Munich Cancer Registry

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ICD-10 C21: Anal cancer

Incidence and Mortality

Year of diagnosis	1998-2016
Patients	1,514
Diseases	1,514
Creation date	08/21/2018
Export date	08/09/2018
Population	4.81 m

Munich Cancer Registry
Cancer Registry Bavaria - Upper Bavaria Regional Center
at Klinikum Grosshadern/IBE
Marchioninistr. 15
Munich, 81377
Germany

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

https://www.tumorregister-muenchen.de/en/facts/base/bC21__E-ICD-10-C21-Anal-cancer-incidence-and-mortality.pdf

Index of figures and tables

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 4.69 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, August 2018

[#] 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 2.65 million to 4.10 in 2002, and to 4.69 million in 2007).

[##] Due to the high frequency and good prognosis of non-malignant skin cancer (C44), no systematic ascertainment is performed for this diagnosis. C44 is not designated as a primary, but rather as a secondary tumor.

[###] DCO (death certificate only) identifies a cancer case that first becomes available to the MCR through the death certificate.

ICD-10 codes (ICD-10 2015) used for specifying cancer site

Code	Description
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

Cases with invasive cancer by year of diagnosis, proportions of DCO, further malignancies, deaths, and active follow-up (ALL PATIENTS) (incl. DCO)

Year of diagnosis	All cases n	DCO cases n	Prop. DCO %	Prop. at least 1 further malign. prior + synchron. %	Prop. at least 1 further malign. after %	Prop. deaths %	Prop. actively followed %
1998	46			8.7	13.4	67.4	97.8
1999	34	3	8.8	6.3	13.0	61.8	97.1
2000	41			7.4	12.9	73.2	95.1
2001	56	3	5.4	8.5	12.7	62.5	92.9
2002	65	2	3.1	10.3	12.5	67.7	96.9 #
2003	67	1	1.5	10.0	11.9	47.8	91.0
2004	73	2	2.7	11.0	11.4	43.8	98.6
2005	76	1	1.3	13.1	10.9	60.5	92.1
2006	81	4	4.9	14.5	10.7	53.1	93.8
2007	94	4	4.3	15.2	10.0	56.4	81.9 #
2008	87	1	1.1	15.0	9.4	47.1	75.9
2009	112	1	0.9	15.7	9.3	43.8	74.1
2010	118	6	5.1	16.6	7.6	51.7	75.4
2011	104	1	1.0	16.3	7.4	40.4	72.1
2012	105			17.0	5.8	43.8	74.3
2013	108			18.0	6.0	30.6	68.5
2014	110	4	3.6	17.9	4.1	27.3	71.8
2015	70	2	2.9	18.3	2.2	20.0	98.6
2016	67	4	6.0	18.6	4.5	19.4	73.1 ##
1998-2016	1514	39	2.6	18.6	13.4	46.0	82.6

1,514 cases diagnosed 1998-2016 are related to a total of 1,514 patients. Currently, in 469 (31.0 %) of these 1,514 patients more than one malignancy of any cancer type has been registered. Hereby, groups of 360 / 85 / 24 (23.8 % / 5.6 % / 1.6 %) patients exist having 2 / 3 / 4+ malignancies.

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 retreived from the respective headings.

How to interpret:
In 2014, a subgroup of 110 cases has been diagnosed, of which 17.9 % previously and/or concurrently (synchronously) had at least one other malignancy of any cancer type. In 4.1 % of cases, at least one new malignancy has occurred during the follow-up period (all numbers refer to the date of the database export, see cover sheet).

Table 1a

Cases with invasive cancer by year of diagnosis, proportions of DCO, further malignancies, deaths, and active follow-up (MALES) (incl. DCO)

Year of diagnosis	Males n	Males %	DCO cases n	Prop. DCO %	Prop. at least 1 further malign. prior + synchron. %	Prop. at least 1 further malign. after %	Prop. deaths %	Prop. actively followed %
1998	15	32.6			6.7	15.0	73.3	93.3
1999	10	29.4	1	10.0	4.0	14.6	70.0	100.0
2000	11	26.8			2.8	14.1	54.5	90.9
2001	21	37.5	1	4.8	7.0	14.2	81.0	95.2
2002	16	24.6			9.6	13.5	81.3	100.0 #
2003	21	31.3	1	4.8	9.6	13.3	61.9	95.2
2004	17	23.3			8.1	12.7	52.9	94.1
2005	16	21.1			10.2	12.2	62.5	87.5
2006	26	32.1			12.4	11.8	61.5	96.2
2007	35	37.2			12.8	11.2	60.0	85.7 #
2008	27	31.0			13.0	11.2	37.0	70.4
2009	41	36.6	1	2.4	12.9	11.2	48.8	75.6
2010	39	33.1	3	7.7	13.9	10.0	71.8	92.3
2011	43	41.3			13.9	10.4	48.8	76.7
2012	29	27.6			15.3	8.1	58.6	82.8
2013	39	36.1			16.5	9.2	38.5	71.8
2014	38	34.5			16.4	8.5	28.9	76.3
2015	25	35.7			16.4	6.8	20.0	96.0
2016	20	29.9	1	5.0	16.6	15.0	30.0	85.0 ##
1998-2016	489	32.3	8	1.6	16.6	15.0	52.4	85.1

489 cases diagnosed 1998-2016 are related to a total of 489 patients. Currently, in 149 (30.5 %) of these 489 patients more than one malignancy of any cancer type has been registered. Hereby, groups of 114 / 29 / 6 (23.3 % / 5.9 % / 1.2 %) patients exist having 2 / 3 / 4+ malignancies.

\# 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 retreived from the respective headings.

How to interpret:
In 2014, a subgroup of 38 cases has been diagnosed, of which 16.4 % previously and/or concurrently (synchronously) had at least one other malignancy of any cancer type. In 8.5 % of cases, at least one new malignancy has occurred during the follow-up period (all numbers refer to the date of the database export, see cover sheet).

Table 1b

Cases with invasive cancer by year of diagnosis, proportions of DCO, further malignancies, deaths, and active follow-up (FEMALES)
(incl. DCO)

Year of diagnosis	Females n	Females %	DCO cases n	Prop. DCO %	Prop. at least 1 further malign. prior + synchron. %	Prop. at least 1 further malign. after %	Prop. deaths %	Prop. actively followed %	
1998	31	67.4			9.7	12.6	64.5	100.0	
1999	24	70.6	2	8.3	7.3	12.3	58.3	95.8	
2000	30	73.2			9.4	12.3	80.0	96.7	
2001	35	62.5	2	5.7	9.2	11.9	51.4	91.4	
2002	49	75.4	2	4.1	10.7	12.0	63.3	95.9	#
2003	46	68.7			10.2	11.3	41.3	89.1	
2004	56	76.7	2	3.6	12.2	10.8	41.1	100.0	
2005	60	78.9	1	1.7	14.2	10.2	60.0	93.3	
2006	55	67.9	4	7.3	15.3	10.1	49.1	92.7	
2007	59	62.8	4	6.8	16.2	9.3	54.2	79.7	#
2008	60	69.0	1	1.7	15.8	8.5	51.7	78.3	
2009	71	63.4			17.0	8.3	40.8	73.2	
2010	79	66.9	3	3.8	17.9	6.4	41.8	67.1	
2011	61	58.7	1	1.6	17.5	5.8	34.4	68.9	
2012	76	72.4			17.8	4.6	38.2	71.1	
2013	69	63.9			18.7	4.4	26.1	66.7	
2014	72	65.5	4	5.6	18.5	1.9	26.4	69.4	
2015	45	64.3	2	4.4	19.2	0.0	20.0	100.0	
2016	47	70.1	3	6.4	19.5	0.0	14.9	68.1	##
1998-2016	1025	67.7	31	3.0	19.5	12.6	42.9	81.4	

1,025 cases diagnosed 1998-2016 are related to a total of 1,025 patients. Currently, in 320 (31.2 %) of these 1,025 patients more than one malignancy of any cancer type has been registered. Hereby, groups of 246 / 56 / 18 (24.0 % / 5.5 % / 1.8 %) patients exist having 2 / 3 / 4+ malignancies.

\# 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 retreived from the respective headings.

How to interpret:
In 2014, a subgroup of 72 cases has been diagnosed, of which 18.5 % previously and/or concurrently (synchronously) had at least one other malignancy of any cancer type. In 1.9 % of cases, at least one new malignancy has occurred during the follow-up period (all numbers refer to the date of the database export, see cover sheet).

Table 2

Incidence measures by year of diagnosis including DCO cases
(with respect to registry area expansion from 2.65 to 4.10 m as of 2002,
and from 4.10 to 4.81 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	15	31	1.4	2.6	0.9	1.4	1.2	1.9	1.4	2.3
1999	10	24	0.9	2.0	0.5	0.9	0.8	1.3	1.0	1.6
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	21	46	1.1	2.3	0.7	1.3	1.0	1.7	1.1	2.0
2004	17	56	0.9	2.8	0.6	1.4	0.8	2.0	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	55	1.4	2.7	0.8	1.5	1.1	2.1	1.2	2.4
2007	35	59	1.6	2.6	0.9	1.1	1.3	1.6	1.6	2.1
2008	27	60	1.2	2.6	0.7	1.2	1.0	1.7	1.1	2.1
2009	41	71	1.8	3.1	1.1	1.7	1.5	2.3	1.7	2.6
2010	39	79	1.7	3.4	0.8	1.6	1.3	2.3	1.7	2.8
2011	43	61	1.9	2.6	1.0	1.4	1.5	1.9	1.8	2.2
2012	29	76	1.3	3.2	0.6	1.6	0.9	2.3	1.2	2.6
2013	39	69	1.7	2.9	0.9	1.4	1.3	2.0	1.5	2.3
2014	38	72	1.6	3.0	0.9	1.6	1.3	2.1	1.5	2.4
2015	25	45	1.1	1.8	0.6	0.9	0.9	1.3	0.9	1.5
2016	20	47	0.8	1.9	0.5	1.0	0.6	1.4	0.7	1.5
1998-2016	489	1025	1.3	2.7	0.8	1.4	1.1	1.9	1.3	2.2

The computation of the incidence measures includes all cancers, 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	46	64.1	14.5	34.3	90.7	48.1	52.1	62.2	78.2	84.5
1999	34	67.5	18.2	30.8	94.8	39.4	56.3	67.2	84.2	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	67	62.4	15.4	35.2	91.9	41.9	49.4	62.7	74.4	85.6
2004	73	65.5	14.4	28.1	95.9	47.0	54.6	64.3	78.2	82.8
2005	76	67.7	12.9	32.2	91.7	47.8	59.7	68.8	78.6	83.2
2006	81	63.5	13.0	28.5	93.2	45.3	54.4	63.8	70.0	82.0
2007	94	68.0	14.4	28.6	94.9	47.5	56.7	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	112	63.7	13.5	23.8	102	47.1	54.2	64.4	72.1	81.6
2010	118	67.8	13.5	36.9	94.4	49.1	58.0	68.8	77.6	86.0
2011	104	64.6	13.4	22.8	101	47.4	54.7	64.1	74.0	82.3
2012	105	67.8	14.5	37.2	96.5	49.3	55.3	68.8	80.5	86.5
2013	108	66.2	13.8	32.1	96.7	48.7	56.4	65.7	76.1	85.8
2014	110	65.0	14.4	1.4	93.5	45.8	56.1	67.1	75.2	82.6
2015	70	65.7	12.3	33.8	92.7	49.2	58.0	66.1	74.0	80.2
2016	67	66.0	12.8	36.4	95.6	53.2	57.1	63.7	74.5	85.2
1998-2016	1514	65.7	13.9	1.4	102	47.4	55.8	65.5	76.2	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	15	58.0	14.0	34.3	84.5	35.6	48.4	58.4	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	21	60.3	13.5	35.2	85.9	41.3	51.2	59.0	69.5	76.3
2004	17	58.6	16.6	28.1	82.8	40.8	44.9	54.9	70.6	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	35	66.0	13.2	45.4	93.9	47.5	56.1	65.3	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	39	68.2	12.7	42.4	93.5	49.1	58.0	70.6	78.0	83.3
2011	43	64.4	12.4	33.3	89.4	49.6	54.5	64.9	74.1	79.1
2012	29	72.6	13.3	47.4	96.5	54.8	62.9	73.8	82.2	91.6
2013	39	64.6	13.7	32.1	88.4	44.9	53.5	65.7	73.2	81.9
2014	38	64.1	12.1	40.1	84.1	42.7	54.0	66.1	72.5	79.4
2015	25	63.8	12.9	33.8	90.2	50.7	55.5	65.9	70.2	78.8
2016	20	64.8	11.4	44.7	85.2	52.5	56.1	62.0	75.5	81.3
1998-2016	489	64.1	13.0	28.1	102	46.3	54.9	64.2	73.4	80.9

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	24	69.2	18.3	34.3	94.8	40.1	56.6	71.5	86.2	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	56	67.5	13.1	39.6	95.9	49.0	59.3	66.0	78.9	83.2
2005	60	68.9	13.4	32.2	91.7	46.3	62.3	70.8	79.3	84.0
2006	55	64.4	13.7	28.5	93.2	49.0	54.4	64.4	77.5	83.6
2007	59	69.2	15.1	28.6	94.9	44.6	58.9	70.9	80.5	87.4
2008	60	68.5	14.5	33.6	93.9	47.9	58.3	68.9	80.2	86.9
2009	71	64.0	13.7	23.8	88.9	47.3	54.4	63.2	74.1	82.9
2010	79	67.6	14.0	36.9	94.4	48.1	57.5	67.0	76.8	87.1
2011	61	64.8	14.2	22.8	101	47.4	55.6	62.3	72.8	83.4
2012	76	66.0	14.5	37.2	92.5	49.2	53.6	64.3	79.3	86.0
2013	69	67.1	13.8	39.2	96.7	49.9	56.7	65.6	76.5	87.0
2014	72	65.4	15.5	1.4	93.5	45.8	56.4	67.5	75.5	83.5
2015	45	66.8	12.0	41.8	92.7	47.7	58.6	66.3	75.8	80.7
2016	47	66.4	13.4	36.4	95.6	53.6	57.6	64.8	74.5	87.5
1998-2016	1025	66.4	14.2	1.4	101	47.5	56.2	66.5	77.2	85.7

Table 4

Age distribution by 5-year age group and sex for period 2007-2016
(incl. DCO)

Age at diagnosis Years	Cases n	%	Cum.%	Males n	%	Cum.%	Females n	%	Cum.%
0-4	1	0.1	0.1			0.0	1	0.2	0.2
5-9	0	0.0	0.1			0.0			0.2
10-14	0	0.0	0.1			0.0			0.2
15-19	0	0.0	0.1			0.0			0.2
20-24	2	0.2	0.3			0.0	2	0.3	0.5
25-29	1	0.1	0.4			0.0	1	0.2	0.6
30-34	5	0.5	0.9	3	0.9	0.9	2	0.3	0.9
35-39	14	1.4	2.4	4	1.2	2.1	10	1.6	2.5
40-44	36	3.7	6.1	14	4.2	6.3	22	3.4	5.9
45-49	62	6.4	12.4	21	6.3	12.5	41	6.4	12.4
50-54	102	10.5	22.9	36	10.7	23.2	66	10.3	22.7
55-59	116	11.9	34.8	42	12.5	35.7	74	11.6	34.3
60-64	114	11.7	46.5	35	10.4	46.1	79	12.4	46.6
65-69	128	13.1	59.6	52	15.5	61.6	76	11.9	58.5
70-74	124	12.7	72.3	49	14.6	76.2	75	11.7	70.3
75-79	105	10.8	83.1	39	11.6	87.8	66	10.3	80.6
80-84	72	7.4	90.5	22	6.5	94.3	50	7.8	88.4
85+	93	9.5	100.0	19	5.7	100.0	74	11.6	100.0
All ages	975	100.0		336	100.0		639	100.0	

Table 5

Age-specific incidence, DCO rate and proportion of all cancers
for period 2007-2016

Age at diagnosis Years	Males n	Females n	Males Age-spec. incid.	Females Age-spec. incid.	Males DCO rate n=5 %	Females DCO rate n=18 %	Males Prop.all cancers n=113978 %	Females Prop.all cancers n=112253 %
0- 4		1		0.1		100.0		0.7
5- 9								
10-14								
15-19								
20-24		2		0.1				0.5
25-29		1		0.1				0.1
30-34	3	2	0.2	0.1			0.3	0.1
35-39	4	10	0.2	0.6			0.3	0.4
40-44	14	22	0.8	1.2			0.6	0.5
45-49	21	41	1.1	2.1			0.5	0.6
50-54	36	66	2.1	3.9			0.6	0.8
55-59	42	74	3.0	5.0			0.5	0.8
60-64	35	79	2.9	5.9	2.9		0.3	0.7
65-69	52	76	4.4	5.9	1.9		0.3	0.5
70-74	49	75	4.4	5.9	2.0		0.2	0.5
75-79	39	66	4.9	6.6	5.1	1.5	0.2	0.5
80-84	22	50	4.8	7.1		12.0	0.2	0.5
85+	19	74	6.2	10.1		13.5	0.2	0.6
All ages	336	639			1.5	2.8	0.3	0.6
Incidence								
Raw			1.5	2.7				
WS			0.8	1.4				
ES			1.1	1.9				
BRD-S			1.4	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).

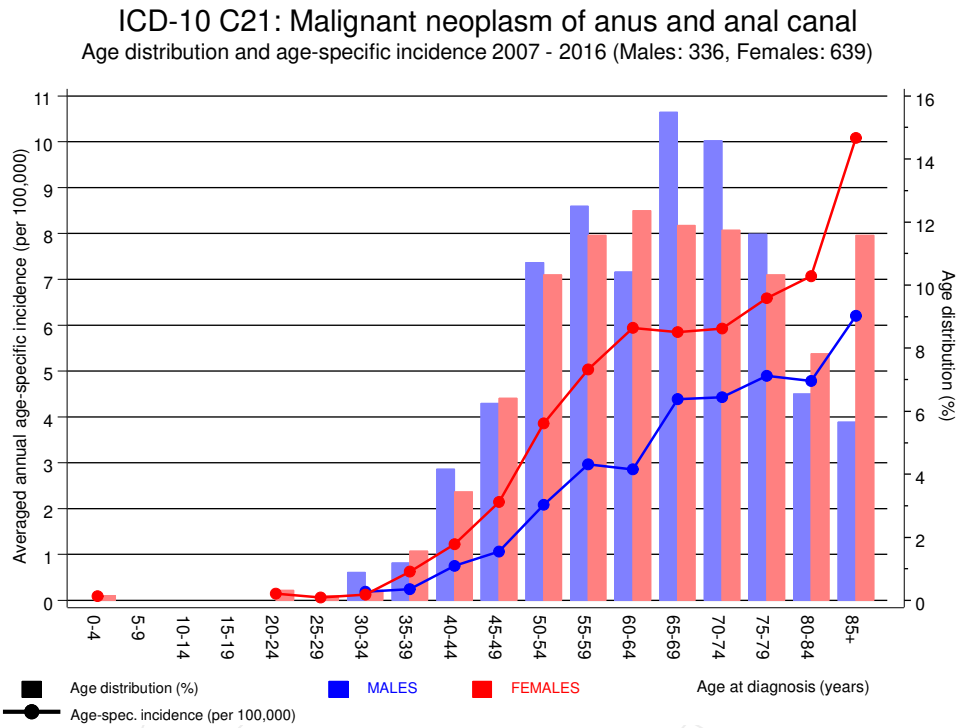


Figure 6. Age distribution (males: mean=65.3 yrs, median=66.1 yrs; females: mean=66.5 yrs, median=66.6 yrs) and age-specific incidence.

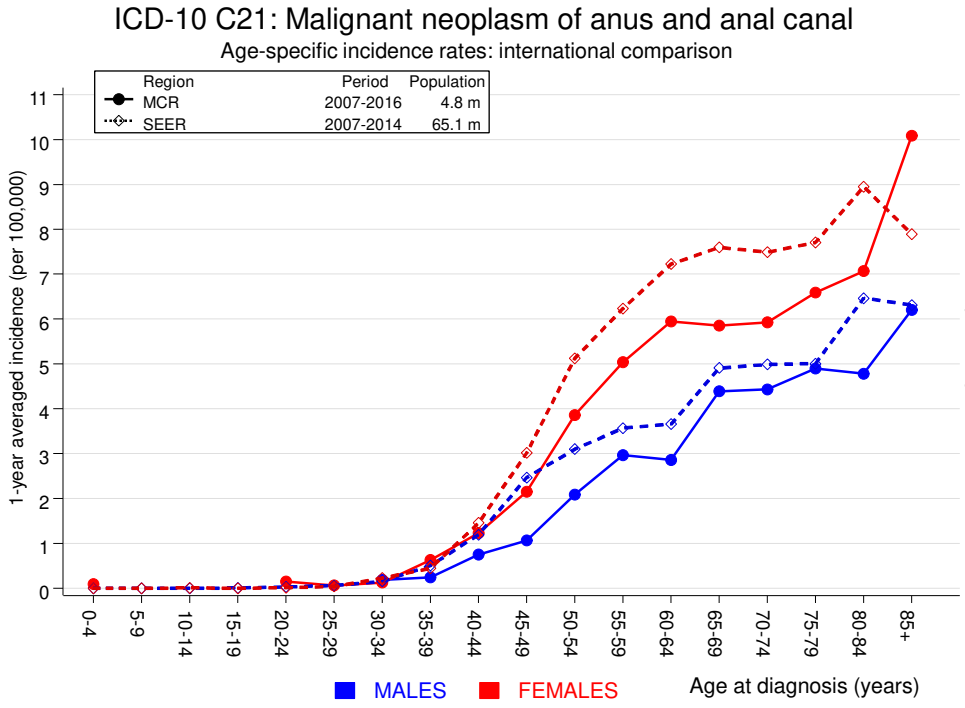


Figure 6a. Age-specific incidence in MCR registry areas compared to SEER (Surveillance, Epidemiology, and End Results, USA).

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.

Table 7a

Standardized incidence ratio (SIR, with 95% confidence limits), excess absolute risk (EAR) and DCO rate of further malignancies for period 1998–2016

MALES

Diagnosis		Observed n	Expected n	SIR	CI 95%	CI 95%		EAR	DCO %
C09–C10	Oropharynx	2	0.3	7.6	0.9	27.4		11.0	
C15	Oesophagus	2	0.5	4.4	0.5	15.9		9.8	
C16	Stomach	4	0.9	4.4	1.2	11.2	#	19.6	25.0
C18	Colon	6	2.2	2.8	1.0	6.0	#	24.3	33.3
C19–C20	Rectum	5	1.2	4.0	1.3	9.4	#	23.9	
C33–C34	Lung	16	2.7	5.8	3.3	9.5	#	84.4	
C43	Malign. melanoma	2	1.0	1.9	0.2	6.9		6.1	
C61	Prostate	9	6.5	1.4	0.6	2.6		15.9	
Others, specified		18	4.9	3.6	2.2	5.8	#	83.1	5.6
Not observed		0	3.0	0.0	0.0	1.2		-19.1	
All further malignancies		64	23.3	2.7	2.1	3.5	#	259.1	6.3

Patients	466
Median age at next malignancy (years)	66.8
Person-years	1572
Mean observation time (years)	3.4
Median observation time (years)	1.9

The occurrence of further malignancy listed is statistically significant.

Observed further malignancies with count 1 are pooled in category “Others, specified”.

Table 7b

Standardized incidence ratio (SIR, with 95% confidence limits), excess absolute risk (EAR) and DCO rate of further malignancies for period 1998–2016
FEMALES

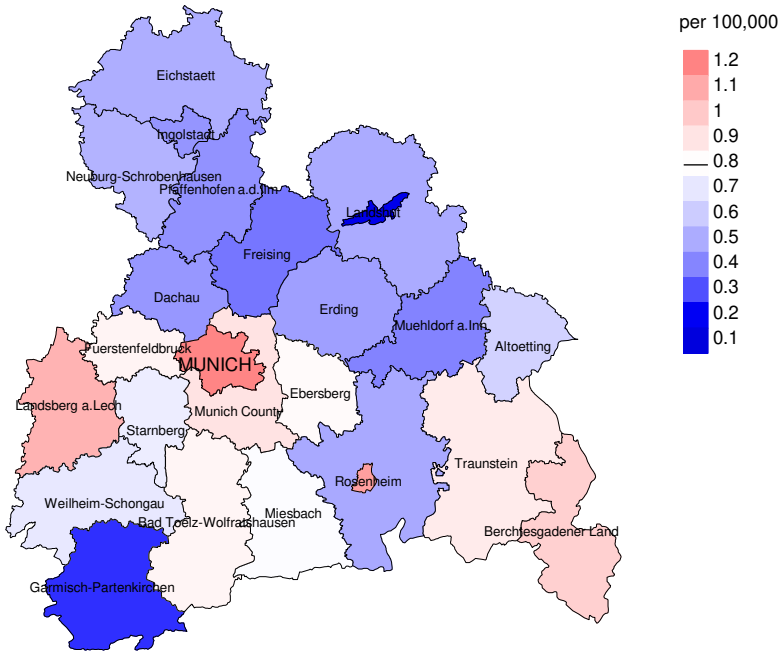
Diagnosis		Observed n	Expected n	SIR	CI 95%	CI 95%		EAR	DCO %
C03–C06	Oral cavity	2	0.2	8.4	1.0	30.4	#	4.8	
C16	Stomach	4	1.4	2.9	0.8	7.3		7.1	25.0
C17	Small intestine	2	0.2	9.8	1.2	35.3	#	4.9	
C18	Colon	15	3.9	3.9	2.2	6.4	#	30.4	33.3
C19–C20	Rectum	6	1.6	3.7	1.3	8.0	#	11.9	
C25	Pancreas	3	1.8	1.6	0.3	4.8		3.2	
C33–C34	Lung	25	3.0	8.4	5.4	12.3	#	60.1	4.0
C43	Malign. melanoma	2	1.5	1.3	0.2	4.7		1.3	
C50	Breast	24	12.3	2.0	1.3	2.9	#	32.0	8.3
C51	Vulva	7	0.4	17.2	6.9	35.5	#	18.0	
C53	Cervix uteri	3	0.5	5.6	1.1	16.3	#	6.7	33.3
C54	Corpus uteri	4	2.2	1.8	0.5	4.7		4.9	
C56	Ovary	2	1.6	1.2	0.1	4.5		1.1	
C67	Bladder	2	0.8	2.6	0.3	9.4		3.4	
C73	Thyroid	4	0.7	5.7	1.6	14.7	#	9.0	
C82–C85	NHL	6	1.6	3.9	1.4	8.4	#	12.1	
C91–C96	Leukaemia	4	0.6	6.2	1.7	15.9	#	9.2	25.0
Others, specified		8	2.9	2.7	1.2	5.4	#	13.8	
Not observed		0	3.1	0.0	0.0	1.2		−8.3	
All further malignancies		123	40.4	3.0	2.5	3.6	#	225.6	8.9

Patients	967
Median age at next malignancy (years)	71.3
Person-years	3661
Mean observation time (years)	3.8
Median observation time (years)	2.4

The occurrence of further malignancy listed is statistically significant.

Observed further malignancies with count 1 are pooled in category “Others, specified”.

Average incidence (world standard population) 2007 - 2016: Males



Average incidence (world standard population) 2007 - 2016: Females

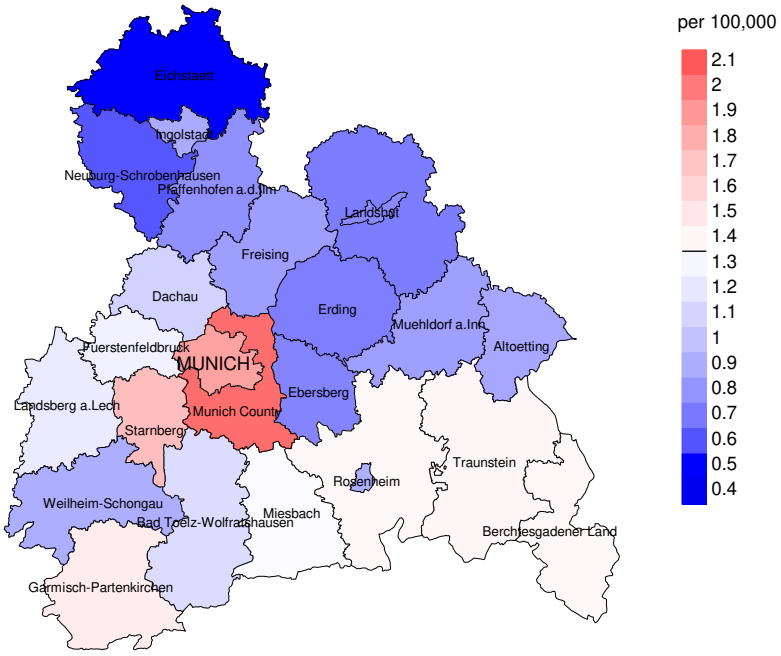
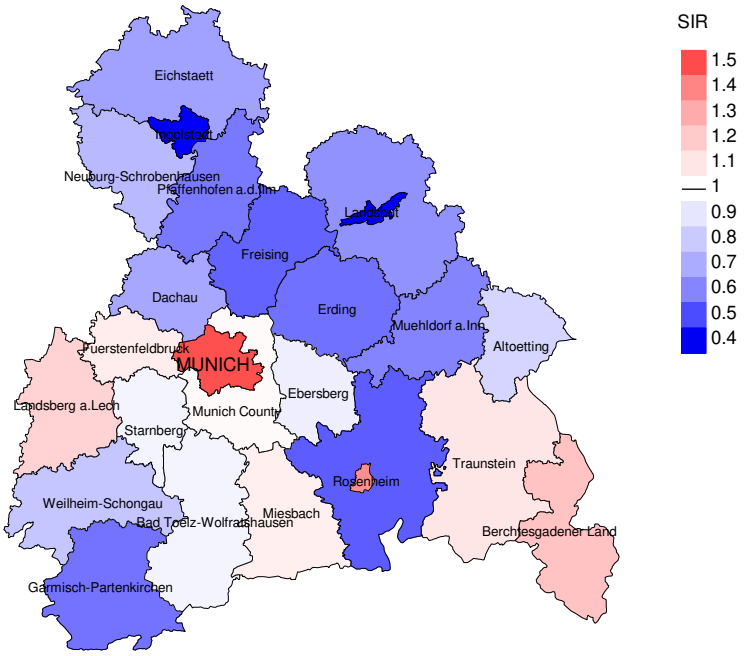


Figure 8a. Map of cancer incidence (world standard population, incl. DCO cases) by county averaged for period 2007 to 2016. According to their individual incidence rates, the counties are displayed in different red and blue hues, being the fine white color attributed to the population mean (males 0.8/100,000 WS N=336, females 1.4/100,000 WS N=639).

The results should be interpreted with caution! E.g., in county Ebersberg with a population of 66,416 female residents (averaged) in the period from 2007 to 2016 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 0.7/100,000 (world standard population). Though, the value of this parameter may vary with an underlying probability of 99% between 0.2 and 1.9/100,000.

Standardized incidence ratio (SIR) 2007 - 2016: Males



Standardized incidence ratio (SIR) 2007 - 2016: Females

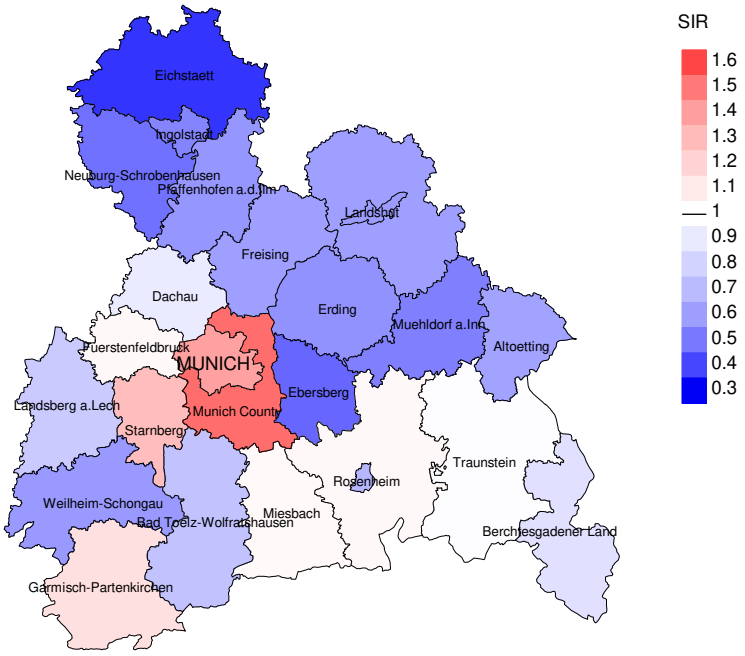


Figure 8b. Map of standardized incidence ratio (SIR, incl. DCO cases) by county averaged for period 2007 to 2016. According to their individual SIR values, the counties are displayed in different red and blue hues, being the fine white color attributed to the population overall of 1.0 (males N=336, females N=639).

The results should be interpreted with caution! E.g., in county Ebersberg with a population of 66,416 female residents (averaged) in the period from 2007 to 2016 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 0.46. Though, the value of this parameter may vary with an underlying probability of 99% between 0.15 and 1.06, and is therefore not statistically striking.

MORTALITY

Table 9a

Annual cohorts: Incident cancers, follow-up status, proportion of DCO, deaths among the annual cohorts and proportion of available death certificates (with respect to registry area expansion from 2.65 to 4.10 m as of 2002, and from 4.10 to 4.81 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	46	97.8		31	67.4	87.1
1999	34	97.1	8.8	21	61.8	90.5
2000	41	95.1		30	73.2	96.7
2001	56	92.9	5.4	35	62.5	97.1
2002	65	96.9	3.1	44	67.7	97.7
2003	67	91.0	1.5	32	47.8	100.0
2004	73	98.6	2.7	32	43.8	96.9
2005	76	92.1	1.3	46	60.5	97.8
2006	81	93.8	4.9	43	53.1	100.0
2007	94	81.9	4.3	53	56.4	98.1
2008	87	75.9	1.1	41	47.1	100.0
2009	112	74.1	0.9	49	43.8	98.0
2010	118	75.4	5.1	61	51.7	96.7
2011	104	72.1	1.0	42	40.4	92.9
2012	105	74.3		46	43.8	97.8
2013	108	68.5		33	30.6	93.9
2014	110	71.8	3.6	30	27.3	96.7
2015	70	98.6	2.9	14	20.0	92.9
2016	67	73.1	6.0	13	19.4	76.9
1998-2016	1514	82.6	2.6	696	46.0	96.3

Table 9b

Annual cohorts of incident cancers and deaths, proportion of death certificates and cases deceased within the same year of being diagnosed with cancer (incl. DCO)
(with respect to registry area expansion from 2.65 to 4.10 m as of 2002, and from 4.10 to 4.81 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	46	13	84.6	4	8.7
1999	34	13	84.6	2	5.9
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	67	29	100.0	5	7.5
2004	73	34	100.0	5	6.8
2005	76	48	95.8	10	13.2
2006	81	45	97.8	6	7.4
2007	94	48	93.8	8	8.5
2008	87	43	97.7	6	6.9
2009	112	42	100.0	4	3.6
2010	118	70	100.0	20	16.9
2011	104	71	97.2	10	9.6
2012	105	58	100.0	11	10.5
2013	108	51	100.0	5	4.6
2014	110	58	93.1	7	6.4
2015	70	65	98.5	8	11.4
2016	67	57	100.0	10	14.9
1998-2016	1514	828	97.2	141	9.3

Table 9c

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 2.65 to 4.10 m as of 2002, and from 4.10 to 4.81 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	13	46.2	53.8	81.8
2000	19	84.2	15.8	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	45	66.7	33.3	79.5
2007	48	64.6	35.4	80.0
2008	43	83.7	16.3	90.5
2009	42	69.0	31.0	92.9
2010	70	75.7	24.3	87.1
2011	71	81.7	18.3	89.9
2012	58	69.0	31.0	75.9
2013	51	62.7	37.3	70.6
2014	58	70.7	29.3	85.2
2015	65	67.7	32.3	81.3
2016	57	49.1	50.9	78.9
1998-2016	828	71.3	28.7	84.7

Table 10a

Medians of age at death according to the grouping in Table 9
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	69.1	73.3	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	23	80.1	72.8	86.3	72.8
2014	19	66.4	65.1	73.2	66.0
2015	26	74.1	72.9	74.1	70.4
2016	19	70.3	70.5	69.8	70.0
1998-2016	285	69.8	69.1	72.9	69.3

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 10b

Medians of age at death according to the grouping in Table 9
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	10	87.0	77.7	87.8	82.4
2000	15	80.3	80.3	60.0	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	30	79.9	79.9	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	47	75.6	73.7	85.1	74.3
2012	39	79.6	77.3	86.5	77.7
2013	28	80.6	79.2	85.7	80.6
2014	39	74.4	70.7	82.2	73.6
2015	39	78.0	75.0	87.6	76.3
2016	38	80.0	78.8	81.1	77.8
1998-2016	543	80.2	77.2	85.1	79.0

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 11a

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	0.09	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	0.43	0.3	0.43	0.4	0.40	0.5	0.40
2004	8	0.4	0.47	0.2	0.37	0.3	0.42	0.5	0.48
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	0.23	0.2	0.21	0.3	0.22	0.3	0.21
2008	13	0.6	0.48	0.3	0.44	0.5	0.46	0.6	0.50
2009	6	0.3	0.15	0.1	0.14	0.2	0.14	0.2	0.14
2010	25	1.1	0.64	0.5	0.64	0.8	0.65	1.0	0.63
2011	20	0.9	0.47	0.4	0.42	0.7	0.45	0.9	0.50
2012	15	0.7	0.52	0.3	0.53	0.5	0.53	0.6	0.52
2013	14	0.6	0.36	0.3	0.27	0.4	0.30	0.5	0.36
2014	16	0.7	0.42	0.4	0.42	0.5	0.43	0.6	0.43
2015	18	0.8	0.72	0.3	0.56	0.5	0.62	0.7	0.75
2016	8	0.3	0.40	0.2	0.36	0.2	0.37	0.3	0.41
1998-2016	201	0.5	0.41	0.3	0.38	0.4	0.39	0.5	0.42

Table 11b

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	5	0.4	0.21	0.2	0.17	0.2	0.19	0.3	0.20
2000	13	1.1	0.43	0.4	0.30	0.6	0.33	0.9	0.42
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	0.32	0.4	0.25	0.6	0.28	0.7	0.29
2005	28	1.4	0.47	0.5	0.35	0.8	0.38	1.1	0.42
2006	21	1.0	0.38	0.4	0.28	0.6	0.30	0.8	0.34
2007	23	1.0	0.39	0.4	0.34	0.6	0.36	0.8	0.37
2008	23	1.0	0.38	0.3	0.26	0.5	0.29	0.7	0.35
2009	23	1.0	0.32	0.4	0.23	0.6	0.25	0.7	0.27
2010	28	1.2	0.35	0.5	0.28	0.7	0.29	0.8	0.30
2011	38	1.6	0.62	0.6	0.44	0.9	0.49	1.2	0.53
2012	25	1.1	0.33	0.4	0.23	0.6	0.25	0.8	0.29
2013	18	0.8	0.26	0.2	0.17	0.4	0.19	0.5	0.23
2014	25	1.0	0.35	0.4	0.26	0.6	0.30	0.8	0.31
2015	26	1.1	0.58	0.4	0.42	0.6	0.47	0.8	0.52
2016	20	0.8	0.43	0.3	0.29	0.4	0.31	0.6	0.37
1998-2016	389	1.0	0.38	0.4	0.28	0.6	0.30	0.7	0.34

Table 12

Age distribution of age at death (cancer-related) for period 2007-2016
(**incl. multiple malignancies**)

Age at death Years	Cases n	%	Cum.%	Males n	%	Cum.%	Females n	%	Cum.%
0-4									
5-9									
10-14									
15-19									
20-24									
25-29									
30-34									
35-39									
40-44	4	1.0	1.0	1	0.7	0.7	3	1.2	1.2
45-49	15	3.8	4.8	4	2.8	3.5	11	4.4	5.6
50-54	16	4.1	8.9	8	5.6	9.1	8	3.2	8.8
55-59	32	8.2	17.1	15	10.5	19.6	17	6.8	15.7
60-64	37	9.4	26.5	17	11.9	31.5	20	8.0	23.7
65-69	48	12.2	38.8	24	16.8	48.3	24	9.6	33.3
70-74	61	15.6	54.3	24	16.8	65.0	37	14.9	48.2
75-79	48	12.2	66.6	19	13.3	78.3	29	11.6	59.8
80-84	49	12.5	79.1	16	11.2	89.5	33	13.3	73.1
85+	82	20.9	100.0	15	10.5	100.0	67	26.9	100.0
All ages	392	100.0		143	100.0		249	100.0	

Table 13

Age-specific mortality (cancer-related) and proportion of all cancers
for period 2007-2016
(**incl. multiple malignancies**)

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								
5- 9								
10-14								
15-19								
20-24								
25-29								
30-34								
35-39								
40-44	1	3	0.1	0.07	0.2	0.14	0.2	0.4
45-49	4	11	0.2	0.19	0.6	0.27	0.3	0.8
50-54	8	8	0.5	0.22	0.5	0.12	0.4	0.4
55-59	15	17	1.1	0.36	1.2	0.23	0.4	0.6
60-64	17	20	1.4	0.49	1.5	0.25	0.3	0.5
65-69	24	24	2.0	0.46	1.8	0.32	0.3	0.5
70-74	24	37	2.2	0.49	2.9	0.49	0.3	0.5
75-79	19	29	2.4	0.49	2.9	0.44	0.2	0.4
80-84	16	33	3.5	0.73	4.7	0.66	0.2	0.5
85+	15	67	4.9	0.79	9.1	0.91	0.2	0.7
All ages	143	249					0.3	0.5
Mortality								
Raw			0.6	0.43	1.1	0.39		
WS			0.3	0.38	0.4	0.29		
ES			0.5	0.40	0.6	0.31		
BRD-S			0.6	0.43	0.8	0.34		
PYLL-70								
per 100,000			3.1		4.5			
ES			2.7		3.7			
AYLL-70			9.2		10.8			

Table 14a

Further malignancies in deaths in period 1998-2016
MALES

Diagnosis	Total n	Total %↓	Pre n	Pre ←%	Syn-chron ±30d n	Syn-chron ±30d ←%	Post n	Post ←%
C03-C06 Oral cavity	2	2.3	1	50.0			1	50.0
C09-C10 Oropharynx	3	3.5	1	33.3	1	33.3	1	33.3
C12-C13 Hypopharynx	2	2.3	1	50.0			1	50.0
C15 Oesophagus	5	5.8	2	40.0			3	60.0
C16 Stomach	4	4.7	1	25.0			3	75.0
C18 Colon	9	10.5	5	55.6			4	44.4
C19-C20 Rectum	7	8.1	1	14.3	2	28.6	4	57.1
C25 Pancreas	1	1.2					1	100.0
C32 Larynx	1	1.2	1	100.0				
C33-C34 Lung	13	15.1	1	7.7	3	23.1	9	69.2
C43 Malign. melanoma	1	1.2					1	100.0
C44 Skin others	5	5.8	1	20.0	1	20.0	3	60.0
C60 Penis	2	2.3	1	50.0			1	50.0
C61 Prostate	14	16.3	8	57.1	1	7.1	5	35.7
C62 Testis	1	1.2	1	100.0				
C64 Kidney	3	3.5	3	100.0				
C65 Renal pelvis	1	1.2					1	100.0
C67 Bladder	3	3.5	2	66.7	1	33.3		
C70-C72 CNS cancer	1	1.2					1	100.0
C73 Thyroid	2	2.3	1	50.0			1	50.0
C76-C79 CUP	1	1.2					1	100.0
C81 Hodgkin lymphoma	2	2.3	2	100.0				
C82-C85 NHL	3	3.5	2	66.7			1	33.3
All further malignancies	86	100.0	35	40.7	9	10.5	42	48.8

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 further malignancy.

Table 14b

Further malignancies in deaths in period 1998–2016
FEMALES

Diagnosis		Total n	Total %↓	Pre n	Pre ←%	Syn-chron ±30d n	Syn-chron ±30d ←%	Post n	Post ←%
C03–C06	Oral cavity	3	1.6	3	100.0				
C09–C10	Oropharynx	3	1.6	1	33.3			2	66.7
C15	Oesophagus	2	1.1			1	50.0	1	50.0
C16	Stomach	11	5.8	2	18.2	1	9.1	8	72.7
C18	Colon	21	11.1	6	28.6	4	19.0	11	52.4
C19–C20	Rectum	7	3.7	1	14.3	5	71.4	1	14.3
C25	Pancreas	3	1.6					3	100.0
C33–C34	Lung	28	14.8	3	10.7	3	10.7	22	78.6
C43	Malign. melanoma	3	1.6	2	66.7			1	33.3
C44	Skin others	10	5.3	3	30.0			7	70.0
C50	Breast	27	14.3	16	59.3	5	18.5	6	22.2
C51	Vulva	7	3.7	3	42.9			4	57.1
C53	Cervix uteri	17	9.0	15	88.2			2	11.8
C54	Corpus uteri	8	4.2	3	37.5			5	62.5
C56	Ovary	4	2.1	3	75.0			1	25.0
C64	Kidney	2	1.1	1	50.0	1	50.0		
C67	Bladder	2	1.1	1	50.0			1	50.0
C73	Thyroid	5	2.6	1	20.0			4	80.0
C76–C79	CUP	2	1.1					2	100.0
C82–C85	NHL	10	5.3	6	60.0			4	40.0
C90	Mult. myeloma	3	1.6	1	33.3			2	66.7
C91–C96	Leukaemia	4	2.1	1	25.0			3	75.0
Others, specified		7	3.7	2	28.6			5	71.4
All further malignancies		189	100.0	74	39.2	20	10.6	95	50.3

Further malignancies with number of cases 1 are pooled in category “Others, specified”.

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 further malignancy.

Table 15

Age-specific mortality (cancer-related) and proportion of all cancers
for period 2007-2016
(**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								
5- 9								
10-14								
15-19								
20-24								
25-29								
30-34								
35-39								
40-44	1	2	0.1	0.07	0.1	0.11	0.2	0.3
45-49	3	10	0.2	0.17	0.5	0.27	0.3	0.9
50-54	8	6	0.5	0.24	0.4	0.11	0.4	0.4
55-59	12	16	0.8	0.31	1.1	0.28	0.4	0.7
60-64	13	16	1.1	0.43	1.2	0.29	0.3	0.5
65-69	18	16	1.5	0.46	1.2	0.27	0.3	0.4
70-74	15	26	1.4	0.50	2.1	0.51	0.2	0.5
75-79	14	20	1.8	0.48	2.0	0.41	0.2	0.4
80-84	14	20	3.0	0.93	2.8	0.61	0.3	0.4
85+	12	51	3.9	0.86	6.9	0.88	0.3	0.7
All ages	110	183					0.3	0.5
Mortality								
Raw			0.5	0.41	0.8	0.38		
WS			0.2	0.36	0.3	0.28		
ES			0.4	0.38	0.4	0.30		
BRD-S			0.5	0.42	0.6	0.33		
PYLL-70								
per 100,000			2.6		3.7			
ES			2.3		3.1			
AYLL-70			9.6		11.3			

* See corresponding tables with multiple malignancies.

Table 16

Age-specific mortality (cancer-related) and proportion of all cancers
for period 2007-2016
(**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								
5- 9								
10-14								
15-19								
20-24								
25-29								
30-34								
35-39								
40-44	1	1	0.1	0.08	0.1	0.06	0.2	0.2
45-49	2	10	0.1	0.13	0.5	0.28	0.2	0.9
50-54	5	6	0.3	0.17	0.4	0.12	0.3	0.4
55-59	9	12	0.6	0.27	0.8	0.24	0.3	0.5
60-64	7	11	0.6	0.25	0.8	0.22	0.2	0.4
65-69	14	11	1.2	0.41	0.8	0.21	0.2	0.3
70-74	9	21	0.8	0.32	1.7	0.45	0.1	0.4
75-79	14	15	1.8	0.56	1.5	0.33	0.2	0.3
80-84	10	14	2.2	0.77	2.0	0.50	0.2	0.3
85+	12	40	3.9	0.86	5.5	0.73	0.3	0.6
All ages	83	141					0.2	0.4
Mortality								
Raw			0.4	0.35	0.6	0.32		
WS			0.2	0.29	0.2	0.24		
ES			0.3	0.32	0.3	0.26		
BRD-S			0.3	0.36	0.4	0.28		
PYLL-70								
per 100,000			1.8		3.1			
ES			1.5		2.5			
AYLL-70			9.5		12.1			

* See corresponding tables with multiple malignancies.

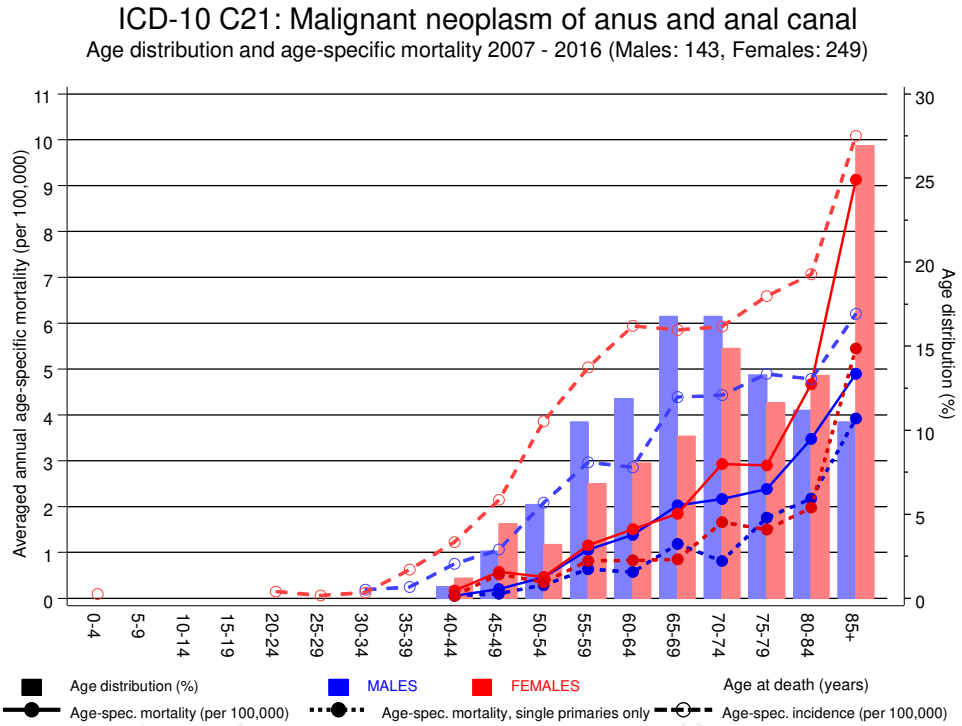


Figure 17. Distribution of age at death (bars; males: mean=67.4 yrs, median=67.2 yrs; females: mean=70.6 yrs, median=71.3 yrs) and age-specific mortality (all patients: solid line, patients with single primaries: dotted line). The age-specific incidence is additionally plotted for comparison (dashed line).

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

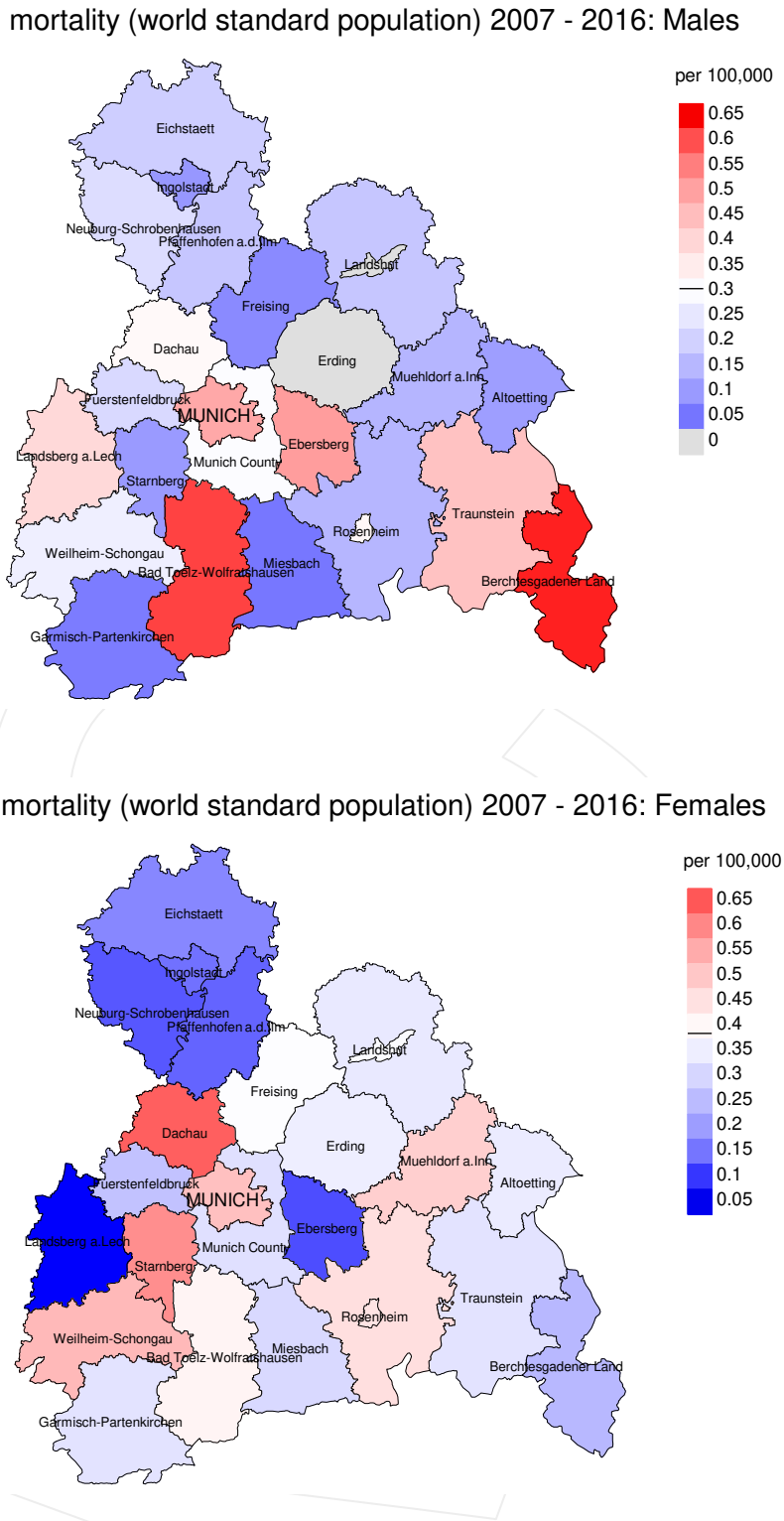
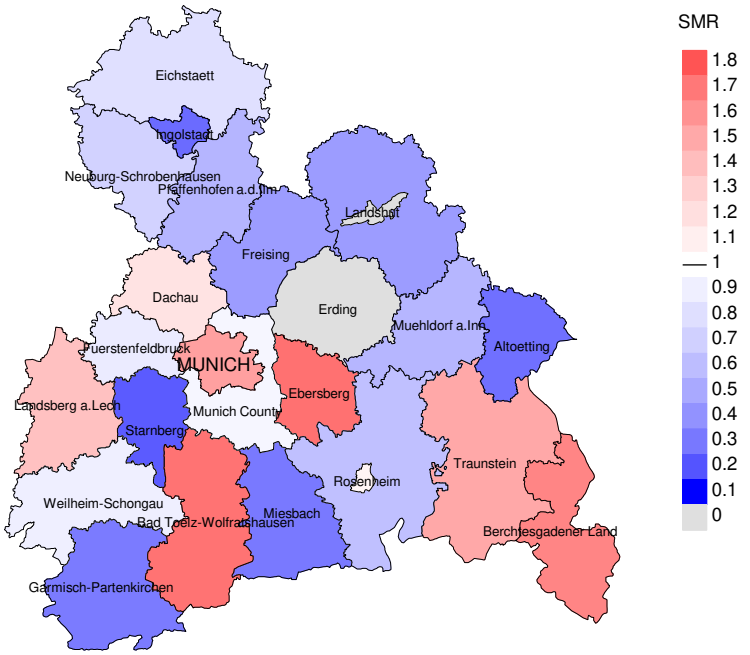


Figure 18a. Map of cancer mortality (world standard population) by county averaged for period 2007 to 2016. According to their individual mortality rates, the counties are displayed in different red and blue hues, being the fine white color attributed to the population mean (males 0.3/100,000 WS N=143, females 0.4/100,000 WS N=249).

The results should be interpreted with caution! E.g., in county Ebersberg with a population of 66,416 female residents (averaged) in the period from 2007 to 2016 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 0.1/100,000 (world standard population). Though, the value of this parameter may vary with an underlying probability of 99% between 0.0 and 1.0/100,000.

Standardized mortality ratio (SMR) 2007 - 2016: Males



Standardized mortality ratio (SMR) 2007 - 2016: Females

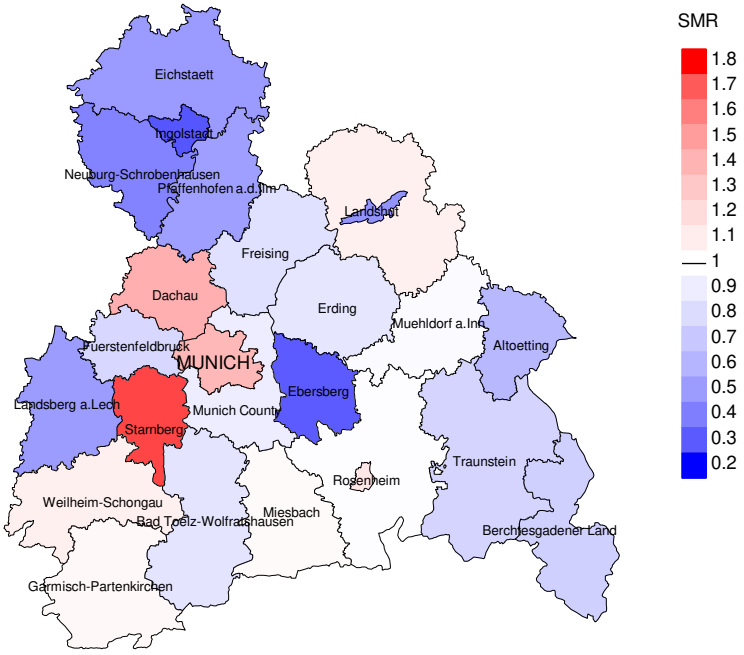


Figure 18b. Map of standardized mortality ratio (SMR, incl. DCO cases) by county averaged for period 2007 to 2016. According to their individual SMR values, the counties are displayed in different red and blue hues, being the fine white color attributed to the population overall of 1.0 (males N=143, females N=249).

The results should be interpreted with caution! E.g., in county Ebersberg with a population of 66,416 female residents (averaged) in the period from 2007 to 2016 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 0.30. Though, the value of this parameter may vary with an underlying probability of 99% between 0.02 and 1.40, 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

MCR	Munich Cancer Registry (Tumorregister München)
GEKID	Association of Population-based Cancer Registries in Germany (Gesellschaft der epidemiologischen Krebsregister in Deutschland e.V.)
SEER	Surveillance, Epidemiology, and End Results (USA)
DCO	Death certificate only
BRD-S	German standard population
ES	European standard population (old)
WS	World standard population
SIR	Standardized incidence ratio
CI	Confidence interval
EAR	Excess absolute risk = excess cancer cases (O - E) per 10,000 person-years
PYLL-70	Potential years of life lost prior to age 70 given a person dies before that age
AYLL-70	Average years of life lost prior to age 70 given a person dies before that age
SMR	Standardized mortality ratio
MI-index	Ratio between mortality and incidence
FRG	Federal Republic of Germany

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