# Munich Cancer Registry

- Survival
- Selection Matrix
- Homepage

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

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

## Cancer statistics: Baseline statistics

## D05: Breast cancer i.s. (women)

| | |
|---|---|
| Year of diagnosis | 1998-2012 |
| Patients | 4,161 |
| Diseases | 4,226 |
| Creation date | 03/20/2014 |
| Export date | 02/12/2014 |
| Population (females) | 2.3 m |


http://www.tumorregister-muenchen.de/en/facts/base/base_D05f_E.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 4.5 million inhabitants, account for the frequency of cancer diseases[##] and the achieved long term results. Additionally, the long term survival evaluated by the Munich Cancer Registry (MCR) is compared with the results of the population-based registry in the USA (SEER), which is useful for checking the consistency of the data on an international level.

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

The foot notes describe the currentness of the data. The baseline statistics and survival data are updated annually. This yearly analysis comprises the Annual Report of the MCR. The time-delayed acquisition of data and the occasionally high DCO-rates indicate optimizing reserves, among others, because of current financial and legal conditions that hinder the analyses.

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

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

Munich Cancer Registry, March 2014

[#] Base data has been collected since 1998. An increase in new diseases is apparent, which is an effect of two extensions in the MCR catchment area (from a base population of 2.51 million to 3.96 in 2002, and to 4.52 million in 2007). Death certificates from 2013 are incorporated into these analyses.

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

[###] DCO (death certificate only) identifies a cancer case that first becomes available to the MCR through the death certificate. A high proportion of DCO cases (≥5%) in particular cancer types indicate insufficient participation of specific cancer specializations.

# INCIDENCE

Table 1

Patient cohorts by year of diagnosis including DCO cases and multiple primaries, and with proportion of deaths and active follow-up

| Year of diagnosis | Cases n | DCO cases n | Prop. DCO % | Prop. mult. primaries % | Prop. deaths % | Prop. actively followed % |
|---|---|---|---|---|---|---|
| 1998 | 109 | | | 47.7 | 18.3 | 92.7 |
| 1999 | 127 | | | 39.4 | 20.5 | 98.4 |
| 2000 | 139 | | | 38.1 | 22.3 | 97.1 |
| 2001 | 163 | | | 46.0 | 16.6 | 98.8 |
| 2002 | 216 | | | 36.6 | 14.4 | 94.4 # |
| 2003 | 218 | | | 33.9 | 9.2 | 95.9 # |
| 2004 | 269 | | | 33.5 | 12.3 | 95.2 # |
| 2005 | 312 | | | 31.4 | 7.4 | 95.5 # |
| 2006 | 311 | | | 36.0 | 6.1 | 89.7 # |
| 2007 | 346 | | | 35.8 | 3.5 | 77.7 # ## |
| 2008 | 406 | | | 26.4 | 2.5 | 45.6 |
| 2009 | 404 | | | 27.5 | 4.7 | 49.0 |
| 2010 | 427 | | | 23.7 | 2.1 | 49.4 |
| 2011 | 407 | | | 22.6 | 2.7 | 65.1 |
| 2012 | 372 | | | 28.0 | 1.6 | 97.8 ### |
| 1998-2012 | 4226 | | | 31.3 | 7.0 | 77.1 |

# The increases of incident cases in 2002 and 2007 reflect the expansion to additional registry areas.

## Since 2007 the percentage of actively followed patients sharply declined compared to the previous years. This is a consequence of ambiguous data protection rules that currently forbid cancer registries in Bavaria to obtain the essential life status informations from competent registration offices.

### Please be aware that data of recent annual patient cohorts may not yet be fully processed. Therefore, the presented figures and tables are potentially related to different time periods as pointed out in the respective headlines or legends.

Table 2

Incidence measures by year of diagnosis and gender including DCO cases
(with respect to registry area expansion from 2.51 to 3.96 m as of 2002,
and from 3.96 to 4.52 m as of 2007, respectively)

| Year of diagnosis | Cases n | Incidence raw | Incidence WS | Incidence ES | Incidence BRD-S |
|---|---|---|---|---|---|
| 1998 | 109 | 9.3 | 6.2 | 8.1 | 8.7 |
| 1999 | 127 | 10.7 | 7.0 | 9.3 | 10.0 |
| 2000 | 139 | 11.6 | 7.1 | 9.7 | 10.6 |
| 2001 | 163 | 13.4 | 8.7 | 11.6 | 12.5 |
| 2002 | 216 | 11.0 | 7.3 | 9.7 | 10.5 |
| 2003 | 218 | 11.1 | 7.1 | 9.5 | 10.2 |
| 2004 | 269 | 13.6 | 8.3 | 11.2 | 12.1 |
| 2005 | 312 | 15.7 | 9.5 | 12.7 | 13.8 |
| 2006 | 311 | 15.5 | 9.8 | 13.0 | 14.1 |
| 2007 | 346 | 15.0 | 9.3 | 12.4 | 13.4 |
| 2008 | 406 | 17.5 | 10.9 | 14.5 | 15.4 |
| 2009 | 404 | 17.4 | 10.8 | 14.3 | 15.3 |
| 2010 | 427 | 18.2 | 11.5 | 15.5 | 16.4 |
| 2011 | 407 | 17.2 | 10.5 | 14.1 | 15.2 |
| 2012 | 372 | 15.8 | 9.7 | 13.0 | 14.0 |
| 1998-2012 | 4226 | 14.7 | 9.2 | 12.3 | 13.2 |

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 | 109 | 56.7 | 10.9 | 28.5 | 89.2 | 43.9 | 49.3 | 56.3 | 62.3 | 69.0 |
| 1999 | 127 | 58.4 | 10.3 | 40.9 | 88.2 | 45.9 | 50.5 | 57.7 | 63.3 | 72.4 |
| 2000 | 139 | 59.6 | 12.0 | 30.9 | 85.6 | 43.9 | 51.1 | 59.0 | 67.8 | 77.5 |
| 2001 | 163 | 57.9 | 11.8 | 26.0 | 93.0 | 42.6 | 49.8 | 58.1 | 65.5 | 72.6 |
| 2002 | 216 | 58.4 | 11.2 | 34.3 | 88.8 | 45.5 | 50.1 | 57.9 | 65.1 | 74.2 |
| 2003 | 218 | 59.2 | 11.3 | 33.3 | 91.7 | 44.1 | 50.2 | 58.8 | 67.6 | 73.6 |
| 2004 | 269 | 60.8 | 10.8 | 32.5 | 90.7 | 46.8 | 53.5 | 62.1 | 67.6 | 74.1 |
| 2005 | 312 | 60.0 | 11.6 | 30.0 | 91.4 | 43.2 | 52.5 | 61.5 | 66.8 | 73.6 |
| 2006 | 311 | 59.5 | 10.8 | 33.8 | 84.9 | 45.5 | 50.9 | 60.4 | 67.3 | 72.5 |
| 2007 | 346 | 60.0 | 11.7 | 26.3 | 90.8 | 43.8 | 51.5 | 60.9 | 67.8 | 73.9 |
| 2008 | 406 | 59.5 | 11.4 | 34.0 | 92.5 | 43.7 | 51.1 | 59.7 | 67.6 | 71.7 |
| 2009 | 404 | 60.0 | 11.1 | 26.2 | 89.6 | 44.9 | 52.0 | 60.9 | 67.5 | 73.1 |
| 2010 | 427 | 59.0 | 10.7 | 27.2 | 89.8 | 45.0 | 51.4 | 59.3 | 66.7 | 72.4 |
| 2011 | 407 | 60.2 | 11.1 | 30.8 | 92.5 | 45.4 | 51.0 | 60.6 | 68.5 | 73.9 |
| 2012 | 372 | 60.2 | 11.3 | 31.1 | 91.9 | 47.2 | 51.0 | 60.1 | 67.7 | 74.5 |
| 1998-2012 | 4226 | 59.5 | 11.2 | 26.0 | 93.0 | 44.8 | 51.2 | 59.8 | 67.3 | 73.5 |

Table 4

Age distribution by 5-year age group for period 1998-2012
(incl. DCO)

| Age at diagnosis Years | Cases n | % | Cum.% |
|---|---|---|---|
| 25-29 | 7 | 0.2 | 0.2 |
| 30-34 | 38 | 0.9 | 1.1 |
| 35-39 | 107 | 2.5 | 3.6 |
| 40-44 | 284 | 6.7 | 10.3 |
| 45-49 | 437 | 10.3 | 20.7 |
| 50-54 | 618 | 14.6 | 35.3 |
| 55-59 | 645 | 15.3 | 50.5 |
| 60-64 | 722 | 17.1 | 67.6 |
| 65-69 | 691 | 16.4 | 84.0 |
| 70-74 | 339 | 8.0 | 92.0 |
| 75-79 | 180 | 4.3 | 96.3 |
| 80-84 | 95 | 2.2 | 98.5 |
| 85+ | 63 | 1.5 | 100.0 |
| All ages | 4226 | 100.0 | |

Included in the statistics are 35.8% multiple primaries.

Table 5

Age-specific incidence, DCO rate and proportion of all cancers
for period 1998-2012

| Age at diagnosis Years | Cases n | Age-spec. incidence | DCO rate n=0 % | Prop. all cancers n=142297 % |
|---|---|---|---|---|
| 0- 4 | | 0.0 | | |
| 5- 9 | | 0.0 | | |
| 10-14 | | 0.0 | | |
| 15-19 | | 0.0 | | |
| 20-24 | | 0.0 | | |
| 25-29 | 7 | 0.4 | | 0.7 |
| 30-34 | 38 | 1.8 | | 2.0 |
| 35-39 | 107 | 4.8 | | 3.0 |
| 40-44 | 279 | 12.1 | | 4.8 |
| 45-49 | 433 | 20.5 | | 5.4 |
| 50-54 | 615 | 32.6 | | 6.0 |
| 55-59 | 638 | 35.8 | | 5.0 |
| 60-64 | 718 | 41.3 | | 4.4 |
| 65-69 | 685 | 42.7 | | 3.9 |
| 70-74 | 337 | 24.4 | | 2.0 |
| 75-79 | 177 | 16.2 | | 1.1 |
| 80-84 | 93 | 10.8 | | 0.6 |
| 85+ | 63 | 7.7 | | 0.4 |
| All ages | 4190 | | 0.0 | 2.9 |
| Incidence | | | | |
| Raw | | 14.6 | | |
| WS | | 9.1 | | |
| ES | | 12.2 | | |
| BRD-S | | 13.1 | | |

The age-specific incidence characterizes the disease risk in a particular age group. The age distribution depends on the patient population frequency in each age group and reflects the tangible clinical picture of everyday patients care (see following chart).

Table 6

Standardized incidence ratio (SIR, with 95% confidence limits), excess absolute risk (EAR) and DCO rate of second primaries for period 1998-2012

| Diagnosis | | Observed n | Expected n | SIR | LCL 95% | UCL 95% | | EAR | DCO % |
|---|---|---|---|---|---|---|---|---|---|
| C16 | Stomach | 3 | 4.0 | 0.8 | 0.2 | 2.2 | | -0.6 | |
| C17 | Small intestine | 2 | 0.7 | 2.9 | 0.3 | 10.4 | | 0.9 | |
| C18 | Colon | 14 | 11.4 | 1.2 | 0.7 | 2.1 | | 1.7 | |
| C19-C20 | Rectum | 10 | 5.5 | 1.8 | 0.9 | 3.3 | | 3.0 | |
| C22 | Liver | 3 | 1.3 | 2.2 | 0.5 | 6.5 | | 1.1 | 33.3 |
| C25 | Pancreas | 15 | 5.0 | 3.0 | 1.7 | 5.0 | # | 6.7 | 13.3 |
| C33-C34 | Lung | 20 | 10.3 | 1.9 | 1.2 | 3.0 | # | 6.5 | |
| C43 | Malign. melanoma | 9 | 5.5 | 1.7 | 0.8 | 3.1 | | 2.4 | |
| C50 | Breast | 332 | 47.9 | 6.9 | 6.2 | 7.7 | # | 190.7 | |
| C51 | Vulva | 4 | 1.1 | 3.6 | 1.0 | 9.1 | | 1.9 | |
| C54 | Corpus uteri | 19 | 8.2 | 2.3 | 1.4 | 3.6 | # | 7.3 | 5.3 |
| C56 | Ovary | 8 | 5.8 | 1.4 | 0.6 | 2.7 | | 1.5 | |
| C64 | Kidney | 4 | 3.2 | 1.3 | 0.3 | 3.2 | | 0.5 | |
| C70-C72 | CNS cancer | 4 | 2.0 | 2.0 | 0.5 | 5.2 | | 1.4 | 25.0 |
| C73 | Thyroid | 3 | 3.4 | 0.9 | 0.2 | 2.6 | | -0.2 | |
| C76-C79 | CUP | 2 | 1.9 | 1.0 | 0.1 | 3.7 | | 0.0 | 50.0 |
| C82-C85 | NHL | 10 | 4.9 | 2.1 | 1.0 | 3.8 | | 3.4 | |
| C90 | Mult. myeloma | 3 | 1.5 | 2.0 | 0.4 | 5.9 | | 1.0 | |
| C91-C96 | Leukaemia | 4 | 1.9 | 2.1 | 0.6 | 5.4 | | 1.4 | |
| Other primaries | | 12 | 7.5 | 1.6 | 0.8 | 2.8 | | 3.0 | |
| Not observed | | 0 | 6.4 | 0.0 | 0.0 | 0.6 | # | -4.3 | |
| All mult. primaries | | 481 | 139.4 | 3.5 | 3.1 | 3.8 | # | 229.3 | 1.2 |

| | |
|---|---|
| Patients | 2830 |
| Mean age at second malignancy (years) | 64.1 |
| Person-years | 14896 |
| Mean observation time (years) | 5.3 |
| Median observation time (years) | 4.7 |

# The occurrence of second malignancy is statistically significant.

Observed second malignancies with count 1 are pooled in category "Other primaries".

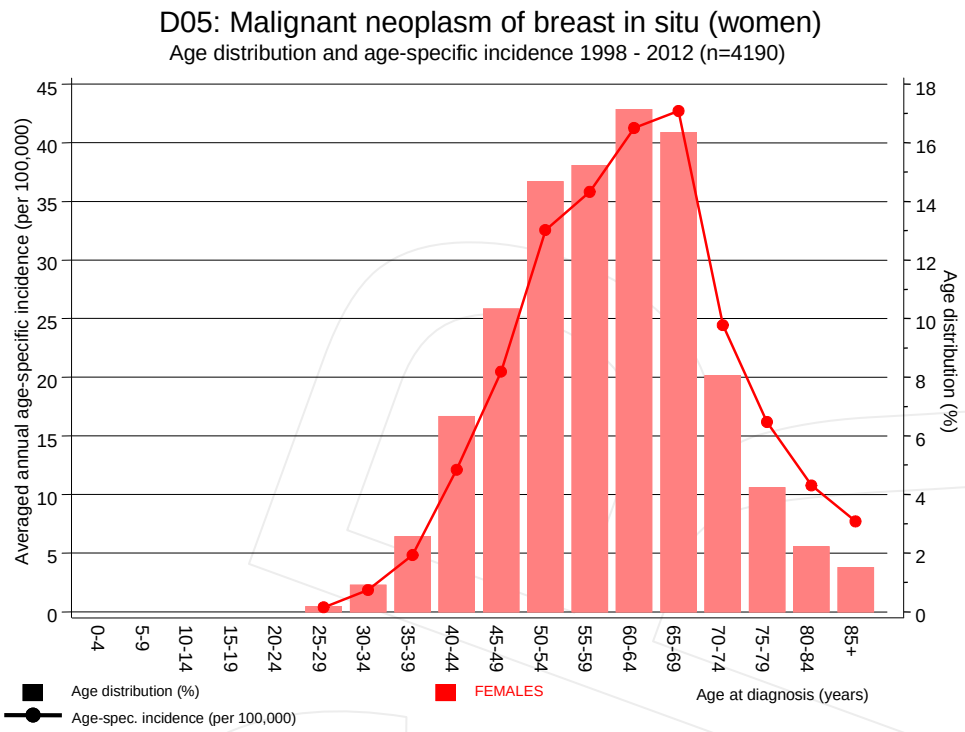


**Figure 7.** Age distribution and age-specific incidence

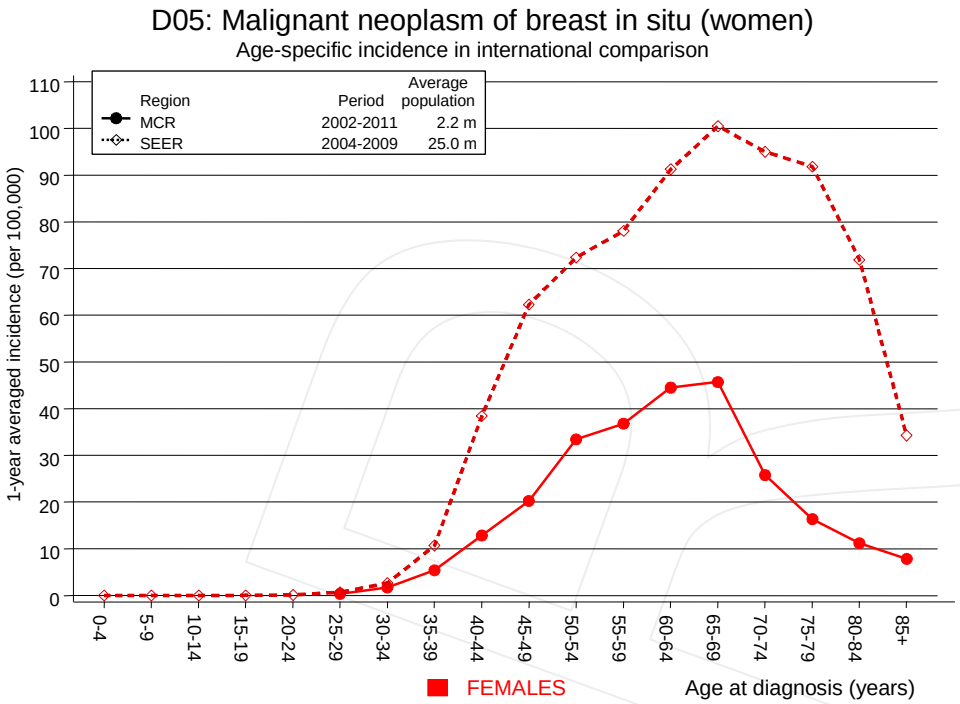


**Figure 7a.** Age-specific incidence in MCR registry areas compared to SEER (Surveillance, Epidemiology, and End Results, USA).

Reference:

Surveillance, Epidemiology, and End Results (SEER) Program SEER*Stat Database: Incidence - SEER 18 Regs Research Data, released April 2012, based on the November 2011 submission. http://www.seer.cancer.gov.

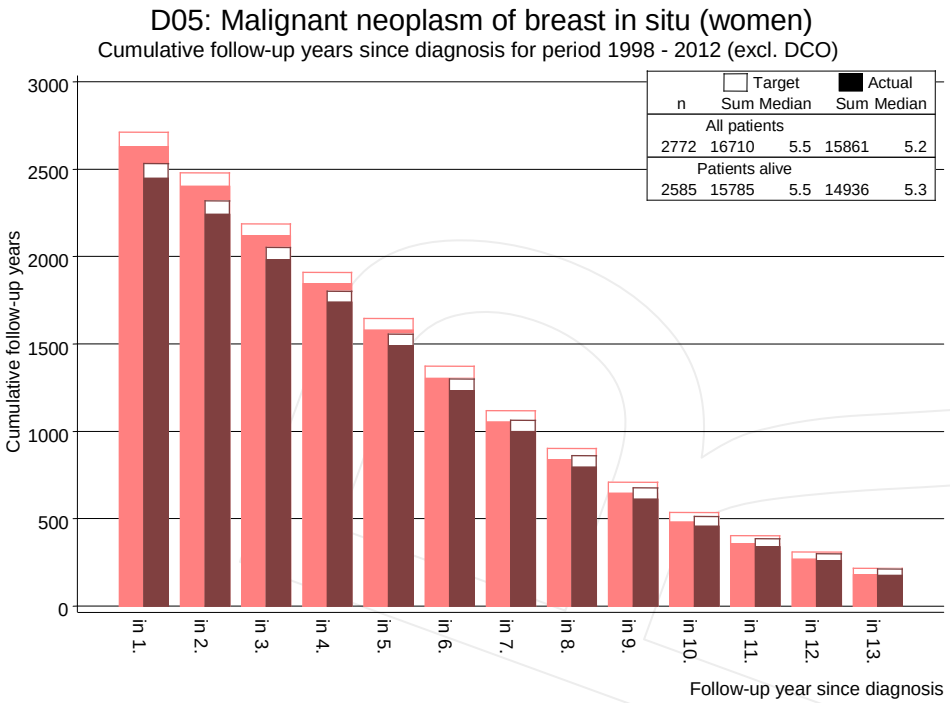


**Figure 8.** Cumulative follow-up years depending on time since diagnosis

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

Average incidence (world standard population) 2003 - 2008

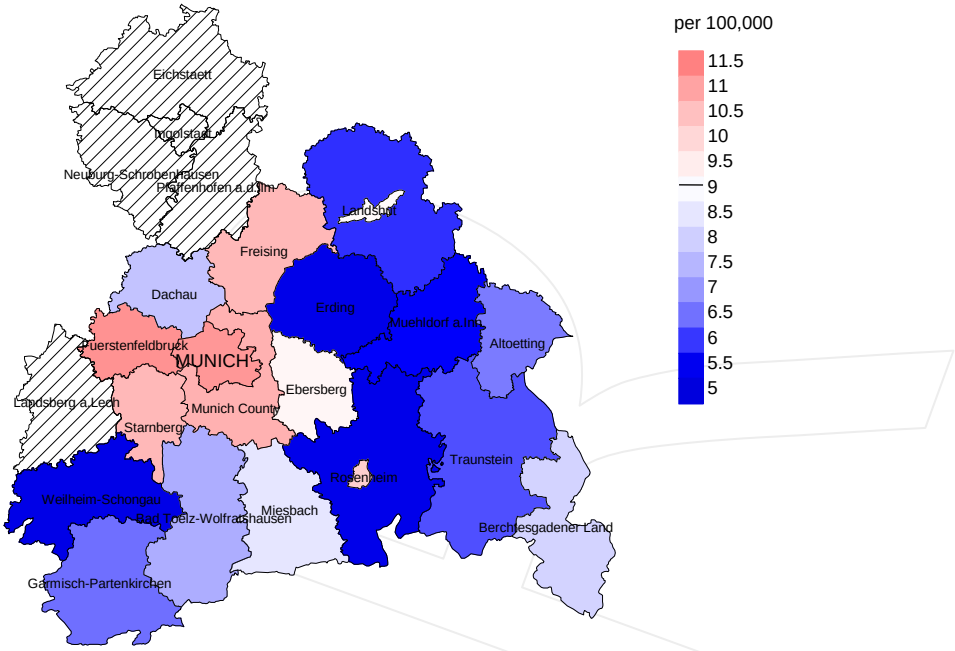


**Figure 9a.** Map of cancer incidence (world standard population, incl. DCO cases) by county averaged for period 2003 to 2008. According to their individual incidence rates, the counties are displayed in different red and blue color temperatures where the fine white color indicates the population mean (9.1/100,000 WS N=1,768). Since cancer data are not available in some counties until 2007, the local incidence rates were not calculated, and the map tiles show as shaded.

The results should be interpreted with caution! E.g., in county Ebersberg with a population of 63,131 female residents (averaged) in the period from 2003 to 2008 a total of 57 women were identified with newly diagnosed breast cancer i.s. (women). Therefore, the mean incidence rate for this cancer type in this area can be calculated at 9.3/100,000 (world standard population). Though, the value of this parameter may vary with an underlying probability of 99% between 6.3 and 13.2/100,000.

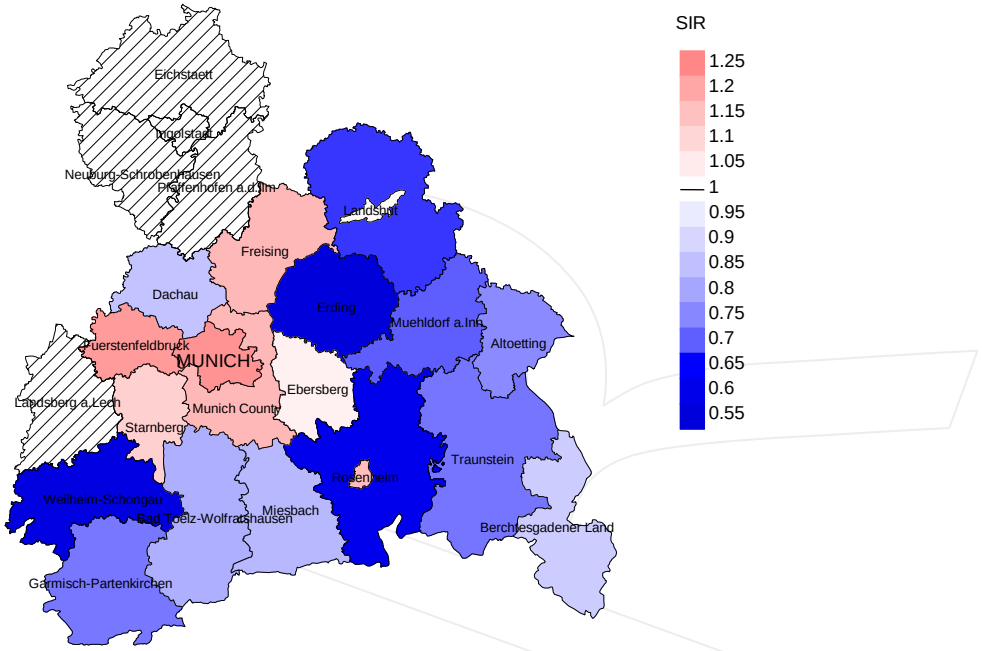


**Figure 9b.** Map of standardized incidence ratio (SIR, incl. DCO cases) by county averaged for period 2003 to 2008. According to their individual SIR values, the counties are displayed in different red and blue color temperatures where the fine white color indicates the population overall of 1.0 (N=1,768). Since cancer data are not available in some counties until 2007, the local SIR values were not calculated, and the map tiles show as shaded.

The results should be interpreted with caution! E.g., in county Ebersberg with a population of 63,131 female residents (averaged) in the period from 2003 to 2008 a total of 57 women were identified with newly diagnosed breast cancer i.s. (women). Therefore, the mean standardized incidence ratio (SIR) for this cancer type in this area can be calculated at 1.03. Though, the value of this parameter may vary with an underlying probability of 99% between 0.72 and 1.44, 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 4.52 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 | 109 | 92.7 | | 20 | 18.3 | 100.0 |
| 1999 | 127 | 98.4 | | 26 | 20.5 | 96.2 |
| 2000 | 139 | 97.1 | | 31 | 22.3 | 96.8 |
| 2001 | 163 | 98.8 | | 27 | 16.6 | 92.6 |
| 2002 | 216 | 94.4 | | 31 | 14.4 | 100.0 |
| 2003 | 218 | 95.9 | | 20 | 9.2 | 100.0 |
| 2004 | 269 | 95.2 | | 33 | 12.3 | 97.0 |
| 2005 | 312 | 95.5 | | 23 | 7.4 | 95.7 |
| 2006 | 311 | 89.7 | | 19 | 6.1 | 100.0 |
| 2007 | 346 | 77.7 | | 12 | 3.5 | 83.3 |
| 2008 | 406 | 45.6 | | 10 | 2.5 | 90.0 |
| 2009 | 404 | 49.0 | | 19 | 4.7 | 100.0 |
| 2010 | 427 | 49.4 | | 9 | 2.1 | 100.0 |
| 2011 | 407 | 65.1 | | 11 | 2.7 | 81.8 |
| 2012 | 372 | 97.8 | | 6 | 1.6 | 100.0 |
| 1998-2012 | 4226 | 77.1 | | 297 | 7.0 | 96.3 |

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 4.52 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 | 109 | 17 | 94.1 | | |
| 1999 | 127 | 21 | 85.7 | | |
| 2000 | 139 | 19 | 78.9 | 1 | 0.7 |
| 2001 | 163 | 15 | 73.3 | | |
| 2002 | 216 | 25 | 96.0 | | |
| 2003 | 218 | 38 | 92.1 | | |
| 2004 | 269 | 42 | 97.6 | | |
| 2005 | 312 | 40 | 95.0 | 2 | 0.6 |
| 2006 | 311 | 45 | 88.9 | 1 | 0.3 |
| 2007 | 346 | 33 | 97.0 | | |
| 2008 | 406 | 43 | 95.3 | | |
| 2009 | 404 | 56 | 100.0 | 2 | 0.5 |
| 2010 | 427 | 62 | 96.8 | 1 | 0.2 |
| 2011 | 407 | 66 | 100.0 | 2 | 0.5 |
| 2012 | 372 | 55 | 96.4 | 4 | 1.1 |
| 1998-2012 | 4226 | 577 | 94.6 | 13 | 0.3 |

Table 10c

Annual cohorts of deaths, proportion of cancer-related and not 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 4.52 m as of 2007, respectively)

| Year of death | Deaths n | Prop. cancer-related % | Prop. not cancer-related % | Prop. cancer recorded on death certificate % |
|---|---|---|---|---|
| 1998 | 17 | 58.8 | 41.2 | 50.0 |
| 1999 | 21 | 61.9 | 38.1 | 77.8 |
| 2000 | 19 | 47.4 | 52.6 | 60.0 |
| 2001 | 15 | 40.0 | 60.0 | 54.5 |
| 2002 | 25 | 44.0 | 56.0 | 66.7 |
| 2003 | 38 | 73.7 | 26.3 | 74.3 |
| 2004 | 42 | 57.1 | 42.9 | 65.9 |
| 2005 | 40 | 57.5 | 42.5 | 71.1 |
| 2006 | 45 | 66.7 | 33.3 | 85.0 |
| 2007 | 33 | 63.6 | 36.4 | 75.0 |
| 2008 | 43 | 51.2 | 48.8 | 65.9 |
| 2009 | 56 | 39.3 | 60.7 | 50.0 |
| 2010 | 62 | 53.2 | 46.8 | 73.3 |
| 2011 | 66 | 43.9 | 56.1 | 59.1 |
| 2012 | 55 | 54.5 | 45.5 | 75.5 |
| 1998-2012 | 577 | 53.9 | 46.1 | 67.6 |

Table 11

Means 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 (not cancer-related) Years | Age at death (according to death certificate) Years |
|---|---|---|---|---|---|
| 1998 | 17 | 75.2 | 69.1 | 84.0 | 70.3 |
| 1999 | 21 | 71.0 | 68.4 | 75.3 | 70.4 |
| 2000 | 19 | 75.9 | 66.7 | 84.3 | 69.9 |
| 2001 | 15 | 74.5 | 63.8 | 81.7 | 64.1 |
| 2002 | 25 | 74.0 | 68.9 | 78.0 | 70.5 |
| 2003 | 38 | 71.1 | 66.9 | 82.9 | 67.1 |
| 2004 | 42 | 72.8 | 66.9 | 80.7 | 68.4 |
| 2005 | 40 | 77.2 | 74.2 | 81.4 | 75.2 |
| 2006 | 45 | 73.2 | 71.2 | 77.2 | 71.2 |
| 2007 | 33 | 72.1 | 68.8 | 78.0 | 68.5 |
| 2008 | 43 | 77.4 | 72.4 | 82.6 | 75.2 |
| 2009 | 56 | 76.6 | 65.7 | 83.6 | 68.8 |
| 2010 | 62 | 75.4 | 69.6 | 82.0 | 72.8 |
| 2011 | 66 | 76.9 | 71.1 | 81.4 | 72.9 |
| 2012 | 55 | 76.0 | 71.9 | 81.0 | 75.2 |
| 1998-2012 | 577 | 75.0 | 69.6 | 81.2 | 71.5 |

By 2010, life expectancy for a newborn male in Germany is 77.5 years compared with 82.6 years for his female counterpart.

Deaths of patients are considered to be cancer-related, in case that fact was recorded on the death certificate, or patients had suffered from metastasis or recurrence.

Table 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 | 10 | 0.9 | 0.09 | 0.4 | 0.07 | 0.6 | 0.08 | 0.7 | 0.08 |
| 1999 | 13 | 1.1 | 0.10 | 0.5 | 0.07 | 0.7 | 0.08 | 0.9 | 0.09 |
| 2000 | 9 | 0.7 | 0.06 | 0.4 | 0.05 | 0.5 | 0.06 | 0.7 | 0.06 |
| 2001 | 6 | 0.5 | 0.04 | 0.3 | 0.03 | 0.4 | 0.03 | 0.4 | 0.03 |
| 2002 | 11 | 0.6 | 0.05 | 0.3 | 0.04 | 0.4 | 0.04 | 0.5 | 0.05 |
| 2003 | 28 | 1.4 | 0.13 | 0.7 | 0.10 | 1.0 | 0.11 | 1.2 | 0.12 |
| 2004 | 24 | 1.2 | 0.09 | 0.6 | 0.08 | 0.9 | 0.08 | 1.0 | 0.08 |
| 2005 | 23 | 1.2 | 0.07 | 0.5 | 0.05 | 0.7 | 0.06 | 0.9 | 0.07 |
| 2006 | 30 | 1.5 | 0.10 | 0.7 | 0.07 | 1.0 | 0.08 | 1.3 | 0.09 |
| 2007 | 21 | 0.9 | 0.06 | 0.4 | 0.05 | 0.6 | 0.05 | 0.8 | 0.06 |
| 2008 | 22 | 0.9 | 0.05 | 0.4 | 0.04 | 0.6 | 0.04 | 0.7 | 0.05 |
| 2009 | 22 | 0.9 | 0.05 | 0.5 | 0.05 | 0.7 | 0.05 | 0.8 | 0.05 |
| 2010 | 33 | 1.4 | 0.08 | 0.6 | 0.06 | 0.9 | 0.06 | 1.1 | 0.07 |
| 2011 | 29 | 1.2 | 0.07 | 0.5 | 0.05 | 0.8 | 0.05 | 0.9 | 0.06 |
| 2012 | 30 | 1.3 | 0.08 | 0.5 | 0.06 | 0.8 | 0.06 | 1.0 | 0.07 |
| 1998-2012 | 311 | 1.1 | 0.07 | 0.5 | 0.06 | 0.7 | 0.06 | 0.9 | 0.07 |

Table 13

Age distribution of age at death (cancer-related) for period 1998-2012
(**incl. multiple primaries**)

| Age at death Years | Cases n | % | Cum.% |
|---|---|---|---|
| 35-39 | 2 | 0.6 | 0.6 |
| 40-44 | 6 | 1.9 | 2.5 |
| 45-49 | 14 | 4.4 | 6.9 |
| 50-54 | 22 | 6.9 | 13.8 |
| 55-59 | 29 | 9.1 | 22.9 |
| 60-64 | 49 | 15.4 | 38.2 |
| 65-69 | 42 | 13.2 | 51.4 |
| 70-74 | 41 | 12.9 | 64.3 |
| 75-79 | 48 | 15.0 | 79.3 |
| 80-84 | 21 | 6.6 | 85.9 |
| 85+ | 45 | 14.1 | 100.0 |
| All ages | 319 | 100.0 | |

Included in the statistics are 35.8% multiple primaries.

Table 14

Age-specific mortality (cancer-related) and proportion of all cancers
for period 1998-2012
(**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 | 2 | 0.1 | 0.02 | 0.4 |
| 40-44 | 6 | 0.3 | 0.02 | 0.6 |
| 45-49 | 14 | 0.7 | 0.03 | 0.7 |
| 50-54 | 22 | 1.2 | 0.04 | 0.8 |
| 55-59 | 29 | 1.6 | 0.04 | 0.7 |
| 60-64 | 49 | 2.8 | 0.07 | 0.8 |
| 65-69 | 42 | 2.6 | 0.06 | 0.5 |
| 70-74 | 41 | 3.0 | 0.12 | 0.5 |
| 75-79 | 48 | 4.4 | 0.27 | 0.5 |
| 80-84 | 21 | 2.4 | 0.22 | 0.2 |
| 85+ | 45 | 5.5 | 0.71 | 0.4 |
| All ages | 319 | | | 0.5 |
| Mortality | | | | |
| Raw | | 1.1 | 0.08 | |
| WS | | 0.5 | 0.06 | |
| ES | | 0.8 | 0.06 | |
| BRD-S | | 0.9 | 0.07 | |
| PYLL-70 | | | | |
| per 100,000 | | 7.2 | | |
| ES | | 6.1 | | |
| AYLL-70 | | 10.8 | | |

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

Table 15

Multiple primaries in deaths in period 1998-2012

| Diagnosis | | Total n | Total %↓ | Pre n | Pre ←% | Syn-chron ±30d n | Syn-chron ±30d ←% | Post n | Post ←% |
|---|---|---|---|---|---|---|---|---|---|
| C16 | Stomach | 4 | 1.1 | 1 | 25.0 | | | 3 | 75.0 |
| C17 | Small intestine | 3 | 0.8 | | | | | 3 | 100.0 |
| C18 | Colon | 13 | 3.6 | 1 | 7.7 | 1 | 7.7 | 11 | 84.6 |
| C19-C20 | Rectum | 10 | 2.8 | 3 | 30.0 | | | 7 | 70.0 |
| C22 | Liver | 3 | 0.8 | | | | | 3 | 100.0 |
| C23-C24 | Bile | 3 | 0.8 | | | | | 3 | 100.0 |
| C25 | Pancreas | 17 | 4.7 | | | | | 17 | 100.0 |
| C33-C34 | Lung | 26 | 7.2 | | | 1 | 3.8 | 25 | 96.2 |
| C43 | Malign. melanoma | 8 | 2.2 | 3 | 37.5 | | | 5 | 62.5 |
| C44 | Skin others | 9 | 2.5 | 2 | 22.2 | 2 | 22.2 | 5 | 55.6 |
| C50 | Breast | 179 | 49.7 | | | 67 | 37.4 | 112 | 62.6 |
| C53 | Cervix uteri | 3 | 0.8 | 3 | 100.0 | | | | |
| C54 | Corpus uteri | 9 | 2.5 | 7 | 77.8 | | | 2 | 22.2 |
| C56 | Ovary | 16 | 4.4 | 6 | 37.5 | 1 | 6.3 | 9 | 56.3 |
| C70-C72 | CNS cancer | 5 | 1.4 | 1 | 20.0 | | | 4 | 80.0 |
| C73 | Thyroid | 4 | 1.1 | 1 | 25.0 | | | 3 | 75.0 |
| C82-C85 | NHL | 9 | 2.5 | 2 | 22.2 | | | 7 | 77.8 |
| C90 | Mult. myeloma | 9 | 2.5 | 1 | 11.1 | | | 8 | 88.9 |
| C91-C96 | Leukaemia | 8 | 2.2 | | | | | 8 | 100.0 |
| Other primaries | | 22 | 6.1 | 7 | 31.8 | 1 | 4.5 | 14 | 63.6 |
| All mult. primaries | | 360 | 100.0 | 38 | 10.6 | 73 | 20.3 | 249 | 69.2 |

Multiple primaries with number of cases n<3 are pooled in category "Other primaries".

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

Table 16

Age-specific mortality (cancer-related) and proportion of all cancers
for period 1998-2012
(**Singular 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 | 4 | 0.2 | 0.02 | 0.4 |
| 45-49 | 6 | 0.3 | 0.02 | 0.4 |
| 50-54 | 9 | 0.5 | 0.02 | 0.4 |
| 55-59 | 14 | 0.8 | 0.03 | 0.4 |
| 60-64 | 24 | 1.4 | 0.04 | 0.5 |
| 65-69 | 19 | 1.2 | 0.04 | 0.3 |
| 70-74 | 22 | 1.6 | 0.09 | 0.3 |
| 75-79 | 30 | 2.7 | 0.29 | 0.4 |
| 80-84 | 14 | 1.6 | 0.22 | 0.2 |
| 85+ | 30 | 3.7 | 0.67 | 0.3 |
| All ages | 172 | | | 0.3 |
| Mortality | | | | |
| Raw | | 0.6 | 0.05 | |
| WS | | 0.3 | 0.04 | |
| ES | | 0.4 | 0.04 | |
| BRD-S | | 0.5 | 0.05 | |
| PYLL-70 | | | | |
| per 100,000 | | 3.3 | | |
| ES | | 2.8 | | |
| AYLL-70 | | 10.6 | | |

* See corresponding tables with multiple primaries.

Table 17

Age-specific mortality (cancer-related) and proportion of all cancers
for period 1998-2012
(**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 | 3 | 0.1 | 0.01 | 0.3 |
| 45-49 | 2 | 0.1 | 0.01 | 0.1 |
| 50-54 | 1 | 0.1 | 0.00 | 0.0 |
| 55-59 | 3 | 0.2 | 0.01 | 0.1 |
| 60-64 | 8 | 0.5 | 0.02 | 0.2 |
| 65-69 | 8 | 0.5 | 0.02 | 0.2 |
| 70-74 | 4 | 0.3 | 0.02 | 0.1 |
| 75-79 | 5 | 0.5 | 0.06 | 0.1 |
| 80-84 | 1 | 0.1 | 0.02 | 0.0 |
| 85+ | 12 | 1.5 | 0.28 | 0.1 |
| All ages | 47 | | | 0.1 |
| Mortality | | | | |
| Raw | | 0.2 | 0.02 | |
| WS | | 0.1 | 0.01 | |
| ES | | 0.1 | 0.01 | |
| BRD-S | | 0.1 | 0.01 | |
| PYLL-70 | | | | |
| per 100,000 | | 1.1 | | |
| ES | | 0.9 | | |
| AYLL-70 | | 10.5 | | |

* See corresponding tables with multiple primaries.

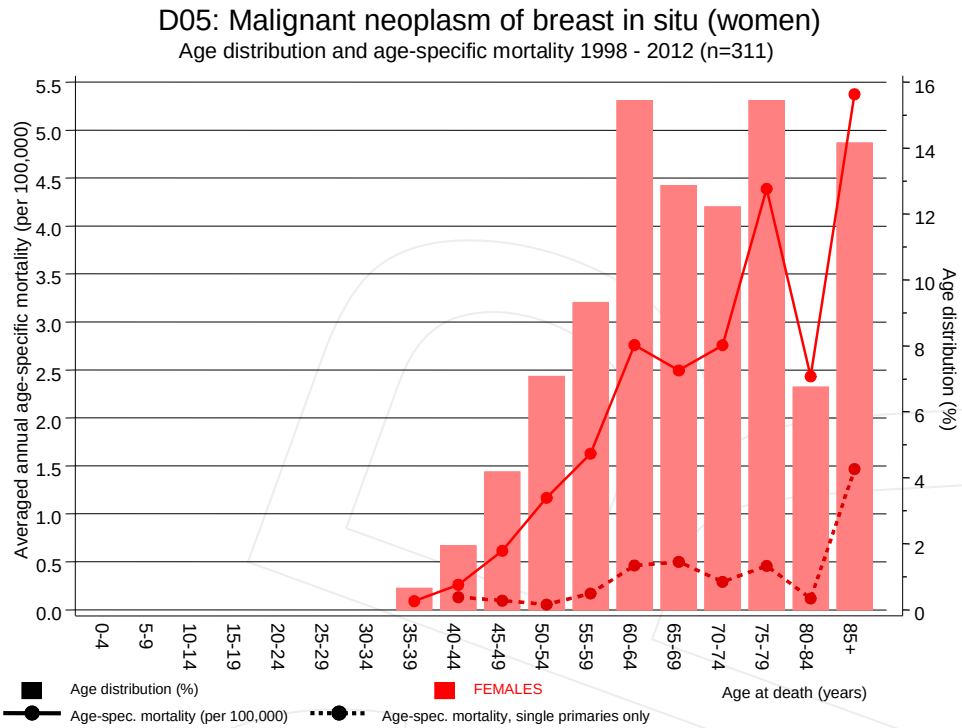


**Figure 18.** Distribution of age at death (bars) and age-specific mortality (all patients: solid line, patients with single primaries: dotted line). "

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

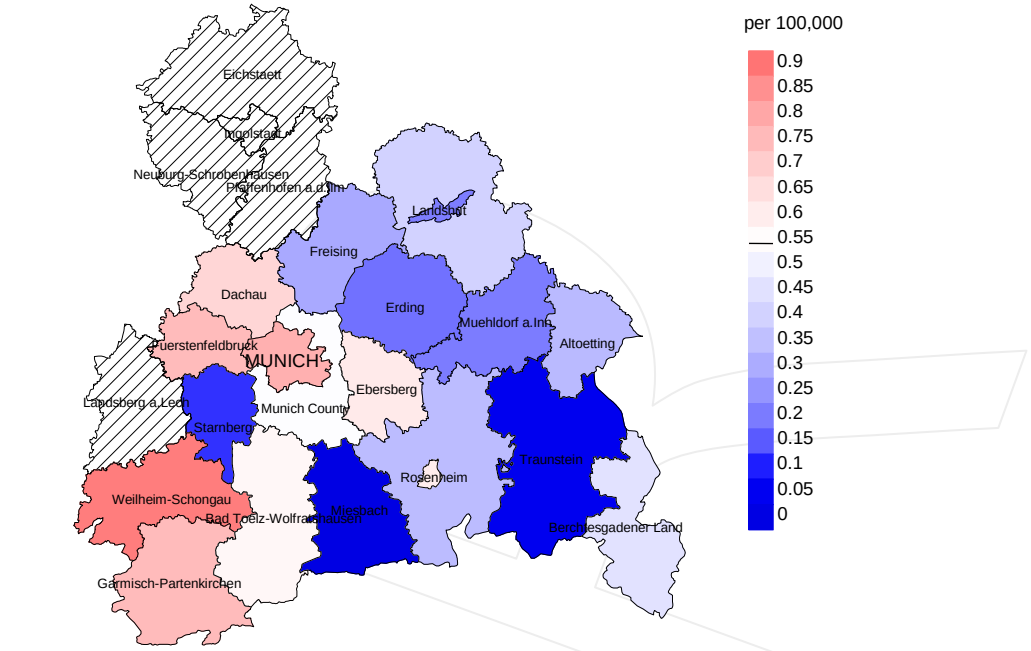


**Figure 19a.** Map of cancer mortality (world standard population) by county averaged for period 2003 to 2008. According to their individual mortality rates, the counties are displayed in different red and blue color temperatures where the fine white color indicates the population mean (0.5/100,000 WS N=140). Since cancer data are not available in some counties until 2007, the local mortality rates were not calculated, and the map tiles show as shaded.

The results should be interpreted with caution! E.g., in county Ebersberg with a population of 63,131 female residents (averaged) in the period from 2003 to 2008 a total of 5 women died from breast cancer i.s. (women). Therefore, the mean mortality 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 1.9/100,000.

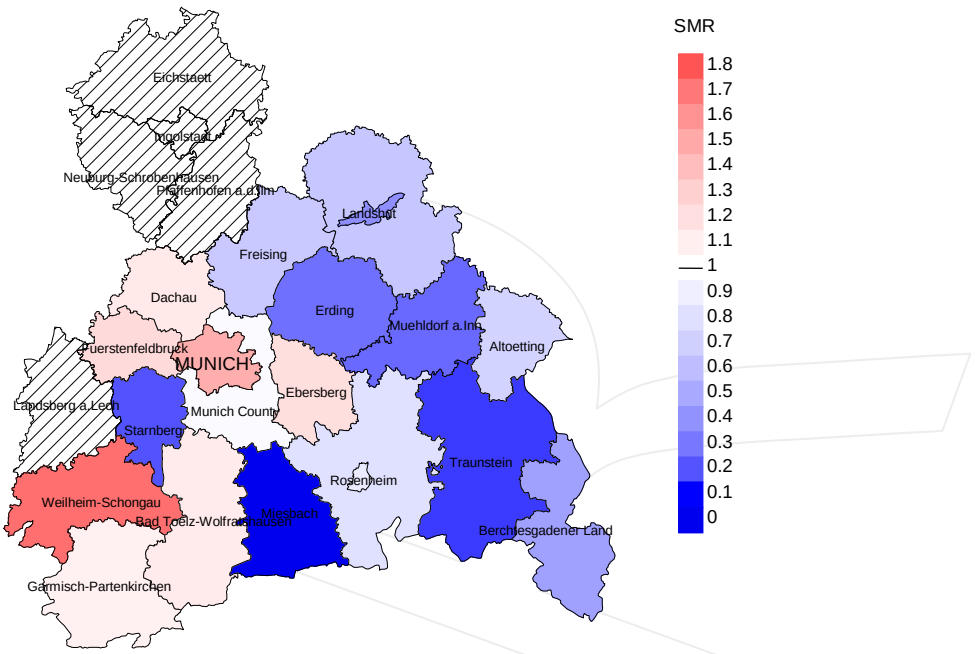


**Figure 19b.** Map of standardized mortality ratio (SMR, incl. DCO cases) by county averaged for period 2003 to 2008. According to their individual SMR values, the counties are displayed in different red and blue color temperatures where the fine white color indicates the population overall of 1.0 (N=140). Since cancer data are not available in some counties until 2007, the local SMR values were not calculated, and the map tiles show as shaded.

The results should be interpreted with caution! E.g., in county Ebersberg with a population of 63,131 female residents (averaged) in the period from 2003 to 2008 a total of 5 women died from breast cancer i.s. (women). Therefore, the mean standardized mortality ratio (SMR) for this cancer type in this area can be calculated at 1.21. Though, the value of this parameter may vary with an underlying probability of 99% between 0.26 and 3.43, and is therefore not statistically striking.

## Statistical Notes

In all tables and figures the respective reference values should be carefully considered. The incidence rates include diagnoses (with multiple primary), and death certificate only (DCO) cases. For mortality statistics patients, diagnoses and progressive course of disease are presented. In the calculations, all courses of disease are considered whereby progressions occurred and/or death certificate identified progressive cancers were ascertained. Additionally there are three groups of disease course to consider:

1. **All multiple primaries included**

   The mortality statistic describes the tumor-specific death, independent of any malignancy. The patient perspective, induced secondary malignancies, and the problem of multiple malignancies from the same primary tumor all have reasons for their inclusion.

2. **First singular primary** (no information about other prior or synchronous malignancy)

   The mortality statistic describes the tumor-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**

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

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