Abstract

Van Doorn JWC: *Low back disability among self-employed dentists, veterinarians, physicians and physical therapists in the Netherlands. A retrospective study over a 13-year period (N=1,119) and an early intervention program with 1-year follow-up (N=134).*
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This study was carried out among self-employed dentists, veterinarians, physicians and physical therapists insured against the financial consequences of disability by the insurance company Movir in Nieuwegein, the Netherlands. Disability for an individual was defined as a condition in which someone, due to illness or accident, regardless of the cause, is unable to pursue his/her profession, according to medical assessment. It concerned both short-term and long-term periods of sickness absence.

The study consists of two parts:

a) A retrospective investigation into the magnitude of the problem of low back disability from 1977 through 1989.

b) A test of an early intervention program, introduced in 1990, involving a control group of low back disability claimants of 1987 and 1988 combined.

Low back pain was the main cause of disability in 1,119 claims, submitted by 839 claimants. In 795 cases, this involved the first low back disability claim during the whole insurance period.

The incidence of low back disability increased by 211 percent, from 3.48 per 1,000 persons at risk in 1977 to 7.35 in 1989. The costs of compensation for low back disability increased from 5.7 percent of the total compensation paid in 1977 to 13 percent in 1989. Nearly a quarter of the claims, all of which lasted longer than six months, accounted for 90 percent of the compensation costs of low back disability.

The present study showed that in the case of veterinarians over 34 years of age and dentists over 44 years of age, specific low back pain, nonspecific low back pain in combination with a deferred period of 14 days or more, low back problems before acceptance, and the presence of psychosocial problems at the start of the disability were significantly associated with the duration of low back disability. This means that these "factors" predicted a longer duration.

Based on the retrospective data, a predictive model of long-term low back disability was developed, which could be used for secondary prevention among the population studied.

At termination of a first claim of low back disability, a deferred period of 30 days or more, and low back surgery at the first claim or before acceptance predicted a longer working period until a recurrence, while low back problems before acceptance had an inverse effect.

The retrospective study demonstrated the effect of insurance factors on the incidence and the duration of low back disability, and on the recurrence rate. The higher the insured daily compensation, the higher the risk of claiming low back disability. A deferred period of 14 days or more decreased the risk of claiming low back disability. Furthermore, a deferred period of 30 days or more protected against a recurrent claim of low back disability. On the other hand, claimants with nonspecific low back pain and a deferred period of 14 days or more returned to work much later than claimants with nonspecific low back pain and a deferred period of three days. The hypothesis is that persons with a deferred period of 14 days or more only claim disability for nonspecific low back pain when they experience a "serious problem" and otherwise keep on working because they are not compensated during their deferred period.

After the introduction of an early intervention program the mean cumulative duration of low back disability decreased significantly. Standardized to 1990 (N=134), the number of claimants who reached a cumulative duration of one year was reduced by 56 percent. The early intervention program was cost-effective. Most of the savings were due to the reduction in the number of claimants who reached the period of one year disability.

For the early intervention program, specific low back pain, fear of becoming long-term disabled and duration of low back complaints of six months or more were predictors of long-term low back disability. Being restrained from work for 50 percent or less was a predictor of a short duration.

Objectives

The main objectives of this study were:

a) To investigate low back disability among self-employed dentists, veterinarians, physicians and physical therapists in the Netherlands from 1977 through 1989.

b) To evaluate the effect of an early intervention program on low back disability among the same professional groups.

The following questions were asked:

a)
- In what way were the demographic, diagnostic, insurance, and psychosocial factors related to low back disability in the group studied?
- What was the trend in frequency of low back disability from 1977 through 1989?
- What was the trend in costs of compensation for low back disability? Which variables were associated with the costs?
- Which variables were associated with the duration of low back disability?
- Which variables were associated with the recurrence of low back disability?

b)
- What was the result of the early intervention program in terms of duration of low back disability. In other words, can early intervention prevent chronic low back disability?
- Was the early intervention program cost-effective, and what were the cost benefits?
- Which variables were associated with the duration of low back disability among the early intervention group?

Introduction

Low back disability needs to be distinguished from low back pain. World-wide, the life-time history of low back pain ranged from 51 percent to 80 percent (Bergquist-Ullman and Larsson 1977, Horal 1969, Hult 1954b, Lloyd et al. 1986, Nachemson 1976, Snijdelaar 1992, Valkenburg and Haanen 1982, Wickström et al. 1978, Wiikeri et al. 1978). A minority of those with low back pain goes on sick leave (Haanen 1984, Lloyd et al. 1986, Magora and Taustein 1969, Westrin 1973). In Holland, disability rates of 32 percent and 29 percent among men and women respectively have been reported in those with low back pain during a period of 18 months (Haanen 1984). Throughout western society, low back disability among the working population has increased dramatically since the 1950's (Cats-Baril and Frymoyer 1991c, Clemmer et al. 1991, Gibson et al. 1980, Hoek 1972, Nachemson 1991b, 1992, Nettelbladt 1985, Policy Analysis Inc. 1981, Uyttendael et al. 1981, Waddell 1987, 1992). However, no corresponding increase in the incidence of low back pain has been shown (Waddell 1987). Disability in the Netherlands has reached epidemic proportions (Burkhauser 1991). Disability lasting longer than 52 months (entitling one to disability benefits on the basis of the Disablement Insurance Act [WAO] and the General Disablement Insurance Act [AAW]) increased from 84 per 1,000 workers in 1975 to 138 per 1,000 workers in 1980, to 142 per 1,000 workers in 1985, and to 152 per 1,000 workers in 1989. More specifically, in the same period, the percentage of those newly entitled to disability benefits due to diseases of the musculoskeletal system increased remarkably (Knepper and Croon 1991).

In the literature, it has been reported that low back disability is related to occupational, psychosocial, diagnostic, demographic, anthropometric, health behavioral, and injury factors (Frymoyer and Cats-Baril 1987). It has been shown that repetitive work in general increases the sickness absence rate, low back pain being no exception (Bergquist-Ullman and Larsson 1977). The higher the educational level, the fewer the disability days (Deyo and Tsui-Wu 1987, Uyttendael et al. 1981). Work absenteeism is most strongly correlated to income, the rate increasing as the income decreases (Deyo and Tsui-Wu 1987). According to a panel of experts, self-employment is associated with a low risk of disability (Frymoyer and Cats-Baril 1987). These statements are confirmed by the two and half to five times lower annual mean of sick leave among dentists, general practitioners and specialists compared with the average United States worker, who lost five days annually due to medical illness (Jack and Ries 1981, Mandel 1993, Wall and Ayer 1984). Insurance has been shown to have a negative effect on low back disability. Compared with those who were not insured, insured persons claimed more low back disability and were off work longer, even when they had the same symptoms and performed the same type of job (Fordyce 1976, Fordyce et al. 1978, Greenough 1993, Greenough and Fraser 1989, Landoff 1953, Leavitt 1992, Nachemson 1983, Sander and Meyers 1986). Liberalization of compensation seemed to increase frequency and duration of back injury (Worrall and Appell 1987). It has been suggested that disability in back pain is primarily related to psychosocial dysfunction (Bigos et al. 1986, 1991, Lancourt and Kettelhut 1992). The Boeing study showed that work satisfaction and relation to colleagues and supervisors are more important than physical work factors as predictors of low back claims (Bigos et al. 1991). Moreover, it has been indicated that psychosocial factors relate not only to the risk of filing back injury claims, but also effect clearly objective injury claims (Battié et al. 1993).

In 1977, the Social Security program in the Netherlands, which covers all employees (excluding civil servants), paid 700 thousand Dutch Guilders (NLG) per hour for compensation of sickness absence and permanent disability due to low back pain. These costs doubled in a 13-year period to NLG 1.4 million in 1990. The figures were based on 260 "8-hour" work days per year (Maljers 1994). Worldwide, the distribution of costs for low back disability is skewed towards the high end: 5-25 percent of the low back cases account for 75-95 percent of the total costs (Andersson et al. 1983, Bigos et al. 1986, Frymoyer and Cats-Baril 1991, Kelsey and White 1980, Leavitt et al. 1971, Miller 1967, Nachemson 1983, Snook and Webster 1987, Spengler et al. 1986, Taugher 1973, Webster and Snook 1990). The persons receiving low back compensation for six months or more suffer from chronic low back pain. Acute low back pain in general has a physical basis. Chronic low back pain, on the other hand, becomes increasingly dissociated

from its original physical basis and increasingly associated with emotional distress, depression, failed treatment, and adoption of a sick role (Waddell 1987). The chance of a low back disabled person returning to work decreases with time. After six months, the chance to return is about 30—55 percent and after two years almost nil (McGill 1968, Nachemson 1989c, Rosen 1986).

Most of the data previously stated pertain to blue collar workers. The follow-up period of most of these studies was short. Little is known about low back disability among self-employed medical professionals, such as dentists, veterinarians, physicians and physical therapists. This study examines the amount of low back disability among these professional groups during the period from 1977 through 1989. These professionals appear to be highly educated, motivated and well-paid workers, involved in nonrepetitive tasks; they are all self-employed. In the literature, all these factors are reported to be related to a low risk of low back disability.

For secondary prevention of low back disability, the Quebec Task Force formulated a general clinical recommendation stating that "the ultimate goal of treatment of work-related spinal disorders should be returning the worker to his/her usual occupation or rehabilitation to an appropriate work activity, with minimum delay" (Spitzer et al. 1987). To achieve this goal, return to work must be integrated from early onset into the treatment (Dent 1985, Hansson 1990, Nachemson 1983, Waddell and Allan 1990). The statement that motion of the spine, gradually increasing physical activities and an early return to work accelerates the cure of occupational low back pain (Hansson 1990, Nachemson 1983) has been demonstrated by Lindström et al. (1992a, 1992b). In general, the results of early intervention programs and early return to work programs are very promising (Cady et al. 1985, Chöler et al. 1985, Fitzler and Berger 1982, 1983, Lindström et al. 1992a, 1992b, Nachemson 1983, Wiesel et al. 1984, 1988, 1994, Wood 1987).

From the literature it is evident that the approach in early intervention should be positive, and no doubt should be cast on the disabled and no adverse relationship should be set up (Bigos and Battié 1987, Fitzler and Berger 1982, 1983, Rowe 1983). Physicians have to gain the confidence and trust of the patients so they can help them with their problems. This is possible by actively helping the patients understand their options regarding the reality of back pain and work (Bigos and Battié 1991). Furthermore, "the main theme of management must change from rest to rehabilitation and restoration of function" (Waddell 1987). The present work assesses the results of an early intervention program which was introduced in 1990, aimed at secondary prevention of low back disability among self-employed dentists, veterinarians, physicians and physical therapists in the Netherlands.

Survey of the literature

Low back pain in four professional groups

Dentists

The reported life-time history of low back pain among dentists in the United States and Canada varies from 36 percent to 57 percent (Diakow and Cassidy 1984, Norris 1977, Shugars et al. 1984). Worldwide, the percentage of dentists who suffered from back or neck pain at some time in their lives ranged from 60 to 65 and remained the same after changing the work posture from standing to sitting (Bassett 1983, Biller 1946, Diakow and Cassidy 1984, Dyce and Dow 1965, Kelstrup 1977). The quoted life-time histories of back pain are within the range reported for the general working population. Whether the ratio between cervical and cervicothoracic pain and lumbosacral pain has changed after the introduction of sit-down dentistry remains unclear, but the pain in the low back is still twice as common as any other musculoskeletal problem (Diakow and Cassidy 1984, Shugars et al. 1987).

In the early 1970's, 99 percent of the dentists employed by the City of Stockholm used a vertical patient chair. These dentists suffered to a greater extent from problems of the musculoskeletal system during a two-year period as compared with a socioeconomically matched control group (Kajland et al. 1974). Troubles of the back were more common, and a significantly higher work absence was found among the dentists. Those who reported musculoskeletal problems also reported lower work satisfaction. It was not possible to establish any relationship between work satisfaction and absence due to illness of the musculoskeletal system.

A survey study reported that in 1984 an average of 79 percent of the American dentists were seated when treating patients (Shugars et al. 1987). Dental practice was mentioned as an aggravating factor by 59 percent of those who reported back pain (Diakow and Cassidy 1984). The work posture and work-related psychosocial stress during practice can contribute to low back pain among dentists. The forward bent sitting posture of the dentist, accompanied by bending and twisting, and the relatively static work (Bassett 1983, Diakow and Cassidy 1984, Shugars et al. 1987) were associated with an increased risk of low back pain (Bergquist-Ullman and Larsson 1977, Brown 1975, Damkot et al. 1984, Daniel et al. 1980, Frymoyer et al. 1980, 1983, Hult 1954a, 1954b, Kroemer and Robinette 1969, Lawrence 1955, Lloyd et al. 1986, Maeda et al. 1980, Magora 1972, Partridge and Anderson 1978, Troup 1984, Wickström et al. 1978). Reported work-related psychosocial stress factors have been time-pressure (working to a fixed schedule), constant coping with tense or fearful patients, and the demands due to the exact nature of work (Bassett 1983). Other sources of work-related psychological stress have been patients who do not show up at their appointments or who were not satisfied, financial aspects, which could give difficulties in managing a practice, problems associated with colleagues (dentists, dental nurses, dental hygienists and dental technicians), working in social and environmental isolation, and coping with the physical, chemical and infectious hazards in dentistry (Boersma-Van der Meulen 1988). Most dentists cope with such stress by adapting their environment and goals. Some react adversely and develop excessive anxiety which results in a vicious circle in which the stress worsens and psychosomatic complaints or even a "burn-out" syndrome occurs (Scully et al. 1990). It is striking that, of those who reported musculoskeletal pain, the pain interfered with sleeping in nearly one fourth (Shugars et al. 1987). It is well known that sleepdisturbance can be an indication of somatization.

High frequencies of back pain were reported in the group from 30 to 40 years of age. In Canada, dentists in this age group are generally establishing and building their practices. Financial obligations may promote longer and harder working hours, placing more stress on the dentist's back (Diakow and Cassidy 1984). Another Canadian study showed that 70 percent of the dentists who had suffered from back or neck pain at some time in their lives had never missed work. From those who had missed work, 60 percent were absent from practice for less than one week. Bassett assumed that most of the dentists kept working despite back or neck pain because of insurance, i.e. for financial reasons. Many self-employed dentists suffer a direct loss of income if they are unable to work (Bassett 1983).

Veterinarians

In a cross-sectional questionnaire study in 1992, a life-time history of low back pain of 61 percent was found among self-employed veterinarians in the

provinces Noord-Brabant and Limburg in the Netherlands. Only 23 percent of the veterinarians who reported low back pain consulted a physician one or more times for this problem (Snijdelaar 1992).

Veterinarians, like many other professionals, are subjected to psychosocial stress. Several work-related psychosocial stress factors were described by Boon (1992). Collaboration with colleagues (50 percent have a group-practice) seems to pose problems for many veterinarians. Apparently the practical work, which often could be fulfilled by a less educated person than a veterinarian creates tensions for the academically educated. Governmental rules are not always easy to interpret, and are often changing. As in other professions, aggravation occurs when a client does not appear at an appointment. Veterinary science of surgery has become commercialized in the last decades and the motivation is primarily a profit-seeking one. There is competition between veterinarians, especially between those with and without an official license to set up a practice (Boon 1992).

Physicians

The only data available in the literature concerning back disability among physicians is a retrospective study of disability for thoracolumbar back pain among self-employed physicians, insured by the insurance company Artsen Onderlinge in the Netherlands (Van Wiechen 1989). It involved the first claims of thoracolumbar back disability of physicians, who were accepted without a special insurance condition for thoracolumbar complaints. From the period of 1975 through 1984, the incidence density of thoracolumbar back disability, defined as the incidence of population Y during period X, divided by the man-years of population Y during period X, was 33 per 10,000 man-years. The incidence density increased with advancing age, both in men and women.

Physicians seemed to be admitted to a hospital half as often for back pain as the general population. The figures of the physicians included first claims only and no recurrences, which were included in the data of the general population. When recurrences were included also for the physicians, this difference was smaller, but still very prominent.

Between 1964 and 1988, an incidence density of back disability for periods longer than 52 weeks was reported as three per 10,000 male man-years. This figure can be compared with an incidence density of 13 per 10,000 among office workers in industry during the period of 1975 through 1983. The same remark about recurrences for the hospital admissions can be made for the incidence density of back disability lasting longer than one year.

For 17 percent of the physicians (18 percent men versus 7.7 percent women) who were disabled longer than three months, disability still remained after one year, compared with 36 percent (35 percent men versus 36 percent women) of the claimants in the general working population. After three months of back disability, the chance to return to full-time work before one year of disability was 83 percent for physicians, compared with 65 percent for the general working population. After three months of disability, a much greater percentage of physicians seemed to suffer from specific causes of back pain (International Classification of Diseases (ICD) codes 721 and 722) (World Health Organization 1977), as compared with the general working population, in which high percentages of nonspecific causes of back pain were reported (ICD Code 724). In conclusion, physicians were admitted to a hospital less often because of back pain and were less long-term disabled than the general population in the Netherlands.

Physical therapists

Physical therapy is a physically demanding job, involving both dynamic loading situations, especially bending and twisting, lifting (with sudden maximum efforts), and static work postures. No difference in incidence, prevalence, point prevalence, life-time prevalence, and recurrences of back pain have been found compared with the general working population (Molumphy et al. 1985, Scholey and Hair 1989). The life-time history of low back pain among physical therapists in the United States, working in seven different work settings, was found to be 52 percent (Molumphy et al. 1985), and for physical therapists working in United Kingdom hospitals for the NHS it was 57 percent (Scholey and Hair 1989). In both studies, the initial onset of back pain occurred between the ages of 21 and 30 years, and during their first years working as physical therapists. The American study showed that 29 percent of the physical therapists reported work-related back pain while 21 percent was not work-related. Forty-two percent of the physical therapists who reported work-related back pain went on sick leave, but only 17 percent used workers' compensation benefits. Physical therapists were more likely to attribute their back pain to work than the general working population (Scholey and Hair 1989). They associated the initial onset of work-related back pain especially with twisting, bending and lifting (Molumphy et al. 1985, Scholey and Hair 1989). However, among physical therapists, no relationship was found between neither dynamic

nor static loading conditions and the annual prevalence of back pain (Scholey and Hair 1989).

Incidence and prevalence

In the last decades, several epidemiological studies have been performed in western societies on the incidence and the prevalence of low back disability (Table 1). The results are hard to compare. Various definitions have been used for incidence and prevalence regarding claims or claimants, concerning the minimum number of days absent from work, and regarding the definition of the rate. In general, the incidence rate based on workers' compensation board records and Social Security data varied between 0.1 percent and 4.75 percent.

No trend has been detected in incidence or prevalence rates reported by several studies performed in different countries and years (Table 1). However, follow-up studies have shown a clear increase of low back disability. In a 10-year period between 1959 and 1968, the number of sickness claimants due to backache in the Haarlem postal service in the Netherlands increased from 53 to 111, while the population at risk stayed constant (N=1,813), meaning that the incidence rate increased from 2.9 percent to 6.1 percent (Hoek 1972). A retrospective study among employees of a Belgian university and university hospital showed an increase in sick listing due to low back pain from 0.4 percent of the employees in 1971 to 3.6 percent in 1978. The incidence was significantly higher in women as compared to men (Uyttendael et al. 1981). Nachemson (1992) estimated an increase in sick listing for low back pain in Sweden from three percent in 1980 (Chöler et al. 1985), to five percent in 1983 (Riksförsäkringsverket 1987–1988), and to eight percent in 1987 (Nachemson 1991a). The average number of days of sick listing due to low back pain showed the same increasing trend (Nachemson 1992): 25 days in 1980 (Chöler et al. 1985), 30 days in 1983 (Riksförsäkringsverket 1987– 1988), and 40 days in 1987 (Nachemson 1991a). The annual number of episodes of incapacitating back pain per 1,000 persons at risk multiplied in the United Kingdom from 1953 to 1982 by a factor of 2.5 among men (from 2.17 percent to 5.46 percent) and by a factor of 5.9 among women (from 0.8 percent to 4.77 percent) (Waddell 1987). The total days of sick certification due to backache per 1,000 persons at risk increased 3.7 times among men and 4.9 times among women. An acceleration in the trend was observed in the mid-1970's. Furthermore, the total days of sickness benefit for low back pain deteriorated markedly in recent years, from nearly 30 million days per year in 1984 to 60 million days in 1990 (Waddell 1992). Waddell (1987) reported the same increase in low back disability in Canada between the 1950's and the 1970's as in the United Kingdom. The incidence rate of low back sick listing in a retrospective study among steel workers in Canada showed a decrease from 1967 through 1972, followed by a conspicuous increase from 0.644 man-years in 1973 to 1.250 in 1977. The increase has been partially explained by a relaxation in the workers' compensation board requirements for eligibility of benefits (Gibson et al. 1980). Clemmer et al. (1991) performed a retrospective study among petroleum drilling workers in the Gulf of Mexico from 1979 through 1985. The annual incidence rate (number of injuries per 200,000 work hours) of low back injuries increased, in contrast to the decreasing trend in the annual incidence rate for all other injuries.

The Social Security system in the United States defines permanent disability of an individual as follows: a person should be unable to engage in any substantially gainful activity by reason of any medically determinable physical or mental impairment which can be expected to result in death or which has lasted or can be expected to last for a continuous period of not less than 12 months (Disability evaluation under Social Security 1979). Between 1957 and 1976, the average increase for all awards in the Social Security Disability program was 250 percent, slightly higher than the rate of population growth during that period. The awards for back pain rose by 2,800 percent, representing a growth rate 14 times the rate of population growth (Cats-Baril and Frymoyer 1991c). Data from the National Health Statistics (Policy Analysis Inc. 1981) in the United States reported that the annual "impairment of physical activity" due to a spinal condition increased from 8–16 per 1,000 persons in 1970–1971 to 14–25 per 1,000 in 1979–1980, which represented an increase of 170 percent. The majority of the increase occurred between the years of 1976 and 1980. According to Cats-Baril and Frymoyer (1991c), socioeconomic rather than medical influences most likely accounted for the growth of permanent disability. They hypothesized the existence of a social malaise since the mid-1970's. As in the United States, a similar increase in permanent disability was reported in Sweden. From 1952 to 1987 the increase of the number of persons suffering from permanent disability amounted to 6,000 percent (Nachemson 1991b). Waddell (1987) concluded that low back disability is a relatively recent western epidemic, expressed by increased work loss, sick certification, compensation, and long-term disability.

Table 1. Incidence and prevalence rates

Author	Country	Year	Period in years	Incidence	Remarks [a]
Haanen (1984)	Holland	1976–1977	1.5	men: 6.2%/year women: 6.5%/year	questionnaire: men, off job for at least two days; women, unable to do regular housework; cross-sectional study
Lenshoek et al. (1987)	Holland	1975–1982	8	men: 0.13%/man-year	Social Security data: office workers in industry, back disability exceeding one year; incidence density
Van Wiechen (1989)	Holland	1975–1984	10	0.33%/man-year	insurance company data: self-employed physicians, first claims of thoracolumbar back disability; incidence density
		1964–1988	23	men: 0.03%/man-year	back disability exceeding one year
Verbeek (1991)	Holland	1980–1985	6	men: 0.27%/man-year women: 0.19%/man-year	Social Security data: 85% of general working population (all tax payers, civil servants excluded), back disability exceeding one year
Zuidema (1985)	Holland	1980	1	4.75%	Social Security data: absenteeism due to lumbar injuries in the building trade
Gyntelberg (1974)	Denmark	1970's	1	7.9%	questionnaire: 40–59 year old men, LBP severe enough to warrant bed rest or to require absence from work; cross-sectional study
Hult (1954b)	Sweden	1949+1952	1	2.93%/man-year	field investigation: workers in different occupations, back trouble that causes incapacity for work
Horal (1969)	Sweden	1964	1	~2%	Social Security data: sick listed for lumbar spine disorder during at least one week
Blow and Jackson (1971)	UK	1967	1	1%	back injuries among dock workers, sickness absence of at least three days
David (1985)	UK	1977–1978		men: 0.58% women: 0.12%	Social Security data (DHSS): industrial back sprains and strains, minimum of three days off work during 1977–1978
Wood and Badley (1985, 1987)	UK	1978	1	2.1%	Social Security data: reporting sick for work due to back pain
Stubbs and Nicholson (1979)	UK		1	0.86%	accident data: two large construction companies
Anderson (1986)	UK		2	2.25%/year	jobs in dockyard, at least one episode of sickness absence due LBP over two years
Gibson et al. (1980)	Canada	1977	1	1.25%	WCB records: steel workers; retrospective study
Spitzer et al. (1987)	Canada	1981	1	1.37%	WCB records: absence from work of at least one day, for a spinal disorder at least one time during 1981, regardless of the number of times
Bond (1970)	US			2%	back pain reported in industry
Leavitt et al. (1971)	US	1967		2%	back pain reported in industry
Liberty Mutual (1976)	US	1976	1	2.0%	WCB records: industrial population
Klein et al. (1984)	US	1979	1	0.75% (0.15%-2.08%)	WCB records: compensation claims due to back strains/sprains in 26 states
Snook (1982)	US	1979	1	0.78%	WCB records, California: all types of employees, back strains, absence from work for at least 1 day
Spengler et al. (1986)	US	1979–1980	1.25	claimants: 2.2%/year claims: 2.3%/year	WCB records, The Boeing Company: back injuries; retrospective study
Battié (1989)	US	1982–1986	4	claimants: ~3%/year	LBP reporting in industry, The Boeing Company: prospective study
				Prevalence	
Svensson and Andersson (1982)	Sweden	1978	point	3.6%	questionnaire: 40–47 year old men, all men with current symptoms or problems recurring at least once a month; cross-sectional study
				3.5%	Social Security data: the same population studied
Svensson et al. (1988)	Sweden	1979–1981	point	age 38–49: 2.6% age 50–64: 5.9%	questionnaire: 38–64 year old women, all women with current symptoms or problems recurring at least once a month; cross-sectional study
				age 38–49: 3.3% age 50–64: 5.9%	Social Security data: the same population studied
Afacan (1982)	UK	1976–1977	1	14.8%	National Coal Board records: men, sickness absence due to back injuries
Lee et al. (1985)	Canada	1978–1979	point	4.4%	Canada Health Survey: "serious trouble" with back and spine

[a] LBP low back pain
[a] WCB records: workers' compensation board records (injuries on the job)

Duration

The mean period lost from work due to low back pain is around 30 days per case (Riksförsäkringsverket 1987–1988, Wood and Badley 1985, 1987). Return to work is influenced by the clinical diagnosis (Andersson 1981). Subjects with sciatica return to work much more slowly than subjects with back pain only. Sixty percent of the persons with only low back pain returned to work in 10 days whereas only nine percent of those with sciatica did so (Christ 1973, Svensson 1982, Svensson and Andersson 1982). Furthermore, the average sickness period increases with advancing age (Riksförsäkringsverket 1987–1988, Rossignol et al. 1988).

The worker, the employer and the attending physician seem to influence the return to work. Malingering, psychosocial disability (Beals and Hickman 1972) and illness behavior (Waddell and Main 1984, Waddell et al. 1980, 1984) have negative effects on resuming work. Similar findings were reported when no follow-up or encouragement occurred, and when no light duty, part-time or alternative work was offered by the employer (Snook 1989). However, recent studies showed that unwarranted work-restrictions for industrial workers with low back pain decreased the chance of returning to full-time work (Hall et al. 1994, Skovron et al. 1993). Inappropriate treatment and too much treatment from the attending physician delayed the return to work (Nachemson 1989a). Furthermore, return to work was more strongly influenced by social and work-related factors than either physical findings or surgical effects (Waddell 1987, Waddell et al. 1986, 1988).

Early intervention

The prognosis of simple low back pain is very good. Ninety percent of the claimants return to work within six weeks (Andersson et al. 1983, Chöler et al. 1985, Snook and Webster 1987, Spitzer et al. 1987), with or without treatment (Waddell 1987). However, the chance to return to work decreases conspicuously with time (McGill 1968, Nachemson 1989c, Rosen 1986). In an overview of the literature, Waddell (1987) noted that industrial physicians and occupational therapists have emphasized the physical, psychological, and social value of early return to work (Derebery and Tullis 1983, Goldberg 1982, White 1966), but that this has never been proved (Catchlove and Cohen 1982, McVeigh 1986). Nachemson (1983) reported an indirect proof of the benefits of return to work. According to Bigos and Battié (1987), the effective early intervention should center around:

- Teaching patients about back care, including how to control symptoms through improved body mechanics.
- Applying these educational principles, especially to the patient's livelihood.
- Avoiding the debilitation that results from overusing bed rest and medication.
- Recommendations to increase cardiovascular fitness.
- Judicious use of surgery.

The benefits of such an approach have been shown in several studies. Lindström et al. (1992a, 1992b) reported a graded activity program performed among industrial workers who had been sick listed due to low back pain for eight weeks. Specific causes of low back pain were excluded. The program included an individual, submaximal, gradually increased, exercise program, with a behavioral approach. The operant condition method used aimed at teaching the patients that it is safe to move, while regaining function. Furthermore, the patients were continually encouraged to return to work. The patients in the activity group returned to work 5.1 weeks earlier than the patients in the control group.

In 1977, the Los Angeles Fire Department made important changes in the return to work program, permitting more limited duty assignments for temporarily disabled firemen. This change, in combination with a physical fitness program, reduced workers' compensation costs by 25 percent (Cady et al. 1985).

Chöler et al. (1985) showed that emphasizing proven effective treatment methods, educating the primary care physician, providing the patient with a realistic understanding, interacting as needed with the work site, and using stringent guidelines for surgical intervention, could not necessarily return everybody to the same job, but could return everybody to work within a 15-week period.

Wiesel et al. (1984, 1988, 1994) used a standardized diagnostic and treatment protocol at Potomac Electric Power Company (Washington, DC) to monitor and communicate with the attending physicians. During a 10-year follow-up, the average time lost per injury decreased by 40 percent (Wiesel et al. 1994). Low back surgery dropped by almost 70 percent and the operative success rate increased from 56 percent to more than 90 percent. Furthermore, there was a 59 percent decrease in indemnity costs, resulting in a cumulative 10-year savings of over 2.6 million US Dollars (USD). Wiesel et al. (1984, 1994) concluded that the emphasis should be on quality care, which, in turn, will lead to cost efficiency.

Fitzler and Berger (1982, 1983) designed a protocol to handle low back pain at American Billrite Inc. (Cambridge, MA). The key element was immediate referral to the company clinic to keep the worker on the job, and away from outside practitioners. Management provided light duty work and rest periods for the temporarily disabled. The amount of lost time decreased by 50 percent, from 2.78 per 200,000 man-hours in 1980 to 1.56 in 1982. This approach reduced the costs of workers' compensation for low back pain from over USD 200,000 per year to less than USD 20,000 per year.

Wood (1987) increased communication between the patient (hospital staff member), employer, practitioner and insurer at the Juan de Fuca Hospitals (Victoria, BC, Canada). The intention of the tone of the communication was pleasant and the focus was in the best interests of the patient. The message to the patient was: "You are a vital part of the hospital team. Your work is important and your job is waiting for you." The proportion of high-hour (over 1,000 hours) claims decreased from 7.1 percent in the eight months prior to the approach to 1.7 percent initiated four months after the approach began. Furthermore, a strong reduction in the frequency of back accidents was reported.

In contrast to these positive results was the study reported by Greenwood et al. (1988) about a very early intervention program among coal miners in West Virginia. One week after the injury, a rehabilitation nurse visited the worker (at home) to conduct an evaluation of the worker's health and psychosocial conditions. Workers at risk of an extended disability (longer than 120 days) were provided with recovery management services. Compared to a control group, there was no significant difference in lost days, indemnity benefits and medical benefits. One of the reasons could be the climate at which the early intervention program took place. The intervention approach went against the general principles that a level of temporary or permanent disability is to be expected as a result of work, and when a disabling injury occurs, there is little that can or should be done about it. The authors stated that rigorous appraisals of intervention must be undertaken to determine at what point in time, under what conditions and in what environment intervention yields cost-effective benefits.

In this context the Michigan disability prevention study should be mentioned, which analyzed the impact of various employer policies and practices on prevention of work place disability due to all kind of occupational injuries and illnesses (Hunt and Habeck 1993). Only Safety Diligence and Proactive Return-to-Work Program seemed to have a powerful disability reduction. Conclusively, the twin strategies of trying to prevent injuries in the first place and working to ameliorate the disability effects through disability management techniques, were both shown to be productive in reducing work place disability.

A retrospective study over a 13-year period (N=1,119)

Material and methods

Material

Source of data

In the Netherlands, the self-employed are not covered by social security for disability until one year has elapsed. Any resident in the Netherlands whose disability exceeds the one-year boundary can apply for compensation by the General Disablement Insurance Act (AAW). However, the income substitution received in this way is the minimum wage. Someone who is disabled for 80 percent or more receives 70 percent of the minimum wage. In 1990 this minimum wage per year was equal to NLG 25,980. Persons who are disabled to a degree of less than 80 percent will be covered by a lower percentage (from 51 percent to 21 percent) of the minimum wage, and those who are less than 25 percent disabled are not entitled to compensation (Voorlichtingscentrum Sociale Verzekering 1990). For these reasons it seems clear that self-employed medical professionals should insure themselves against the financial consequences of disability.

Data for this study were obtained from the private non-profit mutual insurance company Movir, Nieuwegein, the Netherlands, where self-employed dentists, veterinarians, physicians and physical therapists can voluntarily insure themselves against the financial consequences of disability. For most of the subjects in this study, the insurance at Movir was the only coverage against disability, except for the coverage by the General Disablement Insurance Act (AAW) mentioned above. The figures of Movir refer to compensation of disability only, and not to the medical costs of disability. The definitions of the terms used in this study are presented in the glossary.

The procedure of acceptance by the insurance company starts with the completion of a health certificate and a physical examination by a general physician. If the person to be insured has had or still has low back problems at the time of the application, an expert opinion is sought. It is possible that upon acceptance low back disability is excluded from compensation. In taking out disability insurance, the insured person may opt for an insured daily compensation and a deferred period. Most persons insure themselves the moment they buy a practice for which they usually borrow money. The applicants are forced to insure themselves so that the bank has a guarantee that the applicants can fulfill their financial obligations in case of disability.

According to the rules of the insurance policy, a subject ought to report a claim within 72 hours after the onset of the disability. In the Netherlands there is a strict separation of treatment (of a patient) and (his/her) work incapacity evaluation. The disability is assessed by a medical advisor from the insurance company. In 1986, a new article in the policy came into effect which states that the medical assessment of claimants who are disabled for more than 5 years in a 6-year period, or in the case of physical therapists, more than 2 years in a 3-year period, will not be based upon the claimant's own profession, but upon professions in general with a social position and education equal to the claimant's own profession. This article is effective for dentists, veterinarians and physicians if their disability starts under the age of 50, and for all physical therapists, regardless of age.

All disability claims are coded in the central computer of the insurance company according to the ICD (*ninth revised edition*) (World Health Organization 1977). Low back symptoms are categorized under codes XIII-02(720, 721, 722, 724) and XIII-04(732, 733, 737, 738). The computerized files of all claims with these codes in the period 1977 through 1989 were obtained from the insurance company. Each claim contained profession, age, sex, deferred period, insured daily compensation, degree and duration of disability.

Development of the insurance company Movir

The total number of self-employed dentists, veterinarians, physicians and physical therapists insured by Movir steadily increased from 6,424 on January 1, 1977 to 13,962 on January 1, 1990 (Figure 1). The distribution according to age changed over the period studied (Figure 2). The same trend was found for all professional groups separately, except for physicians. The latter showed no change in distribution according to age over the years. In general, the insured population advanced in age: the number of persons under 35 years decreased, while the group between 35 and 44 years went up. This trend was most evident among veterinarians and physical therapists. Among veterinarians, the relative number of persons in the group

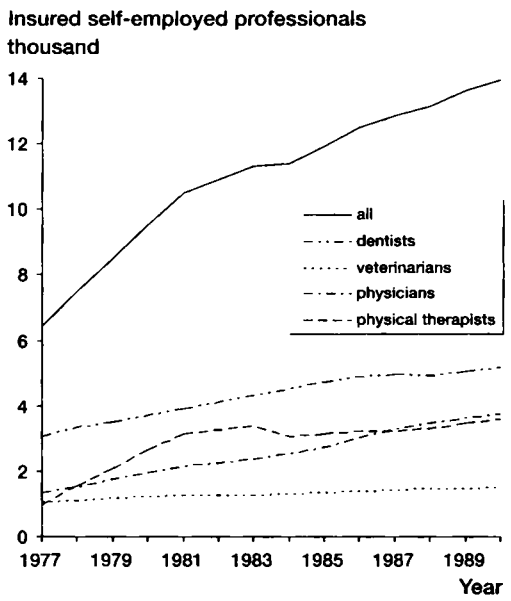

Figure 1. Number of insured self-employed professionals according to profession (1977–1990).

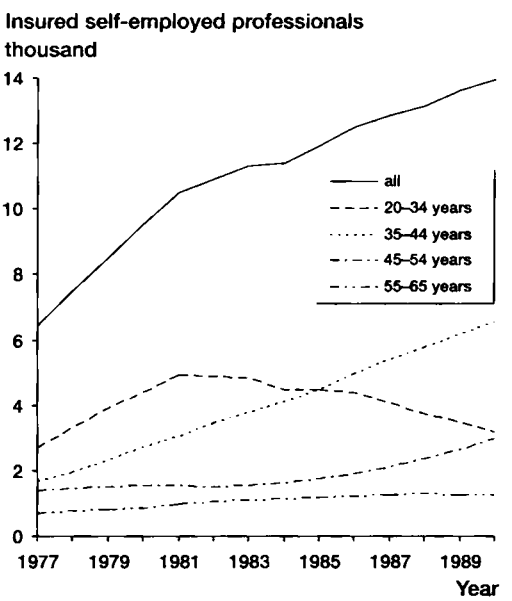

Figure 2. Number of insured self-employed professionals (1977–1990). Age distribution.

over 45 years increased over the years from 26 percent to 38 percent.

Of all persons insured, a small number had a restriction for compensation of low back disability (58 persons in 1977, 75 in 1980, 104 in 1985 and 131 in 1989).

Generalization

Data regarding the number of self-employed dentists, veterinarians, physicians and physical therapists working in the Netherlands are based on publications of Central Bureau of Statistics (Centraal Bureau voor de Statistiek 1980, 1983, 1984, 1986a, 1986b, 1989, 1992), Ministry of Welfare, Health and Cultural Affairs (Ministerie van Welzijn, Volksgezondheid en Cultuur 1984, 1985, 1986, 1987), Royal Netherlands Veterinary Association (Koninklijke Nederlandse Maatschappij voor Diergeneeskunde 1977...1990, 1992), Netherlands Institute for Research of Primary Health Care (Nederlands instituut voor onderzoek van de eerstelijnsgezondheidszorg 1986, 1988, 1991, 1992) and National Hospital Institute (Nationaal Ziekenhuisinstituut 1980...1990, 1986...1990). From these statistics the market share of Movir by profession through the years was calculated.

Over the whole period studied self-employed dentists (dentist-specialists included) insured by Movir represented 65 percent to 70 percent of the dentists in the Netherlands (both self-employed and in paid employment) (Centraal Bureau voor de Statistiek 1980, 1983, 1984, 1986a, 1986b, 1989, 1992, Ministerie van Welzijn, Volksgezondheid en Cultuur 1984, 1985, 1986, 1987). No differentiation between the number of self-employed dentists and dentists in paid employment in the Netherlands is available. It is assumed that the market share of self-employed dentists over the period studied varied between 75 percent and 80 percent.

More than 80 percent of the self-employed veterinarians in the Netherlands (Koninklijke Nederlandse Maatschappij voor Diergeneeskunde 1977...1990, 1992) were insured by Movir over the period 1977 through 1990.

From 1980 through 1990, the market share of self-employed physicians (general practitioners and specialists) gradually increased from about 20 percent in 1980 to 30 percent in 1990 (Nationaal Ziekenhuisinstituut 1980...1990, 1986...1990, Nederlands instituut voor onderzoek van de eerstelijnsgezondheidszorg 1988, 1992).

From 1977 through 1982, the number of self-employed physical therapists in the Netherlands was estimated by Institute of Health Care (Nederlands instituut voor onderzoek van de eerstelijnsgezondheidszorg 1986). During these years the market share of self-employed physical therapists increased from 25 percent to 50 percent. From 1983 through 1986, no reliable data on self-employed physical therapists

is available because of changes in practices, which were forced by governmental rules. In 1987 and 1989, 44 percent of the self-employed physical therapists in the Netherlands (Nederlands instituut voor onderzoek van de eerstelijnsgezondheidszorg 1988, 1991) were insured by Movir.

Low back disability claims

From 1977 through 1989, 1,215 claims were recorded by MOVIR under the ICD codes of low back pain. These files were checked by a physician. Criteria for entering the population studied were low back problems as the main causes of disability. After comparing the computer file with the original clinical report and/or disability report, low back pain seemed to be the main cause of disability in 1,119 claims. These 1,119 claims were filed by 839 persons. Three levels of reporting were distinguished:

I) report of a medical officer (a general practitioner) or information from the claimant him/herself;
II) report of claimant's treating specialist; and
III) expert opinion.

Demographic, insurance, medical and psychosocial variables were obtained and analyzed. Information on diagnostic imaging was collected only from reports produced by the claimant's attending specialist and/or by an expert.

Specific low back pain had a higher level of reporting than nonspecific low back pain. In total, 661 claims were classified as nonspecific low back pain. In 81 percent of these claims, the information was classified as level I, in 10 percent as level II and in 9.4 percent as level III. The classification of a claim as specific low back pain (n 370) was based upon information of level I in 37 percent, of level II in 38 percent and of level III in 25 percent. As expected, the level of reporting increased with the duration of disability.

In addition, the level of reporting increased from 1986 onwards. From 1986, two full-time medical advisors instead of one were used by the insurance company. At the same time, the handling of claims changed. Reports from a local general practitioner functioning as a medical officer replaced telephone interviews by the medical advisor with the claimant. More information was obtained from the attending specialist and more expert opinions were sought.

For 49 of the 1,119 claims no information was available: two dossiers could not be located and 47 dossiers were transferred to another insurance company after separation of the coinsurance contract in January 1990. The duration of disability of these unavailable dossiers was short: for 12 it was less than 16 days, for 39 less than 6 months, and for only one, more than 1 year. Most of the 49 claims were by physical therapists and started in the last years of the study: one in 1983, three in 1987, 18 in 1988 and 27 in 1989. These claims were kept among the disabled group to prevent an underestimation of the annual incidence rate of low back disability among physical therapists at the end of the period under investigation. In the worst case, all of these 49 (4.4 percent) claims recorded as low back pain could be due to another disease. However, the risk that these claims were not caused by low back pain was very small. All 49 claims were ICD coded as XIII-02 721, -722 and -724. These 49 claims started in 1983, 1987, 1988 and 1989. During these years 444 claims were recorded in the same ICD codes, 37, or 8 [95% confidence interval: 5.6–11.1] percent, of which seemed not to be related to low back pain but rather to complaints from the cervical spine. Therefore, 8 percent of the 49 claims were probably not related to low back pain. This corresponded to four claims, or 0.4 percent of the 1,119 claims.

Claims not related to low back pain

For analyzing the claims not related to low back pain, a sample of 878 claims over the period from 1977 through 1989 not coded in the categories of low back symptoms according to the ICD were chosen at random from persons still insured on January 1, 1991 (in total 12,479 persons). The medical reports and/or disability reports of these claims were checked by a physician.

Thirteen claims of this sample were actually claims of low back disability (seven times low back pain caused by an accident, once low back pain associated with pregnancy and five times low back pain per se). Therefore, 1.5 percent of the sample seemed to be low back disabled. The number of claims from 1977 through 1989 amounted to 13,492, of which 1,215 were coded as low back pain. Therefore, 12,277 claims were not coded as low back pain. For 1.5 percent of the 12,277 claims, or 182 claims, the cause of disability was likely to be low back pain.

Observation period

The median value of the observation period, or period from the moment a person entered the study until the end of observation, of each claimant was 1,216 (4–5,766) days, with an average of 1,578 days. The reason for the end of observation was the completion of the retrospective study (January 1, 1991) or expiration of the insurance policy before this date. Examples of such expirations were: pensionable age, death, acceptance of paid employment, suppression of medical information on acceptance, surrender of

Table 2. Insured daily compensation in Dutch Guilders indexed to 1990[a]: median-value and distribution in low, middle and high groups according to profession. All claims 1977–1989, minus physicians' claims and 5.5% of dentists' claims

	n	Median	Low	Middle	High
Dentists	396	365 (40–755)	<300	300–399	>399
Veterinarians	220	260 (21–1,074)	<225	225–314	>314
Physical therapists	317	167 (31–400)	<125	125–199	>199
All	933	257 (21–1,074)			

[a]exchange rate on December 31, 1990 (Rabobank 1993):
1 Dutch Guilder = 0.59 US Dollars
1 Dutch Guilder = 3.33 Swedish Crowns

the insurance policy in case of permanent disability, or separation of the coinsurance contract at January 1, 1990.

Methods

Insured daily compensation

To analyze the influence of the insured daily compensation on disability, all compensation was indexed to 1990, with index figures from the Central Bureau of Statistics of the Netherlands. All physicians and a few dentists were excluded, because they were insured by another company as well and the amount of the insured daily compensation with the other insurance company was not known. The exclusion amounted to 5.5 percent of dentists' low back disability claims, which included 6.1 percent of their first low back disability claims. The indexed insured daily compensation was divided into three equivalent groups (low, middle and high). Profession had great influence on the median value of the insured daily compensation (Table 2). Therefore, separation into the three compensation groups was standardized for profession.

In 1990, the costs of a substitute (salary, social premiums and vacation compensation), amounted to NLG 115,000 per year (NLG 315 per day, seven days a week) for dentists (Bedrijfsvereniging voor de Gezondheid, Geestelijke en Maatschappelijke Belangen 1993, Nederlandse Maatschappij tot bevordering der Tandheelkunde 1993, Van Dijk 1993), 97,000 (NLG 265 per day, seven days a week) for veterinarians (Bedrijfsvereniging voor de Gezondheid, Geestelijke en Maatschappelijke Belangen 1993, Koninklijke Nederlandse Maatschappij voor Diergeneeskunde 1993) and 60,000 (NLG 165 per day, seven days a week) for physical therapists (Bedrijfsvereniging voor de Gezondheid, Geestelijke en Maatschappelijke Belangen 1993, Vereniging van Vrijgevestigde Fysiotherapeuten 1993).

Costs

Annual costs of low back disability were obtained from the disability reports and computer files for the whole period under investigation. Annual costs of compensation for other diseases classified according to the categories of the ICD were obtained from the central computer. In addition, reservations for expected payments in future years for the current disability claims were supplied by Movir. To compare the costs in the different years of the study, all compensation was indexed to 1990.

Statistics

For all statistical tests used in this study, a P-value of less than 0.05 was regarded as significant.

Age at which disability started (starting age)

In order to analyze the starting age of low back disability, the claims were subdivided into eight groups (< 30, 30–34, 35–39, 40–44, 45–49, 50–54, 55–59, and 60–65 years; coded one to eight). Among first claims, the difference in median starting age (expressed as coded value) between specific and non-specific low back disability was tested with the Wilcoxon Rank Sum Test.

Number of claims per month

In order to analyze the influence on low back disability of seasonal variations of the work load among veterinarians and vacation among all persons, the number of claims per month were compared with the Chi-squared test, both for profession and deferred period.

Chronic (permanent and temporary) low back disability

For chronic low back disability, permanent low back disability was distinguished from temporary low back disability. The difference between these two groups in distribution of several, perhaps discriminat-

ing variables was also analyzed with the Chi-squared test.

Incidence rate

The annual incidence rate was computed from 1977 through 1989. The incidence rate for a particular calendar year is the annual number of new claimants per 1,000 persons at risk. The population at risk is the population at mid-year, calculated by the sum of the number insured on January 1st and the number insured on January 1st of the following year, divided by two. Persons with a restriction on compensation for low back pain were excluded from the population at risk.

The distribution of the population at risk according to profession, age, deferred period and insured daily compensation changed over the years, which could have influenced the annual incidence rate. Therefore, the incidence rates were analyzed with BMDP's stepwise logistic regression program LR. The aim of logistic regression is to examine the joint effect of some independent variables on low back disability (in this case, the presence or absence of low back disability). Variables significantly related to low back disability were selected and tested by a stepwise procedure. To control entry and removal of variables, a P-value of 0.10 and of 0.15 was used respectively. The regression coefficients beta were estimated using the maximum likelihood method. The criterion to enter a variable as a categorical or as a continuous variable was tested with the use of the likelihood ratio test. The incidence rate was calculated for each calendar year of the study, standardized to 1977 by adjusting for the variables profession, age and deferred period.

The influence of insured daily compensation on the incidence was analyzed separately from 1982 through 1989 (no data of the denominator was available before 1982). Furthermore, the incidence rate of chronic low back disability and the rate of specific and nonspecific low back disability was analyzed in the same way. The list of variables did not include gender because the number of females among the insured persons and the disabled was very small.

The incidence rate of low back disability lasting longer than 52 weeks over the period from 1980 through 1985 in this study was compared with that among the general working population in the Netherlands. Data on sickness work absenteeism of the general working population were collected by Verbeek (1991) from the Joint Medical Service (GMD) which is enforcing legal insurance against disability exceeding 52 weeks, according to the Disablement Insurance Act (WAO) and the General Disablement Insurance Act (AAW). These data related to 85 percent of the Dutch working population, which includes all tax payers exclusive of civil servants. The incidence rate in both groups was given per 1,000 man-years. The possible association of employment (self-employed medical professionals versus general working population), age and gender with the incidence of low back disability lasting longer than one year was analyzed with the logistic regression method.

Duration

The data of the claims were analyzed in order to investigate the association of several possibly predictive variables with duration or number of disability days. Several persons claimed low back disability twice or more during the period studied which would influence the analysis. For this reason only first claims of low back disability were taken into account. The claimants were observed from the start of the disability until January 1, 1991 or until the termination of their insurance policy, whichever came first. Ninety percent of the claimants were observed for more than one year. On January 1, 1991, 745 first claims were terminated and 50 first claims were still open. Therefore, a survival method for analyzing the length of time to a response was appropriate. The response is an event that occurs at a specific point in time, which according to survival analysis, is mostly "*death*", but in this case is "*end of compensation*". The data on cases for which the response had not yet occurred at the completion of the study, i.e., which were still being compensated, are called incomplete or censored. The distribution of the time to response, or duration of low back disability, was assessed with the Kaplan and Meier method. To compare independent groups of survival according to the duration of low back disability, the Mantel-Cox test was used. The duration in days at which 75 percent, 50 percent and 25 percent of the claims were still compensated was used to describe the Kaplan-Meier curves. The Brookmeyer-Crowley 95% confidence interval (in days) was given for the duration at which 50 percent of the claims were still compensated (median duration).

The percentages of claimants who returned to work within 15, 30, 45, 90, 180, 365 and 730 days were estimated by the Kaplan and Meier method for all claims (N=1,119) and for first claims (n 795) in the period studied. For first claims, a subdivision according to diagnosis and deferred period was made. Return to work in this context means "*end of compensation*", or that the claimant can fulfill his/her job at more than 75 percent. The chance to return to work within two years after the start of disability was cal-

culated at the start, and at the following time point under the condition that the claimant was still disabled: 15, 30, 45, 90, 180 and 365 days.

In the foregoing analysis, the association between one variable at a time and the duration of low back disability was studied. To investigate the effect of several variables at the same time, a multivariate analysis had to be used. The Cox-regression model was used for this purpose. This model yields an equation for the hazard or death rate (probability per time-unit of "dying" or in this case probability per time-unit of "*end of compensation*" at a specified time t when it is known that the claimant was still compensated just before t) as a function of several covariates. The *end of compensation* rate is in principle equal to the return to work rate. By means of stepwise selection of variables, it was possible to identify a subset of independent variables which were significantly related to "survival" or "duration of low back disability". Interaction between pairs of variables was taken into account. Interaction means that the effect of one variable depends on the level of another variable. To test the significance of the deviation from zero of the coefficient beta, the likelihood ratio test was used. A P-value of 0.05 was used as a criterion for removal of variables with the backwards stepwise procedure. The regression coefficient beta and the corresponding standard error were estimated. The + sign of the beta-value denotes a positive effect on the *end of compensation* rate (this means a shorter duration of low back disability, or that a claimant returns to work earlier) and the – sign denotes a negative effect on *the end of compensation* rate. The predictive value of a variable is given by the relative hazards of the categories of that variable. The relative hazard is the ratio of the *end of compensation* rates of category A and B, often called relative risk (Bigos et al. 1991, Matthews and Farewell 1988). In the present work this ratio was named relative risk as well. The standard Cox regression model assumes proportional hazards. This implies that the relative risk is constant over time.

Predictive model of long-term low back disability

Among first claims, a predictive model of long-term low back disability was built with variables known at the beginning of the disability to estimate the chance of a claimant remaining disabled. With the aid of the Cox-regression model, a predictive index was calculated for each claimant. Five predictive groups (quintiles) of this index were determined and the resulting model was described with the Kaplan-Meier curve. Within the quintiles, the relative risk is quite constant.

Recurrence

All first low back disability claims which were terminated before the end of the observation period on January 1, 1991, were followed from the moment compensation ended until a recurrent episode occurred, or until January 1, 1991. Because the termination of a first claim coincided with the ending of the insurance policy, 42 terminated first claims were excluded. For 4 terminated first claims, no dossier was available.

This study was based on 699 terminated first claims. For 181 terminated claims, a report of recurrence was submitted. Until January 1, 1991, 419 terminated claims had no recurrence of low back disability. For 99 terminated claims, the insurance policy ended before January 1, 1991 and before a recurrence occurred. For the last two groups, the working period, or the duration from the termination of a first claim of low back disability until the onset of a recurrent claim of low back disability, was called incomplete or censored. The distribution of the time to response, in this case the working period, was assessed with the Kaplan and Meier method. The data of the claims were analyzed to investigate the association of several possibly predictive variables known at the end of the first claim with the working period. To test the significance of the coefficient beta of a variable, the likelihood ratio test was used. The predictive value of a variable on a recurrent claim of low back disability, or recurrence rate, was given by the relative hazards of the categories of that variable. The relative hazard was estimated using BMDP's 2L program. In the present study, this relative hazard was called relative risk (Bigos et al. 1991, Matthews and Farewell 1988).

Results

Demography

Claimants and claims

From 1977 through 1989, 839 persons were disabled due to low back pain. Fourteen of these low back disabilities started before 1977 and still existed in 1977. The number of low back disability claims increased every year (Table 3). The 839 persons accounted for 1,119 claims. For 795 persons, the first claim of low back disability during the insurance period was filed during the period under consideration. Forty-four persons had claimed low back disability one or more times before 1977 and according to the definition of a recurrence, their first claim since 1977 was a recur-

Table 3. Number of low back disability claims per starting year

Starting year	Claims
<1977	14
1977	33
1978	52
1979	68
1980	62
1981	71
1982	71
1983	76
1984	86
1985	95
1986	111
1987	116
1988	122
1989	142
All	1,119

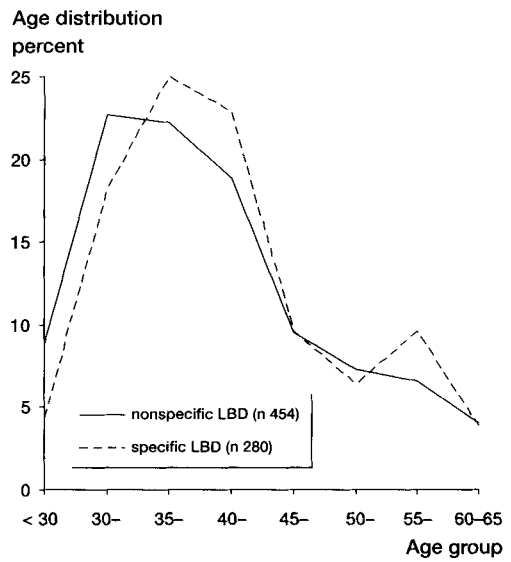

Figure 3. Percentage distribution of the starting age of first claims of specific and nonspecific low back disability (LBD).

rence. The average number of recurrences per person was 0.55 (0–13). For 261 claims made by 247 claimants, the disability existed longer than 179 days, or was chronic.

Of the 839 persons who claimed low back disability during the period studied, 91 reported low back problems before acceptance. Fourteen of these had undergone back surgery. Because of low back pain, 21 men were declared unfit for military service. In 37 cases it was not known whether or not they had had problems of the lower back before acceptance.

In 61 claims, low back disability ended due to expiration of the insurance policy: 34 due to reaching the pensionable age, 9 due to death, 2 due to accepting paid employment, 8 due to surrender of the insurance policy in case of permanent disability, 1 due to suppressing medical information on acceptance and, in 7 cases, the reason of expiration was unknown. The duration of 5 of the claims was shortened by the article in the insurance policy about the medical assessment of claimants based upon professions in general with a social position and education equal to the claimant's own profession (see p. 13). This article was applied in 1989 and 1990. Four claims from physical therapists and one from a physician were terminated for this reason.

Profession

During the period under investigation, 295 dentists claimed low back disability 419 times, 162 veterinarians 220 times, 140 physicians 163 times, while 242 physical therapists filed claims 317 times.

Starting age

Among first claims of low back disability (n 795), the starting age was relatively higher for specific causes of low back pain in comparison with nonspecific low back pain (Figure 3). This difference proved to be significant (P 0.03). In the group of first claims, the distribution of starting age of confirmed disc herniations was comparable with that of specific causes of low back pain, with an even higher percentage of claims starting between 35 and 44 years of age.

Number of claims per month

There was a considerable seasonal variation in the filing of all disability claims ($Chi^2 = 24.88$, $P < 0.01$). Particularly in December there were more claims than the expected. Another seasonal variation applied to veterinarians ($Chi^2 = 22.62$, $P < 0.02$), with most claims (n 220) occurring in the period from October through March (Figure 4). No difference in the number of claims per month was found for persons with a deferred period of only three days (n 405).

Diagnosis

In classifying low back disability, nonspecific low back pain was distinguished from specific low back pain. In total, 661 claims (59 percent of all claims) were due to nonspecific low back pain and 379 (34 percent of all claims) to specific low back pain (Table 4). For 79 claims (7.1 percent of all claims), no classification could be made: for 49, no dossier was available, whereas for the other 30, no proper diagnosis

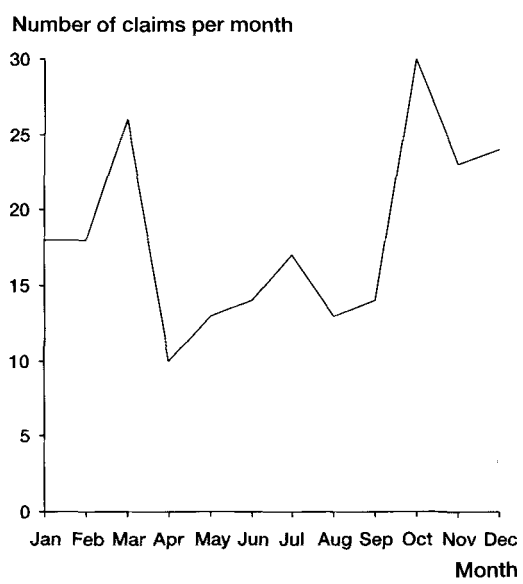

Figure 4. Seasonal variation in the filing of all low back disability claims (n 220) by veterinarians.

Table 4. Classification of low back disability claims according to diagnosis

	Claims			
Diagnosis	All	Chronic	Permanent	First
Nonspecific LBP[a]	661	78	22	454
Specific LBP[a]	379	172	57	280
disc herniation	299	127	35	234
presumed	70	19	6	53
confirmed	229	108	29	181
spinal stenosis	15	9	7	11
spondylolisthesis	22	6	2	8
instability	12	12	6	6
disc degeneration	11	11	6	6
structural deformity	2	2	0	2
inflammation	12	7	4	8
osteoporosis	3	3	2	2
fracture	1	1	0	1
spinal tumor	0	0	0	0
pregnancy	13	3	0	10
mental disorder	13	11	5	7
visceral disease	1	1	0	1
Unknown	79	11	0	61
All	1,119	261	79	795

[a] LBP low back pain

could be obtained from the information.

Furthermore, the claims were distributed according to the different specific causes of low back pain (Table 4). Some of the disabled had two different reasons, simultaneously or sequentially, for specific low back pain during one claim. Therefore the sum of the number of separate specific reasons of low back pain was higher than the total number of claims due to specific low back pain. A radicular syndrome due to a disc herniation contributed to most of the claims in the group of specific low back pain. Specific low back pain was the main cause of chronic low back disability.

A higher percentage of specific causes of low back pain was found among claims by subjects with a deferred period of 14 days or more (42 percent), as compared to claims by subjects with a deferred period of three days (21 percent).

Treatment

Operative treatment after failure of conservative treatment was classified as surgery. For nonspecific low back pain, conservative treatment was reported in 374 claims, surgery one or more times among five claims, whereas the type of treatment was not described in 282 cases. For specific low back pain cases, conservative treatment was performed in 166 claims, surgery one or more times among 190 claims, and for 23 claims, the type of treatment was not reported. No information about treatment was available in 68 of the claims of which no diagnosis was reported and in 11 of the claims of which no diagnosis was reported, the treatment was conservative.

Chronic low back disability developed in 23 percent of all claims, in 12 percent of the claims for nonspecific low back pain and in 45 percent of the claims for specific low back pain. In the case of nonspecific low back pain, 19 percent of the claims from subjects who were conservatively treated had a duration of six months or beyond, 40 percent of the claims from subjects who were operatively treated and only 1.4 percent of the claims from subjects of whom no treatment was reported. For claims of specific low back pain, no differences in percentages of chronic disability were found between conservatively (46 percent) and operatively (49 percent) treated persons. Only 8.6 percent of the claims for specific low back pain in subjects of whom no treatment was reported, became chronic.

Low back surgery was performed 200 times in the population studied, five recurrent operations among subjects during one period of low back disability included. Surgery was the type of treatment in a total of 194 times for specific low back pain, of which 189 times for a confirmed disc herniation. The average age of claimants who underwent surgery was 42 years.

In at least 13 cases of the 200 operations, a complication occurred (persistent motor deficit, post-operative fibrosis, post-operative discitis, pseudarthrosis

Table 5. Distribution of chronic low back disability in permanent and temporary disability

Variable/covariate	Permanent	Temporary	Chi [a]	P-value
Degree of disability				
all	79	182		
≤50%	25	130	36.15	< 0.001
>50%	54	52		
Diagnosis				
nonspecific LBP[b]	22	56	0.60	NS[c]
specific LBP[b]	57	115		
unknown	0	11		
Other disease besides LBP				
no	30	123	25.58	< 0.001
yes	49	49		
unknown	0	10		
Age at start of this period				
< 35	1	43	91.30	< 0.001
35–44	15	93		
45–54	16	31		
55–65	47	15		
Profession				
dentists	33	45	30.76	< 0.001
veterinarians	30	46		
physicians	10	14		
physical therapists	6	77		
Registered low back problems before this period				
no	45	91	0.42	NS
yes	34	82		
unknown	0	9		
Low back surgery before this period				
no	73	162	0.00	NS
yes	6	13		
unknown	0	7		
Psychosocial problems at start of this period				
no	64	143	0.17	NS
yes	15	29		
unknown	0	10		
Psychosocial problems during this period				
no	48	119	1.73	NS
yes	31	53		
unknown	0	10		
Insured daily compensation				
all	64	163		
low group	33	43	14.35	< 0.001
middle group	16	47		
high group	15	73		

[a] Chi-squared test: category "unknown" excluded.
[b] LBP low back pain.
[c] NS not significant.

after fusion, instability after discectomy, or persistent side effects of myelography), resulting 12 times in chronic low back disability, of which four times even in permanent disability. Furthermore, it must be noted that 4 persons were operated on twice or more during one period of disability. All remained disabled more than 6 months of which one permanent.

From 1977 through 1989, the average number of operations for a disc herniation per million persons at risk per year, recurrent operations included, was 1,310. Including all types of spinal surgery, an average of 1,390 operations per million persons at risk per year were performed.

Chronic (permanent and temporary) low back disability

261 claims lasted longer than 6 months or were chronic (Tables 4 and 5). These claims were filed by 247 persons. Most of the chronic claims occurred in the claimant's first period of low back disability: 182 times in the first period and 79 in a recurrent period of low back disability. Among the chronics, 45 experienced low back problems already before acceptance, 8 underwent surgery before acceptance and 9 were refused by the Army because of back problems. Long-term disability developed among 50 percent of the claimants who experienced low back problems before acceptance.

Some of the chronically disabled were permanently disabled and will be compensated until the insurance policy expires. In total, 79 of 247 chronically disabled were permanently disabled. Of the permanently disabled, 54 became so in their first episode of low back disability, and 25 in a recurrent episode (17 a first recurrence). The median duration until expiration of the insurance policy was 10 (1.5–36) years.

For testing the difference of several, perhaps discriminating, variables between permanent and temporary chronically low back disabled, the category "unknown" was excluded. The permanently, chronically disabled group differed from the temporary group (Table 5). The permanent group contained more claimants who were more than 50 percent disabled ($P < 0.001$), and/or who had a higher percentage of other diseases besides low back pain ($P < 0.001$)). In addition, when comparing the permanent with the temporary group, a higher percentage of claims were found in the age group over 54 years ($P < 0.001$). In general, a much lower percentage of claims came from physical therapists ($P < 0.001$). Finally, a higher percentage of claims were in the lowest group of insured daily compensation ($P < 0.001$).

Costs

Among the population at risk, the total costs for compensation of disability of all diseases increased from 1977 through 1989. Indexed to 1990, the compensation paid in 1977 amounted to NLG 10.9 million and in 1989 to NLG 64.1 million. The costs refer exclusively to the compensation paid in any year. Reservations for expected payments in future years

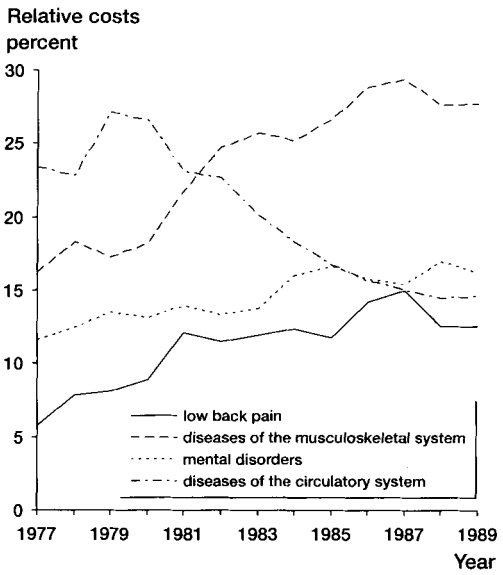

Figure 5. Percentage distribution of costs for compensation of disability, indexed to 1990, by category of diseases (1977–1989).

for the current disability claims are not included. These reservations increased sevenfold in 13 years.

Among the same population, the relative costs for compensation of disability, (i.e., the percent of total compensation paid), for each category of diseases according to the ICD was calculated for each year of the period studied. The relative costs for neoplasms decreased from 8 percent in 1977 to 5 percent in 1980, after which it remained more or less the same. For mental disorders, the relative costs increased from 12 percent in 1977 to 16 percent in 1984, then remained constant (Figure 5). Throughout the years, diseases of the nervous system were responsible for about 9 percent of all compensation paid. The relative costs for diseases of the circulatory system decreased from 24 percent in the late 1970's to 15 percent in the late 1980's. A contradictory trend was detected for diseases of the musculoskeletal system, in which the relative costs increased from 16 percent in 1977 to 29 percent in 1987, after which it slightly decreased to 28 percent in 1989. The relative costs for injuries decreased from 15 percent in 1977 to 11 percent in 1989.

The relative costs for low back pain increased from 5.7 percent in 1977 to 13 percent in 1989, with a peak value of 15 percent in 1987 (Figure 5). It should be noted that indexed to 1990, the absolute compensation paid for low back disability increased from NLG 7.5 million in 1987 to NLG 8.0 million in 1989.

Table 6. Low back disability from 1977 through 1989. Distribution of duration of compensated absence and costs (indexed to 1990), by *percentage* of all 1,119 cases

Months of absence	Claims		Open cases		Percentage of	
	n	%	n	%	DD[a]	CC[b]
< 1	465	*42*	0	*0*	*1.6*	*1.1*
1–3	224	*20*	0	*0*	*3.4*	*2.8*
3–6	169	*15*	0	*0*	*6.0*	*5.9*
> 6	261	*23*	77	*6.9*	*89*	*90*
> 6: temporary	182	*16*	35	*3.1*	*37*	*40*
> 6: permanent	79	*7.1*	42	*3.8*	*52*	*50*

[a] DD: 366,000 disability days
[b] CC: NLG 57.4 million compensation costs

Table 7. Low back disability from 1977 through 1989. Distribution of duration of compensated absence and costs (indexed to 1990), by *percentage* of cases with a deferred period of 3 days (n=405)

Months of absence	Claims		Open cases		Percentage of	
	n	%	n	%	DD[a]	CC[b]
< 1	262	*65*	0	*0*	*4.4*	*5.2*
1–3	65	*16*	0	*0*	*4.9*	*6.4*
3–6	27	*6.7*	0	*0*	*4.8*	*6.8*
> 6	51	*13*	10	*2.5*	*86*	*82*

[a] DD: 72,000 disability days
[b] CC: NLG 11.5 million compensation costs

The costs for compensation of the 1,119 claims of low back disability over the whole period studied were distributed according to the percentage of claims, the percentage of costs, the percentage of the disability days and the duration of disability. The annual compensation was indexed to 1990. A quarter of the claims (23 percent) accounted for 90 percent of the compensation paid during the period studied, and 89 percent of the disability days (Table 6). These claims had a duration of more than 6 months, which means that they were chronic. Furthermore, 7.1 percent of the claims, all compensated until expiration of the insurance policy, (i.e., permanent claims), were responsible for 50 percent of the compensation paid and 52 percent of the disability days.

The deferred period influenced the distribution of costs for compensation according to the percentage of costs and the duration of disability. Out of the total claims, 36 percent had a deferred period of 3 days and accounted for 20 percent of all compensation paid and 20 percent of all disability days. Of this group (n 405), 65 percent lasted for less than 1 month, while 13 percent lasted for more than 6 months (Table 7).

Table 8. Description of low back disability over the period 1977–1989, number of new claimants

Year	Population at risk	All	Diagnosis, all			Chronics
			nonsp. LBP[a]	spec. LBP[b]	unknown	
1977	6,906	32	23	9	1	8
1978	7,957	51	25	23	3	10
1979	8,956	64	40	23	2	12
1980	9,920	62	41	21	0	12
1981	10,594	67	45	22	1	25
1982	10,997	69	41	25	4	14
1983	11,239	75	36	31	8	12
1984	11,547	83	60	20	3	16
1985	12,106	90	53	37	1	21
1986	12,578	104	68	34	3	22
1987	12,894	108	62	40	6	28
1988	13,259	119	62	40	19	25
1989	13,658	137	78	38	23	29

[a] nonsp. LBP: nonspecific low back pain
[b] spec. LBP: specific low back pain

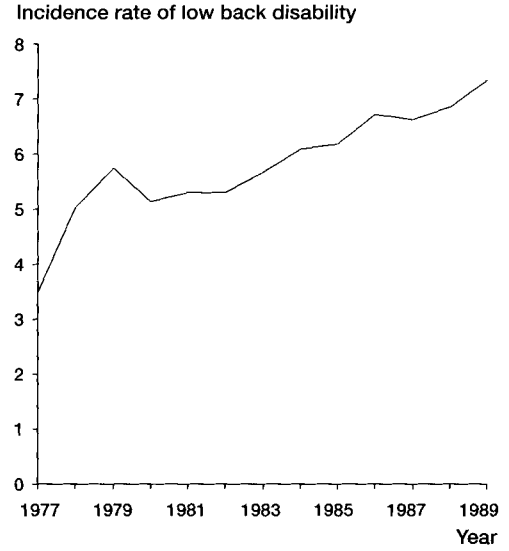

Figure 6. The annual incidence rate of low back disability per 1,000 persons at risk, adjusted for profession, age, and deferred period calculated with the use of stepwise logistic regression.

These chronic claims accounted for 82 percent of the costs and 86 percent of the disability days.

Out of the total claims, 25 percent had a deferred period of 14 days and accounted for 18 percent of all compensation paid and 21 percent of all disability days. Of this group (n 278), 34 percent of the claims lasted for less than one month and 27 percent lasted for more than six months. These chronic claims accounted for 90 percent of the costs and 87 percent of the disability days.

Furthermore, out of the total claims, 34 percent had a deferred period of one month and accounted for 55 percent of all compensation paid and 52 percent of all disability days. Of this group (n 382), 26 percent of the claims lasted for less than one month and 31 percent lasted for more than six months. These chronic claims accounted for 92 percent of the costs and 91 percent of the disability days.

Finally, 4.8 percent of the total claims had a deferred period of more than one month and were responsible for 7.0 percent of all compensation paid and 7.2 percent of all disability days. Of this group (n 54), 15 percent of the claims lasted for less than one month and 33 percent lasted for more than six months. These chronic claims accounted for 99 percent of the costs and 90 percent of the disability days.

Incidence

The number of new claimants of low back disability per calendar year was subdivided into diagnosis and chronicity. The number of new claimants increased over the period studied, but the number of the population at risk went up as well (Table 8). Specific and nonspecific causes of low back disability could occur separately in one person and in the same calendar year. This happened 10 times from 1977 through 1989 and explains why the number of new claimants per year for all low back disabilities is not always equal to the sum of the new claimants for the different low back disability categories.

Low back disability

The annual incidence rate of low back disability per 1,000 persons at risk, adjusted for profession, age, and deferred period was calculated with the use of stepwise logistic regression. This adjusted annual incidence rate increased from 3.5 per 1,000 persons at risk in 1977 to 7.4 in 1989 (Figure 6).

The association between profession, age and deferred period and the risk of claiming low back disability was analyzed with stepwise logistic regression as well. This risk yields the probability that a person becomes low back disabled one or more times in a calendar year, in other words yields the chance of the incidence of low back disability. The risk of claiming low back disability for each variable was adjusted for the other variables mentioned above, and for calendar year. For example, the risk of claiming low back disability according to profession was adjusted for calendar year, age and deferred period. A relative risk

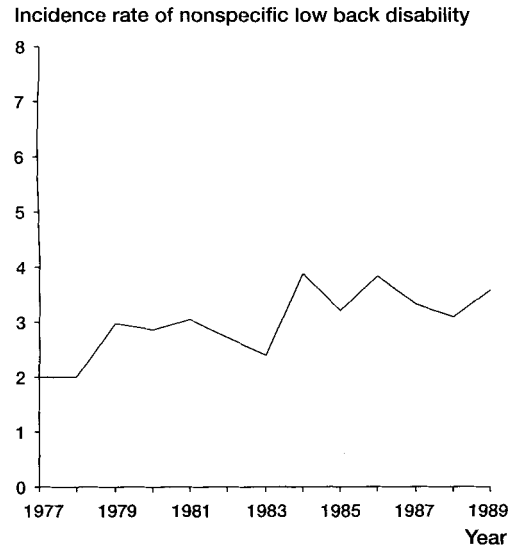

Figure 7. The annual incidence rate of nonspecific low back disability, adjusted for profession, age, and deferred period calculated with the use of stepwise logistic regression.

(RR) greater than one expresses a greater risk of claiming low back disability, in comparison to the baseline. A relative risk of two means a doubled risk compared to the baseline. A relative risk less than one on the other hand expresses a reduced risk. The bracketed values after the relative risk denote its 95% confidence interval.

Compared to dentists, physical therapists and veterinarians had a significantly greater risk of claiming low back disability (RR = 2.67 [2.23–3.19] and 2.04 [1.72–2.43], respectively), while physicians had no significantly different risk (0.87 [0.72–1.06]).

The three age groups over 34 years had a significantly greater risk than the age group under 35 years: 2.15 [1.82–2.52] for 35–44 years, 2.22 [1.81–2.71] for 45–54 years, and 2.26 [1.80–2.84] for 55–65 years.

The subjects who had a deferred period of 14 days or more had a four times smaller risk than those with a deferred period of three days (0.27 [0.23–0.31]).

Chronic low back disability

Disability was defined as chronic when it lasted longer than 179 days. With stepwise logistic regression analysis no association between calendar year and the risk of chronic low back disability could be shown. This holds true for age divided in 2-, 3-, 4- and 6-year groups. The length of the deferred period was not significantly related to the risk of claiming chronic low back disability.

Similar, although more significant, associations, as those previously described for all low back disabilities, were also found between the four professions and the risk of chronic low back disability: 0.40 [0.25–0.66] for physicians, 3.17 [2.22–4.55] for physical therapists, and 3.23 [2.31–4.50] for veterinarians; dentist served as baseline.

The risk of claiming chronic low back disability went up significantly with advancing age: 3.34 [2.28–4.90] for the age group 35–45 years, 4.83 [3.06–7.63] for 45–55 years, and 11.24 [7.14–17.70] for 55–65 years; the baseline was the age group under 35 years.

Nonspecific low back disability

The annual incidence rate of nonspecific low back disability, adjusted for profession, age, and deferred period, went up from 1.99 per 1,000 persons at risk in 1977 to 3.58 in 1989 (Figure 7).

Calendar year, profession, age and deferred period showed a significant association with the risk of claiming nonspecific low back disability. Using dentists as baseline, physical therapists were at greatest risk (2.60 [2.04–3.30]). Veterinarians had the second highest risk (1.65 [1.33–2.04]), while physicians showed the lowest risk (0.50 [0.37–0.67]).

The relative risk of the age group 55–65 years (1.85 [1.38–2.48], versus the age group under 35 years) was lower than the relative risk of the age group 35–44 years and the age group 45–54 years (1.94 [1.58–2.38] and 2.30 [1.79–2.95], respectively versus age group under 35 years).

For the insured with a deferred period of three days, there was a six times greater risk (5.88 [4.76–7.14]) of claiming nonspecific causes of low back disability than for those with a deferred period of 14 days or more.

Specific low back disability

No significant association was detected between the risk of low back disability for specific causes and the calendar year, or the length of the deferred period. Furthermore, no association between calendar year and the risk of specific low back disability was found when the period under investigation was divided into 2-, 3-, 4- or 6-year groups. However, profession and age were significantly related to the risk of claiming specific low back disability.

With the dentists serving as baseline, the greatest risk was found for veterinarians (3.01 [2.24–4.05[), followed by physical therapists (2.03 [1.49–2.75]) and physicians (1.54 [1.15–2.06]). This was the only category of low back disability for which physicians had a greater risk than dentists.

Table 9. Disability lasting longer than 52 weeks. Incidence rate 1980–1985 per 1,000 man-years, adjusted for age and gender. Relative risk and [95% confidence intervals]

	Medical professionals[a] RR [95% CI]	General working population[b] RR [95% CI]
Age		
25–34	1.0	1.0
35–44	4.4 [1.9–10.2]	2.2 [2.1–2.2]
45–54	3.8 [1.4–10.5]	4.0 [3.9–4.1]
55–65	18.8 [8.1–43.3]	5.5 [5.3–5.6]
Gender		
male	1.0	1.0
female	2.7 [1.3–5.3]	0.89 [0.88–0.91]
All ([b] vs [a])	1.0	3.0 [2.4–3.9]

[a] self-employed dentists, veterinarians, physicians and physical therapists insured by Movir.
[b] 85% of the general working population in the Netherlands (all tax payers, civil servants excluded). Statistics based on data from Verbeek (1991).

The age groups 35–44 years and 55–65 years showed the greatest risk of claiming specific low back disability: 2.38 [1.79–3.15] and 3.07 [2.10–4.48], respectively versus the age group under 35 years. The relative risk of the age group 45–54 years was 1.98 [1.39–2.85].

Low back disability and insured daily compensation

The effect of insured daily compensation on the incidence of low back disability was studied beginning with 1982. This year was chosen since no information of the denominator was available before. The association between daily compensation (using intervals one, two and three for the low, middle and high groups) and low back disability increased with rising daily compensation: the risk was 1.50 [1.22–1.84] for the middle group of insured daily compensation, versus the lowest group, and 2.01 [1.65–2.46] for the highest group. These risks of low back disability were adjusted for calendar year and age by the use of stepwise logistic regression. The subdivision of insured daily compensation into three groups was already standardized for profession.

Low back disability exceeding one year

From 1980 through 1985, the average incidence of low back disability exceeding one year was compared with that among the general working population. The latter related to 85 percent of the Dutch working population, which means all tax payers, excluding civil servants.

The association between age and gender and the risk of claiming low back disability lasting longer than one year was analyzed with stepwise logistic regression. For both the medical professionals and the general working population, age and gender showed a significant association with that risk (Table 9).

The incidence rate, adjusted for differences in distribution according to age and gender, was 0.85 per 1,000 man-years among self-employed medical professionals versus 2.56 per 1,000 man-years among the general working population. The general working population showed a three times greater risk of claiming low back disability lasting longer than one year than the self-employed medical professionals (2.99 [2.35–3.82]). Adjusted only for the difference in distribution according to age, the relative risk was 2.93 [2.30–3.75].

The risk of claiming low back disability exceeding one year, among the self-employed medical professionals with a deferred period of three days and those with a deferred period of 14 days or more, were compared with that of the general working population, adjusted for the difference in distribution according to age. The general working population had a 2.21 [1.33–3.68] times higher risk than the self-employed medical professionals with a deferred period of three days, and a 3.15 [2.39–4.17] times higher risk than the self-employed medical professionals with a deferred period of 14 days or more. No significant difference was found in the risk between self-employed medical professionals with a deferred period of three days and those with a deferred period of 14 days or more.

Duration

The median duration of all the claims was 51 [95% confidence interval: 41–58] days. For the first claims (n 795) it was 56 [42–64] days.

Return to work or end of compensation

In the case of first claims, 28 percent returned to work (i.e., their compensation was ended) within 15 days, 47 percent within 45 days, 60 percent within 90 days, 77 percent within 180 days, 85 percent within 1 year and 89 percent within 2 years. The chance of returning to work decreased with increasing duration. Almost the same chance to return to work within 2 years after the start of the disability was detected for all claims as well as for first claims. For first claims, the chance to return to work within 2 years after the start of the disability decreased from 89 percent at the start, to 71 percent after 90 days, and to 50 percent after 180 days. After 1 year, the chance of returning to

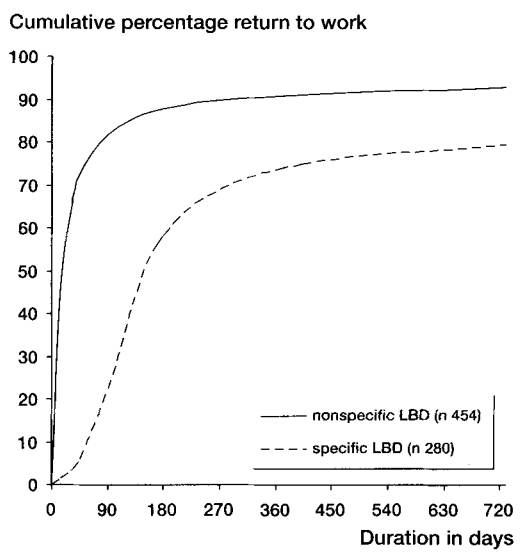

Figure 8. In the case of first claims, disabled, due to specific low back pain, returned to work much more slowly than nonspecific low back disabled.

work within 2 years after the start of the disability was only 22 percent.

In the case of first claims, diagnosis had a significant influence on the percentage of claimants who returned to work (Figure 8). Disabled, due to specific low back pain, returned to work much more slowly than nonspecific low back disabled. However, after one year of disability no differences in the chance to return to work within two years after the start were found between claimants with nonspecific and specific low back pain.

Association between several variables and duration

Among first claims of low back disability, the association between several variables and duration was studied with the use of the Kaplan and Meier method. Diagnosis, profession, age at which the disability started (divided into four categories: < 35, 35–44, 45–54, and 55–65 years), deferred period, low back problems before acceptance, psychosocial problems known at the start of the disability, and insured daily compensation showed a significant association with duration ($P < 0.05$; Table 10).

Several variables associated with the duration of low back disability in the univariate analyses could be present in one and the same person, and influence each other. To estimate the effect of a covariable corrected for the other variables, a multivariate analysis was performed using the Cox-regression model. Interactions between all variables were taken into account. The 63 claims with one or more variables "unknown" were excluded from the multivariate analysis. Therefore, this analysis was performed on 732 first claims. The association between insured daily compensation and duration of low back disability was studied in a separate model, because the real insured daily compensation of physicians and a small part of the dentists was unknown.

Before the stepwise procedure, the variable age at the start of the disability was analyzed as a nominal variable with the four categories mentioned. Deferred period was another nominal variable, with four categories (3, 14, 30, and > 30 days). Age at the start of the disability was analyzed during the stepwise procedure as an ordinal variable in which the code corresponded with the order of ranking. On the basis of the analysis, the number of categories in the deferred period was reduced from four to two (3 days respectively 14 days or more). After entering the interaction of profession and age at which the disability started into the multivariate model, profession per se showed no significant association with duration ($P = 0.30$). All other variables and interactions in the multivariate model were significantly related to duration ($P < 0.05$; Table 11). A relative risk smaller than one means an inverse association with return to work, in other words implicates a relationship with duration of low back disability. For a good interpretation of the data, it must be noted that the group of physical therapists over 44 years was very small.

A separate analysis was performed which included the insured daily compensation variable. For each profession the insured daily compensation, indexed to 1990, was divided into three rather equal groups: a low, a middle and a high group. All physicians and a small part of the dentists were excluded because they were insured by another insurance company as well, and their insured daily compensation with that company was not known. This meant that 643 first claims were analyzed (univariately) for an association between insured daily compensation and duration of disability (Table 10). For 51 of these first claims one or more variables were "unknown", and these claims were excluded from the multivariate analysis. Therefore, a Cox-regression analysis including the insured daily compensation variable was performed on 592 first claims only.

Before the stepwise procedure, the insured daily compensation variable contained three groups (low, middle and high). In the definite multivariate model, the number of covariates of the insured daily compensation variable was reduced from three to two. Because the highest group behaved like the lowest

Table 10. Distribution of duration according to the Kaplan and Meier method. Response is "*end of compensation*", time to response in days

Variable	n	%	Percentile [a] 75th	50th	25th	95% CI [b] median	*P* [c]
All	795		13	56	159	42–64	
Diagnosis							<0.001
nonsp. LBP[d]	454	*57*	8	17	55	15–20	
specific LBP[d]	280	*35*	96	151	395	137–168	
unknown	61	*7.7*	17	57	100	37–72	
Gender							NS
female	113	*14*	17	62	208	42–119	
male	682	*86*	12	53	151	40–62	
Gender of physical therapists	240		13	53	160	39–68	NS
female	85	*35*	16	58	208	40–126	
male	155	*65*	10	50	150	31–67	
Age at start of disability							<0.001
< 35	221	*28*	9	23	130	16–39	
35–44	352	*44*	14	60	155	48–74	
45–54	129	*16*	20	71	154	48–88	
55–65	93	*12*	24	107	1,515	63–212	
Profession							<0.001
dentists	275	*35*	9	23	136	17–33	
veterinarians	146	*18*	17	108	393	61–144	
physicians	134	*17*	31	78	122	63–84	
phys. therapists	240	*30*	13	53	160	39–68	
Deferred period							<0.001
3 days	232	*29*	8	14	58	12–16	
14 days[e]	207	*26*	14	51	175	39–68	
30 days	309	*39*	25	98	225	84–114	
>30 days	47	*5.9*	49	96	194	75–136	
≥14 days	563	*71*	23	83	206	70–96	<0.001
Low back problems before acceptance *							<0.001
no	671	*84*	12	49	146	40–58	
yes	87	*11*	20	111	711	62–189	
unknown	37	*4.7*	17	59	160	31–100	
* *Low back surgery before acceptance*							NS
no	747	*94*	12	53	157	42–62	
yes	13	*1.6*	23	114	1,515	23–1,155	
unknown	35	*4.4*	15	57	153	20–92	
* *Refused by the Army on LBP*	682		12	53	151	40–62	NS
no	526	*77*	13	59	155	48–70	
yes	20	*2.9*	10	17	394	10–117	
unknown	136	*20*	10	31	122	17–50	
Psychosocial problems at start of disability							<0.001
no	710	*89*	12	48	150	37–59	
yes	50	*6.3*	59	212	1,985	97–1,079	
unknown	35	*4.4*	15	57	153	20–92	
Starting year of disability (n 786)							NS
1977	24	*3.1*	11	20	91	12–46	
1978	40	*5.1*	10	76	182	23–122	
1979	55	*7.0*	14	63	152	25–84	
1980	54	*6.9*	10	42	194	17–65	
1981	54	*6.9*	9	49	152	23–63	
1982	51	*6.5*	10	40	106	18–61	
1983	52	*6.6*	17	67	159	31–107	
1984	63	*8.0*	11	32	126	17–63	
1985	65	*8.3*	11	75	189	35–117	
1986	72	*9.2*	13	31	132	22–84	
1987	77	*9.8*	18	78	186	56–109	
1988	89	*11*	14	59	141	37–79	
1989	90	*12*	15	42	172	25–100	
trend (linear)							NS
Starting year: groups (n 786)							NS
1977–1981	227	*29*	10	46	158	31–64	
1982–1985	231	*29*	12	50	152	33–66	
1986–1989	328	*42*	15	58	154	41–76	
Insured daily compensation [f]	643		11	42	177	33–56	<0.01
low group	208	*32*	12	49	213	33–80	
middle group	219	*34*	9	30	124	21–42	
high group	216	*34*	13	56	228	36–84	

[a] percentile still compensated estimated in days.
[b] Brookmeyer-Crowley 95% confidence interval (CI) for median survival time in days.
[c] Mantel-Cox test of equality of survivor functions. NS not significant.
[d] LBP low back pain.
[e] exclusively for physical therapists.
[f] distribution in low, middle and high group of insured daily compensation as given in Table 2.

group of insured daily compensation, these two groups were unified and compared to the middle group of insured daily compensation.

The multivariate analysis with the insured daily compensation variable included gave the same results for the other variables studied as the multivariate analysis performed on the 732 first claims. The interaction between the variables compensation and age at which the disability started had a significant association with duration of low back disability ($P < 0.05$) (Table 11). For the interpretation of the data, the age at the onset of disability (< 35, 35–44, 45–54, and 55–65 years) is distributed according to low, middle and high group of insured daily compensation (Table 12).

Predictive model of long-term low back disability

A predictive model of long-term low back disability was built, to assess, at the start of a first claim, the chance of a claimant remaining disabled. The variable insured daily compensation was not included in the predictive model. With the aid of the Cox-regression model, a predictive index for remaining disabled was calculated for each claimant (Table 13).

The claimants were divided into five predictive groups, or quintiles, from weakest to strongest association with the chance of remaining disabled. The product-limit plot of these quintiles allows visual assessment of the predictive power of the model

Table 11. Multivariate analysis according to the Cox proportional hazards model. Response is "*end of compensation*". Model without (•; n 732) and with insured daily compensation (○; n 592, physicians' first claims and 6.1% of dentists' first claims excluded)

Variable	Category A vs	Category B	Coeff.[a]	SE[b]	RR[c]	95% CI[d]
• *Diagnosis and deferred period*						
Nonspecific LBP[e] deferred period	≥14 days	3 days	−1.12	0.12	0.33	0.26–0.41
Deferred period 3 days LBP[e]	specific	nonspecific	−1.84	0.18	0.16	0.11–0.23
LBP[e] & def. period	spec. & ≥ 14 days	nonsp. & 3 days	−2.09	0.25	0.12	0.07–0.20
• *Profession and age at start of disability*						
Dentists	35–44	dentists < 35	−0.51	0.07	0.60	0.52–0.69
	45–54	dentists < 35	−1.02	0.10	0.36	0.30–0.44
	55–65	dentists < 35	−1.53	0.12	0.22	0.17–0.28
Veterinarians	< 35	dentists < 35	−0.38	0.29	0.69	0.39–1.22
	35–44	dentists < 35	−0.84	0.33	0.43	0.23–0.83
	45–54	dentists < 35	−1.30	0.36	0.27	0.13–0.56
	55–65	dentists < 35	−1.76	0.40	0.17	0.08–0.38
Physicians	< 35	dentists < 35	−0.35	0.35	0.70	0.35–1.42
	35–44	dentists < 35	−0.46	0.39	0.63	0.29–1.37
	45–54	dentists < 35	−0.56	0.42	0.57	0.25–1.31
	55–65	dentists < 35	−0.67	0.45	0.51	0.21–1.25
Physical therapists	< 35	dentists < 35	−0.47	0.27	0.62	0.37–1.06
	35–44	dentists < 35	−0.63	0.31	0.53	0.28–0.99
	45–54	dentists < 35	−0.79	0.35	0.45	0.22–0.92
	55–65	dentists < 35	−0.95	0.39	0.39	0.18–0.84
• *Low back problems before acceptance*						
	yes	no	−0.43	0.13	0.65	0.50–0.84
• *Psychosocial problems at start of disability*						
	yes	no	−0.74	0.17	0.48	0.34–0.67
○ *Insured daily compensation and age at start of disability*[f]						
Low + high group	35–44	< 35	−0.60	0.08	0.55	0.46–0.65
	45–54	< 35	−1.20	0.12	0.30	0.24–0.38
	55–65	< 35	−1.80	0.15	0.17	0.12–0.22
Age < 35	middle group	low + high group	−0.47	0.22	0.62	0.40–0.97
Group & age	middle 35–44	low + high < 35	−0.74	0.27	0.48	0.28–0.82
	middle 45–54	low + high < 35	−1.01	0.31	0.37	0.20–0.69
	middle 55–65	low + high < 35	−1.27	0.35	0.28	0.14–0.57

[a] Coeff. coefficient beta.
[b] SE standard error.
[c] RR relative risk = ratio of the *end of compensation* rates of category A and B.
[d] CI confidence interval of the relative risk.
[e] LBP low back pain.
[f] distribution in low, middle and high group of insured daily compensation as given in Table 2.

Table 12. Multivariate model, insured daily compensation included (n 592): distribution of claimants according to age at start of disability and insured daily compensation

Age	Daily comp.	n	% of age group
< 35	low	73	*37*
	middle	74	*38*
	high	50	*25*
35–44	low	64	*25*
	middle	86	*33*
	high	109	*42*
45–54	low	23	*28*
	middle	23	*28*
	high	35	*43*
> 54	low	35	*64*
	middle	16	*29*
	high	4	*7*

(Figure 9). The relative risk, or the ratio of the *end of compensation* rates, for each of these five quintiles was calculated, with quintile I as the baseline. Within the quintiles, the relative risk was quite constant. The relative risk showed a decreasing trend:

Quintile:	I	Relative risk: 1.00
	II	0.82
	III	0.51
	IV	0.29
	V	0.14

The median duration increased from quintile I to quintile V. The percentage of claimants which remained disabled increased with advancing quintile as well (Figure 9).

Compared to the average distribution of all claimants, quintile V was comprised of a higher percent-

Table 13. Predictive model of long-term low back disability. Calculation of the predictive index

Predictive index = sum (coefficient beta(i) * X(i)) =
−1.8383 * (Diagnosis)
−1.1226 * (Deferred period)
+0.8699 * (Diagnosis) * (Deferred period)
−0.3762 * (Veterinarians)
−0.3507 * (Physicians)
−0.4731 * (Physical therapists)
−0.5085 * (Age at start of disability, all)
+0.0479 * (Age at start of disability, veterinarians)
+0.4027 * (Age at start of disability, physicians)
+0.3495 * (Age at start of disability, physical therapists)
−0.4307 * (Low back problems before acceptance)
−0.7434 * (Psychosocial problems at start of disability)

Variable (i)	Category	Code X(i)
Diagnosis	nonspecific LBP[a]	0
	specific LBP[a]	1
Deferred period	3 days	0
	≥14 days	1
Profession	dentists	000
	veterinarians	100
	physicians	010
	physical therapists	001
Age at start of disability	< 35	1
	35–44	2
	45–55	3
	55–65	4
Low back problems before acceptance	no	0
	yes	1
Psychosocial problems at start of disability	no	0
	yes	1

[a] LBP low back pain

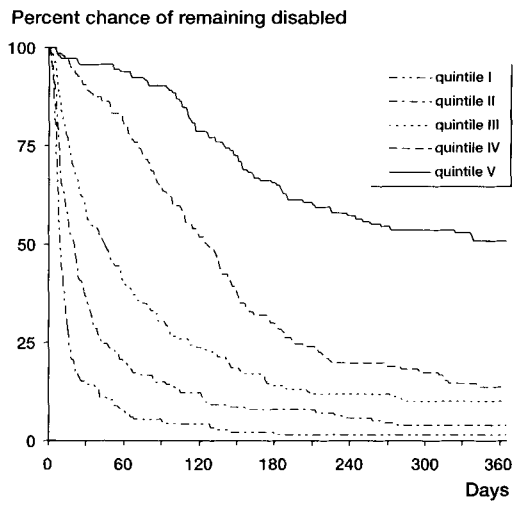

Figure 9. Predictive model of long-term low back disability. The claimants were divided into five predictive groups (i.e., quintiles), from weakest to strongest association with the chance of remaining disabled. The product-limit plot of these quintiles allows visual assessment of the predictive power of the model.

age of claimants with specific low back pain, dentists over 54 years of age, veterinarians older than 34 years, claimants with low back problems before acceptance and claimants with psychosocial problems known at the start of the disability (Table 14).

Table 14. Percentage distribution of first claimants (n 732) per quintile according to the predictive variables

Predictive variable;		Quintiles	I (n 145)	II (n 154)	III (n 151)	IV (n 137)	V (n 145)	All (N 732)
Diagnosis and deferred period	nonspecific LBP,	def. period = 3 days	99	8.4	13	1.5	0.7	25
		≥14 days	0.7	92	56	17	17	37
	specific LBP,	def. period = 3 days	0	0	6.6	12	12	6.0
		≥14 days	0	0	24	70	70	32
Profession and age at start of disability	dentists,	< 35	27	7.1	7.3	2.2	0.7	8.9
		35–44	42	0	9.9	9.5	18	16
		45–54	12	0.6	8.6	0	5.5	5.5
		55–65	0	0	8.6	0.7	20	5.9
	veterinarians,	< 35	5.5	5.2	0.7	6.6	1.4	3.8
		35–44	6.2	0.6	14	2.2	23	9.2
		45–54	0	5.8	0	6.6	9.0	4.2
		55–65	0	0	4.6	0.7	5.5	2.2
	physicians,	< 35	2.1	0	0.7	0	1.4	0.8
		35–44	2.1	8.4	25	0.7	2.1	7.8
		45–54	2.1	5.2	2.0	15	0.7	4.9
		55–65	0.7	3.9	2.0	8.0	2.8	3.4
	physical therapists,	< 35	0	36	8.6	25	2.8	15
		35–44	0	27	2.6	21	4.8	11
		45–54	0	0	5.3	1.5	2.8	1.9
		55–65	0	0	0.7	0	0	0.1
Low back problems before acceptance		no	93	98	85	94	71	88
		yes	6.9	1.9	15	5.8	29	12
Psychosocial problems at start of disability		no	99	99	95	91	82	93
		yes	0.7	1.3	5.3	9.5	18	6.8

Most claimants in quintile I and II suffered from nonspecific low back pain. Furthermore, quintile III still consisted of 56 percent of claimants with nonspecific low back pain.

Recurrence

Terminated first claims of low back disability (n 699) were analyzed in order to investigate the association of several possibly predictive variables known at the end of a first claim with the working period (i.e., the duration from the termination of a first claim until the onset of a recurrence). Furthermore, the association of several possibly predictive variables with the recurrence rate was studied. For this "recurrence study", duration of the first claim, psychosocial problems during the first claim and other diseases besides low back pain were added to the list of variables mentioned at the "duration study" (Table 10). In the univariate analyses, only deferred period, low back problems before acceptance, and low back surgery at the first claim or before acceptance showed a significant relationship with the working period and with the recurrence rate ($P < 0.05$).

Working period

Fifty percent of terminated first claims had a recurrence in 9.1 [95% confidence interval: 7.6–9.9] years, which was the median working period. One year after termination, 8.6 percent of the recovered persons had submitted a recurrent claim, 16 percent after 2 years, 20 percent after 3 years, and 47 percent after 8 years.

The median working period for terminated claims with a deferred period of 14 days was 6.9 [5.8–10.9] years. Terminated first claims with a deferred period of three days had a median working period of 8.0 [lower, one-sided 95% confidence limit: 5.8] years, and those with a deferred period of 30 days had a median working period of 9.7 [lower, one-sided 95% confidence limit: 8.5] years.

Fifty percent of the claimants with a terminated first claim and with low back problems before acceptance claimed a recurrence within 6.9 [3.3–7.9] years, while 50 percent of those without low back problems before acceptance submitted a recurrent claim within 9.3 [8.0–10.9] years.

Terminated first claims with low back surgery at the first claim or before acceptance showed a longer median working period (10.9 [left-sided 95% confidence limit: 7.6] years) compared with those without low back surgery (8.5 [6.9–9.3] years).

Recurrence rate

A deferred period of three days served as baseline for the ratio of the recurrence rates, in other words as baseline for the relative risk of a recurrent claim of low back disability. The ratio of the recurrence rates for a terminated first claim with a deferred period of 14 days was almost one (RR = 1.06 [0.73–1.52]). The recurrence rate for a terminated first claim with a deferred period of 30 days was 1.4 times smaller than the baseline (RR = 0.69 [0.48–0.99]), and the recurrence rate for a terminated first claim with a deferred period of more than 30 days was twice smaller than the recurrence rate for a deferred period of three days (RR = 0.50 [0.21–1.16]). The last two groups together, in other words terminated claims with a deferred period of 30 days or more, had a 1.5 times smaller recurrence rate than the baseline (RR = 0.66 [0.46– 0.99]).

The risk of a recurrent claim was 1.83 [1.21–2.79] for terminated first claims with low back problems before acceptance compared with those without low back problems before acceptance.

Subjects with low back surgery at the first claim or before acceptance showed a 1.7 times smaller recurrence rate than those without low back surgery (RR = 0.60 [0.39–0.92], with no low back surgery as baseline).

An early intervention program with 1-year follow-up (N=134)

Material and methods

Early intervention group

The study was performed at the private nonprofit mutual insurance company Movir, Nieuwegein, the Netherlands (see p. 13). (The definitions used in the study are described in the glossary.) From January 1, 1990 to January 1, 1991 an early intervention program was given to all patients filing a new low back disability claim (N=134). The early intervention protocol was based on the "Critical Path for the Management of Spinal Disorders", published by the Quebec Task Force (Spitzer et al. 1987). The program was carried out by one physician with spinal experience, employed by the insurance company. Each claimant was followed for one year.

In the first week of disability the insurance physician phoned the claimant in order to distinguish between disability due to nonspecific low back pain and disability due to specific low back pain. When in doubt, the protocol for disability due to nonspecific low back pain was followed (Table 15). According to the protocol, 90 low back disability claimants were visited in their homes by the same physician. Those with nonspecific low back pain were visited in the second week of disability and those with specific low back pain four weeks after the start of therapy. The most frequent diagnosis of specific low back pain was a radicular syndrome, in which case the start of therapy coincided with the onset of conservative therapy (in most cases bed rest) or to the date of surgery.

Personal contact with the disabled was aimed at creating mutual trust. The insurance physician evaluated and tried to understand the claimant's problems. The tone of the conversation was positive and the insurance physician tried to avoid an adverse relationship. An explanation was given of the mutual beneficial aspects of the early intervention: good rehabilitation and early return to his/her practice for the claimant and cost savings for the insurance company. An important part of the approach was the restoration of the claimant's self-esteem by emphasizing the improvement of function and ignoring the pain. The aim was for the claimant to take responsibility for his/her own recovery.

Standard evaluation

For the early intervention of low back disability, the model of an integrated approach of medical, psychological/sociological, and ergonomic factors was used (Figure 10). At each home visit, the insurance physician performed a standard evaluation. The medical assessment included a historical and a careful physi-

Table 15. Protocol handling low back disability

Time	Nonspecific LBP[a]	Specific LBP[a]
1st week of disability	Distinguish between nonspecific and specific LBP Telephone call	
2nd week of disability	Medical assessment Visit at home	
4 weeks after start therapy		Medical assessment Visit at home
After 6 weeks of disability	Medical assessment Expert opinion	
3 to 4 months after start of therapy		Medical assessment Expert opinion
3 months after expert opinion	Evaluation of trunk muscle condition	

[a] LBP low back pain.

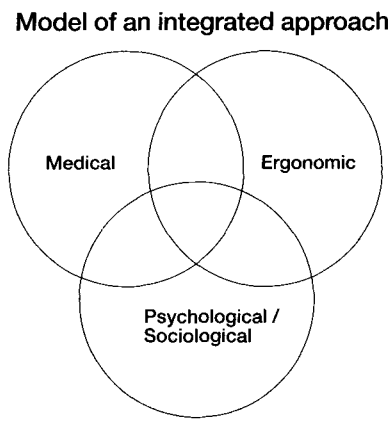

Figure 10. For the early intervention of low back disability, the model of an integrated approach of medical, psychological/sociological, and ergonomic factors was used.

cal examination. The following questions were asked during the historical examination:

- Is low back pain the main cause of disability? Are there any other complaints? Is low back pain associated with pregnancy?
- How did the pain start? Gradually or suddenly? When did the pain start? Date stopped working due to low back pain? Degree restrained from work?
- Pain: Which type? Is there radiation to the legs? Is there aggravation by coughing, sneezing, walking, or at a particular movement?
- What is the claimant's disability report (Waddell and Main 1984) about heavy lifting, sitting for half an hour, traveling for half an hour, standing for half an hour, walking for half an hour, sleep disturbance, social life restriction, sex life restriction, help with footwear?
- Is diagnostic imaging performed? When? Results?
- Treatment: What is the name and specialty of the attending physician? What therapy is prescribed? Used since when? In case of bed rest: how long prescribed?
- Were there previous episodes of low back pain? If yes: When? How long?; Claimed disability? If yes: When? How long?; What was the treatment? How was the response to the treatment?
- Back surgery (present or in the past)?
- Trauma or fracture of the spine (present or in the past)?
- Infection of the spine (present or in the past)?
- Is there a family history of back pain?

An impression about psychosocial factors was obtained by asking questions about:

- Job perspective (fear of becoming long-term disabled?)
- Work Apgar based on the work of Bigos et al. (1991): a) Do you enjoy your job?; b) Do you get along well with your colleague(s) and/or assistant(s)?; and c) Do you have any problems with the authorities (i.e., government, social insurance, general management of a hospital)?
- Problems at work or in family.
- Practice: taken over by colleague, or by substitute, or closed?
- Sleep pattern (sleep disturbed regularly by low back pain? wide awake?).
- Smoking; Use of alcohol.
- Nervous exhaustion or depression (present or in the past).
- Life events.
- Contact with a psychologist or psychiatrist (present or in the past).
- Confidence in treatment and attending physician.
- Financial necessity to work, in other words being underinsured.
- Argument with a disability insurance company or litigation (present or in the past).

Information about the ergonomic situation on the job was gathered with the aim of giving practical ergonomic hints, which will be further described under ergonomic advice.

The whole evaluation was concluded with a diagnosis and an assessment of the degree of disability. Furthermore, the insurance physician explained the prognosis of the complaint and the duration until return to light duty work and/or to full-time work. Regular follow-up calls were made to ensure a proper return to work, which was the endpoint of the intervention of the insurance physician.

Advice

If necessary, diagnostic and/or therapeutic advice was given, which could be medical, psychosocial, and/or ergonomic. Medical advice consisted of information about active rehabilitation (Hansson 1990, Nachemson 1983):

- Early physical activation and return to work are crucial parts of the treatment.
- During early return to work, avoid heavy lifts, lift close to the object, stay close to the work site, avoid twisting, change position, avoid low chairs and when seated use lumbar support.
- When necessary, improve trunk muscle strength and fitness. For those who were interested, a pamphlet with trunk muscle exercises of the National Institute of Sports and Public Health (Nationaal Instituut voor de Sportgezondheidszorg 1986) was handed over, including explanation about the technical performance of these exercises (Figure 11).
- Especially for the claimants who had undergone surgery, or who were rehabilitating after bed rest, improvement of general fitness was recommended through daily walking, cycling or swimming.
- Each claimant was told that a good general fitness and strong trunk musculature reduces back pain and diminishes the risk of a recurrent episode of back pain.

For professional psychological advice, a multidisciplinary expert opinion, which contains a psychological evaluation, could be initiated. More information about this evaluation will be given below.

All persons should use their back properly, both during working hours and leisure time. Risk factors of low back pain are heavy lifting (Chaffin and Park

NISGZ
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6860 AB Oosterbeek

VERSTERKING VAN BUIK- EN RUGSPIEREN

1. Laat de oefeningen liefst voorafgaan door een algemene warming-up (NISGZ poster 14).
2. De oefeningen zijn gerangschikt van licht naar zwaar; houdt hiermee rekening in de opbouw van uw programma.
3. Adem rustig door tijdens de oefeningen; juist ook op het zwaarste moment.
4. Houdt een oefening minimaal 5-10 seconden vol; liefst langer.
5. Houdt in een schema (zie onder) bij hoe lang u een oefening volhoudt en hoe vaak u een oefening herhaalt. Herhaal elke oefening minimaal 10 keer.
6. Raadpleeg voor uitbreiding of aanpassing van deze oefeningen een sportfysiotherapeut of SMA.

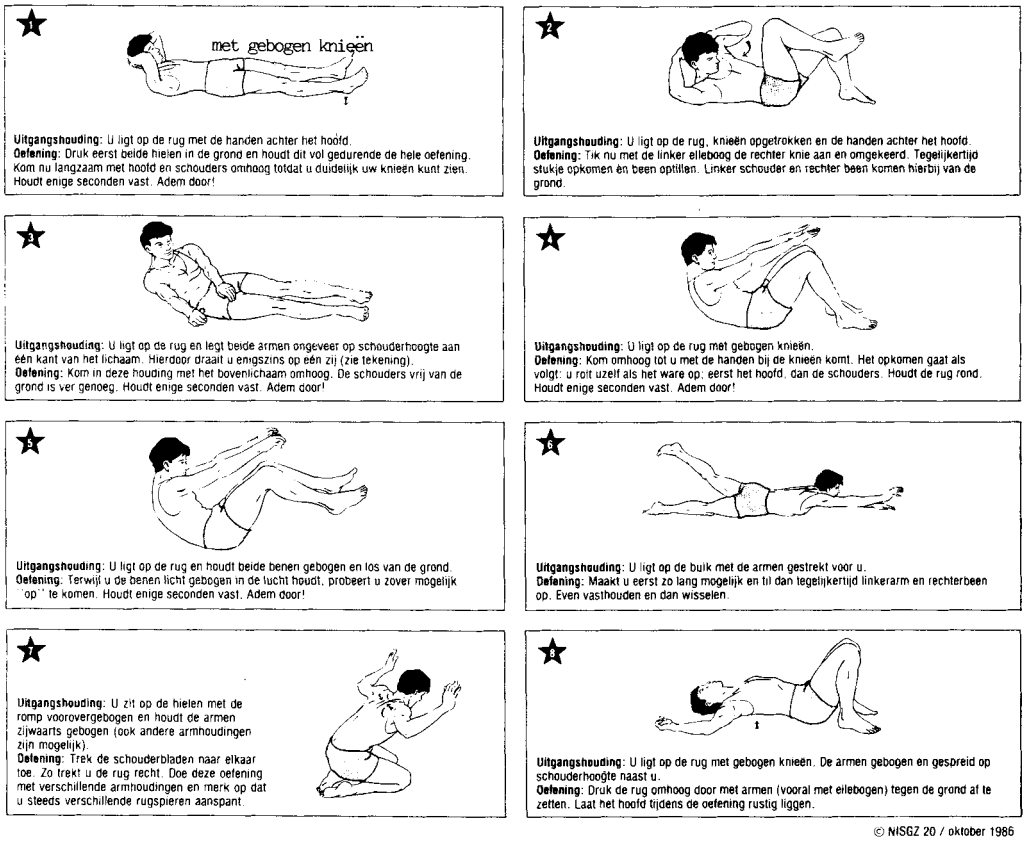

Figure 11. Trunk muscle exercises with an explanation in Dutch (Nationaal Instuut voor de Sportgezondheidszorg 1986).

1973, Snook et al. 1978), prolonged sitting (Magora 1972), bending (Snook et al. 1978) and twisting (Snook et al. 1978). The worst action for the back is heavy lifting in combination with lateral bending and twisting (Glover 1960, Tichauer 1965, Troup et al. 1970). Next to this general ergonomic advice, specific advice was given for the various professions:

Dentists: Alternate sitting and standing while working. When working seated, sit with the knees flexed at an angle of 105 degrees and try to position the patient as horizontal as possible. During long-term treatment, stretch the back for a few seconds after 10 minutes of working. Move around between the treatment of different patients, for example by

picking up each patient in the waiting room and escorting him/her back after the treatment (Ellis 1981).

Veterinarians: Those who are treating pets should move around shortly between two consultations or treatments during consulting hours and surgery hours respectively. It is wise to have assistance when lifting a heavy animal onto the examination table, or to let the animal jump onto the table. For surgery, a table that can be adjusted in height should be used.

Veterinarians who are treating cattle should ask the help of the farmer with heavy lifting, pulling and pushing, for example at normal deliveries or cesarean section of cows. Furthermore, they should try to keep their back straight when suturing during an operation and a cesarean section of a cow, by standing straddle-legged, by kneeling, or by sitting on a stool bound fast onto their buttocks. Pigs should be vaccinated with a vaccinating stick instead of a pistol. By using the stick, the veterinarian avoids multiple bending.

Physicians and physical therapists: The practical recommendations described above are appropriate for physicians and physical therapists as well, particularly moving around shortly between two consultations or treatments during consulting hours and surgery hours respectively. During long-term treatment, stretch the back for a few seconds after 10 minutes of working. Lift a heavy patient together with an assistant or a nurse.

In the Netherlands, there is a strict separation between treatment and disability evaluation. In general, the claimants were treated by their attending physician. Advice was given by the insurance physician to the disabled, but never enforced. If necessary, the insurance physician contacted the claimant's general practitioner or attending specialist.

Multidisciplinary expert opinion

If a person did not return to full-time work after six weeks of disability for nonspecific low back pain, or did not return to at least part-time or light duty work within three to four months after the start of therapy in case of specific low back disability, independent expert opinions were sought (Table 15). These multidisciplinary expert opinions involved the assessment by an orthopedic surgeon, including an examination of the lumbar spine function with the IsoStation B-200, and a psychologist as well (Van Akkerveeken et al. 1992). For evaluating the lumbar spine function with the IsoStation B-200, the B-200 Back Evaluation System developed by the Occupational Orthopedic Center was used (Deutsch 1989). The psychological evaluation included a clinical interview and a psychometric evaluation with the use of the following tests: Netherlands Personality Questionnaire, Netherlands Condensed M.M.P.I., Pain Cognition List, Utrecht Coping List, Sleep List, Self Assessment Questionnaire and Zung Depression List.

Both advice about the degree of disability and therapeutic advice were sought. The expert report was discussed by the insurance physician and the disabled person, at which time the two tried to agree upon a schedule for returning to work. Again, regular follow-up calls were made to check that the schedule was kept. If necessary, the effect of trunk muscle exercises was evaluated with the IsoStation three to five months after the first examination.

Control group

The early intervention group (1990) was compared to a historical control group consisting of all low back disability claimants in the years 1987 and 1988 combined. Data of the control group were obtained from the retrospective study (see pp. 13–17). Each claimant was followed for one year. The control group was chosen because it contained the claimants of the last two years of the retrospective data of which the follow-up period of one year did not continue in 1990. There were no changes in insurance regulations between 1988 and 1990.

Until 1990 all claimants of low back disability were sent to a local general practitioner, functioning as a medical officer, for medical assessment. This physician was asked to report on the following:

- Date stopped working due to disability.
- Degree restrained from work.
- History and findings on physical examination (asked without any specifications).
- Duration of complaints.
- Treatment: which treatment and since when.
- Diagnosis.
- History of back problems.
- Advised degree of disability.
- Advised date of return to work, including degree of return to work.
- Prognosis of disability.
- Date for next work incapacity evaluation.

The medical advisor at the insurance company determined the degree of disability based on the report from the medical officer, information of the claimant's attending physician and sometimes on an expert opinion. No protocol was used for these actions.

Table 16. Distribution of claimants of the early intervention group and the control group, according to diagnosis and cumulative duration of low back disability

Diagnosis	Cumulative duration	Early intervention group	Control group	Total
Low back pain		134	195	329
	< 1 year	120	154	274
	1 year	14	41	55
Nonspecific LBP[a]		85	117	202
	< 1 year	83	106	189
	1 year	2	11	13
Specific LBP[a]		49	78	127
	< 1 year	37	48	85
	1 year	12	30	42

[a] LBP low back pain

Description of the groups

For the early intervention group and the control group, disability caused by nonspecific low back pain was distinguished from disability due to specific low back pain. Specific low back pain involved a diagnosis of disc herniation, spinal stenosis (central and/or lateral), spondylolisthesis greater than grade I, disc degeneration at three or more levels, proven instability, structural deformity (a. thoracolumbar kyphosis more than 72 degrees, b. structural scoliosis), inflammation (Morbus Bechterew, spondylitis, spondylodiscitis), osteoporosis, fracture, low back pain associated with a spinal tumor, low back pain associated with pregnancy, or low back pain associated with a mental disorder (i.e. chronic pain syndrome at start of disability).

The control group consisted of all low back disability claimants in the years 1987 and 1988 combined, whose data were obtained retrospectively (see pp. 13–17). The low back disability claims of the controls were coded by one physician before the start of the early intervention program. Criteria for entering the control group were low back symptoms as the main cause of disability. Claims which had entered the retrospective study, because they were categorized in the central computer of the insurance company under the codes of low back pain according to the ICD (ninth revised edition; World Health Organization 1977), but of which the dossier was not available at the insurance company to check the diagnosis, were excluded from the control group. In total, 25 claimants of 1987 and 1988 were excluded. The claims of 1990 were coded by the same physician and were checked by an independent orthopedic surgeon.

During the early intervention program, 134 persons submitted a low back disability claim, versus 195 during 1987 and 1988 (Table 16). Fourteen claimants were involved both in the early intervention group and in the control group. Four claimants could not be followed for 1 year after the onset of the disability: one in the early intervention group, with a duration of 172 days, because of suppression of medical information upon acceptance, and 3 in the historical review group. Reasons for incomplete data in the control group were death of one subject (duration of 20 days) and acceptance of paid employment by two persons (duration of 226 days and 28 days, respectively).

Statistics

For all statistical tests used in this intervention study, a P-value of less than 0.05 was considered to be significant.

Cumulative duration

In order to analyze the cost-effectiveness and the cost benefits of the early intervention program, the cumulative duration for all claimants in 1990 was compared to that for all claimants in 1987 and 1988. All low back disability claims of one claimant were included. In case of a recurrent claim within the observation period of one year, the days of disability were added up, until a maximum of 365 days. This was called the cumulative duration of low back disability.

The mean cumulative duration for the early intervention group and the control group was standardized to 1990 and calculated as follows:

((adjusted) percentage of claimants with a cumulative duration < 1 year)
* ((adjusted) mean of claimants with a cumulative duration < 1 year)
+ ((adjusted) percentage of claimants with a cumulative duration = 1 year) * (365)

The distribution of the claimants according to diagnosis, deferred period, profession and age differed in the early intervention group and the controls, which could have influenced the mean cumulative duration and the risk of a claimant reaching a cumulative duration of one year. There was no difference in distribution of claimants according to registered low back problems before the current period (low back problems before acceptance and/or low back disability before this period of low back disability) between the early intervention group and the control group. In both groups circa 40 percent of the claimants had reg-

istered low back problems before the current period. Furthermore, 19 percent of the claimants in the early intervention group had psychosocial problems at the start of the disability, compared to 11 percent of the controls. Information regarding the control group was obtained by a retrospective analysis of claim files and/or medical reports, although no specific questions were asked about psychosocial problems. Questions concerning psychosocial factors, however, did form part of the standard evaluation of claimants in the early intervention program. In conclusion, it was safe to exclude the variable psychosocial problems at the start of the disability from the analysis of the cumulative duration, because a higher percentage was reported among claimants in the early intervention group. Therefore, the difference in cumulative duration between claimants in the early intervention group and the control group was only adjusted for diagnosis, deferred period, profession and age.

Cumulative duration less than one year: Multiple linear regression was used to evaluate the difference between the early intervention group and the control group in mean cumulative duration for claimants of which the cumulative duration did not exceed one year, adjusted for diagnosis, deferred period, profession and age (Kahn and Sempos 1989). Cumulative duration was entered as a continuous variable (0–364 days); all other variables were entered as categoric (Table 17). The coefficient beta of a variable(i) represents the average change in mean cumulative duration associated with one unit change in the code Xi, adjusted for all other variables included in the regression. The adjusted mean cumulative duration of the control group was calculated by means of multiple regression analysis.

Cumulative duration of one year: Computation of the adjusted percentage of claimants with a cumulative duration of one year was performed using multiple logistic regression, including group, diagnosis, deferred period, profession and age (Kahn and Sempos 1989). These variables were entered as categoric. The response variable was absence or presence of a cumulative duration of one year. The adjusted odds ratios of a cumulative duration of one year were estimated by the multiple logistic regression model (see p. 17). The adjusted percentage of claimants with a cumulative duration of one year was calculated from the adjusted odds ratio of a cumulative duration of one year, using the following formula:

$$\text{odds ratio} = \frac{P_{87\&88} / (1-P_{87\&88})}{P_{90} / (1-P_{90})}$$

$P_{87\&88}$ = risk control group; P_{90} = risk early intervention group

Cost benefit

An actuary calculated the cost benefit of the early intervention program by adding up the differences between the early intervention group and the control group in compensation costs, reservations for expected payments in future years for disability exceeding one year, and costs of medical advice. To compare both groups the total number of claimants and the number of claimants exceeding the period of one year disability in 1987 and 1988 were standardized to 1990. The following formulas were used:

compensation costs = N (in 1990) * mean cumulative duration * mean insured daily compensation * mean degree of disability

reservation = number of claimants 1 year disabled standardized to 1990 * mean insured daily compensation * reservation factor at mean age * mean degree of disability * 365

costs medical advice = N (in 1990) * mean costs per case

Predictors of duration for the early intervention group

Forty-four claimants returned to work within two weeks in case of disability for nonspecific low back pain, or within four weeks after the start of therapy for specific low back disability. Therefore, 90 persons were visited in their homes for a standard evaluation of their low back disability. Two of these claimants undergoing surgery after the standard evaluation were excluded from the analysis. For the remaining 88 claimants the median duration from the start of the claim until the home visit was 22 days: 13 days for nonspecific low back pain and 48 days for specific low back pain (Table 20).

All claimants were followed until March 15, 1992. Five persons claimed more periods of low back pain: three had one recurrence and two filed two recurrences. The mean duration was 59 days of their first claims, the mean cumulative duration was 66 days for their first recurrences included (n 5) and 114 days for their second recurrences included (n 2).

For analyzing the possible predictive variables at the time of the standard evaluation among the early intervention group, the duration from the date of the home visit until return to work was used. In eight cases the claim was still open at the end of the observation period on March 15, 1992. The duration of these claims was censored. Therefore, the survival method according to Kaplan and Meier, for analyzing the length of time to a response, was appropriate (see

Table 17. Multiple linear regression on cumulative duration less than one year: coefficient beta of a variable(i) represents the average change in mean cumulative duration associated with one unit change in X(i), adjusted for all other variables included in the regression

Variable (i)	Category	Code X(i)	Coeff.[a]	SE[b]
Constant			34.3	
Group	early intervention	0		
	control	1	7.0	7.1
Diagnosis	nonspecific LBP[c]	0		
	specific LBP[c]	1	113.0	8.1
Deferred period	3 days	0		
	≥14 days	1	22.0	9.0
Profession	dentists	000		
	veterinarians	100	2.2	10.3
	physicians	010	–36.0	11.5
	physical therapists	001	–5.7	11.7
Age at start of disabillty	< 35	000		
	35–44	100	–12.3	10.1
	45–54	010	9.3	12.3
	55–65	001	–14.9	15.6

[a] Coeff. coefficient beta.
[b] SE standard error.
[c] LBP low back pain.

Table 18. Multiple logistic regression. Response is "cumulative duration of one year"

Variable (i)	Category	Code X(i)	AOR[a]	95%CI[b]
Group	early intervention	0		
	control	1	2.7	1.3–5.9
Diagnosis	nonspecific LBP[c]	0		
	specific LBP[c]	1	7.8	3.6–17.0
Deferred period	3 days	0		
	≥14 days	1	1.6	0.7–3.9
Profession	dentists	000		
	veterinarians	100	2.0	0.8–5.2
	physicians	010	0.3	0.1–1.1
	physical therapists	001	2.8	0.9–8.5
Age at start of disabillty	< 35	000		
	35–44	100	3.3	0.8–13.5
	45–54	010	11.7	2.5–55.4
	55–65	001	22.4	4.2–119

[a] AOR adjusted odds ratio
[b] CI confidence interval
[c] LBP low back pain

p. 17). In the present study, the response was "*end of compensation*". All possible predictive variables were categoric. The variables were related to demography (Table 21), and to the standard evaluation. The latter consisted of history (Table 22), physical examination (Table 23) and psychosocial questions (Table 24).

Because more than one factor influenced the duration of low back disability after the standard evaluation, a multivariate model was built, according to the Cox proportional hazards regression method (see p. 18). The step-up stepwise procedure was used. Additional variables were added one at a time to the model, and at a given step up the variables with the smallest *P*-value was added, as long as the *P*-value was less than 0.05. This implicates that the variables not in the model do not add statistically significant predictive power to the variables already in the model (Bigos et al. 1991). The predictive value of a variable is given by the relative hazards of the categories of that variable. The relative hazard is the ratio of the *end of compensation* rates of category A and B, often called relative risk (Bigos et al. 1991, Matthews and Farewell 1988). In the present study this ratio was named relative risk as well. The standard Cox regression model assumes proportional hazards. This implies that the relative risk is constant with time.

Results

Cumulative duration

For claimants of which the cumulative duration was less than one year, the crude mean cumulative duration was 68 days for the early intervention group and 74.9 days for the control group; difference 6.9 (*standard error 9.6*) days. Adjusted for diagnosis, deferred period, profession and age, the mean cumulative duration was 68 days for the early intervention group and 75 days for the controls; difference 7.0 (*7.1*) days (Table 17). These differences were not significant. For this reason, 68 days was used in both groups as the mean cumulative duration of claimants whose cumulative duration was less than one year.

Ten percent of the claimants had a cumulative duration of one year in the early intervention group, versus 21 percent in the control group (Table 16). Multiple logistic regression yielded the odds ratio of a cumulative duration of one year. The odds ratio, adjusted for diagnosis, deferred period, profession and age, was 2.72 [1.26–5.87] for the control group, with the early intervention group as baseline ($P < 0.001$; Table 18). From the adjusted odds ratio, the adjusted percentage of claimants who reached a cumulative duration of one year was calculated. Standardized to 1990, the adjusted percentage of claimants with a cumulative duration of one year was 23

Table 19. Cost-effectiveness and cost benefit early intervention program. Total number of claimants and number of claimants exceeding one year of disability standardized to 1990 (N=134)

	1987–1988	1990	Decrease in 1990
Mean cumulative duration, days	136	98	38
One year disabled	32	14	18
			Cost Benefit[a]
Compensation [a]	3.4	2.4	+0.9
Reservation [ab]	18.2	8.3	+9.8
Medical advice [a]	0.019	0.144	−0.125
Total [a]	21.6	10.9	+10.7

[a] amount in million Dutch Guilders in 1990, exchange rate on December 31, 1990 (Rabobank 1993)
1 Dutch Guilder = 0.59 US Dollars
1 Dutch Guilder = 3.33 Swedish Crowns
[b] reservation for expected payments in future years for disability exceeding one year

Table 20. Distribution of claimants according to duration in days from start low back disability until medical assessment

Duration (days)	Nonspecific LBP[a]	Specific LBP[a]	All
< 15	27	7	34
15–31	10	7	17
32–44	2	10	12
45–92	1	18	19
> 93	0	6	6
All	40	48	88
Mean in days	15	49	34
Median in days	13	48	22

[a] LBP low back pain

among the controls and 10 among the early intervention group.

With the use of the above-mentioned data, the mean cumulative duration was calculated: 98 days for the early intervention group ((0.90 * 68) + (0.10 * 365)); 136 days for the controls ((0.77 * 68) + (0.23 * 365)). This difference of 38 days between the two groups was significant ($P < 0.05$).

After excluding the 14 claimants who were involved in both groups, the mean cumulative duration was 102 days and 145 days for the early intervention group and the control group respectively. In 1990, 11 percent of the claimants had a cumulative duration of one year. The adjusted odds ratio of a cumulative duration of one year was 2.79 [1.27–6.13] for the controls, with the early intervention group as baseline ($P < 0.001$). This implies that it is safe to use the mean cumulative duration and the standardized number of claimants with a cumulative duration of one year from all claimants, without excluding the 14 mentioned previously, for calculating the cost-effectiveness and the cost benefit of the early intervention program.

Cost benefit and cost-effectiveness

In the case of the control group, the total number of claimants and the number of claimants with a cumulative duration of one year were standardized to 1990, the year of the early intervention program. As mentioned above, the mean cumulative duration, adjusted for diagnosis, deferred period, profession and age, was 98 days for the early intervention group, compared to 136 days for the controls. Fourteen of the 134 claimants of the early intervention group reached a cumulative duration of one year, at which point the mean degree of disability was 55 percent, compared to 41 of the 195 claimants from the control group, with a mean degree of disability of 52 percent. Standardized to 1990, and adjusted for diagnosis, deferred period, profession and age, 32 claimants reached a cumulative duration of one year among the controls of 1987 and 1988.

The cost benefit of the early intervention program was calculated by an actuary (Table 19). The total savings of the early intervention program for 134 claimants amounted to NLG 10.7 million, or a decrease of 49 percent of the total costs. The program was cost-effective: an investment of NLG 125,000 in costs for medical advice resulted in a reduction of 28 percent on compensation costs and 54 percent on reservation for expected payments in future years for disability exceeding one year.

Predictors of duration for the early intervention group

The mean duration of low back disability from the time of the standard evaluation until return to work was 144 (22) days. The median was 73 [39–98] days.

In the univariate analysis, the demographic factors age (> 44 years versus < 45 years) and profession (dentists, veterinarians and physicians together versus physical therapists) were significantly related

Table 21. Variables evaluated as predictors for duration of low back disability, at the moment of the standard evaluation. Distribution of duration in days according to the Kaplan and Meier method. Response is *"end of compensation"*

Demographics I	n	Median	95% CI[a]	P-value[b]
Gender				NS
male	80	73	45–102	
female	8	27	17–128	
Age				NS
< 35	14	34	17–110	
35–44	42	64	30–104	
45–54	22	45	20–282	
55–65	10	104	47–	
				< 0.05
< 45	56	64	33–101	
45–65	32	82	27–282	
Compensation group[c]				NS
low	10	98	62–350	
middle	26	34	27–94	
high	36	47	24–101	

[a] Brookmeyer-Crowley 95% confidence interval (CI) for median survival time in days
[b] Mantel-Cox test of equality of survivor functions.

Demographics II		n	Median	95% CI[a]	P-value[b]
Profession					NS
dentists	(1)	26	83	25–111	
veterinarians	(2)	29	77	30–17	
physicians	(3)	13	93	39–128	
phys. therap.	(4)	20	33	17–75	
					< 0.05
	1–3	68	83	62–110	
	4	20	33	17–75	
Deferred period, days					NS
3		33	81	27–111	
14		11	38	13–117	
30		41	63	34–102	
> 30		3	56	7–	

[c] Distribution in low, middle and high group of insured daily compensation as given in Table 2.

Table 22. Variables evaluated as predictors for duration of low back disability, at the moment of the standard evaluation. Distribution of duration in days according to the Kaplan and Meier method. Response is *"end of compensation"*

History I	n	Median	95% CI[a]	P-value[b]
Registered LBP[c] *before the current period*[d]				NS
no	48	59	30–91	
yes	40	75	45–117	
Low back surgery before the current disability period				< 0.05
no	84	69	34–94	
yes	4	123	27–	
Pregnancy (women)				NS
no	7	26	17–128	
yes	1	33	–	
Site(s) of symptoms				NS
lumbar	80	73	45–101	
lumbar and higher	8	17	4–	
Pain radiation				NS
no	63	37	27–91	
above knee level	13	94	45–233	
below knee level	12	110	73–231	
Other complaints				NS
no	78	73	34–98	
yes	10	64	13–	
Duration of low back complaints until standard evaluation				< 0.05
< 6 months	74	62	33–94	
> 6 months	14	101	56–	
Duration from start of low back disability until standard evaluation				NS
< 15 days	34	30	17–62	
15–31 days	17	31	13–137	
32–44 days	12	91	59–111	
45–92 days	19	104	82–209	
> 92 days	6	75	39–128	
Treatment				< 0.05
conservative	66	45	27–80	
operative	22	104	83–209	
Bedrest (nonspecific LBP)				NS
≤ 7 days	34	17	11–27	
> 7 days	6	47	34–110	
Degree restrained from work				< 0.05
≤ 50%	19	15	11–56	
> 50%	69	83	62–105	

History II	n	Median	95% CI[a]	P-value[b]
Disability report (Waddell and Main 1984)				
– Help required or avoid heavy lifting (a heavy suitcase)				NS
no	14	33	5–350	
yes	74	73	39–98	
– Sitting generally limited to < 0.5 h				< 0.01
no	74	62	30–91	
yes	14	128	47–	
– Traveling in a car or bus generally limited to < 0.5 h				NS
no	44	56	24–102	
yes	44	80	34–105	
– Standing in one place generally limited to < 0.5 h				NS
no	37	37	24–83	
yes	49	83	45–110	
– Walking generally limited to < 0.5 h				NS
no	59	53	27–101	
yes	29	81	56–110	
– Sleep disturbed regularly by LBP (2–3 times a week)				NS
no	65	61	30–91	
yes	20	110	34–209	
– Regularly miss or curtail social activities (excluding sports)				NS
no	34	27	17–82	
yes	53	96	64–111	
– Diminished frequency of sexual activity				NS
no	15	26	20–59	
yes	29	77	34–104	
– Help regularly required with footwear				NS
no	78	73	45–102	
yes	9	15	7–82	

[a] Brookmeyer-Crowley 95% confidence interval (CI) for median survival time in days.
[b] Mantel-Cox test of equality of survivor functions. NS not significant.
[c] LBP low back pain.
[d] Low back problems before acceptance and/or low back disability before this period of low back disability.

Table 23. Variables evaluated as predictors for duration of low back disability, at the moment of the standard evaluation. Distribution of duration in days according to the Kaplan and Meier method. Response is *"end of compensation"*

Exam. & diagnostic proc.	n	Median	95% CI[a]	*P*-value[b]
Spasm paraspinal muscles				NS
no	53	81	45–110	
yes	35	45	24–104	
Modified Schober (Waddell 1982)				NS
≥5 cm	42	39	20–102	
<5 cm	46	75	59–110	
Abdominal muscle strength[c]				NS
good	31	32	20–80	
poor / fair	54	91	56–110	
Neurologic signs				
– SLR-test[d]				NS
negative	83	67	34–98	
positive	5	92	56–	
– Sensory deficit (dermatomal)				< 0.05
no	68	39	27–80	
yes	20	110	91–364	
– Motor deficit				NS
no	72	56	27–83	
yes	16	104	91–364	
– Reflex diminished				NS
no	75	61	34–83	
yes	13	103	83–123	
Diagnostic procedures[e]				< 0.001
normal / no procedure	34	20	11–34	
root compr. suspected	12	24	17–83	
root compr. confirmed	35	104	83–123	
structural deformity	7	292	82–	
Diagnosis				< 0.0001
nonspecific LBP[f]	40	20	13–34	
specific LBP[f]	48	104	83–128	

[a] Brookmeyer-Crowley 95% confidence interval (CI) for median survival time in days.
[b] Mantel-Cox test of equality of survivor functions. NS not significant.
[c] assessment of abdominal muscle strength: good, when a sit-up is done easily; fair, when a is sit-up is only possible with a lot of effort; poor when a sit-up is not possible.
[d] positive when pain radiates under knee level at SLR < 75°.
[e] plain radiography and/or CT-scan and/or MRI-scan and/or myelogram and/or EMG.
[f] LBP low back pain.

Table 24. Variables evaluated as predictors for duration of low back disability, at the moment of the standard evaluation. Distribution of duration in days according to the Kaplan and Meier method. Response is *"end of compensation"*

Psychosocial factors	n	Median	95% CI[a]	*P*-value[b]
Confidence in treatment				NS
yes	80	69	34–98	
sometimes	2	47	–	
no	4	128	110–	
Fear of becoming long-term disabled				< 0.01
no	56	39	25–73	
sometimes	8	104	27–117	
yes	22	137	83–350	
				< 0.01
no	56	39	25–73	
yes & sometimes	30	117	83–233	
Work Apgar (based on the work of Bigos et al. (1991))				
– Job enjoyment				NS
yes	73	67	34–91	
sometimes	11	31	19–231	
no	4	282	128–	
– Getting along well with colleague(s) and/or assistant(s)				NS
yes	76	62	30–83	
sometimes	5	121	13–	
no	5	106	34–	
				< 0.05
yes	76	62	30–83	
no & sometimes	10	110	101–	
Smoking				NS
no	24	75	33–117	
yes	25	96	24–123	
Alcohol (two or more drinks per day)				NS
no	61	63	34–91	
yes	7	73	34–	
Nervous exhaustion or depression (present or in the past)				NS
no	56	69	39–101	
yes	14	94	13–350	
Life events				NS
no	36	69	45–98	
yes	34	47	20–123	
Contact with psychologist or psychiatrist (present or in the past)				NS
no	60	73	45–104	
yes	9	12	4–83	
Financial necessity to work				NS
no	55	61	34–102	
sometimes	23	79	27–117	
yes	3	8	4–	
Argument with a disability insurance company or litigation (present or in the past)				NS
no	78	75	45–104	
yes	5	17	11–	

[a] Brookmeyer-Crowley 95% confidence interval (CI) for median survival time in days.
[b] Mantel-Cox test of equality of survivor functions.NS not significant.

with duration ($P < 0.05$; Table 21). Furthermore, history data such as low back surgery before the current disability period, sitting limited to less than half an hour, duration of current low back complaints until the time of the standard evaluation (6 months or more versus less than 6 months), treatment (operative versus conservative) and degree restrained from work (more than 50 percent versus 50 percent or less) showed a significant association with duration (Table 22). In case of the disability report (Waddell 1987), only half of the claimants answered the question about a diminished sexual activity due to the low back pain. For the remaining eight questions, the relationship of the total number of limitations with duration was analyzed. A score of four or more limitations out of eight, a score of five or more, as well as a score of six or more was not significantly related with duration. A sensory deficit was associated with duration ($P = 0.0173$). Moreover, the presence of one or more neurologic signs (SLR-test, sensory deficit, motor deficit, reflex diminished) was significantly related

Table 25. Predictors for duration of low back disability at the moment of the standard evaluation. Multivariate analysis according to the Cox proprtional hazards model. Response is "*end of compensation*"

Variable	category A vs	category B	Coeff.[a]	SE[b]	RR[c]	95% CI[d]	P-value
Diagnosis	specific LBP[e]	nonspecific LBP[e]	−0.90	0.23	0.41	0.25–0.65	< 0.001
Fear of becoming long-term disabled	yes & sometimes	no	−0.91	0.27	0.40	0.24–0.69	< 0.001
Degree restrained from work	>50%	<50%	−1.01	0.31	0.36	0.20–0.68	< 0.01
Duration of low back complaints	>6 months	<6 months	−0.92	0.38	0.40	0.19–0.85	< 0.01

[a] Coeff. coefficient beta.
[b] SE standard error.
[c] RR relative risk = ratio of the *end of compensation* rates of category A and B.
[d] CI confidence interval of the relative risk.
[e] LBP low back pain.

with duration as well ($P = 0.0377$). Other predictive variables were diagnostic procedures (normal or no procedure; root compression suspected on plain radiography; root compression confirmed on CT-scan, MRI-scan, myelogram or EMG; structural deformity) and diagnosis (specific low back pain versus non specific low back pain; Table 23). Regarding the psychosocial factors, persons with a fear of becoming long-term disabled showed a significant relationship with duration. The same was true for persons who were not getting along well with their colleague(s) and/or assistant(s) (Table 24). For the Work Apgar, the probable relationship of problems with the authorities with duration was not analyzed, because the question had no relevance for 65 of the 88 claimants.

In the multivariate analysis, significant predictors of duration from the time of the standard evaluation until return to work proved to be, in descending order of significance: diagnosis (specific low back pain versus nonspecific low back pain), fear of becoming long-term disabled, degree restrained from work (more than 50 percent versus 50 percent or less), duration of low back complaints (6 months or more versus less than 6 months; Table 25). The given relative risk for each variable denotes the *end of compensation* rate compared to the baseline. In principle, the *end of compensation* rate is equal to the return to work rate. A relative risk smaller than one means an inverse association with return to work, in other words is a predictor of duration of low back disability.

Discussion

Retrospective insurance data

The present work involves a retrospective study of low back disability based upon insurance data. In the Netherlands, the issue of causality does not play a role in the assessment of disability. The figures of this study refer to compensation for disability only, and not to medical costs of disability. Retrospective data never prove causality.

It has been reported previously that insurance data in general are mainly administrative. Therefore, while accurate on absence and costs, they lack validity on diagnosis (Wood and Badley 1987). For this reason, claims classified in the insurance data as disability due to low back pain were validated by checking the medical report of each claim. Furthermore, a sampling method was used to validate the claims not classified in the insurance data as low back pain during the period studied. It may be concluded that the number of low back disability claims reported in this study is underestimated. There seemed to be a particular underestimation of low back disability due to accidents and pregnancy. The reason for this was that the codes relating to the lower back in the ICD (World Health Organization 1977) subcategories XI (Complications of Pregnancy, Childbirth, and the Puerperium) and XVII (Injury and Poisoning) were not included in the study.

Another problem of insurance data is that not all workers are covered by the insurance company (Wood and Badley 1987). This leads to the question whether or not the insurance data can be generalized. With a market share of approximately 80 percent of the self-employed dentists and veterinarians, the figures on low back disability among dentists and veterinarians are representative for self-employed dentists and veterinarians in the Netherlands. The study also gives a good impression of the magnitude of the problem of low back disability among self-employed physical therapists in the Netherlands. Since only 20-30 percent of physicians in the Netherlands are in the population studied, the data is only an indication of low back disability among self-employed physicians.

Private insurance company data yield a positive selection of the risk of disability. Applicants who had low back problems before acceptance, for example, could be excluded from compensation of low back disability.

The fourth implication of insurance data is that it provides no information about low back pain because not everyone with low back pain claims disability and many do not stay away from work (Haanen 1984, Lloyd et al. 1986, Magora and Taustein 1969, Westrin 1973, Wood and Badley 1987).

Demography

Diagnosis

The percentage of claims with a specific diagnosis is rather high compared to the one percent suggested in the literature (Spitzer et al. 1987) for patients with a spinal disorder. The percentage of specific causes in this study is even higher than in a Belgian study on sick listing of employees at a university and university hospital, where 74 percent of the claimants suffered from low back pain and 26 percent had sciatica (Uyttendael et al. 1981). After three months of back disability, physicians insured by the insurance company Artsen Onderlinge in the Netherlands showed a much higher percentage of specific causes of back pain (spondylosis and disc herniation), compared with the general working population (Van Wiechen 1989). This supports the assumption that not all persons with nonspecific low back pain claim disability, and particularly that self-employed dentists, veterinarians, physicians and physical therapists go on sick leave only if the back pain is more "serious" or "worse", compared with the general working population. This could be due to motivation for work and/or due to the fact that nonspecific low back pain limits mainly physically heavy work. On the other hand, the deferred period on the insurance policy influenced the distribution according to diagnosis. In this study, 21 percent of all claims by subjects with a deferred period of three days were caused by specific low back pain, while 42 percent of the claims by subjects with a deferred period of 14 days or more were due to specific causes. A probable explanation for this difference might be that persons with a deferred period of 14 days or more will not claim each period of nonspecific low back pain because they expect that they will return, and most do, to full-time work within their deferred period. Furthermore, it is possible that these subjects will keep on working because they suffer a direct loss of income if they are unable to work (Bassett 1983).

Number of claims per month

All four professional groups together claimed significantly more disability in December. Somatization could be an explanation. An indication for this is that more persons seem to be depressed around Christmas and the end of the year.

No significant difference in number of claims per month was found for persons with a deferred period of three days. The hypothesis that those subjects would claim more during the vacation, to have some days off paid for, could not be supported.

A seasonal heavy work load for most veterinarians occurs from October until May. There are, for example, a lot of deliveries, especially in February, March and April. During the period of the seasonal heavy work load veterinarians claimed significantly more low back disability. A multicausality is presumed: veterinarians perform physically hard work, get less sleep because of a large number of deliveries when on duty, and have familial stress because of their busy schedules.

Starting age

Most first claims of low back disability started between 30 and 45 years of age. The starting age was higher than in the general working population (Hult 1954a, 1954b, Klein et al. 1984, National Council on Compensation Insurance 1984). This could be explained by the fact that these self-employed professionals finish their study relatively late in life and therefore start working later than the general working population.

In the age group 35 years and younger, there were relatively more first claims of nonspecific low back disability compared to specific low back disability claims. Most first claims with specific causes of low back disability started between 35 and 44 years of age. For disc herniations an even higher percentage of claims occurred in this age group. This is in agreement with findings in the literature about the average age for lumbar discectomy (Frymoyer 1988, Spangfort 1972) and admission to the hospital because of a disc herniation (Heliövaara 1988, Spangfort 1972).

Surgery

Over the period 1977–1989, the average number of operations for a low back disc herniation per million persons at risk per year, recurrent operations included, was 1,310 for the population studied, compared with 550 for all inhabitants in the Netherlands (Centraal Bureau voor de Statistiek 1994, SIG Zorginformatie 1993). The figure is high as well, compared with the number of disc operations abroad (Benn and Wood 1975, Heliövaara 1988, Kane 1990, Keller 1987, Nachemson 1991b, Wood and Badley 1987). However, the number of disc operations in the present study was calculated for a population of 20 to 65 years of age, while the number of operations world-wide referred to all inhabitants per country. In the Netherlands, the number of lumbar back disc operations performed among persons 20 to 65 years of age increased from 610 per million persons at risk in 1977 to 1,010 in 1989, with an average of 825 per million persons at risk per year (Centraal Bureau voor de Statistiek 1994, SIG Zorginformatie 1993). In the United States the annual low back surgery rates for persons over age 19 increased from 1,030 per million adults in 1980 to 1,470 in 1990 (Cherkin 1993). Approximately 75 percent of these operations had as primary diagnoses a herniated disc. Presumably, self-employed medical professionals in the Netherlands had direct access to medical treatment, which as such can explain why the low back disc surgery rate was as high as that among the general working population in the United States, where the access to surgery is unlimited.

The average age of claimants who underwent surgery for a confirmed disc herniation was 42 years. This is in accordance with the average age of patients undergoing lumbar discectomy as described in the literature (Frymoyer 1988, Spangfort 1972).

A critical look at surgery is necessary. In at least 13 cases (6.5 percent) of the 200 lower back operations, a relatively serious complication occurred. Twelve of these cases became chronically disabled, of which 4 permanent disabled. Four persons were operated on two or more times during one period of disability; all remained disabled more than 6 months, of which one was called permanent disabled. It should be noted that six operations (three percent of the operations) were performed for nonspecific low back pain, among five subjects. Two of these cases became chronic.

Costs

From 1977 through 1989, the relative costs of compensation for low back pain amply doubled. For the general working population in the Netherlands, the same trend, expressed as compensation paid per hour, was reported among the disabled covered by the Sickness Benefits Act (ZW) (providing legal benefit for the first 52 weeks of sickness absence) and the Disablement Insurance Act (WAO) (providing legal benefit for disability lasting longer than 52 weeks) (Maljers 1994).

Among the general working population worldwide, the small group of chronic claims was responsible for most of the costs: 5-25 percent of the low back cases accounted for 75-95 percent of the costs (Andersson et al. 1983, Bigos et al. 1986, Frymoyer and Cats-Baril 1991, Kelsey and White 1980, Leavitt et al. 1971, Miller 1967, Nachemson 1983, Snook and Webster 1987, Spengler et al. 1986, Taugher 1973, Webster and Snook 1990). In a Canadian study, 7.4 percent of the cases, lasting six months or more, were responsible for 76 percent of the costs and 68 percent of the total days off work (Abenhaim and Suissa 1987). In the present study, 23 percent of the claims (N=1,119) accounted for 90 percent of the costs and 89 percent of the compensated days. The duration of all of these claims was six months and beyond, or chronic. The deferred period seemed to be responsible for most of the difference between the self-employed professional groups and the industrial workers. Among industrial workers in Canada, no deferred period for compensation exist. In the present study, the distribution of the claims with a deferred period of three days, according to the percentage of claims, the percentage of disability days, the percentage of costs, and the duration of disability, approaches the distribution among the industrial workers. However, the distribution of claims with a deferred period of 14 days or more shows an even greater difference with the distribution among the industrial workers than the whole group of self-employed professionals.

Permanent low back disability

As part of the chronic group, the group of permanently disabled accounted for only a small part of all claims (7.1 percent), but were responsible for half the compensation costs of low back disability. For the permanently disabled, the insurance company has decided that compensation will be paid until expiration of the insurance policy. This decision seemed to be based upon the seriousness of the problem, which was indicated by the fact that for a relatively high number of claimants in the permanent group the degree of disability was more than 50 percent, and/or another disease besides low back pain occurred, as compared to the temporary group of chronic disabled. Psychosocial factors had no influence whether or not a claim became permanent.

An insurance effect can be distinguished. For the permanent disabled claims, 52 percent were in the group of low insured daily compensation and 23 percent in the high group, as compared to the temporary chronic claims, where the figures were 26 percent and 45 percent respectively. Interaction with age was suspected because most of the claims in the age group over 54 years belonged to the group of low insured daily compensation (59 percent) and this age group was strongly associated with permanent low back disability. One of the possible explanations could be that persons with a low insured daily compensation were more easily called permanently disabled by the insurance company than those with a high compensation. This is questionable however, because permanent disability is strongly related to high costs of compensation for low back disability.

Physical therapists accounted for only a small part of the permanent claims, while they were responsible for almost half of the temporary claims. This could be explained by the fact that most of the physical therapists, both insured and disabled, were under 45 years of age.

Incidence

Since 1977 the number of claimants of low back disability went up from 32 (with 33 claims) per year to 137 (with 142 claims) per year in 1989. Hypothetically this rise could be caused by the increase in the population at risk, with a shift towards the age group between 35 and 44 years. This is the age group reported as the one with the highest number of hospital admissions due to a disc herniation (Heliövaara 1988, Spangfort 1972). An incidence study was performed to test this hypothesis.

Trend

The 211 percent increase of the adjusted incidence rate of low back disability from 1977 through 1989 indicated that the hypothesis stated above can not be supported.

The increase in the incidence rate for low back disability was mainly caused by nonspecific low back disability (180 percent increase from 1977 through 1989). This is remarkable since the incidence of low back pain does not seem to have changed for several decades (Waddell 1987). However, the increase in the incidence rate for all low back disabilities and for nonspecific causes of low back disability is in accordance with findings of other studies performed over the same period. In the United Kingdom back-related disability rates increased significantly since the fifties and declined markedly from 1984 through 1990 (Waddell 1987, 1992). From 1979 through 1985, the annual incidence rate of low back injuries among petroleum drilling workers in the Gulf of Mexico increased, in contrast to the decreasing trend of the annual incidence rate for all other injuries (Clemmer

et al. 1991). Nachemson (1992) estimated an increase in sick listing for low back pain in Sweden from three percent in 1980 (Chöler et al. 1985), to five percent in 1983 (Riksförsäkringsverket 1987-1988), and to eight percent in 1987 (Nachemson 1991a), an increase by a factor of 2.66. It should be emphasized that the incidence rate of low back disability among self-employed medical professionals was still lower compared with that rate among the general working population world-wide (Battié 1989, Gibson et al. 1980, Haanen 1984, Nachemson 1992, Spengler et al. 1986, Spitzer et al. 1987). It is most likely that medical professionals have a better knowledge of the anatomy of the back than the general working population, which suggests that they understand the implications of low back problems better. Therefore, they are presumably better suited to cope with low back problems than the general working population. Moreover, self-employment is related to a low risk of low back disability (Frymoyer and Cats-Baril 1987).

The increase in the incidence rate of low back disability (without differentiation for diagnosis) and nonspecific low back disability could be explained by the changes in the Dutch health care system and Dutch society during the late 1970's and 1980's, which will be discussed on pages 51–52 of this chapter. The highest risk of claiming low back disability was found for physical therapists and veterinarians. Since 1984, physical therapists were forced by the government to change the way of collaboration in their practices with the financial implication of having to pay social premiums (De Regt and Van Zaaijen-Bosma 1988). This became a source of financial problems, and led to problems with colleagues and to litigation. Most of these problems were solved in 1988, but for some physical therapists, these cases were still open in 1990. For many physical therapists, the whole matter is a psychological trauma.

Veterinary science of surgery has become commercialized in the last decades, in that there is primarily profit-seeking motivation. An attending problem is that veterinarians are not educated to be entrepreneurs. The competition between veterinarians has increased during the period studied, especially between those with an official license to establish a practice and those without. Veterinarians did start to collaborate in practice, which was strenuous for many of them because they were not well trained in cooperation (Boon 1992). Furthermore, in the last decades the practical work, which often could be fulfilled by a less educated person than a veterinarian created tensions for the academically educated.

Although the crude incidence rate of specific low back disability increased, no significant association of specific low back disability with calendar year was found. Presumably, low back disability due to specific low back pain is more related to a disease, rather than nonspecific low back disability, which is more related to psychological and socioeconomic factors (Andersson 1991, Cats-Baril and Frymoyer 1991a, 1991c, Volinn et al. 1988, Waddell 1987).

Chronic low back disability is a world-wide social problem because it is responsible for most of the costs of low back disability. The same is true in this study. In accordance with the trend reported among the general working population, an increase in the incidence rate of chronic low back disability was expected (Burkhauser 1991, Cats-Baril and Frymoyer 1991c, Knepper and Croon 1991, Nachemson 1991b). Although the crude incidence rate of chronic low back disability went up (180 percent), no significant association of calendar year with the risk of claiming chronic low back disability was found. This could be caused by the small number of chronic low back disability claims.

In conclusion, the same increasing trend in the incidence rate of low back disability, particularly for (nonspecific) low back disability, was found among self-employed medical professionals in the Netherlands as reported for the general working population world-wide. No association was found, however, between calendar year and the risk of claiming chronic low back disability.

Low back disability exceeding one year

In the period 1980–1985, the average incidence rate of low back disability exceeding 52 weeks among self-employed dentists, veterinarians, physicians and physical therapists was much lower than that among the general working population in the Netherlands (0.85 per 1,000 man-years versus 2.56). The results are in accordance with the findings of Van Wiechen (1989) among self-employed physicians insured by the insurance company Artsen Onderlinge in the Netherlands, where a much lower incidence density of back disability lasting longer than 52 weeks was reported among physicians than among office workers in industry. The difference in risk of claiming low back disability exceeding one year could be explained by the high level of education (Cats-Baril and Frymoyer 1991a, Deyo and Tsui-Wu 1987, Uyttendael et al. 1981), the high income (Cats-Baril and Frymoyer 1991a, Deyo and Tsui-Wu 1987), and the self-employed nature of the work (Frymoyer and Cats-Baril 1987) of medical professionals as compared with the general working population. The positive selection of the population at risk also could have influenced the above-mentioned difference. During

Table 26. Percentage distribution of return to work per week

Week	Sweden[a] 1979–1981	Canada[b] 1981	USA[c] 1987	Netherlands[d] 1977–1989 All	DP3
1	60		42		
2	67		62	28	53
4		74		40	65
6	88		79	47	71
8		92			
12	95		87	60	80
24	98	93	89	77	88
52	99	96	93	85	93

[a] Chöler et al. 1985.
[b] Spitzer et al. 1987.
[c] Snook and Webster 1987.
[d] Present work, all first claims and first claims with a deferred period 3 days (DP3).

the period studied, 0.7 percent to 1.0 percent of the persons insured were excluded from compensation, while the Social Security system in the Netherlands covers all workers. Furthermore, self-employed medical professionals could have had more financial incentives to return to work. It is assumed that the compensation for self-employed medical professionals covered their financial obligations, but not all their expenses. Most workers covered by the Dutch Disablement Insurance Act (WAO) however, received 70 percent of their gross income, which was after taxation equal to 85 percent of their net income.

Deferred period

A deferred period prevents low back disability, especially for nonspecific causes. The incidence study showed an almost four times lower risk of claiming low back disability for self-employed medical professionals with a deferred period of 14 days or more, and a six times lower risk of claiming nonspecific low back disability, than those with a deferred period of three days. It is assumed that many of the self-employed medical professionals with a deferred period of 14 days or more will keep on working despite low back pain (nonspecific), while colleagues with a deferred period of three days claim disability.

Furthermore, the effect of the deferred period on the risk of claiming low back disability is presumably influenced by the selection of the deferred period. According to the rules of the insurance company, a deferred period of 14 days is only possible for physical therapists. However, physical therapists can choose an insurance policy with another deferred period as well. The choice of a deferred period seems to depend on the needs and the financial situation of the applicant. Medical professionals in a solo practice, like dentists, need a substitute immediately to take over the job in case of disability. It is imaginable that for this reason they choose for a policy with a short deferred period. Other medical professionals, especially those who collaborate in a practice, have agreed by contract that the colleague(s) will take over the job during the first month of disability. Presumably most of these medical professionals have a policy with a deferred period of one month.

Insured daily compensation

The three groups of insured daily compensation (low, middle and high) showed an increasing association with the risk of claiming low back disability. The middle group of insured daily compensation is comparable with the fee for a substitute, while the high group of insured daily compensation is markedly higher than the fee for a substitute. Presumably, persons with a high insured daily compensation were more likely to claim low back disability than those with a lower insured daily compensation. This insurance effect has been reported for the general working population. Compared with those who were not insured, insured persons claimed more low back disability and were off work longer, even when they had the same symptoms and performed the same type of job (Fordyce 1976, Fordyce et al. 1978, Landoff 1953, Leavitt 1992, Nachemson 1983, Sander and Meyers 1986).

However, a critical remark on the method of the present study should be given. The association of insured daily compensation with the risk of low back disability was adjusted for profession and age, but not for deferred period. The latter had a significant association with the risk of low back disability.

Duration

Return to work or end of compensation

Among the general working population world-wide, most low back disabled return to work within six weeks (Table 26). Compared with these figures, low back disabled, self-employed medical professionals in the Netherlands returned to work much more slowly. This difference seemed to be caused by the deferred period on the insurance policy. In general, no deferred period for compensation exists among the general working population. In the study of first claims, claimants with a deferred period of three days showed almost the same relative distribution according to return to work in time as the general working population (Table 26).

The chance to return to work within two years after the start of the disability decreased dramatically from 71 percent after three months had elapsed, to 50 percent after six months, and to 22 percent after one year. These changes are in agreement with the figures in the literature regarding the general working population, which reported a decrease in the chance to return to work from 30–55 percent after six months had elapsed, to 10–25 percent after one year had elapsed (McGill 1968, Nachemson 1989c, Rosen 1986). Van Wiechen (1989) reported that after three months of back disability the chance to return to full-time work before one year of disability was 83 percent for physicians in the Netherlands. That chance is higher compared with the 63 percent found among the present population studied. This study showed that the chance of physicians, who are low back disabled for three months, of returning to work within one year was higher than that of dentists, veterinarians and physical therapists. This could be caused by differences in both physical and psychosocial work factors, as well as psychologic factors, for example fear-avoidance beliefs (Waddell et al. 1993).

Diagnosis and deferred period. The median duration of first claims with nonspecific low back pain was 17 days and 151 days for first claims with specific low back pain. This is in accordance with findings in the literature that the mean days lost from work due to sciatica are longer than the mean days lost from work due to low back pain alone (Uyttendael et al. 1981, Wood and Badley 1985), meaning that return to work is influenced by symptoms (Andersson et al. 1983, Christ 1973, Svensson 1982, Svensson and Andersson 1982).

The present study showed that a deferred period of 14 days or more increased the duration of nonspecific low back disability. This could be explained by the following: in the case of sick leave for nonspecific low back pain, persons with a deferred period of three days will claim compensation. Presumably persons with a deferred period of 14 days or more will not claim each period of sick leave for nonspecific low back pain because they expect to return, and most of them do, to full-time work within their deferred period, or they keep on working despite the low back pain. These persons will only file a claim when they experience the low back pain as "a serious problem". For instance, these subjects have more severe pain (than experienced in the past), they suffer (more) frequently from low back pain, or their low back pain is associated with psychosocial problems. Furthermore, the handling of a claim by the insurance company should be taken into account. In general no action was taken before the end of the deferred period. This handling increases the risk of long-term disability because the chance of returning to work dramatically decreases with time. For nonspecific low back disability, six weeks is the "point of no return" towards chronicity (Remerie 1992, Waddell 1987). In other words, after six weeks of disability has expired, the chance of returning to work is very slim. Chronic pain is sometimes described as persisting beyond normal healing time. It has been hypothesized that beyond this point (of no return), the continued nociception has got a psychological basis, while the role of tissue damage has diminished (Waddell et al. 1993). An example of the psychological factors are fear-avoidance beliefs about physical activity and work, which seemed to be strongly related to work loss due to low back pain.

Profession and age. Disability is influenced by work factors, individual factors and social factors (Andersson 1991). Therefore, the relationship between profession and low back disability is difficult to establish, especially since not everyone in the same profession performs the same job and is therefore not subject to the same exposure. Besides, exposure to several risk factors often occurs in the same profession. This is in agreement with a difference in association of profession and duration between the univariate and multivariate analyses in this study. In the univariate analysis, a significant association between profession and duration was found, while this was not significant in the multivariate analysis. This is in accordance with the findings of Rossignol et al. (1988), who performed a three-year follow-up study of compensated back injuries. The mean cumulative duration was longer for physically heavy jobs compared with white collar workers. In a multivariate analysis, occupation had no significant association with the risk of being absent from work for more than six months.

The gradual increase of duration of disability with the age could be expected, since it has been reported in the literature that low back injuries in younger subjects are more benign than in older subjects (Afacan 1982, Battié 1989, Battié et al. 1990, Bigos et al. 1986, National Council on Compensation Insurance 1984, Spengler et al. 1986). An inverse relation between advancing age and return to work in the multivariate analysis was found. The same was found in the general working population in Canada. The average sickness period increased with advancing age and age was found to be an important factor associated with the risk of chronic back disability, especially for those 45 to 65 years (Rossignol et al. 1988). The explanation by Rossignol et al. that when an older worker suffers a back injury, the consequences on the

spine are far more important than at a younger age, thus leading to longer disability, seems to be too limited. Rossignol et al. hypothesized an aging-factor, which would reduce the ability of the spine to repair itself and to return to function after injury. This hypothesis is supported by the phenomenon that human back muscle power markedly decreases in people in their fifties (Astrand and Rodahl 1986). Furthermore, it should be mentioned that the risk of specific causes of low back pain, for example a radicular syndrome due to stenosis, increases with advancing age. However, other factors might be important as well.

In the past, a healthy worker effect was expected among self-employed medical professionals at an age over 45 years. Veterinarians could find salaried employment for example in a slaughterhouse, in industry, or at the university, while physicians could easily get a job as a medical advisor at an insurance company or as a general manager in a hospital. In the last decade, these aforementioned positions have become occupied by younger colleagues, directly after their graduation from a university, or by professional managing directors. During the 1980's paid employment for dentists reduced by closure of the school dentistry services and the National Health Service practices, while the number of positions for medical advisors decreased due to merging of several National Health Services. Therefore, the opportunities for retiring from free practice after the age of 45 years have decreased. A change in task assignment with advancing age has become less common during the period studied. By contract, the older colleague has to perform the same job as his younger colleague (this pertains especially to veterinarians). The result of these factors is that the older persons remain in practice until retiring age, performing the same job as their younger colleagues.

In the last decade early retirement has become very popular in the Netherlands. However, early retirement is not possible for many self-employed medical professionals because their pensions start at age 65. For this reason it is possible that the disability insurance is (mis)used for early retirement. In the case of disability, the aforementioned factors have a negative effect on resuming work.

Veterinarians: In the three oldest age groups, veterinarians showed the lowest *end of compensation* rate. Veterinarians perform physically heavy work. However, psychosocial factors, which are associated with a longer duration of disability (Bergquist-Ullman and Larsson 1977), seem to be important among veterinarians as well (Boon 1992). A relationship was found between seasonal hard work and the number of low back disability claims per month. Multicausality, involving physically hard work, little sleep and somatization, seems likely. Furthermore, veterinarians have to return to full-time work or leave their practice after exceeding a period of one year of disability. Part-time work or performing only light work is not accepted after a one year disability. As mentioned above, there are few alternatives to salaried employment anymore, and pension does not start until the age of 65 years.

Dentists: In the two oldest age groups, dentists had the second lowest *end of compensation* rates of the four professions. The work posture and stress in practice might contribute to low back problems amongst dentists. The forward bent sitting posture of the dentist, accompanied with bending and twisting, and the relatively static work (Bassett 1983, Diakow and Cassidy 1984, Shugars et al. 1984) are associated with an increased risk of low back pain (Andersson 1991, Waddell 1987). Work-related stress factors could be time pressure (working to a fixed schedule), the constant coping with tense, fearful patients, and the exact nature of the work (Bassett 1983). These factors are present during the whole career of a dentist. Possibly, dentists in the oldest age group are less able to cope with the physical and psychological demands of the job. Furthermore, many dentists in that age group do not like their jobs anymore; moreover the financial incentives to work decrease.

Physical therapists: In the youngest age group, physical therapists tended to have the lowest *end of compensation* rate, and in the age group between 35 and 44 years they showed the second lowest *end of compensation* rate, after veterinarians. It has to be noted that 92 percent of the first claims of the physical therapists started in the two youngest age groups. Physical therapy is a physically demanding job, involving both dynamic stress, as bending, twisting, and lifting (with sudden maximum efforts), as well as static work postures. However, no difference in incidence, prevalence, point prevalence, life-time prevalence, and recurrences of back pain were found compared with the general working population (Molumphy et al. 1985, Scholey and Hair 1989). As stated above for veterinarians, the physical work load can only partially explain the negative relation with return to work. Psychosocial factors are presumed to be a main cause. As mentioned before, physical therapists were forced by the government to change the way of collaboration in practice, which caused a lot of psychosocial problems. Furthermore, physical therapists are more likely than the general working population to attribute their back pain to work (Scholey and Hair 1989). According to Lehmann et

al. (1993) persons who regard their low back trouble to be work-related and who are absent from work for more than two weeks, are at high risk of long-term disability.

Physicians: In the three age groups over 34 years, physicians had the highest *end of compensation* rates of all professions in this study. Most physicians do not have a physically demanding job. Very often the older physician performs the role of mentor in the practice, while their younger colleagues work more hours and are on duty more often. Presumably, physicians claim disability when they really cannot perform their jobs, or when they suffer from specific low back pain. Perhaps a physician is more motivated to work than the other professionals because a physician is not supposed to be ill. Furthermore, in the case of disability, specialists are not under the extra financial pressure to pay the salary of their nurse and/or medical receptionist, because the latter are paid by the hospital. General practitioners, dentists and veterinarians, however, are the employer of their nurse and/or medical receptionist and have to go on paying these costs in the case of their own disability. In all the medical professions, the practice is rarely closed. Instead, a colleague or a substitute takes over the job in case of disability. The insured daily compensation is used to cover a substitute's costs. In this study, specialists were not distinguished from general practitioners. However, most of the physicians, both insured and low back disabled, were specialists. The financial stress factor mentioned above could be another explanation for the difference in return to work between physicians on the one hand, and dentists and veterinarians on the other.

Compensation and age proved to have a significant association with return to work. A possible explanation, however, can only be given for the effect of age and compensation in the oldest age group. In the group over 54 years of age (n=55), 35 claims were in the low group of insured daily compensation, compared with 4 claims in the high group of insured daily compensation. Therefore, it can be assumed that among the oldest age group, the low group of insured daily compensation was the most influential in the combined group.

In the age group over 54 years, the combined group of low and high insured daily compensation had a smaller *end of compensation* rate than the middle group of insured daily compensation. The low group of insured daily compensation was the most influential in the combined group. The middle group of insured daily compensation is comparable with the fee for a substitute, while the low group of insured daily compensation is markedly lower than the fee for a substitute. One may hypothesize that these subjects were underinsured, and therefore suffered from financial stress during the rehabilitation period, causing a prolonged disability. However, it is possible that the insured daily compensation of a person in the year the disability started was sufficient to pay a substitute, but because the index figures of the insured daily compensation (the figures were indexed to 1990) were less than the increase of the substitute's fee, it may have been insufficient to pay the fee of a substitute in 1990.

Another explanation could be the nature of the policy of the insurance company. It was shown that a high percentage of the chronic claims in the low group of insured daily compensation were called permanently disabled by the insurance company, which could mean that they were called permanently disabled more easily than the chronic claims with a high insurance, especially in the oldest age group.

Aging factor. With regard to Rossignol et al. (1988) who hypothesized an aging-factor, which would reduce the ability of the spine to repair itself and function properly after injury, it may be concluded from the present study that the effect of age on duration of low back disability is even more multicausal. The discussion about the inverse association of profession and age with return to work, as well that of compensation and age with return to work, made clear that psychosocial dysfunction and insurance are important factors in the explanation of the relationship between the older age group and duration of low back disability.

Psychosocial problems. An association of several psychological factors such as monotony at work, work dissatisfaction, poor relationships with coworkers, stress, and depression with low back pain was reported by several authors (Astrand 1987, Battié 1989, Beals and Hickman 1972, Bergenudd and Nilsson 1988, Bergquist-Ullman and Larsson 1977, Bigos et al. 1986, 1991, Damkot et al. 1984, Haanen 1984, Magora 1973, Svensson and Andersson 1983, 1989, Svensson et al. 1988, Westrin 1970). This study also showed there is an association between psychosocial factors known at the start of the disability and duration of the first claims. However, the data were obtained by retrospective analysis of claim files and/or medical reports, and not by questionnaire. The present results contradict the finding of Cats-Baril and Frymoyer (1991b), who reported that psychological variables at the onset of an episode of low back pain were not predictive of long-term disability. In that particular study however, some of the patients were still working despite the back pain. Nevertheless, the results of the present study are in

agreement with other studies, which indicate that psychological dysfunction has a deterrent effect on resuming work (Beals and Hickman 1972, Lancourt and Kettelhut 1992).

Low back problems before acceptance, without low back pain being excluded from compensation, showed a significant association with the duration of first claims. Furthermore, at the termination of a first claim, persons who had low back disability before acceptance, were at higher risk of a recurrent claim than those who did not report low back problems before acceptance. This is in accordance with findings reported in the literature in which a previous history of back pain strongly affects the subsequent reports of back pain (Battié et al. 1990, Bigos et al. 1991, Troup et al. 1987). Although no data is available on the incidence rate of low back disability among those who reported low back problems before acceptance compared with those who did not, the group of chronically disabled is the most costly for the insurance company. A more strict and accurate screening for previous low back pain at the time of acceptance would be advisable for the insurer. The result of this line of policy is questionable, however. World-wide, a life-time history of low back pain from 51 percent to 80 percent is reported (Bergquist-Ullman and Larsson 1977, Horal 1969, Hult 1954b, Lloyd et al. 1986, Nachemson 1976, Snijdelaar 1992, Valkenburg and Haanen 1982, Wickström et al. 1978, Wiikeri et al. 1978). It may be assumed that most applicants, who in general are between 20 and 35 years of age, have had low back pain before. Furthermore, it seems to be difficult to rely on memory in questionnaire data and interviews. In a Swedish insurance data study, one fourth of all men who said they had never had back pain had in fact been sick listed with back pain (Svensson 1982, Svensson and Andersson 1982).

Predictive model of long-term low back disability

By increasing the chance of successful secondary prevention, the risk of a claimant of becoming long-term disabled can be diminished, and at the same time the costs of low back disability. Therefore a predictive model was built on the data of first claims, in order to assess, at the start of the disability, claimant's chance of remaining disabled.

Claimants in quintiles (predictive groups) I and II do not need special attention; almost all of them returned to work within three months.

In quintile III, the majority of the claimants had nonspecific low back pain. It was reported previously that most patients with nonspecific low back pain return to work within six weeks (Andersson et al. 1983, Chöler et al. 1985, Snook and Webster 1987, Spitzer et al. 1987, Waddell 1987). In quintile III, however, one third of the claimants were still disabled after three months.

In quintiles IV and V, almost all claimants suffered from specific low back pain. In general, patients with specific low back pain, for example a radicular syndrome caused by a disc herniation, return to full-time work within three to six months (Spitzer et al. 1987). However, claimants in quintile IV and especially in quintile V returned to work much later.

For secondary prevention of low back disability, claimants with nonspecific low back pain in quintiles III, IV and V, and those with specific low back pain in quintile V need qualified rehabilitation guidance. Perhaps, claimants in quintile V need options for another job or adapted work. This would imply tertiary prevention.

This predictive model is biased in the sense that it is not validated. Its value should be proved with new data. Furthermore, this predictive model was built with first claims of low back disability among self-employed dentists, veterinarians, physicians and physical therapists insured by a mutual insurance company in the Netherlands. Presumably, this population is at lower risk of chronic disability than the general working population (Frymoyer and Cats-Baril 1987). Consequently, generalization of the model could be difficult and comparison with other predictive models published in the literature is not easy (Cats-Baril and Frymoyer 1991b, Frymoyer and Cats-Baril 1987, Lancourt and Kettelhut 1992, Lehmann et al. 1993).

In conclusion, the present model can be used for secondary prevention purposes among the population studied. The significance of the model must be proved prospectively, however.

Recurrence

Working period and recurrence rate

The recurrence rate in the present study is lower than the to recurrent sick listing for low back pain in Sweden (44 percent in one year, 1987 (Nachemson 1991a)) and recurrent low back injuries in Canada (20 percent in one year, 36 percent in three years (Abenhaim et al. 1988, Rossignol et al. 1992)). However, the figures showed a higher percentage of recurrences than reported among workers in a dockyard in the United Kingdom (8.9 percent in a period of two years (Anderson 1986)). It may be concluded that the percentage of recurrences among self-

employed medical professionals is comparable with that among the general working population.

In 50 percent of the terminated first claims, a recurrent claim of low back disability was submitted within 9 years. This percentage is much higher than the 22 percent of recurrences after 9 1/4 years of terminated first claims reported among physicians insured by the insurance company Artsen Onderlinge in the Netherlands (Van Wiechen 1989). In the present study of terminated first claims, the percentage of recurrences of low back disability was much lower among physicians compared to the other three professions. The difference in recurrence rate between the two studies, however, is probably caused by the inconsistent time frames. Van Wiechen's study was performed from 1964 through 1988, whereas this study was from 1977 through 1989. The present study could have been influenced more by the social changes in the Dutch health care system, which started in the early 1980's, than Van Wiechen's study. Furthermore, the observation period of this study was much shorter compared with Van Wiechen's study, which could have influenced the outcome of the analysis.

The finding that a deferred period of 30 days or more had a lower recurrence rate than a deferred period of three days indicated that a deferred period of this length "protected" against a recurrence.

Persons who have been accepted by the insurance company without an exclusion, although reported to have suffered from low back pain, had a higher risk of a recurrent claim of low back disability than those who did not report to have had low back pain before acceptance. This is in accordance with the results reported in the literature stating that a previous history of back pain strongly affects the subsequent reports of back pain (Battié et al. 1990, Bigos et al. 1991, Troup et al. 1987).

The association of the duration of the initial episode of compensated occupational spinal injury with the risk of a recurrent claim reported by Rossignol et al. (1992) was not confirmed by this study. An explanation could be that the initial episode in the study of Rossignol et al. referred to the entry into the study and not to the first episode in a worker's life, while first claims in this study pertained to the first event of low back disability during the insurance period, which was very often the first period in the claimant's life.

In conclusion

Increase of low back disability

In a 13-year period there was an enormous increase in the magnitude of the problem of low back disability among self-employed dentists, veterinarians, physicians and physical therapists in the Netherlands, although the risk of claiming low back disability exceeding one year was still three times lower than in the general working population.

This increasing trend of low back disability among a group of self-employed, highly educated and well-paid professionals is very striking. According to the literature, self-employment, a high level of education and a high family income are associated with a low risk of low back disability (Cats-Baril and Frymoyer 1991a, Deyo and Tsui-Wu 1987, Frymoyer and Cats-Baril 1987, Uyttendael et al. 1981). These factors could be an explanation for the lower incidence rate of low back disability exceeding the one year boundary among self-employed medical professionals compared with the general working population. But they seemed to have no influence on the trend of low back disability.

According to the literature, the explanation for the growth of disability must be psychological and socioeconomic rather than medical (Andersson 1991, Cats-Baril and Frymoyer 1991a, 1991c, Volinn et al. 1988, Waddell 1987). Work-related psychological and psychosocial factors are known for the group studied. The governmental rules, which changed during the 1980's in order to decrease the costs of the Dutch health care system, are a source of stress for all professional groups in the study, especially because there are no longer any certainties in the Dutch health care system. Most of the professional groups in this study argued with the government about the scale of fees. In general, over the period of this study, the income of the medical professionals decreased. The prestige of medical professionals in the society has also decreased during the last 20 years. Volinn et al. (1988) reported that a rise in job insecurity and a concurrent rise in economic insecurity has increased the likelihood that back pain becomes disabling. This is in agreement with Clemmer and Mohr's view (1991), who assumed that the increase of lost time due to low back strain injuries was a worker's response to possible lay-off and uncertain future employment.

Another social development in the 1980's was the decreasing age for retirement in the general working population and the reduced opportunities for the self-employed medical professionals at the age over 45 years to leave free practice and to accept a salaried employment, as mentioned before. This is supported

by the extremely high risk of claiming chronic low back disability of the age group 55–65 years compared to the age group under 35 years.

Cats-Baril and Frymoyer explained the increase in permanent low back disability in the United States and Great-Britain as a result of a social slump since the mid-1970's. They stated that "work is not valued as it used to be, leisure time is valued more, the stigma of being on welfare is not as strong as it used to be, the workers' compensation system and other benefit laws are perceived as overly generous, litigation has become a national sport, and/or the number of malingerers is increasing" (Cats-Baril and Frymoyer 1991c). Among self-employed medical professionals, there is no evidence that malingering was the cause of the increase of low back disability, or that litigation about disability had increased a great deal during the period studied. However, all the other factors seemed to be important, especially the reduction of the stigma of being on welfare. During the period under investigation, disability increasingly functioned as conflict avoidance in the Dutch society. Work-related problems were "solved" by declaring a worker ill and by consequently allowing compensation (Knepper and Croon 1991).

Insurance factors

This study showed that the type of insurance, in this case whether or not a deferred period existed in the insurance policy, had an important effect on the magnitude of the problem of low back disability among self-employed dentists, veterinarians, physicians and physical therapists. This problem would have been much larger, if each insured person had had a deferred period of only three days. The incidence rate of low back disability would have been much higher, as well as the number of recurrences. And above all, the absolute costs for compensation of low back disability would have been higher.

Next to these effects of deferred period on the insurance policy, the height of the insured daily compensation influenced the risk of claiming low back disability and showed an association with duration. Furthermore, it was shown that the handling of a claim by the insurance company could have influenced the duration of low back disability, and consequently the costs of compensation. This study showed the effect of the insurance system on the amount of low back disability, and supports the statement by Nachemson (1989b) that western society is suffering from it's own "AIDS"-epidemic: the Acute Insurance Disabling Systems. The impression is that the insurance mechanisms just described could be applied towards other insurance systems world-wide.

Recommendations. A disability insurance should cover the financial consequences in the event of disability due to a medical calamity, while self-employed professionals should take responsibility for the financial consequences in the case of a minor illness, such as acute nonspecific low back pain. Therefore, an insurance company should sell insurance policies only with a deferred period of at least 14 days, or even of at least 30 days. Considering the effect of a deferred period, this strategy will reduce the risk of low back disability and the accompanying costs. However, immediate action should be taken by an insurance company at the moment someone claims low back disability, and not after the deferred period has expired. The latter handling diminished the probability of *end of compensation* in the case of nonspecific low back disability with a deferred period of 14 days or more.

Early intervention

Primary prevention of disability is hard to accomplish for an insurance company; that belongs to the government. However, it is shown in the literature that the proper handling of a claim, consisting of early intervention, good follow-up and communication, and active rehabilitation including early return to work, reduces the risk of chronic low back disability and reduces the number of recurrences (Cady et al. 1985, Chöler et al. 1985, Fitzler and Berger 1982, 1983, Hunt and Habeck 1993, Lindström et al. 1992a, 1992b, Nachemson 1983, Wiesel et al. 1984, 1988, 1994, Wood 1987). It should be emphasized that chronic low back disability is associated with high compensation costs. With the aim of secondary prevention of low back disability, an early intervention program was introduced by the insurance company Movir, Nieuwegein, the Netherlands, in 1990.

The savings of this early intervention program were considerable. An insurer has to make reservations for expected payments in future years for the current disability claims. Due to the reduction of the number of claimants with a cumulative duration of one year, the costs on reservation decreased markedly. This was an important part of the savings. The early intervention program did not prevent chronic low back disability completely, but reduced markedly the disability with a cumulative duration of one year.

These results were achieved by one physician employed by the disability insurance company. Claimants may have seen this medical officer as their

opponent. If that had been the case it is reasonable to assume that the program would have been less successful. The most important rule of an early intervention program therefore is to create mutual trust between the insured and the insurer (Bigos and Battié 1987, 1991, Fitzler and Berger 1982, 1983, Rowe 1983).

In addition, an integrated evaluation of medical, psychological/sociological, and ergonomic factors is probably essential. This approach is vital from the beginning. The physician should focus on restoring the claimant's self-esteem. After gaining the claimant's trust, the physician can stimulate the claimant to active rehabilitation, leading to the claimant taking responsibility for his/her own progress (Bigos and Battié 1991, Waddell 1987).

Early return to work should be an important part of the rehabilitation, the success of which has been shown by Lindström et al. (1992a, 1992b) as well. They found that an individual, gradually increasing exercise program, with a behavioral approach improved return to work. For the self-employed dentists, veterinarians, physicians and physical therapists in the present study, part-time and/or light duty work was always possible. Therefore, the disabled could gradually return to full-time work. It should be emphasized that pain was no reason for recommending part-time and/or light duty work. The positive effect of permitting more limited duty assignments on return to work among firemen was reported by Cady et al. (1985).

Time is a very important factor in the rehabilitation of low back disabled. The protocol of the early intervention program was based on a time schedule, in which proven causes of low back pain were distinguished from nonspecific low back pain. A multidisciplinary expert opinion was effective at certain instances indicated in this protocol. Proper medical care is cost-effective, as was shown before by Chöler et al. (1985), and by Wiesel et al. (1984, 1988, 1994).

Furthermore, good communication between the physician of the insurance company and the claimant's attending physician is also necessary (Harmsen-Alkema and Noz 1992, Wiesel et al. 1984, 1988, 1994, Wood 1987). The initiative must be taken by the physician of the insurance company after the home visit and where applicable after the expert opinion. The aim of this communication is to find a mutual path of medical treatment and return to work of the claimant based on proven medical care.

Self-employed medical professionals are in general highly motivated workers. This ought to be a good climate for an early intervention program and probably explains the good results compared to the early intervention program among coal miners in West Virginia (Greenwood et al. 1988).

Predictors of duration

At the time of the standard evaluation, which was at a median of 13 days after the start of the claim for nonspecific low back pain, 48 days after the start for specific low back pain and 22 days after the start for all claims, diagnosis seemed to be the strongest predictor for duration until return to work. This is not surprising, because natural recovery is much faster for nonspecific than for specific low back pain (Spitzer et al. 1987). Furthermore, claimants who performed 50–75 percent of their normal activities at the time of the standard evaluation seemed to return to work much earlier than those who were disabled for a degree of more than 50 percent. It is understandable that those who perform more than 50 percent of their normal job, experience a less serious low back problem or can cope better with that problem, and therefore return to work earlier. It should be emphasized that the analyzed group was a negative selection of the early intervention group. Only those claimants who were visited in their homes were studied. Those excluded had returned to work within two weeks after the start in case of nonspecific low back disability, or within four weeks after the start of therapy in case of disability for specific low back pain. Predictors of duration until return to work found among the early intervention group are very hard to compare with predictive models published in the literature by Cats-Baril and Frymoyer (1991b), Frymoyer and Cats-Baril (1987), Lancourt and Kettelhut (1992) and Lehmann et al. (1993), because of the differences in population studied, the time of the evaluation and the work status at that time. Moreover, according to the protocol of the early intervention program of the present study, claimants with specific low back disability were evaluated after definite therapy (conservative treatment or surgery). Resulting predictors of duration until return to work referred to that time of standard evaluation. Furthermore, the outcome of the present work could be influenced by the small number of persons involved. However, specific low back pain was found to be a predictor of duration until return to work in the retrospective study among self-employed medical professionals as well (see pp. 25–30). In contrast with the retrospective findings, the deferred period was not associated with duration in the early intervention study. Presumably, the effect of the deferred period on duration in the retrospective study was caused by the time of the first work inca-

pacity evaluation, which was at the end of that deferred period. In the early intervention study, all claims were handled according to the protocol, irrespective of the deferred period. Furthermore, the aforementioned negative selection of the analyzed group could have diminished the effect of the deferred period as found in the retrospective data. Remarkably, the psychological factor regarding fear of becoming long-term disabled was the second strongest predictor of duration. Claimants with a fear of becoming long-term disabled seemed to return to work much later. It is hypothesized that these persons already adapted a sick role and as such behave like chronic pain patients, in which psychological factors are more important than the role of tissue damage (Waddell 1987, Waddell et al. 1993). Some claimants already experienced low back complaints before they claimed disability. The maximum duration from the start of the claim until the standard evaluation was 117 days, with an average of 34 days. Therefore, persons who experienced low back complaints for 6 months or more at the time of the standard evaluation, suffered at least for 3–6 months at the time they claimed disability. In the literature, these persons are called chronic low back pain patients. Low back complaints for 6 months or more at the time of the standard evaluation seemed to be a predictor of duration of low back disability. This can be explained by the fact that chronic low back pain is rarely associated with any detectable physical finding and more associated with emotional distress, depression, failed treatment and adaptation of a sick role (Waddell 1987), as was mentioned above as well. Subjects with these chronic complaints should be approached as chronic low back disabled. A multidisciplinary expert opinion should be initiated immediately at the start of the disability. Most of these persons might need a cognitive behavioral training program (Mayer and Gatchel 1988, Mayer et al. 1985, 1987, Pither 1989, Vink et al. 1993). As an improvement of the early intervention program, chronic pain syndrome at the onset of disability should be added as a third category of classification, next to nonspecific low back pain and specific low back pain.

Socioeconomical importance

The early intervention approach could have socioeconomical importance for the society at large if it were applied to the general working population. A large reduction in disabilities exceeding one year could be expected. This would mean a considerable decrease in the number of subjects newly entitled to disability benefits, according to the Dutch Disablement Insurance Act (WAO). A general policy towards an early intervention including active rehabilitation and return to work is recommendable. In an attempt to cut the costs of compensation, a new law was accepted by the Dutch parliament in 1993. The consequence of the law was a decrease in the amount and the length of the Disablement Insurance Act (WAO) covered compensation (Voorlichtingscentrum Sociale Verzekering 1994). It should be pointed out that good management of the amount of new long-term disabled, for example the early intervention program of this study, should make a reduction in the amount and the length of compensation for those who are disabled for serious chronic illnesses superfluous. Success of the recommended general policy can only be guaranteed if claimants and both attending physicians and insurance physicians change their attitudes towards active rehabilitation and return to work. The strict separation of treatment and evaluation of work incapacity in the Netherlands is a negative factor in this context. It has been shown that this separation results in a low involvement of the attending physicians with long-term disability, not more than voluntary contacts of the disabled with their attending physicians and coordination problems of the disability claim. In other words, this separation of treatment and evaluation is a counterproductive factor in reducing the duration of disability (Prins 1990). Therefore, this strict separation should be eliminated and replaced by good communication between insurance physicians and attending physicians based on proven medical care.

Conclusions

The following conclusions can be drawn from the retrospective epidemiological study:

- From 1977 through 1989, the incidence rate of low back disability increased by 211 percent. Yet the incidence rate of low back disability exceeding one year was three times lower than in the general working population in the Netherlands.
- Physical therapists and veterinarians had a higher risk of claiming low back disability than dentists, while physicians were at lowest risk. Among veterinarians a relationship was found between the number of low back disability claims and the seasonal variations of the work load.
- The age groups between 35 and 65 had a higher risk of claiming low back disability than the age group under 35 years. Moreover, the risk of claiming chronic low back disability for the age group above 54 years was 11 times that risk for the age group under 35 years.
- During the period under investigation, the costs of compensation for low back disability increased from 5.7 percent to 13 percent of the total compensation paid. Nearly a quarter of the claims, all lasting longer than six months (chronics), accounted for 90 percent of the compensation paid for low back disability during the period 1977–1989.
- The low back disc surgery rate was as high as the rate among the general working population in the United States, and was much higher than that rate among the general working population in the Netherlands. The high surgery rate was probably caused by the direct access of self-employed medical professionals to medical treatment.
- In the predictive model, claimants with specific low back pain, dentists over 54 years of age, veterinarians older than 34 years, claimants with low back problems before acceptance and claimants with psychosocial problems known at the start of the disability were at high risk of long-term low back disability.
- Several insurance factors effected low back disability:
  - A deferred period of 14 days or more reduced the risk of claiming low back disability. In case of nonspecific low back disability however, a claim with a deferred period of 14 days or more had a much longer duration than a claim with a deferred period of three days.
  - At the termination of a first claim, a deferred period of 30 days or more protected against a recurrent claim of low back disability.
  - The presence of a deferred period explained to a large extent the differences in low back disability between self-employed medical professionals and the general working population.
  - Persons with a high insured daily compensation were more likely to claim low back disability than persons with a low insured daily compensation.
  - Subjects with a low insured daily compensation, especially those older than 54 years, were called permanent disabled more easily by the insurance company.

The early intervention program showed the following:

- Attention should focus on:
  - A time-dependent approach, at which specific causes of low back pain are distinguished from nonspecific low back pain.
  - An integrated evaluation of medical, psychological/sociological and ergonomic factors, beginning with the first consultation.
  - Mutual trust between the insurance physician and the claimant.
  - Active rehabilitation and early gradual return to work.
  - Good communication between the insurance physician and the claimant's attending physician.
- The program decreased the mean cumulative duration of low back disability and reduced the number of claimants who reached a cumulative duration of one year.
- The program was highly cost-effective. The total costs were reduced to 51 percent. Compensation costs and reservations for expected payments in future years decreased to 46 percent.
- Predictors of long-term low back disability at the time of the evaluation were specific low back pain, fear of becoming long-term disabled, and duration of low back complaints of six months or more.

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Curriculum vitae

Jan Willem C van Doorn was born on November 17, 1959, in Haarlem, the Netherlands. After passing the atheneum exam at Bisschoppelijk College Hageveld in Heemstede in 1978, he studied one year pharmacy at the University of Amsterdam before studying medicine at the same university. He graduated in June 1988. From July 1988 until January 1990, he collected data about low back disability among persons insured at the insurance company Movir in Nieuwegein, and at the same time he was resident in orthopedics at the Department of Orthopedics of Ziekenhuis Hilversum (Head: Frank AJ van Hussen, M.D., Ph.D.). He started a program of early intervention of low back disability at Movir in January 1990, and since then he works as a medical advisor.

Glossary

Chronic low back disability is disability of which the duration exceeds 179 days or six months.

Deferred period is the number of waiting days for compensation (Dutch: wachtdagen, Swedish: karensdagar), chosen by the applicant. The options are three days, one month, three months or one year. A deferred period of 14 days is exclusively used for physical therapists. In addition they can opt for the other deferred periods as well. In case of a recurrent claim of disability within three months after termination of the previous claim, and due to the same cause as the previous claim, the deferred period is taken into account only once.

Disability is the state in which someone due to illness or accident, regardless of the cause, is unable to pursue his/her profession, according to medical assessment. Disability concerns both short-term sickness absence and long-term unfitness to work

Duration is defined as all disability days, including weekends and legal holidays. Duration refers to the onset of the disability and not to the start of the compensation, which depends on the deferred period.

End of compensation (or returned to work) is the moment that the claimant can fulfill his/her job for more than 75 percent, according to medical assessment.

Entitled to compensation is a claimant whose duration of disability exceeds the deferred period and whose degree of disability is 25 percent or more. At 25–34 percent disability the compensation amounts to 30 percent of the insured daily compensation, which increases stepwise to 75 percent of the insured daily compensation at 65–79 percent disability. At 80–100 percent disability the full amount of the insured daily compensation is paid.

Exchange rate of one Dutch Guilder (NLG) was 0.59 US Dollars (USD) and 3.33 Swedish Crowns (SKR), on December 31, 1990 (Rabobank 1993).

First claim is the first period of low back disability during the insurance period.

Healthy worker effect is caused by healthy workers who stay in the same profession and job, while those with low back pain quit their job for a less demanding one.

Insured daily compensation is the coverage of the insurance policy per day, weekends and legal holidays included, chosen by the applicant.

Low back problems before acceptance are low back problems known from the health certificate or expert report, without a restriction for compensation of low back pain on the insurance policy.

Nonspecific low back pain: low back pain alone; or low back pain with radiation to the upper buttocks or the thighs; or radicular syndrome, without signs of nerve root compression on radiography (myelography and/or CT-scan and/or MRI-scan).

Permanent disabled are chronic claimants who will be compensated until expiration of the policy, as decided by the insurance company.

Psychosocial problems are regarded as present if one or more of the following variables are reported: 1. stress in family or at work beginning at most one year before the start of the disability, 2. nervous exhaustion, 3. mental disorder. Stress in family stands for problems in the relationship, divorce, severe illness or death in the family. Problems in the practice with colleagues or with the government, financial problems are called stress at work. Per definition a mental disorder has to be diagnosed by a psychiatrist. Psychosocial problems can already exist at the start of disability and/or can develop during the disability period. Psychosocial problems present at the start of the disability are regarded as present when one or more of the above-mentioned variables are reported at the beginning of the disability period.

Radicular syndrome (of one nerve root) is characterized by one or more of the following criteria: pain in a segment like distribution, mono-radicular neurological deficit, signs of nerve root compression (positive Lasegue-test etc.) (Van Akkerveeken 1989).

Recurrence is a claim of low back disability filed at least one month after termination of the previous claim. If a claim is reported within one month after the end of the previous claim, the two claims are seen as one and the duration of that claim is the sum of the two disability periods. Recurrences are measured for the whole period a person is insured by the insurance company and not just for the period studied. Some persons have already been disabled one or more times due to low back pain before 1977 and therefore their first claim since 1977 is a recurrence.

Registered low back problems before the current period are low back problems before acceptance and/or low back disability before this period of low back disability.

Specific low back pain: disc herniation (a. presumptive: radicular syndrome on physical examination, b. confirmed by radiograpy (myelography and/or CT-scan and/or MRI-scan) or surgery), spinal stenosis (central and/or lateral), spondylolisthesis greater than grade I, disc degeneration at three of more levels, instability, structural deformity (a. thoracolumbar kyphosis more than 72 degrees, b. structural scoliosis), inflammation (Morbus Bechterew, spondylitis, spondylodiscitis), osteoporosis, fracture, low back pain associated with a spinal tumor, low back pain associated with pregnancy, low back pain associated with a mental disorder (i.e., chronic pain syndrome at start of disability), or low back pain associated with a visceral disease.

Working period is the duration (in days) from the termination of a first claim of low back disability until the onset of a recurrent claim of low back disability. The working period is at least one month.

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