	3.4	20.8	38.1	38.1
1999	1	73.8		73.8	73.8	73.8	73.8	73.8	73.8	73.8
2000	1	56.5		56.5	56.5	56.5	56.5	56.5	56.5	56.5
2001	3	63.9	25.3	37.2	87.6	37.2	37.2	66.8	87.6	87.6
2002	4	49.6	27.8	22.5	75.3	22.5	25.7	50.4	73.6	75.3
2003	3	39.7	11.1	28.8	51.1	28.8	28.8	39.2	51.1	51.1
2004	3	59.0	21.4	35.4	77.3	35.4	35.4	64.3	77.3	77.3
2005	2	51.3	37.2	25.0	77.7	25.0	25.0	51.3	77.7	77.7
2006	3	52.1	22.7	26.4	69.6	26.4	26.4	60.3	69.6	69.6
2007	4	34.6	28.6	1.9	70.6	1.9	14.3	32.9	54.8	70.6
2008	7	48.3	24.6	8.6	77.7	8.6	32.1	55.5	73.0	77.7
2009	7	40.7	9.9	21.1	53.6	21.1	38.3	41.7	44.6	53.6
2010	6	42.0	23.5	4.0	67.4	4.0	29.7	43.0	64.5	67.4
2011	8	38.0	22.9	1.7	69.3	1.7	23.4	39.9	53.3	69.3
2012	9	58.6	21.0	18.0	84.3	18.0	58.7	63.0	69.3	84.3
2013	7	37.7	18.9	5.4	57.9	5.4	20.4	42.9	55.3	57.9
2014	1	56.6		56.6	56.6	56.6	56.6	56.6	56.6	56.6
1998-2014	71	46.2	22.0	1.7	87.6	18.0	31.1	44.6	64.5	73.4

#### Table 3b

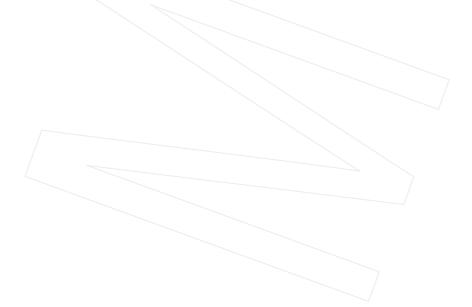
# Age distribution parameters by year of diagnosis (FEMALES) (incl. DCO)

Year of	Cases		Std.					Median			
	Cases										
diagnosis	n	Mean	dev.	Min.	Max.	10%	25%	50%	75%	90%	
1998	1	49.8		49.8	49.8	49.8	49.8	49.8	49.8	49.8	
1999	1	33.0		33.0	33.0	33.0	33.0	33.0	33.0	33.0	
2000	2	56.9	0.1	56.9	56.9	56.9	56.9	56.9	56.9	56.9	
2001	2	43.8	5.8	39.7	47.8	39.7	39.7	43.8	47.8	47.8	
2002	2	56.3	0.1	56.2	56.3	56.2	56.2	56.3	56.3	56.3	
2003	6	53.4	15.8	33.7	74.6	33.7	40.1	52.0	68.1	74.6	
2004	1	4.4		4.4	4.4	4.4	4.4	4.4	4.4	4.4	
2005	1	62.8		62.8	62.8	62.8	62.8	62.8	62.8	62.8	
2007	5	36.0	25.3	0.8	60.7	0.8	27.7	30.0	60.6	60.7	
2008	3	47.5	12.2	33.5	55.9	33.5	33.5	53.1	55.9	55.9	
2009	7	41.1	21.3	3.6	71.9	3.6	30.1	47.0	51.1	71.9	
2010	1	2.7		2.7	2.7	2.7	2.7	2.7	2.7	2.7	
2011	7	56.7	14.2	40.2	76.5	40.2	44.4	50.2	70.1	76.5	
2012	7 /	58.4	23.7	8.0	78.4	8.0	55.4	61.7	76.7	78.4	
2013	3	28.6	25.7	2.7	54.1	2.7	2.7	29.0	54.1	54.1	
1998-2014	49	46.7	21.0	0.8	78.4	4.4	33.7	50.2	60.7	71.9	

Age at diagnosis	Cases			Males			Females		
Years	n	00	Cum.%	n	00	Cum.%	n	00	Cum.%
10410		Ŭ	o unit o	/	Ū	0 4 0		Ũ	
0-4	7	8.5	8.5	3	6.1	6.1	4	12.1	12.1
5-9	4	4.9	13.4	3	6.1	12.2	1	3.0	15.2
10-14	0	0.0	13.4			12.2			15.2
15-19	1	1.2	14.6	1	2.0	14.3			15.2
20-24	2	2.4	17.1	2	4.1	18.4			15.2
25-29	4	4.9	22.0	2	4.1	22.4	2	6.1	21.2
30-34	6	7.3	29.3	3	6.1	28.6	3	9.1	30.3
35-39	6	7.3	36.6	5	10.2	38.8	1	3.0	33.3
40-44	10	12.2	48.8	8	16.3	55.1	2	6.1	39.4
45-49	5	6.1	54.9	2	4.1	59.2	3	9.1	48.5
50-54	5	6.1	61.0	1	2.0	61.2	4	12.1	60.6
55-59	9	11.0	72.0	7	14.3	75.5	2	6.1	66.7
60-64	7	8.5	80.5	3	6.1	81.6	4	12.1	78.8
65-69	6	7.3	87.8	4	8.2	89.8	2	6.1	84.8
70-74	5	6.1	93.9	3	6.1	95.9	2	6.1	90.9
75-79	4	4.9	98.8	1	2.0	98.0	3	9.1	100.0
80-84	1	1.2	100.0	1	2.0	100.0			100.0
85+	0	0.0	100.0			100.0			100.0
All ages	82	100.0		49	100.0		33	100.0	

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

Included in the statistics are 18.4% multiple primaries in males and 18.2% in females.

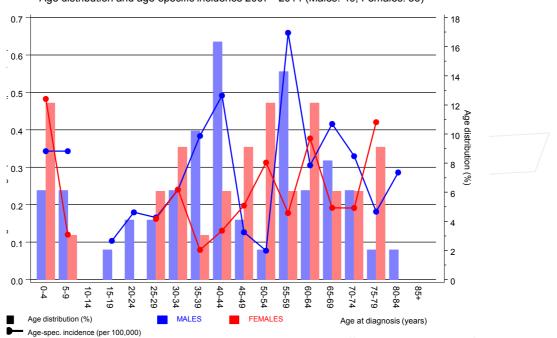


Age-specific incidence, DCO rate and proportion of all cancers for period 2007-2014

Ngo ot				Females			Males Prop.all	-
Age at	Malaa	Demoles	/ =	Age-		DCO rate		cancers
diagnosis			/ =	spec.	n=1 %	n=0	n=91183 %	n=89596
Years	n	n	incia.	incid.	0	010	0	00
0- 4	2	4	0.3	0.5			1.7	2.9
0 - 4 5 - 9	3 3	4	0.3					
	3	1 /					3.1	1.3
10-14	1		0.0	0.0			0 5	
15-19	1		0.1	0.0			0.5	
20-24	2	0	0.2	0.0			0.5	0 0
25-29	2	2	0.2	0.2			0.4	0.3
30-34	3	3	0.2	0.2			0.4	0.3
35-39	5	1	0.4	0.1			0.4	0.1
40-44	8	2	0.5	0.1			0.4	0.1
45-49	2	3	0.1	0.2			0.1	0.1
50-54	1	4	0.1	0.3			0.0	0.1
55-59	7	2	0.7	0.2			0.1	0.0
60-64	3	4	0.3	0.4			0.0	0.0
65-69	4	2	0.4	0.2			0.0	0.0
70-74	3	2	0.3	0.2			0.0	0.0
75-79	1	3	0.2	0.4	100.0		0.0	0.0
80-84	1		0.3	0.0			0.0	
85+			0.0	0.0				
All ages	49	33			2.0	0.0	0.1	0.0
Incidence								
Raw			0.3	0.2				
WS			0.3	0.2				
ES			0.3	0.2				
BRD-S			0.3	0.2				

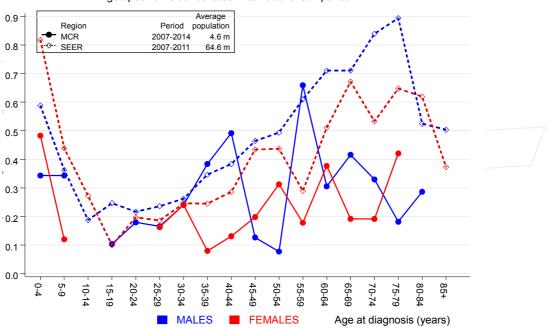
The age-specific incidence characterizes the disease risk in a particular age group. The age distribution depends on the patient population frequency in each age group and reflects the tangible clinical picture of everyday patients care (see following chart).





C-10 C72: Malignant neoplasm of spinal cord, cranial nerves and other parts of central nervous system Age distribution and age-specific incidence 2007 - 2014 (Males: 49, Females: 33)

Figure 6. Age distribution and age-specific incidence



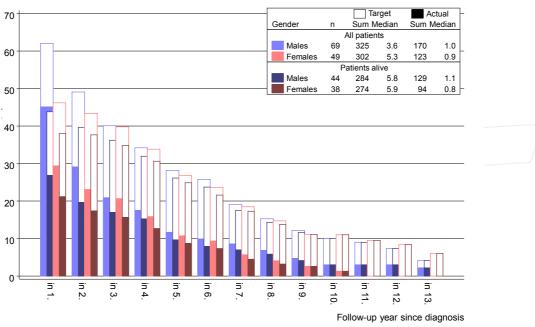
D-10 C72: Malignant neoplasm of spinal cord, cranial nerves and other parts of central nervous system: Age-specific incidence rates: international comparison

**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.



:D-10 C72: Malignant neoplasm of spinal cord, cranial nerves and other parts of central nervous system Cumulative follow-up years since diagnosis for period 1998 - 2014 (excl. DCO)

### 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 Observed Expected LCL UCL DCO Diagnosis SIR 95% 95% EAR 8 n n Other primaries 3 0.1 25.9 5.3 75.7 # 169.3 Not observed 0 0.0 -62.8 1.1 0.0 3.4

0.5 All mult. primaries 3 1.2 2.5 7.4 Patients 69 Median age at second malignancy (years) 61.1 170 Person-years 2.5 Mean observation time (years) Median observation time (years) 1.0

# The occurrence of second malignancy is statistically significant.

Observed second primaries with count 1 are pooled in category "Other primaries"

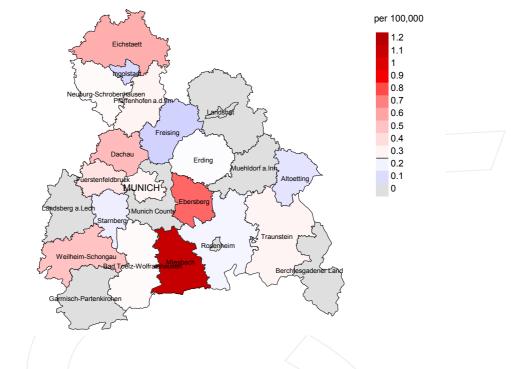
106.5

Table 8b

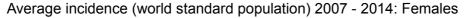
#### Standardized incidence ratio (SIR, with 95% confidence limits), excess absolute risk (EAR) and DCO rate of second primaries for period 1998-2014 FEMALES Observed Expected LCL UCL DCO Diagnosis SIR 95% 95% n EAR n Other primaries /1 0.0 24.6 0.6 136.9 78.2 -48.2 Not observed 0 0.6 0.0 0.0 6.2 8.8 All mult. primaries 1 0.6 1.6 0.0 30.0 Patients 49 Median age at second malignancy (years) 51.4 123 Person-years 2.5 Mean observation time (years) Median observation time (years) 0.9

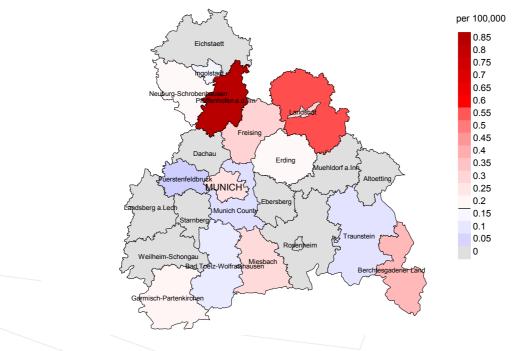
# The occurrence of second malignancy is statistically significant.

Observed second primaries with count 1 are pooled in category "Other primaries"



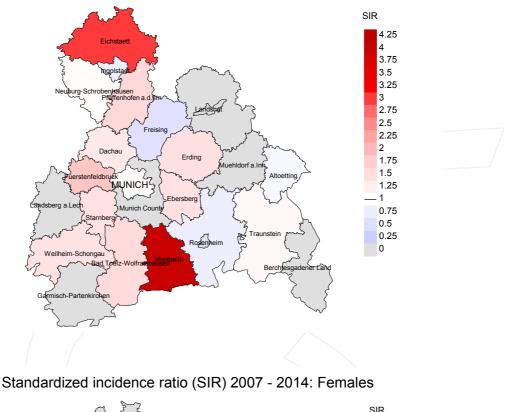
Average incidence (world standard population) 2007 - 2014: Males



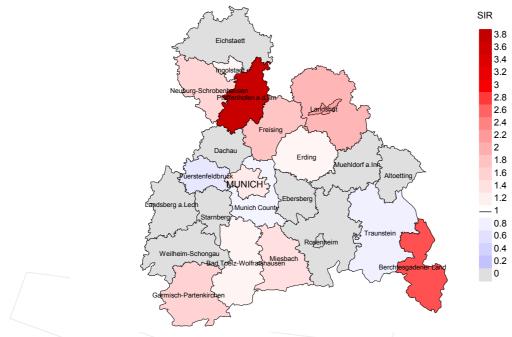


**Figure 9a.** Map of cancer incidence (world standard population, incl. DCO cases) by county averaged for period 2007 to 2014. According to their individual incidence rates, the counties are displayed in different red and blue color temperatures where the fine white color indicates the population mean (males 0.3/100,000 WS N=49, females 0.2/100,000 WS N=33).

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 0 women were identified with newly diagnosed spinal cord cancer. Therefore, the mean incidence 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 1.0/100,000.



Standardized incidence ratio (SIR) 2007 - 2014: Males



**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=49, females N=33).

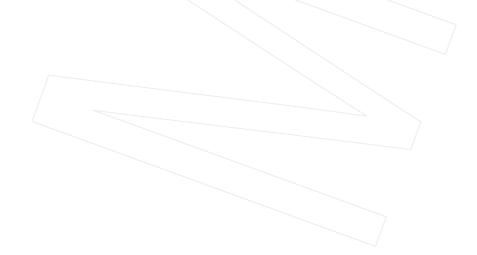
The results should be interpreted with caution! E.g., in county Ebersberg with a population of 64,924 female residents (averaged) in the period from 2007 to 2014 a total of 0 women were identified with newly diagnosed spinal cord cancer. Therefore, the mean standardized incidence ratio (SIR) for this 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 5.79, 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)

						Prop.
		Prop.				deaths
	Incident	actively	Prop.		Prop.	with death
Year of	cases	followed	DCO	Deaths	deaths	certific.
diagnosis	n	00	00	n	0/0	00
1998	3	100.0				
1999	2	100.0		1	50.0	100.0
2000	3 5	66.7		1	33.3	100.0
2001	5	100.0		3	60.0	100.0
2002	6	83.3		2 4	33.3	100.0
2003	9	100.0		4	44.4	100.0
2004	4	100.0		2	50.0	100.0
2005	3	100.0		1	33.3	100.0
2006	3	66.7				
2007	9	66.7		2	22.2	100.0
2008	10	40.0	10.0	3	30.0	100.0
2009	14	35.7		2	14.3	100.0
2010	7	71.4		3	42.9	100.0
2011	15	53.3		3	20.0	100.0
2012	16	81.3		9	56.3	88.9
2013	10	100.0		1	10.0	100.0
2014	1	100.0				
1998-2014	120	72.5	0.8	37	30.8	97.3



#### 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)

			Prop.		
			deaths		Prop.
Year of	Incident		with death	Deaths in	deaths in
diagnosis/	cases	Deaths	certific.	same year	same year
death	n	n	00	n	00
1998	3	1	100.0		
1999	2				
2000	3				
2001	5	1	100.0		
2002	6	2	100.0	1	16.7
2003	9	2	100.0	1	11.1
2004	4	2	100.0		
2005	3	1	100.0	_ 1	33.3
2006	3	3	100.0		
2007	9	3	100.0		
2008	10	2	100.0	1	10.0
2009	14	4	100.0	1	7.1
2010	7	4	100.0	1	14.3
2011	15	4	100.0		
2012	16	5	80.0	2	12.5
2013	10	8	100.0	1	10.0
2014	1	3	100.0		
1998-2014	120	45	97.8	9	7.5

#### Table 10c

Annual cohorts of deaths, proportion of cancer-related and non-cancerrelated 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)

				Prop.	
				cancer	
		Prop.	Prop.	recorded	
		cancer-	non-cancer-	on death	
Year of	Deaths	related	related	certificate	
death	n	8	%	%	
acach	11	0	0	0	
1998	1	100.0		100.0	
1999	T	100.0		100.0	
2000					
2000	1	100.0		100.0	
2001	2	100.0		100.0	
2002	2	100.0		100.0	
2003	2		F.O. 0	50.0	
		50.0	50.0		
2005	1	100.0		100.0	
2006	3	100.0		100.0	
2007	3	33.3	66.7	100.0	
2008	2	100.0		100.0	
2009	4	75.0	25.0	75.0	
2010	4	75.0	25.0	75.0	
2011	4	100.0		100.0	
2012	5	80.0	20.0	100.0	
2013	8 3	75.0	25.0	100.0	
2014	3	100.0		100.0	
1998-2014	45	82.2	17.8	93.2	



					Age at
		Age at	Age at	Age at	death
		death	death	death	(according
		(all	(cancer-	(non-cancer-	to death
Year of	Deaths	causes)	related)	related)	certificate)
death	n	Years	Years	Years	Years
1998	1	29.3	29.3		29.3
1999					
2000					
2001	1	75.4	75.4		75.4
2002	2	58.9	58.9		58.9
2003	2	45.5	45.5		45.5
2004	1	90.8		90.8	
2005	1	77.9	77.9		77.9
2006					
2007	1	79.5	79.5		79.5
2008	2	75.1	75.1		75.1
2009	1 2 3 2 4 1	44.0	26.6	75.4	26.6
2010	2	43.5	43.5		43.5
2011	4	55.7	55.7		55.7
2012	1	69.9	69.9		69.9
2013	6	61.4	61.2	61.6	61.4
2014	3	64.0	64.0		64.0
1998-2014	30	62.8	61.2	75.4	61.4

#### Table 11a

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

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.

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 2001 2002 2003					
2004 2005	1	68.5	68.5		68.5
2005 2006 2007 2008	3 2	63.1 84.7	63.1	84.7	63.1 84.7
2009 2010 2011	1 2	2.5 71.7	2.5 64.1	79.2	2.5 64.1
2012 2013 2014	4 2	57.8 65.2	38.5 68.2	78.7 62.2	38.5 65.2
1998-2014	15	68.2	63.6	79.2	64.1

#### Table 11b

Medians of age at death according to the grouping in Table 10  $${\rm FEMALES}$$ 

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.

Year of	Deaths	Mort.	MI-Index	Mort.	MI-Index	Mort.	MI-Index	Mort.	MI-Index
death	n	raw	raw	WS	WS	ES	ES	BRD-S	BRD-S
1998	1	0.1	0.50	0.1	0.35	0.1	0.39	0.1	0.61
1999									
2000									
2001	1	0.1	0.33	0.0	0.26	0.1	0.35	0.1	0.57
2002	2	0.1	0.50	0.1	0.32	0.1	0.42	0.1	0.42
2003	2	0.1	0.67	0.1	0.53	0.1	0.63	0.1	0.59
2004									
2005	1	0.1	0.50	0.0	0.23	0.0	0.40	0.1	0.51
2006									
2007	1	0.0	0.25	0.0	0.07	0.0	0.17	0.1	0.33
2008	2	0.1	0.29	0.0	0.13	0.1	0.20	0.1	0.29
2009	2	0.1	0.29	0.1	0.50	0.1	0.36	0.1	0.27
2010	2	0.1	0.33	0.1	0.25	0.1	0.35	0.1	0.38
2011	4	0.2	0.50	0.1	0.26	0.1	0.34	0.1	0.42
2012	1	0.0	0.11	0.0	0.09	0.0	0.10	0.0	0.10
2013	5	0.2	0.71	0.2	0.69	0.2	0.66	0.2	0.71
2014	3	0.1	3.00	0.1	2.72	0.1	2.36	0.1	2.70
1998-2014	27	0.1	0.38	0.1	0.31	0.1	0.35	0.1	0.39

#### Table 12a

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

Table 12b

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

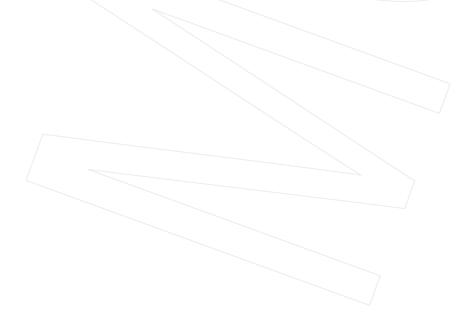
Year of	Deaths	Mort.	MI-Index	Mort. M	1I-Index	Mort. M	II-Index	k Mort. N	1I-Index
death	n	raw	raw	WS	WS	ES	ES	BRD-S	BRD-S
1998									
1999									
2000									
2001									
2002									
2003									
2004	1	0.1	1.00	0.0	0.19	0.0	0.38	0.0	0.68
2005									
2006	3	0.1		0.1		0.1		0.2	
2007									
2008									
2009	1	0.0	0.14	0.1	0.38	0.1	0.25	0.0	0.16
2010	1	0.0	1.00	0.0	0.26	0.0	0.48	0.0	0.86
2011									
2012	3	0.1	0.43	0.1	0.56	0.1	0.50	0.1	0.52
2013	1	0.0	0.33	0.0	0.13	0.0	0.20	0.0	0.26
2014									
1998-2014	10	0.0	0.20	0.0	0.20	0.0	0.19	0.0	0.21

Age at									
death	Cases			Males			Females		
Years	n	00	Cum.%	n	010	Cum.%	n	010	Cum.%
0-4	1	3.8	3.8			0.0	1	16.7	16.7
5-9	1	3.8	7.7	1	5.0	5.0			16.7
10-14	1	3.8	11.5	1	5.0	10.0			16.7
15-19	1	3.8	15.4			10.0	1	16.7	33.3
20-24	1	3.8	19.2	1	5.0	15.0			33.3
25-29	0	0.0	19.2			15.0			33.3
30-34	1	3.8	23.1	1	5.0	20.0			33.3
35-39	1	3.8	26.9			20.0	1	16.7	50.0
40 - 44	2	7.7	34.6	2	10.0	30.0			50.0
45-49	1	3.8	38.5	1	5.0	35.0			50.0
50-54	0	0.0	38.5			35.0			50.0
55-59	1	3.8	42.3	1	5.0	40.0			50.0
60-64	4	15.4	57.7	3	15.0	55.0	1	16.7	66.7
65-69	4	15.4	73.1	3	15.0	70.0	1	16.7	83.3
70-74	4	15.4	88.5	4	20.0	90.0			83.3
75-79	3	11.5	100.0	2	10.0	100.0	1	16.7	100.0
80-84	0	0.0	100.0			100.0			100.0
85+	0	0.0	100.0			100.0			100.0
All ages	26	100.0		20	100.0		6	100.0	

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

Table 13

Included in the statistics are 18.4% multiple primaries in males and 18.2% in females.



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

Age at death	Males F	emales	Males Age- spec.		Females Age- spec.		Males Prop.all cancers	Females Prop.all cancers
Years	n	n		MI-index		MI-index		90
$ \begin{array}{rrrr} 0 - & 4 \\ 5 - & 9 \\ 1 0 - 1 4 \end{array} $	1 1	1	0.0 0.1 0.1	0.33	0.1 0.0 0.0	0.25	4.8 5.6	6.7
15-19 20-24 25-29	1	1	0.0 0.1 0.0		0.1 0.0 0.0	1.00	2.1	4.5
30-34 35-39	1	1	0.1		0.0 0.1	1.00	1.1	0.4
40-44 45-49 50-54	2 1		0.1 0.1 0.0	0.50	0.0 0.0 0.0		0.4 0.1	
55-59 60-64 65-69	1 3 3	1 1	0.1 0.3 0.3	1.00 0.75	0.0 0.1 0.1	0.25 0.50	0.0 0.1 0.0	0.0
70-74 75-79 80-84 85+	4 2	1	0.4 0.4 0.0 0.0	1.33 2.00	0.0 0.1 0.0 0.0	0.33	0.0	0.0
All ages	20	6					0.0	0.0
Mortality Raw WS ES BRD-S			0.1 0.1 0.1 0.1	0.33 0.36	0.0 0.0 0.0 0.0	0.18 0.21 0.19 0.20		
PYLL-70 per 100,000 ES AYLL-70			2.0 2.1 23.2		1.0 1.4 32.5			

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

Table	15a
TUDIC	1Ju

Multiple primaries in deaths in period 1998-2014  $$\rm MALES$$ 

Diagnosis C16 Stomach C25 Pancreas C33-C34 Lung C43 Malign. melanoma C61 Prostate C62 Testis C69 Eye sarcoma C70-C72 CNS cancer C76-C79 CUP C82-C85 NHL	Total n 1 1 1 3 2 1 1 1 1 1 1	Total %↓ 7.7 7.7 7.7 23.1 15.4 7.7 7.7 7.7 7.7 7.7 7.7	Pre n 1 1	Pre ** 33.3 50.0 100.0	Syn- chron ±30d n	Syn- chron ±30d ←%	Post n 1 1 2 1 1 1 1 1 1	Post ←% 100.0 100.0 66.7 50.0 100.0 100.0 100.0 100.0
All mult. primaries	13	100.0	3	23.1		7.7	9	69.2

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.

MCR

	Multiple	primaries	s in de FEM	aths in ALES	period	1998-2014	4	
Diagnosis	Total n	Total %↓	Pre n	Pre ←%	Syn- chron ±30d n	Syn- chron ±30d ←%	Post n	Post ←%
C18 Cold	on 1	100.0					1	100.0

Table 15b

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.

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

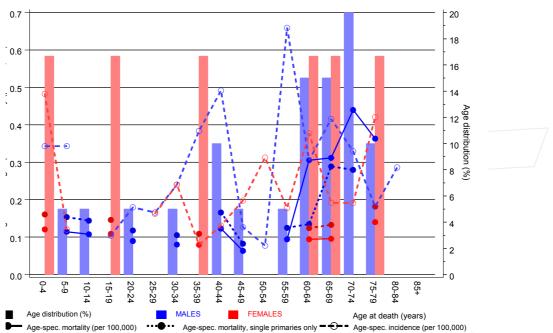
			Males		Females		Males	Females
Age at			Age-		Age-		Prop.all	Prop.all
death	Males Fe	emales	spec.		spec.		cancers	cancers
Years	n	n	mortal.	MI-index	mortal.	MI-index	010	90
0-4		1	0.0		0.1	0.22		7.7
5-9	1		0.1	0.29	0.0		5.0	
10-14	1		0.1	1.00	0.0		5.6	
15-19		1	0.0		0.1	1.00		5.0
20-24	1		0.1	0.44	0.0		2.3	
25-29			0.0		0.0			
30-34	1		0.1	0.29	0.0		1.2	
35-39		1	0.0		0.1	0.88		0.4
40-44	2		0.1		0.0		0.5	
45-49	1		0.1		0.0		0.1	
50-54	-		0.0	0.15	0.0		0.1	
55-59	1		0.1	0.15	0.0		0.0	
60-64	3	1	0.3	1.31	0.1	0.29	0.1	0.0
65-69	3	1 1	0.3		0.1	0.44	0.1	0.0
70-74	3	Ť	0.3		0.0	0.11	0.0	0.0
75-79	1	1	0.2	1.00	0.0	0.43	0.0	0.0
80-84	± \	1	0.2	1.00	0.0	0.43	0.0	0.0
85+			0.0		0.0			
0.0+			0.0		0.0			
	1.0	6					0.0	0.0
All ages	18	ю					0.0	0.0
March a 7 these								
Mortality			0 1	0.05	0.0	0.10		
Raw			0.1		0.0	0.19		
WS			0.1	0.28	0.0	0.20		
ES			0.1	0.31	0.0	0.19		
BRD-S			0.1	0.34	0.0	0.20		
PYLL-70								
	,		2.0		1 0			
per 100,000	)		2.0		1.0			
ES AVII 70					1.4			
AYLL-70			23.2		32.5			

## \* See corresponding tables with multiple primaries.

#### Age-specific mortality (cancer-related) and proportion of all cancers for period 2009-2014 (Single primaries only \*)

			Males		Females		Males	Females
Age at			Age-		Age-		Prop.all	Prop.all
death	Males Fe	emales	spec.		spec.		cancers	cancers
Years	n	n	mortal.	MI-index	mortal.	MI-index	010	90
0- 4		1 /	0.0		0.2	0.29		7.7
5-9	1		0.2	0.39	0.0		5.0	
10-14	1		0.1	1.00	0.0		5.6	
15-19		1	0.0		0.1	1.00		5.6
20-24	1		0.1	0.57	0.0		2.6	
25-29			0.0		0.0			
30-34	1		0.1	0.38	0.0		1.2	
35-39		1	0.0		0.1	1.21		0.5
40 - 44	2		0.2	0.30	0.0		0.5	
45-49	1 /		0.1	0.57	0.0		0.1	
50-54			0.0		0.0			
55-59	1 /		0.1	0.23	0.0		0.0	
60-64	1	1	0.1	0.58	0.1	0.38	0.0	0.0
65-69	2	1 1	0.3	0.61	0.1	0.61	0.0	0.0
70-74	2		0.3	2.20	0.0		0.0	
75-79		1	0.0		0.2	0.57		0.0
80-84			0.0		0.0			
85+			0.0		0.0			
All ages	13	6					0.0	0.0
Mortality								
Raw			0.1		0.0	0.25		
WS			0.1	0.31	0.0	0.27		
ES			0.1	0.33	0.0	0.25		
BRD-S			0.1	0.34	0.0	0.26		
PYLL-70								
per 100,000			2.6		1.4			
ES 200,000			2.7		1.8			
AYLL-70			28.0		32.5			
			20.0		52.5			

## \* See corresponding tables with multiple primaries.

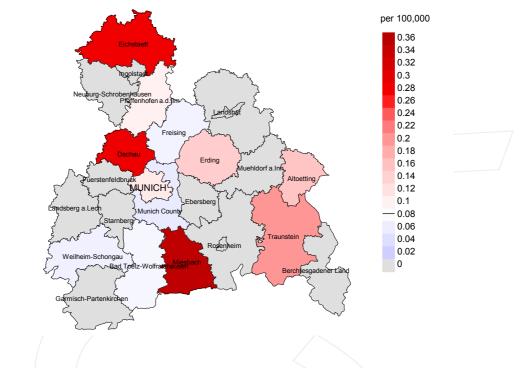


C-10 C72: Malignant neoplasm of spinal cord, cranial nerves and other parts of central nervous system Age distribution and age-specific mortality 2009 - 2014 (Males: 20, Females: 6)

**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).

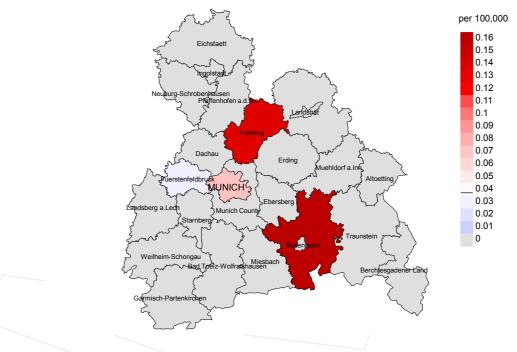
The difference between age at diagnosis (Table 3) and age at spinal cord cancer-related death (see Table 10) should be considered.





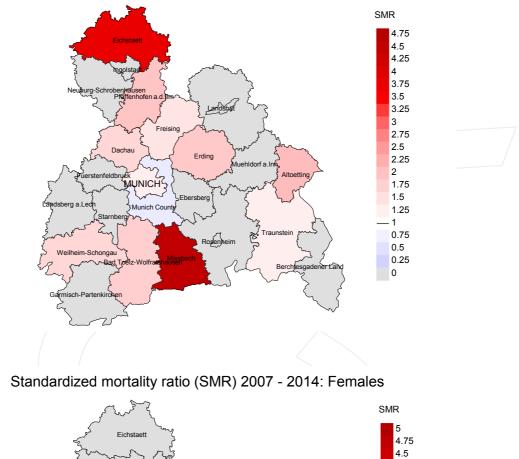
Average mortality (world standard population) 2007 - 2014: Males

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

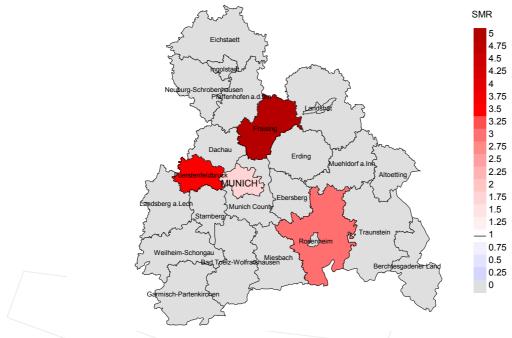


**Figure 19a.** Map of cancer mortality (world standard population) by county averaged for period 2007 to 2014. According to their individual mortality rates, the counties are displayed in different red and blue color temperatures where the fine white color indicates the population mean (males 0.1/100,000 WS N=20, females 0.0/100,000 WS N=6).

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 0 women died from spinal cord 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 1.0/100,000.



Standardized mortality ratio (SMR) 2007 - 2014: Males



**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=20, females N=6).

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 0 women died from spinal cord cancer. 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 31.16, 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 GEKID	Federal Republic of Germany Association of Population-based Cancer Registries in Germany (Gesellschaft der epidemiologischen Krebsregister in Deutschland e.V.)
MCR SEER	Munich Cancer Registry (Tumorregister München) 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

#### **Recommended Citation**

Munich Cancer Registry. ICD-10 C72: Spinal cord cancer - Incidence and Mortality [Internet]. 2016 [updated 2016 Apr 13; cited 2016 Jun 1]. Available from: http://www.tumorregister-

muenchen.de/en/facts/base/bC72\_E-ICD-10-C72-Spinal-cord-cancer-incidence-and-mortality.pdf

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