

# Munich Cancer Registry



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

## ICD-10 C45: Mesothelioma

### Incidence and Mortality

Year of diagnosis	1998-2016
Patients	1,443
Diseases	1,445
Creation date	08/21/2018
Export date	08/09/2018
Population	4.81 m



Munich Cancer Registry  
Cancer Registry Bavaria - Upper Bavaria Regional Center  
at Klinikum Grosshadern/IBE  
Marchioninstr. 15  
Munich, 81377  
Germany

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

[https://www.tumorregister-muenchen.de/en/facts/base/bC45\\_\\_E-ICD-10-C45-Mesothelioma-incidence-and-mortality.pdf](https://www.tumorregister-muenchen.de/en/facts/base/bC45__E-ICD-10-C45-Mesothelioma-incidence-and-mortality.pdf)

### Index of figures and tables

Fig./Tbl.		Page
1	Annual cases, DCO, mult. malignancies, follow-up / yr	4
2	Incidence by year of diagnosis	7
3	Age distribution parameters by year of diagnosis	8
4	Age distribution by 5-year age group and sex	9
5	Age-specific incidence, DCO rate, proportion malignancies	10
6	Age distribution and age-specific incidence (chart)	11
6a	Age-specific incidence internationally (chart)	12
7	Standardized incidence ratio of further malignancies	13
8a	Map of cancer incidence (WS) by county (chart)	15
8b	Standardized incidence ratio (SIR) by county (chart)	16
9a	Pts incident cohorts and mortality / yr	17
9b	Incidence and mortality by year of diagnosis	18
9c	Cancer-related deaths, death certification available / yr	19
10	Medians of age at death / yr	20
11	Mortality by year of death	22
12	Distribution of age at death	23
13	Age-specific mortality	24
14	Further malignancies in deaths	25
15	Age-specific mortality (first primaries)	27
16	Age-specific mortality (single primaries)	28
17	Age distribution and age-specific mortality (chart)	29
18a	Map of cancer mortality (WS) by county (chart)	30
18b	Standardized mortality ratio (SMR) by county (chart)	31

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

In these analyses, the clinics and physicians of Upper Bavaria and the city and county of Landshut<sup>#</sup>, with a total of 4.69 million inhabitants, account for the frequency of cancer diseases<sup>##</sup> and the achieved long term results. Additionally, the long term survival evaluated by the Munich Cancer Registry (MCR) is compared with the results of the population-based registry in the USA (SEER), which is useful for checking the consistency of the data on an international level.

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

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

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

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

Munich Cancer Registry, August 2018

<sup>#</sup> Base data has been collected since 1998. An increase in new diseases is apparent, which is an effect of two extensions in the MCR catchment area (from a base population of 2.65 million to 4.10 in 2002, and to 4.69 million in 2007).

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

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

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

Code	Description
C45.-	Mesothelioma
C45.0	Mesothelioma of pleura
C45.1	Mesothelioma of peritoneum
C45.2	Mesothelioma of pericardium
C45.7	Mesothelioma of other sites
C45.9	Mesothelioma, unspecified

## INCIDENCE

Table 1

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

Year of diagnosis	All cases n	DCO cases n	Prop. DCO %	Prop. at least 1 further malign. prior + synchron. %	Prop. at least 1 further malign. after %	Prop. deaths %	Prop. actively followed %
1998	41	10	24.4	4.9	3.6	100.0	100.0
1999	33	7	21.2	5.4	3.6	100.0	100.0
2000	43	22	51.2	8.5	3.7	97.7	100.0
2001	45	10	22.2	8.6	3.7	97.8	100.0
2002	60	18	30.0	9.9	3.7	96.7	100.0 #
2003	63	12	19.0	10.9	3.6	95.2	100.0
2004	80	10	12.5	10.7	3.8	96.3	98.8
2005	76	8	10.5	10.9	3.8	96.1	97.4
2006	74	8	10.8	11.8	3.5	95.9	95.9
2007	102	5	4.9	12.5	3.5	92.2	96.1 #
2008	101	7	6.9	13.0	3.2	99.0	99.0
2009	85	4	4.7	13.7	3.5	92.9	95.3
2010	99	9	9.1	14.9	3.0	91.9	96.0
2011	98	5	5.1	15.4	2.8	84.7	89.8
2012	104	6	5.8	16.0	2.7	93.3	99.0
2013	94	9	9.6	16.4	2.4	88.3	95.7
2014	79	9	11.4	16.8	2.5	78.5	96.2
2015	99	3	3.0	17.7	3.6	66.7	97.0
2016	69	2	2.9	18.2	2.9	30.4	87.0 ##
1998-2016	1445	164	11.3	18.2	3.6	88.2	96.6

1,445 cases diagnosed 1998-2016 are related to a total of 1,443 patients. Currently, in 313 (21.7 %) of these 1,443 patients more than one malignancy of any cancer type has been registered. Hereby, groups of 267 / 35 / 11 (18.5 % / 2.4 % / 0.8 %) patients exist having 2 / 3 / 4+ malignancies.

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

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

How to interpret:

In 2014, a subgroup of 79 cases has been diagnosed, of which 16.8 % previously and/or concurrently (synchronously) had at least one other malignancy of any cancer type. In 2.5 % of cases, at least one new malignancy has occurred during the follow-up period (all numbers refer to the date of the database export, see cover sheet).

Table 1a

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

Year of diagnosis	Males n	Males %	DCO cases n	Prop. DCO %	Prop. at least 1 further malign. prior + synchron. %	Prop. at least 1 further malign. after %	Prop. deaths %	Prop. actively followed %
1998	30	73.2	9	30.0	6.7	3.5	100.0	100.0
1999	25	75.8	5	20.0	5.5	3.5	100.0	100.0
2000	33	76.7	17	51.5	8.0	3.6	100.0	100.0
2001	30	66.7	6	20.0	8.5	3.7	96.7	100.0
2002	45	75.0	11	24.4	11.0	3.7	97.8	100.0 #
2003	50	79.4	7	14.0	12.2	3.5	98.0	100.0
2004	70	87.5	10	14.3	11.3	3.6	97.1	100.0
2005	57	75.0	5	8.8	11.5	3.5	94.7	96.5
2006	60	81.1	6	10.0	12.5	3.3	95.0	95.0
2007	81	79.4	4	4.9	12.9	3.4	95.1	97.5 #
2008	81	80.2	4	4.9	13.3	3.1	100.0	100.0
2009	69	81.2	3	4.3	13.8	3.3	92.8	94.2
2010	76	76.8	9	11.8	15.4	3.0	96.1	98.7
2011	80	81.6	2	2.5	15.8	2.8	83.8	90.0
2012	81	77.9	4	4.9	16.5	2.6	93.8	98.8
2013	77	81.9	8	10.4	16.5	1.8	89.6	96.1
2014	64	81.0	6	9.4	17.1	1.5	81.3	96.9
2015	81	81.8	3	3.7	18.3	2.3	67.9	97.5
2016	52	75.4	1	1.9	18.7	2.0	28.8	86.5 ##
1998-2016	1142	79.0	120	10.5	18.7	3.5	89.1	96.9

1,142 cases diagnosed 1998-2016 are related to a total of 1,140 patients. Currently, in 252 (22.1 %) of these 1,140 patients more than one malignancy of any cancer type has been registered. Hereby, groups of 214 / 29 / 9 (18.8 % / 2.5 % / 0.8 %) patients exist having 2 / 3 / 4+ malignancies.

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

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

How to interpret:

In 2014, a subgroup of 64 cases has been diagnosed, of which 17.1 % previously and/or concurrently (synchronously) had at least one other malignancy of any cancer type. In 1.5 % of cases, at least one new malignancy has occurred during the follow-up period (all numbers refer to the date of the database export, see cover sheet).

Table 1b

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

Year of diagnosis	Females n	Females %	DCO cases n	Prop. DCO %	Prop. at least 1 further malign. prior + synchron. %	Prop. at least 1 further malign. after %	Prop. deaths %	Prop. actively followed %
1998	11	26.8	1	9.1	0.0	3.7	100.0	100.0
1999	8	24.2	2	25.0	5.3	3.8	100.0	100.0
2000	10	23.3	5	50.0	10.3	3.9	90.0	100.0
2001	15	33.3	4	26.7	9.1	4.1	100.0	100.0
2002	15	25.0	7	46.7	6.8	3.9	93.3	100.0 #
2003	13	20.6	5	38.5	6.9	4.1	84.6	100.0
2004	10	12.5			8.5	4.4	90.0	90.0
2005	19	25.0	3	15.8	8.9	4.6	100.0	100.0
2006	14	18.9	2	14.3	9.6	4.5	100.0	100.0
2007	21	20.6	1	4.8	11.0	3.8	81.0	90.5 #
2008	20	19.8	3	15.0	11.5	3.6	95.0	95.0
2009	16	18.8	1	6.3	13.4	4.1	93.8	100.0
2010	23	23.2			12.8	3.1	78.3	87.0
2011	18	18.4	3	16.7	14.1	2.8	88.9	88.9
2012	23	22.1	2	8.7	14.4	3.3	91.3	100.0
2013	17	18.1	1	5.9	15.8	4.5	82.4	94.1
2014	15	19.0	3	20.0	15.3	6.0	66.7	93.3
2015	18	18.2			15.4	8.6	61.1	94.4
2016	17	24.6	1	5.9	16.5	5.9	35.3	88.2 ##
1998-2016	303	21.0	44	14.5	16.5	3.7	84.8	95.4

303 cases diagnosed 1998-2016 are related to a total of 303 patients. Currently, in 61 (20.1 %) of these 303 patients more than one malignancy of any cancer type has been registered. Hereby, groups of 53 / 6 / 2 (17.5 % / 2.0 % / 0.7 %) patients exist having 2 / 3 / 4+ malignancies.

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

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

How to interpret:

In 2014, a subgroup of 15 cases has been diagnosed, of which 15.3 % previously and/or concurrently (synchronously) had at least one other malignancy of any cancer type. In 6.0 % of cases, at least one new malignancy has occurred during the follow-up period (all numbers refer to the date of the database export, see cover sheet).

Table 2

Incidence measures by year of diagnosis including DCO cases  
(with respect to registry area expansion from 2.65 to 4.10 m as of 2002,  
and from 4.10 to 4.81 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	30	11	2.7	0.9	1.7	0.5	2.4	0.7	2.9	0.9
1999	25	8	2.2	0.7	1.3	0.4	2.0	0.5	2.5	0.6
2000	33	10	2.9	0.8	1.7	0.3	2.6	0.5	3.2	0.7
2001	30	15	2.6	1.2	1.6	0.6	2.3	0.9	2.7	1.1
2002	45	15	2.4	0.8	1.4	0.4	2.0	0.6	2.7	0.7
2003	50	13	2.7	0.7	1.5	0.3	2.2	0.4	2.8	0.5
2004	70	10	3.7	0.5	1.9	0.3	2.8	0.4	3.6	0.5
2005	57	19	3.0	1.0	1.6	0.5	2.3	0.6	3.1	0.8
2006	60	14	3.1	0.7	1.6	0.3	2.4	0.4	3.2	0.6
2007	81	21	3.7	0.9	1.8	0.4	2.8	0.6	3.7	0.8
2008	81	20	3.6	0.9	1.8	0.3	2.6	0.5	3.4	0.6
2009	69	16	3.1	0.7	1.5	0.2	2.2	0.4	3.0	0.5
2010	76	23	3.4	1.0	1.6	0.4	2.4	0.6	3.1	0.8
2011	80	18	3.6	0.8	1.6	0.2	2.5	0.4	3.4	0.6
2012	81	23	3.6	1.0	1.5	0.4	2.4	0.6	3.3	0.8
2013	77	17	3.3	0.7	1.5	0.3	2.3	0.4	3.0	0.5
2014	64	15	2.7	0.6	1.1	0.2	1.7	0.3	2.4	0.4
2015	81	18	3.4	0.7	1.3	0.3	2.1	0.4	3.0	0.5
2016	52	17	2.2	0.7	0.8	0.3	1.3	0.4	2.0	0.5
1998-2016	1142	303	3.1	0.8	1.5	0.3	2.3	0.5	3.1	0.6

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

Table 3

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

Year of diagnosis	Cases n	Std.		Median						
		Mean	dev.	Min.	Max.	10%	25%	50%	75%	90%
1998	41	66.7	10.2	48.8	89.2	55.9	59.5	66.0	70.5	84.0
1999	33	67.5	9.3	47.8	86.4	56.1	61.4	67.7	74.3	80.6
2000	43	67.8	15.9	8.5	92.8	55.3	58.9	66.2	78.8	88.4
2001	45	66.0	9.8	45.6	85.4	54.5	57.7	65.6	72.9	79.8
2002	60	67.7	12.5	27.9	88.5	49.6	60.9	66.0	76.2	84.7
2003	63	69.6	10.9	30.7	91.2	58.1	62.1	69.8	77.7	82.6
2004	80	69.9	8.1	44.9	90.1	61.8	65.1	68.8	73.8	81.6
2005	76	69.6	10.3	38.5	88.3	57.5	63.8	70.5	76.7	83.4
2006	74	70.1	9.9	40.6	87.8	57.0	64.9	71.2	77.8	81.7
2007	102	69.4	9.4	40.3	92.4	55.4	64.6	70.4	76.1	79.6
2008	101	71.9	8.8	42.4	88.1	61.9	67.4	71.8	77.2	84.2
2009	85	72.1	9.6	44.3	97.3	60.3	65.4	72.0	80.1	83.8
2010	99	71.4	9.9	36.2	93.6	57.3	66.9	72.1	78.1	83.1
2011	98	73.3	8.3	52.5	87.3	62.0	67.4	73.4	79.8	84.1
2012	104	73.3	9.8	41.3	95.6	60.1	69.2	73.5	79.7	84.8
2013	94	72.1	9.6	43.1	95.4	59.7	65.7	72.7	78.2	85.2
2014	79	74.1	9.7	35.4	92.1	61.8	70.1	75.0	80.0	85.2
2015	99	74.8	10.4	26.1	91.6	61.7	70.8	76.3	80.4	87.6
2016	69	74.1	9.6	45.1	91.6	57.3	70.7	75.7	80.3	83.5
1998-2016	1445	71.2	10.2	8.5	97.3	58.1	65.2	72.0	78.2	83.7

Table 3a

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

Year of diagnosis	Cases n	Std.		Median						
		Mean	dev.	Min.	Max.	10%	25%	50%	75%	90%
1998	30	66.9	9.7	49.4	89.2	56.8	59.5	65.6	70.5	83.2
1999	25	67.1	9.1	50.8	86.4	56.1	60.9	67.3	74.1	80.6
2000	33	67.1	15.8	8.5	92.8	55.3	58.9	65.0	78.1	85.9
2001	30	64.0	9.3	45.6	83.2	51.5	57.1	64.0	69.1	77.3
2002	45	68.4	11.2	46.4	88.4	50.3	61.8	66.3	75.8	84.5
2003	50	68.5	10.5	30.7	90.3	58.0	62.1	69.6	74.8	80.6
2004	70	70.3	7.7	44.9	90.1	62.9	65.5	68.9	73.7	81.6
2005	57	69.9	9.4	45.1	86.8	57.5	64.5	70.5	76.5	83.4
2006	60	69.6	9.2	46.6	87.8	57.1	64.5	69.7	76.9	80.8
2007	81	70.1	8.8	44.4	92.4	58.2	64.8	70.6	76.1	79.6
2008	81	71.2	7.7	48.5	88.1	61.9	66.4	71.0	74.7	82.3
2009	69	71.2	9.6	44.3	97.3	59.0	65.2	70.5	79.6	82.6
2010	76	71.5	8.9	46.1	91.8	58.9	66.9	71.8	77.6	83.1
2011	80	72.7	8.4	52.5	87.0	61.6	66.6	73.3	78.7	84.0
2012	81	73.8	8.0	53.7	91.5	63.2	69.7	73.5	79.6	84.0
2013	77	72.1	8.6	49.4	92.4	61.0	67.1	72.9	77.8	81.5
2014	64	73.7	8.9	35.4	88.0	62.1	70.2	74.7	78.4	83.8
2015	81	74.6	10.2	26.1	91.6	66.4	71.3	76.2	78.8	85.6
2016	52	75.1	9.2	45.1	91.6	67.9	71.4	76.1	81.1	83.5
1998-2016	1142	71.1	9.6	8.5	97.3	58.9	65.4	71.8	77.7	82.9



Table 3b

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

Year of diagnosis	Cases n	Mean	Std. dev.	Min.	Max.	Median				
						10%	25%	50%	75%	90%
1998	11	66.3	12.1	48.8	85.2	53.1	55.9	66.0	76.8	84.0
1999	8	68.8	10.6	47.8	81.3	47.8	63.7	70.7	76.0	81.3
2000	10	70.3	17.0	35.6	90.6	46.4	59.8	73.1	82.6	89.5
2001	15	69.9	9.7	54.5	85.4	56.4	64.4	70.0	79.8	83.6
2002	15	65.5	16.0	27.9	88.5	48.9	57.4	63.8	79.1	85.6
2003	13	74.0	11.6	57.3	91.2	58.1	62.7	77.8	82.6	88.3
2004	10	67.1	10.8	53.1	84.7	53.5	57.5	66.8	76.6	81.7
2005	19	68.5	12.9	38.5	88.3	39.9	62.8	70.9	77.1	84.2
2006	14	72.2	12.5	40.6	86.6	57.0	65.9	76.5	79.6	83.9
2007	21	66.8	11.5	40.3	81.1	49.8	64.6	68.8	76.0	79.3
2008	20	74.6	12.1	42.4	87.8	55.9	70.0	75.7	83.2	86.9
2009	16	75.8	9.0	62.3	87.1	63.3	66.8	77.1	84.0	86.9
2010	23	71.2	13.1	36.2	93.6	54.6	65.3	73.8	78.2	82.5
2011	18	76.0	7.8	57.9	87.3	66.6	70.1	76.6	83.9	85.2
2012	23	71.4	14.5	41.3	95.6	51.3	59.6	72.3	84.1	86.7
2013	17	71.9	13.6	43.1	95.4	55.8	63.7	72.4	81.5	90.0
2014	15	75.8	12.5	42.7	92.1	59.6	70.0	78.8	84.1	88.6
2015	18	75.6	11.3	53.5	90.8	57.9	67.7	77.5	84.6	89.6
2016	17	70.8	10.1	50.4	91.3	55.3	66.7	73.8	76.0	79.3
1998-2016	303	71.4	12.3	27.9	95.6	55.3	64.4	72.8	80.7	85.4

Table 4

Age distribution by 5-year age group and sex for period 2007-2016  
(incl. DCO)

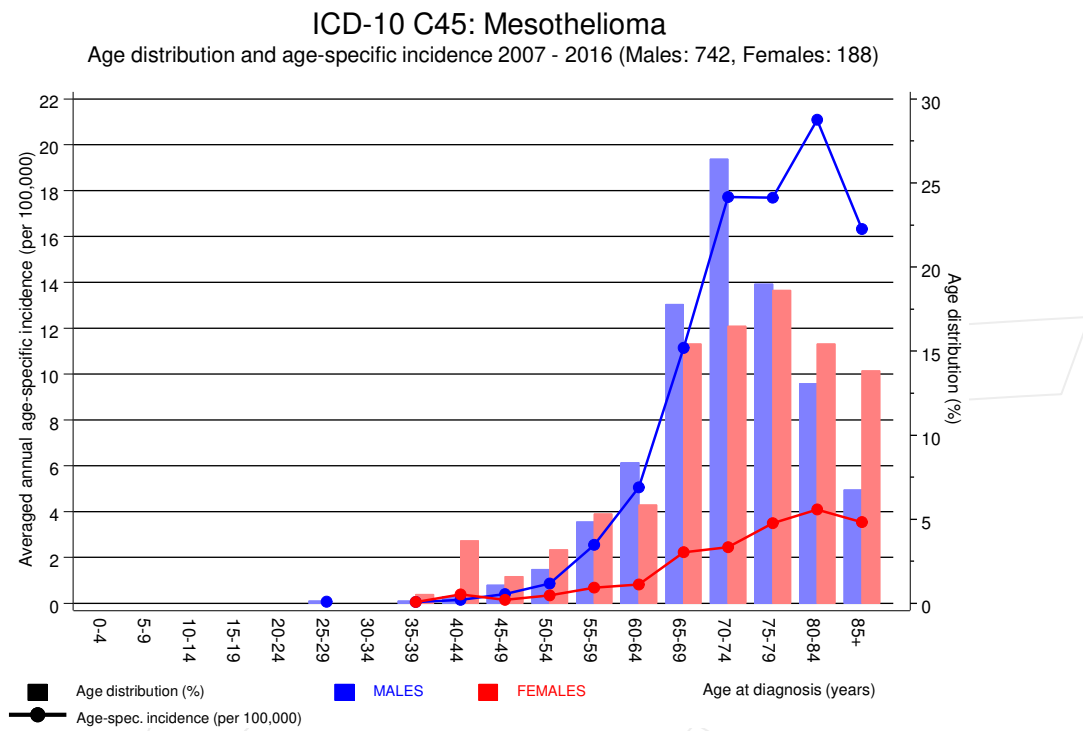
Age at diagnosis Years	Cases n	Males			Females				
		%	Cum.%	n	%	Cum.%	n	%	Cum.%
0-4									
5-9									
10-14									
15-19									
20-24									
25-29	1	0.1	0.1	1	0.1	0.1			0.0
30-34	0	0.0	0.1			0.1			0.0
35-39	2	0.2	0.3	1	0.1	0.3	1	0.5	0.5
40-44	10	1.1	1.4	3	0.4	0.7	7	3.7	4.3
45-49	11	1.2	2.6	8	1.1	1.8	3	1.6	5.9
50-54	21	2.3	4.8	15	2.0	3.8	6	3.2	9.0
55-59	46	4.9	9.8	36	4.9	8.6	10	5.3	14.4
60-64	73	7.8	17.6	62	8.4	17.0	11	5.9	20.2
65-69	161	17.3	34.9	132	17.8	34.8	29	15.4	35.6
70-74	227	24.4	59.4	196	26.4	61.2	31	16.5	52.1
75-79	176	18.9	78.3	141	19.0	80.2	35	18.6	70.7
80-84	126	13.5	91.8	97	13.1	93.3	29	15.4	86.2
85+	76	8.2	100.0	50	6.7	100.0	26	13.8	100.0
All ages	930	100.0		742	100.0		188	100.0	

Table 5

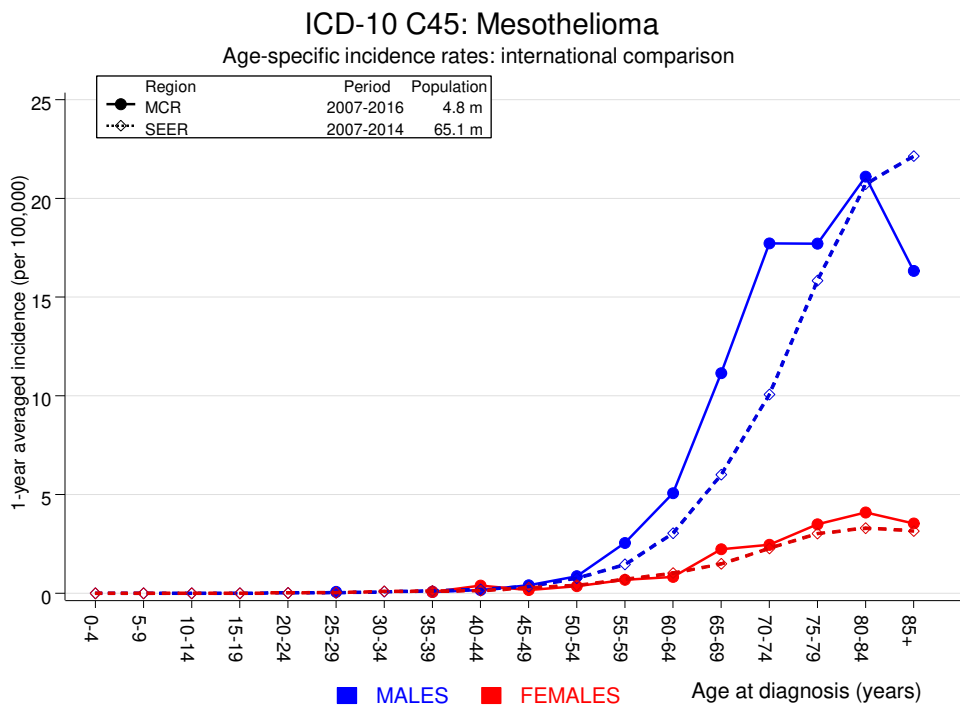
Age-specific incidence, DCO rate and proportion of all cancers for period 2007-2016

Age at diagnosis Years	Males n	Females n	Males Age- spec. incid.	Females Age- spec. incid.	Males DCO rate n=44 %	Females DCO rate n=15 %	Males	Females
							Prop.all cancers n=113978 %	Prop.all cancers n=112253 %
0- 4								
5- 9								
10-14								
15-19								
20-24								
25-29	1		0.1				0.1	
30-34								
35-39	1	1	0.1	0.1			0.1	0.0
40-44	3	7	0.2	0.4			0.1	0.2
45-49	8	3	0.4	0.2			0.2	0.0
50-54	15	6	0.9	0.4	6.7		0.2	0.1
55-59	36	10	2.5	0.7			0.4	0.1
60-64	62	11	5.1	0.8	4.8		0.5	0.1
65-69	132	29	11.1	2.2	4.5		0.7	0.2
70-74	196	31	17.7	2.4	4.6		0.9	0.2
75-79	141	35	17.7	3.5	5.7	2.9	0.9	0.3
80-84	97	29	21.1	4.1	11.3	17.2	0.9	0.3
85+	50	26	16.3	3.5	12.0	34.6	0.6	0.2
All ages	742	188			5.9	8.0	0.7	0.2
Incidence								
Raw			3.2	0.8				
WS			1.4	0.3				
ES			2.2	0.5				
BRD-S			3.0	0.6				

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



**Figure 6.** Age distribution (males: mean=72.5 yrs, median=73.2 yrs; females: mean=72.8 yrs, median=74.1 yrs) and age-specific incidence.



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

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

Table 7a

Standardized incidence ratio (SIR, with 95% confidence limits),  
excess absolute risk (EAR) and DCO rate of further malignancies  
for period 1998–2016

## MALES

Diagnosis	Observed n	Expected n	SIR	CI 95%	CI 95%	EAR	DCO %
C18 Colon	4	2.4	1.7	0.5	4.3	11.5	
C19–C20 Rectum	2	1.4	1.5	0.2	5.3	4.5	
C33–C34 Lung	14	3.0	4.6	2.5	7.7 #	78.1	78.6
C43 Malign. melanoma	2	1.1	1.8	0.2	6.5	6.4	50.0
C61 Prostate	6	7.5	0.8	0.3	1.7	-10.6	33.3
C64 Kidney	3	0.9	3.3	0.7	9.8	15.0	33.3
C82–C85 NHL	2	1.0	2.0	0.2	7.2	7.1	50.0
Others, specified	9	4.3	2.1	0.9	3.9	33.2	22.2
Not observed	0	3.9	0.0	0.0	0.9 #	-27.7	
All further malignancies	42	25.5	1.6	1.2	2.2 #	117.4	42.9
Patients		1016					
Median age at next malignancy (years)		73.5					
Person-years		1405					
Mean observation time (years)		1.4					
Median observation time (years)		1.0					

# The occurrence of further malignancy listed is statistically significant.

Observed further malignancies with count 1 are pooled in category "Others, specified".

Table 7b

Standardized incidence ratio (SIR, with 95% confidence limits), excess absolute risk (EAR) and DCO rate of further malignancies for period 1998–2016

FEMALES

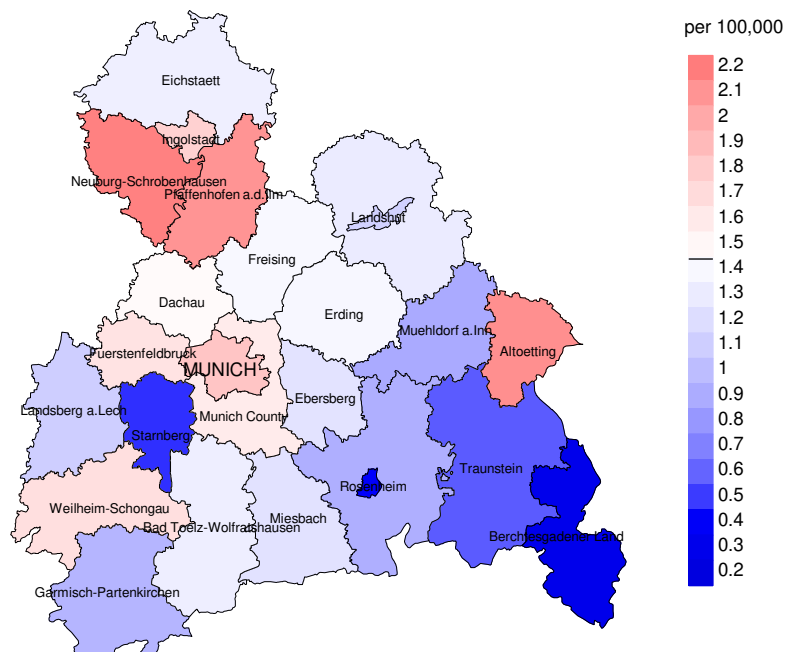
Diagnosis	Observed n	Expected n	SIR	CI 95%	CI 95%	EAR	DCO %
C33–C34 Lung	2	0.3	6.6	0.8	23.9	47.0	100.0
C56 Ovary	2	0.2	12.7	1.5	45.8 #	51.0	50.0
Others, specified	4	1.7	2.3	0.6	6.0	63.5	50.0
Not observed	0	1.7	0.0	0.0	2.2	-46.7	
All further malignancies	8	3.9	2.1	0.9	4.1	114.8	62.5

Patients 258  
 Median age at next malignancy (years) 70.7  
 Person-years 361  
 Mean observation time (years) 1.4  
 Median observation time (years) 0.7

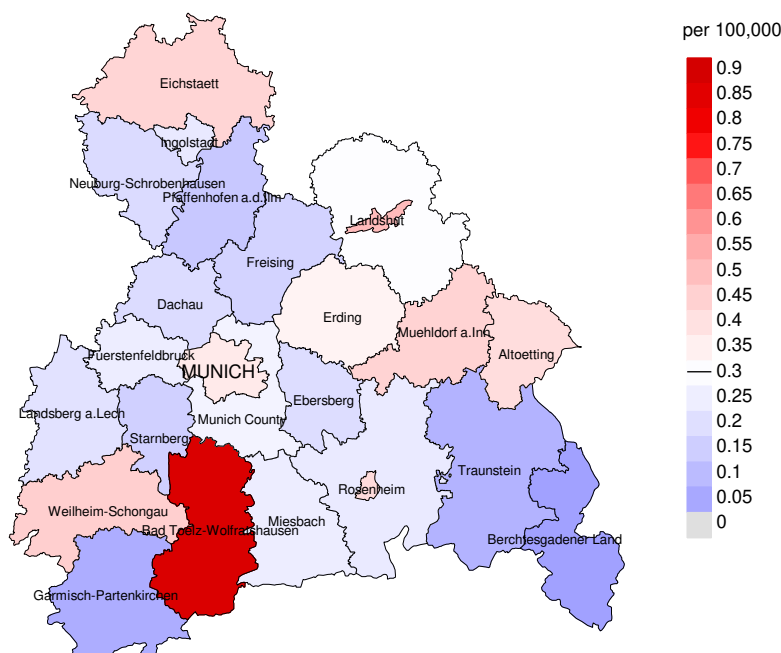
# The occurrence of further malignancy listed is statistically significant.

Observed further malignancies with count 1 are pooled in category “Others, specified”.

Average incidence (world standard population) 2007 - 2016: Males



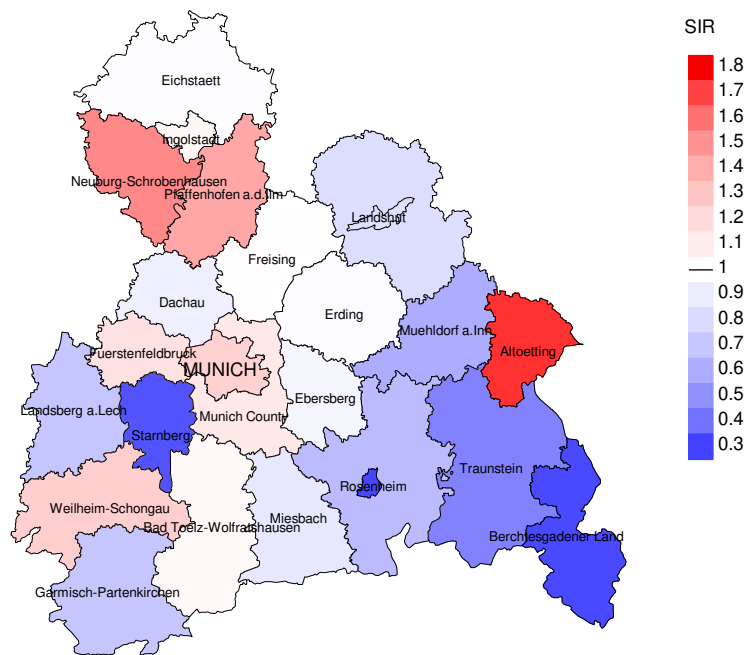
Average incidence (world standard population) 2007 - 2016: Females



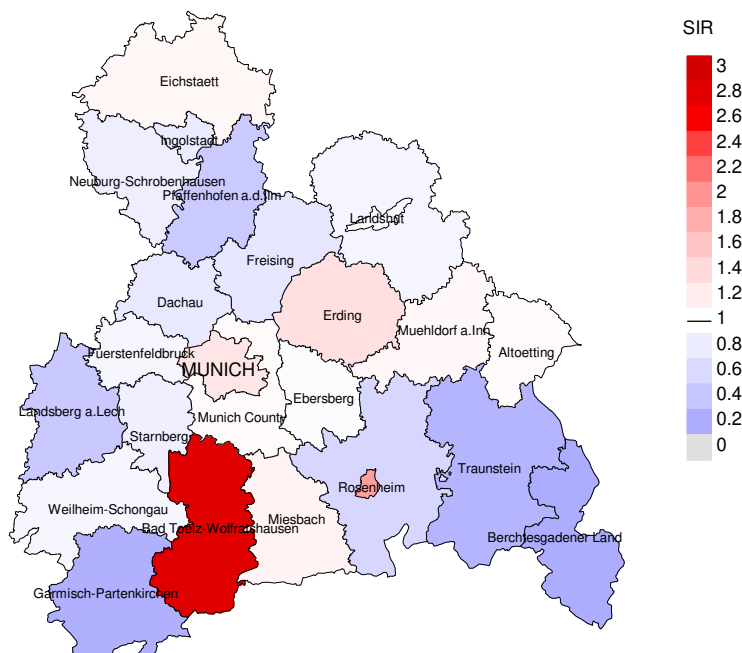
**Figure 8a.** Map of cancer incidence (world standard population, incl. DCO cases) by county averaged for period 2007 to 2016. According to their individual incidence rates, the counties are displayed in different red and blue hues, being the fine white color attributed to the population mean (males 1.4/100,000 WS N=742, females 0.3/100,000 WS N=188).

The results should be interpreted with caution! E.g., in county Ebersberg with a population of 66,416 female residents (averaged) in the period from 2007 to 2016 a total of 5 women were identified with newly diagnosed 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 1.1/100,000.

Standardized incidence ratio (SIR) 2007 - 2016: Males



Standardized incidence ratio (SIR) 2007 - 2016: Females



**Figure 8b.** Map of standardized incidence ratio (SIR, incl. DCO cases) by county averaged for period 2007 to 2016. According to their individual SIR values, the counties are displayed in different red and blue hues, being the fine white color attributed to the population overall of 1.0 (males N=742, females N=188).

The results should be interpreted with caution! E.g., in county Ebersberg with a population of 66,416 female residents (averaged) in the period from 2007 to 2016 a total of 5 women were identified with newly diagnosed mesothelioma. Therefore, the mean standardized incidence ratio (SIR) for this cancer type in this area can be calculated at 0.99. Though, the value of this parameter may vary with an underlying probability of 99% between 0.21 and 2.79, and is therefore not statistically striking.



## MORTALITY

Table 9a

Annual cohorts: Incident cancers, follow-up status, proportion of DCO, deaths among the annual cohorts and proportion of available death certificates (with respect to registry area expansion from 2.65 to 4.10 m as of 2002, and from 4.10 to 4.81 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	41	100.0	24.4	41	100.0	92.7
1999	33	100.0	21.2	33	100.0	93.9
2000	43	100.0	51.2	42	97.7	95.2
2001	45	100.0	22.2	44	97.8	90.9
2002	60	100.0	30.0	58	96.7	98.3
2003	63	100.0	19.0	60	95.2	95.0
2004	80	98.8	12.5	77	96.3	96.1
2005	76	97.4	10.5	73	96.1	100.0
2006	74	95.9	10.8	71	95.9	98.6
2007	102	96.1	4.9	94	92.2	97.9
2008	101	99.0	6.9	100	99.0	99.0
2009	85	95.3	4.7	79	92.9	94.9
2010	99	96.0	9.1	91	91.9	97.8
2011	98	89.8	5.1	83	84.7	98.8
2012	104	99.0	5.8	97	93.3	100.0
2013	94	95.7	9.6	83	88.3	97.6
2014	79	96.2	11.4	62	78.5	96.8
2015	99	97.0	3.0	66	66.7	95.5
2016	69	87.0	2.9	21	30.4	85.7
1998-2016	1445	96.6	11.3	1275	88.2	96.9

Table 9b

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

(with respect to registry area expansion from 2.65 to 4.10 m as of 2002, and from 4.10 to 4.81 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	41	39	94.9	23	56.1
1999	33	28	92.9	12	36.4
2000	43	40	95.0	19	44.2
2001	45	38	94.7	19	42.2
2002	60	51	96.1	25	41.7
2003	63	44	93.2	24	38.1
2004	80	58	96.6	24	30.0
2005	76	61	96.7	24	31.6
2006	74	68	98.5	23	31.1
2007	102	73	95.9	28	27.5
2008	101	94	98.9	36	35.6
2009	85	71	98.6	19	22.4
2010	99	90	96.7	31	31.3
2011	98	93	97.8	30	30.6
2012	104	98	100.0	36	34.6
2013	94	89	97.8	34	36.2
2014	79	78	100.0	26	32.9
2015	99	71	100.0	29	29.3
2016	69	85	100.0	18	26.1
1998-2016	1445	1269	97.6	480	33.2

Table 9c

Annual cohorts of deaths, proportion of cancer-related and non-cancer-related deaths, and cancer recorded on death certificates  
(incl. DCO)

(with respect to registry area expansion from 2.65 to 4.10 m as of 2002,  
and from 4.10 to 4.81 m as of 2007, respectively)

Year of death	Deaths n	Prop. cancer- related %	Prop. non-cancer- related %	Prop. cancer recorded on death certificate %
1998	39	87.2	12.8	97.3
1999	28	92.9	7.1	100.0
2000	40	92.5	7.5	100.0
2001	38	89.5	10.5	100.0
2002	51	94.1	5.9	100.0
2003	44	90.9	9.1	100.0
2004	58	91.4	8.6	98.2
2005	61	96.7	3.3	94.9
2006	68	97.1	2.9	98.5
2007	73	93.2	6.8	100.0
2008	94	97.9	2.1	100.0
2009	71	95.8	4.2	100.0
2010	90	94.4	5.6	98.9
2011	93	92.5	7.5	97.8
2012	98	93.9	6.1	95.9
2013	89	96.6	3.4	98.9
2014	78	92.3	7.7	96.2
2015	71	95.8	4.2	98.6
2016	85	96.5	3.5	97.6
1998-2016	1269	94.2	5.8	98.4

Table 10a

Medians of age at death according to the grouping in Table 9  
MALES

Year of death	Deaths n	Age at death (all causes) Years	Age at death (cancer-related) Years	Age at death (non-cancer-related) Years	Age at death (according to death certificate) Years
1998	31	67.5	69.1	65.5	68.3
1999	22	68.6	68.6		68.6
2000	27	67.3	66.8	79.6	67.5
2001	26	65.7	65.9	56.2	65.8
2002	42	66.2	67.0	57.9	66.8
2003	36	66.3	66.3	73.3	66.3
2004	46	70.8	71.0	66.2	71.0
2005	54	71.0	71.2	66.2	71.2
2006	56	72.7	73.1	55.1	73.1
2007	61	69.7	70.0	69.5	69.7
2008	75	70.3	70.3	69.3	70.1
2009	57	70.3	70.3	72.6	70.5
2010	70	74.3	74.1	74.9	74.5
2011	80	75.2	74.9	80.9	75.2
2012	78	74.0	73.8	79.1	73.7
2013	70	73.8	73.6	85.1	73.9
2014	65	74.3	74.0	78.0	74.2
2015	58	76.6	76.6	72.2	76.5
2016	68	77.3	77.3	78.2	77.3
1998-2016	1022	72.6	72.5	72.7	72.6

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

Table 10b

Medians of age at death according to the grouping in Table 9  
FEMALES

Year of death	Deaths n	Age at death (all causes) Years	Age at death (cancer-related) Years	Age at death (non-cancer-related) Years	Age at death (according to death certificate) Years
1998	8	73.7	70.4	85.6	73.7
1999	6	62.8	66.1	55.0	66.1
2000	13	77.2	79.3	75.2	79.3
2001	12	70.5	70.6	60.9	70.6
2002	9	64.9	64.3	80.3	64.3
2003	8	81.3	81.3	80.5	82.6
2004	12	64.5	64.5		63.8
2005	7	75.1	75.1		75.1
2006	12	75.1	75.1		75.1
2007	12	71.7	72.3	64.9	72.2
2008	19	72.2	72.2		72.2
2009	14	78.6	78.6		78.6
2010	20	75.9	75.9		75.9
2011	13	79.1	79.1		79.1
2012	20	76.4	75.0	81.2	77.1
2013	19	74.7	74.7		74.7
2014	13	74.4	70.1	87.6	74.4
2015	13	83.7	83.7		83.7
2016	17	76.0	75.4	91.5	75.4
1998-2016	247	74.7	74.5	78.3	74.6

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

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

Table 11a

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

## MALES

Year of death	Deaths n	Mort. raw	MI-Index raw	Mort. WS	MI-Index WS	Mort. ES	MI-Index ES	Mort. BRD-S	MI-Index BRD-S
1998	27	2.4	0.90	1.5	0.89	2.2	0.90	2.6	0.89
1999	22	2.0	0.88	1.2	0.88	1.7	0.89	2.2	0.90
2000	25	2.2	0.76	1.3	0.73	2.0	0.76	2.5	0.77
2001	23	2.0	0.77	1.2	0.72	1.7	0.72	2.1	0.76
2002	40	2.1	0.89	1.2	0.87	1.8	0.89	2.3	0.86
2003	34	1.8	0.68	1.0	0.70	1.5	0.68	1.9	0.68
2004	41	2.2	0.59	1.1	0.58	1.7	0.60	2.3	0.63
2005	52	2.7	0.91	1.4	0.88	2.1	0.90	2.8	0.90
2006	54	2.8	0.90	1.3	0.82	2.0	0.85	3.0	0.93
2007	58	2.6	0.72	1.3	0.70	1.9	0.70	2.6	0.70
2008	73	3.3	0.90	1.6	0.92	2.4	0.93	3.2	0.95
2009	54	2.4	0.78	1.1	0.77	1.7	0.76	2.2	0.74
2010	65	2.9	0.86	1.3	0.82	2.0	0.84	2.8	0.89
2011	73	3.3	0.91	1.3	0.86	2.2	0.88	3.1	0.93
2012	74	3.3	0.91	1.4	0.94	2.2	0.93	3.0	0.93
2013	67	2.9	0.87	1.2	0.82	1.9	0.84	2.6	0.86
2014	61	2.6	0.95	1.1	1.04	1.7	1.00	2.3	0.96
2015	55	2.3	0.68	0.8	0.60	1.4	0.64	2.0	0.67
2016	66	2.7	1.27	1.0	1.22	1.7	1.26	2.4	1.25
1998-2016	964	2.6	0.84	1.2	0.82	1.9	0.83	2.6	0.85

Table 11b

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

## FEMALES

Year of death	Deaths n	Mort. raw	MI-Index raw	Mort. WS	MI-Index WS	Mort. ES	MI-Index ES	Mort. BRD-S	MI-Index BRD-S
1998	7	0.6	0.64	0.3	0.53	0.4	0.57	0.6	0.65
1999	4	0.3	0.50	0.2	0.63	0.3	0.59	0.3	0.52
2000	12	1.0	1.20	0.4	1.06	0.6	1.09	0.8	1.24
2001	11	0.9	0.73	0.4	0.63	0.6	0.66	0.8	0.73
2002	8	0.4	0.53	0.2	0.49	0.3	0.50	0.3	0.49
2003	6	0.3	0.46	0.1	0.48	0.2	0.46	0.2	0.47
2004	12	0.6	1.20	0.3	1.30	0.5	1.27	0.5	1.20
2005	7	0.4	0.37	0.1	0.30	0.2	0.34	0.3	0.40
2006	12	0.6	0.86	0.3	0.95	0.4	0.90	0.5	0.88
2007	10	0.4	0.48	0.2	0.36	0.3	0.41	0.4	0.46
2008	19	0.8	0.95	0.4	1.18	0.5	1.10	0.6	0.99
2009	14	0.6	0.88	0.2	0.77	0.3	0.81	0.4	0.87
2010	20	0.9	0.87	0.3	0.67	0.4	0.71	0.6	0.76
2011	13	0.6	0.72	0.2	0.64	0.3	0.67	0.4	0.71
2012	18	0.8	0.78	0.3	0.69	0.4	0.72	0.6	0.77
2013	19	0.8	1.12	0.3	0.93	0.4	0.99	0.6	1.07
2014	11	0.5	0.73	0.2	0.97	0.3	0.88	0.3	0.76
2015	13	0.5	0.72	0.2	0.63	0.3	0.65	0.4	0.68
2016	16	0.7	0.94	0.2	0.89	0.4	0.87	0.5	0.95
1998-2016	232	0.6	0.77	0.2	0.71	0.4	0.73	0.5	0.75

Table 12

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

Age at death Years	Cases			Males			Females		
	n	%	Cum.%	n	%	Cum.%	n	%	Cum.%
0-4									
5-9									
10-14									
15-19									
20-24									
25-29									
30-34									
35-39									
40-44	5	0.6	0.6	1	0.2	0.2	4	2.6	2.6
45-49	8	1.0	1.6	5	0.8	0.9	3	2.0	4.6
50-54	17	2.1	3.8	13	2.0	2.9	4	2.6	7.2
55-59	30	3.8	7.5	25	3.9	6.8	5	3.3	10.5
60-64	57	7.1	14.6	49	7.6	14.4	8	5.2	15.7
65-69	141	17.6	32.3	124	19.2	33.6	17	11.1	26.8
70-74	189	23.7	55.9	154	23.8	57.4	35	22.9	49.7
75-79	163	20.4	76.3	136	21.1	78.5	27	17.6	67.3
80-84	114	14.3	90.6	88	13.6	92.1	26	17.0	84.3
85+	75	9.4	100.0	51	7.9	100.0	24	15.7	100.0
All ages	799	100.0		646	100.0		153	100.0	

Table 13

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

Age at death Years	Males		Females		Males		Females	
	n	n	Age- spec. mortal.	MI-index	Age- spec. mortal.	MI-index	Prop.all cancers %	Prop.all cancers %
0- 4								
5- 9								
10-14								
15-19								
20-24								
25-29								
30-34								
35-39								
40-44	1	4	0.1	0.33	0.2	0.57	0.2	0.6
45-49	5	3	0.3	0.63	0.2	1.00	0.4	0.2
50-54	13	4	0.8	0.87	0.2	0.67	0.6	0.2
55-59	25	5	1.8	0.69	0.3	0.50	0.7	0.2
60-64	49	8	4.0	0.79	0.6	0.73	1.0	0.2
65-69	124	17	10.5	0.94	1.3	0.59	1.7	0.3
70-74	154	35	13.9	0.79	2.8	1.13	1.7	0.5
75-79	136	27	17.1	0.96	2.7	0.77	1.5	0.4
80-84	88	26	19.1	0.91	3.7	0.90	1.2	0.4
85+	51	24	16.7	1.02	3.3	0.92	0.8	0.3
All ages	646	153					1.2	0.3
Mortality								
Raw			2.8	0.87	0.6	0.81		
WS			1.2	0.85	0.2	0.75		
ES			1.9	0.86	0.4	0.77		
BRD-S			2.6	0.88	0.5	0.79		
PYLL-70								
per 100,000			6.7		2.1			
ES			5.7		1.7			
AYLL-70			6.3		10.1			



Table 14a

Further malignancies in deaths in period 1998–2016  
MALES

Diagnosis	Total n	Total %↓	Pre n	Pre ←%	Syn- chron ±30d n	Syn- chron ±30d ←%	Post n	Post ←%
C16 Stomach	6	2.6	5	83.3			1	16.7
C18 Colon	18	7.7	14	77.8	2	11.1	2	11.1
C19–C20 Rectum	14	6.0	12	85.7	2	14.3		
C33–C34 Lung	18	7.7	3	16.7	5	27.8	10	55.6
C38,C45 Mesothelioma	3	1.3					3	100.0
C43 Malign. melanoma	17	7.2	15	88.2			2	11.8
C44 Skin others	29	12.3	19	65.5	2	6.9	8	27.6
C61 Prostate	75	31.9	67	89.3	4	5.3	4	5.3
C64 Kidney	10	4.3	7	70.0	1	10.0	2	20.0
C67 Bladder	5	2.1	4	80.0	1	20.0		
C76–C79 CUP	4	1.7	3	75.0			1	25.0
C82–C85 NHL	11	4.7	7	63.6	3	27.3	1	9.1
Others, specified	25	10.6	18	72.0	2	8.0	5	20.0
All further malignancies	235	100.0	174	74.0	22	9.4	39	16.6

Further malignancies with number of cases 1 to 2 are pooled in category “Others, specified”.

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

Table 14b

Further malignancies in deaths in period 1998-2016  
FEMALES

Diagnosis	Total n	Total %↓	Pre n	Pre ←%	Syn- chron ±30d n	Syn- chron ±30d ←%	Post n	Post ←%
C16 Stomach	1	2.1	1	100.0				
C18 Colon	5	10.4	5	100.0				
C33-C34 Lung	4	8.3	1	25.0	1	25.0	2	50.0
C43 Malign. melanoma	2	4.2	2	100.0				
C44 Skin others	2	4.2	1	50.0			1	50.0
C50 Breast	13	27.1	12	92.3			1	7.7
C53 Cervix uteri	1	2.1	1	100.0				
C54 Corpus uteri	6	12.5	5	83.3			1	16.7
C56 Ovary	3	6.3	1	33.3			2	66.7
C67 Bladder	2	4.2	2	100.0				
C70-C72 CNS cancer	1	2.1	1	100.0				
C73 Thyroid	4	8.3	4	100.0				
C81 Hodgkin lymphoma	1	2.1	1	100.0				
C82-C85 NHL	2	4.2	2	100.0				
C90 Mult. myeloma	1	2.1	1	100.0				
All further malignancies	48	100.0	40	83.3	1	2.1	7	14.6

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

Table 15

Age-specific mortality (cancer-related) and proportion of all cancers  
for period 2007-2016  
(First primaries only \*)

Age at death Years	Males n	Females n	Males Age- spec. mortal.	Males MI-index	Females Age- spec. mortal.	Females MI-index	Males Prop.all cancers %	Females Prop.all cancers %
0- 4								
5- 9								
10-14								
15-19								
20-24								
25-29								
30-34								
35-39								
40-44	1	3	0.1	0.33	0.2	0.60	0.2	0.5
45-49	5	3	0.3	0.63	0.2	1.00	0.5	0.3
50-54	12	4	0.7	1.00	0.2	0.67	0.7	0.2
55-59	23	4	1.6	0.64	0.3	0.50	0.8	0.2
60-64	44	6	3.6	0.81	0.5	0.75	1.1	0.2
65-69	106	13	8.9	0.97	1.0	0.65	1.8	0.3
70-74	123	29	11.1	0.81	2.3	1.12	1.7	0.5
75-79	96	21	12.0	0.96	2.1	0.81	1.4	0.4
80-84	64	23	13.9	0.96	3.3	0.96	1.2	0.4
85+	30	19	9.8	0.97	2.6	0.95	0.6	0.3
All ages	504	125					1.2	0.3
Mortality								
Raw			2.2	0.88	0.5	0.86		
WS			1.0	0.86	0.2	0.80		
ES			1.5	0.87	0.3	0.81		
BRD-S			2.0	0.88	0.4	0.84		
PYLL-70								
per 100,000			6.1		1.7			
ES			5.2		1.4			
AYLL-70			6.5		10.5			

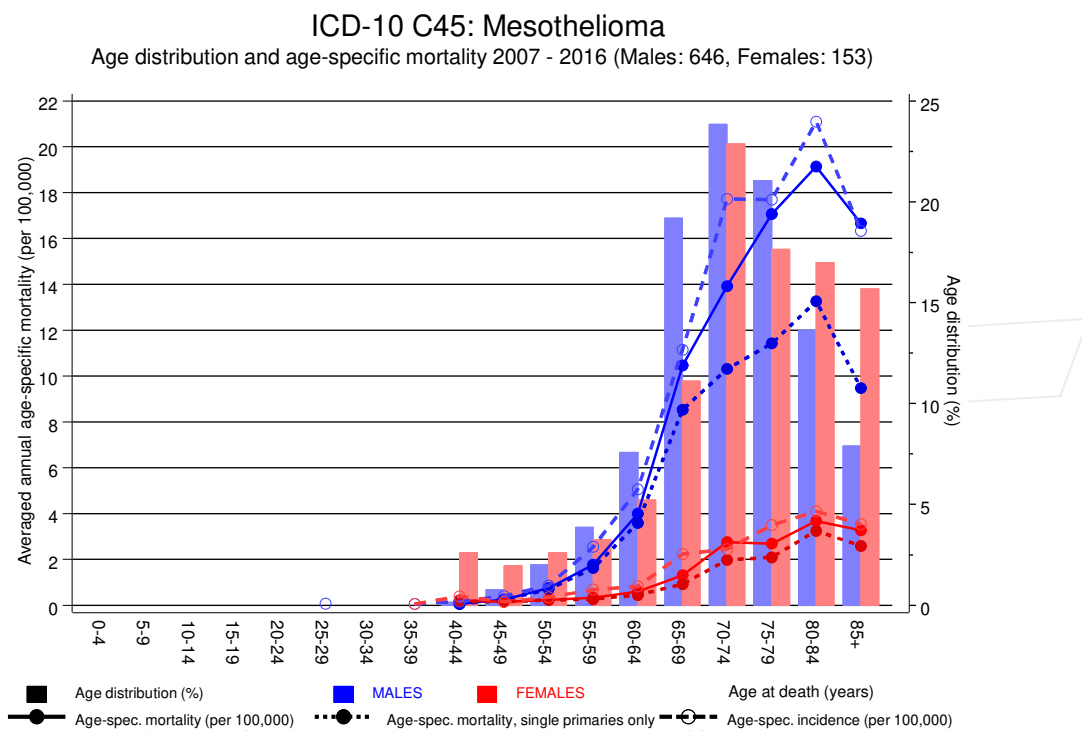
\* See corresponding tables with multiple malignancies.

Table 16

Age-specific mortality (cancer-related) and proportion of all cancers  
for period 2007-2016  
(**Single primaries only** \*)

Age at death Years	Males n	Females n	Males Age- spec. mortal.	MI-index	Females Age- spec. mortal.	MI-index	Males Prop.all cancers %	Females Prop.all cancers %
0- 4								
5- 9								
10-14								
15-19								
20-24								
25-29								
30-34								
35-39								
40-44	1	3	0.1	0.33	0.2	0.60	0.2	0.5
45-49	5	3	0.3	0.63	0.2	1.00	0.5	0.3
50-54	12	4	0.7	1.00	0.2	0.67	0.7	0.2
55-59	23	4	1.6	0.64	0.3	0.50	0.8	0.2
60-64	44	6	3.6	0.85	0.5	0.75	1.1	0.2
65-69	101	12	8.5	0.95	0.9	0.63	1.8	0.3
70-74	114	25	10.3	0.80	2.0	1.04	1.6	0.5
75-79	91	21	11.4	0.95	2.1	0.81	1.4	0.4
80-84	61	23	13.3	0.92	3.3	1.00	1.2	0.4
85+	29	19	9.5	0.94	2.6	0.95	0.7	0.3
All ages	481	120					1.2	0.3
Mortality								
Raw			2.1	0.87	0.5	0.85		
WS			1.0	0.85	0.2	0.78		
ES			1.5	0.86	0.3	0.80		
BRD-S			2.0	0.87	0.4	0.83		
PYLL-70								
per 100,000			6.0		1.7			
ES			5.1		1.4			
AYLL-70			6.6		10.8			

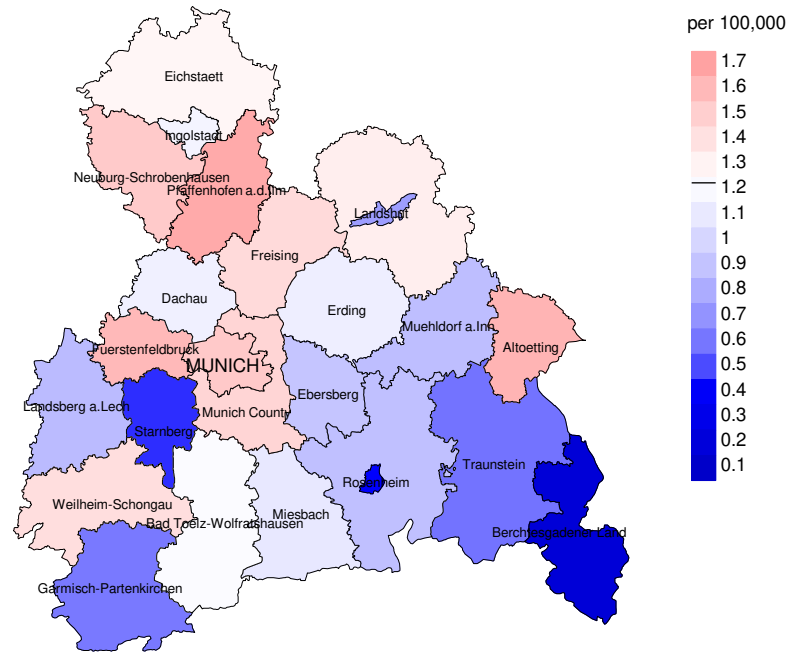
\* See corresponding tables with multiple malignancies.



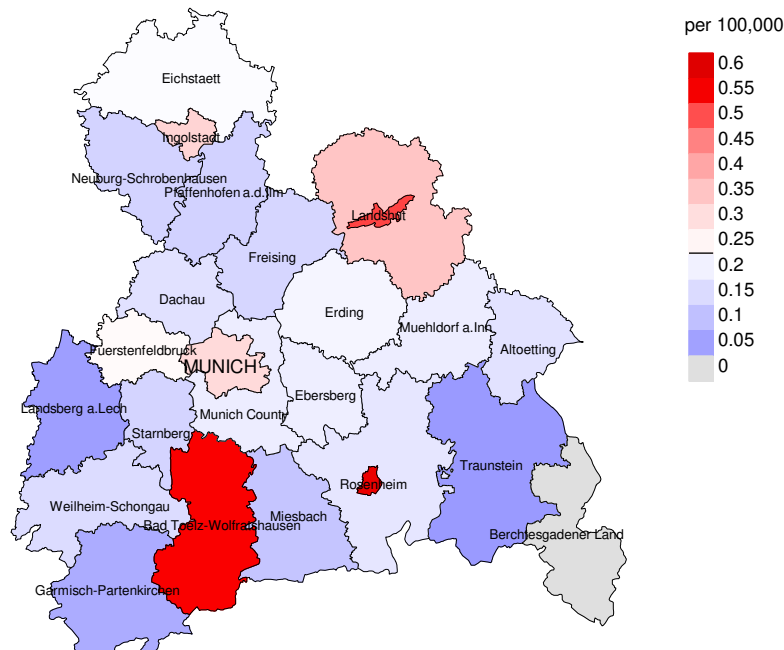
**Figure 17.** Distribution of age at death (bars; males: mean=71.8 yrs, median=72.3 yrs; females: mean=73.0 yrs, median=73.7 yrs) and age-specific mortality (all patients: solid line, patients with single primaries: dotted line). The age-specific incidence is additionally plotted for comparison (dashed line).

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

Average mortality (world standard population) 2007 - 2016: Males



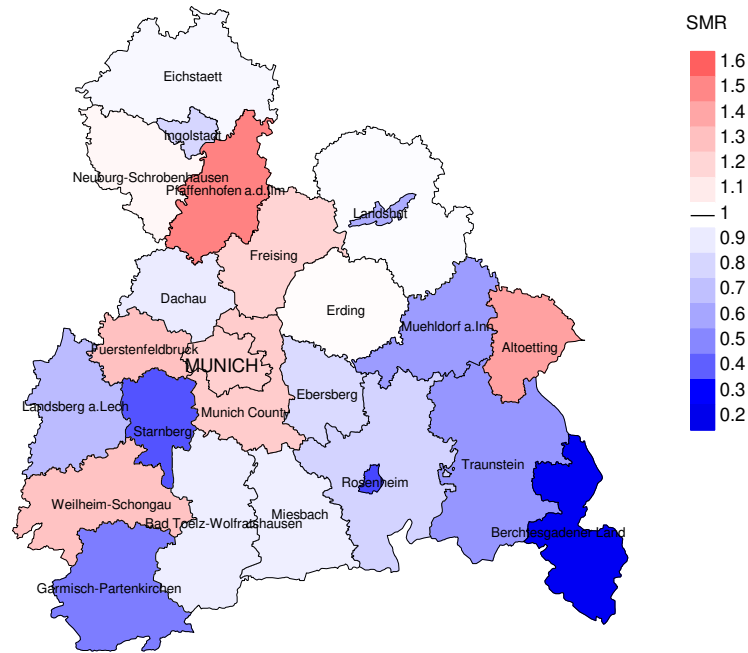
Average mortality (world standard population) 2007 - 2016: Females



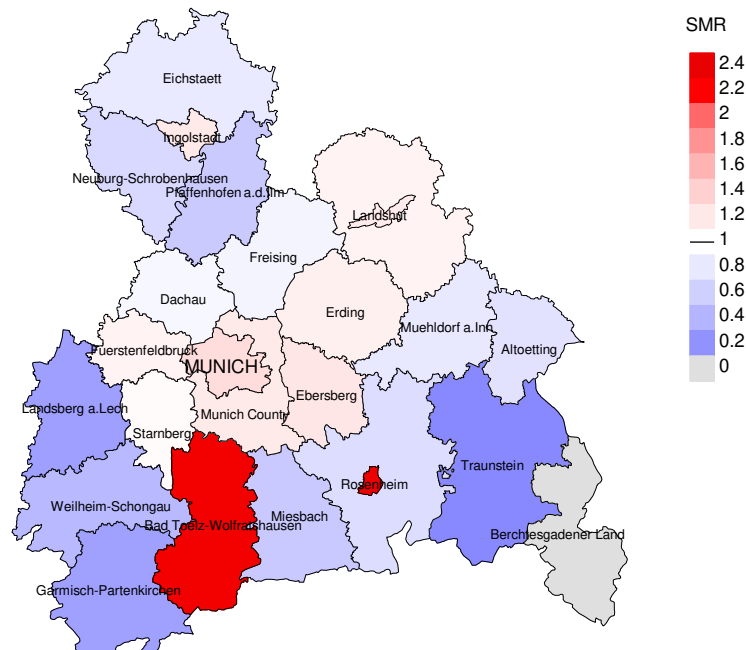
**Figure 18a.** Map of cancer mortality (world standard population) by county averaged for period 2007 to 2016. According to their individual mortality rates, the counties are displayed in different red and blue hues, being the fine white color attributed to the population mean (males 1.2/100,000 WS N=646, females 0.2/100,000 WS N=153).

The results should be interpreted with caution! E.g., in county Ebersberg with a population of 66,416 female residents (averaged) in the period from 2007 to 2016 a total of 5 women died from 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 1.1/100,000.

Standardized mortality ratio (SMR) 2007 - 2016: Males



Standardized mortality ratio (SMR) 2007 - 2016: Females



**Figure 18b.** Map of standardized mortality ratio (SMR, incl. DCO cases) by county averaged for period 2007 to 2016. According to their individual SMR values, the counties are displayed in different red and blue hues, being the fine white color attributed to the population overall of 1.0 (males N=646, females N=153).

The results should be interpreted with caution! E.g., in county Ebersberg with a population of 66,416 female residents (averaged) in the period from 2007 to 2016 a total of 5 women died from mesothelioma. Therefore, the mean standardized mortality ratio (SMR) for this cancer type in this area can be calculated at 1.22. Though, the value of this parameter may vary with an underlying probability of 99% between 0.26 and 3.44, 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**

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

**Recommended Citation**

Munich Cancer Registry. ICD-10 C45: Mesothelioma - Incidence and Mortality [Internet]. 2018 [updated 2018 Aug 21; cited 2018 Oct 1]. Available from: [https://www.tumorregister-muenchen.de/en/facts/base/bC45\\_\\_E-ICD-10-C45-Mesothelioma-incidence-and-mortality.pdf](https://www.tumorregister-muenchen.de/en/facts/base/bC45__E-ICD-10-C45-Mesothelioma-incidence-and-mortality.pdf)

**Copyright**

The content of the public web site provided by the Munich Cancer Registry is available worldwide and free of charge. All documents are free to download, utilize, copy, print-out and distribute, providing that the MCR is referenced.

**Disclaimer**

The Munich Cancer Registry reserves the right to not be responsible for the topicality, correctness, completeness or quality of the information provided. Liability claims regarding damage caused by the use of any information provided, including any kind of information which is incomplete or incorrect, will therefore be rejected.