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IMPACT OF AGEING ON CURATIVE HEALTH CARE WORKFORCE COUNTRY REPORT DENMARK

ERIKA SCHULZ

SUPPLEMENT B TO NEUJOBS WORKING PAPER D12.1

SEPTEMBER 2013

This paper shows the impact of demographic change on the demand for and supply of health care workforce in Denmark. As the need for health care services increases with age, the population ageing is expected to have a direct influence on the demand for health care and its workforce. The future supply of the health workforce is determined by the currently considerable portion of workforce that is approaching retirement age during the next 15 years.

Based on the NEUJOBS demographic scenarios tough and friendly and age- and gender specific utilization rates the changes in the health workforce needed are calculated. Changes in labour supply and employment are shown using the results of the econometric model NEMESIS. In both demographic scenarios an increase in population size and an ageing of the population is expected. In 2025 every fifth persons will be at least 65 years old. In the tough scenario with constant fertility rates and a moderate increase in life expectancy the pure demographic effect will lead to an increase in the demand for health professionals by around 8 %. In the friendly scenario with an increase in fertility rates and a higher increase in life expectancy the demand for health workforce will increase by 13 %. The estimated increase in employment will meet the demand in the friendly scenario, while in the tough scenario a strengthening of the health workforce shortage is calculated.



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IMPACT OF AGEING ON CURATIVE HEALTH CARE WORKFORCE IN DENMARK

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SUPPLEMENT B TO NEUJOBS WORKING PAPER D12.1

1 Introduction

The health care sector is one of the most important sectors of the economy in Denmark. The share of health and social services (sector Q according to the National Account Classification of Industries NACE2) in Gross Domestic Product (GDP) was 11.5 % in 2009, and the share of health care workforce in total employment 18.8 % in 2011. The sector showed a high dynamic in the past. Between 2000 and 2011 around 37,000 additional jobs were created in health and social work, while in total economy 136,000 were created from 2000 to 2008, but due to the economic crises a decline in employment was realized between 2008 and 2011. In 2011 the total employment was still behind the figures in 2000. The employment in health care and social work sector increased until 2010 and only in the last year a slightly decline was realized.

While the demand and spending for long-term care services is strongly related to the age of the population, the demand and spending for curative health care is related to the nearness to death (and death is related to age) and influenced by a variety of non-demographic factors, such as changes in the organisation, budget constraints to provide high quality health care cost effectively, political reforms and new technologies. In particular the health care expenditure is influenced by non-demographic factors. Studies show that new technologies are an important driver of health care expenditures (Zweifel et al 1999, Breyer and Ulrich 2000.). Nevertheless, the use of curative health care services is stronger related to the characteristics of the patients than the health care expenditure. Elderly people have a higher number of contacts to different kind of doctors, they suffer to a higher degree on multi-morbidity, and their hospital visits are both more frequent and longer. The demand for ambulatory care and hospital activities requires an adequate number and structure of medical and non-medical personnel. Thus, the employment in health care is stronger related to changes in the composition of the population than the health expenditures.

The expected societal transition with a combination of population ageing, changing household and family structure as well as increasing female employment will have a significant impact on the economic growth and employment in health care and social work. But the impact of population ageing on the demand for services, the expenditure and the employment will be different between curative health care activities and long-term care activities. Thus, the development in the two parts of the health care and social work sector will be analysed separately.

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This paper focuses on the curative health care sector only. The impact of demographic change on the employment in long-term care will be analysed and published in the Danish country report to D12.2.

Section 2 of this paper provides an overview of the size and characteristics of the personnel employed in the curative health care. Section 3 describes the methods to estimate the future health workforce demand and supply. Section 4 focusses on the impact of demographic development on the changes in health care demand. Section 5 concentrates on the impact of demographic development and changing labour force participation on the total labour force. Section 6 provides a calculation of health care workforce supply and shows the result of demand and supply of health workforce. Section 7 discusses the results and the challenges.

2 Current situation and development of health care employment in the past

The situation of the health labour market is determined by the health care system. The health care market is not a normal market with the demands presenting the preferences of the individuals and prices representing the value of a good or service. The supply and demand is determined by regulations concerning the financing system, the access to health care services, the defined health care basket financed, the organisation and reimbursement system for ambulatory care and hospitals. The health labour market is influenced by regulations concerning the needed qualification, the regulations concerning the provision of ambulatory care by practising physicians and hospital services. To understand and interpret the current situation on the health labour market a description of the relevant health care system characteristics is essential. Some relevant characteristics are discussed in subsection 2.1. Subsection 2.2 provides an overview of the current employment situation in health and social care.

2.1 Characteristics of the Danish health care system

The Danish health care system is a decentralized and to a high share tax financed system with an easy and equal access to health care for the patients. Taxes came from the state (progressive tax) and the municipalities (proportional tax). General practitioners act as gatekeeper for hospital treatments and specialists. Patients are allowed to consult emergency wards, dentists, chiropractors, ear, nose and throat specialists or ophthalmologists without prior referral. Hospital treatments and general preventive, diagnostic and curative services are free of charge at the point of use, but co-payments are required for pharmaceuticals, dental care for adults, physiotherapy, psychology consultations, chiropractic's, and podiatry. Co-payments have an impact on access for low-income groups, particularly regarding dental care (HiT 2012). Co-payments amount to 14 % of total health expenditures.

The primary sector consists of private (self-employed) practitioners (general practitioners, specialists, physiotherapists, dentists, chiropractors and pharmacists) and

municipal health services, such as nursing homes, home nurses, health visitors and municipal dentists (free for children under 18 years old).

Most secondary and tertiary care takes place in general hospitals owned and operated by the regions. Doctors and other health professionals are employed in hospitals on a salaried basis. Hospitals have both inpatient and outpatient clinics as well as 24-hour emergency wards. Outpatient clinics are often used for pre- or post-hospitalization diagnosis and treatments. Most public hospitals are general hospitals with different specialization levels.

The Danish health system is organized according to three administrative levels: state level, regional level and local level. Planning and regulation take place at both state and local levels.

State level

The state holds the overall regulatory and supervisory functions as well as fiscal functions but is also increasingly taking responsibility for more specific planning activities, such as quality monitoring and planning of the distribution of medical specialties at the hospital level. The state has an element of control over the supply of health professionals, since the training of authorized health professionals (with a few exceptions) is public. The state can also influence health professionals' qualifications by determining the content of their training. Further training in the health sector for specialists is the responsibility of the National Board of Health (in 2013 renamed in Danish Health and Medicines Authority) at the Ministry of Health, and it is adjusted continually to meet the needs of the health sector with regard to subjects, content and capacity. Postgraduate training programmes for medical specialties, including general practice, are defined by the Ministry of Health based on advice from the National Board of Health and the National Council for Postgraduate Education of Physicians.

The state decides which professions are to be reimbursed by the regions. There are certain quotas, for example for physiotherapists, and in order to buy a general practice, authorization as a GP is required from the National Board of Health plus a license from the regions. Dentists, however, can establish a practice wherever they choose and still be reimbursed by the regions.

Regional level

The five regions are responsible for providing hospital, somatic and psychiatric care, and for financing self-employed health care professionals. The regions own and run hospitals, prenatal care centres and community psychiatric units and they finance GPs, practising specialists, physiotherapists, chiropractors, dentists and pharmaceuticals. The regions' interest organization, Danish Regions, influences planning in the health system as it negotiates the annual financial frames of the regions with the state as well as the pay and working conditions for regional employees as it is the regions' central employer and bargaining organization. In this way, the regions, as one collective body, can to some extent regulate the number of people employed in hospitals and the number of private practitioners entitled to reimbursement from the regions based on negotiated number of doctors per 1000 inhabitants.

Local level

The 98 municipalities are responsible for disease prevention and health promotion. They are responsible for providing services such as nursing homes, home nurses, health visitors, school health care, and dental care for some groups, municipal dentists, prevention and health promotion, and institutions for people with special needs (i.e. people with disabilities, treatment for drug- and alcohol-related problems, and school health services).

Regulation takes place through, among other things, national and regional guidelines, licensing systems for health professionals and national quality monitoring systems. A series of laws and initiatives have been introduced since the 1990s to strengthen patient rights, including national laws on patient choice as well as the establishment of an independent governmental institution responsible for complaints procedures (for more details on the Danish health care system see appendix).

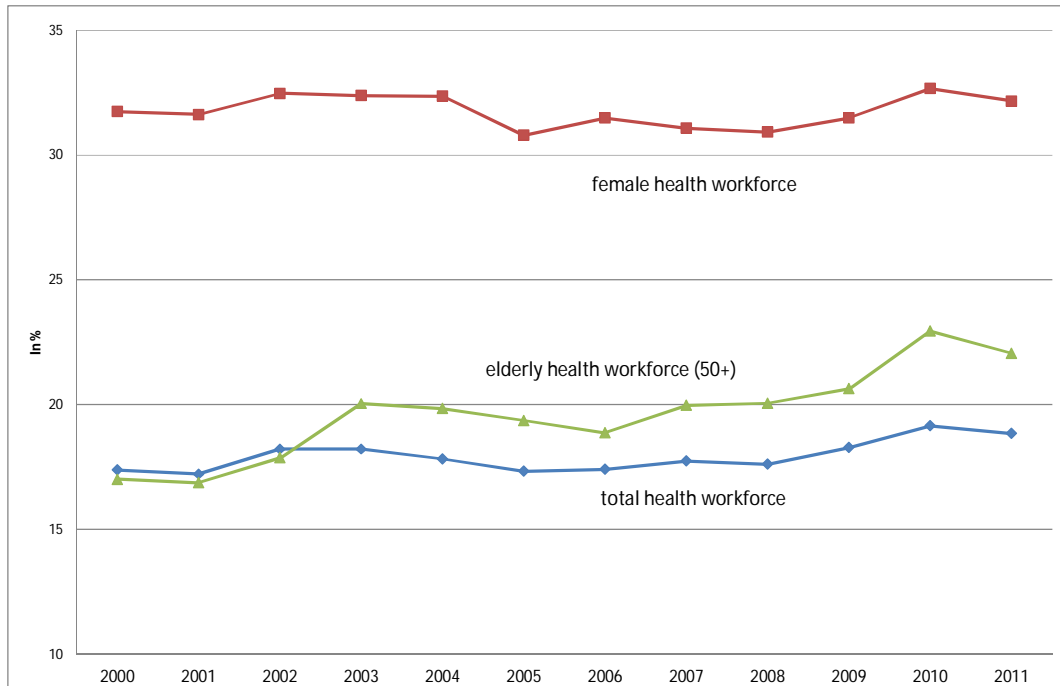
2.2 Employment

An overview of the development in employment provides the data of the EU labour force survey, which are the most comparable data between the Member States. According to the labour force survey some 509,000 people were employed in health care and social work (sector Q NACE Rev2) in Denmark in 2011. The share in total employment was 18.8 %. In line with other EU countries realized Denmark a decline in employment in total economy while the employment in health and social services realized an increase between 2000 and 2011.

Health and social work is predominantly the area of female employment. Around a third of total female employment was engaged in health and social care in 2011 (Figure 1). Between 2000 and 2010 some 20,000 new jobs for females were created in this sector, but the last year shows a slightly decline.

Denmark experienced - as other EU countries - an ageing of the workforce. The share of employees' aged 50+ in total employment increased from 24.5 % in 2000 to 28.8 % in 2011. The ageing of the workforce shows a higher dynamic in health and social work than in economy in total. The share of health workforce aged 50+ (in total health workforce) increased from 24 % (2000) to 33.8 % (2011). Around 17 % of total elderly employment was engaged in health and social care in 2000. This share increased to 22 % in 2011.

Figure 1 Share of health and social work employment in total employment, total female employment, and total elderly employment in Denmark (%)



Source: Eurostat, LFS, calculation of DIW Berlin.

2.2.1 Overview of personnel in curative health care

The EU labour force statistics provides an overview of the development in health care and social work, and some information by NACE2 2digits codes. The total sector Q can be subdivided into human health care (Q86), residential care (Q87) and social work without accommodation (Q88). In 2011 around 188,000 employees were engaged in human health care, 122,000 in residential care, and 200,000 in social care without accommodation (Table 1). Thus, some 7 % of total employment and 37 % of the employment in sector Q is engaged in human health care in Denmark.

The human health workforce is characterized by a high share of female employment (Table 23 in appendix). In 2011 some 81 % of employees in human health care were females, with the highest share in the age-group 40-49 years (86 %). Health and in particular nursing care is still a field of female employment. Around 12 % of female employment in Denmark is concentrated in human health care.

Table 1 Employees in human health care, residential care and social work without accommodation in Denmark 2011 (1000 persons)

Age-groups	Human health care			Residential care			Social work without accommodation		
	Total	Males	Females	Total	Males	Females	Total	Males	Females
15 - 24	11.0	2.3	8.7	13.5	1.9	11.7	23.9	8.4	15.4
25 - 39	60.6	11.6	49.0	31.6	5.7	25.8	66.7	14.8	52.0
40 - 49	47.8	6.6	41.2	30.9	6.6	24.4	51.2	7.2	43.9
50 - 54	25.9	6.0	19.9	21.1	2.9	18.1	25.5	4.2	21.5
55 - 59	26.5	5.5	20.9	16.3	2.6	13.8	21.2	2.5	18.5
60 - 64	13.3	3.9	9.5	7.0	0.6	6.3	9.0	1.7	7.4
65 - 74	3.1	1.0	2.1	1.2	0.4	0.8	2.1	0.9	1.3
total	188.2	36.9	151.3	121.6	20.7	100.9	199.6	39.7	160.0

Source: EU LFS; calculation of DIW Berlin.

Another fact is the high share of elderly employment. In human health care around 37 % of employees are at least 50 years old, among men 44%. Thus, a considerable portion of the workforce is approaching retirement age during the next 15 years, and the high share indicates the challenge to replace the retirees.

The labour force survey provides also information on the occupations by age-groups and gender in human health care (Q86). The main occupational groups in human health care are health professionals and nursing and assistant professions (**Table 2**). In 2010 the nursing and midwifery associate professionals amounted to around 40,000 and they had the largest share of human health workforce (23%). Around 30,000 health professionals and 7,000 nursing professionals were engaged in human health care. Their shares amounted to 18 % and 4 % respectively. Another large occupational group is personal care and related workers, around 28,000 persons in 2010. They amount to 17 % of human health workforce. The occupational group 'secretaries and keyboard-operating clerks' accounted to 19,000 that is 11 % of human health workforce.

The general characteristics of the human health workforce such as a high share of female employment and elderly employment can also be seen in occupational groups. The share of female employment is still highest among nursing, personnel care, social work assistants as well as housekeeping and secretaries, whilst the share among health professionals amount only to 56 %.

The share of elderly employees (50+) is in some minor professions 100%, but is also high in administrative associate professionals (64 %) and social work associate professional (69 %). Around half of the nursing and midwifery professionals are at least 50 years old, among personal care and related workers 43 %.

Health professionals as well as nursing and midwifery associate professionals show a high dynamic between 2008 and 2011. The number of health professionals increased by 9,000, the number of nursing associates by 6,000.

Table 2 Personnel in human health care by occupations in 2008 and 2010

Occupations (ISCO88)	ISCO CODE	2008 in 1,000 Total	2010 in 1,000			2010 Shares in %		
			Males	Females	Total	50+	Females	Occupations
Life science professionals	221	0.00	0.00	0.20	0.20	0.00	100.00	0.12
Health professionals (except nursing)	222	21.60	13.41	16.83	30.24	37.53	55.65	17.65
Nursing and midwifery professionals	223	5.71	0.30	7.04	7.34	50.07	95.96	4.28
Special education teaching professionals	234	0.28	0.00	0.38	0.38	100.00	100.00	0.22
Business professionals	241	0.00	0.15	0.28	0.43	38.57	64.51	0.25
Social science and related professionals	244	4.03	0.35	4.89	5.25	51.40	93.25	3.06
Physical and engineering science technicians	311	0.15	0.28	0.00	0.28	100.00	0.00	0.16
Optical and electronic equipment operators	313	1.17	0.00	0.81	0.81	15.95	100.00	0.47
Life science technicians and related associate profession	321	4.91	0.17	6.48	6.64	39.85	97.50	3.88
Health associate professionals (except nursing)	322	15.75	1.05	14.41	15.46	26.14	93.22	9.03
Nursing and midwifery associate professionals ²	323	33.49	1.74	38.05	39.78	31.53	95.64	23.22
Pre-primary education teaching associate professionals	332	0.00	0.00	0.14	0.14	0.00	100.00	0.08
Administrative associate professionals	343	1.74	0.38	1.27	1.65	64.10	77.11	0.96
Social work associate professionals	346	0.55	0.00	0.45	0.45	69.12	100.00	0.26
Artistic, entertainment and sports associate professional	347	0.00	0.00	0.14	0.14	0.00	100.00	0.08
Secretaries and keyboard-operating clerks	411	11.20	0.24	18.45	18.69	31.71	98.70	10.91
Material-recording and transport clerks	413	0.00	0.22	0.00	0.22	100.00	0.00	0.13
Client information clerks	422	4.55	0.00	6.60	6.60	34.11	100.00	3.86
Housekeeping and restaurant services workers	512	0.00	0.00	0.33	0.33	0.00	100.00	0.19
Personal care and related workers ¹	513	25.05	4.50	23.75	28.25	43.23	84.06	16.49
Other personal services workers	514	0.57	0.00	0.46	0.46	0.00	100.00	0.27
Domestic and related helpers, cleaners and launderers	913	6.03	1.21	5.72	6.92	34.96	82.56	4.04
Messengers, porters, doorkeepers and related workers	915	0.00	0.18	0.36	0.54	0.00	66.84	0.32
Transport labourers and freight handlers	933	0.67	0.11	0.00	0.11	0.00	0.00	0.06
Total		137.46	24.29	147.04	171.32	36.37	85.82	100.00

Source: EU LFS; calculation of DIW Berlin.

2.2.2 2.2.2 Characteristic of employees in hospitals

Overview

Nearly all hospitals in Denmark are public hospitals owned and run by the regions (99%). In 2010 27 organizational units on 72 sites exists (HiT 2012). The hospital size ranges from some 20 beds to 1533 beds in the largest Odense University Hospital (HiT 2012). Regions are responsible for planning hospital capacity and workforce. Non-emergency access to hospitals needs a referral from the GP. Patients have the right to choose another – also private and abroad hospital – if the waiting time will exceed one month (new regulation: two months). There are 20 private (for profit) hospitals with in total 500 beds (Pedersen et al 2011). These small hospitals (most have 5 to 10 beds) provide in particular elective orthopedic surgery. They employ 850 nurses, 20 % of them are also employed in public hospitals, and 800 physicians, 70 % of them are also employed in public hospitals.

The Statistical Office of Denmark, StatBank Denmark, provide information on the employees by industry (DB07). As the data source for accounting employees has changed in the past, fully comparable data are available from the year 2009 onwards. In 2009 around 110,000 persons were employed in hospital activities (subsector Q 86001). Thus, around 60 % of human health workforce was engaged in hospital

activities. The number of employees increased to 112,500 in 2011 (Table 3). The increase was higher for males, at 4 %, than for females, at 2 %. Nevertheless, females still dominate the employment in the hospital sector with a share of 82 % in 2011. The development in the three years shows the ageing of the hospital workforce. The increase in employees was highest in the oldest working ages; the number of employees aged 65+ increases by some 400 that is 27 %. In 2011 around 35 % of the hospital workforce was at least 50 years old, 41 % of males and 33 % of females. The majority of them will exit the labour market during the next 15 years.

Table 3 Employment in hospital activities (sector Q86001) in 2009 and 2011

Age-groups	2009			2011			Changes 2011/09 in pers.			Changes 2011/09 in %		
	Total	Males	Females	Total	Males	Females	Total	Males	Females	Total	Males	Females
-15 years	38	19	19	35	24	11	- 3	5	- 8	-7.9	26.3	-42.1
16-19 years	895	232	663	650	188	462	- 245	- 44	- 201	-27.4	-19.0	-30.3
20-24 years	3 407	600	2 807	3 240	626	2 614	- 167	26	- 193	-4.9	4.3	-6.9
25-29 years	10 465	1 351	9 114	10 527	1 451	9 076	62	100	- 38	0.6	7.4	-0.4
30-34 years	14 660	2 341	12 319	14 698	2 328	12 370	38	- 13	51	0.3	-0.6	0.4
35-39 years	13 962	2 184	11 778	15 196	2 494	12 702	1 234	310	924	8.8	14.2	7.8
40-44 years	14 238	2 289	11 949	14 150	2 326	11 824	- 88	37	- 125	-0.6	1.6	-1.0
45-49 years	14 949	2 603	12 346	15 010	2 488	12 522	61	- 115	176	0.4	-4.4	1.4
50-54 years	15 516	2 874	12 642	15 411	2 901	12 510	- 105	27	- 132	-0.7	0.9	-1.0
55-59 years	13 287	2 672	10 615	14 242	2 811	11 431	955	139	816	7.2	5.2	7.7
60-64 years	7 083	1 772	5 311	7 478	1 906	5 572	395	134	261	5.6	7.6	4.9
65-66 years	877	271	606	1 012	343	669	135	72	63	15.4	26.6	10.4
67+ years	569	250	319	828	340	488	259	90	169	45.5	36.0	53.0
Total	109 946	19 458	90 488	112 477	20 226	92 251	2 531	768	1 763	2.3	3.9	1.9

Source: StatBank Denmark; Employed persons; calculation of DIW Berlin.

Occupations

Eurostat provides a statistics on employees in hospitals by occupations as head counts and as full-time equivalents. The last available year is 2009, may be due to the change in accounting methods. According to the Eurostat statistics in 2009 around 113,000 persons were employed in hospitals, 3,000 persons more than accounted in the employment statistics by industries of the Statistical Office of Denmark (StatBank) (Table 4). In hospitals 13,750 physicians were employed, 39,400 nurses and midwives, 10,000 associate professional nurses, and 3,800 caring personnel. The number of other health service providers amounts to 17,000 and the other staff to 29,000.

Between 2001 and 2009 the personnel in hospitals increased by 9,000 persons, thereof 3,000 physicians, 4,000 professional nurses, 4,000 associate professional nurses and 3,000 other health service providers. The number of 'other staff' in hospitals declined at 2,000.

Eurostat as well as the Statistical Office of Denmark (StatBank) provide also the number of employees accounted in full-time equivalents (FTE). Both statistics showed the same figures, but the statistics of StatBank provide a more detailed overview of occupations and includes figures for the years 2010 and 2011 (Table 24 in appendix). In 2011 around 103,000 FTE were employed in public hospitals. The largest occupation

group are nurses (34,000 FTE), followed by administrative and other staff (17,000 FTE). Physicians accounted to 14,500 FTE and social and health care assistant to 11,000 FTE.

Table 4 Employees in hospitals by occupations and working-time 2001-2009

Employment	2001	2002	2003	2004	2005	2006	2007	2008	2009
Head counts									
Total hospital employment	104 235	107 810	106 222	105 228	105 762	107 619	109 770	112 033	113 139
Physicians or doctors	10 598	11 240	11 463	11 795	12 394	12 862	13 003	13 367	13 748
Professional nurses and midwives (total)	35 274	36 292	36 231	36 627	37 320	37 804	37 829	37 857	39 383
Associate professional nurses	6 020	7 231	7 386	7 483	7 618	7 878	8 403	9 552	10 015
Caring personnel	7 024	6 331	5 634	5 019	4 490	4 146	4 224	3 520	3 813
Other health service providers employed by hospital	14 183	14 953	15 222	15 512	15 997	16 438	16 523	16 513	17 121
Other staff employed by hospital	31 136	31 763	30 286	28 792	27 943	28 491	29 788	31 224	29 059
Full time equivalents									
Total hospital employment	90 212	91 876	91 426	92 647	92 961	94 898	95 144	95 595	102 248
Physicians or doctors	10 824	11 129	11 311	11 751	12 192	12 793	13 109	13 376	13 886
Professional nurses and midwives (total)	30 677	30 855	30 891	31 755	32 135	32 635	32 622	31 248	34 746
Associate professional nurses	6 425	7 374	7 674	7 995	8 296	8 736	8 753	9 398	9 864
Caring personnel	6 524	6 013	5 092	4 517	3 891	3 417	2 972	2 570	2 488
Other health service providers employed by hospital	9 473	9 677	9 802	9 777	9 921	10 180	10 827	11 186	11 881
Other staff employed by hospital	26 288	26 828	26 656	26 852	26 526	27 137	26 861	27 817	29 383
Source: Eurostat; health statistics, personnel in hospitals.									

The number of full-time equivalents is lower than the head counts, in particular for nurses and social and health assistance. That is due to the high share of part-time employment in these occupations, whilst the number of part-time physicians is small, at 700. That means: Nearly all physicians are working full-time (Table 25 in appendix).

2.2.3 Characteristics of personnel in rehabilitation institutions

Rehabilitation treatments are partly provided by public hospitals. Increasingly, geriatric departments for rehabilitation of older people are being set up in regional hospitals (HIT 2012). Municipalities are responsible for prevention and rehabilitation activities. They provide training in patient homes, care centres or municipality rehabilitation centres. This ensures that the needed treatments are provided by the required professionals like doctors and physiotherapists. No information on personnel engaged in rehabilitation measures exists. They are part of the staff in hospitals or in municipalities.

2.2.4 Personnel in ambulatory care

Health care outside hospitals is in general provided by private practitioners like general practitioners, practising specialists, physiotherapists or dentists, and by health professionals employed by municipalities in municipal health care centres like dentists

for dental care to children or health visitors. Municipalities are also responsible for providing services such as home care, school health care, prevention and health promotion, and institutions for people with special needs (i.e. people with disabilities, treatment for drug- and alcohol-related problems, and school health services).

The StatBank Denmark provides an overview of the employment in medical and dental practice activities. In 2011, the number of employees in medical and dental practices amounted to 58,700 persons, thereof 11,300 males and 47,400 females (Table 5). Also the ambulatory health care shows a high share of elderly employment. The share of employees at least 50 years old amounted to 41 %, among males 53 %.

Table 5 Personnel in medical and dental practice (Q86002) by gender and age-groups in 2009 and 2011

Age-groups	2009			2011			Changes 2011/09 in pers.			Changes 2011/09 in %		
	Total	Males	Females	Total	Males	Females	Total	Males	Females	Total	Males	Females
<15 years	628	217	411	547	180	367	- 81	- 37	- 44	-12.9	-17.1	-10.7
16-19 years	1 378	335	1 043	1 503	391	1 112	125	56	69	9.1	16.7	6.6
20-24 years	1 597	202	1 395	1 932	300	1 632	335	98	237	21.0	48.5	17.0
25-29 years	3 095	468	2 627	3 218	520	2 698	123	52	71	4.0	11.1	2.7
30-34 years	5 093	799	4 294	5 005	829	4 176	- 88	30	- 118	-1.7	3.8	-2.7
35-39 years	6 297	864	5 433	7 170	1 088	6 082	873	224	649	13.9	25.9	11.9
40-44 years	7 160	938	6 222	7 249	951	6 298	89	13	76	1.2	1.4	1.2
45-49 years	7 539	1 137	6 402	7 861	1 059	6 802	322	- 78	400	4.3	-6.9	6.2
50-54 years	8 105	1 460	6 645	8 169	1 370	6 799	64	- 90	154	0.8	-6.2	2.3
55-59 years	7 333	1 668	5 665	8 029	1 650	6 379	696	- 18	714	9.5	-1.1	12.6
60-64 years	4 816	1 582	3 234	5 241	1 654	3 587	425	72	353	8.8	4.6	10.9
65-66 years	916	443	473	1 158	492	666	242	49	193	26.4	11.1	40.8
67+ years	1 202	592	610	1 636	821	815	434	229	205	36.1	38.7	33.6
Total	55 159	10 705	44 454	58 718	11 305	47 413	3 559	600	2 959	6.5	5.6	6.7

Source: StatBank Denmark; Employed persons; calculation of DIW Berlin.

The Statistical Office of Denmark provides also a statistics on the personnel employed by municipalities for dental care and health care. In 2011, in total around 5,000 health professionals were employed by municipalities, thereof 950 dentists and 35 doctors. The main occupational group are dental assistants, at 2,300 employees, and health visitors, at 1,700 employees (Table 6).

Table 6 Personnel (FTE) in municipal dental care and health care in 2009 to 2011

	2009	2010	2011
Total staff in municipal health care	5 249	5 102	4 907
Total municipal dental care	3 401	3 258	3 191
Dentists in municipal dental care	1 012	986	946
Dental assistants	2 389	2 271	2 245
Total municipal health care	1 848	1 844	1 716
Doctors in municipal health care	79	66	35
Health visitors	1 769	1 779	1 680

Source: StatBank Denmark

There is little information on the number of practising physicians and other practising health care professionals in private practices. The Health in Transition report for Denmark mentioned 3,600 practising general practitioners, 3,300 practising dentists, 1,900 practising psychologists and around 3,600 pharmacists (HiT 2012). Additional around 19,200 nurses are working outside hospitals. The Health Statistics for the Nordic Countries (NOMESCO) provide a statistic on physicians in health and social services by speciality. According to this statistics around 4,000 physicians are general practitioners (Table 7). It can be assumed that the majority of them are working in private practices. The other physicians can be employed or can work in private practices, but the share of private practising physicians by speciality is not known.

Table 7 Employed physicians by speciality in health and social services 2009

Employed physicians by specialty in health and social services 2009 (NACE1.1* sector 85.1 and 85.3)		
Specialty	Number	Number per 100.000 inhabitants
General practice	4 066	74
Internal medicine	1 433	26
Paediatrics	352	6
Surgery	802	15
Plastic surgery	93	2
Gynaecology and obstetrics	496	9
Orthopaedic surgery, incl. hand surgery	607	11
Ophthalmology	298	5
Ear, nose and throat	313	6
Psychiatry	920	17
Skin and sexually transmitted diseases	146	3
Neurology	275	5
Oncology	121	2
Anaesthetics	893	16
Radiology	471	9
Clinical laboratory specialities incl. pathology	460	8
Other specialities	145	3
Specialists in total	11 891	216
Physicians without specialist authorization	6 906	125
Physicians in total within NACE1.1 85.1 and 85.3	18 797	341
*) National Account Classification of Industries		
Source: NOMESCO: Health Statistics for the Nordic Countries 2011		

2.3 Shortness of health professions

In Denmark a shortage of general practitioners in some outlying areas is reported (HiT 2012). While the number of physicians slightly increased in the last years, still recruitment problems persist, particularly in rural areas. In particular practising specialists are concentrated in the capital and other urban areas. During the past 5 – 10 years, active recruitment of health workers from outside Denmark has taken place. Regulations were introduced with the aim to encourage foreign professionals to work in Denmark. Foreign qualified professionals from third countries can easily access the Danish labour market in professions experiencing currently a shortage of personnel. The Agency for Labour Retention and International Recruitment provides a Positive List showing the professional fields that are open for foreign professionals. This list includes medical doctors, hospital doctors, dentists, opticians and nurses (Nyidanmark 2013).

Pedersen (2011) expects that the shortage of health care personnel will increase during the next years. He expects a shortage of nursing assistance of 5,700, of nurses of 5,600 and of physicians of 2,600 at 2015.

Another indicator showing a shortage of health professionals are long waiting times. Although Denmark introduced a waiting time guarantee and the extended free choice of hospitals and specialists if patients have to wait more than one month, long waiting times for medical examinations are reported by 0.8 % of the surveyed population in 2010 (Eurostat; results of EU SILC 2010).

3 Methods to estimate the future health workforce

3.1 Introduction

The current situation is the starting point for the estimation of the effect of societal change, in particular demographic change, on the demand for health care services and the workforce needed to meet this demand as well as for the expected changes in the health workforce supply. In view of the challenges due to the ageing of the population as well as due to the high share of health workforce that is expected to retire over the next decade the need for health workforce planning has become a central issue for politicians and health care providers. In Australia (HWA 2012) and in Canada (Birch et al 2009) health workforce planning is carried out for special occupations or medical specialities, in the EU a feasibility study for health workforce planning is conducted (Matrix Insight 2012). A project financed by the EU concerning health workforce planning has started in 2013. The general objective of the 'EU joint action on health workforce planning' project is a platform for collaboration and exchange between Member States to prepare the future for health workforce (EU HWF 2013). One work package of this project deals with the data and methods of health workforce planning (WP4).

Generally, health workforce planning is based on the estimation of effects of demographic change on the supply of and requirements for healthcare services (Birch et al 2009). But the studies take also into account changes in productivity (HWA 2012b) and changes in the need for health care services (Birch et.al. 2009). Forecasting health workforce need approaches to estimate the changes in demand and estimation of changes in supply of health workforce. The Health Workforce Australia (HWA 2012c) discusses different approaches on the demand as well as on the supply side. Roberfroid et al (2009) discuss different approaches to forecast physicians supply.

3.2 Methods to estimate the demand driven need for health workforce

The demand for health workforce is influenced by a variety of factors like the changes in the demand for health care services, changes in regulations, the economic growths (in particular in public tax financed health systems), new technologies and new available treatment methods. We are focusing on the impact of changes in the demand for services on the health workforce only. The question appears: how to measure the demand for health services? As mentioned above, the health care market is a highly regulated market. EU health care systems provide universal and - in the point of use free - access to at least a core set of health care services, and the prices of these health services are fixed by the state or are the result of an agreement between health care providers and funding institutions (health insurance funds of government). The demand for services is also influenced by the providers of health care due to asymmetric information (physicians are in general better informed about the appropriate level and kind of treatments). The Health Workforce Australia (HWA 2012c) mentioned as main methods the measure demand:

Need based approach:

This approach measures the need for health services based on the health status of all persons living in the community, not just of those people seeking medical services. It requires significant information on the incidence, prevalence and disability states for virtually all diseases and conditions by age and gender.

Pros: This approach is comprehensive; measuring needs is more appropriate than measuring the – by manifold factors influenced – realized demand.

Cons: This approach requires significant amounts of detailed data that are not often available.

Utilization method:

This approach measures expressed demand, and is based on service utilization patterns as currently observed. It uses medical service and hospital inpatient data by age and gender.

Pros: This approach has the advantage that the realized demand is measured.

Cons: A problem is data limitations for outpatient services. However this approach is relevant for modelling demand for health services and the medical workforce.

Economic estimation method:

This method links demand for the health workforce to variables presumed to contribute to demand for health. For example the assumed relationship between national income and demand for health services can be built into the forecasting equation.

Pros: Easily to use.

Cons: This approach has the disadvantage that it provides no information of the composition of workforce, no direct relationship between demand for services and changes in the needed health workforce.

Benchmarking method:

This method compares a workforce-to-population ratio (benchmark) in best performing health care systems with the ratios in the country of interest. It assumes that the used benchmark is optimal for providing effective health care.

Pros: This approach has the advantage that it requires only a minimal set of data and can be easily used.

Cons: This approach may lead to insufficient results in the case that the benchmark is influenced by regulations, historical development, maybe an oversized workforce.

3.3 Methods to calculate the development of the health workforce supply

The HWA (2012c) identifies two methods for measuring health workforce supply:

Time series approach:

This approach uses past trends for the projection of workforce supply. Time series analysis assumes that the influencing factors underlying past trends remain constant in the future.

Pros: The advantage of this approach is that it requires only a minimal set of data.

Cons: The disadvantage is that the quality of the projection depends on the quality of the data included in the estimation equation (interlinks with other subsectors in health care, but also other sectors).

Stock and flow method:

This method identifies the size of the current workforce, and the sources of inflows and outflows from the stock. The future health workforce supply is calculated by moving forward the initial stock using the expected in- and outflows. The stock data on the current workforce by age and gender have to be differentiated by occupations, facilities, and working-time. The inflows comprise data on students and graduates, students in vocational training, migrants, and persons moving from other sectors or other occupations in the health care market. The outflows comprise data on retirement, emigration, and movements to other sectors.

Pros: This approach can be applied also for single occupations, in particular if detailed data are available from the Associations of the health professions.

Cons: While data on the workforce stock are available in most EU countries, data on in- and outflows are not easily to collect. In particular the estimation of migration flows (from/into another country, but also from/into another sector) is a challenge due to the manifold influencing factors and missing data on current migration flows by occupations, age and gender. Another fact is that the current workforce may not represent the balance on the health care market. May be the health workforce is oversized or there may be a shortage of health professionals. Additional data showing the imbalances are needed differentiated by occupations and kind of services.

Another approach to estimate the changes in health workforce by main occupational fields was used for the case of Germany (Helmrich and Zika 2010).

Top down method:

This method identifies the share of health workforce in total employment and the trend in the past as well as the underlying factors. The estimation of the health workforce is based on the overall development of the total workforce and assumptions about changes in sectorial employment.

Pros: The advantage of this approach is that the health workforce is estimated in relation to the overall changes in labour supply, the economic growth, and the development in total employment. It takes into account future changes in industrial structure.

Cons: The disadvantage is that no detailed information by kind of services or occupations is provided.

3.4 Conclusion: preferred methods and data bases

To estimate the future supply of health workforce the flow model is typically used. The Health Workforce Australia, for example, used a dynamic version of the stock and flow approach (HWA 2012c). However, in this NEUJOBS working paper a variant of a top down model is used due to the fact that in the NEUJOBS project the growth and employment by countries and sectors is estimated (Boitier, Lancesseur, Zagamé 2013).

One sector is the pooled sector 'non-market services' which consists of sectors Q 'Human health and social work activities', O 'Public administration and defence; compulsory social security', P 'Education', subsectors R90-92 'Creative, arts and entertainment activities', R93 'Sports activities' and S 94 'Activities of membership organisations'. Thus, we must take into account the development of the pooled sector by estimating the supply of health workforce (see chapter 6.1).

For the estimation of the demand we use the utilization approach. We collect utilization data for institutional care and ambulatory care and carry out scenarios showing the pure demographic effect (demography), and taking into account changes in utilisation (need) as well as changes in productivity (for example changes in the average length of stay in hospitals).

4 Demand on curative health care workforce 2025

4.1 Population development

The demand for human health care personnel depends on the development of the number of people in need for health care and their level of morbidity as well as other non-demographic factors. The nearness to death is the main driver of need for health care services. As the probability to die increases with the age, the need for curative health care is (indirect) related to age. Thus, the expected ageing of the population with the huge increase in the number in particular of the oldest old will raise the demand for health care and therefore for health professionals.

NEUJOBS carried out two population projections – tough and friendly - which are based on the EUROPO2010 projection from Eurostat as a reference scenario (Huisman et al 2013). The projections are based on changes in the three demographic components: fertility, life expectancy, and migration. In 2010 Denmark realized a fertility rate of 1.84 children per women that is well above the EU average of 1.6. It is expected that the fertility rate will be constant in the tough scenario and will further increase up to 1.94 children per women in 2025 (Table 8). In contrast to the fertility are the life expectancies of males and females below the EU average. In 2010 the life expectancy at birth was for males 77.2 years and for females 81.4 years. In both demographic scenarios an increase in life expectancy is assumed with a higher increase in the friendly scenario. In 2010 Denmark realized around 15,000 net migrations. In the tough scenario a decline in net migration and in the friendly scenario an increase in net migration is assumed. The assumptions of the Europop scenario are always between the tough and friendly scenario.

Table 8 Assumptions of population forecast Denmark

2010	2030		
	Friendly	Tough	Europop
Fertility rates			
1.87	1.94	1.87	1.84
Life expectancy at birth males			
77.2	83.1	79.4	80.2
Life expectancy at birth females			
81.4	86.3	83.2	84.3
Net migration per year (1000)			
15.3	18.0	5.9	12.0

Source: Eurostat, Europop; NEUJOBS D10.1 (version March 2013).

In 2010 around 5.5 million persons lived in Denmark (Table 9). 18 % of the inhabitants were under 15 years old, 22 % were in prime working age (35-49 years) and 16 % were at least 65 years old. All three demographic scenarios expect the same trend, an increase in the number of inhabitants combined with an ageing of the population. The number of inhabitants is expected to increase to 5.7 million in the tough and to around 5.8 million in the friendly and Europop scenario in 2025.

Table 9 Population projection until 2025 in Denmark

Age-groups	2010	2025			Changes 2025/2010					
		tough	friendly	Europop	tough	friendly	Europop	tough	friendly	Europop
in 1000 persons					in %					
0-14	1 001	980	1 006	973	-22	5	-28	-2.18	0.50	-2.80
15-34	1 342	1 417	1 454	1 426	75	112	84	5.59	8.33	6.29
35-49	1 202	1 020	1 035	1 035	-182	-166	-167	-15.14	-13.85	-13.89
50-64	1 087	1 134	1 147	1 153	47	60	66	4.34	5.50	6.10
65+	903	1 107	1 187	1 224	204	284	321	22.61	31.44	35.51
total	5 535	5 657	5 829	5 811	122	294	276	2.21	5.31	4.99
age-structure in %					in %-points					
0-14	18.09	17.31	17.27	16.75	-0.78	-0.83	-1.34	-4.29	-4.57	-7.43
15-34	24.24	25.04	24.94	24.54	0.80	0.70	0.30	3.31	2.87	1.23
35-49	21.71	18.03	17.76	17.81	-3.69	-3.95	-3.90	-16.98	-18.20	-17.98
50-64	19.64	20.05	19.67	19.85	0.41	0.04	0.21	2.08	0.18	1.06
65+	16.31	19.57	20.36	21.05	3.25	4.05	4.74	19.95	24.81	29.07
total	100	100	100	100	0.00	0.00	0.00	0.00	0.00	0.00

Source: Eurostat; Europop2010; D10.2; calculation of DIW Berlin.

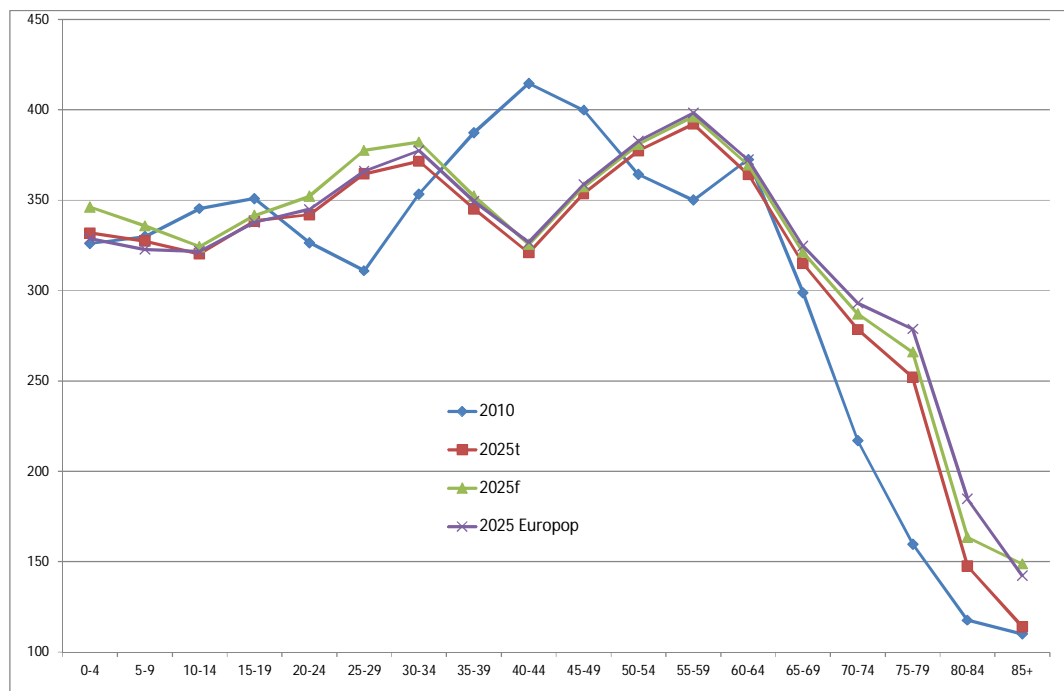
Due to the high and – in the friendly scenario – increasing fertility rate will the number and the share of young people (0-14 years) only slightly decline. The increase in life expectancy leads to a significant growth in the number and share of the elderly. The share of the elderly (65+) will increase to 19.6 % in the tough scenario, to 20.4 % in the

friendly scenario, and to 21 % in the Europop scenario. Whereas the share of people in the young working ages (15-34) are expected to be more or less constant, and the share of elderly workforce (50-64) will only increase marginally, and the share of people in prime working age will decline.

The decline of people aged 35 to 49 years is expected to account to 170,000 to 180,000. The dependency ratio, young and elderly in relation to people in working age (0-14 and 65+ to 15-64 years old), is expected to increase from 0.52 in 2010 to 0.58 in the tough scenario and to 0.61 in the friendly and Europop variant in 2025.

The changes in the age-groups of the Danish population can be explained by the age-structure in the base year 2010. In 2010 the population showed three peaks, a small peak in the age-group 15-19, and a high peak in the age-group 40-44, and another small peak in the age-group 60-64 (Figure 2). During the next 15 years these peaks (and valleys) will shift to higher ages. Additional, the projections show a significant increase in the number of the oldest people (70+), in particular in the age-group 75-79. This can be explained by the reduction in mortality rates in particular in the older ages.

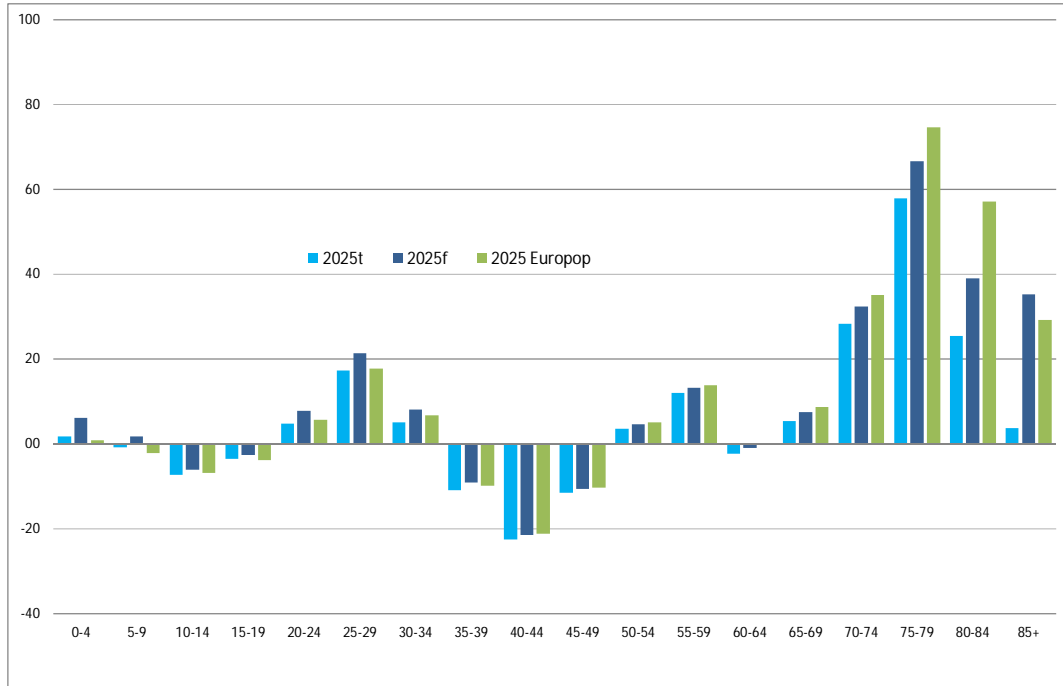
Figure 2 Age-profile of the population in Denmark 2010 and 2025



Sources: NIDI D10.1;Eurostat Europop2010; calculation by DIW Berlin..

Figure 3 shows the expected changes in the age-groups for the three population scenarios in %. The highest relative increase is expected for the age-group 75-79 with 58 % in the tough, 66 % in the friendly, and 75 % in the Europop scenario. The higher increase in life expectancy in the friendly and Europop scenario compared to the tough scenario leads additional to a high increase in the oldest age-groups.

Figure 3 Population by age-groups in Denmark – changes between 2010 to 2025 in %



Sources: NIDI D10.1;Eurostat Europop2010; calculation by DIW Berlin..

4.2 Impact of demographic change on health care demand

The impact on demographic changes on health care demand is shown for six fields of acute health care, namely hospital inpatient activities, hospital outpatient activities, activities of General Practitioners (GPs), activities of dentists for adults, and activities of specialists. The demand on other health care services will be calculated in line with the changing demand in these fields of acute health care.

4.2.1 Utilisation data: Hospitals

Hospitals in Denmark provide inpatients treatments, outpatient services, and emergency care. For inpatient as well as outpatient treatments in hospitals data on the number of cases by age-groups, gender and diagnosis exists. These statistics are based on the National Patient Register and are published by the StatBank Denmark. The statistics includes all hospitals (public and private). Comparable data are available from 2006 onwards.

Inpatient hospital treatments

In 2011 around 1.3 million people were admitted to a hospital for inpatient treatments, 0.6 million men and 0.7 million women (Table 26 in appendix). Between 2006 and 2011 the number of hospital inpatient admissions increased by 120,000, this is an average annual growth rate of more than 1 % for men as well as for women. In 2011 around 38 % of inpatients were aged 65 and older, some 29 % were aged 70 and older. The share of elderly inpatients increased in the last 5 years.

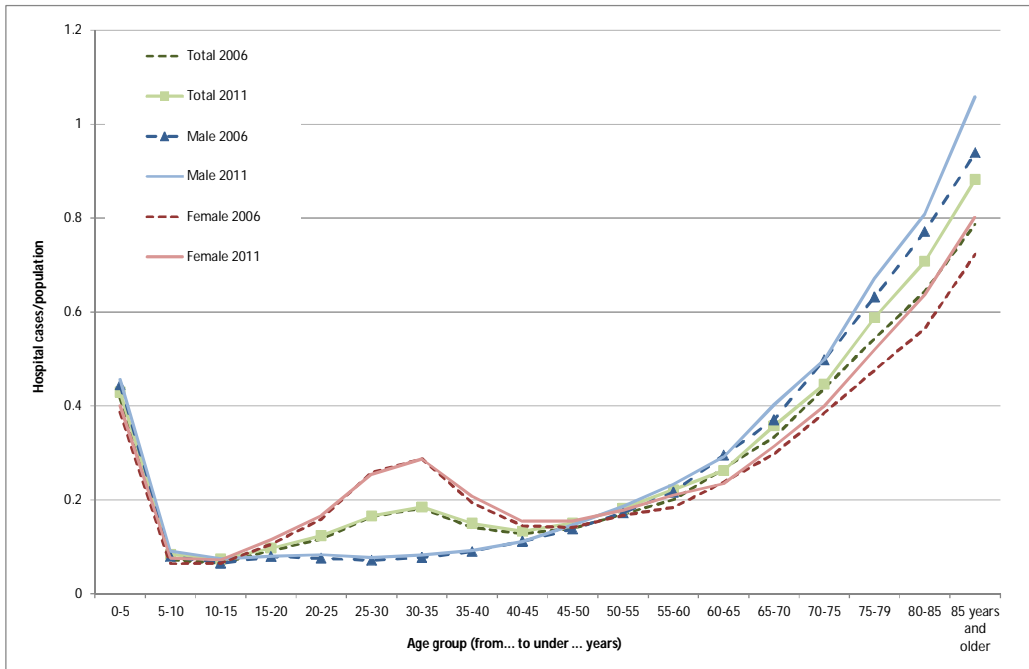
In 2011, in total around 4.4 million days were spent in hospitals, 2.1 million days by men and 2.3 million days by women. While the number of hospital inpatient admissions increased between 2006 and 2011, the total number of inpatient days in hospitals declined by 620,000, that is 12 %. Thus, the average length of stay declined for males and females and also for the elderly inpatients. That is due to new diagnostic and treatments, such as minimal invasive treatments, the increase in productivity, the introduction of activity based reimbursement of treatments by using the Diagnosis Related Groups (DRG) classification for a higher share of treatments in hospitals. Additionally a shift from inpatient to outpatient treatments can be observed. This has an effect on the number of admissions as well as on the total number of hospital days.

The utilization of hospital inpatient activities can be shown using the ratio of admissions to population by age-groups and gender. Additionally, the average length of stay by age-groups and gender have to be taken into account. The prevalence of inpatient hospitalization show an u-shaped curve with high prevalence for the youngest age-groups due to new-borns in hospitals, a peak for females in the birth giving ages, and a steady increase with age from the age-group 45-49 onwards (**Figure 4**). The prevalence rate was nearly constant between 2006 and 2011 for the age-groups under 65 years. For the older ages from 65 years onwards the ratio increased for men and for women, in particular for the oldest old.

Contrary to the hospital admission the average length of stay increases with age from the age-group 5-10 years onwards (Figure 5). In the middle age-groups the length of stay is lower for men than for women. The reverse situation can be observed for the older ages. Between 2006 and 2011 the average length of stay declined for both sexes and all age-groups, but in particular for the elderly.

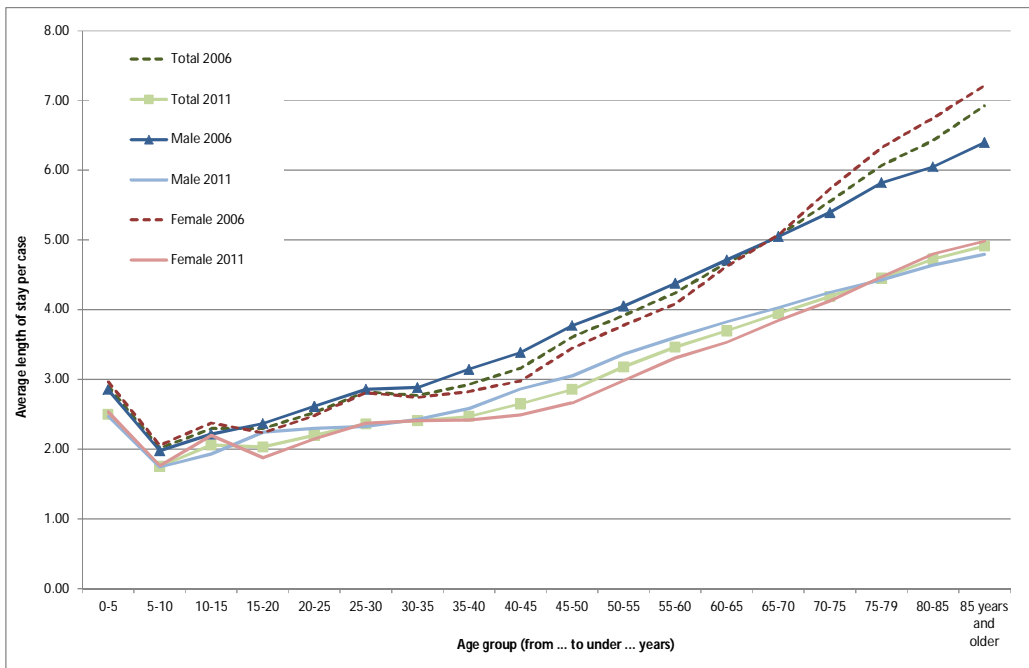
The average length of stay may be influenced by the shift from pre surgery and after surgery treatments from hospital inpatient departments to outpatient departments. The number of outpatient treatments increased between 2006 and 2011 by 1.1 million that is 19 %. There is a break in the time series in 2009 may be due to changes from inpatient treatment to outpatient treatments in the classification, but in total the number of outpatients increased markedly as well as the share of the elderly outpatients.

Figure 4 Hospital admissions – treatment cases per person by sex and age-groups 2006 and 2011 (Denmark)



Source: StatBank Denmark; calculation of DIW Berlin.

Figure 5 Average length of stay in hospitals by sex and age-groups 2006 and 2011 (Denmark)



Source: StatBank Denmark; calculation of DIW Berlin.

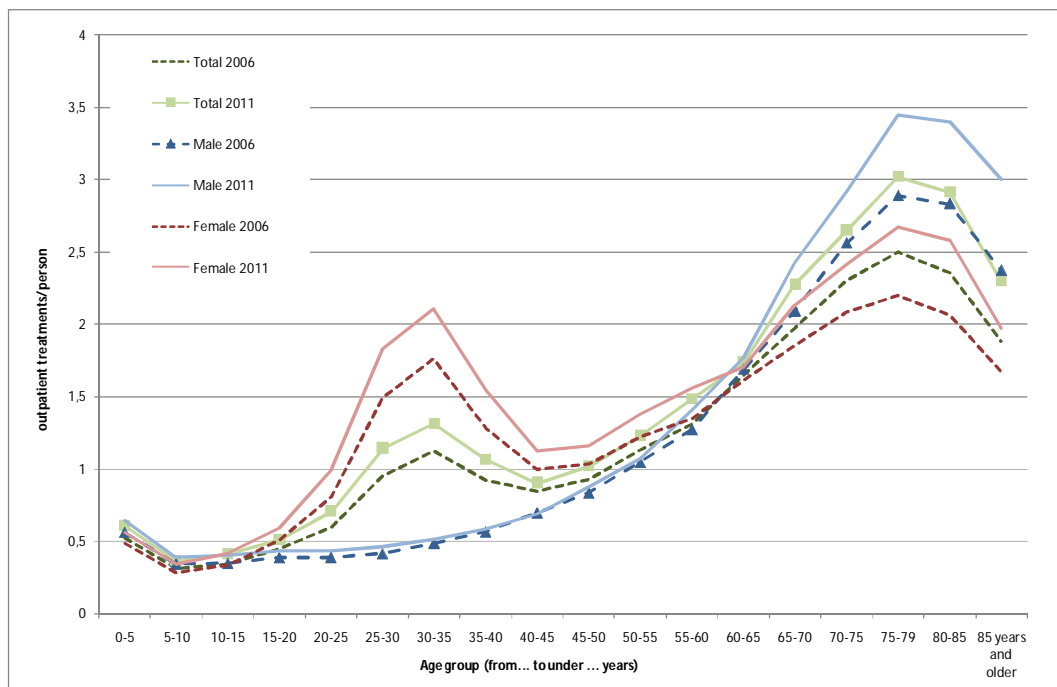
Outpatient treatments in hospitals

Hospital outpatient treatments are in the majority pre- and post-hospital admission treatments. In 2011, around 7 million outpatient treatments were carried out in outpatient departments of hospitals, thereof 3 million for men and 4 million for women (Table 27 in appendix). More than one third of outpatient treatments were carried out for persons at least 65 years old, and one quarter for at least 70 years old persons.

The prevalence for outpatient treatments by age-groups shows in general the same trend as for hospital inpatient admissions. The prevalence rate increases with age for men from the age-group 5-10 years onwards, for females a peak can be observed in the birth giving ages and from the age-group 40-45 an increase with age can be observed (Figure 6). The prevalence rate is highest for the age-group 75-79 years and falls thereafter.

Between 2006 and 2011 an increase in prevalence rates for females in the birth giving ages, and for males and females in particular in the older age-groups from 65 years onwards can be seen. The growth rates were in particular high for treatments related to complications in pregnancy and childbirth, and in the older age for treatments related to the cancer, in particular malignant tumours of pancreas, trachea, bronchus and lung.

Figure 6 Hospital outpatient treatments by age-groups and gender 2006 and 2011



Source: StatBank Denmark; calculation of DIW Berlin.

4.2.2 Utilisation ambulatory care physicians

The health care system in Denmark is dominated by a gate keeping role of General Practitioners (GP). As nearly all inhabitants have chosen the referral system the GPs play a dominant role in primary health provision and for the individual health pathways through the health and social care system. All patients have to consult at first their GP (exceptions emergency wards, dentists, chiropractors, ear, nose and throat specialists or ophthalmologists). The StatBank Denmark provides a statistics on the contacts to health professionals which are reimbursed by the public health system. According to this statistics the number of contacts to a GP amounted to 41.6 million in 2011 (Table 10). The total number of all contacts to health care professionals amounted to 60 million. Thus, around 70 % of all ambulatory contacts to health professionals are contacts to a GP.

Table 10 Contacts to health professionals in outpatient care 2006 to 2011

Health Professionals	2006	2007	2008	2009	2010	2011
	Number of contacts in million					
Total	55.8	56.6	58.3	58.4	58.6	60.0
General practitioner (GP)	38.9	39.5	40.7	41.0	40.8	41.6
Specialist	4.8	4.9	5.0	5.1	5.3	5.3
Dentist/dental hygienist	4.3	4.4	4.4	3.9	3.9	3.9
Chiropractor	1.9	2.0	2.0	2.0	2.0	2.0
Physiotherapist	5.5	5.6	5.9	6.0	6.2	6.5
Chiropodist	0.0	0.0	0.0	0.0	0.0	0.2
Psychologist	0.2	0.2	0.3	0.4	0.4	0.3
Other	0.0	0.0	0.0	0.0	0.0	0.0

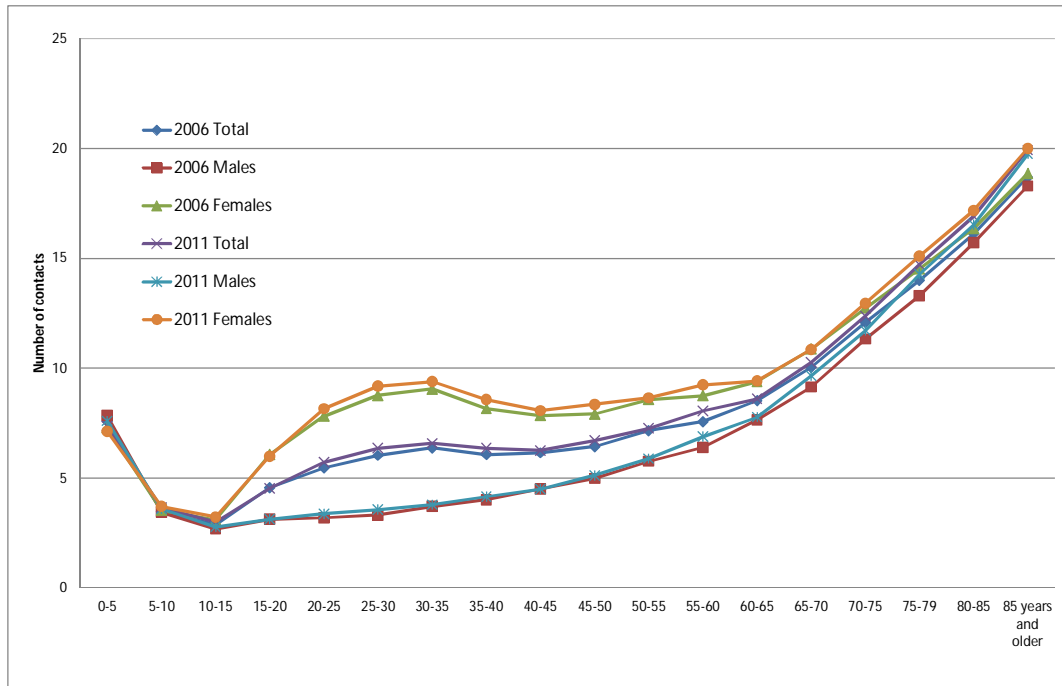
Source: StatBank Denmark.

Consultations of general practitioners

Inhabitants consult their GP on average 7 times a year, females visit their GP more often, on average 9 times, males realized on average less than 6 consultations (Table 28 in appendix). Between 2006 and 2011 the average number on consultations per inhabitant varies, but no clear trend can be seen. An exception is the slightly increase in the average number of consultations of people aged 70 and older. In general the share of elderly among patients consulting their GP increased in the last five years by 2.7 %-points. In 2011 the share of consultation of elderly (65+) amounts to 31 % and of people at least 70 years old 23 %.

The average number of consultations increases in general with age, with the exception of children under 5 years old, and females in the birth giving ages (Figure 7). Females have at all ages a higher number of contacts to a GP than males, except in the youngest ages. Between 2006 and 2011 the number of consultations per person were relative stable with only a slightly increase in the oldest ages.

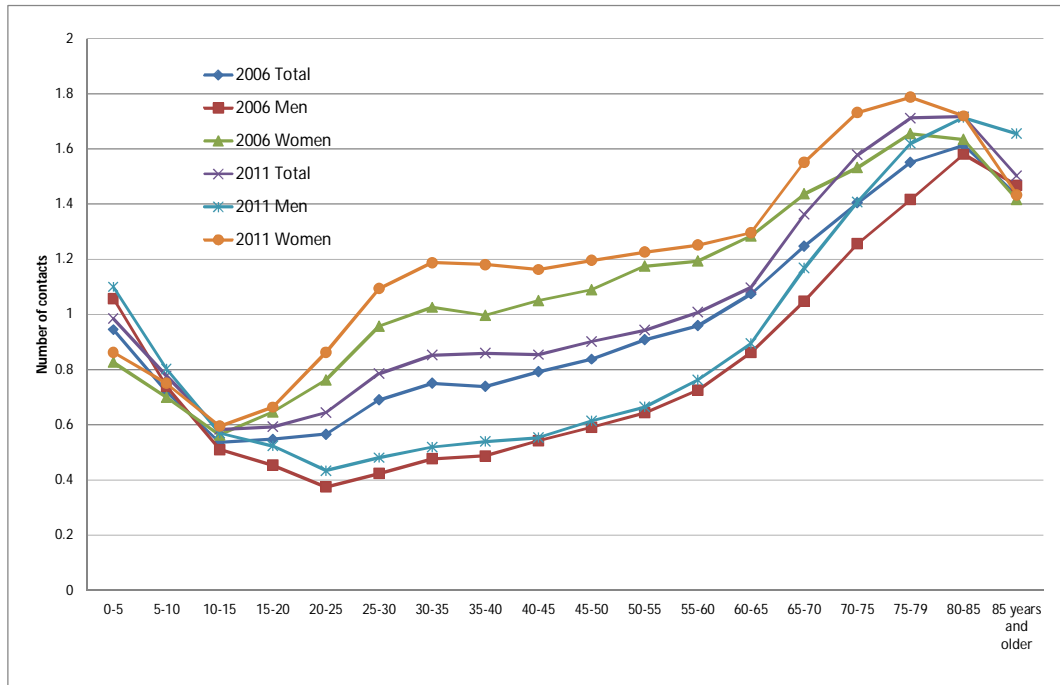
Figure 7 Average number of contacts to a GP per person per year in 2006 and 2011 (Denmark)



Source: StatBank Denmark; calculation of DIW Berlin.

GPs can refer their patients to specialists for further treatments. The number of contacts to a specialist increased between 2006 and 2011 and amounted to 5.3 million in 2011 (Table 29 in appendix). The average number of consultations increased for both sexes and also for elderly patients. The share of patients aged 65+ consulting a specialist was 27 % in 2011, the share of people 70+ around 19 %.

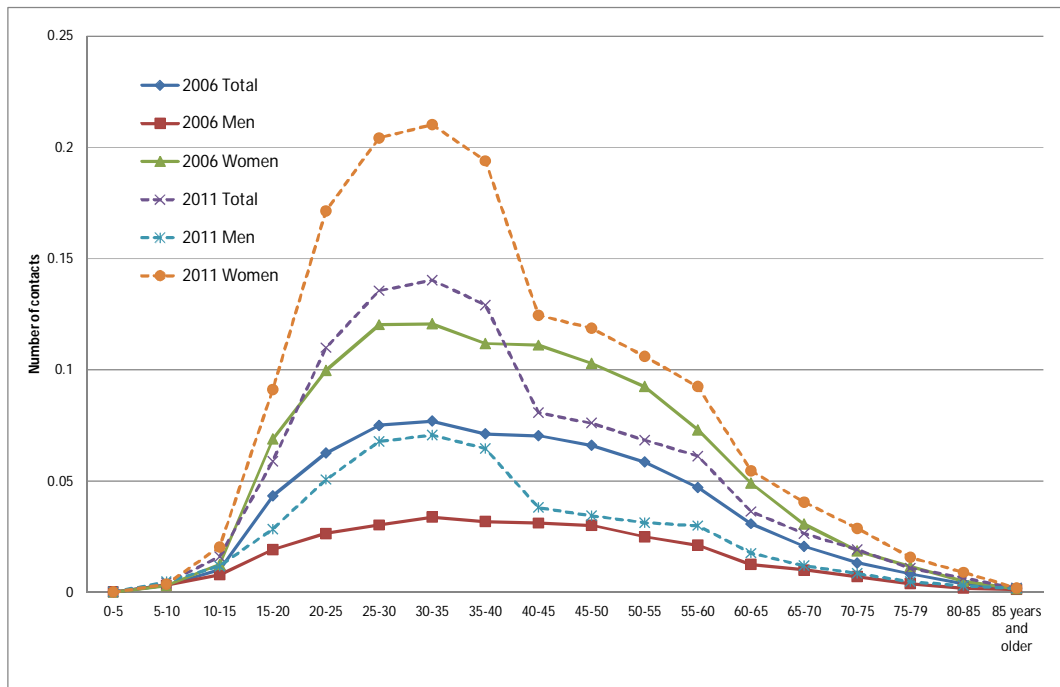
The utilization measured as consultations per person by age-groups and gender shows a slightly different figure than the consultations of GPs. The difference in the number of contacts to a specialist between males and females is significant higher, in particular in the middle age-groups (Figure 8). The average number of consultations of females is some 2 and a half times of that of males in the age-groups 25 to 44. Another phenomenon is that from the age 60 onwards the utilization rates of males and females have increased markedly between 2006 and 2011.

Figure 8 Average number of contacts to a specialist by age-groups 2006 and 2011

Source: StatBank Denmark; calculation of DIW Berlin.

In Denmark, similar to Germany, the number of persons suffering from psychological diseases increased in the past significantly. The number of contacts to a psychologist increased from 233,000 in 2006 to 345,000 in 2011 (Table 30 in appendix). Around 75 % of contacts to a psychologist were realized by female patients. In 2011 the average number of contacts to a psychologist was 3 visits per 100 males and more than 9 visits per 100 females.

Figure 9 shows the utilization by age-groups and gender. In general, the contacts to psychologists are low in the youngest ages up to 15 years and in the oldest ages (75+). In 2006, the visits to a psychologist by males increased slightly for adults, but the utilization rate was relative constant in the middle age-groups. In contrast, the number of visits to a psychologist of females increases significant after the age of 15. The utilization rate shows a peak in the age-groups 25 to 34 years, and a moderate decline thereafter. Remarkable are the changes in utilization between 2006 and 2011 for males, but in particular for females. A huge increase in the number of psychologists' visits can be observed in all age-groups, but in particular in the young working ages. In Germany a similar trend can be seen. May be that high workloads, the changes in working conditions, the reconciliation of family and working life and other stress factors contribute to the increase in psychological diseases.

Figure 9 Contacts to a psychologist by age-groups and gender 2006 and 2011

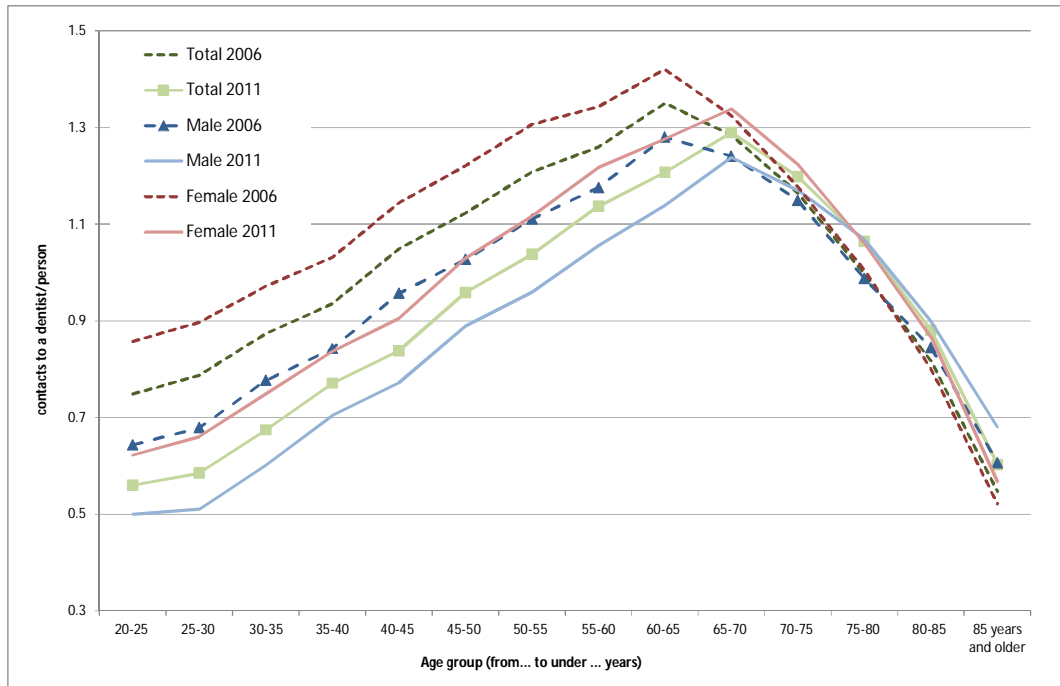
Source: StatBank Denmark; calculation of DIW Berlin.

4.2.3 Utilisation ambulatory care dentists

In Denmark, the dental care for children under 18 years old is free of charge and provided by the dentists employed by the municipalities. Dental care for adults is provided by private practising dentists and requires co-payments. For adult dental care a statistics of the number of contacts by age and gender exists. In 2011, around 3.9 million contacts to a dentist are reported; 1.8 million by males and 2.1 million by females (Table 31 in appendix). On average people visit a dentist once a year. The number of contacts to a dentist per person was a little bit lower for men than for women. Between 2006 and 2011 the average number of contacts slightly declined.

Figure 10 shows the number of contacts to a dentist by age and gender for people aged 20 and over. The number of contacts increases steadily with age up to the age-group 60-64 years, and declines thereafter. As in other health care services, females visit a dentist more often than males. Between 2006 and 2011 a decline in utilization in all age-groups up to 60-64 years can be observed, but the older ages show a slightly increase in utilization rates. Additional, a shift of the peak to from 60-64 to 65-69 can be seen.

Figure 10 Number of contacts to a dentist by sex and age-groups in 2006 and 2011 (Denmark)



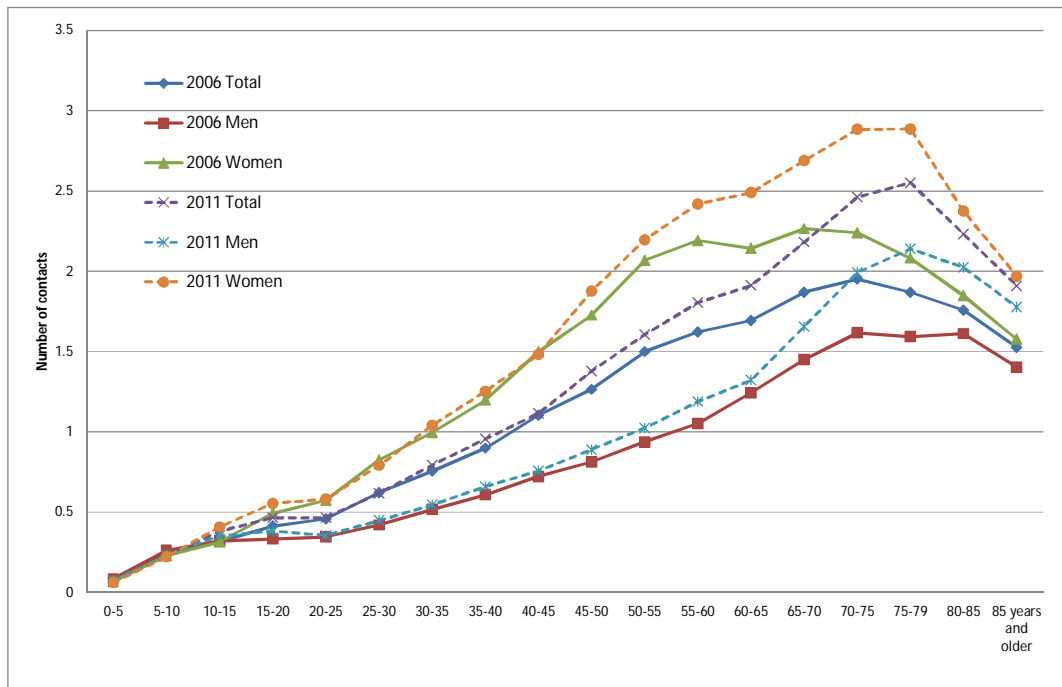
Source: StatBank Denmark; calculation of DIW Berlin.

4.2.4 Utilisation other professions

General practitioners as well as specialist can refer patients to therapeutically professionals like physiotherapists or chiropractors. Also rehabilitation measures are carried out by therapeutically professions. In 2011, around 6.5 million contacts to a physiotherapist are reported; 2.3 million by males and 4.2 million by females (Table 32 in appendix). On average people visit a physiotherapist once a year, females (1.5 times) more often than males (0.8 times). Around one third of physiotherapists' visits were done by elderly patients (65+).

Elderly have a two times higher number of contacts to a physiotherapist than on average. In 2006 the average number of contacts to physiotherapists shows a steadily increase up to the age-group 65-69 for females and 70-74 for males (Figure 11). In general, females visit a physiotherapist more often than males in all age-groups, but the difference was highest between the 45 and 69 years old. Between 2006 and 2011 the utilization rates increased in particular for the elderly patients. Preventive and rehabilitation measures for elderly have increased.

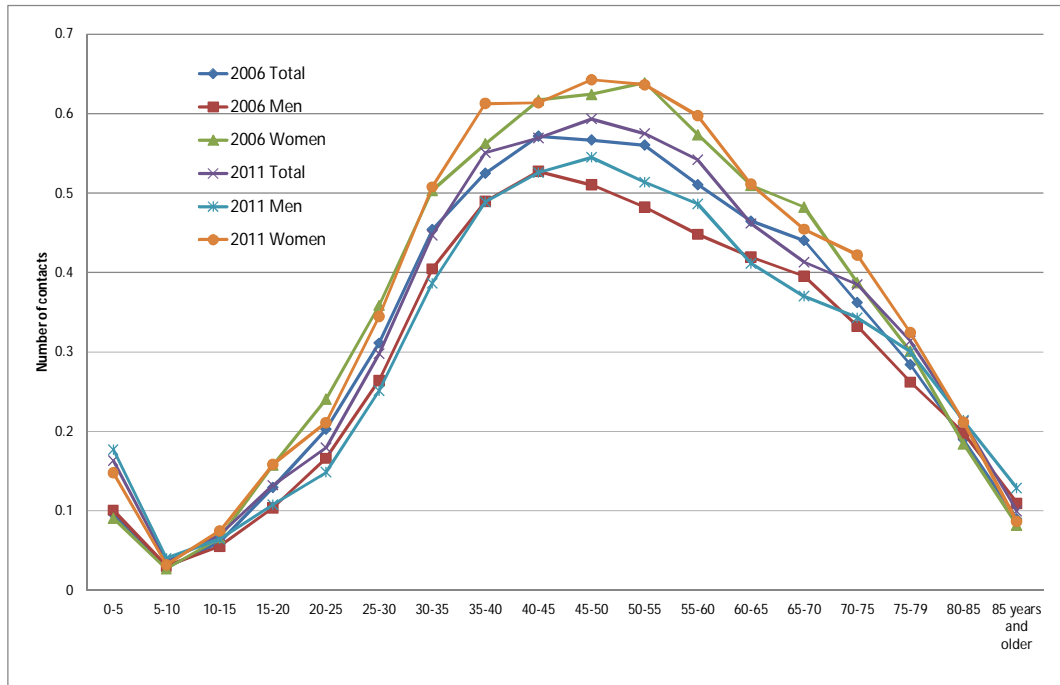
Figure 11 Contacts to a physiotherapist by age-groups and gender 2006 and 2011



Source: StatBank Denmark; calculation of DIW Berlin.

Measures by chiropractors are less frequent than by physiotherapists. In 2011, around 2 million contacts to chiropractors are reported, 0.9 million by men and 1.1 million by women (Table 33 in appendix). The number of contacts to chiropractors shows no clear trend in the last 5 years. The share of treatments provided to elderly is at 16 % significant lower than in the case of physiotherapists' treatments.

The utilization rates of chiropractors' visits show another course over the age-groups. Treatments of chiropractors are more common among persons in the middle age-groups (Figure 12). In 2011, the highest numbers of contacts were realized in the age-group 45-49 years; they are higher for females than for males. Between 2006 and 2011 only a slightly increase in utilization in the age-groups 45-59 for males can be observed.

Figure 12 Contacts to a chiropractor by age-groups and gender 2006 and 2011

Source: StatBank Denmark; calculation of DIW Berlin.

4.3 Changes in demand for health care activities and impact on personnel needed

The changes in the demand for health care services can be calculated using the population forecasts and combining them with the utilization rates for all kind of health care services. The pure demographic effect can be shown using constant age- and gender-specific utilization rates. For hospital care changes in morbidity and productivity can be taken into account by using past trends in hospitalization rates (as proxy for changes in morbidity) and changes in the length of stay (as proxy for changes in productivity). The underlying assumption is that a treatment which needs a shorter stay is more effective and efficient; an equal health outcome supposed. For the forecast the past trends in prevalence and in length of stay were halved. It is assumed that the morbidity driven increase in hospital utilization will be extenuated by the medical-technological progress, which also allows more patients to be treated in outpatient departments of the hospitals or in ambulatory facilities. In Denmark the length of hospital stay is already well below the EU average. It is assumed that the observed changes in length of stay in the past will not continue in the future, but that the annual rate of decline will be halved.

4.3.1 Status-quo-scenario

The status-quo-scenario shows the pure demographic effect on the demand for health services in 2025. The changes in demand are driven by the changes in the size of the population as well as by the changes in the age-structure. As shown above, all demographic scenarios expect an increase in population size and an ageing of the population, but to a different degree due to the underlying assumptions.

The demographic change leads to an increase in the number of hospital cases as well as in the total number of hospital days. The number of hospital cases is expected to increase by 14.6 % in the friendly scenario, by 8.5 % in the tough scenario, and by 15.4 % in the Europop scenario (Table 11). As the length of hospital stay increases with age the expected ageing of the population will lead to a higher change in hospital days compared to hospital cases. In the friendly scenario an increase in total hospital days of 19.2 % is expected, in the tough scenario of 11.7 %, and in the Europop scenario of 20.9 %. The share of elderly will increase in both cases and days. In contrast, the share of females will decline in both, cases and days.

Table 11 Changes in hospital cases and total hospital days between 2010 and 2025 - constant utilisation rates

	2010	2025			changes 2025/2010			changes 2025/2010 in %		
		tough	friendly	Europop	tough	friendly	Europop	tough	friendly	Europop
Hospital cases in million	1.3	1.4	1.5	1.5	0.1	0.2	0.2	8.5	14.6	15.4
Cases per 100 inhabitants	23.3	24.7	25.3	25.6	1.4	2.0	2.3	6.2	8.8	9.9
Hospital days in million	4.5	5.1	5.4	5.5	0.5	0.9	0.9	11.7	19.2	20.9
Average length of stay	3.5	3.6	3.7	3.7	0.1	0.1	0.2	2.9	4.1	4.8
Share women in cases	0.54	0.53	0.53	0.52	0.0	0.0	0.0	-0.8	-1.5	-2.7
Share women in hospital days	0.53	0.52	0.52	0.51	0.0	0.0	0.0	-0.7	-1.5	-3.0
Share of elderly in cases	0.38	0.43	0.45	0.46	0.1	0.1	0.1	13.8	18.5	21.6
Share of elderly in hospital days	0.50	0.55	0.57	0.58	0.1	0.1	0.1	10.6	14.5	16.7
Mean Age of patients	50.0	52.1	53.0	53.7	2.2	3.0	3.8	4.3	6.0	7.5

Source: StatBank Denmark, hospital statistics; NEUJOBS demographic scenarios D10.1; calculations of DIW Berlin.

A similar development is expected for treatments in outpatient departments in hospitals. The number of outpatient cases will increase between 7.9 % in the tough and 13.5 % in the Europop scenario; the share of elderly patients will increase in all scenarios, but the share of females is expected to decline (Table 12). The decline in the share of female inpatient and outpatient hospital treatments can be explained by the difference in the increase of life expectancy. The life expectancy of males is expected to increase by 2.2 (tough) and 5.9 (friendly) years, while the life expectancy of females will increase by 1.8 (tough) and 4.9 (friendly) years. Thus, the gap in life expectancy between females and males will decline, and the increase in elderly will be higher for males than for females.

Table 12 Changes in hospital outpatient treatment cases between 2010 and 2025 - constant utilisation rates

	2010	2025			changes 2025/2010			changes 2025/2010 in %		
		tough	friendly	Europop	tough	friendly	Europop	tough	friendly	Europop
Hospital outpatient treatment cases in million	6.7	7.2	7.5	7.6	0.5	0.8	0.9	7.9	12.3	13.5
Cases per inhabitant	1.2	1.3	1.3	1.3	0.1	0.1	0.1	5.6	6.7	8.1
Share women	0.57	0.56	0.56	0.55	0.0	0.0	0.0	-1.1	-1.8	-2.7
Share of elderly	0.35	0.40	0.41	0.42	0.1	0.1	0.1	15.4	19.0	22.0
Mean Age of patients	52.3	54.2	54.8	55.3	1.9	2.5	3.0	3.7	4.7	5.8

Source: StatBank Denmark; NEUJOBS demographic scenarios D10.1; calculations of DIW Berlin.

The demand for ambulatory health care services can be divided in two groups: one group showing an increase in prevalence rates with age, and one group showing a higher utilization in the middle age-groups. As shown above an increase in prevalence with age is observed for consultations of general practitioners, specialists, dentists (up to 65 years), and physiotherapists. For these health care services an increase in the total number of treatment cases, an increase in the average number of cases per inhabitant, and an increase in the share of elderly is expected. But the share of females will decline. The Table 13 summarizes the results, and the tables 34 to 37 in the appendix show the results for each of the mentioned health care services in detail.

The highest increase is expected for general practitioners. In the friendly scenario the number of contacts will increase by 10.6 %, in the tough scenario by 5.9 % and in the Europop scenario by 11.1 %. General practitioners act as gatekeeper and are the first contact point for persons in need for health care. Thus, changes in population size as well as changes in age-structure have a direct influence on the number of contacts to a GP. The number of contacts to a physiotherapist is expected to increase by 9.8 % in the friendly and by 6.3 % in the tough scenario. The changes in the physiotherapists' visits are influenced by the ageing of the population due to the high increase in prevalence with age.

Table 13 Changes in the number of contacts to a GP, specialist, and dentist for adults, and physiotherapist between 2010 and 2025

Number of contacts to a	2010	2025			changes 2025/2010			changes 2025/2010		
		tough	friendly	Europop	tough	friendly	Europop	tough	friendly	Europop
		in million						in %		
general practitioner (GP)	40.8	43.2	45.1	45.3	2.4	4.3	4.5	5.9	10.6	11.1
specialist	5.3	5.5	5.7	5.8	0.3	0.5	0.5	5.0	8.8	9.2
dentist for adults	3.90	4.05	4.17	4.20	0.2	0.3	0.3	4.0	7.0	7.8
physiotherapist	6.20	6.59	6.81	6.88	0.4	0.6	0.7	6.3	9.8	11.0

Source: StatBank Denmark; NEUJOBS demographic scenarios D10.1; calculations of DIW Berlin.

The changes in the number of contacts to a specialist are a little lower, 8.8 % in the friendly and 5 % in the tough scenario. The difference in the average contacts to a specialist between persons in the middle age-groups and the elderly are not as high as for physiotherapists' consultations. Also in dental care for adults an increase is

expected, although the average number of contacts declines from the age-group 65-70 onwards.

The second group of ambulatory health care services is characterized by services that are used by persons in the middle age-groups, like chiropractor treatments and treatments carried out by psychologists. In these cases the increase in population has a higher influence as the ageing process. The number of contacts is expected to increase, but to a lower degree than in the other fields of ambulatory health care. In the friendly scenario the increase is 2.7 % for chiropractor visits and 2.6 % for psychologists' visits, in the tough scenario the increase is 0.4 % each (Table 14 and Table 15). In contrast to the other ambulatory health services the average number of cases per inhabitant is expected to decline by 2.5 % in the friendly and 1.8 % in the tough scenario.

Table 14 Changes in the number of contacts to a chiropractor between 2010 and 2025 - constant utilisation rates

	2010	2025			changes 2025/2010			changes 2025/2010 in %		
		tough	friendly	Europop	tough	friendly	Europop	tough	friendly	Europop
Number of contacts in million	2.0	2.0	2.0	2.0	0.0	0.1	0.1	0.4	2.7	2.9
Cases per inhabitant	0.4	0.4	0.3	0.3	0.0	0.0	0.0	-1.8	-2.5	-2.0
Share women	0.55	0.56	0.56	0.56	0.0	0.0	0.0	0.7	0.4	0.2
Share of elderly	0.15	0.18	0.18	0.19	0.0	0.0	0.0	21.6	24.4	27.9
Mean Age of patients	46.9	48.0	48.1	48.4	1.1	1.2	1.5	2.4	2.6	3.3

Source: StatBank Denmark; NEUJOBS demographic scenarios D10.1; calculations of DIW Berlin.

Table 15 Changes in the number of contacts to a psychologist between 2010 and 2025 - constant utilisation rates

	2010	2025			changes 2025/2010			changes 2025/2010 in %		
		tough	friendly	Europop	tough	friendly	Europop	tough	friendly	Europop
Number of contacts in 1000	409	411	420	416	1.4	10.8	6.4	0.4	2.6	1.6
Cases per inhabitant	0.1	0.1	0.1	0.1	0.0	0.0	0.0	-1.8	-2.5	-3.3
Share women	0.76	0.75	0.75	0.75	0.0	0.0	0.0	-0.2	-0.2	-0.3
Share of elderly	0.03	0.04	0.04	0.04	0.0	0.0	0.0	18.0	19.0	22.9
Mean Age of patients	36.9	36.9	36.8	37.0	0.0	-0.1	0.1	-0.1	-0.2	0.2

Source: StatBank Denmark; NEUJOBS demographic scenarios D10.1; calculations of DIW Berlin.

The changes in the total number of contacts to all kinds of ambulatory health care services show Table 16. The total number includes also the contacts to other health professionals (see also Table 38 in appendix). In total the number of outpatient contacts will increase by 9.8 % in the friendly and by 5.5 % in the tough scenario. In 2025 the total number of contacts is expected to amount to 64.3 million in the friendly and 61.8 million in the tough scenario. The share of elderly will increase from 29 % in 2010 to around 35 % in 2025. The mean age of patient will increase up to 50.9 years (tough) and 51.5 years (friendly). But the share of females will decline slightly.

Table 16 Changes in the number of total contacts to health professionals between 2010 and 2025 - constant utilisation rates

	2010	2025			changes 2025/2010			changes 2025/2010 in %		
		tough	friendly	Europop	tough	friendly	Europop	tough	friendly	Europop
Number of outpatient contacts in million	58.6	61.8	64.3	64.6	3.2	5.7	6.1	5.5	9.8	10.3
Cases per inhabitant	10.6	10.9	11.0	11.1	0.3	0.4	0.5	3.2	4.2	5.1
Share women	0.60	0.60	0.60	0.59	0.0	0.0	0.0	-0.2	-0.7	-1.3
Share of elderly	0.29	0.34	0.35	0.36	0.0	0.1	0.1	16.8	21.4	24.6
Mean Age of patients	49.0	50.9	51.5	52.0	1.9	2.4	3.0	3.9	5.0	6.1

Source: StatBank Denmark; NEUJOBS demographic scenarios D10.1; calculations of DIW Berlin.

4.3.2 Changes in length of stay

The changes in total hospital days can be calculated taking changes in the length of stay as proxy for changes in productivity into account. It is assumed that the past trend will be halved. As a result the average length of hospital stay will decline from 3.5 days in 2010 to 2.5 days in 2025 (Table 17). Under this assumption the total number of hospital days will decline during the forecast period. In 2010 4.5 million hospital days were realized. In 2025 the number of hospital days will be 3.7 million in the friendly and 3.5 million in the tough scenario. Changes in the average length of stay have a significant effect on the future development.

Table 17 Changes in hospital cases and days between 2010 and 2025 – projection taking into account decline in average length of stay

	2010	2025			changes 2025/2010			changes 2025/2010 in %		
		tough	friendly	Europop	tough	friendly	Europop	tough	friendly	Europop
Hospital cases in million	1.3	1.4	1.5	1.5	0.1	0.2	0.2	8.5	14.6	15.4
Cases per 100 inhabitants	23.3	24.7	25.3	25.6	1.4	2.0	2.3	6.2	8.8	9.9
Hospital days in million	4.5	3.5	3.7	3.7	-1.1	-0.9	-0.8	-23.7	-18.9	-17.9
Average length of stay	3.5	2.5	2.5	2.5	-1.0	-1.0	-1.0	-29.7	-29.2	-28.8
Share women in cases	0.54	0.53	0.53	0.52	0.0	0.0	0.0	-0.8	-1.5	-2.7
Share women in hospital days	0.53	0.50	0.50	0.49	0.0	0.0	0.0	-4.0	-4.9	-6.3
Share of elderly in cases	0.38	0.43	0.45	0.46	0.1	0.1	0.1	13.8	18.5	21.6
Share of elderly in hospital days	0.50	0.51	0.53	0.54	0.0	0.0	0.0	1.4	5.2	7.6
Mean Age of patients	50.0	52.1	53.0	53.7	2.2	3.0	3.8	4.3	6.0	7.5

Source: StatBank Denmark, hospital statistics; NEUJOBS demographic scenarios D10.1; calculations of DIW Berlin.

4.3.3 Changes in utilisation

In another scenario we take also the changes in the prevalence of hospitalization into account. We assumed that the past trend will be halved. The increase in prevalence has

a contrary effect on the total hospital days as the reduction in the average length of stay. However, the number of hospital days is expected to decline also under these assumptions (Table 18). The changes in the length of stay have a higher impact on the future development as the changes in morbidity.

Table 18 Changes in hospital cases and hospital days between 2010 and 2025 – projection taking into account decline in average length of stays and changes in utilization

	2010	2025			changes 2025/2010			changes 2025/2010 in %		
		tough	friendly	Europop	tough	friendly	Europop	tough	friendly	Europop
Hospital cases in million	1.3	1.5	1.6	1.6	0.2	0.3	0.3	16.9	23.6	24.5
Cases per 100 inhabitants	23.3	26.6	27.3	27.6	3.3	4.0	4.3	14.4	17.3	18.6
Hospital days in million	4.5	3.7	4.0	4.0	-0.8	-0.6	-0.5	-17.8	-12.4	-11.2
Average length of stay	3.5	2.5	2.5	2.5	-1.0	-1.0	-1.0	-29.6	-29.1	-28.7
Share women in cases	0.54	0.54	0.53	0.53	0.0	0.0	0.0	-0.1	-0.9	-2.0
Share women in hospital days	0.53	0.51	0.50	0.50	0.0	0.0	0.0	-3.0	-3.9	-5.3
Share of elderly in cases	0.38	0.43	0.45	0.46	0.1	0.1	0.1	15.0	19.9	23.1
Share of elderly in hospital days	0.50	0.51	0.53	0.54	0.0	0.0	0.0	2.5	6.5	8.8
Mean Age of patients	50.0	52.5	53.4	54.2	2.6	3.4	4.2	5.1	6.9	8.4

Source: StatBank Denmark, hospital statistics; NEUJOBS demographic scenarios D10.1; calculations of DIW Berlin.

4.4 Impact on health care workforce demand

In Denmark information on employees by facilities and occupations is rare. Beside the EU LFS the Statistics Denmark provides data on hospital employment by occupations. These data are used to calculate the number of total hospital days per employee in 2010. This ratio was held constant to calculate the needed hospital staff based on changes of hospital utilization measured in total hospital days. According to the hospital statistics, in 2010 some 115,000 persons were employed in hospitals thereof 15,000 physicians and 38,000 nurses (Table 19). As there is no detailed information on personnel needed by occupations or for specific treatments, it is expected that the current occupational structure will be constant over time. Thus, the employment in all occupations will increase like the total employment in hospitals. This is also assumed for midwives, because in Denmark the number of children aged under 5 years will increase in all demographic scenarios (contrary to the situation in Germany). The needed hospital personnel will increase by 11,000 in the tough scenario and 17,000 in the friendly scenario. The increase in hospital demand requires additional nursing staff of 3,600 in the tough and 5,800 in the friendly scenario. To meet the demand the number of physicians employed in hospitals has to increase by 1,400 in the tough and 2,200 in the friendly scenario.

Information on practising physicians and dentists and employment in other ambulatory health care activities is rare. Only the 'Health Systems in Transition' report

for Denmark (HiT Denmark 2012) mentioned the number of general practitioners (3,600) and the number of practising dentists (3,300). Thus, only the development of the total employment needed for “medical and dental care activities” can be calculated. In the tough scenario additional 3,200 employees are needed, and in the friendly scenario 5,600. The demand for primary care activities by general practitioners will be higher than for dentists’ activities.

Table 19 Changes in personnel needed

	2010	2025			changes 2025/2010			changes 2025/2010 in %		
		tough	friendly	Europop	tough	friendly	Europop	tough	friendly	Europop
Employment in hospital activities (persons)										
Physicians	14 592	15 971	16 800	17 005	1 379	2 207	2 413	9.5	15.1	16.5
Nurses	38 126	41 730	43 893	44 430	3 604	5 767	6 304	9.5	15.1	16.5
Pharmacists	335	366	385	390	32	51	55	9.5	15.1	16.5
Chiropractors	24	27	28	28	2	4	4	9.5	15.1	16.5
Dentists	93	102	108	109	9	14	15	9.5	15.1	16.5
Occupational therapist	1 189	1 301	1 369	1 386	112	180	197	9.5	15.1	16.5
Physiotherapist	1 969	2 155	2 267	2 295	186	298	326	9.5	15.1	16.5
Midwives	1 532	1 677	1 764	1 785	145	232	253	9.5	15.1	16.5
Bioanalysts	5 714	6 254	6 578	6 658	540	864	945	9.5	15.1	16.5
Radiographer	1 428	1 563	1 645	1 665	135	216	236	9.5	15.1	16.5
Other health professions	276	302	317	321	26	42	46	9.5	15.1	16.5
Assistants	958	1 049	1 103	1 117	91	145	158	9.5	15.1	16.5
Social and health care assistants	14 518	15 890	16 714	16 918	1 372	2 196	2 400	9.5	15.1	16.5
Other patient oriented functions	14 547	15 922	16 747	16 952	1 375	2 200	2 405	9.5	15.1	16.5
Administrative and other staff	19 956	21 842	22 974	23 255	1 886	3 019	3 299	9.5	15.1	16.5
Total personnel (needed)	115 257	126 151	132 692	134 313	10 894	17 435	19 056	9.5	15.1	16.5
Employment in ambulatory care activities (persons)										
Medical and dental care activities total	57 122	60 282	62 702	63 030	3 160	5 580	5 908	5.5	9.8	10.3
<i>thereof</i>										
GP (HiT 2012)	3 600	3 814	3 981	4 000	214	381	400	5.9	10.6	11.1
Dentist (private practice) (HiT 201)	3 300	3 433	3 530	3 556	133	230	256	4.0	7.0	7.8
Employment in hospital and ambulatory health care activities (persons)										
Total	172 379	186 433	195 394	197 344	14 054	23 015	24 965	8.2	13.4	14.5

Source: Calculation of DIW Berlin.

5 Estimation of labour supply in curative health care

In the next two sections 5 and 6 the expected changes in the health workforce supply is discussed. As mentioned above (in section 3) we are using a top down approach to calculate the labour supply in health care. This approach requires a stepwise procedure:

At first the changes in total labour force has to be calculated. The two demographic scenarios, friendly and tough, provide data on the changes of the population in working age differentiated by education level. The EU LFS provides information on the labour force participation of men and women differentiated by age-groups and education level. Based on this information the future labour force is calculated in two variants a) using constant labour force participation rates, and b) taking changes in

labour force participation in particular of females and elderly into account. In section 5 this calculation of the total labour force is carried out.

The total labour force provides information on the size of the workforce available. The labour force comprises employed and unemployed people. To calculate the total employment and the employment in health care sector, the labour force has to be split into employment and unemployment. This requires a model taken into account the overall economic development and that allows for the simultaneous modelling of the supply and demand side of the labour market. In the NEUJOBS project the so called New Economic Model of Evaluation by Sectorial Interdependency and Supply (NEMESIS model) is used (Boitier et al 2013). The NEMESIS model provides information on the total employment and the employment broken down by broad groups of industries for all EU countries. Based on this information in section 6 the changes in employment in the health care sector are calculated.

5.1 Working age population

In general, the potential workforce is defined as people between 15 and 64 years old. In the past decades labour force participation of people over 64 was low and in some countries nearly zero. This is expected to change significantly in the future due to modifications in the pensions systems. The activity rates have already increased in the older working age groups. Therefore we also provide figures for an extended potential workforce, people aged 15 to 69 (Table 20).

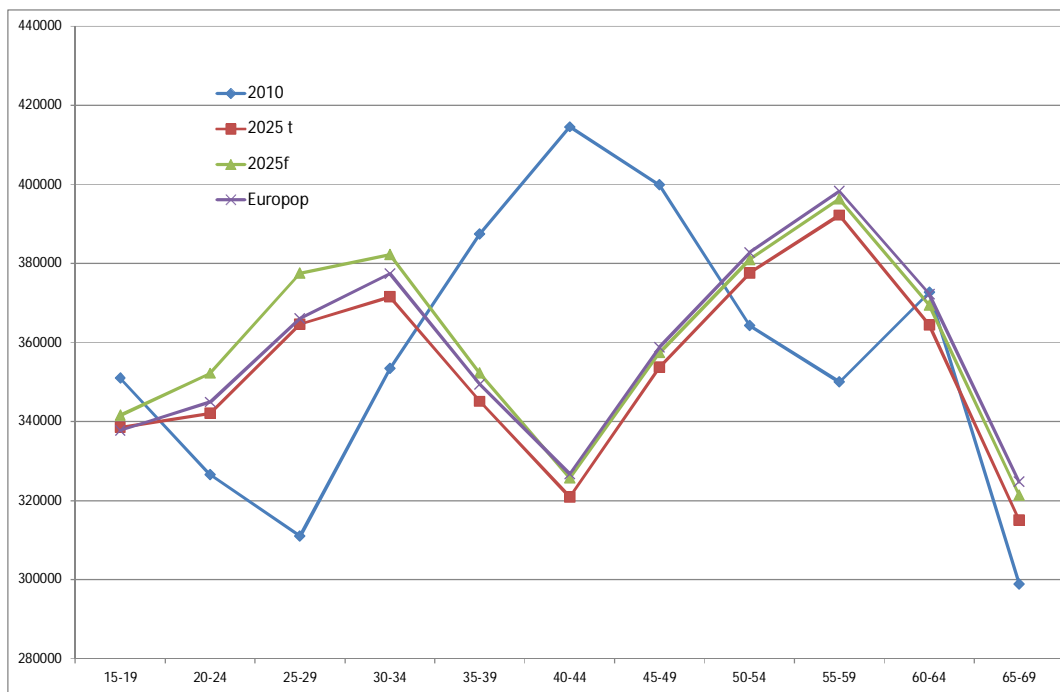
Table 20 Potential workforce and mean age in 2010 and 2025

2010	2025			Changes 2025/2010			Changes 2025/2010 in %		
	Friendly	Tough	Europop	Friendly	Tough	Europop	Friendly	Tough	Europop
Potential workforce I (15 - 64) in millions									
3.63	3.64	3.57	3.61	0.01	-0.06	-0.02	0.14	-1.65	-0.44
Potential workforce II (15 - 69) in millions									
3.93	3.96	3.89	3.94	0.03	-0.04	0.01	0.70	-1.11	0.25
Population in young working age (15-24) in 1000									
677	694	681	683	16	3	5	2.41	0.47	0.77
Population in prime working age (25-54) in 1000									
2230	2176	2133	2161	-54	-97	-69	-2.44	-4.35	-3.10
Population in old working age I (55-64) in 1000									
723	766	757	771	43	34	48	5.97	4.70	6.63
Population in old working age II (55-69) in 1000									
1022	1087	1072	1095	66	50	74	6.43	4.91	7.22
Mean age (15-64) in years									
40.55	40.33	40.40	40.48	-0.22	-0.15	-0.07			
Mean age (15-69) in years									
42.60	42.53	42.60	42.70	-0.06	0.00	0.11			

Source: Europop 2010, NEUJOBS D10.1 and D10.2 (version March 2013), calculation of DIW Berlin.

In 2010 the potential workforce (15-69) amounted to 3.9 million, thereof 677,000 in young working age (15-24), 2.2 million in prime working age (25-54), and 1 million in old working age (55-69). During the next 15 years only slightly changes in the potential workforce (15-69) is expected. In the friendly scenario an increase by 0.7 % is calculated, in the tough scenario a decline by 1.1 %. Relevant is the change in the age-structure. The relative high fertility rate and the expected net migration will lead to an increase in the number of people in young working age. The decline in prime working age can be traced back to the shift of the currently high peak in the age-group 35-44 to higher ages (see Figure 13). This dominates also the increase in old working age. The number of people in prime working age will decline by 54,000 in the friendly and 97,000 in the tough scenario. The number of people in old working age (55-69) will increase by 66,000 in the friendly and 50,000 in the tough scenario. But the mean age of the working age population will be nearly constant.

Figure 13 Development of people in working age in Denmark



Sources: Europop2010, NIDI tough and friendly D10.2

The future labour force is not only influenced by the changes in the size and age-structure of the population, but also by the changes in skill levels. The labour force participation behaviour, in particular of women, depends on the achieved education level. The population forecast provides also an estimation of the changes in the education levels (Huisman et al 2013). In 2010 25 % of males and 29 % of females (15-74 years) were high educated (ISCED level 5+6). It is assumed that the share of high educated people will increase during the next 15 years. The share of high educated males is expected to increase to 30 % in the tough and 33 % in the friendly scenario.

The share of high educated females will increase to 37 % in the tough and 41 % in the friendly scenario.

5.2 Changes in labour force participation rates

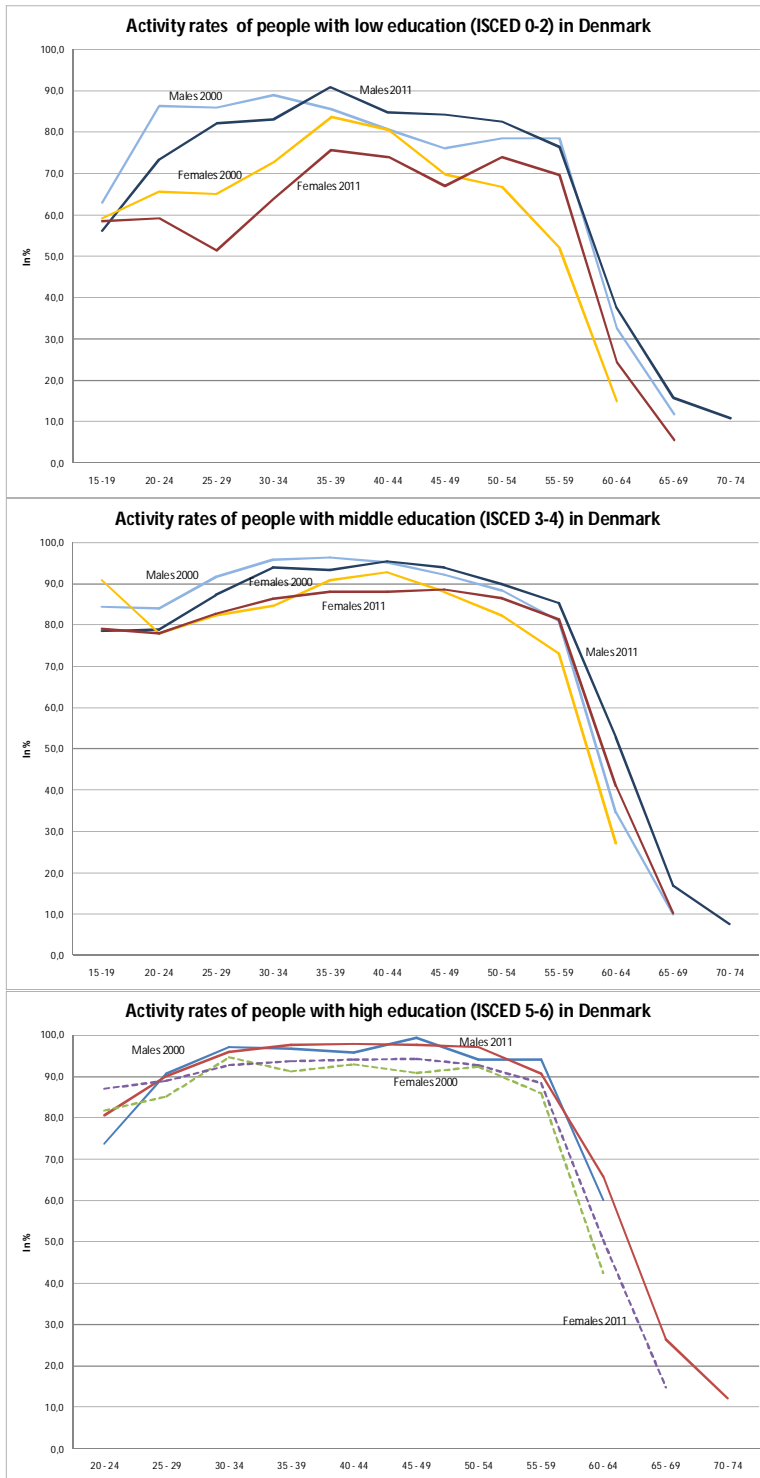
According to the definition of the International Labour Organisation are people classified as active at the labour market, if they are working at least one hour per week or if they are unemployed, but searching for a job. That means, also marginal employment is included. The activity rates (or labour force participation rates), show the share of the employed and unemployed people in the population in the age-groups. Figure 14 shows the activity rates of males and females by education levels.

The higher is education level the higher the activity rates for both, males and females. *High educated people* realized in the prime working age activity rates between 90 % and nearly 100 %. High educated females realized slightly lower activity rates than males. During the past decade only marginal changes in activity rates can be seen, except in the oldest working age-groups. The activity rates of persons aged 60-64 years increased by 5.7 %-points for males and by 8.1 %-points for females. The activity rates of persons aged 65-69 years increased by 6.3 %-points (males) and 6.9 %-points (females). In 2011, around 26 % of males and 15 % of females in the age-group 65-69 were active at the labour market..

People with *middle education* (ISCED level 3-4) participate to a little bit lower degree at the labour market. In 2011, the activity rates for males in prime working age was some 95 %, the activity rates for females was lower than 90 %. Between 2000 and 2011 the activity rates declined slightly for both males and females in the young and prime working age. In contrast, the activity rates of older people with middle education increased, in the age-group 60-64 by 18 %-points for men and 14 %-points for women, and in the age-group 65-69 by around 7 %-points each. In 2011 around 17.5 % of males and 10% of females were active at the labour market (age-group 65-69)

People with a *low education* realized lower activity rates than middle or high educated people. In particular females in young working age and also in the birth giving age-groups were only to 50-60 % active at the labour market. Between 30 and 40 years of age the activity rate of female increased, shows afterwards a slightly decline until the age of 60 and falls rapidly thereafter. Remarkable is the decline in female activity rates in young and prime working age between 2000 and 2011. In 2011 low educated males realized activity rates in prime working age between 80 % and 90 %. Between 2000 and 2011 the labour force participation rates of males in the middle age-groups increased slightly. The activity rates of persons in the older working age-groups increased also for people with low education, but the increase was smaller. The activity rate of persons aged 60-64 increased by 5 %-points for men and 9 %-points for women; and in the age-group 65-69 by 4 %-points (men) and 6 %-points (women). In 2011, around 16 % of males and 6 % of females were active at the labour market (65-69 years).

Figure 14 Labour force participation rates by education level in Denmark



Sources: Eurostat; LFS; calculation of DIW Berlin.

5.3 Development of total labour force

The future labour force is calculated using the demographic scenarios friendly and tough differentiated by gender, age-groups and education level as well as the activity rates in the same demarcation. The labour force is calculated in two ways: firstly using constant activity rates of 2010, and secondly taking the changes in labour force participation in the last decade into account. The average yearly growth rates were calculated and we assumed half of these growths for the next 15 years.

The variant with constant activity rates shows the impact of population change and changing education levels on the labour force. As the size of the working age population will change only slightly, the changes in age-structure dominates the future development of the labour force. The labour force was 2.95 million in 2010 and will be nearly constant during the next 15 years (Table 21). Due to changes in educational structure the share of females will increase slightly by around 0.4 %-points. In 2010 the share of elderly workforce (55+) was 17 %. The share of elderly workforce will increase by around 2 %-points in the tough and 1.8 %-points in the friendly scenario.

Table 21 Development of labour force in Denmark

	2010	2025			Changes 2025/2010*		
	Base year	tough	friendly	Europop	tough	friendly	Europop
		constant activity rates					
Labour force in millions	2.95	2.94	3.00	2.98	-0.01	0.06	0.03
men	1.55	1.53	1.57	1.56	-0.02	0.02	0.01
women	1.40	1.40	1.44	1.42	0.01	0.04	0.02
Share females (%)	47.40	47.80	47.85	47.71	0.40	0.45	0.31
Share 55+ (%)	16.68	18.64	18.48	18.77	1.96	1.80	2.10
men	17.85	19.57	19.49	19.76	1.72	1.63	1.91
women	15.37	17.62	17.37	17.69	2.25	2.00	2.32
Share higher educated (%)	32.14	38.56	42.45		6.42	10.31	
men	28.88	34.11	37.73		5.22	8.85	
women	35.75	43.42	47.59		7.67	11.84	
		increasing activity rates					
Labour force in millions	2.95	2.99	3.06	3.03	0.05	0.12	0.09
men	1.55	1.55	1.58	1.57	0.00	0.03	0.02
women	1.40	1.45	1.48	1.46	0.05	0.09	0.07
Share females (%)	47.40	48.35	48.44	48.26	0.95	1.04	0.86
Share 55+ (%)	16.68	21.11	20.89	21.26	4.43	4.21	4.58
men	17.85	21.57	21.46	21.78	3.71	3.61	3.93
women	15.37	20.62	20.29	20.71	5.25	4.91	5.33
Share higher educated (%)	32.14	38.78	42.56		6.65	10.42	
men	28.88	34.25	37.79		5.36	8.91	
women	35.75	43.63	47.63		7.88	11.89	
*) Changes of labour force in millions; changes of share in %-points.							
Source: D10.2 population projection; Eurostat, activity rates by education level; calculation of DIW Berlin.							

Taking changes in activity rates into account, in particular the increase in labour force participation of the elderly, changes the picture only marginal. The labour force is expected to increase by 50,000 in the tough and 120,000 in the friendly scenario. The share of females will increase by 1 %-points. Due to the increase in activity rates of the elderly the share of the labour force at least 55 years old will increase from 17 % in 2010 to around 21 % in 2025. The share of the higher educated workforce will increase by 6.7 %-points in the tough and 10.4 %-points in the friendly scenario.

6 Estimations of labour force in curative health care

The estimated labour force shows the development of the people active at the labour market, independently of their employment status. In Denmark a relative constant size of the labour force is expected, but the estimation do not provide any information on the changes in employment and unemployment. Projections of the economic growth, employment and unemployment are carried out by the ERASME team using the NEMESIS model (**N**ew **E**conometric **M**odel of **E**valuation by **S**ectoral **I**nterdependency and **S**upply) (Boitier et al 2013). In the NEUJOBS project the NEMESIS model is used to show some quantitative socio-economic and environmental results in the framework of the "socio-ecological transition". The NEMESIS model is based on detailed sectorial models for each of the EU-27 using data from National Accounts. It provides results for the economic development, changes in industrial structures, labour supply and sectorial employment for 30 NEMESIS sectors. One is the grouped sector "non-market services". The non-market sector comprises of the NACE2 industries O "Public administration and defence, compulsory social security", P "Education", Q86 "Human health services", Q87+88 "residential care activities and social work activities without accommodation", R90-92 "Creative, arts and entertainment activities, libraries, museums, cultural activities etc.", R93 "Sports activities, amusement + recreation activities" and S94 "Activities of membership organisations". For countries for which input-output-tables are available a downscaling of the employment to NACE2 sectors was carried out. But that could not be done for Denmark. For Denmark the NEMESIS model provide information on the total labour force, the total employment by education level, the unemployment and the employment in the NEMESIS sector 'non-market services'. To show the development of the employment in human health care we had to carry out a kind of downscaling ourselves. We used the information at the NACE2 level from the National Accounts and calculated the historic shares of Q86 and Q87+88 sectors. We used constant shares to calculate the employment in 2025.

6.1 Estimation of labour force and employees by the NEMESIS model

According to the National Accounts the total labour force was 2.985 million in 2010 (Table 22). There is only a slightly difference to the labour force based on the EU LFS

data. The NEMESIS model calculated an increase in labour force to 3.06 million in the friendly and to 3.02 million in the tough scenario. These estimations are in line with the results based on increasing activity rates in section 5.

While the labour force is expected to be nearly constant over time, the employment is expected to increase by 112,000 in the friendly scenario and to decline by 43,000 in the tough scenario. For the non-market services a higher dynamic is expected. In the friendly scenario the employment will increase by more than 14 %, in the tough scenario by 4.8 %. While in the friendly scenario the employment is expected to increase for high educated as well as for low educated workers, in the tough scenario a decline in high educated employment is calculated. In 2010 510,000 people were employed in sector Q that is 52 % of the employment in 'non-market services'. Under the assumption that the share of sector Q in non-market services will be constant, the employment in sector Q as well as in human health care will increase in line with the employment in non-market services. In human health care an increase in employment by 24,000 in the friendly and 8,000 in the tough scenario is calculated.

Table 22 Results of NEMESIS model

NEMESIS Model	2010	2025		Changes 2025/2010			
		friendly	tough	friendly	tough	friendly	tough
		in 1000 persons				in %	
Labour force	2 985	3 058	3 020	73	35	2.45	1.17
Total employment	2 760	2 872	2 717	112	-43	4.06	-1.56
High education	900	1 219	1 056	319	156	35.44	17.33
Low education	1 859	1 653	1 661	-206	-198	-11.08	-10.65
Non-market services							
Employment	973	1 111	1 020	138	47	14.17	4.78
High education	463	529	449	66	-14	14.17	-3.07
Low education	510	582	571	72	61	14.18	11.90
Sector Q	510	582	534	72	24	14.17	4.78
Sector Q86	170	194	178	24	8	14.17	4.78
Source: Boitier et al 2013; calculation of DIW Berlin.							

7 Summary and discussion

According to the calculation of the demand for health workforce based on the utilization approach, a moderate change in needed health workforce in acute health care services is expected. In 2025, the needed health workforce will amount to around 186,000 in the tough scenario and about 195,000 in the friendly scenario. Thus, in the tough scenario an increase in demand for health workforce by 8.2 % and in the friendly scenario by 13.4 % is calculated.

This estimation has some limitations. First, constant utilization rates are assumed as well as constant ratios of employees in service provision to patients. Second, no changes of health care provision between facilities are taken into account (shift from institutional full-time care to outpatient care in hospitals, shift to ambulant surgery). Third, no new treatment and diagnostic methods are taken into account, no new diseases. The projection shows the pure demographic effect.

For hospitals changes in utilization and productivity can be taken into account. Taken changes in length of stay (proxy for productivity) and changes in utilization (proxy for need for care) into account will lead to a reduction in the need for personnel. In hospitals the total care days will decline by -18 % (tough) and -12 % (friendly) until 2025.

The calculated changes in the need for health workforce can be compared with the NEMESIS results concerning the employment in 'non-market services' that includes also health care and social services. In the friendly scenario the expected change in employment is a little bit higher than the calculated change in the need for health workforce: 14.2 % increase in employment compared to 13.4 % increase in needed health workforce. The changes in employment are high enough to meet the demographic driven increase in demand. In the tough scenario the demographic driven change in demand is higher than the calculated increase in employment: 4.8 % increase in employment compared to 8.2 % increase in demand for health workforce. Thus, in the tough scenario the current reported shortage of health workforce in some rural areas may be continue and might be tighten.

While the demand side shows the pure demographic effect, the NEMESIS model takes also the economic growth and the changes in industrial structure into account. Under the framework conditions of the friendly scenario a high economic growth is expected and a shift to a green economy. The economic development is a precondition of the possibility to increase public spending on education and research (also in universities), and to increase the number of places in medicine courses. The increase in public and private spending on research and development may support medical-technological innovations that increase the possibility to treat people. The experience in the past was that new medical treatment methods increased the demand for these new treatments as well as the supply. Both have an impact on the health workforce.

As in Denmark most hospitals are own and run by the regions, the high expected economic growth in the friendly scenario will increase the scope of financing additional staff in hospitals as well as in municipal health care services. Inpatient and outpatient treatments in hospitals play a dominant role in health care provision and employment. Around 115,000 out of 172,000 health care workers are employed in hospitals, and in municipality ambulatory care additional around 5,000 health professionals.

In the tough scenario a lower economic growth is expected. Under this condition an expansion of the health workforce is limited due to financial restrictions. Nevertheless, other measures can be undertaken to increase the attractiveness of working places in hospitals and outpatient practices, for example reduction of workload, more flexibility

in working times, measures to increase the possibility to combine family life and career. To increase the potential workforce in nursing and care males have to be encouraged to work in these traditional female occupations. In general, measures have to be undertaken to increase the incentives to reduce the number of health professionals working outside the health care sector or who are not directly engaged in health care provision to the patients as well as to increase the average length of stay in health care workplaces, in particular in nursing and caring activities.

In general, it is easier to deal with the existing regional disparities in the favourable situation of the friendly scenario, while in the tough scenario the regional discrepancies may be tighten. In the last years measures were undertaken to recruit health professionals from other countries. The recruitment of personal from third countries outside the EU is limited due to ethical recruitment principles. Health professionals will be not recruited in countries showing a shortage of health workforce. Across the EU countries free movement of workers are guaranteed. But the sending countries may also experience a shortage of health professionals and significant (also temporary) emigrations may be a problem for other EU countries. In the demographic scenarios positive net migrations are assumed. The experience in the past was that a majority of migrants are in young and middle working age. This migration was taken into account in the demographic scenarios, but no assumption of the qualification or occupational structure of migration flows have made.

To sum up, under the framework conditions of the friendly scenario the estimated change in health care employment will meet the increasing demand for health care workforce. In the tough scenario the increase in employment is expected to be lower than the increase in demand for health workforce. The current shortage of the health workforce in some regions may be tightening. The results on the demand side show the pure demographic effect. Other non-demographic factors are also important for the future demand for health care services and its workforce, in particular the medical-technological progress. These factors can't be taken into account due to data restrictions. Further research is needed to include all relevant influencing factors.

Appendix: Health care system

Regulations and conditions influencing the demand for health care services and the needed employment

While the Danish health system provides two options to be covered by the system, almost all inhabitants (99%) refer to the so called Group1, that is to say they prefer the referring system. They are allowed to consult emergency wards, dentists, chiropractors, ear, nose and throat specialists or ophthalmologists without prior referral, but their general practitioner (GP) must refer them to all other medical specialties, physiotherapeutic and hospital treatments. Consultation with a GP or specialist is free of charge, while other services require co-payments (dental care, podiatry, psychology consultations, chiropractic's and physiotherapy). Visits to specialists and other health care professionals without referrals have to be paid privately. Patients are allowed to change their GP for a nominal fee at any time.

In Group 2, individuals are free to consult any GP and any specialist without referral. The region will subsidize the expenses up to the cost of the corresponding treatment for a patient in Group 1. The same rules apply to treatments by podiatrists, psychologists, dentists, chiropractors and physiotherapists. Hospital treatments are free. Only a minority of the population (1%) chooses this option, probably due to the level of general satisfaction with the referral system. (Pedersen et al 2011)

Regulations and conditions influencing the supply of services and employees (referring to HiT Denmark 2012)

The primary sector consists of private (self-employed) practitioners (GPs, specialists, physiotherapists, dentists, chiropractors and pharmacists) and municipal health services, such as nursing homes, home nurses, health visitors and municipal dentists. The GPs act as gatekeepers, referring patients to hospital and specialist treatments.

Most secondary and tertiary care takes place in general hospitals owned and operated by the regions. Doctors and other health professionals are employed in hospitals on a salaried basis. Hospitals have both inpatient and outpatient clinics as well as 24-hour emergency wards. Outpatient clinics are often used for pre- or post-hospitalization diagnosis and treatments. Most public hospitals are general hospitals with different specialization levels.

Oral health care for children and adolescents is provided by the municipal dental service. Dental health care for adults (18+ years) is offered by private dental practitioners.

Community pharmacies are privately organized but subject to comprehensive state regulation on price and location to ensure that everybody has reasonable access to a pharmacy, even in rural areas.

Many actors are involved in rehabilitation care within the health care sector, the social sector, the occupational sector and the educational sector; with each sector carrying out

a different aspect of work. The splitting of tasks and responsibilities in rehabilitation and intermediate care is a problem in particular of securing coherent patient pathways.

The major structural reform of 2007 changed the administrative landscape of Denmark by creating larger municipalities and regions and redistributing tasks and responsibilities. Modernization of the hospital sector has included a restructuring of acute care, with centralization of units in so-called “joint acute wards”.

At the state level, the Ministry of Health has a governing role over regional and municipal organization and management of health care, as well as the supervision and partial financing of the municipalities and regions. In the field of health care, the Ministry is in charge of the administrative functions that are related to the organization of hospitals, community psychiatry and self-employed health professionals with agreements with the region, as well as the market authorization of pharmaceuticals and supervision of the pharmacy sector. Prevention and health promotion are also part of the Ministry’s remit.

The National Board of Health (in 2013 renamed in Danish Health and Medicines Authority), a central body established in 1903 and now connected to the Ministry of Health, is responsible for supervising health personnel and institutions, and for advising different ministries, regions and municipalities on health issues. Furthermore, the National Board of Health is responsible for planning the distribution of medical specialties among hospitals.

The regions own and run hospitals, prenatal care centres and community psychiatric units and they finance GPs, specialists, physiotherapists, dentists and pharmaceuticals. Reimbursements for private practitioners and salaries for employed health professionals are agreed through negotiations between Danish Regions and the different professional organizations. The Ministry of Health, the Ministry of Finance and Local Government Denmark also participate in these negotiations.

The 98 municipalities are also governed by councils elected every four years (the elections take place at the same time as regional council elections). They are responsible for providing services such as nursing homes, home nurses, health visitors, school health care, and dental care for some groups, municipal dentists, prevention and health promotion, and institutions for people with special needs (i.e. people with disabilities, treatment for drug- and alcohol-related problems, and school health services). These activities are financed by taxes, with funds distributed through global budgets and carried out by salaried health professionals. Salaries and working conditions are negotiated by Local Government Denmark and the different professional organizations.

Local Government Denmark is the interest organization of the municipalities in Denmark. The distribution of seats in the political committees is based on the elections to the local town councils.

Following the 2007 reform, the Health Act 2005 was revised. Statutory cooperation between municipalities and regions was established in the form of mandatory regional health care agreements covering issues such as coordination of treatment, prevention, discharge and rehabilitation. The health care agreements are anchored in regional

consultative committees consisting of representatives from the region, the municipalities within the region and private practitioners.

The regions' interest organization, Danish Regions, influences planning in the health system as it negotiates the annual financial frames of the regions with the state as well as the pay and working conditions for regional employees as it is the regions' central employer and bargaining organization. In this way, the regions, as one collective body, can to some extent regulate the number of people employed in hospitals and the number of private practitioners entitled to reimbursement from the regions. An even geographical distribution of GPs was further strengthened through practice planning from 1976. Furthermore, the regions' collective negotiations with professional organizations can to some extent regulate the activities of private practitioners by associating certain activities with fees, thereby creating an incentive for private practitioners to carry out certain activities. An example of this was the introduction of special fees for preventive advisory talks given by GPs. These have been removed again in the most recent negotiations. The degree of decentralization can, however, be questioned as these are examples of the regions acting collectively through their interest organizations. Therefore, the individual regional council's influence is more limited.

Each region can determine the size, content and costs of hospital activities through detailed budgets. These budgets enable them to specify which treatments should be offered and which technical equipment should be bought. The regions' opportunities to plan their own capacity is, however, reduced by: (1) choice, which allows hospital patients access to treatment in other regions; (2) waiting list guarantees, which force them to prioritize specific interventions/treatments; and (3) various initiatives, which have been introduced by centrally conceived legislation or agreements (Vrangbæk, 1999).

The role of the state is mainly to regulate and contain expenditure and to provide some general guidelines for the health care sector. There is no national health plan for the development of the health sector. In terms of organization, the five regions are responsible for providing hospital, somatic and psychiatric care, and for financing private practitioners (such as GPs, practising specialists, dentists, physiotherapists, chiropractors, and so on) for their public sector work. Private practitioners are self-employed but reimbursed for their services by the regions. However, only those who have a prior agreement with the regions are reimbursed, based on a negotiated number of doctors per 1000 inhabitants. Very few doctors work without such an agreement. A few private profit-making clinics and small hospitals are also paid by the regions for attending to patients according to contracts or waiting time guarantees. Furthermore, municipalities employ health care providers, who mainly take care of children and the older people.

There is a licensing system for health care professionals but not for health care facilities. However, a number of quality standards in the Danish model for accreditation pertain to physical structure. Health care facilities are supervised and increasingly governed by the National Board of Health.

The state has an element of control over the supply of health professionals, since the training of authorized health professionals (with a few exceptions) is public. This is the

case when there are applicants for all places, which has not always been the case for nurses. The state can also influence health professionals' qualifications by determining the content of their training. Training is regulated centrally by the Ministry of Science, Technology and Innovation, together with a number of councils, such as the Health Training Council and the Social and Health Training Council, which work in cooperation with the Ministry of Health, the National Board of Health and others. Further training in the health sector for specialists is the responsibility of the National Board of Health, and it is adjusted continually to meet the needs of the health sector with regard to subjects, content and capacity. Postgraduate training programmes for medical specialties, including general practice, are defined by the Ministry of Health based on advice from the National Board of Health and the National Council for Postgraduate Education of Physicians.

The state decides which professions are to be reimbursed by the regions. There are certain quotas, for example for physiotherapists, and in order to buy a general practice, authorization as a GP is required from the National Board of Health plus a license from the regions. Dentists, however, can establish a practice wherever they choose and still be reimbursed by the regions. The regions limit the number of GPs entitled to receive reimbursement as a means of controlling costs. The number of GPs, measured per 1000 population, is negotiated by each region and representatives of the GPs working in the region.

Appendix: Statistics

Table 23 Share of human health care workforce in total health and social work sector, and age-structure of human health care workforce in Denmark 2011 (in %)

Age-groups	Human health care			Human health care			Share females
	Share in sector Q			Age-structure			
	Total	Males	Females	Total	Males	Females	
15 - 24	22.7	18.3	24.3	5.8	6.2	5.8	79.1
25 - 39	38.1	36.1	38.6	32.2	31.4	32.4	80.9
40 - 49	36.8	32.4	37.6	25.4	17.9	27.2	86.2
50 - 54	35.7	45.8	33.4	13.8	16.3	13.2	76.8
55 - 59	41.4	51.9	39.3	14.1	14.9	13.8	78.9
60 - 64	45.4	62.9	40.9	7.1	10.6	6.3	71.4
65 - 74	48.4	43.5	50.0	1.6	2.7	1.4	67.7
total	36.9	37.9	36.7	100	100	100	80.4

Source: EU LFS; calculation of DIW Berlin.

Table 24 Employees (FTE) in public hospitals in Denmark 2001 to 2011

Occupation	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Physicians	10 824	11 129	11 311	11 751	12 192	12 793	13 109	13 376	13 886	14 335	14 490
nurses	29 660	29 847	29 796	30 620	30 985	31 495	31 472	30 118	33 471	34 330	34 214
Pharmacists	129	150	159	194	209	218	229	266	290	323	354
Chiropractors	0	0	0	0	7	10	13	14	14	22	24
Dentists	48	54	58	59	60	63	63	66	68	71	73
Occupational therapist	1 046	1 083	1 069	1 070	1 083	1 137	1 102	1 102	1 129	1 094	1 081
Physiotherapist	1 757	1 808	1 839	1 832	1 925	1 969	1 805	1 765	1 836	1 817	1 801
Midwives	1 017	1 008	1 095	1 135	1 149	1 140	1 149	1 130	1 274	1 323	1 309
Bioanalysts	4 777	4 803	4 835	4 728	4 677	4 733	4 847	4 920	5 188	5 213	5 154
Radiographer	918	919	935	938	966	1 011	1 095	1 082	1 262	1 374	1 409
other health professions	174	180	183	194	192	215	214	233	232	234	234
assistants	623	675	717	750	789	811	814	830	854	884	888
social and health care assistants	12 949	13 387	12 766	12 512	12 187	12 153	11 725	11 968	12 352	11 994	11 010
Other patient oriented functions	11 099	11 306	11 212	11 485	11 229	11 475	12 274	12 732	13 351	13 455	13 341
Administrative and other staff	15 191	15 528	15 450	15 378	15 310	15 675	15 233	15 994	17 040	17 337	17 195
Total	90 212	91 877	91 425	92 647	92 961	94 898	95 144	95 595	102 248	103 805	102 578

Source: StatBank Denmark; employees in public hospitals; 2001-2003 employment statistics Ministry of Health, 2004 onwards statistics of regions.

Table 25 Employees in public hospitals by occupations, part-time, full-time 2011

Occupation	full-time	part-time	blue collar	total
Physicians	13 969	733	193	14 895
nurses	18 244	19 053	717	38 013
Pharmacists	302	66	1	369
Chiropractors	17	10	0	27
Dentists	50	40	2	92
Occupational therapist	614	556	8	1 178
Physiotherapist	1 105	838	8	1 951
Midwives	610	856	62	1 529
Bioanalysts	3 780	1 668	183	5 631
Radiographer	1 182	278	5	1 465
other health professions	112	161	1	275
assistants	554	405	4	963
social and health care assistants	5 506	6 091	1 745	13 342
Other patient oriented functions	9 174	4 925	292	14 391
Administrative and other staff	12 961	4 591	2 227	19 779
Total	68 182	40 270	5 447	113 900

Source: StatBank Denmark; employees in public hospitals.

Table 26 Hospital inpatient admissions, total hospital days and average length of stay

Year	Number of hospital admissions				
	Total	Males	Females	share 65+	share 70+
	in million			in %	
2006	1.18	0.54	0.64	35.23	28.10
2007	1.19	0.54	0.65	35.51	28.17
2008	1.18	0.54	0.64	36.18	28.58
2009	1.25	0.57	0.67	37.14	28.95
2010	1.29	0.60	0.69	37.61	29.05
2011	1.29	0.60	0.69	38.49	29.39
	Total hospital days				
	Total	Males	Females	share 65+	share 70+
	in million			in %	
2006	4.99	2.31	2.69	49.73	41.24
2007	4.91	2.28	2.63	49.31	40.61
2008	4.85	2.26	2.59	49.73	40.83
2009	4.76	2.24	2.52	49.94	40.36
2010	4.54	2.15	2.38	50.08	39.92
2011	4.38	2.10	2.28	50.26	39.63
	Average length of stay				
	Total	Males	Females	65+	70+
	in days				
2006	4.25	4.27	4.23	5.99	6.23
2007	4.14	4.21	4.07	5.74	5.96
2008	4.13	4.22	4.05	5.68	5.90
2009	3.82	3.92	3.74	5.14	5.33
2010	3.52	3.62	3.44	4.69	4.84
2011	3.38	3.49	3.29	4.42	4.56

Source: StatBank Denmark; calculation of DIW Berlin.

Table 27 Hospital outpatient treatments 2006 to 2011

Year	Number of hospital outpatient treatments				
	Total	Males	Females	share 65+	share 70+
	in million			in %	
2006	5.81	2.52	3.29	31.30	22.78
2007	5.96	2.58	3.38	31.66	22.75
2008	5.91	2.57	3.34	33.06	23.74
2009	6.45	2.79	3.66	34.14	24.17
2010	6.66	2.89	3.77	34.75	24.33
2011	6.92	2.98	3.94	35.38	24.56

Source: StatBank Denmark; calculation of DIW Berlin.

Table 28 Number of contacts to a GP 2006 to 2011

Year	Number of contacts to a general practitioner (GP)				
	in million			in %	
	Total	Males	Females	share 65+	share 70+
2006	38.93	15.23	23.60	28.18	21.70
2007	39.47	15.45	23.92	28.35	21.67
2008	40.73	15.94	24.69	28.93	21.94
2009	40.96	16.12	24.75	29.48	22.10
2010	40.79	16.14	24.58	30.16	22.47
2011	41.59	16.52	25.01	30.87	22.74

Year	Average number of contacts to a GP per person				
	Total	Males	Females	65+	70+
	2006	7.16	5.66	8.60	13.23
2007	7.23	5.71	8.68	13.26	14.67
2008	7.41	5.85	8.91	13.63	15.12
2009	7.42	5.89	8.88	13.58	15.10
2010	7.35	5.87	8.78	13.40	15.04
2011	7.47	5.98	8.90	13.50	15.22

Source: StatBank Denmark; calculation of DIW Berlin.

Table 29 Number of contacts to a specialist 2006 to 2011

Year	Number of contacts to a specialist				
	in million			in %	
	Total	Males	Females	share 65+	share 70+
2006	4.78	1.87	2.90	24.62	18.04
2007	4.85	1.90	2.95	25.01	18.15
2008	4.96	1.95	3.00	25.70	18.48
2009	5.06	2.00	3.06	26.11	18.53
2010	5.27	2.09	3.17	26.46	18.54
2011	5.34	2.11	3.23	27.33	18.93
	Average number of contacts to a specialist per person				
	Total	Males	Females	65+	70+
2006	0.88	0.70	1.05	1.42	1.49
2007	0.89	0.70	1.07	1.44	1.51
2008	0.90	0.72	1.08	1.47	1.55
2009	0.92	0.73	1.10	1.49	1.57
2010	0.95	0.76	1.13	1.52	1.60
2011	0.96	0.76	1.15	1.54	1.63

Source: StatBank Denmark; calculation of DIW Berlin.

Table 30 Contacts to a psychologist 2006 to 2011

Year	Number of contacts to a psychologist				
	in 1000			in %	
	Total	Males	Females	share 65+	share 70+
2006	232.9	52.2	180.3	4.18	1.95
2007	241.2	54.5	186.4	4.42	2.02
2008	300.9	68.7	231.9	4.11	1.85
2009	383.4	92.5	290.5	3.55	1.60
2010	409.3	99.8	309.3	3.46	1.52
2011	345.0	84.7	260.2	4.60	2.07
	Average number of contacts to a psychologist per 100 persons				
	Total	Males	Females	65+	70+
2006	4.28	1.94	6.57	1.17	0.79
2007	4.42	2.02	6.76	1.26	0.84
2008	5.48	2.52	8.37	1.43	0.94
2009	6.94	3.38	10.43	1.53	1.03
2010	7.38	3.63	11.06	1.54	1.02
2011	6.19	3.07	9.27	1.67	1.15

Source: StatBank Denmark; calculation of DIW Berlin.

Table 31 Contacts of persons at least 18 years old to a dentist 2006 to 2011

Year	Number of contacts of adults (18+) to a dentist				
	in million			in %	
	Total	Males	Females	share 65+	share 70+
2006	4.35	1.98	2.37	19.85	12.42
2007	4.35	1.98	2.37	20.93	12.99
2008	4.44	2.02	2.41	21.89	13.50
2009	3.91	1.79	2.11	23.46	14.21
2010	3.90	1.79	2.10	24.83	14.83
2011	3.94	1.81	2.13	26.45	15.69
	Average number of contacts to a dentist per adult person				
	Total	Males	Females	65+	70+
2006	1.03	0.95	1.10	1.04	0.94
2007	1.02	0.95	1.09	1.08	0.97
2008	1.04	0.96	1.11	1.12	1.01
2009	0.91	0.85	0.96	1.03	0.93
2010	0.90	0.84	0.95	1.05	0.95
2011	0.90	0.84	0.96	1.10	1.00

Source: StatBank Denmark; calculation of DIW Berlin.

Table 32 Contacts to a physiotherapist in 2006 to 2011

Year	Number of contacts to a physiotherapist				
	in million			in %	
	Total	Males	Females	share 65+	share 70+
2006	5.53	1.95	3.57	27.44	18.93
2007	5.61	1.98	3.63	28.33	19.49
2008	5.89	2.09	3.80	29.32	20.04
2009	6.04	2.15	3.88	30.73	20.85
2010	6.20	2.20	4.00	31.82	21.51
2011	6.48	2.31	4.17	33.55	22.46
	Average number of contacts to a physiotherapist per person				
	Total	Males	Females	65+	70+
2006	1.02	0.73	1.30	1.83	1.81
2007	1.03	0.73	1.32	1.88	1.88
2008	1.07	0.77	1.37	2.00	2.00
2009	1.09	0.79	1.39	2.09	2.10
2010	1.12	0.80	1.43	2.15	2.19
2011	1.16	0.83	1.49	2.29	2.34

Source: StatBank Denmark; calculation of DIW Berlin.

Table 33 Contacts to a chiropractor 2006 to 2011

Year	Number of contacts to a chiropractor				
	in million			in %	
	Total	Males	Females	share 65+	share 70+
2006	1.92	0.85	1.06	13.50	7.72
2007	2.01	0.89	1.12	13.89	7.93
2008	1.99	0.88	1.11	14.32	8.23
2009	1.98	0.88	1.10	14.67	8.39
2010	1.97	0.88	1.09	14.74	8.30
2011	2.01	0.90	1.11	15.50	8.73
Average number of contacts to a chiropractor per 100 person					
	Total	Males	Females	65+	70+
2006	35.22	31.75	38.46	31.19	25.59
2007	36.87	33.05	40.45	33.15	27.37
2008	36.26	32.37	39.92	33.00	27.75
2009	35.87	32.11	39.39	32.68	27.72
2010	35.57	31.88	39.05	31.68	26.88
2011	36.05	32.61	39.34	32.74	28.20

Source: StatBank Denmark; calculation of DIW Berlin.

Table 34 Changes in the number of contacts to a GP between 2010 and 2025 - constant utilisation rates

	2010	2025			changes 2025/2010			changes 2025/2010 in %		
		tough	friendly	Europop	tough	friendly	Europop	tough	friendly	Europop
General treatment cases (contacts GP) in million	40.8	43.2	45.1	45.3	2.4	4.3	4.5	5.9	10.6	11.1
Cases per inhabitant	7.4	7.6	7.7	7.8	0.3	0.4	0.4	3.6	5.0	5.8
Share women	0.60	0.60	0.60	0.59	0.0	0.0	0.0	-0.2	-0.8	-1.5
Share of elderly	0.30	0.35	0.37	0.38	0.0	0.1	0.1	16.4	21.2	24.4
Mean Age of patients	48.5	50.5	51.1	51.7	2.0	2.6	3.2	4.1	5.4	6.6

Source: StatBank Denmark; NEUJOBS demographic scenarios D10.1; calculations of DIW Berlin.

Table 35 Changes in the number of contacts to a specialist between 2010 and 2025 - constant utilisation rates

	2010	2025			changes 2025/2010			changes 2025/2010 in %		
		tough	friendly	Europop	tough	friendly	Europop	tough	friendly	Europop
Number of contacts to a specialist in million	5.3	5.5	5.7	5.8	0.3	0.5	0.5	5.0	8.8	9.2
Cases per inhabitant	1.0	1.0	1.0	1.0	0.0	0.0	0.0	2.7	3.3	4.0
Share women	0.60	0.60	0.60	0.59	0.0	0.0	0.0	-0.2	-0.7	-1.2
Share of elderly	0.26	0.31	0.32	0.33	0.0	0.1	0.1	18.0	22.1	25.8
Mean Age of patients	45.9	47.9	48.3	49.0	1.9	2.4	3.0	4.2	5.2	6.6

Source: StatBank Denmark; NEUJOBS demographic scenarios D10.1; calculations of DIW Berlin.

Table 36 Changes in the number of contacts of adults to a dentist between 2010 and 2025 - constant utilisation rates

	2010	2025			changes 2025/2010			changes 2025/2010 in %		
		tough	friendly	Europop	tough	friendly	Europop	tough	friendly	Europop
Number of contacts to a dentist of adult persons in million	3.9	4.1	4.2	4.2	0.2	0.3	0.3	4.0	7.0	7.8
Cases per inhabitant	0.7	0.7	0.7	0.7	0.0	0.0	0.0	1.8	1.6	2.6
Share women	0.54	0.54	0.54	0.54	0.0	0.0	0.0	0.3	-0.1	-0.4
Share of elderly	0.25	0.29	0.30	0.31	0.0	0.1	0.1	17.5	20.7	23.5
Mean Age of patients	52.4	53.7	54.0	54.3	1.4	1.6	2.0	2.7	3.1	3.7

Source: StatBank Denmark; NEUJOBS demographic scenarios D10.1; calculations of DIW Berlin.

Table 37 Changes in the number of contacts to a physiotherapist between 2010 and 2025 - constant utilisation rates

	2010	2025			changes 2025/2010			changes 2025/2010 in %		
		tough	friendly	Europop	tough	friendly	Europop	tough	friendly	Europop
Number of contacts in million	6.2	6.6	6.8	6.9	0.4	0.6	0.7	6.3	9.8	11.0
Cases per inhabitant	1.1	1.2	1.2	1.2	0.0	0.0	0.1	4.0	4.3	5.7
Share women	0.64	0.64	0.64	0.64	0.0	0.0	0.0	-0.2	-0.8	-1.2
Share of elderly	0.32	0.37	0.38	0.39	0.1	0.1	0.1	16.4	19.9	22.3
Mean Age of patients	54.2	56.0	56.4	56.8	1.8	2.2	2.6	3.3	4.1	4.7

Source: StatBank Denmark; NEUJOBS demographic scenarios D10.1; calculations of DIW Berlin.

Table 38 Changes in the number of contacts to other health care professionals between 2010 and 2025

	2010	2025			changes 2025/2010			changes 2025/2010 in %		
		tough	friendly	Europop	tough	friendly	Europop	tough	friendly	Europop
Number of contacts in 1000	26.6	27.7	28.4	28.7	1.0	1.8	2.0	3.9	6.6	7.7
Cases per inhabitant	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6	1.2	2.5
Share women	0.50	0.49	0.49	0.49	0.0	0.0	0.0	-1.0	-1.8	-2.3
Share of elderly	0.24	0.29	0.30	0.31	0.0	0.1	0.1	20.1	23.0	26.7
Mean Age of patients	49.7	51.5	51.7	52.1	1.7	2.0	2.4	3.5	4.0	4.9

Source: StatBank Denmark; NEUJOBS demographic scenarios D10.1; calculations of DIW Berlin.

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