Munich Cancer Registry

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ICD-10 C60: Penile cancer

Incidence and Mortality

Year of diagnosis	1998-2014
Patients	394
Diseases	394
Creation date	04/13/2016
Export date	12/23/2015
Population (males)	2.28 m

Munich Cancer Registry at Munich Cancer Center
Marchioninistr. 15
Munich, 81377
Germany

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

http://www.tumorregister-muenchen.de/en/facts/base/bC60__E-ICD-10-C60-Penile-cancer-incidence-and-mortality.pdf

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

In these analyses, the clinics and physicians of Upper Bavaria and the city and county of Landshut[#], with a total of 4.64 million inhabitants, account for the frequency of cancer diseases[##] and the achieved long term results. Additionally, the long term survival evaluated by the Munich Cancer Registry (MCR) is compared with the results of the population-based registry in the USA (SEER), which is useful for checking the consistency of the data on an international level.

In comparing several tables, inconsistent figures may be detected. This is based on the fact that different patient cohorts are included in the base calculation, for example when proportions of multiple tumors or DCO-cases[###] are concerned. In other cases the individual tumor diagnosis is the basis for calculation, for example with incidence.

The foot notes describe the currentness of the data. The baseline statistics and survival data are updated annually. This yearly analysis comprises the Annual Report of the MCR.

Clinics and physicians have access to essentially more detailed data, with which they can check, compare and in the best case optimize their own data and results.

We would be pleased to receive corrections, critique and useful suggestions. Just send an e-mail to tumor@ibe.med.uni-muenchen.de.

Munich Cancer Registry, April 2016

[#] Base data has been collected since 1998. An increase in new diseases is apparent, which is an effect of two extensions in the MCR catchment area (from a base population of 2.51 million to 3.96 in 2002, and to 4.52 million in 2007).

[##] 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
C60.-	Malignant neoplasm of penis
C60.0	Prepuce
C60.1	Glans penis
C60.2	Body of penis
C60.8	Overlapping lesion of penis
C60.9	Penis, unspecified

INCIDENCE

Table 1

All patients with invasive cancer by year of diagnosis, proportions of DCO, multiple primaries, deaths, and active follow-up (incl. DCO)

Year of diagnosis	Cases n	DCO cases n	Prop. DCO %	Prop. mult. primaries %	Prop. deaths %	Prop. actively followed %	
1998	11	1	9.1	36.4	81.8	100.0	
1999	13			30.8	69.2	100.0	
2000	9			11.1	55.6	88.9	
2001	11	1	9.1	45.5	54.5	100.0	
2002	27	1	3.7	33.3	66.7	96.3	#
2003	30	1	3.3	16.7	70.0	100.0	
2004	19			47.4	57.9	89.5	
2005	18	2	11.1	33.3	72.2	88.9	
2006	21	1	4.8	14.3	61.9	81.0	
2007	34	1	2.9	32.4	52.9	70.6	#
2008	28			35.7	57.1	75.0	
2009	25	1	4.0	12.0	36.0	64.0	
2010	43			25.6	34.9	53.5	
2011	24	2	8.3	29.2	29.2	54.2	
2012	38	3	7.9	28.9	28.9	65.8	
2013	19			15.8	26.3	100.0	
2014	24	1	4.2	25.0	20.8	100.0	##
1998-2014	394	15	3.8	27.4	48.5	79.7	

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 found in the respective headings.

Table 2

Incidence measures by year of diagnosis including DCO cases
(with respect to registry area expansion from 2.51 to 3.96 m as of 2002,
and from 3.96 to 4.64 m as of 2007, respectively)

Year of diagnosis	Cases n	Incidence raw	Incidence WS	Incidence ES	Incidence BRD-S
1998	11	1.0	0.6	0.9	1.5
1999	13	1.2	0.7	1.0	1.3
2000	9	0.8	0.4	0.7	0.9
2001	11	0.9	0.5	0.8	1.2
2002	27	1.4	0.8	1.2	1.6
2003	30	1.6	0.9	1.3	1.7
2004	19	1.0	0.5	0.8	1.1
2005	18	1.0	0.5	0.7	1.0
2006	21	1.1	0.6	0.8	1.1
2007	34	1.5	0.9	1.3	1.6
2008	28	1.3	0.6	0.9	1.3
2009	25	1.1	0.6	0.9	1.0
2010	43	1.9	1.0	1.5	1.8
2011	24	1.1	0.5	0.8	0.9
2012	38	1.7	0.8	1.2	1.6
2013	19	0.8	0.5	0.7	0.8
2014	24	1.1	0.5	0.8	1.0
1998-2014	394	1.2	0.6	1.0	1.2

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

Table 3

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

Year of diagnosis	Cases n	Mean	Std. dev.	Min.	Max.	10%	25%	Median 50%	75%	90%
1998	11	71.4	10.3	51.9	82.9	58.6	65.5	70.6	81.5	82.7
1999	13	65.7	13.7	44.7	92.4	49.0	59.2	61.2	74.8	83.9
2000	9	69.9	12.3	57.3	89.0	57.3	60.7	63.7	83.0	89.0
2001	11	67.3	15.6	35.6	85.5	48.6	58.7	70.3	82.0	82.1
2002	27	68.1	11.9	42.6	90.1	49.9	61.2	70.5	76.8	82.4
2003	30	68.1	12.6	43.2	93.1	52.8	60.4	67.0	79.5	82.5
2004	19	73.2	10.3	59.3	91.0	59.7	64.4	72.0	84.0	89.1
2005	18	70.4	10.9	44.2	85.0	46.0	65.6	71.7	77.6	83.3
2006	21	65.6	12.6	42.2	81.6	46.2	59.8	66.4	78.1	80.6
2007	34	67.2	14.7	41.4	94.3	48.3	58.2	65.0	81.0	88.7
2008	28	69.5	12.5	42.8	94.4	46.9	63.3	71.0	79.7	83.0
2009	25	64.2	12.5	42.1	89.4	46.8	56.0	63.8	72.6	81.1
2010	43	69.7	11.2	48.7	92.7	56.2	63.0	69.9	75.2	86.0
2011	24	68.7	9.9	50.6	89.9	55.7	59.5	71.0	74.2	81.9
2012	38	71.4	11.0	45.5	86.9	57.1	62.7	73.5	79.3	84.4
2013	19	65.5	13.0	40.4	92.3	47.3	57.5	64.5	73.8	87.3
2014	24	72.3	10.2	56.3	99.5	58.6	67.1	71.8	78.6	83.9
1998-2014	394	68.8	12.1	35.6	99.5	51.4	60.5	69.7	77.2	83.8

Table 4

Age distribution by 5-year age group for period 2007-2014
(incl. DCO)

Age at diagnosis Years	Cases n	%	Cum.%
40-44	6	2.6	2.6
45-49	12	5.1	7.7
50-54	12	5.1	12.8
55-59	25	10.6	23.4
60-64	35	14.9	38.3
65-69	28	11.9	50.2
70-74	46	19.6	69.8
75-79	25	10.6	80.4
80-84	27	11.5	91.9
85+	19	8.1	100.0
All ages	235	100.0	

Included in the statistics are 35.3% multiple primaries.

Table 5

Age-specific incidence, DCO rate and proportion of all cancers for period 2007-2014

Age at diagnosis Years	Cases n	Age-spec. incidence	DCO rate n=8 %	Prop. all cancers n=91183 %
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	6	0.4		0.3
45-49	12	0.8		0.4
50-54	12	0.9		0.2
55-59	25	2.4	4.0	0.3
60-64	35	3.6	2.9	0.3
65-69	28	2.9		0.2
70-74	46	5.1		0.3
75-79	25	4.5	8.0	0.2
80-84	27	7.7	3.7	0.3
85+	19	8.2	15.8	0.3
All ages	235		3.4	0.3
Incidence				
Raw		1.3		
WS		0.7		
ES		1.0		
BRD-S		1.2		

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).

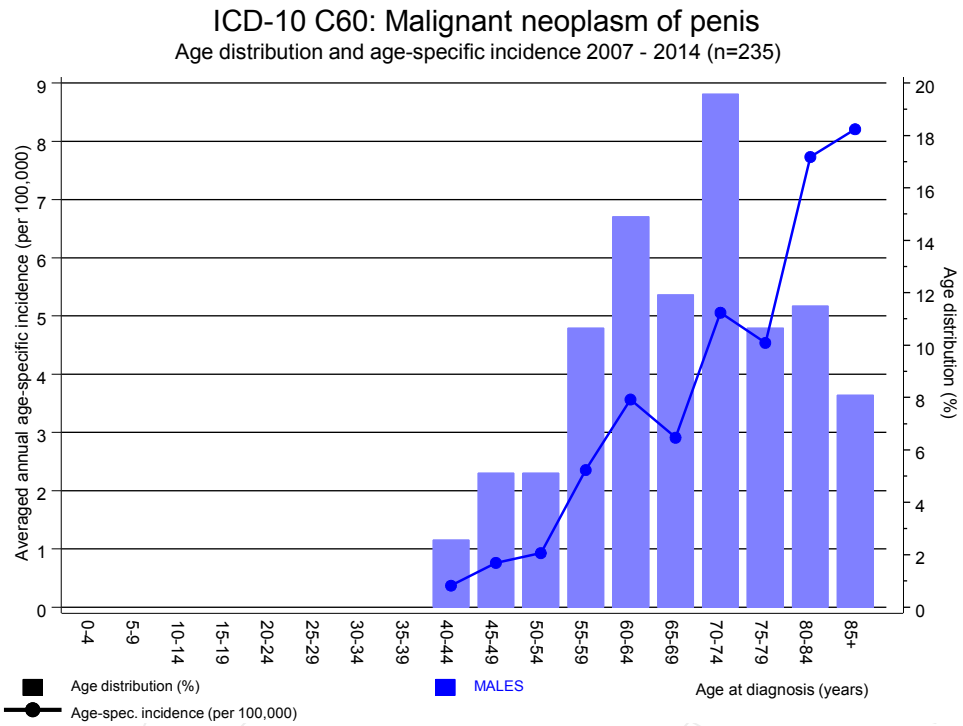

Figure 6. Age distribution and age-specific incidence

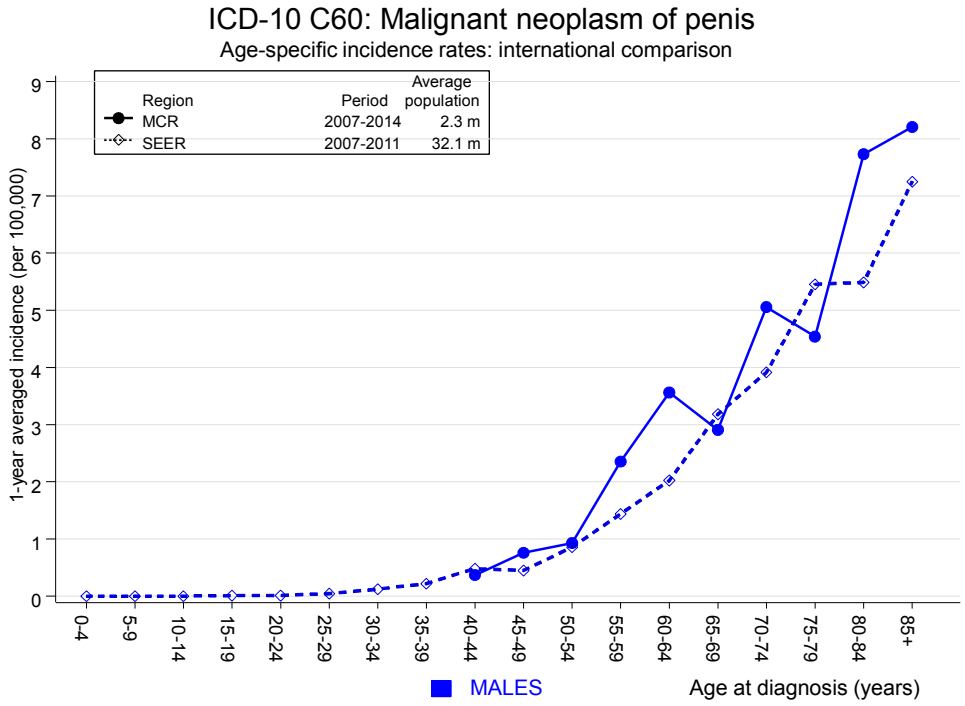

Figure 6a. Age-specific incidence in MCR registry areas compared to SEER (Surveillance, Epidemiology, and End Results, USA).

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.

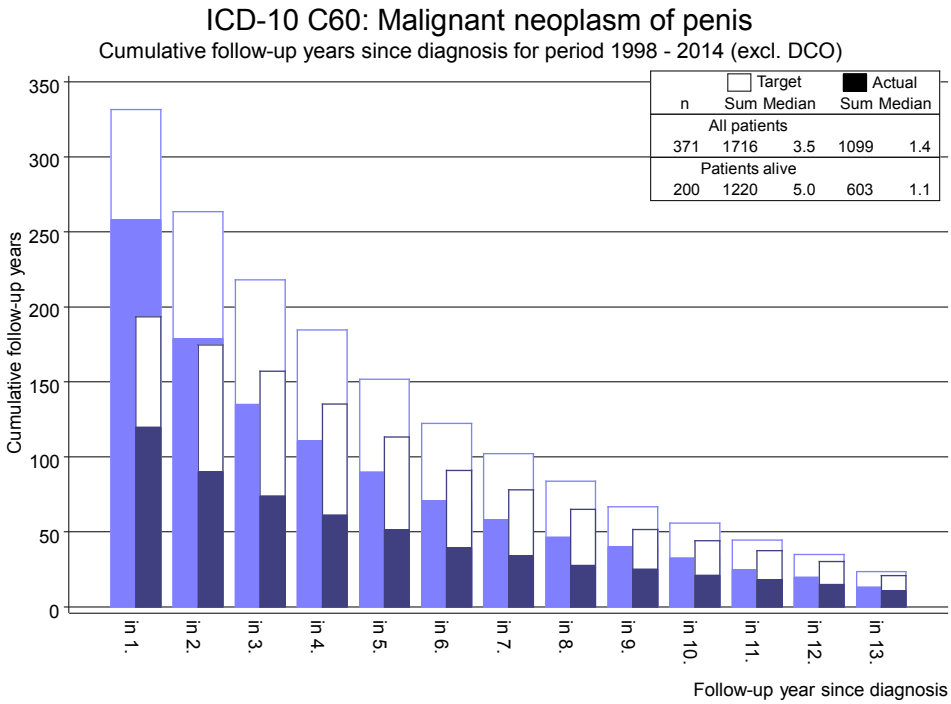

Figure 7. Cumulative follow-up years depending on time since diagnosis

The increase of the lost to follow-up rate can be interpreted as a consequence of a declining number of survivors over time.

Table 8

Standardized incidence ratio (SIR, with 95% confidence limits), excess absolute risk (EAR) and DCO rate of second primaries for period 1998–2014

Diagnosis		Observed n	Expected n	SIR	LCL 95%	UCL 95%		EAR	DCO %
C16	Stomach	2	0.9	2.3	0.3	8.3		10.3	
C18	Colon	5	2.0	2.4	0.8	5.7		27.0	
C19-C20	Rectum	3	1.1	2.8	0.6	8.1		17.5	
C25	Pancreas	2	0.7	2.7	0.3	9.8		11.5	
C33-C34	Lung	7	2.3	3.0	1.2	6.2	#	42.8	14.3
C61	Prostate	12	6.0	2.0	1.0	3.5	#	54.8	16.7
C64	Kidney	3	0.7	4.4	0.9	13.0		21.2	33.3
Other primaries		8	2.8	2.9	1.2	5.7	#	47.7	12.5
Not observed		0	3.8	0.0	0.0	1.0	#	-35.0	
All mult. primaries		42	20.3	2.1	1.5	2.8	#	198.0	11.9

Patients	371
Median age at second malignancy (years)	72.0
Person-years	1094
Mean observation time (years)	2.9
Median observation time (years)	1.4

The occurrence of second malignancy is statistically significant.

Observed second primaries with count 1 are pooled in category “Other primaries”

Average incidence (world standard population) 2007 - 2014

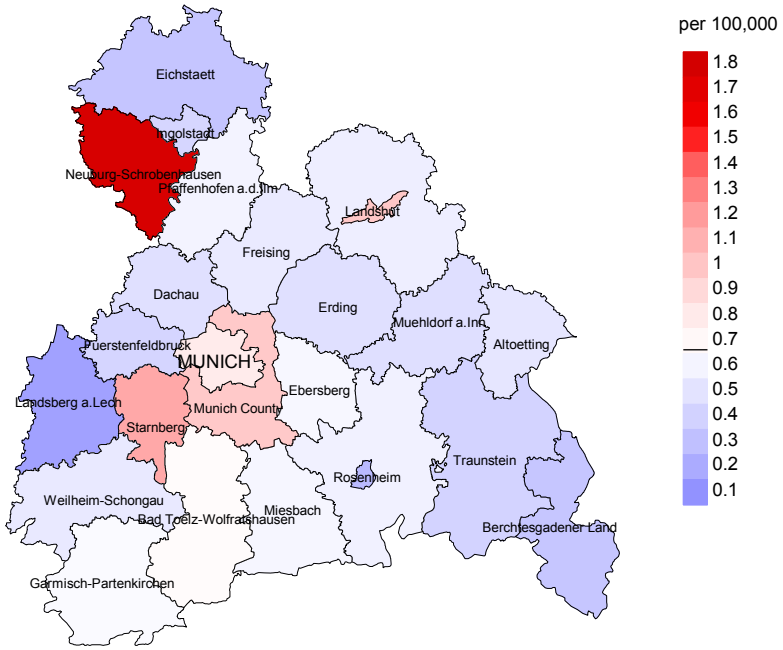

Figure 9a. Map of cancer incidence (world standard population, incl. DCO cases) by county averaged for period 2007 to 2014. According to their individual incidence rates, the counties are displayed in different red and blue color temperatures where the fine white color indicates the population mean (0.7/100,000 WS N=235).

The results should be interpreted with caution! E.g., in county Ebersberg with a population of 63,886 male residents (averaged) in the period from 2007 to 2014 a total of 6 men were identified with newly diagnosed penile cancer. Therefore, the mean incidence rate for this cancer type in this area can be calculated at 0.6/100,000 (world standard population). Though, the value of this parameter may vary with an underlying probability of 99% between 0.1 and 1.7/100,000.

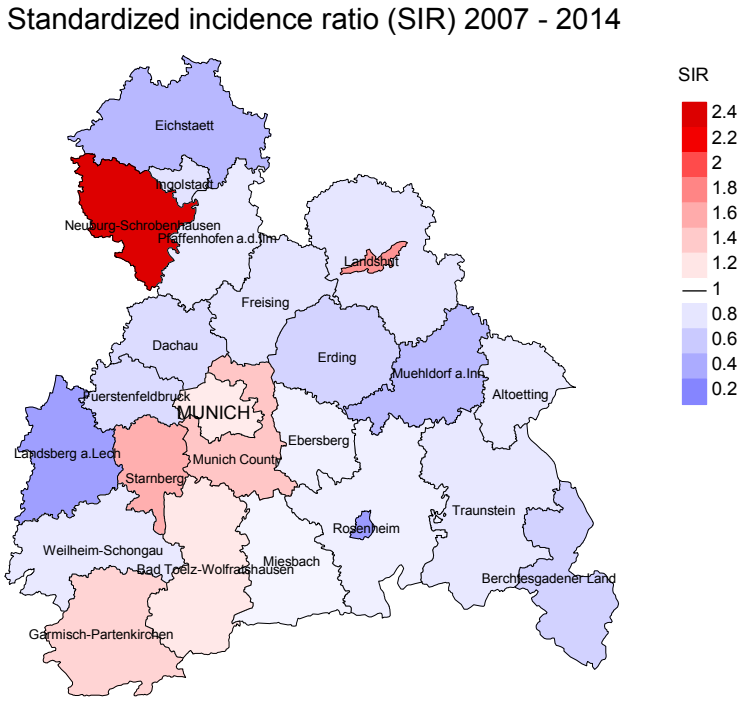

Figure 9b. Map of standardized incidence ratio (SIR, incl. DCO cases) by county averaged for period 2007 to 2014. According to their individual SIR values, the counties are displayed in different red and blue color temperatures where the fine white color indicates the population overall of 1.0 (N=235).

The results should be interpreted with caution! E.g., in county Ebersberg with a population of 63,358 male residents (averaged) in the period from 2007 to 2014 a total of 6 men were identified with newly diagnosed penile cancer. Therefore, the mean standardized incidence ratio (SIR) for this cancer type in this area can be calculated at 0.90. Though, the value of this parameter may vary with an underlying probability of 99% between 0.23 and 2.34, and is therefore not statistically striking.

MORTALITY

Table 10a

Patient cohorts of incident cancers by year of diagnosis, follow-up status, proportion of DCO, deaths among the annual cohorts and proportion of available death certificates (with respect to registry area expansion from 2.51 to 3.96 m as of 2002, and from 3.96 to 4.64 m as of 2007, respectively)

Year of diagnosis	Incident cases n	Prop. actively followed %	Prop. DCO %	Deaths n	Prop. deaths %	Prop. deaths with death certific. %
1998	11	100.0	9.1	9	81.8	88.9
1999	13	100.0		9	69.2	100.0
2000	9	88.9		5	55.6	100.0
2001	11	100.0	9.1	6	54.5	100.0
2002	27	96.3	3.7	18	66.7	94.4
2003	30	100.0	3.3	21	70.0	100.0
2004	19	89.5		11	57.9	90.9
2005	18	88.9	11.1	13	72.2	100.0
2006	21	81.0	4.8	13	61.9	84.6
2007	34	70.6	2.9	18	52.9	100.0
2008	28	75.0		16	57.1	100.0
2009	25	64.0	4.0	9	36.0	100.0
2010	43	53.5		15	34.9	100.0
2011	24	54.2	8.3	7	29.2	100.0
2012	38	65.8	7.9	11	28.9	100.0
2013	19	100.0		5	26.3	100.0
2014	24	100.0	4.2	5	20.8	100.0
1998-2014	394	79.7	3.8	191	48.5	97.4

Table 10b

Annual cohorts of incident cancers and deaths, proportion of death certificates and cases deceased the same year of cancer diagnosis
(incl. DCO)
(with respect to registry area expansion from 2.51 to 3.96 m as of 2002, and from 3.96 to 4.64 m as of 2007, respectively)

Year of diagnosis/ death	Incident cases n	Deaths n	Prop. deaths with death certific. %	Deaths in same year n	Prop. deaths in same year %
1998	11	8	100.0	2	18.2
1999	13	8	87.5	1	7.7
2000	9	3	100.0		
2001	11	9	100.0	1	9.1
2002	27	8	87.5	3	11.1
2003	30	11	90.9	5	16.7
2004	19	18	100.0	2	10.5
2005	18	16	100.0	3	16.7
2006	21	12	83.3	1	4.8
2007	34	21	95.2	6	17.6
2008	28	17	94.1	4	14.3
2009	25	15	100.0	2	8.0
2010	43	19	100.0	2	4.7
2011	24	24	100.0	4	16.7
2012	38	20	100.0	5	13.2
2013	19	15	100.0	3	15.8
2014	24	15	93.3	5	20.8
1998-2014	394	239	96.7	49	12.4

Table 10c

Annual cohorts of deaths, proportion of cancer-related and non-cancer-related deaths, and cancer recorded on death certificates (incl. DCO)
(with respect to registry area expansion from 2.51 to 3.96 m as of 2002, and from 3.96 to 4.64 m as of 2007, respectively)

Year of death	Deaths n	Prop. cancer-related %	Prop. non-cancer-related %	Prop. cancer recorded on death certificate %
1998	8	50.0	50.0	75.0
1999	8	75.0	25.0	85.7
2000	3	66.7	33.3	100.0
2001	9	44.4	55.6	66.7
2002	8	37.5	62.5	71.4
2003	11	54.5	45.5	70.0
2004	18	44.4	55.6	72.2
2005	16	50.0	50.0	75.0
2006	12	50.0	50.0	70.0
2007	21	81.0	19.0	85.0
2008	17	58.8	41.2	81.3
2009	15	60.0	40.0	80.0
2010	19	68.4	31.6	73.7
2011	24	62.5	37.5	75.0
2012	20	45.0	55.0	70.0
2013	15	66.7	33.3	73.3
2014	15	46.7	53.3	85.7
1998-2014	239	57.3	42.7	76.2

Table 11

Medians of age at death according to the grouping in Table 10

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	8	78.4	76.2	81.2	76.2
1999	8	75.0	75.0	67.8	80.6
2000	3	49.9	51.8	46.9	49.9
2001	9	81.8	77.5	82.1	79.8
2002	8	74.7	75.5	73.8	75.5
2003	11	77.5	73.5	77.5	77.5
2004	18	79.0	73.0	82.4	80.9
2005	16	76.5	76.5	78.9	75.1
2006	12	77.7	69.6	81.5	72.3
2007	21	71.9	71.2	86.7	71.2
2008	17	80.6	79.3	82.5	75.8
2009	15	76.6	71.3	77.5	71.4
2010	19	73.9	73.0	80.8	73.4
2011	24	74.5	74.2	75.3	74.5
2012	20	75.6	74.6	79.3	75.6
2013	15	75.7	73.9	77.0	73.7
2014	15	69.7	68.5	73.5	72.5
1998-2014	239	76.0	73.8	79.4	74.3

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 12

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	4	0.4	0.36	0.2	0.33	0.3	0.36	0.6	0.40
1999	6	0.5	0.46	0.3	0.42	0.5	0.49	0.6	0.50
2000	2	0.2	0.22	0.1	0.34	0.2	0.28	0.2	0.22
2001	4	0.3	0.36	0.2	0.35	0.3	0.40	0.5	0.41
2002	3	0.2	0.11	0.1	0.09	0.1	0.11	0.2	0.13
2003	6	0.3	0.20	0.2	0.17	0.2	0.18	0.4	0.21
2004	8	0.4	0.42	0.2	0.42	0.3	0.43	0.5	0.43
2005	8	0.4	0.44	0.2	0.45	0.3	0.48	0.5	0.51
2006	6	0.3	0.29	0.2	0.28	0.3	0.30	0.3	0.29
2007	17	0.8	0.50	0.4	0.44	0.6	0.45	0.8	0.52
2008	10	0.4	0.36	0.2	0.31	0.3	0.35	0.5	0.39
2009	9	0.4	0.36	0.2	0.29	0.3	0.33	0.4	0.37
2010	13	0.6	0.30	0.3	0.27	0.4	0.27	0.5	0.29
2011	15	0.7	0.63	0.3	0.64	0.5	0.65	0.6	0.66
2012	9	0.4	0.24	0.2	0.22	0.3	0.23	0.4	0.22
2013	10	0.4	0.53	0.2	0.41	0.3	0.44	0.4	0.54
2014	7	0.3	0.29	0.2	0.31	0.2	0.31	0.3	0.31
1998-2014	137	0.4	0.35	0.2	0.32	0.3	0.34	0.5	0.36

Table 13

Age distribution of age at death (cancer-related) for period 2007-2014
(**incl. multiple primaries**)

Age at death Years	Cases n	%	Cum.%
45-49	4	4.4	4.4
50-54	2	2.2	6.7
55-59	6	6.7	13.3
60-64	10	11.1	24.4
65-69	14	15.6	40.0
70-74	16	17.8	57.8
75-79	14	15.6	73.3
80-84	12	13.3	86.7
85+	12	13.3	100.0
All ages	90	100.0	

Included in the statistics are 35.3% multiple primaries.

Table 14

Age-specific mortality (cancer-related) and proportion of all cancers
for period 2007-2014
(**incl. multiple primaries**)

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		0.0		
45-49	4	0.3	0.33	0.4
50-54	2	0.2	0.17	0.1
55-59	6	0.6	0.24	0.2
60-64	10	1.0	0.29	0.2
65-69	14	1.5	0.50	0.2
70-74	16	1.8	0.35	0.2
75-79	14	2.5	0.56	0.2
80-84	12	3.4	0.44	0.2
85+	12	5.2	0.63	0.2
All ages	90			0.2
Mortality				
Raw		0.5	0.38	
WS		0.2	0.35	
ES		0.4	0.37	
BRD-S		0.5	0.39	
PYLL-70				
per 100,000		1.9		
ES		1.7		
AYLL-70		8.6		

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

Table 15

Multiple primaries in deaths in period 1998-2014

Diagnosis		Total n	Total %↓	Pre n	Pre ←%	Syn-chron ±30d n	Syn-chron ±30d ←%	Post n	Post ←%
		1	1.4	1	100.0				
C11	Nasopharynx	1	1.4					1	100.0
C15	Oesophagus	1	1.4					1	100.0
C16	Stomach	2	2.9					2	100.0
C18	Colon	4	5.8	3	75.0			1	25.0
C19-C20	Rectum	4	5.8	3	75.0			1	25.0
C21	Anus/canal	1	1.4					1	100.0
C22	Liver	1	1.4					1	100.0
C25	Pancreas	1	1.4					1	100.0
C33-C34	Lung	8	11.6	2	25.0	2	25.0	4	50.0
C43	Malign. melanoma	1	1.4	1	100.0				
C44	Skin others	6	8.7	4	66.7			2	33.3
C60	Penis	1	1.4					1	100.0
C61	Prostate	17	24.6	14	82.4			3	17.6
C64	Kidney	4	5.8	2	50.0	1	25.0	1	25.0
C65	Renal pelvis	1	1.4	1	100.0				
C67	Bladder	6	8.7	3	50.0	1	16.7	2	33.3
C68	Urethra	1	1.4					1	100.0
C70-C72	CNS cancer	1	1.4					1	100.0
C73	Thyroid	1	1.4	1	100.0				
C76-C79	CUP	1	1.4	1	100.0				
C81	Hodgkin lymphoma	1	1.4	1	100.0				
C82-C85	NHL	3	4.3	1	33.3			2	66.7
C91-C96	Leukaemia	1	1.4					1	100.0
All mult. primaries		69	100.0	38	55.1	4	5.8	27	39.1

ICD-10 C44 (Other malignant neoplasms of skin) is not systematically recorded by MCR and therefore not considered for evaluation as a particular primary but at least as a multiple malignancy.

Table 16

Age-specific mortality (cancer-related) and proportion of all cancers
for period 2007-2014
(**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		0.0		
45-49	4	0.3	0.36	0.4
50-54	2	0.2	0.20	0.1
55-59	4	0.4	0.18	0.2
60-64	9	0.9	0.32	0.2
65-69	6	0.6	0.25	0.1
70-74	12	1.3	0.30	0.2
75-79	14	2.5	0.64	0.2
80-84	5	1.4	0.33	0.1
85+	6	2.6	0.55	0.1
All ages	62			0.2
Mortality				
Raw		0.3	0.33	
WS		0.2	0.30	
ES		0.3	0.32	
BRD-S		0.3	0.34	
PYLL-70				
per 100,000		1.6		
ES		1.4		
AYLL-70		10.3		

* See corresponding tables with multiple primaries.

Table 17

Age-specific mortality (cancer-related) and proportion of all cancers
for period 2007-2014
(**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		0.0		
45-49	3	0.2	0.30	0.3
50-54	2	0.2	0.22	0.1
55-59	4	0.4	0.19	0.2
60-64	5	0.5	0.20	0.1
65-69	6	0.6	0.27	0.1
70-74	10	1.1	0.26	0.2
75-79	10	1.8	0.53	0.2
80-84	5	1.4	0.42	0.1
85+	5	2.2	0.50	0.1
All ages	50			0.2
Mortality				
Raw		0.3	0.29	
WS		0.1	0.26	
ES		0.2	0.28	
BRD-S		0.3	0.30	
PYLL-70				
per 100,000		1.3		
ES		1.1		
AYLL-70		10.3		

* See corresponding tables with multiple primaries.

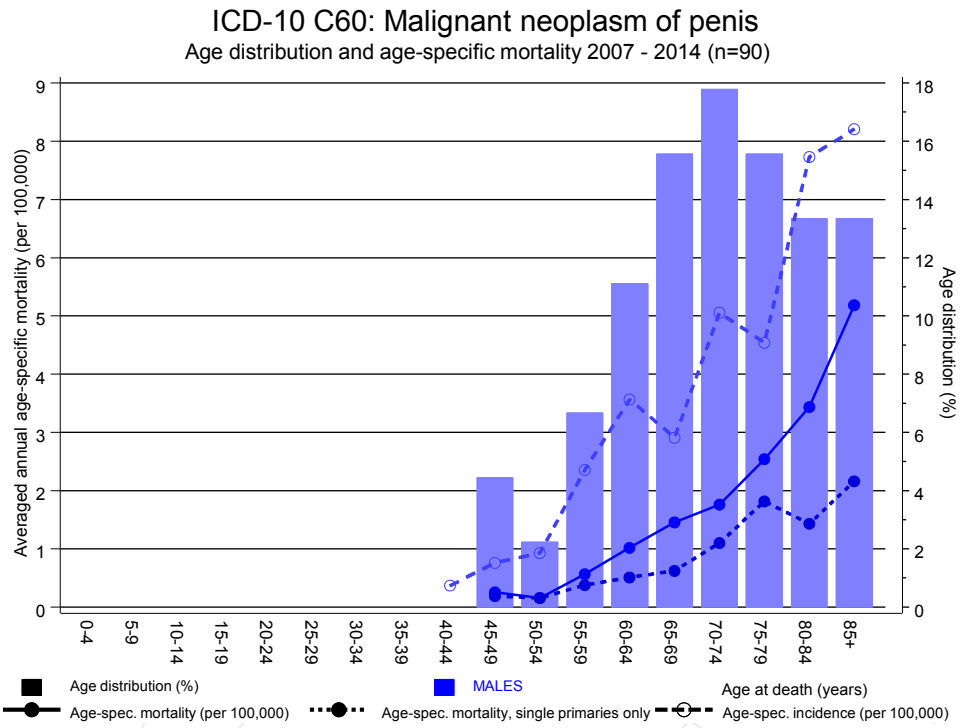

Figure 18. Distribution of age at death (bars) and age-specific mortality (all patients: solid line, patients with single primaries: dotted line). The age-specific incidence is additionally plotted for comparison (dashed line).

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

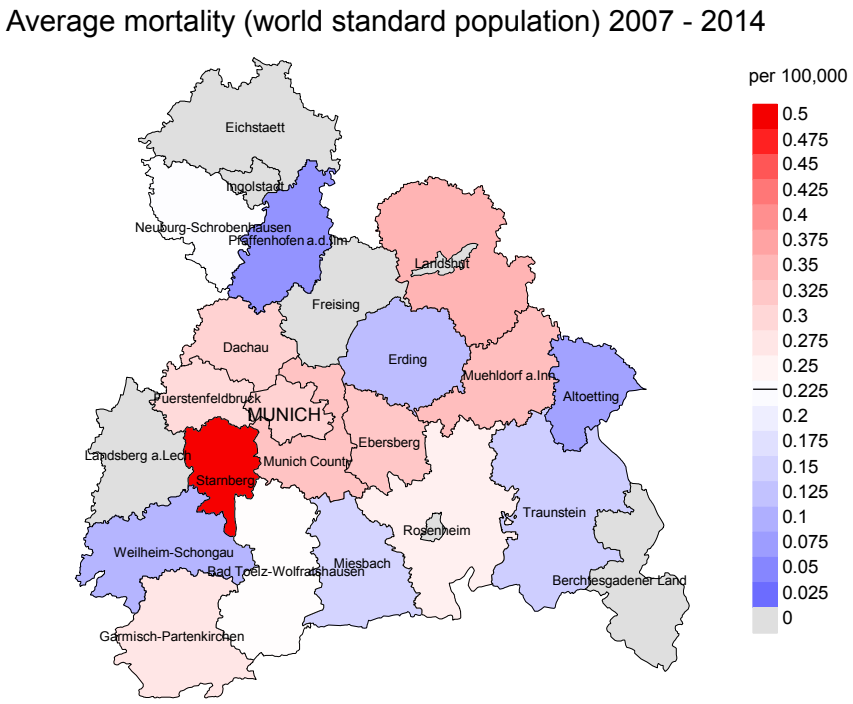

Figure 19a. Map of cancer mortality (world standard population) by county averaged for period 2007 to 2014. According to their individual mortality rates, the counties are displayed in different red and blue color temperatures where the fine white color indicates the population mean (0.2/100,000 WS N=89).

The results should be interpreted with caution! E.g., in county Ebersberg with a population of 63,886 male residents (averaged) in the period from 2007 to 2014 a total of 4 men died from penile cancer. Therefore, the mean mortality rate for this cancer type in this area can be calculated at 0.3/100,000 (world standard population). Though, the value of this parameter may vary with an underlying probability of 99% between 0.0 and 1.2/100,000.

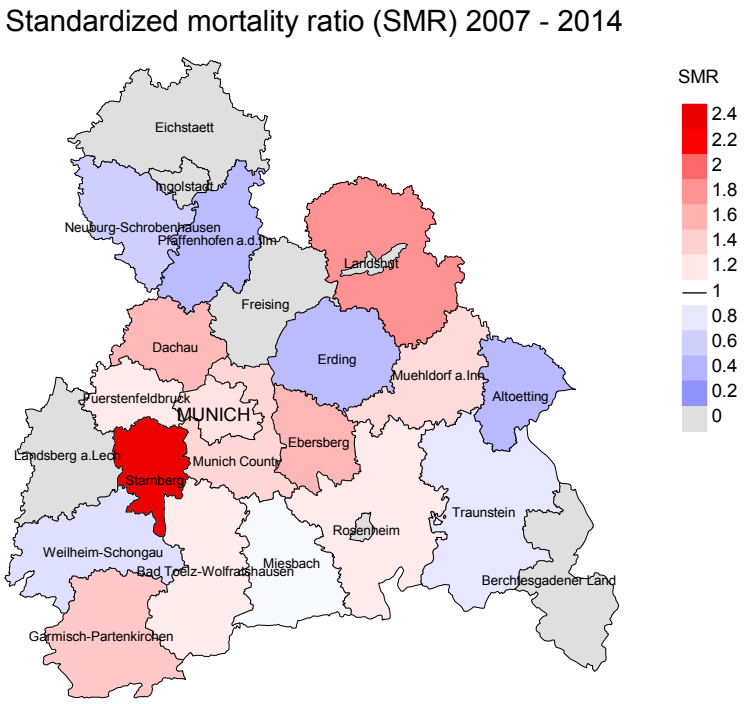

Figure 19b. Map of standardized mortality ratio (SMR, incl. DCO cases) by county averaged for period 2007 to 2014. According to their individual SMR values, the counties are displayed in different red and blue color temperatures where the fine white color indicates the population overall of 1.0 (N=89).

The results should be interpreted with caution! E.g., in county Ebersberg with a population of 63,358 male residents (averaged) in the period from 2007 to 2014 a total of 4 men died from penile cancer. Therefore, the mean standardized mortality ratio (SMR) for this cancer type in this area can be calculated at 1.59. Though, the value of this parameter may vary with an underlying probability of 99% between 0.27 and 5.00, 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

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

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