COMMENTARY

Is Time for Sleep Declining Among Americans?

Commentary on Knutson et al. Trends in the prevalence of short sleepers in the USA: 1975-2006. SLEEP 2010;33:37-45.

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THE MILLIONS OF AMERICANS WHO DO NOT GET ENOUGH SLEEP NIGHT AFTER NIGHT RISK DEVELOPING CUMULATIVE NEUROBEHAVIORAL DEFICITS and experiencing sleepiness-related errors and accidents.[1-3] Since reduced sleep duration has frequently been associated with a higher prevalence of obesity,[4] morbidity, and mortality,[5] these people may also be incurring health risks, although it remains uncertain whether these relationships are causal.

In this issue of SLEEP, Knutson and colleagues[6] attempt to address the question of whether sleep duration among Americans has been steadily decreasing, using time use studies. Although many who believe Americans are sleeping less each decade attribute this to a culture that increasingly perceives sleep as a flexible commodity that can be exchanged for waking activities considered more essential or of greater value,[7] the investigation of secular trends in the prevalence of sleep duration is complicated by inconsistent methodologies for establishing sleep time using surveys.

This is what makes the study of Knutson et al.,[6] which focuses on 8 nationally representative time use studies performed between 1975 and 2006, unique and important. Looking at the combined data of all studies with more than 73,000 respondents and adjusting for many important confounders, they find a small and statistically non-significant increase in the odds of being a short sleeper (< 6 hours) from 1975 to 2006 (OR 1.08, P = 0.29). Also, there was no strictly monotonous increase in the prevalence of short sleepers across years, with the highest prevalence being observed in the 1998-99 survey (11.8%) followed by the 1985 survey (9.9%).

It is unclear how much of the differences among studies in findings of sleep duration is due to residual differences in survey methodology (i.e. subject sampling, data sampling, or activity coding). This stresses the importance of consistent study methodology for the investigation of secular trends in sleep time. With constantly emerging new ideas and research avenues, it is by no means trivial to hold on to a once established study design. The American Time Use Survey (ATUS) completed its 6th year in 2008, and there is a 22 page document addressing the changes between 2003-2008 data files. Nevertheless, it was extremely important that the 2008 initiative to discontinue the ATUS could be stopped, so that this study will likely provide us with important insight into secular trends in sleep time and waking activity time in the future.

However, the ATUS should not be our only resource. There is a wealth of prospective studies collecting data on relevant health outcomes and, sometimes, also on sleep quality and quantity. However, different surveys often also use different questions to assess sleep quality and quantity. For example, the boundaries of sleep time categories vary greatly between studies and complicate merging or comparing data from different studies. The sleep research community should propagate a set of questions addressing both sleep quality and quantity that, comparable to the SF-36 for quality of life, could be routinely used in different surveys and would guarantee comparability across surveys and over time.

Does the fact that Knutson et al.[6] found no significant secular trend in the prevalence of short sleepers reassure us that sleep time is not decreasing among Americans? It certainly does not give us a reason to panic, but the fact that sleep time has not significantly decreased during the past 30 years does not diminish the public health relevance of chronic partial sleep deprivation. As Knutson et al.[6] correctly point out time use surveys greatly overestimate sleep time, because both daytime sleep and activities that usually do not qualify as sleep (e.g., falling asleep, dozing off, waking up) are coded as sleep. It is likely that time use surveys may overestimate physiologic sleep by approximately two hours.[7,8] Therefore, as Knutson et al.[6] discuss correctly, the proportion of the population sleeping less than 6 hours per night may be significantly higher than the time use survey based estimates of 7.5% to 11.8%. Furthermore, when Knutson et al. restricted their analysis to full-time workers, there was a significant secular trend in the odds of being a short sleeper (OR 1.19, P = 0.05). This corroborates results of previous studies showing that work is the dominant waking activity exchanged for (less) sleep,[7] and it designates full-time workers as a group at risk for short sleep and its related consequences.

The question remains why large parts of the population hazard the consequences of chronic sleep debt? First, many studies have demonstrated a large variability of individual sleep need,[9] so we have to acknowledge the fact that at least some of the short sleepers actually do not need more sleep. Second, a 14-day study on chronic partial sleep deprivation[1] suggests that those who do need more sleep simply may have habituated to feeling sleepy; although objective measures of neurobehav-

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ioral performance deteriorated continuously with time in study in the group allowed 4 or 6 hours of sleep per night, subjective assessments of sleepiness saturated quickly and showed only minor increases during days 4 to 14 of restriction. It is possible, therefore, that many of the short sleepers may have "forgotten" how well they could feel and perform if they satisfied their individual sleep need. Third, people differ in their position of circadian phase, with larks and owls representing the extremes. Especially late phase chronotypes may accumulate a sleep debt during the week, as these individuals may have to get up early due to social demands without being able to advance their circadian controlled sleep-onset. This misalignment of biological and social time was recently coined "social jet lag" by Rönneberg and coworkers.[10] However, even early phase or indifferent types engage in chronic sleep debt. Fourth, a recent study facilitating ATUS data found that long workers (≥ 8 hours) terminated bed time on average 0.68 h earlier than short workers (< 8 hours) and 1.31 h earlier than respondents not working on the interview day, but time of going to bed did not differ among groups.[3] Watching television was the primary activity people engaged in before going to bed, accounting for 46.3% of the 2h pre-bed. This shows, on the one hand, that television may be an important social Zeitgeber for the time of going to bed,[11] and, on the other hand, that many long-workers may not be willing to pass on leisure time in order to increase sleep time.

Finally, we have to acknowledge how little we know about chronic partial sleep loss, its consequences, and recovery from it. Despite the much higher prevalence of life-style induced chronic partial sleep deprivation, acute total sleep deprivation still dominates experimental reports and theoretical models of sleep-wake dynamics, even though we know that mathematical models of sleep homeostasis based on acute total sleep deprivation do not accurately predict the consequences of chronic partial sleep loss.[12] If we are interested in the long-term effects of short sleep, epidemiological studies could give us the answers, and they have thus attracted more and more attention during the past few years. However, only a minority of these studies was prospective, sleep time was usually measured subjectively, the degree of adjustment for confounding varied greatly between studies, and, finally, it is unclear whether the reduced sleep times per se lead to higher risks of morbidity and mortality,[5] or whether this is rather due to the associated changes in waking activity. Clearly more objective epidemiology is needed on sleep time and its associated health risks.

Sleep is one of the basic human needs that both affects, and is affected by, numerous lifestyle, socioeconomic, and health related factors.[13] Therefore, causality is likely to flow in both directions. Although we know that individual sleep need differs greatly between subjects, we presently have practically no ways of predicting who will respond to sleep loss.[14] We expect to gain major insight from studies relating specific genotypes to the effects of sleep deprivation, but we have to acknowledge that these studies are still in the fledgling stages.[15] All of the above point out important future research avenues. The manuscript by Knutson et al.[6] reminds us, among other things, of the importance of consistent research methodologies in order to be able to make comparisons across studies and over time of sleep duration and its role in health and safety.

DISCLOSURE STATEMENT

Dr. Basner has indicated no financial conflicts of interest.

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