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Healthcare expenditure and illness-related costs

Polynomics
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POLYNOMICS

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Table of contents

In brief

We have already become more or less accustomed to the yearly ritual: Each autumn, when the new health insurance premiums for the next year are announced, we find that they have risen sharply again, as in previous years. This is followed by an outcry from the Swiss press, and the politicians vie with one another in demanding a slowdown or even a total halt to healthcare expenditure. Two aspects are usually left out of the picture here: On the one hand, illness also generates costs outside of the healthcare sector. For this reason, healthcare expenditure only represents part of the total costs that the Swiss economy has to bear as a result of illness. On the other hand, healthcare expenditure is ultimately a means to an end, in order to restore the health of sick individuals as well and as quickly as possible. So, for example, higher healthcare expenditure due to improved treatment methods can reduce illness-related costs outside of the healthcare sector. An overall consideration of all the components is necessary to determine whether or not healthcare expenditure is worthwhile.

In overall terms, illness-related costs consist of three components: direct, indirect and intangible costs. Direct illness-related costs relate to financial expenses that must be incurred in order to combat an illness. They may arise both within the healthcare sector (for example: compensation for doctors or expenditure on drugs and medicines) and outside of it (for example: expenditure on converting an apartment to make it suitable for disabled use, or travel expenses to visit the doctor), so the terms “direct medical costs” and “direct non-medical costs” are used.

As well as financial outlay, illness also leads to a loss of productive time. It results in absences from the workplace, and therefore causes indirect costs due to productivity losses for employers and employees. However, indirect costs are also incurred when family members and friends spend time in order to look after patients themselves (what is known as “informal care”).

Finally, illness also causes costs in the form of pain and suffering, or a generally poorer quality of life, and these are borne by patients, relatives and those close to the patient. Even if these intangible costs are virtually impossible to quantify in monetary terms, they nevertheless represent a real loss of benefit for those affected, so they cannot be neglected.

In this systematic representation of illness-related costs, healthcare expenditure corresponds to direct medical costs, i.e. all financial outlay in the healthcare sector. Since this expenditure is incurred directly in monetary units, it is relatively easy to record and is also reported each year in official public statistics. However, the remaining components of illness-related costs do not appear in public statistics, because these costs are not incurred directly in monetary form; instead, they have to be determined indirectly by assessing the value of the time lost or the reduction in the quality of life.

In studies of illness-related costs (known as cost-of-illness studies), assessments of this sort are undertaken for specific illnesses, providing the basis for a knowledge of the magnitudes of the various cost components. Existing studies for Switzerland show that healthcare expenditure in the case of various illnesses accounts for only a small portion of the total illness-related costs. On average, the proportion was about one-third, and the remaining two thirds of illness-related costs were caused by indirect costs such as loss of productivity at the workplace and informal care.

This static analysis already shows that incorrect assumptions may be reached by examining healthcare expenditure on an exclusive basis, since only a small portion of overall illness-related costs is considered in this case. This conclusion is reinforced if we bear in mind that healthcare expenditure is not merely a cost consequence of illness; on the contrary, it is used to combat illness and to help patients to attain a better state of health. Healthcare expenditure therefore reduces the other illness-related costs, because a better state of health or a faster recovery will lead to fewer productivity losses, less informal care and a reduction of pain and suffering.

This influence exerted by healthcare expenditure on illness-related costs is especially important in connection with medical and technological progress. Innovations in the healthcare sector lead to new equipment, medicines and procedures which are usually more costly than the existing versions, but which allow more effective and speedy treatment of illnesses in return. There are many such examples. For instance, minimally invasive surgical procedures such as laparoscopy have now made it possible for hernia patients to return to work almost twice as quickly after the operation, with significantly less pain.

These reciprocal relationships between direct and indirect or intangible illness-related costs do not, as such, mean that increases in healthcare expenditure

(due for example to medical and technological progress) automatically pose a problem. On the contrary, the questions that arise are: When is higher healthcare expenditure worthwhile, or what is the breakdown of the total effect in terms of increases in healthcare expenditure and reductions in the other cost components? Empirical evidence currently suggests that higher healthcare expenditure over the last thirty years has been more than compensated by the benefit from the associated medical and technological progress, so illness-related costs have tended to diminish. There are several studies which prove that higher healthcare expenditure in the industrialized countries has made a significant contribution to the increase in life expectancy. Moreover, various scientific studies in the US have shown that every dollar invested in the healthcare sector between 1980 and 2000 earned a return of 1.5 to 2 dollars, in the form of higher life expectancy and improved health. Even if these studies cannot be applied directly to Switzerland and although they do not indicate whether improvements to efficiency might have made even higher returns possible, they nevertheless provide a strong indication that technological progress and the associated increase in healthcare expenditure have also been worthwhile in Switzerland, given that the US is the country with the most expensive healthcare sector in the world.

Both the static and the dynamic analyses show that it is not expedient to focus solely on the amount of healthcare expenditure, and this approach can lead to incorrect decisions. Under some circumstances, a short-term reduction in healthcare expenditure may lead to higher overall costs in the long term, thereby reducing well-being in society as a whole. As the Swiss healthcare sector is structured at present, none of the players has an overall perspective on illness-related costs. Service providers and innovators are mainly interested in improving the state of health so as to reduce indirect and intangible costs, whereas health insurers concentrate principally on healthcare expenditure. But since the Swiss population has to bear all illness-related costs, health policy decisions ought to take account of all the cost components of illness, as well as the frequently long-term links between healthcare expenditure and illness-related costs. Higher healthcare expenditure is justified if it results in a sustained improvement in the state of health, which in turn reduces overall illness-related costs. Conversely, a reduction in healthcare expenditure is justified only if it leads to improvement in efficiency in the system, and if no high-benefit services are cut.

1 Background

The level and development of healthcare expenditure are omnipresent topics of public discussion in Switzerland. With a good 11 % of its gross domestic product allocated to this purpose, Switzerland is regularly among the leaders in international comparisons, and this state of affairs draws criticism from various quarters. Calls for a reduction in healthcare expenditure are especially loud whenever the annual announcement of health insurance premiums for the following year comes around. Most political reform proposals aim to cut healthcare expenditure or to shift its financing.

One aspect that is neglected in this context, however, is that healthcare expenditure represents only one part of the overall picture, meaning that consideration is only given to the input side. As a result, the impact of healthcare expenditure on the health and well-being of the population is often concealed. Healthcare expenditure is the result of the use of resources in the healthcare sector, in order to combat illnesses. The consequent improvement in the state of health reduces the costs that are incurred due to illness outside of the healthcare sector.

It follows that a distinction should be drawn between the terms “healthcare expenditure” and “illness-related costs”. Healthcare expenditure, in fact, only accounts for part of illness-related costs. It refers merely to the direct medical costs that are linked to the treatment of illnesses, whereas illness-related costs comprise all the costs that a society incurs due to illness. In addition to direct medical costs, these include – in particular – direct costs outside the healthcare sector (for example, childcare due to the parents’ illness or conversion work required due to a restricted state of health), indirect costs due to illness-related losses of productivity at the workplace and costs of informal care by relatives or acquaintances, as well as intangible costs due to the pain and suffering associated with illness.

When it comes to health policy decisions, it is important to keep the overall picture in mind and always to take additional account of the income-related effects (outcome) in respect of measures on the expenditure side (input). This means shifting the focus away from healthcare expenditure towards overall illness-related costs. It should be remembered that healthcare expenditure is merely a means to an end, i.e. to restore the health of sick people as quickly and as well as possible. In turn, this ultimately means nothing more or less than reducing the indirect and intangible costs of illness. In terms of total cost management, a

reduction in costs therefore always equates to an increase in overall social well-being. When a reduction is made in healthcare expenditure only, the expenditure saved may – under certain circumstances – have a negative impact on the indirect and intangible costs, if illnesses can no longer be combatted so well as a result.

This argument is reinforced still further if dynamic factors due to medical and technological progress are also taken into account. In the first instance, large amounts of time and money must be expended on the development of medical innovations, but the benefit from them is only reaped in the future. Accordingly, a static consideration of healthcare expenditure mainly takes account of the short-term effects on a national economy. Longer-term welfare can only be determined if the influence of healthcare expenditure on total illness-related costs is taken into account as well.

Among other aims, this study intends to supply answers do the following questions:

- What are illness-related costs, and which components to they comprise?
- How can healthcare expenditure be classified within the generic category of "illness-related costs"?
- What are the magnitudes of healthcare expenditure as compared to other illness-related costs in Switzerland?
- How does healthcare expenditure influence the other illness-related costs, and what part does medical and technological progress play here?
- In overall terms, did healthcare expenditure pay off in the past?
- Which conclusions can be drawn for regulation of the healthcare sector?

The study is structured as follows: Section 2 starts by explaining the economic cost concept and demarcating the terms and concepts used, before presenting methods of measuring illness-related costs. This section closes with a summary of the empirical evidence for selected disease patterns in Switzerland. Section 3 deals with the dynamic effects. The interdependency between healthcare expenditure and illness-related costs is illustrated, and there is an examination of the question as to whether healthcare expenditure is worthwhile as a means of reducing illness-related costs. Section 4 summarizes the results of the various lines of argument in the form of conclusions, and sets them within the context of Swiss health policy. Detailed descriptions of studies carried out in order to determine illness-related costs for Switzerland (cost-of-illness studies) are offered as profiles for selected disease patterns in the annex (cf. section 5).

2 Healthcare expenditure – only part of illness-related costs

2.1 Costs mean more than expenditure – the economic cost concept

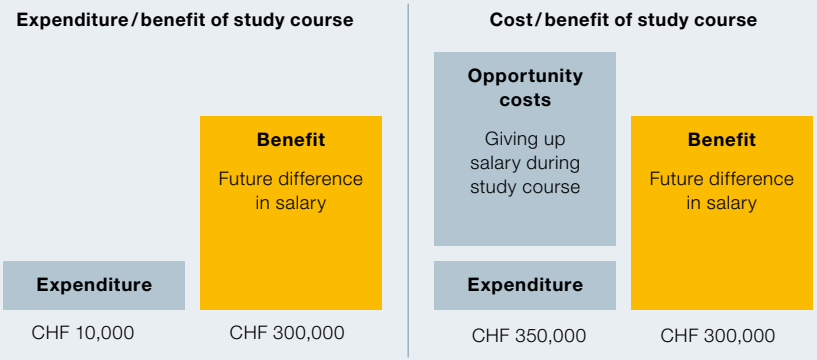
Costs are commonly equated with expenditure, which is to say that "costs" are understood to mean amounts of money that have to be spent on something. Accordingly, the terms "health care costs" are often used when in fact healthcare expenditure is meant, i.e. all monetary expenses within the healthcare sector. These involve all the monetary flows that are set in train in a country for services and goods aimed at the prevention and treatment of illnesses and accidents, and for related rehabilitation and care (cf. BFS [Swiss Federal Statistical Office, SFSO], 2011a).

Viewed in economic terms, however, expenditure merely makes up one portion of the costs. According to economic theory, costs are generally regarded as lost benefit (or utility). The terms used here are opportunity or alternative costs that result from the unused possibilities which have to be abandoned. Opportunity costs of this sort are always present when resources are in short supply, even if no monetary expenditure at all is incurred. For example, Robinson Crusoe makes no monetary payments to anyone, but he nevertheless knows that the costs of picking strawberries can be regarded as the sacrificed quantity of raspberries (or his benefit from them) which he would otherwise have been able to pick with the same expenditure of time and effort (cf. Samuelson, 1976).

The difference between expenditure and economic costs can be shown simply by the example of a college or university course. A student at a university or college must incur expenditure with which he finances his studies. This includes, for instance, payments for course fees, books and travel expenses. As well as this monetary expenditure, however, a student also invests time in his studies by taking part in lectures, learning, and writing assignments and tests. He could also use this time for other activities, for example in order to take up gainful employment and earn money. This unearned money equates to the opportunity costs incurred due to the course of study. The overall costs of the studies therefore include not only the financial expenditure, but also the opportunity costs for the time used, in the form of lost earnings which could have been gained by using this time.

This example shows how important it is to include consideration of the opportunity costs when reaching decisions. If someone is about to decide whether to

Figure 1 | Comparison of costs/benefits of a study course



In a cost-benefit comparison, the opportunity costs must always be taken into account because the expenditure represents only part of the costs. The fictitious numerical example of a college study course shows that in terms of purely financial interests, disregarding the opportunity costs can lead to an incorrect decision. The expenditure and lost pay during the study period cannot be compensated by the higher pay after the study course.

Source: Polynomics.

embark on a course of university study, he usually weighs up the costs and benefits of such a decision. If he only takes account of the monetary expenditure, he neglects an important cost component, which may lead to an incorrect decision. Figure 1 illustrates this case with a fictitious numerical example. For example, if someone is interested in income only,[1] it may be that study comes off poorly in an overall consideration, because the likelihood of the higher pay that can be achieved with a university degree is outweighed by the income that is not earned during the study period. In this case, the benefit from the university study would be less than the resultant loss of benefit, or the costs, because the invested money and the time used could be utilized in other ways, with higher total income (cf. figure 1).

[1] Of course, other non-monetary components also play a part in a decision of this sort. However, these too can basically be treated as benefits or costs.

2.2 Healthcare expenditure and illness-related costs – a demarcation of terms

An illness is essentially a loss of benefit that occurs because a deterioration takes place in the normal state of health. This loss of benefit is reflected in various costs, not all of which consist of monetary payments or expenditure. These include the resources that must be expended in order to combat the illness, or the opportunity costs incurred because the work output of sick persons is restricted. The pain and suffering caused by an illness must also be included in the term "economic costs".

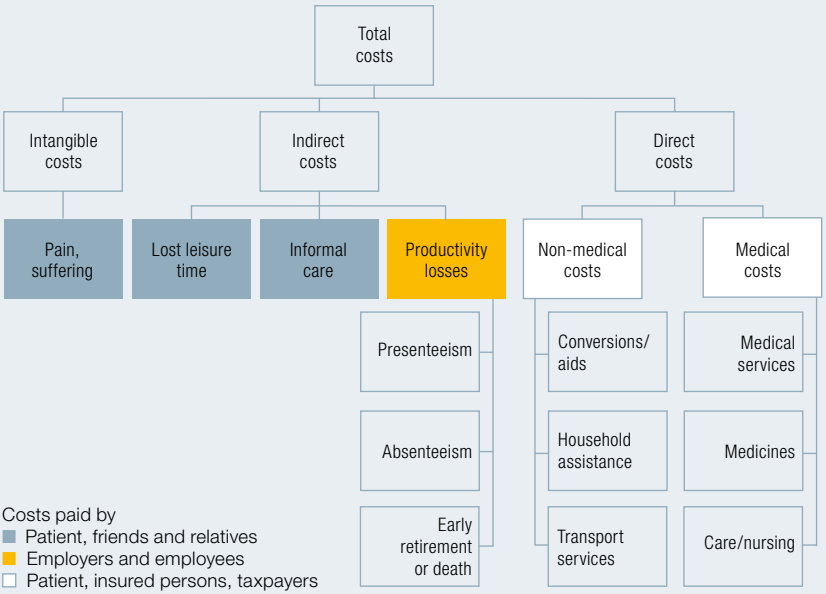
For the purposes of evaluation in terms of health economics, therefore, three basic cost categories must be differentiated in order to calculate the illness-related costs: These are direct, indirect and intangible costs (cf. for example Schöffski et al., 2008).

Direct costs correspond to monetary expenditure that becomes necessary due to the illness. They can be recorded directly in monetary units and are incurred both within and outside the healthcare sector. Direct costs can therefore be split into medical and non-medical costs. Direct medical costs arise directly from the expenditure of resources to treat an illness, for example by means of medicines, hospital stays and outpatient medical and nursing services. On the other hand, the direct non-medical costs comprise the expenditure that is caused by the consequences of the illness or treatment, but which is not incurred in the healthcare sector. For example, these include expenditure on illness-related conversion of homes, travel expenses or household assistance.

In contrast to the direct costs, indirect costs describe opportunity costs which do have an impact on the consumption of resources, but which do not entail any direct payments or expenditure. They mainly comprise losses of productivity due to illness or premature death, i.e. the loss of resources (in the form of time) which could have been used otherwise. At the workplace, loss of productivity is incurred due to illness-related absences (absenteeism) and also due to restricted performance capacity (presenteeism). In overall terms, the indirect costs are the value of lost working and leisure time. This may be the time of patients as well as that of relatives and friends, who (for example) take care of a patient at no charge (informal care[2]).

[2] The breakdown of the individual cost categories is not always uniform in the literature. In some studies, informal care in particular is assigned to direct (non-medical) costs (cf. e.g. Kobelt et al., 2006a).

Figure 2 | Cost categories: illness-related costs



Illness-related costs can be broken down into direct, indirect and intangible costs. The allocation of individual cost items to the relevant categories differs in the literature. For example, some studies also assign informal care to direct costs. Cost-of-illness studies rarely take account of the intangible costs and lost leisure time. Likewise, informal care and loss of productivity are partially neglected. Moreover, as regards productivity losses, account is taken only of absenteeism (i.e. illness-related absence from the workplace) and early retirement. Costs are also incurred due to presenteeism – reduced performance ability while present at the workplace – and losses of productivity due to premature death.

Source: Polynomics.

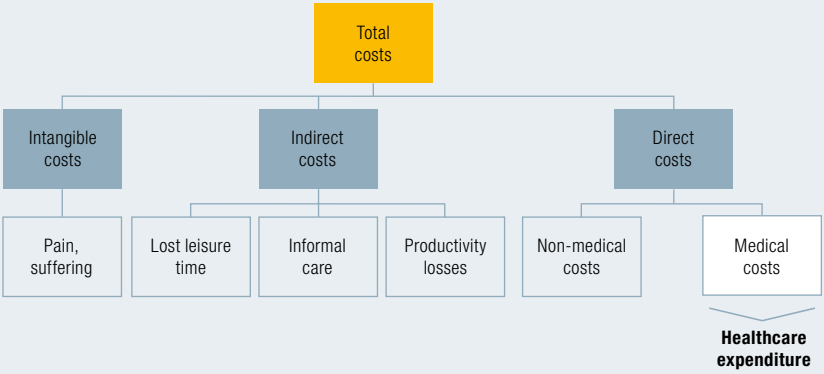
The intangible costs are losses of benefit that arise due to an illness but which have no direct impact on the consumption of resources. These include physical and mental impairments such as suffering, pain or (in general) the resultant loss of quality of life. As the term itself suggests, intangible costs are difficult to record in monetary form, because they do not entail any effects on resources that can be assessed in terms of value. Figure 2 provides a graphic overview of the systematization of illness-related costs.

This rough breakdown into direct, indirect and intangible costs already shows that not all illness-related costs are borne by the same persons. The specific structure of the national healthcare sector has a major influence on which groups must bear the illness-related costs. In Switzerland, the financial expenses of combating an illness – the direct medical costs – are paid mainly by the insured persons (through premiums), taxpayers (cantonal contributions to inpatient expenditure and premium discounts) and patients (through retentions, deductibles and self-payments). On the other hand, direct non-medical costs are financed mainly by the patients and their relatives. In respect of indirect costs, the productivity losses due to reduced working capacity are borne mainly by the employers and employees themselves,[3] whereas the illness-related intangible costs due to pain and suffering fall principally upon the patients and their relatives.

Now, how does healthcare expenditure fit into this systematic representation of illness-related costs? As already mentioned in section 2.1 healthcare expenditure is the money that is spent in a country on services and goods for the purposes of prevention, treatment, rehabilitation and care in connection with illnesses and accidents. Hence, healthcare expenditure precisely corresponds to the portion of direct medical costs (monetary expenditure within the healthcare sector, cf. figure 3). According to the systematic representation shown here, healthcare expenditure merely corresponds to a partial element of direct and total illness-related costs. But from the overall social perspective, total illness-related costs are the decisive factor, regardless of where they are incurred, by whom and in what form. This overall view is the only way of determining which costs an economy has to bear due to a specific illness.

[3] In the case of an accident (as opposed to an illness), a portion of the indirect costs is assumed by those paying the premiums for accident insurance, because the loss of productivity due to incapacity for work is included in the mandatory daily allowance which is one of the insurance benefits. In the area of health insurance, however, daily allowance insurance of this sort is voluntary.

Figure 3 | Proportion of healthcare expenditure to illness-related costs



Illness-related costs consist of intangible, indirect and direct costs. However, healthcare expenses only form part of the total costs; they correspond to the direct medical costs.

Source: Polynomics.

2.3 How can illness-related costs be measured?

Healthcare expenditure is relatively simple to determine, because it consists of direct costs and is therefore incurred in the form of monetary payments. Therefore, healthcare expenditure is registered and published each year by statistical agencies at national level. By contrast, the total costs incurred due to an illness are difficult to determine, because indirect and intangible costs are not incurred directly in monetary form; they must be determined by circuitous means. Various methods and concepts have been developed in economics for this purpose.

Measuring indirect costs

When it comes to measuring indirect costs, the main difficulties lie in determining how many resources (mainly in the form of time) are lost to the economy due to illness, and how their value should be assessed. Since indirect costs consist partially of loss of productivity, which is manifested on the labour market, the measurement concepts used in practice are based on different assumptions about the functioning of the labour market. When determining indirect costs, a distinction is normally drawn between productivity losses on the labour market and the opportunity costs of informal care by relatives (cf. figure 4).

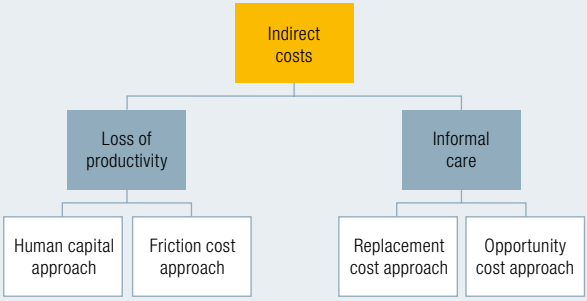
In order to measure productivity losses on the labour market, most cost-of-illness studies apply the human capital approach or HCA (cf. for example Breyer et al., 2005; or Zhang and Anis, 2010). With this approach, every hour not worked due to illness is regarded as a loss of productivity.[4] Illness among non-employed persons such as pensioners or persons with an incapacity for work therefore generates no indirect costs for the economy with this approach. In order to obtain the monetary value of the indirect costs, the number of working hours lost is multiplied by an hourly pay rate. According to economic theory, the assumption behind this is that the wages or salary paid reflect the productivity of the employees. Hence, the hourly pay rate corresponds to the opportunity costs of one lost hour of work.

One advantage of this method is that it is relatively simple to implement, and can also be applied in principle to housework, voluntary work or leisure time. A point for which the human capital approach draws criticism is that in reality, the salary paid often does not correspond to the effective productivity of the employees. The actual costs are typically underestimated if the salary is below productivity, for example due to the employees' risk aversion (cf. Zhang and Anis, 2010). Another criticism is that the human capital approach assumes full employment on the labour market. If this is not the case and a certain level of unemployment obtains, the human capital approach calculates – from the employer's viewpoint – the potential costs, rather than the costs actually incurred. With this argument, there would be an overestimate of the actual costs, for example because employers will at some point replace a chronic invalid who is no longer capable of work (cf. van den Hout, 2010).

In order to respond to the second criticism in particular, the human capital approach was developed further into the friction cost approach (FCA) (cf. Koopmanschap and van Ineveld, 1992). With the friction cost approach, the lost earnings are not calculated until retirement, but are limited instead to what is known as a friction period. Only those production losses are calculated until the sick person is replaced by a new (previously unemployed) employee. The friction period depends on the availability of jobseekers, i.e. on the level of unemployment. In addition to the loss of productivity, transaction costs are incurred to find

[4] Most cost-of-illness studies are prevalence-based, i.e. the costs of illness for all those currently ill during the year in progress are calculated. By contrast, there is also a variant: the incidence-based cost-of-illness study. In this case, the costs of all new incidences of the illness in a year are calculated for the entire lifetime (cf. Larg and Moss, 2011). In incidence-based studies of this sort, all productivity losses to be incurred in the future are downscaled by an interest rate (discount rate) on a "net present value" (cf. e.g. Johannesson, 1996; Drummond et al., 1997).

Figure 4 | Methods of measuring indirect costs



Various methods are available to measure indirect costs. As regards productivity losses, a distinction can be drawn between the human capital approach (HCA) and the friction cost approach (FCA). The HCA takes account of all productivity losses until retirement, whereas the FCA limits productivity losses to a friction period, as it is known. This is based on the assumption that the sick employee will be replaced after a certain time by someone who was previously unemployed. There are also two different methods for assessing the value of informal care: the replacement cost approach (RCA) and the opportunity cost approach (OCA). With the RCA, the time spent on care is valued using the market pay rate for nursing, whereas the OCA takes account of the actual opportunity costs for the caregiver.

Source: Polynomics.

and induct the new employee. Even in case of short-term incapacity for work with no replacement by a new employee, a lower production loss is assumed with the FCA than with the HCA. It is presumed that part of the work is temporarily taken over by colleagues, or that it can be completed after returning to the workplace.

The key criticism levelled at the friction cost approach is that the actual indirect costs are underestimated, because the approach is limited to gainful activity and no account is taken of the opportunity costs of voluntary work and lost leisure time. As with the HCA, no indirect costs due to loss of productivity are incurred for pensioners or persons who are not gainfully employed. In the literature on cost-of-illness studies, the friction cost approach has not yet become established, and the human capital method is still used to measure the indirect costs in the majority of cases.

In addition to the method for calculating loss of productivity, there are also different approaches to the calculation basis for a unit of lost productivity. The individual salary may be applied for this purpose, or the average national income may be used. The latter can additionally be differentiated by gender and age. Instead of the national gross salary, the added value of productivity can be used. This value is based on total domestic production, and it takes account of age and gender differences. Since the reduction in labour productivity is not proportional to the reduction in annual hours worked, an elasticity factor is introduced as a correction (cf. Verstappen et al., 2005).

In contrast to productivity losses at the workplace, the indirect costs of informal care are often neglected in the literature due to the difficulty of measuring them. As regards evaluation methods, a distinction can be drawn between the opportunity cost and the replacement cost approaches. With the opportunity cost approach (OCA), it is assumed that individuals will work until the marginal utility of labour corresponds to the marginal costs of leisure, i.e. the opportunity costs of leisure time correspond to the net salary rate as such. On the other hand, the replacement cost approach (RCA) offsets the time spent on care against the market salary for nursing and housekeeping. This corresponds to the costs that would be incurred for professional care, regardless of the actual opportunity costs of the informal caregiver. The opportunity cost approach also defines a lower limit, and the replacement cost approach defines an upper limit for the actual costs, as it can be assumed that informal care is provided only if the opportunity costs relating to the leisure time of the caregiver are less than the costs of professional nursing care (cf. Krauth, 2010).

Measuring intangible costs

As their name suggests, it is considerably more difficult to measure the intangible costs of illness, since they do not entail any impact on resources that can be assessed in terms of value. On the contrary, this type of cost represents a pure loss of benefit. If we nevertheless wish to make some statement about the magnitude of these costs, they have to be valued in monetary units. In economics, the concept of willingness to pay (WTP) is normally used to assess the value of benefit. The underlying assumption behind this concept is that the benefit from a "good"[5] is the value attributed to it by the persons who consume or use it. The amount that a person is prepared to pay for a specific good varies from indi-

[5] The term "good" should be understood as being general in this context. As well as consumer goods, it may also include services or non-traded goods such as beautiful countryside and even health, or freedom from pain.

vidual to individual. In the case of tradable goods that are sold, a comparison between the willingness to pay and the price determines whether or not the good is purchased. A person will purchase a good if willingness to pay is greater than the price asked, i.e. when the benefit from the good exceeds the associated costs. If the price is exactly equal to the willingness to pay, the person will be undecided as to whether to buy the good or keep the money. In this case, the benefit from the good is exactly equal to the associated costs. If the price is above the willingness to pay, the person will not buy the good because the costs are greater than the benefit from the good.

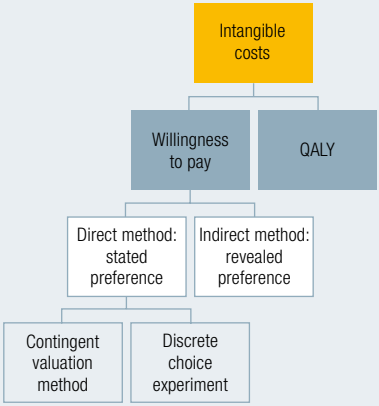
The benefit from non-tradable goods can also be measured with the concept of willingness to pay. In connection with the intangible costs of illness, the loss of benefit can be defined by determining the willingness to pay for preventing pain and suffering or for an unrestricted quality of life. This corresponds to nothing more or less than a monetary valuation of the loss of benefit that is entailed.

Willingness to pay is generally determined by direct or indirect methods (cf. figure 5). With the indirect method, known as the revealed preference method, disclosed preferences are examined. Behaviour patterns are observed in reality and conclusions are then drawn about the willingness to pay for a product. For example, the purchase of a painkiller can be used to deduce the value of freedom from pain. For people who do not buy painkillers, it can be assumed that the benefit is lower than the market price. For the purchasers, however, the market price sets the lower limit for the value that they accord to freedom from pain. If the level of accepted prices varies across individuals or different groups, willingness-to-pay figures can be derived from purchase decisions (cf. for example Johannesson, 1996).

The evaluation of observed data of this sort often proves to be problematic from the statistical viewpoint. On the one hand, it is unclear whether the individual was even aware of the respective alternatives when deciding on his choice. Since most decisions are based on several criteria, these data cannot be used as a basis to ensure that all the aspects have been incorporated into the decision-making. On the other hand, revealed preference methods can generally be used only in very special situations, where such products actually exist on a market and purchasing decisions can be observed as a basis for drawing conclusions about willingness to pay. This is seldom likely to be the case, especially as regards the intangible costs of illnesses.[6]

[6] For more examples of the use of revealed preference methods, cf. Telser (2002, sect. 2).

Figure 5 | Methods of measuring intangible costs



Intangible costs correspond to a loss of benefit which the willingness-to-pay approach can assess in terms of monetary value. Either a direct or an indirect method can be applied for this purpose. The indirect method (the revealed preference method) aims to derive a person's willingness to pay indirectly on the basis of his behaviour, whereas the direct method (stated preference method) measures willingness to pay by means of direct questionnaires or discrete choice experiments as part of a survey. However, both methods entail relatively high outlay. The intangible costs can also be determined approximately with the QALY approach (Quality-Adjusted Life Years). In this case, the loss of benefit is determined on the basis of the illness and is monetarized with a flat-rate estimate of costs per QALY.

Source: Polynomics.

As an alternative to the indirect methods, what are known as stated preference methods have been developed in economics. With these direct methods, expressed preferences are recorded in the form of surveys. A basic distinction can be drawn between two approaches. With the contingent valuation method, the person is asked about his willingness to pay with the help of a questionnaire or a personal interview, whereas discrete choice experiments determine willingness to pay on the basis of discrete decisions between scenarios of different natures (cf. Telser, 2002). Both methods require questioning of patients and relatives, which involves major outlay. For this reason, they are rarely used in cost-of-illness studies.

As an approximation in order to determine the intangible costs, a so-called QALY (Quality Adjusted Life Years) approach is used in some studies. A QALY is a measurement for assessing the value of a year of life depending on the state of health. In full health, the QALY has a value of one. Depending on how restrictive an illness is, the value decreases until it becomes zero on death. The loss of benefit from a life year in imperfect health is then determined with the help of a monetarization of the QALY. Flat-rate cost estimates are usually selected in the studies for this purpose. There is comprehensive discussion of the "right" or "appropriate" value of a QALY in the literature (Eichler et al., 2004), but this approach cannot be used for an individual consideration of the loss of benefit due to illness.

In overall terms, the determination of willingness to pay in order to prevent pain, suffering and restrictions on quality of life for patients and relatives proves to involve significantly more outlay than a calculation of the direct and indirect costs. Accordingly, most cost-of-illness studies omit any calculation of the intangible costs and report only the direct and indirect costs.

2.4 How high are illness-related costs in Switzerland?

Cost-of-illness studies are normally carried out in order to identify the costs of individual illnesses to the national economy. Consequently, they always involve partial analyses. It will not be possible to arrive at a conclusive answer to the question about the level of illness-related costs in Switzerland on the basis of the scientific literature. Existing cost-of-illness studies can nevertheless be used to estimate the magnitudes of healthcare expenditure and illness-related costs for specific disease patterns, from which conclusions can be drawn for the entire healthcare sector. It is preferable to draw such conclusions on the basis of studies that refer to Switzerland, since the structures of national healthcare sectors often differ very widely and the breakdown of cost categories can therefore vary from country to country.

The main results from seven studies showing the total costs for different illnesses in Switzerland are presented below.[7] These studies were all published in recent years, and they provide information on both the direct and indirect costs of an illness, enabling up-to-date statements to be made about the ratios of healthcare expenditure and illness-related costs for various categories of illness. Older studies and those providing inadequate information on individual cost components were excluded for the purposes of the following synthesis.

[7] More detailed descriptions of the studies and their results are given in section 5.

The seven studies showing illness-related costs for Switzerland deal primarily with chronic illnesses, probably because such illnesses are occurring with increasing frequency due to demographic ageing, and are becoming more important (cf. Christensen et al., 2009). Three studies calculate the costs of brain disorders; in addition to studies on multiple sclerosis (Kobelt et al., 2006a and 2006b) and dementia (Kraft et al., 2010), there is an overview study covering all major brain disorders (Andlin-Sobocki et al., 2005). Other chronic illnesses for which Swiss cost figures are available are: cancer (Jönsson and Wilking, 2007), rheumatoid arthritis (Lundkvist et al., 2008) and chronic low back pain (Wieser et al., 2010). The only cost-of-illness study for an acute illness relates to sepsis or blood poisoning (Schmid et al., 2004).

Of course, the disease patterns in these seven studies are not a representative selection of all illnesses in Switzerland. But the inclusion of rheumatoid arthritis, cancer and brain disorders (including depressions and migraine) means that the studies include four of the seven most frequent chronic illnesses in Switzerland. Moreover, the study on back pain deals with the most frequent physical disorder in Switzerland, from which almost half of the population suffers, and which cannot be directly attributed to an illness (cf. BFS, 2010).

Table 1 provides an overview of the total costs determined in these studies for Switzerland. The total costs in this case essentially comprise direct medical and direct non-medical costs, as well as indirect costs (loss of productivity and informal care).[8] As described in section 2.2, the direct medical costs can be equated to the healthcare expenditure for the illness in question. The results show, on the one hand, that the total costs per disease pattern for Switzerland differ significantly in some cases. This is not surprising given that the various illnesses entail completely different prevalence figures and forms of treatment.

Low back pain generates the highest costs apart from the brain disorders (which comprise twelve disorders). Both categories of illness involve relatively low costs per patient, but their prevalence is high. The most expensive illness per patient is sepsis, followed by dementia and multiple sclerosis (cf. section 5). In overall terms, however, the relatively low prevalence of these illnesses nevertheless results in lower total costs. Nevertheless, a direct comparison between the illnesses is only possible to a limited extent, because the studies used different methods and data in some cases.

[8] Intangible costs were calculated only in the study on the costs of multiple sclerosis, so they are not reported here (cf. Kobelt et al., 2006a, and section 5.1).

Table 1 | Healthcare expenditure and illness-related costs in Switzerland

	Healthcare expenditure (direct medical costs) in million CHF/a	Direct non-medical costs in million CHF/a	Indirect costs in million CHF/a	Total costs in million CHF/a	Ratio of healthcare expenditure to illness-related costs
Multiple sclerosis	192	55	273	520	37.0 %
Sepsis	355	no data	844	1,199	29.6 %
Rheumatoid arthritis	790	278	1,332	2,400	32.9 %
Dementia	3,486	no data	2,771	6,257	55.7 %
Cancer	3,062	241	4,593	7,655	40.0 %
Back pain (HCA)	2,751	1,224	6,316	10,291	26.7 %
Back pain (FCA)	2,751	1,224	3,390	7,365	37.3 %
Brain diseases/ disorders	6,082	2,696	9,831	18,609	32.7 %

HCA: human capital approach; FCA: friction cost approach to calculate productivity losses

The total costs of an illness comprise the direct medical costs, the direct non-medical costs and the indirect costs. The intangible costs are disregarded here because they are only calculated in one study on multiple sclerosis. The direct medical costs reflect the healthcare expenditure. It is evident that this accounts for only a small proportion of the illness-related costs – an average of easily one-third. On average, the indirect costs account for 55 % of the total costs. In overall terms, back pain generates the highest costs apart from the brain disorders (which comprise twelve diseases). But cancer and dementia also cause high costs for the Swiss economy, at about 6 to 8 billion CHF per year.

Sources: Andlin-Sobocki et al. (2005), Jäger et al. (2008), Jönsson and Wilking (2007), Kobelt et al. (2006a), Kraft et al. (2010), Lundkvist et al. (2008), Schmid et al. (2004), Wieser et al. (2010), own calculations.

One of the main results of this overview is the finding that direct medical costs – healthcare expenditure – account for a relatively low portion of total costs for virtually every illness pattern. Dementia is the only illness where healthcare expenditure attains a portion of over 50 %, mainly because dementia primarily affects older people who are no longer in the work process in most cases. For this reason, no losses of work productivity were determined for dementia-type illnesses, and this is reflected in lower indirect costs. For all the other illnesses, the healthcare expenditure accounts for between 26 % and 40 % of the total costs. On average, it amounts to easily one-third.

This result also applies to sepsis, the only acute illness among the studies considered here. All in all, however, it may be assumed that the percentage of indirect costs for acute illnesses is significantly lower than for chronic illnesses, since productivity losses are limited to a shorter period.[9] On the other hand, most studies underestimate the indirect costs, because they usually take account only of productivity losses and informal care. Indirect costs for non-gainfully employed persons and the costs of lost leisure time in general are rarely taken into account.

In overall terms, the results show with relative clarity that a large proportion of illness-related costs do not appear in the official statistics for the healthcare sector. On the basis of the studies presented, it may be assumed that the illness-related costs incurred by the economy outside of the healthcare sector or in indirect form amount to approximately two thirds. Healthcare expenditure therefore accounts for just one-third of the total costs.

[9] The indirect costs of sepsis are caused mainly by the high mortality rate; in the study examined here, it was almost 50 %. This led to high productivity losses due to premature death, which were included in the calculation in this study.

3 Healthcare expenditure can reduce illness-related costs

3.1 Healthcare expenditure influences illness-related costs – an overview

The preceding remarks on healthcare expenditure and illness-related costs in section 2 showed that the healthcare expenditure reported in the official statistics accounts for only part of the total illness-related costs. This statement was based on a purely static analysis. When considered in this way, healthcare expenditure is viewed purely as a cost component of illness. In addition to this static result, however, there are also dynamic relationships between healthcare expenditure and illness-related costs, which mean that a unilateral focus on healthcare expenditure can lead to incorrect assessments.

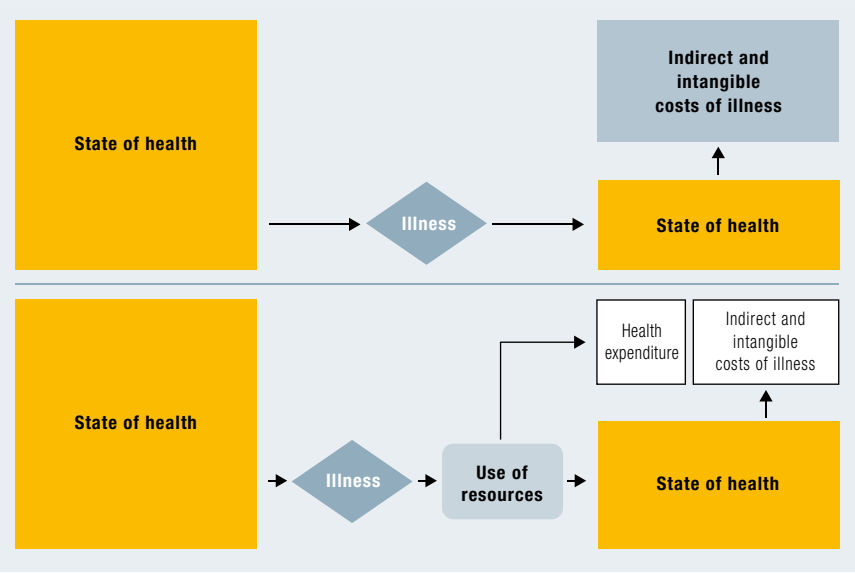
The dynamic relationship comes into being because healthcare expenditure is incurred only when an illness is actually combatted.[10] If illness was not combatted, no resources would need to be laid out in the healthcare sector. The illness would then take its course and lead to a deterioration in the state of health which would entail illness-related costs in the form of opportunity costs[11] due to lost working and leisure time, and losses of benefit due to reductions in the quality of life. In such a scenario, the illness-related costs would consist merely of indirect and intangible cost elements (cf. figure 6, upper section).

It is only when resources are expended in order to combat an illness that healthcare expenditure is incurred which, all things being equal, will only then increase the illness-related costs. But by combatting the illness, the healthcare expenditure in this scenario becomes an input with which the output or outcome of better health should be "produced". This leads to less severe consequences of illness and hence to a reduction of indirect and intangible costs as compared to a situation where the illness is not combated (cf. figure 6, lower section). If, for instance, a medical treatment results in a patient recovering health more quickly so that he can work at an earlier point in time, the indirect costs due to productivity losses at the workplace are reduced. In a situation with healthcare expenditure as an input in the recovery process, there are consequently substitution

[10] In this context, prevention may be understood as combating an illness before it breaks out.

[11] Also including all costs due to premature death because of illness.

Figure 6 | Relationships between healthcare expenditure and illness-related costs



This chart shows a highly simplified picture of the relationships between healthcare expenditure and illness-related costs. Healthcare expenditure is incurred when combatting an illness. If the illness is not combatted, it would lead to a deteriorated state of health with consequent indirect and intangible costs (upper section of the figure). It is only when resources are expended in order to combat an illness that healthcare expenditure is incurred as the cost of these resources. This increases the illness-related costs but at the same time, the healthcare expenditure acts as an input, leading to a better state of health and lower indirect and intangible illness-related costs (lower section of the figure).

Source: Polynomics.

relationships between healthcare expenditure as direct medical costs and the other illness-related cost components, namely the indirect and intangible costs.[12]

The dynamic component increases again if medical and technological progress is also taken into account. This normally leads to an increase in the direct medical costs – the healthcare expenditure – because the innovations are usually more expensive than conventional procedures. At the same time, illnesses can be treated more effectively, which further reduces the indirect and intangible costs. A new medicine which (for example) effectively combats pain in cases of arthritis causes a reduction in the intangible costs due to the reduced quality of life resulting from this illness.

There are numerous examples in the scientific literature which prove the substitution relationship whereby medical and technological progress reduces the indirect and intangible costs. Most of these studies furnish proof either at the level of one illness or a specific type of treatment. An overview of this literature would go beyond the scope of this study, so only a few such contributions are mentioned below by way of example.

[12] In addition, it is possible that substitution relationships exist within the healthcare expenditure, e.g. because there are shifts from inpatient to outpatient treatment (cf. Lichtenberg, 2001; but also Law and Grépin, 2010).

Healthcare expenditure as a cost component or input for better health – the example of demographic ageing

The difference between the static view, in which healthcare expenditure is mainly seen as a cost component of illness, and the dynamic view, which regards healthcare expenditure as an input for better health, can be presented using the example of the debate on demographic ageing. In the industrialized nations, the steep rise in healthcare expenditure over the last 30 years has gone hand in hand with a noticeable increase in life expectancy, especially among persons aged over 60 years (cf. Christensen et al., 2009).

The impact of higher life expectancy on health is a subject of controversial discussion in the literature. There are two rival theories. The compression theory assumes that as life expectancy increases, people remain largely healthy into old age and severe illnesses only commence in the last phase of life, i.e. shortly before death (Fries, 1980). The years gained are mainly lived in good health. Illness commences in the phase shortly prior to death. However, this phase is becoming shorter and shorter due to better medicine. On the other hand, the expansion or medicalization theory assumes that higher life expectancy leads to more age-related illnesses, and the years gained are increasingly spent in illness and handicap (cf. Olshansky et al., 1991).

Both theories may lead to higher healthcare expenditure. In the case of the expansion theory, this increase is actually the inevitable consequence of demographic ageing. Increasing life expectancy is "bought" at the cost of more chronic age-related illnesses and consequently higher healthcare expenditure. According to the compression theory, healthcare expenditure may increase because it is viewed as an input for an improvement in the state of health in old age. Other people can cause high healthcare expenditure even though they may not be disabled or in need of care. If the medical measures are effective, they lead to an improvement in health and they prevent disabilities and the need for care (cf. Niehaus, 2006).

Most studies that deal with demographic ageing reach the conclusion that developments to date favour the compression theory. However, a mixed form of the two theories is more likely, on the grounds that chronic age-related illnesses occur more frequently, but are less serious in nature than before, and old age can therefore generally be spent in a better state of health than in the past (cf. e. g. Christensen et al., 2009). This clearly indicates that over the dynamic course of time, the input character of healthcare expenditure predominates over the pure cost component.

The vast majority of studies deal with the effects of medical and technological progress in the form of new methods, equipment or medicines on the state of health. Especially in the field of medicines, there are numerous studies because the approval authorities in most countries require proof of improved effectiveness before a new preparation can be used. One may cite the example of technological progress in the field of anticoagulants to inhibit blood clotting. Here, for example, a new active substance (rivaroxaban) has been able to reduce the risk of thrombosis after major orthopedic operations by about one half (cf. Eriksson et al., 2008; and Lassen et al., 2008).

Some studies go one step further and examine the effects on illness-related cost components that result from medical and technological progress. In an overview study, Zhang and Anis (2010) (for example) show that in the case of rheumatoid arthritis, new forms of treatment with biological products led to a reduction of about 50 % in workplace losses. These innovations also enabled a significant decrease in absences from the workplace (absenteeism) and in productivity losses during working hours (presenteeism).

The fact that technological progress is not only evident in the form of drugs is demonstrated by the example of laparoscopic surgery, in which the abdominal cavity and the organs it contains are rendered visible by means of special rod lenses (endoscopes) through small apertures in the abdominal wall which are made by the surgeon. This avoids opening up the abdominal wall, so this method is classified as minimally invasive surgery. Past medical and technological progress has meant that increasing numbers of interventions can be effected by means of laparoscopy. One application form of this sort is for hernia, which can be operated on either by opening the abdominal wall or by laparoscopic methods. Although the laparoscopic procedure does not produce superior results as regards all aspects of the state of health and, in particular, entails more frequent relapses, this method has been proven to be less painful, and it leads to a faster recovery than the open method (Goers et al., 2008). In a British study, Stoker et al. (1994) were able to show that patients could return to work after 14 days (median) following a laparoscopic procedure, whereas the period for patients treated with the open procedure was twice as long (28 days). This innovation therefore leads to a significant reduction in indirect illness-related costs in the form of productivity losses at the workplace. Moreover, significantly more people were without pain among the laparoscopic patients, and there were significantly fewer persons with severe pain, which entails a reduction in intangible costs.

As indicated, there are numerous studies at the level of illnesses or procedures showing that medical and technological progress in particular lead to a better state of health for patients and to a reduction in indirect and intangible costs; however, studies of this sort at the level of society as a whole are rather infrequent. This is mainly due to the greater difficulties in empirical implementation at the aggregated level. There are some exceptions, especially in the field of research into the determinants of life expectancy. For example, in a study with data from 19 OECD countries, Zweifel and Ferrari (1992) were able to show that a 10 % increase in per capita healthcare expenditure in 1970 resulted in an increase of a good 1 % in residual life expectancy ten years later. This positive link between healthcare expenditure and life expectancy was also proven in a later study for the period until 2000 (cf. Zweifel et al., 2005). The health economists Frech and Miller reached a similar result in two studies with WHO and OECD data from 18 countries (cf. Frech and Miller, 1999; and Miller and Frech, 2004). In both studies, they conclude that within healthcare expenditure, it is expenditure on medicines that has the most positive impact on life expectancy. A 10 % increase in expenditure on medicines led to an increase of almost 1 % in disability-adjusted life expectancy (DALE).

A study by Lichtenberg and Virabhak (2007) goes beyond a consideration of life expectancy. In a growth model, the authors examine the influence of medical and technological progress in medicines on various health-related variables. Using US data, they are able to show that technological progress has not only led to better survival rates but also that it has a positive influence on the perceived state of health and has reduced physical restrictions due to illness.

3.2 Is healthcare expenditure worthwhile?

The preceding section showed that healthcare expenditure should not simply be understood as a cost component of illness, but rather that it represents an input into combatting illness which results in the attainment of a better state of health and that consequently indirect and intangible illness-related costs are reduced. Rising healthcare expenditure, for example due to medical and technological progress, does not constitute a problem a priori on account of these substitution relationships between direct and indirect or intangible illness-related costs. The question therefore arises as to when higher healthcare expenditure is worthwhile, or whether the overall effect due to higher healthcare expenditure and reductions in the other cost components is advantageous. Higher healthcare expenditure is justified if the benefit it creates is greater, i.e. the overall illness-related costs are

lower despite the higher healthcare expenditure and the decline in indirect and intangible costs is therefore greater than the increase in healthcare expenditure.

A sufficient condition for healthcare expenditure to be worthwhile would be if willingness to pay for the related improvements in the state of health were greater than the healthcare expenditure required to achieve them. In section 2.3, the willingness-to-pay approach was used merely to calculate the intangible costs, but in this context it can also be used to assess the benefit of an improvement in the state of health in monetary terms. The gain in benefit, quantified in monetary units, from (for example) better possibilities for treatment can therefore be compared directly with the additional costs incurred in the form of higher healthcare expenditure. If the willingness to pay is greater, the higher healthcare expenditure is worthwhile.

Willingness-to-pay analyses of this sort are carried out almost exclusively in connection with individual procedures, treatments or programmes. One example that should be mentioned for Switzerland is the study by Nocera et al. (2002 and 2003), in which a cost-benefit analysis of various programmes to combat Alzheimer's disease was undertaken. The authors reach the conclusion that a programme to relieve pressure on relatives of Alzheimer's patients providing care would generate more benefits than costs in overall terms. Thanks to such a programme, relatives providing care could request professional caregivers for a few weeks each year at the cost of their health insurance, in order to relieve pressure on themselves. This would equate to a shift from indirect costs due to informal care to direct costs in the form of higher expenditure for professional care. The savings thanks to informal care are evidently assessed as greater by the Swiss population than the additional costs incurred due to healthcare expenditure or insurance premiums. Depending on the surveying method, a net benefit of at least CHF 21 million per year is obtained. By contrast, a programme for the early detection of Alzheimer's disease would come off considerably worse, and with certain surveying methods could even lead to a net losts of CHF -19 million, in which case the additional healthcare expenditure would not be compensated by the benefit gained.

Virtually no willingness-to-pay analyses are available at the level of the healthcare sector as a whole, because they are disproportionately more difficult to carry out for such an aggregated variable. One exception is the study by Telser et al. (2004),[13] in which the loss of benefit in Switzerland due to possible reforms in the healthcare sector was quantified using the willingness-to-pay approach. One

[13] Also cf. Zweifel et al. (2006).

Table 2 | Benefits and costs from medical and technological progress

in the US in USD billion	1980–1990	1990–2000	1980–2000
Gross benefit from reduced mortality	24,538	23,593	48,131
Increase in healthcare expenditure	14,928	11,591	26,519
Net benefit	9,611	12,001	21,612
Return on investment per USD invested (ROI)	1.64	2.04	1.81

During the period between 1980 and 2000, medical and technological progress in the US generated more benefit than it cost. The gross benefit from reduced mortality is equal to the savings on indirect illness-related costs and is significantly more than the increase in healthcare expenditure, i.e. direct medical illness-related costs. For each invested dollar, benefit of USD 1.81 was "earned" over the entire period, and there was a slight additional increase in the return on investment after 1990.

Source: Murphy and Topel (2006).

option for reform that was considered here was a delay of two years in access to innovations, which would lead to a per capita loss of benefit of CHF -780 for the Swiss population. Extrapolated to the adult Swiss population, the benefit from immediate as opposed to delayed access to innovation amounts to some CHF 5 billion per year. At the time of the study, this figure accounted for about 10 % of total healthcare expenditure, which underscores the high benefit of innovation as far as the Swiss population is concerned. However, this study did not include an assessment of value with the healthcare expenditure actually incurred, so it is impossible to judge conclusively whether net benefit is obtained from technological progress in overall terms.

In the US, two recent studies have attempted to answer this question. Murphy and Topel (2006) calculated the increase in life expectancy due to medical and technological progress, and from this they extrapolated the gain in benefit with the help of the willingness-to-pay approach, in order to obtain gross macroeconomic benefit values. This overall social benefit from increased life expectancy can then be compared to the healthcare expenditure incurred in order to achieve this result. Table 2 shows the results of this analysis for the years from 1980 to 2000. For the decades from 1980 to 1990 and also from 1990 to 2000, higher life expectancy resulted in the US, representing a benefit of some USD 25 billion for the economy as a whole. Over the same periods, the growth in healthcare expenditure was USD 15 and 11.6 billion, equivalent to a benefit surplus for the

two decades of almost USD 10 and 12 billion respectively. This means that each dollar invested in the form of healthcare expenditure generated a return of USD 1.64 in the first decade and USD 2.04 in the second decade. For the entire period under consideration, the return on investment (ROI) was USD 1.81 per dollar invested.

This result was confirmed in a second study by Luce et al. (2006). In this study too, the authors assess the value of the improvements in life expectancy or the reduction of illness-related mortality achieved due to medical and technological progress. Over the same period between 1980 and 2000, the authors arrive at a return on investment of USD 1.94 per dollar invested, if consideration is given only to the reduced number of deaths, and of USD 1.55 if the average life expectancy is the subject of investigation. The values are therefore in the same range as those of Murphy and Topel (2006). This suggests quite strongly that, at least in the US, healthcare expenditure has paid off in the past. The benefit from medical and technological progress exceeds healthcare expenditure by 50 % to 100 %.

4 Players tend to take partial views – conclusions for Swiss health policy

The discussion about healthcare expenditure is omnipresent. When the health insurance premiums are announced in autumn each year, if not before, politicians and journalists debate the absolute levels as well as the annual increase. It should be noted that these discussions only ever deal with the expenditure or costs incurred directly in the healthcare sector, with the aim of prevention and treatment of illnesses and accidents, and related rehabilitation and care (cf. BFS, 2011a).

For the most part, there is no debate about how "expensive" health is for the Swiss economy as a whole. Alongside healthcare expenditure as such, various other illness-related costs are incurred, as has been shown. In addition to direct non-medical costs outside of the healthcare sector (e.g. for building conversions due to disabilities), indirect costs in particular – in the form of productivity losses at the workplace or informal care by relatives – are numbered among the components of the total costs of an illness. But so-called intangible costs, such as the pain and suffering of patients and relatives, should not be neglected, even if it is often extremely difficult to quantify them in specific terms.

On the basis of various cost-of-illness studies, it has been possible to show that indirect illness-related costs substantially exceed healthcare expenditure in Switzerland. On average, healthcare expenditure accounts for about one-third of total illness-related costs. However, the political discussion focuses mainly on measures to cut healthcare expenditure. This must already be regarded as critical when viewed from the static perspective, because other cost components are not taken into account; it becomes even more explosive if dynamic effects are taken into consideration as well. If healthcare expenditure is understood solely as a cost component of illness and the downstream indirect effects are disregarded, there is a risk of incorrect health policy decisions. Certain measures may indeed reduce costs in the short term, but in the long term they entail higher indirect illness-related costs (such as productivity losses) if the state of health of the patients deteriorates. In contrast, medical and technological progress normally generates increased healthcare expenditure, but in the long term it may reduce other cost components, for example because patients return to health more quickly or suffer less pain.

Various empirical studies show that the benefits from higher life expectancy or a sustained improvement in the state of health exceed the healthcare expenditure

required to achieve them. This does not necessarily allow a conclusion as to whether all the resources used in the healthcare sector are deployed efficiently. In Switzerland as elsewhere, it must be assumed that resources could be better utilized in order to achieve the goals of a better state of health and a reduction in indirect and intangible costs.

Against the backdrop of these relationships, it is appropriate for the health policy discussion not only to cover healthcare expenditure but also, and in particular, to focus on the effects on the outcome and hence the indirect and intangible costs. We shall now briefly discuss the extent to which the players in the Swiss healthcare sector have incentives to adopt this overall view. We shall consider service providers, insurers, political circles and the general public in their roles as patients, relatives, premium payers and taxpayers.

As far as the service providers are concerned, two groups can be differentiated: on the one hand, there are the established doctors (in private practice), hospitals and pharmacies, whose attention focuses mainly on restoring or improving the state of health of their sick patients. Since only a fraction of the direct medical costs incurred are borne directly by the patients thanks to comprehensive health insurance coverage, these service providers have virtually no incentives to take account of healthcare expenditure when taking their decisions on treatment. On the contrary, their main interest is directed at improving the patients' state of health and therefore at reducing the indirect and intangible costs. Due to insurance cover, healthcare expenditure is only considered as a secondary factor. For doctors and hospitals, the contracting obligation that is implemented in the present system does even more to reduce the incentives to keep healthcare expenditure low, because the services of all authorized service providers are compensated by the health insurance schemes regardless of the scope and quality the services provided.

Similar considerations apply to the second group of service providers, the "innovators" such as pharmaceutical or medical technology companies which engage in research. Here too, the reduced interest in healthcare expenditure on the part of insured patients is passed on to the service providers. They will be better able to assert their positions on the market if they research and develop new forms of treatment and therapy which can be used to generate enhanced health or higher life expectancy in comparison to existing methods. Product innovations that reduce indirect and intangible cost components are more worthwhile in such a system than process-related innovations that lead to lower healthcare expend-

iture. The catalogue of services for basic insurance, which is open in principle, strengthens these incentives even if the addition of medicines to the list of specialties has to be examined in advance by the Federal Office of Public Health (FOPH).

Whereas service providers focus primarily on the patients' state of health and attempt to reduce indirect and intangible illness-related costs by means of suitable treatments and innovations, the primary interest of the health insurance organizations is precisely the opposite – namely, to reduce healthcare expenditure. Measures aimed at reducing the costs to be reimbursed should generally meet with support from the health insurers, no matter whether they entail an increase in cost participation by patients, a higher proportion of financing for (inpatient) healthcare expenditure by the cantons, or a curtailment of the catalogue of services or the list of specialties for medicines. All other illness-related costs are of subsidiary importance given the current structure of the healthcare sector. As opposed to the situation with accident insurance, there is no mandatory daily allowance insurance which brings at least part of the productivity losses at the workplace into the insurers' range of vision.

As far as political circles are concerned, the interactions between healthcare expenditure and illness-related costs should basically mean that there is an interest in focusing on all cost components. As the cost-of-illness studies for Switzerland have been able to show, productivity losses and the costs of informal care can be very high, depending on the illness in question. Measures to combat or alleviate chronic illnesses in particular may entail economic benefits despite the higher healthcare expenditure if, for instance, productivity losses can be reduced in the long term. Nevertheless, health policy is primarily typified by measures that are somewhat geared to the shortterm in order to reduce healthcare expenditure. Some of the reasons for this may well be that direct cost cuts in healthcare expenditure are easier to communicate and they are relatively quick to take effect, so they increase the chances of winning elections in the short term. By contrast, long-term effects on total costs are more difficult to convey and they often come into play after the timeframe until the next elections.

Service providers, health insurance schemes and politicians alike only take a partial view of illness-related costs. It is only for the general public that all the cost components play important parts. The intangible costs of an illness due to pain and suffering are borne by the patients and their relatives. The indirect costs arising from informal care fall upon relatives, but the costs of productivity losses

by employers are also borne by the individuals themselves, since losses of income must be expected as a result of restricted working capacity. As regards direct costs, specifically healthcare expenditure, the cost impact on individuals is not so direct due to insurance coverage and partial cantonal finance for inpatient services. But due to cost participation in the form of deductibles and retentions, as well as the monthly health insurance premiums and taxes to be paid, these costs are ultimately borne by the individuals or the population as a whole.

Viewed from the perspective of the national economy, there is consequently an interest in focusing equally on all cost components when health policy measures are under discussion. Restricting the discussion to curbing healthcare expenditure while neglecting the other cost components may work in the short term under certain circumstances, but it could bring about contrary long-term effects in respect of the total costs.

To summarize, it can be stated that the incentives to consider the various cost components in the current Swiss health system differ very widely among the relevant players, making it difficult to operate health policy that can attract majority support and which is – above all – sustainable. This is particularly true against the backdrop of an ongoing increase in chronic illnesses over the coming years, due not least to demographic ageing. This will constantly present the Swiss health system with new challenges in respect of financing, for which suggested solutions geared to the long term are needed. As well as the overall view of all cost components related to illness, the aim should also be to identify opportunities for increasing efficiency in the health system so that a more efficient approach to the use of resources can counteract the inevitable increase in healthcare expenditure caused by medical and technological progress.

5 Profiles of cost-of-illness studies for various disease patterns

In the following section, seven studies will be used to illustrate the total costs to Switzerland of various illnesses. Table 3 provides a summary of the overall costs determined for selected disease patterns based on the available studies for Switzerland. In these cases, the total costs consist essentially of direct and indirect costs. Intangible costs are only reported in the study on the costs of multiple sclerosis. The allocation of the various types of costs incurred to these two categories is not uniform in all the studies under consideration, so for reasons of comparability, the cost types in this summary have been assigned as described in section 2.2. The various cost types per patient and (with the use of the prevalence statistics) for Switzerland as a whole are shown below for each of the disease patterns examined.

Apart from the brain disorders, which cover twelve different disorders, the highest costs are caused by back pain. Both these categories of illness entail rela-

Table 3 | Overview of illness-related costs in Switzerland

	Direct costs CH in million CHF/a	Indirect costs CH in million CHF/a	Total costs CH in million CHF/a
Multiple sclerosis	247	273	520[a)]
Sepsis	355	844	1,199
Rheumatoid arthritis	1,068	1,332	2,400
Dementia	3,486	2,771	6,257
Cancer	3,062	4,593	7,655
Low back pain	3,975	6,316	10,291
Brain disorders	8,778	9,831	18,609

a) Shown without intangible costs to allow comparability with other illnesses

The proportion of indirect costs to total costs fluctuates between 44 % and 70 %. Alongside brain disorders, the highest costs are caused by back pain on account of its high prevalence. Multiple sclerosis causes the lowest costs overall, partly because this illness displays low prevalence in Switzerland as compared to other disease patterns. In general, the costs of the different illnesses can only be compared to each other on a limited scale, because they were determined in part on the basis of different data and methods.

Source: Andlin-Sobocki et al. (2005), Jäger et al. (2008), Jönsson and Wilking (2007), Kobelt et al. (2006a), Kraft et al. (2010), Lundkvist et al. (2008), Schmid et al. (2004), Wieser et al. (2010), own calculations.

tively low costs per patient but have high rates of prevalence. By far the most costly illness per patient is sepsis, followed by dementia and multiple sclerosis. However, a direct comparison between the illnesses is only possible to a limited extent, because the studies used different methods and data in some cases.

The respective studies on the determination of illness-related costs for the disease patterns shown in the table are presented in more detail below, with explanations of the data bases, the selected methods and the assumptions made.

5.1 Multiple sclerosis

Multiple sclerosis (MS) is a chronic, progressive and inflammatory disease of the central nervous system, which consists of the brain and the spinal marrow.[14] As demyelination of the nerve fibres proceeds, the myelin sheath (which surrounds the nerve cell axons as a sort of insulating layer) is damaged or destroyed. As a result, electrical pulses cannot be forwarded, or can only be forwarded slowly, so symptoms such as vision and speech disorders, muscular weakness or coordination disorders appear. But as there is no fixed pattern of symptoms, they may vary from patient to patient in terms of occurrence as well as severity. The progression of the illness is also individual, and a distinction can be drawn between relapsing-remitting, primary chronic-progressive and secondary chronic-progressive MS. The cause of MS remains unclear at present. It is the most frequent neurological disease among young adults, and the first symptoms appear between the ages of 20 and 40 in the majority of cases. Women are affected about twice or three times as often as men. The disease is incurable but thanks to major progress in research during recent decades, especially since the introduction of immunomodulatory therapy, its progression can be attenuated and decelerated. This is achieved with medicines which influence the immune system. It has also been possible to reduce mortality, which is not significantly higher among MS patients than for those not affected by the disease.

In Switzerland, a prevalence of about 8,000 (Jäger et al., 2008, and Andlin-Sobocki et al., 2005) is assumed. This number is based on a study by Beer and Kesserling (1994), who calculated a prevalence rate of 110 MS patients per 100,000 inhabitants in 1986 in the Canton of Bern. However, no official statistical data are available.

[14] cf. and below, www.multiplesklerose.ch/Multiple-Sklerose.ms.0.html; www.sprechzimmer.ch → Krankheitsbilder → Multiple Sklerose, accessed on 13.07.2011.

Kobelt et al. (2006a and 2006b) calculate the costs caused by MS for various European countries including Switzerland. For this purpose, 1,100 patients registered with the Swiss Multiple Sclerosis Society were surveyed with the help of questionnaires. The costs were calculated for different degrees of severity of the disease (Expanded Disability Status Scale). Since the random sample only takes account of registered patients, the distribution of degrees of severity may be distorted upwards, if it assumed that serious cases of MS are more likely to be registered with the Swiss Multiple Sclerosis Society.

Depending on the degree of severity of the disease, the average annual costs per patient fluctuate between almost CHF 20,000 to over CHF 140,000 (direct and indirect costs). Table 4 summarizes the costs for the median degree of severity, which for 2005 were CHF 65,000 per patient. Assuming 8,018 MS patients in Switzerland (cf. Andlin-Sobocki et al., 2005), this produces annual costs amounting to CHF 520 million. The proportions of direct and indirect costs are approximately equal in this case.

Costs of medicines cause about 40 % of the direct medical costs. 13 % of the respondents spent an average of 38 days in hospital (during the study period of 3 months), generating average annual costs of about CHF 4,000 per patient. The costs of outpatient treatment are slightly lower; such treatment was used by almost 80 % of the patients, on average five times per month. The largest portion of medical costs is caused by professional care. A good half of the direct non-medical costs was due to investments in adaptations to living accommodation, wheelchairs and aids/assistance. The other half consists of costs for professional assistance at home.

Informal care and productivity losses were also included in the indirect costs for the purposes of this comparison. Almost half of the MS patients make use of an average of 3.5 hours of informal care services per day. Assuming average available income in each case, this generates average annual costs per patient of well over CHF 9,000. However, informal care accounts for a small percentage of the indirect costs as compared to productivity losses, which are responsible for about 40 % of the total costs. A calculation of informal care using the replacement cost method (cf. table 2.3) would nevertheless result in a significantly higher value. The productivity losses, which amount to an average of CHF 25,000 per patient and year, were calculated using the human capital approach. About one-third of the patients took early retirement due to illness at an average age of 42 years. Early retirement therefore causes the majority of the productivity losses, with

Table 4 | Costs of multiple sclerosis

	Per patient in CHF/a	Costs CH in million CHF/a	In % of total costs
Direct medical costs	24,002	192	37.0 %
Of which: costs of medicines	9,775	78	15.1 %
Direct non-medical costs	6,847	55	10.6 %
Total direct costs	30,849	247	47.6 %
Informal care	9,335	75	14.4 %
Losses of productivity	24,669	198	38.0 %
Total indirect costs	34,004	273	52.4 %
Total costs	64,853	520	100.0 %
Intangible costs	23,000	184	
Total costs (including intangible costs)	87,853	704	

Data are based on annual costs in CHF, 2004/2005
Total costs were extrapolated assuming 8,018 MS patients as per Andlin-Sobocki et al. (2005)

The annual costs of MS (direct and indirect costs) in Switzerland amount to about CHF 270 million or CHF 65,000 per patient. A good half of these costs is due to the indirect costs, i.e. informal care and (in particular) productivity losses. As regards the latter, the main cause is the high rate of early retirements among MS sufferers. The direct medical costs, which comprise healthcare expenditure, account for rather more than one-third of the total costs. If the intangible costs are taken into account as well, the average annual costs per patient increase by CHF 23,000, leading to total costs of CHF 700 million.

Source: Kobelt et al. (2006a), own calculations.

annual costs per patient of CHF 24,000. A calculation using the friction cost approach would result in significantly lower costs here.

In contrast to most of the other studies, Kobelt et al. (2006a and 2006b) additionally calculate the intangible costs of illness. The average quality of life for MS patients is about one-third less than that of the normal population, according to this study. The associated loss of quality-adjusted life years was then valued in monetary terms (cf. section 2.3). This produces annual intangible costs of CHF 23,000. The annual total costs of MS therefore increase by 35 % to CHF 88,000 per patient, or a total of CHF 700 million.

5.2 Sepsis

Sepsis, or blood poisoning, is a generalized infective illness that affects the entire body.[15] The pathogens are bacteria, viruses or fungi which usually enter the body through wounds, damaged skin or the lungs. If the immune system is weakened, they may reach the circulatory system via the blood and lymphatic vessels, so they are transported into vital body organs where they trigger infections. A differentiation is made between sepsis, severe sepsis and septic shock. If treated promptly, sepsis has relatively high chances of being cured. On the other hand, sepsis can end fatally if not treated or treated too late, when it leads to organ failure. Severe sepsis and septic shock are among the most frequent causes of death in intensive care units. Drugs to treat infective illnesses are available as therapy. In cases of severe sepsis and septic shock, immediate intensive medical treatment is necessary.

The incidence and/or mortality rates for sepsis are generally underestimated in statistics, because sepsis often develops from other underlying illnesses and is therefore not always declared as the cause of death. When calculating the prevalence, Schmid et al. (2004) (for example) include not only deaths declared as due to sepsis in the mortality data, but also those due to organ failures which were highly likely to have been caused by sepsis.

Schmid et al. (2004) calculate the costs of severe sepsis for Switzerland, and these values are shown in table 5. According to their calculations, 5,800 to 14,000 cases of sepsis are treated each year in Switzerland, of which about 60 % involve severe sepsis. The costs are extrapolated on the basis of 61 patient files dating from 2001, or about 1 % of annual cases. These patients have an average age of 62. The average stay in intensive care was 13 days and the mortality rate was almost 50 %, but no link between mortality and age could be found.

The total costs per patient amount to CHF 140,000 which, assuming a total of 3,500 cases (lower limit) of severe sepsis, produces total costs of about CHF 500 million. With a prevalence of 8,500 (upper limit), the total costs amount to CHF 1.2 billion. However, this figure only includes the costs during inpatient treatment; the costs of any subsequent damage after surviving sepsis and any follow-on costs for outpatient treatment were not taken into account. The direct costs, which reflect the costs of stays in the intensive care unit, account for about 30 % of the total costs. In this context, patients who do not survive sepsis gener-

[15] cf. and below, www.sepsis-gesellschaft.de; www.sprechzimmer.ch → Krankheitsbilder → Blutvergiftung, Sepsis, accessed on 13.07.2011.

Table 5 | Costs of severe sepsis

	Per patient in CHF/a	Costs CH in million CHF/a (low)	Costs CH in million CHF/a (high)	In % of total costs
Direct medical costs	41,790	146	355	29.6 %
Of which: costs of medicines	8,020	28	68	5.7 %
Direct non-medical costs	no data	no data	no data	no data
Total direct costs	41,790	146	355	29.6 %
Informal care				0.0 %
Losses of productivity	99,271	347	844	70.4 %
Total indirect costs	99,271	347	844	70.4 %
Total costs	141,061	493	1,199	100.0 %

Data are based on annual costs in CHF, 2001
Total costs were extrapolated assuming 3,500 or 8,500 patients respectively
Low: lower limit of 3,500 patients; high: upper limit of 8,500 patients

The annual costs of severe sepsis in Switzerland amount to between CHF 500 million and CHF 1.2 billion, or CHF 140,000 per patient. A prevalence of 3,500 to 8,500 and a mortality rate of 50 % are assumed. Over 70 % of the costs are caused by productivity losses, due in particular to premature death. The direct medical costs per patient are also relatively high, as stays in the ICU are involved.

Source: Schmid et al. (2004).

ate higher average direct costs per patient than survivors. The staff costs account for half of the direct costs, while medicines generate 20 % of the costs.

The indirect costs only include productivity losses, which were calculated by applying the human capital approach. Illness-related absence from the workplace (only during time in hospital), early retirement and premature death were included here. The average costs per patient amount to almost CHF 100,000. Of these, 95 % are due to premature death. The high costs per patient in this case are explained because, unlike the other studies examined, productivity losses were calculated not for one year but for the entire lifetime or until retirement (at 65).

5.3 Rheumatoid arthritis

Rheumatoid arthritis (RA) is the most frequent inflammatory rheumatological disease of the joints.[16] In most cases it affects the fingers and wrists, but other joints may also be involved. The cause is unknown at present, but it is assumed to be an autoimmune disease in which the immune system cells attack the body's own (autologous) substances. The inflammations which this causes may attack and destroy the bones and cartilage of the affected joints. The chronic illness generally follows a relapsing-remitting progression and leads to severe pain, restrictions of the locomotor system and inflammation-related fatigue. RA usually starts between the ages of 40 and 60, but it can strike all age groups. Prevalence increases with age. Women are affected two to three times more frequently than men. RA should receive medicinal treatment as soon as possible in order to prevent tissue damage. For this purpose, medicines are used to regulate the immune system, to inhibit inflammation and to relieve pain. Another therapeutic measure is rheumatism surgery, in which the most severe joint modifications are treated operatively.

Rheuma Schweiz[17] (the Swiss rheumatism association) indicates a prevalence rate for Switzerland of 1 %, and the incidence rate is about 30 new cases per 100,000 inhabitants. Lundkvist et al. (2008) assume a prevalence rate of 0.66 % for Central and Northern Europe, so they arrive at 49,000 cases of the illness for Switzerland in 2006.

The total costs of RA for Switzerland are shown in table 6. According to Lundkvist et al. (2008), annual costs of CHF 2.4 billion or an average of CHF 49,000 per patient are incurred. But the data are not from Switzerland. In order to calculate the costs, use was made of data from various European countries published in other studies. The calculated average costs per patient for individual types of resource were adapted to Swiss price levels and then extrapolated with the prevalence rate. The direct medical costs account for about one-third of the total costs, of which a good 40 % are costs of medicines. All in all, the direct costs are responsible for 45 % of the total costs, so the indirect costs account for rather more than one half. Informal care accounts for a good 20 % and productivity losses for 34 % of the total costs. The intangible costs of rheumatoid arthritis were not determined in the study by Lundkvist et al. (2008).

[16] cf. and below, www.rheuma-schweiz.ch/go2/de/141; www.sprechzimmer.ch → Krankheitsbilder → Rheumatoide Arthritis, Polyarthritis chronische, accessed on 13.07.2011.

[17] www.rheuma-schweiz.ch/go2/de/160, accessed on 13.07.2011.

Table 6 | Costs of rheumatoid arthritis

	Per patient in CHF/a	Costs CH in million CHF/a	In % of total costs
Direct medical costs	16,120	790	32.9 %
Of which: costs of medicines	6,655	326	13.6 %
Direct non-medical costs	5,675	278	11.6 %
Total direct costs	21,794	1,068	44.5 %
Informal care	10,457	512	21.4 %
Losses of productivity	16,720	819	34.1 %
Total indirect costs	27,177	1,332	55.5 %
Total costs	48,972	2,400	100.0 %

Data are based on annual costs in CHF, 2006 (euro values were converted with purchasing power parities)
Total costs were extrapolated assuming 49,000 RA patients

The annual costs of RA in Switzerland amount to about CHF 2.4 billion or CHF 49,000 per patient. The indirect costs account for rather more than one half. One third of the costs are caused by direct medical costs and another third by productivity losses. However, the information is not based on Swiss data but on data from other countries which were extrapolated for Switzerland.

Source: Lundkvist et al. (2008).

5.4 Dementia

Dementia, a loss of cognitive, emotional and social abilities, groups together over 50 illnesses of which the most frequent form is Alzheimer's disease.[18] The cause of Alzheimer's disease has not yet been fully clarified. The progressive and irreversible collapse of the brain function causes loss of memory capacity, deterioration of thinking ability, language and practical skills, leading to the loss of independence. Dementia mainly affects people from the age of 65 onwards. Women are affected rather more often than men, due partially to their longer life expectancy given that age is the main risk factor for dementia. Dementia cannot be cured at present, but medicines known as antidementive drugs have been available for some years; these are able to delay the progression of the disease by a few years. However, they are only effective in case of early diagnosis and treatment.

[18] www.alz.ch/d/html/alzheimer+6.html; www.sprechzimmer.ch → Krankheitsbilder → Demenz, Altersdemenz, accessed on 13.07.2011.

Table 7 | Costs of dementia

	Per patient in a nursing home in CHF/a	Per patient at home in CHF/a	Costs CH in million CHF/a	In % of total costs
Direct medical costs	68,891	8,720	3,486	55.7 %
Of which: costs of medicines	266	266	27	0.4 %
Direct non-medical costs	no data	no data	no data	no data
Total direct costs	68,891	8,720	3,486	55.7 %
Informal care	0	46,581	2,771	44.3 %
Losses of productivity	no data	no data	no data	no data
Total indirect costs	0	46,581	2,771	44.3 %
Total costs	68,891	55,301	6,257	100.0 %

Data are based on annual costs in CHF, 2007 (euro values were converted with purchasing power parities)
Total costs were extrapolated assuming 102,560 dementia patients

The annual costs of dementia in Switzerland amount to about CHF 6 billion or about CHF 60,000 per patient, but the non-medical direct costs could not be determined due to lack of data. Patients living in a nursing home generate higher costs than those who receive care at home. The majority of costs are accounted for by overall nursing care – both in a nursing home and at home. Since most dementia patients are over 65, no productivity losses on the labour market were calculated.

Source: Kraft et al. (2010).

In Switzerland, it is assumed that about 100,000 persons are affected (Kraft et al., 2010). Due to demographic development, it may be assumed that this number will continue to rise.

The costs of dementia in Switzerland in 2007 were over CHF 6 billion according to Kraft et al. (2010) (cf. table 7). Annual costs per patient of CHF 69,000 are incurred in case of care in a nursing home, or of CHF 55,000 in case of care at home. For pan-Swiss total costs, it was assumed that 58 % of dementia patients live in a nursing home while the remaining 42 % receive care at home. The direct medical costs account for over half of the total costs, of which the majority are costs for care. For patients in a nursing home, the nursing costs amount to CHF 68,400. For those who receive care at home, professional care (e.g. the Spitex nursing service) accounts for about 60 % of the direct medical costs. A further high percentage is due to inpatient treatments, although these were only

calculated for patients receiving care at home. Costs of aids or illness-related accommodation conversions were disregarded, so no direct non-medical costs are available.

In order to calculate informal care, the replacement cost approach was used, i.e. the time expended on care is valued using a market pay rate for nursing care. For an average of 3.2 hours of care per day, this results in annual costs of about CHF 47,000. Losses of productivity were not included in the costs because the majority of dementia patients are over 65 years old, so the productivity losses due to restricted working capacity or early retirement are limited. Intangible costs incurred by the patients or caregiving relatives were not quantified in the study by Kraft et al. (2010).

5.5 Cancer

Cancer is a collective term for various disease patterns affecting the organs, and is generally understood to refer to malignant tumours.[19] These result from originally normal tissue cells which multiply in an uncontrolled manner and then penetrate and destroy the surrounding tissue. These cancer cells can form offshoots known as metastases in other parts of the body. There are also malignant systemic diseases which account for 5 % of all cancer cases. Rather than only one organ, in this case the disease affects the entire blood or lymphatic system (e.g. leukaemia). Treatment methods differ according to the tumour. The basic options available are operative removal of the tumour, radiotherapy or treatment with drugs. Over recent decades, the mortality rate for most cancer localizations has fallen due to progress in cancer therapy (Wilking and Jönsson, 2005).

According to the Swiss Federal Statistical Office, BFS, there are about 36,000 new cases per year in Switzerland, and the mortality rate due to cancer is about 16,000. Prevalence figures are only available for breast cancer (72,000) and colorectal cancer (32,000) (BFS, 2011b).

Table 8 shows the costs calculated for cancer in Switzerland by Jönsson and Wilking (2007). The proportion of healthcare expenditure on cancer to total healthcare expenditure was recorded on the basis of other studies. In contrast to the other studies examined, the costs per patient were not determined and then extrapolated but instead, the total costs were calculated directly using a top-down approach. In the absence of detailed data, findings for other countries were used to arrive at an assumed average proportion of 6.6 % for the costs of

[19] www.krebsliga.ch/de/uber_krebs, accessed on 13.07.2011.

Table 8 | Costs of cancer

	Per capita[a)] in CHF/a	Costs CH in million CHF/a	In % of total costs
Direct medical costs	414	3,062	40.0 %
Of which: costs of medicines	33	241	3.2 %
Direct non-medical costs	no data	no data	no data
Total direct costs	414	3,062	40.0 %
Informal care	no data	no data	no data
Losses of productivity	622	4,593	60.0 %
Total indirect costs	622	4,593	60.0 %
Total costs	1,036	7,655	100.0 %

Data are based on annual costs in CHF, 2004 (euro values were converted with purchasing power parities)

a) Due to the lack of prevalence data, no costs per patient can be reported. The per capita values were calculated with a population of 7,390,000 for 2004

The annual costs of cancer in Switzerland are about CHF 7.7 billion. This value is based on the assumption that direct medical costs account for 6.6 % of total healthcare expenditure and indirect costs (excluding informal care) make up 60 % of the total costs. On a per capita basis, cancer causes costs of over CHF 1,000 per year. The costs of drugs only account for a quota of 3.2 % of this sum.

Source: Jönsson and Wilking (2007), own calculations.

cancer treatment in Switzerland in relation to total healthcare costs. For 2004, this leads to direct costs of CHF 3 billion. A large portion of these costs is incurred for inpatient hospital care. The costs of medicines to treat cancer cases were calculated on the assumption that they account of 5 % of total expenditure on medicines. For Switzerland, this approach produces a value of CHF 240 million or 8 % of direct costs. To check plausibility, the 2004 sale value of 67 cancer drugs was examined (these account for the majority of cancer drugs that are used). This produced a similar value of CHF 223 million for Switzerland.

Due to the lack of data, the indirect costs are not calculated by Jönsson and Wilking (2007). The authors of the present report estimated these costs on an approximate basis. In the studies considered by Jönsson and Wilking (2007), indirect costs account for about 70 % to 85 %. However, these studies are not up to date, and studies in the US and Sweden show that the proportion of indirect costs has decreased over time. In the US, for example, the percentage fell from 71 % in 2000 to 65 % in 2002. In Sweden, the 2004 percentage was 50 % but it

was still 57 % four years previously. This is due in part to the ongoing availability of new and better treatments which increase the likelihood of survival. As a result, there is a decrease in the costs of productivity losses due to premature death, which account for a large part of the indirect costs. Moreover, the prices of drugs increase due to new developments, so direct costs rise in relation to indirect costs. On the basis of these values, an indirect cost quota of 60 % was assumed. For Switzerland, this produces annual indirect costs of CHF 4.6 billion or total costs of CHF 7.7 billion. The intangible costs are again disregarded.

For brain tumours, which account for about 1.5 % of all new cases per year, Andlin-Sobocki et al. (2005) arrive at total costs of CHF 175 million (cf. section 5.7). This corresponds to 2.3 % of the total costs determined for all types of cancer.

5.6 Low back pain

Back pain is pain in the area of the lumbar vertebral column.[20] If the duration is less than six weeks, the term “acute back pain” is used and for durations of over twelve weeks, the condition is referred to as “chronic back pain”. Different causes of the complaint may be present and the cause cannot be identified in many cases. Chronic back pain can be caused by other chronic illnesses or can develop from acute disorders. Preventive measures include good training of the back muscles. In case of acute pain, analgesics may be taken so that patients can continue their day-to-day activities. If pain continues for longer periods, physiotherapy and massages, etc. are recommended. Acupuncture and behavioural therapy measures are most helpful in case of chronic pain.

Back or lumbar pain is one of the main reasons for visits to the doctor in Switzerland. The Swiss health survey in 2007 showed that 47 % of women and 39 % of men suffered from back pain in the four weeks prior to the survey. Of these respondents, 10 % stated that they suffered from severe conditions (BFS, 2010). The MEM Research Center at the University of Bern carried out a large-scale survey in which 16,634 German-speaking persons aged over 18 took part, and which arrived at a prevalence rate of 24.3 % (cf. Wieser et al., 2010).

[20] Bundesärztekammer (BÄK) [German Medical Association, (GMA)], Kassenärztliche Bundesvereinigung (KBV) [Association of Statutory Health Insurance Physicians], Arbeitsgemeinschaft der Wissenschaftlichen Medizinischen Fachgesellschaften (AWMF) [Association of the Scientific Medical Societies in Germany], Nationale VersorgungsLeitlinie Kreuzschmerz – Langfassung [National Disease Management Guideline on Back Pain, long version], Version 1.1. 2010 [06.06.2011]: http://www.versorgungsleitlinien.de/themen/kreuzschmerz.

Wieser et al. (2010) calculate the costs of chronic low back pain for Switzerland. Table 9 summarizes the results. Per patient, the average was CHF 7,400 in 2005. Due to the high prevalence, with about 1.4 million persons affected, the total costs amount to CHF 10.3 billion. The data are based on a survey of 1,253 persons who already stated that they had back pain in a previous cross-sectional survey by the MEM Research Center of the University of Bern. For almost 90 % of the respondents, the current episode of back pain lasted four weeks or longer. Almost half of the respondents did not make use of any resources in the healthcare sector during the surveyed period, so they did not generate any direct medical costs.

About one quarter of the total costs consist of direct medical costs. These are mainly caused by medical care, and outpatient care (utilized by 23 % of respondents in the preceding four weeks) accounts for a larger quota than inpatient care. The proportion of respondents who required a stay in hospital or in a rehabilitation clinic in the previous twelve months was about 9 %. Costs of medicines account for a negligible portion; on average, they are CHF 30 per year and patient. This small amount comes about on the one hand because only 28 % of the respondents took painkillers within the preceding four weeks, and on the other because these painkillers are relatively cheap. Assistance with everyday activities causes the largest quota of direct non-medical costs. About 7 % of the respondents took advantage of such assistance. However, this also includes informal assistance because there is no differentiation between professional assistance and help from relatives and friends. The average time expended of 6.5 hours per week was evaluated at an hourly pay rate of CHF 23, producing average costs per patient of CHF 522; no separate indication of the costs of informal care is possible.

The productivity losses were calculated with the human capital approach as well as the friction cost approach, and a friction period of 22 weeks was assumed. The productivity losses included not only illness-related absence from the workplace and early retirement, but also presenteeism, i.e. reduced productivity at the workplace. Almost 20 % stated that they were an average of about 30 % less productive. Regardless of the calculation method, this generates the largest portion of costs for productivity losses. With the human capital approach, the figure is 44 % of the costs and with the friction cost approach, it is actually above 80 %. The second largest quota of costs (about 40 %) with the human capital approach is caused by long-term incapacity for work, which affects 4 % of the respondents. Indirect costs account for over 60 % of total costs if the human capital approach

Table 9 | Costs of low back pain

	Per patient in CHF/a	Costs CH in million CHF/a (HCA)	In %	Costs CH in million CHF/a (FCA)	In % of total costs
Direct medical costs	1,974	2,751	26.7 %	2,751	37.3 %
Of which: costs of medicines	31	42	0.4 %	42	0.6 %
Direct non-medical costs	878	1,224	11.9 %	1,224	16.6 %
Total direct costs	2,851	3,975	38.6 %	3,975	54.0 %
Informal care	no data	no data	no data	no data	no data
Losses of productivity	4,529	6,316	61.4 %	3,390	46.0 %
Total indirect costs	4,529	6,316	61.4 %	3,390	46.0 %
Total costs	7,381	10,291	100.0 %	7,365	100.0 %

Data are based on annual costs in CHF, 2005
Total costs were extrapolated assuming 1,394,318 persons affected
HCA: human capital approach; FCA: friction cost approach to calculate productivity losses
Costs of informal care cannot be reported separately; they are included in the non-medical costs

The annual costs of low back pain amount to about CHF 10 billion or CHF 7,400 per patient in Switzerland. If the friction cost approach (FCA) is selected instead of the human capital approach (HCA) to calculate the indirect costs, the total costs are slightly lower, at about CHF 7 billion. The costs are largely determined by productivity losses, due in particular to reduced productivity at the workplace.

Source: Wieser et al. (2010).

is applied. With the friction cost approach, this figure is 46 %. The figures show that the choice of method has a decisive influence on the result. The total costs with the human capital approach, at CHF 10.3 billion, are 40 % higher than with the friction cost approach (CHF 7.4 billion). The intangible costs of low back pain were not determined in the study.

5.7 Major brain disorders

The study by Andlin-Sobocki et al. (2005) groups together the twelve most frequent and costly brain disorders. These may be broken down into neurological diseases (Parkinson's disease, multiple sclerosis, stroke, epilepsy, migraine, dementia), neurosurgical diseases (trauma, brain tumour) and mental disorders (psychotic disorders, anxiety disorders, addiction disorders, affective disorders and dementia). Andlin-Sobocki et al. (2005) use data from the existing literature to calculate a prevalence of over 2 million cases for Switzerland, corresponding to a good quarter of the total population who are affected by one of these illnesses.

Table 10 | Overview of brain disorders

	Direct medical costs	Direct non-medical costs	Indirect costs[a)]	Prevalence rate CH per 100,000 inhabitants	Total costs CH in million CHF/a
Neurological diseases				9,667	3,753
Parkinson's disease	x	x	x	202[d)]	402
Multiple sclerosis	x	x	x	110	599
Stroke	x	x	x	137[e)]	633
Epilepsy	x	x	x	600[f)]	772
Migraine	x		x	8,619[f)]	1,347
Neurosurgical diseases				176	314
Trauma	x			153	139
Brain tumour	x	x	x	23	175
Neurological/mental disorders				992	2,898
Dementia	x	x		992[d)]	2,898
Mental disorders				17,285	11,644
Psychotic disorders	x	x		522[f)]	1,097
Anxiety disorders	x		x[b)]	9,784[f)]	2,271
Addiction disorders (alcohol and drugs)	x	x	x[c)]	1,892[f)]	2,827
Affective disorders	x		x	5,088[f)]	5,450
Total costs					18,609

Data are based on annual costs in CHF, 2004 (euro values were converted with purchasing power parities)

a) Only includes loss of productivity, informal care was only recorded for multiple sclerosis and dementia; b) Only absenteeism is included; c) Only recorded for drugs;
d) Data based on persons aged over 64; e) Data based on persons aged over 24;
f) Data based on persons aged 18–65.

The table provides an overview of the cost types for various illness patterns of brain disorders and the cost types that were recorded. The direct non-medical and indirect costs were not calculated for all the illnesses, so the reported total costs for some of the disease patterns should be regarded as lower limits. This applies in particular to migraine and anxiety disorders, which have high prevalence in Switzerland with about 9,000 cases per 100,000 inhabitants in each case; not all of the cost types were calculated for these disorders. Informal care could only be included for two illnesses (dementia and multiple sclerosis).

Source: Andlin-Sobocki et al. (2005).

Table 11 | Costs of all brain disorders

	Per patient in CHF/a	Costs CH in million CHF/a	In % of total costs
Direct medical costs	2,967	6,082	32.7 %
Of which: costs of medicines	216	443	2.4 %
Direct non-medical costs	1,315	2,696	14.5 %
Total direct costs	4,282	8,778	47.2 %
Informal care	372	762	4.1 %
Losses of productivity	4,424	9,069	48.7 %
Total indirect costs	4,796	9,831	52.8 %
Total costs	9,078	18,609	100.0 %

Data are based on annual costs in CHF, 2004 (euro values were converted with purchasing power parities)
Total costs were extrapolated assuming 2,049,854 patients

Brain disorders cause costs of CHF 18.6 billion or CHF 9,000 per patient in Switzerland each year. These costs include the twelve most frequent and costly illnesses. However, the direct non-medical costs, the productivity losses and the informal care were not calculated for all the illnesses. It may be assumed that increased consideration of informal care, which was only included for two illnesses, would significantly increase the quota of indirect costs and the total costs.

Source: Andlin-Sobocki et al. (2005), Jäger et al. (2008).

However, there is the problem of comorbidity, i.e. the simultaneous presence of diseases, so double counting is likely. Especially with mental disorders, multiple diagnoses often occur, so for example addiction disorders are often accompanied by anxiety disorders or depression.

Table 10 shows the prevalence rate for the illnesses examined. It also shows the cost types that are included in the calculation of total costs. High prevalence is reported for migraine and anxiety disorders, which together account for almost two thirds of the total of patients. Anxiety disorders include panic disorders, generalized anxiety disorder, specific phobias, obsessive-compulsive disorders, agoraphobia and social phobias. Moreover, affective disorders, i.e. depression and bipopular disorder, are relatively widespread. All in all, these three illnesses cause 20 % of the total costs of brain disorders. By contrast, there are relatively few patients with brain tumours, multiple sclerosis or strokes. Due to their high costs per case, these illnesses nevertheless generate high costs for Switzerland. For instance, a patient with a brain tumour causes average costs that are about

50 times higher than those for a patient with migraine. But as the individual illnesses do not always involve the same cost categories, a comparison is only possible to a limited extent. In overall terms, mental disorders cause the highest costs within the category of brain disorders, due to their frequency in Switzerland.

The total costs of brain disorders are shown in table 11. The annual costs for Switzerland were CHF 18.6 billion in 2004. Per patient, they amount to an average of CHF 9,000. One third of this sum is due to direct medical costs. Costs of drugs account for about 7 % of these. Direct non-medical costs cause about 15 % of total costs, but they were not calculated for migraine, trauma, anxiety disorders and affective disorders.

Informal care was recorded only for dementia and multiple sclerosis, so the quota of 4 % of the total costs is significantly underestimated. Likewise, productivity losses were not calculated for all illnesses; they are not taken into account for trauma, dementia and psychotic disorders, but in the case of dementia, most patients are over 65 years old and no loss of productivity would be determined if the human capital approach were used. The intangible costs were not determined for any of the disease patterns listed, and these are likely to be high for brain disorders in particular, due to the associated restrictions on life.

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