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**UNEMPLOYMENT AND  
MORTALITY AND MORBIDITY  
– EPIDEMIOLOGICAL STUDIES**

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## **ABSTRACT**

The aim of this thesis is to examine the associations between unemployment and mortality and morbidity and what roles pre-existing risk factors, such as psychiatric diagnoses, alcohol disorders, behavioural risk factors, sickness absence and socioeconomic factors, might have in these associations.

The studies were based on two populations: the Swedish conscription cohort 1969/70, and the Stockholm population 1990/91. The Swedish conscription cohort 1969/70 contained 49,321 men, born in 1949–51, who during mandatory conscription examination went through psychological assessment and screening for mental disorder, and were surveyed for information on social background and alcohol and drug use. Information from registers on mortality from 1971–2006 and morbidity 1973–2006, and mid-life labour market information 1990–94, was linked to the cohort. The Stockholm population 1990/91 consisted of all 24–58 year-olds in Stockholm Sweden during these years, 386,885 men and 384,183 women. Registered labour market information 1990–1994 and morbidity 1993–94 were linked to this cohort. Data were entered into Cox proportional hazard regression models and logistic regression models.

In study I, psychiatric diagnosis at age 18 screening, before or at an early stage of labour market entry, was found to be associated with increased risk of suicide and suicide attempt in middle age. In studies II and IV, poor health and risk factors for poor health, measured between ages 10 and 42, were found to be more prevalent among persons who became unemployed in middle age than among those who remained employed. In studies II and IV, it was also found that those who became unemployed had increased risk of mortality – from all-cause mortality, from natural causes including cardiovascular disease, and from external causes (both suicide and causes other than suicide). They also had an increased risk of hospitalisation from alcohol-related causes. The increased risks of the unemployed were to a large extent attenuated by controlling for confounders, but remained significant for mortality, violent death, external death other than suicide, and hospitalisation from alcohol-related causes. The strongest confounder in the associations between unemployment and mortality and morbidity was previous sickness absence. In study III, sickness absence in the Stockholm population was found to be a predictor of unemployment in men and in women. In study III, it was also found that unemployment in 1992–93 was associated with a (statistically significantly) increased risk of suicide for men in 1994–95. This elevated risk was strongly attenuated by controlling for sickness absence before unemployment.

The conclusion is that unemployment is associated with an increased risk of mortality and alcohol-related hospitalisation. The persons in poor health and with risk factors for poor health showed an increased risk of unemployment. After taking into account that the unemployed had poorer health and more risk factors for poor health, the associations between unemployment and mortality and alcohol-related hospitalisation were strongly attenuated. Even after controlling for differences in poor health and risk factors for poor health, there were statistically significantly increased risks of mortality and alcohol-related hospitalisation associated with unemployment.

## LIST OF PUBLICATIONS

- I. Lundin A, Lundberg I, Allebeck P, Hemmingsson T. Psychiatric diagnosis in late adolescence and long-term risk of suicide and suicide attempt. *Acta Psychiatr Scand.* 2011 Aug 13.
- II. Lundin A, Lundberg I, Hallsten L, Ottosson J, Hemmingsson T. Unemployment and mortality – a longitudinal prospective study on selection and causation in 49321 Swedish middle-aged men. *J Epidemiol Community Health.* 2010 Jan;64(1):22-8.
- III. Lundin A, Backhans M, Hemmingsson T. Unemployment and Hospitalization Owing to an Alcohol-Related Diagnosis Among Middle-Aged Men in Sweden. *Alcoholism: Clinical and Experimental Research.* 2011
- IV. Lundin A, Lundberg I, Allebeck P, Hemmingsson T. Unemployment and suicide in the Stockholm population – a register based study on 771,068 men and women (manuscript).

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## LIST OF ABBREVIATIONS

ABV	Alcohol By Volume
AKU	Arbetskraftsundersökningen, the Swedish Labour Force Survey
CI	Confidence Interval
CVD	Cardiovascular Disease
HR	Hazard Ratio
ICD	International Classification of Disease
ILO	International Labour Organization
LFS	Labour Force Survey
LOUISE	The Longitudinal Integration Database for Health Insurance and Labour Market Studies
MPI	Militärpsykologiska Institutet, Sweden's Institute for Military Psychology
NCDS	National Child Development Study, U.K.
NLSY	National Longitudinal Study of Youth, U.S.
OR	Odds Ratio
RR	Risk Ratio
SEK	Swedish krona, the currency of Sweden
SUN	Svensk utbildningsnomenklatur, the Swedish version of the International Standard Classification of Education
WHO	World Health Organization

# 1 INTRODUCTION

To what extent does unemployment cause mortality and morbidity? The point of departure for this thesis was that the unemployed have higher mortality than the employed (1-5). One hypothesis is that unemployment has detrimental effects on health, giving rise to mortality and morbidity through poverty and psychosocial stress. Another hypothesis is that persons with risk factors for morbidity and mortality have a higher risk of job loss or lower chances of employment, which would create non-causal associations between unemployment and mortality and morbidity (6-12).

There are many studies of the unemployment-mortality and unemployment-morbidity associations, and several have tried to assess the extent to which pre-existing health differences between the unemployed and the employed affect – confound – the associations between unemployment and subsequent morbidity and mortality. Prior health differences between persons who become unemployed and those who remain employed may, however, be unobserved, simply because information on certain health characteristics in the general population is scarce. To what extent the unemployment-mortality and unemployment-morbidity associations are causal, or an artifact of confounding, is a classical, unresolved question.

In this thesis, the focus is on trying to estimate, in the Swedish general population, the extent to which the unemployment-mortality and unemployment-morbidity associations can be explained by observed differences in health, obtained from various sources. Sickness insurance benefits are available for everyone in the labour force (employed and unemployed), and are based on administrative registers held by the Swedish Social Insurance Agency. Information on psychiatric care and other hospitalisation with a psychiatric diagnosis was collected from the Patient Register at the National Board of Health and Welfare. Psychiatric diagnoses and psychological assessments from the screening of a total population of adolescents were available from mandatory conscription tests, recorded by the National Service Administration. Further, information on self-reported drug use and smoking, collected in connection with conscription at age 18, was also used. The main exposure of interest in all the studies was registered unemployment. The associations between unemployment and mortality and morbidity were studied during the Swedish recession of the 1990s; the unemployment rate rose steeply from a low level in 1991 to high but stable levels in the following years.

The thesis is organised as follows: section 1 presents the background and defines unemployment; section 2 describes the literature; section 3 presents the aims of the studies; section 4 describes material and methods; section 5 presents the results; section 6 discusses the results; section 7 considers methodological aspects; and, section 8 presents conclusions.

## 2 BACKGROUND

### 2.1 UNEMPLOYMENT AND THE SOCIAL DETERMINANTS OF HEALTH

Employment brings income, identity and social contacts to individuals. Unemployment potentially deprives individuals of the same. Unemployment or employment is generally regarded as one of the important *social determinants of health* – the economic and social conditions that shape the individual's health and risk factors for health (13-15). From a material point of view, lack of economic resources may affect health through poor nutrition, poor housing and selective health-care seeking. It is also possible that individual 'behavioural choices', e.g., taking up smoking or drinking and adopting various hazardous behaviour, and also individual development, educational achievement, socialisation and personality are shaped by socioeconomic structures (16). Moreover, socioeconomic structures are hypothesised to affect individuals' health through psychosocial stress; for example, 'behavioural choices' may be the result of 'negative coping' rather than a result of lack of money. Health has been put in relation to both an absolute position and a relative socioeconomic position, and unemployment relates to both (8).

### 2.2 UNEMPLOYMENT – DEFINITIONS AND LEGISLATION

*Unemployment* is broadly defined as not having but wanting a (paid) job. The definition most often used is that of the International Labour Organization (ILO), which states that unemployment occurs when an individual is without a job and has actively looked for work during the past four weeks (17). The unemployment rate is usually measured through Labour Force Surveys (LFS), although the definition of who is to be considered unemployed differs across countries. In Sweden since 1959, the official unemployment rate has been measured through the Swedish Labour Force Survey (AKU, Arbetskraftsundersökningen), which is conducted on random samples of 29,500 15–74 year-olds. Individuals are defined as either employed, unemployed, or not in the workforce. An 'unemployed' person is anyone who, during a specified week, reports not being employed but wants, and is able to, work, and who has applied for work during the last four weeks or is starting a new job within two weeks. *Unemployment rates* are calculated as the prevalence of unemployed among those in the workforce in the ages 16–64 (the most common age at end of compulsory schooling and the most common age for the taking of retirement pension) (18).

In this study, unemployment was defined as being listed as unemployed by the Swedish Public Employment Service, or being a recipient of unemployment insurance (A-kassa) or cash labour market assistance (KAS). To be eligible for benefits or assistance, a person has to register as unemployed at the Swedish Public Employment Service. An 'unemployed' person (redefined as 'openly unemployed' in 2011) is, according to the Swedish National Labour Market Board, a jobseeker registered at an employment service, who has no work, who is actively seeking work, who is currently available for work, and who is not on a labour market program (19). All residents of Sweden between ages 16 and 64 are insured. Those earning above SEK 6,000 the previous year who had chosen to be affiliated to an unemployment insurance fund at the time of our



studies were entitled to about 90% of their salary (with a minimum and maximum level established by law) when subject to involuntary job loss.

## **2.3 UNEMPLOYMENT AND HEALTH**

Unemployment is connected with mortality and morbidity via four hypothetical paths: 1) Unemployment causes morbidity and mortality through changed behaviour or by triggering psychiatric illness in the unemployed. 2) Ill-health causes job losses; when downsizing, or in cases of labour turnover, employers might choose to lose unhealthy employees. 3) Ill-health prolongs the duration of unemployment; workers in ill-health may have a higher risk of not getting a new job if they happen to become unemployed. 4) Some underlying trait or factor, in the same individual, will cause both unemployment and morbidity; for example, some personality trait or latent ill-health might manifest itself both in job loss and in morbidity. Path 1 is here referred to as the causation hypothesis, and paths 2-4 are variants of the selection hypothesis. Paths 2 and 3 involve direct selection, and path 4 indirect selection (20).

### **2.3.1 Unemployment, mortality and morbidity**

Unemployment, or involuntary job loss, is considered a critical life event. The individual is faced with the challenge of adapting to an interruption in his or her career. Although the unemployed in Sweden generally receive relatively generous benefits, which subsidize them in their job seeking (helping them not to lower their reservation wage, or take jobs below their qualifications), there is a risk that job loss stratifies those who become unemployed from the employed, with respect to future position in the labour market, mental health, personality and behaviour. The detrimental effects of unemployment are described differently in economics, sociology and social psychology, but all disciplines share the view that job loss potentially triggers chains of cumulative disadvantage, through environmental (e.g., signalling of lower ability to work), social (e.g., new role acquisition) and individual (e.g., stress-induced mental ill-health and negative coping strategies) mechanisms (21-23).

### **Theory**

There is no general theory of unemployment and health (24). Often, post-hoc explanations are used, which draw on descriptive analyses of the typical stages that the unemployed sequentially pass through after job loss, typically from shock to depression (25-27). The empirical evidence for the stages model has been strongly criticised (27). Theories of mental illness following uncontrollable 'bad' events, such as attribution theory, typically also include unemployment. From these are borrowed the concept of learned helplessness, which is related to self-esteem, locus of control, coping and depression (25, 28).

Two theories that more specifically focus on unemployment and mental health are essentially eclectic. Jahoda describes employment as important because it, besides financial security, brings 'latent' value, in forms such as time structure, access to social networks, joy of participation in collective efforts, social identity, and required activity. Being unemployed is being without these. Warr describes nine specific environmental

causes of mental health: opportunity for control, opportunity for skill use, externally generated goals, variety, environmental clarity, availability of money, physical security, opportunity for interpersonal contact, and valued social position, all of which are threatened by unemployment (29). Ezzy draws on identity theory and suggests that job loss is best described as a status passage. Unemployment initiates a process where the individual's own life-plan is questioned, a process that may involve lowered mental health (26). From a life-course perspective, which is also eclectic, failure to pass certain life goals has also been suggested, which draws on Erikson's notion of identity development (30).

### **Mortality**

Many studies have shown that the unemployed have an increased risk of mortality (1-5, 31). These studies focus on the end outcome of the critical change (unemployment), with stress/coping or socialisation/role acquisition in the individual as possible mechanisms. Several studies focus on unemployment and suicide, since suicide is an obvious outcome of mental ill-health. The unemployed are consistently found to be at higher risk (2 to 3 times) of suicide (2, 3, 7, 31-34). The unemployed are also found to be at increased risk of mortality from alcohol-related causes (2, 35). Some studies also investigate the association between unemployment and cardiovascular mortality, although the causal relationship has been questioned (1, 31, 36).

### **Morbidity**

Unemployment and psychiatric morbidity and illness have been studied longitudinally using several indicators, including hospitalisation for suicide attempt (37, 38), other inpatient care (39), dispensed antidepressants and other psychotropic medicines (40-43), symptoms of depression (44, 45), and low mental well-being (7, 9, 46, 47). The unemployed are consistently found to have increased morbidity and illness. A community sample study, where the participants' mental health was determined using interviews, showed that re-employment lowered levels of depression and anxiety (48). That is, leaving the state of unemployment improves health, which can be interpreted as support for a causal relationship.

### **Behaviour**

Health risk behaviours, such as smoking and risk-level consumption of alcohol, have also consistently been found to be more prevalent among the unemployed (49-60). For alcohol-related behaviour the association with unemployment is less obvious. Some studies have found that unemployment increases drinking (61-63), while a few others have found no increase (59, 64, 65), or even that the unemployed reduce their drinking (59, 66). Also, reduced drinking after re-employment, which suggests a causal link between unemployment and drinking, has been shown for alcohol (58), but Dooley and Prause found that unemployment increased drinking, which was not reversed by re-employment (67).

## **2.3.2 Determinants of unemployment**

Although the main determinants of unemployment are the economic cycle, seasonality and political ambition, unemployment is not a random phenomenon. Hiring and firing

is a selection process based on individual characteristics. In economics, e.g., in the Mincerian version of human capital, education and work experience (investment in human capital) are central to explaining labour market differences. Studies of determinants of unemployment from the US (68-70), the UK (71-73), the Netherlands (74, 75), Norway (76) and Sweden (77) consistently show a strong link between education and unemployment. Other variables concern worker ability of a more psychological and cognitive nature; cognitive ability, personality and mental health have all been suggested (78-82), together with social class of origin (79, 83). In signalling theory, e.g., in Spence (84), educational credentials are postulated as the most important determinant, since – when potential employers screen for worker ability – credentials are used as explicit proxies for tacit general ability.

The consequences of current unemployment for continued and recurring unemployment have been addressed in a number of studies, in cohorts from the US (68-70), the UK (71-73, 85), the Netherlands (74, 75), Norway (76), and Sweden (77). Most have reported a greater likelihood of becoming unemployed among persons who have experienced unemployment in the past, possibly because the unemployed have more risk factors for unemployment, or because persons in unemployment or with experience of unemployment are less attractive to potential employers. That is, unemployment predicts future unemployment.

### **2.3.3 Health-related determinants of unemployment**

Hiring and firing are selection processes that may involve factors related to health, e.g., cognitive capacity, personality traits, illness and behaviour (86-91). Several studies have shown that persons with psychiatric problems, including alcohol problems, more often become unemployed (92-94). In a Finnish registry study, Ostamo and colleagues showed that suicide attempters had a much higher risk of unemployment during the recession of the 1990s (95). In another Finnish study of health care workers, hospitalisation due to a psychiatric diagnosis was found to predict later unemployment (96). In studies based on random samples of the general population, persons with self-reported psychiatric problems and symptoms are more often found to be unemployed, on the basis of self-reports or linked registry data (86, 97, 98). Studies of the general population, where psychiatric disorders were identified through screening and diagnosed by interview, have shown that depression and alcohol disorder (58, 99) and depressive symptoms (100) were significantly negatively associated with later employment. In a study of the British household panel, common mental disorders were found to be more prevalent among the unemployed, not because of a higher incidence of illness among the unemployed, but because of longer durations of illness (101). In Norway, however, psychiatric symptoms were found to be associated with both subsequent job loss and a lower chance of re-employment (86).

In the working population, sickness absence offers information on individuals' health status. Sickness absence is a good predictor of mortality owing to suicide, alcohol and cardiovascular disease (CVD) in Finland (102). In a Swedish study, mental health problems were found to be associated with sickness absence, not only due to a psychiatric diagnosis but also to a somatic diagnosis (103). Sickness absence has also

been shown to be related to job loss among public sector employees in Finland (104) and in occupational cohorts in the Netherlands (105). In a Swedish study of about 300,000 individuals (in the LINDA register, a statistical register of 3.35% of the population), sickness absence in 1989–91, before the recession, was found to be positively associated with unemployment during the recession 1992–98 (106).

### **2.3.4 Health-related confounding**

Several studies have shown that there is more pre-existing ill-health and ill-health-related behaviour among job losers. The consequences of unemployment, whether risk of mortality, morbidity, illicit behaviour, recurring unemployment or labour market exit, are hard to study with accuracy if the unemployed and employed are heterogeneous with regard to the prevalence of risk factors for the outcome in question. (107). That is, a non-causal association will exist between unemployment and, for example, suicide if persons with psychiatric illness are more likely to become unemployed or less likely to exit unemployment. The question of the extent to which the well-known correlations between unemployment and mortality and morbidity can be explained by health-related selection is not resolved. Even if health-related selection is established, this might not be significant enough to explain the differences in mortality and morbidity found between the unemployed and employed (107).

Presentations of four methodological approaches that have been used to assess causality in the unemployment-mortality and unemployment-morbidity associations follow below: time-series studies of the association between unemployment rates and mortality rates; observational studies with a lag structure (wear-off of selection); observational studies based on events resembling natural experiments; and, observational studies with prospective health information.

#### *Time series studies*

If unemployment is an important determinant of the societal level of mental health, then aggregate data are an efficient means of studying the association between them. At an aggregate level, confounding by ill-health does not arise; if there is no effect of unemployment on an individual's risk of, for example, suicide, then the prevalence of suicide does not follow an increase in unemployment. Many time-series studies revolve around the question of whether recession increases or decreases total mortality (108-112). Studies of unemployment and cause-specific mortality, and even of unemployment and poor mental health, show inconsistent results. Some (113-115), but not all (116-120), have found a positive association between the unemployment rate and suicide/suicide attempt. In a recent study of cause-specific mortality rates, an increase in the unemployment rate was found to be associated with an increase in mortality, specifically by suicide. For Sweden, however, there was no such association (121). Another time-series study based on Swedish data showed that admissions to inpatient psychiatric treatment decreased as unemployment rose (122). A potential weakness of time-series analysis is that it is not known if it is the persons who become unemployed who actually have increased mortality. It might be that some other secular factor is related to both unemployment rates and cause-specific mortality rates.

### *The wear-off of selection*

In a couple of studies, it is argued that the influence of health-related selection in the unemployment-mortality association can be tested by examining whether incidence rates of mortality are non-proportional (3, 4, 123, 124). It is suggested that an increased risk of mortality during the first years of unemployment, but not later, would indicate confounding by health selection. A “washout period” would insure against this confounding, since the mortally ill could not be mortally ill for several years, but would die off (3, 4, 124). All of these studies found similar relative risks of mortality in the first and second period, and concluded that there was little evidence of confounding by ill-health. In contrast to these studies, Kposowa showed that unemployment in men was associated with suicide only during the first two years of follow-up (of nine), HR = 2.3, while for women, the unemployed had an increased risk of suicide also in the long-run, 2-year HR = 25.19; 5-year HR = 3.85, 9-year HR = 3.06 (125). In Sweden, Nylén and colleagues found very high risks of suicide among the unemployed the first 5 years (male RR = 3.29, female RR = 4.83), which decreased the following 10 years, male RR = 1.30, female RR = 2.05 (although insignificant for men) (32).

### *Natural experiments*

Two types of studies are based on situations where unemployment is believed to be more random, and thus less affected by health-related selection: closure studies and studies conducted in times of high unemployment.

Closure studies take their point of departure in the fact that individuals who are gainfully employed lose their jobs due to factors unrelated to their individual characteristics and health. In a series of studies, Eliason and Storrie utilised the Swedish Central Register of Enterprise and Establishments to identify workers who ended up in unemployment after being laid off from closures and downsizing. These were matched to the general population. Increased risk of cause-specific mortality, including suicide (35), hospitalisation due to alcohol-related causes (38) and inpatient psychiatric care (39) were found for job losers. Martikainen and colleagues studied unemployment and mortality following downsizing and closure in two periods – one during high, and one during low unemployment. Relative risks were much lower in times of high unemployment. Relative risks were also lower for persons unemployed following closure than those unemployed following downsizing (126).

Martikainen and Valkonen (127) showed that during the Finnish recession of the 1990s the relative risk of suicide associated with unemployment diminished when more people became unemployed – possibly because the two groups became more similar when job loss became less selective and more marked by chance. In a Swedish study, unemployment was statistically significantly associated with mortality during low unemployment but not high (128). In a recent study by Mäki and Martikainen (129), the relative risks of unemployment and suicide were found to be similar in times of low and high unemployment. In another Finnish study by Luoto and colleagues, unemployment was found to be associated with high consumption of alcohol, but only in times of high unemployment and only among single people (130).

Both factory studies and studies conducted in times of high unemployment rely on the assumption that unemployment incidence is random – but not that duration is random. Persons in greater ill-health might still have longer spells, and thus be more prevalent among the unemployed (131).

*Observational studies with prospective health information*

A few studies have used information on health status before unemployment. Martikainen studied job loss in the Finnish census 1980 and mortality in 1981–85. Although persons with high sickness absence and those who obtained reimbursement for psychotropic medicine had higher levels of unemployment (and mortality), these factors had no impact on the association between unemployment and mortality, and only a small impact on the unemployment-suicide association, after adjusting for age, socioeconomic position, education and marital status (2). In that study, the unemployment HR for all-cause mortality was 1.93, suicide 1.92, alcohol-related death, 5.24, and CVD 1.54. Morris and Shaper (1) used a repeated-measurements survey (with times t1 and t2) to study mortality among men who reported being unemployed at t2, but who had been stably employed for at least five years before t1. They showed that those who reported being ‘unemployed not due to illness’ were more often current smokers, heavy drinkers and in fair/poor health. There was, however, little confounding by these risk factors. The relative risk of mortality associated with unemployment in that study was 2.13.

In two Swedish follow-up studies of a survey population, confounding by health, behaviour and personality at baseline of the association between unemployment and mortality was assessed. Nylén and colleagues showed that unstable personality and smoking and drinking confounded the unemployment-mortality association (32). Excluding any of the health-related variables (alcohol habits, smoking, sleeping pills or unstable personality) would lead to 4–6% higher relative risks. Voss and colleagues showed similar confounding when studying unemployment and cause-specific deaths during 24 years of follow-up. In that study, there was a significant association between unemployment and suicide among women, but not among men (33).

Gerdtham and Johannesson followed 27,994 20–64 year-olds in the Survey of Living Conditions, where information on self-reported unemployment was accompanied by data on health-related variables, such as functional ability, self-rated health, high blood pressure and deceased parents. In that study, unemployment was found to be significantly associated with all-cause mortality, suicide and mortality from other disease (31). The confounding role of differential health status was not estimated.

Backhans and Hemmingsson showed in a repeated-measurements survey (23,794 men and women in Stockholm County) that psychiatric symptoms (measured by a general health questionnaire) following job loss (registry data) were reduced from a statistically significant odds ratio of 1.25 to an odds ratio of 1.12 (non-significant) after taking into account pre-existing psychiatric symptoms and sickness absence (132).

In two studies based on several waves of administration of the U.S. National Longitudinal Survey of Youth, NLSY, covering 12,688 individuals sampled at ages 14 to 22, the associations between self-reports of unemployment at ages 14 to 37 and alcohol patterns and symptoms of depression were investigated (45, 133). The associations with both heavy and frequent drinking, and symptoms of depression were reduced after controlling for previous patterns (for alcohol outcomes) and symptoms (of depression), but the increased risks associated with unemployment remained.

### **2.3.5 Life course and unemployment**

The life-course perspective considers that associations and risk factors might have their origin earlier in life – which might be of importance for understanding inequalities in health (134). Persons who have higher risk of unemployment may be more vulnerable to psychiatric morbidity and mortality because of a negative pathway that begins earlier in life. That is, the employed and the unemployed are, when compared at a specific point in life, heterogeneous because the unemployed have since early in life accumulated more risk factors for ill-health and a less advantageous labour market position, possibly in a reciprocal process (22, 135). The production of this heterogeneity is of interest in life-course studies. What causes the heterogeneity in risks is interpretable as the indirect cause of the increased risk (21). Mel Bartley argues that the individual worker's health is not necessarily a risk factor for unemployment. Rather, unqualified and low-paid and hazardous positions are occupied by persons who are easily made redundant. This secondary labour market will have accumulated poorer health, but unemployment is seen as a marker of belonging to the secondary labour market rather than a factor per se (136).

Study of youth unemployment is warranted not only because the transition from school to the labour market is a critical period. Methodologically, the study of youth unemployment also offers the advantage of considering initial conditions; the association between youth unemployment and the onset of psychiatric problems and changed behaviours is not influenced by previous labour market experience (23). Youth cohorts offer prospective information on individual characteristics before transition from school to the labour market, or at least at an early stage of working life. In New Zealand, two prospective cohorts with rich information on mental health, maladaptive behaviour, school involvement/performance and family background have been used to study the associations between early factors and youth and young-adult unemployment. In the Dunedin Multidisciplinary Health and Development Study (1,037 individuals born in 1972/1973), behavioural adjustment and personal and familial characteristics in childhood predicted youth unemployment at ages 15–21 (137). In the Christchurch Health and Development Study (1,265 individuals born in 1977), psychiatric disorder, substance abuse and individual adjustment problems prior to leaving school predicted unemployment at ages 16–18 (138) and 18–25 (139-141). In the UK, the National Child Development Study (17,000 individuals born in 1958 followed up from age 7 to 42), with information on socioeconomic background, health and a wide range of behavioural problems, has been used in several studies of unemployment. Many of these studies focus on childhood disadvantage and maladjustment and unemployment at ages 16, 23, 33 and 42 (71, 83, 142, 143). In Sweden, selection into youth

unemployment based on depressive symptoms and nervous complaints was shown in a cohort of school leavers in the Northern Swedish cohort (all 1,080 compulsory school leavers in Luleå, Sweden, born in 1965) (144). Further, Bäckman and Nilsson showed, in a long-term follow-up of the Stockholm Birth Cohort (all children in Stockholm 1963, born in 1953, alive in 1980, n = 14,294), that the children with childhood poverty, childhood social problems and deviant behaviour before age 30 more often ended up in long-term unemployment during the recession of the 1990s, at ages 40–43 (145).

The associations between youth unemployment and later mental health and alcohol consumption, controlled for the initial risk factor of poor mental health, have also been studied in some of these cohorts. Several studies show that unemployment is associated with worse mental health and higher alcohol consumption, but also that at least part of this can be explained by confounding from early indicators of lower mental health and patterns of behaviour (46, 49, 138, 142, 146-149). In Sweden, youth unemployment has been shown to be related to smoking and excessive drinking at age 30, even after controlling for adolescent mental health, smoking and drinking (63). In a later follow up of that cohort, accumulated young adult unemployment predicted psychological distress, nervous problems, depressive symptoms, smoking and alcohol consumption at age 42, even after controlling for several adolescent health risks (150).



### 3 AIMS

The overall aim of this thesis is to examine associations between unemployment and mortality and morbidity. There is a special focus on what role pre-existing ill-health, specifically psychiatric morbidity, has in the associations.

The specific research questions were:

1. *Is psychiatric diagnosis measured before or at early labour market entrance associated with suicide and suicide attempt in middle age (study I)?*
2. *Are there associations between poor health, negative health-related behaviours, and negative personality measures in late adolescence and risk of unemployment in middle-aged Swedish men (study II, study IV)?*
3. *To what extent are the associations between unemployment and all-cause and cause-specific mortality among Swedish middle-aged men explained by pre-existing risk factors (study II)?*
4. *Is there an association between poor health in terms of sickness absence and later risk of unemployment among Swedish men and women (study III)?*
5. *To what extent is the association between unemployment and suicide among Swedish men and women explained by health-related confounding (study III)?*
6. *To what extent is the association between unemployment and hospitalisation due to an alcohol-related diagnosis among Swedish middle-aged men explained by pre-existing risk factors (study IV)?*

## **4 MATERIAL AND METHODS**

### **4.1 STUDY MATERIALS**

Studies I, II, and IV are based on the Swedish conscription cohort 1969/70, and study III on the Stockholm population 1990/91. An overview of the studies, the research questions, and the materials are presented in figure 1.

#### **4.1.1 Swedish conscription cohort 1969/70**

During autumn 1969 to spring 1970, 50,563 individuals were examined for conscription; about 3,000 more were summoned (151). At this time, appearing for examination, usually at age 18, was stipulated by law for Swedish male citizens and residents. In 1969, Swedish conscription testing changed radically, with the establishment of the National Service Administration (Pliktverket) and the introduction of more thorough tests. The conscription testing was essentially a selection process, aimed at identifying individuals suited for military service and placing them in a suitable education scheme (as exempted from armed service, eligible for non-commanding positions, non-commissioned-officer training, and officer training). Although appearing for examination was mandatory by law, tests and surveys were voluntary.

For two days, the young men underwent physical tests and examinations, and cognitive tests, and were also evaluated by a psychologist. All were also screened for psychiatric symptoms and, if deemed suitable, referred to a psychiatrist. All the young men participated, in connection with cognitive testing, in two surveys – one related to psychosomatic and social circumstances in child and adolescence, the other related to drug and alcohol use. The first survey questionnaire took 18 minutes to complete, and one minute to administer. This survey was later the basis for the psychologists' assessments. The second survey questionnaire took 17 minute to complete, and three minutes to administer (152). This survey was under the auspices of the Institute for Military Psychology (Militärpsykologiska institutet, MPI), but conducted for sociological research. The conscripts were informed that participation in this survey was independent of the rest of the examination, and would not affect selection or ranking (151).

In this thesis, only conscripts born in 1949–1951 were included (N = 49,321); older conscripts were excluded to create a homogenous birth cohort.

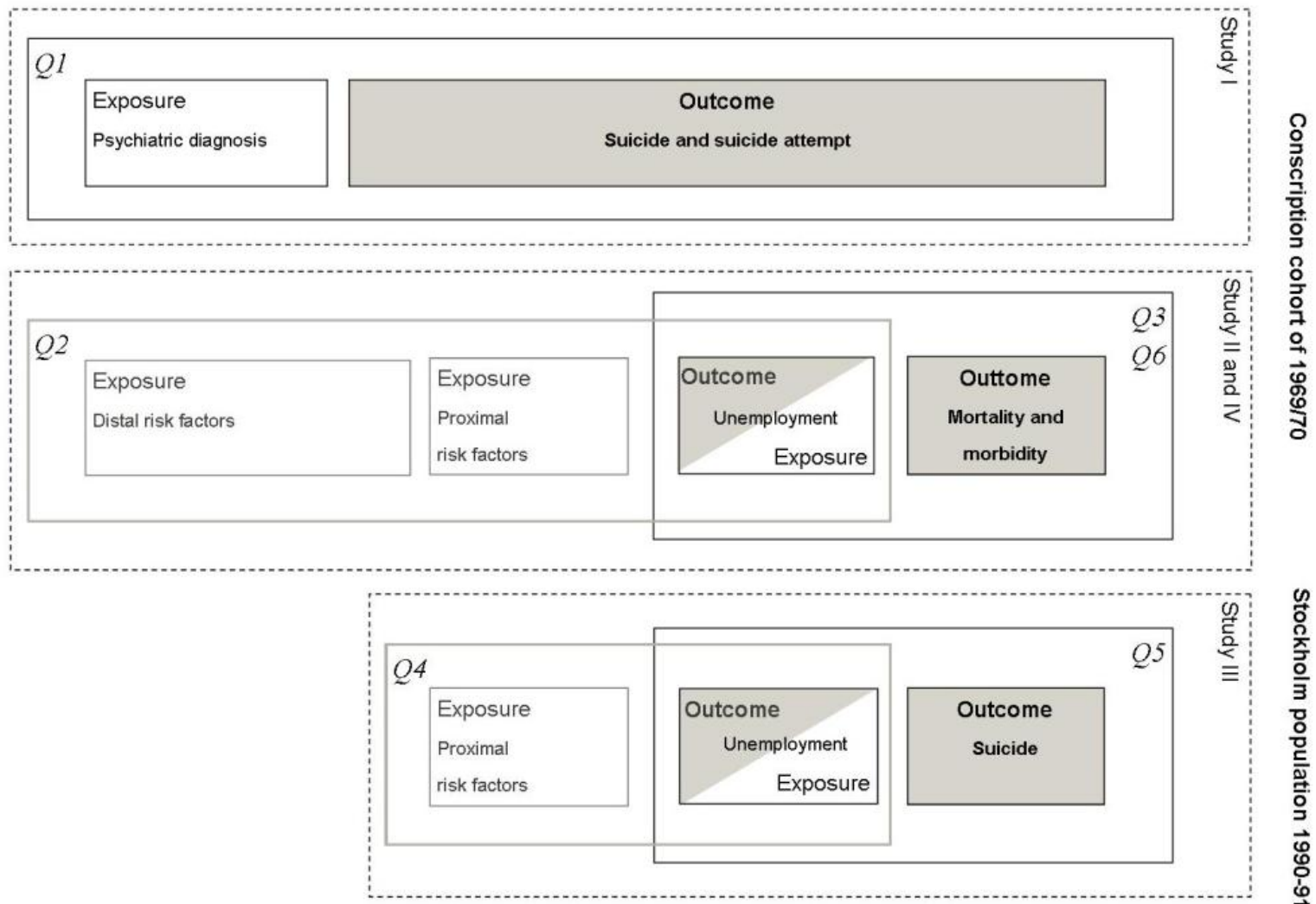


Figure 1. Summary of studies, research questions and material

#### 4.1.1.1 Conscript variables

The variables used in this study, which originate from conscription are the following:

*Psychiatric diagnosis:* Through referral by themselves or by a psychologist or physiologist, or due to poor cognitive test results, individuals visited a psychiatrist. The psychiatrist made a diagnosis according to the 8<sup>th</sup> version of the International Classification of Disease (ICD-8).

*Emotional control:* The psychologist assessed all the men according to a 5-point scale of emotional control: the ability to channel and control nervousness, stress tolerance and disposition to anxiety. The ranking distribution was approximately Gaussian, where rank 3 was normal. The variable is dichotomized into having low emotional control (ranks 1 and 2) or not. The psychologist interviewed the conscripts for between 15 and 60 minutes (mean 25 minutes). (151).

*Police/childcare authorities:* In the survey on social and familial circumstances a question was asked whether the conscript had ever been in contact with police or childcare authorities: (Yes, several times, Yes occasionally, No, never). The response was coded 1 if *Yes*. At this time, childcare authorities (Barnavårdsnämnden) consisted in a municipal child welfare board, which had the purpose of caring for children's health and upbringing, and had the right to take children into custody.

*Smoking:* The alcohol and drug use survey contained the question: 'How much do you smoke per day? 1) > 20 cigarettes or equivalent/day, 2) 11-20 cig., 3) 6-20 cig., 4) 1-5 cig., 5) Don't smoke', Smoking was dichotomized; a smoker was defined as > 5/day.

*Risk use of alcohol:* was based on nine questions in the drug-use survey, three qualitative measures, and six questions on amount and frequency of drinking. The three qualitative measures were: 'How often do you drink until you are intoxicated?' 1) Often, 2) Quite often, 3) Occasionally, 4) Never; 'If you ever have a hangover, have you then used alcohol as an eye opener?' 1) Yes, 2) No, and 'Have you ever been apprehended for drunkenness?' 1) Yes, twice or more, 2) Yes, once, 3) No, never. The six quantitative measures, which were used to calculate consumption of at least 250g (100% ethanol)/week were:

'How often do you drink medium strength beer/strong beer?' 1) More or less daily, 2) Some times during the week, 3) More seldom, 4) Never.

'How much do you drink when you drink beer?' 1) 3 cans or more, 2) 2 cans, 3) 1 can, 4) A glass, 5) Never drink beer.

'How often do you drink wine/strong wine?' 1) More or less daily, 2) Some times during the week, 3) More seldom, 4) Never.

'How much do you drink when you drink wine?' 1) 1 bottle or more, 2) ½-1 bottle, 3) ½ bottle, 4) A glass, 5) Never drink wine.

‘How often do you drink spirits?’ 1) A couple of times a week, 2) Once a week, 3) Once or twice a month, 4) Less frequently, 5) Never.

‘How much do you drink when you drink spirits?’ 1) More than 350 ml, 2) 150–350 ml, 3) 50–149 ml, 4) less than 50 ml, 5) Never drink spirits.

Content and strength of beer wine and spirits was assumed to be: Beer = 450 ml, mean ABV 4.3; Wine 750 ml, mean ABV 13.5; Spirits = mean ABV 39.9% (153).

#### *4.1.1.2 Registry data on the conscripts*

Information from five registers was linked to the conscription data: the Longitudinal Integration Database for Health Insurance and Labour Market Studies (LOUISE), the Cause of Death Register, the Patient Register, the Total Population Register and, the Population and Housing Censuses of 1990 and 1960.

#### **LOUISE**

In 1990 Statistics Sweden started a statistical register based on information in various administrative registers, with the purpose of facilitating longitudinal research on education and the labour market (154). Each year, everyone 16 years or older residing in Sweden on 31 December of that year is included. The following information on the conscripts was used:

*Unemployment:* From 1992 and onwards, LOUISE has information on days of unemployment – calculated from date when registered/deregistered at the local unemployment office – based on administrative data from the Swedish Public Employment Service. In 1990 and 1991, the only information available consisted in total yearly cash unemployment benefits from any of the unemployment insurance funds or the general cash labour market assistance, as reported to the Swedish Tax Agency by the unemployment insurance funds or the Swedish Social Insurance Agency.

*Income:* Information on income is total yearly gross cash wage or salary, according to reports by employers to the Swedish Tax Agency.

*Sickness absence:* Sickness insurance encompasses all residents in Sweden 16 years or older. Before 1992, sickness was compensated from the first day of sickness. Any illness that hindered work ability by at least ¼ was compensated. The compensation level was 90% of individual gross income from paid employment during the previous year, but could not exceed SEK 222,750 in 1990, and SEK 241,500 in 1991. The information is the yearly total amount, as reported by the National Swedish Social Insurance Board to the Swedish Tax Agency. Categories of sickness absence were based on quintiles (in study II on amount of compensation in SEK, and in study IV on estimated days of compensation).

*Disability pension:* Information on disability pension is registered as a total yearly amount in SEK, as reported by the National Swedish Social Insurance Board to the Swedish Tax Agency. Anyone between 16 and 65 years of age could be granted disability pension if their working capacity was impaired by at least 50% due to poor health. The compensation level is stipulated at a national level, based on previous income, with a minimum and a maximum.

*Education:* Education is registered according to Swedish Educational Terminology (SUN, an acronym for Svensk UtbildningsNomenklatur), the Swedish version of the International Standard Classification of Education maintained by UNESCO. It is based on all relevant administrative school records. Level of education in SUN is categorised as: 1) Primary and lower secondary, < 9 years; 2) Primary and lower secondary, 9 (10) years; 3) Secondary; 4) Upper secondary; 5) Post-secondary, 2 years or less; 6) Post-secondary, 3-4 years; 7) Postgraduate education.

### **Cause of Death Register**

The Swedish Cause of Death Register covers all deaths of residents of Sweden (registered with the Swedish Tax Registry), regardless of whether the death occurred in Sweden or abroad. Swedish citizens residing abroad (no longer registered with the Swedish Tax Registry) are not included. The causes of death are classified according to the English version of the International Classification of Diseases (ICD). Underlying cause of death is defined in the ICD as the disease or injury that initiated the train of morbid events leading directly to death, or the circumstances of the accident or violence that produced the fatal injury. Before 1994, responsibility for the register lay with Statistics Sweden, and from 1994 and onward with the National Board of Health and Welfare. Only about 0.8% of all deaths lack a cause of death. (155). In Sweden, ICD-8 was used from 1969, ICD-9 from 1987, and ICD-10 from 1997.

#### *Variables used:*

*Externally caused death* was defined through the diagnoses E80–E99 (ICD-9) and V, X and Y (ICD-10). Deaths with other diagnoses were defined as *non-violent deaths*.

*Suicide* was defined through the diagnoses E95 and E98 (ICD-8 and ICD-9) and X60–X84 and Y10–Y34 (ICD-10). *Cardiovascular disease* was defined through the diagnoses 340–459 (ICD-9) and I01–I98 (ICD-10)

### **Patient Register**

The National Patient Register contains information on in-patients in public hospitals and psychiatric care. It has complete coverage from 1987, but for psychiatric care coverage is good from 1973. Responsibility for the register has lain with the National Board of Health and Welfare. Medical diagnoses are classified according to the ICD. In Sweden ICD-8 was used from 1969, ICD-9 from 1987, and ICD-10 from 1997. A main diagnosis is missing is 1% of cases. Missing psychiatric diagnoses are 6%, due to geographical differences in reporting. All injuries and poisonings are attached with a separate diagnosis (E-code). In about 3.1% of E-coded cases, a diagnosis is missing (156).

*Variables used:*

*Psychiatric diagnosis* was defined through the diagnoses 290–309 (ICD-8), 290–313 (ICD-9), and F00–F69 (ICD-10). *Suicide attempt* was defined through the diagnoses E95 and E98 (ICD-8 and ICD-9), and X60–X84 and Y10–Y34 (ICD-10). *Alcohol-related* was defined through the diagnoses 291, 303 and 980 (ICD-8); 303, 305A, 980, 571A, 571B, 571C, 571D and 291W (ICD-9); and, F100–F103, T51 and K70 (ICD-10).

### **Population and Housing Censuses**

Population and housing censuses were conducted every five years in Sweden from 1930 up until 1990. They encompass the total population registered in Sweden on 1 November of the year in question. The population and housing censuses from 1960 contain data on all individuals who live in the same dwelling. From data on household situation and civil status, information on parents and children can be derived. That is, the relationships considered are social rather than biological. The following variables were used:

*Socioeconomic position:* Socioeconomic position derives from a classification of the working population based on the individual's occupation. The classification stems from the concept of social class. Occupations are grouped according to socioeconomic group (Manual workers, Non-manual employees, Self-employed, and Non-classified). Within groups, distinctions are made according to the general level of educational requirements, measured in years of post-compulsory schooling (Unskilled worker, less than 2 years; Skilled worker, at least 2 years; Assistant non-manual employee I, less than 2 years; Assistant non-manual employee II, 2 years; Non-manual employee at intermediate level, 3 years; Non-manual employee at higher level, six years; Self-employed (non-employed academics), six years; and Farmers, no general educational requirements. The classification is standard and described in 'Meddelanden i samordningsfrågor' (MIS) 1989:5 (157). Information on the conscripts' socioeconomic position was available in the census of 1990. Information on the socioeconomic position of the household in childhood was obtained from the census of 1960 according to the principle of dominance, of parents or other heads of household. Linkage was possible due to the Multi-Generation Register, a research register covering all persons ever registered in Sweden since 1961, and these persons' biological and adoptive parents (158).

*Crowded housing:* Information on crowded housing was obtained from the mother's census of 1960. Any household with more than two persons per room (kitchen not included) was, at the time of the census, classified as living in crowded housing by Statistics Sweden (159).

## **Total Population Register**

*Immigration and emigration:* Date of immigration/emigration was obtained from the Total Population Register. The Total Population Register encompasses all residents in Sweden, and is therefore based on the same administrative register as the Cause of Death register.

### **4.1.2 Stockholm population 1990/91**

The population consisted of all residents of Stockholm during 1990 and 1991 (officially residing in Stockholm 31 December 1989, 31 December 1990, and 31 December 1991), who in 1990 were between the ages 24 and 58 (men: N = 386,885, and women: N = 384,183). Information on labour market status, sickness absence, socioeconomic position, age and sex were obtained from LOUISE 1990–1993. Information on mortality 1992–1995 for the population was obtained from the Cause of Death register.

#### *4.1.2.1 Registry data on the Stockholm population 1990/91*

### **LOUISE**

From 1990, the statistical register LOUISE contains yearly information on education and labour market position, which is collected from various administrative registers. Everyone 16 years or older residing in Sweden on 31 December is included. The following information on residents of Stockholm during 1990 and 1991 was used:

*Unemployment:* Unemployment information for the years 1990–1992 was based on total yearly cash unemployment benefits from any of the unemployment insurance funds and general cash labour market assistance, as reported to the Swedish Tax Agency by the unemployment insurance funds or the Swedish Social Insurance Agency. For study 3, we calculated days of unemployment from information on unemployment benefits and cash labour market assistance and income.

*Income:* Information on income is total yearly gross cash wages or salary, according to reports by employers to the Swedish Tax Agency.

*Sickness absence:* All residents in Sweden 16 years or older are encompassed by the social insurance scheme and entitled to sickness insurance benefits. In the early 1990s, the compensation level was 90% of the individuals' gross income from paid employment from the previous year, but could not exceed SEK 222,750 in 1990 and SEK 241,500 in 1991 (if their previous earnings exceeded a certain amount). Before 1992, there was no waiting period; sickness was compensated from the first day of sickness. Information on yearly amounts, as reported by the National Swedish Social Insurance Board to the Swedish Tax Agency, is available. In Sweden, the unemployed are entitled to sickness insurance benefits when they are too ill to be able to take on paid employment.

*Disability pension:* As part of the social insurance scheme, anyone between 16 and 65 years of age can be granted disability pension if their working capacity is impaired by at least 50% due to poor health. The compensation level is based on previous income,



with a minimum and a maximum. Information is available on the individual's yearly amount of benefits received from the National Swedish Social Insurance Board.

*Education:* Education is registered according to Swedish educational terminology, based on information from the educational registers. Level of education is categorised as: 1) primary and lower secondary, < 9 years, 2) primary and lower secondary, 9 (10) years, 3) secondary school, 4) upper secondary, 5) post-secondary, 2 years or less, 6) post-secondary, 3-4 years, and 7) postgraduate education.

*Socioeconomic position:* Socioeconomic position is based on a classification of the working population according to the individual's occupation. The classification stems from the concept of social class and is described in *Meddelanden i samordningsfrågor (MIS) 1989:5 (157)*. The classification is performed by Statistics Sweden on the basis of the information collected in the Population and Housing Census of 1990. The groups are: 1) unskilled workers, 2) skilled workers, 3) assistant non-manual employees, 4) non-manual employees at intermediate level, 5) non-manual employees at higher level, 6) entrepreneurs and farmers and, 7) not classified.

#### **Cause of Death Register**

Cause and date of death were obtained from the Cause of Death Register. *Suicide* 1994-95 was categorised as ICD-9: E950-959 and E980-989.

## **4.2 STUDY POPULATIONS**

In studies I, II and IV (which examine questions 1, 2, 3 and 6) the Swedish conscription cohort 1969/70, of 49,321 men born in 1949-51, is used.

In study I (examining question 1), the Patient Register and Cause of Death Register were linked to the Swedish conscription cohort 1969/70. 48,391 individuals had full information, and were alive at the start of follow-up for suicide, 1 January 1971. 48,342 were available at the start of follow-up for suicide attempt, 1 January 1973.

The population in study II and study IV (examining questions 2, 3 and 6) consisted of 49,321 men born in 1949-51 who underwent conscription testing in 1969/70. 37,798 were defined as having a strong connection to the labour market before the recession of the 1990s (no disability pension 1991-1992, annual income above SEK 50,000, and receiving no unemployment benefit 1990-91). 7,794 did not have a strong connection to the labour market. 1,377 had died before the start of follow-up, 1 January 1995.

The population in study III (examining questions 4 and 5) consisted of all residents of Stockholm County during 1990 and 1991 (officially residing in Stockholm on 31 December 1989, 31 December 1990, and 31 December 1991) who were between 25 and 58 years-old in 1990. There were 386,885 men and 384,183 women, of whom 324,994 men and 320,127 women who received no disability pension 1990-1993, who had a yearly income of at least SEK 29,700 in 1990 and SEK 32,200 in 1990, and who were alive on 1 January 1994.

### **4.3 STATISTICAL ANALYSIS**

#### **4.3.1 Survival analysis**

In studies I, II and IV, Cox proportional hazard models were used to examine the associations between psychiatric diagnoses and suicide and suicide attempt (study I), unemployment and cause-specific mortality (study II), and unemployment and hospitalisation due to alcohol-related causes (study IV). 95% confidence intervals were calculated around the hazard ratios. Breslow's method for handling ties was used. All Cox proportional hazard models were conducted using the PHREG procedure in SAS version 9.1 (SAS Institute Inc., Cary, NC). In study I, person-years were calculated from 1 January 1971 for suicide, and from 1 January 1973 for suicide attempt. In studies II and IV, person-years were calculated from 1 January 1995. Individuals were censored at date of death/discharge or emigration. Confounding variables were included individually, and also grouped in accordance with order of appearance in the life course (in studies II and IV).

#### **4.3.2 Logistic regression**

In study III, logistic regressions were used to examine the association between unemployment and suicide, and also the association between sickness absence and unemployment. 95% confidence intervals were calculated around the odds ratios. Logistic regressions were performed using the LOGISTIC procedure in SAS 9.1. In this study, all associations were adjusted for age and separate analyses were performed for men and women.

## 5 RESULTS

*Is psychiatric diagnosis measured before or at early labour market entrance associated with suicide and suicide attempt in middle age (study I)?*

Of the 49,321 men born in 1949-51 who in 1969/70 were screened for psychiatric symptoms, 5,780 were diagnosed with a mental disorder diagnosis by a psychiatrist (11.7%). During follow-up there were 624 suicides, 316 occurring in young adulthood and 308 in middle age, and 1,170 suicide attempts, 686 occurring in young adulthood and 484 in middle age.

Psychiatric diagnosis was associated with increased relative risk (HR) of both suicide, HR = 2.7 (2.2–3.2), and suicide attempt, HR = 3.5 (3.1–4.0) 1971/73–2006. For most diagnoses, there was an increased risk of suicide as well as suicide attempt not only in the first time band (young adulthood), but also in the second (middle age). Hazard ratios of suicide and suicide attempt in middle age (years 1989–2006) for persons with a psychiatric diagnosis were 2.1 (1.6–2.7) and 2.6 (2.1–3.1), respectively.

*Are there associations between poor health, negative health-related behaviours, and negative personality measures in late adolescence and risk of unemployment in middle-aged Swedish men (study II, study IV)?*

Of the persons in the original cohort (49,321) with a strong connection to the labour market 1990–91 (n = 37,798), 5,410 experienced unemployment 1992–94, of whom 4,263 were unemployed 90 days or more. Comparisons showed that risk factors were most prevalent among the 7,794 persons with a weak connection to the labour market (study II). Psychiatric diagnosis at age 18 was more than twice as common among the excluded/dead at follow-up as among the employed, and registry information on psychiatric diagnosis was between 5 and 14 times more common than among the employed.

Compared with the employed, higher prevalence of all risk factors was found among the unemployed (studies II and IV). The greatest difference in prevalence between the employed and unemployed was found for previous hospitalisation due to alcohol-related diagnosis; of the persons unemployed 90 days or more 1992–1994, 2.2% had been hospitalised 1973–83, compared with only 0.6% of the employed. The prevalence of hospitalisation due to alcohol-related diagnoses in the period 1984–91 showed a very similar difference, 0.6% for the employed and 2.5% for the unemployed. Also, there was a large difference in the prevalence of high sickness absence between the employed and the unemployed; more than 21% of the unemployed 90 days or more in 1992–1994 belonged to the high sickness absence group in 1990–91, compared with 8% of the fully employed.

*To what extent are the associations between unemployment and all-cause and cause-specific mortality among Swedish middle-aged men explained by pre-existing risk factors (study II)?*

Analysis of the 37,798 individuals with a strong connection to the labour market in 1990–91 showed that those who became unemployed 1992–94 ( $n = 5,410$ ) had increased risk of all-cause mortality from natural causes, including CVD, and also from external causes, both from suicide and from causes other than suicide 1995–2003.

All risk factors except childhood social class were significantly associated with all-cause mortality, and with most of the other outcomes considered. Childhood social class was significantly associated with mortality from CVD. Persons in the highest sickness absence quartile had the highest risk of all studied mortality outcomes except CVD and violent death other than suicide, for which the associations with low income were higher.

Controlling for ill-health or risk factors for ill-health diluted the associations between unemployment and types of mortality in 1995–2003 by 54–89%. The single strongest confounder, for all outcomes, was sickness absence, which alone reduced the crude estimates by 39–50%. After controlling for potential confounders, statistically significantly increased relative risks remained for all-cause mortality, HR = 1.30 (1.06–1.58) and mortality from external causes, HR = 1.55 (1.01–2.37) in 1995–2003.

Analyses were re-run with follow-up split into two time bands, 1995–98 and 1999–2003. Relative risks were more pronounced in the first period for all outcomes except CVD. Controlling for confounders reduced this excess risk by between 32% and 81%; significant HRs, of all-cause mortality of 1.57 (1.13–2.18), of mortality from external causes of 2.16 (1.24–3.78), and of its subcategory violent death other than suicide of 3.46 (1.33–9.00) remained. In the second period, relative risks were reduced by 72–100% in comparison with the crude relative risks, and no statistical significance remained.

*Is there an association between poor health in terms of sickness absence and later risk of unemployment among Swedish men and women (study III)?*

Between 1992 and 1993, 39,668 of the men and 35,279 of the women in the 1990/91 Stockholm population were unemployed (registered recipients of unemployment insurance benefits or cash labour market assistance). Among those from lower socioeconomic positions, of younger ages and in poorer health (indicated by higher sickness absence 1990-91), unemployment was more common.

Unemployment prevalence ranged from 8% among men with the lowest number of sickness absence days (60% of the population) to 28.8% among those in the highest quintile. For women, the corresponding range was 8 to 19.3%.

For both men and women, longer sickness absence 1990–91 significantly increased the odds of unemployment 1992–93, compared with those with less than 14 days of sickness absence. In the multivariable analysis, adjusted for age, socioeconomic position and unemployment during the two previous years (1991 and 92), the odds ratios of unemployment for men (in categories of sickness absence with 0–15 days as reference) were: 16–34 days OR = 1.66 (1.61–1.71), 35–62 days OR = 2.27 (2.18–2.35), > 62 days OR = 2.70 (2.60–2.80). Corresponding odds ratios for women were: 16–34 days OR = 1.35 (1.31–1.39); 35–62 days OR = 1.58 (1.52–1.64); > 62 days OR = 2.00 (1.93–2.07).

*To what extent is the association between unemployment and suicide among Swedish men and women explained by health-related confounding (study III)?*

Among the 324,994 men and 320,127 women in the Stockholm population, 171 men and 78 women committed suicide in 1994–95. Among those unemployed 1992–93 (39,668 men and 35,279 women), there were increased risks of suicide during 1994–95 for both men and women. After including socioeconomic position and sickness absence in the multivariable model, the relative risks declined.

In the full model, the odds ratios of suicide for men with unemployment 1–90 days and more than 90 days were 1.49 (0.72–3.09) and 1.54 (0.98–2.42), respectively. For women, the corresponding odds ratios were 1.84 (0.80–4.23) and 0.85 (0.38–1.90). Only unemployment more than 90 days for men was close to statistically significant. Excluding sickness absence and socioeconomic position from the model increased this point estimate by 40% (that is, controlling for these factors reduced the odds ratios by about 50%). Sickness absence was the strongest confounder. For women, excluding control for previous unemployment, a group with a high risk of suicide, increased the OR of unemployment 0–90 days from a non-significant OR of 2.10 (0.91–4.85) to a significant OR of 2.68 (1.23–5.85).

*To what extent is the association between unemployment and hospitalisation due to an alcohol-related diagnosis among Swedish middle-aged men explained by pre-existing risk factors (study IV)?*

Among the studied 37,798 middle-aged men with a strong connection to the labour market, 759 were hospitalised due to an alcohol-related diagnosis between the years 1995–2006. Those unemployed in 1992–94 had statistically significantly increased risks of hospitalisation due to an alcohol-related diagnosis.

When entering pre-existing risk factors into the regression model, the association decreased, indicating that part of the association between unemployment and the outcome was due to confounding. For those unemployed 1–89 days, and more than 89 days, controlling for ill-health or risk factors for ill-health diluted the associations with hospitalisation in 1995–2006 by 58% and 69%. For both unemployment groups

statistically significantly increased relative risks remained: unemployment <89 days HR = 1.52 (1.10–2.10), unemployment >89 days HR = 1.61 (1.36–1.92).

Analyses were re-run with follow-up split into three time bands, 1995–98 (t1), 1999–2002 (t2), and 2003–06 (t3) In table 1 the reducing effect of each confounder and also relative risks from multivariable regression, with risk factors added to the model, grouped in order of their appearance in the life course, are shown. Relative risks were most pronounced in the first period, but declined between the second and the third period. In the first two periods, the relative risks were attenuated by between 43 and 87% after the addition of confounders. In the fully adjusted model, relative risks were very similar for these periods: (t1: unemployment <89 days HR = 1.70 (1.08–2.67), >89 days HR = 1.74 (1.36–2.24); t2: unemployment <89 days HR = 1.76 (0.97–3.19), >89 days HR = 1.74 (1.25–2.43)). In the last time band, 2003–06 (t3), the relative risk of alcohol-related diagnosis was statistically significant only for persons with >89 days of unemployment (crude); this relative risk was attenuated by 74% when including confounders (fully adjusted HR = 1.25 (0.87–1.80)).

For all years, sickness absence had the greatest reducing effect on the unemployment-hospitalisation association. Sickness absence explained as much, or more, of the association between unemployment and hospitalisation than risk factors in childhood/late adolescence and previous hospitalisation combined (table 1).

**Table 1. Associations between unemployment, 1-89 and > 89 days, and alcohol-related hospitalisation. Crude and adjusted hazard ratios (HRs) with 95% confidence intervals (CIs).**

	<b>T1: 1995-98</b>		<b>T2: 1999-2002</b>		<b>T3: 2003-06</b>	
	<b>1-89 days</b>	<b>90- days</b>	<b>1-89 days</b>	<b>90- days</b>	<b>1-89 days</b>	<b>90- days</b>
	HR 95% CI	HR 95% CI	HR 95% CI	HR 95% CI	HR 95% CI	HR 95% CI
<b>Crude</b>	<b>2.82 (1.80-4.41)</b>	<b>3.74 (2.96-4.74)</b>	<b>2.34 (1.30-4.21)</b>	<b>2.88 (2.11-3.94)</b>	<b>1.43 (0.70-2.90)</b>	<b>1.96 (1.39-2.77)</b>
Crowded housing 1960	2.79 (1.78-4.36)	3.68 (2.90-4.66)	2.30 (1.28-4.15)	2.82 (2.06-3.85)	1.40 (0.69-2.85)	1.91 (1.35-2.70)
Childhood SEP 1960	2.75 (1.76-4.31)	3.70 (2.92-4.68)	2.29 (1.27-4.12)	2.81 (2.05-3.84)	1.40 (0.69-2.84)	1.93 (1.36-2.72)
Risk use of alcohol 1969	2.64 (1.69-4.14)	3.32 (2.62-4.21)	2.21 (1.23-3.98)	2.58 (1.89-3.53)	1.38 (0.68-2.81)	1.86 (1.31-2.63)
Smoking 1969	2.61 (1.67-4.09)	3.34 (2.63-4.23)	2.20 (1.22-3.96)	2.63 (1.92-3.60)	1.34 (0.66-2.73)	1.80 (1.27-2.54)
Psychiatric diagnosis 1969	2.71 (1.73-4.25)	3.52 (2.78-4.46)	2.29 (1.27-4.12)	2.78 (2.03-3.80)	1.40 (0.69-2.86)	1.91 (1.35-2.70)
Low emotional control 1969	2.72 (1.74-4.26)	3.53 (2.79-4.47)	2.29 (1.27-4.12)	2.77 (2.03-3.79)	1.41 (0.69-2.86)	1.92 (1.36-2.72)
Police/childcare contact 1969	2.64 (1.69-4.14)	3.36 (2.65-4.26)	2.21 (1.23-3.98)	2.62 (1.92-3.59)	1.38 (0.68-2.80)	1.85 (1.31-2.62)
<b>Adjusted for all the above</b>	<b>2.41 (1.54-3.78)</b>	<b>2.85 (2.24-3.63)</b>	<b>2.05 (1.14-3.70)</b>	<b>2.29 (1.67-3.15)</b>	<b>1.28 (0.63-2.60)</b>	<b>1.65 (1.16-2.35)</b>
<b>% reduction in HR</b>	<i>22.40</i>	<i>32.51</i>	<i>21.55</i>	<i>31.33</i>	<i>22.99</i>	<i>31.28</i>
Psychiatric diagnosis 1973-91	2.15 (1.37-3.39)	2.58 (2.02-3.30)	2.09 (1.16-3.77)	2.44 (1.77-3.35)	1.33 (0.65-2.71)	1.77 (1.27-2.51)
<b>Adjusted for all the above</b>	<b>2.01 (1.28-3.16)</b>	<b>2.29 (1.79-2.93)</b>	<b>1.90 (1.05-3.43)</b>	<b>2.06 (1.50-2.815)</b>	<b>1.22 (0.60-2.48)</b>	<b>1.52 (1.07-2.16)</b>
<b>% reduction in HR</b>	<i>44.42</i>	<i>52.23</i>	<i>32.91</i>	<i>43.46</i>	<i>48.15</i>	<i>42.83</i>
SEP 1990	2.51 (1.6-3.94)	3.23 (2.54-4.11)	2.25 (1.24-4.06)	2.73 (1.98-3.76)	1.34 (0.66-2.74)	1.82 (1.28-2.59)
Education 1990	2.44 (1.56-3.83)	3.15 (2.48-4.00)	2.09 (1.16-3.77)	2.51 (1.83-3.44)	1.30 (0.64-2.56)	1.75 (1.23-2.48)
Income 1990-1991	2.29 (1.46-3.59)	2.82 (2.22-3.58)	2.14 (1.19-3.86)	2.54 (1.85-3.49)	1.28 (0.63-2.60)	1.69 (1.19-2.40)
Sickness absence 1990-1991	2.00 (1.28-3.14)	2.13 (1.67-2.71)	1.87 (1.04-3.38)	1.97 (1.42-2.72)	1.17 (0.57-2.39)	1.42 (0.99-2.03)
<b>Full model</b>	<b>1.70 (1.08-2.67)</b>	<b>1.74 (1.36-2.24)</b>	<b>1.76 (0.97-3.19)</b>	<b>1.74 (1.25-2.43)</b>	<b>1.05 (0.52-2.15)</b>	<b>1.25 (0.87-1.80)</b>
<b>% reduction in HR</b>	<i>61.70</i>	<i>72.86</i>	<i>43.13</i>	<i>60.67</i>	<i>87.38</i>	<i>74.18</i>

## 6 DISCUSSION

*Is psychiatric diagnosis measured before or at early labour market entrance associated with suicide and suicide attempts in middle age? (study I)?*

In study I, the long-term association between psychiatric diagnosis at age 18 and suicide and suicide attempt was examined. The main finding was that most diagnoses were predictive of suicide and suicide attempt in young adulthood, and also in middle age. There was very little decline in relative risks.

A main advantage is that psychiatric diagnoses is measured before, or at an early stage of labour market entry, which makes them unlikely to be a consequence of individual labour market circumstances. The study of psychiatric diagnoses in a total population is warranted from a methodological point of view. Many studies investigate psychiatric diagnoses in cases identified through contact with hospitals or through surveys. In those cases, there is always a possibility that the exposure, i.e., mental illness, affects the probability of being included in the study, which might give the wrong prevalence and possibly bias the estimate of the studied outcome (160-168).

Previous studies of non-patient materials (169-172), including earlier studies of the cohort used here (173, 174), have shown that psychiatric diagnosis predicts suicide and suicide attempt. Few have had the opportunity to follow up psychiatric diagnoses over an extended period. An increased long-term risk of suicide associated with psychiatric diagnosis was also shown in the Swedish Lundby Study, of a total rural population of 3,563 individuals who were interviewed and diagnosed by psychiatrists (169), and in a 17-year follow-up of a sample of 8,000 individuals in Finland (170). In a 9½-year follow-up of a random sample of 2,283 individuals in Stockholm County, Sweden, who were examined by psychiatrists, all suicides had been given a psychiatric diagnosis (171). These studies had, however, few deaths in many of the diagnostic groups, which included individuals with milder depression. Also, this study showed that common disorders are associated with increased risk of suicide and suicide attempt.

*Are there associations between poor health, negative health-related behaviours, and negative personality measures in late adolescence and risk of unemployment in middle-aged Swedish men? (study II, study IV)*

In studies II and IV, the prevalence of pre-existing risk factors was examined among persons with a strong attachment to the labour market who later lost their jobs during recession or were to keep their jobs. In study II, there was also an examination of prevalence among persons excluded due to weak labour market attachment, and among those had died before follow-up. It was found that risk factors were more prevalent among the dead at follow-up in middle age, and also among those defined



as having a weak labour market attachment, than among those included in the study. All risk factors were, however, more prevalent among job losers than among the stably employed. The differences in psychiatric diagnosis between the groups were extensive; for example, age-18 psychiatric diagnosis was about 50% more common, and a psychiatric diagnosis collected from inpatient registers twice as common among persons unemployed 90 days or more as among the fully employed. This finding is in conflict with statements made in the reporting of previous studies that have suggested that mental health problems are predictive of being out of the labour force rather than of being unemployed (15). Risk use of alcohol at age 18 was more prevalent among the unemployed, but even larger alcohol-related differences were found for hospitalisation with an alcohol-related diagnosis. There was also a large difference in the prevalence of high sickness absence; more than 21% of persons who later became unemployed belonged to this group, compared with 8% of the fully employed. That is, observable differences in health were related to later unemployment.

Health-related selection into unemployment has been established in several settings. Psychiatric diagnoses, both those identified through interviews in the general population and those from registers, are associated with unemployment (96, 99, 101). The higher sickness absence among the unemployed found in studies II and IV is similar to studies from Finland (104), the Netherlands (105), and a previous Swedish study, which showed that sickness absence predicted job loss when entering the recession of the 1990s (106).

*To what extent are the associations between unemployment and all-cause and cause-specific mortality among Swedish middle-aged men explained by pre-existing risk factors? (study II)*

In study II, job-loss in middle-aged men was found to be associated with increased risk of mortality, and more specifically with mortality from external causes, both suicide and other externally caused death, and non-violent death, including CVD. Controlling for confounding showed that the association between job loss and mortality to a large extent was due to confounding; those who lost their jobs had poorer health or risk factors for poor health already before job loss, which biased the excess risk associated with unemployment upwards. Controlling for confounders explained 54–89% of the excess risk associated with unemployment. In the fully adjusted model, only all-cause mortality and mortality from external causes remained significant. For suicide during the first four years, the reduction was 65%. This is similar to the reducing effect of mental disorders suggested by sensitivity analysis in a three-year follow up of suicide of New Zealand 1991 census data (34).

Proximal risk factors had a stronger reducing effect than distal; in the multivariable models however, it was shown that proximal risk factors provided little additional explanation. One interpretation is that they had a mediating effect. Sickness absence, the proximal risk factor which explained most of the excess risk, could reflect accumulation of ill-health and risk factors caused by earlier risk factors. Sickness

absence has previously been found to be associated with mortality from CVD and suicide (102), and to be a risk factor for unemployment (104), but a previous study has found only a small confounding effect of sickness absence on the unemployment-mortality association (2).

The relative risk of mortality declined with time. This has been interpreted in terms of the wear-off of selection. Early studies that lacked the opportunity to examine health-related selection in the association between unemployment and mortality argued that if mortally ill individuals lost their jobs (i.e., the outcome cause exposure), then discarding the first years of follow-up would ensure a better estimate of causal relative risk; the mortally ill would have ‘died off’ (3, 4). In the current study, however, relative risks in the second period were reduced after controlling for the confounders, which indicates that there might have been residual confounding even after the first follow-up period.

*Is there an association between poor health in terms of sickness absence and later risk of unemployment among Swedish men and women (study III)?*

In study III, sickness absence 1990–91 was found to be associated with unemployment 1992–93. Persons with high sickness absence had increased odds of becoming unemployed relative to those with little or no sickness absence, even after adjusting for age, socioeconomic position and unemployment 1990–91. This finding is similar to those found in previous studies in Finland (104), and in the Netherlands (105). A previous register study of about 300,000 individuals, representative of the entire Swedish population, showed that frequency and number of spells of sickness absence in 1989–91, before the recession, predicted unemployment during the recession, 1992–1998 (106).

Morbidity, or some other underlying cause of higher sickness absence, might be the reason for employers to end the employment of persons in poor health. Alternatively, the underlying causes of sickness absence may make it harder to find a new job when the old one ends, through actual or signalled lower employability. In one Swedish study, based on all men and women born in 1953, residing in Stockholm 1963, sickness absence from school (ages 12 and 15) was found to be a strong independent predictor of sickness absence from work (at age 27), and was interpreted as a prevailing pattern across the life-span (175).

There is, to some extent, a flow of individuals between sickness insurance and unemployment insurance (176). In Sweden, the unemployed are entitled to sickness insurance; if the unemployed become too sick to be able to take offered jobs, then, during this period, the individual transfers to sickness benefit. Since unemployment benefits are less generous than sickness benefits, there is little incentive to transfer from sickness benefit to unemployment benefit (176, 177). Hence, the increased OR of unemployment among persons with higher sickness absence is likely to be related to health-related selection.

*To what extent is the association between unemployment and suicide among Swedish men and women explained by health-related confounding (study III)?*

Study III, based on the entire population of Stockholm aged 25–58 in 1990–91, examined the association between unemployment and suicide. It was found that men and women unemployed 1992–93 had an increased risk of suicide 1994–95. Since those who were more often absent from work had a strongly increased risk of becoming unemployed, and also an increased risk of suicide, we controlled for potential confounding by sickness absence. Only unemployment more than 90 days for men was close to statistically significant. Excluding sickness absence and socioeconomic position from the model increased the point estimate the 40%; that is, controlling for these factors reduced the odds ratio by about 50%. Sickness absence was the strongest confounder. In a previous study by our research group, sickness absence alone reduced the hazard ratio of suicide associated with unemployment by 38% (178).

The crude relative risks of suicide for unemployed men (1-90 days OR = 1.74, >90 days OR = 2.07) and women (1-90 days OR = 2.68, >90 days OR = 1.78) were similar to those found by Mäki and Martikainen for registered unemployment in the corresponding time period: 2.08 for short-term, and 2.99 for long-term, unemployed men; and 1.99 for short-term, and 2.40 for long-term, unemployed women (129). In earlier studies of job loss among middle-aged men (178), the relative risk of more than 89 days of unemployment was, during the first four years, 1.76 after adjustment. This is higher than the relative risk found for men in the current study, OR = 1.54, because of the inclusion of younger age groups. In a previous Swedish cohort of nearly 30,000 20–64-year-olds, self-reported unemployment was found to be associated with a relative risk of suicide of 2.5 during 10-17 years of follow-up (31).

In this study, we used sickness absence as a proxy for risk factors for suicide, and showed that part of the unemployment-suicide association was due to confounding. We had no information on the causes of sickness absence, and therefore cannot say why sickness absence is correlated with suicide. Sickness absence with psychiatric diagnosis, but not somatic diagnosis, has been shown to predict suicide (179), but in a Swedish study psychiatric diagnosis was associated with increased frequency and duration of both psychiatric and somatic sickness absence (103). In the previous study by our research group, sickness absence was found to be a mediator of earlier risk factors. In one Swedish study of all men and women born in 1953, residing in Stockholm 1963, sickness absence from school (age 12 and 15) was found to be a strong independent predictor of sickness absence from work at age 27 (175). In a longer follow-up of the same material, sickness absence from school was found to be strongly associated with suicide, with a relative risk of 2.15 (1.11–4.30) (180). It is possible that sickness absence captures not only morbidity, but also mental illness and personality.

*To what extent is the association between unemployment and hospitalisation due to an alcohol-related diagnosis among Swedish middle-aged men explained by pre-existing risk factors (study IV)?*

In study IV, the association between job loss among middle-aged men in 1992–94 was associated with increased risk of hospitalisation due to an alcohol-related diagnosis in 1995–2006. 58% and 69% of the excess risks of hospitalisation 1995–2006 associated with unemployment up to 89 days and more than 89 days were due to confounding. This is a similar finding to those in the US (133) and in Britain (49). In the National Longitudinal Survey of Youth (NLSY) in the US, Mossakowski found that unemployment was associated with increased risk of heavy drinking, but more than 50% of the association was explained by confounding from prior heavy drinking and present socioeconomic status/education. In the British National Child Development Study (NCDS), higher alcohol intake at age 33 was found to be associated with recent and accumulated unemployment, of which 12 to 47% was explained by confounding, including previous consumption.

After controlling for confounders, relative risks remained increased and statistically significant; unemployment <89 days HR = 1.52 (1.10–2.10), >89 days HR = 1.61 (1.36–1.92). This relative risk is similar to those for hospitalisation due to an alcohol-related diagnosis following job loss found in a previous Swedish study (38). The remaining increased risk of unemployment and hospitalisation due to an alcohol-related diagnosis might be causal. Two principal causal mechanisms are possible. Either the unemployed change their alcohol consumption (i.e., increase it), or some other circumstance, related to their job loss, e.g., single status, increases the risk of hospitalisation.

The increased risk of being hospitalised due to an alcohol-related diagnosis was found to be of the same magnitude during the first four and the following four years of follow-up. Thereafter, the relative risks associated with unemployment diminished. It might be that the unemployed, for some reason, decreased their drinking, either because they found a job and recovered, or they found a better coping strategy and recovered.

## 7 METHODOLOGICAL CONSIDERATIONS

### 7.1 UNEMPLOYMENT MEASURE

#### *Registered unemployment*

Unemployment is, in this thesis, defined as being listed as unemployed at the Swedish Public Employment Service (study II and study IV), or being a recipient of unemployment insurance or cash labour market assistance (study III). The Swedish Public Employment Service is the monitoring authority for all unemployment insurance boards. Those who are registered as unemployed or qualify for unemployment insurance or receive cash labour market assistance meet the standard ILO unemployment criteria. More individuals are generally registered as unemployed with the Swedish Public Employment Service than those who report unemployment in the Swedish Labour Force Survey (using the official, ILO-harmonised unemployment categorisation), since this definition also captures part-time unemployment and other under-employment (181).

In principal, not everyone who is seeking work and fulfils the official criteria of being unemployed utilise the Swedish Public Employment Service. However, since registering at the Swedish Public Employment Service is a requirement to be entitled to unemployment benefits from any of the unemployment insurance funds, or the general cash labour market assistance, the great majority of jobseekers without employment will have done so (182).

This thesis relies on registered unemployment data, although many other studies are based on self-reports, and often retrospective unemployment information, e.g., (31-33, 46, 183). Several studies have shown considerable underreporting, even when individuals try to recollect unemployment in the same year (184-188). Jürges showed that underreporting of unemployment was not random; for example, persons who were content with life had better recollection, and those with a weak labour market connection had less recall. The currently unemployed also better recollect unemployment than the currently employed (189). Studies have also shown that women underreport their unemployment; rather, some regard themselves as out of the labour market (185).

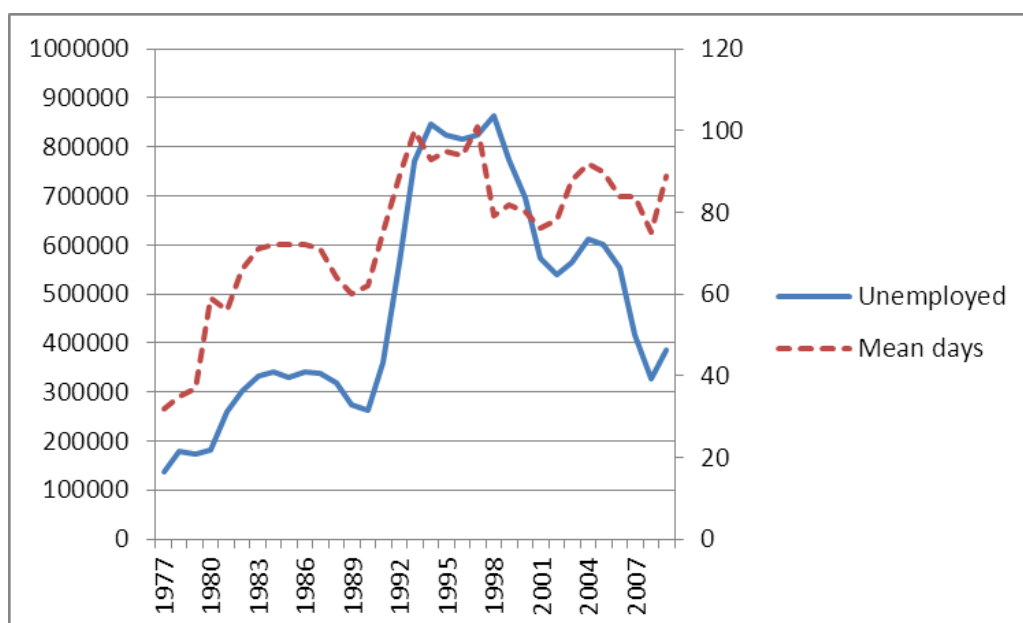
A previous large Swedish study of unemployment and suicide categorised unemployment as reporting seeking work or having disability pension (183). Since taking disability pension is, by definition, a health-related exit from the work force, the relative risk found for the 'unemployed' is most likely confounded by morbidity. In our studies, disability pension is an exclusion criterion.

#### *Duration and incidence*

We differentiate between up to 89 and 90 days or more of unemployment 1992-94 (study II and study IV) and 1992-93 (study III). This distinction is made because a substantial proportion of job losers will make up a group of people with high

employability who nevertheless experience a shorter period as unemployed, before they find adequate new jobs or go back to their former employers (rehiring/temporary layoffs) (190, 191). Those with low employability, e.g., because of inadequate education, ill-health, young or old age, have longer periods of unemployment. Our distinction does not tally with the definition of long-term-unemployment, which in Sweden, both in the Labour Force Survey and within the Swedish Public Employment Service, is unemployment longer than 26 weeks. The majority of newly unemployed at the Swedish Public Employment Service will, however, exit unemployment within three months (192). Figure 2 shows the number (left axis) and mean duration (right axis) of cases of insured unemployment 1976–2009. At the time of the Swedish recession of the 1990s mean days of unemployment increased from 75 in 1991 to 89 in 1992, peaking at 100 in 1993, and then declining to 93 in 1994. It has previously been shown that individuals with less than three months of unemployment have a much better chance of leaving unemployment than those with more than 3 months (191, 193).

**Figure 2. Unemployment 1976–2009, total number (left axis) and mean days (right axis).**



Source: Swedish Unemployment Insurance Board (IAF).

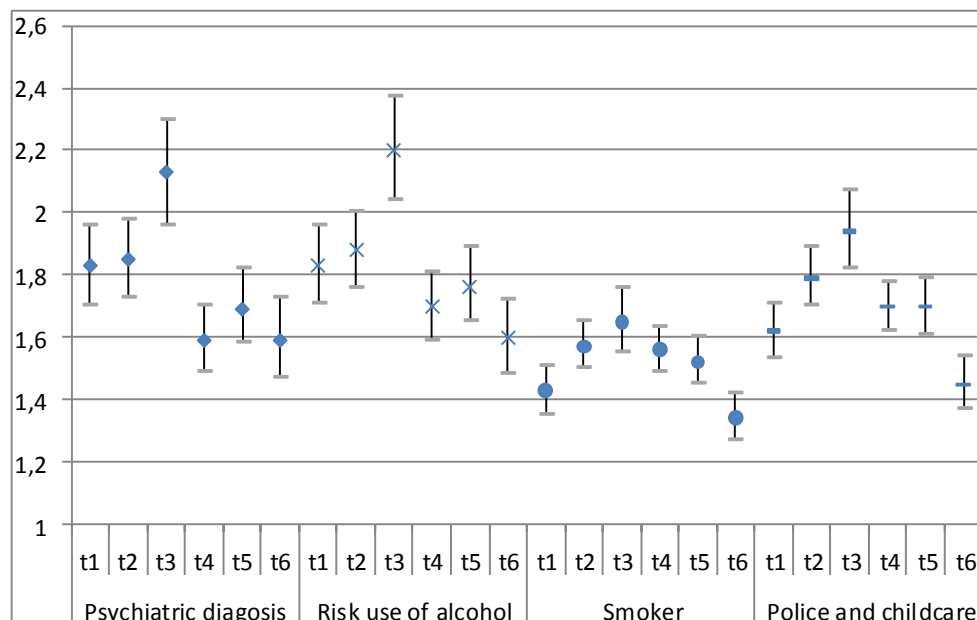
#### *Period and composition*

At any specific point in time, the stock of unemployed will reflect incidence and duration (inflow-outflow). Both incidence and duration are related to levels of demand and supply (vacancies and unemployed). Incidence and duration are also determined by individual factors. In times of low unemployment, the unemployed make up a group of highly unemployable individuals (194). If health is related to unemployment duration (e.g., because of discrimination), which it has been shown to be (70, 86, 195, 196), then the long-term unemployed will have a high mortality risk, even if unemployment has no detrimental effect (107).

A couple of studies argue that, since job loss is more random when unemployment rates are low, the employed and the unemployed become more similar (even the long-term unemployed), and the unemployment-mortality association less biased during such periods (2, 129, 197). Mäki and Martikainen (129) conclude that, since the long-term unemployed have similar hazard ratios for suicide in times of high and low unemployment, there is no bias from health-related selection. In their study, however, they had no opportunity to control for previous health. In this thesis, where the studies were conducted in a period of rapidly increasing unemployment (and thus are “bias-free”), we found that: 1) job losses (incident cases) decreased the association between unemployment and suicide, because the previously unemployed had higher risks (study III); 2) that there was health-related selection into job loss, measured by ill-health and risk factors for ill-health (study II and study III); and 3) the larger part of the association between unemployment and mortality and hospitalisation owing to alcohol-related diagnosis was due to health-related confounding (study II, study III, and study IV).

Figure 2 shows the relative risk of being unemployed (receiving unemployment insurance or cash labour market assistance) in five-year intervals between 1976 and 2005, for individuals with risk use of alcohol, contact with police and childcare authorities, psychiatric diagnosis, and smoking, at age 18 in the Swedish conscription cohort 1969/70. It confirms stronger selection effects at the time of high unemployment, 1985–90 (t = 3), but all risk factors are statistically significantly associated with unemployment across all periods.

**Figure 2. Odds ratio of unemployment in five-year intervals, for individuals with risk use of alcohol, contact with police and childcare authorities, psychiatric diagnosis and smoking, at age 18 (95% confidence intervals in bars).**



Note: t1 = 1976–80; t2 = 1981–4; t3 = 1985–90; t4 = 1991–4; t5 = 1995–2000; t6 = 2001–5

## 7.2 OUTCOME MEASURES

One main outcome, suicide, is in this thesis categorised through the diagnoses E95 and (ICD-8 and ICD-9) and X60–X84 (ICD-10), which comprise externally caused deaths which were doubtless due to suicide, together with E98 (ICD-8 and ICD-9) and Y10–Y34 (ICD-10), which encompass self-inflicted deaths, but with doubt about the cause (undetermined suicides).

In a previous study based on the Swedish cohort of 1969/70, it was shown that externally caused deaths were generally recorded with high accuracy, but revealed several definite suicides among the undetermined suicides (198). Little difference has been shown in risk factors for undetermined and definite suicides; rather, the difference between undetermined and definite suicides is due to availability of information on intent (199). The coding into definite and undetermined cause is made by a physician based on *probable* circumstances, regardless of whether the circumstances were examined or not (200). If the physician used information from previous records, e.g., on depression, to code into definite suicide, then registry information on depression and definite suicide as cause of death is not independent (199). With the inclusion of undetermined suicides, such circularity is avoided.

## 7.3 CONFOUNDER MEASURES

In studies II, III, and IV, the associations between unemployment and mortality and morbidity are controlled for confounding. Of special interest was the confounding effect of psychiatric illness, since psychiatric illness might be a common cause of death from suicide and unemployment. In study III, sickness absence was used as a surrogate indicator of risk factors for ill-health, while studies II and IV utilised information from several sources to capture potential underlying heterogeneity. Generally, information on mental health in the unselected general population is scarce. Patient registers offer reliable diagnoses, but patients represent a selected proportion of the population, a severely ill and care-seeking group (160-162). Sample surveys, of course, risk selective non-response; individuals with a psychiatric diagnosis (163-168) or higher alcohol consumption (201) have been shown to be less inclined to participate in surveys. That is, information on psychiatric illness in the general population is difficult to obtain and often unmeasured. Any misclassification of variables used as potential confounders makes full adjustment impossible (202, 203). Thus, parts of the associations between unemployment and morbidity and mortality, even after adjustment, might be due to residual confounding.

### *Psychiatric diagnoses*

The conscript cohort of 1969/70 was the first to undergo a rigorous psychiatric examination at conscription. Before 1969, the psychiatric examination was handled by ambulating psychiatric units at time of military service – several months after the conscription tests. A high prevalence of mental problems among those who dropped out and relocated (downgraded) within the solitary service system had been noted. Exemption from military service rose from about 5% in 1959-66 to 9.1% in the present cohort of 1969/70, and 11.9% in the following cohort. In the cohort of 1969/70, about



12% received a psychiatric diagnosis, which is fewer than in later cohorts; Otto found that 17.2% among those born in 1953 (tested for conscription in 1971-73) received a psychiatric diagnosis (204).

Since 1969, psychiatric diagnoses have been set in accordance with ICD-8, and several diagnoses have since disappeared. Most likely, these individuals would have received similar diagnoses on the basis of their symptoms. Many studies rely on the American Psychiatric Association's classification, Diagnostic and Statistical Manual of Mental Disorders (DSM). WHO's International Statistical Classification of Diseases and Related Health Problems (ICD) is used for the official Swedish classification of disease. ICD-8, which was used at the conscription testing, and was generally used in Sweden between 1969 and 1986 is basically similar to DSM version II (205). With DSM-III-R, this classification system was radically changed, which hampers comparisons with psychiatric diagnoses in newer data sets.

Comparisons between psychiatric diagnoses in other, older, conscript cohorts and earlier registers have shown good agreement. Patients with what was called psychosis and mental retardation were well identified in the screening and given a corresponding diagnosis, but also patients with neurosis and personality disorders were identified, with diagnoses corresponding to ICD-8 diagnoses 300-309 (206). Since neurosis and personality disorders are harder to identify in the general population than psychosis and mental retardation (which before were identified through the cognitive tests and physical examination), and were also the dominant diagnoses among the exempted, drop outs and the relocated, it is likely that the new screening introduced in 1969 aimed at high sensitivity.

#### *Psychologists' rankings*

The psychologists' rankings were based on what, from a military point of view, constitute positive features, which most likely overlap positive civilian features (207). There is no written explanatory statement for the rankings, but the interviews were semi-structured, ensuring coverage of specific aspects of school, work and family, and adaptation. The reliability of the psychological judgments was tested using inter-rater reliability tests, which showed high consistency between the raters (pairwise correlations  $r \approx .85$ ) (207). *Emotional control* is a ranking of the ability to channel and control nervousness, stress tolerance and disposition to anxiety, where a low rank was assigned to those with lowered function due to psychosomatic symptoms. This ranking is therefore conceptually close to a measure of neuroticism/emotional instability. Previous studies of this cohort have found associations between this measure and suicide (208), alcoholism (208, 209), and disability pension with a psychiatric diagnosis (210).

#### *Questionnaires*

Refusal to participate in the two questionnaires was negligible, at 0.4% and 1.2% (211). Survey questions on the use of alcohol have been reported to provide underestimates of quantities and frequencies of drinking, especially where non-anonymous questionnaires are used. The prevalence of drug use found by these non-anonymous alcohol and drug

use questionnaires has been shown to be lower than that found in later anonymous versions of the same questionnaire in the same setting (212). Record linkage to several registers has shown that validity is good (213).

To what extent are measures of alcohol use and smoking in late adolescence valid in middle age? Alcohol patterns are often described as things that are established early in life. Alcoholism has been shown to have good stability (214, 215). Smoking is a variable believed to capture risk factors for somatic illness, but is also used as a marker of early mental illness or personality. Smoking cessation in this cohort has been shown to be considerable, but inversely associated with mental well-being – the mental well-being that is also associated with taking up smoking (216). Hence, with time the ‘misclassification’ of the variable is non-random, but sensitivity is high.

#### *Registry data*

The accuracy of registry data is largely determined by the centrality of the specific information (217). In this thesis, information on sickness absence is based on sickness benefits from general sickness insurance. This information comes from one of the most central registers, the tax register, and is well-controlled and administered.

Sickness absence is used as a surrogate indicator of ill-health. Several reasons for using sickness absence, as well as illness and morbidity, have been suggested (175). As a measure of health, it is potentially less accurate. Investigations of sickness absence in the Whitehall II study suggest that sickness absence does not solely capture morbidity, but is still an adequate global measure of health. In Sweden, life-course studies have shown that unfavourable childhood conditions manifest themselves in adult sickness absence (175). In times of high unemployment, sickness absence levels decrease (218, 219), possibly because individuals in employment are selected into good health in times of high unemployment, or because incentives to be away from work are lower when unemployment is high. In our studies, the individual days of sickness absence considered were during 1990 and 1991, before the onset of the economic crisis, when incentives should have been unaffected by the threat of unemployment.

## 8 SUMMARY AND MAIN CONCLUSION

The background to this thesis is the higher mortality and morbidity of the unemployed compared with the employed. Unemployment is associated with mortality and morbidity either because unemployment has detrimental effects, or because people with poor health or risk factors for poor health are more likely to lose their jobs or less likely to find jobs. If differences in pre-existing health or risk factors for health before unemployment are not taken into account, estimates of the effects of unemployment might be incorrect. Few studies of the general population have had the opportunity to examine the potential effects of pre-existing differences in health or risk factors for health.

The general aim of this thesis was to examine the associations between unemployment and mortality and morbidity, and the role played by pre-existing ill-health, specifically psychiatric morbidity, in the associations. Several sources of information on health were used.

The first question addressed was: *Is psychiatric diagnosis measured before or at early labour market entrance associated with suicide and suicide attempt in middle age?* Using the Swedish cohort of 1969/70, 49,321 men born in 1949–51, who during mandatory conscription test at age 18 were screened for psychiatric symptoms, and where applicable diagnosed by a psychiatrist, it was shown that psychiatric diagnosis in the general population was associated with suicide and suicide attempt not only early in life but also in mid-life.

The second question, *Are there associations between poor health, negative health-related behaviours, and negative personality measures in late adolescence and risk of unemployment in middle-aged Swedish men?*, was also addressed in the Swedish cohort of 1969/70, by comparing the prevalence of potential risk factors between individuals with a strong (37,798) and weak (7,794) connection to the labour market 1990–91, and between job losers and the employed 1992–94 among individuals with a strong connection to the labour market 1990–91. More poor health and risk factors for poor health, measured between ages 10 and 42, and established on the basis of information obtained from censuses, self-reports, psychological evaluations, psychiatric diagnoses, patient registers, registered sickness insurance, education and income registers, were found among individuals who lost their jobs in the recession of the 1990s, at the ages of about 41–45.

The third question, *To what extent are the associations between unemployment and all-cause and cause-specific mortality among Swedish middle-aged men explained by pre-existing risk factors?*, was addressed by considering the 37,798 individuals among the 49,321 with a strong connection to the labour market 1990–91. Those who lost their jobs 1992–1994 had increased risk of mortality during the following years,

but this was to a large part due to health-related confounding. Controlling for confounders reduced the risk estimated by 54–89%.

The fourth question, *Is there an association between poor health in terms of sickness absence and later risk of unemployment among Swedish men and women?*, was addressed using registry data on the entire population of Stockholm aged 25–58 in 1990–91. It was found (in both men and women) that higher levels of sickness absence, measured through sickness insurance benefits 1991–91, were associated with a higher risk of job loss during the years of recession 1992–93.

The fifth question, *To what extent is the association between unemployment and suicide among Swedish men and women explained by health-related confounding* was also addressed by considering the entire population of Stockholm aged 25–58 in 1990–91. Unemployment 1992–93 was found to be associated with a higher risk of suicide. Controlling for health, indicated by higher levels of sickness absence in addition to socioeconomic position decreased the unemployment-suicide association in men by 50%, indicating that part of the association was due to health-related confounding.

The sixth question, *To what extent is the association between unemployment and hospitalisation due to an alcohol-related diagnosis among Swedish middle-aged men explained by pre-existing risk factors?*, was addressed by considering the 37,798 of the 49,321 conscripts of 1969/70 who had a strong connection to the labour market 1990–91. Those who lost their jobs 1992–1994 had an increased risk of hospitalisation due to an alcohol-related diagnosis during the following years, but controlling for confounders reduced the increased risks by 58–69%. Statistically significant increased relative risks remained even after control for confounding.

The main result is that unemployment was associated with an increased risk of mortality and alcohol-related hospitalisation. Individuals with poor health and risk factors for poor health had an increased risk of unemployment. When taking into account that the unemployed had poorer health and more risk factors for poor health, the associations between unemployment and mortality and alcohol-related hospitalisation were strongly attenuated. But, even after controlling for differences in poor health and risk factors for poor health, there was a statistically significantly increased risk of mortality and alcohol-related hospitalisation.

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