Munich Cancer Registry

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ICD-10 C61: Prostate cancer

Incidence and Mortality

Year of diagnosis	1998-2019
Patients	59,132
Diseases	59,132
Creation date	01/25/2021
Database export	01/07/2021
Population (males)	2.43 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/bC61__E-ICD-10-C61-Prostate-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, January 2021

[#] 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
C61	Malignant neoplasm of prostate

INCIDENCE

Table 1

Cases with invasive cancer by year of diagnosis, proportions of DCO, further malignancies, deaths, and active follow-up (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	1568	161	10.3	10.2	14.3	74.6	96.7
1999	1530	120	7.8	9.6	14.1	71.6	97.1
2000	1718	152	8.8	9.6	13.9	66.9	97.1
2001	1796	123	6.8	9.6	13.7	63.7	96.3
2002	3380	315	9.3	9.7	13.5	63.5	96.1 #
2003	3339	236	7.1	9.8	13.1	60.0	96.0
2004	3293	229	7.0	9.9	12.6	56.1	96.3
2005	3231	198	6.1	9.9	12.0	53.4	94.8
2006	3132	185	5.9	10.2	11.4	50.1	91.2
2007	3712	245	6.6	10.3	10.9	48.1	88.5 #
2008	3398	200	5.9	10.5	10.2	46.9	97.1
2009	3175	176	5.5	10.8	9.4	44.3	97.7
2010	3072	195	6.3	11.0	8.6	40.7	97.0
2011	3289	192	5.8	11.3	8.0	37.8	97.4
2012	3336	163	4.9	11.5	7.4	33.1	97.0
2013	3027	151	5.0	11.6	6.8	32.3	96.3
2014	3050	164	5.4	11.8	6.1	28.9	94.0
2015	2414	159	6.6	12.0	5.5	29.0	92.9
2016	2344	153	6.5	12.2	4.9	23.8	99.4
2017	2293	154	6.7	12.4	3.9	19.5	99.8
2018	1788	36	2.0	12.5	2.7	10.2	99.7
2019	1247	9	0.7	12.6	2.3	6.5	75.3 ##
1998–2019	59132	3716	6.3	12.6	14.3	44.1	95.4

59,132 cases diagnosed 1998-2019 are related to a total of 59,132 patients. Currently, in 15,422 (26.1 %) of these 59,132 patients more than one malignancy of any cancer type has been registered. Hereby, groups of 11,994 / 2,556 / 872 (20.3 % / 4.3 % / 1.5 %) 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 2017, a subgroup of 2,293 cases has been diagnosed, of which 12.4 % previously and/or concurrently (synchronously) had at least one other malignancy of any cancer type. In 3.9 % 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 4.92 m as of 2007, respectively)

Year of diagnosis	Cases n	Incidence raw	Incidence WS	Incidence ES	Incidence BRD-S
1998	1568	141.5	83.9	129.4	175.6
1999	1530	136.7	79.7	121.7	160.5
2000	1718	150.9	86.6	132.8	176.3
2001	1796	155.0	88.3	134.9	177.8
2002	3380	181.4	99.1	151.2	198.1
2003	3339	178.1	96.2	145.5	188.9
2004	3293	175.0	92.5	138.9	179.7
2005	3231	170.6	88.2	132.6	172.1
2006	3132	163.5	83.2	125.0	161.9
2007	3712	167.6	85.6	128.0	164.2
2008	3398	152.7	75.2	113.0	146.5
2009	3175	142.3	69.8	104.1	133.5
2010	3072	136.3	66.6	99.5	127.3
2011	3289	147.0	69.5	104.3	135.2
2012	3336	147.0	69.6	103.9	134.0
2013	3027	131.5	61.3	92.0	118.9
2014	3050	130.8	61.7	92.1	117.7
2015	2414	101.5	47.1	70.9	91.8
2016	2344	97.5	45.3	68.0	87.6
2017	2293	95.0	43.2	65.2	84.5
2018	1788	73.4	34.5	51.3	65.6
2019	1247	51.2	23.6	35.2	45.8
1998-2019	59132	134.1	66.7	99.7	128.2

The computation of the incidence measures includes all cancers, irrespective of first or subsequent malignancy.

Table 3

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

Year of diagnosis	Cases n	Mean	Std. dev.	Min.	Max.	10%	25%	Median 50%	75%	90%
1998	1568	70.8	9.7	47.0	99.8	58.2	63.3	70.3	77.8	84.2
1999	1530	70.2	9.6	43.0	99.5	58.2	62.9	70.0	76.4	84.0
2000	1718	70.4	9.4	40.6	98.8	58.8	63.4	69.9	76.6	83.2
2001	1796	70.1	9.3	43.6	100	58.6	63.1	69.9	76.4	82.2
2002	3380	70.6	9.5	42.6	102	59.1	63.8	70.0	76.8	83.4
2003	3339	70.1	9.1	35.2	101	58.9	63.8	69.4	75.9	82.2
2004	3293	70.0	9.2	40.0	100	59.2	63.8	69.1	76.1	82.2
2005	3231	70.2	9.1	38.4	101	59.0	64.2	69.4	76.2	82.4
2006	3132	70.5	8.9	41.6	98.6	59.7	64.8	69.6	76.2	82.7
2007	3712	70.3	9.1	37.6	99.9	59.2	64.5	69.6	76.1	82.4
2008	3398	70.7	8.9	25.1	101	59.5	65.5	70.4	76.2	82.6
2009	3175	70.5	9.0	43.2	105	59.3	65.2	70.3	75.8	82.4
2010	3072	70.8	9.2	38.4	102	59.4	65.0	70.7	76.4	83.0
2011	3289	71.2	9.3	40.0	109	59.5	65.7	71.2	76.6	83.3
2012	3336	71.1	8.8	2.7	100	59.7	65.5	71.4	76.4	82.4
2013	3027	71.2	9.2	42.4	103	59.0	65.4	71.8	76.7	82.8
2014	3050	71.1	9.2	44.0	104	58.4	65.1	71.6	76.8	82.8
2015	2414	71.4	9.5	44.4	102	58.5	65.2	72.1	77.5	83.6
2016	2344	71.5	9.6	14.9	103	58.5	65.5	72.2	77.6	83.2
2017	2293	71.8	9.4	43.8	102	58.6	65.3	72.7	77.9	83.0
2018	1788	70.7	9.3	26.9	97.7	57.8	64.4	71.5	77.5	81.3
2019	1247	71.4	8.4	41.0	93.6	59.8	65.3	71.9	77.6	81.7
1998–2019	59132	70.7	9.2	2.7	109	59.0	64.6	70.6	76.7	82.7

Table 4

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

Age at diagnosis Years	Cases n	%	Cum.%
0-4	1	0.0	0.0
5-9	0	0.0	0.0
10-14	1	0.0	0.0
15-19	0	0.0	0.0
20-24	0	0.0	0.0
25-29	2	0.0	0.0
30-34	0	0.0	0.0
35-39	7	0.0	0.0
40-44	60	0.2	0.2
45-49	396	1.1	1.3
50-54	1162	3.2	4.5
55-59	2608	7.2	11.7
60-64	4534	12.5	24.3
65-69	7390	20.4	44.7
70-74	8283	22.9	67.6
75-79	6181	17.1	84.7
80-84	3155	8.7	93.5
85+	2365	6.5	100.0
All ages	36145	100.0	

Table 5

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

Age at diagnosis Years	Cases n	Age-spec. incidence	DCO rate n=1997 %	Prop. all cancers n=143063 %
0- 4	1	0.1	100.0	0.5
5- 9		0.0		
10-14	1	0.1	100.0	0.8
15-19		0.0		
20-24		0.0		
25-29	2	0.1		0.2
30-34		0.0		
35-39	7	0.3		0.4
40-44	60	2.6		2.3
45-49	396	15.8	0.3	8.3
50-54	1162	49.6	0.1	14.8
55-59	2608	134.1	0.3	22.1
60-64	4534	278.0	0.6	27.8
65-69	7390	485.9	0.7	32.5
70-74	8283	591.1	1.6	32.2
75-79	6181	558.3	3.6	28.0
80-84	3155	480.6	13.0	22.3
85+	2365	554.6	48.4	24.0
All ages	36145		5.5	25.3
Incidence				
Raw		120.0		
WS		57.3		
ES		85.4		
BRD-S		109.6		

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).

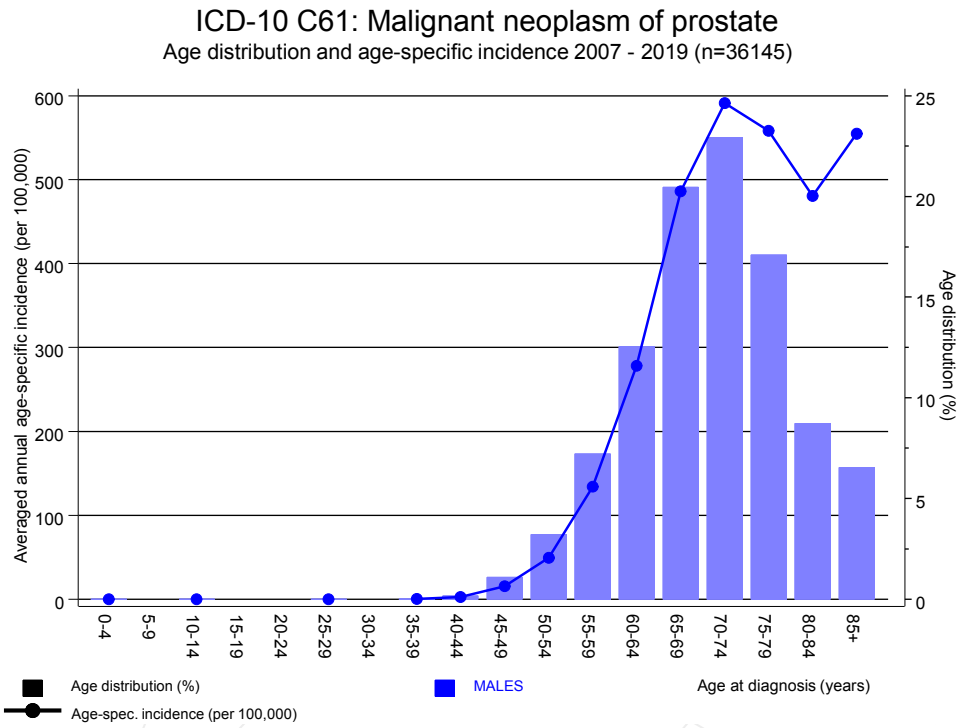

Figure 6. Age distribution (mean=71.0 yrs, median=71.2 yrs) and age-specific incidence.

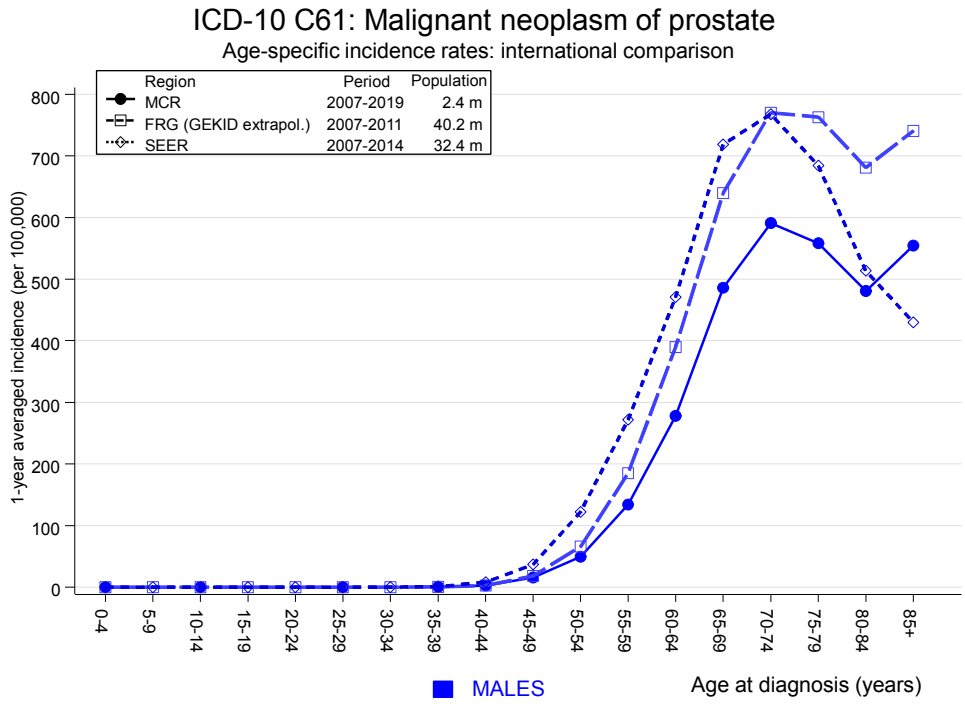

Figure 6a. Age-specific incidence in MCR registry areas compared to Germany (FRG, GEKID extrapolation) and SEER (Surveillance, Epidemiology, and End Results, USA).

Reference:

Extrapolated age-specific patient population of Germany, data status middle of 2010. Association of Population-based Cancer Registries in Germany (GEKID e.V.). Berlin, 2014. http://www.gekid.de. Last access: 02/11/2015
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 7

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

Diagnosis		Observed n	Expected n	SIR	CI 95%	CI 95%		EAR	DCO %
C03–C06	Oral cavity	44	36.8	1.2	0.9	1.6		0.3	
C07–C08	Salivary gland	26	12.5	2.1	1.4	3.1	#	0.5	15.4
C09–C10	Oropharynx	70	44.2	1.6	1.2	2.0	#	1.0	
C12–C13	Hypopharynx	39	24.6	1.6	1.1	2.2	#	0.5	5.1
C15	Oesophagus	183	96.0	1.9	1.6	2.2	#	3.3	5.5
C16	Stomach	384	220.1	1.7	1.6	1.9	#	6.2	6.5
C17	Small intestine	96	30.1	3.2	2.6	3.9	#	2.5	2.1
C18	Colon	952	536.1	1.8	1.7	1.9	#	15.8	5.0
C19–C20	Rectum	462	278.3	1.7	1.5	1.8	#	7.0	3.7
C21	Anus/canal	25	11.5	2.2	1.4	3.2	#	0.5	
C22	Liver	202	153.0	1.3	1.1	1.5	#	1.9	14.9
C23–C24	Bile	103	56.8	1.8	1.5	2.2	#	1.8	8.7
C25	Pancreas	447	209.5	2.1	1.9	2.3	#	9.0	26.4
C30–C31	Sinuses	17	9.3	1.8	1.1	2.9	#	0.3	5.9
C32	Larynx	79	49.5	1.6	1.3	2.0	#	1.1	10.1
C33–C34	Lung	1033	625.8	1.7	1.6	1.8	#	15.4	9.4
C38,C45	Mesothelioma	83	38.5	2.2	1.7	2.7	#	1.7	4.8
C40–C41	Bone	15	3.9	3.9	2.2	6.4	#	0.4	
C43	Malign. melanoma	526	225.4	2.3	2.1	2.5	#	11.4	1.3
C46,C49	Soft tissue	49	29.5	1.7	1.2	2.2	#	0.7	2.0
C50	Breast	32	14.4	2.2	1.5	3.1	#	0.7	6.3
C60	Penis	35	13.4	2.6	1.8	3.6	#	0.8	5.7
C62	Testis	14	7.0	2.0	1.1	3.3	#	0.3	7.1
C64	Kidney	494	179.9	2.7	2.5	3.0	#	11.9	5.5
C65	Renal pelvis	77	24.8	3.1	2.5	3.9	#	2.0	
C66	Ureter	45	14.4	3.1	2.3	4.2	#	1.2	
C67	Bladder	758	262.3	2.9	2.7	3.1	#	18.8	5.5
C68	Urethra	31	4.8	6.5	4.4	9.2	#	1.0	
C69	Eye melanoma	16	6.0	2.7	1.5	4.3	#	0.4	
C70–C72	CNS cancer	136	64.4	2.1	1.8	2.5	#	2.7	9.6
C73	Thyroid	67	28.2	2.4	1.8	3.0	#	1.5	1.5
C76–C79	CUP	152	91.7	1.7	1.4	1.9	#	2.3	3.9
C81	Hodgkin lymphoma	19	10.9	1.7	1.0	2.7	#	0.3	
C82–C85	NHL	477	229.2	2.1	1.9	2.3	#	9.4	7.1
C90	Mult. myeloma	148	73.0	2.0	1.7	2.4	#	2.8	10.8
C91–C96	Leukaemia	170	84.5	2.0	1.7	2.3	#	3.2	30.0
Others, specified		85	47.5	1.8	1.4	2.2	#	1.4	22.4
Not observed		0	1551.9	0.0	0.0	0.0	#	-58.8	
All further malignancies		7591	5399.4	1.4	1.4	1.4	#	83.0	7.9

Patients	54997
Median age at next malignancy (years)	75.8
Person-years	264055
Mean observation time (years)	4.8
Median observation time (years)	3.5

The occurrence of further specified malignancy is statistically significant.

Further observed malignancies with count 1 to 12 are pooled in category “Others, specified”.

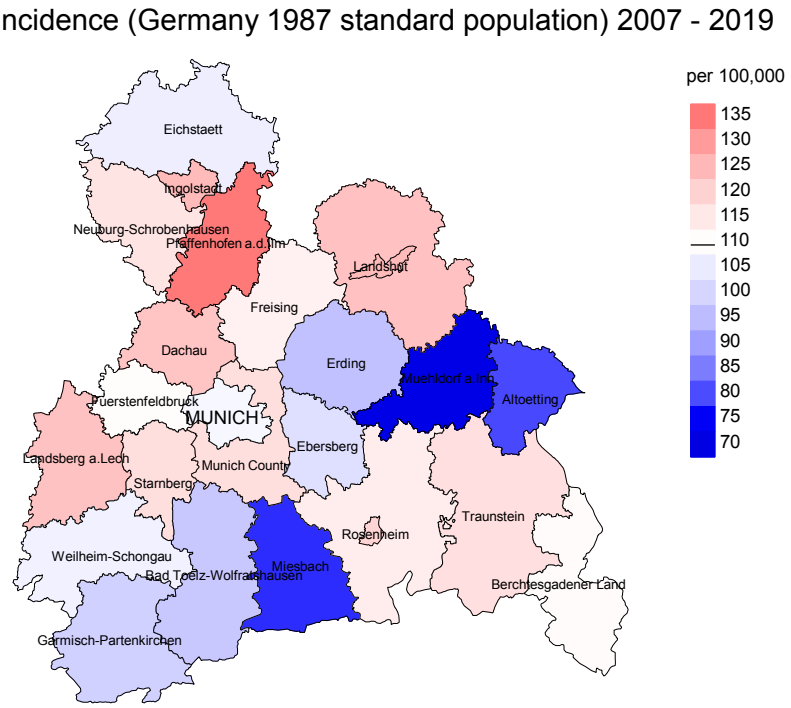

Figure 8a. Map of cancer incidence (german standard population, incl. DCO cases) by county averaged for period 2007 to 2019. According to their individual incidence rates, the counties are displayed in different red and blue hues, being the fine white color attributed to the population mean (109.6/100,000 WS N=36,145).

The results should be interpreted with caution! E.g., in county Ebersberg with a population of 66,374 male residents (averaged) in the period from 2007 to 2019 a total of 965 men were identified with newly diagnosed prostate cancer. Therefore, the mean incidence rate for this cancer type in this area can be calculated at 102.3/100,000 (german standard population). Though, the value of this parameter may vary with an underlying probability of 99% between 94.0 and 111.2/100,000.

Standardized incidence ratio (SIR) 2007 - 2019

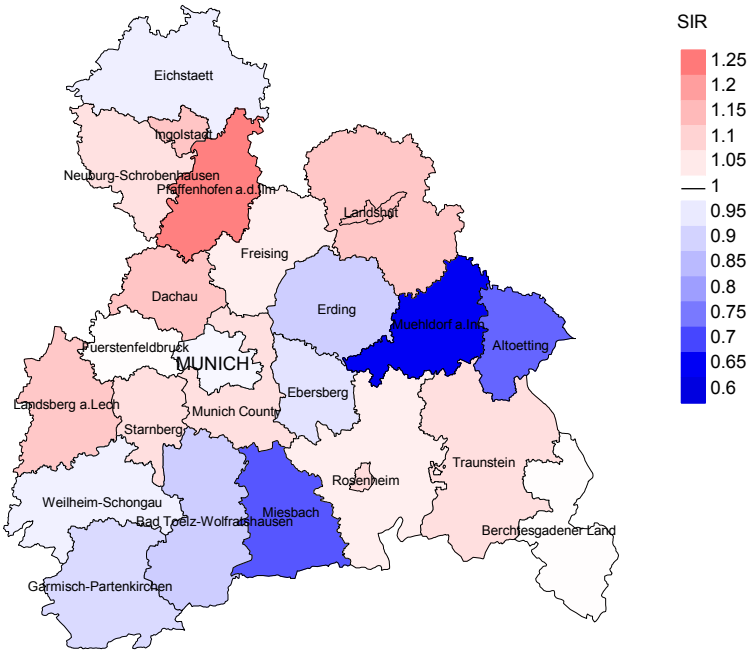

Figure 8b. Map of standardized incidence ratio (SIR, incl. DCO cases) by county averaged for period 2007 to 2019. According to their individual SIR values, the counties are displayed in different red and blue hues, being the fine white color attributed to the population overall of 1.0 (N=36,145).

The results should be interpreted with caution! E.g., in county Ebersberg with a population of 65,991 male residents (averaged) in the period from 2007 to 2019 a total of 965 men were identified with newly diagnosed prostate cancer. Therefore, the mean standardized incidence ratio (SIR) for this cancer type in this area can be calculated at 0.94. Though, the value of this parameter may vary with an underlying probability of 99% between 0.86 and 1.02, 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 4.92 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	1568	96.7	10.3	1170	74.6	95.4
1999	1530	97.1	7.8	1095	71.6	94.5
2000	1718	97.1	8.8	1149	66.9	94.1
2001	1796	96.3	6.8	1144	63.7	94.7
2002	3380	96.1	9.3	2145	63.5	93.5
2003	3339	96.0	7.1	2003	60.0	93.6
2004	3293	96.3	7.0	1849	56.1	94.4
2005	3231	94.8	6.1	1724	53.4	93.4
2006	3132	91.2	5.9	1568	50.1	93.0
2007	3712	88.5	6.6	1786	48.1	92.7
2008	3398	97.1	5.9	1592	46.9	92.3
2009	3175	97.7	5.5	1405	44.3	92.1
2010	3072	97.0	6.3	1251	40.7	92.6
2011	3289	97.4	5.8	1242	37.8	90.3
2012	3336	97.0	4.9	1105	33.1	88.7
2013	3027	96.3	5.0	978	32.3	88.1
2014	3050	94.0	5.4	880	28.9	86.1
2015	2414	92.9	6.6	700	29.0	87.6
2016	2344	99.4	6.5	559	23.8	84.1
2017	2293	99.8	6.7	447	19.5	79.0
2018	1788	99.7	2.0	182	10.2	59.3
2019	1247	75.3	0.7	81	6.5	90.1
1998–2019	59132	95.4	6.3	26055	44.1	91.8

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. %	Deaths in same year n	Prop. deaths in same year %
1998	1568	659	94.5	209	13.3
1999	1530	614	94.0	151	9.9
2000	1718	634	95.0	169	9.8
2001	1796	666	92.3	163	9.1
2002	3380	991	95.5	372	11.0
2003	3339	1051	97.4	274	8.2
2004	3293	1044	97.3	258	7.8
2005	3231	1145	96.7	235	7.3
2006	3132	1213	97.0	233	7.4
2007	3712	1386	97.3	299	8.1
2008	3398	1500	98.7	265	7.8
2009	3175	1535	98.3	232	7.3
2010	3072	1655	98.2	255	8.3
2011	3289	1763	98.7	261	7.9
2012	3336	1816	98.3	232	7.0
2013	3027	1848	98.3	217	7.2
2014	3050	1931	97.9	234	7.7
2015	2414	2005	98.1	216	8.9
2016	2344	2142	98.6	231	9.9
2017	2293	2219	96.5	225	9.8
2018	1788	1632	34.7	76	4.3
2019	1247	1373	53.4	33	2.6
1998–2019	59132	30822	92.2	4840	8.2

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	659	56.3	43.7	80.3
1999	614	58.1	41.9	77.8
2000	634	58.7	41.3	77.9
2001	666	53.9	46.1	75.9
2002	991	60.2	39.8	77.7
2003	1051	63.6	36.4	76.3
2004	1044	59.8	40.2	75.0
2005	1145	61.7	38.3	73.5
2006	1213	61.3	38.7	75.7
2007	1386	63.3	36.7	73.9
2008	1500	59.3	40.7	70.0
2009	1535	57.4	42.6	69.8
2010	1655	60.1	39.9	71.8
2011	1763	59.0	41.0	69.6
2012	1816	59.5	40.5	70.3
2013	1848	55.0	45.0	66.8
2014	1931	55.0	45.0	67.4
2015	2005	54.4	45.6	64.4
2016	2142	53.7	46.3	64.0
2017	2219	50.1	49.9	61.7
2018	1632	35.3	64.7	53.6
2019	1373	33.8	66.2	47.5
1998-2019	30822	55.3	44.7	69.2

Table 10

Medians of age at death according to the grouping in Table 9

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	659	80.7	79.0	82.8	80.1
1999	614	80.4	78.0	83.2	79.7
2000	634	80.7	80.0	82.7	80.8
2001	666	80.5	78.7	82.6	80.9
2002	991	79.7	78.3	81.8	79.5
2003	1051	79.0	77.2	82.2	78.3
2004	1044	80.3	78.2	83.0	79.5
2005	1145	80.3	78.4	83.5	79.1
2006	1213	79.7	78.1	82.0	78.8
2007	1386	79.8	78.4	82.2	79.0
2008	1500	80.0	77.7	83.0	78.7
2009	1535	80.5	78.3	83.2	79.6
2010	1655	80.4	78.8	83.1	79.6
2011	1763	81.1	79.2	83.4	80.0
2012	1816	81.1	79.0	83.5	79.8
2013	1848	81.7	79.6	83.8	80.6
2014	1931	81.9	79.3	84.3	80.7
2015	2004	81.5	79.3	84.1	80.1
2016	2142	82.1	80.0	84.2	80.7
2017	2219	82.8	80.7	84.8	81.6
2018	1632	81.8	79.3	83.3	81.5
2019	1373	82.8	79.9	83.8	80.4
1998–2019	30821	81.1	79.0	83.5	80.0

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 11

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

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	371	33.5	0.24	18.3	0.22	31.7	0.24	48.6	0.28
1999	357	31.9	0.23	17.0	0.21	29.5	0.24	44.7	0.28
2000	372	32.7	0.22	17.0	0.20	30.1	0.23	45.9	0.26
2001	359	31.0	0.20	16.0	0.18	28.4	0.21	43.0	0.24
2002	597	32.0	0.18	15.8	0.16	27.2	0.18	40.2	0.20
2003	668	35.6	0.20	17.1	0.18	29.3	0.20	44.0	0.23
2004	624	33.2	0.19	15.2	0.16	26.3	0.19	39.9	0.22
2005	706	37.3	0.22	16.3	0.18	28.4	0.21	44.0	0.26
2006	743	38.8	0.24	16.8	0.20	29.2	0.23	43.9	0.27
2007	877	39.6	0.24	16.9	0.20	29.2	0.23	43.8	0.27
2008	889	39.9	0.26	16.4	0.22	28.1	0.25	42.4	0.29
2009	881	39.5	0.28	15.9	0.23	27.1	0.26	40.4	0.30
2010	994	44.1	0.32	17.1	0.26	29.3	0.30	44.1	0.35
2011	1041	46.5	0.32	17.5	0.25	30.6	0.29	46.0	0.34
2012	1080	47.6	0.32	17.5	0.25	30.3	0.29	45.9	0.34
2013	1017	44.2	0.34	15.9	0.26	27.7	0.30	41.6	0.35
2014	1063	45.6	0.35	16.2	0.26	28.0	0.30	41.4	0.35
2015	1090	45.8	0.45	15.9	0.34	27.5	0.39	41.1	0.45
2016	1150	47.8	0.49	15.8	0.35	27.7	0.41	42.0	0.48
2017	1111	46.0	0.48	14.9	0.35	26.2	0.40	39.4	0.47
2018	576	23.7	0.32	7.8	0.23	13.5	0.26	20.0	0.31
2019	464	19.1	0.37	6.1	0.26	10.6	0.30	16.1	0.35
1998-2019	17030	38.6	0.29	15.2	0.23	26.2	0.26	39.3	0.31

Table 12

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

Age at death Years	Cases n	%	Cum.%
0-4			
5-9			
10-14			
15-19			
20-24			
25-29	1	0.0	0.0
30-34	0	0.0	0.0
35-39	0	0.0	0.0
40-44	3	0.0	0.0
45-49	20	0.2	0.2
50-54	57	0.5	0.7
55-59	190	1.6	2.2
60-64	467	3.8	6.0
65-69	1081	8.8	14.9
70-74	1988	16.3	31.1
75-79	2725	22.3	53.4
80-84	2723	22.3	75.7
85+	2978	24.3	100.0
All ages	12233	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	Cases n	Age-spec. mortality	MI-index	Prop. all cancers %
0- 4		0.0		
5- 9		0.0		
10-14		0.0		
15-19		0.0		
20-24		0.0		
25-29	1	0.0	0.50	1.2
30-34		0.0		
35-39		0.0		
40-44	3	0.1	0.05	0.5
45-49	20	0.8	0.05	1.5
50-54	57	2.4	0.05	2.3
55-59	190	9.8	0.07	4.6
60-64	467	28.6	0.10	7.8
65-69	1081	71.1	0.15	12.6
70-74	1988	141.9	0.24	17.9
75-79	2725	246.1	0.44	23.8
80-84	2723	414.8	0.86	28.9
85+	2978	698.4	1.26	36.2
All ages	12233			19.1
Mortality				
Raw		40.6	0.34	
WS		14.7	0.26	
ES		25.4	0.30	
BRD-S		38.0	0.35	
PYLL-70				
per 100,000		38.3		
ES		32.0		
AYLL-70		5.6		

Table 14

Further malignancies in deaths in period 1998–2019

Diagnosis		Total n	Total %↓	Pre n	Pre ←%	Syn-chron ±30d n	Syn-chron ±30d ←%	Post n	Post ←%
C03–C06	Oral cavity	56	0.6	24	42.9	2	3.6	30	53.6
C07–C08	Salivary gland	23	0.3	4	17.4	4	17.4	15	65.2
C09–C10	Oropharynx	65	0.8	30	46.2	2	3.1	33	50.8
C12–C13	Hypopharynx	36	0.4	12	33.3	2	5.6	22	61.1
C15	Oesophagus	162	1.9	26	16.0	11	6.8	125	77.2
C16	Stomach	382	4.4	79	20.7	26	6.8	277	72.5
C17	Small intestine	51	0.6	14	27.5			37	72.5
C18	Colon	953	11.0	348	36.5	63	6.6	542	56.9
C19–C20	Rectum	534	6.2	203	38.0	46	8.6	285	53.4
C21	Anus/canal	17	0.2	6	35.3	1	5.9	10	58.8
C22	Liver	224	2.6	20	8.9	8	3.6	196	87.5
C23–C24	Bile	97	1.1	12	12.4	4	4.1	81	83.5
C25	Pancreas	482	5.6	34	7.1	22	4.6	426	88.4
C32	Larynx	93	1.1	46	49.5	5	5.4	42	45.2
C33–C34	Lung	1178	13.6	128	10.9	73	6.2	977	82.9
C38,C45	Mesothelioma	91	1.1	5	5.5	4	4.4	82	90.1
C43	Malign. melanoma	384	4.4	189	49.2	16	4.2	179	46.6
C44	Skin others	671	7.8	188	28.0	20	3.0	463	69.0
C46,C49	Soft tissue	40	0.5	12	30.0	2	5.0	26	65.0
C50	Breast	28	0.3	12	42.9	3	10.7	13	46.4
C60	Penis	32	0.4	6	18.8	4	12.5	22	68.8
C62	Testis	47	0.5	34	72.3	3	6.4	10	21.3
C64	Kidney	429	5.0	194	45.2	57	13.3	178	41.5
C65	Renal pelvis	68	0.8	15	22.1	10	14.7	43	63.2
C66	Ureter	45	0.5	11	24.4	9	20.0	25	55.6
C67	Bladder	1141	13.2	440	38.6	292	25.6	409	35.8
C68	Urethra	33	0.4	11	33.3	9	27.3	13	39.4
C69	Eye melanoma	17	0.2	9	52.9	1	5.9	7	41.2
C70–C72	CNS cancer	145	1.7	6	4.1	8	5.5	131	90.3
C73	Thyroid	46	0.5	11	23.9			35	76.1
C76–C79	CUP	191	2.2	22	11.5	19	9.9	150	78.5
C81	Hodgkin lymphoma	23	0.3	10	43.5	1	4.3	12	52.2
C82–C85	NHL	402	4.7	123	30.6	44	10.9	235	58.5
C90	Mult. myeloma	147	1.7	31	21.1	9	6.1	107	72.8
C91–C96	Leukaemia	180	2.1	12	6.7	10	5.6	158	87.8
Others, specified		123	1.4	28	22.8	9	7.3	86	69.9
All further malignancies		8636	100.0	2355	27.3	799	9.3	5482	63.5

Further malignancies with number of cases 1 to 16 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 2007-2019
(**First primaries only** *)

Age at death Years	Cases n	Age-spec. mortality	MI-index	Prop. all cancers %
0- 4		0.0		
5- 9		0.0		
10-14		0.0		
15-19		0.0		
20-24		0.0		
25-29		0.0		
30-34		0.0		
35-39		0.0		
40-44	2	0.1	0.04	0.4
45-49	14	0.6	0.04	1.1
50-54	43	1.8	0.04	1.9
55-59	150	7.7	0.06	4.2
60-64	382	23.4	0.09	7.7
65-69	857	56.4	0.13	12.5
70-74	1616	115.3	0.23	19.0
75-79	2227	201.1	0.45	26.6
80-84	2248	342.4	0.92	33.3
85+	2479	581.3	1.36	41.8
All ages	10018			20.2
Mortality				
Raw		33.2	0.33	
WS		12.0	0.24	
ES		20.8	0.28	
BRD-S		31.1	0.34	
PYLL-70				
per 100,000		30.2		
ES		25.3		
AYLL-70		5.5		

* 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	Cases n	Age-spec. mortality	MI-index	Prop. all cancers %
0- 4		0.0		
5- 9		0.0		
10-14		0.0		
15-19		0.0		
20-24		0.0		
25-29		0.0		
30-34		0.0		
35-39		0.0		
40-44	1	0.0	0.02	0.2
45-49	14	0.6	0.04	1.2
50-54	40	1.7	0.04	1.8
55-59	131	6.7	0.06	3.7
60-64	296	18.2	0.08	6.0
65-69	584	38.4	0.10	8.7
70-74	1078	76.9	0.18	13.2
75-79	1419	128.2	0.32	17.8
80-84	1462	222.7	0.68	23.1
85+	1713	401.7	1.00	31.5
All ages	6738			14.2
Mortality				
Raw		22.4	0.25	
WS		8.2	0.19	
ES		14.1	0.22	
BRD-S		20.9	0.25	
PYLL-70				
per 100,000		24.0		
ES		20.2		
AYLL-70		6.0		

* See corresponding tables with multiple malignancies.

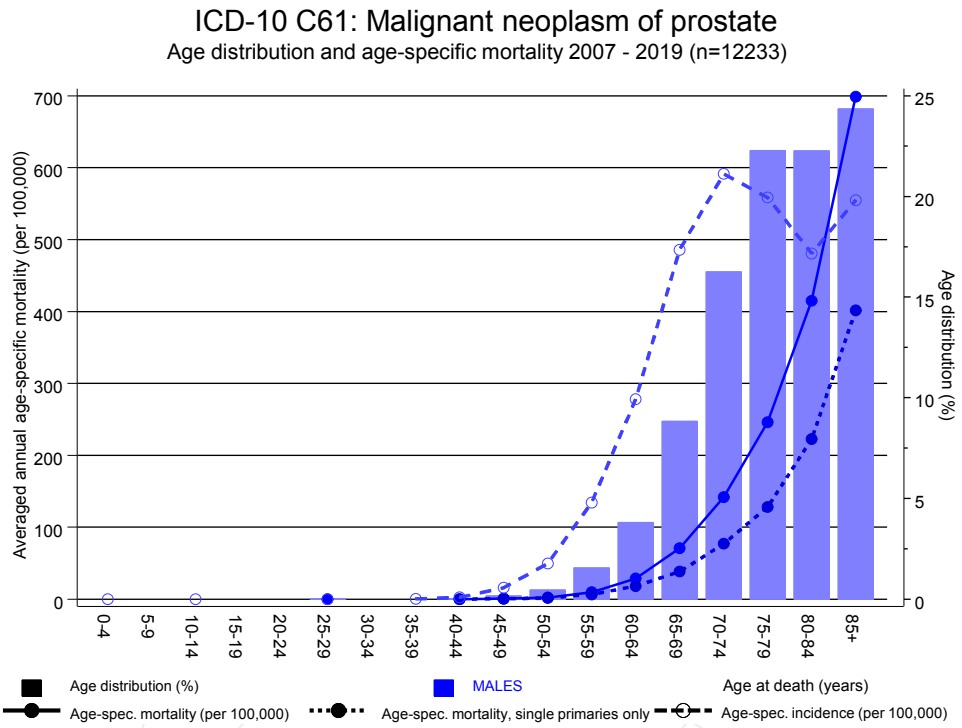

Figure 17. Distribution of age at death (bars; mean=72.2 yrs, median=72.2 yrs) and age-specific mortality (all patients: solid line, patients with single primaries: dotted line). The age-specific incidence is additionally plotted for comparison (dashed line).

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

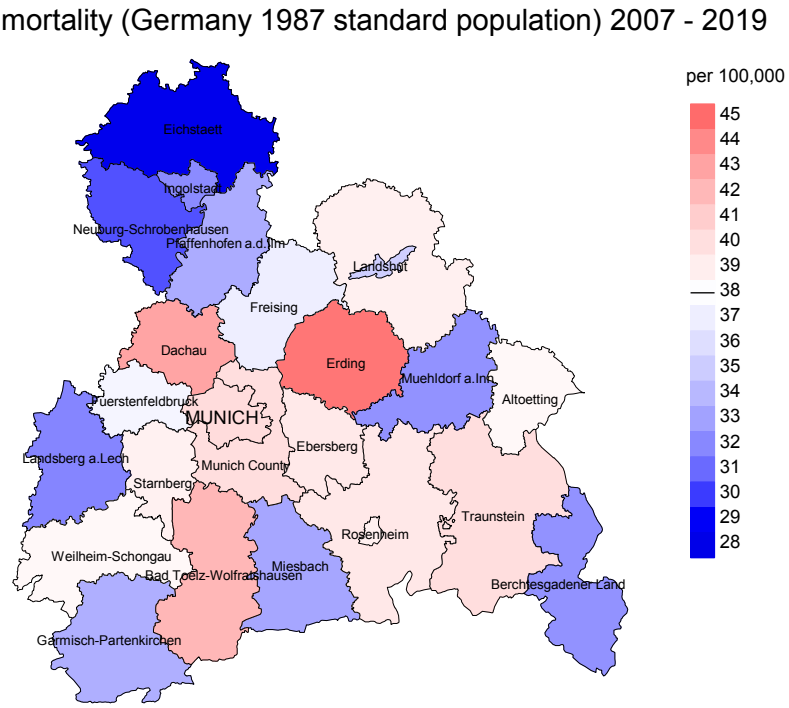

Figure 18a. Map of cancer mortality (german standard population) by county averaged for period 2007 to 2019. According to their individual mortality rates, the counties are displayed in different red and blue hues, being the fine white color attributed to the population mean (38.0/100,000 WS N=12,233).

The results should be interpreted with caution! E.g., in county Ebersberg with a population of 66,374 male residents (averaged) in the period from 2007 to 2019 a total of 360 men died from prostate cancer. Therefore, the mean mortality rate for this cancer type in this area can be calculated at 39.4/100,000 (german standard population). Though, the value of this parameter may vary with an underlying probability of 99% between 34.3 and 45.1/100,000.

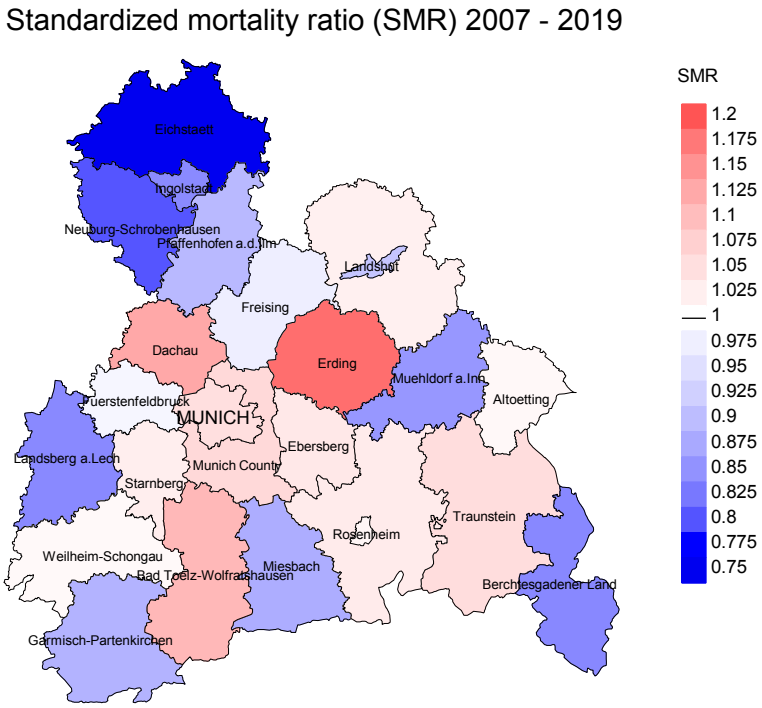

Figure 18b. Map of standardized mortality ratio (SMR, incl. DCO cases) by county averaged for period 2007 to 2019. According to their individual SMR values, the counties are displayed in different red and blue hues, being the fine white color attributed to the population overall of 1.0 (N=12,233).

The results should be interpreted with caution! E.g., in county Ebersberg with a population of 65,991 male residents (averaged) in the period from 2007 to 2019 a total of 360 men died from prostate cancer. Therefore, the mean standardized mortality ratio (SMR) for this cancer type in this area can be calculated at 1.04. Though, the value of this parameter may vary with an underlying probability of 99% between 0.90 and 1.19, 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

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