# **Munich Cancer Registry**



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### ICD-10 C74: Adrenal cancer

## **Incidence and Mortality**

Year of diagnosis	1998-2014
Patients	210
Diseases	210
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/bC74\_\_E-ICD-10-C74-Adrenal-cancer-incidence-and-mortality.pdf

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

In these analyses, the clinics and physicians of Upper Bavaria and the city and county of Landshut<sup>#</sup>, with a total of 4.64 million inhabitants, account for the frequency of cancer diseases<sup>##</sup> and the achieved long term results. Additionally, the long term survival evaluated by the Munich Cancer Registry (MCR) is compared with the results of the population-based registry in the USA (SEER), which is useful for checking the consistency of the data on an international level.

In comparing several tables, inconsistent figures may be detected. This is based on the fact that different patient cohorts are included in the base calculation, for example when proportions of multiple tumors or DCO-cases\*\*\*\* 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
C74 C74.0	Malignant neoplasm of adrenal gland Cortex of adrenal gland
C74.1	Medulla of adrenal gland
C74.9	Adrenal gland, unspecified

#### **INCIDENCE**

Table 1

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

				Prop.		Prop.
		DCO /	Prop.	mult.	Prop.	actively
Year of	Cases	cases	DCO	primaries	deaths	followed
diagnosis	n	n	%	%	%	<del></del>
1998	8			37.5	37.5	100.0
1999	6	1	16.7	33.3	100.0	100.0
2000	9	1	11.1	22.2	66.7	100.0
2001	9	1	11.1	11.1	55.6	100.0
2002	7/			14.3	85.7	100.0 #
2003	1/1	1	9.1	9.1	72.7	100.0
2004	/16	1	6.3	18.8	56.3	100.0
2005	14	2	14.3	14.3	35.7	85.7
2006	13			15.4	76.9	100.0
2007	12			8.3	41.7	66.7 #
2008	10			10.0	60.0	80.0
2009	15	1	6.7	13.3	40.0	80.0
2010	15			26.7	46.7	73.3
2011	16			18.8	43.8	68.8
2012	16	3	18.8	18.8	62.5	75.0
2013	19	2	10.5	21.1	36.8	100.0
2014	14	2	14.3	14.3	35.7	85.7 ##
1998-2014	210	15	7.1	17.6	52.9	87.6

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

<sup>##</sup> Please be aware that data of recent annual patient cohorts may not yet be fully processed. The years under evaluation can be found in the respective headings.

Table 1a

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

Year of	All	Males	Females	Prop. males	
diagnosis	n/	n	n	%	
1998	/ 8	/ 1	7	12.5	
1999	/ 6	/ 1	5 /	16.7	
2000	9	6	3/	66.7	
2001	9	3	3 6 4	33.3	
2002	7	3		42.9	
2003	11	3	8 /	27.3	
2004	16	7	9	43.8	
2005	14	10	4	71.4	
2006	13	6	7	46.2	
2007	12	6	6	50.0	
2008	10	3	7	30.0	
2009	15	6	9	40.0	
2010	15	5	10	33.3	
2011	16	8	8	50.0	
2012	16	9	7 <	56.3	
2013	19	11	8	57.9	
2014	14	6	8	42.9	
1998-2014	210	94	116	44.8	

Table 2

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

			Males	Fem.	Males	Fem.	Males	Fem.	Males	Fem.
Year of	Males	Females	Inc.	Inc.	Inc.	Inc.	Inc.	Inc.	Inc.	Inc.
diagnosis	n	n	raw	raw	WS	WS	ES	ES	BRD-S	BRD-S
1998	1	7	0.1	0.6	0.2	0.7	0.1	0.6	0.1	0.6
1999	1	5	0.1	0.4	0.1	0.2	0.1	0.3	0.1	0.4
2000	6	3 /	0.5	0.2	0.4	0.3	0.5	0.3	0.5	0.3
2001	3	6 <	0.3	0.5	0.5	0.5	0.4	0.5	0.2	0.5
2002	3	4	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.2
2003	3	8	0.2	0.4	0.3	0.4	0.2	0.4	0.1	0.4
2004	7	9	0.4	0.5	0.2	0.7	0.3	0.6	0.4	0.4
2005	10	4	0.5	0.2	0.8	0.2	0.7	0.2	0.6	0.2
2006	6	7	0.3	0.3	0.2	0.3	0.3	0.3	0.3	0.3
2007	6	6	0.3	0.3	0.4	0.3	0.3	0.3	0.3	0.2
2008	3	7	0.1	0.3	0.1	0.2	0.1	0.2	0.1	0.3
2009	6	9	0.3	0.4	0.3	0.3	0.3	0.4	0.2	0.4
2010	5 /	10	0.2	0.4	0.4	0.4	0.3	0.4	0.2	0.4
2011	8	8	0.4	0.3	0.5	0.4	0.4	0.4	0.3	0.3
2012	9	7	0.4	0.3	0.4	0.2	0.4	0.2	0.4	0.2
2013	11	8	0.5	0.3	0.6	0.2	0.5	0.2	0.5	0.2
2014	6	8	0.3	0.3	0.1	0.2	0.2	0.2	0.3	0.3
1998-2014	94	116	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3

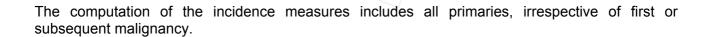


Table 3

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

Year of	Cases		Std.					Median		
diagnosis	n	Mean	dev.	Min.	Max.	10%	25%	50%	75%	90%
1998	8	37.1	30.9	0.1	66.7	0.1	0.6	53.1	61.4	66.7
1999	6	65.5	17.8	31.1	83.1	31.1	65.8	70.3	72.6	83.1
2000	9	54.2	25.1	4.6	75.5	4.6	61.1	63.0	66.0	75.5
2001	9	34.0	27.9	0.1	77.8	0.1	4.1	33.2	53.8	77.8
2002	7	35.6	32.9	0.1	76.1	0,1	1.1	47.9	67.2	76.1
2003	11	41.4	30.9	0.3	78.5	0.8	2.5	56.6	64.2	71.3
2004	16	45.6	32.5	2.0	84.6	2.1	7.0	52.7	73.7	83.8
2005	14	39.4	36.1	0.3	87.9	0.6	1.0	47.4	76.2	79.4
2006	13	53.9	21.0	0.5	81.5	40.3	43.7	54.8	64.9	77.6
2007	12	36.1	29.6	0.0	80.5	0.0	4.4	38.0	62.2	72.7
2008	10	60.5	27.0	1.4	88.2	15.0	56.1	66.3	80.9	85.9
2009	15	48.0	22.5	2.0	78.7	5.5	39.6	52.6	62.7	77.6
2010	15	42.2	30.9	0.0	82.7	0.8	4.3	44.6	72.7	77.4
2011	16 /	37.8	28.9	0.0	78.5	0.1	1.4	44.4	58.6	74.1
2012	16	55.5	28.1	0.1	90.4	0.3	49.4	61.9	71.5	88.9
2013	19	52.4	34.9	0.0	94.5	0.4	4.0	59.9	84.0	94.1
2014	14	66.3	15.9	41.2	86.4	46.0	48.4	69.0	81.1	84.1
1998-2014	210	47.5	29.3	0.0	94.5	0.7	22.8	55.7	71.2	80.7

Table 3a

Age distribution parameters by year of diagnosis (MALES)

(incl. DCO)

Year of	Cases		Std.					Median		
diagnosis	n	Mean	dev.	Min.	Max.	10%	25%	50%	75%	90%
1998	1	0.8		0.8	0.8	0.8	0.8	0.8	0.8	0.8
1999	1	70.6		70.6	70.6	70.6	70.6	70.6	70.6	70.6
2000	6	55.9	25.6	4.6	75.5	4.6	62.4	63.4	66.0	75.5
2001	3	17.3	29.3	0.1	51.2	0.1	0.1	0.8	51.2	51.2
2002	3	17.8	26.1	1.1	47.9	1.1	1.1	4.4	47.9	47.9
2003	3	22.4	36.3	0.3	64.2	0.3	0.3	2.5	64.2	64.2
2004	7	69.4	12.5	47.5	83.8	47.5	57.8	72.4	77.9	83.8
2005	10	35.0	36.8	0.6	87.9	0.7	1.0	26.0	74.4	82.1
2006	6	58.8	13.5	42.2	77.6	42.2	43.9	62.0	64.9	77.6
2007	6	28.0	25.1	0.0	60.7	0.0	0.0	29.7	48.0	60.7
2008	3	61.8	8.2	56.1	71.2	56.1	56.1	57.9	71.2	71.2
2009	6	39.4	19.2	2.0	54.9	2.0	39.6	43.8	52.6	54.9
2010	5	21.9	35.2	0.0	82.7	0.0	0.8	3.5	22.4	82.7
2011	8	37.6	32.8	0.5	78.5	0.5	1.4	44.4	65.0	78.5
2012	9	50.1	26.9	0.3	88.9	0.3	49.1	60.5	62.2	88.9
2013	11	41.1	33.4	0.0	84.0	0.4	0.6	51.6	71.0	78.1
2014	6	67.1	14.6	41.2	81.1	41.2	62.3	70.8	76.7	81.1
1998-2014	94	43.3	29.9	0.0	88.9	0.6	3.5	51.4	65.7	77.6

Table 3b

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

Year of	Cases		Std.					Median			
diagnosis	n	Mean	dev.	Min.	Max.	10%	25%	50%	75%	90%	
1998	7	42.3	29.3	0.1	66.7	0.1	0.3	57.1	64.8	66.7	
1999	5	64.5	19.7	31.1	83.1	31.1	65.8	70.1	72.6	83.1	
2000	3	50.7	29.3	17.7	73.4	17.7	17.7	61.1	73.4	73.4	
2001	6	42.3	25.5	4.1	77.8	4.1	29.7	43.5	55.0	77.8	
2002	4	49.0	34.0	0.1	76.1	0,1	26.3	59.8	71.7	76.1	
2003	8	48.6	27.8	0.8	78.5	0.8	28.4	59.5	66.9	78.5	
2004	9	27.2	31.4	2.0	84.6	2.0	5.8	7.1	43.4	84.6	
2005	4	50.6	36.7	0.3	79.4	0.3	23.2	61.3	77.9	79.4	
2006	7	49.7	26.2	0.5	81.5	0.5	40.3	54.7	72.2	81.5	
2007	6	44.1	33.9	0.2	80.5	0.2	8.6	51.5	72.7	80.5	
2008	7	59.9	32.8	1.4	88.2	1.4	28.6	75.5	83.5	88.2	
2009	9	53.7	23.7	5.5	78.7	5.5	51.9	60.3	64.2	78.7	
2010	10	52.3	24.3	4.3	77.4	16.4	32.7	59.8	72.7	77.2	
2011	8	38.0	26.7	0.0	70.3	0.0	13.8	44.4	58.6	70.3	
2012	7 /	62.5	30.2	0.1	90.4	0.1	53.0	69.5	85.8	90.4	
2013	8	68.0	32.6	0.4	94.5	0.4	54.4	77.0	93.0	94.5	
2014	8	65.7	17.8	46.0	86.4	46.0	47.3	65.6	83.6	86.4	
1998-2014	116	50.9	28.4	0.0	94.5	1.4	30.4	57.6	72.7	83.1	

Table 4

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

Age at									
diagnosis	Cases			Males			Females		
Years	n	%	Cum.%	n	용	Cum.%	n	용	Cum.%
0 - 4	21	17.9	17.9	14	25.9	25.9	7	11.1	11.1 /
5-9	2	1.7	19.7			25.9	2	3.2	14.3
10-14	0	0.0	19.7			25.9			14.3
15-19	1	0.9	20.5	_ 1	1.9	27.8			14.3
20-24	2	1.7	22.2	2	3.7	31.5			14.3
25-29	4	3.4	25.6			31.5	4	6.3	20.6
30-34	1	0.9	26.5			31.5	1	1.6	22.2
35-39	4	3.4	29.9	3	5.6	37.0	1	1.6	23.8
40 - 44	5	4.3	34.2	2	3.7	40.7	3	4.8	28.6
45-49	9	7.7	41.9	5	9.3	50.0	4	6.3	34.9
50-54	6	5.1	47.0	4	7.4	57.4	2	3.2	38.1
55-59	9	7.7	54.7	5	9.3	66.7	4	6.3	44.4
60-64	13	/ 11.1/	65.8	6	11.1	77.8	7	11.1	55.6
65-69	6	5.1	70.9	1	1.9	79.6	5	7.9	63.5
70 - 74	8	6.8	77.8	3	5.6	85.2	5	7.9	71.4
75-79	9	7.7	85.5	4	7.4	92.6	5	7.9	79.4
80-84	9	7.7	93.2	3	5.6	98.1	6	9.5	88.9
85+	8	6.8	100.0	1	1.9	100.0	7	11.1	100.0
All ages	117	100.0		54	100.0		63	100.0	

Included in the statistics are 20.4% multiple primaries in males and 20.6% in females.



Table 5

Age-specific incidence, DCO rate and proportion of all cancers for period\_2007-2014

							Males	Females
			Males	Females	Males	Females	Prop.all	Prop.all
Age at			Age-	Age-	DCO rate	DCO rate	cancers	cancers
diagnosis	Males	Females	spec.	spec.	n=2	n=6	n=91183	n=89596
Years	n	n	incid.	incid.	%	%	%	용
0- 4	14	7 /	1.6	0.8			7.9	5.1
5- 9		2	0.0	0.2				2.6
10-14			0.0	0.0				
15-19	1		0.1	0.0			0.5	
20-24	2		0.2	0.0			0.5	
25-29		4	0.0	0.3				0.6
30-34		1	0.0	0.1				0.1
35-39	3	1	0.2	0.1			0.3	0.1
40 - 44	2	3	0.1	0.2			0.1	0.1
45-49	5	4	0.3	0.3			0.2	0.1
50-54	4	2	0.3	0.2	25.0	50.0	0.1	0.0
55-59	5	4	0.5	0.4			0.1	0.1
60-64	6	7/	0.6	0.7			0.1	0.1
65-69	1	5	0.1	0.5		20.0	0.0	0.0
70 - 74	3	5	0.3	0.5			0.0	0.0
75-79	4	5	0.7	0.7	25.0		0.0	0.0
80-84	3	6	0.9	1.1			0.0	0.1
85+	1	7	0.4	1.2		57.1	0.0	0.1
All ages	54	63			3.7	9.5	0.1	0.1
Incidence								
Raw			0.3	0.3				
WS			0.3	0.3				
ES			0.3	0.3				
BRD-S			0.3	0.3				

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).



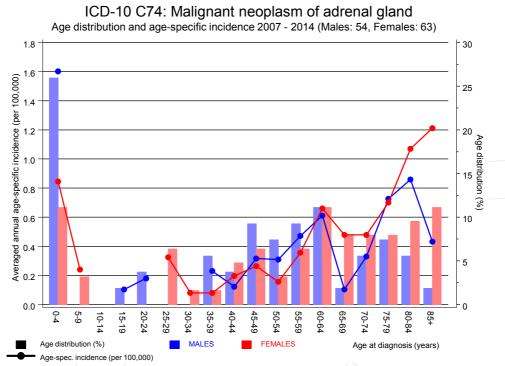


Figure 6. Age distribution and age-specific incidence



#### ICD-10 C74: Malignant neoplasm of adrenal gland Age-specific incidence rates: international comparison Average 1.8 Region MCR Period population 2007-2014 4.6 m 1.6 SEER 2007-2011 64.6 m (ber 100,000) averaged incidence 1.0 0.8 0.6 0.2 0.0 2 35-39 85+ 15-19

Age at diagnosis (years)

**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.

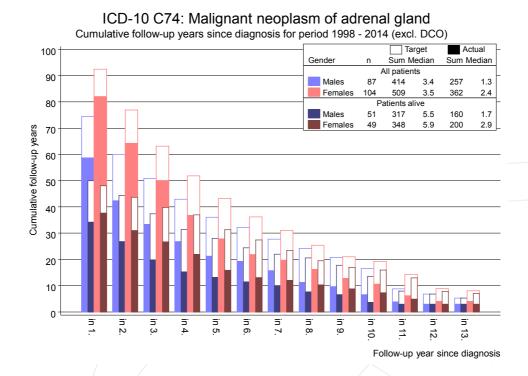


Figure 7. Cumulative follow-up years depending on time since diagnosis

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

	Tai	ble 8a					
Standardized incider excess absolute ri	sk (EAR) for peri		ate of				
	Observed	Expected		LCL	UCL		DCO
Diagnosis	n	n	SIR	95%	95%	EAR	왕
C43 Malign. melanoma	2	0.1	21.2	2.6	76.5	# 74.0	
C61 Prostate	3	0.6	4.8	1.0	13.9	92.0	
Other primaries	5	0.6	7.8	2.5	18.2	# 169.2	
Not observed	0	0.9	0.0	0.0	4.0	-35.8	
All mult. primaries	10	2.3	4.4	2.1	8.0	# 299.4	
Patients		8	9				
Median age at second maligna	ancy (year	s) 67.	3				
Person-years		25	8				
Mean observation time (years	5)	2.	9				
Median observation time (yea	ars)	1.	3				

# 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

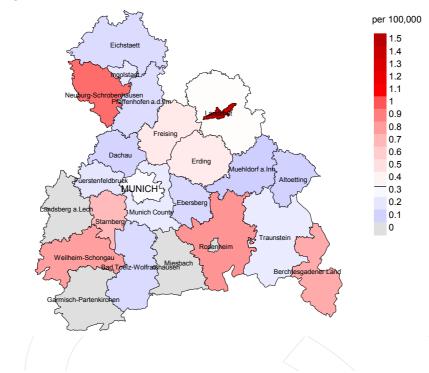
FEMALES

	Observed	Expected		LCL	UCL		DCO
Diagnosis	n	n	SIR	95%	95%	EAR	90
C73 Thyroid	2	0.1	38.6	4.7	139.5 #	53.8	
Other primaries	6	1.1	5.7	2.1	12.3 #	136.4	16.7
Not observed	0	1.3	0.0	0.0	2.9	-35.3	
All mult. primaries	8	2.4	3.3	1.4	6.6 #	154.8	12.5
Patients			104				
Median age at second	malignancy	(years)	65.4				
Person-years			362				
Mean observation time	(years)		3.5				
Median observation ti	me (years)		2.4				

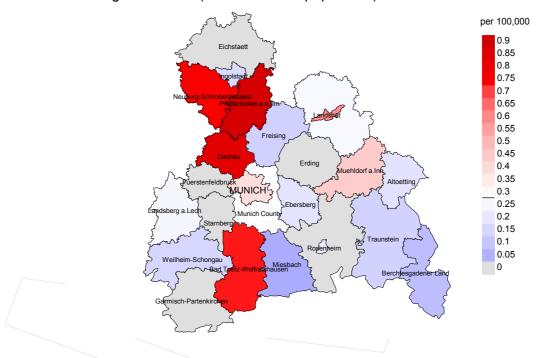
# The occurrence of second malignancy is statistically significant.

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

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



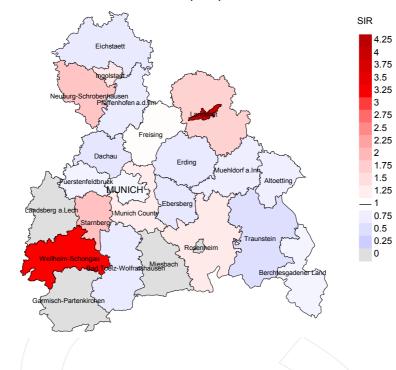
#### Average incidence (world standard population) 2007 - 2014: Females



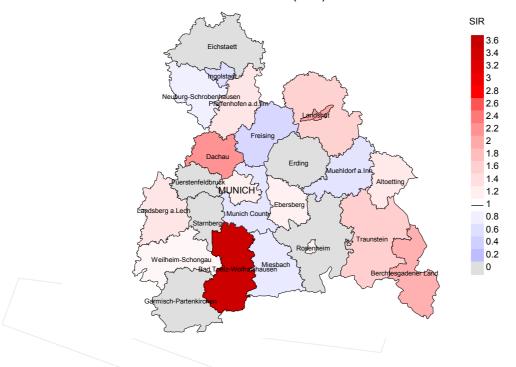
**Figure 9a.** Map of cancer incidence (world standard population, incl. DCO cases) by county averaged for period 2007 to 2014. According to their individual incidence rates, the counties are displayed in different red and blue color temperatures where the fine white color indicates the population mean (males 0.3/100,000 WS N=54, females 0.3/100,000 WS N=63).

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 adrenal cancer. 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 - 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=54, females N=63).

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 adrenal cancer. Therefore, the mean standardized incidence ratio (SIR) for this cancer type in this area can be calculated at 1.18. Though, the value of this parameter may vary with an underlying probability of 99% between 0.06 and 5.46, 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	Incident cases	Prop. actively followed	Prop.	Deaths	Prop. deaths	Prop. deaths with death certific.
diagnosis	n	%	%	n	%	%
1998	8	100.0		3	37.5	100.0
1999	6	100.0	16.7	6	100.0	100.0
2000	9	100.0	11.1	6	66.7	100.0
2001	9	100.0	11.1	5/	55.6	80.0
2002	7	100.0		6	85.7	100.0
2003	11	100.0	9.1	8	72.7	100.0
2004	16	100.0	6.3	9	56.3	100.0
2005	14	85.7	14.3	5	35.7	100.0
2006	13	100.0		10	76.9	100.0
2007	12	66.7		5	41.7	100.0
2008	10	80.0		6	60.0	100.0
2009	15	80.0	6.7	6	40.0	100.0
2010	15	73.3		7	46.7	100.0
2011	16	68.8		7	43.8	85.7
2012	16	75.0	18.8	10	62.5	100.0
2013	19	100.0	10.5	7	36.8	71.4
2014	14	85.7	14.3	5	35.7	80.0
1998-2014	210	87.6	7.1	111	52.9	95.5

Table 10b

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

(with respect to registry area expansion from 2.51 to 3.96 m as of 2002, and from 3.96 to 4.64 m as of 2007, respectively)

			Prop.		
			deaths		Prop.
Year of	Incident		with death	Deaths in	deaths in
diagnosis/	cases	Deaths	certific.	same year	same year
death	n /	n	%	n	%
1998	8	4	100.0		
1999	6	4	100.0	/ 1	16.7
2000	9	3	66.7		
2001	9 7	6	100.0	2	22.2
2002	7	8	100.0	2	28.6
2003	11	7	100.0	3	27.3
2004	16	7	85.7		12.5
2005	14	7	100.0	2 3	21.4
2006	13 /	5	100.0		
2007	12	6	100.0		
2008	10	11	100.0	3	30.0
2009	15	8	100.0	1	6.7
2010	15	6	100.0	\1	6.7
2011	16	10	90.0		12.5
2012	16	14	100.0	5	31.3
2013	19	15	100.0	2 5 3 4	15.8
2014	14	11	100.0	4	28.6
1998-2014	210	132	97.7	32	15.2

Table 10c

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

(with respect to registry area expansion from 2.51 to 3.96 m as of 2002, and from 3.96 to 4.64 m as of 2007, respectively)

				Prop.
				cancer
		Prop.	Prop.	recorded
		cancer-	non-cancer-	on death
Year of	Deaths	related	related	certificate
death	n	96	96	%
1998	4	100.0		100.0
1999	4	100.0		100.0
2000	3	100.0		100.0
2001	6	100.0		100.0
2002	8	100.0		87.5
2003	7 _	100.0		100.0
2004	7	85.7	14.3	83.3
2005	/ 7	100.0		100.0
2006	5	80.0	20.0	80.0
2007	6	100.0		100.0
2008	11	90.9	9.1	90.9
2009	\ 8	87.5	12.5	87.5
2010	6	83.3	16.7	100.0
2011	10	70.0	30.0	100.0
2012	14	92.9	7.1	100.0
2013	15	93.3	6.7	100.0
2014	11	81.8	18.2	90.9
1998-201	4 132	90.9	9.1	95.3

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

					Age at
		Age at	Age at	Age at	death
		death	death	death	(according
		(al1	(cancer-	(non-cancer-	to death
Year of	Deaths	causes)	related)	related)	certificate)
death	n	Years	Years	Years	Years
1998					
1999	1	48.2	48.2		48.2
2000	1	4.2	4.2		
2001	4	64.2	64.2		64.2
2002	2	27.6	27.6		27.6
2003					
2004	3	70.9	70.9		70.9
2005	3	78.7	78.7		78.7
2006	3	65.8	67.3	51.8	67.3
2007	2 5 3	58.8	58.8		58.8
2008	5	56.4	56.4		56.4
2009		66.8	60.4	80.5	60.4
2010	4	56.5	39.1	82.1	56.5
2011	4 6	70.1	60.6	79.6	70.1
2012	6	58.8	50.9	75.1	58.8
2013	7	62.2	62.2		62.2
2014	3	81.2	81.2		81.2
1998-2014	51	63.8	61.7	79.6	64.0

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  $\begin{tabular}{ll} \begin{tabular}{ll} \begin{tabula$ 

Year of death	Deaths n	Age at death (all causes)	Age at death (cancer-related)	Age at death (non-cancer-related) Years	Age at death (according to death certificate) Years
1998	4	69.2	69.2		69.2
1999	3	72.0	72.0		72.0
2000	2	66.7	66.7		66.7
2001	2	66.8	66.8		66.8
2002	6	70.8	70.8		73.1
2003	7	68.1	68.1		68.1
2004	4	54.1	35.5	82.3	52.5
2005	4	70.6	70.6	32.0	70.6
2006	2	62.2	62.2		62.2
2007	4	47.6	47.6		47.6
2008	6	64.4	58.1	83.6	58.1
2009	6 5 2 6	57.5	57.5		57.5
2010	2	64.6	64.6		64.6
2011	6	46.2	51.7	31.2	62.4
2012	8	54.9	54.9		54.9
2013	8	74.6	69.7	93.9	74.6
2014	8	80.2	80.2	85.1	84.5
1998-2014	81	68.1	66.5	82.3	68.1

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

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

Year of	Deaths	Mort.	MI-Index	Mort.	MI-Index	Mort.	MI-Index	Mort.	MI-Index
death	n	raw	raw	WS	WS	ES	ES	BRD-S	BRD-S
1998									
1999	1	0.1	1,00	0.1	1.49	0.1	1.16	0.1	1.05
2000	1	0.1	0.17	0.2	0.44	0.1	0.27	0.1	0.15
2001	4	0.3	1.33	0.2	0.48	0.3	0.82	0.3	1.22
2002	2	0.1	0.67	0.2	0.56	0.1	0.64	0.1	0.65
2003									
2004	3	0.2	0.43	0.1	0.45	0.1	0.41	0.2	0.36
2005	3	0.2	0.30	0.1	0.08	0.1	0.19	0.2	0.36
2006	2	0.1	0.33	0.1	0.26	0.1	0.26	0.1	0.25
2007	2	0.1	0.33	0.1	0.15	0.1	0.21	0.1	0.27
2008	5	0.2	1.67	0.2	2.16	0.2	1.70	0.2	1.84
2009	2	0.1	0.33	0.1	0.20	0.1	0.27	0.1	0.31
2010	3	0.1	0.60	0.2	0.41	0.1	0.49	0.1	0.49
2011	3	0.1	0.38	0.2	0.33	0.1	0.34	0.1	0.40
2012	5	0.2	0.56	0.1	0.34	0.2	0.45	0.2	0.50
2013	7	0.3	0.64	0.3	0.50	0.3	0.55	0.3	0.63
2014	3	0.1	0.50	0.1	0.82	0.1	0.61	0.1	0.50
1998-2014	46	0.1	0.49	0.1	0.36	0.1	0.43	0.1	0.48

Table 12b

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

Year of	Deaths	Mort.	MI-Index	Mort.	MI-Index	Mort.	MI-Index	Mort.	MI-Index
death	n	raw	raw	WS	WS	ES	ES	BRD-S	BRD-S
1998	4	0.3	0.57	0.2	0.26	0.3	0.41	0.3	0.55
1999	3	0.3	0.60	0.1	0.49	0.2	0.56	0.2	0.59
2000	2	0.2	0.67	0.1	0.34	0.1	0.47	0.1	0.50
2001	2	0.2	0.33	0.1	0.14	0.1	0.24	0.2	0.31
2002	6	0.3	1.50	0.3	1.19	0.3	1.27	0.3	1.42
2003	7	0.4	0.88	0.2	0.45	0.2	0.62	0.3	0.82
2004	3	0.2	0.33	0.1	0.14	0.1	0.23	0.1	0.31
2005	4	0.2	1.00	0.1	0.46	0.1	0.72	0.2	0.87
2006	2	0.1	0.29	0.1	0.21	0.1	0.28	0.1	0.31
2007	4	0.2	0.67	0.2	0.50	0.2	0.61	0.2	0.65
2008	5	0.2	0.71	0.1	0.54	0.2	0.77	0.2	0.68
2009	5	0.2	0.56	0.2	0.71	0.2	0.62	0.2	0.52
2010	2	0.1	0.20	0.1	0.15	0.1	0.18	0.1	0.18
2011	4	0.2	0.50	0.1	0.30	0.1	0.34	0.2	0.50
2012	8	0.3	1.14	0.2	1.02	0.3	1.26	0.3	1.52
2013	7	0.3	0.88	0.1	0.60	0.2	0.79	0.2	0.96
2014	6	0.3	0.75	0.1	0.48	0.1	0.57	0.2	0.63
1998-2014	74	0.2	0.64	0.1	0.41	0.2	0.53	0.2	0.61

Table 13

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

(incl. multiple primaries)

Age at								
death	Cases		Males			Females		
Years	n	% Cum.%	/ n	양	Cum.%	n	용	Cum.%
0 - 4	3	4.2 / 4.2	/ 2	6.7	6.7	1	2.4	2.4
5-9	1	1.4 5.6	/ 1	3.3	10.0			2.4
10-14	2	2.8 8.5	1	3.3	/13.3	1	2.4	4.9
15-19	1	1.4 9.9	1	3.3	16.7/			4.9
20-24	1	1.4 11.3	1	3.3	20.0			4.9
25-29	3	4.2 15.5			20.0	3	7.3	12.2
30-34	0	0.0 15.5			20.0			12.2
35-39	3	4.2 19.7	1	3.3	23.3	2	4.9	17.1
40 - 44	1	1.4 21.1			23.3	1	2.4	19.5
45-49	6	8.5 29.6	4	13.3	36.7	2	4.9	24.4
50-54	5	7.0 36.6	2	6.7	43.3	3	7.3	31.7
55-59	5	7.0 43.7	1	3.3	46.7	4	9.8	41.5
60-64	9 /	12.7 56.3	5	16.7	63.3	4	9.8	51.2
65-69	8	11.3 67.6	3	10.0	73.3	5	12.2	63.4
70-74	8	11.3 78.9	4	13.3	86.7	4	9.8	73.2
75-79	4	5.6 84.5			86.7	4	9.8	82.9
80-84	5	7.0 91.5	2	6.7	93.3	3	7.3	90.2
85+	6	8.5 100.0	2	6.7	100.0	4	9.8	100.0
All ages	71	100.0	30	100.0		41	100.0	

Included in the statistics are 20.4% multiple primaries in males and 20.6% in females.



Table 14

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

			Males		Females		Males	Females
Age at			Age-		Age-		Prop.all	Prop.all
death	Males	Females	spec.		spec.		cancers	cancers
Years	n	n	mortal.	MI-index	mortal.	MI-index	용	%
0- 4	2	1 /	0.2	0.14	0.1	0.14	16.7	6.7
5- 9	1		0.1	1.00	0.0		4.8	
10-14	1	1 <	0.1	1.00	0.1	1.00	5.6	5.0
15-19	1		0.1	1.00	0.0		2.8	
20-24	1		0.1	0.50	0.0		2.1	
25-29		3	0.0		0.2	0.75		4.7
30-34			0.0		0.0			
35-39	1	2	0.1	0.33	0.2	2.00	0.6	0.8
40-44		1	0.0		0.1	0.33		0.2
45-49	4	2	0.3	0.80	0.1	0.50	0.4	0.2
50-54	2 /	3	0.2	0.50	0.2	1.50	0.1	0.2
55-59	1/	4	0.1	0.20	0.4	1.00	0.0	0.2
60-64	5	/ 4	0.5	0.83	0.4	0.57	0.1	0.1
65-69	3	5	0.3	3.00	0.5	1.00	0.0	0.1
70-74	4	4	0.4	1.33	0.4	0.80	0.0	0.1
75-79		\4	0.0		0.6	0.80		0.1
80-84	2	3	0.6	0.67	0.5	0.50	0.0	0.0
85+	2	4	0.9	2.00	0.7	0.57	0.0	0.0
	_			2.00	<b>.</b> .			0.0
All ages	30	41					0.1	0.1
Mortality								
Raw			0.2	0.56	0.2	0.65		
WS			0.1	0.42	0.1	0.50		
ES			0.2	0.48	0.2	0.60		
BRD-S			0.2	0.53	0.2	0.65		
PYLL-70								
per 100,000			3.6		3.4			
ES			4.2		3.5			
AYLL-70			25.9		20.6			
, ,			23.3		20.0			

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

Table 15a

Multiple primaries in deaths in period 1998-2014

MALES

Multiple p	rimaries	in dea MAL		n period	d 1998–	2014		
Diagnosis	Total n	Total %↓	Pre n	Pre ←%	Syn- chron ±30d n	Syn- chron ±30d ←%	Post n	Post ←%
C16 Stomach C33-C34 Lung C43 Malign. melanoma C44 Skin others C61 Prostate C64 Kidney C67 Bladder C73 Thyroid C91-C96 Leukaemia	1 2 4 2 3 1 1 1	6.3 12.5 25.0 12.5 18.8 6.3 6.3 6.3	1 3 2	50.0 75.0 66.7 100.0			1 1 2 1 1	100.0 50.0 25.0 100.0 33.3 100.0

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 15b

Multiple primaries in deaths in period 1998-2014
FEMALES

				Syn-	Syn-		
				chron	chron		
Total	Total	Pre	Pre	±30d	±30d	Post	Post
n	응↓	n	<b>←</b> %	n	<b>←</b> %	n	←%
/ 1 /	5.0					1	100.0
/ 1 /	5.0					1	100.0
/ 1 /-	5.0					1	100.0
3	15.0			2	66.7	1	33.3
1	5.0					1	100.0
1	5.0			1	100.0		
4	20.0	3	75.0	1	25.0		
3	15.0	3	100.0				
1	5.0			_ 1	100.0		
2	10.0			1	50.0	1	50.0
1	5.0					1	100.0
1	5.0			_ 1	100.0		
20	100.0	6	30.0	7	35.0	7	35.0
	n  1 1 1 3 1 4 3 1 2 1 1	n %,  1 5.0 1 5.0 1 5.0 3 15.0 1 5.0 4 20.0 3 15.0 1 5.0 2 10.0 1 5.0 1 5.0 1 5.0	n % \ n  1	n % \ n \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	Total Total Pre Pre ±30d  n %↓ n ←% n  1 5.0 1 5.0 1 5.0 3 15.0 2 1 5.0 1 5.0 1 5.0 1 5.0 1 5.0 1 5.0 1 5.0 1 5.0 1 5.0 1 5.0 1 5.0 1 5.0 1 5.0 1 5.0 1 5.0 1 5.0 1 5.0 1 5.0 1 5.0	Total Total Pre Pre ±30d ±30d n %↓ n ←% n ←% n ←%  1 5.0	Total Total Pre Pre ±30d ±30d Post n %↓ n ←% n  1 5.0 1 5.0 1 5.0 3 15.0 1 5.0 1 5.0 1 5.0 1 5.0 1 5.0 1 5.0 1 5.0 1 5.0 1 5.0 1 100.0 4 20.0 3 75.0 1 25.0 3 15.0 3 100.0 1 5.0 2 10.0 1 5.0 2 10.0 1 5.0 1 100.0 1 5.0 1 100.0

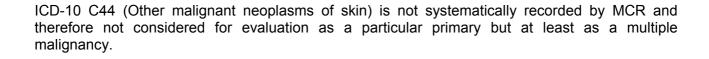


Table 16

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

(First primaries only \*)

			Males		Females		Males	Females
Age at			Age-		Age-		Prop.all	Prop.all
death	Males F	emales	spec.		spec.		cancers	cancers
Years	n	n	mortal. 1	MI-index	mortal.	MI-index	%	%
0- 4	2	1 /	0.2	0.14	0.1	0.14	20.0	7.7
5- 9	1		0.1	1.00	0.0		5.0	
10-14	1	1 <	0.1	1.00	0.1/	1.00	5.6	5.3
15-19	1		0.1	1.00	0.0		3.0	
20-24	1		0.1	0.50	0.0		2.3	
25-29		3	0.0		0.2	0.75		5.1
30-34			0.0		0.0			
35-39	1	2	0.1	0.33	0.2	2.00	0.6	0.9
40-44		1	0.0		0.1	0.50		0.2
45-49	3 /	2	0.2	1.50	0.1	0.67	0.3	0.2
50-54	2 /	3	0.2	0.50	0.2	1.50	0.1	0.2
55-59	1 /	4	0.1	0.25	0.4	1.00	0.0	0.2
60-64	3	4	0.3	1.00	0.4	0.67	0.1	0.1
65-69	3	4	0.3	3.00	0.4	0.80	0.1	0.1
70-74	4	4	0.4	1.33	0.4	1.00	0.1	0.1
75-79		4	0.0		0.6	1.33		0.1
80-84	1	3	0.3	0.50	0.5	0.75	0.0	0.1
85+	2	2	0.9	2.00	0.3	0.33	0.0	0.0
	_	\ <u>-</u> )				7		
All ages	26	38					0.1	0.1
Mortality								
Raw			0.1	0.57	0.2	0.70		
WS			0.1	0.42	0.1	0.52		
ES			0.1	0.48	0.2	0.63		
BRD-S			0.1	0.54	0.2	0.71		
PYLL-70								
per 100,000			3.3		3.4			
ES			4.0		3.5			
AYLL-70			28.0		21.3			

<sup>\*</sup> 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 \*)

			Males		Females		Males	Females
Age at			Age-		Age-		Prop.all	Prop.all
death	Males	Females	spec.		spec.		cancers	cancers
Years	n	n	mortal.	MI-index	mortal.	MI-index	용	%
0- 4	2	1 /	0.2	0.14	0.1	0.14	20.0	7.7
5- 9	1		0.1	1.00	0.0		5.0	
10-14	1	1 <	0.1	1.00	0.1/	1.00	5.6	5.6
15-19	1		0.1	1.00	0.0		3.0	
20-24	1		0.1	0.50	0.0		2.6	
25-29		3	0.0		0.2	0.75		5.4
30-34			0.0		0.0			
35-39	1	2	0.1	0.33	0.2	2.00	0.6	1.0
40-44		1	0.0		0.1	0.50		0.2
45-49	3	2	0.2	1.50	0.1	0.67	0.3	0.2
50-54	1 /	3	0.1	0.33	0.2	1.50	0.1	0.2
55-59	1/	4	0.1	0.25	0.4	1.00	0.0	0.2
60-64	3	/3	0.3	1.00	0.3	0.50	0.1	0.1
65-69	2	4	0.2	2.00	0.4	1.00	0.0	0.1
70-74	3	3	0.3	1.00	0.3	0.75	0.1	0.1
75-79		4	0.0		0.6	1.33		0.1
80-84	1	3	0.3	0.50	0.5	0.75	0.0	0.1
85+	1	2	0.4	1.00	0.3	0.40	0.0	0.0
	_		0.1	1.00	0.0	0.10	0.0	0.0
All ages	22	36					0.1	0.1
-								
Mortality								
Raw			0.1	0.49	0.2	0.69		
WS			0.1	0.38	0.1	0.51		
ES			0.1	0.43	0.2	0.61		
BRD-S			0.1	0.47	0.2	0.69		
-								
PYLL-70								
per 100,000			3.2		3.3			
ES			3.9		3.5			
AYLL-70			30.1		21.9			
, ,			33.1		21.9			

<sup>\*</sup> See corresponding tables with multiple primaries.

#### ICD-10 C74: Malignant neoplasm of adrenal gland Age distribution and age-specific mortality 2007 - 2014 (Males: 30, Females: 41)

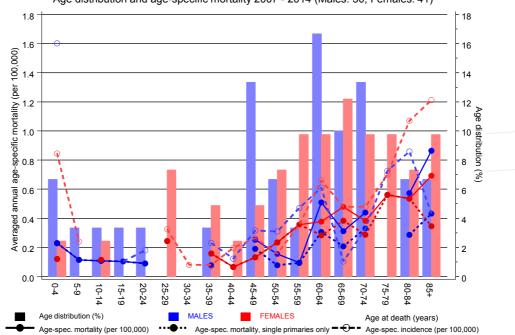
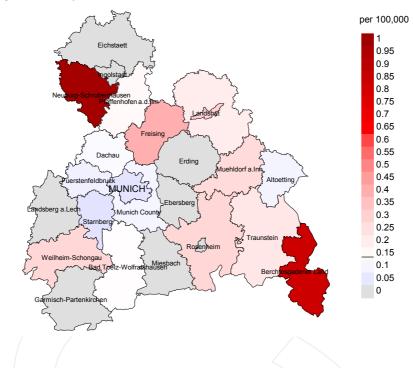


Figure 18. Distribution of age at death (bars) and age-specific mortality (all patients: solid line, patients with single primaries: dotted line). The age-specific incidence is additionally plotted for comparison (dashed line).

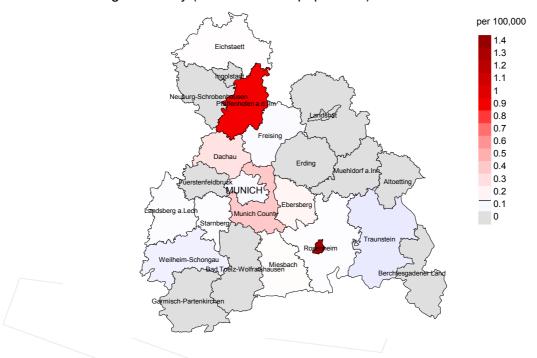
The difference between age at diagnosis (Table 3) and age at adrenal cancer-related death (see Table 10) should be considered.



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



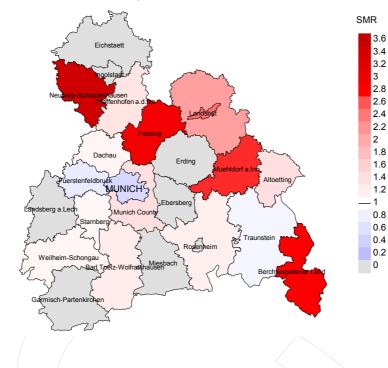
#### Average mortality (world standard population) 2007 - 2014: Females



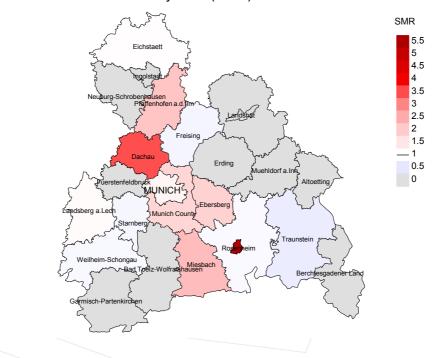
**Figure 19a.** Map of cancer mortality (world standard population) by county averaged for period 2007 to 2014. According to their individual mortality rates, the counties are displayed in different red and blue color temperatures where the fine white color indicates the population mean (males 0.1/100,000 WS N=29, females 0.1/100,000 WS N=40).

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 died from adrenal cancer. 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 - 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=29, females N=40).

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 died from adrenal cancer. Therefore, the mean standardized mortality ratio (SMR) for this cancer type in this area can be calculated at 1.86. Though, the value of this parameter may vary with an underlying probability of 99% between 0.10 and 8.63, 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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