Prevalence of Insomnia in the Adult Norwegian Population

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Summary: A representative adult sample (18 years and above) of the Norwegian population, comprising 2001 subjects, participated in telephone interviews, focusing on the one-month point prevalence of insomnia and use of prescribed hypnotics. Employment of DSM-IV inclusion criteria of insomnia yielded a prevalence rate of 11.7%. Logistic regression analysis performed on the different insomnia symptoms revealed that somatic and psychiatric health were the strongest predictors of insomnia, whereas gender, age, and socioeconomic status showed a more inconsistent relationship. Use of prescribed hypnotic drugs was reported by 6.9% and was related to being female, elderly, and having somatic and emotional problems. Sleep onset problems and daytime impairment were more common during winter compared to summer. Use of hypnotics was more common in the southern (rather than the northern) regions of Norway. For sleep onset problems a Season x Region interaction was found, indicating that the prevalence of sleep onset problems increased in southern Norway from summer to winter, while the opposite pattern was found in the northern regions. The importance of clinically adequate criteria and seasonal variation in the evaluation of insomnia is briefly discussed.

Key words: Insomnia; epidemiology; age; gender; socioeconomic status; physical symptoms or illness; emotional or psychological problems; season

INTRODUCTION

INSOMNIA IS USUALLY DEFINED AS DIFFICULTY INITIATING OR MAINTAINING SLEEP OR NON-RESTORATIVE SLEEP.1 The central features are prolonged sleep onset latency, many or long nocturnal awakenings, and/or early morning awakening without being able to go back to sleep.2 In addition, most diagnostic systems include negative daytime consequences as another central feature of insomnia.3-6 Finally, a subjective complaint of poor sleep should also be incorporated in the definition of insomnia, as objective sleep disturbances seldom are recognized in the absence of subjective complaints7 and because subjective dissatisfaction with sleep is the main reason for seeking treatment.

A consistent finding from research on prevalence of insomnia is that it is more common among women than to men,8-22 it increases with age,8, 9, 11-13, 15, 17, 18, 20, 22-24 and is associated with low socioeconomic status.9,10,12,13,16,18 In addition, emotional and somatic distress have in several studies been linked to insomnia.9,11,12,15,17,19,20,22 The latter findings are consistent with the fact that insomnia is noted as a diagnostic symptom for several mood and anxiety disorders,25 and that numerous medical disorders (e.g., pain-syndromes, cerebrovascular diseases, cancer, hyperthyroidism etc.) can cause insomnia.26

Hypnotic use is related to insomnia, and is more common among women,12,16,19,20,23,27 and the elderly12,13,15-17,19,20,23,27,28 and is associated with somatic and emotional distress.13,16,20 For socioeconomic status, however, the relationship with hypnotic use is more obscure.12,13,16

In spite of these commonly found factors related to insomnia, the overall prevalence of insomnia reported in different studies varies widely, from about 29 to 48%.20 Different factors may contribute to this variation. Central among them are methodological issues such as variability in data collection procedures. These methods range from personal and telephone interviews to self-report; the phrasing of items and criteria do not always appear congruent when comparing studies. Karacan et al.13 conclude that such comparisons therefore are difficult and, in many cases, appear meaningless. Another concern, that has been emphasized by Liljenberg et al.,30 is the fact that the majority of studies do not incorporate operationally defined criteria for insomnia, based on current diagnostic classification systems.31 Additionally, as daytime illumination is the primary signal synchronizing the human sleep-wake rhythm,32 it is surprising that nearly all major epidemiological studies have ignored potential seasonal variations in their reports on the prevalence of insomnia.8-10, 12-24, 29, 33, 34 An exception to this is the Norwegian study by Husby and Lingjærde11 who reported the prevalence of insomnia to be higher during midwinter as compared to the remaining seasons of the year. However, age range for subjects in this study varied only between 20 and 54 years, data was collected retrospectively, and all subjects were from the same geographic location. As Norway covers several degrees of latitude (from 58° to 71° North), the illumination varies significantly between the southern and northern counties. During summer the period between sunrise and sunset is of longer duration in the northern counties compared to the southern, while the opposite is true during winter. Norway is therefore ideal for studying regional and seasonal influences of natural light on sleep.

Based on the current state of affairs we wanted to conduct a study addressing the following questions: 1) Using operational definitions of insomnia based on DSM-IV inclusion criteria, what are the prevalence rates of insomnia symptomatology and hypnotic use in the adult Norwegian population? 2) Which sociodemographic factors are associated with insomnia symp-
tomatology and hypnotic use? 3) Are there any seasonal and geographical variations in the prevalence of insomnia symptomatology in Norway?

METHODS

Participants

A group of 2001 randomly selected adults, 1091 females and 910 males, stratified by number of inhabitants of each county of Norway, participated in the study. Mean unweighted age of the sample was 44.7 years (s=15.6; range=18-99 years). Of the total sample 9.6% had no education subsequent to mandatory schooling, while 30.3% had one to three years, 32.2% had four to six years, and 27.8% had more than six years of education subsequent to mandatory schooling, respectively. Furthermore, 13.0% of the sample had a family income below 250 000 NOK, 32.5% had a family income between 250 000 and 500 000 NOK, and 36.0% had a family income over 500 000 NOK, while 18.5% did not report their family income. In terms of somatic and psychological health, the participants were asked to report on current sleep. The sleep and health questions, together with response alternatives, are presented in Table 1. Of the 10 questions, six had predetermined response alternatives (items 3, 6, 7, 8, 9, and 10) whereas four items were open-ended (items 1, 2, 4, and 5). All questions focused on the month prior to the interview, thus the results should be regarded as one-month point prevalence figures.

Definitions and Rationale

The first inclusion criterion for insomnia in DSM-IV states that “the predominant complaint is difficulty initiating or maintaining sleep, or nonrestorative sleep, for at least 1 month,” while the second and last criteria states that “the sleep disturbance (or associated daytime fatigue) causes clinically significant distress or impairment in social, occupational, or other important areas of functioning.” The operationalization of these criteria is given in Table 2.

Procedure

The study was part of a telephone interview conducted by an opinion-research institute (Opinion), employing the next birthday technique. In the next birthday technique the interviewer asks to speak to the adult member of the household who has the next birthday. It is based on the assumption that assignment of the birthdates is a random process. Thus, the next birthday technique constitutes a procedure of randomly selecting individuals within
Half of the interviews (1000) were conducted during the first two weeks of December 1999, and the other half (1001) during the first two weeks of June 2000. In all, 3515 subjects were asked to participate, and of these 1514 subjects refused, yielding a response rate of 56.9%. In order to investigate whether insomnia was related to age, the sample was divided into four age-groups: 1) 18—29 years, 2) 30—44 years, 3) 45—59 years and 4) 60 years and above. Socioeconomic status was based on length of education and family income. These two items were transformed into z-scores and added in order to create a single composite variable. Subjects with negative z-scores were defined as below mean; subjects with positive z-scores were defined as above mean in socioeconomic status, respectively. The subjects were further divided into groups with or without somatic symptoms or illness and with or without emotional or psychological problems. For analyses of regional differences, the five most northern counties of Norway were defined as Northern (62°—71° north), while the other counties were defined as Southern (58°—62° north).

**Statistics**

The data analyses were performed with SPSS version 10.1. All prevalence figures and confidence intervals were calculated by weighting the cases according to the population distribution of gender and age in order to correct for potential divergence between the sample and the distribution of age and gender in the general population of Norway. For all cases a weight less than two was used. Phi-coefficients were calculated in order to express the interrelationships between the various symptoms of insomnia. In order to investigate whether discrepancy between sleep obtained (question 4 in Table 1) and reported sleep need

### Table 3—Prevalence of insomnia distributed by gender

<table>
<thead>
<tr>
<th>Prevalence (95% CI)</th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean sleep onset latency &gt;30 minutes</td>
<td>10.5% (8.5-12.4)</td>
<td>15.6% (13.4-17.9)</td>
</tr>
<tr>
<td>Mean wake time after sleep onset &gt;30 minutes</td>
<td>12.4% (10.3-14.5)</td>
<td>20.1% (17.6-22.6)</td>
</tr>
<tr>
<td>Awakening at least 30 minutes earlier than preferred &gt;9 days during previous month</td>
<td>12.0% (10.0-14.1)</td>
<td>15.9% (13.6-18.1)</td>
</tr>
<tr>
<td>Expressing being somewhat or very dissatisfied with sleep during previous month</td>
<td>7.4% (5.8-9.1)</td>
<td>8.9% (7.1-10.6)</td>
</tr>
<tr>
<td>Daytime impairment &gt;4 days during previous month</td>
<td>11.5% (9.5-13.6)</td>
<td>17.9% (15.5-20.3)</td>
</tr>
<tr>
<td>Insomnia based on DSM-IV inclusion criteria</td>
<td>8.5% (6.7-10.2)</td>
<td>14.7% (12.6-16.9)</td>
</tr>
<tr>
<td>Used prescribed hypnotics at least once during the previous month</td>
<td>4.2% (3.0-5.5)</td>
<td>9.4% (7.6-11.1)</td>
</tr>
</tbody>
</table>

### Table 4—Prevalence and 95% confidence interval of insomnia as a function of age

<table>
<thead>
<tr>
<th></th>
<th>18-29 years</th>
<th>30-44 years</th>
<th>45-59 years</th>
<th>60 years and above</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean sleep onset latency &gt;30 min</td>
<td>17.2% (13.7-20.7)</td>
<td>8.2% (5.9-10.5)</td>
<td>8.8% (6.1-11.5)</td>
<td>18.1% (14.5-21.7)</td>
</tr>
<tr>
<td>Mean wake time after sleep onset &gt;30 min</td>
<td>11.6% (8.6-14.6)</td>
<td>9.5% (7.2-12.3)</td>
<td>12.4% (9.2-15.6)</td>
<td>26.7% (22.5-30.8)</td>
</tr>
<tr>
<td>Early morning awakening &gt;10 days</td>
<td>3.7% (2.0-5.5)</td>
<td>8.0% (5.6-10.2)</td>
<td>14.6% (11.2-18.0)</td>
<td>27.9% (23.7-32.1)</td>
</tr>
<tr>
<td>Dissatisfaction with current sleep</td>
<td>9.9% (6.3-11.6)</td>
<td>7.4% (5.2-9.7)</td>
<td>5.4% (3.2-7.6)</td>
<td>7.8% (5.3-10.3)</td>
</tr>
<tr>
<td>Daytime impairment &gt;4 days</td>
<td>20.5% (16.8-24.3)</td>
<td>14.8% (11.8-17.8)</td>
<td>12.7% (9.5-16.0)</td>
<td>9.3% (6.6-12.0)</td>
</tr>
<tr>
<td>Total insomnia (both DSM-IV inclusion criteria)</td>
<td>11.8% (8.8-14.7)</td>
<td>8.5% (6.1-10.8)</td>
<td>9.4% (6.5-12.2)</td>
<td>14.0% (10.7-17.2)</td>
</tr>
<tr>
<td>Hypnotic use at least once during previous month</td>
<td>1.3% (0.2-2.4)</td>
<td>2.6% (1.2-3.9)</td>
<td>6.5% (4.1-8.9)</td>
<td>15.8% (12.4-19.2)</td>
</tr>
</tbody>
</table>
(question 5 in Table 1) was related to age, a one-way ANOVA analysis was conducted, employing a Bonferroni corrected post-hoc test.

A weighted logistic regression procedure was used to investigate whether sociodemographic variables (gender, age, socioeconomic status) and somatic and psychological health were related to insomnia and use of hypnotics. An equivalent procedure was utilized in order to explore the possible relationship between geographical region and season on the one hand, and insomnia and hypnotic use on the other.

The phi-coefficients between the independent variables were in all cases less than 0.22. Thus, interpretation of the odds ratio for each independent variable should not be affected by the bivariate relationships between them.

The odds ratio given in Table 5 and Table 7 represents how much greater probability there is for satisfying the criterion in question if the given value of the dichotomized variable is present, as compared to the case where the other possible value for the variables is present, controlling for all the other variables in the analysis. The age variable in Table 5 is the only that is not dichotomized. The odds ratio for the age groups given in Table 5 represent how much greater probability there is for satisfying the criteria compared to the age group 44—59 years, controlling for all the other variables in the analysis. The age group 44—59 years was selected as a reference group because this group was fairly equal to the 30—44 year group as shown in Table 4.

**RESULTS**

Table 3 presents the prevalence and 95% confidence interval (CI) for insomnia symptomatology, with breakdown by gender, while Table 4 presents the prevalence and 95% confidence interval (CI) of insomnia as a function of age. The discrepancy between daily sleep obtained and sleep needed was significantly related to age-group (F(3,1961)=20.1, p<.001). All age groups had negative discrepancy values, indicating sleep debts. For the age groups 18—29 years, 30—44 years, 45—59 years, and 60+ years and above the discrepancies were -.83 h, -.78 h, -.47 h, and -.40 h, respectively. The post-hoc analysis showed that the youngest age group (18—29 years) had significantly greater discrepancy than the 45-59 years group (p<.001) and the 60+ age group (p<.001). The age group 30—44 years also had significantly greater discrepancy than the 45—59 years group (p<.001) and the 60+ age group (p<.001). The discrepancy was not significant for the difference between the 18—29 and 30—44 years groups and for the difference between the 45—59 and 60+ age groups.

Of the total population, 13.1% (CI: 11.6-14.6) reported mean sleep onset latency exceeding 30 minutes, and this symptom was more prevalent among
Mean sleep onset latency exceeding 30 minutes were also predicted by socioeconomic status below the mean, and by the presence of emotional problems and somatic symptoms (see Table 5). A total of 16.3% (CI: 14.7-18.0) reported mean wake time after sleep onset exceeding 30 minutes. Being 60 years or above, female, having physical symptoms or an illness and emotional or psychological problems were positively associated with mean wake time after sleep onset exceeding 30 minutes (see Table 5).

For early morning awakening (waking up at least 30 minutes earlier than preferred more than 10 days during the previous month) analysis showed that 14.0% (CI: 12.4-15.5) of the population reported this problem. Being 60 years and above, socioeconomic status below the mean, and reporting physical symptoms or illness and emotional or psychological problems increased the probability of reporting early morning awakening (see Table 5).

Dissatisfaction with current sleep was reported by a total of 8.2% (CI: 7.0-9.4). Physical symptoms or illness and emotional or psychological problems increased the risk of dissatisfaction with current sleep, as did being 18—29 years old and 60 years and above. Having socioeconomic status below mean decreased the risk of dissatisfaction with current sleep (see Table 5).

The final criterion analyzed was daytime impairment for five days or more during the previous month. A total of 14.8% (CI: 13.2-16.3) of the population reported this problem. Being female, 18—29 years old, and having physical symptoms or illness and emotional or psychological problems increased the probability of daytime impairment. Being 60 years and above decreased the probability of daytime impairment (see Table 5).

Finally, analysis of the prevalence of fulfilling both DSM-IV main inclusion criteria showed that this affected 11.7 percent (CI: 10.3-13.1), and that females, subjects with physical symptoms or illness, and subjects with emotional or psychological problems were at greater risk than others. Fulfilling both DSM-IV main inclusion criteria was not however, associated with any specific DSM-IV main inclusion criteria was not associated with any specific

Table 6—Phi-coefficients of relationships between different insomnia symptoms

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Mean sleep onset latency &gt;30 minutes</th>
<th>Mean wake time after sleep onset &gt;30 minutes</th>
<th>Early morning awakening &gt;10 days</th>
<th>Dissatisfaction with current sleep</th>
<th>Daytime impairment &gt;4 days</th>
<th>Hypnotic Use at least once during previous month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean sleep onset latency &gt;30 minutes</td>
<td>.</td>
<td>21***</td>
<td>.12***</td>
<td>.25***</td>
<td>.21***</td>
<td>.16***</td>
</tr>
<tr>
<td>Mean wake time after sleep onset &gt;30 minutes</td>
<td>.30***</td>
<td>.29***</td>
<td>.24***</td>
<td>.18***</td>
<td>.12***</td>
<td></td>
</tr>
<tr>
<td>Early morning awakening &gt;10 days</td>
<td>.20***</td>
<td>.21***</td>
<td>.15***</td>
<td>.13***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dissatisfaction with current sleep</td>
<td>.38***</td>
<td>.19***</td>
<td>.14***</td>
<td></td>
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</tr>
</tbody>
</table>

*** phi is significant at the .001 level (2-tailed)
### Table 7—Seasonal and regional predictors of insomnia expressed as odds ratio's

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Mean sleep onset latency &gt;30 minutes</th>
<th>Mean wake time after sleep onset &gt;30 minutes</th>
<th>Early morning awakening &gt;10 days</th>
<th>Dissatisfaction with current sleep</th>
<th>Daytime impairment &gt;4 days</th>
<th>Total insomnia (both DSM-IV inclusion criteria)</th>
<th>Hypnotic Use at least once during previous month</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Season</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winter</td>
<td>1.46 (1.09-1.95)</td>
<td>1.02 (0.78-1.33)</td>
<td>1.30 (0.98-1.72)</td>
<td>0.96 (0.67-1.37)</td>
<td>1.33 (1.01-1.76)</td>
<td>1.41 (1.04-1.91)</td>
<td>0.85 (0.58-1.24)</td>
</tr>
<tr>
<td><strong>Region</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>North</td>
<td>1.38 (0.86-2.20)</td>
<td>0.85 (0.53-1.35)</td>
<td>0.68 (0.40-1.15)</td>
<td>1.53 (0.93-2.53)</td>
<td>1.20 (0.77-1.88)</td>
<td>1.39 (0.87-2.24)</td>
<td>0.43 (0.19-0.95)</td>
</tr>
<tr>
<td><strong>Season x Region</strong></td>
<td>0.39 (0.19-0.79)</td>
<td>0.77 (0.39-1.51)</td>
<td>1.10 (0.54-2.25)</td>
<td>0.44 (0.19-1.02)</td>
<td>0.66 (0.35-1.25)</td>
<td>0.42 (0.20-0.87)</td>
<td>2.36 (0.84-6.61)</td>
</tr>
</tbody>
</table>

A total of 6.9% (CI: 5.7-8.0) reported use of hypnotic drugs prescribed by a medical doctor at least once during the previous month. Being female, experiencing physical symptoms or illness and emotional or psychological problems increased the probability of hypnotic use. Being 18–29 and 30–44 years decreased the probability of hypnotic use, while being 60 years and above increased the probability of hypnotic use. Being 18–29 and 30–44 years decreased the probability of hypnotic use, while being 60 years and above increased the probability of hypnotic use. Socioeconomic status was not related to the use of hypnotic drugs (see Table 5). In all, six insomnia symptoms were investigated (mean sleep onset latency >30 minutes, mean wake time after sleep onset >30 minutes, early morning awakening >10 days, dissatisfaction with current sleep, daytime impairment >4 days, and hypnotic use at least once during the previous month).
this, studies have indicated that insomniacs are not able to fall asleep any faster than non-insomniacs during daytime, and tests, sensitive to sleep deprivation (such as daytime vigilance) do not discriminate insomniacs from non-insomniacs. Some researchers have suggested that daytime repercussions typically occur with insomnia secondary to medical and psychiatric conditions (secondary insomnia), but not so with primary insomnia.

Gender

The logistic regression analyses indicated that several symptoms of insomnia were clearly related to gender. Three indicators of insomnia (wake time after sleep onset, daytime impairment, and hypnotic use), as well as both DMS-IV inclusion criteria were more prevalent among females. Males did not report more sleep difficulties than females on any variable. These findings are generally in line with the majority of other studies in the field.

Age

The youngest age group (18—29 years) had increased probability of experiencing problems initiating sleep and daytime sleepiness, being dissatisfied with current sleep, and decreased probability of having early morning awakening. The age group 30—44 years had decreased probability of reporting problems maintaining sleep and early morning awakening. The oldest group (60+) had increased probability of reporting problems initiating and maintaining sleep, as well as early morning awakening and dissatisfaction with sleep, but decreased probability of reporting daytime impairment. These results indicate that younger subjects typically have problems related to the early phase of the sleep cycle, which are probably due to both lifestyle (e.g., staying up late at weekends) and circadian factors (long endogenous circadian period). Old age was associated with overall problems in the sleep cycle. In sum, these results are in line with a tendency to a shortening of the sleep-wake rhythm with advancing age. Additionally, sleeping difficulties in the elderly are probably also related to age-specific neurological changes leading to more shallow and fragmented sleep. Other age-related factors such as increased frequency of somatic disorders, medication use, and number of daytime naps, reduced level of outdoor light exposure, and social contact, may also contribute to the worsening of sleep with advancing age. An interesting finding was that subjects in the oldest age group had reduced probability of reporting daytime impairment. The discrepancy between sleep obtained and sleep needed was negative for all age-groups (all had sleep debts) but declined with increasing age, a finding suggesting that the elderly have greater opportunities to obtain their sleep need, thus reducing sleep impairment. Other possible explanations are that the elderly have less scheduled responsibilities, putting them in a position where potential daytime impairment does not manifest or that they adjust their expectations toward their sleep in accordance with common age-related sleep changes. In agreement with previous studies, however, age was a strong predictor of hypnotic use.

Socioeconomic Status

In the present study, socioeconomic status below the mean was a predictor of mean sleep onset latency exceeding 30 minutes and early morning awakening. Similar findings have been demonstrated in other epidemiological studies, and probably reflect that disadvantageous social factors (as unemployment and poor living conditions) interfere with sleep. Surprisingly, however, socioeconomic status below mean reduced the probability of dissatisfaction with current sleep.

Physical and Emotional Distress

Consistent with other epidemiological studies, physical symptoms and emotional problems were strongly related to all of the criteria of insomnia, including the use of hypnotic drugs. Thus, somatic and psychiatric health seem to be the best predictors of insomnia. The cause and effect relationship between physical symptoms and psychological problems on the one hand and insomnia on the other is, however, difficult to discern. In many cases, insomnia is probably secondary to emotional and physical disorders. Studies indicate, however, that the cause-effect relationship in some cases may go in both directions, thus implying a relationship of a transactional nature. Such relationships seem to be well documented for the relationship found between depression and insomnia.

Seasonal and Geographic Variation

The final question addressed was related to possible seasonal variations in insomnia symptomatology. The results showed that mean sleep onset latency exceeding 30 minutes, daytime impairment, and the fulfillment of both DMS-IV inclusion criteria were more frequent during winter as compared to summer. This finding is in line with the study of Hushby and Lingjærde, who reported increased prevalence of insomnia during winter, suggesting a phase-delay of the sleep-wake rhythm in winter. As bright light exposure in the morning tends to advance the sleep-wake rhythm, lack of illumination in the morning may cause a relative delay of the sleep phase in subjects with intrinsically long rhythms, thus, increasing the problems of falling asleep during the winter. The prevalence of daytime impairment was also greater in winter compared to summer. Studies have consistently shown that light administered during the dark phases of the day suppresses melatonin and increases alertness, thus, reduction of daytime light in winter may lead to increased melatonin production and reduced alertness. The only main geographic difference found was that use of hypnotics was more common in the southern, compared to the northern, regions, and probably reflects that the access to medical services is more difficult in the latter region. For mean sleep onset latency exceeding 30 minutes and for fulfillment of both DMS-IV inclusion criteria a Season x Region interaction was found, reflecting a decrease of insomnia symptomatology in the North from summer to winter, while the opposite trend was found for the southern regions. As sunset occurrence is late (or not at all when there is midnight sun) in the North during summer, this may indicate that illumination in the night interferes with sleep, a suggestion confirmed in studies with bright light therapy. Overall, these findings may appear incongruent with each other, but are in line with the hypothesis that both darkness during the day and illumination during the night may contribute to insomnia.
Limitations of the Present Study

Although the participation rate of 56.9% in this study is comparable to other epidemiological studies it was relatively low, and might, therefore, make the data and the conclusions less confident. The way insomnia was defined constitutes a departure from the majority of other epidemiological studies by including cut-off points based on specific time estimates. The reason for employing the 30 minutes criteria is that it conforms to the standard criteria employed in definitions of insomnia in ordinary clinical settings as well as to the criteria for clinically significant improvement in insomnia treatment research, thus aiming to make the present study clinically more meaningful.

A concern is, however, the fact that the present study primarily did not include any questions of frequency of nights with insomnia, but rather focused on average values, thus not taking night-to-night variability into account. Additionally, no question about the duration of symptomatology was raised in the survey, thereby precluding distinction among individuals who suffer from acute, short-term, and chronic insomnia. The question of hypnotic usage in this study focused exclusively on prescribed medications. As usage of over-the-counter medications and herbal supplements as sleep aids was not recorded, the prevalence of hypnotic use reported in this study may represent an underestimate of the actual prevalence rate of use of sleep-promoting drugs.

Conclusions

It is concluded that several challenges lie ahead in the investigation of the prevalence of insomnia. A clarification and operationalization of the criteria to define insomnia is strongly recommended. The utility of the criterion of daytime impairment should be the object of research for further studies and warrants theoretical clarification. A major challenge is to obtain consensus about items to be utilized in future epidemiological studies of insomnia. Only then, it seems, would it become meaningful to discuss the actual prevalence of insomnia, and to compare studies across different populations and sub-groups. As surprisingly little is known about the impact of latitude, daytime illumination and dark pulses, as well as season, on the prevalence of insomnia, these issues should receive increased attention from researchers in the future.

ACKNOWLEDGMENTS

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