Summary
This thesis describes the risk of recurrence of sickness absence after a previous episode of sickness absence, not only recurrence after long-term sickness absence, but also recurrence after frequent episodes of short-term sickness absence. The main focus was on the recurrence of sickness absence due to common mental disorders (CMDs). Once there is a tendency towards sickness absence, will this eventually lead to long-term sickness absence? The results of our research seem to be confirmative.

Although long episodes of absence are an economic burden, because they result in production losses, short episodes are a nuisance for both the employers and the employees. Employees who are frequently absent cause considerable problems within the company, and are at risk of recurrent sickness absence in the future. No studies have yet investigated the extent of the risk that frequent sickness absence leads to long-term sickness absence. However, this would provide important knowledge on which companies and occupational health services could base their sickness absence policies. Information about sickness absence can be obtained from the company records, and can be used in a relatively simple and cheap way to identify risk groups.

The research described in this thesis is based on longitudinal monitoring of data on a large cohort of employees in the Dutch Post and Telecommunication companies, obtained from the sickness absence registration system over a total period of more than ten years. The sickness absence registration system described in the various studies is maintained by ArboNed, which is the second largest occupational health service in the Netherlands, with approximately 1 million employees in various companies under contract. In addition to the advantage that it provides low-cost data, the added value of a sickness absence registration system is that the data are recorded in a systematic and uniform way, which facilitates accurate comparison over time. Moreover, the information is virtually complete, because baseline data are available for the study population, i.e. there is not only information about sick-listed employees, but also about non-sick-listed employees, and this is important for the calculation of the denominator of the epidemiological equation. Another advantage of a registration system is that there is no inherent problem of non-response, as is encountered on research based on questionnaires. However, registration systems also have their disadvantages. There is a lack of information about factors that can be important for research on sickness absence, such as health status, chronic illnesses, subjective experiences and the work environment. Furthermore, information obtained from the registration system can not be used without the necessary background knowledge. During the study period there have been important changes in work
disability legislation. In 2004 an act was effectuated, forcing employers to continue to pay 70% of the wages to sick-listed employees for a period of two years (VLZ). This act has influenced sickness absence registration procedures: before 2004 only one year of sickness absence was registered; in 2004 this was changed to 2 years. Furthermore, there were reorganizations in the companies we studied, and the internal occupational health services have been out-sourced to the external occupational health services ArboNed in 1998. There have also been changes in the classification systems used by the occupational physicians to diagnose the reasons for sickness absence. This changed from the original ICD-9 coding, to a system with main diagnostic groups in 1999, and since 2001 the diagnoses are coded in a classification system for occupational health departments (CAS-classification), which can be converted into ICD-10 codes.

However, in spite of the limitations of the registration system, this thesis demonstrates that it is possible to achieve interesting results and to describe risk groups. The most important findings will be described below.

Chapter 1 describes the current state-of-art in research on sickness absence and return to work, and a number of theoretical models will be discussed. The research questions that are addressed in this thesis are introduced, and background information about the study population is provided.

Chapter 2 describes a study in which we investigated the risk of recurrence after frequent or long-term sickness absence in a population of 53,990 employees under 55 years of age working in the Dutch Post and Telecommunications companies. Frequent sickness absence was defined as 4 or more episodes of sickness absence within a period of 1 year (n = 4,126). Long-term sickness absence was defined as an episode lasting 6 weeks or longer (n = 3,585). Data on employees who had both frequent and long-term episodes of sickness absence (n = 979) were analyzed separately. The reference population consisted of employees with no frequent or long-term episodes of sickness absence (n = 45,300). Sickness absence was monitored over a period of 4 years (1998–2001) after the reference year (1997).

Employees with frequent episodes of sickness absence had a higher risk of recurrent frequent sickness absence than the reference population: 3 times higher for women and 5 times higher for men, after adjustment for confounders. They also had a higher risk of long-term sickness absence: twice as high for men and one and a half times as high for women. Compared with the reference population, the risk of recurrent long-term sickness absence is also approximately twice as high for men and one and a half times as high for women.
We conclude that frequent and long-term sickness absence are not independent, and that both mechanisms probably have the same underlying mechanisms; for instance, health status, psychological factors, coping, or working conditions. Future research should focus on the relative contribution of health and work-related mechanisms to the risk of recurrent sickness absence. When predicting the risk of future sickness absence, it is important to take the history of sickness absence into consideration.

Chapter 3 focuses on the risk of work disability and job termination in the cohort of frequent sickness absentees (n = 4126) and long-term sickness absentees (n = 3585), or a combination of both (n = 979) among 53,990 employees under 55 years of age working in the Dutch Post and Telecommunication companies. The reference population consisted of employees (n = 45,300) with no frequent or long-term episodes of sickness absence. We also investigated whether certain diagnoses at baseline, according to the ICD-9, were related to a higher risk of work disability or job termination. Work disability was defined as sickness absence with a minimum duration of one year.

In the 4-year follow-up period (1998–2001), approximately 6.7% of the employees became entitled to disability benefits. The disability rates were higher in women than in men, and were also higher in older employees.

Employees with previous episodes of frequent or long-term sickness absence had a higher risk of work disability during the follow-up period, compared to the reference population. Men with sickness absence due to neoplasms (RR = 4.9), mental disorders (RR = 1.4) and respiratory diseases (RR = 1.9) had a higher risk of work disability than men with sickness absence due to musculoskeletal disorders. In both men and women, accidents represented a lower risk of work disability than musculoskeletal disorders. There was no significant difference between the diagnostic categories in women. For both men and women the work disability rate was higher for depression than for adjustment disorders.

Approximately 20% of the employees left their employment in the follow-up period. Frequent and/or long-term sickness absentees had a 1.3–1.8 higher risk of leaving their employment, compared to the reference population. Long-term and frequent sickness absentees have a higher chance of leaving their employment involuntarily than the reference population, with relative risks between 1.5 and 2.5. In men, neoplasms (RR = 3.0) and mental disorders (RR = 1.3) were related to a higher risk of job termination than musculoskeletal disorders. In women, infectious diseases (RR = 1.7) and diseases of the nervous system (RR = 1.6) were related to a higher risk of job termination than musculoskeletal disorders.
We conclude that it is important to monitor employees who are on sick-leave for longer periods of time and employees with frequent episodes of sick-leave, in an attempt to reduce disability rates. Older employees were more at risk of long-term sickness absence and they also had higher risks of disability and involuntary job termination. In view of the fact that the working population is growing older, it is important to stimulate age-related management policies to prevent employees from dropping out of the labour force. Special attention should be paid to employees with long-term absence due to depressive disorders, because they are at risk for work disability.

Chapter 4 describes the incidence of sickness absence due to CMDs in the total population of ArboNed in the period 2001–2007. We differentiated between stress-related symptoms, depressive symptoms and anxiety symptoms, and calculated the annual incidence per 1000 employees. The annual incidence was calculated by dividing the number of medically certified episodes of sickness absence by the number of employees covered by ArboNed. Days of sickness absence due to CMDs were computed as a percentage of the total number of days of certified sick-leave in each year. The results were stratified according to gender, age-groups and economic sector. The incidence of sickness absence due to CMDs was 2.2% in 2001, which increased to 2.7% in 2004, and then decreased to 2.0% in 2007. Sickness absence due to CMDs was more common in women than in men, with the highest incidences in the age-groups of 30–39 years and 40–49 years. The percentage of days of sickness absence due to CMDs was highest in the fields of public service and education (39%), followed by financial services (31%) and health care (30%). The decrease in the incidence of sickness absence due to CMDs after 2004 may be the result of changes in the Dutch sickness absence legislation, aimed at reducing disability claims. Another explanation may be the various developments in the economic market. Unemployment decreased after 2004, and higher unemployment rates are related to less sickness absence and vice versa.

The aim of the study described in Chapter 5 was to determine the duration of sickness absence due to depressive symptoms in the working population. Depression is one of the most frequently encountered CMDs. In international research, reports on the duration of sickness absence due to depressive disorders vary widely. However, there is no available information about the duration of sickness absence among depressed workers in the Netherlands.

Data on all episodes of sickness absence (n = 9 910) for all employees included in contracts covered by ArboNed that started between April 2002 and November 2005, and were certified by an occupational physician with a diagnosis of depression, were collected from the
registration system. The duration until complete return to work was computed using Kaplan-Meier survival analysis. On average, men were on sick-leave for 200 days and women for 213 days due to depressive symptoms. More women (25.5%) than men (22.3%) qualified for a disability pension, granted after one year of work incapacity. Older employees had a longer duration of sickness absence due to depressive symptoms than younger employees, and employees in small companies were on sick-leave due to depressive symptoms for longer than employees in larger sized companies. Large companies probably have more opportunities for part-time return to work, and many large companies have structured protocols on how to deal with long-term sickness absence.

We found a longer duration of sickness absence due to depressive symptoms than that reported in the international literature. The duration of an episode of depression in the Netherlands is comparable to that reported in other countries, whereas the duration of sickness absence is longer. It could be hypothesized that employees in the Netherlands return to work when they are completely recovered, whereas in other countries employees start working again (part-time) during recovery. It is possible that differences in social legislation and benefits also contribute to these differences.

Moreover, differences in definitions and methods may account for this difference in duration of sickness absence. In our study, depressive symptoms were not strictly assessed according to the Diagnostic and Statistical Manual of Mental Disorders criteria, thus limiting the comparability of results. Our study population was not a random sample from the entire working population in the Netherlands, because employers voluntarily engage our occupational health services. However, the large sample size and the use of registered rather than self-reported information on sickness absence are strong points of our study.

Because of the risk of chronicity, it is important that occupational physicians recognize depressive symptoms at an early stage in the sickness absence. We recommend that specific methods should be developed and applied to identify employees who are at risk for chronic depression.

The research questions in Chapter 6 concern the recurrence of sickness absence due to common mental disorders and the difference in recurrence risk according to type of mental disorder. CMDs are an important cause of sickness absence and long-term work disability, and although they are known to have high recurrence rates, little is known about the recurrence of sickness absence due to CMDs. The occupational physicians classify mental disorders -according to the Dutch Guidelines for Mental Disorders- as follows: distress symptoms, adjustment disorders, depressive disorders, anxiety disorders
and other psychiatric disorders, such as psychoses, bipolar affective disorders, and disorders caused by psychoactive substances.

A dynamic cohort consisting of 137,172 employees (62% men and 38% women) working at the Dutch Post (70%) and Telecommunication (30%) companies was studied over a 7-year period. A total of 9,904 employees were absent due to CMDs. The incidence density (ID) and the recurrence density (RD) of sickness absence due to CMDs was calculated per 1000 person-years. The first episode of sickness absence was considered as the reference episode. Recurrence was defined as the start of at least one new episode of sickness absence due to CMDs after complete return to work for at least 28 days. The duration and time-to-onset of recurrent sickness absence due to CMDs was computed in months using Kaplan-Meier survival analysis. A log-rate analysis was performed to determine determinants of recurrent sickness absence due to CMDs.

The ID of sickness absence due to CMDs in the total population was 27.7 employees per 1000 person-years (95% CI = 27.1–28.2), and the RD of sickness absence due to CMDs was 84.5 employees per 1000 person-years (95% CI = 80.7–88.3). Of the 9,904 employees with a first absence due to CMDs, 1,925 (19%) had a recurrence. The median duration until a recurrent episode of sickness absence in the employees with a recurrence varied between 8 and 11 months (95% CI = 6–14 months), depending on the initial diagnosis. Of employees who had a recurrence, 90% had the recurrence within 3 years. The incidence of sickness absence due to CMDs was higher in women than in men, but both genders had similar recurrence risks. In both genders the risk of recurrence of distress symptoms was lower than for the category other psychiatric disorders. Men between 35 and 55 years of age and women under 45 years of age had a higher risk of recurrence than their counterparts aged ≥ 55 years. Both men and women with a lower salary scale, married women and women with a tenure < 5 years had relatively higher risk of recurrence of sickness absence due to CMDs.

After an episode of sickness absence due to CMDs, employees are at increased risk for a recurrence. In accordance with the Dutch guidelines, we advise relapse prevention consultations for a period of 3 years after return to work, whether or not it is feasible in practice. There should be more intensive monitoring in the first 18 months and low-frequency monitoring in the following 18 months.

The study described in Chapter 7 investigated the recurrence of sickness absence due to common mental disorders (CMDs), including distress, adjustment disorders, depressive disorders and anxiety disorders, in male and female employees in the Netherlands per age-group. Episodes of sickness absence due to CMDs were counted in 137,172 employees working in the Dutch Post and Telecommunication...
companies between 2001 and 2007. The incidence density (ID) and recurrence density (RD) of sickness absence due to CMDs was calculated per 1000 person-years in men and women in the age-groups of < 35 years, 35–44 years, 45–54 years, and ≥ 55 years. The time-to-onset of recurrent sickness absence due to CMDs was computed in months, using Kaplan-Meier survival analysis, and compared across groups with logrank tests.

The ID of one episode of sickness absence due to CMDs was 25.0 per 1000 person-years between 2001 and 2007, and the RD was 76.7 per 1000 person-years. Recurrences were more frequent in women < 35 years of age and in women between 35 and 44 years of age. In men there was no difference between the age-groups. The median in time-to-onset of recurrence among those with recurrent varied between 8 and 14 months, and did not differ across the age-groups. Of employees with a recurrence, 90% had the recurrence within 3 years.

The results of our study show that employees who have returned to work after having been absent with mental disorders stay at risk for recurrent sickness absence. The recommendation to monitor employees for 3 years after return to work, as described in Chapter 6, applies to both men and women in all age-groups.

In Chapter 8 we compare parametric hazard rate models for the onset of long-term sickness absence and duration until return to work. Cox proportional hazards models are commonly used in sickness absence research. However, parametric models are to be preferred when time, in itself, is considered as important independent variable, for instance with regard to the duration of sickness absence.

The hazard is the risk of an event, for example the risk of onset of long-term sickness absence. The hazard function (or hazard rate) is probability that an event will take place at time t, given that that event has not taken place before time t. The baseline hazard can be interpreted as the hazard function for the average individual in the sample. In Cox models, the functional form of the baseline hazard is not given, but is determined from the data, whereas parametric models specify the baseline hazard. Different types of parametric models can be distinguished, depending on the type of time-dependence. In exponential models, the hazard rate is assumed to be constant. Weibull models assume a hazard function that is a power function of duration. Log-logistic and log-normal models permit non-monotonic hazard functions in which hazard rates can increase and then decrease, or vice versa. Gompertz-Makeham models assume the hazard rate to be an exponential function of duration times. Parametric models are more parsimonious, and have more power than Cox models.

We performed a prospective cohort study on sickness absence with 1997 as a baseline year and 4-year follow-up among 53830 employees.
employees working in the Post and Telecommunication companies in the Netherlands. The time to onset of long-term (> 6 weeks) sickness absence and return to work were modelled with parametric hazard rate models. The exponential parametric model with a constant hazard rate gave the most accurate description of the time to onset of long-term sickness absence, and Gompertz-Makeham models with monotonically declining hazard rates gave the best description of time to return to work from long-term sickness absence.

We conclude that parametric models offer more possibilities than commonly used models for time-dependent processes such as sickness absence and return to work. However, the advantages of parametric models above Cox models apply mainly to return to work and less to the onset of long-term sickness absence.

In Chapter 9 the most important findings of our studies are discussed and recommendations are made for practical application and future studies. The strengths and limitations of the various studies are also discussed. We conclude that it is important not only to monitor employees with longer periods of sickness absence, but also employees with frequent episodes of sickness absence. It is important to identify these employees at an early stage, in order to limit recurrent sickness absence, disability and involuntary job termination as much as possible. Employees who have been absent due to CMDs should be offered a relapse prevention consultation 3 months after they return to work, in order to prevent a recurrence.

This dissertation shows the importance of a high-quality absence registration system in order to identify risk groups for recurrent sickness absence. The challenge is to make good use of these results, in the formulation of sickness absence policies and the development of new interventions in occupational health care.