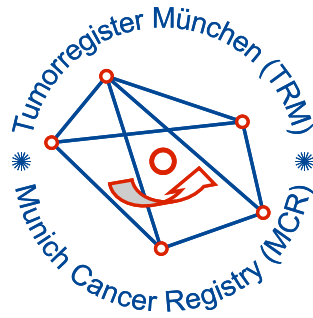


# Munich Cancer Registry



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## ICD-10 C21: Anal cancer

### Incidence and Mortality

Year of diagnosis	1998-2019
Patients	1,929
Diseases	1,929
Creation date	01/25/2021
Database export	01/07/2021
Population	4.92 m



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[https://www.tumorregister-muenchen.de/en/facts/base/bC21\\_\\_E-ICD-10-C21-Anal-cancer-incidence-and-mortality.pdf](https://www.tumorregister-muenchen.de/en/facts/base/bC21__E-ICD-10-C21-Anal-cancer-incidence-and-mortality.pdf)

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

In these analyses, the clinics and physicians of Upper Bavaria and the city and county of Landshut<sup>#</sup>, with a total of 4.69 million inhabitants, account for the frequency of cancer diseases<sup>##</sup> and the achieved long term results. Additionally, the long term survival evaluated by the Munich Cancer Registry (MCR) is compared with the results of the population-based registry in the USA (SEER), which is useful for checking the consistency of the data on an international level.

In comparing several tables, inconsistent figures may be detected. This is based on the fact that different patient cohorts are included in the base calculation, for example when proportions of multiple tumors or DCO-cases<sup>###</sup> 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](mailto:tumor@ibe.med.uni-muenchen.de).

Munich Cancer Registry, January 2021

<sup>#</sup> 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).

<sup>##</sup> 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.

<sup>###</sup> 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	70			11.4	13.1	75.7	97.1
1999	50	3	6.0	8.3	12.9	76.0	96.0
2000	51			8.8	12.5	78.4	96.1
2001	66	3	4.5	9.3	12.4	68.2	93.9
2002	72	2	2.8	10.4	12.1	72.2	97.2 #
2003	68	1	1.5	10.3	11.6	54.4	92.6
2004	74	2	2.7	11.3	11.1	48.6	98.6
2005	79	1	1.3	13.0	10.7	68.4	94.9
2006	82	4	4.9	14.2	10.4	57.3	95.1
2007	94	4	4.3	14.9	9.7	62.8	97.9 #
2008	88	1	1.1	14.7	9.4	55.7	95.5
2009	114	1	0.9	15.4	9.1	50.9	98.2
2010	119	6	5.0	16.3	7.9	56.3	100.0
2011	105	2	1.9	16.0	7.7	43.8	98.1
2012	107			16.6	6.5	48.6	97.2
2013	112			17.6	6.8	37.5	98.2
2014	113	4	3.5	17.6	5.9	36.3	93.8
2015	122	2	1.6	18.0	5.3	28.7	87.7
2016	119	3	2.5	18.2	5.1	34.5	99.2
2017	82	3	3.7	18.4	3.7	25.6	100.0
2018	68	1	1.5	18.4	2.2	16.2	100.0
2019	74	1	1.4	18.5	2.9	17.6	86.5 ##
1998-2019	1929	44	2.3	18.5	13.1	48.6	96.2

1,929 cases diagnosed 1998-2019 are related to a total of 1,929 patients. Currently, in 593 (30.7 %) of these 1,929 patients more than one malignancy of any cancer type has been registered. Hereby, groups of 451 / 108 / 34 (23.4 % / 5.6 % / 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 retrieved from the respective headings.

How to interpret:

In 2017, a subgroup of 82 cases has been diagnosed, of which 18.4 % previously and/or concurrently (synchronously) had at least one other malignancy of any cancer type. In 3.7 % 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	28	40.0			3.6	14.2	78.6	92.9
1999	19	38.0	1	5.3	4.3	13.7	84.2	100.0
2000	18	35.3			4.6	13.3	72.2	94.4
2001	29	43.9	1	3.4	7.4	13.4	86.2	96.6
2002	20	27.8			8.8	12.7	90.0	100.0 #
2003	21	30.9	1	4.8	9.6	12.2	71.4	95.2
2004	18	24.3			9.2	11.7	55.6	94.4
2005	18	22.8			10.5	11.5	72.2	88.9
2006	26	31.7			12.2	11.1	73.1	96.2
2007	35	37.2			12.5	10.4	65.7	100.0 #
2008	28	31.8			12.7	10.3	53.6	92.9
2009	43	37.7	1	2.3	12.5	10.0	55.8	100.0
2010	40	33.6	3	7.5	13.4	9.1	80.0	100.0
2011	43	41.0	1	2.3	13.5	9.0	53.5	100.0
2012	29	27.1			14.7	7.1	65.5	96.6
2013	41	36.6			15.8	7.5	43.9	100.0
2014	39	34.5			15.8	6.5	41.0	94.9
2015	46	37.7			15.9	5.6	37.0	91.3
2016	39	32.8			15.9	5.2	41.0	100.0
2017	38	46.3	2	5.3	16.3	2.6	34.2	100.0
2018	18	26.5	1	5.6	16.4	2.5	22.2	100.0
2019	23	31.1	1	4.3	16.4	0.0	26.1	87.0 ##
1998-2019	659	34.2	12	1.8	16.4	14.2	57.2	96.8

659 cases diagnosed 1998-2019 are related to a total of 659 patients. Currently, in 195 (29.6 %) of these 659 patients more than one malignancy of any cancer type has been registered. Hereby, groups of 145 / 39 / 11 (22.0 % / 5.9 % / 1.7 %) 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 retrieved from the respective headings.

How to interpret:

In 2017, a subgroup of 38 cases has been diagnosed, of which 16.3 % previously and/or concurrently (synchronously) had at least one other malignancy of any cancer type. In 2.6 % 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	42	60.0			16.7	12.6	73.8	100.0
1999	31	62.0	2	6.5	11.0	12.5	71.0	93.5
2000	33	64.7			11.3	12.2	81.8	97.0
2001	37	56.1	2	5.4	10.5	11.9	54.1	91.9
2002	52	72.2	2	3.8	11.3	11.9	65.4	96.2 #
2003	47	69.1			10.7	11.3	46.8	91.5
2004	56	75.7	2	3.6	12.4	10.8	46.4	100.0
2005	61	77.2	1	1.6	14.2	10.3	67.2	96.7
2006	56	68.3	4	7.1	15.2	10.0	50.0	94.6
2007	59	62.8	4	6.8	16.0	9.4	61.0	96.6 #
2008	60	68.2	1	1.7	15.7	8.9	56.7	96.7
2009	71	62.3			16.9	8.7	47.9	97.2
2010	79	66.4	3	3.8	17.7	7.3	44.3	100.0
2011	62	59.0	1	1.6	17.3	7.0	37.1	96.8
2012	78	72.9			17.6	6.3	42.3	97.4
2013	71	63.4			18.5	6.5	33.8	97.2
2014	74	65.5	4	5.4	18.6	5.5	33.8	93.2
2015	76	62.3	2	2.6	19.1	5.1	23.7	85.5
2016	80	67.2	3	3.8	19.4	5.1	31.3	98.8
2017	44	53.7	1	2.3	19.4	4.3	18.2	100.0
2018	50	73.5			19.4	2.1	14.0	100.0
2019	51	68.9			19.5	4.2	13.7	86.3 ##
1998-2019	1270	65.8	32	2.5	19.5	12.6	44.1	95.8

1,270 cases diagnosed 1998-2019 are related to a total of 1,270 patients. Currently, in 398 (31.3 %) of these 1,270 patients more than one malignancy of any cancer type has been registered. Hereby, groups of 306 / 69 / 23 (24.1 % / 5.4 % / 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 retrieved from the respective headings.

How to interpret:

In 2017, a subgroup of 44 cases has been diagnosed, of which 19.4 % previously and/or concurrently (synchronously) had at least one other malignancy of any cancer type. In 4.3 % 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 4.92 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	28	42	2.5	3.6	1.6	1.7	2.2	2.5	2.7	3.1
1999	19	31	1.7	2.6	1.0	1.2	1.5	1.7	2.0	2.1
2000	18	33	1.6	2.7	0.9	1.5	1.4	2.1	1.8	2.4
2001	29	37	2.5	3.0	1.5	1.5	2.1	2.2	2.6	2.6
2002	20	52	1.1	2.7	0.6	1.3	0.9	1.9	1.2	2.2
2003	21	47	1.1	2.4	0.7	1.3	1.0	1.8	1.1	2.0
2004	18	56	1.0	2.8	0.6	1.4	0.8	2.0	1.0	2.4
2005	18	61	1.0	3.1	0.6	1.4	0.8	2.0	0.9	2.6
2006	26	56	1.4	2.8	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	28	60	1.3	2.6	0.7	1.2	1.0	1.7	1.2	2.1
2009	43	71	1.9	3.1	1.1	1.7	1.6	2.3	1.8	2.6
2010	40	79	1.8	3.4	0.9	1.6	1.3	2.3	1.7	2.8
2011	43	62	1.9	2.7	1.0	1.4	1.5	2.0	1.8	2.2
2012	29	78	1.3	3.3	0.6	1.6	0.9	2.3	1.2	2.7
2013	41	71	1.8	3.0	1.0	1.4	1.4	2.1	1.6	2.4
2014	39	74	1.7	3.1	0.9	1.6	1.3	2.2	1.5	2.5
2015	46	76	1.9	3.1	1.1	1.5	1.6	2.1	1.7	2.5
2016	39	80	1.6	3.3	0.9	1.6	1.3	2.3	1.5	2.6
2017	38	44	1.6	1.8	0.8	0.9	1.1	1.3	1.4	1.4
2018	18	50	0.7	2.0	0.4	1.1	0.6	1.5	0.7	1.7
2019	23	51	0.9	2.1	0.4	1.1	0.7	1.5	0.8	1.7
1998-2019	659	1270	1.5	2.8	0.8	1.4	1.2	2.0	1.4	2.3

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	Std.		Min.	Max.	Median				
		Mean	dev.			10%	25%	50%	75%	90%
1998	70	66.4	13.6	34.3	92.4	49.0	57.3	65.1	78.2	85.3
1999	50	68.9	16.1	30.8	94.8	43.8	61.9	69.0	82.5	89.5
2000	51	64.4	12.4	34.7	89.8	51.4	56.1	64.0	72.7	80.0
2001	66	65.0	14.7	35.3	92.5	43.7	55.2	63.4	77.0	85.5
2002	72	67.3	12.6	41.6	89.2	51.6	58.7	66.0	78.5	84.0
2003	68	62.5	15.3	35.2	91.9	41.9	49.6	62.9	74.3	85.6
2004	74	65.5	14.2	28.1	95.9	47.0	54.7	64.1	78.2	82.8
2005	79	67.4	13.1	32.2	91.7	46.4	59.6	68.4	78.1	83.2
2006	82	63.7	13.0	28.5	93.2	45.3	54.4	63.9	70.4	82.0
2007	94	68.0	14.4	28.6	94.9	47.5	56.7	68.1	80.0	87.2
2008	88	66.5	14.0	33.6	93.9	46.2	57.4	68.0	75.7	85.7
2009	114	63.9	13.5	23.8	102	47.1	54.2	64.4	72.2	82.0
2010	119	67.7	13.5	36.9	94.4	49.1	58.0	68.6	77.6	86.0
2011	105	64.5	13.4	22.8	101	47.4	54.7	63.8	73.9	82.3
2012	107	67.8	14.4	37.2	96.5	49.3	55.3	68.8	80.5	86.5
2013	112	66.0	13.7	32.1	96.7	48.7	56.4	65.7	75.5	84.4
2014	113	64.7	14.3	1.4	93.5	45.8	55.8	65.4	74.9	82.0
2015	122	65.1	12.8	30.9	92.7	49.5	55.5	65.9	74.4	80.4
2016	119	65.7	13.3	36.4	95.6	50.9	56.9	63.9	76.4	84.5
2017	82	66.2	13.7	26.3	89.9	48.9	53.7	68.0	77.6	83.7
2018	68	64.6	11.6	40.1	94.2	50.0	56.9	62.4	73.0	80.8
2019	74	64.9	13.1	26.5	92.2	48.8	56.1	65.1	74.9	81.7
1998-2019	1929	65.8	13.7	1.4	102	47.8	56.0	65.6	76.2	84.1



Table 3a

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

Year of diagnosis	Cases n	Std.		Min.	Max.	10%	25%	Median		
		Mean	dev.					50%	75%	90%
1998	28	62.6	12.6	34.3	86.6	48.4	56.1	62.1	71.1	79.0
1999	19	68.1	15.8	30.8	94.0	36.6	63.5	67.5	82.5	86.7
2000	18	65.3	11.4	44.7	82.4	50.8	56.3	64.2	76.9	80.0
2001	29	63.4	13.3	37.4	92.4	42.8	56.4	62.1	69.8	82.1
2002	20	67.7	11.1	51.4	87.8	52.5	58.0	66.1	78.8	80.7
2003	21	60.3	13.5	35.2	85.9	41.3	51.2	59.0	69.5	76.3
2004	18	59.0	16.0	28.1	82.8	40.8	44.9	55.5	70.6	81.2
2005	18	63.9	9.6	47.8	82.6	50.6	59.0	62.4	70.1	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	28	62.1	11.9	36.9	76.9	43.9	54.3	62.4	73.4	75.7
2009	43	63.7	13.4	37.5	102	46.3	54.1	65.5	70.8	79.0
2010	40	68.0	12.6	42.4	93.5	49.7	58.6	70.5	77.8	82.7
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	41	64.1	13.7	32.1	88.4	45.3	53.5	64.6	73.1	80.6
2014	39	63.7	12.2	40.1	84.1	42.7	53.9	65.2	72.5	79.4
2015	46	62.6	12.9	33.8	92.1	49.5	53.3	61.2	70.2	79.5
2016	39	62.3	12.5	44.3	85.4	47.5	52.4	60.0	73.9	82.1
2017	38	68.2	14.9	26.3	89.9	48.3	55.3	71.5	79.2	86.4
2018	18	64.7	10.5	47.4	86.7	49.6	58.5	64.4	72.8	77.1
2019	23	67.1	10.6	48.6	84.5	53.0	59.0	70.5	76.0	79.3
1998-2019	659	64.6	13.0	26.3	102	47.4	55.1	64.9	74.1	81.3

Table 3b

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

Year of diagnosis	Cases n	Std.		Median						
		Mean	dev.	Min.	Max.	10%	25%	50%	75%	90%
1998	42	68.9	13.7	44.6	92.4	49.6	58.7	69.8	80.0	87.1
1999	31	69.4	16.6	34.3	94.8	47.5	57.7	70.5	85.6	89.8
2000	33	63.9	13.0	34.7	89.8	51.4	56.1	63.7	71.1	81.4
2001	37	66.4	15.9	35.3	92.5	45.0	54.6	65.4	79.0	87.9
2002	52	67.1	13.2	41.6	89.2	49.2	59.2	66.0	78.2	87.0
2003	47	63.5	16.0	36.1	91.9	42.7	49.4	63.1	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	61	68.4	13.8	32.2	91.7	46.2	62.2	70.8	79.3	83.4
2006	56	64.7	13.7	28.5	93.2	49.0	54.7	64.5	77.8	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	62	64.6	14.2	22.8	101	47.4	54.8	62.3	72.8	83.4
2012	78	66.0	14.4	37.2	92.5	49.2	53.8	64.3	79.2	86.0
2013	71	67.2	13.6	39.2	96.7	52.0	56.7	65.8	76.5	86.8
2014	74	65.3	15.3	1.4	93.5	45.8	56.2	66.3	75.5	83.5
2015	76	66.7	12.5	30.9	92.7	47.7	58.7	68.3	76.2	80.7
2016	80	67.3	13.4	36.4	95.6	53.4	57.7	66.6	77.2	85.8
2017	44	64.5	12.5	44.0	89.6	50.1	53.5	63.4	75.1	82.0
2018	50	64.5	12.1	40.1	94.2	50.7	56.8	62.0	73.1	80.9
2019	51	63.9	14.1	26.5	92.2	45.7	55.1	64.2	72.9	82.3
1998-2019	1270	66.3	14.0	1.4	101	48.1	56.3	66.4	77.1	85.1

Table 4

Age distribution by 5-year age group and sex for period 2007-2019  
(incl. DCO)

Age at diagnosis Years	Cases			Males			Females		
	n	%	Cum.%	n	%	Cum.%	n	%	Cum.%
0-4	1	0.1	0.1			0.0	1	0.1	0.1
5-9	0	0.0	0.1			0.0			0.1
10-14	0	0.0	0.1			0.0			0.1
15-19	0	0.0	0.1			0.0			0.1
20-24	2	0.2	0.2			0.0	2	0.2	0.4
25-29	3	0.2	0.5	1	0.2	0.2	2	0.2	0.6
30-34	7	0.5	1.0	3	0.6	0.9	4	0.5	1.1
35-39	17	1.3	2.3	4	0.9	1.7	13	1.5	2.6
40-44	45	3.4	5.7	16	3.5	5.2	29	3.4	6.0
45-49	88	6.7	12.4	39	8.4	13.6	49	5.7	11.7
50-54	144	10.9	23.3	51	11.0	24.7	93	10.9	22.6
55-59	162	12.3	35.6	57	12.3	37.0	105	12.3	34.9
60-64	160	12.1	47.8	50	10.8	47.8	110	12.9	47.7
65-69	165	12.5	60.3	63	13.6	61.5	102	11.9	59.6
70-74	162	12.3	72.6	65	14.1	75.5	97	11.3	71.0
75-79	147	11.2	83.8	56	12.1	87.7	91	10.6	81.6
80-84	104	7.9	91.6	29	6.3	93.9	75	8.8	90.4
85+	110	8.4	100.0	28	6.1	100.0	82	9.6	100.0
All ages	1317	100.0		462	100.0		855	100.0	

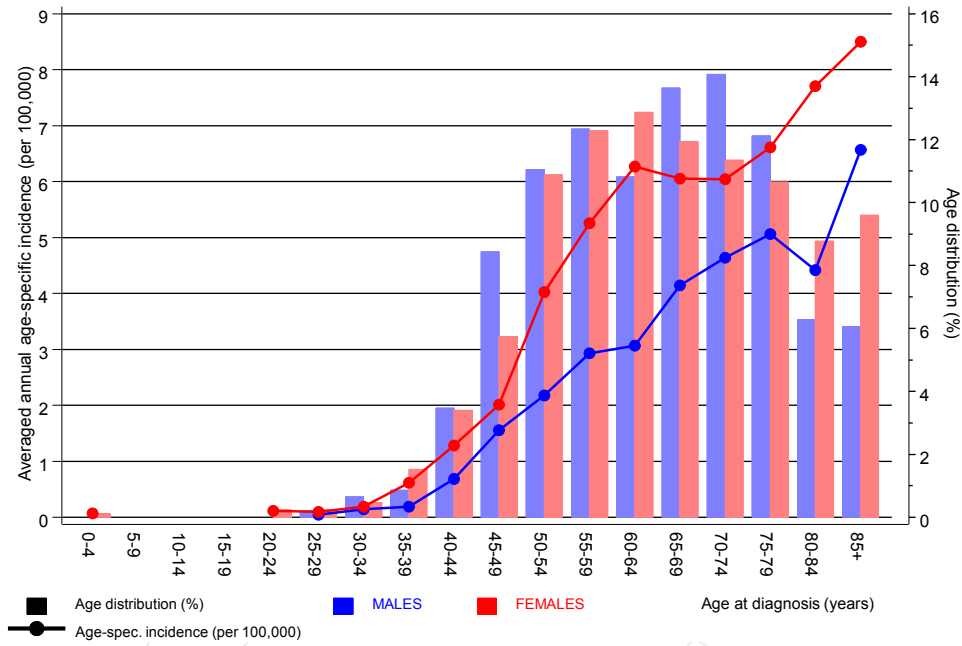
Table 5

Age-specific incidence, DCO rate and proportion of all cancers for period 2007–2019

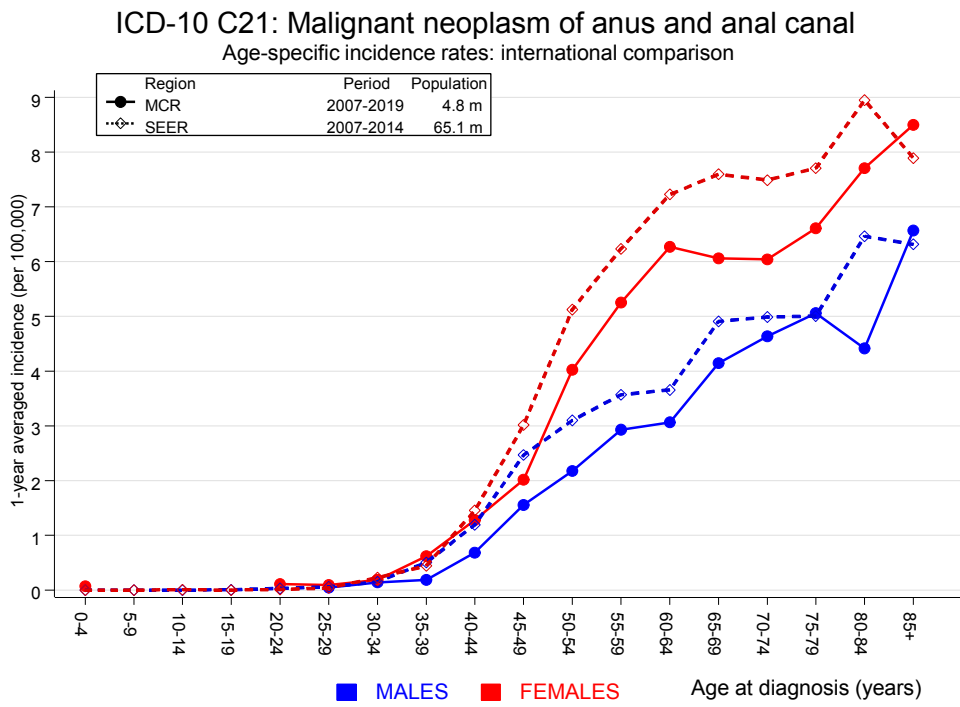
Age at diagnosis Years	Males n	Females n	Males Age- spec. incid.	Females Age- spec. incid.	Males DCO rate n=9 %	Females DCO rate n=19 %	Males Prop.all cancers n=143063 %	Females Prop.all cancers n=144724 %
0- 4		1		0.1		100.0		0.6
5- 9								
10-14								
15-19								
20-24		2		0.1				0.4
25-29	1	2	0.0	0.1			0.1	0.2
30-34	3	4	0.1	0.2			0.3	0.2
35-39	4	13	0.2	0.6			0.2	0.4
40-44	16	29	0.7	1.3			0.6	0.5
45-49	39	49	1.6	2.0			0.8	0.6
50-54	51	93	2.2	4.0			0.7	0.8
55-59	57	105	2.9	5.3			0.5	0.8
60-64	50	110	3.1	6.3			0.3	0.8
65-69	63	102	4.1	6.1	4.8		0.3	0.6
70-74	65	97	4.6	6.0	4.6		0.3	0.5
75-79	56	91	5.1	6.6	5.4	1.1	0.3	0.5
80-84	29	75	4.4	7.7		9.3	0.2	0.5
85+	28	82	6.6	8.5		12.2	0.3	0.5
All ages	462	855			1.9	2.2	0.3	0.6
Incidence								
Raw			1.5	2.7				
WS			0.8	1.4				
ES			1.2	1.9				
BRD-S			1.4	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).

ICD-10 C21: Malignant neoplasm of anus and anal canal  
 Age distribution and age-specific incidence 2007 - 2019 (Males: 462, Females: 855)



**Figure 6.** Age distribution (males: mean=65.2 yrs, median=65.7 yrs; females: mean=66.2 yrs, median=66.1 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 2019, based on the November 2018 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 1998-2019

MALES

Diagnosis	Observed n	Expected n	SIR	CI 95%	CI 95%	EAR	DCO %
C00 Lip	1	0.0	26.2	0.7	146.0	4.3	
C03-C06 Oral cavity	1	0.3	3.4	0.1	18.8	3.2	
C09-C10 Oropharynx	4	0.4	11.0	3.0	28.1 #	16.4	
C12-C13 Hypopharynx	1	0.2	5.1	0.1	28.3	3.6	
C15 Oesophagus	5	0.7	7.6	2.5	17.7 #	19.6	
C16 Stomach	4	1.3	3.0	0.8	7.6	12.0	25.0
C17 Small intestine	1	0.2	5.1	0.1	28.4	3.6	
C18 Colon	11	3.2	3.4	1.7	6.1 #	35.0	27.3
C19-C20 Rectum	6	1.8	3.3	1.2	7.3 #	19.0	
C23-C24 Bile	1	0.3	2.9	0.1	16.0	2.9	
C25 Pancreas	1	1.3	0.8	0.0	4.3	-1.4	
C30-C31 Sinuses	1	0.1	15.9	0.4	88.5	4.2	
C32 Larynx	1	0.3	2.9	0.1	16.1	3.0	
C33-C34 Lung	22	4.0	5.5	3.5	8.4 #	81.4	
C43 Malign. melanoma	2	1.5	1.3	0.2	4.8	2.3	
C46,C49 Soft tissue	1	0.2	5.2	0.1	28.9	3.6	
C60 Penis	1	0.1	11.5	0.3	64.0	4.1	100.0
C61 Prostate	14	9.5	1.5	0.8	2.5	20.1	
C62 Testis	1	0.1	9.5	0.2	53.1	4.0	
C64 Kidney	3	1.2	2.6	0.5	7.5	8.3	
C65 Renal pelvis	1	0.1	6.8	0.2	37.9	3.9	
C67 Bladder	4	1.6	2.6	0.7	6.6	11.0	
C68 Urethra	1	0.0	33.9	0.9	188.8	4.4	
C69 Eye carcinoma	1	0.0	79.5	2.0	442.8 #	4.5	
C70-C72 CNS cancer	2	0.4	4.6	0.6	16.7	7.1	
C73 Thyroid	1	0.2	4.3	0.1	24.1	3.5	
C76-C79 CUP	4	0.6	7.0	1.9	17.9 #	15.5	
Not observed	0	4.3	0.0	0.0	0.9 #	-19.4	
All further malignancies	96	34.1	2.8	2.3	3.4 #	279.7	5.2
Patients		638					
Median age at next malignancy (years)		69.5					
Person-years		2215					
Mean observation time (years)		3.5					
Median observation time (years)		1.9					

# The occurrence of further specified malignancy is statistically significant.

Table 7b

Standardized incidence ratio (SIR, with 95% confidence limits),  
excess absolute risk (EAR) and DCO rate of further malignancies  
for period 1998-2019

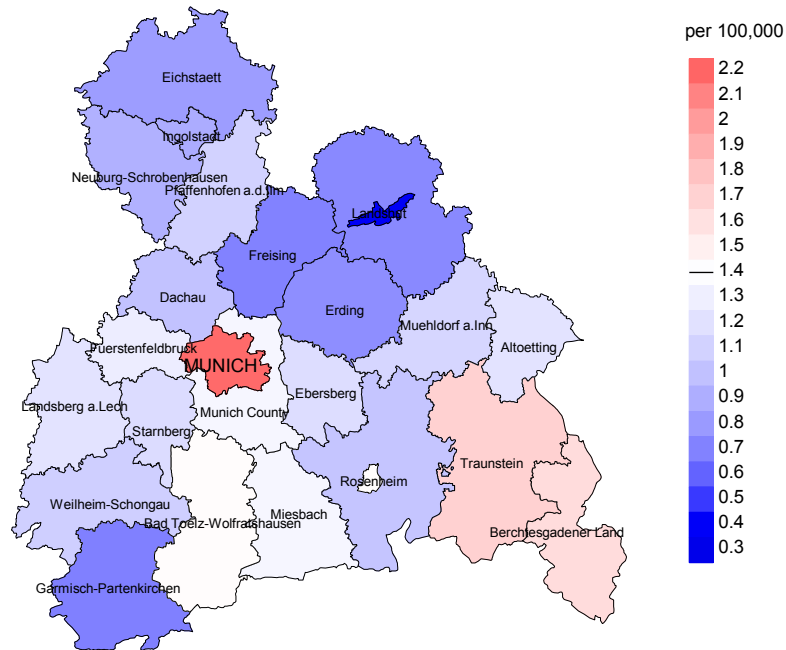
## FEMALES

Diagnosis	Observed n	Expected n	SIR	CI 95%	CI 95%	EAR	DCO %
C03-C06 Oral cavity	2	0.3	6.8	0.8	24.4	3.7	
C09-C10 Oropharynx	1	0.2	4.7	0.1	26.1	1.7	
C11 Nasopharynx	1	0.0	57.1	1.4	318.4 #	2.1	
C15 Oesophagus	2	0.3	6.1	0.7	22.0	3.7	
C16 Stomach	4	1.8	2.3	0.6	5.8	4.9	25.0
C17 Small intestine	2	0.3	7.5	0.9	27.2	3.8	
C18 Colon	21	4.9	4.3	2.7	6.5 #	35.2	23.8
C19-C20 Rectum	8	2.0	3.9	1.7	7.8 #	13.1	
C22 Liver	1	0.6	1.6	0.0	9.0	0.8	
C25 Pancreas	3	2.3	1.3	0.3	3.8	1.5	
C32 Larynx	1	0.1	10.8	0.3	60.1	2.0	
C33-C34 Lung	27	3.8	7.1	4.7	10.3 #	50.7	3.7
C43 Malign. melanoma	5	1.9	2.6	0.8	6.1	6.8	40.0
C46,C49 Soft tissue	1	0.3	3.5	0.1	19.7	1.6	
C48 Peritoneal	1	0.2	5.0	0.1	28.0	1.8	
C50 Breast	34	15.5	2.2	1.5	3.1 #	40.4	5.9
C51 Vulva	10	0.5	19.0	9.1	34.9 #	20.7	
C52 Vagina	2	0.1	21.4	2.6	77.2 #	4.2	
C53 Cervix uteri	3	0.7	4.5	0.9	13.1	5.1	33.3
C54 Corpus uteri	7	2.8	2.5	1.0	5.2 #	9.2	
C55,C57 Fem. genitals un	1	0.1	8.3	0.2	46.0	1.9	
C56 Ovary	3	2.0	1.5	0.3	4.3	2.1	33.3
C64 Kidney	1	1.2	0.9	0.0	4.7	-0.4	
C67 Bladder	3	1.0	3.0	0.6	8.9	4.4	
C73 Thyroid	4	0.8	4.8	1.3	12.3 #	6.9	
C76-C79 CUP	1	0.9	1.1	0.0	5.9	0.1	
C81 Hodgkin lymphoma	2	0.1	22.2	2.7	80.2 #	4.2	
C82-C85 NHL	8	2.0	4.1	1.8	8.0 #	13.2	
C90 Mult. myeloma	1	0.6	1.6	0.0	9.0	0.8	
C91-C96 Leukaemia	4	0.7	5.4	1.5	13.9 #	7.1	25.0
Not observed	0	2.8	0.0	0.0	1.3	-6.0	
All further malignancies	164	50.9	3.2	2.7	3.8 #	247.4	8.5
Patients		1217					
Median age at next malignancy (years)		72.4					
Person-years		4572					
Mean observation time (years)		3.8					
Median observation time (years)		2.2					

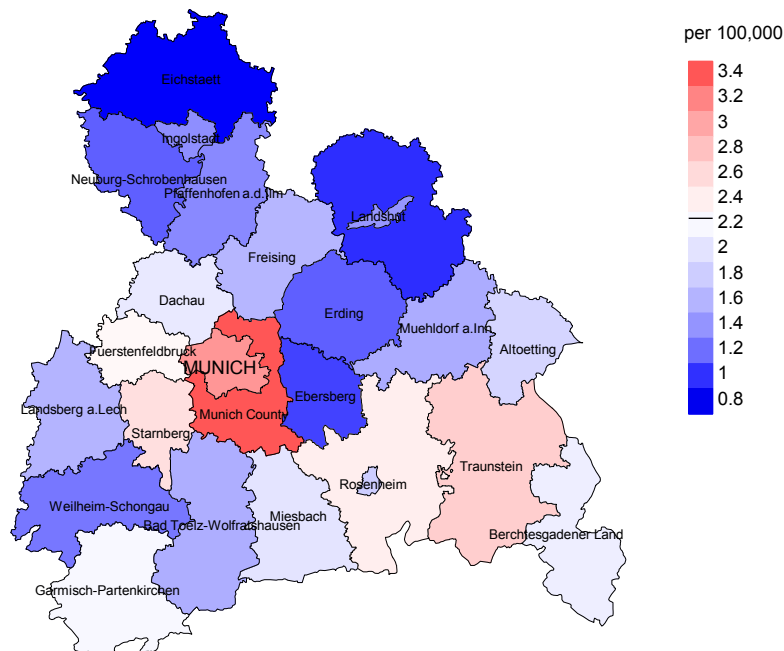
# The occurrence of further specified malignancy is statistically significant.



Average incidence (Germany 1987 standard population) 2007 - 2019: Males



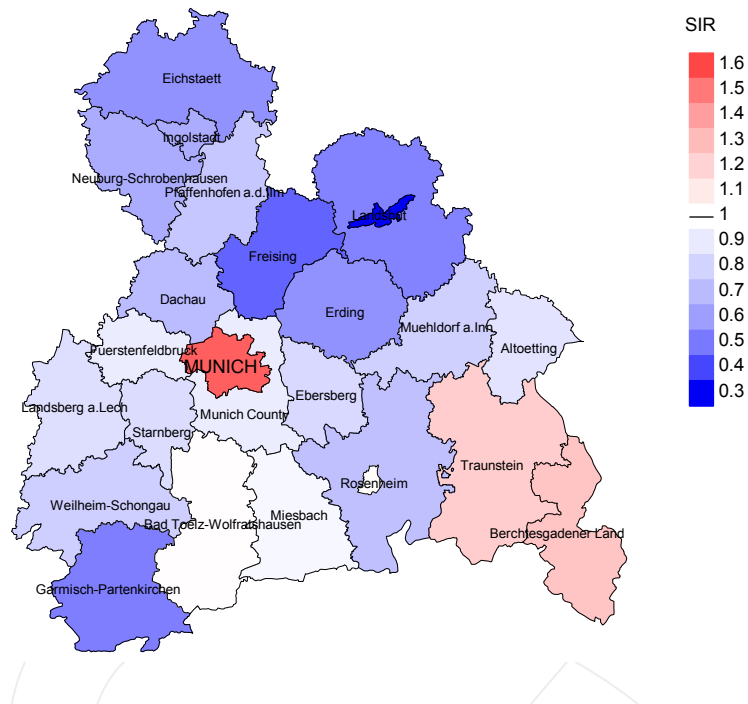
Average incidence (Germany 1987 standard population) 2007 - 2019: Females



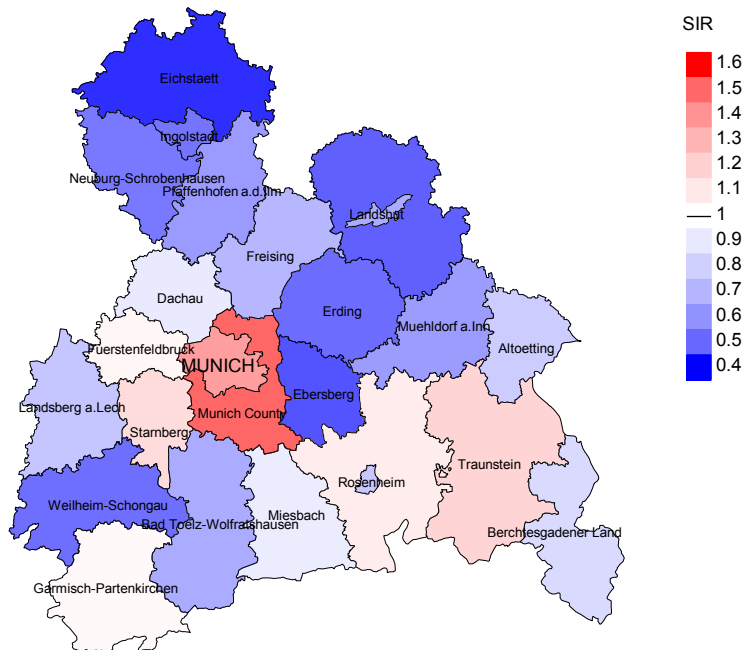
**Figure 8a.** Map of cancer incidence (german standard population, incl. DCO cases) by county averaged for period 2007 to 2019. According to their individual incidence rates, the counties are displayed in different red and blue hues, being the fine white color attributed to the population mean (males 1.4/100,000 WS N=462, females 2.3/100,000 WS N=855).

The results should be interpreted with caution! E.g., in county Ebersberg with a population of 67,462 female residents (averaged) in the period from 2007 to 2019 a total of 11 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 (german standard population). Though, the value of this parameter may vary with an underlying probability of 99% between 0.4 and 2.2/100,000.

Standardized incidence ratio (SIR) 2007 - 2019: Males



Standardized incidence ratio (SIR) 2007 - 2019: Females



**Figure 8b.** Map of standardized incidence ratio (SIR, incl. DCO cases) by county averaged for period 2007 to 2019. 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=462, females N=855).

The results should be interpreted with caution! E.g., in county Ebersberg with a population of 67,153 female residents (averaged) in the period from 2007 to 2019 a total of 11 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 0.47. Though, the value of this parameter may vary with an underlying probability of 99% between 0.18 and 0.96.

## 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 4.92 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	70	97.1		53	75.7	90.6
1999	50	96.0	6.0	38	76.0	94.7
2000	51	96.1		40	78.4	97.5
2001	66	93.9	4.5	45	68.2	93.3
2002	72	97.2	2.8	52	72.2	98.1
2003	68	92.6	1.5	37	54.4	97.3
2004	74	98.6	2.7	36	48.6	91.7
2005	79	94.9	1.3	54	68.4	92.6
2006	82	95.1	4.9	47	57.3	97.9
2007	94	97.9	4.3	59	62.8	96.6
2008	88	95.5	1.1	49	55.7	93.9
2009	114	98.2	0.9	58	50.9	93.1
2010	119	100.0	5.0	67	56.3	94.0
2011	105	98.1	1.9	46	43.8	91.3
2012	107	97.2		52	48.6	94.2
2013	112	98.2		42	37.5	88.1
2014	113	93.8	3.5	41	36.3	97.6
2015	122	87.7	1.6	35	28.7	88.6
2016	119	99.2	2.5	41	34.5	82.9
2017	82	100.0	3.7	21	25.6	71.4
2018	68	100.0	1.5	11	16.2	72.7
2019	74	86.5	1.4	13	17.6	69.2
1998-2019	1929	96.2	2.3	937	48.6	92.4

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 4.92 m as of 2007, respectively)

Year of diagnosis/ death	Incident cases n	Deaths n	Prop. deaths with death certific. %	Prop. deaths in same year	
				Deaths in same year n	Prop. deaths in same year %
1998	70	16	87.5	5	7.1
1999	50	30	80.0	4	8.0
2000	51	28	89.3	4	7.8
2001	66	45	97.8	8	12.1
2002	72	41	97.6	9	12.5
2003	68	39	100.0	5	7.4
2004	74	44	100.0	5	6.8
2005	79	57	96.5	11	13.9
2006	82	50	98.0	6	7.3
2007	94	48	93.8	8	8.5
2008	88	47	97.9	6	6.8
2009	114	44	100.0	4	3.5
2010	119	77	100.0	20	16.8
2011	105	72	97.2	10	9.5
2012	107	59	100.0	11	10.3
2013	112	54	100.0	5	4.5
2014	113	60	93.3	7	6.2
2015	122	67	98.5	8	6.6
2016	119	69	100.0	14	11.8
2017	82	75	97.3	7	8.5
2018	68	47	38.3	3	4.4
2019	74	39	46.2	6	8.1
1998–2019	1929	1108	92.9	166	8.6

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 4.92 m as of 2007, respectively)

Year of death	Deaths n	Prop. cancer- related %	Prop. non-cancer- related %	Prop. cancer recorded on death certificate %
1998	16	68.8	31.3	92.9
1999	30	70.0	30.0	87.5
2000	28	82.1	17.9	96.0
2001	45	73.3	26.7	90.9
2002	41	85.4	14.6	92.5
2003	39	84.6	15.4	89.7
2004	44	79.5	20.5	88.6
2005	57	78.9	21.1	87.3
2006	50	66.0	34.0	79.6
2007	48	64.6	35.4	80.0
2008	47	83.0	17.0	91.3
2009	44	65.9	34.1	88.6
2010	77	72.7	27.3	85.7
2011	72	81.9	18.1	90.0
2012	59	69.5	30.5	76.3
2013	54	63.0	37.0	70.4
2014	60	71.7	28.3	85.7
2015	67	67.2	32.8	80.3
2016	69	52.2	47.8	76.8
2017	75	64.0	36.0	78.1
2018	47	40.4	59.6	72.2
2019	39	43.6	56.4	61.1
1998–2019	1108	69.1	30.9	83.6

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	4	61.7	60.2	61.7	61.7
1999	11	68.0	71.7	59.1	73.8
2000	9	68.6	68.6	88.4	74.9
2001	18	74.0	73.4	82.1	74.7
2002	14	66.0	58.3	67.5	65.8
2003	18	66.2	63.8	77.2	64.4
2004	16	70.4	70.1	71.2	69.3
2005	23	71.8	68.4	78.1	68.4
2006	18	64.0	63.3	66.6	63.4
2007	15	71.6	70.5	71.6	71.8
2008	14	69.7	69.1	73.3	70.2
2009	11	72.9	66.6	82.0	68.9
2010	37	70.8	71.6	67.1	71.6
2011	24	72.3	72.3	67.6	72.0
2012	20	72.6	70.3	83.1	74.0
2013	24	80.5	72.9	86.3	72.9
2014	21	68.4	66.2	73.2	66.4
2015	27	74.5	76.6	74.1	71.5
2016	26	70.7	70.5	71.8	70.0
2017	37	75.2	75.1	78.0	74.9
2018	20	76.1	69.1	79.9	67.5
2019	20	77.5	77.7	77.2	78.9
1998-2019	427	71.8	70.6	75.4	70.9

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	12	73.8	72.0	86.4	72.5
1999	19	84.0	79.0	87.8	78.1
2000	19	76.5	76.5	79.6	78.4
2001	27	80.6	73.3	86.5	80.6
2002	27	82.4	82.9	60.4	82.9
2003	21	81.0	78.1	89.3	81.0
2004	28	77.3	74.8	91.9	75.4
2005	34	80.7	80.0	85.3	80.4
2006	32	79.9	77.1	82.2	80.0
2007	33	80.0	76.2	84.5	77.8
2008	33	81.7	80.8	84.9	81.7
2009	33	74.7	73.6	83.3	74.0
2010	40	83.9	79.8	86.0	83.3
2011	48	76.4	74.3	85.1	75.0
2012	39	79.6	77.3	86.5	77.7
2013	30	80.6	78.5	84.2	80.5
2014	39	74.4	70.7	82.2	73.6
2015	40	77.7	75.0	85.8	76.3
2016	43	80.8	77.3	84.6	77.8
2017	38	82.1	78.3	85.7	81.1
2018	27	82.8	79.3	86.9	85.0
2019	19	77.8	73.5	79.5	73.5
1998-2019	681	80.2	77.0	85.1	78.5

By 2018, Bavarians' life expectancy at birth is estimated at 79.3 years for boys and 83.8 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	2	0.2	0.07	0.1	0.09	0.2	0.08	0.2	0.08
1999	7	0.6	0.37	0.4	0.35	0.6	0.39	0.8	0.40
2000	8	0.7	0.44	0.4	0.48	0.7	0.47	0.8	0.46
2001	15	1.3	0.52	0.7	0.48	1.2	0.55	1.6	0.64
2002	9	0.5	0.45	0.3	0.55	0.4	0.47	0.5	0.40
2003	15	0.8	0.71	0.5	0.66	0.7	0.65	0.8	0.73
2004	12	0.6	0.67	0.3	0.53	0.5	0.61	0.7	0.70
2005	17	0.9	0.94	0.4	0.75	0.6	0.80	0.9	0.93
2006	11	0.6	0.42	0.4	0.43	0.5	0.47	0.6	0.50
2007	8	0.4	0.23	0.2	0.21	0.3	0.22	0.3	0.21
2008	13	0.6	0.46	0.3	0.42	0.5	0.44	0.6	0.48
2009	6	0.3	0.14	0.1	0.13	0.2	0.13	0.2	0.13
2010	28	1.2	0.70	0.6	0.66	0.9	0.69	1.2	0.70
2011	20	0.9	0.47	0.4	0.42	0.7	0.45	0.9	0.50
2012	16	0.7	0.55	0.3	0.58	0.5	0.57	0.7	0.56
2013	15	0.7	0.37	0.3	0.27	0.4	0.30	0.6	0.37
2014	18	0.8	0.46	0.4	0.43	0.6	0.45	0.7	0.47
2015	19	0.8	0.41	0.4	0.31	0.5	0.35	0.7	0.43
2016	12	0.5	0.31	0.2	0.26	0.4	0.28	0.5	0.31
2017	26	1.1	0.68	0.5	0.64	0.7	0.65	1.0	0.69
2018	11	0.5	0.61	0.2	0.45	0.3	0.49	0.4	0.56
2019	9	0.4	0.39	0.1	0.30	0.2	0.34	0.3	0.37
1998-2019	297	0.7	0.45	0.3	0.40	0.5	0.42	0.7	0.46



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	9	0.8	0.21	0.3	0.19	0.5	0.20	0.6	0.20
1999	14	1.2	0.45	0.4	0.33	0.7	0.38	0.9	0.44
2000	15	1.2	0.45	0.5	0.32	0.7	0.35	1.0	0.44
2001	18	1.5	0.49	0.6	0.41	1.0	0.44	1.2	0.47
2002	26	1.3	0.50	0.4	0.32	0.7	0.37	0.9	0.42
2003	18	0.9	0.38	0.3	0.25	0.5	0.28	0.7	0.32
2004	23	1.2	0.41	0.5	0.34	0.7	0.37	0.9	0.38
2005	28	1.4	0.46	0.5	0.34	0.8	0.37	1.1	0.42
2006	22	1.1	0.39	0.5	0.29	0.6	0.31	0.8	0.35
2007	23	1.0	0.39	0.4	0.34	0.6	0.36	0.8	0.37
2008	26	1.1	0.43	0.4	0.29	0.6	0.33	0.8	0.39
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	39	1.7	0.63	0.6	0.44	1.0	0.49	1.2	0.54
2012	25	1.1	0.32	0.4	0.22	0.6	0.24	0.8	0.28
2013	19	0.8	0.27	0.3	0.18	0.4	0.19	0.6	0.24
2014	25	1.0	0.34	0.4	0.25	0.6	0.29	0.8	0.30
2015	26	1.1	0.34	0.4	0.25	0.6	0.28	0.8	0.31
2016	24	1.0	0.30	0.3	0.21	0.5	0.23	0.7	0.26
2017	22	0.9	0.50	0.3	0.35	0.5	0.38	0.6	0.44
2018	8	0.3	0.16	0.1	0.09	0.2	0.11	0.2	0.13
2019	8	0.3	0.16	0.1	0.12	0.2	0.13	0.3	0.15
1998-2019	469	1.0	0.37	0.4	0.27	0.6	0.29	0.8	0.33

Table 12

Age distribution of age at death (cancer-related) for period 2007-2019  
 (incl. multiple malignancies)

Age at death Years	Cases			Males			Females		
	n	%	Cum.%	n	%	Cum.%	n	%	Cum.%
0-4									
5-9									
10-14									
15-19									
20-24									
25-29									
30-34									
35-39	1	0.2	0.2	1	0.5	0.5			0.0
40-44	5	1.0	1.2	2	1.0	1.5	3	1.0	1.0
45-49	18	3.6	4.8	7	3.5	5.0	11	3.7	4.7
50-54	21	4.2	9.1	12	6.0	10.9	9	3.0	7.8
55-59	38	7.6	16.7	17	8.5	19.4	21	7.1	14.9
60-64	46	9.3	26.0	21	10.4	29.9	25	8.4	23.3
65-69	61	12.3	38.2	30	14.9	44.8	31	10.5	33.8
70-74	68	13.7	51.9	28	13.9	58.7	40	13.5	47.3
75-79	69	13.9	65.8	32	15.9	74.6	37	12.5	59.8
80-84	73	14.7	80.5	29	14.4	89.1	44	14.9	74.7
85+	97	19.5	100.0	22	10.9	100.0	75	25.3	100.0
All ages	497	100.0		201	100.0		296	100.0	

Table 13

Age-specific mortality (cancer-related) and proportion of all cancers  
for period 2007-2019  
(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	1		0.0	0.25			0.4	
40-44	2	3	0.1	0.13	0.1	0.10	0.3	0.4
45-49	7	11	0.3	0.18	0.5	0.22	0.5	0.7
50-54	12	9	0.5	0.24	0.4	0.10	0.5	0.4
55-59	17	21	0.9	0.30	1.1	0.20	0.4	0.6
60-64	21	25	1.3	0.42	1.4	0.23	0.4	0.5
65-69	30	31	2.0	0.48	1.8	0.30	0.3	0.5
70-74	28	40	2.0	0.43	2.5	0.41	0.3	0.5
75-79	32	37	2.9	0.57	2.7	0.41	0.3	0.4
80-84	29	44	4.4	1.00	4.5	0.59	0.3	0.5
85+	22	75	5.2	0.79	7.8	0.91	0.3	0.7
All ages	201	296					0.3	0.5
Mortality								
Raw			0.7	0.44	1.0	0.35		
WS			0.3	0.38	0.3	0.25		
ES			0.5	0.40	0.5	0.27		
BRD-S			0.6	0.44	0.7	0.30		
PYLL-70								
per 100,000			3.4		3.9			
ES			2.9		3.2			
AYLL-70			10.0		10.2			

Table 14a

Further malignancies in deaths in period 1998-2019  
MALES

Diagnosis	Total n	Total %↓	Pre n	Pre ←%	Syn- chron ±30d n	Syn- chron ±30d ←%	Post n	Post ←%
C03-C06 Oral cavity	2	1.7	1	50.0			1	50.0
C09-C10 Oropharynx	4	3.4	1	25.0	1	25.0	2	50.0
C12-C13 Hypopharynx	2	1.7	1	50.0			1	50.0
C15 Oesophagus	6	5.0	2	33.3			4	66.7
C16 Stomach	4	3.4	1	25.0			3	75.0
C18 Colon	15	12.6	6	40.0	3	20.0	6	40.0
C19-C20 Rectum	9	7.6	2	22.2	3	33.3	4	44.4
C25 Pancreas	1	0.8					1	100.0
C32 Larynx	2	1.7	2	100.0				
C33-C34 Lung	18	15.1	1	5.6	3	16.7	14	77.8
C43 Malign. melanoma	3	2.5	1	33.3			2	66.7
C44 Skin others	6	5.0	2	33.3	1	16.7	3	50.0
C46,C49 Soft tissue	1	0.8					1	100.0
C60 Penis	2	1.7	1	50.0			1	50.0
C61 Prostate	21	17.6	12	57.1	1	4.8	8	38.1
C62 Testis	1	0.8	1	100.0				
C64 Kidney	4	3.4	3	75.0	1	25.0		
C65 Renal pelvis	1	0.8					1	100.0
C67 Bladder	5	4.2	2	40.0	1	20.0	2	40.0
C68 Urethra	1	0.8			1	100.0		
C70-C72 CNS cancer	2	1.7					2	100.0
C73 Thyroid	2	1.7	1	50.0			1	50.0
C76-C79 CUP	2	1.7					2	100.0
C81 Hodgkin lymphoma	2	1.7	2	100.0				
C82-C85 NHL	3	2.5	2	66.7			1	33.3
All further malignancies	119	100.0	44	37.0	15	12.6	60	50.4

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 1998-2019  
FEMALES

Diagnosis	Total n	Total %↓	Pre n	Pre ←%	Syn- chron ±30d n	Syn- chron ±30d ←%	Post n	Post ←%
C03-C06 Oral cavity	3	1.3	3	100.0				
C09-C10 Oropharynx	3	1.3	1	33.3			2	66.7
C15 Oesophagus	2	0.9			1	50.0	1	50.0
C16 Stomach	12	5.2	3	25.0	1	8.3	8	66.7
C17 Small intestine	1	0.4					1	100.0
C18 Colon	26	11.4	8	30.8	6	23.1	12	46.2
C19-C20 Rectum	7	3.1	1	14.3	5	71.4	1	14.3
C21 Anus/canal	1	0.4					1	100.0
C23-C24 Bile	1	0.4					1	100.0
C25 Pancreas	3	1.3					3	100.0
C33-C34 Lung	30	13.1	3	10.0	3	10.0	24	80.0
C43 Malign. melanoma	5	2.2	2	40.0			3	60.0
C44 Skin others	10	4.4	3	30.0			7	70.0
C46,C49 Soft tissue	1	0.4					1	100.0
C48 Peritoneal	1	0.4					1	100.0
C50 Breast	37	16.2	23	62.2	5	13.5	9	24.3
C51 Vulva	8	3.5	4	50.0			4	50.0
C52 Vagina	2	0.9	1	50.0			1	50.0
C53 Cervix uteri	21	9.2	19	90.5			2	9.5
C54 Corpus uteri	11	4.8	4	36.4			7	63.6
C55,C57 Fem. genitals un	1	0.4					1	100.0
C56 Ovary	7	3.1	3	42.9	1	14.3	3	42.9
C64 Kidney	2	0.9	1	50.0	1	50.0		
C67 Bladder	4	1.7	1	25.0			3	75.0
C70-C72 CNS cancer	1	0.4					1	100.0
C73 Thyroid	5	2.2	1	20.0			4	80.0
C76-C79 CUP	3	1.3	1	33.3			2	66.7
C81 Hodgkin lymphoma	1	0.4	1	100.0				
C82-C85 NHL	12	5.2	8	66.7			4	33.3
C90 Mult. myeloma	4	1.7	1	25.0			3	75.0
C91-C96 Leukaemia	4	1.7					4	100.0
All further malignancies	229	100.0	92	40.2	23	10.0	114	49.8

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 15

Age-specific mortality (cancer-related) and proportion of all cancers  
for period 2007-2019  
(First 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						
5- 9						
10-14						
15-19						
20-24						
25-29						
30-34						
35-39	1		0.0	0.25	0.4	
40-44	2	2	0.1	0.13	0.4	0.3
45-49	6	10	0.2	0.17	0.5	0.7
50-54	12	6	0.5	0.27	0.5	0.3
55-59	14	19	0.7	0.26	0.4	0.6
60-64	17	21	1.0	0.39	0.3	0.6
65-69	23	20	1.5	0.49	0.3	0.4
70-74	18	29	1.3	0.41	0.2	0.5
75-79	25	27	2.3	0.61	0.3	0.4
80-84	23	27	3.5	1.21	0.3	0.4
85+	16	58	3.8	0.94	0.3	0.7
All ages	157	219			0.3	0.5
Mortality						
Raw			0.5	0.43		
WS			0.2	0.36		
ES			0.4	0.39		
BRD-S			0.5	0.43		
PYLL-70						
per 100,000			3.0			3.2
ES			2.5			2.6
AYLL-70			10.6			10.6

\* See corresponding tables with multiple malignancies.

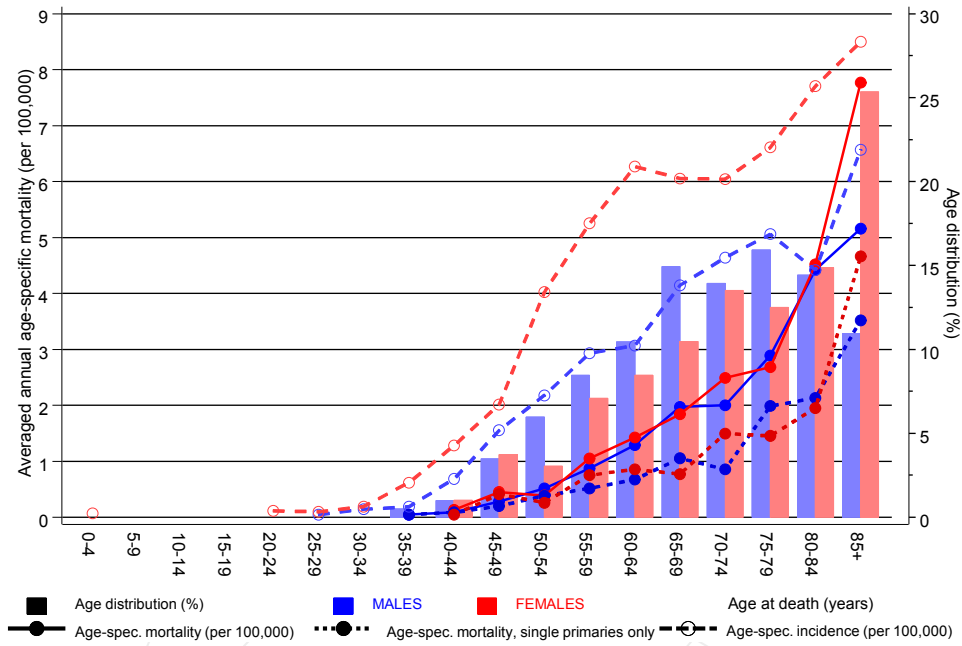
Table 16

Age-specific mortality (cancer-related) and proportion of all cancers  
for period 2007-2019  
(**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						
5- 9						
10-14						
15-19						
20-24						
25-29						
30-34						
35-39	1		0.0	0.25	0.4	
40-44	2	1	0.1	0.13	0.4	0.1
45-49	5	10	0.2	0.16	0.4	0.7
50-54	9	6	0.4	0.23	0.4	0.3
55-59	10	15	0.5	0.21	0.3	0.5
60-64	11	15	0.7	0.27	0.2	0.4
65-69	16	13	1.1	0.38	0.2	0.3
70-74	12	24	0.9	0.30	0.1	0.4
75-79	22	20	2.0	0.61	0.3	0.3
80-84	14	19	2.1	0.82	0.2	0.3
85+	15	45	3.5	0.88	0.3	0.5
All ages	117	168			0.2	0.4
Mortality						
Raw			0.4	0.35		
WS			0.2	0.29		
ES			0.3	0.32		
BRD-S			0.4	0.35		
PYLL-70						
per 100,000			2.3			2.6
ES			1.9			2.2
AYLL-70			11.2			11.5

\* See corresponding tables with multiple malignancies.

ICD-10 C21: Malignant neoplasm of anus and anal canal  
 Age distribution and age-specific mortality 2007 - 2019 (Males: 201, Females: 296)

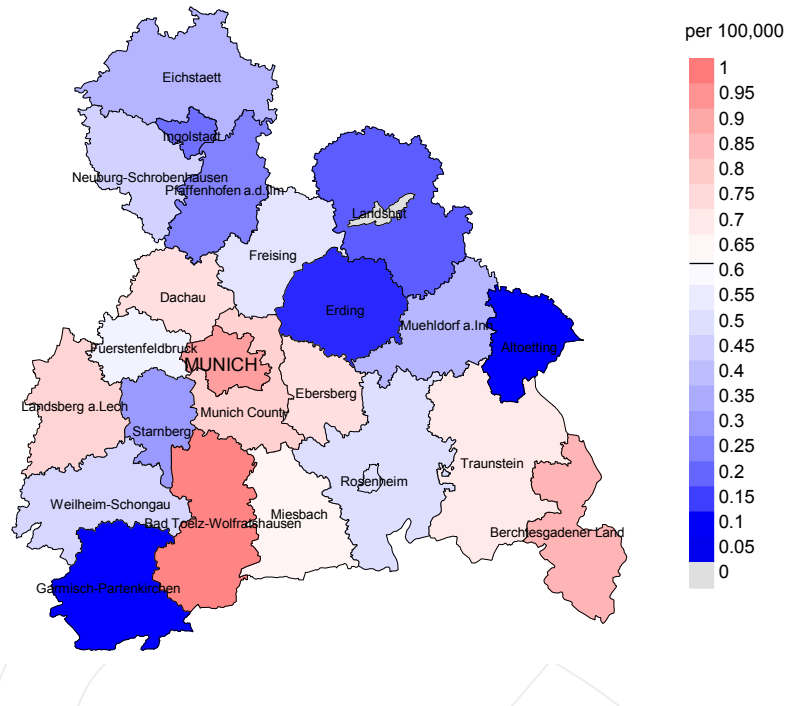


**Figure 17.** Distribution of age at death (bars; males: mean=67.1 yrs, median=67.0 yrs; females: mean=70.4 yrs, median=70.8 yrs) and age-specific mortality (all patients: solid line, patients with single primaries: dotted line). The age-specific incidence is additionally plotted for comparison (dashed line).

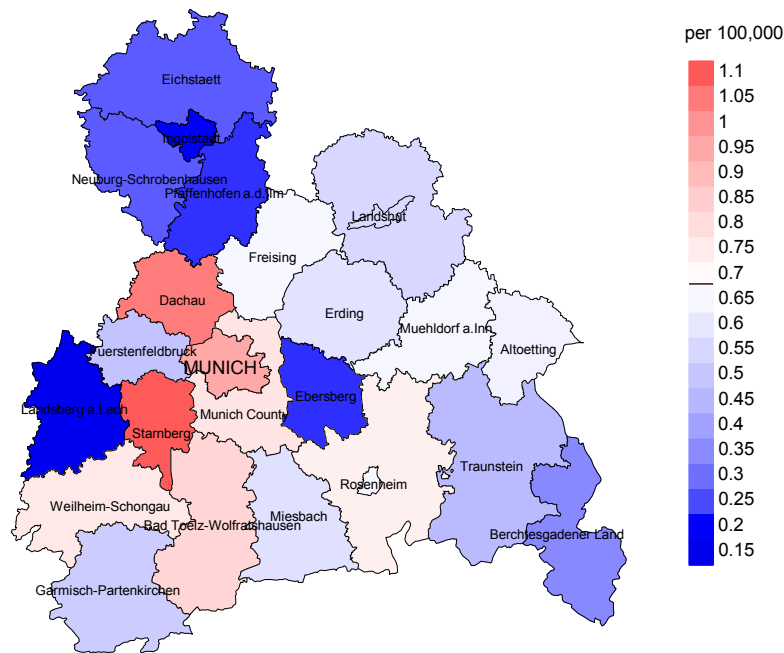
The difference between age at diagnosis (Table 3) and age at anal cancer-related death (see Table 10) should be considered.



Average mortality (Germany 1987 standard population) 2007 - 2019: Males



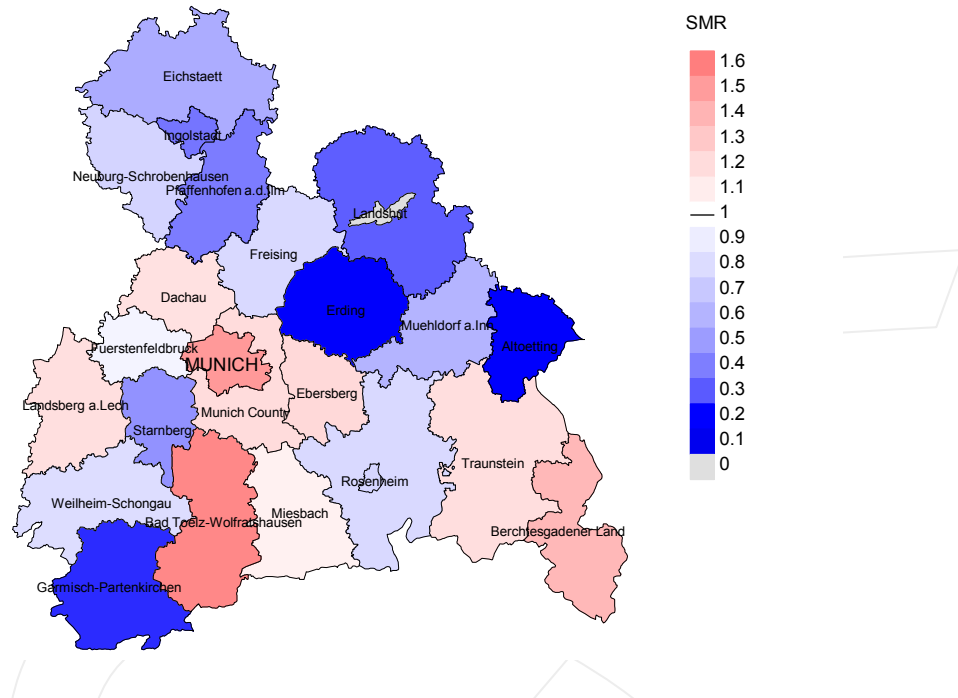
Average mortality (Germany 1987 standard population) 2007 - 2019: Females



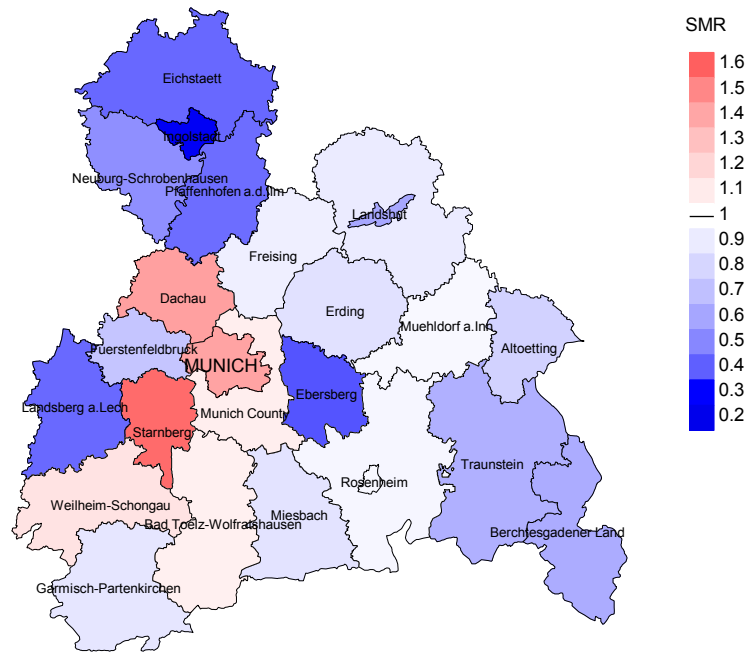
**Figure 18a.** Map of cancer mortality (german standard population) by county averaged for period 2007 to 2019. According to their individual mortality rates, the counties are displayed in different red and blue hues, being the fine white color attributed to the population mean (males 0.6/100,000 WS N=201, females 0.7/100,000 WS N=296).

The results should be interpreted with caution! E.g., in county Ebersberg with a population of 67,462 female residents (averaged) in the period from 2007 to 2019 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 0.2/100,000 (german 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 - 2019: Males



Standardized mortality ratio (SMR) 2007 - 2019: Females



**Figure 18b.** Map of standardized mortality ratio (SMR, incl. DCO cases) by county averaged for period 2007 to 2019. 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=201, females N=296).

The results should be interpreted with caution! E.g., in county Ebersberg with a population of 67,153 female residents (averaged) in the period from 2007 to 2019 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 0.38. Though, the value of this parameter may vary with an underlying probability of 99% between 0.04 and 1.38, 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 ratio of mortality and incidence (mortality-to-incidence ratio, **MIR, MI-Index**) is a statistical index 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 MIR. 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 (FRG) 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 of mortality to incidence, MIR
FRG	Federal Republic of Germany

**Recommended Citation**

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