

Safety and Health: The Role of Sleep and Circadian Rhythms

Kathryn J. Reid PhD
Northwestern University
Department of Neurology, Feinberg School of Medicine
Center for Sleep and Circadian Biology
Transportation Center

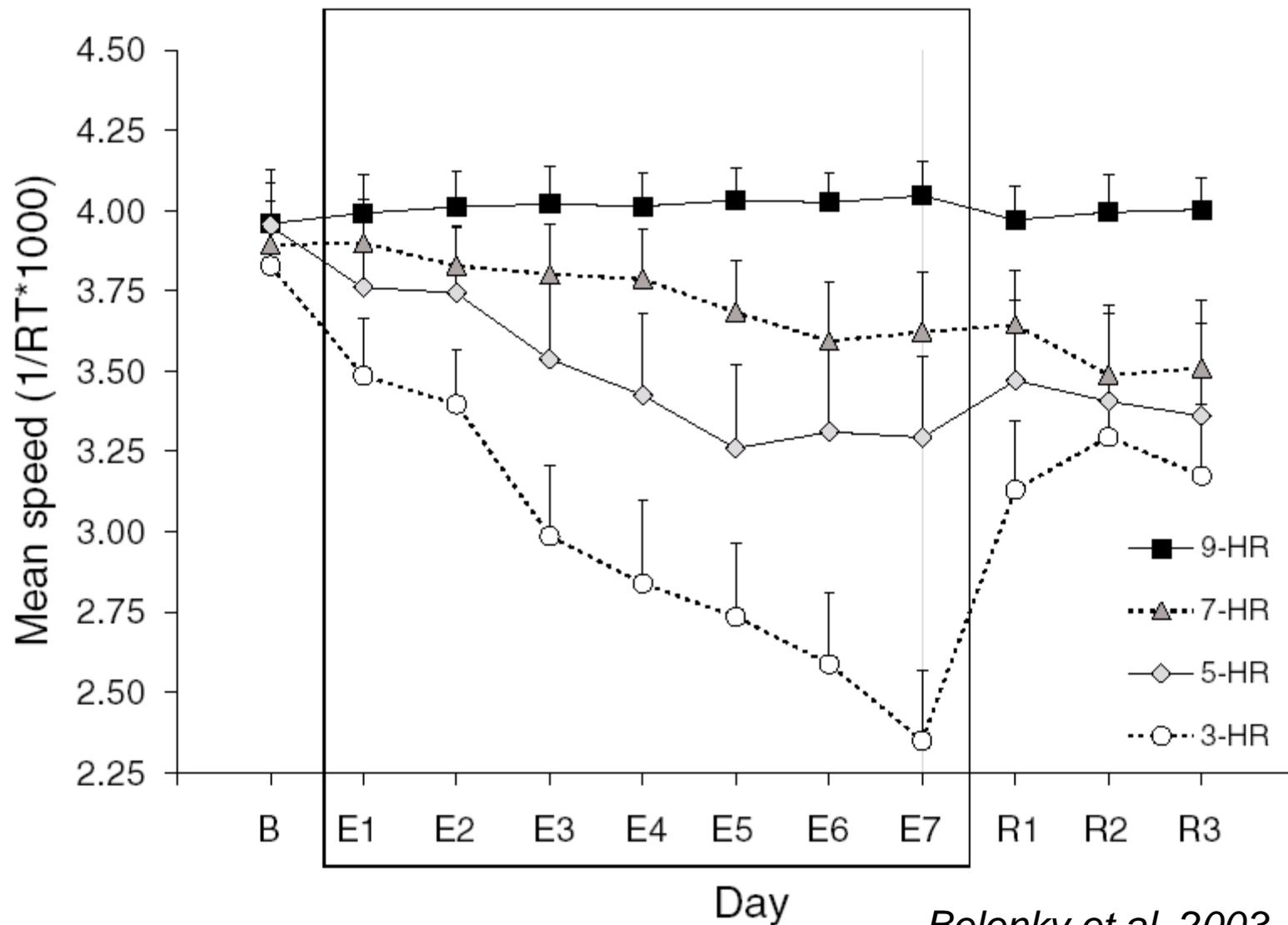


Giugno-Luglio 99 ~~June~~ July 99

How tired is too tired?

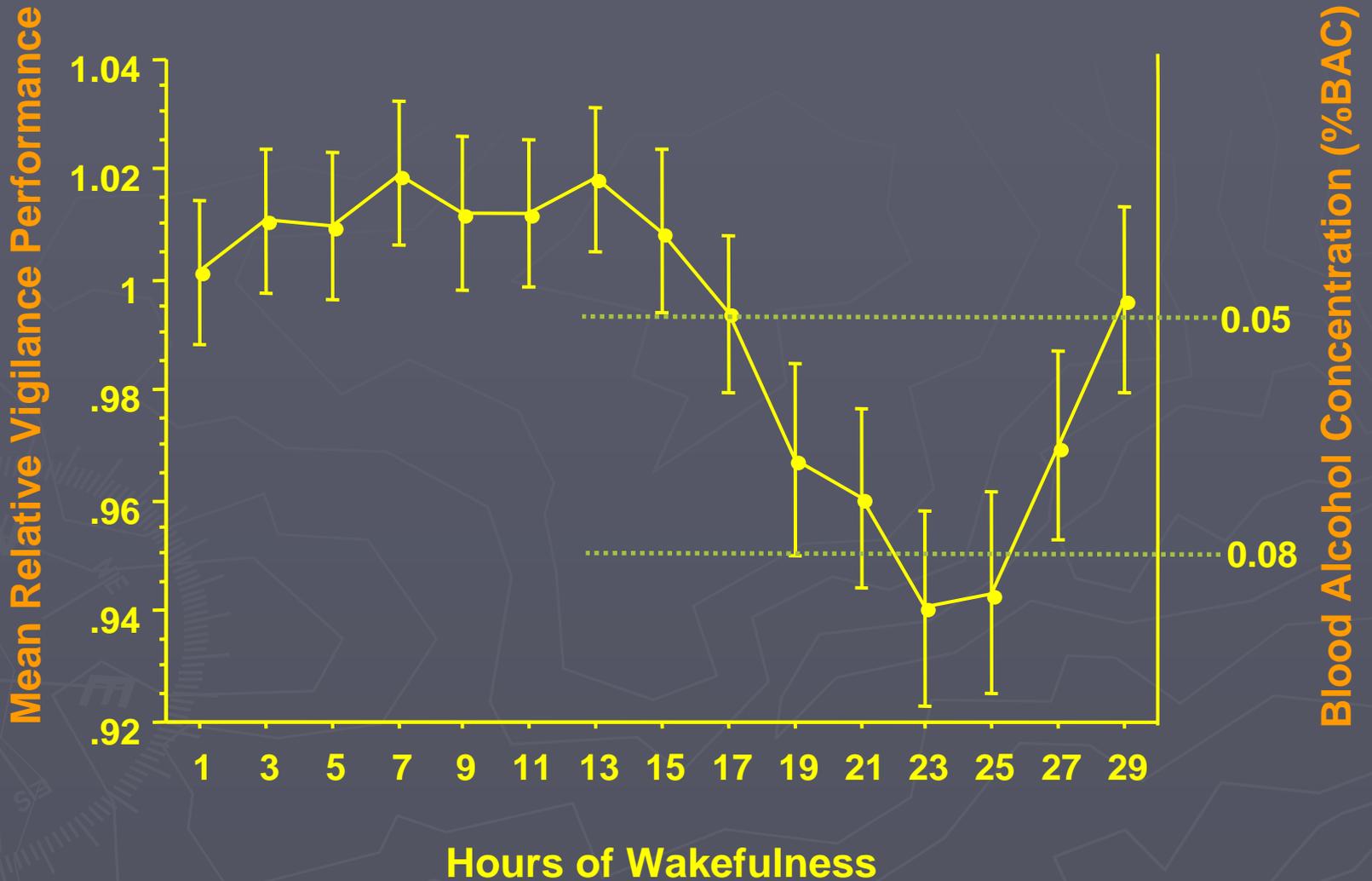
F A I D

Partial Sleep Debt: Impact on Performance

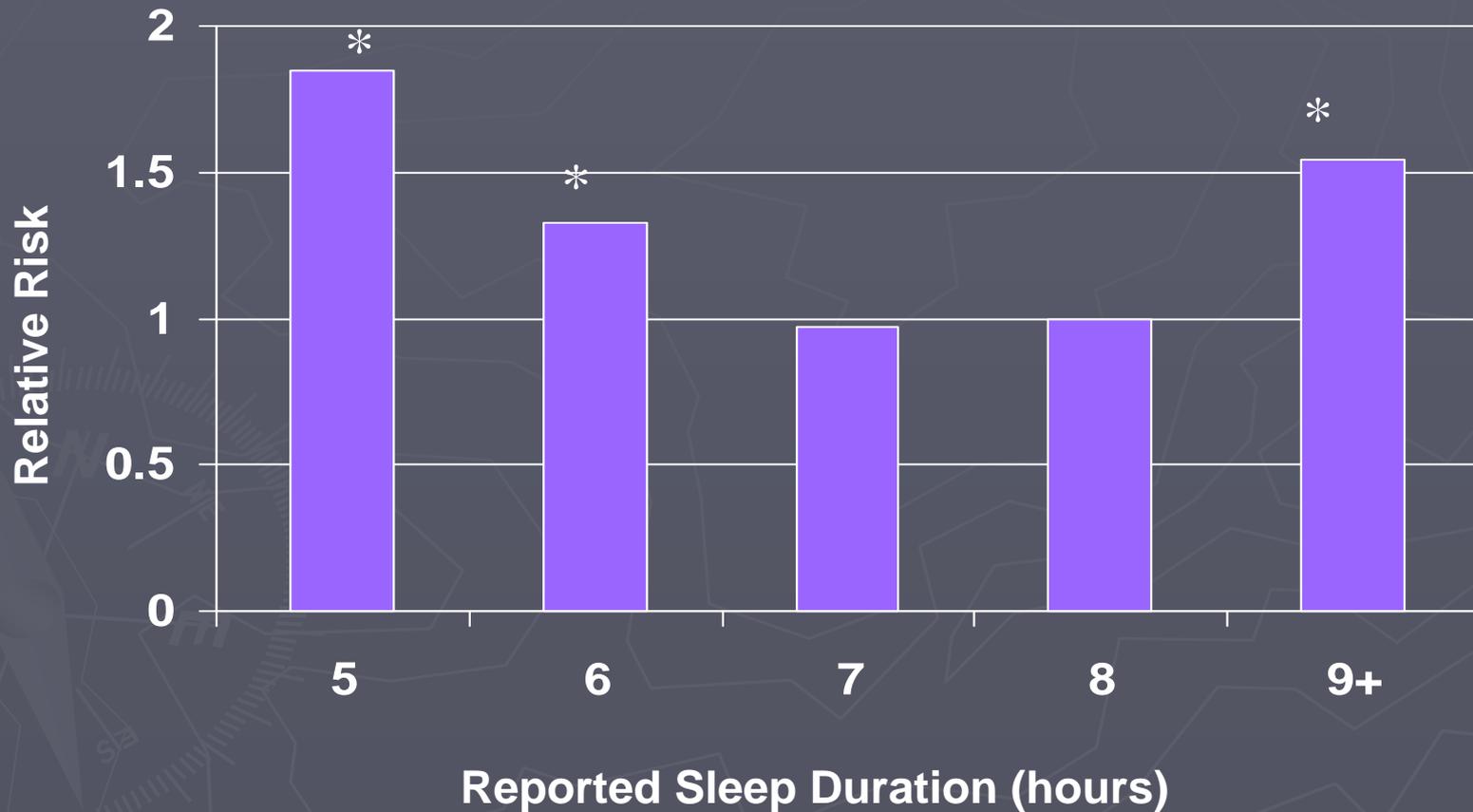


Belenky et al, 2003

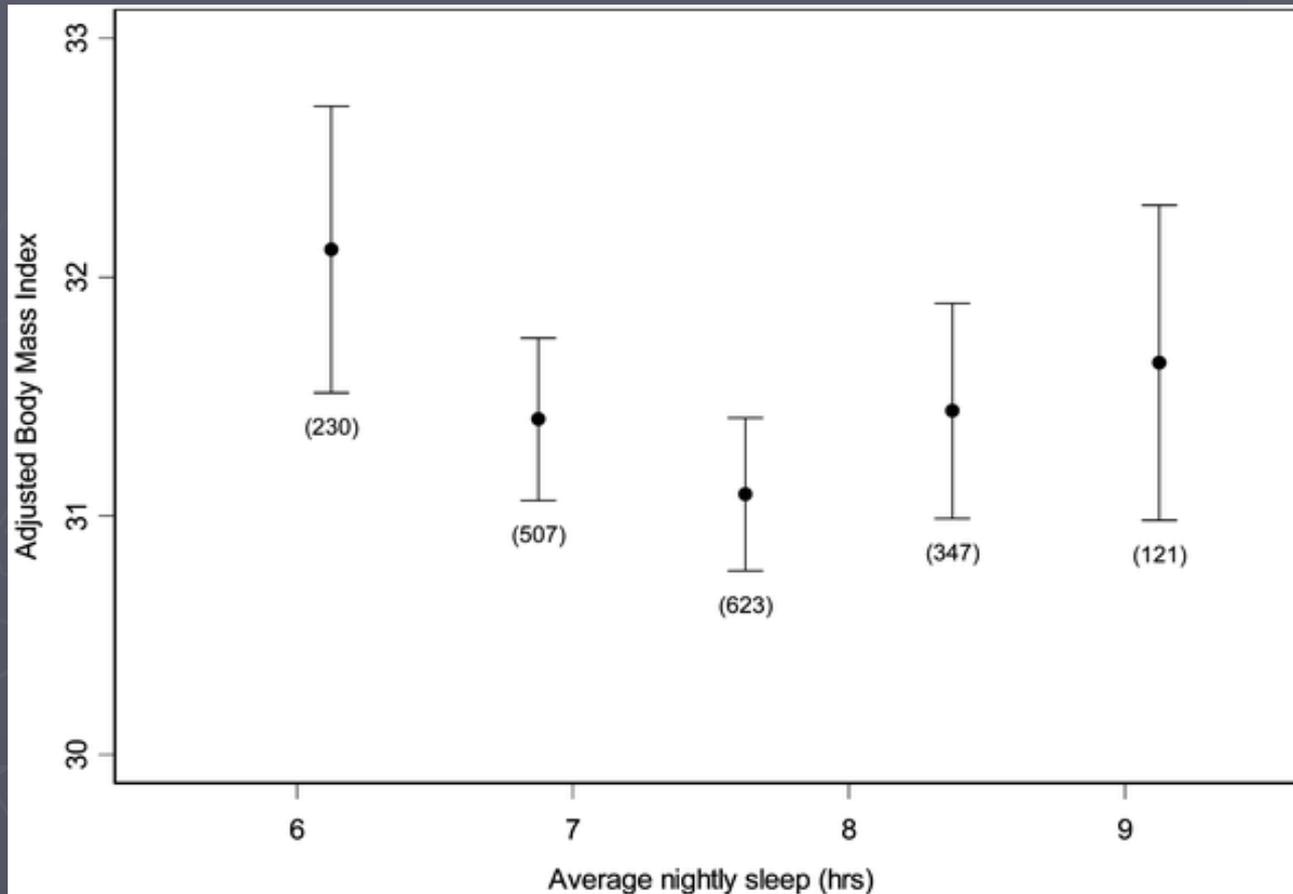
Expressing The Performance Impairment Due to Fatigue as a Blood Alcohol Equivalent



Age-adjusted Relative Risks of Symptomatic Diabetes (1187 cases)



Sleep duration and body mass index



Low leptin associated with short sleep

Taheri et al, 2004 PLoS

Wisconsin Sleep Cohort Study

National Sleep
Foundation
IISI North America

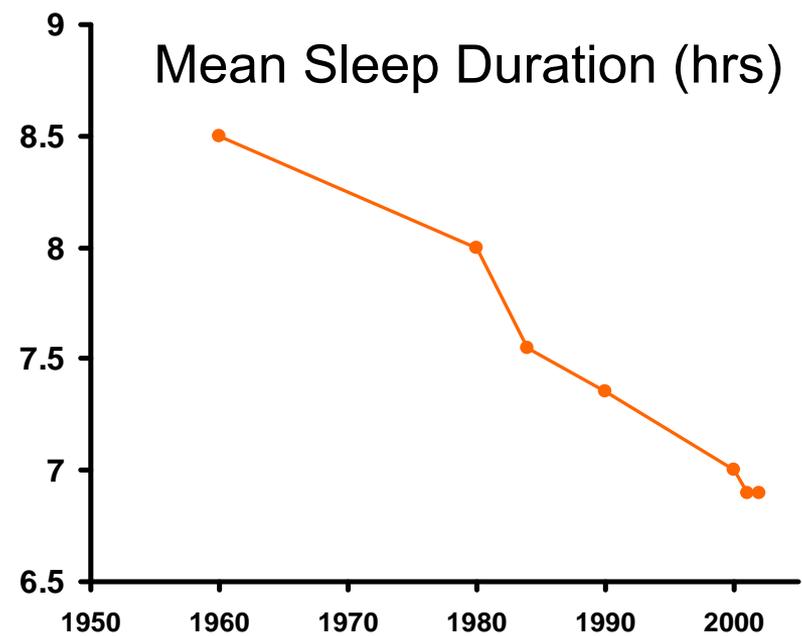
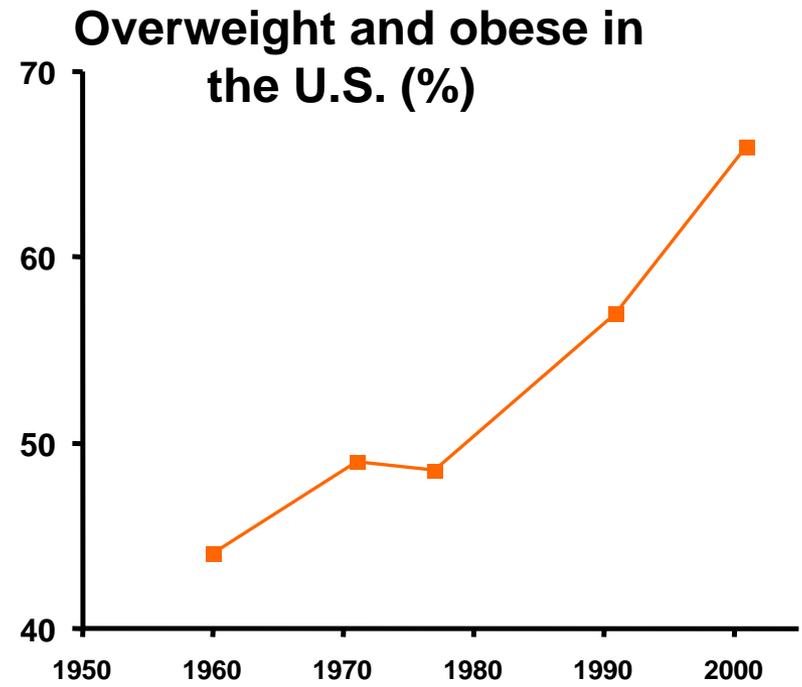
Sleep Loss and Obesity: Interacting Epidemics

March 28, 2006

SOURCES

Obesity: CDC (NHES, NHANES)

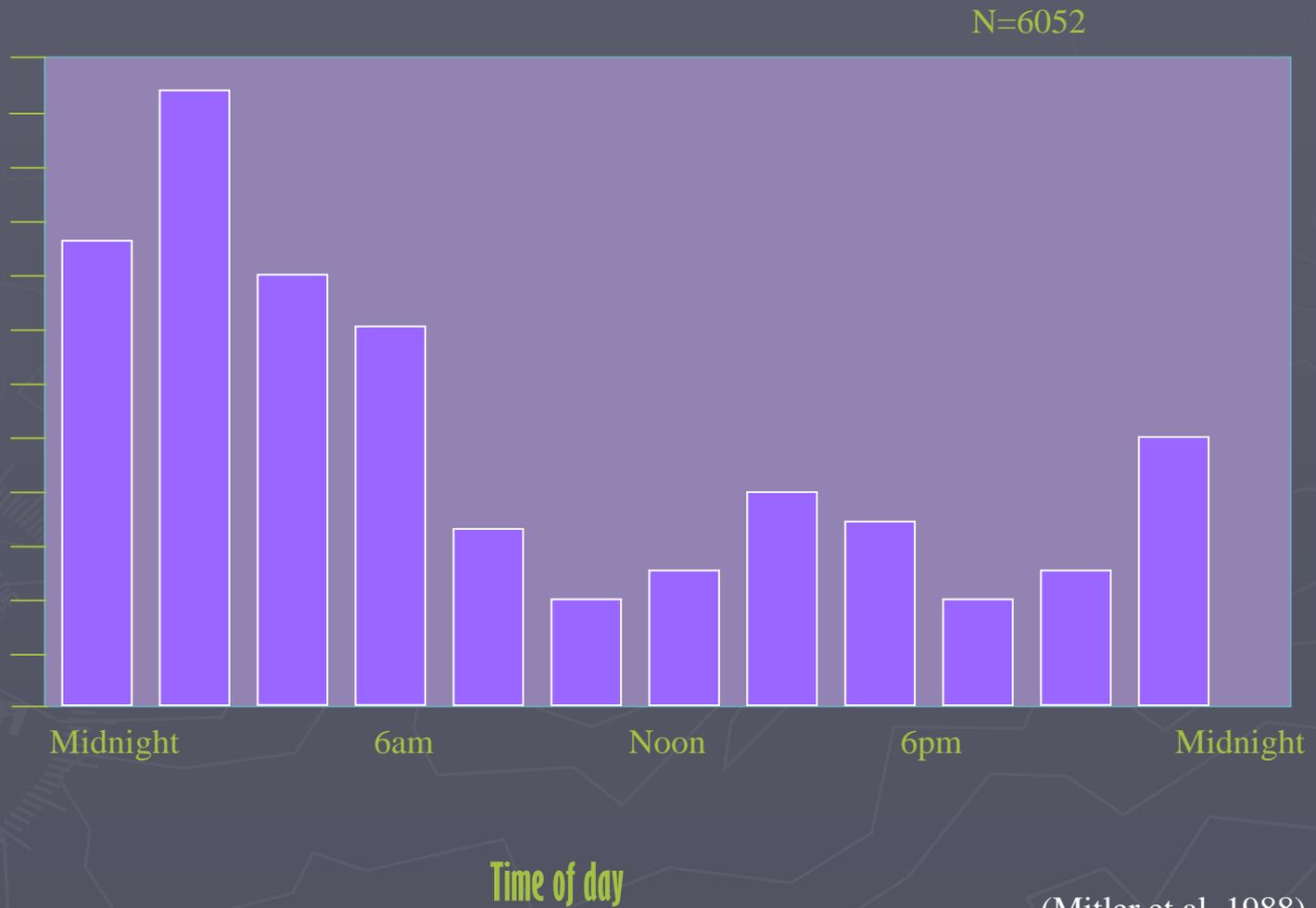
Sleep: Roffwarg *Science* 1966, NHIS (unpublished data), National Sleep Foundation polls, Hale *J Public Health* 2005



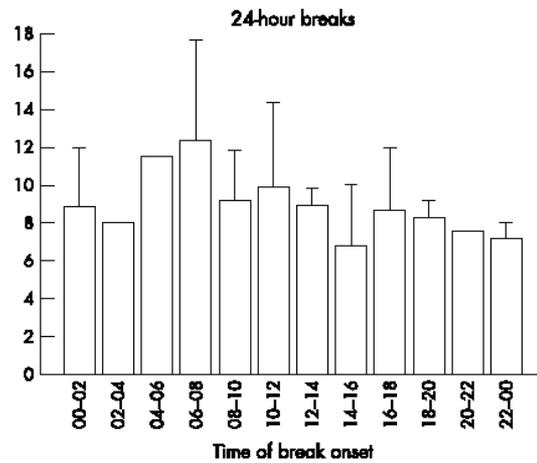
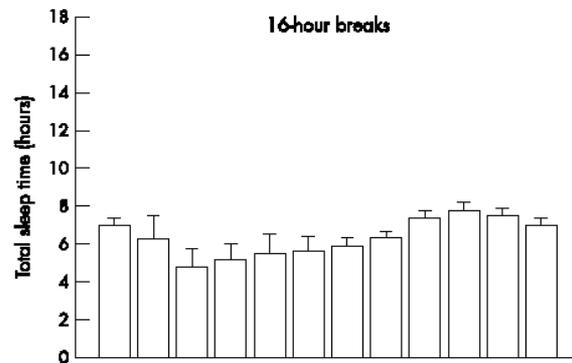
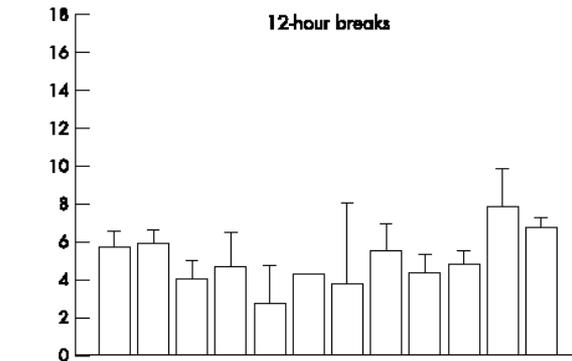
Safety and Health

- ▶ Short sleep duration (6 hours or less) and circadian disruption are associated with poor performance, cardio-metabolic health outcomes and reductions in mood.
- ▶ Short sleep duration can be due to any number of reasons including: inadequate sleep opportunity, sleep disorders or sleeping at a sub-optimal circadian time of day (shift work, "social jet lag").

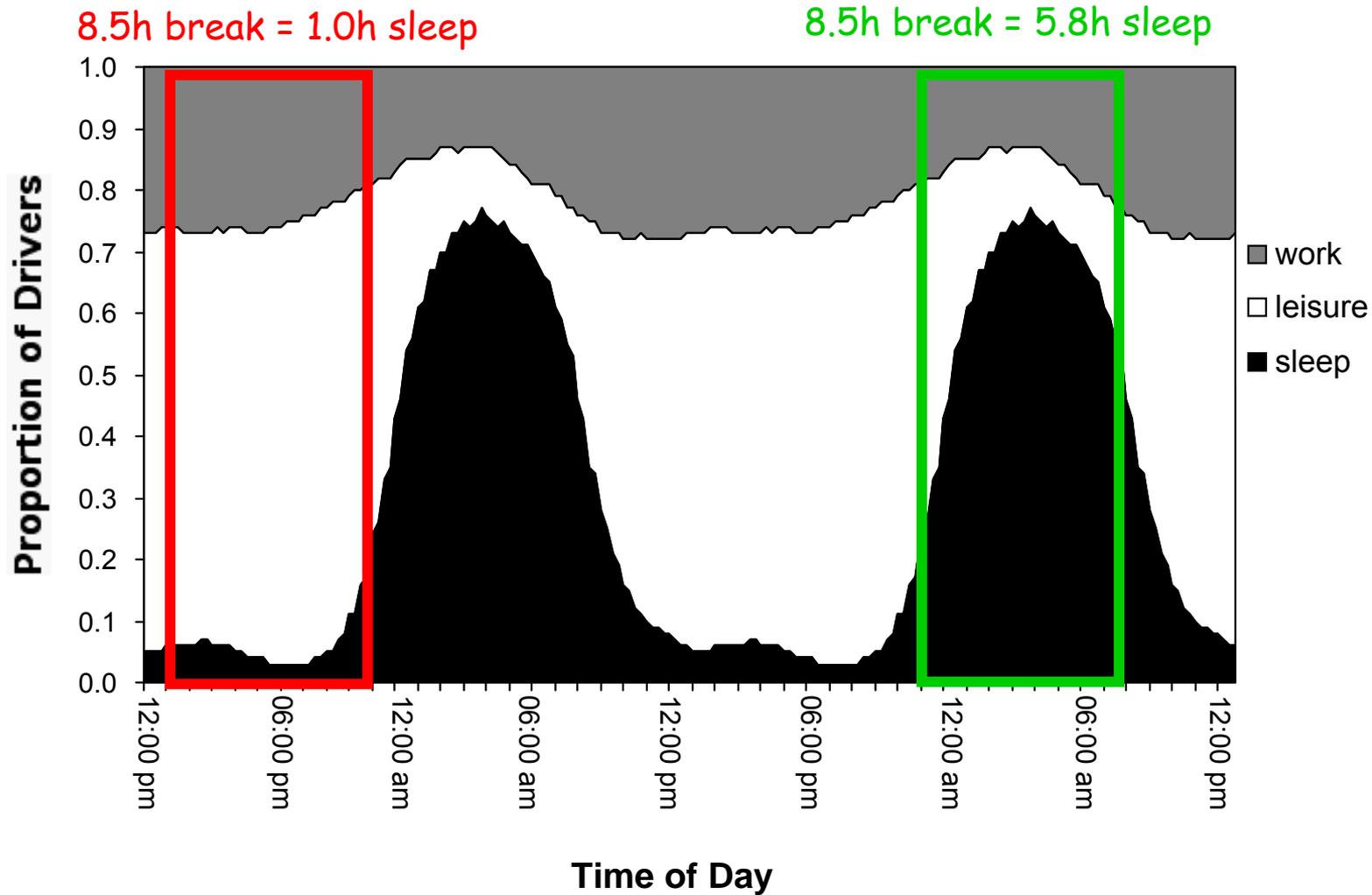
Fatigue-related Accidents



(Mitler et al. 1988)



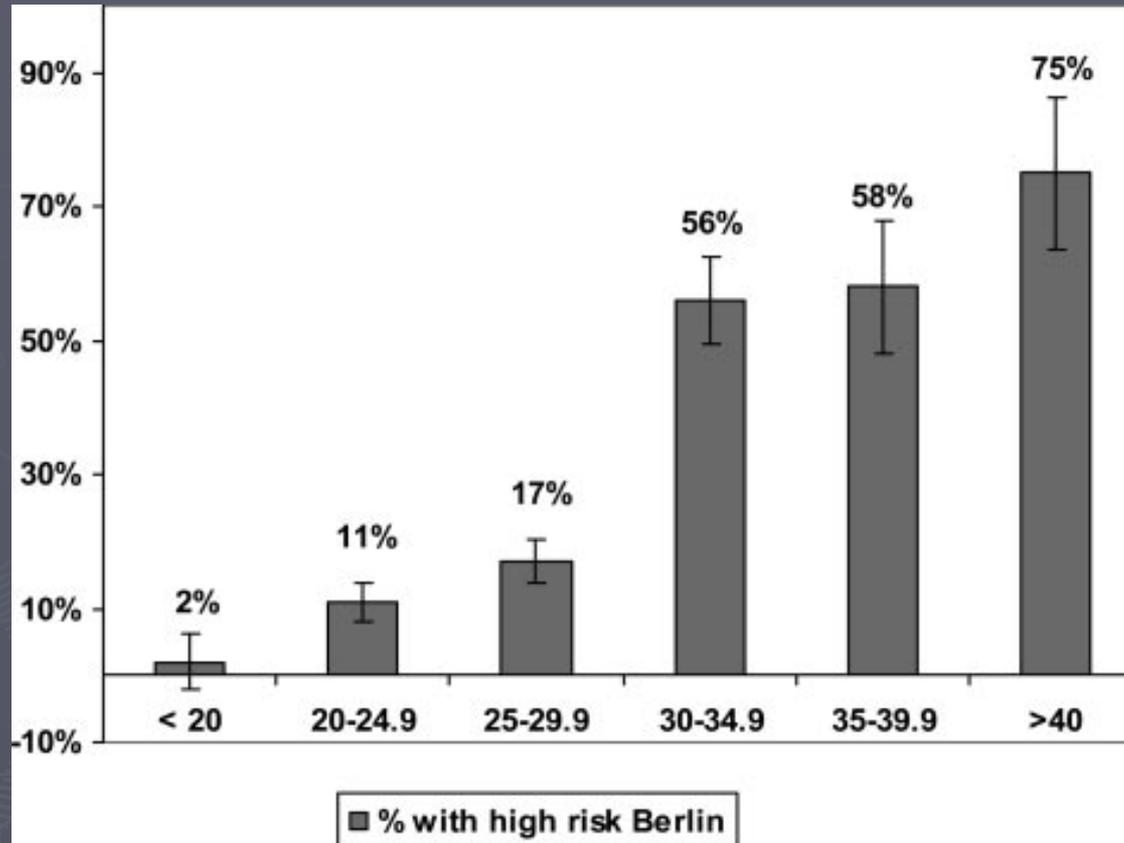
Timing & Duration of Breaks Influences Sleep Duration



Impact of Shift Work on Health

- ▶ Higher body mass index
- ▶ Increased risk of cancer
- ▶ Increased metabolic dysfunction (e.g. type II diabetes)
- ▶ Increase risk of cardiovascular disease
- ▶ Circadian rhythm sleep disorder: Shift Work Disorder
- ▶ Increase in gastrointestinal and reproductive disorders

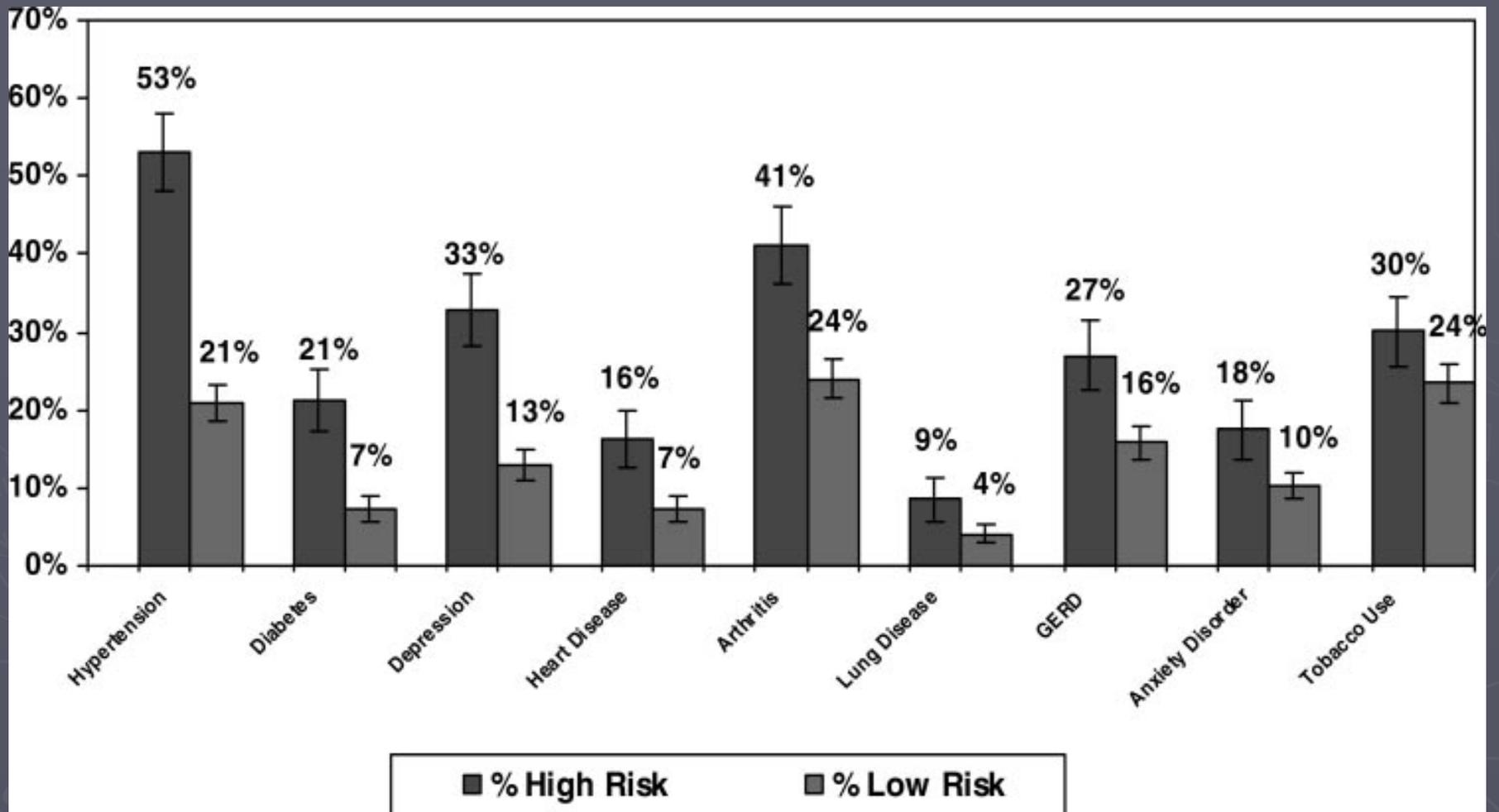
Risk for Obstructive Sleep Apnea by Body Mass Index



Prevalence of positive Berlin questionnaire scores by BMI.

(Hiestand et al. 2006).

Risk for Obstructive Sleep Apnea and Prevalence of Chronic Illness



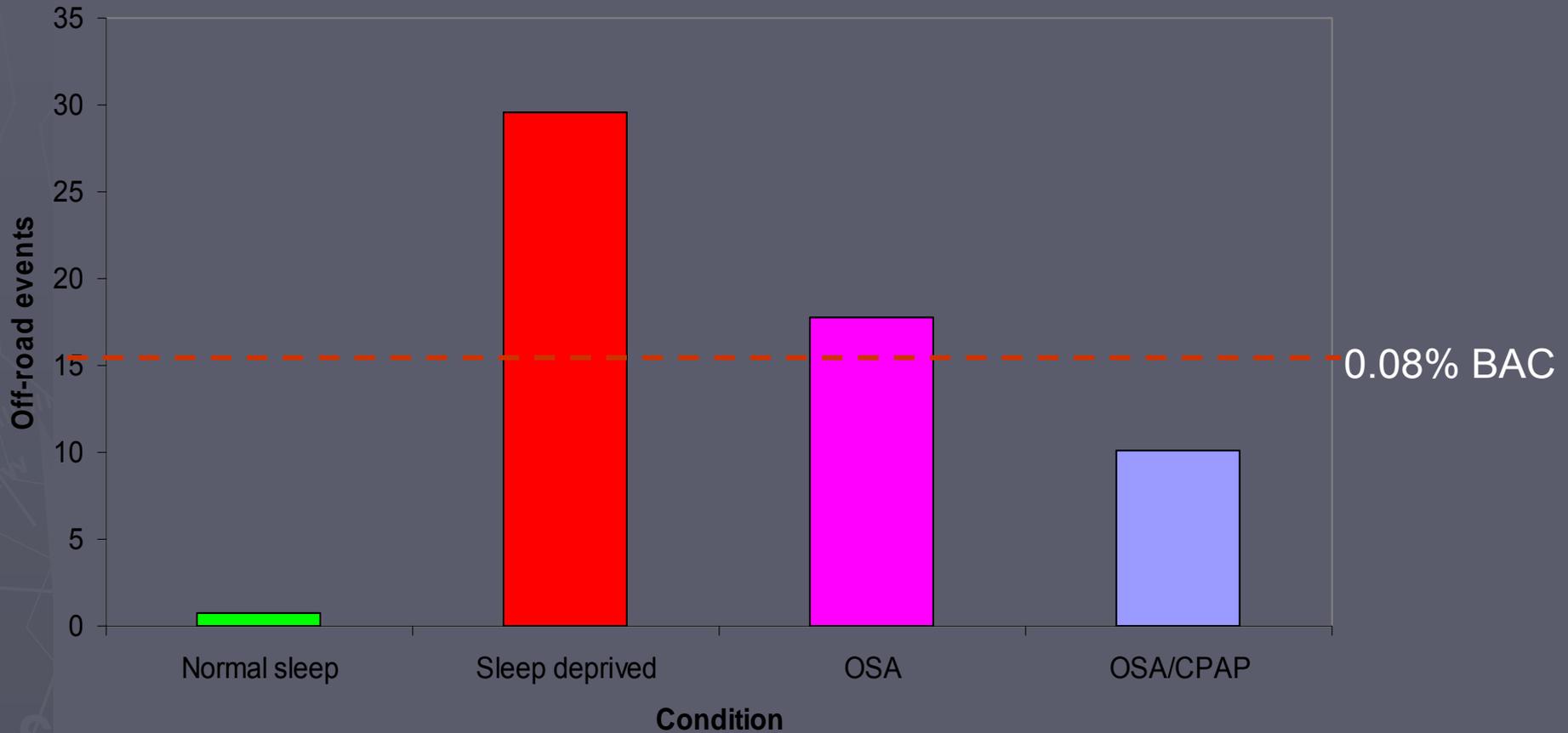
Prevalence of chronic illnesses among individuals with high-risk Berlin questionnaire score. Individuals were asked, "Have you ever been told by a doctor that you have any of the following medical conditions.

(Hiestand et al. 2006).

Body Mass Index (BMI)

- ▶ There is discussion in some sectors of the transportation industry, in particular trucking, that are suggesting that anyone with a BMI of greater than 35 kg/m² be automatically referred for evaluation by a sleep specialist to determine whether they have obstructive sleep apnea.

Obstructive Sleep Apnea Off-road events



Acute sleep deprivation 24hrs

Adapted from Hack et al. (2001)