

sleep loss + obesity

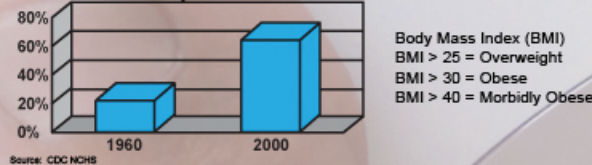
Interacting epidemics?

Nearly two thirds of US adults are overweight and approximately one third are obese. While most Americans are aware of the obesity epidemic, it is less well known that we are also experiencing an epidemic of chronic sleep deprivation. The percentage of adults who reported sleeping 6 hours or less jumped from approximately 20% of the population in 1985 to 25% of the population in 2004 across all age groups.¹ In another study by Bonnet and Arand, they concluded that significant sleep loss exists in one-third or more of normal adults.²

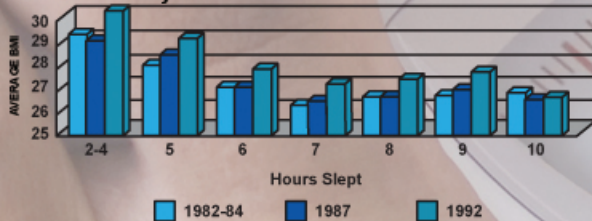
As the public health community grapples to identify factors that are contributing to the obesity epidemic beyond diet and exercise, researchers in sleep medicine are finding evidence that sleep deprivation contributes to increased body mass and obesity. The emerging research suggests that the importance of sleep in maintaining a healthy weight has been underestimated by both the public and health officials alike.

To address this issue of sleep loss and obesity, the National Sleep Foundation (NSF), ILSI North America, and the Atlanta School of Sleep Medicine hosted a two-day scientific workshop in Washington, DC in 2006. Participants included a multidisciplinary group of researchers and federal officials with expertise in obesity, sleep medicine and public health.

Percent of US Population with BMI >25



NHANES I Analysis



Sleep Deprivation Affects Body Mass Index

The hypothalamus and nearby structures in the central nervous system control sleep, circadian rhythms and body weight regulation. Because these systems are intertwined, dysfunction in one system can disrupt function in others.



Altered Endocrine System

Partial sleep deprivation disrupts endocrine and metabolic function. Sleep deprivation raises levels of ghrelin, a hunger-stimulating hormone and decreases levels of leptin, a hunger-suppressing hormone.³ Ghrelin affects the central nervous system by acting through a series of centrally-controlled changes in energy metabolism. In addition, ghrelin circuits in the CNS are intertwined with circadian and sleep regulation circuits.⁴



"While there is a growing awareness among some sleep, metabolic, cardiovascular, and diabetes researchers that insufficient sleep could be leading to a cascade of disorders, few in the general medical profession or in the public have yet made the connection."

Fred W. Turek, PhD, Northwestern University

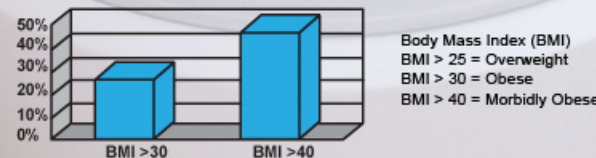
Circadian Control of Sleep and Energy Balance

The master circadian clock is in the suprachiasmatic nucleus and regulates the 24 hour sleep-wake cycle. Researchers have recently found evidence that the circadian clock is regulating more than just the timing of metabolic or energy balance rhythms. This has been discovered by the examination of mice that have mutations in the "Clock" genes of the circadian clock. The researchers were originally looking for disruptions in the sleep-wake cycle when they noticed the Clock mutant mice were on average 10% heavier. They also found changes in lipid profiles and metabolic parameters (glucose and leptin). With an increase in leptin you find an increase in insulin resistance, which has implications for diabetes. This led them to conclude that disrupting the total amount of sleep affected metabolism. Further research revealed that increased body weight and altered metabolic parameters in non-mutant mice likewise altered sleep time.⁵

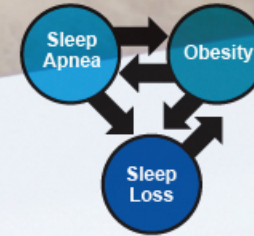
Obesity as a Risk Factor for Obstructive Sleep Apnea

Obesity is a risk factor for obstructive sleep apnea (OSA). OSA is a serious condition in which the airway collapses repetitively during sleep. It is usually indicated by loud snoring, pauses in breath and gasping for breath while sleeping. It has been estimated that more than 50% of OSA is directly related to excess weight.⁶

Percent of Obese People with Sleep Apnea



Sleep Apnea and Obesity as Bidirectional Risk Factors for Each Other and Sleep Loss



Chronic Sleep Loss as a Risk Factor for Cardiovascular and Other Disease

While obesity is a risk factor for obstructive sleep apnea (OSA), OSA contributes to cardiovascular disease. Systemic hypertension has been reported in up to 50% of patients with OSA.⁷ In addition, cardiac arrhythmias such as bradyarrhythmias and arterial fibrillation have been associated with OSA.⁸



Conclusions

- Some research has shown an association between chronic sleep loss and obesity, insulin resistance and cardiovascular disease.
- Circadian dysregulation leads to disease and metabolic dysfunction
- Circadian clocks are in every cell of the body.

Future Challenges

- A balanced, multi-disciplinary, integrated approach that targets the individual, the environment and society is needed to successfully reverse the trend of increased body weight.
- The importance of sufficient and restorative sleep must be made a priority for the public, medical community and public health professionals to more successfully combat the obesity epidemic.
- Funding must be made available for further study of the health consequences of sleep loss and sleep deprivation including public surveillance studies to better quantify the magnitude of the problem.
- The importance of sleep should be raised to the same level of importance as diet and exercise in a new triumvirate for good health and well-being.

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