Munich Cancer Registry

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ICD-10 C18.1: Appendix cancer

Incidence and Mortality

Year of diagnosis	1998-2014
Patients	565
Diseases	565
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/bC181_E-ICD-10-C18.1-Appendix-cancer-incidence-and-mortality.pdf

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

In these analyses, the clinics and physicians of Upper Bavaria and the city and county of Landshut[#], 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
C18.1	Malignant neoplasm: Appendix

INCIDENCE

Table 1

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

Year of diagnosis	Cases n	DCO cases n	Prop. DCO %	Prop. mult. primaries %	Prop. deaths %	Prop. actively followed %	
1998	12			33.3	50.0	100.0	
1999	15			33.3	26.7	86.7	
2000	17			29.4	17.6	94.1	
2001	13			23.1	61.5	100.0	
2002	35			31.4	42.9	94.3	#
2003	21			38.1	57.1	95.2	
2004	20			25.0	25.0	95.0	
2005	31			41.9	61.3	90.3	
2006	24			33.3	37.5	83.3	
2007	33			24.2	45.5	78.8	#
2008	32			25.0	34.4	65.6	
2009	38			31.6	39.5	65.8	
2010	43			14.0	25.6	60.5	
2011	51			11.8	17.6	47.1	
2012	72			13.9	22.2	61.1	
2013	60			23.3	8.3	96.7	
2014	48			20.8	6.3	100.0	##
1998-2014	565			24.1	29.4	78.9	

\# 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 diagnosis	All n	Males n	Females n	Prop. males %
1998	12	7	5	58.3
1999	15	8	7	53.3
2000	17	7	10	41.2
2001	13	8	5	61.5
2002	35	15	20	42.9
2003	21	9	12	42.9
2004	20	9	11	45.0
2005	31	12	19	38.7
2006	24	12	12	50.0
2007	33	20	13	60.6
2008	32	16	16	50.0
2009	38	18	20	47.4
2010	43	21	22	48.8
2011	51	27	24	52.9
2012	72	30	42	41.7
2013	60	32	28	53.3
2014	48	24	24	50.0
1998-2014	565	275	290	48.7

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)

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	7	5	0.6	0.4	0.4	0.3	0.5	0.4	0.5	0.3
1999	8	7	0.7	0.6	0.6	0.5	0.6	0.6	0.9	0.6
2000	7	10	0.6	0.8	0.4	0.6	0.5	0.7	0.6	0.9
2001	8	5	0.7	0.4	0.4	0.2	0.6	0.3	0.6	0.3
2002	15	20	0.8	1.0	0.5	0.7	0.7	0.9	0.8	1.0
2003	9	12	0.5	0.6	0.3	0.3	0.4	0.4	0.5	0.5
2004	9	11	0.5	0.6	0.3	0.4	0.4	0.5	0.5	0.5
2005	12	19	0.6	1.0	0.4	0.6	0.5	0.8	0.6	0.9
2006	12	12	0.6	0.6	0.4	0.4	0.5	0.5	0.6	0.5
2007	20	13	0.9	0.6	0.6	0.5	0.8	0.5	1.0	0.5
2008	16	16	0.7	0.7	0.5	0.5	0.6	0.5	0.7	0.6
2009	18	20	0.8	0.9	0.5	0.6	0.7	0.7	0.8	0.8
2010	21	22	0.9	0.9	0.6	0.7	0.8	0.8	0.9	0.8
2011	27	24	1.2	1.0	0.8	0.7	1.0	0.8	1.1	1.0
2012	30	42	1.3	1.8	0.9	1.7	1.1	1.7	1.3	1.9
2013	32	28	1.4	1.2	0.9	1.0	1.1	1.1	1.4	1.3
2014	24	24	1.1	1.0	0.8	0.7	1.0	0.8	1.1	0.9
1998-2014	275	290	0.9	0.9	0.6	0.6	0.7	0.7	0.9	0.8

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 patients)
(incl. DCO)

Year of diagnosis	Cases n	Mean	Std. dev.	Min.	Max.	10%	25%	Median 50%	75%	90%
1998	12	54.8	20.9	13.2	87.9	32.1	43.3	55.8	63.8	86.0
1999	15	46.2	18.7	24.9	80.5	26.2	27.4	43.0	59.8	75.1
2000	17	50.6	13.7	24.7	81.6	32.7	41.6	49.5	60.1	64.1
2001	13	60.9	17.1	34.3	88.5	35.2	54.0	62.6	68.9	84.4
2002	35	56.4	19.1	17.7	90.9	29.9	37.0	60.3	72.8	78.6
2003	21	60.1	18.3	23.5	88.5	32.4	56.3	60.0	77.1	79.4
2004	20	51.9	21.3	13.8	81.0	22.4	33.8	57.8	71.9	75.9
2005	31	63.5	14.5	16.1	89.9	46.9	56.7	67.2	71.8	76.7
2006	24	61.6	11.9	40.8	81.2	44.8	50.5	63.9	71.5	76.0
2007	33	54.2	21.4	15.8	84.4	23.9	39.5	61.0	70.7	78.7
2008	32	54.3	19.7	18.9	86.2	27.5	41.7	52.5	72.0	80.6
2009	38	59.6	20.8	12.4	91.8	26.3	52.4	60.1	76.4	84.7
2010	43	59.5	19.8	14.9	94.1	31.8	43.5	64.6	70.8	81.9
2011	51	56.9	20.3	15.5	88.8	30.3	41.0	58.3	73.0	83.8
2012	72	49.6	21.9	9.7	89.9	18.5	28.2	50.6	67.5	77.3
2013	60	53.1	19.7	15.7	83.5	24.1	35.1	55.7	71.8	76.4
2014	48	52.8	19.6	20.3	86.7	24.4	34.7	52.1	69.7	79.5
1998-2014	565	55.3	19.7	9.7	94.1	25.8	40.5	58.3	70.7	79.5

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	7	52.6	12.2	32.1	64.1	32.1	40.0	56.0	63.6	64.1
1999	8	45.5	22.5	24.9	80.5	24.9	26.8	36.1	66.3	80.5
2000	7	50.1	9.9	37.4	64.0	37.4	39.0	49.5	59.2	64.0
2001	8	59.2	16.7	34.3	88.5	34.3	48.0	60.0	67.5	88.5
2002	15	56.9	14.9	27.1	79.8	35.0	53.4	59.7	65.9	74.9
2003	9	58.5	13.8	32.4	78.0	32.4	56.3	58.1	60.0	78.0
2004	9	53.4	19.8	27.8	76.4	27.8	32.9	58.2	74.3	76.4
2005	12	64.7	11.9	34.1	77.0	53.3	59.5	69.5	71.5	74.8
2006	12	62.9	11.1	44.8	78.3	49.4	53.9	64.7	73.3	76.0
2007	20	57.0	22.0	15.8	84.4	24.3	39.0	63.8	74.1	82.3
2008	16	51.8	16.7	19.3	80.6	27.5	38.6	55.1	63.4	71.9
2009	18	62.1	17.5	12.4	84.7	40.8	53.2	63.8	75.4	83.8
2010	21	62.8	15.3	27.9	86.5	43.5	57.4	64.6	70.8	81.4
2011	27	56.1	17.2	15.5	85.6	34.7	41.0	56.6	68.7	79.4
2012	30	56.0	17.1	9.7	79.8	27.6	48.5	59.0	68.0	75.4
2013	32	60.2	16.9	19.4	79.5	35.6	48.1	64.4	74.3	76.6
2014	24	50.1	20.2	20.3	82.7	23.6	30.0	53.0	63.0	81.8
1998-2014	275	57.0	17.2	9.7	88.5	30.6	45.9	59.2	69.7	77.5

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	5	57.9	30.9	13.2	87.9	13.2	46.7	55.5	86.0	87.9
1999	7	47.0	14.8	26.9	64.7	26.9	28.4	52.7	59.8	64.7
2000	10	51.0	16.4	24.7	81.6	28.7	41.6	49.3	60.8	72.8
2001	5	63.5	19.4	35.2	84.4	35.2	56.7	62.6	78.5	84.4
2002	20	56.1	22.2	17.7	90.9	26.3	35.0	62.6	74.0	83.3
2003	12	61.3	21.6	23.5	88.5	30.6	46.3	64.0	79.1	84.0
2004	11	50.6	23.4	13.8	81.0	17.0	34.6	57.4	70.4	73.4
2005	19	62.8	16.2	16.1	89.9	45.7	54.2	63.8	72.2	83.1
2006	12	60.3	13.0	40.8	81.2	43.1	49.0	62.3	70.7	72.3
2007	13	50.0	20.5	17.8	76.0	19.1	40.9	51.2	68.5	74.4
2008	16	56.7	22.5	18.9	86.2	22.8	43.9	49.2	77.1	85.5
2009	20	57.4	23.6	15.9	91.8	21.8	38.3	58.5	77.2	87.2
2010	22	56.3	23.2	14.9	94.1	26.0	35.1	64.2	70.7	85.4
2011	24	57.8	23.5	17.1	88.8	22.7	42.8	59.0	79.8	87.0
2012	42	45.1	24.0	13.7	89.9	16.4	21.9	42.6	63.4	78.1
2013	28	44.9	19.9	15.7	83.5	22.7	30.4	37.5	61.9	75.1
2014	24	55.5	19.1	24.4	86.7	28.8	39.3	51.3	72.2	77.3
1998-2014	290	53.8	21.7	13.2	94.1	22.7	35.1	56.6	71.7	81.6

Table 4

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

Age at diagnosis Years	Cases n	%	Cum.%	Males n	%	Cum.%	Females n	%	Cum.%
5-9	1	0.3	0.3	1	0.5	0.5			0.0
10-14	3	0.8	1.1	1	0.5	1.1	2	1.1	1.1
15-19	20	5.3	6.4	4	2.1	3.2	16	8.5	9.5
20-24	19	5.0	11.4	7	3.7	6.9	12	6.3	15.9
25-29	22	5.8	17.2	9	4.8	11.7	13	6.9	22.8
30-34	14	3.7	21.0	4	2.1	13.8	10	5.3	28.0
35-39	20	5.3	26.3	9	4.8	18.6	11	5.8	33.9
40-44	24	6.4	32.6	11	5.9	24.5	13	6.9	40.7
45-49	28	7.4	40.1	14	7.4	31.9	14	7.4	48.1
50-54	22	5.8	45.9	13	6.9	38.8	9	4.8	52.9
55-59	31	8.2	54.1	19	10.1	48.9	12	6.3	59.3
60-64	34	9.0	63.1	23	12.2	61.2	11	5.8	65.1
65-69	41	10.9	74.0	26	13.8	75.0	15	7.9	73.0
70-74	27	7.2	81.2	12	6.4	81.4	15	7.9	81.0
75-79	35	9.3	90.5	20	10.6	92.0	15	7.9	88.9
80-84	19	5.0	95.5	13	6.9	98.9	6	3.2	92.1
85+	17	4.5	100.0	2	1.1	100.0	15	7.9	100.0
All ages	377	100.0		188	100.0		189	100.0	

Included in the statistics are 36.7% multiple primaries in males and 15.9% in females.

Table 5

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

Age at diagnosis Years	Males n	Females n	Males Age-spec. incid.	Females Age-spec. incid.	Males DCO rate n=0 %	Females DCO rate n=0 %	Males Prop.all cancers n=91183 %	Females Prop.all cancers n=89596 %
0- 4			0.0	0.0				
5- 9	1		0.1	0.0			1.0	
10-14	1	2	0.1	0.2			1.0	2.2
15-19	4	16	0.4	1.7			1.9	9.7
20-24	7	12	0.6	1.1			1.9	3.9
25-29	9	13	0.7	1.1			1.6	2.0
30-34	4	10	0.3	0.8			0.5	0.9
35-39	9	11	0.7	0.9			0.8	0.6
40-44	11	13	0.7	0.8			0.6	0.3
45-49	14	14	0.9	0.9			0.4	0.3
50-54	13	9	1.0	0.7			0.3	0.1
55-59	19	12	1.8	1.1			0.3	0.2
60-64	23	11	2.3	1.0			0.2	0.1
65-69	26	15	2.7	1.4			0.2	0.1
70-74	12	15	1.3	1.4			0.1	0.1
75-79	20	15	3.6	2.1			0.2	0.1
80-84	13	6	3.7	1.1			0.2	0.1
85+	2	15	0.9	2.6			0.0	0.1
All ages	188	189			0.0	0.0	0.2	0.2
Incidence								
Raw			1.0	1.0				
WS			0.7	0.8				
ES			0.9	0.9				
BRD-S			1.0	1.0				

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

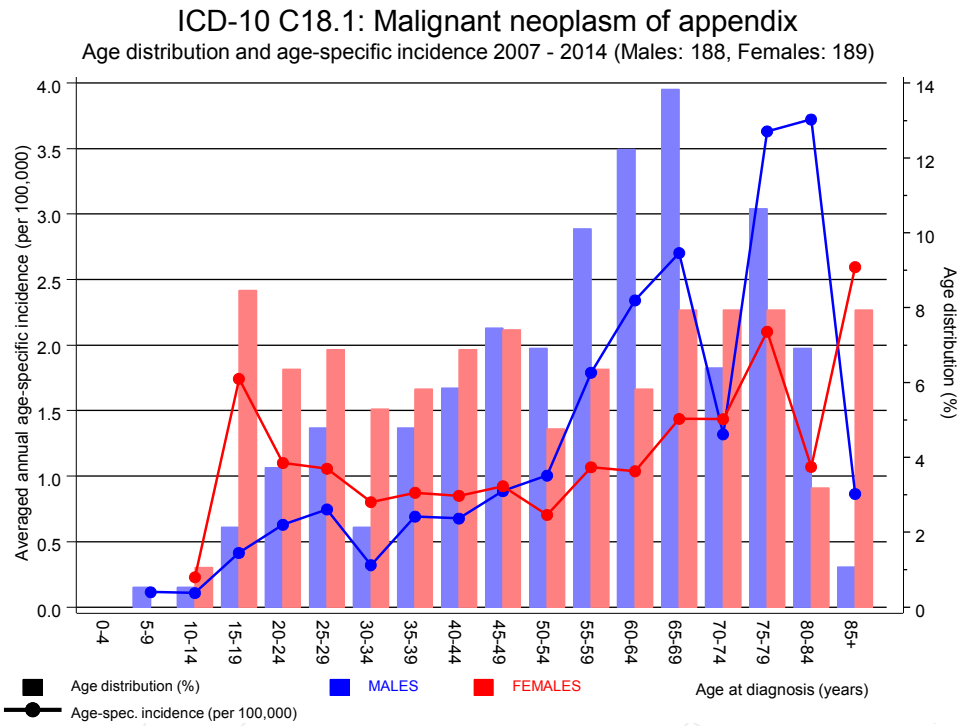


Figure 6. Age distribution and age-specific incidence

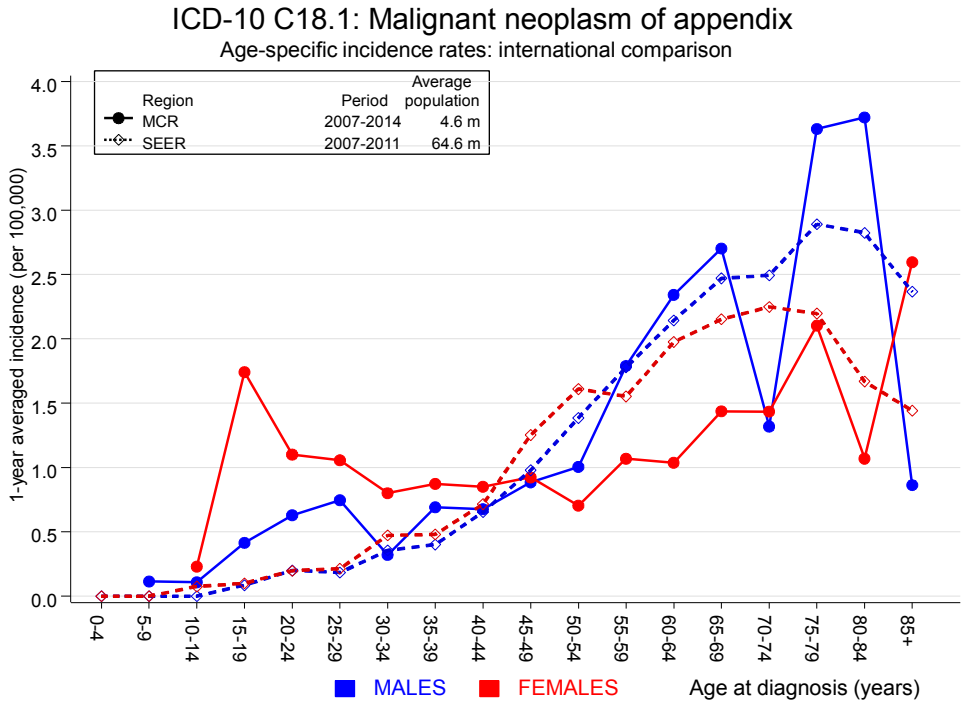


Figure 6a. Age-specific incidence in MCR registry areas compared to SEER (Surveillance, Epidemiology, and End Results, USA).

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.

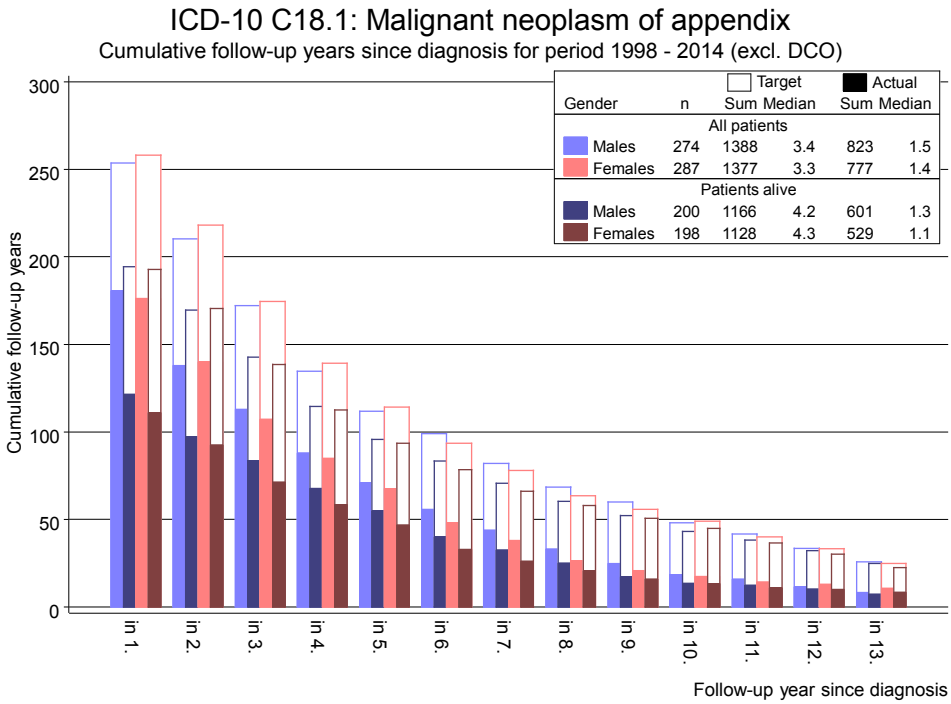


Figure 7. Cumulative follow-up years depending on time since diagnosis

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

Diagnosis		Observed n	Expected n	SIR	LCL 95%	UCL 95%		EAR	DCO %
C15	Oesophagus	3	0.2	16.3	3.4	47.5	#	34.4	
C17	Small intestine	4	0.1	78.1	21.3	200.0	#	48.3	
C18	Colon	9	0.9	10.4	4.8	19.8	#	99.4	
C19-C20	Rectum	6	0.5	11.5	4.2	25.0	#	67.0	
C61	Prostate	10	2.7	3.7	1.8	6.8	#	89.2	
C64	Kidney	2	0.3	5.8	0.7	20.8		20.2	
C82-C85	NHL	3	0.4	8.1	1.7	23.6	#	32.1	
Other primaries		4	0.6	7.3	2.0	18.6	#	42.2	
Not observed		0	3.9	0.0	0.0	0.9	#	-47.7	
All mult. primaries		41	9.5	4.3	3.1	5.9	#	385.1	

Patients	272
Median age at second malignancy (years)	70.8
Person-years	818
Mean observation time (years)	3.0
Median observation time (years)	1.5

The occurrence of second malignancy is statistically significant.

Observed second primaries with count 1 are pooled in category “Other primaries”

Table 8b

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

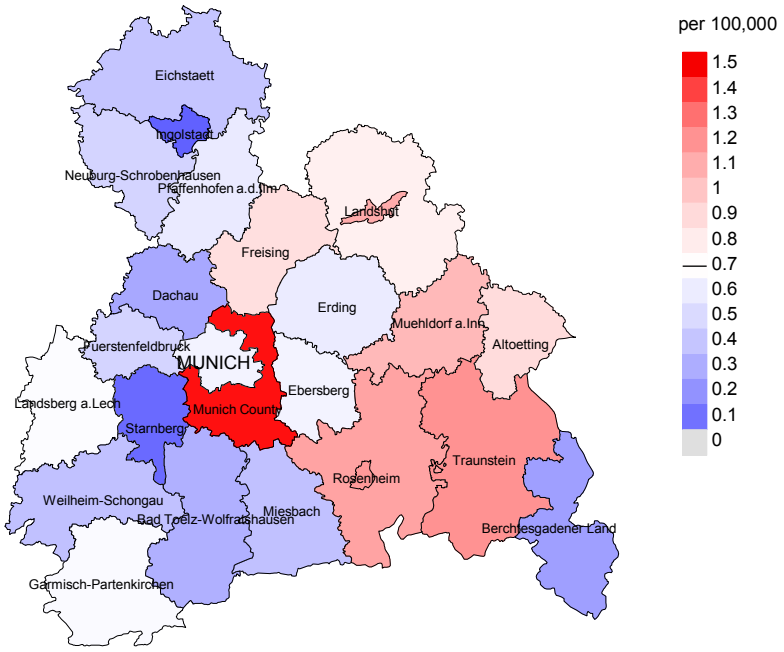
Diagnosis		Observed n	Expected n	SIR	LCL 95%	UCL 95%		EAR	DCO %
C16	Stomach	3	0.2	15.8	3.3	46.1	#	36.3	33.3
C17	Small intestine	2	0.0	69.8	8.5	252.1	#	25.5	
C18	Colon	7	0.5	12.9	5.2	26.6	#	83.4	
C19–C20	Rectum	3	0.2	12.6	2.6	36.8	#	35.7	
C25	Pancreas	2	0.2	8.4	1.0	30.3	#	22.8	
C33–C34	Lung	3	0.4	7.1	1.5	20.8	#	33.3	
C50	Breast	2	1.9	1.0	0.1	3.8		0.9	
C56	Ovary	2	0.2	8.3	1.0	29.9	#	22.7	
Other primaries		2	0.2	8.3	1.0	29.9	#	22.7	
Not observed		0	1.9	0.0	0.0	1.9		-24.8	
All mult. primaries		26	6.0	4.3	2.8	6.4	#	258.4	3.8

Patients	282
Median age at second malignancy (years)	67.7
Person-years	774
Mean observation time (years)	2.7
Median observation time (years)	1.4

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

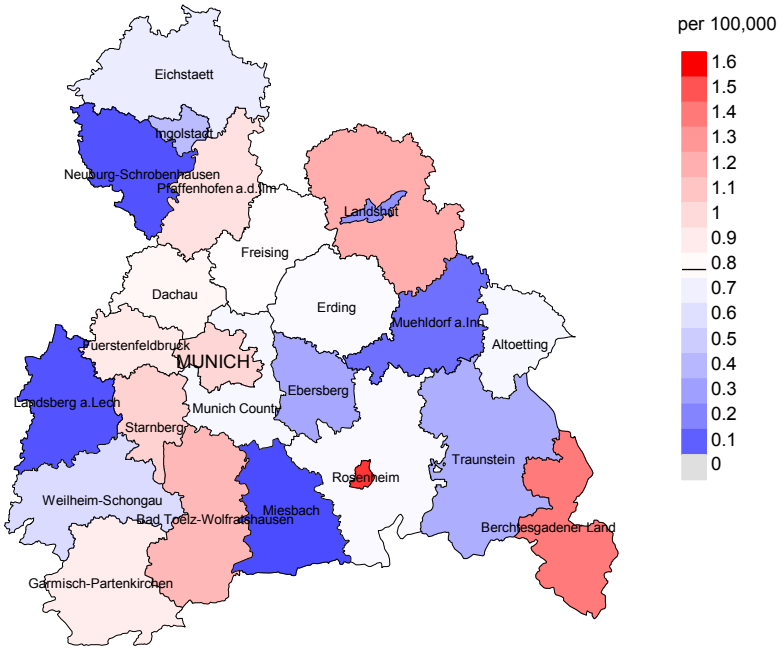
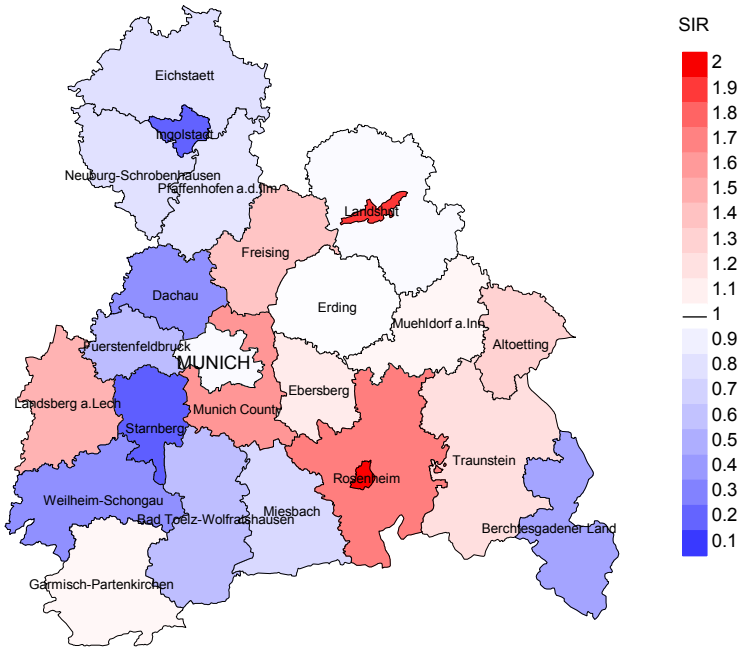


Figure 9a. Map of cancer incidence (world standard population, incl. DCO cases) by county averaged for period 2007 to 2014. According to their individual incidence rates, the counties are displayed in different red and blue color temperatures where the fine white color indicates the population mean (males 0.7/100,000 WS N=188, females 0.8/100,000 WS N=189).

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 2 women were identified with newly diagnosed appendix cancer. Therefore, the mean incidence rate for this cancer type in this area can be calculated at 0.3/100,000 (world standard population). Though, the value of this parameter may vary with an underlying probability of 99% between 0.0 and 1.7/100,000.

Standardized incidence ratio (SIR) 2007 - 2014: Males



Standardized incidence ratio (SIR) 2007 - 2014: Females

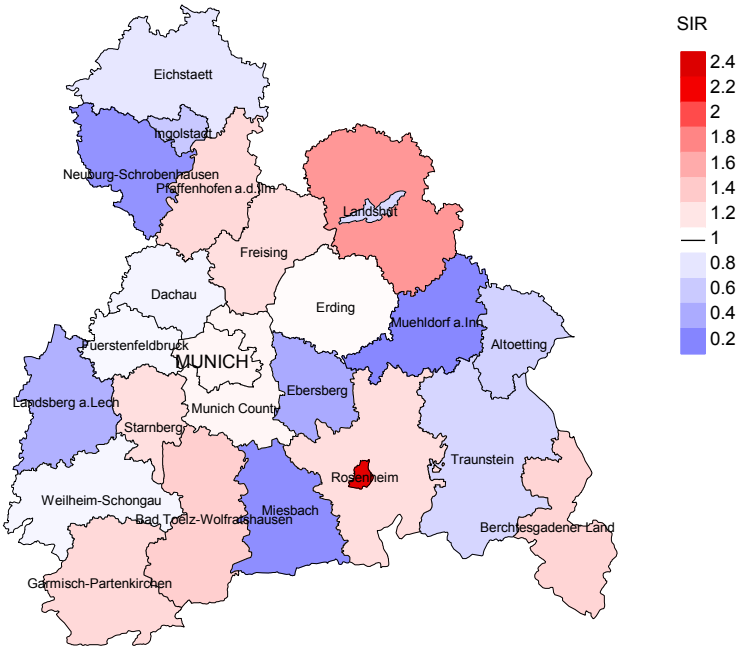


Figure 9b. Map of standardized incidence ratio (SIR, incl. DCO cases) by county averaged for period 2007 to 2014. According to their individual SIR values, the counties are displayed in different red and blue color temperatures where the fine white color indicates the population overall of 1.0 (males N=188, females N=189).

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 2 women were identified with newly diagnosed appendix cancer. Therefore, the mean standardized incidence ratio (SIR) for this cancer type in this area can be calculated at 0.39. Though, the value of this parameter may vary with an underlying probability of 99% between 0.02 and 1.81, 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	12	100.0		6	50.0	100.0
1999	15	86.7		4	26.7	75.0
2000	17	94.1		3	17.6	100.0
2001	13	100.0		8	61.5	100.0
2002	35	94.3		15	42.9	100.0
2003	21	95.2		12	57.1	100.0
2004	20	95.0		5	25.0	100.0
2005	31	90.3		19	61.3	94.7
2006	24	83.3		9	37.5	100.0
2007	33	78.8		15	45.5	93.3
2008	32	65.6		11	34.4	100.0
2009	38	65.8		15	39.5	100.0
2010	43	60.5		11	25.6	100.0
2011	51	47.1		9	17.6	100.0
2012	72	61.1		16	22.2	87.5
2013	60	96.7		5	8.3	100.0
2014	48	100.0		3	6.3	100.0
1998-2014	565	78.9		166	29.4	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)

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	12	5	100.0	2	16.7
1999	15	5	80.0	2	13.3
2000	17				
2001	13	5	100.0	2	15.4
2002	35	5	100.0	2	5.7
2003	21	9	100.0	2	9.5
2004	20	7	100.0		
2005	31	11	90.9	5	16.1
2006	24	10	90.0	1	4.2
2007	33	4	100.0	1	3.0
2008	32	15	93.3	1	3.1
2009	38	14	100.0	4	10.5
2010	43	24	100.0	4	9.3
2011	51	15	100.0	2	3.9
2012	72	18	94.4	6	8.3
2013	60	21	100.0	2	3.3
2014	48	20	100.0	3	6.3
1998-2014	565	188	97.3	39	6.9

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	5	80.0	20.0	80.0
1999	5	100.0		100.0
2000				
2001	5	100.0		100.0
2002	5	60.0	40.0	60.0
2003	9	66.7	33.3	88.9
2004	7	85.7	14.3	85.7
2005	11	72.7	27.3	80.0
2006	10	80.0	20.0	88.9
2007	4	100.0		100.0
2008	15	86.7	13.3	78.6
2009	14	78.6	21.4	100.0
2010	24	70.8	29.2	79.2
2011	15	100.0		93.3
2012	18	72.2	27.8	82.4
2013	21	85.7	14.3	85.7
2014	20	70.0	30.0	75.0
1998-2014	188	79.8	20.2	84.7

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	1	56.4	56.4		56.4
1999	2	71.5	71.5		71.5
2000					
2001	4	64.3	64.3		64.3
2002	2	71.0	71.0		63.2
2003	2	60.1	60.1		60.1
2004	4	69.6	69.6		82.0
2005	4	75.1	74.9	79.9	74.9
2006	5	76.4	58.5	76.8	58.5
2007					
2008	10	65.7	65.4	81.2	65.1
2009	5	78.9	78.9		78.9
2010	7	78.1	75.9	78.1	75.9
2011	8	67.7	67.7		67.8
2012	8	79.2	79.8	71.4	79.8
2013	13	71.9	66.8	71.9	66.8
2014	9	67.2	70.8	62.4	70.8
1998-2014	84	72.8	72.2	76.8	72.8

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

Table 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	4	85.9	85.8	88.1	85.8
1999	3	72.9	72.9		76.9
2000					
2001	1	49.6	49.6		49.6
2002	3	91.0	95.7	76.9	79.2
2003	7	74.8	76.0	74.8	76.0
2004	3	79.7	79.9	79.7	79.7
2005	7	70.4	70.4	70.7	70.4
2006	5	66.8	66.8		66.8
2007	4	68.3	68.3		68.3
2008	5	72.2	72.2		73.8
2009	9	81.7	80.1	84.7	81.7
2010	17	87.4	80.8	89.4	87.4
2011	7	68.4	68.4		68.4
2012	10	79.1	71.8	83.8	78.1
2013	8	67.6	67.6		67.6
2014	11	77.4	49.8	79.2	65.2
1998-2014	104	77.4	74.2	82.6	75.9

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 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	1	0.1	0.14	0.0	0.11	0.1	0.13	0.1	0.13
1999	2	0.2	0.25	0.1	0.18	0.2	0.24	0.3	0.31
2000									
2001	4	0.3	0.50	0.2	0.50	0.3	0.50	0.3	0.52
2002	2	0.1	0.13	0.1	0.10	0.1	0.12	0.1	0.16
2003	2	0.1	0.22	0.1	0.19	0.1	0.20	0.1	0.22
2004	4	0.2	0.44	0.1	0.44	0.2	0.46	0.3	0.50
2005	3	0.2	0.25	0.1	0.24	0.1	0.25	0.2	0.30
2006	3	0.2	0.25	0.1	0.27	0.1	0.29	0.2	0.28
2007									
2008	8	0.4	0.50	0.2	0.42	0.3	0.44	0.3	0.49
2009	5	0.2	0.28	0.1	0.15	0.1	0.21	0.3	0.32
2010	6	0.3	0.29	0.1	0.18	0.2	0.23	0.2	0.27
2011	8	0.4	0.30	0.2	0.24	0.3	0.26	0.3	0.28
2012	7	0.3	0.23	0.1	0.14	0.2	0.19	0.3	0.25
2013	10	0.4	0.31	0.2	0.26	0.3	0.31	0.4	0.30
2014	7	0.3	0.29	0.2	0.19	0.2	0.24	0.3	0.24
1998-2014	72	0.2	0.26	0.1	0.21	0.2	0.24	0.2	0.27

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	3	0.3	0.60	0.0	0.15	0.1	0.28	0.2	0.47
1999	3	0.3	0.43	0.1	0.25	0.2	0.33	0.2	0.43
2000									
2001	1	0.1	0.20	0.1	0.40	0.1	0.33	0.1	0.29
2002	1	0.1	0.05	0.0	0.01	0.0	0.02	0.0	0.02
2003	4	0.2	0.33	0.1	0.23	0.1	0.27	0.2	0.30
2004	2	0.1	0.18	0.0	0.08	0.1	0.11	0.1	0.12
2005	5	0.3	0.26	0.1	0.15	0.1	0.18	0.2	0.19
2006	5	0.2	0.42	0.1	0.38	0.2	0.39	0.2	0.39
2007	4	0.2	0.31	0.1	0.19	0.1	0.24	0.2	0.28
2008	5	0.2	0.31	0.1	0.21	0.1	0.25	0.2	0.27
2009	6	0.3	0.30	0.1	0.10	0.1	0.16	0.2	0.25
2010	11	0.5	0.50	0.1	0.22	0.2	0.30	0.3	0.39
2011	7	0.3	0.29	0.1	0.18	0.2	0.22	0.2	0.24
2012	6	0.3	0.14	0.1	0.06	0.2	0.10	0.2	0.12
2013	8	0.3	0.29	0.2	0.16	0.2	0.22	0.3	0.24
2014	7	0.3	0.29	0.2	0.23	0.2	0.24	0.2	0.25
1998-2014	78	0.2	0.27	0.1	0.15	0.1	0.19	0.2	0.22

Table 13

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

Age at death Years	Cases n	%	Cum.%	Males n	%	Cum.%	Females n	%	Cum.%
25-29	1	1.0	1.0	1	2.0	2.0			0.0
30-34	1	1.0	1.9	1	2.0	3.9			0.0
35-39	3	2.9	4.8			3.9	3	5.6	5.6
40-44	2	1.9	6.7	2	3.9	7.8			5.6
45-49	4	3.8	10.5			7.8	4	7.4	13.0
50-54	6	5.7	16.2	4	7.8	15.7	2	3.7	16.7
55-59	5	4.8	21.0	3	5.9	21.6	2	3.7	20.4
60-64	8	7.6	28.6	4	7.8	29.4	4	7.4	27.8
65-69	14	13.3	41.9	7	13.7	43.1	7	13.0	40.7
70-74	13	12.4	54.3	9	17.6	60.8	4	7.4	48.1
75-79	18	17.1	71.4	10	19.6	80.4	8	14.8	63.0
80-84	16	15.2	86.7	6	11.8	92.2	10	18.5	81.5
85+	14	13.3	100.0	4	7.8	100.0	10	18.5	100.0
All ages	105	100.0		51	100.0		54	100.0	

Included in the statistics are 36.7% multiple primaries in males and 15.9% in females.

Table 14

Age-specific mortality (cancer-related) and proportion of all cancers
for period 2007-2014
(**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	1		0.1	0.11	0.0		1.6	
30-34	1		0.1	0.25	0.0		1.1	
35-39		3	0.0		0.2	0.27		1.2
40-44	2		0.1	0.18	0.0		0.4	
45-49		4	0.0		0.3	0.29		0.3
50-54	4	2	0.3	0.31	0.2	0.22	0.2	0.1
55-59	3	2	0.3	0.16	0.2	0.17	0.1	0.1
60-64	4	4	0.4	0.17	0.4	0.36	0.1	0.1
65-69	7	7	0.7	0.27	0.7	0.47	0.1	0.1
70-74	9	4	1.0	0.75	0.4	0.27	0.1	0.1
75-79	10	8	1.8	0.50	1.1	0.53	0.1	0.1
80-84	6	10	1.7	0.46	1.8	1.67	0.1	0.2
85+	4	10	1.7	2.00	1.7	0.67	0.1	0.1
All ages	51	54					0.1	0.1
Mortality								
Raw			0.3	0.27	0.3	0.29		
WS			0.1	0.20	0.1	0.15		
ES			0.2	0.24	0.2	0.20		
BRD-S			0.3	0.27	0.2	0.23		
PYLL-70								
per 100,000			1.8		1.9			
ES			1.6		1.6			
AYLL-70			13.2		13.4			

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

Table 15a

Multiple primaries in deaths in period 1998-2014
MALES

Diagnosis	Total n	Total %↓	Pre n	Pre ←%	Syn-chron ±30d n	Syn-chron ±30d ←%	Post n	Post ←%
C12-C13 Hypopharynx	1	2.4					1	100.0
C15 Oesophagus	1	2.4					1	100.0
C16 Stomach	1	2.4					1	100.0
C17 Small intestine	3	7.1	1	33.3	1	33.3	1	33.3
C18 Colon	6	14.3			5	83.3	1	16.7
C19-C20 Rectum	6	14.3	3	50.0	2	33.3	1	16.7
C25 Pancreas	1	2.4					1	100.0
C33-C34 Lung	2	4.8					2	100.0
C44 Skin others	2	4.8	2	100.0				
C61 Prostate	8	19.0	3	37.5	2	25.0	3	37.5
C65 Renal pelvis	3	7.1					3	100.0
C67 Bladder	4	9.5	3	75.0			1	25.0
C73 Thyroid	1	2.4	1	100.0				
C76-C79 CUP	1	2.4					1	100.0
C82-C85 NHL	1	2.4			1	100.0		
C91-C96 Leukaemia	1	2.4	1	100.0				
All mult. primaries	42	100.0	14	33.3	11	26.2	17	40.5

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

Diagnosis		Total n	Total %↓	Pre n	Pre ←%	Syn-chron ±30d n	Syn-chron ±30d ←%	Post n	Post ←%
C03-C06	Oral cavity	1	2.6					1	100.0
C16	Stomach	2	5.3					2	100.0
C18	Colon	7	18.4			4	57.1	3	42.9
C19-C20	Rectum	4	10.5	2	50.0	1	25.0	1	25.0
C25	Pancreas	1	2.6					1	100.0
C33-C34	Lung	3	7.9	1	33.3			2	66.7
C43	Malign. melanoma	1	2.6	1	100.0				
C46,C49	Soft tissue	1	2.6	1	100.0				
C48	Peritoneal	1	2.6	1	100.0				
C50	Breast	2	5.3	1	50.0			1	50.0
C51	Vulva	1	2.6	1	100.0				
C53	Cervix uteri	1	2.6			1	100.0		
C54	Corpus uteri	1	2.6			1	100.0		
C55,C57	Fem. genitals un	1	2.6	1	100.0				
C56	Ovary	7	18.4	1	14.3	5	71.4	1	14.3
C64	Kidney	1	2.6	1	100.0				
C67	Bladder	2	5.3	1	50.0			1	50.0
C70-C72	CNS cancer	1	2.6					1	100.0
All mult. primaries		38	100.0	12	31.6	12	31.6	14	36.8

ICD-10 C44 (Other malignant neoplasms of skin) is not systematically recorded by MCR and therefore not considered for evaluation as a particular primary but at least as a 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	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	1		0.1	0.11	0.0		1.8	
30-34	1		0.1	0.25	0.0		1.2	
35-39		1	0.0		0.1	0.11		0.4
40-44	2		0.1	0.18	0.0		0.5	
45-49		4	0.0		0.3	0.31		0.4
50-54	4	1	0.3	0.36	0.1	0.17	0.3	0.1
55-59	1	1	0.1	0.06	0.1	0.10	0.0	0.0
60-64	3	3	0.3	0.18	0.3	0.38	0.1	0.1
65-69	5	7	0.5	0.31	0.7	0.50	0.1	0.2
70-74	6	3	0.7	1.00	0.3	0.21	0.1	0.1
75-79	7	7	1.3	0.58	1.0	0.58	0.1	0.1
80-84	4	6	1.1	0.50	1.1	1.20	0.1	0.1
85+	3	9	1.3	3.00	1.6	0.60	0.1	0.1
All ages	37	42					0.1	0.1
Mortality								
Raw			0.2	0.25	0.2	0.25		
WS			0.1	0.18	0.1	0.12		
ES			0.2	0.22	0.1	0.16		
BRD-S			0.2	0.25	0.2	0.20		
PYLL-70								
per 100,000			1.6		1.2			
ES			1.4		1.0			
AYLL-70			14.9		11.3			

* 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 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	1		0.1	0.11	0.0		2.0	
30-34	1		0.1	0.25	0.0		1.2	
35-39		1	0.0		0.1	0.11		0.5
40-44	2		0.1	0.18	0.0		0.5	
45-49		4	0.0		0.3	0.31		0.4
50-54	4	1	0.3	0.36	0.1	0.17	0.3	0.1
55-59	1	1	0.1	0.07	0.1	0.11	0.0	0.1
60-64	2	1	0.2	0.13	0.1	0.14	0.1	0.0
65-69	4	7	0.4	0.27	0.7	0.54	0.1	0.2
70-74	5	2	0.5	0.83	0.2	0.15	0.1	0.0
75-79	6	5	1.1	0.50	0.7	0.50	0.1	0.1
80-84	3	4	0.9	0.38	0.7	0.80	0.1	0.1
85+	2	7	0.9	2.00	1.2	0.50	0.1	0.1
All ages	31	33					0.1	0.1
Mortality								
Raw			0.2	0.22	0.2	0.20		
WS			0.1	0.16	0.1	0.10		
ES			0.1	0.19	0.1	0.14		
BRD-S			0.2	0.21	0.1	0.16		
PYLL-70								
per 100,000			1.5		1.1			
ES			1.4		0.9			
AYLL-70			16.2		11.8			

* See corresponding tables with multiple primaries.

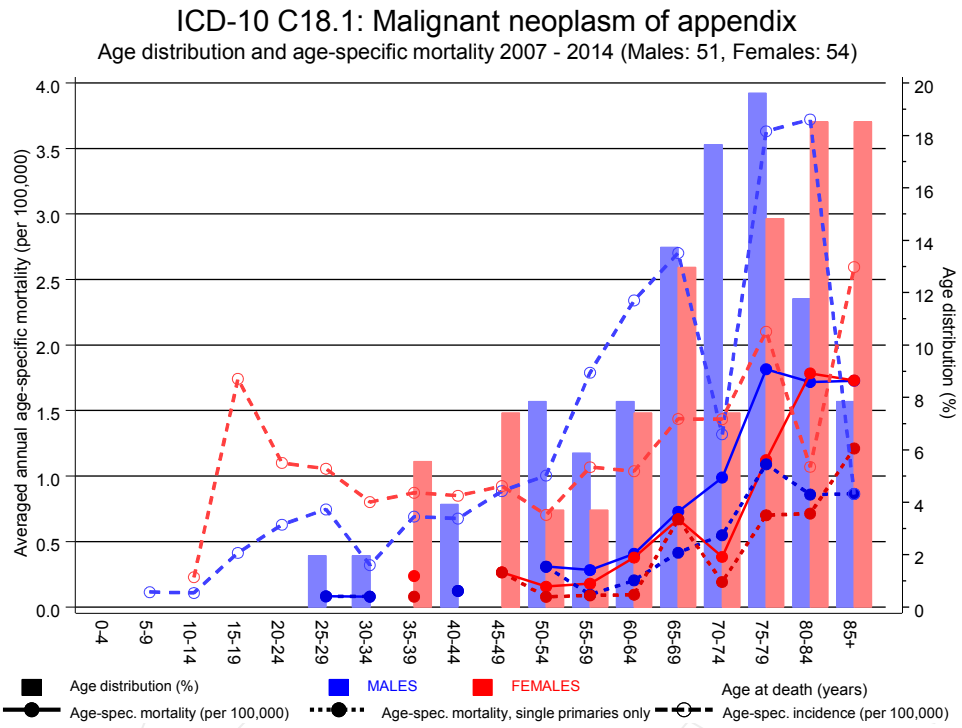
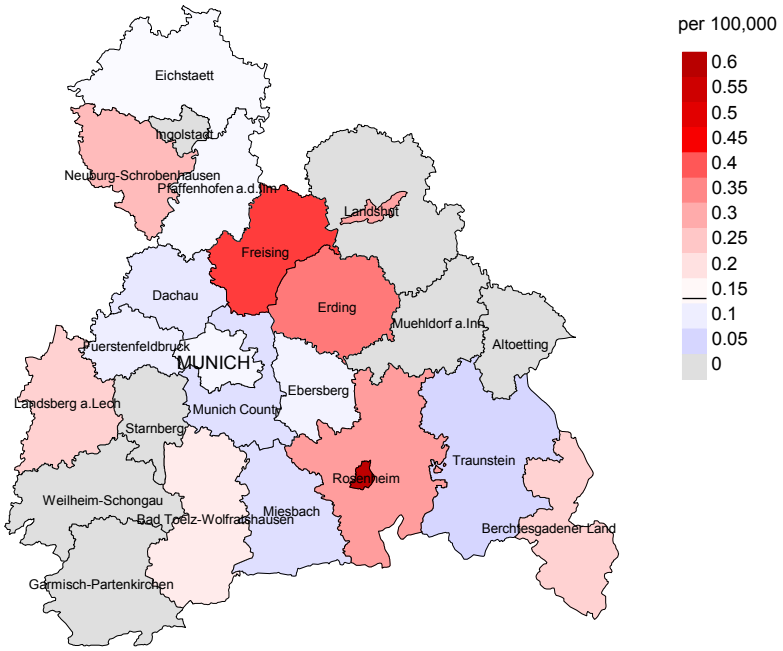


Figure 18. Distribution of age at death (bars) and age-specific mortality (all patients: solid line, patients with single primaries: dotted line). The age-specific incidence is additionally plotted for comparison (dashed line).

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

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



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

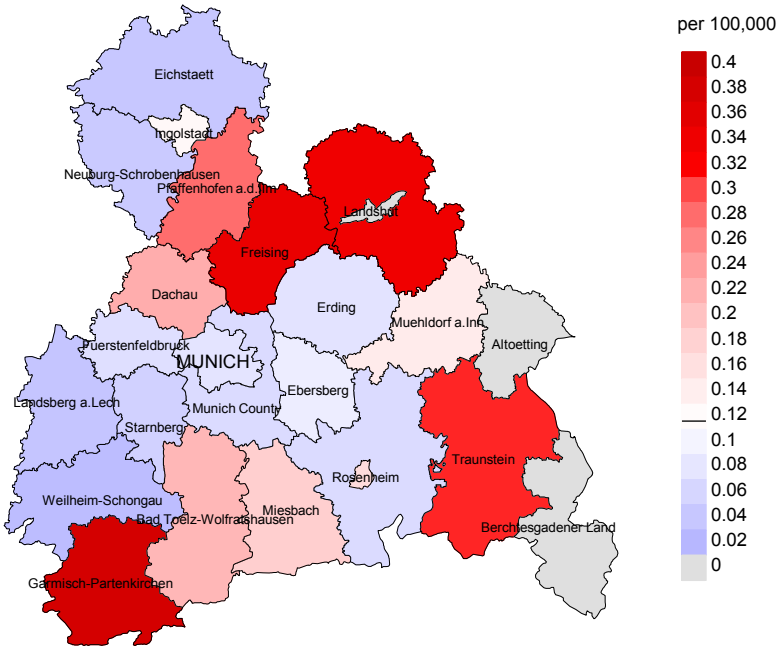
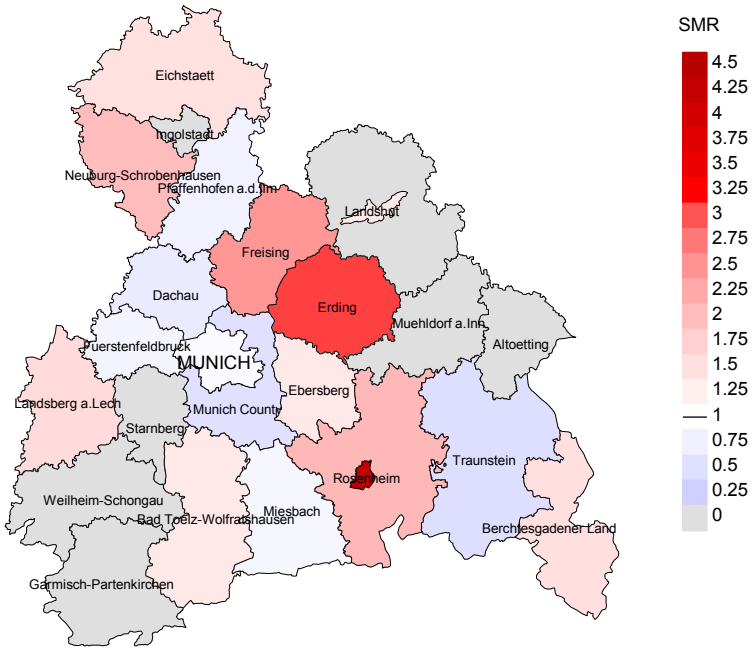


Figure 19a. Map of cancer mortality (world standard population) by county averaged for period 2007 to 2014. According to their individual mortality rates, the counties are displayed in different red and blue color temperatures where the fine white color indicates the population mean (males 0.1/100,000 WS N=51, females 0.1/100,000 WS N=53).

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 1 women died from appendix cancer. Therefore, the mean mortality rate for this cancer type in this area can be calculated at 0.1/100,000 (world standard population). Though, the value of this parameter may vary with an underlying probability of 99% between 0.0 and 0.7/100,000.

Standardized mortality ratio (SMR) 2007 - 2014: Males



Standardized mortality ratio (SMR) 2007 - 2014: Females

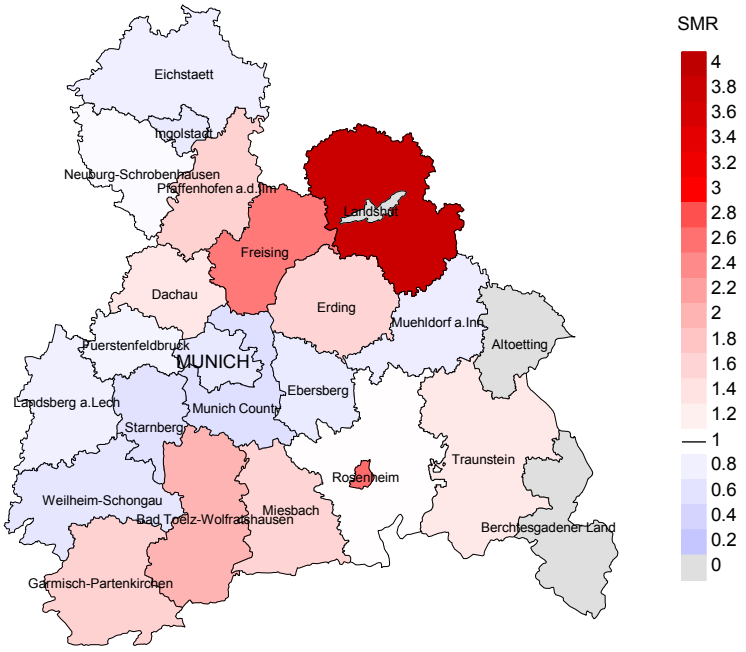


Figure 19b. Map of standardized mortality ratio (SMR, incl. DCO cases) by county averaged for period 2007 to 2014. According to their individual SMR values, the counties are displayed in different red and blue color temperatures where the fine white color indicates the population overall of 1.0 (males N=51, females N=53).

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 1 women died from appendix cancer. Therefore, the mean standardized mortality ratio (SMR) for this cancer type in this area can be calculated at 0.71. Though, the value of this parameter may vary with an underlying probability of 99% between 0.00 and 5.31, 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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