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Content

Introduction

A comprehensive view of the health situation of the population in Germany is an important prerequisite for planning and designing a targeted health policy, along with health care and prevention services. It is thus a key towards improving health in Germany. But which diseases occur particularly frequently in Germany, which regions have the highest disease prevalence, where is the most urgent need for action, where can the greatest prevention potential be seen?

BURDEN 2020, a joint research project with the Robert Koch Institute and the Federal Environment Agency, funded by the Innovation Fund of the Joint Federal Committee, provides transparency on this issue. In the BURDEN 2020 project, the burden of disease for Germany is calculated at the national and regional level using the methodologies of the Global Burden of Disease (GBD) study, with appropriate modifications and additions. The project focuses on selected diseases based on the combination of different data sources. In addition to the causes of death statistics, survey data or environmental data, the routine data of the AOK Research Institute (WIdO) are used.

Since 1976, the WIdO has been involved, among other things, in the analysis of routine data and can thus help to find answers for questions about disease prevalence and health care. This expertise can be used to describe the health situation of the population in Germany more comprehensively. It is based on the estimation of disease prevalence with a regional differentiation by the 401 German rural and urban districts. The methodological tools established at the WIdO are based on three pillars: firstly, the analysis of the claims data of the more than 27 million AOK-insured persons and secondly, the application of a prevalence concept that considers the challenges of a dynamic, open cohort. Thirdly, an age-, sex- and morbidity-adjusted extrapolation procedure is used which, based on the routine data of the AOK-insurees, allows statements about all inhabitants of Germany at the regional level. For the purpose of a burden of disease study, this information can also serve to measure the health impairment of the population .

The concept of burden of disease represents a comprehensive approach to measuring morbidity. After all, the mere prevalence of a disease says little about the severity of health impairments due to a disease. The concept of burden of disease was developed in the 1990s to take account of the differing impact of various diseases. It considers both the effects of a disease due to premature death (mortality) and the health impairments caused by this disease (morbidity). Morbidity, determined by the number of years lost due to health impairment, is calculated multiplicatively from the prevalence of a disease, the frequency of sequelae or severity grades, and an associated weighting factor reflecting the health impairment.

In the BURDEN 2020 project, the approach to calculating the burden of disease from the international Global Burden of Disease (GBD) study is being adopted for Germany and was adjusted and expanded. This project, funded by the Innovation Fund of the Federal Joint Committee (GBA), for the first time comprehensively calculates the disease burden for Germany with a regional differentiation by the 96 German spatial planning regions. It illustrates clearly which specific population groups or regions bear the highest burden of disease and which prevention potential is available. Initially, a selection of major, primarily non-communicable diseases was considered within the framework of the BURDEN 2020 project.

In order to calculate the burden of disease due to morbidity, information on disease prevalence and the disease-specific occurrence of severity grades or sequelae is needed. Here, routine data of statutory health insurance (SHI) represent a central data source since regionalised values can be depicted and longitudinal analyses can be conducted. For about 75 % of the diseases to be

included in the BURDEN 2020 project, the necessary key figures are measured on the basis of the routine data of the approximately 27 million people insured by the AOK.

Based on these prevalence and severity grades, the burden of disease can be calculated using the weighting factors established by the international GBD study in order to draw a comprehensive picture of the health situation in Germany.

The present methodology documentation contains all case definitions for the calculation of disease prevalence, diseases rates and severity grades estimated by WIdO on the basis of routine health insurance data. In addition, the routine data-based numerator/denominator concepts for determining the epidemiological outcomes (1- and 10-year prevalence, rates) and the frequency of disease-specific severity grades are given.

The following table shows the key data provided by the WIdO for the BURDEN 2020 project (Innovation Fund funding code 01VSF17007). The results determined for 2017 are publicly available in German at www.krankheitslage-deutschland.de.

Table 1: Overview of outcomes on disease prevalence, disease rates and severity grades for the BURDEN 2020 project

Disease	Outcome	BURDEN severity grades
Cardiovascular diseases		
Ischemic heart disease	1-year prevalence *(not used for DALY calculations)*	---
Heart failure due to ischemic heart disease	1-year prevalence	Mild/moderate/severe
Angina pectoris	1-year prevalence	---
Myocardial infarction	Rate per 100,000 person years (insurance periods)	Stratified by the time from infarction event
Heart failure due to hypertensive heart disease	1-year prevalence	Mild/moderate/severe
Stroke	10-year prevalence	Subdivision into three types of stroke (ischaemic stroke, intracerebral haemorrhage, subarachnoid haemorrhage).
Diabetes		
Diabetes type 1	1-year prevalence	Neuropathy/diabetic foot/amputation vision loss/blindness
Diabetes type 2	1-year prevalence	Neuropathy/ diabetic foot/amputation vision loss/blindness
Cancers		
Lung cancer	10-year prevalence	Phase 1/2/3/4
Breast cancer	10-year prevalence	Phase 1/2a and 2b with or without mastectomy/3/4
Colorectal cancer	10-year prevalence	Phase 1/2a and 2b with or without stoma/3/4
Prostate cancer	10-year prevalence	Phase 1/2a, 2b, 2c, 2d with or without incontinence or impotence/3/4
Mental Disorders		
Depression (major)	1-year prevalence	Asymptomatic/mild/moderate/severe
Dysthymia	1-year prevalence	---
Anxiety and stress disorder	1-year prevalence	---
Neurological diseases		
Alzheimer and other dementias	1-year prevalence	---
Chronic respiratory tract diseases		
Chronic obstructive pulmonary disease (COPD)	1-year prevalence	---
Communicable diseases		
Lower respiratory tract infection (LRI)	Rate per 100,000 person years (insurance periods)	---

General comments on the classifications used

The ICD codes refer to the 2017 version of ICD-10-GM, i. e. the German modification of the WHO ICD-10 (International Classification of Diseases). The ICD classification is available at https://www.bfarm.de/DE/Kodiersysteme/Services/Downloads/_node.html, ICD-10-GM version 2017 (last accessed 21st March 2023).

The OPS ("Operationen- und Prozedurenschlüssel") refers to the 2017 version of the German modification of the WHO ICPM (International Classification of Procedures in Medicine). The OPS classification is available at https://www.bfarm.de/DE/Kodiersysteme/Services/Downloads/_node.html, OPS version 2017 (last accessed 21st March 2023).

The ATC classification refers to the May 2020 version of the German modification of the international WHO classification. It is available at https://www.wido.de/publikationen-produkte/arzneimittel-klassifikation/?L=0 (last accessed 21st March 2023).

In the outpatient sector, EBM is a German system for coding the billing of services provided by SHI-accredited physicians ("Einheitlicher BewertungsMaßstab").

Unless otherwise stated, the codes or German billing numbers considered for the case definitions are valid in the respective analysed periods. These time periods include:

- For 1-year prevalence and the rates, the years 2017 and 2016 are considered. The validity of the given codes therefore refers to this period. An exception are the OPS codes for amputations in diabetes, which are valid for the time period between 2006 and 2017.
- For the 10-year prevalence, the provided codes cover the period from 2007 to 2017. This applies to the diagnoses underlying the case definition as well as mastectomies (OPS codes). The codes for the cancer sequelae relate to the period 2016/2017.

As a general rule, ICD codes are indicated without special characters ('-', '!', '+', '*', ...). Five-digit ICD codes are interrupted with '.' for readability, OPS codes with '-' and '.'.

Unless otherwise stated, codes that are unspecified at the end always include all subordinate codes in the hierarchy.

In the German statutory health insurance data, diagnoses from the outpatient sector and the hospital outpatient sector are documented with an additional label indicating the type of diagnosis: 'confirmed' ("gesichert"), 'condition after' ("Zustand nach"), 'exclusion' ("Ausschluss") or 'suspected' ("Verdacht"). The latter two diagnosis types ('exclusion' and 'suspected') were not included in the definition of cases. Unless otherwise stated, only 'confirmed' diagnoses were considered for the detection of cases in the data. For ischaemic heart disease, 'condition after' diagnoses were also considered in order to detect cases with a previous heart attack or myocardial infarction.

Numerator/denominator concepts for prevalence and rates

Depending on the disease under consideration and the outcomes to be determined, proportions are estimated as prevalence or rates. The procedures for determining the respective population in the denominator and the corresponding number in the numerator are shown below.

Since different time periods are considered in each case, it is necessary to differentiate between the following terms:

- 'Target quarters' are the quarters within the BURDEN 2020 target year 2017.
- 'Assessment' time periods are the time periods for which the fulfilment of the case definition criteria is assessed.

All outcomes for the BURDEN 2020 target year of 2017 are estimated for four subsets per quarter within this target year – i. e. in the four target quarters of 2017. For all prevalence and disease rates, a rolling quarterly estimation is therefore performed.

The regional allocation of the insurees is carried out on a quarterly basis in order to be able to consider inflows to and outflows from a region during the year.

General definitions

- All outcomes are determined using insurance durations in the target year or target quarter.
- **Dealing with implausible insurance durations**:
  If too long a period of coverage is indicated for an insured person in a quarter, it will be capped at the possible maximum number of days per quarter.
- **Implementation of the criterion 'continuously insured' for prevalence:**
  - For all prevalences (1- and 10-year prevalence), a continuous insurance period must be available (4 or 40 quarters) in order to ensure complete insurance histories and thus completeness of the claims data for case definition.
  - All insured persons who were insured in every quarter of the period under review (4 or 40 previous quarters) and whose summed-up insurance days of the total period under review (4 or 40 quarters) has a proportion of at least 361/365ths of the target duration (100%) are considered as 'continuously insured'. If the actual duration of insurance is shorter, the respective insurees are not considered.

  - Exceptions to this are those who deceased in the target quarter or those who were new born in the assessment period:
    - For new-borns, insurance durations are considered from the date of birth. In addition, a grace period applies, i.e. new-borns only have to be continuously insured from the second quarter after birth. In such cases, all times from birth are retroactively counted as insured.
    - For those who die in the target quarter, only the duration up to the date of death is used to calculate the insurance duration for the criterion 'continuously insured'. Persons who were continuously insured until the day of death in the target quarter are thus included.
- For the **rates** of myocardial infarctions and lower respiratory tract infections, only the respective target quarter from 2017 is considered. All insured persons with at least one insurance day in the target quarter under consideration are considered. Cases (number of myocardial infarctions/episodes of lower respiratory tract infections) are counted and rates are determined based on the sum of the insurance durations in the denominator. The result will show, for example, #myocardialinfarction cases/100,000 insured years.
- **Place of residence:** The place of residence is determined based on the most recent information within the target quarter that is available in the master file data about the insured persons.
- **Age classification:** The age is determined in completed years of life at the middle of each target quarter. Exceptions are deceased persons and new-borns: For those who died before the middle of the quarter, the last age reached (age at the date of death) is considered; for those who were born after the middle of the target quarter, an age of 0 years is set (i.e. no negative value is used for age).
- **Necessary restrictions of the reference population:**
  Insured persons are only considered if the following criteria are fulfilled in the target quarter:
  - AOK-insured with at least 1 day, i.e. type of insurance > 100
  - Sex male or female
  - Valid age (between 0 and 120 years)
  - Valid regional allocation to one of the 401 German urban or rural districts

Estimation of 1-year prevalence

For the calculation of the denominator, the reference population within the BURDEN-2020 reference year 2017 is determined on a quarterly basis (i. e. four times in total) as well as the subset of the insured persons who meet the case definition criteria for the numerator within this reference population.

The reference population is composed of all insured persons with 'continuous' insurance durations over a period of four quarters (i.e. the target quarter plus three preceding quarters), taking the special cases of new-borns and deceased persons into account (see above).

The criterion of continuous insurance duration is necessary to ensure that during the period of in most cases one year for determining the 1-year prevalence, complete histories of insured persons and thus complete claims data are available for the assessment of the case definition.

The denominator is calculated as the sum of the insurance durations of the persons in the reference population in the target quarter under consideration, with the values of the four target quarters summed up to the target year of 2017.

The numerator is calculated as the sum of the insurance durations of those persons in the reference population in the target quarter under consideration who meet the case definition in the period of the three preceding quarters up to and including the target quarter. For the total value of the numerator in the target year 2017, the values of the four target quarters of 2017 are summed up.

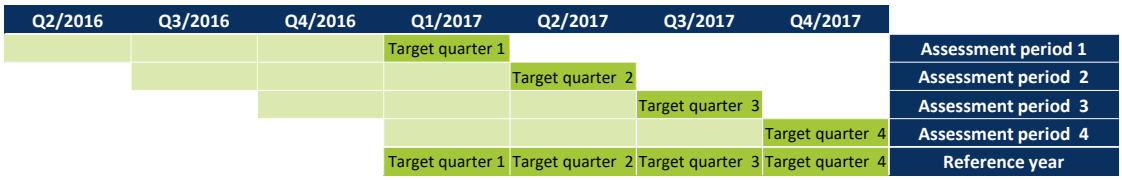
The quotient of the numerator (sum of time insured with disease) and the denominator (sum of insurance periods of the population) equals the prevalence.

For new-borns or for persons deceased during the target quarter, only the days within the respective target quarter since birth or until death are counted.

The regional allocation is made based on the most recent information in the target quarter, and the allocation to the age groups is made using the middle of the respective target quarter as described under the general specifications.

The following figure shows schematically which time periods are considered when the respective case definition criteria are applied:

Figure 1: Schematic representation of the assessment periods and the target periods for the definition of 1-year prevalence in the BURDEN reference year 2017



Source: own representation

All 1-year prevalences determined on the basis of AOK routine data are extrapolated to all residents in Germany for the BURDEN 2020 project according to an age-, sex- and morbidity-adjusted extrapolation procedure (Breitkreuz et al., AStA Wirtsch Sozialstat Arch 2019, 13:35-72; https://doi.org/10.1007/s11943-019-00241-z) and made available at the level of the 96 spatial planning regions broken down by age groups and sex.

Estimation of 10-year prevalence

For the calculation of the denominator, the reference population within the BURDEN 2020 reference year 2017 is determined on a quarterly basis (i.e. four times in total) as well as the subset of the insured persons who meet the case definition criteria for the numerator within this reference population.

The reference population is composed of all insured persons with 'continuous' durations of insurance over a period of 40 quarters (i.e. the target quarter plus 39 preceding quarters), considering the special cases of new-borns and deceased persons (see above).

The criterion of continuous insurance duration is necessary to ensure that during the period of mostly one year for the determining the 10-year prevalence, complete histories of insured persons and thus complete claims data are available for the assessment of the case definition.

The denominator is calculated as the sum of the insurance durations of the persons in the reference population in the target quarter under consideration, with the values of the four target quarters summed up to the target year of 2017.

The numerator is calculated as the sum of the insurance durations of those persons in the reference population in the target quarter under consideration who meet the case definition in the (10-year) period of the 39 preceding quarters up to and including the target quarter. For the total value of the numerator in the reference year 2017, the values of the four target quarters of 2017 are summed up.

The quotient of the numerator (sum of time insured with disease) and the denominator (sum of insurance periods of the population) equal the prevalence.

For new-borns, deceased persons and persons leaving the AOK in the target quarter, only the days within the respective target quarter since birth or until death/policy termination are counted.

The regional allocation is made based on the most recent information for the target quarter, and the allocation to the age groups is made using the middle of the respective target quarter as described under the general specifications.

All 10-year prevalences determined on the basis of AOK routine data are extrapolated to all residents in Germany for the BURDEN 2020 project according to an age-, sex- and morbidity-adjusted extrapolation procedure (Breitkreuz et al., AStA Wirtsch Sozialstat Arch 2019, 13:35-72; https://doi.org/10.1007/s11943-019-00241-z) and made available at the level of the 96 spatial planning regions broken down by age groups and sex.

Estimation of rates of myocardial infarctions and lower respiratory tract infections

To consider possible multiple disease events for myocardial infarctions and lower respiratory tract infections, a rate is calculated based on the number of cases per 100,000 insured years.

The persons insured with AOK for at least 1 day in the respective target quarter of 2017 are considered as the reference population. The denominator of the rate is the sum of the insurance durations (in days) of the persons in the population within the target quarter, whereby the values of the four target quarters for the reference year 2017 are summed up.

The numerator results from the number of cases in the respective target quarter among the persons in the reference population. Again, for the reference year 2017, the values of the individual target quarters are summed up. There may be several cases per year per person, and in the case of myocardial infarctions, even several cases per quarter.

The total value for 2017 is then calculated as the quotient of the numerator (sum of the number of cases) divided by the denominator (sum of the insurance durations) and is presented as a value per 100,000 person years. One year is counted as 365.25 days.

All rates determined on the basis of AOK routine data are extrapolated to all residents in Germany for the BURDEN 2020 project according to an age-, sex- and morbidity-adjusted extrapolation procedure (Breitkreuz et al., AStA Wirtsch Sozialstat Arch 2019, 13:35-72; https://doi.org/10.1007/s11943-019-00241-z) and made available at the level of the 96 spatial planning regions broken down by age groups and sex.

Estimation of severity grades

In addition to disease prevalence, severity grades are estimated for various diseases on the basis of routine data in order to be able to quantify the patients' health impairment.

For this purpose, the severity grade definitions of the international Global Burden of Disease study are adopted for BURDEN 2020. This guarantees compatibility with the severity-grade specific weights ('disability weights'), the measure for quantifying health impairment. To operationalise the severity grade definitions, the prevalent cases of a disease are assigned to the defined severity grades in order to quantify the health impairment of the populations suffering from the disease in question.

The challenge in estimating the severity grades of a disease is that some severity grades are rare, such as major amputations in diabetes mellitus or blindness due to diabetic retinopathy. Such rare conditions cannot be reliably captured through health surveys due to limited sample sizes. These data gaps can be filled by SHI routine data, since the large numbers of insured persons also allow the counting of rare conditions – provided that a severity grade or sequela can be defined in the claims data using corresponding codes. However, some severity grades are so rare that no regional differentiation by age and sex is possible even on the basis of the data of the 27 million AOK insured people . Therefore, the severity grades in the BURDEN 2020 project are not estimated by region, but only on the national level by age and sex.

1 Cardiovascular diseases

Heart failure can develop as a consequence of various cardiovascular diseases. In the BURDEN 2020 project, cases of heart failure due to ischemic heart disease and hypertensive heart disease are considered. Since heart failure can be a sequela of different causes, the cases definition criteria of the severity grades of heart failure and their implementation are presented first. In the following subchapters on ischaemic and hypertensive heart disease, the definition of heart failure is used.

1.1 Heart failure

1.1.1 1-year prevalence of heart failure

To identify persons with heart failure, patients with diagnoses recorded during treatment in the outpatient and inpatient sector are considered. In the case of outpatient diagnoses in patients with an SHI, all 'confirmed' diagnoses are considered, whereby a target diagnosis must be documented in at least 2 of 4 quarters of the reference year and relevant drugs must also have been prescribed.

Basic quantity:

Persons in the reference population for 1-year prevalence (see heading 'Estimation of 1-year prevalence' in the section 'Numerator/denominator concepts for prevalence and rates')

AND

The following criteria apply within the annual period under consideration:

Inclusion criteria heart failure

A. Criterion to consider inpatient diagnoses:
Target diagnosis is documented as main or secondary diagnosis. (Only discharged, full- and semi-residential hospital cases are considered.)

OR

B. Criterion to consider diagnoses from ambulatory hospital care
Target diagnosis was documented as a 'confirmed' diagnosis in the year under consideration in the claims data of the ambulatory hospital care sector.

OR

C. Criterion to consider outpatient diagnoses:

C1st Target diagnosis was documented as a 'confirmed' diagnosis in at least 2 of 4 quarters of the reference year (M2Q criterion). The M2Q criterion is also met if two different diagnoses pertaining to the defined disease pattern were recorded.

AND

C2nd There was a prescription for drugs of the target ATC codes with at least 50 defined daily doses (DDD) per substance group.

Table 2: Target ICD heart failure

ICD	Title
I50	Heart failure

Table 3: Target ATC on the substance groups for heart failure

ATC Code	Substance
Substance group: Cardiac glycosides	
C01A	Cardiac glycosides
Substance group: Diuretics	
C03	Diuretics
Substance group: Beta blocking agents	
C07	Beta adrenoceptor blocking agents
Substance group: ACE inhibitor	
C09A	ACE inhibitor, plain
C09B	ACE inhibitor, combination
Substance group: Sartane – Angiotensin II receptor blockers (ARBs)	
C09C	Angiotensin II receptor blockers (ARBs), plain
C09D	Angiotensin II receptor blockers (ARBs), combinations

1.1.2 Definition of sequelae/severity grades of heart failure

The classification into the severity grades is based on the documented NYHA stages.

- NYHA I/II/without NYHA indication: (mild)
- NYHA III: (moderate)
- NYHA IV: (severe)

For each patient with heart failure, the highest documented severity grade is considered for each evaluation period. Cases requiring inpatient treatment due to heart failure (criterion: main diagnosis) are always analysed as severe cases. If no NYHA stage is documented, the cases are classified as mild cases.

1.2 Ischaemic heart disease

Under the term ischaemic heart disease (coronary heart disease), the following individual diseases are included:

- Heart failure (CHF) due to ischemic heart disease (CHD)
- Angina pectoris
- Myocardial infarction

1.2.1 1-year prevalence of ischemic heart disease

To identify persons with ischemic heart disease (CHD), patients with diagnoses recorded during treatment in the outpatient and inpatient sector are considered. For outpatient diagnoses and diagnoses of ambulatory hospital treatment, all 'confirmed' and 'condition after' diagnoses are considered. For outpatients diagnosed by a physician with an SHI accreditation, a target diagnosis must have been documented in at least 2 of 4 quarters of the reference year and relevant drugs must also have been prescribed.

Basic quantity:

Persons in the reference population for 1-year prevalence (see heading 'Estimation of 1-year prevalence' in the section 'Numerator/denominator concepts for prevalence and rates')

AND

The following criteria apply within the annual period under consideration:

Inclusion criteria ischemic heart disease

A. Criterion to consider inpatient diagnoses:
Target diagnosis is documented as main or secondary diagnosis. (Only discharged, full- and semi-residential hospital cases are considered.)

OR

B. Criterion to consider diagnoses from ambulatory hospital care
Target diagnosis was documented as 'confirmed' or 'condition after' diagnosis in the year under consideration in the claims data recorded during treatment in ambulatory hospital care.

OR

C. Criterion to consider outpatient diagnoses:

C1st Target diagnosis was documented as 'confirmed' or 'condition after' diagnosis in at least 2 out of 4 quarters of the reference year (M2Q criterion). The M2Q criterion is also met if two different diagnoses pertaining to the defined disease pattern were recorded.

AND

C2nd There was a prescription for drugs of the target ATC codes with at least 50 defined daily doses (DDD) per substance group.

OR

D. Criterion to consider inpatient OPS:
At least one of the listed target OPS codes was documented in the year under consideration.

OR

E. Criterion to consider OPS from ambulatory hospital care:
At least one target OPS code was documented in the claims data recorded during treatment in the ambulatory hospital care sector in the year under consideration.

Table 4: Target ICD codes ischemic heart disease

ICD	Title
I20	Angina pectoris
I21	Acute myocardial infarction
I22	Subsequent myocardial infarction
I23	Certain current complications following acute myocardial infarction
I24	Other acute ischaemic heart diseases
I25	Chronic ischaemic heart disease

Table 5: Target ATC on the substance groups for ischemic heart disease

ATC Code	Substance
Substance group: Platelet aggregation inhibitors excl. heparin	
B01AC	Platelet aggregation inhibitors excl. heparin
Substance group: Nitrates – vasodilators used in cardiac diseases	
C01DA	Organic nitrates
C01DX12	Molsidomine
C01DX11	Trapidil
Substance group: Beta blocking agents	
C07	Beta adrenoceptor blocking agent
Substance group: Calcium channel blockers	
C08	Calcium channel blockers
C09XA53	Aliskiren and amlodipine
C09XA54	Aliskiren, amlodipine and hydrochlorothiazide
Substance group: ACE-Inhibitors	
C09A	ACE inhibitors, plain
C09B	ACE inhibitors, combinations
Substance group: Angiotensin II receptor blockers (ARBs)	
C09C	Angiotensin II receptor blockers, plain
C09D	Angiotensin II receptor blockers, combinations

ATC Code	Substance
Substance group: Lipid modifying agents excl. herbal antilipidemics (C10AP and C10BP) and excl. alipogene tiparvovec (C10AX10)	
C10	Lipid modifying agents
excl. C10AP excl. C10BP excl. C10AX10	

Table 6: Target OPS codes ischemic heart disease

OPS	Title
1-275.5	Coronary angiograph of bypass vein grafts
5-360	Disobliteration (endarterectomy) of coronary arteries
5-361	Creation of an aortocoronary bypass
5-362	Creation of an aortocoronary bypass by minimally invasive technique
5-363	Other revascularisation of the heart
8-837.0	Percutaneous transluminal angioplasty of heart and coronary arteries: Balloon angioplasty
8-837.1	Percutaneous transluminal angioplasty of heart and coronary arteries: Laser angioplasty:
8-837.2	Percutaneous transluminal angioplasty of heart and coronary arteries: Atherectomy
8-837.5	Percutaneous transluminal angioplasty of heart and coronary arteries: Rotoablation
8-837.6	Percutaneous transluminal angioplasty of heart and coronary arteries: Selective thrombolysis
8-837.8	Percutaneous transluminal angioplasty of heart and coronary arteries: Insertion of prosthesis
8-837.e	Percutaneous transluminal angioplasty of heart and coronary arteries: Percutaneous transmyocardial laser vascularisation (PMR)
8-837.k	Percutaneous transluminal angioplasty of heart and coronary arteries: Insertion of non drug-eluting stent
8-837.m	Percutaneous transluminal angioplasty of heart and coronary arteries: Insertion of drug-eluting stent
8-837.p	Percutaneous transluminal angioplasty of heart and coronary arteries: Insertion of non drug-eluting covered stent (stent graft)
8-837.q	Percutaneous transluminal angioplasty of heart and coronary arteries: Blade angioplasty (scoring or cutting balloon)
8-837.t	Percutaneous transluminal angioplasty of heart and coronary arteries: Thrombectomy from coronary arteries
8-837.u	Percutaneous transluminal angioplasty of heart and coronary arteries: Insertion of non drug-eluting bifurcation stent
8-837.v	Percutaneous transluminal angioplasty of heart and coronary arteries: Insertion of drug-eluting bifurcation stent
8-837.w	Percutaneous transluminal angioplasty of heart and coronary arteries: Insertion of a coated stent

OPS	Title
8-839.9	Using specialised techniques for coronary artery recanalisation
8-83d excl. 8-83d.3 excl. 8-83d.4 excl. 8-83d.5	Other percutaneous transluminal angioplasty of heart and coronary arteries

1.2.2 1-year prevalence of heart failure due to ischemic heart disease

The intersection of ischemic heart disease (see section 1.2.1) and heart failure (see section 1.1.1) forms the basis for the prevalence of heart failure due to ischemic heart disease. Severity is mapped using NYHA stages (see section 1.1.2).

1.2.3 Angina pectoris

1.2.3.1 1-year prevalence of angina pectoris

To determine persons with angina pectoris, patients with diagnoses recorded during treatment in the outpatient and inpatient sector or with a specific drug prescription are included.

In addition to the specific profile for angina pectoris, the profile for ischemic heart disease (see 1.2.1) must also be fulfilled.

Basic quantity:

Persons in the population for 1-year prevalence (see heading 'Estimation of 1-year prevalence' in the section 'Numerator/denominator concepts for prevalence and rates')

AND

The following criteria apply within the annual period under consideration:

A. Condition ischemic heart disease
The definition criteria for ischemic heart disease are fulfilled (see case definition for coronary artery disease under 1.2.1).

AND

Inclusion criteria angina pectoris diagnoses or drugs

B. Criterion to consider inpatient diagnoses:
Target diagnosis is documented as main or secondary diagnosis. (Only discharged, full- and semi-residential hospital cases are considered.)

OR

C. Criterion to consider diagnoses from ambulatory hospital care
Target diagnosis was documented as a 'confirmed' diagnosis in the year under consideration in the claims data from ambulatory hospital care.

OR

D. Criterion to consider outpatient diagnoses:
Target diagnosis was documented as a 'confirmed' diagnosis.

OR

E. Criterion to consider drug prescription:
A prescription for a drug with one of the target ATC codes was filled.

Table 7: Target ICD angina pectoris

ICD	Title
I20	Angina pectoris

Table 8: Target ATC angina pectoris

ATC Code	Substance
C01DA	Organic nitrates
C01DX12	Molsidomine

1.2.3.2 No definition of sequelae/severity grades

For angina pectoris, severity grades were not estimated using routine data..

1.2.4 Myocardial infarction

1.2.4.1 Rates of myocardial infarction

To identify persons with myocardial infarction, only inpatient hospital cases with a corresponding main diagnosis are analysed.

A rate for myocardial infarctions adjusting for multiple infarctions (several cases per year) is estimated. Rates (number of cases per 100,000 persons) are shown in the results.

All episodes of myocardial infarction with an admission date in the calendar year 2017 are recorded.

Since in a further step, average episode durations in a time window of up to 28 days are estimated for myocardial infarctions (see 1.2.4.2 Sequelae/severity grades of myocardial infarction), hospital cases occurring within this time window of 28 days are not counted more than once. This means that a myocardial infarction only counts as an acute event if the time interval to the previous myocardial infarction is greater than 28 days. The admission date of the inpatient cases is used to determine the time interval. 'Old cases' from the end of the previous year (here: December 2016) are also considered: In summary, only those myocardial infarctions with an admission date in 2017 are counted as cases for which there was no previous myocardial infarction within 28 days.

Basic quantity:

Persons in the population as described in the section on rates (see heading 'Estimation of rates of myocardial infarctions and lower respiratory tract infections' in the section 'Numerator/denominator concepts for prevalence and rates')

AND

The following criteria apply to the period under consideration:

Inclusion criterion myocardial infarction
Target diagnosis is documented as the main diagnosis of a discharged, full- and semi-residential hospital case

AND

Inclusion criterion time interval before possible previous event greater than 28 days:
There was no other (previous) myocardial infarction in the period of 28 days before the hospital admission date of the case under consideration. For the chronological assignment of the previous case, the date of admission is used. 'Old cases' from December 2016 are also considered.

Table 9: Target ICD myocardial infarction

ICD	Title
I21	Acute myocardial infarction
I22	Subsequent myocardial infarction

1.2.4.2 Sequelae/severity grades of myocardial infarction in the categories 0 to 2 / 3 to 28 days from infarction

For myocardial infarctions according to the above case definition (hereinafter referred to as 'relevant' myocardial infarctions), severity grades are determined on the basis of routine data depending on the time since the myocardial infarction event. For this purpose, average case numbers in the two categories (0 to 2 days, 3 to 28 days from infarction) are estimated as outcomes. The procedure for this is outlined below.

For the relevant myocardial infarction cases, all observed patient days within the time window of up to 28 days after the start of the hospital stay are first calculated. For this purpose, it is determined how long a patient survived after the event (hospital admission date). The observation period ends after 28 days at the latest from the date of hospitalisation. If a patient has NOT died within the first 28 days after the event, the entire duration (date of hospitalisation plus 28 days) is analysed. If a patient has died within this time window, only the days from the hospital admission date up to and including the date of death count. Days that extend into the following year (here: 2018) are also considered. The observed patient days are subsequently divided into two categories:

a) 0 to 2 days after myocardial infarction (hospital admission date)

b) 3 to 28 days after myocardial infarction (hospital admission date)

All days at the beginning and end of an interval are counted in half, the days in between are counted in full. So, for a person who is not deceased, the counting methodology would be as follows:

day since hospital admission (= day 0)	0	1	2	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
numerator	0,5	1	0,5	0,5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0,5
interval	0 to 2 days			3 to 28 days																										

- 0.5 days = date of hospital admission of the relevant infarction event, with assignment to the first interval (0 to 2 days).
- 1 day = 1st day after hospital admission of the relevant infarction event, with assignment to the first interval (0 to 2 days).
- 0.5 days = on 2nd day after hospital admission of the relevant infarction event, with assignment to the first interval (0 to 2 days).
- 0.5 days = on 2nd day after hospital admission of the relevant infarction event, with assignment to the first interval (3 to 28 days).
- 1 day each = days 3 to 27 after hospital admission, with assignment to the second interval (3 to 28 days).
- 0.5 days = on 28th day after hospital admission of the relevant infarction event, with assignment to the first interval (3 to 28 days).

If a patient has died before day 28, the end of the interval is the day of death, which is always counted as half. In total, a maximum of 29 days are considered per case. The counting method with half days ensures that the sum of the counters per case is still only a maximum of 28.

This method of counting was chosen because information on time of death is available only on a daily basis, which results in a certain inaccuracy. This assumes that the death occurred approximately in the middle of the day.

To determine the severity grades, all observed patient days in the respective categories (0 to 2 days/3 to 28 days) are then added up and divided by the number of days in the respective interval (2 or 26 days) to obtain the ***average observed number of cases in the respective category.*** This average number of cases is already adjusted for observation periods of different durations. Therefore, if patients die early, such cases only count proportionately with shorter observation durations in the respective category.

Finally, the proportion of severity in each category (0 to 2 days/3 to 28 days) is calculated as the ***average observed number of cases in each category*** divided by the total number of myocardial infarction cases.

1.3 Heart failure due to hypertensive heart disease

1.3.1 1-year prevalence of heart failure due to hypertensive heart disease

To identify persons with hypertensive heart disease (HHD), patients with diagnoses recorded during treatment in the outpatient and inpatient sectors are included. In the case of outpatients diagnosed by an SHI accredited physician, all 'confirmed' diagnoses are considered, whereby a target diagnosis must have been recorded in at least 2 of 4 quarters of the reference year. If only one diagnosis has been recorded but a relevant drug has been prescribed within the same time period, the definition criteria are also considered to be fulfilled.

Since only patients with heart failure due to hypertensive heart disease are to be identified, the intersection of hypertensive heart disease and heart failure is to be estimated. Therefore, the criteria of both hypertensive heart disease and heart failure must be fulfilled (cf. 1.1.1).

Basic quantity:

Persons in the population for 1-year prevalence (see heading 'Estimation of 1-year prevalence' in the section 'Numerator/denominator concepts for prevalence and rates')

AND

The following criteria apply within the annual period under consideration:

A. Criterion to consider heart failure:
The inclusion criteria for heart failure are fulfilled (heart failure (cf. 1.1.1).

AND

B. Criteria to consider hypertensive heart disease

B1st **Criterion to consider inpatient diagnoses:**
Target diagnosis is documented as main or secondary diagnosis. (Only discharged, full- and semi-residential hospital cases are considered.)

OR

B2nd **Criterion to consider diagnoses from ambulatory hospital care**
Target diagnosis was documented as a 'confirmed' diagnosis in the year under consideration in the claims data of ambulatory hospital care.

OR

B3rd **Criterion to consider outpatient diagnoses:**
Target diagnosis was documented as a 'confirmed' diagnosis in at least 2 of 4 quarters of the reference year (M2Q criterion). The M2Q criterion is also met if two different diagnoses pertaining to the defined disease pattern were recorded.

OR

B4th **Criterion to consider outpatient diagnoses:**
The target diagnosis was documented as a 'confirmed' diagnosis in only one quarter of the reference year AND there was a prescription for a drug with one of the target ATC codes.

Table 10: Target ICD codes hypertensive heart disease

ICD	Title
I11	Hypertensive heart disease
I13	Hypertensive heart and renal disease

Table 11: Target ATC codes hypertensive heart disease

ATC Code	Substance
C02	Antihypertensives
C03	Diuretics
C07	Beta blocking agents
C08	Calcium channel blockers
C09	Agents acting on the renin-angiotensin system

1.3.2 Sequelae/severity of heart failure due to hypertensive heart disease

In hypertensive heart disease, only heart failure is recorded as a subsequent condition (sequelae). The definition criteria for patients with heart failure are described in section 1.1.1. The severity classification is as shown in section 1.1.2.

1.3.3 Heart failure due to hypertensive heart disease – documentation

Since heart failure due to hypertensive heart disease (HHD) is already considered as a sequela, no further inclusion of heart failure due to hypertensive heart disease into a GBD-like envelope takes place. Overlaps within the set of heart failure patients due to different causes are considered in the project via a comorbidity correction.

Case definition criteria for HHD: The inclusion is based on recorded diagnoses (I11 or I13). Deviating from the GBD rationale, hypertensive heart and renal disease (ICD-10 I13) is also included, as these are essentially HHD cases as well. This is possible because, in contrast to GBD, kidney diseases are not considered in the pilot project (in GBD, the code I13 was assigned to renal diseases).

For the sequela heart failure, with HHD the BURDEN case definition for heart failure must be fulfilled at the same time.

The mapping of the severity grades is done in a manner comparable to other heart failure definitions on the basis of the highest NYHA severity documented in the evaluation time period (1 year). If no NYHA stage is recorded, the cases are classified as mild cases comparable to heart failure due to IHD (best case scenario).

1.4 Stroke

A 10-year prevalence is estimated for strokes.

1.4.1 Case definition stroke

To identify persons with a stroke, only inpatient hospital cases with a corresponding principal diagnosis are considered.

The case definition is fulfilled if the following condition is met:

Criterion to consider inpatient diagnosis:
Target diagnosis is documented as the main diagnosis. (Only discharged, full- and semi-residential hospital cases are included.)

Table 12: Target ICD stroke

ICD	Title
I60	Subarachnoid haemorrhage
I61	Intracerebral haemorrhage
I63	Cerebral infarction
I64	Stroke, not specified as haemorrhage or infarction

1.4.2 10-year prevalence of stroke

Basic quantity:

Persons in the population for 10-year prevalence (see heading 'Estimation of 10-year prevalence' in the section 'Numerator/denominator concepts for prevalence and rates')

AND

the case definition of stroke is met in the 10-year period under consideration (i. e. in the target quarter of the BURDEN 2020 target year 2017 plus 39 previous quarters).

1.4.3 Distinction between the three main outcomes according to types of stroke based on the distribution among AOK-insured persons

For the 10-year prevalence, a distinction is made between three subtypes on the basis of the nationwide AOK data by age groups and sex:

- cerebral infarction (ICD I63)
- intracerebral haemorrhage (ICD I61)
- subarachnoid haemorrhage (ICD I60)

The diagnosis I64 counts as a stroke, but it is not possible to derive which of the specific forms of stroke is to be differentiated. Therefore, these cases are redistributed on the basis of the observed frequencies of the specifically documented cases (in the respective age and sex group).

For cases with both a non-specific diagnosis and a specific diagnosis, no redistribution takes place. In these cases, the specific diagnosis is considered to be valid. For cases with more than one specific form of stroke, the affected insured persons are considered for the calculation of each individual prevalence. This means that an insured person with two different strokes contributes to both: the prevalence of ischaemic stroke and the prevalence of intracerebral haemorrhage. For the total prevalence of strokes, however, this insured person counts only once.

The distinction between the three types of stroke is made solely on the basis of the observed ratio among the AOK insured persons (in the respective age and sex group) and not on the basis of the calculated prevalence figures derived from the extrapolation method adjusted by age, sex and morbidity.

1.4.4 No definition of sequelae/severity grades

For strokes, severity grades were not estimated using routine data.

2 Diabetes

For diabetes, a distinction is made between types of diabetes (type 1 or type 2). For this purpose, 1-year prevalence and severity distributions are estimated (see Table 13). The case definitions for these patient groups are presented in detail in the following sections.

Table 13: Patient groups and main diabetes outcomes in the BURDEN 2020 project

Patient group	Outcome	Explanation:
Prevalence		
Diabetes population		No outcome is provided for this; this patient group only serves to define the diabetes population.
Diabetes Type 1/ Type 2	1-year prevalence	Extrapolation to the population using the estimation procedure (Breitkreuz et al., AStA Wirtsch Sozialstat Arch 2019, 13:35-72; https://doi.org/10.1007/s11943-019-00241-z); prevalence is stratified by age group and sex
Severity distributions		
Diabetics with neuropathy but without diabetic foot and without amputation	Proportion of all diabetics	Proportions stratified by diabetes type, age group and sex
Diabetics with diabetic foot, but without amputation	Proportion of all diabetics	Proportions stratified by diabetes type, age group and sex
Diabetics with amputation	Proportion of all diabetics	Proportions stratified by diabetes type, age group and sex
Diabetics with vision loss/blindness: moderate	Proportion of all diabetics	Proportions stratified by diabetes type, age group and sex
Diabetics with vision loss/blindness: severe	Proportion of all diabetics	Proportions stratified by diabetes type, age group and sex
Diabetics with vision loss/blindness: blindness	Proportion of all diabetics	Proportions stratified by diabetes type, age group and sex
Uncomplicated diabetes cases (neither neuropathy nor diabetic foot nor amputation nor vision loss/blindness).	Proportion of all diabetics	Proportions stratified by diabetes type, age group and sex

2.1 Diabetes population

In order to identify persons suffering from diabetes mellitus and to further classify diabetes types, first the patient group 'diabetes mellitus population' is defined, to which all diabetics are assigned regardless of diabetes type, secondary diseases etc.

The diabetes mellitus population is defined as follows:

Basic quantity:

Persons in the population for 1-year prevalence (see heading 'Estimation of 1-year prevalence' in the section 'Numerator/denominator concepts for prevalence and rates')

AND

at least one of the following criteria A-D applies – in relation to the annual period under consideration:

A. Criterion to consider inpatient care:
At least one target diagnosis (ICD E10-E14) was documented as an inpatient primary or secondary diagnosis. Only discharged, full- and semi-residential hospital cases are considered.

OR

B. Criterion to consider ambulatory hospital care:
At least one 'confirmed' target diagnosis (ICD E10-E14) was documented in the claims data of ambulatory hospital care in the reference year.

OR

C. Criterion to consider outpatient care M2Q:
At least one target diagnosis (ICD E10-E14) was documented as a 'confirmed' diagnosis in at least 2 of 4 quarters of the reference year. The M2Q criterion is also considered to be met in the case of two different diagnoses.

OR

D. Criterion to consider outpatient care M1Q and drug:
At least one target diagnosis (ICD E10-E14) was documented as a 'confirmed' diagnosis AND at least one drug of the target substance group (ATC A10) was prescribed (see Table 15).

Table 14: Target ICD codes diabetes mellitus

ICD	Title
E10	Type 1 diabetes mellitus
E11	Type 2 diabetes mellitus
E12	Malnutrition-related diabetes mellitus
E13	Other specified diabetes mellitus
E14	Unspecified diabetes mellitus

Table 15: Target ATC codes diabetes mellitus

ATC	Substance group
A10A	Insulins and analogues
A10B and A10X	Blood glucose lowering drugs excl. insulins and other drugs used in diabetes

2.2 1-year prevalence of diabetes mellitus type 1 or type 2

Preliminary note: BURDEN 2020 only considers type 1 and type 2 diabetes. Other existing (but rarer) types of diabetes are not considered separately. Instead, the 'remainder' group is redistributed. The 'Remainder' group is first determined using the hierarchical algorithm described below, whereby this 'Rest' group cannot be assigned to either type 1 or type 2. The redistribution of the 'Remainder' group into type 1 and type 2 diabetes is based on the expected ratio of the two types of diabetes by age group and sex.

The allocation of each person from the 'diabetes mellitus basic population' to the group of type 1 or type 2 diabetics or to the remainder set to be finally redistributed is based on hierarchically arranged allocation criteria. We start in hierarchy 1. If an allocation is made on the basis of the criteria of hierarchy 1, the criteria of hierarchies 2 to 6 are disregarded, otherwise hierarchy 2 applies. If an assignment is made on the basis of the criteria of hierarchy 2, the criteria of hierarchies 3 to 6 are disregarded, otherwise hierarchy 3 applies, etc.

Diagnoses from the following areas are used for classification:

1st Sector of inpatient/hospital main diagnoses (HSP-MD); only discharged full- or semi-residential inpatient hospital cases are considered.

2nd Sector of further diagnoses: Diagnoses are counted multiple times if they belong to different billing cases:

a. Inpatient/hospital secondary diagnoses (HSP-SD), only discharged full- or semi-residential inpatient hospital cases are considered.

b. ‘Confirmed’ ambulatory hospital care diagnoses (HSP-ACD)

c. ‘Confirmed’ outpatient diagnoses (OPD–C)

The ATC and ICD codes given below generally include all sub-codes ('begins with').

Classification criteria for the types of diabetes:

Basic quantity

All persons of the defined 'diabetes mellitus – population' of the reference year are allocated as follows to type 1 or type 2 diabetes mellitus or the remainder set to be redistributed:

Hierarchy 1: Allocation based on specific drug prescriptions.

Type 2:

If at least one of the following criteria is met:

There is *no* insulin prescription in the year under consideration (ATC: A10A)

OR

In the year under consideration there is *at least one* prescription of an non-insulin antidiabetic drug (ATC: A10B – excluding metformin[1] (A10BA02) – or A10X) before

Hierarchy 2: Allocation based on unique ICD coding of hospital main diagnoses (HSP-MDs full- and semi-residential discharged cases, main diagnosis).

Type 1:

if at least one E10
AND
no E11
AND
no E13 is available.

Type 2:

if at least one E11
AND
no E10
AND
no E13 is available.

'Remainder':

if at least one E13
AND
no E10
AND
no E11 is available.

[1] Metformin is listed here as an exception, as it can be an additional therapeutic alternative in certain cases of overweight or obese patients with type 1 diabetes (German Diabetes Association DDG: S3 guideline therapy of type 1 diabetes, 2nd edition, AWMF register number: 057-013. https://www.awmf.org/leitlinien/detail/ll/057-013.html (last accessed May 22, 2019)).

Hierarchy 3: Allocation based on unique enrolment in DMPs[2].

Type 1:

If enrolled exclusively in DMP DM type 1 in the year under consideration.

Type 2:

If enrolled exclusively in DMP DM type 2 in the year under consideration.

Hierarchy 4: Allocation based on unique ICD coding of further diagnoses

The following diagnoses from billing cases will be considered here:

- HSP-SD: Secondary diagnoses, discharged full- and semi-residential cases

OR

- HSP-ACD: 'confirmed' diagnoses from ambulatory hospital care

OR

- OPD–C: Outpatient 'confirmed' diagnoses

Type 1:

if at least one case with E10
AND
no case with E11
AND there is
no case with E13.

Type 2:

if at least one case with E11
AND
no case with E10
AND there is
no case with E13.

'Remainder':

if at least one case with E13
AND
no case with E10
AND there is
no case with E11.

Hierarchy 5: Allocation based on relative majority of billing cases with corresponding ICD coding of further diagnoses'

The following cases will be considered here:

[2] DMP data are only available as from the 2nd half of 2008 onwards

- HSP-SD: Secondary diagnoses, discharged full- and semi-residential cases: Number is counted once per billing case

OR

- HSP-OPD: 'confirmed' diagnoses from ambulatory hospital care: Number is counted once per billing case

OR

- OPD–C: Outpatient 'confirmed' diagnoses: Number is counted once per billing case

Type 1:

if there are at least two more billing cases with E10 than billing cases with E11 or E13 (all cases with E11 or E13 are added together).

Type 2:

If there are at least two more billing cases with E11 than billing cases with E10 or E13 (all cases with E10 or E13 are added together).

'Remainder':

If there are at least two more billing cases with E13 than billing cases with E10 or E11 (all cases with E10 or E11 are added together).

Hierarchy 6: 'Remainder':

All previously unclassified individuals are redistributed by age and sex based on the expected Type 1 vs. Type 2 ratio so that no remainder category remains.

2.3 Sequelae: Neuropathy/diabetic foot/amputation/vision loss

All sequelae of diabetes are estimated separately for the types of diabetes (Type 1, Type 2). People with diabetes in the redistributed 'Remainder' category are not considered.

2.3.1 Diabetic Neuropathy

Basic quantity:

All persons allocated to the diabetes types in section 2.2 (type 1 or type 2, without remainder category)

AND

At least one of the following criteria applies in the reference year:

A. Criterion to consider inpatient diagnoses:
Target diagnosis is documented as main or secondary diagnosis. (Only discharged, full- and semi-residential hospital cases are considered.)

B. Criterion to consider diagnoses from ambulatory hospital care
Target diagnosis was documented as a 'confirmed' diagnosis in the claims data recorded during treatment in ambulatory hospital care in the reference year.

C. Criterion to consider outpatient diagnoses M2Q:
Target diagnosis was documented as a 'confirmed' diagnosis ('C') in at least two quarters (M2Q). The M2Q criterion is also met if two different diagnoses pertaining to the defined disease pattern were recorded.

D. Criterion to consider Diabetic Neuropathy:
The definition criteria for diabetic foot are met (see section 2.3.2).

E. Criterion to consider Diabetes mellitus with amputation:
The definition criteria for diabetic foot with amputation are met (see section 2.3.3).

Table 16: Target ICD codes diabetic neuropathy

ICD	Title
E10.4-	Type 1 diabetes mellitus with neurological complications
E11.4-	Type 2 diabetes mellitus with neurological complications
E12.4-	Malnutrition-related diabetes mellitus with neurological complications
E13.4-	Other specified diabetes mellitus: With neurological complications
E14.4-	Unspecified diabetes mellitus: With neurological complications
G59.0	Diabetic mononeuropathy
G63.2	Diabetic polyneuropathy

2.3.2 Diabetic foot

Basic quantity:

All persons allocated to the diabetes types in section 2.2 (type 1 or type 2, without remainder category)

AND

At least one of the following criteria applies in the reference year:

A. Criterion to consider inpatient diagnoses:
Target diagnosis is documented as main or secondary diagnosis. (Only discharged, full- and semi-residential hospital cases are considered.)

B. Criterion to consider diagnoses from ambulatory hospital care
Target diagnosis was documented as a 'confirmed' diagnosis in the claims data recorded during treatment in ambulatory hospital care in the reference year.

C. Criterion to consider outpatient diagnoses M2Q:
Target diagnosis was documented as a 'confirmed' diagnosis ('C') in at least two quarters (M2Q) in the reference year. The M2Q criterion is also met if two different diagnoses pertaining to the defined disease pattern were recorded.

D. Criterion to consider outpatient diagnoses:
Target EBM billing code was recorded in the reference year.

Table 17: Target ICD codes diabetic foot

ICD	Title
E10.74	Type 1 diabetes mellitus with multiple complications: With diabetic foot syndrome, controlled
E10.75	Type 1 diabetes mellitus with multiple complications: With diabetic foot syndrome, uncontrolled
E11.74	Type 2 diabetes mellitus with multiple complications: With diabetic foot syndrome, controlled
E11.75	Type 2 diabetes mellitus with multiple complications: With diabetic foot syndrome, uncontrolled
E12.74	Malnutrition-related diabetes mellitus with multiple complications: With diabetic foot syndrome, controlled
E12.75	Malnutrition-related diabetes mellitus with multiple complications: With diabetic foot syndrome, uncontrolled
E13.74	Other specified diabetes mellitus with multiple complications: With diabetic foot syndrome, controlled
E13.75	Other specified diabetes mellitus with multiple complications: With diabetic foot syndrome, uncontrolled
E14.74	Unspecified diabetes mellitus with multiple complications: With diabetic foot syndrome, controlled
E14.75	Unspecified diabetes mellitus with multiple complications: With diabetic foot syndrome, uncontrolled

The ICD codes have only been valid since the 2009 version.

Table 18: Target EBM[3] billing code diabetic foot

EBM	Title
02311	Treatment of diabetic foot

2.3.3 Diabetes mellitus with amputation

This profile is used to identify patients with diabetes who underwent an amputation or an amputation revision surgery. In terms of the burden of disease approach, only major amputations are considered, as only those limit the physical functioning of the patients in terms of the 'disability weights' definitions.

In order to narrow down to diabetes-associated amputations, a diabetes diagnosis must have been documented as the main or secondary diagnosis for the same hospital case as the amputation. In addition, hospital cases are excluded where a main diagnosis was documented that points to another underlying condition (tumours or trauma) being causative for the amputation. Cases with these main diagnoses were excluded based on Kröger et al.[4] and Santosa et al.[5], although only tumours or trauma were excluded as non-diabetes-associated principal diagnoses (Narres et al.[6]).

Since amputations are recorded exclusively in the course of surgery, it is not sufficient to consider only 2017 as the year of analysis. Instead, all insured persons from 2006 up to and including 2017 are examined for the entire period to determine whether an amputation was performed.

Since there are no continuous insurance histories since 2006 for all insured persons in 2017, the amputation histories may be incomplete, so that too few amputations may be recorded. However, internal reviews of the claims data showed that the amputation frequencies would differ only slightly if restricted to continuously insured persons with complete insurance histories. Therefore, no correction is made for this inaccuracy.

Basic quantity

All persons allocated to the diabetes types in section 2.2 (type 1 or type 2, without remainder category)

AND

continuously insured with AOK in the years from 2006 to 2017

AND

in the time period between 2006 and 2017, there was at least one completed (after discharge), full -residential hospital stay meeting the following criteria:

[3] EBM is a German system for coding the billing of services provided by SHI-accredited physicians.

[4] Kröger K, Berg C, Santosa F, Malyar N, Reinecke H. Lower Limb Amputation in Germany. Dtsch Arztebl Int. 2017, 114(7): 130-136.

[5] Santosa F, Moysidis T, Kanya S, Babadagi-Hardt Z, Luther B, Kröger K. Decrease in major amputations in Germany. Int Wound J. 2015, 12(3): 276-9.

[6] Narres M, Kvitkina T, Claessen H, Droste S, Schuster B, Morbach S, Rümenapf G, Van Acker K, Icks A. Incidence of lower extremity amputations in the diabetic compared with the non-diabetic population: A systematic review. PLoS One. 2017, 12(8): e0182081.

A. Criterion to consider OPS:
Target OPS code was documented

AND

B. Criterion to consider diabetes diagnosis:
In the same hospital case, a diabetes target diagnosis (ICD E10 to E14) was documented as the main or secondary diagnosis.

AND NOT

C. Exclusion condition other diagnoses:
In the same hospital case, an exclusion diagnosis (tumours: ICD C00 to D48, traumas: ICD S00 to T98) was documented as the main diagnosis.

Table 19: Target OPS codes diabetic amputation

OPS	Title
5-864.3	Amputation and exarticulation lower extremity: Transfemoral amputation, unspecified
5-864.4	Amputation and exarticulation lower extremity: Amputation of proximal thigh
5-864.5	Amputation and exarticulation lower extremity: Amputation of mid or distal thigh
5-864.6	Amputation and exarticulation lower extremity: Amputation in the knee area
5-864.7	Amputation and exarticulation lower extremity: Exarticulation of the knee
5-864.8	Amputation and exarticulation lower extremity: Lower leg amputation, unspecified
5-864.9	Amputation and exarticulation lower extremity: Amputation of proximal lower leg
5-864.a	Amputation and exarticulation lower extremity: Amputation of middle lower leg
5-864.x	Amputation and exarticulation lower extremity: Other
5-864.y	Amputation and exarticulation lower extremity: Unspecified
5-866.3	Revision of an amputation area: Thigh area
5-866.4	Revision of an amputation area: Lower leg area

Table 20: Target ICD codes diabetic amputation

ICD	Title
E10	Type 1 diabetes mellitus
E11	Type 1 diabetes mellitus
E12	Malnutrition-related diabetes mellitus
E13	Other specified diabetes mellitus
E14	Unspecified diabetes mellitus

Table 21: Exclusion target ICD codes diabetic amputation

ICD Chapter	ICD Group	Title
II	C00 to D48	Neoplasms
XIX	S00 to T98	Injuries, poisoning and certain other consequences of external causes

2.3.4 Vision loss/blindness due to diabetes

This profile is used to identify patients with diabetes who suffer from visual impairment, up to and including blindness, due to diabetic retinopathy. In addition to the required documentation of the diabetic retinopathy, the severity of the vision impairment is assessed. Here, the vision impairment of the left and right eye is assessed individually for each patient. In terms of vision impairment, the better eye is decisive for the classification of the severity grades of impairment for each affected person.

Basic quantity:

All persons according to the types of diabetes 2.2 differentiated below (type 1 or type 2, without remainder category)

AND

At least one of the following criteria need to be met in the reference year:

A. Criterion to consider inpatient diagnoses:
Target diagnosis diabetic retinopathy is documented as a principal or secondary diagnosis. (Only discharged, full- and semi-residential hospital cases are considered.)

B. Criterion to consider diagnoses from ambulatory hospital care
Target diagnosis diabetic retinopathy was documented as a 'confirmed' diagnosis in the claims data recorded during treatment in ambulatory hospital care in the reference year.

C. Criterion to consider outpatient diagnoses M2Q:
Target diagnosis diabetic retinopathy was documented as a 'confirmed' diagnosis ('C') in at least two quarters (M2Q).

Table 22: Target ICD codes diabetic retinopathy

ICD	Title
H36.0	Diabetic retinopathy

Definition of the severity grades of vision loss/blindness

For the insured diabetes population (by type) with diabetic retinopathy, the severity grades of vision impairment are to be considered. The documented diagnoses of blindness and vision impairment (ICD-10: H54) are used for this. Here, the main and secondary inpatient diagnoses (only discharged, full- and semi-residential hospital cases), the diagnoses from ambulatory hospital care and the 'confirmed' outpatient 'confirmed' diagnoses are considered as diagnostic data sources. A one-time documentation of an ICD diagnosis for a level of severity is sufficient.

The degree of vision impairment must first be determined individually for each eye of the patient. The highest level of severity documented in the evaluation year is always used per eye and per patient. The following severity grade classification is made using the ICD codes:

Table 23: Target ICD codes vision loss/blindness

Severity grade	ICD	Title
Moderate	H54.2	Moderate visual impairment, binocular
	H54.6	Moderate visual impairment, monocular
Severe	H54.1	Severe visual impairment, binocular
	H54.5	Severe visual impairment, monocular
Blind	H54.0	Blindness, binocular
	H54.4	Blindness, monocular

Finally, the severity grade is determined for the patient across both eyes, with the better eye determining the severity grade, since in the case of unilateral blindness and a normal-sighted eye at the same time, the criteria for vision impairment are not met on the basis of the lay descriptions of GBD. Thus, the following patient-level severity grade classification applies across both eyes:

- Moderate: there was at least moderate vision impairment in both eyes.
  This is the case in the following combinations:
  - Both eyes have the severity grade 'moderate'.
  - One eye has the severity grade 'moderate', the other eye has the severity grade 'severe'.
  - One eye has the severity grade 'moderate', the other eye has the severity grade 'blind'.

- Severe: at least one severe vision impairment was present in both eyes.
  This is the case in the following combinations:
  - Both eyes have the severity grade 'severe'.
  - One eye has the severity grade 'severe', the other eye has the severity grade 'blind'.
- Blindness: both eyes have the severity grade 'blind'.

3 Cancers

To identify persons with one of the cancer diseases under consideration, patients with diagnoses recorded during treatment in the outpatient and inpatient sector are considered. A 10-year prevalence is determined, whereby an insured person is considered to be affected by the disease as soon as at least one of the criteria described below is met in the quarterly rolling ten-year period.

Generally, all 'confirmed' (relevant) cancer diagnoses are considered for outpatient diagnoses of SHI-accredited physicians and diagnoses of ambulatory hospital care. If a documented, 'confirmed' target diagnosis in a quarter of the ten-year period under consideration is followed by a further 'confirmed' target diagnosis in at least one of the three subsequent quarters, the insured person is considered to be prevalent. If 'confirmed' target diagnoses are documented in at least two different facilities within the same quarter, the insured person is also considered to be prevalent.

In the inpatient setting, the single documentation of a target diagnosis as a principal or secondary diagnosis is sufficient for an insured person to be classified as having the disease.

Insurance durations are used to implement the prevalence for all types of cancer considered. The case definition criteria are applied to four different quarterly rolling basic quantities of insured persons as described in the section 'Numerator/denominator concepts for prevalence and rates'.

3.1 Lung cancer

In the following, cancer of the lungs, bronchus and trachea are summarised under lung cancer.

3.1.1 10-year prevalence of lung cancer

To identify persons with lung cancer, patients with diagnoses recorded during treatment in the outpatient and inpatient sector are considered. For lung cancer, a 10-year prevalence is estimated, whereby an insured person is considered as having the disease as soon as the criteria described below are met in the quarterly rolling ten-year period.

Basic quantity:

Persons in the population for 10-year prevalence (see heading 'Estimation of 10-year prevalence ' in the section 'Numerator/denominator concepts for prevalence and rates')

AND

At least one of the following criteria applies to the 10-year period under consideration (target quarter plus 39 preceding quarters):

Inclusion criteria lung cancer

A. **Criterion to consider inpatient diagnoses:**
   Target diagnosis is documented as a main or secondary diagnosis. Only discharged, full- and semi-residential hospital cases are considered.

OR

B. Criterion to consider outpatient diagnoses and diagnoses from ambulatory hospital care – diagnosis confirmation within three subsequent quarters:
From the quarter of its documentation, a 'confirmed' target diagnosis is verified by at least one further 'confirmed' target diagnosis in at least one further of the three subsequent quarters ('M2Q)'

OR

C. Criterion to consider outpatient diagnoses and diagnoses from ambulatory hospital care – diagnoses from different medical facilities in the same quarter:
Confirmed target diagnoses are recorded by at least two different medical facilities within the same quarter.

Table 24: Target diagnoses lung, bronchus, and trachea cancer

ICD	Title
C33	Malignant neoplasm of trachea
C34	Malignant neoplasm of bronchus and lung

3.1.2 Severity grades for lung cancer

Table 25: Definition of sequelae/Severity grades in lung cancer

Patient group	Outcome	Stratification	Severity grade specific weight ('disability weight')
Phase 1: Diagnosis and primary therapy phase in lung cancer	Proportion of all lung cancer patients	Proportions stratified by age group and sex	0.288
Phase 2: Controlled phase in lung cancer	Proportion of all lung cancer patients	Proportions stratified by age group and sex	0.049
Phase 3: Metastatic phase in lung cancer	Proportion of all lung cancer patients	Proportions stratified by age group and sex	0.451
Phase 4: Terminal phase in lung cancer	Proportion of all lung cancer patients	Proportions stratified by age group and sex	0.540

The allocation of the phases is made for the exact day in the respective target quarter of the rolling period. If technically possible, the duration of the phases within the quarter under consideration is assigned to the day on the basis of the insurance periods and the relevant events (chemotherapy, radiation, etc.). If the criteria for several phases are met at the same time, only the most severe phase according to the respective disability weight is considered for each patient (phase 4 before phase 3 before phase 1 before phase 2). If, for example, a patient has metastases (phase 3) and is also in the terminal phase (phase 4), the patient is assigned to the terminal phase for the period under consideration.

For each day within the target quarter, it is therefore necessary to determine in which phase the day falls.

For patients with implausible information on insurance durations (number of insurance days in the quarter is greater than the number of days from the 1st day of the quarter to the date of death), the duration of insurance is capped at the date of death.

3.1.2.1 Phase 1: Diagnosis and primary therapy phase in lung cancer

At least one of the following treatments is given:

- Chemotherapy
- Radiation/radiotherapy/nuclear medicine therapy
- Relevant surgery

Relevant catalogue ATC, EBM, OPS

The duration of this phase is covered by GBD and, in the case of lung cancer, is 3.3 months from the date of chemotherapy or radiation/radiotherapy/nuclear medicine therapy or operation. For this purpose, 3.3 months (counted as 100 days) from the documented date (prescription date for drugs (ATC codes) or OPS date or treatment date for EBM) are considered to belong to the corresponding phase. The period to be assessed is assigned to each documentation of a relevant treatment.

Table 26: Target codes[7] diagnosis and primary therapy phase in lung cancer

Sector	Catalogue	Code	Title
Chemotherapy	ATC	L01	Antineoplastic agents
Radiation	EBM	17372	Additional flat rate radionuclide therapy of bone metastases, haematopoietic organs, tumours and/or tumour metastases in a body cavity or in a hollow organ or of inflammation
Radiation	EBM	25320	Radiation with a telecobalt device for benign or malignant diseases or radiation with a linear accelerator for benign diseases.
Radiation	EBM	25321	Irradiation with a linear accelerator for malignant diseases or space-occupying processes of the central nervous system

[7] EBM is a German system for coding the billing of services provided by SHI-accredited physicians.

Sector	Catalogue	Code	Title
Radiation	EBM	25322	Surcharge to the fee schedule items 25320 or 25321 for irradiation of more than 2 irradiation fields,
Radiation	EBM	25323	Surcharge for fee schedule item 25321 for irradiation in 3-D technology (also stereotactic, fractionated irradiation of brain lesions) and/or large-field and/or half-body irradiation,
Radiation	EBM	25330	Moulage or flab therapy
Radiation	EBM	25331	Intracavitary/Intraluminal brachytherapy
Radiation	EBM	25333	Interstitial brachytherapy
Radiation	EBM	25340	Irradiation planning for percutaneous irradiation without computer assistance and individual dose planning
Radiation	EBM	25341	Computer-assisted radiation planning for percutaneous irradiation with individual dose planning
Radiation	EBM	25342	Computer-assisted radiation planning for percutaneous irradiation with individual dose planning for irregular fields with individual blocks, multi-lamella collimator, non-coplanar fields and/or 3-D planning.
Radiation	EBM	40840	Flat rate for individually adjusted masking, if necessary by means of multi-leaf collimator technique, compensators and/or individually manufactured positioning or fixation aids, if necessary including material costs for verification and documentation services within the framework of irradiation field documentation in connection with the provision of the service according to fee schedule items 25320 or 25321.
Surgery	OPS	5-314	Excision, resection and destruction (of diseased tissue) in the trachea
Surgery	OPS	5-320	Excision and destruction of diseased tissue in the bronchus
Surgery	OPS	5-321	Excision and resection in lung and bronchus
Surgery	OPS	5-322	Atypical lung resection
Surgery	OPS	5-323	Segmental resection and bisegmental resection of lung
Surgery	OPS	5-324	Simple lobectomy and bilobectomy of lung
Surgery	OPS	5--325	Extended lobectomy and bilobectomy of lung
Surgery	OPS	5327	Simple (pleuro-)pneum(on)ectomy
Surgery	OPS	5-328	Extended (pleuro-)pneum(on)ectomy
Radiotherapy	OPS	8-522	High voltage radiotherapy
Radiotherapy	OPS	8-523	Other high voltage radiotherapy
Radiotherapy	OPS	8-527	Construction and adjustment of fixation and treatment aids in radiotherapy
Radiotherapy	OPS	8-528	Radiation simulation for external irradiation and brachytherapy
Radiotherapy	OPS	8-529	Radiation simulation for percutaneous irradiation and brachytherapy

Sector	Catalogue	Code	Title
Nuclear medicine. Therapy	OPS	8-530.1	Nuclear medicine therapy
Chemotherapy	OPS	8-541	Instillation of and locoregional therapy with cytotoxic drugs and immunomodulators
Chemotherapy	OPS	8-542	Non-complex chemotherapy
Chemotherapy	OPS	8-543	Moderately complex and intensive block chemotherapy
Chemotherapy	OPS	8-544	Highly complex and intensive block chemotherapy
Chemotherapy	OPS	8-546	Hyperthermic chemotherapy
Chemotherapy	OPS	8-547	Other immunotherapy
Chemotherapy	OPS	8-549	Percutaneous isolated organ perfusion with chemotherapeutics

3.1.2.2 Phase 2: Controlled phase in lung cancer

The so-called controlled phase is assigned if none of the other three phases apply.

3.1.2.3 Phase 3: Metastatic phase in lung cancer

In the rolling annual period under consideration (target quarter plus three previous quarters), metastases are documented at least once. Inpatient main and secondary diagnoses, outpatient 'confirmed' diagnoses and 'confirmed' diagnoses from ambulatory care are considered as diagnostic data sources. As soon as metastases have been documented at least once in the annual period under consideration, all time periods in the target quarter under consideration are assigned to the metastatic phase. Only phase 4 (one month – i. e. 30 days before death) may still count as a higher-ranking phase in these time periods.

Table 27: Target codes metastatic phase in lung cancer

Sector	Catalogue	Code	Title
Metastases	ICD-10	C77	Secondary and unspecified malignant neoplasm of lymph nodes
Metastases	ICD-10	C78	Secondary malignant neoplasm of respiratory and digestive organs
Metastases	ICD-10	C79	Secondary malignant neoplasm of other and unspecified sites

3.1.2.4 Phase 4: Terminal phase for lung cancer

Comparable to GBD, this phase applies one month before death whereas 30 days are counted as one month.

3.2 Breast cancer

3.2.1 10-year prevalence of breast cancer

To identify persons with breast cancer, patients with diagnoses recorded during treatment in the outpatient and inpatient sector are recorded. For breast cancer, a 10-year prevalence is estimated, whereby an insured person is considered to have the disease as soon as the criteria described below are met in the quarterly rolling ten-year period.

Basic quantity:

Females in the population for 10-year prevalence (see heading "Estimation of 10-year prevalence ' in the section "Numerator/denominator concepts for prevalence and rates')

AND

At least one of the following criteria applies to the 10-year period under consideration (target quarter plus 39 preceding quarters):

Inclusion criteria for breast cancer

A. **Criterion to consider inpatient diagnoses:**
Target diagnosis is documented as main or secondary diagnosis. Only discharged, full- and semi-residential hospital cases are considered.

OR

B. **Criterion to consider outpatient diagnoses and diagnoses from ambulatory hospital care – diagnosis confirmation within three subsequent quarters:**
From the quarter of its documentation, a 'confirmed' target diagnosis is verified by at least one further 'confirmed' target diagnosis in at least one more of the three subsequent quarters ('M2Q)'

OR

C. **Criterion to consider outpatient diagnoses and diagnoses from ambulatory hospital care – diagnoses from different health care facilities in the same quarter:**
Confirmed target diagnoses are documented by at least two different health care facilities within the same quarter.

Table 28: Target diagnoses for breast cancer

ICD	Title
C50	Malignant neoplasm of breast

3.2.2 Severity grades in breast cancer

Table 29: Definition of sequelae/severity grades in breast cancer

Patient group	Outcome	Stratification	Severity grade specific weight ('disability weight')
Phase 1: Diagnosis and primary therapy phase in breast cancer	Proportion of all breast cancer patients	Proportions stratified by age group	0.288
Phase 2a: Controlled phase in breast cancer, with mastectomy	Proportion of all breast cancer patients	Proportions stratified by age group	0.083
Phase 2b: Controlled phase in breast cancer, without mastectomy	Proportion of all breast cancer patients	Proportions stratified by age group	0.049
Phase 3: Metastatic phase in breast cancer	Proportion of all breast cancer patients	Proportions stratified by age group	0.451
Phase 4: Terminal phase in breast cancer	Proportion of all breast cancer patients	Proportions stratified by age group	0.540

The allocation of the phases is made to the exact day in the respective target quarter of the rolling period. If technically possible, the duration of the phases within the quarter under consideration is assigned to the day on the basis of the insurance periods and the relevant events (chemotherapy, radiation, etc.). If the criteria for several phases are met at the same time, only the most severe phase according to the respective disability weight is considered for each patient (phase 4 before phase 3 before phase 1 before phase 2). If, for example, a patient has metastases (phase 3) and is also in the terminal phase (phase 4), the patient is assigned to the terminal phase for the period under consideration.

For each day within the target quarter, it is therefore necessary to assess in which phase the day falls.

For patients with implausible information on insurance durations (number of insurance days in the quarter is greater than the number of days from the 1st day of the quarter to the date of death), the duration of insurance is capped at the date of death.

3.2.2.1 Phase 1: Diagnosis and primary therapy phase in breast cancer

At least one of the following treatments is given:

- Chemotherapy
- Radiation/radiotherapy/nuclear medicine therapy
- Relevant surgery

Relevant catalogue ATC, EBM, OPS, outpatient

The duration of this phase is covered by GBD and, in the case of breast cancer, is 3.0 months from the date of chemotherapy or radiation/radiotherapy/nuclear medicine therapy or surgery. For

this purpose, 3.0 months (counted as 91 days) from the documented date (prescription date for drugs (ATC codes) or OPS date or treatment date for EBM) are considered to belong to the corresponding phase. The period to be assessed is assigned to each documentation of a relevant treatment.

Table 30: Target codes[8] diagnosis and primary therapy phase in breast cancer

Sector	Catalogue	Code	Title
Chemotherapy	ATC	L01	Antineoplastic agents
Radiation	EBM	17372	Additional flat rate radionuclide therapy of bone metastases, haematopoietic organs, tumours and/or tumour metastases in a body cavity or in a hollow organ or of inflammation
Radiation	EBM	25320	Radiation with a telecobalt device for benign or malignant diseases or radiation with a linear accelerator for benign diseases.
Radiation	EBM	25321	Irradiation with a linear accelerator for malignant diseases or space-occupying processes of the central nervous system
Radiation	EBM	25322	Surcharge to the fee schedule items 25320 or 25321 for irradiation of more than 2 irradiation fields,
Radiation	EBM	25323	Surcharge for fee schedule item 25321 for irradiation in 3-D technology (also stereotactic, fractionated irradiation of brain lesions) and/or large-field and/or half-body irradiation,
Radiation	EBM	25330	Moulage or flab therapy
Radiation	EBM	25331	Intracavitary/Intraluminal brachytherapy
Radiation	EBM	25333	Interstitial brachytherapy
Radiation	EBM	25340	Irradiation planning for percutaneous irradiation without computer assistance and individual dose planning
Radiation	EBM	25341	Computer-assisted radiation planning for percutaneous irradiation with individual dose planning
Radiation	EBM	25342	Computer-assisted radiation planning for percutaneous irradiation with individual dose planning for irregular fields with individual blocks, multi-lamella collimator, non-coplanar fields and/or 3-D planning.
Radiation	EBM	40840	Flat rate for individually adjusted masking, if necessary by means of multi-leaf collimator technique, compensators and/or individually manufactured positioning or fixation aids, if necessary including material costs for verification and documentation services within the framework of irradiation field documentation in connection with the provision of the service according to fee schedule items 25320 or 25321.
Surgery	OPS	5870	Partial (breast-conserving) excision of the mamma and destruction of mamma tissue

[8] EBM is a German system for coding the billing of services provided by SHI-accredited physicians.

Sector	Catalogue	Code	Title
Surgery	OPS	5-872	(Modified radical) Mastectomy
Surgery	OPS	5-874	Extended (radical) mastectomy with resection in the Mm. pectorales majores et minores and partial thoracic wall resection
Surgery	OPS	5-877	Subcutaneous mastectomy and skin-sparing mastectomy procedure
Radiotherapy	OPS	8-522	High voltage radiotherapy
Radiotherapy	OPS	8-523	Other high voltage radiotherapy
Radiotherapy	OPS	8-527	Construction and adjustment of fixation and treatment aids in radiotherapy
Radiotherapy	OPS	8-528	Radiation simulation for external irradiation and brachytherapy
Radiotherapy	OPS	8-529	Radiation simulation for percutaneous irradiation and brachytherapy
Nuclear medicine. Therapy	OPS	8-530.1	Nuclear medicine therapy
Chemotherapy	OPS	8-541	Instillation of and locoregional therapy with cytotoxic drugs and immunomodulators
Chemotherapy	OPS	8-542	Non-complex chemotherapy
Chemotherapy	OPS	8-543	Moderately complex and intensive block chemotherapy
Chemotherapy	OPS	8-544	Highly complex and intensive block chemotherapy
Chemotherapy	OPS	8-546	Hyperthermic chemotherapy
Chemotherapy	OPS	8-547	Other immunotherapy
Chemotherapy	OPS	8-549	Percutaneous isolated organ perfusion with chemotherapeutics

3.2.2.2 Phase 2: Controlled phase in breast cancer

The so-called controlled phase is assigned if none of the other three phases apply. The proportion of patients in the controlled phase must then be further stratified according to the share of patients with or without mastectomy.

3.2.2.2.1 Phase 2a: Controlled phase in breast cancer, with mastectomy

First, all breast cancer patients in the controlled phase who have had a mastectomy must be identified. However, mastectomies are also done in patients without breast cancer. Therefore, for all breast cancer patients in the controlled phase with mastectomies (10-year period), only the proportion that exceeds the proportion of mastectomies in women who do not have breast cancer (mastectomies for breast cancer minus baseline mastectomies equals excess mastectomies) is to be quantified. This correction is made at the aggregate level by 5-year age groups. For this purpose, the following proportions are calculated nationwide by age group for all female insured persons:

- Mastectomies in insured persons without breast cancer: Proportion of insured persons without breast cancer but with mastectomies in the past 10-year period (target quarter under consideration plus 39 previous quarters) in relation to the insured persons of the population without breast cancer (population for the 10-year prevalence).
- Mastectomies in breast cancer: Proportion of breast cancer patients with mastectomies in the past 10-year period (target quarter plus 39 previous quarters) in relation to all breast cancer patients
- Proportion excess mastectomies: Proportion of mastectomies for breast cancer minus proportion of mastectomies for insured persons without breast cancer

The share of excess mastectomies is the proportion of interest.

Table 31: Target codes mastectomies

Sector	Catalogue	Code	Title
Mastectomy	OPS	5-870	Partial (breast-conserving) excision of the mamma and destruction of mamma tissue
Mastectomy	OPS	5-872	(Modified radical) Mastectomy
Mastectomy	OPS	5-874	Extended (radical) mastectomy with resection in the Mm. pectorales majores et minores and partial thoracic wall resection
Mastectomy	OPS	5-877	Subcutaneous mastectomy and skin-sparing mastectomy procedure

3.2.2.2.2 Phase 2b: Controlled phase in breast cancer, without mastectomy

Similarly, the proportion of all breast cancer patients in the controlled phase in which no mastectomy was done or the mastectomy occurred before the incidental cancer diagnosis should be determined. As described above, the proportion of excess mastectomies is determined for patients with mastectomy. The remainder (within phase 2) is then the proportion value for phase 2 b of breast cancer patients without mastectomy.

3.2.2.3 Phase 3: Metastatic phase in breast cancer

In the rolling annual period under consideration (target quarter plus three previous quarters), metastases are recorded at least once. Inpatient main and secondary diagnoses, outpatient 'confirmed' diagnoses and 'confirmed' diagnoses from ambulatory hospital care are considered as diagnostic data sources. As soon as metastases have been recorded at least once in the annual period under consideration, all time periods in the target quarter under consideration are assigned to the metastatic phase. Only phase 4 (one month – i. e. 30 days before death) may still count as a higher-ranking phase in these time periods.

Table 32: Target codes metastatic phase in breast cancer

Sector	Catalogue	Code	Title
Metastases	ICD-10	C77	Secondary and unspecified malignant neoplasm of lymph nodes
Metastases	ICD-10	C78	Secondary malignant neoplasm of respiratory and digestive organs
Metastases	ICD-10	C79	Secondary malignant neoplasm of other and unspecified sites

3.2.2.4 Phase 4: Terminal phase in breast cancer

Comparable to GBD, this phase applies one month before death whereas 30 days are counted as one month.

3.3 Colorectal cancer

In the following, cancer of the large intestine (colon), rectum (rectum) and anus are summarised under colorectal cancer.

3.3.1 10-year prevalence of colorectal cancer

To identify persons with colorectal cancer, patients with diagnoses recorded during treatment in the outpatient and inpatient sector are recorded. For colorectal cancer, a 10-year prevalence is estimated, whereby an insured person is considered to have the disease as soon as the criteria described below are met in the quarterly rolling ten-year period.

Basic quantity:

Persons in the population for 10-year prevalence (see heading 'Estimation of 10-year prevalence' in the section 'Numerator/denominator concepts for prevalence and rates')

AND

At least one of the following criteria applies to the 10-year period under consideration (target quarter plus 39 preceding quarters):

Inclusion criteria for colorectal cancer

A. **Criterion to consider inpatient diagnoses:**
Target diagnosis is documented as main or secondary diagnosis. Only discharged, full- and semi-residential hospital cases are considered.

OR

B. **Criterion to consider outpatient diagnoses and diagnoses from ambulatory hospital care – diagnosis confirmation within three subsequent quarters:**

From the quarter of its documentation, a 'confirmed' target diagnosis is verified by at least one further 'confirmed' target diagnosis in at least one further of the three subsequent quarters ('M2Q)'

OR

C. Criterion to consider outpatient diagnoses and diagnoses from ambulatory hospital care – diagnoses from different health care facilities in the same quarter:
Confirmed target diagnoses are documented by at least two different health care facilities within the same quarter.

Table 33: Target diagnosis for colorectal cancer

ICD	Title
C18	Malignant neoplasm of colon
C19	Malignant neoplasm of rectosigmoid junction
C20	Malignant neoplasm of rectum
C21	Malignant neoplasm of anus and anal canal

3.3.2 Severity grades in colorectal cancer

Table 34: Definition of sequelae/severity grades in colorectal cancer

Patient group	Outcome	Stratification	Severity grade specific weight ('disability weight')
Phase 1: Diagnosis and primary therapy phase in colorectal cancer	Proportion of all colorectal cancer patients	Proportions stratified by age group and sex	0.288
Phase 2a: Controlled phase in colorectal cancer, with stoma	Proportion of all colorectal cancer patients	Proportions stratified by age group and sex	0.139
Phase 2b: Controlled phase in colorectal cancer, without stoma	Proportion of all colorectal cancer patients	Proportions stratified by age group and sex	0.049
Phase 3: Metastatic phase in colorectal cancer	Proportion of all colorectal cancer patients	Proportions stratified by age group and sex	0.451
Phase 4: Terminal phase for colorectal cancer	Proportion of all colorectal cancer patients	Proportions stratified by age group and sex	0.540

The allocation is made to the exact day in the respective target quarter of the rolling period. If technically possible, the duration of the phases within the quarter under consideration is assigned

to the day on the basis of the insurance periods and the relevant events (chemotherapy, radiation, etc.). If the criteria of several phases are met at the same time, only the most severe phase according to the respective disability weight is analysed for each patient (phase 4 before phase 3 before phase 1 before phase 2). If, for example, a patient has metastases (phase 3) and is also in the terminal phase (phase 4), the patient is assigned to the terminal phase for the period under consideration. For each day within the target quarter, it is therefore necessary to assess in which phase the day falls.

For patients with implausible information on insurance durations (number of insurance days in the quarter is greater than the number of days from the 1st day of the quarter to the date of death), the duration of insurance is capped at the date of death.

3.3.2.1 Phase 1: Diagnosis and primary therapy phase in colorectal cancer

At least one of the following treatments is given:

- Chemotherapy
- Radiation/radiotherapy/nuclear medicine therapy
- Relevant operation

Relevant catalogue ATC, EBM, OPS

The duration of this phase is covered by GBD and, in the case of colorectal cancer, is 4.0 months from the date of chemotherapy or radiation/radiotherapy/nuclear medicine therapy or surgery. For this purpose, 4.0 months (counted as 122 days) from the recorded date (prescription date for drugs (ATC codes) or OPS date or treatment date for EBM) are considered to belong to the corresponding phase. The period to be assessed is assigned to each documentation of a relevant treatment.

Table 35: Target codes[9] diagnosis and primary therapy phase in colorectal cancer

Treatment	Catalogue	Code	Title
Chemotherapy	ATC	L01	Antineoplastic agents
Radiation	EBM	17372	Additional flat rate radionuclide therapy of bone metastases, haematopoietic organs, tumours and/or tumour metastases in a body cavity or in a hollow organ or of inflammation
Radiation	EBM	25320	Radiation with a telecobalt device for benign or malignant diseases or radiation with a linear accelerator for benign diseases.
Radiation	EBM	25321	Irradiation with a linear accelerator for malignant diseases or space-occupying processes of the central nervous system
Radiation	EBM	25322	Surcharge to the fee schedule items 25320 or 25321 for irradiation of more than 2 irradiation fields,

[9] EBM is a German system for coding the billing of services provided by SHI-accredited physicians.

Treatment	Catalogue	Code	Title
Radiation	EBM	25323	Surcharge for fee schedule item 25321 for irradiation in 3-D technology (also stereotactic, fractionated irradiation of brain lesions) and/or large-field and/or half-body irradiation,
Radiation	EBM	25330	Moulage or flab therapy
Radiation	EBM	25331	Intracavitary/Intraluminal brachytherapy
Radiation	EBM	25333	Interstitial brachytherapy
Radiation	EBM	25340	Irradiation planning for percutaneous irradiation without computer assistance and individual dose planning
Radiation	EBM	25341	Computer-assisted radiation planning for percutaneous irradiation with individual dose planning
Radiation	EBM	25342	Computer-assisted radiation planning for percutaneous irradiation with individual dose planning for irregular fields with individual blocks, multi-lamella collimator, non-coplanar fields and/or 3-D planning.
Radiation	EBM	40840	Flat rate for individually adjusted masking, if necessary by means of multi-leaf collimator technique, compensators and/or individually manufactured positioning or fixation aids, if necessary including material costs for verification and documentation services within the framework of irradiation field documentation in connection with the provision of the service according to fee schedule items 25320 or 25321.
Surgery	OPS	5-452	Local excision and destruction of diseased tissue in the large intestine
Surgery	OPS	5-455	Partial resection of the large intestine
Surgery	OPS	5-456	(Total) Colectomy and proctocolectomy
Surgery	OPS	5-482	Perianal local excision and destruction of diseased tissue in the rectum
Surgery	OPS	5-484	Rectum resection with sphincter retention
Surgery	OPS	5-485	Rectum resection without sphincter retention
Surgery	OPS	5-492	Local excision and destruction of diseased tissue in the anal canal
Radiotherapy	OPS	8-522	High voltage radiotherapy
Radiotherapy	OPS	8-523	Other high voltage radiotherapy
Radiotherapy	OPS	8-527	Construction and adjustment of fixation and treatment aids in radiotherapy
Radiotherapy	OPS	8-528	Radiation simulation for external irradiation and brachytherapy
Radiotherapy	OPS	8-529	Radiation simulation for percutaneous irradiation and brachytherapy
Nuclear medicine. Therapy	OPS	8-530.1	Nuclear medicine therapy

Treatment	Catalogue	Code	Title
Chemotherapy	OPS	8-541	Instillation of and locoregional therapy with cytotoxic drugs and immunomodulators
Chemotherapy	OPS	8-542	Non-complex chemotherapy
Chemotherapy	OPS	8-543	Moderately complex and intensive block chemotherapy
Chemotherapy	OPS	8-544	Highly complex and intensive block chemotherapy
Chemotherapy	OPS	8-546	Hyperthermic chemotherapy
Chemotherapy	OPS	8-547	Other immunotherapy
Chemotherapy	OPS	8-549	Percutaneous isolated organ perfusion with chemotherapeutics

3.3.2.2 Phase 2: Controlled phase of colon and rectum cancer

The so-called controlled phase is assigned if none of the other three phases apply. The proportion of patients in the controlled phase must then be further differentiated.

3.3.2.2.1 Phase 2a: Controlled phase in colorectal cancer, with stoma

First, all colorectal cancer patients in the controlled phase who have had a stoma must be identified. Inpatient main and secondary diagnoses (only discharged, full- and semi-residential inpatient cases), outpatient 'confirmed' diagnoses and 'confirmed' diagnoses from ambulatory hospital care are considered as diagnostic data sources.
However, stomata surgeries are also done in patients without colorectal cancer. Therefore, for all colorectal cancer patients in the controlled phase with stoma (period stomata: reference quarter; period colorectal cancer patients: 10-year period), only the proportion that exceeds the share of stomata in insured persons without colorectal cancer (10-year period) is to be quantified. This correction is made at the aggregate level grouped by 5-year age groups and sex.

For this purpose, the following proportions are calculated nationwide by age group and sex for all insured persons:

- Stomata in insured persons without colorectal cancer: Proportion of insured persons without colorectal cancer but with stoma (in the target quarter under consideration) in relation to the insured persons of the population without colorectal cancer (population for the 10-year prevalence)
- Stomata in colorectal cancer: Proportion of colorectal cancer patients with stoma in the quarterly period considered in relation to all colorectal cancer patients
- Proportion excess stomata: Proportion of stomata in colorectal cancer minus proportion of stomata in insured persons without colorectal cancer

The share of excess stomata is the proportion under interest.

Table 36: Target codes stomata

Treatment	Catalogue	Code	Title
Stoma	ICD-10	Z43.2	Attention to ileostomy
Stoma	ICD-10	Z43.3	Attention to colostomy
Stoma	ICD-10	Z93.2	Ileostomy status
Stoma	ICD-10	Z93.3	Colostomy status

3.3.2.2.2 Phase 2b: Controlled phase in colorectal cancer, without stoma

Similarly, the proportion of all colorectal cancer patients in the controlled phase who did not have a stoma during the assessment period or who had had a stoma before the incident cancer diagnosis was also to be estimated.

As described above, the proportion of excess stomata is estimated for the patients with stoma. The remainder (within phase 2) is then the proportion for phase 2 b of colorectal cancer patients without stoma.

3.3.2.3 Phase 3: Metastatic phase in colorectal cancer

In the rolling annual period under consideration (target quarter plus three previous quarters), metastases are documented at least once. Inpatient main and secondary diagnoses, outpatient 'confirmed' diagnoses and 'confirmed' diagnoses from ambulatory hospital care are considered as diagnostic data sources. As soon as metastases have been documented at least once in the annual period under consideration, all time periods in the target quarter under consideration are assigned to the metastatic phase. Only phase 4 (one month – i. e. 30 days before death) may still count as a higher-ranking phase in these time periods.

Table 37: Target code metastatic phase in colorectal cancer

Sector	Catalogue	Code	Title
Metastases	ICD-10	C77	Secondary and unspecified malignant neoplasm of lymph nodes
Metastases	ICD-10	C78	Secondary malignant neoplasm of respiratory and digestive organs
Metastases	ICD-10	C79	Secondary malignant neoplasm of other and unspecified sites

3.3.2.4 Phase 4: Terminal phase for colorectal cancer

Comparable to GBD, this phase applies one month before death whereas 30 days are counted as one month.

3.4 Prostate cancer

3.4.1 10-year prevalence of prostate cancer

To identify persons with prostate cancer, patients with diagnoses recorded during treatment in the outpatient and inpatient sector are considered. For prostate cancer, a 10-year prevalence is estimated, whereby an insured person is considered to have the disease as soon as the criteria described below are met in the quarterly rolling ten-year period.

Basic quantity:

Males in the population for 10-year prevalence (see heading 'Estimation of 10-year prevalence' in the section 'Numerator/denominator concepts for prevalence and rates')

AND

At least one of the following criteria applies to the 10-year period under consideration (target quarter plus 39 preceding quarters):

Inclusion criteria prostate cancer

A. Criterion to consider inpatient diagnoses:
Target diagnosis is documented as main or secondary diagnosis. Only discharged, full- and semi-residential hospital cases are considered.

OR

B. Criterion to consider outpatient diagnoses and diagnoses from ambulatory hospital care – diagnosis confirmation within three subsequent quarters:
From the quarter of its documentation, a 'confirmed' target diagnosis is verified by at least one further 'confirmed' target diagnosis in at least one further of the three subsequent quarters ('M2Q)'

OR

C. Criterion to consider outpatient diagnoses and diagnoses from ambulatory hospital care – diagnoses from different health care facilities in the same quarter:
Confirmed target diagnoses are documented by at least two different health care facilities within the same quarter.

Table 38: Target diagnoses prostate cancer

ICD	Title
C61	Malignant neoplasm of prostate

3.4.2 Severity grades in prostate cancer

Table 39: Definition of sequelae/severity grades in prostate cancer

Patient group	Outcome	Stratification	Severity grade specific weight ('disability weight')
Phase 1: Diagnosis and primary therapy phase in prostate cancer	Proportion of all prostate cancer patients	Proportions stratified by age group	0.288
Phase 2a: Controlled phase in prostate cancer, with impotence	Proportion of all prostate cancer patients	Proportions stratified by age group	0.065
Phase 2b: Controlled phase in prostate cancer, with incontinence	Proportion of all prostate cancer patients	Proportions stratified by age group	0.181
Phase 2c: Controlled phase in prostate cancer with impotence and incontinence	Proportion of all prostate cancer patients	Proportions stratified by age group	0.195
Phase 2d: Controlled phase in prostate cancer without impotence and incontinence	Proportion of all prostate cancer patients	Proportions stratified by age group	0.049
Phase 3: Metastatic phase in prostate cancer	Proportion of all prostate cancer patients	Proportions stratified by age group	0.451
Phase 4: Terminal phase in prostate cancer	Proportion of all prostate cancer patients	Proportions stratified by age group	0.540

The allocation of the phases is made to the exact day in the respective target quarter of the rolling period. If technically possible, the duration of the phases within the quarter under consideration is assigned to the day on the basis of the insurance periods and the relevant events (chemotherapy, radiation, etc.). If the criteria of several phases are met at the same time, only the most severe phase according to the respective disability weight is considered for each patient (phase 4 before phase 3 before phase 1 before phase 2). If, for example, a patient has metastases (phase 3) and is also in the terminal phase (phase 4), the patient is assigned to the terminal phase for the period under consideration. For each day within the target quarter, it is therefore necessary to determine in which phase the day falls.

For patients with implausible information on insurance durations (number of insurance days in the quarter is greater than the number of days from the 1st day of the quarter to the date of death), the duration of insurance is capped at the date of death.

3.4.2.1 Phase 1: Diagnosis and primary therapy phase in prostate cancer

At least one of the following treatments is given:

- Chemotherapy
- Radiation/radiotherapy/nuclear medicine therapy
- Relevant surgery

Relevant catalogue ATC, EBM, OPS

The duration of this phase is covered by GBD and, in the case of prostate cancer, is 4.0 months from the date of chemotherapy or radiation/radiotherapy/nuclear medicine therapy or surgery. For this purpose, 4.0 months (counted as 122 days) from the documented date (prescription date for drugs (ATC codes) or OPS date or treatment date for EBM) are considered to belong to the corresponding phase. The period to be assessed is assigned to each documentation of a relevant treatment.

Table 40: Target codes[10] diagnosis and primary therapy phase in prostate cancer

Sector	Catalogue	Code	Title
Chemotherapy	ATC	L01	Antineoplastic agents
Radiation	EBM	17372	Additional flat rate radionuclide therapy of bone metastases, haematopoietic organs, tumours and/or tumour metastases in a body cavity or in a hollow organ or of inflammation
Radiation	EBM	25320	Radiation with a telecobalt device for benign or malignant diseases or radiation with a linear accelerator for benign diseases.
Radiation	EBM	25321	Irradiation with a linear accelerator for malignant diseases or space-occupying processes of the central nervous system
Radiation	EBM	25322	Surcharge to the fee schedule items 25320 or 25321 for irradiation of more than 2 irradiation fields,
Radiation	EBM	25323	Surcharge for fee schedule item 25321 for irradiation in 3-D technology (also stereotactic, fractionated irradiation of brain lesions) and/or large-field and/or half-body irradiation,
Radiation	EBM	25330	Moulage or flab therapy
Radiation	EBM	25331	Intracavitary/Intraluminal brachytherapy
Radiation	EBM	25333	Interstitial brachytherapy
Radiation	EBM	25340	Irradiation planning for percutaneous irradiation without computer assistance and individual dose planning
Radiation	EBM	25341	Computer-assisted radiation planning for percutaneous irradiation with individual dose planning
Radiation	EBM	25342	Computer-assisted radiation planning for percutaneous irradiation with individual dose planning for irregular fields with individual blocks, multi-lamella collimator, non-coplanar fields and/or 3-D planning.

[10] EBM is a German system for coding the billing of services provided by SHI-accredited physicians.

Sector	Catalogue	Code	Title
Radiation	EBM	40840	Flat rate for individually adjusted masking, if necessary by means of multi-leaf collimator technique, compensators and/or individually manufactured positioning or fixation aids, if necessary including material costs for verification and documentation services within the framework of irradiation field documentation in connection with the provision of the service according to fee schedule items 25320 or 25321.
Surgery	OPS	5-601	Transurethral excision and destruction of prostate tissue
Surgery	OPS	5-602	Transrectal and percutaneous destruction of prostate tissue
Surgery	OPS	5-603	Excision and destruction of prostate tissue
Surgery	OPS	5-604	Radical prostatovesiculectomy
Radiotherapy	OPS	8-522	High voltage radiotherapy
Radiotherapy	OPS	8-523	Other high voltage radiotherapy
Radiotherapy	OPS	8-524	Brachytherapy with sealed radionuclides
Radiotherapy	OPS	8-525	Other brachytherapy with sealed radionuclides
Radiotherapy	OPS	8-527	Construction and adjustment of fixation and treatment aids in radiotherapy
Radiotherapy	OPS	8-528	Radiation simulation for external irradiation and brachy-therapy
Radiotherapy	OPS	8-529	Radiation simulation for percutaneous irradiation and brachytherapy
Radiotherapy	OPS	8-52a	Proton therapy
Radiotherapy	OPS	8-52b	Carbon ion therapy
Radiotherapy	OPS	8-52c	Other heavy ion therapy
Nuclear medicine. Therapy	OPS	8-530.1	Nuclear medicine therapy
Nuclear medicine. Therapy	OPS	8-530.d0	Nuclear medicine therapy
Chemotherapy	OPS	8-541	Instillation of and locoregional therapy with cytotoxic drugs and immunomodulators
Chemotherapy	OPS	8-542	Non-complex chemotherapy
Chemotherapy	OPS	8-543	Moderately complex and intensive block chemotherapy
Chemotherapy	OPS	8-544	Highly complex and intensive block chemotherapy
Chemotherapy	OPS	8-546	Hyperthermic chemotherapy
Chemotherapy	OPS	8-547	Other immunotherapy
Chemotherapy	OPS	8-549	Percutaneous isolated organ perfusion with chemotherapeu-tics

3.4.2.2 Phase 2: Controlled phase in prostate cancer

The so-called controlled phase is assigned if none of the other three phases apply. The proportion of patients in the controlled phase must then be further differentiated.

3.4.2.2.1 Phase 2a/2b/2c: Controlled phase in prostate cancer with impotence or incontinence or impotence and incontinence

First, all prostate cancer patients in the controlled phase who are affected by impotence and/or incontinence in the quarter under consideration are to be identified. However, incontinence and impotence also occur independently of prostate cancer. Therefore, for all prostate cancer patients in the controlled phase (10-year period), only the proportion that exceeds the proportion of incontinence or impotence in insured persons without prostate cancer is to be quantified. This correction is made at the aggregate level by 5-year age groups.

Table 41: Target codes diagnosis urinary incontinence and impotence in prostate cancer

Sector	Catalogue	Code	Title
Incontinence	ICD-10	N39.3	Stress incontinence
Incontinence	ICD-10	N39.4	Other specified urinary incontinence
Incontinence	ICD-10	R32	Unspecified urinary incontinence
Impotence	ICD-10	N48.4	Impotence of organic origin

For this purpose, the following proportions are calculated nationwide by age group for all male insured persons:

- Impotence in insured persons without prostate cancer: Proportion of insured persons with impotence in relation to the insured persons of the population without prostate cancer (population for the 10-year prevalence)
- Incontinence in insured persons without prostate cancer: Proportion of insured persons with impotence and incontinence in relation to the insured persons of the population without prostate cancer (population for the 10-year prevalence)
- Impotence and incontinence in insured persons without prostate cancer: Proportion of insured persons with impotence and incontinence (both present together in the target quarter under consideration) in relation to the insured persons of the population without prostate cancer (population for the 10-year prevalence)
- Impotence in prostate cancer: Proportion of prostate cancer patients with impotence in the quarterly period considered in relation to all prostate cancer patients in the population
- Incontinence in prostate cancer: Proportion of prostate cancer patients with impotence in the quarterly period considered in relation to all prostate cancer patients in the population
- Impotence and incontinence in prostate cancer: Proportion of prostate cancer patients with impotence and incontinence in the quarterly period considered in relation to all prostate cancer patients in the population
- Proportion excess impotence: Proportion of impotence in prostate cancer minus proportion of impotence in insured persons without prostate cancer

- Proportion excess incontinence: Proportion of incontinence in prostate cancer minus proportion of incontinence in insured persons without prostate cancer
- Proportion excess impotence and incontinence Proportion of impotence and incontinence in prostate cancer minus proportion of impotence and incontinence in insured persons without prostate cancer

The shares on excess impotence, excess incontinence or excess impotence and incontinence is the proportion under interest.

3.4.2.2.2 Phase 2d: Controlled phase in prostate cancer without impotence and without incontinence

The proportion of phase 2d (controlled phase in prostate cancer with neither impotence nor incontinence) is calculated as the remainder (100% minus the proportion of excess impotence and incontinence minus the proportion of excess impotence without incontinence minus the proportion of excess incontinence without impotence).

3.4.2.3 Phase 3: Metastatic phase in prostate cancer

In the rolling annual period under consideration (target quarter plus three previous quarters), metastases are documented at least once. Inpatient main and secondary diagnoses, outpatient 'confirmed' diagnoses and 'confirmed' diagnoses from ambulatory hospital care are considered as diagnostic data sources. As soon as metastases have been documented at least once in the annual period under consideration, all time periods in the target quarter under consideration are assigned to the metastatic phase. Only phase 4 (one month – i. e. 30 days before death) may still count as a higher-ranking phase in these time periods.

Table 42: Target codes metastatic phase in prostate cancer

Sector	Catalogue	Code	Title
Metastases	ICD-10	C77	Secondary and unspecified malignant neoplasm of lymph nodes
Metastases	ICD-10	C78	Secondary malignant neoplasm of respiratory and digestive organs
Metastases	ICD-10	C79	Secondary malignant neoplasm of other and unspecified sites

3.4.2.4 Phase 4: Terminal phase of prostate cancer

Comparable to GBD, this phase applies one month before death whereby 30 days are counted as one month.

4 Mental Disorders

4.1 Depressive disorders

Depressive disorders are divided into major depression (Chapter 4.1.1) and dysthymia (Chapter 4.1.2).

4.1.1 Major depression

4.1.1.1 1-year prevalence of major depression

To identify people with major depression disorder (MDD), patients with diagnoses recorded during treatment in the outpatient and inpatient sectors are considered. In the case of outpatient diagnoses by SHI-accredited physicians, all 'confirmed' diagnoses are considered, whereby a target diagnosis must be documented in at least 2 of 4 quarters of the reference year.

Basic quantity:

Persons in the population for 1-year prevalence (see heading 'Estimation of 1-year prevalence' in the section 'Numerator/denominator concepts for prevalence and rates')

AND

The following criteria apply within the annual period under consideration:

Inclusion criteria for depression

A. **Criterion to consider inpatient diagnoses:**
Target diagnosis is documented as main or secondary diagnosis. (Only discharged, full- and semi-residential hospital cases are considered.)

OR

B. **Criterion to consider diagnoses from ambulatory hospital care**
Target diagnosis was documented as a 'confirmed' diagnosis in the year under consideration in the claims data recorded during treatment in ambulatory hospital care.

OR

C. **Criterion to consider outpatient diagnoses:**
Target diagnosis was documented as a 'confirmed' diagnosis in at least 2 of 4 quarters of the reference year (M2Q criterion). The M2Q criterion is also met if two different diagnoses pertaining to the defined disease pattern were recorded.

AND NOT

D. **Exclusion criterion manic illness/bipolar affective disorder:**

Insured persons with a diagnosis of a manic episode or bipolar affective disorder are excluded. A one-time diagnosis of exclusion is sufficient for exclusion.

D1st **Criterion to consider inpatient diagnoses:**
Exclusion diagnosis is documented as main or secondary diagnosis in the year under consideration. (Only discharged, full- and semi-residential hospital cases are considered.)

OR

D2nd **Criterion to consider diagnoses from ambulatory hospital care**
Exclusion diagnosis was documented as a 'confirmed' diagnosis in the year under consideration in the claims data recorded during treatment in ambulatory hospital care.

OR

D3rd **Criterion to consider outpatient diagnoses:**
Exclusion diagnosis was documented at least once as a 'confirmed' diagnosis in the year under consideration.

Table 43: Target diagnoses major depressive disorders

ICD	Title
F32	Depressive episode
F33	Recurrent depressive disorder

Table 44: Exclusion diagnosis manic episodes/bipolar disorder

ICD	Title
F30	Manic episode
F31	Bipolar affective disorder

4.1.1.2 Sequelae/severity grades of major depression

Based on the documented diagnoses (ICD codes), severity grades can be defined as follows:

- F32.8/F33.8/F33.4 = asymptomatic
- F32.0/F33.0 = mild
- F32.1/F33.1 = moderate
- F32.2/F32.3/ F33.2/ F33.3 = severe
- F32.9 / F33.9 as well as ICD-3-digit F32, F33 without severity grade indication, redistribution necessary

For the severity grade classification, only the non-specific '.9' diagnoses (ICD F32.9 and F33.9) and three-digit documented ICD (F32, F33) are categorised as 'without indication of severity grade'. The diagnoses F32.8 and F33.8 are considered asymptomatic depression diagnoses.

The severity grade classification is made as follows:

- Patients with only one of the following diagnoses are assigned to an asymptomatic severity grade: F33.4/F32.8/F33.8.
- All remaining patients are divided into the group with at least one F32/F33 diagnosis from a specialist (specialist physician: psychiatrist/neurologist/psychotherapist; hereafter referred to as patient group with specialist contact) and the remainder group with F32/F33 diagnoses exclusively from non-specialists (patient group without specialist contact).
  - For the insured persons who have at least one documented diagnosis from psychology specialists (physicians/psychologists), the severity classification of the MDD is exclusively based on the documented diagnoses of the psychology specialist .
  - For the remaining patients, the severity grade classification is therefore based on the diagnoses documented by physicians who are not psychology specialists.
- Within these patient groups (with/without specialist contact), the severity grade classification is as follows:
  - If there is at least one specific severity grade for asymptomatic/mild/moderate/severe depression, the highest severity grade is assumed. Here, the '.8' diagnoses are considered asymptomatic, as it is assumed that this specific diagnosis is only documented if the severity was not at least mild.
  - Patients with documentation of only non-specific ICD without indication of severity grades '(.9' diagnoses or ICD-3 digits) are redistributed to severity grades within their specialist group (with/without specialist contact) according to age group and sex. This means that for all patients in this category (composite category from the variables specialist contact yes/no, age group, sex) with non-specific ICD documentation, the severity distribution is assumed to be the same as for patients with specific ICD documentation in the same category (specialist contact, age group, sex). This means that all insured persons with non-specific severity grades are redistributed on the basis of the observed severity grade distribution (asymptomatic/mild/moderate/severe) within the group under consideration (specialist vs. non-specialist) as well as according to age groups and sex.

4.1.2 Dysthymia

4.1.2.1 1-year prevalence of dysthymia

To identify persons with dysthymia, patients with diagnoses recorded during treatment in the outpatient and inpatient sector are considered. In the case of outpatient diagnoses by SHI-accredited physicians, all ‘confirmed’ diagnoses are considered, whereby a target diagnosis must be documented in at least 2 of 4 quarters of the reference year.

Basic quantity:

Persons in the population for 1-year prevalence (see heading ‘Estimation of 1-year prevalence’ in the section ‘Numerator/denominator concepts for prevalence and rates’)

AND

At least one of the following criteria applies to the annual period under consideration:

Inclusion criteria for dysthymia

A. Criterion to consider inpatient diagnoses:
Target diagnosis is documented as main or secondary diagnosis. (Only discharged, full- and semi-residential hospital cases are considered.)

OR

B. Criterion to consider diagnoses from ambulatory hospital care
Target diagnosis was documented as a 'confirmed' diagnosis in the year under consideration in the claims data of ambulatory hospital care.

OR

C. Criterion to consider outpatient diagnoses:
Target diagnosis was documented as a 'confirmed' diagnosis in at least 2 of 4 quarters of the reference year (M2Q criterion).

AND NOT

Exclusion criterion manic illness/bipolar affective disorder

Insured persons with a manic episode or bipolar affective disorder are excluded. A one-time diagnosis of exclusion is sufficient for exclusion.

D. Criterion to consider inpatient diagnoses:
Exclusion diagnosis is documented as main or secondary diagnosis in the year under consideration. (Only discharged, full- and semi-residential hospital cases are considered.)

OR

E. Criterion to consider diagnoses from ambulatory hospital care
Exclusion diagnosis was documented as a 'confirmed' diagnosis in the year under consideration in the claims data of ambulatory hospital care.

OR

F. Criterion to consider outpatient diagnoses:
Exclusion diagnosis was documented at least once as a 'confirmed' diagnosis in the year under consideration.

Table 45: Target diagnoses for dysthymia

ICD	Title
F34.1	Dysthymia

Table 46: Exclusion diagnosis manic episodes/bipolar disorder

ICD	Title
F30	Manic episode
F31	Bipolar affective disorder

4.1.2.2 No definition of sequelae/severity grades in dysthymia

There is no estimation of severity grades using routine data.

4.2 Anxiety and stress disorder

4.2.1 1-year prevalence of anxiety and stress disorders

To identify persons with anxiety and stress disorders, patients with diagnoses recorded during treatment in the outpatient and inpatient sector are considered. In the case of outpatient diagnoses by SHI-accredited physicians, all 'confirmed' diagnoses are considered, whereby a target diagnosis must be documented in at least 2 of 4 quarters of the reference year.

Basic quantity:

Persons in the population for 1-year prevalence (see heading 'Estimation of 1-year prevalence' in the section 'Numerator/denominator concepts for prevalence and rates')

AND

The following criteria apply within the annual period under consideration:

Inclusion criteria for anxiety and stress disorders

A. **Criterion to consider inpatient diagnoses:**
Target diagnosis is documented as main or secondary diagnosis. (Only discharged, full- and semi-residential hospital cases are considered.)

OR

B. **Criterion to consider diagnoses from ambulatory hospital care**
Target diagnosis was documented as a 'confirmed' diagnosis in the year under consideration in the claims data of ambulatory hospital care.

OR

C. **Criterion to consider outpatient diagnoses:**
Target diagnosis was documented as a 'confirmed' diagnosis in at least 2 of 4 quarters of the reference year (M2Q criterion). The M2Q criterion is also met if two different diagnoses pertaining to the defined disease pattern were recorded.

Table 47: Target ICD codes anxiety and stress disorder

ICD	Title
F40	Phobic anxiety disorders
F41	Other anxiety disorders
F42	Obsessive-compulsive disorder
F43	Reaction to severe stress, and adjustment disorders
F44	Dissociative disorders (conversion disorders)
F93.0	Separation anxiety disorder of childhood
F93.1	Phobic anxiety disorder of childhood
F93.2	Social anxiety disorder of childhood

4.2.2 No definition of sequelae/severity grades in anxiety and stress disorder

Severity grades were not estimated using routine data.

5 Neurological diseases – Alzheimer and other dementias

5.1 1-year prevalence of Alzheimer and other dementias

To identify persons with dementias, patients with diagnoses recorded during treatment in the outpatient and inpatient sector are recorded. In principle, all 'confirmed' diagnoses are considered for outpatient diagnoses by SHI-accredited physicians. Apart from the main inpatient diagnoses, for which the one-time documentation of a target code is sufficient, all other diagnoses must have been documented in at least two out of four quarters (M2Q criterion).

Basic quantity:

Persons in the population for 1-year prevalence (see heading 'Estimation of 1-year prevalence' in the section 'Numerator/denominator concepts for prevalence and rates') with a minimum age of 40 years

AND

The following criteria apply within the annual period under consideration:

Inclusion criteria dementia

A. **Criterion to consider inpatient diagnoses:**
Target diagnosis is documented as the main diagnosis. (Only discharged, full- and semi-residential hospital cases are considered.)

OR

B. **Criterion to consider further diagnoses:**
Target diagnosis was documented in at least 2 of 4 quarters (M2Q criterion) in the reference year in the claims data of the inpatient sector as a secondary diagnosis (only discharged, full- and semi-residential hospital cases) or recorded during treatment in ambulatory hospital care as a 'confirmed' diagnosis or during treatment in the outpatient sector as a 'confirmed' diagnosis. The M2Q criterion is also met if there are two different diagnoses pertaining to the defined disease pattern and if there are diagnoses from two different sectors.

Table 48: Target ICD Codes Alzheimer and other dementias

ICD	Title
F00	Dementia in Alzheimer disease
F01	Vascular dementia
F02	Dementia in other diseases classified elsewhere
F03	Unspecified dementia
G30	Alzheimer disease
G31.0	Circumscribed brain atrophy
G31.82	Other specified degenerative diseases of nervous system

5.2 No definition of sequelae/severity grades in Alzheimer and other dementias

Severity grades were not estimated using routine data.

6 COPD

6.1 1-year prevalence of COPD and other chronic lower respiratory tract diseases excluding asthma

To identify people with COPD and other chronic lower respiratory tract diseases (excluding asthma), patients with diagnoses recorded during treatment in the outpatient and inpatient sector are considered. In the case of outpatient diagnoses by SHI-accredited physicians, all 'confirmed' diagnoses are considered, whereby either a target diagnosis must have been documented in at least 2 of 4 quarters of the reference year (M2Q criterion) or a relevant drug must have been prescribed in addition to the diagnosis (M1Q plus drugs).

Basic quantity:

The population for 1-year prevalence (see heading 'Estimation of 1-year prevalence' in the section numerator/denominator concepts for prevalence and rates') with a minimum age of 35 years

AND

The following criteria apply within the annual period under consideration:

Inclusion criteria COPD and other chronic lower respiratory tract diseases excluding asthma

A. Criterion to consider inpatient diagnoses:
Target diagnosis is documented as main or secondary diagnosis. (Only discharged, full- and semi-residential hospital cases are considered.)

OR

B. Criterion to consider diagnoses from ambulatory hospital care
Target diagnosis was documented as a 'confirmed' diagnosis in the year under consideration in the claims data recorded during treatment in ambulatory hospital care.

OR

C. Criterion to consider outpatient diagnoses M2Q:
Target diagnosis was documented as a 'confirmed' diagnosis in at least 2 of 4 quarters of the reference year (M2Q criterion). The M2Q criterion is also met if two different diagnoses from the defined disease pattern were recorded.

OR

D. Criterion to consider outpatient diagnoses M1Q and drug:
The target diagnosis was documented as a 'confirmed' diagnosis in only one quarter of the reference year AND there was a prescription for a drug with one of the target ATC codes.

Table 49: Target ICD codes COPD and other chronic lower respiratory tract diseases excluding asthma

ICD	Title
J41	Simple and mucopurulent chronic bronchitis
J42	Unspecified chronic bronchitis

J43	Emphysema
J44	Other chronic obstructive pulmonary disease

Table 50: Target ATC codes COPD and other chronic lower respiratory tract diseases excluding asthma

ATC Code	Substance
R03AL excl. R03AL01* excl. R03AL02*	Adrenergics in combination with anticholinergics incl. triple combinations with corticosteroids excl. R03AL01 (Fenoterol and Ipratropium bromide) excl. R03AL02 (Salbutamol and Ipratropium bromide)
R03BB excl. R03BB01* excl. R03BB02* excl. R03BB03*	Anticholinergics excl. R03BB01 (Ipratropium bromide) excl. R03BB02 (Oxitropium bromide) excl. R03BB03 (Stramoni preparations)
R03DX07	Roflumilast

** Exclusion of drugs containing short-acting active ingredients.*
The ATC codes cover all long-acting muscarinic receptor antagonists (LAMAs), both plain and combination drug products.

6.2 No definition of sequelae/severity grades

Severity grades were not estimated using routine data..

7 LRI – Lower respiratory infections

To identify people with a lower respiratory tract infection (LRI), patients with diagnoses recorded during treatment in the outpatient and inpatient sector are considered.

Concerning LRI, individual cases are considered in order to adjust for multiple infections in the same person (see also general specifications for determining rates in the section 'Numerator/denominator concepts for prevalence and rates').

7.1 LRI in the narrower sense

Concerning LRI, cases are considered. One limitation of the health insurance routine data is that only one case is generated in the SHI claims data per quarter and physician contact – regardless of how often a patient has seen a doctor with different LRI episodes in the quarter.

7.1.1 Rates of LRI in the narrower sense

LRI case numbers are estimated on a quarterly basis.

The age classification is approximated to the middle of the quarter; if necessary, negative age values for new-borns in the quarter are set to 0.

The regional allocation is made on the basis of the insured person master data from the respective quarter.

Rates (number of cases per 100,000 person years) are given as results.

Basic quantity:

Persons in the population as described in the section on rates (see heading ' Estimation of rates of myocardial infarctions and lower respiratory tract infections ' in the section 'Numerator/denominator concepts for prevalence and rates')

AND

The following criteria apply related to the quarterly period under consideration of the insured person:

Inclusion criteria LRI

A. **Criterion to consider inpatient diagnoses:**
Target diagnosis LRI is documented as main or secondary diagnosis. (Only discharged, full- and semi-residential hospital cases are considered.). The admission date of the hospital case is used for the quarterly allocation.

OR

B. **Criterion to consider diagnoses from ambulatory hospital care**
Target diagnosis LRI was documented as a 'confirmed' diagnosis in the claims data of ambulatory hospital care.

OR

C. Criterion to consider outpatient diagnoses:
Target diagnosis LRI was documented as a 'confirmed' diagnosis.

All quarterly cases are counted (inpatient cases, cases from ambulatory hospital care, outpatient cases). This means that only one case is counted per quarter and per insured person – regardless of whether the person was treated both as an outpatient and inpatient or whether the person was treated several times in hospital within the quarter.

Table 51: Target ICD codes LRI

ICD	Title
A48.1	Legionnaires disease
A70	Chlamydia psittaci infection
B96.0	Mycoplasma pneumoniae as the cause of diseases classified to other chapters
B97.2	Coronavirus as the cause of diseases classified to other chapters
B97.4	Respiratory syncytial virus [RS virus] as the cause of diseases classified to other chapters
B97.5	Reovirus as the cause of diseases classified to other chapters
B97.6	Parvovirus as the cause of diseases classified to other chapters
J09	Influenza due to identified zoonotic or pandemic influenza virus
J10	Influenza due to identified seasonal influenza virus
J11	Influenza, virus not identified
J12	Viral pneumonia, not elsewhere classified
J13	Pneumonia due to Streptococcus pneumoniae
J14	Pneumonia due to Haemophilus influenzae
J15	Bacterial pneumonia, not elsewhere classified
J16	Pneumonia due to other infectious organisms, not elsewhere classified
J17	Pneumonia in diseases classified elsewhere
J18	Pneumonia, organism unspecified
J20	Acute Bronchitis
J21	Acute Bronchiolitis
J22	Unspecified acute lower respiratory infection
J85.1	Abscess of lung with pneumonia
P23	Congenital pneumonia
U04	Severe acute respiratory syndrome [SARS]

7.1.2 No definition of sequelae/severity grades

Severity grades were not estimated using routine data.

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- COPD: Henriette Steppuhn
- Infectious diseases: Sebastian Haller

The BURDEN 2020 project is advised by a scientific advisory board consisting of: Prof. Dr. Hajo Zeeb (Chairman), Prof. Dr. Gabriele Doblhammer (Deputy Chairman), Prof. Dr. Reinhard Busse, Conrad Franke, Dr. Henk Hilderink, Prof. Dr. Tobia Lakes, Dr. Odile Mekel, Prof. Dr. Ralf Münnich, Prof. Dr. Annette Peters, PD Dr. Enno Swart and Prof. Dr. phil. Susanne Wurm. The WIdO author group would like to thank all members of the scientific advisory board for their constructive criticism, well-founded expert support of the project and the numerous helpful comments, evaluations and recommendations.

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