

Women's Sleep: Longitudinal Changes and Secular Trends in a 24-year Perspective. Results of The Population Study of Women in Gothenburg, Sweden

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Study Objectives: To present observational data on the frequency of sleep problems, sleep duration, and sleep medication in an urban female population.

Design: A prospective population study, initiated in 1968-69, with follow-ups in 1974-75, 1980-81, and 1992-93.

Setting: Göteborg, Sweden, with around 445,000 inhabitants.

Participants: 1462 women born in 1908, 1914, 1918, 1922, 1930, and 205 women born in 1942 and 1954, a representative selection of women of the respective age in the general population.

Interventions: NA

Measurements: Reported number of hours slept per night, sleep problems, use of sleeping pills, and sleep satisfaction.

Results: The frequency of sleep problems increased with age, as did consultations for sleep problems and the use of sleep medication, while no

major differences in these parameters could be discerned in a 24-year secular trend analysis of 38- and 50-year-old women, except a lower sleeping pill use in 50-year-old women in 1992-93. An interesting finding was also that the significant reduction of the proportion of 38-year-old women sleeping more than 8 hours per night between 1968-69 and 1980-81 was not accompanied by a secular deterioration in sleep satisfaction in that age group.

Conclusions: Sleep duration decreased by approximately 0.4 hours per night between the ages of 38 and 66. The frequency of sleep problems increased by around 30% between the ages of 38 and 84. The use of sleeping pills also increased, except in the 50-year-old cohort.

Key words: Sleep, longitudinal, secular trends, sleep problems, sleep medication, population study, women.

INTRODUCTION

RESEARCH ON SLEEP, SLEEP PATTERNS, AND PREVALENCE OF SLEEP PROBLEMS IN POPULATIONS HAS BEEN PRESENTED IN A NUMBER OF CROSS-SECTIONAL SURVEYS.^{1,2,3} Attempts have been made in several prospective epidemiologic studies to relate sleep habits to mortality and health indicators.^{4,5,6,7,8} Relatively little is known about longitudinal changes and secular trends in the sleep patterns of different age groups. As there are indications of gender differences in sleep patterns and related health indicators,^{1,2} observations regarding female populations are of interest, both for descriptive and clinical purposes.

The purpose of this paper is to report, including both cross-sectional and longitudinal data, on the frequency of sleep problems, sleep duration, sleep satisfaction, and sleep-medication use in an urban female sample of women, with 24 years of follow-up, including cross sectional as well as longitudinal data.

Study population and methods

In 1968-69, a representative sample of 1622 women living in Göteborg, Sweden, were invited, by post, to a free health examination. A total of 1462 women, aged 38, 46, 50, 54, and 60 (90.1%), accepted the invitation and participated in the Prospective Population Study of Women in Gothenburg.⁹ Göteborg is the second largest city in Sweden, with around 445,000 inhabitants in 1968-69. The sample was obtained from the Rev-

enue Office Register. The sampling method was based on date of birth (all women born on day 6, 12, 18, 24, and 30 of each month were invited). Therefore, it appears that the participants, described in Table 1, may be considered a representative cross-section of women in the community in the age groups studied. Recent analysis of survival rates among participants versus nonsampled women born the same year revealed no major differences, providing additional evidence that participants were representative of the general population from which they were selected.¹⁰ However, some differences were observed between participants and nonparticipants.¹⁰

The survey was performed during a 12-month period, examining those born in the beginning of the year first, thus reducing the influence of age differences within each age group as much as possible. The same procedure was applied in all the subsequent examinations, making the intervals between examinations as even as possible.

In 1974-75, all women examined in 1968-69 were offered a second examination.¹¹ A total of 1302 women attended this examination (89.1% of the women originally examined). In 1980-81, a third examination was conducted comprising 1154 participants (78.9% of the women originally examined).¹² Two new age groups, aged 26 and 38 in 1980-81, were recruited, with the purpose of enabling cross-sectional comparisons over time. A fourth examination was conducted in 1992-93.¹⁰ Of the women originally examined and still alive, 70.1% participated in this 24-year follow-up (Table I). Details of the sampling procedure and participation rates for all four examinations have also been presented elsewhere.^{9,10,11,12}

Information about sleep and sleep problems was obtained by means of a standard interview at all examinations. In 1968-69, 1974-75, and 1980-81, the women also reported if they "had or had had sleep problems," and if they had consulted a doctor or been admitted to hospital for this reason. In connection with questions concerning medication, the women were also asked if they had used sleeping pills: never, some time(s) per month, some time(s) per week, almost daily, or daily. Information on duration of sleep was obtained by the question: "How many hours do you sleep during one 24-hour period?" This definition implicitly includes napping.

Disclosure Statement

The study was supported by grants from the Swedish Medical Research Council (27X-4578), the Swedish Council for Planning and Coordination of Research, and the Faculty of Medicine of Göteborg University, Sweden

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Statistical methods

Student's t-test and chi-square analyses were used to assess bivariate associations. All tests were two-sided and p-values less than 0.05 were considered to be statistically significant.

The study was approved by the Ethics Committee of Göteborg University.

RESULTS

Age and aging effects

The proportion of women who stated that they had sleep problems and used sleep-medication in different age cohorts from the four different examinations are shown in Figure 1 (a and b) as well as sleep duration (longitudinally 1968-69 and 1974-75) (Figure 1c). Sleep duration was reported to be somewhat longer in the youngest cohorts than in the cohorts aged 50 years and up. The frequency of sleep problems increased with increasing age, as well as use of sleep medication, but less than half of the women who indicated sleep problems used sleeping pills. With increasing age, more women consulted a doctor for sleep problems.

Age-specific cohort effects

By comparing women of the same age groups at different examinations, secular trends could be estimated. In particular, the data permitted comparisons of 38-year-olds as well as 50-year-olds from different birth cohorts in 1968-69, 1980-81, 1992-93.

The proportion of 38-year-old women sleeping >8 hours was lower in 1968-69 than 1980-81 (21.1% vs 8.2%, $p < 0.001$) (Figure 2). Comparison of sleep-problem prevalence in different age cohorts over time did not change (Table 2). The frequency of 38-year-olds' sleeping-pill use did not differ significantly between 1968-69 and 1992-93. Among 50-year-olds, the use of sleeping pills was significantly lower in 1992-93, compared to 1980-81, despite an unchanged frequency of sleep problems (Table 2).

DISCUSSION

Due to its representativeness, high participation rate, and thorough follow up (also of nonparticipants), this population study of women from Göteborg, Sweden, is probably one of the best documented epidemiologic studies in the world of middle-aged and older women. In this study, observations could be made concerning aging effects and cohort effects in relation to sleep problems. Studying the different age cohorts longitudinally revealed that sleep duration apparently decreased with age in women in the different age cohorts. This reduction was a total of approximately 0.4 hours per night, from a mean sleep duration of 7.5 hours at

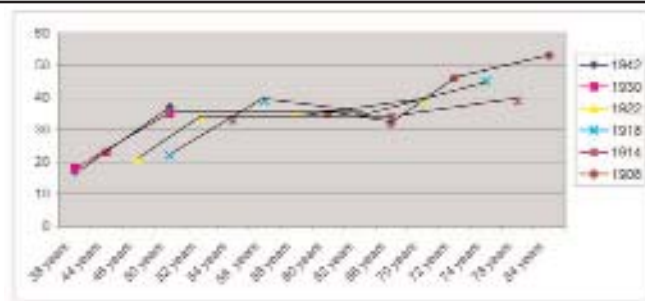


Fig 1a

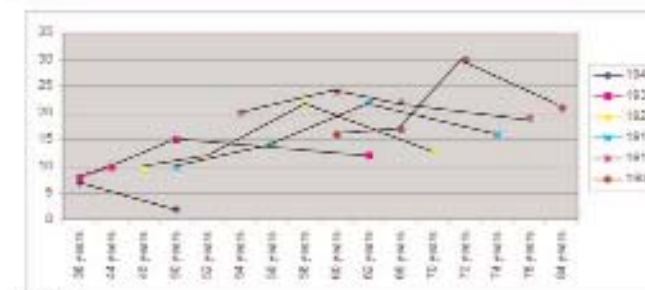


Fig 1b

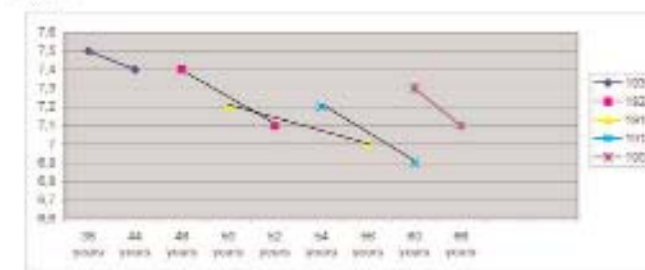


Fig 1c

Figure 1—Percent of women who stated they had sleep problems in the different age cohorts at the four different examinations in 1968-69, 1974-75, 1980-81 and 1992-93 (Fig 1 a), percent using sleep medication in different age cohorts at the four different examinations (Fig 1 b), and sleep duration (hours) in the different age cohorts (longitudinally 1968-69 and 1974-75) (Fig 1 c).

the age of 38 to 7.1 hours at the age of 66. The prevalence of sleep problems seemed to increase with age from approximately 20% at the age of 38 to approximately 45% to 50% at the age of 84. However, less than half of the women with sleep problems had sought medical help, and the use of sleeping pills was limited to less than half of the women with sleep problems at all ages. Most women were of the opinion that they slept enough. Other cross-sectional population studies have reported sleep problems in approximately one third of the population (US).¹³ Severe insomnia was observed in 4% to 22% in a multicenter European survey, more in females than males.² In an Icelandic study concerning elderly men and women aged 65 to 84, an increase in sleep disturbances with age was found, especially in women.¹ About 12% of these elderly women used sleeping pills, and only 32.5% reported no insomnia at all.¹

We observed some statistically significant cohort differences in the available sleep variables. For instance, fewer 38-year-olds in 1980-81 slept more than 8 hours, compared to the 38-year-olds examined in 1968-69. Unfortunately, this question was not asked in 1992, so we were unable to confirm whether this was a continuing trend. It is worth noting that the 38-year-old women experienced having slept enough to the same extent in 1980-81 as in 1968-69. It is also interesting to note that 50-year-old women were far less likely to use sleep medication in 1992-93 than in the 1960s and 1980s. It may be speculated that hormonal replacement therapy, the use of which increased during the 1990s in this age group, was becoming more common than sleeping pills in the treatment of sleep problems during

Table 1—Year of birth, age at the different examinations and number of women who participated in the Population Study of Women in Gothenburg. The age cohorts compared in the cross-sectional analyses are indicated by bold type.

Year of birth	1968-69			1974-75		1980-81		1992-93		
	age	n	% ¹	age	n	age	n	age	n	%
1908	60	81	(84)	66	65	72	49	84	19	23
1914	54	180	(89)	60	163	66	140	78	79	44
1918	50	398	(91)	56	351	62	325	74	213	54
1922	46	431	(90)	52	387	58	332	70	170	63
1930	38	372	(90)	44	336	50	308	62	249	67
1942						38	122	50	93	76
1954						26	85	38	61	72
Total		1462							984	70*

¹ Percent of women originally sampled

*Participation rate, calculated from all women still alive in 1992-93

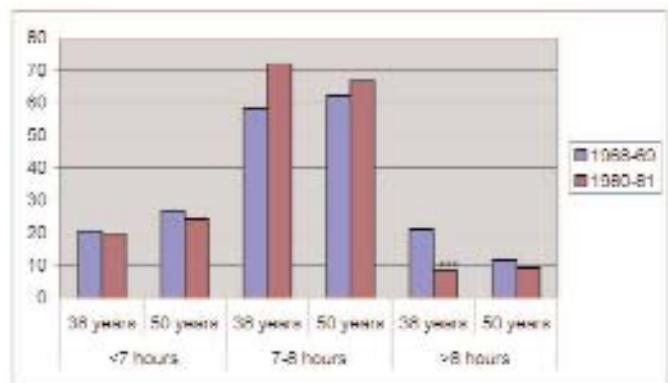


Figure 2—Frequency of women aged 38 and 50 in the 1968-69, 1980-81, and 1992-93 examinations indicating < 7 hours sleep, 7-8 hours sleep, and > 8 hours sleep, respectively.

menopause.¹⁴ Data from the present study (not shown) support this idea. Specifically, women who had sleep problems in 1968-69 were twice as likely to become users of hormone replacement therapy in the future, regardless of menopausal status.

CONCLUSIONS

In this population study of women with a 24-year-follow-up, sleep duration decreased in all cohorts between the ages of 38 and 66. Sleep problems increased with age, reaching approximately 40% in 60-year-old and 50% in 84-year-old women. Cohort comparisons of 38-, 50- and 60-year-olds between 1968-69 and 1992-93 suggested that sleep problems and frequency of sleeping pill use did not seem to increase over time. The only discernable secular trends were decreased use of sleeping pills in 50-year-old women between 1968-69 and 1992-93 and a decrease of the proportion of 38-year-old women sleeping more than 8 hours daily in 1980-81, compared to 1968-69. This decrease was not accompanied by a secular deterioration in sleep satisfaction.

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Table 2—Cohort comparisons of the groups aged 38, 50, and 60 (62) respectively, concerning experience of enough sleep, sleep problems, and sleep-medication use. Results of the 1968-69, 1980-81, and 1992-93 examinations*.

Age	enough sleep	sleep problems	sleep medication
38 years			
1968-69	59%	18%	8%
1980-81	79%	17%	7%
1992-93	-	20%	8%
	n.s.	n.s.	n.s.
50 years			
1968-69	61%	22%	11%
1980-81	74%	35%	15%
1992-93	-	37%	2%
	n.s.	n.s.	p<0.01
60 or 62			
1974-75	-	40%	14%
1980-81	-	35%	12%
1992-93	-	35%	12%
		n.s.	n.s.

*In 1992-93, only information about sleep problems and sleep medication was obtained.