Munich Cancer Registry

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	1998-2013
Patients	1,212
Diseases	1,212
Creation date	05/19/2015
Export date	12/30/2014
Population	4.64 m

BERLIN

GERMANY

BAVARIA

MUNICH

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. 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, May 2015

[#] 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 2014 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 (ICD-10 2015) used for specifying cancer site

Code	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	45			20.0	60.0	97.8
1999	33	3	9.1	18.2	60.6	97.0
2000	41			29.3	65.9	100.0
2001	56	3	5.4	25.0	62.5	94.6
2002	65	2	3.1	32.3	67.7	98.5 #
2003	66	1	1.5	24.2	43.9	93.9
2004	71	3	4.2	26.8	36.6	97.2
2005	76	1	1.3	39.5	55.3	94.7
2006	79	4	5.1	32.9	48.1	97.5
2007	94	4	4.3	31.9	51.1	88.3 # ##
2008	87	1	1.1	20.7	46.0	77.0
2009	111	1	0.9	30.6	36.0	72.1
2010	116	6	5.2	29.3	44.0	70.7
2011	101	1	1.0	16.8	32.7	69.3
2012	104			26.9	24.0	74.0
2013	67			38.8	7.5	97.0 ###
1998–2013	1212	30	2.5	28.1	43.7	85.6

\#   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	45	14	31	31.1
1999	33	10	23	30.3
2000	41	11	30	26.8
2001	56	21	35	37.5
2002	65	16	49	24.6
2003	66	20	46	30.3
2004	71	16	55	22.5
2005	76	16	60	21.1
2006	79	26	53	32.9
2007	94	34	60	36.2
2008	87	27	60	31.0
2009	111	41	70	36.9
2010	116	38	78	32.8
2011	101	40	61	39.6
2012	104	29	75	27.9
2013	67	25	42	37.3
1998-2013	1212	384	828	31.7

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 4.64 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	14	31	1.3	2.6	0.8	1.4	1.1	1.9	1.4	2.3
1999	10	23	0.9	1.9	0.5	0.9	0.8	1.3	1.0	1.5
2000	11	30	1.0	2.5	0.6	1.4	0.8	1.9	1.0	2.1
2001	21	35	1.8	2.9	1.0	1.4	1.5	2.1	1.8	2.4
2002	16	49	0.9	2.5	0.5	1.3	0.8	1.8	0.9	2.1
2003	20	46	1.1	2.3	0.7	1.3	1.0	1.7	1.1	2.0
2004	16	55	0.9	2.8	0.5	1.4	0.7	1.9	0.9	2.4
2005	16	60	0.8	3.0	0.5	1.4	0.7	2.0	0.9	2.6
2006	26	53	1.4	2.6	0.8	1.5	1.1	2.0	1.2	2.3
2007	34	60	1.5	2.6	0.9	1.2	1.3	1.7	1.5	2.1
2008	27	60	1.2	2.6	0.7	1.2	1.0	1.7	1.1	2.1
2009	41	70	1.8	3.0	1.1	1.7	1.5	2.3	1.7	2.6
2010	38	78	1.7	3.3	0.8	1.6	1.2	2.3	1.6	2.7
2011	40	61	1.8	2.6	1.0	1.4	1.4	1.9	1.7	2.2
2012	29	75	1.3	3.2	0.6	1.6	0.9	2.3	1.2	2.6
2013	25	42	1.1	1.8	0.6	0.8	0.9	1.2	1.0	1.5
1998-2013	384	828	1.3	2.7	0.7	1.4	1.1	1.9	1.3	2.2

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 diagnosis	Cases n	Mean	Std. dev.	Min.	Max.	10%	25%	Median 50%	75%	90%
1998	45	64.2	14.7	34.3	90.7	48.1	52.1	61.7	78.2	84.5
1999	33	66.9	18.2	30.8	94.8	39.4	56.3	67.0	81.9	89.8
2000	41	63.0	11.8	34.7	89.8	51.4	56.1	62.1	70.8	79.8
2001	56	64.6	15.2	35.3	92.5	43.4	54.9	62.6	77.8	85.5
2002	65	66.2	12.6	41.6	89.2	51.4	57.3	63.2	76.5	84.0
2003	66	62.4	15.5	35.2	91.9	41.9	49.4	62.1	74.4	85.6
2004	71	65.7	14.4	28.1	95.9	47.0	54.6	65.5	78.6	82.8
2005	76	67.7	12.9	32.2	91.7	47.8	59.7	68.8	78.6	83.2
2006	79	63.4	13.1	28.5	93.2	44.8	54.2	63.5	70.4	83.2
2007	94	67.8	14.7	28.6	94.9	47.2	56.5	68.1	80.0	87.2
2008	87	66.4	14.0	33.6	93.9	46.2	57.1	67.9	75.8	85.7
2009	111	63.6	13.5	23.8	102	47.1	54.1	64.0	72.0	81.6
2010	116	67.8	13.7	36.9	94.4	49.1	57.7	69.1	77.6	86.0
2011	101	64.6	13.6	22.8	101	47.4	54.8	63.8	74.0	82.3
2012	104	67.7	14.5	37.2	96.5	49.3	55.0	68.3	80.5	86.5
2013	67	66.7	14.0	32.1	94.0	49.4	56.5	67.5	77.1	86.4
1998-2013	1212	65.7	14.1	22.8	102	47.2	55.4	65.5	76.7	84.9

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	14	57.6	14.5	34.3	84.5	35.6	48.4	56.7	64.2	78.5
1999	10	63.4	18.4	30.8	86.7	33.7	54.9	66.0	77.6	85.4
2000	11	62.8	9.8	50.8	82.4	53.2	54.3	62.1	72.3	72.7
2001	21	61.6	13.2	37.4	82.1	42.8	56.4	61.8	66.8	79.3
2002	16	64.9	10.0	51.4	79.9	52.5	56.9	63.0	74.8	79.5
2003	20	60.1	13.9	35.2	85.9	40.9	50.4	58.4	69.8	76.4
2004	16	59.2	17.0	28.1	82.8	40.8	44.8	55.5	74.6	81.2
2005	16	63.3	10.0	47.8	82.6	50.6	58.8	61.7	69.7	80.3
2006	26	61.5	11.4	38.6	84.6	43.5	54.2	63.6	67.1	74.1
2007	34	66.2	13.4	45.4	93.9	47.5	56.1	65.7	78.8	87.2
2008	27	61.7	11.8	36.9	76.9	43.9	53.0	61.7	73.4	75.7
2009	41	63.3	13.3	37.5	102	46.3	54.1	65.5	70.0	77.8
2010	38	68.3	12.8	42.4	93.5	49.1	58.0	70.6	78.0	83.3
2011	40	64.3	12.7	33.3	89.4	48.5	54.4	64.3	74.7	79.3
2012	29	72.6	13.3	47.4	96.5	54.8	62.9	73.8	82.2	91.6
2013	25	65.1	14.1	32.1	88.4	47.1	56.5	65.7	73.2	84.4
1998-2013	384	64.1	13.3	28.1	102	46.2	54.9	64.2	73.9	81.2

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	31	67.1	14.0	44.6	90.7	49.5	57.1	65.9	78.6	85.7
1999	23	68.4	18.3	34.3	94.8	40.1	56.3	70.7	85.6	90.2
2000	30	63.2	12.6	34.7	89.8	49.4	56.1	62.8	70.8	80.6
2001	35	66.3	16.2	35.3	92.5	45.0	52.6	65.4	82.5	87.9
2002	49	66.6	13.4	41.6	89.2	48.9	58.8	64.4	76.8	87.3
2003	46	63.4	16.2	36.1	91.9	42.7	49.4	62.9	76.7	86.8
2004	55	67.7	13.2	39.6	95.9	49.0	58.1	66.5	79.7	83.2
2005	60	68.9	13.4	32.2	91.7	46.3	62.3	70.8	79.3	84.0
2006	53	64.3	13.9	28.5	93.2	49.0	54.4	63.5	77.5	83.6
2007	60	68.8	15.4	28.6	94.9	44.5	58.3	70.7	80.3	87.2
2008	60	68.5	14.5	33.6	93.9	47.9	58.3	68.9	80.2	86.9
2009	70	63.8	13.7	23.8	88.9	47.2	54.4	63.0	73.1	83.7
2010	78	67.6	14.1	36.9	94.4	48.1	57.5	67.3	76.8	87.1
2011	61	64.8	14.2	22.8	101	47.4	55.6	62.3	72.8	83.4
2012	75	65.8	14.6	37.2	92.5	49.2	53.4	63.9	79.2	86.0
2013	42	67.7	14.0	39.2	94.0	49.9	56.7	69.2	78.9	86.8
1998-2013	828	66.5	14.4	22.8	101	47.5	55.6	66.6	78.1	85.8

Table 4

Age distribution by 5-year age group and gender for period 1998-2013
(incl. DCO)

Age at diagnosis Years	Cases n	%	Cum.%	Males n	%	Cum.%	Females n	%	Cum.%
20-24	2	0.2	0.2			0.0	2	0.2	0.2
25-29	3	0.2	0.4	1	0.3	0.3	2	0.2	0.5
30-34	8	0.7	1.1	4	1.0	1.3	4	0.5	1.0
35-39	23	1.9	3.0	9	2.3	3.6	14	1.7	2.7
40-44	54	4.5	7.4	19	4.9	8.6	35	4.2	6.9
45-49	90	7.4	14.9	24	6.3	14.8	66	8.0	14.9
50-54	118	9.7	24.6	42	10.9	25.8	76	9.2	24.0
55-59	131	10.8	35.4	50	13.0	38.8	81	9.8	33.8
60-64	163	13.4	48.8	49	12.8	51.6	114	13.8	47.6
65-69	144	11.9	60.7	54	14.1	65.6	90	10.9	58.5
70-74	130	10.7	71.5	44	11.5	77.1	86	10.4	68.8
75-79	127	10.5	81.9	44	11.5	88.5	83	10.0	78.9
80-84	101	8.3	90.3	26	6.8	95.3	75	9.1	87.9
85+	118	9.7	100.0	18	4.7	100.0	100	12.1	100.0
All ages	1212	100.0		384	100.0		828	100.0	

Included in the statistics are 33.9% multiple primaries in males and 37.6% in females.

Table 5

Age-specific incidence, DCO rate and proportion of all cancers
for period 1998-2013

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=158258 %	Females Prop.all cancers n=153136 %
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		2	0.0	0.1				0.4
25-29	1	2	0.0	0.1			0.1	0.2
30-34	4	4	0.2	0.2			0.3	0.2
35-39	9	14	0.4	0.6			0.4	0.4
40-44	19	35	0.7	1.4			0.6	0.6
45-49	24	66	1.0	2.9			0.4	0.8
50-54	42	76	2.1	3.7			0.5	0.7
55-59	50	81	2.7	4.2	2.0		0.3	0.6
60-64	49	114	2.8	6.1			0.2	0.7
65-69	54	90	3.4	5.2	3.7		0.2	0.5
70-74	44	86	3.4	5.7	2.3		0.2	0.5
75-79	44	83	5.3	7.0	4.5	3.6	0.2	0.5
80-84	26	75	5.2	8.0	3.8	9.3	0.2	0.5
85+	18	100	5.3	11.2	5.6	12.0	0.2	0.6
All ages	384	828			2.1	2.7	0.2	0.5
Incidence								
Raw			1.3	2.7				
WS			0.7	1.4				
ES			1.1	1.9				
BRD-S			1.3	2.2				

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).

Table 6a

Standardized incidence ratio (SIR, with 95% confidence limits),
excess absolute risk (EAR) and DCO rate of second primaries
for period 1998-2013
MALES

Diagnosis		Observed n	Expected n	SIR	LCL 95%	UCL 95%		EAR	DCO %
C16	Stomach	3	0.6	5.2	1.1	15.2	#	25.1	
C18	Colon	2	1.4	1.5	0.2	5.3		6.6	
C19-C20	Rectum	4	0.8	5.2	1.4	13.2	#	33.4	
C33-C34	Lung	6	1.6	3.7	1.4	8.0	#	45.4	
C61	Prostate	7	4.1	1.7	0.7	3.5		30.4	
Other primaries		9	2.3	3.9	1.8	7.5	#	69.6	
Not observed		0	3.4	0.0	0.0	1.1		-35.4	
All mult. primaries		31	14.1	2.2	1.5	3.1	#	175.1	

Patients	266
Median age at second malignancy (years)	63.8
Person-years	964
Mean observation time (years)	3.6
Median observation time (years)	2.3

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 1998-2013
FEMALES

Diagnosis		Observed n	Expected n	SIR	LCL 95%	UCL 95%		EAR	DCO %
C16	Stomach	2	1.0	1.9	0.2	7.0		3.7	
C17	Small intestine	2	0.1	15.0	1.8	54.0	#	7.2	
C18	Colon	11	2.8	3.9	1.9	6.9	#	31.3	36.4
C19-C20	Rectum	4	1.2	3.3	0.9	8.3		10.6	
C25	Pancreas	2	1.2	1.6	0.2	5.8		2.9	
C33-C34	Lung	17	2.0	8.5	4.9	13.6	#	57.5	5.9
C50	Breast	16	8.8	1.8	1.0	3.0	#	27.8	6.3
C51	Vulva	4	0.3	14.4	3.9	36.9	#	14.3	
C53	Cervix uteri	3	0.4	7.6	1.6	22.2	#	10.0	33.3
C54	Corpus uteri	2	1.6	1.3	0.2	4.6		1.6	
C56	Ovary	2	1.2	1.7	0.2	6.2		3.2	
C73	Thyroid	3	0.5	5.8	1.2	16.9	#	9.5	
C82-C85	NHL	4	1.1	3.7	1.0	9.5	#	11.2	
C91-C96	Leukaemia	3	0.4	6.7	1.4	19.5	#	9.8	33.3
Other primaries		9	3.9	2.3	1.1	4.4	#	19.6	11.1
Not observed		0	2.1	0.0	0.0	1.8		-8.0	
All mult. primaries		84	28.7	2.9	2.3	3.6	#	212.4	10.7

Patients	607
Median age at second malignancy (years)	71.6
Person-years	2605
Mean observation time (years)	4.3
Median observation time (years)	3.2

The occurrence of second malignancy is statistically significant.

Observed second primaries with count 1 are pooled in category "Other primaries".
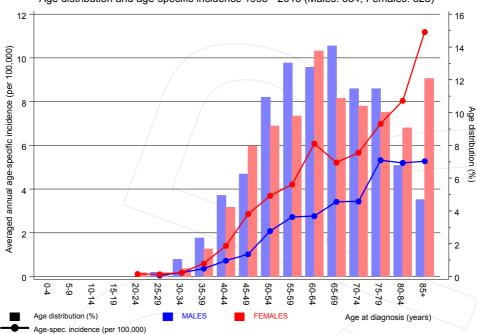
Figure 7. Age distribution and age-specific incidence

C21: Malignant neoplasm of anus and anal canal

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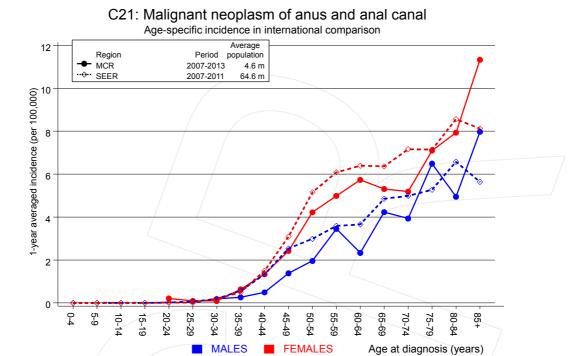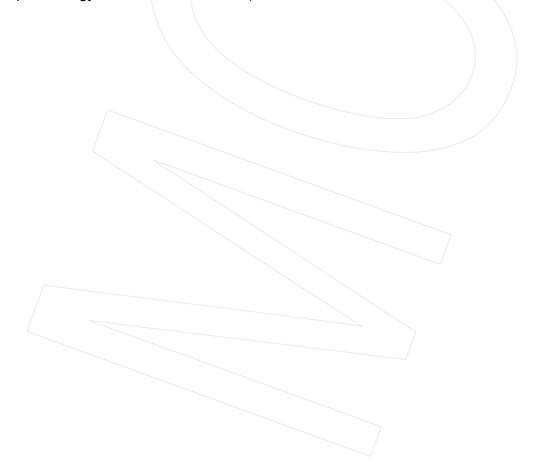
Figure 7a. Age-specific incidence in MCR registry areas compared to SEER (Surveillance, Epidemiology, and End Results, USA).

Reference:

Surveillance, Epidemiology, and End Results (SEER) Program SEER*Stat Database: Incidence - SEER 18 Regs Research Data, released April 2014, based on the November 2013 submission. http://www.seer.cancer.gov.

C21: Malignant neoplasm of anus and anal canal
Cumulative follow-up years since diagnosis for period 1998 - 2013 (excl. DCO)

Gender	n	Target Sum	Median	Actual Sum	Median
All patients					
Males	249	1096	3.0	1009	2.9
Females	561	2867	4.0	2691	3.8
Patients alive					
Males	139	820	5.2	732	4.6
Females	362	2350	5.7	2173	5.5
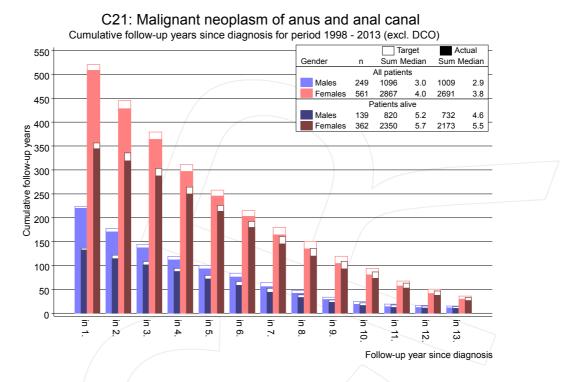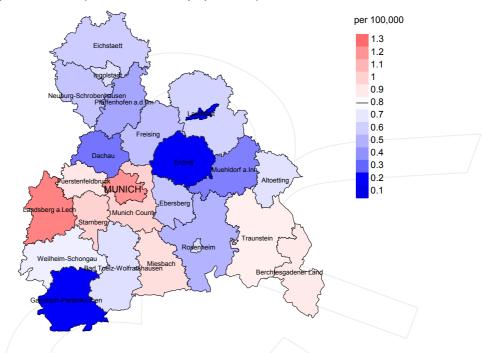
Figure 8. Cumulative follow-up years depending on time since diagnosis

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) 2007 - 2013: Males

Average incidence (world standard population) 2007 - 2013: Females
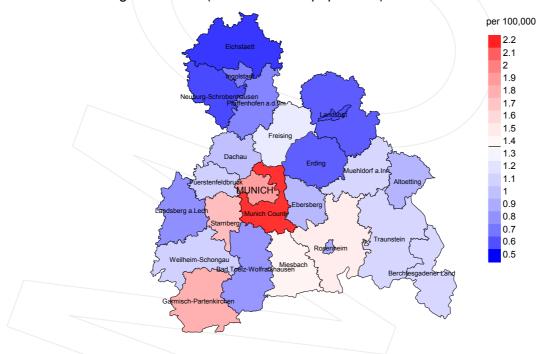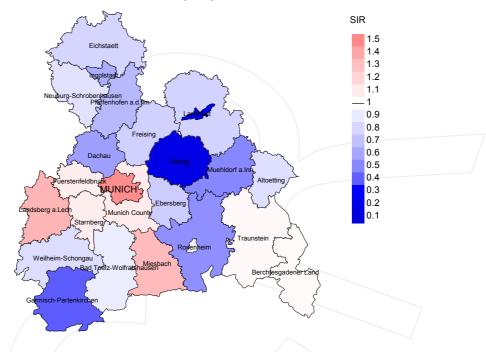
Figure 9a. Map of cancer incidence (world standard population, incl. DCO cases) by county averaged for period 2007 to 2013. According to their individual incidence rates, the counties are displayed in different red and blue color temperatures where the fine white color indicates the population mean (males 0.8/100,000 WS N=234, females 1.4/100,000 WS N=446).

The results should be interpreted with caution! E.g., in county Ebersberg with a population of 64,928 female residents (averaged) in the period from 2007 to 2013 a total of 7 women were identified with newly diagnosed anal cancer. Therefore, the mean incidence rate for this cancer type in this area can be calculated at 1.0/100,000 (world standard population). Though, the value of this parameter may vary with an underlying probability of 99% between 0.3 and 2.5/100,000.

Standardized incidence ratio (SIR) 2007 - 2013: Males

Standardized incidence ratio (SIR) 2007 - 2013: Females
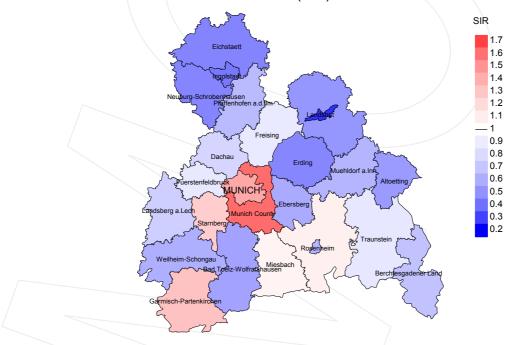
Figure 9b. Map of standardized incidence ratio (SIR, incl. DCO cases) by county averaged for period 2007 to 2013. According to their individual SIR values, the counties are displayed in different red and blue color temperatures where the fine white color indicates the population overall of 1.0 (males N=234, females N=446).

The results should be interpreted with caution! E.g., in county Ebersberg with a population of 64,642 female residents (averaged) in the period from 2007 to 2013 a total of 7 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 0.58. Though, the value of this parameter may vary with an underlying probability of 99% between 0.17 and 1.43, 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	45	97.8		27	60.0	88.9
1999	33	97.0	9.1	20	60.6	85.0
2000	41	100.0		27	65.9	96.3
2001	56	94.6	5.4	35	62.5	97.1
2002	65	98.5	3.1	44	67.7	97.7
2003	66	93.9	1.5	29	43.9	100.0
2004	71	97.2	4.2	26	36.6	100.0
2005	76	94.7	1.3	42	55.3	97.6
2006	79	97.5	5.1	38	48.1	97.4
2007	94	88.3	4.3	48	51.1	97.9
2008	87	77.0	1.1	40	46.0	100.0
2009	111	72.1	0.9	40	36.0	100.0
2010	116	70.7	5.2	51	44.0	96.1
2011	101	69.3	1.0	33	32.7	87.9
2012	104	74.0		25	24.0	96.0
2013	67	97.0		5	7.5	100.0
1998-2013	1212	85.6	2.5	530	43.7	96.4

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	45	13	84.6	4	8.9
1999	33	12	83.3	1	3.0
2000	41	19	84.2	4	9.8
2001	56	29	96.6	8	14.3
2002	65	35	97.1	8	12.3
2003	66	29	100.0	5	7.6
2004	71	34	100.0	5	7.0
2005	76	48	95.8	10	13.2
2006	79	44	100.0	6	7.6
2007	94	48	93.8	8	8.5
2008	87	43	97.7	6	6.9
2009	111	42	100.0	4	3.6
2010	116	70	100.0	20	17.2
2011	101	70	97.1	10	9.9
2012	104	58	100.0	11	10.6
2013	67	47	100.0	3	4.5
1998-2013	1212	641	97.3	113	9.3

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	13	61.5	38.5	90.9
1999	12	41.7	58.3	80.0
2000	19	89.5	10.5	100.0
2001	29	62.1	37.9	85.7
2002	35	85.7	14.3	91.2
2003	29	82.8	17.2	89.7
2004	34	76.5	23.5	88.2
2005	48	83.3	16.7	91.3
2006	44	65.9	34.1	79.5
2007	48	64.6	35.4	80.0
2008	43	81.4	18.6	90.5
2009	42	69.0	31.0	92.9
2010	70	75.7	24.3	87.1
2011	70	78.6	21.4	89.7
2012	58	69.0	31.0	75.9
2013	47	59.6	40.4	68.1
1998-2013	641	73.0	27.0	85.4

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	3	54.9	46.7	61.7	54.9
1999	3	59.9	62.8	58.9	62.8
2000	4	60.1	51.7	88.4	68.5
2001	12	75.3	74.7	82.1	75.8
2002	10	62.1	55.4	66.8	58.3
2003	11	63.5	60.4	76.5	61.9
2004	11	69.9	69.7	69.9	68.6
2005	16	70.1	70.1	74.9	70.1
2006	15	63.5	63.3	65.6	63.4
2007	15	71.6	70.5	71.6	71.8
2008	14	69.7	69.7	69.0	70.2
2009	10	70.9	66.6	80.9	68.9
2010	31	69.0	70.8	63.4	70.8
2011	24	72.3	72.3	67.6	72.0
2012	19	74.0	71.2	83.1	75.2
2013	21	80.1	71.9	86.3	71.9
1998-2013	219	69.3	68.7	72.9	69.2

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	10	77.7	59.6	86.4	72.5
1999	9	86.9	75.5	87.8	77.7
2000	15	80.3	80.4	34.8	80.3
2001	17	82.9	78.7	85.8	82.9
2002	25	81.9	82.1	60.4	82.1
2003	18	82.0	81.8	89.3	82.0
2004	23	83.2	77.2	91.9	81.6
2005	32	80.0	80.0	83.0	80.0
2006	29	80.0	80.3	80.0	80.0
2007	33	80.0	76.2	84.5	77.8
2008	29	81.6	80.7	84.5	80.9
2009	32	74.6	73.6	80.8	74.0
2010	39	83.3	79.8	85.8	83.3
2011	46	75.0	73.2	78.8	74.3
2012	39	79.6	77.3	86.5	77.7
2013	26	80.6	78.1	85.7	80.6
1998-2013	422	80.5	77.8	85.7	79.8

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	0.10	0.1	0.10	0.1	0.08	0.1	0.07
2000	3	0.3	0.27	0.2	0.35	0.3	0.32	0.3	0.29
2001	9	0.8	0.43	0.4	0.41	0.7	0.48	1.0	0.54
2002	6	0.3	0.38	0.2	0.45	0.3	0.39	0.3	0.33
2003	9	0.5	0.45	0.3	0.45	0.4	0.42	0.5	0.41
2004	8	0.4	0.50	0.2	0.40	0.3	0.45	0.5	0.51
2005	12	0.6	0.75	0.3	0.61	0.5	0.64	0.6	0.73
2006	9	0.5	0.35	0.3	0.36	0.4	0.39	0.5	0.41
2007	8	0.4	0.24	0.2	0.22	0.3	0.23	0.3	0.22
2008	12	0.5	0.44	0.3	0.39	0.4	0.42	0.5	0.46
2009	6	0.3	0.15	0.1	0.14	0.2	0.14	0.2	0.14
2010	25	1.1	0.66	0.5	0.66	0.8	0.67	1.0	0.65
2011	20	0.9	0.50	0.4	0.44	0.7	0.47	0.9	0.52
2012	15	0.7	0.52	0.3	0.54	0.5	0.54	0.6	0.53
2013	12	0.5	0.48	0.2	0.37	0.3	0.40	0.5	0.46
1998-2013	156	0.5	0.41	0.3	0.38	0.4	0.39	0.5	0.41

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	7	0.6	0.23	0.3	0.20	0.4	0.21	0.5	0.21
1999	4	0.3	0.17	0.1	0.15	0.2	0.17	0.3	0.18
2000	14	1.2	0.47	0.4	0.31	0.7	0.35	0.9	0.43
2001	9	0.7	0.26	0.3	0.20	0.5	0.22	0.6	0.25
2002	24	1.2	0.49	0.4	0.32	0.7	0.36	0.9	0.42
2003	15	0.8	0.33	0.2	0.19	0.4	0.23	0.5	0.27
2004	18	0.9	0.33	0.4	0.26	0.6	0.29	0.7	0.29
2005	28	1.4	0.47	0.5	0.35	0.8	0.38	1.1	0.42
2006	20	1.0	0.38	0.4	0.27	0.6	0.28	0.8	0.32
2007	23	1.0	0.38	0.4	0.34	0.6	0.35	0.8	0.36
2008	23	1.0	0.38	0.3	0.26	0.5	0.29	0.7	0.35
2009	23	1.0	0.33	0.4	0.23	0.6	0.26	0.7	0.28
2010	28	1.2	0.36	0.5	0.29	0.7	0.30	0.8	0.30
2011	35	1.5	0.57	0.6	0.41	0.9	0.45	1.1	0.50
2012	25	1.1	0.33	0.4	0.23	0.6	0.25	0.8	0.29
2013	16	0.7	0.38	0.2	0.27	0.3	0.28	0.5	0.34
1998-2013	312	1.0	0.38	0.4	0.27	0.6	0.30	0.7	0.33

Table 13

Age distribution of age at death (cancer-related) for period 1998-2013
(incl. multiple primaries)

Age at death Years	Cases n	%	Cum.%	Males n	%	Cum.%	Females n	%	Cum.%
30-34	1	0.2	0.2			0.0	1	0.3	0.3
35-39	1	0.2	0.4	1	0.6	0.6			0.3
40-44	11	2.4	2.8	7	4.5	5.1	4	1.3	1.6
45-49	22	4.7	7.5	6	3.8	9.0	16	5.1	6.7
50-54	24	5.1	12.6	10	6.4	15.4	14	4.5	11.2
55-59	32	6.8	19.4	18	11.5	26.9	14	4.5	15.7
60-64	43	9.2	28.6	17	10.9	37.8	26	8.3	24.0
65-69	50	10.7	39.3	24	15.4	53.2	26	8.3	32.4
70-74	60	12.8	52.1	25	16.0	69.2	35	11.2	43.6
75-79	53	11.3	63.5	21	13.5	82.7	32	10.3	53.8
80-84	70	15.0	78.4	15	9.6	92.3	55	17.6	71.5
85+	101	21.6	100.0	12	7.7	100.0	89	28.5	100.0
All ages	468	100.0		156	100.0		312	100.0	

Included in the statistics are 33.9% multiple primaries in males and 37.6% in females.

Table 14

Age-specific mortality (cancer-related) and proportion of all cancers
for period 1998-2013
(**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		0.0	0.25		0.4
35-39	1		0.0	0.11	0.0		0.3	
40-44	7	4	0.3	0.37	0.2	0.11	0.8	0.4
45-49	6	16	0.3	0.25	0.7	0.24	0.3	0.8
50-54	10	14	0.5	0.24	0.7	0.18	0.3	0.5
55-59	18	14	1.0	0.36	0.7	0.17	0.3	0.3
60-64	17	26	1.0	0.35	1.4	0.23	0.2	0.4
65-69	24	26	1.5	0.44	1.5	0.29	0.2	0.3
70-74	25	35	2.0	0.57	2.3	0.41	0.2	0.4
75-79	21	32	2.5	0.48	2.7	0.39	0.2	0.3
80-84	15	55	3.0	0.58	5.9	0.73	0.1	0.5
85+	12	89	3.5	0.67	10.0	0.89	0.1	0.7
All ages	156	312					0.2	0.4
Mortality								
Raw			0.5	0.41	1.0	0.38		
WS			0.3	0.38	0.4	0.27		
ES			0.4	0.39	0.6	0.30		
BRD-S			0.5	0.41	0.7	0.33		
PYLL-70								
per 100,000			3.5		4.5			
ES			3.1		3.8			
AYLL-70			11.4		11.8			

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

Table 15a

Multiple primaries in deaths in period 1998-2013
MALES

Diagnosis	Total n	Total %↓	Pre n	Pre ←%	Syn-chron ±30d n	Syn-chron ±30d ←%	Post n	Post ←%
C03-C06 Oral cavity	1	1.5	1	100.0				
C09-C10 Oropharynx	3	4.5	1	33.3	1	33.3	1	33.3
C12-C13 Hypopharynx	1	1.5	1	100.0				
C15 Oesophagus	3	4.5	2	66.7			1	33.3
C16 Stomach	3	4.5	1	33.3			2	66.7
C18 Colon	7	10.4	4	57.1			3	42.9
C19-C20 Rectum	6	9.0			2	33.3	4	66.7
C32 Larynx	1	1.5	1	100.0				
C33-C34 Lung	10	14.9			3	30.0	7	70.0
C43 Malign. melanoma	2	3.0	1	50.0			1	50.0
C44 Skin others	6	9.0	2	33.3	1	16.7	3	50.0
C60 Penis	1	1.5	1	100.0				
C61 Prostate	9	13.4	4	44.4	1	11.1	4	44.4
C64 Kidney	1	1.5	1	100.0				
C67 Bladder	4	6.0	2	50.0	1	25.0	1	25.0
C70-C72 CNS cancer	3	4.5	1	33.3	1	33.3	1	33.3
C73 Thyroid	1	1.5	1	100.0				
C82-C85 NHL	3	4.5	2	66.7			1	33.3
C90 Mult. myeloma	1	1.5	1	100.0				
C91-C96 Leukaemia	1	1.5					1	100.0
All mult. primaries	67	100.0	27	40.3	10	14.9	30	44.8
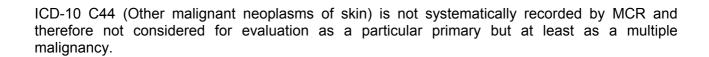
ICD-10 C44 (Other malignant neoplasms of skin) is not systematically recorded by MCR and therefore not considered for evaluation as a particular primary but at least as a multiple malignancy.

Table 15b

Multiple primaries in deaths in period 1998-2013
FEMALES

Diagnosis	Total n	Total %↓	Pre n	Pre ←%	Syn-chron ±30d n	Syn-chron ±30d ←%	Post n	Post ←%
C03-C06 Oral cavity	3	1.8	3	100.0				
C09-C10 Oropharynx	3	1.8	1	33.3			2	66.7
C15 Oesophagus	2	1.2			1	50.0	1	50.0
C16 Stomach	8	4.9	1	12.5	1	12.5	6	75.0
C18 Colon	19	11.6	6	31.6	2	10.5	11	57.9
C19-C20 Rectum	6	3.7	1	16.7	4	66.7	1	16.7
C21 Anus/canal	2	1.2			1	50.0	1	50.0
C25 Pancreas	3	1.8					3	100.0
C33-C34 Lung	18	11.0	2	11.1	3	16.7	13	72.2
C43 Malign. melanoma	3	1.8	2	66.7			1	33.3
C44 Skin others	5	3.0	1	20.0			4	80.0
C50 Breast	23	14.0	11	47.8	5	21.7	7	30.4
C51 Vulva	7	4.3	3	42.9			4	57.1
C52 Vagina	2	1.2	2	100.0				
C53 Cervix uteri	17	10.4	15	88.2			2	11.8
C54 Corpus uteri	5	3.0	2	40.0			3	60.0
C56 Ovary	2	1.2	2	100.0				
C64 Kidney	2	1.2	1	50.0	1	50.0		
C67 Bladder	2	1.2	2	100.0				
C70-C72 CNS cancer	4	2.4	1	25.0	1	25.0	2	50.0
C73 Thyroid	3	1.8					3	100.0
C76-C79 CUP	2	1.2					2	100.0
C82-C85 NHL	10	6.1	6	60.0			4	40.0
C90 Mult. myeloma	3	1.8	1	33.3			2	66.7
C91-C96 Leukaemia	6	3.7	2	33.3			4	66.7
Other primaries	4	2.4	1	25.0			3	75.0
All mult. primaries	164	100.0	66	40.2	19	11.6	79	48.2

Multiple primaries with number of cases 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 1998-2013
(**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		0.0	0.33		0.5
35-39			0.0		0.0			
40-44	7	2	0.3	0.39	0.1	0.06	0.9	0.2
45-49	5	16	0.2	0.24	0.7	0.28	0.3	0.9
50-54	9	11	0.4	0.24	0.5	0.16	0.3	0.4
55-59	15	13	0.8	0.34	0.7	0.19	0.3	0.3
60-64	13	21	0.7	0.30	1.1	0.24	0.2	0.4
65-69	18	18	1.1	0.44	1.0	0.26	0.2	0.3
70-74	16	25	1.2	0.53	1.6	0.40	0.1	0.3
75-79	15	21	1.8	0.48	1.8	0.38	0.2	0.2
80-84	14	40	2.8	0.67	4.3	0.73	0.2	0.5
85+	10	71	2.9	0.71	7.9	0.89	0.1	0.6
All ages	122	239					0.2	0.4

Mortality						
Raw	0.4	0.39	0.8	0.36
WS	0.2	0.35	0.3	0.26
ES	0.3	0.37	0.4	0.29
BRD-S	0.4	0.40	0.6	0.32

PYLL-70		
per 100,000	3.0	3.8
ES	2.6	3.3
AYLL-70	11.8	12.3

* See corresponding tables with multiple primaries.

Table 17

Age-specific mortality (cancer-related) and proportion of all cancers
for period 1998-2013
(**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		0.0	0.33		0.5
35-39			0.0		0.0			
40-44	6	1	0.2	0.38	0.0	0.03	0.8	0.1
45-49	4	16	0.2	0.22	0.7	0.31	0.3	1.0
50-54	8	10	0.4	0.23	0.5	0.16	0.3	0.4
55-59	13	10	0.7	0.35	0.5	0.17	0.3	0.3
60-64	7	15	0.4	0.19	0.8	0.19	0.1	0.3
65-69	14	13	0.9	0.39	0.8	0.21	0.2	0.2
70-74	13	19	1.0	0.46	1.3	0.34	0.1	0.3
75-79	13	17	1.6	0.45	1.4	0.35	0.2	0.2
80-84	12	28	2.4	0.71	3.0	0.57	0.2	0.4
85+	10	56	2.9	0.71	6.3	0.74	0.2	0.6
All ages	100	186					0.2	0.4
Mortality								
Raw			0.3	0.36	0.6	0.31		
WS			0.2	0.32	0.2	0.23		
ES			0.3	0.34	0.3	0.25		
BRD-S			0.3	0.37	0.4	0.28		
PYLL-70								
per 100,000			2.4		3.3			
ES			2.1		2.8			
AYLL-70			12.4		13.2			

* See corresponding tables with multiple primaries.

C21: Malignant neoplasm of anus and anal canal

Age distribution and age-specific mortality 1998 - 2013 (Males: 156, Females: 312)
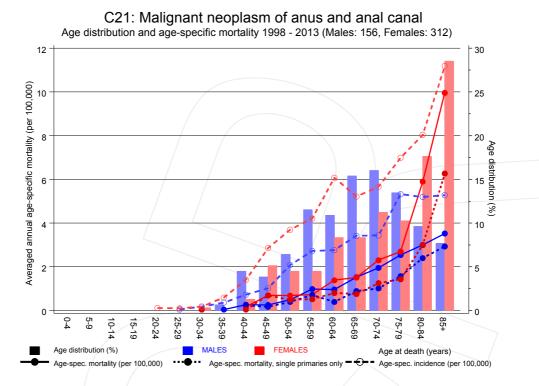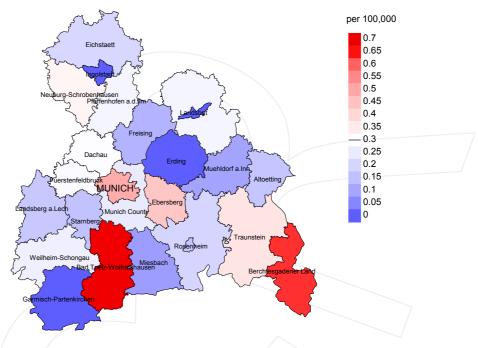
Figure 18. Distribution of age at death (bars) and age-specific mortality (all patients: solid line, patients with single primaries: dotted line). The age-specific incidence is additionally plotted for comparison (dashed line).

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) 2007 - 2013: Males

Average mortality (world standard population) 2007 - 2013: Females
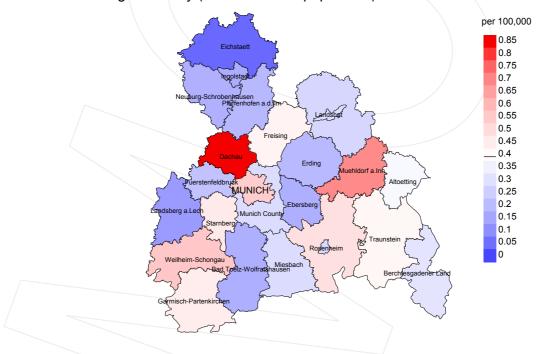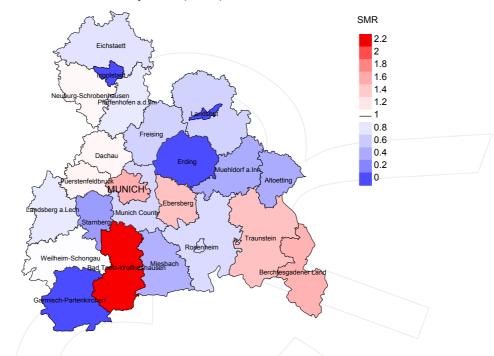
Figure 19a. Map of cancer mortality (world standard population) by county averaged for period 2007 to 2013. According to their individual mortality rates, the counties are displayed in different red and blue color temperatures where the fine white color indicates the population mean (males 0.3/100,000 WS N=97, females 0.4/100,000 WS N=173).

The results should be interpreted with caution! E.g., in county Ebersberg with a population of 64,928 female residents (averaged) in the period from 2007 to 2013 a total of 2 women died from anal cancer. Therefore, the mean mortality rate for this cancer type in this area can be calculated at 0.2/100,000 (world standard population). Though, the value of this parameter may vary with an underlying probability of 99% between 0.0 and 0.8/100,000.

Standardized mortality ratio (SMR) 2007 - 2013: Males

Standardized mortality ratio (SMR) 2007 - 2013: Females
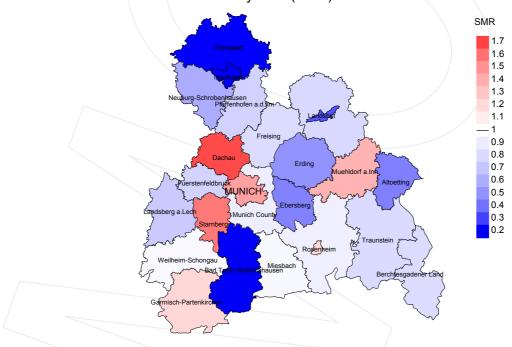
Figure 19b. Map of standardized mortality ratio (SMR, incl. DCO cases) by county averaged for period 2007 to 2013. According to their individual SMR values, the counties are displayed in different red and blue color temperatures where the fine white color indicates the population overall of 1.0 (males N=97, females N=173).

The results should be interpreted with caution! E.g., in county Ebersberg with a population of 64,642 female residents (averaged) in the period from 2007 to 2013 a total of 2 women died from anal cancer. Therefore, the mean standardized mortality ratio (SMR) for this cancer type in this area can be calculated at 0.45. Though, the value of this parameter may vary with an underlying probability of 99% between 0.02 and 2.07, 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 cancer-related death for patients who have no therapeutic restrictions due to a previous or synchronous cancer. These statistics are comparable to studies that have exclusion criteria based on a second malignancy.

3. **Single primary** (no information about other prior, syn- or metachronous malignancy)

   The mortality statistic describes the tumor-specific death that occurs without any impact through secondary primaries, earlier, synchronous, later or induced. Precisely the difference between disease group 1 and 2 highlight the magnitude of the problem of secondary malignancies.

For this reason differences appear concerning official mono-causal mortality statistics. To judge the maximum deviation, 2 further tables are presented. In the first table the distribution of secondary malignancies before, at or after the described cancer are shown, that could be an alternative cause of death. In the second table, the age-specific mortality rates for all courses of disease, without designation of secondary malignancies are shown.

A previously minimally acknowledged statistic is the **age at death**, which allows for a good assessment of the quality of classification of the apparent tumor-specific death. For assumed tumor-independent deaths, the age of death should be estimated from the age of diagnosis and the normal life expectancy, whereas tumor-dependent deaths can be estimated from the age of diagnosis plus the average tumor-specific life expectancy. The comparison of different tumors demonstrates this association, if the causes of cancer and the competing cause of death are independent of each other (e.g. breast and colon versus head/neck and lung).

The index from mortality and incidence (Mortality-Incidence ratio, **MI-index**) is a statistic that allows for the evaluation of the quality of data. For diseases with poor prognoses, comparable values are obtained from all age groups, because to a large extent, the numerator and denominator contain the same cases. For tumors with a good prognosis, increasing and decreasing incidence and age-specific differences in prognosis can more strongly alter the MI- index. Additionally, attention should be paid to the confidence intervals where fewer cases are reported.

The complexity of problems identified here emphasizes the importance of relative survival data for the appropriate analysis of long term results.

As a measurement of the burden of disease, the number of potential life years loss due to premature deaths in a cohort can be calculated (**PYLL**, potential years of life lost, standardized per 100,000 persons or per European standard) as well as the average loss of life years per individual (**AYLL**, average years of life lost). Depending upon the analytic aim (health economy, prevention, health care research) different methods exist for the generation of these measurements. In the results presented here, the age for a premature death is considered to be before 70 years, according to the guidelines of the OECD and the WHO (as seen in the abbreviation PYLL-70 or AYLL-70).

Shortcuts

FRG	Federal Republic of Germany
GEKID	Association of Population-based Cancer Registries in Germany
	(Gesellschaft der epidemiologischen Krebsregister in Deutschland e.V.)
MCR	Munich Cancer Registry (Tumorregister München)
SEER	Surveillance, Epidemiology, and End Results (USA)

AYLL-70	Average years of life lost prior to age 70 given a person dies before that age
BRD-S	German standard population
DCO	Death certificate only
EAR	Excess absolute risk
	= excess cancer cases (O - E) per 10,000 person-years
ES	European standard population (old)
LCL	Lower confidence limit
MI-index	Ratio between mortality and incidence
PYLL-70	Potential years of life lost prior to age 70 given a person dies before that age
SIR	Standardized incidence ratio
SMR	Standardized mortality ratio
UCL	Upper confidence limit
WS	World standard population

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