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Costing manual: Methods and Reference Prices for Economic Evaluations in Healthcare

2024 version

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Commissioned by the National Health Care Institute

| Van goede zorg verzekerd |



Acknowledgement

It gives us great pleasure to present you with the updated version of the costing manual: Methods and Reference Prices for Economic Evaluations in Healthcare for the year 2023. This update was performed on the basis of a commission by the National Health Care Institute. The last update of the costing manual dates from 2015 and the reference prices and other data have not been revised since. It was, therefore, time to update this manual and we have duly obliged with maximum conviction and dedication. This project would have been impossible, however, without contributions from various people and organisations.

First and foremost we would like to thank the consortium of researchers from the Erasmus School of Health Policy & Management (ESHPM), the institute for Medical Technology Assessment (iMTA), the Trimbos Institute (TI) and Maastricht University (MU). The contributions by Pieter van Baal (ESHPM), Werner Brouwer (ESHPM), Ruben Drost (MU), Silvia Evers (MU and Ti), Job van Exel (ESHPM), Vivian Reckers (ESHPM), Nasr-Eddine Tannaoui (iMTA), Frederick Thielen (ESHPM) and Ben Wijnen (Ti) to the various chapters have helped to make this update a success.

We are also grateful for the invaluable input we received from the National Health Care Institute. The critical involvement in this update of the National Health Care Institute team, which comprised Leonie Huis in 't Veld, Carly Sweegers, Reva Efe and Taco Hofland, helped us make the manual easier to read and properly aligned with the new guideline for economic evaluations in healthcare.

We would also like to express our thanks to the survey respondents. Your input has helped us improve and refine the manual and make it an even more valuable instrument for economic evaluations in healthcare.

Thanks to these joint efforts and dedication on the part of all these people and organisations we can now, with pride, present this updated version of the costing manual. We are convinced that the manual will make a valuable contribution to the further development and use of economic evaluations in healthcare.

On behalf of all the authors,
Leona Hakkaart-van Roijen

Table of contents

Acknowledgement	1
Glossary	4
1 Introduction	6
2 Step-by-step plan for costing studies	8
2.1 The perspective of the economic evaluation, step 1	10
2.2 The time horizon of the economic evaluation, step 2	10
2.3 Cost categories, step 3	10
2.4 Identification units, step 4	11
2.5 Volume measurement of units, step 5	11
2.6 Valuation units, step 6	12
2.7 Dealing with uncertainty, step 7	14
3 Costs in healthcare	16
3.1 Identification of units	16
3.2 Volume measurement of units	17
3.3 Valuation units	21
3.4 Costs of diseases in years of life gained	26
4 Reference prices and other sources for the valuation of standard healthcare cost units	28
4.1 Days of care	28
4.2 Day treatment in hospital	28
4.3 Outpatient visits	29
4.4 Emergency room (ER)	29
4.5 Transportation by ambulance	29
4.6 Medicines	30
4.7 Medical procedures	32
4.8 Diagnostics	33
4.9 Blood products	34
4.10 Devices	34
4.11 GP consultations	35
4.12 Paramedical care	35
4.13 Elderly care	36
4.14 Home care	36
4.15 Mental healthcare	37
4.16 Rehabilitation	39
4.17 Disability care	40
4.18 Reference prices	40
5 Costs of patients and family	44
5.1 Travel expenses	44

5.2	Cost of time spent by the patient	46
5.3	Cost of time spent by informal carers	47
5.4	Other costs of patients and family	47
5.5	Standard calculation values	48
6	Costs in other sectors	49
6.1	Productivity losses	49
6.2	Other costs	53
6.3	Standard calculation values	55
7	Methodology of costing studies	57
7.1	Staff costs	57
7.2	Costs of materials	61
7.3	Costs of medical equipment	63
7.4	Costs which are not directly attributable	64
7.5	Cost price assessment outside hospitals	68
7.6	Standard calculation values	68
	References	70
	Appendix 1: Standard calculation values and reference prices	75

Glossary

AIOS	Junior doctors in training to become specialists (Artsen in opleiding tot specialist)
ALAT	Alanine Aminotransferase
BFAG	Drug Price Negotiation Unit (Buro Financiële Arrangements Geneesmiddelen)
VAT	Value Added Tax
CLA	Collective labour agreement
CBS	Statistics Netherlands (Centraal Bureau voor de Statistiek)
MEB	Medicines Evaluation Board (College ter Beoordeling van Geneesmiddelen)
CPI	Consumer price index
CRF	Case report form
CRP	C-reactive protein
CT	Computer Tomography
CVA	Cerebrovascular accident
DTC	Diagnosis Treatment Combination
DHD	Dutch Hospital Data
DIRUM	Database or Instruments for Resource Use Measurement
ECG	Electrocardiogram
EF	Ejection fraction
EMA	European Medicines Agency
GGZ	Mental Health Care (Geestelijke gezondheidszorg)
GIP	Medicines and medical devices Information Project (Genees- en hulpmiddelen Informatie Project)
GVS	Medicine Reimbursement System (Geneesmiddelenvergoedingssysteem)
HAVO	Senior General Secondary Education (Hoger Algemeen Voortgezet Onderwijs)
HbA1C	Haemoglobin A1C
HICP	Harmonized Indices of Consumer Prices
iCARE	Informal CARE effect
iMCQ	iMTA Medical Consumption Questionnaire
iMTA	institute for Medical Technology Assessment
iPCQ	iMTA Productivity Cost Questionnaire
iVICQ	iMTA Valuation of Informal Care Questionnaire
MRI	Magnetic Resonance Imaging
MSZ	Specialist Medical Care (Medisch specialistische zorg)
NZa	Dutch Healthcare Authority (Nederlandse Zorgautoriteit)
OECD	Organisation for Economic Co-operation and Development
OK	Operating Room (Operatiekamer)
ORT	Compensation for irregular working hours (Onregelmatigheidstoelage)
OTC	Over The Counter
OV	Public transport (Openbaar vervoer)
PAAZ	General Hospital Psychiatric Unit (Psychiatrische Afdeling Algemeen Ziekenhuis)
PAID	Practical Application to Include future Disease costs
PET	Positron Emission Tomography
POH	Nurse practitioner (Praktijkondersteuner Huisarts)
PPP	Purchasing Power Parities
PUK	University Hospital Psychiatric Clinic (Psychiatrische Universiteitskliniek)
RIBW	Regional Institutions for Sheltered Accommodation (Regionale Instellingen voor Beschermd Wonen)
RIVM	National Institute for Public Health and the Environment (Rijksinstituut voor Volksgezondheid en Milieu)
SEH	Accident and Emergency Department (Spoedeisende hulp)
SFK	Foundation for Pharmaceutical Statistics (Stichting Farmaceutische Kengetallen)
SO	Special Education (Speciaal Onderwijs)
SPECT	Single-Photon Emission Computed Tomography
TIC-P	Treatment Inventory of Costs in Psychiatric Patients
TSH	Thyroid Stimulating Hormone
UR	Prescription Only (Uitsluitend op recept)
VMBO	Pre-vocational secondary education (Voorbereidend middelbaar beroepsonderwijs)
Vso	Special secondary education (Voortgezet speciaal onderwijs)
VWO	Pre-university Education (Voorbereidend Wetenschappelijk Onderwijs)

VWS	(Ministry of) Health, Welfare and Sport
WAO	Disablement Benefits Act (Wet arbeidsongeschiktheid)
WB	Whole Body
WEC	Law on Resource Centres (Wet op de expertisecentra)
Wmg	Healthcare Market Regulation Act (Wet marktordening gezondheidszorg)
Wmo	Social Support Act (Wet maatschappelijke ondersteuning)

1 Introduction

It gives us great pleasure to present you with the updated version of the costing manual : Methods and Reference Prices for Economic Evaluations in Healthcare for the year 2023. This manual describes the identification, measurement and valuation of costs used in economic evaluations. The last update of the costing manual was published in 2015 and the reference prices and other figures have not been revised since there.

For this update of the costing manual we collaborated intensively with an extensive project team made up of researchers from ESHPM, iMTA, Trimbos and Maastricht University, and we listened specifically to the request of the National Health Care Institute and users for an accessible manual. Economic evaluations offer an insight into the cost-effectiveness of interventions. It is very important that such evaluations are performed in accordance with the applicable guideline. In 2023 the National Health Care Institute developed a new guideline, in cooperation with an external expert committee, for the performance of economic evaluations in healthcare. The costing guidance for Economic Evaluations in Healthcare forms an essential part of the guideline for economic evaluations.¹ The aim of the costing manual is to support researchers and policymakers in the performance and assessment of a costing study in economic evaluations. The costing manual must be used for the identification, measurement and valuation of the costs. Using this manual will improve the quality, uniformity and standardisation of cost identification, measurement and valuation in the context of economic evaluations of care interventions. The manual is based on the most recent literature on economic evaluations and uses current standard calculation values and reference prices. Moreover, the manual aligns entirely with the recommendations included in the guideline for economic evaluations in healthcare.

This revised version of the costing manual has been developed with the help of feedback from users and stakeholders. We have rearranged and updated the content of the manual to ensure that it is a clear and practical source for cost analysis and calculations. When updating the reference prices we looked at newly available data. For example, since the publication of the costing manual in 2015, various costing studies have been published in scientific literature which contain information which is relevant for the new costing manual. An insight into the costs in other sectors is important for economic evaluations from a social perspective. The information that has now become available on intersectoral costs within the sectors of education and security and justice has also been included in this revised version. An interactive web application was also used to update the costing manual. This makes it possible to update the manual to the most recent data.

Document structure

The table of content of the costing manual 2023 makes it possible to search specifically for subjects and to check how the costs can be calculated of individual healthcare cost units. The step-by-step plan for costing studies is presented in chapter 2. When calculating costs in economic evaluations seven steps are completed which are all linked to the recommendations made in the guideline for economic evaluations in healthcare. For each step a short description is provided of the applicable guiding principles, the available methods and the important criteria when choosing the method. The step-by-step plan is shown in a straightforward diagram (see Figure 2.1). Parts of this diagram are depicted at the beginning of each chapter, highlighting the step covered in that particular chapter. All the subsequent chapters contain a practical description of sources for the volume measurement and valuation of units. Chapter 3 focuses on the costs

in healthcare. It discusses the healthcare cost units, for example days of care, and sources for measuring volumes (the number of days of care), and valuation (for example costs per day of care). The reference prices for common healthcare cost units in healthcare, as well as the methodology and sources on which they are based, are described in chapter 4. The costs relating to patients and family are presented in chapter 5. Chapter 6 is dedicated to the measurement units and costs in other sectors, namely productivity losses, education, security and justice. Chapter 7 describes the methodology of costing studies in healthcare. This methodology can be used when no reference price is available, or if the cost price of a healthcare cost unit is expected to deviate significantly from the reference price.

2 Step-by-step plan for costing studies

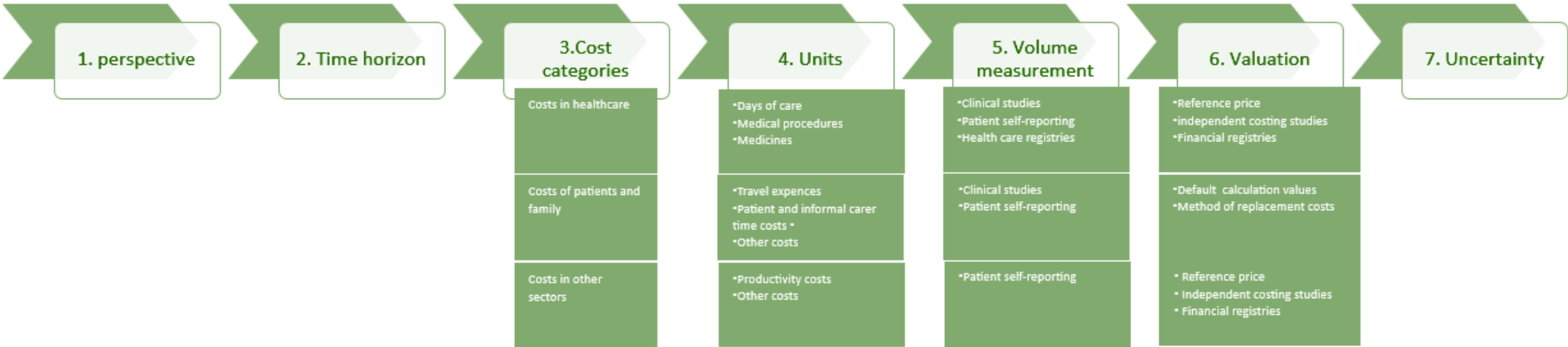
This chapter presents the step-by-step plan for costing studies, whereby the calculation of costs in economic evaluations is regarded as a process of seven successive steps. The step-by-step plan describes these steps in chronological order:

- 1 The perspective of the economic evaluation (paragraph 2.1).
- 2 The time horizon of the economic evaluation (paragraph 2.2).
- 3 The choice of cost categories (paragraph 2.3).
- 4 Identification of units (paragraph 2.4).
- 5 Volume measurement of units (paragraph 2.5).
- 6 Valuation of units (paragraph 2.6).
- 7 Dealing with uncertainty (paragraph 2.7).

At each step in the step-by-step plan important choices have to be made which affect the way in which the subsequent steps are carried out. These choices are based on the objective of the economic evaluation, the disease or intervention being evaluated and the choices made in previous steps. For example, determining the perspective of the economic evaluation is of crucial importance and has a major influence on many choices made later in the step-by-step plan. In doing so the focus is not only on the choice of time horizon and cost categories, but also on the identification, volume measurement and valuation of units.

This chapter focuses on the methodological aspects of the step-by-step plan for calculating costs in economic evaluations, see Figure 2-1. The choices relating to the step-by-step plan are dependent on the considerations made by the researcher.

Figure 2-1 Step-by-step plan for costing study in economic evaluations



2.1 The perspective of the economic evaluation, step 1

The guideline for economic evaluations in healthcare recommends performing and reporting economic evaluations from a social perspective.¹ The social perspective takes account of all actors in society with all costs having to be included, irrespective of who bears them.² This means that, in addition to the costs in healthcare, the costs borne by patients and family and costs in other sectors in the economic evaluation are also included.² Costs from a social perspective are therefore not the same as costs charged to the government's healthcare budget or costs payable by an insurer.

In addition to the social perspective, other perspectives can be chosen, for example the perspective of the insurer, the healthcare organisation, the patient, the government and/or the employer.^{3,4} When choosing these alternative perspectives it is important to provide a clear substantiation of their relevance. Different perspectives can lead to considerable differences in the costs included in the study (see Example 1). Costs paid by patients themselves and/or costs outside healthcare are generally not included in perspectives other than the social perspective. The valuation of costs may also differ per perspective.

Example 1

The cost price of a medical intervention is €250. The intervention also reduces the patient's ability to work. This leads to productivity costs of €50. In this case the costs from the social perspective are €300.

Productivity costs are not included in the healthcare perspective. The costs from the healthcare perspective are therefore €250.

2.2 The time horizon of the economic evaluation, step 2

The next step is to determine the time horizon during which costs are measured. The guiding principle when determining the time horizon is that all consequences of the intervention are included in the analysis. In principle the guideline for economic evaluations recommends a lifelong time horizon in model-based economic evaluations.¹ If a lifelong time horizon is deviated from, this must be properly substantiated. In many acute problem interventions the time horizon may be relatively short and the costs can be measured in practice. For studies with a lifelong time horizon the costs to be incurred in the future must also be included in the analysis. The guideline for economic evaluations also states that, in the case of model-based economic evaluations, the costs in years of life gained must also be taken into account (paragraph 2.4).

If costs have to be determined in the long term, this must be taken into account when organising the economic evaluation because the costs cannot only be identified by a personal observation and, instead, other sources must also be used. Long-term costs can be calculated by extrapolating time-to-event data over a lifelong time horizon and then multiplying that data by the expected costs over that period. In all of this, account must be taken of the fact that the relative importance of costs in future years decreases due to discounting (paragraph 2.6.1.2).

2.3 Cost categories, step 3

The third step is to choose the cost categories. Based on the social perspective, three cost categories can be identified, namely healthcare costs, costs of patients and family and costs in other sectors⁵, as shown in Table 2-1.

Table 2-1 Cost categories in economic evaluations of care interventions

Costs in healthcare	Costs of patients and family	Costs in other sectors
Medical costs for prevention, diagnostics, therapy, rehabilitation and care	Informal care, patient costs (time costs and travel	Productivity costs, legal costs, special education

Healthcare costs are all costs which are directly related to the treatment, diagnostics, rehabilitation, care and prevention of the disease. They also include the unrelated medical costs in years of life gained, in other words costs of future medical interventions which are not connected to the disease studied during the economic evaluation. The costs for patient and family may comprise, among other things, travel expenses, personal payments, or changes to the home. Which costs are incurred in other sectors depends very much on the intervention to be evaluated and may, for example, relate to productivity costs, legal costs, or the costs of education. All the cost categories referred to must be included in an economic evaluation, if relevant.

2.4 Identification units, step 4

If costs need to be calculated in an economic evaluation, all units that play a role must be identified. The cost categories are defined in step 3. The focus in step 4 is on specifying the elements or units which are relevant within these cost categories (such as days of care and the administration of a certain chemotherapy). This step not only covers the identification of the units on behalf of the original intervention, but also the units which are relevant as a consequence of side effects, complications and follow-up treatments. Table 2-2 contains a number of examples of the units which can be identified per cost category.

Table 2-2 Examples of cost categories in economic evaluations of care interventions

Costs in healthcare	Costs of patients and family	Costs in other sectors
• Days of care • Outpatient visits • Emergency Room • GP consultations • Paramedical care • Transportation by ambulance • Nursing home • Care home • Home care • Mental healthcare • Disability care • Rehabilitation	• Travel expenses • Cost of time spent (informal carers) • Special food/diet • Vitamin preparations • Clothing as a consequence of weight loss • A wig in the event of hair loss due to chemotherapy • Help with personal care • Childcare • Provisions in the home • Medical devices • Telephone and transport costs as a consequence of medicines being delivered to the home	• Productivity costs • Investigation, prosecution, sentencing and probation • Supervision and assistance with (re)joining the employment process • Interventions at work • Loss or damage caused by a patient • The (extra) costs of special education

2.5 Volume measurement of units, step 5

Step 5 is all about measuring the number of units. Various sources can be used to collect this data. These sources can be subdivided into primary and secondary sources. Primary data collection takes place, for example, during a clinical or observational study. In doing so, not only is clinical data collected, but also information about the use of care within the hospital. In that case data is collected, for example, on the number of days of care, outpatient visits and which diagnostics were performed. Questionnaires are often used to collect data about healthcare utilisation outside the hospital, for example GP care, physiotherapy, informal care and lost productivity, which are completed by the patients themselves or their informal carers. Secondary data sources are existing data sources, such as patient records, financial information systems from care institutions or data files from insurers.

2.6 Valuation units, step 6

In step 6 of the specification of costs the units are valued on the basis of existing cost prices (reference prices, see chapter 4) or an independent costing study (chapter 7). It is preferable to value units on the basis of reference prices. Reference prices are standardised average cost prices of healthcare cost units. The use of reference prices increases the comparability of economic evaluations. Existing sources have been used to determine reference prices, with due regard for the hierarchy in these sources. Empirical data from independent costing studies by researchers or published literature (A) are preferable in this regard. If these sources are not available, the focus will be on financial registries (B), followed by Dutch Healthcare Authority (NZA) rates (C), market prices (D) and lastly Diagnosis and Treatment Combination (DTC) rates (E). Each reference price in chapter 4 is accompanied by an indication of the source used to determine it.

It is important to note that both the NZa rate and the DTC rate are not an exact reflection of the actual costs for a care product. Rather, they are standardised approaches for determining reimbursements and covering various components of the healthcare costs.

If a reference price is not regarded as realistic, for example due to relatively high or low care intensity of the patient population, or when no reference price is available, independent costing studies is recommended. The efforts associated with independent costing studies are only justified for the units with a relevant contribution to the total and incremental costs. The relative importance of the various units can lead to the most important units being valued by independent costing studies, while existing cost prices, such as reference prices, can be used for the relatively less important units.

Independent costing studies is often only possible if the healthcare organisation uses a cost price model, or if a researcher has access to financial sources within the organisation.

It is important to note the difference between the terms 'costs' and 'prices'. The term 'costs' refers to the total costs incurred in order to produce a product or deliver a service. This includes, for example, the costs of staff salaries and the purchase of materials. The term 'price' refers to the amount that has to be paid for a product or service. The price may also include a profit margin.

2.6.1 Price index, discounting and conversion factor

Three elements need to be taken into account when evaluating units:

- 1 The price index (paragraph 2.6.1.1).
- 2 Discounting (paragraph 2.6.1.2).
- 3 The conversion factor (paragraph 2.6.1.3).

2.6.1.1 Price index

When determining costs in economic evaluations, the year the prices relate to should always be stated. When cost prices of various units are not determined on the basis of financial data from the same calendar year, these prices must be corrected for inflation over the years. This is done using the consumer price index (CPI) which is available from the Statline database provided by *Centraal Bureau voor de Statistiek* (Statistics Netherlands) (CBS; www.statline.cbs.nl).⁶ Table 2-3 presents the CPI for various reference years.

Table 2-3 Consumer price index 2012-2022

from	to	percentage	factor	from	to	percentage	factor
2012	2013	2.5	1.025	2012	2022	26.5	1.265
2013	2014	1.0	1.010	2013	2022	23.4	1.234
2014	2014	0.6	1.006	2014	2022	22.2	1.222

2015	2016	0.3	1.003	2015	2022	21.4	1.214
2016	2017	1.4	1.014	2016	2022	21.1	1.211
2017	2018	1.7	1.017	2017	2022	19.4	1.194
2018	2019	2.6	1.026	2018	2022	17.4	1.174
2019	2020	1.3	1.013	2019	2022	14.4	1.144
2020	2021	2.7	1.027	2020	2022	13.0	1.130
2021	2022	10.0	1.100	2021	2022	10.0	1.100

Source: CBS (2023) Price index figures for consumer prices.⁶

Example 2

Costs from 2022 are presented in an economic evaluation. An appointment with a physiotherapist is calculated on the basis of the 2019 cost price as being €39. The cost price in 2022 is then €39*1.144=€44.62.

When cost prices from several European countries have to be corrected for inflation for the purpose of an economic evaluation, the harmonised price index figures of the European Central Bank must be used (Harmonized Indices of Consumer Prices; HICP). The HICP price index figures are established periodically for the countries within the Eurozone, the European Union, the European Economic Community and several other countries. The most current price index figures can be obtained online from Eurostat.⁷

2.6.1.2 Discounting

Care interventions often lead to long-term flows of costs and health-related effects. Because the value of future costs and effects decreases with time, this must be taken into account when making decisions. This is done by converting future costs and effects into a 'current value' by means of 'discounting'. The most common method is to calculate a net cash value based on constant discounting. The formula for calculating the net cash value of costs (C) in the current year (t=0) up to and including year n in accordance with the constant discounting model is:

$$C = \sum_{t=0}^n K_t (1+i)^{-t}$$

In this formula K_t stands for the costs in year t and i is the constant discounting basis for costs. No discounting is applied in the first year. Example 3 provides an example of how discounting should be applied.

There is broad consensus about the need to discount costs in economic evaluations, even though the amount of the discounting is the subject of debate and differs from one country to the next. In the Dutch guideline for economic evaluations in healthcare the assumption is a discounting basis of 3% for costs and 1.5% is prescribed for effects.¹

Example 3

In an economic evaluation annual costs are estimated to be €100.00. Without discounting, the costs after 3 years are €300.00.

In the event of a discounting basis of 3%, costs in years 1, 2 and 3 respectively are:

First year: $€100 * (1+0.03)^{-0} = €100.00$

Second year: $€100 * (1+0.03)^{-1} = €97.09$

Third year: $€100 * (1+0.03)^{-2} = €94.26$

Total costs after 3 years are then €291.35.

2.6.1.3 Conversion factor

Purchasing power parities (PPPs) are used for the conversion between countries, based on the gross domestic product. Purchasing power parities take account of differences in purchasing power between countries so that an adjustment can be made for absolute price differences. The purchasing power parities have been calculated for a large number of countries by the Organisation for Economic Co-operation and Development (OECD).⁸

If costs from other countries and calendar years are used for a cost estimate, the sequence in which the inflation adjustment and conversion are applied affects the estimated costs.⁹ When using such cost estimates, costs first have to be indexed to the desired cost year (using inflation figures from the country of the cost estimate), after which a PPP conversion must be applied to express the costs in Dutch values.

2.7 Dealing with uncertainty, step 7

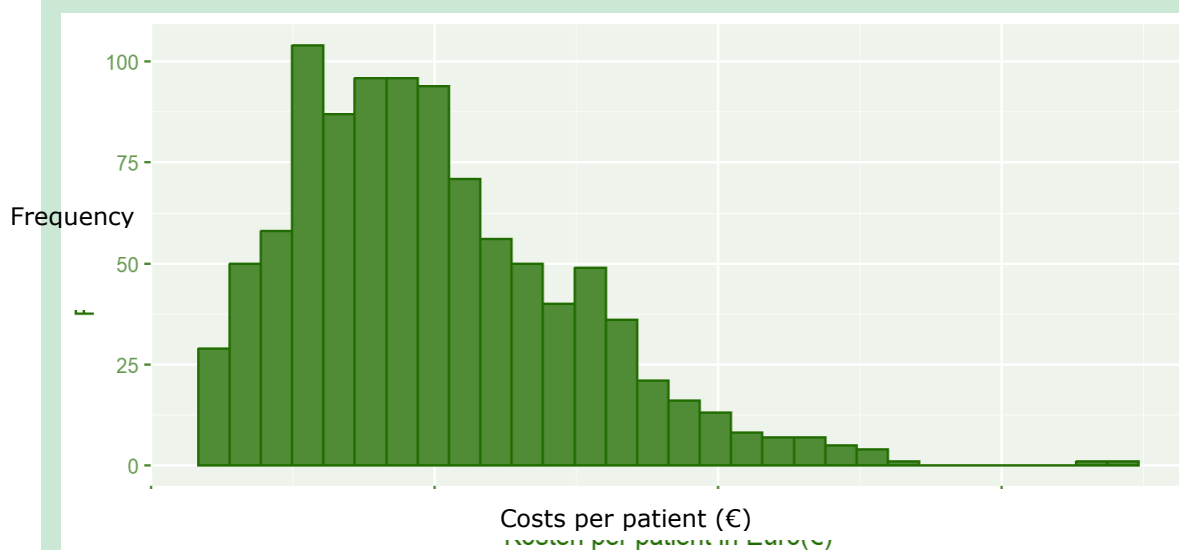
There is a consensus in the scientific literature that each economic evaluation should include an analysis of uncertainties. Data on healthcare utilisation can vary in quality, accuracy and representativeness, and that results in uncertainty about the accuracy of the values entered. Alternative sources for healthcare utilisation can be used in scenario analyses and alternative assumptions can be tested to identify such structural uncertainties. In addition to structural uncertainty, parameters in economic evaluations are inherently uncertain due to variability of the sample. In economic evaluations, spread relating to costs can be included in deterministic uncertainty analysis and probabilistic analysis. The average healthcare utilisation and the standard error can be determined in situations in which volume data is measured at patient level. If data is not available at patient level, an estimate can be made of the upper and lower limit. The guideline for economic evaluations in healthcare states that if no information is available about the variation, a range of +/- 20% must be used.¹ Because costs cannot be negative and often show an imbalance (usually due to a small number of patients with very high costs), the normal distribution is generally not suitable for cost data. Usable alternatives are gamma or log-normal distributions.¹⁰

In general, existing cost prices (for example reference prices) are taken as given. However, cost prices based on independent costing studies do show a spread between patients.

Example 4

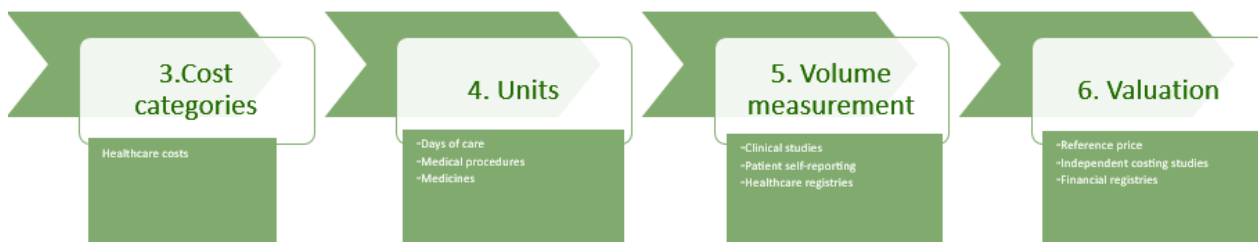
Figure 2-2 Distribution of costs in a notional population shows the distribution of annual costs for a notional population. For this population the average annual costs are set at €1,000, with a standard deviation of +/- €500. The majority of patients in the population have relatively few costs. By contrast, a small number of patients have very high costs (for example due to a lengthy admission to hospital). The costs are therefore not normally distributed around the average, but have an imbalance (the median of €883 is below the average of €1,000). Account can be taken of the imbalance of costs by using a gamma or log-normal distribution in the probabilistic sensitivity analysis.

Figure 2-2 Distribution of costs in a notional population



3 Costs in healthcare

Figure 3-1 Step-by-step plan for costs in healthcare



Within the cost category *costs in healthcare* a distinction can be made between two types of costs:

- All healthcare costs which are directly related to, or influenced by, the prevention, diagnostics, therapy, rehabilitation and care work performed in relation to the disease or intervention. The costs of treating side effects of an intervention also belong in this cost category.
- All healthcare costs which are incurred in years of life gained, also known as indirect medical costs. This concerns all medical costs which are incurred as a consequence of the life-prolonging effect of an intervention. When an intervention extends someone's life, this normally results in additional healthcare costs. These costs may be so-called 'related costs' (for example blood thinners following a heart operation) or 'unrelated costs' (for example the costs of a broken hip in the years of life gained after a heart transplantation).

Both types of costs must be taken into account in an economic evaluation of a life-prolonging intervention.

This chapter provides an overview of:

- the identification of units (paragraph 3.1);
- the volume measurement of units (paragraph 3.2);
- the valuation of units (paragraph 3.3);
- the medical costs in years of life gained (paragraph 3.4).

3.1 Identification of units

If you want to calculate the costs of a disease or treatment, all units of the healthcare utilisation must be separated out (such as diagnostics, interventions and aftercare). Depending on the relevance for the economic evaluation, the identification of units can be variable in terms of detail. Within this framework a distinction is made between detailed cost specifications ('microcosting') and global cost specifications ('grosscosting').¹¹ These methods are clarified later on in this chapter (paragraph 3.3.2).

Key sources for identifying units are:

- clinical studies, including comparative clinical studies and observational studies;
- registries (for example observational studies/real-world data) which reveal care consumption in daily Dutch practice;
- clinical guidelines, including those of GPs (nhg.artsennet.nl) and medical specialists (www.richtlijndatabase.nl);
- treatment protocols used in hospitals;
- medical and health-economic literature;
- consultations with experts;
- DTC information system.

When it comes to identifying units the aim is to gain a general impression of the relevant healthcare utilisation. It is impossible to distinguish any hierarchy between the various sources and the most relevant source for identifying units depends on the economic evaluation.

3.2 Volume measurement of units

After the relevant units have been identified, the next step is to quantify the use of various units. The most important criteria for choosing a method of volume measurement are the reliability of the data, the generalisability of the data, the impact on the total and incremental costs and the availability of data.

There is a range of sources for collecting volume data, including:

- clinical studies (paragraph 3.2.1)
- patient self-reporting (paragraph 3.2.2)
- healthcare organisation registries (paragraph 3.2.3)
- national registries (paragraph 3.2.4)
- literature (paragraph 3.2.5)
- expert consultation (paragraph 3.2.6)
- DTC information system (paragraph 3.2.7)

The advantages and disadvantages of the various sources are discussed in paragraph 3.2.1 to paragraph 3.2.7. Although clinical studies, patient self-reporting and healthcare registries are the most valuable sources for the collection of volume data, it is impossible to distinguish any clear hierarchy between these sources. Information from national registries, literature, consultations with experts and the DTC information system are less preferable. The most suitable volume measurement method needs to be assessed for each study.

3.2.1 Clinical studies

3.2.1.1 *Comparative clinical study*

The best known type of prospective study is the randomised clinical study. An advantage of clinical studies is that the data collection of healthcare utilisation can be integrated with the data collection of medical data as usually registered in the so-called 'case report form' (CRF). In this way the quality and the completeness of the data can be guaranteed on the basis of systematic checks. The extra efforts and costs of the data collection for the purpose of the economic evaluation are relatively minor. In order to realise these benefits, it is necessary to take account in the design of the study that an economic evaluation will also be performed.

Problems which may occur in the context of collecting data on the healthcare utilisation in clinical studies relate to the short follow-up period and the difficulty of tracing data on patients who leave the study prematurely. Another problem is the distortion which can occur when measuring volume data within the framework of the clinical study. For example the monitoring consultations which are scheduled at fixed points in time during a clinical study, as a result of which a measurement of the number of consultations is not representative for daily practice. This means an adjustment has to be made for the bias which arises as a consequence of the study. For a further discussion regarding the problems which occur when collecting data on the healthcare utilisation in clinical studies, please refer to the relevant literature.^{3,12-14}

3.2.1.2 *Observational study*

Observational studies involve data being collected in daily practice. An observational study is often a patient registry based on the indication. Population screenings involving people who have no health issues are also observational studies. In the

case of patient registries, the collection of healthcare utilisation data can be integrated into the collection of medical data. The quality and completeness of the data can be guaranteed on the basis of systematic checks.

Problems which may occur in the context of collecting data on the healthcare utilisation in observational studies relate to the possible short follow-up period and the difficulty of tracing complete data from patient records, in particular when patients continue their medical treatment in another care institution. Another problem is the possible differences in baseline characteristics between patient groups.

3.2.1.3 *Other clinical studies*

Other types of clinical studies which involve the use of primary data for the collection of volume data are the follow-up or cohort study, the case-control study and the cross-sectional study. For a detailed description of these types of clinical studies please refer to the relevant literature, for example Swanborn (2010).¹⁵

3.2.2 **Patient self-reporting**

Patients receive care and therefore represent a usable source of information. There are significant benefits to taking measurements for the economic evaluation from the same patients as in the clinical study. It increases the internal validity by concentrating the volume measurement on the objective of the economic evaluation (measuring what and from whom you want to measure). A key disadvantage of self-reporting by patients is the time and effort associated with collecting data (the so-called 'respondent burden'). A high respondent burden can be detrimental to the response and completeness of the data. Other important disadvantages are that selective responses (the so-called 'selection bias') can lead to distortion of the results and limit the validity due to the extent to which patients are able to remember events (the so-called 'recall bias' or 'information' bias).

Patients can be questioned using diaries, questionnaires or interviews in order to collect volume data. The advantage of a diary is that the patient can update it directly after each event. However, keeping a diary may require a lot of time and effort on the part of the patient.

Questionnaires are often easy to incorporate into an economic evaluation and there are many different ones which can be used to measure the healthcare utilisation.¹⁶ The Database of Instruments for Resource Use Measurement (DIRUM; www.dirum.org) contains information on a large number of questionnaires. Examples of questionnaires which can be used to collect volume data are the iMTA Medical Consumption Questionnaire (iMCQ) and the Treatment Inventory of Costs in Psychiatric Patients (TIC-P) (www.imta.nl). The iMCQ is a questionnaire for the collection of data on the non-disease-specific healthcare utilisation. The TIC-P is aimed at the healthcare utilisation of respondents with psychological problems.¹⁷

3.2.3 **Healthcare organisation registries**

Data can also be collected retrospectively on the basis of (electronic) patient records and/or hospital information systems. However, these data sources have not been set up to support the data collection, but to support the primary care process. This may mean that the available data is not accurate or complete enough to be used in economic evaluations. Another disadvantage of collecting data via a healthcare organisation is that the only information available is information on care provided by the organisation in question. Nevertheless, collecting data via healthcare organisations can be a feasible and reliable alternative, particularly with regard to data on the initial treatment and data which is less suitable for reporting by the patient, such as the use of medicines (paragraph 4.6).

3.2.4 National registries

3.2.4.1 *Statistics Netherlands (Centraal Bureau voor de Statistiek, CBS)*

The CBS Statline is the best source of information for general statistical data (statline.cbs.nl). Data about, for example, healthcare utilisation can be found under the theme of health and welfare.

3.2.4.2 *National Institute for Rijksinstituut voor Volksgezondheid en Milieu (Public Health and the Environment)*

The website of the National Institute for Public Health and the Environment (RIVM), also contains a large number of reports and publications (www.rivm.nl). Information about public health and care is available on the website www.vzinfo.nl. The place to start obtaining an insight into the available national registries is the website www.vzinfo.nl/zorggegevens. This website provides an overview of available registries in the Netherlands. A description is given for each registry of the data which is collected and the responsible body. The website www.vzinfo.nl also provides information on, among other things, the quality, accessibility and costs of Dutch healthcare.

3.2.4.3 *Other national registries*

Other possible sources from which to collect volume data are the websites and publications of organisations like the National Health Care Institute (www.zorginstituutnederland.nl), Nivel (www.nivel.nl), Vektis (www.vektis.nl), Monitor Langdurige Zorg (www.monitorlangdurigezorg.nl) and Dutch Hospital Data (DHD; www.dutchhospitaldata.nl).

3.2.4.4 *Observational databases*

Medical data is increasingly being registered while care is provided in electronic dossiers and then collected in so-called 'observational databases'. These observational databases provide data from potentially millions of patients for scientific research. This observational databases can then be enhanced by linking the data from the individual registries.

The PHARMO Institute manages extensive observational files (which have been taken primarily from pharmacies, but also registries of GPs, hospitals and the PALGA database).

3.2.5 Literature

Another important source of volume data for economic evaluations are the results from published medical and health-economic literature. It is also possible to search, for example, for cost-effectiveness studies and burden of illness studies. In addition to the scientific literature, files from earlier reimbursement applications may also contain valuable information. When using data from previous research, it is important to check to what extent the patient population and the medical treatment, as well as the methods for the volume measurement, correspond. Differences between countries (for example in patient populations, treatment patterns, care systems and the funding of care) and differences in time can hamper the use of international literature.² It is therefore desirable to consult Dutch literature first before resorting to international studies. If international data is used, it must be validated for the Dutch setting.¹

3.2.6 Consultation with experts

If volume data cannot be established on the basis of actual measurement, it is still possible to base data on expert opinion or expert elicitation. This involves, for example, doctors being asked to disclose a patient's average healthcare utilisation (e.g. treatment pattern). The guideline for economic evaluations describes how consultations with experts can be used to collect information.¹

3.2.7 The DTC information system

The DTC information system was introduced in 2005 and hospitals are obliged to use it to register healthcare cost units per patient. A DTC is defined as the entirety of healthcare cost units of a hospital and medical specialist that results from the diagnosis for which the patient consults the medical specialist in the hospital. Any activity which can be declared is expressed as a DTC care product. There are approximately 4,400 DTC care products. The DTC system is maintained by the NZa.

The average care profile and price is determined for each DTC care product on the basis of volume data from all general and university hospitals. This method is clarified in more detail on the basis of Example 5. However, hospitals and healthcare insurers negotiate on the price and quality of types of treatment and the care provided. As a result, the price and care provided may differ between hospitals and between healthcare insurers without this variation being reflected in DTC care products.

Volume data is publicly available at www.opendisdata.nl.¹⁸ This website provides an insight into the number of patients with a specific care product, the number of patients that have registered specific activities within a care product and the total number of registered activities. The website therefore provides an indication of the healthcare utilisation for a particular care product. However, the aggregation level makes it difficult to make an accurate estimate, based on this data, of healthcare utilisation per care activity. For example, care activities are divided into categories (for example, '1 or 2 outpatient visits'; '3 to 4 outpatient visits'; '1 day treatment appointment or more than 4 outpatient visits') as a result of which the exact healthcare utilisation is unclear and there is a lower limit before care activities can be registered separately.

Example 5

Fout! Verwijzingsbron niet gevonden. Table 3-1 shows the care profile of the DTC 'Surgery/Knee (including meniscus injury)'. In this example 1% of the patients have had an extensive operation to an injured knee and the average number of extensive knee operations for these patients was 1.0.

Table 3-1 Care profile of the DTC 'surgery/regular care/osteo-arthritis to the knee/operative with clinical episode(s)'

Care units	% patients that received this healthcare cost unit
Outpatient visits	54
Diagnostics	47
Extensive operation to injured knee	0.6
Hospital admission due to injury	0.8
Extensive operation skin and/or soft tissue due to injury	0.8
Operation to the knee ligament(s) due to injury	0.1
Operation to the joint bone due to injury	0.1
Extensive operation leg due to injury	0.1
Extensive operation to stomach and/or chest and/or blood vessels	0.1
Source: OpenDIS ¹⁸ , on the basis of data August 2023	

3.2.8 Overview of volume measurement units

Table 3-2 provides an overview of type of sources and advantages and disadvantages for volume measurement.

Table 3-2 Advantages and disadvantages of various sources for volume measurement

	Advantages	Disadvantages
Clinical studies	- Detailed uptake of care, incl. interventions, medication, follow-up - Prospective data	- Specific patient groups - Not representative for Dutch practice

		• Generalisability limited • Short follow-up
Patient self-reporting	• Patient's perspective healthcare utilisation • Lots of validated instruments available • Combination possible with costs outside healthcare	• Possible selection bias and recall bias • Patient time investment • Possibly inaccurate • Under- or over-reporting
healthcare organisation registries	• Detailed and reliable data • Large numbers of patients • Low costs and time investment	• Generalisability limited • Not primarily intended for research
National registries	• Data healthcare utilisation at national level • Standardised and reliable data • Long-term data	• Access possibly time intensive and expensive • Limited in available variables and/or degree of detail • Not primarily intended for research
Literature	• Overview of existing knowledge and research results • Broad range of type of studies at university level RCTs, observational studies and systematic reviews	• Limited comparability and possibly dated
Consultations with experts	• Valuable if no other sources of data are available, or to supplement existing data • Insight into future trends • Clinical guidelines and policy context	• Subjective and possibly not independent • Possibly inaccurate
DTC information system	• Standardised and detailed information about healthcare utilisation • Rates and diagnoses • National system	• Access limited • Not primarily intended for research • High aggregation level

RCTs: Randomized controlled trials

3.3 Valuation units

After the healthcare cost units have been identified and their scope determined, the next step is to assign a value to the healthcare cost units. When choosing the valuation method it is important to take account of the following criteria: availability of data; available time to carry out independent costing studies; and resources for acquiring data.

Key sources for valuing units are:

- reference prices (paragraph 3.3.1 and chapter 4)
- independent costing studies and literature (paragraph 3.3.2 and chapter 7)
- financial healthcare registries and national registries (paragraph 3.3.3)
- NZa rates (paragraph 3.3.4)
- market prices (paragraph 3.3.5)
- DTC rates (paragraph 3.3.6)

Units are preferably valued using reference prices (see paragraph 3.3.1 and chapter 4). Reference prices are average cost prices of healthcare cost units (for example, medical procedures, consultations or days of care) which can be used directly in economic evaluations. In some instances reference prices are not available, or they are too inaccurate for the evaluation in question. In that case independent costing studies is required (see paragraph 3.3.2 and chapter 7). If no reference prices are available and costing studies is impossible, other evaluation units, such as financial healthcare registries, NZa rates, market prices, or DTC rates, can be used. The limitations of these evaluation units are clarified in paragraphs 3.3.3 to 3.3.6. In the absence of reference prices or other evaluation units, it may be possible to use reference prices for similar units (proxy prices). The limitations of the use of proxy prices are clarified in paragraph 3.3.7.

3.3.1 Reference prices

Standardised methods such as reference prices are preferred in economic evaluations which contribute to the decision-making at national level. Reference prices are cost prices which are predetermined on the basis of a large and varied population. Reference prices increase the comparability between economic evaluations, particularly in the case of healthcare cost units which substantially influence an economic evaluation conclusion^{5,19,20}. The use of uniform prices means that

differences in costs between economic evaluations are exclusively the consequence of differences in underlying healthcare utilisation. It is, however, important to find a balance between standardisation and comparability on the one hand and specific characteristics of the economic evaluation on the other.

The use of reference prices also has its limitations because, when determining reference prices, no account is taken of differences between patients or differences in care intensity. Data for differentiating between the reference prices according to diagnosis or specialism is for the time being limited or unavailable. A check must therefore always be carried out for healthcare cost units which make an important contribution to the total and incremental costs to determine whether the reference price is representative and can be generally applied.

The reference prices for a large number of types of healthcare providers is part of this costing manual (chapter 4). Standard calculation values are also presented. Standard calculation values do not reflect the cost price of a healthcare cost unit, but values which can be used to calculate costs and cost prices.

3.3.1.1 *Determining reference prices for the costing manual*

The sources used to determine a reference price in the costing manual reflect the hierarchy according to which various types of data are used to determine the reference price:

- A. The first data used in the hierarchy is empirical data, such as independent costing studies or published cost price studies. This is data obtained from direct observations or studies with bottom-up microcosting being preferred to top-down microcosting and the grosscosting method.
- B. If this data is unavailable, outdated, or of insufficient quality, financial registries are used. This is data obtained from the records or accounts which provide an overview of the organisation's costs and revenues. National databases such as the *Zorgcijfersdatabank* and the GIP-databank (Medicines and medical devices Information Project database) be used for this. This data is less specific than empirical data.
- C. If these sources are insufficient, the rates established by the NZa are examined. These rates are based on the actual costs of the healthcare providers and are used as a guideline for the prices of certain products or services.
- D. If NZa rates are unavailable or irrelevant, the next source to be used may be market prices. These are prices demanded by other providers in the market which can serve as a reference point in order to determine a price.
- E. Hierarchically, the last data to be used is DTC rates. These are the rates established by the NZa for specific DTCs. These rates are less suitable as reference prices because they are based on information on the total patient treatment pathway and all procedures and do not necessarily reflect the actual costs.

Cost prices from independent costing studies or literature are preferred because they provide a more detailed and more accurate estimate of the actual costs than cost prices from financial registries. If these are unavailable, NZa rates are used as the source. The NZa rates are intended to be used to determine the maximum reimbursements which healthcare insurers must pay healthcare providers for specific care products and services. These rates are based on various factors, such as the cost price of the care, the quality and the performance. By contrast, a DTC is a standardised registration unit used to determine the diagnosis and treatment of a patient in the Dutch healthcare system. It contains all the relevant information about

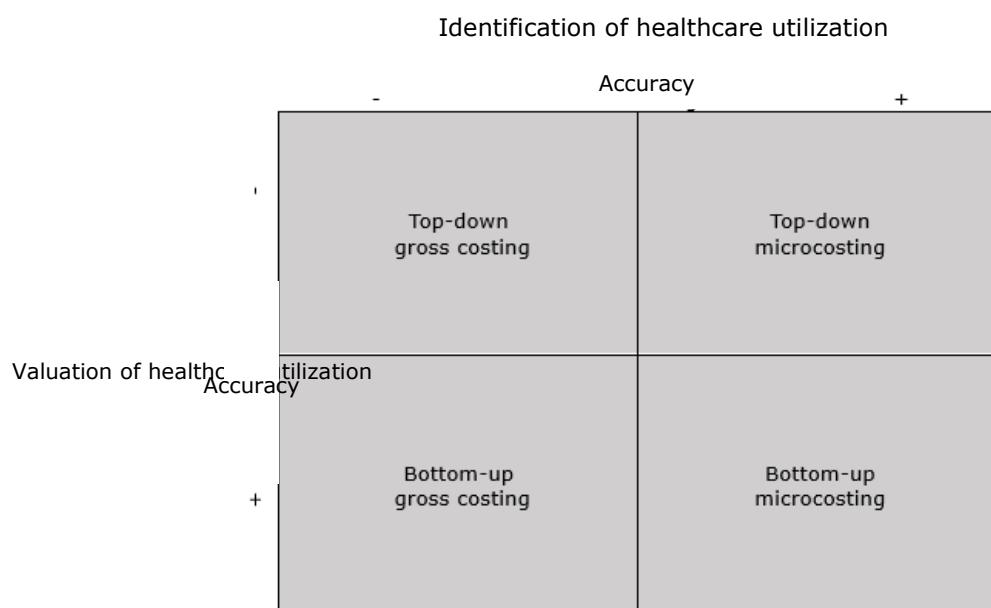
the diagnosis, types of treatment, medication, care activities and the duration of the treatment. A DTC is opened when a patient is treated for a specific health problem and is closed when the treatment has been completed, or after a certain period of time, depending on the patient treatment pathway. A DTC also contains information about the reimbursement for the healthcare provider and the costs of the care institution. The reimbursement for a DTC is determined by the healthcare insurers and healthcare providers on the basis of mutual consultation. The reimbursement is based on an average estimate of the required care for a specific diagnosis and treatment.

The above sources were used to determine reference prices in this costing manual of the various healthcare cost units. The letters A to E were then used to indicate how the reference prices included in the costing manual were determined.

3.3.2 Independent costing studies and published cost price studies (A)

The valuation of units can be of varying accuracy depending on the relevance for the economic evaluation. Within this framework a distinction is, however, made between top-down and bottom-up cost specifications and between microcosting and grosscosting methods.^{11,21-23} Microcosting studies produce the most accurate specification of costs.²⁴

Figure 3-2 Methods for calculating costs in healthcare



Source: Tan et al. (2009)²¹.

3.3.2.1 Bottom-up microcosting

Bottom-up microcosting involves all relevant healthcare cost units being identified and each individual healthcare cost unit being valued for individual patients.^{22,24} For example, in a bottom-up microcosting study the use of medication and diagnostics and the duration of a procedure per individual patient are measured. Generally speaking, bottom-up microcosting is regarded as the gold standard. Bottom-up microcosting provides insight into the costs which are directly attributable to specific patients. The method is recommended when large differences in the costs of healthcare cost units between patients are expected, when there is an expectation that the healthcare cost units will make up a large share of the total and incremental costs, or in the event of very varied healthcare cost units in a single department. One disadvantage of bottom-up microcosting is that it is a time-consuming method. A fictitious example of a microcosting study is shown in Example 6.

Example 6

A bottom-up microcosting is performed to identify the costs of an outpatient visit. 100 patients were included in this study. Table 3-3 shows a selection of healthcare cost units for the first three patients.

Table 3-3 Number of used units per patient

Care units	Patient 1	Patient 2	Patient 3
Staff			
Nurse 1	20 minutes	18 minutes	14 minutes
Nurse 2	12 minutes	14 minutes	9 minutes
Doctor	1 minute	3 minutes	0 minutes
Etc.			
Materials			
Sterile gloves	2 pairs	3 pairs	2 pairs
Sterile gauzes	3	4	3
2 ml syringe	1	1	0
5 ml syringe	0	0	1
Etc.			
Medication			
Paracetamol 500mg	1	0	0
Paracetamol 1,000mg	0	1	0
Prednison 4mg	0	1	0
Etc.			

Volumes are then valued with relevant prices, such as salaries for staff and prices for materials and medication. Ultimately, the costs for each patient identified and average costs can be calculated for the total studied population.

3.3.2.2 Top-down microcosting

Because bottom-up microcosting is so time-consuming, preference is often given to top-down microcosting. This involves all relevant healthcare cost units being identified and each individual healthcare cost unit being valued for an average patient.¹⁸ In a bottom-up microcosting study the duration of a procedure is, for example, determined on the basis of a norm time (the time which a doctor is considered to need to perform a procedure). In this calculation the time spent on each patient is assumed to be the same. A top-down cost price calculation means that aggregated sources such as annual accounts are used as the source for the determination of the costs. This method is primarily suitable for use when no large differences in the costs of units between patients are expected, when it is expected that the healthcare cost units will not make up a large share of the total and incremental costs, in the case of relatively homogeneous production with a minor number of products, or if individual patient data is unavailable.

3.3.2.3 Bottom-up grosscosting

In case of bottom-up grosscosting the total costs are estimated by looking in detail at individual cost components. This means that all individual costs which are directly related to a care activity, for example, a day of care, are identified and added up in order to calculate the total costs of a day of care. If bottom-up grosscosting were to be used to calculate the costs of a day of care in a hospital, all relevant cost components would be identified, such as staff costs, the costs of medical supplies, etc., which are directly related to the provision of days of care. After that, these individual costs are added up in order to calculate the total costs of days of care. Bottom-up grosscosting therefore involves a valuation of the cost component for each individual patient.

3.3.2.4 *Top-down grosscosting*

Top-down grosscosting identifies healthcare cost units at a high aggregation level. A grosscosting specification of costs is based, for example, only on the number of days that a patient was admitted, but no further distinction is made according to the individual cost components of an admission, such as the costs of staff, materials and medication. Top-down grosscosting values costs for average patients from combined sources.²¹ Grosscosting must only be considered if no data on individual healthcare cost units is available. Due to the inaccuracy of grosscosting estimates, outcomes must always be interpreted with a certain degree of caution.^{25,26}

A detailed description of various methods for independent costing studies can be found in chapter 7.

3.3.3 **Financial healthcare organisation registries and national registries (B)**

Cost prices can be based on existing registered information within healthcare organisations, such as the financial records or annual reports. Before any independent costing studies is performed, it is advisable to identify the extent to which data on cost prices is already available within the organisation. In addition to registered information held by healthcare organisations, national registries such as *Zorgcijfersdatabank* and the *GIP-databank* (Medicines and medical devices Information Project database) are useful for determining cost prices. *Zorgcijfersdatabank* is a central source of data about the Dutch healthcare sector and contains healthcare statistics, such as healthcare expenditure and patient numbers. The *GIP-databank* (Medicines and medical devices Information Project database) (Medicines and medical devices Information Project database) is a database which contains information on medicines and medical devices which are reimbursed by the Dutch healthcare insurers. Basing cost price data on national registries generally results in a global calculation of the cost price per product due to the high aggregation level of data. Within this data no distinction is usually made according to medical types of treatment or patient groups within a care sector, nor is any distinction made between volume and cost prices. Independent costing studies is required when the cost price is expected to deviate significantly from the global cost price.

3.3.4 **NZa rates (C)**

The NZa sets maximum rates for a number of types of care, such as GP care and dental care. The problem with using NZa rates is that no one properly knows what the relationship is with the actual cost price of a procedure. After all, the rate not only serves as a reimbursement for costs, but also contains elements of macrobudgetting and income policy.

In addition to NZa rates, there are also so-called 'walk-in rates' for certain types of treatment. These are rates which healthcare providers charge if the person does not have a contract with the healthcare insurer. The walk-in rates charged by healthcare providers can differ considerably and generally stated on the healthcare providers' websites.

3.3.5 **Market prices (D)**

In theory market prices can be used for the valuation of a healthcare cost unit. If a market is functioning properly, based on free access for providers, complete information and competition, market prices are an excellent approximation of the opportunity costs. Opportunity costs represent the value of the most important alternative purpose for which the resources could have been used. They are, therefore, an approximation of the actual value of the unit in question. Healthcare is, however, a regulated market to which the above characteristics do not apply. That is why market prices are often unsuitable for costing studies. One exception to this is the market for devices offered via an unregulated market. Consequently, market prices can indeed be used for the valuation of devices.

3.3.6 DTC rates (E)

In the DTC system, patients are classified into varying homogeneous groups in terms of diagnoses and medical types of treatment. The spread in average costs between care products can be considerable because, in reality, a homogeneous group of patients does not exist. However, the aggregation level of care products makes it difficult to use DTC rates to value units (see paragraph 3.2.7). Moreover, DTC rates are not cost prices, but negotiated rates. Unless no other information is available for the valuation of units, DTC rates should not be used in economic evaluations.

3.3.7 Proxy prices

If reference prices or alternatives are unavailable for specific healthcare cost units and costing studies is regarded as being impossible or undesirable (for example because the healthcare cost unit is only used sporadically), it may be possible to use existing reference prices for similar healthcare cost units as a proxy. It must then be determined which healthcare provider could be a proper reflection of the healthcare cost unit in question. Key factors for determining the comparability are cost components (including salary and overheads) and the duration of a consultation or visit. The considerable uncertainty regarding the cost price which is inevitable if proxy prices are used must be acknowledged.

Proxy prices are not used to determine reference prices and have not been added to the hierarchy as described in paragraph 3.3.1.1. No proxy prices are presented in this costing manual.

3.4 Costs of diseases in years of life gained

In the practice of economic evaluations a distinction is often made between costs in years of life gained of related diseases and unrelated diseases. The costs of related diseases in years of life gained are costs as a consequence of the disease at which the intervention was aimed, in contrast to costs of unrelated diseases. The costs of unrelated diseases are exclusively the consequence of living longer and are only relevant if interventions lead to life being prolonged. Examples are the costs of a broken hip in the years of life gained as a consequence of a heart transplant.

The costs of related diseases in years of life can be estimated using the standard approach. The same does not apply to the costs of unrelated diseases. After all, these are costs relating to a wide variety of diseases (all diseases except the related disease), with regard to which it is not known in advance whether they will even occur. In order to resolve this problem, the costs of unrelated diseases will be estimated using data on the average healthcare utilisation per person, instead of the costs per patient or care activity. These average healthcare costs per person are multiplied by the volume (the number of years of life gained). Account must be taken of the fact that healthcare costs increase with age. It is furthermore recommended that these costs are adjusted for the costs which have normally already been included in an economic evaluation (the costs of related diseases).²⁷ Data from the Costs of Diseases Study (*Kosten van ziekten studie*) could be used for this purpose.²⁸ Different studies in the field of ageing have revealed that healthcare costs are, on average, highest in the year prior to someone's death^{29,30} and that, consequently, the estimate of the costs in years of life gained has been too low.³¹ If we want to take this into account in an economic evaluation, we can use the Practical Application to Include future Disease costs (PAID).^{32,33} Using PAID makes it possible to estimate the unrelated healthcare costs, while taking account of costs for the last year of someone's life.

The most recent version of PAID at the time of writing (March 2023) is PAID 3.0 and it can be downloaded from www.imta.nl/tools/paid/.³⁴ There are a number of important differences between PAID 3.0 compared to earlier versions of PAID. First and foremost, the estimates of medical costs are based on the Costs of Diseases Study and mortality data from 2017.^{35,36} PAID 3.0 also offers the option of including

costs of non-medical consumption in years of life gained.³⁷ In addition, the user interface has been substantially changed: PAID 3.0 is an online application which uses Shiny R. A user manual including detailed examples and any updates can be found at www.imta.nl/tools/paid/.

4 Reference prices and other sources for the valuation of standard healthcare cost units

This chapter discusses a number of standard healthcare cost units. The reference price, and an explanation of how it was determined, are stated for each healthcare cost unit. In doing so the same hierarchy is applied as described in paragraph 3.3.1 and an indication is given for each healthcare cost unit of the hierarchical level at which the reference prices have been determined. If the source data are from 2021 or before then, they will have been indexed for 2022 using the price index figures (see paragraph 2.6.1.1). The following care units are each discussed below:

- Days of care (paragraph 4.1)
- Day treatment (paragraph 4.2)
- Outpatient visits (paragraph 4.3)
- Emergency room (paragraph **Fout! Verwijzingsbron niet gevonden.**)
- Transportation by ambulance (paragraph 4.5)
- Medicines (paragraph 4.6)
- Medical procedures (paragraph 4.7)
- Diagnostics (paragraph 4.8)
- Blood products (paragraph 4.9)
- Devices (paragraph 4.10)
- GP consultations (paragraph 4.11)
- Paramedical care (paragraph 4.12)
- Care for the elderly (paragraph **Fout! Verwijzingsbron niet gevonden.**)
- Home care (paragraph 4.14)
- Mental healthcare (paragraph 4.15)
- Rehabilitation (paragraph 4.16)
- Disability care (paragraph 4.17)

4.1 Days of care

The reference price for a day of care is based on a costing studies by the Ministry of Health, Welfare and Sport (VWS) (hierarchy level A). The costs per day of care are €537 (excluding staff costs). The costs of staff are estimated to be 20% of the costs of a day of care. The reference price for a day of care, including staff costs is therefore €644.³⁸

The costs of a day of care in intensive care are based on information from the Ministry of Health, Welfare and Sport (VWS). The reference price for a day of care in intensive care is equal to €2,727.³⁸

Independent costing studies may be required in the event of a patient population with a relatively high or low level of care complexity. Previous studies have revealed that reference prices may differ between medical specialisms. When days of care are concentrated within a specific medical specialism, it may be necessary to carry out an independent costing studies.

4.2 Day treatment in hospital

Day treatment is a collective name for many types of treatment in a hospital. This characteristic represents one of the problems when it comes to estimating a uniform reference price. Moreover, recent national data is not accessible and, therefore, reference prices for common day treatment cannot be estimated on the basis of detailed data.

For the costs of administering oncolytics reference prices were determined in a bottom-up microcosting study from 2018 (hierarchy level A).³⁹ This study assessed

the costs of the intravenous and subcutaneous administration of trastuzumab and rituximab in 6 Dutch hospitals. The estimates include the costs for the pharmacy and materials, but exclude the costs of the interventions. When indexed to 2022 values, the costs for intravenous administration are €171 and €75.28 for subcutaneous administration.

The study reports various costs, depending on the number of therapies a patient receives (monotherapy versus combination therapy) and the therapy treatment time. In the study the average duration of an intravenous administration and subcutaneous administration was 66.6 and 6.5 minutes respectively.³⁹ If the therapy treatment time differs from the average treatment time in the study, it is recommended that alternative cost prices are applied, or that an independent costing study is performed.

No reference prices are known for other specific types of day treatment. Indexation of the 2015 reference price produces a reference price of €335. This reference price is based on the volume data of cost price data of 25 general and university hospitals in 2003 (hierarchy level B).⁴⁰ The estimate does not include any costs of medical specialists and medical procedures. If day treatment represents an important element of an economic evaluation, it is recommended that an independent costing study is performed.

4.3 Outpatient visits

The reference price for outpatient visits for 2022 is €120. This reference price is based on CBS data on the total costs and the total number of outpatient visits in 2019 (hierarchy level B), indexed to 2022.^{41,42}

Independent costing studies may be required in the event of a patient population with a relatively high or low care intensity. Previous study has revealed that reference prices for outpatient visits may differ between medical specialisms. A breakdown of reference prices according to specialisms is not possible due to a lack of current data. When outpatient visits are concentrated in a specific medical specialism, independent costing studies may therefore also be required.

4.4 Emergency room (ER)

The reference price for visits to the ER for 2022 is €258. This reference price is based on the *Kostenonderzoek beschikbaarheidsbijdrage spoedeisende hulp t.b.v. marktverstoringstoets 2021* (ER availability contribution costing study on behalf of market disruption assessment 2021) (hierarchy level A).⁴³ The figures were then indexed to 2022.

Account has to be taken of the possibility of considerable differences in cost prices of contact with the ER as a consequence of varying intensity of the demand for care. There are considerable differences between types of ER treatments, varying from treating a graze to large-scale multitraumas. Moreover, the way the ER is organised also affects the costs. Consequently, the costs of availability (such as having sufficient staff to cope with traumas) depend on, among other things, the number of patients that normally visit the ER. Lastly, when determining the costs of visits to the ER, it is important to take account of the involvement of doctors and the use of facilities from other departments, for example departments that are asked to consult (surgery, internal medicine) or the plaster room. Independent costing studies can therefore be required if the ER is an important part of the economic evaluation.

4.5 Transportation by ambulance

Table 4-1 shows the reference prices for transportation by ambulance. The reference price for the umbrella healthcare cost unit 'ambulance journey' has been calculated on the basis of the total expenditure as reported by the RIVM and the number of ambulance journeys undertaken, as stated in the *Sektorkompas Ambulancezorg*

(Ambulance Care Sector Compass) (hierarchy level B).^{28,44} A distinction has then been made according to transport on demand (non-emergency) and emergency transport. On the basis of information from the *NZa's Tariefbeschikking regionale ambulancevoorzieningen* (Regional ambulance services rates ruling), it has been assumed that emergency transport is 2.25 times more expensive than transport on demand.⁴⁵

Table 4-1 Reference prices for transportation by ambulance (Euro 2022)

	Reference price 2022
Ambulance journey	528
Transport on demand	293
Emergency transport	657
Ambulance care in the Netherlands (2020) (Ambulancezorg Nederland (2020)) Ambulance Care Sector Compass 2019 (Sektorkompas Ambulancezorg 2019) ⁴⁴ NZa (2022) NZa Regional ambulance services rates ruling (Tariefbeschikking regionale ambulancevoorzieningen) ⁴⁵ RIVM (2019) Costs of diseases (Kosten van ziekten) ²⁸	

4.6 Medicines

When calculating the costs for medicines a distinction must be made between medicines which may only be supplied on prescription by a pharmacy (prescription-only medicines; POM) and medicines which are available without prescription (Over The Counter; OTC). This distinction is important for calculation of costs. This is because POM medicines fall under the Healthcare (Market Regulation) Act (*Wet marktordening gezondheidszorg*; Wmg). Medicines can be part of inpatient care (care for patients in a hospital or other institution), or can be prescribed to patients who are not in an institution (extramural care). Extramural medicines are only reimbursed from the basic healthcare package if the medicine is included in the *Geneesmiddelenvergoedingssysteem* (Medicine Reimbursement System, GVS).

The specification of costs of Wmg medicines is examined below first and this involves, among other things, a discussion of the valuation of medicines and the issuing costs. This is followed by a description of the specification of costs for inpatient medicines. Lastly, the specification of costs of OTC medicines is examined.

4.6.1 Wmg medicines

Medicines which fall under the Wmg are valued by adding up the purchase price of the medicine to the reimbursement for the costs of the pharmaceutical care (in other words: issuing costs).

$$WMG \text{ costs} - \text{medicines} = \text{Purchase price of medicine} + \text{Costs pharmaceutical care}$$

4.6.1.1 The valuation of medicines

The primary publicly accessible source for determining the costs of medicines is the National Health Care Institute website: www.medicijnkosten.nl. The website provides an insight into the variation in costs between the various manufacturers that supply the medicine. The costs of the Wmg medicines can be calculated on the basis of the dosage and the frequency of use. The information on this website is updated every month and is based on data from the G-standard. In addition to the purchase price of the medicines, information is also provided on the amount of any personal contribution for the patient. From a social perspective all costs must be included in the calculation, including any personal contribution for the patient. For Wmg-medicines the website [medicijnkosten.nl](http://www.medicijnkosten.nl) contains the official prices that can be claimed, excluding the costs for pharmaceutical care. The valuation of medicines is based on the lowest costs of the medicine in question.

Alternative sources are the G-standard of the Z-index, the claims files of healthcare

insurers (Vektis) and national registries, such as the GIP-databank (Medicines and medical devices Information Project database) (www.gipdatabank.nl; freely accessible), the *Stichting Farmaceutische Kengetallen* (Foundation for Pharmaceutical Statistics) (SFK; www.sfk.nl; freely accessible). Using the G-standard and the claims files of healthcare insurers costs money. The data in the GIP-databank (Medicines and medical devices Information Project database) and SFK are accessible to the public, but the data is aggregated. The average costs per user per year can be obtained from the GIP-databank (Medicines and medical devices Information Project database), disaggregated for branded and generic medicines.

The prices as reported on www.medicijnkosten.nl include 9% VAT (Value Added Tax). The prices in the G-standard exclude VAT as standard. Prices excluding VAT should be used in economic evaluations.

4.6.1.2 *Costs for pharmaceutical care (issuing costs)*

For each delivered medicine, an amount is charged for issuing the medicine to the patient. In other words if, for example, a prescription is used to prescribe three different medicines, three times these costs will be calculated. The amount of the issue fee does not depend on the number of days for which the medicine is prescribed. The maximum issue period is 90 days.

Since 2012, healthcare insurers have been free to determine the fees for issuing a medicine to a patient in their negotiations with the pharmacies and the rates may therefore differ per pharmacy. On the website www.medicijnkosten.nl it is assumed that an amount of between €6.00 and €7.00 is charged for a standard issue of a medicine. The issue costs are therefore assumed to be €6.50 per issue. In a number of situations the amount of the issue fee may differ from the standard issue fee. If medicine is being issued for the first time, this amount is increased to between €12.00 and €15.00. Consequently, the charge for a first issue is assumed to be €13.50. Furthermore, different agreements can be made about the fees for issuing medicines outside office hours, the issuing of specific medicines, such as medicines which are not readily available (the so-called pharmacy-prepared medicines) and medicines which are issued in weekly dosage systems. Indications of the issue costs can be found on the website: www.medicijnkosten.nl. Generally speaking there is no information about first issues and specific issues of medicines. The following rule of thumb is then applied, namely that a first issue is assumed if the medicine has been prescribed for a short period, for example for less than 30 days. The calculation of the costs of medication for chronic use is based on the standard fee.

4.6.1.3 *Other comments*

Healthcare insurers and pharmacies can make mutual agreements about discount percentages on the purchase price of medicines. The purchase prices may differ per pharmacy as a result. It is only possible to obtain exact information about healthcare insurers' reimbursements to pharmacies on the basis of data from healthcare insurers. In the absence of information on discount percentages, the list prices (the prices without a discount) are used to calculate the cost of medicines, as reported at www.medicijnkosten.nl.

Independent costing studies based on pharmacy financial records have to be used for the valuation of medicines which have to be specially prepared at the pharmacy. In doing so, the costs of raw materials and the costs of the actual preparation have to be taken into account. This is, however, only important if these medicines are an important part of the assessment.

In a number of cases additional costs can play a role when using Wmg medicines. Examples include injections of which the dosage differs from the standard packaging as supplied by the manufacturer.

4.6.1.4 *Costs for medicines for inpatient use*

Because hospitals and other institutions often use large volumes of medicines, hospitals and other institutions may be able to purchase medicines at lower prices than public pharmacies as a consequence of negotiations with pharmaceutical companies. Consequently, the costs of medicines in an inpatient setting may differ from the costs in an extramural setting. In practice it is often not possible to find out the purchase prices for inpatient use. Prices may also vary per hospital. If the costs of certain medicines during an admission or day treatment form a significant proportion of the total costs, it will be necessary to carry out an independent investigation, for example using hospital financial records. If this is not possible, the website www.medicijnkosten.nl will be used.

In addition to any discounts which individual hospitals negotiate with manufacturers, (additional) price reductions apply for some expensive medicines due to financial arrangements which manufacturers have agreed with the *Buro Financiële Arrangementen Geneesmiddelen* (Drug Price Negotiation Unit, BFAG) of the Ministry of Public Health, Welfare and Sport (VWS). Individual discount percentages per product are confidential and not set off in the prices reported at www.medicijnkosten.nl. By contrast, the total annual reduction in expenditure across all medicines for which an arrangement has been made is published.⁴⁶ However, because the variation in discounts may be considerable and because discounts per product are unavailable, it is once again advisable to use the prices available at www.medicijnkosten.nl.

The costs for pharmaceutical care for extramural medicines can be used to approximate the hospital pharmacy issue costs. Another option is to perform an independent costing study using hospital financial records. This option is recommended if medicines which are administered during a stay in hospital represent a large proportion of the total costs.

For medicines which are administered parenterally by a nurse in the hospital, account must be taken of the costs of administering the medicine, for example the costs of an intravenous drip system and the costs for a nurse. The costs of subcutaneous and intravenous administration of oncology drugs is described in paragraph 4.2. If the cost prices of administering non-oncology drugs are unavailable, the cost prices of administering oncology drugs as described in paragraph 4.2 can be used as a proxy price. One condition for doing so is that the process of administering non-oncology drugs (including location, number of healthcare providers involved and treatment time) corresponds to the process for oncology drugs. It is up to the researcher to determine the extent to which this condition is fulfilled and whether the use of a proxy price is justified.

Various types of treatment are increasingly being offered in a home situation, with treatment taking place under the supervision of a medical specialist (transferred hospital care). The costs of administering medicines in the home situation can differ considerably from the costs of administering the same medicines in hospital.⁴⁷

4.6.2 **Over-the-counter (OTC) medicines**

OTC medicines are valued using the medicine's sales price. The status of self-care medicines can be found in the *Farmacotherapeutisch Kompas* (Pharmacotherapeutic Compass) (www.farmacotherapeutischkompas.nl). Information about the valuation of OTC medicines can be found at www.medicijnkosten.nl. No issue costs are charged on self-care medicines (including if the medicine is issued on prescription). It is preferable to assume the sales price of whole standard packages.

4.7 **Medical procedures**

Medical procedures are preferably valued using an independent costing study, particularly if they make up a large share of the total costs. The most important

variables which determine the cost price of medical procedures are the length of time, the number of staff and the use of special materials such as implants. If an independent costing studies is impossible, hospital financial records can be used.

In 2022 a bottom-up costing studies in five Dutch hospitals was used as a basis for calculating integral cost prices per minute for the use of an operating room (OR), with a distinction being made between conventional and hybrid operating rooms) (hierarchy level A).⁴⁸ The cost price of using a conventional OR is €11.09 per minute and the cost price of using a hybrid OR is €23.34 per minute. These cost prices include costs for accommodation, equipment, staff and overheads. If these cost prices are used, a check needs to be carried out to determine whether the underlying data is representative for the study. The costs of materials are not included in the cost prices.

4.8 Diagnostics

Primary diagnostics covers the (diagnostic) care provided by hospitals, independent treatment centres, thrombosis clinics and GP laboratories.

Table 4-2 shows the reference prices of many imaging diagnostics. This data comes from the NZa's *Kostprijsonderzoek medische specialistische zorg* (Cost price survey for specialist medical care) 2016 (hierarchy level A).⁴⁹ The costing studie can be obtained from the NZa. The weighted average has been calculated on the basis of the ratio of the number of claimed care activities per type of diagnostics.

Table 4-2 Reference prices for diagnostics (Euro 2022)

Type of diagnostics	Reference price 2022
MRI general (weighted average)	267
MRI hip(s)/lower extremity/extremities	264
MRI brain	254
MRI lumbosacral spinal column	227
MRI shoulder(s)/upper extremity/extremities	271
MRI abdomen	342
CT general (weighted average)	188
CT scan of the abdomen, retroperitoneum, including oral and/or rectal contrast substance, with or under administration of an intravenous contrast agent.	214
CT scan of the thorax, the heart and large blood vessels including addition of contrast agent	196
CT scan of the brain and/or skull with or without intravenous contrast agent	153
CT scan of the lower extremities, with or without intravenous contrast	179
CT scan of the facial skeleton, with or without intravenous contrast	147
SPECT general (weighted average)	445
SPECT of skeleton detail	266
SPECT of ventricles ECG-triggered, rest with EF calculations	515
SPECT of the brain	626
SPECT of abdomen	323
PET general (weighted average)	963
PET WB (Whole Body), oncology	971
PET Partial (neurological, cardiological)	700
Ultrasound general (weighted average)	103
Ultrasound of the abdominal organs	118
Ultrasound lower extremity/extremities	97.16
On-screen ultrasound in connection with pregnancy	85.76
Ultrasound of mammary gland	95.80

Ultrasound of the thyroid and/or neck	91.08
X-ray	82.17
24 hour blood pressure measurement	96.78
MRI = Magnetic Resonance Imaging CT = Computer Tomography SPECT = Single-Photon Emission Computer Tomography PET = Positron Emission Tomography Source: Cost price survey for specialist medical care ⁴⁹	

Table 4-3 shows the reference prices of laboratory diagnostics for general research. This data comes from the NZa's Cost price survey for specialist medical care 2016 (hierarchy level A).⁴⁹ The weighted average has been calculated on the basis of the ratio of the number of claimed care activities per type of diagnostics.

Account must also be taken of the collection of any samples (for example blood and urine). If these costs are not included in the cost price of days of care, day treatment or outpatient visits, they must be included separately. The hospital receives a reimbursement for the collection of samples which is based on the so-called order rate. The 2022 average order rate was €4.22. The average number of tests per sample is estimated to be 6, which results in an order rate per test of €0.70.

Table 4-3 Reference prices for laboratory diagnostics (Euro 2022)

	Reference price 2022
CRP test	4.38
HbA1C test	4.52
TSH test	4.14
Creatinine test	1.49
Creatinine clearance	6.14
ALAT test	1.74
CRP = C-reactive protein HbA1C = Haemoglobin A1C TSH = Thyroid stimulating hormone ALAT = Alanine Aminotransferase Source: Cost price survey for specialist medical care ⁴⁹	

4.9 Blood products

The main publicly accessible source for determining the costs of blood products is the National Health Care Institute website: www.farmacotherapeutischkompas.nl (hierarchy level D). The website provides an insight into the variation in costs between the various manufacturers that supply the blood products. The costs can be calculated on the basis of the dosage and the frequency of use. The information on this site is updated every month and is based on data from the Medicines Evaluation Board (MEB) or the European Medicines Agency (EMA). In addition to the purchase price of the blood products, information is also provided on the amount of any personal contribution for the patient.

The prices as reported on www.farmacotherapeutischkompas.nl include 9% VAT (Value Added Tax).

4.10 Devices

The term devices covers a varied range of products. Table 4-4 shows an overview of the 10 devices with the highest costs per claim, as reported at www.gipdatabase.nl (hierarchy level B) where a broad range of costs of devices per claim are presented.⁵⁰ If desired, the GIP-databank (Medicines and medical devices Information Project

database) also provides an overview of the most frequently claimed devices and the devices with the most users.

If specific devices are unavailable in the GIP-databank (Medicines and medical devices Information Project database), the applicable market prices can be used. When doing so, account must be taken of the fact that there may be a lot of variation in the specifications of devices which can lead to differences in prices. Different providers may also apply different prices for the same product.

Table 4-4 Reference prices for top 10 devices with highest costs per claim (Euro 2022)

Unit, per item	Reference price 2022
Arm prosthesis	3540
Leg prosthesis	2790
Devices for the use of communication devices (e.g. computers for people with a physical disability)	1550
Devices for communication and information in conjunction with visual impairments (e.g. magnifying glasses)	1230
Other devices for communication, information and detection	1170
Other devices for mobility	1040
Other devices for diabetes	974
Other devices for arm-hand-finger function	927
Orthopaedic shoes	889
Special optical devices	731
Source: The National Health Care Institute (2022) Gip database ⁵⁰	

4.11 GP consultations

The most important variables which determine the cost price of GP consultations are the length of time, the location and possibly the use of material. Table 4-5 shows the reference price for GP care, based on the total expenditure in 2021 and the number of consultations in 2021 (hierarchy level B).⁵¹ A distinction has been made between a standard consultation and a home visit. The costs were allocated to these units on the basis of the directly attributable costs per volume, plus the indirect costs (registration fees). Registration fees have been allocated proportionally to consultations and visits.

Information about the expenditure for the somatic practice nurse (*Praktijkondersteuner Huisarts (POH)-somatiek*) and the number of appointments is unavailable, meaning that no distinction can be made between the reference prices for the somatic practice nurse and those for GPs. If the costs of the practice nurse make up a significant proportion of the economic evaluation, independent costing studies will be essential.

Table 4-5 Reference prices for GP consultations (Euro 2022)

	Reference price 2022
Consultation, average (also applicable to telephone and e-mail consultation)	30.87
Consultation shorter than 20 minutes (also applicable to telephone and e-mail consultation)	28.74
Consultation longer than 20 minutes (also applicable to telephone and e-mail consultation)	42.47
Visit, average	43.31
Visits shorter than 20 minutes	36.72
Visits longer than 20 minutes	48.21
Source: The National Health Care Institute (2023) <i>Zorgcijfersdatabank</i> ⁵¹	

4.12 Paramedical care

There are various types of paramedical care, including physiotherapy, exercise therapy (*Mensendieck and Cesar*), speech therapy, occupational therapy and dietary

advice. A significant portion of the costs of paramedical care consists of the practitioner's time and the costs of equipment.

The reference prices for paramedical care are included in Table 4-6. These reference prices are based on the total expenditure and production data in 2021 in the extramural setting (hierarchy level B).⁵²

Table 4-6 Reference prices for paramedical care per session (Euro 2022)

	Reference price 2022
Physiotherapy	38.89
Exercise therapy	42.91
Speech therapy	40.93
Occupational therapy	24.32
Dietary advice	24.70
Combined lifestyle interventions (<i>Gecombineerde leefstijlinterventies</i> , GLI)	128

Source: The National Health Care Institute (2023) *Zorgcijfersdatabank*⁵²

4.13 Elderly care

Table 4-7 shows the reference prices for inpatient elderly care. The reference price for inpatient care (nursing and care, including daytime activities) is based on the total expenditure and production data in 2022. This is an average for patients with various care intensities (hierarchy level B).⁵³ Data for specific care intensities is available from the *Zorgcijfersdatabank*.⁵³

The reference price of daytime activities is based on the cost price of daytime activities basis calculated by KPMG (hierarchy level A).⁵⁴

Independent costing studies can be required for patient populations with a relatively high or low care intensity, or when these costs form a significant proportion of the economic evaluation.

Table 4-7 Reference prices for nursing homes and care homes (Euro 2022)

	Reference price 2022
Nursing and care, incl. daytime activities, per day	290
Daytime activities, per part of a day	83.29

Sources: The National Health Care Institute (2023) *Zorgcijfersdatabank*⁵³ and KPMG (2018) Long-term-care costing study⁵⁴

Table 4-8 shows the reference prices for geriatric rehabilitation care. The reference prices are based on the total costs of the entire stay and the average days per stay in 2021, indexed to 2022 (hierarchy level B).^{55,56}

Table 4-8 Reference prices for geriatric rehabilitation care (Euro 2022)

	Reference price 2022
Geriatric rehabilitation care, average per day	329
Geriatric rehabilitation care following amputation, per day	306
Geriatric rehabilitation care following a cerebrovascular accident (CVA), per day	357
Geriatric rehabilitation care following elective operation, per day	360
Geriatric rehabilitation care following trauma, per day	331
Geriatric rehabilitation care other diagnoses, per day	311

Sources: The National Health Care Institute (2023) *Zorgcijfersdatabank*⁵⁶ and Vektis (2021) Geriatric rehabilitation care factsheet⁵⁵

4.14 Home care

The healthcare cost units which fall under home care include household help, personal care, supervision, nursing and treatment. Cost prices for these types of home care are based on the figures and volumes presented in the *Zorgcijfersdatabank* (hierarchy level B).⁵³

Table 4-9 shows the reference prices for home care. The reference prices for personal

care, nursing, supervision and treatment are based on the total expenditure and production data in 2022 (hierarchy level B).⁵³ Within these healthcare cost units no distinction is made according to elderly home care and home care within the framework of mental healthcare or disability care.

Table 4-9 Reference prices for home care (Euro 2022)

Distinction between healthcare cost units, per hour	Reference price 2022
1. Household help (help with clearing up and cleaning the living space)	32.76
2. Personal care (supporting or assuming responsibility for activities relating to personal care)	57.58
3. Supervision (activities to support the performance of general daily tasks)	64.00
4. Nursing (actions to help recovery, prevention or exacerbation of the disorder)	75.00
5. Treatment (necessary actions in connection with disorder, including medical care)	138

Sources: The National Health Care Institute (2023) *Zorgcijfersdatabank*⁵³

In addition to the costs which are directly related to the care for patients, account must be taken of the travel expenses incurred by the healthcare provider. Based on the data from the *Zorgcijfersdatabank* the assumption is €30.64 per visit (hierarchy level B).⁵³ The healthcare provider's travel expenses consist of the costs of travel time and the material costs (transport, maintenance and depreciation). The total costs of home care can be calculated as follows:

$$\begin{aligned}
 & \text{Total costs per home care visit} \\
 &= (\text{Reference price home care} * \text{Number of hours of care provided}) \\
 &+ \text{Travel expenses}
 \end{aligned}$$

Example 7

Home care

One person receives 2 hours of home nursing every day. The total costs of home care per visit is therefore €30.64 + 75 * 2 = €180.64 per day.

4.15 Mental healthcare

Since the change to the system in 2014, primary, secondary and tertiary mental healthcare (GGZ) have been replaced by a subdivision into echelons. These echelons are supposed to form a continuum to ensure that appropriate care is provided in the right place.

Patients with minor psychological problems are treated by their GP in cooperation with a practice nurse. People with moderate, but not complex, disorders falls within general basic mental healthcare. This treatment may consist of conversations with, for example, a(n) (independent) psychologist or psychotherapist, or treatment via the internet (e-health). Patients with a more complex and/or more high-risk disorder are referred to mental healthcare specialists. This type of mental healthcare is provided by a psychiatrist, clinical psychologist and/or psychotherapist in a mental healthcare institution. The type of the treatment can vary from outpatient, day treatment and part-time or clinical admission. Sheltered *accommodation Regionale Instellingen voor Beschermd Wonen* (Regional Institution for Protected Living, RIBW) exists for people who may require long-term-care, but for whom care provided by a psychiatric hospital would be excessive.

The reference prices for mental healthcare per healthcare provider are each discussed below. With the exception of GP consultations and consultations with a GP mental healthcare nurse practitioner, the assumption is that each appointment will take an hour, in line with the *Kostprijsonderzoek geestelijke gezondheidzorg en forensische zorg 2020* (Mental healthcare and forensic care costing studies 2020).⁵⁷ Furthermore, the cost price per minute is provided because the duration of the appointment per minute takes precedence in the *Zorgprestatiemodel* (care

performance model) as of 2022.

4.15.1 GP

At a GP practice, mental healthcare can be provided by the GP or by a practice nurse. The cost price of a consultation with the GP is €30.87 (see paragraph 4.11).

For the calculation of the cost price of an appointment with the mental healthcare practice nurse the data from the *Zorgcijfersdatabank* on the total costs and volumes relating to mental healthcare provided by practice nurses in 2021 is used, indexed to 2022, as shown in Table 4-10 (hierarchy level B).⁵¹

Table 4-10 Reference price for mental healthcare practice nurse

	Reference price 2022
Consultation, average (also applicable to telephone and e-mail consultation)	20.85
Consultation, shorter than 20 minutes (also applicable to telephone and e-mail consultation)	9.31
Consultation, longer than 20 minutes (also applicable to telephone and e-mail consultation)	23.12
Visit, average	28.50
Visit, shorter than 20 minutes	17.34
Visit, longer than 20 minutes	28.91
Group consultation	11.56
Source: The National Health Care Institute (2023) <i>Zorgcijfersdatabank</i> ⁵¹	

4.15.2 Social work

The cost price for social work is based on the mental healthcare and forensic care costing study 2020 (hierarchy level A), which was based in 2022 on an indexed cost price of €127 per appointment and €2.12 per minute.⁵⁷

4.15.3 Appointment with independent basic mental healthcare provider

The valuation of an appointment with an independent healthcare provider was made using a weighted average of the cost prices provided on basic mental healthcare providers. This includes various categories psychologists, nurses and doctors. The mental healthcare and forensic care costing study 2020 was used for this valuation (hierarchy level A).⁵⁷ A cost price per healthcare provider, indexed to 2022, of €98.61 per appointment and €1.64 per minute was calculated on this basis.

4.15.4 General basic mental healthcare institutions, appointment with healthcare provider

A weighted average of the cost prices provided on healthcare providers at general basic mental healthcare institutions was used for the valuation of an appointment with a healthcare provider at a general basic mental healthcare institution. This includes various categories psychologists, nurses and doctors. The mental healthcare and forensic care costing study 2020 was used for this valuation (hierarchy level A).⁵⁷ A cost price per healthcare provider, indexed to 2022, of €121 per appointment and €2.01 per minute was calculated on this basis.

4.15.5 Appointment with independent specialist mental healthcare provider

The valuation of an appointment with an independent specialist mental healthcare provider was made using a weighted average of the cost prices provided on independent specialist mental healthcare providers. This includes various categories of psychologists, nurses and doctors. The mental healthcare and forensic care costing study 2020 was used for this valuation (hierarchy level A).⁵⁷ A cost price per healthcare provider, indexed to 2022, of €140 per appointment and €2.33 per minute was calculated on this basis.

4.15.6 Specialist mental healthcare institutions, appointment with healthcare provider

A weighted average of the cost prices provided on healthcare providers at specialist mental healthcare institutions was used for the valuation of an appointment with a healthcare provider at a specialist mental healthcare institution. This includes various

categories psychologists, nurses and doctors. The mental healthcare and forensic care costing study 2020 was used for this valuation (hierarchy level A).⁵⁷ A cost price per healthcare provider, indexed to 2022, of €134 per appointment and €2.23 per minute was calculated on this basis.

4.15.7 General Hospital Psychiatric Unit (PAAZ)/University Hospital Psychiatric Clinic (PUK), contact with specialist mental healthcare provider

A weighted average of the cost prices provided on healthcare providers at PAAZ/PUK institutions was used for the valuation of an appointment with a healthcare provider at a PAAZ/PUK institution. This includes various categories of psychologists, nurses and doctors. The mental healthcare and forensic care costing study 2020 was used for this valuation (hierarchy level A).⁵⁷ A cost price per healthcare provider, indexed to 2022, of €148 per appointment and €2.33 per minute was calculated on this basis.

4.15.8 Day of care in a psychiatric institution

A weighted average for the various care intensity packages of stay was used for the valuation of a day of care in a psychiatric hospital/institution. The mental healthcare and forensic care costing study 2020 was used for this valuation (hierarchy level A).⁵⁷ A cost price per day of care in a psychiatric institution, indexed to 2022, of €327 per day was calculated on this basis.

4.15.9 Day of care in a General Hospital Psychiatric Unit (PAAZ)/University Hospital Psychiatric Clinic (PUK)

A weighted average for the various care intensity packages of stay was used for the valuation of a day of care in a PAAZ/PUK. The mental healthcare and forensic care costing study 2020 was used for this valuation (hierarchy level A).⁵⁷ A cost price per day of care in a psychiatric institution, indexed to 2022, of €490 per day was calculated on this basis.

4.15.10 Specialised mental healthcare, daytime activities

The mental healthcare and forensic care costing study 2020 (hierarchy level A) was used for the valuation of daytime activities within specialised mental healthcare.⁵⁷ An indexed cost price of €22.81 per part of a day for 2022 was calculated on this basis.

4.16 Rehabilitation

Cost price calculations for rehabilitation are complex due to considerable differences between the treatment of patients and the large quantity of equipment used. The most important variables which determine the cost price are the length of time and the use of equipment.

The reference prices for rehabilitation in Table 4-11 are based on the *Brancherapport Revalidatie 2020* (Rehabilitation Sector Report 2020) (hierarchy level B).⁵⁸ The reference prices for rehabilitation are determined by dividing the total costs across the rehabilitation centres by the number of consultations carried out and the number of days of care. The various costs for children and adults were calculated on the basis of the relative share in the total patient population and costs.

Table 4-11 Reference prices for rehabilitation (Euro 2022)

	Reference price 2022
Rehabilitation treatment consultation, children and adults	371
Rehabilitation treatment consultation, children	497
Rehabilitation treatment consultation, adults	347
Day of care rehabilitation centre, children and adults (incl. rehabilitation treatment hours)	910
Day of care rehabilitation centre, children (incl. rehabilitation treatment hours)	1368
Day of care rehabilitation centre, adults (incl. rehabilitation treatment hours)	849
Source: Rehabilitation Sector Report 2020 (Brancherapport Revalidatie 2020) ⁵⁸	

4.17 Disability care

Disability care covers a large number of different types of healthcare organisations. The most important healthcare organisations in terms of size are those for people with mental and sensory disabilities, the day care centres for the disabled and the substitute family homes. The most important variables which determine the cost price of care are staff resources, the length of time and the use of devices and equipment.

The reference prices for inpatient care in Table 4-12 are based on the total expenditure and volume of care provided in 2022, as taken from the *Zorgcijfersdatabank* (hierarchy level B).⁵⁹

Table 4-12 Reference prices for disability care (Euro 2022)

Inpatient care (per day)	Reference price 2022
People with mental disabilities, incl. daytime activities	282
People with mental disabilities, excl. daytime activities	163
People with minor mental disabilities, incl. daytime activities	345
People with minor mental disabilities and significant behavioural disorders, incl. daytime activities	458
People with physical disabilities, incl. daytime activities	301
People with physical disabilities, excl. daytime activities	234
People with auditory and communication disabilities, incl. daytime activities	429
People with auditory and communication disabilities, excl. daytime activities	263
Visually impaired people, incl. daytime activities	277
Visually impaired people, excl. daytime activities	208

Source: The National healthcare Institute (2023) *Zorgcijfersdatabank*⁵⁹

4.18 Reference prices

Table 4-13 provides an overview of all reference prices presented in this chapter. The paragraph which deals with the healthcare cost unit in question is indicated in the last column.

Table 4-13 Reference prices for costs in healthcare (Euro 2022)

Unit	Reference price	Paragraph
Days of care		
Day of care excluding staff costs, hospital	537	4.1
Day of care including staff costs, hospital	644	4.1
Day of care, intensive care (incl. diagnostics and medication)	2727	4.1
Day treatment		
Day treatment, hospital	335	4.2
Intravenous administration, hospital	171	4.2
Subcutaneous administration, hospital	75.28	4.2
Outpatient visits		
Outpatient visits, hospital	120	4.3
Accident and emergency	258	Fout! Verwijzingsbron niet gevonden.
Transportation by ambulance		
Ambulance journey, weighted average	528	4.5
Ambulance journey, transport on demand	293	4.5
Ambulance journey, emergency transport	657	4.5
Medical procedures		
Conventional OT, use per minute	11.09	4.7
Hybrid OT, use per minute	23.34	4.7
Diagnostics		
MRI general (weighted average)	267	4.8

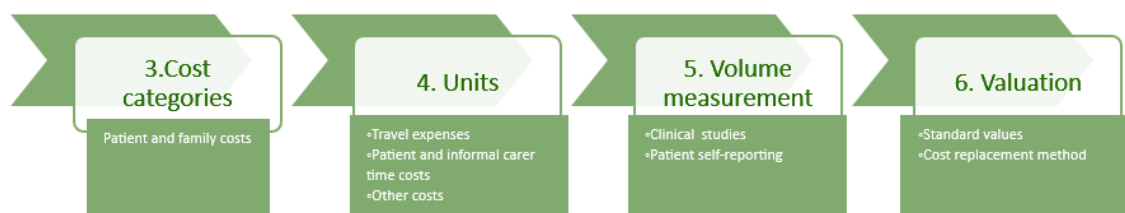
MRI hip(s)/ lower extremity/extremities	264	4.8
MRI brain	254	4.8
MRI lumbosacral spinal column	227	4.8
MRI shoulder(s)/upper extremity/extremities	271	4.8
MRI abdomen	342	4.8
CT general (weighted average)	188	4.8
CT scan of the abdomen, retroperitoneum, including oral and/or rectal contrast substance, with or under administration of an intravenous contrast agent.	214	4.8
CT scan of the thorax, the heart and large blood vessels including addition of contrast agent	196	4.8
CT scan of the brain and/or skull with or without intravenous contrast agent	153	4.8
CT scan of the lower extremities, with or without intravenous contrast	179	4.8
CT scan of the facial skeleton, with or without intravenous contrast	147	4.8
SPECT general (weighted average)	445	4.8
SPECT of skeleton detail	266	4.8
SPECT of ventricles ECG-triggered, rest with EF calculations	515	4.8
SPECT of the brain	626	4.8
SPECT of abdomen	323	4.8
PET general (weighted average)	963	4.8
PET WB (Whole Body), oncology	971	4.8
PET Partial (neurological, cardiological)	700	4.8
Ultrasound general (weighted average)	103	4.8
Ultrasound of the abdominal organs	118	4.8
Ultrasound lower extremity/extremities	97.16	4.8
On-screen ultrasound in connection with pregnancy	85.76	4.8
Ultrasound of mammary gland	95.80	4.8
Ultrasound of the thyroid and/or neck	91.08	4.8
X-ray	82.17	4.8
24 hour blood pressure measurement	86.78	4.8
CRP test	4.38	4.8
HbA1C test	4.52	4.8
TSH test	4.14	4.8
Creatinine test	1.49	4.8
Creatinine clearance	6.14	4.8
ALAT test	1.74	4.8
Auxiliary materials		
Arm prosthesis	3540	4.10
Leg prosthesis	2790	4.10
Devices for the use of communication devices (e.g. computers for people with a physical disability)	1550	4.10
Devices for communication and information in conjunction with visual impairments (e.g. magnifying glasses)	1230	4.10
Other devices for communication, information and detection	1170	4.10
Other devices for mobility	1040	4.10
Other devices for diabetes	974	4.10
Other devices for arm-hand-finger function	927	
Orthopaedic shoes	889	4.10
Special optical devices	731	4.10
GP consultations		
GP, consultation average (also applicable to telephone and e-mail consultation)	30.87	4.11
GP, consultation shorter than 20 minutes (also applicable to telephone and e-mail consultation)	28.74	4.11
GP, consultation longer than 20 minutes (also applicable to telephone and e-mail consultation)	42.47	4.11
GP, visit average	43.31	4.11
GP, visit shorter than 20 minutes	36.72	4.11

GP, visit longer than 20 minutes	48.21	4.11
Paramedical care		
Physiotherapy (per session)	38.89	4.12
Exercise therapy (per session)	42.91	4.12
Speech therapy (per session)	40.93	4.12
Occupational therapy (per session)	24.32	4.12
Dietary advice (per session)	24.70	4.12
Combined lifestyle interventions (Gecombineerde leefstijlinterventies, GLI)	128	4.12
Care for the elderly		
Nursing and care, incl. daytime activities, per day	290	Fout! Verwijzingsbron niet gevonden.
Daytime activities, per part of a day	83.29	Fout! Verwijzingsbron niet gevonden.
Geriatric rehabilitation care, average per day	329	4.13
Geriatric rehabilitation care following amputation, per day	306	4.13
Geriatric rehabilitation care following a cerebrovascular accident (CVA), per day	357	4.13
Geriatric rehabilitation care following elective operation, per day	360	4.13
Geriatric rehabilitation care following trauma, per day	331	4.13
Geriatric rehabilitation care other diagnoses, per day	311	4.13
Home care (care for the elderly, mental healthcare and disability care)		
Home help	32.76	4.14
The costs of personal care at home	57.58	4.14
Supervision at home, per hour	64.00	4.14
Nursing at home, per hour	75.00	4.14
Treatment at home, per hour	138	4.14
Travel expenses, per visit	30.64	4.14
Mental healthcare		
Mental healthcare practice nurse, consultation average (also applicable to telephone and e-mail consultation)	20.85	4.15.1
Mental healthcare practice nurse, consultation shorter than 20 minutes (also applicable to telephone and e-mail consultation)	9.31	4.15.1
Mental healthcare practice nurse, consultation longer than 20 minutes (also applicable to telephone and e-mail consultation)	23.12	4.15.1
Mental healthcare practice nurse, visit average	28.50	4.15.1
Mental healthcare practice nurse, visit shorter than 20 minutes	17.34	4.15.1
Mental healthcare practice nurse, visit longer than 20 minutes	28.91	4.15.1
Mental healthcare practice nurse, group consultation	11.56	4.15.1
Social work appointment	127	0
Appointment with independent basic mental healthcare provider	98.61	4.15.3
Appointment with healthcare provider in general basic mental healthcare institutions	121	4.15.4
Appointment with independent specialist mental healthcare provider	140	4.15.5
Appointment with healthcare provider in specialist mental healthcare institutions	134	4.15.6
Appointment with healthcare provider in a PAAZ/PUK	148	4.15.7
Day of care, psychiatric institution	327	4.15.8
Day of care, PAAZ/PUK	490	4.15.9
Daytime activities part of a day, specialised mental healthcare	22.81	4.15.10
Rehabilitation		
Rehabilitation treatment consultation, children and adults	371	4.16
Rehabilitation treatment consultation, children	497	4.16
Rehabilitation treatment consultation, adults	347	4.16
Day of care rehabilitation centre, children and adults (incl. rehabilitation treatment hours)	910	4.16
Day of care rehabilitation centre, children (incl. rehabilitation treatment hours)	1368	4.16
Day of care rehabilitation centre, adults (incl. rehabilitation treatment hours)	849	4.16

Disability care		
Inpatient care (per day), people with mental disabilities, incl. daytime activities	282	4.17
Inpatient care (per day), people with mental disabilities, excl. daytime activities	163	4.17
Inpatient care (per day), people with minor mental disabilities, incl. daytime activities	345	4.17
Inpatient care (per day), people with minor mental disabilities and significant behavioural disorders, incl. daytime activities	458	4.17
Inpatient care (per day), people with physical disabilities, incl. daytime activities	301	4.17
Inpatient care (per day), people with physical disabilities, excl. daytime activities	234	4.17
Inpatient care (per day), people with auditory and communication disabilities, incl. daytime activities	429	4.17
Inpatient care (per day), people with auditory and communication disabilities, excl. daytime activities	263	4.17
Inpatient care (per day), visually impaired people, incl. daytime activities	277	4.17
Inpatient care (per day), visually impaired people, excl. daytime activities	208	4.17

5 Costs of patients and family

Figure 5-1 Step-by-step plan for costs of patients and family



Patient and family costs are costs which occur outside the formal healthcare sector but which still have a direct relationship with the disease or treatment. This chapter examines the most important types of costs which fall within this cost category: travel expenses (paragraph 5.1), cost of time spent by the patient (paragraph 5.2) and cost of time spent by the informal carer (paragraph 5.3).

5.1 Travel expenses

Travel expenses which are related to medical treatment must, in principle, be included in an economic evaluation from a social perspective. It must be established in advance whether these costs are expected to influence the total and incremental costs, and therefore whether they are relevant enough to be included. When patients visit, for example, a hospital, GP or physiotherapist for treatment or a check-up, they will normally incur travel expenses. Paragraph 5.1.1 provides methods for carrying out the relevant volume measurement (e.g. travel frequency and travel distance), after which paragraph 5.1.2 describes the valuation (costs).

5.1.1 Volume measurement methods for travel expenses

The volume measurement for travel expenses consists of determining the travel frequency and the travel distance per relevant type of transport. Generally speaking, a distinction is made between four types of transport, namely car, public transport, transport covered by the Social Support Act (*Wet maatschappelijke ondersteuning*, Wmo) and taxi. Transport by ambulance is not considered here because these costs are included in costs incurred in healthcare (paragraph 4.5). However, it is recommended, when enquiring about the various types of transport, also to ask immediately about transportation by ambulance so that the volume measurement of all forms of transport can be combined.

Transport covered by the Wmo is not paid (in full) by patients and family and therefore only partially falls under the costs of patients and family. The part that is covered by the Wmo falls under the costs in other sectors.

It is often easy to determine the frequency of visits to healthcare organisations, given that this is related to the medical treatment and is usually already registered. However, the same does not apply to determining the distance and the method of transport. These items can be measured by including questions in the CRF, by ensuring that patients keep a record in the diary, or by means of surveys or interviews (see Example 8). The travel time can also be determined in this way.

Example 8

The following questions can be used to determine the distance and type of transport (to be answered at each treatment appointment):

Which method of transport have you used to travel from home to the hospital/GP/etc.?

- Car
- Public transport
- Taxi
- Ambulance
- Transport covered by the Social Support Act (Wmo)
- Other, namely ...

What was the one-way travel distance between your house and the hospital/GP/etc.?

- This distance was ... kilometres.

If you travelled by car, did you pay to park it?

- Yes, the parking fee was €....
- No, I did not pay a parking fee.

If no information is available about the distance actually travelled, it may be possible to use averages, see Table 5-1. In order to calculate the kilometres travelled per visit, the distance must be multiplied by two (in order to determine the total distance for a return journey). Of course, it may be necessary to deviate from the following average distances, for example in the case of medical treatment which can only be performed in a number of different hospitals. Such deviations must be clearly described and substantiated.

Table 5-1 Average distance from home to a healthcare organisation

Provision	Distance (kilometres)
Hospital (incl. outpatient clinic away from a hospital)*	4.8
Hospital (excl. outpatient clinic away from a hospital)*	7.1
GP practice	1.0
Pharmacy	1.2
Physiotherapy practice	2.2
Care and nursing home	3.7
Midwife	3.6
Child health centre	1.7

Source: CBS (2022) Proximity of provisions (*Nabijheid voorzieningen*)⁶⁰; data from 2021, or most recently available

* The majority of the hospitals have outpatient clinics at locations away from a hospital. If it is not known whether an outpatient clinic away from a hospital exists, the distance to a hospital including an outpatient clinic can be used.

5.1.2 Methods for the valuation of travel expenses

This paragraph discusses, in turn, the costs of transport by car, public transport, taxi and transport covered by the Social Support Act.

The costs incurred when travelling by car are variable and, for example, depend on the type car. The cost price includes petrol, depreciation, maintenance, tax and insurance. When calculating the costs of transport by car, the costs per kilometre as calculated by the *Nationaal Instituut voor Budgetvoorlichting* (National Institute for Family Finance Information, Nibud) are taken as a guiding principle. Given that it can be assumed that the car would also have been purchased and used without any healthcare utilisation, it is recommended that a price of €0.26 per kilometre be applied (hierarchy level A).⁶¹ This approach can be deviated from if there are well-founded reasons (for example in the case of persistent price increases). In doing so the assumption will be an average kilometre price of a car with petrol engine across various classes. This amount is higher than the reimbursement per kilometre of

€0.21 per kilometre for commuting as used by the Tax and Customs Administration (2023).⁶²

The calculation of travel expenses by car should also take account of parking fees. Ideally, this data should be collected using a questionnaire as shown in Example 8. If it is not known how much parking fee has been paid, the advice is to assume average parking fees across 32 towns/cities of €3.92 per visit (hierarchy level A).⁶³ Parking fees can differ considerably between towns and cities, regions and healthcare organisations so, if there is reason to do so, it is reasonable to deviate from these standard calculation values.

As regards travelling by public transport, it is recommended to assume a price of €0.21 per kilometre (hierarchy level A). This amount is an average price per kilometre on various types of public transport (bus, tram, metro and train), weighted according to the number of kilometres.⁶⁴

A kilometre price of €2.47, with an initial charge of €3.36 is recommended for transport by taxi and transport covered by the Social Support Act (Wmo). These amounts have been determined on the basis of the maximum rates as established by central government, based on a travel time of one hour per 50 kilometres (hierarchy level C).⁶⁵ As regards the reimbursement of the transport covered by the Wmo, the amount of the personal contribution is to be determined on the basis of the regulations within the municipality in question.

If the exact mode of transport is unknown, it is advisable to assume a kilometre price which is equal to that of a car, because that is the means of transport most commonly used to travel to a care institution. Table 5-2 shows an overview of the various transport costs prices.

Table 5-2 Costs per kilometre according to means of transport (Euro 2022, price per kilometre car in Euro 2023)

Means of transport	Standard calculation values
Car: * Price per kilometre	€0.26
* Parking fees per visit	€3.92
Public transport (price per kilometre):	€0.21
Taxi & transport covered by the Social Support Act (initial charge + price per kilometre)	€3.36 + €2.47
Sources: Nibud (2023) Car expenses (<i>Autokosten</i>) ⁶¹ , <i>Consumentenbond</i> (Consumers' Association) (2018) <i>Parkeertarieven in de stad</i> (Parking fees in town) ⁶³ , <i>Autoriteit Consument & Markt</i> (Netherlands Authority for Consumers and Markets) (2021) <i>Vervoersmonitor</i> (Transport monitor) ⁶⁴ , and Central government (2022) <i>Tarieven gebruik Taxi</i> (Taxi rates) ⁶⁵ . Figures for public transport have been indexed on the basis of the <i>Landelijke Tarieven Index</i> (National Rates Index, LTI) by 1.75% per year	

5.2 Cost of time spent by the patient

The manner in which the time investment on the part of patients has to be included in economic evaluations is the subject of some discussion. In the costing manual a distinction is made between free time and time spent on paid or unpaid work. Free time is not valued in monetary terms, but it is assumed that it has been already sufficiently valued in terms of quality of life on the effect side. Although monetary valuations of free time are available, it is difficult to disregard this aspect in any valuation of quality-of-life.⁶⁶ An additional monetary valuation of free time can therefore lead to double-counting.

By contrast, productivity losses in relation to paid and unpaid work are expressed in monetary terms. This is described in more detail in paragraph 6.1.

5.3 Cost of time spent by informal carers

Informal care is provided by someone in a patient's social circle, such as a partner, family member, friend or neighbour. The social relationship between a patient and an informal carer is crucial in the definition of informal care. Informal care is an important element of the total care a patient can receive. It can, for example, consist of care or help with daily activities.

5.3.1 Volume measurement methods for informal care

One problem when measuring the volume of informal care is that it is, in some cases, not easy to determine the quantity of time spent in any clear-cut way. An informal carer may, for example, state that they provide informal care for 24 hours a day, by constantly keeping a watch and assisting as necessary. However, during that time the informal carer may carry out other, normal activities, such as housework, or may watch TV. It is then difficult to say how much of the time is effectively spent on informal care. It can also be difficult to determine what is and is not informal care. If, for example, someone always cooks dinner and now does so for their sick partner, this cannot be regarded as informal care. However, if the person in question has to cook something special which takes extra time or has to help their partner eat, this can be regarded as informal care.

One solution for the proper registration of informal care is to establish how much time is actually spent on informal care and the tasks carried out by means of self-reporting. This therefore relates specifically to the time which could normally be spent on something else, but which now has to be used to provide informal care. There are various methods which can be used to determine this amount of time and the chosen method has to align with the way the time is then valued. Possible instruments for measuring and valuing time spent on informal care are described in detail in the iVICQ (iMTA Valuation or Informal Care Questionnaire).⁶⁷

This modular questionnaire has been specifically developed to identify the provision of informal care and to enable the effects of informal care to be included in economic evaluations. The iVICQ is freely accessible via www.imta.nl/questionnaires/ivicc.

If it is impossible to measure the time spent by informal carers, this time can be estimated on the basis of EQ-5D data from patients, using the informal CARE effect (iCARE) tool. This is available via www.imta.nl/tools/icare.⁶⁸

5.3.2 Methods for the valuation of informal care

Various methods exist for the valuation of time spent on informal care, including the replacement cost method, the opportunity costs method, contingent valuation methods (willingness to pay and willingness to accept), well-being methods, and discrete choice experiments. All have advantages and disadvantages. The choice for a specific valuation method for the time spent on informal care cannot be seen separately from the valuation of other aspects of informal care (such as loss of health or well-being).⁶⁹

In the costing manual it is recommended that informal care is valued on the basis of the replacement costs for domestic care. This is equated to a standard hourly rate as used in the *Rekentool kostprijen Wmo* (Wmo cost price calculation tool).⁷⁰

The basis is the intermediate pay step point number of the scale +1. In 2022 this standard hourly rate was €18.80 (hierarchy level A). This valuation method also provides room to include other aspects, such as any decline in an informal carer's health.

5.4 Other costs of patients and family

Other costs which are incurred outside healthcare and which are related to the disease or medical treatment of the patient are, for example, costs of special food, vitamin compounds taken on a doctor's instructions, provisions in or adjustments to

the home, the purchase of clothing as a consequence of weight loss during severe types of treatment, childcare and transport costs if specific medicines are delivered to the home. If such costs form an essential element of the treatment from a (socio-)medical perspective, they should be included in the economic evaluation. It is advisable to make a rough estimate first of the extent of these costs in order to establish whether it is sensible to register data (for example, in the form of cost diaries).

5.5 Standard calculation values

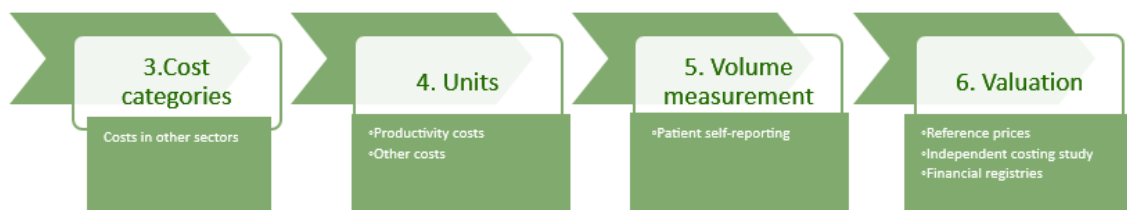
Table 5-3 shows the standard calculation values presented in this chapter. The paragraph which deals with the issues in question is indicated in the last column.

Table 5-3 Standard calculation values for the calculation of costs of patients and family (Euro 2022)

Unit	Standard calculation values	Paragraph
Average distance from home to hospital (incl. outpatient clinic away from a hospital)	4.8 km	5.1.1
Average distance from home to hospital (excl. outpatient clinic away from a hospital)	7.1 km	5.1.1
Average distance from home to GP practice	1.0 km	5.1.1
Average distance from home to pharmacy	1.2 km	5.1.1
Average distance from home to physiotherapy practice	2.2 km	5.1.1
Average distance from home to nursing and care home	3.7 km	5.1.1
Average distance from home to midwife	3.6 km	5.1.1
Average distance from home to child health centre	1.7 km	5.1.1
Car, costs per kilometre	€0.26	5.1.2
Car, parking fees per visit	€3.92	5.1.2
Public transport, costs per kilometre	€0.21	5.1.2
Taxi & transport covered by the Social Support Act (initial charge + price per kilometre)	€3.36 + €2.47	5.1.2
Cost of time spent by informal carers, replacement costs per hour	€18.80	5.1.2
Wmo = Social Support Act (<i>Wet maatschappelijke ondersteuning</i>)		

6 Costs in other sectors

Figure 6-1 Step-by-step plan for costs in other sectors



This chapter describes the methods used to calculate the costs in other sectors. These costs outside healthcare consist of:

- productivity losses (paragraph 6.1)
- other costs in other sectors (paragraph 6.2)

6.1 Productivity losses

Health problems can have a major impact on the way patients spend their time and on how productive they are. Health-related changes can therefore result in changes in terms of time budgeting and productivity. The value of productivity changes (profits or losses) may represent a significant portion of the total costs in an economic evaluation and should therefore be included in economic evaluations performed from a social perspective. Costs of productivity losses can be described as costs which result from productivity losses and replacement costs as a consequence of disease, absence through sickness, incapacity for work and/or the death of productive people, with regard to both paid and unpaid work.^{67,68} Although the emphasis in the literature is often on the valuation of changes in productivity in the context of paid work, productivity losses in the context of unpaid work are also relevant.⁷³

As far as paid work is concerned, a considerable portion of productivity losses arises as a consequence of absence through sickness (absenteeism). Furthermore, productivity losses may occur while paid work is being performed because someone may be working less efficiently as a consequence of health issues. This is then referred to as efficiency losses (or presenteeism).

Unpaid work which has not been carried out can also lead to productivity losses. The term unpaid work should not only be regarded as meaning voluntary work, but also, for example, household chores.

In this paragraph, a distinction is made between:

- productivity losses in the context of paid work
- productivity losses in the context of unpaid work

6.1.1 Volume measurement methods

Registered data on absence through sickness (absenteeism) is often not accessible, or is difficult to access, for researchers. For the determination of productivity losses, researchers are therefore usually reliant on data collection by means of self-reporting by patients in the form of diaries, questionnaires or interviews (paragraph 3.2.2). Previous research has revealed that self-reported absence through sickness is a reliable alternative for registered absence through sickness.⁷⁴

For the determination of productivity losses as a consequence of reduced productivity at work (presenteeism) researchers are dependent on self-reporting by patients, given that there are usually no alternative sources. In order to determine the scope

of efficiency losses, patients may be asked to indicate the extent to which their productivity was reduced compared to their productivity on a 'normal' working day.

Productivity losses as a consequence of absence through sickness and efficiency losses in the context of paid work are determined on the basis of the number of days and the number of hours per day that someone is absent from work, or less productive as normal, as a consequence of health issues or medical treatment.

Various instruments exist to measure productivity losses in the context of paid and unpaid work. One frequently used instrument is the iMTA Productivity Cost Questionnaire (iPCQ).⁷⁵ In order to calculate costs using the recommended friction cost method (paragraph 6.1.2.1) you have to know when the absenteeism started. Numerous instruments do not include any questions on this. The iPCQ does contain a relevant question what makes the instrument suitable for determining the productivity losses on the basis of the friction cost method as well.

6.1.2 Valuation methods

For the valuation of productivity losses a distinction is made between paid work and unpaid work.

6.1.2.1 Productivity losses in the context of paid work

Productivity losses can be valued in different ways, whereby the friction cost method and the human capital approach are the most commonly used.⁷⁶ The guideline for economic evaluations in healthcare recommends using the friction cost method. The friction cost method is based on the social perspective and the idea that people are, in principle, replaceable within a production process. Consequently, productivity losses or additional productivity costs only occur during the period required to replace people who are unable to work due to illness and this means that the vacancy term is a key element.⁷⁷ How long this period lasts depends on, among other things, the extent of the period of unemployment and the degree of mobility on the job market. During this adaptation period, the so-called friction period, productivity costs can arise because of a temporary decline in production as a result of which extra costs have to be incurred to maintain production, or due to a combination of these. In order to calculate the productivity losses in accordance with the friction cost, the frequency, the duration of the absenteeism and the costs per (part of the) friction period must be known. With regard to the frequency of the friction periods a distinction needs to be made between absenteeism from work and incapacity for work. In the context of absenteeism from work the duration of each period of absence period must be known. If the duration of the period of absence is shorter than the friction period, all the absenteeism days count as production loss. The length of the friction period can be calculated using the following formula:

$$\text{Friction period} = 365 / \left(\frac{\text{Number of filled vacancies in a particular year}}{\text{Number of open vacancies at a specific time during this same year}} \right) + 4 \text{ weeks}$$

The length of the friction period is calculated on the basis of the average vacancy term plus 4 weeks. These 4 weeks are an estimate of the period which is assumed to be the period that employers use before a decision is taken to publish a vacancy to replace the employee who has had to be absent due to illness. On the basis of CBS data about filled and open vacancies in 2022 this friction period was calculated as being 136 calendar days (19.4 weeks).⁷⁸

In order to limit the effect of fluctuations in the job market on the friction period, it is advisable to assume the average friction period over a period of the past 5 years. For the 2018-2022 period the average friction period was calculated as being 115 calendar days (16.4 weeks). In the event of a period of absence longer than 115

(calendar) days, a maximum of 115 days production loss was calculated (see Table 6-1).

In the event of incapacity for work, it generally applies that there are no (additional) social productivity losses. After all, people are declared incapacitated for work in the Netherlands after at least two years of work absence.

Table 6-1 Vacancy term and friction period

	2018	2019	2020	2021	2022	5 years on average
# filled vacancies (x 1,000)	1146	1232	1085	1244	1507	
# outstanding vacancies (x 1,000)	248.3	281.1	221.3	313.4	444.4	
Vacancy term	79	83	74	92	108	87
Friction period (days) (= vacancy term + 28 days)	107	111	102	120	136	115
Friction period (weeks)	15.3	15.9	14.6	17.1	19.4	16.4
Source: CBS Statline ⁷⁸						

The value of the productivity losses of the work which the employee should have carried out but failed to carry out due to illness can be approximated using the gross added value. The gross added value of work shows the market value of production and is higher than the labour costs. The labour costs are, however, a good approximation for the gross added value of labour, including an adjustment for the elasticity of labour. The average labour costs per hour for 2022 are presented in Table 6-2. For further particulars and clarification of the friction cost method please refer to Koopmanschap and Rutten (1996).⁷⁹

Table 6-2 Productivity costs per hour per paid worker (Euro 2022)

Average	
Productivity costs per hour	39.88
Source: CBS (2023) <i>Arbeidskosten</i> (Labour costs). ⁸⁰	
Calculations of costs of productivity losses per hour on the basis of data on hourly wages and labour costs from 2020. Figures are indexed to 2022	

The calculation of productivity losses of long-term absenteeism requires information about the absenteeism start date. If the absenteeism started earlier than the recall period of the instrument used to measure absenteeism, this must be taken into account for the calculation of productivity losses.

Example 9 shows how productivity losses can be calculated using the friction cost method.

Example 9

Short-term absenteeism

A person works 24 hours per week, spread across 3 days per week. The respondent was absent for 2 days during the past 4 weeks. The productivity losses are then calculated as follows:

$$2 \text{ days} * 8 \text{ hours per working day} * €39.88 = €638.08.$$

Long-term absenteeism; absenteeism period shorter than the friction period

A person works 24 hours per week, spread across 3 days per week. On the basis of the start date of the absenteeism, the total duration of the absenteeism was calculated as being 56 (calendar) days. The productivity losses are then calculated as follows:

$$56 \text{ calendar days of absenteeism} = 56/7 = 8 \text{ working weeks. } 8 \text{ working weeks} * 3 \text{ working days per week} = 24 \text{ working days. } 24 \text{ working days} * 8 \text{ hours per working day} * €39.88 = €7,656.96.$$

Long-term absenteeism; absenteeism period longer than the friction period.

A person works 24 hours per week, spread across 3 days per week. On the basis of the start date of the absenteeism, the total duration of the absenteeism was calculated as being 150 (calendar) days. The productivity costs are limited to the friction period (115 days in 2022, see Table 6.1). The productivity losses are then calculated as follows:

$$115 \text{ calendar days absenteeism} = 115/7 = 16.4 \text{ working weeks. } 16.4 \text{ working weeks} * 3 \text{ working days per week} = 49.2 \text{ working days. } 49.2 \text{ working days} * 8 \text{ hour per working day} * €39.88 = €15,724.11.$$

The same valuation of productivity costs per hour is used to determine productivity costs due to efficiency losses, with only the relative loss in efficiency leading to productivity costs (Example 10).

Example 10

Efficiency losses (presenteism)

A person works 24 hours per week, spread across 3 days per week. The respondent has been 2 days less productive than normal during the past 4 weeks. The person stated that they can do 30% of their normal work on these days. The productivity losses are then calculated as follows:

$$2 \text{ days} * 8 \text{ hour per working day} * (100\% - 30\%) * €39.88 = €446.66.$$

In some cases an intervention results in an employee who has had to be off work for a long period of time being able to return to their work. No productivity costs are charged for employees who return to work following long-term absenteeism.

Another method for calculating productivity losses is the human capital approach. This is, however, not recommended in the guideline for economic evaluations. One point of criticism against using the human capital approach is that it is apparently based on an individual patient's perspective that does not correspond to the broader social perspective. For more information about the human capital approach please refer to Van den Hout (2010)⁷² and Krol and Brouwer (2014)⁷⁷

Compensation mechanisms and multiplier effects

When people are absent (as a consequence of health issues) the total production loss may be smaller or greater than would be estimated on the basis of the hours lost by those individuals themselves. The production losses may be lowered due to so-called compensation mechanisms, for example, the work being caught up on later or being taken over by colleagues or agency staff. Although this may mean smaller production losses, these compensation mechanisms can still imply extra costs (for the employer

or the individual). Due to so-called 'multiplier effects' the productivity losses may, in fact, be greater than estimated on the basis of lost working hours. This applies when productivity losses of the absent employee also have a negative influence on the production of colleagues, for example in the context of team production.⁸² The impact of compensation mechanisms and multiplier effects on productivity losses and costs cannot be properly calculated at present.⁸³ It is therefore recommended that these are not included in the calculation of productivity costs.

6.1.2.2 *Productivity losses in the context of unpaid work*

It is difficult to measure the amount of time which is no longer spent on unpaid work and, to a large extent, the same problems exist as when measuring the cost of time spent by informal carers (paragraph 5.3). Unpaid work can be subdivided into domestic activities (e.g. cooking food or cleaning), caring tasks (e.g. looking after children who live at home, or caring and assisting for family or friends) and voluntary work (e.g. at a sports club or a care institution). Unpaid work is measured by asking how much time would be needed if all the activities not done by the patient were to be performed by someone else. This prevents the loss of unpaid work being limited to activities which are actually performed by others.

The productivity loss of unpaid work is valued on the basis of replacement costs for domestic care. This is equated to a standard hourly rate for cleaning, as used in the Wmo cost price calculation tool (hierarchy level A). The basis when doing so is the intermediate pay step point number of the scale +1. This standard hourly rate was €18.80 in 2022.⁷⁰

6.2 **Other costs**

The other costs outside healthcare may fall within other public sectors and vary significantly per economic evaluation. Which costs are incurred in other sectors depends very much on the intervention to be evaluated. For information about costs in other public sectors please refer to *the Handleiding intersectorale kosten en baten van (preventieve) interventies* (Manual of intersectoral costs and revenues of (preventive) interventions) as developed by Maastricht University.^{84,85} The manual in question distinguishes between four categories of intersectoral costs: 'Education', 'Labour and social security', 'Household and free time' and 'Security and justice'. In line with the guideline for economic evaluations, 'Education' and 'Security and justice' are clarified in detail below. One should not forget that healthcare (interventions) can also lead to costs and revenues in other sectors. However, little is still known about the intersectoral economic impact on these sectors.

6.2.1 **Education**

Research has shown that poor health can be accompanied by reduced learning capacity, poorer educational performance and absenteeism from school.⁸⁶ The inclusion of educational costs in economic evaluations is important if healthcare, as expected, influences the participation in education and/or educational performance of children, young people or students. If it concerns an intervention aimed at the health of populations of a very young age, such as babies or toddlers, it may be important for model-based economic evaluations, or evaluations with a long follow-up, to include educational costs in the evaluation.

Interventions in healthcare can result in cost savings in the education sector via the resulting health gain and improved school performance. One key example of cost saving in the education sector is the prevention of learning delays and the possible consequence of a child or young person having to repeat the year. If illness ultimately does not lead to a child having to repeat the year, but does lead to (extra) school absenteeism, this absenteeism must also be included in the evaluation. In this context the basis is the principle that the learning delay must be rectified by spending free time in the form of extra studies by the person in question or tuition

after school. The cost price is determined on the basis of government costs per pupil per year and the applicable educational standards. Consequently, a minimum of 7,520 hours spread across eight years applies in primary education, which equates to an average of 940 hours of primary education per year. A minimum of 189 days education per year applies to secondary education.⁸⁷ The standard hours per year are 925 hours for pre-vocational secondary education (*voorbereidend middelbaar beroepsonderwijs*, VMBO), 940 hours for senior general secondary education level (*hoger algemeen voortgezet onderwijs*, HAVO) and 950 hours for pre-university education (*voorbereidend wetenschappelijk onderwijs*, VWO). Personal voluntary contributions are not included in the cost price determination.

A second example of a cost item is special education. Special education is more expensive than regular education. The Law on Resource Centres (*Wet op de expertisecentra*, WEC) regulates special education at both primary and secondary education levels.⁸⁸ The WEC establishes amounts for special primary education and special secondary education per student per year. If an intervention leads to a health gain and if that health gain leads to a situation in which the child or young person does not need to engage in special primary or secondary education, the intervention will lead to a cost saving on this item.

Conversely, a health gain can also lead to higher costs in the education sector. One example is when educational performance improves in such a way that this gives a student more opportunities to attend higher education and longer further education courses before the student enters the job market. A second example is a reduction in the number of students dropping out. In the event of serious illness or death, the child or young person 'leaves' the education sector and the costs of educating or training that person no longer apply. Conversely, if an intervention prevents dropping out, the educational costs will, in fact, be higher. The costs for changes to the course and duration of the school career vary considerably and are therefore not included as a reference price in the costing manual. Table 6-3 shows the reference prices for education.

Table 6-3 Reference prices for education (Euro 2022)

Unit	Reference price
Primary education per year	9,846
Primary education per day ^a	52.10
Primary education per hour ^b	10.47
Secondary education per year	14,342
Secondary education per day ^a	75.88
Secondary education per hour ^b	15.26
Senior secondary vocational education per year	19,521
Senior secondary vocational education per day ^a	103
Senior secondary vocational education per hour ^b	20.77
Higher vocational education per year	15,963
Higher vocational education per day ^a	84.46
Higher vocational education per hour ^b	16.98
Pre-university education per year	29,735
Pre-university education per day ^a	157.33
Pre-university education per hour ^b	31.63
Special (primary) education per year	15,855
Special (primary) education per day ^a	83.89
Special (primary) education per hour ^b	16.87
Tuition by student per hour	15.00
Tuition by teacher per hour	30.00
Remedial teaching per hour	40.00
Source: House of Representatives of the States General (2022) ⁸⁹	
^a Costs on the basis of total costs divided by 189 days of education per year	

6.2.2 Security and justice

The 'Security and justice' sector is an important public sector in the Netherlands.⁹⁰ The aim of this sector is to provide citizens with security (protection from crime, fire and disasters), assistance (by the police and fire service) and justice.⁹⁰ The public expenditure for this sector amounted to 16 billion euros in 2020.⁹¹ Well over 75% of this is spent on the police, prisons and the justice system.

It is relevant to include these costs in economic evaluations in the event of interventions aimed at young people and adults who come into contact with the police and judicial authorities.^{92–94} The relevance of these costs can be determined using treatment protocols, literature and consultations with experts. Costs may also be relevant for interventions which are aimed specifically at populations in, for example, a (youth) prison or addiction treatment and care facility. The social costs (savings) of these interventions can be considerable.^{94–97} The prevalence of delinquent acts often increases (under the influence of alcohol and drugs) from the late childhood years onwards and are a predictor for criminal behaviour at a later age.^{98,99}

Insight into the frequency, nature and scope of common delinquent and criminal acts can be obtained by means of self-reporting questionnaires among perpetrators (see also the *Monitor Zelf-gerapporteerde Jeugdcriminaliteit* (Self-reported youth crime monitor, MJZ) measurement 2020).¹⁰⁰ In order to include the social costs related to these delinquent and criminal acts in economic evaluations of interventions aimed at the perpetrators, the costs per unit are shown in Table 6-4.¹⁰¹ A top-down microcosting approach was used to calculate these costs, with data being included on government expenditure in relation to the incidence of the delinquent acts, the number of perpetrators and the number of reported and resolved crimes.¹⁰¹ The data comes from 2021 and is indexed to 2022.¹⁰² Costs for victims are not included in the table below and it may be higher than the government expenditure alone.

Table 6-4 Government expenditure per delinquent act per perpetrator (Euro 2022)

Delinquent act ^a	Average costs per act
Robbery/theft accompanied by violence	13,855
Straightforward theft/pickpocketing	3,147
Handling stolen goods	929
Acts of destruction/vandalism relating to private or public property	8,809
Disorderly conduct/discrimination	3,605
Arson	14,627
Cybercrime	106,076
Assault and aggravated assault	19,927
Threats	23,451
Forced sexual contact	4,088
Driving without a licence	7,086
Driving while under the influence	1,424
Selling soft drugs	5,612
Selling hard drugs	32,335
Offences relating to firearms/weapons	32,333

^a See Reckers-Droog et al. (2019)¹⁰¹ for clarification of the calculations and a description of the delinquent act.

6.3 Standard calculation values

Table 6-5 shows the standard calculation values presented in this chapter. The paragraph which deals with the issues in question is indicated in the last column.

Table 6-5 Standard calculation values for costs in other sectors (Euro 2022)

Element	Standard calculation values	Paragraph
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Paid work:		
Friction period	115 calendar days (16 weeks)	6.1.2
Productivity costs per hour per paid worker	39.88	6.1.2
Unpaid work:		
Replacement costs per hour	18.80	6.1.2
Education:		
Primary education per year	9,846	6.2.1
Primary education per day	52.10	6.2.1
Primary education per hour	10.47	6.2.1
Secondary education per year	14,342	6.2.1
Secondary education per day	75.88	6.2.1
Secondary education per hour	15.26	6.2.1
Senior secondary vocational education per year	19,251	6.2.1
Senior secondary vocational education per day	103	6.2.1
Senior secondary vocational education per hour	20.77	6.2.1
Higher vocational education per year	15,963	6.2.1
Higher vocational education per day	84.46	6.2.1
Higher vocational education per hour	16.98	6.2.1
Pre-university education per year	29,735	6.2.1
Pre-university education per day	157.33	6.2.1
Pre-university education per hour	31.63	6.2.1
Special (primary) education per year	15,855	6.2.1
Special (primary) education per day	83.89	6.2.1
Special (primary) education per hour	16.87	6.2.1
Tuition by student per hour	15.00	6.2.1
Tuition by teacher per hour	30.00	6.2.1
Remedial teaching per hour	40.00	6.2.1
Costs per delinquent act per perpetrator		
Robbery/theft accompanied by violence	13,855	6.2.2
Straightforward theft/pickpocketing	3,147	6.2.2
Handling stolen goods	929	6.2.2
Acts of destruction/vandalism relating to private or public property	8,809	6.2.2
Disorderly conduct/discrimination	3,605	6.2.2
Arson	14,627	6.2.2
Cybercrime	106,076	6.2.2
Assault and aggravated assault	19,927	6.2.2
Threat	23,451	6.2.2
Forced sexual contact	4,088	6.2.2
Driving without a licence	7,086	6.2.2
Driving while under the influence	1,424	6.2.2
Selling soft drugs	5,612	6.2.2
Selling hard drugs	32,335	6.2.2
Offences relating to firearms/weapons	32,333	6.2.2

7 Methodology of costing studies

It is preferable to use reference prices for the valuation of units within economic evaluations (see chapter 4). Sometimes, however, no reference prices are available, or they are too inaccurate for the evaluation in question. It may also be the case that healthcare cost units reveal considerable differences between patients. In those instances an independent costing studies is desirable. This chapter offers guidelines for performing an independent costing studies. Costs can be divided into directly attributable costs of medical departments (consisting of staff costs (paragraph 7.1), costs of materials (paragraph 7.2) and costs of medical equipment (paragraph 7.3)), and costs which are not directly attributable (paragraph 7.4 consisting of costs of support departments, accommodation and depreciation costs and overheads). When an integral cost price of a unit is calculated, both the directly attributable and the costs which are not directly attributable must be included.

7.1 Staff costs

Table 7-1 shows which cost categories fall under staff costs. Staff costs can be calculated using a top-down or bottom-up approach (see also paragraph 3.3.2) and both are discussed below.

Table 7-1 Cost categories which are considered to be staff costs

Staff costs
Gross salary
Compensation for irregular working hours
Holiday pay
Contribution to medical expenses
Social security contributions
Pension premiums
Supplementary payment to benefits under the Disablement Benefits Act (WAO).
Commuting expenses
Bonuses
Parental leave

7.1.1 Bottom-up calculation of staff costs

7.1.1.1 Volume measurement

If a bottom-up cost price calculation is used as a basis, it will be necessary to determine the time spent by the various employees on a healthcare cost unit and the costs per unit of time. There are basically three sources which can be used for the volume measurement of the time spent on a healthcare cost unit, namely healthcare organisation registries, time measurements and consultations with experts. These sources are explained below.

Healthcare organisation registries

Healthcare organisations maintain registries of the time spent on planning care, partly for administrative and financial reasons. One example of an existing registry relates to operating theatres. Most hospitals keep a record of the planned and actual duration of an operation. Another example of an existing registry is the schedule in an outpatient clinic. The number of appointments per part of a day can be used to calculate the average duration of a consultation.

Time measurements

If no registry exists, or if the information it contains is not specific enough, time measurements must be performed. In doing so, it is important to define clearly which time is being measured (for example, including or excluding the time which the

practitioner has to wait for the next patient and including or excluding administrative actions which belong to the healthcare cost unit). It is impossible to indicate in advance how many measurements are required per healthcare cost unit in order to obtain a representative estimate of time. This partly depends on the variance in the measured length of time.

Consultations with experts

The required length of time per healthcare cost unit can also be obtained by asking various experts to estimate how much time is spent on a healthcare cost unit. Although this method requires a smaller time investment on the part of the researcher, it also generates less accurate results than time measurements. Another disadvantage is that experts may not have an overview of the entire process and are unable to estimate the length of time spent by other healthcare providers.¹

7.1.1.2 Valuation

The valuation of the measured times requires information about gross salary, workable hours per year, compensation for irregular working hours and supplements for other costs. Each of these is discussed below. The valuation of time spent by medical specialists is dealt with separately.

Gross salary

An employee's gross salary is determined by the scale to which their job is allocated and the pay step point number (increment) in the scale. This pay step point number is determined primarily by age and experience. An employee's gross salary can be regarded as being the current salary of the employee in question, insofar as this is known to the researcher. It is also possible to assume the salary scale belonging to the job. In that case it is advisable to use the gross salary associated with the intermediate pay step point number of the scale +1. A different approach can only be taken in exceptional circumstances, for example if a job is primarily performed by young employees, or if the department is subject to consistently high staff turnover. Further information regarding gross salary and salary schemes can be found in the collective labour agreement (*Collectieve Arbeidsovereenkomst*, CAO) of the sector in question. The wage of medical specialists is described later on in this paragraph.

Workable hours per year

If the annual wage costs are known, the costs per healthcare cost unit can be calculated by dividing the measured times per healthcare cost unit by the workable hours per year. Nursing and non-medical staff in general and university hospitals have approximately 1,543 workable hours at their disposal, based on a 36 hour working week.^{103,104} This is based on an average of 6 public holidays per year which do not coincide with a Saturday or Sunday, 9% holiday hours, plus 15 extra age-related hours and an average absence through sickness of 5%. The percentage of absence through sickness (excluding pregnancy leave) is based on 2019 data in the sector hospitals. In 2020 and 2021 absenteeism was higher than normal due to the COVID-19 pandemic and not representative for other years. Lastly, the number of workable hours has been reduced by 1 day of special leave and 2 days of leave in connection with (continuing) education and/or study.

In connection with training activities which take place around daily activities, the number of workable hours is higher for junior doctors. Junior doctors have approximately 1,989 workable hours per year at their disposal, based on an average working week of 46 hours.^{103,104}

See Table 7-2 for the workable hours per year for nursing and non-medical staff and junior doctors. The workable hours of medical specialists are described later on in this paragraph.

Table 7-2 Workable hours per year for nursing and non-medical staff and junior doctors

	Nursing and non-medical staff (36 hour working week).	Junior doctor (46 hour working week).
Basic	1,872	2,392
Public holidays	43	55
Holiday	183	215
Sick leave	82	106
Special leave	7	9
Studying and courses	14	18
Workable hours	1,543	1,989

Sources: NVZ (2022) Hospitals Collective Labour Agreement (*Collectieve Arbeidsovereenkomst Ziekenhuizen*) 2021-2023¹⁰⁴ and NFU (2022) University Medical Centres CLA (*CAO universitair medische centra*)¹⁰³

Compensation for irregular working hours

If work takes place between 20.00 and 07.00, or at the weekend, the employee is entitled to compensation for irregular working hours. The compensation for irregular working hours is calculated on the gross salary and applies only in the event of work being regularly performed at the above-mentioned times. The amount of the compensation for irregular working hours varies according to time and day, as shown in Table 7-3. These supplements also apply to junior doctors in university hospitals. Different supplements apply to residents in training to become specialists in general hospitals and these only apply if the hours exceed the average hours per working week. The supplements for medical specialists for 24 hour services also deviate from this schedule and these are described later on in this paragraph.

Table 7-3 Compensation for irregular working hours in general and university hospitals

	General hospitals	University hospitals
Monday-Friday		
Between 00.00-06.00	47%	47%
Between 06.00-07.00	22%	47%
Between 20.00-22.00	22%	47%
After 22.00	47%	47%
Saturdays		
Between 00.00-06.00	52%	47%
Between 06.00-08.00	38%	47%
Between 12.00-22.00	38%	47%
After 22.00	52%	47%
Sundays and public holidays		
Throughout 24 hours	60%	72%

Sources: NVZ (2022) Hospitals Collective Labour Agreement (*Collectieve Arbeidsovereenkomst Ziekenhuizen*) 2021-2023¹⁰⁴ and NFU (2022) University Medical Centres CLA (*CAO universitair medische centra*)¹⁰³

Supplement for other costs such as social security contributions and holiday pay

In addition to the fixed gross wages and the compensation for irregular working hours the other components from Table 7-2 also represent staff costs for the employer. In total these costs make up approximately 29% of the total staff costs.¹⁰⁵ This means that the calculations of the staff costs should be based on the gross salary, plus any costs for compensation for irregular working hours, plus a supplement of 41% ($29/(100-29)=41$). Of this it is approximated that 8% consists of holiday pay, 21% of social security contributions and pension contributions, 5% of supplementary payments to benefits under the Disablement Benefits Act (WAO), 2% of bonuses, a contribution to the medical expenses and other one-off payments and 6% of other staff costs. Because social security contributions are subject to a

maximum, the percentage of these costs decreases as a percentage of the salary in higher salary groups. A supplementary percentage of 35% can be assumed for these higher salary groups, such as medical specialists on the payroll (see also later on in this paragraph). An illustration of the way in which the gross wage costs can be calculated is shown in Example 11.

Example 11

A cost price calculation is made of a visit to the A&E at a university hospital. In the process a distinction is made between the price during and outside office hours. The time which a nurse spends on a patient is 15 minutes, irrespective of whether the visit takes place during or outside office hours. This is the measured time (direct contact time with the patient), including time for administrative work and consultation. Enquiries revealed that the nurses in this department are usually assigned to scale 8. This results in a monthly salary of €3,576 (scale 8, increment 6).¹²⁰ The salary costs per hour amount to: $(€3,576 \times 12) / 1,543 = €27.81$. These costs must be multiplied by the supplement for, among other things, holiday pay and social security contributions. The calculation is therefore: $€27.81 + (€27.81 \times 41\%) = €39.21$. The costs of a nurse for a single fifteen minute visit therefore amount to: $€39.21 / 4 = €9.80$. If a visit takes place on working days between 20.00 and 07.00, this price must also include the compensation for irregular working hours. To that end the costs per hour are first multiplied by the applicable compensation for irregular working hours percentage: $€27.81 + (€27.81 \times 47\%) = €40.88$. After that the calculation is the same as above: $€40.88 + (€40.88 \times 41\%) = €57.64$, so: $€57.64 / 4 = €14.41$ per visit.

Valuation of time spent by medical specialists

The discussion of the valuation of the costs of a medical specialist deals in turn with the hourly rate for an independent specialist and an hourly rate for a specialist on the payroll.

Hourly rate for an independent specialist

An integral rate for claimable care products has applied to hospitals since 2015. The Ministry of Health, Welfare and Sport (VWS) regards integral rates as being a system whereby patients and healthcare insurers no longer have to pay separately for hospital costs and the medical specialist's fee.

The calculation of the costs of an independent medical specialist is based on the hourly rate of a medical specialist on the payroll of the general hospital.

Hourly rate for a specialist on the payroll

In the case of medical specialists on the payroll the salary scales included in the CLA can be used as a basis. The following guiding principles are used for the calculation: the intermediate pay step point number of the scale +1, compensation for irregular working hours of 10%, a supplement for holiday pay, social security contributions and non-wage labour costs of 35%, a supplement for job-related costs of €5,813¹⁰⁴ and €4,988¹⁰³ for a specialist in a general and a university hospital respectively. A maximum of 2,087 workable hours and a share in patient-related time of 70% are also assumed. The resulting calculations are included in Table 7-4.

Table 7-4 Average costs of a medical specialist on the payroll (Euro 2022)

	General hospital	University hospital
Wage per month	10,928	10,824
Compensation for irregular working hours 10% per month.	1,093	1,082
Social security contributions per month	4,207	4,167
Subtotal per year	194,737	192,884

supplement for job-related costs	6,475	6,752
Total per year	201,212	199,636
Workable hours per year	2087	2087
Patient-related hours per year (70%)	1461	1461
Costs per hour worked	96	96
Costs per patient-related hour	138	137
Sources: ¹⁰⁴ NVZ (2022) Hospitals Collective Labour Agreement (<i>Collectieve Arbeidsovereenkomst Ziekenhuizen</i>) 2021-2023 ¹⁰³ and NFU (2022) University Medical Centres CLA (<i>CAO universitair medische centra</i>)		

7.1.2 Top-down calculation of staff costs

If a top-down cost price calculation is used, the staff costs can often be relatively easily extrapolated from the ledger of the department or financial overviews used for budgeting.

If a medical department uses a lot of agency staff, a check must be carried out to see whether these can be charged directly to the department's cost centre, or recorded centrally to one of the hospital's general cost centres. In the latter case, a decision must be taken as to which share of these costs has to be charged to the department in question. Another check must be carried out to determine how the costs and any reimbursements are recorded for sick or pregnant employees. In principle, both the continued salary payments during illness and any reimbursements which the hospital receives from the business association must be included in the calculation of costs.

7.2 Costs of materials

This paragraph first of all examines the bottom-up and the top-down approach for determining costs of materials. This is followed by a discussion of methods for determining specific costs of materials: the costs of food (paragraph 7.2.1), other accommodation-related costs (paragraph 7.2.2), general costs (paragraph 7.2.3) and costs relating to clients or residents (paragraph 7.2.4).

A bottom-up calculation of the costs of materials involves determining which materials are used per healthcare cost unit. In general, this data will not have been registered and the researcher's own measurements or consultations with experts will have to be used instead. The purchase prices from the financial records including VAT can be used for the valuation of the materials. VAT is 9% for medical materials and 21% for general materials.¹⁰⁶ Account also needs to be taken of the fact that, for some materials, costs will also be incurred for preparing, conserving or distributing them within the hospital. This applies, for example, to medicines (paragraph 4.6) and blood products (paragraph 4.9).

In the event of a top-down approach the costs of materials of the department can be relatively easily traced on the basis of the financial records. The costs of materials in care institutions are usually separated into costs of food, other accommodation-related costs, general costs and costs relating to clients or residents. However, the extent to which costs of materials are recorded to the cost centre of the patient-related department differs significantly per healthcare organisation.

In practice a lot of the costs of materials are determined using the top-down approach and only the materials which are expected to make up a relatively large share of the total costs (in other words materials which are used frequently and/or are extremely expensive) are determined using the bottom-up method. When a combination of the top-down and bottom-up approaches is applied, there is a danger of double-counting. To prevent this, the costs determined using the top-down

approach must be adjusted (see Example 12).

Example 12

In an economic evaluation the medicines and days of care are regarded as separate healthcare cost units. The medicine consumption of each patient is registered and the costs are calculated by multiplying the use by the corresponding medicine prices. The number of days of care each patient spends in hospital is also registered. The price of a day of care is established using a financial overview from the nursing department in question. The costs for medicines are included in the patient-related costs from the financial overview. Given that the costs of medicines per patient have already been determined, the patient-related costs are adjusted to avoid any double-counting.

The rest of this paragraph shows the methods for determining specific costs of materials:

- the costs of food (paragraph 7.2.1)
- other accommodation-related costs (paragraph 7.2.2)
- general costs (paragraph 7.2.3)
- costs relating to clients or residents (paragraph 7.2.4)

7.2.1 Costs of food

The costs of food are not usually recorded in medical departments' accounts, but centrally in a support department (for example the catering department). This cost centre therefore includes the not directly attributable salary costs of the staff of the catering department, which must then be allocated to medical departments (see paragraph 7.4.1.1). If food costs are recorded by medical departments, these can be allocated to healthcare cost units using the top-down approach. It may also be the case that some of the costs of food are recorded centrally in a support department (for example the costs of meals), with other costs being recorded in medical departments (for example the costs of parenteral food).

7.2.2 Other accommodation-related costs

The other accommodation-related costs include, among other things, the costs of housekeeping, furnishings and fittings and laundry. Generally speaking these costs do not include the costs which are not directly attributable of support departments which must be allocated to medical departments (see paragraph 7.4.1.1).

7.2.3 General costs

General costs include, among other things, the costs of records, communication costs and costs of general management. Generally speaking these costs do not include the costs which are not directly attributable of support departments which must be allocated to medical departments (see paragraph 7.4.1.1). If general costs are recorded by medical departments, these can be allocated to healthcare cost units using the top-down approach.

7.2.4 Costs relating to clients or residents

Costs relating to clients or residents represent the largest cost component from the perspective of economic evaluations. These costs include, for example, the costs of medicines and of other medical materials, such as implants and sterile materials. It is probable that a large proportion of the client-related costs are directly attributable to the medical department and are regarded as a separate healthcare cost unit in the economic evaluation, for example medicines (paragraph 4.6) and blood products (paragraph 4.9).

With regard to the client-related costs, an assessment must first be made to determine whether the costs are expected to be high and may lead to differences between patients in the economic evaluation. If that is the case, a separate

healthcare cost unit must be created for these costs. Some expensive materials (for example a certain type of stent or catheter) are only used for a certain patient population. If these costs are allocated to all patients without any distinction being made, this could lead to substantial errors in the cost price calculation. If high costs are expected which cannot lead to differences between patients, the client-related costs must be included in the bottom-up cost price calculation of another healthcare cost unit. Only when the client-related costs are relatively low are they included using the top-down cost price calculation of another healthcare cost unit.

7.3 Costs of medical equipment

The costs of medical equipment consist of depreciation, interest on the invested capital and maintenance costs. Paragraph 7.3.3 explains how the annual costs for depreciation and interest are calculated. The calculation requires information on the replacement value (paragraph 7.3.1), the residual value, the depreciation period (paragraph 7.3.2), the interest rate and the annuity factor (paragraph 7.3.3). In order to determine the costs of medical equipment per procedure, the annual costs for depreciation and interest (paragraph 7.3.3) are multiplied by the costs for maintenance (paragraph 7.3.4). The result is divided by the number of procedures (paragraph 7.3.5).

7.3.1 Replacement value

Organisations often determine depreciation costs by means of linear depreciation on the basis of the original purchase price. In the context of economic evaluations, however, the replacement value is used to provide a better approximation of the opportunity costs. If a device is not already too old, it is possible to approximate the replacement value using the purchase value which is adjusted by means of indexation for the moment of purchase and the moment of the costing studies (paragraph 2.6.1.1). Another possibility is to obtain the current price from the supplier. The situation becomes more difficult in the case of equipment for which new advanced models have appeared on the market which can do more or work faster. In those situations a similar device will, in many instances, no longer be sold. In that case it is advisable to adjust the original purchase value based on the price index figure.

7.3.2 Economic life

The economic life can be determined using the depreciation periods prescribed by the NZa. These are 50 years for the depreciation of buildings and 10 years for the depreciation of inventory.¹⁰⁷ A different period can only be applied if it is plausible that the NZa period does not correspond to the actual economic life.

7.3.3 Annual costs for depreciation and interest

The interest costs are often not registered per device in the financial records of a healthcare organisation, but are included in the general capital charges. In economic evaluations the annual depreciation and interest costs are calculated on the basis of annuity depreciation. This ensures that there are constant costs of depreciation and interest during the term of the annuity. The following formula is used to calculate an annuity:

$$k = \frac{V - \frac{R}{(1+i)^n}}{a_{n,i}} \quad \text{and} \quad a_{n,i} = \frac{1}{i} * \left(1 - \frac{1}{(1+i)^n}\right)$$

In which:

k = annual depreciation and interest costs

V = replacement value

R = residual value

n = depreciation period

i = interest rate
 $a_{n,i}$ = annuity factor

In order to limit the influence of fluctuations in current interest rates, the average interest rate over a longer period can be used as a basis for long-term investment accounts. The average interest rate over the past 5 years was 2.5%. This percentage is based on the so-called long-term interest (loans with a term > 5 year) as reported by the De Nederlandsche Bank (Dutch Central Bank).¹⁰⁸

7.3.4 Maintenance costs

Once the annual costs for depreciation and interest have been calculated, the annual maintenance costs must be determined. If an 'all-in' maintenance contract has been concluded with the supplier, the costs of this contract can be used for the annual costs. In other cases an estimate must be made of the time and materials used for the purpose of maintaining the device in question, for example when the hospital carries out the maintenance itself. The annual maintenance costs are estimated to be 5% of the invested capital.¹⁰⁹

7.3.5 Annual number of procedures

If the costs of medical equipment are not reported per procedure, the costs per procedure can be determined by dividing the total annual costs for depreciation, interest and maintenance by the number of procedures.

It may be possible to deduce the annual number of procedures via the hospital information system. When doing so the existence of several devices of a single type must be taken into account. On the other hand it is possible that a single type of device is used for several types of procedures. An estimate of the length of time per procedure is then the most appropriate weighting factor. Existing registries from the department in question (for example a diary or schedule) can also be used to determine the annual number of procedures.

7.4 Costs which are not directly attributable

Costs which are not directly attributable are costs which do not have any direct relationship with the unit. Examples are costs of the Executive Board and the costs of security. Costs which are not directly attributable can be subdivided into costs of support departments, accommodation and depreciation costs and overhead costs.

Support departments in a hospital include, for example, the catering, cleaning and washing and laundry departments. Security and the post room are also support departments. Accommodation and depreciation costs include the staff costs and costs relating to the site and building (such as costs of maintenance and energy costs), the depreciation of sites, buildings and systems and the rental/operational leasing of capital goods. The costs which are not directly attributable which do not belong to the costs of support departments or accommodation and depreciation costs are charged to overhead costs. These include, among other things, costs which are not directly attributable of medical departments, such as staff costs for general and administrative jobs, general costs, depreciation, allocations to provisions and interest.

7.4.1 Allocation of costs which are not directly attributable to medical departments

Various methods exist for the allocation of costs which are not directly attributable to medical departments. The preferred method is the cost centre method. This method specifies the costs of the support departments (support cost centres) across the medical departments (main cost centres) on the basis of allocation formulas. An alternative method is the mark-up method. Both methods are explained below.

7.4.1.1 Cost centre method

A good definition of the healthcare cost units is important when using the cost centre method because it determines the classification into support departments and medical departments. In economic evaluations the issue is the question of whether a healthcare cost unit should be regarded as a separate product, or part of another product. Days of care and outpatient visits are, for example, almost always regarded as separate healthcare cost units. The departments in which these healthcare cost units are generated, the nursing departments and outpatient clinics, are then regarded as medical departments. If imaging diagnostics and function tests are also treated as separate healthcare cost units, the departments where these healthcare cost units are generated, namely the departments for imaging diagnostics and function tests, are also regarded as medical departments. However, if these healthcare cost units are part of other healthcare cost units, such as days of care and/or outpatient visits, the departments for imaging diagnostics and function tests are regarded as support departments.

Allocation formulas

Allocation formulas are used to allocate the costs of support departments to the medical departments. A decision has to be taken for each support department as to which is the most suitable allocation formula. If possible, the allocation of the support departments is based on the actual uptake by the medical departments. For example, although the costs of medicines are often recorded centrally to the pharmacy cost centre, the medical departments that actually acquired the medicines are still registered. The purchase value of the medicines used by the medical department can then be used as the allocation formula for the allocation of the costs of the pharmacy (including staff and other material resources).

Table 7-5 indicates possible allocation formulas for charging on of the costs for a number of support departments. These allocation formulas were determined partly by using the 'uniform cost allocation' report which was drawn up for the 'medical specialist or hospital care product characterisation' project.¹¹⁰ The best allocation formula for allocating accommodation and depreciation costs to medical departments is the number of square metres.

Table 7-5 Allocation formulas for the cost allocation of costs which are not directly attributable of support departments

Support cost centre	Allocation formula
Management/Executive Board	Permanent staff positions, number of members of staff Total costs per cost centre
Administrative/financial department	Permanent staff positions, number of members of staff
Personnel department	Permanent staff positions, number of members of staff
'Public Relations' and information	Permanent staff positions, number of members of staff
Training	Permanent staff positions, number of members of staff
Security/reception	Total costs per cost centre
Technical department/IT	Number of network connections Total costs per cost centre
Post room	Number of items of post Total costs per cost centre
Cleaning	Square metres
Washing and laundry service	Actual uptake (for example, in kg washing) Number of patients/days of care
Catering department	Number of meals Number of patients/days of care
Pharmacy	Purchase value of medicines
Internal blood bank	Purchase value of blood products
Departments for imaging diagnostics and function tests	Number of imaging diagnostics and function tests (preferably weighted)
Laboratories	Number of laboratory tests (preferably weighted)

It is recommended that the cost allocation of support departments to medical departments is based on the direct allocation method, whereby the costs of support departments are only allocated to the medical departments.¹¹¹ This method is clarified in more detail on the basis of Example . For more information on alternative methods of cost allocation for the charging on of costs of support departments to medical departments please refer to the literature.¹¹²⁻¹¹⁴

Example 13

A hospital consists of the neurology and surgery medical departments. The costs which are not directly attributable are €3,937.500, namely €1,050.00 for cleaning, €2,100.00 for washing and laundry service and €787.500 for accommodation and depreciation. The notional allocation formulas are shown in Table 7-6. Square metres are used for the cleaning, accommodation and depreciation and the number of patients is used as the allocation formula for the washing and laundry service. The costs which are not directly attributable of the medical departments are:

Table 7-6 Notional hospital allocation formulas

Costs which are not directly attributable			
	Cleaning	Washing and laundry service	Accommodation and depreciation
Allocation formula	Square metres	Number of patients	Square metres
Neurology	40	15,000	40
Surgery	65	20,000	65
Total	105	35,000	105

Neurology:

$$\left(€1.050.000 * \frac{40}{105}\right) + \left(€2.100.000 * \frac{15.000}{35.000}\right) + \left(€787.500 * \frac{40}{105}\right) = €1.600.000$$

Surgery:

$$\left(€1.050.000 * \frac{65}{105}\right) + \left(€2.100.000 * \frac{20.000}{35.000}\right) + \left(€787.500 * \frac{65}{105}\right) = €2.337.500$$

7.4.1.2 Mark-up method

One disadvantage of the cost centre method is that information is required about allocation formulas in order to allocate costs. This information is often unavailable. An alternative is then to use the mark-up method. In the mark-up method the costs which are not directly attributable are allocated by adding a mark-up to the directly attributable costs (see Example). This mark-up is expressed as a percentage of the directly attributable costs. The advantage of the mark-up method is that it is easy to use. A multiple mark-up method can also be used. In other words, a differentiation is used for the mark-up of products. For example, a mark-up of 30% on staff costs and 10% on food costs. One disadvantage of this method is the implicit assumption that a linear and direct link exists between the directly attributable costs and costs which are not directly attributable.

Example 14

The neurology department of a hospital offers patients conservative treatment, or treatment involving thrombolysis. On an annual basis the number of days of care for which patients are admitted for conservative treatment is 20,000. The number of days of care for which patients are admitted for thrombolysis treatment is 10,000. The notional costs which are, and are not, directly attributable of the neurology department are shown in Table 7-7. The directly attributable costs per day of care are:

Conservative treatment:

€3,100,000/20,000 days of care=€155 per day of care

Thrombolysis treatment:

€2,400,000/10,000 days of care=€240 per day of care

Table 7-7 Notional costs which are, and are not, directly attributable of a neurology department

	Conservative	Thrombolysis	Total
Directly attributable costs	€3,100,000	€2,400,000	€5,500,000
Number of days of care per year	20,000	10,000	
Directly attributable costs per day of care	€155	€240	
Costs which are not directly attributable			€1,600,000
Cleaning	Mark-up		€400,000
Washing and laundry service	Mark-up		€900,000
Accommodation and depreciation	Mark-up		€300,000
Total costs which are, and are not, directly attributable			€7,100,000

The mark-up is calculated by dividing the costs which are not directly attributable by the directly attributable costs:

€1,600,000/€5,500,000=29%.

The costs which are not directly attributable per day of care are:

Conservative treatment: €155*0.29=€45

Thrombolysis treatment: €240*0.29=€70

Allocation of directly attributable costs and costs which are not directly attributable

Based on the CBS data from 2019 an estimate has been made of the share of accommodation and depreciation costs in the total costs of Dutch hospitals.¹¹⁵ This costs amount to 6.0% of the total operating costs. For university hospitals the share of accommodation and depreciation costs is slightly lower than for general hospitals (5.6% versus 6.2%, respectively).

Data from 2019 has been used to avoid any distortion in the data for 2020 and 2021 due to the COVID-19 pandemic.

Directly attributable costs (staff costs, food and accommodation-related costs and client and resident-related costs) amount to approximately 81% of the total costs. Other, unattributable costs therefore amount to approximately 19% of the costs. When only directly attributable costs are measured, these must be increased by a factor of 1.24 in order to obtain the total costs. The generic mark-up percentage for overheads on the directly attributable costs of medical departments is therefore 24%. This generic mark-up percentage includes the accommodation and depreciation costs. The mark-up percentage for university hospitals is 27% and 23% for general hospitals.

This concerns generic mark-up percentages whereby very significant differences may exist between healthcare organisations and products.

7.5 Cost price assessment outside hospitals

The same methodology can be largely used for a costing studies at healthcare providers other than in hospital. However, not all the components will be equally relevant for a costing study. For example, food and accommodation-related costs are less relevant for a costing studies in primary care. However, such cost items are indeed relevant for a costing studies in nursing homes. Another example is that the costs of materials for nursing homes will probably consist of incontinence products which may not be relevant to other healthcare providers.

Other sources and calculation values may also be relevant. Sources for staff costs will have to be related to the type of care that is at the heart of the costing studies, such as the CLAs that apply to GPs¹¹⁶ and staff in nursing homes, care homes and home care¹¹⁷. In addition, the number of workable hours may also differ compared to the CLAs which apply to hospitals. For example, full-time employment for staff working in nursing homes, care homes and home care is 36 hours according to the CLA, but full-time employment for primary care physiotherapists is 38 hours according to the relevant CLAs.¹¹⁸ The CLA which is applicable to GPs specifies an hourly wage, meaning that workable hours did not need to be calculated. The compensation for irregular working hours may also differ between healthcare providers. The share of overhead costs in total costs can also differ compared to the share of overhead costs in the total costs as determined for hospitals. On the basis of the CBS data, mark-up percentages can be calculated for a number of healthcare providers other than hospitals.¹¹⁹

7.6 Standard calculation values

Table 7-8 provides an overview of the standard calculation values presented in this chapter. The paragraph which deals with the calculation value in question is indicated in the last column.

Table 7-8 Standard calculation values for costs in the healthcare sector (Euro 2022)

Unit	Standard calculation values	Paragraph
Workable hours		
Workable hours per year, nursing and non-medical staff	1,543	7.1.1.2
Workable hours per year, junior doctors	1,989	7.1.1.2
Compensation for irregular working hours		
Compensation for irregular working hours, general hospitals, Mon-Fri, 00.00-06.00 and after 22.00	47%	7.1.1.2
Compensation for irregular working hours, general hospitals, Mon-Fri, 06.00-07.00 and 20.00-22.00	22%	7.1.1.2
Compensation for irregular working hours, general hospitals, Sat, 00.00-06.00 and after 22.00	52%	7.1.1.2
Compensation for irregular working hours, general hospitals, Sat, 06.00-08.00 and 12.00-22.00	38%	7.1.1.2
Compensation for irregular working hours, general hospitals, Sundays and public holidays	60%	7.1.1.2
Compensation for irregular working hours, university hospitals, Mon-Sat	47%	7.1.1.2
Compensation for irregular working hours, university hospitals, Sundays and public holidays	72%	7.1.1.2
Other supplements		
Supplement for holiday pay, social security contributions, pension contribution and non-wage labour costs, average	41%	7.1.1.2
Supplement for holiday pay, social security contributions, pension contribution and non-wage labour costs, higher (medical) staff	35%	7.1.1.2
Costs for a medical specialist		
Medical specialist, general hospital, costs per hour worked	96	7.1.1.2
Medical specialist, general hospital, costs per patient-related hour	138	7.1.1.2

Medical specialist, university hospital, costs per hour worked	96	7.1.1.2
Medical specialist, university hospital, costs per patient-related hour	137	7.1.1.2
Depreciation		
Depreciation of buildings	50 years	7.3.2
Depreciation of inventory	10 years	7.3.2
Interest rate	2.5%	7.3.3
Supplement for maintenance costs	5%	7.3.4
Supplement for accommodation and depreciation costs	6%	7.4.1.2
Supplement for accommodation, depreciation and overhead costs	24%	7.4.1.2

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Appendix 1: Standard calculation values and reference prices

Unit	Standard calculation values and reference prices	Paragraph
Days of care		
Day of care excluding staff costs, hospital	537	4.1
Day of care including staff costs, hospital	644	4.1
Day of care, intensive care (incl. diagnostics and medication)	2727	4.1
Day treatment		
Day treatment, hospital	335	4.2
Intravenous administration, hospital	171	4.2
Subcutaneous administration, hospital	75.28	4.2
Outpatient visits		
Outpatient visits, hospital	120	4.3
Accident and emergency	258	4.4
Transportation by ambulance		
Ambulance journey, weighted average	528	4.5
Ambulance journey, transport on demand	293	4.5
Ambulance journey, emergency transport	657	4.5
Medical procedures		
Conventional OT, use per minute	11.09	4.7
Hybrid OT, use per minute	23.34	4.7
Diagnostics		
MRI general (weighted average)	267	4.8
MRI hip(s)/ lower extremity/extremities	264	4.8
MRI brain	254	4.8
MRI lumbosacral spinal column	227	4.8
MRI shoulder(s)/upper extremity/extremities	271	4.8
MRI abdomen	342	4.8
CT general (weighted average)	188	4.8
CT scan of the abdomen, retroperitoneum, including oral and/or rectal contrast substance, with or under administration of an intravenous contrast agent.	214	4.8
CT scan of the thorax, the heart and large blood vessels including addition of contrast agent	196	4.8
CT scan of the brain and/or skull with or without intravenous contrast agent	153	4.8
CT scan of the lower extremities, with or without intravenous contrast	179	4.8
CT scan of the facial skeleton, with or without intravenous contrast	147	4.8
SPECT general (weighted average)	445	4.8
SPECT of skeleton detail	266	4.8
SPECT of ventricles ECG-triggered, rest with EF calculations	515	4.8
SPECT of the brain	626	4.8
SPECT of abdomen	323	4.8
PET general (weighted average)	963	4.8
PET WB (Whole Body), oncology	971	4.8
PET Partial (neurological, cardiological)	700	4.8
Ultrasound general (weighted average)	103	4.8
Ultrasound of the abdominal organs	118	4.8
Ultrasound lower extremity/extremities	97.16	4.8
On-screen ultrasound in connection with pregnancy	85.76	4.8
Ultrasound of mammary gland	95.80	4.8

Ultrasound of the thyroid and/or neck	91.08	4.8
X-ray	82.17	4.8
24 hours blood pressure measurement	96.78	4.8
CRP test	4.38	4.8
HbA1C test	4.52	4.8
TSH test	4.14	4.8
Creatinine test	1.49	4.8
Creatinine clearance	6.14	4.8
ALAT test	1.74	4.8
Auxiliary materials		
Arm prosthesis	3540	4.10
Leg prosthesis	2790	4.10
Devices for the use of communication devices (e.g. computers for people with a physical disability)	1550	4.10
Devices for communication and information in conjunction with visual impairments (e.g. magnifying glasses)	1230	4.10
Other devices for communication, information and detection	1170	4.10
Other devices for mobility	1040	4.10
Other devices diabetes	974	4.10
Other devices for arm-hand-finger function	927	4.10
Orthopaedic shoes	889	4.10
Special optical devices	731	4.10
GP consultations		
GP, consultation average (also applicable to telephone and e-mail consultation)	30.87	4.11
GP, consultation shorter than 20 minutes (also applicable to telephone and e-mail consultation)	28.74	4.11
GP, consultation longer than 20 minutes (also applicable to telephone and e-mail consultation)	42.47	4.11
GP, visit average	43.31	4.11
GP, visit shorter than 20 minutes	36.72	4.11
GP, visit longer than 20 minutes	48.21	4.11
Paramedical care		
Physiotherapy (per session)	38.89	4.12
Exercise therapy (per session)	42.91	4.12
Speech therapy (per session)	40.93	4.12
Occupational therapy (per session)	24.32	4.12
Dietary advice	24.70	4.12
Combined lifestyle interventions (<i>Gecombineerde leefstijlinterventies</i> , GLI)	128	4.12
Care for the elderly		
Nursing and care, incl. daytime activities, per day	290	Fout! Verwijzingsbron niet gevonden.
Care for the elderly, daytime activities, per part of a day	83.29	Fout! Verwijzingsbron niet gevonden.
Geriatric rehabilitation care, average per day	329	4.13
Geriatric rehabilitation care following amputation, per day	306	4.13
Geriatric rehabilitation care following a cerebrovascular accident (CVA), per day	357	4.13
Geriatric rehabilitation care following elective operation, per day	360	4.13
Geriatric rehabilitation care following trauma, per day	331	4.13
Geriatric rehabilitation care other diagnoses, per day	311	4.13
Home care (care for the elderly, mental healthcare and disability care)		
Home help	32.76	4.14
The costs of personal care at home	57.58	4.14
Supervision at home, per hour	64.00	4.14
Nursing at home, per hour	75.00	4.14

Treatment at home, per hour	138	4.14
Travel expenses, per visit	30.64	4.14
Mental healthcare		
GP consultation	30.87	4.15.1
Mental healthcare practice nurse, consultation average (also applicable to telephone and e-mail consultation)	20.85	4.15.1
Mental healthcare practice nurse, consultation shorter than 20 minutes (also applicable to telephone and e-mail consultation)	9.31	4.15.1
Mental healthcare practice nurse, consultation longer than 20 minutes (also applicable to telephone and e-mail consultation)	23.12	4.15.1
Mental healthcare practice nurse, visit average	28.50	4.15.1
Mental healthcare practice nurse, visit shorter than 20 minutes	17.34	4.15.1
Mental healthcare practice nurse, visit longer than 20 minutes	28.91	4.15.1
Mental healthcare practice nurse, group consultation	11.56	4.15.1
Social work consultation	127	0
Consultation with independent basic mental healthcare provider	98.61	4.15.3
Consultation with healthcare provider in general basic mental healthcare institutions	121	4.15.4
Consultation with independent specialist mental healthcare provider	140	4.15.5
Consultation with healthcare provider in specialist mental healthcare institutions	134	4.15.6
Consultation with healthcare provider in a PAAZ/PUK	148	4.15.7
Day of care, psychiatric institution	327	4.15.8
Day of care, PAAZ/PUK	490	4.15.9
Daytime activities part of a day, specialised mental healthcare	22.81	4.15.10
Rehabilitation		
Rehabilitation treatment consultation, children and adults	371	4.16
Rehabilitation treatment consultation, children	497	4.16
Rehabilitation treatment consultation, adults	347	4.16
Day of care rehabilitation centre, children and adults (incl. rehabilitation treatment hours)	910	4.16
Day of care rehabilitation centre, children (incl. rehabilitation treatment hours)	1368	4.16
Day of care rehabilitation centre, adults (incl. rehabilitation treatment hours)	849	4.16
Disability care		
Inpatient care (per day), people with mental disabilities, incl. daytime activities	282	4.17
Inpatient care (per day), people with mental disabilities, excl. daytime activities	163	4.17
Inpatient care (per day), people with minor mental disabilities, incl. daytime activities	345	4.17
Inpatient care (per day), people with minor mental disabilities and significant behavioural disorders, incl. daytime activities	458	4.17
Inpatient care (per day), people with physical disabilities, incl. daytime activities	301	4.17
Inpatient care (per day), people with physical disabilities, excl. daytime activities	234	4.17
Inpatient care (per day), people with auditory and communication disabilities, incl. daytime activities	429	4.17
Inpatient care (per day), people with auditory and communication disabilities, excl. daytime activities	263	4.17
Inpatient care (per day), visually impaired people, incl. daytime activities	277	4.17
Inpatient care (per day), visually impaired people, excl. daytime activities	208	4.17
Transport		
Average distance from home to hospital (incl. outpatient clinic away from a hospital)	4.8	5.1.1
Average distance from home to hospital (excl. outpatient clinic away from a hospital)	7.1	5.2.1
Average distance from home to GP practice	1	5.1.1
Average distance from home to pharmacy	1.2	5.1.1
Average distance from home to physiotherapy practice	2.2	5.1.1
Average distance from home to nursing and care home	3.7	5.1.1
Average distance from home to midwife	3.6	5.1.1
Average distance from home to child health centre	1.7	5.1.1
Car, costs per kilometre	0.26	5.3.1

Car, parking fees per visit	3.92	5.1.23.1
Public transport, costs per kilometre	0.21	5.1.23.1
Taxi (initial charge + price per kilometre)	3.36 + 2.47	5.1.23.1
Cost of time spent by informal carers, replacement costs per hour	18.80	5.3.2
Paid work		
Friction period (weeks)	16.4	6.1.2
Productivity costs per hour per paid worker	39.88	6.1.2
Unpaid work		
Replacement costs per hour	18.80	6.1.2
Education		
Primary education per year	9,846	6.2.1
Primary education per day	52.10	6.2.1
Primary education per hour	10.47	6.2.1
Secondary education per year	14,342	6.2.1
Secondary education per day	75.88	6.2.1
Secondary education per hour	15.26	6.2.1
Senior secondary vocational education per year	19,521	6.2.1
Senior secondary vocational education per day	103	6.2.1
Senior secondary vocational education per hour	20.77	6.2.1
Higher vocational education per year	15,963	6.2.1
Higher vocational education per day	84.46	6.2.1
Higher vocational education per hour	16.98	6.2.1
Pre-university education per year	29,735	6.2.1
Pre-university education per day	157.33	6.2.1
Pre-university education per hour	31.63	6.2.1
Special (primary) education per year	15,855	6.2.1
Special (primary) education per day	83.89	6.2.1
Special (primary) education per hour	16.87	6.2.1
Tuition by student per hour	15.00	6.2.1
Tuition by teacher per hour	30.00	6.2.1
Remedial teaching per hour	40.00	6.2.1
Costs per delinquent act per perpetrator		
Robbery/theft accompanied by violence	13,855	6.2.2
Straightforward theft/pickpocketing	3,147	6.2.2
Handling stolen goods	929	6.2.2
Acts of destruction/vandalism relating to private or public property	8,809	6.2.2
Disorderly conduct/discrimination	3,605	6.2.2
Arson	14,627	6.2.2
Cybercrime	106,076	6.2.2
Assault and aggravated assault	19,927	6.2.2
Threat	23,451	6.2.2
Forced sexual contact	4,088	6.2.2
Driving without a licence	7,086	6.2.2
Driving while under the influence	1,424	6.2.2
Selling soft drugs	5,612	6.2.2
Selling hard drugs	32,335	6.2.2
Offences relating to firearms/weapons	32,333	6.2.2
Workable hours		
Workable hours per year, nursing and non-medical staff	1,543	7.1.1.2
Workable hours per year, junior doctors	1,989	7.1.1.2
Compensation for irregular working hours		
Compensation for irregular working hours, general hospitals, Mon-Fri, 00.00-06.00 and after 22.00	47%	7.1.1.2
Compensation for irregular working hours, general hospitals, Mon-Fri, 06.00-07.00 and 20.00-22.00	22%	7.1.1.2
Compensation for irregular working hours, general hospitals, Sat, 00.00-06.00 and after	52%	7.1.1.2

22.00		
Compensation for irregular working hours, general hospitals, Sat, 06.00-08.00 and 12.00-22.00	38%	7.1.1.2
Compensation for irregular working hours, general hospitals, Sundays and public holidays	60%	7.1.1.2
Compensation for irregular working hours, university hospitals, Mon-Sat	47%	7.1.1.2
Compensation for irregular working hours, university hospitals, Sundays and public holidays	72%	7.1.1.2
Other supplements		
Supplement for holiday pay, social security contributions, pension contribution and non-wage labour costs, average	41%	7.1.1.2
Supplement for holiday pay, social security contributions, pension contribution and non-wage labour costs, higher (medical) staff	35%	7.1.1.2
Costs for a medical specialist		
Medical specialist, general hospital, costs per hour worked	96	7.1.1.2
Medical specialist, general hospital, costs per patient-related hour	138	7.1.1.2
Medical specialist, university hospital, costs per hour worked	96	7.1.1.2
Medical specialist, university hospital, costs per patient-related hour	137	7.1.1.2
Depreciation		
Depreciation of buildings	50 years	7.3.2
Depreciation of inventory	10 years	7.3.2
Interest rate	2.5%	7.3.3
Supplement for maintenance costs	5%	7.3.4
Supplement for accommodation and depreciation costs	6%	7.4.1.2
Supplement for accommodation, depreciation and overhead costs	24%	7.4.1.2

Colophon

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