



## Daylight exposure in the in-door working population in Sweden, relation to sleep, wakefulness and health

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### Introduction

Light exposure regulate our circadian rhythm. Modern life style and lack of light increases circadian misalignment and could be detrimental for health. Researchers have not yet been able to give advice to the society of how much light we need to stay healthy.

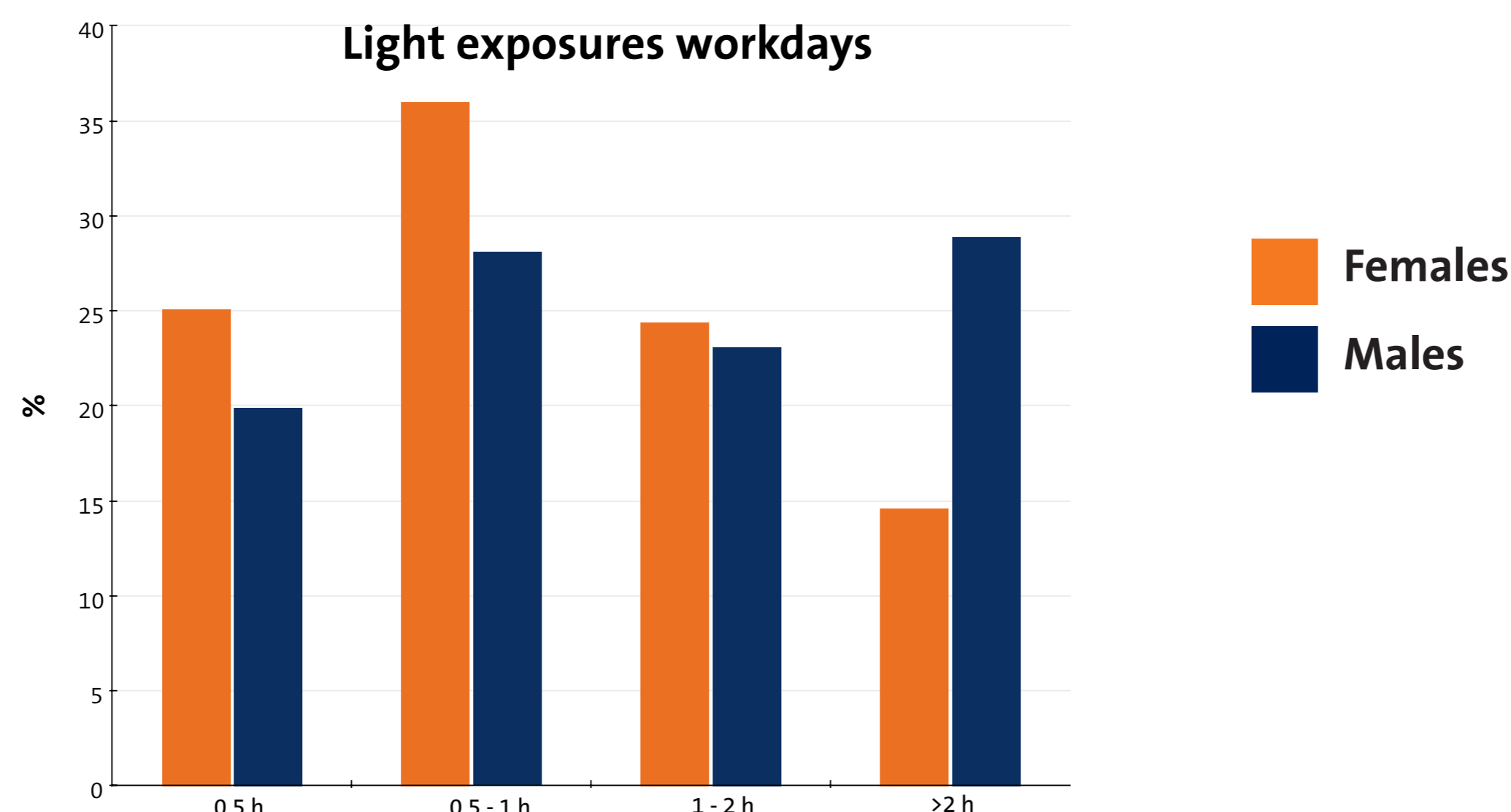
### Methods

Swedish Longitudinal Occupational Survey of Health (SLOSH) of 2012 was analysed. The database included 7324 workers, females (55.8%), mean age =50.1 yrs (range 24-73 yrs).

### Results

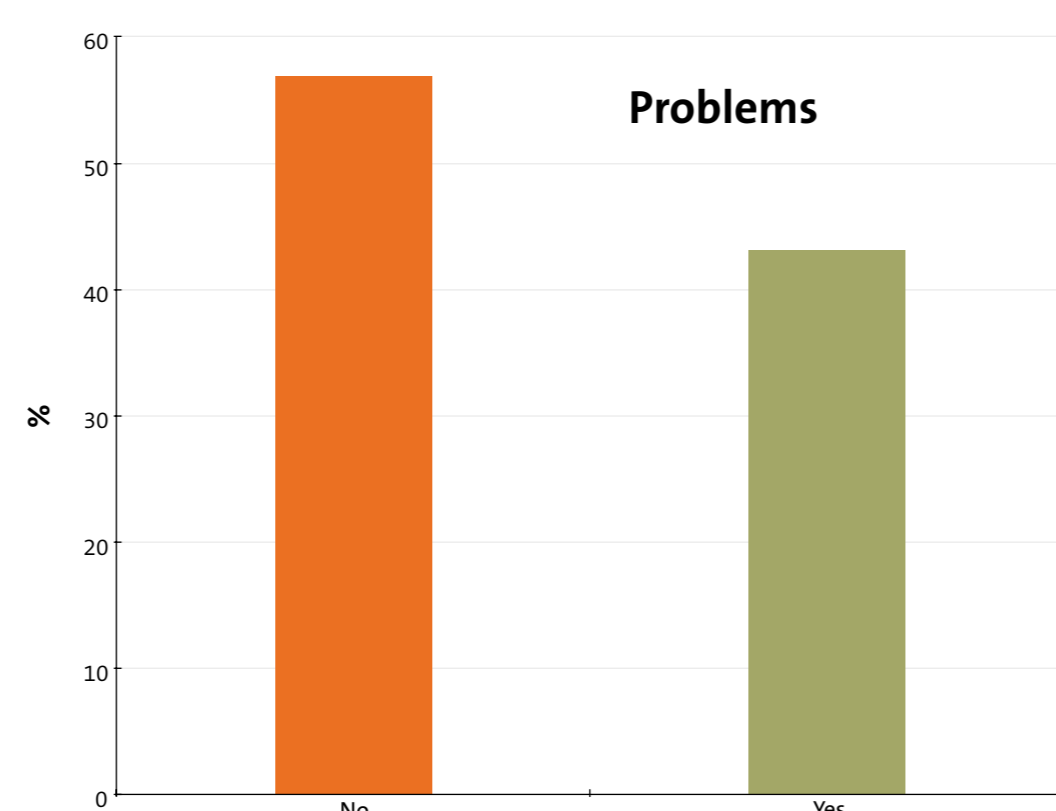
On workdays the reported daylight outdoor exposure in winter was  $\leq 1$  h in 55.3% for in-door workers (Fig.1), exposure being longer in males and increasing by age.

Figure 1



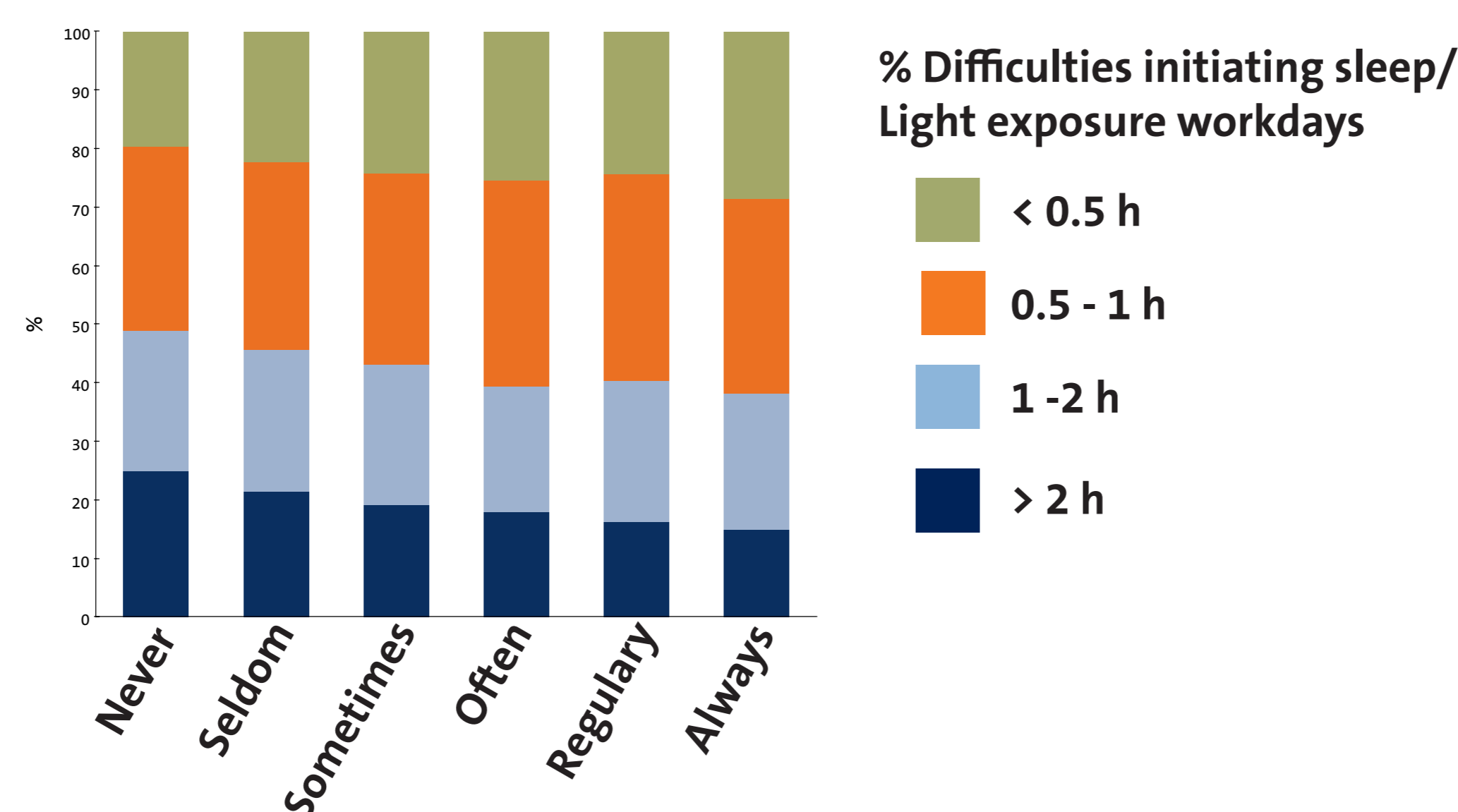
Those having problems with lowered mood, fatigue and lack of energy in autumn/winter amounted to 43.1% (Fig. 2). Of these, 20.9%, reported severe/marked problems.

Figure 2



Light exposure was found to significantly correlate to sleep problems (Karolinska Sleep Questionnaire). This link is shown below for the sleep item “Difficulties initiating sleep”, most problems were found for groups with less natural daylight exposure (Fig. 3).

Figure 3



### Results continued

In a regression model predicting sleep problems (controlling for sex, age and education), several sleep items were found to be related to short light exposure:

- Problems final awakening
- Repeated awakenings
- Non-restorative sleep
- Too early final awakenings
- Upset/worried sleep
- Mental fatigue
- Short sleep

Items not being related to light were snoring, apnoea symptoms, involuntary dozing off and physical fatigue.

The questionnaire also included items on habitual bed times. Short light exposure was associated with a later onset of sleep as well as a later rise time but sleep length was reduced only for groups with very short light exposure (<0.5 h) and long exposure (>2 h).

Self-rated health was particularly low among the group with low daily exposures (<0.5 h).

### Summary

Data demonstrate that short out-door light exposure seem to be related to sleep problems, mental fatigue and lowered general health perception. Sub groups in working life with chronic absence of natural daylight are likely exposed to increased serious health risks.

### Discussion

The questions were posed to cover the Swedish winter (Dec-Feb) when natural daylight exposure is limited. The exposure levels are naturally longer in summer. In total, 9 % of the population reported marked or severe problems with sleep, lowered mood and fatigue. These patterns remained when also considering daylight exposure on free days or combinations of ratings given for both work days and free days. Although significance levels were high, the importance of daylight exposure to explain sleep problems is still marginal since the explained variance ranged from 2.5-5.5 %.