Munich Cancer Registry



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

ICD-10 C45.0: Pleural mesothelioma

Incidence and Mortality

Year of diagnosis	1998-2014
Patients	1,112
Diseases	1,112
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/bC450_E-ICD-10-C45.0-Pleural-mesothelioma-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
C45.0	Mesothelioma of pleura

INCIDENCE

Table 1

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

				Prop.		Prop.
		/DCO /	Prop.	mult.	Prop.	actively
Year of	Cases	cases	DCO	primaries	deaths	followed
diagnosis	n	n	양	%	용	%
1998	29	2	6.9	10.3	100.0	100.0
1999	26	2	7.7	7.7	100.0	100.0
2000	36	19	52.8	11.1	100.0	100.0
2001	39	9	23.1	7.7	100.0	100.0
2002	56	17	30.4	16.1	98.2	100.0 #
2003	59	12	20.3	18.6	98.3	100.0
2004	72	9	12.5	13.9	98.6	98.6
2005	69	8	11.6	20.3	97.1	97.1
2006	69	8	11.6	20.3	94.2	95.7
2007	93	5	5.4	19.4	88.2	92.5 #
2008	97	7	7.2	19.6	96.9	97.9
2009	82	4	4.9	25.6	91.5	95.1
2010	85	8	9.4	28.2	89.4	94.1
2011	88	4	4.5	23.9	81.8	90.9
2012	89	4	4.5	21.3	79.8	93.3
2013	77	10	13.0	23.4	79.2	100.0
2014	46	7	15.2	23.9	41.3	97.8 ##
1998-2014	1112	135	12.1	19.9	89.6	96.5

[#] 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 1a

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

Year of	All	Males	Females	Prop. males	
diagnosis	n	n	n	00	
1998	29	20	9	69.0	
1999	26	20	6 /	76.9	
2000	36	29	7/	80.6	
2001	39	25	14	64.1	
2002	56	43	1/3	76.8	
2003	59	48		81.4	
2004	72	64	8	88.9	
2005	69	55	14	79.7	
2006	69	57	12	82.6	
2007	93	75	18	80.6	
2008	97	78	19	80.4	
2009	82	66	16	80.5	
2010	85	65	20	76.5	
2011	88	74	14	84.1	
2012	89	72	17	80.9	
2013	77	64	13	83.1	
2014	46	37	9	80.4	
1998-2014	1112	892	220	80.2	

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)

			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
1998	20	9	1.8	0.8	1.1	0.4	1.6	0.6	2.1	0.7
1999	20	6	1.8	0.5	1.1	0.2	1.6	0.3	2.0	0.5
2000	29	7 /	2.5	0.6	1.4	0.2	2.2	0.3	2.8	0.4
2001	25	14 <	2.2	1.2	1.3	0.6	1.9	0.8	2.3	1.0
2002	43	13	2.3	0.7	1.3	0.3	1.9	0.5	2.5	0.6
2003	48	11	2.6	0.6	1.4	0.2	2.1	0.3	2.6	0.4
2004	64	8	3.4	0.4	1.7	0.2	2.6	0.3	3.4	0.4
2005	55	14	2.9	0.7	1.5	0.3	2.2	0.5	3.0	0.6
2006	57	12	3.0	0.6	1.5	0.2	2.3	0.4	3.0	0.5
2007	75	18	3.4	0.8	1.7	0.4	2.6	0.5	3.4	0.7
2008	78	19	3.5	0.8	1.7	0.3	2.5	0.4	3.2	0.6
2009	66	16	3.0	0.7	1.4	0.2	2.1	0.4	2.9	0.5
2010	65	20	2.9	0.9	1.3	0.4	2.0	0.5	2.7	0.7
2011	74	14	3.2	0.6	1.5	0.2	2.3	0.3	3.1	0.4
2012	72	17	3.2	0.7	1.4	0.3	2.1	0.4	2.9	0.5
2013	64	13	2.8	0.6	1.3	0.2	2.0	0.3	2.6	0.4
2014	37	\9	1.6	0.4	0.6	0.1	1.0	0.2	1.5	0.2
1998-2014	892	220	2.8	0.7	1.4	0.3	2.1	0.4	2.8	0.5

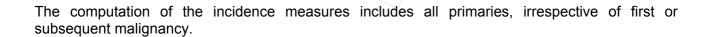


Table 3

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%
1998	29	66.7	10.4	48.8	89.2	51.1	60.1	66.0	70.5	84.0
1999	26	67.3	8.6	50.8	81.3	56.1	60.9	67.5	74.1	80.6
2000	36	69.8	13.3	35.6	92.8	55.9	59.3	68.0	78.7	89.3
2001	39	67.1	9.7	45.6	85.4	54.7	58.8	66.1	73.6	83.0
2002	56	69.0	11.3	46.4	88.5	51,9	61.4	66.7	77.0	84.9
2003	59	70.3	10.6	30.7	91.2	58.9	63.7	70.1	77.8	82.6
2004	72	70.8	7.6	53.1	90.1	63.1	65.6	69.8	74.8	81.7
2005	69	70.7	9.2	45.1	88.3	58.9	64.7	70.7	77.1	83.5
2006	69	69.9	9.7	40.6	87.8	57.0	64.9	70.6	77.2	81.7
2007	93	69.2	9.6	40.3	92.4	55.4	64.5	70.3	76.0	79.6
2008	97	71.9	9.0	42.4	88.1	61.5	67.2	71.9	77.2	84.6
2009	82	72.2	9.6	44.3	97.3	60.3	65.4	72.2	80.1	83.8
2010	85	71.9	9.5	36.2	93.6	59.7	67.6	71.9	78.1	83.1
2011	88/	72.9	8.4	52.5	87.3	61.2	67.0	73.4	79.3	83.9
2012	89	73.0	9.8	41.3	95.6	59.6	69.2	73.4	79.6	84.8
2013	77	72.9	9.1	49.4	95.4	61.3	67.1	72.9	78.7	85.4
2014	46	75.4	7.4	56.1	92.1	66.5	70.9	75.1	80.0	85.2
1998-2014	1112	71.1	9.6	30.7	97.3	58.9	65.1	71.5	77.9	83.5

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	20	67.1	10.4	49.4	89.2	53.9	60.8	65.6	72.6	83.2
1999	20	65.5	8.6	50.8	81.0	55.3	59.5	63.3	71.0	79.0
2000	29	69.3	11.9	53.1	92.8	55.9	59.3	65.0	78.1	89.3
2001	25	65.4	9.3	45.6	83.2	54.7	57.4	65.6	72.9	78.9
2002	43	69.1	11.0	46.4	88.4	51.9	61.8	66.3	76.5	84.5
2003	48	68.8	10.2	30.7	90.3	58.9	62.9	69.6	74.2	81.2
2004	64	71.1	7.1	53.2	90.1	63.8	66.2	69.8	74.0	81.7
2005	55	70.3	9.3	45.1	86.8	58.9	64.7	70.5	76.9	83.4
2006	57	69.8	9.1	46.6	87.8	57.6	64.9	69.3	76.8	80.9
2007	75	69.9	8.8	44.4	92.4	58.2	64.5	70.4	76.1	79.6
2008	78	71.2	7.9	48.5	88.1	61.5	66.0	71.1	74.9	82.7
2009	66	71.3	9.6	44.3	97.3	59.5	65.2	70.5	79.6	82.6
2010	65	71.9	8.6	50.8	91.8	59.7	67.6	71.6	77.8	83.1
2011	74	72.4	8.4	52.5	87.0	61.2	66.6	73.1	78.7	83.7
2012	72	73.4	7.9	53.7	88.8	62.8	69.5	73.5	79.1	83.9
2013	64	72.0	8.8	49.4	92.4	61.0	66.2	72.3	78.0	81.3
2014	37	74.2	6.8	56.1	86.8	66.2	70.9	74.3	77.9	83.8
1998-2014	892	70.8	9.0	30.7	97.3	59.2	65.1	71.0	77.2	82.4

Table 3b

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

Year of	Cases		Std.					Median		
diagnosis	n	Mean	dev.	Min.	Max.	10%	25%	50%	75%	90%
1998	9	65.8	11.0	48.8	85.2	48.8	60.1	66.0	69.8	85.2
1999	6	73.2	6.1	64.6	81.3	64.6	67.7	74.4	77.0	81.3
2000	7	72.0	18.9	35.6	90.6	35.6	61.7	74.5	88.4	90.6
2001	14	70.3	9.9	54.5	85.4	56.4	64.4	70.2	79.8	83.6
2002	13	68.9	12.9	48.9	88.5	53,8	57.4	67.0	79.1	85.6
2003	11	76.7	10.5	57.3	91.2	62.7	68.5	79.8	82.6	88.3
2004	8	68.6	11.1	53.1	84.7	53.1	59.6	68.0	77.7	84.7
2005	14	72.5	8.8	58.3	88.3	62.3	63.2	73.0	78.1	84.2
2006	12	70.4	12.5	40.6	83.9	57.0	63.2	74.2	78.7	81.9
2007	18	66.2	12.1	40.3	81.1	45.3	60.1	68.8	76.0	80.8
2008	19	74.8	12.4	42.4	87.8	48.2	69.6	75.8	84.2	87.2
2009	16	75.8	9.0	62.3	87.1	63.3	66.8	77.1	84.0	86.9
2010	20	71.8	12.3	36.2	93.6	58.2	66.5	72.9	78.2	84.6
2011	14 /	75.5	8.4	57.9	87.3	66.6	69.5	76.0	83.9	85.2
2012	17/	71.4	16.0	41.3	95.6	43.1	59.6	72.3	84.7	87.6
2013	13	77.3	9.7	63.7	95.4	65.1	72.2	73.8	85.5	90.0
2014	9	80.5	8.2	68.1	92.1	68.1	74.2	82.7	85.3	92.1
1998-2014	220	72.4	11.8	35.6	95.6	57.3	65.5	73.7	81.4	86.1

Table 4

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

Age at diagnosis	Cases			Males			Females		
Years	n	ଚ	Cum.%	n	ે	Cum.%	n	૾ૢ	Cum.%
35-39	1	0.2	0.2			0.0	1	0.8	0.8
40 - 44	6	0.9	1.1	2	0.4	0.4	4	3.2	4.0
45-49	7	1.1	2.1/	4	0.8	/ 1.1	3	2.4	6.3
50-54	14	2.1	4.3	11	2.1	3.2	3	2.4	8.7
55-59	32	4.9	9.1	29	5.5	8.7	3	2.4	11.1
60-64	62	9.4	18.6	54	10.2	18.8	8	6.3	17.5
65-69	133	20.2	38.8	112	21.1	39.9	21	16.7	34.1
70 - 74	154	23.4	62.3	132	24.9	64.8	22	17.5	51.6
75-79	113	17.2	79.5	94	17.7	82.5	19	15.1	66.7
80 - 84	85	12.9	92.4	64	12.1	94.5	21	16.7	83.3
85+	50	7.6	100.0	29	5.5	100.0	21	16.7	100.0
All ages	657	100.0		531	100.0		126	100.0	

Included in the statistics are 26.2% multiple primaries in males and 29.4% in females.



Table 5

Age-specific incidence, DCO rate and proportion of all cancers for period_2007-2014

							Males	Females
			Males	Females	Males	Females	Prop.all	Prop.all
Age at			Age-	Age-	DCO rate	DCO rate	cancers	_
diagnosis	Males	Females	spec.	spec.	n=37	n=12	n=91183	n=89596
Years	n	n	incid.	incid.	%	90	%	%
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			0.0	0.0				
35-39		1	0.0	0.1				0.1
40 - 44	2	4	0.1	0.3			0.1	0.1
45-49	4	3	0.3	0.2			0.1	0.1
50-54	11	3	0.8	0.2	9.1		0.2	0.0
55-59	29	3 /	2.7	0.3			0.4	0.0
60-64	54	8	5.5	0.8	5.6		0.5	0.1
65-69	112	21	11.6	2.0	5.4		0.7	0.2
70-74	132	22	14.5	2.1	6.1		0.8	0.2
75-79	94	19	17.1	2.7	6.4	5.3	0.8	0.2
80-84	64	21	18.3	3.7	14.1	14.3	0.7	0.2
85+	29	21	12.5	3.6	13.8	38.1	0.5	0.2
All ages	531	126			7.0	9.5	0.6	0.1
Incidence								
Raw			2.9	0.7				
WS			1.4	0.3				
ES			2.1	0.4				
BRD-S			2.8	0.5				

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).



ICD-10 C45.0: Mesothelioma of pleura

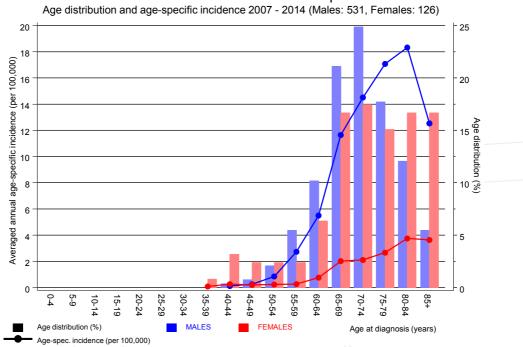


Figure 6. Age distribution and age-specific incidence



ICD-10 C45.0: Mesothelioma of pleura Age-specific incidence rates: international comparison Average Period population 2007-2014 4.6 m 2007-2011 64.6 m

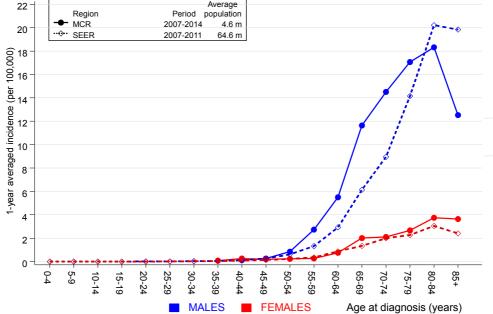


Figure 6a. Age-specific incidence in MCR registry areas compared to SEER (Surveillance, Epidemiology, and End Results, USA).



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.

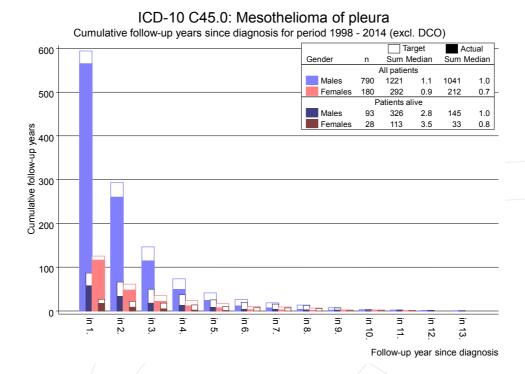


Figure 7. Cumulative follow-up years depending on time since diagnosis

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

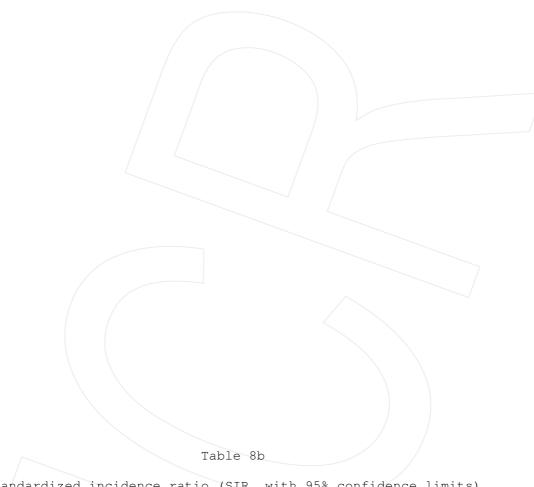
Table 8a Standardized incidence ratio (SIR, with 95% confidence limits), excess absolute risk (EAR) and DCO rate of second primaries for period 1998-2014 MALES Observed Expected LCL UCL DCO Diagnosis SIR 95% 95% EAR C18 Colon 3 1.9 1.6 0.3 4.7 10.6 C33-C34 Lung 12 2.3 5.2 2.7 9.0 # 91.1 83.3 5 6.0 0.8 0.3 2.0 -9.0 40.0 C61 Prostate 2 0.7 2.9 0.3 10.4 12.3 C64 Kidney 9 Other primaries 4.2 2.1 1.0 4.1 45.3 33.3 Not observed 0 4.7 0.0 0.0 0.8 # -44.7All mult. primaries 31 19.8 1.6 1.1 2.2 # 105.6 48.4 823 Patients 72.6 Median age at second malignancy (years) 1062 Person-years 1.3 Mean observation time (years)

The occurrence of second malignancy is statistically significant.

Median observation time (years)

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

0.9



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

FEMALES

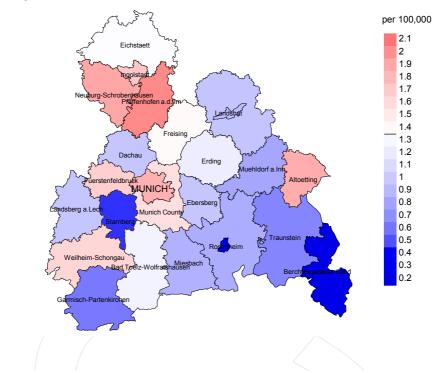
01	bserved	Expected		LCL	UCL		DCO
Diagnosis	n	n	SIR	95%	95%	EAR	%
C33-C34 Lung	2	0.2	10.3	1.2	37.2 #	83.3	100.0
Other primaries Not observed	3	1.0	3.0		8.7 2.7	92.0 -63.6	66.7
All mult. primaries	5	2.6	1.9	0.6	4.5	111.7	80.0

Patients	190
Median age at second malignancy (years)	71.0
Person-years	217
Mean observation time (years)	1.1
Median observation time (years)	0.7

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

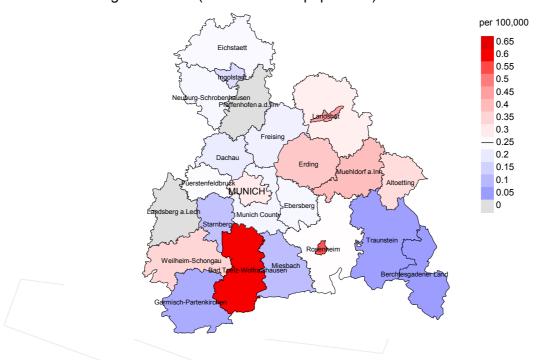
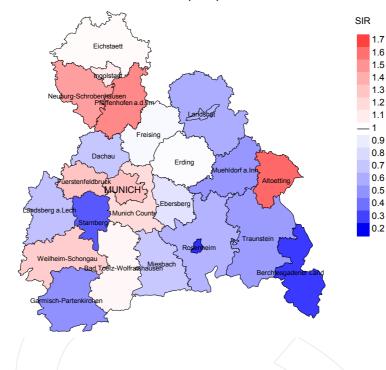


Figure 9a. Map of cancer incidence (world standard population, incl. DCO cases) by county averaged for period 2007 to 2014. According to their individual incidence rates, the counties are displayed in different red and blue color temperatures where the fine white color indicates the population mean (males 1.4/100,000 WS N=531, females 0.3/100,000 WS N=126).

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 5 women were identified with newly diagnosed pleural mesothelioma. 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 0.8/100,000.

Standardized incidence ratio (SIR) 2007 - 2014: Males



Standardized incidence ratio (SIR) 2007 - 2014: Females

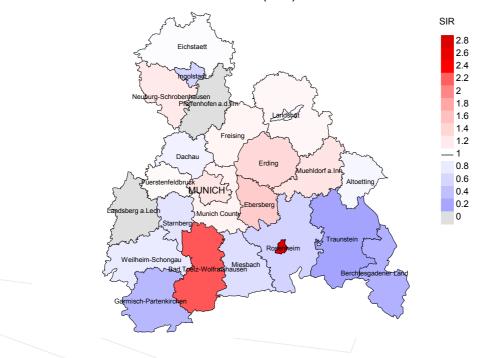


Figure 9b. Map of standardized incidence ratio (SIR, incl. DCO cases) by county averaged for period 2007 to 2014. According to their individual SIR values, the counties are displayed in different red and blue color temperatures where the fine white color indicates the population overall of 1.0 (males N=531, females N=126).

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 5 women were identified with newly diagnosed pleural mesothelioma. Therefore, the mean standardized incidence ratio (SIR) for this cancer type in this area can be calculated at 1.50. Though, the value of this parameter may vary with an underlying probability of 99% between 0.32 and 4.25, 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)

		Duran				Prop.
	Inciden	Prop. t actively	Drop		Drop	deaths with death
Voon of		followed	Prop.	Dootha	Prop.	
Year of	cases		DCO	Deaths		
diagnosis	n	90	%	n	%	90
1998	29	100.0	6.9	29	100.0	89.7
1999	26	100.0	7.7	26	100.0	792.3
2000	36	100.0	52.8	36	100.0	94.4
2001	39	100.0	23.1	39/	100.0	89.7
2002	56	100.0	30.4	55	98.2	98.2
2003	59	100.0	20.3	58	98.3	94.8
2004	72	98.6	12.5	71	98.6	95.8
2005	69	97.1	11.6	67	97.1	100.0
2006	69	95.7	11.6	65	94.2	98.5
2007	93	92.5	5.4	82	88.2	97.6
2008	97	97.9	7.2	94	96.9	98.9
2009	82	95.1	4.9	75	91.5	94.7
2010	85	94.1	9.4	76	89.4	97.4
2011	88	90.9	4.5	72	81.8	98.6
2012	89	93.3	4.5	71	79.8	100.0
2013	77	100.0	13.0	61	79.2	100.0
2014	46	97.8	15.2	19	41.3	94.7
1998-2014	1112	96.5	12.1	996	89.6	97.0

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	%	n	%
1998	29	24	95.8		41.4
1999	26	21	90.5	6	23.1
2000	36	36	94.4	17	47.2
2001	39	35	94.3	18	46.2
2002	56	46	95.7	24	42.9
2003	59	41	92.7	23	39.0
2004	72	53	96.2	21	29.2
2005	69	59	96.6	22	31.9
2006	69	63	98.4	20	29.0
2007	93	66	95.5	25	26.9
2008	97	87	98.9	34	35.1
2009	82	69	98.6	17	20.7
2010	85	83	96.4	26	30.6
2011	88	80	97.5	25	28.4
2012	89	87	100.0	28	31.5
2013	77	81	98.8	31	40.3
2014	46	60	100.0	1/7	37.0
1998-2014	1112	991	97.2	366	32.9

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)

				Prop.
				cancer
		Prop.	Prop.	recorded
		cancer-	non-cancer-	on death
Year of	Deaths	related	related	certificate
death	n	%	%	%
acaen	11	Ů	_ / " /	O .
1998	24	87.5	12.5	95.7
1999	21	90.5	9.5	100.0
2000	36	91.7	8.3	100.0
2001	35	91.4	8.6	100.0
2002	46	93.5	6.5	100.0
2002		90.2		
	41		9.8	100.0
2004	53	90.6	9.4	100.0
2005	59	96.6	3.4	94.7
2006	63	98.4	1.6	100.0
2007	66	92.4	7.6	100.0
2008	87	97.7	2.3	100.0
2009	\ 69	97.1	2.9	100.0
2010	83	95.2	4.8	98.8
2011	80	93.8	6.3	98.7
2012	87	95.4	4.6	96.6
2013	81	96.3	3.7	98.8
2014	60	91.7	8.3	98.3
1998-2014	991	94.3	5.7	98.9
7 7				

 $$\operatorname{\textsc{Table}}\xspace$ 11a $$\operatorname{\textsc{Medians}}\xspace$ of age at death according to the grouping in Table 10 $$\operatorname{\textsc{MALES}}\xspace$

		Age at death	Age at death	Age at death	Age at death (according
		(all	(cancer-	(non-cancer-	to death
Year of	Deaths	causes)	related)	related)	certificate)
death	n	Years	Years	Years	Years
1998	19	69.1	69.1	65.9	69.1
1999	16	66.5	66.5		66.5
2000	24	67.9	67.5	79.6	68.0
2001	23	65.6	65.8	55.1	65.7
2002	39	66.8	67.2	57.9	67.0
2003	33	68.0	68.0	73.3	68.0
2004	43	71.0	70.8	76.5	71.0
2005	54	71.0	71.2	66.2	71.2
2006	53	73.0	73.1	54.4	73.1
2007	58	69.6	69.7	69.5	69.6
2008	71	70.0	70.0	69.3	69.8
2009	55	70.3	70.3	69.6	70.5
2010	65	74.4	74.1	76.7	74.6
2011	70	75.5	75.1	80.9	75.7
2012	70	73.8	73.6	79.8	73.6
2013	64	74.1	73.9	85.1	74.1
2014	49	73.9	73.6	75.2	73.9
1998-2014	806	71.7	71.6	74.9	71.7

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.

 $\begin{tabular}{ll} Table 11b \\ \hline \begin{tabular}{ll} Medians of age at death according to the grouping in Table 10 \\ \hline \begin{tabular}{ll} FEMALES \end{tabular}$

		Age at death (all	Age at death (cancer-	Age at death (non-cancer-	Age at death (according to death
Year of	Deaths	causes)	related)	related)	certificate)
death	n	Years	Years	Years	Years
acacii	11	icais	icais	icars	icais
1998	5	70.4	69.7	85.6	70.4
1999	5	64.6	67.7	55.0	67.7
2000	12	79.3	81.4	75.2	81.4
2001	12	70.5	70.6	60.9	70.6
2002	7	64.9	64.3	80.3	64.3
2003	8	81.3	81.3	80.5	82.6
2004	10	67.4	67.4		65.2
2005	5	75.4	75.4		75.4
2006	10	73.4	73.4		73.4
2007	8	72.3	75.0	64.9	72.4
2008	16	75.3	75.3		75.3
2009	14	78.6	78.6		78.6
2010	18	75.9	75.9		75.9
2011	10	78.4	78.4		78.4
2012	17	77.1	75.0	86.7	77.1
2013	17	74.7	74.7		74.7
2014	11	74.9	74.4	87.6	74.9
1998-2014	185	74.7	74.6	78.3	74.7

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	17	1.5	0.85	0.9	0.83	1.4	0.84	1.7	0.82
1999	16	1.4	0,80	0.9	0.80	1.3	0.82	1.6	0.83
2000	22	1.9	0.76	1.1	0.80	1.7	0.78	2.3	0.80
2001	21	1.8	0.84	1.1	0.79	/ 1.5	0.78	1.8	0.78
2002	37	2.0	0.86	1.1	0.85	1.7	0.86	2.1	0.82
2003	31	1.7	0.65	0.9	0.64	1,3	0.64	1.7	0.65
2004	38	2.0	0.59	1.1	0.60	1.6	0.61	2.1	0.62
2005	52	2.7	0.95	1.4	0.92	2.1	0.94	2.8	0.93
2006	52	2.7	0.91	1.3	0.84	2.0	0.87	2.8	0.94
2007	55	2.5	0.73	1.2	0.72	1.9	0.72	2.4	0.72
2008	69	3.1	0.88	1.5	0.90	2.3	0.91	3.0	0.92
2009	53	2.4	0.80	1.1	0.79	1.7	0.79	2.2	0.76
2010	61	2.7	0.94	1.2	0.91	1.9	0.92	2.6	0.96
2011	65	2.8	0.88	1.2	0.82	1.9	0.85	2.8	0.90
2012	67	2.9	0.93	1.3	0.96	2.0	0.95	2.8	0.96
2013	61	2.7	0.95	1.1	0.88	1.8	0.90	2.4	0.92
2014	46	2.0	1.24	0.9	1.41	1.4	1.32	1.9	1.24
1998-2014	763	2.4	0.86	1.2	0.84	1.8	0.85	2.4	0.86

Table 12b

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

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	4	0.3	0.44	0.2	0.39	0.2	0.41	0.3	0.45
1999	3	0.3	0.50	0.1	0.65	0.2	0.59	0.2	0.49
2000	11	0.9	1.57	0.3	1.37	0.5	1.49	0.8	1.71
2001	11	0.9	0.79	0.4	0.69	0.6	0.72	0.8	0.78
2002	6	0.3	0.46	0.1	0.46	0.2	0.45	0.3	0.45
2003	6	0.3	0.55	0.1	0.65	0.2	0.62	0.2	0.57
2004	10	0.5	1.25	0.3	1.37	0.4	1.33	0.4	1.24
2005	5	0.3	0.36	0.1	0.33	0.2	0.35	0.2	0.38
2006	10	0.5	0.83	0.2	0.97	0.3	0.92	0.5	0.89
2007	6	0.3	0.33	0.1	0.23	0.1	0.28	0.2	0.34
2008	16	0.7	0.84	0.3	0.97	0.4	0.93	0.5	0.87
2009	14	0.6	0.88	0.2	0.77	0.3	0.81	0.4	0.87
2010	18	0.8	0.90	0.2	0.64	0.4	0.70	0.5	0.77
2011	10	0.4	0.71	0.1	0.65	0.2	0.66	0.3	0.69
2012	16	0.7	0.94	0.2	0.82	0.4	0.87	0.5	0.96
2013	17	0.7	1.31	0.2	1.36	0.4	1.39	0.5	1.36
2014	9	0.4	1.00	0.1	1.35	0.2	1.22	0.3	1.05
1998-2014	172	0.5	0.78	0.2	0.74	0.3	0.76	0.4	0.77

Table 13

Age distribution of age at death (cancer-related) for period 2007-2014

(incl. multiple primaries)

Age at									
death	Cases			Males			Females		
Years	n	엉	Cum.%	n	양	Cum.%	n	90	Cum.%
40 - 44	3	0.5	0.5	/ 1	0.2	0.2	2	1.9	1.9
45-49	5	0.9	1.4	4	0.8	1.0	1	0.9	2.8
50-54	15	2.6	3.9	12	2.5	3.6	3	2.8	5.7
55-59	22	3.8	7.7	19	4.0	7.5	3	2.8	8.5
60-64	47	8.1	15.8	42	8.8	16.4	5	4.7	13.2
65-69	120	20.6	36.4	110	23.1	39.4	10	9.4	22.6
70-74	135	23.2	59.5	107	22.4	61.8	28	26.4	49.1
75-79	109	18.7	78.2	92	19.3	81.1	17	16.0	65.1
80-84	80	13.7	91.9	62	13.0	94.1	18	17.0	82.1
85+	47	8.1	100.0	28	5.9	100.0	19	17.9	100.0
All ages	583	100.0		477	100.0		106	100.0	

Included in the statistics are 26.2% multiple primaries in males and 29.4% in females.



Table 14

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

			Males		Females		Males	Females
Age at			Age-		Age-		Prop.all	Prop.all
death	Males	Females	spec.		spec.		cancers	cancers
Years	n	n	mortal.	MI-index	mortal.	MI-index	%	용
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			0.0		0.0			
35-39			0.0		0.0			
40 - 44	1	2	0.1	0.50	0.1	0.50	0.2	0.3
45-49	4	1	0.3	1.00	0.1	0.33	0.4	0.1
50-54	12	3	0.9	1.09	0.2	1.00	0.6	0.2
55-59	19/	3	1.8	0.66	0.3	1.00	0.6	0.1
60-64	42	5	4.3	0.78	0.5	0.63	0.9	0.1
65-69	110	10	11.4	0.98	1.0	0.48	1.5	0.2
70-74	107	28	11.8	0.81	2.7	1.27	1.2	0.4
75-79	92	17	16.7	0.98	2.4	0.89	1.1	0.3
80-84	62	18	17.8	0.97	3.2	0.86	0.8	0.3
85+	28	19	12.1	0.97	3.3	0.90	0.5	0.2
All ages	477	106					1.0	0.2
Mortality								
Raw			2.6	0.90	0.6	0.84		
WS			1.2	0.89	0.2	0.76		
ES			1.9	0.89	0.3	0.80		
BRD-S			2.5	0.90	0.4	0.82		
PYLL-70								
per 100,000			7.2		1.5			
ES			6.2		1.2			
AYLL-70			6.1		9.6			
-								

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

Table 15a

Multiple primaries in deaths in period 1998-2014

MALES

					Syn- chron	Syn- chron		
	Total	Total	Pre	Pre	±30d	±30d	Post	Post
Diagnosis	n	/ % ↓	n	← %	n	← %	n	← %
-								
C03-C06 Oral cavity	2	1.2	1	50.0			1	50.0
C09-C10 Oropharynx	/ 2 /	1.2	2	100.0				
C16 Stomach	5	3.0	5	100.0				
C18 Colon	11	6.5	9	81.8	2	18.2		
C19-C20 Rectum	11	6.5	10	90.9	1	9.1		
C22 Liver	2	1.2	1	50.0	1	50.0		
C33-C34 Lung	14	8.3	2	14.3	3	21.4	9	64.3
C38,C45 Mesothelioma	3	1.8					3	100.0
C43 Malign. melanoma	11	6.5	10	90.9			1	9.1
C44 Skin others	16	9.5	12	75.0			4	25.0
C61 Prostate	46	27.4	40	87.0	2	4.3	4	8.7
C64 Kidney	8	4.8	6	75.0	_ 1	12.5	$\sqrt{1}$	12.5
C67 Bladder	10	6.0	8	80.0	1	10.0	1	10.0
C70-C72 CNS cancer	3	1.8	1	33.3	1	33.3	1	33.3
C73 Thyroid	2	1.2	1	50.0			1	50.0
C76-C79 CUP	2	1.2	2	100.0				
C82-C85 NHL	8	4.8	6	75.0	2	25.0		
C90 Mult. myeloma	3	1.8	2	66.7			1	33.3
C91-C96 Leukaemia	4	2.4	2	50.0	2	50.0		
Other primaries	5	3.0	5	100.0				
-								
All mult. primaries	168	100.0	125	74.4	16	9.5	27	16.1

Multiple primaries with number of cases 1 are pooled in category "Other primaries"

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

			FEMA	LES					
Diagnosis		Total n	Total %↓	Pre n	Pre ←%	Syn- chron ±30d n	Syn- chron ±30d ←%	Post n	Post ←%
_									
C18 C C33-C34 L		1 4 3	2.6 10.5 7.9	1 4 1	100.0 100.0 33.3			2	66.7
C44 S C50 B	Malign. melanoma kin others Freast	2 2 10	5.3 5.3 26.3	2 1 9	100.0 50.0 90.0			1 1	50.0 10.0
C54 C C67 B	ervix uteri Orpus uteri Nadder	1 3 2	2.6 7.9 5.3	1 2 2	100.0 66.7 100.0			1	33.3
C73 T C81 H C82-C85 N	NS cancer Thyroid Todgkin lymphoma THL Tult. myeloma	3 4 1 1 1	7.9 10.5 2.6 2.6 2.6	2 4 1 1	66.7 100.0 100.0 100.0			1	33.3

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 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.	MI-index	Females Age- spec. mortal.	MI-index	cancers	Females Prop.all cancers
0- 4 5- 9 10-14 15-19 20-24 25-29 30-34			0.0 0.0 0.0 0.0 0.0		0.0 0.0 0.0 0.0 0.0 0.0			
35-39 40-44 45-49 50-54 55-59 60-64 65-69 70-74 75-79 80-84 85+	1 4 11 18 38 94 90 70 45 19	1 1 3 2 4 7 23 14 16 15	0.0 0.1 0.3 0.8 1.7 3.9 9.8 9.9 12.7 12.9 8.2	0.50 1.00 1.22 0.62 0.81 1.01 0.86 1.01 1.00	0.0 0.1 0.1 0.2 0.2 0.4 0.7 2.2 2.0 2.9 2.6	1.00 0.67 0.47 1.21 0.93	0.2 0.4 0.7 0.7 1.0 1.7 1.3 1.1 0.8 0.4	0.2 0.1 0.2 0.1 0.1 0.2 0.5 0.3 0.3
All ages	390	86					1.0	0.3
Mortality Raw WS ES BRD-S			2.2 1.0 1.5 2.0	0.92 0.91 0.91 0.93	0.5 0.2 0.2 0.3	0.79 0.82		
PYLL-70 per 100,000 ES AYLL-70			6.6 5.7 6.4		1.1 0.9 9.7			

^{*} 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 Females n n	/ - /	Females Age- spec. ex mortal. MI-index	Males Females Prop.all Prop.all cancers cancers % %
0- 4 5- 9 10-14 15-19 20-24 25-29 30-34 35-39 40-44	1 1	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	0.3 0.2
45-49 50-54 55-59 60-64 65-69 70-74 75-79 80-84 85+	4 1 11 3 17 2 38 4 92 6 84 19 66 14 43 16 19 15	0.3 1.00 0.8 1.22 1.6 0.59 3.9 0.81 9.6 1.01 9.2 0.85 12.0 0.99 12.3 0.98 8.2 1.00	0.1 0.33 0.2 1.00 0.2 1.00 0.4 0.67 0.6 0.43 1.8 1.12 2.0 0.93	0.5 0.1 0.8 0.2 0.7 0.1 1.1 0.2 1.9 0.2 1.5 0.5 1.4 0.4 1.1 0.4 0.6 0.3
All ages Mortality Raw WS ES	375 81	2.1 0.91 1.0 0.90 1.5 0.90	0.4 0.85 0.1 0.76 0.2 0.80	1.2 0.3
BRD-S PYLL-70 per 100,000 ES AYLL-70		2.0 0.92 6.5 5.6 6.4	0.3 0.84 1.1 0.9 10.1	

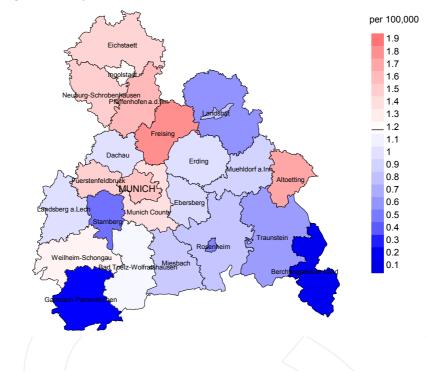
^{*} See corresponding tables with multiple primaries.

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 pleural mesothelioma-related death (see Table 10) should be considered.



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



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

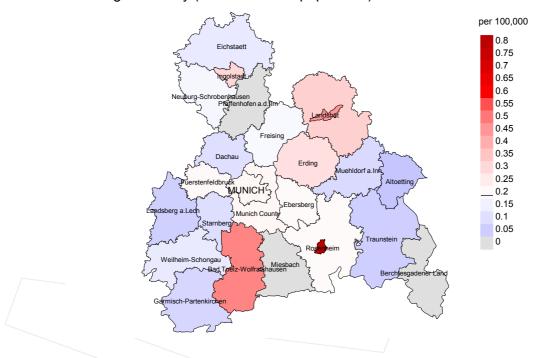
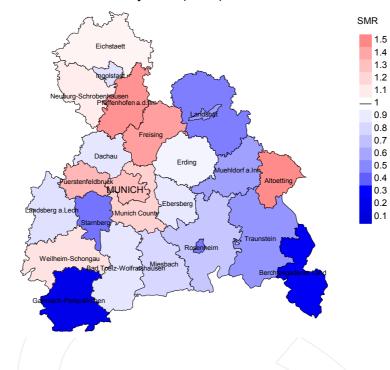


Figure 19a. Map of cancer mortality (world standard population) by county averaged for period 2007 to 2014. According to their individual mortality rates, the counties are displayed in different red and blue color temperatures where the fine white color indicates the population mean (males 1.2/100,000 WS N=474, females 0.2/100,000 WS N=105).

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 4 women died from pleural mesothelioma. Therefore, the mean mortality 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 0.8/100,000.

Standardized mortality ratio (SMR) 2007 - 2014: Males



Standardized mortality ratio (SMR) 2007 - 2014: Females

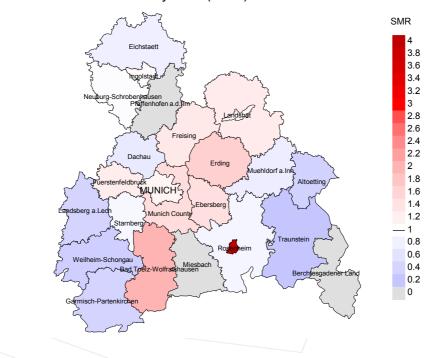


Figure 19b. Map of standardized mortality ratio (SMR, incl. DCO cases) by county averaged for period 2007 to 2014. According to their individual SMR values, the counties are displayed in different red and blue color temperatures where the fine white color indicates the population overall of 1.0 (males N=474, females N=105).

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 4 women died from pleural mesothelioma. Therefore, the mean standardized mortality ratio (SMR) for this cancer type in this area can be calculated at 1.45. Though, the value of this parameter may vary with an underlying probability of 99% between 0.24 and 4.57, 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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Index of figures and tables

	Fig./Tbl.			
	1	Pts cohorts, DCO, mult. prim., follow-up / yr	3	
	1a	Gender distribution by year of diagnosis	4	
	2	Incidence by year of diagnosis	5	
	3	Age distribution parameters by year of diagnosis	6	
	4	Age distribution by 5-year age group and gender	8	
	5	Age-specific incidence, DCO rate, proportion malignancies	9	
	6	Age distribution and age-specific incidence (chart)	10	
	6a	Age-specific incidence internationally (chart)	11	
	7	Cumulative follow-up years (chart)	12	
	8	Standardized incidence ratio of second primaries	12	
	9a	Map of cancer incidence (WS) by county (chart)	14	
	9b	Standardized incidence ratio (SIR) by county (chart)	15	
	10a	Pts incident cohorts and mortality / yr	16	
	10b	Incidence and mortality by year of diagnosis	17	
	10c	Cancer-related deaths, death certification available / yr	18	
	11	Medians of age at death / yr	19	
	12	Mortality by year of death	21	
	13	Distribution of age at death	22	
	14	Age-specific mortality	23	
	15	Multiple primaries in deaths	24	
	16	Age-specific mortality (first primaries)	26	
	17	Age-specific mortality (single primaries)	27	
	18	Age distribution and age-specific mortality (chart)	28	
	19a	Map of cancer mortality (WS) by county (chart)	29	
	19b	Standardized mortality ratio (SMR) by county (chart)	30	