## **Munich Cancer Registry**



- ▶ Survival
- ▶ Selection Matrix
- ▶ Homepage

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

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

### **Cancer statistics: Baseline statistics**

## C92: Myeloid leukaemia

Year of diagnosis	1998-2011
Patients	2752
Diseases	2758
Creation date	04/02/2013
Export date	01/03/2013
Population	4.5 m



http://www.tumorregister-muenchen.de/en/facts/base/base\_C92\_\_E.pdf

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

In these analyses, the clinics and physicians of Upper Bavaria and the city and county of Landshut<sup>#</sup>, with a total of 4.5 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. The time-delayed acquisition of data and the occasionally high DCO-rates indicate optimizing reserves, among others, because of current financial and legal conditions that hinder the analyses.

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

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

Munich Cancer Registry, April 2013

- Base data has been collected since 1998. An increase in new diseases is apparent, which is an effect of two extensions in the MCR catchment area (from a base population of 2.51 million to 3.96 in 2002, and to 4.52 million in 2007). Death certificates from 2011 are incorporated into these analyses.
- Due to the high frequency and good prognosis of non-malignant skin cancer (C44), no systematic ascertainment is performed for this diagnosis. C44 is not designated as a primary, but rather as a secondary tumor.
- DCO (death certificate only) identifies a cancer case that first becomes available to the MCR through the death certificate. A high proportion of DCO cases (≥5%) in particular cancer types indicate insufficient participation of specific cancer specializations.

### Some remarks regarding this cancer type

The results for leukemias should be interpreted with caution. As with other primarily non-surgically or non-radiologically treated cancer diseases, the MCR hardly manages to obtain even the simplest information on this cancer. The proportion of DCO cases indicates a situation that is far away from a satisfying cooperation. In the group of institutions that potentially participate in reporting are a few hospitals that refuse any contribution to MCR.

### ICD-10 codes used for specifying cancer site

ICD-10	Description
C92	Myeloid leukaemia
C92.0	Acute myelblastic leukaemia
C92.1	Chronic myeloid leukaemia [CML], BCR/ABL-positive
C92.2	Atypical chronic myeloid leukaemia, BCR/ABL-negative
C92.3	Myeloid sarcoma
C92.4	Acute promyelocytic leukaemia [PML]
C92.5	Acute myelomonocytic leukaemia
C92.6	Acute myeloid leukaemia with 11q23-abnormality
C92.7	Other myeloid leukaemia
C92.8	Acute myeloid leukaemia wiht multilineage dysplasia
C92.9	Myeloid leukaemia, unspecified

#### **INCIDENCE**

Table 1 Patient cohorts by year of diagnosis including DCO cases and multiple primaries, and with proportion of deaths and active follow-up

				Prop.		Prop.
		DCO	Prop.	mult.	Prop.	actively
Year of	Cases #	cases	DCO	primaries	deaths	followed
diagnosis	n	n	%	%	%	%
1998	91	26	28.6	11.0	87.9	100.0
1999	110	33	30.0	14.5	80.9	100.0
2000	128	39	30.5	12.5	72.7	99.2
2001	135	59	43.7	20.7	83.7	98.5
2002	176	61	34.7	15.9	77.3	96.6
2003	233	88	37.8	19.7	80.3	98.7
2004	226	86	38.1	25.2	75.7	97.8
2005	215	74	34.4	27.0	76.3	97.2
2006	242	95	39.3	31.8	84.7	97.1
2007	234	74	31.6	26.9	74.8	95.3 ##
2008	241	80	33.2	31.5	72.2	88.4
2009	245	61	24.9	30.2	69.8	89.8
2010	296	63	21.3	34.5	67.6	96.6
2011	186	50	26.9	36.0	59.7	85.5 ###
1998-2011	2758	889	32.2	26.0	75.0	95.3

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

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

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

Table 1a

Patient cohorts by year of diagnosis and gender including DCO cases

Year of diagnosis	All n	Males n	Females n	Prop. males %	
1998	91	43	48	47.3	
1999	110/	62	48	56.4	
2000	128	66	62	51.6	
2001	135	69	66	51.1	
2002	176	88	88	50.0	
2003	233	119	114	51.1	
2004	226	111	115	49.1	
2005	215	104	111	48.4	
2006	242	142	100	58.7	
2007	234	131	103	56.0	
2008	241	127	114	52.7	
2009	245	121	124	49.4	
2010	296	151	145	51.0	
2011	186	95	91	51.1	
1998-2011	2758	1429	1329	51.8	

Table 2

Incidence measures by year of diagnosis and gender including DCO cases (with respect to registry area expansion from 2.51 to 3.96 m as of 2002, and from 3.96 to 4.52 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	43	48	3.9	4.1	2.7	2.5	3.7	3.1	4.7	3.5
1999	62	48	5.5	4.0	3.5	2.2	4.9	3.0	5.9	3.6
2000	66	62	5.8	5.2	4.5	3.0	5.5	3.9	6.4	4.5
2001	69	66	6.0	5.4	3.7	2.5	5.1	3.7	6.5	4.7
2002	88	88	4.7	4.5	3.2	2.3	4.2	3.1	5.2	3.8
2003	119	114	6.3	5.8	3.6	3.0	5.4	4.0	6.9	4.9
2004	111	115	5.9	5.8	3.5	3.3	4.8	4.2	6.1	5.0
2005	104	111	5.5	5.6	3.3	3.0	4.4	3.9	5.7	4.7
2006	142	100	7.4	5.0	4.2	2.2	5.9	3.0	7.7	4.0
2007	131	103	5.9	4.5	3.6	2.2	4.7	3.0	5.9	3.7
2008	127	114	5.7	4.9	3.5	2.2	4.5	3.1	5.7	4.0
2009	121	124	5.4	5.3	3.2	2.6	4.2	3.6	5.3	4.3
2010	151	145	6.7	6.2	3.7	3.0	5.2	4.1	6.6	4.9
2011	95	91	4.2	3.9	2.5	2.3	3.3	2.8	4.0	3.3
1998-2011	1429	1329	5.7	5.0	3.5	2.6	4.7	3.5	5.9	4.2



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

Table 3

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

Year of	Cases		Std.			4.00	0.50	Median		
diagnosis	n	Mean	dev.	Min.	Max.	10%	25%	50%	75%	90%
1998	91	62.0	21.8	0.9	94.1	32.4	48.5	68.2	78.4	86.3
1999	110	64.3	17.7	1.5	92.0	39.2	55.0	69.2	76.4	85.1
2000	128	59.1	21.0	0.4	97.6	32.2	46.4	63.1	73.8	81.5
2001	135	64.4	15,9	9.8	96.4	38.5	56.5	66.2	76.5	81.6
2002	176	63.4	18.4	2.0	96.1	37.3	52.9	67.5	77.7	83.1
2003	233	65.5	17.6	/1.0	98.9	41.4	54.5	68.5	79.8	84.2
2004	226	65.1	18.1	0.4	93.3	40.4	56.7	67.7	78.2	84.6
2005	215	64.1	19.3	0.6	92.9	38.6	55.2	69.4	78.5	83.5
2006	242	67.9	17.6	1.0	95.1	40.9	62.5	72.3	79.5	84.8
2007	234	64.6	18.4	3.0	94.5	38.7	55.5	69.0	77.2	83.7
2008	241	66.5	18.9	0.6	98.1	41.2	59.4	71.6	78.9	84.2
2009	245	65.2	18.4	4.2	100	38.2	54.0	69.8	78.2	86.3
2010	296	67.6	17.1	1.3	94.2	47.1	59.3	71.0	78.3	86.4
2011	186	63.5	20.9	0.3	98.4	39.2	51.4	69.7	78.5	84.7
1998-2011	2758	65.0	18.6	0.3	100	38.9	55.3	69.4	78.3	84.5

Table 3a

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

Year of	Cases		Std.					Median		
diagnosis	n	Mean	dev.	Min.	Max.	10%	25%	50%	75%	90%
1998	43	62.9	22.2	0.9	94.1	32.4	48.7	70.1	77.8	86.5
1999	62	62.7	17.7	1.5	91.5	38.9	54.9	66.4	74.7	81.5
2000	66	56.5	22.4	0.4	97.6	22.7	43.0	61.8	72.4	79.7
2001	69	60.7	16.9	9.8	96.4	37.7	51.2	63.0	75.1	80.1
2002	88	60.0	19.7	2.0	94.9	30.6	48.6	63.9	75.1	80.5
2003	119	65.9	16.5	10.1	93.6	40.6	55.8	68.2	78.2	85.1
2004	111	65.5	17.2	0.4	90.1	41.8	60.1	67.3	78.2	84.6
2005	104	62.9	19.1	2.7	91.3	36.4	51.6	69.4	77.8	81.1
2006	142	66.2	17.0	1.0	93.6	41.5	59.9	70.7	76.5	82.2
2007	131	62.6	18.6	3.0	94.5	36.4	49.0	68.0	75.8	82.1
2008	127	64.0	20.6	0.6	98.1	35.0	53.8	69.3	77.7	83.7
2009	121	63.5	18.5	4.2	92.2	37.6	52.8	69.4	75.9	82.7
2010	151	67.3	16.4	2.9	93.4	48.7	60.6	70.9	77.5	83.4
2011	95	64.1	19.6	6.4	98.4	40.6	52.9	69.5	77.2	84.1
1998-2011	1429	63.8	18.6	0.4	98.4	37.8	54.3	68.4	76.5	82.7

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	48	61.2	21.6	1.3	87.5	27.9	44.8	63.8	80.1	86.3
1999	48	66.4	17.6	12.6	92.0	41.4	56.3	70.9	77.2	87.9
2000	62	61.8	19.3	16,5	94.3	35.6	47.6	64.2	76.1	86.2
2001	66	68.3	13.9	26.8	89.5	53.6	59.5	71.2	79.3	84.0
2002	88	66.8	16.4	13.5	96.1	42.8	56.0	69.6	80.1	85.6
2003	114	65.1	18.7	1.0	98.9	41.4	53.4	68.8	81.2	84.2
2004	115	64.7	19.0	0.7	93.3	39.1	55.9	68.1	78.5	84.2
2005	111	65.3	19.5	0.6	92.9	41.6	57.6	69.4	80.4	84.6
2006	100	70.4	18.1	1.8	95.1	39.8	66.5	75.0	81.9	86.7
2007	103	67.1	17.9	3.5	94.3	43.6	60.4	70.1	79.9	86.0
2008	114	69.2	16.5	15.7	94.9	45.9	61.7	72.8	81.3	86.5
2009	124	66.8	18.2	17.8	100	39.1	57.2	70.8	80.2	86.9
2010	145	67.9	17.9	1.3	94.2	46.4	58.4	71.0	81.0	87.5
2011	91	62.9	22.2	0.3	90.0	38.8	49.5	70.9	79.1	84.7
1998-2011	1329	66.3	18.5	0.3	100	40.4	56.5	70.5	80.1	85.9

Age at									
diagnosis	Cases			Males			Females		
Years	n	%	Cum.%	n	96	Cum.%	n	%	Cum.%
0 - 4	30	1.1	1./1	18	1.3	1.3	12	0.9	0.9
5-9	15	0.5	1.6	/10	0.7	2.0	5	0.4	1.3
10-14	14	0.5	2.1	6	0.4	2.4	8	0.6	1.9
15-19	24	0.9	3.0	15	1.0	3.4	9	0.7	2.6
20-24	28	1.0	4.0	15	1.0	4.5	13	1.0	3.5
25-29	38	1.4	5.4	20	1.4	5.9	18	1.4	4.9
30-34	56	2.0	7.4	37	2.6	8.5	19	1.4	6.3
35-39	88	3.2	10.6	44	3.1	11.5	44	3.3	9.6
40-44	124	4.5	15.1	71	5.0	16.5	53	4.0	13.6
45-49	120	4.4	19.5	57	4.0	20.5	63	4.7	18.4
50-54	143	5.2	24.7	80	5.6	26.1	63	4.7	23.1
55-59	180	6.5	31.2	84	5.9	32.0	96	7.2	30.3
60-64	225	8.2	39.3	132	9.2	41.2	93	7.0	37.3
65-69	351	12.7	52.1	197	13.8	55.0	154	11.6	48.9
70-74	372	13.5	65.6	203	14.2	69.2	169	12.7	61.6
75-79	382	13.9	79.4	211	14.8	84.0	171	12.9	74.5
80-84	311	11.3	90.7	131	9.2	93.1	180	13.5	88.0
85+	257	9.3	100.0	98	6.9	100.0	159	12.0	100.0
All ages	2758	100.0		1429	100.0		1329	100.0	

Included in the statistics are 31.5% multiple primaries in males and 31.3% in females.

Table 5

Age-specific incidence, DCO rate and proportion of all cancers for period 1998-2011

			Ior p	period 19	998-2011			
Age at diagnosis Years	Males n	Females	Age- spec.	Females Age- spec. incid.		Females DCO rate n=441	cancers	Females Prop.all cancers n=129521
icarb	-11	11	incia.	mera.	•	\	Ü	Ü
0- 4	18	12	1.4	1.0			6.4	5.8
5- 9	10	5	0.8	0.4			6.5	4.8
10-14	6	8	0.5	0.6			4.5	5.3
15-19	15	9	/ 1.1/	0.7	6.7		5.2	3.8
20-24	15	13	1.0	0.9	13.3	7.7	3.0	3.0
25-29	20	18	1.2	1.0			2.5	2.0
30-34	37	19	1.9	1.0	8.1		2.8	1.1
35-39	44	44	2.0	2.1	15.9	9.1	2.2	1.3
40-44	71	53	3.2	2.5	9.9	9.4	2.6	1.0
45-49	57	63	2.9	3.3		14.3	1.3	0.9
50-54	80	63	4.8	3.7	17.5	19.0	1.1	0.7
55-59	84	96	5.4	5.9	17.9	25.0	0.7	0.8
60-64	132	93	8.7	5.8	25.0	24.7	0.7	0.6
65-69	197	154	14.5	10.3	31.0	32.5	0.8	0.9
70-74	203	169	19.7	13.7	36.9	30.8	0.9	1.1
75-79	209	171	30.9	17.2	37.3	41.5	1.2	1.2
80-84	131	180	32.2	22.6	60.3	53.9	1.2	1.3
85+	98	159	35.3	21.4	67.3	58.5	1.2	1.1
711	1 4 0 7	1220			21 2	22.2	1.1	1 0
All ages	1427	1329			31.3	33.2	/1.1	1.0
Incidence								
Raw			5.7	5.0				
WS			3.4					
ES			4.7	3.5				
BRD-S			5.9	4.2				

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).

DCO

Table 6a

Standardized incidence ratio (SIR, with 95% confidence limits), excess absolute risk (EAR) and DCO rate of second primaries for period 1998-2011 MALES

Observed Expected

LCL UCL

Diagnosis	n	n	SIR	95%	95%		DCC
C18 Colon C33-C34 Lung C43 Malign. melanoma C61 Prostate C67 Bladder C82-C85 NHL	4 5 4 13 2 9	2.0 2.5 0.8 6.0 0.8 0.8	2.0 2.0 4.8 2.2 2.5 11.1	1.1 0.3 5.1	4.7 12.2 3.7 8.9 21.1	13.2 # 16.6 # 36.5 6.2 # 42.9	7.
C90 Mult. myeloma C91-C96 Leukaemia	8	0.3	15.7 25.2		40.2 49.7		75.0
Other primaries Not observed	13	5.8 1.6	2.3		3.9 2.3		
All mult. primaries	62	20.9	3.0	2.3	3.8	# 215.2	12.
ients n age at second malignancy son-years n observation time (years)	(years)	872 69.4 1909					

# The occurrence of second malignancy is statistically significant.

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

Table 6b

Standardized incidence ratio (SIR, with 95% confidence limits), excess absolute risk (EAR) and DCO rate of second primaries for period 1998-2011

FEMALES

	Observed	Expected		LCL	UCL		DCO
Diagnosis	n /	n	SIR	95%	95%	EAR	%
C18 Colon	2	1.2	1.6	0.2	5.8	4.6	
C25 Pancreas	2	0.5	3.9	0.5	14.0	9.0	50.0
C33-C34 Lung	4	0.9	4.3	1.2	11.0 #	18.7	
C50 Breast	7/	4.3	1.6	0.6	3.3	16.2	
C53 Cervix uteri	2	0.2	8.7	1.0	31.2 #	10.8	100.0
C54 Corpus uteri	4	0.8	5.3	1.4	13.5 #	19.7	
Other primaries	7	2.2	3.2	1.3	6.6 #	29.2	28.6
Not observed	0	3.3	0.0	0.0	1.1	-20.0	
All mult. primaries	28	13.5	2.1	1.4	3.0 #	88.1	17.9



# The occurrence of second malignancy is statistically significant.

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

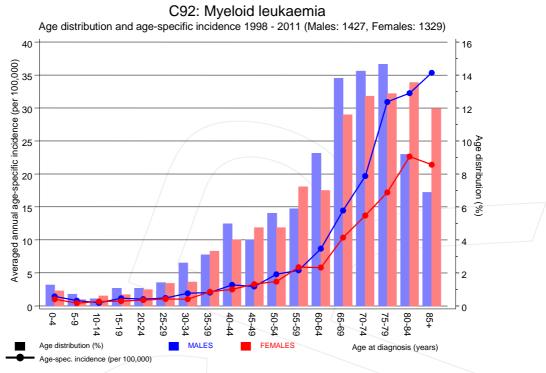
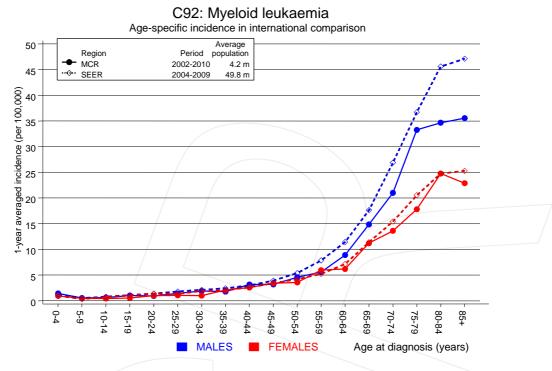


Figure 7. Age distribution and age-specific incidence





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



Reference:

Surveillance, Epidemiology, and End Results (SEER) Program SEER\*Stat Database: Incidence - SEER 18 Regs Research Data, released April 2012, based on the November 2011 submission. http://www.seer.cancer.gov.

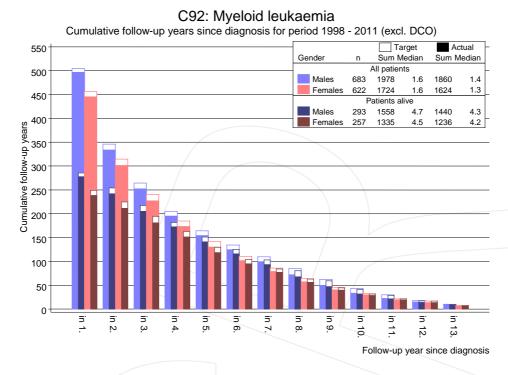
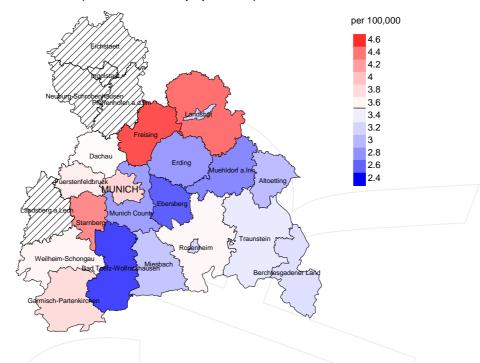


Figure 8. Cumulative follow-up years depending on time since diagnosis

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



#### Average incidence (world standard population) 2003 - 2008: Males



### Average incidence (world standard population) 2003 - 2008: Females

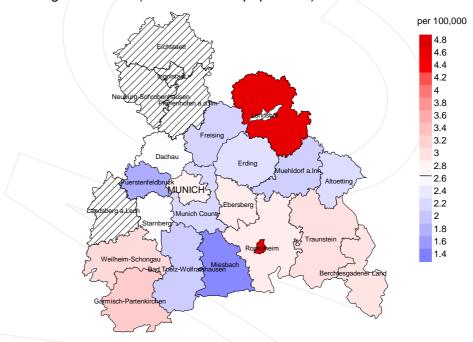
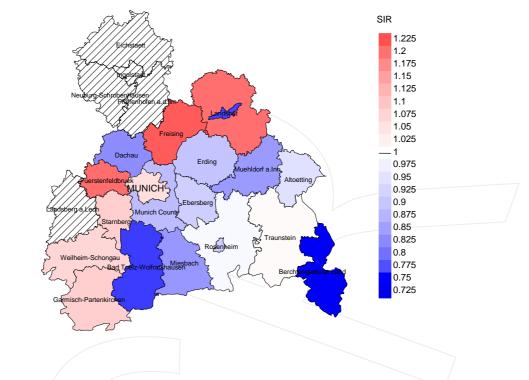


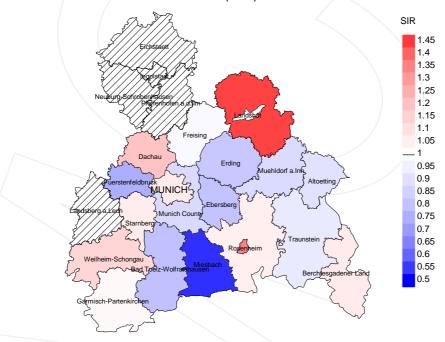
Figure 9a. Map of cancer incidence (world standard population, incl. DCO cases) by county averaged for period 2003 to 2008. According to their individual incidence rates, the counties are displayed in different red and blue color temperatures where the fine white color indicates the population mean (males 3.5/100,000 WS N=692, females 2.7/100,000 WS N=635). Since cancer data are not available in some counties until 2007, the local incidence rates were not calculated, and the map tiles show as shaded.

The results should be interpreted with caution! E.g., in county Ebersberg with a population of 63,131 female residents (averaged) in the period from 2003 to 2008 a total of 15 women were identified with newly diagnosed myeloid leukaemia. Therefore, the mean incidence rate for this cancer type in this area can be calculated at 2.9/100,000 (world standard population). Though, the value of this parameter may vary with an underlying probability of 99% between 1.1 and 7.1/100,000.

#### Standardized incidence ratio (SIR) 2003 - 2008: Males



### Standardized incidence ratio (SIR) 2003 - 2008: Females



**Figure 9b.** Map of standardized incidence ratio (SIR, incl. DCO cases) by county averaged for period 2003 to 2008. 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=692, females N=635). Since cancer data are not available in some counties until 2007, the local SIR values were not calculated, and the map tiles show as shaded.

The results should be interpreted with caution! E.g., in county Ebersberg with a population of 63,131 female residents (averaged) in the period from 2003 to 2008 a total of 15 women were identified with newly diagnosed myeloid leukaemia. Therefore, the mean standardized incidence ratio (SIR) for this cancer type in this area can be calculated at 0.80. Though, the value of this parameter may vary with an underlying probability of 99% between 0.37 and 1.51, 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 4.52 m as of 2007, respectively)

		Prop.				Prop. deaths
	Incident	actively	Prop.		Prop.	with death
Year of	cases	followed	DCO	Deaths	deaths	certific.
diagnosis	n	%	%	/ n /	%	%
1998	91	100.0	28.6	80	87.9	97.5
1999	110	100.0	30.0	89	80.9	96.6
2000	128	99.2	30.5	93	72.7	96.8
2001	135	98.5	43.7	113	83.7	99.1
2002	176	96.6	34.7	136	77.3	97.8
2003	233	98.7	37.8	187	80.3	99.5
2004	226	97.8	38.1	171	75.7	98.8
2005	215	97.2	34.4	164	76.3	99.4
2006	242	97.1	39.3	205	84.7	98.5
2007	234	95.3	31.6	175	74.8	98.9
2008	241	88.4	33.2	174	72.2	99.4
2009	245	89.8	24.9	171	69.8	98.8
2010	296	96.6	21.3	200	67.6	99.0
2011	186	85.5	26.9	111	59.7	100.0
1998-2011	2758	95.3	32.2	2069	75.0	98.7

Table 10b

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

			Prop.		
			deaths		Prop.
Year of	Incident		with death	Deaths in	deaths in
diagnosis/	cases	Deaths	certific.	same year	same year
death	n	_ n /	%	n	8
1998	91	92	98.9	46	50.5
1999	110	86	97.7	42	38.2
2000	128	94	96.8	53	41.4
2001	135	117	97.4	64	47.4
2002	176	122	98.4	79	44.9
2003	233	144	98.6	109	46.8
2004	226	138	98.6	100	44.2
2005	215	179	99.4	106	49.3
2006	242	169	98.8	140	57.9
2007	234	166	98.8	111	47.4
2008	241	163	98.2	118	49.0
2009	245	158	97.5	_ 111	45.3
2010	296	195	99.0	137	46.3
2011	186	170	98.8	87	46.8
1998-2011	2758	1993	98.4	1303	47.2

Table 10c

Annual cohorts of deaths, proportion of cancer-related and not 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 4.52 m as of 2007, respectively)

				Prop.	
				cancer	
		Prop.	Prop.	recorded	
		cancer-	not cancer-	on death	
Year of	Deaths	related	related	certificate	
death	n /	%	%	%	
1998	92	73.9	26.1	95.6	
1999	86	80.2	19.8	97.6	
2000	94	88.3	11.7	100.0	
2001	117	83.8	16.2	97.4	
2002	122	91.0	9.0	99.2	
2003	144	91.0	9.0	99.3	
2004	138	92.0	8.0	97.8	
2005	179	93.3	6.7	99.4	
2006	169	94.7	5.3	98.8	
2007	166	92.8	7.2	98.8	
2008	163	87.7	12.3	95.0	
2009	158	91.8	8.2	96.8	
2010	195	92.8	7.2	97.9	
2011	170	90.6	9.4	96.4	
1998-2011	1993	89.9	10.1	97.9	

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

					Age at
		Age at	Age at	Age at	death
		death	death	death	(according
		(all	(cancer-	(not cancer-	to death
Year of	Deaths	causes)	related)	related)	certificate)
death	n	Years	Years	Years	Years
1998	48	60.7	60.3	61.7	61.3
1999	48	68.0	66.4	73.8	67.8
2000	57	64.6	63.8	71.6	65.3
2001	50	67.4	67.7	65.3	67.6
2002	57	65.6	65.5	66.2	66.0
2003	81	68.9	68.3	78.1	68.8
2004	70	70.1	70.1	69.4	70.1
2005	92	69.0	69.2	66.6	69.0
2006	99	69.5	69.5	69.5	69.3
2007	81	66.7	67.4	47.4	67.3
2008	85	68.7	69.2	65.7	68.9
2009	82	70.0	69.6	73.1	70.6
2010	101	71.8	71.4	76.1	71.6
2011	84	70.1	69.5	74.9	70.4
1998-2011	1035	68.4	68.3	69.2	68.6

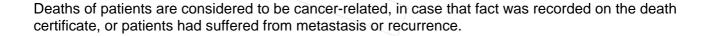


Table 11b Means of age at death according to the grouping in Table 10 FEMALES

					Age at
		Age at	Age at	Age at	death
		death	death	death	(according
		(all	(cancer-	(not cancer-	to death
Year of	Deaths	causes)	related)	related)	certificate)
death	n	Years	Years	Years	Years
1998	44	59.4	57.8	64.2	59.6
1999	38	69.7	70.7	65.6	69.8
2000	37	72.3	70.0	86.8	72.3
2001	67	69.4	67.9	75.4	69.8
2002	65	71.1	70.6	76.0	71.1
2003	63	71.7	70.7	78.5	71.7
2004	68	71.7	71.9	68.4	71.7
2005	87	68.0	68.6	58.4	68.7
2006	70	72.1	72.2	71.9	72.1
2007	85	69.2	69.5	66.9	69.6
2008	78	72.4	70.9	83.8	71.9
2009	76	73.1	73.4	68.6	73.2
2010	94	74.4	74.5	70.5	74.6
2011	86	72.2	71.2	83.7	72.4
1998-2011	958	70.8	70.6	73.0	71.0



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 12a  $\begin{tabular}{ll} Mortality measures (cancer-related death) and mortality-incidence-index \\ by year of death \\ \hline MALES \\ \end{tabular}$ 

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	35	3.2	0.81	2.3	0.88	3.0	0.82	3.8	0.80
1999	38	3.4	0.61	2.0	0.58	3.0	0.61	3.7	0.63
2000	51	4.5	0.77	2.8	0.63	4.0	0.73	5.2	0.82
2001	45	3.9	0.65	2.2	0.60	3.4	0.65	4.7	0.73
2002	52	2.8	0.59	1.7	0.54	2.4	0.58	3.1	0.59
2003	76	4.1	0.64	2.3	0.63	3.4	0.64	4.5	0.64
2004	64	3.4	0.58	1.8	0.51	2.8	0.57	3.9	0.65
2005	85	4.5	0.82	2.3	0.70	3.5	0.78	4.8	0.84
2006	92	4.8	0.65	2.4	0.58	3.7	0.62	5.0	0.66
2007	78	3.5	0.60	1.9	0.53	2.7	0.57	3.7	0.62
2008	74	3.3	0.58	1.7	0.48	2.5	0.55	3.3	0.59
2009	74	3.3	0.61	1.6	0.50	2.4	0.56	3.3	0.63
2010	91	4.0	0.61	2.0	0.53	3.0	0.58	3.9	0.59
2011	75	3.3	0.79	1.6	0.65	2.4	0.72	3.3	0.81
1998-2011	930	3.7	0.65	2.0	0.58	2.9	0.63	4.0	0.67

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	33	2.8	0.69	2.0	0.80	2.3	0.75	2.5	0.72
1999	31	2.6	0.65	1.1	0.51	1.7	0.57	2.2	0.62
2000	32	2.7	0.52	1.1	0.38	1.7	0.42	2.2	0.49
2001	53	4.4	0.80	2.2	0.85	3.0	0.81	3.9	0.82
2002	59	3.0	0.67	1.3	0.59	1.9	0.62	2.5	0.67
2003	55	2.8	0.48	1.1	0.38	1.7	0.43	2.3	0.47
2004	63	3.2	0.55	1.3	0.41	2.0	0.47	2.6	0.52
2005	82	4.1	0.74	1.9	0.64	2.7	0.68	3.3	0.70
2006	68	3.4	0.68	1.3	0.62	2.0	0.67	2.8	0.70
2007	76	3.3	0.74	1.5	0.68	2.1	0.71	2.7	0.73
2008	69	3.0	0.61	1.2	0.55	1.8	0.58	2.4	0.59
2009	71	3.1	0.57	1.2	0.46	1.8	0.51	2.4	0.56
2010	90	3.8	0.62	1.4	0.46	2.1	0.51	2.8	0.57
2011	79	3.4	0.87	1.4	0.59	2.0	0.74	2.7	0.83
1998-2011	861	3.3	0.65	1.4	0.55	2.1	0.59	2.7	0.63

Table 13

Age distribution of age at death (cancer-related) for period 1998-2011 (incl. multiple primaries)

Age at								
death	Cases		Males			Females		
Years	n	% Cum.%	n	%	Cum.%	n	%	Cum.%
0-4	4	0.2 0.2		0.1	0.1	3	0.3	0.3
5-9	2	0.1 0.3	2	0.2	0.3			0.3
10-14	6	0.3 0.7	/ 3	0.3	0.6	3	0.3	0.7
15-19	9	0.5 1.2	5	0.5	1.2	4	0.5	1.2
20-24	8	0.4 /1.6	6	0.6	1.8	2	0.2	1.4
25-29	16	0.9 2.5	/ 11	1.2	3.0	5	0.6	2.0
30-34	18	1.0 / 3.5	/ 11	1.2	4.2	7	0.8	2.8
35-39	37	2.1 5.6	21	2.2	6.4	16	1.9	4.6
40-44	47	2.6 8.2	27	2.9	9.3	20	2.3	7.0
45-49	54	3.0 11.2	28	3.0	12.3	26	3.0	10.0
50-54	63	3.5 14.7	37	4.0	16.2	26	3.0	13.0
55-59	114	6.3 21.0	52	5.6	21.8	62	7.2	20.2
60-64	150	8.3 29.4	81	8.7	30.4	69	8.0	28.2
65-69	235	13.1 42.5	135	14.4	44.9	100	11.6	39.8
70-74	267	14.9 57.3	149	15.9	60.8	118	13.7	53.5
75-79	337	18.8 76.1	186	19.9	80.7	151	17.5	71.1
80-84	245	13.6 89.7	105	11.2	91.9	140	16.3	87.3
85+	185	10.3 100.0	76	8.1	100.0	109	12.7	100.0
All ages	1797	100.0	936	100.0		861	100.0	

Included in the statistics are 31.5% multiple primaries in males and 31.3% in females.

Table 14

Age-specific mortality (cancer-related) and proportion of all cancers for period 1998-2011 (incl. multiple primaries)

			Males		Females		Males	Females
Age at			Age-		Age-		_	Prop.all
death		Females	_ /		spec.		cancers	cancers
Years	n	n	mortal.	MI-index	mortal.	MI-index	8	%
		_	/	/	\	\		
0 - 4	1	3	0.1		0.3	0.25	3.4	13.6
5- 9	2	_	0.2		0.0		6.5	/
10-14	3	3	0.2		0.2		10.3	12.5
15-19	5	4	0.4		0.3		13.2	13.8
20-24	6	2	0.4		0.1	0.15	7.5	4.7
25-29	11	5	0.7		0.3	0.28	12.6	4.9
30-34	11	7 <	0.6	0.30	0.4		6.5	3.4
35-39	21	16	1.0	0.48	0.8	0.36	5.8	3.5
40-44	27	20	1.2		0.9	0.38	3.6	2.0
45-49	28	26	1.4		1.4		1.8	1.5
50-54	37	26	2.2	0.46	1.5	0.41	1.3	1.0
55-59	52	62	3.3	0.62	3.8	0.65	1.0	1.5
60-64	81	69	5.3	0.61	4.3	0.74	1.1	1.2
65-69	135	100	9.9	0.69	6.7	0.65	1.3	1.4
70-74	149	118	14.4	0.73	9.6	0.70	1.3	1.5
75-79	186	151	27.5	0.88	15.2	0.88	1.7	1.7
80-84	105	140	25.8	0.80	17.6	0.78	1.2	1.5
85+	76	109	27.4	0.78	14.7	0.69	1.1	1.0
All ages	936	861					1.4	1.4
Mortality								
Raw			3.7	0.66	3.3	0.65		
WS			2.0	0.58	1.4	0.55		
ES			3.0	0.63	2.1			
BRD-S			4.0	0.67	2.7			
PYLL-70								
per 100,000			26.8		21.3			
ES			24.9		19.9			
AYLL-70			14.5		14.0			

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

Table 15a  $\begin{tabular}{ll} Multiple primaries in deaths in period 1998-2011 \\ \hline MALES \\ \end{tabular}$ 

**MORTALITY** 

					Syn- chron	Syn- chron		
	Total	Total	Pre	Pre	±30d	±30d	Post	Post
Diagnosis	n /	%↓	n	<b>←</b> %	n	<b>←</b> %	n	<b>←</b> %
3		· /						
C03-C06 Oral cavity	3	0.9	3	100.0				
C16 Stomach	6	1.9	5	83.3			1	16.7
C18 Colon	27	8.3	19	70.4	3	11.1	5	18.5
C19-C20 Rectum	/10	3.1	7	70.0	2	20.0	1	10.0
C22 Liver	3	0.9	1	33.3			2	66.7
C25 Pancreas	4 /	1.2	1	25.0			3	75.0
C33-C34 Lung	14	4.3	7	50.0	5	35.7	2	14.3
C43 Malign. melanoma	10	3.1	9	90.0	/ 1	10.0		
C44 Skin others	10	3.1	2	20.0			8	80.0
C61 Prostate	59	18.2	53	89.8	4	6.8	2	3.4
C64 Kidney	11	3.4	11	100.0				
C67 Bladder	20	6.2	17	85.0	1	5.0	2	10.0
C70-C72 CNS cancer	7	2.2	3	42.9	2	28.6	2	28.6
C76-C79 CUP	3	0.9	2	66.7	1	33.3		
C81 Hodgkin lymphoma	4	1.2	4	100.0				
C82-C85 NHL	28	8.6	18	64.3	_ 3	10.7	7	25.0
C90 Mult. myeloma	4	1.2	3	75.0	1	25.0		
C91-C96 Leukaemia	86	26.5			29	33.7	57	66.3
Other primaries	15	4.6	8	53.3	2	13.3	5	33.3
All mult. primaries	324	100.0	173	53.4	54	16.7	97	29.9

Multiple primaries with number of cases n<3 are pooled in category "Other primaries".

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

Table 15b

Multiple primaries in deaths in period 1998-2011
FEMALES

					Syn- chron	Syn- chron		
	Total	Total	Pre	Pre	±30d	±30d	Post	Post
Diagnosis	n /	%↓	n	<b>←%</b>	n	<b>←%</b>	n	<b>←</b> %
C16 Stomach	4	/1.3	4	100.0				
C18 Colon	/9	3.0	8	88.9	\ 1	11.1		
C19-C20 Rectum	8	2.6	5	62.5	1	12.5	2	25.0
C33-C34 Lung	8	2.6	4	50.0	2	25.0	2	25.0
C43 Malign. melanoma	7	2.3	7	100.0				
C44 Skin others	9 /	3.0	5	55.6			4	44.4
C50 Breast	86	28.3	76	88.4	4	4.7	6	7.0
C53 Cervix uteri	8	2.6	5	62.5	_ 2	25.0	1	12.5
C54 Corpus uteri	20	6.6	16	80.0	2	10.0	2	10.0
C56 Ovary	5	1.6	5	100.0				
C67 Bladder	9	3.0	7	77.8	1	11.1	1	11.1
C70-C72 CNS cancer	3	1.0	3	100.0				
C73 Thyroid	9	3.0	9	100.0				
C81 Hodgkin lymphoma	5	1.6	4	80.0	1	20.0		
C82-C85 NHL	13	4.3	12	92.3			1	7.7
C90 Mult. myeloma	6	2.0	4	66.7	_ 2	33.3		
C91-C96 Leukaemia	72	23.7			29	40.3	43	59.7
Other primaries	23	7.6	9	39.1	2	8.7	12	52.2
All mult. primaries	304	100.0	183	60.2	47	15.5	74	24.3

Multiple primaries with number of cases n<3 are pooled in category "Other primaries".

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

Table 16

Age-specific mortality (cancer-related) and proportion of all cancers for period 1998-2011

(Singular primaries only \*)

			Males		Females		Males	Females
Age at			Age-		Age-		_	Prop.all
death		Females	_ /		spec.		cancers	cancers
Years	n	n	mortal.	MI-index	mortal.	MI-index	%	%
			/	/	\	\		
0 - 4	1	3	0.1		0.3		4.2	13.6
5- 9	2		0.2		0.0		6.9	
10-14	3	3	0.2		0.2		10.3	13.0
15-19	5	4	0.4		0.3		14.3	14.8
20-24	5	1 /	0.3		0.1		6.7	2.6
25-29	10	5	0.6		0.3		12.3	5.2
30-34	11	7 <	0.6		0.4		6.7	3.9
35-39	20	14	0.9		0.7		5.9	3.4
40-44	23	16	1.0	0.36	0.8	0.34	3.3	1.8
45-49	26	23	1.3	0.50	1.2	0.43	1.9	1.5
50-54	33	19	2.0	0.46	1.1	0.42	1.3	0.9
55-59	49	47	3.1	0.65	2.9	0.61	1.1	1.4
60-64	61	52	4.0	0.60	3.2	0.79	0.9	1.1
65-69	91	79	6.7	0.66	5.3	0.66	1.1 /	1.4
70-74	110	75	10.7	0.77	6.1	0.60	1.2	1.2
75-79	122	110	18.1	0.83	11.1	0.91	1.5	1.5
80-84	75	102	18.5	0.82	12.8	0.80	1.1	1.3
85+	52	80	18.7	0.74	10.8	0.66	0.9	0.9
All ages	699	640					1.3	1.3
Mortality								
Raw			2.8	0.63	2.4	0.62		
WS			1.6		1.1			
ES			2.2		1.6			
BRD-S			2.9		2.0	0.61		
PYLL-70								
per 100,000	)		23.9		17.9			
ES			22.5		16.9			
AYLL-70			16.0		14.8			

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

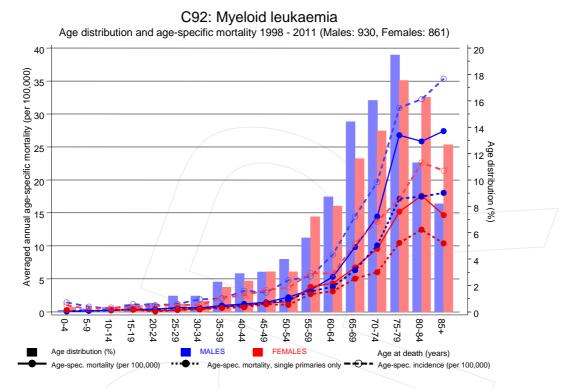
Table 17

Age-specific mortality (cancer-related) and proportion of all cancers for period 1998-2011

(Single primaries only \*)

			Males		Females		Males	Females
Age at			Age-		Age-			Prop.all
death		Females	_ /		spec.		cancers	cancers
Years	n	n	mortal.	MI-index	mortal.	MI-index	%	%
0 - 4	1	3	0.1		0.3	0.25	4.3	13.6
5- 9	2		0.2		0.0		7.1	
10-14	3	3	0.2		0.2		10.3	13.6
15-19	5	4	0.4		0.3		14.3	17.4
20-24	5	1 /	0.3		0.1		7.1	2.8
25-29	10	5 /	0.6	0.53	0.3		13.3	5.6
30-34	11	7 <	0.6	0.32	0.4		6.9	4.3
35-39	18	12	0.8	0.46	0.6	0.29	5.5	3.1
40-44	22	15	1.0	0.35	0.7	0.33	3.3	1.9
45-49	24	22	1.2	0.47	1.1	0.45	1.8	1.6
50-54	31	18	1.9	0.46	1.0	0.43	1.4	0.9
55-59	48	44	3.1	0.70	2.7	0.60	1.2	1.4
60-64	58	50	3.8	0.63	3.1	0.81	1.0	1.2
65-69	86	75	6.3	0.67	5.0	0.65	1.2	1.5
70-74	104	74	10.1	0.77	6.0	0.62	1.4	1.4
75-79	116	104	17.2	0.83	10.5	0.89	1.7	1.7
80-84	71	99	17.5	0.81	12.5	0.81	1.3	1.5
85+	50	77	18.0	0.74	10.4		1.1	1.0
All ages	665	613					1.4	1.4
J								
Mortality								
Raw			2.6	0.63	2.3	0.62		
WS			1.5	0.55	1.1			
ES			2.1		1.5			
BRD-S			2.8	0.65	1.9	0.60		
PYLL-70								
per 100,000			23.0		17.0			
ES			21.7		16.2			
AYLL-70			16.1		14.8			
, ,					-1.0			

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

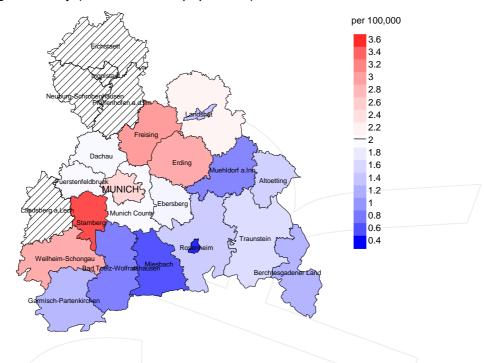


**Figure 18.** Distribution of age at death (bars) and age-specific mortality (all patients: solid line, patients with single primaries: dotted line). The age-specific incidence is additionally plotted for comparison (dashed line).

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



#### Average mortality (world standard population) 2003 - 2008: Males



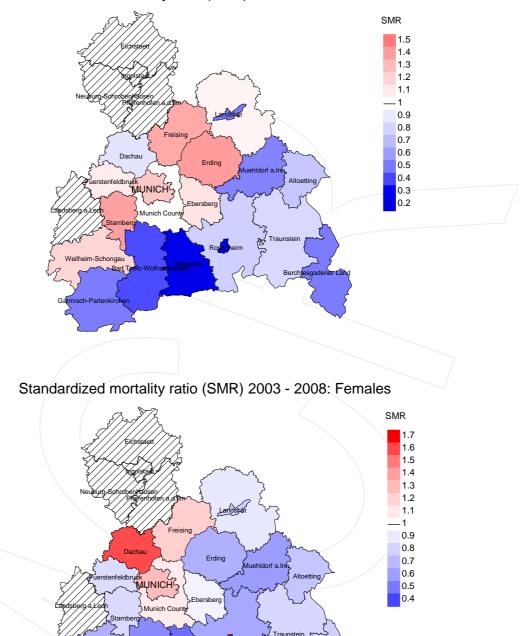
### Average mortality (world standard population) 2003 - 2008: Females



**Figure 19a.** Map of cancer mortality (world standard population) by county averaged for period 2003 to 2008. 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 2.0/100,000 WS N=453, females 1.4/100,000 WS N=403). Since cancer data are not available in some counties until 2007, the local mortality rates were not calculated, and the map tiles show as shaded.

The results should be interpreted with caution! E.g., in county Ebersberg with a population of 63,131 female residents (averaged) in the period from 2003 to 2008 a total of 11 women died from myeloid leukaemia. Therefore, the mean mortality rate for this cancer type in this area can be calculated at 1.8/100,000 (world standard population). Though, the value of this parameter may vary with an underlying probability of 99% between 0.7 and 3.8/100,000.

#### Standardized mortality ratio (SMR) 2003 - 2008: Males



**Figure 19b.** Map of standardized mortality ratio (SMR, incl. DCO cases) by county averaged for period 2003 to 2008. 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=453, females N=403). Since cancer data are not available in some counties until 2007, the local SMR values were not calculated, and the map tiles show as shaded.

The results should be interpreted with caution! E.g., in county Ebersberg with a population of 63,131 female residents (averaged) in the period from 2003 to 2008 a total of 11 women died from myeloid leukaemia. Therefore, the mean standardized mortality ratio (SMR) for this cancer type in this area can be calculated at 0.94. Though, the value of this parameter may vary with an underlying probability of 99% between 0.37 and 1.95, and is therefore not statistically striking.

#### **Statistical Notes**

In all tables and figures the respective reference values should be carefully considered. The incidence rates include diagnoses (with multiple primary), and death certificate only (DCO) cases. For mortality statistics patients, diagnoses and progressive course of disease are presented. In the calculations, all courses of disease are considered whereby progressions occurred and/or death certificate identified progressive cancers were ascertained. Additionally there are three groups of disease course to consider:

#### 1. All multiple primaries included

The mortality statistic describes the tumor-specific death, independent of any malignancy. The patient perspective, induced secondary malignancies, and the problem of multiple malignancies from the same primary tumor all have reasons for their inclusion.

2. First singular primary (no information about other prior or synchronous malignancy)

The mortality statistic describes the tumor-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**

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) FRG Federal Republic of Germany

GEKID Association of Population-based Cancer Registries in Germany

(Gesellschaft der epidemiologischen Krebsregister in Deutschland e.V.)

LCL Lower confidence limit

MI-index Ratio between mortality and incidence

MCR Munich Cancer Registry (Tumorregister München)

PYLL-70 Potential years of life lost prior to age 70 given a person dies before that age

SEER Surveillance, Epidemiology, and End Results (USA)

SIR Standardized incidence ratio
SMR Standardized mortality ratio
UCL Upper confidence limit
WS World standard population

#### **Recommended Citation**

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