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# AMOUNT OF WORK

Studies on premature death and subjective  
health in a work life balance perspective

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# ABSTRACT

The aim of this thesis is to increase knowledge about the association between amount of work and health. Amount of work is measured as unemployment, excessive work, and interference between work and home.

Two studies, based on the Swedish Twin Register, consider amount of work in work-related settings and focus on mortality in both sexes (n=20 632). Two studies take into account demands from both professional and domestic settings and consider their impact on subjective health (n=6 800).

Unemployment had a strong effect on suicide among women and on death by external undetermined causes among men. For women, the relationship was strengthened by use of sleeping pills and tranquillizers as well as by personality. For men, this applied to low level of education, long-term illness and use of sleeping pills. Overtime work and 'extra work' were both associated with premature death among women. Among men, this applied only to 'extra work'. Working less than five hours' overtime per week was related to a reduced risk of premature death among men.

Work-home interference was associated with impaired sleep quality and suboptimal self-rated health. These associations disappeared among women, but not among men, when adjusted for lack of unwinding. Part-time work lowered the odds for suboptimal subjective health. Only among full-time working men was an association observed for use of medication. Home-work interference was associated with impaired sleep quality and suboptimal self-rated health among full-time but not part-time workers. The associations with sleep quality disappeared when adjusted for lack of unwinding but not those with self-rated health.

Working women experienced interference arising from both professional and domestic settings simultaneously and they also lack unwinding. Women with qualified, demanding and time-inflexible work constituted a high-risk group since they had the most significant excessive odds of suboptimal self-rated health that remained when lack of unwinding was controlled for.

In the absence of a work-life balance, unhealthy stress may arise, and health may be threatened. The health outcomes encountered in this thesis can partly be explained by a long lasting activation of the body's stress systems. Physiological activation, allostatic load, is here considered in its role as a link between amount of work and health.

## LIST OF PUBLICATIONS

The thesis is based on the following papers, which are referred to in the text by their Roman numerals.

- I. Voss M, Nylén L, Floderus B, Diderichsen F, Terry P. Unemployment and early cause-specific mortality: a study based on the Swedish twin registry. *Am J Public Health* 2004;94(12):2155-2161.
- II. Nylén L, Voss M, Floderus B. Mortality among women and men relative to unemployment, part time work, overtime work, and extra work: a study based on data from the Swedish twin registry. *Occup Environ Med* 2001; 58(1):52-57.
- III. Nylén L, Melin B, Laflamme L. Interference between work and outside work demands relative to health, unwinding possibilities among full-time and part-time employees. *Submitted*
- IV. Nylén L, Melin B, Laflamme L. Interplay between sources of interference, unwinding, work characteristics and health - a study among working women. *Submitted*

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Paper II has been reprinted with permission from the BMJ Publishing Group.

### *Ethics approval*

All studies forming the thesis were reviewed and approved by ethical committees. The first two, by the ethical committee of Karolinska Institutet (Dnr. KI 99-116) and the last two by the Regional Ethical Review Board in Stockholm (Dnr. KI 00-413 and KI 2005-486-31).

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## INTRODUCTION

Many individuals experience conflicting time demands and often have a feeling that they lack time. These experiences can engender stress. In general terms, when stress increases, and/or time for rest and recovery decreases, there is a risk of weakened health. Many factors play an important role in maintaining a balance between stress and recovery, factors associated with working life and private life as well as with the individuals' physical and psychological status.

Both prolonged unemployment (i.e. absence of work) and excessive work either in the form of paid overtime or caused by the double burden of combined paid work and domestic duties, can both cause stress reactions and, can in the long run, have negative health consequences for the individual. But this is not an individual matter only. A healthy population is an advantage both for companies and organisations and on a national level. In order to facilitate an active and health-promoting working life, it may well be necessary to deal with the experience – and consequences – of the imbalance between amount of work and other aspects of life.

In this thesis, attention is paid to that stage of life when a person is involved in the workforce, either without or with employment, full- or part-time, and focus is placed on the association between amount of work and health. Amount of work is conceptualized as no time in paid work e.g. unemployment, as overtime or part-time in paid work, and as the cumulative effect of paid work and domestic unpaid work (i.e. interference). Health is measured in terms of premature death and subjective health.

## AMOUNT OF WORK

The percentage of women and men within the Swedish workforce has been relatively stable over the last 30 years as shown in Figure 1. It has varied between 3.9 million to 4.5 million from 1975 to 1990. Today women work almost as much as men, and the current size of the work force is about 4.2 million.<sup>1</sup>

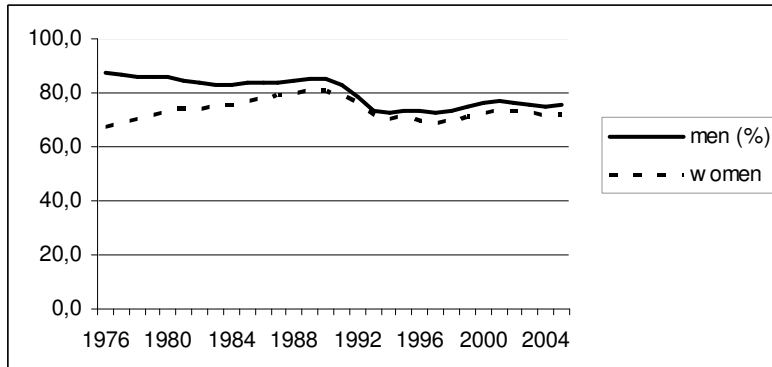


Figure 1. Employed women and men in Sweden during 1976-2005, given in percent (Statistics Sweden 2006).

## Unemployment

The rate of unemployment has varied over the years, as seen in Figure 2. In Sweden, after being relatively low and stable, one to three percent, between 1976 and 1990, it reached a peak of eight percent in 1993. In 2006, 6.3 percent are currently unemployed, of whom slightly more are men. About 30 years ago, in 1976, the situation was the reverse with thirty percent more women than men being unemployed.<sup>1</sup>

Unemployment is included in this thesis as a particular type of amount of paid work, representing a situation where paid work is absent but where the individual would prefer to work.

Unemployment is a well-documented predictor of morbidity<sup>2-5</sup> and has been associated with different health parameters, such as increased consumption of health care,<sup>2,4,5</sup> mental illness,<sup>6,7</sup> and mortality.<sup>8-11</sup> In general terms, impaired health is more common among the unemployed than the employed,<sup>12,13</sup> and that the risk of premature death increases the higher the

number of years unemployed.<sup>8</sup> Many studies concern only men, but when women are taken into account, no specific gender differences in mortality risks are seen.<sup>5, 8, 11</sup> Cause-specific mortality studies show that the suicide rate is higher among the unemployed than among the employed,<sup>9, 11</sup> with more pronounced suicide rates among women than among men.<sup>14</sup>

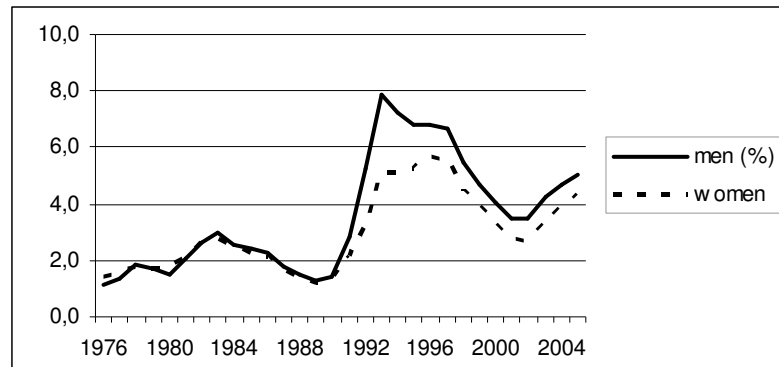


Figure 2. Unemployed women and men during 1976-2005, percentage of the Swedish workforce (Statistics Sweden 2006).

The effect of unemployment on health also depends on the labour market context,<sup>15, 16</sup> and its effect is not as remarkable in periods of relatively high unemployment.<sup>17</sup> It varies also across various strata of the workforce, where it has been observed that young people may prefer being unemployed rather than having a job they do not want.<sup>18-20</sup>

Different understandings of the relationship between unemployment and health have been suggested. For some individuals, not having a job is seen as an extreme stress factor that triggers physiological reactions, including increased secretion of stress hormones detrimental to health.<sup>21</sup> Also, the importance of an optimum balance between demands and control over the situation has been emphasized.<sup>22-24</sup> A decrease in income due to the unemployment, leading to a strained financial situation with limited freedom of action and lower personal standard,<sup>25</sup> is an additional reason for health

impediment among the unemployed. In some contexts, unemployment may also cause feelings of shame and worthlessness.<sup>26</sup> Some have posed that unemployment can be harmful due to a lack of the vital functions associated with gainful employment.<sup>27</sup> These functions consist of time structure of the working day, participation in common goals and activities, social relations and activities outside the family, personal status/identity and creation of activity. Another model, the Warr's vitamin model, does not make any distinction between employed and unemployed and focuses instead on the interplay between the individual and the environment.<sup>28</sup> Unemployment has also been considered as a status passage, i.e. a process leading from employment to unemployment, instead of a comparison between employed and unemployed individuals.<sup>20</sup>

### **Part-time and overtime in paid work**

Not only absence of paid work but also the length of the working day constitutes a stress factor that may trigger physical stress reactions leading to negative health consequences.

**Part-time.** Part-time work, compared to full-time work, is associated with greater scope for balancing the demands of work and those of home.<sup>29-31</sup> When part-time workers are burdened with overtime work, this scope diminishes and negative work-home interference occurs.<sup>30</sup> In Sweden, as in many other countries, women make up the majority of part-time workers, most often as a result of family responsibilities.<sup>32</sup> In Sweden, in 2005, 36 percent of women worked part-time compared to 11 percent among men, as shown in Figure 3.<sup>1</sup>

The advantages and disadvantages of “voluntary” part-time work (i.e. working part-time because one wants to) have been discussed.<sup>29</sup> Among other things, it offers a way of finding time to spend with the family or a way of managing one's domestic obligations. Many men in particular work part-time for health

reasons. Involuntary part-time unemployment could be a reason why a person does not work full-time

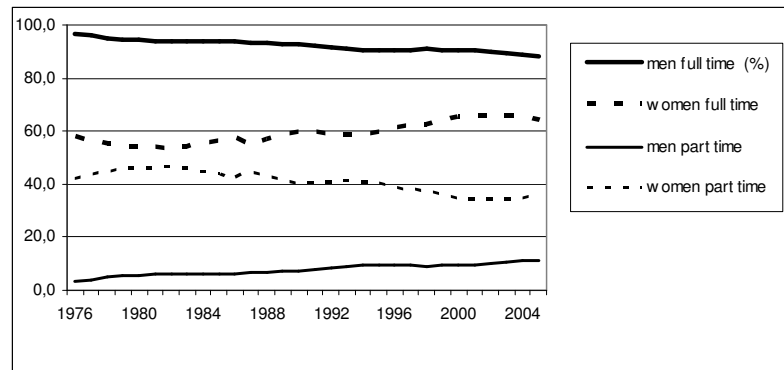


Figure 3. Full-time and part-time work, percentage of employed women and men 1976-2005 (Statistics Sweden).

**Overtime.** In a large number of countries,<sup>33</sup> the amount of overtime in paid work has increased over the years. While the average number of hours worked has been relative stable during the last 20 years in the European Union, there has been an increase in the proportion of individuals working more than 48 hours a week. Studies indicate also that there has been an increase in time spent working at a very high pace and to tight deadlines.<sup>34</sup> In Sweden, men work overtime more often than women, 22 and 15 percent respectively in 2005. Among men working overtime, 6 percent do so without remuneration while the corresponding figure for women is three percent. The number of men reporting overtime as part of their paid work, but without remuneration, has increased from zero (reported) in 1987 to 54 500 men and 23 900 women in 2004.<sup>1</sup>

Overtime work is associated with injury hazards,<sup>35</sup> fatigue and reduced sleep.<sup>36, 37</sup> It has also been linked to the imbalance between demands emanating from work and from home.<sup>38</sup> Both women and men show an impaired ability to recover, but only women have higher blood pressure in connection with overtime work.<sup>39</sup>

The cause of overtime work<sup>36</sup> has a moderating effect on the association between overtime and self-rated health.<sup>40</sup> If an individual's desired working hours correspond with his/her actual working hour, it is beneficial for health.<sup>41</sup> Imposed overtime work, however, is associated with adverse mental health,<sup>42</sup> and low work-time control is associated with poor health and psychological distress among women, but not among men.<sup>43</sup>

Long working hours are associated with cardiovascular disease,<sup>44,45</sup> early retirement caused by disability or illness, subjective poor health and fatigue.<sup>46</sup> For the connection between long working hours and health, two pathways are suggested, one via insufficient recovery and the other via poor lifestyle.<sup>46</sup>

### **Paid work and private life interaction**

For many, paid work does not correspond to the start and end of their working day. At home there is demanding, essential though seldom paid work to be done. Combining paid work with one's private life can be both easier and more difficult depending on the social context.<sup>3,47</sup>

**Total workload.** Total workload, based on the total strain of paid work at a workplace and unpaid work in the home, is of great importance for the understanding of health differences.<sup>48</sup> Also, this total or double workload is distributed differently among women and men. Women work outside their home somewhat less than men but the burden of the two groups becomes more similar when unpaid housework is included in the amount of work.<sup>47,49</sup> Total working hours including paid work, domestic work, and commuting, is associated with sickness absence among both women and men.<sup>50</sup>

**Interaction.** The combination of paid work and private life has often been studied in terms of interaction between the two settings. There is abundant literature analyzing the interplay between the setting of paid work and domestic unpaid work.<sup>51-</sup><sup>56</sup> A series of different concepts are used to describe the interaction,<sup>54,55</sup> e.g. ‘work-family conflict’, ‘work-family interface’, ‘work-family tension’, ‘work-family interaction’, and ‘negative work-family spillover’. The word ‘family’ can be substituted with ‘home’, ‘private life’, ‘non-work’, and ‘outside work life’. In this thesis, the phenomenon is described as ‘work-home interference’ and ‘home-work interference’, since the negative effects both at home caused by demands at work, and at work caused by demands at home, have been considered.

The various different ways of conceptualizing work and private life, as well as the diversity of measures, make it difficult to compare outcomes across studies and across groups. Generally, negative work-home influence is more common than home-work influence with equal prevalence among women and men.<sup>53,56</sup> The first studies in this area consider negative work-home interaction. Then, the positive effects from having access to both work and family are highlighted. At the same time, studies looking at the effects of home-work interaction became more common, and even the fact that men are involved in both work and home duties received attention.<sup>54,55</sup>

The consequences of work-home interaction differ partly due to what antecedents the interaction is defined by. Most studies concern married individuals. There is no consistency in the results according to effect of marital status on the interactions. The relationship between sex and work-home and home-work interaction is low.<sup>56</sup> Considering personality factors, it has been observed that neuroticism and type A behaviour are positively associated with a conflict situation while extraversion and internal locus of control are negatively associated.<sup>57-59</sup> Attitude studies show that a high involvement in one setting is associated

with conflicts originating from the same setting.<sup>54, 60</sup> A gender difference in experiencing the balance between paid work and home has been reported.<sup>61</sup>

The different antecedents that define work-home and home-work interaction found in previous studies are all possible mechanisms in the association with suboptimal health.

**Work-home interference.** Demands at work are associated with negative work-home interference. Individuals reporting job stress, work overload, and pressure at work, have all shown a strong positive association with work-home interaction.<sup>41, 58, 60, 62-64</sup> Amount of time required by the work is the most obvious way that work affects private life and is associated with negative work-home interference.<sup>41, 42, 58, 65</sup>

Reorganisation and downsizing<sup>62</sup> are related to work-family conflicts as well as job insecurity.<sup>66</sup> A high level of decision latitude, job control, or social support at the workplace and in the family are related to a lower level of negative work-home interaction.<sup>58, 59, 66-68</sup> Younger women and men report more negative work-home interaction than their elders.<sup>58</sup>

Self-reported poor physical health,<sup>64, 69, 70</sup> burnout,<sup>52, 66</sup> depression,<sup>67</sup> and sickness absence<sup>71, 72</sup> are found to relate to work-family interaction. Also, specific symptoms such as headache, backache, upset stomach, fatigue, dizziness and chest pain, as well as sleep deprivation, have been observed.<sup>73</sup>

An increased consumption of coffee, cigarettes and alcohol has been observed among individuals experiencing work-family conflicts.<sup>59, 69</sup> Use of medication is positively related to work-home and home-work conflicts.<sup>59, 62</sup>

**Home-work interference.** The demands arising in the domestic setting are related to negative home-work interference. Younger men report a higher degree of negative



interaction than older men.<sup>58</sup> The number of children at home has a bearing on this negative interaction.<sup>64, 66</sup> Women with younger children report more negative interaction than those with older or no children. For men, the age of the children has minor influence.<sup>74, 75</sup>

Poor physical health<sup>69</sup> and psychiatric disorders<sup>76</sup> are related to negative home-work interaction.

## **HEALTH**

The complexity of health can be seen in its definition according to the World Health Organization (WHO). WHO defines health as “the dynamic state of complete physical, mental, social, and spiritual well-being and not merely the absence of illness”.<sup>77</sup> The concept of health has different meanings for different individuals, and it can be measured in a variety of ways. In the western world, health status includes mortality rates, biochemical data, health care consumption, subjective indicators such as self- or other reported morbidity, disability and behavioural data such as smoking, alcohol use, medication, etc.<sup>78</sup>

Health is often measured as morbidity, which in turn includes the three concepts of disease, illness, and sickness. Disease is a state which is defined and categorized by medical science. Illness, on the other hand, describes the subjective experience of ill-health, while sickness is instead defined by the individual’s social role and function within society.<sup>79, 80</sup> How health is measured therefore depends in part on how it is defined. It has been suggested that some of the sex differences found in earlier studies may depend on the symptoms or conditions studied.<sup>81, 82</sup>

### **Premature death**

Death is an absolute state, and mortality rates are commonly used as an indicator of ill-health in epidemiological studies.<sup>80</sup> In public health, mortality in a population is interpreted as “the fewer the premature deaths, the better the health in the

population'. A higher mortality rate in a group means a shorter life expectancy in the same group, as in the case of men having a higher mortality rate than women. Premature death measures the loss of years of productive life and describes death occurring earlier than expected.<sup>78</sup> Also, differences in the causes of premature deaths are of great interest, and cardiovascular diseases, suicides, and death due to external causes have been on the focus of attention when studying the working population, for instance.

### **Subjective health**

Subjective health is an important measurement. Compared to mortality, it can be graded differently, e.g. from excellent, good, fair, poor, to very poor health. Depending on an individual's cognitive conception of their own health<sup>83</sup> and how they define it, the evaluation of their own health comprises different aspects of health.<sup>84</sup> Using subjective measures, the general health level can be assessed in population-based studies and this enables comparisons between different groups within the population.<sup>85, 86</sup>

In spite of different definitions, it has been shown that the evaluation of one's own health has significant predictive potential for both morbidity and mortality.<sup>86-90</sup> No consensus concerning sex differences in the reports of self rating of health has been established,<sup>86, 91</sup> but social and psychological determinant seems to be important for women and behavioural determinants for men.<sup>92</sup> The biological underpinning of self-rated health has been studied and correlations between self-rated health and the biological system have been found. Poor subjective health was found to be associated with higher levels of inflammatory cytokines (involved in sickness behaviour and inflammations) among women, but not among men.<sup>93</sup>

Three indicators of subjective health are considered in this thesis.

**Sleep** affects the biological system and can be described as subjective calmness of sleep, and ease of falling asleep. This is demonstrated in terms of physiological sleep measures such as ‘total sleep time’ and ‘deep sleep’.<sup>94</sup> Sleeping problems can be seen as an early indicator of stress modified by gender.<sup>95</sup> Disturbances in sleep patterns result in impaired recovery and may be linked to disease,<sup>96</sup> mental fatigue,<sup>97</sup> and burnout symptoms.<sup>98</sup> Stroke and heart disease have been documented in association with disturbed sleep among men.<sup>99</sup>

**Self-rated health** includes different aspects of health that one considers important, depending on one’s state of life, life situation, and lifestyle.<sup>84</sup> These aspects can include physical, psychological, and social factors.<sup>91, 100-102</sup>

There are several ways of self-rating health using single questions. The global non-comparative question “how would you rate your own health?” is the most common. The reliability of this measure is high in all age groups and for both women and men.<sup>101, 102</sup> Another alternative is the age-comparative question “how would you rate your own health status compared to others in your age group?”. A third alternative is the time-comparative question “how would you rate your own health status today compared by one year ago?”.<sup>86, 103</sup>

**Medication** is not a common way of measuring health outcomes. Among older people, use of medication/drugs is suggested as a proxy for self-rated health.<sup>104</sup> In Sweden, sleeping pills and tranquillizers are prescription drugs and the individual has to see a doctor to obtain this kind of medication. In Canada, a study on the impact of work-life conflicts on prescription drug use showed that five percent took sleeping pills or tranquillizers and that there was a dramatic increase in costs for medication over time.<sup>105</sup>

## **A WORK-LIFE BALANCE PERSPECTIVE**

Using work-life balance perspective is a concise way of describing the physical and psychological balance between paid work and other aspects of life. This is a perspective that makes it possible to discuss public health and individual health matters in relation to the situation for unemployed individuals, for individuals with different working hours and those saying they experience a negative interference between the paid work and other aspects of life.

A political goal in Sweden is to enable people to combine paid work with having a family and children, by encouraging women to join the workforce, and men to take a greater responsibility for child care. In Sweden, almost as many women as men are gainfully employed. In many other countries, an increasing number of women are entering the labour market. These ongoing socio-economic, demographic, and cultural changes in Europe influence the way in which both women and men organize their lives. These changes have certainly helped to put the work-life balance on the agenda. The integration of paid work and other aspects of life is a main item on the policy agenda of the European Union today. Work-life balance is one of the four key themes for the European Foundation for the Improvement of Living and Working Conditions.<sup>106</sup>

But it is not only a matter for the individual. In their struggle to optimize the utilization of human resources, employers have an economic interest in their employees striking a good balance between work and private life.<sup>107</sup> At the same time, organizational changes and downsizing are leading to an increased amount of work, responsibility and flexibility for some, and unemployment or monotonous work for others.

Work-life balance is also a matter for decision-makers and politicians since this interaction between paid work and private life has resulted in policy changes as a result of a shift in attitudes concerning the responsibilities and demands of paid work vis-à-vis private life.<sup>107</sup>

## Some conceptual models in brief

There are various models proposed in order to explain the relationship between paid work and other aspects of a person's life. The *segmentation model*, also called the *segregation model*, considers work and home as separated from one another and as having no reciprocal influence on each other.<sup>108</sup> The *compensation model* and the *spillover model* represent interaction between the settings. Negative satisfaction at work is compensated for in the domestic setting according to the compensatory hypothesis, while a negative experience at work brings negativity into the domestic setting according to the spillover theories. Spillover has been studied both as a negative and positive phenomenon.<sup>58</sup> These theories have been further developed, testing the hypothesis that the patterns of work/non-work differs between different groups.<sup>109</sup>

Another model is the *instrumental model*, with the main idea of which is that material provided in one setting may be utilized in the other setting. For instance, income in the work setting may help the individual to provide necessities in the domestic setting. According to the conflict model, choices have to be made due to high demands in both settings leading to a conflicting situation with possible overload. Three forms of such conflicts have been distinguished. *Time-based conflict* refers to time pressure from one setting making it physically difficult or impossible to meet the demands from the other setting. *Strain-based conflict* refers to when the demands in one setting drain the energy resources and spill over to the other setting with a subsequent lack of energy. *Behaviour-based conflict* refers to difficulties in combining the attitudes at work with those at home.<sup>60</sup>

A lot of hypotheses concerning the balance between work and the domestic sphere are based on stress theories with a focus on roles. The fundamental theory is that individuals have a certain amount of time and energy to divide between the two settings.

For the *role stress model* and *role conflict model*, the assumption is that the individual's multiple roles are primarily a source of strain and stress and these roles conflict due to expectations of the individual's involvement in both work and family life.<sup>32</sup> Another theory is the *role expansion model* showing that an individual has more to gain than lose from being involved both in work and family life.<sup>32</sup>

Earlier approaches to studying the interaction between the two settings have been criticized for not taking causes and consequences into account and new models have therefore emerged. According to the *congruence model*, similarities between the two settings depend on a third variable acting as a common cause. This model has a lot in common with the spillover model. The *resource drain model* is similar to the role strain models and refers to limited personal time and energy resources that have to be shared between the two settings.<sup>51, 110</sup>

Recent theoretical perspectives suggest models for work-private life studies that no longer focus on the specific relation between work and private life. Some examples are, for instance, the *conservation of resources (COR) model* from the stress and burnout research field which describes an overall struggle to maintain personal resources that turn in to stress reactions if this struggle is lost.<sup>64</sup> Barnett's *fit model*<sup>111</sup> refers to a person's ability to meet the demands from work and private life and how well these demands fit their life situation. According to the *work/family border model*, people are "border-crossers" and the model deals with how individuals manage this border in order to maintain the balance. The more similar the climate in the two spheres, the easier the transition.<sup>112</sup> The *ecological system model* assumes the work-family interface is a "process" based on person, context, and time characteristics.<sup>58</sup> Based on the *effort-recovery model*,<sup>113</sup> work-home interaction has been studied in terms of a process of interaction where ability and willingness to invest time and effort in the different settings are taken into consideration.<sup>114</sup>

## **MECHANISMS - STRESS AND LACK OF UNWINDING**

**Stress** is a way of reacting to changes in the environment – or in one’s situation. An explanation of how the environment “gets under the skin”<sup>115, 116</sup> is the activation of the body’s stress defence systems, which act as a physiological mechanism between the environmental stressor and ill-health. In this thesis, this physiological activation, known as the ‘allostatic load’, is considered in its role as a link between amount of work and health.<sup>117</sup>

Stress can be caused by high demands, quantitative as well as qualitative, i.e. over-stimulation. Under-stimulation may also cause stress, such as when an individual is not able to use his/her knowledge and skills.<sup>118</sup> Both these conditions may result in an increased risk of stress with subsequent health problems.

**Unwinding** has the effect of “charging one’s batteries”. It is often referred to as recovery or recuperation and could be explained as reducing tension and stress through relaxation and/or through social or physical activities.<sup>119, 120</sup> Unwinding includes two dimensions, the duration of the unwinding activities and the quality of the unwinding process. Occasions for, and duration of unwinding have a documented effect on health.<sup>121-124</sup> Women’s leisure time has been found to more likely be fragmented and interrupted than men’s.<sup>125</sup>

Among women, elevated stress hormones are found in the evening after work,<sup>48</sup> and in connection with strenuous work for both women and men.<sup>126</sup> The experience of lack of unwinding, physically, mentally and/or emotionally is individual and varies depending on gender, age, life style, and health.<sup>95, 127</sup> How these factors interact with unwinding has only been sporadically investigated. An increased stress level, combined with a lack of scope for unwinding might cause a malfunction of the mental and biological systems resulting in negative health consequences.<sup>128, 129</sup> It is for example shown that insufficient recovery results in increased allostatic load.<sup>130</sup>

## The allostatic stress model

Disease could be seen in the light of a reaction of the human organism due to a failure to cope and balance the internal environment caused by changes in the external environment.<sup>131</sup> Physiological mechanisms can explain how stressors affect health. The allostatic stress model can be used as the basis for studies of the relationship between stress/recovery and health.<sup>132, 133</sup> It is an explanatory model that describes how a high level of stress and insufficient time for recovery lead to a disturbance in the balancing process that is constantly ongoing in the human body, and how this prolonged activation of the physiological stress systems may ultimately lead to negative health consequences.

There are two main systems involved in the body's stress defence. The sympathetic-adrenal-medullary system (SAM) is activated in the first phase and prepares the body to fight. The activation of the system starts in the hypothalamus and signals are sent via the sympathetic nervous system to the medulla of the adrenal glands, where adrenaline is secreted. The other system is the hypothalamic-pituitary-adrenocortical system (HPA) which is activated in the second phase by the secretion of cortisol. This system is a combined effort by the nervous, endocrine, and immune systems and is called the HPA axis. When exposed to stressors, the HPA axis is also activated by the hypothalamus. It is a slower system but has a more distinguished role in connection with prolonged exposure to stressors than the SAM system.<sup>134</sup>

Allostasis refers to the ability of the various physiological systems to adapt to the environmental stressors and reach stability through change.<sup>128, 129</sup> A normal and healthy process is when a stressor increases the activities in the physiological systems (cardiovascular activity, hormones, metabolism, immune defence, etc) to provide the body with energy to be prepared for challenges, and to cope with changes in the environment. Then, when the stress activation ceases, the



systems take time to recover and return to their base levels (homeostasis). The normal stress activity and recovery of these systems help the individual to adapt to various demands and pressures. If, on the other hand, the stress activation continues for a prolonged time or a new type of stress occurs before the physiological systems have completely recovered, it results in an allostatic load. This load describes an imbalance occurring between the energy mobilisation involved in the stress active phase and the recovery build-up phase. If the individual does not return to base level, the pressure on the systems accumulates which can cause a degeneration of the physiological systems.<sup>129, 133, 135, 136</sup>

Because of the involvement of the whole body in the process, various forms of health consequences can arise when the systems are activated chronically or are out of balance. Both over- and under-activity of the physiological systems are a health risk as they induce higher stress hormone levels and blood pressure, with an increased risk of arteriosclerosis, heart disease, and similar ailments.<sup>47, 118</sup> Differences in behavioural strategies to cope with stress can also explain why individuals may differ in their vulnerability to different stress-related diseases.<sup>137</sup>

The normal allostatic response is initiated by a stressor that sustains for an appropriate interval, and then turns off. Four situations are thought to lead to an imbalance between stress and recovery reactions and to contribute to an allostatic load.<sup>115, 129, 138</sup>

- repeated hits from multiple novel stressors
- lack of adaptation to repeated exposure to stressors (closely related to the above)
- prolonged stress response due to a delayed shut down of the response
- inadequate response leading to elevated activity of other, normally counter-regulating allostatic systems after stress

## AIMS

The overarching aim of this thesis was to increase knowledge about the associations between amount of work and health. Amount of work was measured in various ways, from the absence of paid work to the combination of work performed in professional and domestic settings. An additional aim was to highlight a number of mechanisms that might be useful when trying to explain the relationships found.

Four main study questions corresponding to four different studies were addressed. In the first three studies, all analyses were performed stratified by sex and the fourth one focuses on women.

- What effect does unemployment (i.e. lack of paid work) have on cause-specific mortality? (Study I)
- What effect do unemployment (i.e. lack of paid work) and excessive work (overtime and extra work) have on non-specific mortality? (Study II)
- What is the relationship between a perceived imbalance in work/home demands, unwinding and subjective health? (Study III)
- Among working women, does the interplay between work/home interference, unwinding and self-rated health vary depending on the employment conditions? (Study IV)

## METHODS

The model shown in Figure 4 illustrates the ways in which the specific issues in the studies forming this thesis were empirically addressed in order to investigate the relationship between amount of work and health. This relationship is regarded as essentially dynamic and as a balancing act that takes place on several levels at the same time, including a person's work-life balance (e.g. maintaining a balance between work and family) and allostatic reactions in the body (e.g. upholding the functions of the body).

Factors both inside and outside working life, as well as individual factors, are taken into account when discussing amount of work relative to premature death and subjective health.

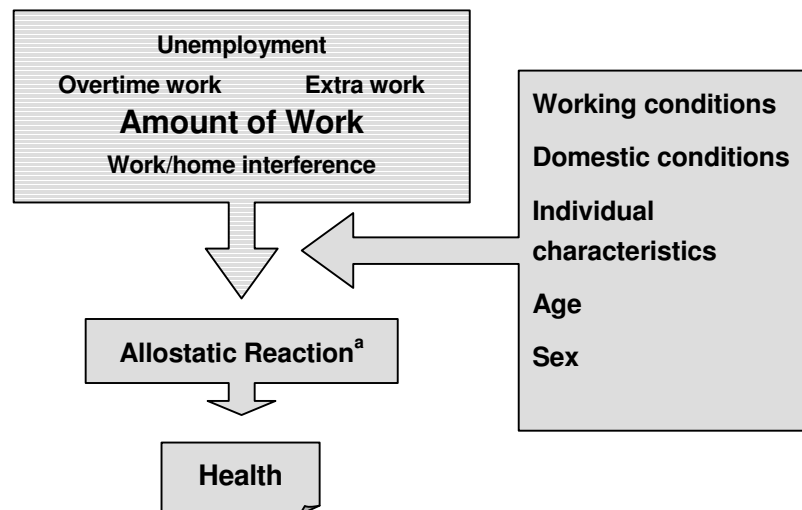


Figure 4. An analytical frame for the study of amount of work and health  
<sup>a</sup> not measured.

## TWO APPROACHES

The thesis consists of four register-based studies extracting data from two available data sources. Figure 5 presents a schematic view of the four studies, highlighting their respective main study question, study population, and statistical methods. Study I and II emanate from the Swedish twin registry and focus on amount of paid work relative to mortality. Study III and IV emanate from a population-based survey focusing on amount of work both at the workplace and in the home relative to early signs of suboptimal health.

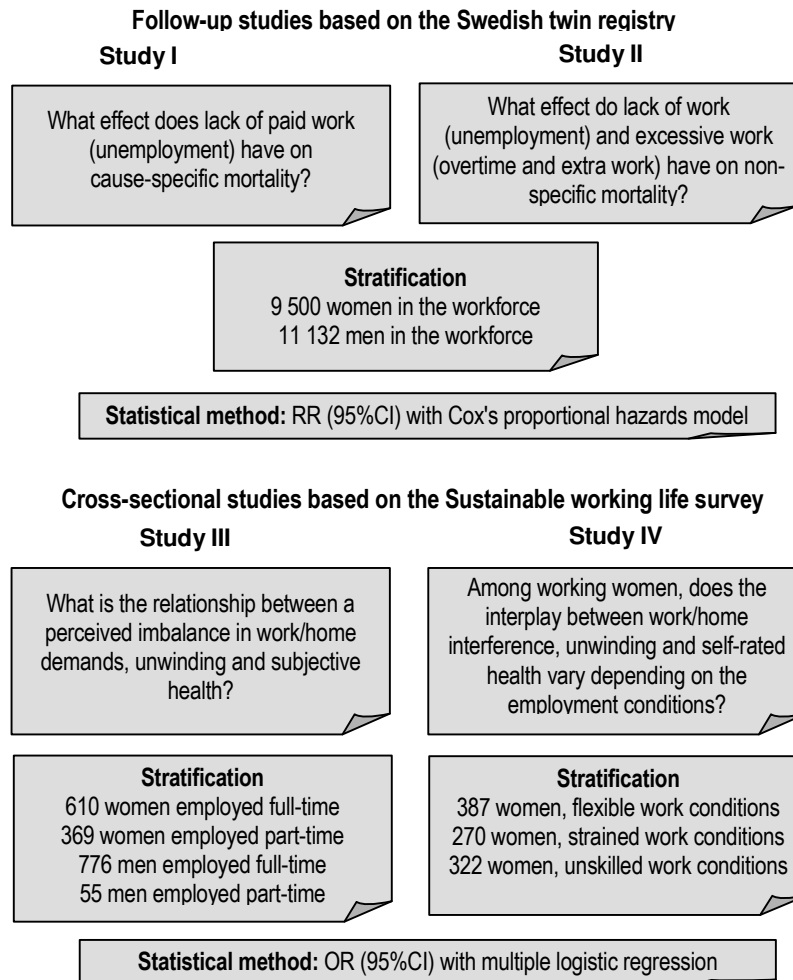


Figure 5. Description of the four studies.

## **AMOUNT OF PAID WORK AND PREMATURE DEATH**

The two studies based on the twin registry (I, II) consider; no paid work, excessive paid work and their effects on premature death.

Study I investigated the association between unemployment and early cause-specific mortality, while study II investigated the effect of unemployment, overtime work, and extra work on early non-specific mortality. Both studies were performed for women and men separately based on mortality data over a 24-year observation period.

### **Data source: the Swedish Twin Registry**

The Swedish Twin Registry was developed at what is now the Institute of Environmental Medicine at Karolinska Institutet. It consists of three large age cohorts; twins born 1886-1925, 1926-1958, and 1959-1990. The Registry is updated continuously with mortality data through the linking and matching of central computer population files (such as the Cause of Death Register and DAFA/SPAR). Twins born between 1926 and 1958 have been subjected to many investigations. The one from which the data for studies I and II was extracted took place in 1973, using an extensive questionnaire.<sup>139</sup> The main areas of the questionnaire were: medical symptoms and use of medication, annoyance experienced because of factors in the general and occupational environments, smoking and drinking habits, physical activity, food habits, psychosocial status, occupational and educational history, housing conditions and certain background data. The response rates of the 1973 questionnaire were 85 % for women and 79 % for men.

This registry can be used as a general epidemiological base line registry since the twins do not deviate from the general population other than in terms of higher infant mortality and lower birth weight.<sup>140</sup>

Studies I and II were based on the population of twins, who in the questionnaire in 1973 had specified a main occupation, i.e. defined a job title. A total of 9 500 women and 11 132 men were included in both studies.

### **Measures and statistical methods used in studies I and II**

An overview of the exposure, confounding and outcome variables considered in these studies is given in Figure 6.

#### *Exposure variables*

The measure of unemployment was derived from three different questions that were combined in various ways in studies I and II. Information was based on the following questions:

- Are you employed at the present time?
- Are you now or have you ever been unemployed?
- If so, for how long have you been unemployed?

Those who stated that they had been unemployed were compared to those said they had not in the main analyses in both studies.

In study II: Overtime work was based on the questions:

- How many hours of overtime do you work a week?
- Have you now or have you earlier had an extra job?
- If so, how many hours a week do you work extra?

Part-time work was based on the question:

- Are you employed at the present time? Yes, full-time; Yes, part-time.

### *Potential confounders*

The same social, behavioural, health and personality factors were adjusted for in both studies. Possible confounders were:

- age
- children
- smoking habits
- use of sleeping pills
- stressful life
- personality factors (introversion-extraversion, instability)
- marital status
- education
- alcohol habits
- use of tranquilizers
- shift work
- long-term or serious illness

From the above, only those factors that showed an independent association with mortality were considered as confounders in the full model, which explains the different factors used for women and men in the analyses. Differences found in the association with mortality were the use of sleeping pills and extravert personality among women and the use of tranquilizers and instable personality among men. Stressful life and shift work did not show any association with mortality and were therefore excluded from the analysis.

### *Outcome variables*

Mortality was measured as premature death, i.e. death before 70 years of age. In study I, the cause-specific mortality was based on death certificates and the observation period for mortality stretched from January 1, 1973 to December 31, 1996. The main causes of death in the population were considered as well as causes that could be due to the individual's mental stage.

The following underlying causes, taken from the International Classification of Diseases (ICD), were considered:

- malignant neoplasms
- diseases of the circulatory system
- external cause of death
- alcohol-related diseases

The focus of study II was on non-specific mortality only. Data was derived from the twin registry and the observation period for mortality was the 24 years following the distribution of the questionnaire.

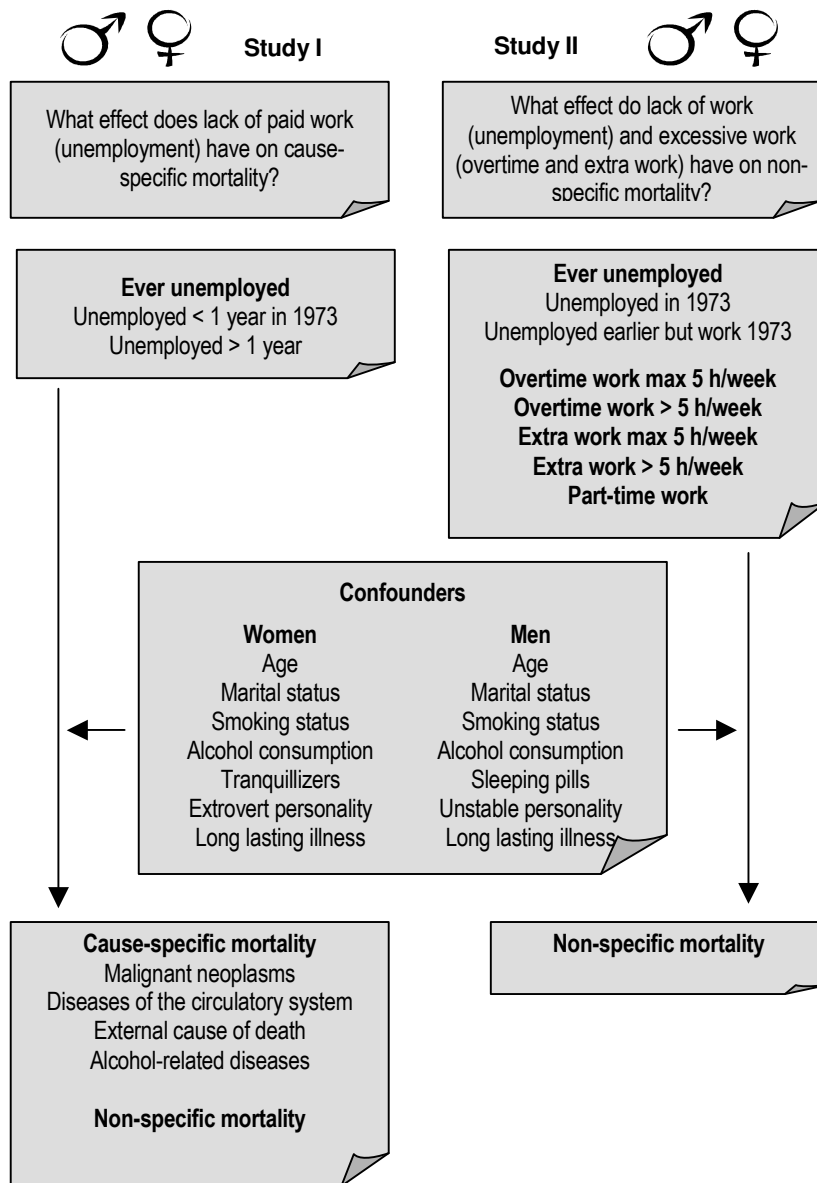


Figure 6. An overview of the exposure, confounding and outcome variables in studies I and II.



### *Statistical analyses*

In studies I and II the material was analysed using ‘Cox proportional hazards model’.<sup>141</sup> The analyses included a full 24-year follow-up as well as a follow-up restricted to the first 10 years in study I, and the first 5 years in study II.

The findings have been presented as relative risks (RR) with 95 % confidence intervals (CI). In the analyses, both twins in each pair were included and treated as independent individuals. No consideration was given to twin status; the individuals were regarded as a normal random selection of the population.<sup>140, 142</sup>

To study the degree to which different factors affect the impact of unemployment on mortality, study I also analysed synergy effects according to a model suggested by Rothman<sup>143</sup> and based on odds ratios in a logistic regression model.

## **PAID WORK, PRIVATE LIFE AND SUBJECTIVE HEALTH**

Study III investigated the interplay between a perceived imbalance between work/home demands, lack of unwinding and subjective health, stratified by sex and by work schedule (full-time or part-time). Study IV stratified three groups of women sharing similar types of working conditions and examined whether various forms of interference between work and home affected their health differentially.

The perceived imbalance between work and private life were related to three indicators of suboptimal health: sleep quality, self-rated health and medication intake in study III, and to self-rated health only in study IV. How the associations were affected by lack of unwinding was also investigated in both studies.

### **Data source: A sustainable working life**

A survey on “sustainable working life” was coordinated by the National Institute for Working Life in collaboration with the Division of Psychosocial Factors and Health at Karolinska Institutet, TCO (The Swedish Confederation for Professional Employees), Senior Citizen 2005 (Parliamentary Committee on the Elderly at the Swedish Ministry of Health and Social Affairs) and a non-governmental organisation, Forum 50+. The aim of the survey was to increase knowledge of people’s relations in working life relative to their private life, in order to create more stimulating and sustainable working life. The main areas of the survey were: employment, working conditions, working hours, working environment, attitudes towards work, real or desirable changes at work, future employment, retirement, the relationship between work and private life, the individual’s social surroundings, health, sleep, and lifestyle.

From the Swedish Population Registry, a representative sample of the entire Swedish population (n= 6 800 individuals), stratified by sex, age and domicile (urban, rural) was selected by Statistics Sweden. The sample consisted of women and men domiciled in Sweden as of October 2000, aged from 25 to 75. Data from this group were collected by a postal questionnaire administrated by Statistics Sweden. The response rate was relatively low, but a thorough dropout analysis indicated that the respondents were nevertheless representative of the population.<sup>144, 145</sup> Restricting the analysis to the working population only, the response rates were 60 % for women and 50 % for men.

Studies III and IV were based on this cross-sectional survey and encompassed 1 810 individuals, 25 to 64 years of age, who stated they were gainfully employment in the questionnaire.

## Measures and statistical methods used in studies III and IV

An overview of the exposure, confounding and outcome variables considered in these studies is given in Figure 7.

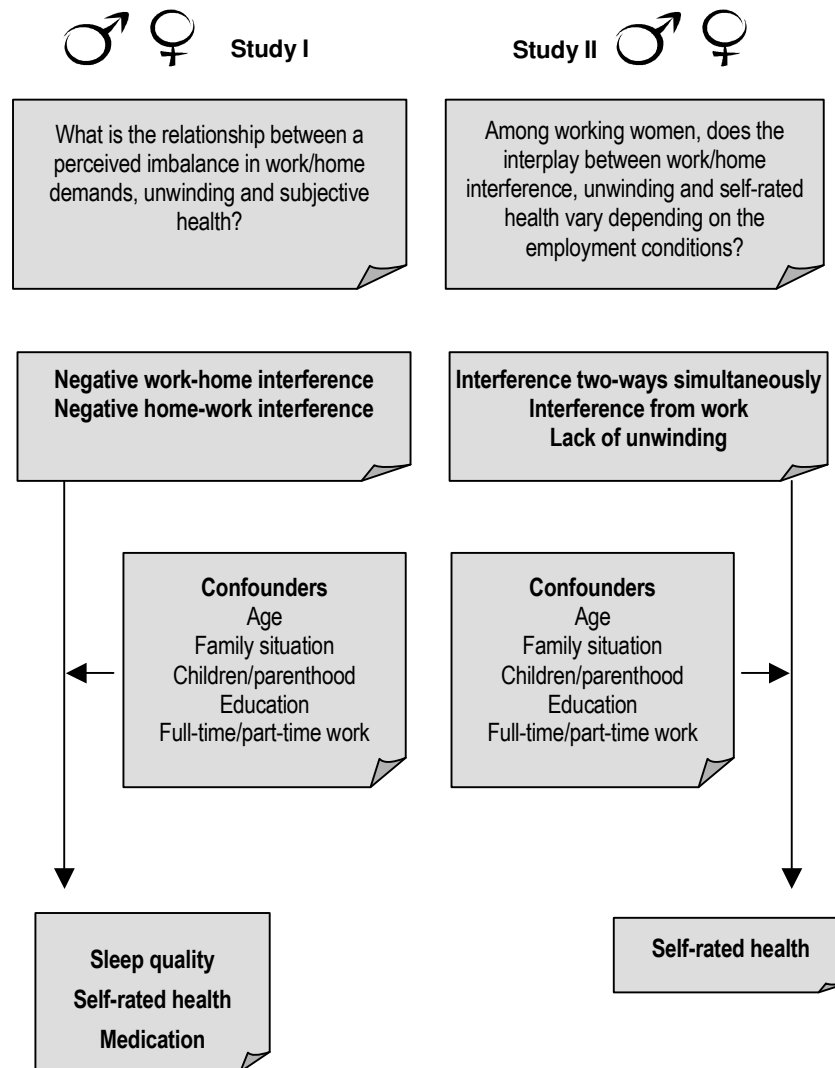


Figure 7. An overview of the exposure, confounding and outcome variables in studies III and IV.

### *Stratifications*

In study III the individuals were stratified by sex and by work schedule (full-time or part-time). The employees were split into four groups: full-time working women (n=610), full-time working men (n=776), part-time working women (n=369), and part-time working men (n=55).

Study IV focused on women and comprised 979 working women classified into three strata according to their working conditions: flexible conditions (n=387), strained conditions (n=270) and unskilled conditions (n=322).

To construct the clusters, five relevant variables were retained and treated simultaneously in a cluster analysis:

- influence on the person's working hour schedule (four levels)
- physically demanding work (four levels)
- mental demand (four levels)
- decision authority (four levels)
- skill discretion (four levels)

The last three measures are from the extended version of Karasek and Theorell's demand-control model.<sup>22, 146</sup> The response alternatives were rearranged for all variables into a four-level scale, and a disjoint cluster analysis without a tree structure was applied.<sup>147</sup> In this study the optimal number of clusters turned out to be three. The characteristics of the three clusters are shown in Table 1, and each cluster was labelled according to its most significant descriptors.

Table 1. The characteristics of the three clusters in study IV and their labels.

	<b>Cluster 1 “flexible” n=387</b>	<b>Cluster 2 “strained” n=270</b>	<b>Cluster 3 “unskilled” n=322</b>
Influence on work hour	high	Low	low
Physically demanding work	low	High	mixed
Mental demand	low	High	low
Decision authority	high	Low	low
Skill discretion	high	High	low

*Exposure variables*

The questions correlated to the exposure were:

- Do the demands at work affect your home and family life in a negative way?
- Do the demands from home/your family affect your work in a negative way?

In study III these two directions were considered separately, one at the time. In study IV they were considered together, but also studied individually by excluding the other one.

Exposure to lack of unwinding was also measured in study IV, with the following four single questions, considered both one at the time and all four together:

- Do you consider that you get enough sleep?
- Apart from sleep, do you think that you get enough rest/unwinding between working days?
- How often do you feel that the time for unwinding between working periods is too short?
- How often do you feel too tired to cope with your family, friends or leisure activities?

### *Potential confounders*

The following potential confounders were taken into consideration in the two studies:

- age
- family situation
- children/parenthood
- education

Additional confounders in study III were:

- work categories (working with people, things or with symbols)
- lack of unwinding (four questions)

An additional confounder in study IV was:

- working schedule (full-time/part-time)

### *Outcome variables*

In both studies, self-rated health was measured by asking the question:

- How healthy do you consider yourself to be at present?

Study III also considers sleep quality and medication as outcome variables, based on the following questions:

- What is the quality of your sleep on the whole?
- To what extent have you used the following types of drugs during the last 12 months? Sleeping pills? Tranquillizers?

### *Prevalence*

The prevalence of the exposure and outcome variables is described in Table 2.

Table 2. The prevalence of exposure and outcome variables in study III.

	Women <sup>a</sup>	Men <sup>a</sup>
<b>Employed individuals age 25-64 years</b>	<b>979</b>	<b>831</b>
full-time work	610	776
part-time work	369	55
<b>Exposure variables</b>		
<i>Full-time work</i>		
negative interference from work to home	423	445
negative interference from home to work	164	198
<i>Part-time work</i>		
negative interference from work to home	206	26
negative interference from home to work	95	9
<b>Outcome variables</b>		
<i>Full-time work</i>		
suboptimal sleep quality	214	265
suboptimal self-rated health	153	173
Medication sleep/ tranquilizers	78	55
<i>Part-time work</i>		
suboptimal sleep quality	132	20
suboptimal self-rated health	111	23
medication sleep/ tranquilizers	55	8
<b>Exposure and outcome variables</b>		
<i>Full-time work</i>		
work - home / suboptimal sleep quality	167	184
work - home / suboptimal self-rated health	125	130
work - home / medication sleep/ tranquilizers	56	39
home - work / suboptimal sleep quality	72	84
home - work / suboptimal self-rated health	64	62
home - work / medication sleep/ tranquilizers	23	17
<i>Part-time work</i>		
work - home / suboptimal sleep quality	81	11
work - home / suboptimal self-rated health	65	13
work - home / medication sleep/ tranquilizers	31	4
home - work / suboptimal sleep quality	41	4
home - work / suboptimal self-rated health	27	6
home - work / medication sleep/ tranquilizers	19	2

<sup>a</sup> number experiencing the actual variable

### *Statistical analyses*

In studies III and IV the material was analysed using logistic regression. The findings were presented as odds ratios (OR) with 95 % confidence intervals (CI). In study III the associations between experienced work-home and home-work interference and in turn suboptimal sleep quality, suboptimal self-rated health, and medication with sleeping pills or tranquillizers were analysed in two steps. First, adjusted for confounding from domestic and individual factors, the effect of the two separate directions of interference was assessed by multivariate logistic regression. In the second step, the effect of not being able to unwind was also adjusted for. The adjusted OR could not be calculated for part time working men due to too few cases. Therefore, the crude odds ratios with 95% confidence intervals for the two exposures are presented in Tables 3 and 4 for all four groups being studied.

Table 3. Interference from work to home. Logistic regression, crude odds ratio (OR) with 95 percent confidence interval (CI).

Crude OR (95% CI)	Sleep quality	Self-rated health	Medication
<b>Full time work</b>			
women (n=610)	2.02 (1.36-3.06)	2.69 (1.67-4.51)	1.31 (0.75-2.39)
men (n=776)	2.44 (1.76-3.41)	3.03 (2.04-4.59)	1.96 (1.07-3.79)
<b>Part time work</b>			
women (n=369)	1.58 (1.01-2.51)	1.41 (0.87-2.29)	0.97 (0.54-1.77)
men (n=55)	1.63 (0.54-5.03)	1.90 (0.65-5.75)	1.14 (0.24-5.38)

Table 4. Interference from home to work. Logistic regression, Crude Odds Ratio (OR) with 95 percent confidence interval (CI).

Crude OR (95% CI)	Sleep quality	Self-rated health	Medication
<b>Full time work</b>			
women (n=610)	1.63 (1.12-2.36)	2.62 (1.76-3.90)	1.19 (0.69-2.00)
men (n=776)	1.67 (1.19-2.33)	1.96 (1.35-2.83)	1.35 (0.72-2.44)
<b>Part time work</b>			
women (n=369)	1.59 (0.98-2.59)	0.99 (0.58-1.66)	1.63 (0.87-3.01)
men (n=55)	1.40 (0.31-6.05)	3.50 (0.81-18.43)	2.06 (0.26-11.72)



In study IV, simultaneous interference from work and from home, from work only, and from lack of unwinding, respectively, were analysed in association with self-rated health. The crude effect was assessed by univariate logistic regression and the effect adjusted for confounding using multivariate logistic regression.

## RESULTS

### AMOUNT OF PAID WORK AND PREMATURE DEATH

#### **Absence of paid work – sex-specific relationships**

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What effect does lack of work (unemployment) have on cause-specific mortality?

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The main causes of death associated with unemployment were external ones, i.e., related to injuries, poisoning, and other external causes (ICD-9 E800-E999). More specifically, during the 24-year follow-up period and with adjustment for confounding, unemployment among women had a clear effect on suicide (RR 2.7, 95% CI 1.2-6.5) and, among men, on death by undetermined causes (RR 5.8, 95% CI 2.4-14.0).

Further, for unemployed women, there were synergistic relationships to mortality (non-specific) with joint exposure to sleeping pills, with a risk that was 7 times higher than expected from additivity, and for tranquilizers the risk was almost 3 times higher. Also, a tendency towards increased risk was seen among those with an extravert and unstable personality. Among men, these synergistic relationships applied to low level of education with a 4 times higher risk, and a doubled risk for long-term illness. Also a tendency towards increased risk was seen when considering use of sleeping pills.

#### **Absence of paid work and paid work in terms of part-time, overtime and extra work – sex-specific relationships**

---

What effect do lack of work (unemployment) and excessive work (overtime and extra work) have on non-specific mortality?

---

As in Study I, unemployment led to increased non-specific mortality for both women (RR 2.6, 95% CI 1.1-2.4) and men (RR 1.3, 95% CI 1.0-1.7) after adjustment for confounding.

The highest excess risk was seen among men unemployed in 1973 during the five-year period immediately following the questionnaire (RR 3.3, 95% CI 1.3-8.2).

Excessive amount of work was also associated with increased mortality for both women and men. For women there was a greater risk if they did more than five hours a week overtime work (RR 1.9, 95% CI 1.1-3.3) after adjustment for confounding. For men, more than five hours a week of extra work was associated with a slight risk increase (RR 1.3, 95% CI 1.0-1.7), but on the other hand fewer than five hours overtime per week was related to an under-risk of mortality (RR 0.6, 95% CI 0.4-0.8) among men. For men working part-time the mortality risk estimate was greater, but not significant, after controlling for confounding (RR 1.58, 95% CI 0.91-2.77), which was not the case among part-time working women (RR 0.95, 95% CI 0.72-1.26).

## **PAID WORK, PRIVATE LIFE AND SUBJECTIVE HEALTH**

### **Interplay between paid work and private life – sex-specific relationships**

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What is the relationship between a perceived imbalance in work/home demands, unwinding and subjective health?

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#### *Interference from work to home*

For all groups considered, i.e. women and men working full-time and women working part-time, sleep quality and self-rated health were strongly associated with experienced interference; see Table 5. The highest odds ratios were found for self-rated health. Among women, the odds were higher among full-time than part-time workers. The association with medicine intake (sleeping pills and tranquillizers) was particularly marked for full-time working men. (no data available for part-time working men)

When introducing lack of unwinding into the model, a sex difference, but not a work schedule difference, was noted.

Unwinding had a protective effect on health among full-time and part-time working women who experienced interference from work to home, while the statistically significant association between interference and health remained among men.

Table 5. Interference from work to home. Statistically significant adjusted odds ratios (OR) and 95 % confidence interval (CI).

	OR adjusted for confounding <sup>a</sup> (95 % CI)			OR adjusted for unwinding <sup>b</sup> (95 % CI)		
	SQ	SRH	MED	SQ	SRH	MED
<b>Full time work</b>						
women	2.28 (1.48-3.58)	3.31 (1.95-5.86)	-	-	-	-
men	2.81 (1.95-4.09)	3.78 (2.44-6.01)	2.03 (1.06-4.10)	1.62 (1.06-2.49)	1.76 (1.05-2.99)	-
<b>Part time work</b>						
women	1.87 (1.13-3.15)	2.25 (1.27-4.09)	-	-	-	-

<sup>a</sup> Adjusted for age, family situation, children, education and work category

<sup>b</sup> Adjusted for rest between work periods, rest between workdays, coping with private life activities, age, family situation, parenthood/children, education and work category  
 SQ = sleep quality, SRH = self-rated health, MED = medication with sleeping pills or tranquilizers

#### *Interference from home to work*

Among full-time working individuals, there were also associations between interference from home to work and sleep quality and self-rated health, while no such relationships were indicated among part-time working women; see Table 6 (no data available for part-time working men).

In contrast to interference from work to home, a work schedule difference, but not a sex difference was noted when introducing lack of unwinding into the model. Among full-time working individuals who experienced interference from home to work, the associations with self-rated health remained for both women and men after adjustment for lack of unwinding, while the association with sleep quality was no longer significant for either of them.

Table 6. Interference from home to work. Statistically significant adjusted odds ratio (OR) and 95 % confidence interval (CI).

	OR adjusted for confounding <sup>a</sup> (95 % CI)			OR adjusted for unwinding <sup>b</sup> (95 % CI)		
	SQ	SRH	MED	SQ	SRH	MED
<b>Full time work</b>						
women	1.62 (1.10-2.40)	2.64 (1.74-4.01)	-	-	1.91 (1.23-2.97)	-
men	1.48 (1.02-2.15)	2.27 (1.50-3.41)	-	-	1.67 (1.07-2.59)	-
<b>Part time work</b>						
women	-	-	-	-	-	-

<sup>a</sup> Adjusted for age, family situation, children, education and work category

<sup>b</sup> Adjusted for rest between work periods, rest between workdays, coping with private life activities, age, family situation, parenthood/children, education and work category

SQ = sleep quality, SRH = self-rated health, MED = medication with sleeping pills or tranquilizers

### **Interplay between paid work and private life, working conditions, and unwinding - among women**

Among working women, does the interplay between work/home interference, unwinding and self-rated health vary depending on the employment conditions?

Table 7 describes the interference variables when the various unwinding parameters were taken into consideration.

#### *Two-way interference and lack of unwinding*

Irrespective of whether they were exposed to flexible, strained or unskilled working conditions, experience of two-way interference among working women was strongly associated with suboptimal self-rated health. The highest odds were found among women with strained working conditions.

The four variables measuring lack of unwinding were all significantly associated with suboptimal self-rated health in all three groups. The highest odds ratio was found for ‘too tired to do leisure activities’ among women with strained working conditions. In all groups, the associations between two-way interference and self-rated health disappeared after adjusting for this problem, while they remained when adjusting for ‘not enough sleep’.

The effect of the remaining two unwinding variables differed between the three groups of women. For instance, adjustment for ‘lack of rest between work days’, showed a protective effect for those with strained conditions, and adjustment for ‘lack of rest between work periods’ indicated conversely a protective effect among women with unskilled conditions.

Table 7. The effect of unwinding on the relationship between interference and self-rated health. Statistical significant adjusted odds ratios (OR and 95 % confidence interval (CI)).

	Interference adjusted for each unwinding variable		
	adjusted <sup>a</sup> OR (95 % CI)	two-way interference - self-rated health OR (95 % CI)	work interference - self-rated health OR (95 % CI)
<b>“Flexible”</b>		3.35 <sup>b</sup> (1.67-6.93)	-
not enough sleep	2.93 (1.72-5.08)	2.40 (1.15-5.10)	-
lack of rest btw work days	3.76 (2.14-6.77)	2.21 (1.05-4.77)	-
lack of rest btw work periods	3.26 (1.85-5.92)	2.22 (1.05-4.81)	-
tired for leisure activities	4.50 (2.22-9.94)	-	-
<b>“Strained”</b>		4.57 <sup>b</sup> (1.63-15.22)	5.20 <sup>b</sup> (1.92-17.04)
not enough sleep	3.30 (1.80-6.20)	3.19 (1.10-10.80)	3.97 (1.53-13.18)
lack of rest btw work days	5.70 (2.90-11-80)	-	3.54 (1.15-13.54)
lack of rest btw work periods	4.41 (1.99-10.96)	3.80 (1.21-14.77)	4.57 (1.51-17.43)
tired for leisure activities	14.08 (3.96-90.29)	-	-
<b>“Unskilled”</b>		3.04 <sup>b</sup> (1.50-6.27)	-
not enough sleep	4.15 (2.36-7.50)	2.19 (1.04-4.65)	-
lack of rest btw work days	2.60 (1.46-4.71)	2.34 (1.07-5.18)	-
lack of rest btw work periods	3.64 (1.95-7.11)	-	-
too tired to do leisure activities	6.01 (2.75-14.86)	-	-

<sup>a</sup>adjusted for potential confounders; age, family situation, children/parenthood, education, full-time/part-time job.

<sup>b</sup>interference adjusted for the potential confounders above only.

*Work to home interference and lack of unwinding*

Work interference was significantly associated with self-rated health among women with strained working conditions only. Women with strained working conditions, experiencing work interference only, were not particularly affected by adjustment for any of the unwinding variables except for the 'too tired to do leisure activities' variable.

## DISCUSSION

The ability to maintain a healthy work-life balance is influenced by the culture and social security systems of a country. In countries like Sweden, gender equality regarding the right to combine parenthood and employment may help to make a balance easier to achieve. But still there are obstacles that cause many individuals to experience an imbalance between paid work and other aspects of life. This imbalance naturally has the potential to have a negative effect on a person's health.

At the individual level, one can pose that stress mechanisms are coming into play to explain the associations found between various amount of work, i.e. unemployment, excessive work, and the perceived imbalance in work/home demands - and health. When stress occurs and the body's physiological systems are activated for a prolonged time, negative health consequences may be triggered.<sup>132, 133</sup>

Two different approaches were used to investigate the association of interest. The first one, regarding work in a more traditional manner, used a prospective design and measured the effect of unemployment and excessive work on premature death. The second approach, regarding work in an inclusive manner, used a cross-sectional design and measured the relationship between amount of work and early signs of health deterioration. Both approaches are important in a public health perspective and are susceptible to contribute to the promotion of a healthy working life and of healthier lifestyles.

Even if Sweden has had almost equally many women and men in its workforce for many decades, changes in the labour market may affect women and men differently. In what is still a segregated labour market, women's professions are predominantly found in the areas of service, care and sales, and men's within construction and manufacturing, trade,



process and mechanical jobs and the transport sector.<sup>148, 149</sup> Many women are employed in the poorer paid segments of the public and private sectors, where a growing number of temporary jobs are also found.<sup>148, 149</sup> Even within the same profession, women and men often have different work content and conditions,<sup>150</sup> including working tasks, working hours, salary, influence and self-determination - factors that may influence health.

## **MAIN FINDINGS**

The main findings concerning each separate “amount of work”, i.e. unemployment, excessive work, and the perceived imbalance in work/home demands will be discussed separately. Possible mechanisms involved and their roles played in a work-life balance perspective will be discussed.

### **Unemployment**

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What effect does unemployment (i.e. lack of paid work) have on mortality?

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The results from studies I and II indicate, not surprisingly, that unemployment has a strong effect on premature death.<sup>8-11</sup> The most common cause-specific reasons for death are suicide for women and undetermined death for men. The fact that this difference between men and women has not been noted in other/previous studies may depend on these causes being combined or on suicide possibly being more difficult to identify among men. Among unemployed men with a low level of education or with a long-term illness, an excess risk of premature death was noted.

The effect of unemployment on mortality may also be reinforced by low education as well as by, personality, health, and health-related factors (use of sleeping pills or tranquillizers).

A possible health related selection<sup>13</sup> to the detrimental for unemployed should be taken into account, as in periods of low-unemployment the proportion of individuals suffering from ill-health are higher among the unemployed compared to periods of high-unemployment. Furthermore, the associations between unemployment and mortality are shown to be stronger during low-unemployment periods.<sup>17</sup>

There are many reasons that may help explain why unemployment is detrimental to health and so closely linked to premature death. Unemployment is a particular type of amount of paid work, representing a situation where paid work is absent but where the individual would prefer to work. Unemployment can definitely be regarded as a stress factor, leading to e.g. increased stress hormones, because of a lack of structure in life, shortage of money, and a feeling of worthlessness.<sup>21,23,26</sup> This situation may lead to e.g. intensive job-seeking or forced passivity. Both situations (stressful life events) and the pressure of job-seeking are associated with increased physiological activity that may in turn lead to negative health consequences.

The causes of death (suicide and undetermined causes) found in relation to unemployment can, of course not be explained by disturbed physiological activity, only. This effect is perhaps more related to coping strategies and personality.<sup>137</sup> Among women, it might be that the internal stress reactions arisen from unemployment are more affected by a psychological experience connected with unemployment, while unemployment among men more often has to do with skills and ill-health.<sup>151</sup> The excess risk of premature death that appeared among unemployed women who used sleeping pills or tranquillizers might be regarded as a part of a coping strategy. Also, those with an extravert and unstable personality showed a tendency towards an excess risk of premature death indicating different strategies to deal with difficulties. Increased stress levels for a prolonged time cause an allostatic load which leads to increased ill-health. This in turn may affect the individual's chances of obtaining a new job.

Yet, it should be underlined that study I and study II apply to a population of workers who were likely to be unemployed during a period of time when unemployment was uncommon in Sweden. This may have been an aggravating contextual factor. It is difficult to determine whether the results obtained then (1973-1996) would still be as strong for today's workforce – or all segments of it. But, even in more recent time periods, similar associations are still found between unemployment and suicide.<sup>11</sup> This may suggest that the effect of context is not as strong as one might think when it comes to the effect being studied, it might rather be a general stressor arising from losing control over the situation either through a lack of structure in life, shortage of money, or a feeling of worthlessness.<sup>21</sup>

In connection with unemployment (involuntary lack of paid work), the work-life imbalance could be due to the general stress mentioned above, which might be detrimental for health. If the studies on the other hand had concerned people who had given up paid work voluntarily, the results would probably have been totally different. It is obviously not simply the lack of work that matters, also the individual's control over the situation is important.

### **Part-time, full-time and overtime in paid work**

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What effect does excessive work (overtime and extra work) have on non-specific mortality?

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*Premature death.* Women make up the majority of part-time workers. Men who work part-time often do it for reasons related to individual health problems whereas women “choose” it because of their domestic duties.<sup>149</sup> In study II, part-time working men had an increased but not significant mortality risk after controlling for confounding but women did not. Instead, women had a raised mortality risk when working more than five hours overtime a week. This phenomenon is probably better understood when considering women's total workload,<sup>48</sup> and therefore taking into account their domestic

responsibilities.<sup>38</sup> Likewise, the under-risk of premature death from fewer than five hours of overtime among men might be explained by the facilitating effect of less domestic obligations – and also the positive effect of increased earnings. It is possible that it is voluntary rather than imposed overtime that is connected with this under-risk.

Having “extra work” more than five hours a week is probably totally different to working voluntary overtime at the ordinary occupation. Extra work among women and men could be due to a strained financial situation. The increased mortality risk could be an effect of stress due to the circumstances or due to an extra burden put on the total workload. The likelihood of excessive work being detrimental to health can be understood in the allostatic stress model perspective (see below).

*Subjective health.* Part-time work offers a way of allowing oneself time to spend with the family or a way of managing domestic, or private, obligations. Also, part-time work could be the result of enforced part-time unemployment.

The advantages and disadvantages of having a “voluntary” part-time job have been discussed.<sup>29</sup> As found in study III, women working part-time, by choice or otherwise, have fewer subjective health problems associated with negative home-work interference.

The results in studies II, III, and IV concerning excessive work (though measured in various ways) suggest that, for some, the total workload is indeed too much. Why excessive work tends to be detrimental to health can be explained by the allostatic stress model.<sup>138</sup> Long working hours, either due to overtime in paid work or to a combination of paid work and unpaid domestic work, increase the body’s stress level and activate the physiological systems for a prolonged time. This shortens the all-important recovery time for the systems. Prolonged activation may also make it difficult for the systems to return to their normal base level. Both these scenarios may cause negative health effects.<sup>133</sup>

It is not appropriate to say that overtime work is a health problem per se and it is possible that when it is “voluntarily” – rather than imposed – its effect on health are not that important given that a balance is achieved. Still, long working hours even if “voluntary”, may induce long term stress without possibilities to unwind or ability for the physiological systems to deactivate and this indicates a less favourable health outcome.<sup>133</sup> Working conditions are for instance crucial for the effect of overtime on health. Physical demanding work could be harmful to health already in connection with a full-time employment.

For maintaining a good work-life balance, ‘actual’ working hours have to be in accordance with ‘desired’ working hours as long as they are reasonable.<sup>40</sup> It is probably beneficial if set tasks can be finished within regular working hours, allowing the worker to exercise some control over his/her job. This also enables a balance to be struck between workload and recovery.<sup>39</sup>

### **Combining work and private life**

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What is the relationship between a perceived imbalance in work/home demands, unwinding and subjective health?

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*Interference.* Looking more closely at the part of life not occupied by paid work, and at how paid work and private life interfere with each other, one can gain a more multidimensional picture of the possible sources of stress factors. This picture may help to explain the adverse health effects found in connection with excessive paid work, e.g. women, working more than five hours overtime a week showed an increased risk of premature death. Difficulties in combining paid work with domestic duties showed an association with early signs of subjective ill-health for women and men in study III. Sub-optimal sleep quality and self-rated health were strongly associated with experienced interference for both women and men. This could be interpreted as early signs of an excessive total workload that might lead to negative health consequences.

Home-work interference was similar for full-time working women and men. A possible explanation for this is the likelihood of some domestic (or private) duties having to be carried out during the day.

Experiencing work-home interference can be seen as a stress factor and a reflection of one's feeling that the time available is not sufficient to allow one to fulfil all the tasks that have to be achieved: the total amount of work – or workload – being too much. This increases the body's stress level and activates the physiological systems

The findings in study III concerning work/home interference are in line with previous studies,<sup>52,54,55</sup> even if the association between interference and all the health indicators used in this thesis has not been considered earlier.

*Unwinding.* The protective effect of unwinding, shown in study III, on the association between work/home interference and health, has been reported earlier.<sup>119,122,152</sup> Work/home interference and lack of unwinding could even be regarded as a vicious circle, with negative interference reducing the chances of unwinding, and a lack of unwinding resulting in negative interference. A lack of unwinding might result in diminished personal resources to deal with daily life demands, which in turn affects the level of stress further reducing for the chances of unwinding, and so on and so on. It is therefore likely that they, over time, have an aggravating effect on each other.<sup>153</sup>

Unwinding can take a large number of different forms and specific forms may function differently for different people and may differ between women and men. One of the unwinding variables used in studies III and IV represents aspects of time outside the ordinary work schedule, i.e. too tired to do leisure activities. Reducing time for leisure activities and friends could be understood as a strategy for balancing the demands of work

and home. The remaining unwinding variables measure time for rest i.e. not enough sleep, rest between work days and rest between work periods. Women in particular may have difficulties in relaxing after work in part because their total workload exceeds that of men,<sup>47,49,154</sup> and also because they are prone to adopting emotional strategies to deal with stressful situations.<sup>155,156</sup> This can be compared to the significant association found with sleeping pills and tranquillizers for men (before adjustment for unwinding), which points to a male-specific coping strategy for managing the demands of a full-time job. In such instances, the physiological systems insufficient time for essential recovery and an allostatic overload appears which in turn may have negative health consequences.<sup>128</sup>

It is possible that the way unwinding is measured in study III provides a better picture of the way women unwind compared to men. There are probably other important factors in the way men unwind that have not been controlled for or measured in this thesis. Whether unwinding per se has a similar effect on the association between work/home interference and health, for both women and men, has yet to be studied.

Also, adjusting the results for unwinding could have different effects depending on the health indicator, since one of the health indicators is sleep quality (SQ) and sleep is also an important factor for recovery.<sup>95,98</sup>

Among the three health indicators used, one is under the impression that sleep quality and self-rated health are interchangeable measures – or that, alternatively, sleep quality is a part of the self-rated health. It could also be that sleep quality is an earlier health indicator than self-rated health. The fact that the relation between home-work interference and sleep quality disappears when adjusted for unwinding, but that the relation between home-work interference and self-rated health does not, could be interpreted as pointing towards a dose-effect.

It could also be explained as a broader conceptualisation of self-rated health<sup>84</sup>, which implies more factors involved when health is self-rated than when sleep quality is. No association with medication was shown, which could be due to the use of this kind of medication when actively working is uncommon.

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Among working women, does the interplay between work/home interference, unwinding and self-rated health vary depending on the employment conditions?

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The work-home and home-work interferences were considered separately without taking the other one into account in study III. Due to the effect of lack of unwinding found on these associations among women, and in order to get a deeper understanding of underlying multidimensional stress factors, study IV was restricted to this situation for women only. It separated those women experiencing both work-home, and home-work interference, from those experiencing only one of them. In order to study the actual working situation more in detail, women were classified (clustered) based on resemblance and differences in some of their working conditions (influence on working hours, physical and mental demands, decision authority, and skill discretion). The three groups that appeared in the cluster analysis classified these women's working conditions as predominantly flexible, strained, or unskilled. A general association between a simultaneous two-way interference between work and home, and suboptimal self-rated health was found in all the three groups of working women.

*Strained working conditions.* Women with strained working conditions constituted a high risk group since the highest odds were found among them. The high risk of physical and mental symptoms that has been shown in connection with simultaneous exposure to the demands of paid work and domestic demands depends substantially on synergistic effects.<sup>157</sup> Interference solely from work was associated with self-rated health only among women with strained working



conditions. Some of the negative effects of work and home demands may be explained by the work situation since earlier studies describe a lack of control at work as a risk factor for health.<sup>22,43,158</sup> Support for this interpretation also comes from the higher prevalence of good self-rated health found among women with flexible conditions. It has been shown that job flexibility is favourable for work-home balance and with a flexible job it may be possible to work longer hours before work negatively interferes with the home setting.<sup>159</sup>

*Unwinding.* Women with strained working conditions experiencing work interference only were not particularly affected by adjustment for any of the unwinding variables except the 'too tired to do leisure activities' variable. This variable had a similar buffering effect in all three groups, while the associations between interference and self-rated health remained when adjusting for the 'not enough sleep' variable. The overall importance of sleep for unwinding for all women might explain the lack of a buffering effect from 'not enough sleep'. These two variables do not seem to be dependent on the work characteristics forming the clusters. A protective effect for those women with strained conditions from 'lack of rest between work days' could be due to more mentally demanding work with a greater need of unwinding. The fact that 'lack of rest between work periods' had a protective effect among women with unskilled conditions could instead be due to them having more monotonous or physical work and a longer weekend rest being more beneficial to them.

The experience of work-home interference seen as a stress factor can be an expression of not having enough time for all the tasks that have to be done, i.e. the total workload being too much. What can be learned from study IV concerning women with various working conditions is that the modification effect of unwinding strongly suggests that the effect of experienced negative interference on health is mediated by the chances the individual has to unwind. This may be a matter of both time to

unwind (quantity) and the quality of the unwinding when it occurs. Lack of unwinding may even be a greater health problem than the level of stress.<sup>116</sup> Alternatively, lack of unwinding can be seen as a main contributor to stress symptoms.

## **WORK-LIFE BALANCE**

How the amount of work – in various forms – relates to individual health is the centre of interest in this thesis. Be it for the study of “absence of paid work” or of “total amount of work” where both private and paid work matters are considered, the perspective proposed is that of a desirable balance between one’s commitments in various settings, i.e., a “work-life balance”. In absence of this balance, unhealthy stress may arise and health may be threatened. A sense of imbalance may occur when people find their paid work situation too demanding, too complex or insufficiently stimulating. But the feeling may also come from home or private-related factors. Interestingly, in the data at hand, the work-home interference is more common than home-work interference, for both men and women. And for women in particular, experiencing interference both ways is common. Not only does this affect health but it may also impact on one’s work performance. Therefore, for the organisation, there are functional and economical advantages of employees striking a good balance between work and private life.<sup>107</sup> A lack of balance may affect work performance and also lead to increased costs for sick-leave and rehabilitation.

As the mix of paid work and private life is dynamic and constantly varies, changes occurring in the labour market may also affect the nature of the balance problems that might be encountered by individuals. These changes sometimes even imply a shifting of the boundaries between people’s paid work and private lives. For many employees today, the earlier distinct border between these two has been blurred and for many individuals there is no fixed border left.<sup>160</sup> Our “24-hour society” with extension of opening hours and the impact of

communication technology on work do not per se make it easier to balance paid work and private life.

In spite of a political will in Sweden to enable people, both men and women, to combine involvement in paid work with family life,<sup>148</sup> many individuals experience conflicting time demands. This might partly be explained by a reduction in time devoted to paid work, if one looks at the total life span. Extended education and early retirement trends imply later entry into, and earlier exit from, the labour market. This means that during a shorter period in life, many life activities take place simultaneously, e.g. establishing a position on the labour market, marrying, having children, and settling down etc. Circumstances like this may cause already vulnerable individuals to experience increased problems in handling and balancing the demands of working life and the expectations of their private life. In study II for instance, women working overtime had an increased risk of premature death even after social, behavioural, health and personality factors were adjusted for. This could be interpreted as if the “paid work” part in the work-life balance is taking too much space or becoming too heavy or dense so that an imbalance occurs.

When the “paid work” part is overloaded, it may also interfere with the “other aspects of life” part, resulting in a work-life imbalance. Study III showed that such a negative interference between the two settings is associated with detrimental subjective health effects among both women and men, even after adjustment for family situation, children, level of education and work categories. The fact that this association disappeared among women and remained among men after adjustment for unwinding, as described above, could be interpreted in a work-life balance perspective as high workload in both settings and a general lack of time and chance to unwind, i.e. “charging the batteries” for women. Women seem to be more vulnerable than men from this perspective, and consulting study IV, flexible working conditions are to be

preferred to strained individuals, among women. Among men, the lack of effect from unwinding could be explained in a work-life balance perspective by what they include in work/home interference since a different perception of balance between paid work and other aspects of life has been described in a previous study.<sup>61</sup>

Adding unemployment to the work-life balance perspective may make the “paid work” part contain too little paid work, but a lot of unpaid work trying to get a job, and also perhaps a lot of worries about the situation. This unpaid work and the worries probably interfere with the “other aspects of life” part and cause a work-life imbalance.

## **STRENGTHS AND LIMITATIONS OF THE STUDIES**

### **Misclassification**

In studies I and II, the assessment of the different exposure variables refers to one point in time, 1973, and the changes in exposure for the study subjects over the decades were not possible to measure. Neither was it possible to measure the number of unemployment episodes and the duration of each episode.

Exposed individuals could repeatedly be unemployed during the follow-up period. This does not lead to misclassification of the exposure because the exposure analysed was "ever unemployed" and the different levels of exposure were not taken into account. Individuals classified as never unemployed as of 1973 could encounter unemployment later on and therefore be misclassified. This limitation would lead to underestimated risk if those who became unemployed after 1973 had the same mortality pattern as those reported as ever unemployed as of 1973. It is likely that the validity of the exposure classification is highest for the time closest to the data collection.

Among women, the number of cases during the first 5-year period was small. Among men, the precision was also reduced over the same period, but several of the point estimates were more pronounced for the first 5-year period. This suggests that the results for the 24-year period may be diluted by misclassification of the exposures (apart from a time-dependent reduction in the RR).

Focus in studies III and IV is on the pressure experienced from work/home interference – regardless of source. It is possible that the inclusive measure used encompasses the whole range of potential sources of interference. Self-report measures as used in this thesis are essential in such instances because they procure the individual assessment of the subjects themselves concerning e.g. feelings about health or unwinding. They have broad appeal and involve little interpretation by the investigator.<sup>78</sup>

One question is used to measure the experience of work-home interference and one to measure the home-work interference. Single item measures are not always optimal due to a loss in specificity, in particular for prevalence studies. In studies III and IV the results are used in order to make comparisons between different groups and there is no reason to believe that there are differences between those groups' understanding of the questions posed. With single item measures as in this case it is of importance to use terms that describe a concept in “general” terms and that have “face validity” - meaning that it seems to measure what it claims to measure, for many different individuals.<sup>78</sup> There is good reason to believe that this is the case here.

In contrast to study IV, it is not known in study III whether it is the same individuals that experience interference from work to home as from home to work. A revisit of the material however shows that some but not all respondents, among both men (25%) and women (27%), experience interference

simultaneously in both directions. The study results should be interpreted with adequate consideration for this possible bias, which could introduce an overestimation of the odds ratios.

An additional strength of the fourth study is the distinction introduced among women based on both their working conditions and their source of experienced interference, a combination that only has been slightly considered in earlier studies. The results of the cluster analysis in study IV may lack reliability as checks were not made to assess the stability of the derived cluster solutions. Herein, the solution was replicated across three equivalent samples of the data and stability was confirmed.

For all variables, the dichotomisations bring variation in frequencies within the exposure groups since the “middle response alternative” is included here. An advantage of this is that the whole population of respondents is taken into consideration. This may result in slightly lower odds ratios than if the exposure groups had consisted of only those who were most exposed.

### **Selection bias**

In studies I and II, the association between unemployment and mortality may partly be affected by the selection mechanisms, because individuals with certain risk indicators are more likely to become unemployed than those without the risk indicators in question. However, unemployment may also contribute to the development of these risk indicators and, in turn, to poor health. Unemployment in studies I and II was measured in a period of low-unemployment. Since, among unemployed, the proportion of poor health is higher in periods of low-unemployment than in periods of high, this may introduce a health selection bias to take into account when comparisons are made for other time period with higher unemployment.

The identification of ceased subjects should have a very high sensitivity and specificity, so there should not be any bias in the mortality data. However, higher death rates were found among

those who did not answer the questionnaire, and it may be that the non-respondents (17%) comprise an excess number of unemployed subjects. The effects of the non-response are not possible to assess. There might be a potential selection bias that reduces the associations found.

In studies III and IV, the response rate was low, 60 percent among women and 50 percent among men. Since focus is on relative differences rather than absolute ones, the association between interference and subjective health is probably not affected by the low response rate.

A possible selection mechanism may be that those with a high level of negative interference between the settings do not answer the questionnaire to the same extent as others. If so, the odds ratios measured are underestimated. More responses from married individuals could also result in underestimation of the odds ratios, if the total work load is more pronounced among single parents, but this effect is controlled for with the adjusted measurements. It is also difficult to determine in which cluster of working conditions the non-respondents would have belonged.

There is no scope for controlling for ill-health, and as is often the case in surveys of this kind, it is possible that the respondents are in better health than non-respondents, introducing a healthy worker bias, leading to an underestimation of the odds ratios.

### **Additional considerations**

The cross-sectional design used in studies III and IV makes it impossible to discuss causality and leaves no scope for measuring the effect on health of intensity level in either experienced interference or unwinding. Also, reverse causality cannot be ruled out. Yet, as the primary purpose of the studies was explore whether traces of associations with early signs of subjective health disorders could be observed, the use of cross-sectional data procured interesting information that can be a starting point for more robust designs.<sup>162</sup>

A major advantage of studies I and II was that it was possible to control for confounding caused by genetic and early social and environmental conditions by analysing unemployment among discordant twin pairs. Generally, twins have early social and environmental conditions in common. In addition, it was also possible to take into consideration the potential impact of social, behavioural, work, and health-related factors on the relations studied.

The cross-sectional data, however, did not permit a clear determination of the timing between risk indicators and unemployment. Adjustment for risk indicators that constitute links in the causal chain between an exposure and an outcome may inaccurately reduce an association and mask an actual effect or part of the effect attributable to the exposure.

After adjustment for long-lasting or serious illness, the results may still be influenced by selective illness. The question used may have a low sensitivity and probably fails to capture all types of illness. This could imply an overestimation of the effect due to unemployment.

In studies II and IV, when controlling for potential confounders (age, family situation, children/parenthood, education, and full time/part time), a slight increase in the odds ratios was observed, but it did not have any major effect on the results. This could be explained by the fact that the variables considered have both positive and negative effects on the interference between work and home.

Even though unwinding has an overall effect on the association between interference and subjective health, the direction of the causality is not indicated as the design is cross-sectional. Those experiencing negative interference are probably those who need to unwind the most. Or the other way round, those who lack opportunities to unwind may be experiencing interference to a greater extent.



## CONCLUSIONS

The results of the studies making up this thesis suggest that both absence of paid work and additional work are detrimental to health. For each of the “amounts of work” studied herein, the following conclusions can be derived.

### **Unemployment – can too little be too much?**

- For women, unemployment impacts on premature death by suicide. This association is strengthened by the use of sleeping pills or tranquillizers. Also, having an extravert and unstable personality showed a tendency to strengthen the associations.
- For men, unemployment instead impacts on premature death by external undetermined causes. This association is strengthened by low level of education or long-term illness. Use of sleeping pills also shows a tendency to strengthen the associations.

### **Paid work – can additional work be too much?**

- For part-time working women, there is no increased risk for premature death as there is for part-time working men. This latter risk disappears, however, after control for confounding.
- Overtime work for more than five hours a week increase the risk of premature death among women, while for men, overtime work for less than five hours a week introduces an under-risk instead.
- For men, extra work for more than five hours a week – as opposed to overtime – increases the risk of premature death.

**Interference, work-home, home-work or both ways – can the total amount of work become greater than the sum of two separate amounts?**

- Experience of work/home interferences associated with subjective health is common among both women and men (no data for part-time working men).

*Work-home interference* (adjusted for age, family situation, children, education, and work category)

- For both women and men, there are associations with impaired sleep quality and suboptimal self-rated health. There are also associations with medicine intake for men. The strongest associations are found with self-rated health among full-time workers.

*Home-work interference* (adjusted for age, family situation, children, education, and work category)

- For both full-time working women and men, there are associations with impaired sleep quality and sub-optimal self-rated health. There are no such associations among part-time workers, however.

*Simultaneous work-home and home-work interference* (adjusted for age, family situation, children, education, and full-time/part-time job)

- There are associations with suboptimal self-rated health irrespective of work situation.
- For women with qualified, demanding, and time-inflexible working conditions, the association with suboptimal self-rated health is the strongest.  
(these data were only available concerning women)

**Interference and lack of unwinding – can unwinding be a buffer when the combination of two parts is bigger than their sum?**

The beneficial effect of unwinding on health is more pronounced for women than for men. This could be interpreted as women's total workload in general exceeding that of men and as just a little more already being too much.

*Work-home interference and adjustment for lack of unwinding*

- For women, the associations with impaired sleep quality and suboptimal self-rated health disappeared when adjusting for lack of unwinding, whilst for men, the same thing happened to the association with medicine intake.

*Home-work interference and adjustment for lack of unwinding*

- For both women and men, the association with impaired sleep quality disappeared but not the one with suboptimal self-rated health when adjusting for lack of unwinding.

*Simultaneous work-home and home-work interference and adjustment for lack of unwinding*

- The association with suboptimal self-rated health disappeared, irrespective of work situation.
- For women with qualified, demanding, and time-inflexible working conditions, the association with suboptimal self-rated health is only partly affected by lack of unwinding.

(these data were only available concerning women)

*Lack of unwinding*

- For women, lack of unwinding is associated with suboptimal self-rated health.

(these data were only available concerning women)

The explanations proposed for the effects on – or associations with – health, that are identified by the present studies can be of various kinds. Herein, emphasis has been placed on stress reactions and related activation of the body's stress defence systems. Physiological activation, known as the 'allostatic load', is indeed considered in its role as a link between amount of work and health.

A work-life balance perspective makes it possible to envisage public health and individual health matters in relation to the situation for unemployed individuals, for individuals with different working hours and those with a negative interference between the paid work and other aspects of life. In the absence of this balance, unhealthy stress may arise, and health may be threatened.

A sense of imbalance may occur when people find their paid work situation too demanding, too complex or insufficiently stimulating. But the feeling may also come from home or private-related factors. On the company or organisation level, there are functional and economical advantages to be derived when a good balance between work and private life is achieved by the employees. A lack of balance may affect work performance and also lead to increased costs for staff turnover, sick-leave and rehabilitation.

## **SAMMANFATTNING (SUMMARY IN SWEDISH)**

Denna avhandling skrevs i avsikt att öka kunskapen om hur mängden arbete påverkar hälsotillståndet. Olika former av arbetsmängd studerades, t ex arbetslöshet, övertidsarbete och den sammantagna arbetsmängden i individens yrkesliv och privatliv.

Två inledande studier baserades på det svenska tvillingregistret och fokuserade på arbetslöshet i förhållande till specifika dödsorsaker; samt på effekten av arbetslöshet, deltidsarbete, övertidsarbete och extra arbete på förtidig död. Studierna inkluderade 9 500 yrkesarbetande kvinnor och 11 132 män vilka besvarade en enkät år 1973. Två avslutande studier fokuserade på kombinationen av yrkesarbete och privatliv, samt dess samband med tidiga tecken på försämrad subjektiv hälsa. Data baserades här på en enkätundersökning år 2001, omfattande en representativ andel av den svenska befolkningen i åldrarna 25-75 år, stratifierad för kön, ålder, och boendeort (n=6 800 personer). Ur denna population valdes alla hel- och deltidsarbetande kvinnor (n=979) och män (n=831) i åldrarna 25-64 år.

I studie I, inriktad på arbetslöshet (d.v.s. avsaknad av betalt arbete), påvisades en förhöjd självmordsrisk bland kvinnor och en förhöjd risk för död p.g.a. yttre obestämmd orsak bland män. Bland kvinnorna förstärktes risken vid användande av sömnmedel och lugnande medel. Bland männen fanns en motsvarande förstärkt effekt vid låg utbildningsnivå och lång tids sjukdom. I studie II påvisades, förutom sambanden mellan arbetslöshet och förtidig död, att övertid och extra arbete ökade risken för förtidig död bland kvinnor. Bland män observerades detta samband endast vad gäller extra arbete. Övertidsarbete som inte överstiger fem timmar per vecka noterades ge en

minskad risk för förtidig död bland män. För deltidarbete noterades en ökad risk bland män men inte bland kvinnor.

Studie III visade att krav i yrkesarbetet som medförde störningar i privatlivet (arbete-hem påverkan) hade samband med försämrad sömnkvalité och självskattad hälsa bland både kvinnor och män. Dessa samband försvann bland kvinnorna, men inte bland männen, då data justerades för brist på återhämtning/nedvarvning. Samband mellan arbete-hem påverkan och intag av sömnmedel eller lugnande medel noterades endast hos heltidsarbetande män. När krav i privatlivet medförde störningar i yrkesarbetet (hem-arbete påverkan) fanns samband med försämrad sömnkvalité och självskattad hälsa hos heltidsarbetande kvinnor och män. Sambandet med sömnkvalité försvann då data justerades för brist på återhämtning, dock inte för självskattad hälsa.

Deltidarbete minskade i allmänt risken för studerade negativa hälsoförändringar. I studie IV identifierades via klusteranalys tre grupper av kvinnor med ”flexibla”, ”pressade” och ”okvalificerade” arbetsförhållanden. Oavsett grupp noterades att samtidigt ha arbete-hem och hem-arbete påverkan, samt brist på återhämtning, har samband med nedsatt självskattad hälsa. Kvinnor med ”pressade” arbetsförhållanden utgör en högriskgrupp då denna grupp uppvisade de högsta oddskvoterna vad gäller nedsatt självskattad hälsa.

I avsaknad av en god balans mellan arbete och privat liv kan hälsovådliga stressymptom uppkomma. De nedsättningar i hälsostatus som observerats i detta avhandlingsarbete kan sannolikt till en del förklaras av en långvarig aktivering av kroppens stresssystem. Denna fysiologiska aktivering, allostatisk reglering, kan vara en bidragande mekanism för de observerade sambanden mellan mängden arbete och hälsa.

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