

# Effects of sleep changes on pain-related health outcomes in the general population: A systematic review of longitudinal studies with exploratory meta-analysis.

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## INTRODUCTION

Emerging longitudinal research has highlighted poor sleep as a risk factor of a range of adverse health outcomes, including disabling pain conditions.

In establishing the causal role of sleep in pain, it remains to be clarified whether sleep deterioration over time is a driver of pain onset and, importantly, whether sleep improvement over time can prevent or mitigate pain related outcomes.

## METHODS

16 relevant articles were identified from a systematic literature search was performed using PubMed MEDLINE, Ovid EMBASE, and Proquest PsycINFO, to identify longitudinal studies that evaluated the effect of sleep changes (simulating sleep deterioration, sleep stability or sleep improvement over time) on subsequent pain related outcomes in the general population.

Fig. 1 Flowchart of study selection

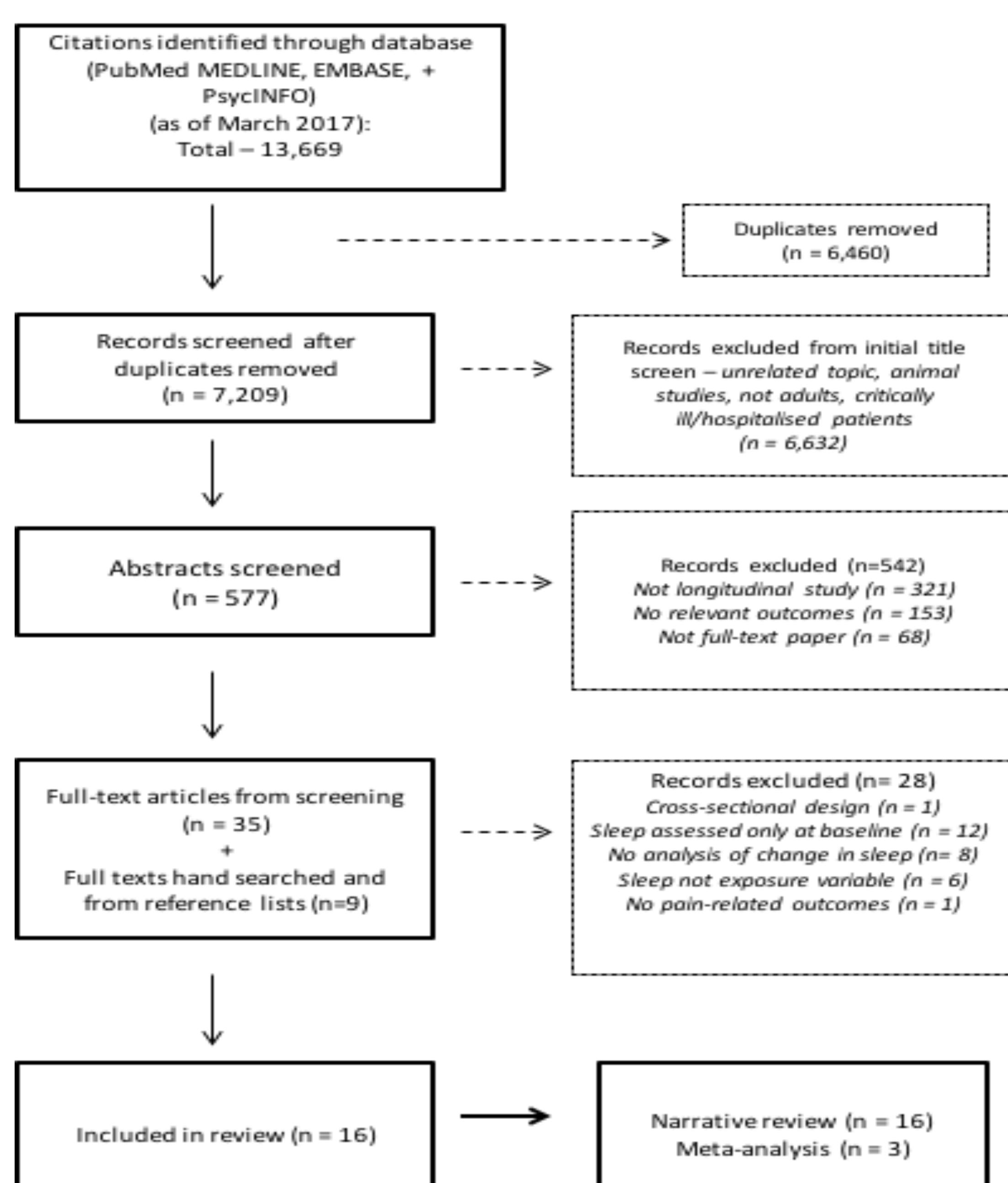
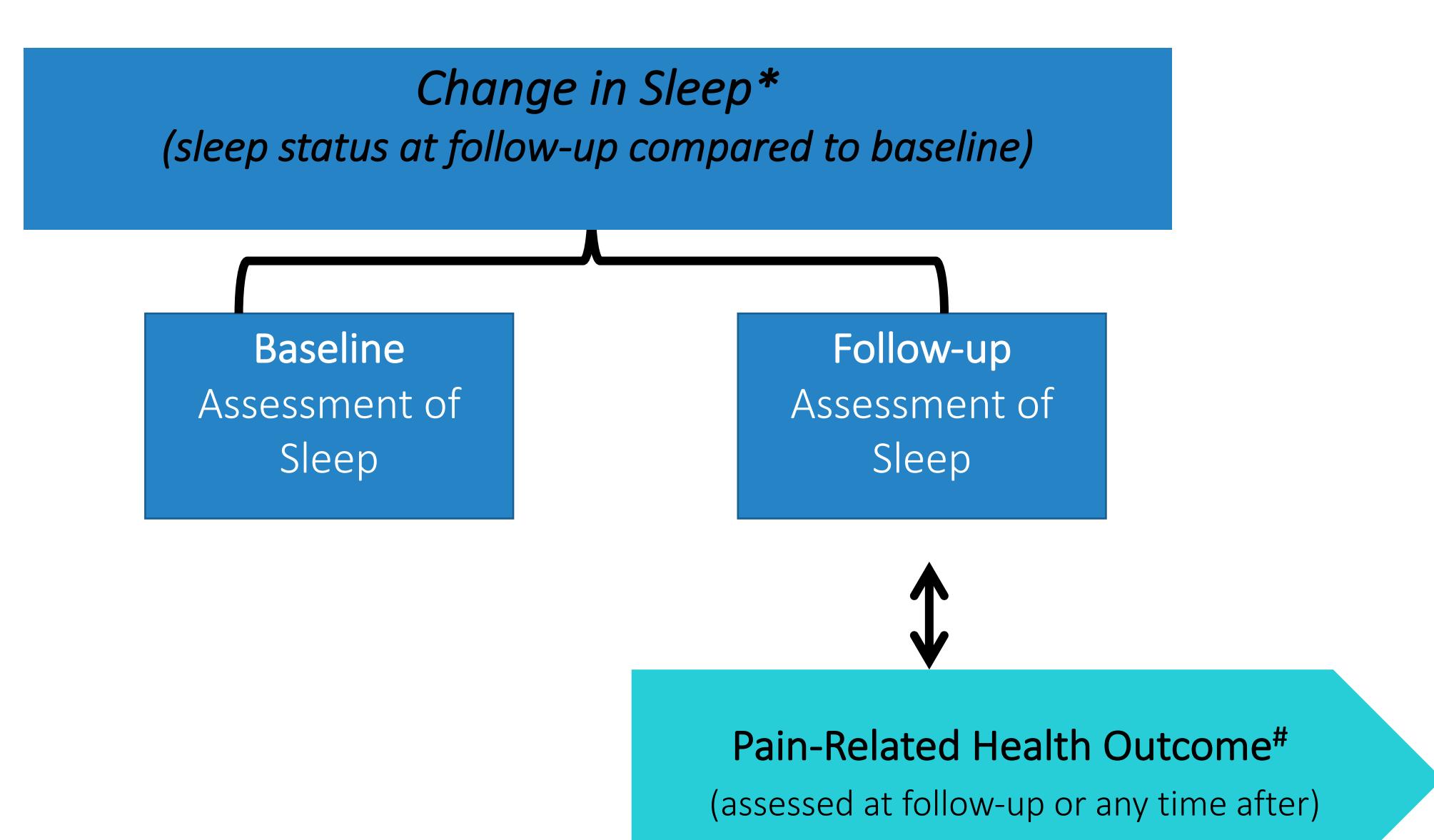


Fig. 2. Methodology design for included studies.



## RESULTS

16 prospective cohort studies from 9 countries involving a total of 61,100 participants recruited from the general community (female %: 50% - 100%; mean age: 30 – 80+ years). The length of follow-up ranged from 1 month to 23 years, with a median follow-up period of 4.5 years.

### Changes in sleep and subsequent risk of developing pain conditions

Increase in insomnia symptoms associated with a two- to three-fold increase in risk of subsequently developing a pain condition

### Changes in sleep and subsequent inflammatory or immune function biomarkers

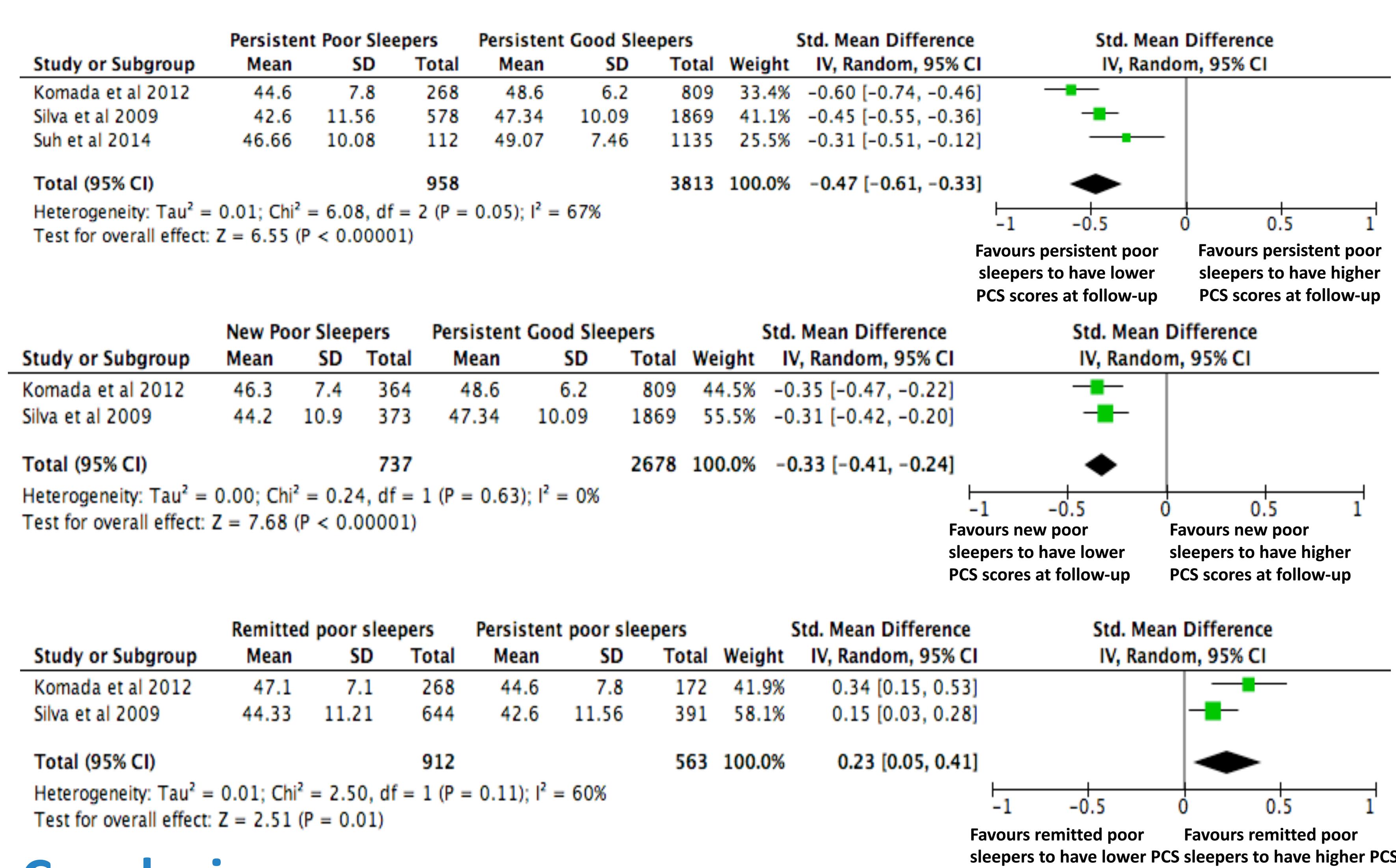
Reduction in sleep quantity associated with an aggravation of pain-related inflammatory and immunological processes, as indicated by natural killer cell activity (NKCA), C-reactive protein (CRP), Interleukin-6 (IL-6), and cortisol levels.

### Changes in sleep and subsequent subjective reports of pain related health status

Worsened sleep quality over time associated with a decline in subjective physical health status, as measured with the 36-item Short From Health Survey (SF-36).

### Meta-analysis: Effect of sleep changes on subjective pain-related health status (Physical Component Summary [PCS] scores from SF-36).

Persistent poor sleepers and those who developed poor sleep reported worse perceived physical functioning (lower PCS scores) at follow-up. Poor sleepers whose sleep problems remitted reported better functioning (higher PCS scores).



## Conclusions

Findings suggest a negative effect of sleep deterioration over time on both objective and subjective pain related health outcomes in the general population. Insufficient evidence to suggest a clear positive effect of sleep improvement.

Examining change in sleep provides another step in establishing the causal relationship between sleep and pain-related factors.

## Future research agenda

Experimental and longitudinal studies to verify the causal links and temporal relationship between sleep, inflammatory processes, and the experience of pain.

Assessment of the potential effectiveness of public health interventions that aim to improve pain and quality of life via promoting sleep.

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\*Change in sleep refers to change in (i) sleep duration, (ii) sleep quality, and/or (iii) insomnia symptoms. #Pain-related health outcome refers to (i) measures indicative of pain conditions or symptoms, (ii) established biomarkers, and/or (iii) subjective health status.