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

C21: Anal cancer

Year of diagnosis	1998-2011
Patients	1061
Diseases	1061
Creation date	04/02/2013
Export date	01/03/2013
Population	4.5 m

http://www.tumorregister-muenchen.de/en/facts/base/base_C21__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[#], with a total of 4.5 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. 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.

ICD-10 codes used for specifying cancer site

ICD-10	Description
C21.-	Malignant neoplasm of anus and anal canal
C21.0	Anus, unspecified
C21.1	Anal canal
C21.2	Cloacogenic zone
C21.8	Overlapping lesion of rectum, anus and anal canal

INCIDENCE

Table 1

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

Year of diagnosis	Cases # n	DCO cases n	Prop. DCO %	Prop. mult. primaries %	Prop. deaths %	Prop. actively followed %
1998	47			17.0	59.6	97.9
1999	36	3	8.3	16.7	55.6	97.2
2000	47			23.4	59.6	100.0
2001	57	3	5.3	24.6	61.4	94.7
2002	70	2	2.9	31.4	58.6	97.1
2003	73	1	1.4	23.3	39.7	93.2
2004	82	3	3.7	23.2	36.6	97.6
2005	80	1	1.3	38.8	52.5	95.0
2006	80	4	5.0	30.0	42.5	97.5
2007	93	4	4.3	28.0	46.2	87.1 ##
2008	89	1	1.1	18.0	40.4	77.5
2009	105	1	1.0	24.8	30.5	78.1
2010	114	6	5.3	28.1	35.1	90.4
2011	88	1	1.1	12.5	13.6	62.5 ###
1998-2011	1061	30	2.8	24.8	42.4	88.8

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

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	47	14	33	29.8
1999	36	12	24	33.3
2000	47	14	33	29.8
2001	57	21	36	36.8
2002	70	20	50	28.6
2003	73	24	49	32.9
2004	82	20	62	24.4
2005	80	20	60	25.0
2006	80	26	54	32.5
2007	93	32	61	34.4
2008	89	26	63	29.2
2009	105	39	66	37.1
2010	114	38	76	33.3
2011	88	35	53	39.8
1998-2011	1061	341	720	32.1

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)

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	14	33	1.3	2.8	0.8	1.4	1.1	2.0	1.4	2.5
1999	12	24	1.1	2.0	0.7	1.0	0.9	1.4	1.2	1.6
2000	14	33	1.2	2.7	0.8	1.6	1.1	2.1	1.3	2.4
2001	21	36	1.8	3.0	1.0	1.5	1.5	2.1	1.8	2.5
2002	20	50	1.1	2.6	0.7	1.3	1.0	1.8	1.2	2.1
2003	24	49	1.3	2.5	0.8	1.4	1.2	1.9	1.3	2.1
2004	20	62	1.1	3.1	0.7	1.5	0.9	2.1	1.1	2.7
2005	20	60	1.1	3.0	0.7	1.3	0.9	1.9	1.1	2.5
2006	26	54	1.4	2.7	0.8	1.5	1.1	2.0	1.2	2.3
2007	32	61	1.4	2.6	0.8	1.2	1.2	1.7	1.5	2.1
2008	26	63	1.2	2.7	0.7	1.3	1.0	1.8	1.1	2.2
2009	39	66	1.7	2.8	1.0	1.5	1.4	2.1	1.6	2.4
2010	38	76	1.7	3.2	0.9	1.6	1.3	2.3	1.6	2.7
2011	35	53	1.6	2.3	0.9	1.2	1.3	1.7	1.5	2.0
1998-2011	341	720	1.4	2.7	0.8	1.4	1.1	1.9	1.3	2.3

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 diagnosis	Cases n	Mean	Std. dev.	Min.	Max.	10%	25%	Median 50%	75%	90%
1998	47	64.5	14.6	34.3	90.7	48.1	52.1	64.0	78.2	84.5
1999	36	65.8	18.6	29.3	94.8	36.6	55.6	66.8	79.8	89.8
2000	47	63.2	12.3	34.7	89.8	50.8	54.3	61.9	71.1	82.4
2001	57	64.9	15.4	35.3	92.5	43.4	55.2	62.9	78.7	86.2
2002	70	65.8	12.6	41.6	89.2	49.1	56.8	63.2	75.9	83.2
2003	73	62.3	15.3	35.2	91.9	42.7	49.7	61.5	74.2	85.6
2004	82	66.2	14.4	28.1	95.9	47.7	54.7	66.0	79.7	83.1
2005	80	67.8	12.8	32.2	91.7	49.6	59.7	68.8	78.6	83.3
2006	80	64.0	13.4	28.5	93.2	45.6	54.3	63.9	72.0	83.4
2007	93	68.1	14.5	28.6	94.9	47.5	56.7	68.3	79.7	87.2
2008	89	66.3	13.9	33.6	93.9	46.2	57.7	67.9	75.7	85.7
2009	105	64.2	12.9	37.5	102	47.3	54.4	64.9	72.0	81.6
2010	114	67.2	13.2	36.9	93.5	50.1	57.5	67.7	76.8	84.7
2011	88	64.6	12.9	22.8	91.2	47.3	55.7	64.6	74.4	81.9
1998-2011	1061	65.5	13.9	22.8	102	47.2	55.3	65.4	76.5	84.5

Table 3a

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

Year of diagnosis	Cases n	Mean	Std. dev.	Min.	Max.	10%	25%	Median 50%	75%	90%
1998	14	57.6	14.5	34.3	84.5	35.6	48.4	56.7	64.2	78.5
1999	12	60.2	19.4	29.3	86.7	30.8	45.8	64.7	72.5	84.2
2000	14	63.8	10.7	50.8	83.9	53.2	54.3	63.1	72.3	82.4
2001	21	61.6	13.2	37.4	82.1	42.8	56.4	61.8	66.8	79.3
2002	20	63.8	10.8	46.4	79.9	49.8	54.5	63.0	73.4	79.1
2003	24	59.5	13.2	35.2	85.9	41.3	50.4	58.2	68.9	76.3
2004	20	58.8	15.3	28.1	82.8	42.5	47.4	55.7	70.5	81.2
2005	20	62.5	10.1	47.8	82.6	50.7	54.7	60.6	69.7	77.7
2006	26	61.7	11.1	38.6	84.6	44.5	54.2	63.6	67.1	74.1
2007	32	66.5	13.7	45.4	93.9	47.5	56.2	65.8	78.9	87.2
2008	26	61.4	11.8	36.9	76.9	43.9	53.0	61.5	73.1	75.7
2009	39	63.5	13.5	37.5	102	45.2	54.1	65.6	70.8	79.0
2010	38	66.6	12.7	42.4	93.5	49.1	54.2	69.1	77.6	82.0
2011	35	64.4	12.6	33.3	89.4	47.3	54.5	64.9	75.5	79.1
1998-2011	341	62.9	13.0	28.1	102	45.5	54.1	63.0	72.3	79.5

Table 3b

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

Year of diagnosis	Cases n	Mean	Std. dev.	Min.	Max.	10%	25%	Median 50%	75%	90%
1998	33	67.4	13.9	44.6	90.7	49.5	57.1	68.9	78.4	85.7
1999	24	68.6	17.9	34.3	94.8	40.1	56.6	71.5	83.7	90.2
2000	33	62.9	13.1	34.7	89.8	47.5	55.7	61.3	70.8	81.4
2001	36	66.9	16.3	35.3	92.5	45.0	53.6	67.8	82.7	87.9
2002	50	66.6	13.2	41.6	89.2	49.1	58.8	63.8	76.8	87.1
2003	49	63.7	16.2	36.1	91.9	42.7	49.4	63.1	76.7	88.0
2004	62	68.6	13.4	39.6	95.9	49.6	60.5	68.4	80.3	83.9
2005	60	69.6	13.2	32.2	91.7	47.8	62.5	71.6	79.6	84.8
2006	54	65.1	14.3	28.5	93.2	49.0	54.4	64.6	78.6	85.3
2007	61	69.0	14.9	28.6	94.9	48.1	58.9	70.5	80.2	87.0
2008	63	68.3	14.3	33.6	93.9	47.9	58.2	68.3	80.0	86.8
2009	66	64.6	12.6	39.9	88.9	48.5	54.6	63.6	73.1	82.9
2010	76	67.4	13.5	36.9	92.7	50.1	57.9	67.0	76.7	86.1
2011	53	64.8	13.2	22.8	91.2	49.4	55.8	64.4	72.8	82.3
1998-2011	720	66.8	14.1	22.8	95.9	47.6	56.5	66.7	78.2	85.6

Table 4

Age distribution by 5-year age group and gender for period 1998-2011 (incl. DCO)

Age at diagnosis Years	Cases n	%	Cum.%	Males n	%	Cum.%	Females n	%	Cum.%
20-24	1	0.1	0.1		0.0		1	0.1	0.1
25-29	4	0.4	0.5	2	0.6	0.6	2	0.3	0.4
30-34	7	0.7	1.1	3	0.9	1.5	4	0.6	1.0
35-39	19	1.8	2.9	9	2.6	4.1	10	1.4	2.4
40-44	48	4.5	7.4	18	5.3	9.4	30	4.2	6.5
45-49	78	7.4	14.8	22	6.5	15.8	56	7.8	14.3
50-54	106	10.0	24.8	43	12.6	28.4	63	8.8	23.1
55-59	108	10.2	35.0	45	13.2	41.6	63	8.8	31.8
60-64	150	14.1	49.1	48	14.1	55.7	102	14.2	46.0
65-69	135	12.7	61.8	48	14.1	69.8	87	12.1	58.1
70-74	110	10.4	72.2	34	10.0	79.8	76	10.6	68.6
75-79	111	10.5	82.7	40	11.7	91.5	71	9.9	78.5
80-84	88	8.3	91.0	18	5.3	96.8	70	9.7	88.2
85+	96	9.0	100.0	11	3.2	100.0	85	11.8	100.0
All ages	1061	100.0		341	100.0		720	100.0	

Included in the statistics are 27.3% multiple primaries in males and 33.6% in females.

Table 5

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

Age at diagnosis Years	Males n	Females n	Males Age-spec. incid.	Females Age-spec. incid.	Males DCO rate n=8 %	Females DCO rate n=22 %	Males Prop.all cancers n=132509 %	Females Prop.all cancers n=129521 %
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		1	0.0	0.1				0.2
25-29	2	2	0.1	0.1			0.2	0.2
30-34	3	4	0.2	0.2			0.2	0.2
35-39	9	10	0.4	0.5			0.5	0.3
40-44	18	30	0.8	1.4			0.7	0.6
45-49	22	56	1.1	2.9			0.5	0.8
50-54	43	63	2.6	3.7			0.6	0.7
55-59	45	63	2.9	3.8	2.2		0.4	0.5
60-64	48	102	3.2	6.4			0.3	0.7
65-69	48	87	3.5	5.8	4.2		0.2	0.5
70-74	34	76	3.3	6.2	2.9		0.2	0.5
75-79	40	71	5.9	7.1	5.0	4.2	0.2	0.5
80-84	18	70	4.4	8.8	5.6	10.0	0.2	0.5
85+	11	85	4.0	11.4	9.1	14.1	0.1	0.6
All ages	341	720			2.3	3.1	0.3	0.6
Incidence								
Raw			1.4	2.7				
WS			0.8	1.4				
ES			1.1	1.9				
BRD-S			1.3	2.3				

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).

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

Diagnosis	Observed n	Expected n	SIR	LCL 95%	UCL 95%	EAR	DCO %
C09-C10 Oropharynx	2	0.2	12.9	1.6	46.5 #	21.0	
C16 Stomach	2	0.5	3.8	0.5	13.9	16.8	
C18 Colon	2	1.2	1.7	0.2	6.0	9.1	
C19-C20 Rectum	4	0.7	5.7	1.5	14.6 #	37.5	
C33-C34 Lung	3	1.5	2.1	0.4	6.0	17.6	
C61 Prostate	6	3.5	1.7	0.6	3.7	28.3	
Other primaries	7	1.8	3.8	1.5	7.8 #	58.6	
Not observed	0	2.9	0.0	0.0	1.3	-33.0	
All mult. primaries	26	12.3	2.1	1.4	3.1 #	155.7	

Patients	254
Mean age at second malignancy (years)	66.8
Person-years	880
Mean observation time (years)	3.5
Median observation time (years)	2.4

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

Diagnosis		Observed n	Expected n	SIR	LCL 95%	UCL 95%		EAR	DCO %
C16	Stomach	2	0.9	2.2	0.3	7.9		5.0	
C17	Small intestine	2	0.1	19.4	2.4	70.1	#	8.7	
C18	Colon	11	2.5	4.4	2.2	7.9	#	39.1	27.3
C19-C20	Rectum	4	1.1	3.7	1.0	9.5	#	13.4	
C25	Pancreas	3	1.0	2.9	0.6	8.5		9.0	
C33-C34	Lung	10	1.6	6.1	2.9	11.1	#	38.3	10.0
C50	Breast	15	7.4	2.0	1.1	3.4	#	35.1	6.7
C51	Vulva	3	0.2	13.0	2.7	38.1	#	12.7	
C53	Cervix uteri	3	0.3	8.9	1.8	26.0	#	12.2	33.3
C73	Thyroid	3	0.4	6.7	1.4	19.5	#	11.7	
C82-C85	NHL	2	0.9	2.2	0.3	8.0		5.0	
C91-C96	Leukaemia	2	0.4	5.5	0.7	19.7		7.5	50.0
Other primaries		7	3.4	2.0	0.8	4.2		16.4	14.3
Not observed		0	3.9	0.0	0.0	1.0	#	-17.7	
All mult. primaries		67	24.2	2.8	2.1	3.5	#	196.4	11.9

Patients	567
Mean age at second malignancy (years)	72.0
Person-years	2181
Mean observation time (years)	3.8
Median observation time (years)	3.0

The occurrence of second malignancy is statistically significant.

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

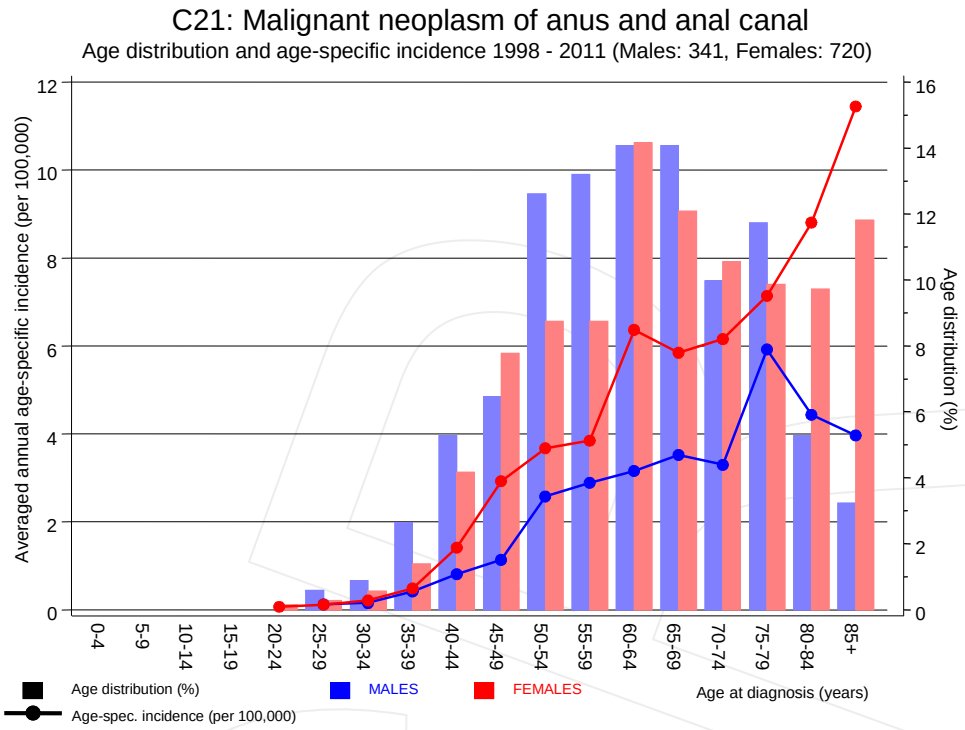


Figure 7. Age distribution and age-specific incidence

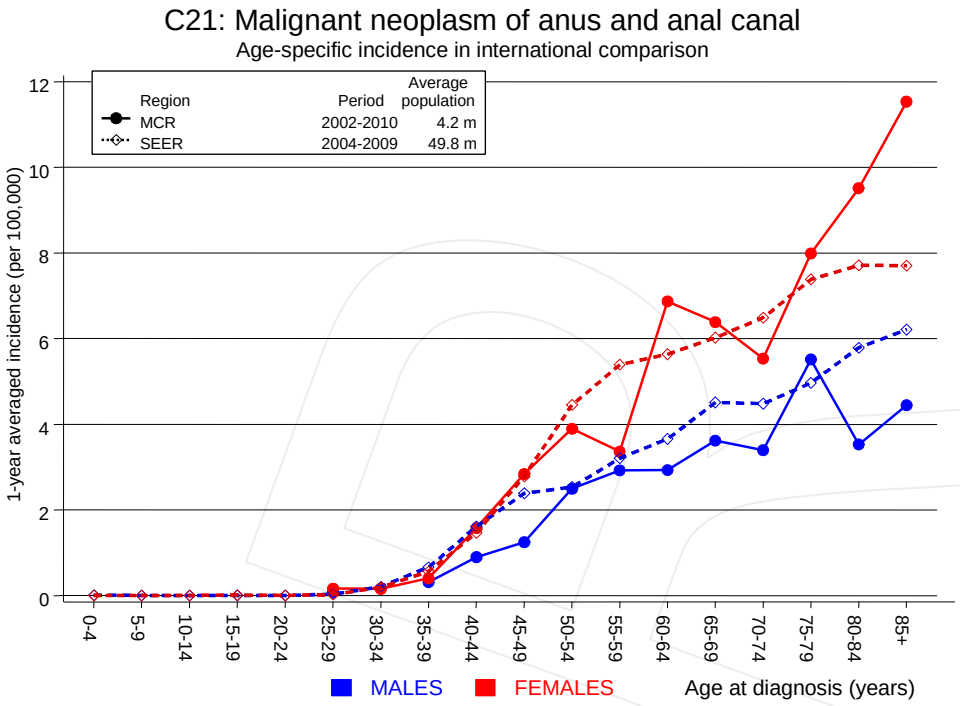


Figure 7a. Age-specific incidence in MCR registry areas compared to SEER (Surveillance, Epidemiology, and End Results, USA).

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.

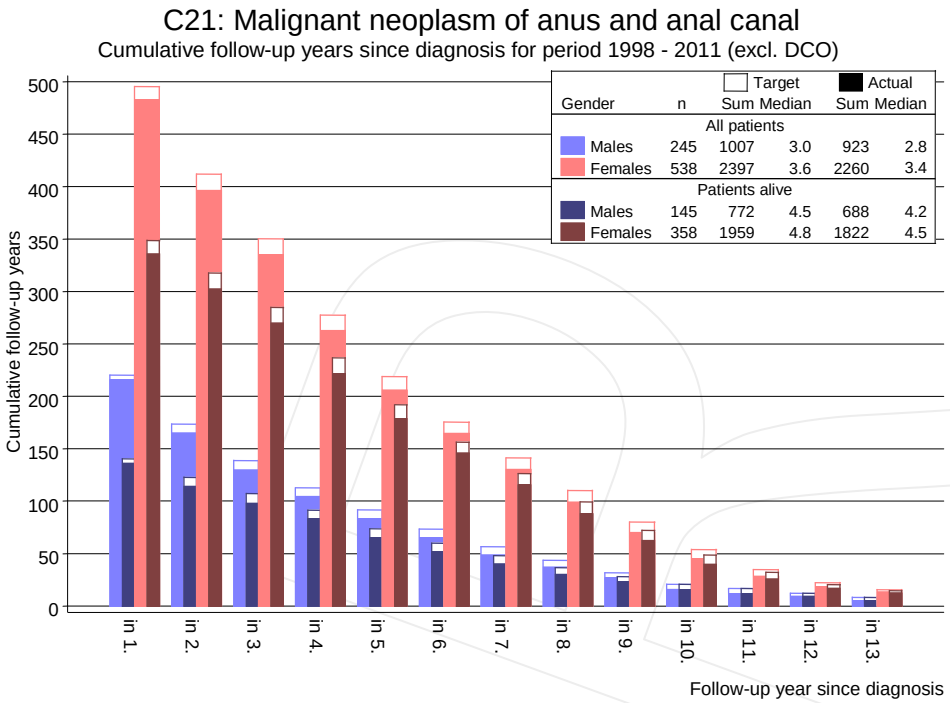
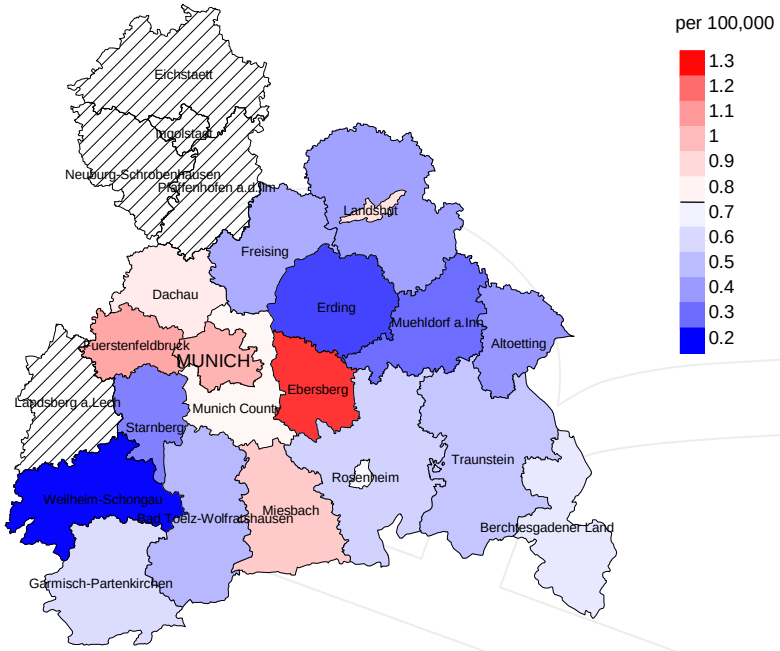


Figure 8. Cumulative follow-up years depending on time since diagnosis

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

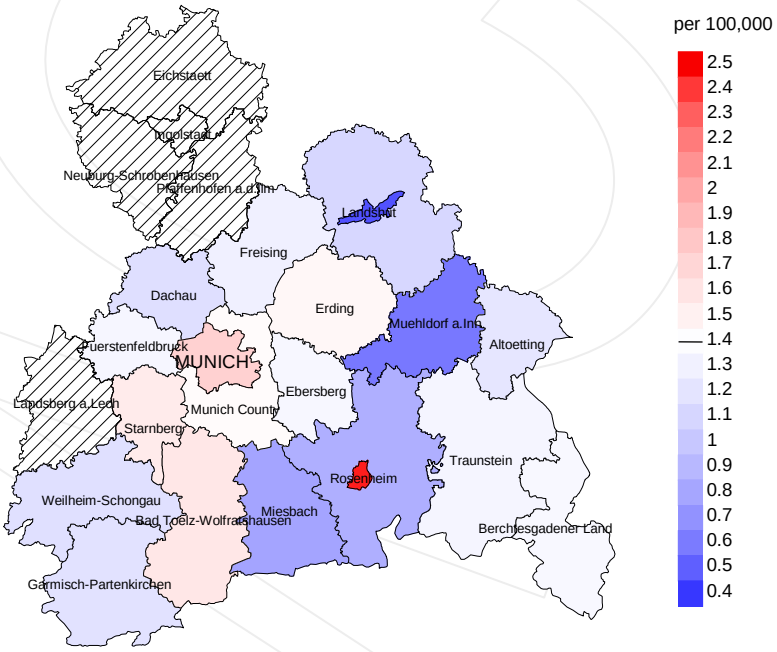
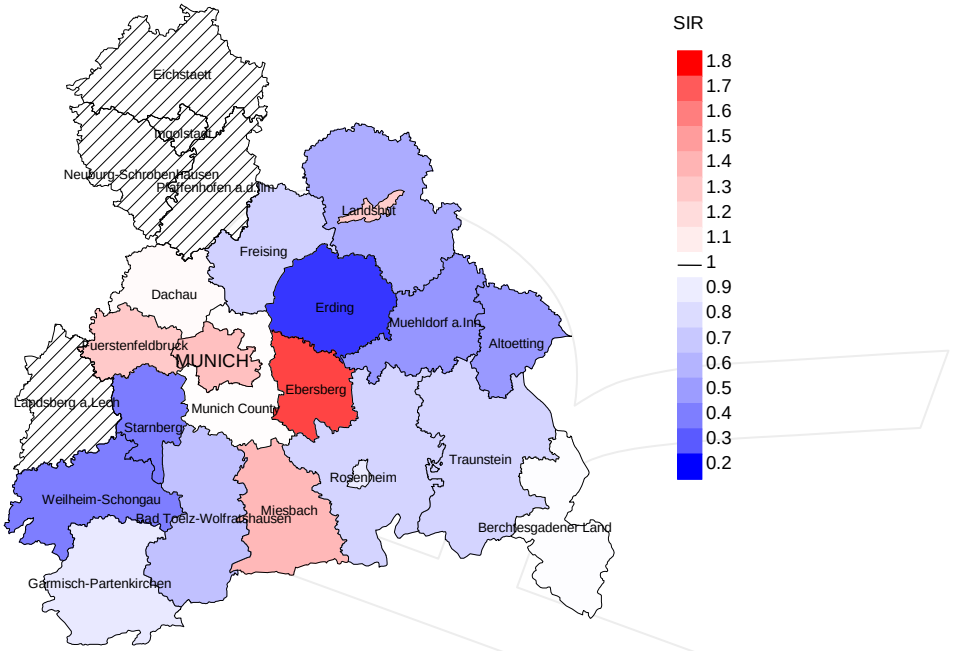


Figure 9a. Map of cancer incidence (world standard population, incl. DCO cases) by county averaged for period 2003 to 2008. According to their individual incidence rates, the counties are displayed in different red and blue color temperatures where the fine white color indicates the population mean (males 0.8/100,000 WS N=143, females 1.4/100,000 WS N=343). 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 8 women were identified with newly diagnosed anal cancer. Therefore, the mean incidence rate for this cancer type in this area can be calculated at 1.3/100,000 (world standard population). Though, the value of this parameter may vary with an underlying probability of 99% between 0.4 and 3.2/100,000.

Standardized incidence ratio (SIR) 2003 - 2008: Males



Standardized incidence ratio (SIR) 2003 - 2008: Females

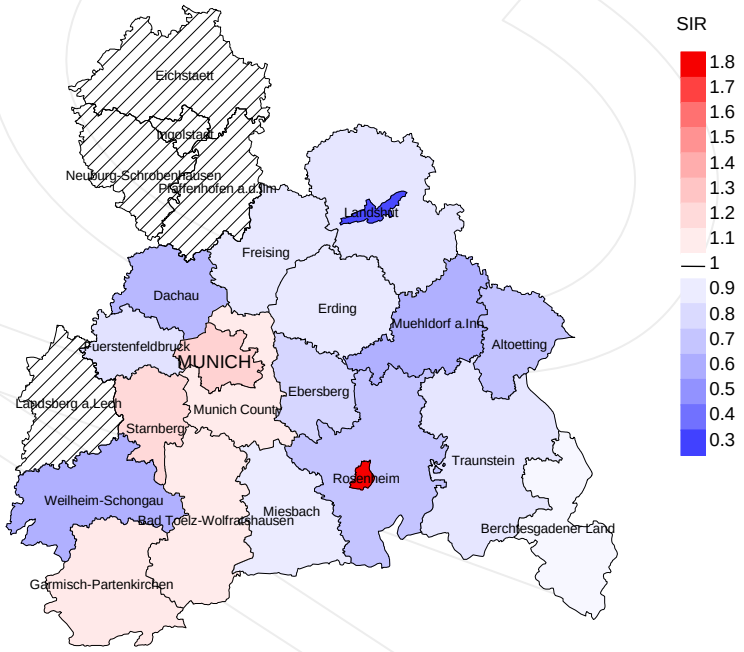


Figure 9b. Map of standardized incidence ratio (SIR, incl. DCO cases) by county averaged for period 2003 to 2008. According to their individual SIR values, the counties are displayed in different red and blue color temperatures where the fine white color indicates the population overall of 1.0 (males N=143, females N=343). 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 8 women were identified with newly diagnosed anal cancer. Therefore, the mean standardized incidence ratio (SIR) for this cancer type in this area can be calculated at 0.78. Though, the value of this parameter may vary with an underlying probability of 99% between 0.25 and 1.82, 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)

Year of diagnosis	Incident cases n	Prop. actively followed %	Prop. DCO %	Deaths n	Prop. deaths %	Prop. deaths with death certific. %
1998	47	97.9		28	59.6	89.3
1999	36	97.2	8.3	20	55.6	90.0
2000	47	100.0		28	59.6	96.4
2001	57	94.7	5.3	35	61.4	97.1
2002	70	97.1	2.9	41	58.6	97.6
2003	73	93.2	1.4	29	39.7	100.0
2004	82	97.6	3.7	30	36.6	100.0
2005	80	95.0	1.3	42	52.5	97.6
2006	80	97.5	5.0	34	42.5	100.0
2007	93	87.1	4.3	43	46.2	97.7
2008	89	77.5	1.1	36	40.4	97.2
2009	105	78.1	1.0	32	30.5	96.9
2010	114	90.4	5.3	40	35.1	97.5
2011	88	62.5	1.1	12	13.6	91.7
1998-2011	1061	88.8	2.8	450	42.4	96.9

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 4.52 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	47	14	85.7	4	8.5
1999	36	13	84.6	1	2.8
2000	47	19	84.2	4	8.5
2001	57	30	96.7	8	14.0
2002	70	38	97.4	8	11.4
2003	73	31	100.0	5	6.8
2004	82	36	100.0	5	6.1
2005	80	52	96.2	11	13.8
2006	80	47	100.0	7	8.8
2007	93	48	93.8	8	8.6
2008	89	48	97.9	6	6.7
2009	105	42	100.0	4	3.8
2010	114	70	100.0	20	17.5
2011	88	66	97.0	10	11.4
1998-2011	1061	554	96.9	101	9.5

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)

Year of death	Deaths n	Prop. cancer-related %	Prop. not cancer-related %	Prop. cancer recorded on death certificate %
1998	14	64.3	35.7	91.7
1999	13	46.2	53.8	81.8
2000	19	89.5	10.5	100.0
2001	30	63.3	36.7	86.2
2002	38	86.8	13.2	91.9
2003	31	83.9	16.1	90.3
2004	36	75.0	25.0	86.1
2005	52	80.8	19.2	88.0
2006	47	66.0	34.0	80.9
2007	48	64.6	35.4	80.0
2008	48	75.0	25.0	87.2
2009	42	69.0	31.0	92.9
2010	70	72.9	27.1	85.7
2011	66	77.3	22.7	85.9
1998-2011	554	73.6	26.4	87.0

Table 11a

Means 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 (not cancer-related) Years	Age at death (according to death certificate) Years
1998	3	56.7	46.7	61.7	56.7
1999	3	60.2	62.8	58.9	62.8
2000	4	63.6	55.3	88.4	69.5
2001	13	72.4	71.6	75.2	73.1
2002	11	59.4	54.7	67.8	57.8
2003	12	60.9	57.8	76.5	59.6
2004	12	69.3	67.9	72.1	67.5
2005	17	66.1	65.1	68.5	65.1
2006	16	65.9	62.6	70.3	65.6
2007	15	73.1	73.2	73.0	75.0
2008	17	66.8	66.1	69.4	67.5
2009	10	70.1	63.8	79.6	68.8
2010	30	68.3	70.2	60.8	70.1
2011	23	71.6	70.0	77.7	69.4
1998-2011	186	67.6	66.2	70.8	67.5

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

Means 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 (not cancer-related) Years	Age at death (according to death certificate) Years
1998	11	73.9	70.7	82.4	73.7
1999	10	79.3	72.5	86.2	77.3
2000	15	74.1	76.9	34.8	76.6
2001	17	79.6	75.4	84.3	80.8
2002	27	77.1	77.8	60.4	77.0
2003	19	78.5	77.2	85.3	78.0
2004	24	79.6	76.4	91.6	78.6
2005	35	76.8	75.3	85.2	75.9
2006	31	75.7	76.2	74.4	77.3
2007	33	76.5	73.3	83.8	73.8
2008	31	79.3	77.6	84.4	78.8
2009	32	75.0	73.6	78.6	74.5
2010	40	77.0	73.0	85.3	75.7
2011	43	74.7	73.6	78.2	74.4
1998-2011	368	76.8	75.2	81.9	76.3

By 2010, life expectancy for a newborn male in Germany is 77.5 years compared with 82.6 years for his female counterpart.

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

Table 12a

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

Year of death	Deaths n	Mort. raw	MI-Index raw	Mort. WS	MI-Index WS	Mort. ES	MI-Index ES	Mort. BRD-S	MI-Index BRD-S
1998	1	0.1	0.07	0.1	0.10	0.1	0.08	0.1	0.08
1999	1	0.1	0.08	0.1	0.08	0.1	0.07	0.1	0.06
2000	3	0.3	0.21	0.2	0.27	0.3	0.24	0.3	0.21
2001	10	0.9	0.48	0.5	0.46	0.8	0.53	1.0	0.58
2002	7	0.4	0.35	0.3	0.41	0.4	0.37	0.4	0.32
2003	10	0.5	0.42	0.3	0.42	0.5	0.39	0.5	0.40
2004	8	0.4	0.40	0.2	0.32	0.3	0.35	0.5	0.42
2005	12	0.6	0.60	0.3	0.48	0.5	0.50	0.6	0.58
2006	9	0.5	0.35	0.3	0.36	0.4	0.39	0.5	0.40
2007	8	0.4	0.25	0.2	0.24	0.3	0.24	0.3	0.23
2008	13	0.6	0.50	0.3	0.45	0.5	0.47	0.6	0.51
2009	6	0.3	0.15	0.1	0.14	0.2	0.14	0.2	0.14
2010	24	1.1	0.63	0.5	0.60	0.8	0.62	1.0	0.62
2011	18	0.8	0.51	0.4	0.48	0.6	0.50	0.8	0.52
1998-2011	130	0.5	0.38	0.3	0.36	0.4	0.37	0.5	0.39

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	8	0.7	0.24	0.3	0.20	0.4	0.22	0.5	0.21
1999	5	0.4	0.21	0.2	0.19	0.3	0.21	0.3	0.22
2000	14	1.2	0.42	0.4	0.28	0.7	0.31	0.9	0.39
2001	9	0.7	0.25	0.3	0.20	0.5	0.22	0.6	0.25
2002	26	1.3	0.52	0.4	0.33	0.7	0.38	1.0	0.45
2003	16	0.8	0.33	0.3	0.21	0.4	0.24	0.6	0.28
2004	19	1.0	0.31	0.4	0.24	0.6	0.27	0.7	0.27
2005	30	1.5	0.50	0.5	0.38	0.8	0.41	1.1	0.46
2006	22	1.1	0.41	0.4	0.28	0.6	0.30	0.8	0.34
2007	23	1.0	0.38	0.4	0.33	0.6	0.34	0.8	0.35
2008	23	1.0	0.37	0.3	0.25	0.5	0.28	0.7	0.33
2009	23	1.0	0.35	0.4	0.25	0.6	0.27	0.7	0.30
2010	27	1.2	0.36	0.5	0.29	0.7	0.29	0.8	0.30
2011	33	1.4	0.62	0.6	0.46	0.8	0.50	1.1	0.54
1998-2011	278	1.1	0.39	0.4	0.28	0.6	0.31	0.8	0.34

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.%
30-34	1	0.2	0.2		0.0		1	0.4	0.4
35-39	2	0.5	0.7	2	1.5	1.5			0.4
40-44	11	2.7	3.4	8	6.2	7.7	3	1.1	1.4
45-49	24	5.9	9.3	8	6.2	13.8	16	5.8	7.2
50-54	22	5.4	14.7	9	6.9	20.8	13	4.7	11.9
55-59	29	7.1	21.8	16	12.3	33.1	13	4.7	16.5
60-64	36	8.8	30.6	13	10.0	43.1	23	8.3	24.8
65-69	43	10.5	41.2	21	16.2	59.2	22	7.9	32.7
70-74	47	11.5	52.7	18	13.8	73.1	29	10.4	43.2
75-79	41	10.0	62.7	15	11.5	84.6	26	9.4	52.5
80-84	60	14.7	77.5	10	7.7	92.3	50	18.0	70.5
85+	92	22.5	100.0	10	7.7	100.0	82	29.5	100.0
All ages	408	100.0		130	100.0		278	100.0	

Included in the statistics are 27.3% multiple primaries in males and 33.6% in females.

Table 14

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

Age at death Years	Males n	Females n	Males Age-spec. mortal.	MI-index	Females Age-spec. mortal.	MI-index	Males Prop.all cancers %	Females Prop.all cancers %
0- 4			0.0		0.0			
5- 9			0.0		0.0			
10-14			0.0		0.0			
15-19			0.0		0.0			
20-24			0.0		0.0			
25-29			0.0		0.0			
30-34		1	0.0		0.1	0.25		0.5
35-39	2		0.1	0.22	0.0		0.5	
40-44	8	3	0.4	0.44	0.1	0.10	1.1	0.3
45-49	8	16	0.4	0.36	0.8	0.29	0.5	0.9
50-54	9	13	0.5	0.21	0.8	0.21	0.3	0.5
55-59	16	13	1.0	0.36	0.8	0.21	0.3	0.3
60-64	13	23	0.9	0.27	1.4	0.23	0.2	0.4
65-69	21	22	1.5	0.44	1.5	0.25	0.2	0.3
70-74	18	29	1.7	0.53	2.3	0.38	0.2	0.4
75-79	15	26	2.2	0.38	2.6	0.37	0.1	0.3
80-84	10	50	2.5	0.56	6.3	0.71	0.1	0.5
85+	10	82	3.6	0.91	11.0	0.96	0.1	0.7
All ages	130	278					0.2	0.5
Mortality								
Raw			0.5	0.38	1.1	0.39		
WS			0.3	0.36	0.4	0.28		
ES			0.4	0.37	0.6	0.31		
BRD-S			0.5	0.39	0.8	0.34		
PYLL-70								
per 100,000			4.3		4.9			
ES			3.7		4.2			
AYLL-70			12.6		12.1			

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

Table 15a

Multiple primaries in deaths in period 1998-2011
MALES

Diagnosis	Total n	Total %↓	Pre n	Pre ←%	Syn-chron ±30d n	Syn-chron ±30d ←%	Post n	Post ←%
C09-C10 Oropharynx	4	7.7	1	25.0	1	25.0	2	50.0
C12-C13 Hypopharynx	2	3.8	1	50.0			1	50.0
C15 Oesophagus	2	3.8	1	50.0			1	50.0
C16 Stomach	2	3.8	1	50.0			1	50.0
C18 Colon	6	11.5	4	66.7			2	33.3
C19-C20 Rectum	5	9.6			2	40.0	3	60.0
C22 Liver	1	1.9	1	100.0				
C32 Larynx	1	1.9	1	100.0				
C33-C34 Lung	6	11.5			2	33.3	4	66.7
C43 Malign. melanoma	2	3.8	1	50.0			1	50.0
C44 Skin others	5	9.6	2	40.0			3	60.0
C61 Prostate	6	11.5	2	33.3	1	16.7	3	50.0
C64 Kidney	1	1.9	1	100.0				
C67 Bladder	3	5.8	1	33.3	1	33.3	1	33.3
C70-C72 CNS cancer	2	3.8			1	50.0	1	50.0
C82-C85 NHL	3	5.8	2	66.7			1	33.3
C91-C96 Leukaemia	1	1.9					1	100.0
All mult. primaries	52	100.0	19	36.5	8	15.4	25	48.1

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 15b

Multiple primaries in deaths in period 1998-2011
FEMALES

Diagnosis	Total n	Total %↓	Pre n	Pre ←%	Syn-chron ±30d n	Syn-chron ±30d ←%	Post n	Post ←%
C03-C06 Oral cavity	1	0.8	1	100.0				
C09-C10 Oropharynx	3	2.3	1	33.3			2	66.7
C15 Oesophagus	2	1.5			1	50.0	1	50.0
C16 Stomach	6	4.5	1	16.7			5	83.3
C17 Small intestine	1	0.8					1	100.0
C18 Colon	19	14.4	6	31.6	3	15.8	10	52.6
C19-C20 Rectum	6	4.5	1	16.7	4	66.7	1	16.7
C21 Anus/canal	1	0.8					1	100.0
C25 Pancreas	3	2.3					3	100.0
C33-C34 Lung	12	9.1	2	16.7	1	8.3	9	75.0
C44 Skin others	2	1.5	1	50.0			1	50.0
C50 Breast	21	15.9	10	47.6	4	19.0	7	33.3
C51 Vulva	6	4.5	3	50.0			3	50.0
C52 Vagina	2	1.5	2	100.0				
C53 Cervix uteri	13	9.8	11	84.6			2	15.4
C54 Corpus uteri	5	3.8	2	40.0			3	60.0
C56 Ovary	1	0.8	1	100.0				
C64 Kidney	2	1.5	1	50.0	1	50.0		
C67 Bladder	2	1.5	2	100.0				
C70-C72 CNS cancer	4	3.0	1	25.0	1	25.0	2	50.0
C73 Thyroid	3	2.3					3	100.0
C76-C79 CUP	2	1.5					2	100.0
C81 Hodgkin lymphoma	1	0.8	1	100.0				
C82-C85 NHL	9	6.8	5	55.6			4	44.4
C90 Mult. myeloma	1	0.8					1	100.0
C91-C96 Leukaemia	4	3.0	1	25.0			3	75.0
All mult. primaries	132	100.0	53	40.2	15	11.4	64	48.5

Multiple primaries with number of cases n<1 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** *)

Age at death Years	Males n	Females n	Males Age-spec. mortal.	MI-index	Females Age-spec. mortal.	MI-index	Males Prop.all cancers %	Females Prop.all cancers %
0- 4			0.0		0.0			
5- 9			0.0		0.0			
10-14			0.0		0.0			
15-19			0.0		0.0			
20-24			0.0		0.0			
25-29			0.0		0.0			
30-34		1	0.0		0.1	0.33		0.6
35-39	1		0.0	0.13	0.0		0.3	
40-44	8	1	0.4	0.47	0.0	0.04	1.1	0.1
45-49	6	16	0.3	0.33	0.8	0.31	0.4	1.1
50-54	8	10	0.5	0.20	0.6	0.18	0.3	0.4
55-59	14	12	0.9	0.34	0.7	0.22	0.3	0.3
60-64	11	19	0.7	0.26	1.2	0.23	0.2	0.4
65-69	17	16	1.2	0.41	1.1	0.23	0.2	0.3
70-74	14	21	1.4	0.54	1.7	0.36	0.2	0.3
75-79	9	18	1.3	0.31	1.8	0.37	0.1	0.2
80-84	9	39	2.2	0.60	4.9	0.74	0.1	0.5
85+	8	64	2.9	0.80	8.6	0.96	0.1	0.7
All ages	105	217					0.2	0.4
Mortality								
Raw			0.4	0.36	0.8	0.37		
WS			0.2	0.34	0.3	0.27		
ES			0.3	0.35	0.5	0.30		
BRD-S			0.4	0.36	0.6	0.33		
PYLL-70								
per 100,000			3.6		4.1			
ES			3.2		3.6			
AYLL-70			12.7		12.4			

* 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** *)

Age at death Years	Males n	Females n	Males Age-spec. mortal.	MI-index	Females Age-spec. mortal.	MI-index	Males Prop.all cancers %	Females Prop.all cancers %
0- 4			0.0		0.0			
5- 9			0.0		0.0			
10-14			0.0		0.0			
15-19			0.0		0.0			
20-24			0.0		0.0			
25-29			0.0		0.0			
30-34		1	0.0		0.1	0.33		0.6
35-39			0.0		0.0			
40-44	7		0.3	0.44	0.0		1.1	
45-49	4	16	0.2	0.25	0.8	0.35	0.3	1.2
50-54	7	9	0.4	0.18	0.5	0.17	0.3	0.5
55-59	12	10	0.8	0.33	0.6	0.22	0.3	0.3
60-64	7	13	0.5	0.19	0.8	0.18	0.1	0.3
65-69	13	11	1.0	0.34	0.7	0.17	0.2	0.2
70-74	12	17	1.2	0.50	1.4	0.32	0.2	0.3
75-79	7	16	1.0	0.26	1.6	0.38	0.1	0.3
80-84	8	28	2.0	0.73	3.5	0.57	0.1	0.4
85+	8	52	2.9	0.80	7.0	0.83	0.2	0.7
All ages	85	173					0.2	0.4
Mortality								
Raw			0.3	0.32	0.7	0.33		
WS			0.2	0.30	0.3	0.24		
ES			0.3	0.31	0.4	0.26		
BRD-S			0.3	0.33	0.5	0.29		
PYLL-70								
per 100,000			2.8		3.6			
ES			2.5		3.2			
AYLL-70			12.8		13.4			

* See corresponding tables with multiple primaries.

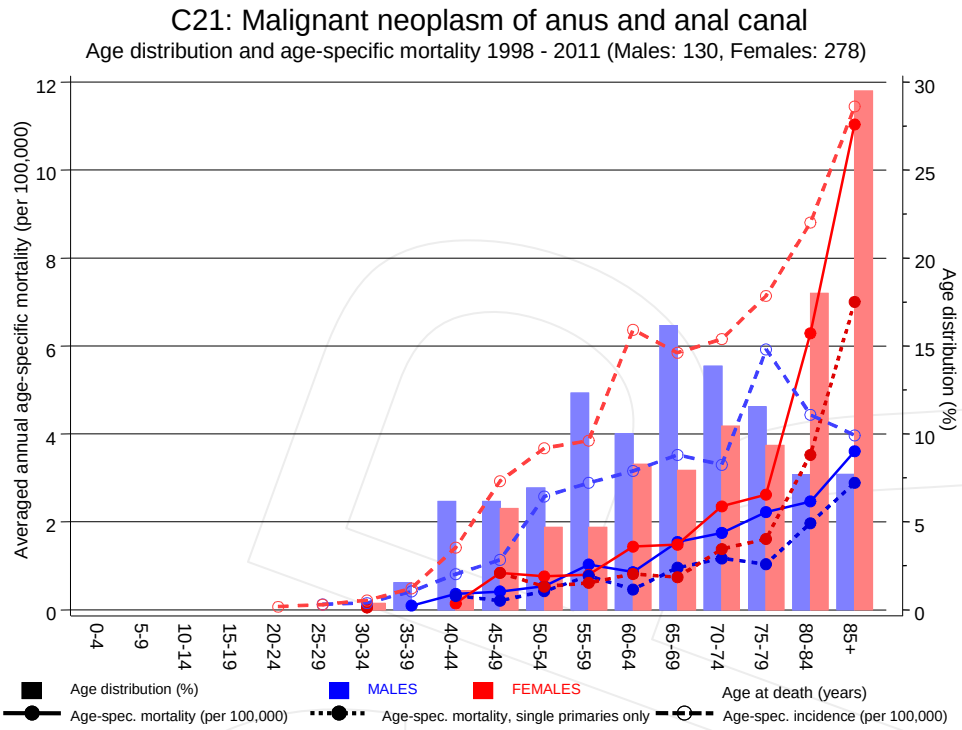
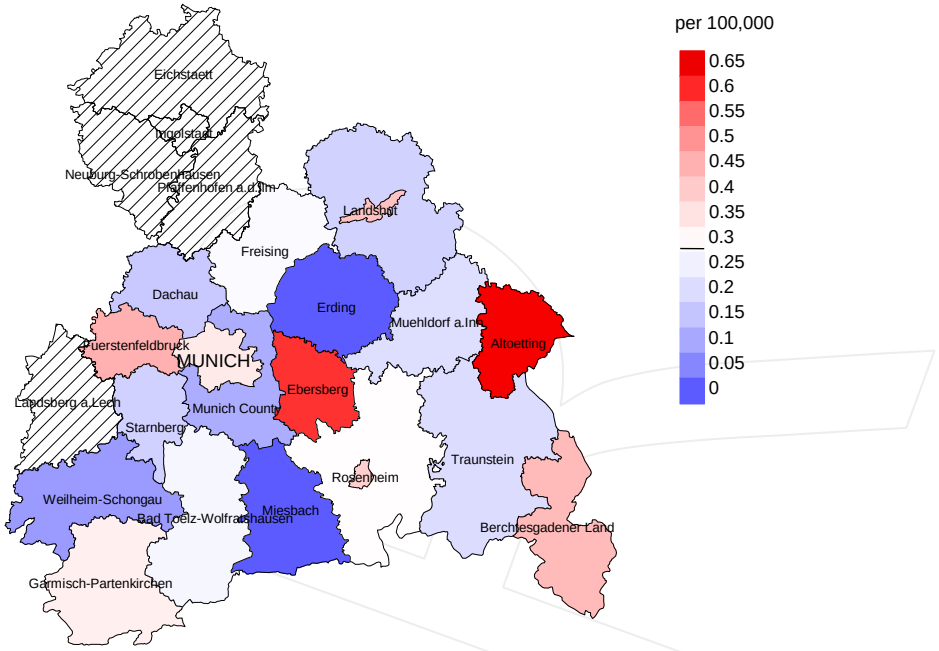


Figure 18. Distribution of age at death (bars) and age-specific mortality (all patients: solid line, patients with single primaries: dotted line). The age-specific incidence is additionally plotted for comparison (dashed line).

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

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



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

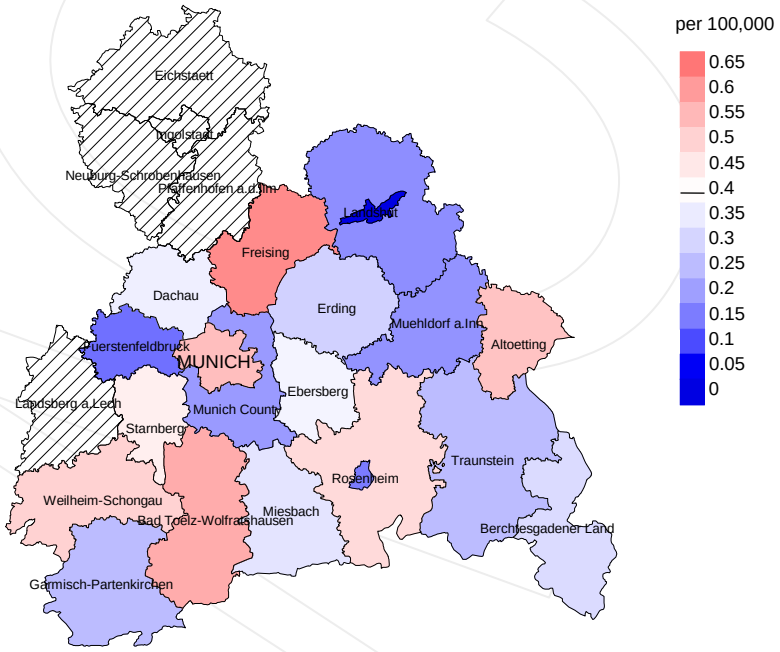
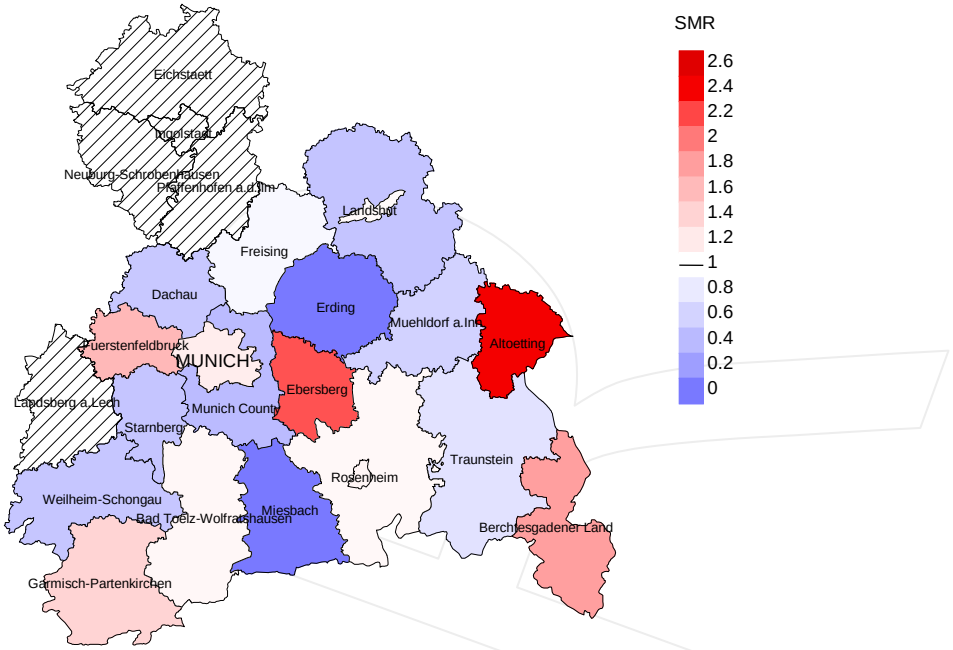


Figure 19a. Map of cancer mortality (world standard population) by county averaged for period 2003 to 2008. According to their individual mortality rates, the counties are displayed in different red and blue color temperatures where the fine white color indicates the population mean (males 0.3/100,000 WS N=58, females 0.4/100,000 WS N=132). 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 3 women died from anal cancer. Therefore, the mean mortality rate for this cancer type in this area can be calculated at 0.4/100,000 (world standard population). Though, the value of this parameter may vary with an underlying probability of 99% between 0.0 and 1.7/100,000.

Standardized mortality ratio (SMR) 2003 - 2008: Males



Standardized mortality ratio (SMR) 2003 - 2008: Females

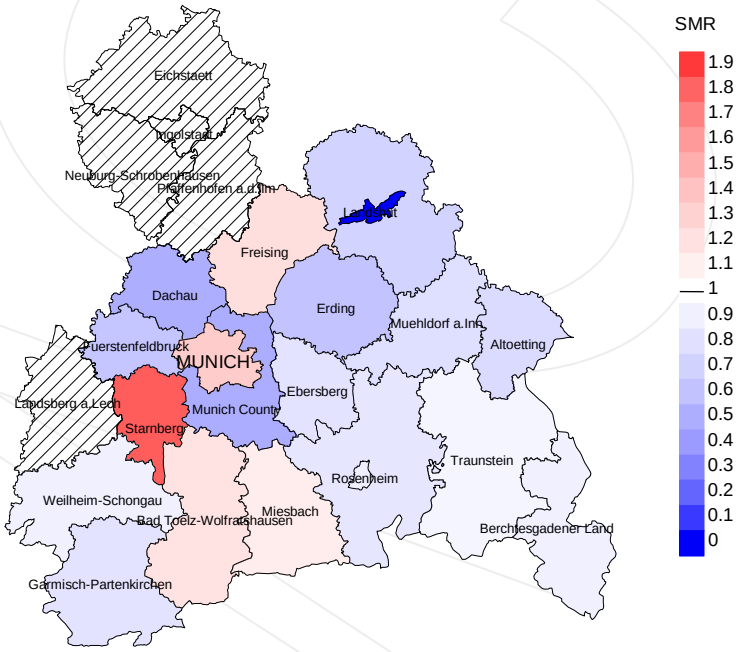


Figure 19b. Map of standardized mortality ratio (SMR, incl. DCO cases) by county averaged for period 2003 to 2008. According to their individual SMR values, the counties are displayed in different red and blue color temperatures where the fine white color indicates the population overall of 1.0 (males N=58, females N=132). 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 3 women died from anal cancer. Therefore, the mean standardized mortality ratio (SMR) for this cancer type in this area can be calculated at 0.81. Though, the value of this parameter may vary with an underlying probability of 99% between 0.09 and 2.97, 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

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Index of figures and tables