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van Tulder, M.W.; Koes, B.W.; Bouter, L.M.

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A cost-of-illness study of back pain in The Netherlands

Maurits W. van Tulder *, Bart W. Koes and Lex M. Bouter

Institute for Research in Extramural Medicine (EMGO-Institute) Faculty of Medicine, Vrije Universiteit, 1081 BT Amsterdam (The Netherlands)

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Summary

In this study we estimated the costs of back pain to society in The Netherlands in 1991 to be 1.7% of the GNP. The results also show that musculoskeletal diseases are the fifth most expensive disease category regarding hospital care, and the most expensive regarding work absenteeism and disablement. One-third of the hospital care costs and one-half of the costs of absenteeism and disablement due to musculoskeletal disease were due to back pain. The total direct medical costs of back pain were estimated at US\$367.6 million. The total costs of hospital care due to back pain constituted the largest part of the direct medical costs and were estimated at US\$200 million. The mean costs of hospital care for back pain per case were US\$3856 for an inpatient and US\$199 for an outpatient. The total indirect costs of back pain for the entire labour force in The Netherlands in 1991 were estimated at US\$4.6 billion; US\$3.1 billion was due to absenteeism and US\$1.5 billion to disablement. The mean costs per case of absenteeism and disablement due to back pain were US\$4622 and US\$9493, respectively. The indirect costs constituted 93% of the total costs of back pain, the direct medical costs contributed only 7%. It is therefore concluded that back pain is not only a major medical problem but also a major economical problem.

Key words: Back pain; Cost of illness; Direct cost; Absenteeism; Disablement

Introduction

Back pain is a major health problem in Western industrialised countries. The magnitude of the problem can be expressed as incidence and prevalence figures. The annual incidence of back pain has been reported to be about 5% (Frymoyer and Cats-Baril 1991), the yearly prevalence of back pain in the United States to be 15–20% and in European countries 25–40%, and the lifetime prevalence has been reported to exceed 70% (Andersson et al. 1991). The majority of epidemi-

ological studies has been conducted in the United States, the United Kingdom and Scandinavia and, so far, only one extensive study has investigated the occurrence of back pain in The Netherlands. This study of an urban population in The Netherlands reported a lifetime prevalence of low back pain (LBP) of 51% for men and 58% for women, and a point-prevalence of LBP of 22% for men and 30% for women. Ten percent of the men and 18% of the women reported to have visited a general practitioner (GP) because of their back pain (Valkenburg and Haanen 1982). Back pain is not only one of the most frequent reasons for visiting a GP or physical therapist, back pain is also a major cause of work absenteeism and disablement. However, despite the magnitude of the problem little is known about the causes, and most of the diagnostic and therapeutic interventions lack scientific evidence regarding their effectiveness (Flor and Turk 1984).

The impact of back pain on society is usually estimated by examining the costs. Numerous studies have estimated or reported the costs of back pain in different societies (Leavitt et al. 1971; Bonica 1982; Schaepe

Abbreviations: SIG, Informatics in Health and Welfare; LIZ, National Information of Social Insurance; COTG, Central Health Care Charge Agency; CBS, Netherlands Central Bureau of Statistics; SVr, Social Security Council.

* *Corresponding author:* Maurits W. van Tulder, M.Sc., Institute for Research in Extramural Medicine (EMGO-Institute), Faculty of Medicine, Vrije Universiteit, Van der Boechorststraat 7, 1081 BT Amsterdam, The Netherlands. Tel.: (31) 20-4448178; FAX: (31) 20-4448181.

1982; Biering-Sørensen 1983; Klein et al. 1984; Wiesel et al. 1984; Spengler et al. 1986; Abenhaim and Suissa 1987; Haddad 1987; Snook and Webster 1987; Spitzer et al. 1987; Nelson 1988; Crocker 1989; Federspiel et al. 1989; Webster and Snook 1990; Deyo et al. 1991; de Girolamo 1991; Frymoyer and Cats-Baril 1991; Nachemson 1991; Nyiendo 1991; Papageorgiou and Rigby 1991). However, most studies only covered a part of the costs, typically the workers' compensation costs, and were based on company, city or state figures. So far, only two comprehensive national studies of the costs of back pain have been executed in the USA. Grazier et al. (1984) estimated the total direct costs of low back disorders at US\$12.9 billion, of which hospital inpatient treatment accounted for the largest amount of US\$4.5 billion; the total indirect costs were US\$3.0 billion. Frymoyer and Cats-Baril (1991) updated these costs for 1990, which resulted in total direct costs of US\$24.3 billion and total indirect costs of US\$3.6 billion. Webster and Snook (1994) estimated the costs of workers' compensation claims for LBP in 1989 from figures of 45 states. LBP accounted for 16% of all claims but for 33% of all costs. The mean cost per case for LBP was estimated at US\$8321, the median cost at US\$396. The medical costs represented 32.4% and indemnity payments 65.8% of the total costs. The total costs for workers' compensation for LBP in the USA in 1989 were estimated at US\$11.4 billion. One cannot assume that the results of these studies can be directly extrapolated to other societies. Cultural differences may exist in the perceived severity of the complaints and in the nature and organisation of the health care, social welfare and insurance systems.

The Netherlands health care system is relatively heavily regulated by law. The government controls the health care facilities, including non-hospitals, mainly by regulating all charges and fees in the health care sector by budgets and tariffs (Vondeling et al. 1993). Hospitals are paid a tariff, specialists are paid a fee-for-service for all patients under a defined benefit package, general practitioners are paid a standard yearly tariff in case of compulsory insured patients and a fee-for-service in case of privately insured patients, and paramedical therapists are paid a fee-for-service. In The Netherlands most of the lower income groups (over 60% of the population) are compulsory insured in sickness funds, and nearly all the rest of the population take out private health insurance. These are usually individual policies adjusted for risk, particularly age. Policies vary in the extent of coverage, co-payments and deductibles. The whole population is covered under compulsory insurance for serious and prolonged disability and sickness (Abel-Smith 1992).

In this study we assessed the burden of back pain on society in The Netherlands by estimating the total direct and indirect costs.

Methods

Data sources

To obtain a complete overview of the costs of back pain in The Netherlands we started our search for relevant data sources with a report in which the authors have comprehensively described the existing medical registrations available for research in The Netherlands (Verzijden et al. 1991). We also searched for annuals and reports at the medical libraries of two universities. In this way we listed all health care authorities in The Netherlands, including medical insurance and social security agencies, which could possibly register epidemiological and economical information relevant for our purposes. Annuals and reports which could not be obtained at the two libraries, were applied for at the relevant authorities. We also applied for additional data from some registering authorities if their publications did not offer the desired level of detail. When we refer in this manuscript to reports or data of these authorities, their abbreviations are presented between parentheses. A list of abbreviations is given.

Cost of illness

In a cost-of-illness (COI) study the burden of a disease on society is estimated in economical terms. The approach most frequently used to estimate the COI is the human capital approach. According to this approach the direct costs are estimated on the basis of market prices and the indirect costs by assessing the loss of productivity due to morbidity and premature mortality (Hodgson and Meiners 1982; Scitovsky 1982). We used this approach to estimate the direct and indirect costs of back pain in The Netherlands in 1991. The year 1991 was chosen because it was the latest year of which complete information could be gathered. The cost estimates were based on data on the use of and charges for the different types of health care services by diagnosis. All costs were allocated to the primary diagnosis and presented in US dollars using the average exchange rate in 1991. Diagnostic categories were based on the International Classification of Disease (ICD). If available, the data were classified into the categories 'musculoskeletal disease' (ICD 710-739), 'dorsopathies' (ICD 720-724), 'ankylosing spondylitis and other inflammatory spondylopathies' (ICD 720), 'spondylosis and allied disorders' (ICD 721), 'intervertebral disc disorders' (ICD 722), 'other disorders of cervical region' (ICD 723), and 'other and unspecified disorders of the back' (ICD 724). When figures based on the ICD are presented, the category dorsopathies is referred to as back pain. To compare the costs of back pain and musculoskeletal diseases with the costs of other diseases in The Netherlands we also present the figures of hospitalisation, absenteeism and disablement for the other 16 major disease categories of the ICD.

Direct costs

Direct costs consist primarily of medical costs of diagnosis, treatment, continuing care, prevention, rehabilitation and organisation, but also includes nonmedical expenditures caused by illness or disease (Hodgson and Meiners 1982; Scitovsky 1982). As there is no registration available of the direct non-medical costs, such as travel and time expenses, out-of-pocket costs or costs of civil services, these costs were not included. Therefore, we only estimated the direct medical costs of back pain, in particular the costs of hospital care, medical specialist care, general practice care, and paramedical care.

Hospital care costs. The hospital care costs include the costs of clinical care and additional costs of treatment, examinations, drugs, paramedical care and operating rooms. The hospital care costs are divided in outpatient costs (patients are treated within 1 day and do not stay overnight) and inpatient costs. The costs of outpatient care were estimated by multiplication of the total number of outpatient treatments (SIG) with the mean cost of outpatient care (LIZ). The

costs of inpatient care were estimated by multiplication of the total days of inpatient care (SIG) with the mean costs of 1 day of inpatient care (LIZ). The costs were estimated for back pain as primary diagnosis at discharge from hospital. The registration of the number of days of outpatient treatment in 1991 covered 75% of all treatments in The Netherlands; for inpatient care the coverage was as high as 99.4% (SIG). In estimating the hospital care costs for the total population of The Netherlands these figures were extrapolated to 100%.

Medical specialist care costs. The costs of operations by medical specialists were estimated by multiplication of the total number of operations for back pain performed in 1991 in Dutch hospitals (SIG) with the relevant tariffs for each operation (COTG). Figures were available for the 25 most common operations per specialism. The tariffs used were the tariffs for the operation, the tariffs for anaesthesiology, and the tariffs for assistency.

The costs of outpatient consultation that go with any referral to a medical specialist were estimated by multiplication of the total number of consultations resulting in a hospital admission for back pain with the relevant tariffs of referral for each specialism. The number of consultations were based on the 25 most common discharge diagnoses per specialism (LIZ).

General practice care costs. Because of the lack of a central register, the costs of GP care could not be assessed directly. Therefore, we used a report on the costs of the 17 main ICD categories in The Netherlands in 1987 (Koopmanschap et al. 1991). In this report the costs of hospitalisation and general practice costs were estimated for musculoskeletal diseases (ICD categories 710-739). General practice costs for musculoskeletal diseases in 1987 amounted to 10% of the costs of hospitalisation for musculoskeletal diseases. In our study we estimated the costs of hospitalisation for back pain in 1991. We then assumed that the ratio between the costs of hospitalisation and general practice costs for back pain in 1991 was about the same as for musculoskeletal diseases in 1987. Therefore, the general practice costs of back pain in 1991 were estimated to amount to 10% of the estimated costs of hospitalisation for back pain in 1991.

Paramedical care costs. Figures were available of one health insurance company (LIASS) which only registered compulsory insurance for physical therapy. The costs of physical therapy for back pain were estimated by multiplication of the number of treatments with the valid standard tariff; one treatment by a physical therapist costed US\$17.41 in 1991. The total physical therapy costs of back pain in The Netherlands were estimated by extrapolating the costs of this insurance company; because the coverage was 5% of the insured people in The Netherlands we multiplied the costs by 20. We also accounted for the fact that only figures of compulsory insurance for

physical therapy were available. Sixty-nine percent of the physical therapy costs in The Netherlands in 1991 were covered by the compulsory medical insurance (LIZ), so the costs were multiplied by 100/69. While the costs of physical therapy accounted for 89% of the total paramedical costs in 1991, we finally multiplied by 100/89 to estimate the total paramedical costs in The Netherlands in 1991.

Indirect costs

Indirect costs of disease are defined as production losses and related costs to society due to morbidity and mortality (Koopmanschap and Van Ineveld 1992). In case of back pain, production losses can be the result of work absenteeism and disablement due to morbidity. Back pain carries a negligible risk of mortality and the indirect costs of mortality were therefore not estimated. In COI studies according to the human capital approach, which is based on the assumption that earnings reflect productivity, indirect costs are often restricted to the earnings lost (Ament and Evers 1993). The social security system in The Netherlands is based on two laws prescribing the obligation to have insurance for the loss of income due to sickness, injury or disability. Under the Sickness Benefits Act (SBA) workers receive sick pay during absenteeism, with a maximum of 52 weeks. If the worker is still unable to work after 52 weeks, he/she is entitled to a disability pension covered by the Disablement Insurance Act (DIA). People who were not employed previous to their disablement are covered by the General Disablement Act (GDA).

Costs of absenteeism. In the present study we estimated the costs of absenteeism due to back pain by multiplying the total number of sick days with the mean costs of 1 sick day. The gross sick pay starts after two qualifying days for the sickness benefit and amounts to 70% of the daily wage. However, due to additional insurances or collective labour agreements almost every employee receives full wages during absenteeism. We therefore extrapolated the sick pay to 100%. Registration of the payments under the SBA only covers the figures of the industrial insurance boards, which comprise 80% of all insured employees under the SBA. In our estimate of the total costs of absenteeism we extrapolated the costs of the industrial insurance boards to 100%. A diagnosis is only registered if the employee has been examined by a medical adviser of an insurance company, which is usually scheduled about 6 weeks after onset of disease. To estimate the total costs of absenteeism due to back pain, we assumed that the proportion of musculoskeletal diseases and back pain amongst those with a sick leave less than 6 weeks (no diagnosis) was equal to the proportion amongst those with a sick leave more than 6 weeks (registered diagnosis). Because the category 'no diagnosis'

TABLE I

ACTUAL NUMBER OF CASES, ACTUAL NUMBER OF DAYS (SIG) AND EXTRAPOLATED COSTS OF OUTPATIENT AND INPATIENT CARE FOR BACK PAIN IN 1991

ICD-710-739: diseases of the musculoskeletal system and connective tissue; ICD-720-724: dorsopathies; ICD-720: ankylosing spondylitis and other inflammatory spondylopathies; ICD-721: spondylosis and allied disorders; ICD-722: intervertebral disc disorders; ICD-723: other disorders of cervical region; ICD-724: other and unspecified disorders of back.

ICD code	Inpatient care			Outpatient care		Hospital care
	n	Days (n)	Costs (US\$)	n	Costs (US\$)	Costs (US\$)
Total	1,533,798	16,139,679	6,511,078,000	347,823	92,289,000	6,603,367,000
710-739	150,701	1,491,716	601,789,000	52,349	13,890,000	615,679,000
720-724	51,323	493,315	199,013,000	10,599	2,812,000	201,825,000
720	307	6261	2,526,000	2	531	2,527,000
721	1251	15,297	6,171,000	841	223,000	6,394,000
722	30,677	316,435	127,656,000	2611	693,000	128,349,000
723	2328	13,908	5,611,000	1097	291,000	5,902,000
724	16,760	141,414	57,049,000	6048	1,605,000	58,654,000

accounted for 35% of the total costs of absenteeism, we multiplied the costs of back pain with $100/(100-35)$. About 70% of all employees in The Netherlands are insured under the SBA, the remaining 30% are insured by private companies. We assumed that absenteeism of privately insured people is equal to that of publicly insured people, and therefore estimated the costs of absenteeism of the total labour force in The Netherlands in 1991 by again extrapolating to 100%.

Besides these insurance costs, the SBA also involves administration costs. In 1991 the total administration costs amounted to 8.7% of the total insurance costs. The administration costs of back pain were estimated by adding this proportion to the insurance costs of back pain.

Costs of disablement. The total costs of disablement were estimated by multiplying the total days of disability with the mean daily pension in 1991. The Social Insurance Council (SVr) in The Netherlands registers all payments under the DIA/ GDA on a national basis.

Results

Direct costs

Hospital care costs. The mean costs of outpatient care in 1991 were US\$199 and the mean costs of 1 day of inpatient care were US\$401 (LIZ). The total costs of back pain as registered by the SIG were US\$2.1 million for outpatient care and almost US\$198 million for inpatient care. The extrapolated outpatient costs of back pain in 1991 were therefore US\$2.8 million, and the extrapolated inpatient costs US\$199 million (Table I). We estimated the total costs of hospital care to be about US\$202 million. The mean costs of hospital care for back pain per case was US\$199 for outpatient care and US\$3856 for inpatient care. Back pain accounted for about one-third of the costs of the musculoskeletal diseases. After diseases of the circulatory system, neoplasms, injury and poisoning, and diseases of the digestive system, diseases of the musculoskeletal system were the fifth most expensive disease category regarding hospitalisation accounting for 7% of the total costs of hospitalisation (Table IV).

Medical specialist care costs. In 1991 in The Netherlands the number of operations for back pain were 9966 excisions of the lumbar or lumbosacral intervertebral disc, 2587 laminotomy/laminectomy, 904 recurrent excisions of the lumbar or lumbosacral intervertebral disc, and 168 chemonucleolysis. The tariffs for the operation and the associated anaesthesiology and assistance were US\$338.5 for excisions of the lumbar or lumbosacral intervertebral disc, US\$297.6 for laminotomy/laminectomy, US\$407.5 for recurrent excisions of the lumbar or lumbosacral intervertebral disc, and US\$243.8 for chemonucleolysis. The total costs of the tariffs declared by medical specialists for these operations were estimated at US\$4.6 million.

The total number of outpatient consultations resulting in a hospital admission for back pain in 1991 in The Netherlands were 30,337 to a neurologist, 9991 to a

TABLE II

ACTUAL NUMBER OF CASES (n) AND NUMBER OF DAYS OF ABSENTEEISM AS REGISTERED BY THE SVr, AND RELATED COSTS IN 1991, AND EXTRAPOLATED COSTS AS ESTIMATED IN THIS STUDY (costs in million US\$)

ICD-710-739: diseases of the musculoskeletal system and connective tissue; ICD-720-724: dorsopathies; ICD-720: ankylosing spondylitis and other inflammatory spondylopathies; ICD-721: spondylosis and allied disorders; ICD-722: intervertebral disc disorders; ICD-723: other disorders of cervical region; ICD-724: other and unspecified disorders of back.

ICD code	n	Sick days	Costs	Extrapolated Costs
Total	5,798,245	118,032,761	6199	17,237
710-739	299,041	25,197,539	1395	5952
720-724	157,502	13,011,522	728	3104
720	743	111,359	6	27
721	2289	328,934	19	82
722	15,169	2,993,750	171	730
723	12,804	1,155,107	62	264
724	126,497	8,422,372	469	2001

neurosurgeon, 5309 to an orthopedist, and 72 to a rheumatologist. The relevant tariffs were US\$23.1 for orthopedics, US\$42.7 for neurosurgery, US\$63.1 for rheumatology, and US\$48.5 for neurology. The total costs of the tariffs declared by medical specialists for outpatient consultations for back pain in 1991 were estimated at US\$2 million.

The total medical specialist care costs in 1991 were therefore US\$6.6 million.

General practice care costs. In The Netherlands US\$1155 million was spent on GP care in 1991. The costs of GP care for back pain were estimated to be US\$22 million.

Paramedical care costs. In The Netherlands US\$738 million was spent on paramedical care in 1991, of which 69% was covered by compulsory medical insurance and 31% by private health insurances (LIZ). About 89% of paramedical costs came on account of physical therapy. The extrapolated costs of paramedical care for back pain in The Netherlands in 1991 were US\$139 million, which equals about 19% of all paramedical costs in 1991.

Indirect costs

Costs of absenteeism. The actual number of sick days registered by the SVr and the calculated costs of back pain spent under the SBA are presented in Table II. The mean daily sick pay in 1991 amounted to US\$66.66 for men and US\$36.38 for women (LIZ). The reported costs of absenteeism due to back pain under the SBA were US\$728 million. Adjusting for absenteeism shorter than 6 weeks, the costs of back pain were about US\$1.1 billion. The additional administration costs were US\$97 million for back pain. Accounting for the 70% coverage

TABLE III

DISABLEMENT BENEFITS IN 1991: ACTUAL NUMBER OF CASES AND NUMBER OF DAYS OF DISABLEMENT AS REGISTERED BY THE SVr, AND RELATED COSTS, BY DIAGNOSIS, AND EXTRAPOLATED COSTS AS ESTIMATED IN THIS STUDY (COSTS IN MILLION US\$)

ICD-710-739: diseases of the musculoskeletal system and connective tissue; ICD-720-724: dorsopathies; ICD-720: ankylosing spondylitis and other inflammatory spondylopathies; ICD-721: spondylosis and allied disorders; ICD-722: intervertebral disc disorders; ICD-723: other disorders of cervical region; ICD-724: other and unspecified disorders of back.

ICD code	n	Days of disablement (1000)	Costs	
			Costs	Extrapolated Costs
Total	997,277	209,085	10,136	10,136
710-739	297,768	58,260	2857	3173
720-724	143,155	27,672	1359	1509
720	2936	587	29	33
721	9361	1970	97	107
722	64,457	12,868	637	708
723	9618	1881	90	100
724	56,783	10,368	506	562

of the daily wage and the 80% coverage of the industrial insurance boards, we estimated the total costs of absenteeism due to back pain under the SBA to be about US\$2.2 billion. Back pain accounted for 52% of the costs of absenteeism due to musculoskeletal diseases. In 79% of the sick benefits no diagnosis was

registered because of a sick leave shorter than 6 weeks; this accounted for 35% of the total costs of absenteeism. In case of a sick leave longer than 6 weeks 24% was due to musculoskeletal diseases, 22% due to respiratory diseases, and 15% due to mental disorders (SVr). However, musculoskeletal diseases accounted for 35%, respiratory diseases only for 5%, and mental disorders for 25% of the total costs of absenteeism (Table IV). For comparison, diseases of the circulatory system and neoplasms accounted for respectively 2% and 1% of the number of sick leaves, and for respectively 5% and 2% of the total costs. The mean number of days of absenteeism per episode was 170 for neoplasms, 146 for diseases of the circulatory system, 104 for mental disorders, 84 for musculoskeletal diseases, and 14 for respiratory diseases.

The total costs of absenteeism due to back pain in The Netherlands in 1991, including absenteeism of the privately insured employees, were estimated to be about US\$3.1 billion. Based on 2080 h a year absenteeism due to back pain costs about US\$1.5 million an hour. The mean cost per episode of absenteeism due to back pain was estimated to be US\$4622.

Costs of disablement. As presented in Table III, the total costs of disablement due to back pain were estimated at US\$1.5 billion. The mean daily pension in 1991 was US\$54.91 for men and US\$36.78 for women. The mean cost per case of disablement due to back pain was US\$9,493. Table IV shows that diseases of

TABLE IV

NUMBER OF CASES OF HOSPITAL CARE (SIG), ABSENTEEISM AND DISABLEMENT (SVr) AND EXTRAPOLATED COSTS (million US\$) BY DISEASE CATEGORY IN 1991 IN THE NETHERLANDS

Diagnosis	Hospital care		Absenteeism		Disablement	
	n	Costs	n	Costs	n	Costs
0 No diagnosis			4,561,064	*	90,656	*
I Infectious diseases	18,638	91	30,667	283	6936	77
II Neoplasma	159,221	761	7130	265	18,607	194
III Endocrine, nutritional and metabolic diseases	33,548	182	4347	114	10,632	117
IV Diseases of the blood and blood-forming organs	18,332	61	2217	30	1724	19
V Mental disorders	23,798	317	184,090	4244	286,612	3298
VI Diseases of the nervous system and sense organs	143,900	300	30,624	519	52,863	622
VII Diseases of the circulatory system	228,419	1115	21,042	785	81,325	983
VIII Diseases of the respiratory system	146,688	415	272,128	848	29,157	345
IX Diseases of the digestive system	144,114	557	82,943	674	23,825	272
X Diseases of the genitourinary system	133,885	348	25,091	296	10,614	112
XI Pregnancy, childbirth and the puerperium	133,266	297	58,521	1088	3158	22
XII Diseases of the skin	23,831	107	17,876	208	7616	79
XIII Diseases of the musculoskeletal system	203,050	616	299,041	5952	297,768	3173
XIV Congenital anomalies 24,354	65	1126	39	6263	72	
XV Certain conditions originating in the perinatal period	53,251	206				
XVI Symptoms, signs and ill-defined conditions	103,363	310	87,550	421	19,076	212
XVII Injury and poisoning	114,527	588	94,596	1471	50,444	539
Factors influencing contact with health services	175,436	268				
Total	1,881,621	6603	5,798,245	17,237	997,277	10,136

* In the extrapolated costs the costs of the category 'no diagnosis' were divided over the 17 major disease categories according to their share in the total costs of absenteeism and disablement.

the musculoskeletal system together with mental disorders are by far the most prevalent and expensive causes of disablement in The Netherlands. Musculoskeletal diseases accounted for 31% of the total costs of disablement; back pain accounted for 48% of these costs of the musculoskeletal diseases. By way of comparison, diseases of the circulatory system accounted for 10% of the total costs of disablement and neoplasms only for 2%.

Discussion

In 1991 in The Netherlands about US\$27.8 billion was spent on health care expenses which equals 9.8% of the gross national product (LIZ), while the costs of absenteeism and disablement accounted for 15% of the gross national product (GNP). Compared to other European countries the proportion spent on health care, absenteeism and disablement in The Netherlands is high (Maljers 1994). In this study we have assessed the burden of back pain on society by estimating the costs.

The direct non-medical costs were not estimated in our study, but, as these costs are only low compared to the direct medical costs (Hodgson and Meiners 1982), this will not have led to a significant underestimation. The total direct medical costs of back pain were estimated in this study at US\$367.6 million consisting of US\$200 million for hospital care (56.5%), US\$6.6 million for medical specialist care (1%), US\$22 million for general practice care (6%), and US\$139 million for paramedical care (36%).

If available, we have used the ICD to classify our data and have reported on the ICD categories of musculoskeletal disease (710-739) and its subcategories of back pain (720-724). One major drawback of this classification is that cases with traumatic, infectious or malignant back pain are not necessarily classified into these categories, but may have been classified under the main ICD disease categories infectious diseases (I), neoplasms (II), or injury and poisoning (XVII). As a result the figures presented in this study may be an underestimation of the total costs of back pain.

We encountered some problems in estimating the direct medical costs of back pain in The Netherlands. In estimating the costs of hospital care we used the mean costs of outpatient and inpatient care. How far these mean costs are representative for patients with back pain remains unknown. The extrapolation of the 75% registration of outpatient care and the 99.4% registration of inpatient care to 100% seems to be justified. The costs of medical specialist care were probably underestimated, because figures were only available of the 25 most prevalent operations per specialism. We also did not include operations not classified under localisation, but only used the operations

which were definitely executed for thoracolumbar and lumbosacral back pain. However, operations due to back pain not counted in these statistics are scarcely performed. The costs of consultations not leading to hospital admission could not be estimated, which may also have led to an underestimation of the medical specialist care costs. Information about general practice care and paramedical care was scarce which resulted in only rough estimates. The costs of paramedical care were based on the compulsory medical insurance figures of only one health insurance company with a market share of 5%. Other insurance companies did not want to put their figures at our disposal. Extrapolating these figures to 100% for the entire population in The Netherlands implies that we did not consider the differences in referrals or visits between compulsory and voluntary insured people. It is known that the medical consumption of the voluntary insured is not as high compared to the compulsory insured. The above-mentioned shortcomings may have led to an imprecise estimate (probably an underestimation) of the direct medical costs, but were largely unavoidable. Another shortcoming in our study of the direct medical costs was that information about pharmaceutical care and artificial devices, nursing homes, home nursing, management and administration, which may all contribute in the direct medical costs of back pain, was not available at all. We thus may have substantially underestimated the direct medical costs of back pain. According to Koopmanschap et al. (1991) these sectors accounted for 25–30% of all direct medical costs in The Netherlands. Therefore, the direct medical costs of back pain in 1991 in The Netherlands might have been as high as US\$550 million.

We estimated the total cost of absenteeism due to back pain for the whole labour force in The Netherlands in 1991 at US\$3.1 billion. In 1991 over 7.2 million sick reports were registered of which 5.8 million (81%; SVr) resulted in a sick pay under the SBA. Most of the 1.4 million who did not receive a sick pay had recovered within the two qualifying days for sickness benefit. The earnings lost because of the sick leave of these 1.4 million were paid by the employers according to collective labour agreements. We did not account for the expenditures of these qualifying days. We also did not account for people who do not earn wages, such as children, the elderly, housewives and the unemployed; and we also did not estimate the monetary equivalents of psychosocial costs related to pain and grief. Therefore, we may also have underestimated the real costs of absenteeism due to back pain. We estimated the total costs of absenteeism due to back pain for the entire labour force in the Netherlands by using the registration of the SVr. The expenditures of the SVr cover 70% of the daily wages of 80% of all employees covered by the SBA. We extrapolated these proportions to

100% to get an accurate cost estimate of the costs of absenteeism of all employees covered by the SBA. As the SBA covers 70% of all employees in The Netherlands we also extrapolated this proportion to 100%. This assumption may be debatable since absenteeism of the privately insured might be considerably less than that of the publicly insured. However, no figures were available of the absenteeism of the privately insured, and we had to estimate the total costs under this assumption. If this has led to an overestimation because of the lesser absenteeism among privately insured, or to an underestimation because of the higher daily sick pay of the privately insured, remains unknown. Only registration of the absenteeism of privately insured can solve this problem. In 1991 US\$10.1 billion was paid for disablement pensions of which over US\$1.3 billion came on account of back pain (14%). Registration of these pensions covers 100% of the population in The Netherlands, so this cost estimate seems to be quite accurate.

In this study we quantified the magnitude of the problem by assessing the costs of back pain. The total costs of back pain in the Netherlands in 1991 were estimated at f4.8 billion, f367.6 million direct medical costs (7%) and f4.4 billion indirect costs (93%). These total expenses on back pain in 1991 equaled 1.7% of the GNP of The Netherlands. Comparison of the results of our study with international studies is difficult because of the different social, cultural and socioeconomic patterns. The differences in health and insurance systems between the US and The Netherlands, for example, makes comparison of our results with those of Grazier et al. (1984) and their update by Frymoyer and Cats-Baril (1991) quite a difficult task. In The Netherlands the costs of absenteeism and disablement are tremendous, accounting for 15% of the GNP (Maljers 1994). It was therefore to be expected that the indirect costs would by far exceed the direct costs of back pain, which was indeed confirmed by our results. According to Grazier et al. (1984) in the US the direct costs of back pain are more than 4 times higher than the indirect costs. Frymoyer and Cats-Baril (1991) stated that the indirect costs may be substantially underestimated and should be in the order of 3 or 4 times the direct costs. Other studies also reported the proportion of direct costs to the total costs of back pain to be only small, ranging from 14% to 25% (Leavitt et al. 1971; Spitzer et al. 1987; Abenhaim and Suissa 1987; Klein 1984).

So far, accurate and relevant quantification of the financial impact of back pain in The Netherlands had been lacking. In our study we used national figures of absenteeism and disablement, making our estimates of the indirect costs quite accurate. As discussed before, the direct costs are probably underestimated in this study and less accurately represented than the indirect

costs. Most of the figures reported in the international literature are also very rough estimates only. Comparison of these figures is hampered by the fact that they have been derived from various sources, for example countries, states (in the USA), industrial settings, and insurance companies. Discrepancies among studies also arise by methodological differences due to different classification systems or survey techniques used. From our data as well as from the literature it may be concluded that the financial impact of back pain on industry and society is enormous. Deyo (1991) stated that the medical costs of back pain in the US by far exceed the medical costs of AIDS and ischaemic heart disease. In the United Kingdom back pain is the second most common cause of physical disability after cardiovascular disease (Waddell 1993). Back pain also is the most common occupational hazard and the most common reason for workers' compensation claims accounting for the highest costs. In The Netherlands diseases of the musculoskeletal system were the fifth most expensive disease category regarding hospital care after among others circulatory diseases and neoplasms; back pain accounts for about one-third of these costs of musculoskeletal diseases. Musculoskeletal diseases (50% back pain) and mental disorders are the most expensive disease categories in The Netherlands regarding absenteeism and disablement and by far exceed the costs of circulatory diseases and neoplasms. There is little reason to expect that these costs will decrease in the near future. We agree with Nachemson (1991b) who stated that the epidemic increase of low back pain is becoming a threat for the social welfare system, and therefore not only a medical but also a economical problem. It may even become a political problem.

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