



Federal Ministry
of Economics
and Technology

BUSINESS.
GROWTH.
PROSPERITY.

Stimuli to innovation in the healthcare industry

Effects on healthcare costs, competitiveness and employment

Results of the research project of the same name carried out on behalf
of the Federal Ministry of Economics and Technology (BMWi)

Imprint

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Contents

Executive Summary.....	4
1. From healthcare sector to healthcare industry.....	5
2. Stimuli to innovation in the healthcare industry	11
3. Economic power and innovative potential.....	14
4. Innovations and healthcare costs	29
5. Job market: healthcare industry.....	35
6. Innovation – hampered and promoted	41
7. Recommendations for action of the authors of the study.....	49

List of Figures

Fig. 1: Traditional and new perspectives on the healthcare sector.....	5
Fig. 2: The four areas of the healthcare industry	7
Fig. 3: Statistical breakdown of the healthcare industry, gross value-added in 2005 in EUR m	8
Fig. 4: Interdependence of the healthcare industry in the HSA.....	9
Fig. 5: Exports of the healthcare industry in the HSA, 2005 in EUR bn	10
Fig. 6: Diagrammatic relationship between the terms obstacles to innovation, drivers of innovation, and stimuli to innovation.....	11
Fig. 7: Effects of innovations in the healthcare industry	12
Fig. 8: Course participants primary prevention	13
Fig. 9: Comparison of the innovative capacity of European countries.....	14
Fig. 10: Share of global trade in medical products.....	15
Fig. 11: Share of total spending on... accounted for by the statutory health insurance system in 2008.	15
Fig. 12: Disproportionately high growth rates in production by the pharmaceuticals industry compared to the processing and finishing sector overall (index: 2000 = 100).....	17
Fig. 13: Net value-added per employee 2007 in EUR '000.....	18
Fig. 14: Focal points of the activity of dedicated biotechnology companies (only one specialist area given per company).....	20
Fig. 15: Estimated annual costs and benefits of e-health in a model economy with ten locations between 1994 and 2008, in EUR m	22
Fig. 16: Health vacation as a problem-solver	24
Fig. 17: Rise in preventive spending by the statutory health insurance system	25
Fig. 18: Manner of operation of an electronic stability programme.....	28
Fig. 19: Direct healthcare costs per inhabitant in euros (2002 – 2008) by age group.....	29
Fig. 20: Premature deaths per 100,000 inhabitants, Germany (all diseases, age-standardised)	30
Fig. 21: Sickness rates of the compulsory members of the statutory health insurance institutions not counting pensioners, annual average (in %)	31
Fig. 22: Years of gainful employment lost due to unfitness for work, invalidity and premature death (in '000 years).....	32
Fig. 23: Growth in the number of employees in the healthcare sector (health sector personnel count) and of wage and salary earners overall (2000 – 2009).....	35

Fig. 24: Change in the number of full-time staff in the healthcare sector by type of institution from 2000 to 2009 (in '000 persons)	36
Fig. 25: Number of healthcare professions and health-related occupational areas	37
Fig. 26: Selected technical auxiliary professions in hospitals	40
Fig. 27: Regulations for medical products	45
Fig. 28: The organisational relationships of the main actors in the German healthcare sector, 2005	47

List of Tables

Table 1: Key figures in the healthcare industry [in EUR bn]	6
Table 2: Basic parameters of the Health Satellite Account for 2005	7
Table 3: Sales of biopharmaceuticals in Germany	20
Table 4: The most expensive disease groups based on their direct costs	30
Table 5: The most expensive diseases based on their indirect costs (lost years of gainful employment, in '000 years)	31
Table 6: Comparison of direct and indirect healthcare costs (period 2003–2008)	33
Table 7: Simulation results of the HWWI study on the development of healthcare costs in Germany	33
Table 8: Healthcare professions with the highest growth in the period 2000–2009 (full-time staff)	38

Executive Summary

The healthcare industry is an important commercial sector, whose importance will continue to grow. It contributes more than 10% of annual gross value-added in Germany and with a total of 5.4 million people employed in the sector it accounts for a seventh of all wage and salary earners.¹

Besides the hospitals and private practitioners, the pharmaceuticals industry, the medical equipment manufacturers, the private and statutory health and nursing care insurance institutions and health-related parts of the retail and services sector also form part of the core of the healthcare industry. In a comprehensive appraisal the health products of other sectors are also relevant – for example from the IT sector (e-health), the food industry (functional food), the tourism sector (wellness and fitness products), and the residential property market (senior citizen-friendly housing). All these areas of production are in turn closely linked to other sectors of the national economy (see Chapter 1 for details). A growing healthcare industry therefore also means rising demand and employment in other sectors.

At macroeconomic level spending on health should no longer be viewed merely as “costs”, but instead should be seen as (necessary) economy-boosting investment in healthy and efficient human capital. These investments are rewarded with a yield in the form of growing productivity, competitiveness and rising prosperity. This also strengthens Germany’s industrial competitiveness compared to other countries.

Innovations in the healthcare industry play an especially important role. Both the medical technology and the pharmaceutical and biotechnology sectors are reporting rising annual sales, to a large extent with new products (details of developments are described in Chapter 2).

The effects of innovations in the healthcare industry are diverse and can be broken down into demand, productivity and spillover effects. The main focus of political debates is the demand effects (mostly rising sales volumes for new products and procedures) and the

resulting increase in direct healthcare costs. The other effects, which are either less easy to measure and quantify or are only indirectly connected, are easy to ignore.

A broader examination makes it clear that improved diagnostics and treatment methods and new drugs have among other things reduced periods of absence of wage and salary earners due to sickness. The indirect healthcare costs thus saved in Germany in the period 2003 to 2008 were EUR 22.3 bn higher than the increase in direct healthcare costs, which underlines the positive macroeconomic effects of healthcare. The healthcare industry is thus contributing to higher productivity from human capital (dealt with extensively in Chapter 4).

The growth in employment within the healthcare industry and the opportunities for new jobs and qualifications resulting from medical progress are dealt with in Section 4. While the total number of wage and salary earners in Germany only grew by just under 2.8% in the period 2000 to 2009 (+ 1.1 million people), the number of employees in the healthcare sector rose by more than 15%, or + 620,000 employees. This trend also highlights the stabilising effect of the healthcare industry on the economy as a whole during periods of crisis.

The Federal Employment Office currently lists just 380 professions in the occupational area of health. Taken together with health-related professions from other occupational areas (services, technology, natural sciences, and social and educational sciences) a total of just under 500 job profiles were identified for the healthcare industry. And even so, due to the expanding health market, new technical developments and the organisational environment there is still growing demand for new job profiles and qualifications.

Summary: With innovative products and methods leading to avoidance of mortality and morbidity (improving health of the population) and with rising sales the healthcare industry is contributing not only to growth in macroeconomic production (GDP), but also to increasing the maximum output and productive capacity of the national economy.

1 These results are based on the newly-developed calculation system of the Health Satellite Account (HSA), for more details see Chapter 1.

1. From healthcare sector to healthcare industry

The healthcare sector has for a long time been viewed solely from the perspective of social policy. Discourses on cost containment and stability of contribution rates dominated political and social debate. This one-sided perception has changed – health service providers are increasingly being viewed as crisis-resistant employers and regional economic factors. Providers are becoming companies and a healthy population forms the basis for the efficiency and competitiveness of Germany as an industrial centre. The healthcare sector is turning into a healthcare industry.

This paradigm shift has taken place in recent decades not only in Germany. Throughout the world the economic importance of the health sector and its stabilising effect in periods of crisis is being recognised. Aspects of the changing understanding of the healthcare sector are shown in Fig. 1.

Health in all Policies

The public health approach offers an even more pronounced change of perspective. Here a new health society is being promoted with “Health in all Policies”. Health can be produced and managed by changing the regulatory environment and thus influencing behaviour. In parallel with this, as a result of information and education citizens play a greater role as active, critical consumers. As health is perceived as a valuable good, in this health society issues like stability of contribution rates and cost containment are pushed into the background.² While health is accepted as a personal and social priority, the economic importance of the sector is recognised in addition. We are seeing the emergence of a co-ordinated, inter-ministerial policy which is pursuing co-operation and networking of healthcare-related service providers among themselves, with other policy areas and with the health-related actors outside of the health system.

Fig. 1: Traditional and new perspectives on the healthcare sector

Traditional view	Extended to include/New view
Healthcare sector	→ Healthcare industry
Predominantly public financing	→ New sources of financing
Input orientation	→ Profit orientation
Cost factor	→ High-growth market/ New occupational areas
Use of services / Consumption	→ Investments in health
Delimited healthcare sector	→ Health in all sectors of society

Source: (Henke et al. 2010), p. 21.

A new perspective What we understand by the term “healthcare industry”

Healthcare industry

The “healthcare industry” produces and markets goods and services which in the broadest sense serve the preservation and restoration of health. Therefore, besides the healthcare sector in the narrower sense – the in-patient and out-patient institutions, pharmacies, and suppliers of medical aids and remedies, etc. – the term also includes the medical upstream services and supply industry, for example the pharmaceuticals industry, medical biotechnology and medical technology, the health products trade and the “secondary healthcare market” with its products such as health tourism, wellness and fitness.

The healthcare industry is a cross-sectoral industry – besides the healthcare sector healthcare-related products and services are also provided by the processing and finishing sector, the construction trade, the information and communication industry, and the distribution sector. Thus in order to record the economic events of the sector at macroeconomic level, the first “satellite account for the healthcare industry in Germany” was developed for the year 2005.³ The calcul-

² See Henke 2009.

³ Henke et al. 2010 on behalf of the Federal Ministry of Economics and Technology (BMWi).

Table 1: Key figures in the healthcare industry [in EUR bn]

	Change 2007 to 2005				
	2005	2006	2007	Difference	share of 2005
Total goods	373.02	394.16	408.66	35.64	9.55 %
Share of national economy	7.75 %	7.67 %	7.56 %		
Production value	326.31	340.6	349.47	23.16	7.10 %
Share of national economy	8.03 %	7.98 %	7.77 %		
Gross value-added	203.07	209.87	213.26	10.19	5.02 %
Share of national economy	10.02 %	10.01 %	9.80 %		
Consumer spending	273.87	282.17	289.23	15.36	5.61 %
Share of national economy	17.30 %	17.49 %	17.76 %		
Exports	54.5	63.8	69.85	15.35	28.17 %
Share of national economy	6.08 %	6.19 %	6.26 %		
Wage and salary earners in thousands	5,282	5,353	5,432	150	2.84 %
Share of national economy	13.60 %	13.70 %	13.67 %		

Source: (Henke et al. 2010).

ations highlighted the major economic importance of the health sector – its share of gross value-added for any given year is about 10 %, and every seventh salary earner (13.6 %) is employed there. Using the developed methodology a current follow-up project is now determining the corresponding figures for the subsequent years – the initial results also highlight the dynamism of the sector over the course of time (Table 1).

The PROGNOSE Atlas of the Future 2009 numbers the healthcare industry among the emerging sectors⁴ of the German economy. It has strongly growing value-added potential in the coming 5 – 10 years and will greatly influence economic performance.⁵ Indicators of an emerging sector are the high level of integration within the global market, the range of industry-relevant cross-sectional technologies, and research and development that generates a great number of product and process innovations.⁶

The Health Satellite Account (HSA) Structure and key figures of the healthcare industry

Health Satellite Account (HSA)

In the research project entitled “Creation of a satellite account for the healthcare industry in Germany” funded by the Federal Ministry of Economics and Technology (BMWi) an input-output table was created which records supply and demand for health products based on the methodology of the Macroeconomic Account (MA) and shows all the interdependencies between the healthcare industry and the national economy for the year 2005. Determination of the contribution of the healthcare industry to value-added and employment in Germany was a dominant feature.

In the HSA the healthcare industry is subdivided into two areas from the point of view of products:

→ the Core Healthcare Industry (CHI) and

→ the Extended Healthcare Industry (EHI).

Those goods and services which are allocated to the healthcare sector based on current understanding and which are paid for by social insurance belong to the “**Core Healthcare Industry**” (CHI). Among other things

4 Specifically: mechanical engineering, vehicle construction, logistics, measurement and control technology (MCT), information and communication technologies (ICT), together with high-end corporate and research services.

5 Prognos AG 2009: 2.

6 Ibid.

Table 2: Basic parameters of the Health Satellite Account for 2005

	HI	CHI	EHI
Consumer spending at market prices in EUR bn	278.4	217.0	61.3
Share of national economy	17.6 %	13.7 %	3.9 %
Gross value-added in EUR bn	206.8	158.9	47.9
Share of national economy	10.2 %	7.8 %	2.4 %
Salary earners in thousands	5,377	4,052	1,324
Share of national economy	13.8 %	10.4 %	3.4 %

HI: Healthcare Industry; CHI: Core Healthcare Industry; EHI: Extended Healthcare Industry,
Source: Taken from (Henke et al. 2010).

these include pharmaceuticals and medical aids, medical and nursing services, etc. Categorisation is defined by the Health Spending Account of the German Federal Statistics Office.

The “**Extended Healthcare Industry**” (EHI) category comprises those goods and services that can be classed as health-promoting. For example these include clothing with particularly non-irritant materials and organic cotton, functional foods with health-promoting ingredients, wellness tours, and fitness studios and residential property construction where senior citizen-friendly assistance systems for persons with health restrictions are being utilised (“Ambient Assisted Living”). These categories have not previously been included in the health sector in official statistics.

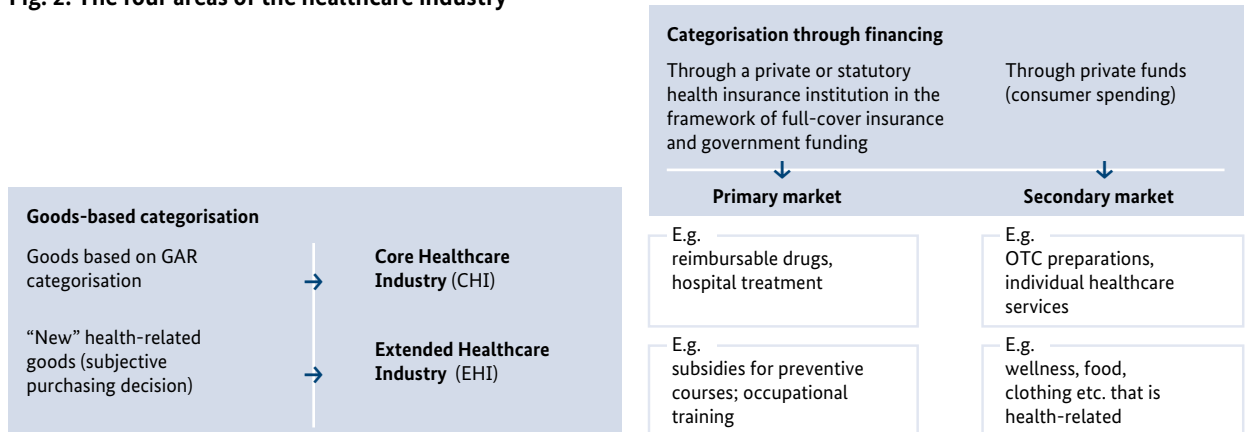
As Table 2 shows, the ratio of the core category to the extended category in the healthcare industry is about 3:1 (both for production and for the numbers of persons employed).

From a funding point of view health products are subdivided into a primary and a secondary healthcare market. The **primary healthcare market** comprises the

“classical” healthcare services, which mainly means Statutory Health Insurance (SHI) and Private Health Insurance (PHI) (including nursing care insurance), but also to a certain extent employers (continued payment of salary in the event of sickness), the state (contributions to SHI), and other social security institutions. The primary healthcare market comprises the health-related goods and services for which users are reimbursed in the framework of the existing financing system.

The **secondary healthcare market** is the term used to refer to the market for all privately financed products and services related to health. This includes over-the-counter drugs and individual healthcare services, fitness and wellness, health tourism, and to a certain extent the sport/leisure, food and housing sectors. Thus the secondary healthcare market includes all health-related services and goods that are neither paid for by private or statutory health insurance institutions in the framework of full-cover insurance policies nor financed out of public-sector funds.

As Fig. 2 indicates, goods from the two areas of the healthcare industry can be allocated to both the first and the second market.

Fig. 2: The four areas of the healthcare industry

GAR = Health Spending Account, OTC = over-the-counter drugs
Source: (Henke et al. 2010)

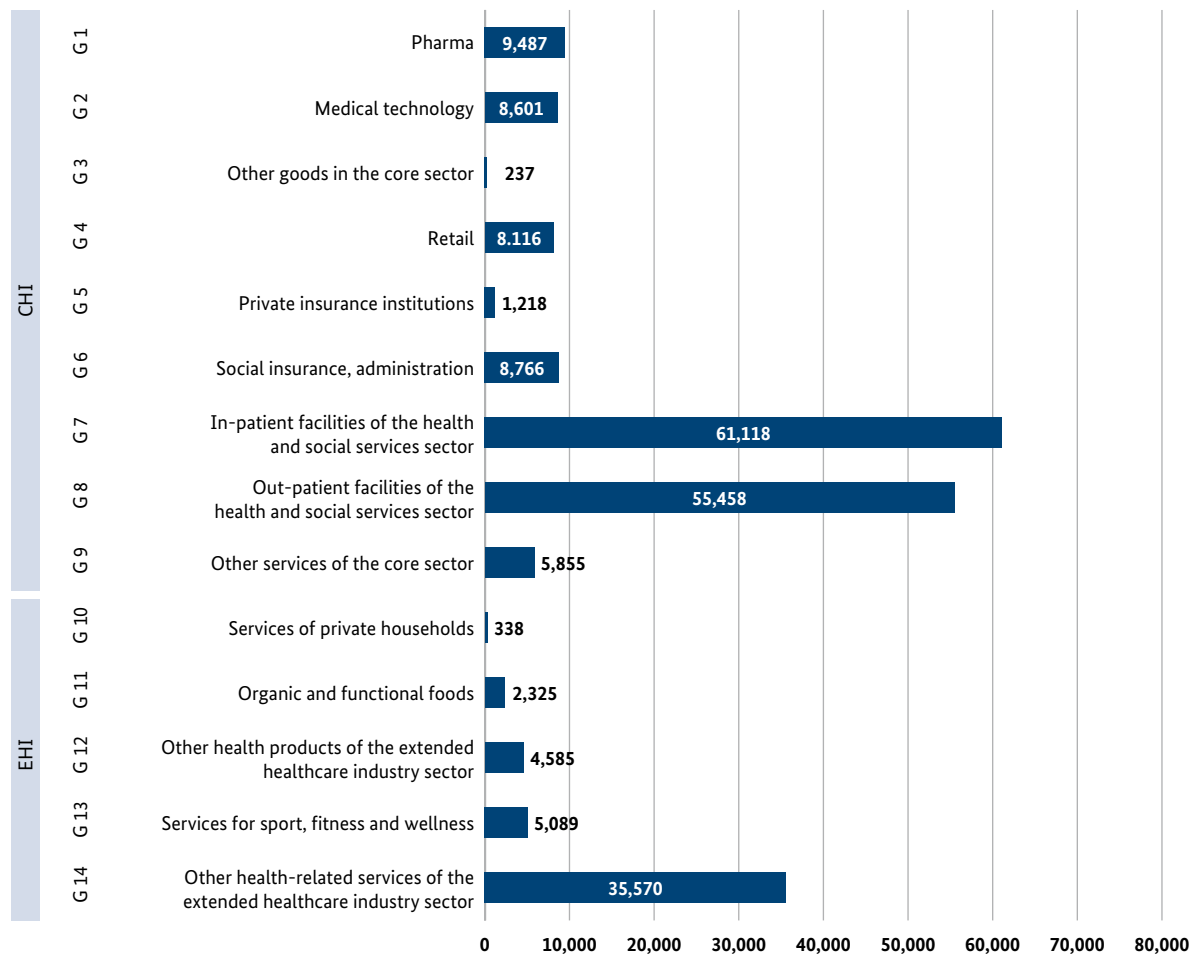
Key parameters in the German healthcare industry

In 2005 the gross value-added of the total healthcare industry, at over EUR 206 bn, was worth more than 10% of the German economy. This does not take account of the gross value-added of the demand triggered by the healthcare industry in other areas of production. Such

indirect value-added shares and employment effects are created by the close interdependence between the health industry and the economy as a whole.⁷

The size of the value-added of the individual segments and categories of goods in the healthcare industry in 2005 can be seen in Fig. 3.

Fig. 3: Statistical breakdown of the healthcare industry, gross value-added in 2005 in EUR m

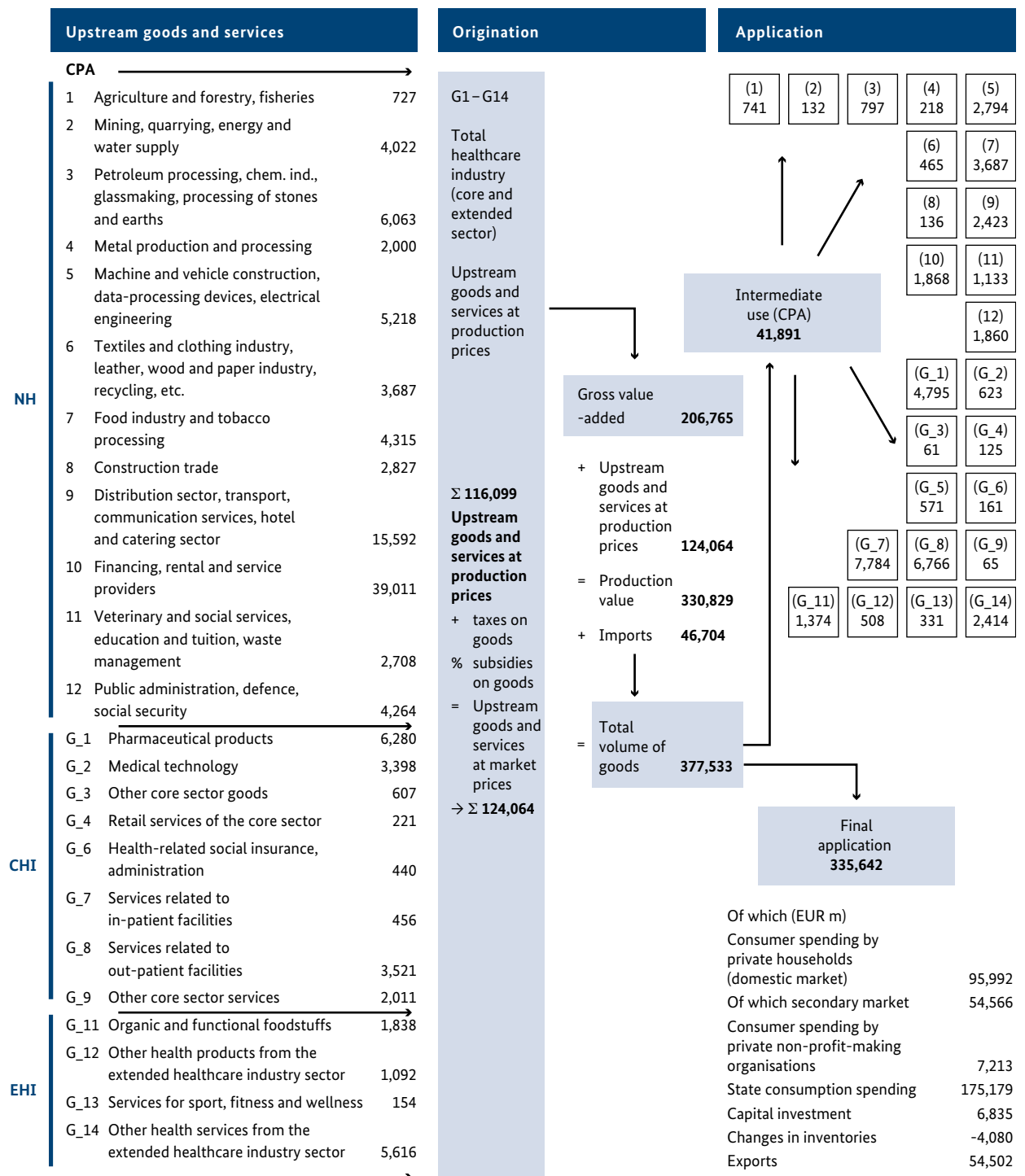


Source: (Henke et al. 2010), our own representation.

⁷ Cf. Henke et al. 2010: 172.

Fig. 4: Interdependence of the healthcare industry in the HSA

Map of the origination and application account of the G1 – G14* category of goods



* Figures in EUR m and for 2005, compiled and calculated based on Henke, K.-D.; Neumann, K.; Schneider, M. et al. (2010): Creation of a satellite account for the healthcare industry in Germany, Nomos, Bonn/Berlin.

Source: Compiled and calculated based on (Henke et al. 2010).

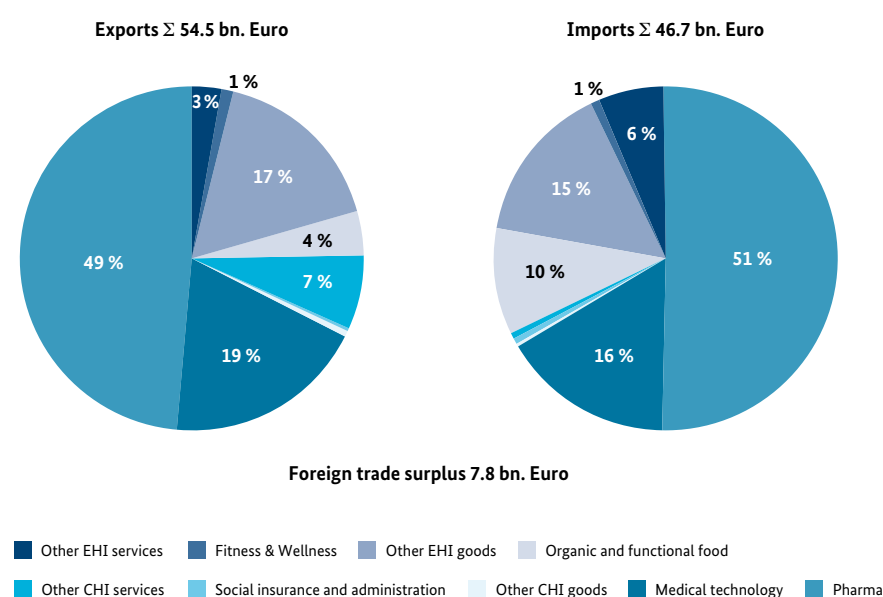
Interdependence of the healthcare industry

The healthcare industry has a close interdependence with other business sectors on both the origination and the application side. Thus on the one hand it procures upstream goods and services not only from within its own sector, but also from 12 sectors that are not classified as belonging to the healthcare industry (abbreviated NH, see Fig. 4). On the other hand products from the healthcare industry are used as upstream goods and services in the production processes of other commercial sectors (so-called intermediate use).

In 2005 the healthcare industry spent about EUR 116 bn on upstream goods and services – of which just under 78 % (EUR 90.4 bn) from other commercial sectors (NH). Through this demand it exerts value-added and employment effects over a broad economic spectrum. The intermediate use indicates that the goods and services produced by the healthcare industry to the value of just under EUR 42 bn re-enter the production processes of downstream companies as upstream goods and services, of which EUR 16.3 bn in other sectors (NH).

The exports of the healthcare industry are of particular importance – with a foreign trade surplus of almost EUR 8 bn. The interdependence with international trade is shown in Fig. 5.⁸

Fig. 5: Exports of the healthcare industry in the HSA, 2005 in EUR bn



Source: Taken from (Henke et al. 2010).

⁸ The flows of goods in the table are all valued at purchase prices, and the exports at the value at the national border. The “purchase prices” pricing concept is used in the table as actual market transactions (purchases and sales) are primarily portrayed in it. Cf. German Federal Statistics Office 2010b: 24 et seq.

2. Stimuli to innovation in the healthcare industry

Besides knowledge and entrepreneurial initiative innovations are one of the most important factors for growth and competitiveness in the economy.⁹ They make a critical contribution to increasing gross national product and mostly boost employment.

The healthcare industry is characterised by a high level of innovative dynamism – thus for example just under a third of all sales in the medical technology sector come from products not more than three years old, and in biotechnology the proportion of R&D spending is up to 50% of sales.

Effects of innovations in other sectors

The spillover effects of innovations in the healthcare industry also extend into other sectors, because jobs and new job profiles are created both there and in the healthcare industry itself.¹¹ An example is the “Green Hospital” project, in which the Asklepios Klinik Hamburg-Harburg is co-operating with the research-based technology group GE with the aim, to be achieved by 2013, of equipping the clinic with innovative environmental technologies in an environmentally-friendly and energy-saving manner. Besides combined heat, power and cooling facilities and solar technology these also include energy-efficient medical technology, lighting concepts and systems for water treatment. For GE this co-operation venture represents an “opportunity to further amalgamate its own fields of business and hence to use the crisis to broaden the scope of its market presence”.¹²

Stimuli to innovation are considered to be those effects that arise from innovations and impact various different sectors within and also outside of the healthcare industry (see Fig. 6).¹⁰ The stimulus term includes in particular the economic and social effects of innovations in terms of growth, development and employment.

Of particular importance are innovations which themselves act as drivers of subsequent innovation – the so-called basic innovations. These include new technologies (e.g. micro-system and sensor technology, and transmission technologies) which are creating novel types of potential applications (product and service innovations). This is triggering an innovation process which is opening up new markets induced by supply (e.g. telemedicine due to technical progress in IT and radio technology, homecare thanks to new medical technology, and new areas for action for healthcare professions such as teleradiology).

Through demand, productivity and also so-called spillover effects stimuli to innovation in the healthcare industry are leading to growth, efficiency improvement and employment growth (see Fig. 7). In particular demand effects (rising sales volumes and prices) are influencing healthcare costs. From a macroeconomic perspective the avoidance of direct, indirect and psychosocial¹³ healthcare costs is thus of great importance. Indirect healthcare costs, as an opportunity cost, represent a measure of the value of the goods and services which society cannot generate due to loss of production because of sickness (for more detail see Chapter 4).

Fig. 6: Diagrammatic relationship between the terms obstacles to innovation, drivers of innovation, and stimuli to innovation



Source: Our own representation.

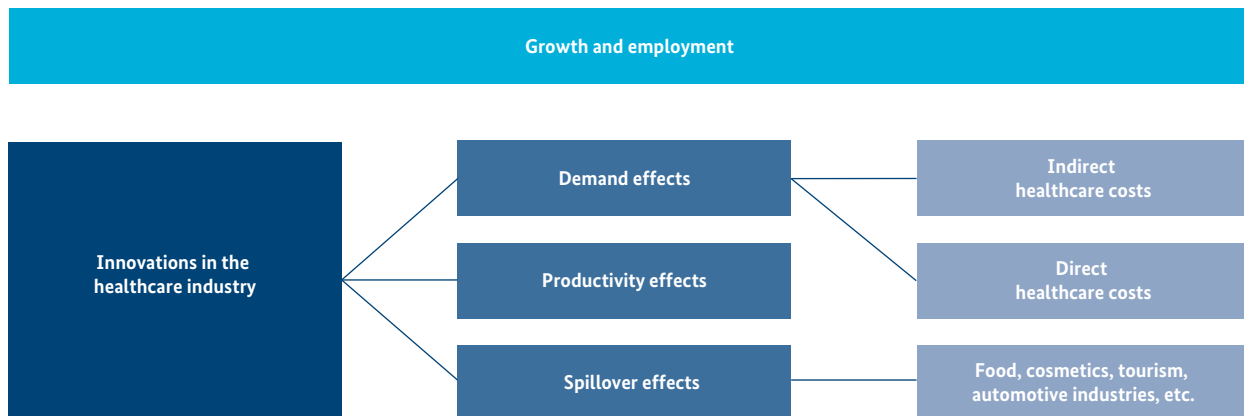
9 Cf. European Commission 11.12.2002: 2.

10 By contrast the “Innovation in the healthcare sector” MetaForum defines stimuli to innovation as “activities which use existing trends and initiate inherent dynamism in order to change the healthcare sector for the purpose of achieving the superordinate objectives.” Stimuli to innovation are thus understood as being drivers of innovation which provide the impetus for the development of innovations. See Fraunhofer Institute for Systems and Innovation Research 2009: 13.

11 Cf. Federal Ministry of Economics and Technology (BMWi) 2009: 13 et seq.

12 Cf. Dirks 2009: 40 et seq.

13 Psychosocial healthcare costs are those which suggest restrictions due to sickness. This includes on the one hand for persons directly affected e.g. reduction in productivity without unfitness for work or due to change of occupation. On the other hand a diminished feeling of self-esteem, fear and suffering, for example, result in psychosocial costs in the narrower sense. Previously psychosocial costs have only been recorded in exceptional cases, for example in connection with life insurance or industrial accidents, by means of economic performance figures.

Fig. 7: Effects of innovations in the healthcare industry

Source: Our own representation.

The innovative potential of the healthcare industry results from product, process, organisational and system innovations with the objective of preservation, restoration and promotion of health along the entire supply chain. This takes place by means of constant optimisation of the products and services supplied together with improved co-ordination of the provision of services.

Stimulation to innovation:

“Minimally invasive surgical methods“

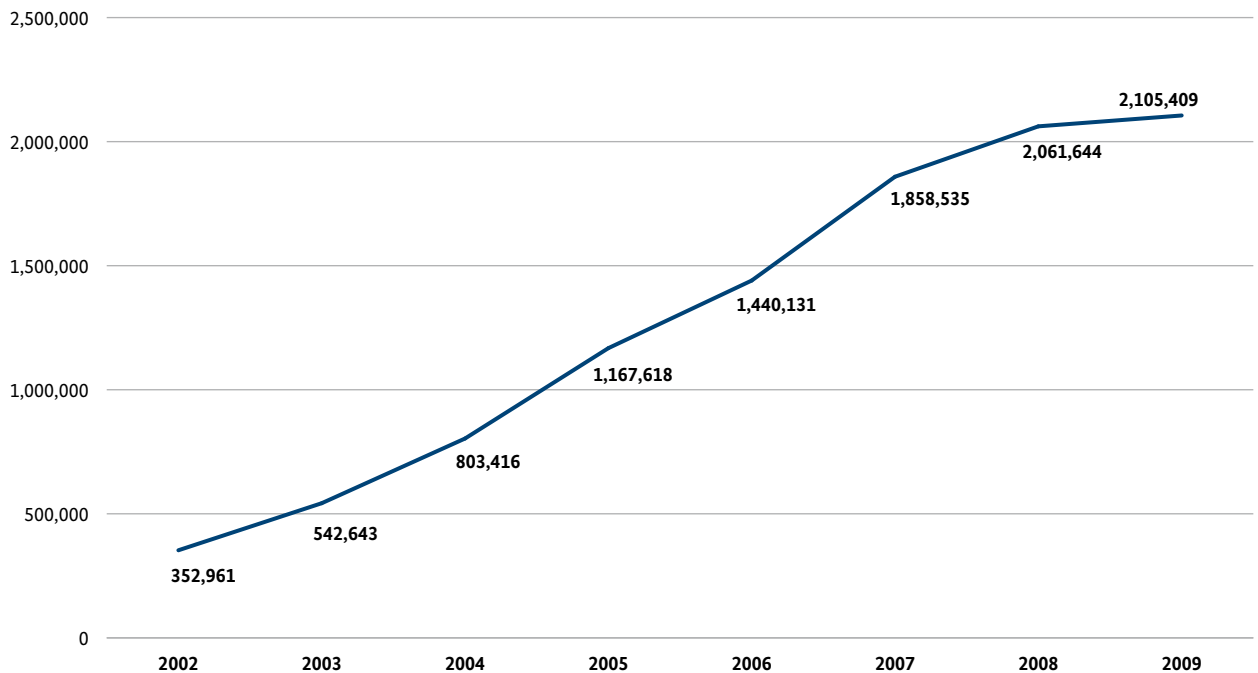
Thanks to technical progress in anaesthesia, medical technology and surgical methods (product and process innovations) more and more operations can be carried out on an out-patient basis. This is having the following effects:

- reduced physical and mental stress for patients, trusted doctor as surgeon, faster recovery
- cost saving by means of avoidance of hospital stays (e.g. health insurance institution TK Baden-Württemberg saved about EUR 900,000 by means of out-patient operations in 2004).
- new qualification opportunities for doctors' assistants and specialist medical assistants (1997 Curriculum “Out-patient operations” of the German Medical Association).

Innovations in the healthcare industry are many and varied. They range from new drugs and therapies through standards for treatment of diseases (medical guidelines), new QM or tariff and billing systems (DRGs) and the use of new surgical procedures to innovative medical technologies and process changes among health service providers (clinical pathways). Innovations in connection with health are mostly considered to be progress related to medical technology. The subdivisions within this are as follows:¹⁴

- **pharmacological progress**
(new active ingredients, combinations of active ingredients or forms of delivery),
- **medical progress in diagnosis and therapy**
(new treatment, therapy and rehab methods),
- **progress in medical technology**
(technical developments in medical products or procedures in diagnostics and therapy),
- **progress in micro- and macroeconomic organisation of the healthcare sector**
(development of standards, new tariff and billing systems, changes in work organisation, new contract designs between service providers, etc.).

14 Cf. Reimers 2009: 25 et seq.

Fig. 8: Course participants primary prevention**Stimulation to innovation: “Prevention”**

Since 2000 the statutory health insurance institutions have been obliged to finance primary prevention and health promotion benefits (Section 20 Social Security Code (SGB) V).

- Within a short space of time numerous courses were being advertised by fitness clubs, physiotherapists, nutritionists, etc.
- The number of course participants rose very rapidly, – from 353,000 in 2002 it increased six-fold – so that in 2009 2.1 million persons insured in the SHI system took part in a health insurance company-funded preventive course.¹⁵
- The effect of this trend, among other things, on the market for physiotherapists is clearly visible: In the period from 2002 to 2009 the number of physiotherapists increased by 55 % (from 78,000 to 121,000).¹⁶

¹⁵ National Association of Statutory Health Insurance Institutions 2010: 64.

¹⁶ Data source: German Federal Statistics Office.

3. Economic power and innovative potential

In a European context Germany is one of the innovative leaders.¹⁷ Together with Sweden, Denmark and Finland, Germany is one of the countries whose innovative capacity is well above the European average. Within this leading group Germany and Finland are advancing the most rapidly.¹⁸

As a country lacking raw materials and with high wages Germany's advantage from know-how in product and technology development is the decisive factor in competition with other countries. Germany as a medical location enjoys great international respect – for its medical technology, medical products, pharmaceutical drugs, and new medical treatment procedures and methods. German innovations in these areas led to the country being known as the “Pharmacy of the World”, and still today the name “Charité” has a reputation throughout the world for medical excellence of the “Made in Germany” calibre. Below we introduce some of the sectors of the healthcare industry and examples of their innovative strength.

Commercial sectors of the healthcare industry

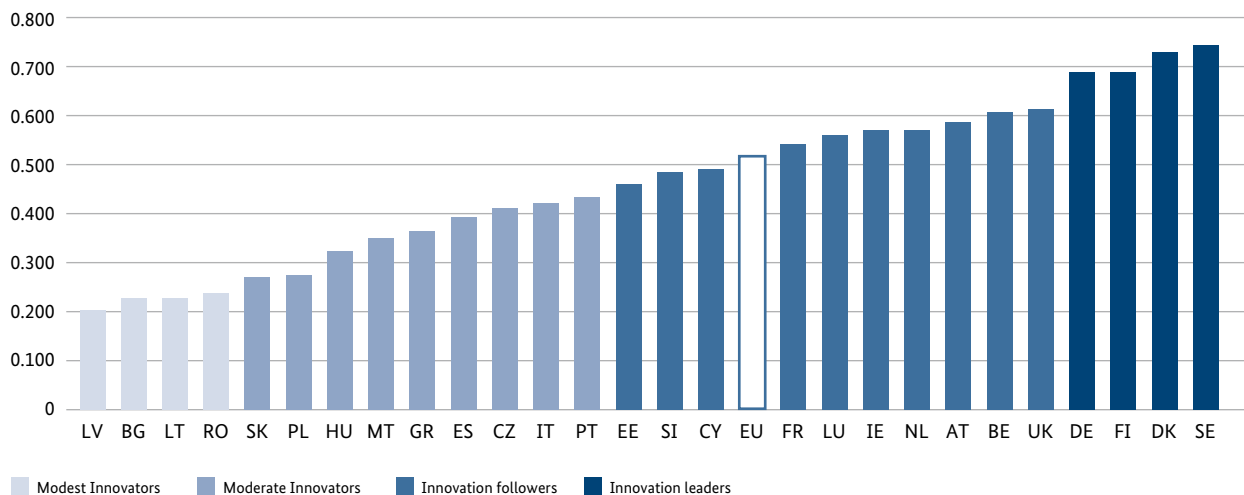
Medical technology

The German medical technology industry is an exceptional growth sector with growth rates of 5 % per annum. With an export rate of 62.5 % Germany is second in global trade, right behind the United States.

In addition to this medical technology stands out as a particularly innovative sector. Nine per cent of sales are invested in research and development and 15 % of employees are active in this field. Just under a third of all sales in the sector are generated with products no more than three years old.

In 2005 about 137,000 wage and salary earners were employed in medical technology (HSA database); this represents 2.5 % of all persons active in the healthcare industry. Each of these jobs guarantees a further 0.75 jobs (together just under 103,000) in other sectors.

Fig. 9: Comparison of the innovative capacity of European countries



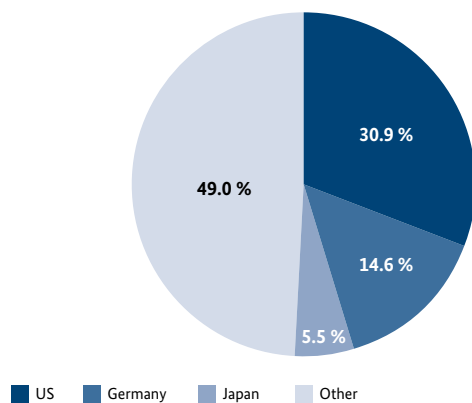
Note: Average performance is measured using a composite indicator building on data for 24 indicators going from a lowest possible performance of 0 to a maximum possible performance of 1. Average performances in 2010 reflects performance in 2008/2009 due to a lag in data availability.

The performance of Innovation leaders is 20 % or more above that of the EU27; of Innovation followers it is less than 20 % above but more than 10 % below that of the EU27; of Moderate innovators it is less than 10 % below but more than 50 % below that of the EU27; and for Modest innovators it is below 50 % that of the EU27.

Source: (European Commission 01.02.2011): 4.

¹⁷ Cf. European Commission 2011.

¹⁸ European Commission 1.2.2011.

Fig. 10: Share of global trade in medical products

Source: Our own representation, cf. Aachen Centre of Competence for Medical Technology (AKM) 2005: 46.

Description of the sector

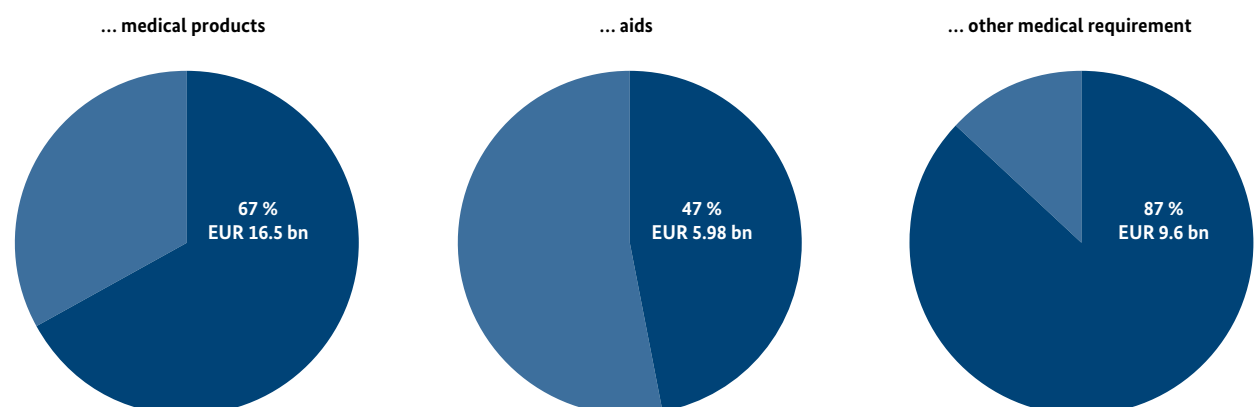
The global market for medical technology is estimated to be worth about EUR 220 bn (reference year 2007). After the US (EUR 90 bn) and Japan (EUR 25 bn), at about EUR 23 bn the German market for medical technology is the third-largest individual market and by far the largest medical technology market in Europe. In global terms unit sales of medical technology products have risen by up to 10 % per annum over the past few years – a trend which is expected to continue in years to come.

The gross value-added of the medical technology products sector is expected to grow more quickly than the healthcare industry overall, with growth to 2030 being forecast at 67.4 %. With export rates of 60–65 % the German medical technology industry is very export

intensive – in the mid-90s the rate was only about 40 %. The main customers for German medical technology are the countries of the European Union, followed by North America. Germany is behind the US in terms of its share of global trade in medical technology products, but well ahead of Japan (reference year 2001). Within the European Union the German share of value-added and employment in medical technology is about 40 %.

The medical technology industry forms part of the core of the healthcare industry. On the upstream side it is closely integrated with various sectors, such as nano-technology, micro-systems technology, microelectronics and optical technologies. In Germany the medical technology industry invests about 9 % of its sales in research and development – which is more than twice as much as in the processing and finishing sector overall (3.8 %). The share of sales accounted for by innovative products (less than three years old) is 31 %. In terms of registered patents medical technology has a significant lead over other sectors.

The statutory health insurance system accounts for a large share of spending on medical products (not counting capital goods and dental prostheses), medical aids and other medical requirements. In a period of eight years (2000–2008) SHI spending on medical products increased by 25 %.

Fig. 11: Share of total spending on ... accounted for by the statutory health insurance system in 2008.

Source: Our own representation, (German Federal Statistics Office 2010a).



Artificial hip joint with ceramic head and cup

In hospitals the use of modern medical technology is frequently linked to reduction of the length of stay, i.e. the in-patient process of diagnosis, treatment and rehabilitation is shortened because the recovery process is faster. In the same period the hospital can treat more cases or reduce contingency costs and thus increase productivity. There continues to be a shift towards out-patient services as a result of progress in medical technology. The growing share of spending on medical technology in hospitals accompanied by a fall-off in personnel is evidence that technology is substituting labour to a certain extent.

The advance of age- and civilisation-related diseases (such as diabetes, depression and dementia, and cardiovascular and musculo-skeletal disorders) is further increasing the requirement for innovative medical technology. On the basis of biotechnological and microsystem-based key technologies a pronounced shift towards miniaturisation and computerisation is taking place in medical technology, making new forms of diagnosis and therapy possible.

Example of innovation: Endoprosthetics

An important example of an area of application for medical technology is joint replacement. Thus the number of operations involving endoprosthetic joint and bone replacement, for example, has increased significantly over the past few years. Studies have shown

that with the help of minimally invasive surgery the duration of patients' stays in hospital can be shortened significantly. Patients lose less blood, they can start rehabilitation sooner, and they are mobile again more quickly.

The growth in the sales of manufacturers of endoprostheses is similarly positive. For example the American company Biomet, which also has a manufacturing facility in Berlin, achieved average annual growth rates of 14 % between 1993 and 2008.¹⁹ The medical technology companies reporting to BVMed, which represent more than 90 % of sales in Germany, achieved the following sales growth during the period 2006 to 2010:

- growth of 6 % overall and 1.5 % per annum for knee implants
- growth of 8 % overall and 2 % per annum for hip joint implants.

The critical driver of this trend, besides the rising age structure of the population, is technical progress in endoprosthetics – both on the part of manufacturers and of hospital surgeons. The design of prostheses, their anchoring in bones, and development of materials and implantation techniques have advanced enormously in order to meet the growing functional demands of patients. For example this also includes computer-assisted implantation techniques.²⁰

The resulting rise in direct healthcare costs contrasts with direct and indirect benefits. Besides the significant improvement in the quality of life of patients and the reduction in periods of absence due to sickness, thanks to the use of modern implants and minimally invasive surgical procedures lengths of stays in hospital (advantageous from the point of view of both the hospital and the patient) and rehabilitation times are being reduced.

Use of minimally invasive surgical techniques greatly reduces the length of hospital stays for total hip endoprostheses: A survey at the Ruhr University in Bochum showed that the postoperative length of stay in hospi-

¹⁹ Biomet 2009.

²⁰ Fuhrmann 15.6.2009.

tal can be reduced to seven days as a result – from 13.5 days for the reference group that had undergone conventional operations.²¹ The number of days of unfitness for work per case due to musculo-skeletal disorders viewed overall²² also exhibits a falling trend.²³

Pharmaceuticals industry

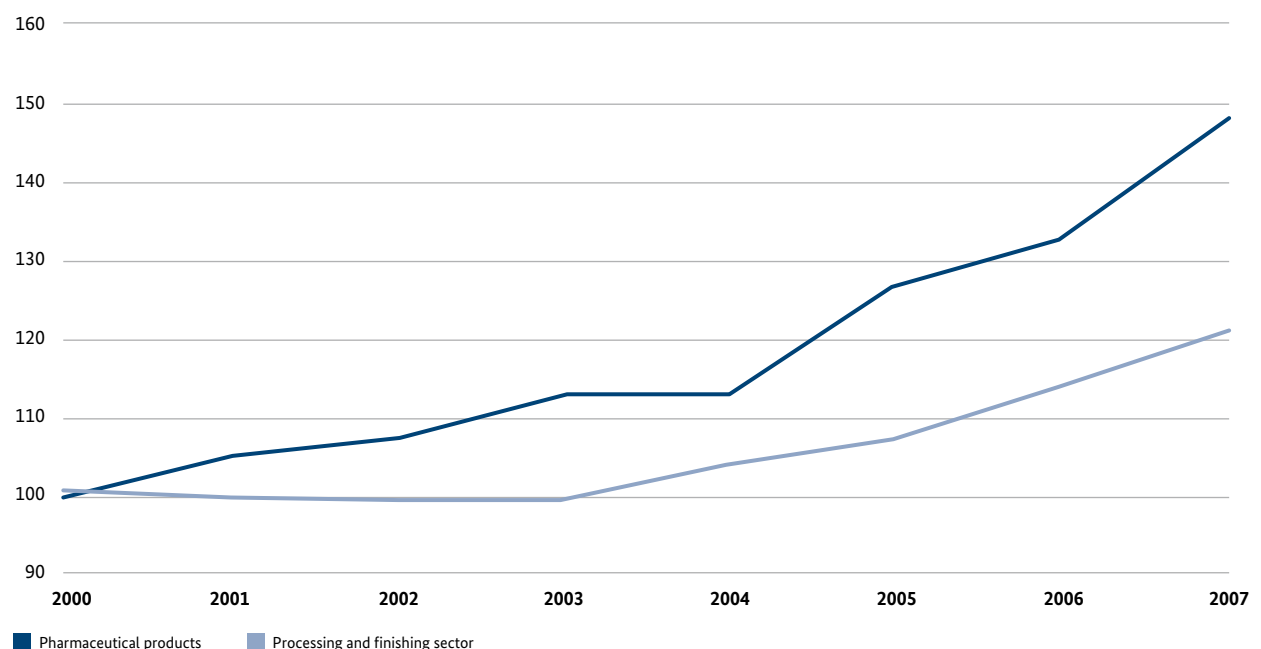
The pharmaceuticals industry is a sector with above-average growth rates. Production of pharmaceutical products in Germany has increased by 4 % per annum over the past ten years in real terms. Export has played a decisive role in this. More growth is forecast for the next few years: by 2030 gross value-added is expected to increase to more than double the figure for 2005. The pharmaceuticals industry is one of the sectors with the highest innovation density.



Description of the sector

The market for pharmaceutical drugs is growing steadily. Between 2000 and 2008 sales rose by about EUR 11 bn to EUR 41.6bn.

Fig. 12: Disproportionately high growth rates in production by the pharmaceuticals industry compared to the processing and finishing sector overall (index: 2000 = 100)

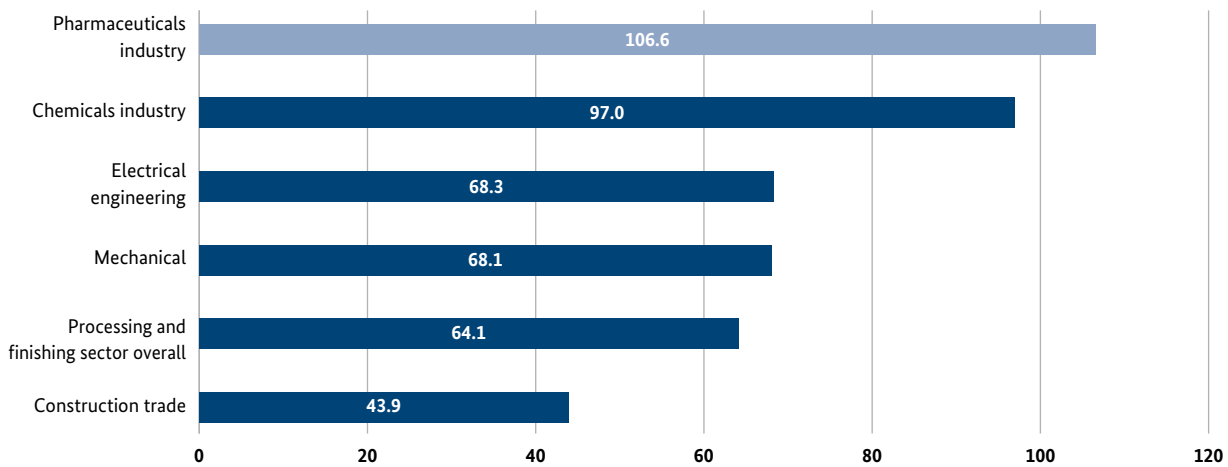


Source: (German Ministry of Health (BMG) 2009): 5.

²¹ Dömer 2009: 51.

²² Individual diagnoses are unfortunately not reported.

²³ Nevertheless in assessment of innovations in endoprosthetics it should also be taken into account that of all the OECD countries Germany carries out the most operations for both hip and knee joint replacements – about double the OECD average. (OECD: Health at a Glance 2011, forthcoming (expected p. 22)).

Fig. 13: Net value-added per employee 2007 in EUR '000

Source: (Association of Research-based Pharmaceuticals Companies (VfA) 2010).

Gross value-added for 2005 amounted to about EUR 9.5 bn (4.6 % of total gross value-added in the health-care industry). An increase of 226 % to EUR 21 bn is expected for 2030 (the share would then be 6.2 %).²⁴ With net value-added of over EUR 100,000 per employee (2007) the pharmaceuticals industry is one of the most productive commercial sectors in the entire national economy (see Fig. 13).

In 2005 about 76,000 members of the working population were active in the pharmaceuticals sector; by 2030 this number could grow by about 38 %.²⁵ Each employee in the pharmaceuticals sector guarantees up to 1.63 jobs in other sectors.²⁶

The German balance of trade is positively influenced by the pharmaceuticals industry. The balance of trade surplus in 2005 amounted to approximately EUR 2.8 bn.²⁷ Cross-sectoral interdependencies affect almost all areas of production, in particular the chemicals industry, the research and development sector, and business-related services.

In 2008 about 9.2 % (EUR 5.2 bn) of all spending on research and development was accounted for by the pharmaceuticals sector.²⁸ Only the automotive and electrical goods industries can boast higher R&D spends. In 2008 Germany accounted for about 8 % of total global R&D spending in the pharmaceuticals sector.²⁹ With more than 11,000 patent registrations in 2008 the German pharmaceuticals sector was only outperformed by the US.³⁰

Innovative drugs are having positive macroeconomic effects. Periods of unfitness for work are being shortened or avoided, the working life of employees is being extended, and mortality is falling while quality of life is being enhanced. As far as common diseases are concerned, optimised supply of innovative medication promises potential savings of over EUR 9 bn.³¹

Innovation costs in the pharmaceuticals industry are high, as drugs have to be tested intensively prior to approval. In the course of the development time of eight to fifteen years, of 5,000 to 10,000 potential substances just one remains as a rule.³² In 2003 the total cost of development of a new active ingredient was estimated at USD 1.3 bn.³³

²⁴ Cf. Henke et al. 2010.

²⁵ Ibid.

²⁶ Cf. Schumacher, Reiß 2006.

²⁷ Exports to the value of EUR 26.8 bn compared with imports of EUR 24 bn. Cf. Henke et al. 2010.

²⁸ The Hamburg Institute of International Economics (HWWI) reports about EUR 3.4 bn for 2005. Cf. Bräuninger et al. 2008.

²⁹ Cf. German Pharmaceutical Industry Association (BPI) 2009.

³⁰ According to the German Patent and Trademark Office a total of 62,417 patents were registered in Germany (German Patent and Trademark Office (DPMA) 2008).

³¹ Cf. Schönermark.Kielhorn + colleagues 2010.

³² Cf. Bräuninger et al. 2008.

³³ Cf. German Pharmaceutical Industry Association (BPI) 2009.

Thus expenditure on drugs is the fastest-growing component of health spending in Germany. Between 1991 and 2008 SHI drug sales increased by 80 % to EUR 26.7 bn – while the number of prescriptions fell over the same period.³⁴ Spending per SHI member rose by 90 %.³⁵ Nevertheless, spending on drugs over the past few years has been kept down by the growing share accounted for by prescribed generics.

Commercial sectors that are closely linked to the healthcare industry

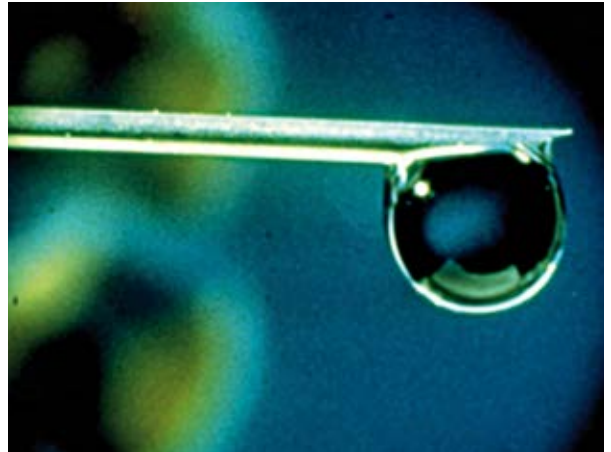
Biotechnology

Biotechnology is a relatively new sector concerned with the “application of the science and technology of living organisms”. Besides areas of application in agriculture and industry, in particular in medicine (“red” biotechnology), it is seen as one of the most important key technologies for the development of new medical and pharmaceutical products.

Description of the biotech sector in Germany

The average age at the end of 2005 of the 531 German biotech companies was just 6.9 years. In 2009 they generated sales of about EUR 2.2 bn, of which EUR 756 m was accounted for by red biotechnology. The very high share of sales of almost 50 % accounted for by spending on research and development reflects that the sector is very research-intensive, among other things due to its lack of maturity.

Sales in the sector grew at an explosive rate between 2005 and 2008 with annual growth rates of 6–14 %. Due to the financial and economic crisis in 2009 it was impossible for this trend to continue. However, the year-on-year rate of 8.7 % achieved in 2010 meant a return to the high level before the crisis.³⁶



In 1978 the first drop of genetically manufactured human insulin was obtained.

Also, the number of people employed in the biotechnology sector has grown significantly since 2005. Between then and 2008 it increased by 11 % in the companies exclusively active in biotechnology and by as much as 25 % in commercial biotechnology overall.

Now as previously, overcoming bottlenecks in financing has been one of the greatest challenges for the sector. Due to high R&D spending there is a large capital requirement compared with other sectors. In view of what are as a rule long and cost-intensive development times for modern biotechnology products the sector needs a lot of patience before they turn a profit. Many companies have taken measures to identify alternative sources of capital in order to safeguard their business activity for an extended period. Among German biotech companies a pronounced trend towards sales-generating services and technologies can be observed.

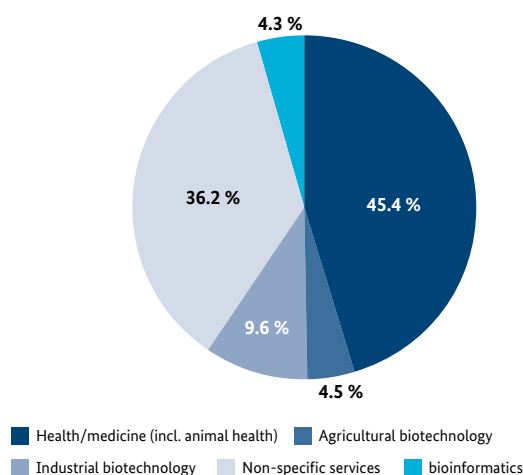
There is a small number of successful companies but still a large number of companies struggling with problems, which needs to be taken into account in interpreting the available statistical data.

34 Cf. press conference on the Drug Prescription Report, 17.9.2009.

35 German Federal Statistics Office and own calculation for 2008 based on the final calculations for 1999–2008 of the German Ministry of Health (BMG).

36 More extensive details at: <http://www.biotechnologie.de/BIO/Navigation/DE/Hintergrund/studien-statistiken,did=123044.html> (last checked on 7.9.2011).

Fig. 14: Focal points of the activity of dedicated biotechnology companies (only one specialist area given per company)



Source: (biotechnologie.de 2009): 10.

In terms of content the main areas of activity of the biotechnology companies are clearly broken down: Almost half of all the companies develop new drugs or diagnostic tests. Thus medicine is traditionally the most important area of application of biotechnology, followed by non-specific services (contractors for research and other biotech companies or suppliers). Together with laboratory reagents and services the latter represent the largest contribution to sales in the biotechnology sector, accounting for just under 60 % of all sales in 2008 (EUR 1.3 bn).

In medicine there is a wide range of applications for biotechnological products and procedures – ranging from diagnostics to therapy. Medical biotechnology is closely interwoven with both the pharmaceuticals industry and medical technology. Experts anticipate that these three sectors will increasingly merge with each other in future.

The importance of biotechnological products in the health sector is growing – especially biopharmaceuticals, the interface between biotechnology and the pharmaceuticals industry. Thus at the end of 2009 188 biopharmaceuticals were approved in Germany, including biotechnologically produced vaccines.³⁷

Sales of biopharmaceuticals in Germany (as a proportion of the sales of the pharmaceuticals industry overall) have been growing positively since 2005 (see Table 3) and the share of the German pharmaceuticals market they account for has been growing steadily – from 12 % in 2006 to 16 % in 2009.³⁸

In 2009 12 of every 44 newly approved drugs were biopharmaceuticals.³⁹ According to the German Association of Research-based Pharmaceuticals Companies (VfA), in 2015 approximately half of the new drugs coming to market will be the result of a genomically-based research approach.

Example of innovation: Pharmaceutical drugs for children

Drugs for children represent a particular challenge, because clinical tests have hardly ever been carried out on children in the past for ethical reasons.

Among biopharmaceuticals the rate of approval of drugs for children is very high – at the end of 2009 they accounted for about two-thirds of all preparations on the German market. Many biopharmaceutical preparations are also developed for children from the outset – the very first biopharmaceutical, in 1982, was insulin.

Table 3: Sales of biopharmaceuticals in Germany

	2005	2006	2007	2008	2009
Sales in EUR bn	2.77	3.1	4.0	4.4	4.7
Annual growth		12 %	29 %	10 %	7 %

Source: (Michl 2010) and additional years.

³⁷ Cf. Michl 2010: 11.

³⁸ Cf. Ibid.

³⁹ Cf. Ibid.: 6.

Of the various diabetes types, Type 1 diabetes occurs mostly in childhood and is the most frequent metabolic disease among children. In Germany approximately 24,000 children between 0 and 19 years old are affected by Type 1 diabetes. Since the early 1990s the annual incidence has doubled – a further doubling is expected between now and 2025.

Conventional insulin therapy requires a strict meal-time regime (same times and same calorie intake) and is not suitable for children. For this reason 90 % of all children are now treated with “intensified conventional insulin therapy” (ICT), in which extended- and immediate-action forms of insulin are used.

More than 3,000 children in Germany carry an insulin pump today, and 42 % of them are under five years old. As a rule the children can deal with their condition independently following a familiarisation phase – thanks to the availability of various genetic forms of insulin and child-friendly application aids. In view of the potential long-term damage to health due to a chronically high blood sugar level (damage to the retina, nerves, blood vessels, etc.) and the macroeconomic “diabetes excess costs”⁴⁰ of EUR 22.3 bn (reference year 2001)⁴¹ a reliable diabetes therapy for children has a high macroeconomic value.

Information and communication technology

The ICT sector produces key technologies for all other sectors and is therefore also of great importance to the healthcare industry. According to the German Federal Statistics Office information and communication technologies include all facilities “which make possible the transmission or exchange between people of information in digitised form and by electronic means”⁴².

The opportunities for ICT in the healthcare sector are seen in particular to be,

- in making it possible for the population to take greater responsibility for its own health,
- in reducing spending on health by all participants, and
- in improving the health of the population, for example by means of electronic exchange of information on treatment methods and diagnosis and therapy outcomes.⁴³

ICT applications in the healthcare sector range from electronic patient files through capture and billing systems for medical technology services, complex hospital information systems (HIS), telemedicine with the transfer of vital and image data, and speech recognition software, to electronic integration of medical devices within the HIS.

Growth potential and barriers to development in the e-health market

e-health is a high-growth market for Germany, just as it is for Europe. Spending on information and communication technologies in the healthcare sector has been rising for years, and further growth is expected. After the pharmaceutical drugs market and the market for medical devices e-health is in third position in the European health sector. Its achievements include developments such as information networks, electronic data management and health portals.⁴⁴

The e-health market can be divided into the following four segments:⁴⁵

1. Clinical information systems (the largest sub-market, accounting for just under 40 % in Germany) – applications in the in-patient and out-patient sector for doctors and other service providers, e.g. radiology and nursing care information systems, medical imaging and medical practice software;

40 These are the costs that can be exclusively attributed to diabetes.

41 Köster 2005: 5.

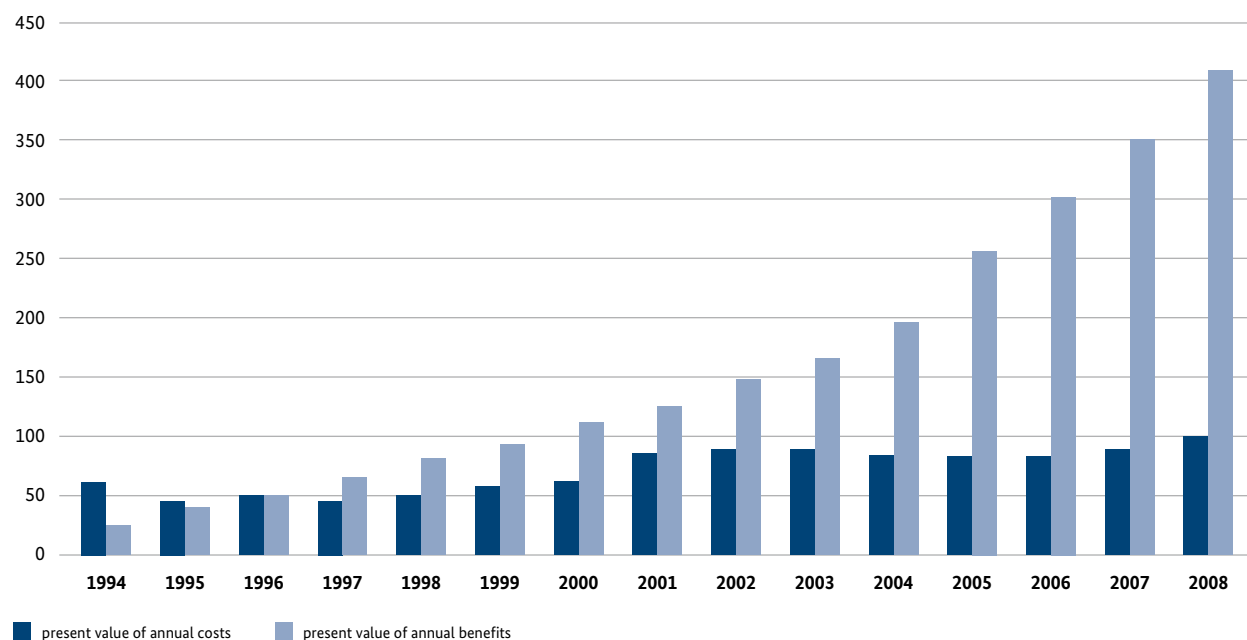
42 German Federal Statistics Office 2009a.

43 Cf. Hauschild, Schnorr-Bäcker S. 2005: 1089 – 1094.

44 Cf. European Commission 15.3.2010.

45 Cf. European Commission 2007: 10.

Fig. 15: Estimated annual costs and benefits of e-health in a model economy with ten locations between 1994 and 2008, in EUR m



Source: (Stroetmann, et al. 2006): 22.

2. Telemedicine and homecare (second-largest sub-market, accounting for an estimated 35 % of e-health spending in Germany) – personalised healthcare services, for example disease management modules, remote supervision of patients, teleconsultation and teleradiology;
3. Integrated regional/national health information networks for the exchange of health data – between service providers and health insurance institutions, for example e-prescriptions and e-referrals;
4. Systems relating to the healthcare sector – solutions for e-learning, health portals on the internet, databases for healthcare research, supporting systems (procurement and logistics, accounting, etc.).

According to estimates of the World Health Organisation up to 40% of costs incurred in the health sector are attributable to information and communication procedures. However, unlike other sectors the health sector has so far made very little use of ICT. Part of the reason for this is on the one hand the absence of a single IT standard for the equipment used and on the other hand the sparse networking of participants. In addition studies have shown that e-health systems only

become viable when they are tailored precisely to the respective requirement and to large numbers of cases.

Viewed in the long term, however, widespread utilisation of electronic applications in the healthcare sector offers enormous cost savings, as suggested by the model calculations of a European study (see Fig. 15). Apart from the population (insured persons, patients) (42 %), service providers (52 %) benefit most from widespread utilisation of e-health.⁴⁶

Telemedicine

Telemedicine is understood as the provision of medical services where information and communication technologies are used to overcome spatial separation. It features transmission of data, results or images which facilitate diagnostic or therapeutic interaction. Exchange of data takes place either between doctors and other service providers or between doctor and patient, for example for the monitoring of the vital data of the chronically sick (telemonitoring). This gives specialists faster access to information and allows patients higher quality of life.

⁴⁶ Cf. Stroetmann, et. al. 2006: 22.

However, the great potential of telemedicine to improve the quality and efficiency of healthcare has not yet been exhausted: The main obstacle to nationwide application of telemedical solutions in Germany is outstanding tariff issues in respect of the provision and billing of telemedical services as a component of the standard healthcare benefits in the framework of the statutory health insurance system. A further obstacle here is the lack of a single IT standard due to the large number of contractors. By no means the least of the obstacles standing in the way of telemedical solutions are problems of data protection, a lack of acceptance by doctors and patients (for example due to complicated operability), and inadequate technical infrastructure. Nevertheless, some health insurance institutions now pay for telemonitoring of heart patients.

Example of innovation:

“Telemedicine for cardiac insufficiency patients (ZERTIVA)”

Cardiac insufficiency is of enormous significance for the national economy. In the western countries 1–2 % of the total health budget is used for the treatment of cardiac insufficiency – for Germany this would correspond to about EUR 2.4–4.8 bn per annum (according to the healthcare cost accounts EUR 3.23 bn was spent on the treatment of cardiac insufficiency in 2008, which was 1.27 % of total healthcare costs⁴⁷). About two-thirds of the costs are accounted for by in-patient treatment (in 2006 this came to EUR 1.3 bn). The hospitalisation rate due to cardiac insufficiency has doubled over the past 10–15 years in some European countries. Cardiovascular complaints are the most frequent reason for the deployment of emergency medical staff.

Measures which can sustainably reduce the frequency of hospital treatment for patients with cardiac insufficiency thus contribute to cost reduction and at the same time improve the quality of life of those affected. The use of telemedical solutions for the transmission of vital sign parameters (ECG, blood pressure and pulse) to a medical centre offers the possibility of reducing

the delay between the occurrence of complaints and the required intervention. This leads to shortening of in-patient hospital stays, improvement of healthcare services and reduction in the deployment of emergency medical staff.

The Zertiva telemedicine project was initiated by the Techniker health insurance institution and carried out from November 2003 in co-operation with the PHTS Telemedizin company. The cost-saving effect of telemedicine was clearly demonstrated here. The cost of the drugs therapy, the out-patient medical services, the therapies against any undesirable events and of unfitness for work and, where applicable, telemedical care were taken into account.

As a result of this modelling it was demonstrated that the total cost (EUR 3,746 without telemedicine vs. EUR 2,292 with telemedicine) and the effectiveness-adjusted cost (EUR 6,397 without vs. EUR 3,065 with telemedicine) of the treatment of cardiac insufficiency is lower where telemedicine is used. Telemedical care reduces the rehospitalisation rate and shortens in-patient hospital stays.

Tourist industry

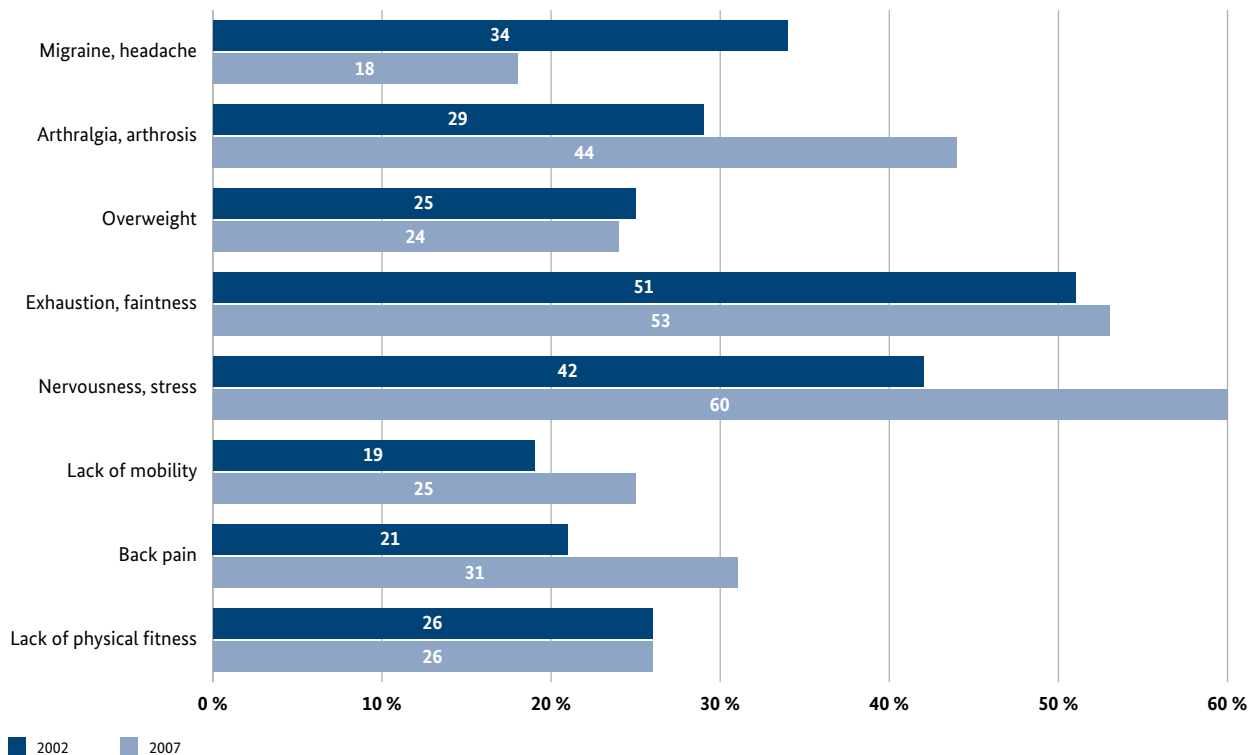
The tourist industry is a classical cross-sectoral industry. All industry sectors benefit from tourist spending, directly through the spending of tourists. In the largest commercial tourist sector, hotel and catering, sales in 2008 were approximately EUR 50 bn. The hotel and catering sector includes the hotel industry, other provision of accommodation, food and beverage-related restaurants and catering, canteens and caterers, with a total of 1.32 million employees.⁴⁸

Since 2002 demand in the tourist sector overall in Germany has been growing again. Germany is becoming increasingly attractive to foreign tourists in particular. In 2004 the growth rate for overnight stays by guests from abroad was 8.8 %, and in 2006 it was as high as 9.8 %.⁴⁹ Nevertheless, compared to other European

47 Source: German Federal Statistics Office healthcare costs table (13.7.2011).

48 Cf. Federal Ministry of Economics and Technology (BMWi) 2004: 32.

49 German Federal Statistics Office 2009b: 427.

Fig. 16: Health vacation as a problem-solver

Source: (Institute of Leisure Economics 29.6.2007).

countries, for Germany the share of overnight stays by nationals is of much greater importance. A relatively small component of sales is attributable to “Other services”, which include sport products and services and the health and wellness sector for example.

Health tourism

The “health tourism and wellness” sector forms part of the extended healthcare industry sector. The term health tourism comprises tourism products and services extended to include health-related aspects such as anti-ageing vacations, wellness vacations, healthcare vacations, etc. The leisure and recreation destination is of primary importance, in contrast to medical tourism, where medical treatment is the dominant feature.

About 29% of European vacationers (extrapolation from a survey of holidaymakers) spend their vacation in a health tourism institution.

A reason for the increase in health tourism might be the travel allowances granted by health insurance institutions as part of preventive programmes. Some tour operators have shifted the focus of their activity

to the co-ordination and marketing of subsidised health products and services.

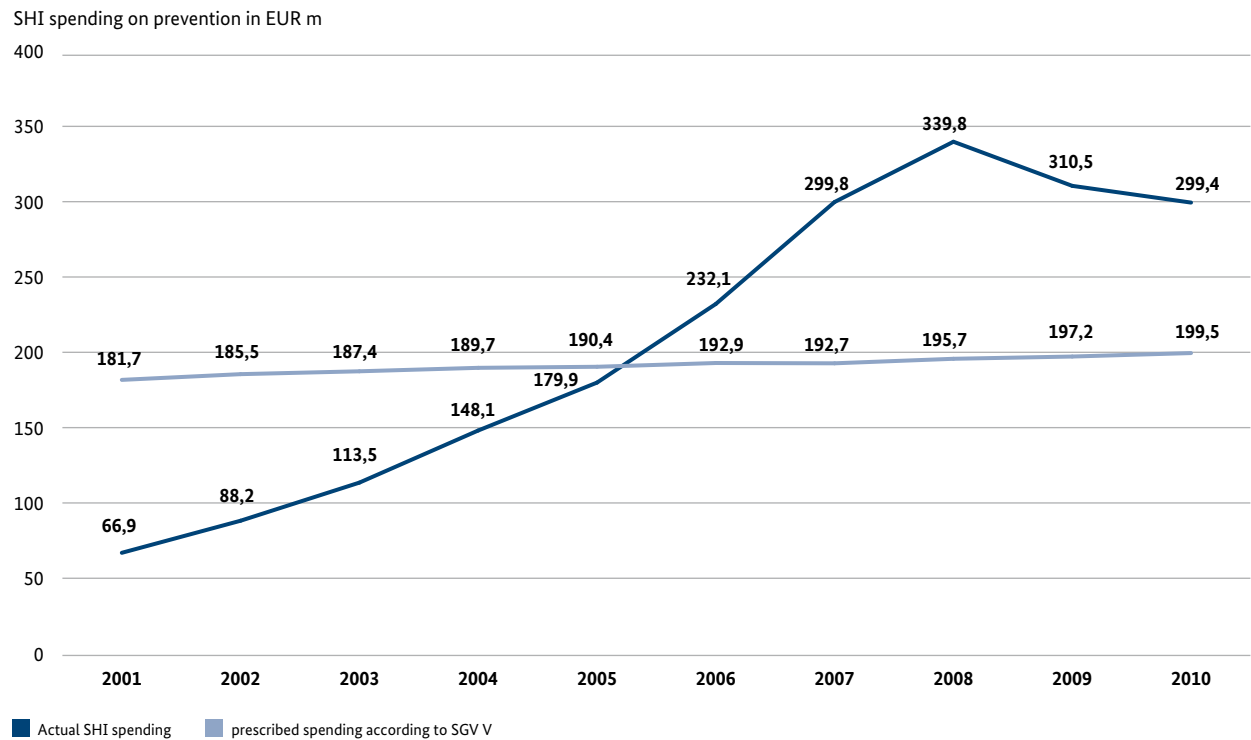
Medical tourism

According to information supplied by the German Federal Statistics Office 67,650 foreign patients received treatment in German hospitals in 2008. The market for medical tourism certainly has potential, however currently this is neither a strong market segment (only about a 0.4% share of all hospital admissions) nor a fast-growing one.

However, the international market for medical tourism is most certainly growing. Networks of hospitals, airlines and hotel chains, etc., have organised themselves to provide comprehensive care to foreign medical tourists.

Example of innovation: “Health Cologne” network⁵⁰

In the spring of 2009 KölnTourismus, gewi-Institut für Gesundheitswirtschaft e.V. and other Cologne-based actors in the health sector founded the Cologne Health

Fig. 17: Rise in preventive spending by the statutory health insurance system

Source: (German Ministry of Health (BMG) 2009): 5.

Pool. This currently contains eight partners from the medical, hotel industry and retail sectors. The service is completed by three patient management companies, which carefully look after visitors from the Arab world (allMEDArab), Russia, Ukraine and the CIS (MEDCOLOGNE), as well as from England and the US (GlobalGuest Germany).

Through their contributions KölnTourismus and the members of the Health Pool finance the broad-based print publication entitled "Health Cologne" in Arabic, Russian and English. This advertises Cologne as a healthcare location as well as the tourist highlights. Since the beginning of 2009 more than 8,000 copies have already been distributed to disseminators for the travel and health industry in Russia and Ukraine alone, among other things as a supplement to the largest travel magazine, TourBusinessNews. The Arab edition was distributed in 2009 at the Arabian Roadshow of the German National Tourist Board (DZT) and at the ATM in Dubai. The English version is also already available in the branches of the German National Tourist Board (DZT) and was successfully distributed at the tourism sector's flagship trade fair, Internationale Tourismus-Börse Berlin (ITB), and at the most important incoming trade fair in Germany, Germany Travel Mart (GTM).

The housing and real estate industry The private household as a healthcare location

Over the past few years the relationship between the housing and real estate industry and the healthcare industry has become a focal point for the sector due to new living situations for the elderly and new technical developments (homecare and telemedicine) which make healthcare at home possible. Demand for small residential property units is growing and the number of one- and two-person households is increasing. In Germany these households will also change in respect of their age structure – as a result of demographic change the average age in private households is rising sharply.

Accommodation suitable for the elderly a high-growth market

Demand for obstacle-reduced or -free housing is growing. In 2003, for example, in North-Rhine Westphalia between 11 % and 23 % of households in which senior citizens resided planned to convert their own accommodation to make it suitable for the elderly.⁵¹ The total

51 Cf. Mester 2007: 48. No reliable figures are currently available for the number of obstacle-reduced residential property units. Cf. Mester 2007: 27.

number of obstacle-free residential units is still relatively small at 500,000. However, it is estimated that by 2025 a total of about 1.5 million senior citizen-friendly residential properties will be required.⁵²

Besides accommodation in homes, hybrid forms combining both out-patient and in-patient healthcare have meanwhile become established. These include service-oriented accommodation and serviced housing. In service-oriented housing, in addition to their accommodation senior citizens are also provided with domestic, social or nursing services. The market for serviced housing has been growing for approximately 15 years. Between 1995 and 1998 alone supply more than doubled, even though growth rates have been falling for some years.⁵³ Approximately one per cent of Germans over 65 lives in accommodation with services.

Interaction between the healthcare industry and the housing and real estate industry

Developments in the healthcare industry are influencing the requirement for housing products and services. Among other things due to medical innovations the German population is living longer and today's over-60s are more mobile and healthier than 20 years ago. The healthcare industry is having a direct impact on the housing and real estate sector, for example through product innovations and organisational innovations: both shorten in-patient treatment times and therefore extend the period spent in a patient's own home. Correspondingly, there is demand for senior citizen-friendly products and services from the housing and real estate industry.

There is also an effect in the reverse direction between the healthcare industry and the housing and real estate industry – the housing sector is influencing developments in the healthcare sector. If senior citizen-friendly accommodation is designed in a manner that is beneficial to health, elderly people can remain in their own

homes for longer, which is confirmed by a study by the Institute of Nursing Science at the University of Bielefeld.⁵⁴ The state has reacted to this and has established appropriate investment incentives. According to the German Federal Ministry of Transport, Building and Urban Development, from 2009 to 2011 EUR 80–100 m per annum was available for home adaptations in the form of grants and loans.

Example of innovation: “Ambient Assisted Living” (AAL)

Co-operation ventures between the healthcare industry and the housing and real estate industry have great potential due to the cross-sectoral interaction.

New co-operation models are emerging between the healthcare industry and the residential property market in particular in the Ambient Assisted Living (AAL) sector. AAL refers to networked information systems whose components are unobtrusively integrated into the environment and which allow extensive independent assistance to be given to people in their interaction with the environment.

The so-called “vitality check” informs relatives automatically (for example by text message) if no movement has taken place in the residential unit over an extended period of time even though someone is at home.

Many applications are currently being tested in the framework of pilot projects in respect of their suitability for everyday use and their cost-benefit relationships, in some cases with the participation of the funding bodies, the social insurance institutions. Provided this pilot phase is completed with positive results, innovative products and procedures are likely to be included in the list of standard benefits of the statutory health insurance institutions. This would also further assist developments in the real estate and residential property market.

⁵² German Bundestag (lower house of the German parliament) 13.4.2011.

⁵³ Cf. Mester 2007: 50.

⁵⁴ Cf. Braubach 2003: 34.

Health-related innovations in the food industry

Healthy nutrition

The 2008 Nutrition Report of the Deutsche Gesellschaft für Ernährung e. V. (DGE) (German Food Association)⁵⁵ establishes some positive trends in the dietary behaviour of the Germans, such as the increase in per capita annual consumption of cereals (+ 1.9 kg), fruit (+ 1.4 kg) and vegetables (+ 1.1 kg). This says that the reduction in overall fat consumption is to be welcomed, in particular given the prevalence of overweight and obesity. Nevertheless, the test results of school entry medical examinations available from various German federal states show that a growing number of first-year pupils suffer from overweight and obesity. A negative development is the growing sugar consumption, for example in the form of jelly products and non-alcoholic soft drinks. Since 1995 sugar consumption has increased by 400 g per person per year.

Functional food

According to a study carried out by the periodical Focus,⁵⁶ functional food products (foodstuffs enriched with certain ingredients which have a positive effect on health) are in heavy demand. The first products with special lactobacilli were launched on the market in 1996, and already today every sixth yoghurt is probiotic.⁵⁷ Functional food is meanwhile reported to include 1,400 products from 41 product groups. Between 2000 and 2005 the number of functional food buyers in Europe is reported to have doubled. Forecast: rising.

An example of an innovation in the food industry with verifiable benefits for maintaining the health of the population is dietary margarine, which contains phytosterols. Phytosterols help to reduce a person's LDL cholesterol level. LDL cholesterol is a critical factor in the risk of disease of the coronary arteries. According

to the Institute of Health Economics and Clinical Epidemiology of the University of Cologne, consistent use of low-fat margarine with added phytosterols would allow the healthcare industry to make substantial savings on treatment and drugs.⁵⁸

Automotive sector

Innovations in the automotive sector are most certainly having benefits in maintaining the health of the population. Below we demonstrate this using driver assistance systems and developments in automotive technology (exhaust and drive technology) by way of example.

Driver assistance systems

The first and also the most significant innovation in the automotive sector, in particular in assistance systems, is the seatbelt system. Since the introduction of the compulsory use of seatbelts in 1976 the number of fatalities due to traffic accidents has fallen strikingly⁵⁹, a trend which continued in the subsequent years thanks to progressive automotive technology:

Whereas with a vehicle stock of just under 5 million registered vehicles in 1953 12,631 people were killed in traffic accidents (ratio of 26.5 persons per 10,000 vehicles), in 2008 with vehicle stock about twelve times as large 4,477 persons were killed (ratio of 0.9 persons per 10,000 vehicles).

Modern driver assistance systems are subdivided into active and passive systems. The seatbelt and the airbag number amongst the passive assistance systems designed to guarantee vehicle occupants protection if the hazardous situation, i.e. an accident, is imminent and no longer preventable. On the other hand active electronic driver assistance systems are designed to help vehicle drivers avoid accidents in the first place.

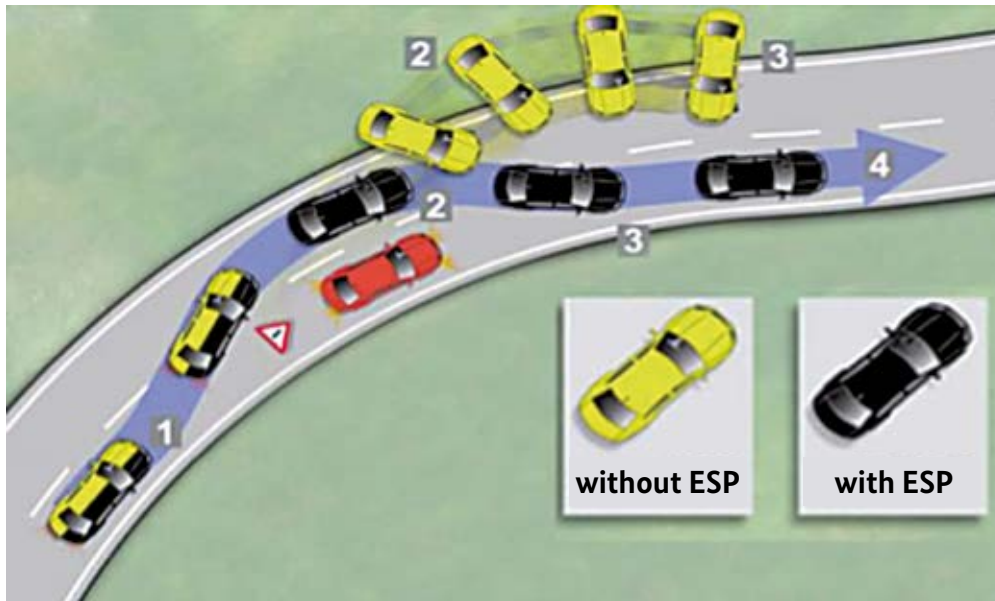
55 Cf. German Food Association 4.2.2009.

56 Dommasch 2005.

57 Cf. German Food Association 12.11.2002.

58 Cf. Gerber et al. December 2006: 247–254, Berlin Medical 2009: 40.

59 Cf. German Federal Statistics Office 2009c.

Fig. 18: Manner of operation of an electronic stability programme

Source: (Autotouring.at 2007).

Examples of such active systems are the electronic stability programme (ESP) and the anti-lock braking system (ABS), etc.

All these assistance systems are designed to protect the occupants of a vehicle from physical injury and through this protection therefore have an indirect impact on the health system.

The potential cost savings for the health system and ultimately also for the national economy are considerable. Thus for a person killed in a road traffic accident the resulting cost (also including healthcare sector costs) is EUR 1,161,885.⁶⁰ Based on this, in 2004 the German Federal Highway Research Institute calculated a total cost to the national economy of approximately EUR 30.9bn (damage to persons and property taken together) as a result of persons fatally injured in road traffic accidents. Of this EUR 15.24bn is attributable to personal injury.

On the other hand the automotive manufacturers are always interested in increasing the unit sales figures for their vehicles and benefit not least from a positive safety image.

⁶⁰ Cf. German Federal Highway Research Institute (BAST) 2006.

4. Innovations and healthcare costs

Innovations in the healthcare industry which preserve or restore health have two essential effects:

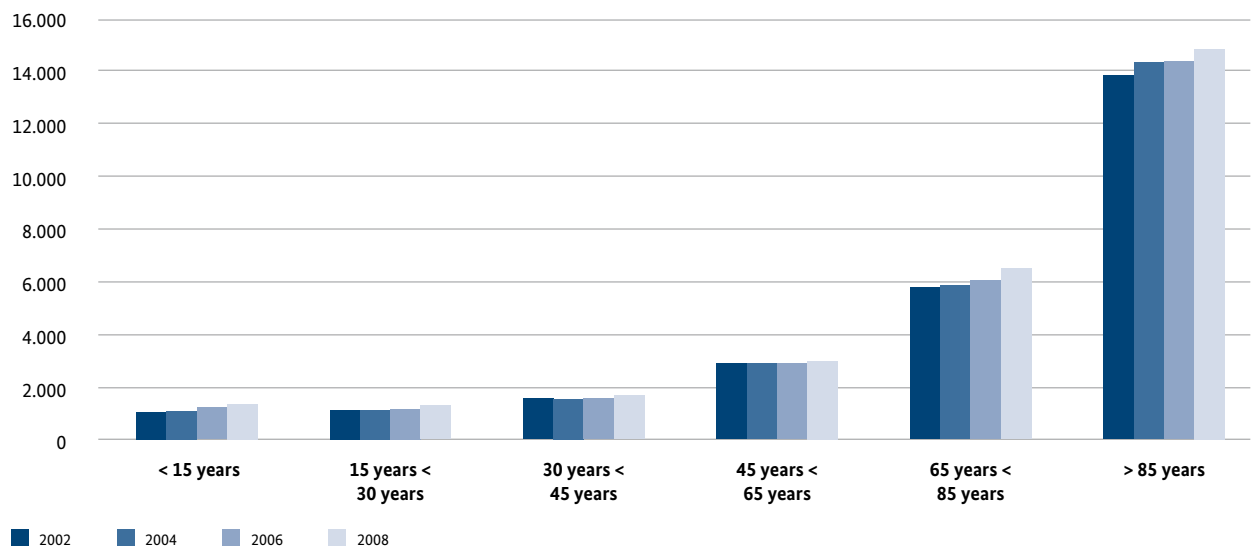
1. They improve and widen the range of diagnosis and treatment options to include previously untreatable diseases. As a rule this results in a rise in direct healthcare costs.⁶¹ From the point of view of the manufacturers and service providers this means a rise in sales and (additional) income (growth and employment).
2. Progress in medicine is accompanied by a reduction in (premature) mortality, increased life expectancy and improved health in old age. The years of life gained are spent either with persistent or new health-related problems and corresponding additional treatment costs or in mainly good health, so that for example periods of absence due to sickness of members of the working population (indirect healthcare costs) fall or the latter's working lives are prolonged.

Development of direct healthcare costs

The **direct costs** refer to the use of monetary resources in the healthcare sector directly associated with medical treatment or a preventive, rehabilitation or nursing care measure. These also include the administrative costs of the service providers and of all public and private institutions which finance healthcare services in Germany. Non-medical costs, for example private medical consultations or free nursing care provided by relatives, are not included in the healthcare cost accounts.

Fig. 19 highlights that direct healthcare costs in Germany rise not only with increasing age – they rise in all age groups over the course of time.

Fig. 19: Direct healthcare costs per inhabitant in euros (2002–2008) by age group



Source: Our own representation, (German Federal Statistics Office).

⁶¹ Even if in individual cases diagnosis or treatment costs fall compared to the existing method due to the application of a medical technology innovation, at macroeconomic level this is frequently more than offset by a rising number of cases. Bräuninger et al. 2007 argue similarly; Kraft 2006 and Henke, Reimers 2007.

Table 4: The most expensive disease groups based on their direct costs

	EUR m	Share in %	EUR per inhabitant	Ranking of disease
Total (all diseases)	254,280	100	3,100	
Of which:				
Circulatory system Including hypertension, cerebrovascular diseases (strokes and cerebral infarctions) and ischemic heart diseases ⁶²	36,973	14.5	450	1
Digestive system Including diseases of the oral cavity, of the salivary glands and of the jawbone	34,814	13.7	420	2
Musculo-skeletal system This includes dorsopathies (back complaints), arthrosis and osteoporosis	28,545	11.2	350	4
Psychological behavioural disorders For example dementia, depression and schizophrenia are particularly cost-intensive	28,654	11.3	350	3

Source: Our own representation based on (German Federal Statistics Office 2010c).

In 2008 in Germany costs totalling EUR 254 bn were incurred due to direct use of healthcare services. Of this 50.7%, or EUR 129 bn, was attributable to just four disease groups (see Table 4).

Based on the period from 2004 to 2008 the result is an increase in total direct healthcare costs by EUR 29.3 bn. The sizes of the increases in the individual disease groups vary. Thus the cost of psychological behavioural disorders and tumours increased by the greatest margin, approximately EUR 3.9 bn, spending on cardiovascular diseases increased by EUR 3.5 bn, and expenditure on diseases of the musculo-skeletal system rose by EUR 3.3 bn.

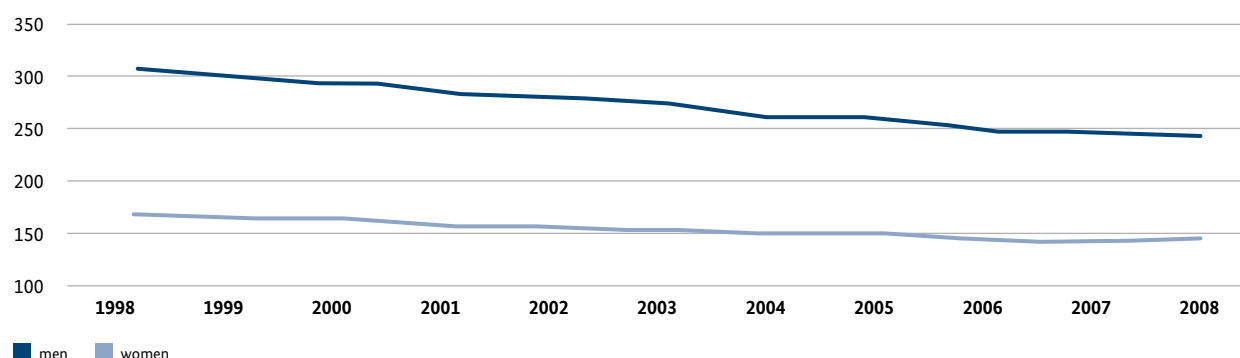
Development of indirect healthcare costs

Indirect healthcare costs measure the loss of resources indirectly linked to a disease. This primarily means the potential macroeconomic losses due to unfitness for work, invalidity and premature death among the working population; these are stated in the form of

lost years of gainful employment. The so-called intangible costs must be included in the indirect costs. These comprise the limiting factors such as pain, depression or general loss of quality of life resulting from a disease. However, it is barely possible to quantify these.

An important sign of improved health is increasing life expectancy among the population. In Germany the life expectancy of men has increased from 71.70 to 77.17 years since the mid-1980s and of women from 78.03 to 82.40 years. However, this general trend towards increasing life expectancy is due to several factors – improved lifestyles and eating habits, falling physical stress in the work process and the nature and method of provision of healthcare services are all of importance.

By contrast, the “premature mortality” figure is more a reflection of the impact of healthcare services and of medical progress. It is a long-term indicator of the health of people in middle age. This figure represents the number of fatalities before the age of 65. Premature mortality in Germany for both sexes together fell by over 22 % in the period 1998 to 2008 (see Fig. 20).

Fig. 20: Premature deaths per 100,000 inhabitants, Germany (all diseases, age-standardised)

Source: Our own representation, (German Federal Statistics Office).

62 There is a link to the cause of death statistics here, because the chronic ischemic heart diseases were the most frequent cause of death in 2007, accounting for 76,915 deaths. Acute myocardial infarction is one of the best-known complications associated with ischemic heart disease and is the second most frequent cause of death.

In Germany there were a total of approximately 4.2 million lost years of gainful employment in 2008 due to unfitness for work, invalidity or premature death.

Injuries and poisonings constituted the most expensive form of sickness in terms of indirect costs (see Table 5). Unfitness for work, invalidity and premature mortality led to a total of 834,000 lost years of gainful employment in 2008, i.e. at 19.6% about a fifth of the indirect costs. The first four disease categories together accounted for just under 62 % of all indirect costs in 2008.

A key indicator of the positive impact of medical progress on the productivity of the national economy over the course of time is falling sickness rates and falling

periods of absence due to sickness. After the reunification the sickness rate for all SHI-insured persons fell from 4.9 % (1991) to 3.2 % in 2007,⁶³ though it increased slightly to 3.37 % in 2008 (12.3 days p.a.) (see Fig. 21).

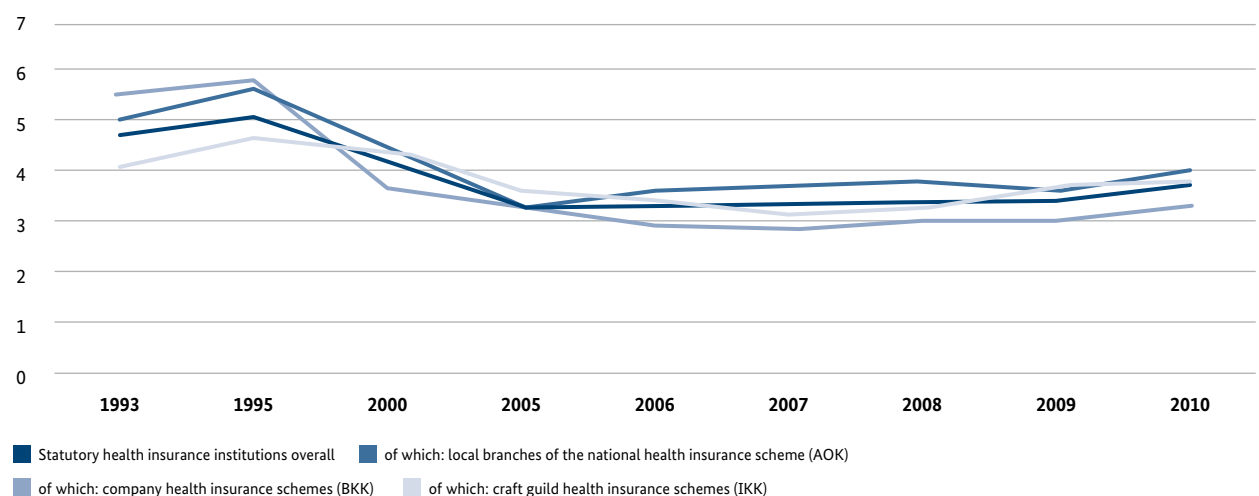
The Federal Institute for Industrial Health and Safety and Occupational Medicine (BAuA) has calculated the macroeconomic production loss for 2008 based on average duration of unfitness for work per employee: a total of EUR 43 bn of production lost through unfitness for work (456.8 million days of unfitness for work), or 1.7 % of gross national income.⁶⁴ Even more dramatic is the EUR 78 bn loss of gross value-added – a 3.1 % share of gross national income.

Table 5: The most expensive diseases based on their indirect costs (lost years of gainful employment, in '000 years)

	Unfitness for work	Invalidity	Mortality	Total	Disease ranking
Injuries + poisonings	210	408	216	834	1
Psychological behavioural disorders	196	524	43	763	2
Tumours	78	156	291	525	3
Musculo-skeletal system	351	153	2	506	4
Circulatory system	86	108	188	382	5

Source: Our own representation based on (German Federal Statistics Office 2010c).

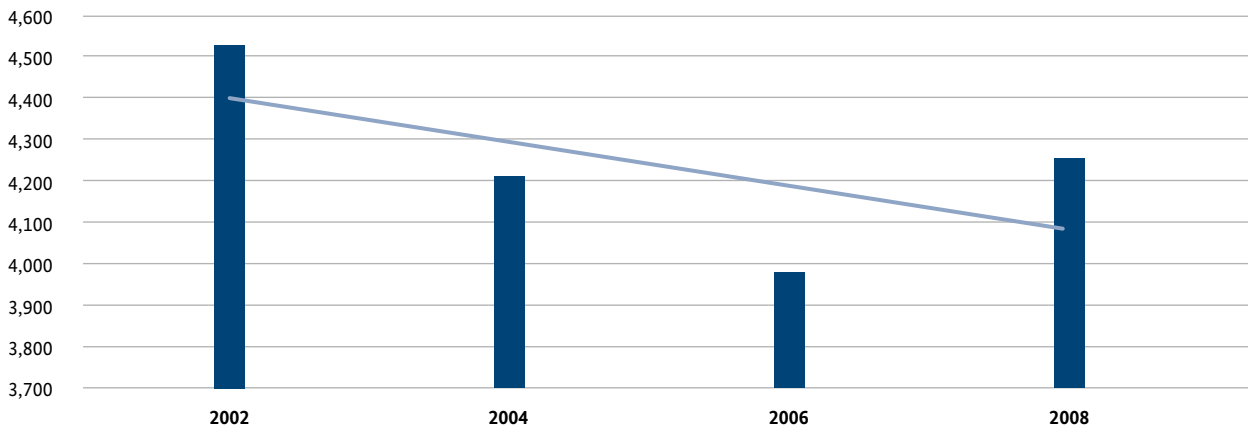
Fig. 21: Sickness rates of the compulsory members of the statutory health insurance institutions not counting pensioners, annual average (in %)



Source: (German Federal Statistics Office).

⁶³ Cf. Badura 2008: 210.

⁶⁴ Federal Institute for Industrial Health and Safety and Occupational Medicine (BAuA) 2009: 28.

Fig. 22: Years of gainful employment lost due to unfitness for work, invalidity and premature death (in '000 years)

Source: Our own representation, (German Federal Statistics Office).

The figure for lost years of gainful employment over the course of time exhibits a falling trend (light blue) since 2002 (see Fig. 22), though with a rise in 2008 compared to the previous survey period, 2006.

In respect of the concrete incidence of disease long-term changes can similarly be identified due to progress in medical technology. Thus, for example, thanks to new drugs and therapies cardiovascular diseases – which for a long time have been the number one cause of death – are slowly declining in importance. Between 1990 and 2004 their importance fell by 33.1 % among women and by 38.2 % among men.⁶⁵ Progress in cancer treatment over the last few decades has also led to a reduction in cancer mortality in Germany.⁶⁶

A portrayal of the relationship between disease and healthcare, taking into account the introduction of innovative diagnosis and treatment procedures, shows how the number of days of unfitness for work changed between 2002 and 2008 for the 20 diseases with the longest periods of unfitness for work. Most striking is

the almost 40 % fall-off in back pain, which was down by about 8.7 million days of unfitness for work in 2008. This corresponds to a fall in the number of years of gainful employment lost due to back pain in the same period from 181,000 years (2002) to 104,000 years (2008).⁶⁷ This development is a result both of medical progress in the treatment of disease and of the increased use of technical medical aids and ergonomic furniture in companies and diverse training and education measures aimed at behavioural prevention in the framework of corporate health management. About 75 % of all interventions in corporate health promotion are based on reduction of physical stress factors.⁶⁸

There have also been significant reductions in periods of unfitness for work due to other diseases of the musculo-skeletal system (spinal disc injuries and other diseases of the spinal column and of the back) as well as bronchitis and gastritis. By contrast there has hardly been any change in mental illnesses (depressive episode and reactions to severe traumatic stresses and adjustment disorders).

⁶⁵ RKI 2009.

⁶⁶ Cf. RKI 2009: 70.

⁶⁷ Data source: German Federal Statistics Office.

⁶⁸ National Association of Statutory Health Insurance Institutions 2009.

Table 6: Comparison of direct and indirect healthcare costs (period 2003 – 2008)

Direct healthcare costs in EUR m for Germany					
2002	2004	2006	2008	Cumulative additional costs 2003 – 2008 compared to 2002*	
218,768	224,970	236,524	254,280	101,184	
Lost years of gainful employment in '000 years for Germany					
2002	2004	2006	2008	Reduction in lost years of gainful employment 2003 – 2008 compared to 2002*	Loss of gross value-added avoided due to reduction in number of lost years of gainful employment (EUR m)
4,515	4,207	3,972	4,251	2,097	123,500**

* The German Federal Statistics Office publishes the healthcare costs and the lost years of gainful employment at two-yearly intervals. For the missing years the averages of the previous and subsequent years have been assumed.

** The gross value-added was calculated on the basis of the average gross value-added of the respective year (source: German Federal Statistics Office, National Accounts). The following figures were used as a basis: EUR 51,800 (2003), EUR 57,800 (2004), EUR 57,700 (2005), EUR 59,400 (2006), EUR 60,900 (2007) and EUR 62,000 (2008).

Development of healthcare costs overall

Comparison of the development of direct and indirect healthcare costs during the period 2003 to 2008 shows that rising spending on pharmaceutical drugs and therapy contrasts with falling costs in respect of the national economy due to the improved health of the population (see Table 6).

The fall in the number of lost years of gainful employment in the period 2003 to 2008 compared to the level of 2002 corresponds to an avoided loss of gross value-added to the value of EUR 123.5 bn – and is thus **EUR 22.3 bn** higher than the cumulative increase in healthcare costs.

This is a strong argument in favour of more prevention, which is further supported by the fiscal importance of the healthcare industry.⁶⁹ Improved health can be seen as an investment and a growth factor. Increasing the healthy component of the working-age population and a higher labour force participation rate among the

working-age population are ways of achieving improved economic growth. Besides this, a longer healthy lifespan among members of the working population combined with lifelong expansion of skills by means of training and education can act as a counterweight to a lack of skilled workers and demographic decline of the labour force.⁷⁰

In 2007 the Hamburg Institute of International Economics (HWWI) carried out a macroeconomic cost simulation in order to determine how direct healthcare costs and the indirect cost of absence from work due to sickness of wage and salary earners in Germany will change by 2037 and what economic impact could result from improved health.⁷¹ The result of the base simulation indicates that improved health among the population in the period under review results in cumulative cost savings of EUR 910 bn compared to the situation with unchanged health. Worthy of particular note is the fact that the increase in the total cost of improved health can be almost exclusively attributed to the rise in indirect costs.⁷²

Table 7: Simulation results of the HWWI study on the development of healthcare costs in Germany

	Total cumulative saving with improved health	
	Base simulation (Life expectancy + 5 years)	With a large increase in life expectancy (+ 7 years)
Up to 2017	EUR 97.4 bn	EUR 171.6 bn
Up to 2027	EUR 403.9 bn	EUR 638.8 bn
Up to 2037	EUR 910.7 bn	EUR 1,405.8 bn
Up to 2037 as a percentage of total spending	8 %	12.5 %

Source: (Bräuninger et al. 2007).

69 Also see Martin, Henke 2008.

70 Cf. Kaufmann, Stahmer 20.12.2007.

71 Bräuninger et al. 2007.

72 Ageing of the total labour force and increased gross value-added per member of the working population (+ 1.5 % p.a.) plays a particularly important role here. Regarding direct healthcare costs improved health offsets the age-related increase in spending.

The base simulation was compared with a second variation based on a larger increase in life expectancy (plus 7 years) – justified as the expected consequence of increasing health consciousness and of greater future medical progress. In this variation the direct and indirect annual healthcare costs increase from EUR 348 bn in 2007 to just EUR 363 bn in 2037 – assuming constant health they would work out at about EUR 453 bn p.a. in 2037. The cumulative savings over the total period due to improved health then amount to EUR 1,406 bn – which is about 12.5 % of the total costs which, according to the summary by the authors, can be attributed to innovations in the health sector.⁷³

Assuming that in the past, too, it was possible to save about 8 % of the total costs by means of progress related to medical technology, based on the health spending⁷⁴ the following calculation can be made for the period 1992 – 2008:

Total health spending 1992 – 2008 ⁷⁵	EUR 3,608,185 m
Indirect costs (about 1/3 of the total costs) ⁷⁶	EUR 1,858,762 m
<hr/> Total costs	<hr/> EUR 5,466,947 m
Of which 8 % savings due to innovations	EUR 437,356 m

This would correspond to average annual savings in the period under review of about EUR 27 bn – by way of comparison: in 2008 one contribution rate point in the statutory health insurance system was equivalent to about EUR 9.9 bn.⁷⁷

Conclusion: By means of avoidance of mortality and morbidity (increasing health of the population) and also through rising sales the healthcare industry contributes not only to growth in actual macroeconomic production (GDP). It also leads to an increase in the maximum output and supply opportunity (productive capacity) of the national economy.

73 Cf. Bräuninger et al. 2007: 40.

74 Direct healthcare costs are only available for the years 2002, 2004 and 2006. On average they are only 4 – 5 % lower than the respective health spending for the year.

75 German Federal Statistics Office.

76 See Bräuninger et al. 2007: 39.

77 Source: Federal Ministry of Health, Facts and figures on health insurance (www.bundesgesundheitsministerium.de).

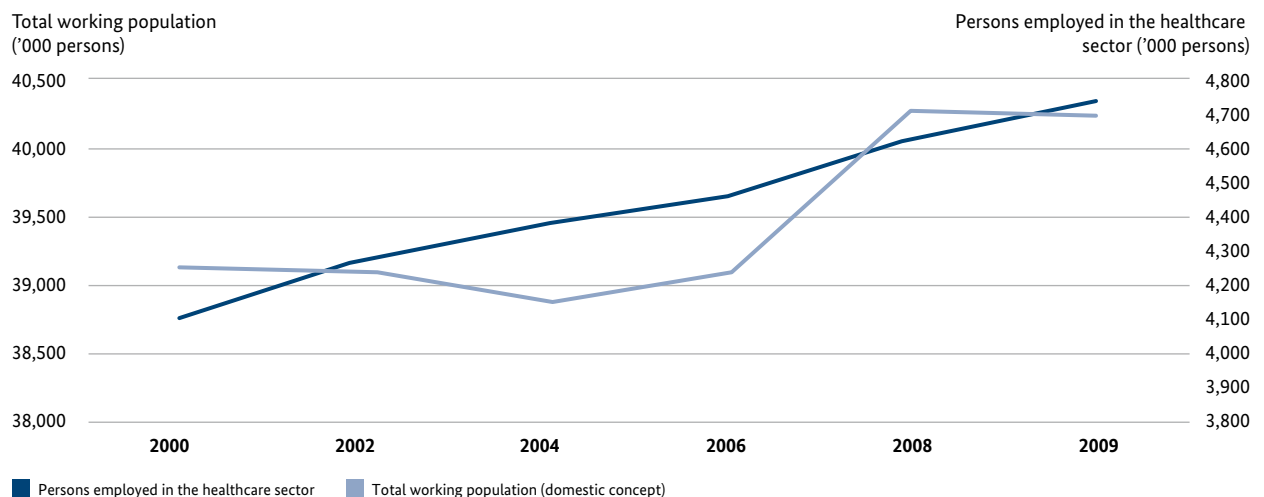
5. Job market: healthcare industry

About every seventh member of the working population in Germany is active in the healthcare industry – the total is about 5.5 million people. According to the available calculations of the Health Satellite Account the number of wage and salary earners grew by 150,000 persons, or just under 3 %, in the period 2005 to 2007 – from 5.282 million to 5.432 million.

A longer period can be examined on the basis of the health sector personnel count, though this only includes the wage and salary earners of the core of the healthcare industry. While the total number of wage and salary earners in Germany only increased by just under 2.8 % (+ 1.1 million) in the period 2000 to 2009, the number of employees in the healthcare sector grew by over 15 %, or 620.000.⁷⁸ This means that 50 % of total employment growth in Germany in the period under review was due to the healthcare industry.

By far the largest percentage of jobs (just under 60 %) are in the out-patient and in-patient institutions of the health and social services sector: in doctors' and physiotherapists' practices, in nursing care services, and in hospitals, rehabilitation clinics and nursing homes. Taken together with the upstream goods and services industries, the distribution sector and the insurance institutions 75 % of employees can be allocated to the Core Healthcare Industry. About a quarter of the jobs belong to the extended healthcare industry sector.

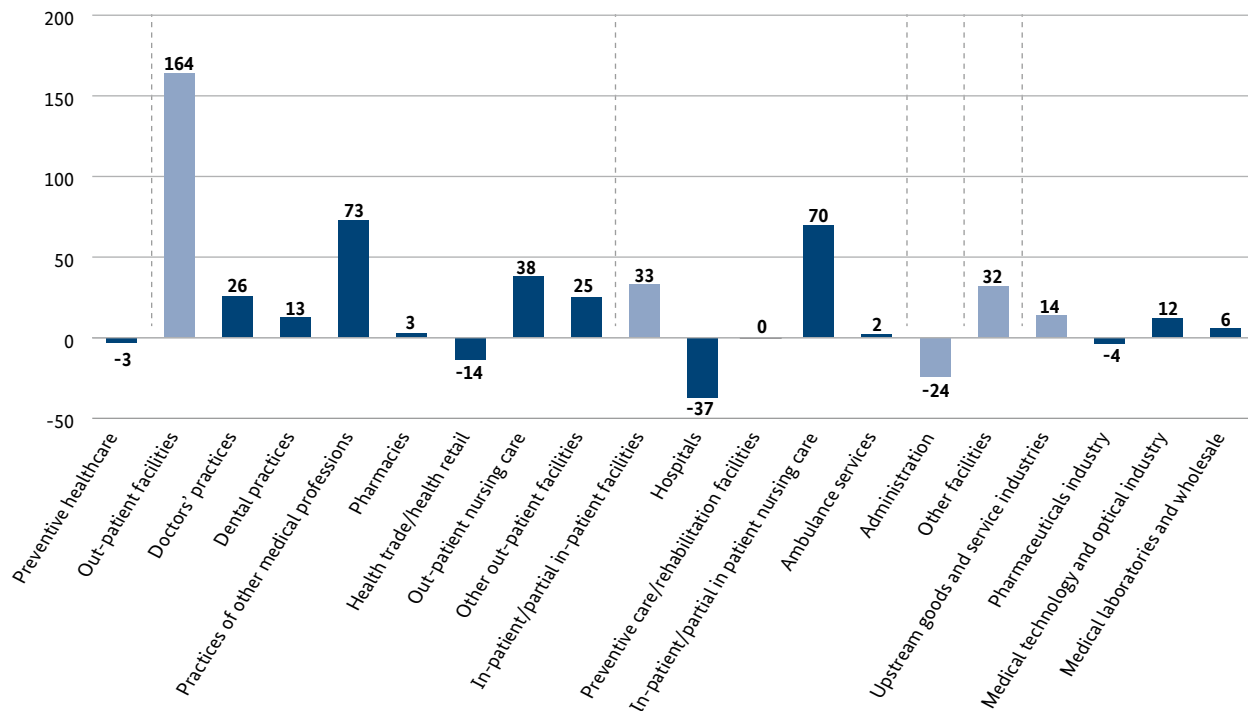
Fig. 23: Growth in the number of employees in the healthcare sector (health sector personnel count) and of wage and salary earners overall (2000–2009)



Source: (German Federal Statistics Office).

⁷⁸ In interpreting the data it should be noted that the employment statistics are based on the concept that persons with several employment relationships are only counted once based on their main activity, whereas the health sector personnel counts jobs – so persons with several activities in the healthcare sector are counted a multiple number of times.

Fig. 24: Change in the number of full-time staff in the healthcare sector by type of institution from 2000 to 2009 (in '000 persons)



Source: Our own representation, (German Federal Statistics Office).

Employment growth by type of institution

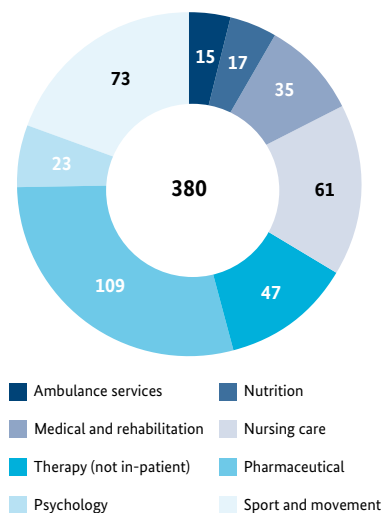
Development of employment varied depending on the individual type of institution. More than two-thirds of the employment growth, totalling 305,000 full-time staff in the period 2000–2009, was attributable to the out-patient sector. In the in-patient sector employment increased exclusively in nursing care institutions, while personnel in hospitals was reduced (see Fig. 24).

Growth was also mixed in the upstream sectors. While employment in the pharmaceutical industry only increased slightly (number of employees), the figures for medical technology, the optical industry, medical

laboratories and wholesale trading grew by more than 18 % respectively.⁷⁹ Indeed, in the pharmaceuticals industry employment measured in terms of full-time staff declined between 2000 and 2009 (see Fig. 24). The number of staff employed in research and development continued to rise, against the trend.

The upstream goods and services industries are much more capital and technology intensive than the in-patient and out-patient institutions. They therefore also have more substitution options for the labour factor, these being very limited in the healthcare sector in the narrower sense. In addition jobs can be relocated to foreign markets.

⁷⁹ Own calculations based on the German Federal Statistics Office.

Fig. 25: Number of healthcare professions and health-related occupational areas

There are four additional areas with occupations that can be indirectly allocated to the healthcare sector. These include

- services with the three sub-categories tourism and leisure industry, cosmetics, bodycare and wellness, together with cleanliness and hygiene,
- the natural sciences with the four sub-categories laboratory, biology, chemistry and pharmaceuticals,
- social and educational science, with the six sub-categories health and social management, social work and social care, education, school, training and education, work with elderly people, work with children and young people, and work with the disabled,
- technology, with the three sub-categories biotechnology, genetic engineering and optics, and optoelectronics.

Source: Our own representation based on Federal Employment Office (2010), as at: August 2010.

Innovations and employment

Since 2000 the statutory health insurance institutions have been obliged to finance primary prevention and health promotion benefits (Section 20 Social Security Code (SGB) V).

- The trend towards out-patient forms of treatment is to a large extent due to progress in medical technology: new drugs and modern treatment methods are shortening hospital stays or even making them unnecessary and are making care in the patient's home possible (telemedicine and homecare).
- Process innovations such as clinical treatment pathways and guideline-based medicine have led to a shortening of hospital stays. This frequently makes it possible for wage earners to return to their jobs more quickly.
- Of the upstream goods and services industries included in the health sector personnel count, medical technology in particular is the driver of employment with growth of 12,000 full-time staff in the period 2000 – 2008 – the most important driving force there was increased foreign demand.

Employment growth by healthcare profession

Health-related occupations

The independent occupational area “health” can be divided into eight sub-categories: ambulance service, nutrition, medical and rehabilitation, nursing care, therapy (paramedical), medicine, psychology, and occupations related to sport and physical exercise.

Fig. 25 illustrates the occupations in the health sector. The most important sub-categories are medicine (109 occupations), sport and physical exercise (73 occupations), nursing care (61 occupations) and out-patient therapy (47 occupations), while the technology (9 occupations) and ambulance service (15 occupations) sub-categories bring up the rear.

The only data on growth in numbers of employees by occupation is that available from the health sector personnel count. This breaks down the occupations in the healthcare sector as follows (in brackets the share of the overall healthcare sector accounted for by the respective occupations in 2009):

Table 8: Healthcare professions with the highest growth in the period 2000 – 2009 (full-time staff)

Occupation	Growth (2000 – 2009)	
	Full-time staff ('000)	in %
Geriatric nurses	82	+ 38.9
Therapeutic occupations	36	+ 83.7
Physiotherapists	35	+ 66.0
Healthcare professionals and nurses	33	+ 6.0
Healthcare and nursing auxiliaries	33	+ 21.4
Specialist medical and dental assistants	28	+ 6.4
Doctors	26	+ 9.8

Source: Our own calculation and representation (German Federal Statistics Office).

- health service occupations with 13 sub-categories (57%)
- social occupations with 3 sub-categories (9%)
- healthcare technicians with 4 sub-categories (3%)
- other healthcare specialisations with 5 sub-categories (2%), and
- other occupations in the healthcare sector (29%).

The largest increase during the period 2000 – 2009 is in the health service occupations, with about 463,000 employees. Healthcare professionals and nurses represent the largest part of this professional group, accounting for about 30%, followed by medical specialist assistants, with about 23.5%, and doctors, with 12% (not counting dentists).

In the social occupations category there was similarly a rise in the number of employees, even though the increase of 156,000 employees (2000 – 2009) is only equivalent to approximately a third of the increase in the health service occupations. Geriatric nurses dominate here, with an increase by approximately 60%.

As with the growth by type of institution, on examination of the human resources growth by healthcare profession we thus see that in numerical terms the nursing and therapeutic occupations produced the greatest growth (taken together 80% of the total increase, see Table 8). The increased requirement for geriatric nurses is primarily due to the growth in the number of nursing-dependent persons receiving professional care. Besides demographic growth, the large increase in the numbers of physiotherapists and practitioners of other therapeutic occupations can also be attributed to the increased importance of physiotherapy in the health

system, which is closely connected with progress in medical technology. Whereas in the past patients initially had to be immobilised for several weeks following major operations, thanks to modern anaesthesia and minimally invasive surgical procedures they can now be mobilised sooner, which shortens rehabilitation times, reduces treatment costs and increases quality of life.

New job profiles Training options and job opportunities

Expansion of the privately financed sector of the healthcare market, technical developments and the new organisational framework are having desirable effects. The elderly population is demanding new products and services, and this trend is resulting in numerous changes to the many job markets in the healthcare industry.

Development of modern healthcare is a continuous process of innovation – both in respect of the knowledge and skills of healthcare personnel and in respect of the technology in which these are applied. When employees use new technologies, they develop increasingly specific skills and take on increasingly complex tasks. This process is taking place in all occupations. However, if meanwhile there is a major change in the operating environment, as for example with the ageing of society (increase in chronic diseases and multimorbidity) or due to system innovations such as the introduction of DRGs in hospitals, new demands are also placed on the service providers, and these lead to a new understanding of roles. Thus over the past few years new areas of activity in the management of the chronically sick have emerged (so-called case managers), in specialist wound treatment, in medical controlling and in medical technology assistance.

A reform driven both by demographic growth and by technical innovations leads to the concept of delegation of medical functions to other healthcare professions, for example in accordance with the acronym AGnES: physician-relieving, community-based, e-health-supported, systemic intervention.⁸⁰ The AGnES concept was developed between 2005 and 2008 by the Institute of Community Medicine in Greifswald, Mecklenburg-Western Pomerania, with the primary objective of providing GP healthcare in the thinly populated rural regions. It makes provision for suitably trained nursing personnel and doctors' assistants to make home visits without the supervision of a doctor. In areas with imminent or already manifest undersupply of general practitioners this personnel can also contribute to enabling an individual GP to look after a larger patient base and/or a larger territory.

New areas of activity for doctors at the interface between the primary and secondary healthcare markets or the core and extended categories can be seen for example in health promotion (mobility, nutritional and stress management; addiction prevention; corporate health management).⁸¹ At the same time health promotion should increasingly be linked with the gerontological, preventive, curative and rehabilitative potential of doctors or other medical experts.

The doctor is given the option here of co-operating with expert partners and gaining access to the health promotion market. Together with business partners he can offer high quality individual services, co-operating with experienced trainers, sports instructors, personal coaches, health psychologists, etc., who take care of the labour-intensive service and care. The original area of activity of the medical profession is being extended beyond the treatment of disease.

Another rapidly growing occupational area in the secondary healthcare market since the end of the 90s is

that of the wellness occupations (for example wellness managers, wellness consultants, wellness trainers, even wellness journalists), which can for the most part be allocated to the services occupational area.

From these points of view, too, the labour-intensive healthcare sector is thus a growth sector with spillover effects impacting other commercial sectors.⁸²

Example of innovation: New technical auxiliary professions

The use of new technologies in surgery, in particular at the beginning of the 90s, saw the emergence of new requirements in respect of qualifications for middle-ranking medical personnel. Whereas up to that point in time the functional nursing duties (technical assistance during surgery and with anaesthesia) were taken care of by appropriately trained nursing personnel, over the course of time specific new basic training courses were developed for theatre, anaesthesia and surgical technical assistants.

This development was driven in particular by the personnel shortage in surgery and what was for a long time considered to be an overlong traditional training course, consisting of a three-year nursing course, two years of practical experience, and two years of specialist surgical training.⁸³ By contrast the training course to become a theatre assistant only lasts three years and does not require any work experience. While just five theatre assistants were trained in 2000, by 2005 this had risen to 181. Over the entire period from 2000 to 2008, 874 theatre assistants were trained (with a pass grade in the final examination).⁸⁴ In February 2010 the Bundesrat (upper house of parliament) presented a bill to standardise the training of theatre assistants nationally and at the same time to secure their financing.⁸⁵

⁸⁰ van Berg et al. 2009.

⁸¹ Cf. Pöthig et al.

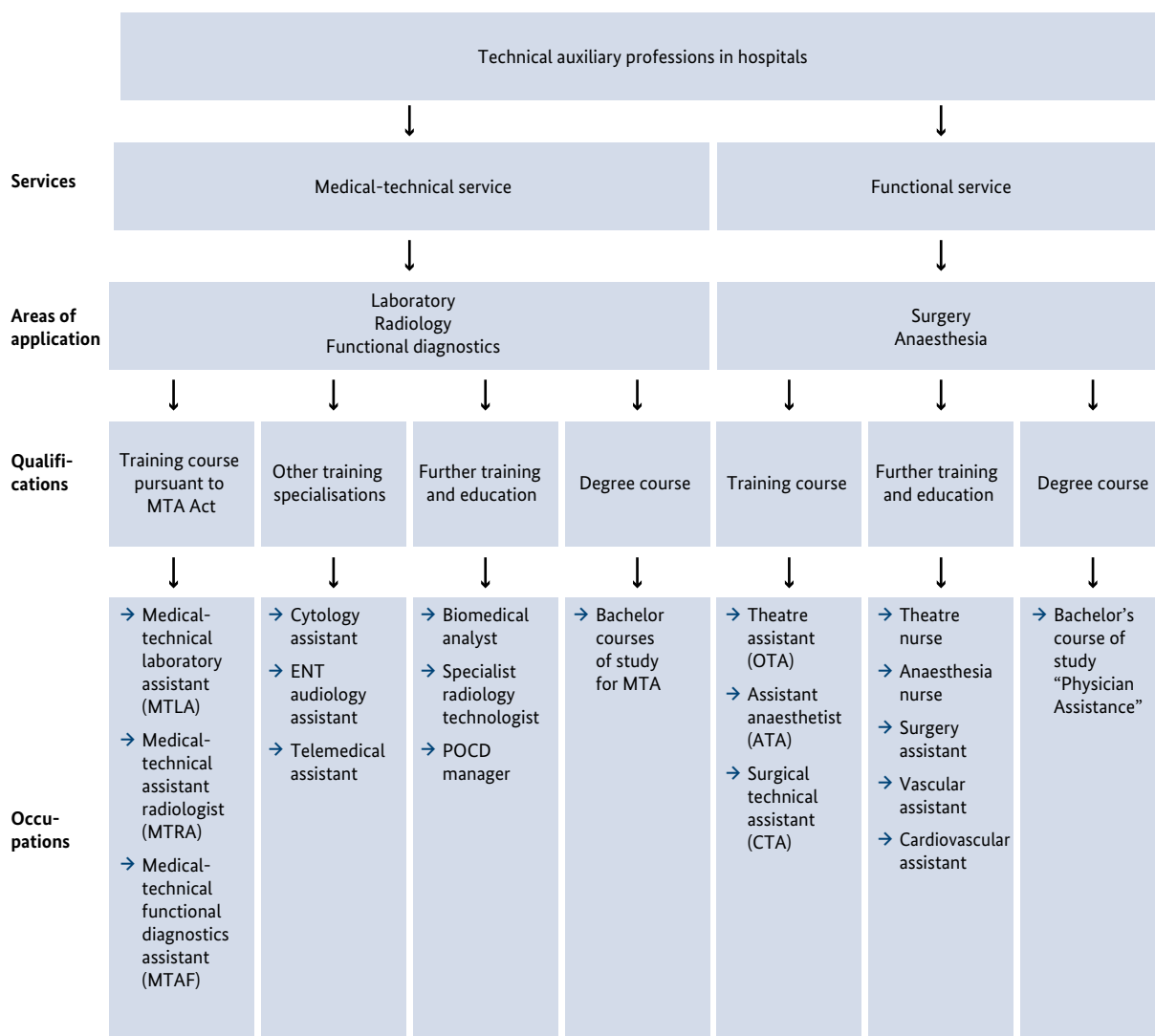
⁸² Also see Henke et al. 2006.

⁸³ Cf. Kramer 2000.

⁸⁴ German Federal Statistics Office table: Graduates with a pass grade in the final examination from healthcare sector educational establishments, access 20.9.2010.

⁸⁵ OTA-Online 12.2.2010.

Fig. 26: Selected technical auxiliary professions in hospitals



Source: (German Hospital Institute (DKI) 2009).

6. Innovation – hampered and promoted

The great importance of the innovative capacity of the healthcare industry for improvement of the population's health, cost development in the healthcare sector and the export opportunities of the sector makes it necessary to identify more precisely the drivers of innovation and obstacles to innovation.

Drivers of innovation and obstacles to innovation

Drivers of innovation have a stimulating effect on the climate for innovation and the innovative capacity of companies, while obstacles (or barriers) to innovation hinder the implementation and spread of innovations in various ways.

Beyond national systems there are drivers of innovation which are caused by megatrends such as demographic change, globalisation and the environmental protection movement. These trends induce and change demand for products and services, open up new markets and stimulate innovative forces. According to a Swiss study the predominant factors influencing innovation processes are the “social driving forces”, such as demographic growth, individual responsibility, eating habits, educational level and income distribution (30%). They are more important than economic driving forces (27%), technological driving forces – such as organic and genetic engineering, medical technology, information technology and software, organic chemistry and telecommunications and nanotechnology (22%), – and political driving forces, which account for 22%.⁸⁶

Determining factors in innovation processes

Drivers of innovation and obstacles and barriers to innovation can be categorised as follows:⁸⁷

→ Financial factors

Capital resources of companies, availability of external sources of financing such as risk capital or state subsidies, scope of government regulation

→ Knowledge factors

Intensity of R&D, access to qualified personnel, market information and information technologies, availability of external services and potential co-operation partners, internal organisational factors

→ Market factors

Market structure, demand for innovative products, market positioning of competitors, scope and structure of public-sector demand

→ Institutional factors

Infrastructure including education system, rights of ownership, legislation, standards, technology and innovation policy, distribution and social policy, among other policy areas

⁸⁶ Cf. Bührlen, Kickbusch 2009: 53.

⁸⁷ Based on Organisation for Economic Co-operation and Development (OECD) 2005: 113 and Steg 2005: 16.

Finance-related drivers of and obstacles to innovation

As a rule innovations are associated with investments and start-up and marketing costs. If no suitable cash resources are available and nor are there any external sources of financing, desirable innovations will fail to materialise. Prefinancing always involves the risk that refinancing will not take place as planned, because for example demand (from buyers with high purchasing power) was overestimated.

The regulatory framework of the healthcare sector – in particular collective financing and comprehensive protection of the population in the event of sickness – on the one hand ensures the existence of demand from buyers with high purchasing power in all segments of the population, and in particular in times of economic crisis. However, financial factors can also create obstacles to dynamic growth in the health sector. In the past the health spending of the social insurance sector was predominantly viewed as being a cost aspect and was hardly ever seen as being an investment generating prosperity and growth. Since the mid-70s the objective of health policy in Germany has frequently been cost containment; with appropriate regulatory systems in respect of social insurance (budgeting, limits on benefits and additional payments for insured persons) it has also influenced the climate for innovation.⁸⁸

Example: Financing of hospitals

An example of a finance-related obstacle to innovation that we would like to cite here is the current financing of hospitals. This comes from two sources (dual financing): the ongoing operating expenditure is refinanced by the health insurance institutions, and the cost of investments in buildings and larger medical technology systems is borne by the German federal states. For years

now the latter have not been settling their investment liabilities in full vis-à-vis the hospitals – the German Hospital Association estimates the investment backlog at about EUR 50 bn. Financing of urgently required replacement investments through the capital market is in the majority of cases only possible for private clinic operators.

However, the introduction of a new tariff system for in-patient services from 2004 in the form of per-case flat rates based on diagnosis-related groups (DRGs) can be viewed as an example of a finance-related driver of innovation. In German hospitals it has triggered an enormous shift towards process optimisation and structural changes.

Knowledge-related drivers of and obstacles to innovation

In connection with the creation of innovations attention must also in particular be paid to “knowledge as a driver” and lack of knowledge as an obstacle or barrier to the innovation process. The knowledge factors include the results of research and development, the availability of qualified personnel, access to technical and market information, availability of external services and co-operation partners, and the willingness of companies to change and innovate.⁸⁹

In Germany companies increasingly complain about manpower bottlenecks – of both a quantitative and a qualitative nature. Compared to other sectors the particularly labour-intensive healthcare industry (up to 70% of costs are accounted for by wages and salaries) only has very limited options in respect of substitution for the labour factor. Moreover, the situation in the job market will become worse due to the demographic trend.

⁸⁸ Cf. Nusser 2005 among others: 23 (Here the regulatory health framework in Germany is assessed as being unfavourable for the pharmaceuticals sector) and German Hospital Association 4.7.2006.

⁸⁹ Cf. Blind November 2007: 44 – 46.

Measures taken by the German federal government to deal with increasing demand for qualified personnel

“The aim of the federal government is to meet the growing requirement for qualified personnel, primarily by means of additional training and education measures in the domestic market and a significant increase in labour market participation by women, older people and migrants already living in the country. If Germany is to succeed against the international competition for qualified personnel, conditions must be attractive to workers from abroad.”⁹⁰ The measures are as follows:

- Increased spending on training and education; improvement of language skills among children; reduction in the number of dropouts from education and training; “Qualify and Connect” initiative; improved conditions for permeability between occupational and academic training and education; exploitation by 2015 of a potential 275,000 additional new students in higher education; promotion of the training and education activities of SMEs
- Increased financing of training and higher education: the new BAföG (educational grant); the new Master’s BAföG (master’s student grant); scholarships awarded by the organisations for the promotion of talented young scholars; Scholarships for Professional Advancement; education loans
- “Contribution of labour migration to securing the skilled labour base in Germany” action programme: “With effect from 1 January 2009, for highly qualified workers the income threshold for a permanent residence permit was reduced from EUR 86,400 to EUR 64,800. The residence permit also confers entitlement to take up employment. Access to the job market has been facilitated for graduates from the new EU states. Where the latter are applying for jobs, in future no check will be made as to whether domestic

job-seekers are available for the position. For graduates from non-EU countries the job market has been opened up beyond the IT sector to include all fields, provided no domestic job-seekers could be obtained for the position in question.”⁹¹

- Strengthening of the concept of Germany as a centre of knowledge and of the academic system: Excellence Initiative; Research and Innovation Pact, Higher Education Pact 2020 (creation of student places and excellence in research); “Academic Freedom Act” initiative

The “Academic Freedom Act” initiative consists of the following main points:⁹²

- introduce global budgets for scientific and research institutions
- attract and retain the best brains
- foster networking with the scientific sector and industry
- facilitate construction of suitable facilities for the scientific sector
- make quick and efficient procurement of goods and services possible

In a current brochure⁹³ the German Federal Ministry of Labour and Social Affairs lists the following five points for securing skilled personnel:

1. Activation and job security
2. Improved compatibility between family and occupation
3. Educational opportunities for all from an early age
4. Qualification: training and education
5. Integration and qualified immigration

90 Federal Ministry of Education and Research (BMBF) 2009: 86.

91 Ibid.: 89 f.

92 Ibid.: 96.

93 German Federal Ministry of Labour and Social Affairs (BMAS) 2011.

In respect of knowledge factors not only the availability of knowledge is important. It must also be ensured that **knowledge transfer** is carried out smoothly. This requires networking with other knowledge holders and partners on the ground that goes beyond regional relationships. In this connection the European Commission states the following: “While innovative enterprise clusters generate their competitiveness from regional sources, they increasingly form a part of transnational knowledge and production networks.”⁹⁴

In respect of health-related services the lack of consumer sovereignty, or for the healthcare sector patient sovereignty, is obstructive to innovation. For example according to CEPTON inadequate patient education and doctors’ lack of willingness to provide information are the reasons that too little innovation is used in therapy. This can also lead to the conditions for the implementation of new innovative techniques developing unpropitiously.⁹⁵

Drivers of and obstacles to innovation due to market factors

Markets are for the most part characterised by specific supply and demand structures, by pricing mechanisms and competitive criteria and by the degree of state influence. A characteristic of the German healthcare market is its far-reaching dependence on social security regulations – about 90% of the population is insured under a statutory insurance scheme. In 2007 about 73% of health spending was accounted for by the social security institutions and public-sector budgets.⁹⁶

In Germany persons insured under a statutory insurance scheme have access to a very extensive range of benefits. There is no conclusive, positively defined benefits list – pursuant to Section 2, Para. 1 Social Security Code

(SGB) V the “quality and effectiveness of the benefits [...] must correspond to the generally recognised state of medical knowledge and medical progress.” Pursuant to Section 12, Para. 1 Social Security Code (SGB) V (efficiency principle) “benefits must be...adequate, appropriate and economically viable; they must not exceed what is necessary.” To this extent all patients are entitled to expensive treatment options if they are medically justified.

Nevertheless, obstacles in terms of barriers to market entry exist for new (innovative) medical products, methods and treatment procedures. For manufacturers there are two hurdles to overcome before they can bring their products to market – first of all the EU legal requirements for market access, which are aimed at equipment safety and technical performance, and in addition the regulatory framework for the inclusion of innovative products and new examination and treatment methods (NETM) in the SHI reimbursement systems.

From the point of view of health policy a regulatory framework for the market for healthcare services appears necessary in principle in order to guarantee the safety and effectiveness of products or methods (market access regulations) and secure financing of medically essential services and benefits for the whole population in the framework of the health system. The formulation of these regulations influences the innovation-friendliness of the system. This results in a state of conflict for health policy: On the one hand innovation-friendly regulations and the general regulatory environment should secure access for patients to beneficial and useful innovations and promote medical progress. On the other hand, there should at the same time be a mechanism in place to prevent noticeably invalid, harmful or uneconomic innovations being used on patients at the expense of the SHI.

⁹⁴ European Commission 11.12.2002: 13.

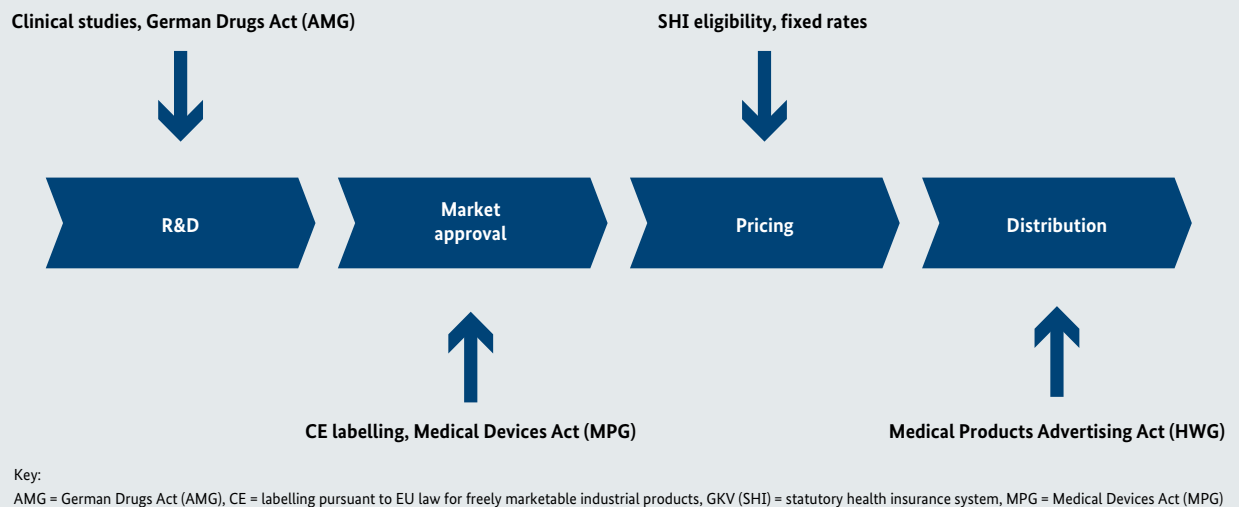
⁹⁵ Cf. Cepton 2007: 54.

⁹⁶ Cf. German Federal Statistics Office.

Regulatory density

A peculiarity of the sector is its extraordinarily high regulatory density, shown here for new medical products by way of example. This results in obstacles which hinder the innovation process.

Fig. 27: Regulations for medical products



For the introduction of new examination and treatment methods (NETM) in the SHI there are various regulations in the out-patient and in-patient sectors: for out-patient healthcare the principle of prohibition with conditional approval applies (inclusion in the SHI benefits list only after a positive decision by the Joint Federal Committee – G-BA), whereas in the hospital sector innovative methods can be introduced and financed without prior approval of the method by the Joint Federal Committee (G-BA) being required. In spite of this the introduction of NETM can involve protracted and complex negotiations. “The opportunity for companies to participate in this process themselves is very limited. Initiation by industry is not possible at all.”⁹⁷

Looked at on the supply side the combination in Germany of what is by international standards a high density of doctors and nursing personnel and the large number of in-patient facilities ensures an environment conducive to innovation, in particular because those insured enjoy direct access to all levels of healthcare benefits. This stimulates competition between private practitioners, medical specialists and hospitals in a given region, though also between the out-patient and in-patient sectors. A sign of the adequacy of the healthcare infrastructure in Germany is that, in contrast to many other OECD countries, waiting times are barely heard of.⁹⁸

⁹⁷ Cepton 2007: 51.

⁹⁸ However, an increasing number of bottlenecks have recently been recorded among specialist private practitioners. The fact that this applies above all to persons insured in the SHI system but not to privately insured patients shows that tariff-related incentives also come into play.

Year-on-year increases in health spending are among other things a sign that demand for healthcare services is growing. This is apparent in particular in the secondary healthcare market, where in addition to benefits chargeable to the SHI the population acquires health products using private means, and where growth is not inhibited by regulation. The causes of rising demand are, as already mentioned elsewhere, the great preference for healthcare services, which is increasing with growing prosperity, and a changing disease spectrum as the population ages (chronic diseases and age-related diseases).⁹⁹

The changing demands of the population in the era of modern information and communication technologies can also be cited as a demand-side driver of innovation. This triggers a whole series of innovative processes on the part of the providers of healthcare services: for example hospitals have for several years been offensively marketing their services on the internet and engaging in brand building – a sign of increased competition since the introduction of per-case flat rates based on diagnosis-related groups (DRGs) for in-patient treatment.

Drivers of and obstacles to innovation due to institutional factors

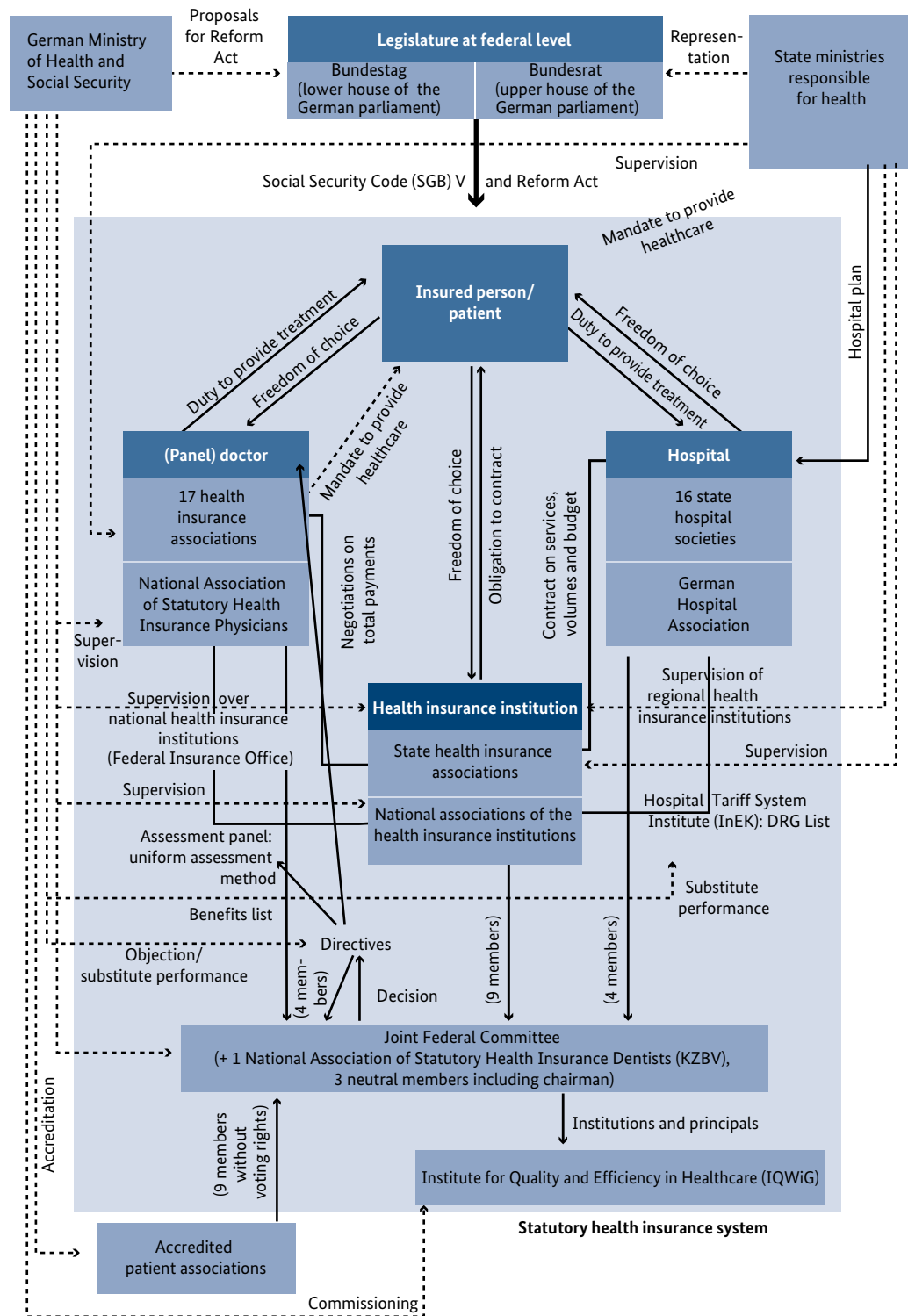
The institutional structure of the German healthcare sector is very complex. This is shown by the chart below of the most important actors and their relationships to each other (for 2005). Meanwhile, in the wake of the health reform in 2007 the institutional structure has changed again – instead of the various national associations at the head of the individual types of health insurance institution there is now the National Association of Statutory Health Insurance Institutions, which has been introduced as the new institution for the health funds.

The many lines and arrows also highlight the fact that the manner of operation of the system is difficult for the individual actors to understand. This is due to the reduced permeability for information and delays in the launch of new products and services.

In addition there is a whole series of – health policy-related – barriers to market entry, which nevertheless also inhibit innovation to a certain extent – approval and licensing procedures, advertising bans, consumer protection regulations, quality inspections and compulsory certification together with statutory rules, which together add to the institutional framework. Items worthy of particular note are hospital planning under the aegis of the German federal states, requirements planning in the out-patient sector (statutory health insurance doctors) carried out by the health insurance associations, and the nationwide regulatory systems for pharmaceutical drugs prices.

99 Also see Chapter 3 on innovative potential.

Fig. 28: The organisational relationships of the main actors in the German healthcare sector, 2005



Source: (Busse, Riesberg 2005): 37.

Institutional obstacles to innovation using the examples of emergency treatment and healthcare facility legislation

The sub-optimal effectiveness of the current institutional structures can be demonstrated using the example of emergency treatment. Ambulance services are planned by the municipalities, while hospitals plan emergency services. The health insurance associations are responsible for emergency medical services and the pharmacies plan their own night and weekend opening times. “They all have their own control points and make the structures impenetrable for patients, so that the latter doesn’t know whom he should turn to.”¹⁰⁰

In addition, differences in regulations at federal government and state level hinder free evolution of supra-regional developments. This is apparent from the example of healthcare facility legislation: From 1974 to 2006 the federal government was responsible for healthcare facility legislation. With the Federalism Reform of 2006 the legislative powers were transferred to the federal states. Since then there has been uncertainty for the medical institutions as to the regulatory framework under which they will operate in future – the new laws have only been passed in some of the federal states. In any case institutions with facilities in several federal states will be confronted with varying requirements over the next few years.¹⁰¹

In respect of internationalisation as a stimulator of innovation the markets for health-related services, which in all countries are very national in character, are proving to be especially difficult. For them it is particularly true that “innovation mechanisms and practices as well as the associated structures and processes which function successfully in one country cannot be directly and ‘mechanically’ transferred into the socially, economically and culturally differing contexts of another country.”

100 So Neubauer, G., in WISO (2009) http://www.gesundheitskongress.de/2009/dl/EGK09_Newsletter_091012_Versorgung.pdf.

101 Steg 2005: 29.

7. Recommendations for action of the authors of the study

One increasingly gets the impression that the healthcare industry, as one of Germany's largest commercial sectors, should be given greater attention in terms of economic policy. In order to increase the positive effects of the cross-sectoral healthcare industry on the national economy as a whole, below we identify measures which create, maintain and strengthen an innovation-friendly climate in the healthcare industry.

The peculiarity of health as a commodity means that various different policy areas impact on the healthcare industry. It is to a great extent regulated by the state, from provision of health products to financing. Moreover, the Second Health Industry Congress of the Federal Ministry of Economics and Technology in October 2010 showed how important research-related expansion of this sector is.

This situation must be more strongly reflected in the design of the departments in the various federal ministries dealing with questions related to this export-oriented key sector. A new form of co-operation at inter-ministerial level is needed which can bring about changes and also recognises health policy as a part of economic, research, educational, family and labour market policy. In order to achieve a unified approach by the federal government in matters relating to the healthcare industry, the activities of all federal ministries in this area should be co-ordinated by the Federal Ministry of Economics. Health, like the issue of education and training, is a key growth factor and therefore justifies greater prominence on the political agenda.

In respect of innovations faster conversion of an idea into a reimbursable benefit must be the central objective. For this purpose barriers to innovation must be recognised and eliminated. An action or master plan entitled "Healthcare Industry" could play a pioneering role. Indeed, discussion and implementation of selected results of the research project entitled "Stimuli to innovation in the healthcare industry – effects on healthcare costs, competitiveness and employment" gives rise to a requirement for an inter-ministerial working group to draw up suitable strategies.

Recommendations for action in respect of economic policy to strengthen stimuli to innovation in the healthcare industry

1. Creation of an innovation platform under the leadership of the BMWi in order to promote an innovation-friendly climate

In order to optimise know-how transfer and networking of the sector an innovation platform should be established at federal level under the leadership of the BMWi. Among other things this platform could be used to initiate innovation partnerships or organise workshop discussions.

2. Export initiative for the healthcare industry

Healthcare markets throughout the world are growing. In order to better exploit the related export opportunities for German industry, small and medium-sized manufacturers in particular must become better networked and must co-operate more closely with export-assisting institutions. An export initiative at federal level can help to achieve this.

3. Establishment of innovative forms of healthcare and healthcare models as an export service

Not only medical technology and new drugs, but also innovative healthcare concepts in the healthcare and nursing sector can be marketed as an export service (policy and management consulting). With its demographic development Germany is a pioneer in the care of multimorbid and very elderly patients and patients suffering from dementia and should market this know-how more aggressively abroad.

4. Strengthening of SMEs – development of new ways of financing innovation

Small and medium-sized companies are a cornerstone of the healthcare industry.¹⁰² However, they frequently lack resources, for example in respect of innovations for prefinancing or protracted reimbursement processes and with regard to imminent lack of qualified personnel for long-term human resources concepts. Here targeted promotional measures in economic policy can be implemented and barriers to innovation can be reduced.

102 For additional details see Central Innovation Programme for SMEs (ZIM), BMWi (www.zim-bmwi.de).

5. **Promotion of competition among the service providers**

The potential for greater competition in the German health system is far from being fully exploited. New approaches are required in order to achieve this such as more selective contracts (regionalisation and a move away from national prices), integrated healthcare models (among other things to reduce counterproductive financial incentives such as allocation premiums), and equal prices for similar services, irrespective of whether rendered by hospitals or private practitioners and which in the final analysis serve to overcome sectoral separation.

6. **Drawing up of a consistent regulatory framework**

A single standardised set of competition and reimbursement regulations needs to be drawn up for the healthcare industry. This would make it possible to reduce relevant obstacles to innovation.

7. **Improvement of the regulatory framework for the private household as a healthcare location**

The private household must be recognised as a health location and the requirements for provision of services (billing terms, qualification of personnel, data-protection regulations, etc.) must be met.

8. **Reinforcement of the interdependencies between the sectors**

The interdependence between the core sector, the extended sector and the non-health sector (for example the automotive sector, the food industry, the residential property market, tourism, etc.) should be intensified both as a stimulating factor and as a recipient of stimulus.

9. **Increasing the attractiveness of the healthcare professions**

The attractiveness of the healthcare professions urgently needs to be improved. For example this can be achieved by means of a social image campaign, reform of training and education (especially nursing training and medical degrees, and development of new curricula for new occupational areas), improved further training and education, and improvement of working conditions.

10. **Development of new business models and healthcare concepts for changed structures**

Supply bottlenecks in thinly populated regions, a lack of skilled workers, demographic changes and the availability of modern technology such as senior citizen-friendly assistance systems to support the elderly population, to relieve pressure on healthcare personnel and as a solution for logistical matters – these and other factors require new approaches in healthcare, too.

Requirement: New tariff systems as drivers of innovation

The introduction of DRGs for payment of in-patient medical benefits has had a significant impact as a driver of innovation. Nevertheless, as far as further development of the tariff system is concerned it is doubtful whether the positive impact will be maintained. The objective of a single nationwide base rate (with a narrow band for regional deviations) does not reflect the differences in the cost situation. Thus comparative advantages of location can hardly be used.

Looked at from the point of view of the healthcare system as a whole and the necessary removal of the sectoral separation the Council of Health Experts recently warned that the DRG system tends to exacerbate the lack of co-ordination that needs to be overcome. “Neither competition between the out-patient and in-patient sectors for the out-patient potential nor the typical DRG strategy of the hospitals (growth in the number of cases at any price) is helping to improve co-ordination of healthcare for patients with multiple chronic diseases. In the absence of appropriate corrections one can even assume that the provision of healthcare to what is the most important group of patients will deteriorate in future. Both for the medical specialist and for the hospital sector there is a lack of any incentive to organise the provision of care to chronically sick patients in any way other than in response to episodes of acute exacerbation.”¹⁰³

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Inhibitor of innovation: Regulation

Billing procedures used in the out-patient sector also have an inhibiting effect on the use of innovative products and methods. As early as 2001 experts and representatives of the medical profession described the scale of charges for physicians (GOÄ)¹⁰⁴ as being “in urgent need of reform”. The justification: “... in spite of the partial revision in 1996 the performance specifications for the scale of charges for physicians (GOÄ) lags well behind the state of medical progress.”¹⁰⁵ In actual fact, amendment of the GOÄ was supposed to have been tackled in the last legislative period. However, this was preceded by a dispute about reform of the scale of charges for dentists (GOZ), which has not been adjusted to take account of developments in dentistry since 1988, and on the basis of which the GOÄ amendment is due to take place. The draft bill of the German Ministry of Health (BMG) on further development of the GOZ had been vehemently opposed both by doctors’ representatives and by some of the German federal states. This demonstrates very clearly that a large degree of involvement by the state in pricing processes is accompanied by a particularly high level of clumsiness.

In concrete terms the delay in bringing about the amendment of the scale of charges has in practice had the following impact, for example: Until now services rendered by doctors and hospitals on a purely telemedical basis have not been billable, because there are no corresponding fee data. It is true that some pilot projects in telemedicine, for example the Heidelberg project for the care of heart failure patients, HeiTel, are now being financed through direct agreements with individual health insurance institutions. But the enormous potential for telemedically-supported nationwide healthcare in Germany will continue to be unexploited without a suitable individual billing capability.

New examination and treatment methods (NETM)

For new examination and treatment methods differing rules apply to the out-patient and in-patient sectors: While NETM can in principle only be applied by private practitioners where the Federal Joint Committee (GBA) has submitted a positive vote (prohibition with reservation of approval), hospitals can apply NETM pursuant to Section 137 c, Para. 1 Social Security Code (SGB) V as long as no explicit prohibition has been applied by the GBA (approval with reservation of prohibition). This approach is explicitly intended to guarantee integration of medical progress in the SHI system. In respect of the financing of NETM a so-called “innovation clause” in the German Hospital Fees Act (Section 6, Para. 2 KHEntgG) states that where NETM cannot be paid for in a due and proper manner with the defined per-case flat rates and additional charges, temporary case-based fees or additional charges can be agreed upon.

Criticism of the NETM approach

The NETM approach is in many respects bureaucratic and opaque and ultimately tends to create a barrier to innovation rather than to ensure the swift transfer of new medical knowledge to day-to-day treatment. The following specific points of criticism are cited:¹⁰⁶

Lack of transparency in the procedure for recognition of a NETM by the Hospital Tariff System Institute (InEK): The Institute does not have to justify its decisions, not even in the event of rejection, and the decision-making criteria are not known.

High bureaucratic cost and effort on the part of the service providers: Even with identical NETM each hospital using the system must submit an application to the InEK, and if the respective NETM is not included in the DRG system a repeat application must be submitted each year.



104 Scale of charges for physicians (GOÄ) for billing of services for privately insured patients.

105 Schumacher 2001: 14.

106 Cf. the expert report of the German Hospital Institute (German Hospital Institute (DKI) 2009).

Varying treatment of recognised NETM in the tariff negotiations: Despite recognition by the InEK some of the health insurance institutions currently delay or refuse payment – the tariff agreement practice appears to be arbitrary. On refusal of a NETM payment, frequently no reasons are given or it is referred to the Medical Review Board of the Statutory Health Insurance Institutions (MDK) for expert appraisal, though these are not made available to the hospitals (lack of transparency).

In 2008 appropriate fees were only agreed for 61 % of the NETM recognised by the InEK – just under 40 % of the innovative potential was unused.¹⁰⁷ Overall the share of hospitals' revenue budgets accounted for by total NETM revenues was only 0.3 %, and only 0.1 % in respect of medical NETM.¹⁰⁸ This proportion appears very low for the innovative medical technology sector.

Innovation funding

The state has created suitable incentives for the financing of innovations. It would be conceivable to earmark part of the annual tax subsidy for the health fund for temporary trial of NETM. Such an approach is in line with the 3 % target of the German federal government, according to which government, states and companies should jointly spend up to 3 % of GDP on research and development.

Bibliography

- Aachen Centre of Competence for Medical Technology (pub.) (2005): The state of medical technology in Germany by international standards. Study on behalf of the German Federal Ministry of Education and Research (BMBF). Revised final report. Federal Ministry of Education and Research. Aachen-Frankfurt. Available online at http://www.akm-aachen.de/fileadmin/user_upload/MTStudie.pdf, last checked on 31.5.2010.
- Autotouring.at (2007): ESP for everyone! Europe's automobile clubs demand more safety ex-works.
- Badura, Bernhard (2008): Absenteeism Report 2008. Corporate health management: Costs and benefits, figures, data, and analyses from all sectors of industry.
- Berlin Medical (2009): Phytosterols in Becel pro. activ products reduce cholesterol. In: Berlin Medical, Vol. 6, p. 40.
- Biomet (pub.) (2009): Strong Growth at Biomet. Berlin Letters, 09/2. Available online at <http://www.biomet.de/userfiles/files/Misc/BerlinerBrief-2009-2.pdf>, last checked on 18.6.2010.
- biotechnologie.de (pub.) (2009): The German Biotechnology Sector. Data and facts. Available online at www.biotechnologie.de/BIO/Navigation/DE/Hintergrund/studien-statistiken,did=95732.html?view, last checked on 9.2.2010.
- Blind (November 2007): New key technologies – factors for success and failure. (TAB Brief, 32).
- Braubach, Matthias (2003): Living environment and need for nursing care in old age. Published by the Institute of Nursing Science of the University of Bielefeld.
- Bräuninger, M.; Sattler, Ch; Kriedel, N.; et. al. (2007): Development of health in Germany up to 2037. A macroeconomic cost simulation. Published by Hamburg Institute of International Economics (HWWI). (HWWI Policy Paper).

¹⁰⁷ Ibid.: 67.

¹⁰⁸ Ibid.: 77.

- Bräuninger, M.; Straubhaar, T.; Fitzner, V.; et al. (2008): Policy check on Germany as a pharmaceuticals industry location: recognising potential – using opportunities. Hamburg Institute of International Economics (HWWI) & Price Waterhouse Coopers (PWC).
- Bührlen, B.; Kickbusch, I. (2009): Innovation system healthcare: objectives and benefits of innovations. Results of the first Metaforum, “Innovation in the Healthcare Sector”. Stuttgart. Available online at <http://publica.fraunhofer.de/eprints/urn:nbn:de:0011-n-723481.pdf>, last checked on 9.10.2009.
- German Federal Ministry of Labour and Social Affairs (BMAS) (pub.) (2011): Securing skilled personnel – objectives and measures of the German federal government. Available online at http://www.bmas.de/SharedDocs/Downloads/DE/fachkraeftesicherung-ziele-massnahmen.pdf;jsessionid=7407B621285D16C112FFF75D32D6095A?__blob=publicationFile, last checked on 14.9.2011.
- Federal Institute for Industrial Health and Safety and Occupational Medicine (BAuA) (pub.) (2009): Health and safety at work 2008.
- German Federal Highway Research Institute (BAST) (2006): Macroeconomic costs of road traffic accidents in Germany 2004. German Federal Highway Research Institute (BAST) Available online at http://www.bast.de/cln_016/nn_75110/sid_7ED71C53F2CFFEC83220F4B2CD89D0C1/DE/Publikationen/Infos/2007-2006/02-2006.html, last checked on 22.6.2010.
- German Federal Ministry of Education and Research (BMBF) (pub.) (2009): Research and innovation for Germany, summary and prospects. Bonn, Berlin. Available online at http://www.bmbf.de/pub/forschung_und_innovation_fuer_deutschland.pdf, last checked on 9.10.2009.
- German Ministry of Health (BMG) (pub.) (2009): Third report of the “Pharma” task force. On improvement of the local conditions for and the innovative potential of the pharmaceutical industry in Germany. Berlin.
- Federal Ministry of Economics and Technology (BMWi) (pub.) (2004): Economic stimuli to barrier-free tourism for all. A survey on behalf of the Federal Ministry of Economics and Technology (BMWi).
- Federal Ministry of Economics and Technology (BMWi) (pub.) (2009): Highlights of economic policy. Monthly Report July 2009.
- German Pharmaceutical Industry Association (BPI) (pub.) (2009): Pharma Data 2009. Available online at http://www.bpi.de/fileadmin/media/bpi/Downloads/Internet/Publikationen/Pharma-Daten/Pharmadaten_2009_EN.pdf, last updated on 10.9.2009, last checked on 09.10.2012.
- Busse, R.; Riesberg, A. (2005): Health systems in a state of change. WHO European regional office, Copenhagen.
- Cepton (pub.) (2007): Benefits through innovation. A study carried out as a contribution to the medical technology industry for the improvement of health-care services in Germany. Munich.
- German Food Association (4.2.2009): Nutrition Report 2008. German Food Association. Available online at <http://www.dge.de/modules.php?name=News&file=article&sid=909>.
- German Food Association: Functional food – edible health? Press release of 12/13.11.2002. Available online at <http://www.dge.de/modules.php?name=News&file=article&sid=167>, last checked on 22.6.2010.
- German Hospital Association: Press release of the German Hospital Association on the key points of the 2006 health reform. Press release of 4.7.2006. Available online at http://www.dkgev.de/media/file/2694.2006-07-04_PM-DKG-zu-den-Eckpunkten-einer-Gesundheitsrefo%E2%80%A6.pdf.
- German Bundestag (lower house of the German parliament) (pub.) (2011): Small-scale inquiry: senior citizen-friendly conversions and housing. Available online at <http://dipbt.bundestag.de/dip21/btd/17/055/1705544.pdf>, last updated on 13.4.2011, last checked on 7.7.2011.

- German Hospital Institute (DKI) (pub.) (2009): Ambition and reality of budget negotiations for the implementation of medical technology innovations.
- German Hospital Institute (DKI) (pub.) (2009): Further development of the paramedical health-care professions using the technical auxiliary professions in the healthcare sector by way of example. Düsseldorf. Available online at https://www.bundesgesundheitsministerium.de/fileadmin/fa_redaktion_bak/pdf_publicationen/Gutachten-Heilberufe_201001.pdf, last checked on 11.10.2012.
- German Patent and Trademark Office (DPMA) (pub.) (2008): Annual Report 2008. Available online at <http://www.dpma.de/docs/service/veroeffentlichungen/jahresberichte/dpma-jahresbericht2008.pdf>, last checked on 22.6.2010.
- Dirks, C. (2009): Ambitious Project. In: kma Das Gesundheitswirtschaftsmagazin, August 2009, Issue 158.
- Domer, Stefanie (2009): Results in the mid rehabilitation stage following a total hip endoprosthesis operation in MIS technology compared to the standard procedure. Available online at <http://www-brs.ub.ruhr-uni-bochum.de/netahtml/HSS/Diss/DomerStephanie/diss.pdf>, last checked on 22.6.2010.
- Dommasch, L. (2005): The market for fitness and wellness data – facts – trends. FOCUS.
- European commission (pub.) (11.12.2002): Communication from the Commission to the Council, the European Parliament, the Economic and Social Committee and the Committee of the Regions. Industrial policy in an expanded Europe. Brussels. (COM(2002) 714).
- European Commission (pub.) (2007): eHealth Taskforce Report 2007. Available online at http://ec.europa.eu/information_society/activities/health/docs/publications/lmi-report-final-2007dec.pdf, last checked on 17.5.2010.
- European Commission (pub.) (15.3.2010): Electronic health services will take the pressure off health systems. Available online at http://ec.europa.eu/news/environment/100315_de.htm, last checked on 20.4.2010.
- European Commission (pub.) (1.2.2011): Innovation Union Scoreboard 2010. The Innovation Union's performance scoreboard for research and innovation.
- Fraunhofer Institute for Systems and Innovation Research (pub.) (2009): Innovation for improved health – MetaForum “Innovation in the healthcare sector” 2007 – 2009.
- Fuhrmann, Renée (15.6.2009): Causes of failure in the fitting of hip endoprostheses. Statement to the press conference of the German Medical Association on 11 June 2009 in Berlin. Event of 15.6.2009. Event of 15.6.2009. Berlin. Available online at <http://www.bundesaerztekammer.de/downloads/Statement-PD-Fuhrmann.pdf>, last checked on 11.10.2012.
- Gerber, A.; Evers, T.; Lauterbach, K. W.; Haverkamp, H. (December 2006): Cost-benefit analysis of a plant sterol containing low-fat margarine for cholesterol reduction. In: The European Journal of Health Economics (4), vol. 7, pp. 247 – 254.
- National Association of Statutory Health Insurance Institutions (pub.) (2008): Prevention Report 2008. Services of the statutory health insurance system in primary prevention and corporate health promotion. Year under review 2008. Medizinischer Dienst des Spitzenverbandes Bund der Krankenkassen e.V. (MDS).
- National Association of Statutory Health Insurance Institutions (pub.) (2009): Prevention Report 2009. Services of the statutory health insurance system in primary prevention and corporate health promotion. Year under review 2009. Medizinischer Dienst des Spitzenverbandes Bund der Krankenkassen e.V. (MDS).

- National Association of Statutory Health Insurance Institutions (pub.) (2010): Prevention Report 2010. Services of the statutory health insurance system in primary prevention and corporate health promotion. Year under review 2010. Medizinischer Dienst des Spitzenverbandes Bund der Krankenkassen e.V. (MDS).
- Hauschild, W.; Schnorr-Bäcker S. (2005): E-health – the electronic healthcare sector in Germany. Published by the German Federal Statistics Office. (Economics and Statistics, 10).
- Henke, K.-D.; Cobbers, B.; Georgi, A.; Schreyögg, J. (2006): The Berlin healthcare industry – prospects for growth and employment. Second edition Berliner Schriftenreihe Gesundheitswissenschaften (series of papers on the health sciences published in Berlin).
- Henke, Klaus-Dirk (2009): Allocation of constantly scarce resources in the healthcare sector from a macroeconomic perspective. In: Medical Ethics Magazine, Yr. 55.
- Henke, Klaus-Dirk; Neumann, Kartte; Schneider, Markus (2010): Creation of a satellite account for the healthcare industry in Germany. Research project on behalf of the Federal Ministry of Economics and Technology (BMWi): Nomos (European papers on state and industry, 30).
- Henke, Klaus-Dirk; Reimers, Lutz (2007): On the influence of demography and progress in medical technology on health spending. In: Ulrich, V. Ried W. (pub.): Efficiency, quality and sustainability in the healthcare sector. Commemorative publication for Eberhard Wille. Baden-Baden.
- Press release on the high-growth health tourism market (2007). Institute of Leisure Economics. Available online at <http://www.ff-freizeitwirtschaft.de/pdf/Wachstumswelt.pdf>, last updated on 29.6.2007, last checked on 26.4.2010.
- Kaufmann, F. -X; Stahmer, C. (2007): Human capital – the poor relation. In: FAZ, 20.12.2007.
- Köster, I. et al (2005): The cost of diabetes mellitus. Results of the KoDiM Study, PMV forschungsgruppe, Cologne. Published by PMV forschungsgruppe. Available online at http://www.pmvforschungsgruppe.de/pdf/02_forschung/a_ergebnis_kodim.pdf, last checked on 14.6.2010.
- Kraft, Marc (2006): Innovation processes in medical technology. In: SPECTARIS – German Sector Association for Optical, Medical and Mechatronic Technologies (pub.): The potential savings of innovative medical technology in the healthcare sector. Berlin 2006. Berlin.
- Kramer, Horst (2000): Training and education in the surgery sector. Federal Institute of Vocational Education and Training (BiBB). (BWP, 5/2000). Available online at <http://www.bibb.de/veroeffentlichungen/de/publication/show/id/525>, last checked on 20.9.2010.
- Martin, K.; Henke, Klaus-Dirk (2008): Health economy-related scenarios on prevention. Baden-Baden.
- Mester, Klaus-Hendrik (2007): The effects of demographic change on senior citizen-friendly housing in North-Rhine Westphalia. Göttingen: V & R Unipress (articles on housing and habitat, 226).
- Michl, D. (2010): Medical Biotechnology in Germany 2010. Published by Die forschenden Pharma-Unternehmen (vfa), Munich. (BCG Report). Available online at <http://www.vfa-bio.de/embed/bcg-report-2010.pdf>, last checked on 11.10.2012.
- Nusser, M. (2005): Germany as a location for pharmaceutical innovation: performance, obstacles to innovation and recommendations for action. In: GGW, Issue 3, first published: http://www.wido.de/fileadmin/wido/downloads/pdf_ggw/wido_ggw_aufs2_0305.pdf, last checked on 11.10.2012.

- Organisation for Economic Co-operation and Development (OECD) (pub.) (2005): Oslo Manual. Guidelines for Collecting and Interpreting Innovation Data. Third Edition. Available online at http://www.uis.unesco.org/Library/Documents/OECD Oslo Manual 05_en.pdf, last checked on 11.10.2012.
- OTA-Online: National training courses for surgical assistants. Press release of 12.2.2010. Available online at <http://www.ota-online.info/index.php?area=1&p=news&newsid=180>.
- Pöthig, D.; Arnold, L.; Gentsch, E.: Health promotion – a new area of activity for doctors. In: Deutsches Ärzteblatt, Yr. 106, Issue 33, pp. A 1611-4.
- Press conference on Drug Prescription Report. General documents on the Berlin Federal Press Conference. Press release of 17 September 2009. Berlin.
- Prognos AG (pub.) (2009): Atlas of the future for the sectors 2009. Available online at http://www.prognos.com/fileadmin/pdf/Atlanten/zukunftsatlas_09/Prognos_Zukunftsatlas_Branchen_2009_-_Auf_einen_Blick.pdf, last checked on 14.10.2009.
- Reimers, Lutz (2009): How do innovations enter the healthcare market? In: GGW, Yr. 9, Issue. 1, pp 22 – 30. Available online at http://wido.de/fileadmin/wido/downloads/pdf_ggw/wido_ggw_aufs3_0209.pdf, last checked on 14.10.2009.
- Reisenews Online (pub.) (2009): Cologne: Brochure entitled “Health Cologne”. Available online at <http://www.reisenews-online.de/2009/08/30/koln-broschure-%E2%80%9Ehealth-cologne%E2%80%9C/>, last updated on 30.8.2009, last checked on 7.7.2011.
- RKI (pub.) (2009): Health and sickness in old age. (Government health report).
- Council of Health Sector Experts (pub.) (2009): Co-ordination and integration – healthcare in an extended life society. Special survey 2009, long version. Available online at http://www.svr-gesundheit.de/fileadmin/user_upload/Gutachten/2009/Kurzfassung-2009.pdf, last checked on 9.10.2009.
- Schönermark.Kielhorn + colleagues (pub.) (2010): Innovative drugs as success factors in an optimised healthcare system. Required adjustments to the regulatory framework. On behalf of the Association of Research-based Pharmaceuticals Companies (VfA). Available online at <http://www.vfa.de/de/presse/studienliste.html/schoenermark-optimierte-versorgung.pdf>, last updated on 3.3.2010, last checked on 17.8.2003.
- Schumacher, H. (2001): Scale of charges for physicians (GOÄ): Is greater freedom possible? The reform of the private practitioners’ scale of charges is a laborious business – at the Sixth Chamber Colloquium of the North Rhine Medical Associations Georg Baum from the Federal Ministry of Health spoke in favour of for the “Proposed Model”. In: Rheinisches Ärzteblatt, Issue 8. Available online at <http://www.aekno.de/downloads/archiv/2001.08.014.pdf>, last checked on 9.10.2009.
- Schumacher, N.; Reiß, T. (2006): The innovative pharmaceuticals industry as an opportunity for Germany as an industrial location. A study on behalf of PhRMA (Pharmaceutical Research and Manufacturers of America), the sector association for the research-based pharmaceuticals industry in the US, and the German-based LAWG (Local American Working Group). Available online at http://www.amcham.de/fileadmin/user_upload/Policy/Health_Care/Finalversion_Studie_ATK_Fraunhofer_deutsch.pdf, last checked on 10.6.2010.
- German Federal Statistics Office (pub.): Government health report. Available online at www.gbe-bund.de.

- German Federal Statistics Office (pub.): Government health report: Employees in the healthcare sector, health sector personnel count. Available online at www.gbe-bund.de.
- German Federal Statistics Office (pub.): Government health report: Hospital statistics. Available online at www.gbe-bund.de.
- German Federal Statistics Office (pub.): Government health report: Healthcare cost accounts. Available online at www.gbe-bund.de.
- German Federal Statistics Office (pub.): Government health report: Healthcare cost accounts. Available online at www.gbe-bund.de.
- German Federal Statistics Office (pub.) (2009a): Information society in Germany. Wiesbaden.
- German Federal Statistics Office (pub.) (2009b): Moderate growth in internal tourism 2008. Results of the monthly tourism survey. In co-operation with Martin Szibalski. Wiesbaden. (Economics and Statistics, 5/2009).
- German Federal Statistics Office (pub.) (2009c): German road accident statistics 2008. Wiesbaden.
- German Federal Statistics Office (pub.) (2010a): Health spending report 2008.
- German Federal Statistics Office (pub.) (2010b): Review of input-output account. Wiesbaden.
- German Federal Statistics Office (pub.) (2010c): Healthcare costs 2002, 2004, 2006 and 2008. Wiesbaden. (Technical Series 12, Series 7.2).
- Steg, H. (2005): Transnationalisation of national innovation systems. Working Paper no. 11. December 2005. Economic and Social Sciences Faculty at the University of Dortmund.
- Stroetmann, K. et al. (2006): eHealth is worth it. Published by the European Commission. Available online at http://ec.europa.eu/information_society/activities/health/docs/publications/ehealthimpactsept2006.pdf, last checked on 25.5.2010.
- van Berg, Neeltje den; Meinke, Claudia; Heymann, Romy; Fiß, Thomas; Suckert, Eileen; Pöller, Christian et al. (2009): AGnES: Assistance to general practitioners by qualified surgery staff – evaluation of the pilot projects: quality and acceptance. In: Deutsches Ärzteblatt.de, yr. 106, Issue 1 – 2, 2009. Available online at <http://www.aerzteblatt.de/v4/archiv/artikel.asp?id=62886>, last checked on 5.10.2010.
- Association of Research-based Pharmaceuticals Companies (VfA) (pub.) (2010): on the internet: available online at <http://www.vfa.de/de/wirtschaftspolitik/strukturdaten/wirtschaftsfaktor>, last updated on 4.10.2010.

