“Sleep problems - a time perspective”

“A cross-sectional and longitudinal approach”

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Abstract

Sleep problems are one of the most common health complaints in the population. Furthermore, people often judge good sleep as crucial for everyday well-being and it has been shown that lack of sleep has negative health effects. However, sleep has not been a subject of much sociological study.

In this study sleep problems are analysed in different ways. First, a cross-sectional analysis is done in order to find out whether sleep problems in the population have increased from 1968 to 2000. Secondly, a longitudinal analysis is done to see how sleep problems pattern from middle-age to old-age. Last, it is analysed whether there are any differences in the sleep patterns from middle-age to old-age for manual workers and non-manuals.

This study shows that there has been an increase in sleep problems from 1968 to 2000 in the population. However the increase has only affected younger age groups (between the age 19-55), the elderly population is unaffected. The increase is found among both men and women. Longitudinal analyses of a cohort (born 1915-1925) followed from middle-age to old-age (for 34 years) showed that one out of four experienced an onset of sleep problems during the study. This is in line with earlier research stating that insomnia to a large part is age-related. Furthermore, it was found that manual workers had a larger increase of sleep problems across the 34 years than non-manuals, perhaps suggesting an accumulation effect.

All analyses were separated for gender and women constantly reported more sleep problems than men. This is not surprising since this relation have been found across almost all cultures and times. Nevertheless, in this study no increase of the gender gap was found with advancing age, a relation found in most other studies. However more research is needed to understand the reason behind the gendered nature of sleep problems.

Key words: Insomnia, sleep problems, social class, gender differences, cohort.
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Introduction

A good night’s sleep can be crucial for one’s well-being. Not only do people often complain about lack of sleep, many also value their sleep so highly that they dedicate their free time to it. Sleep problems are a common complaint in the general population and earlier studies have concluded that sleep problems are connected with negative health outcomes, such as: diabetes (Yaggi et al., 2006), psychiatric disorders (Ford and Kamerow, 1989a), cognitive decline (Cricco et al., 2001) and even mortality (Hublin et al., 2007). A good night’s sleep is therefore not only to regard as an unnecessary luxury, but more so as a valuable resource; differentiating people’s health and possibilities. The study of peoples sleep therefore becomes an important subject of study.

This study relates to the large body of insomnia studies. It is worth mentioning that there is no consensus to how to define and measure insomnia (Ohayon, 2002). In this study the terms insomnia/sleep problems/sleep disturbances are used interchangeably, except in the theoretical part where insomnia is discussed as a specific diagnosis. In general, three tendencies have been found in insomnia studies (not all): insomnia is to a large part age-related, women have a predisposition for insomnia and lower social class is associated with insomnia. Data from Swedish studies also suggests that there has been an increase in people reporting sleep problems during the last decade (Broman et al., 2004, Hetta et al., 2006).

This study is mainly descriptive. However both cross-sectional and longitudinal results are discussed. The use of both a longitudinal and a cross-sectional design hints that an age-period-cohort-study (APC) probably should be the most relevant analysis of sleep problems in the population; but a proper APC-study lies outside the scope of this paper. What this study does is to compare prevalence between two measurement points; it is possible to recognize whether sleep problems have increased in the general population and between different age and gender groups. Furthermore, in this study a single cohort is followed over 34-years to evaluate the general pattern of sleep problems over the life course. However, this study doesn’t compare different cohorts which would have been fruitful, but it can be regarded as a taste of what would be possible to find using proper APC-analysis. All analyses are separated for gender since sleep problems earlier has been found to be gendered.

Regarding age it has been found that the pattern of sleep differs across the life-span. Sleep is closely connected with different ages; infants have their needs and abilities to sleep, whereas elderly people have their needs and abilities to sleep. Most important for this study is the association between sleep
problems and entering old age. In epidemiological studies approximately 40-50% of the elderly population report some kind of sleep disturbance (Ohayon, 2002). This relationship can be due to a variety of factors. Ancoli-Israel (1997) argues that the common idea that elderly people need less sleep is a myth; it is more likely that the ability to sleep is affected by age. However, it is yet not known whether sleep problems increase because of the physiology of sleep changes, the occurrence of other health conditions, or psycho-social factors.

A range of physiological changes occurs as one ages, some affecting sleep negatively such as: nocturia, restless legs syndrome, sleep apnea, pain, and other health conditions (Ohayon, 2004). Yet, it is too simplistic to recognize sleep as a physiological phenomenon alone.

The psychosocial changes connected with advancing age are a range of status and identity transitions possibly affecting the ability to sleep. Hislop and Arber (2003) mention for example that the transition from work to retirement, from good to bad health, from active to a sedentary lifestyle, from being a spouse to a widow/widower and from being a care-giver to a care receiver; all these transitions can lead to increased stress, worrying and insecurity which can have a negative effect on one’s sleep. However this study aims at bringing some light on the continuity of sleep problems. A cohort is followed for 34-years in order to gain understanding of how the trajectories of sleep problems develops throughout life, and more specific as one is approaching and entering old age.

Gender patterns have been seen in sleep studies. In a meta-analysis of 29 studies it was concluded that women have a 40% increased risk of having insomnia compared to men. After 65 years of age the risk increases to 70% (Zhang and Wing, 2006). In a similar meta-analysis by Ohayon (2002) the risk was also set to 40%, but the increased risk ratio of 70% was found in people over the age of 45, instead of 65. No biological explanations have sufficiently explained the gender difference in sleep. However, results from some studies on women’s stage in the reproductive status (menstrual cycle, pregnancy and menopause) have found that this might affect sleep negatively (Lee et al., 2008, Pien et al., 2008). Other researchers have suggested social explanations to the gender difference in sleep. Hislop and Arber (2006) have for example studied the effects of different social roles, responsibilities and gender division of labour. Women tend to be ascribed social roles that include much caring and worrying, and studies have shown that sleep is negatively affected by worrying and anxiety (Arber et al., 2009). Women’s larger share of worry and anxiety is supported by, for example Robichaud et al. (2003).

It has been suggested that socioeconomic status also patterns sleep and especially that low socioeconomic status might have a negative impact on sleep. This relation has been found in some studies (Geroldi et al., 1996, Friedman et al., 2007). Albeit, little is yet known about the directional causality of SES’s relationship to sleep. A body of literature has discussed sleep as a potential pathway
between SES and health (Van Cauter and Spiegel, 1999, Moore et al., 2002, Sickel et al., 1999). But as Moore et al. (2002) points out, the lack of longitudinal data makes it difficult to distinguish if lower SES leads to poor sleep, or if poor sleep leads to lower SES and if either/both might be mainly influenced by health status. SES might also account for some of the gender difference in sleep because women, at least in Britain, tend to have lower SES than men (Arber et al., 2009). Another hypothesis is that low SES might cause stress (which have negative effects on peoples physiology) leading to bad health (McEwen, 1998).

Results from Swedish studies have suggested that reported sleep problems are increasing in the population. In order to analyse this, the first aim of the study is:

1. To cross-sectionally analyse the amount of reported sleep problems between the years 1968-2000 and to compare different age and gender groups distribution of sleep problems between the 32-years.

Most studies show that sleep problems tend to increase with age. To gain a more thorough understanding of how sleep problems tend to develop over the life course a cohort will be analysed longitudinally in line with the second aim:

2. To make a longitudinal analysis, following a cohort over 34-years. This is done in order to investigate the impact of aging on sleep problems and to gain information about the recurrence of sleep problems.

Research has also shown that certain groups have a larger risk of suffering from sleep problems, the last aim is:

3. To make group analyses in order to obtain information if certain groups have more or less sleep problems. Groups being compared are based on gender and social class.
Theory and earlier research

From a sociological perspective sleep has long been a dark spot on the map. Little has been said or written about the sociological relevance of sleep. As Williams points out:

_Sleep provides a paradigmatic example of intertwining of biological processes: a complex, emergent, embodied phenomenon which is irreducible to any one domain or discourse._ (Williams, 2002)

Perhaps this quote gives us some insight to the neglect of sleep as a sociological issue? The biologic perspective has predominated the study of sleep, which in some way might have reduced the number of sociologists studying sleep. Yet, to view sleep from a strictly biologic perspective is too narrow, which becomes obvious when you regard questions as to _how_ and _when_ people sleep. In a historical and geographical sense you can easily track that people sleep on different occasions and in different ways. For example you can look at the siesta-cultures around the Mediterranean Sea, the commuting workers on Tokyo’s metro, or night shift workers. They all practice their sleep in another pattern than the most common western way of eight hours of sleep during the night. As for _how_ people sleep, examples as to clothing and differences in body position makes it evident that sleep is a social practise highly determined by cultural setting.

From an historical perspective it is apparent that sleep is also determined by social factors. Elias (1978) has increased the understanding of how sleep has undergone a civilizing process. The most obvious is how sleep, from the middle-ages, has transformed from something done in public to a more private activity primarily performed in a secluded area far away from noise and people.

Another important insight is how modern life has led to a “colonization” of the night. In earlier times the night was in Melbin’s words a frontier between two days. New inventions like electricity have reshaped our habits until night is no longer the absolute frontier (Melbin, 1987). This has had a major influence on how we regard sleep, and especially sleep duration. The concept of eight hour sleep between two working days is a relatively new one.
The physiology of sleep

Sleep is generally conceived as a "resting state in which the body is not active and the mind is unconscious" (definition taken from “Cambridge advanced learner's dictionary”) (Woodford and Jackson, 2003). This definition is informative for how sleep is generally perceived. Yet, this definition is not precise enough, for example the definition does not allow distinguishing between coma and sleep, and does not take to account for example sleep walking. In contrast to the more common definitions of sleep most scholarly definitions of sleep are based on the study of brain activity in wakefulness and sleep.

The sleep stages and brain waves in sleep

In 1968 consensus based guidelines were developed for how sleep was to be measured and staged in normal human subjects with EEG. The guidelines were called the “Rechtschaffen and Kales Sleep Staging Criteria” (R & K) (Rechtschaffen and Kales, 1968). Until recently these definitions of the sleep stages have been the dominant. The “R & K” guidelines consisted of three different stages Waking, Non-REM sleep (sub-grouped into four different stages) and REM sleep. The different sleep stages were based on statistical scoring criteria for brain activity and eye movements. In the four sub-groups of Non-REM sleep stage 3 and 4 comprise of slow wave sleep (SWS) or Delta-sleep.

According to the “R & K” guidelines sleep generally proceed in a cycle of: Stage 1 -> Stage 2 -> Stage 3 -> Stage 4 -> REM sleep, throughout the night. With different proportions of the sleep stages in different parts of the night.

In 2007 a revised version of the “R & K” guidelines was published (Iber et al., 2007). The revision included a range of changes based on the empirical results from the period 1968 to 2004. The revision insisted on keeping the three major sleep stages Wakefulness (Stage W), non-REM sleep (NREM sleep) and REM sleep. The most prominent change made in the revision was a reduction of the four non-REM sleep stages to three. The two different slow wave sleep stages (Stage 3 and 4) were collapsed into one. There were also changes made regarding the criteria for different sleep stages, all of a more technical nature. The commission also proposed a new terminology for the different sleep stages which will most likely be adopted by the research community, even though the revision has gained some criticism. The revised version of the sleep stages are the following:

Stage W (Wakefulness)
Stage N1 (Non-REM sleep 1)
Stage N2 (Non-REM sleep 2)
Stage N3 (Non-REM sleep 3)
Stage R (REM sleep)
It must be noted that the sleep stages is much of a work-in-progress. The sleep stages are not as easily demarked as they are generally understood. The measuring of brain waves and categorizing of the sleep stages are made like a threshold, if the brainwaves exceed an amplitude or likewise one are entering a new sleep stage. Many researchers mean that sleep stages must be understood more as a natural continuum and some researchers have also found that the demarcation of four different sleep stages is irrelevant, or that at least more sleep stages should be added. (Schulz, 2008).

The circadian rhythm
Borbély (1982) has suggested a two process model to understand the physiology of sleep regulation. Borbély’s model proposes that two processes are at state simultaneously: the circadian rhythm and the homeostatic process. The circadian rhythm can be understood as a clock regulating the timing of sleep. The circadian rhythm is mainly located in the hypothalamus and regulates the timing through melatonin levels, core body temperature, and cortisol. The circadian rhythm is mainly determined by ocular light (also called a “zeitgeber”), and therefore humans have a circadian rhythm of approximately 24 hours. The homeostatic component is basically a process who records the duration of how long it was since one was last asleep. The longer ago one slept, the longer and deeper will the following sleep period be. The deep sleep is maintained with an increase in slow wave sleep (Stage N3) on account of REM sleep (Stage R).

Sleep disorders
Sleep disorders are medical disorders of the sleep pattern. There has been an increase in classifiable disorders in the last twenty years. The most frequent sleep disorder is insomnia.

Insomnia
Insomnia is to be understood both as a sleep disorder and as a symptom. Insomnia as a primary sleep disorder is not as common as insomnia as a symptom of other sleep disorders, diseases or environmental causes. In epidemiological studies of prevalence of insomnia in the population one usually considers both primary and secondary insomnia. The results from epidemiological studies are much varied in prevalence due to different inclusion criteria and also depending on cultural setting and which age groups included in the study. There is no consensus as to how one should diagnose insomnia. Because of the lack of clinical signs one usually relies on self-reports. However there are disparities between how different manuals define insomnia. The two manuals most frequently used is “The International Classification of Sleep Disorders (ICSD)” (Michael and Thorp, 1997) and “Diagnostic and Statistical Manual (DSM)” (A.P.A, 1994). In ICDS insomnia is defined as: “an almost nightly complaint of an insufficient amount of sleep or not feeling rested after the habitual sleep episode” (Michael and Thorp, 1997). While in DSM insomnia is defined as: “a complaint of difficulty initiating or maintaining sleep or of non-restorative sleep that lasts for one month, along with
the presence of functional impairment or significant distress” (A.P.A, 1994). However, in this study it is not possible to measure insomnia in a way comparable with any of the insomnia diagnoses.

One usually differentiates between primary and secondary (comorbid) insomnia. Primary insomnia is a sleep disorder not due to any co-existing physical or medical conditions (Harvey, 2001). Primary insomnia is thought to be prevalent in 25-30% of persons diagnosed with insomnia (Roth and Roehrs, 2003). Secondary insomnia can be a result of other underlying causes and Vitiello (1997) has suggested the following:

A) *Sleep disturbances secondary to physical and mental illness*. (Depression and anxiety disorder).
B) *Other primary sleep disorders*. (Obstructive sleep apnea or periodic leg movement).
C) *Sleep hygiene* (Bed time habits).
D) *Circadian rhythm and Melatonin* (Changes in the regulation of sleep).

**Prevalence in the population**

Estimates of insomnia in epidemiological studies have been shown to vary greatly. The variation is mainly due to different use of methodology and diverse inclusion criteria. In a review of Ohayon (2002), four types of insomnia studies are identified. In studies with wide inclusion criteria’s (only looking at insomnia symptoms), as the present, about 30-48% of the general population reports sleep problems. The second type of insomnia studies asks for daytimes consequences (prevalence 9-15%). The third type also takes to account for dissatisfaction with quantity or quality of sleep (prevalence 8-18%). The last definition of insomnia corresponds with the DMS-IV classification of insomnia (prevalence around 6%).

The distribution of insomnia throughout the population is unequal. Certain groups are risk groups with higher prevalence than others. Groups reporting higher levels of insomnia are: women, people with low education/low social status or unemployed, separated or divorced individuals, people who are medically ill and people suffering from depression, anxiety or substance abuse. Insomnia has also been found to increase with age (Sateia et al., 2000).

Insomnia has been found to contribute to a range of ill-health conditions. Caution must be taken regarding these results, mainly because as earlier been shown in 75-70% of the cases insomnia is a comorbid condition. The coexistence of other diseases/symptoms complicates any statement of the causal direction. In one of the most thorough reviews of insomnia and its health consequences by Taylor (2003) evidence was found that insomnia was predictive of: depression, anxiety disorder, other psychological disorders, alcohol abuse or dependence, drug abuse or dependence and suicide. Furthermore, insomnia was also related to lower immune functioning. The study found inconclusive evidence for insomnia as a risk factor for cardiovascular disease and mortality. However, use of sleep
medication was predictive of mortality. Sleep can also be connected with inability to cope with stress, increasing among other things cortisol levels, which possibly can link sleep to lowered immune functioning.

**Other sleep disorders**

Apart from insomnia, other examples of sleep disorders are: restless legs syndrome/periodic legs movement, obstructive sleep apnea syndrome, narcolepsy and REM sleep behavior disorder. Insomnia and restless legs syndrome have a female predominance, however most other sleep disorders are more frequent among men. (Dzaja et al., 2005).

**Age- and gender- related changes in the physiology of sleep**

It has been found that sleep difficulties increase as people age. As showed in this chapter, aging is connected with physiological changes negatively affecting sleep. For example the circadian rhythm is known to change in people as they age. In general both the timing and functioning is disrupted. The timing is affected in such it is earlier. Elderly people often get sleepy earlier and wake up earlier (Carrier et al., 2002). The melatonin level have also been reported to decrease in elderly people, leading to a lessened ability to sleep (Dijk et al., 2000).

Furthermore, a reduction of slow wave sleep (Stage N3) has been found in elderly individuals, and most prominent in men (Webb, 1982, Reynold et al., 1985). A more recent field of study on the physiology of sleep is the effect of women’s position in the reproduction stage (menstrual cycle, menopause and pregnancy) and its possibly negative effect on sleep, for a review see Dzaja (2005). Even though there is some evidence showing that age-related changes decrease the ability to sleep many researchers believes that the physiological changes of sleep are not the most prominent reason for the increase in sleep problems in old age. As Vitiello (1997) points out, it is more likely that the occurrence of other ill-health conditions leading to the great amount of sleep problems rather than changes in the physiology of sleep.

Regarding the gender difference in sleep, researchers have shown that women have more sleep problems than men, and in general the gender gap increases in old age (Ohayon, 2002, Zhang and Wing, 2006). However, studies of sleep physiology have often contradicted this statement. It has been found that sleep disorders (except insomnia) are more likely to occur in men. Furthermore, men are also more affected by changes in the sleep architecture (reduction of slow wave sleep). These findings suggest that the gender difference in sleep problems cannot be explained solely by physiological factors.
Sleep and its social determinants

Sleep is not determined by physiological factors alone. For example there seems to be no physiological explanations as to why women report more sleep difficulties than men.

Sleep and socioeconomic status

Low socioeconomic status seems to predict sleep problems. Low socioeconomic status is related to the occurrence of sleep problems (Friedman et al., 2007). Socioeconomic status is thought to affect sleep both in the setting where you sleep (people worse off might live crowded, with more disturbing factors) but also as an stressor (worrying and anxiety about for example economic issues). There is also a body of research that points to sleep as a mediator of the relationship between socioeconomic status and health (Moore et al., 2002, Van Cauter and Spiegel, 1999). Little is yet known whether sleep is a reflection of health or actually a determinant of health, or both. It has been found that low socioeconomic status is associated with ill-health (Marmot, 2004), but it is uncertain whether ill-health leads to more sleep problems or if sleep problems actually lead to worse health. However, it is important to point out that sleep to a large degree seems to follow the results from research on health inequalities: sleep appears to follow a social gradient where people have proportionally worse sleep as further down the social gradient you move. Socioeconomic status is also patterned within the society and certain groups tend to have lower SES than others. Women tend to have lower SES than men and therefore is it possible that socioeconomic status to a part explains the gender differences in sleep, as been pointed out by Arber and colleagues (2009).

Another interesting area of research is focusing on stress as a pathway between the society and the body: “How does the environment get under the skin” as Taylor and associates (1997) puts it. Much of the research in this area has tried to explain how differences in SES can affect health, and one hypothesis is that SES affects health through chronic stress/allostatic load, mental distress, coping skills and resources, and health habits (Taylor et al., 1997). Stress has also shown to negatively affect sleep (Morin et al., 2003) and could therefore possibly be part of the explanation of the association between SES and sleep, and also the relationship between sleep and health.

Sleep and psychology

Another link between sleep and its social determinants is psychology. Research has shown that sleep can be negatively affected foremost by depression and anxiety. Epidemiological studies have found that for persons with depression between 50-90% also report sleep problems (Casper et al., 1985, Hetta et al., 1985, Riemann et al., 2001). Whereas in epidemiological studies of insomnia about 20% usually reports depression (Ford and Kamerow, 1989b, Balter and Uhlenhuth, 1992, Soldatos, 1994). But, as pointed out by Soldatos (1994) and others, the causal relationship between insomnia and psychiatric disorders have not yet been defined, and there is uncertainty which one is the
precursor of the other. However, what is known is that there is a strong association between insomnia and depression/anxiety.

**Sleep and social life**

As stated by Dzaja et al. (2005) “sleep takes place within a social context which influences the patterning of sleep throughout the life course. As a mirror of everyday life, sleep reflects the roles and responsibilities, gender division, health patterns and transitions which characterize people’s lives.” (Dzaja, 2005:69) This quote implies that sleep can never be extracted from the setting where it is practiced. One must therefore also consider the cultural surroundings where sleep is done to understand sleep as a practice.

A large part of what’s been written about the psycho-social aspects of sleep has tried to explain the gender differences in sleep. In recent years foremost the members of The Sociology of Sleep group at Surrey University\(^1\) have made important contributions to the area of sociology of sleep. Foremost Hislop and Arber have offered increased understanding of how women’s sleep has become a disposable resource often neglected due to other responsibilities such as caring for children, partners or elderly relatives. Women’s double work; having a career and main responsibility at home, tends to transform the bedroom to an “invisible workplace”. All in all, women tend to sacrifice their sleep as a part of their role as mothers and partners in order to fulfil their role as main care-giver.

Entering old-age also leads to psycho-social changes that might affect people’s sleep. Aging is connected with a range of status and identity transitions. That can lead to an increased amount of worrying, insecurity and sadness. Hislop and Arber (2003) mentions, for example: the transition from work to retirement, from good to bad health, from active to a sedentary lifestyle and from being a spouse to a widow/widower. These transitions are associated with stress, which might affect sleep.

**Age and gender differences in sleep and its social determinants**

Earlier studies have found that women are more likely to be affected by social factors disturbing their sleep; both from a socioeconomic, psychological and a psycho-social stand point. Less is known of how age influences social factors. However, most research seems to suggest that people often are negatively affected by social factors as they age (Hislop and Arber, 2003).

\(^1\) [http://www.sociologyofsleep.surrey.ac.uk/](http://www.sociologyofsleep.surrey.ac.uk/)
Summary
From a physiological perspective there is some evidence that sleep is in fact affected by aging. However, it seems like ageing per se is not the most influential issue; it is rather the decline in health that is responsible for the increase of sleep problems in old age. Regarding the gender difference in sleep problems, the physiology of sleep cannot supply a thorough explanation to the gender difference in sleep problems. If any thing, the case should be rather the opposite; men seem to, for example, be more negatively affected by age-related sleep changes than women. Men are both experiencing a larger reduction of slow wave sleep (Stage N3) and men are also more prone to develop a range of sleep disorders, prominently obstructive sleep apnea. On the other hand, it is suggested that women’s sleep is affected by their phase in the reproductive status. But the results from studies of women’s sleep in different reproductive statuses are inconclusive. What is evident is that women are more likely to suffer from insomnia and other sleep disturbances than men. The lack of physiological explanations of these facts suggests social or psychological explanations.

Research has shown that insomnia is often related to depression and anxiety (which are more prevalent among women). Furthermore, women tend to be ascribed the care-giver role which might lead to an increased amount of worrying that is also connected to insomnia. Regarding of socioeconomic status the tendency is also that women are worse off. Lower socioeconomic status has been seen to affect sleep negatively and women have, in general, lower socioeconomic status. In a British survey it was concluded that SES differences can reduce the gender difference by 50% (Arber et al., 2009).

Earlier research (in Sweden)
The challenge of comparing results from sleep studies lies in the much varied definitions of sleep problems. Depending on definition of sleep problems one might end up with a result that between 2-50% experiences sleep disturbances. So, a very large body of studies is available yet not comparable. In this chapter we will mainly focus on studies from the same geographical area (Sweden) to exclude at least a part of the numerous studies. This is to secure that one at least might tap into the same trends in sleep problems.

As noted earlier, the definitions of insomnia are numerous. However, this study will focus on studies which report cross-sectional differences between different years and longitudinal studies of specific samples. In the case of cross-sectional studies these can report trends in the populations: are sleep problems increasing or decreasing? In the case of longitudinal studies they report intra-individual changes in sleep problems across different time spans. These results can be compared with the results from the present study in order to analyse differences in how trajectories of sleep problems develop.
This can for example answer the question of how many have experienced an increase of sleep problems with age.

**Prevalence of sleep problems in Sweden (cross-sectional)**

Swedish studies are quite unanimous that the prevalence of insomnia has increased during the last two decades. Hetta et al. (2006) reports a fivefold increase in insomnia complaints during the last twenty years. In 1981, 9% out of 1962 respondents aged 20-59 reported sleeping difficulties (during the last two weeks) in contrast to 45% in 2003.

A similar study, from the same authors, but exclusive to the Uppsala Municipality (Broman et al., 2004) found a similar result. The study stretched from 1993 to 2003 and had a range of specific sleep questions. The study found that the number of persons reporting severe or very severe problems of either initiating sleep or night awakenings increased from 12.2% to 20.7%. They also found evidence for women reporting significantly more sleep insufficiency than men.

In the study “Sleep disturbances in a young adult population: Can gender differences be explained by differences in psychological status?” by Lindberg et al. (1997), it was found that gender differences are prominent in a young adult population (20-45 years), and that the difference could not be explained by women’s higher prevalence of anxiety. Regarding sleep problems and age, only a weak relation was found, most likely because of the young sample.

Data from Statistics Sweden (2009) also confirms that reported sleep problems in the population are increasing and that women have more sleep problems than men. Men have had an increase in sleep problems from 12.5% in 1986-87 to 22.3% in 2007 (answered yes to a question of sleep problems in the last two weeks) whereas women have had an increase from 16.3% in 1986-87 to 28.5% in 2007. However, the increase in sleep problems is most prominent in the younger age groups.

The chapter “De äldres hälsoutveckling” (Vogel, 2006) from Statistics Sweden study “Welfare of older adults” concludes that sleep problems are more common among old persons but since the 1980’s there has been a large increase in reported sleep problems among persons of working age. It is speculated whereas the increase of sleep problems among those in the working ages is due to increasing unemployment, work strain and experiences of economic insecurity. However the group with largest amount of sleep problems is older women and it is also stated that the gender difference is more salient in the older age groups. Regarding social class, both manual- and non-manual workers have experienced an increase in sleep problem from the 1980’s to the 2000’s although manual workers constantly report more sleep problems. The increase of sleep problems during the last two decades is most prominent in younger non-manuals.
The individual course of sleep problems in Sweden (longitudinal)

Not many Swedish studies have followed a sample for a longer period of time studying their sleep pattern. The strength of following a specific panel is that one can generalize a sleep pattern across the life course. The longitudinal studies from Sweden have foremost explored whether sleep problems tend to increase with age or not and the results from these studies are inconclusive.

Janson et al. (2001) have reported that in a randomly selected sample of men aged 30-69 in Uppsala Municipality, followed across ten years, they found no evidence for age to be related to insomnia. Insomnia was rather connected to lifestyle factors.

However, for women, Björkelund et al. (2002) have found that sleep problems tend to increase rather strongly with age. The study is exclusive to Gothenburg Municipality and follows a sample across 24-years. The prevalence increases from approximately 20% at the age of 28 to 45-50% at the age of 84.

Statistics Sweden concluded that in an elderly population, there is a risk ratio of 1.4-1.5 for experiencing sleep problems when aging 8 years (1995 to 2003). Women and men have approximately the same risk of developing sleep problems during the 8 years (Vogel, 2006).

The results from these studies seems to suggest that it is not certain whether sleep problems increase with age or not in Sweden, an association found in most other countries. However, international studies have found that sleep problems tend to start increasing around middle-age and then increase even more in old-age (Ohayon, 2002). Studies reporting no association between age and insomnia can possibly be due to young samples.
Aims

The aim of this thesis is to study the distribution of sleep problem between the years 1968-2002 in different ways. The reason for using different methods in the analysis is to somewhat disentangle age, period and cohort effects. Can we with cross-sectional analysis identify changes in the amount of people reporting sleep problems between the years 1968 and 2000? This could possibly yield information about period and cohort effects. Furthermore, a cohort is followed over time in order to analyse the impact of age on sleep problems (age effects). Also, different groups are studied to investigate whether Swedish data supports earlier research that has shown that both gender and social class tend to pattern sleep.

1) The first aim is to cross-sectionally analyse the amount of reported sleep problems between the years 1968-2000 and to compare different age and gender groups’ distribution of sleep problems during the 32-years.

2) The second aim is to make a longitudinal analysis, following a cohort over 34-years. This is done in order to investigate the impact of aging on sleep problems and to gain information about the recurrence of sleep problems.

3) The third aim is to make group analyses in order to obtain information about if certain groups have more or less sleep problems. Groups being compared are based on gender and social class.
Material and methods

Material

**LNU and the SWEOLD-study**

The Swedish Level of Living Survey (LNU) is a nationally representative sample of the Swedish population, aged 18-75 years. The study was initiated in 1968 and followed up in 1974, 1981, 1991 and 2000. The study follows a panel over time, continuously adding younger individuals and immigrants in order to keep the sample nationally representative.

In 1992, individuals who had reached the age ceiling of 75 years were included in the sample of the Swedish Panel of Living Conditions of the Oldest Old (SWEOLD). The SWEOLD study was followed up in 2002. The LNU and SWEOLD make up a longitudinal dataset that follows individuals for 36 years (a schematic overview is given in Figure 1):

**Figure 1. Schematic picture of the study design of LNU and SWEOLD**

The studies are based on interviews conducted by professional interviewers. The interviews are performed in the individual’s home or on the location where the person is institutionalized. People unable to answer questions (mainly due to poor cognition) were interviewed with a proxy (a close relative or a care giver). Sample characteristics of the SWEOLD samples are reported in Table 1:
Table 1. Sample characteristics of the SWEOLD study, 1992 and 2002

<table>
<thead>
<tr>
<th>Year of data collection</th>
<th>1992</th>
<th>2002</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Response rate</td>
<td>95.4</td>
<td>537</td>
</tr>
<tr>
<td>Interview type</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Home visit</td>
<td>81.1</td>
<td>439</td>
</tr>
<tr>
<td>Telephone</td>
<td>6.3</td>
<td>34</td>
</tr>
<tr>
<td>Proxy</td>
<td>11.9</td>
<td>64</td>
</tr>
<tr>
<td>Age groups</td>
<td></td>
<td></td>
</tr>
<tr>
<td>77-79</td>
<td>25.5</td>
<td>137</td>
</tr>
<tr>
<td>80-84</td>
<td>43.4</td>
<td>233</td>
</tr>
<tr>
<td>85+</td>
<td>31.1</td>
<td>167</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>39.5</td>
<td>212</td>
</tr>
<tr>
<td>Female</td>
<td>60.5</td>
<td>325</td>
</tr>
</tbody>
</table>

Description of the data collection of LNU (Erikson and Åberg, 1987) and SWEOLD (Lundberg and Thorslund, 1996) can be found elsewhere.

Study population
In the cross-sectional analysis, 5921 persons (non-response rate 9.2%) were included in year 1968 and 5142 (non-response rate 23.4%) in year 2000. In the cross-sectional analysis of the oldest old, 537 persons (non-response rate 4.6%) were included in year 1992 and 621 (non-response rate 11.5%) in year 2002.

In the longitudinal part of the study a panel of 322 individuals are followed. These persons have completed each wave of LNU and SWEOLD interviews (1968, 1974, 1981, 1991 2000/02). The panel is a cohort of individuals born between 1915 and 1925 (57% females), the upper age-limit is set because of cohorts are usually defined in 10-year interval. The people are 77-87 years old in 2002 and there are proportionally less people as you approach the upper age limit (87 years).

Response rate (in the longitudinal sample)
In the longitudinal part of the study a panel is followed from 1968 to 2002. 425 persons were in the study in 1968 and still alive in 2002. Of these 68% answered at each year of the survey. Statistical analysis (not shown) shows that there are no differences in 2002 between the complete sample (N=621) and the selected sample (n=322) in the distribution of sleep problems. This supports that
there is no large selection bias between those who have had the possibility to be included in each year of the study, but have chosen not to participate, and those who have responded each time.

However, the respondents who have lived until they are more than 76 years are most probably a selected group. It has been concluded that sleep problems are connected with mortality (Hublin et al., 2007) which suggests that this study most likely are affected by mortality bias. Mortality bias means that those who are worse off sleeping wise are more likely to pass away during the time of the study. Which leads to those who live to participate in the last year of the study is a selected group with less sleep problems. To control for this, a mortality analysis was performed on having sleep problems or not (Appendix 1.) over four and a half years and over 34 years. This was done to explore whether sleep problems was associated with mortality over a shorter and a long period. Results from the analysis showed no association between sleep problems over a shorter period. However, over a long period sleep problems was associated with mortality. People with sleep problems in 1968 had an increased risk of 30% to die before the end of the study in 2002. This suggests that the panel used in this study is a selected one Yet, the fact that there were no association between sleep problems and death over a short period and the fact that the selected sample shows no difference between the whole sample; the mortality bias is judge not to be to critical for the study as a whole.

**Method**

**Statistical analyses**

The data were analysed using SPSS 17.0 for Windows (SPSS, Chicago, IL). Cross-tabulations were made to compare prevalence between different years and age groups. Significance testing were done using Chi-square tests and Fishers’s exact test (when the cell count subceed five).

Cox proportional hazard regressions were used to analyse mortality risk. Cox regressions are used to identify risk of an event under a specific time period. Cox regression models the time to an occurrence taking place based on the value of a given covariate (in this case is the covariate occurrence of sleep problems) (Collett, 2003). The risk is expressed as a hazard ratio; where a value over 1 describes an increased risk of mortality. Variables controlled for are age and gender. Initially the researcher chooses a time of start and a censure time, if the respondent is alive after the censure time he/her is considered to be alive. In this study, mortality is studied over a short and a long time period. The long time period starts when the respondent answer the survey in 1968 (the year of the first LNU-survey) until the censure time, 2002. The short time period is on 4.5 years. Starting from an answer in 2002 and the censure time is set to 4.5 years. The censure time of 4.5 years is chosen because of data on deaths is only available up to that period. The death register holds data on date of death and is therefore possible to use as a continuous variable, which enables a Cox regression.
Measurements

Sleep

Sleep problems have been included in each wave of the LNU-questionnaire and is integrated in a list of health issues, together with for example: cancer, diabetes and lung problems. The question is stated as follows: “Have you had any sleep problems during the last 12 month?” The question can be answered: “No”, “Slight” or “Severe”. In this study, sleep problem is mostly used as a dichotomized variable where slight and severe sleep problems are both treated as sleep problems. However, criticism has been directed at studies using single-item questions regarding sleep problems, by Ohayon (2002) and others. The critique has for example pointed to the lack of comparability with insomnia diagnoses and cannot measure the frequency of the problem (how many nights a week/month).

Socioeconomic status

Social class: In this study, socioeconomic status is measured using socioeconomic classification of different occupations. The socioeconomic classification (SEI) is based on the typical length of education required for the occupation, trade unions membership and position in and size of the organization (Andersson et al., 1981).

Social class is in this study measured on household level. This can only be done when the occupation of both the respondent and his/her spouse is known. The classification based on household level follows an order of dominance, described by Erikson (1984). The order of dominance suggests that certain positions are dominating and have more influence on a household’s living conditions and behavioural patterns than others. The order of dominance is based on the assumption that occupations with higher qualifications dominate occupations with lower qualifications and non-manual occupation dominates manual occupations. This measure of social class was used in this study since our underlying assumption was that sleep is more affected by general living conditions and behavioural patterns rather than by own working conditions. If, on the other hand, working conditions were believed to the largest influence on sleep an individual measure of social class would have been used.

Furthermore, because of the quite small sample (n=322) used in the analysis of socioeconomic differences in sleep problems occupation was coded into two positions: manual and non-manual. Farmers and entrepreneurs are an ambiguous category; therefore farmers with large farms were coded as non-manuals whereas the rest of the farmers were coded as manual workers. Entrepreneurs with employees were coded as non-manuals whereas entrepreneurs without employees were coded as manual workers.
The classification is derived from a question about main occupation during their working life in the last SWEOLD questionnaire, 2002.

**Age**

In this study age is divided into age groups. When analyzing the total population (data from LNU) age is divided into ten year categories. Whilst when analyzing the oldest old (data from SWEOLD) the respondents are divided into the following age groups: 77-79, 80-84 and 85+.

**Vital status**

Vital status was collected from 1968 to 2007. The data was obtained from the Swedish National Cause of Death Register.
Results

Cross-sectional results

Cross-sectional differences 1968 to 2000

The prevalence of sleep problems have been seen to increase in Sweden. In an analysis of the changes in sleep problems between the years 1968 and 2000 the prevalence of insomnia has increased from 13% to 19% in the general population. Yet, separated for gender and age groups it is evident that certain groups are affected by the increase while others are not. As seen in Table 1 men between the age 19 and 45 have experienced an increase in sleep problems between 1968 and 2000, while the older age groups of men are unaffected. In regards of women the same tendency is found. Women between the age 19 and 55 have experienced an increase of sleep problems while older age groups are unaffected.

Table 2. Prevalence of sleep problems, separated for gender, between 1968 and 2000

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>19-25</td>
<td>2.6</td>
<td>11.9***</td>
<td>6.6</td>
<td>20.5***</td>
</tr>
<tr>
<td>26-35</td>
<td>6.7</td>
<td>16.0***</td>
<td>8.2</td>
<td>17.5***</td>
</tr>
<tr>
<td>36-45</td>
<td>5.5</td>
<td>16.5***</td>
<td>12.6</td>
<td>21.8***</td>
</tr>
<tr>
<td>46-55</td>
<td>11.3</td>
<td>13.6</td>
<td>18.3</td>
<td>25.9**</td>
</tr>
<tr>
<td>56-65</td>
<td>14.2</td>
<td>15.9</td>
<td>27.6</td>
<td>24.4</td>
</tr>
<tr>
<td>66-75</td>
<td>17.5</td>
<td>13.8</td>
<td>32.2</td>
<td>33.0</td>
</tr>
</tbody>
</table>

*p < .05; **p < .01; ***p < .001.

A more profound understanding of the trends in sleep problems is given in Diagram 1 and 2. The diagram shows the amount of people in different age group suffering from sleep problems in 1968, 1981, 1991 and 2000. The average curve represents the percentage of all men reporting sleep problems in one year.
As can be seen in Diagram 1 and 2 there has been a reduction of the difference in the percentage of people reporting sleep problems between the age groups for both women and men; the difference between younger and older age groups are not as large in 2000 as in 1968. This reduction can mostly be found in the increase of sleep problems in the younger age groups (19-55) that came about during the 1980-2000’s. In the older age groups the percentages are more stable over time. This implies that
the increase of sleep problems is most pronounced in the younger age groups and there has been acceleration in their increase of sleep problems from the period 1991 to 2000. Furthermore, it is evident that sleep problems have increased measured for the whole population across the 32 years since the average curve (based on prevalence for all men (Diagram 1) and all women (Diagram 2) have increased for both men and women.

Cross-sectional differences between elderly people 1992 to 2002

In the oldest age groups (where data is only available between 1992 and 2002) the prevalence of sleep problems have increased from 46% to 54% but the difference is not statistically significant. Based on Table 2 the prevalence of sleep problems seems to be unchanged over the ten year period. The only significant change is in men above 85 years of age who have experienced an increase in sleep problems.

Table 3. Prevalence of sleep problems, separated for gender, between 1992 and 2002

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>77-79</td>
<td>25.8</td>
<td>22.5</td>
<td>41.9</td>
<td>44.7</td>
</tr>
<tr>
<td>80-84</td>
<td>29.9</td>
<td>26.0</td>
<td>43.1</td>
<td>44.5</td>
</tr>
<tr>
<td>85+</td>
<td>32.2</td>
<td>48.6*</td>
<td>48.5</td>
<td>46.9</td>
</tr>
</tbody>
</table>

*p < .05; **p < .01; ***p < .001.

Prevalence of sleep problems in the selected sample, 2002

A panel was followed for 34 years. The persons in the panel are a cohort born between 1915 and 1925. Sample characteristics can be found in Table 3:

Table 4. Age and sex of the persons in the studied sample (n = 322)

<table>
<thead>
<tr>
<th>Age</th>
<th>Men (n=138)</th>
<th>Women (n=184)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>77-79</td>
<td>51</td>
<td>62</td>
<td>113</td>
</tr>
<tr>
<td>80-84</td>
<td>69</td>
<td>89</td>
<td>158</td>
</tr>
<tr>
<td>85-87</td>
<td>18</td>
<td>33</td>
<td>51</td>
</tr>
</tbody>
</table>

The prevalence of sleep problems in 2002, in the studied cohort (n=322), is presented in Table 4. Women report significantly more sleep problems (38.7%) than men (28.3%). Women also report both more slight and severe sleep problems, but severe and slight sleep problems were not significantly different for gender on its own.
Table 5. Prevalence of reported sleep problems (%) in 2002 (n = 322)

<table>
<thead>
<tr>
<th></th>
<th>Men (n=138)</th>
<th>Women (n=184)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes, slight</td>
<td>20.3</td>
<td>27.2</td>
</tr>
<tr>
<td>Yes, severe</td>
<td>8.0</td>
<td>11.5</td>
</tr>
<tr>
<td>Total</td>
<td>28.3</td>
<td>38.7*</td>
</tr>
</tbody>
</table>

* p < .05; ** p < .01; *** p < .001.

Longitudinal results

Prevalence of recurrent sleep problems

Recurrence of sleep problems is measured by the number of times a person in the panel has reported sleep problem. As seen in Table 5 the majority of men, 58.7%, do not report sleep problems on any occasion. 37% of the women did not report sleep problems on any occasion. More than twice as many women than men report sleep problems on 2 or 3 occasions. Seven times as many women report sleep problems on 4 or 5 occasions. All gender differences in Table 5 are statistically significant except for sleep problems on one occasion.

Table 6 The prevalence of recurrent sleep problems (%) in the repeated studies, 1968-2002. (n=322)

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
<th>Gender diff.</th>
</tr>
</thead>
<tbody>
<tr>
<td>No sleep problems</td>
<td>58.7</td>
<td>37.0</td>
<td>*</td>
</tr>
<tr>
<td>Sleep problems on 1 occasion</td>
<td>29.0</td>
<td>29.9</td>
<td>n.s.</td>
</tr>
<tr>
<td>Sleep problems on 2 or 3 occasion</td>
<td>10.9</td>
<td>23.3</td>
<td>**</td>
</tr>
<tr>
<td>Sleep problem on 4 or 5 occasions</td>
<td>1.4</td>
<td>9.8</td>
<td>***</td>
</tr>
</tbody>
</table>

* p < .05; ** p < .01; *** p < .001.

Trends in sleep problems during a 34-year period

Except for individuals with sleep problems on every, or none, of the occasions there have been large degree of intra-individual change in sleep status. In Table 6 a set of different trends are presented. The trends are set by collecting the sleep status for every year: a plus sign implicates that the person has sleep problems; a minus sign is lack of sleep problems. The respondents are then categorized, based on the answers from the five interviews, as having: no sleep problems, a decrease or increase of sleep problems or constant sleep problems. Those who have reported sleep problems on at least one occasion but not shown a clear visible decrease or increase are labelled as having an irregular pattern.
Table 7  Trends in reported sleep problems, 1968-2002: possible alternatives and percentage of men and women reporting the different trends. (n=322)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>No sleep problems</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>58.7</td>
<td>37.0</td>
<td>**</td>
</tr>
<tr>
<td>Increase</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>22.5</td>
<td>27.2</td>
<td>n.s.</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decrease</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>3.6</td>
<td>3.8</td>
<td>n.s.</td>
</tr>
<tr>
<td></td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant s. prob.</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>0.7</td>
<td>2.7</td>
<td>n.s.</td>
</tr>
<tr>
<td>Irregular</td>
<td>(+/-)</td>
<td>(+/-)</td>
<td>(+/-)</td>
<td>(+/-)</td>
<td>(+/-)</td>
<td>14.5</td>
<td>29.3</td>
<td>**</td>
</tr>
</tbody>
</table>

*p < .05; **p < .01; ***p < .001.

**Trends over time**

As seen in Table 6 the majority of men and women did not report any sleep problems over the 34 year period. For women the second most common trend was to have an irregular pattern; those outcomes were also the only significantly different patterns between the genders. Around one fourth of both women (27.2%) and men (22.5%) report an increase of sleeping problems with time, the higher amount of women reporting an increase of sleep problems is not significantly different. Approximately 4% of both women and men report a decline in sleep problems with time. A decrease of sleep problems can possibly be due to retirement from a stressful job, effective treatment of sleep problems or other. Individuals with constant sleep problems (reports sleep problems on every occasion) were 0.7% of the men and 2.7% of the women. These numbers are quite small, however one must hold in mind that these persons have reported sleep problems for a period of 34 years. The percentage of people reporting an irregular pattern of sleep problem was 14.5% for men and 29.3% for women. It is probable that this group has had sleep problems during a short period of time, perhaps because of stress, and then returned to sleeping well. In regard to women, who reported significantly more irregular sleep patterns than men, the main pattern was to report sleep problems on only one occasion. This might reflect a diminished ability to sleep during menopause reported in some earlier studies (Pien et al., 2008).
Trends in sleep problems and socioeconomic status

Table 7 shows the same sleep trends but based on social class. The general tendency is that manual workers experience more sleep problems than non-manuals. The only social class difference that is statistically significant on its own is that manual workers experience a larger increase of sleep problems with age than non-manuals do, 31.9% versus 19.4%.

Table 8: Prevalence (%) of different sleep trends, 1968-2002, differentiated for manual workers and non-manuals (n=321):

<table>
<thead>
<tr>
<th></th>
<th>Manual</th>
<th>Non-manual workers</th>
</tr>
</thead>
<tbody>
<tr>
<td>No problems</td>
<td>43.3</td>
<td>48.9</td>
</tr>
<tr>
<td>Increase</td>
<td>31.9</td>
<td>19.4**</td>
</tr>
<tr>
<td>Decrease</td>
<td>1.4</td>
<td>5.6</td>
</tr>
<tr>
<td>Constant problems</td>
<td>3.5</td>
<td>0.6*</td>
</tr>
<tr>
<td>Irregular</td>
<td>19.9</td>
<td>25.6</td>
</tr>
</tbody>
</table>

*p < .05; **p < .01; ***p < .001.

1 One respondent did not leave information about SES and was therefore excluded from the analysis

2 Fischer's exact test used because of cell count below five
Discussion

With cross-sectional analysis this study concludes that there has been an increase in sleep problems from 1968 to 2000/02. The number of persons reporting sleep problems in the population has risen from 1968 to 2000 for adults (age 19-55), but not for older adults (age 56+). In line with most of the earlier research on the area women report more sleep problems than men, in every part of this study.

In the longitudinal analysis it was found that one fourth of the population develop sleep problems between the age 43-54 and 77-87. Women report more sleep problems in all ages, however, the gender difference doesn’t seem to increase as people age. Analysis also showed that manual workers report a larger increase of sleep problems as they age than non-manuals.

Cross-sectional results

The first aim of the study was to explore whether there had been a change in the prevalence of sleep problems between the years 1968 and 2000/02. Most Swedish studies have reported an increase of sleep problems in the population over time (Broman et al., 2004, Hetta et al., 2006, Vogel, 2006). The result from the present study confirms earlier research; there has been an increase in sleep problems between the years 1968 and 2000/02. Dregan and Armstrong (2009) state that: “The discovery of increasing sleep disturbances in cross-sectional surveys suggests a time or period effect in which the environment changes between two measure points”. Based on Dregan and Armstrong’s statement something has probably changed in the environment (on a societal level) affecting peoples sleep. However in this study we have found that the increase in sleep problems is exclusive to younger age groups (19-45 for men, 19-55 for women). This suggests that a change has occurred mainly affecting people in the younger ranges of working age.

It is not very likely that the increase is due to changes in the sleep physiology of the younger age groups; instead one can assume that there are other factors are at work. In the study by Dregan and Armstrong (2009) they try to explain an increase of sleep problems in the British population in the 1990’s by the economic downturn; operating through worry over possible job loss or financial strain resulting in increasing sleep problems. In Sweden one has noticed an increase in the level of anxiety and worrying in the younger population (not necessarily connected to economic downturn) during the last decades. The increase in worrying and anxiety has been of such a nature that a Swedish
Government Official Report has been written on the subject (Bremberg et al., 2006). This makes it reasonable to believe that anxiety and worrying is at least one explanation for the increase of sleep problems in the younger Swedish population.

Another possible explanation to the increasing sleep problems is of a more social nature, younger cohorts can possibly have a different attitude toward sleep than older cohorts or different attitude towards reporting sleep problems. Dement and Vaughan (2000) have pointed to the fact that people have in a larger degree started to regard sleep as a disposable resource, possible to neglect in order to do other things. Dement and Vaughan mentions for example the occurrence of Internet and late-night television. A change in attitude would also be understood as a period effect in a survey study like this one. Yet, in this study we have no instrument to measure such a statement.

Regarding the oldest age groups (77+), which could only be compared over ten years (1992-2002), there was only a weak tendency towards an increase in sleep problems. The only group having a statistically significant change was men over the age of 85. This could be associated with the fact that elderly men in Sweden tend to live longer with more complex diseases as been showed by Meinow (2008).

**Longitudinal results**

The second aim of this thesis was to follow a cohort over 34 years (1968-2002) in order to describe their pattern of sleep problems across the life span. Swedish and international research has found strong evidence that insomnia increases with age. Yet, most researchers believe insomnia is not related to aging per se rather with a decline in health (Ancoli-Israel, 1997). In this study one fourth of the individuals reported an onset of insomnia from middle-age to old-age. This suggests that insomnia is to a large part age-related, most likely due to the occurrence of other health problems. However in this study it is hard to distinguish whether the age-related increase in sleep problems is due to physiological, psychological or social reasons.

Most researchers have found that the gender gap in sleep problems between men and women increase in old age (Ohayon, 2002, Zhang and Wing, 2006). This relation is not found in the present study. However the study shows an excess of women reporting sleep problems in all other aspects. Women have higher prevalence rates and report more recurrence in sleep problems than men. It is only possible to speculate why this study do not support an increase of the gender gap in old age; however the longitudinal sample is quite small and more women do in fact report a larger increase in sleep problems, yet not significant. It is possible that given a larger sample, women would have reported growing inequalities in sleep problems in old-age.
Sleep and social class
Recent studies have shown that lower social class leads to more sleep problems. However, social class’ effect on sleep in a longitudinal perspective has not been studied much.

In this study we analysed whether there are differences in the longitudinal cohort for as how manual workers’ and non-manuals’ sleep patterns differ across the life span. This study identified observable differences between how manual workers and non-manuals are affected by sleep problems as they enter old age. Most notable is the larger increase of sleep problems affecting manual workers as they age. The relation between social class and sleep has a multifaceted nature. As earlier noted it is also problematic to distinguish the directional causal relationship between sleep and social class. In this study it is found that social class differences in sleep problems are increasing as one age. However, since so little is known about the causal relationship between sleep and social class it is not possible to distinguish whether class has a direct effect on sleep, or if sleep works as a proxy for, most likely, health. More explicit, the relationship between sleep and social class might in fact hide a relationship (found by some researchers) between social class and health (Chandola et al., 2007) and that increasing inequality in health problems found in groups with lower social class leads to increased inequality in sleep problems.

In Britain social class accounts for a large part of the gender difference in sleep problems. Arber (2009) has found that if you control for the respondents own SES the gender gap in sleep problems decrease by 50%. This implicates that the large gender difference in sleep is partly on behalf of that women have lower social class than men. In this study social class influences your sleep negatively (larger increase of sleep problems) but gender does not. This probably implicates that as people age; the major reason for experiencing an increase of sleep problems is because of social class rather than gender. There are no observable social class-differences between men and women in this study and this might explain why the gender difference does not increase with age in this study (in contrast to previous research). But, since social class is measured on household level in the present study, in contrast to own SES in Arber’s study, it is difficult to make a real distinction between gender and social class in this study.

To sum up, the gender difference in sleep problems seems to be constant as people age in this study. Whereas the difference in sleep between manual workers and non-manuals seems to increase as they age. An important explanation to this relationship is probably health (i.e. manual workers tend to have worse health).
Sleep and gender
The majority of previous insomnia studies have found considerable difference between men’s and women’s prevalence of sleep problems. In this study women and men have been studied separately and in line with earlier research women report more sleep problems.

Regarding the prevalence in 1968, 2000 and 2002 women report more sleep problems than men. In the longitudinal part of the study women also report more chronic insomnia and sleep problems on more occasions than men. Looking at the complete picture: women are more likely to have sleep problems, both in prevalence over one year and 34 years.

Cross sectional studies have previous shown that gender inequalities in sleep increase with age (Ohayon, 2002, Zhang and Wing, 2006). The longitudinal part of this study does not support that relationship. The inconsistency of this finding with earlier studies might be explained by the longitudinal design of the present study. Cross-sectional studies are to their nature more of a “snap-shot” of the population and do not control for cohort effects or take account for prior life events. Earlier studies might have mistaken the increase of gender differences in sleep problems in old age because of older age cohort’s larger gender differences across the whole life-span. The possibly larger gender difference in sleep across the whole life in older age cohorts might be explained by the fact that older age cohorts have been relatively more structured by the traditional gendered division of labour, and have also in a sense been accustomed to the traditional gendered social roles with women as main care-givers and men as breadwinners. And, as Hislop and Arber points out, the traditional female role as main care-giver tends to make the bed room to an “invisible workplace” where sleep is a disposable resource (Hislop and Arber, 2003). If younger age cohort’s have less gender differences in sleep this might give support to Hislop and Arber’s theory in such that the gender inequality in sleep problems is diminishing or at least not increasing.

Aspiration levels and willingness to report sleep problems could also be a part of the explanation to why women report more sleep problems than men. Perhaps men and women have different aspiration levels on sleep, or can the fairly high amount of men never reporting sleep problems reflect a social pressure upon men not to complain about lack of sleep?

Age, period and cohort effects
Cross-sectional analysis between the years 1968 and 2000 indicates that there has been an actual increase in sleep problems during the last three decades. This suggests that period effects are at hand i.e. something on the societal level have altered which affects how people sleep, or how they report sleep problems. Yet, if one compare differences between age groups one can see that the increase in
sleep problems is only, or primarily, affecting the younger age groups. This suggests that it is more plausible to suspect cohort effects. However, we cannot predict how the younger age-groups sleep patterns will develop, but if the younger cohorts were to follow older cohorts trajectories (with large increase of sleep problems from middle age to old age) we are moving towards a sleep deprived society, with as many as 75% of the elderly persons suffering from sleep problems.

However, the fairly large increase of sleep problems in the younger age cohorts must not be followed by large increases of sleep problems in old age, as seen in older age cohorts. A possible scenario is that the nature of sleep problems is indeed changing. Younger age groups might be more affected by social factors whereas older age cohorts were mainly affected by changes in the physiology and a more general health decline.

**Limitations and further research**

Ohayon has in a review categorized four ways of doing insomnia studies. Studies like the present, only asking about insomnia symptoms, are least precise and have also gained some criticism. The use of a single-item insomnia question in this study is motivated by the possibility to gain a long follow-up. However, one might also add that the question has been unchanged over the years and much of the fieldwork is also unchanged which strengthens the possibility to make good comparisons over the years. Another positive aspect of the question is that it’s asked in a context with a range of severe symptoms and diseases; probably leading to it is measuring more severe states of sleep problems.

Earlier studies have shown that insomnia leads to excess mortality (Hublin et al., 2007). The long follow up period of this study might lead to the occurrence of mortality bias i.e. people reporting sleep problems in the earlier stages of life have a larger risk of dying before completing each wave of the survey. This might lead to that the persons included in the study are those in the population with least sleep problems. A mortality analysis has been carried out (Appendix 1) showing that insomnia is connected to mortality over a long period of time, but not on a short period. This indicates that the panel is indeed a selected group.

This study is to its nature descriptive. Further research should be more focused on identifying the mechanism leading to sleep problems.

To sum up, sleep problems have been seen to increase in the younger age groups of the population. Furthermore it is found that sleep problems increase with age. What’s unique in this study is the ability to show how individuals’ sleep patterns change over a long period of time. The present study shows that sleep problems to a great extent is age-related. As many as one out of four experience an onset of
sleep problem between the age 43-53 and 77-87. This finding is important because it shows that the increased risk of suffering from sleep problems that has been found in previous research has its major onset between middle-age and old-age. Furthermore, the study gives evidence to the fact that women have a higher degree of sleep problems, not only in prevalence over a year, but also over 34 years.

The large increase of sleep problems in old age is however troublesome, mainly because of the finding that sleep problems are also increasing in the younger age groups. If younger age groups also will experience an increase of sleep problems with advancing age we will witness an epidemic increase in sleep problems. Therefore more research is needed on why younger cohorts have seen such large increase in sleep problems and preventions are needed to avoid the increasing numbers of sleep problems.

What differentiates this study from most previous research is the finding that the gender differences in sleep do not increase with age. This can possibly be attributed to cohort effects. Older age cohorts might report more gender differences across the whole life-span than younger age cohorts, which in a cross-sectional analysis would look like an increase in gender differences as people age. Building on earlier findings, that women have an increased risk ratio over men in sleep problems with advancing age, and the finding in this study that the gender difference is constant for men and women with advancing age, make reason for believing that the gender differences might decrease in younger age cohorts. However, to more closely study these relations more research is needed, mainly more advanced multi-level analyses are needed.

Low SES has, in this study, been shown to contribute to an increase in sleep problems when aging. This might be connected with the larger degree of health problems affecting people with lower SES. It could also be argued that people with sleep disorders haven’t been able to acquire a higher SES. More longitudinal studies are needed to analyse whether sleep is a reflection of your SES or a determinant. Furthermore, and to make it even more intriguing, it must also be clarified whether sleep is a reflection of your health or a determinant.

As a final remark it is worth mentioning that sleep is a very complex process and once again it is worth to go back to and dwell over Williams quote in the beginning of the theory chapter. Is sleep a biological or social process? The answer is probably both. Sleep is of such importance for everyday well-being and health that it should not be neglected by researchers. Therefore it is important to recognize and study sleep also in the spheres of social science.
References


**Electronic resources:**

## Appendix 1

Table 8. Cox regression: Mortality risk for people with sleep problems across 4.5 years and 34 years. Controlled for age and gender.

<table>
<thead>
<tr>
<th></th>
<th>HR</th>
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<tbody>
<tr>
<td>No sleep problems, 34 years</td>
<td>1.00</td>
</tr>
<tr>
<td>Sleep problems, 34 years</td>
<td>1.33**</td>
</tr>
<tr>
<td>No sleep problems 4.5 years</td>
<td>1.00</td>
</tr>
<tr>
<td>Sleep problems 4.5 years</td>
<td>1.03</td>
</tr>
</tbody>
</table>

*p < .05; **p < .01; ***p < .001.