Association of socioeconomic status with sleep disturbances in the Swiss population-based CoLaus study

Silvia Stringhini¹, José Haba-Rubio¹, Pedro Marques-Vidal¹, Gerard Waeber¹, Martin Preisig¹, Idris Guessous¹,², Pascal Bovet¹, Peter Vollenweider¹, Mehdi Tafti³, Raphael Heinzer¹

1. Institute for Social and Preventive Medicine, Center For Investigation and Research In Sleep, Department of Internal Medicine, Department of Psychiatry, Lausanne University Hospital, Lausanne, Switzerland
2. Unit of Population Epidemiology, Geneva University Hospitals, Geneva, Switzerland
3. Centre for Integrative Genomics, Lausanne University, Lausanne, Switzerland
Background

- Insufficient sleep related to increased risk of cardio-metabolic disorders, vehicle accidents, workplace injuries, and poorer cognitive performances and mental health.
- In high income countries, about half of the population reports to suffer from sleep disturbances.
- Common determinants: age, gender, heavy drinking and obesity, stress, anxiety and several psychiatric disorders, low SES.
- Studies on SES and sleep very heterogeneous.
Objectives

1. To assess the association between SES (education and occupational position) and several subjective and objective measures of sleep disturbances

2. To examine whether other socio-demographic, behavioural and psychological factors explain the SES-sleep association
Data

Colaus Study (2003-2006)
- Random sample of the city of Lausanne (N~120,000)
- 6184 participants aged 35 – 75 years

Colaus First Follow-up (2009-2012)
- 5064 participants administered a sleep questionnaire
- 2162 participants underwent a polysomnography
  (Hypnolaus study)
Data

COLAUS STUDY
N=6733
(2003-2006)

COLAUS FOLLOW-UP STUDY
N=5064
(2009-2012)

SUBJECTIVE SLEEP ANALYSES
SLEEP QUESTIONNAIRE
1673 excluded (missing data)
MAIN ANALYSIS ➔ N=3391

OBJECTIVE SLEEP ANALYSES
HYPNOLAUS STUDY (2009-2013)
2162 Colaus follow-up participants
593 excluded (missing data)
MAIN ANALYSIS ➔ N=1569

SUBSET CURRENTLY EMPLOYED
N=2184

SUBSET CURRENTLY EMPLOYED
N=1011
Measures

Socioeconomic indicators:

- **Educational level**: high (tertiary education), middle (upper secondary non tertiary education, including vocational) and low (lower secondary education or lower)
- **Occupational position**: high (entrepreneurs, professionals, higher managers), middle (self-employed, lower managers, skilled clerks) and low (unskilled clerks, farmers, skilled manual workers, unskilled manual workers)

Other factors:

- **Socio-demographic**: age, sex, employment status, marital status and place of birth
- **Behavioural factors**: smoking, heavy drinking, sedentary behaviour, high coffee consumption and obesity
- **Psychological factors (CES-D)**: depression, somatic complaints, depressed affect, positive affect and interpersonal problems
Sleep measures

Subjective evaluation of sleep (questionnaire-based):

- Sleep quality (Pittsburgh Sleep Quality Index)
- Sleep latency (time before falling asleep)
- Sleepiness (Epworth Sleepiness Scale)
- Sleep duration
- Insomnia (sleep latency >30 min OR waking up in the middle of the night or too early in the morning)

Objective evaluation of sleep (polysomnography-based):

- 3051 consecutive CoLaus subjects invited to undergo a complete full night in-home polysomnographic (PSG) recording (HypnoLaus nested study)
- PSG recordings manually scored by trained sleep technicians and reviewed by an expert sleep physician
  - Total sleep time
  - Sleep latency
  - Slow wave sleep
  - Sleep efficiency
  - Stage shifts
Methodology: Poisson regression with robust standard errors

- Model 1 → adjusted for age and use of sleep medications
- Model 2= model 1 + socio-demographic factors
- Model 3= model 1 + behavioral factors
- Model 4= model 1 + psychological factors
- Model 5= Fully adjusted

→ Analysis stratified by sex for subjective sleep analysis and sex-adjusted for objective sleep analysis (smaller N)
### Subjective sleep and risk factors

<table>
<thead>
<tr>
<th></th>
<th>Poor sleep quality</th>
<th>Long sleep latency</th>
<th>Excessive daytime sleepiness</th>
<th>Short sleep duration</th>
<th>Insomnia</th>
<th>Poor sleep quality</th>
<th>Long sleep latency</th>
<th>Excessive daytime sleepiness</th>
<th>Short sleep duration</th>
<th>Insomnia</th>
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</thead>
<tbody>
<tr>
<td><strong>MEN</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Use of sleep medications (Ref. No)</td>
<td>4.10***</td>
<td>4.24***</td>
<td>1.17</td>
<td>1.20*</td>
<td>2.36***</td>
<td>3.45***</td>
<td>3.44***</td>
<td>0.85</td>
<td>1.52***</td>
<td>1.87***</td>
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<tr>
<td>Non-working full-time (Ref. Yes)</td>
<td>1.07</td>
<td>1.61</td>
<td>0.93</td>
<td>0.57***</td>
<td>1.17</td>
<td>1.10</td>
<td>1.16</td>
<td>0.91</td>
<td>0.81*</td>
<td>1.01</td>
</tr>
<tr>
<td>Living alone (Ref. In couple)</td>
<td>1.11</td>
<td>1.42</td>
<td>1.07</td>
<td>0.99</td>
<td>1.03</td>
<td>1.10</td>
<td>1.13</td>
<td>1.03</td>
<td>1.06</td>
<td>1.05</td>
</tr>
<tr>
<td>Not born in CH (Ref. Born in CH)</td>
<td>1.23**</td>
<td>1.94**</td>
<td>1.21</td>
<td>1.24*</td>
<td>1.12</td>
<td>1.12</td>
<td>1.15</td>
<td>1.43*</td>
<td>1.20*</td>
<td>1.07</td>
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<td>Current smoking (Ref. No)</td>
<td>1.03</td>
<td>1.26</td>
<td>1.29</td>
<td>0.99</td>
<td>0.94</td>
<td>1.00</td>
<td>1.04</td>
<td>0.82</td>
<td>1.14</td>
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<tr>
<td>Heavy drinking (Ref. No)</td>
<td>1.23*</td>
<td>1.52</td>
<td>0.81</td>
<td>1.01</td>
<td>1.02</td>
<td>1.18**</td>
<td>0.69</td>
<td>1.81*</td>
<td>1.00</td>
<td>1.15</td>
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<tr>
<td>Sedentary (Ref. Active)</td>
<td>0.94</td>
<td>1.11</td>
<td>0.71*</td>
<td>0.68***</td>
<td>1.13</td>
<td>1.06</td>
<td>1.06</td>
<td>0.89</td>
<td>0.74***</td>
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<td>High coffee consumption (Ref. Low)</td>
<td>1.18</td>
<td>0.61</td>
<td>1.13</td>
<td>1.30</td>
<td>1.13</td>
<td>0.95</td>
<td>1.88*</td>
<td>0.48</td>
<td>1.13</td>
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<td>Obesity (Ref. Normal weight)</td>
<td>1.07</td>
<td>0.90</td>
<td>0.91</td>
<td>1.15</td>
<td>0.94</td>
<td>1.09</td>
<td>1.02</td>
<td>1.02</td>
<td>1.21</td>
<td>1.17</td>
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<tr>
<td>Somatic complaints (Ref. Low)</td>
<td>2.11***</td>
<td>2.07***</td>
<td>1.99*</td>
<td>1.52***</td>
<td>2.09***</td>
<td>1.89***</td>
<td>1.69***</td>
<td>1.89***</td>
<td>1.60***</td>
<td>1.64***</td>
</tr>
<tr>
<td>Depressed affect (Ref. Low)</td>
<td>1.79***</td>
<td>2.29***</td>
<td>2.11***</td>
<td>1.18</td>
<td>1.67***</td>
<td>1.54***</td>
<td>1.32</td>
<td>1.76***</td>
<td>1.30**</td>
<td>1.28***</td>
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<tr>
<td>Dist. interpersonal rel. (Ref. Low)</td>
<td>1.43***</td>
<td>1.76*</td>
<td>1.79***</td>
<td>1.05</td>
<td>1.47***</td>
<td>1.29***</td>
<td>1.34</td>
<td>1.61**</td>
<td>1.09</td>
<td>1.16</td>
</tr>
<tr>
<td>Positive affect (Ref. High)</td>
<td>1.58***</td>
<td>1.89**</td>
<td>1.46*</td>
<td>1.07</td>
<td>1.39***</td>
<td>1.60***</td>
<td>1.50*</td>
<td>1.59**</td>
<td>1.22**</td>
<td>1.32***</td>
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<tr>
<td>Depression (Ref. No)</td>
<td>1.98***</td>
<td>1.97**</td>
<td>1.73***</td>
<td>1.29**</td>
<td>1.90***</td>
<td>1.70***</td>
<td>1.40</td>
<td>1.73**</td>
<td>1.45***</td>
<td>1.48***</td>
</tr>
</tbody>
</table>
Subjective sleep and SES

Adjustment for socio-demographic, behavioural and psychological factors did not change these associations.
Objective sleep and SES

- **Sleep efficiency**
  - Education: p=0.019
  - Occupation: p=0.038

- **Total sleep time**
  - Education: p=0.732
  - Occupation: p=0.941

- **Sleep latency**
  - Education: p=0.940
  - Occupation: p=0.155

- **Stage shifts**
  - Education: p=0.047
  - Occupation: p=0.003

- **Slow wave sleep**

**High** | **Middle** | **Low**
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Discussion

- Both subjectively and objectively measured sleep disturbances are related to low SES
- Association of SES with sleep disturbances was particularly strong for occupational position
- Association of SES with sleep disturbances only marginally explained by socio-demographic, behavioural and psychological factors
Discussion

- 30% of men and 40% of women had poor sleep quality, and approximately one out of three participants reported short sleep duration and/or insomnia.

- Gender, marital status and psychological factors associated to sleep disturbancies but not behavioural factors.

- Low occupational position strongly associated with all sleep disorders; association particularly evident in women.

  - Job-related psychosocial stress related to poor sleep and more common among people with a low occupational position.
  - People with a low occupational position potentially more exposed to shift work which is known to affect circadian rhythms.
  - Working women with low occupational position may particularly suffer from the combination of work and family responsibilities, with negative consequences on sleep.
Discussion

- Social differences in sleep disturbances only marginally accounted for by social variations in socio-demographic, behavioural and psychological factors
  - These factors only moderately associated with sleep outcomes
  - Other important factors such as job characteristics, shift work, stress, family commitments, and financial difficulties not assessed

- Results from sleep questionnaire and PSG consistent in indicating higher burden of sleep disturbances in low SES individuals
  - SES differences in sleep duration among women in subjective evaluations but not in PSG
  - PSG analysis conducted in men and women together, subjective evaluation of sleep influenced by underlying psychological/health characteristics potentially patterned by SES, PSG conducted during a single night
Strengths & limitations

Strengths
- Population-based study
- Two indicators of SES assessed in relation to several sleep outcomes
- One of the first studies to additionally use objectively measured sleep disturbances

Limitations
- Low participation rate in the Colaus study (40%)
- Population further reduced because of missing values
- Objective measurements of sleep only available for a sub-sample
- Important factors potentially affecting sleep not assessed in the study
Implications

- Raise awareness among health practitioners about the higher prevalence of sleep disturbances among socioeconomically disadvantaged individuals

- Further research on the role of other potential mediators of the SES-sleep such as job characteristics (including workload, shift-work, and work-family demand) and psychological and financial stress

- Further research is needed to establish the extent to which social differences in sleep contribute to explain socioeconomic differences in health