Munich Cancer Registry

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ICD-10 C92.1: Chronic myel. leukaemia

Incidence and Mortality

Year of diagnosis	1998-2014
Patients	888
Diseases	888
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/bC921_E-ICD-10-C92.1-Chronic-myel.-leukaemia-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.

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 (ICD-10 2015) used for specifying cancer site

Code	Description
C92.1	Chronic myeloid leukaemia [CML], BCR/ABL-positive

INCIDENCE

Table 1

All patients 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	18	1	5.6	11.1	77.8	100.0	
1999	35	5	14.3	14.3	71.4	100.0	
2000	37	10	27.0	8.1	64.9	97.3	
2001	39	17	43.6	20.5	71.8	97.4	
2002	57	21	36.8	19.3	68.4	91.2	#
2003	72	25	34.7	15.3	68.1	97.2	
2004	59	20	33.9	20.3	67.8	96.6	
2005	50	18	36.0	26.0	66.0	96.0	
2006	55	22	40.0	36.4	69.1	90.9	
2007	61	19	31.1	34.4	54.1	80.3	#
2008	69	25	36.2	30.4	60.9	81.2	
2009	57	14	24.6	29.8	47.4	70.2	
2010	67	16	23.9	29.9	46.3	74.6	
2011	56	15	26.8	28.6	57.1	76.8	
2012	64	16	25.0	32.8	40.6	70.3	
2013	55	20	36.4	30.9	45.5	100.0	
2014	37	13	35.1	43.2	43.2	94.6	##
1998-2014	888	277	31.2	26.4	58.8	87.5	

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
by year of diagnosis and gender
(incl. DCO)

Year of diagnosis	All n	Males n	Females n	Prop. males %
1998	18	8	10	44.4
1999	35	19	16	54.3
2000	37	19	18	51.4
2001	39	18	21	46.2
2002	57	25	32	43.9
2003	72	34	38	47.2
2004	59	35	24	59.3
2005	50	21	29	42.0
2006	55	31	24	56.4
2007	61	34	27	55.7
2008	69	40	29	58.0
2009	57	30	27	52.6
2010	67	33	34	49.3
2011	56	35	21	62.5
2012	64	39	25	60.9
2013	55	34	21	61.8
2014	37	22	15	59.5
1998-2014	888	477	411	53.7

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	8	10	0.7	0.9	0.5	0.5	0.7	0.6	0.8	0.7
1999	19	16	1.7	1.3	1.2	0.7	1.5	1.0	1.7	1.2
2000	19	18	1.7	1.5	1.2	0.7	1.5	1.0	1.8	1.2
2001	18	21	1.6	1.7	1.2	0.8	1.4	1.1	1.6	1.5
2002	25	32	1.3	1.6	0.8	0.8	1.1	1.1	1.5	1.4
2003	34	38	1.8	1.9	1.1	0.9	1.6	1.3	1.9	1.6
2004	35	24	1.9	1.2	1.1	0.6	1.5	0.9	1.9	1.1
2005	21	29	1.1	1.5	0.6	0.7	0.9	1.0	1.1	1.2
2006	31	24	1.6	1.2	0.9	0.5	1.3	0.8	1.7	1.0
2007	34	27	1.5	1.2	0.9	0.5	1.2	0.7	1.5	0.9
2008	40	29	1.8	1.2	0.9	0.5	1.3	0.7	1.8	1.0
2009	30	27	1.3	1.2	0.8	0.6	1.1	0.8	1.3	0.9
2010	33	34	1.5	1.5	0.9	0.7	1.2	0.9	1.5	1.1
2011	35	21	1.5	0.9	0.9	0.4	1.2	0.6	1.5	0.7
2012	39	25	1.7	1.1	1.0	0.5	1.3	0.7	1.7	0.8
2013	34	21	1.5	0.9	0.8	0.4	1.1	0.6	1.4	0.7
2014	22	15	1.0	0.6	0.4	0.2	0.7	0.3	0.9	0.5
1998-2014	477	411	1.5	1.2	0.9	0.6	1.2	0.8	1.5	1.0

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	18	58.8	22.7	27.0	87.4	27.0	36.6	64.7	81.5	86.5
1999	35	61.5	18.0	1.5	88.5	35.3	54.9	68.2	72.5	79.7
2000	37	63.5	19.9	16.5	97.6	34.7	49.8	66.7	78.1	88.0
2001	39	61.5	21.4	9.8	96.4	26.8	43.5	64.0	79.1	85.9
2002	57	65.5	16.3	27.4	96.1	38.8	55.4	69.4	76.1	83.8
2003	72	64.3	18.7	21.0	98.9	38.1	49.8	68.1	80.4	85.1
2004	59	65.2	15.5	19.4	93.3	44.6	55.2	66.1	76.2	84.7
2005	50	67.0	16.3	25.2	92.9	42.6	56.7	69.9	78.9	84.4
2006	55	68.2	16.5	28.0	92.5	40.9	59.5	72.3	79.4	86.5
2007	61	65.1	19.0	18.0	94.2	37.6	47.2	69.7	81.9	86.0
2008	69	69.9	17.2	11.3	98.1	41.7	62.5	74.3	81.5	87.2
2009	57	65.4	16.2	28.3	100	43.0	54.2	65.8	76.3	86.3
2010	67	66.8	17.8	15.7	91.4	47.5	53.9	70.9	79.2	87.8
2011	56	65.8	16.2	16.6	91.4	43.6	54.7	68.7	79.0	84.1
2012	64	66.0	20.9	5.4	98.7	35.7	56.4	72.4	80.8	88.4
2013	55	66.6	17.8	21.7	92.6	39.2	52.5	71.8	81.6	86.1
2014	37	71.3	17.4	33.0	92.3	39.7	68.1	76.5	84.5	86.9
1998-2014	888	65.9	17.9	1.5	100	39.6	54.2	69.8	79.7	85.9

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	8	57.9	20.7	32.4	86.5	32.4	38.6	58.9	74.4	86.5
1999	19	56.3	19.9	1.5	80.3	30.7	43.4	59.9	69.8	78.3
2000	19	59.6	19.0	16.5	97.6	34.7	48.2	60.5	72.4	79.6
2001	18	51.6	22.8	9.8	96.4	23.3	37.7	51.5	64.0	81.6
2002	25	61.5	16.2	32.7	83.8	38.0	49.7	62.4	75.5	78.7
2003	34	59.7	19.3	21.0	91.1	35.2	41.9	61.0	77.3	83.7
2004	35	63.7	16.1	19.4	90.1	41.8	51.0	65.7	75.5	84.6
2005	21	64.1	17.3	30.9	91.0	42.5	46.4	69.5	77.7	81.5
2006	31	68.8	14.9	37.3	92.5	48.2	59.5	70.7	77.2	86.5
2007	34	62.2	19.7	18.0	91.8	33.9	44.6	67.3	77.4	84.0
2008	40	68.4	17.2	11.3	98.1	44.7	61.5	72.6	80.5	84.0
2009	30	64.0	16.8	28.3	92.2	40.6	53.1	65.5	76.3	85.7
2010	33	65.3	19.0	15.7	89.2	38.5	59.9	70.9	77.8	80.0
2011	35	63.8	17.0	16.6	91.4	42.8	53.3	67.7	75.2	83.5
2012	39	64.4	21.4	10.4	94.0	30.4	51.3	72.2	80.8	84.8
2013	34	65.8	17.7	21.7	92.6	39.2	50.3	71.8	75.4	84.5
2014	22	70.3	16.8	33.4	90.2	39.7	68.1	75.1	81.8	85.9
1998-2014	477	63.6	18.4	1.5	98.1	37.8	50.9	68.0	77.4	84.1

Table 3b

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

Year of diagnosis	Cases n	Mean	Std. dev.	Min.	Max.	Median 10%	25%	50%	75%	90%
1998	10	59.5	25.3	27.0	87.4	27.0	33.6	65.8	81.7	86.5
1999	16	67.6	13.8	35.3	88.5	46.3	58.6	70.8	77.6	79.8
2000	18	67.6	20.5	27.4	93.9	32.2	54.5	73.4	86.2	89.0
2001	21	69.9	16.4	26.8	88.7	53.6	62.4	73.9	82.1	85.9
2002	32	68.7	15.9	27.4	96.1	53.0	58.0	70.4	80.6	88.4
2003	38	68.4	17.3	25.2	98.9	42.2	54.8	73.4	82.3	87.8
2004	24	67.4	14.6	28.0	93.3	49.3	57.4	68.9	78.3	84.7
2005	29	69.0	15.4	25.2	92.9	46.6	62.9	70.3	79.5	85.6
2006	24	67.6	18.6	28.0	92.2	33.3	60.9	73.5	79.8	84.1
2007	27	68.9	17.6	35.1	94.2	43.6	53.2	69.8	84.6	86.4
2008	29	71.9	17.3	26.6	94.9	41.4	62.6	74.9	84.5	88.6
2009	27	67.0	15.6	38.7	100	46.3	56.5	65.8	79.8	89.0
2010	34	68.3	16.6	29.0	91.4	47.6	53.9	71.8	83.6	89.3
2011	21	69.2	14.4	41.3	87.1	50.5	56.2	73.3	81.4	84.1
2012	25	68.5	20.4	5.4	98.7	44.8	57.0	73.1	80.9	90.1
2013	21	68.1	18.3	25.3	92.4	50.7	52.8	71.6	83.3	88.0
2014	15	72.7	18.6	33.0	92.3	48.4	48.9	82.0	86.7	88.4
1998-2014	411	68.5	17.0	5.4	100	44.8	55.6	72.5	82.3	87.7

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	0.2	0.2			0.0	1	0.5	0.5
10-14	2	0.4	0.6	2	0.7	0.7			0.5
15-19	6	1.3	1.9	6	2.2	3.0			0.5
20-24	3	0.6	2.6	3	1.1	4.1			0.5
25-29	9	1.9	4.5	6	2.2	6.4	3	1.5	2.0
30-34	5	1.1	5.6	4	1.5	7.9	1	0.5	2.5
35-39	13	2.8	8.4	8	3.0	10.9	5	2.5	5.0
40-44	22	4.7	13.1	15	5.6	16.5	7	3.5	8.5
45-49	27	5.8	18.9	12	4.5	21.0	15	7.5	16.1
50-54	31	6.7	25.5	13	4.9	25.8	18	9.0	25.1
55-59	23	4.9	30.5	10	3.7	29.6	13	6.5	31.7
60-64	31	6.7	37.1	21	7.9	37.5	10	5.0	36.7
65-69	49	10.5	47.6	33	12.4	49.8	16	8.0	44.7
70-74	65	13.9	61.6	41	15.4	65.2	24	12.1	56.8
75-79	49	10.5	72.1	32	12.0	77.2	17	8.5	65.3
80-84	68	14.6	86.7	37	13.9	91.0	31	15.6	80.9
85+	62	13.3	100.0	24	9.0	100.0	38	19.1	100.0
All ages	466	100.0		267	100.0		199	100.0	

Included in the statistics are 35.2% multiple primaries in males and 42.7% 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=83 %	Females DCO rate n=55 %	Males Prop.all cancers n=91183 %	Females Prop.all cancers n=89596 %
0- 4			0.0	0.0				
5- 9		1	0.0	0.1				1.3
10-14	2		0.2	0.0			2.0	
15-19	6		0.6	0.0			2.8	
20-24	3		0.3	0.0			0.8	
25-29	6	3	0.5	0.2			1.1	0.5
30-34	4	1	0.3	0.1			0.5	0.1
35-39	8	5	0.6	0.4			0.7	0.3
40-44	15	7	0.9	0.5			0.8	0.2
45-49	12	15	0.8	1.0	8.3		0.4	0.3
50-54	13	18	1.0	1.4	7.7		0.3	0.3
55-59	10	13	0.9	1.2	30.0	7.7	0.1	0.2
60-64	21	10	2.1	0.9	14.3		0.2	0.1
65-69	33	16	3.4	1.5	21.2	18.8	0.2	0.1
70-74	41	24	4.5	2.3	34.1	20.8	0.2	0.2
75-79	32	17	5.8	2.4	37.5	41.2	0.3	0.2
80-84	37	31	10.6	5.5	64.9	35.5	0.4	0.4
85+	24	38	10.4	6.6	75.0	73.7	0.4	0.4
All ages	267	199			31.1	27.6	0.3	0.2
Incidence								
Raw			1.5	1.1				
WS			0.8	0.5				
ES			1.1	0.7				
BRD-S			1.4	0.8				

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).

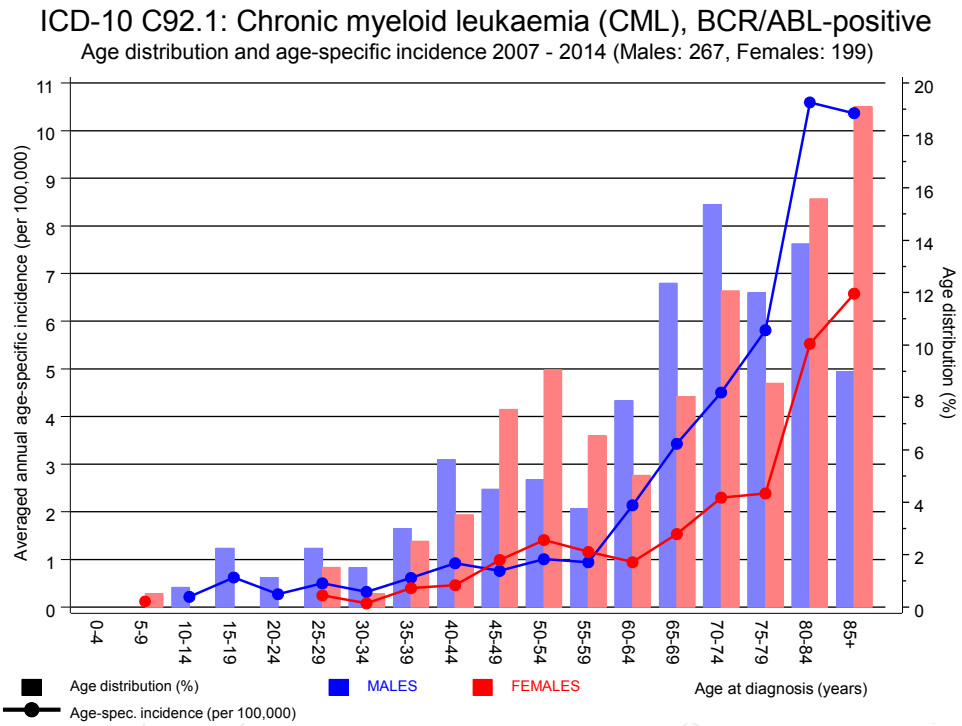


Figure 6. Age distribution and age-specific incidence

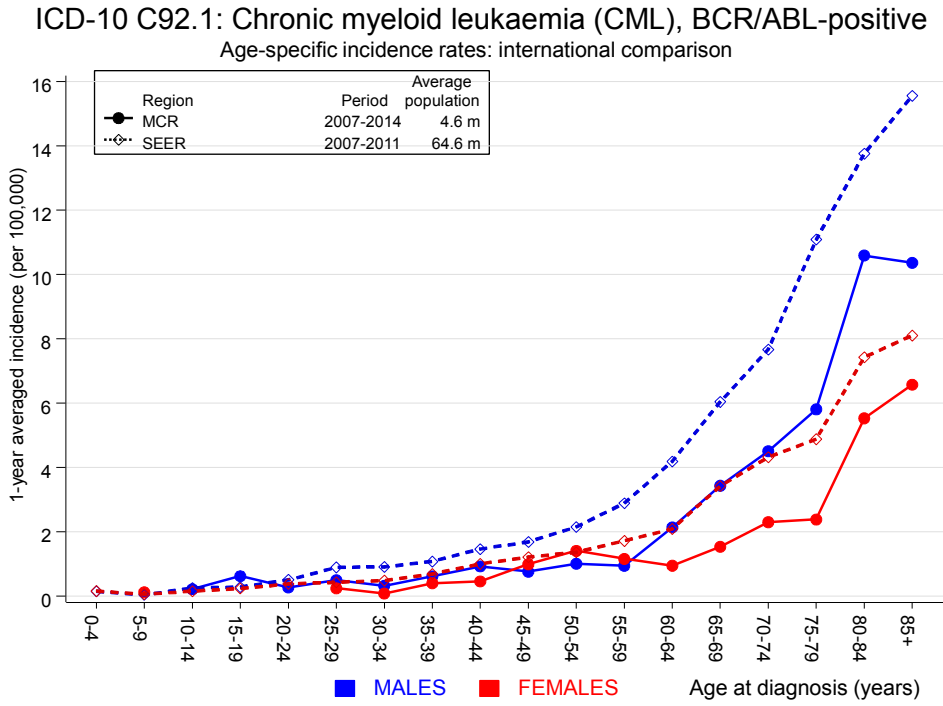


Figure 6a. Age-specific incidence in MCR registry areas compared to SEER (Surveillance, Epidemiology, and End Results, USA).

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.

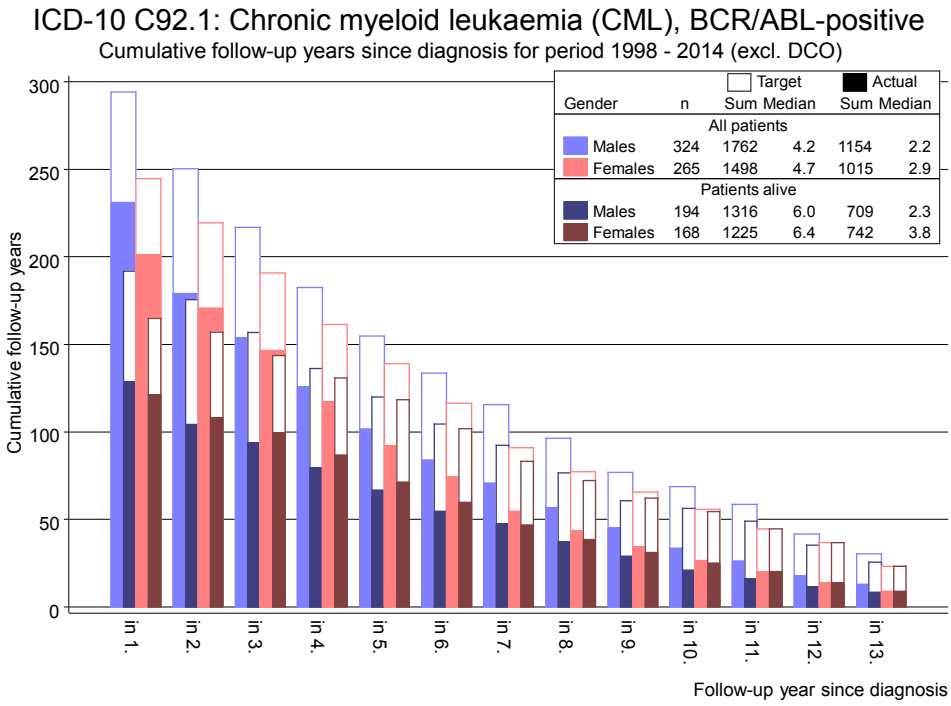


Figure 7. Cumulative follow-up years depending on time since diagnosis

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 %
C18	Colon	5	1.3	3.7	1.2	8.7	#	30.4	
C25	Pancreas	3	0.5	6.0	1.2	17.5	#	20.8	
C33–C34	Lung	3	1.7	1.8	0.4	5.2		10.9	
C43	Malign. melanoma	3	0.6	4.6	1.0	13.6		19.6	
C61	Prostate	9	4.2	2.2	1.0	4.1		40.3	
C64	Kidney	2	0.5	3.9	0.5	14.0		12.3	
C67	Bladder	2	0.6	3.4	0.4	12.1		11.7	
C82–C85	NHL	3	0.6	5.2	1.1	15.3	#	20.2	
C91–C96	Leukaemia	3	0.2	13.0	2.7	37.9	#	23.0	66.7
Other primaries		9	2.8	3.3	1.5	6.2	#	51.9	
Not observed		0	1.4	0.0	0.0	2.5		-12.0	
All mult. primaries		42	14.5	2.9	2.1	3.9	#	229.0	4.8

Patients	372
Median age at second malignancy (years)	70.6
Person-years	1203
Mean observation time (years)	3.2
Median observation time (years)	1.6

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

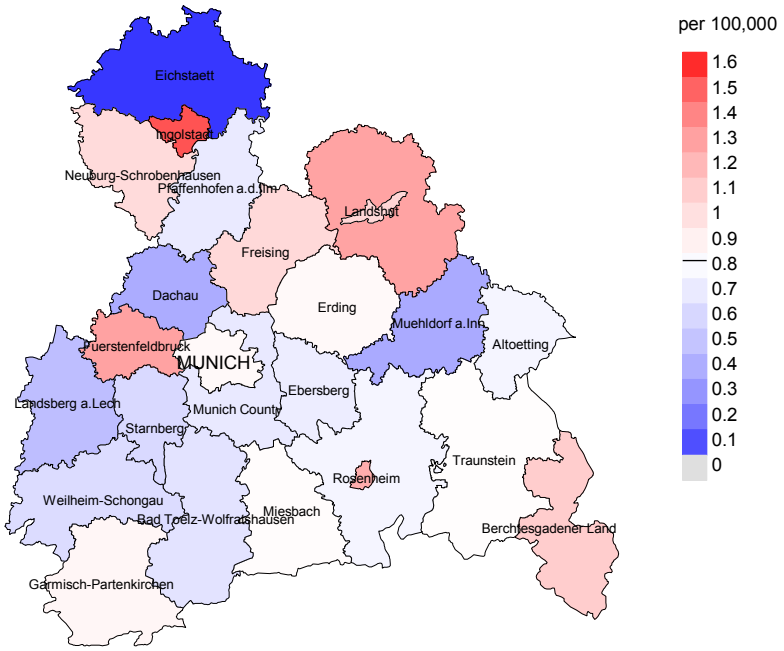
Diagnosis		Observed n	Expected n	SIR	LCL 95%	UCL 95%		EAR	DCO %
C18	Colon	2	0.9	2.2	0.3	8.0		10.4	
C33–C34	Lung	2	0.7	2.9	0.3	10.3		12.3	
C50	Breast	8	3.0	2.7	1.1	5.2	#	47.0	
C53	Cervix uteri	2	0.2	12.9	1.6	46.5	#	17.4	
C54	Corpus uteri	3	0.5	5.6	1.1	16.3	#	23.2	
C82–C85	NHL	2	0.4	5.6	0.7	20.2		15.5	50.0
C91–C96	Leukaemia	3	0.2	19.8	4.1	57.9	#	26.9	33.3
Other primaries		4	0.8	4.7	1.3	12.2	#	29.8	25.0
Not observed		0	3.0	0.0	0.0	1.2		-28.6	
All mult. primaries		26	9.7	2.7	1.8	3.9	#	153.8	11.5

Patients	304
Median age at second malignancy (years)	68.1
Person-years	1060
Mean observation time (years)	3.5
Median observation time (years)	2.6

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

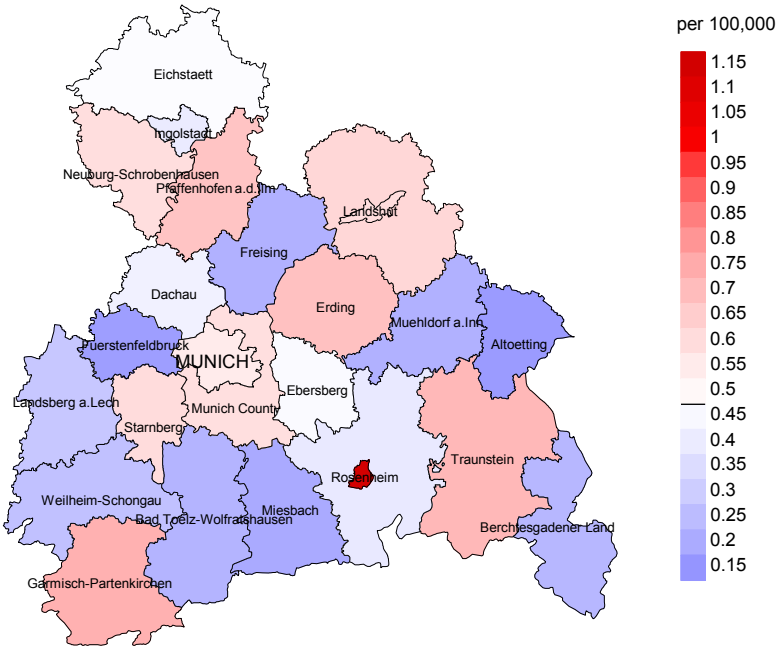
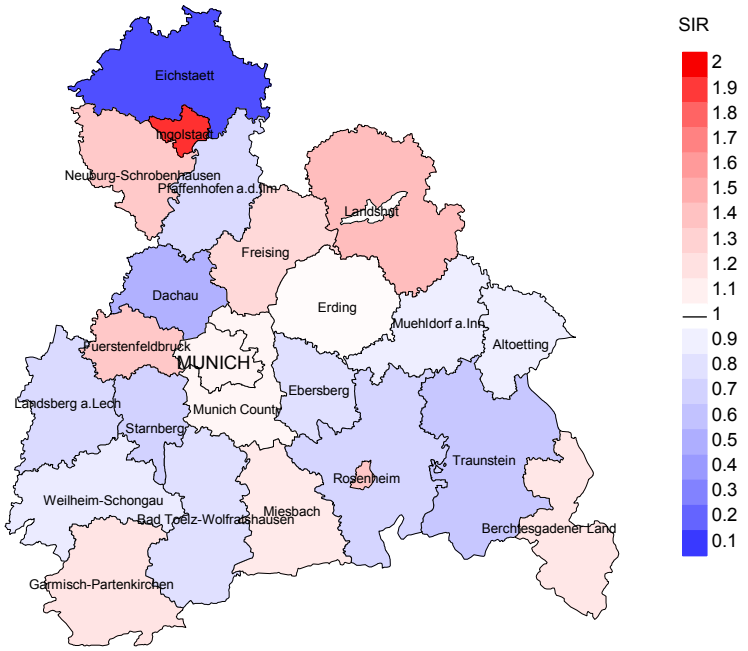


Figure 9a. Map of cancer incidence (world standard population, incl. DCO cases) by county averaged for period 2007 to 2014. According to their individual incidence rates, the counties are displayed in different red and blue color temperatures where the fine white color indicates the population mean (males 0.8/100,000 WS N=267, females 0.5/100,000 WS N=199).

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 5 women were identified with newly diagnosed chronic myel. leukaemia. Therefore, the mean incidence rate for this cancer type in this area can be calculated at 0.5/100,000 (world standard population). Though, the value of this parameter may vary with an underlying probability of 99% between 0.1 and 1.5/100,000.

Standardized incidence ratio (SIR) 2007 - 2014: Males



Standardized incidence ratio (SIR) 2007 - 2014: Females

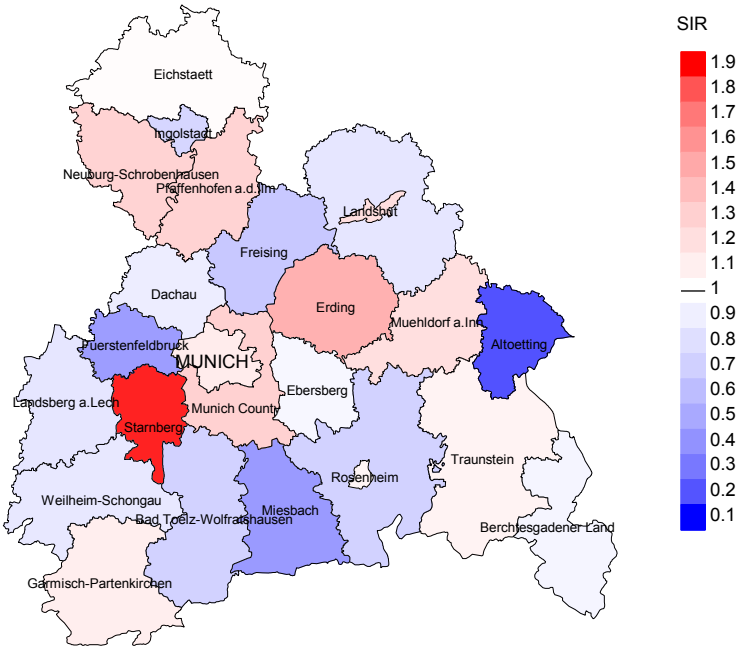


Figure 9b. Map of standardized incidence ratio (SIR, incl. DCO cases) by county averaged for period 2007 to 2014. According to their individual SIR values, the counties are displayed in different red and blue color temperatures where the fine white color indicates the population overall of 1.0 (males N=267, females N=199).

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 5 women were identified with newly diagnosed chronic myel. leukaemia. Therefore, the mean standardized incidence ratio (SIR) for this cancer type in this area can be calculated at 0.95. Though, the value of this parameter may vary with an underlying probability of 99% between 0.20 and 2.68, 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	18	100.0	5.6	14	77.8	92.9
1999	35	100.0	14.3	25	71.4	96.0
2000	37	97.3	27.0	24	64.9	100.0
2001	39	97.4	43.6	28	71.8	96.4
2002	57	91.2	36.8	39	68.4	100.0
2003	72	97.2	34.7	49	68.1	100.0
2004	59	96.6	33.9	40	67.8	97.5
2005	50	96.0	36.0	33	66.0	100.0
2006	55	90.9	40.0	38	69.1	100.0
2007	61	80.3	31.1	33	54.1	97.0
2008	69	81.2	36.2	42	60.9	100.0
2009	57	70.2	24.6	27	47.4	100.0
2010	67	74.6	23.9	31	46.3	100.0
2011	56	76.8	26.8	32	57.1	96.9
2012	64	70.3	25.0	26	40.6	100.0
2013	55	100.0	36.4	25	45.5	100.0
2014	37	94.6	35.1	16	43.2	100.0
1998-2014	888	87.5	31.2	522	58.8	98.9

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	18	14	100.0	2	11.1
1999	35	14	92.9	1	2.9
2000	37	27	92.6	10	27.0
2001	39	31	96.8	13	33.3
2002	57	37	100.0	24	42.1
2003	72	30	100.0	25	34.7
2004	59	37	97.3	20	33.9
2005	50	36	100.0	20	40.0
2006	55	35	100.0	28	50.9
2007	61	27	100.0	21	34.4
2008	69	28	96.4	27	39.1
2009	57	26	100.0	18	31.6
2010	67	22	100.0	17	25.4
2011	56	37	100.0	20	35.7
2012	64	32	96.9	18	28.1
2013	55	45	97.8	22	40.0
2014	37	41	100.0	16	43.2
1998–2014	888	519	98.5	302	34.0

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	14	57.1	42.9	85.7
1999	14	57.1	42.9	92.3
2000	27	77.8	22.2	100.0
2001	31	71.0	29.0	93.3
2002	37	83.8	16.2	97.3
2003	30	76.7	23.3	100.0
2004	37	81.1	18.9	94.4
2005	36	88.9	11.1	100.0
2006	35	94.3	5.7	100.0
2007	27	85.2	14.8	100.0
2008	28	57.1	42.9	88.9
2009	26	69.2	30.8	96.2
2010	22	77.3	22.7	90.9
2011	37	78.4	21.6	91.9
2012	32	62.5	37.5	93.5
2013	45	64.4	35.6	88.6
2014	41	70.7	29.3	87.8
1998-2014	519	75.0	25.0	94.3

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	8	61.3	62.9	57.1	66.4
1999	11	69.4	52.7	80.5	62.8
2000	15	74.7	70.2	76.7	77.7
2001	7	62.5	61.4	64.0	62.5
2002	13	65.2	66.4	53.2	66.4
2003	14	74.5	72.4	76.5	74.5
2004	20	75.4	75.8	68.6	75.4
2005	22	72.9	72.3	74.7	72.9
2006	22	75.1	75.0	75.9	75.1
2007	11	72.8	70.9	85.5	72.8
2008	15	72.0	74.8	59.0	72.5
2009	15	77.2	78.3	71.2	78.3
2010	16	78.9	78.4	80.0	78.9
2011	22	76.1	75.2	83.8	76.1
2012	23	75.8	73.4	81.4	75.4
2013	27	75.0	76.6	73.7	75.8
2014	25	74.1	73.6	76.4	74.1
1998-2014	286	74.2	73.5	75.3	74.2

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	6	43.3	43.3	52.3	46.9
1999	3	81.1	79.1	81.2	79.1
2000	12	83.4	78.2	86.9	83.4
2001	24	80.3	77.0	87.3	79.3
2002	24	73.4	72.3	82.8	73.4
2003	16	80.6	77.7	83.3	80.6
2004	17	74.6	74.8	74.6	74.2
2005	14	78.7	73.6	87.5	78.7
2006	13	73.4	74.7	67.0	73.4
2007	16	80.4	77.5	86.4	80.4
2008	13	81.3	72.8	85.7	79.9
2009	11	84.9	86.3	67.7	84.9
2010	6	85.6	85.6		85.6
2011	15	79.5	79.2	87.0	80.0
2012	9	77.6	79.5	77.4	78.5
2013	18	83.9	77.6	88.6	82.5
2014	16	79.1	76.5	81.1	78.8
1998-2014	233	79.3	76.6	84.0	78.8

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	4	0.4	0.50	0.2	0.43	0.3	0.45	0.4	0.48
1999	6	0.5	0.32	0.4	0.33	0.5	0.32	0.5	0.31
2000	13	1.1	0.68	0.7	0.60	1.0	0.68	1.4	0.78
2001	6	0.5	0.33	0.3	0.24	0.4	0.29	0.6	0.36
2002	10	0.5	0.40	0.3	0.41	0.4	0.39	0.6	0.36
2003	13	0.7	0.38	0.4	0.35	0.6	0.38	0.8	0.40
2004	16	0.9	0.46	0.4	0.39	0.7	0.46	1.0	0.51
2005	20	1.1	0.95	0.5	0.89	0.8	0.92	1.1	0.98
2006	21	1.1	0.68	0.5	0.64	0.9	0.66	1.2	0.72
2007	10	0.5	0.29	0.2	0.24	0.3	0.28	0.4	0.28
2008	10	0.4	0.25	0.2	0.23	0.3	0.26	0.5	0.25
2009	10	0.4	0.33	0.2	0.22	0.3	0.28	0.5	0.38
2010	11	0.5	0.33	0.2	0.23	0.3	0.29	0.5	0.33
2011	18	0.8	0.51	0.3	0.38	0.6	0.46	0.8	0.53
2012	15	0.7	0.38	0.3	0.28	0.4	0.33	0.6	0.38
2013	17	0.7	0.50	0.3	0.38	0.5	0.47	0.7	0.52
2014	19	0.8	0.86	0.4	0.85	0.6	0.86	0.8	0.85
1998-2014	219	0.7	0.46	0.3	0.39	0.5	0.44	0.7	0.47

Table 12b

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

Year of death	Deaths n	Mort. raw	MI-Index raw	Mort. WS	MI-Index WS	Mort. ES	MI-Index ES	Mort. BRD-S	MI-Index BRD-S
1998	4	0.3	0.40	0.2	0.50	0.3	0.50	0.3	0.43
1999	2	0.2	0.13	0.0	0.06	0.1	0.08	0.2	0.13
2000	8	0.7	0.44	0.2	0.29	0.4	0.36	0.5	0.44
2001	16	1.3	0.76	0.5	0.64	0.8	0.70	1.1	0.78
2002	21	1.1	0.66	0.5	0.58	0.7	0.60	0.9	0.66
2003	10	0.5	0.26	0.2	0.18	0.3	0.21	0.4	0.26
2004	14	0.7	0.58	0.3	0.47	0.5	0.53	0.6	0.59
2005	12	0.6	0.41	0.2	0.36	0.4	0.38	0.5	0.38
2006	12	0.6	0.50	0.2	0.44	0.4	0.49	0.5	0.50
2007	13	0.6	0.48	0.2	0.40	0.3	0.43	0.4	0.46
2008	6	0.3	0.21	0.1	0.22	0.2	0.23	0.2	0.24
2009	8	0.3	0.30	0.1	0.12	0.1	0.16	0.2	0.21
2010	6	0.3	0.18	0.1	0.10	0.1	0.12	0.2	0.14
2011	11	0.5	0.52	0.2	0.43	0.3	0.46	0.4	0.53
2012	5	0.2	0.20	0.1	0.12	0.1	0.16	0.2	0.21
2013	12	0.5	0.57	0.2	0.39	0.3	0.46	0.3	0.48
2014	10	0.4	0.67	0.2	0.68	0.2	0.72	0.3	0.67
1998-2014	170	0.5	0.41	0.2	0.33	0.3	0.36	0.4	0.40

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.%
35-39	1	0.6	0.6	1	0.9	0.9			0.0
40-44	3	1.7	2.2	3	2.7	3.6			0.0
45-49	2	1.1	3.3			3.6	2	2.8	2.8
50-54	6	3.3	6.6	3	2.7	6.4	3	4.2	7.0
55-59	14	7.7	14.4	9	8.2	14.5	5	7.0	14.1
60-64	6	3.3	17.7	4	3.6	18.2	2	2.8	16.9
65-69	20	11.0	28.7	14	12.7	30.9	6	8.5	25.4
70-74	29	16.0	44.8	20	18.2	49.1	9	12.7	38.0
75-79	36	19.9	64.6	24	21.8	70.9	12	16.9	54.9
80-84	31	17.1	81.8	19	17.3	88.2	12	16.9	71.8
85+	33	18.2	100.0	13	11.8	100.0	20	28.2	100.0
All ages	181	100.0		110	100.0		71	100.0	

Included in the statistics are 35.2% multiple primaries in males and 42.7% 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.	Males MI-index	Females Age-spec. mortal.	Females MI-index	Males Prop.all cancers %	Females Prop.all cancers %
0- 4			0.0		0.0			
5- 9			0.0		0.0			
10-14			0.0		0.0			
15-19			0.0		0.0			
20-24			0.0		0.0			
25-29			0.0		0.0			
30-34			0.0		0.0			
35-39	1		0.1	0.13	0.0		0.6	
40-44	3		0.2	0.20	0.0		0.7	
45-49		2	0.0		0.1	0.13		0.2
50-54	3	3	0.2	0.23	0.2	0.17	0.2	0.2
55-59	9	5	0.8	0.90	0.4	0.38	0.3	0.2
60-64	4	2	0.4	0.19	0.2	0.20	0.1	0.1
65-69	14	6	1.5	0.42	0.6	0.38	0.2	0.1
70-74	20	9	2.2	0.49	0.9	0.38	0.2	0.1
75-79	24	12	4.4	0.75	1.7	0.71	0.3	0.2
80-84	19	12	5.4	0.51	2.1	0.39	0.3	0.2
85+	13	20	5.6	0.54	3.5	0.53	0.2	0.2
All ages	110	71					0.2	0.2
Mortality								
Raw			0.6	0.41	0.4	0.36		
WS			0.3	0.32	0.1	0.26		
ES			0.4	0.38	0.2	0.30		
BRD-S			0.6	0.42	0.3	0.33		
PYLL-70								
per 100,000			2.2		1.2			
ES			1.9		1.0			
AYLL-70			10.1		10.6			

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 ←%
C03-C06	Oral cavity	1	1.3					1	100.0
C09-C10	Oropharynx	2	2.6	1	50.0			1	50.0
C15	Oesophagus	2	2.6					2	100.0
C16	Stomach	4	5.2	3	75.0			1	25.0
C18	Colon	4	5.2	1	25.0			3	75.0
C19-C20	Rectum	3	3.9	2	66.7	1	33.3		
C22	Liver	4	5.2	2	50.0			2	50.0
C25	Pancreas	4	5.2	1	25.0			3	75.0
C33-C34	Lung	7	9.1	3	42.9	1	14.3	3	42.9
C43	Malign. melanoma	1	1.3					1	100.0
C44	Skin others	4	5.2	1	25.0			3	75.0
C61	Prostate	13	16.9	12	92.3			1	7.7
C62	Testis	1	1.3	1	100.0				
C64	Kidney	3	3.9	3	100.0				
C65	Renal pelvis	1	1.3	1	100.0				
C67	Bladder	7	9.1	7	100.0				
C70-C72	CNS cancer	1	1.3					1	100.0
C76-C79	CUP	2	2.6	1	50.0	1	50.0		
C82-C85	NHL	3	3.9	1	33.3			2	66.7
C90	Mult. myeloma	1	1.3	1	100.0				
C91-C96	Leukaemia	9	11.7			2	22.2	7	77.8
All mult. primaries		77	100.0	41	53.2	5	6.5	31	40.3

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 ←%
C09-C10 Oropharynx	1	1.8					1	100.0
C12-C13 Hypopharynx	1	1.8	1	100.0				
C19-C20 Rectum	3	5.3	2	66.7	1	33.3		
C23-C24 Bile	2	3.5	2	100.0				
C25 Pancreas	2	3.5			2	100.0		
C33-C34 Lung	2	3.5	1	50.0	1	50.0		
C43 Malign. melanoma	2	3.5	2	100.0				
C44 Skin others	3	5.3	1	33.3			2	66.7
C50 Breast	12	21.1	8	66.7	1	8.3	3	25.0
C51 Vulva	2	3.5	1	50.0			1	50.0
C52 Vagina	2	3.5	1	50.0			1	50.0
C53 Cervix uteri	3	5.3	2	66.7	1	33.3		
C54 Corpus uteri	5	8.8	4	80.0			1	20.0
C56 Ovary	1	1.8					1	100.0
C61 Prostate	1	1.8	1	100.0				
C64 Kidney	1	1.8	1	100.0				
C67 Bladder	1	1.8	1	100.0				
C70-C72 CNS cancer	3	5.3	2	66.7			1	33.3
C74-C80 Cancer others	1	1.8					1	100.0
C82-C85 NHL	1	1.8					1	100.0
C91-C96 Leukaemia	7	12.3			1	14.3	6	85.7
C96 Systemic	1	1.8					1	100.0
All mult. primaries	57	100.0	30	52.6	7	12.3	20	35.1

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.	Males MI-index	Females Age-spec. mortal.	Females MI-index	Males Prop.all cancers %	Females Prop.all cancers %
0- 4			0.0		0.0			
5- 9			0.0		0.0			
10-14			0.0		0.0			
15-19			0.0		0.0			
20-24			0.0		0.0			
25-29			0.0		0.0			
30-34			0.0		0.0			
35-39			0.0		0.0			
40-44	3		0.2	0.23	0.0		0.7	
45-49		2	0.0		0.1	0.15		0.2
50-54	2	2	0.2	0.20	0.2	0.13	0.1	0.1
55-59	7	5	0.7	0.88	0.4	0.63	0.3	0.2
60-64	4	1	0.4	0.27	0.1	0.14	0.1	0.0
65-69	11	4	1.1	0.48	0.4	0.31	0.2	0.1
70-74	16	6	1.8	0.62	0.6	0.35	0.2	0.1
75-79	17	10	3.1	0.71	1.4	0.83	0.3	0.2
80-84	13	5	3.7	0.59	0.9	0.33	0.2	0.1
85+	10	17	4.3	0.59	2.9	0.68	0.2	0.3
All ages	83	52					0.2	0.2
Mortality								
Raw			0.5	0.42	0.3	0.37		
WS			0.2	0.31	0.1	0.25		
ES			0.3	0.38	0.2	0.29		
BRD-S			0.5	0.42	0.2	0.33		
PYLL-70								
per 100,000			1.6		1.0			
ES			1.4		0.9			
AYLL-70			9.7		11.4			

* 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.	Males MI-index	Females Age-spec. mortal.	Females MI-index	Males Prop.all cancers %	Females Prop.all cancers %
0- 4			0.0		0.0			
5- 9			0.0		0.0			
10-14			0.0		0.0			
15-19			0.0		0.0			
20-24			0.0		0.0			
25-29			0.0		0.0			
30-34			0.0		0.0			
35-39			0.0		0.0			
40-44	1		0.1	0.08	0.0		0.3	
45-49		2	0.0		0.1	0.18		0.2
50-54	2	1	0.2	0.20	0.1	0.07	0.1	0.1
55-59	6	4	0.6	0.86	0.4	0.67	0.3	0.2
60-64	3	1	0.3	0.25	0.1	0.14	0.1	0.0
65-69	10	3	1.0	0.53	0.3	0.23	0.2	0.1
70-74	12	5	1.3	0.50	0.5	0.29	0.2	0.1
75-79	14	8	2.5	0.61	1.1	0.80	0.3	0.2
80-84	11	4	3.1	0.50	0.7	0.36	0.3	0.1
85+	9	16	3.9	0.53	2.8	0.64	0.3	0.3
All ages	68	44					0.2	0.2
Mortality								
Raw			0.4	0.37	0.2	0.34		
WS			0.2	0.27	0.1	0.22		
ES			0.3	0.33	0.1	0.26		
BRD-S			0.4	0.37	0.2	0.30		
PYLL-70								
per 100,000			1.2		0.8			
ES			1.0		0.7			
AYLL-70			8.4		11.6			

* See corresponding tables with multiple primaries.

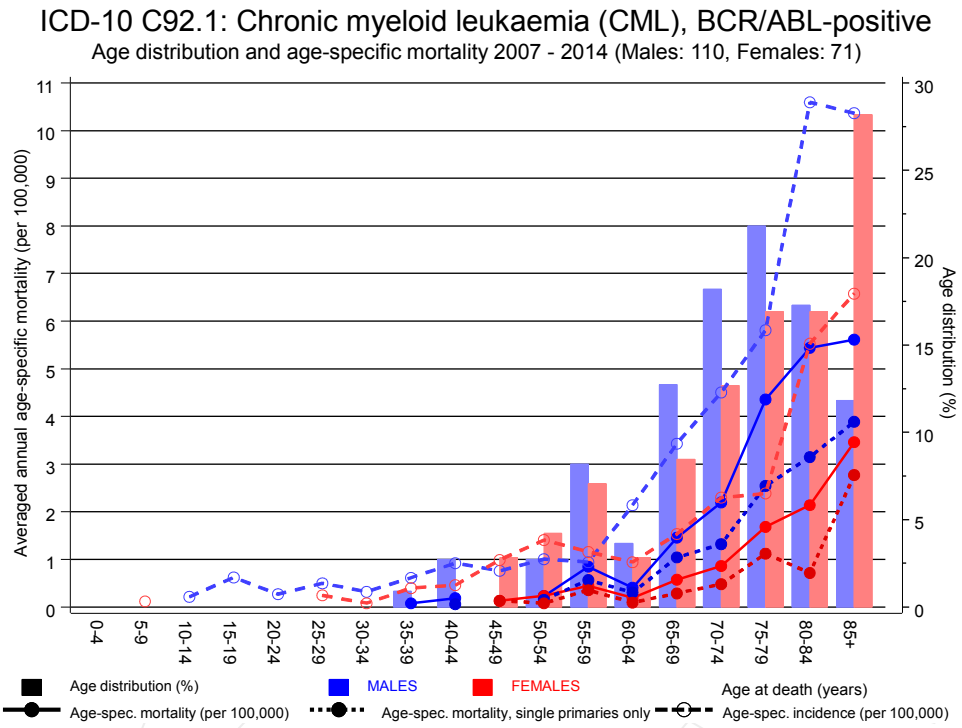
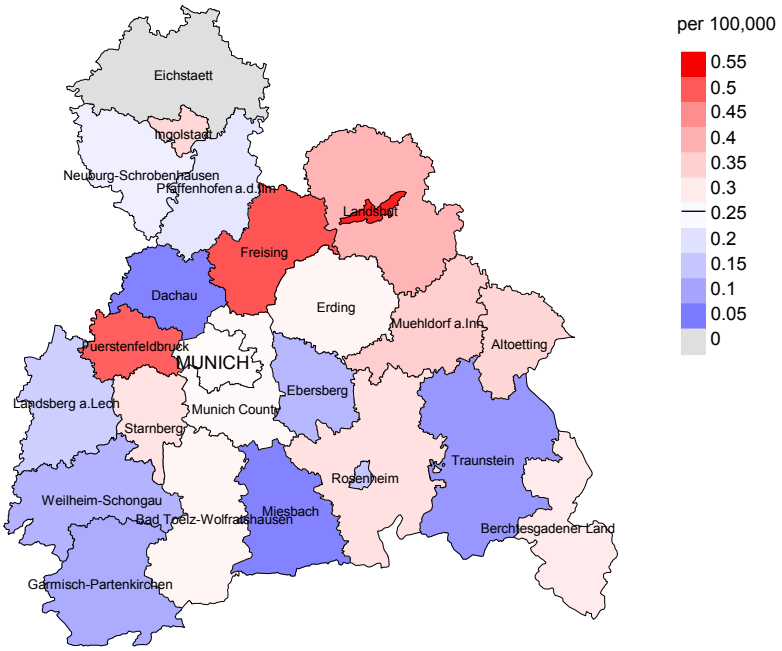


Figure 18. Distribution of age at death (bars) and age-specific mortality (all patients: solid line, patients with single primaries: dotted line). The age-specific incidence is additionally plotted for comparison (dashed line).

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

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



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

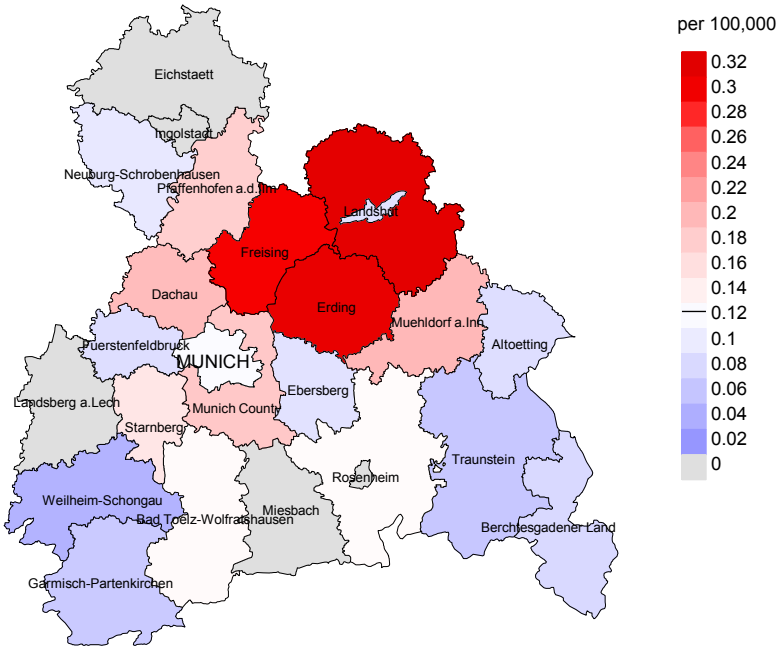
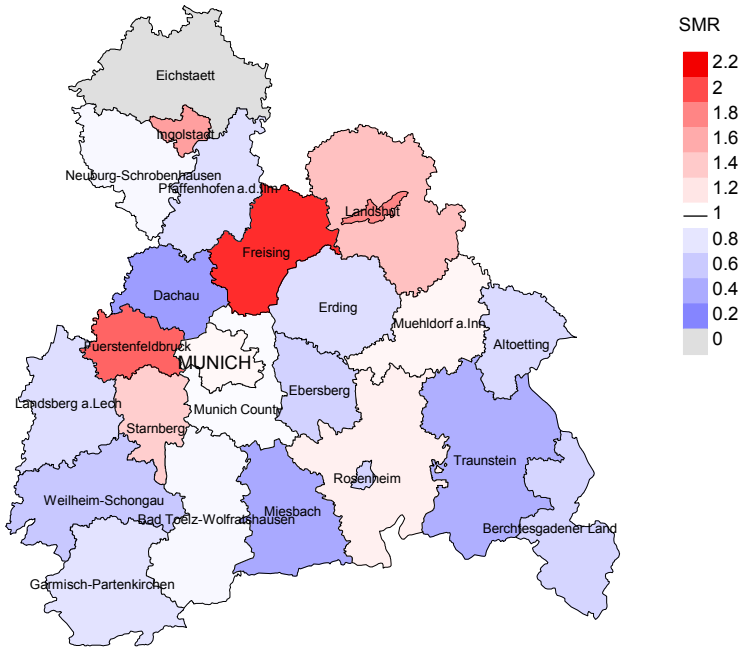


Figure 19a. Map of cancer mortality (world standard population) by county averaged for period 2007 to 2014. According to their individual mortality rates, the counties are displayed in different red and blue color temperatures where the fine white color indicates the population mean (males 0.3/100,000 WS N=109, females 0.1/100,000 WS N=71).

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 chronic myel. leukaemia. 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

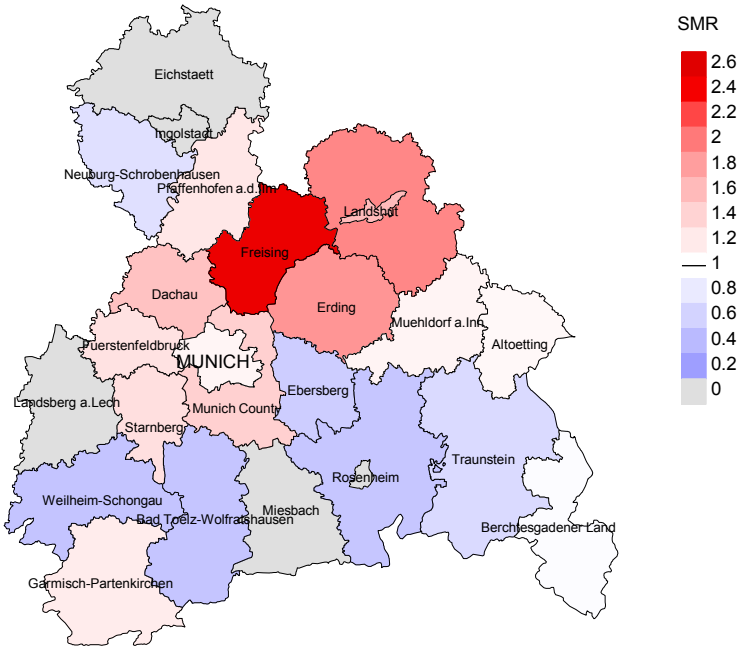


Figure 19b. Map of standardized mortality ratio (SMR, incl. DCO cases) by county averaged for period 2007 to 2014. According to their individual SMR values, the counties are displayed in different red and blue color temperatures where the fine white color indicates the population overall of 1.0 (males N=109, females N=71).

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 chronic myel. leukaemia. Therefore, the mean standardized mortality ratio (SMR) for this cancer type in this area can be calculated at 0.55. Though, the value of this parameter may vary with an underlying probability of 99% between 0.00 and 4.06, 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

Recommended Citation

Munich Cancer Registry. ICD-10 C92.1: Chronic myel. leukaemia - Incidence and Mortality [Internet]. 2016 [updated 2016 Apr 13; cited 2016 Jun 1]. Available from: http://www.tumorregister-muenchen.de/en/facts/base/bC921_E-ICD-10-C92.1-Chronic-myel.-leukaemia-incidence-and-mortality.pdf

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