Munich Cancer Registry

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

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

Cancer statistics: Baseline statistics

C45.0: Pleural mesothelioma

Year of diagnosis	1998-2013
Patients	1,052
Diseases	1,052
Creation date	05/19/2015
Export date	12/30/2014
Population	4.64 m

http://www.tumorregister-muenchen.de/en/facts/base/base_C450_E.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. The time-delayed acquisition of data and the occasionally high DCO-rates indicate optimizing reserves, among others, because of current financial and legal conditions that hinder the analyses.

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, May 2015

[#] 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). Death certificates from 2014 are incorporated into these analyses.

[##] 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. A high proportion of DCO cases (≥5%) in particular cancer types indicate insufficient participation of specific cancer specializations.

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

Code	Description
C45.0	Mesothelioma of pleura

INCIDENCE

Table 1

Patient cohorts by year of diagnosis including DCO cases and multiple primaries, and with proportion of deaths and active follow-up

Year of diagnosis	Cases n	DCO cases n	Prop. DCO %	Prop. mult. primaries %	Prop. deaths %	Prop. actively followed %	
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	97.1	
2007	93	5	5.4	19.4	87.1	96.8	# ##
2008	97	7	7.2	19.6	96.9	97.9	
2009	82	4	4.9	25.6	91.5	95.1	
2010	84	8	9.5	27.4	88.1	92.9	
2011	88	4	4.5	23.9	79.5	88.6	
2012	89	4	4.5	21.3	74.2	89.9	
2013	64	9	14.1	26.6	57.8	100.0	###
1998-2013	1052	127	12.1	19.8	89.6	96.3	

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

Since 2007 the percentage of actively followed patients sharply declined compared to the previous years. This is a consequence of ambiguous data protection rules that currently forbid cancer registries in Bavaria to obtain the essential life status informations from competent registration offices.

Please be aware that data of recent annual patient cohorts may not yet be fully processed. Therefore, the presented figures and tables are potentially related to different time periods as pointed out in the respective headlines or legends.

Table 1a

Patient cohorts by year of diagnosis and gender
including DCO cases

Year of diagnosis	All n	Males n	Females n	Prop. males %
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	13	76.8
2003	59	48	11	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	84	64	20	76.2
2011	88	74	14	84.1
2012	89	73	16	82.0
2013	64	52	12	81.3
1998-2013	1052	843	209	80.1

Table 2

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

Year of diagnosis	Males n	Females n	Males Inc. raw	Fem. Inc. raw	Males Inc. WS	Fem. Inc. WS	Males Inc. ES	Fem. Inc. ES	Males Inc. BRD-S	Fem. Inc. BRD-S
1998	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	64	20	2.8	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	73	16	3.2	0.7	1.4	0.3	2.1	0.4	3.0	0.5
2013	52	12	2.3	0.5	1.0	0.2	1.6	0.3	2.1	0.3
1998-2013	843	209	2.8	0.7	1.4	0.3	2.2	0.4	2.9	0.5

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

Table 3

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

Year of diagnosis	Cases n	Mean	Std. dev.	Min.	Max.	10%	25%	Median 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	84	71.9	9.5	36.2	93.6	59.7	67.3	72.0	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	72.7	9.5	41.3	88.8	59.6	68.6	73.4	79.2	84.7
2013	64	73.1	9.1	50.0	95.4	61.3	66.9	72.5	79.5	85.4
1998-2013	1052	70.9	9.7	30.7	97.3	58.8	65.0	71.2	77.8	83.5

Table 3a

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

Year of diagnosis	Cases n	Mean	Std. dev.	Min.	Max.	10%	25%	Median 50%	75%	90%
1998	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	64	71.9	8.6	50.8	91.8	59.7	67.3	71.7	77.9	83.1
2011	74	72.4	8.4	52.5	87.0	61.2	66.6	73.1	78.7	83.7
2012	73	73.4	7.8	53.7	88.8	62.8	69.3	73.4	78.9	83.9
2013	52	72.3	8.9	50.0	92.4	61.0	66.2	72.1	78.8	82.2
1998-2013	843	70.6	9.1	30.7	97.3	58.9	65.0	70.6	77.1	82.4

Table 3b

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

Year of diagnosis	Cases n	Mean	Std. dev.	Min.	Max.	10%	25%	Median 50%	75%	90%
1998	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	16	69.9	15.2	41.3	87.6	43.1	59.4	72.2	84.4	86.7
2013	12	76.3	9.3	63.7	95.4	65.1	70.9	73.7	83.5	86.7
1998-2013	209	71.9	11.7	35.6	95.4	57.0	65.1	73.1	80.8	85.4

Table 4

Age distribution by 5-year age group and gender for period 1998-2013 (incl. DCO)

Age at diagnosis Years	Cases n	%	Cum.%	Males n	%	Cum.%	Females n	%	Cum.%
30-34	1	0.1	0.1	1	0.1	0.1			0.0
35-39	2	0.2	0.3			0.1	2	1.0	1.0
40-44	7	0.7	1.0	2	0.2	0.4	5	2.4	3.3
45-49	17	1.6	2.6	12	1.4	1.8	5	2.4	5.7
50-54	32	3.0	5.6	26	3.1	4.9	6	2.9	8.6
55-59	67	6.4	12.0	56	6.6	11.5	11	5.3	13.9
60-64	138	13.1	25.1	116	13.8	25.3	22	10.5	24.4
65-69	216	20.5	45.6	185	21.9	47.2	31	14.8	39.2
70-74	222	21.1	66.7	186	22.1	69.3	36	17.2	56.5
75-79	158	15.0	81.7	123	14.6	83.9	35	16.7	73.2
80-84	126	12.0	93.7	95	11.3	95.1	31	14.8	88.0
85+	66	6.3	100.0	41	4.9	100.0	25	12.0	100.0
All ages	1052	100.0		843	100.0		209	100.0	

Included in the statistics are 22.9% multiple primaries in males and 22.0% in females.

Table 5

Age-specific incidence, DCO rate and proportion of all cancers
for period 1998-2013

Age at diagnosis Years	Males n	Females n	Males Age-spec. incid.	Females Age-spec. incid.	Males DCO rate n=91 %	Females DCO rate n=36 %	Males Prop.all cancers n=158258 %	Females Prop.all cancers n=153136 %
0- 4			0.0	0.0				
5- 9			0.0	0.0				
10-14			0.0	0.0				
15-19			0.0	0.0				
20-24			0.0	0.0				
25-29			0.0	0.0				
30-34	1		0.0	0.0			0.1	
35-39		2	0.0	0.1				0.1
40-44	2	5	0.1	0.2			0.1	0.1
45-49	12	5	0.5	0.2	8.3		0.2	0.1
50-54	26	6	1.3	0.3	3.8		0.3	0.1
55-59	56	11	3.1	0.6	8.9	27.3	0.4	0.1
60-64	116	22	6.5	1.2	8.6	13.6	0.5	0.1
65-69	185	31	11.7	1.8	8.6	6.5	0.7	0.2
70-74	186	36	14.5	2.4	6.5	11.1	0.7	0.2
75-79	123	35	14.9	2.9	14.6	11.4	0.6	0.2
80-84	95	31	19.0	3.3	17.9	25.8	0.7	0.2
85+	41	25	12.0	2.8	26.8	48.0	0.4	0.1
All ages	843	209			10.8	17.2	0.5	0.1
Incidence								
Raw			2.8	0.7				
WS			1.4	0.3				
ES			2.2	0.4				
BRD-S			2.9	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).

Table 6a

Standardized incidence ratio (SIR, with 95% confidence limits), excess absolute risk (EAR) and DCO rate of second primaries for period 1998-2013
MALES

Diagnosis	Observed n	Expected n	SIR	LCL 95%	UCL 95%	EAR	DCO %
C18 Colon	3	1.3	2.3	0.5	6.6	22.3	
C33-C34 Lung	10	1.6	6.2	2.9	11.3 #	111.7	90.0
C61 Prostate	4	4.3	0.9	0.3	2.4	-3.6	25.0
C64 Kidney	2	0.5	4.1	0.5	14.8	20.2	
Other primaries	7	2.0	3.5	1.4	7.1 #	66.3	28.6
Not observed	0	4.1	0.0	0.0	0.9 #	-55.0	
All mult. primaries	26	13.9	1.9	1.2	2.7 #	161.8	46.2

Patients	558
Median age at second malignancy (years)	72.4
Person-years	750
Mean observation time (years)	1.3
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".

Table 6b

Standardized incidence ratio (SIR, with 95% confidence limits),
excess absolute risk (EAR) and DCO rate of second primaries
for period 1998-2013
FEMALES

Diagnosis	Observed n	Expected n	SIR	LCL 95%	UCL 95%	EAR	DCO %
C33-C34 Lung	2	0.1	15.9	1.9	57.4 #	125.4	100.0
Other primaries	1	0.1	9.9	0.2	55.0	60.1	
Not observed	0	1.5	0.0	0.0	2.5	-100	
All mult. primaries	3	1.7	1.7	0.4	5.1	85.4	66.7

Patients	127
Median age at second malignancy (years)	70.4
Person-years	149
Mean observation time (years)	1.2
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".

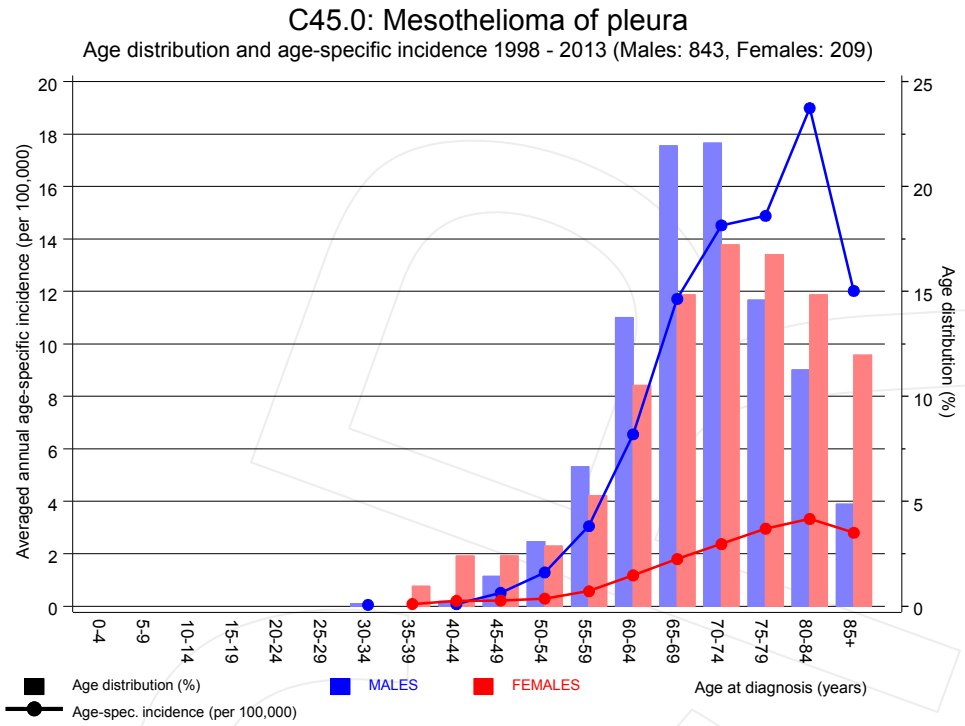


Figure 7. Age distribution and age-specific incidence

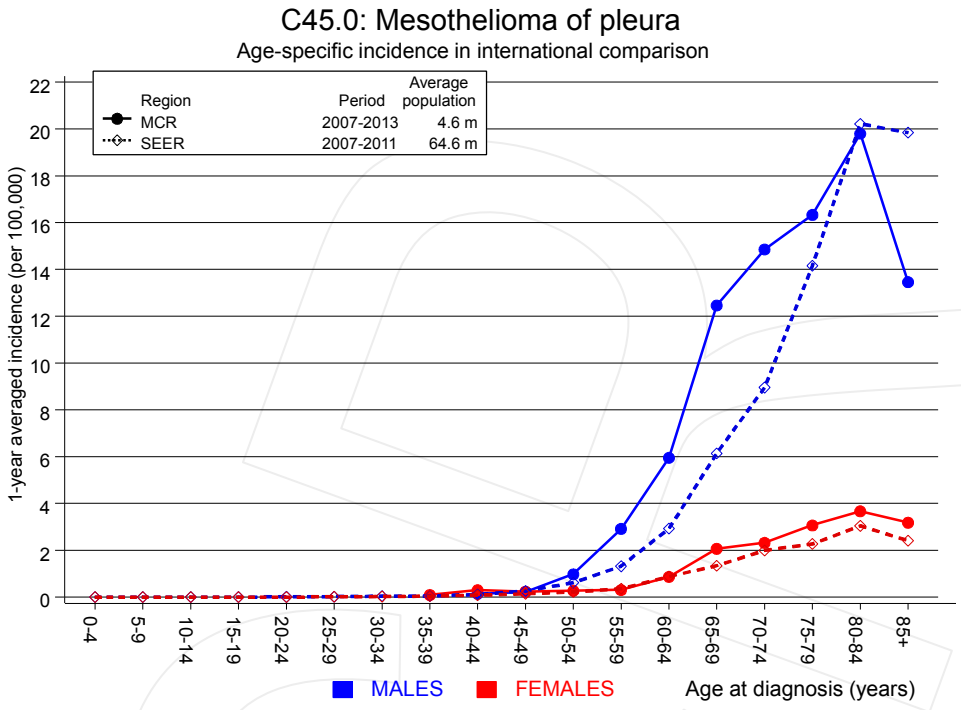


Figure 7a. Age-specific incidence in MCR registry areas compared to SEER (Surveillance, Epidemiology, and End Results, USA).

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.

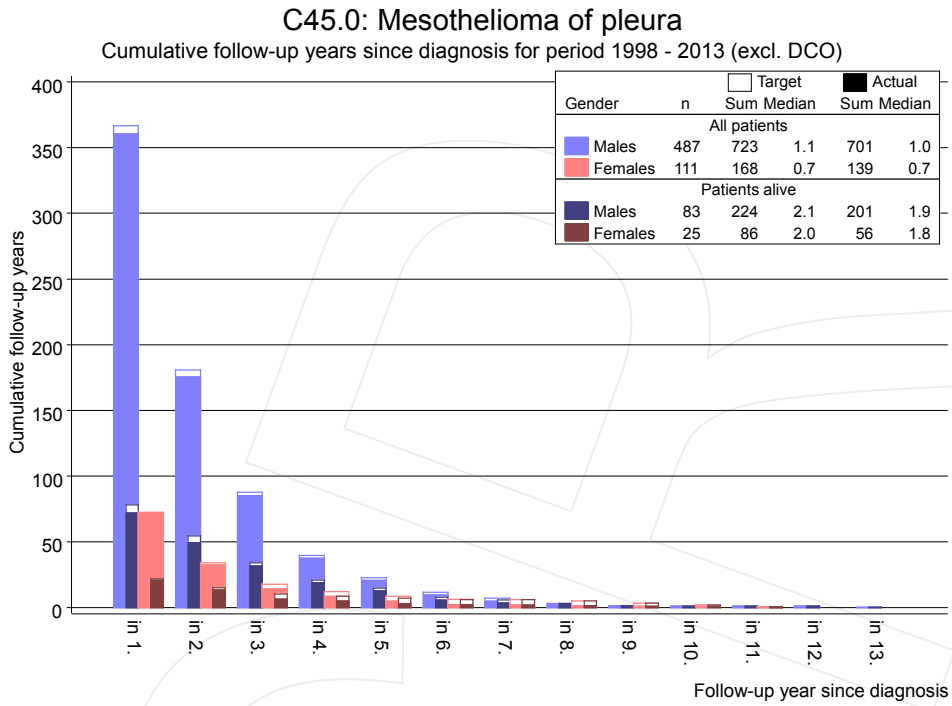
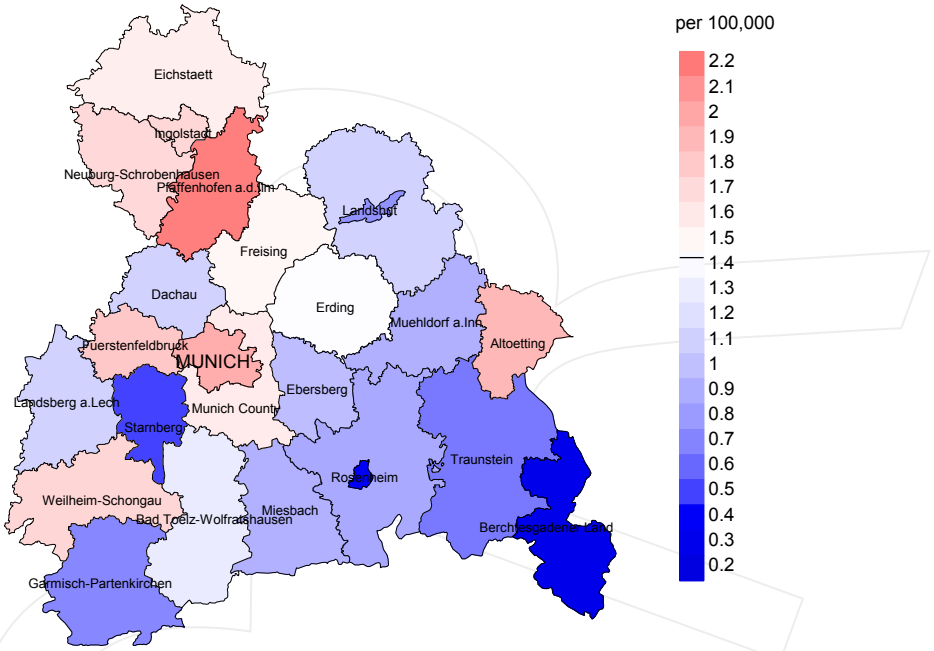


Figure 8. Cumulative follow-up years depending on time since diagnosis

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

Average incidence (world standard population) 2007 - 2013: Males



Average incidence (world standard population) 2007 - 2013: Females

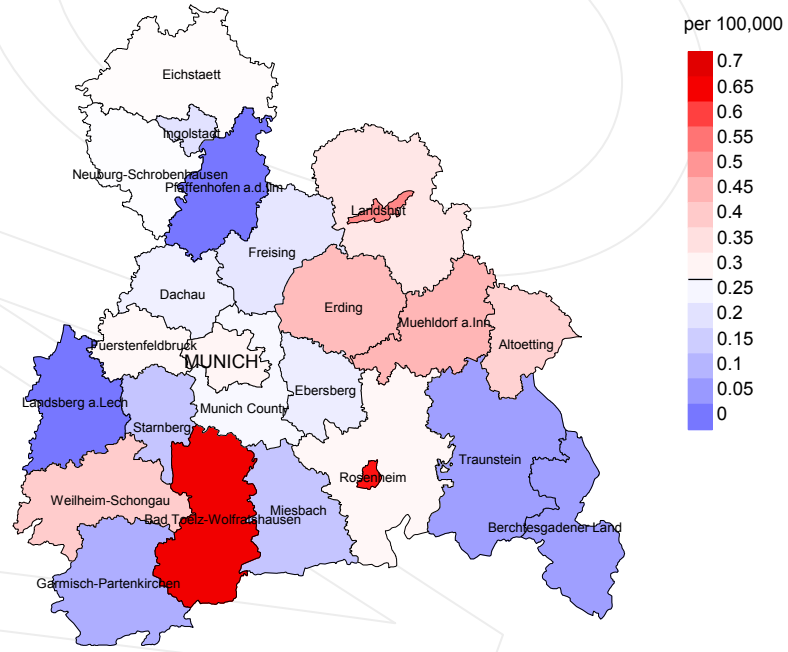
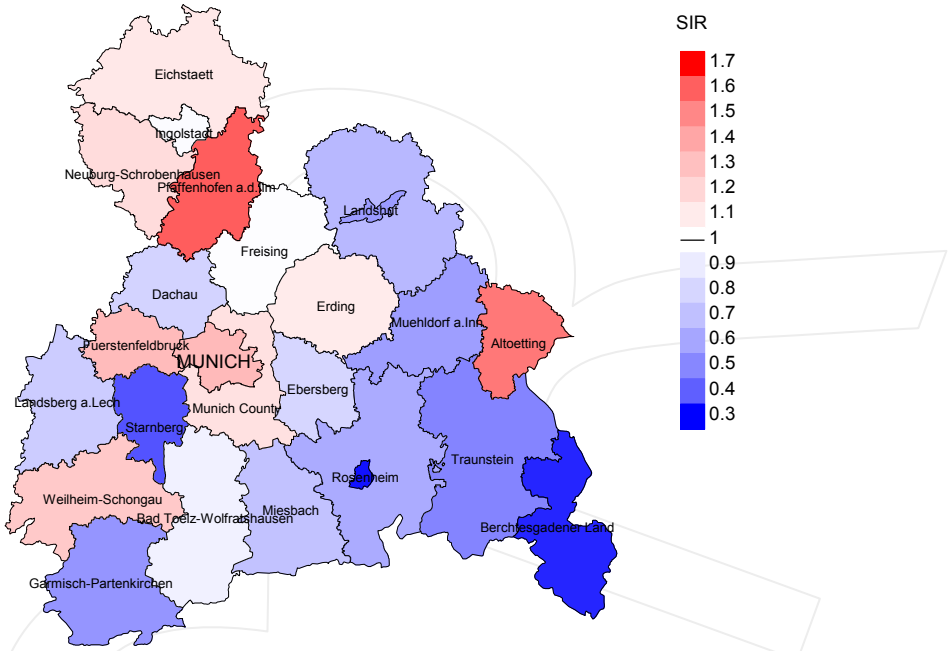


Figure 9a. Map of cancer incidence (world standard population, incl. DCO cases) by county averaged for period 2007 to 2013. According to their individual incidence rates, the counties are displayed in different red and blue color temperatures where the fine white color indicates the population mean (males 1.4/100,000 WS N=482, females 0.3/100,000 WS N=115).

The results should be interpreted with caution! E.g., in county Ebersberg with a population of 64,928 female residents (averaged) in the period from 2007 to 2013 a total of 4 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 0.9/100,000.

Standardized incidence ratio (SIR) 2007 - 2013: Males



Standardized incidence ratio (SIR) 2007 - 2013: Females

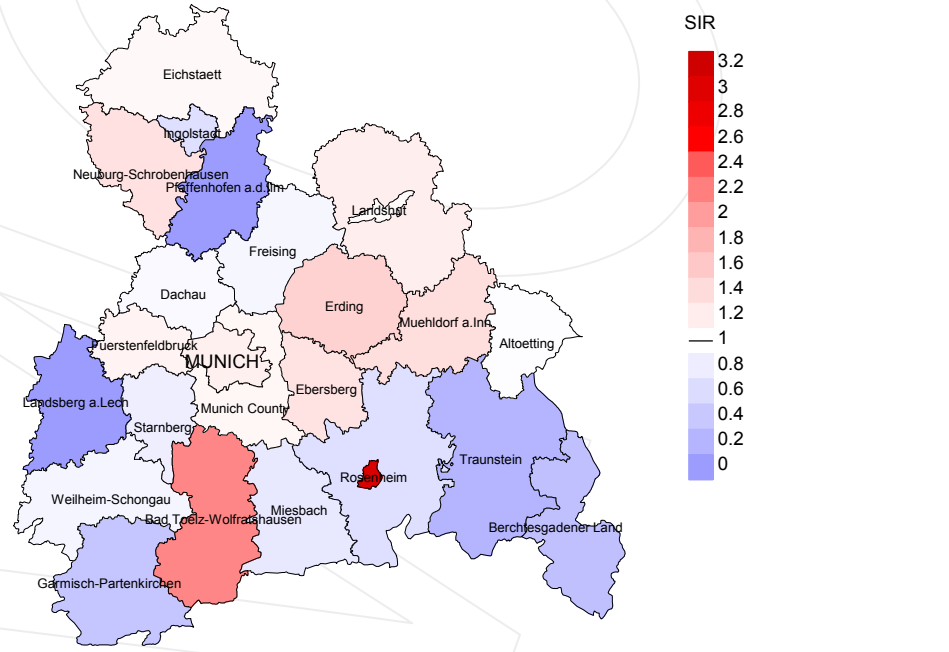


Figure 9b. Map of standardized incidence ratio (SIR, incl. DCO cases) by county averaged for period 2007 to 2013. According to their individual SIR values, the counties are displayed in different red and blue color temperatures where the fine white color indicates the population overall of 1.0 (males N=482, females N=115).

The results should be interpreted with caution! E.g., in county Ebersberg with a population of 64,642 female residents (averaged) in the period from 2007 to 2013 a total of 4 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 1.32. Though, the value of this parameter may vary with an underlying probability of 99% between 0.22 and 4.14, and is therefore not statistically striking.

MORTALITY

Table 10a

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

Year of diagnosis	Incident cases n	Prop. actively followed %	Prop. DCO %	Deaths n	Prop. deaths %	Prop. deaths with death certific. %
1998	29	100.0	6.9	29	100.0	89.7
1999	26	100.0	7.7	26	100.0	92.3
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	97.1	11.6	65	94.2	98.5
2007	93	96.8	5.4	81	87.1	97.5
2008	97	97.9	7.2	94	96.9	98.9
2009	82	95.1	4.9	75	91.5	94.7
2010	84	92.9	9.5	74	88.1	94.6
2011	88	88.6	4.5	70	79.5	98.6
2012	89	89.9	4.5	66	74.2	95.5
2013	64	100.0	14.1	37	57.8	91.9
1998-2013	1052	96.3	12.1	943	89.6	96.1

Table 10b

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

Year of diagnosis/ death	Incident cases n	Deaths n	Prop. deaths with death certific. %	Deaths in same year n	Prop. deaths in same year %
1998	29	24	95.8	12	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	84	83	96.4	26	31.0
2011	88	80	97.5	25	28.4
2012	89	87	100.0	28	31.5
2013	64	77	98.7	28	43.8
1998-2013	1052	927	97.0	346	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)

Year of death	Deaths n	Prop. cancer-related %	Prop. non-cancer-related %	Prop. cancer recorded on death certificate %
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
2003	41	90.2	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	77	96.1	3.9	98.7
1998-2013	927	94.5	5.5	98.9

Table 11a

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

Year of death	Deaths n	Age at death (all causes) Years	Age at death (cancer-related) Years	Age at death (non-cancer-related) Years	Age at death (according to death certificate) Years
1998	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	62	74.1	73.9	85.1	74.1
1998-2013	755	71.6	71.6	74.3	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.

Table 11b

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

Year of death	Deaths n	Age at death (all causes) Years	Age at death (cancer-related) Years	Age at death (non-cancer-related) Years	Age at death (according to death certificate) Years
1998	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	15	73.1	73.1		73.1
1998-2013	172	74.6	74.5	75.2	74.6

By 2010, life expectancy for a newborn male in Germany is 77.5 years compared with 82.6 years for his female counterpart.

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

Table 12a

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

Year of death	Deaths n	Mort. raw	MI-Index raw	Mort. WS	MI-Index WS	Mort. ES	MI-Index ES	Mort. BRD-S	MI-Index BRD-S
1998	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	0.95	1.2	0.92	1.9	0.93	2.6	0.97
2011	65	2.8	0.88	1.2	0.82	1.9	0.85	2.8	0.90
2012	67	2.9	0.92	1.3	0.94	2.0	0.94	2.8	0.95
2013	59	2.6	1.13	1.1	1.05	1.7	1.07	2.4	1.10
1998-2013	715	2.4	0.85	1.2	0.83	1.8	0.84	2.4	0.86

Table 12b

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

Year of death	Deaths n	Mort. raw	MI-Index raw	Mort. WS	MI-Index WS	Mort. ES	MI-Index ES	Mort. BRD-S	MI-Index BRD-S
1998	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	1.00	0.2	0.84	0.4	0.89	0.5	0.99
2013	15	0.6	1.25	0.2	1.34	0.4	1.36	0.5	1.33
1998-2013	161	0.5	0.77	0.2	0.72	0.3	0.74	0.4	0.76

Table 13

Age distribution of age at death (cancer-related) for period 1998-2013
(**incl. multiple primaries**)

Age at death Years	Cases n	%	Cum.%	Males n	%	Cum.%	Females n	%	Cum.%
30-34	1	0.1	0.1	1	0.1	0.1			0.0
35-39	1	0.1	0.2			0.1	1	0.6	0.6
40-44	3	0.3	0.6	1	0.1	0.3	2	1.2	1.9
45-49	9	1.0	1.6	7	1.0	1.3	2	1.2	3.1
50-54	23	2.6	4.2	19	2.7	3.9	4	2.5	5.6
55-59	49	5.6	9.8	39	5.4	9.4	10	6.2	11.8
60-64	103	11.7	21.6	88	12.3	21.6	15	9.3	21.1
65-69	175	20.0	41.5	160	22.3	44.0	15	9.3	30.4
70-74	192	21.9	63.4	156	21.8	65.8	36	22.4	52.8
75-79	150	17.1	80.5	123	17.2	83.0	27	16.8	69.6
80-84	112	12.8	93.3	83	11.6	94.6	29	18.0	87.6
85+	59	6.7	100.0	39	5.4	100.0	20	12.4	100.0
All ages	877	100.0		716	100.0		161	100.0	

Included in the statistics are 22.9% multiple primaries in males and 22.0% in females.

Table 14

Age-specific mortality (cancer-related) and proportion of all cancers
for period 1998-2013
(**incl. multiple primaries**)

Age at death Years	Males n	Females n	Males Age-spec. mortal.	MI-index	Females Age-spec. mortal.	MI-index	Males Prop.all cancers %	Females Prop.all cancers %
0- 4			0.0		0.0			
5- 9			0.0		0.0			
10-14			0.0		0.0			
15-19			0.0		0.0			
20-24			0.0		0.0			
25-29			0.0		0.0			
30-34	1		0.0	1.00	0.0		0.5	
35-39		1	0.0		0.0	0.50		0.2
40-44	1	2	0.0	0.50	0.1	0.40	0.1	0.2
45-49	7	2	0.3	0.58	0.1	0.40	0.4	0.1
50-54	19	4	0.9	0.73	0.2	0.67	0.6	0.1
55-59	39	10	2.1	0.70	0.5	0.91	0.7	0.2
60-64	88	15	5.0	0.76	0.8	0.68	1.0	0.2
65-69	160	15	10.1	0.86	0.9	0.48	1.3	0.2
70-74	156	36	12.2	0.84	2.4	1.00	1.1	0.4
75-79	123	27	14.9	1.00	2.3	0.77	0.9	0.3
80-84	83	29	16.6	0.87	3.1	0.94	0.8	0.3
85+	39	20	11.4	0.95	2.2	0.80	0.4	0.1
All ages	716	161					0.9	0.2
Mortality								
Raw			2.4	0.85	0.5	0.77		
WS			1.2	0.83	0.2	0.72		
ES			1.8	0.84	0.3	0.74		
BRD-S			2.5	0.86	0.4	0.76		
PYLL-70								
per 100,000			7.8		1.8			
ES			6.8		1.5			
AYLL-70			6.7		9.7			

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

Table 15a

Multiple primaries in deaths in period 1998-2013
MALES

Diagnosis	Total n	Total %↓	Pre n	Pre ←%	Syn-chron ±30d n	Syn-chron ±30d ←%	Post n	Post ←%
C03-C06 Oral cavity	2	1.3	1	50.0			1	50.0
C09-C10 Oropharynx	2	1.3	2	100.0				
C16 Stomach	5	3.1	5	100.0				
C18 Colon	9	5.7	7	77.8	2	22.2		
C19-C20 Rectum	11	6.9	10	90.9	1	9.1		
C22 Liver	2	1.3	1	50.0	1	50.0		
C33-C34 Lung	13	8.2	2	15.4	2	15.4	9	69.2
C38,C45 Mesothelioma	3	1.9					3	100.0
C43 Malign. melanoma	10	6.3	9	90.0			1	10.0
C44 Skin others	14	8.8	11	78.6			3	21.4
C61 Prostate	44	27.7	38	86.4	2	4.5	4	9.1
C64 Kidney	8	5.0	6	75.0	1	12.5	1	12.5
C67 Bladder	10	6.3	8	80.0	1	10.0	1	10.0
C70-C72 CNS cancer	3	1.9	1	33.3	1	33.3	1	33.3
C73 Thyroid	2	1.3	1	50.0			1	50.0
C76-C79 CUP	2	1.3	2	100.0				
C82-C85 NHL	8	5.0	6	75.0	2	25.0		
C90 Mult. myeloma	2	1.3	1	50.0			1	50.0
C91-C96 Leukaemia	4	2.5	2	50.0	2	50.0		
Other primaries	5	3.1	5	100.0				
All mult. primaries	159	100.0	118	74.2	15	9.4	26	16.4

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 1998-2013
FEMALES

Diagnosis		Total n	Total %↓	Pre n	Pre ←%	Syn-chron ±30d n	Syn-chron ±30d ←%	Post n	Post ←%
C16	Stomach	1	3.1	1	100.0				
C18	Colon	3	9.4	3	100.0				
C33-C34	Lung	3	9.4	1	33.3			2	66.7
C43	Malign. melanoma	2	6.3	2	100.0				
C44	Skin others	2	6.3	1	50.0			1	50.0
C50	Breast	8	25.0	7	87.5			1	12.5
C54	Corpus uteri	3	9.4	2	66.7			1	33.3
C67	Bladder	2	6.3	2	100.0				
C70-C72	CNS cancer	3	9.4	2	66.7			1	33.3
C73	Thyroid	2	6.3	2	100.0				
C81	Hodgkin lymphoma	1	3.1	1	100.0				
C82-C85	NHL	1	3.1	1	100.0				
C90	Mult. myeloma	1	3.1	1	100.0				

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 1998-2013
(**Singular primaries only** *)

Age at death Years	Males n	Females n	Males Age-spec. mortal.	MI-index	Females Age-spec. mortal.	MI-index	Males Prop.all cancers %	Females Prop.all cancers %
0- 4			0.0		0.0			
5- 9			0.0		0.0			
10-14			0.0		0.0			
15-19			0.0		0.0			
20-24			0.0		0.0			
25-29			0.0		0.0			
30-34			0.0		0.0			
35-39			0.0		0.0			
40-44	1	1	0.0	0.50	0.0	0.25	0.1	0.1
45-49	7	2	0.3	0.64	0.1	0.40	0.4	0.1
50-54	16	4	0.8	0.73	0.2	0.67	0.6	0.2
55-59	38	9	2.1	0.69	0.5	0.90	0.7	0.2
60-64	81	13	4.6	0.77	0.7	0.68	1.1	0.2
65-69	137	13	8.7	0.88	0.8	0.54	1.4	0.2
70-74	131	31	10.2	0.87	2.0	0.97	1.2	0.4
75-79	93	24	11.3	1.01	2.0	0.77	0.9	0.3
80-84	63	24	12.6	0.88	2.6	1.00	0.8	0.3
85+	30	17	8.8	0.94	1.9	0.85	0.4	0.2
All ages	597	138					0.9	0.2
Mortality								
Raw			2.0	0.86	0.4	0.79		
WS			1.0	0.84	0.2	0.73		
ES			1.5	0.85	0.3	0.75		
BRD-S			2.0	0.87	0.4	0.78		
PYLL-70								
per 100,000			7.1		1.5			
ES			6.1		1.2			
AYLL-70			6.8		9.2			

* See corresponding tables with multiple primaries.

Table 17

Age-specific mortality (cancer-related) and proportion of all cancers
for period 1998-2013
(**Single primaries only** *)

Age at death Years	Males n	Females n	Males Age-spec. mortal.	MI-index	Females Age-spec. mortal.	MI-index	Males Prop.all cancers %	Females Prop.all cancers %
0- 4			0.0		0.0			
5- 9			0.0		0.0			
10-14			0.0		0.0			
15-19			0.0		0.0			
20-24			0.0		0.0			
25-29			0.0		0.0			
30-34			0.0		0.0			
35-39			0.0		0.0			
40-44	1	1	0.0	0.50	0.0	0.25	0.1	0.1
45-49	7	2	0.3	0.64	0.1	0.40	0.5	0.1
50-54	16	4	0.8	0.76	0.2	0.67	0.6	0.2
55-59	37	9	2.0	0.67	0.5	0.90	0.8	0.3
60-64	80	12	4.5	0.78	0.6	0.67	1.2	0.3
65-69	134	12	8.5	0.89	0.7	0.55	1.6	0.2
70-74	124	27	9.7	0.87	1.8	0.93	1.4	0.4
75-79	88	24	10.6	0.99	2.0	0.77	1.1	0.3
80-84	60	24	12.0	0.87	2.6	1.00	0.9	0.3
85+	30	17	8.8	0.94	1.9	0.85	0.6	0.2
All ages	577	132					1.1	0.3
Mortality								
Raw			1.9	0.85	0.4	0.78		
WS			1.0	0.84	0.2	0.72		
ES			1.5	0.85	0.2	0.74		
BRD-S			1.9	0.86	0.3	0.77		
PYLL-70								
per 100,000			7.0		1.4			
ES			6.0		1.2			
AYLL-70			6.8		9.4			

* See corresponding tables with multiple primaries.

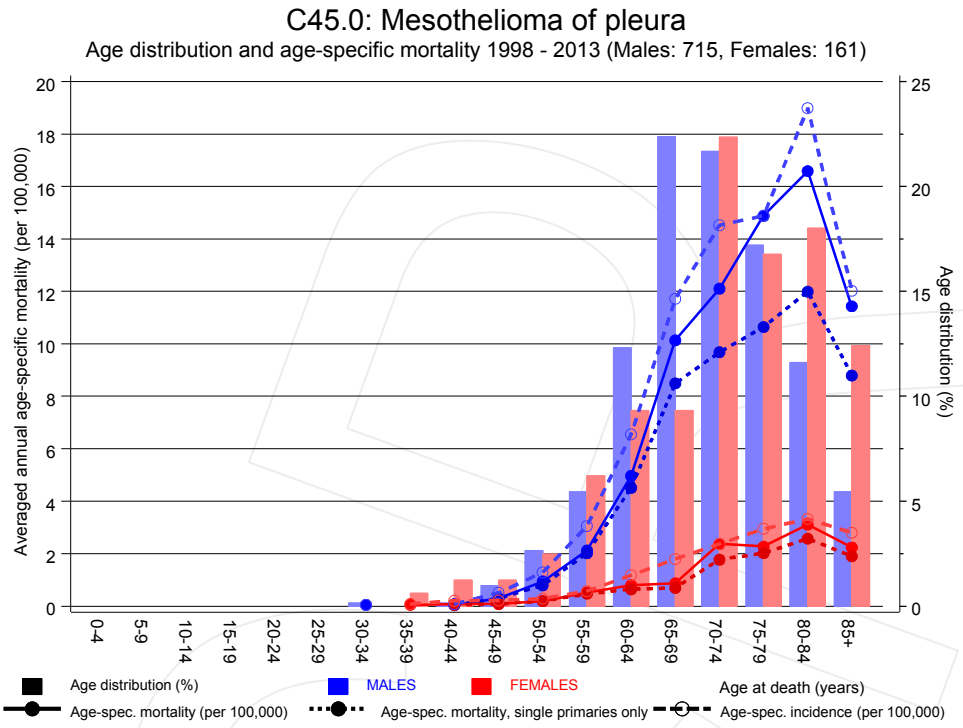
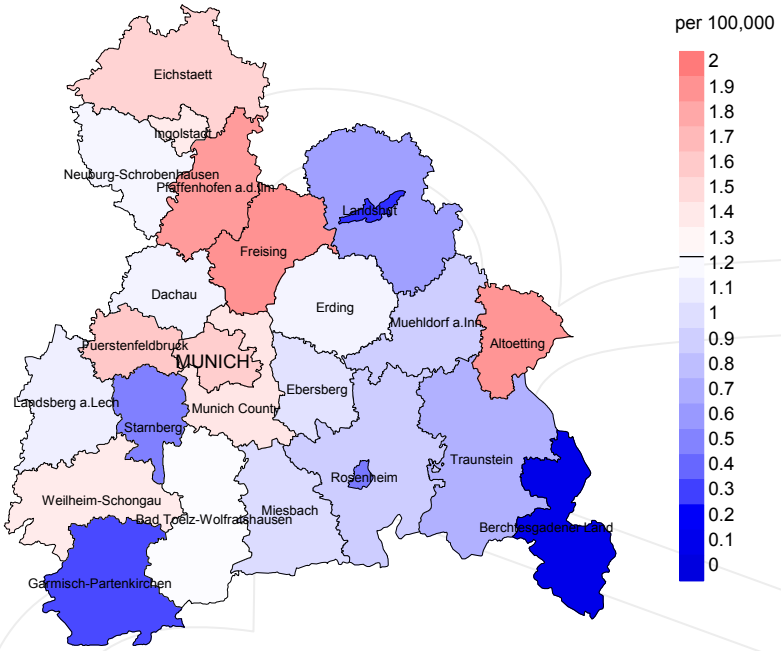


Figure 18. Distribution of age at death (bars) and age-specific mortality (all patients: solid line, patients with single primaries: dotted line). The age-specific incidence is additionally plotted for comparison (dashed line).

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 - 2013: Males



Average mortality (world standard population) 2007 - 2013: Females

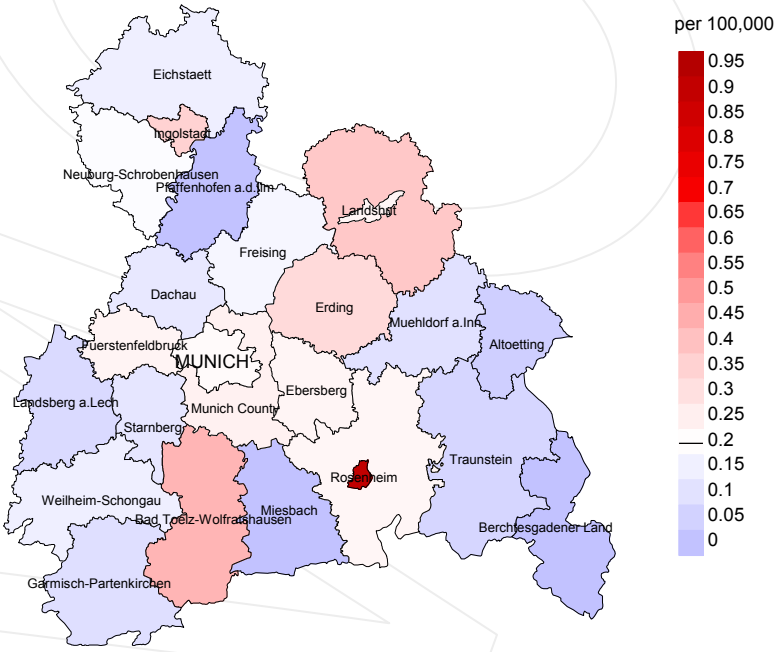
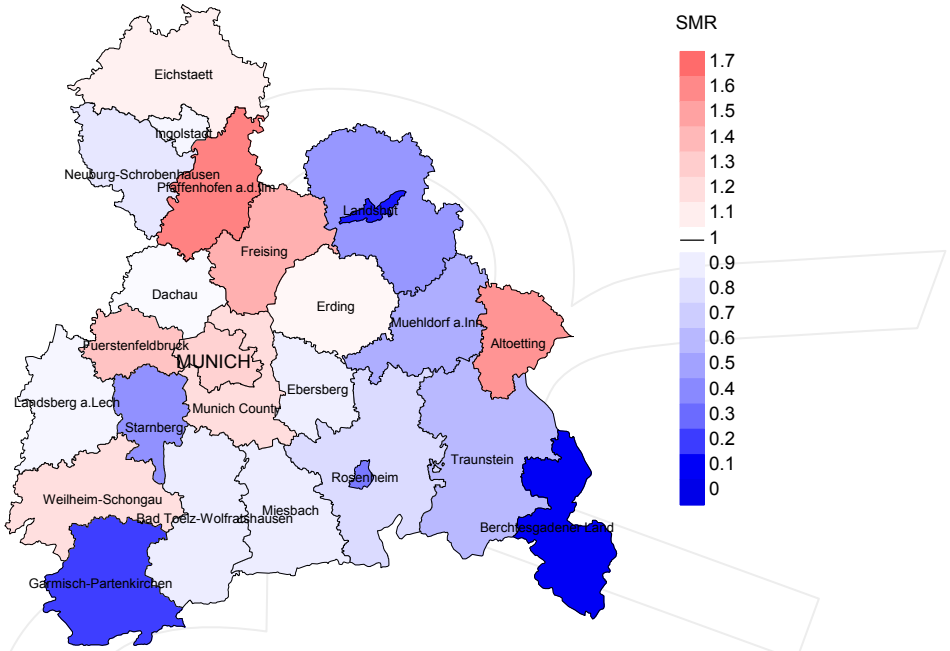


Figure 19a. Map of cancer mortality (world standard population) by county averaged for period 2007 to 2013. According to their individual mortality rates, the counties are displayed in different red and blue color temperatures where the fine white color indicates the population mean (males 1.2/100,000 WS N=426, females 0.2/100,000 WS N=95).

The results should be interpreted with caution! E.g., in county Ebersberg with a population of 64,928 female residents (averaged) in the period from 2007 to 2013 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 0.9/100,000.

Standardized mortality ratio (SMR) 2007 - 2013: Males



Standardized mortality ratio (SMR) 2007 - 2013: Females

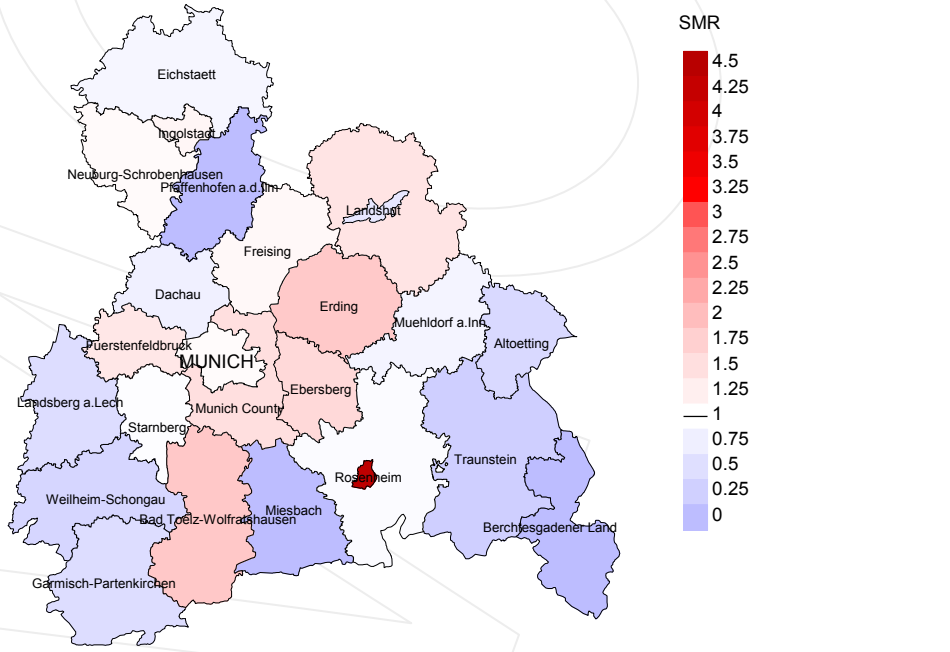


Figure 19b. Map of standardized mortality ratio (SMR, incl. DCO cases) by county averaged for period 2007 to 2013. According to their individual SMR values, the counties are displayed in different red and blue color temperatures where the fine white color indicates the population overall of 1.0 (males N=426, females N=95).

The results should be interpreted with caution! E.g., in county Ebersberg with a population of 64,642 female residents (averaged) in the period from 2007 to 2013 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 1.61. Though, the value of this parameter may vary with an underlying probability of 99% between 0.27 and 5.08, 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. 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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